



# **US 101/San Luis Bay Drive**

Intersection Control Evaluation (ICE)

Step 1

Final Report

County of San Luis Obispo



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Step 1

Final Report

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County of San Luis Obispo

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October 2019

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## REPORT SIGNATURE SHEET

This report has been prepared under the direction of the following registered civil engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.



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---

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10/30/2019

Date



# Table of Contents

1.	Introduction.....	1
2.	Screening Objectives .....	2
2.1	Project Analysis Conditions .....	2
2.1.1	Baseline Conditions .....	2
2.1.2	Design Year Conditions .....	4
2.1.2.1	Traffic Forecasts – Basis .....	4
2.1.2.2	Traffic Forecasts – Assumptions & Methodologies .....	6
2.1.2.3	Interim Design Year (2030) Traffic Forecasts .....	6
2.1.2.4	Ultimate Design Year (2045) Traffic Forecasts .....	6
2.2	Project Alternatives .....	7
2.2.1	No Build Alternative .....	7
2.2.2	All Way Stop Control (AWSC) Alternative .....	7
2.2.3	Traffic Signal Alternative.....	7
2.2.4	Roundabout Alternative .....	8
3.	Screening Criteria.....	8
3.1	Traffic Operations Analysis .....	8
3.2	Analysis Criteria .....	9
4.	Capacity Assessment/Analysis .....	9
4.1	No Build Alternative Analysis .....	9
4.1.1	Baseline Conditions Analysis .....	9
4.1.2	Interim Design Year (2030) Analysis .....	10
4.1.3	Ultimate Design Year (2045) Analysis.....	11
4.2	All Way Stop Control (AWSC) Alternative Analysis.....	11
4.2.1	Baseline Conditions Analysis .....	11
4.2.2	Interim Design Year (2030) Analysis .....	12
4.2.3	Ultimate Design Year (2045) Analysis.....	13
4.3	Traffic Signal Alternate Analysis .....	13
4.3.1	Baseline Conditions Analysis .....	14



4.3.2	Interim Design Year (2030) Analysis	14
4.3.3	Ultimate Design Year (2045) Analysis	16
4.4	Roundabout Alternative Analysis	17
4.4.1	Ultimate Design Year (2045) Analysis	17
5.	Footprint Development & Assessment	18
5.1	Traffic Signal Alternative	19
5.1.1	Interim Design Year (2030) Traffic Signal Alternative	19
5.1.2	Ultimate Design Year (2045) Traffic Signal Alternative	19
5.2	Roundabout Alternative	23
5.2.1	West Roundabout Conceptual Design	23
5.2.2	East Roundabout Conceptual Design	25
5.2.3	Roundabout Performance Checks	27
	Fastest Path and Vehicle Speed Checks	27
6.	Safety Considerations	29
6.1	Historic Collision Data	29
6.2	Safety Analysis	29
6.2.1	Collision Cost Analysis	29
6.2.2	Number of Conflicting Points	30
6.2.2	Reduced Speed Potential	31
6.2.3	Pedestrian and Bike Safety	31
7.	Preliminary Capital Cost Estimates	31
8.	Alternatives Comparison	32
9.	Non-Viable Build Alternative	35
10.	Phasing Potential	35
11.	Conclusions and Recommendation	37
11.1	Baseline and Interim Design Year (2030) Conditions	38
11.2	Ultimate Design Year (2045) Conditions	39
	Appendix Index	42



## Figure Index

Figure 1.1	Project Location Map.....	1
Figure 2.1	Baseline (Existing) Conditions Peak Hour Intersection Volumes.....	3
Figure 2.2	Regional and Avila Travel Demand Model Comparison on US 101 .....	5
Figure 2.3	Interim Design Year (2030) Peak Hour Traffic Forecasts .....	6
Figure 2.4	Ultimate Design Year (2045) Peak Hour Traffic Forecasts .....	7
Figure 5.1	Interim Design Year Traffic Signal Alternative.....	20
Figure 5.2	Ultimate Design Year Traffic Signal Alternative .....	21
Figure 5.3	Roundabout Alternative – West Roundabout.....	24
Figure 5.4	Roundabout Alternative – East Roundabout.....	26

## Table Index

Table 1: Observed Weekday Peak Hours at Study Intersections .....	3
Table 2: Transportation Facilities .....	5
Table 3A: No Build - Baseline Conditions Peak Hour Intersection Level-of-Service (LOS).....	10
Table 3B: No Build - Baseline Conditions Peak Hour Queuing Analysis .....	10
Table 4: No Build - Interim Design Year (2030) Peak Hour Intersection Level-of-Service (LOS).....	11
Table 5: No Build - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS) .....	11
Table 6A: AWSC - Baseline Conditions Peak Hour Intersection Level-of-Service (LOS) .....	12
Table 6B: AWSC - Baseline Conditions Peak Hour Queuing Analysis .....	12
Table 7: AWSC - Interim Design Year (2030) Peak Hour Intersection Level-of-Service (LOS) .....	13
Table 8: AWSC - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS) .....	13
Table 9A: Traffic Signal - Baseline Conditions Peak Hour Intersection .....	14
Level-of-Service (LOS).....	14
Table 9B: Traffic Signal - Baseline Conditions Peak Hour Queuing Analysis .....	14
Table 10A: Traffic Signal - Interim Design Year (2030) Peak Hour Intersection Level-of-Service (LOS) .....	15
Table 10B: Traffic Signal - Interim Design Year (2030) Peak Hour Queuing Analysis .....	15
Table 11A: Traffic Signal - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS) .....	16



Table 11B: Traffic Signal - Ultimate Design Year (2045) Peak Hour Queuing Analysis.....	17
Table 12A: Roundabout - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS) .....	18
Table 12B: Roundabout- Ultimate Design Year (2045) Peak Hour Queuing Analysis .....	18
Table 13A: West Roundabout Fastest Path Speeds (MPH).....	28
Table 13B: East Roundabout Fastest Path Speeds (MPH).....	28
Table 14: Intersection Collision Data.....	29
Table 15: Alternative Comparison Summary – Ultimate Design Year (2045).....	33
Table 16: Phasing Potential – Alternatives LOS Comparison.....	36
Table 17A: Ultimate Design Year - Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive Intersections Combined Collision Cost Analysis and B/C .....	40
Table 17B: Ultimate Design Year - US 101 NB Ramps/San Luis Bay Drive Intersection Collision Cost Analysis and B/C .....	41

## Appendix Index

Appendix A Level of Service (LOS) Definitions
Appendix B No Build Alternative Synchro/Sim-Traffic Reports
Appendix C All Way Stop Control (AWSC) Alternative Synchro/Sim-Traffic Reports
Appendix D Traffic Signal Alternative Synchro/Sim-Traffic Reports
Appendix E Roundabout Alternative Sidra Reports
Appendix F Traffic Signal Alternative Truck Turn Exhibits (To be provided)
Appendix G Roundabout Alternative Fast Path and Truck Turn Exhibits
Appendix H Existing Utilities Exhibit
Appendix I Preliminary Opinion of Probable Capital Cost Estimates
Appendix J Caltrans June 6, 2019 Email Review Memo

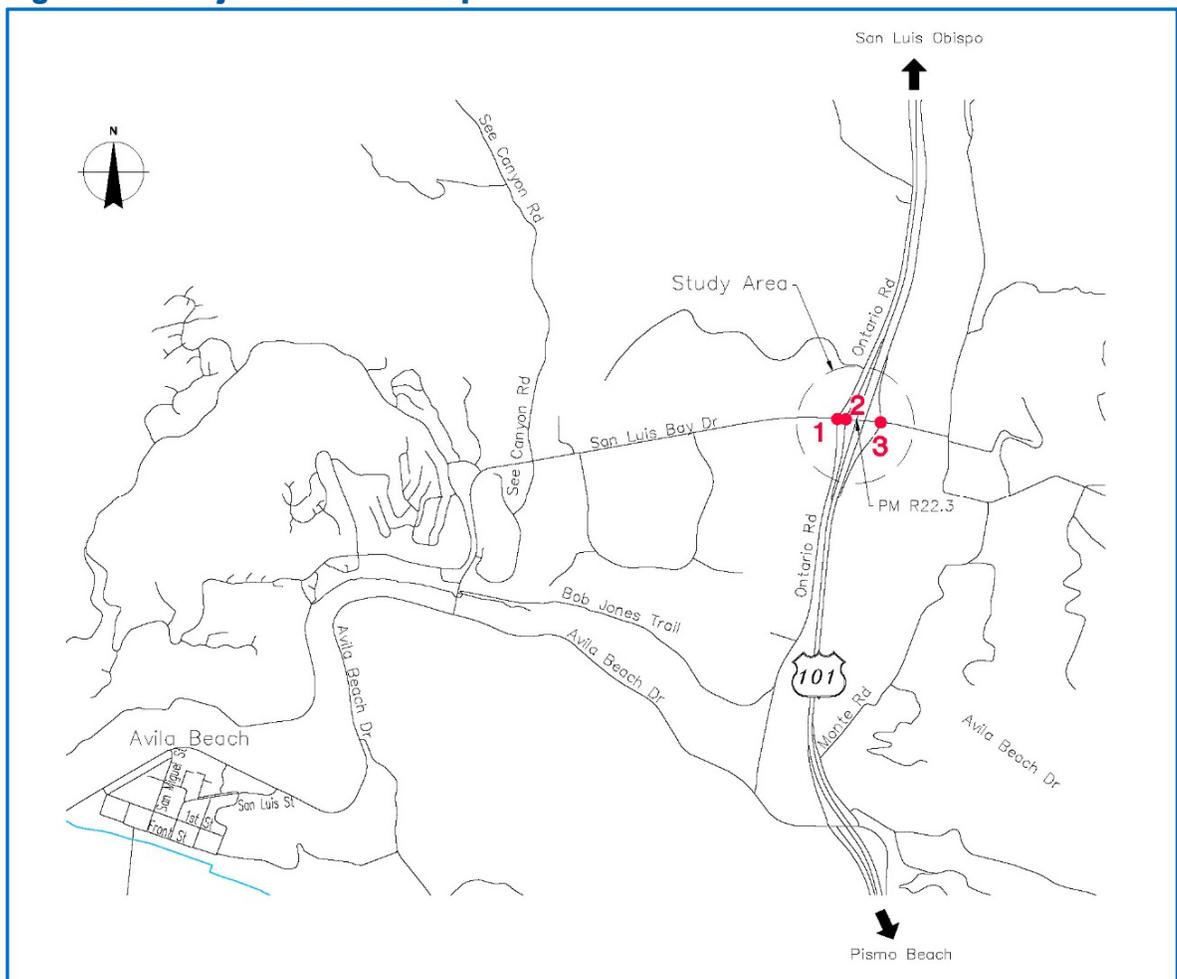


# 1. Introduction

This document has been prepared to present the results of conceptual alternatives analysis performed by GHD for the County of San Luis Obispo in support of the Intersection Control Evaluation (ICE) - Step I process. The analysis is consistent with the California MUTCD 2014 Edition, Chapter 4C. Traffic Control Signal Needs, Section 4C.01, Standard 01, and Caltrans' Traffic Operations Policy Directive 13-02, Intersection Control Evaluation (ICE). The purpose of the study is to identify viable alternatives (project) to improve safety, reduce delay, and enhance mobility for all travel modes on San Luis Bay Drive at Ontario Road and at the interchange of San Luis Bay Drive with Route 101 (US 101).

