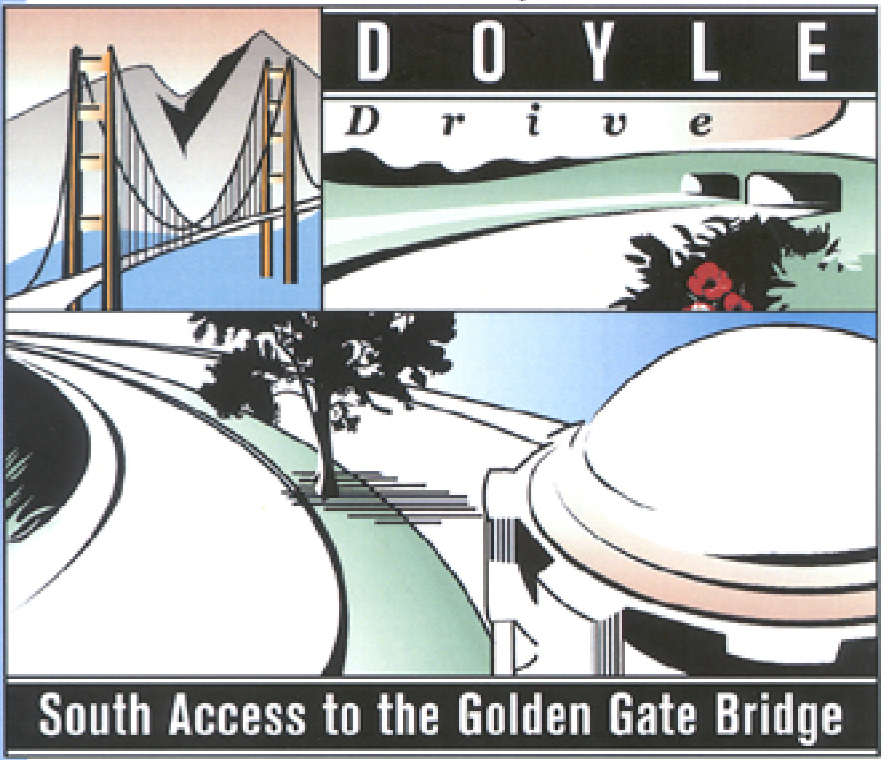
SFCTA Contract Number 99/00-7



FINAL TRAFFIC AND TRANSIT OPERATIONS REPORT

December 2004

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1.0 INTRODUCTION

This report summarizes the traffic and transit operations analyses for the South Access to the Golden Gate Bridge - Doyle Drive Project. The project alternatives were analyzed to determine how well they accommodate future traffic operations or affect transportation circulation using state of the practice methods and criteria.

This report describes the methodologies used, the existing condition in Year 2000, and the future operations in the design year (2030/2032) for each project alternative for the following four types of transportation elements:

- Traffic
- Transit
- Pedestrians and Bicycles
- Construction Period Traffic

1.1 PROJECT DESCRIPTION

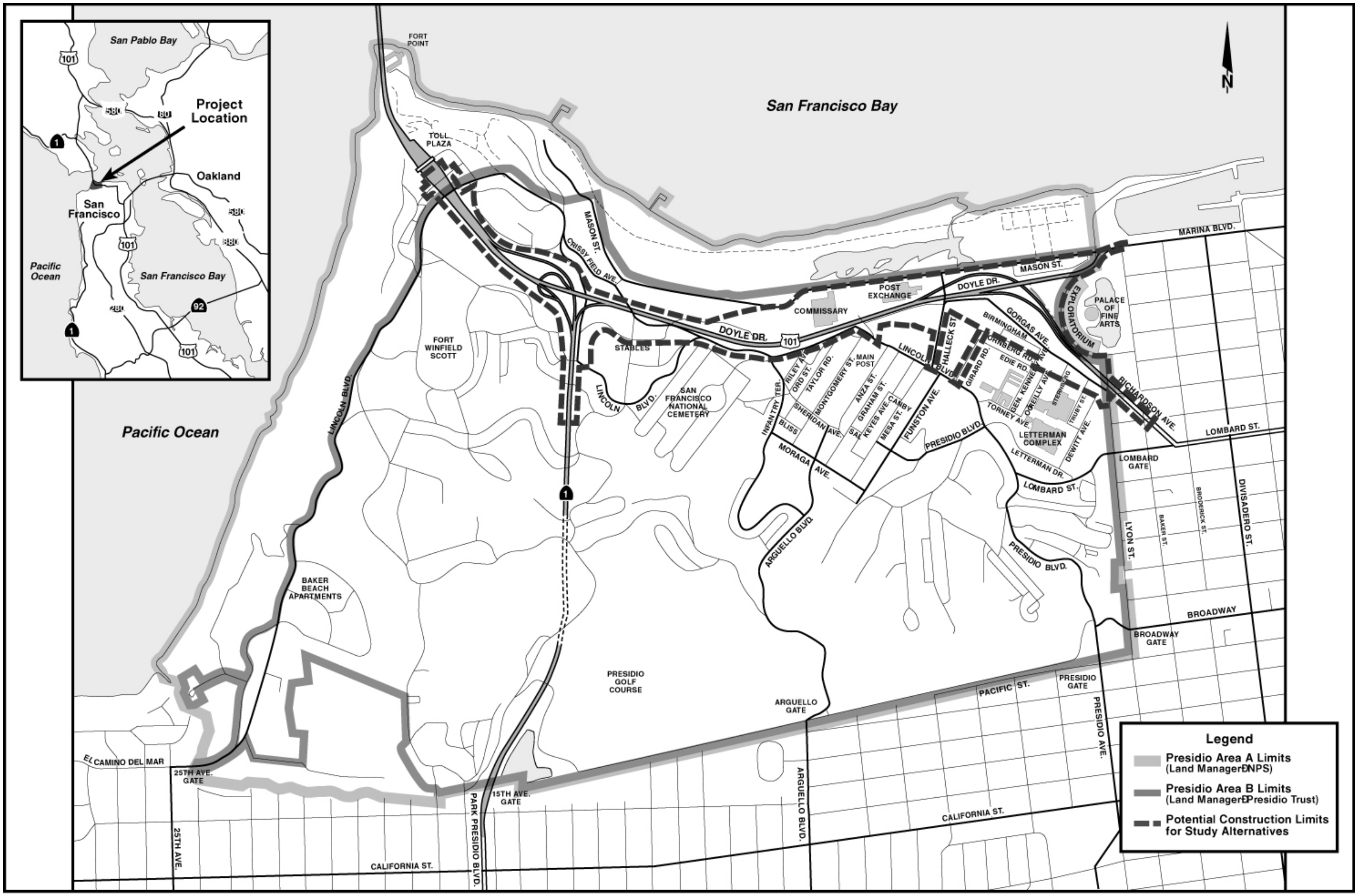
Doyle Drive is located in the Presidio of San Francisco (the Presidio), in the northern part of the City of San Francisco at the southern approach to the Golden Gate Bridge (see Figure 1.1-1). In 1994, when the US Army transferred jurisdiction of the Presidio to the National Park Service (NPS), it became part of the National Park system and Golden Gate National Recreation Area (GGNRA). In 1998, management of the Presidio was divided between two federal agencies: The Presidio Trust (the Trust), the agency responsible for oversight of 80 percent of the Presidio delineated as Area B; and the NPS, which is responsible for management of the coastal portions of the park (the remaining 20 percent) that are delineated as Area A. Doyle Drive lies predominately within the Area B lands managed by the Trust with a small portion at the western end located in Area A on land operated by the Golden Gate Bridge, Highway and Transportation District (GGBHTD). The Presidio has also been designated a National Historic Landmark District (NHLD) since 1962 with the Doyle Drive roadway determined to be a contributing element to that landmark.

Doyle Drive, the southern approach of US 101 to the Golden Gate Bridge, is 2.4 kilometers (1.5 miles) long with six traffic lanes. There are three San Francisco approach ramps which connect to Doyle Drive: one beginning at the intersection of Marina Boulevard and Lyon Street; one at the intersection of Richardson Avenue and Lyon Street; and one where Park Presidio Boulevard (State Route 1) merges into Doyle Drive approximately 1.6 kilometers (one mile) west of the Marina Boulevard approach (see Figure 1.1-1). Doyle Drive passes through the Presidio on an elevated concrete viaduct (low-viaduct) and transitions to a high steel truss viaduct (high-viaduct) as it approaches the Golden Gate Bridge Toll Plaza.

Doyle Drive is nearly 70 years old and it is approaching the end of its useful life, although regular maintenance, seismic retrofit, and partial rehabilitation activities are keeping the structure safe in the short term. However, further structural degradation caused by age and the effects of heavy traffic and exposure to salt air will cause the structures to become seismically and structurally unsafe in the coming years. In addition, the eastern portion of the aging facility is located in a potential liquefaction zone identified on the State of California Seismic Hazard Zones map dated August 2000.

Currently, Doyle Drive has nonstandard design elements, including travel lanes from 2.9 to 3.0 meters (9.5 to 10.0 feet) in width, no fixed median barrier, no shoulders and exit ramps that have tight turning radii. During peak traffic hours, plastic pylons are manually moved to provide a median lane as well as to reverse the direction of traffic flow of several lanes (Project Study Report: Doyle Drive Reconstruction, 1993).

FIGURE 1.1-1
PROJECT LOCATION



1.1.1 Project Purpose

The purpose of the South Access to the Golden Gate Bridge - Doyle Drive Project is to replace Doyle Drive in order to improve the seismic, structural, and traffic safety of the roadway within the setting and context of the Presidio of San Francisco and its purpose as a National Park.

1.2 ALTERNATIVES THAT ARE BEING CONSIDERED

The build alternatives for the Doyle Drive Project were developed with input from public scoping and reflected the parkway concept that evolved from previous studies. Through the screening analysis, six alternatives were selected for consideration in the Administrative DEIS/DEIR: Alternative 1, No-Build; Alternative 2, Replace and Widen; Alternatives 3a and 3b, Long Tunnels; and Alternatives 4a and 4b, Short Tunnels.

Subsequent to the Administrative DEIS/DEIR in 2002, a fifth alternative, the Presidio Parkway, was added to the list of alternatives for more detailed study. In comparison to the tunnel alternatives it was determined that Alternative 5, Presidio Parkway, would provide all the benefits and functions of Alternatives 3a, 3b, 4a, and 4b with less cost, construction duration and environmental impact. Hence, in November 2003 the four tunnel alternatives were recommended to be removed from further consideration and analysis in the DEIS/DEIR.

At a public meeting held in February 2004, the public agreed with the decision to drop Alternatives 3a, 3b, 4a, and 4b and retain Alternative 1, No-Build, Alternative 2, Replace and Widen, and Alternative 5, Presidio Parkway for consideration in the DEIS/DEIR.

This section describes the build alternatives in terms of physical and operating characteristics and a No-Build Alternative. As shown in Figure 1.1-1, the project limits are from Merchant Road, just south of the Golden Gate Bridge Toll Plaza, to the intersection of Richardson Avenue/Francisco Street and Marina Boulevard/Lyon Street. During the screening process, all alternatives were evaluated for their ability to meet the project's Purpose and Need. Detailed drawings showing the plan and profile of each alternative in addition to the various design options can be found in Appendix A.

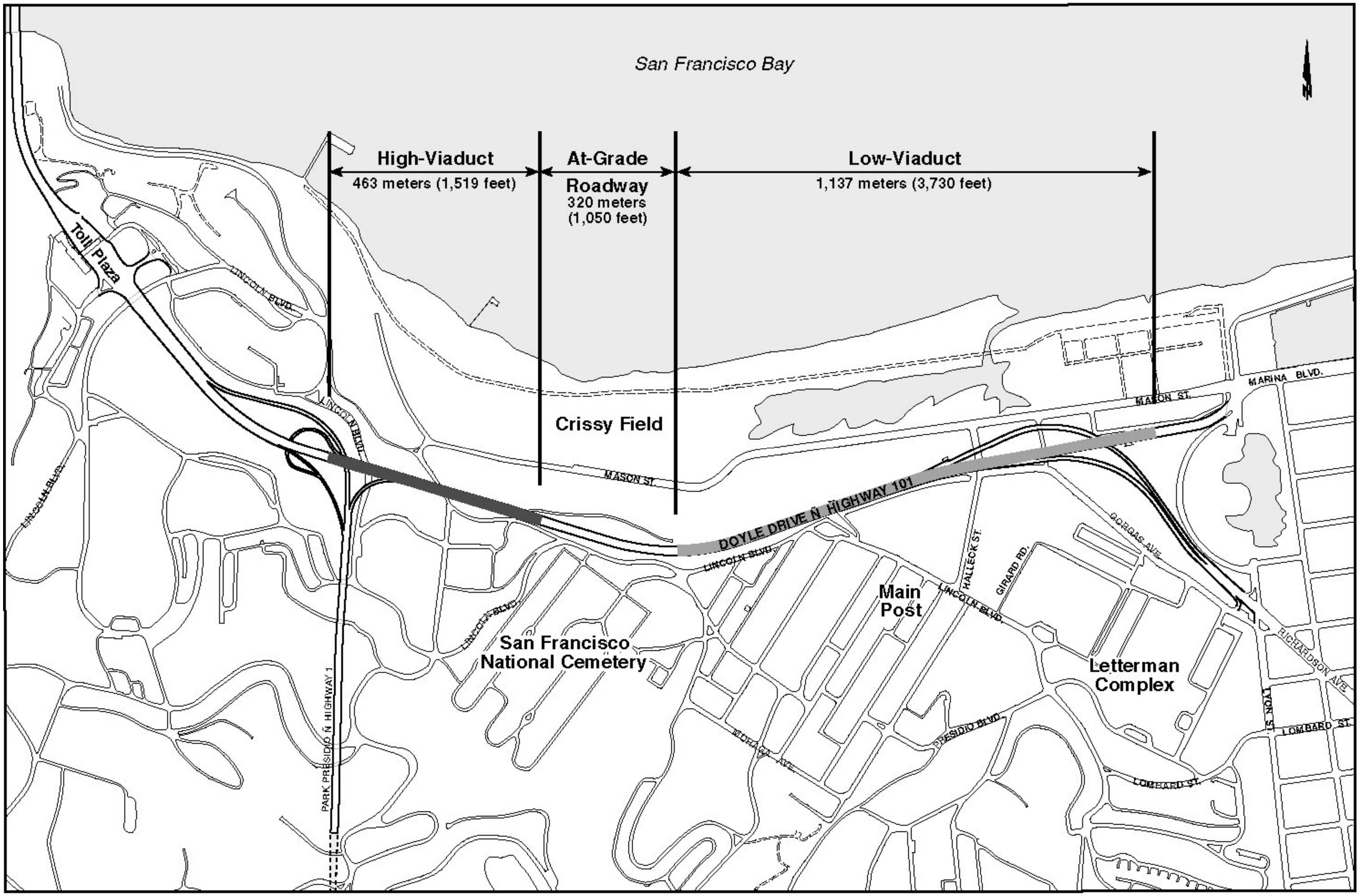
1.2.1 Alternative 1: No-Build Alternative

The No-Build Alternative represents the future year conditions if no other actions are taken in the study area beyond what is already programmed by the year 2020. The No-Build Alternative provides the baseline for existing environmental conditions and future travel conditions against which all other alternatives are compared.

Doyle Drive would remain in its current configuration, with six traffic lanes ranging in width from 2.9 to 3.0 meters (9.5 to 10 feet) and an overall facility width of 20.4 meters (67 feet) (see Figure 1.2.1-1). There are no fixed median barriers or shoulders. The lane configuration is changed by manually moving plastic pylons to increase the number of lanes in the peak direction of traffic. The facility passes through the Presidio on a high steel truss viaduct and a low elevated concrete viaduct with lengths of 463 meters (1,519 feet) and 1,137 meters (3,730 feet), respectively. This alternative does not improve the seismic, structural, or traffic safety of the roadway.

Vehicular access to the Presidio is available from Doyle Drive via the off-ramp to Merchant Road at the Golden Gate Bridge Toll Plaza. Presidio access at the east end of the project will be provided for southbound traffic via a right turn from Richardson Avenue to Gorgas Avenue. Presidio access for northbound traffic will be provided by a slip ramp from Richardson Avenue to Gorgas Avenue, which is currently under construction.

FIGURE 1.2.1-1
ALTERNATIVE 1: NO-BUILD



1.2.2 Alternative 2: Replace and Widen

The Replace and Widen Alternative would replace the 463-meter (1,519-foot) high-viaduct and the 1,137-meter (3,730-foot) low-viaduct with wider structures that meet the most current seismic and structural design standards (see Figure 1.2.2-1). The new facility would be replaced on the existing alignment and widened to incorporate improvements for increased traffic safety.

This alternative would include either six 3.6-meter (12-foot) lanes and a 3.6-meter (12-foot) eastbound auxiliary lane with a fixed median barrier or six 3.6-meter (12-foot) lanes with a moveable median barrier. The new facility would have an overall width of 38.0 meters (124 feet). The fixed median barrier option would require localized lane width reduction to 3.3 meters (11 feet) to avoid impacts to the historic batteries and Lincoln Boulevard, reducing the facility width to 32.4 meters (106 feet). Both options would include continuous outside shoulders along the facility. At the Park Presidio interchange, the two ramps connecting eastbound Doyle Drive to Park Presidio Boulevard and the ramp connecting westbound Doyle Drive to southbound Park Presidio Boulevard would be reconfigured to accommodate the wider facility. The Replace and Widen Alternative would operate similar to the existing facility except that there would be a median barrier and shoulders to accommodate disabled vehicles.

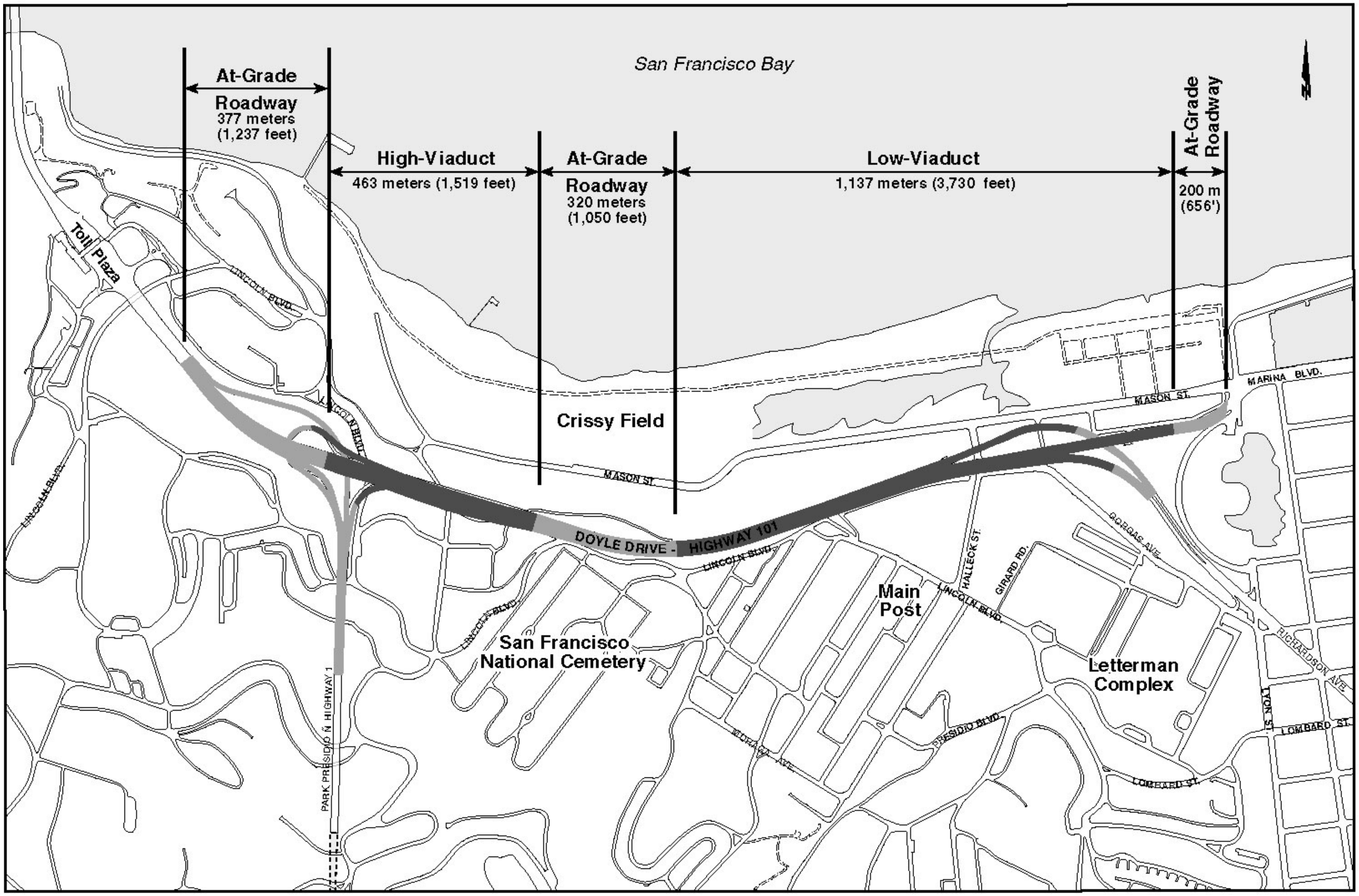
The Replace and Widen Alternative includes two options for the construction staging:

No Detour Option – The widened portion of the new facility would be constructed on both sides and above the existing low-viaduct and would maintain traffic on the existing structure. Traffic would be incrementally shifted to the new facility as it is widened over the top of the existing structure. Once all traffic is on the new structure, the existing structure would be demolished and the new portions of the facility would be connected. To allow for the construction staging using the existing facility, the new low-viaduct would be constructed two meters (six feet) higher than the existing low-viaduct structure.

With Detour Option - A 20.4-meter (67-foot) wide temporary detour facility would be constructed to the north of the existing Doyle Drive to maintain traffic through the construction period. Access to Marina Boulevard during construction would be maintained on an elevated temporary structure south of Mason Street. On and off ramps to the mainline detour facility would be located near the Post Exchange (PX) building.

Vehicular access to the Presidio is available from Doyle Drive via the off-ramp to Merchant Road at the Golden Gate Bridge Toll Plaza. Presidio access at the east end of the project will be provided for southbound traffic via a right turn from Richardson Avenue to Gorgas Avenue. There would be no Presidio access for northbound traffic at the east end of Doyle Drive due to geometric constraints and concerns for traffic safety.

FIGURE 1.2.2-1
ALTERNATIVE 2: REPLACE AND WIDEN



1.2.3 Alternative 5: Presidio Parkway Alternative

The Presidio Parkway Alternative would replace the existing facility with a new six-lane facility and an eastbound auxiliary lane between the Park Presidio interchange and the new Presidio access at Girard Road (see Figure 1.2.3-1). The new facility would have an overall width of up to 45 meters (148 feet), and would incorporate wide landscaped medians and continuous shoulders. To minimize impacts to the park, the footprint of the new facility would include a large portion of the existing facility's footprint east of the Park Presidio interchange. A 450-meter (1,476-foot) high-viaduct would be constructed between the Park Presidio interchange and the San Francisco National Cemetery. Shallow cut-and-cover tunnels would extend 240 meters (787 feet) past the cemetery to east of Battery Blaney. The facility would then continue towards the Main Post in an open depressed roadway with a wide, heavily landscaped median. From Building 106 (Band Barracks) cut-and-cover tunnels up to 310 meters long (984 feet) would extend to east of Halleck Street. The facility would then rise slightly on a low level causeway 160 meters (525 feet) long over the site of the proposed Tennessee Hollow restoration and a depressed Girard Road. East of Girard Road the facility would return to existing grade north of the Gorgas warehouses and connect to Richardson Avenue.

The Presidio Parkway Alternative would include an underground parking facility at the eastern end of the project corridor between the Mason Street Warehouses, Gorgas Street Warehouses and Palace of Fine Arts. The parking garage would supply approximately 500 spaces to maintain the existing parking supply in the area and improve pedestrian and vehicular access between the Presidio and the Palace of Fine Arts.

At the intersection with Merchant Road, just east of the toll plaza, a design option has been developed for a Merchant Road slip ramp. This option would provide an additional new connection from westbound Doyle Drive to Merchant Road. This ramp would provide direct access to the Golden Gate Visitors' Center and alleviate the congested weaving section where northbound Park Presidio Boulevard merges into Doyle Drive.

The Park Presidio interchange would be reconfigured due to the realignment of Doyle Drive to the south. The exit ramp from eastbound Doyle Drive to southbound Park Presidio Boulevard would be replaced with standard exit ramp geometry and widened to two lanes. The loop of the westbound Doyle Drive exit ramp to southbound Park Presidio Boulevard would be improved to provide standard exit ramp geometry. The northbound Park Presidio Boulevard connection to westbound Doyle Drive would be realigned to provide standard entrance ramp geometry. There are two options for the northbound Park Presidio Boulevard ramp to an eastbound Doyle Drive connection:

Option 1: Loop Ramp - Replace the existing ramp with a loop ramp to the left to reduce construction close to the Calvary Stables and provide standard entrance and exit ramp geometry.

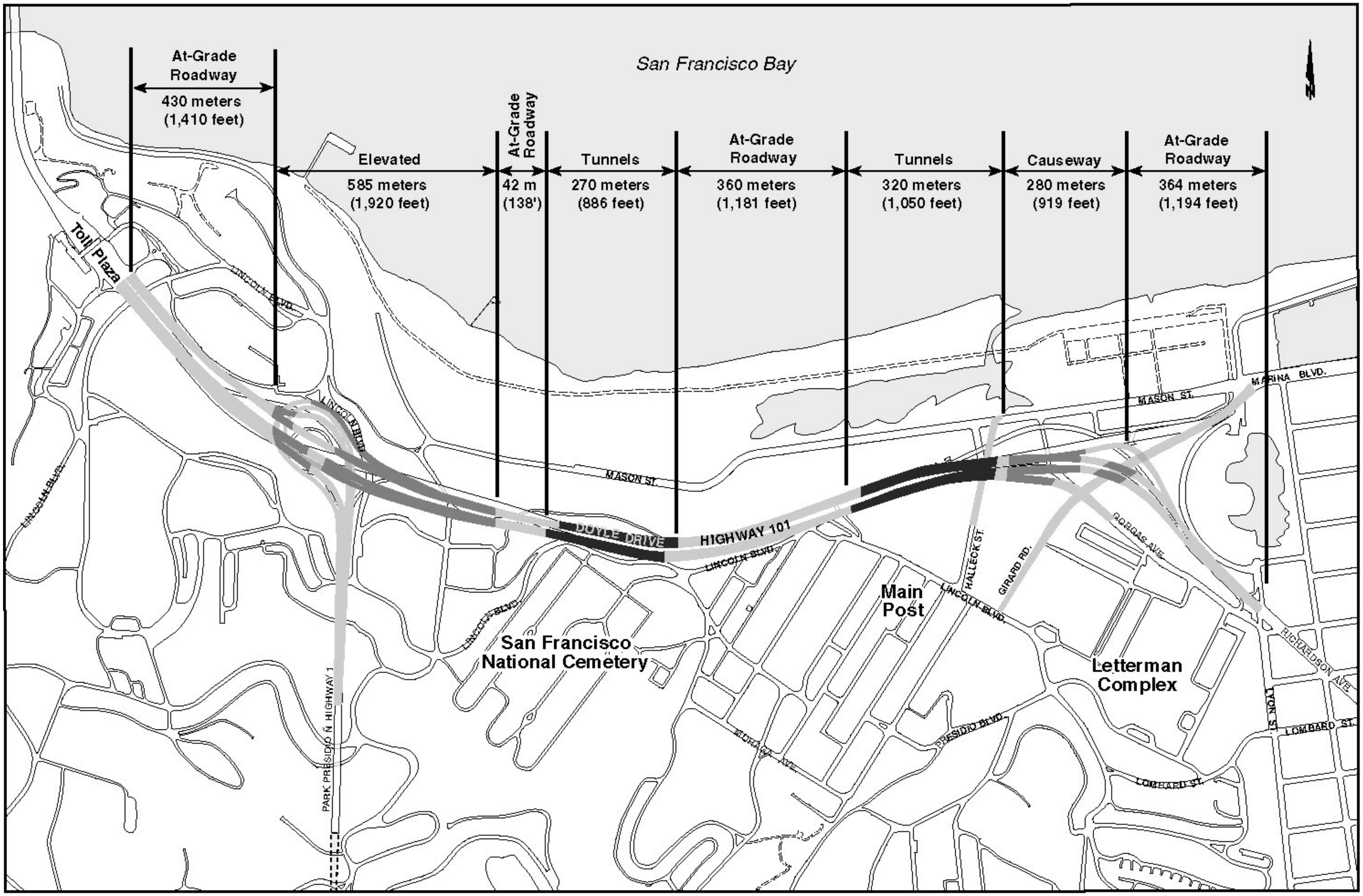
Option 2: Hook Ramp - Rebuild the ramp with a similar configuration as the existing ramp with a curve to the right and improved exit and entrance geometry.

The Presidio Parkway Alternative includes two options for direct access to the Presidio and Marina Boulevard at the eastern end of the project:

Diamond Option – Direct access to the Presidio and Marina Boulevard in both directions is provided by the access ramps from Doyle Drive connecting to a grade-separated interchange at Girard Road. East of the new Letterman garage, Gorgas Avenue is a one-way street and connects to Richardson Avenue with access to Palace Drive via a signalized intersection at Lyon Street.

Circle Drive Option – The Circle Drive Option provides direct access to the Presidio and Marina Boulevard for eastbound traffic by access ramps connecting to a grade-separated interchange of Girard Road. Westbound traffic from Richardson Avenue would access the Presidio and Palace Drive through a jug handle intersection with Gorgas Avenue.

FIGURE 1.2.3-1
ALTERNATIVE 5: PRESIDIO PARKWAY



1.3 DOCUMENT ORGANIZATION

This report presents the traffic and transit operations analyses used to evaluate how well the project alternatives operate currently and in the future with each of the project alternatives. Section 2.0 in this report describes the methodology used to analyze the alternatives. Section 3.0 describes the existing conditions for the Base Year. Section 4.0 discusses the future traffic operations and transportation circulation in the Design Year, while Section 5.0 summarizes the additional analysis for the Merchant Drive ramp option and the Park Presidio interchange ramp option. Section 6.0 concludes the report by providing highlights.

2.0 METHODOLOGY

This section details the specific methodologies used to analyze the project alternatives. These methods were developed for this project in coordination with FHWA and the cooperating/responsible agencies, Caltrans, National Park Service, Presidio Trust, and Golden Gate Bridge, Highway and Transportation District (GGBHTD).

The study area is, and will continue to be, changed by on-going efforts to implement improvements throughout the Presidio. Therefore, to accurately reflect changes resulting from the project alternatives, the planned improvements have been incorporated into the existing and future year analyses using published documents such as the Draft Environmental Impact Statement (EIS) and Presidio Trust Management Plan (PTMP), NPS' General Management Plan Amendment (GMPA), the Letterman Access EIS, and design plans.

The study area is evaluated for four different networks: The Alternative 1 - No-Build (which includes the slip ramp from northbound Richardson Avenue to Gorgas Street); Alternative 2 - Replace and Widen (which has the Richardson Avenue northbound slip ramp removed but is otherwise similar to Alternative 1). The Parkway Alternative (Alternative 5) is evaluated as two separate networks: the Diamond Option network and the Circle Drive network. Parkway Alternative (Alternative 5) design options to provide a Merchant Drive slip ramp and a hook ramp configuration from northbound Park Presidio to southbound Doyle Drive were analyzed independently of the four networks analyzed. Both design options could be integrated into the four networks analyzed.

2.1 BASE YEAR DEFINITION

Economic conditions and employment destinations have resulted in variations in traffic volumes in the project study area since the initial data was collected in 2000. Since that time, regularly assembled data at the Golden Gate Bridge have suggested that both daily and highest hourly traffic volumes have actually decreased for the same time periods between 2000 and 2003. The decrease seems to primarily be a result of economic conditions, as no major decrease occurred with the 2002 toll increase. As illustrated in Table 2.1-1, the bridge volumes have dropped on an average representative weekday in October between these two time periods. A traffic analysis based on the higher Year 2000 volumes represents a more conservative approach, as a key aspect of this study is to evaluate how alternatives would accommodate future traffic.

TABLE 2.1-1
COMPARISON OF SOUTHBOUND GOLDEN GATE BRIDGE TRAFFIC VOLUMES

Day of Week	AM Peak Hour				Daily			
	Oct-00	Oct-03	Change	Percent Change	Oct-00	Oct-03	Change	Percent Change
Monday	6000	5469	-532	-8.9%	57263	53330	-3933	-6.9%
Tuesday	6498	5638	-860	-13.2%	59194	55375	-3819	-6.5%
Wednesday	6304	5537	-767	-12.2%	60175	55806	-4369	-7.3%
Thursday	6214	5658	-556	-8.9%	61334	57131	-4203	-6.9%
Friday	5770	5184	-586	-10.1%	62586	57423	-5163	-8.2%
Midweek Average (Tuesday-Thursday)	6339	5611	-728	-11.5%	60234	56104	-4130	-6.9%

Source: Golden Gate Bridge Highway and Transportation District; DKS Associates, 2004

2.2 BASE YEAR DATA COLLECTION

Data used in the analysis was obtained through a variety of sources. These included traffic volume counts, travel speed/delay runs, and transit stop surveys conducted in May 2000; data from the Draft EIS for the Presidio Trust's Implementation Plan - *Background Transportation Report*; earlier surveys obtained for the development of the San Francisco Travel Demand Model (SF-TDM); and southbound Golden Gate Bridge data. Golden Gate Transit and MUNI supplied their transit route data. For a limited number of minor segments and intersections where no current counts were available, the volumes were obtained from the SF-TDM. The source, type, and date of data used are described below.

TABLE 2.2-1
DATA SOURCES FOR ANALYSIS

Data Source	Data Type	Collection Date
Transit Field Survey	a. Bus Alighting and Boarding volumes b. Segment Travel Times	May 2000
Traffic Counts	a. Turning Movements b. Segment Volumes	May and October 2000
SFCTA Traffic Count Database	a. Segment Volumes	Various
Caltrans	a. Segment Volumes	Various
GGBHTD	a. Traffic Volumes - Southbound/Northbound Golden Gate Bridge Volumes b. Transit - Transit Routes - Bus Volumes/Frequency - Passenger Volumes	Various
MUNI	a. Routes b. Bus Volumes/Frequency c. Passenger Volumes	Past three years
SFCTA Travel Demand Model	a. Segment Volumes b. Future Turning Movements c. Travel Times	Various
TransitInfo.org (511.org)	a. Route Schedules	N/A

2.3 DEFINITION OF DESIGN YEAR

The defined design year of a traffic project is generally targeted at 20 years of completion of the project. As the current construction plan estimates completion in 2012, the project design year would be defined as 2032.

The Association of Bay Area Governments (ABAG) prepares bi-annual population projections. The last adopted update to these at the commencement of the revised Doyle project is Projections 2002. As documented in subsequent sections, the most distant horizon year for Projections 2002 is 2025. Thus, a projection of the design year to an assumed 2030 condition was developed by extending the growth from 2020 to 2025 an additional five years. As this growth rate was developed for trip tables, the projections for population and employment shown in Table 1 are representative of the trip table growth.

Another set of available forecasts are available from the State of California Department of Finance. Unlike the Association of Bay Area Governments, these forecasts are for population only. The projections for the two counties most related to study area traffic from the Department of Finance are also found in 2.3-1.

Because the population and employment are not projected to increase according to any government agency between 2030 and 2032, the design year forecasts were assumed to be most appropriate using the design year methodology documented in this chapter.

TABLE 2.3-1
COMPARISON OF POPULATION AND EMPLOYMENT PROJECTIONS

County	Year	Population	Employment
Source: ABAG Projections 2002			
San Francisco	2020	811,100	745,600
	2025	815,200	770,500
	Design Year[1]	*819,300*	*795,400*
Marin	2020	275,500	155,160
	2025	281,400	163,270
	Design Year[1]	*287,300*	*171,380*
Source: Department of Finance			
San Francisco	2020	820,545	Not Available
	2025	810,595	Not Available
	2030	796,208	Not Available
	2032	789,236	Not Available
Marin	2020	251,260	Not Available
	2025	250,273	Not Available
	2030	248,684	Not Available
	2032	246,793	Not Available

[1] The design year is developed by applying an additional five-year growth rate for trip tables based on the 2020 to 2025 rate; population and employment growth is shown for illustrative purposes in this table

As documented in Chapter 3, the peak hour peak direction volumes are projected to grow by less than seven percent from 2000 to the design year, so that further adjustments to the design year volumes seem insignificant.

2.4 TRAVEL DEMAND MODEL DEVELOPMENT

The San Francisco County Travel Demand Forecasting Model (SF-TDM) was developed for the San Francisco County Transportation Authority (SFCTA) to provide detailed forecasts of travel demand (including both vehicles and for transit riders) for the Doyle Drive Environmental and Design Study. The objective was to accurately represent the complexity of the destination, temporal and modal options and provide detailed information on travelers making discrete choices. These objectives led to the development of an activity-based model that uses synthesized population as the basis for decision-making rather than zonal-level aggregate data sources.

The SF-TDM predicts the activity patterns of San Francisco travelers across the entire day in order to capture the interrelationships between trips, modes, and destinations found in “tours” or chains of trips. In order to capture these relationships it is necessary to represent the entire day. Typical “4-step” travel models may represent only a single peak period or an overall daily period. Instead, the SF-TDM divides the weekday into 5 broad time periods:

- Early AM (3am-6am)
- AM Peak (6am-9am)
- Midday (9am-3:30pm)
- PM Peak (3:30pm-6:30pm)
- Evening (6:30pm-3am)

Most of the components were estimated using household survey data collected by the Metropolitan Transportation Commission (MTC) for San Francisco residents only. The model is applied as a focused model, which combines trip-making from the entire Bay Area (derived from MTC’s BAYCAST trip tables) with the travel demand from San Francisco residents produced by the activity model.

The highest weekday volumes were observed during the AM peak period between 6:00AM and 9:00AM and the PM peak period between 3:30PM and 6:30PM. The highest weekend volumes were observed on a Saturday between 3:30 and 6:30PM. These periods were used for the analyses described below.

Until recently, the only available tool to forecast the future traffic demand for the City of San Francisco and vicinity was the regional travel model maintained by the MTC for the nine-county San Francisco Bay area, which was not able to effectively forecast local street demands. Therefore, SFCTA developed a travel demand model, the SF-TDM, between 1998 and 2001, to be consistent with overall regional demand and to be specifically enhanced to deal with local conditions including traffic and transit patterns. The SF-TDM was approved by the SFCTA Board, acting as the congestion management agency, to project future traffic and transit volumes for projects in San Francisco.

SF-TDM uses TP+ software to simulate the daily movement of people within and through San Francisco. Several unique features allow for a variety of trip behaviors. For example, a customized travel path methodology accounts for San Francisco residents’ tendency to “chain” several trips together. This path, called a “tour”, provides a more accurate forecast of San Francisco residents’ travel patterns. Customized equations also allow for allocating trips among the many different travel mode options, including transit, available.

A version of the model that was validated to the traffic characteristics of the study area was developed according to the Base Year conditions. This included review of traffic counts at a variety of locations in the study area.

To develop the Design Year baseline conditions, the SF-TDM incorporated the *Projections 2002* series of demographic assumptions for region, including out-of-county trips produced by MTC for the Draft *2001 Regional Transportation Plan*, and the *Draft Presidio Trust Management Plan* (PTMP) proposed improvements and projects. These assumptions provide a cumulative analysis that incorporates other land use growth and local transportation projects within San Francisco. The Year 2025 MTC trip table was expanded to this project's Design Year horizon using a purpose-specific methodology developed with MTC and Caltrans. Appendix B includes the technical memoranda with additional details about the Year 2025 expansion to the Design Year.

A 2010 analysis was prepared to assess impacts to the transportation system during the construction period. As the construction is scheduled for 2008 to 2012, the 2010 represents a mid-point in the construction of the facility. Because no Year 2010 network or land use scenarios are available for this project, a special set of scenarios was created by using the base 2020 roadway network and tables, then assuming that one-third of the land uses assumed to be in place by the Design Year would occur by 2010. Note that this method is not applicable for all the evaluation criteria. Further details about the SF-TDM can be found in the *San Francisco Travel Model Development—Model Validation Report*, issued in 2001.

2.4.1 Weekend Model Development

Because this corridor can be as, or even more, heavily traveled on the weekends, a project-specific weekend travel demand model was developed to analyze existing and future conditions. Existing conditions were identified based on travel survey data and actual weekend traffic counts. Travel behavior during a peak weekend period was developed by adjusting weekday demand by trip purpose to reflect weekend conditions. Appendix B includes the technical memorandum that details the methodology used to develop this model, identify the typical peak period, validate with current counts, and forecast future demand.

2.4.2 Peak Period to Peak Hour Conversion

As noted previously, the SF-TDM estimates weekday traveler behavior in five time periods based on daily activity patterns. Because the Bay Area commute extends for more than one hour, it is not reasonable to develop regional traffic forecasts on the hourly basis that is used for most traffic analyses; a three-hour peak period is used. In order to determine a peak-hour demand for use in operations studies, the peak-period volumes from the model were multiplied by a peak-period to peak-hour ratio.

The peak-period to peak-hour ratio plays a large role in identifying the potential effects of traffic in the project area. A ratio that is too large would assign an unrealistically high volume amount of traffic to the roadways, while a ratio that is too small would not assign enough volume to the roadways leading to an incorrect assessment of the effects. To provide consistent comparisons, a single overall ratio was developed for the project area for each peak period by calculating the percentage of the peak period traffic that occurs during the peak hour. The ratios were based on a variety of data listed above to increase reliability.

The derivation of the peak-period to peak-hour conversion factor used for this report is summarized in Tables 2.4.2-1 and 2.4.2-2. As these tables show, this ratio varies widely from one day to another, particularly in the PM peak; depending on proximity to the Golden Gate Bridge; and whether the peak direction or both directions are analyzed. The data in these two tables follow implementation of FasTrak on the Golden Gate Bridge and stop signs on Marina Boulevard. October data was used as it represents typical conditions at the GGB when compared to the daily volumes over a year.

Based on these and other counts, peak period to peak hour conversion factors were developed to be representative in the study area. Those used are:

- AM Peak Hour
  - 38% of the AM Peak Period for all roads except the Golden Gate Bridge
  - 35% of the AM Peak Period for the Golden Gate Bridge
- PM Peak Hour = 35% of the PM Peak Period

TABLE 2.4.2-1
AM PEAK PERIOD TO PEAK HOUR DATA

Time Period	Southbound Volumes			Northbound Volumes			Both Direction Volumes		
	Hour	Period	Percent	Hour	Period	Percent	Hour	Period	Percent
Golden Gate Bridge									
Year Median	-	-	36.8%	-	-	-	-	-	-
Year Average	-	-	37.0%	-	-	-	-	-	-
Mon: 16-Oct-00	6,287	16,814	37.4%	3,337	8,645	38.6%	9,624	25,459	37.8%
Tue: 17-Oct-00	6,371	17,347	36.7%	3,413	8,794	38.8%	9,784	26,141	37.4%
Wed: 18-Oct-00	6,212	17,027	36.5%	3,414	9,015	37.9%	9,626	26,042	37.0%
Thur: 19-Oct-00	6,280	16,894	37.2%	3,326	8,880	37.5%	9,606	25,774	37.3%
Fri: 20-Oct-00	5,692	15,713	36.2%	3,472	9,183	37.8%	9,164	24,896	36.8%
Marina									
Mon: 16-Oct-00	1,562	4,081	38.3%	461	1,247	37.0%	2,023	5,328	38.0%
Tue: 17-Oct-00	1,711	4,281	40.0%	475	842	56.4%	2,186	5,123	42.7%
Wed: 18-Oct-00	1,775	4,438	40.0%	415	878	47.3%	2,190	5,316	41.2%
Thur: 19-Oct-00	1,804	4,524	39.9%	420	1,019	41.2%	2,224	5,543	40.1%
Fri: 20-Oct-00	1,665	4,150	40.1%	481	1,210	39.8%	2,146	5,360	40.0%
Richardson									
Mon: 16-Oct-00	2,659	6,917	38.4%	1,195	3,380	35.4%	3,854	10,297	37.4%
Tue: 17-Oct-00	2,740	7,345	37.3%	1,242	2,703	45.9%	3,982	10,048	39.6%
Wed: 18-Oct-00	3,037	7,981	38.1%	1,229	2,703	45.5%	4,266	10,684	39.9%
Thur: 19-Oct-00	3,035	8,205	37.0%	1,280	3,229	39.6%	4,315	11,434	37.7%
Fri: 20-Oct-00	3,056	8,137	37.6%	1,260	3,327	37.9%	4,316	11,464	37.6%
Marina and Richardson									
Mon: 16-Oct-00	4,221	10,998	38.4%	1,656	4,627	35.8%	5,877	15,625	37.6%
Tue: 17-Oct-00	4,451	11,626	38.3%	1,717	3,545	48.4%	6,168	15,171	40.7%
Wed: 18-Oct-00	4,812	12,419	38.7%	1,644	3,581	45.9%	6,456	16,000	40.4%
Thur: 19-Oct-00	4,839	12,729	38.0%	1,700	4,248	40.0%	6,539	16,977	38.5%
Fri: 20-Oct-00	4,721	12,287	38.4%	1,741	4,537	38.4%	6,462	16,824	38.4%

Source: Caltrans; Golden Gate Bridge, Highway and Transportation District; DKS Associates, 2004

TABLE 2.4.2-2
PM PEAK PERIOD TO PEAK HOUR DATA

Time Period	Southbound Volumes			Northbound Volumes			Both Direction Volumes		
	Hour	Period	Percent	Hour	Period	Percent	Hour	Period	Percent
Golden Gate Bridge									
Year Median	-	-	35.1%	-	-	-	-	-	-
Year Average	-	-	35.3%	-	-	-	-	-	-
Mon: 16-Oct-00	3,301	9,473	34.8%	5,794	16,941	34.2%	9,095	26,414	34.4%
Tue: 17-Oct-00	3,431	9,839	34.9%	5,860	17,142	34.2%	9,291	26,981	34.4%
Wed: 18-Oct-00	3,252	9,725	33.4%	5,888	16,774	35.1%	9,140	26,499	34.5%
Thur: 19-Oct-00	3,422	9,695	35.3%	5,772	16,884	34.2%	9,194	26,579	34.6%
Fri: 20-Oct-00	3,790	10,628	35.7%	5,662	15,521	36.5%	9,452	26,149	36.1%
Marina									
Mon: 16-Oct-00	686	1,927	35.6%	1,012	2,116	47.8%	1,698	4,043	42.0%
Tue: 17-Oct-00	641	1,850	34.6%	1,031	3,018	34.2%	1,672	4,868	34.3%
Wed: 18-Oct-00	707	2,055	34.4%	1,255	3,384	37.1%	1,962	5,439	36.1%
Thur: 19-Oct-00	729	2,073	35.2%	1,257	3,520	35.7%	1,986	5,593	35.5%
Fri: 20-Oct-00	855	2,215	38.6%	1,158	2,802	41.3%	2,013	5,017	40.1%
Richardson									
Mon: 16-Oct-00	1,546	4,193	36.9%	2,649	7,525	35.2%	4,195	11,718	35.8%
Tue: 17-Oct-00	1,508	4,401	34.3%	2,628	7,481	35.1%	4,136	11,882	34.8%
Wed: 18-Oct-00	1,421	4,120	34.5%	2,472	7,089	34.9%	3,893	11,209	34.7%
Thur: 19-Oct-00	1,567	4,616	33.9%	2,530	6,973	36.3%	4,097	11,589	35.4%
Fri: 20-Oct-00	1,632	4,320	37.8%	2,460	5,819	42.3%	4,092	10,139	40.4%
Marina and Richardson									
Mon: 16-Oct-00	2,232	6,120	36.5%	3,661	9,641	38.0%	5,893	15,761	37.4%
Tue: 17-Oct-00	2,149	6,251	34.4%	3,659	10,499	34.9%	5,808	16,750	34.7%
Wed: 18-Oct-00	2,128	6,175	34.5%	3,727	10,473	35.6%	5,855	16,648	35.2%
Thur: 19-Oct-00	2,296	6,689	34.3%	3,787	10,493	36.1%	6,083	17,182	35.4%
Fri: 20-Oct-00	2,487	6,535	38.1%	3,618	8,621	42.0%	6,105	15,156	40.3%

Source: Caltrans, Golden Gate Bridge, Highway and Transportation District (GGBHTD), and DKS Associates, 2004

2.4.3 Peak Period to Daily Conversion

Although not used in traffic analyses, daily volumes are often needed as input to other portions of this project's environmental studies. Because the number of lanes in each direction varies during an average weekday on the Golden Gate Bridge (GGB), Doyle Drive, Richardson on-ramp, and Marina on-and off-ramps, the daily traffic forecasts from a single travel model network assignment cannot be used. Because the SF-TDM captures traveler behavior at the two busiest periods of three hours each, the busiest times of day were already known. Because the peak-periods are assumed to be a significant portion of the total daily traffic, normally the daily traffic can be estimated from these.

Using the same data as above, a peak- period to daily volume ratio was developed by calculating the percentage of the daily traffic that occurs during the peak periods. A sum of the two peak periods demonstrated that 40 percent of the daily traffic volume occurs in the two peak periods, which is consistent with typical traffic analysis assumptions. Table 2.4.3-1 summarizes the derivation of the peak-period to daily conversion factor.

TABLE 2.4.3-1
PEAK PERIOD TO AVERAGE DAY DATA

Day	Southbound			Northbound			Both Directions		
	Combined Peak Periods	Day	Percent	Combined Peak Periods	Day	Percent	Combined Peak Periods	Day	Percent
Golden Gate Bridge									
16-Oct-00	26,287	57,388	45.8%	25,586	60,949	42.0%	51,873	118,337	43.8%
17-Oct-00	27,186	57,676	47.1%	25,936	62,604	41.4%	53,122	120,280	44.2%
18-Oct-00	26,752	58,407	45.8%	25,789	64,014	40.3%	52,541	122,421	42.9%
19-Oct-00	26,589	59,287	44.8%	25,764	65,571	39.3%	52,353	124,858	41.9%
20-Oct-00	26,341	58,791	44.8%	24,704	67,334	36.7%	51,045	126,125	40.5%
Marina									
16-Oct-00	3,363	11,279	29.8%	6,008	13,102	45.9%	9,371	24,381	38.4%
17-Oct-00	3,860	11,226	34.4%	6,131	13,210	46.4%	9,991	24,436	40.9%
18-Oct-00	4,262	11,852	36.0%	6,493	13,932	46.6%	10,755	25,784	41.7%
19-Oct-00	4,539	12,436	36.5%	6,597	14,042	47.0%	11,136	26,478	42.1%
20-Oct-00	4,012	12,555	32.0%	6,365	13,318	47.8%	10,377	25,873	40.1%
Richardson									
16-Oct-00	11,110	26,114	42.5%	10,905	28,925	37.7%	22,015	55,039	40.0%
17-Oct-00	11,746	27,072	43.4%	10,184	27,716	36.7%	21,930	54,788	40.0%
18-Oct-00	12,101	27,944	43.3%	9,792	27,365	35.8%	21,893	55,309	39.6%
19-Oct-00	12,821	28,552	44.9%	10,202	28,387	35.9%	23,023	56,939	40.4%
20-Oct-00	12,457	29,375	42.4%	9,146	27,901	32.8%	21,603	57,276	37.7%
Marina and Richardson									
16-Oct-00	14,473	37,393	38.7%	16,913	42,027	40.2%	31,386	79,420	39.5%
17-Oct-00	15,606	38,298	40.7%	16,315	40,926	39.9%	31,921	79,224	40.3%
18-Oct-00	16,363	39,796	41.1%	16,285	41,297	39.4%	32,648	81,093	40.3%
19-Oct-00	17,360	40,988	42.4%	16,799	42,429	39.6%	34,159	83,417	40.9%
20-Oct-00	16,469	41,930	39.3%	15,511	41,219	37.6%	31,980	83,149	38.5%
								Median:	**40.4%**
								Average:	**40.7%**

Source: Caltrans, Golden Gate Bridge, Highway and Transportation District (GGBHTD), and DKS Associates, 2004

2.5 GOLDEN GATE BRIDGE OPERATIONS

Doyle Drive (the southern approach to the Golden Gate Bridge) traffic is directly affected by bridge operations. Because the Golden Gate Bridge is a six-lane facility with moveable lane designations, there may be from two to four lanes in one direction or another at different times of the day. In the base year for this study, the bridge configurations are four lanes southbound and two lanes northbound in the AM peak period, and three lanes in each direction for the other two study periods – PM peak period and weekend peak period.

When design year forecasts were developed, the new travel patterns for the region showed significant growth in projected outbound traffic from San Francisco in the AM peak hour. This has resulted in an observation that there could be significant delays at the Golden Gate Bridge if the current lane configuration is kept in place for the design year. To examine this issue more closely, a detailed operations analysis for the AM peak hour was performed to quantify the impacts of various lane configurations.

2.5.1 Detailed Bridge Traffic Operations Analysis (FREQ)

The main tool used in the detailed operations analysis of the Golden Gate Bridge was an operational analysis program called FREQ (pronounced free-q). FREQ is a macroscopic model for the analysis of freeway and highway systems: it uses the *Highway Capacity Manual* relationships and other traffic flow theory concepts to predict traffic performance. FREQ is designed for evaluating traffic management and traffic control alternatives (such as incident management, ramp metering, mainline HOV lanes and HOV bypass lanes at ramp meters). FREQ is particularly well-suited for analyzing the lengths of queues. Outputs include traffic performance tables, contour diagrams of traffic performance and highway summary tables.

The operations analysis inputs are more extensive that those in a travel demand model. Inputs include flow rates for bridge lanes and the toll booths, distribution of traffic within the peak period, and lanes, distances and free flow speeds for each segment.

The findings of the traffic operations analysis are documented in the base and future year sections of this report. Detailed parameters and testing to confirm the data inputs, calibration and findings is provided in a separate Traffic Forecasting Report.

2.6 TRAFFIC EVALUATION CRITERIA

The National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) require that the combined environmental document identify and disclose the effects resulting from the project alternatives. This report addresses those directly related to traffic operations and circulation.

The following guidance documents were reviewed and used to identify appropriate specific methodology or evaluation criteria needed for evaluation.

- Caltrans Highway Design Manual (HDM), November 2001
- Highway Capacity Manual (HCM), 2000
- City of San Francisco Guidelines for Environmental Review (OER), October 2002
- State of the practice traffic analysis methodologies

In addition, the Park Road Standards Memorandum prepared by the U.S. Department of Interior, July 1994 was reviewed. It was determined that this memorandum described standards that are consistent with standards published in Caltrans Highway Design Manual (HDM) and the Highway Capacity Manual (HCM), as well as design standards recommended by the American Association of State Highway and Transportation Officials (AASHTO).

Doyle Drive is a roadway segment on the Strategic Highway Network (STRAHNET) as defined and designated by the Federal Highway Administration (FHWA). This is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes. Although the Golden Gate Bridge Highway and Transportation District operates Doyle Drive, Caltrans owns and maintains Doyle Drive, and is responsible for administering the Strategic Highway Network within California. Whenever possible the methodology and criteria described in their *Highway Design Manual* (HDM) were used. When the HDM did not define a specific methodology or evaluation criteria needed for evaluation, others were used based on the above guidance. Because this project is a transportation improvement, the methodology and criteria defined in the HDM were used whenever there were conflicting directions in various documents. For instance, the intersection methodologies are slightly different from those described by OER; such as, the peak hour factors used in the study reflect a full capacity condition (peak hour factors at intersections = 1.0).

To evaluate the traffic-related effects of the project alternatives, the analyses were separated into two groups – those related to intersections and those related to roadway segments. The effects were identified using the following six measures of effectiveness.

At intersections

- **Level of Service (LOS)** – measured in peak hour delay per vehicle
- **Queues** – measured in meters

On roadway segments

- **LOS** – measured in peak hour delay per vehicle
- **Travel Time** – measured in minutes to travel a given distance
- **Merge/Diverge** – measured by following appropriate Caltrans' standards
- **Weaving** – measured by following appropriate Caltrans' standards

2.6.1 Intersection Level of Service

Because intersections often act as bottlenecks during congested conditions, measuring the change in average delay per vehicle is a common way to measure effects of project alternatives on nearby streets. This analysis is known as Level of Service (LOS) and describes the effectiveness of intersection operations using delay.

Caltrans' HDM, Chapter 400 – Intersections at Grade specifies design and evaluation requirements for at-grade intersections. The intersection's "capacity" to handle peak hour traffic is the determining feature of its effectiveness. The capacity analysis methodology for both unsignalized and signalized intersections is described in the HDM as follows:

(1) Unsignalized Intersections. Chapter 10 of the HCM provides a methodology for capacity analysis of unsignalized intersections controlled by stop or yield signs. The assumption is made that the minor street movement does not affect major street traffic. Unsignalized intersections generally become candidates for signalization when traffic queues begin to develop on the cross street. See Chapter 9 of the Traffic Manual for signal warrants. (HDM 2001, Chapter 400)

(2) Signalized Intersections. See Topic 406 or the "District Traffic Branch" for analysis of signalized intersections, including ramps. Section 406, Ramp Intersection Capacity Analysis, states that the "procedure for ramp intersection analysis may be used to estimate the capacity of any signalized intersection where the phasing is relatively simple." The analysis of complex signalized intersections should be referred to the District Traffic Branch. (HDM 2001, Chapter 400). The evaluation criteria must consider the requirement set forth in these design guidelines.

Evaluation Criteria. The degree of congestion was measured by the delay per vehicle. The HCM includes these methods used to determine intersection LOS. The analysis for delay is determined using specific methods identified in the HCM, Chapters 16 (Signalized Intersections) and 17 (Unsignalized Intersections). The software package, Synchro 5.0, was used to apply the HCM methodology for both signalized and unsignalized intersections to determine the LOS and evaluate the degree of delay and congestion that occurs.

LOS can range from “A” representing free-flow conditions, to an “F” representing extremely long delays. LOS B and C signify stable conditions with acceptable delays. LOS D is typically considered acceptable conditions for peak hour traffic in urban areas. LOS E is approaching capacity and LOS F represents conditions at or above capacity. Table 2.6.1-1 contains the correlation between control delay and level of service for signalized and unsignalized intersections. Control delay is the component of delay that results when a traffic control device, traffic signal or stop sign, causes a lane group to reduce speed or to stop.

Using the OER guidelines, a project alternative significantly effects an intersection when the LOS degrades from D, or better, to LOS E or F, or from LOS E to F. For an intersections already operating at LOS E or F, the V/C ratio (Volume/Capacity) was included in parentheses next to the delay to report the LOS. The V/C ratio provides another measure of the effectiveness of intersection operations when already operating above capacity. The guidelines also defined a significant effect as a five percent change in traffic volumes. Therefore, additional intersection improvements for changes of less than five percent were not needed. When significant adverse effects were identified, accompanying mitigation improvements or exceptions were also identified.

The intersections evaluated are listed in Table 2.6.1-2. These intersections are either redesigned or newly constructed as part of the Doyle Drive project, or are potentially influenced by changes in traffic flow associated with project alternatives.

TABLE 2.6.1-1
INTERSECTION LEVEL OF SERVICE THRESHOLDS

Level Of Service	Signalized Control Delay per Vehicle (seconds)	Unsignalized Control Delay per Vehicle (seconds)
A	Delay ≤ 10	Delay ≤ 10
B	10 < Delay ≤ 20	10 < Delay ≤ 15
C	20 < Delay ≤ 35	15 < Delay ≤ 25
D	35 < Delay ≤ 55	25 < Delay ≤ 35
E	55 < Delay ≤ 80	35 < Delay ≤ 50
F	Delay > 80	Delay > 50

Note: At two-way stop controlled (unsignalized) intersections, the LOS is presented for the worst approach.
Source: Highway Capacity Manual, Transportation Research Board, Washington D.C. 2000

TABLE 2.6.1-2
STUDY INTERSECTIONS

Intersection			Alternatives				
				Design Year			
No.	**North / South**	**East / West**	**Base Year**	**1 No Build**	**2 Replace and Widen**	**5 Parkway: Diamond Option**	**5 Parkway: Circle Drive Option**
Intersections Included in Replacement Project Alternatives							
1	Lyon	Marina	■	■	■	■	■
2	Richardson	Francisco	■	■	■	■	■
3	Lincoln (N)	GGB Viewing Area	■	■	■	■	■
4	Lincoln (S)	Merchant	■	■	■	■	■
5	Girard	Lincoln	■	■	■	■	■
6	Halleck	Mason	■	■	■	■	■
7	Richardson / 101	Gorgas / Lyon	*n/a*	■	■	■ [1]	■ [1]
8	Marina/Girard	Gorgas / 101 SB Ramps	*n/a*	*n/a*	*n/a*	■ [1]	■ [1]
9	Marina/Girard	NB Ramps	*n/a*	*n/a*	*n/a*	■ [1]	[1]
Other Potentially Impacted Intersections							
10	Broderick	Marina	■	■	■	■	■
11	Divisadero	Marina	■	■	■	■	■
12	Richardson	Chestnut	■	■	■	■	■
13	Richardson	Lombard	■	■	■	■	■
14	101 / Lombard	Broderick		■	■	■	■
15	Lyon	Lombard Gate	■	■	■	■	■
16	Presidio	Pacific	■	■	■	■	■
17	Park Presidio	Lake	■	■	■	■	■
18	Merchant	GGB Viewing Area	■	■	■	■	■

Source: DKS Associates, 2004
Notes: n/a = intersection does not exist in this alternative.
[1]New intersection.

2.6.2 Intersection Queue Lengths

The queue length at an intersection includes vehicles that stop or slow down in observance of traffic control devices. The “queue” includes vehicles waiting at the stop line to the vehicles slowing down at the rear of the queue. At intersections, queues can be either over- or under-saturated. For over-saturated queues, the arrival rate of cars is higher than the amount of cars that the intersection can accommodate. For under-saturated queues, the arrival rate is less than the service flow rate and the intersections tend to operate adequately. Intersections with over-saturated queues tend to block upstream intersections, driveways, turning pockets, and restrict vehicle movements. Traffic may also spill over to other time periods

The most notable effect of queues at intersections is that they may influence the geometric requirements of the roadway. When queues are too long and vehicles have excessive delays before crossing through the intersection, accepted engineering practice would add more lanes at either the intersection or on nearby roadway segments to reduce the queue and delay. Because of the extensive number of sensitive resources near this facility, adding more lanes may not always be possible.

The HDM does not specify any methods for analyzing intersection effectiveness based on queues. However, the HCM defines a queue as a line of vehicles, bicycles, or persons waiting to be served by the system in which the flow rate from the front of the queue determines the average speed within the queue. The internal queue dynamics can involve starts and stops. The Synchro program used for this report is capable of calculating and analyzing queue lengths. Queue lengths that exceed the storage length for individual movements will block upstream traffic and access to turning bays. Bay block time percent is a measurement produced by Synchro, which indicates the amount of time (percent) per cycle that a queue blocks upstream traffic or prevents access to turning bays.

Evaluation Criteria. Since there is no explicit definition of when a change in the queue length or bay block time should be considered significant, an increase in queue length that exceeds the turning bay or link length were considered significant. If a significant change was identified, then appropriate designs or operational improvements were examined and the most cost-effective solution recommended mitigating the change.

2.6.3 Segment Level of Service

Roadway segments can become congested even when not regulated by a traffic signal. Analysis of these segments is based on the density of vehicles on that segment. Because of the transitional nature of Doyle Drive, there is a need to apply different measurement tools for different segments. Some segments operate as urban streets with signalized intersections; others operate as highway segments with no interruption. Therefore, uninterrupted segments are best-analyzed using highway LOS methodology while signalized segments are best-analyzed using urban street methodology.

The evaluation contains two distinct methodologies – for uninterrupted highway segments, the HCM, *Chapter 21 – Multilane Highways* methodology was to analyze the capacity and LOS of the highway segments where speeds vary between 45 miles per hour and 60 miles per hour; for urban street segments, the HCM, *Chapter 15 – Urban Streets* methodology was used. These two measurement tools were applied according to the most appropriate method for each segment, as listed in Table 2.6.3-1.

TABLE 2.6.3-1
SEGMENT LEVEL OF SERVICE METHOD

No.	Location	Direction	LOS Method
1	US 101 From the Merchant Road Ramps to Park Presidio Blvd	SB	Highway
2	US 101 From Park Presidio Blvd to the Merchant Road Ramps	NB	Highway
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Highway
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Highway
5	Richardson From the Marina Blvd Access Ramps to Lyon St	SB	Urban Street or Highway (depending on Alternatvive)
6	Richardson From Lyon St to the Marina Blvd Access Ramps	NB	Urban Street or Highway (depending on Alternatvive)
7	Marina Blvd From the Doyle Drive Merger to Lyon St	EB	Urban Street or Highway (depending on Alternatvive)
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street or Highway (depending on Alternatvive)
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Highway
10	Park Presidio from the Park Presidio Tunnel to the US 101 Ramps	NB	Highway
11	US 101 between Park Presidio on and off-ramps	SB	Highway
12	US 101 between Park Presidio off and on-ramps	NB	Highway
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Highway
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Highway

Source: DKS Associates, 2004, Highway Capacity Manual

Highway Segment

A basic highway segment can be characterized by several performance measures, including density in terms of passenger cars per mile per lane, and speed in terms of mean passenger-car speed. These measures are interrelated and density can be calculated using the following equation from the Highway Capacity Manual:

$$d = \frac{V}{N \times S}$$

where, d: density (vehicles per mile per lane, vpmpl)
V: peak hour volume (vehicles per hour, vph)
N: number of travel lanes (lanes)
S: average travel speed (miles per hour, mph)

The peak-period volumes were obtained from the SF-TDM and converted to peak-hour volumes. The peak-hour volumes (*V*) were passenger car equivalents using the observed percent of trucks and buses, and grades ("upgrades" only). The average travel speed, S, was calculated using procedures defined in Chapter 21 (Conventional Highways) of the HCM. The volumes were then used to calculate the density of the highway segments for each project alternative since the number of lanes was also known. Table 2.6.3-2 identifies the density ranges used to define LOS for highway segments; they range from LOS A, or free-flow conditions, to LOS F, or highly congested conditions.

TABLE 2.6.3-2
HIGHWAY SEGMENT LEVEL OF SERVICE THRESHOLDS

Level Of Service	Average Density (vehicles/mile/lane)
A	Density ≤ 11
B	11 < Density ≤ 18
C	18 < Density ≤ 26
D	26 < Density ≤ 35
E	35 < Density ≤ 45
F	Density > 45

Source: Highway Capacity Manual, Transportation Research Board, Washington D.C., 2000

Urban Street Segment

Where segments are slower and traffic flows are interrupted by traffic signals, they are defined as urban streets. For urban streets, the average segment travel speed was used to calculate the LOS for urban streets. Table 2.6.3-3 identifies the speed ranges used to define LOS for urban street segments. The average speed is based on the posted speeds recommended for the roadway, and are adjusted for congested conditions using formulas provided in the HCM.

TABLE 2.6.3-3
URBAN STREET SEGMENT LEVEL OF SERVICE THRESHOLDS

Urban Street Classification	I	II	III	IV
Range of free-flow speeds (FFS)	55 to 45	45 to 35	35 to 30	35 to 25
Typical FFS	50	40	35	30
LOS	**Average Travel Speed**			
A	>42	>35	>30	>25
B	>34-42	>28-35	>24-30	>19-25
C	>27-34	>22-28	>18-24	>13-19
D	>21-27	>17-22	>14-18	>9-13
E	>16-21	>13-17	>10-14	>7-9
F	≤16	≤13	≤10	≤7

Note: All speeds are in MPH (miles per hour)

Source: DKS Associates, 2004

Evaluation Criteria. The Caltrans HDM requires that highways be designed for a LOS D or better according to the *Highway Capacity Manual* definition. And, while it is beyond the requirements of this project to improve segments not affected by the project alternatives, it was noted if a segment operated below standard.

2.6.4 Segment Travel Time

The concept of travel time was also used to evaluate the performance of the segments, as users are quite adept at finding the quickest time path to their destination. This makes travel time analysis particular easy to understand and evaluate. The HCM defines travel time as the average time spent by vehicles traversing a highway segment, including control delays.

To estimate average peak period travel times in the Base Year, travel time is first measured during free-flow and peak period conditions to calibrate the SF-TDM. Then the delay (in terms of time) resulting from each alternative was calculated based on the change from the Base Year and the Design Year No Build condition. Changes in delay can be due to deceleration, movement in queues, and acceleration of vehicle passing through an intersection.

Evaluation Criteria. There are no standard evaluation criteria for travel time. The criterion of travel time was identified as a descriptive measure, and therefore, there is no significance level associated with it. It is assumed that an impact on travel time will be mitigated in the highway or urban street segment LOS section.

The following eight highway segments were evaluated. Note that the segments listed as Golden Gate Bridge begin at, but do not include, the toll plaza.

- Golden Gate Bridge Toll Plaza to Park Presidio/Lake Street
- Park Presidio/Lake Street to Golden Gate Bridge Toll Plaza
- Golden Gate Bridge Toll Plaza to Marina Boulevard/Divisadero Street
- Marina Boulevard/Divisadero Street to Golden Gate Bridge Toll Plaza
- Golden Gate Bridge Toll Plaza to Francisco Street/Richardson Avenue
- Francisco Street/Richardson Avenue to Golden Gate Bridge Toll Plaza
- Park Presidio/Lake Street to Marina/Divisadero Street
- Marina/Divisadero Street to Park Presidio/Lake Street

2.6.5 Segment Merge / Diverge Level of Service

When traffic moves from or to the side of the road to enter (merge) or exit (diverge) the facility; conflicting traffic movements occur. These conflicts vary with the length of merge/diverge areas, traffic volumes and lane density. For example, longer merge and diverge distances are required for ramps with high traffic volumes.

Caltrans' HDM does not contain a method for evaluating the merge and diverge areas on highway segments, but refers to Chapter 25, Ramps and Ramp Junctions in the HCM to evaluate the LOS of merge and diverge influence areas.

The level of service for merging and diverging areas is based on the capacity of the highway sections affected by the merging/diverging, and the capacity of an off-ramp for diverging areas. Three measurements used to calculate the LOS are:

- The traffic flow (volume) on the two outside lanes of the highway immediately upstream of the influence area;
- The capacity of the freeway approaching, entering and departing the influence areas; and,
- The capacity of the ramp and the density of flow on the ramp.

Evaluation Criteria. The *HCM* states, "levels of service in merge and diverge influence areas are defined in terms of density for all cases of stable operation, LOS A through E. LOS F exists when the demand exceeds the capacity of upstream or downstream freeway sections or the capacity of an off-ramp." Caltrans Design Guide defines LOS E and LOS F as deficient levels of service.

The software package, Highway Capacity Software, HCS2000 (version 4.1a), analyzes ramp junction merges and diverges using the HCM methodology. Table 2.6.5-1 includes the density ranges for identifying the LOS for merge and diverge areas. All on and off ramps that are part of the Doyle Drive reconstruction were examined. They are shown in Table 2.6.5-2.

TABLE 2.6.5-1
LEVEL OF SERVICE CRITERIA FOR MERGE AND DIVERGE AREAS

Level Of Service	Average Density (vehicles/mile/lane)
A	Density ≤ 10
B	10 < Density ≤ 20
C	20 < Density ≤ 28
D	28 < Density ≤ 35
E	Density > 35
F	Demand exceeds capacity

Source: Highway Capacity Manual, Transportation Research Board, Washington D.C. 2000

TABLE 2.6.5-2
MERGE/DIVERGE LOCATIONS BY ALTERNATIVE

			Alternatives			
			Design Year			
No.	**Location**	**Base Year**	**1 No Build**	**2 Replace and Widen**	**5 Parkway: Diamond Option**	**5 Parkway: Circle Drive Option**
1	US 101 Southbound exit diverge to Park Presidio	■	■	■	■	■
2	US 101 Southbound entrance merge from Park Presidio	■	■	■	■	■
3	US 101 Northbound entrance merge from Park Presidio	■	■	■	■	■
4	US 101 Northbound exit diverge to Park Presidio	■	■	■	■	■
5	US 101 Southbound diverge to Richardson	■	■	■	[1]	[1]
6	Doyle Drive and Richardson merge into US 101 Northbound	■	■	■	[3]	[3]
7	Park Presidio Southbound merge from US 101 Ramps	■	■	■	■	■
8	Park Presidio Northbound diverge to US 101 Ramps	■	■	■	■ [2]	■ [2]
9	US 101 SB exit diverge to Girard	*n/a*	*n/a*	*n/a*	■ [2]	■ [2]
10	US 101 NB exit diverge to Girard	*n/a*	*n/a*	*n/a*	■ [2]	*n/a*

Notes

n/a = merge/diverge location does not exist in this alternative.

[1] merge/diverge location eliminated in this alternative.

[2] new merge/diverge location.

[3] alternative adds a lane when roadways meet; no merge analysis needed

Source: DKS Associates, 2004

2.6.6 Segment Weaving

When ramps are closely spaced drivers maneuver across lanes of traffic to avoid conflicts. These maneuvers are called "weaving" and lead to safety and delay concerns. Any proposed weaving areas were analyzed if there was no weaving area existing before. Caltrans' HDM defines weaving sections as a length of one-way roadway where, vehicles are crossing paths, changing lanes, or merging with through traffic as they enter or exit a highway or collector-distributor road.

For the analysis of weaving sections, Caltrans' *HDM* accepts two methods, the Leisch method and the LOS D method (*Highway Capacity Manual*, 1965). Both methods utilize an accepted level of service standard for the operation of the weaving sections. The LOS standard used is based on the capacity of the roadway segment and operation of traffic volumes in the weaving section within the segment. The Leisch method involves several look-up charts (Nomographs) and tables depicting acceptable weaving lengths and LOS for the volumes on the weaving section. The LOS D method projects volumes on the weaving section and compares them to capacities along the weaving section. For this analysis, the team used the Leisch method.

The application of the weaving analysis depends on a number of variables. The resulting analysis is summarized in a letter representation of the adequacy of the weaving section. These are described as LOS "A" to "F", with LOS A representing the least congested condition and LOS F representing the most congested condition.

A study of preliminary designs resulted in an identification of all Doyle Drive roadway sections that qualify as weaving sections. These are shown in Table 2.6.6-1.

TABLE 2.6.6-1
WEAVING LOCATIONS BY ALTERNATIVE

No.	Location	Alternatives				
		Base Year	Design Year			
			1 No Build	2 Replace and Widen	5 Parkway: Diamond Option	5 Parkway: Circle Drive Option
1	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	■	■	■	■	■
2	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	■	■	■	■	■
3	US 101 Northbound between the Park Presidio exit ramp and Richardson/Marina Access merge	■	■	■	■	■
4	US 101 Southbound between the Park Presidio exit ramp and Richardson/Marina Access merge	■	■	■	■	■

Source: DKS Associates, 2004

Evaluation Criteria. Caltrans' *HDM* standard for weaving sections in urban areas is LOS "D" or better. The *HDM* also states that the accepted length of weaving lanes should not be less than 500 meters (1,640 feet) except where excessive cost or severe environmental constraints would require consideration of a shorter length.

2.6.7 Local Roads Analysis

Representative traffic volumes on a selection of local roads in the study area were taken directly from the San Francisco Travel Demand Model. These volumes were taken for each alternative to determine the impacts on the local community in the future. Under the future conditions, these volumes were then compared to the projected no-build scenario to determine the level of impact.

2.7 TRANSIT EVALUATION CRITERIA

Currently, San Francisco Municipal Railway (MUNI), Golden Gate Bridge, Highway and Transit District (Golden Gate Transit, or GGT), and the Presidio Trust operate transit service within and through the project area. Doyle Drive itself carries MUNI and GGT transit service; and these routes are most directly affected by the project alternatives. This report indicates all transit services that utilize, or are potentially affected, by the Doyle Drive project. Only transit lines that use Doyle Drive are evaluated in this document. Transit analysis prepared in this report is performed only for weekday peak periods, as this is the time that most transit agencies are most concerned about performance of the system.

The Draft PTMP estimates that by the Design Year, there will be additional residents living and working in the Presidio. This report estimates that 70 percent of external trips into the Presidio and 50 percent of all internal trips (within the Presidio) will arrive by automobile.

This report does not propose route restructuring; and route changes are not assumed in this analysis. Subsequent studies will be undertaken by transit operations when they determine the need to study and implement future route changes.

2.7.1 Travel Time Along Segments

Transit vehicles can often travel faster than private vehicles in congested conditions if there is dedicated transit-only or carpool/transit-only right-of-way. However, when transit vehicles do not have their own right-of-way, they are dependent on the general conditions and speeds of the roadway. Transit travel time consists of three time variables, including:

- In-vehicle travel time – the operational time on the roadway
- Acceleration/deceleration travel time – results from buses having to slow down or speed up to access their stops
- Boarding/alighting time –the additional time needed for passengers to enter and exit the bus

All GGT routes that cross the Golden Gate Bridge follow the same segment of roadway between the Golden Gate Bridge and Lombard Street, except GGT Route 50. For purposes of this report, all GGT travel times except for Route 50 are combined. The primary segment analyzed for GGT and MUNI Route 76 begins at, but does not include, the Golden Gate Toll Plaza. The routes and their segments include:

- **GGT Route 50.** Golden Gate Bridge (at toll plaza) and Park Presidio at Lake Street.
- **GGT other routes.** Golden Gate Bridge (at toll plaza) and Richardson Avenue at Francisco Street.
- **MUNI Route 28.** Merchant Interchange (underneath Golden Gate Bridge toll plaza) and Richardson Avenue at Francisco Street; Merchant Interchange and Park Presidio at Lake Street.
- **MUNI Route 76.** Golden Gate Bridge (at toll plaza) and Richardson Avenue at Francisco Street.

Changes in transit travel times are only important when the additional time delays are so significant that they may affect ridership. Unfortunately, there is no specific policy by any operator or planning agency to identify a significant change. Generally, bus scheduling includes variable run times from one day to the next, so that travel time changes of less than two minutes are considered negligible. When travel times increase by five or ten minutes, transit resources and rider disincentives begin to occur.

Evaluation Criteria. No transit agency has defined standards related to transit travel time. GGT staff expressed interest in preventing any significant deterioration of travel times beyond the baseline condition and recommended that a significant travel time change would be an increase of three or more minutes.

The transit travel times were obtained directly from the SF-TDM. The analysis of transit travel time was identified as a descriptive measure, and therefore, there is no significance level is associated with it. It was assumed that any change in travel time was included in the Segment LOS analysis.

2.7.2 Transit Operations (Capacity) Level of Service

The transit LOS describes over/under crowding conditions of the transit routes by estimating the peak hour load factors, or percentage of bus loading. The methodology was developed by OER to determine the effects of development on the system capacity and was used for this report.

In contrast to longer-distance freeway-oriented bus transit operators, MUNI has established a capacity utilization service standard with includes both seating capacity and standing passengers. In assuming standing passengers, MUNI buses can usually accommodate 30 percent to 80 percent more passengers when compared to the number of available seats, depending upon the specific transit vehicle type and configuration.

A number of transit routes operate on Doyle Drive and were evaluated, including:

- **MUNI Routes** – 28 and 76
- **GGT Routes –** 2, 4, 8, 10, 18, 20, 24, 26, 28, 30, 32, 34, 38, 44, 48, 50, 54, 56, 60, 70, 72, 74, 76, 78, 80, 90 and 93 (based on the route structure in 2000)

In addition, an assessment was made for nearby MUNI Routes 82x, 43 and 29 to verify whether or not ridership impacts would occur on these routes. A description of stop activity is also included in some sections of this report. The activity at local transit stops affects the attractiveness of transit routes on Doyle Drive. It is also is important to include appropriate bus stop facilities, amenities and geometric considerations in the project alternatives.

There are no specific evaluation standards for stop activity. However, bus stops should provide enough room for buses to load and unload without blocking traffic and to allow other buses to access the stop as buses loading/unloading clear the stop. The lead and cooperating/responsible agencies that included the transit provider's evaluated transit stop requirements and determined that four-bus bays were needed in each direction to accommodate GGT and MUNI routes on Doyle Drive and Richardson Avenue. Transit stops are identified in Table 2.7.2-1.

TABLE 2.7.2-1
STOP LOCATIONS BY ALTERNATIVE

Transit Stop	Direction	Alternatives: Base Year	Design Year: 1 No Build	Design Year: 2 Replace and Widen	Design Year: 5 Parkway: Diamond Option	Design Year: 5 Parkway: Circle Drive Option
US 101 S. of Toll Plaza	Northbound	■	■	■	■	■
	Southbound	■	■	■	■	■
Merchant, E. of Toll Plaza	Northbound	■	■	■	■	■
	Southbound	■	■	■	■	■
Merchant, W. of Toll Plaza	Northbound	■	■	■	■	■
	Southbound	■	■	■	■	■
Richardson, south or north. of Gorgas	Northbound	■	■	■	■	■
Richardson, South or north of Gorgas	Southbound	■	■	■	■	■

Source: DKS Associates, 2004

Evaluation Criteria. Each operator has a "load factor" calculation that determines if a bus is over/under capacity. A summary of the load factor standards, as described in OER's *Guidelines for Environmental Review: Transportation Impacts* is illustrated in Table 2.7.2-2. Although there are national guidelines to determine the capacity of transit services, facilities and systems (i.e. TCRP Report 100 – Transit Capacity and Quality of Service Manual) the OER standards were developed to describe when buses are over-crowded – allowing for both seated and standing passengers. GGT routes run primarily on freeway segments for several miles; therefore, standing passengers should be avoided and a load factor of 1.00 passenger per seat these routes should not be exceeded.

TABLE 2.7.2-2
TRANSIT OPERATIONS LEVEL OF SERVICE BY OPERATOR

Transit Operator	TOLOS	Peak Period Load Factor	Peak Hour Load Factor	Ratio: riders/seat	Duration of Peak Period for Load Factor	Peak Hour Capacity Utilization[1]
MUNI[2]	E	0.80	0.96	1.0 - 1.8	2 hours	96%
BART	E	1.00	1.00	1.35	1 hour	135%
AC Transit	E	1.00	1.00	1.00	1 hour	100%
Golden Gate Transit	E	1.00	1.00	1.00	1 hour	100%
Caltrain	E	1.00	1.00	1.00	1 hour	100%
Sam Trans	E	1.00	1.00	1.00	1 hour	100%

Notes:
1. When the "peak hour capacity utilization" noted here is met or exceeded, the relevant portion of the transit system is assumed to be operating at or above the load standard, TOLOS E, which is an unacceptable condition.
2. The riders/seat ratio varies by transit vehicle

Source: *Transportation Impact Analysis Guidelines for Environmental Review, City and County of San Francisco, October 2002.San Francisco Office of Environmental Review*

2.8 PEDESTRIAN AND BICYCLE EVALUATION CRITERIA

Providing for, and improving, pedestrian and bicycle access to and from the Presidio is important. The bicycle and pedestrian assessment addresses whether the project alternatives are consistent with the appropriate design manuals and planning documents.

Preserving these networks is critical to the success of the Presidio and to the project. Summaries of relevant documents, such as the *San Francisco Bicycle Plan*, and various Presidio Trust plans pertaining to pedestrian and bicycle access were reviewed to ensure the project alternatives are consistent with the goals stated in the documents.

2.8.1 Bicycles

Bicycle transportation is an important consideration within the Bay area, and is of particular interest in recreational areas like the Presidio. A great deal of attention to providing for bicyclists has occurred in several planning efforts at the Presidio resulting in the San Francisco Bicycle Plan and Presidio Trails and Bikeways Master Plan. This report identifies any project elements that may preclude the implementation of those plans.

In Caltrans' HDM, Chapter 1000 provides detailed design standards for Class I, II and II bicycle facilities. The definition of each class of bicycle lanes is:

- Class I – separate off-street path
- Class II – dedicated, striped bike lane on roadway edge
- Class III – signed route only, bicyclists share the roadway with vehicles.

Evaluation Criteria. This report examines whether any of the project alternatives preclude, or negatively affect implementation of the above plans by obstructing, rerouting, or requiring a more inconvenient route.

2.8.2 Pedestrians

The location of bridges, tunnels, staircases and surface streets determine where pedestrians can cross or walk along the facility. A substandard pedestrian facility exists on the north side of the Doyle Drive structures. Presidio plans to maintain and expand pedestrian facilities are described in the Presidio Trails and Bikeways Mater Plan.

Caltrans does not have any specific standards related to pedestrian accommodations, although the roadway must include appropriate (ADA compliant) pedestrian treatments where pedestrian/traffic conflicts are expected. In particular, several project alternatives include intersections where pedestrian activities are expected. While the pedestrian facilities on the northern end are substandard, this project does not include a replacement pedestrian facility. As discussed in Chapter 3, pedestrian facilities are usually provided in well occupied areas.

In order to quantitatively describe the pedestrian benefits, travel times between some key connections can be examined. The key connections used in this report are:

- Lincoln Boulevard and Sheridan Avenue (National Cemetery) to Mason Street and Halleck Street (Crissy Field Interpretative Center)
- Lyon and Mason Streets (Exploratorium/Palace of Fine Arts) to Lincoln Boulevard and Halleck Street (Main Post)
- Bay and Baker Streets (Marina neighborhood) to Mason Street and Halleck Street (Crissy Field Interpretative Center)

Evaluation Criteria. Distances, and routing, between key attractions are used to evaluate changes among alternatives. For this document, a brisk 1.2 meters/second (4 feet per second, which is consistent with HCM assumptions) were assumed in calculating what the pedestrian travel time changes would be.

2.8.3 Intersection Crossing Times

Pedestrians can, and will, cross various intersections included in the project alternatives. Therefore, the layout and design of the intersections must provide adequate crossing time for pedestrians. This time allowance was included as part of the intersection LOS analysis.

The San Francisco Department of Parking and Traffic (DPT) provided the following guidelines for pedestrian crossings. Their overall guidance was consistent with the Manual on Uniform Traffic Control Devices for Streets and Highways, 2003 Edition (MUTCD), which states that, "*the pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder during the WALKING PERSON (symbolizing WALK) signal indication, to travel at a walking speed of 1.2 meters (4 feet) per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait,"*

DPT requires a walking speed of 0.76 meters per second (2.5 feet per second) if no median exists and 1.2 meters per second (4 feet per second) with medians. DPT follows MUTCD and Caltrans guidance's for a 4 to 7-second "WALK" symbol interval before the clearance interval begins. The resulting minimum clearance time is then applied to the green, yellow and any trailing all-red phases at an intersection for both the WALK and flashing DON'T WALK signals.

DPT's current fixed-time signal timing plans were used to evaluate all existing intersections, except the intersection at Francisco Street and Richardson Avenue. At Francisco Street and Richardson Avenue, the timing plans were changed to account for the introduction of "walk/don't walk" signal heads, as well as to accommodate an increase in pedestrian traffic that will probably result from nearby developments.

2.9 CONSTRUCTION PERIOD TRAFFIC EVALUATION

Because Doyle Drive is heavily used, the construction could easily disrupt traffic flow and increase congestion and travel time for vehicles and buses. Major construction projects such as this will typically last several years and often require road closures and other traffic and transit changes. Detailed construction staging, phasing, transportation management plans are developed. These detailed plans determine the duration, flow, signage and times of day when lane closures and other traffic controls will be needed to create a safe and effective construction environment.

Careful study of construction requirements for the project alternatives resulted in a preliminary staging strategy that does not vary greatly from the current condition or between alternatives. However, some road closures or lane reductions were identified and evaluated for the Year 2010 to identify the potential traffic effects during construction by analyzing the highway segments during these periods. The temporary impacts of construction were analyzed for major highway segments to explain what kinds of traffic shifts may occur.

2.10 SUMMARY OF METHODS

Table 2.10-1 summarizes the issue that was analyzed, the measure of effectiveness, and the associated methodology used.

TABLE 2.10-1
SUMMARY OF METHODS

Issue		Measure	Methodology
Traffic	Intersection	LOS Queue	HCM 2000 HCM 2000
	Segment	LOS Travel Time Merge / Diverge Weave	HCM 2000 SF-TDM (Travel Demand Model) HCM 2000 (HCS2000 version 4.1a) Caltrans Leisch Method
Transit		Travel Time Capacity	SF-TDM (Travel Demand Model) OER Load Factors
Bicycles/Pedestrians		Assessment Minimum Crossing Speed/Time	Consistency with plans HCM 2000
Construction Period Traffic		Segment Volumes	SF-TDM

3.0 EXISTING CONDITIONS

This section describes the operational and circulatory characteristics for traffic, transit, bicycle, and pedestrian facilities in the study area, as they exist in the Base Year.

3.1 GOLDEN GATE BRIDGE OPERATIONS

The Golden Gate Bridge, Highway and Transportation District (GGBHTD) records hourly counts at the Toll Plaza. From these counts an indication of the maximum flow rate per lane can be determined. In October 2003, the GGBHTD recorded data of approximately 4,100 vehicles at peak hour in the southbound direction when two lanes were open, which can be interpreted as 2,050 vehicles per lane per hour as a maximum flow rate for bridge traffic.

DKS analyzed the operations of the bridge using a freeway/highway operations program entitled FREQ. FREQ allows for a more detailed analysis of operations, including the associated impacts of weaving and congestion spillback. The program was chosen as the preferred analysis tool to represent the potential impacts of reducing lanes on the Golden Gate Bridge.

There are eleven toll booths at the south end of the bridge. During the AM peak period in 2004, there are seven “mixed” (FasTrak, and cash lanes) and four FasTrak lanes in the southbound direction. The northbound direction uses the two lanes that do not have toll booths on them. When an additional northbound lane is added, the easternmost toll booth is turned off to allow northbound traffic to use the toll booth lane as a travel lane. During the PM peak period, there are seven “mixed” lanes and two FasTrak lanes in the southbound direction; the two easternmost toll booths carry traffic in the northbound direction.

The Golden Gate Bridge, Highway and Transportation District also records the aggregate fare payment method for the toll booths. Automatic toll collection (FasTrak), introduced in 1999, has quickly become the preferred toll payment method for morning commuters. Data provided from the October 26, 2003 AM peak period commute shows that the toll payment proportions are as follows:

- Automatic Toll Collection (FasTrak) – 69.5 percent
- Carpool (free) – 4.1 percent
- Cash – 25.9 percent
- Other – 0.5 percent

The Golden Gate Bridge, Highway and Transportation District also records hourly counts at each toll booth. The implementation of FasTrak has provided significant toll plaza increases. FasTrak toll booths are shown to be able to carry over 1,100 vehicles per booth per hour. Other toll booths have also seen an increase in flows of up to 400 vehicles per booth per hour with the introduction of FasTrak readers at each booth.

During the AM peak period, using an assumption of four FasTrak lanes (1,100 vehicles per booth per hour) and seven cash lanes (380 vehicles per booth per hour), the total anticipated flow capacity of the toll plaza is estimated at 7,060 vehicles for an eleven toll booth scenario. During the PM peak period, the capacity at the toll plaza (southbound direction) would be 4,860.