The project location consisting of the US 101/San Luis Bay Drive interchange and Ontario Road/San Luis Bay Drive intersection are located south of City of San Luis Obispo in the County of San Luis Obispo. The project location is shown on Figure 1.1.

**Figure 1.1 Project Location Map**



The project study area includes US 101 which is a major north-south interstate that traverses along coastal California. US 101 serves as the principal inter-regional auto and truck travel route that



connects San Luis Obispo County (and other portions of the Central Coast) with the Los Angeles urban basin to the south, and the San Francisco Bay Area to the north. Within San Luis Obispo County, US 101 provides major connection between and through several cities, including the City of San Luis Obispo and the Five Cities Area. US 101 represents a major commuter travel route and, within the study area, forms a full access interchange with San Luis Bay Drive.

Other major roadways located within the study area include San Luis Bay Drive and Ontario Road. San Luis Bay Drive is a major east-west two-lane undivided arterial that begins at Monte Road to the east and terminates at Avila Beach Drive to the west. San Luis Bay Drive provides a full access interchange with US 101. Per the current County Bikeways Plan, a Class II Bike Lane is proposed on San Luis Bay Drive beginning at the Ontario Road intersection and extending west to Avila Beach Drive.

Ontario Road is a two-lane undivided roadway that primarily runs north-south from Avila Beach Drive to the south to South Higuera Street to the north. Ontario Road is a collector north of San Luis Bay Drive and serves as the frontage road west of US 101. Per the current County Bikeways Plan, Ontario Road is proposed to be upgraded from Class III to Class II.

For the purposes of this ICE Step 1 evaluation, the focus study intersections include the following:

1. San Luis Bay Drive at Ontario Road
2. San Luis Bay Drive at US 101 Southbound Ramps
3. San Luis Bay Drive at US 101 Northbound Ramps

This document contains a description of the following sections consistent with the Caltrans ICE document guidelines for the Step I process:

- Screening Objectives
- Screening Criteria
- Capacity Assessment/Analysis
- Footprint Development & Assessment
- Safety Considerations
- Recommendations & Documentation

## **2. Screening Objectives**

### **2.1 Project Analysis Conditions**

This section contains a brief description of the approximate time frames for which the traffic operations analysis was conducted. The project alternatives (discussed within the next section) were analyzed for the baseline (existing) condition and for two future design year conditions, interim design year (year 2030) and ultimate design year (year 2045) conditions.

#### **2.1.1 Baseline Conditions**

The distance between US 101 northbound and southbound ramps intersections on San Luis Bay Drive is approximately 530 feet while the distance between the southbound ramps and Ontario Road is approximately 115 feet. Due to the close intersection spacing between the US 101 southbound ramps and Ontario Road, the two intersections essentially operate as a single



intersection with five approaches and exits. Both ramp intersections are stop controlled on the off-ramp approaches at San Luis Bay Drive and Ontario Road is stop sign controlled at San Luis Bay Drive.

New weekday AM and PM peak hour intersection traffic counts were collected at the three study intersections on September 11, 2018 for a 2-hour AM (7:00-9:00 am) period and a 4-hour PM (2:00-6:00 pm) period. The observed AM and PM peak hours are shown in Table 1.

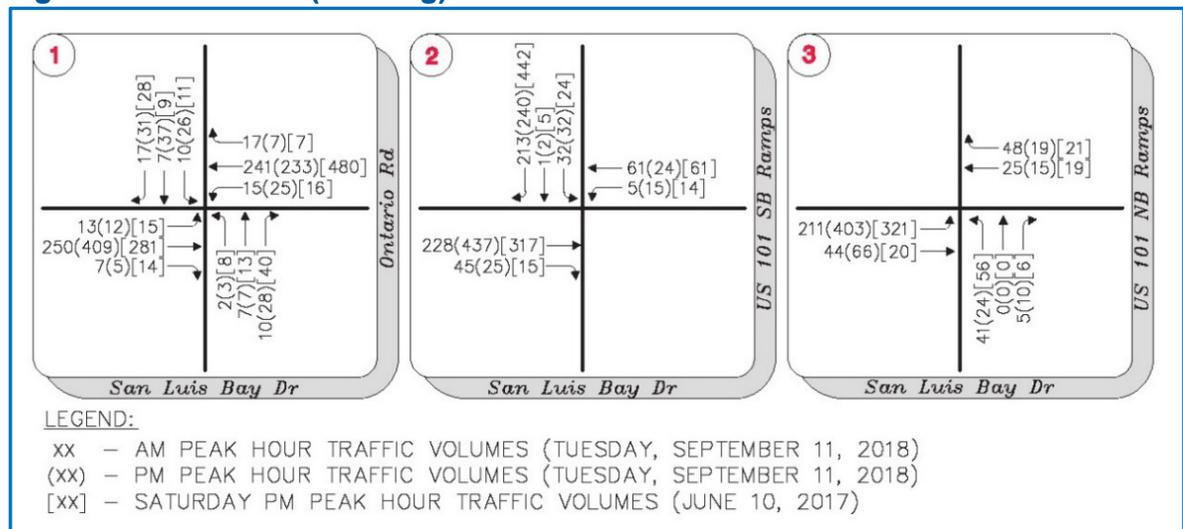
**Table 1: Observed Weekday Peak Hours at Study Intersections**

Intersections	AM Peak Hour	PM Peak Hour
San Luis Bay Drive at US 101 NB Ramps	8:00-9:00	4:45-5:45
San Luis Bay Drive at US 101 SB Ramps	8:00-9:00	4:30-5:30
San Luis Bay Drive at Ontario Road	8:00-9:00	4:30-5:30

The County also provided Saturday PM peak hour intersection traffic counts collected at the three study intersections on June 10, 2017. Counts were collected for the 4-hour period between 12:00-4:00 pm with the peak hour occurring between 1:15-2:15 pm. The Saturday PM peak hour is assumed to represent a peak summer weekend condition at the study intersections. Just as a disclosure, there was a concert with approximately 1,700 attendees on June 10, 2017 based on special event data collected in Avila Beach.

The AM and PM peak hour intersection traffic volumes obtained on September 11, 2018 and the Saturday PM peak hour intersection traffic volumes obtained on June 10, 2017 are presented below on Figure 2.1.

**Figure 2.1 Baseline (Existing) Conditions Peak Hour Intersection Volumes**



Based on the peak hour intersection volumes provided on Figure 2.1, the weekday AM peak hour link volumes is 530 vehicles, the weekday PM peak hour link volumes is 693 vehicles and the Saturday PM peak hour link volumes is 826 vehicles on San Luis Obispo Drive west of Ontario



Road. The EB/WB peak hour traffic distribution on this link is 51% / 49% during the weekday AM peak hour, 62% / 38% during the weekday PM peak hour, and 38% / 62% during the Saturday PM peak hour. As the weekday PM and Saturday PM peak hour volumes are significantly higher than the weekday AM peak hour and as the peak hour traffic distribution is opposite between these two peak hours, the County recommended that the weekday and Saturday PM peak hours represent the analysis peak hours for this study.

## **2.1.2 Design Year Conditions**

The various intersection control alternatives are also evaluated for both an Interim Design Year (2030) and/or the Ultimate Design Year (2045).

### **2.1.2.1 Traffic Forecasts – Basis**

The interim and ultimate design year traffic forecasts for the weekday peak hours are based on the year 2035 traffic forecasts presented in the 2015 Avila Circulation Study and Traffic Impact Fee Update. The Avila Circulation Study analyzed transportation facilities throughout the Avila Valley, including the three study intersections at the San Luis Bay Drive interchange. The 2035 forecasts from the Avila Circulation Study were developed utilizing the Avila Travel Demand Model (TDM), which was created as part of the Avila Circulation Study.

In order to derive interim and ultimate year traffic forecasts for the Saturday peak hour, year 2035 forecasts for the Saturday peak were derived as the basis, by applying the factor of existing Saturday to PM peak hour to the 2035 PM traffic forecasts. Therefore, year 2035 was utilized as the basis for all scenarios, and interim and ultimate year traffic forecasts were developed in a consistent manner.

During development of the Avila TDM, land use inputs were vetted through the County to reflect existing local conditions. External gateways at the model's boundaries were validated against the SLOCOG Regional Travel Demand Model (SLOCOG RTDM) for existing and forecasted travel conditions. Table 2 presents a summary of transportation facilities in the vicinity of the study area, as represented in both the SLOCOG and Avila Travel Demand Models. As shown in Table 2, average daily traffic counts collected in September 2014 (for the Avila Circulation Study) along San Luis Bay Drive west of Ontario Road were 7,966 vehicles per day. Traffic counts on US 101 were obtained from the Caltrans Traffic Census Program. In 2015, US 101 north of San Luis Bay Drive had an AADT of 73,500 and south of San Luis Bay Drive the AADT was 67,200. US 101 within the vicinity of Avila's planning area has historically experienced approximately 0.5% compounded annual growth in AADT over a 10 year period (2005 through 2015).

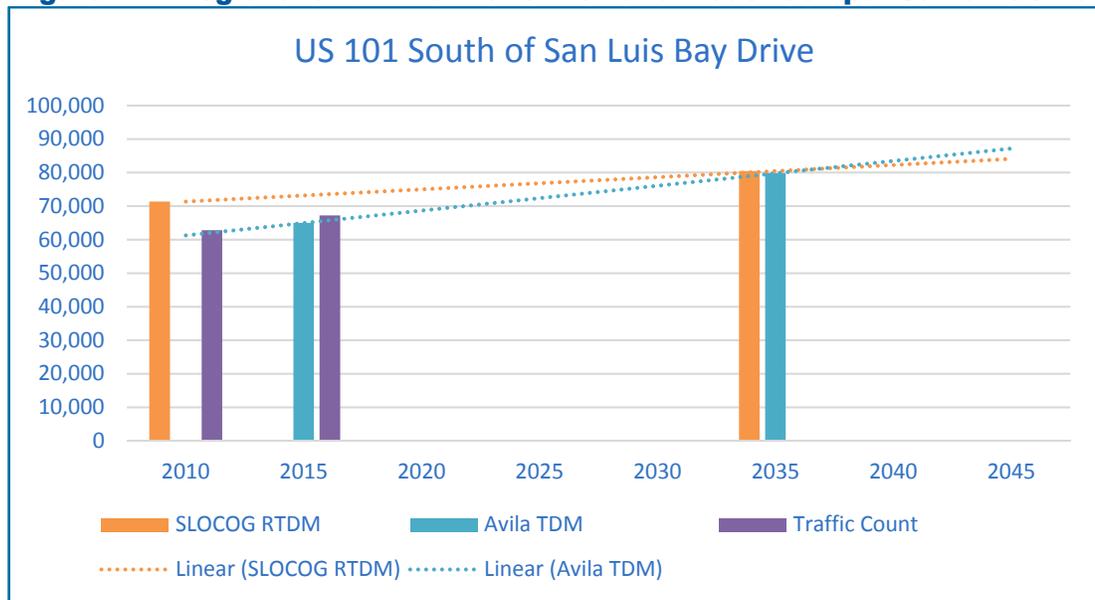


**Table 2: Transportation Facilities**

Roadway/Location	SLOCOG RTDM Daily Volume		Avila Travel Demand Model Daily Volume		Traffic Count	US 101 Projected 2035 Growth
	2010	2035	2015	2035	2015	(0.5% annual)
US 101 North of Higuera St	68,226	78,618	65,704	80,126	69,300	76,400
US 101 North of San Luis Bay Dr	77,204	86,751	72,458	87,623	73,500	81,000
US 101 at San Luis Bay Dr	70,760	79,911	63,099	76,626	-	
US 101 South of San Luis Bay Dr	71,355	80,447	64,964	79,772	67,200	74,100
San Luis Bay Drive w of Ontario Rd	6,139	6,449	8,856	11,003	8,010	

Although the SLOCOG RTDM presents a lower growth rate between 2010 and 2035, the 2010 volumes on US 101 were higher than existing Caltrans traffic counts in 2010 (AADT of 62,800 south of San Luis Bay Drive). Therefore, the growth rate presented in the Avila model between 2015 and 2035 is higher than the SLOCOG model. Based on the Avila model, 2035 traffic volumes are projected to increase by approximately 1.0% per year. Figure 2.2 presents the correlation between the SLOCOG RTDM and the Avila TDM base and forecasted volumes along US 101 south of San Luis Bay Drive.

**Figure 2.2 Regional and Avila Travel Demand Model Comparison on US 101**



As shown in Figure 2.2, the 2035 projections from the Avila model are consistent with the SLOCOG RTDM. Additionally, the trend line for the Avila TDM forecasts closely follows the observed traffic counts on US 101. Assuming the growth rate continues as shown for the Avila TDM trend line also provides a conservative approach for developing 2045 forecasts. The Avila TDM and projected 2035 forecasts from the Avila Circulation Study was utilized as the basis for developing interim design year (2030) and ultimate design year (2045) forecasts for the San Luis Bay Drive ICE study.



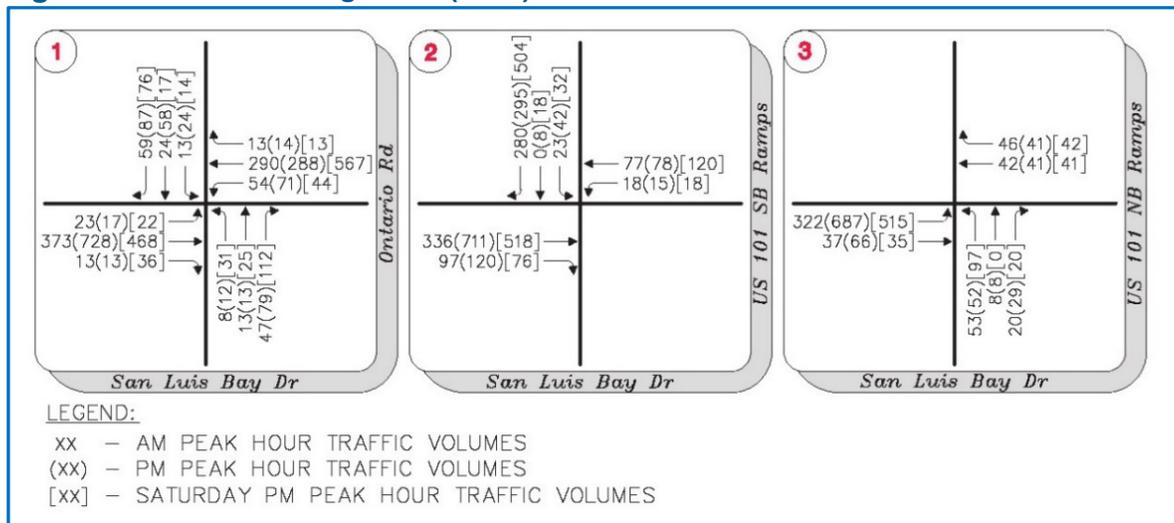
### 2.1.2.2 Traffic Forecasts – Assumptions & Methodologies

The interim design year (2030) and the ultimate design year (2045) forecasts for the study intersections were developed assuming a straight-line growth between the 2014 base and the 2035 forecasts in the Avila TDM. The delta methodology was utilized to derive the 2030 forecasts. To derive the 2045 forecasts, a 1.0% annual growth rate was utilized, based on the 2035 forecasts and projected over the ten-year period. The 1.0% annual growth rate is consistent with the Avila TDM forecasts along San Luis Bay Drive and US 101.

### 2.1.2.3 Interim Design Year (2030) Traffic Forecasts

The interim design year (2030) forecasts were developed utilizing the delta methodology assuming straight-line growth between the 2014 (base year) Avila TDM and the 2035 forecasted intersection volumes. The growth or 'delta' between 2014 and 2035 forecasts were factored to account for projected growth out to year 2030. Figure 2.3 presents the interim design year (2030) forecasted peak hour traffic volumes at the three study intersection. Again, only the weekday and Saturday PM peak hours represent the analysis peak hours for this study.

**Figure 2.3 Interim Design Year (2030) Peak Hour Traffic Forecasts**

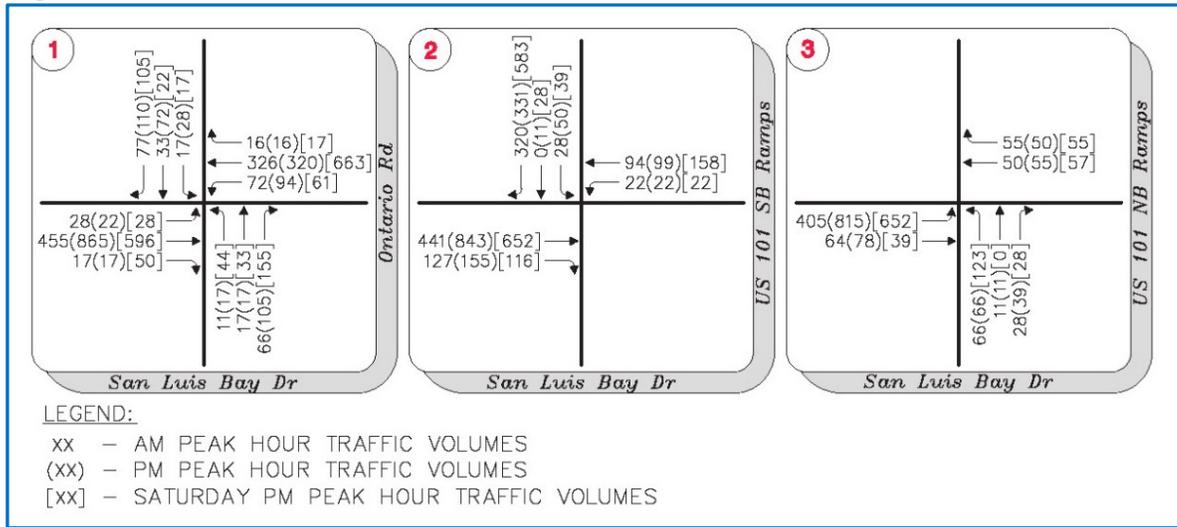


### 2.1.2.4 Ultimate Design Year (2045) Traffic Forecasts

The ultimate design year (2045) forecasts were developed utilizing a 1.0% annual growth rate projected 10 years beyond year 2035. Figure 2.4 presents the ultimate design year (2045) forecasted peak hour traffic volumes at the three study intersection. Again, only the weekday and Saturday PM peak hours represent the analysis peak hours for this study.



**Figure 2.4 Ultimate Design Year (2045) Peak Hour Traffic Forecasts**



## 2.2 Project Alternatives

This study includes analysis of the following four alternatives:

- No Build
- All Way Stop Control (AWSC)
- Traffic Signal
- Roundabout (2045 Screening Assessment)

A description of each alternative is provided in the following sections.

### 2.2.1 No Build Alternative

The No Build Alternative assumes no changes to the existing intersection geometrics and controls. The capacity assessment/analysis (Level of Service (LOS), delay and queuing) for this alternative is provided in Section 4.1. Both the Ontario Road/San Luis Bay Drive and US 101 Northbound (NB) Ramps/San Luis Bay Drive intersections are projected to operate at peak hour LOS “F” during both the Interim Design Year (2030) and Ultimate Design Year (2045) and the No Build Alternative does not represent a viable alternative for these conditions.