Travel time/speed sample runs in the AM peak period were undertaken and no significant delays related to congestion were observed. Some slow-down occurs in the vicinity of the toll plaza, especially southbound, but the results of the delay runs show no significant delay occurring in either direction on the Golden Gate Bridge.

In 2004, the travel time/speed sample speeds that showed no significant delays in either direction were replicated. It was found (through recent speed delay surveys) that there is no congestion-related slow down in either direction (on the Golden Gate Bridge) during the AM peak hour. The surveys also noted that any toll plaza delay was generally created if someone had to wait behind a car getting change, but that this did not extend beyond a few vehicles.

3.2 TRAFFIC CONDITIONS

Doyle Drive is, and will continue to be, classified as a multilane conventional highway with a posted speed of 45 mph for its mainline section and 35 mph for its ramp and weaving sections. Generally, Doyle Drive operates as a transitional roadway. At the west terminus, near the Golden Gate Bridge, it operates like a free-flow roadway, while at the east terminus it operates like an arterial roadway meeting local streets. Within the 2.4-kilometer section (1.5 miles) there are several ramps that carry significant traffic, reversible lane configurations that change throughout the day and access to the local street network. These changes make Doyle Drive difficult to define with a single term, but the differing segments generally operate as a conventional highway. The Doyle Drive operational segments, from west to east, are described below.

- **Park Presidio Boulevard to south of Merchant Road.** Includes approximately seven traffic lanes that generally operate as four lanes in the peak direction and three lanes in the non-peak direction using reversible lanes. Much of this segment requires lane changes and significant weaving associated with the GGB toll plaza, Merchant Road ramps (to/from GGB viewing area), and Park Presidio Boulevard ramps.
- **Park Presidio Boulevard Interchange to Marina Boulevard.** Includes six lanes of traffic that generally operate as three lanes in the peak direction, two lanes in the non-peak direction, and one lane unused as a buffer lane. In the AM peak, four lanes are provided in the peak (eastbound) direction, and two in the non-peak (westbound) direction.
- **Richardson Avenue, Lyon Street to Marina Boulevard Access Ramps.** Includes one roadway that transitions to an urban street with three lanes of traffic in each direction. The portion of this segment closer to Doyle Drive operates with two highway lanes in the northbound direction, and three highway lanes in the southbound direction.
- **Marina Boulevard Access Ramps to Lyon Street (Marina connector).** Includes a single roadway with five traffic lanes. Plastic pylons are used to reverse, reduce, and divide the traffic varying the facility from two lanes near Lyon Street in each direction to one lane near the Richardson Avenue ramp connections. Other lanes are used as buffer zones when not used for traffic.

The measures of effectiveness used to describe the adequacy of existing traffic operations for each alternative were described in Chapter 2.0 Methodology and include Level of Service (LOS) with time of delay, length of queuing, segment LOS, travel time between two points, speed on the segment, length for merging and/or diverging, and length for weaving.

3.2.1 Intersection Level of Service

The methodology described in Section 2.6.1 was used to analyze intersections to determine current operations. However, a series of constraints were needed to account for the high pedestrian, bicycle, and transit activities, as well as for parking restrictions. Specific considerations included adjusting pedestrian crossing times to allow adequate crossing time, and adding bicycle and bus volumes. Additional transit impacts may occur when transit vehicles stop in moving traffic lanes in order to pick-up and drop-off passengers, as is the case with Route 28 on Park Presidio Boulevard. Table 3.2.1-1 provides the existing AM, PM, and Weekend LOS and delay by intersection. These results are also visually displayed on Figure 3.2.1-1. Detailed intersection LOS calculations are provided in Appendix C.

Traffic along Marina Boulevard all-way stop intersections at Divisadero Street and Broderick Street currently operate at a deficient level of service. Intersections operating at LOS E or LOS F are considered to be deficient. These all-way stops were installed in 2000 to create a traffic calming effect on Marina Boulevard. The congestion shown at the two unsignalized intersections along Marina Boulevard are a result of the heavy volumes traveling along Marina Boulevard.

FIGURE 3.2-1
EXISTING INTERSECTION LEVEL OF SERVICE (Base Year)

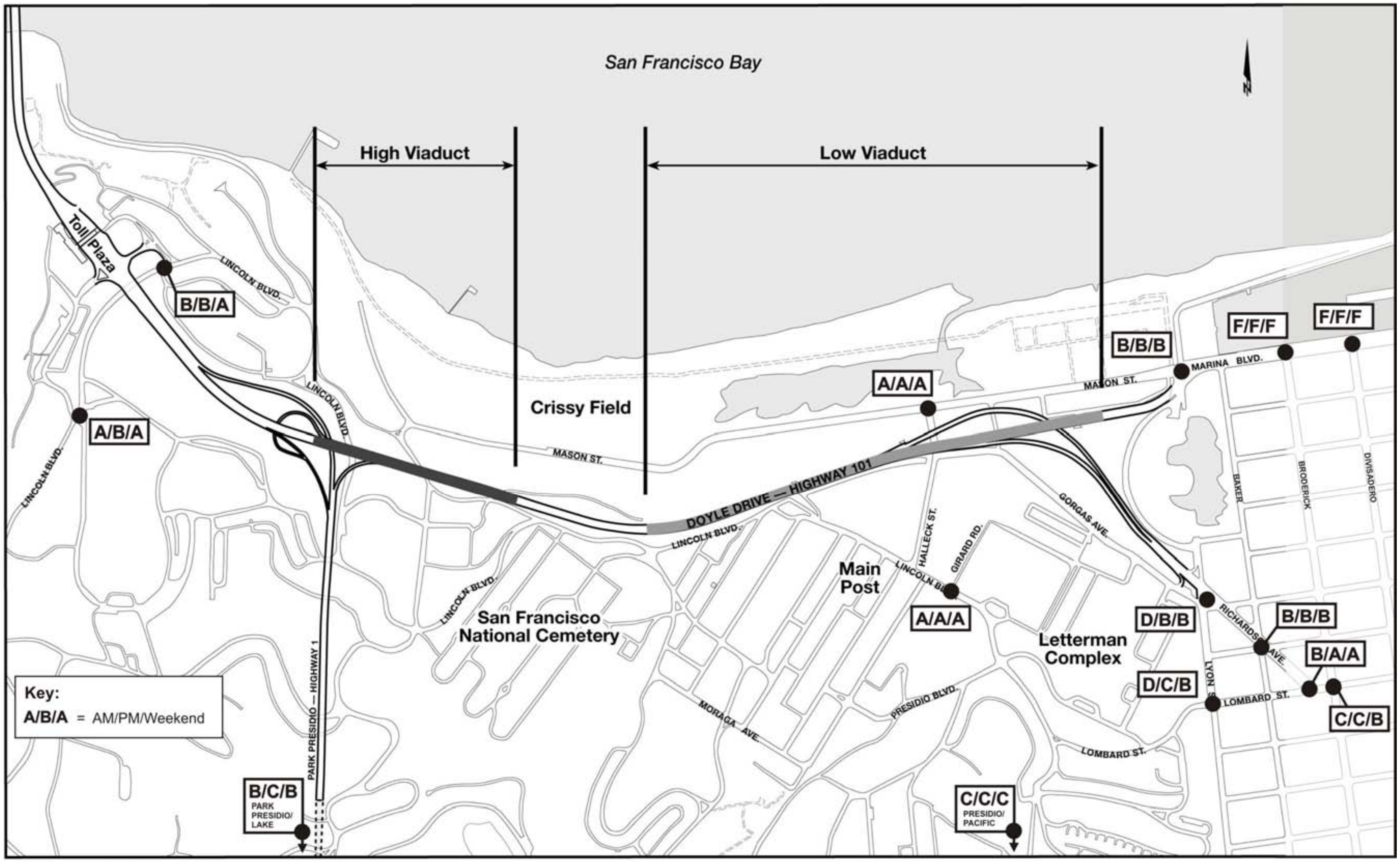


TABLE 3.2.1-1
INTERSECTION LEVEL OF SERVICE FOR EXISTING CONDITIONS

Intersection			AM Peak Hour		PM Peak Hour		Weekend Peak Hour	
No.	North/South	East/West	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]
1	Lyon	Marina	B	13	B	18	B	20
2	101 / Richardson	Francisco	C	34	A	10	B	11
3	Lincoln (N)	GGB Viewing Area	B	12	B	12	B	11
4	Lincoln (S)	Merchant	A	10	B	11	B	11
5	Girard	Lincoln	A	<1	A	<1	A	<1
6	Halleck	Mason	A	6	A	6	A	6
10[2]	Broderick	Marina	F	59	F	>100	F	>100
11	Divisadero	Marina	F	79	F	>100	F	>100
12	101 / Richardson	Chestnut	B	13	B	15	B	12
13	101 / Richardson	Lombard	B	10	A	5	A	7
14	Broderick	Lombard	C	21	C	25	B	18
15	Lyon	Lombard Gate	D	29	C	18	B	13
16	Presidio	Pacific	C	16	C	19	C	19
17	Park Presidio	Lake	B	17	C	21	B	15
18	Merchant	GGB Viewing Area	A	9	B	13	B[3]	12[3]

Notes:
1. Delay measured in seconds per vehicle
2. Intersections 7 through 9 do not exist today
3. Weekend peak hour congestion varies significantly depending on weather and events

Source: DKS Associates, 2004 from HCM 2000 methodology

3.2.2 Intersection Queue Lengths

When a vehicle reaches a red traffic signal, the vehicle is in a “queue” waiting to proceed through the intersection. The total length of the waiting vehicles, or the queue length, describes how far from a signalized intersection the line of vehicles is located at peak times. Table 3.2.2-1 identifies the existing maximum peak hour queue length for the study intersections. See Appendix D for a complete set of calculated queue lengths for all intersections and movements.

It is recognized that although intersections may operate at a satisfactory level of service, particular approaches may have excessive queue lengths. Examples of this are found at the intersection of Richardson Avenue and Francisco Street.

TABLE 3.2.2-1
MAXIMUM QUEUE LENGTHS FOR EXISTING CONDITIONS

No.	Intersection	Direction	Time Period	Queue Length[1]	Critical Movement	Storage Description
1	Marina / Mason	SB	PM	82	Right	Mason contains overflow storage
		EB	Weekend	99	Shared	440 meters back to the Richardson off-ramp
		WB	PM	105	Left	120 meters back to Baker
2	Richardson / Francisco	NB	PM	40	Shared	140 meters back to Chestnut
		SB	AM	>246[2]	Through	375 meters back onto Marina ramps
		EB	AM	25	Shared	10 meters back to Lyon, Gorgas contains overflow storage
		WB	PM	63	Shared	90 meters back to Baker

Notes: 1. Queue length in meters; queues are averaged across all lanes
2 Queue shown is maximum after two traffic cycles, observed queues may be longer
Source: DKS Associates, 2004

3.2.3 Segment Level of Service

Table 3.2.3-1 contains the existing LOS and vehicle density for the highway segments within the project area. The peak direction of Doyle Drive traffic is near the preferred design standard of LOS D.

For urban street segments (segments containing a signal) identified in this study, the Urban Street Segment methodology was used. This method is based on urban street class and average travel speed. Table 3.2.3-2 identifies the four urban street segments evaluated in the project area including the segment classification and existing LOS. Although particular intersections may operate at high level of congestion, each of the urban street segments is estimated to operate at acceptable levels of service (Level of Service D or better) during peak hours.

TABLE 3.2.3-1
PEAK HOUR HIGHWAY SEGMENT LEVEL OF SERVICE FOR EXISTING CONDITIONS

Segment		AM		PM		Weekend	
		LOS	Density[1]	LOS	Density[1]	LOS	Density[1]
1	US 101 Southbound between the Merchant Road Ramps and Park Presidio	D	31	B	16	C	23
2	US 101 Northbound between Park Presidio and the Merchant Road Ramps	C	20	D	28	C	23
3	US 101 Southbound between Park Presidio and Marina Blvd access ramps	D	26	C	26	C	24
4	US 101 Northbound between Marina Blvd access ramps and Park Presidio	B	14	D	31	B	18
9[2]	Park Presidio Southbound between US 101 and the Park Presidio Tunnel	C	24	C	23	C	22
10	Park Presidio Northbound between the Park Presidio Tunnel and US 101	C	24	D	28	C	20
11	US 101 Southbound between Park Presidio off and on-ramps	D	28	B	13	C	19
12	US 101 Northbound between Park Presidio on and off-ramps	A	11	C	24	B	14
13	US 101 Southbound between Marin County and Merchant Road (Golden Gate Bridge)	D	29	C	20	D	28
14	US 101 Northbound between Merchant Road and Marin County (Golden Gate Bridge)	D	29	E	42	D	20

Notes: 1. Density measured in vehicle per mile per lane
2. Segments 5 through 8 were analyzed as Urban Arterial Segments only (see Table 3.2.3-2)

Source: DKS Associates, 2004

TABLE 3.2.3-2
PEAK HOUR URBAN STREET SEGMENT LEVEL OF SERVICE FOR EXISTING CONDITIONS

Segment		Urban Street Class[1]	AM		PM		Weekend	
			LOS	Speed[2]	LOS	Speed[2]	LOS	Speed[2]
5	Richardson Southbound between Marina Blvd access ramps and Lyon	II	C	19	B	26	B	26
6	Richardson Northbound between Lyon and Marina Blvd access ramps	II	B	26	D	14	B	26
7	Marina Blvd Southbound between Lyon and Doyle Drive merger	III	B	26	B	27	B	27
8	Marina Blvd Northbound between Doyle Drive merger and Lyon	III	B	27	B	25	B	27

Notes:
1. Urban Street Class II have a range of free flow speeds between 35 to 45 mph, while Urban Street Class III have a range of free flow speeds between 30 to 35 mph
2. Speed calculated according to HCM methodology in miles per hour (mph). It is calculated as the average speed on the link. Delays at intersections are included in travel time analysis.

Source: DKS Associates, 2004

3.2.4 Segment Travel Time

Table 3.2.4-1 identifies the travel time for selected highway segments and demonstrates a higher travel time in the peak direction when compared with the non-peak direction. The average PM peak direction travel time is estimated to be up to 1.5 minutes longer when compared to the non-peak direction for the segments between Park Presidio Boulevard at Lake and the Golden Gate Bridge, and up to 1.3 minutes longer from Marina at Divisadero to the Golden Gate Bridge.

TABLE 3.2.4-1
PEAK PERIOD TRAVEL TIME ON ROADWAY SEGMENTS FOR EXISTING CONDITIONS

	Segment	AM [1, 2]	PM [1, 2]	Weekend [1, 2, 3]
1	Golden Gate Bridge toll plaza to Park Presidio and Lake	3.8	3.1	3.0
2	Park Presidio and Lake to Golden Gate Bridge toll plaza	3.4	4.4	2.8
3	Golden Gate Bridge toll plaza to Marina and Divisadero	3.4	2.7	2.7
4	Marina and Divisadero to Golden Gate Bridge toll plaza	2.7	4.0	2.7
5	Golden Gate Bridge toll plaza to Francisco / Richardson	2.9	2.5	2.4
6	Francisco / Richardson to Golden Gate Bridge toll plaza	2.6	4.0	2.6
7	Park Presidio and Lake to Marina and Divisadero	5.6	5.9	4.4
8	Marina and Divisadero to Park Presidio and Lake	5.2	6.4	4.9

Notes:
1. Travel time measured in minutes
2. Travel times based on speed calculated from the SFCTA Travel Demand Model (TDM)
3. Weekend peak hour congestion varies significantly depending on weather and events

Source: DKS Associates, 2004

3.2.5 Segment Merge / Diverge Level of Service

The ability of vehicles to merge and diverge effectively has been defined with a level of service calculation, based on information about geometries and traffic volumes. Table 3.2.5-1 details the LOS results for the merge/diverge of all the on- and off-ramps in the project area. LOS E and LOS F are considered to be deficient based on the Caltrans Design Guide. According to HCM 2000, the *capacity of a merge or diverge area is always controlled by the capacity of its entering and exiting roadways, that is the freeway segments up and downstream of the ramps or by the capacity of the ramp itself. For diverge areas, failure often occurs because of insufficient capacity on the off-ramp.*

TABLE 3.2.5-1
PEAK HOUR MERGE/DIVERGE LEVEL OF SERVICE ANALYSIS FOR EXISTING CONDITIONS

		AM		PM		Weekend	
No.	**Segment Number**	**LOS**	**Density[1]**	**LOS**	**Density[1]**	**LOS**	**Density[1]**
1	US 101 Southbound exit diverge to Park Presidio	F[2]	26	B	13	C	21
2	US 101 Southbound entrance merge from Park Presidio	E	36	C	21	C	27
3	US 101 Northbound entrance merge from Park Presidio	C	28	C	27	B	18
4	US 101 Northbound exit diverge to Park Presidio	B	18	D	34	C	23
5	US 101 Southbound diverge to Doyle Drive and Richardson	E	37	C	22	C	27
6	Doyle Drive and Richardson merge into US 101 Northbound	B	19	E	37	C	23
7	Park Presidio Southbound merge from US 101 Ramps	D	26	D	25	C	22
8	Park Presidio Northbound diverge to US 101 Ramps	C	27	D	30	C	23

Notes: 1. Density measured in vehicles per mile per lane
2. Highway influence area and ramp demand exceed capacity

Source: DKS Associates, 2004

Deficiencies are found during the AM peak at the southbound diverge (exit) to Park Presidio Boulevard, at the southbound entrance merge from Park Presidio Boulevard, and southbound diverge (exit) to Richardson Avenue and Marina Boulevard. During the PM peak, a LOS deficiency is calculated at the westbound merge (on) between Richardson Avenue and Marina Boulevard. See Appendix E for a complete set of calculations of this analysis. The southbound diverge (exit) from US 101 to Park Presidio Boulevard and merge from Park Presidio Boulevard onto US 101 deficiencies during the AM peak hour are due to the capacity at this location being exceeded. The US 101 southbound diverge to Doyle Drive and Richardson is deficient due to capacity issues downstream. During the PM peak period, the Doyle Drive and Richardson merge into US 101 northbound deficiency is due to the high volumes of traffic that are making this merge.

3.2.6 Segment Weaving

Table 3.2.6-1 presents the LOS for highway weaving sections based on the Caltrans-approved Leisch method nomograph. The close spacing of the Merchant Road and Park Presidio Boulevard ramps combined with high traffic volumes on the Golden Gate Bridge result in congestion associated with weaving traffic between these two interchanges, problems as indicated by the deficient level of service.

3.2.7 Local Street Volumes

Representative volumes from the San Francisco Travel Demand Model are shown for the local roads for the existing conditions. The AM conditions are found in Table 3.2.7-1; the PM conditions are in Table 3.2.7-2.

In the AM peak hour, the highest volumes occur at the Presidio and Lombard Gates where there is approximately 1,000 vehicles traveling through these gates in both directions. During the PM peak hour, the highest volumes occur at the Presidio Gate and along Lincoln Boulevard with a lower flow occurring at the Lombard Gate.

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TABLE 3.2.6-1
WEAVING SEGMENT LEVEL OF SERVICE FOR EXISTING CONDITIONS

No.	Location	Level of Service		
		AM	PM	Weekend
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	C	C	E
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E	F
3	US 101 Southbound between the Park Presidio exit ramp and Richardson/Marina Access merge	C	A	C
4	US 101 Northbound between the Park Presidio exit ramp and Richardson/Marina Access merge	A	A	B

Note: Results interpreted from the nomograph.

Source: DKS Associates, 2004

TABLE 3.2.7-1
AM PEAK HOUR LOCAL STREET VOLUMES

Segment		Direction	Base Year (vehicles)
2	Lincoln--Long Avenue to Crissy Field	Westbound	10
	Lincoln--Crissy Field to Long Avenue	Eastbound	0
3	Lincoln--Sheridan to Crissy Field	Westbound	60
	Lincoln--Crissy Field to Sheridan	Eastbound	80
6	Mason--Zanowiz to Lyon	Westbound	10
	Mason--Lyon to Zanowiz	Eastbound	10
8	Lombard Gate--Lyon to Ruger	Westbound	510
	Lombard Gate--Ruger to Lyon	Eastbound	400
9	Girard--Lincoln to Gorgas	Northbound	20
	Girard--Gorgas to Lincoln	Southbound	10
10	Presidio Gate--Pacific to Broadway	Northbound	500
	Presidio Gate--Broadway to Pacific	Southbound	590
11	Arguello Gate--Pacific to Washington	Northbound	90
	Arguello Gate--Washington to Pacific	Southbound	60
13	15th Ave--Lake to Wedemeyer	Northbound	20
	15th Ave--Wedemeyer to Lake	Southbound	30
14	Lincoln--Brooks to Browley	Northbound	450
	Lincoln--Browley to Brooks	Southbound	10
17	Halleck Street – Lincoln to Mason	Northbound	30
	Halleck Street – Mason to Lincoln	Southbound	20
18	McDowell Street -- Lincoln to Mason	Northbound	20
	McDowell Street -- Mason to Lincoln	Southbound	0

Source: DKS Associates, 2004

TABLE 3.2.7-2
PM PEAK HOUR LOCAL STREET VOLUMES

	Segment	Direction	Base Year (vehicles)
2	Lincoln--Long Avenue to Crissy Field	Westbound	260
	Lincoln--Crissy Field to Long Avenue	Eastbound	30
3	Lincoln--Sheridan to Crissy Field	Westbound	340
	Lincoln--Crissy Field to Sheridan	Eastbound	60
6	Mason--Zanowiz to Lyon	Westbound	10
	Mason--Lyon to Zanowiz	Eastbound	50
8	Lombard Gate--Lyon to Ruger	Westbound	490
	Lombard Gate--Ruger to Lyon	Eastbound	290
9	Girard--Lincoln to Gorgas	Northbound	30
	Girard--Gorgas to Lincoln	Southbound	20
10	Presidio Gate--Pacific to Broadway	Northbound	580
	Presidio Gate--Broadway to Pacific	Southbound	530
11	Arguello Gate--Pacific to Washington	Northbound	150
	Arguello Gate--Washington to Pacific	Southbound	160
13	15th Ave--Lake to Wedemeyer	Northbound	60
	15th Ave--Wedemeyer to Lake	Southbound	40
14	Lincoln--Brooks to Browley	Northbound	530
	Lincoln--Browley to Brooks	Southbound	490
17	Halleck Street – Lincoln to Mason	Northbound	40
	Halleck Street – Mason to Lincoln	Southbound	40
18	McDowell Street -- Lincoln to Mason	Northbound	260
	McDowell Street -- Mason to Lincoln	Southbound	10

Source: DKS Associates, 2004

3.3 TRANSIT CONDITIONS

MUNI, Golden Gate Transit, Presidio Trust and “club” buses operate transit service within and through the study area. MUNI Route 28 is an important crosstown route that connects areas on the western side of San Francisco with the Presidio and Fort Mason.

Golden Gate Transit buses that operate on Doyle Drive provide public transit service between San Francisco and Marin and Sonoma counties. This service falls into two general categories: “Basic” service operates on a near 24-hours / 7-days per week basis, whereas “Commute” routes operate on a peak period / peak directional weekday basis.

Table 3.3-1 lists the number of buses that have some, or part, of their route on Doyle Drive. As shown in this table, Golden Gate Transit is heavily oriented to peak period and peak direction service, resulting in about two-thirds of all buses traveling in the peak direction during each peak period. Figure 3.3-1 contains a visual diagram of these routes, as well as the path of MUNI Routes 43, 29 and 82x.

In response to the low ridership associated with the recent downturn in the Bay Area economy, several Golden Gate Transit (GGT) services were eliminated or revised in November 2003. This report evaluates Base Year transit service levels on Doyle Drive as part of a “worst case” scenario. One example of this service revision is 30-minute GGT Route 50 service has been replaced with hourly GGT Route 10 service. It should be noted that GGT is committed to providing increased bus service in the area once the economy improves. As such, it was requested that the base year GGT routes remain intact under the existing conditions and that these were used for all future scenarios.

In addition, the buses open to the general public discussed here, other buses operate in the corridor. Golden Gate Transit District operates a subscription bus service across the Golden Gate Bridge to Doyle Drive. Also tour buses, private buses that travel to San Francisco, and Airport buses providing service to San Francisco International Airport operate in this corridor. Finally, the Presidio Shuttle services operate in the study area, although they do not use Doyle Drive.

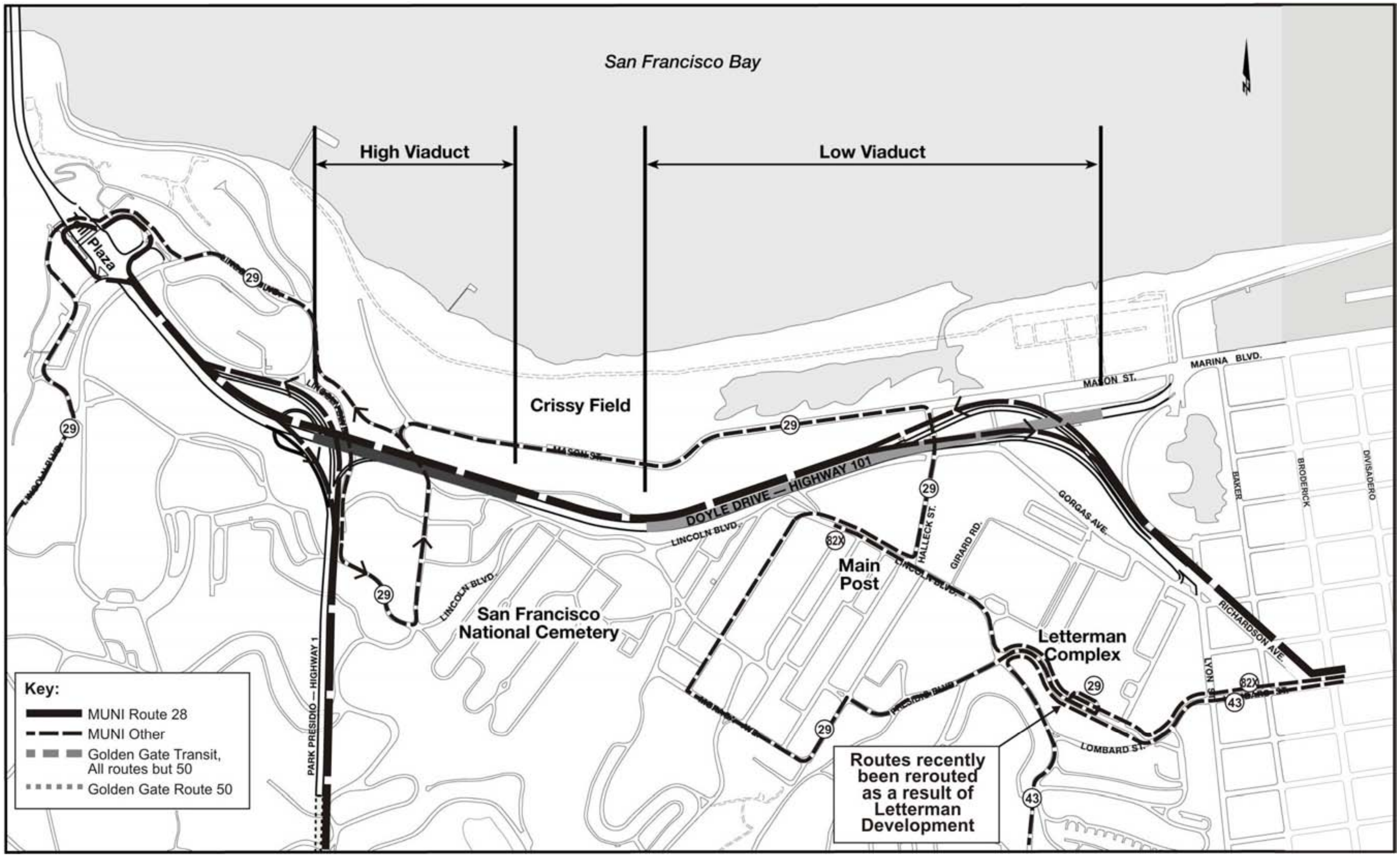
TABLE 3.3-1
EXISTING NUMBER OF BUSES ON DOYLE DRIVE

	All Day				Weekday Peak Period			
	Weekday		Saturday		AM		PM	
Route	In	Out	In	Out	In	Out	In	Out
San Francisco MUNI								
28	100	100	85	85	20	20	18	18
76[1]	-	-	9	9	-	-	-	-
Total MUNI	100	100	94	94	20	20	18	18
Golden Gate Transit								
2	9	7	-	-	9	-	-	7
4	22	25	-	-	20	-	-	21
8	5	4	-	-	4	-	-	4
10	1	-	13	13	-	-	-	-
18	12	13	-	-	10	-	-	11
20	29	35	33	33	6	7	6	7
24	22	21	-	-	19	-	-	18
26	10	7	-	-	8	-	-	6
28	2	2	-	-	2	-	-	2
30	9	9	-	-	0	1	3	1
32	3	3	-	-	3	-	-	3
34	4	3	-	-	4	-	-	3
38	8	8	-	-	7	-	-	7
44	5	4	-	-	5	-	-	4
48	3	3	-	-	3	-	-	3
50	29	16	16	16	5	1	6	3
54	17	17	-	-	16	-	-	13
56	8	8	-	-	8	-	-	8
60/70/80	35	50	36	38	5	8	8	8
72	10	12	-	-	9	-	-	10
74	16	15	-	-	11	-	-	12
76	13	12	-	-	13	-	-	10
78	3	3	-	-	3	-	-	3
90	3	2	-	-	1	1	-	1
93	6	1	-	-	6	-	-	1
Total GGT	284	280	98	84	177	18	23	166

Notes: 1. Operates on Sundays only

Source: DKS Associates, 2004 from published timetables

FIGURE 3.3-1
BASE YEAR BUS ROUTES



3.3.1 Transit Travel Time

The effective travel time of buses affects the transit riders and the overall productivity of the transit system. The current peak travel times are shown in Table 3.3.1-1. This data is obtained from examining the speeds of traffic on the roadway segments used by each route, and adding additional delay for loading and unloading passengers. Thus, as with the traffic travel times, peak period transit travel times are higher in the peak than in the non-peak direction.

TABLE 3.3.1-1
PEAK HOUR TRAVEL TIME FOR TRANSIT ROUTES FOR EXISTING CONDITION

	AM	PM
Segment	**Travel Time[1, 2]**	**Travel Time[1, 2]**
1 GGT Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.0(SB) 4.6(NB)	4.4(SB) 5.6 (NB)
2 GGT other routes: Golden Gate Bridge and Richardson/Francisco	5.5(SB) 5.1(NB)	5.0(SB) 6.7 (NB)
3 MUNI Route 28: Presidio/Lake to/from Richardson/Francisco via the Golden Gate Bridge plaza	10.1(SB) 10.1(NB)	11.1(SB) 10.6 (NB)

Notes: 1. Travel time is measured in minutes
2. Travel time information is derived from the SF-TDM model

Source: DKS Associates, 2004

3.3.2 Transit Operations (Capacity) Level of Service

Table 3.3.2-1 and Table 3.3.2-2 illustrate the northbound and southbound peak hour load factors for the combined Golden Gate Transit routes on Doyle Drive, Golden Gate Transit Route 50 and MUNI Route 28. As the tables show, no overall deficiencies exist, but some deficiencies on individual Golden Gate Transit routes are estimated. These localized deficiencies are monitored by Golden Gate Transit, which periodically adjusts their bus schedules to meet passenger loads.

Table 3.3.2-3 describes the current alighting and boarding activity for each of the bus stop locations in the project area. The greatest activity occurs in the AM peak period at the GGB toll plaza, with 257 total passenger boardings and alightings. During the PM peak period, the greatest activity is on Richardson Avenue at the northbound stop beyond Francisco Street, with 125 combined boardings and alightings between both MUNI and Golden Gate Transit.

TABLE 3.3.2-1
NORTHBOUND PEAK LOAD FACTORS FOR ROUTES ON DOYLE DRIVE IN EXISTING CONDITION
(Base Year)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
MUNI								
28	22	20	567	520	191	466	34%	90%
Golden Gate Transit								
2		4		172		79		46%
4		12		516		286		55%
8		3		129		43		33%
18		5		215		129		60%
20	2	2	86	86	32	50	38%	58%
24		7		301		220		73%
26		4		172		78		45%
28		2		86		10		12%
32		1		43		25		58%
34		1		43		22		51%
38		3		129		104		81%
44		2		86		48		56%
48		2		86		39		46%
50	2	2	86	86	14	44	17%	51%
54		6		258		192		75%
56		4		172		104		61%
72		4		172		165		96%
74		5		215		137		64%
76		5		215		150		70%
78		2		86		26		31%
60/70/80	3	2	129	86	80	48	62%	91%
90		1		43		9		20%
93		1		43		11		26%

Notes: 1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004

TABLE 3.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTOR ANALYSIS ON DOYLE DRIVE IN EXISTING CONDITION (Base Year)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
MUNI								
28	18	19	378	447	231	370	61%	83%
Golden Gate Transit								
2	5		215		121		56%	
4	7		301		262		87%	
8	2		86		61		71%	
18	6		258		151		58%	
20	2	1	86	43	109	63	100+%	100+%
24	9		387		243		63%	
26	3		129		115		89%	
28	2		86		17		20%	
32	1		43		34		80%	
34	1		43		43		99%	
38	4		172		134		78%	
44	2		86		61		71%	
48	2		86		37		44%	
50	4	3	172	129	33	59	19%	45%
54	6		258		199		77%	
56	4		172		106		62%	
72	3		129		142		100+%	
74	5		215		181		84%	
76	4		172		126		73%	
78	2		86		25		29%	
60/70/80	2	3	86	129	58	65	68%	50%
90	1		43		12		27%	
93	4		172		69		40%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004

TABLE 3.3.2-3
STOP ACTIVITY BY LOCATION FOR EXISTING CONDITION (Base Year)

Location	Peak Hour	Inbound		Outbound	
		Boardings	Alightings	Boardings	Alightings
Golden Gate Transit					
Francisco-Richardson NB	AM	-	-	3	0
	PM	-	-	79	40
Francisco-Richardson SB	AM	0	12	-	-
	PM	0	1	-	-
GGB Toll Plaza SB	AM	104	153	-	-
	PM	6	21	-	-
GGB Toll Plaza NB	AM	-	-	21	0
	PM	-	-	58	21
MUNI					
Francisco-Richardson NB	AM	-	-	3	0
	PM	-	-	5	1
Francisco-Richardson SB	AM	4	12	-	-
	PM	5	8	-	-
Merchant Road SB, west of Toll Plaza	AM	-	-	15	3
	PM	-	-	33	1
Merchant Road WB, east of Toll Plaza (by concessions)	AM	0	1	8	31
	PM	0	2	46	32

Source: DKS Associates, 2004 from Field Surveys

3.4 PEDESTRIANS AND BICYCLE CONDITIONS

The general character of pedestrian and bicycle circulation is described as follows (*Presidio Trust Management Plan*, July 2001 & *Presidio Trust Management Plan*, May 2002):

"The Presidio does not have a continuous system of sidewalks, bicycle trails and bicycle lanes. Sidewalks and marked pedestrian crossings are provided sporadically throughout the Presidio. In many cases within the Presidio, pedestrian and bicyclists must mix with vehicles on the street system to move from one area to another.

Sidewalks within the Presidio are generally provided in areas that are currently well occupied, such as the western portion of the Letterman Planning District and along Lincoln Boulevard in the Main Post. Most intersections within the Main Post and along Lincoln Boulevard have marked pedestrian crossings…"

3.4.1 Bicycles

Bicycles are currently prohibited on the Doyle Drive mainline and sidewalk on the north side of the structure. The project is within the Presidio, where the *Presidio Trails and Bikeways Master Plan* and *Presidio Trust Management Plan* have identified an extensive set of bicycle routes and plans:

"Currently, there are several bicycle routes within the Presidio, although bicycles and vehicles share a standard-width roadway along most of these routes… Lombard Street, Presidio Boulevard, Mason Street, Arguello Boulevard, 14 Avenue, and El Camino del Mar are part of the designated San Francisco Citywide Bicycle Routes (Routes #4, #55, #2, #65, #69, and #95, respectively) that continue into the Presidio. Most of these routes are Class III facilities (signed route only – bicycles share the roadway with vehicles), although the travel lanes that vehicles and bicycles share are generally wider in the southwestern portion of the Park.

Mason Street has Class I (separate off-Street path) and Class II facilities (dedicated, striped bike lanes on roadway edge)."

A new multi-use trail along Mason Street (Class I) was constructed as part of the Crissy Marsh restoration and links Fort Point with bicycle trails adjacent to Marina Boulevard and provides a continuous route along the Doyle Drive corridor. The proposed Presidio Promenade trail will also provide a continuous bike route parallel to Doyle Drive.

3.4.2 Pedestrians

There is an existing sidewalk on the north side of Doyle Drive structure. The location of two staircases (adjacent to roadway merges at the Marina and Richardson ramps and the Park Presidio Boulevard interchange) makes this route non-accessible. The sidewalk begins at Lyon and Marina Boulevard, and ends at the Merchant Avenue exit ramps, where the path crosses the off-ramp.

The sidewalk is 1.5 meters (4 feet – 10 inches) clear between barrier and bridge railing with many light and sign poles that further reduce the width by about 0.41 meters (16 inches). The effective width is about 1.09 meters (3 feet – 6 inches) and is ADA deficient because of this narrow width and required staircases. The sidewalk is also prone to minor flooding during rainy conditions.

The Crissy Marsh bicycle trail described above also accommodates pedestrians through this scenic area with direct access available to many Presidio area attractions, including Stillwell Hall, the Crissy Field Interpretive Center, and the Commissary.

For comparative purposes, a number of major attractions and important places where pedestrian connections are useful were identified. Then, these were paired to illustrate potential pedestrian travel times between these locations. The pedestrian travel time between these locations was estimated using a brisk 1.2 meters per second (4 feet per second) walking speed and are as follows:

- Lincoln Boulevard and Sheridan Avenue (National Cemetery) to Mason Street and Halleck Street (Crissy Field Interpretative Center) – approximately 900 meters (2,953 feet) or 12 minutes walking time
- Lyon and Mason Street (Exploratorium/Palace of Fine Arts) to Lincoln Boulevard and Halleck Street (Main Post) – approximately 950 meters (3,117 feet) or 13 minutes walking time
- Bay and Baker Streets (Marina neighborhood) to Mason Street and Halleck Street (Crissy Field Interpretative Center) – approximately 1,000 meters (3,281 feet) or 14 minutes walking time

3.4.3 Pedestrian Crossings at Intersections

Pedestrians are unable to cross the at-grade portion of Doyle Drive today. However, pedestrian crossings are available underneath the Doyle Drive high viaduct, and at Halleck and Marshall Streets. Areas east of Marshall Avenue cannot be crossed because the ramps from Richardson Avenue do not provide adequate vertical clearance until Marshall Avenue.

The signalized intersections of Marina Boulevard and Lyon Street, and Richardson Avenue and Francisco Street provide the standard 1.2 meters per second (4 feet per second) walking speed to cross the major streets. However, these intersections do not have "walk/don't walk" signal heads for the crosswalks resulting in an up-front loss in walking time.

At the Richardson Avenue and Francisco Street intersection, a signal timing change would be required to provide adequate crossing time. The crosswalk for Francisco Street at this intersection is 31.7 meters (104 feet). This is longer than a typical cross section of this roadway, as the crosswalk runs at an angle. Currently, 26 seconds is provided for traffic and pedestrians to cross Richardson Avenue during the AM peak period. The City of San Francisco prefers to provide an additional five seconds crossing time to a "walk" phase when a "walk/don't walk" signal head is installed, which is consistent with 2003 *Manual of Uniform Traffic Control Devices (MUTCD)* guidance. This would increase the needed crossing time to 31 seconds to accommodate pedestrians crossing Francisco Street.

4.0 DESIGN YEAR CONDITIONS

Reconstructing Doyle Drive will be a major investment in both time and resources. The new facility will have a design life between 50 and 100 years and must accommodate the traffic demands placed on it throughout its life. The Design Year, 20 years after it is opened to traffic, is the required analysis period for future conditions.

This chapter describes the forecasted traffic and transit operations for each of the project alternatives – including circulation in and around Doyle Drive in the Design Year. Particular attention was devoted to providing the appropriate level of operations defined in the Caltrans *Highway Design Manual,* or HDM. Other important, but more qualitative, issues such as reducing intrusion into adjacent neighborhoods and park roads are also addressed.

This study quantitatively measured the effect of each alternative on both traffic intersections and roadway segments for the Base Year and the design year (20-year build) horizon. The analysis is conducted for Design Year conditions, except for the existing conditions and the construction impact analysis, which are evaluated for traffic operations only using a 2010 horizon year when construction is estimated to be completed.

As noted in Chapter 2, the Design Year alternatives have been grouped for purposes of analyzing traffic, because differences between the alternatives are minor from a traffic perspective. Within this chapter, a systems evaluation is provided for Alternatives 1 and 2, as well as Alternative 5 Diamond Option and Circle Drive Option. Alternatives 3 and 4 have previously been analyzed and discarded.

4.1 GOLDEN GATE BRIDGE OPERATIONS

For the design year, the Golden Gate Bridge operational assumptions were defined and applied to each alternative. The assumptions were based on forecast changes in traffic volumes. The volumes for the design year come from the San Francisco County Transportation Authority forecast model for Doyle Drive. The conversion of data from AM peak period to peak hour is 35 percent, which is the current ratio of peak period to peak hour that the bridge currently experiences.

Two different operating assumptions for the Golden Gate Bridge AM peak period operations were studied. For the PM Peak Period and the Weekend Peak Period, the 3 lanes in each direction configuration was assumed to be adequate for the design year. They were the existing AM Peak Period Configuration (two lanes northbound and four lanes southbound) and an alternative AM Peak Period configuration that assumed three lanes in each direction.

Existing AM Peak Period Configuration (two lanes northbound and four lanes southbound): Using the current AM peak period configuration, DKS determined that the northbound traffic would greatly exceed the effective capacity of two northbound lanes on the bridge, and estimated that traffic would back up onto Doyle Drive, Park Presidio and Merchant Road. The backup begins to form early in the commute (about 7:15 AM) and is forecast to build up past the 9:00 AM end time. This back-up would extend through the study corridor, reaching Richardson Avenue. Table 4.1-1 below compares the northbound FREQ models results for the current operations and design year operations. The change in average speed from 48.6 miles per hour to 11.9 miles per hour indicates the congestion present in the design year.

TABLE 4.1-1
FREQ ANALYSIS RESULTS SUMMARY NORTHBOUND DIRECTION (Existing Configuration)

Scenario	Travel Time (veh-hr)	Travel Distance (veh-mi)	Average Speed (mph)
Northbound Base Year (2-lanes)	243	11834	48.6
Northbound Design Year (2-lanes)	1548	16340	11.9

Source: DKS Associates, 2004

In the southbound direction, ample flow capacity would exist for commuters coming into San Francisco. No delays would be anticipated in this direction as indicated by the average speed results in Table 4.1-2.

TABLE 4.1-2
FREQ ANALYSIS RESULTS SUMMARY SOUTHBOUND DIRECTION (Existing Configuration)

Scenario	Travel Time (veh-hr)	Travel Distance (veh-mi)	Average Speed (mph)
Southbound Base Year (4-lanes)	723	35791	49.5
Southbound Design Year (4-lanes)	764	37805	49.5

Source: DKS Associates, 2004

Alternative AM Peak Period Configuration (three lanes northbound and three lanes southbound): When a three lane northbound configuration was used, the improvement in carrying capacity of the bridge was forecast to eliminate the congestion problem.

The expansion to three northbound lanes in the AM peak period on the Golden Gate Bridge requires that the southbound traffic also be reduced from the current four to three lanes. This also would require the reduction of one toll booth inbound from the current 11 to 10.

In the southbound direction, a short 15-minute queue would be expected at the decrease of four to three lanes heading onto the Golden Gate Bridge at the point where the lane drop occurs (south of the Sausalito Road exit north of the Golden Gate Bridge). Otherwise, the roadway should be able to adequately carry the heavy traffic load. Table 4.1-3 indicates the improved performance of using three lanes in the northbound direction (average speed of 48.5 miles per hour) compared to the two lanes (average speed of 11.9 miles per hour). The slight drop in performance for the southbound directions is indicated in the table with an average speed of 49.5 miles per hour for four southbound lanes and 47.9 miles per hour for three southbound lanes.

TABLE 4.1-3
FREQ ANALYSIS RESULTS SUMMARY SOUTHBOUND DIRECTION
(Alternative Configuration)

Scenario	Travel Time (veh-hr)	Travel Distance (veh-mi)	Average Speed (mph)
Northbound Design Year (2-lanes)	1548	16340	11.9
Northbound Design Year (3-lanes)	386	18721	48.5
Southbound Design Year (4-lanes)	764	37805	49.5
Southbound Design Year (3-lanes)	790	37852	47.9

Source: DKS Associates, 2004

Configuration Assumption for Design Year Alternatives

By the design year, it is forecast that the current AM peak period lane configurations on the Golden Gate Bridge will produce considerable queuing of vehicles onto Doyle Drive through the project area, as well as onto other streets, such as Park Presidio, Merchant Road and Richardson Avenue. Meanwhile, traffic in the opposing direction on the bridge will easily be able to be accommodated. This imbalance of traffic flows on a facility with changeable lanes will result in a likelihood that bridge crews would need to modify the lane configurations from those in use in the base year.

If the configuration is converted to three lanes in each direction for the AM peak period condition, the northbound queuing would disappear, and the impacts to southbound traffic would be much less minimal. For this reason, this alternative configuration is an assumption made when analyzing the alternatives in this report.

4.2 FUTURE YEAR TRAFFIC

The project alternatives were defined during the scoping and screening activities and further refined through a series of technical studies, agency/citizen coordination, design reviews and operational analyses.

All alternatives were tested using the San Francisco County Transportation Authority's traffic model, detailed in Section 2. Each alternative assumes identified roadway and access changes to the existing condition that are anticipated through the redevelopment of the Presidio. In particular, adjustments were made to reflect the redevelopment of the Letterman Digital Arts Center as described in the *Letterman EIS* and *Letterman Redevelopment Richardson Avenue Access Traffic Operations Analysis (March, 2001)*. The Access Improvements are listed in Table 4.2-1

TABLE 4.2-1
LETTERMAN REDEVELOPMENT ACCESS IMPROVEMENTS

	Intersection/ Street	Change Control	Change Configuration
1	New Off-Ramp	N/A	Add a new off-ramp on US 101 – Richardson Ave North – near Lyon Street to Gorgas Avenue/Marshall Street.
2	Gorgas Avenue	No Change	Add two lanes on Gorgas Avenue approaching new intersection with Richardson Avenue. Convert section of Gorgas Avenue between new intersection with Richardson Avenue and Lyon Street to a one-lane, one-way eastbound roadway.
3	Richardson/ Gorgas/ Lyon	Signalize	A new intersection at Lyon Street and Richardson Ave. This intersection will have a right turn only lane from southbound Richardson (existing) and two approach lanes from the new direct access from Gorgas Avenue.

Source: Letterman Redevelopment Richardson Avenue Access – DRAFT Technical Memorandum – Traffic Operations Analysis – November 1, 2000.

In addition, there are a number of new traffic signalization projects and other traffic changes that were identified to occur as part of the PTMP. This plan (and its accompanying EIS and traffic report) includes a number of improvements to accommodate the increased traffic anticipated for this urban national park. The improvements listed in the PTMP EIS are summarized in Table 4.2-2. In addition to these project-related improvements, other minor roadway improvements are also planned for the Presidio.

TABLE 4.2-2
PRESIDIO TRUST MANAGEMENT PLAN IMPROVEMENTS – TRAFFIC

Action Code	Intersection	Changed Control	Changed Configuration
TR-1	Presidio/Pacific	Signalize	
TR-2	Arguello/Jackson	Signalize	
TR-3	Lincoln/25th/El Camino del Mar	Signalize	Remove parking on east side of 25th Avenue to add one right turn lane in the northbound approach
TR-4	Lombard/ Presidio	Signalize	Addition of a right-turn only lane on the northbound approach.
TR-6	Lincoln/GGB Viewing Area	All-way Stop Sign	Install an eastbound left-turn pocket and a westbound right-turn pocket.
TR-7	Lincoln/ Merchant	Signalize	Realign Merchant and Storey Avenue to create a single intersection. Add a northbound left-turn pocket.
TR-8	Lincoln/Kobbe	Signalize	Realign Washington Blvd to create a perpendicular intersection with Lincoln Blvd and convert Kobbe Avenue to a one-way eastbound roadway
TR-11	14th/Lake		Designate 15th Avenue gate for outbound traffic and open 14th Avenue gate for inbound traffic and restrict northbound and/or southbound approaches to right turn movements.
TR-12	Lyon/Lombard	Signalize	Restripe the eastbound approach to provide an exclusive left-turn lane and shared right-through lane
TR-15	14th/California		Restrict northbound and southbound approaches to right-turn movements.
TR-16	25th/California		Restripe to add a left-turn lane to both the eastbound and westbound approaches. Not expected to require the removal of on-street parking spaces.
TR-17	Presidio/Jackson	Signalize	
TR-18	Presidio/Washington	Signalize	
TR-19	Arguello/Washington	Signalize	
TR-20	Lincoln/Girard	Signalize	

Source: PTMP Draft Plan and EIS

The alternatives evaluated for this report include design elements to accommodate future Design Year traffic needs for the alternative proposed in the PTMP. As the planning process continues for the Presidio Trust plans, specific strategies to address park circulation continue to be developed. Within this document, key intersections within the Presidio are evaluated, although roadway segments within the Presidio itself are not.

4.2.1 Intersection Level of Service

In the Design Year, the No-Build Alternative and the Parkway Alternative options have a new signal on Richardson Avenue at Gorgas Avenue/Lyon Street. Timing plans for those new signals were developed in accordance with the existing signal timing progression used for downstream/upstream signals. Fixed signal timing plans for new signals on other roadways were optimized to provide the least amount of intersection delay.

Since the forecasted volumes were near the useful capacity, the analyses did not need to constrain the Design Year volume forecasts downward to meet the effective capacity of the roadway segments. However, the peak hour factors are constrained to a 1.0 calculation, because the major roadways in the project area are projected to flow at even loads throughout the peak hour. This adjustment is based on a flow rate assessment made specifically for the proposed Design Year traffic volumes on this project, and differs from the normal OER peak hour factor methods used for a development impact study.

The AM Intersection LOS are shown in Table 4.2.1-1 and the PM Intersection LOS in Table 4.2.1-2. Table 4.2.1-3 contains the weekend condition. Although LOS describes the overall measure of effectiveness for an intersection, individual approaches may operate at a better or worse LOS. However, proposed improvements to provide acceptable operations were based on the aggregate LOS as defined in the HCM.

The LOS results on Tables 4.2.1-1 and 4.2.1-2 are also summarized visually in Figures 4.2.1-1 through 4.2.1-3. Detailed technical calculations are provided in Appendix C.

Findings

The analysis shows that the intersections in the study area would continue to operate with acceptable level of service for all alternatives except the two unsignalized intersections along Marina (Marina at Divisidero and Marina at Broderick). Both of these intersections operate at LOS F during the existing conditions with significant delays. With the exception of the Parkway alternatives during the AM and Weekend Peak periods, these intersections would continue to experience significant delays. It should be noted that the delay in most alternatives is less than the delay during the existing conditions and very similar to forecast delay that would occur during the No Build Alternative project condition.

Since both intersections operate as all-way stop controlled intersections, the only feasible mitigation is signalization. This signalization would likely include signal coordination, because of the proximity of these intersections. This would result in acceptable LOS conditions at both intersections.

TABLE 4.2.1-1
AM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
1	Lyon	Marina	Control	Signal	Signal	Signal	Signal	Signal
			Delay	13	10	10	15	15
			LOS	B	A	A	B	B
2	101 / Richardson	Francisco	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	34	35	35	38	39
			LOS	C	C	C	D	D
3	Lincoln (N)	GGB Viewing Area	Control	2-way [2]	All-way	All-way	All-way	All-way
			Delay [1]	13	18	20	17	16
			LOS	B	C	C	C	C
4	Lincoln (S)	Merchant	Control	2-way [2]	Signal	Signal	Signal	Signal
			Delay [1]	10	15	15	14	14
			LOS	A	B	B	B	B
5	Girard	Lincoln	Control	2-way [2]	2-way [2]	2-way [2]	All-way	All-way
			Delay [1]	<1	11	12	13	12
			LOS	A	B	B	B	B
6	Halleck	Mason	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	6	7	7	7	7
			LOS	A	A	A	A	A
7	Richardson / 101	Gorgas / Lyon	Control	-	Signal	Signal	Signal	Signal
			Delay [1]	-	17	16	16	16
			LOS	-	B	B	B	B
8	Marina / Girard	Gorgas / 101 SB Ramps	Control	-	-	-	Signal	Signal
			Delay [1]	-	-	-	14	10
			LOS	-	-	-	B	A
9	Marina / Girard	101 NB Ramps	Control	-	-	-	Signal	Signal
			Delay [1]	-	-	-	9	9
			LOS	-	-	-	A	A
10	Broderick	Marina	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	59	99	>100	35	33
			LOS	F	F	F	E	D
11	Divisadero	Marina	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	79	>100	>100	36	32
			LOS	F	F	F	E	D
12	101 / Richardson	Chestnut	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	12	14	14	14	14
			LOS	B	B	B	B	B

TABLE 4.2.1-1
AM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE (Continued)

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
13[3]	101 / Richardson	Lombard	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	10	9	9	3	3
			LOS	B	A	A	A	A
14[3]	101 / Lombard	Broderick	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	21	21	21	13	13
			LOS	C	C	C	B	B
15	Lyon	Lombard Gate	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	29	26	27	18	16
			LOS	D	C	C	B	B
16	Presidio	Pacific	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	16	15	16	13	13
			LOS	C	B	B	B	B
17	Park Presidio	Lake	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	17	24	24	24	25
			LOS	B	C	C	C	C
18[4]	Merchant	GGB Viewing Area	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	9	12	8	11	11
			LOS	A	B	A	B	B

Notes

1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2004

TABLE 4.2.1-2
PM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection				Alternatives				
					Design Year			
#	North/South	East/West	Criteria	Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
1	Lyon	Marina	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	18	9	25	14	14
			LOS	B	A	C	B	B
2	Richardson	Francisco	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	10	14	15	21	22
			LOS	A	B	B	C	C
3	Lincoln (N)	GGB Viewing Area	Control	2-way [2]	2-way [2]	2-way [2]	All-way	All-way
			Delay [1]	12	15	16	12	12
			LOS	B	C	C	B	B
4	Lincoln (S)	Merchant	Control	2-way	Signal	Signal	Signal	Signal
			Delay [1]	11	17	18	15	16
			LOS	B	B	B	B	B
5	Girard	Lincoln	Control	2-way [2]	2-way [2]	2-way [2]	All-way	All-way
			Delay [1]	<1	13	2	15	15
			LOS	A	B	B	B	B
6	Halleck	Mason	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	6	7	6	6	6
			LOS	A	A	A	A	A
7	Richardson / 101	Gorgas / Lyon	Control	-	Signal	Signal	Signal	Signal
			Delay [1]	-	17	17	25	20
			LOS	-	B	B	C	C
8	Marina / Girard	Gorgas / 101 SB Ramps	Control	-	-	-	Signal	Signal
			Delay [1]	-	-	-	15	10
			LOS	-	-	-	B	B
9	Marina / Girard	101 NB Ramps	Control	-	-	-	Signal	Signal
			Delay [1]	-	-	-	6	6
			LOS	-	-	-	A	A
10	Broderick	Marina	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	>100	>100	>100	>100	>100
			LOS	F	F	F	F	F
11	Divisadero	Marina	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	>100	>100	>100	>100	>100
			LOS	F	F	F	F	F
12	Richardson	Chestnut	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	15	17	16	17	16
			LOS	B	B	B	B	B

TABLE 4.2.1-2
PM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE
(continued)

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
13[3]	Richardson	Lombard	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	5	7	7	3	3
			LOS	A	A	A	A	A
14[3]	101 / Lombard	Broderick	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	25	22	21	24	22
			LOS	C	C	C	C	C
15	Lyon	Lombard Gate	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	18	20	20	17	17
			LOS	C	C	C	B	B
16	Presidio	Pacific	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	19	16	17	14	14
			LOS	C	B	B	B	B
17	Park Presidio	Lake	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	21	38	41	40	39
			LOS	C	D	D	D	D
18[4]	Merchant	GGB Viewing Area	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	13	11	11	10	10
			LOS	B	B	B	B	B

Notes

1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2004

TABLE 4.2.1-3
WEEKEND PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection				Alternatives				
					Design Year			
#	North/South	East/West	Criteria	Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
1	Lyon	Marina	Control Delay [1] LOS	Signal 20 B	Signal 8 A	Signal 8 A	Signal 11 B	Signal 11 B
2	101 / Richardson	Francisco	Control Delay [1] LOS	Signal 11 B	Signal 14 B	Signal 14 B	Signal 16 B	Signal 16 B
3	Lincoln (N)	GGB Viewing Area	Control Delay [1] LOS	2-way [2] 11 B	2-way [2] 8 A	2-way [2] 8 A	2-way [2] 8 A	2-way [2] 8 A
4	Lincoln (S)	Merchant	Control Delay [1] LOS	2-way 11 B	Signal 13 B	Signal 13 B	Signal 13 B	Signal 13 B
5	Girard	Lincoln	Control Delay [1] LOS	2-way [2] <1 A	2-way [2] 9 A	2-way [2] 9 A	All-way 12 B	All-way 13 B
6	Halleck	Mason	Control Delay [1] LOS	All-way 6 A	All-way 6 A	All-way 6 A	All-way 6 A	All-way 6 A
7	101 / Richardson	Gorgas / Lyon	Control Delay [1] LOS	- - -	Signal 14 B	Signal 14 B	Signal 14 B	Signal 14 B
8	Marina / Girard	Gorgas / 101 SB Ramps	Control Delay [1] LOS	- - -	- - -	- - -	Signal 12 B	Signal 10 A
9	Marina / Girard	101 NB Ramps	Control Delay [1] LOS	- - -	- - -	- - -	Signal 8 A	Signal 5 A
10	Broderick	Marina	Control Delay [1] LOS	All-way >100 F	All-way >100 F	All-way >100 F	All-way 14 B	All-way 13 B
11	Divisadero	Marina	Control Delay [1] LOS	All-way >100 F	All-way >100 F	All-way >100 F	All-way 14 B	All-way 13 B
12	101 / Richardson	Chestnut	Control Delay [1] LOS	Signal 12 B	Signal 14 B	Signal 14 B	Signal 12 B	Signal 11 B

TABLE 4.2.1-3
WEEKEND PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE (continued)

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
13[3]	101 / Richardson	Lombard	Control Delay [1] LOS	Signal 7 A	Signal 7 A	Signal 7 A	Signal 2 A	Signal 2 A
14[3]	101 / Lombard	Broderick	Control Delay [1] LOS	Signal 18 B	Signal 19 B	Signal 19 B	Signal 11 B	Signal 11 B
15	Lyon	Lombard Gate	Control Delay [1] LOS	All-way 13 B	Signal 32 C	Signal 37 D	Signal 15 B	Signal 15 B
16	Presidio	Pacific	Control Delay [1] LOS	All-way 19 C	Signal 14 B	Signal 14 B	Signal 12 B	Signal 13 B
17	Park Presidio	Lake	Control Delay [1] LOS	Signal 15 B	Signal 17 B	Signal 17 B	Signal 15 B	Signal 16 B
18[4]	Merchant	GGB Viewing Area	Control Delay [1] LOS	All-way 12 B	All-way 10 A	All-way 10 A	All-way 10 B	All-way 10 A

Notes
1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2004

4.2.2 Intersection Queue Lengths

Results of the intersection queuing analysis are provided in Table 4.2.2-1. The 95th percentile queue length of the critical movement is provided along with the corresponding time when this movement is at its worst. Detailed calculations are provided in Appendix D.

TABLE 4.2.2-1
MAXIMUM QUEUES AT APPROACHES TO INTERSECTIONS

#	Intersection	Movement	Time Period	Queue Length[1]	Critical Movement	Storage Description
Base Year						
1	Marina / Mason	SB	PM	84	Right	Mason contains overflow storage
		EB	PM	75	Thru	440 meters back to the Richardson off-ramp
		WB	PM	166	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	41	Thru	140 meters back to Chestnut
		SB	AM	>248[2]	Thru	375 meters back onto Marina ramps
		EB	AM	14	Shared	10 meters back to Lyon, Gorgas contains overflow storage
		WB	PM	64	Shared	90 meters back to Baker
Design Year Alternative 1 No Build						
1	Marina / Mason	SB	PM	8	Right	Mason contains overflow storage
		EB	AM	95	Thru	440 meters back to the Richardson off-ramp
		WB	PM	69	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	41	Thru	140 meters back to Chestnut
		SB	AM	>242[2]	Thru	90 meters back to Gorgas, signal coordination assumed
		EB	AM	37	Shared	10 meters back to Lyon, left turn, Gorgas contains overflow storage
		WB	PM	55	Shared	90 meters back to Baker
4	Lincoln / Merchant	NB	AM	70	Left	400 meters back to Kobbe
		SB	PM	15	Right	365 meters back to Viewing Area Access
		EB	AM	81	Shared	Over 300 meters back to 101 Ramps
Design Year Alternative 2 Replace and Widen						
1	Marina / Mason	SB*	PM	115	Right	Mason contains overflow storage
		EB	AM	98	Thru	440 meters back to the Richardson off-ramp
		WB	PM	65	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	44	Thru	140 meters back to Chestnut
		SB	AM	>241[2]	Thru	90 meters back to Gorgas, signal coordination assumed
		EB	AM	36	Shared	10 meters back to Lyon, Gorgas contains overflow storage
		WB	PM	57	Shared	90 meters to Baker
4	Lincoln / Merchant	NB	AM	75	Left	400 meters back to Kobbe
		SB	PM	14	Right	365 meters back to Viewing Area Access
		EB	PM	15	Shared	Over 300 meters back to 101 Ramps

Notes:

1. Queue lengths are in meters; queue lengths are averaged across all lanes
2. Queue length shown is maximum after two traffic cycles; observed queues may be longer.

Source DKS Associates, 2004

TABLE 4.2.2-1
MAXIMUM QUEUES AT APPROACHES TO INTERSECTIONS (continued)

#	Intersection	Movement	Time Period	Queue Length[1]	Critical Movement	Storage Description
Design Year Alternative 5 Parkway: Diamond Option						
1	Lyon / Marina / Mason	SB	PM	11	Right	Mason contains overflow storage
		EB	AM	88	Thru	125 meters back to Palace of Fine Arts Parking access; 440 meters to Richardson Ramp
		WB	PM	73	Thru	120 meters back to Baker
2	Richardson / Francisco	NB*	PM	79	Thru	140 meters back to Chestnut (140 meters)
		SB	AM	252	Thru	90 meters back to Gorgas
		EB	AM	34	Shared	130 meters back to Letterman Parking Garage driveway
		WB*	PM	>146[2]	Shared	90 meters back to Baker
4	Lincoln / Merchant	NB	AM	67	Thru	400 meters to back Kobbe
		SB	PM	16	Thru	365 meters back to Viewing Area Access
		EB	PM	14	Shared	Over 300 meters back to 101 Ramps
8	Gorgas/Lyon and 101/Rochardson	NB*	PM	>256[2]	Thru	145 meters to Francisco
		SB	AM	173	Thru	820 meters to the 101 SB off-ramp to Gorgas Avenue
		EB	PM	58	Right	160 meters to the parking lot driveway onto Gorgas
9	Marina/Girard and Gorgas/101 SB Ramp	NB	PM	7	Thru	430 meters to the parking lot driveway onto Gorgas
		SB	AM	87	Left	260 meters to the beginning of the 101 SB off-ramp
		EB	PM	66	Thru	280 meters to Lincoln
		WB	AM	34	Thru	200 meters to 101 NB on-ramp
11	Marina/Girard and 101 NB Ramp	NB	AM	20	left	Storage goes back 120 meters
		EB	AM	68	Thru	205 meters to 101 SB off-ramp
		WB	AM	7	Thru	320 meters to the Marina/Lyon intersection

Notes:

1. Queue lengths are in meters; queue lengths are averaged across all lanes
2. Queue length shown is maximum after two traffic cycles; observed queues may be longer.

Source DKS Associates, 2004

TABLE 4.2.2-1
MAXIMUM QUEUES AT APPROACHES TO INTERSECTIONS (continued)

#	Intersection	Movement	Time Period	Queue Length[1]	Critical Movement	Storage Description
Design Year Alternative 5 Parkway: Circle Drive Option						
1	Lyon / Marina / Mason	SB	PM	11	Right	Mason contains overflow storage
		EB	AM	82	Thru	125 meters back to Palace of Fine Arts Parking access; 440 meters to Richardson Ramp
		WB	PM	78	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	114	Thru	140 meters back to Chestnut (140 meters)
		SB*	AM	>253[2]	Thru	90 meters back to Gorgas
		EB	AM	31	Shared	130 meters back to Letterman Parking Garage driveway
		WB	PM	144	Shared	90 meters back to Baker
4	Lincoln / Merchant	NB	AM	66	Thru	400 meters to back Kobbe
		SB	PM	16	Thru	365 meters back to Viewing Area Access
		EB	PM	14	Shared	Over 300 meters back to 101 Ramps
8	Gorgas/Lyon and 101/Richardson	NB*	PM	>241[2]	Thru	205 meters to Francisco.
		SB	AM	175	Thru	820 meters to the 101 SB off-ramp to Gorgas Avenue
		EB	PM	57	Right	125 meters to the parking lot driveway onto Gorgas
		WB	AM	24	Thru	140 meters to 101/Richardson
9	Marina/Girard and Gorgas/101 SB Ramp	NB	PM	3	Right	430 meters to the parking lot driveway onto Gorgas
		SB	AM	64	Left	260 meters to the beginning of the 101 SB off-ramp
		EB	PM	27	Thru	280 meters to Lincoln
		WB	PM	5	Thru	200 meters to 101 NB on-ramp
11	Marina/Girard and 101 NB Ramp	NB	PM	5	left	Parking lot driveway
		EB	PM	127	Thru	205 meters to 101 SB off-ramp
		WB	PM	2	Thru	320 meters to the Marina/Lyon intersection

Notes:
1. Queue lengths are in meters; queue lengths are averaged across all lanes
2. Queue length shown is maximum after two traffic cycles; observed queues may be longer.

Source DKS Associates, 2004

Findings

As demonstrated, nearly all the movements of the project intersections have adequate storage space for the queues that would be generated in the future. However, the following movements may have storage requirements in the peak hour that exceed available storage capacity and therefore may impact the upstream signal or stop-controlled intersection.

- Westbound at Lyon/Marina/Mason in the Existing Condition, and in Alternatives 1 (note that turn restrictions would prevent blockage of Baker Street intersection)
- Southbound at Richardson/Francisco in all Design Year alternatives (resulting from new Richardson/Gorgas/Lyon intersection for Presidio access)
- Westbound at Richardson/Francisco in all Design Year Alternatives (to Broderick Street)

4.2.3 Segment Level of Service

The segment LOS was based on the density of vehicles and/or average travel speed, depending on whether it was a highway or urban street segment. The AM segment LOS results are provided for highway segments in Table 4.2.3-1, and for urban streets in Table 4.2.3-2, PM LOS results are provided for highway segments in Table 4.2.3-3, and for urban streets in Table 4.2.3-4. The weekend peak highway segment LOS are shown in Table 4.2.3-5 and 4.2.3-6. Some transitional segments are listed in both tables for informational purposes.

Findings

Operational studies have shown that traffic on the Golden Gate Bridge (Segments 13 and 14) and the northbound approach link to this link (Segment 2) would operate at a deficient level of service unless the bridge lanes are operated with three lanes in each direction. This would result in a Level of Service F for Segment 13 during the AM peak hour, although operational studies project that this would result in much less congestion than if the four lane southbound/two lane northbound configuration were used in the design year.

Overall, an acceptable LOS D was achieved for all highway segments except for the Golden Gate Bridge operations, particularly during the PM Peak period for all future design year alternatives. It should be noted that the bridge is forecasted to operate with LOS F under the No-Build Alternative; no alternative is forecast to have any further impacts on the Golden Gate Bridge operations.

Speeds on Richardson Avenue in the northbound direction are anticipated to fall to LOS E conditions in the design year in all alternatives. This estimated design deficiency is indicated for the segment level analysis, although any upstream intersections are projected to operate at a sufficient level of service.

As no new deficiencies would result beyond the No-Build Alternative, no mitigation is required.

TABLE 4.2.3-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Hour Volume	pc/h	6150	6441	6414	6550	6556
			Lanes	lanes	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1537*	*1610*	*1603*	*1638*	*1639*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	31	33	33	33	34
			LOS		D	D	D	D	D
2[1]	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Hour Volume	vehicles	2994	5019	5013	5091	5096
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*998*	*1255*	*1253*	*1273*	*1274*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	20	25	25	26	26
			LOS		C	C	C	C	C
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Hour Volume	vehicles	5203	4981	4996	4951	4888
			Lanes	number	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1301*	*1245*	*1249*	*1238*	*1222*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	26	25	25	25	24
			LOS		D	C	C	C	C
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Hour Volume	vehicles	2049	2947	2979	2994	2948
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*683*	*982*	*993*	*998*	*983*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	14	20	20	20	20
			LOS		B	C	C	C	C
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Hour Volume	pc/h	3717	3325	3320	3053	3063
			Lanes	lanes	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1858*	*1663*	*1660*	*1527*	*1532*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*48*	*49*	*49*	*50*	*50*
			Density	v/lane/mile	39	34	34	31	31
			LOS		E	D	D	D	D
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Hour Volume	vehicles	1443	2141	2208	2743	2636
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*721*	*1071*	*1104*	*1372*	*1318*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	14	21	22	27	26
			LOS		B	C	C	D	D

TABLE 4.2.3-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Hour Volume	vehicles	1486	1656	1676	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*743*	*828*	*838*	*n/a* [1]	*n/a* [1]
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a* [1]	*n/a* [1]
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a* [1]	*n/a* [1]
			Density	v/lane/mile	21	24	24	n/a [1]	n/a [1]
			LOS		C	C	C	n/a [1]	n/a [1]
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Hour Volume	vehicles	606	806	770	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*303*	*403*	*385*	*n/a* [1]	*n/a* [1]
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a* [1]	*n/a* [1]
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a* [1]	*n/a* [1]
			Density	v/lane/mile	9	12	11	n/a [1]	n/a [1]
			LOS		A	B	B	n/a [1]	n/a [1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Hour Volume	vehicles	2380	2480	2485	2576	2592
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1190*	*1240*	*1243*	*1288*	*1296*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	24	25	25	26	26
			LOS		C	C	C	C	C
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Hour Volume	vehicles	2379	3092	3101	3073	3072
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1190*	*1546*	*1551*	*1537*	*1536*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*49*	*50*	*50*
			Density	v/lane/mile	24	31	31	31	31
			LOS		C	D	D	D	D
11	US 101 between Park Presidio on and off-ramps	SB	Hour Volume	vehicles	4217	4345	4314	4328	4295
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1406*	*1448*	*1438*	*1443*	*1432*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Density	v/lane/mile	28	29	29	29	29
			LOS		D	D	D	D	D
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	1601	2564	2593	2641	2617
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*534*	*855*	*864*	*880*	*872*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	11	17	17	18	17
			LOS		A	B	B	B	B

Notes
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives.

TABLE 4.2.3-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Hour Volume	vehicles	5780	6098	6102	6105	6123
			Lanes	number	4	3	3	3	3
			Flow Rate	*pc/h/lane*	*1445*	*2033*	*2034*	*2035*	*2041*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*46*	*46*	*46*	*46*
			Density	v/lane/mile	29	44	44	44	44
			LOS		D	F[2]	F[2]	F[2]	F[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Hour Volume	vehicles	2862	4990	4990	4991	4989
			Lanes	number	2	3	3	3	3
			Flow Rate	*pc/h/lane*	*1431*	*1663*	*1663*	*1664*	*1663*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	29	34	34	34	34
			LOS		D	D[3]	D[3]	D[3]	D[3]

Notes
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives.
2. If Golden Gate Bridge southbound configuration remains at the current four lanes, this segment would operate at LOS D for all future design year scenarios. However, because related analysis also shows that queuing would be significant on Doyle Drive if this configuration is used, and that queuing on the bridge would be minimal in this configuration, three lanes are assumed for the Golden Gate Bridge in all design year scenarios.
3. If Golden Gate Bridge northbound configuration remains at the current two lanes, this segment would operate at LOS F for all future design year scenarios.

Source: DKS Associates, 2004

TABLE 4.2.3-2
URBAN STREET SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	3717	3094	3087	3130	3138
			Speed	FFS	35	35	35	35	35
				Calculated	19	23	23	23	23
			LOS		C	C	C	C	C
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	1443	2259	2161	2817	2851
			Speed	FFS	35	35	35	35	35
				Calculated	26	22	23	18	17
			LOS		B	C	C	D	D
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	1486	1656	1676	1271	1203
			Speed	FFS	35	35	35	30	30
				Calculated	26	26	26	16	16
			LOS		B	B	B	C	C
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	606	806	770	236	196
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	23	23
			LOS		B	B	B	B	B

Source: DKS Associates, 2004

TABLE 4.2.3-3
HIGHWAY SEGMENT LEVEL OF SERVICE -- PM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Hour Volume	pc/h	3120	5074	5437	5612	5572
			Lanes	lanes	3	4	4	4	4
			Flow Rate	*pc/h/lane*	*1040*	*1268*	*1359*	*1403*	*1393*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*50.0*	*n/a*
			Density	v/lane/mile	21	25	27	28	28
			LOS		C	C	D	D	D
2	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Hour Volume	vehicles	5649	6219	6263	6448	6431
			Lanes	number	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1412*	*1555*	*1566*	*1612*	*1608*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	28	32	32	33	33
			LOS		D	D	D	D	D
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Hour Volume	vehicles	2608	3590	3838	3785	3752
			Lanes	number	2	4	4	4	4
			Flow Rate	*pc/h/lane*	*1304*	*897*	*960*	*946*	*938*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	26	18	19	19	19
			LOS		D	B	C	C	C
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Hour Volume	vehicles	4619	4806	4795	4924	4902
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1540*	*1602*	*1598*	*1641*	*1634*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	31	33	33	34	33
			LOS		D	D	D	D	D
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Hour Volume	pc/h	1734	2543	2660	2398	2431
			Lanes	lanes	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*867*	*1271*	*1330*	*1199*	*1216*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	17	25	27	24	24
			LOS		B	C	D	C	C
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Hour Volume	vehicles	2802	2931	3008	3355	3291
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1401*	*1466*	*1504*	*1678*	*1646*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*50*	*50*	*49*	*49*
			Density	v/lane/mile	28	29	30	34	34
			LOS		D	D	D	D	D

TABLE 4.2.3-3
HIGHWAY SEGMENT LEVEL OF SERVICE – PM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
7	Marina Boulevard From the Doyle Drive Merge to Lyon St	EB	Hour Volume	vehicles	873	1047	1178	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*437*	*523*	*589*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	13	15	17	n/a [1]	n/a [1]
			LOS		B	B	B	n/a [1]	n/a [1]
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Hour Volume	vehicles	1817	1875	1787	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*909*	*937*	*893*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	26	27	26	n/a [1]	n/a [1]
			LOS		C	D	C	n/a [1]	n/a [1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Hour Volume	vehicles	2251	2935	2984	3094	3080
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1125*	*1468*	*1492*	*1547*	*1540*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*	*49*	*50*
			Density	v/lane/mile	23	30	30	31	31
			LOS		C	D	D	D	D
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Hour Volume	vehicles	2768	2864	2853	2792	2790
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1384*	*1432*	*1426*	*1396*	*1395*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*	*n/a*	*n/a*
			Density	v/lane/mile	28	29	29	28	28
			LOS		D	D	D	D	D
11	US 101 between Park Presidio on and off-ramps	SB	Hour Volume	vehicles	1884	2929	3180	3190	3163
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*628*	*976*	*1060*	*1063*	*1054*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	13	20	21	21	21
			LOS		B	C	C	C	C
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	3605	4016	4068	4252	4230
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1202*	*1339*	*1356*	*1417*	*1410*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*50*	*50*
			Density	v/lane/mile	24	27	27	28	28
			LOS		C	D	D	D	D

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

TABLE 4.2.3-3
HIGHWAY SEGMENT LEVEL OF –SERVICE -- PM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Hour Volume	vehicles	2987	5275	5732	5734	5723
			Lanes	number	3	3	3	3	3
			Flow Rate	pc/h/lane	996	1758	1911	1911	1908
			Free Flow Speed	miles/hour	50	50	50	50	50
			Congested Speed	miles/hour	N/A	48	47	47	47
			Density	v/lane/mile	20	37	41	41	40
			LOS		C	E[2]	E[2]	E[2]	E[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Hour Volume	vehicles	5890	6450	6491	6500	6492
			Lanes	number	3	3	3	3	3
			Flow Rate	pc/h/lane	1963	2150	2164	2167	2164
			Free Flow Speed	miles/hour	50	50	50	50	50
			Congested Speed	miles/hour	47	45	45	45	45
			Density	v/lane/mile	42	47	48	48	48
			LOS		E	F[2]	F[2]	F[2]	F[2]

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

Source: DKS Associates, 2004

TABLE 4.2.3-4
URBAN STREET SEGMENT LEVEL OF SERVICE -- PM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	1734	2439	2560	2633	2665
			Speed	FFS	35	35	35	35	35
				Calculated	26	26	26	25	25
			LOS		B	B	B	B	B
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	2776	2772	2784	3402	3418
			Speed	FFS	35	35	35	35	35
				Calculated	14	13	13	11	10
			LOS		D	E[1]	E[1]	E[1]	E[1]
7	Marina Blvd from the Doyle Drive merge to Lyon St	EB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	873	1047	1178	887	820
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	24	22
			LOS		B	B	B	B	B
8	Marina Blvd from Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	1817	1875	1787	1276	1233
			Speed	FFS	35	35	35	30	30
				Calculated	25	25	26	28	29
			LOS		B	B	B	A	A

Notes:
1. The Forecast design years for this segment are projected to deteriorate to lower speeds. Signalized operations would be required to assure overall adequate traffic flow

Source: DKS Associates, 2004

TABLE 4.2.3-5
HIGHWAY SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Hour Volume	pc/h	4583	5430	5446	5471	5466
			Lanes	lanes	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1146*	*1358*	*1362*	*1368*	*1367*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	23	27	27	27	27
			LOS		C	D	D	D	D
2	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Hour Volume	vehicles	3377	5277	5271	5304	5299
			Lanes	number	3	4	4	4	4
			Flow Rate	*pc/h/lane*	*1126*	*1319*	*1318*	*1326*	*1325*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	23	26	26	27	27
			LOS		C	D	D	D	D
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Hour Volume	vehicles	3596	3493	3501	3397	3389
			Lanes	number	3	4	4	4	4
			Flow Rate	*pc/h/lane*	*1199*	*873*	*875*	*849*	*847*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	24	18	18	17	17
			LOS		C	B	B	B	B
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Hour Volume	vehicles	2624	3550	3533	3633	3612
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*875*	*1183*	*1178*	*1211*	*1204*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	18	24	24	24	24
			LOS		B	C	C	C	C
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Hour Volume	pc/h	2520	2532	2516	2271	2306
			Lanes	lanes	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1260*	*1266*	*1258*	*1136*	*1153*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	25	25	25	23	23
			LOS		C	C	C	C	C
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Hour Volume	vehicles	1683	2407	2455	2960	2907
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*842*	*1204*	*1228*	*1480*	*1453*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*50*	*50*
			Density	v/lane/mile	17	24	25	30	29
			LOS		B	C	C	D	D

TABLE 4.2.3-5
HIGHWAY SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
7	Marina Blvd from the Doyle Drive merge to Lyon St	EB	Hour Volume	vehicles	1076	960	986	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*538*	*480*	*493*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	15	14	14	n/a [1]	n/a [1]
			LOS		B	B	B	n/a [1]	n/a [1]
8	Marina Blvd from Lyon St to the Doyle Drive merge	WB	Hour Volume	vehicles	941	1142	1078	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*471*	*571*	*539*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	13	16	15	n/a [1]	n/a [1]
			LOS		B	B	B	n/a [1]	n/a [1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Hour Volume	vehicles	2213	2165	2182	2278	2283
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1107*	*1082*	*1091*	*1139*	*1141*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	22	22	22	23	23
			LOS		C	C	C	C	C
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Hour Volume	vehicles	1980	1955	1975	1875	1892
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*990*	*978*	*987*	*937*	*946*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	20	20	20	19	19
			LOS		C	C	C	C	C
11	US 101 between Park Presidio on and off-ramps	SB	Hour Volume	vehicles	2892	3376	3376	3292	3285
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*964*	*1125*	*1125*	*1097*	*1095*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	19.3	22.5	22.5	21.9	21.9
			LOS		C	C	C	C	C
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	2102	3439	3421	3535	3510
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*701*	*1146*	*1140*	*1178*	*1170*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	14	23	23	24	23
			LOS		B	C	C	C	C

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

TABLE 4.2.3-5
HIGHWAY SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Hour Volume	vehicles	4153	5556	5559	5561	5560
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1384*	*1852*	*1853*	*1854*	*1853*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*N/A*	*48*	*48*	*48*	*48*
			Density	v/lane/mile	28	39	39	39	39
			LOS		D	E[2]	E[2]	E[2]	E[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Hour Volume	vehicles	3000	5226	5219	5230	5226
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1000*	*1742*	*1740*	*1743*	*1742*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*48*	*48*	*48*	*48*
			Density	v/lane/mile	20	36	36	36	36
			LOS		C	E[2]	E[2]	E[2]	E[2]

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

Source: DKS Associates, 2004

TABLE 4.2.3-6
URBAN STREET SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	2520	2441	2434	2361	2388
			Speed	FFS	35	35	35	35	35
				Calculated	26	26	26	27	27
			LOS		B	B	B	B	B
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	1683	2363	2373	2978	2979
			Speed	FFS	35	35	35	35	35
				Calculated	26	21	20	16	16
			LOS		B	C	C	D	D
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	1076	960	986	589	525
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	26	29
			LOS		B	B	B	A	A
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	941	1142	1078	514	498
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	28	29
			LOS		B	B	B	A	A

Source: DKS Associates, 2004

4.2.4 Segment Travel Time

In addition to LOS, travel time was used to evaluate the performance of several highway segments for each alternative. The results are presented in Table 4.2.4-1.

TABLE 4.2.4-1
PEAK PERIOD TRAVEL TIME ON ROADWAY SEGMENTS (in minutes)

No.	Location	Dir	Base Year	Design Year Alternative: No Build	Design Year Alternative: Replace and Widen	Design Year Alternative: Parkway: Diamond Option	Design Year Alternative: Parkway: Circle Drive Option
AM Peak Period							
1	GGB to Park Presidio and Lake	SB	3.8	3.9	3.9	3.6	3.6
2	Park Presidio and Lake to GGB	NB	3.4	5.3	5.5	5.5	5.5
3	GGB to Marina and Divisadero	EB	3.4	3.2	3.1	3.7	4.0
4	Marina and Divisadero to GGB	WB	2.7	2.7	2.7	3.2	3.2
5	GGB to Francisco and Richardson	EB	2.9	3.0	2.2	2.9	3.0
6	Francisco and Richardson to GGB	WB	2.6	2.8	2.8	2.5	2.7
7	Park Presidio and Lake to Marina and Divisadero	EB	5.6	7.1	7.1	8.0	8.2
8	Marina and Divisadero to Park Presidio and Lake	WB	5.2	5.0	5.1	5.6	5.7
PM Peak Period							
1	GGB to Park Presidio and Lake	SB	3.1	5.2	5.7	5.1	4.7
2	Park Presidio and Lake to GGB	NB	4.4	4.5	4.5	4.2	4.2
3	GGB to Marina and Divisadero	EB	2.7	2.8	2.7	3.4	3.4
4	Marina and Divisadero to GGB	WB	3.9	3.7	3.7	3.6	3.5
5	GGB to Francisco and Richardson	EB	2.5	2.6	1.8	2.6	2.5
6	Francisco and Richardson to GGB	WB	4.2	3.9	3.9	3.1	3.2
7	Park Presidio and Lake to Marina and Divisadero	EB	5.9	5.8	5.8	6.6	6.7
8	Marina and Divisadero to Park Presidio and Lake	WB	6.3	7.2	7.4	7.7	7.4

Source: DKS Associates, 2004

Findings

Travel times in general would become longer in the design year because of increased regional traffic. The introduction of additional signals on Richardson Avenue and Marina Boulevard results in longer travel time to both streets in Presidio Parkway Alternative options.

4.2.5 Segment Merge / Diverge Level of Service

The LOS analysis for the merge/diverge locations for all on- and off-ramps in the project area are shown in Table 4.2.5-1 for the AM peak hour, and Table 4.2.5-2 for the PM peak hour. Table 4.2.5-3 contains a forecast of performance during the weekend peak hour. Detailed calculations are provided in Appendix E.

TABLE 4.2.5-1
AM PEAK HOUR MERGE/DIVERGE ANALYSIS

No.	Ramp	Criteria	Base Year	Design Year Alternative			
				No Build	Replace and Widen	Parkway: Diamond Option	Parkway: Circle Drive Option
1	US 101 Southbound diverge ramp to Park Presidio	LOS	F[2]	F[2]	F[2]	D	D
		Density[1]	26	29	29	32	32
2	US 101 Southbound merge ramp from Park Presidio	LOS	E[2]	E[2]	D	D	D
		Density[1]	36	32	32	31	31
3	US 101 Northbound merge ramp from Park Presidio	LOS	C	C	C	C	C
		Density[1]	28	42	27	28	28
4	US 101 Northbound diverge ramp to Park Presidio	LOS	B	B	B	B	B
		Density[1]	18	24	20	20	20
5	US 101 Southbound diverge ramp to Marina/Richardson	LOS	E	F	F	-	-
		Density[1]	37	46	45	-	-
6	US 101 Northbound merge ramp from Marina/Richardson	LOS	B	B	C	-	-
		Density[1]	19	27	28	-	-
7	Park Presidio merge ramp from US 101	LOS	C	C	C	C	C
		Density[1]	26	29	24	25	25
8	Park Presidio diverge ramp from US 101	LOS	C	C	D	D	D
		Density[1]	27	34	30	29	29
9	US 101 SB exit diverge to Girard	LOS	-	-	-	D	C
		Density[1]	-	-	-	28	28
10	US 101 NB exit diverge to Girard	LOS	-	-	-	C	-
		Density[1]	-	-	-	21	-

Notes:

1. Density is measured in vehicles per mile per lane
2. Density is not considered in LOS calculation where highway Influence area or ramps are over capacity,

Source: DKS Associates, 2004

TABLE 4.2.5-2
PM PEAK HOUR MERGE/DIVERGE ANALYSIS

No.	Ramp	Criteria	Base Year	Design Year Alternative: No Build	Design Year Alternative: Replace and Widen	Design Year Alternative: Parkway: Diamond Option	Design Year Alternative: Parkway: Circle Drive Option
1	US 101 Southbound diverge ramp to Park Presidio	LOS	B	F[2]	F[2]	D	D
		Density[1]	13	24	26	31	31
2	US 101 Southbound merge ramp from Park Presidio	LOS	C	C	C	C	C
		Density[1]	21	26	26	25	25
3	US 101 Northbound merge ramp from Park Presidio	LOS	C	D	D	D	D
		Density[1]	27	28	28	29	29
4	US 101 Northbound diverge ramp to Park Presidio	LOS	D	D	D	D	D
		Density[1]	34	34	30	30	30
5	US 101 Southbound diverge ramp to Marina/Richardson	LOS	C	E	E	-	-
		Density[1]	22	35	36	-	-
6	US 101 Northbound merge ramp from Marina/Richardson	LOS	E	F	F	-	-
		Density[1]	37	39	40	-	-
7	Park Presidio merge ramp from US 101	LOS	C	D	D	D	D
		Density[1]	25	31	28	29	29
8	Park Presidio diverge ramp from US 101	LOS	D	D	C	C	C
		Density[1]	30	31	27	27	27
9	US 101 SB exit diverge to Girard	LOS	-	-	-	C	C
		Density[1]	-	-	-	22	21
10	US 101 NB exit diverge to Girard	LOS	-	-	-	C	-
		Density[1]	-	-	-	25	-

Notes:

1. Density is measured in vehicles per mile per lane
2. Density is not considered in LOS calculation where highway Influence area or ramps are over capacity,

Source: DKS Associates, 2004

Findings

Less than adequate service levels were projected for Alternatives 1 and 2 in the design year for southbound Doyle Drive diverge at Park Presidio Boulevard. The addition of a second exit lane from southbound US 101 to Park Presidio Boulevard in the Parkway Alternative (Alternative 5) improves the LOS to an acceptable level (LOS D). Also, the reconfiguration of lanes between Richardson and Marina (assigning a lane specifically for Marina Boulevard, results in no merge/diverge being required in the Parkway Alternatives.

TABLE 4.2.5-3
WEEKEND PEAK HOUR MERGE/DIVERGE ANALYSIS

No.	Ramp	Criteria	Base Year	Design Year Alternative			
				No Build	Replace and Widen	Parkway: Diamond Option	Parkway: Circle Drive Option
1	US 101 Southbound diverge ramp to Park Presidio	LOS	B	F[2]	F[2]	D	D
		Density[1]	13	24	26	31	31
2	US 101 Southbound merge ramp from Park Presidio	LOS	C	C	C	C	C
		Density[1]	21	26	26	25	25
3	US 101 Northbound merge ramp from Park Presidio	LOS	C	D	D	D	D
		Density[1]	27	28	28	29	29
4	US 101 Northbound diverge ramp to Park Presidio	LOS	D	D	D	D	D
		Density[1]	34	34	30	30	30
5	US 101 Southbound diverge ramp to Marina/Richardson	LOS	C	E	E	-	-
		Density[1]	22	35	36	-	-
6	US 101 Northbound merge ramp from Marina/Richardson	LOS	E	F	F	-	-
		Density[1]	37	39	40	-	-
7	Park Presidio merge ramp from US 101	LOS	C	D	D	D	D
		Density[1]	25	31	28	29	29
8	Park Presidio diverge ramp from US 101	LOS	D	D	C	C	C
		Density[1]	30	31	27	27	27
9	US 101 SB exit diverge to Girard	LOS	-	-	-	C	C
		Density[1]	-	-	-	22	21
10	US 101 NB exit diverge to Girard	LOS	-	-	-	C	-
		Density[1]	-	-	-	25	-

Notes:

1. Density is measured in vehicles per mile per lane
2. Density is not considered in LOS calculation where highway Influence area or ramps are over capacity,

Source: DKS Associates, 2004

4.2.6 Segment Weaving

The LOS for the weaving areas were calculated using Caltrans'-approved methodologies or the Leisch method (nomograph). The results are shown in Table 4.2.6-1.