### 2.2.2 All Way Stop Control (AWSC) Alternative

For the AWSC Alternative, each study intersection is evaluated as all way stop controlled. No changes in the intersection’s approach geometrics were assumed for this analysis. The capacity assessment/analysis (Level of Service (LOS), delay and queuing) for this alternative is provided in Section 4.2. Each of the three study intersections are projected to operate at peak hour LOS “E” or LOS “F” during both the Interim Design Year (2030) and Ultimate Design Year (2045) and the AWSC Alternative does not represent a viable alternative for these conditions.

### 2.2.3 Traffic Signal Alternative

For the Traffic Signal Alternative, the study intersection controls are converted from existing control to a coordinated signalized intersection system. For this alternative, one controller is assumed to



control the traffic signal system between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections to provide for improved capacity and reduced delay between the two intersections. For this alternative, it is also assumed that traffic would be cleared between the two intersections. The Traffic Signal Alternative lane geometrics are shown in Section 5 in this report. The capacity assessment/analysis (Level of Service (LOS), delay and queuing) for this alternative is provided in Section 4.3. Based on the capacity assessment/analysis, the Traffic Signal Alternative represents a viable alternative for all study conditions.

#### **2.2.4 Roundabout Alternative**

The Roundabout Alternative features the construction of a six-leg roundabout combining the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections into a single roundabout intersection (also referred to as the “West Roundabout”). The preliminary layout and geometrics for this roundabout are shown on in Section 5 in this report. A smaller 4-leg roundabout is proposed at the US 101/San Luis Bay Drive intersection (also referred to as the “East Roundabout”). The preliminary layout and geometrics for this roundabout are also shown in Section 5 in this report. The capacity assessment/analysis (Level of Service (LOS), delay and queuing) for this alternative is only provided for the Ultimate Design Year (2045) and is provided in Section 4.4. Based on the capacity assessment/analysis, the Roundabout Alternative represents a viable alternative for the Ultimate Design Year (2045) condition.

Since this is Step 1 of the ICE process, only truck turns and fast paths were evaluated for this alternative. Based on this analysis and input from County and Caltrans staff, if the roundabout alternative appears to be viable, other roundabout design performance checks will need to be verified during the ICE Step 2 process.

### **3. Screening Criteria**

The traffic operations for the No Build, AWSC and Traffic Signal Alternatives were analyzed for the weekday and Saturday PM peak hours in the Baseline (existing) Conditions, Interim Design Year (2030) and Ultimate Design Year (2045). The traffic operations for the Roundabout Alternative was analyzed for the weekday and Saturday PM peak hours only for the Ultimate Design Year (2045).

The No Build, AWSC and Traffic Signal Alternatives were analyzed using Synchro/Sim-Traffic analysis software, and the Roundabout Alternative was analyzed using SIDRA 8 analysis software based on the SIDRA standard Roundabout Capacity Model.

As accepted by Caltrans, the SIDRA analysis methodology was used for roundabouts to determine the LOS, V/C, delay and the 95th percentile queues.

#### **3.1 Traffic Operations Analysis**

Traffic operations have been quantified through the determination of Level of Service (LOS). LOS is a qualitative measure of traffic measuring conditions, whereby a letter grade "A" through "F" is assigned to an intersection or roadway segment representing progressively worsening traffic conditions. LOS was calculated for different intersection control types using the methods documented in the Highway Capacity Manual 2000 (HCM 2000). LOS definitions for different types of intersection controls are outlined in Table A1 provided in Appendix A.



San Luis Obispo County has established LOS “C” as the threshold for the acceptable operation of roadways and interchanges in rural areas and LOS “D” in urban areas. For the 2015 Avila Circulation Study and Traffic Fee Update, the target LOS for the Ontario Road/San Luis Bay Drive intersection was identified as LOS “D”. For this study, LOS “D” is considered as the threshold for acceptable intersection operations.

Caltrans also provides guidance on LOS policy on State facilities. Caltrans’ Guide for the Preparation of Traffic Impact Studies indicates that Caltrans endeavors to maintain a target LOS at the transition between “C” and “D”. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. Consistent with Caltrans policy, this study considers LOS “C” as the standard acceptable threshold for both the US 101 northbound (NB) and southbound (SB) ramp intersections with San Luis Bay Drive.

### **3.2 Analysis Criteria**

The following criteria are incorporated in the analysis in order to most accurately reflect intersection operating conditions.

- PHF: 0.92 was used for all intersections
- Truck Percentages: from data counts
- 1.10 Environmental factor for Opening Year roundabout analysis
- 1.05 Environmental factor for Design Year roundabout analysis

## **4. Capacity Assessment/Analysis**

### **4.1 No Build Alternative Analysis**

The following section provides the traffic operations analysis and queuing results for the No Build Alternative. The No Build Alternative assumes no changes to the existing intersection geometrics and controls.

#### **4.1.1 Baseline Conditions Analysis**

Table 3A presents the Baseline Conditions weekday and Saturday PM peak hour intersection Level of Service (LOS) and delay. As indicated in Table 3A, each study intersection currently operates at an acceptable LOS during both the weekday and Saturday PM peak periods. Copies of the Baseline Conditions peak hour LOS worksheets are provided in Appendix B.



**Table 3A: No Build - Baseline Conditions Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay	LOS	Delay	LOS
				1	Ontario Road/ San Luis Bay Drive	TWSC	D
2	US 101 SB Ramps/ San Luis Bay Drive	TWSC	C	10.2	B	11.6	B
3	US 101 NB Ramps/ San Luis Bay Drive	TWSC	C	23.3	C	18.7	C

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNCBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNCBT

Table 3B presents the Baseline Conditions weekday and Saturday PM peak hour intersection queuing analysis results. As indicated in Table 3B, sufficient storage exists at each study intersection to currently accommodate the 95<sup>th</sup> percentile queues. Copies of the Baseline Conditions peak hour queuing worksheets are provided in Appendix B.

**Table 3B: No Build - Baseline Conditions Peak Hour Queuing Analysis**

							Baseline Conditions	
Intersection		Lane		Movement	No. Lanes	Available Storage Per Lane (ft)	95 <sup>th</sup> Percentile Queue/Lane (ft)	
ID	Location	Direction	Config.				PM Peak Hour <sup>1</sup>	SAT Peak Hour <sup>1</sup>
<b>1</b>	<b>Ontario Road/San Luis Bay Drive</b>	EB	LTR	Eastbound Left/Through/Right	1	1060	9	11
		WB	LTR	Westbound Left/Through/Right	1	60	40	43
		NB	LTR	Northbound Left/Through/Right	1	1375	45	51
		SB	LTR	Southbound Left/Through/Right	1	770	45	28
<b>2</b>	<b>US 101 SB Ramps/San Luis Bay Drive</b>	EB	TR	Eastbound Through/Right	1	60	0	7
		WB	LT	Westbound Left/Through	1	415	19	20
		SB	LT	Southbound Left/Through	1	120	45	40
		SB	R	Southbound Right	1	980	67	123
<b>3</b>	<b>US 101 NB Ramps/San Luis Bay Drive</b>	EB	TR	Eastbound Left/Through	1	905	43	44
		WB	LT	Westbound Through/Right	1	415	0	0
		NB	LTR	Northbound Left/Through/Right	1	995	47	52

Notes: 1. **Bolded** entries indicate queues projected to exceed available storage

#### 4.1.2 Interim Design Year (2030) Analysis

The Interim Design Year weekday and Saturday PM peak hour intersection traffic operations were quantified with the resulting LOS and delay provided in Table 4. As shown in Table 4, both the Ontario Road/San Luis Bay Drive and the US 101 NB Ramps/San Luis Bay Drive intersections are projected to operate at LOS “F” during both the weekday and Saturday PM peak periods with the current lane geometrics and traffic control. Based on the projected peak hour LOS presented in Table 4, the No Build Alternative does not represent a viable Interim Design Year (2030) alternate. Copies of the Interim Design Year peak hour LOS worksheets are provided in Appendix B.



**Table 4: No Build - Interim Design Year (2030) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay	LOS	Delay	LOS
				1	Ontario Road/ San Luis Bay Drive	TWSC	D
2	US 101 SB Ramps/ San Luis Bay Drive	TWSC	C	12.0	B	14.7	B
3	US 101 NB Ramps/ San Luis Bay Drive	TWSC	C	247.3	F	106.8	F

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT

### 4.1.3 Ultimate Design Year (2045) Analysis

The Ultimate Design Year weekday and Saturday PM peak hour intersection traffic operations were quantified with the resulting LOS and delay provided in Table 5. As shown in Table 5, both the Ontario Road/San Luis Bay Drive and the US 101 NB Ramps/San Luis Bay Drive intersections are projected to operate at LOS “F” during both the weekday and Saturday PM peak periods with the current intersection geometrics and traffic control. Based on the projected peak hour LOS presented in Table 5, the No Build Alternative does not represent a viable Ultimate Design Year (2045) alternate. Copies of the Ultimate Design Year peak hour LOS worksheets are provided in Appendix B.

**Table 5: No Build - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay	LOS	Delay	LOS
				1	Ontario Road/ San Luis Bay Drive	TWSC	D
2	US 101 SB Ramps/ San Luis Bay Drive	TWSC	C	14.1	B	19.8	C
3	US 101 NB Ramps/ San Luis Bay Drive	TWSC	C	1142.5	F	651.1	F

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT

## 4.2 All Way Stop Control (AWSC) Alternative Analysis

The following section provides the traffic operations analysis and queuing results for the AWSC Alternative. For this alternative, only the Ontario Road/San Luis Bay Drive intersection is evaluated as all way stop controlled. No changes in the intersection’s approach geometrics were assumed for this analysis.

### 4.2.1 Baseline Conditions Analysis

Table 6A presents the Baseline Conditions weekday and Saturday PM peak hour intersection Level of Service (LOS) and delay. As indicated in Table 6A, each study intersection currently operates at an acceptable LOS during both the weekday and Saturday PM peak periods. Copies of the Baseline Conditions peak hour LOS worksheets are provided in Appendix C.



**Table 6A: AWSC - Baseline Conditions Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay	LOS	Delay	LOS
1	Ontario Road/ San Luis Bay Drive	AWSC	D	12.6	B	15.1	C
2	US 101 SB Ramps/ San Luis Bay Drive	AWSC	C	3.6	A	6.5	A
3	US 101 NB Ramps/ San Luis Bay Drive	AWSC	C	7.5	A	8.5	A

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT

Table 6B presents the Baseline Conditions weekday and Saturday PM peak hour intersection queuing analysis results. As indicated in Table 6B, sufficient storage generally exists at each study intersection to currently accommodate the 95<sup>th</sup> percentile queues. The exception though is the projected peak hour queues on the westbound San Luis Bay Drive approach to Ontario Road. The table shows that the peak hour queues on this approach are projected to exceed available storage by up to 5-feet. Copies of the Baseline Conditions peak hour queuing worksheets are provided in Appendix C.