Findings

A less than adequate weave condition (Level of Service E) was identified on northbound US 101 between the Park Presidio on-ramp and Merchant Road exit-ramp. To eliminate this potential problem, a Merchant Road slip ramp option is carried forth.

The findings also identified a southbound weaving section between the Merchant Road on-ramp and the Park Presidio off-ramp in the AM and PM peak hour (Level of Service E) in the No Project and Replace and Widen Alternatives. The southbound weave condition at this location was improved by adding a second lane to the exit ramp at Park Presidio in the Parkway Alternatives.

The traffic forecasts also indicate that the northbound segment of Doyle Drive between merge point from Richardson Avenue and Marina Boulevard to the off-ramp at Park Presidio is projected to deteriorate to Level of Service E during the Design Year in all alternatives. This occurs because traffic increases result in this new deficiency. As this operates at Level of Service E in all alternatives, there are no additional impacts associated with design alternatives and options.

There are no impacts identified in the segment weaving analysis, since the No-Build Alternative is anticipated to operate at unacceptable levels of service for three of the four segments during at least one time period.

As no new deficiencies would result beyond the No-Build Alternative, no mitigation is required. It is noted that design options found in various alternatives eliminate projected weaving deficiencies for northbound Doyle Drive between Park Presidio and Merchant Road ramps, and southbound Doyle Drive between Merchant Road and Park Presidio ramps.

TABLE 4.2.6-1
WEAVING ANAYSIS

Location		Level of Service		
		AM	PM	Weekend
Base Year				
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	C	C	N/A
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E[1]	N/A
3	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	C	A	N/A
4	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	A	A	N/A
Design Year -- No-Build Alternative				
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	E[1]	E[1]	D
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E[1]	D
3	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	D	C	C
4	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	B	E[1]	C
Design Year -- Replace and Widen Alternative				
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	E[1]	E[1]	D
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E[1]	D
3	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	D	B	B
4	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	C	E[1]	C

Note: Results interpreted from nomograph

1. Deficient Weaving segment would be remedied with new northbound slip ramp.
2. Design Year level of service deficiencies are projected in the No-Build Alternatives, so no additional impacts would occur

TABLE 4.2.6-1
WEAVING ANALYSIS (continued)

Location		Level of Service AM	PM	Weekend
Design Year – Parkway Alternative: Diamond Option				
2	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	D/E	D	D
1	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	B	E[1]	D
4	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	C	B	B
3	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	B	E[2]	C
Design Year -- Parkway Alternative: Circle Drive Option				
2	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	D/E	D	C
1	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	B	E[1]	C
4	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	C	B	B
3	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	B	E[2]	C

Note: Results interpreted from nomograph
1. Deficient Weaving segment would be remedied with new northbound slip ramp.
2. Design Year level of service deficiencies are projected in the No-Build Alternatives, so no additional impacts would occur

Source: DKS Associates, 2004

4.2.7 Local Street Volumes

While no traffic volumes on local streets within the Presidio are forecast to reach congested traffic conditions, changes in overall traffic volumes by alternative may influence the overall quality of the park experience, as each vehicle adds some noise and safety concerns to persons using the park. To summarize the various changes in volumes associated with each alternative, a general table of traffic on local roads has been prepared.

It should be noted that these are representative volumes from the San Francisco Travel Demand Model. Thus, these volumes are best understood in terms of the aggregate change in traffic volumes between alternatives.

A set of representative roadway segments within the Presidio are summarized in tabular form to illustrate these differences. The AM conditions are found in Table 4.2.7-1; the PM conditions are in Table 4.2.7-2.

In the AM peak hour, the highest volumes are expected at the Presidio and Lombard Gates. The volumes of Lombard Gate are forecast to be similar to the existing conditions by the design year in Alternatives 1 and 2, while the new access provided the Alternative 5 options will result in less traffic through the Lombard Gate for morning traffic going into the Presidio. The Presidio Gate volumes vary by less than 50 vehicles between any alternative in the design year.

Another area of increased traffic demand is Halleck Street, where Alternatives 1 and 2 forecast increased traffic. This additional traffic will be ameliorated when direct access is provided between the Main Post area and Doyle Drive in the Alternative 5 options. Mason Street traffic increases in Alternative 2, once the Letterman access ramp from Richardson Avenue is eliminated in this alternative. Finally, Girard Road volumes will increase once the connection to Doyle Drive is made, as shown in Alternative 5 options.

The PM conditions generally show comparable results, with westbound Lombard Gate traffic decreasing with the Alternative 5 options, as well as the Alternative 5 options reducing traffic volumes on Halleck Street and Mason Street. Generally the changes are attributable to the introduction of the direct access between the Main Post area and Doyle Drive in the Alternative 5 options.

TABLE 4.2.7-1
AM PEAK HOUR LOCAL STREET VOLUMES

				Design Year				Difference to Design Year No Build		
		Dir.	Base Year (veh)	No Build (veh)	Replace and Widen (veh)	Parkway: Diamond Option (veh)	Parkway: Circle Drive Option (veh)	Replace and Widen (veh)	Parkway: Diamond Option (veh)	Parkway: Circle Drive Option (veh)
2	Lincoln--Long Avenue to Crissy Field	WB	10	80	60	60	60	-20	-20	-20
	Lincoln--Crissy Field to Long Avenue	EB	0	60	60	50	50	0	-10	-10
3	Lincoln--Sheridan to Crissy Field	WB	60	140	120	120	130	-20	-20	-10
	Lincoln--Crissy Field to Sheridan	EB	80	100	100	70	70	0	-30	-30
6	Mason--Zanowiz to Lyon	WB	10	10	70	10	10	60	0	0
	Mason--Lyon to Zanowiz	EB	10	20	10	10	10	-10	-10	-10
8	Lombard Gate--Lyon to Ruger	WB	510	530	540	220	190	10	-310	-340
	Lombard Gate--Ruger to Lyon	EB	400	500	470	500	490	-30	0	-10
9	Girard--Lincoln to Gorgas	NB	20	90	90	140	100	0	50	10
	Girard--Gorgas to Lincoln	SB	10	50	50	470	440	0	420	390
10	Presidio Gate--Pacific to Broadway	NB	500	640	660	610	600	20	-30	-40
	Presidio Gate--Broadway to Pacific	SB	590	650	650	630	640	0	-20	-10
11	Arguello Gate--Pacific to Washington	NB	90	240	260	260	260	20	20	20
	Arguello Gate--Washington to Pacific	SB	60	90	90	120	120	0	30	30
13	15th Ave--Lake to Wedemeyer	NB	20	80	90	90	90	10	10	10
	15th Ave--Wedemeyer to Lake	SB	30	110	110	110	110	0	0	0
14	Lincoln--Brooks to Browley	NB	450	660	650	610	610	-10	-50	-50
	Lincoln--Browley to Brooks	SB	10	450	460	400	410	10	-50	-40
17	Halleck Street – Lincoln to Mason	NB	30	70	150	30	40	80	-40	-30
	Halleck Street – Mason to Lincoln	SB	20	30	20	10	10	-10	-20	-20
18	McDowell Street -- Lincoln to Mason	NB	20	90	70	70	70	-20	-20	-20
	McDowell Street -- Mason to Lincoln	SB	0	10	10	10	10	0	0	0

Source: DKS Associates, 2004

TABLE 4.2.7-2
PM PEAK HOUR LOCAL STREET VOLUMES

		Dir.	Base Year (veh)	Design Year: No Build (veh)	Design Year: Replace and Widen (veh)	Design Year: Parkway: Diamond Option (veh)	Design Year: Parkway: Circle Drive Option (veh)	Difference to Design Year No Build: Replace and Widen (veh)	Difference to Design Year No Build: Parkway: Diamond Option (veh)	Difference to Design Year No Build: Parkway: Circle Drive Option (veh)
2	Lincoln--Long Avenue to Crissy Field	WB	260	170	150	50	40	-20	-120	-130
	Lincoln--Crissy Field to Long Avenue	EB	30	70	110	50	50	40	-20	-20
3	Lincoln--Sheridan to Crissy Field	WB	340	300	290	170	190	-10	-130	-110
	Lincoln--Crissy Field to Sheridan	EB	60	130	170	110	110	40	-20	-20
6	Mason--Zanowiz to Lyon	WB	10	20	30	10	10	10	-10	-10
	Mason--Lyon to Zanowiz	EB	50	140	50	30	30	-90	-110	-110
8	Lombard Gate--Lyon to Ruger	WB	490	620	620	340	340	0	-280	-280
	Lombard Gate--Ruger to Lyon	EB	290	300	330	330	310	30	30	10
9	Girard--Lincoln to Gorgas	NB	30	90	90	290	250	0	200	160
	Girard--Gorgas to Lincoln	SB	20	90	100	470	450	10	380	360
10	Presidio Gate--Pacific to Broadway	NB	580	650	660	620	610	10	-30	-40
	Presidio Gate--Broadway to Pacific	SB	530	660	670	630	630	10	-30	-30
11	Arguello Gate--Pacific to Washington	NB	150	180	160	180	180	-20	0	0
	Arguello Gate--Washington to Pacific	SB	160	310	350	390	390	40	80	80
13	15th Ave--Lake to Wedemeyer	NB	60	130	130	130	130	0	0	0
	15th Ave--Wedemeyer to Lake	SB	40	130	150	160	160	20	30	30
14	Lincoln--Brooks to Browley	NB	530	550	540	520	510	-10	-30	-40
	Lincoln--Browley to Brooks	SB	490	850	670	610	620	-180	-240	-230
17	Halleck Street – Lincoln to Mason	NB	40	150	110	20	30	-40	-130	-120
	Halleck Street – Mason to Lincoln	SB	40	70	50	40	40	-20	-30	-30
18	McDowell Street -- Lincoln to Mason	NB	260	190	10	50	50	-180	-140	-140
	McDowell Street -- Mason to Lincoln	SB	10	10	10	10	10	0	0	0

Source: DKS Associates, 2004

4.3 FUTURE YEAR TRANSIT

For this study, the same frequency of transit services that use Doyle Drive was assumed for all alternatives. Table 4.3-1 lists the number of buses that have some or part of their route on Doyle Drive for all alternatives.

The number of peak period buses on Doyle Drive would continue to be heavily oriented in one direction. About two-thirds of all the buses on Doyle Drive occur during the peak period.

An evaluation of the overall transit ridership at the southern edge of the Presidio (MUNI Route 28, 29, 43; Golden Gate Transit Route 50) and eastern edge of the Presidio (MUNI Route 28, 43, 82X; Golden Gate Transit Routes into San Francisco except Route 50) was made. None of the build alternatives increased ridership by more than one percent in either the AM or PM peak hour. Thus, no impacts on the capacity of these routes are anticipated.

TABLE 4.3-1
NUMBER OF BUSES ON DOYLE DRIVE – ALL ALTERNATIVES

	All Day				Weekday Peak Period			
	Weekday		Saturday		AM		PM	
Route	In	Out	In	Out	In	Out	In	Out
San Francisco MUNI								
28	100	100	85	85	20	20	18	18
76[1]	-	-	9	9	-	-	-	-
Total MUNI	100	100	94	94	20	20	18	18
Golden Gate Transit (GGT)								
2	9	7	-	-	9	-	-	7
4	22	25	-	-	20	-	-	21
8	5	4	-	-	4	-	-	4
10	1	-	13	13	-	-	-	-
18	12	13	-	-	10	-	-	11
20	29	35	33	33	6	7	6	7
24	22	21	-	-	19	-	-	18
26	10	7	-	-	8	-	-	6
28	2	2	-	-	2	-	-	2
30	9	9	-	-	0	1	3	1
32	3	3	-	-	3	-	-	3
34	4	3	-	-	4	-	-	3
38	8	8	-	-	7	-	-	7
44	5	4	-	-	5	-	-	4
48	3	3	-	-	3	-	-	3
50	29	16	16	16	5	1	6	3
54	17	17	-	-	16	-	-	13
56	8	8	-	-	8	-	-	8
60/70/80	35	50	36	38	5	8	8	8
72	10	12	-	-	9	-	-	10
74	16	15	-	-	11	-	-	12
76	13	12	-	-	13	-	-	10
78	3	3	-	-	3	-	-	3
90	3	2	-	-	1	1	-	1
93	6	1	-	-	6	-	-	1
Total GGT	284	280	98	84	177	18	23	166

Notes: 1. Operates on Sundays only

Source: DKS Associates, 2004 from SF-TDM

4.3.1 Transit Travel Time

Table 4.3.1-1 summarizes the peak hour transit travel times by segment for each alternative.

Findings

By the Design Year, increased regional traffic results in reduced travel speeds for the local transit operators. Travel times are expected to increase about one minute on all transit routes in peak directions in the Design Year when compared to 2000, with less significant growth in off-peak directions.

When comparing the Design Year conditions for each alternative, the effect of each of the alternatives on travel times varies depending on the route. The majority of riders are carried on GGT routes, which would increase from the current 2.9-minute trip in the AM peak to a 5.5-minute trip by the Design Year. In the PM peak, the projected travel time is expected to increase from 4.0 minutes to 6.4 minutes by the Design Year.

The Parkway Alternative options do not substantially change travel times from the Replace and Widen alternative, as the routing and stop locations are similar.

Because this corridor mainly affects much longer GGT and MUNI routes, the impacts to overall transit travel time of about one minute or less per trip is less than 5 percent of the 45 to 120 minute one-way trip time on these routes. The impact in terms of transit travel time (one component of overall travel time) to individual riders on the system would be greater, and this would vary depending on the amount of time spent on a bus.

4.3.2 Transit Operations (Capacity) Level of Service

The peak hour load factors are shown in Table 4.3.2-1. These factors describe whether the current buses have enough seating capacity to carry all passengers, or whether more is needed. In addition, an examination of total passenger loads crossing the southern edge of the Presidio was made.

Findings

The results of the analysis are provided on a route-by-route basis. While some individual GGT routes are forecast to have load factors over 100 percent, It should be noted that GGT frequently balances route service between over-productive service and under-productive services in an area where many routes serve the same corridor. Assuming that route service is reallocated by the Design Year to serve more productive routes, the assumed level of transit service for the design year should be adequate in handling passenger loads. The combined load factor on GGT routes does not exceed 82 percent for any the Design Year alternative.

While alternatives show different loads on different routes, total GGT ridership in this corridor is forecast to be approximately 11,700 two-way average weekday riders in the Design Year, and should not vary by more than 100 riders in any alternative.

MUNI Route 28 is projected to see a leveling of demand by the Design Year. No alternative changes the overall anticipated ridership of this route on Doyle Drive by more than 30 riders, although it should be noted that this route is expected to carry its maximum available capacity on Route 28 for the Doyle Drive route segment by the Design Year.

An evaluation of routes that cross into the Richmond neighborhoods from the project project area was also conducted. These included MUNI routes 28, 29, 43 and Golden Gate Transit Route 50. This evaluation indicated a less than one percent change in bus passenger loads on the routes that cross the southern border of the Presidio.

In sum, no alternative is anticipated to induce additional bus demand above the design year no-build (Alternative 1) condition.

TABLE 4.3.1-1
PEAK HOUR TRAVEL TIME FOR TRANSIT SERVICES

Path	Segment	AM Travel Time[1]	PM Travel Time[1]
Base Year			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.0 (SB) 4.6 (NB)	4.4 (SB) 5.6 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.5 (SB) 5.1 (NB)	5.0 (SB) 6.7 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.1 (SB) 10.1 (NB)	11.1 (SB) 10.6 (NB)
Design Year – Alternative 1 No Build			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.2 (SB) 6.6 (NB)	6.5 (SB) 5.8 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.5 (SB) 5.3 (NB)	5.1 (SB) 6.4 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.7 (SB) 11.9 (NB)	11.5 (SB) 12.2 (NB)
Design Year – Alternative 2 Replace and Widen			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.2 (SB) 6.8 (NB)	7.0 (SB) 5.8 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	4.7 SB) 5.3 (NB)	4.3 (SB) 6.4 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	9.9 (SB) 12.1 (NB)	11.3 (SB) 12.2 (NB)
Design Year – Alternative 5 Parkway: Diamond Option			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	4.9 (SB) 6.8 (NB)	6.4 (SB) 5.5 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.4 (SB) 5.0 (NB)	5.1 (SB) 5.6 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.3 (SB) 11.8 (NB)	11.4 (SB) 11.1 (NB)
Design Year – Alternative 5 Parkway: Circle Drive Option			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	4.9 (SB) 6.8 (NB)	6.0 (SB) 5.5 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.5 (SB) 5.2 (NB)	5.7 (SB) 5.7 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.4 (SB) 12.0 (NB)	11.7 (SB) 11.2 (NB)

Notes:

1. Travel time is measured in minutes includes time for passenger loading and disembarking .

Source: DKS Associates, 2004 from SF- TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Base Year (Existing Conditions)								
MUNI								
28	22	20	567	520	191	466	34%	90%
Golden Gate Transit								
2		4		172		79		46%
4		12		516		286		55%
8		3		129		43		33%
18		5		215		129		60%
20	2	2	86	86	32	50	38%	58%
24		7		301		220		73%
26		4		172		78		45%
28		2		86		10		12%
32		1		43		25		58%
34		1		43		22		51%
38		3		129		104		81%
44		2		86		48		56%
48		2		86		39		46%
50	2	2	86	86	14	44	17%	51%
54		6		258		192		75%
56		4		172		104		61%
72		4		172		165		96%
74		5		215		137		64%
76		5		215		150		70%
78		2		86		26		31%
60/70/80	3	2	129	86	80	48	62%	91%
90		1		43		9		20%
93		1		43		11		26%

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 fromSF-TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternatives 1 (No Build) and 2 (Replace and Widen)								
MUNI								
28	5	5	215	215	82	211	38%	98%
GGT								
2		4		172		139		81%
4		12		516		396		77%
8		3		129		74		57%
10	2	5	86	215	6	6	7%	3%
18		5		215		111		52%
20	2	2	86	86	8	47	9%	55%
24		7		301		204		68%
26		4		172		172		100%
28		2		86		9		11%
32		1		43		23		54%
34		1		43		20		47%
38		3		129		118		91%
44		2		86		74		86%
48		2		86		86		100%
50	2	2	86	86	14	81	16%	94%
54		6		258		248		96%
56		4		172		166		96%
70	1	1	43	43	33	41	77%	95%
71		4		172		151		88%
72		4		172		167		97%
74		5		215		214		100%
75		5		215		196		91%
76		5		215		204		95%
78		2		86		8		9%
80	2	1	86	43	8	41	9%	95%
90		1		43		40		93%
93		1		43		40		93%

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Diamond Option								
MUNI								
28	5	5	215	215	82	226	38%	105%
GGT								
2		4		172		145		84%
4		12		516		396		77%
8		3		129		75		58%
10	2	5	86	215	6	6	7%	3%
18		5		215		110		51%
20	2	2	86	86	8	47	9%	55%
24		7		301		204		68%
26		4		172		172		100%
28		2		86		9		11%
32		1		43		23		54%
34		1		43		20		47%
38		3		129		115		89%
44		2		86		74		86%
48		2		86		86		100%
50	2	2	86	86	14	81	16%	94%
54		6		258		245		95%
56		4		172		166		96%
70	1	1	43	43	33	41	77%	95%
71		4		172		151		88%
72		4		172		167		97%
74		5		215		215		100%
75		5		215		196		91%
76		5		215		204		95%
78		2		86		11		13%
80	2	1	86	43	8	41	9%	95%
90		1		43		40		93%
93		1		43		40		93%

Notes: 1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Circle Drive Option								
MUNI								
28	5	5	215	215	82	226	38%	105%
GGT								
2		4		172		145		84%
4		12		516		397		77%
8		3		129		80		62%
10	2	5	86	215	6	6	7%	3%
18		5		215		110		51%
20	2	2	86	86	8	47	9%	55%
24		7		301		204		68%
26		4		172		172		100%
28		2		86		9		11%
32		1		43		23		54%
34		1		43		20		47%
38		3		129		109		85%
44		2		86		74		86%
48		2		86		86		100%
50	2	2	86	86	14	81	16%	94%
54		6		258		243		94%
56		4		172		166		96%
60	1	1	43	43	33	41	77%	95%
70		4		172		151		88%
71		4		172		167		97%
72		5		215		217		101%
74		5		215		196		91%
75		5		215		204		95%
76		2		86		10		12%
78	2	1	86	43	8	41	9%	95%
80		1		43		40		93%
90		1		43		40		93%
93		1		43		40		93%

Notes: 1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Base Year								
MUNI								
28	18	19	378	447	231	370	61%	83%
Golden Gate Transit								
2	5		215		121		56%	
4	7		301		262		87%	
8	2		86		61		71%	
18	6		258		151		58%	
20	2	1	86	43	109	63	100+%	100+%
24	9		387		243		63%	
26	3		129		115		89%	
28	2		86		17		20%	
32	1		43		34		80%	
34	1		43		43		99%	
38	4		172		134		78%	
44	2		86		61		71%	
48	2		86		37		44%	
50	4	3	172	129	33	59	19%	45%
54	6		258		199		77%	
56	4		172		106		62%	
72	3		129		142		100+%	
74	5		215		181		84%	
76	4		172		126		73%	
78	2		86		25		29%	
60/70/80	2	3	86	129	58	65	68%	50%
90	1		43		12		27%	
93	4		172		69		40%	

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternatives 1 (No Build) and 2 (Replace and Widen)								
MUNI								
28	6	6	258	258	242	358	94%	139%
GGT								
2	5		215		216		100%	
4	7		301		297		99%	
8	2		86		72		84%	
18	6		258		239		93%	
20	2	1	86	43	85	39	99%	91%
24	9		387		355		92%	
26	3		129		99		77%	
28	2		86		77		90%	
32	1		43		32		74%	
34	1		43		37		86%	
38	4		172		157		91%	
44	2		86		50		58%	
48	2		86		82		95%	
50	4	3	172	129	163	109	95%	84%
54	6		258		251		97%	
56	4		172		165		96%	
72	3		129		127		98%	
74	5		215		208		97%	
76	4		172		156		91%	
78	2		86		75		87%	
80	2	3	86	129	66	174	77%	135%
90	1		43		42		98%	
93	4		172		169		98%	

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE *(continued)*

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Diamond Option								
MUNI								
28	6	6	258	258	247	359	96%	139%
GGT								
2	5		215		216		100%	
4	7		301		297		99%	
8	2		86		73		85%	
18	6		258		239		93%	
20	2	1	86	43	85	40	99%	93%
24	9		387		355		92%	
26	3		129		99		77%	
28	2		86		77		90%	
32	1		43		32		74%	
34	1		43		37		86%	
38	4		172		157		91%	
44	2		86		50		58%	
48	2		86		82		95%	
50	4	3	172	129	163	109	95%	84%
54	6		258		252		98%	
56	4		172		165		96%	
72	3		129		127		98%	
74	5		215		209		97%	
76	4		172		156		91%	
78	2		86		75		87%	
80	2	3	86	129	67	171	78%	133%
90	1		43		40		93%	
93	4		172		169		98%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Circle Drive Option								
MUNI								
28	6	6	258	258	246	359	95%	139%
GGT								
2	5		215		215		100%	
4	7		301		297		99%	
8	2		86		72		84%	
18	6		258		239		93%	
20	2	1	86	43	86	39	100%	91%
24	9		387		355		92%	
26	3		129		99		77%	
28	2		86		77		90%	
32	1		43		32		74%	
34	1		43		37		86%	
38	4		172		157		91%	
44	2		86		50		58%	
48	2		86		82		95%	
50	4	3	172	129	163	109	95%	84%
54	6		258		250		97%	
56	4		172		163		95%	
72	3		129		127		98%	
74	5		215		207		96%	
76	4		172		156		91%	
78	2		86		75		87%	
80	2	3	86	129	70	174	81%	135%
90	1		43		42		98%	
93	4		172		169		98%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

4.4 FUTURE YEAR PEDESTRIANS AND BICYCLES

4.4.1 Bicycles

Bicycles would continue to be prohibited on Doyle Drive. Bicycle activity in the Doyle Drive corridor is accommodated by already designated bicycle paths and routes on either side of the Project area on routes described in the *Presidio Trails and Bikeways Master Plan*.

The project alternatives that elevate Doyle Drive or place it in a tunnel would continue to allow bicyclists to cross over or under the facility, and may introduce new locations where crossing can occur. However, the two access options facilitate bicyclists in different ways. The Parkway Alternatives provide crossings at two signalized intersections on Richardson—at Girard and at Gorgas Avenue intersection.

4.4.2 Pedestrians

The No-Build Alternative preserves the pedestrian sidewalk along Doyle Drive. This sidewalk is not ADA accessible. The sidewalk is removed in the Replace and Widen and the two Parkway Alternatives. New trails that parallel Doyle Drive are in place or planned on both sides of the facility that should accommodate pedestrians including portions of the Bay Trail, Presidio Promenade and the Golden Gate Promenade, as designated in the *Presidio Trails and Bikeways Master Plan.* In the Parkway Alternatives, the tunnel design will allow for easier access for pedestrians west of the Main Post area. Also in the Parkway Alternatives, the street treatments on Richardson Avenue will allow for shorter and more direct pedestrian movements between the Main Post area and the Palace of Fine Arts.

All project alternatives would continue to allow pedestrians to cross over or under the facility at numerous locations. However, the two different access options in Alternative 5 facilitate pedestrians in different ways. This alternative includes pedestrian crossings on Girard Road from between the Palace of Fine Arts and Girard Road, as well as a crossing for Richardson Avenue at the Gorgas Avenue. intersection. Tunnels that would be provided in Alternative 5 would also allow for new pedestrian connections (e.g., Batteries to Cemetery).

4.4.3 Pedestrian Crossings

The resulting pedestrian walk times are summarized in Table 4.4.1. This table illustrates the walking travel time changes of providing the pedestrian walk paths (in Alternative 5options) over the proposed Doyle Drive Tunnel (path 1), as well as the ease of negotiating the area between the Main Post, Exploratorium, Crissy Field Interpretative Center and the Marina Neighborhood (in paths 2 and 3). The resulting travel time-saving is between 15 and 25 percent.

The time needed for a person to walk between different Presidio attractions would be different for each alternative. Today, Doyle Drive blocks easy pedestrian connectivity between many locations on opposite sides of the road. In the future, the installation of the new signalized intersection for the Digital Arts Center parking garage would reduce some walk distances and time by providing a shorter access route. Using a brisk 1.2 meters per second (4 feet per second) average walk speed, a quantitative assessment of pedestrian crossings is included in this report.

TABLE 4.4.1
PEDESTRIAN WALK TIMES BY ALTERNATIVE (in minutes)

Path	Base Year	Design Year		
		Alternative 1 No Build	Alternative 2 Replace and Widen	Alternative 5 Parkway (all options)
1. Cemetery area to Crissy Field Interpretative Center area	12	12	12	9
2. Exploratorium/Palace of Fine Arts area to the Main Post area	13	12	12	11
3. Marina neighborhood to Crissy Field Interpretative Center area	14	14	14	12

Source: DKS Associates, 2004

4.5 CONSTRUCTION PERIOD

Review of the detour plans indicated that the construction period for the Doyle Drive replacement would be approximately four to five years. During this length of time, a series of construction phases would occur and construction vehicles, equipment and workers would be traversing the project area.

This section identifies the potential impacts that may occur during construction and that may affect selection of a preferred alternative. Once a preferred alternative is selected, and during final design, a formal *Transportation Management Plan* will develop strategies to address construction equipment, signage, time-of-day and general area-wide traffic reduction and management. Specifically, this chapter contains a discussion of these construction impacts:

- Construction vehicles
- Area-wide traffic reduction
- Ramp/road closures (greater than one month)

4.5.1 Construction Vehicles

The movement of construction vehicles may be a sensitive issue, given Doyle Drive's location within the Golden Gate National Recreation Area. Construction will involve demolition; excavation; and installation of new tunnel, bridge, and roadway structures; as well as landscaping and signing. Vehicles would include trucks hauling debris and delivering construction materials and supplies, as well as commuter vehicles driven by construction workers. Some of these vehicles will include graders and heavy earthmoving and paving equipment. The volume of these vehicles would vary through the project, depending on the specific construction activity and the schedules of the various building elements for each alternative.

Construction traffic is expected to access the project site from Park Presidio and the Golden Gate Bridge as was required during demolition and construction of the Letterman Digital Arts Complex. This traffic would enter the Presidio from eastbound Richardson Avenue while exiting traffic would use Mason Street to Lyon Street to westbound Doyle Drive. Depending on type of construction vehicle and time of arrival, some occasional access may require use of local streets in the Presidio. During final design, the Authority would work carefully with the Presidio Trust, the National Park Service, and the Golden Gate Bridge, Highway, and Transportation District, as well as other affected agencies to define specific construction procedures and routes and implementation of the Transportation Management Plan.

4.5.2 Area-wide Traffic Reduction Strategies

Area roadways would continue to serve a high volume of traffic during construction. Although the number of current travel lanes would not be eliminated, some geometric restrictions (such as narrower lanes, alignment adjustments or more restrictive turning radii) and pavement conditions may relieve available capacity or other situations where driver speeds will need to be reduced. Therefore, the *Transportation Management Plan* would include area-wide traffic reduction strategies aimed at reducing traffic in the construction area, and minimizing both Doyle Drive traffic and diversions to low-speed park roads during construction. An over-arching strategy for construction zones begins with encouraging traffic to use alternate routes and reducing the area-wide traffic demand. In this situation, a reduction of five or ten percent in traffic would help to minimize additional traffic congestion. Sample strategies include:

- Traffic between Golden Gate Bridge and Park Presidio/Richardson Avenue/Marina Boulevard:
  - Public awareness campaign for both commuters and tourists
  - Advance notice of major ramp closures
  - Strategies to increase mode share of travel on Golden Gate Transit buses and ferries (including consideration of fare subsidies and increased service)
- Traffic between Park Presidio and Richardson Avenue/Marina Boulevard:
  - Public awareness campaign for both commuters and tourists
  - Advance notice of major ramp closures
  - Redirecting traffic away from this movement and onto other San Francisco streets
- Traffic with one trip end at the Presidio:
  - Public awareness campaign for both commuters and tourists
  - Advance notice of major ramp closures
  - Strategies to increase the mode share of travel for local trip makers
  - Redirecting traffic away from this movement and onto other San Francisco streets

4.5.3 Transit Operations

Transit services would continue to operate as the project moves forward. The closure of Lincoln Boulevard would require rerouting of the PresidiGo shuttles and Muni Route 29.

4.5.4 Pedestrian and Bicycle Operations

The existing (but difficult to use and ADA non-compliant) adjacent sidewalk along the north side of Doyle Drive would be closed during the duration of construction. New trails that parallel Doyle Drive are in place or planned on both sides of the facility that should accommodate pedestrians including portions of the Bay Trail, Presidio Promenade and the Golden Gate Promenade, as designated in the *Presidio Trails and Bikeways Master Plan*.

Bicycles will be routed to already-designated bicycle paths and routes on either side of the Project area on routes described in the *Presidio Trails and Bikeways Master Plan*.

4.5.5 Ramp/Road Closures and Operational Changes

The construction staging concept for the Replace and Widen alternative and the two Parkway alternatives is shown in Appendix F. During various construction stages in the project, some ramps or roadways would need to be closed for a periods of time over one month. Most of the closures are anticipated to take between four to six months. The preliminary construction phasing has determined a number of instances where roadway lane capacity would be reduced. In order to assess the effects of this reduction, the SF-TDM was used to determine the traffic flows and volumes and identify impacts. Using the travel model, a construction year (2010 as the midpoint of construction) scenario was created by interpolating year 2000 and 2030 results. Once completed, the effects from various closures were identified.

Because each closure affects traffic in a different corridor at different times of day, each of these projected traffic conditions were examined individually. The AM and PM peak hour forecasted traffic volumes on major facilities for each major closure scenario are presented in Tables 4.5.5-1 through Table 4.5.5-4. Traffic and transportation impacts will be different throughout the corridor. This section describes potential impacts based on specific locations within the project study area.

General 2010 Traffic Conditions

By 2010, traffic on major facilities is expected to grow, with most growth occurring mainly in the non-peak commute direction. Generally, mainline Doyle Drive volumes are not projected to change by more than 200 vehicles.

Alternative 2: Replace and Widen

Park Presidio/Doyle Drive Ramp Closures

For the Replace and Widen Alternative, there are two major situations anticipated that could affect traffic.

For both the Detour and No Detour option, ramp closures are required in the initial stages of the project. This situation is analyzed as network 2A. The two ramps proposed for closure are those that connect Park Presidio northbound to Doyle Drive southbound, and Doyle Drive northbound to Park Presidio southbound. It is anticipated that this closure could be as long as six months. While the Doyle Drive northbound to Park Presidio southbound ramp may be closed for a longer duration, this particular situation represents the early critical “worst case” traffic diversion scenario.

At a peak hour basis, the Park Presidio northbound to Doyle Drive southbound ramp is projected to carry 930 vehicles in the AM peak hour and 730 vehicles in the PM peak hour. The Doyle Drive northbound to Park Presidio southbound ramp is projected to carry 430 vehicles in the AM peak hour and 910 in the PM peak hour. The removal of these vehicles means that a total of 1160 vehicles would be diverted in the AM peak hour and 1640 in the PM peak hour.

The SF-TDM indicates that these ramp closures would result in traffic moving to other ramps and streets. The general impact of this closure is projected to be that most drivers (over 60 percent in each time period) would not use either Park Presidio or Doyle Drive; these drivers would make their trips on other local streets through the Richmond District. The remaining 40 percent (about 460 in the AM peak hour and 660 in the PM peak hour) would travel up Park Presidio and cut through the Toll Plaza Visitor’s area to continue their trip. These trips would distribute evenly; half (or 20 percent overall) would cut underneath the toll plaza, and the other half would use Lincoln Boulevard to cross underneath Doyle Drive to cross between one side to the other. This is forecasted to result in 350 AM peak hour vehicles and 100 PM peak hour vehicles traveling underneath the Toll Plaza in the peak direction, through this narrow roadway segment. Except for this localized increase in traffic in the toll plaza area, no other substantial change in local Presidio traffic volumes is forecast to occur. Thus, other local roadways are not expected to have deterioration in traffic speeds, or resulting levels of service.

Appropriate actions would be to discourage traffic in the toll plaza area by warning motorists of the lane closure and encouraging alternate routes, as well as coordinating an overall trip reduction strategy as part of the Transportation Management Plan. The results are shown in Tables 4.5.5-1 and 4.5.5-2.

Lincoln Boulevard Closure

Rerouting of local Presidio traffic would occur during the three month period while the 2A construction scenario (Park Presidio / Doyle Drive ramp closures) is in place, early in the project. During this time, Lincoln Boulevard near the National Cemetery is proposed for closure for a three month period. Local traffic would be diverted to Halleck, Mason and McDowell. This would occur during a period while the northbound Park Presidio ramp to southbound Doyle Drive would also be closed. (Note: Halleck would be required to be opened when Lincoln would be closed.) The most critical time period for this closure would be the PM, when 230 vehicles would be expected to use this diverted route westbound (Location 3 on Tables 4.4.1-1 and 4.4.1-2). As the detour roads have fewer than 50 vehicles forecast on them at peak hour, the additional traffic should not result in any adverse congestion.

Marina/Richardson Merge and Diverge Relocation

Following completion of the previous two scenarios, under the *No Detour Option*, a diversion of the Marina and Richardson merge (northbound) and diverge (southbound) points would be required. As traffic speeds and capacities would be reduced for this period, an overall drop of 80 vehicles northbound and 340 vehicles southbound would occur on Doyle Drive in the AM. The PM volumes would drop by 160 vehicles northbound and 250 vehicles southbound. These vehicles would relocate to a variety of other streets, with no other local streets showing more than 100 vehicles increase in traffic.

There results are also shown in Tables 4.5.5-1 and 4.5.5-2 as Network 2B. The analysis suggests that no major efforts are needed to reduce regional traffic volumes as a result of this shift beyond a general project-related traffic reduction strategy.

Marina Boulevard Access

During the final construction stage of the *No Detour option*, the replacement of Marina Boulevard access would require a temporary rerouting of traffic south of the facility. This traffic would need to cross the northbound Richardson Avenue roadway at an at-grade temporary signalized intersection. As there is also a temporary ramp proposed for much of the construction period to run from Doyle Drive northbound to Park Presidio southbound which may attract more traffic through the project site, this situation was tested with and without this temporary ramp in place.

In the AM condition, the northbound Doyle Drive volumes would drop by 60 vehicles and the southbound by 220 vehicles. In the PM condition, the roadway is projected to have a drop of 160 vehicles in the northbound direction, and less than 10 vehicles in the southbound direction. The traffic is anticipated to disperse to a variety of other streets, with no other street showing traffic changes of more than 100 vehicles in any direction.

The new intersection created in this situation should operate satisfactorily, assuming that three outbound lanes are available on Richardson through this intersection, and that two left-turn travel lanes are available for traffic wishing to travel to Marina. The high volume of PM peak hour right-turning traffic from the Marina detour (in addition to concerns about site distance) may also necessitate a signal control.

Assuming that all design constraints are met, no additional actions beyond the normal traffic reduction strategy for the project would seem to be needed.

There results are also shown in Tables 4.5.5-1 and 4.5.5-2 as network 2C.

Parkway Alternatives: Diamond Option and Circle Drive Option

Lincoln Boulevard Closure

Early in the project, one traffic detour would involve the rerouting of internal Presidio traffic. During the initial stages of construction, Lincoln Boulevard near the National Cemetery is proposed for closure for a three month period. During this time, local traffic will be diverted to Halleck, Mason and McDowell. This would occur during a period while the Northbound Park Presidio hook ramp to Southbound Doyle Drive would also be closed. (Note: Halleck would be required to be opened when Lincoln would be closed.) The most critical time period for this closure would be the PM, when 290 vehicles would be expected to use this diverted route westbound (Location 3 on Tables 4.5.5-3 and 4.5.5-4). As the detour roads have fewer than 50 vehicles forecast on them at peak hour, the additional traffic should not result in any adverse congestion.

Marina Boulevard Access without Doyle Drive to Park Presidio Ramp Closure

For the Parkway alternative, the “worst case” scenario is the point in the construction staging where traffic to and from Marina Boulevard would need to cross a temporary northbound Richardson Avenue traffic flow. As traffic flow varies between the Diamond Option and the Circle Drive option, both of these situations have been analyzed but the results were not appreciably different.

In this scenario, the substantially constrained outbound traffic on Richardson was tested at two lanes. In this instance, outbound Doyle Drive operated adequately in the AM peak hour, with less than 100 vehicles change on Doyle Drive. However, in the PM condition, the lack of three through lanes posed a substantial barrier to traffic, and over 1,000 vehicles shifted to other streets. About 250 vehicles would shift to Lincoln, another 250 vehicles would use Park Presidio to reach the bridge, and another 300 vehicles would choose other routes instead of using the Doyle Drive to Park Presidio southbound ramp. In the case where this ramp is closed, the traffic would divert to the toll plaza routing discussed above in Alternative 2. The remaining vehicles would disperse to other local streets. Except for this localized increase in traffic in the toll plaza area, no other significant change in local Presidio traffic volumes is forecast to occur. Thus, other local roadways are not expected to have deterioration in traffic speeds, or resulting levels of service.

For the above reason, a full three lanes would be needed to carry the volumes coming from Richardson Avenue. With three lanes, the new intersection created in this situation should operate satisfactorily and traffic diversion would not occur. Similar to Alternative 2, two left-turn travel lanes would be available for traffic wishing to travel to Marina Boulevard. The high volume of PM peak hour right-turning traffic from the Marina detour (in addition to concerns about site distance) may also necessitate a signal control.

No substantial congestion is anticipated on roadways within the Presidio during this phase. Generally, all of these local roadways are forecast to have stable or slightly lower traffic volumes, even with the closure of Halleck Street. Once the extension of Girard Road to Marina Boulevard is opened, it will experience increased traffic, but this is expected as part of the implementing of either of the Parkway Alternatives.

These strategies would need additional investigation as part of the *Transportation Management Plan*, and implementation monitoring with interactive traffic management would be required to alleviate this upcoming bottleneck.

Results are also shown in Tables 4.5.5-3 and 4.5.5-4. For the Diamond option construction, the traffic is shown to operate as to 5aB (with the Doyle Drive to Park Presidio Ramp opened). Traffic forecasted during a Circle Drive option construction are shown as 5bB (with the Doyle Drive to Park Presidio Ramp opened).

Marina Boulevard Access with Doyle Drive to Park Presidio Ramp Closure

One possible variation of the previously-mentioned phase is for the Doyle Drive northbound to Park Presidio southbound ramp to remain closed, rather than to have a temporary ramp for a portion of the construction period. In the case where this ramp is kept closed during construction, the traffic would divert to the toll plaza routing discussed above in Alternative 2. The remaining vehicles would disperse to other local streets.

Similar to the previously mentioned phase, a full three lanes would be needed to carry the anticipated volumes coming from Richardson Avenue. With three lanes, the signalized intersection created in this situation should operate satisfactorily and traffic diversion would not occur. Similar to alternative 2, 2 lanes would be available on Girard Road for traffic wishing to travel to Marina Boulevard.

No substantial congestion is anticipated on roadways within the Presidio during this phase. Generally, all of these local roadways are forecast to have stable or slightly lower traffic volumes, even with the closure of Halleck Street. Once the extension of Girard Road to Marina Boulevard is opened, it will experience increased traffic, but this is expected as part of the implementing of either of the Parkway Alternatives.

These strategies would need additional investigation as part of the Transportation Management Plan, and implementation monitoring with interactive traffic management would be required to alleviate this upcoming bottleneck.

Results are also shown in Tables 4.5.5-3 and 4.5.5-4. For the Diamond option construction, the traffic is shown to operate as to 5aA (with the Doyle Drive to Park Presidio Ramp closed). Traffic forecasted during a Circle Drive option construction are shown as 5bA (with the Doyle Drive to Park Presidio Ramp closed).

TABLE 4.5.5-1
2010 ALTERNATIVE 2 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – AM PEAK HOUR

Location		Dir.	2010				Change (from 2010 base)		
			No Build (veh)	2A (veh)	2B (veh)	2C (veh)	2A (veh)	2B (veh)	2C (veh)
1	US 101--Park Presidio On to Merchant Off	WB	3,470	4,260	3,470	3,470	790	0	0
	US 101--Merchant On to Park Presidio Off	EB	5,950	6,590	5,840	5,870	640	-110	-80
2	Lincoln--Long Avenue to Crissy Field	WB	40	50	70	50	10	30	10
	Lincoln--Crissy Field to Long Avenue	EB	20	20	20	20	0	0	0
3	Lincoln--Sheridan to Crissy Field	WB	70	70	70	70	0	0	0
	Lincoln--Crissy Field to Sheridan	EB	70	80	120	90	10	50	20
4	US 101--Marina On to Park Presidio Off	WB	2,240	2,000	2,160	2,180	-240	-80	-60
	US 101--Park Presidio On to Marina Off	EB	5,030	4,640	4,680	4,800	-390	-350	-230
5	Marina--US 101 to Lyon	WB	580	500	560	610	-80	-20	30
	Marina--Lyon to US 101	EB	1,450	1,360	1,410	1,400	-90	-40	-50
6	Mason--Zanowiz to Lyon	WB	30	10	10	10	-20	-20	-20
	Mason--Lyon to Zanowiz	EB	-	-	10	10	0	10	10
7	Richardson--Lyon to Marina On	WB	1,660	1,490	1,600	1,560	-170	-60	-100
	Richardson--Marina Off to Francisco	EB	3,580	3,280	3,270	3,410	-300	-310	-170
8	Lombard Gate--Lyon to Ruger	WB	560	560	530	550	0	-30	-10
	Lombard Gate--Ruger to Lyon	EB	470	470	470	460	0	0	-10
9	Girard--Lincoln to Gorgas	NB	40	60	60	60	20	20	20
	Girard--Gorgas to Lincoln	SB	20	20	20	20	0	0	0
10	Presidio Gate--Pacific to Broadway	NB	570	550	560	560	-20	-10	-10
	Presidio Gate--Broadway to Pacific	SB	630	640	630	630	10	0	0
11	Arguello Gate--Pacific to Washington	NB	120	130	120	120	10	0	0
	Arguello Gate--Washington to Pacific	SB	60	70	60	60	10	0	0
12	Park Presidio--Lake Street to US 101 Off	NB	2,590	2,270	2,490	2,530	-320	-100	-60
	Park Presidio--US 101 On to Lake Street	SB	2,290	1,950	2,340	2,310	-340	50	20
13	15th Ave--Lake to Wedemeyer	NB	30	30	30	30	0	0	0
	15th Ave--Wedemeyer to Lake	SB	60	60	60	60	0	0	0
14	Lincoln--Brooks to Browley	NB	540	550	530	530	10	-10	-10
	Lincoln--Browley to Brooks	SB	240	410	280	280	170	40	40
15	Lombard--Divisadero to Broderick	WB	1,520	1,450	1,530	1,480	-70	10	-40
	Lombard--Broderick to Divisadero	EB	2,190	2,220	2,170	2,220	30	-20	30
16	Marina--Divisadero to Broderick	WB	570	500	550	600	-70	-20	30
	Marina--Broderick to Divisadero	EB	1,210	1,240	1,210	1,180	30	0	-30
17	Halleck --Lincoln to Mason	NB	10	20	30	30	10	20	20
	Halleck--Mason to Lincoln	SB	20	20	10	20	0	-10	0
18	McDowell Street--Lincoln to Mason	NB	20	20	20	20	0	0	0
	McDowell Street-- Mason to Lincoln	SB	10	10	10	10	0	0	0

Source: DKS Associates, 2004

TABLE 4.5.5-2
2010 ALTERNATIVE 2 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – PM PEAK HOUR

Location		Dir.	2010				Change (from 2010 base)		
			No Build (veh)	2A (veh)	2B (veh)	2C (veh)	2A (veh)	2B (veh)	2C (veh)
1	US 101--Park Presidio On to Merchant Off	WB	5,710	6,460	5,670	5,620	750	-40	-90
	US 101--Merchant On to Park Presidio Off	EB	3,920	4,660	3,860	3,930	740	-60	10
2	Lincoln--Long Avenue to Crissy Field	WB	200	100	210	270	-100	10	70
	Lincoln--Crissy Field to Long Avenue	EB	20	30	30	20	10	10	0
3	Lincoln--Sheridan to Crissy Field	WB	290	230	310	370	-60	20	80
	Lincoln--Crissy Field to Sheridan	EB	80	80	100	90	0	20	10
4	US 101--Marina On to Park Presidio Off	WB	4,720	4,260	4,580	4,560	-460	-140	-160
	US 101--Park Presidio On to Marina Off	EB	3,070	2,630	2,820	3,070	-440	-250	0
5	Marina--US 101 to Lyon	WB	1,850	1,550	1,770	1,760	-300	-80	-90
	Marina--Lyon to US 101	EB	960	820	900	910	-140	-60	-50
6	Mason--Zanowiz to Lyon	WB	10	10	-	-	0	-10	-10
	Mason--Lyon to Zanowiz	EB	30	20	30	30	-10	0	0
7	Richardson--Lyon to Marina On	WB	2,880	2,700	2,810	2,810	-180	-70	-70
	Richardson--Marina Off to Francisco	EB	2,110	1,800	1,920	2,160	-310	-190	50
8	Lombard Gate--Lyon to Ruger	WB	550	550	530	550	0	-20	0
	Lombard Gate--Ruger to Lyon	EB	380	450	350	310	70	-30	-70
9	Girard--Lincoln to Gorgas	NB	40	60	50	50	20	10	10
	Girard--Gorgas to Lincoln	SB	50	90	60	60	40	10	10
10	Presidio Gate--Pacific to Broadway	NB	640	620	640	640	-20	0	0
	Presidio Gate--Broadway to Pacific	SB	630	600	610	620	-30	-20	-10
11	Arguello Gate--Pacific to Washington	NB	110	140	120	120	30	10	10
	Arguello Gate--Washington to Pacific	SB	180	200	170	170	20	-10	-10
12	Park Presidio--Lake Street to US 101 Off	NB	2,640	2,200	2,600	2,670	-440	-40	30
	Park Presidio--US 101 On to Lake Street	SB	2,510	2,040	2,550	2,470	-470	40	-40
13	15th Ave--Lake to Wedemeyer	NB	70	70	70	70	0	0	0
	15th Ave--Wedemeyer to Lake	SB	50	60	60	50	10	10	0
14	Lincoln--Brooks to Browley	NB	440	540	420	440	100	-20	0
	Lincoln--Browley to Brooks	SB	530	570	540	530	40	10	0
15	Lombard--Divisadero to Broderick	WB	2,160	2,150	2,170	2,160	-10	10	0
	Lombard--Broderick to Divisadero	EB	1,650	1,480	1,550	1,620	-170	-100	-30
16	Marina--Divisadero to Broderick	WB	1,260	1,230	1,270	1,240	-30	10	-20
	Marina--Broderick to Divisadero	EB	930	810	890	890	-120	-40	-40
17	Halleck --Lincoln to Mason	NB	20	20	30	20	0	10	0
	Halleck--Mason to Lincoln	SB	40	40	30	40	0	-10	0
18	McDowell Street--Lincoln to Mason	NB	200	90	210	260	-110	10	60
	McDowell Street-- Mason to Lincoln	SB	10	10	10	10	0	0	0

Source: DKS Associates, 2004

TABLE 4.5.5-3
2010 ALTERNATIVE 5 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – AM PEAK HOUR

Location		Dir.	2010					Change from 2010 Base			
			No Build (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)
1	US 101--Park Presidio On to Merchant Off	WB	3,470	3,700	3,200	3,710	3,210	230	-270	240	-260
	US 101--Merchant On to Park Presidio Off	EB	5,950	6,080	5,530	6,070	5,530	130	-420	120	-420
2	Lincoln--Long Avenue to Crissy Field	WB	40	20	20	20	20	-20	-20	-20	-20
	Lincoln--Crissy Field to Long Avenue	EB	20	20	20	20	20	0	0	0	0
3	Lincoln--Sheridan to Crissy Field	WB	70	80	70	80	70	10	0	10	0
	Lincoln--Crissy Field to Sheridan	EB	70	50	40	50	40	-20	-30	-20	-30
4	US 101--Marina On to Park Presidio Off	WB	2,240	1,990	1,950	1,980	1,940	-250	-290	-260	-300
	US 101--Park Presidio On to Marina Off	EB	5,030	4,820	4,500	4,800	4,470	-210	-530	-230	-560
5	Marina--US 101 to Lyon	WB	580	460	470	440	440	-120	-110	-140	-140
	Marina--Lyon to US 101	EB	1,450	1,250	1,180	1,230	1,120	-200	-270	-220	-330
6	Mason--Zanowiz to Lyon	WB	30	20	20	20	20	-10	-10	-10	-10
	Mason--Lyon to Zanowiz	EB	-	10	10	10	10	10	10	10	10
7	Richardson--Lyon to Marina On	WB	1,660	1,550	1,510	1,530	1,470	-110	-150	-130	-190
	Richardson--Marina Off to Francisco	EB	3,580	3,000	2,840	3,010	2,850	-580	-740	-570	-730
8	Lombard Gate--Lyon to Ruger	WB	560	240	210	220	190	-320	-350	-340	-370
	Lombard Gate--Ruger to Lyon	EB	470	400	370	430	410	-70	-100	-40	-60
9	Girard--Lincoln to Gorgas	NB	40	70	60	20	20	30	20	-20	-20
	Girard--Gorgas to Lincoln	SB	20	480	430	470	430	460	410	450	410
10	Presidio Gate--Pacific to Broadway	NB	570	530	490	520	480	-40	-80	-50	-90
	Presidio Gate--Broadway to Pacific	SB	630	650	580	630	570	20	-50	0	-60
11	Arguello Gate--Pacific to Washington	NB	120	100	90	90	90	-20	-30	-30	-30
	Arguello Gate--Washington to Pacific	SB	60	80	70	80	70	20	10	20	10
12	Park Presidio--Lake Street to US 101 Off	NB	2,590	2,560	2,350	2,550	2,350	-30	-240	-40	-240
	Park Presidio--US 101 On to Lake Street	SB	2,290	2,100	2,130	2,090	2,150	-190	-160	-200	-140
13	15th Ave--Lake to Wedemeyer	NB	30	40	30	40	30	10	0	10	0
	15th Ave--Wedemeyer to Lake	SB	60	60	50	60	50	0	-10	0	-10
14	Lincoln--Brooks to Browley	NB	540	520	480	520	480	-20	-60	-20	-60
	Lincoln--Browley to Brooks	SB	240	380	200	390	210	140	-40	150	-30
15	Lombard--Divisadero to Broderick	WB	1,520	1,390	1,330	1,420	1,310	-130	-190	-100	-210
	Lombard--Broderick to Divisadero	EB	2,190	2,230	2,070	2,250	2,070	40	-120	60	-120
16	Marina--Divisadero to Broderick	WB	570	450	440	440	430	-120	-130	-130	-140
	Marina--Broderick to Divisadero	EB	1,210	1,180	1,090	1,170	1,060	-30	-120	-40	-150
17	Halleck --Lincoln to Mason	NB	10	0	0	0	0	-10	-10	-10	-10
	Halleck--Mason to Lincoln	SB	20	0	0	0	0	-20	-20	-20	-20
18	McDowell Street--Lincoln to Mason	NB	20	20	20	20	20	0	0	0	0
	McDowell Street-- Mason to Lincoln	SB	10	30	30	20	20	20	20	10	10

Source: DKS Associates, 2004

TABLE 4.5.5-4
2010 ALTERNATIVE 5 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – PM PEAK HOUR

Location		Dir.	2010					Change from 2010 Base			
			No Build (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)
1	US 101--Park Presidio On to Merchant Off	WB	5710	5850	5470	5850	5470	140	-240	140	-240
	US 101--Merchant On to Park Presidio Off	EB	3920	4440	4110	4310	3960	520	190	390	40
2	Lincoln--Long Avenue to Crissy Field	WB	200	460	440	350	450	260	240	150	250
	Lincoln--Crissy Field to Long Avenue	EB	20	30	30	20	30	10	10	0	10
3	Lincoln--Sheridan to Crissy Field	WB	290	540	530	510	530	250	240	220	240
	Lincoln--Crissy Field to Sheridan	EB	80	90	90	80	90	10	10	0	10
4	US 101--Marina On to Park Presidio Off	WB	4720	3670	3750	3680	3790	-1050	-970	-1040	-930
	US 101--Park Presidio On to Marina Off	EB	3070	2900	2890	2810	2830	-170	-180	-260	-240
5	Marina--US 101 to Lyon	WB	1850	1130	1190	1090	1100	-720	-660	-760	-750
	Marina--Lyon to US 101	EB	960	710	710	580	600	-250	-250	-380	-360
6	Mason--Zanowiz to Lyon	WB	20	30	30	20	30	10	10	0	10
	Mason--Lyon to Zanowiz	EB	20	20	20	20	20	0	0	0	0
7	Richardson--Lyon to Marina On	WB	2880	2650	2660	2530	2580	-230	-220	-350	-300
	Richardson--Marina Off to Francisco	EB	2110	1960	1950	2120	2110	-150	-160	10	0
8	Lombard Gate--Lyon to Ruger	WB	550	510	460	480	480	-40	-90	-70	-70
	Lombard Gate--Ruger to Lyon	EB	380	300	270	240	290	-80	-110	-140	-90
9	Girard--Lincoln to Gorgas	NB	50	360	330	260	300	310	280	210	250
	Girard--Gorgas to Lincoln	SB	40	70	70	50	70	30	30	10	30
10	Presidio Gate--Pacific to Broadway	NB	640	580	590	590	590	-60	-50	-50	-50
	Presidio Gate--Broadway to Pacific	SB	630	570	580	560	580	-60	-50	-70	-50
11	Arguello Gate--Pacific to Washington	NB	110	180	170	140	180	70	60	30	70
	Arguello Gate--Washington to Pacific	SB	180	240	220	210	200	60	40	30	20
12	Park Presidio--Lake Street to US 101 Off	NB	2640	2690	2760	2720	2810	50	120	80	170
	Park Presidio--US 101 On to Lake Street	SB	2510	2050	2260	2050	2260	-460	-250	-460	-250
13	15th Ave--Lake to Wedemeyer	NB	70	70	70	70	80	0	0	0	10
	15th Ave--Wedemeyer to Lake	SB	60	60	60	60	60	0	0	0	0
14	Lincoln--Brooks to Browley	NB	440	440	480	480	470	0	40	40	30
	Lincoln--Browley to Brooks	SB	530	490	480	490	480	-40	-50	-40	-50
15	Lombard--Divisadero to Broderick	WB	2160	2180	2130	2150	2150	20	-30	-10	-10
	Lombard--Broderick to Divisadero	EB	1650	1670	1670	1680	1680	20	20	30	30
16	Marina--Divisadero to Broderick	WB	1260	1110	1140	1090	1090	-150	-120	-170	-170
	Marina--Broderick to Divisadero	EB	930	690	680	560	580	-240	-250	-370	-350
17	Halleck --Lincoln to Mason	NB	20	0	0	0	0	-20	-20	-20	-20
	Halleck--Mason to Lincoln	SB	40	0	0	0	0	-40	-40	-40	-40
18	McDowell Street--Lincoln to Mason	NB	200	410	330	310	380	210	130	110	180
	McDowell Street-- Mason to Lincoln	SB	10	50	50	50	50	40	40	40	40

Source: DKS Associates, 2004

5.0 TRAFFIC IMPACTS OF DESIGN OPTIONS

Two design options have been identified that would result in different roadway configurations near the GGB Toll Plaza and the Park Presidio Interchange, but these options are not expected to adversely affect the corridor's traffic demands. As a result, a summary of the analyzed traffic volumes and results on expected traffic circulations for these options are provided in this chapter.

5.1 THE MERCHANT ROAD SLIP RAMP

It is documented that Doyle Drive under existing conditions has a continued weaving deficiency for northbound traffic between Park Presidio on-ramp and Merchant Road off-ramp. This weaving deficiency is a daily occurrence and often will impact mainline traffic circulation on Doyle Drive. This can be eliminated by the Merchant Road Slip Ramp option which proposes to eliminate this severe weaving problem by providing a slip ramp to Merchant Road. This design option basically allows traffic to access the toll plaza area and Merchant Road from Doyle Drive without weaving with through traffic on the mainline, eliminating the weaving deficiency.

In testing this option in the San Francisco County travel model, the effect of this alternative is less than 20 vehicles on any link. A demonstration of traffic changes on potentially affected links is provided as Table 5.1-1 for AM peak hour conditions, and Table 5.1-2 for PM peak hour conditions. As these tables show, the result of adding the slip ramp would not significantly affect other traffic volumes in the area. The expected traffic demand is distributed to specific ramps that eliminates the weaving activity and mainline traffic impacts. The one segment with a substantial reduction in volumes would be the mainline segment between Park Presidio and the Merchant Road on-ramp, as the off-ramp traffic would no longer be traveling on this segment. Otherwise, the traffic volumes would change by less than 80 vehicles or 1.3 percent for surrounding segments for the AM or PM peak hours. This variation is well within the margin of error of a travel model assignment process.

TABLE 5.1-1
AM PEAK HOUR VOLUMES FOR MERCHANT ROAD SLIP RAMP DESIGN OPTIONS

			Design Year			
Segment	**Direction**	**Base Year**	**Parkway Diamond Option (current design)**	**Merchant Road Ramp Option**	**Difference**	**Percent Difference**
Doyle Drive from Marina Boulevard to Park Presidio	NB	2049	2994	2980	-14	-0.5%
Doyle Drive from Park Presidio to Merchant Road	NB	2994	5091	4858	-233	-4.6%
Golden Gate Bridge	NB	3108	5479	5417	-62	-1.1%
Ramp from Doyle Drive NB to Park Presidio SB	NB	448	354	387	33	9.3%
Ramp from Doyle Drive NB to Merchant Road	NB	220	242	197	-45	-18.6%
Merchant Road from Overlook to Lincoln	SB	203	141	95	-46	-32.6%
Lincoln from Merchant Road to Merchant Road	WB	68	105	66	-39	-37.1%

Source: DKS Associates, July 2004.

TABLE 5.1-2
PM PEAK HOUR VOLUMES FOR MERCHANT ROAD SLIP RAMP DESIGN OPTIONS

			Design Year			
Segment	**Direction**	**Base Year**	**Parkway Diamond Option (current design)**	**Merchant Road Ramp Option**	**Difference**	**Percent Difference**
Doyle Drive from Marina Boulevard to Park Presidio	NB	4619	4924	4915	-9	-0.2%
Doyle Drive from Park Presidio to Merchant Road	NB	5649	6448	6104	-344	-5.3%
Golden Gate Bridge	NB	5890	6500	6501	1	0.0%
Ramp from Doyle Drive NB to Park Presidio SB	NB	1014	671	685	14	2.1%
Ramp from Doyle Drive NB to Merchant Road	NB	306	363	313	-50	-13.8%
Merchant Road from Overlook to Lincoln	SB	102	172	126	-46	-26.7%
Lincoln from Merchant Road to Merchant Road	WB	108	144	107	-37	-25.7%

Source: DKS Associates, July 2004.

5.2 THE PARK PRESIDIO NORTHBOUND TO DOYLE DRIVE SOUTHBOUND HOOK RAMP OPTION

The loop ramp configuration carried forth in Alternative 5 can be shortened to a hook ramp configuration for cost savings. This ramp configuration would change traffic volumes slightly, and this change is documented.

While the ramp change to a hook ramp would not introduce any additional traffic movements, the slightly shorter distance would result in slight increases to ramp traffic on this segment. It would also create minor changes to traffic on surrounding streets, but these changes are not more than 75 vehicles or greater than 1.7 percent of the mainline Doyle Drive traffic. A demonstration of traffic changes on potentially affected links is provided as Table 5.2-1 for AM peak hour conditions, and Table 5.2-2 for PM peak hour conditions.

TABLE 5.2-1
AM PEAK HOUR VOLUMES FOR PARK PRESIDIO TO DOYLE RAMP DESIGN OPTIONS

Segment	Direction	Base Year	Design Year			
			Loop Ramp Option (Diamond)	Park Presidio to Doyle Drive Hook Ramp Option	Difference	Percent Difference
Doyle Drive from Park Presidio to Marina Boulevard	SB	5203	4951	4972	21	0.4%
Doyle Drive from Golden Gate Bridge to Park Presidio	SB	6149	6550	6497	-53	-0.8%
Golden Gate Bridge	SB	6276	6629	6612	-17	-0.3%
Ramp from Park Presidio NB to Doyle Drive SB	NB	986	623	677	54	8.7%
Lincoln from Merchant Road to Merchant Road	EB	409	613	621	8	1.3%
Park Presidio from Lake Street to Doyle Drive	NB	2379	3073	3097	24	0.8%

Source: DKS Associates, July 2004.

TABLE 5.2-2
PM PEAK HOUR VOLUMES FOR PARK PRESIDIO TO DOYLE RAMP DESIGN OPTIONS

Segment	Direction	Base Year	Design Year			
			Loop Ramp Option (Diamond)	Park Presidio to Doyle Drive Hook Ramp Option	Difference	Percent Difference
Doyle Drive from Park Presidio to Marina Boulevard	SB	2607	3785	3849	64	1.7%
Doyle Drive from Golden Gate Bridge to Park Presidio	SB	3120	5612	5602	-10	-0.2%
Golden Gate Bridge	SB	2987	5734	5736	2	0.0%
Ramp from Park Presidio NB to Doyle Drive SB	NB	724	596	671	75	12.6%
Lincoln from Merchant Road to Merchant Road	EB	449	504	503	-1	-0.2%
Park Presidio from Lake Street to Doyle Drive	NB	2768	2792	2838	46	1.6%

Source: DKS Associates, July 2004.

6.0 TRAFFIC AND TRANSIT OPERATIONS HIGHLIGHTS

In comparison to the base year condition, traffic conditions and congestion changes are related primarily to an increase in regional growth and the implementation of the Presidio Trust's management plan to become self-sufficient by Year 2013.

Traffic operations for all alternatives would operate generally as well or slightly better, when compared with the Design Year No-Build condition. The differences in traffic volumes between alternatives would vary by only eight percent and result from the access option used.

In Alternative 5 options, traffic volumes would decrease slightly on both Richardson Avenue and Marina Boulevard due to slower roadway speeds on the segments east of Lyon Street, when compared to current traffic conditions. In addition, new traffic signals would be installed on these roadways, further encouraging slower speeds. The reduction in traffic would also be a result of less vehicles using Doyle Drive to go between the Richmond and Sunset areas and slightly more Golden Gate Bridge traffic using Park Presidio (due to encouraged use in the southbound direction with the widened ramp from SB 101 off of the Golden Gate Bridge and onto Park Presidio).

By the Design Year, traffic increases will be expected, primarily in the off-peak direction. In addition, additional travel to and from the Presidio will occur as a result of development activity underway there.

Expected Design Year traffic demands for Alternative 5, show an increase on Richardson Avenue and decrease demands on Marina Boulevard. This would occur because Marina Boulevard traffic would utilize a newly created Girard/Marina interchange with multiple signals, and travel on slower speed, urban street segments between Lyon Street and Doyle Drive. This would encourage less traffic to utilize Doyle Drive / Marina Boulevard via the connection.

In the Merchant Road Slip Ramp option, Doyle Drive northbound traffic approaching the Golden Gate Bridge would be able to exit before the Toll Plaza area without having to weave across traffic coming from northbound Park Presidio, which would improve roadway operations. It is not expected to create any notable shifts in traffic of more than 20 vehicles except for traffic directly on this ramp.

The Hook Ramp option for the Park Presidio northbound to Doyle Drive southbound would have slight increases on Doyle Drive and Park Presidio traffic, but this increase would be less than 80 vehicles.

A tabular summary of traffic and transit changes is also provided below with more details of the differences between the project alternatives.

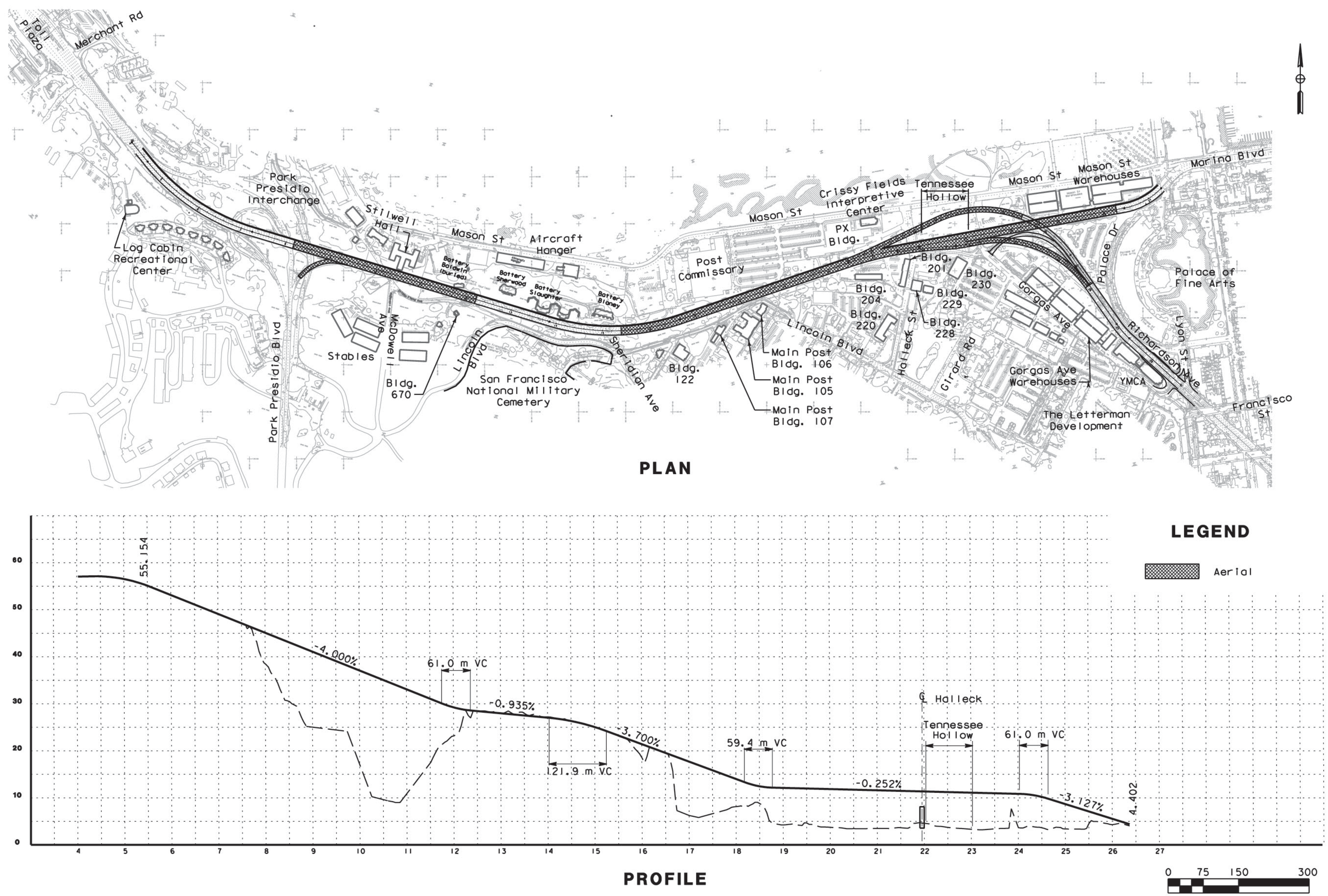
TABLE 6-1
SUMMARY OF FINDINGS

Transportation Effect	Alternative 1	Alternative 2 Replace and Widen	Alternative 5 Diamond Option	Alternative 5 Circle Drive Option
Effect on Marina Boulevard/Lyon Street interesection traffic	Highest estimated intersection delay of 9seconds	Highest estimated intersection delay of over 25 seconds at	Highest estimated intersection delay of 14 seconds	Highest estimated intersection delay of 14 seconds
Effect on Mainline Doyle Drive traffic flow	Less than 10% increase in peak traffic from base year	Less than 10% increase in peak traffic from base year	Less than 10% increase in peak traffic from base year	Less than 10% increase in peak traffic from base year
			2% increase in peak traffic from 2030 No-build	2% increase in peak traffic from 2030 No-build
	63% to 68% increase in non-peak traffic from base year	67% to 74% increase in non-peak traffic from base year	70% to 80% increase in non-peak traffic from base year	70% to 80% increase in non-peak traffic from base year
			Less than 2% increase in non-peak traffic from 2030 No-build	Less than 2% increase in non-peak traffic from 2030 No-build
Effect on Park Presidio/Merchant Road area	Weaving deficiency NB between Park Presidio and Merchant	Weaving deficiency NB between Park Presidio and Merchant	Weaving deficiency NB between Park Presidio and Merchant (eliminated by Merchant Rd slip ramp option)	Weaving deficiency NB between Park Presidio and Merchant (eliminated by Merchant Rd slip ramp option)
	Ramp deficiency from US 101 SB to Park Presidio SB	Ramp deficiency from US 101 SB to Park Presidio SB	Ramp deficiency eliminated by 2-lane exit ramp	Ramp deficiency eliminated by 2-lane exit ramp
Effect on transit travel times	Adds 0.4 (AM)/0.7 (PM) minutes to Doyle routes compared to base year	Adds 0.4 (AM)/0.7 (PM) minutes to Doyle routes compared to base year	Adds 1.3 (AM)/2.3 (PM) minutes to Doyle routes compared to base year	Adds 0.1 (AM)/ 1.7 (PM) minutes on Doyle routes compared to base year
			Adds 0.9 (AM)/1.6 (PM) minutes to Doyle routes compared to 2030 No-build	Adds -0.3 (AM)/ 1.0 (PM) minutes on Doyle routes compared to 2030 No-build
Greatest effect from construction phasing		Closure of Park Presidio to Doyle Ramps; traffic would divert to Toll Plaza area and Richmond streets Temporary detour of Marina Boulevard adequate if three lanes outbound available on Richardson	Temporary detour of Marina Boulevard adequate if three lanes outbound available on Richardson	Temporary detour of Marina Boulevard adequate if three lanes outbound available on Richardson
Effects on Presidio traffic	Indirect entrance at Letterman Digital Arts Complex and Main Post from the east (temporary slip ramp)	Indirect entrance at Letterman Digital Arts Complex and Main Post from the east (no temporary slip ramp)	Direct access into Letterman Digital Arts Complex and Main Post area	Direct access into Letterman Digital Arts Complex and Main Post area
	Indirect egress for Main Post in all directions	Indirect egress for Main Post in all directions	Direct egress for Letterman Digital Arts Complex and Main Post area, except out-of-direction for northbound Doyle traffic	Direct egress for Letterman Digital Arts Complex and Main Post area
	1030 peak hour vehicles through Lombard Gate	1010 peak hour vehicles through Lombard Gate	720 AM peak hour vehicles through Lombard Gate	680 AM peak hour vehicles through Lombard Gate
Effect on pedestrian walk times	No change from base year	No change from base year	25% reduction from base year/no-build for trips crossing Doyle	25% reduction from base yearno-build for trips crossing Doyle

APPENDIX A

DETAILED DRAWINGS

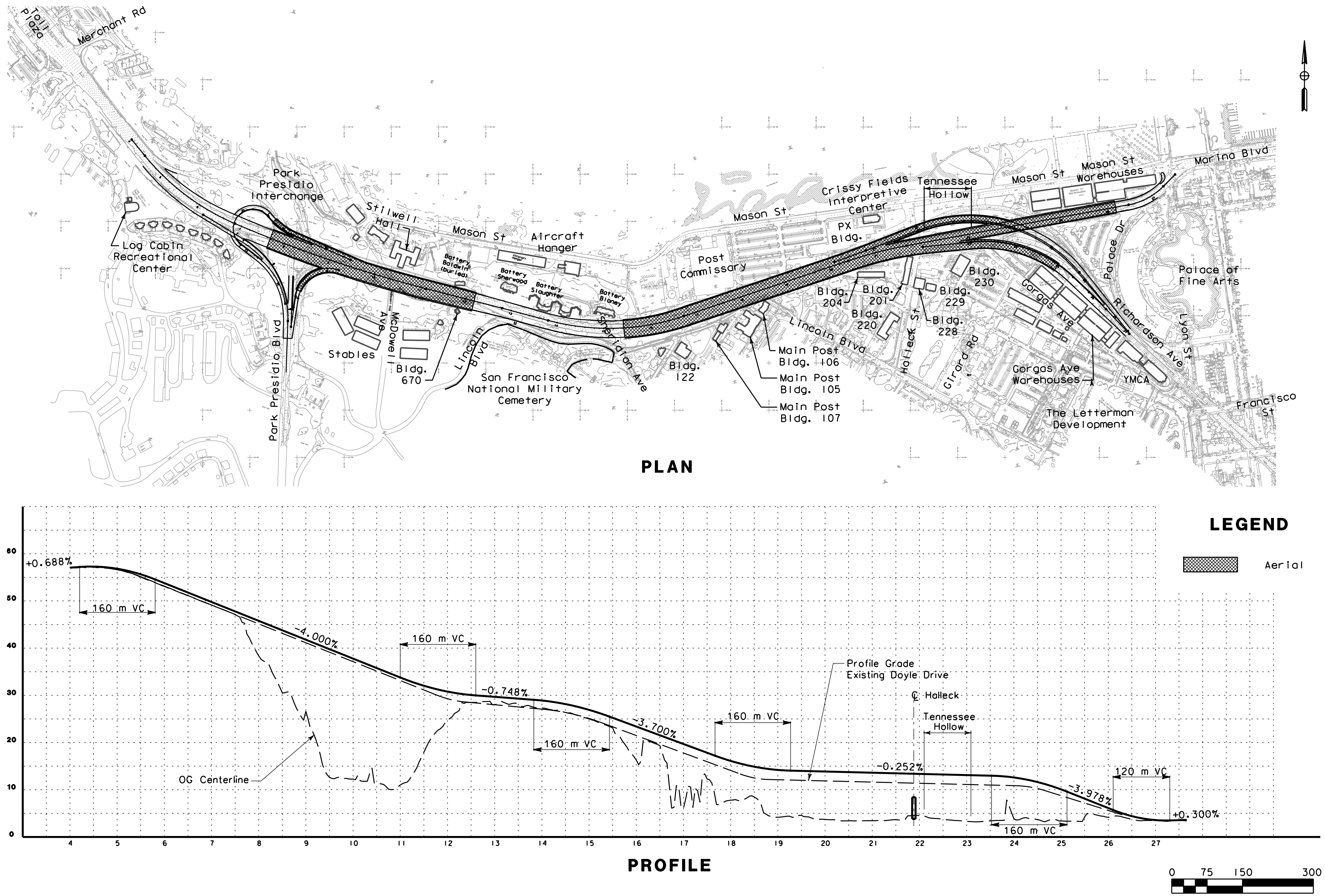
1. No Build



04548.04

No Build Alternative

2. Replace and Widen - No Detour



04548.04

Alternative 2—Replace and Widen – No Detour

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
•	•	•	•		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

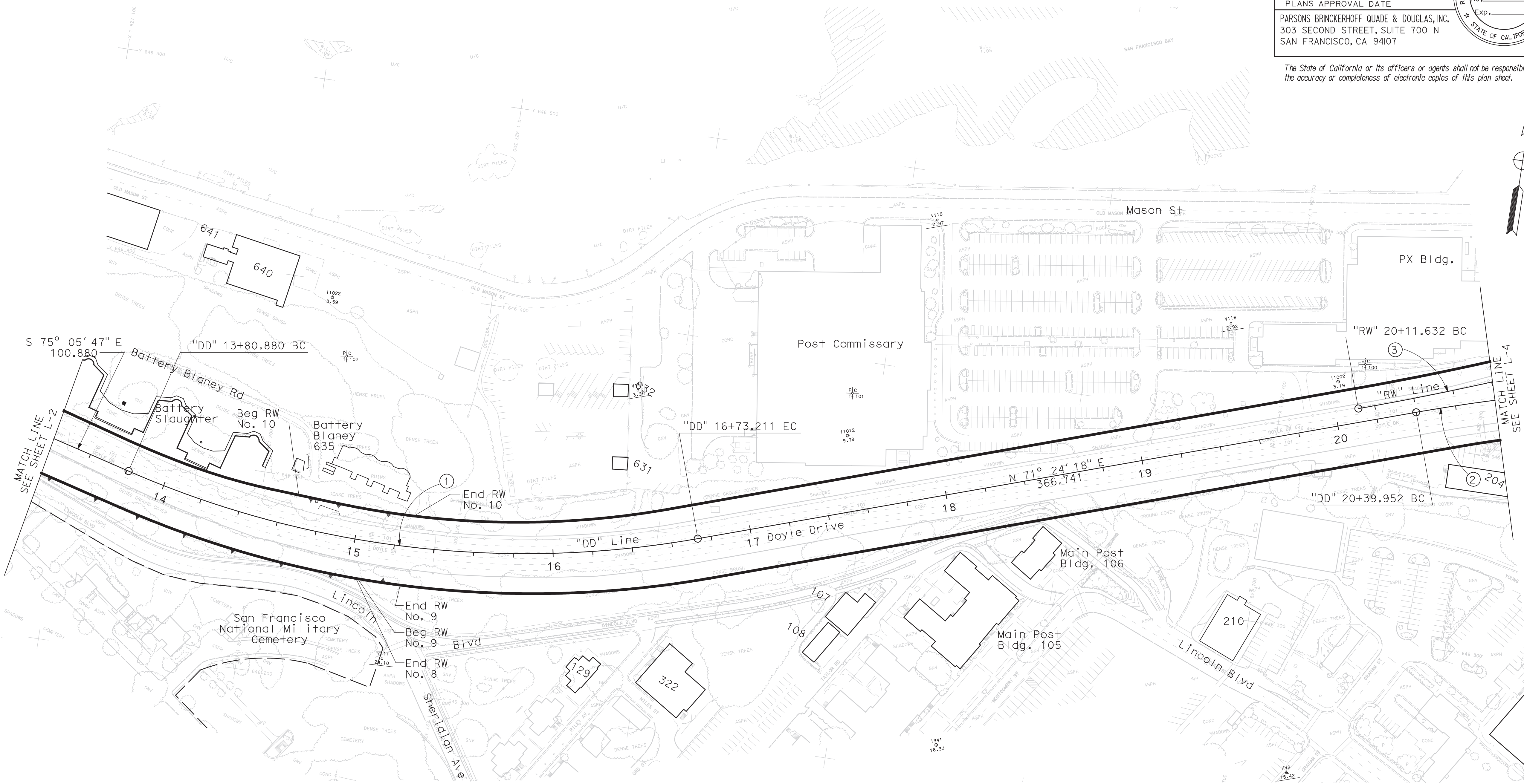
REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

DOYLE Drive Implementing The Vision

Caltrans Metric



CURVE DATA

NO.	R	△	T	L	X	Y
1	500.000	33°29'55"	150.477	292.332	1,827,277.534	646,251.466
2	900.000	8°08'31"	64.055	127.893	1,827,828.462	646,436.821
3	1,510.200	2°41'50"	35.555	71.097	1,827,772.407	646,425.242

ALTERNATIVE 2
REPLACE AND WIDEN - NO DETOUR
LAYOUT
SCALE: 1:1000

L-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN OVERSIGHT

CALCULATED/DESIGNED BY | CHECKED BY

DATE | REVISED BY | DATE REVISED

04548.04

Alternative 2—Replace and Widen – No Detour
Detail Near Batteries and Building 106

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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DOYLE drive Implementing The Vision

Caltrans Metric

CURVE DATA

NO.	R	△	T	L	X	Y
1	900.000	8°08'31"	64.055	127.893	1,827,828.462	646,436.821
2	138.378	34°58'40"	43.601	84.477	1,828,404.981	646,543.185
3	301.200	71°48'12"	218.046	377.465	1,828,119.220	646,560.406
4	272.667	49°10'19"	124.756	234.006	1,828,154.183	646,468.179
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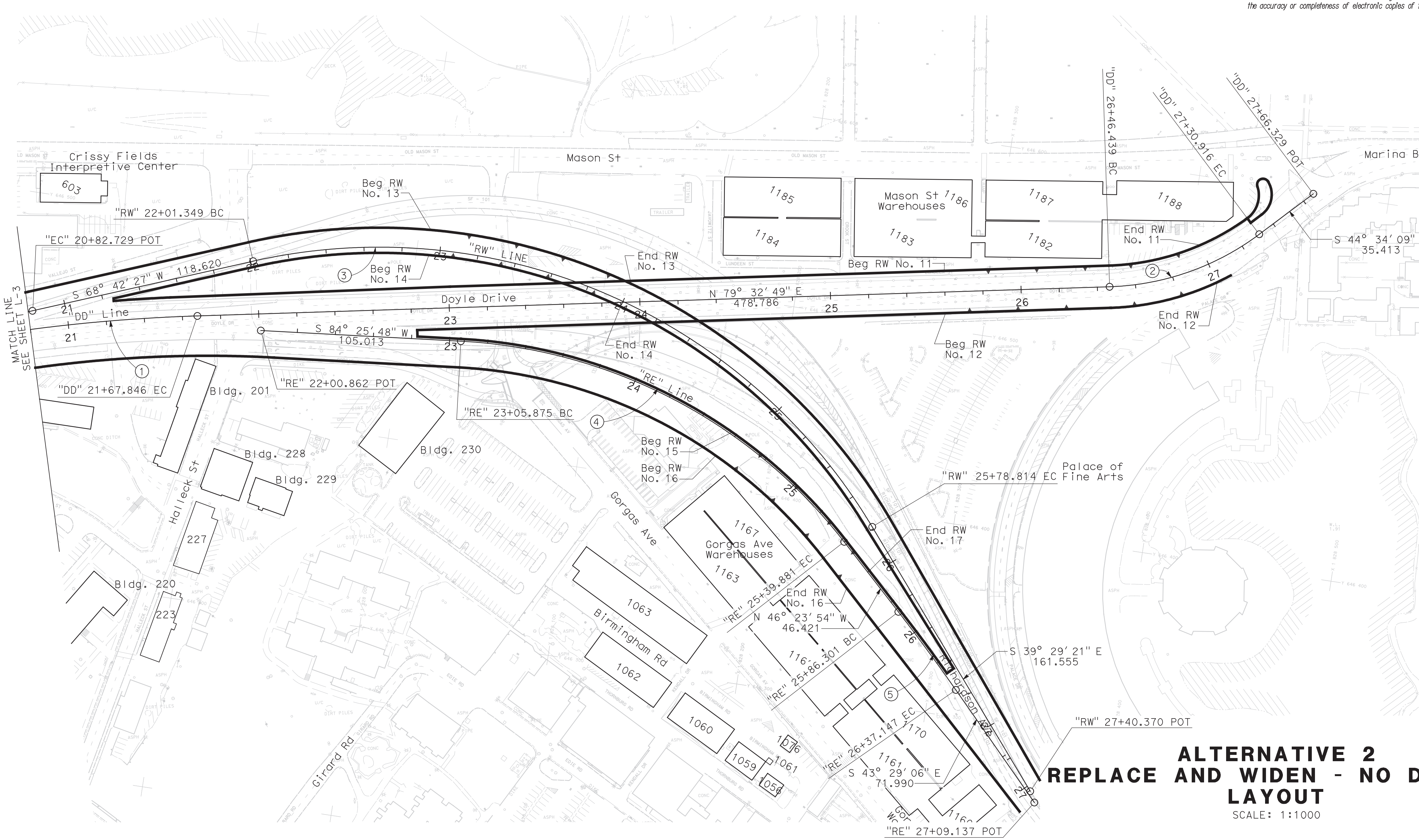


ALTERNATIVE 2
REPLACE AND WIDEN - NO DETOUR
LAYOUT

SCALE: 1:1000

L-4

DESIGN OVERSIGHT

.

CALCULATED/ DESIGNED BY

CHECKED BY

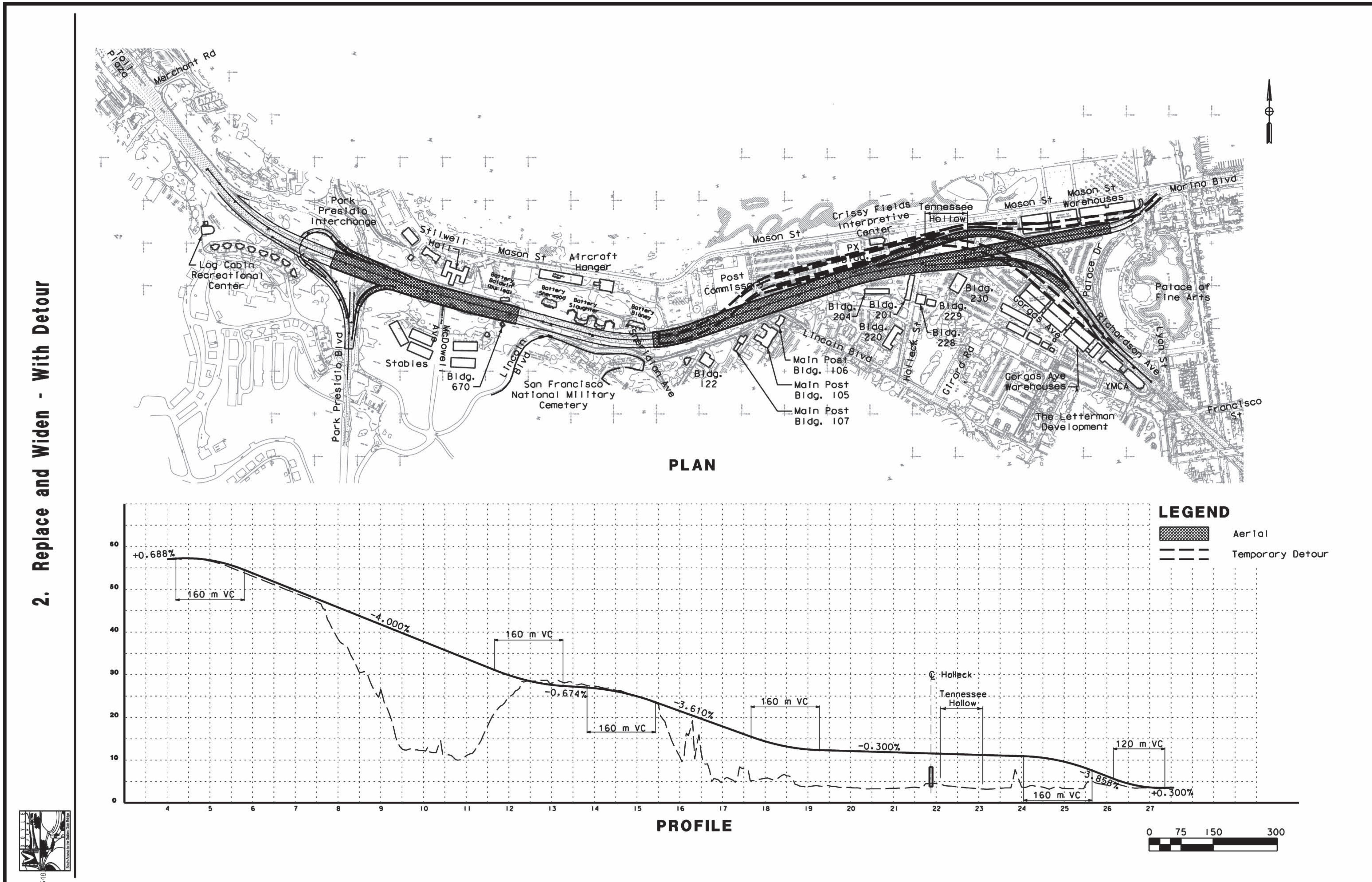
DATE

REVISED BY

DATE REVISED

04548.04

Alternative 2—Replace and Widen – No Detour
Detail of Gorgas Avenue and Mason Street



Alternative 2—Replace and Widen – with Detour

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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DOYLE Drive Implementing The Vision

Caltrans Metric

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN OVERSIGHT .