**Table 6B: AWSC - Baseline Conditions Peak Hour Queuing Analysis**

							Existing - AWSC	
Intersection		Direction	Lane Config.	Movement	No. Lanes	Available Storage Per Lane (ft)	95 <sup>th</sup> Percentile Queue/Lane (ft)	
ID	Location						PM Peak Hour <sup>1</sup>	SAT Peak Hour <sup>1</sup>
1	Ontario Road/ San Luis Bay Drive	EB	LTR	Eastbound Left/Through/Right	1	1060	105	86
		WB	LTR	Westbound Left/Through/Right	1	60	<b>65</b>	<b>61</b>
		NB	LTR	Northbound Left/Through/Right	1	1375	44	47
		SB	LTR	Southbound Left/Through/Right	1	770	38	27
2	US 101 SB Ramps/ San Luis Bay Drive	EB	TR	Eastbound Through/Right	1	60	0	3
		WB	LT	Westbound Left/Through	1	415	21	19
		SB	LT	Southbound Left/Through	1	120	46	69
		SB	R	Southbound Right	1	980	84	203
3	US 101 NB Ramps/ San Luis Bay Drive	EB	TR	Eastbound Left/Through	1	415	50	41
		WB	LT	Westbound Through/Right	1	910	0	0
		NB	LTR	Northbound Left/Through/Right	1	995	47	52

Notes: 1. **Bolded** entries indicate queues projected to exceed available storage

#### 4.2.2 Interim Design Year (2030) Analysis

The Interim Design Year weekday and Saturday PM peak hour intersection traffic operations were quantified with the resulting LOS and delay provided in Table 7. As shown in Table 7, both the Ontario Road/San Luis Bay Drive and the US 101 SB Ramps/San Luis Bay Drive intersections are projected to operate at LOS “F” during both the weekday and Saturday PM peak periods under AWSC. As also shown, the US 101 NB Ramps/San Luis Bay Drive intersection is projected to operate at LOS “E” during the weekday PM peak hour period under AWSC. Based on the projected peak hour LOS presented in Table 7, the AWSC Alternative does not represent a viable Interim Design Year (2030) alternate. Copies of the Interim Design Year peak hour LOS worksheets are provided in Appendix C.



**Table 7: AWSC - Interim Design Year (2030) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay	LOS	Delay	LOS
				1	Ontario Road/ San Luis Bay Drive	AWSC	D
2	US 101 SB Ramps/ San Luis Bay Drive	AWSC	C	104.0	F	56.9	F
3	US 101 NB Ramps/ San Luis Bay Drive	AWSC	C	49.8	E	17.7	C

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT

### 4.2.3 Ultimate Design Year (2045) Analysis

The Ultimate Design Year weekday and Saturday PM peak hour intersection traffic operations were quantified with the resulting LOS and delay provided in Table 8. As shown in Table 8, both the Ontario Road/San Luis Bay Drive and the US 101 SB Ramps/San Luis Bay Drive intersections are projected to operate at LOS “F” during both the weekday and Saturday PM peak periods under AWSC. As also shown, the US 101 NB Ramps/San Luis Bay Drive intersection is projected to operate at LOS “F” during the weekday and LOS “E” during the Saturday PM peak hour periods under AWSC. Based on the projected peak hour LOS presented in Table 8, the AWSC Alternative does not represent a viable Ultimate Design Year (2045) alternate. Copies of the Ultimate Design Year peak hour LOS worksheets are provided in Appendix C.

**Table 8: AWSC - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay	LOS	Delay	LOS
				1	Ontario Road/ San Luis Bay Drive	AWSC	D
2	US 101 SB Ramps/ San Luis Bay Drive	AWSC	C	199.3	F	140.6	F
3	US 101 NB Ramps/ San Luis Bay Drive	AWSC	C	114.9	F	41.1	E

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT

### 4.3 Traffic Signal Alternate Analysis

This section provides a summary of the intersection operations associated with the Traffic Signal Alternate. For this alternative, each of the study intersections are converted from stop sign controlled to traffic signal controlled. In addition, the traffic signals at the Ontario Road/San Luis Bay Drive and at the US 101 SB Ramps/San Luis Bay Drive intersections are proposed to operate as a single coordinated signalized intersection system. One controller is assumed to control the traffic signal system between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections to provide improved circulation and to clear traffic between the two intersections.



### 4.3.1 Baseline Conditions Analysis

In addition to traffic signal control, this analysis assumes existing approach geometrics at each of the study intersections. Table 9A presents the Baseline Conditions weekday and Saturday PM peak hour intersection Level of Service (LOS) and delay. As indicated in Table 9A, each study intersection currently operates at an acceptable LOS during both the weekday and Saturday PM peak periods. Copies of the Baseline Conditions peak hour LOS worksheets are provided in Appendix D.

**Table 9A: Traffic Signal - Baseline Conditions Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday Peak Hour	
				Delay <sup>3</sup>	LOS	Delay <sup>3</sup>	LOS
1	Ontario Road/ San Luis Bay Drive	Signal	D	31.8	C	29.3	C
2	US 101 SB Ramps/ San Luis Bay Drive	Signal	C	12.2	B	16.4	B
3	US 101 NB Ramps/ San Luis Bay Drive	Signal	C	8.6	A	9.1	A

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT
3. Intersections 1 and 2 were ran as clustered intersections. Synchro methodology was used for the analysis.

Table 9B presents the Baseline Conditions weekday and Saturday PM peak hour intersection queuing analysis results. As indicated in Table 9B, sufficient storage exists at each study intersection to currently accommodate the 95<sup>th</sup> percentile queues. Copies of the Baseline Conditions peak hour queuing worksheets are provided in Appendix D.

**Table 9B: Traffic Signal - Baseline Conditions Peak Hour Queuing Analysis**

							Existing Signal	
							95th Percentile Queue/Lane (ft)	
ID	Location	Direction	Lane Config.	Movement	No. Lanes	Available Storage Per Lane (ft)	Exist PM Peak Hour <sup>1</sup>	Exist SAT Peak
1	<b>Ontario Road/ San Luis Bay Drive</b>	EB	LTR	Eastbound Left/Through/Right	1	1060	335	364
		NB	LTR	Northbound Left/Through/Right	1	1375	50	73
		SB	LTR	Southbound Left/Through/Right	1	770	104	59
2	<b>US 101 SB Ramps/ San Luis Bay Drive</b>	WB	LT	Westbound Left/Through	1	415	77	138
		SB	LT	Southbound Left/Through	1	120	56	332
		SB	R	Southbound Right	1	980	225	650
3	<b>US 101 NB Ramps/ San Luis Bay Drive</b>	EB	LT	Eastbound Left/Through	1	415	150	168
		WB	TR	Westbound Through/Right	1	910	52	60
		NB	LTR	Northbound Left/Through/Right	1	995	45	73

Notes: 1. **Bolded** entries indicate queues projected to exceed available storage.

### 4.3.2 Interim Design Year (2030) Analysis

The Interim Design Year analysis assumes traffic signal control with existing approach geometrics at each of the study intersections with the resulting LOS and delay provided in Table 10A. As shown in Table 10A, the Ontario Road/San Luis Bay Drive intersection is projected to operate at LOS “E” during both the weekday and Saturday PM peak hours. As also shown in the table, both San Luis Bay Drive intersections with the US 101 SB Ramps and with the US 101 NB Ramps are



projected to operate at LOS “C” or better during both PM peak hour periods. Copies of the Interim Design Year peak hour LOS worksheets are provided in Appendix D.

**Table 10A: Traffic Signal - Interim Design Year (2030) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday PM Peak Hour	
				Delay <sup>3</sup>	LOS	Delay <sup>3</sup>	LOS
1	Ontario Road/ San Luis Bay Drive	Signal	D	68.1	E	62.4	E
2	US 101 SB Ramps/ San Luis Bay Drive	Signal	C	25.7	C	32.2	C
3	US 101 NB Ramps/ San Luis Bay Drive	Signal	C	18.6	B	22.4	C

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT
3. Intersections 1 and 2 were ran as clustered intersections. Synchro methodology was used for the analysis.

Table 10B presents the Interim Design Year weekday and Saturday PM peak hour intersection queuing analysis results. Copies of the Interim Design Year peak hour queuing worksheets are provided in Appendix D.

**Table 10B: Traffic Signal - Interim Design Year (2030) Peak Hour Queuing Analysis**

							2030 Signal	
							95th Percentile Queue/Lane (ft)	
ID	Location	Direction	Lane Config.	Movement	No. Lanes	Available Storage Per Lane (ft)	2030 PM Peak Hour <sup>1</sup>	2030 SAT Peak Hour <sup>1</sup>
1	Ontario Road/ San Luis Bay Drive	EB	LTR	Eastbound Left/Through/Right	1	1060	436	461
		NB	LTR	Northbound Left/Through/Right	1	1375	248	724
		SB	LTR	Southbound Left/Through/Right	1	770	450	146
2	US 101 SB Ramps/ San Luis Bay Drive	WB	LT	Westbound Left/Through	1	415	185	260
		SB	LT	Southbound Left/Through	1	120	<b>321</b>	<b>289</b>
		SB	R	Southbound Right	1	980	787	679
3	US 101 NB Ramps/ San Luis Bay Drive	EB	LT	Eastbound Left/Through	1	415	366	369
		WB	TR	Westbound Through/Right	1	910	110	107
		NB	LTR	Northbound Left/Through/Right	1	995	123	128

Notes: 1. **Bolded** entries indicate queues projected to exceed available storage.

As indicated in Table 10B, the 95<sup>th</sup> percentile queues are projected to exceed available storage during both PM peak hours on the US 101 SB off-ramp shared through plus left-turn lane at the intersection with San Luis Bay Drive. Based on the projected queues on this approach, it is recommended to extend the shared through plus left-turn lane to provide a minimum of 325 feet of storage. This recommendation is shown on Figure 5.1 provided in Section 5.