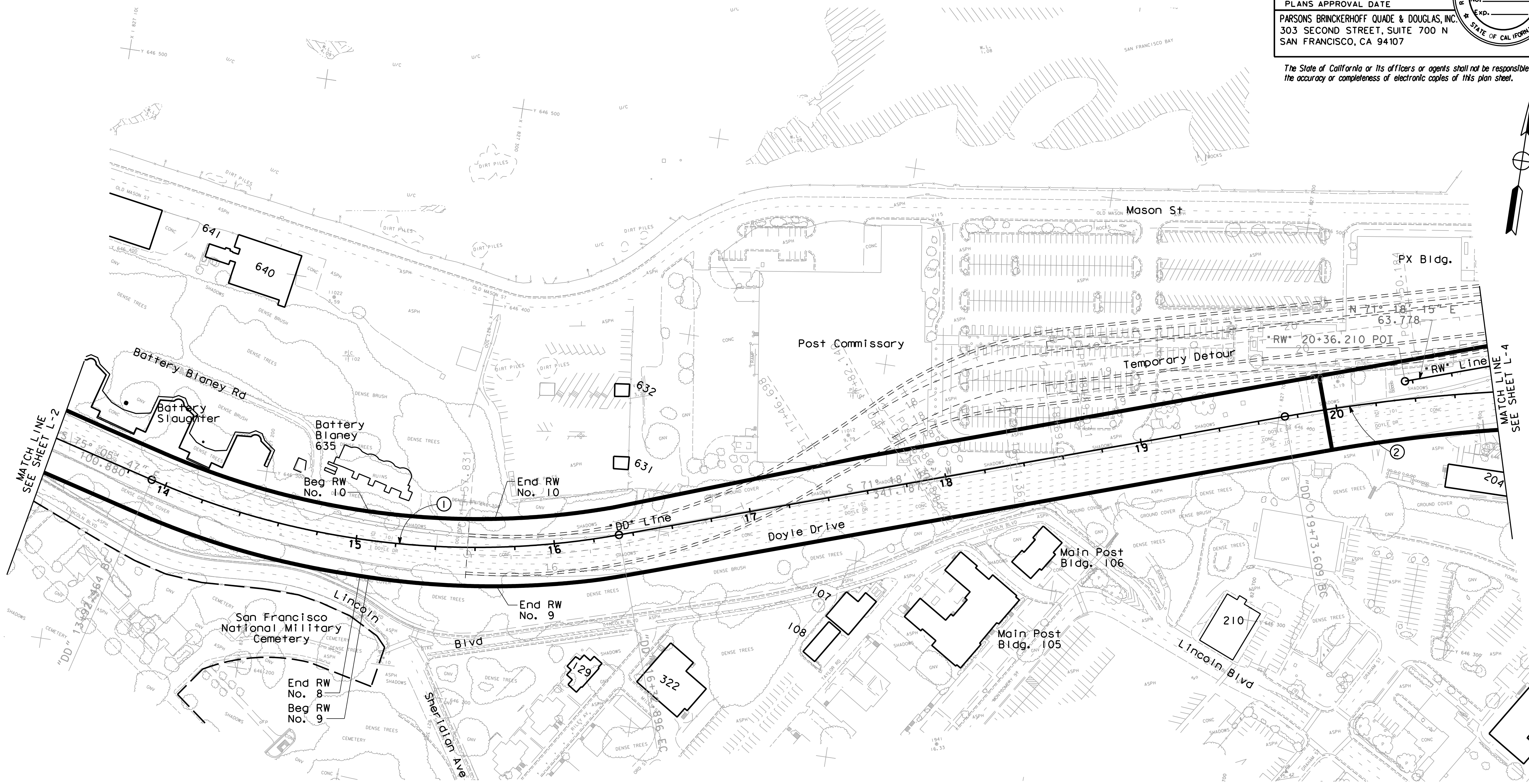
CALCULATED/DESIGNED BY

CHECKED BY

DATE REVISED BY

DATE REVISED

04548.04



CURVE DATA

NO.	R	△	T	L	X	Y
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ALTERNATIVE 2
REPLACE AND WIDEN - WITH DETOUR
LAYOUT

SCALE: 1:1000

L-3

Alternative 2—Replace and Widen – with Detour
Detail Near Batteries and Building 106

CURVE DATA

NO.	R	△	T	L	X	Y
1	900.000	8° 45′ 34″	68.931	137.594	1,827,768.215	646,426.338
2	138.378	34° 58′ 40″	43.601	84.477	1,828,404.981	646,543.185
3	230.000	73° 31′ 46″	171.841	295.166	1,828,151.123	646,563.198
4	221.032	60° 00′ 44″	127.644	231.511	1,828,211.458	646,472.683
5	248.000	12° 37′ 27″	27.433	54.643	1,828,355.877	646,268.385

Doyle Drive — Implementing The Vision

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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DATE | REVISED BY | DATE REVISED

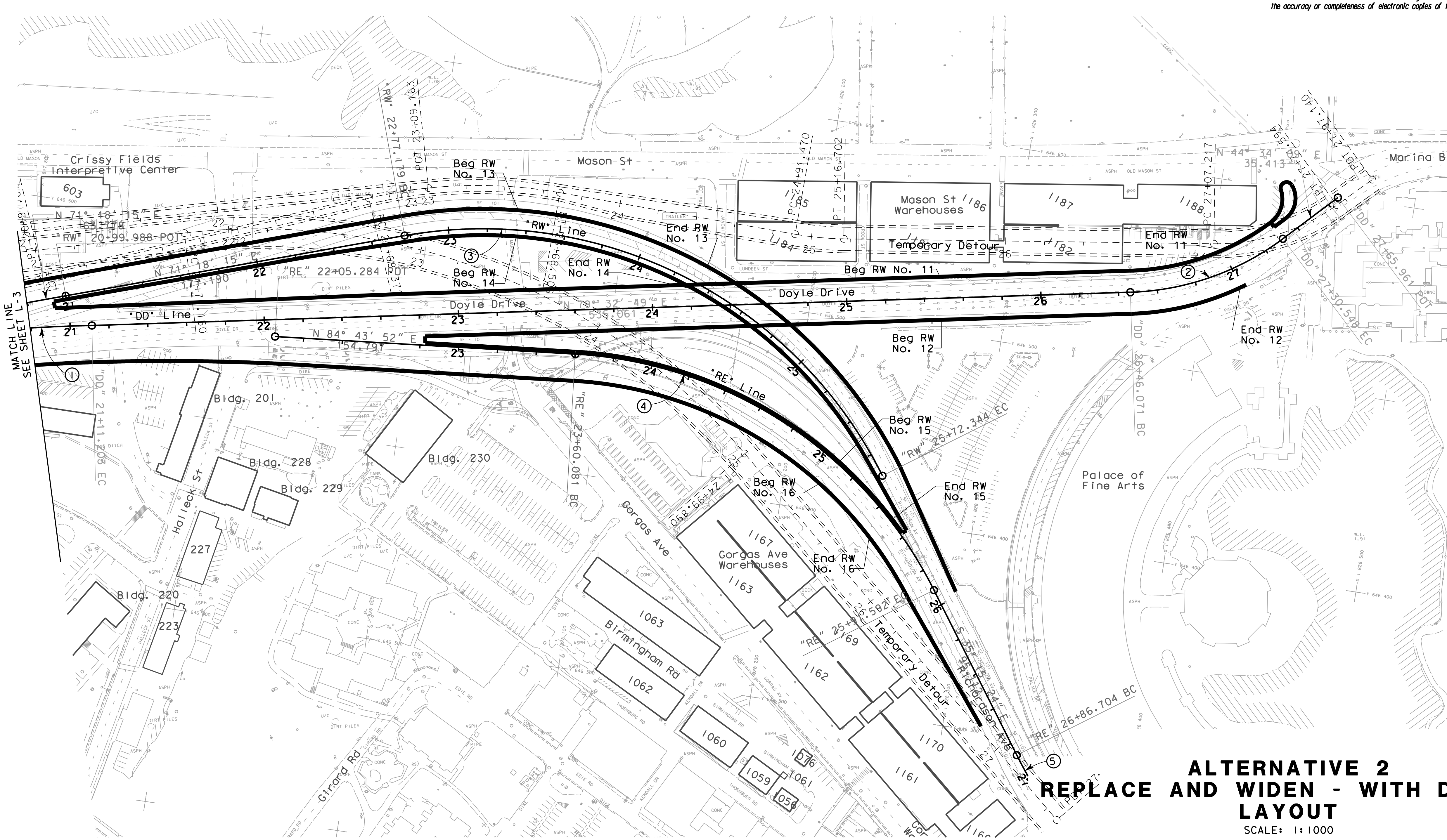
CALCULATED/DESIGNED BY | CHECKED BY

DESIGN OVERSIGHT .

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

04548.04



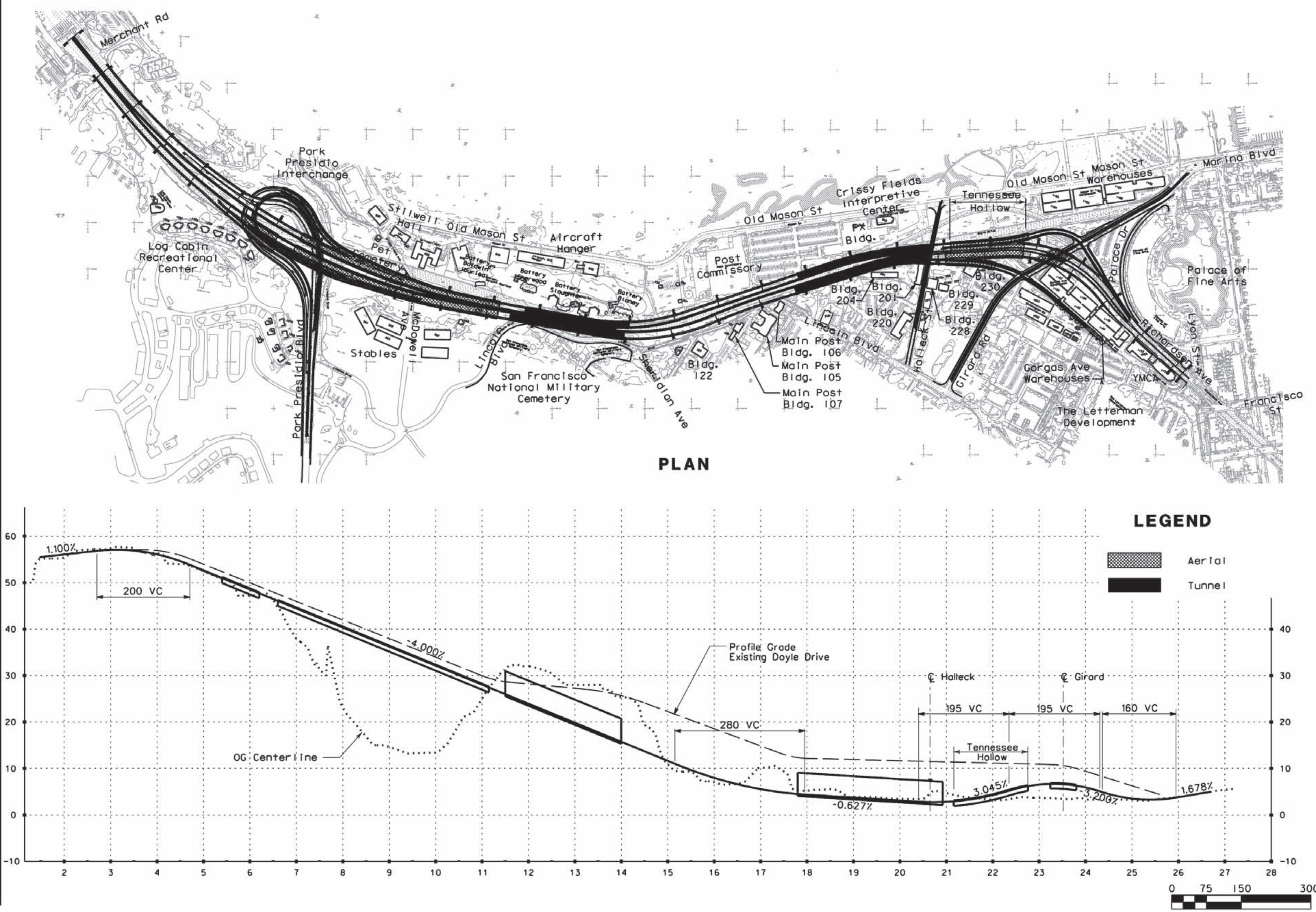
ALTERNATIVE 2
REPLACE AND WIDEN - WITH DETOUR
LAYOUT

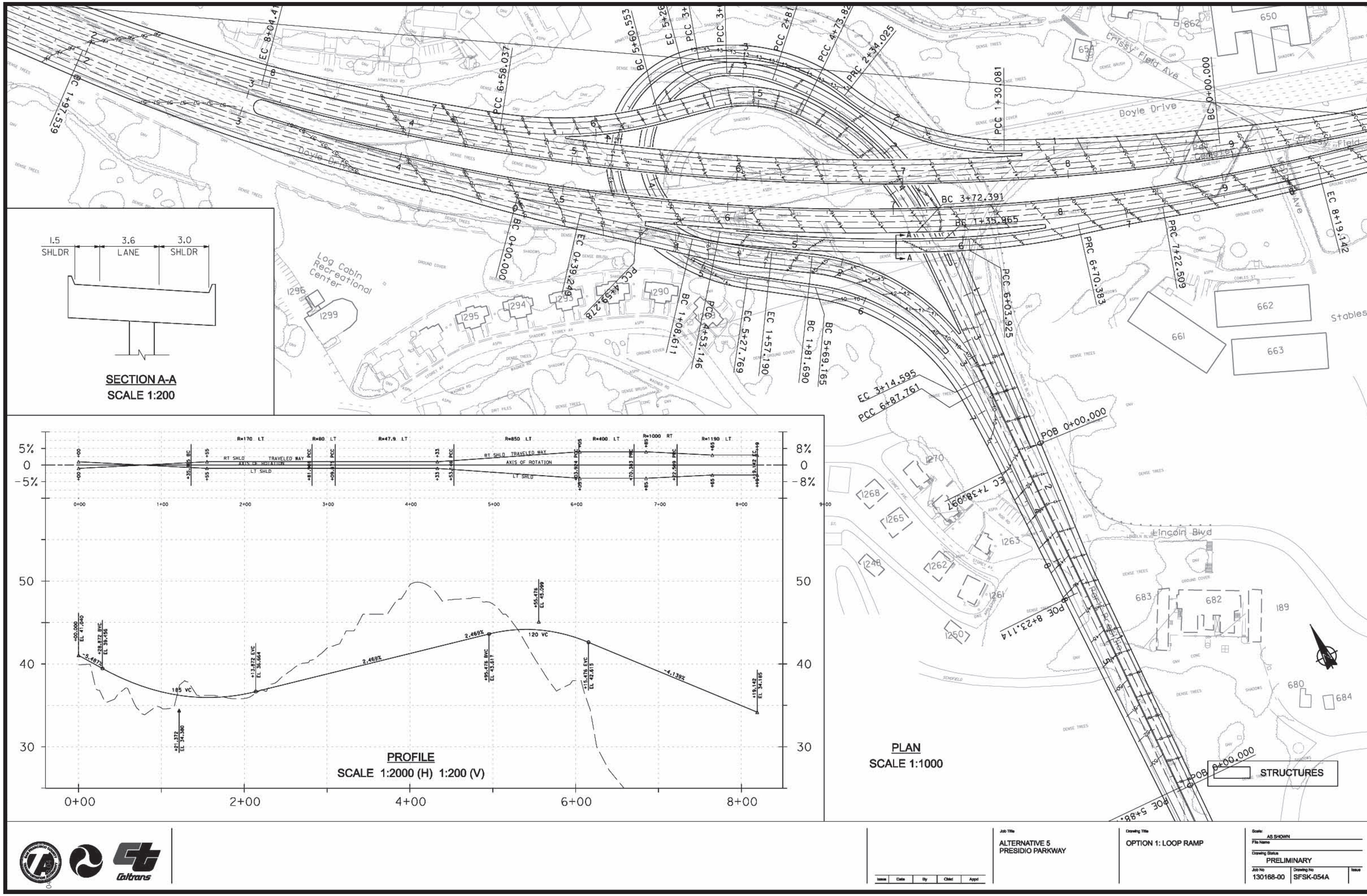
SCALE: 1:1000

L-4

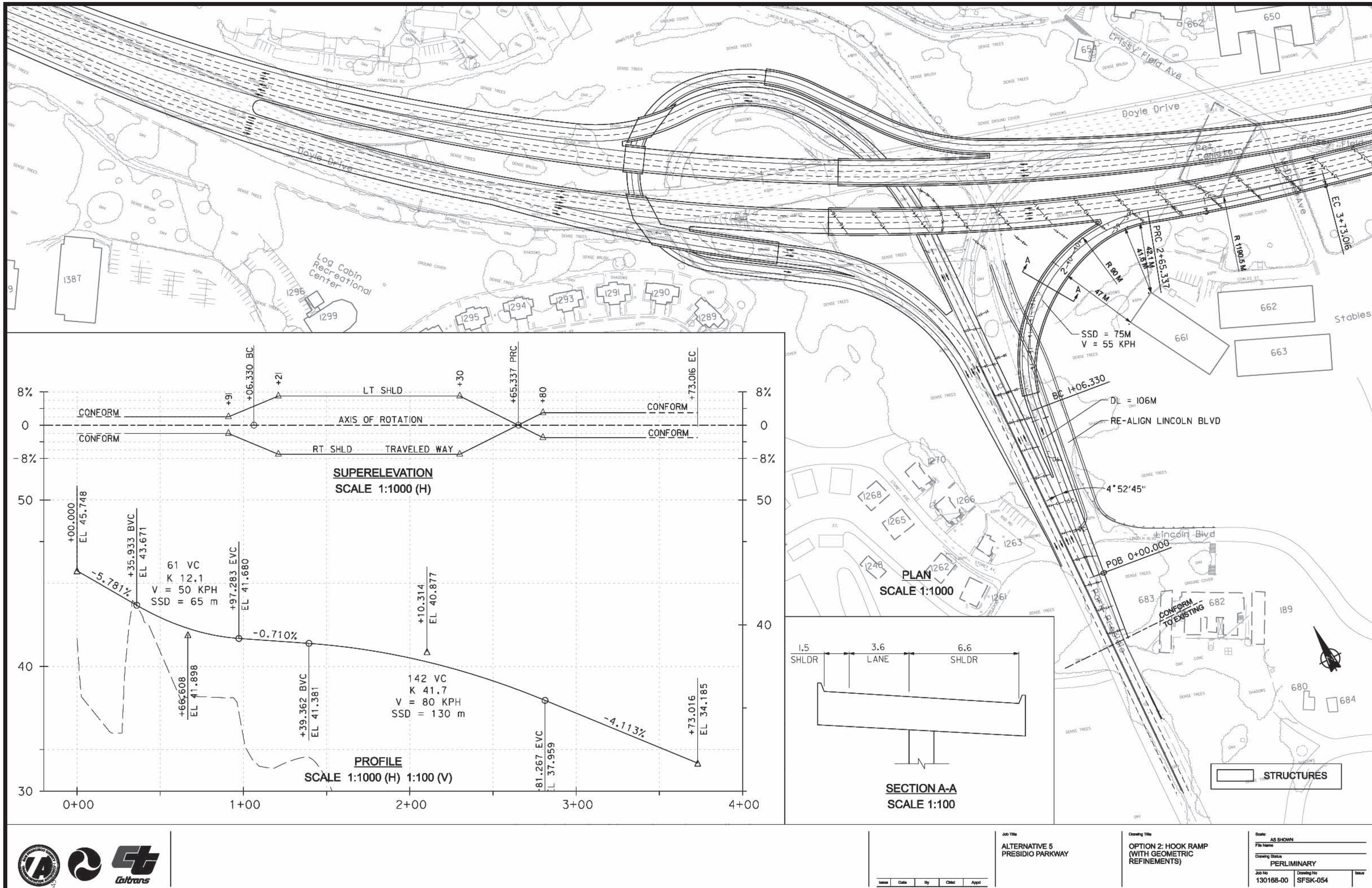
Alternative 2—Replace and Widen – with Detour
Detail of Gorgas Avenue and Mason Street

5. Presidio Parkway

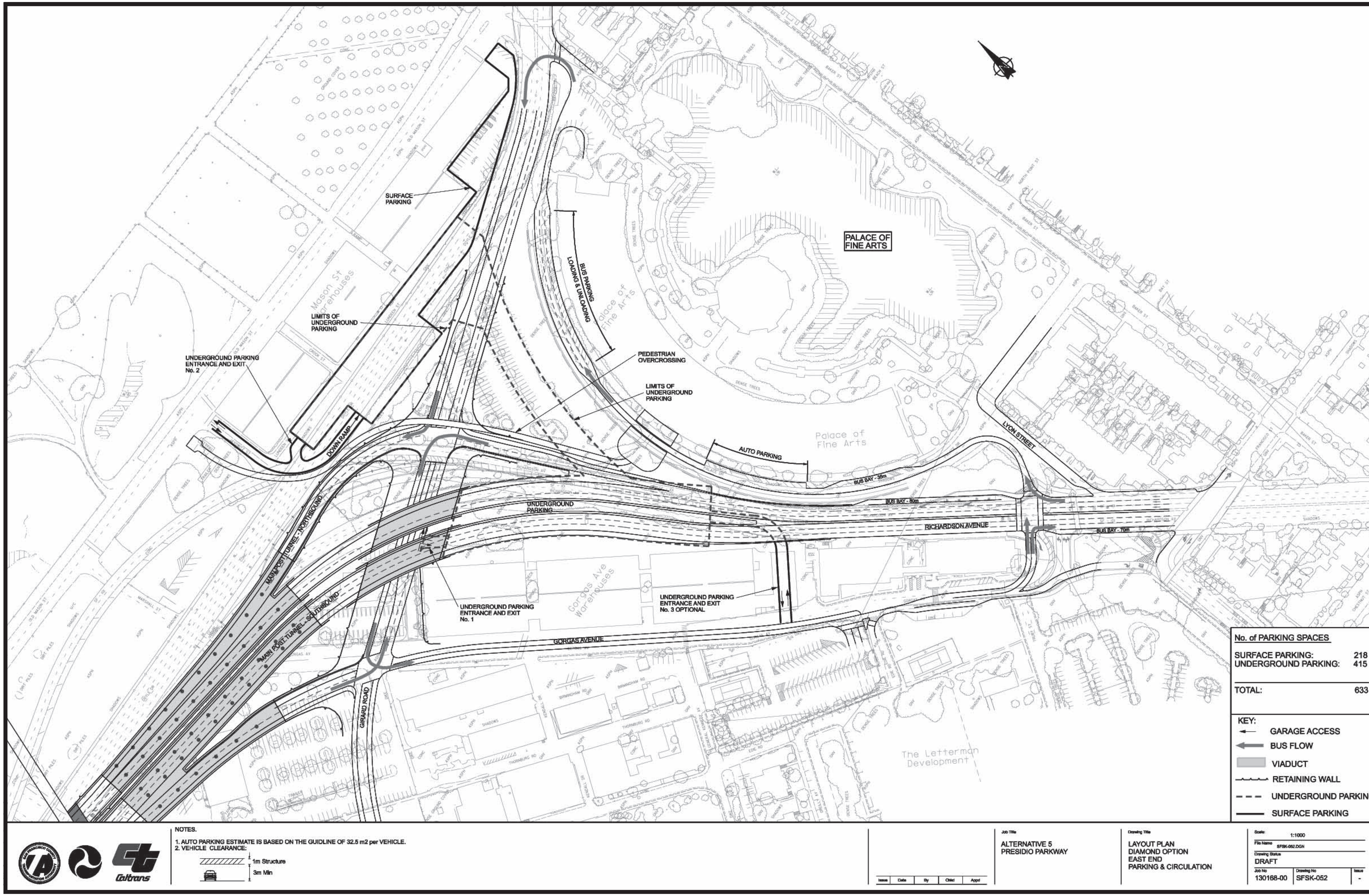




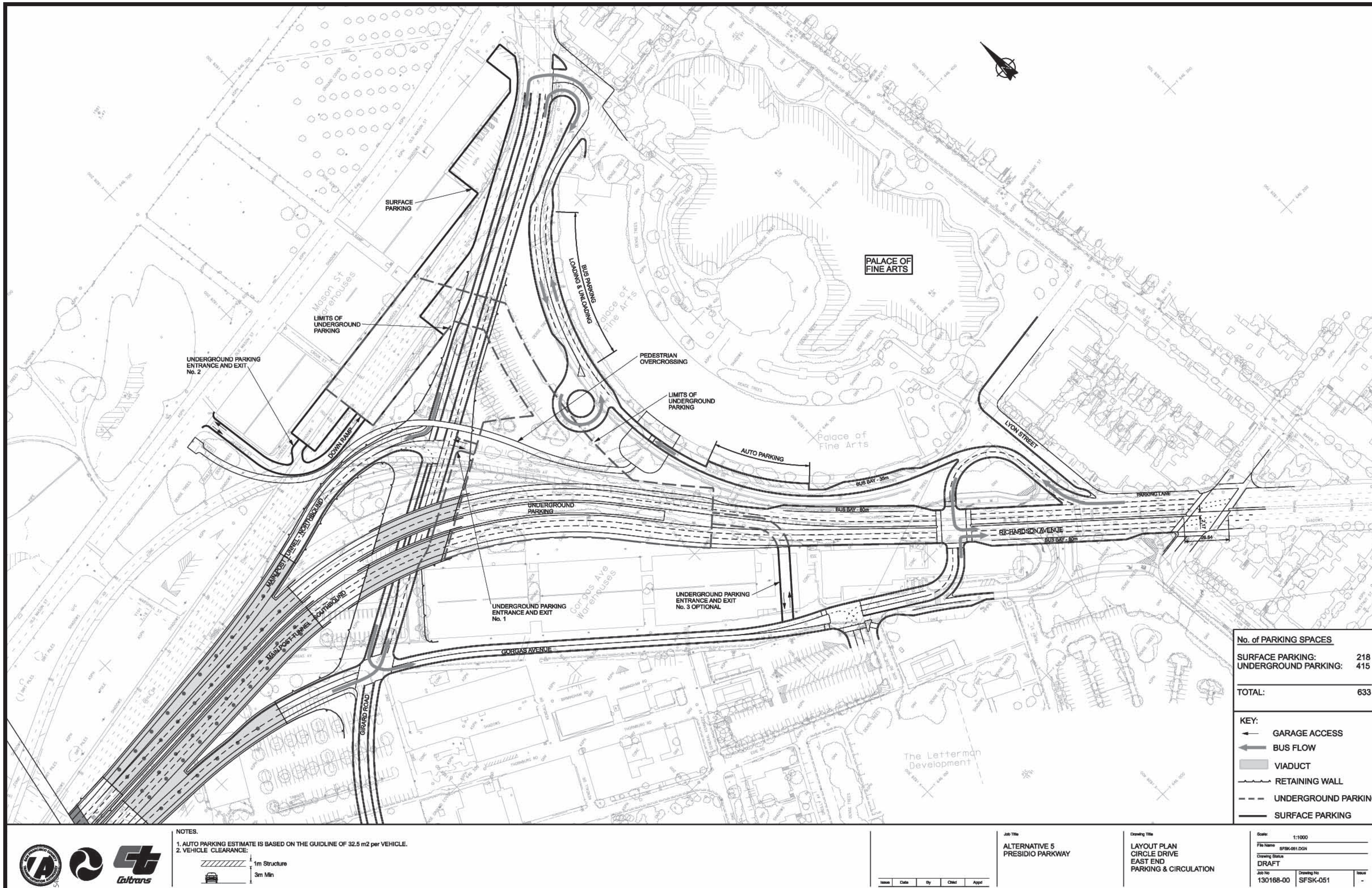
Alternative 5—Presidio Parkway with Loop Ramp Option



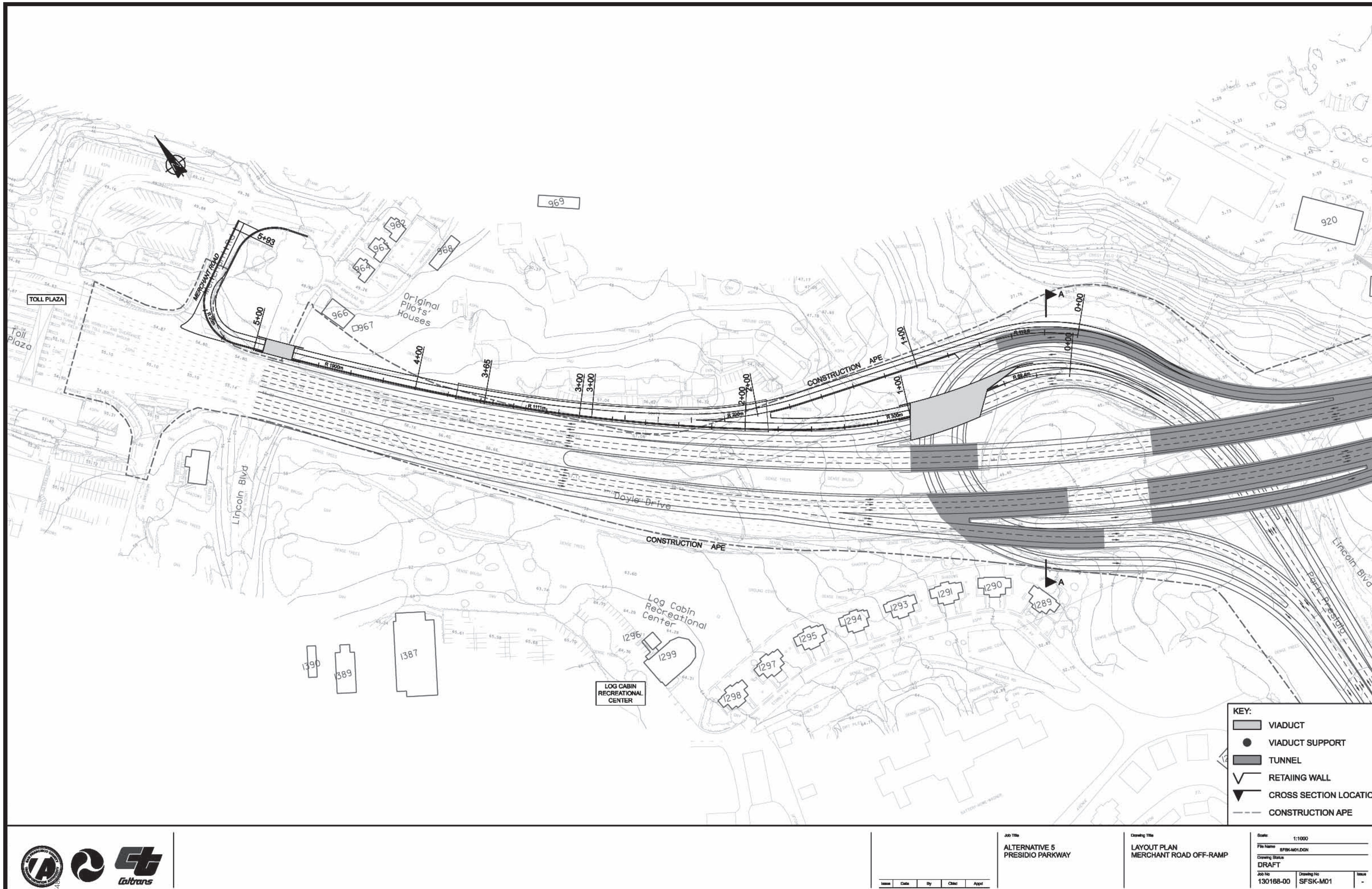
Alternative 5—Presidio Parkway with Hook Ramp Option



Alternative 5—Presidio Parkway with Diamond Option



Alternative 5—Presidio Parkway with Circle Drive Option



Alternative 5—Presidio Parkway with Merchant Road Slip-Ramp

APPENDIX B

TECHNICAL MEMORANDA

Memorandum

San Francisco County Transportation Authority
100 Van Ness Avenue 25TH Floor
San Francisco, California 94102
415.522.4800 FAX 415.522.4829
info@sfcta.org www.sfcta.org

Date: 6.3.04

To: Gary Kennerley, PB

From: Joe Castiglione, SFCTA

Subject: Doyle Drive 2030 Forecast Update

The purpose of this memo is to describe the methodology used to update the forecasts of regional travel demand in order to support the analysis requirements of the Doyle Drive Environmental & Design Study. This effort involved updating all land use, socioeconomic and transportation network inputs to the San Francisco Model to reflect revised assumptions about regional and local growth as described in ABAG's (Association of Bay Area Government) "Projections 2002" publication. The inputs used for the original Doyle Drive alternative model runs were based on ABAG's "Projections 2000" forecasts.

The San Francisco Travel Demand Model was developed to support the Doyle Drive Environmental & Design Study and other transportation and land use planning analyses in San Francisco. The San Francisco Model provides detailed forecasts of San Francisco residents' travel behavior, which is then integrated with forecasts of regional travel produced by the Metropolitan Transportation Commission's (MTC) 9-county "Baycast" model. This integrated demand is then assigned to regional highway and transit networks to provide forecast volumes. The current horizon year for the San Francisco model is 2025. The selection of this horizon year was based on the desire to maintain consistency with MTC's 2001 RTP assumptions, which use a 2025 horizon year.

To satisfy the analysis needs of the Doyle Drive Environmental & Design Study, it was necessary to develop new 2030 horizon year travel demand forecasts, beyond the time frame of the latest available regional travel demand forecasts from MTC 2001RTP. This memo describes the methodology used to develop these 2030 travel demand forecasts, based the regional land use forecasts found in ABAG's "Projections2002" and MTC's 2001 RTP travel demand forecasts. The approach involved two primary steps: 1) developing 2030 inputs for the San Francisco travel demand forecast model, and 2) developing 2030 regional travel demand "trip tables." Each step is described below.

In order to develop 2030 forecasts of San Francisco resident travel demand, it was necessary to develop 2030 inputs to the San Francisco travel demand forecast model. MTC's Projections2002-based 2020 and 2025 forecasts of households, population, employed residents and employment were used to accomplish this goal. MTC has developed Projections2002-based 2025 land use forecasts using information from ABAG's regional economic models. MTC's 2020 and 2025 land use forecasts were compared by MTAZ (MTC Travel Analysis Zone) to calculate growth rates for households, household population, employed residents and employees. The more detailed San Francisco model zones nest within the MTAZ system, so the calculated MTAZ growth rates were applied to the SFTAZs within each given MTAZ. Separate growth rates were calculated for changes in households, household population, employed residents and employment. A single employment growth rate was applied to all the various employment sectors because more detailed, sector-specific information was not available. These 2020-2025 growth rates were applied to the existing San Francisco model Projections2002-based 2025 land use inputs developed by the San Francisco Planning Department in order to develop 2030 forecasts.

This approach was identical to the approach used to develop the inputs for the original Doyle analysis, with one distinction. In developing the inputs used in the original analysis, it was necessary to extrapolate Projections2000-based growth from 2020 to 2030, due to the information available at that time. In the update described in this memo it was only necessary to extrapolate growth from 2025 to 2030, due to the availability of information for a further horizon year.

Table 2.1 Distribution of Full-Day Activity Patterns (continued)

BATS Survey	1996			1996		
Day of week	**SAT**			**SUN**		
Segment	**Worker**	**Student**	**Other**	**Worker**	**Student**	**Other**
N. Obs	79	14	25	92	16	24
Type of Primary Tour	%	%	%	%	%	%
None – No travel	**11.4**	**7.1**	**24.0**	**6.5**	**6.3**	**25.0**
Work – Total	**53.2**			**41.3**		
No stops	20.3			17.4		
Stop before	12.7			4.3		
Stop after	10.1			8.7		
Stops both ways	8.9			9.8		
Subtour	0.0			1.1		
Subtour+before	0.0			0.0		
Subtour+after	1.3			0.0		
Subtour+bothways	0.0			0.0		
Education – Total		**28.5**			**25.0**	
No stops		14.3			18.8	
Stop before		7.1			0.0	
Stop after		0.0			0.0	
Stops both ways		7.1			6.3	
Other	**35.4**	**64.3**	**76.0**	**52.2**	**68.7**	**75.0**
No stops	22.8	50.0	36.0	28.3	62.5	54.2
Stop before	3.8		8.0	9.8	6.3	12.5
Stop after	3.8		20.0	6.5		4.2
Stops both ways	5.1	14.3	12.0	7.6		4.2
Number of Secondary Tours	%	%	%	%	%	%
None	53.2	42.9	56.0	64.1	62.5	62.5
One	29.1	42.9	32.0	22.8	37.5	29.2
Two or more	17.7	14.3	12.0	13.0	0.0	8.3

Compared to the weekday patterns from the 1996 survey, the Saturday and Sunday patterns are very different. Workers are a bit more likely to stay home on Saturdays, but non-working adults are less likely to stay home on weekends than on weekdays. The percent of workers making work tours is much lower than on weekdays, but still surprisingly high (52 percent on Saturday, 41 percent on Sunday). It could be that these are sometimes different sorts of "work" activities than those reported on weekdays. There are very few work-based sub-tours on weekends, for example. The percentage of students making education tours is also much lower than on weekdays (28 percent on Saturday, 25 percent on Sundays).

Another noticeable difference is that all person types make more secondary home-based tours on weekends, particularly on Saturday, but also on Sunday. Table 2.2 is similar in structure to Table 2.1, but this one shows the time-of-day distribution for all primary tours. Again, the sample sizes are very small for the weekend days, particularly for education tours (four cases on each day). The TOD distributions for weekday (M-F) tours are very similar in 1990 and 1996. The most noticeable difference is a shift out of the AM peak-PM peak combination for work and education tours. This might indicate some peak-spreading occurring between the two years.

Table 2.2 Time-of-Day Distribution of Primary Tours

BATS Survey	**1990**			**1996**		
Day of week	**M-F**			**M-F**		
Segment	**Work**	**Education**	**Other**	**Work**	**Education**	**Other**
N.Obs	1,786	247	819	712	105	290
Primary Tour Times of Day (%)						
Early – Early	0.1					
Early – AM peak	0.1					0.6
Early – Mid-day	3.0		0.2	5.2		0.3
Early – PM peak	1.2			2.1	1.9	0.7
Early – Late	0.1			0.3		
AM peak – AM peak	0.2	0.4	2.6			2.1
AM peak – Mid-day	9.6	69.6	16.6	9.6	74.3	11.0
AM peak – PM peak	55.5	24.3	6.8	41.2	17.1	5.2
AM peak – Late	9.5	0.8	1.5	12.4		3.4
Mid-day – Mid-day	3.2	2.4	39.7	4.1	3.8	37.9
Mid-day – PM peak	8.6	2.4	14.0	10.3	2.9	16.6
Mid-day – Late	6.4		3.8	10.8		4.5
PM peak – PM peak			5.5	0.7		4.5
PM peak – Late	1.5		4.6	2.1		7.6
Late – Late	1.0		4.6	1.3		5.5

Table 2.2 Time-of-Day Distribution of Primary Tours (continued)

BATS Survey	**1996**			**1996**		
Day of week	**SAT**			**SUN**		
Segment	**Work**	**Education**	**Other**	**Work**	**Education**	**Other**
N.Obs	42	4	56	38	4	77
Primary Tour Times of Day (%)						
Early – Early						
Early – AM peak	2.4					
Early – Mid-day	2.4		1.8	2.6		
Early – PM peak				5.2		
Early – Late						
AM peak – AM peak						5.2
AM peak – Mid-day	11.9	75.0	8.9	10.5	50.0	2.6
AM peak – PM peak	21.4			28.9	50.0	2.6
AM peak – Late	4.8			5.3		
Mid-day – Mid-day	4.8	25.0	46.4	2.6		49.4
Mid-day – PM peak	31.0		21.4	21.1		18.2
Mid-day – Late	9.5		5.4	10.5		1.3
PM peak – PM peak	4.8		3.6	2.6		10.4
PM peak – Late	7.1		1.8	7.9		5.2
Late – Late	2.6		10.7	2.6		5.2

Between weekdays and weekends, there are a number of differences. Work tours are less likely to be AM peak-PM peak on weekends, and more likely to be Mid-day-PM peak. Weekend work tours are also more likely to begin in the PM peak or late periods.

Based on the very small sample, education tours on weekends are still most likely to be AM peak-Mid-day. Other primary tours appear to happen later on the weekends, with AM peak starts decreasing and Mid-day starts increasing. Also, the number of Late-Late tours is higher on Saturday and the number of PM peak-PM peak tours is higher on Sundays.

2.2 Model Specification and Implementation

Given the available numbers of weekend person-days and tours in the 1996 SF county sample, it is not possible to estimate a sophisticated choice model as was done for the 1990 data. Therefore, the most useful and efficient approach was to specific classification models to replace the logit choice models used for weekdays. This was done as follows:

- **Tour Pattern Model.** This model is a classification table giving the probability of choosing each of the 49 possible alternatives in the day pattern model as a function of the person type (working adult, student, other adult). The 49 alternatives are the 16 primary tour types times the three secondary tour frequencies in Table 2.1, plus the no travel alternative. Thus, the "model" is the joint distribution of the two distributions shown in Table 2.1, and is applied stochastically to assign to a single pattern to each person.

- **Primary Tour Time-of-Day Model.** This model is a classification table giving the probability of choosing each of the 15 possible time period combinations as a function of the primary tour type (work, education, other). This table is the one shown in Table 2.2. It is applied stochastically to assign a single time period combination to each primary tour.

- **Other Classification Models.** Other models in the system predict additional details, such as the exact number of secondary and work-based tours and stops in cases where the pattern model predicts 1+ or 2+, or predict the trip chain types and times of day for secondary and work-based tours conditional on the choices for the primary tour. There were not enough cases in the data to derive new tables for these distributions for weekend tours. In any case, given that these are secondary distributions conditional on the primary features of the day pattern, they are relatively transferable across days of the week. So the existing classification models were used, instead of deriving new ones for weekend travel.

By substituting the new classification models for the existing pattern and time-of-day choice models, three new versions of the tour/trip generation program were created:

1. **SATTGEN1.CPP.** To predict Saturday tours and trips;
2. **SUNTGEN1.CPP.** To predict Sunday tours and trips; and
3. **WKDTGEN1.CPP.** To predict weekday tours and trips based on the 1996 data.

This last version was created for comparison purpose only. It was used to see how much of the change in forecasts comes from switching from the 1990 to the 1996 survey, versus switching from weekdays to the weekend. It is not meant as a replacement for the existing weekday model, since the existing model contains many policy-sensitive variables that this one does not.

Table 2.3 shows the tour/trip generation results from the original model, both uncalibrated and the latest calibration, alongside the results from the three new versions. The new weekday model gives 2.94 million total trips, which is about halfway between the old uncalibrated (2.27 million) and calibrated (3.56 million) results. There are about the same number of trips on Sunday (2.93 million) as weekdays, but many more trips on Saturday (3.5 million). These additional Saturday trips are mainly due to more secondary home-based tours, so they may be shorter in length than weekday trips on average.

Table 2.4 presents these same results in terms of tours and trips per person and trips per tour. If the "Weekday 96" results were viewed as a target, it would indicate that the calibration of the original model did a good job at getting the right number of trips per tour, but may have gone too far in increasing the number of tours – particularly home-based other tours made by workers and other adults. Of course, although the 1996 survey did a good job at capturing more trips, it may still be under-representing some types of trips, so it may still be too low as a target. In terms of the contrast between Saturday, Sunday and Monday through Friday, Table 2.4 shows the same pattern as Table 2.3.

Tables 2.5 and 2.6 show trip time-of-day distributions in terms of absolute numbers and percentages. The results for the new weekday model are once again between the old uncalibrated and calibrated results for each time period. The main difference between weekdays and weekends is a shift from AM peak to Mid-day trips on both Saturday and Sunday. The fractions of trips in the PM peak and Late periods stay relatively constant.

■ 2.3 Weekend Period Choice

This section describes the efforts CS took to determine the optimal weekend period to model for the Doyle Drive study. For consistency, the period selected must match up with one of the time five periods in the SFCTA travel model.

Analysis

CS had previously selected Saturday as the appropriate day for measuring maximum weekend peak volumes. CS determined that overall volumes city-wide and in the Doyle Drive area were about 20 percent higher on Saturdays than on Sundays (note Figure 2.1). The Doyle Drive area was defined for the study as all links within the micro-simulation area. The following chart provided evidence that volumes are higher during every time period on Saturday compared to Sunday. It should be noted, however, that this does not provide guidance as to what time period to choose to model. While mid-day peaks seem to have the highest volumes, this may be due to the fact that the mid-day time periods are about twice as long as any other time period. To determine where peaking occurs, we have undertaken an hourly analysis of data on Doyle Drive alone, excluding any other count data from other. The data source for our analysis includes the traffic counts taken by CS for the study, traffic counts from Caltrans, and traffic counts from the Golden Gate Bridge district.

Table 2.3 Tour Results from the Original Model

Person type	Tour type	People	Tours	% of Tours	Trips	% of Trips
SF Model	**Uncalibrated**					
Worker	HBWork	392,186	323,113	36.6%	867,635	38.2%
Worker	HBOther	392,186	139,701	15.8%	342,884	15.1%
Worker	Wbased	392,186	110,060	12.5%	262,168	11.6%
Student	HBEduc	113,276	69,945	7.9%	176,252	7.8%
Student	HBOther	113,276	51,290	5.8%	126,973	5.6%
Other	HBOther	232,852	189,478	21.4%	493,829	21.8%
Total	Total	738,314	883,587	100.0%	2,269,741	100.0%
SF Model	**Calibrated**					
Worker	HBWork	392,186	321,353	25.6%	990,847	29.5%
Worker	HBOther	392,186	328,935	26.2%	816,403	24.3%
Worker	Wbased	392,186	158,520	12.6%	376,364	11.2%
Student	HBEduc	113,276	69,514	5.5%	174,639	5.2%
Student	HBOther	113,276	51,446	4.1%	127,797	3.8%
Other	HBOther	232,852	326,651	26.0%	869,213	25.9%
Total	Total	738,314	1,256,419	100.0%	3,355,263	100.0%
SF Model	**Weekday 96**					
Worker	HBWork	392,186	323,725	29.7%	995,642	33.9%
Worker	HBOther	392,186	242,235	22.2%	619,526	21.1%
Worker	Wbased	392,186	118,198	10.8%	281,805	9.6%
Student	HBEduc	113,276	77,052	7.1%	187,420	6.4%
Student	HBOther	113,276	68,421	6.3%	169,474	5.8%
Other	HBOther	232,852	261,888	24.0%	684,956	23.3%
Total	Total	738,314	1,091,519	100.0%	2,938,823	100.0%
SF Model	**Saturday 96**					
Worker	HBWork	392,186	208,408	16.1%	650,483	18.6%
Worker	HBOther	392,186	504,800	39.0%	1,273,414	36.4%
Worker	Wbased	392,186	10,164	0.8%	26,071	0.7%
Student	HBEduc	113,276	32,240	2.5%	96,097	2.7%
Student	HBOther	113,276	184,520	14.3%	476,461	13.6%
Other	HBOther	232,852	352,954	27.3%	980,105	28.0%
Total	Total	738,314	1,293,086	100.0%	3,502,631	100.0%
SF Model	**Sunday 96**					
Worker	HBWork	392,186	162,223	14.7%	507,134	17.3%
Worker	HBOther	392,186	477,700	43.3%	1,278,315	43.6%
Worker	Wbased	392,186	4,295	0.4%	9,782	0.3%
Student	HBEduc	113,276	28,459	2.6%	74,483	2.5%
Student	HBOther	113,276	120,377	10.9%	269,365	9.2%
Other	HBOther	232,852	310,478	28.1%	790,247	27.0%
Total	Total	738,314	1,103,532	100.0%	2,929,326	100.0%

Table 2.4 Tours per Person Results from the Original Model

Person Type	Tour Type	Tours/Person	Trips/Person	Trips/tour	% Stops Before	% Stops After
SF Model	**Uncalibrated**					
Worker	HBWork	0.82	2.21	2.69	18.3%	29.5%
Worker	HBOther	0.36	0.87	2.45	14.4%	17.5%
Worker	WkBased	0.28	0.67	2.38	11.3%	17.0%
Student	HBEduc	0.62	1.56	2.52	13.7%	21.2%
Student	HBOther	0.45	1.12	2.48	14.4%	18.7%
Other	HBOther	0.81	2.12	2.61	20.6%	19.2%
Total	Total	1.20	3.07	2.57	16.7%	22.6%
SF Model	**Calibrated**					
Worker	HBWork	0.82	2.53	3.08	30.9%	44.9%
Worker	HBOther	0.84	2.08	2.48	15.1%	18.9%
Worker	WkBased	0.40	0.96	2.37	11.5%	16.1%
Student	HBEduc	0.61	1.54	2.51	13.4%	21.0%
Student	HBOther	0.45	1.13	2.48	14.5%	19.1%
Other	HBOther	1.40	3.73	2.66	22.4%	20.9%
Total	Total	1.70	4.54	2.67	20.5%	25.8%
SF Model	**Weekday 96**					
Worker	HBWork	0.83	2.54	3.08	32.0%	43.3%
Worker	HBOther	0.62	1.58	2.56	17.2%	20.6%
Worker	WkBased	0.30	0.72	2.38	12.0%	16.4%
Student	HBEduc	0.68	1.65	2.43	9.4%	20.0%
Student	HBOther	0.60	1.50	2.48	17.5%	16.6%
Other	HBOther	1.12	2.94	2.62	17.4%	22.8%
Total	Total	1.48	3.98	2.69	20.5%	27.1%
SF Model	**Saturday 96**					
Worker	HBWork	0.53	1.66	3.12	40.4%	38.2%
Worker	HBOther	1.29	3.25	2.52	17.0%	18.0%
Worker	WkBased	0.03	0.07	2.57	15.2%	26.9%
Student	HBEduc	0.28	0.85	2.98	49.7%	25.0%
Student	HBOther	1.63	4.21	2.58	17.3%	20.2%
Other	HBOther	1.52	4.21	2.78	20.9%	29.5%
Total	Total	1.75	4.74	2.71	22.7%	24.9%
SF Model	**Sunday 96**					
Worker	HBWork	0.41	1.29	3.13	34.3%	44.5%
Worker	HBOther	1.22	3.26	2.68	22.8%	21.4%
Worker	WkBased	0.01	0.02	2.28	7.6%	13.7%
Student	HBEduc	0.25	0.66	2.62	25.2%	25.2%
Student	HBOther	1.06	2.38	2.24	10.1%	6.3%
Other	HBOther	1.33	3.39	2.55	21.4%	14.7%
Total	Total	1.49	3.97	2.65	22.7%	21.3%

Table 2.5 Time-of-Day Distribution of Tours (Absolute)

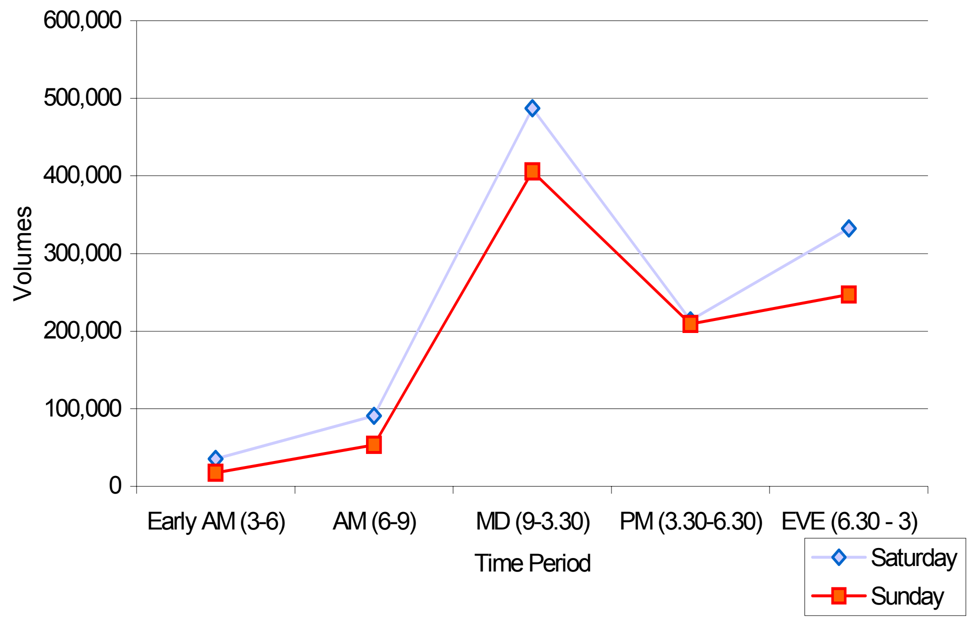
Person Type	Tour Type	Early	AM Peak	Mid-Day	PM Peak	Late	Total Trips
SF Model	**Calibrated**						
Worker	HBWork	15,011	287,023	160,336	278,519	126,746	867,635
Worker	HBOther	448	31,700	84,461	77,885	148,390	342,884
Worker	WkBased	103	5,528	222,920	25,279	8,338	262,168
Student	HBEduc	163	73,748	65,562	29,773	7,006	176,252
Student	HBOther	25	19,242	41,717	33,624	32,365	126,973
Other	HBOther	197	46,191	280,692	91,815	74,934	493,829
Total	Total	15,947	463,432	855,688	536,895	397,779	2,269,741
SF Model	**Calibrated**						
Worker	HBWork	41,862	318,568	424,054	165,795	40,568	990,847
Worker	HBOther	155	37,863	153,569	289,382	335,434	816,403
Worker	WkBased	17	8,066	348,339	15,099	4,843	376,364
Student	HBEduc	18	71,473	71,505	26,330	5,313	174,639
Student	HBOther	1	12,559	31,773	28,460	55,004	127,797
Other	HBOther	40	66,306	262,982	139,468	400,417	869,213
Total	Total	42,093	514,835	1,292,222	664,534	841,579	3,355,263
SF Model	**Weekday 96**						
Worker	HBWork	25,804	271,795	224,231	279,366	194,446	995,642
Worker	HBOther	1,589	65,930	162,559	124,763	264,685	619,526
Worker	WkBased	-	5,372	230,630	32,883	12,920	281,805
Student	HBEduc	1,464	76,155	78,813	27,557	3,431	187,420
Student	HBOther	446	11,448	62,516	45,189	49,875	169,474
Other	HBOther	2,832	71,816	330,106	136,742	143,460	684,956
Total	Total	32,135	502,516	1,088,855	646,500	668,817	2,938,823
SF Model	**Saturday 96**						
Worker	HBWork	11,757	118,506	208,023	213,615	98,582	650,483
Worker	HBOther	3,928	126,818	537,476	232,454	372,738	1,273,414
Worker	WkBased	-	914	18,764	4,970	1,423	26,071
Student	HBEduc	-	34,252	56,931	4,069	845	96,097
Student	HBOther	1,331	31,605	232,151	103,786	107,588	476,461
Other	HBOther	3,376	64,657	527,639	182,328	202,105	980,105
Total	Total	20,392	376,752	1,580,984	741,222	783,281	3,502,631
SF Model	**Sunday 96**						
Worker	HBWork	12,914	100,094	123,815	166,491	103,820	507,134
Worker	HBOther	759	122,737	601,602	275,729	277,488	1,278,315
Worker	WkBased	-	125	7,358	1,480	819	9,782
Student	HBEduc	-	34,242	18,450	19,474	2,317	74,483
Student	HBOther	-	22,860	141,970	59,154	45,381	269,365
Other	HBOther	-	73,778	420,633	167,742	128,094	790,247
Total	Total	13,673	353,836	1,313,828	690,070	557,919	2,929,326

Table 2.6 Time-of-Day Distribution of Tours (Percentage)

SF Model	Uncalibrated					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	1.7%	33.1%	18.5%	32.1%	14.6%
Worker	HBOther	0.1%	9.2%	24.6%	22.7%	43.3%
Worker	WkBased	0.0%	2.1%	85.0%	9.6%	3.2%
Student	HBEduc	0.1%	41.8%	37.2%	16.9%	4.0%
Student	HBOther	0.0%	15.2%	32.9%	26.5%	25.5%
Other	HBOther	0.0%	9.4%	56.8%	18.6%	15.2%
Total	Total	0.7%	20.4%	37.7%	23.7%	17.5%
SF Model	Calibrated					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	4.2%	32.2%	42.8%	16.7%	4.1%
Worker	HBOther	0.0%	4.6%	18.8%	35.4%	41.1%
Worker	WkBased	0.0%	2.1%	92.6%	4.0%	1.3%
Student	HBEduc	0.0%	40.9%	40.9%	15.1%	3.0%
Student	HBOther	0.0%	9.8%	24.9%	22.3%	43.0%
Other	HBOther	0.0%	7.6%	30.3%	16.0%	46.1%
Total	Total	1.3%	15.3%	38.5%	19.8%	25.1%
SF Model	Weekday 96					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	2.6%	27.3%	22.5%	28.1%	19.5%
Worker	HBOther	0.3%	10.6%	26.2%	20.1%	42.7%
Worker	WkBased	0.0%	1.9%	81.8%	11.7%	4.6%
Student	HBEduc	0.8%	40.6%	42.1%	14.7%	1.8%
Student	HBOther	0.3%	6.8%	36.9%	26.7%	29.4%
Other	HBOther	0.4%	10.5%	48.2%	20.0%	20.9%
Total	Total	1.1%	17.1%	37.1%	22.0%	22.8%
SF Model	Saturday 96					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	1.8%	18.2%	32.0%	32.8%	15.2%
Worker	HBOther	0.3%	10.0%	42.2%	18.3%	29.3%
Worker	WkBased	0.0%	3.5%	72.0%	19.1%	5.5%
Student	HBEduc	0.0%	35.6%	59.2%	4.2%	0.9%
Student	HBOther	0.3%	6.6%	48.7%	21.8%	22.6%
Other	HBOther	0.3%	6.6%	53.8%	18.6%	20.6%
Total	Total	0.6%	10.8%	45.1%	21.2%	22.4%
SF Model	Sunday 96					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	2.5%	19.7%	24.4%	32.8%	20.5%
Worker	HBOther	0.1%	9.6%	47.1%	21.6%	21.7%
Worker	WkBased	0.0%	1.3%	75.2%	15.1%	8.4%
Student	HBEduc	0.0%	46.0%	24.8%	26.1%	3.1%
Student	HBOther	0.0%	8.5%	52.7%	22.0%	16.8%

Other	HBOther	0.0%	9.3%	53.2%	21.2%	16.2%
Total	Total	0.5%	12.1%	44.9%	23.6%	19.0%

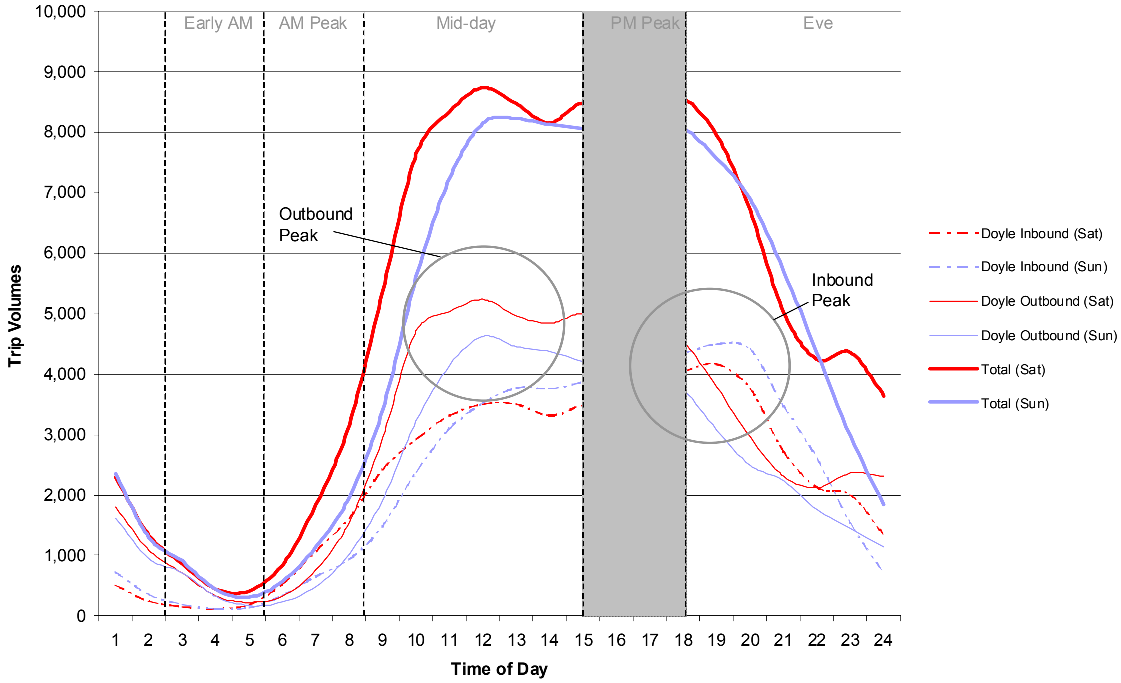
Figure 2.1 Saturday Versus Sunday Traffic Volumes (Entire City)



For the purposes of this analysis, CS chose the volumes on Doyle Drive as those at the Tolls. CS's results showed that for Doyle Drive, as well as the area at large, Saturday experiences higher volumes throughout the day. On Doyle Drive itself, however, there are two important notes that are not true of the entire area. First, the differences between Saturday and Sunday on Doyle are much tighter than the rest of the area, with around eight percent higher overall Saturday volumes (compared to 20 percent area-wide).

Second, there are separate peaks on Doyle Drive for the inbound and outbound directions. These peaks are symmetrical to weekday peaks, flipped and shifted to later in the day. The inbound peak occurs at around 7:00 p.m., while the outbound peak occurs at around 11:00 a.m. More importantly, the inbound peak is higher on Sunday, while the outbound peak is higher on Saturday (see Figure 2.2). Overall, Saturday peaks remain higher.

Figure 2.2 Hourly Volumes



The two clear candidates for peak time period are Mid-day and PM Peak. While mid-day peak has a slightly higher maximum, the sustained peak is greater for the PM Peak time period. This is due to the fact that the PM Peak catches the end of the outbound peak and the beginning of the inbound peak.

Recommendation

CS selected the Saturday PM Peak as the appropriate time period for the weekend model. A careful study of the previous figure will reveal an outbound peak that builds quickly and tails off slowly, and an inbound peak that builds slowly and tails off quickly. Because of this, the PM Peak time period will best capture changes in both of these peaks better than the Mid-day Peak, which derives the majority of its volume from the outbound peak.

One additional issue raised by this analysis is the likely effect of Electronic Toll Collection (ETC) on the choice of weekend day selection. Current estimates of inbound capacities for weekdays hover around 6,000 cars per hour. While the inbound peak is lower for the weekend (around 4,500), some of this can be explained by the efficiency difference of commuters and weekend travelers. It is possible that increased ETC facilities on the bridge will increase the throughput of the toll and increase the importance of the inbound peak. This, in turn, could lead to a higher Sunday peak. Despite this possibility, our recommendation of a Saturday peak stands. It is difficult to predict the penetration of ETC use among weekend travelers, and even more difficult to predict the effects on bridge throughput due to this penetration.

2.4 Model Calibration

The weekend model was calibrated using techniques identical to those used by CS, while calibrating the weekday city-wide model. Note that calibration was performed for the PM weekend (Saturday) peak period only, due to its selection (above) as the appropriate weekend time period. Table 2.7 shows the calibration targets and results for all Saturday periods for the Golden Gate Bridge. Table 2.8 shows calibration targets and results for all links by functional class. The 'OBS' column gives observed counts, while the 'EST' column gives model estimated counts. The final column shows the percentage difference between the observed and estimated counts.

Table 2.7 Travel Demand Model Calibration Results for Golden Gate Bridge

Early AM Period (3:00 am to 6:00 am) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	796	120	-84.9%
52267	52425	Golden Gate	S	840	379	-54.9%

AM Period (6:00 am to 9:00 am) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	5350	3147	-41.2%
52267	52425	Golden Gate	S	5192	2665	-48.7%

Mid-day Period (9:00 am to 3:30 pm) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	29658	22153	-25.3%
52267	52425	Golden Gate	S	13053	22369	71.4%

PM Peak Period (3:30 pm to 6:30 pm) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	7000	7584	8.3%
52267	52425	Golden Gate	S	9899	10021	1.2%

Evening Period (6:30 pm to 3:00 am) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	17204	10339	-39.9%
52267	52425	Golden Gate	S	13020	6284	-51.7%

Table 2.8 Travel Demand Model Results by Facility Type

Facility Type	Data	Total

Collector	Sum of PM-EST	26783
	Sum of PM-OBS	22065
	Sum of PM Diff (EST-OBS)	4718
Freeway	Sum of PM-EST	17605
	Sum of PM-OBS	16899
	Sum of PM Diff (EST-OBS)	706
Freeway Ramp	Sum of PM-EST	1604
	Sum of PM-OBS	3828
	Sum of PM Diff (EST-OBS)	-2224
Fwy-Fwy Conn	Sum of PM-EST	15131
	Sum of PM-OBS	11632
	Sum of PM Diff (EST-OBS)	3499
Local Street	Sum of PM-EST	18011
	Sum of PM-OBS	34099
	Sum of PM Diff (EST-OBS)	-16088
Major Arterial	Sum of PM-EST	114683
	Sum of PM-OBS	117133
	Sum of PM Diff (EST-OBS)	-2450
Minor Arterial	Sum of PM-EST	64417
	Sum of PM-OBS	52731
	Sum of PM Diff (EST-OBS)	11686
Total Sum of PM-EST		258234
Total Sum of PM-OBS		258387
Total Sum of PM Diff (EST-OBS)		-153

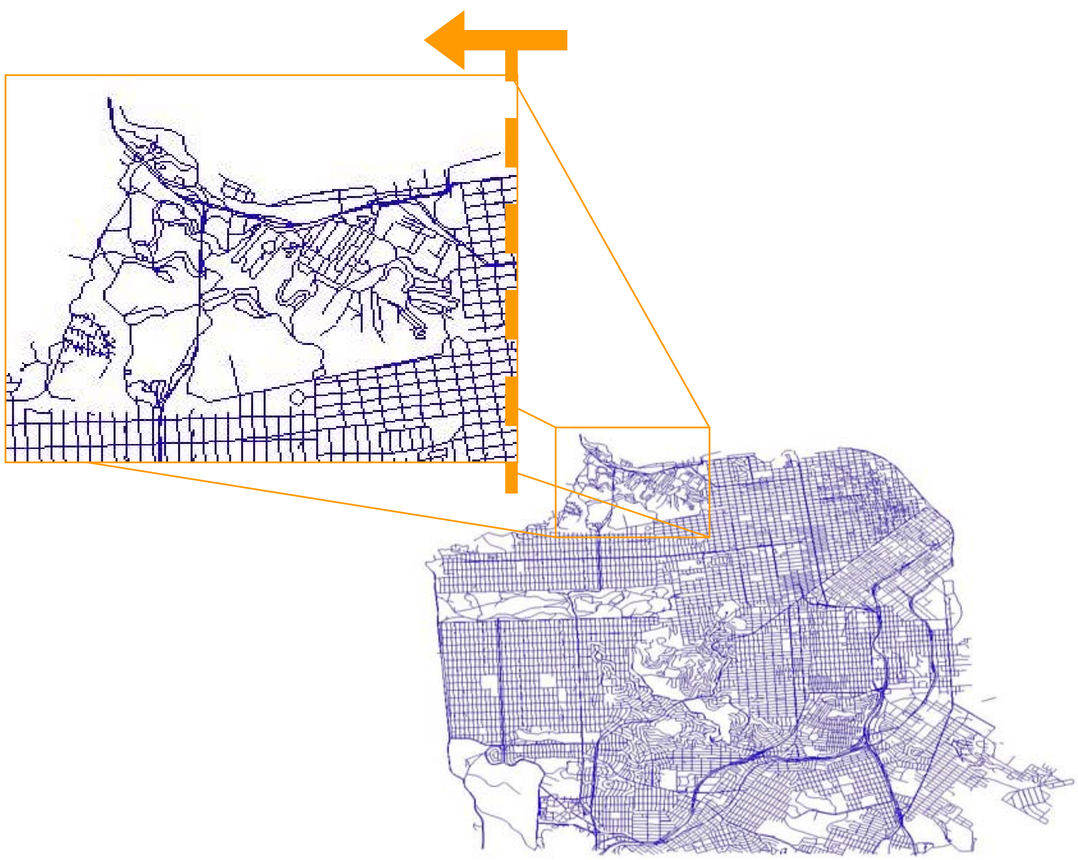
Legend: EST – Estimated
OBS – Observed
Diff Difference

3.0 Travel Model Integration

3.1 Demand Adjustment Methodology

The first step in model calibration is the translation of demand from the travel demand model into the simulation model. As illustrated below, CS must extract demand from the city-wide travel demand model for the simulation model area. Once CS constructs a new subset of origin and destination pair flows, CS adjusts these flows as described in the next section.

Figure 3.1 Micro-Simulation Study Area in Context with Screenline



The goal of travel demand model conversion is twofold:

1. Calibrate the simulation model to existing counts as closely as possible; and

2. Preserve the integrity of the travel demand model inputs to the greatest degree possible.

The closer that one comes to (1), the more confidence one has in the simulation model to replicate local conditions accurately. The closer that one comes to (2), the more confidence one has that the travel model will transfer county-wide travel pattern changes accurately to the simulation model. These two goals require certain tradeoffs because they conflict with one another. To perfectly calibrate to local conditions, one would simply use counts as inputs to the simulation model. To perfectly preserve the travel model data, one would not alter the travel model inputs as all.

As expected, however, the travel model does not perfectly represent data at a microscopic scale to the degree required for simulation calibration, particularly in local areas with ill-defined corridors. At a conceptual level, the travel demand model provides the travel demand through the Doyle Drive area via three quantities (two scalars and one vector) for each Transportation Analysis Zone (TAZ):

1. The number of trips entering the study area via the TAZ;
2. The number of trips leaving the study area via the TAZ; and
3. A vector of trip distributions to all other TAZs from this TAZ.

Conceptually, (1) and (3) are independent, but (2) depends on the (1) and (3) of other TAZs in the network (There are other ways to conceptualize this, but in every case, these three basic quantities are related.). Because the most difficult piece of information to acquire is trip distributions, CS attempted to leave this as presented by the travel model. To achieve this, we may only alter (1) or (2), not both. Because they are related, altering both entrance and exit volumes would necessitate altering distributions.

CS has chosen to adjust the travel model data using entrance volume adjustments and then some minor exit (distribution) adjustments for key streets. By keeping The methodology simple and in-line with the capabilities of both models, CS adjusts the demand enough to meet calibration requirements, while ensuring that changes in travel demand model travel patterns are accurately passed along to the simulation model. The methodology is three-fold:

1. **Mainline Adjustment.** For major streets (Lombard, Marina, Park Presidio), adjust volumes to match count data using a multiplier.

2. **Screen-line Adjustment**:

   – Create screen-lines along all major corridors (Marina East, Marina South, Richmond A,B,C,D West, Richmond A,B,C,D South, Richmond A,B,C,D East, Richmod D North);

- Adjust the screen-line model counts to match the screen-line count data, using a multiplier; and
- Distribute the screen-line counts to the links within the screen-line using count data proportions. Note that this distribution excludes the major streets from (1).

3. **Arterial 'Bleed' Adjustment.** For several major exits (Lombard, Marina, Park Presidio, 25th Street), the model places too few trips on the main arterial and too many on minor parallel streets. This is the one instance where CS proposes to adjust the exit volumes (and therefore overall trip distribution vectors), albeit on a very limited basis. For this adjustment, the minor streets are adjusted to match count data using a multiple. Due to the model over-assignment, this multiple is always less than one. The trips that are taken off the local streets by this multiple are then placed on the main arterial, so that no trips are lost.

These adjustments are not invasive enough to invalidate future model run data. Because they define appropriate corridors and apply multipliers to corridor level data only, changes in model travel patterns are detected appropriately. See tables 3.1, 3.2, and 3.3 for a full listing (by time period) of original and modified model volumes for each Paramics TAZ. Original model volumes represent the input from the Travel Demand Model, while modified model volumes represent the final demands input into Paramics after demand adjustment.

Table 3.1 Weekday AM Adjustment

	Entrance Volumes		Exit Volumes	
Paramics TAZ Number	Original Model Volumes	Modified Model Volumes	Original Model Volumes	Modified Model Volumes
7	223	218	342	394
8	326	319	158	251
9	395	388	131	192
10	250	376	180	452
11	500	492	467	488
12	430	424	244	433
16	27	31	136	177
17	19	21	172	231
18	11	11	12	13
19	14	13	24	32
20	8	7	35	41
21	17	20	31	54
22	18	18	44	51
23	13	13	24	32
24	13	11	23	31
25	103	96	79	97
26	190	188	39	67

27	155	127	50	59
28	8	27	22	20
29	11	11	20	99
34	45	42	18	34
35	13	13	53	60
36	25	24	21	20
37	0	0	0	0
38	69	71	26	32
39	27	30	42	59
40	41	40	194	208
41	52	50	85	87
42	159	156	288	265
43	161	153	36	40
44	66	62	22	20
45	13	70	31	35
53	17,350	16,791	8,216	7,364
54	57	57	27	27
55	84	83	95	84
1	1,312	1,580	4,401	5,825
2	0	134	0	430
15	0	66	760	227
46	35	118	445	498
47	15	87	181	214
48	37	429	187	178
49	523	422	1,147	732
50	2,097	2,414	4,478	7,018
51	19	261	545	255
6	0	303	494	501
13	0	177	494	523
14	230	74	520	544
52	1,138	502	1,136	645
56	260	98	232	273
57	6	195	27	79
58	1	393	15	67
59	230	236	492	462
60	1,147	625	1,154	1,029
61	17	180	239	569
62	41	338	10	223
63	0	0	80	134
64	13	168	89	97
65	2	170	288	296

66	4	170	117	156
67	14	340	416	504
68	778	902	2,414	1,650
69	1,828	716	820	809
70	48	352	57	84
71	2,503	1,916	1,447	1,330
72	636	1,021	40	778
75	43	535	430	1,187
76	1,061	417	2,573	1,884
77	134	94	0	0
78	235	103	1	0
79	4,960	8,570	4,346	4,934
80	178	232	710	127
81	89	117	25	200
82	1,537	429	749	946
83	517	1,203	26	641
5	14	494	97	221
30	438	612	865	1,094
84	0	91	0	0
85	0	134	0	0
4	7	774	73	1,535
31	2,018	781	1,643	956
3	158	691	1	2
32	223	512	100	193
33	167	418	139	236

Table 3.2 Weekday PM Adjustment

	Entrance Volumes		Exit Volumes	
Paramics TAZ Number	Original Model Volumes	Modified Model Volumes	Original Model Volumes	Modified Model Volumes
7	356	355	440	372
8	284	274	351	357
9	285	267	305	314
10	252	600	324	285
11	636	643	683	716
12	444	421	402	501
16	127	210	128	160
17	117	206	175	226
18	37	38	35	41
19	46	41	36	47

20	53	46	40	49
21	32	28	30	29
22	60	61	42	44
23	33	30	19	23
24	36	40	24	24
25	121	105	98	137
26	131	119	98	112
27	125	255	107	168
28	46	117	39	78
29	25	26	31	70
34	57	49	53	65
35	49	48	58	66
36	45	44	43	49
37	0	0	0	0
38	69	90	53	73
39	52	49	50	51
40	149	139	190	207
41	110	107	89	91
42	449	441	415	434
43	135	132	89	108
44	68	66	50	64
45	39	122	28	35
53	9,476	11,535	16,503	16,184
54	82	82	60	79
55	113	111	104	134
1	4,413	4,805	2,494	2,417
2	291	142	0	256
15	923	132	0	160
46	121	162	95	95
47	58	155	49	49
48	134	276	66	320
49	1,208	804	917	802
50	4,970	5,833	3,765	4,140
51	215	554	8	559
6	0	243	0	676
13	87	208	1	464
14	879	243	556	636
52	1,548	984	1,420	1,192
56	383	128	422	385
57	30	256	18	95
58	3	509	4	11
59	504	364	296	243
60	1,362	1,425	1,374	1,512
61	56	422	227	600
62	49	369	25	453
63	0	223	121	186
64	105	288	18	31
65	42	270	12	106
66	54	272	15	488
67	172	590	49	446
68	2,613	1,943	1,956	2,442

69	1,588	1,568	1,789	2,116
70	81	919	43	41
71	2,178	2,106	2,840	2,377
72	132	1,075	352	940
75	208	1,178	76	97
76	2,787	1,569	2,088	2,065
77	38	441	56	62
78	299	185	85	106
79	5,865	4,464	5,178	5,597
80	84	1,246	51	183
81	26	277	29	205
82	1,581	592	1,813	1,484
83	128	569	585	875
5	46	1,103	29	792
30	1,171	1,546	793	1,661
84	0	404	0	218
85	0	391	0	218
4	2	313	0	299
31	2,253	1,249	2,265	1,767
3	85	788	31	930
32	211	684	312	711
33	200	686	297	401

Table 3.3 Weekend PM Adjustment

	Entrance Volumes		Exit Volumes	
Paramics TAZ Number	Original Model Volumes	Modified Model Volumes	Original Model Volumes	Modified Model Volumes
7	320	341	386	288
8	259	291	307	315
9	257	291	294	274
10	238	258	275	367
11	577	603	641	671
12	422	462	365	484
16	113	112	114	143
17	122	123	145	195
18	31	33	28	38
19	30	31	30	50
20	42	42	38	69
21	22	22	27	57
22	45	48	38	110
23	37	36	28	80
24	31	31	27	28
25	111	119	90	117
26	129	156	93	67
27	123	151	81	245
28	53	55	34	115
29	44	44	38	27

34	55	60	41	69
35	42	42	44	84
36	36	38	35	65
37	0	0	0	0
38	60	68	53	145
39	52	51	42	69
40	138	138	157	206
41	99	100	84	122
42	450	442	414	392
43	103	125	58	54
44	62	71	51	74
45	40	39	30	37
53	10,042	10,340	7,584	8,279
54	84	90	72	86
55	110	115	99	68
1	2,894	2,122	3,008	2,337
2	3	71	0	0
15	231	45	226	88
46	114	61	107	107
47	59	52	52	55
48	99	214	138	266
49	1,081	295	980	611
50	3,098	3,567	4,375	4,311
51	137	151	5	2
6	0	473	0	0
13	0	339	0	0
14	90	230	42	94
52	1,190	1,081	1,290	513
56	125	20	124	304
57	13	39	17	13
58	0	79	6	5
59	77	272	102	21
60	1,451	969	1,813	1,230
61	0	0	136	96
62	20	16	6	83
63	0	4	54	36
64	30	209	24	46
65	10	209	5	28
66	32	209	30	175
67	49	419	83	397
68	2,268	1,342	2,082	1,945
69	1,684	1,179	1,595	1,258
70	84	589	46	32
71	2,224	1,497	2,555	1,656
72	148	873	265	994
75	110	618	106	129
76	2,076	686	2,183	3,425
77	0	0	108	0
78	107	247	279	0
79	5,099	6,077	5,140	5,339
80	19	416	161	21

81	16	572	61	0
82	1,736	529	1,592	1,407
83	196	322	877	662
5	135	679	73	63
30	1,396	852	1,104	942
84	0	71	0	0
85	0	73	0	0
4	0	0	0	808
31	1,634	1,070	1,719	530
3	11	197	34	22
32	261	155	295	409
33	220	141	293	340

4.0 Calibration

4.1 Calibration Methodology

The goals of model calibration are two-fold:

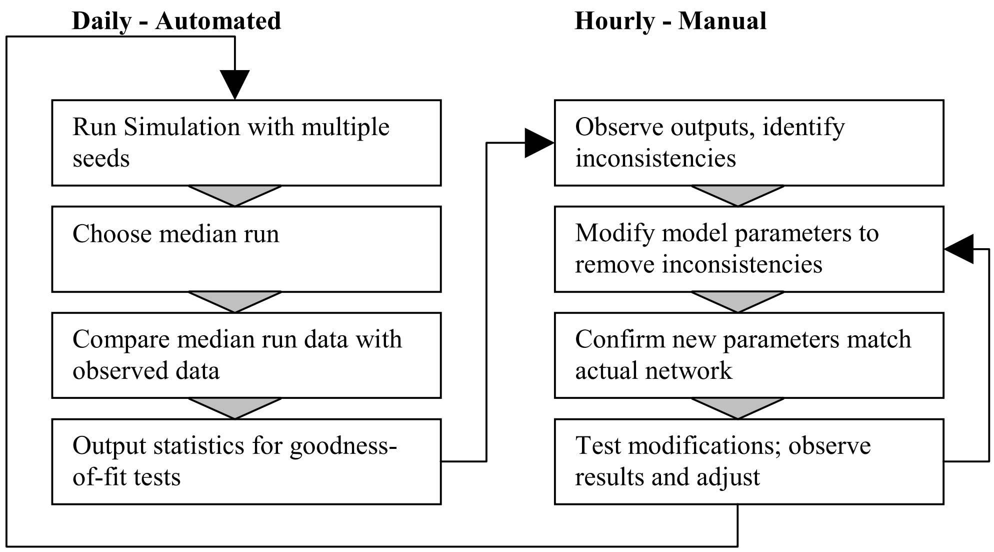
1. Match model behavior and outputs to existing conditions, and
2. Preserve the integrity of the model for future extrapolation.

Few researchers and practitioners have written on the issue of micro-simulation calibration and validation, particularly in regards to the application of micro-simulation models within the context of a larger regional travel model. For this reason, our approach is largely borrowed from travel demand model calibration techniques, supplemented by the existing research on micro-simulation calibration, techniques used in Europe by the simulation creators, and our experience with micro-simulations.

First, a distinction must be made between model calibration and model validation: model calibration is the process adjusting the model to match a given set of observed data; model validation is the process of testing and approving or rejecting this calibration, based on an independent set of observed data. We will use AM Peak period data to calibrate the model, and then validate it for the PM peak and weekend time periods using an independent subset of the observed data. Therefore, our validation targets are composed of a looser subset of the calibration targets. Second, we note that our calibration involves assignment only, due to the dynamic route choice inherent in Paramics.

Calibration of the micro-simulation model itself is an iterative process outlined in Figure 4.1.

Figure 4.1 Micro-Simulation Calibration Process



Due to its iterative nature, model calibration does not lend itself to any larger calibration timeline. Rather, model calibration is always a series of the above steps, repeated until the model is deemed calibrated.

The process of model calibration involves modifying calibration parameters to replicate existing conditions. Calibration parameters can be used to change the overall behavior of the model or for specific behavior at links on lanes or at junctions. Usually, the major adjustments to a model include moving curb and stop-line control points, and coding forced lane changes to override default Paramics lane changing.

The main link, lane, and junction calibration parameters include:

- Changing the hazard warning distance,
- Including link gradients,
- Coding junction visibility,
- Changing link headway factor,
- Coding link end speeds,
- Coding lane end stop time,
- Forced lane changes,
- Forced merges,
- Stay in lane, and
- Lane and turn restrictions.

The overall behavior of the model can be changed by increasing or decreasing the "mean headway"; the "mean reaction time"; or a driver-vehicle-unit (DVU), Paramics notation for a given driver) aggression and awareness distributions. Note the aggression and awareness is set for each vehicle when it is released onto the network with the levels of these falling within a normal distribution. These levels can be adjusted, but only if the user has some background data that suggests they are not consistent with the particular model being built. The default values used by Paramics have been calibrated against site specific headway and speed data extracted from loop detectors in the United Kingdom.

The specific parameters used in ? calibration are presented in Appendix X.

4.2 Summary of Results

4.2.1 AM

The AM Peak period was calibrated according to the rigorous set of criteria listed in Table 4.1. For all intersections (for which CS collected 5-minute turning count data), CS calibrated the model to four values: gross intersection volumes; intersection approach volumes; intersection depart volumes; and intersection turning movements. The full intersection listing is given in Table 4.4. For each of the four values, CS attempted to match a specific relative error to a proposed goal. In some cases, for low volume intersections, a value was considered matched if it met a given volume of counts, noted in Table 4.1 as 'or within this range.' CS met all intersection goals for the AM Weekday Peak Period, both for the period as a whole and for three sub-hour periods within the peak period.

CS also calibrated ten critical links to within a given relative error for the AM Weekday Peak Period for both the period as a whole and for three sub-hour periods within the peak period. These numbers, the percentages within which they were calibrated, as well as the total difference in number of vehicles between the model and counts are given in Table 4.1. The 'subset' at the bottom of the table refers to the number of data points for each type of calibration metric. Grayed values indicate (non-target) reference values.

4.2.2 PM

The PM Peak period was calibrated according to the rigorous set of criteria listed in Table 4.2. For all intersections (for which CS collected 5-minute turning count data), CS calibrated the model to four values: gross intersection volumes; intersection approach volumes; intersection depart volumes; and intersection turning movements. The full intersection listing is given in Table 4.4. For each of the four values, CS attempted to match a specific relative error to a proposed goal. In some cases, for low volume intersections, a value was considered matched if it met a given volume of counts, noted in Table 4.2 as 'or within this range.' CS met all intersection goals for the PM Weekday Peak

Period, both for the period as a whole and for three sub-hour periods within the peak period.

CS also calibrated ten critical links to within a given relative error for the PM Weekday Peak Period for both the period as a whole and for three sub-hour periods within the peak period. These numbers, the percentages within which they were calibrated, as well as the total difference in number of vehicles between the model and counts are given in Table 4.2. The 'subset' at the bottom of the table refers to the number of data points for each type of calibration metric. Grayed values indicate (non-target) reference values.

4.2.2 Weekend

The Weekend Peak period was calibrated according to the rigorous set of criteria listed in Table 4.3. For all intersections (for which CS collected 5-minute turning count data), CS calibrated the model to four values: gross intersection volumes; intersection approach volumes; intersection depart volumes; and intersection turning movements. The full intersection listing is given in Table 4.4. For each of the four values, CS attempted to match a specific relative error to a proposed goal. In some cases, for low volume intersections, a value was considered matched if it met a given volume of counts, noted in Table 4.3 as 'or within this range.' CS met all intersection goals for the Weekend Peak Period, both for the period as a whole and for three sub-hour periods within the peak period.

CS also calibrated ten critical links to within a given relative error for the Weekend Peak Period for both the period as a whole and for three sub-hour periods within the peak period. These numbers, the percentages within which they were calibrated, as well as the total difference in number of vehicles between the model and counts are given in Table 4.3. The 'subset' at the bottom of the table refers to the number of data points for each type of calibration metric. Grayed values indicate (non-target) reference values.

Table 4.1 Weekday AM Calibration Results

period	measure	Intersections: gross volumes	Intersections: approach volumes	Intersections: depart volumes	Intersections: turn movements	Links: golden gate (EB)	Links: golden gate (WB)	Links: park presidio (NB)	Links: park presidio (SB)	Links: doyle (EB)	Links: doyle (WB)	Links: marina (EB)	Links: marina (WB)	Links: lombard (EB)	Links: lombard (WB)
	goal	80%	70%	65%	60%	1	1	1	1	1	1	1	1	1	1
Entire Peak Period	relative error	10%	20%	20%	30%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
(6:30 AM - 9:00 AM)	or within this range	350	200	200	75										
150 minutes	match	**86%**	**76%**	**69%**	**67%**	**-10%**	**-8%**	**6%**	**3%**	**1%**	**10%**	**-1%**	**-6%**	**-2%**	**8%**
	vehicles off by					-1313	-549	402	152	80	400	-70	-100	-128	192
3 Sub-Peak Periods	goal	80%	70%	70%	60%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
50 Min Periods	relative error	20%	30%	30%	40%	15%	15%	15%	15%	10%	15%	15%	15%	15%	15%
(6:30 AM - 7:20 AM)	or within this range	125	75	75	25	500	500	500	500	500	500	500	500	500	500
(7:20 AM - 8:10 AM)	match	**82%**	**78%**	**73%**	**69%**	**100%**	**100%**	**100%**	**100%**	**67%**	**100%**	**100%**	**100%**	**100%**	**100%**
(8:10 AM - 9:00 AM)	vehicles off by (avg)					-438	-183	134	51	27	133	-23	-33	-43	64
	relative error	20%	30%	30%	40%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Peak Hour	or within this range	220	110	110	55										
(7:45 AM - 8:45 AM)	match	86%	78%	73%	76%	1	1	0	1	1	1	0	1	1	1
	vehicles off by					-587	-73	142	372	-511	45	-453	-134	-174	53
summary	subset	42	152	153	404	1	1	1	1	1	1	1	1	1	1

Table 4.2 Weekday PM Calibration Results

		Intersections				Links									
period	**measure**	gross volumes	approach volumes	depart volumes	turn movements	doyle (EB)	doyle (WB)	golden gate (EB)	golden gate (WB)	lombard (EB)	lombard (WB)	marina (EB)	marina (WB)	park presidio (NB)	park presidio (SB)
	goal	80%	75%	70%	65%	1	1	1	1	1	1	1	1	1	1
Entire Peak Period	relative error	20%	25%	25%	35%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
(4:00 - 6:30 PM)	or within this range	400	300	300	150										
150 minutes	match	**84%**	**79%**	**72%**	**75%**	**-7%**	**2%**	**-15%**	**-2%**	**-12%**	**5%**	**-2%**	**4%**	**11%**	**-2%**
	vehicles off by					-370	140	-1191	-263	-434	276	-32	179	179	179
3 Sub-Peak Periods	goal	75%	70%	65%	60%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
50 Min Periods	relative error	20%	30%	30%	40%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
(4:00 - 4:50 PM)	or within this range	150	100	100	50	500	500	500	500	500	500	500	500	500	500
(4:50 - 5:40 PM)	match	**77%**	**79%**	**72%**	**76%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
(5:40 - 6:30 PM)	vehicles off by (avg)					-123	47	-397	-88	-145	92	-11	60	220	-42
	relative error	30%	40%	40%	50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Peak Hour	or within this range	250	150	150	100	500	500	500	500	500	500	500	500	500	500
	match	82%	0%	79%	86%	1	1	1	1	1	1	1	1	1	1
summary	subset	44	155	153	404	1	1	1	1	1	1	1	1	1	1

Table 4.3 Weekday PM Calibration Results

		Intersections						Links							
period	**measure**	gross volumes	approach volumes	depart volumes	turn movements	golden gate (EB)	golden gate (WB)	doyle (EB)	doyle (WB)	lombard (EB)	lombard (WB)	marina (EB)	marina (WB)	park presidio (NB)	park presidio (SB)
	goal	85%	75%	70%	70%	1	1	1	1	1	1	1	1	1	1
Entire Peak Period	relative error	25%	25%	25%	25%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
(4:00 - 6:30 PM)	or within this range	300	300	100	100										
150 minutes	match	**100%**	**79%**	**71%**	**71%**	**-5%**	**-16%**	**15%**	**2%**	**12%**	**-7%**	**11%**	**-12%**	**-15%**	**5%**
	vehicles off by					-487	-1289	854	133	389	-286	285	-257	-879	299
3 Sub-Peak Periods	goal	70%	60%	60%	50%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
50 Min Periods	relative error	30%	40%	40%	50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
(4:00 - 4:50 PM)	or within this range	250	150	150	100	500	500	500	500	500	500	500	500	500	500
(4:50 - 5:40 PM)	match	**100%**	**81%**	**74%**	**81%**	**100%**	**33%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
(5:40 - 6:30 PM)	vehicles off by (avg)					-162	-369	285	44	130	-95	95	-86	-293	100
	relative error	30%	40%	40%	50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Peak Hour	or within this range	250	150	150	100	500	500	500	500	500	500	500	500	500	500
	match	100%	86%	71%	82%	1	1	1	1	1	1	1	1	1	1
summary	subset	4	14	14	34	1	1	1	1	1	1	1	1	1	1

Table 4.4 Listing of Intersections Used in Calibration

AREA A	1	Marina	Fillmore
	2	Marina	Scott/Cervantes
	3	Marina	Divisadero
	4	Marina	Broderick
	5	Marina	Baker
	6	Marina	Lyon/Mason
	7	Lombard	Fillmore
	8	Lombard	Scott
	9	Lombard	Divisadero
	10	Lombard	Broderick
	11	Lombard	Baker
	12	Lombard	Richardson
	13	Richardson	Baker
	14	Richardson	Francisco
	15	Divisadero	Jefferson
	16	Divisadero	North Point
	17	Divisadero	Chestnut
	18	Divisadero	Greenwich
	19	Broderick	Beach
	20	Broderick	Bay
	21	Baker	North Point
	22	Mason	near Bank
	23	Crissy Field	McDowell
	24	Lincoln	Hoffman (Armistead)
	25	Lincoln	Kobbe
AREA B	26	Lincoln	Sheridan
	27	Arguello	Moraga
	28	Lombard	Presidio
	29	Lombard	Lyon
AREA C	30	El Camino Del Mar	26th Avenue
	31	El Camino Del Mar	25th Avenue
	32	Lake	25th Avenue
	33	Lake	15th Avenue
	34	Lake	14th Avenue
	35	Lake	12th Avenue
	36	Lake	Arguello
	37	California	26th Avenue
	38	California	25th Avenue

	39	California	15th Avenue
	40	California	14th Avenue
	41	California	Funston
	42	California	Arguello
	43	Sacramento	Arguello
	44	West Pacific	Arguello
	45	Presidio	Pacific
	46	Presidio	Jackson
	47	Presidio	West Broadway
	48	Presidio	West Pacific
	49	Lyon	Jackson

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MEMORANDUM

Date: January 29, 2002

To: Dina Potter, PBQD

Joe Story, DKS Associates

From: Joe Castiglione, SFCTA

Subject: 2030 Doyle Drive Travel Demand Forecasting Methodology

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The purpose of this memo is to describe the methodology used to develop forecasts of regional travel demand in order to support the analysis requirements of the Doyle Drive Environmental & Design Study. A primary feature of this effort is that it involved developing forecasts for the year 2030, which is beyond the horizon year of all current forecasts of population, land use, and transporation system changes. The current San Francisco and MTC model horizon years are 2020. However, using new 2025 travel demand and land use forecasts prepared by MTC and ABAG, it was possible to develop 2030 forecasts. The following paragraphs describe the specific steps involved in developing these 2030 forecasts, based on the structure of the San Francisco Travel Demand Forecast Model and MTC's Baycast Model.

The San Francisco Travel Demand Model was developed to support the Doyle Drive Environmental & Design Study and other transportation and land use planning analyses in San Francisco. The San Francisco Model provides detailed forecasts of San Francisco residents' travel behavior, which is then integrated with forecasts of regional travel produced by the Metropolitan Transportation Commission's (MTC) 9-county "Baycast" model. This integrated demand is then assigned to regional highway and transit networks to provide forecast volumes.

The current horizon year for the San Francisco model is 2020. The selection of this horizon year was influenced by two primary factors. First, until recently, 2020 was the furthest future year for which land use forecasts were available from the Association of Bay Area Governments (ABAG). ABAG's forecasts of households, population and employment are key inputs needed to develop the detailed TAZ-level land use forecasts used in the San Francisco model. ABAG's forecasts also function as critical model constraints – in order to be "consistent" with MTC's regional model, San Francisco must not exceed ABAG's forecasts for total households, population, employed residents, and employment. The second factor influencing the choice of 2020 as a horizon year is that this was the furthest future year for which MTC model outputs were available. Because the San Francisco model relies on the MTC model for forecasts of regional demand, this is also a critical constraint.

To satisfy the analysis needs of the Doyle Drive Environmental & Design Study, it was necessary to develop travel demand forecasts for a 2030 horizon year, which is beyond the time frame of the latest available regional land use and travel demand forecasts. This memo describes the methodology used to develop these 2030 travel demand forecasts, based the best available regional land use and travel demand forecasts. The approach involved two primary steps: 1) developing 2030 inputs for the San Francisco travel demand forecast model, and 2) developing 2030 regional travel demand "trip tables." Each step is described in detail below.

In order to develop 2030 forecasts of San Francisco resident travel demand, it was necessary to develop 2030 inputs to the San Francisco travel demand forecast model. MTC's 2020 and 2025 forecasts of households, population, employed residents and employment were used to accomplish this goal. MTC has developed 2025 land use forecasts using information from ABAG's regional economic models. MTC's 2020 and 2025 land use forecasts were compared by MTAZ (MTC Travel Analysis Zone) to calculate growth rates for households, household population, employed residents and employees. The more detailed San Francisco model zones nest within the MTAZ system, so the calculated MTAZ growth rates were applied to the SFTAZ's within each given MTAZ. Separate growth rates were calculated for changes in households, household population, employed residents and employment. A single employment growth rate was applied to all the various employment sectors because more detailed, sector-specific information was not available. These 2020-2025 growth rates were first applied to the existing San Francisco model 2020 land use inputs in order to develop 2025 forecasts. The 2020-2025 growth rates were then applied a second time, to the new 2025 forecasts, in order to develop 2030 land use inputs.

One important exception to the forecasts of households, household population, employed residents and employment was the Presidio. All 2030 land use assumptions used in the Presidio were consistent with the 2020 land use assumptions of the PTIP New Draft Plan Alternative scenario provided by the Presidio Trust.

At the time the forecasts were prepared, there was no additional information on changes to the regional transportation system beyond 2020, so the input highway and transit networks used in 2030 forecasts were the 2020 networks. The San Francisco Model was then run using the 2030 land use inputs and networks, and produced 2030 forecasts of San Francisco residents' travel.

In order to develop 2030 forecasts of regional traveler demand, forecasts of 2025 travel demand provided to the San Francisco County Transportation Authority (SFCTA) by MTC were extrapolated to 2030. These 2025 forecasts, however, were "pre-mode choice" meaning that specific modes used by travelers (Drive Alone, Shared Ride 2, Shared Ride 3+, Transit-Walk Access, Transit-Drive Access, Bike, and Walk) had not been assigned to the trips. Therefore, there were two steps involved in developing the 2030 forecasts of regional demand. The first involved predicting the total demand for travel in 2030 by pivoting off of the 2025 demand provided by MTC. The second step involved assigning a specific mode for all the trips in this new 2030 demand.

In order to predict the total 2030 regional travel demand, a set of trip purpose-specific growth factors was developed, based on the 2020-2025 land use changes, and were then applied to the

2025 trip tables. For home based work trips, we proposed to use a "fratar" distribution approach. The fratar method modifies a matrix of values based upon a set of production and attraction factors for each of the zones in the matrix. The process is a relatively simple iterative one: In the first iteration, each row in the matrix is factored according to its production factor. At the end of the iteration, the row totals will match the target row values, but the column totals will most likely not match their targets. In the second iteration each column in the modified matrix is factored according its attraction factor. At then end of the iteration, the column totals will match the target column values, but the row totals may not match their targets. This process continues for some number of iterations; the row and column totals should converge towards the target totals. When the criteria for convergence is met, the process is complete. Growth in employed residents was used as the production factor and growth in employment was used as the attraction factor.

To develop 2030 home-based school, shopping, and social and recreation trips a simpler method was used, where the 2020-2025 growth in households was used as a simple factor applied to the production end of these trip purposes using the 2025 trip tables from MTC. A similar, simple method was also used to develop 2030 non-home based trips, but for this purpose growth in employment, rather than households, was used as the production end factor.

Once the forecasts of total demand were estimated using the 2025 trip tables and the 2020-2025 growth rates, it was necessary to assign specific modes to these trips. Purpose- and geographic-specific mode splits were developed from MTC's 2005 forecasts of regional demand. 2005 was selected because it was the furthest year for which MTC has applied and tested their current mode choice model. The mode splits were then applied to the total predicted 2030 regional demand by purpose. The resultant product was a set of 2030 trip tables, disaggregated by MTC's modes.

Upon completing the creation of the 2030 regional travel demand forecasts and the 2030 San Francisco model inputs, the San Francisco model stream was run. The San Francisco model predicted the 2030 behavior of San Francisco residents, and then integrated this demand with the regional 2030 demand which was extrapolated from the 2025 regional trip tables.

Table 1 shows the differences between the original Projections2000-based and updated Projections2002-based 2030 forecasts for San Francisco and Bay Area population, households, and employment. The revised assumptions show slightly more households, population, and jobs in San Francisco, while regional households, population and jobs are virtually unchanged.

Table1. Proj2000-based and Proj2002-based Year 2030 Forecasts

	SF		BAY AREA	
	Proj2000	Proj2002	Proj2000	Proj2002
Households	340,715	350,821	3,067,522	2,998,983
Household Population	778,743	798,203	8,292,292	8,269,932
Jobs	774,474	796,264	5,169,148	5,158,529

An important exception to the methodology of forecasting growth in households, household population, employed residents and employment was the Presidio. All 2030 land use assumptions for the Presidio in this update are consistent with the forecast land use assumptions of the PTMP scenario provided by the Presidio Trust. The PTMP scenario assumptions are slightly different than the Presidio assumptions used in the original Doyle analysis, which were based on the PTIP "preferred" alternative. Table 2 shows the differences between the PTIP and PTMP assumptions in the Presidio.

Table 2. Presidio Population and Employment Assumptions

	PTIP (original)	PTMP (update)
Household Population	3,907	3,986
Jobs	7,408	7,078

In order to develop 2030 forecasts of regional traveler demand, forecasts of 2025 travel demand produced to support MTC's 2001 RTP were provided to the San Francisco County Transportation Authority by MTC, and were extrapolated to 2030. In order to predict the total 2030 regional travel demand, a set of trip purpose-specific growth factors was developed, based on the 2020-2025 land use changes, and were then applied to the 2025 trip tables. For home based work trips, we proposed to use a "fratar" distribution approach. The fratar method modifies a matrix of values based upon a set of production and attraction factors for each of the zones in the matrix. The process is a relatively simple iterative one: In the first iteration, each row in the matrix is factored according to its production factor. At the end of the iteration, the row totals will match the target row values, but the column totals will most likely not match their targets. In the second iteration each column in the modified matrix is factored according its attraction factor. At then end of the iteration, the column totals will match the target column values, but the row totals may not match their targets. This process continues for some number of iterations; the row and column totals should converge towards the target totals. When the criteria for convergence is met, the process is complete. Growth in employed residents was used as the production factor and growth in employment was used as the attraction factor.

To develop 2030 home-based school, shopping, and social and recreation trips a simpler method was used, where the 2020-2025 growth in households was used as a simple factor applied to the production end of these trip purposes using the 2025 trip tables from MTC. A similar, simple method was also used to develop 2030 non-home based trips, but for this purpose growth in employment, rather than households, was used as the production end factor.

The transportation networks used to support the analysis were based on MTC's 2001 RTP 2025 "Project" networks, and include all likely major transportation projects in the region. Additional refinements to the San Francisco networks, such as MUNI service changes, were also incorporated into the future year networks. At the time the forecasts were prepared, there was no additional information on changes to the regional transportation system beyond 2025, so the input highway and transit networks used in 2030 forecasts were the 2025 networks. Upon completing the creation of the 2030 regional travel demand forecasts and the 2030 San Francisco model inputs, the San Francisco model stream was run. The San Francisco model predicted the 2030 behavior of San Francisco residents, and then integrated this demand with the regional 2030 demand which was extrapolated from the 2025 regional trip tables.

APPENDIX C

DETAILED INTERSECTION LEVEL OF SERVICE CALCULATIONS

2000

(Existing Conditions) AM

Movement	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0		4.0	
Lane Util. Factor	0.97	1.00			1.00		1.00		0.88	
Frt	1.00	0.85			1.00		0.85		0.85	
Flt Protected	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (prot)	3433	1583			1770		1583		2787	
Flt Permitted	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (perm)	3433	1583			1770		1583		2787	
Volume (vph)	228	23	0	0	118	0	6	0	557	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	228	23	0	0	118	0	6	0	557	8
Lane Group Flow (vph)	228	23	0	0	118	0	6	0	565	0
Turn Type		Free		custom	Prot		custom			
Protected Phases	8				2				8	
Permitted Phases		Free		2			2		8	
Actuated Green, G (s)	35.0	75.0			32.0		32.0		35.0	
Effective Green, g (s)	35.0	75.0			32.0		32.0		35.0	
Actuated g/C Ratio	0.47	1.00			0.43		0.43		0.47	
Clearance Time (s)	4.0				4.0		4.0		4.0	
Lane Grp Cap (vph)	1602	1583			755		675		1301	
v/s Ratio Prot	0.07				c0.07				c0.20	
v/s Ratio Perm		0.01					0.00			
v/c Ratio	0.14	0.01			0.16		0.01		0.43	
Uniform Delay, d1	11.4	0.0			13.2		12.4		13.4	
Progression Factor	1.00	1.00			1.00		1.00		1.00	
Incremental Delay, d2	0.2	0.0			0.4		0.0		1.1	
Delay (s)	11.6	0.0			13.6		12.4		14.4	
Level of Service	B	A			B		B		B	
Approach Delay (s)	10.5		0.0		13.6			14.4		
Approach LOS	B		A		B			B		

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95			1.00			0.91	1.00		0.91	
Frt		1.00			0.89			1.00	0.85		1.00	
Flt Protected		0.96			1.00			1.00	1.00		1.00	
Satd. Flow (prot)		3409			1663			5085	1583		5085	
Flt Permitted		0.75			1.00			1.00	1.00		1.00	
Satd. Flow (perm)		2659			1663			5085	1583		5085	
Volume (vph)	179	64	3	0	7	27	0	3092	625	0	1237	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	179	64	3	0	7	27	0	3092	625	0	1237	0
Lane Group Flow (vph)	0	246	0	0	34	0	0	3092	625	0	1237	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0	90.0		51.0	
Effective Green, g (s)		31.0			31.0			51.0	90.0		51.0	
Actuated g/C Ratio		0.34			0.34			0.57	1.00		0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		916			573			2882	1583		2882	
v/s Ratio Prot					0.02			c0.61			0.24	
v/s Ratio Perm		0.09							0.39			
v/c Ratio		0.27			0.06			1.07	0.39		0.43	
Uniform Delay, d1		21.3			19.7			19.5	0.0		11.2	
Progression Factor		1.00			1.00			1.00	1.00		0.12	
Incremental Delay, d2		0.7			0.2			40.3	0.7		0.4	
Delay (s)		22.0			19.9			59.8	0.7		1.7	
Level of Service		C			B			E	A		A	
Approach Delay (s)		22.0			19.9			49.8			1.7	
Approach LOS		C			B			D			A	

Intersection Summary			
HCM Average Control Delay	37.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	334	4	6	12	41	63
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	334	4	6	12	41	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	18				684	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				87	94
cM capacity (veh/h)	1599				328	1069

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	338	18	104
Volume Left	334	0	41
Volume Right	0	12	63
cSH	1599	1700	565
Volume to Capacity	0.21	0.01	0.18
Queue Length (ft)	20	0	17
Control Delay (s)	7.8	0.0	12.8
Lane LOS	A		B
Approach Delay (s)	7.8	0.0	12.8
Approach LOS			B

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	1	256	57	352	64	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1	256	57	352	64	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	532	66	67			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	74	96			
cM capacity (veh/h)	490	998	1535			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	257	409	67
Volume Left	1	57	0
Volume Right	256	0	3
cSH	994	1535	1700
Volume to Capacity	0.26	0.04	0.04
Queue Length (ft)	26	3	0
Control Delay (s)	9.9	1.3	0.0
Lane LOS	A	A	
Approach Delay (s)	9.9	1.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	82	154	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	82	154	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	154				195	77
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1424				776	968

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	27	55	103	51	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1424	1700	1700	1700	1700
Volume to Capacity	0.00	0.03	0.06	0.03	0.00
Queue Length (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1140	1	0	593	10	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1140	1	0	593	10	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	760	381	198	395	10
Volume Left (vph)	0	0	0	0	10
Volume Right (vph)	0	1	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	5.4	5.4	7.7	7.7	7.0
Degree Utilization, x	1.15	0.58	0.42	0.85	0.02
Capacity (veh/h)	656	653	423	451	501
Control Delay (s)	103.4	14.4	15.1	39.3	10.1
Approach Delay (s)	73.7		31.2		10.1
Approach LOS	F		D		B

Intersection Summary			
Delay	58.9		
HCM Level of Service	F		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1180	3	0	645	39	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1180	3	0	645	39	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	787	396	215	430	39
Volume Left (vph)	0	0	0	0	39
Volume Right (vph)	0	3	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	5.7	5.7	8.0	8.0	7.1
Degree Utilization, x	1.25	0.63	0.48	0.96	0.08
Capacity (veh/h)	626	613	413	430	501
Control Delay (s)	142.0	16.6	17.0	60.1	10.6
Approach Delay (s)	100.0		45.7		10.6
Approach LOS	F		E		B

Intersection Summary			
Delay	79.4		
HCM Level of Service	F		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.91			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1861			1688			5061			5084	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1858			1688			5061			5084	
Volume (vph)	7	482	0	0	23	52	0	2421	80	0	1190	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	7	482	0	0	23	52	0	2421	80	0	1190	2
Lane Group Flow (vph)	0	489	0	0	75	0	0	2501	0	0	1192	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		640			581			2868			2881	
v/s Ratio Prot					0.04			c0.49			0.23	
v/s Ratio Perm		c0.26										
v/c Ratio		0.76			0.13			0.87			0.41	
Uniform Delay, d1		26.2			20.2			16.7			11.0	
Progression Factor		1.00			1.00			0.45			1.12	
Incremental Delay, d2		8.4			0.5			0.4			0.4	
Delay (s)		34.7			20.7			7.9			12.8	
Level of Service		C			C			A			B	
Approach Delay (s)		34.7			20.7			7.9			12.8	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3610		1611	4990	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3610		1611	4990	
Volume (vph)	216	1169	0	208	2391	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	216	1169	0	208	2391	0
Lane Group Flow (vph)	216	1169	0	208	2391	0
Turn Type		custom		custom	Prot	
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	492	3610		448	3160	
v/s Ratio Prot	0.12			c0.13	c0.48	
v/s Ratio Perm		0.32				
v/c Ratio	0.44	0.32		0.46	0.76	
Uniform Delay, d1	26.7	0.0		26.9	11.6	
Progression Factor	0.75	1.00		1.00	0.99	
Incremental Delay, d2	2.6	0.2		3.4	0.8	
Delay (s)	22.5	0.2		30.4	12.3	
Level of Service	C	A		C	B	
Approach Delay (s)	3.7		30.4		12.3	
Approach LOS	A		C		B	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.92	
Flt Protected		1.00			1.00			0.95			0.99	
Satd. Flow (prot)		4969			5083			1771			1692	
Flt Permitted		1.00			1.00			0.76			0.96	
Satd. Flow (perm)		4969			5083			1401			1649	
Volume (vph)	0	2283	410	0	1384	4	71	1	2	6	5	17
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2283	410	0	1384	4	71	1	2	6	5	17
Lane Group Flow (vph)	0	2693	0	0	1388	0	0	74	0	0	28	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3037			3106			420			495	
v/s Ratio Prot		c0.54			0.27							
v/s Ratio Perm								c0.05			0.02	
v/c Ratio		0.89			0.45			0.18			0.06	
Uniform Delay, d1		14.9			9.4			23.3			22.4	
Progression Factor		1.65			1.00			1.00			1.00	
Incremental Delay, d2		3.0			0.5			0.9			0.2	
Delay (s)		27.6			9.8			24.2			22.6	
Level of Service		C			A			C			C	
Approach Delay (s)		27.6			9.8			24.2			22.6	
Approach LOS		C			A			C			C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	232	163	94	5	274	6	111	34	8	19	206	236
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	232	163	94	5	274	6	111	34	8	19	206	236

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	489	285	153	461
Volume Left (vph)	232	5	111	19
Volume Right (vph)	94	6	8	236
Hadj (s)	0.0	0.0	0.1	-0.3
Departure Headway (s)	6.5	6.3	7.5	6.3
Degree Utilization, x	0.88	0.50	0.32	0.81
Capacity (veh/h)	547	471	422	461
Control Delay (s)	39.5	15.5	14.0	31.0
Approach Delay (s)	39.5	15.5	14.0	31.0
Approach LOS	E	C	B	D

Intersection Summary			
Delay	29.0		
HCM Level of Service	D		
Intersection Capacity Utilization	90.3%	ICU Level of Service	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	2	1	0	0	8	8	0	491	8	11	515	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	2	1	0	0	8	8	0	491	8	11	515	60

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	3	16	499	586
Volume Left (vph)	2	0	0	11
Volume Right (vph)	0	8	8	60
Hadj (s)	0.2	-0.3	0.0	0.0
Departure Headway (s)	6.3	4.8	4.5	4.4
Degree Utilization, x	0.01	0.02	0.63	0.72
Capacity (veh/h)	507	549	781	804
Control Delay (s)	9.3	7.9	15.0	18.0
Approach Delay (s)	9.3	7.9	15.0	18.0
Approach LOS	A	A	B	C

Intersection Summary			
Delay	16.4		
HCM Level of Service	C		
Intersection Capacity Utilization	47.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		0.91			0.91	
Frt	1.00	0.99			1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00			1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	1847			1863	1583		5085			4974	
Flt Permitted	0.76	1.00			1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1407	1847			1863	1583		5085			4974	
Volume (vph)	308	66	4	0	4	77	0	1994	0	0	2033	347
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	308	66	4	0	4	77	0	1994	0	0	2033	347
Lane Group Flow (vph)	308	70	0	0	4	77	0	1994	0	0	2380	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	29.0	29.0			29.0	29.0		53.0			53.0	
Effective Green, g (s)	29.0	29.0			29.0	29.0		53.0			53.0	
Actuated g/C Ratio	0.32	0.32			0.32	0.32		0.59			0.59	
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	453	595			600	510		2995			2929	
v/s Ratio Prot		0.04			0.00			0.39			c0.48	
v/s Ratio Perm	c0.22					0.05						
v/c Ratio	0.68	0.12			0.01	0.15		0.67			0.81	
Uniform Delay, d1	26.5	21.5			20.7	21.7		12.5			14.6	
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	
Incremental Delay, d2	8.0	0.4			0.0	0.6		1.2			2.6	
Delay (s)	34.5	21.9			20.7	22.4		13.7			17.2	
Level of Service	C	C			C	C		B			B	
Approach Delay (s)		32.1			22.3			13.7			17.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	C

c Critical Lane Group

2000

(Existing Conditions) PM

Movement	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0		4.0	
Lane Util. Factor	0.97	1.00			1.00		1.00		0.88	
Frt	1.00	0.85			1.00		0.85		0.85	
Flt Protected	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (prot)	3433	1583			1770		1583		2787	
Flt Permitted	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (perm)	3433	1583			1770		1583		2787	
Volume (vph)	1318	442	0	0	14	0	499	0	873	19
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1318	442	0	0	14	0	499	0	873	19
Lane Group Flow (vph)	1318	442	0	0	14	0	499	0	892	0
Turn Type		Free		custom	Prot		custom			
Protected Phases	8				2				8	
Permitted Phases		Free		2			2		8	
Actuated Green, G (s)	35.0	75.0			32.0		32.0		35.0	
Effective Green, g (s)	35.0	75.0			32.0		32.0		35.0	
Actuated g/C Ratio	0.47	1.00			0.43		0.43		0.47	
Clearance Time (s)	4.0				4.0		4.0		4.0	
Lane Grp Cap (vph)	1602	1583			755		675		1301	
v/s Ratio Prot	c0.38				0.01				0.32	
v/s Ratio Perm		0.28					0.32			
v/c Ratio	0.82	0.28			0.02		0.74		0.69	
Uniform Delay, d1	17.3	0.0			12.4		18.0		15.7	
Progression Factor	1.00	1.00			1.00		1.00		1.00	
Incremental Delay, d2	4.9	0.4			0.0		7.1		3.0	
Delay (s)	22.2	0.4			12.5		25.1		18.6	
Level of Service	C	A			B		C		B	
Approach Delay (s)	16.8		0.0		24.8			18.6		
Approach LOS	B		A		C			B		

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95			1.00			0.91	1.00		0.91	
Frt		0.95			0.88			1.00	0.85		1.00	
Flt Protected		0.98			1.00			1.00	1.00		1.00	
Satd. Flow (prot)		3267			1637			5085	1583		5085	
Flt Permitted		0.78			1.00			1.00	1.00		1.00	
Satd. Flow (perm)		2611			1637			5085	1583		5085	
Volume (vph)	41	13	31	0	30	262	0	1573	161	0	2472	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	13	31	0	30	262	0	1573	161	0	2472	0
Lane Group Flow (vph)	0	85	0	0	292	0	0	1573	161	0	2472	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0	90.0		51.0	
Effective Green, g (s)		31.0			31.0			51.0	90.0		51.0	
Actuated g/C Ratio		0.34			0.34			0.57	1.00		0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		899			564			2882	1583		2882	
v/s Ratio Prot					c0.18			0.31			c0.49	
v/s Ratio Perm		0.03							0.10			
v/c Ratio		0.09			0.52			0.55	0.10		0.86	
Uniform Delay, d1		20.0			23.5			12.2	0.0		16.4	
Progression Factor		1.00			1.00			1.00	1.00		0.26	
Incremental Delay, d2		0.2			3.4			0.7	0.1		2.3	
Delay (s)		20.2			26.9			13.0	0.1		6.6	
Level of Service		C			C			B	A		A	
Approach Delay (s)		20.2			26.9			11.8			6.6	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	333	4	23	239	17	85
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	333	4	23	239	17	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	262				812	142
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	74				93	91
cM capacity (veh/h)	1302				259	905

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	337	262	102
Volume Left	333	0	17
Volume Right	0	239	85
cSH	1302	1700	639
Volume to Capacity	0.26	0.15	0.16
Queue Length (ft)	26	0	14
Control Delay (s)	8.6	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	8.6	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	273	99	349	119	19
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	273	99	349	119	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	676	128	138			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	70	93			
cM capacity (veh/h)	390	921	1446			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	273	448	138
Volume Left	0	99	0
Volume Right	273	0	19
cSH	921	1446	1700
Volume to Capacity	0.30	0.07	0.08
Queue Length (ft)	31	6	0
Control Delay (s)	10.5	2.2	0.0
Lane LOS	B	A	
Approach Delay (s)	10.5	2.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	58.2%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	165	366	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	165	366	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	366				448	183
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1189				539	828

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	55	110	244	122	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1189	1700	1700	1700	1700
Volume to Capacity	0.00	0.06	0.14	0.07	0.00
Queue Length (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	854	0	0	1141	80	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	854	0	0	1141	80	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	569	285	380	761	80
Volume Left (vph)	0	0	0	0	80
Volume Right (vph)	0	0	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	6.3	6.3	8.4	8.4	7.1
Degree Utilization, x	1.00	0.50	0.89	1.77	0.16
Capacity (veh/h)	565	560	420	434	502
Control Delay (s)	61.6	14.3	47.6	375.2	11.4
Approach Delay (s)	45.9		266.0		11.4
Approach LOS	E		F		B

Intersection Summary			
Delay	165.6		
HCM Level of Service	F		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	927	44	0	1193	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	927	44	0	1193	2	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	618	353	398	795	2
Volume Left (vph)	0	0	0	0	2
Volume Right (vph)	0	44	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	6.1	6.1	8.3	8.3	7.1
Degree Utilization, x	1.05	0.59	0.92	1.84	0.00
Capacity (veh/h)	583	576	398	437	500
Control Delay (s)	74.8	16.3	53.3	404.6	10.1
Approach Delay (s)	53.5		287.5		10.1
Approach LOS	F		F		B

Intersection Summary			
Delay	182.3		
HCM Level of Service	F		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.89			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1862			1656			5085			5085	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1860			1653			5085			5085	
Volume (vph)	2	314	0	3	68	324	0	1392	0	0	2184	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	314	0	3	68	324	0	1392	0	0	2184	2
Lane Group Flow (vph)	0	316	0	0	395	0	0	1392	0	0	2186	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		641			569			2882			2882	
v/s Ratio Prot								0.27			c0.43	
v/s Ratio Perm		0.17			c0.24							
v/c Ratio		0.49			0.69			0.48			0.76	
Uniform Delay, d1		23.3			25.4			11.6			14.8	
Progression Factor		1.00			1.00			0.38			1.00	
Incremental Delay, d2		2.7			6.8			0.5			1.6	
Delay (s)		26.0			32.3			4.9			16.4	
Level of Service		C			C			A			B	
Approach Delay (s)		26.0			32.3			4.9			16.4	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3610		1611	4990	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3610		1611	4990	
Volume (vph)	227	2143	0	127	1362	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	227	2143	0	127	1362	0
Lane Group Flow (vph)	227	2143	0	127	1362	0
Turn Type		custom		custom	Prot	
Protected Phases	8			4	2	
Permitted Phases		2 8		4		
Actuated Green, G (s)	33.0	90.0		33.0	49.0	
Effective Green, g (s)	33.0	90.0		33.0	49.0	
Actuated g/C Ratio	0.37	1.00		0.37	0.54	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	649	3610		591	2717	
v/s Ratio Prot	0.13			0.08	0.27	
v/s Ratio Perm		0.59				
v/c Ratio	0.35	0.59		0.21	0.50	
Uniform Delay, d1	20.7	0.0		19.6	12.8	
Progression Factor	0.69	1.00		1.00	0.58	
Incremental Delay, d2	0.8	0.4		0.8	0.6	
Delay (s)	15.0	0.4		20.4	8.1	
Level of Service	B	A		C	A	
Approach Delay (s)	1.8		20.4		8.1	
Approach LOS	A		C		A	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	53.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.99			1.00			1.00			0.95	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5018			5082			1775			1741	
Flt Permitted		1.00			1.00			0.72			0.88	
Satd. Flow (perm)		5018			5082			1332			1562	
Volume (vph)	0	1463	142	0	2115	8	412	10	3	9	6	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1463	142	0	2115	8	412	10	3	9	6	8
Lane Group Flow (vph)	0	1605	0	0	2123	0	0	425	0	0	23	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2453			2485			562			660	
v/s Ratio Prot		0.32			c0.42							
v/s Ratio Perm								c0.32			0.01	
v/c Ratio		0.65			0.85			0.76			0.03	
Uniform Delay, d1		17.3			20.2			22.1			15.2	
Progression Factor		1.36			1.00			1.00			1.00	
Incremental Delay, d2		1.3			4.0			9.2			0.1	
Delay (s)		24.7			24.2			31.2			15.3	
Level of Service		C			C			C			B	
Approach Delay (s)		24.7			24.2			31.2			15.3	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	30	258	92	7	352	16	104	52	19	22	127	140
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	30	258	92	7	352	16	104	52	19	22	127	140

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	380	375	175	289
Volume Left (vph)	30	7	104	22
Volume Right (vph)	92	16	19	140
Hadj (s)	-0.1	0.0	0.1	-0.2
Departure Headway (s)	6.0	6.4	6.8	6.2
Degree Utilization, x	0.63	0.66	0.33	0.50
Capacity (veh/h)	573	506	467	547
Control Delay (s)	18.7	21.1	13.2	15.3
Approach Delay (s)	18.7	21.1	13.2	15.3
Approach LOS	C	C	B	C

Intersection Summary			
Delay	17.8		
HCM Level of Service	C		
Intersection Capacity Utilization	74.5%	ICU Level of Service	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	48	10	0	4	79	22	0	504	3	13	491	30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	48	10	0	4	79	22	0	504	3	13	491	30

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	58	105	507	534
Volume Left (vph)	48	4	0	13
Volume Right (vph)	0	22	3	30
Hadj (s)	0.2	-0.1	0.0	0.0
Departure Headway (s)	6.7	5.5	5.1	5.0
Degree Utilization, x	0.11	0.16	0.71	0.74
Capacity (veh/h)	475	509	691	708
Control Delay (s)	10.5	9.5	19.6	21.1
Approach Delay (s)	10.5	9.5	19.6	21.1
Approach LOS	B	A	C	C

Intersection Summary			
Delay	18.9		
HCM Level of Service	C		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.94		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	1758		1770	1863	1583		5085			4969	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1332	1758		1402	1863	1583		5085			4969	
Volume (vph)	230	5	3	1	64	437	0	2101	1	0	1907	344
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	230	5	3	1	64	437	0	2101	1	0	1907	344
Lane Group Flow (vph)	230	8	0	1	64	437	0	2102	0	0	2251	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	34.0	34.0		34.0	34.0	34.0		48.0			48.0	
Effective Green, g (s)	34.0	34.0		34.0	34.0	34.0		48.0			48.0	
Actuated g/C Ratio	0.38	0.38		0.38	0.38	0.38		0.53			0.53	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	503	664		530	704	598		2712			2650	
v/s Ratio Prot		0.00			0.03			0.41			c0.45	
v/s Ratio Perm	0.17			0.00		0.28						
v/c Ratio	0.46	0.01		0.00	0.09	0.73		0.78			0.85	
Uniform Delay, d1	21.1	17.5		17.4	18.0	24.1		16.7			17.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.0	0.0		0.0	0.3	7.7		2.2			3.6	
Delay (s)	24.0	17.5		17.4	18.3	31.7		18.9			21.6	
Level of Service	C	B		B	B	C		B			C	
Approach Delay (s)		23.8			30.0			18.9			21.6	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E

c Critical Lane Group

2000

(Existing Conditions) WEEKEND

Movement	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER
Lane Configurations									
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0				4.0		4.0		4.0
Lane Util. Factor	0.97				1.00		1.00		0.88
Frt	1.00				1.00		0.85		0.85
Flt Protected	0.95				0.95		1.00		1.00
Satd. Flow (prot)	3433				1770		1583		2787
Flt Permitted	0.95				0.95		1.00		1.00
Satd. Flow (perm)	3433				1770		1583		2787
Volume (vph)	922	0	0	0	15	0	19	0	1076
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	922	0	0	0	15	0	19	0	1076
Lane Group Flow (vph)	922	0	0	0	15	0	19	0	1076
Turn Type		Free		custom	Prot		custom		
Protected Phases	8				2				8
Permitted Phases		Free		2			2		8
Actuated Green, G (s)	35.0				32.0		32.0		35.0
Effective Green, g (s)	35.0				32.0		32.0		35.0
Actuated g/C Ratio	0.47				0.43		0.43		0.47
Clearance Time (s)	4.0				4.0		4.0		4.0
Lane Grp Cap (vph)	1602				755		675		1301
v/s Ratio Prot	0.27				0.01				c0.39
v/s Ratio Perm							0.01		
v/c Ratio	0.58				0.02		0.03		0.83
Uniform Delay, d1	14.6				12.4		12.5		17.4
Progression Factor	1.00				1.00		1.00		1.00
Incremental Delay, d2	1.5				0.0		0.1		6.1
Delay (s)	16.1				12.5		12.6		23.5
Level of Service	B				B		B		C
Approach Delay (s)	16.1		0.0		12.5			23.5	
Approach LOS	B		A		B			C	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95			1.00			0.91	1.00		0.91	
Frt		0.96			0.90			1.00	0.85		1.00	
Flt Protected		0.99			1.00			1.00	1.00		1.00	
Satd. Flow (prot)		3347			1684			5085	1583		5085	
Flt Permitted		0.89			1.00			1.00	1.00		1.00	
Satd. Flow (perm)		3020			1684			5085	1583		5085	
Volume (vph)	21	36	22	0	33	81	0	2300	220	0	1581	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	21	36	22	0	33	81	0	2300	220	0	1581	0
Lane Group Flow (vph)	0	79	0	0	114	0	0	2300	220	0	1581	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0	90.0		51.0	
Effective Green, g (s)		31.0			31.0			51.0	90.0		51.0	
Actuated g/C Ratio		0.34			0.34			0.57	1.00		0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		1040			580			2882	1583		2882	
v/s Ratio Prot					c0.07			c0.45			0.31	
v/s Ratio Perm		0.03							0.14			
v/c Ratio		0.08			0.20			0.80	0.14		0.55	
Uniform Delay, d1		19.9			20.7			15.4	0.0		12.3	
Progression Factor		1.00			1.00			1.00	1.00		0.06	
Incremental Delay, d2		0.1			0.8			2.4	0.2		0.7	
Delay (s)		20.0			21.5			17.8	0.2		1.4	
Level of Service		C			C			B	A		A	
Approach Delay (s)		20.0			21.5			16.3			1.4	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	117	5	18	88	43	273
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	117	5	18	88	43	273
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	106				301	62
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				93	73
cM capacity (veh/h)	1485				636	1003

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	122	106	316
Volume Left	117	0	43
Volume Right	0	88	273
cSH	1485	1700	930
Volume to Capacity	0.08	0.06	0.34
Queue Length (ft)	6	0	38
Control Delay (s)	7.3	0.0	10.9
Lane LOS	A		B
Approach Delay (s)	7.3	0.0	10.9
Approach LOS			B

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	1	128	235	134	291	24
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1	128	235	134	291	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	907	303	315			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	83	81			
cM capacity (veh/h)	248	737	1245			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	129	369	315
Volume Left	1	235	0
Volume Right	128	0	24
cSH	726	1245	1700
Volume to Capacity	0.18	0.19	0.19
Queue Length (ft)	16	17	0
Control Delay (s)	11.0	6.1	0.0
Lane LOS	B	A	
Approach Delay (s)	11.0	6.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	165	236	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	165	236	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	236				318	118
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1328				650	912

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	55	110	157	79	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1328	1700	1700	1700	1700
Volume to Capacity	0.00	0.06	0.09	0.05	0.00
Queue Length (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	9.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1027	22	0	910	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1027	22	0	910	2	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	685	364	303	607	2
Volume Left (vph)	0	0	0	0	2
Volume Right (vph)	0	22	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	5.9	5.8	8.1	8.1	7.1
Degree Utilization, x	1.11	0.59	0.69	1.37	0.00
Capacity (veh/h)	610	612	422	450	500
Control Delay (s)	92.9	15.6	25.9	202.7	10.1
Approach Delay (s)	66.0		143.8		10.1
Approach LOS	F		F		B

Intersection Summary			
Delay	102.0		
HCM Level of Service	F		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1095	22	0	975	34	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1095	22	0	975	34	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	730	387	325	650	34
Volume Left (vph)	0	0	0	0	34
Volume Right (vph)	0	22	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	6.0	6.0	8.3	8.3	7.1
Degree Utilization, x	1.22	0.65	0.75	1.50	0.07
Capacity (veh/h)	593	585	417	445	501
Control Delay (s)	134.9	18.1	31.2	258.3	10.6
Approach Delay (s)	94.4		182.6		10.6
Approach LOS	F		F		B

Intersection Summary			
Delay	133.5		
HCM Level of Service	F		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.90			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1862			1685			5085			5082	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1862			1685			5085			5082	
Volume (vph)	2	426	0	0	27	65	0	2054	1	0	1543	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	426	0	0	27	65	0	2054	1	0	1543	6
Lane Group Flow (vph)	0	428	0	0	92	0	0	2055	0	0	1549	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		641			580			2882			2880	
v/s Ratio Prot					0.05			c0.40			0.30	
v/s Ratio Perm		0.23										
v/c Ratio		0.67			0.16			0.71			0.54	
Uniform Delay, d1		25.1			20.5			14.2			12.2	
Progression Factor		1.00			1.00			0.33			1.09	
Incremental Delay, d2		5.4			0.6			0.9			0.7	
Delay (s)		30.6			21.0			5.6			13.9	
Level of Service		C			C			A			B	
Approach Delay (s)		30.6			21.0			5.6			13.9	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	B

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3610		1611	4990	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3610		1611	4990	
Volume (vph)	275	1509	0	164	2009	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	275	1509	0	164	2009	0
Lane Group Flow (vph)	275	1509	0	164	2009	0
Turn Type		custom		custom	Prot	
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	492	3610		448	3160	
v/s Ratio Prot	c0.16			0.10	c0.40	
v/s Ratio Perm		0.42				
v/c Ratio	0.56	0.42		0.37	0.64	
Uniform Delay, d1	27.8	0.0		26.1	10.1	
Progression Factor	0.64	1.00		1.00	0.83	
Incremental Delay, d2	3.8	0.3		2.3	0.7	
Delay (s)	21.4	0.3		28.4	9.1	
Level of Service	C	A		C	A	
Approach Delay (s)	3.6		28.4		9.1	
Approach LOS	A		C		A	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		0.91			0.91			1.00				
Frt		1.00			1.00			0.86				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		5085			5085			1611				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		5085			5085			1611				
Volume (vph)	0	2009	0	0	1784	0	0	0	164	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2009	0	0	1784	0	0	0	164	0	0	0
Lane Group Flow (vph)	0	2009	0	0	1784	0	0	164	0	0	0	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0				
Effective Green, g (s)		55.0			55.0			27.0				
Actuated g/C Ratio		0.61			0.61			0.30				
Clearance Time (s)		4.0			4.0			4.0				
Lane Grp Cap (vph)		3108			3108			483				
v/s Ratio Prot		c0.40			0.35			c0.10				
v/s Ratio Perm												
v/c Ratio		0.65			0.57			0.34				
Uniform Delay, d1		11.2			10.5			24.6				
Progression Factor		1.96			1.00			1.00				
Incremental Delay, d2		0.8			0.8			1.9				
Delay (s)		22.9			11.3			26.5				
Level of Service		C			B			C				
Approach Delay (s)		22.9			11.3			26.5			0.0	
Approach LOS		C			B			C			A	

Intersection Summary			
HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	35	354	0	0	332	0	0	0	0	0	0	179
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	35	354	0	0	332	0	0	0	0	0	0	179

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	389	332	0	179
Volume Left (vph)	35	0	0	0
Volume Right (vph)	0	0	0	179
Hadj (s)	0.1	0.0	0.0	-0.6
Departure Headway (s)	4.8	5.3	5.9	5.0
Degree Utilization, x	0.52	0.49	0.00	0.25
Capacity (veh/h)	718	564	527	672
Control Delay (s)	13.0	13.4	8.9	9.7
Approach Delay (s)	13.0	13.4	0.0	9.7
Approach LOS	B	B	A	A

Intersection Summary			
Delay	12.5		
HCM Level of Service	B		
Intersection Capacity Utilization	59.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	45	3	0	1	21	3	0	525	4	3	536	46
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	45	3	0	1	21	3	0	525	4	3	536	46

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	48	25	529	585
Volume Left (vph)	45	1	0	3
Volume Right (vph)	0	3	4	46
Hadj (s)	0.2	0.0	0.0	0.0
Departure Headway (s)	6.5	5.3	4.8	4.7
Degree Utilization, x	0.09	0.04	0.70	0.76
Capacity (veh/h)	496	503	733	757
Control Delay (s)	10.1	8.5	18.3	21.1
Approach Delay (s)	10.1	8.5	18.3	21.1
Approach LOS	B	A	C	C

Intersection Summary			
Delay	19.2		
HCM Level of Service	C		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.90		1.00	1.00	0.85		1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	1667		1770	1863	1583		5085			5014	
Flt Permitted	0.71	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1318	1667		1399	1863	1583		5085			5014	
Volume (vph)	31	3	7	1	76	35	0	1913	0	0	2006	207
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	3	7	1	76	35	0	1913	0	0	2006	207
Lane Group Flow (vph)	31	10	0	1	76	35	0	1913	0	0	2213	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	29.0	29.0		29.0	29.0	29.0		53.0			53.0	
Effective Green, g (s)	29.0	29.0		29.0	29.0	29.0		53.0			53.0	
Actuated g/C Ratio	0.32	0.32		0.32	0.32	0.32		0.59			0.59	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	425	537		451	600	510		2995			2953	
v/s Ratio Prot		0.01			c0.04			0.38			c0.44	
v/s Ratio Perm	0.02			0.00		0.02						
v/c Ratio	0.07	0.02		0.00	0.13	0.07		0.64			0.75	
Uniform Delay, d1	21.2	20.8		20.7	21.6	21.1		12.2			13.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.3	0.1		0.0	0.4	0.3		1.1			1.8	
Delay (s)	21.5	20.9		20.7	22.0	21.4		13.2			15.4	
Level of Service	C	C		C	C	C		B			B	
Approach Delay (s)		21.3			21.8			13.2			15.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 1

(No Build) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0				4.0		4.0
Lane Util. Factor		0.95			0.95	1.00				1.00		1.00
Frt		0.99			1.00	0.85				1.00		0.85
Flt Protected		1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)		3533			3579	1601				1789		1601
Flt Permitted		1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3533			3579	1601				1789		1601
Volume (vph)	0	1515	141	0	791	11	0	0	0	2	0	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1515	141	0	791	11	0	0	0	2	0	3
Lane Group Flow (vph)	0	1656	0	0	791	11	0	0	0	2	0	3
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0				19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0				19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00				0.25		0.25
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2261			2291	1601				453		406
v/s Ratio Prot		c0.47			0.22					0.00		
v/s Ratio Perm						c0.01						0.00
v/c Ratio		0.73			0.35	0.01				0.00		0.01
Uniform Delay, d1		9.1			6.2	0.0				20.9		20.9
Progression Factor		1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2		2.1			0.4	0.0				0.0		0.0
Delay (s)		11.3			6.7	0.0				20.9		21.0
Level of Service		B			A	A				C		C
Approach Delay (s)		11.3			6.6			0.0			21.0	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Cycle Length (s)	75.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		1.00			0.90			1.00			1.00	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		3436			1690			5142			5141	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2627			1690			5142			5141	
Volume (vph)	296	65	2	0	10	32	0	3094	0	0	1930	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	296	65	2	0	10	32	0	3094	0	0	1930	3
Lane Group Flow (vph)	0	363	0	0	42	0	0	3094	0	0	1933	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		905			582			2914			2913	
v/s Ratio Prot					0.02			c0.60			0.38	
v/s Ratio Perm		c0.14										
v/c Ratio		0.40			0.07			1.06			0.66	
Uniform Delay, d1		22.4			19.8			19.5			13.5	
Progression Factor		1.00			1.00			1.23			0.24	
Incremental Delay, d2		1.3			0.2			31.5			1.0	
Delay (s)		23.8			20.1			55.4			4.3	
Level of Service		C			C			E			A	
Approach Delay (s)		23.8			20.1			55.4			4.3	
Approach LOS		C			C			E			A	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	539	5	10	73	55	69
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	539	5	10	73	55	69

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	539	5	10	73	124
Volume Left (vph)	539	0	0	0	55
Volume Right (vph)	0	0	0	73	69
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.1	4.9	5.3	4.7	5.2
Degree Utilization, x	0.77	0.01	0.01	0.10	0.18
Capacity (veh/h)	539	719	643	728	627
Control Delay (s)	21.8	6.8	7.2	7.0	9.4
Approach Delay (s)	21.7		7.0		9.4
Approach LOS	C		A		A

Intersection Summary			
Delay	18.0		
HCM Level of Service	C		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1825	
Flt Permitted	1.00		0.68	1.00	1.00	
Satd. Flow (perm)	1630		1284	1883	1825	
Volume (vph)	2	356	99	554	90	27
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	356	99	554	90	27
Lane Group Flow (vph)	358	0	99	554	117	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		560	822	796	
v/s Ratio Prot	c0.22			c0.29	0.06	
v/s Ratio Perm			0.08			
v/c Ratio	0.52		0.18	0.67	0.15	
Uniform Delay, d1	11.9		9.5	12.4	9.3	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.9		0.7	4.4	0.4	
Delay (s)	14.8		10.2	16.8	9.7	
Level of Service	B		B	B	A	
Approach Delay (s)	14.8			15.8	9.7	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	11	111	189	75	43	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	11	111	189	75	43	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	48	74	126	138	46
Volume Left (vph)	11	0	0	0	43
Volume Right (vph)	0	0	0	75	3
Hadj (s)	0.1	0.0	0.0	-0.3	0.2
Departure Headway (s)	4.9	4.8	4.7	4.4	4.9
Degree Utilization, x	0.07	0.10	0.17	0.17	0.06
Capacity (veh/h)	723	725	741	798	689
Control Delay (s)	7.0	7.2	7.5	7.1	8.2
Approach Delay (s)	7.1		7.3		8.2
Approach LOS	A		A		A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	4	7	5	3	0	35	0	13	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	4	7	5	3	0	35	0	13	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	4	7	5	3	35	13	0	0
Volume Left (vph)	0	0	5	0	35	0	0	0
Volume Right (vph)	0	7	0	0	0	13	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.7	4.1	4.9	4.7	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.01	0.00	0.05	0.01	0.00	0.00
Capacity (veh/h)	762	866	732	755	740	898	791	791
Control Delay (s)	6.5	5.9	6.7	6.5	6.8	5.8	6.4	6.4
Approach Delay (s)	6.1		6.6		6.5		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.5		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Util. Factor		1.00			0.91	1.00		0.91			1.00	1.00
Frt		0.85			1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)		1601			5142	1601		5139			1789	1601
Flt Permitted		1.00			1.00	1.00		1.00			0.77	1.00
Satd. Flow (perm)		1601			5142	1601		5139			1460	1601
Volume (vph)	0	0	5	0	3084	241	0	2252	7	55	1	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	5	0	3084	241	0	2252	7	55	1	10
Lane Group Flow (vph)	0	5	0	0	3084	241	0	2259	0	0	56	10
Turn Type	Prot					Perm				Perm		Perm
Protected Phases	6!				4			4			6!	
Permitted Phases		6				4				6		6
Actuated Green, G (s)		23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)		23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio		0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)		409			3371	1050		3369			373	409
v/s Ratio Prot					c0.60			0.44				
v/s Ratio Perm		0.00				0.15					c0.04	0.01
v/c Ratio		0.01			0.91	0.23		0.67			0.15	0.02
Uniform Delay, d1		25.0			13.3	6.3		9.5			25.9	25.1
Progression Factor		1.00			1.00	1.00		1.53			1.00	1.00
Incremental Delay, d2		0.1			5.1	0.5		0.8			0.9	0.1
Delay (s)		25.1			18.4	6.8		15.4			26.8	25.2
Level of Service		C			B	A		B			C	C
Approach Delay (s)	25.1				17.6			15.4			26.5	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	C

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1191	3	5	780	1	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1191	3	5	780	1	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	794	400	265	520	3
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	3	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	-0.3
Departure Headway (s)	5.4	5.4	5.7	5.7	6.4
Degree Utilization, x	1.19	0.60	0.42	0.83	0.01
Capacity (veh/h)	663	644	610	617	542
Control Delay (s)	119.0	14.9	11.7	29.3	9.5
Approach Delay (s)	84.1		23.4		9.5
Approach LOS	F		C		A

Intersection Summary			
Delay	59.9		
HCM Level of Service	F		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1194	2	3	773	15	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1194	2	3	773	15	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	796	400	261	515	17
Volume Left (vph)	0	0	3	0	15
Volume Right (vph)	0	2	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.5	5.4	5.8	5.8	6.9
Degree Utilization, x	1.21	0.61	0.42	0.83	0.03
Capacity (veh/h)	655	638	605	610	508
Control Delay (s)	124.7	15.2	11.7	29.6	10.1
Approach Delay (s)	88.1		23.6		10.1
Approach LOS	F		C		B

Intersection Summary			
Delay	62.3		
HCM Level of Service	F		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.89			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1880			1674			5109			5142	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1878			1669			5109			5142	
Volume (vph)	3	448	5	2	33	162	0	2411	106	0	1769	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	448	5	2	33	162	0	2411	106	0	1769	0
Lane Group Flow (vph)	0	456	0	0	197	0	0	2517	0	0	1769	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		668			593			2838			2857	
v/s Ratio Prot								c0.49			0.34	
v/s Ratio Perm		c0.24			0.12							
v/c Ratio		0.68			0.33			0.89			0.62	
Uniform Delay, d1		24.7			21.2			17.5			13.5	
Progression Factor		1.00			1.00			0.53			0.98	
Incremental Delay, d2		5.6			1.5			0.4			0.9	
Delay (s)		30.3			22.7			9.7			14.2	
Level of Service		C			C			A			B	
Approach Delay (s)		30.3			22.7			9.7			14.2	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	222	1748	0	132	2383	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	222	1748	0	132	2383	0
Lane Group Flow (vph)	222	1748	0	132	2383	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.12			0.08	c0.47	
v/s Ratio Perm		c0.48				
v/c Ratio	0.41	0.48		0.27	0.77	
Uniform Delay, d1	25.2	0.0		24.0	12.9	
Progression Factor	0.73	1.00		0.49	0.98	
Incremental Delay, d2	1.9	0.4		0.1	0.9	
Delay (s)	20.4	0.4		11.9	13.6	
Level of Service	C	A		B	B	
Approach Delay (s)	2.6		11.9		13.6	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.97	
Flt Protected		1.00			1.00			0.95			0.97	
Satd. Flow (prot)		5020			5139			1795			1778	
Flt Permitted		1.00			1.00			0.70			0.84	
Satd. Flow (perm)		5020			5139			1321			1534	
Volume (vph)	0	2184	410	0	1833	6	181	2	0	21	8	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2184	410	0	1833	6	181	2	0	21	8	8
Lane Group Flow (vph)	0	2594	0	0	1839	0	0	183	0	0	37	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3068			3141			396			460	
v/s Ratio Prot		c0.52			0.36							
v/s Ratio Perm								c0.14			0.02	
v/c Ratio		0.85			0.59			0.46			0.08	
Uniform Delay, d1		14.1			10.6			25.6			22.6	
Progression Factor		1.75			1.00			1.00			1.00	
Incremental Delay, d2		2.1			0.8			3.8			0.3	
Delay (s)		26.7			11.4			29.4			22.9	
Level of Service		C			B			C			C	
Approach Delay (s)		26.7			11.4			29.4			22.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.99			0.98	
Flt Protected		0.97			1.00			0.97			1.00	
Satd. Flow (prot)		1794			1880			1804			1845	
Flt Permitted		0.49			0.99			0.68			0.99	
Satd. Flow (perm)		907			1870			1265			1825	
Volume (vph)	318	178	95	6	495	5	110	35	9	12	200	33
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	318	178	95	6	495	5	110	35	9	12	200	33
Lane Group Flow (vph)	0	591	0	0	506	0	0	154	0	0	245	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		443			914			534			771	
v/s Ratio Prot												
v/s Ratio Perm		c0.65			0.27			0.12			c0.13	
v/c Ratio		1.33			0.55			0.29			0.32	
Uniform Delay, d1		23.0			16.1			17.1			17.4	
Progression Factor		1.00			1.41			1.00			1.00	
Incremental Delay, d2		165.1			2.4			1.4			1.1	
Delay (s)		188.1			25.1			18.5			18.4	
Level of Service		F			C			B			B	
Approach Delay (s)		188.1			25.1			18.5			18.4	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	87.7	HCM Level of Service	F
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	E

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.91			1.00			0.98	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1786			1714			1882			1854	
Flt Permitted		0.80			1.00			1.00			1.00	
Satd. Flow (perm)		1482			1710			1875			1852	
Volume (vph)	60	5	6	1	6	13	5	563	2	3	574	73
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	5	6	1	6	13	5	563	2	3	574	73
Lane Group Flow (vph)	0	71	0	0	20	0	0	570	0	0	650	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		510			589			1063			1049	
v/s Ratio Prot												
v/s Ratio Perm		c0.05			0.01			0.30			c0.35	
v/c Ratio		0.14			0.03			0.54			0.62	
Uniform Delay, d1		20.3			19.6			12.1			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.1			1.9			2.8	
Delay (s)		20.9			19.7			14.1			15.8	
Level of Service		C			B			B			B	
Approach Delay (s)		20.9			19.7			14.1			15.8	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1838		1789	1883	1601		5141			5043	
Flt Permitted	0.75	1.00		0.72	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1421	1838		1364	1883	1601		5141			5043	
Volume (vph)	467	42	8	1	5	384	0	2240	1	0	2160	319
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	467	42	8	1	5	384	0	2240	1	0	2160	319
Lane Group Flow (vph)	467	50	0	1	5	384	0	2241	0	0	2479	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	505	654		485	670	569		2856			2802	
v/s Ratio Prot		0.03			0.00			0.44			c0.49	
v/s Ratio Perm	c0.33			0.00		0.24						
v/c Ratio	0.92	0.08		0.00	0.01	0.67		0.78			0.88	
Uniform Delay, d1	27.8	19.2		18.7	18.7	24.6		15.8			17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	25.1	0.2		0.0	0.0	6.3		2.2			4.5	
Delay (s)	53.0	19.4		18.7	18.8	30.9		18.0			22.0	
Level of Service	D	B		B	B	C		B			C	
Approach Delay (s)		49.7			30.7			18.0			22.0	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	103.0%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 1

(No Build) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0				4.0		4.0
Lane Util. Factor		0.95			0.95	1.00				1.00		1.00
Frt		1.00			1.00	0.85				1.00		0.85
Flt Protected		1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)		3578			3579	1601				1789		1601
Flt Permitted		1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3578			3579	1601				1789		1601
Volume (vph)	0	1046	1	0	1378	11	0	0	0	9	0	50
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1046	1	0	1378	11	0	0	0	9	0	50
Lane Group Flow (vph)	0	1047	0	0	1378	11	0	0	0	9	0	50
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0				19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0				19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00				0.25		0.25
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2290			2291	1601				453		406
v/s Ratio Prot		0.29			c0.39					0.01		
v/s Ratio Perm						0.01						c0.03
v/c Ratio		0.46			0.60	0.01				0.02		0.12
Uniform Delay, d1		6.9			7.9	0.0				21.0		21.6
Progression Factor		1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2		0.7			1.2	0.0				0.1		0.6
Delay (s)		7.5			9.1	0.0				21.1		22.2
Level of Service		A			A	A				C		C
Approach Delay (s)		7.5			9.0			0.0			22.0	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		0.94			0.87			1.00			1.00	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		3325			1645			5142			5141	
Flt Permitted		0.86			1.00			1.00			1.00	
Satd. Flow (perm)		2882			1645			5142			5141	
Volume (vph)	42	79	84	0	16	238	0	2439	0	0	2491	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	42	79	84	0	16	238	0	2439	0	0	2491	2
Lane Group Flow (vph)	0	205	0	0	254	0	0	2439	0	0	2493	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		993			567			2914			2913	
v/s Ratio Prot					c0.15			0.47			c0.48	
v/s Ratio Perm		0.07										
v/c Ratio		0.21			0.45			0.84			0.86	
Uniform Delay, d1		20.8			22.9			16.1			16.4	
Progression Factor		1.00			1.00			1.10			0.29	
Incremental Delay, d2		0.5			2.6			2.1			2.3	
Delay (s)		21.3			25.4			19.8			7.1	
Level of Service		C			C			B			A	
Approach Delay (s)		21.3			25.4			19.8			7.1	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	417	6	22	155	66	101
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	417	6	22	155	66	101

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	417	6	22	155	167
Volume Left (vph)	417	0	0	0	66
Volume Right (vph)	0	0	0	155	101
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.3	5.1	5.4	4.8	5.1
Degree Utilization, x	0.62	0.01	0.03	0.20	0.24
Capacity (veh/h)	660	681	639	723	651
Control Delay (s)	15.3	7.0	7.3	7.8	9.7
Approach Delay (s)	15.1		7.7		9.7
Approach LOS	C		A		A

Intersection Summary			
Delay	12.2		
HCM Level of Service	B		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1842	
Flt Permitted	1.00		0.67	1.00	1.00	
Satd. Flow (perm)	1630		1262	1883	1842	
Volume (vph)	3	526	86	447	114	22
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	526	86	447	114	22
Lane Group Flow (vph)	529	0	86	447	136	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		551	822	804	
v/s Ratio Prot	c0.32			c0.24	0.07	
v/s Ratio Perm			0.07			
v/c Ratio	0.78		0.16	0.54	0.17	
Uniform Delay, d1	13.8		9.4	11.5	9.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	8.4		0.6	2.6	0.5	
Delay (s)	22.2		10.0	14.0	9.9	
Level of Service	C		A	B	A	
Approach Delay (s)	22.2			13.4	9.9	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	7	175	414	80	64	25
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	7	175	414	80	64	25

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	65	117	276	218	89
Volume Left (vph)	7	0	0	0	64
Volume Right (vph)	0	0	0	80	25
Hadj (s)	0.1	0.0	0.0	-0.2	0.0
Departure Headway (s)	5.2	5.2	4.9	4.7	5.3
Degree Utilization, x	0.09	0.17	0.38	0.29	0.13
Capacity (veh/h)	670	669	714	748	634
Control Delay (s)	7.6	8.1	9.7	8.4	9.1
Approach Delay (s)	7.9		9.1		9.1
Approach LOS	A		A		A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	17	23	13	3	0	19	0	123	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	17	23	13	3	0	19	0	123	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	17	23	13	3	19	123	0	0
Volume Left (vph)	0	0	13	0	19	0	0	0
Volume Right (vph)	0	23	0	0	0	123	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.8	4.2	5.1	4.9	4.9	4.1	4.7	4.7
Degree Utilization, x	0.02	0.03	0.02	0.00	0.03	0.14	0.00	0.00
Capacity (veh/h)	721	814	682	712	723	865	761	761
Control Delay (s)	6.8	6.2	7.0	6.7	6.8	6.5	6.5	6.5
Approach Delay (s)	6.4		6.9		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			0.91	1.00		0.91			1.00	1.00
Frt	1.00	0.85			1.00	0.85		1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	1789	1601			5142	1601		5140			1789	1601
Flt Permitted	0.95	1.00			1.00	1.00		1.00			0.66	1.00
Satd. Flow (perm)	1789	1601			5142	1601		5140			1246	1601
Volume (vph)	5	0	97	0	2414	129	0	2764	8	186	5	21
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	0	97	0	2414	129	0	2764	8	186	5	21
Lane Group Flow (vph)	5	97	0	0	2414	129	0	2772	0	0	191	21
Turn Type	Prot					Perm				Perm		Perm
Protected Phases	6!				4			4			6!	
Permitted Phases		6				4				6		6
Actuated Green, G (s)	23.0	23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)	23.0	23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio	0.26	0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)	457	409			3371	1050		3370			318	409
v/s Ratio Prot	0.00				0.47			c0.54				
v/s Ratio Perm		0.06				0.08					c0.15	0.01
v/c Ratio	0.01	0.24			0.72	0.12		0.82			0.60	0.05
Uniform Delay, d1	25.0	26.5			10.1	5.8		11.6			29.5	25.3
Progression Factor	1.00	1.00			1.00	1.00		1.63			1.00	1.00
Incremental Delay, d2	0.0	1.4			1.3	0.2		1.4			8.1	0.2
Delay (s)	25.1	27.9			11.4	6.0		20.2			37.6	25.5
Level of Service	C	C			B	A		C			D	C
Approach Delay (s)	27.8				11.1			20.2			36.4	
Approach LOS	C				B			C			D	

Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1008	3	6	1223	5	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1008	3	6	1223	5	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	672	339	414	815	10
Volume Left (vph)	0	0	6	0	5
Volume Right (vph)	0	3	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	-0.2
Departure Headway (s)	5.8	5.8	5.7	5.7	6.7
Degree Utilization, x	1.09	0.55	0.66	1.29	0.02
Capacity (veh/h)	611	606	620	640	530
Control Delay (s)	84.9	14.5	17.8	161.2	9.8
Approach Delay (s)	61.3		112.9		9.8
Approach LOS	F		F		A

Intersection Summary			
Delay	89.3		
HCM Level of Service	F		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	977	38	2	1225	5	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	977	38	2	1225	5	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	651	364	410	817	6
Volume Left (vph)	0	0	2	0	5
Volume Right (vph)	0	38	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.8	5.8	5.7	5.7	6.9
Degree Utilization, x	1.05	0.58	0.65	1.30	0.01
Capacity (veh/h)	612	614	617	638	510
Control Delay (s)	73.2	15.2	17.7	164.4	10.0
Approach Delay (s)	52.4		115.4		10.0
Approach LOS	F		F		B

Intersection Summary			
Delay	86.7		
HCM Level of Service	F		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1878			1663			5133			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1873			1656			5133			5141	
Volume (vph)	4	358	6	5	44	308	0	1970	23	0	2207	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	358	6	5	44	308	0	1970	23	0	2207	3
Lane Group Flow (vph)	0	368	0	0	357	0	0	1993	0	0	2210	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		666			589			2852			2856	
v/s Ratio Prot								0.39			c0.43	
v/s Ratio Perm		0.20			c0.22							
v/c Ratio		0.55			0.61			0.70			0.77	
Uniform Delay, d1		23.3			23.8			14.5			15.6	
Progression Factor		1.00			1.00			0.76			1.01	
Incremental Delay, d2		3.3			4.6			0.8			1.7	
Delay (s)		26.5			28.4			11.9			17.5	
Level of Service		C			C			B			B	
Approach Delay (s)		26.5			28.4			11.9			17.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	198	2173	0	141	1936	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	198	2173	0	141	1936	0
Lane Group Flow (vph)	198	2173	0	141	1936	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.11			0.09	0.38	
v/s Ratio Perm		c0.60				
v/c Ratio	0.37	0.60		0.29	0.63	
Uniform Delay, d1	24.8	0.0		24.1	11.0	
Progression Factor	0.74	1.00		0.63	1.06	
Incremental Delay, d2	1.3	0.5		1.3	0.7	
Delay (s)	19.7	0.5		16.7	12.4	
Level of Service	B	A		B	B	
Approach Delay (s)	2.1		16.7		12.4	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.96	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5035			5138			1793			1774	
Flt Permitted		1.00			1.00			0.72			0.86	
Satd. Flow (perm)		5035			5138			1350			1559	
Volume (vph)	0	1848	298	0	2144	11	345	8	6	10	6	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1848	298	0	2144	11	345	8	6	10	6	6
Lane Group Flow (vph)	0	2146	0	0	2155	0	0	359	0	0	22	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3077			3140			405			468	
v/s Ratio Prot		c0.43			0.42							
v/s Ratio Perm								c0.27			0.01	
v/c Ratio		0.70			0.69			0.89			0.05	
Uniform Delay, d1		11.9			11.7			30.0			22.4	
Progression Factor		2.01			1.00			1.00			1.00	
Incremental Delay, d2		1.1			1.2			23.7			0.2	
Delay (s)		24.9			13.0			53.7			22.6	
Level of Service		C			B			D			C	
Approach Delay (s)		24.9			13.0			53.7			22.6	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.96			0.94	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1813			1875			1810			1775	
Flt Permitted		0.90			0.99			0.99			1.00	
Satd. Flow (perm)		1637			1866			1800			1770	
Volume (vph)	50	252	90	8	518	15	3	50	20	6	125	93
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	252	90	8	518	15	3	50	20	6	125	93
Lane Group Flow (vph)	0	392	0	0	541	0	0	73	0	0	224	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		800			912			760			747	
v/s Ratio Prot												
v/s Ratio Perm		0.24			c0.29			0.04			c0.13	
v/c Ratio		0.49			0.59			0.10			0.30	
Uniform Delay, d1		15.5			16.6			15.7			17.2	
Progression Factor		1.00			1.35			1.00			1.00	
Incremental Delay, d2		2.1			2.8			0.3			1.0	
Delay (s)		17.6			25.2			15.9			18.2	
Level of Service		B			C			B			B	
Approach Delay (s)		17.6			25.2			15.9			18.2	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.96			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1781			1812			1882			1854	
Flt Permitted		0.80			1.00			1.00			0.98	
Satd. Flow (perm)		1475			1811			1875			1826	
Volume (vph)	43	6	8	1	64	25	5	584	2	16	576	70
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	43	6	8	1	64	25	5	584	2	16	576	70
Lane Group Flow (vph)	0	57	0	0	90	0	0	591	0	0	662	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		508			624			1063			1035	
v/s Ratio Prot												
v/s Ratio Perm		0.04			c0.05			0.32			c0.36	
v/c Ratio		0.11			0.14			0.56			0.64	
Uniform Delay, d1		20.1			20.3			12.3			13.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.5			2.1			3.0	
Delay (s)		20.6			20.8			14.4			16.3	
Level of Service		C			C			B			B	
Approach Delay (s)		20.6			20.8			14.4			16.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.96		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1803		1789	1883	1601		5141			5000	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1364	1803		1410	1883	1601		5141			5000	
Volume (vph)	234	10	4	1	50	426	0	2205	1	0	2397	538
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	234	10	4	1	50	426	0	2205	1	0	2397	538
Lane Group Flow (vph)	234	14	0	1	50	426	0	2206	0	0	2935	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	485	641		501	670	569		2856			2778	
v/s Ratio Prot		0.01			0.03			0.43			c0.59	
v/s Ratio Perm	0.17			0.00		c0.27						
v/c Ratio	0.48	0.02		0.00	0.07	0.75		0.77			1.06	
Uniform Delay, d1	22.6	18.8		18.7	19.2	25.5		15.6			20.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.4	0.1		0.0	0.2	8.7		2.1			34.4	
Delay (s)	26.0	18.9		18.7	19.4	34.2		17.7			54.4	
Level of Service	C	B		B	B	C		B			D	
Approach Delay (s)		25.6			32.6			17.7			54.4	
Approach LOS		C			C			B			D	

Intersection Summary			
HCM Average Control Delay	37.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	E

c Critical Lane Group

2030 ALTERNATIVE 1

(No Build) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0				4.0		4.0
Lane Util. Factor		0.95			0.95	1.00				1.00		1.00
Frt		1.00			1.00	0.85				1.00		0.85
Flt Protected		1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)		3579			3579	1601				1789		1601
Flt Permitted		1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3579			3579	1601				1789		1601
Volume (vph)	0	960	0	0	1130	11	0	0	0	2	0	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	960	0	0	1130	11	0	0	0	2	0	10
Lane Group Flow (vph)	0	960	0	0	1130	11	0	0	0	2	0	10
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0				19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0				19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00				0.25		0.25
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2291			2291	1601				453		406
v/s Ratio Prot		0.27			c0.32					0.00		
v/s Ratio Perm						0.01						c0.01
v/c Ratio		0.42			0.49	0.01				0.00		0.02
Uniform Delay, d1		6.6			7.1	0.0				20.9		21.0
Progression Factor		1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2		0.6			0.8	0.0				0.0		0.1
Delay (s)		7.2			7.9	0.0				20.9		21.1
Level of Service		A			A	A				C		C
Approach Delay (s)		7.2			7.8			0.0			21.1	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		0.99			0.86			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3395			1629			5142			5142	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2603			1629			5142			5142	
Volume (vph)	366	1	15	0	0	9	0	2441	0	0	1987	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	366	1	15	0	0	9	0	2441	0	0	1987	0
Lane Group Flow (vph)	0	382	0	0	9	0	0	2441	0	0	1987	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		897			561			2914			2914	
v/s Ratio Prot					0.01			c0.47			0.39	
v/s Ratio Perm		c0.15										
v/c Ratio		0.43			0.02			0.84			0.68	
Uniform Delay, d1		22.7			19.4			16.1			13.8	
Progression Factor		1.00			1.00			1.11			0.22	
Incremental Delay, d2		1.5			0.1			2.1			1.1	
Delay (s)		24.1			19.5			20.0			4.1	
Level of Service		C			B			C			A	
Approach Delay (s)		24.1			19.5			20.0			4.1	
Approach LOS		C			B			C			A	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	144	0	4	34	35	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	144	0	4	34	35	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	144	0	4	34	45
Volume Left (vph)	144	0	0	0	35
Volume Right (vph)	0	0	0	34	10
Hadj (s)	0.2	0.0	0.0	-0.6	0.1
Departure Headway (s)	4.9	4.6	4.7	4.1	4.4
Degree Utilization, x	0.19	0.00	0.01	0.04	0.05
Capacity (veh/h)	731	780	748	848	783
Control Delay (s)	7.8	6.4	6.6	6.1	7.6
Approach Delay (s)	7.8		6.2		7.6
Approach LOS	A		A		A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1869	
Flt Permitted	1.00		0.75	1.00	1.00	
Satd. Flow (perm)	1631		1404	1883	1869	
Volume (vph)	4	346	4	145	17	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	346	4	145	17	1
Lane Group Flow (vph)	350	0	4	145	18	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		613	822	816	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.51		0.01	0.18	0.02	
Uniform Delay, d1	11.9		8.8	9.5	8.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.7		0.0	0.5	0.0	
Delay (s)	14.6		8.8	9.9	8.9	
Level of Service	B		A	A	A	
Approach Delay (s)	14.6			9.9	8.9	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	0	36	69	24	22	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	36	69	24	22	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	12	24	46	47	23
Volume Left (vph)	0	0	0	0	22
Volume Right (vph)	0	0	0	24	1
Hadj (s)	0.0	0.0	0.0	-0.3	0.2
Departure Headway (s)	4.6	4.6	4.6	4.3	4.4
Degree Utilization, x	0.02	0.03	0.06	0.06	0.03
Capacity (veh/h)	765	759	774	820	791
Control Delay (s)	6.5	6.6	6.7	6.4	7.5
Approach Delay (s)	6.6		6.5		7.5
Approach LOS	A		A		A

Intersection Summary			
Delay	6.7		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	6	2	1	0	9	0	6	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	6	2	1	0	9	0	6	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	6	2	1	9	6	0	0
Volume Left (vph)	0	0	2	0	9	0	0	0
Volume Right (vph)	0	6	0	0	0	6	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.5	4.5
Degree Utilization, x	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Capacity (veh/h)	780	900	748	772	742	902	797	797
Control Delay (s)	6.4	5.8	6.6	6.4	6.6	5.8	6.3	6.3
Approach Delay (s)	6.1		6.5		6.3		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.2		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations											
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0		4.0			4.0	4.0
Lane Util. Factor				0.91	1.00		0.91			1.00	1.00
Frt				1.00	0.85		1.00			1.00	0.85
Flt Protected				1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)				5142	1601		5141			1789	1601
Flt Permitted				1.00	1.00		1.00			0.75	1.00
Satd. Flow (perm)				5142	1601		5141			1413	1601
Volume (vph)	0	0	0	2433	99	0	2362	1	84	1	7
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	2433	99	0	2362	1	84	1	7
Lane Group Flow (vph)	0	0	0	2433	99	0	2363	0	0	85	7
Turn Type					Perm				Perm		Perm
Protected Phases				4			4			6	
Permitted Phases		6			4				6		6
Actuated Green, G (s)				59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)				59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio				0.66	0.66		0.66			0.26	0.26
Clearance Time (s)				4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)				3371	1050		3370			361	409
v/s Ratio Prot				c0.47			0.46				
v/s Ratio Perm					0.06					c0.06	0.00
v/c Ratio				0.72	0.09		0.70			0.24	0.02
Uniform Delay, d1				10.1	5.7		9.9			26.5	25.0
Progression Factor				1.00	1.00		1.56			1.00	1.00
Incremental Delay, d2				1.4	0.2		1.0			1.5	0.1
Delay (s)				11.5	5.9		16.4			28.1	25.1
Level of Service				B	A		B			C	C
Approach Delay (s)	0.0			11.3			16.4			27.8	
Approach LOS	A			B			B			C	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	946	3	3	1109	1	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	946	3	3	1109	1	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	631	318	373	739	4
Volume Left (vph)	0	0	3	0	1
Volume Right (vph)	0	3	0	0	3
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	5.7	5.7	5.6	5.6	6.5
Degree Utilization, x	1.01	0.51	0.58	1.16	0.01
Capacity (veh/h)	621	617	626	643	547
Control Delay (s)	59.7	13.3	15.1	108.4	9.5
Approach Delay (s)	44.1		77.1		9.5
Approach LOS	E		F		A

Intersection Summary			
Delay	61.8		
HCM Level of Service	F		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	938	10	2	1106	4	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	938	10	2	1106	4	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	625	323	371	737	5
Volume Left (vph)	0	0	2	0	4
Volume Right (vph)	0	10	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.7	5.7	5.7	5.7	6.9
Degree Utilization, x	1.00	0.51	0.58	1.16	0.01
Capacity (veh/h)	621	618	625	642	512
Control Delay (s)	57.6	13.4	15.0	107.8	10.0
Approach Delay (s)	42.6		76.7		10.0
Approach LOS	E		F		A

Intersection Summary			
Delay	60.9		
HCM Level of Service	F		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1883			1630			5117			5139	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1882			1630			5117			5139	
Volume (vph)	1	218	0	0	1	300	0	1863	62	0	1686	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	218	0	0	1	300	0	1863	62	0	1686	6
Lane Group Flow (vph)	0	219	0	0	301	0	0	1925	0	0	1692	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		669			580			2843			2855	
v/s Ratio Prot					c0.18			c0.38			0.33	
v/s Ratio Perm		0.12										
v/c Ratio		0.33			0.52			0.68			0.59	
Uniform Delay, d1		21.2			22.9			14.2			13.3	
Progression Factor		1.00			1.00			0.75			0.99	
Incremental Delay, d2		1.3			3.3			0.7			0.8	
Delay (s)		22.5			26.2			11.3			14.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.5			26.2			11.3			14.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	61	1675	0	38	1848	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	61	1675	0	38	1848	0
Lane Group Flow (vph)	61	1675	0	38	1848	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.03			0.02	c0.37	
v/s Ratio Perm		c0.46				
v/c Ratio	0.11	0.46		0.08	0.60	
Uniform Delay, d1	22.8	0.0		22.6	10.7	
Progression Factor	0.60	1.00		0.59	1.01	
Incremental Delay, d2	0.4	0.4		0.1	0.6	
Delay (s)	14.2	0.4		13.5	11.4	
Level of Service	B	A		B	B	
Approach Delay (s)	0.8		13.5		11.4	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			0.99			0.91	
Flt Protected		1.00			1.00			0.96			1.00	
Satd. Flow (prot)		5014			5137			1792			1714	
Flt Permitted		1.00			1.00			0.79			1.00	
Satd. Flow (perm)		5014			5137			1480			1714	
Volume (vph)	0	1587	315	0	1705	10	60	4	3	0	2	4
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1587	315	0	1705	10	60	4	3	0	2	4
Lane Group Flow (vph)	0	1902	0	0	1715	0	0	67	0	0	6	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3064			3139			444			514	
v/s Ratio Prot		c0.38			0.33						0.00	
v/s Ratio Perm								c0.05				
v/c Ratio		0.62			0.55			0.15			0.01	
Uniform Delay, d1		11.0			10.2			23.1			22.1	
Progression Factor		2.30			1.00			1.00			1.00	
Incremental Delay, d2		0.8			0.7			0.7			0.0	
Delay (s)		26.0			10.9			23.8			22.2	
Level of Service		C			B			C			C	
Approach Delay (s)		26.0			10.9			23.8			22.2	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.95	
Flt Protected		0.96			1.00			0.97			1.00	
Satd. Flow (prot)		1805			1864			1806			1787	
Flt Permitted		0.40			1.00			0.76			0.99	
Satd. Flow (perm)		761			1858			1410			1779	
Volume (vph)	366	61	3	5	439	35	102	58	18	6	125	76
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	366	61	3	5	439	35	102	58	18	6	125	76
Lane Group Flow (vph)	0	430	0	0	479	0	0	178	0	0	207	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		372			908			595			751	
v/s Ratio Prot												
v/s Ratio Perm		c0.57			0.26			c0.13			0.12	
v/c Ratio		1.16			0.53			0.30			0.28	
Uniform Delay, d1		23.0			15.8			17.2			17.0	
Progression Factor		1.00			1.12			1.00			1.00	
Incremental Delay, d2		96.3			2.2			1.3			0.9	
Delay (s)		119.3			20.0			18.5			17.9	
Level of Service		F			B			B			B	
Approach Delay (s)		119.3			20.0			18.5			17.9	
Approach LOS		F			B			B			B	

Intersection Summary			
HCM Average Control Delay	52.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			0.89			1.00			0.99	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1797			1669			1880			1872	
Flt Permitted		0.96			0.99			1.00			0.99	
Satd. Flow (perm)		1752			1659			1878			1855	
Volume (vph)	5	6	3	2	1	12	2	528	6	11	566	24
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	6	3	2	1	12	2	528	6	11	566	24
Lane Group Flow (vph)	0	14	0	0	15	0	0	536	0	0	601	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		603			571			1064			1051	
v/s Ratio Prot												
v/s Ratio Perm		0.01			c0.01			0.29			c0.32	
v/c Ratio		0.02			0.03			0.50			0.57	
Uniform Delay, d1		19.5			19.5			11.8			12.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.1			0.1			1.7			2.3	
Delay (s)		19.6			19.6			13.5			14.8	
Level of Service		B			B			B			B	
Approach Delay (s)		19.6			19.6			13.5			14.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.96		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1816		1789	1883	1601		5141			5061	
Flt Permitted	0.75	1.00		0.74	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1418	1816		1396	1883	1601		5141			5061	
Volume (vph)	9	19	6	5	7	52	0	1894	2	0	1937	228
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	19	6	5	7	52	0	1894	2	0	1937	228
Lane Group Flow (vph)	9	25	0	5	7	52	0	1896	0	0	2165	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	504	646		496	670	569		2856			2812	
v/s Ratio Prot		0.01			0.00			0.37			c0.43	
v/s Ratio Perm	0.01			0.00		c0.03						
v/c Ratio	0.02	0.04		0.01	0.01	0.09		0.66			0.77	
Uniform Delay, d1	18.8	18.9		18.8	18.8	19.3		14.1			15.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.0	0.0	0.3		1.2			2.1	
Delay (s)	18.9	19.1		18.8	18.8	19.6		15.3			17.6	
Level of Service	B	B		B	B	B		B			B	
Approach Delay (s)		19.0			19.5			15.3			17.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.3%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 2

(Replace and Widen) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0			4.0	4.0		4.0
Lane Util. Factor		0.95			0.95	1.00			1.00	1.00		1.00
Frt		0.99			1.00	0.85			0.86	1.00		0.85
Flt Protected		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (prot)		3530			3579	1601			1629	1789		1601
Flt Permitted		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (perm)		3530			3579	1601			1629	1789		1601
Volume (vph)	0	1525	151	0	760	12	0	0	3	2	0	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1525	151	0	760	12	0	0	3	2	0	10
Lane Group Flow (vph)	0	1676	0	0	760	12	0	0	3	2	0	10
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0			19.0	19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0			19.0	19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00			0.25	0.25		0.25
Clearance Time (s)		4.0			4.0				4.0	4.0		4.0
Lane Grp Cap (vph)		2259			2291	1601			413	453		406
v/s Ratio Prot		c0.47			0.21					0.00		
v/s Ratio Perm						0.01			0.00			c0.01
v/c Ratio		0.74			0.33	0.01			0.01	0.00		0.02
Uniform Delay, d1		9.3			6.2	0.0			20.9	20.9		21.0
Progression Factor		1.00			1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		2.2			0.4	0.0			0.0	0.0		0.1
Delay (s)		11.5			6.6	0.0			21.0	20.9		21.1
Level of Service		B			A	A			C	C		C
Approach Delay (s)		11.5			6.5			21.0			21.1	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		1.00			0.90			1.00			1.00	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		3437			1693			5142			5142	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2628			1693			5142			5142	
Volume (vph)	293	62	0	0	10	30	0	3087	0	0	1838	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	293	62	0	0	10	30	0	3087	0	0	1838	0
Lane Group Flow (vph)	0	355	0	0	40	0	0	3087	0	0	1838	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		905			583			2914			2914	
v/s Ratio Prot					0.02			c0.60			0.36	
v/s Ratio Perm		c0.14										
v/c Ratio		0.39			0.07			1.06			0.63	
Uniform Delay, d1		22.4			19.8			19.5			13.2	
Progression Factor		1.00			1.00			1.23			0.23	
Incremental Delay, d2		1.3			0.2			30.6			0.9	
Delay (s)		23.6			20.0			54.5			3.9	
Level of Service		C			C			D			A	
Approach Delay (s)		23.6			20.0			54.5			3.9	
Approach LOS		C			C			D			A	

Intersection Summary			
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	564	4	10	59	59	71
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	564	4	10	59	59	71

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	564	4	10	59	130
Volume Left (vph)	564	0	0	0	59
Volume Right (vph)	0	0	0	59	71
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.1	4.9	5.4	4.8	5.3
Degree Utilization, x	0.81	0.01	0.01	0.08	0.19
Capacity (veh/h)	689	713	637	720	627
Control Delay (s)	24.6	6.8	7.3	7.0	9.5
Approach Delay (s)	24.5		7.0		9.5
Approach LOS	C		A		A

Intersection Summary			
Delay	20.4		
HCM Level of Service	C		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1827	
Flt Permitted	1.00		0.68	1.00	1.00	
Satd. Flow (perm)	1630		1283	1883	1827	
Volume (vph)	2	358	72	578	92	26
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	358	72	578	92	26
Lane Group Flow (vph)	360	0	72	578	118	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		560	822	797	
v/s Ratio Prot	c0.22			c0.31	0.06	
v/s Ratio Perm			0.06			
v/c Ratio	0.53		0.13	0.70	0.15	
Uniform Delay, d1	11.9		9.3	12.6	9.3	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.9		0.5	5.0	0.4	
Delay (s)	14.9		9.7	17.6	9.7	
Level of Service	B		A	B	A	
Approach Delay (s)	14.9			16.7	9.7	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	13	109	246	73	43	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	13	109	246	73	43	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	49	73	164	155	46
Volume Left (vph)	13	0	0	0	43
Volume Right (vph)	0	0	0	73	3
Hadj (s)	0.1	0.0	0.0	-0.2	0.2
Departure Headway (s)	4.9	4.9	4.7	4.5	5.0
Degree Utilization, x	0.07	0.10	0.22	0.19	0.06
Capacity (veh/h)	714	717	741	791	672
Control Delay (s)	7.1	7.2	7.8	7.3	8.4
Approach Delay (s)	7.2		7.6		8.4
Approach LOS	A		A		A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	19.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	4	7	6	5	0	33	0	8	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	4	7	6	5	0	33	0	8	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	4	7	6	5	33	8	0	0
Volume Left (vph)	0	0	6	0	33	0	0	0
Volume Right (vph)	0	7	0	0	0	8	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.01	0.01	0.04	0.01	0.00	0.00
Capacity (veh/h)	765	870	735	759	739	896	790	790
Control Delay (s)	6.5	5.9	6.7	6.5	6.8	5.8	6.4	6.4
Approach Delay (s)	6.1		6.6		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.5		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Util. Factor		1.00			0.91	1.00		0.91			1.00	1.00
Frt		0.86			1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)		1629			5142	1601		5138			1789	1601
Flt Permitted		1.00			1.00	1.00		1.00			0.78	1.00
Satd. Flow (perm)		1629			5142	1601		5138			1461	1601
Volume (vph)	0	0	4	0	3076	244	0	2149	12	55	1	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	4	0	3076	244	0	2149	12	55	1	10
Lane Group Flow (vph)	0	4	0	0	3076	244	0	2161	0	0	56	10
Turn Type						Perm				Perm		Perm
Protected Phases					4			4			6	
Permitted Phases		6				4				6		6
Actuated Green, G (s)		23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)		23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio		0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)		416			3371	1050		3368			373	409
v/s Ratio Prot					c0.60			0.42				
v/s Ratio Perm		0.00				0.15					c0.04	0.01
v/c Ratio		0.01			0.91	0.23		0.64			0.15	0.02
Uniform Delay, d1		25.0			13.3	6.3		9.2			25.9	25.1
Progression Factor		1.00			1.00	1.00		1.50			1.00	1.00
Incremental Delay, d2		0.0			4.9	0.5		0.8			0.9	0.1
Delay (s)		25.0			18.2	6.8		14.6			26.8	25.2
Level of Service		C			B	A		B			C	C
Approach Delay (s)	25.0				17.4			14.6			26.5	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1231	3	5	809	14	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1231	3	5	809	14	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	821	413	275	539	16
Volume Left (vph)	0	0	5	0	14
Volume Right (vph)	0	3	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.5	5.5	5.8	5.8	6.9
Degree Utilization, x	1.26	0.63	0.44	0.87	0.03
Capacity (veh/h)	649	632	602	609	508
Control Delay (s)	144.7	16.2	12.2	34.7	10.1
Approach Delay (s)	101.7		27.1		10.1
Approach LOS	F		D		B

Intersection Summary			
Delay	71.6		
HCM Level of Service	F		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1234	1	3	800	17	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1234	1	3	800	17	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	823	412	270	533	19
Volume Left (vph)	0	0	3	0	17
Volume Right (vph)	0	1	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.5	5.5	5.8	5.8	6.9
Degree Utilization, x	1.26	0.63	0.44	0.86	0.04
Capacity (veh/h)	649	632	601	608	507
Control Delay (s)	145.6	16.2	12.1	33.7	10.2
Approach Delay (s)	102.4		26.4		10.2
Approach LOS	F		D		B

Intersection Summary			
Delay	71.9		
HCM Level of Service	F		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.90			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1880			1685			5105			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1879			1680			5105			5141	
Volume (vph)	3	453	5	2	33	122	0	2406	121	0	1717	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	453	5	2	33	122	0	2406	121	0	1717	1
Lane Group Flow (vph)	0	461	0	0	157	0	0	2527	0	0	1718	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		668			597			2836			2856	
v/s Ratio Prot								c0.50			0.33	
v/s Ratio Perm		c0.25			0.09							
v/c Ratio		0.69			0.26			0.89			0.60	
Uniform Delay, d1		24.8			20.6			17.6			13.4	
Progression Factor		1.00			1.00			0.52			0.98	
Incremental Delay, d2		5.8			1.1			0.5			0.9	
Delay (s)		30.5			21.7			9.7			14.0	
Level of Service		C			C			A			B	
Approach Delay (s)		30.5			21.7			9.7			14.0	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	240	1695	0	120	2378	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	240	1695	0	120	2378	0
Lane Group Flow (vph)	240	1695	0	120	2378	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.13			0.07	c0.47	
v/s Ratio Perm		c0.46				
v/c Ratio	0.45	0.46		0.25	0.77	
Uniform Delay, d1	25.5	0.0		23.8	12.9	
Progression Factor	0.74	1.00		0.50	1.01	
Incremental Delay, d2	2.2	0.4		0.1	0.8	
Delay (s)	21.0	0.4		12.0	13.9	
Level of Service	C	A		B	B	
Approach Delay (s)	2.9		12.0		13.9	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.97	
Flt Protected		1.00			1.00			0.95			0.97	
Satd. Flow (prot)		5023			5139			1795			1774	
Flt Permitted		1.00			1.00			0.70			0.84	
Satd. Flow (perm)		5023			5139			1319			1535	
Volume (vph)	0	2184	399	0	1796	6	183	2	0	21	8	9
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2184	399	0	1796	6	183	2	0	21	8	9
Lane Group Flow (vph)	0	2583	0	0	1802	0	0	185	0	0	38	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3070			3141			396			461	
v/s Ratio Prot		c0.51			0.35							
v/s Ratio Perm								c0.14			0.02	
v/c Ratio		0.84			0.57			0.47			0.08	
Uniform Delay, d1		14.0			10.5			25.6			22.6	
Progression Factor		1.72			1.00			1.00			1.00	
Incremental Delay, d2		2.0			0.8			3.9			0.4	
Delay (s)		26.2			11.2			29.6			23.0	
Level of Service		C			B			C			C	
Approach Delay (s)		26.2			11.2			29.6			23.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.99			0.98	
Flt Protected		0.97			1.00			0.96			1.00	
Satd. Flow (prot)		1792			1880			1805			1845	
Flt Permitted		0.48			1.00			0.66			0.99	
Satd. Flow (perm)		884			1873			1240			1827	
Volume (vph)	312	161	94	5	506	6	111	34	8	12	209	34
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	312	161	94	5	506	6	111	34	8	12	209	34
Lane Group Flow (vph)	0	567	0	0	517	0	0	153	0	0	255	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		432			916			524			771	
v/s Ratio Prot												
v/s Ratio Perm		c0.64			0.28			0.12			c0.14	
v/c Ratio		1.31			0.56			0.29			0.33	
Uniform Delay, d1		23.0			16.2			17.1			17.5	
Progression Factor		1.00			1.44			1.00			1.00	
Incremental Delay, d2		156.4			2.5			1.4			1.1	
Delay (s)		179.4			25.8			18.5			18.6	
Level of Service		F			C			B			B	
Approach Delay (s)		179.4			25.8			18.5			18.6	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	82.2	HCM Level of Service	F
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.2%	ICU Level of Service	E