Though the Ontario Road/San Luis Bay Drive intersection is projected to operate at LOS “E” during both the weekday and Saturday PM peak hours, the queuing analysis indicates that this intersection will still provide sufficient storage to accommodate the projected queues. The signal system as a whole is also projected to provide sufficient storage to accommodate the projected queues except as noted above.



### 4.3.3 Ultimate Design Year (2045) Analysis

The Ultimate Design Year analysis initially assumed the traffic signal control with the intersection approach geometrics shown on Figure 5.1. The weekday and Saturday PM peak hour analysis based on these assumptions projected that the Ontario Road/San Luis Bay Drive and San Luis Bay Drive/US 101 SB Ramps intersections would generally operate at LOS “F” during both peak hour periods. As these projected LOS were worse than the target LOS, an improvement to provide a second eastbound San Luis Bay Drive lane from the intersection with Ontario Road to the intersection with the US 101 NB Ramps, and an improvement to provide a second westbound lane between the Ontario Road/San Luis Bay Drive and the US 101 SB Ramps/San Luis Bay Drive intersections was identified to provide improved intersection operations. The recommended Ultimate Design Year improvements are shown on Figure 5.2 provided in Section 5.

Ultimate Design Year weekday and Saturday PM peak hour intersection traffic operations were again quantified based on the recommended improvement with the resulting LOS and delay provided in Table 11A. As shown in Table 11A, each study intersection is projected to operate at an acceptable LOS during both the weekday and Saturday PM peak periods. Copies of the Ultimate Design Year peak hour LOS worksheets are provided in Appendix D.

**Table 11A: Traffic Signal - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday Peak Hour	
				Delay <sup>3</sup>	LOS	Delay <sup>3</sup>	LOS
1	Ontario Road/ San Luis Bay Drive	Signal	D	36.6	D	37.4	D
2	US 101 SB Ramps/ San Luis Bay Drive	Signal	C	15.1	B	34.7	C
3	US 101 NB Ramps/ San Luis Bay Drive	Signal	C	20.5	C	17.7	B

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT
3. Intersections 1 and 2 were ran as clustered intersections. Synchro methodology was used for the analysis.

Table 11B presents the Ultimate Design Year weekday and Saturday PM peak hour intersection queuing analysis results. Copies of the Ultimate Design Year peak hour queuing worksheets are provided in Appendix D.



**Table 11B: Traffic Signal - Ultimate Design Year (2045) Peak Hour Queuing Analysis**

							2045 Signal	
							95th Percentile Queue/Lane (ft)	
							2045 PM Peak Hour <sup>1</sup>	2045 SAT Peak Hour <sup>1</sup>
ID	Location	Direction	Lane Config.	Movement	No. Lanes	Available Storage Per Lane (ft)		
1	Ontario Road/ San Luis Bay Drive	EB	LT	Eastbound Left/Through	1	1060	289	297
		EB	TR	Eastbound Through/Right	1	1060	601	546
		NB	LTR	Northbound Left/Through/Right	1	1375	137	292
		SB	LTR	Southbound Left/Through/Right	1	770	238	110
2	US 101 SB Ramps/ San Luis Bay Drive	WB	LT	Westbound Left/Through	1	415	204	336
		SB	LT	Southbound Left/Through	1	325	167	<b>459</b>
		SB	R	Southbound Right	1	980	462	747
3	US 101 NB Ramps/ San Luis Bay Drive	EB	L	Eastbound Left	1	415	387	313
		EB	T	Eastbound Through	1	415	74	43
		WB	TR	Westbound Through/Right	1	910	118	123
		NB	LTR	Northbound Left/Through/Right	1	995	123	159

Notes: 1. **Bolded** entries indicate queues projected to exceed available storage.

As indicated in Table 11B, the 95<sup>th</sup> percentile queues are projected to exceed available storage during the Saturday PM peak hour on the US 101 SB off-ramp shared through plus left-turn lane at the intersection with San Luis Bay Drive. Based on the projected queues on this approach, it is recommended to extend the shared through plus left-turn lane to provide a minimum of 475 feet of storage. This recommendation is shown on Figure 5.2 provided in Section 5.

#### 4.4 Roundabout Alternative Analysis

This alternative features the construction of a six-leg roundabout combining the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections into a single roundabout intersection (also referred to as the “West Roundabout”). The preliminary geometrics for the proposed combined San Luis Bay Drive/Ontario Road/US 101 SB Ramps roundabout is shown on Figure 5.3 in Section 5. A smaller 4-leg roundabout is proposed at the US 101 NB Ramps/San Luis Bay Drive intersection (also referred to as the “East Roundabout”). The preliminary geometrics for the proposed US 101 NB Ramps/San Luis Bay Drive roundabout is shown on Figure 5.4 in Section 5.

The following capacity assessment/analysis (Level of Service (LOS), delay and queuing) for this alternative is only provided for the Ultimate Design Year (2045).

##### 4.4.1 Ultimate Design Year (2045) Analysis

The Ultimate Design Year weekday and Saturday PM peak hour roundabout traffic operations were quantified with the resulting LOS and delay provided in Table 12A. As shown in Table 12A, each study intersection is projected to operate at an acceptable LOS during both the weekday and Saturday PM peak periods. Copies of the Ultimate Design Year peak hour LOS worksheets are provided in Appendix E.



**Table 12A: Roundabout - Ultimate Design Year (2045) Peak Hour Intersection Level-of-Service (LOS)**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	PM Peak Hour		Saturday Peak Hour	
				Delay	LOS	Delay	LOS
				1	Ontario Road/ US 101 SB Ramps/ San Luis Bay	RNDBT	C
2	US 101 NB Ramps/ San Luis Bay Drive	RNDBT	C	11.1	B	11.0	B

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for AWSC, Signal, RNDBT

Table 12B presents the Ultimate Design Year weekday and Saturday PM peak hour intersection queuing analysis results. As indicated in Table 12B, sufficient storage will be provided at both roundabouts to accommodate the 95<sup>th</sup> percentile queues. Copies of the Ultimate Design Year peak hour queuing worksheets are provided in Appendix E.

**Table 12B: Roundabout- Ultimate Design Year (2045) Peak Hour Queuing Analysis**

							2045 - Roundabout	
							95 <sup>th</sup> Percentile Queue/Lane (ft)	
ID	Intersection Location	Lane		Movement	No. Lanes	Available Storage Per Lane (ft)	PM Peak Hour <sup>1</sup>	SAT Peak Hour <sup>1</sup>
		Direction	Config.					
1	Ontario Road/ US 101 SB Ramps/ San Luis Bay Drive	EB	LTR	Eastbound Left/Through/Right	1	1060	149.6	52.6
		WB	LTR	Westbound Left/Through/Right	1	421	5.6	9.2
		NB	LTR	Northbound Left/Through/Right	1	592	32.4	27.3
		SB	LTR	Southwestbound Left/Through/Right (Off-Ramp)	1	976	22.0	57.6
		SB	LTR	Southbound Left/Through/Right (Ontario Road)	1	696	16.1	20.0
2	US 101 NB Ramps/ San Luis Bay Drive	EB	LTR	Eastbound Left/Through/Right	1	423	0.0	0.0
		WB	LTR	Westbound Left/Through/Right	1	918	11.2	10.4
		NB	LTR	Northbound Left/Through/Right	1	941	11.9	12

Notes: 1. **Red** entries indicate queues projected to exceed available storage

## 5. Footprint Development & Assessment

The following four alternatives have been evaluated within this report:

- No Build
- All Way Stop Control (AWSC)
- Traffic Signal
- Roundabout (2045 Screening Assessment)

The capacity assessment/analysis provided in Section 4 identified that both the No Build Alternative and the AWSC Alternative were projected to operate at peak hour LOS worse than the target LOS thresholds for both Interim Design Year (2030) and Ultimate Design Year (2045) conditions. The conclusion was that neither alternative represents a viable alternative for these conditions.

The following sections provide schematics for the Traffic Signal and Roundabout Alternatives. The lane geometry at the three study intersections for the Traffic Signal Alternative is based on the capacity assessment/analysis conducted in Section 4 for the Baseline, Interim Design Year (2030) and Ultimate Design Year (2045) analysis conditions. The lane geometries for the Roundabout Alternative is specific to the Ultimate Design Year (2045) condition only and is based on the capacity assessment/analysis conducted in Section 4.



## **5.1 Traffic Signal Alternative**

For the Traffic Signal Alternative, each of the study intersections are converted from stop sign controlled to traffic signal controlled. In addition, the traffic signals at the Ontario Road/San Luis Bay Drive and at the US 101 SB Ramps/San Luis Bay Drive intersections are proposed to operate as a single coordinated signalized intersection system. One controller is assumed to control the traffic signal system between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections to provide improved circulation and to clear traffic between the two intersections.

The Baseline Conditions capacity assessment/analysis conducted in Section 4 concluded that acceptable peak hour intersection operations and queueing would occur with just the installation of the traffic signals. Both the Interim Design Year and Ultimate Design Year capacity assessments/analysis, however, identified roadway improvements that would be required for these conditions.

### **5.1.1 Interim Design Year (2030) Traffic Signal Alternative**

In addition to installation of traffic signals, the Interim Design Year queueing analysis provided in Section identified that the 95<sup>th</sup> percentile queues are projected to exceed available storage on the US 101 SB off-ramp shared through plus left-turn lane at the intersection with San Luis Bay Drive. The recommendation was to extend this lane to provide a minimum of 325 feet of storage. These recommended improvement are shown conceptually on Figure 5.1.

Truck turns within and through each intersection were checked using the California Legal 65' truck (Cal-Legal 65 Truck) design vehicle. The truck turn exhibits for this alternative are provided in Appendix F. The limit lines on both the San Luis Bay Drive westbound approach to the US 101 SB Ramps intersection and the eastbound approach to the US 101 NB Ramps intersection will need to be set back to accommodate truck turns as shown on the exhibits. Though this will reduce the available storage on San Luis Bay Drive, sufficient storage should be available to accommodate the peak hour queues.

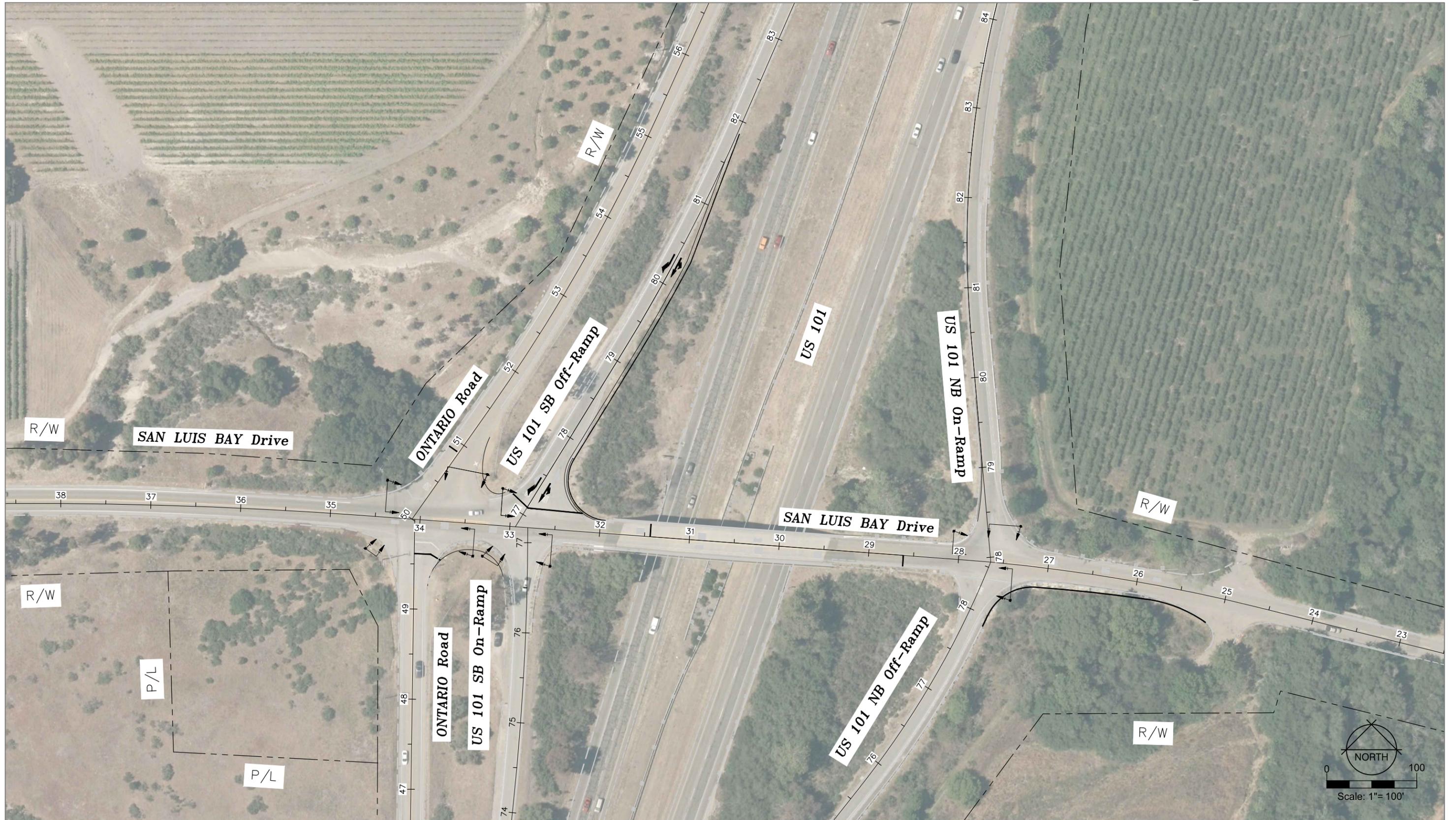
At this time, the recommended Interim Design Year improvements shown conceptually on Figure 5.1 can be provided within existing County and State right-of-way.

### **5.1.2 Ultimate Design Year (2045) Traffic Signal Alternative**

In addition to installation of traffic signals, the Ultimate Design Year capacity assessment/analysis recommended that a second eastbound San Luis Bay Drive lane be provided from just west of Ontario Road extending east over US 101 to the intersection with the US 10 NB ramps. This recommended improvement is shown conceptually on Figure 5.2.

As shown on Figure 5.2, providing the second eastbound San Luis Bay Drive lane will require widening the south side of the existing overcrossing structure (OC) over US 101 by approximately 26' to the south side. At this time, it is assumed that the existing OC can be widened and that a full

# Interim Traffic Signal Alternative

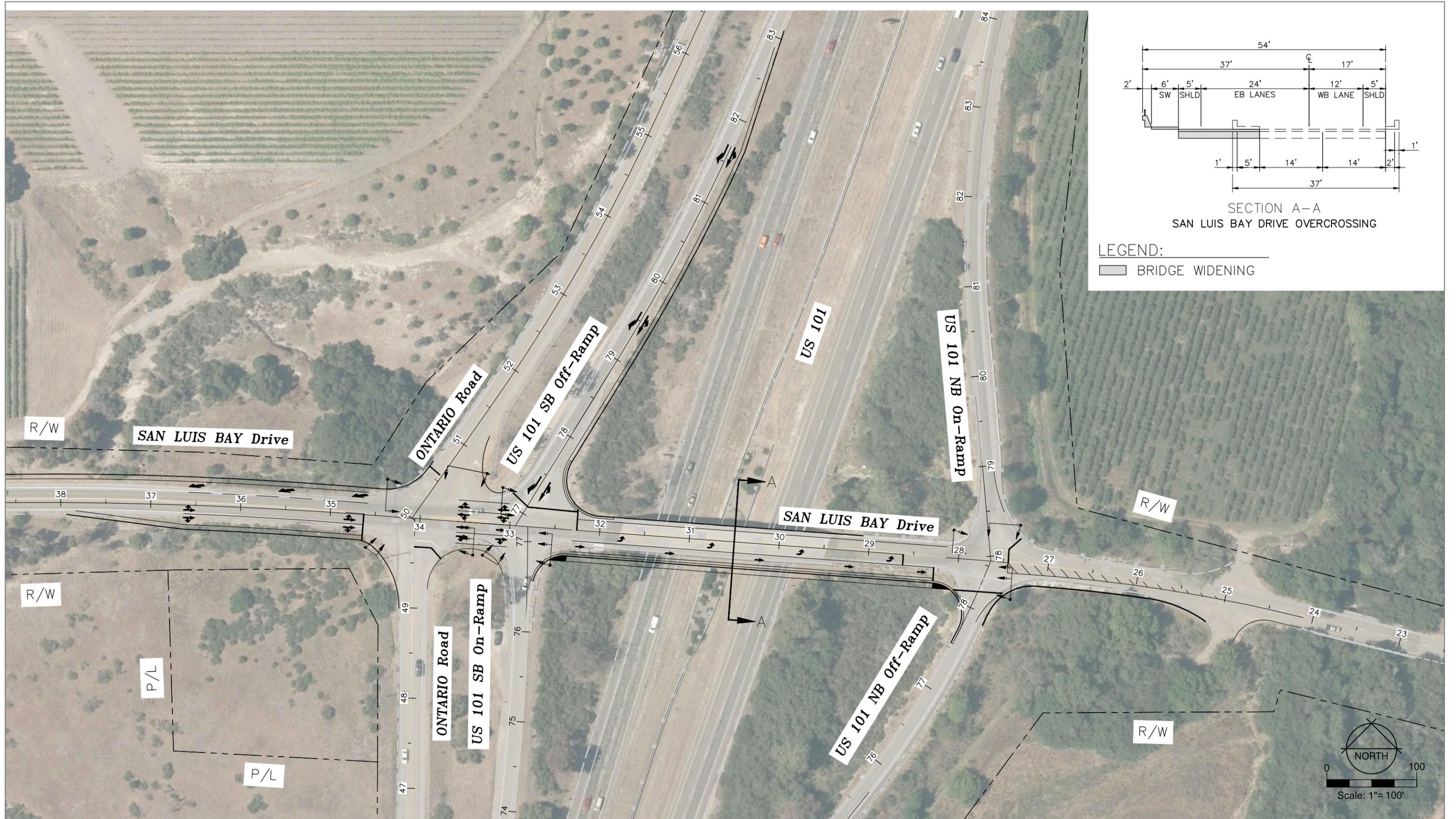


US 101/ San Luis Bay Drive ICE Study

County of San Luis Obispo

Figure 5.1

# Ultimate Traffic Signal Alternative





bridge replacement will not be needed. Section A-A provided on Figure 5.2 illustrates the preliminary cross section for the OC. As shown on the cross section, three 12' lanes are proposed (two eastbound and one westbound), with 5' shoulders and a 6' sidewalk along the south side of the OC.

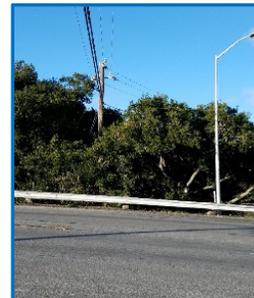
For the Ultimate Design Year condition it was also identified that a second westbound lane between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections was required to meet the target LOS. The second westbound lane would transition back to existing San Luis Bay Drive west of the intersection with Ontario Road. This recommended improvement is also shown conceptually on Figure 5.2. The truck turn exhibits for this alternative are provided in Appendix G.

Utility mapping has been obtained and the utilities currently known to be within the study area are shown on an exhibit provided in Appendix H. The additional eastbound San Luis Bay Drive improvements shown conceptually on Figure 5.2 may impact and require the relocation of one joint use utility pole located on the SW corner of the San Luis Bay Drive/Ontario Road intersection (shown in adjacent photo). There is also underground water transmission lines and

electrical conduit located adjacent to and within this intersection that will need to be verified during future project phases.



The additional westbound San Luis Bay Drive improvements may require the relocation of one joint use utility pole located on the NW corner of the San Luis Bay Drive/Ontario Road intersection (shown in adjacent photo).



The addition of the second eastbound San Luis Bay Drive through lane to the east of Ontario Road as shown conceptually on Figure 5.2 will also require encroaching into the adjacent drainage area (shown in the adjacent photo). The extent of the encroachment into this drainage area and any potential environmental impacts will need to be evaluated during future project phases.



Transitioning the second westbound lane back to existing San Luis Bay Drive west of the



intersection with Ontario Road will also require encroaching into the adjacent drainage area (shown in adjacent photo). The extent of the encroachment into this drainage area and any potential environmental impacts will need to be evaluated during future project phases.



There may also be additional environmental impacts that will be evaluated during future project phases.