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.90			1.00			0.98	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1799			1690			1881			1855	
Flt Permitted		0.79			1.00			0.99			1.00	
Satd. Flow (perm)		1481			1687			1868			1852	
Volume (vph)	60	8	2	1	6	21	8	580	2	3	572	72
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	8	2	1	6	21	8	580	2	3	572	72
Lane Group Flow (vph)	0	70	0	0	28	0	0	590	0	0	647	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		510			581			1059			1049	
v/s Ratio Prot												
v/s Ratio Perm		c0.05			0.02			0.32			c0.35	
v/c Ratio		0.14			0.05			0.56			0.62	
Uniform Delay, d1		20.3			19.7			12.3			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.2			2.1			2.7	
Delay (s)		20.9			19.8			14.5			15.7	
Level of Service		C			B			B			B	
Approach Delay (s)		20.9			19.8			14.5			15.7	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1839		1789	1883	1601		5141			5041	
Flt Permitted	0.75	1.00		0.72	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1421	1839		1363	1883	1601		5141			5041	
Volume (vph)	475	43	8	1	5	379	0	2248	1	0	2160	325
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	475	43	8	1	5	379	0	2248	1	0	2160	325
Lane Group Flow (vph)	475	51	0	1	5	379	0	2249	0	0	2485	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	505	654		485	670	569		2856			2801	
v/s Ratio Prot		0.03			0.00			0.44			c0.49	
v/s Ratio Perm	c0.33			0.00		0.24						
v/c Ratio	0.94	0.08		0.00	0.01	0.67		0.79			0.89	
Uniform Delay, d1	28.1	19.2		18.7	18.7	24.5		15.8			17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	27.7	0.2		0.0	0.0	6.1		2.3			4.6	
Delay (s)	55.8	19.5		18.7	18.8	30.6		18.1			22.2	
Level of Service	E	B		B	B	C		B			C	
Approach Delay (s)		52.3			30.4			18.1			22.2	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	103.2%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 2

(Replace and Widen) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0			4.0	4.0		4.0
Lane Util. Factor		0.95			0.95	1.00			1.00	1.00		1.00
Frt		0.99			1.00	0.85			0.86	1.00		0.85
Flt Protected		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (prot)		3556			3579	1601			1629	1789		1601
Flt Permitted		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (perm)		3556			3579	1601			1629	1789		1601
Volume (vph)	0	1128	50	0	1327	9	0	0	3	6	0	459
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1128	50	0	1327	9	0	0	3	6	0	459
Lane Group Flow (vph)	0	1178	0	0	1327	9	0	0	3	6	0	459
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0			19.0	19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0			19.0	19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00			0.25	0.25		0.25
Clearance Time (s)		4.0			4.0				4.0	4.0		4.0
Lane Grp Cap (vph)		2276			2291	1601			413	453		406
v/s Ratio Prot		0.33			c0.37					0.00		
v/s Ratio Perm						0.01			0.00			c0.29
v/c Ratio		0.52			0.58	0.01			0.01	0.01		1.13
Uniform Delay, d1		7.3			7.7	0.0			20.9	21.0		28.0
Progression Factor		1.00			1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		0.8			1.1	0.0			0.0	0.1		85.2
Delay (s)		8.1			8.8	0.0			21.0	21.0		113.2
Level of Service		A			A	A			C	C		F
Approach Delay (s)		8.1			8.7			21.0			112.0	
Approach LOS		A			A			C			F	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		0.96			0.88			1.00			1.00	
Flt Protected		0.98			1.00			1.00			1.00	
Satd. Flow (prot)		3388			1649			5142			5142	
Flt Permitted		0.76			1.00			1.00			1.00	
Satd. Flow (perm)		2619			1649			5142			5142	
Volume (vph)	72	85	51	0	21	243	0	2560	0	0	2468	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	85	51	0	21	243	0	2560	0	0	2468	0
Lane Group Flow (vph)	0	208	0	0	264	0	0	2560	0	0	2468	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		902			568			2914			2914	
v/s Ratio Prot					c0.16			c0.50			0.48	
v/s Ratio Perm		0.08										
v/c Ratio		0.23			0.46			0.88			0.85	
Uniform Delay, d1		21.0			23.0			16.8			16.2	
Progression Factor		1.00			1.00			1.14			0.31	
Incremental Delay, d2		0.6			2.7			2.8			2.1	
Delay (s)		21.6			25.7			21.9			7.1	
Level of Service		C			C			C			A	
Approach Delay (s)		21.6			25.7			21.9			7.1	
Approach LOS		C			C			C			A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	423	7	19	137	105	99
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	423	7	19	137	105	99

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	423	7	19	137	204
Volume Left (vph)	423	0	0	0	105
Volume Right (vph)	0	0	0	137	99
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.4	5.2	5.5	4.9	5.2
Degree Utilization, x	0.64	0.01	0.03	0.19	0.29
Capacity (veh/h)	647	667	619	698	644
Control Delay (s)	16.2	7.1	7.5	7.8	10.4
Approach Delay (s)	16.0		7.8		10.4
Approach LOS	C		A		B

Intersection Summary			
Delay	12.9		
HCM Level of Service	B		
Intersection Capacity Utilization	48.7%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1629		1789	1883	1843	
Flt Permitted	1.00		0.68	1.00	1.00	
Satd. Flow (perm)	1629		1272	1883	1843	
Volume (vph)	1	558	71	453	107	20
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	558	71	453	107	20
Lane Group Flow (vph)	559	0	71	453	127	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	681		555	822	804	
v/s Ratio Prot	c0.34			c0.24	0.07	
v/s Ratio Perm			0.06			
v/c Ratio	0.82		0.13	0.55	0.16	
Uniform Delay, d1	14.2		9.3	11.5	9.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	10.7		0.5	2.7	0.4	
Delay (s)	24.9		9.7	14.2	9.8	
Level of Service	C		A	B	A	
Approach Delay (s)	24.9			13.6	9.8	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	6	169	381	88	66	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	6	169	381	88	66	34

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	62	113	254	215	100
Volume Left (vph)	6	0	0	0	66
Volume Right (vph)	0	0	0	88	34
Hadj (s)	0.1	0.0	0.0	-0.2	0.0
Departure Headway (s)	5.2	5.2	5.0	4.7	5.2
Degree Utilization, x	0.09	0.16	0.35	0.28	0.14
Capacity (veh/h)	669	668	710	748	647
Control Delay (s)	7.5	8.0	9.4	8.3	9.1
Approach Delay (s)	7.8		8.9		9.1
Approach LOS	A		A		A

Intersection Summary			
Delay	8.7		
HCM Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	17	23	7	2	0	20	0	13	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	17	23	7	2	0	20	0	13	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	17	23	7	2	20	13	0	0
Volume Left (vph)	0	0	7	0	20	0	0	0
Volume Right (vph)	0	23	0	0	0	13	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.02	0.03	0.01	0.00	0.03	0.01	0.00	0.00
Capacity (veh/h)	770	877	736	760	727	868	778	778
Control Delay (s)	6.5	5.9	6.7	6.4	6.8	5.9	6.4	6.4
Approach Delay (s)	6.2		6.6		6.4		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.3		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Util. Factor		1.00			0.91	1.00		0.91			1.00	1.00
Frt		0.86			1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)		1629			5142	1601		5139			1789	1601
Flt Permitted		1.00			1.00	1.00		1.00			0.69	1.00
Satd. Flow (perm)		1629			5142	1601		5139			1294	1601
Volume (vph)	0	0	63	0	2532	128	0	2774	10	171	6	21
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	63	0	2532	128	0	2774	10	171	6	21
Lane Group Flow (vph)	0	63	0	0	2532	128	0	2784	0	0	177	21
Turn Type						Perm				Perm		Perm
Protected Phases					4			4			6	
Permitted Phases		6				4				6		6
Actuated Green, G (s)		23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)		23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio		0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)		416			3371	1050		3369			331	409
v/s Ratio Prot					0.49			c0.54				
v/s Ratio Perm		0.04				0.08					c0.14	0.01
v/c Ratio		0.15			0.75	0.12		0.83			0.53	0.05
Uniform Delay, d1		25.9			10.5	5.8		11.6			28.9	25.3
Progression Factor		1.00			1.00	1.00		1.59			1.00	1.00
Incremental Delay, d2		0.8			1.6	0.2		1.4			6.1	0.2
Delay (s)		26.7			12.1	6.0		19.9			35.0	25.5
Level of Service		C			B	A		B			C	C
Approach Delay (s)	26.7				11.8			19.9			34.0	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1035	2	6	1226	36	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1035	2	6	1226	36	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	690	347	415	817	41
Volume Left (vph)	0	0	6	0	36
Volume Right (vph)	0	2	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	6.0	6.0	5.9	5.9	7.0
Degree Utilization, x	1.14	0.57	0.67	1.33	0.08
Capacity (veh/h)	598	594	605	626	508
Control Delay (s)	104.2	15.5	18.9	176.5	10.6
Approach Delay (s)	74.5		123.5		10.6
Approach LOS	F		F		B

Intersection Summary			
Delay	99.5		
HCM Level of Service	F		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1014	29	6	1232	4	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1014	29	6	1232	4	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	676	367	417	821	5
Volume Left (vph)	0	0	6	0	4
Volume Right (vph)	0	29	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.8	5.8	5.7	5.7	6.9
Degree Utilization, x	1.09	0.59	0.66	1.31	0.01
Capacity (veh/h)	612	602	616	637	512
Control Delay (s)	86.7	15.5	18.2	168.1	10.0
Approach Delay (s)	61.6		117.6		10.0
Approach LOS	F		F		A

Intersection Summary			
Delay	91.8		
HCM Level of Service	F		
Intersection Capacity Utilization	45.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1874			1658			5127			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1871			1658			5127			5141	
Volume (vph)	3	363	13	0	41	325	0	2001	38	0	2246	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	363	13	0	41	325	0	2001	38	0	2246	3
Lane Group Flow (vph)	0	379	0	0	366	0	0	2039	0	0	2249	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		665			590			2848			2856	
v/s Ratio Prot					c0.22			0.40			c0.44	
v/s Ratio Perm		0.20										
v/c Ratio		0.57			0.62			0.72			0.79	
Uniform Delay, d1		23.4			24.0			14.8			15.8	
Progression Factor		1.00			1.00			0.70			0.98	
Incremental Delay, d2		3.5			4.8			0.7			1.8	
Delay (s)		27.0			28.8			11.1			17.4	
Level of Service		C			C			B			B	
Approach Delay (s)		27.0			28.8			11.1			17.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	179	2214	0	161	1980	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	179	2214	0	161	1980	0
Lane Group Flow (vph)	179	2214	0	161	1980	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.10			0.10	0.39	
v/s Ratio Perm		c0.61				
v/c Ratio	0.33	0.61		0.33	0.64	
Uniform Delay, d1	24.5	0.0		24.5	11.2	
Progression Factor	0.72	1.00		0.70	1.04	
Incremental Delay, d2	1.1	0.5		1.5	0.7	
Delay (s)	18.7	0.5		18.7	12.4	
Level of Service	B	A		B	B	
Approach Delay (s)	1.9		18.7		12.4	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.95	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5039			5137			1795			1762	
Flt Permitted		1.00			1.00			0.71			0.88	
Satd. Flow (perm)		5039			5137			1343			1576	
Volume (vph)	0	1915	295	0	2171	15	335	9	2	10	7	9
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1915	295	0	2171	15	335	9	2	10	7	9
Lane Group Flow (vph)	0	2210	0	0	2186	0	0	346	0	0	26	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3079			3139			403			473	
v/s Ratio Prot		c0.44			0.43							
v/s Ratio Perm								c0.26			0.02	
v/c Ratio		0.72			0.70			0.86			0.05	
Uniform Delay, d1		12.1			11.8			29.7			22.4	
Progression Factor		1.91			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.3			20.5			0.2	
Delay (s)		24.4			13.2			50.2			22.6	
Level of Service		C			B			D			C	
Approach Delay (s)		24.4			13.2			50.2			22.6	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.99			0.95	
Flt Protected		0.99			1.00			0.97			0.99	
Satd. Flow (prot)		1809			1875			1802			1777	
Flt Permitted		0.79			1.00			0.72			0.96	
Satd. Flow (perm)		1443			1867			1341			1722	
Volume (vph)	87	242	92	7	531	16	104	52	19	25	127	94
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	87	242	92	7	531	16	104	52	19	25	127	94
Lane Group Flow (vph)	0	421	0	0	554	0	0	175	0	0	246	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		705			913			566			727	
v/s Ratio Prot												
v/s Ratio Perm		0.29			c0.30			0.13			c0.14	
v/c Ratio		0.60			0.61			0.31			0.34	
Uniform Delay, d1		16.6			16.7			17.3			17.5	
Progression Factor		1.00			1.32			1.00			1.00	
Incremental Delay, d2		3.7			3.0			1.4			1.3	
Delay (s)		20.3			25.1			18.7			18.8	
Level of Service		C			C			B			B	
Approach Delay (s)		20.3			25.1			18.7			18.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1793			1833			1882			1855	
Flt Permitted		0.77			1.00			1.00			0.94	
Satd. Flow (perm)		1447			1831			1880			1756	
Volume (vph)	42	5	3	2	87	21	2	594	3	41	571	59
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	42	5	3	2	87	21	2	594	3	41	571	59
Lane Group Flow (vph)	0	50	0	0	110	0	0	599	0	0	671	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		498			631			1065			995	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.06			0.32			c0.38	
v/c Ratio		0.10			0.17			0.56			0.67	
Uniform Delay, d1		20.0			20.6			12.4			13.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.6			2.1			3.7	
Delay (s)		20.4			21.2			14.6			17.3	
Level of Service		C			C			B			B	
Approach Delay (s)		20.4			21.2			14.6			17.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.93		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1750		1789	1883	1601		5141			4996	
Flt Permitted	0.73	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1366	1750		1406	1883	1601		5141			4996	
Volume (vph)	230	9	8	1	49	415	0	2208	1	0	2419	565
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	230	9	8	1	49	415	0	2208	1	0	2419	565
Lane Group Flow (vph)	230	17	0	1	49	415	0	2209	0	0	2984	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	486	622		500	670	569		2856			2776	
v/s Ratio Prot		0.01			0.03			0.43			c0.60	
v/s Ratio Perm	0.17			0.00		c0.26						
v/c Ratio	0.47	0.03		0.00	0.07	0.73		0.77			1.07	
Uniform Delay, d1	22.5	18.9		18.7	19.2	25.2		15.6			20.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.3	0.1		0.0	0.2	8.0		2.1			41.3	
Delay (s)	25.8	19.0		18.7	19.4	33.2		17.7			61.3	
Level of Service	C	B		B	B	C		B			E	
Approach Delay (s)		25.3			31.7			17.7			61.3	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	41.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.1%	ICU Level of Service	E

c Critical Lane Group

2030 ALTERNATIVE 2

(Replace and Widen) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0			4.0	4.0		4.0
Lane Util. Factor		0.95			0.95	1.00			1.00	1.00		1.00
Frt		1.00			1.00	0.85			0.86	1.00		0.85
Flt Protected		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (prot)		3568			3579	1601			1629	1789		1601
Flt Permitted		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (perm)		3568			3579	1601			1629	1789		1601
Volume (vph)	0	986	20	0	1066	11	0	0	6	1	0	12
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	986	20	0	1066	11	0	0	6	1	0	12
Lane Group Flow (vph)	0	1006	0	0	1066	11	0	0	6	1	0	12
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0			19.0	19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0			19.0	19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00			0.25	0.25		0.25
Clearance Time (s)		4.0			4.0				4.0	4.0		4.0
Lane Grp Cap (vph)		2284			2291	1601			413	453		406
v/s Ratio Prot		0.28			c0.30					0.00		
v/s Ratio Perm						0.01			0.00			c0.01
v/c Ratio		0.44			0.47	0.01			0.01	0.00		0.03
Uniform Delay, d1		6.8			6.9	0.0			21.0	20.9		21.1
Progression Factor		1.00			1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		0.6			0.7	0.0			0.1	0.0		0.1
Delay (s)		7.4			7.6	0.0			21.0	20.9		21.2
Level of Service		A			A	A			C	C		C
Approach Delay (s)		7.4			7.5			21.0			21.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		0.99			0.86			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3393			1629			5142			5142	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2606			1629			5142			5142	
Volume (vph)	375	1	18	0	0	8	0	2434	0	0	1991	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	375	1	18	0	0	8	0	2434	0	0	1991	0
Lane Group Flow (vph)	0	394	0	0	8	0	0	2434	0	0	1991	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		898			561			2914			2914	
v/s Ratio Prot					0.00			c0.47			0.39	
v/s Ratio Perm		c0.15										
v/c Ratio		0.44			0.01			0.84			0.68	
Uniform Delay, d1		22.8			19.4			16.0			13.8	
Progression Factor		1.00			1.00			1.11			0.25	
Incremental Delay, d2		1.6			0.0			2.1			1.1	
Delay (s)		24.3			19.5			19.9			4.6	
Level of Service		C			B			B			A	
Approach Delay (s)		24.3			19.5			19.9			4.6	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	144	0	4	34	23	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	144	0	4	34	23	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	144	0	4	34	33
Volume Left (vph)	144	0	0	0	23
Volume Right (vph)	0	0	0	34	10
Hadj (s)	0.2	0.0	0.0	-0.6	0.0
Departure Headway (s)	4.8	4.6	4.7	4.1	4.3
Degree Utilization, x	0.19	0.00	0.01	0.04	0.04
Capacity (veh/h)	737	786	755	856	794
Control Delay (s)	7.8	6.4	6.5	6.1	7.5
Approach Delay (s)	7.8		6.1		7.5
Approach LOS	A		A		A

Intersection Summary			
Delay	7.4		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1869	
Flt Permitted	1.00		0.75	1.00	1.00	
Satd. Flow (perm)	1631		1404	1883	1869	
Volume (vph)	4	345	4	145	17	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	345	4	145	17	1
Lane Group Flow (vph)	349	0	4	145	18	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		613	822	816	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.51		0.01	0.18	0.02	
Uniform Delay, d1	11.8		8.8	9.5	8.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.7		0.0	0.5	0.0	
Delay (s)	14.6		8.8	9.9	8.9	
Level of Service	B		A	A	A	
Approach Delay (s)	14.6			9.9	8.9	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	1	37	90	23	24	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1	37	90	23	24	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	13	25	60	53	24
Volume Left (vph)	1	0	0	0	24
Volume Right (vph)	0	0	0	23	0
Hadj (s)	0.0	0.0	0.0	-0.2	0.2
Departure Headway (s)	4.7	4.7	4.6	4.4	4.5
Degree Utilization, x	0.02	0.03	0.08	0.06	0.03
Capacity (veh/h)	759	756	773	811	775
Control Delay (s)	6.6	6.6	6.8	6.5	7.6
Approach Delay (s)	6.6		6.6		7.6
Approach LOS	A		A		A

Intersection Summary			
Delay	6.8		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	6	17	5	0	4	0	4	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	6	17	5	0	4	0	4	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	6	17	5	4	4	0	0
Volume Left (vph)	0	0	17	0	4	0	0	0
Volume Right (vph)	0	6	0	0	0	4	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.00
Capacity (veh/h)	781	902	752	776	733	878	788	788
Control Delay (s)	6.4	5.8	6.7	6.4	6.6	5.8	6.4	6.4
Approach Delay (s)	6.1		6.6		6.2		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0	4.0		4.0			4.0	4.0
Lane Util. Factor			1.00		0.91	1.00		0.91			1.00	1.00
Frt			0.85		1.00	0.85		1.00			1.00	0.85
Flt Protected			1.00		1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)			1601		5142	1601		5140			1789	1601
Flt Permitted			1.00		1.00	1.00		1.00			0.75	1.00
Satd. Flow (perm)			1601		5142	1601		5140			1412	1601
Volume (vph)	0	0	1	0	2426	90	0	2370	4	85	1	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	1	0	2426	90	0	2370	4	85	1	6
Lane Group Flow (vph)	0	0	1	0	2426	90	0	2374	0	0	86	6
Turn Type			custom			Perm				Perm		Perm
Protected Phases					4			4			6	
Permitted Phases		6	6			4				6		6
Actuated Green, G (s)			23.0		59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)			23.0		59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio			0.26		0.66	0.66		0.66			0.26	0.26
Clearance Time (s)			4.0		4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)			409		3371	1050		3370			361	409
v/s Ratio Prot					c0.47			0.46				
v/s Ratio Perm			0.00			0.06					c0.06	0.00
v/c Ratio			0.00		0.72	0.09		0.70			0.24	0.01
Uniform Delay, d1			25.0		10.1	5.7		9.9			26.6	25.0
Progression Factor			1.00		1.00	1.00		1.63			1.00	1.00
Incremental Delay, d2			0.0		1.4	0.2		1.0			1.6	0.1
Delay (s)			25.0		11.5	5.8		17.1			28.1	25.1
Level of Service			C		B	A		B			C	C
Approach Delay (s)	25.0				11.3			17.1			27.9	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	946	22	3	1061	22	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	946	22	3	1061	22	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	631	337	357	707	27
Volume Left (vph)	0	0	3	0	22
Volume Right (vph)	0	22	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.8	5.8	5.8	5.8	6.9
Degree Utilization, x	1.02	0.54	0.57	1.13	0.05
Capacity (veh/h)	614	614	613	628	511
Control Delay (s)	63.3	14.1	15.0	99.8	10.3
Approach Delay (s)	46.1		71.4		10.3
Approach LOS	E		F		B

Intersection Summary			
Delay	58.7		
HCM Level of Service	F		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	939	10	4	1053	9	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	939	10	4	1053	9	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	626	323	355	702	14
Volume Left (vph)	0	0	4	0	9
Volume Right (vph)	0	10	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	-0.1
Departure Headway (s)	5.7	5.7	5.7	5.7	6.8
Degree Utilization, x	1.00	0.51	0.56	1.11	0.03
Capacity (veh/h)	620	618	621	646	522
Control Delay (s)	58.2	13.4	14.5	90.7	10.0
Approach Delay (s)	43.0		65.1		10.0
Approach LOS	E		F		A

Intersection Summary			
Delay	54.3		
HCM Level of Service	F		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1883			1630			5125			5142	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1882			1630			5125			5142	
Volume (vph)	1	216	0	0	1	357	0	1857	41	0	1633	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	216	0	0	1	357	0	1857	41	0	1633	0
Lane Group Flow (vph)	0	217	0	0	358	0	0	1898	0	0	1633	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		669			580			2847			2857	
v/s Ratio Prot					c0.22			c0.37			0.32	
v/s Ratio Perm		0.12										
v/c Ratio		0.32			0.62			0.67			0.57	
Uniform Delay, d1		21.1			23.9			14.1			13.0	
Progression Factor		1.00			1.00			0.76			0.99	
Incremental Delay, d2		1.3			4.9			0.7			0.8	
Delay (s)		22.4			28.8			11.3			13.7	
Level of Service		C			C			B			B	
Approach Delay (s)		22.4			28.8			11.3			13.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	B

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	72	1622	0	38	1841	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	1622	0	38	1841	0
Lane Group Flow (vph)	72	1622	0	38	1841	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.04			0.02	c0.36	
v/s Ratio Perm		c0.44				
v/c Ratio	0.13	0.44		0.08	0.60	
Uniform Delay, d1	23.0	0.0		22.6	10.7	
Progression Factor	0.62	1.00		0.84	1.02	
Incremental Delay, d2	0.5	0.3		0.2	0.6	
Delay (s)	14.6	0.3		19.1	11.6	
Level of Service	B	A		B	B	
Approach Delay (s)	0.9		19.1		11.6	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	6.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	45.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.86	
Flt Protected		1.00			1.00			0.95			1.00	
Satd. Flow (prot)		5023			5139			1792			1629	
Flt Permitted		1.00			1.00			0.78			1.00	
Satd. Flow (perm)		5023			5139			1460			1629	
Volume (vph)	0	1607	294	0	1657	6	66	2	2	0	0	4
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1607	294	0	1657	6	66	2	2	0	0	4
Lane Group Flow (vph)	0	1901	0	0	1663	0	0	70	0	0	4	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3070			3141			438			489	
v/s Ratio Prot		c0.38			0.32						0.00	
v/s Ratio Perm								c0.05				
v/c Ratio		0.62			0.53			0.16			0.01	
Uniform Delay, d1		10.9			10.1			23.2			22.1	
Progression Factor		2.25			1.00			1.00			1.00	
Incremental Delay, d2		0.8			0.6			0.8			0.0	
Delay (s)		25.5			10.7			23.9			22.1	
Level of Service		C			B			C			C	
Approach Delay (s)		25.5			10.7			23.9			22.1	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.97	
Flt Protected		0.96			1.00			0.97			1.00	
Satd. Flow (prot)		1804			1866			1805			1820	
Flt Permitted		0.39			1.00			0.72			0.97	
Satd. Flow (perm)		730			1865			1338			1779	
Volume (vph)	375	57	3	1	465	34	105	60	20	20	180	57
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	375	57	3	1	465	34	105	60	20	20	180	57
Lane Group Flow (vph)	0	435	0	0	500	0	0	185	0	0	257	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		357			912			565			751	
v/s Ratio Prot												
v/s Ratio Perm		c0.60			0.27			0.14			c0.14	
v/c Ratio		1.22			0.55			0.33			0.34	
Uniform Delay, d1		23.0			16.1			17.4			17.6	
Progression Factor		1.00			1.16			1.00			1.00	
Incremental Delay, d2		121.1			2.4			1.5			1.2	
Delay (s)		144.1			20.9			19.0			18.8	
Level of Service		F			C			B			B	
Approach Delay (s)		144.1			20.9			19.0			18.8	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.88			1.00			0.99	
Flt Protected		0.97			1.00			1.00			1.00	
Satd. Flow (prot)		1796			1656			1882			1870	
Flt Permitted		0.94			1.00			1.00			0.99	
Satd. Flow (perm)		1740			1653			1881			1853	
Volume (vph)	4	2	1	1	1	14	1	544	3	11	563	29
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	2	1	1	1	14	1	544	3	11	563	29
Lane Group Flow (vph)	0	7	0	0	16	0	0	548	0	0	603	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		599			569			1066			1050	
v/s Ratio Prot												
v/s Ratio Perm		0.00			c0.01			0.29			c0.33	
v/c Ratio		0.01			0.03			0.51			0.57	
Uniform Delay, d1		19.4			19.5			11.9			12.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.0			0.1			1.8			2.3	
Delay (s)		19.5			19.6			13.7			14.8	
Level of Service		B			B			B			B	
Approach Delay (s)		19.5			19.6			13.7			14.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.97		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1827		1789	1883	1601		5141			5063	
Flt Permitted	0.75	1.00		0.74	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1417	1827		1396	1883	1601		5141			5063	
Volume (vph)	9	20	5	3	8	66	0	1900	3	0	1958	224
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	20	5	3	8	66	0	1900	3	0	1958	224
Lane Group Flow (vph)	9	25	0	3	8	66	0	1903	0	0	2182	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	504	650		496	670	569		2856			2813	
v/s Ratio Prot		0.01			0.00			0.37			c0.43	
v/s Ratio Perm	0.01			0.00		c0.04						
v/c Ratio	0.02	0.04		0.01	0.01	0.12		0.67			0.78	
Uniform Delay, d1	18.8	18.9		18.7	18.8	19.5		14.1			15.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.0	0.0	0.4		1.2			2.2	
Delay (s)	18.9	19.1		18.8	18.8	19.9		15.4			17.8	
Level of Service	B	B		B	B	B		B			B	
Approach Delay (s)		19.0			19.7			15.4			17.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Diamond Option) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↰	↑↑		↰		↱	↰		↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Util. Factor		0.95			0.95		1.00		1.00	1.00		1.00
Frt		1.00			1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579			3579		1789		1601	1789		1601
Flt Permitted		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579			3579		1789		1601	1789		1601
Volume (vph)	0	1255	0	0	228	0	2	0	2	5	0	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1255	0	0	228	0	2	0	2	5	0	6
Lane Group Flow (vph)	0	1255	0	0	228	0	2	0	2	5	0	6
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		38.0			38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0			38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51			0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813			1813		692		619	692		619
v/s Ratio Prot		c0.35			0.06					0.00		
v/s Ratio Perm							0.00		0.00			c0.00
v/c Ratio		0.69			0.13		0.00		0.00	0.01		0.01
Uniform Delay, d1		14.1			9.7		14.1		14.1	14.1		14.2
Progression Factor		1.00			1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		2.2			0.1		0.0		0.0	0.0		0.0
Delay (s)		16.3			9.9		14.1		14.1	14.2		14.2
Level of Service		B			A		B		B	B		B
Approach Delay (s)		16.3			9.9			14.1			14.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3401			1632			5142			5140	
Flt Permitted		0.59			0.99			1.00			1.00	
Satd. Flow (perm)		2115			1625			5142			5140	
Volume (vph)	304	3	8	6	0	371	0	3136	0	0	2143	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	304	3	8	6	0	371	0	3136	0	0	2143	5
Lane Group Flow (vph)	0	315	0	0	377	0	0	3136	0	0	2148	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		729			560			2914			2913	
v/s Ratio Prot								c0.61			0.42	
v/s Ratio Perm		0.15			c0.23							
v/c Ratio		1.26dl			0.67			1.08			0.74	
Uniform Delay, d1		22.7			25.2			19.5			14.5	
Progression Factor		1.00			1.00			1.00			0.42	
Incremental Delay, d2		1.9			6.3			41.5			1.3	
Delay (s)		24.6			31.5			61.0			7.4	
Level of Service		C			C			E			A	
Approach Delay (s)		24.6			31.5			61.0			7.4	
Approach LOS		C			C			E			A	

Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	110.7%	ICU Level of Service	G

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	515	3	11	61	47	94
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	515	3	11	61	47	94

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	515	3	11	61	141
Volume Left (vph)	515	0	0	0	47
Volume Right (vph)	0	0	0	61	94
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.2	5.0	5.3	4.7	5.1
Degree Utilization, x	0.74	0.00	0.02	0.08	0.20
Capacity (veh/h)	685	709	640	722	649
Control Delay (s)	20.0	6.8	7.2	7.0	9.3
Approach Delay (s)	19.9		7.0		9.3
Approach LOS	C		A		A

Intersection Summary			
Delay	16.6		
HCM Level of Service	C		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1826	
Flt Permitted	1.00		0.66	1.00	1.00	
Satd. Flow (perm)	1630		1242	1883	1826	
Volume (vph)	2	268	87	526	119	35
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	268	87	526	119	35
Lane Group Flow (vph)	270	0	87	526	154	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	690		537	814	790	
v/s Ratio Prot	c0.17			c0.28	0.08	
v/s Ratio Perm			0.07			
v/c Ratio	0.39		0.16	0.65	0.19	
Uniform Delay, d1	11.1		9.6	12.4	9.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.7		0.6	3.9	0.6	
Delay (s)	12.7		10.3	16.3	10.3	
Level of Service	B		B	B	B	
Approach Delay (s)	12.7			15.5	10.3	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	426	46	44	69	144	99
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	426	46	44	69	144	99

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	472	67	46	96	147
Volume Left (vph)	426	44	0	0	0
Volume Right (vph)	46	0	0	0	99
Hadj (s)	0.2	0.2	0.0	0.0	-0.4
Departure Headway (s)	5.0	6.2	6.1	5.9	5.5
Degree Utilization, x	0.65	0.12	0.08	0.16	0.22
Capacity (veh/h)	698	541	552	572	616
Control Delay (s)	16.9	8.8	8.4	8.8	8.9
Approach Delay (s)	16.9	8.6		8.9	
Approach LOS	C	A		A	

Intersection Summary			
Delay	13.4		
HCM Level of Service	B		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	5	2	5	0	33	0	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	5	2	5	0	33	0	0	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	5	2	5	33	0	0	0
Volume Left (vph)	0	0	2	0	33	0	0	0
Volume Right (vph)	0	5	0	0	0	0	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	0.0	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.5	4.6	4.6
Degree Utilization, x	0.01	0.01	0.00	0.01	0.04	0.00	0.00	0.00
Capacity (veh/h)	769	876	738	762	741	797	793	793
Control Delay (s)	6.4	5.8	6.6	6.5	6.8	6.3	6.4	6.4
Approach Delay (s)	6.1		6.5		6.8		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.6		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0			4.0	
Lane Util. Factor		1.00	1.00					0.91			0.91	
Frt		1.00	0.85					1.00			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		1883	1601					5142			5142	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		1883	1601					5142			5142	
Volume (vph)	0	3	77	0	0	0	0	3053	0	0	2817	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	3	77	0	0	0	0	3053	0	0	2817	0
Lane Group Flow (vph)	0	3	77	0	0	0	0	3053	0	0	2817	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)		23.0	23.0					59.0			59.0	
Effective Green, g (s)		23.0	23.0					59.0			59.0	
Actuated g/C Ratio		0.26	0.26					0.66			0.66	
Clearance Time (s)		4.0	4.0					4.0			4.0	
Lane Grp Cap (vph)		481	409					3371			3371	
v/s Ratio Prot		0.00						c0.59			0.55	
v/s Ratio Perm			c0.05									
v/c Ratio		0.01	0.19					0.91			0.84	
Uniform Delay, d1		25.0	26.2					13.1			11.8	
Progression Factor		1.00	1.00					1.00			1.00	
Incremental Delay, d2		0.0	1.0					4.6			2.6	
Delay (s)		25.0	27.2					17.8			14.4	
Level of Service		C	C					B			B	
Approach Delay (s)		27.1			0.0			17.8			14.4	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.93			1.00		1.00	0.90			0.88	
Flt Protected		1.00			0.96		0.95	1.00			1.00	
Satd. Flow (prot)		1756			1800		3471	1687			1644	
Flt Permitted		1.00			0.62		0.73	1.00			0.97	
Satd. Flow (perm)		1756			1161		2683	1687			1604	
Volume (vph)	0	71	71	114	9	0	1238	200	460	3	0	32
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	71	71	114	9	0	1238	200	460	3	0	32
Lane Group Flow (vph)	0	142	0	0	123	0	1238	660	0	0	35	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		459			303		1744	1097			1043	
v/s Ratio Prot		0.08						0.39				
v/s Ratio Perm					c0.11		c0.46				0.02	
v/c Ratio		0.31			0.41		0.71	0.60			0.03	
Uniform Delay, d1		26.7			27.5		10.2	9.1			5.6	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.7			4.0		2.5	2.4			0.1	
Delay (s)		28.5			31.5		12.7	11.5			5.7	
Level of Service		C			C		B	B			A	
Approach Delay (s)		28.5			31.5			12.3			5.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0		4.0		
Lane Util. Factor	1.00	0.95			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)	1789	3579			1883	1601	1789		1601		
Flt Permitted	0.72	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (perm)	1361	3579			1883	1601	1789		1601		
Volume (vph)	74	1251	0	0	53	177	70	0	4	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	74	1251	0	0	53	177	70	0	4	0	0
Lane Group Flow (vph)	74	1251	0	0	53	177	70	0	4	0	0
Turn Type	Perm					Free	custom		custom	Prot	
Protected Phases		4			8					6	
Permitted Phases	4					Free	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Effective Green, g (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Actuated g/C Ratio	0.66	0.66			0.66	1.00	0.26		0.26		
Clearance Time (s)	4.0	4.0			4.0		4.0		4.0		
Lane Grp Cap (vph)	892	2346			1234	1601	457		409		
v/s Ratio Prot		c0.35			0.03						
v/s Ratio Perm	0.05					0.11	c0.04		0.00		
v/c Ratio	0.08	0.53			0.04	0.11	0.15		0.01		
Uniform Delay, d1	5.6	8.2			5.5	0.0	26.0		25.0		
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00		
Incremental Delay, d2	0.2	0.9			0.1	0.1	0.7		0.0		
Delay (s)	5.8	9.1			5.6	0.1	26.7		25.0		
Level of Service	A	A			A	A	C		C		
Approach Delay (s)		8.9			1.4			26.6		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1139	1	4	214	3	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1139	1	4	214	3	6

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	759	381	75	143	9
Volume Left (vph)	0	0	4	0	3
Volume Right (vph)	0	1	0	0	6
Hadj (s)	0.0	0.0	0.0	0.0	-0.3
Departure Headway (s)	4.7	4.7	5.7	5.7	5.8
Degree Utilization, x	1.00	0.50	0.12	0.22	0.01
Capacity (veh/h)	748	750	618	624	602
Control Delay (s)	53.2	11.2	8.2	9.1	8.9
Approach Delay (s)	39.2		8.8		8.9
Approach LOS	E		A		A

Intersection Summary			
Delay	34.1		
HCM Level of Service	D		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1143	7	8	227	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1143	7	8	227	5	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	762	388	84	151	7
Volume Left (vph)	0	0	8	0	5
Volume Right (vph)	0	7	0	0	2
Hadj (s)	0.0	0.0	0.1	0.0	0.0
Departure Headway (s)	4.8	4.7	5.7	5.7	6.1
Degree Utilization, x	1.01	0.51	0.13	0.24	0.01
Capacity (veh/h)	746	749	616	623	569
Control Delay (s)	54.8	11.4	8.3	9.2	9.2
Approach Delay (s)	40.2		8.9		9.2
Approach LOS	E		A		A

Intersection Summary			
Delay	34.7		
HCM Level of Service	D		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1880			1656			5122			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1877			1651			5122			5141	
Volume (vph)	4	520	6	3	31	281	0	2451	65	0	1861	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	520	6	3	31	281	0	2451	65	0	1861	3
Lane Group Flow (vph)	0	530	0	0	315	0	0	2516	0	0	1864	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		647			569			2902			2913	
v/s Ratio Prot								c0.49			0.36	
v/s Ratio Perm		c0.28			0.19							
v/c Ratio		0.82			0.55			0.87			0.64	
Uniform Delay, d1		26.9			23.9			16.6			13.3	
Progression Factor		1.00			1.00			0.39			1.00	
Incremental Delay, d2		11.1			3.8			0.4			1.0	
Delay (s)		38.0			27.7			6.9			14.2	
Level of Service		D			C			A			B	
Approach Delay (s)		38.0			27.7			6.9			14.2	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	158	1838	0	128	2423	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	158	1838	0	128	2423	0
Lane Group Flow (vph)	158	1838	0	128	2423	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.09				c0.48	
v/s Ratio Perm		c0.50		0.08		
v/c Ratio	0.32	0.50		0.28	0.76	
Uniform Delay, d1	25.7	0.0		25.5	11.6	
Progression Factor	1.00	1.00		0.54	0.21	
Incremental Delay, d2	1.7	0.5		1.5	0.8	
Delay (s)	27.4	0.5		15.2	3.2	
Level of Service	C	A		B	A	
Approach Delay (s)	2.6		15.2		3.2	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.96	
Flt Protected		1.00			1.00			0.95			0.97	
Satd. Flow (prot)		5032			5139			1793			1748	
Flt Permitted		1.00			1.00			0.72			0.84	
Satd. Flow (perm)		5032			5139			1351			1510	
Volume (vph)	0	2263	377	0	1819	6	225	4	3	12	1	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2263	377	0	1819	6	225	4	3	12	1	6
Lane Group Flow (vph)	0	2640	0	0	1825	0	0	232	0	0	19	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3281			3350			351			392	
v/s Ratio Prot		c0.52			0.36							
v/s Ratio Perm								c0.17			0.01	
v/c Ratio		0.80			0.54			0.66			0.05	
Uniform Delay, d1		11.5			8.5			29.9			25.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.2			0.6			9.4			0.2	
Delay (s)		13.7			9.1			39.4			25.4	
Level of Service		B			A			D			C	
Approach Delay (s)		13.7			9.1			39.4			25.4	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			1.00			1.00			0.95	
Flt Protected	0.95	1.00			1.00			0.96			0.98	
Satd. Flow (prot)	1789	1881			1880			1808			1758	
Flt Permitted	0.59	1.00			0.99			0.75			0.90	
Satd. Flow (perm)	1120	1881			1871			1411			1617	
Volume (vph)	303	194	2	6	217	1	149	34	2	15	10	14
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	303	194	2	6	217	1	149	34	2	15	10	14
Lane Group Flow (vph)	303	196	0	0	224	0	0	185	0	0	39	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	548	920			915			596			683	
v/s Ratio Prot		0.10										
v/s Ratio Perm	c0.27				0.12			c0.13			0.02	
v/c Ratio	0.55	0.21			0.24			0.31			0.06	
Uniform Delay, d1	16.1	13.1			13.4			17.3			15.4	
Progression Factor	1.00	1.00			1.21			1.00			1.00	
Incremental Delay, d2	4.0	0.5			0.6			1.4			0.2	
Delay (s)	20.1	13.7			16.8			18.6			15.6	
Level of Service	C	B			B			B			B	
Approach Delay (s)		17.6			16.8			18.6			15.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.95			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1793			1783			1882			1863	
Flt Permitted		0.83			0.99			1.00			0.99	
Satd. Flow (perm)		1541			1777			1875			1852	
Volume (vph)	44	9	5	1	9	6	5	563	2	8	575	49
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	44	9	5	1	9	6	5	563	2	8	575	49
Lane Group Flow (vph)	0	58	0	0	16	0	0	570	0	0	632	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		479			553			1125			1111	
v/s Ratio Prot												
v/s Ratio Perm		c0.04			0.01			0.30			c0.34	
v/c Ratio		0.12			0.03			0.51			0.57	
Uniform Delay, d1		22.2			21.5			10.3			10.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.1			1.6			2.1	
Delay (s)		22.7			21.6			12.0			13.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.7			21.6			12.0			13.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1846		1789	1883	1601		5141			5041	
Flt Permitted	0.76	1.00		0.71	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1422	1846		1342	1883	1601		5141			5041	
Volume (vph)	469	59	9	1	4	364	0	2241	1	0	2240	335
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	469	59	9	1	4	364	0	2241	1	0	2240	335
Lane Group Flow (vph)	469	68	0	1	4	364	0	2242	0	0	2575	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	474	615		447	628	534		2970			2913	
v/s Ratio Prot		0.04			0.00			0.44			c0.51	
v/s Ratio Perm	c0.33			0.00		0.23						
v/c Ratio	0.99	0.11		0.00	0.01	0.68		0.75			0.88	
Uniform Delay, d1	29.8	20.8		20.0	20.0	25.9		14.2			16.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	38.8	0.4		0.0	0.0	6.9		1.8			4.3	
Delay (s)	68.7	21.1		20.0	20.1	32.8		16.1			20.7	
Level of Service	E	C		C	C	C		B			C	
Approach Delay (s)		62.6			32.6			16.1			20.7	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Diamond Option) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↰	↑↑		↰		↱	↰		↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lane Util. Factor		0.95		1.00	0.95		1.00		1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579		1789	3579		1789		1601	1789		1601
Flt Permitted		1.00		0.24	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579		446	3579		1789		1601	1789		1601
Volume (vph)	0	890	0	5	1197	0	6	0	9	18	0	86
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	890	0	5	1197	0	6	0	9	18	0	86
Lane Group Flow (vph)	0	890	0	5	1197	0	6	0	9	18	0	86
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		28.0		28.0	28.0		24.0		24.0	24.0		24.0
Effective Green, g (s)		28.0		28.0	28.0		24.0		24.0	24.0		24.0
Actuated g/C Ratio		0.47		0.47	0.47		0.40		0.40	0.40		0.40
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1670		208	1670		716		640	716		640
v/s Ratio Prot		0.25			c0.33					0.01		
v/s Ratio Perm				0.01			0.00		0.01			c0.05
v/c Ratio		0.53		0.02	0.72		0.01		0.01	0.03		0.13
Uniform Delay, d1		11.4		8.6	12.8		10.8		10.9	10.9		11.4
Progression Factor		1.00		1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		1.2		0.2	2.7		0.0		0.0	0.1		0.4
Delay (s)		12.6		8.8	15.5		10.9		10.9	11.0		11.8
Level of Service		B		A	B		B		B	B		B
Approach Delay (s)		12.6			15.5			10.9			11.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		0.99			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3393			1631			5142			5140	
Flt Permitted		0.62			1.00			1.00			1.00	
Satd. Flow (perm)		2193			1628			5142			5140	
Volume (vph)	134	0	6	5	0	513	0	2640	0	0	2755	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	134	0	6	5	0	513	0	2640	0	0	2755	5
Lane Group Flow (vph)	0	140	0	0	518	0	0	2640	0	0	2760	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		755			561			2914			2913	
v/s Ratio Prot								0.51			c0.54	
v/s Ratio Perm		0.06			c0.32							
v/c Ratio		0.19			0.92			0.91			0.95	
Uniform Delay, d1		20.7			28.4			17.4			18.2	
Progression Factor		1.00			1.00			1.00			0.45	
Incremental Delay, d2		0.5			23.1			5.3			5.0	
Delay (s)		21.2			51.5			22.7			13.2	
Level of Service		C			D			C			B	
Approach Delay (s)		21.2			51.5			22.7			13.2	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.8%	ICU Level of Service	F

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	394	6	19	32	47	125
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	394	6	19	32	47	125

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	394	6	19	32	172
Volume Left (vph)	394	0	0	0	47
Volume Right (vph)	0	0	0	32	125
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.2	5.0	5.3	4.7	4.7
Degree Utilization, x	0.57	0.01	0.03	0.04	0.22
Capacity (veh/h)	675	701	643	725	714
Control Delay (s)	13.6	6.8	7.3	6.7	9.1
Approach Delay (s)	13.5		6.9		9.1
Approach LOS	B		A		A

Intersection Summary			
Delay	11.7		
HCM Level of Service	B		
Intersection Capacity Utilization	45.5%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1844	
Flt Permitted	1.00		0.66	1.00	1.00	
Satd. Flow (perm)	1631		1247	1883	1844	
Volume (vph)	4	470	81	422	126	23
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	470	81	422	126	23
Lane Group Flow (vph)	474	0	81	422	149	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		539	814	797	
v/s Ratio Prot	c0.29			c0.22	0.08	
v/s Ratio Perm			0.06			
v/c Ratio	0.69		0.15	0.52	0.19	
Uniform Delay, d1	13.0		9.6	11.5	9.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.5		0.6	2.4	0.5	
Delay (s)	18.5		10.2	13.9	10.2	
Level of Service	B		B	B	B	
Approach Delay (s)	18.5			13.3	10.2	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	380	87	64	87	207	218
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	380	87	64	87	207	218

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	467	93	58	138	287
Volume Left (vph)	380	64	0	0	0
Volume Right (vph)	87	0	0	0	218
Hadj (s)	0.1	0.2	0.0	0.0	-0.4
Departure Headway (s)	5.4	6.5	6.4	6.1	5.6
Degree Utilization, x	0.70	0.17	0.10	0.23	0.45
Capacity (veh/h)	646	514	524	566	617
Control Delay (s)	20.1	9.7	8.9	9.7	11.8
Approach Delay (s)	20.1	9.4		11.1	
Approach LOS	C	A		B	

Intersection Summary			
Delay	14.9		
HCM Level of Service	B		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	16	24	9	5	0	18	0	5	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	16	24	9	5	0	18	0	5	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	16	24	9	5	18	5	0	0
Volume Left (vph)	0	0	9	0	18	0	0	0
Volume Right (vph)	0	24	0	0	0	5	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.9	4.1	4.6	4.6
Degree Utilization, x	0.02	0.03	0.01	0.01	0.02	0.01	0.00	0.00
Capacity (veh/h)	774	882	741	765	724	865	776	776
Control Delay (s)	6.5	5.9	6.7	6.4	6.8	5.9	6.4	6.4
Approach Delay (s)	6.1		6.6		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0			4.0	
Lane Util. Factor		1.00	1.00					0.91			0.91	
Frt		1.00	0.85					1.00			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		1883	1601					5142			5142	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		1883	1601					5142			5142	
Volume (vph)	0	9	236	0	0	0	0	2398	0	0	3401	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	9	236	0	0	0	0	2398	0	0	3401	1
Lane Group Flow (vph)	0	9	236	0	0	0	0	2398	0	0	3402	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)		23.0	23.0					59.0			59.0	
Effective Green, g (s)		23.0	23.0					59.0			59.0	
Actuated g/C Ratio		0.26	0.26					0.66			0.66	
Clearance Time (s)		4.0	4.0					4.0			4.0	
Lane Grp Cap (vph)		481	409					3371			3371	
v/s Ratio Prot		0.00						0.47			c0.66	
v/s Ratio Perm			c0.15									
v/c Ratio		0.02	0.58					0.71			1.01	
Uniform Delay, d1		25.1	29.3					10.0			15.5	
Progression Factor		1.00	1.00					1.00			1.00	
Incremental Delay, d2		0.1	5.8					1.3			17.8	
Delay (s)		25.1	35.1					11.3			33.3	
Level of Service		C	D					B			C	
Approach Delay (s)		34.7			0.0			11.3			33.3	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.98			1.00		1.00	0.88			0.88	
Flt Protected		1.00			0.96		0.95	1.00			1.00	
Satd. Flow (prot)		1845			1806		3471	1656			1645	
Flt Permitted		1.00			0.49		0.69	1.00			0.95	
Satd. Flow (perm)		1845			925		2507	1656			1572	
Volume (vph)	0	239	43	72	12	0	840	107	441	14	0	140
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	239	43	72	12	0	840	107	441	14	0	140
Lane Group Flow (vph)	0	282	0	0	84	0	840	548	0	0	154	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		482			242		1630	1076			1022	
v/s Ratio Prot		c0.15						0.33				
v/s Ratio Perm					0.09		c0.34				0.10	
v/c Ratio		0.59			0.35		0.52	0.51			0.15	
Uniform Delay, d1		29.0			27.0		8.3	8.2			6.1	
Progression Factor		1.00			1.34		1.00	1.00			1.00	
Incremental Delay, d2		5.1			3.9		1.2	1.7			0.3	
Delay (s)		34.1			40.2		9.5	10.0			6.4	
Level of Service		C			D		A	A			A	
Approach Delay (s)		34.1			40.2			9.7			6.4	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0		4.0		
Lane Util. Factor	1.00	0.95			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)	1789	3579			1883	1601	1789		1601		
Flt Permitted	0.73	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (perm)	1374	3579			1883	1601	1789		1601		
Volume (vph)	334	888	0	0	42	1234	42	0	3	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	334	888	0	0	42	1234	42	0	3	0	0
Lane Group Flow (vph)	334	888	0	0	42	1234	42	0	3	0	0
Turn Type	Perm					Free	custom		custom	Prot	
Protected Phases		4			8					6	
Permitted Phases	4					Free	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Effective Green, g (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Actuated g/C Ratio	0.66	0.66			0.66	1.00	0.26		0.26		
Clearance Time (s)	4.0	4.0			4.0		4.0		4.0		
Lane Grp Cap (vph)	901	2346			1234	1601	457		409		
v/s Ratio Prot		0.25			0.02						
v/s Ratio Perm	0.24					c0.77	0.02		0.00		
v/c Ratio	0.37	0.38			0.03	0.77	0.09		0.01		
Uniform Delay, d1	7.1	7.1			5.5	0.0	25.5		25.0		
Progression Factor	1.08	1.07			1.00	1.00	1.00		1.00		
Incremental Delay, d2	1.0	0.4			0.1	3.7	0.4		0.0		
Delay (s)	8.6	8.0			5.5	3.7	25.9		25.0		
Level of Service	A	A			A	A	C		C		
Approach Delay (s)		8.2			3.7			25.9		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	35.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	878	4	5	1193	1	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	878	4	5	1193	1	4

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	585	297	403	795	5
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	4	0	0	4
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	5.8	5.8	5.6	5.6	6.4
Degree Utilization, x	0.94	0.48	0.62	1.23	0.01
Capacity (veh/h)	615	611	631	655	550
Control Delay (s)	45.5	12.7	16.1	134.5	9.5
Approach Delay (s)	34.5		94.7		9.5
Approach LOS	D		F		A

Intersection Summary			
Delay	69.0		
HCM Level of Service	F		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	865	23	6	1200	3	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	865	23	6	1200	3	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	577	311	406	800	4
Volume Left (vph)	0	0	6	0	3
Volume Right (vph)	0	23	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.0
Departure Headway (s)	5.8	5.7	5.6	5.6	6.8
Degree Utilization, x	0.93	0.50	0.63	1.24	0.01
Capacity (veh/h)	614	614	630	654	515
Control Delay (s)	43.1	13.1	16.3	138.3	9.9
Approach Delay (s)	32.6		97.2		9.9
Approach LOS	D		F		A

Intersection Summary			
Delay	69.7		
HCM Level of Service	F		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1873			1653			5137			5141	
Flt Permitted		0.91			0.99			1.00			1.00	
Satd. Flow (perm)		1708			1646			5137			5141	
Volume (vph)	45	473	5	5	39	404	0	2108	14	0	2393	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	473	5	5	39	404	0	2108	14	0	2393	1
Lane Group Flow (vph)	0	523	0	0	448	0	0	2122	0	0	2394	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		588			567			2911			2913	
v/s Ratio Prot								0.41			c0.47	
v/s Ratio Perm		c0.31			0.27							
v/c Ratio		0.89			0.79			0.73			0.82	
Uniform Delay, d1		27.9			26.6			14.4			15.8	
Progression Factor		1.00			1.00			0.35			1.00	
Incremental Delay, d2		18.1			10.7			0.7			2.1	
Delay (s)		45.9			37.3			5.6			17.9	
Level of Service		D			D			A			B	
Approach Delay (s)		45.9			37.3			5.6			17.9	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.2%	ICU Level of Service	G

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	212	2362	0	123	2075	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	212	2362	0	123	2075	0
Lane Group Flow (vph)	212	2362	0	123	2075	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.12				0.41	
v/s Ratio Perm		c0.65		0.08		
v/c Ratio	0.43	0.65		0.27	0.65	
Uniform Delay, d1	26.6	0.0		25.4	10.3	
Progression Factor	1.00	1.00		0.55	0.18	
Incremental Delay, d2	2.7	0.9		1.4	0.7	
Delay (s)	29.3	0.9		15.5	2.6	
Level of Service	C	A		B	A	
Approach Delay (s)	3.2		15.5		2.6	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.93	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5032			5135			1795			1711	
Flt Permitted		1.00			1.00			0.71			0.91	
Satd. Flow (perm)		5032			5135			1334			1596	
Volume (vph)	0	1950	323	0	2272	21	405	14	5	16	1	19
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1950	323	0	2272	21	405	14	5	16	1	19
Lane Group Flow (vph)	0	2273	0	0	2293	0	0	424	0	0	36	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3281			3348			346			414	
v/s Ratio Prot		c0.45			0.45							
v/s Ratio Perm								c0.32			0.02	
v/c Ratio		0.69			0.68			1.23			0.09	
Uniform Delay, d1		10.0			9.9			33.5			25.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.2			124.5			0.4	
Delay (s)		11.2			11.1			158.0			25.8	
Level of Service		B			B			F			C	
Approach Delay (s)		11.2			11.1			158.0			25.8	
Approach LOS		B			B			F			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.95			1.00			0.97			0.93	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1789	1797			1872			1812			1742	
Flt Permitted	0.48	1.00			0.99			0.96			1.00	
Satd. Flow (perm)	907	1797			1864			1762			1737	
Volume (vph)	116	210	92	7	341	13	14	52	19	3	35	45
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	116	210	92	7	341	13	14	52	19	3	35	45
Lane Group Flow (vph)	116	302	0	0	361	0	0	85	0	0	83	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	443	879			911			744			733	
v/s Ratio Prot		0.17										
v/s Ratio Perm	0.13				c0.19			c0.05			0.05	
v/c Ratio	0.26	0.34			0.40			0.11			0.11	
Uniform Delay, d1	13.5	14.1			14.6			15.8			15.8	
Progression Factor	1.00	1.00			1.27			1.00			1.00	
Incremental Delay, d2	1.4	1.1			1.3			0.3			0.3	
Delay (s)	14.9	15.2			19.8			16.1			16.1	
Level of Service	B	B			B			B			B	
Approach Delay (s)		15.1			19.8			16.1			16.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1796			1867			1882			1858	
Flt Permitted		0.79			1.00			1.00			0.99	
Satd. Flow (perm)		1482			1866			1874			1841	
Volume (vph)	40	7	3	1	78	5	6	573	1	11	561	59
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	40	7	3	1	78	5	6	573	1	11	561	59
Lane Group Flow (vph)	0	50	0	0	84	0	0	580	0	0	631	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		461			581			1124			1105	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.05			0.31			c0.34	
v/c Ratio		0.11			0.14			0.52			0.57	
Uniform Delay, d1		22.1			22.4			10.4			11.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.5			1.7			2.1	
Delay (s)		22.6			22.9			12.1			13.1	
Level of Service		C			C			B			B	
Approach Delay (s)		22.6			22.9			12.1			13.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.94		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1764		1789	1883	1601		5141			4994	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1361	1764		1403	1883	1601		5141			4994	
Volume (vph)	231	11	8	1	53	392	0	2169	1	0	2501	593
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	231	11	8	1	53	392	0	2169	1	0	2501	593
Lane Group Flow (vph)	231	19	0	1	53	392	0	2170	0	0	3094	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	454	588		468	628	534		2970			2885	
v/s Ratio Prot		0.01			0.03			0.42			c0.62	
v/s Ratio Perm	0.17			0.00		c0.24						
v/c Ratio	0.51	0.03		0.00	0.08	0.73		0.73			1.07	
Uniform Delay, d1	24.1	20.2		20.0	20.6	26.5		13.9			19.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	4.0	0.1		0.0	0.3	8.7		1.6			40.1	
Delay (s)	28.1	20.3		20.0	20.8	35.2		15.5			59.1	
Level of Service	C	C		C	C	D		B			E	
Approach Delay (s)		27.5			33.4			15.5			59.1	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	40.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	D

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Diamond Option) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Util. Factor		0.95			0.95		1.00		1.00	1.00		1.00
Frt		1.00			1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579			3579		1789		1601	1789		1601
Flt Permitted		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579			3579		1789		1601	1789		1601
Volume (vph)	0	586	0	0	506	0	6	0	4	2	0	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	586	0	0	506	0	6	0	4	2	0	10
Lane Group Flow (vph)	0	586	0	0	506	0	6	0	4	2	0	10
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		38.0			38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0			38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51			0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813			1813		692		619	692		619
v/s Ratio Prot		c0.16			0.14					0.00		
v/s Ratio Perm							0.00		0.00			c0.01
v/c Ratio		0.32			0.28		0.01		0.01	0.00		0.02
Uniform Delay, d1		10.9			10.6		14.2		14.1	14.1		14.2
Progression Factor		1.00			1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		0.5			0.4		0.0		0.0	0.0		0.0
Delay (s)		11.4			11.0		14.2		14.2	14.1		14.2
Level of Service		B			B		B		B	B		B
Approach Delay (s)		11.4			11.0			14.2			14.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	32.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3399			1631			5142			5140	
Flt Permitted		0.59			1.00			1.00			1.00	
Satd. Flow (perm)		2109			1628			5142			5140	
Volume (vph)	293	0	8	3	0	357	0	2363	0	0	2328	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	293	0	8	3	0	357	0	2363	0	0	2328	5
Lane Group Flow (vph)	0	301	0	0	360	0	0	2363	0	0	2333	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		726			561			2914			2913	
v/s Ratio Prot								c0.46			0.45	
v/s Ratio Perm		0.14			c0.22							
v/c Ratio		1.16dl			0.64			0.81			0.80	
Uniform Delay, d1		22.6			24.8			15.6			15.5	
Progression Factor		1.00			1.00			1.00			0.61	
Incremental Delay, d2		1.7			5.6			2.6			1.8	
Delay (s)		24.3			30.4			18.2			11.2	
Level of Service		C			C			B			B	
Approach Delay (s)		24.3			30.4			18.2			11.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.2%	ICU Level of Service	E

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	143	0	4	20	14	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	143	0	4	20	14	17

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	143	0	4	20	31
Volume Left (vph)	143	0	0	0	14
Volume Right (vph)	0	0	0	20	17
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	4.8	4.6	4.7	4.1	4.1
Degree Utilization, x	0.19	0.00	0.01	0.02	0.04
Capacity (veh/h)	740	789	756	858	839
Control Delay (s)	7.7	6.4	6.5	6.0	7.2
Approach Delay (s)	7.7		6.1		7.2
Approach LOS	A		A		A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1873	
Flt Permitted	1.00		0.74	1.00	1.00	
Satd. Flow (perm)	1631		1396	1883	1873	
Volume (vph)	4	331	4	145	24	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	331	4	145	24	1
Lane Group Flow (vph)	335	0	4	145	25	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		604	814	810	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.48		0.01	0.18	0.03	
Uniform Delay, d1	11.6		9.0	9.7	9.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.4		0.0	0.5	0.1	
Delay (s)	14.0		9.0	10.2	9.1	
Level of Service	B		A	B	A	
Approach Delay (s)	14.0			10.1	9.1	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.0%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	444	37	38	23	37	131
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	444	37	38	23	37	131

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	481	46	15	25	143
Volume Left (vph)	444	38	0	0	0
Volume Right (vph)	37	0	0	0	131
Hadj (s)	0.2	0.2	0.0	0.0	-0.5
Departure Headway (s)	4.7	6.1	5.9	5.8	5.2
Degree Utilization, x	0.62	0.08	0.03	0.04	0.21
Capacity (veh/h)	754	548	562	579	641
Control Delay (s)	15.1	8.4	7.8	7.8	8.4
Approach Delay (s)	15.1	8.2		8.3	
Approach LOS	C	A		A	

Intersection Summary			
Delay	12.9		
HCM Level of Service	B		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	6	5	1	1	9	0	0	0
Volume Left (vph)	0	0	1	0	9	0	0	0
Volume Right (vph)	0	5	0	0	0	0	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	0.0	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.5	4.5	4.5
Degree Utilization, x	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Capacity (veh/h)	783	904	751	775	743	799	798	798
Control Delay (s)	6.4	5.8	6.6	6.4	6.6	6.3	6.3	6.3
Approach Delay (s)	6.1		6.5		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0					4.0			4.0	
Lane Util. Factor			1.00					0.91			0.91	
Frt			0.85					1.00			1.00	
Flt Protected			1.00					1.00			1.00	
Satd. Flow (prot)			1601					5142			5139	
Flt Permitted			1.00					1.00			1.00	
Satd. Flow (perm)			1601					5142			5139	
Volume (vph)	0	0	89	0	0	0	0	2271	0	0	2978	12
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	89	0	0	0	0	2271	0	0	2978	12
Lane Group Flow (vph)	0	0	89	0	0	0	0	2271	0	0	2990	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)			23.0					59.0			59.0	
Effective Green, g (s)			23.0					59.0			59.0	
Actuated g/C Ratio			0.26					0.66			0.66	
Clearance Time (s)			4.0					4.0			4.0	
Lane Grp Cap (vph)			409					3371			3369	
v/s Ratio Prot								0.44			c0.58	
v/s Ratio Perm			c0.06									
v/c Ratio			0.22					0.67			0.89	
Uniform Delay, d1			26.4					9.6			12.8	
Progression Factor			1.00					1.00			1.00	
Incremental Delay, d2			1.2					1.1			3.9	
Delay (s)			27.6					10.7			16.7	
Level of Service			C					B			B	
Approach Delay (s)		27.6			0.0			10.7			16.7	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.97			1.00		1.00	0.87			0.87	
Flt Protected		1.00			0.95		0.95	1.00			1.00	
Satd. Flow (prot)		1829			1797		3471	1641			1632	
Flt Permitted		1.00			0.74		0.72	1.00			1.00	
Satd. Flow (perm)		1829			1396		2625	1641			1628	
Volume (vph)	0	132	36	29	1	0	569	78	478	1	0	58
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	132	36	29	1	0	569	78	478	1	0	58
Lane Group Flow (vph)	0	168	0	0	30	0	569	556	0	0	59	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		478			365		1706	1067			1058	
v/s Ratio Prot		c0.09						c0.34				
v/s Ratio Perm					0.02		0.22				0.04	
v/c Ratio		0.35			0.08		0.33	0.52			0.06	
Uniform Delay, d1		27.1			25.1		7.0	8.3			5.7	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.0			0.4		0.5	1.8			0.1	
Delay (s)		29.1			25.5		7.6	10.2			5.8	
Level of Service		C			C		A	B			A	
Approach Delay (s)		29.1			25.5			8.8			5.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0		4.0		
Lane Util. Factor	1.00	0.95			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)	1789	3579			1883	1601	1789		1601		
Flt Permitted	0.75	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (perm)	1412	3579			1883	1601	1789		1601		
Volume (vph)	171	585	0	0	12	503	18	0	1	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	171	585	0	0	12	503	18	0	1	0	0
Lane Group Flow (vph)	171	585	0	0	12	503	18	0	1	0	0
Turn Type	Perm					Perm	custom		custom		
Protected Phases		4			8						
Permitted Phases	4					8	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	59.0	23.0		23.0		
Effective Green, g (s)	59.0	59.0			59.0	59.0	23.0		23.0		
Actuated g/C Ratio	0.66	0.66			0.66	0.66	0.26		0.26		
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0		4.0		
Lane Grp Cap (vph)	926	2346			1234	1050	457		409		
v/s Ratio Prot		0.16			0.01						
v/s Ratio Perm	0.12					c0.31	c0.01		0.00		
v/c Ratio	0.18	0.25			0.01	0.48	0.04		0.00		
Uniform Delay, d1	6.1	6.4			5.4	7.8	25.2		25.0		
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00		
Incremental Delay, d2	0.4	0.3			0.0	1.6	0.2		0.0		
Delay (s)	6.5	6.6			5.4	9.3	25.4		25.0		
Level of Service	A	A			A	A	C		C		
Approach Delay (s)		6.6			9.3			25.3		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	570	3	4	491	2	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	570	3	4	491	2	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	380	193	168	327	5
Volume Left (vph)	0	0	4	0	2
Volume Right (vph)	0	3	0	0	3
Hadj (s)	0.0	0.0	0.0	0.0	-0.2
Departure Headway (s)	5.0	5.0	5.0	5.0	5.6
Degree Utilization, x	0.52	0.27	0.23	0.46	0.01
Capacity (veh/h)	717	711	694	704	579
Control Delay (s)	12.1	8.5	8.4	11.0	8.7
Approach Delay (s)	10.9		10.1		8.7
Approach LOS	B		B		A

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	565	5	5	496	1	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	565	5	5	496	1	6

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	377	193	170	331	7
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	5	0	0	6
Hadj (s)	0.0	0.0	0.0	0.0	-0.5
Departure Headway (s)	5.0	5.0	5.0	5.0	5.4
Degree Utilization, x	0.52	0.27	0.24	0.46	0.01
Capacity (veh/h)	715	710	693	703	599
Control Delay (s)	12.1	8.6	8.4	11.1	8.5
Approach Delay (s)	10.9		10.2		8.5
Approach LOS	B		B		A

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1882			1631			5141			5141	
Flt Permitted		0.99			1.00			1.00			1.00	
Satd. Flow (perm)		1874			1626			5141			5141	
Volume (vph)	6	463	0	4	1	407	0	1856	3	0	1921	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	6	463	0	4	1	407	0	1856	3	0	1921	1
Lane Group Flow (vph)	0	469	0	0	412	0	0	1859	0	0	1922	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		645			560			2913			2913	
v/s Ratio Prot								0.36			c0.37	
v/s Ratio Perm		0.25			c0.25							
v/c Ratio		0.73			0.74			0.64			0.66	
Uniform Delay, d1		25.8			25.9			13.2			13.5	
Progression Factor		1.00			1.00			0.31			0.51	
Incremental Delay, d2		7.0			8.4			0.6			1.0	
Delay (s)		32.8			34.3			4.7			8.0	
Level of Service		C			C			A			A	
Approach Delay (s)		32.8			34.3			4.7			8.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	73	1909	0	35	1841	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	73	1909	0	35	1841	0
Lane Group Flow (vph)	73	1909	0	35	1841	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.04				c0.36	
v/s Ratio Perm		c0.52		0.02		
v/c Ratio	0.15	0.52		0.08	0.58	
Uniform Delay, d1	24.5	0.0		24.0	9.5	
Progression Factor	1.57	1.00		0.85	0.16	
Incremental Delay, d2	0.5	0.4		0.3	0.6	
Delay (s)	38.8	0.4		20.8	2.1	
Level of Service	D	A		C	A	
Approach Delay (s)	1.8		20.8		2.1	
Approach LOS	A		C		A	

Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.90	
Flt Protected		1.00			1.00			0.95			1.00	
Satd. Flow (prot)		5060			5141			1792			1693	
Flt Permitted		1.00			1.00			0.74			1.00	
Satd. Flow (perm)		5060			5141			1391			1693	
Volume (vph)	0	1696	202	0	1881	3	132	2	3	0	1	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1696	202	0	1881	3	132	2	3	0	1	3
Lane Group Flow (vph)	0	1898	0	0	1884	0	0	137	0	0	4	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		50.5			50.5			31.5			31.5	
Effective Green, g (s)		50.5			50.5			31.5			31.5	
Actuated g/C Ratio		0.56			0.56			0.35			0.35	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2839			2885			487			593	
v/s Ratio Prot		c0.38			0.37						0.00	
v/s Ratio Perm								c0.10				
v/c Ratio		0.67			0.65			0.28			0.01	
Uniform Delay, d1		13.9			13.7			21.1			19.1	
Progression Factor		0.42			1.00			1.00			1.00	
Incremental Delay, d2		1.1			1.2			1.4			0.0	
Delay (s)		6.9			14.8			22.5			19.1	
Level of Service		A			B			C			B	
Approach Delay (s)		6.9			14.8			22.5			19.1	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.92			0.99			0.97			0.92	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1789	1724			1852			1812			1740	
Flt Permitted	0.67	1.00			0.99			0.96			1.00	
Satd. Flow (perm)	1268	1724			1838			1762			1737	
Volume (vph)	293	46	60	8	122	15	15	55	20	2	30	40
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	293	46	60	8	122	15	15	55	20	2	30	40
Lane Group Flow (vph)	293	106	0	0	145	0	0	90	0	0	72	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	620	843			899			744			733	
v/s Ratio Prot		0.06										
v/s Ratio Perm	c0.23				0.08			c0.05			0.04	
v/c Ratio	0.47	0.13			0.16			0.12			0.10	
Uniform Delay, d1	15.3	12.5			12.8			15.8			15.7	
Progression Factor	1.00	1.00			0.56			1.00			1.00	
Incremental Delay, d2	2.6	0.3			0.4			0.3			0.3	
Delay (s)	17.9	12.8			7.5			16.2			15.9	
Level of Service	B	B			A			B			B	
Approach Delay (s)		16.5			7.5			16.2			15.9	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.91			1.00			1.00	
Flt Protected		0.97			0.99			1.00			1.00	
Satd. Flow (prot)		1795			1688			1880			1874	
Flt Permitted		0.87			0.97			1.00			0.99	
Satd. Flow (perm)		1621			1662			1875			1858	
Volume (vph)	24	8	4	3	1	9	4	515	5	11	566	18
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	24	8	4	3	1	9	4	515	5	11	566	18
Lane Group Flow (vph)	0	36	0	0	13	0	0	524	0	0	595	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		504			517			1125			1115	
v/s Ratio Prot												
v/s Ratio Perm		c0.02			0.01			0.28			c0.32	
v/c Ratio		0.07			0.03			0.47			0.53	
Uniform Delay, d1		21.8			21.5			10.0			10.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.1			1.4			1.8	
Delay (s)		22.1			21.6			11.4			12.4	
Level of Service		C			C			B			B	
Approach Delay (s)		22.1			21.6			11.4			12.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.92		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1731		1789	1883	1601		5140			5053	
Flt Permitted	0.75	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1417	1731		1411	1883	1601		5140			5053	
Volume (vph)	9	6	7	7	8	27	0	1839	5	0	2017	261
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	6	7	7	8	27	0	1839	5	0	2017	261
Lane Group Flow (vph)	9	13	0	7	8	27	0	1844	0	0	2278	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	472	577		470	628	534		2970			2920	
v/s Ratio Prot		0.01			0.00			0.36			c0.45	
v/s Ratio Perm	0.01			0.00		c0.02						
v/c Ratio	0.02	0.02		0.01	0.01	0.05		0.62			0.78	
Uniform Delay, d1	20.1	20.2		20.1	20.1	20.3		12.5			14.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.1	0.0	0.2		1.0			2.1	
Delay (s)	20.2	20.2		20.2	20.1	20.5		13.5			16.7	
Level of Service	C	C		C	C	C		B			B	
Approach Delay (s)		20.2			20.4			13.5			16.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0		4.0	4.0		4.0
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00		1.00
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579	1601	1789	3579		1789		1601	1789		1601
Flt Permitted		1.00	1.00	0.14	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579	1601	261	3579		1789		1601	1789		1601
Volume (vph)	0	1191	10	8	196	0	10	0	9	6	0	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1191	10	8	196	0	10	0	9	6	0	6
Lane Group Flow (vph)	0	1191	10	8	196	0	10	0	9	6	0	6
Turn Type			Perm	Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8	8	8			2		2			2
Actuated Green, G (s)		38.0	38.0	38.0	38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0	38.0	38.0	38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51	0.51	0.51	0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813	811	132	1813		692		619	692		619
v/s Ratio Prot		c0.33			0.05					0.00		
v/s Ratio Perm			0.01	0.03			0.01		c0.01			0.00
v/c Ratio		0.66	0.01	0.06	0.11		0.01		0.01	0.01		0.01
Uniform Delay, d1		13.7	9.2	9.4	9.7		14.2		14.2	14.2		14.2
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		1.9	0.0	0.9	0.1		0.0		0.0	0.0		0.0
Delay (s)		15.6	9.2	10.3	9.8		14.2		14.2	14.2		14.2
Level of Service		B	A	B	A		B		B	B		B
Approach Delay (s)		15.5			9.8			14.2			14.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3399			1632			5142			5141	
Flt Permitted		0.60			1.00			1.00			1.00	
Satd. Flow (perm)		2122			1625			5142			5141	
Volume (vph)	285	0	8	6	0	379	0	3145	0	0	2188	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	285	0	8	6	0	379	0	3145	0	0	2188	2
Lane Group Flow (vph)	0	293	0	0	385	0	0	3145	0	0	2190	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		731			560			2914			2913	
v/s Ratio Prot								c0.61			0.43	
v/s Ratio Perm		0.14			c0.24							
v/c Ratio		1.20dl			0.69			1.08			0.75	
Uniform Delay, d1		22.4			25.3			19.5			14.7	
Progression Factor		1.00			1.00			1.00			0.43	
Incremental Delay, d2		1.6			6.7			42.7			1.4	
Delay (s)		24.1			32.1			62.2			7.7	
Level of Service		C			C			E			A	
Approach Delay (s)		24.1			32.1			62.2			7.7	
Approach LOS		C			C			E			A	

Intersection Summary			
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	110.3%	ICU Level of Service	G

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	507	4	11	61	45	94
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	507	4	11	61	45	94

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	507	4	11	61	139
Volume Left (vph)	507	0	0	0	45
Volume Right (vph)	0	0	0	61	94
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.1	4.9	5.3	4.7	5.1
Degree Utilization, x	0.73	0.01	0.02	0.08	0.20
Capacity (veh/h)	685	710	642	725	655
Control Delay (s)	19.3	6.8	7.2	6.9	9.3
Approach Delay (s)	19.2		7.0		9.3
Approach LOS	C		A		A

Intersection Summary			
Delay	16.1		
HCM Level of Service	C		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1828	
Flt Permitted	1.00		0.66	1.00	1.00	
Satd. Flow (perm)	1630		1240	1883	1828	
Volume (vph)	2	280	85	520	121	34
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	280	85	520	121	34
Lane Group Flow (vph)	282	0	85	520	155	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	690		536	814	790	
v/s Ratio Prot	c0.17			c0.28	0.08	
v/s Ratio Perm			0.07			
v/c Ratio	0.41		0.16	0.64	0.20	
Uniform Delay, d1	11.2		9.6	12.4	9.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.8		0.6	3.8	0.6	
Delay (s)	12.9		10.2	16.2	10.3	
Level of Service	B		B	B	B	
Approach Delay (s)	12.9			15.3	10.3	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	398	40	32	74	151	63
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	398	40	32	74	151	63

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	438	57	49	101	113
Volume Left (vph)	398	32	0	0	0
Volume Right (vph)	40	0	0	0	63
Hadj (s)	0.2	0.1	0.0	0.0	-0.3
Departure Headway (s)	4.9	6.0	5.9	5.8	5.4
Degree Utilization, x	0.59	0.09	0.08	0.16	0.17
Capacity (veh/h)	708	557	568	585	621
Control Delay (s)	14.8	8.4	8.2	8.7	8.3
Approach Delay (s)	14.8	8.3		8.5	
Approach LOS	B	A		A	

Intersection Summary			
Delay	12.1		
HCM Level of Service	B		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	6	3	5	0	33	0	2	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	6	3	5	0	33	0	2	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	6	3	5	33	2	0	0
Volume Left (vph)	0	0	3	0	33	0	0	0
Volume Right (vph)	0	6	0	0	0	2	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.00	0.01	0.04	0.00	0.00	0.00
Capacity (veh/h)	768	874	737	761	740	898	792	792
Control Delay (s)	6.5	5.9	6.6	6.5	6.8	5.8	6.4	6.4
Approach Delay (s)	6.1		6.5		6.7		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.6		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0			4.0			4.0	
Lane Util. Factor			1.00		0.95			0.91			0.91	
Frt			0.86		1.00			1.00			1.00	
Flt Protected			1.00		1.00			1.00			1.00	
Satd. Flow (prot)			1629		3579			5142			5142	
Flt Permitted			1.00		1.00			1.00			1.00	
Satd. Flow (perm)			1629		3579			5142			5142	
Volume (vph)	0	0	75	0	211	0	0	3063	0	0	2636	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	75	0	211	0	0	3063	0	0	2636	0
Lane Group Flow (vph)	0	0	75	0	211	0	0	3063	0	0	2636	0
Turn Type			custom	Perm								
Protected Phases					8			6			2	
Permitted Phases			4	8								
Actuated Green, G (s)			23.0		23.0			59.0			59.0	
Effective Green, g (s)			23.0		23.0			59.0			59.0	
Actuated g/C Ratio			0.26		0.26			0.66			0.66	
Clearance Time (s)			4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)			416		915			3371			3371	
v/s Ratio Prot					c0.06			c0.60			0.51	
v/s Ratio Perm			0.05									
v/c Ratio			0.18		0.23			0.91			0.78	
Uniform Delay, d1			26.1		26.5			13.2			11.0	
Progression Factor			1.00		1.00			1.00			1.00	
Incremental Delay, d2			0.9		0.6			4.8			1.9	
Delay (s)			27.1		27.1			18.0			12.8	
Level of Service			C		C			B			B	
Approach Delay (s)		27.1			27.1			18.0			12.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Util. Factor		0.95		1.00	1.00		0.97	1.00	1.00	1.00		1.00
Frt		0.98		1.00	1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)		3517		1789	1883		3471	1883	1601	1789		1601
Flt Permitted		1.00		0.69	1.00		0.95	1.00	1.00	0.62		1.00
Satd. Flow (perm)		3517		1303	1883		3471	1883	1601	1171		1601
Volume (vph)	0	85	11	1	5	0	1182	214	429	4	0	58
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	85	11	1	5	0	1182	214	429	4	0	58
Lane Group Flow (vph)	0	96	0	1	5	0	1182	214	429	4	0	58
Turn Type				Perm			Perm		Perm	custom		custom
Protected Phases		4			8			6				
Permitted Phases		4		8			6		6	2		2
Actuated Green, G (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Effective Green, g (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio		0.26		0.26	0.26		0.65	0.65	0.65	0.65		0.65
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Grp Cap (vph)		918		340	492		2256	1224	1041	761		1041
v/s Ratio Prot		c0.03			0.00			0.11				
v/s Ratio Perm				0.00			c0.34		0.27	0.00		0.04
v/c Ratio		0.10		0.00	0.01		0.52	0.17	0.41	0.01		0.06
Uniform Delay, d1		25.3		24.6	24.6		8.4	6.2	7.5	5.5		5.7
Progression Factor		1.00		1.30	1.25		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		0.2		0.0	0.0		0.9	0.3	1.2	0.0		0.1
Delay (s)		25.5		32.1	30.9		9.2	6.5	8.7	5.5		5.8
Level of Service		C		C	C		A	A	A	A		A
Approach Delay (s)		25.5			31.1			8.8			5.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0				4.0		4.0
Lane Util. Factor		0.95			1.00	1.00				1.00		1.00
Frt		1.00			1.00	0.85				1.00		0.85
Flt Protected		1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)		3555			1883	1601				1789		1601
Flt Permitted		0.92			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3290			1883	1601				1789		1601
Volume (vph)	122	1185	18	0	6	190	0	0	0	4	0	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	122	1185	18	0	6	190	0	0	0	4	0	6
Lane Group Flow (vph)	0	1325	0	0	6	190	0	0	0	4	0	6
Turn Type	Perm					Free				custom		custom
Protected Phases		4			8							
Permitted Phases	4					Free				2		2
Actuated Green, G (s)		59.0			59.0	90.0				23.0		23.0
Effective Green, g (s)		59.0			59.0	90.0				23.0		23.0
Actuated g/C Ratio		0.66			0.66	1.00				0.26		0.26
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2157			1234	1601				457		409
v/s Ratio Prot					0.00							
v/s Ratio Perm		c0.40				c0.12				0.00		0.00
v/c Ratio		0.61			0.00	0.12				0.01		0.01
Uniform Delay, d1		8.9			5.4	0.0				25.0		25.0
Progression Factor		1.31			1.00	1.00				1.00		1.00
Incremental Delay, d2		1.2			0.0	0.2				0.0		0.1
Delay (s)		12.9			5.4	0.2				25.0		25.1
Level of Service		B			A	A				C		C
Approach Delay (s)		12.9			0.3			0.0			25.1	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1123	1	7	185	6	8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1123	1	7	185	6	8

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	749	375	69	123	14
Volume Left (vph)	0	0	7	0	6
Volume Right (vph)	0	1	0	0	8
Hadj (s)	0.0	0.0	0.1	0.0	-0.2
Departure Headway (s)	4.7	4.7	5.7	5.6	5.8
Degree Utilization, x	0.99	0.49	0.11	0.19	0.02
Capacity (veh/h)	749	751	616	622	599
Control Delay (s)	49.3	11.1	8.2	8.8	9.0
Approach Delay (s)	36.6		8.6		9.0
Approach LOS	E		A		A

Intersection Summary			
Delay	32.2		
HCM Level of Service	D		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1122	6	5	198	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1122	6	5	198	5	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	748	380	71	132	7
Volume Left (vph)	0	0	5	0	5
Volume Right (vph)	0	6	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.0
Departure Headway (s)	4.7	4.7	5.6	5.6	6.1
Degree Utilization, x	0.98	0.50	0.11	0.21	0.01
Capacity (veh/h)	751	754	619	624	575
Control Delay (s)	48.5	11.1	8.1	8.9	9.1
Approach Delay (s)	35.9		8.6		9.1
Approach LOS	E		A		A

Intersection Summary			
Delay	31.6		
HCM Level of Service	D		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1878			1647			5110			5139	
Flt Permitted		1.00			0.99			1.00			1.00	
Satd. Flow (perm)		1871			1629			5110			5139	
Volume (vph)	7	519	8	8	19	312	0	2443	105	0	1874	7
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	7	519	8	8	19	312	0	2443	105	0	1874	7
Lane Group Flow (vph)	0	534	0	0	339	0	0	2548	0	0	1881	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		644			561			2896			2912	
v/s Ratio Prot								c0.50			0.37	
v/s Ratio Perm		c0.29			0.21							
v/c Ratio		0.83			0.60			0.88			0.65	
Uniform Delay, d1		27.1			24.4			16.9			13.3	
Progression Factor		1.00			1.00			0.39			1.00	
Incremental Delay, d2		11.8			4.8			0.4			1.0	
Delay (s)		38.8			29.2			7.0			14.3	
Level of Service		D			C			A			B	
Approach Delay (s)		38.8			29.2			7.0			14.3	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.7%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	135	1852	0	118	2416	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	135	1852	0	118	2416	0
Lane Group Flow (vph)	135	1852	0	118	2416	0
Turn Type		custom		custom	Prot	
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.08				c0.48	
v/s Ratio Perm		c0.51		0.07		
v/c Ratio	0.27	0.51		0.26	0.76	
Uniform Delay, d1	25.4	0.0		25.3	11.6	
Progression Factor	1.00	1.00		0.52	0.19	
Incremental Delay, d2	1.3	0.5		1.4	0.8	
Delay (s)	26.7	0.5		14.5	2.9	
Level of Service	C	A		B	A	
Approach Delay (s)	2.3		14.5		2.9	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	3.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.92	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5024			5138			1795			1701	
Flt Permitted		1.00			1.00			0.71			0.89	
Satd. Flow (perm)		5024			5138			1336			1546	
Volume (vph)	0	2220	401	0	1815	10	209	6	2	12	1	19
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2220	401	0	1815	10	209	6	2	12	1	19
Lane Group Flow (vph)	0	2621	0	0	1825	0	0	217	0	0	32	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3275			3350			347			401	
v/s Ratio Prot		c0.52			0.36							
v/s Ratio Perm								c0.16			0.02	
v/c Ratio		0.80			0.54			0.63			0.08	
Uniform Delay, d1		11.5			8.5			29.6			25.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.2			0.6			8.3			0.4	
Delay (s)		13.6			9.1			37.9			25.7	
Level of Service		B			A			D			C	
Approach Delay (s)		13.6			9.1			37.9			25.7	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			1.00			1.00			0.95	
Flt Protected	0.95	1.00			1.00			0.96			0.98	
Satd. Flow (prot)	1789	1881			1881			1808			1758	
Flt Permitted	0.63	1.00			1.00			0.75			0.90	
Satd. Flow (perm)	1182	1881			1877			1411			1617	
Volume (vph)	283	208	2	3	185	1	149	34	2	15	10	14
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	283	208	2	3	185	1	149	34	2	15	10	14
Lane Group Flow (vph)	283	210	0	0	189	0	0	185	0	0	39	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	578	920			918			596			683	
v/s Ratio Prot		0.11										
v/s Ratio Perm	c0.24				0.10			c0.13			0.02	
v/c Ratio	0.49	0.23			0.21			0.31			0.06	
Uniform Delay, d1	15.5	13.2			13.1			17.3			15.4	
Progression Factor	1.00	1.00			0.94			1.00			1.00	
Incremental Delay, d2	2.9	0.6			0.5			1.4			0.2	
Delay (s)	18.4	13.8			12.8			18.6			15.6	
Level of Service	B	B			B			B			B	
Approach Delay (s)		16.4			12.8			18.6			15.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.98			1.00			0.99	
Flt Protected		0.97			0.99			1.00			1.00	
Satd. Flow (prot)		1785			1837			1882			1862	
Flt Permitted		0.85			0.98			1.00			0.99	
Satd. Flow (perm)		1573			1813			1875			1843	
Volume (vph)	34	8	7	3	12	2	5	562	2	12	574	49
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	34	8	7	3	12	2	5	562	2	12	574	49
Lane Group Flow (vph)	0	49	0	0	17	0	0	569	0	0	635	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		489			564			1125			1106	
v/s Ratio Prot												
v/s Ratio Perm		c0.03			0.01			0.30			c0.34	
v/c Ratio		0.10			0.03			0.51			0.57	
Uniform Delay, d1		22.0			21.6			10.3			11.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.1			1.6			2.2	
Delay (s)		22.5			21.7			12.0			13.2	
Level of Service		C			C			B			B	
Approach Delay (s)		22.5			21.7			12.0			13.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1837		1789	1883	1601		5141			5040	
Flt Permitted	0.75	1.00		0.72	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1420	1837		1358	1883	1601		5141			5040	
Volume (vph)	483	46	9	1	6	357	0	2232	1	0	2250	342
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	483	46	9	1	6	357	0	2232	1	0	2250	342
Lane Group Flow (vph)	483	55	0	1	6	357	0	2233	0	0	2592	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	473	612		453	628	534		2970			2912	
v/s Ratio Prot		0.03			0.00			0.43			c0.51	
v/s Ratio Perm	c0.34			0.00		0.22						
v/c Ratio	1.02	0.09		0.00	0.01	0.67		0.75			0.89	
Uniform Delay, d1	30.0	20.6		20.0	20.1	25.7		14.2			16.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	46.8	0.3		0.0	0.0	6.5		1.8			4.6	
Delay (s)	76.8	20.9		20.0	20.1	32.2		16.0			21.1	
Level of Service	E	C		C	C	C		B			C	
Approach Delay (s)		71.1			32.0			16.0			21.1	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Util. Factor		0.95			0.95		1.00		1.00	1.00		1.00
Frt		1.00			1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3577			3579		1789		1601	1789		1601
Flt Permitted		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3577			3579		1789		1601	1789		1601
Volume (vph)	0	825	3	0	1156	0	8	0	6	26	0	84
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	825	3	0	1156	0	8	0	6	26	0	84
Lane Group Flow (vph)	0	828	0	0	1156	0	8	0	6	26	0	84
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		38.0			38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0			38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51			0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1812			1813		692		619	692		619
v/s Ratio Prot		0.23			c0.32					0.01		
v/s Ratio Perm							0.00		0.00			c0.05
v/c Ratio		0.46			0.64		0.01		0.01	0.04		0.14
Uniform Delay, d1		11.9			13.5		14.2		14.2	14.3		14.9
Progression Factor		1.00			1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		0.8			1.7		0.0		0.0	0.1		0.5
Delay (s)		12.7			15.2		14.2		14.2	14.4		15.3
Level of Service		B			B		B		B	B		B
Approach Delay (s)		12.7			15.2			14.2			15.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		0.99			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3391			1631			5142			5142	
Flt Permitted		0.61			1.00			1.00			1.00	
Satd. Flow (perm)		2161			1628			5142			5142	
Volume (vph)	115	0	6	6	0	507	0	2665	0	0	2796	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	0	6	6	0	507	0	2665	0	0	2796	0
Lane Group Flow (vph)	0	121	0	0	513	0	0	2665	0	0	2796	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		744			561			2914			2914	
v/s Ratio Prot								0.52			c0.54	
v/s Ratio Perm		0.06			c0.32							
v/c Ratio		0.16			0.91			0.91			0.96	
Uniform Delay, d1		20.5			28.2			17.5			18.5	
Progression Factor		1.00			1.00			1.00			0.57	
Incremental Delay, d2		0.5			21.9			5.8			6.0	
Delay (s)		21.0			50.1			23.3			16.6	
Level of Service		C			D			C			B	
Approach Delay (s)		21.0			50.1			23.3			16.6	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.1%	ICU Level of Service	F

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	392	6	19	31	51	116
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	392	6	19	31	51	116

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	392	6	19	31	167
Volume Left (vph)	392	0	0	0	51
Volume Right (vph)	0	0	0	31	116
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.2	5.0	5.3	4.7	4.7
Degree Utilization, x	0.56	0.01	0.03	0.04	0.22
Capacity (veh/h)	677	702	646	728	711
Control Delay (s)	13.5	6.8	7.2	6.7	9.0
Approach Delay (s)	13.4		6.9		9.0
Approach LOS	B		A		A

Intersection Summary			
Delay	11.7		
HCM Level of Service	B		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1843	
Flt Permitted	1.00		0.67	1.00	1.00	
Satd. Flow (perm)	1630		1253	1883	1843	
Volume (vph)	3	490	78	422	121	23
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	490	78	422	121	23
Lane Group Flow (vph)	493	0	78	422	144	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	690		542	814	797	
v/s Ratio Prot	c0.30			c0.22	0.08	
v/s Ratio Perm			0.06			
v/c Ratio	0.71		0.14	0.52	0.18	
Uniform Delay, d1	13.2		9.5	11.5	9.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	6.2		0.6	2.4	0.5	
Delay (s)	19.5		10.1	13.9	10.2	
Level of Service	B		B	B	B	
Approach Delay (s)	19.5			13.3	10.2	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	370	83	52	93	216	194
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	370	83	52	93	216	194

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	453	83	62	144	266
Volume Left (vph)	370	52	0	0	0
Volume Right (vph)	83	0	0	0	194
Hadj (s)	0.1	0.2	0.0	0.0	-0.4
Departure Headway (s)	5.3	6.4	6.3	6.0	5.6
Degree Utilization, x	0.67	0.15	0.11	0.24	0.41
Capacity (veh/h)	651	521	531	572	621
Control Delay (s)	18.6	9.4	8.9	9.7	11.2
Approach Delay (s)	18.6	9.2		10.6	
Approach LOS	C	A		B	

Intersection Summary			
Delay	14.0		
HCM Level of Service	B		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	14	25	10	4	0	18	0	12	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	14	25	10	4	0	18	0	12	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	14	25	10	4	18	12	0	0
Volume Left (vph)	0	0	10	0	18	0	0	0
Volume Right (vph)	0	25	0	0	0	12	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.9	4.1	4.6	4.6
Degree Utilization, x	0.02	0.03	0.01	0.01	0.02	0.01	0.00	0.00
Capacity (veh/h)	771	878	738	761	725	866	776	776
Control Delay (s)	6.5	5.9	6.7	6.5	6.8	5.9	6.4	6.4
Approach Delay (s)	6.1		6.6		6.4		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.3		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0			4.0			4.0	
Lane Util. Factor			1.00		0.95			0.91			0.91	
Frt			0.86		1.00			1.00			1.00	
Flt Protected			1.00		1.00			1.00			1.00	
Satd. Flow (prot)			1629		3579			5142			5142	
Flt Permitted			1.00		1.00			1.00			1.00	
Satd. Flow (perm)			1629		3579			5142			5142	
Volume (vph)	0	0	234	0	124	0	0	2431	0	0	3291	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	234	0	124	0	0	2431	0	0	3291	0
Lane Group Flow (vph)	0	0	234	0	124	0	0	2431	0	0	3291	0
Turn Type			custom	Perm								
Protected Phases					8			6			2	
Permitted Phases			4	8								
Actuated Green, G (s)			23.0		23.0			59.0			59.0	
Effective Green, g (s)			23.0		23.0			59.0			59.0	
Actuated g/C Ratio			0.26		0.26			0.66			0.66	
Clearance Time (s)			4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)			416		915			3371			3371	
v/s Ratio Prot					0.03			0.47			c0.64	
v/s Ratio Perm			c0.14									
v/c Ratio			0.56		0.14			0.72			0.98	
Uniform Delay, d1			29.1		25.8			10.1			14.8	
Progression Factor			1.00		1.00			1.00			1.00	
Incremental Delay, d2			5.4		0.3			1.4			10.9	
Delay (s)			34.5		26.1			11.5			25.7	
Level of Service			C		C			B			C	
Approach Delay (s)		34.5			26.1			11.5			25.7	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Util. Factor		0.95		1.00	1.00		0.97	1.00	1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)		3563		1789	1883		3471	1883	1601	1789		1601
Flt Permitted		1.00		0.57	1.00		0.95	1.00	1.00	0.69		1.00
Satd. Flow (perm)		3563		1073	1883		3471	1883	1601	1295		1601
Volume (vph)	0	239	7	4	7	0	781	108	432	14	0	187
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	239	7	4	7	0	781	108	432	14	0	187
Lane Group Flow (vph)	0	246	0	4	7	0	781	108	432	14	0	187
Turn Type				Perm			Perm		Perm	custom		custom
Protected Phases		4			8			6				
Permitted Phases		4		8			6		6	2		2
Actuated Green, G (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Effective Green, g (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio		0.26		0.26	0.26		0.65	0.65	0.65	0.65		0.65
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Grp Cap (vph)		930		280	492		2256	1224	1041	842		1041
v/s Ratio Prot		c0.07			0.00			0.06				
v/s Ratio Perm				0.00			0.22		c0.27	0.01		0.12
v/c Ratio		0.26		0.01	0.01		0.35	0.09	0.41	0.02		0.18
Uniform Delay, d1		26.4		24.7	24.7		7.1	5.8	7.5	5.6		6.2
Progression Factor		1.00		1.05	1.08		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		0.7		0.1	0.1		0.4	0.1	1.2	0.0		0.4
Delay (s)		27.1		26.1	26.6		7.5	6.0	8.8	5.6		6.6
Level of Service		C		C	C		A	A	A	A		A
Approach Delay (s)		27.1			26.4			7.8			6.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0				4.0		4.0
Lane Util. Factor	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)	1789	1880			1883	1601				1789		1601
Flt Permitted	0.75	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1416	1880			1883	1601				1789		1601
Volume (vph)	387	810	10	0	9	1224	0	0	0	3	0	16
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	387	810	10	0	9	1224	0	0	0	3	0	16
Lane Group Flow (vph)	387	820	0	0	9	1224	0	0	0	3	0	16
Turn Type	Perm					Free				custom		custom
Protected Phases		4			8							
Permitted Phases	4					Free				2		2
Actuated Green, G (s)	59.0	59.0			59.0	90.0				23.0		23.0
Effective Green, g (s)	59.0	59.0			59.0	90.0				23.0		23.0
Actuated g/C Ratio	0.66	0.66			0.66	1.00				0.26		0.26
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Lane Grp Cap (vph)	928	1232			1234	1601				457		409
v/s Ratio Prot		0.44			0.00							
v/s Ratio Perm	0.27					c0.76				0.00		0.01
v/c Ratio	0.42	0.67			0.01	0.76				0.01		0.04
Uniform Delay, d1	7.3	9.5			5.4	0.0				25.0		25.2
Progression Factor	1.07	1.11			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.3	2.8			0.0	3.5				0.0		0.2
Delay (s)	9.2	13.3			5.4	3.5				25.0		25.4
Level of Service	A	B			A	A				C		C
Approach Delay (s)		12.0			3.5			0.0			25.3	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	814	3	5	1180	1	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	814	3	5	1180	1	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	543	274	398	787	4
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	3	0	0	3
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	5.7	5.7	5.4	5.4	6.4
Degree Utilization, x	0.87	0.44	0.60	1.19	0.01
Capacity (veh/h)	616	613	643	667	547
Control Delay (s)	33.6	11.9	15.2	119.0	9.4
Approach Delay (s)	26.3		84.1		9.4
Approach LOS	D		F		A

Intersection Summary			
Delay	60.4		
HCM Level of Service	F		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	805	20	6	1189	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	805	20	6	1189	5	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	537	288	402	793	7
Volume Left (vph)	0	0	6	0	5
Volume Right (vph)	0	20	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.0
Departure Headway (s)	5.8	5.7	5.5	5.5	6.8
Degree Utilization, x	0.86	0.46	0.61	1.21	0.01
Capacity (veh/h)	614	614	640	663	517
Control Delay (s)	32.9	12.3	15.5	125.1	9.9
Approach Delay (s)	25.7		88.2		9.9
Approach LOS	D		F		A

Intersection Summary			
Delay	62.5		
HCM Level of Service	F		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1872			1656			5135			5141	
Flt Permitted		0.90			1.00			1.00			1.00	
Satd. Flow (perm)		1698			1652			5135			5141	
Volume (vph)	48	490	6	3	44	393	0	2109	19	0	2398	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	48	490	6	3	44	393	0	2109	19	0	2398	1
Lane Group Flow (vph)	0	544	0	0	440	0	0	2128	0	0	2399	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		585			569			2910			2913	
v/s Ratio Prot								0.41			c0.47	
v/s Ratio Perm		c0.32			0.27							
v/c Ratio		0.93			0.77			0.73			0.82	
Uniform Delay, d1		28.5			26.4			14.4			15.8	
Progression Factor		1.00			1.00			0.35			0.67	
Incremental Delay, d2		23.4			9.8			0.7			2.1	
Delay (s)		51.9			36.2			5.7			12.8	
Level of Service		D			D			A			B	
Approach Delay (s)		51.9			36.2			5.7			12.8	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.9%	ICU Level of Service	G

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	207	2367	0	121	2077	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	207	2367	0	121	2077	0
Lane Group Flow (vph)	207	2367	0	121	2077	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		2		
Actuated Green, G (s)	25.0	90.0		57.0	57.0	
Effective Green, g (s)	25.0	90.0		57.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.63	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		1032	3196	
v/s Ratio Prot	0.12				0.41	
v/s Ratio Perm		c0.65		0.07		
v/c Ratio	0.42	0.65		0.12	0.65	
Uniform Delay, d1	26.5	0.0		6.5	10.3	
Progression Factor	1.37	1.00		1.00	0.19	
Incremental Delay, d2	1.2	0.4		0.2	0.7	
Delay (s)	37.6	0.4		6.8	2.7	
Level of Service	D	A		A	A	
Approach Delay (s)	3.4		6.8		2.7	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.94	
Flt Protected		1.00			1.00			0.95			0.99	
Satd. Flow (prot)		5033			5133			1796			1738	
Flt Permitted		1.00			1.00			0.71			0.89	
Satd. Flow (perm)		5033			5133			1332			1578	
Volume (vph)	0	1951	321	0	2254	26	426	12	0	10	8	16
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1951	321	0	2254	26	426	12	0	10	8	16
Lane Group Flow (vph)	0	2272	0	0	2280	0	0	438	0	0	34	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.9			45.9			36.1			36.1	
Effective Green, g (s)		45.9			45.9			36.1			36.1	
Actuated g/C Ratio		0.51			0.51			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2567			2618			534			633	
v/s Ratio Prot		c0.45			0.44							
v/s Ratio Perm								c0.33			0.02	
v/c Ratio		0.89			0.87			0.82			0.05	
Uniform Delay, d1		19.7			19.4			24.1			16.5	
Progression Factor		0.68			1.00			1.00			1.00	
Incremental Delay, d2		4.0			4.3			13.2			0.2	
Delay (s)		17.4			23.8			37.3			16.7	
Level of Service		B			C			D			B	
Approach Delay (s)		17.4			23.8			37.3			16.7	
Approach LOS		B			C			D			B	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.96			0.99			0.97			1.00	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1789	1800			1868			1812			1870	
Flt Permitted	0.48	1.00			0.99			0.97			0.99	
Satd. Flow (perm)	901	1800			1859			1770			1859	
Volume (vph)	90	220	92	7	338	20	14	52	19	3	35	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	220	92	7	338	20	14	52	19	3	35	1
Lane Group Flow (vph)	90	312	0	0	365	0	0	85	0	0	39	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	440	880			909			747			785	
v/s Ratio Prot		0.17										
v/s Ratio Perm	0.10				c0.20			c0.05			0.02	
v/c Ratio	0.20	0.35			0.40			0.11			0.05	
Uniform Delay, d1	13.1	14.2			14.6			15.8			15.3	
Progression Factor	1.00	1.00			1.20			1.00			1.00	
Incremental Delay, d2	1.0	1.1			1.3			0.3			0.1	
Delay (s)	14.1	15.3			18.9			16.1			15.5	
Level of Service	B	B			B			B			B	
Approach Delay (s)		15.1			18.9			16.1			15.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1800			1868			1882			1859	
Flt Permitted		0.79			1.00			1.00			0.99	
Satd. Flow (perm)		1478			1866			1879			1850	
Volume (vph)	40	7	2	1	80	5	3	567	2	7	563	59
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	40	7	2	1	80	5	3	567	2	7	563	59
Lane Group Flow (vph)	0	49	0	0	86	0	0	572	0	0	629	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		460			581			1127			1110	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.05			0.30			c0.34	
v/c Ratio		0.11			0.15			0.51			0.57	
Uniform Delay, d1		22.1			22.4			10.4			10.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.5			1.6			2.1	
Delay (s)		22.6			22.9			12.0			13.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.6			22.9			12.0			13.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.96		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1806		1789	1883	1601		5141			4997	
Flt Permitted	0.72	1.00		0.74	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1359	1806		1391	1883	1601		5141			4997	
Volume (vph)	240	21	8	1	54	381	0	2169	1	0	2503	578
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	240	21	8	1	54	381	0	2169	1	0	2503	578
Lane Group Flow (vph)	240	29	0	1	54	381	0	2170	0	0	3081	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	453	602		464	628	534		2970			2887	
v/s Ratio Prot		0.02			0.03			0.42			c0.62	
v/s Ratio Perm	0.18			0.00		c0.24						
v/c Ratio	0.53	0.05		0.00	0.09	0.71		0.73			1.07	
Uniform Delay, d1	24.3	20.3		20.0	20.6	26.2		13.9			19.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	4.4	0.2		0.0	0.3	7.9		1.6			38.1	
Delay (s)	28.7	20.5		20.0	20.9	34.1		15.5			57.1	
Level of Service	C	C		C	C	C		B			E	
Approach Delay (s)		27.8			32.5			15.5			57.1	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	38.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	D

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0		4.0	4.0		4.0
Lane Util. Factor		0.95	1.00		0.95		1.00		1.00	1.00		1.00
Frt		1.00	0.85		1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00	1.00		1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579	1601		3579		1789		1601	1789		1601
Flt Permitted		1.00	1.00		1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579	1601		3579		1789		1601	1789		1601
Volume (vph)	0	522	3	0	488	0	6	0	5	2	0	9
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	522	3	0	488	0	6	0	5	2	0	9
Lane Group Flow (vph)	0	522	3	0	488	0	6	0	5	2	0	9
Turn Type			Perm	Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8	8	8			2		2			2
Actuated Green, G (s)		38.0	38.0		38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0	38.0		38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51	0.51		0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0	4.0		4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813	811		1813		692		619	692		619
v/s Ratio Prot		c0.15			0.14					0.00		
v/s Ratio Perm			0.00				0.00		0.00			c0.01
v/c Ratio		0.29	0.00		0.27		0.01		0.01	0.00		0.01
Uniform Delay, d1		10.7	9.1		10.6		14.2		14.2	14.1		14.2
Progression Factor		1.00	1.00		1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		0.4	0.0		0.4		0.0		0.0	0.0		0.0
Delay (s)		11.1	9.2		10.9		14.2		14.2	14.1		14.2
Level of Service		B	A		B		B		B	B		B
Approach Delay (s)		11.1			10.9			14.2			14.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	31.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3403			1632			5142			5140	
Flt Permitted		0.59			1.00			1.00			1.00	
Satd. Flow (perm)		2098			1625			5142			5140	
Volume (vph)	305	0	5	5	0	320	0	2395	0	0	2354	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	305	0	5	5	0	320	0	2395	0	0	2354	5
Lane Group Flow (vph)	0	310	0	0	325	0	0	2395	0	0	2359	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		723			560			2914			2913	
v/s Ratio Prot								c0.47			0.46	
v/s Ratio Perm		0.15			c0.20							
v/c Ratio		1.11dl			0.58			0.82			0.81	
Uniform Delay, d1		22.7			24.2			15.8			15.6	
Progression Factor		1.00			1.00			1.00			0.61	
Incremental Delay, d2		1.9			4.3			2.8			1.9	
Delay (s)		24.5			28.5			18.6			11.5	
Level of Service		C			C			B			B	
Approach Delay (s)		24.5			28.5			18.6			11.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	E

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	144	0	4	21	17	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	144	0	4	21	17	17

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	144	0	4	21	34
Volume Left (vph)	144	0	0	0	17
Volume Right (vph)	0	0	0	21	17
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	4.8	4.6	4.7	4.1	4.1
Degree Utilization, x	0.19	0.00	0.01	0.02	0.04
Capacity (veh/h)	738	787	755	856	830
Control Delay (s)	7.8	6.4	6.5	6.0	7.3
Approach Delay (s)	7.8		6.1		7.3
Approach LOS	A		A		A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1873	
Flt Permitted	1.00		0.74	1.00	1.00	
Satd. Flow (perm)	1631		1396	1883	1873	
Volume (vph)	4	333	4	145	24	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	333	4	145	24	1
Lane Group Flow (vph)	337	0	4	145	25	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		604	814	810	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.49		0.01	0.18	0.03	
Uniform Delay, d1	11.6		9.0	9.7	9.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.5		0.0	0.5	0.1	
Delay (s)	14.1		9.0	10.2	9.1	
Level of Service	B		A	B	A	
Approach Delay (s)	14.1			10.1	9.1	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.1%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	459	34	33	25	37	113
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	459	34	33	25	37	113

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	493	41	17	25	125
Volume Left (vph)	459	33	0	0	0
Volume Right (vph)	34	0	0	0	113
Hadj (s)	0.2	0.2	0.0	0.0	-0.5
Departure Headway (s)	4.6	6.0	5.9	5.8	5.2
Degree Utilization, x	0.63	0.07	0.03	0.04	0.18
Capacity (veh/h)	763	548	562	576	637
Control Delay (s)	15.3	8.3	7.8	7.8	8.2
Approach Delay (s)	15.3	8.2		8.1	
Approach LOS	C	A		A	

Intersection Summary			
Delay	13.2		
HCM Level of Service	B		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	6	5	1	1	9	0	0	0
Volume Left (vph)	0	0	1	0	9	0	0	0
Volume Right (vph)	0	5	0	0	0	0	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	0.0	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.5	4.5	4.5
Degree Utilization, x	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Capacity (veh/h)	783	904	751	775	743	799	798	798
Control Delay (s)	6.4	5.8	6.6	6.4	6.6	6.3	6.3	6.3
Approach Delay (s)	6.1		6.5		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0		4.0			4.0			4.0	
Lane Util. Factor			1.00		0.95			0.91			0.91	
Frt			0.86		1.00			1.00			1.00	
Flt Protected			1.00		1.00			1.00			1.00	
Satd. Flow (prot)			1629		3579			5142			5142	
Flt Permitted			1.00		1.00			1.00			1.00	
Satd. Flow (perm)			1629		3579			5142			5142	
Volume (vph)	0	0	82	0	72	0	0	2306	0	0	2907	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	82	0	72	0	0	2306	0	0	2907	0
Lane Group Flow (vph)	0	0	82	0	72	0	0	2306	0	0	2907	0
Turn Type			custom	Perm								
Protected Phases					8			6			2	
Permitted Phases			4	8								
Actuated Green, G (s)			23.0		23.0			59.0			59.0	
Effective Green, g (s)			23.0		23.0			59.0			59.0	
Actuated g/C Ratio			0.26		0.26			0.66			0.66	
Clearance Time (s)			4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)			416		915			3371			3371	
v/s Ratio Prot					0.02			0.45			c0.57	
v/s Ratio Perm			c0.05									
v/c Ratio			0.20		0.08			0.68			0.86	
Uniform Delay, d1			26.3		25.5			9.7			12.3	
Progression Factor			1.00		1.00			1.00			1.00	
Incremental Delay, d2			1.1		0.2			1.1			3.2	
Delay (s)			27.3		25.6			10.8			15.5	
Level of Service			C		C			B			B	
Approach Delay (s)		27.3			25.6			10.8			15.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Util. Factor		0.95		1.00	1.00		0.97	1.00	1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)		3571		1789	1883		3471	1883	1601	1789		1601
Flt Permitted		1.00		0.66	1.00		0.95	1.00	1.00	0.70		1.00
Satd. Flow (perm)		3571		1241	1883		3471	1883	1601	1324		1601
Volume (vph)	0	145	2	2	2	0	510	83	490	1	0	82
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	145	2	2	2	0	510	83	490	1	0	82
Lane Group Flow (vph)	0	147	0	2	2	0	510	83	490	1	0	82
Turn Type				Perm			Perm		Perm	custom		custom
Protected Phases		4			8			6				
Permitted Phases		4		8			6		6	2		2
Actuated Green, G (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Effective Green, g (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio		0.26		0.26	0.26		0.65	0.65	0.65	0.65		0.65
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Grp Cap (vph)		932		324	492		2256	1224	1041	861		1041
v/s Ratio Prot		c0.04			0.00			0.04				
v/s Ratio Perm				0.00			0.15		c0.31	0.00		0.05
v/c Ratio		0.16		0.01	0.00		0.23	0.07	0.47	0.00		0.08
Uniform Delay, d1		25.6		24.6	24.6		6.5	5.8	7.9	5.5		5.8
Progression Factor		1.00		1.33	1.34		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		0.4		0.0	0.0		0.2	0.1	1.5	0.0		0.1
Delay (s)		26.0		32.8	32.9		6.7	5.9	9.5	5.5		6.0
Level of Service		C		C	C		A	A	A	A		A
Approach Delay (s)		26.0			32.8			7.9			6.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0				4.0	4.0	
Lane Util. Factor		0.95			1.00	1.00				1.00	1.00	
Frt		1.00			1.00	0.85				1.00	0.85	
Flt Protected		0.99			1.00	1.00				0.95	1.00	
Satd. Flow (prot)		3524			1883	1601				1789	1601	
Flt Permitted		0.86			1.00	1.00				0.95	1.00	
Satd. Flow (perm)		3062			1883	1601				1789	1601	
Volume (vph)	212	520	5	0	2	494	0	0	0	2	0	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	212	520	5	0	2	494	0	0	0	2	0	3
Lane Group Flow (vph)	0	737	0	0	2	494	0	0	0	2	3	0
Turn Type	Perm					Free				Perm		
Protected Phases		4			8						2	
Permitted Phases	4					Free				2		
Actuated Green, G (s)		59.0			59.0	90.0				23.0	23.0	
Effective Green, g (s)		59.0			59.0	90.0				23.0	23.0	
Actuated g/C Ratio		0.66			0.66	1.00				0.26	0.26	
Clearance Time (s)		4.0			4.0					4.0	4.0	
Lane Grp Cap (vph)		2007			1234	1601				457	409	
v/s Ratio Prot					0.00						0.00	
v/s Ratio Perm		c0.24				c0.31				0.00		
v/c Ratio		0.37			0.00	0.31				0.00	0.01	
Uniform Delay, d1		7.0			5.3	0.0				25.0	25.0	
Progression Factor		1.15			1.00	1.00				1.00	1.00	
Incremental Delay, d2		0.5			0.0	0.5				0.0	0.0	
Delay (s)		8.6			5.3	0.5				25.0	25.0	
Level of Service		A			A	A				C	C	
Approach Delay (s)		8.6			0.5			0.0			25.0	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	507	5	5	473	2	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	507	5	5	473	2	4

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	338	174	163	315	6
Volume Left (vph)	0	0	5	0	2
Volume Right (vph)	0	5	0	0	4
Hadj (s)	0.0	0.0	0.0	0.0	-0.3
Departure Headway (s)	4.9	4.9	5.0	5.0	5.5
Degree Utilization, x	0.46	0.24	0.23	0.44	0.01
Capacity (veh/h)	719	714	703	712	596
Control Delay (s)	11.0	8.3	8.2	10.6	8.5
Approach Delay (s)	10.0		9.8		8.5
Approach LOS	B		A		A

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	502	5	3	478	1	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	502	5	3	478	1	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	335	172	162	319	6
Volume Left (vph)	0	0	3	0	1
Volume Right (vph)	0	5	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	4.9	4.9	5.0	5.0	5.3
Degree Utilization, x	0.46	0.24	0.22	0.44	0.01
Capacity (veh/h)	719	714	704	713	609
Control Delay (s)	10.9	8.2	8.2	10.6	8.4
Approach Delay (s)	10.0		9.8		8.4
Approach LOS	A		A		A

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1878			1631			5139			5142	
Flt Permitted		0.99			1.00			1.00			1.00	
Satd. Flow (perm)		1859			1628			5139			5142	
Volume (vph)	11	439	6	3	1	397	0	1900	7	0	1957	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	439	6	3	1	397	0	1900	7	0	1957	0
Lane Group Flow (vph)	0	456	0	0	401	0	0	1907	0	0	1957	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		640			561			2912			2914	
v/s Ratio Prot								0.37			c0.38	
v/s Ratio Perm		0.25			c0.25							
v/c Ratio		0.71			0.71			0.65			0.67	
Uniform Delay, d1		25.6			25.7			13.4			13.6	
Progression Factor		1.00			1.00			0.31			0.52	
Incremental Delay, d2		6.6			7.6			0.6			1.1	
Delay (s)		32.3			33.2			4.8			8.2	
Level of Service		C			C			A			A	
Approach Delay (s)		32.3			33.2			4.8			8.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	71	1945	0	38	1885	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	71	1945	0	38	1885	0
Lane Group Flow (vph)	71	1945	0	38	1885	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.04				c0.37	
v/s Ratio Perm		c0.53		0.02		
v/c Ratio	0.14	0.53		0.08	0.59	
Uniform Delay, d1	24.4	0.0		24.0	9.7	
Progression Factor	1.57	1.00		0.71	0.18	
Incremental Delay, d2	0.5	0.4		0.4	0.6	
Delay (s)	38.9	0.4		17.5	2.3	
Level of Service	D	A		B	A	
Approach Delay (s)	1.8		17.5		2.3	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			0.99			0.92	
Flt Protected		1.00			1.00			0.95			1.00	
Satd. Flow (prot)		5022			5141			1788			1731	
Flt Permitted		1.00			1.00			0.74			1.00	
Satd. Flow (perm)		5022			5141			1392			1731	
Volume (vph)	0	1644	302	0	1922	1	126	0	5	0	2	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1644	302	0	1922	1	126	0	5	0	2	3
Lane Group Flow (vph)	0	1946	0	0	1923	0	0	131	0	0	5	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		50.5			50.5			31.5			31.5	
Effective Green, g (s)		50.5			50.5			31.5			31.5	
Actuated g/C Ratio		0.56			0.56			0.35			0.35	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2818			2885			487			606	
v/s Ratio Prot		c0.39			0.37						0.00	
v/s Ratio Perm								c0.09				
v/c Ratio		0.69			0.67			0.27			0.01	
Uniform Delay, d1		14.2			13.8			21.0			19.1	
Progression Factor		0.42			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.2			1.4			0.0	
Delay (s)		7.1			15.1			22.3			19.1	
Level of Service		A			B			C			B	
Approach Delay (s)		7.1			15.1			22.3			19.1	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			0.97			0.97			0.99	
Flt Protected	0.95	1.00			1.00			0.99			0.99	
Satd. Flow (prot)	1789	1883			1831			1808			1860	
Flt Permitted	0.66	1.00			0.99			0.97			0.98	
Satd. Flow (perm)	1246	1883			1825			1761			1838	
Volume (vph)	305	47	0	6	120	30	15	50	20	5	35	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	305	47	0	6	120	30	15	50	20	5	35	2
Lane Group Flow (vph)	305	47	0	0	156	0	0	85	0	0	42	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	609	921			892			744			776	
v/s Ratio Prot		0.02										
v/s Ratio Perm	c0.24				0.09			c0.05			0.02	
v/c Ratio	0.50	0.05			0.17			0.11			0.05	
Uniform Delay, d1	15.6	12.1			12.9			15.8			15.4	
Progression Factor	1.00	1.00			0.58			1.00			1.00	
Incremental Delay, d2	2.9	0.1			0.4			0.3			0.1	
Delay (s)	18.5	12.2			7.9			16.1			15.5	
Level of Service	B	B			A			B			B	
Approach Delay (s)		17.6			7.9			16.1			15.5	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.95			1.00			1.00	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1791			1739			1880			1875	
Flt Permitted		0.87			0.93			1.00			0.99	
Satd. Flow (perm)		1615			1653			1873			1863	
Volume (vph)	25	8	5	7	1	5	5	523	6	9	592	17
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	8	5	7	1	5	5	523	6	9	592	17
Lane Group Flow (vph)	0	38	0	0	13	0	0	534	0	0	618	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		502			514			1124			1118	
v/s Ratio Prot												
v/s Ratio Perm		c0.02			0.01			0.29			c0.33	
v/c Ratio		0.08			0.03			0.48			0.55	
Uniform Delay, d1		21.9			21.5			10.1			10.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.1			1.4			2.0	
Delay (s)		22.2			21.6			11.5			12.7	
Level of Service		C			C			B			B	
Approach Delay (s)		22.2			21.6			11.5			12.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.92		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1729		1789	1883	1601		5141			5054	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1364	1729		1413	1883	1601		5141			5054	
Volume (vph)	9	5	6	1	50	29	0	1855	2	0	2024	259
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	5	6	1	50	29	0	1855	2	0	2024	259
Lane Group Flow (vph)	9	11	0	1	50	29	0	1857	0	0	2283	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	455	576		471	628	534		2970			2920	
v/s Ratio Prot		0.01			c0.03			0.36			c0.45	
v/s Ratio Perm	0.01			0.00		0.02						
v/c Ratio	0.02	0.02		0.00	0.08	0.05		0.63			0.78	
Uniform Delay, d1	20.1	20.1		20.0	20.5	20.4		12.6			14.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.0	0.2	0.2		1.0			2.2	
Delay (s)	20.2	20.2		20.0	20.8	20.6		13.6			16.8	
Level of Service	C	C		C	C	C		B			B	
Approach Delay (s)		20.2			20.7			13.6			16.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A

c Critical Lane Group

APPENDIX D

QUEUE LENGTH CALCULATIONS

2000

(Existing Conditions) AM

Lane Group	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	0	25	0		0	0	
Storage Lanes	0	1	0	1	1	1		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	35	10	15	9	15	9	9	15	35	9
Right Turn on Red		Yes		Yes			Yes			Yes
Link Speed (mph)	30		30		30			30		
Link Distance (ft)	125		63		85			133		
Travel Time (s)	2.8		1.4		1.9			3.0		
Volume (vph)	228	23	0	0	118	0	6	0	557	8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	228	23	0	0	118	0	6	0	565	0
Queue Length 50th (ft)	29	0			33		0		94	
Queue Length 95th (ft)	48	0			64		0		138	
Internal Link Dist (ft)	45		1		5			53		
50th Up Block Time (%)					50%				24%	
95th Up Block Time (%)	10%				53%		18%		33%	
Turn Bay Length (ft)					25					
50th Bay Block Time %					19%					
95th Bay Block Time %					38%					
Queuing Penalty (veh)	11				64				159	

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	35		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		127			727			193			474	
Travel Time (s)		2.9			16.5			4.4			10.8	
Volume (vph)	179	64	3	0	7	27	0	3092	625	0	1237	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	246	0	0	34	0	0	3092	625	0	1237	0
Queue Length 50th (ft)		52			3			~723	0		12	
Queue Length 95th (ft)		82			22			#815	0		20	
Internal Link Dist (ft)		47			647			113			394	
50th Up Block Time (%)		10%						38%				
95th Up Block Time (%)		30%						39%				
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		50						1190				

Intersection Summary

Area Type: Other

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		435			410			474			503	
Travel Time (s)		9.9			9.3			10.8			11.4	
Volume (vph)	7	482	0	0	23	52	0	2421	80	0	1190	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	489	0	0	75	0	0	2501	0	0	1192	0
Queue Length 50th (ft)		244			9			121			186	
Queue Length 95th (ft)		#372			38			m112			228	
Internal Link Dist (ft)		355			330			394			423	
50th Up Block Time (%)												
95th Up Block Time (%)		9%										
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		23										

Intersection Summary

Area Type: Other

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

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15	9	15	9
Right Turn on Red		Yes		Yes		Yes
Link Speed (mph)	30		30		30	
Link Distance (ft)	108		53		503	
Travel Time (s)	2.5		1.2		11.4	
Volume (vph)	216	1169	0	208	2391	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	216	1169	0	208	2391	0
Queue Length 50th (ft)	103	10		94	529	
Queue Length 95th (ft)	171	10		160	578	
Internal Link Dist (ft)	28		1		423	
50th Up Block Time (%)	32%			71%	10%	
95th Up Block Time (%)	34%			71%	14%	
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)	71			148	281	

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	115		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		108			436			291			426	
Travel Time (s)		2.5			9.9			6.6			9.7	
Volume (vph)	0	2283	410	0	1384	4	71	1	2	6	5	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	2693	0	0	1388	0	0	74	0	0	28	0
Queue Length 50th (ft)		0			141			28			4	
Queue Length 95th (ft)		634			172			64			22	
Internal Link Dist (ft)		28			356			211			346	
50th Up Block Time (%)												
95th Up Block Time (%)		28%										
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		381										

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	95		0	115		0	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		534			429			677			106	
Travel Time (s)		12.1			9.8			15.4			2.4	
Volume (vph)	308	66	4	0	4	77	0	1994	0	0	2033	347
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	308	70	0	0	4	77	0	1994	0	0	2380	0
Queue Length 50th (ft)	151	26			2	27		258			320	
Queue Length 95th (ft)	246	57			9	59		309			383	
Internal Link Dist (ft)		454			349			597			26	
50th Up Block Time (%)											36%	
95th Up Block Time (%)											36%	
Turn Bay Length (ft)	95											
50th Bay Block Time %	29%											
95th Bay Block Time %	44%											
Queuing Penalty (veh)	25											

Intersection Summary	
Area Type:	Other

2000

(Existing Conditions) PM

Lane Group	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	0	25	0		0	0	
Storage Lanes	0	1	0	1	1	1		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	35	10	15	9	15	9	9	15	35	9
Right Turn on Red		Yes		Yes			Yes			Yes
Link Speed (mph)	30		30		30			30		
Link Distance (ft)	125		63		85			133		
Travel Time (s)	2.8		1.4		1.9			3.0		
Volume (vph)	1318	442	0	0	14	0	499	0	873	19
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	1318	442	0	0	14	0	499	0	892	0
Queue Length 50th (ft)	260	0			4		165		175	
Queue Length 95th (ft)	347	0			13		274		246	
Internal Link Dist (ft)	45		1		5			53		
50th Up Block Time (%)	45%						53%		37%	
95th Up Block Time (%)	47%				39%		53%		41%	
Turn Bay Length (ft)					25					
50th Bay Block Time %							47%			
95th Bay Block Time %							50%			
Queuing Penalty (veh)	610				2		271		346	

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	35		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		127			727			193			474	
Travel Time (s)		2.9			16.5			4.4			10.8	
Volume (vph)	41	13	31	0	30	262	0	1573	161	0	2472	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	85	0	0	292	0	0	1573	161	0	2472	0
Queue Length 50th (ft)		12			130			191	0		100	
Queue Length 95th (ft)		28			209			231	0		136	
Internal Link Dist (ft)		47			647			113			394	
50th Up Block Time (%)								20%				
95th Up Block Time (%)								24%				
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)								340				

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		435			410			474			503	
Travel Time (s)		9.9			9.3			10.8			11.4	
Volume (vph)	2	314	0	3	68	324	0	1392	0	0	2184	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	316	0	0	395	0	0	1392	0	0	2186	0
Queue Length 50th (ft)		140			188			42			431	
Queue Length 95th (ft)		219			294			49			506	
Internal Link Dist (ft)		355			330			394			423	
50th Up Block Time (%)												
95th Up Block Time (%)											9%	
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)											93	

Intersection Summary	
Area Type:	Other

Lane Group	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15	9	15	9
Right Turn on Red		Yes		Yes		Yes
Link Speed (mph)	30		30		30	
Link Distance (ft)	108		53		503	
Travel Time (s)	2.5		1.2		11.4	
Volume (vph)	227	2143	0	127	1362	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	227	2143	0	127	1362	0
Queue Length 50th (ft)	96	68		34	229	
Queue Length 95th (ft)	m106	56		73	267	
Internal Link Dist (ft)	28		1		423	
50th Up Block Time (%)	25%	20%		62%		
95th Up Block Time (%)	26%	21%		63%		
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)	58	441		78		

Intersection Summary	
Area Type:	Other

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	115		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		108			436			291			426	
Travel Time (s)		2.5			9.9			6.6			9.7	
Volume (vph)	0	1463	142	0	2115	8	412	10	3	9	6	8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	1605	0	0	2123	0	0	425	0	0	23	0
Queue Length 50th (ft)		338			371			199			5	
Queue Length 95th (ft)		383			442			#336			16	
Internal Link Dist (ft)		28			356			211			346	
50th Up Block Time (%)		7%			4%			4%				
95th Up Block Time (%)		28%			12%			26%				
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		285										

Intersection Summary

Area Type: Other

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	95		0	115		0	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		534			429			677			106	
Travel Time (s)		12.1			9.8			15.4			2.4	
Volume (vph)	230	5	3	1	64	437	0	2101	1	0	1907	344
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	230	8	0	1	64	437	0	2102	0	0	2251	0
Queue Length 50th (ft)	97	2		0	23	207		328			339	
Queue Length 95th (ft)	164	11		4	49	323		391			407	
Internal Link Dist (ft)		454			349			597			26	
50th Up Block Time (%)											41%	
95th Up Block Time (%)						2%					41%	
Turn Bay Length (ft)	95			115								
50th Bay Block Time %	7%											
95th Bay Block Time %	30%											
Queuing Penalty (veh)	1											

Intersection Summary	
Area Type:	Other

2000

(Existing Conditions) WEEKEND

2030 ALTERNATIVE 1

(No Build) AM

Lane Group	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	1656	791	11	0	2	0	3
Act Effct Green (s)	48.0	48.0	75.0		19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25		0.25
v/c Ratio	0.73	0.35	0.01		0.00		0.01
Uniform Delay, d1	8.9	6.2	0.0		21.0		0.0
Delay	9.3	6.3	0.0		21.0		14.7
LOS	A	A	A		C		B
Approach Delay	9.3	6.2		0.0		17.2	
Approach LOS	A	A		A		B	
Queue Length 50th (m)	71.2	23.6	0.0		0.2		0.0
Queue Length 95th (m)	95.1	32.4	0.0		1.7		1.9
Internal Link Dist (m)	1.9	10.7		24.5		2.1	
50th Up Block Time (%)	35%	23%					
95th Up Block Time (%)	35%	26%					2%
Turn Bay Length (m)					7.6		
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)	584	193					

Intersection Summary

Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 8.3 Intersection LOS: A
Intersection Capacity Utilization 56.4% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	363	42	3094	1933
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.40	0.07	1.06	0.66
Uniform Delay, d1	22.4	15.0	19.5	13.5
Delay	22.8	16.4	55.8	3.3
LOS	C	B	E	A
Approach Delay	22.8	16.4	55.8	3.3
Approach LOS	C	B	E	A
Queue Length 50th (m)	24.8	3.7	~212.0	17.3
Queue Length 95th (m)	36.8	10.4	#242.0	17.5
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	29%		44%	
95th Up Block Time (%)	41%		45%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	127		1380	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 34.6 Intersection LOS: C
Intersection Capacity Utilization 89.5% ICU Level of Service D
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	358	99	554	117
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.18	0.67	0.14
Uniform Delay, d1	0.1	9.4	12.4	7.1
Delay	1.7	9.9	13.1	7.7
LOS	A	A	B	A
Approach Delay	1.7		12.6	7.7
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	5.7	41.5	5.0
Queue Length 95th (m)	12.0	13.1	70.4	12.4
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 58.0%	ICU Level of Service A

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	5	3084	241	2259	56	10
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.01	0.91	0.21	0.67	0.15	0.02
Uniform Delay, d1		0.0	13.3	0.0	9.5	25.9	22.5
Delay		9.4	15.4	0.9	14.8	26.5	24.2
LOS		A	B	A	B	C	C
Approach Delay	9.4		14.3		14.8	26.1	
Approach LOS	A		B		B	C	
Queue Length 50th (m)		0.0	149.1	0.0	135.6	7.5	1.2
Queue Length 95th (m)		2.0	177.8	7.0	148.7	17.0	5.0
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)			12%		19%		
95th Up Block Time (%)			16%		18%	2%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)			423		415		

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2: and 6:NESBL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 14.6 Intersection LOS: B

Intersection Capacity Utilization 76.3% ICU Level of Service C

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	456	197	2517	1769
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.68	0.33	0.88	0.62
Uniform Delay, d1	24.6	19.5	17.4	13.5
Delay	25.3	20.0	9.6	13.5
LOS	C	B	A	B
Approach Delay	25.3	20.0	9.6	13.5
Approach LOS	C	B	A	B
Queue Length 50th (m)	66.0	22.6	40.4	92.8
Queue Length 95th (m)	99.1	39.6	m38.0	114.6
Internal Link Dist (m)	108.7	101.1	120.6	124.6
50th Up Block Time (%)				
95th Up Block Time (%)	1%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 12.8	Intersection LOS: B
Intersection Capacity Utilization 80.7%	ICU Level of Service D
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	222	1748	0	132	2383
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.41	0.48		0.27	0.77
Uniform Delay, d1	25.2	0.0		23.0	12.9
Delay	18.8	1.4		11.5	13.0
LOS	B	A		B	B
Approach Delay	3.4		11.5		13.0
Approach LOS	A		B		B
Queue Length 50th (m)	31.8	12.5		12.6	160.0
Queue Length 95th (m)	51.8	11.7		m10.8	174.8
Internal Link Dist (m)	0.1		1.4		124.6
50th Up Block Time (%)	65%	21%		33%	11%
95th Up Block Time (%)	65%	28%		36%	15%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	145	434		46	302

Intersection Summary

Cycle Length: 90

Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 8.7 Intersection LOS: A

Intersection Capacity Utilization 64.3% ICU Level of Service B

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2594	1839	183	37
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.84	0.59	0.46	0.08
Uniform Delay, d1	13.4	10.6	25.6	17.6
Delay	24.1	10.7	26.4	19.2
LOS	C	B	C	B
Approach Delay	24.1	10.7	26.4	19.2
Approach LOS	C	B	C	B
Queue Length 50th (m)	174.9	64.1	25.6	3.6
Queue Length 95th (m)	190.9	76.8	45.1	10.4
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	36%			
95th Up Block Time (%)	35%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	922			

Intersection Summary

Cycle Length: 90
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 18.9 Intersection LOS: B
Intersection Capacity Utilization 74.8% ICU Level of Service C

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	591	506	154	245
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.31	0.55	0.29	0.32
Uniform Delay, d1	22.3	16.1	16.6	16.5
Delay	144.9	23.4	17.1	16.8
LOS	F	C	B	B
Approach Delay	144.9	23.4	17.1	16.8
Approach LOS	F	C	B	B
Queue Length 50th (m)	~132.4	77.8	16.6	26.1
Queue Length 95th (m)	#195.2	108.8	30.5	43.1
Internal Link Dist (m)	11.4	203.1	131.5	96.8
50th Up Block Time (%)	51%			
95th Up Block Time (%)	53%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 69.7 Intersection LOS: E

Intersection Capacity Utilization 94.4% ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	71	20	570	650
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.14	0.03	0.54	0.62
Uniform Delay, d1	18.5	6.8	12.1	12.7
Delay	19.1	12.2	12.5	13.2
LOS	B	B	B	B
Approach Delay	19.1	12.3	12.5	13.2
Approach LOS	B	B	B	B
Queue Length 50th (m)	7.6	0.8	57.1	68.4
Queue Length 95th (m)	16.9	5.4	84.5	101.7
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				18%
95th Up Block Time (%)				26%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 13.2	Intersection LOS: B
Intersection Capacity Utilization 53.7%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	467	50	1	5	384	2241	2479
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.92	0.08	0.00	0.01	0.67	0.78	0.88
Uniform Delay, d1	27.8	17.2	19.0	18.8	24.3	15.7	16.9
Delay	46.1	18.0	19.0	18.8	25.1	16.0	17.9
LOS	D	B	B	B	C	B	B
Approach Delay		43.4		25.0		16.0	17.9
Approach LOS		D		C		B	B
Queue Length 50th (m)	76.5	5.1	0.1	0.6	54.8	104.3	125.3
Queue Length 95th (m)	#134.6	12.5	1.1	2.8	86.1	124.3	149.3
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							42%
95th Up Block Time (%)	4%						42%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	43%						
95th Bay Block Time %	55%						
Queuing Penalty (veh)	24						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 20.0 Intersection LOS: C

Intersection Capacity Utilization 103.0% ICU Level of Service F

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

2030 ALTERNATIVE 1

(No Build) PM

Lane Group	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	1047	1378	11	0	9	0	50
Act Effct Green (s)	48.0	48.0	75.0		19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25		0.25
v/c Ratio	0.46	0.60	0.01		0.02		0.11
Uniform Delay, d1	6.9	7.9	0.0		21.0		0.0
Delay	7.0	8.1	0.0		21.2		7.3
LOS	A	A	A		C		A
Approach Delay	7.0	8.0		0.0		9.4	
Approach LOS	A	A		A		A	
Queue Length 50th (m)	34.6	52.4	0.0		1.0		0.0
Queue Length 95th (m)	46.2	69.2	0.0		4.2		7.5
Internal Link Dist (m)	1.9	10.7		24.5		2.1	
50th Up Block Time (%)	34%	30%					
95th Up Block Time (%)	35%	31%			41%		56%
Turn Bay Length (m)					7.6		
50th Bay Block Time %							
95th Bay Block Time %							7%
Queuing Penalty (veh)	362	422			2		14

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 48.1%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	205	254	2439	2493
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.21	0.45	0.84	0.86
Uniform Delay, d1	20.5	22.6	16.1	16.4
Delay	20.7	23.2	18.1	4.9
LOS	C	C	B	A
Approach Delay	20.7	23.2	18.1	4.9
Approach LOS	C	C	B	A
Queue Length 50th (m)	12.7	33.3	91.6	28.9
Queue Length 95th (m)	20.8	54.6	111.9	41.1
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)			41%	
95th Up Block Time (%)	22%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	23		1023	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 12.3	Intersection LOS: B
Intersection Capacity Utilization 70.4%	ICU Level of Service C

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	529	86	447	136
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.54	0.16	0.54	0.17
Uniform Delay, d1	0.1	9.4	11.4	7.8
Delay	1.5	9.8	12.0	8.2
LOS	A	A	B	A
Approach Delay	1.5		11.6	8.2
Approach LOS	A		B	A
Queue Length 50th (m)	0.2	4.9	30.9	6.4
Queue Length 95th (m)	14.4	11.7	53.0	14.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.54
Intersection Signal Delay: 6.8 Intersection LOS: A
Intersection Capacity Utilization 62.9% ICU Level of Service B

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	5	97	2414	129	2772	191	21
Act Effct Green (s)	23.0	23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio	0.26	0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio	0.01	0.24	0.72	0.12	0.82	0.60	0.05
Uniform Delay, d1	25.0	25.6	10.1	0.0	11.6	29.4	16.8
Delay	25.2	26.2	10.3	1.1	19.4	30.5	19.9
LOS	C	C	B	A	B	C	B
Approach Delay	26.2		9.8		19.4	29.4	
Approach LOS	C		A		B	C	
Queue Length 50th (m)	0.7	12.9	88.2	0.0	187.0	29.1	1.8
Queue Length 95th (m)	3.3	25.5	104.5	5.2	200.7	51.4	7.3
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)					22%	32%	
95th Up Block Time (%)		8%	2%		25%	51%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)					642	79	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2: and 6:NESBL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 80.2% ICU Level of Service D

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	368	357	1993	2210
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.55	0.60	0.70	0.77
Uniform Delay, d1	23.2	23.5	14.5	15.6
Delay	23.8	24.2	11.2	16.0
LOS	C	C	B	B
Approach Delay	23.8	24.2	11.2	16.0
Approach LOS	C	C	B	B
Queue Length 50th (m)	50.2	49.4	41.4	132.9
Queue Length 95th (m)	77.1	77.6	40.2	157.5
Internal Link Dist (m)	108.7	101.1	120.6	124.6
50th Up Block Time (%)				5%
95th Up Block Time (%)				10%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				167

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.3	Intersection LOS: B
Intersection Capacity Utilization 72.6%	ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	198	2173	0	141	1936
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.37	0.60		0.28	0.63
Uniform Delay, d1	24.8	0.0		21.5	11.0
Delay	18.8	2.1		14.0	11.9
LOS	B	A		B	B
Approach Delay	3.5		14.0		11.9
Approach LOS	A		B		B
Queue Length 50th (m)	28.5	18.5		18.2	106.7
Queue Length 95th (m)	m41.9	15.9		34.5	124.4
Internal Link Dist (m)	0.1		1.4		124.6
50th Up Block Time (%)	65%	28%		27%	
95th Up Block Time (%)	65%	37%		31%	6%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	130	707		41	56

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 7.5	Intersection LOS: A
Intersection Capacity Utilization 54.5%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2146	2155	359	22
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.69	0.69	0.88	0.05
Uniform Delay, d1	11.4	11.7	29.9	16.2
Delay	23.2	11.9	45.3	18.3
LOS	C	B	D	B
Approach Delay	23.2	11.9	45.3	18.3
Approach LOS	C	B	D	B
Queue Length 50th (m)	137.5	83.2	58.7	1.9
Queue Length 95th (m)	151.6	99.0	#108.6	7.3
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	37%			
95th Up Block Time (%)	36%		42%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	782			

Intersection Summary

Cycle Length: 90

Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 19.7 — Intersection LOS: B

Intersection Capacity Utilization 75.6% — ICU Level of Service C

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	392	541	73	224
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	0.48	0.59	0.09	0.29
Uniform Delay, d1	14.3	16.5	11.2	13.0
Delay	14.8	23.1	12.2	13.4
LOS	B	C	B	B
Approach Delay	14.8	23.1	12.2	13.4
Approach LOS	B	C	B	B
Queue Length 50th (m)	40.6	81.5	5.3	18.9
Queue Length 95th (m)	64.4	113.9	13.2	34.5
Internal Link Dist (m)	11.4	203.1	131.5	96.8
50th Up Block Time (%)	39%			
95th Up Block Time (%)	43%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 18.0 Intersection LOS: B
Intersection Capacity Utilization 73.7% ICU Level of Service C

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	57	90	591	662
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.11	0.14	0.56	0.64
Uniform Delay, d1	17.2	14.9	12.3	12.9
Delay	18.2	15.7	12.8	13.5
LOS	B	B	B	B
Approach Delay	18.2	15.7	12.8	13.5
Approach LOS	B	B	B	B
Queue Length 50th (m)	5.7	7.8	60.2	70.9
Queue Length 95th (m)	13.8	17.9	89.1	106.1
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				19%
95th Up Block Time (%)				27%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 13.5	Intersection LOS: B
Intersection Capacity Utilization 58.8%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	234	14	1	50	426	2206	2935
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.48	0.02	0.00	0.07	0.74	0.77	1.04
Uniform Delay, d1	22.6	14.8	19.0	19.2	25.2	15.6	19.3
Delay	23.3	16.6	19.0	19.5	27.3	15.8	46.0
LOS	C	B	B	B	C	B	D
Approach Delay		22.9		26.5		15.8	46.0
Approach LOS		C		C		B	D
Queue Length 50th (m)	31.1	1.2	0.1	5.6	63.1	101.5	~200.5
Queue Length 95th (m)	52.5	5.1	1.1	13.1	#100.0	120.9	#229.7
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							43%
95th Up Block Time (%)					3%		44%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	10%						
95th Bay Block Time %	33%						
Queuing Penalty (veh)	3						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 32.1 Intersection LOS: C

Intersection Capacity Utilization 92.0% ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

2030 ALTERNATIVE 1

(No Build) WEEKEND

	→	←	↖	↑	↘	↓	↙
Lane Group	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	960	1130	11	0	2	0	10
Act Effct Green (s)	48.0	48.0	75.0		19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25		0.25
v/c Ratio	0.42	0.49	0.01		0.00		0.02
Uniform Delay, d1	6.6	7.1	0.0		21.0		0.0
Delay	6.8	7.3	0.0		21.0		12.1
LOS	A	A	A		C		B
Approach Delay	6.8	7.2		0.0		13.6	
Approach LOS	A	A		A		B	
Queue Length 50th (m)	30.5	38.6	0.0		0.2		0.0
Queue Length 95th (m)	41.3	51.3	0.0		1.7		3.4
Internal Link Dist (m)	1.9	10.7		24.5		2.1	
50th Up Block Time (%)	34%	28%					
95th Up Block Time (%)	35%	30%					33%
Turn Bay Length (m)					7.6		
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)	330	325					1

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 7.0	Intersection LOS: A
Intersection Capacity Utilization 41.2%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	382	9	2441	1987
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.42	0.02	0.84	0.68
Uniform Delay, d1	22.4	0.0	16.1	13.8
Delay	22.8	10.9	18.3	3.1
LOS	C	B	B	A
Approach Delay	22.8	10.9	18.3	3.1
Approach LOS	C	B	B	A
Queue Length 50th (m)	26.1	0.0	91.8	19.6
Queue Length 95th (m)	38.6	3.1	112.0	23.5
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	31%		42%	
95th Up Block Time (%)	42%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	139		1030	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 80.8%	ICU Level of Service D

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	350	4	145	18
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.01	0.18	0.02
Uniform Delay, d1	0.1	8.8	9.4	8.3
Delay	1.7	8.8	9.7	8.7
LOS	A	A	A	A
Approach Delay	1.7		9.7	8.7
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.3	0.9
Queue Length 95th (m)	12.0	1.5	17.0	3.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.40
Intersection Signal Delay: 4.3 Intersection LOS: A
Intersection Capacity Utilization 35.9% ICU Level of Service A

Lane Group	SBL	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	2433	99	2363	85	7
Act Effct Green (s)		59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.72	0.09	0.70	0.24	0.02
Uniform Delay, d1		10.1	0.0	9.9	26.5	3.6
Delay		10.3	1.3	15.7	27.2	16.3
LOS		B	A	B	C	B
Approach Delay	0.0	10.0		15.7	26.3	
Approach LOS	A	A		B	C	
Queue Length 50th (m)		89.4	0.0	140.1	11.7	0.1
Queue Length 95th (m)		105.8	4.7	153.0	23.7	3.4
Internal Link Dist (m)	24.9	110.0		34.7	18.1	
50th Up Block Time (%)				20%		
95th Up Block Time (%)		3%		20%	23%	
Turn Bay Length (m)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)				468	9	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 58.4%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	219	301	1925	1692
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.33	0.51	0.68	0.59
Uniform Delay, d1	21.1	21.4	14.2	13.2
Delay	21.6	22.0	10.7	13.3
LOS	C	C	B	B
Approach Delay	21.6	22.0	10.7	13.3
Approach LOS	C	C	B	B
Queue Length 50th (m)	27.2	38.0	37.2	93.5
Queue Length 95th (m)	44.9	62.2	35.7	112.0
Internal Link Dist (m)	108.7	101.1	120.6	124.6
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.2 Intersection LOS: B
Intersection Capacity Utilization 62.7% ICU Level of Service B

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	61	1675	0	38	1848
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.11	0.46		0.08	0.60
Uniform Delay, d1	22.8	0.0		11.7	10.7
Delay	14.0	2.1		8.7	10.9
LOS	B	A		A	B
Approach Delay	2.5		8.7		10.9
Approach LOS	A		A		B
Queue Length 50th (m)	7.7	18.9		1.6	101.7
Queue Length 95th (m)	m14.6	19.6		m2.6	117.3
Internal Link Dist (m)	0.1		1.4		124.6
50th Up Block Time (%)	65%	19%		9%	
95th Up Block Time (%)	65%	26%		17%	4%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	39	376		5	34

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 45.2%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1902	1715	67	6
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.61	0.55	0.15	0.01
Uniform Delay, d1	10.3	10.2	22.0	7.3
Delay	24.0	10.3	22.7	16.5
LOS	C	B	C	B
Approach Delay	24.0	10.3	22.7	16.5
Approach LOS	C	B	C	B
Queue Length 50th (m)	128.2	57.6	8.1	0.3
Queue Length 95th (m)	142.8	69.3	17.7	2.9
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	28%			
95th Up Block Time (%)	28%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	533			

Intersection Summary	
Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 17.6	Intersection LOS: B
Intersection Capacity Utilization 54.7%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	430	479	178	207
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.16	0.53	0.30	0.27
Uniform Delay, d1	22.9	15.6	16.3	13.4
Delay	103.5	18.0	16.8	13.8
LOS	F	B	B	B
Approach Delay	103.5	18.0	16.8	13.8
Approach LOS	F	B	B	B
Queue Length 50th (m)	~89.0	59.7	18.8	17.9
Queue Length 95th (m)	#145.2	88.0	33.6	32.7
Internal Link Dist (m)	11.4	203.1	131.5	96.8
50th Up Block Time (%)	48%			
95th Up Block Time (%)	53%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 45.6 Intersection LOS: D

Intersection Capacity Utilization 83.8% ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	14	15	536	601
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.02	0.03	0.50	0.57
Uniform Delay, d1	15.3	3.9	11.8	12.4
Delay	17.1	11.5	12.2	12.8
LOS	B	B	B	B
Approach Delay	17.1	11.5	12.2	12.8
Approach LOS	B	B	B	B
Queue Length 50th (m)	1.3	0.4	52.2	61.4
Queue Length 95th (m)	5.2	4.4	77.5	91.3
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				15%
95th Up Block Time (%)				24%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 12.6 Intersection LOS: B
Intersection Capacity Utilization 48.3% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	25	5	7	52	1896	2165
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.02	0.04	0.01	0.01	0.09	0.66	0.77
Uniform Delay, d1	18.8	14.4	18.8	18.7	15.5	14.1	15.2
Delay	19.0	15.9	19.0	18.9	16.6	14.3	15.5
LOS	B	B	B	B	B	B	B
Approach Delay		16.7		17.1		14.3	15.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	2.1	0.6	0.8	4.7	78.9	97.5
Queue Length 95th (m)	4.1	7.2	2.8	3.6	12.2	94.3	116.5
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							41%
95th Up Block Time (%)							41%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 53.3%	ICU Level of Service A

2030 ALTERNATIVE 2

(Replace and Widen) AM

Lane Group	EBT	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1676	760	12	0	3	2	0	10
Act Effct Green (s)	48.0	48.0	75.0		19.0	19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25	0.25		0.25
v/c Ratio	0.74	0.33	0.01		0.01	0.00		0.02
Uniform Delay, d1	9.0	6.2	0.0		0.0	21.0		0.0
Delay	9.4	6.3	0.0		0.0	21.0		12.1
LOS	A	A	A		A	C		B
Approach Delay	9.4	6.2		0.0			13.6	
Approach LOS	A	A		A			B	
Queue Length 50th (m)	73.0	22.5	0.0		0.0	0.2		0.0
Queue Length 95th (m)	97.6	30.8	0.0		0.0	1.7		3.4
Internal Link Dist (m)	18.4	14.6		23.6			7.9	
50th Up Block Time (%)	28%	17%						
95th Up Block Time (%)	30%	22%						
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)	491	147						

Intersection Summary

Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 8.4 Intersection LOS: A
Intersection Capacity Utilization 63.6% ICU Level of Service B

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	355	40	3087	1838
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.39	0.07	1.06	0.63
Uniform Delay, d1	22.4	13.2	19.5	13.1
Delay	22.7	15.1	54.9	3.1
LOS	C	B	D	A
Approach Delay	22.7	15.1	54.9	3.1
Approach LOS	C	B	D	A
Queue Length 50th (m)	24.2	3.1	~211.0	14.7
Queue Length 95th (m)	36.0	9.7	#241.0	14.6
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	28%		44%	
95th Up Block Time (%)	40%		45%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	122		1375	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 34.5 Intersection LOS: C

Intersection Capacity Utilization 89.2% ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	360	72	578	118
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.13	0.70	0.15
Uniform Delay, d1	0.1	9.2	12.6	7.2
Delay	1.7	9.6	13.5	7.8
LOS	A	A	B	A
Approach Delay	1.7		13.0	7.8
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	4.1	44.1	5.1
Queue Length 95th (m)	12.1	10.1	74.8	12.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 8.9 Intersection LOS: A
Intersection Capacity Utilization 59.4% ICU Level of Service A

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	4	3076	244	2161	56	10
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.01	0.91	0.22	0.64	0.15	0.02
Uniform Delay, d1		0.0	13.3	0.0	9.2	25.9	22.5
Delay		5.8	15.2	0.8	14.0	26.5	24.2
LOS		A	B	A	B	C	C
Approach Delay	5.8		14.1		14.0	26.1	
Approach LOS	A		B		B	C	
Queue Length 50th (m)		0.0	148.3	0.0	127.1	7.5	1.2
Queue Length 95th (m)		1.4	176.5	7.0	142.3	17.0	5.0
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)			12%		18%		
95th Up Block Time (%)			15%		17%	2%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)			418		378		

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 14.2 Intersection LOS: B
Intersection Capacity Utilization 76.1% ICU Level of Service C

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	461	157	2527	1718
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.69	0.26	0.89	0.60
Uniform Delay, d1	24.7	18.3	17.4	13.3
Delay	25.4	18.8	9.6	13.3
LOS	C	B	A	B
Approach Delay	25.4	18.8	9.6	13.3
Approach LOS	C	B	A	B
Queue Length 50th (m)	67.0	16.9	40.5	88.3
Queue Length 95th (m)	100.5	31.1	m38.2	109.5
Internal Link Dist (m)	108.7	101.1	120.6	118.4
50th Up Block Time (%)				
95th Up Block Time (%)	2%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 12.7	Intersection LOS: B
Intersection Capacity Utilization 81.3%	ICU Level of Service D
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	240	1695	0	120	2378
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.45	0.46		0.24	0.77
Uniform Delay, d1	25.4	0.0		22.7	12.9
Delay	19.2	1.2		11.6	13.3
LOS	B	A		B	B
Approach Delay	3.5		11.6		13.3
Approach LOS	A		B		B
Queue Length 50th (m)	34.6	10.8		11.3	159.6
Queue Length 95th (m)	56.0	10.0		m10.1	174.5
Internal Link Dist (m)	0.1		0.1		118.4
50th Up Block Time (%)	70%	21%		65%	11%
95th Up Block Time (%)	70%	27%		64%	15%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	167	407		77	314

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 9.0	Intersection LOS: A
Intersection Capacity Utilization 65.2%	ICU Level of Service B
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2583	1802	185	38
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.83	0.57	0.47	0.08
Uniform Delay, d1	13.4	10.5	25.6	17.2
Delay	23.7	10.6	26.4	18.8
LOS	C	B	C	B
Approach Delay	23.7	10.6	26.4	18.8
Approach LOS	C	B	C	B
Queue Length 50th (m)	174.2	62.1	25.9	3.6
Queue Length 95th (m)	190.1	74.7	45.5	10.6
Internal Link Dist (m)	0.7	109.0	64.6	106.0
50th Up Block Time (%)	27%			
95th Up Block Time (%)	27%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	709			

Intersection Summary

Cycle Length: 90

Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 18.6 Intersection LOS: B

Intersection Capacity Utilization 74.7% ICU Level of Service C

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	567	517	153	255
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.29	0.56	0.29	0.33
Uniform Delay, d1	22.1	16.2	16.6	16.6
Delay	139.8	24.0	17.2	17.0
LOS	F	C	B	B
Approach Delay	139.8	24.0	17.2	17.0
Approach LOS	F	C	B	B
Queue Length 50th (m)	~125.5	80.9	16.5	27.4
Queue Length 95th (m)	#187.6	112.4	30.5	44.9
Internal Link Dist (m)	11.4	200.0	131.5	96.8
50th Up Block Time (%)	50%			
95th Up Block Time (%)	53%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.29

Intersection Signal Delay: 66.1 Intersection LOS: E

Intersection Capacity Utilization 94.2% ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	70	28	590	647
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.14	0.05	0.56	0.61
Uniform Delay, d1	19.7	4.9	12.3	12.7
Delay	20.1	10.5	12.8	13.2
LOS	C	B	B	B
Approach Delay	20.1	10.5	12.8	13.2
Approach LOS	C	B	B	B
Queue Length 50th (m)	8.0	0.8	60.1	67.8
Queue Length 95th (m)	17.2	6.2	89.0	101.0
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				18%
95th Up Block Time (%)				26%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 13.3 Intersection LOS: B
Intersection Capacity Utilization 53.5% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	475	51	1	5	379	2249	2485
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.94	0.08	0.00	0.01	0.66	0.79	0.88
Uniform Delay, d1	28.1	17.3	19.0	18.8	24.1	15.8	17.0
Delay	49.3	18.0	19.0	18.8	25.0	16.1	18.1
LOS	D	B	B	B	C	B	B
Approach Delay		46.3		24.9		16.1	18.1
Approach LOS		D		C		B	B
Queue Length 50th (m)	78.4	5.2	0.1	0.6	53.9	105.1	125.9
Queue Length 95th (m)	#137.9	12.6	1.1	2.8	84.9	124.9	150.1
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							42%
95th Up Block Time (%)	6%						42%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	43%						
95th Bay Block Time %	55%						
Queuing Penalty (veh)	25						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 20.4 Intersection LOS: C

Intersection Capacity Utilization 103.2% ICU Level of Service F

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

2030 ALTERNATIVE 2

(Replace and Widen) PM

Lane Group	EBT	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1178	1327	9	0	3	6	0	459
Act Effct Green (s)	48.0	48.0	75.0		19.0	19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25	0.25		0.25
v/c Ratio	0.52	0.58	0.01		0.01	0.01		1.00
Uniform Delay, d1	7.2	7.7	0.0		0.0	21.0		23.7
Delay	7.3	7.9	0.0		0.0	21.2		60.0
LOS	A	A	A		A	C		E
Approach Delay	7.3	7.9		0.0			59.5	
Approach LOS	A	A		A			E	
Queue Length 50th (m)	40.6	49.3	0.0		0.0	0.6		~57.0
Queue Length 95th (m)	54.1	65.2	0.0		0.0	3.3		#114.6
Internal Link Dist (m)	18.4	14.6		23.6			7.9	
50th Up Block Time (%)	23%	27%						65%
95th Up Block Time (%)	26%	29%						71%
Turn Bay Length (m)						7.6		
50th Bay Block Time %								65%
95th Bay Block Time %								72%
Queuing Penalty (veh)	285	377						317

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 15.7 Intersection LOS: B

Intersection Capacity Utilization 71.8% ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	208	264	2560	2468
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.23	0.46	0.88	0.85
Uniform Delay, d1	20.8	22.8	16.8	16.2
Delay	21.1	23.4	20.1	5.1
LOS	C	C	C	A
Approach Delay	21.1	23.4	20.1	5.1
Approach LOS	C	C	C	A
Queue Length 50th (m)	13.1	34.9	99.9	29.1
Queue Length 95th (m)	21.4	56.9	120.1	43.9
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)			43%	
95th Up Block Time (%)	23%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	24		1102	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 81.7% ICU Level of Service D

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	559	71	453	127
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.56	0.13	0.55	0.16
Uniform Delay, d1	0.0	9.2	11.5	7.8
Delay	1.4	9.6	12.0	8.2
LOS	A	A	B	A
Approach Delay	1.4		11.7	8.2
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	4.0	31.5	6.0
Queue Length 95th (m)	14.7	10.0	54.0	13.8
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 6.6 Intersection LOS: A

Intersection Capacity Utilization 65.1% ICU Level of Service B

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	63	2532	128	2784	177	21
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.15	0.75	0.12	0.83	0.53	0.05
Uniform Delay, d1		24.6	10.5	0.0	11.6	28.9	19.2
Delay		25.4	10.8	1.1	19.0	29.8	21.3
LOS		C	B	A	B	C	C
Approach Delay	25.4		10.3		19.0	28.9	
Approach LOS	C		B		B	C	
Queue Length 50th (m)		8.0	96.6	0.0	187.1	26.4	2.1
Queue Length 95th (m)		17.9	114.5	5.2	201.0	46.9	7.6
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)					22%	28%	
95th Up Block Time (%)			5%		25%	48%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)			64		646	67	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 15.4	Intersection LOS: B
Intersection Capacity Utilization 77.5%	ICU Level of Service C

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	379	366	2039	2249
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.57	0.62	0.72	0.79
Uniform Delay, d1	23.3	23.6	14.7	15.8
Delay	23.9	24.4	10.5	15.8
LOS	C	C	B	B
Approach Delay	23.9	24.4	10.5	15.8
Approach LOS	C	C	B	B
Queue Length 50th (m)	51.9	51.0	39.2	136.4
Queue Length 95th (m)	79.6	79.9	38.4	160.9
Internal Link Dist (m)	108.7	101.1	120.6	118.4
50th Up Block Time (%)				10%
95th Up Block Time (%)				11%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				231

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 72.4% ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	179	2214	0	161	1980
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.33	0.61		0.32	0.64
Uniform Delay, d1	24.5	0.0		22.3	11.2
Delay	17.9	2.3		16.0	11.9
LOS	B	A		B	B
Approach Delay	3.5		16.0		11.9
Approach LOS	A		B		B
Queue Length 50th (m)	25.4	20.3		21.5	109.9
Queue Length 95th (m)	m34.9	17.7		40.3	140.2
Internal Link Dist (m)	0.1		0.1		118.4
50th Up Block Time (%)	70%	29%		65%	2%
95th Up Block Time (%)	70%	38%		65%	8%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	125	740		105	79

Intersection Summary

Cycle Length: 90
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 7.6 Intersection LOS: A
Intersection Capacity Utilization 55.0% ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2210	2186	346	26
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.71	0.70	0.86	0.05
Uniform Delay, d1	11.7	11.8	29.7	15.4
Delay	22.7	12.0	41.9	17.7
LOS	C	B	D	B
Approach Delay	22.7	12.0	41.9	17.7
Approach LOS	C	B	D	B
Queue Length 50th (m)	140.9	85.3	56.1	2.2
Queue Length 95th (m)	154.8	101.3	#103.4	7.9
Internal Link Dist (m)	0.7	109.0	64.6	106.0
50th Up Block Time (%)	29%			
95th Up Block Time (%)	28%	1%	36%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	623			

Intersection Summary	
Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 76.1%	ICU Level of Service C

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	421	554	175	246
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	0.59	0.61	0.31	0.33
Uniform Delay, d1	15.5	16.6	16.4	14.1
Delay	16.2	22.8	16.9	14.5
LOS	B	C	B	B
Approach Delay	16.2	22.8	16.9	14.5
Approach LOS	B	C	B	B
Queue Length 50th (m)	47.2	81.9	18.6	22.4
Queue Length 95th (m)	76.4	115.1	33.6	39.5
Internal Link Dist (m)	11.4	200.0	131.5	96.8
50th Up Block Time (%)	40%			
95th Up Block Time (%)	44%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 18.6 | Intersection LOS: B

Intersection Capacity Utilization 89.2% | ICU Level of Service D

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	50	110	599	671
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.10	0.17	0.56	0.67
Uniform Delay, d1	18.8	17.8	12.4	13.4
Delay	19.4	18.2	12.8	14.1
LOS	B	B	B	B
Approach Delay	19.4	18.2	12.8	14.1
Approach LOS	B	B	B	B
Queue Length 50th (m)	5.4	11.3	61.3	74.6
Queue Length 95th (m)	13.2	22.8	90.7	112.6
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				20%
95th Up Block Time (%)				28%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 83.5%	ICU Level of Service D

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	230	17	1	49	415	2209	2984
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.47	0.03	0.00	0.07	0.73	0.77	1.06
Uniform Delay, d1	22.5	16.6	19.0	19.2	24.9	15.6	19.3
Delay	23.2	17.6	19.0	19.5	26.3	15.9	52.0
LOS	C	B	B	B	C	B	D
Approach Delay		22.8		25.5		15.9	52.0
Approach LOS		C		C		B	D
Queue Length 50th (m)	30.4	1.7	0.1	5.5	60.8	101.9	~207.0
Queue Length 95th (m)	51.5	5.9	1.1	12.8	94.9	121.0	#236.0
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							43%
95th Up Block Time (%)							44%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	9%						
95th Bay Block Time %	32%						
Queuing Penalty (veh)	3						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 35.2 Intersection LOS: D
Intersection Capacity Utilization 91.1% ICU Level of Service E
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2030 ALTERNATIVE 2

(Replace and Widen) WEEKEND

Lane Group	EBT	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1006	1066	11	0	6	1	0	12
Act Effct Green (s)	48.0	48.0	75.0		19.0	19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25	0.25		0.25
v/c Ratio	0.44	0.47	0.01		0.01	0.00		0.03
Uniform Delay, d1	6.7	6.9	0.0		0.0	21.0		0.0
Delay	6.9	7.1	0.0		0.0	21.0		11.7
LOS	A	A	A		A	C		B
Approach Delay	6.9	7.0		0.0			12.4	
Approach LOS	A	A		A			B	
Queue Length 50th (m)	32.5	35.4	0.0		0.0	0.1		0.0
Queue Length 95th (m)	43.6	47.3	0.0		0.0	1.2		3.7
Internal Link Dist (m)	15.9	18.2		13.9			0.8	
50th Up Block Time (%)	22%	21%						
95th Up Block Time (%)	25%	25%				29%		60%
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)	235	242						3

Intersection Summary

Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 6.9 Intersection LOS: A
Intersection Capacity Utilization 44.6% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	394	8	2434	1991
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.44	0.01	0.84	0.68
Uniform Delay, d1	22.6	0.0	16.0	13.8
Delay	22.9	10.5	18.2	3.6
LOS	C	B	B	A
Approach Delay	22.9	10.5	18.2	3.6
Approach LOS	C	B	B	A
Queue Length 50th (m)	27.1	0.0	91.3	23.8
Queue Length 95th (m)	40.0	2.7	111.4	28.2
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	32%		42%	
95th Up Block Time (%)	43%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	148		1025	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 12.5	Intersection LOS: B
Intersection Capacity Utilization 81.1%	ICU Level of Service D

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	349	4	145	18
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.01	0.18	0.02
Uniform Delay, d1	0.1	8.8	9.4	8.3
Delay	1.7	8.8	9.7	8.7
LOS	A	A	A	A
Approach Delay	1.7		9.7	8.7
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.3	0.9
Queue Length 95th (m)	12.1	1.5	17.0	3.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.40
Intersection Signal Delay: 4.3 Intersection LOS: A
Intersection Capacity Utilization 35.9% ICU Level of Service A

Lane Group	SBL	SBR2	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	1	2426	90	2374	86	6
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.00	0.72	0.08	0.70	0.24	0.01
Uniform Delay, d1		0.0	10.1	0.0	9.9	26.5	0.0
Delay		4.0	10.3	1.3	16.5	27.2	15.3
LOS		A	B	A	B	C	B
Approach Delay	4.0		10.0		16.5	26.4	
Approach LOS	A		A		B	C	
Queue Length 50th (m)		0.0	88.8	0.0	140.3	11.8	0.0
Queue Length 95th (m)		0.4	105.4	4.5	153.5	23.9	2.9
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)					21%		
95th Up Block Time (%)			3%		22%	23%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)					501	10	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 65.0%	ICU Level of Service B

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	217	358	1898	1633
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.32	0.60	0.67	0.57
Uniform Delay, d1	21.1	22.3	14.0	13.0
Delay	21.5	23.1	10.8	13.0
LOS	C	C	B	B
Approach Delay	21.5	23.1	10.8	13.0
Approach LOS	C	C	B	B
Queue Length 50th (m)	26.9	47.3	37.1	88.2
Queue Length 95th (m)	44.4	75.7	35.7	105.8
Internal Link Dist (m)	108.7	101.1	120.6	121.7
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 65.6%	ICU Level of Service B

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	72	1622	0	38	1841
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.13	0.44		0.08	0.60
Uniform Delay, d1	23.0	0.0		11.7	10.7
Delay	14.4	1.9		12.3	11.1
LOS	B	A		B	B
Approach Delay	2.4		12.3		11.1
Approach LOS	A		B		B
Queue Length 50th (m)	9.2	17.0		1.6	101.2
Queue Length 95th (m)	m18.0	17.9		m3.7	116.8
Internal Link Dist (m)	0.1		2.4		121.7
50th Up Block Time (%)	65%	18%			
95th Up Block Time (%)	65%	24%		14%	4%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	47	347		2	37

Intersection Summary

Cycle Length: 90

Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 7.0 Intersection LOS: A

Intersection Capacity Utilization 45.7% ICU Level of Service A

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1901	1663	70	4
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.61	0.53	0.16	0.01
Uniform Delay, d1	10.3	10.0	22.4	0.0
Delay	23.7	10.2	23.0	0.0
LOS	C	B	C	A
Approach Delay	23.7	10.2	23.0	0.0
Approach LOS	C	B	C	A
Queue Length 50th (m)	128.3	55.2	8.6	0.0
Queue Length 95th (m)	142.8	66.4	18.5	0.0
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	81%			
95th Up Block Time (%)	28%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	1031			

Intersection Summary	
Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 17.5	Intersection LOS: B
Intersection Capacity Utilization 54.8%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	435	500	185	257
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.22	0.55	0.32	0.34
Uniform Delay, d1	22.9	15.8	16.6	16.0
Delay	121.6	18.9	17.1	16.4
LOS	F	B	B	B
Approach Delay	121.6	18.9	17.1	16.4
Approach LOS	F	B	B	B
Queue Length 50th (m)	~93.7	64.0	19.9	26.6
Queue Length 95th (m)	#150.2	93.5	35.5	44.5
Internal Link Dist (m)	11.4	196.0	131.5	96.8
50th Up Block Time (%)	49%			
95th Up Block Time (%)	54%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 50.6 Intersection LOS: D

Intersection Capacity Utilization 88.1% ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	7	16	548	603
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.01	0.03	0.51	0.57
Uniform Delay, d1	16.6	2.4	11.9	12.4
Delay	18.4	10.4	12.3	12.8
LOS	B	B	B	B
Approach Delay	18.4	10.4	12.3	12.8
Approach LOS	B	B	B	B
Queue Length 50th (m)	0.7	0.2	53.8	61.7
Queue Length 95th (m)	3.5	4.4	79.9	91.6
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				15%
95th Up Block Time (%)				24%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 12.6 Intersection LOS: B
Intersection Capacity Utilization 48.4% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	25	3	8	66	1903	2182
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.02	0.04	0.01	0.01	0.11	0.67	0.77
Uniform Delay, d1	18.8	15.1	18.7	18.8	16.4	14.1	15.2
Delay	19.0	16.4	19.0	18.9	17.4	14.3	15.5
LOS	B	B	B	B	B	B	B
Approach Delay		17.1		17.6		14.3	15.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	2.2	0.3	0.9	6.4	79.5	98.9
Queue Length 95th (m)	4.1	7.3	2.1	3.7	15.0	94.9	118.0
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							41%
95th Up Block Time (%)							42%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 54.2%	ICU Level of Service A

2030 ALTERNATIVE 5

(Parkway: Diamond Option) AM

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1255	228	2	0	2	5	0	6
Act Effct Green (s)	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.69	0.13	0.00		0.00	0.01		0.01
Uniform Delay, d1	14.0	9.7	14.0		0.0	14.2		0.0
Delay	14.4	9.8	14.0		10.5	14.2		9.0
LOS	B	A	B		B	B		A
Approach Delay	14.4	9.8		12.3			11.4	
Approach LOS	B	A		B			B	
Queue Length 50th (m)	66.5	8.4	0.2		0.0	0.4		0.0
Queue Length 95th (m)	88.3	13.7	1.4		1.2	2.3		2.2
Internal Link Dist (m)	222.2	219.6		26.3			7.1	
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 51.4%	ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	315	377	3136	2148
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.26dl	0.67	1.08	0.74
Uniform Delay, d1	22.7	24.7	19.5	14.5
Delay	23.2	25.5	58.8	6.1
LOS	C	C	E	A
Approach Delay	23.2	25.5	58.8	6.1
Approach LOS	C	C	E	A
Queue Length 50th (m)	21.8	54.0	~223.4	32.3
Queue Length 95th (m)	33.6	84.8	#251.5	35.9
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			34%	
95th Up Block Time (%)	6%		37%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	10		1111	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 35.9 Intersection LOS: D
Intersection Capacity Utilization 110.7% ICU Level of Service G
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	270	87	526	154
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.32	0.16	0.65	0.19
Uniform Delay, d1	0.1	9.6	12.4	7.5
Delay	1.9	10.0	13.0	7.9
LOS	A	B	B	A
Approach Delay	1.9		12.6	7.9
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	5.0	39.4	6.9
Queue Length 95th (m)	10.5	12.1	66.8	15.8
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55.5	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 9.1	Intersection LOS: A
Intersection Capacity Utilization 51.1%	ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	3	77	0	3053	2817
Act Effct Green (s)	23.0	23.0		59.0	59.0
Actuated g/C Ratio	0.26	0.26		0.66	0.66
v/c Ratio	0.01	0.19		0.91	0.84
Uniform Delay, d1	25.0	25.5		13.1	11.8
Delay	25.0	26.0		14.7	12.2
LOS	C	C		B	B
Approach Delay	26.0			14.7	12.2
Approach LOS	C			B	B
Queue Length 50th (m)	0.4	10.1		145.5	120.5
Queue Length 95th (m)	2.5	21.2		173.3	142.8
Internal Link Dist (m)	42.8		49.6	198.8	42.8
50th Up Block Time (%)					24%
95th Up Block Time (%)					25%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					687

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 70.4%	ICU Level of Service C

Lane Group	EBT	WBT	SEL	SET	NWT
Lane Group Flow (vph)	142	123	1238	660	35
Act Effct Green (s)	23.5	23.5	58.5	58.5	58.5
Actuated g/C Ratio	0.26	0.26	0.65	0.65	0.65
v/c Ratio	0.29	0.41	0.71	0.56	0.03
Uniform Delay, d1	16.0	27.4	10.2	4.6	0.5
Delay	16.9	28.4	10.6	4.9	2.3
LOS	B	C	B	A	A
Approach Delay	16.9	28.4		8.7	2.3
Approach LOS	B	C		A	A
Queue Length 50th (m)	11.8	17.6	63.9	29.7	0.2
Queue Length 95th (m)	26.6	33.5	86.9	54.5	3.1
Internal Link Dist (m)	51.1	18.4		46.5	264.4
50th Up Block Time (%)		3%	14%		
95th Up Block Time (%)		37%	19%	9%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)		23	204	30	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 66.9% ICU Level of Service B

Lane Group	EBL	EBT	WBT	WBR	NBL2	NBL	NBR	SEL
Lane Group Flow (vph)	74	1251	53	177	70	0	4	0
Act Effct Green (s)	59.0	59.0	59.0	90.0	23.0		23.0	
Actuated g/C Ratio	0.66	0.66	0.66	1.00	0.26		0.26	
v/c Ratio	0.08	0.53	0.04	0.11	0.15		0.01	
Uniform Delay, d1	5.6	8.2	5.5	0.0	25.9		0.0	
Delay	5.8	8.4	5.6	0.0	26.4		0.0	
LOS	A	A	A	A	C		A	
Approach Delay		8.2	1.3			25.0		0.0
Approach LOS		A	A			C		A
Queue Length 50th (m)	4.1	53.4	2.9	0.0	9.4		0.0	
Queue Length 95th (m)	8.7	68.2	6.5	0.0	19.7		0.0	
Internal Link Dist (m)		71.6	222.2			129.9		57.2
50th Up Block Time (%)								
95th Up Block Time (%)		4%						
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)		23						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBL and 6:SEL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 8.0 Intersection LOS: A

Intersection Capacity Utilization 45.1% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	530	315	2516	1864
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.82	0.55	0.87	0.64
Uniform Delay, d1	26.9	22.8	16.5	13.2
Delay	31.6	23.5	6.7	13.4
LOS	C	C	A	B
Approach Delay	31.6	23.5	6.7	13.4
Approach LOS	C	C	A	B
Queue Length 50th (m)	82.5	41.7	32.6	74.6
Queue Length 95th (m)	#134.6	67.3	m30.3	89.4
Internal Link Dist (m)	123.5	93.1	100.9	105.5
50th Up Block Time (%)				
95th Up Block Time (%)	15%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	40			

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 12.7 Intersection LOS: B

Intersection Capacity Utilization 85.2% ICU Level of Service D

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

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	158	1838	0	128	2423
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.32	0.50		0.28	0.76
Uniform Delay, d1	25.7	0.0		24.4	11.6
Delay	26.3	0.0		13.4	2.5
LOS	C	A		B	A
Approach Delay	2.1		13.4		2.5
Approach LOS	A		B		A
Queue Length 50th (m)	21.6	0.0		6.0	12.4
Queue Length 95th (m)	37.9	0.0		11.0	13.4
Internal Link Dist (m)	0.1		2.0		105.5
50th Up Block Time (%)	72%			56%	
95th Up Block Time (%)	72%			60%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	114			73	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 2.6	Intersection LOS: A
Intersection Capacity Utilization 61.5%	ICU Level of Service B

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2640	1825	232	19
Act Effct Green (s)	59.0	59.0	23.5	23.5
Actuated g/C Ratio	0.65	0.65	0.26	0.26
v/c Ratio	0.80	0.54	0.66	0.05
Uniform Delay, d1	11.0	8.5	29.8	17.1
Delay	11.3	8.6	31.1	20.2
LOS	B	A	C	C
Approach Delay	11.3	8.6	31.1	20.2
Approach LOS	B	A	C	C
Queue Length 50th (m)	105.9	55.7	35.9	1.7
Queue Length 95th (m)	126.4	66.8	60.9	6.9
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	35%			
95th Up Block Time (%)	35%		1%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	916			

Intersection Summary

Cycle Length: 90.5
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 11.3 Intersection LOS: B
Intersection Capacity Utilization 78.3% ICU Level of Service C

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	303	196	224	185	39
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.55	0.21	0.25	0.31	0.06
Uniform Delay, d1	16.1	13.0	13.3	17.2	9.8
Delay	17.0	13.3	16.5	17.7	11.4
LOS	B	B	B	B	B
Approach Delay		15.5	16.5	17.7	11.4
Approach LOS		B	B	B	B
Queue Length 50th (m)	35.1	18.4	15.6	20.6	2.5
Queue Length 95th (m)	60.3	31.0	37.4	35.9	8.2
Internal Link Dist (m)		15.7	211.1	130.9	81.8
50th Up Block Time (%)	31%	13%			
95th Up Block Time (%)	39%	29%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 16.0 Intersection LOS: B

Intersection Capacity Utilization 55.4% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	58	16	570	632
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.12	0.03	0.51	0.57
Uniform Delay, d1	20.2	13.4	10.3	10.7
Delay	21.1	17.0	10.7	11.2
LOS	C	B	B	B
Approach Delay	21.1	17.0	10.7	11.2
Approach LOS	C	B	B	B
Queue Length 50th (m)	6.5	1.2	51.9	59.8
Queue Length 95th (m)	15.1	5.6	76.8	89.0
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 48.3%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	469	68	1	4	364	2242	2575
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.99	0.11	0.00	0.01	0.68	0.75	0.88
Uniform Delay, d1	29.8	19.2	20.0	20.0	25.4	14.2	15.9
Delay	62.4	19.8	20.0	20.2	26.3	14.5	16.9
LOS	E	B	B	C	C	B	B
Approach Delay		57.0		26.2		14.5	16.9
Approach LOS		E		C		B	B
Queue Length 50th (m)	79.9	7.5	0.1	0.5	53.0	98.3	127.3
Queue Length 95th (m)	#141.0	16.5	1.2	2.7	83.5	117.1	151.7
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							40%
95th Up Block Time (%)	8%						40%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	55%						
95th Bay Block Time %	62%	11%					
Queuing Penalty (veh)	40	26					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 20.3 Intersection LOS: C

Intersection Capacity Utilization 101.8% ICU Level of Service F

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

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(Parkway: Diamond Option) PM

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	890	5	1197	6	0	9	18	0	86
Act Effct Green (s)	28.0	28.0	28.0	24.0		24.0	24.0		24.0
Actuated g/C Ratio	0.47	0.47	0.47	0.40		0.40	0.40		0.40
v/c Ratio	0.53	0.02	0.72	0.01		0.01	0.03		0.13
Uniform Delay, d1	11.3	8.6	12.8	10.8		0.0	10.9		6.7
Delay	11.6	9.0	13.2	11.0		6.7	11.1		8.0
LOS	B	A	B	B		A	B		A
Approach Delay	11.6		13.2		8.4			8.5	
Approach LOS	B		B		A			A	
Queue Length 50th (m)	34.2	0.3	51.9	0.4		0.0	1.2		3.4
Queue Length 95th (m)	48.5	1.8	72.6	2.1		2.1	4.3		10.5
Internal Link Dist (m)	222.2		219.6		26.3			7.1	
50th Up Block Time (%)									
95th Up Block Time (%)									26%
Turn Bay Length (m)							7.6		
50th Bay Block Time %									
95th Bay Block Time %									24%
Queuing Penalty (veh)									13

Intersection Summary

Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 12.3 Intersection LOS: B
Intersection Capacity Utilization 51.7% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	140	518	2640	2760
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.18	0.92	0.91	0.95
Uniform Delay, d1	20.3	28.3	17.4	18.2
Delay	20.6	44.7	19.3	13.1
LOS	C	D	B	B
Approach Delay	20.7	44.7	19.3	13.1
Approach LOS	C	D	B	B
Queue Length 50th (m)	8.6	84.8	138.5	47.1
Queue Length 95th (m)	15.5	#145.9	164.5	#78.5
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			26%	2%
95th Up Block Time (%)			29%	6%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			732	76

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 18.7 Intersection LOS: B
Intersection Capacity Utilization 102.8% ICU Level of Service F
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	474	81	422	149
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.49	0.15	0.52	0.18
Uniform Delay, d1	0.1	9.5	11.5	8.2
Delay	1.5	10.0	12.0	8.5
LOS	A	A	B	A
Approach Delay	1.5		11.7	8.5
Approach LOS	A		B	A
Queue Length 50th (m)	0.2	4.7	29.3	7.4
Queue Length 95th (m)	13.7	11.3	50.5	16.3
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55.5	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.52	
Intersection Signal Delay: 7.0	Intersection LOS: A
Intersection Capacity Utilization 58.2%	ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	9	236	0	2398	3402
Act Effct Green (s)	23.0	23.0		59.0	59.0
Actuated g/C Ratio	0.26	0.26		0.66	0.66
v/c Ratio	0.02	0.57		0.71	1.01
Uniform Delay, d1	25.0	28.2		10.0	15.5
Delay	25.2	29.0		10.2	31.4
LOS	C	C		B	C
Approach Delay	28.9			10.2	31.4
Approach LOS	C			B	C
Queue Length 50th (m)	1.2	34.5		86.8	~200.2
Queue Length 95th (m)	4.7	57.7		103.2	#255.8
Internal Link Dist (m)	42.8		63.5	198.8	42.8
50th Up Block Time (%)					28%
95th Up Block Time (%)		24%			30%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)		28			985

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 22.9 Intersection LOS: C

Intersection Capacity Utilization 75.7% ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

	→	←	↘	↘	↖
Lane Group	EBT	WBT	SEL	SET	NWT
Lane Group Flow (vph)	282	84	840	548	154
Act Effct Green (s)	23.5	23.5	58.5	58.5	58.5
Actuated g/C Ratio	0.26	0.26	0.65	0.65	0.65
v/c Ratio	0.58	0.35	0.52	0.45	0.14
Uniform Delay, d1	27.8	27.0	8.3	1.2	0.5
Delay	28.5	37.8	8.5	1.5	1.4
LOS	C	D	A	A	A
Approach Delay	28.5	37.8		5.8	1.4
Approach LOS	C	D		A	A
Queue Length 50th (m)	40.9	13.9	35.0	6.2	0.8
Queue Length 95th (m)	65.8	28.2	48.4	17.6	6.7
Internal Link Dist (m)	51.1	18.4		46.5	264.4
50th Up Block Time (%)					
95th Up Block Time (%)	21%	38%	7%		
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	30	16	28		

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 75.4% ICU Level of Service C

Lane Group	EBL	EBT	WBT	WBR	NBL2	NBL	NBR	SEL
Lane Group Flow (vph)	334	888	42	1234	42	0	3	0
Act Effct Green (s)	59.0	59.0	59.0	90.0	23.0		23.0	
Actuated g/C Ratio	0.66	0.66	0.66	1.00	0.26		0.26	
v/c Ratio	0.37	0.38	0.03	0.77	0.09		0.01	
Uniform Delay, d1	7.0	7.1	5.5	0.0	25.5		0.0	
Delay	7.9	7.7	5.5	0.0	25.9		0.0	
LOS	A	A	A	A	C		A	
Approach Delay		7.7	0.2			24.2		0.0
Approach LOS		A	A			C		A
Queue Length 50th (m)	29.9	42.1	2.3	0.0	5.6		0.0	
Queue Length 95th (m)	53.5	61.2	5.5	0.0	13.4		0.0	
Internal Link Dist (m)		71.6	222.2			129.9		57.2
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBL and 6:SEL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 4.2 Intersection LOS: A

Intersection Capacity Utilization 35.2% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	523	448	2122	2394
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.89	0.79	0.73	0.82
Uniform Delay, d1	27.8	26.3	14.4	15.8
Delay	38.4	30.4	5.0	16.1
LOS	D	C	A	B
Approach Delay	38.4	30.4	5.0	16.1
Approach LOS	D	C	A	B
Queue Length 50th (m)	84.2	68.4	15.8	114.3
Queue Length 95th (m)	#142.6	#115.0	m30.4	135.6
Internal Link Dist (m)	123.5	93.1	100.9	101.6
50th Up Block Time (%)				7%
95th Up Block Time (%)	21%	19%		13%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	55	42		244

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 15.1 Intersection LOS: B
Intersection Capacity Utilization 111.2% ICU Level of Service G
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	212	2362	0	123	2075
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.43	0.65		0.27	0.65
Uniform Delay, d1	26.6	0.0		22.7	10.3
Delay	27.2	0.0		12.9	1.9
LOS	C	A		B	A
Approach Delay	2.2		12.9		1.9
Approach LOS	A		B		A
Queue Length 50th (m)	30.0	0.0		6.1	10.0
Queue Length 95th (m)	49.9	0.0		11.3	10.8
Internal Link Dist (m)	0.1		2.0		101.6
50th Up Block Time (%)	72%			63%	
95th Up Block Time (%)	72%			67%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	153			80	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 2.4	Intersection LOS: A
Intersection Capacity Utilization 58.4%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2273	2293	424	36
Act Effct Green (s)	59.0	59.0	23.5	23.5
Actuated g/C Ratio	0.65	0.65	0.26	0.26
v/c Ratio	0.69	0.68	1.22	0.09
Uniform Delay, d1	9.5	9.9	33.4	18.9
Delay	9.7	10.1	130.1	20.9
LOS	A	B	F	C
Approach Delay	9.7	10.1	130.1	20.9
Approach LOS	A	B	F	C
Queue Length 50th (m)	78.6	81.5	~92.1	3.5
Queue Length 95th (m)	93.8	96.7	#148.1	10.7
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	35%		34%	
95th Up Block Time (%)	35%		61%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	789			

Intersection Summary

Cycle Length: 90.5
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 81.7% ICU Level of Service D
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	116	302	361	85	83
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.26	0.34	0.40	0.11	0.11
Uniform Delay, d1	13.5	12.3	14.4	12.1	7.0
Delay	14.1	12.6	18.8	12.7	8.6
LOS	B	B	B	B	A
Approach Delay		13.0	18.8	12.7	8.6
Approach LOS		B	B	B	A
Queue Length 50th (m)	11.2	26.7	33.2	6.7	3.8
Queue Length 95th (m)	22.4	44.1	59.4	15.2	12.0
Internal Link Dist (m)		15.7	201.5	130.9	81.8
50th Up Block Time (%)		25%			
95th Up Block Time (%)	20%	35%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 14.8	Intersection LOS: B
Intersection Capacity Utilization 50.9%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	50	84	580	631
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.11	0.14	0.52	0.57
Uniform Delay, d1	20.7	21.2	10.4	10.7
Delay	21.4	21.6	10.8	11.1
LOS	C	C	B	B
Approach Delay	21.4	21.6	10.8	11.1
Approach LOS	C	C	B	B
Queue Length 50th (m)	5.8	9.9	53.2	59.7
Queue Length 95th (m)	13.9	20.3	79.1	89.0
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 12.0 Intersection LOS: B

Intersection Capacity Utilization 51.7% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	231	19	1	53	392	2170	3094
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.51	0.03	0.00	0.08	0.73	0.73	1.06
Uniform Delay, d1	24.1	17.0	20.0	20.6	26.0	13.9	18.3
Delay	24.9	18.2	20.0	20.9	27.9	14.1	50.2
LOS	C	B	B	C	C	B	D
Approach Delay		24.4		27.0		14.1	50.2
Approach LOS		C		C		B	D
Queue Length 50th (m)	31.7	1.9	0.1	6.2	58.2	92.8	~214.3
Queue Length 95th (m)	53.7	6.5	1.2	14.1	#91.4	110.6	#243.1
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							41%
95th Up Block Time (%)							42%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	38%						
95th Bay Block Time %	50%						
Queuing Penalty (veh)	8						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 34.3 Intersection LOS: C

Intersection Capacity Utilization 89.0% ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

2030 ALTERNATIVE 5

(Parkway: Diamond Option) WEEKEND

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	586	506	6	0	4	2	0	10
Act Effct Green (s)	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.32	0.28	0.01		0.01	0.00		0.02
Uniform Delay, d1	10.9	10.6	14.2		0.0	14.0		0.0
Delay	11.1	10.8	14.3		9.5	14.0		8.2
LOS	B	B	B		A	B		A
Approach Delay	11.1	10.8		12.4			9.2	
Approach LOS	B	B		B			A	
Queue Length 50th (m)	24.1	20.2	0.5		0.0	0.2		0.0
Queue Length 95th (m)	34.2	29.2	2.7		1.7	1.4		2.7
Internal Link Dist (m)	222.2	219.6		26.3			7.1	
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary
Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.32
Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 32.9% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	301	360	2363	2333
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.16dl	0.64	0.81	0.80
Uniform Delay, d1	22.3	24.5	15.6	15.4
Delay	22.7	25.3	15.9	9.6
LOS	C	C	B	A
Approach Delay	22.7	25.3	15.9	9.6
Approach LOS	C	C	B	A
Queue Length 50th (m)	20.4	51.1	111.5	52.7
Queue Length 95th (m)	31.9	80.4	132.6	55.7
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			22%	
95th Up Block Time (%)	3%		26%	3%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			566	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 14.2 — Intersection LOS: B

Intersection Capacity Utilization 94.2% — ICU Level of Service E

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	335	4	145	25
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.38	0.01	0.18	0.03
Uniform Delay, d1	0.1	9.0	9.7	8.7
Delay	1.7	9.0	10.0	9.0
LOS	A	A	A	A
Approach Delay	1.7		9.9	9.0
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.5	1.3
Queue Length 95th (m)	11.7	1.5	17.3	4.6
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55.5	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 4.5	Intersection LOS: A
Intersection Capacity Utilization 35.0%	ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	89	0	2271	2990
Act Effct Green (s)		23.0		59.0	59.0
Actuated g/C Ratio		0.26		0.66	0.66
v/c Ratio		0.21		0.67	0.89
Uniform Delay, d1		23.6		9.6	12.8
Delay		24.1		9.7	13.8
LOS		C		A	B
Approach Delay	24.1			9.7	13.8
Approach LOS	C			A	B
Queue Length 50th (m)		10.9		78.7	138.6
Queue Length 95th (m)		22.8		93.4	164.8
Internal Link Dist (m)	42.8		49.6	198.8	42.8
50th Up Block Time (%)					25%
95th Up Block Time (%)					26%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					769

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 12.2 Intersection LOS: B
Intersection Capacity Utilization 61.1% ICU Level of Service B

Lane Group	EBT	WBT	SEL	SET	NWT
Lane Group Flow (vph)	168	30	569	556	59
Act Effct Green (s)	23.5	23.5	58.5	58.5	58.5
Actuated g/C Ratio	0.26	0.26	0.65	0.65	0.65
v/c Ratio	0.34	0.08	0.33	0.45	0.05
Uniform Delay, d1	24.4	25.1	7.0	0.8	0.1
Delay	25.0	25.5	7.2	1.2	1.7
LOS	C	C	A	A	A
Approach Delay	25.0	25.5		4.2	1.7
Approach LOS	C	C		A	A
Queue Length 50th (m)	21.3	3.9	20.2	4.4	0.1
Queue Length 95th (m)	38.6	10.6	28.3	15.4	3.8
Internal Link Dist (m)	51.1	18.4		46.5	264.4
50th Up Block Time (%)					
95th Up Block Time (%)					
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 7.1 Intersection LOS: A

Intersection Capacity Utilization 49.4% ICU Level of Service A

Lane Group	EBL	EBT	WBT	WBR	NBL2	NBL	NBR	SEL
Lane Group Flow (vph)	171	585	12	503	18	0	1	0
Act Effct Green (s)	59.0	59.0	59.0	59.0	23.0		23.0	
Actuated g/C Ratio	0.66	0.66	0.66	0.66	0.26		0.26	
v/c Ratio	0.18	0.25	0.01	0.41	0.04		0.00	
Uniform Delay, d1	6.1	6.4	5.3	0.0	25.2		0.0	
Delay	6.2	6.4	5.4	0.6	25.5		0.0	
LOS	A	A	A	A	C		A	
Approach Delay		6.4	0.7			24.2		
Approach LOS		A	A			C		
Queue Length 50th (m)	10.3	19.4	0.6	0.0	2.4		0.0	
Queue Length 95th (m)	18.2	26.4	2.3	9.3	7.5		0.0	
Internal Link Dist (m)		71.6	222.2			129.9		57.2
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.41	
Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 47.3%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	469	412	1859	1922
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.73	0.73	0.64	0.66
Uniform Delay, d1	25.8	25.1	13.2	13.5
Delay	26.5	26.7	4.2	7.0
LOS	C	C	A	A
Approach Delay	26.5	26.7	4.2	7.0
Approach LOS	C	C	A	A
Queue Length 50th (m)	70.0	60.1	13.9	23.8
Queue Length 95th (m)	105.0	94.0	20.3	43.8
Internal Link Dist (m)	123.5	93.1	100.9	103.4
50th Up Block Time (%)				
95th Up Block Time (%)		7%		
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)		14		

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 9.6 Intersection LOS: A
Intersection Capacity Utilization 70.9% ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	73	1909	0	35	1841
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.15	0.52		0.07	0.58
Uniform Delay, d1	24.5	0.0		9.5	9.5
Delay	39.0	3.3		12.1	1.6
LOS	D	A		B	A
Approach Delay	4.6		12.1		1.6
Approach LOS	A		B		A
Queue Length 50th (m)	13.2	31.1		1.3	5.1
Queue Length 95th (m)	m20.7	32.7		6.6	10.5
Internal Link Dist (m)	0.1		0.1		103.4
50th Up Block Time (%)	65%	25%		96%	
95th Up Block Time (%)	65%	33%		71%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	48	559		29	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 3.2	Intersection LOS: A
Intersection Capacity Utilization 47.9%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1898	1884	137	4
Act Effct Green (s)	50.5	50.5	31.5	31.5
Actuated g/C Ratio	0.56	0.56	0.35	0.35
v/c Ratio	0.66	0.65	0.28	0.01
Uniform Delay, d1	13.5	13.7	20.9	4.8
Delay	5.8	13.9	21.5	14.2
LOS	A	B	C	B
Approach Delay	5.8	13.9	21.5	14.3
Approach LOS	A	B	C	B
Queue Length 50th (m)	19.5	76.9	16.7	0.1
Queue Length 95th (m)	27.4	92.2	30.9	2.3
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	131%			
95th Up Block Time (%)	35%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	1571			

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 10.2	Intersection LOS: B
Intersection Capacity Utilization 58.2%	ICU Level of Service A

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	293	106	145	90	72
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.47	0.12	0.16	0.12	0.10
Uniform Delay, d1	15.3	5.2	11.9	12.2	6.8
Delay	15.9	6.3	6.8	12.7	8.6
LOS	B	A	A	B	A
Approach Delay		13.4	6.8	12.7	8.6
Approach LOS		B	A	B	A
Queue Length 50th (m)	32.2	4.0	5.7	7.1	3.2
Queue Length 95th (m)	53.9	12.1	13.9	15.9	10.8
Internal Link Dist (m)		15.7	207.9	130.9	81.8
50th Up Block Time (%)	29%				
95th Up Block Time (%)	38%				
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 11.4 Intersection LOS: B

Intersection Capacity Utilization 39.5% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	36	13	524	595
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.07	0.02	0.47	0.53
Uniform Delay, d1	19.4	6.6	10.0	10.5
Delay	20.3	14.2	10.3	10.9
LOS	C	B	B	B
Approach Delay	20.3	14.2	10.3	10.9
Approach LOS	C	B	B	B
Queue Length 50th (m)	3.9	0.5	46.0	55.1
Queue Length 95th (m)	10.5	4.5	68.5	82.0
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				11%
95th Up Block Time (%)				21%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 47.8% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	13	7	8	27	1844	2278
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.02	0.02	0.01	0.01	0.05	0.62	0.78
Uniform Delay, d1	20.1	9.2	20.0	20.1	9.7	12.5	14.2
Delay	20.3	14.8	20.3	20.2	13.4	12.7	14.5
LOS	C	B	C	C	B	B	B
Approach Delay		17.0		15.9		12.7	14.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	0.7	0.8	0.9	1.5	71.2	100.2
Queue Length 95th (m)	4.2	4.6	3.7	3.8	7.0	85.2	119.7
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							39%
95th Up Block Time (%)							39%
Turn Bay Length (m)	15.2						
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 54.8%	ICU Level of Service A

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) AM

Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1191	10	8	196	10	0	9	6	0	6
Act Effct Green (s)	38.0	38.0	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.66	0.01	0.06	0.11	0.01		0.01	0.01		0.01
Uniform Delay, d1	13.7	0.0	9.4	9.6	14.2		0.0	14.2		0.0
Delay	14.0	5.3	10.1	9.8	14.3		8.3	14.3		9.0
LOS	B	A	B	A	B		A	B		A
Approach Delay	13.9			9.8		11.5			11.7	
Approach LOS	B			A		B			B	
Queue Length 50th (m)	61.4	0.0	0.6	7.1	0.9		0.0	0.5		0.0
Queue Length 95th (m)	81.8	2.1	2.7	12.1	3.6		2.6	2.7		2.2
Internal Link Dist (m)	222.2			219.6		26.3			7.1	
50th Up Block Time (%)										
95th Up Block Time (%)										
Turn Bay Length (m)								7.6		
50th Bay Block Time %										
95th Bay Block Time %										
Queuing Penalty (veh)										

Intersection Summary

Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 13.3 Intersection LOS: B
Intersection Capacity Utilization 49.6% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	293	385	3145	2190
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.20dl	0.68	1.08	0.75
Uniform Delay, d1	22.4	24.9	19.5	14.7
Delay	22.9	25.8	60.1	6.4
LOS	C	C	E	A
Approach Delay	22.9	25.8	60.1	6.4
Approach LOS	C	C	E	A
Queue Length 50th (m)	20.0	55.7	~224.6	34.7
Queue Length 95th (m)	31.2	87.0	#252.6	38.6
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			34%	
95th Up Block Time (%)	2%		37%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			1118	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 36.5 Intersection LOS: D

Intersection Capacity Utilization 110.3% ICU Level of Service G

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	282	85	520	155
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.33	0.16	0.64	0.19
Uniform Delay, d1	0.1	9.6	12.3	7.6
Delay	1.8	10.0	13.0	8.0
LOS	A	A	B	A
Approach Delay	1.8		12.6	8.0
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	4.9	38.7	7.1
Queue Length 95th (m)	10.7	11.8	65.7	16.0
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 9.0 Intersection LOS: A

Intersection Capacity Utilization 51.5% ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	75	211	3063	2636
Act Effct Green (s)		23.0	23.0	59.0	59.0
Actuated g/C Ratio		0.26	0.26	0.66	0.66
v/c Ratio		0.18	0.23	0.91	0.78
Uniform Delay, d1		25.4	26.5	13.2	11.0
Delay		25.9	26.7	15.0	11.2
LOS		C	C	B	B
Approach Delay	25.9		26.7	15.0	11.2
Approach LOS	C		C	B	B
Queue Length 50th (m)		9.8	15.2	146.7	104.6
Queue Length 95th (m)		20.8	24.3	174.6	124.1
Internal Link Dist (m)	42.8		63.5	278.7	42.8
50th Up Block Time (%)					22%
95th Up Block Time (%)					24%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					603

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 79.7%	ICU Level of Service C

Lane Group	EBT	WBL	WBT	SEL	SET	SER	NWL	NWT	NWR
Lane Group Flow (vph)	96	1	5	1182	214	429	4	0	58
Act Effct Green (s)	23.5	23.5	23.5	58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.65		0.65
v/c Ratio	0.10	0.00	0.01	0.52	0.17	0.36	0.01		0.05
Uniform Delay, d1	22.3	25.0	24.6	8.3	6.2	0.0	5.5		0.0
Delay	22.5	32.0	31.0	8.5	6.3	0.7	5.5		1.7
LOS	C	C	C	A	A	A	A		A
Approach Delay	22.5		31.2		6.4			1.9	
Approach LOS	C		C		A			A	
Queue Length 50th (m)	5.8	0.2	0.7	49.8	13.0	0.0	0.2		0.0
Queue Length 95th (m)	11.7	1.5	3.9	64.1	21.5	9.0	1.3		3.6
Internal Link Dist (m)	29.6		16.5		46.2			264.3	
50th Up Block Time (%)				8%					
95th Up Block Time (%)				14%					
Turn Bay Length (m)									
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)				128					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 7.1 Intersection LOS: A

Intersection Capacity Utilization 50.6% ICU Level of Service A

Lane Group	EBT	WBT	WBR	SET	NWL	NWT	NWR
Lane Group Flow (vph)	1325	6	190	0	4	0	6
Act Effct Green (s)	59.0	59.0	90.0		23.0		23.0
Actuated g/C Ratio	0.66	0.66	1.00		0.26		0.26
v/c Ratio	0.61	0.00	0.12		0.01		0.01
Uniform Delay, d1	8.9	5.3	0.0		25.0		0.0
Delay	11.9	5.3	0.0		25.2		15.3
LOS	B	A	A		C		B
Approach Delay	11.9	0.2				19.3	
Approach LOS	B	A				B	
Queue Length 50th (m)	93.0	0.4	0.0		0.5		0.0
Queue Length 95th (m)	119.5	1.5	0.0		3.0		2.9
Internal Link Dist (m)	78.4	222.2		57.2		49.0	
50th Up Block Time (%)	12%						
95th Up Block Time (%)	19%						
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)	205						

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 10.5	Intersection LOS: B
Intersection Capacity Utilization 50.2%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	534	339	2548	1881
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.83	0.60	0.88	0.65
Uniform Delay, d1	27.0	23.4	16.7	13.3
Delay	32.2	24.1	6.9	13.5
LOS	C	C	A	B
Approach Delay	32.2	24.1	6.9	13.5
Approach LOS	C	C	A	B
Queue Length 50th (m)	83.5	46.0	32.9	75.8
Queue Length 95th (m)	#136.4	73.6	m30.4	90.6
Internal Link Dist (m)	123.5	93.1	100.9	98.4
50th Up Block Time (%)				
95th Up Block Time (%)	16%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	43			

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 12.9 Intersection LOS: B

Intersection Capacity Utilization 87.7% ICU Level of Service D

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

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	135	1852	0	118	2416
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.27	0.51		0.26	0.76
Uniform Delay, d1	25.4	0.0		23.9	11.6
Delay	25.9	0.0		12.7	2.2
LOS	C	A		B	A
Approach Delay	1.8		12.7		2.2
Approach LOS	A		B		A
Queue Length 50th (m)	18.2	0.0		0.0	11.2
Queue Length 95th (m)	32.9	0.0		0.0	12.1
Internal Link Dist (m)	0.1		0.1		98.4
50th Up Block Time (%)	72%			63%	
95th Up Block Time (%)	72%			63%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	97			74	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 2.3	Intersection LOS: A
Intersection Capacity Utilization 60.1%	ICU Level of Service B

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2621	1825	217	32
Act Effct Green (s)	59.0	59.0	23.5	23.5
Actuated g/C Ratio	0.65	0.65	0.26	0.26
v/c Ratio	0.79	0.54	0.63	0.08
Uniform Delay, d1	10.9	8.5	29.6	10.2
Delay	11.2	8.6	30.6	15.2
LOS	B	A	C	B
Approach Delay	11.2	8.6	30.6	15.3
Approach LOS	B	A	C	B
Queue Length 50th (m)	104.1	55.7	33.3	1.7
Queue Length 95th (m)	124.0	66.7	57.1	8.5
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	35%			
95th Up Block Time (%)	35%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	909			

Intersection Summary	
Cycle Length: 90.5	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 11.1	Intersection LOS: B
Intersection Capacity Utilization 77.2%	ICU Level of Service C

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	283	210	189	185	39
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.49	0.23	0.21	0.31	0.06
Uniform Delay, d1	15.4	13.1	13.1	17.2	9.8
Delay	16.2	13.4	12.5	17.7	11.4
LOS	B	B	B	B	B
Approach Delay		15.0	12.5	17.7	11.4
Approach LOS		B	B	B	B
Queue Length 50th (m)	31.4	19.9	10.2	20.6	2.5
Queue Length 95th (m)	53.5	33.1	26.4	35.9	8.2
Internal Link Dist (m)		15.7	201.6	130.9	81.8
50th Up Block Time (%)	29%	16%			
95th Up Block Time (%)	38%	30%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 52.5% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	49	17	569	635
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.10	0.03	0.51	0.57
Uniform Delay, d1	18.8	19.0	10.3	10.8
Delay	19.9	20.1	10.7	11.2
LOS	B	C	B	B
Approach Delay	19.9	20.1	10.7	11.2
Approach LOS	B	C	B	B
Queue Length 50th (m)	5.1	1.8	51.7	60.5
Queue Length 95th (m)	13.0	6.3	76.6	89.9
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				14%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 11.4 | Intersection LOS: B

Intersection Capacity Utilization 51.5% | ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	483	55	1	6	357	2233	2592
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	1.02	0.09	0.00	0.01	0.66	0.75	0.88
Uniform Delay, d1	30.0	18.7	20.0	20.0	25.3	14.2	16.0
Delay	70.0	19.4	20.0	20.2	26.1	14.4	17.1
LOS	E	B	B	C	C	B	B
Approach Delay		64.8		26.0		14.4	17.1
Approach LOS		E		C		B	B
Queue Length 50th (m)	~86.1	5.9	0.1	0.7	51.6	97.8	129.0
Queue Length 95th (m)	#146.9	13.9	1.2	3.3	81.7	116.1	153.9
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							40%
95th Up Block Time (%)	12%						40%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	56%						
95th Bay Block Time %	62%	1%					
Queuing Penalty (veh)	32						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 21.1 Intersection LOS: C
Intersection Capacity Utilization 102.0% ICU Level of Service F
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) PM

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	828	1156	8	0	6	26	0	84
Act Effct Green (s)	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.46	0.64	0.01		0.01	0.04		0.13
Uniform Delay, d1	11.9	13.5	14.1		0.0	14.3		5.7
Delay	12.1	13.8	14.2		9.0	14.5		7.6
LOS	B	B	B		A	B		A
Approach Delay	12.1	13.8		12.0			9.2	
Approach LOS	B	B		B			A	
Queue Length 50th (m)	37.1	58.8	0.7		0.0	2.2		2.9
Queue Length 95th (m)	50.5	78.1	3.1		2.2	6.7		10.8
Internal Link Dist (m)	222.2	219.6		26.3			7.1	
50th Up Block Time (%)								
95th Up Block Time (%)						5%		26%
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %						1%		24%
Queuing Penalty (veh)								14

Intersection Summary

Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBSBL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 12.9 — Intersection LOS: B
Intersection Capacity Utilization 50.5% — ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	121	513	2665	2796
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.16	0.91	0.91	0.96
Uniform Delay, d1	20.3	28.1	17.5	18.5
Delay	20.6	42.9	19.9	17.0
LOS	C	D	B	B
Approach Delay	20.6	42.9	19.9	17.0
Approach LOS	C	D	B	B
Queue Length 50th (m)	7.4	83.7	141.2	56.5
Queue Length 95th (m)	13.7	#143.6	167.6	#114.0
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			27%	5%
95th Up Block Time (%)			29%	7%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			748	164

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 20.5 Intersection LOS: C
Intersection Capacity Utilization 102.1% ICU Level of Service F
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	493	78	422	144
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.51	0.14	0.52	0.18
Uniform Delay, d1	0.1	9.5	11.5	8.1
Delay	1.5	9.9	12.0	8.4
LOS	A	A	B	A
Approach Delay	1.5		11.7	8.4
Approach LOS	A		B	A
Queue Length 50th (m)	0.2	4.5	29.3	7.0
Queue Length 95th (m)	13.8	11.0	50.5	15.7
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 6.9 Intersection LOS: A
Intersection Capacity Utilization 59.4% ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	234	124	2431	3291
Act Effct Green (s)		23.0	23.0	59.0	59.0
Actuated g/C Ratio		0.26	0.26	0.66	0.66
v/c Ratio		0.56	0.14	0.72	0.98
Uniform Delay, d1		28.3	25.8	10.1	14.8
Delay		29.0	26.0	10.3	22.9
LOS		C	C	B	C
Approach Delay	29.0		26.0	10.3	22.9
Approach LOS	C		C	B	C
Queue Length 50th (m)		34.2	8.7	89.1	177.2
Queue Length 95th (m)		57.1	15.5	105.8	#241.3
Internal Link Dist (m)	42.8		63.5	278.7	42.8
50th Up Block Time (%)					27%
95th Up Block Time (%)		23%			29%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)		27			920

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 74.9% ICU Level of Service C
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	WBL	WBT	SEL	SET	SER	NWL	NWT	NWR
Lane Group Flow (vph)	246	4	7	781	108	432	14	0	187
Act Effct Green (s)	23.5	23.5	23.5	58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.65		0.65
v/c Ratio	0.26	0.01	0.01	0.35	0.09	0.36	0.02		0.17
Uniform Delay, d1	26.0	24.8	24.6	7.1	5.8	0.0	5.6		0.0
Delay	26.3	26.2	26.7	7.2	5.9	0.7	5.6		1.0
LOS	C	C	C	A	A	A	A		A
Approach Delay	26.3		26.5		5.0			1.3	
Approach LOS	C		C		A			A	
Queue Length 50th (m)	17.5	0.5	1.0	27.9	6.2	0.0	0.8		0.0
Queue Length 95th (m)	27.3	3.3	4.6	37.1	11.7	9.0	2.7		6.3
Internal Link Dist (m)	44.6		119.0		46.2			264.3	
50th Up Block Time (%)									
95th Up Block Time (%)									
Turn Bay Length (m)									
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)									

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.36	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 50.7%	ICU Level of Service A

Lane Group	EBL	EBT	WBT	WBR	SET	NWL	NWT	NWR
Lane Group Flow (vph)	387	820	9	1224	0	3	0	16
Act Effct Green (s)	59.0	59.0	59.0	90.0		23.0		23.0
Actuated g/C Ratio	0.66	0.66	0.66	1.00		0.26		0.26
v/c Ratio	0.42	0.67	0.01	0.76		0.01		0.04
Uniform Delay, d1	7.3	9.4	5.3	0.0		25.0		0.0
Delay	8.2	11.1	5.4	0.0		25.0		11.9
LOS	A	B	A	A		C		B
Approach Delay		10.2	0.0				13.9	
Approach LOS		B	A				B	
Queue Length 50th (m)	34.6	88.1	0.5	0.0		0.4		0.0
Queue Length 95th (m)	55.0	126.7	2.0	0.0		2.5		4.8
Internal Link Dist (m)		119.0	222.2		57.2		49.0	
50th Up Block Time (%)								
95th Up Block Time (%)		9%						
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)		38						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 5.1 Intersection LOS: A
Intersection Capacity Utilization 53.2% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	544	440	2128	2399
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.93	0.77	0.73	0.82
Uniform Delay, d1	28.4	26.1	14.4	15.8
Delay	44.8	29.4	5.1	10.9
LOS	D	C	A	B
Approach Delay	44.8	29.4	5.1	10.9
Approach LOS	D	C	A	B
Queue Length 50th (m)	89.4	66.6	16.4	55.0
Queue Length 95th (m)	#151.7	#111.2	m30.3	91.8
Internal Link Dist (m)	123.5	93.1	100.9	103.3
50th Up Block Time (%)				
95th Up Block Time (%)	28%	16%		4%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	75	34		42

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 111.9% ICU Level of Service G
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	207	2367	0	121	2077
Act Effct Green (s)	25.0	90.0		57.0	57.0
Actuated g/C Ratio	0.28	1.00		0.63	0.63
v/c Ratio	0.42	0.65		0.08	0.65
Uniform Delay, d1	26.5	0.0		0.0	10.3
Delay	37.1	3.5		0.0	2.0
LOS	D	A		A	A
Approach Delay	6.2		0.0		2.0
Approach LOS	A		A		A
Queue Length 50th (m)	35.8	33.5		0.0	10.9
Queue Length 95th (m)	m41.7	24.9		0.0	m11.0
Internal Link Dist (m)	0.1		0.1		103.3
50th Up Block Time (%)	71%	39%			
95th Up Block Time (%)	72%	51%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	147	1061			

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 4.2	Intersection LOS: A
Intersection Capacity Utilization 58.5%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2272	2280	438	34
Act Effct Green (s)	45.9	45.9	36.1	36.1
Actuated g/C Ratio	0.51	0.51	0.40	0.40
v/c Ratio	0.88	0.87	0.82	0.05
Uniform Delay, d1	19.0	19.4	24.0	15.5
Delay	14.1	20.3	30.5	16.0
LOS	B	C	C	B
Approach Delay	14.1	20.3	30.5	16.0
Approach LOS	B	C	C	B
Queue Length 50th (m)	60.9	120.7	66.1	3.3
Queue Length 95th (m)	62.0	143.3	#117.3	9.0
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	49%	7%	7%	
95th Up Block Time (%)	49%	14%	32%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	1113			

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 18.4	Intersection LOS: B
Intersection Capacity Utilization 82.4%	ICU Level of Service D

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

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	90	312	365	85	39
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.20	0.35	0.40	0.11	0.05
Uniform Delay, d1	13.0	12.5	14.4	12.1	14.9
Delay	13.6	12.8	17.7	12.7	15.3
LOS	B	B	B	B	B
Approach Delay		13.0	17.7	12.7	15.3
Approach LOS		B	B	B	B
Queue Length 50th (m)	8.5	28.1	32.0	6.7	3.8
Queue Length 95th (m)	17.7	45.9	58.2	15.2	9.5
Internal Link Dist (m)		15.7	200.1	130.9	81.8
50th Up Block Time (%)		26%			
95th Up Block Time (%)	12%	36%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 51.6%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	49	86	572	629
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.11	0.15	0.51	0.56
Uniform Delay, d1	21.1	21.3	10.3	10.7
Delay	21.8	21.7	10.7	11.1
LOS	C	C	B	B
Approach Delay	21.8	21.7	10.7	11.1
Approach LOS	C	C	B	B
Queue Length 50th (m)	5.7	10.1	52.1	59.3
Queue Length 95th (m)	13.8	20.7	77.2	88.3
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 12.0 Intersection LOS: B
Intersection Capacity Utilization 48.9% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	240	29	1	54	381	2170	3081
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.53	0.05	0.00	0.09	0.71	0.73	1.05
Uniform Delay, d1	24.3	18.2	20.0	20.6	25.7	13.9	18.4
Delay	25.1	19.0	20.0	20.9	26.7	14.1	48.5
LOS	C	B	B	C	C	B	D
Approach Delay		24.4		26.0		14.1	48.5
Approach LOS		C		C		B	D
Queue Length 50th (m)	33.2	3.0	0.1	6.3	56.1	92.8	~212.6
Queue Length 95th (m)	56.1	8.8	1.2	14.2	88.3	110.6	#241.3
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							41%
95th Up Block Time (%)							42%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	39%						
95th Bay Block Time %	50%						
Queuing Penalty (veh)	13						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 33.2 Intersection LOS: C
Intersection Capacity Utilization 88.8% ICU Level of Service D
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) WEEKEND

Lane Group	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	522	3	488	6	0	5	2	0	9
Act Effct Green (s)	38.0	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.29	0.00	0.27	0.01		0.01	0.00		0.01
Uniform Delay, d1	10.7	0.0	10.6	14.2		0.0	14.0		0.0
Delay	10.8	6.3	10.7	14.3		9.2	14.0		8.3
LOS	B	A	B	B		A	B		A
Approach Delay	10.8		10.7		12.0			9.4	
Approach LOS	B		B		B			A	
Queue Length 50th (m)	21.1	0.0	19.4	0.5		0.0	0.2		0.0
Queue Length 95th (m)	30.2	1.2	28.2	2.7		1.9	1.4		2.6
Internal Link Dist (m)	222.2		219.6		26.3			7.1	
50th Up Block Time (%)									
95th Up Block Time (%)									
Turn Bay Length (m)							7.6		
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)									

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.29

Intersection Signal Delay: 10.7 Intersection LOS: B

Intersection Capacity Utilization 31.1% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	310	325	2395	2359
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.11dl	0.58	0.82	0.81
Uniform Delay, d1	22.5	23.9	15.8	15.6
Delay	23.0	24.6	16.1	9.8
LOS	C	C	B	A
Approach Delay	23.0	24.6	16.1	9.8
Approach LOS	C	C	B	A
Queue Length 50th (m)	21.2	45.0	114.5	54.6
Queue Length 95th (m)	33.0	71.7	135.9	55.2
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			23%	
95th Up Block Time (%)	5%		26%	3%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	8		586	40

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 14.3 Intersection LOS: B

Intersection Capacity Utilization 93.3% ICU Level of Service E

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	337	4	145	25
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.38	0.01	0.18	0.03
Uniform Delay, d1	0.1	9.0	9.7	8.7
Delay	1.7	9.0	10.0	9.0
LOS	A	A	A	A
Approach Delay	1.7		9.9	9.0
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.5	1.3
Queue Length 95th (m)	11.8	1.5	17.3	4.6
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55.5	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 4.5	Intersection LOS: A
Intersection Capacity Utilization 35.1%	ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	82	72	2306	2907
Act Effct Green (s)		23.0	23.0	59.0	59.0
Actuated g/C Ratio		0.26	0.26	0.66	0.66
v/c Ratio		0.19	0.08	0.68	0.86
Uniform Delay, d1		23.2	25.4	9.7	12.3
Delay		23.8	25.7	9.9	12.7
LOS		C	C	A	B
Approach Delay	23.8		25.7	9.9	12.7
Approach LOS	C		C	A	B
Queue Length 50th (m)		9.8	5.0	81.0	129.5
Queue Length 95th (m)		21.1	10.2	95.9	153.8
Internal Link Dist (m)	42.8		63.5	278.7	42.8
50th Up Block Time (%)					24%
95th Up Block Time (%)					26%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					730

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 11.8 Intersection LOS: B
Intersection Capacity Utilization 66.2% ICU Level of Service B

Lane Group	EBT	WBL	WBT	SEL	SET	SER	NWL	NWT	NWR
Lane Group Flow (vph)	147	2	2	510	83	490	1	0	82
Act Effct Green (s)	23.5	23.5	23.5	58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.65		0.65
v/c Ratio	0.16	0.01	0.00	0.23	0.07	0.40	0.00		0.08
Uniform Delay, d1	25.4	24.5	24.5	6.5	5.8	0.0	6.0		0.0
Delay	25.7	33.0	33.0	6.5	5.9	0.7	6.0		1.4
LOS	C	C	C	A	A	A	A		A
Approach Delay	25.7		33.0		3.8			1.5	
Approach LOS	C		C		A			A	
Queue Length 50th (m)	10.2	0.2	0.2	16.6	4.7	0.0	0.1		0.0
Queue Length 95th (m)	17.6	2.5	2.5	23.0	9.4	9.5	0.6		4.3
Internal Link Dist (m)	29.6		16.5		46.2			264.3	
50th Up Block Time (%)									
95th Up Block Time (%)									
Turn Bay Length (m)									
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)									

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.40
Intersection Signal Delay: 6.2 Intersection LOS: A
Intersection Capacity Utilization 47.0% ICU Level of Service A

Lane Group	EBT	WBT	WBR	SET	NWL	NWT
Lane Group Flow (vph)	737	2	494	0	2	3
Act Effct Green (s)	59.0	59.0	90.0		23.0	23.0
Actuated g/C Ratio	0.66	0.66	1.00		0.26	0.26
v/c Ratio	0.37	0.00	0.31		0.00	0.00
Uniform Delay, d1	7.0	5.5	0.0		25.0	0.0
Delay	8.2	5.5	0.0		25.0	0.0
LOS	A	A	A		C	A
Approach Delay	8.2	0.0				10.0
Approach LOS	A	A				A
Queue Length 50th (m)	34.3	0.1	0.0		0.3	0.0
Queue Length 95th (m)	46.4	0.8	0.0		2.0	0.0
Internal Link Dist (m)	78.4	222.2		57.2		49.0
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (m)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 4.9 Intersection LOS: A

Intersection Capacity Utilization 34.0% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	456	401	1907	1957
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.71	0.71	0.66	0.67
Uniform Delay, d1	25.5	24.9	13.4	13.6
Delay	26.3	25.8	4.3	7.3
LOS	C	C	A	A
Approach Delay	26.3	25.8	4.3	7.3
Approach LOS	C	C	A	A
Queue Length 50th (m)	67.5	58.1	14.2	23.9
Queue Length 95th (m)	101.4	90.9	22.3	46.4
Internal Link Dist (m)	123.5	93.1	100.9	106.3
50th Up Block Time (%)				
95th Up Block Time (%)		5%		
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)		10		

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 9.5 Intersection LOS: A

Intersection Capacity Utilization 73.2% ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	71	1945	0	38	1885
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.14	0.53		0.08	0.59
Uniform Delay, d1	24.4	0.0		11.9	9.6
Delay	39.1	3.6		10.9	1.7
LOS	D	A		B	A
Approach Delay	4.8		10.9		1.7
Approach LOS	A		B		A
Queue Length 50th (m)	12.9	33.5		0.0	5.8
Queue Length 95th (m)	m19.8	35.5		5.7	11.4
Internal Link Dist (m)	0.1		0.5		106.3
50th Up Block Time (%)	65%	26%		2%	
95th Up Block Time (%)	66%	35%		58%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	46	590		11	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 3.4	Intersection LOS: A
Intersection Capacity Utilization 48.7%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1946	1923	131	5
Act Effct Green (s)	50.5	50.5	31.5	31.5
Actuated g/C Ratio	0.56	0.56	0.35	0.35
v/c Ratio	0.68	0.67	0.27	0.01
Uniform Delay, d1	13.5	13.8	20.6	7.6
Delay	5.7	14.0	21.2	14.8
LOS	A	B	C	B
Approach Delay	5.7	14.0	21.2	14.8
Approach LOS	A	B	C	B
Queue Length 50th (m)	0.2	79.6	15.8	0.2
Queue Length 95th (m)	26.5	95.1	29.5	2.5
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	67%			
95th Up Block Time (%)	13%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	774			

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 10.2	Intersection LOS: B
Intersection Capacity Utilization 59.1%	ICU Level of Service A

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	305	47	156	85	42
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.50	0.05	0.17	0.11	0.05
Uniform Delay, d1	15.6	12.0	11.2	11.9	14.6
Delay	16.2	12.2	6.7	12.6	15.0
LOS	B	B	A	B	B
Approach Delay		15.7	6.7	12.6	15.0
Approach LOS		B	A	B	B
Queue Length 50th (m)	34.2	4.1	6.0	6.6	4.0
Queue Length 95th (m)	57.1	9.5	15.1	15.1	9.9
Internal Link Dist (m)		15.7	208.7	130.9	81.8
50th Up Block Time (%)	31%				
95th Up Block Time (%)	39%				
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 40.5%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	38	13	534	618
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.08	0.03	0.48	0.55
Uniform Delay, d1	18.9	13.2	10.0	10.7
Delay	20.0	17.5	10.4	11.1
LOS	B	B	B	B
Approach Delay	20.0	17.5	10.4	11.1
Approach LOS	B	B	B	B
Queue Length 50th (m)	4.0	1.0	47.2	58.3
Queue Length 95th (m)	10.9	5.0	70.3	86.5
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary
Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 11.1 Intersection LOS: B
Intersection Capacity Utilization 47.9% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	11	1	50	29	1857	2283
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.02	0.02	0.00	0.08	0.05	0.63	0.78
Uniform Delay, d1	20.1	9.1	20.0	20.5	11.1	12.5	14.2
Delay	20.3	15.2	20.0	20.9	14.1	12.7	14.5
LOS	C	B	B	C	B	B	B
Approach Delay		17.5		18.4		12.7	14.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	0.6	0.1	5.9	1.9	72.0	100.8
Queue Length 95th (m)	4.2	4.1	1.2	13.6	7.6	86.2	120.3
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							39%
95th Up Block Time (%)							39%
Turn Bay Length (m)	15.2						
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 13.8	Intersection LOS: B
Intersection Capacity Utilization 54.9%	ICU Level of Service A

APPENDIX E

SEGMENT MERGE / DIVERGE LEVEL OF SERVICE CALCULATIONS

2000

(Existing Conditions) AM

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	6149	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1932	vph
Length of First Accel/Decel Lane	1700	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	6149	1932	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1708	537	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	7106	2233	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.480 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4570 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7106	6900	Yes
v_{12}	4570	4400	Yes
$v_{FO} = v_F - v_R$	4873	6900	No
v_R	2233	2100	Yes

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 28+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence F

Speed in Ramp Influence Area, S_R 51 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 SB from Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	4217	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	986	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	Yes	
Volume on Adjacent Ramp	3717	vph
Position of Adjacent Ramp	Downstream	
Type of Adjacent Ramp	Off	
Distance to Adjacent Ramp	4000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	4217	986	3717	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1171	274	1033	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	3.0	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	4873	1139	4130	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.577 Using Equation 2
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2814 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	6012	6900	No
v_{R12}	3953	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 36- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence E

Speed in Ramp Influence Area, S_R 50.6 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 NB from Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	4	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	1601	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1393	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	400	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1601	1393		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	445	387		v
Trucks and Buses	0	0		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	1.000	1.000		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1779	1548		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.209 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 372 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	3327	9200	No
v_{R12}	1920	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 17+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 54.4 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 NB at Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	2049	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	448	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2049	448	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	569	124	0	v
Trucks and Buses	0	0	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	1.000	1.000	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2277	498	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.680 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1708 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2277	6900	No
v_{12}	1708	4400	No
$v_{FO} = v_F - v_R$	1779	6900	No
v_R	498	2000	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 51 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB to Marina/Richardson
Analyst: BM
Analysis Time Period: Existing-AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	5203	vph
Off Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1486	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	5203	1486	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1445	413	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	6012	1717	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.450 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3650 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6012	6900	No
v_{12}	3650	4400	No
$v_{FO} = v_F - v_R$	4295	6900	No
v_R	1717	3800	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ = 37+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence E

Speed in Ramp Influence Area, S_R 50 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Marina/Richardson to 101
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1443	vph
On Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	606	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1443	606		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	401	168		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1667	700		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.555 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 925 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2367	6750	No
v_{R12}	1736	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 19- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 50.5 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Park Presidio SB from 101
Analyst: BM
Analysis Time Period: Existing-AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1932	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	448	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1932	448		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	537	124		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	2233	518		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 1.000 Using Equation 1
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2233 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2751	4500	No
v_{R12}	2751	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 26+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.1 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: Park Presidio at 101
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2379	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	986	vph
Length of First Accel/Decel Lane	150	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2379	986	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	661	274	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2749	1139	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 1.000 Using Equation 6

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2749 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2749	4500	No
v_{12}	2749	4400	No
$v_{FO} = v_F - v_R$	1610	4500	No
v_R	1139	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50 mph

2000

(Existing Conditions) PM

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis Diverge
Freeway Data:
Number of Lanes in Freeway 3
Free-Flow Speed on Freeway 60.0 mph
Volume on Freeway 3120 vph
Off Ramp Data:
Side of Freeway Right
Number of Lanes in Ramp 1
Free-Flow Speed on Ramp 45.0 mph
Volume on Ramp 1236 vph
Length of First Accel/Decel Lane 1700 ft
Length of Second Accel/Decel Lane 500 ft
Adjacent Ramp Data if one exists:
Does adjacent ramp exist? No
Volume on Adjacent Ramp 0 vph
Position of Adjacent Ramp Upstream
Type of Adjacent Ramp On
Distance to Adjacent Ramp 1000 ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	3120	1236	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	867	343	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	3605	1428	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.604 Using Equation 7
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2743 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3605	6900	No
v_{12}	2743	4400	No
$v_{FO} = v_F - v_R$	2177	6900	No
v_R	1428	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 13- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 52 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 SB from Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	1884	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	724	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	Yes	
Volume on Adjacent Ramp	1734	vph
Position of Adjacent Ramp	Downstream	
Type of Adjacent Ramp	Off	
Distance to Adjacent Ramp	4000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1884	724	1734	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	523	201	482	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	3.0	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2177	837	1927	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.577 Using Equation 2

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 1257 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	3014	6900	No
v_{R12}	2094	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 21+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 53.7 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 NB from Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	4	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3605	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	2044	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	400	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	3605	2044		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	1001	568		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	4166	2362		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.209 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 872 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	6528	9200	No
v_{R12}	3234	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 53.1 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 NB at Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	4619	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1014	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	4619	1014	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1283	282	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	5338	1172	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.573 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3558 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5338	6900	No
v_{12}	3558	4400	No
$v_{FO} = v_F - v_R$	4166	6900	No
v_R	1172	2000	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 34+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence D

Speed in Ramp Influence Area, S_R 50 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Marina/Richardson
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	2607	vph
Off Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	873	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2607	873	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	724	243	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	3013	1009	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.450 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1911 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3013	6900	No
v_{12}	1911	4400	No
$v_{FO} = v_F - v_R$	2004	6900	No
v_R	1009	3800	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\ L_D$ = 22- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Doyle Dr/Richardson to 101
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2802	vph
On Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1817	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	2802	1817		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	778	505		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	3238	2100		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.555 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 1797 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	5338	6750	No
v_{R12}	4112	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 37- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence E

Speed in Ramp Influence Area, S_R 47.7 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Park Presidio SB from 101
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1236	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1014	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1236	1014		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	343	282		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1428	1172		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 1.000 Using Equation 1
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 1428 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2600	4500	No
v_{R12}	2600	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.2 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: Park Presidio at 101
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2768	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	724	vph
Length of First Accel/Decel Lane	150	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2768	724	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	769	201	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	3199	837	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 1.000 Using Equation 6

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3199 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3199	4500	No
v_{12}	3199	4400	No
$v_{FO} = v_F - v_R$	2362	4500	No
v_R	837	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 30+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence D

Speed in Ramp Influence Area, S_R 50 mph

2000

(Existing Conditions) WEEKEND

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	4573	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1685	vph
Length of First Accel/Decel Lane	1700	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	4573	1685	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1270	468	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	5284	1947	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.538 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3743 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5284	6900	No
v_{12}	3743	4400	No
$v_{FO} = v_F - v_R$	3337	6900	No
v_R	1947	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 21+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 SB from Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3571	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	683	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	Yes	
Volume on Adjacent Ramp	2745	vph
Position of Adjacent Ramp	Downstream	
Type of Adjacent Ramp	Off	
Distance to Adjacent Ramp	4000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	3571	683	2745	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	992	190	763	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	3.0	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	4126	789	3050	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.577 Using Equation 2
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2383 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	4915	6900	No
v_{R12}	3172	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 30- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence D

Speed in Ramp Influence Area, S_R 52.5 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 NB from Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	4	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3327	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	2010	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	400	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	3327	2010		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	924	558		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	3845	2323		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.209 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 805 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	6168	9200	No
v_{R12}	3128	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 26+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 53.3 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 NB at Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	2534	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	524	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2534	524	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	704	146	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2928	606	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.659 Using Equation 7
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2136 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2928	6900	No
v_{12}	2136	4400	No
$v_{FO} = v_F - v_R$	2322	6900	No
v_R	606	2000	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 22+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Marina/Richardson
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3572	vph
Off Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1078	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	3572	1078	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	992	299	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	4128	1246	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.450 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2543 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4128	6900	No
v_{12}	2543	4400	No
$v_{FO} = v_F - v_R$	2882	6900	No
v_R	1246	3800	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Marina/Richardson to 101
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1505	vph
On Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	930	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp
Terrain Type	Rolling	Rolling	Level
Grade	%	%	%
Length	mi	mi	mi
Volume, V (vph)	1505	930	vph
Peak-Hour Factor, PHF	0.90	0.90	
Peak 15-min Volume, v15	418	258	v
Trucks and Buses	2	2	%
Trucks and Buses PCE, ET	3.0	3.0	
Recreational Vehicles	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	
Driver Population Adjustment, fP	1.00	1.00	
Adjusted Flow Rate, vp	1739	1075	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.555 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 965 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2814	6750	No
v_{R12}	2155	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 22- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.4 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Park Presidio SB from 101
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2209	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	30.0	mph
Volume on Ramp	524	vph
Length of First Accel/Decel Lane	500	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	2209	524		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	614	146		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	2553	606		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 1.000 Using Equation 1
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2553 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	3159	4500	No
v_{R12}	3159	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 27- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.0 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: Park Presidio at 101
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2000	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	683	vph
Length of First Accel/Decel Lane	150	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2000	683	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	556	190	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2311	789	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 1.000 Using Equation 6

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2311 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2311	4500	No
v_{12}	2311	4400	No
$v_{FO} = v_F - v_R$	1522	4500	No
v_R	789	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50 mph

2030 ALTERNATIVE 1
(No Build) AM

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2258	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	383	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2258	383		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	627	106		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

```
     Length                                        mi           mi           mi
Trucks and buses PCE, ET                       3.0          3.0
Recreational vehicle PCE, ER                   2.0          2.0
Heavy vehicle adjustment, fHV                  0.962        1.000
Driver population factor, fP                   1.00         1.00
Flow rate, vp                                  2609         426                pcp

                         Estimation of V12 Merge Areas

                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v   = v  (P  ) =  2609   pc/h
                   12   F   FM

                               Capacity Checks

                           Actual        Maximum         LOS F?
     v                     3035          4500            No
      FO
     v                     3035          4600            No
      R12

                 Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   28.6    pc/mi
          R                   R            12            A
Level of service for ramp-freeway junction areas of influence  D

                             Speed Estimation

Intermediate speed variable,                 M  = 0.399
                                              S
Space mean speed in ramp influence area,     S  = 49.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 49.8    mph
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	Marina/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	806	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2141	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	806	2141		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	224	595		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	3.0	1.5	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	931	2379	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.555 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 517 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3310	6900	No
v_{R12}	2958	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 26.8 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.389

Space mean speed in ramp influence area, S_R = 53.0 mph

Space mean speed in outer lanes, S_0 = 60.0 mph

Space mean speed for all vehicles, S = 53.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	101 SB to Marina/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4981	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	3325	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4981		3325			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1384		924			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5756	3694	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4622 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5756	6900	No
v_{12}	4622	4400	Yes
$v_{FO} = v_F - v_R$	2062	6900	No
v_R	3694	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 46.0 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.760

Space mean speed in ramp influence area, S_R = 46 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 48.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-AM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2947	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	383	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2947	383		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	819	106		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Composite	Composite	Level	
Grade	4.57 %	3.30 %	%	

Length	0.22 mi	0.20 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	2.5	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3274	426	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.659 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2302 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3274	6900	No
v_{12}	2302	4400	No
$v_{FO} = v_F - v_R$	2848	6900	No
v_R	426	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23.6 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D_S = 0.466

Space mean speed in ramp influence area, S_R = 52 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 55.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2564	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2455	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2564		2455			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	712		682			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	2.80	%	4.90	%		%

Length	0.30	mi	0.30	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	1.000		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	2849		2728		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2849 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5577	4600	Yes
v_{R12}	5577	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 45.2 pc/mi

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 1.316

Space mean speed in ramp influence area, S_R = 36.3 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 36.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-AM
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4345	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	637	vph
Length of first accel/decel lane	100	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4345	637		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1207	177		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Grade	Level	
Grade	-4.70 %	-4.57 %	%	

Length	0.22	mi	0.22	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	4876		708		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.580 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2830 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5584	6900	No
v_{R12}	3538	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 32.1 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.446

Space mean speed in ramp influence area, S_R = 52.0 mph

Space mean speed in outer lanes, S_0 = 54.4 mph

Space mean speed for all vehicles, S = 52.8 mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6441	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2258	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6441		2258			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1789		627			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	6.00	%		%

Length	0.30	mi	0.33	mi	mi
Trucks and buses PCE, ET	3.0		3.0		
Recreational vehicle PCE, ER	2.0		2.0		
Heavy vehicle adjustment, fHV	0.962		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	7443		2509		pcp

Estimation of V12 Diverge Areas

$L_{EQ} = 0.00$ (Equation 25-8 or 25-9)

$P_{FD} = 0.436$ Using Equation 8

$v_{12} = v_R + (v_F - v_R) P_{FD} = 4660$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7443	9200	No
v_{12}	4660	4400	Yes
$v_{FO} = v_F - v_R$	4934	9200	Yes
v_R	2509	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D = 29.0$ pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D_S = 0.524$	
Space mean speed in ramp influence area,	$S_R = 51$	mph
Space mean speed in outer lanes,	$S_0 = 64.3$	mph
Space mean speed for all vehicles,	$S = 55.0$	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3082	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	637	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3082		637			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	856		177			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3561	708	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3561 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3561	4500	No
v_{12}	3561	4400	No
$v_{FO} = v_F - v_R$	2853	4500	No
v_R	708	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 33.5 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.362

Space mean speed in ramp influence area, S_R = 50 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 50.3 mph

2030 ALTERNATIVE 1

(No Build) PM

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2145	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	790	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2145	790		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	596	219		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2479	878	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2479 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3357	4500	No
v_{R12}	3357	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 30.9 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.429

Space mean speed in ramp influence area, S_R = 49.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 49.4 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	Marina/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1875	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2931	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1875	2931		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	521	814		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	3.0	1.5	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2167	3257	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.555 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1203 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5424	6900	No
v_{R12}	4604	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 39.3 pc/mi

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 0.704

Space mean speed in ramp influence area, S_R = 47.3 mph

Space mean speed in outer lanes, S_0 = 58.8 mph

Space mean speed for all vehicles, S = 48.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: 101 SB at Marina/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3590	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2543	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3590		2543			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	997		706			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4148	2826	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3421 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4148	6900	No
v_{12}	3421	4400	No
$v_{FO} = v_F - v_R$	1322	6900	No
v_R	2826	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 35.1 pc/mi/

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable, D_S = 0.682

Space mean speed in ramp influence area, S_R = 48 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 49.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4806	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	790	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4806		790			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1335		219			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	4.57	%	3.56	%		%

Length	0.22	mi	0.20	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	5393		878			pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.585 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3518 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5393	7050	No
v_{12}	3518	4400	No
$v_{FO} = v_F - v_R$	4515	7050	No
v_R	878	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 34.1 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.507	
Space mean speed in ramp influence area,	S_R = 53	mph
Space mean speed in outer lanes,	S_0 = 67.9	mph
Space mean speed for all vehicles,	S = 57.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4016	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2203	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4016		2203			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1116		612			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	2.80	%	4.90	%		%

Length	0.30	mi	0.30	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	4507		2448		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 942 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6955	9200	No
v_{R12}	3390	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 28.3 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.401

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_0 = 55.4 mph

Space mean speed for all vehicles, S = 54.1 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2929	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	661	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2929		661			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	814		184			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	-4.70	%	-4.57	%		%

Length	0.22	mi	0.22	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	3287		734		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.577 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1898 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4021	6900	No
v_{R12}	2632	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 25.7 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.375	
Space mean speed in ramp influence area,	S_R = 53.2	mph
Space mean speed in outer lanes,	S_0 = 56.8	mph
Space mean speed for all vehicles,	S = 54.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5074	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2145	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5074		2145			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1409		596			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	0.00	%	6.00	%		%

Length	0.30 mi	0.33 mi mi
Trucks and buses PCE, ET	1.5	1.5
Recreational vehicle PCE, ER	1.2	1.2
Heavy vehicle adjustment, fHV	0.990	1.000
Driver population factor, fP	1.00	1.00
Flow rate, vp	5694	2383 pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.508 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4065 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5694	6900	No
v_{12}	4065	4400	No
$v_{FO} = v_F - v_R$	3311	6900	Yes
v_R	2383	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 23.9 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.512	
Space mean speed in ramp influence area,	S_R = 51	mph
Space mean speed in outer lanes,	S_0 = 63.4	mph
Space mean speed for all vehicles,	S = 53.8	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2864	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	661	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2864		661			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	796		184			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3310	734	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3310 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3310	4500	No
v_{12}	3310	4400	No
$v_{FO} = v_F - v_R$	2576	4500	No
v_R	734	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 31.4 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.364	
Space mean speed in ramp influence area,	S_R = 50	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 50.3	mph

2030 ALTERNATIVE 1

(No Build) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend-No Build
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2054	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2054		110			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	571		31			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade		%		%		%

```
    Length                                         mi          mi          mi
Trucks and buses PCE, ET              3.0         3.0
Recreational vehicle PCE, ER          2.0         2.0
Heavy vehicle adjustment, fHV         0.962       1.000
Driver population factor, fP          1.00        1.00
Flow rate, vp                         2374        122                    pcp

                    Estimation of V12 Merge Areas

                 L   =    0.00    (Equation 25-2 or 25-3)
                  EQ
                 P   =    1.000   Using Equation  0
                  FM
                 v   = v  (P  ) =  2374   pc/h
                  12   F   FM

                          Capacity Checks

                          Actual        Maximum         LOS F?
     v                    2496          4500            No
      FO
     v                    2780          4600            No
      R12

                Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   24.6    pc/mi
          R                   R            12            A
Level of service for ramp-freeway junction areas of influence  C

                         Speed Estimation

Intermediate speed variable,                 M  = 0.381
                                              S
Space mean speed in ramp influence area,     S  = 50.0    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 50.0    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend-No Build
Freeway/dir or travel:	Marina/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1142	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2407	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1142	2407		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	317	669		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend-No Build
Freeway/dir or travel:	101 SB at Marina/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3493	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2532	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3493		2532			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	970		703			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-Weekend
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3550	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3550		110			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	986		31			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	4.57	%	3.56	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: WEEKEND
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3439	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2194	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3439	2194		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	955	609		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Grade	Level	
Grade	2.80 %	4.90 %	%	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-Weekend
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3376	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	117	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3376		117			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	938		33			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	-4.70	%	-4.57	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-Weekend
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5430	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2054	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5430		2054			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1508		571			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	0.00	%	6.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend-No Build
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1955	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	117	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1955		117			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	543		33			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 2

(Replace and Widen) AM

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	12/5/2001
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2099	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	386	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2099		386			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	583		107			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2356	429		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2356 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2785	4600	No
v_{R12}	2785	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.9 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.354

Space mean speed in ramp influence area, S_R = 53.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 53.6 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: Doyle Dr/Richardson to 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	770	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2208	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	770	2208		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	214	613		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4996	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	3320	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4996		3320			vpl
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1388		922			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2979	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	386	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2979		386			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	828		107			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2593	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2420	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2593		2420			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	720		672			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4314	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	681	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4314	681		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1198	189		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6414	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2099	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6414		2099			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1782		583			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3101	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	681	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3101		681			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	861		189			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 2

(Replace and Widen) PM

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/204
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2258	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	726	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2258		726			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	627		202			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 27/7/2004
Analysis time period: PM
Freeway/dir or travel: Doyle Dr/Richardson to 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1787	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	3008	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1787		3008			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	496		836			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Doyle Dr/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3838	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2660	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3838		2660			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1066		739			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4795	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	726	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4795		726			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1332		202			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4068	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2194	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4068	2194		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1130	609		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	658	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3180		658			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	883		183			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5437	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2258	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5437		2258			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1510		627			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	6102		2509		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.492 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4277 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6102	7050	No
v_{12}	4277	4400	No
$v_{FO} = v_F - v_R$	3593	7050	Yes
v_R	2509	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 25.7 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.589	
Space mean speed in ramp influence area,	S_R = 51	mph
Space mean speed in outer lanes,	S_0 = 68.1	mph
Space mean speed for all vehicles,	S = 55.5	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2853	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	658	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2853		658			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	793		183			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 2

(Replace and Widen) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2070	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	112	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2070	112		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	575	31		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

```
     Length                                         mi           mi           mi
Trucks and buses PCE, ET                       1.5          1.5
Recreational vehicle PCE, ER                   1.2          1.2
Heavy vehicle adjustment, fHV                  0.990        1.000
Driver population factor, fP                   1.00         1.00
Flow rate, vp                                  2323         124                  pcp
```

Estimation of V12 Merge Areas

```
                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v   = v  (P  ) =  2323   pc/h
                   12   F   FM
```

Capacity Checks

```
                           Actual        Maximum         LOS F?
     v                     2447          4600            No
      FO
     v                     2447          4600            No
      R12
```

Level of Service Determination (if not F)

```
Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   21.4    pc/mi
          R                    R            12            A
Level of service for ramp-freeway junction areas of influence  C
```

Speed Estimation

```
Intermediate speed variable,                 M  = 0.336
                                              S
Space mean speed in ramp influence area,     S  = 54.0    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 54.0    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: Doyle Dr/Richardson to 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1078	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2455	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1078	2455		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	299	682		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1210	2728	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.577 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 699 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3938	6750	No
v_{R12}	3427	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 31.0 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.441

Space mean speed in ramp influence area, S_R = 49.3 mph

Space mean speed in outer lanes, S_0 = 55.0 mph

Space mean speed for all vehicles, S = 49.9 mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3501	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2516	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3501		2516			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	973		699			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3533	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	112	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3533		112			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	981		31			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3327	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2010	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3327	2010		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	924	558		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3376	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	125	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3376	125		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	938	35		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3789	139	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.583 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2209 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3928	6900	No
v_{R12}	2348	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 22.5 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.346

Space mean speed in ramp influence area, S_R = 53.8 mph

Space mean speed in outer lanes, S_0 = 56.1 mph

Space mean speed for all vehicles, S = 54.7 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5446	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2070	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5446		2070			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1513		575			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1975	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	125	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1975		125			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	549		35			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Diamond Option) AM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4951	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1898	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4951		1898			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1375		527			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

```
     Length                                      0.00     mi  0.00     mi           mi
Trucks and buses PCE, ET                         1.5          1.5
Recreational vehicle PCE, ER                     1.2          1.2
Heavy vehicle adjustment, fHV                    0.990        1.000
Driver population factor, fP                     1.00         1.00
Flow rate, vp                                    5556         2109                   pcp
```

Estimation of V12 Diverge Areas

```
                  L   =     0.00    (Equation 25-8 or 25-9)
                   EQ
                  P   =     0.260   Using Equation  0
                   FD
                  v   = v   + (v - v ) P   =  3005   pc/h
                   12   R      F   R   FD
```

Capacity Checks

```
                           Actual        Maximum         LOS F?
     v  = v                5556          9200            No
      Fi   F
     v                     3005          4400            No
      12
     v   = v - v           3447          9200            No
      FO   F   R
     v                     2109          3800            No
      R
```

Level of Service Determination (if not F)

```
Density,               D = 4.252 + 0.0086 v  - 0.009  L    =   28.3    pc/mi/
                        R                   12         D
Level of service for ramp-freeway junction areas of influence D
```

Speed Estimation

```
Intermediate speed variable,                 D  = 0.618
                                              S
Space mean speed in ramp influence area,     S  = 49       mph
                                              R
Space mean speed in outer lanes,             S  = 64.7     mph
                                              0
Space mean speed for all vehicles,           S  = 55.1     mph
```

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3071	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	623	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3071		623			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	853		173			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2222	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	354	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2222		354			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	617		98			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2994	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	354	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2994		354			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	832		98			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2641	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2451	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2641		2451			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	734		681			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2934	2723	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 613 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5657	9200	No
v_{R12}	3336	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 27.7 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.399

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_0 = 57.6 mph

Space mean speed for all vehicles, S = 54.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4328	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	623	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4328		623			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1202		173			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6550	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2222	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6550		2222			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1819		617			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB exit diverge to Girard
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2817	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	74	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2817		74			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	783		21			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Diamond Option) PM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Doyle Dr/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3785	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1388	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3785		1388			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1051		386			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2792	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	596	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2792		596			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	776		166			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/204
Analysis time period: PM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2423	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	671	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2423		671			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	673		186			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4924	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	671	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4924		671			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1368		186			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4252	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2196	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4252		2196			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1181		610			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3194	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	596	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3194	596		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	887	166		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5612	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2423	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5612		2423			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1559		673			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB exit diverge to Girard
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3401	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	45	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3401		45			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	945		13			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Diamond Option) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3397	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1126	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3397		1126			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	944		313			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone:	Fax:
E-mail:	

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1875	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	105	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1875		105			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	521		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: Weekend
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	98	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2180		98			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	606		27			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3633	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	98	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3633		98			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1009		27			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3535	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	1769	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3535		1769			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	982		491			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3292	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	105	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3292		105			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	914		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2978	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	19	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2978		19			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	827		5			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) AM

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3072	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	593	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3072		593			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	853		165			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2261	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	331	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2261		331			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	628		92			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2537	368		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2537 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2905	4600	No
v_{R12}	2905	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 24.8 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S =	0.362	
Space mean speed in ramp influence area,	S_R =	53.5	mph
Space mean speed in outer lanes,	S_0 =	N/A	mph
Space mean speed for all vehicles,	S =	53.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2948	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	331	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2948		331			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	819		92			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	1.000		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	3276		368		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.661 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2291 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3276	6900	No
v_{12}	2291	4400	No
$v_{FO} = v_F - v_R$	2908	6900	No
v_R	368	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 19.5 pc/mi/

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.526

Space mean speed in ramp influence area, S_R = 51 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 54.3 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2617	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2479	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2617		2479			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	727		689			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2908	2754	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 608 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5662	9200	No
v_{R12}	3362	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27.9 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.402

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_0 = 57.7 mph

Space mean speed for all vehicles, S = 54.7 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4291	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	593	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4291		593			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1192		165			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

```
     Length                                             mi            mi            mi
Trucks and buses PCE, ET                       1.5          1.5
Recreational vehicle PCE, ER                   1.2          1.2
Heavy vehicle adjustment, fHV                  0.990        1.000
Driver population factor, fP                   1.00         1.00
Flow rate, vp                                  4815         659                       pcp

                        Estimation of V12 Merge Areas

                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    0.583   Using Equation  1
                   FM
                  v   = v  (P  ) =  2808   pc/h
                   12    F   FM

                              Capacity Checks

                           Actual        Maximum         LOS F?
     v                     5474          7050            No
      FO
     v                     3467          4600            No
      R12

                 Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   31.0    pc/mi
          R                    R            12           A
Level of service for ramp-freeway junction areas of influence  D

                             Speed Estimation

Intermediate speed variable,                 M  = 0.430
                                              S
Space mean speed in ramp influence area,     S  = 55.1    mph
                                              R
Space mean speed in outer lanes,             S  = 59.6    mph
                                              0
Space mean speed for all vehicles,           S  = 56.7    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6556	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2261	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6556		2261			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1821		628			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	7357		2512		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3772 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7357	9400	No
v_{12}	3772	4400	No
$v_{FO} = v_F - v_R$	4845	9400	No
v_R	2512	4100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 32.2 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.589	
Space mean speed in ramp influence area,	S_R = 51	mph
Space mean speed in outer lanes,	S_0 = 68.2	mph
Space mean speed for all vehicles,	S = 58.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4888	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1825	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4888		1825			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1358		507			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	5485		2028		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2927 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5485	9200	No
v_{12}	2927	4400	No
$v_{FO} = v_F - v_R$	3457	9200	No
v_R	2028	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 27.6 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.611	
Space mean speed in ramp influence area,	S_R = 49	mph
Space mean speed in outer lanes,	S_0 = 64.7	mph
Space mean speed for all vehicles,	S = 55.3	mph

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) PM

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2790	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	589	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2790		589			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	775		164			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3131	654	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3131 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3131	4500	No
v_{12}	3131	4400	No
$v_{FO} = v_F - v_R$	2477	4500	No
v_R	654	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 26.7 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.487		
Space mean speed in ramp influence area,	S_R = 49	mph	
Space mean speed in outer lanes,	S_0 = N/A	mph	
Space mean speed for all vehicles,	S = 48.7	mph	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/204
Analysis time period: PM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2409	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	672	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2409		672			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	669		187			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2703	747	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2703 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3450	4600	No
v_{R12}	3450	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 28.9 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.414

Space mean speed in ramp influence area, S_R = 52.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 52.6 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4902	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	672	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4902		672			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1362		187			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5501	747	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.588 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3543 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5501	7050	No
v_{12}	3543	4400	No
$v_{FO} = v_F - v_R$	4754	7050	No
v_R	747	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 30.2 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.560

Space mean speed in ramp influence area, S_R = 52 mph

Space mean speed in outer lanes, S_0 = 67.6 mph

Space mean speed for all vehicles, S = 56.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4230	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2201	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4230		2201			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1175		611			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4747	2446	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 992 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7193	9200	No
v_{R12}	3438	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 28.7 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.410

Space mean speed in ramp influence area, S_R = 52.6 mph

Space mean speed in outer lanes, S_0 = 55.0 mph

Space mean speed for all vehicles, S = 53.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3163	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	589	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3163	589		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	879	164		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3550	654		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.583 Using Equation 1

$v_{12} = v_F\,(P_{FM})$ = 2070 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4204	6900	No
v_{R12}	2724	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\,v_R + 0.0078\,v_{12} - 0.00627\,L_A$ = 25.2 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.364

Space mean speed in ramp influence area, S_R = 53.4 mph

Space mean speed in outer lanes, S_0 = 56.5 mph

Space mean speed for all vehicles, S = 54.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5572	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2409	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5572		2409			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1548		669			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6253	2677	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3607 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6253	9400	No
v_{12}	3607	4400	No
$v_{FO} = v_F - v_R$	3576	9400	No
v_R	2677	4100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 30.8 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.604	
Space mean speed in ramp influence area,	S_R = 51	mph
Space mean speed in outer lanes,	S_0 = 70.0	mph
Space mean speed for all vehicles,	S = 57.7	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Doyle Dr/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3752	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1321	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3752		1321			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1042		367			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

```
     Length                                  0.00    mi  0.00    mi           mi
Trucks and buses PCE, ET                     1.5         1.5
Recreational vehicle PCE, ER                 1.2         1.2
Heavy vehicle adjustment, fHV                0.990       1.000
Driver population factor, fP                 1.00        1.00
Flow rate, vp                                4211        1468                   pcp

                         Estimation of V12 Diverge Areas

                  L  =    0.00    (Equation 25-8 or 25-9)
                   EQ
                  P  =    0.260   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2181   pc/h
                   12   R      F   R   FD

                               Capacity Checks

                           Actual        Maximum        LOS F?
     v  = v                4211          9200           No
      Fi   F
     v                     2181          4400           No
      12
     v  = v - v            2743          9200           No
      FO   F   R
     v                     1468          3800           No
      R

                 Level of Service Determination (if not F)

Density,                D = 4.252 + 0.0086 v  - 0.009  L   =   21.2    pc/mi/
                         R                  12          D
Level of service for ramp-freeway junction areas of influence C

                             Speed Estimation

Intermediate speed variable,                  D  = 0.560
                                               S
Space mean speed in ramp influence area,      S  = 50      mph
                                               R
Space mean speed in outer lanes,              S  = 65.8    mph
                                               0
Space mean speed for all vehicles,            S  = 56.5    mph
```

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1892	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	104	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1892		104			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	526		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	2123		116			pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2123 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2123	4500	No
v_{12}	2123	4400	No
$v_{FO} = v_F - v_R$	2007	4500	No
v_R	116	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18.0 pc/mi/

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 49	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2181	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	102	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2181		102			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	606		28			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length		mi	mi	mi
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicle PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.990		1.000	
Driver population factor, fP	1.00		1.00	
Flow rate, vp	2448		113	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2448 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2561	4600	No
v_{R12}	2561	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.3 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.342

Space mean speed in ramp influence area, S_R = 53.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 53.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3612	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	102	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3612		102			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1003		28			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	4053		113			pcp

Estimation of V12 Diverge Areas

$L_{EQ} =$ 0.00 (Equation 25-8 or 25-9)

$P_{FD} =$ 0.653 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD} =$ 2688 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4053	6900	No
v_{12}	2688	4400	No
$v_{FO} = v_F - v_R$	3940	6900	No
v_R	113	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D =$ 22.9 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S	= 0.503	
Space mean speed in ramp influence area,	S_R	= 51	mph
Space mean speed in outer lanes,	S_0	= 64.4	mph
Space mean speed for all vehicles,	S	= 54.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3510	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	1789	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3510		1789			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	975		497			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3939	1988	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 823 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5927	9200	No
v_{R12}	2811	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 24.0 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.354

Space mean speed in ramp influence area, S_R = 53.6 mph

Space mean speed in outer lanes, S_0 = 56.2 mph

Space mean speed for all vehicles, S = 54.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3285	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	104	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3285		104			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	913		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3687	116	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.583 Using Equation 1

$v_{12} = v_F (P_{FM}) =$ 2150 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3803	6900	No
v_{R12}	2266	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 21.8 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.343

Space mean speed in ramp influence area, S_R = 53.8 mph

Space mean speed in outer lanes, S_0 = 56.3 mph

Space mean speed for all vehicles, S = 54.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5466	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2181	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5466		2181			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1518		606			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	6134		2423			pcp

Estimation of V12 Diverge Areas

$L_{EQ} =$ 0.00 (Equation 25-8 or 25-9)

$P_{FD} =$ 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD} =$ 3388 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6134	9200	No
v_{12}	3388	4400	No
$v_{FO} = v_F - v_R$	3711	9200	No
v_R	2423	4100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D =$ 28.9 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.581	
Space mean speed in ramp influence area,	S_R = 50	mph
Space mean speed in outer lanes,	S_0 = 64.4	mph
Space mean speed for all vehicles,	S = 55.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3389	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1083	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

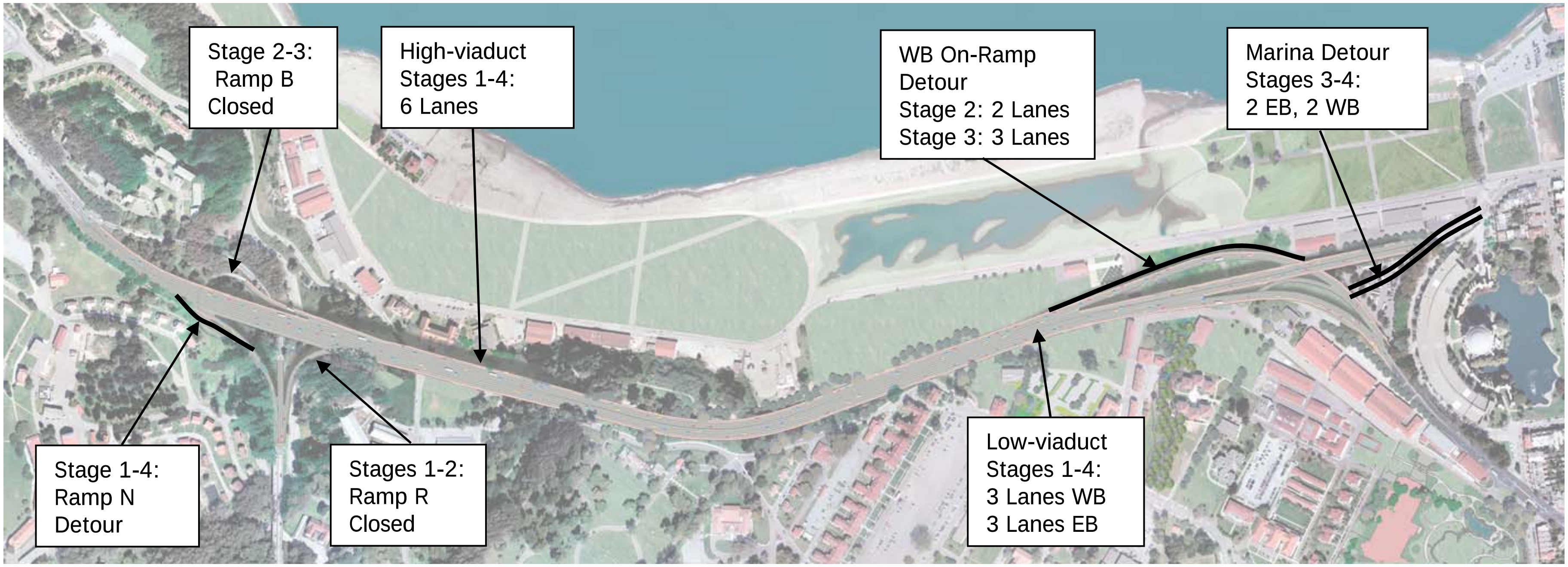
Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3389		1083			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	941		301			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

```
     Length                                 0.00    mi  0.00    mi          mi
Trucks and buses PCE, ET                    1.5         1.5
Recreational vehicle PCE, ER                1.2         1.2
Heavy vehicle adjustment, fHV               0.990       1.000
Driver population factor, fP                1.00        1.00
Flow rate, vp                               3803        1203                  pcp

                         Estimation of V12 Diverge Areas

                  L   =    0.00    (Equation 25-8 or 25-9)
                   EQ
                  P   =    0.260   Using Equation  0
                   FD
                  v   = v   + (v - v ) P   =  1879   pc/h
                   12   R      F   R   FD

                               Capacity Checks

                           Actual         Maximum          LOS F?
     v  = v                3803           9200             No
      Fi   F
     v                     1879           4400             No
      12
     v   = v - v           2600           9200             No
      FO   F   R
     v                     1203           3800             No
      R

                 Level of Service Determination (if not F)

Density,               D = 4.252 + 0.0086 v   - 0.009  L   =   18.6    pc/mi/
                        R                  12           D
Level of service for ramp-freeway junction areas of influence B

                             Speed Estimation

Intermediate speed variable,                  D  = 0.536
                                               S
Space mean speed in ramp influence area,      S  = 50      mph
                                               R
Space mean speed in outer lanes,              S  = 65.8    mph
                                               0
Space mean speed for all vehicles,            S  = 57.1    mph
```

APPENDIX F

CONSTRUCTION STAGING PLANS



<u>Stage 1</u>

Construction: Construct southern portion of High Viaduct and outside widening portion of low Viaduct. Demolish Ramp R. Construct portion of temporary widening of WB on-ramp from Richardson Blvd. and temporary Ramp N.

Detours: WB and EB Doyle Drive traffic on existing alignment. Ramp R is closed.

<u>Stage 2</u>

Construction: Demolish Ramps N and B. Complete construction of southern portion of High Viaduct and replacement of Ramp R and Ramp N. Construct portion of inside widening of Low Viaduct, temporary detour to Marina Blvd., and remainder of temporary WB on-ramp from Richardson Blvd.

Detours: Divert EB Doyle Drive to SB Park Presidio Blvd. traffic on to temporary Ramp N. Ramp B is closed.

<u>Stage 3</u>

Construction: Demolish old High Viaduct and construct north portion of new structure. Replacement of Ramp B. Demolish old Low Viaduct and construct remainder of new structure. Demolish old off-ramp to Richardson Blvd.

Detours: Traffic is moved on to the southern portion of the new High Viaduct. New Ramp R is opened to traffic. Traffic is switched to portion of new Low Viaduct. Marina traffic is switched to temporary detour.

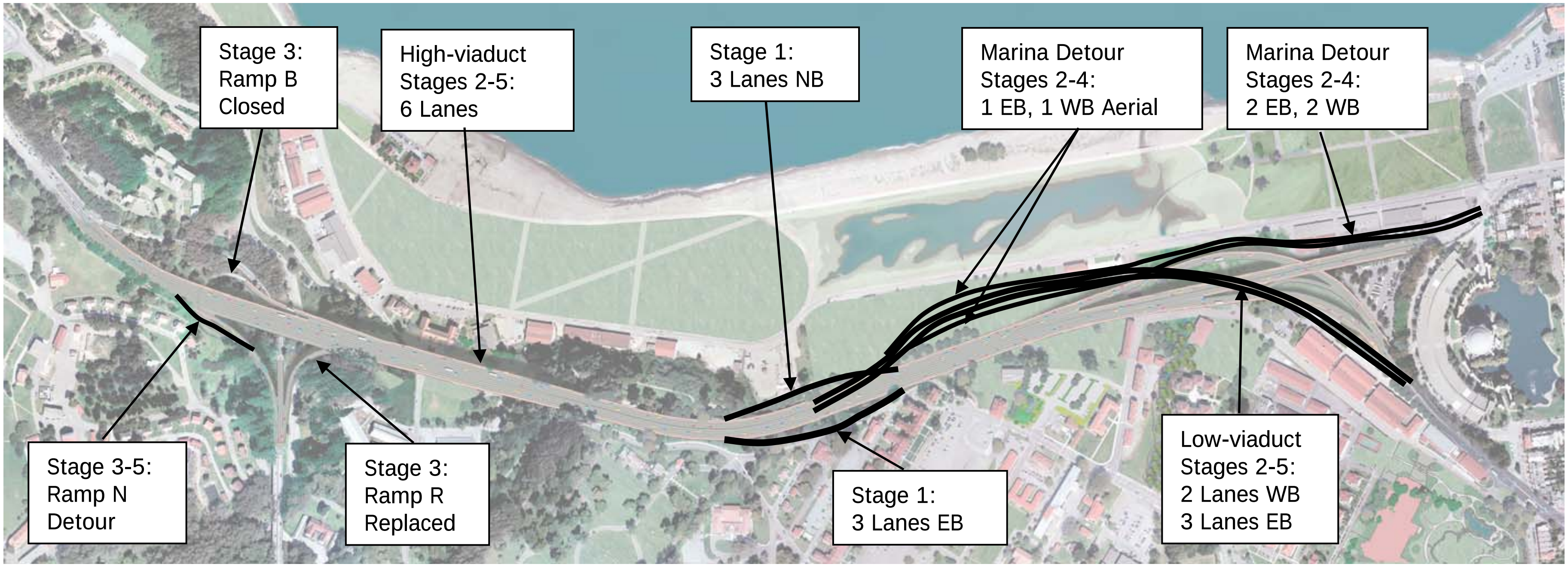
<u>Stage 4</u>

Construction: Complete construction of closure pour and median barrier of High and Low Viaduct. Remove all remaining temporary detours.

Detours: Shift all traffic on to new facility.

Doyle
Drive
Project

Construction Staging
Alternative 2 - Replace & Widen No Detour



Stage 1

Construction: Replace west portion of Low Viaduct between the Cemetery and Main Post.

Detours: WB and EB Doyle Dr. traffic diverted on to temporary detours north and south of construction area.

Stage 2

Construction: Construct southern portion of High Viaduct and temporary Ramp N, demolish Ramp R and remove temporary detours north and south of the west portion of Low Viaduct. Construct Marina and Low Viaduct detours.

Detours: WB and EB Doyle Drive traffic switched back to existing alignment.

Stage 3

Construction: Demolish Ramps N and B. Complete construction of southern portion of High Viaduct, replacement of Ramp R and Ramp N, and replace Low Viaduct.

Detours: East of the Cemetery, WB and EB traffic is diverted on to a temporary structure north of the Low Viaduct. The detour goes over Halleck St., the existing structure, and connects to Richardson Ave. near the Palace of Fine Arts. Marina traffic splits off the main detour west of Halleck St. on to a separate temporary structure that goes over Halleck and Marshall streets and connects to Marina Blvd. at Lyon St. Divert EB Doyle Dr. to SB Park Presidio Blvd. traffic on to temporary Ramp N. Ramp B is closed.

Stage 4

Construction: Demolish old high-viaduct and construct north portion of new structure. Replacement of Ramp B. Remove all temporary detour structures.

Detours: Traffic is moved on to the southern portion of the new high-viaduct. New Ramp R is opened to traffic.

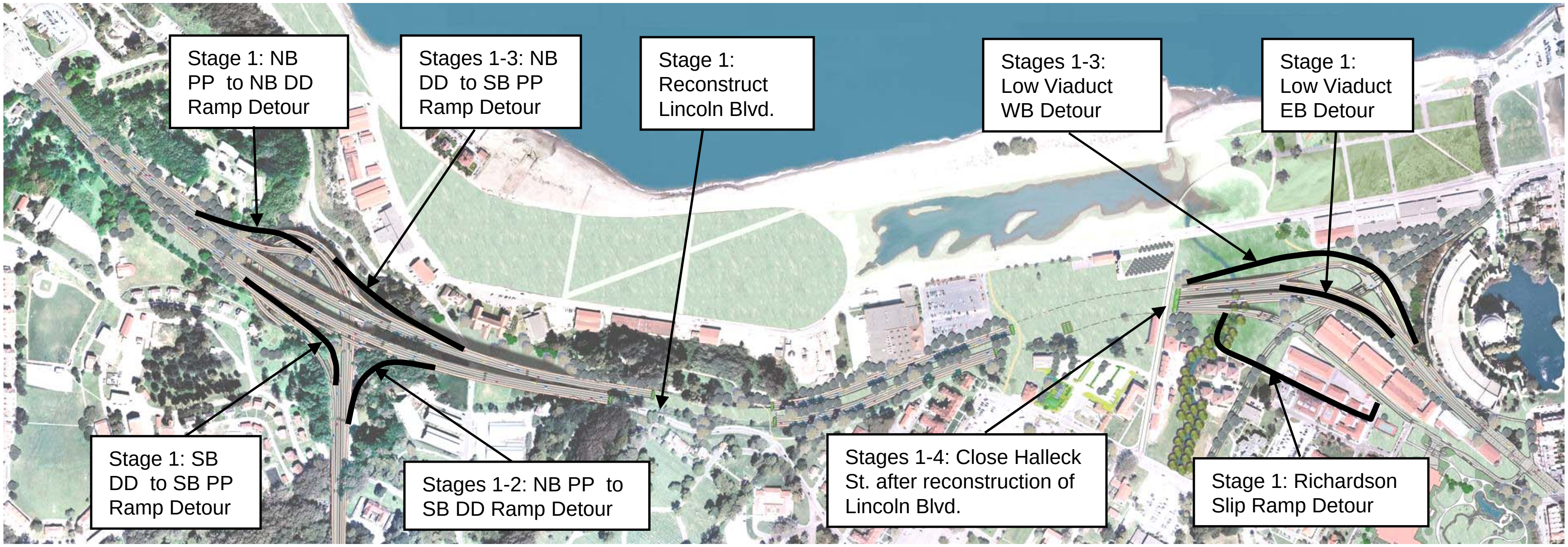
Stage 5

Construction: Complete construction of closure pour and median barrier of high Viaduct. Remove temporary Ramp N.

Detours: Shift all traffic on to new facility.

FHWA Caltrans Doyle Drive Project

Construction Staging
Alternative 2 - Replace & Widen With Detour



Stage 1

Construction: Construct portions of EB DD from the Park Presidio Interchange to Richardson Ave. Construct offline portions of WB DD between the Battery and Main Post Tunnels and between the Park Presidio Interchange and the Toll Plaza. Construct portions of the Park Presidio Interchange ramps. Construct portions of the Girard Rd. Interchange. Construct temporary detours for WB and EB Low Viaduct at Richardson Ave. Construct temporary detours for Park Presidio Interchange ramps. Construct temporary detour for Richardson Ave. slip ramp.

Detours: Divert EB and WB DD on to detours between Low Viaduct and Richardson Ave. Divert EB DD to SB PP and from NB PP to WB DD ramps on to temporary detours. Divert NB PP to EB DD on to a combination of temporary and permanent ramp. Divert WB DD to SB PP on to a combination of temporary and permanent ramp. Divert traffic from Richardson Ave. slip ramp on to temporary detour. Close Halleck St. after reconstruction of Lincoln Blvd.

Stage 2

Construction: Construct WB High Viaduct between Park Presidio Interchange and the Cemetery. Construct remaining portions of the Battery Tunnel. Construct WB DD causeway at Tennessee Hollow. Remove the Marina Viaduct from Tennessee Hollow to Marina Boulevard. Complete construction of Girard Road Interchange. Remove temporary detour fro EB DD to Richardson Avenue. Remove temporary detour from NB PP to EB DD.

Detours: Divert EB DD on to permanent alignment but with 3 lanes. Open permanent WB DD between the Park Presidio Interchange and the Toll Plaza. Open permanent NB PP to WB DD ramp and permanent NB PP to EB DD ramp.

Stage 3

Construction: Remove portions of the existing High Viaduct and construct the remaining portion of the permanent ramp from WB DD to SB PP. Complete construction of the Battery Tunnels. Remove the Low Viaduct between the Cemetery and Halleck Street. Complete construction of EB DD and construct additional portions of WB DD from Cemetery to Halleck Street.

Detours: Divert WB DD on to a combination of temporary and permanent alignment from Richardson Avenue to the Toll Plaza.

Stage 4

Construction: Complete WB DD Main Post Tunnel and construct Halleck Street. Remove remaining portion of existing High Viaduct and residual segments of existing and temporary facilities.

Detours: Open all traffic movements to permanent alignments and open Halleck Street.

Design Options

Merchant Road Option: If selected, this option would be constructed during Stage 1.

Hook Ramp Option: If selected, this option would eliminate the need for the NB PP to SB DD ramp detour during Stages 1-2. Subsequent stages would remain unchanged.

Circle Drive Option: If selected, this option would eliminate the need for the Richardson slip ramp detour. Subsequent stages would remain unchanged.

Doyle Drive Project

Construction Staging
Alternative 5 – Presidio Parkway