At this time, the recommended Ultimate Design Year improvements shown conceptually on Figure 5.2 can be provided within existing County and State right-of-ways.

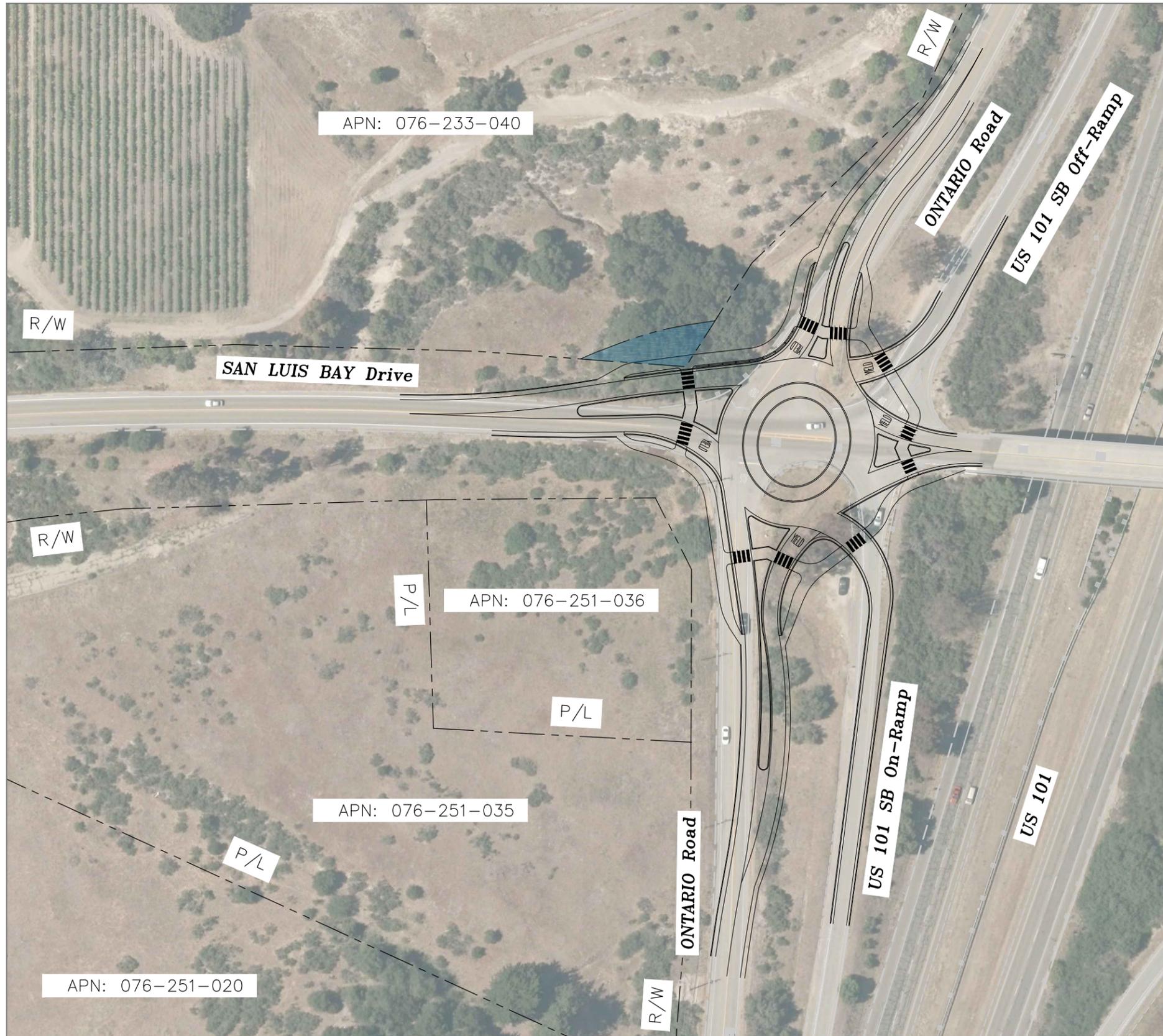
## **5.2 Roundabout Alternative**

### **5.2.1 West Roundabout Conceptual Design**

Due to the close intersection spacing (approximately 115') between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections, the Roundabout Alternative features the construction of a six-leg roundabout combining the two intersections into a single roundabout intersection. For the purposes of this evaluation, this roundabout is referred to as the "West Roundabout". The preliminary layout and geometrics for the West Roundabout are shown conceptually on Figure 5.3.

As shown on Figure 5.3, pedestrian crossings connected by shared-use pathways are proposed on all legs of the roundabout. Per the current County Bikeways Plan, a Class II Bike Lane is proposed on San Luis Bay Drive beginning at the Ontario Road intersection and extending west to Avila Beach Drive while Ontario Road is proposed to be upgraded from Class III to Class II. As bicyclist need to be accommodated, bicycles are accommodated by navigating through the roundabout in two ways. Cyclists may choose to take the travel lane and travel through the roundabout as a vehicle or may choose to take the separated bike ramp/shared use path and travel around the roundabout as a pedestrian.

# Roundabout Alternative (West Roundabout)



**PRELIMINARY ROW REQUIREMENT**

KEY	APN	PRELIMINARY ROW ESTIMATE (SQFT)
	076-233-040	2350

**ROUNDAABOUT GEOMETRICS:**

INSCRIBED CIRCLE DIAMETER: 139'-152'

CENTER ISLAND DIAMETER: 67'-78'

CIRCULATORY ROADWAY WIDTH: 21'

**ENTRY RADIUS:**

NB ONTARIO Road - 91'

SB ONTARIO Road - 80'

US 101 SB Off-Ramp - 87'

EB SAN LUIS BAY Drive - 105'

WB SAN LUIS BAY Drive - 129'

TRUCK APRON WIDTH: 12'

SHARED USE PATH WIDTH: 10'

LANDSCAPE STRIP WIDTH: 2' MIN

SPLITTER ISLAND: 2.8' MIN WITH 6' MIN AT PED CROSSINGS

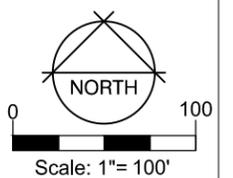




Figure 5.3 also shows that the West Roundabout’s conceptual layout and geometrics are mostly located within existing County and State right-of-ways. Additional right-of-way will though be required in the NW quadrant of the roundabout as shown on the figure.

Potential utility impacts are similar to those described with the Traffic Signal Alternative. Provision of this roundabout will require encroaching into the adjacent drainage area on the south side of San Luis Bay Drive at the approach to Ontario Road. The extent of the encroachment into this drainage area and any potential environmental impacts will need to be evaluated during future project phases. Provision of this roundabout will also require encroaching significantly into the existing drainage area (shown in adjacent photo) located in the NW quadrant of the roundabout, adjacent to both San Luis Bay Drive and Ontario Road. The extent of the encroachment into this drainage area and

any potential environmental impacts will need to be evaluated during future project phases. There may also be additional environmental impacts that will be evaluated during future project phases.



### **5.2.2 East Roundabout Conceptual Design**

A smaller 4-leg roundabout is proposed at the US 101/San Luis Bay Drive intersection. For the purposes of this evaluation, this roundabout is referred to as the “East Roundabout”. The preliminary layout and geometrics for the East Roundabout are shown conceptually on Figure 5.4.

At this time the recommended East Roundabout footprint shown on Figure 5.4 can be provided within existing County and State right-of-way. The utility mapping exhibit provided in Appendix H identifies an existing underground gas line located on the outside of and runs parallel to the US 101 northbound ramps. This gas line will need to be verified during future project phases. Provision of the roundabout will require modifications to the existing drainage system. The extent of the encroachment into the drainage areas and any potential environmental impacts will need to be evaluated during future project phases

# Roundabout Alternative (East Roundabout)



**ROUNDAABOUT GEOMETRICS:**

INSCRIBED CIRCLE DIAMETER: 121'–124'

CENTER ISLAND DIAMETER: 46'–49'

CIRCULATORY ROADWAY WIDTH: 21'

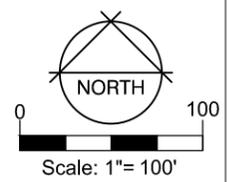
ENTRY RADIUS:

- US 101 NB Off-Ramp – 108'
- EB SAN LUIS BAY Drive – 70'
- WB SAN LUIS BAY Drive – 108'

TRUCK APRON WIDTH: 12'

SHARED USE PATH WIDTH: 10'

SPLITTER ISLAND: 2' MIN





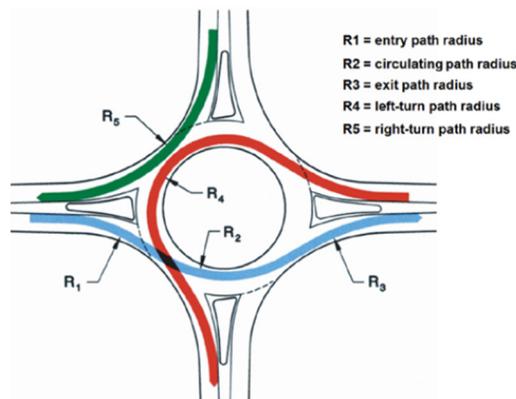
### 5.2.3 Roundabout Performance Checks

For this ICE Step 1 evaluation, two performance checks were conducted for each roundabout to verify the roundabout's feasibility. These performance checks include design vehicle (CA-Legal 65 Truck) and, fastest path and vehicle speed checks. Truck turns are checked at both roundabouts based on the CA-Legal 65 truck design vehicle. Truck turn exhibits for both roundabouts are provided in Appendix G.

#### Fastest Path and Vehicle Speed Checks

The “Fastest Path” represents the path that the most aggressive drivers could take through the roundabout and assumes no other traffic to be within the intersection. NCHRP Report 672 indicates that the recommended maximum vehicle entry speeds along the fastest path should be less than 25 mph at single-lane roundabouts and less than 30 mph at multi-lane roundabouts. NCHRP Report 672 also indicates that the differential speed between consecutive or conflicting projected fast path speeds should be less than 15 mph.

Fastest path speeds are determined for five locations per approach. These include entry speeds (referred to as V1); through movement circulating speeds (V2); exiting speeds (V3); left turn movement circulating speeds (V4); and right turn speeds (V5). A diagram of the described locations is shown in the following exhibit.



**Fast Path Critical Speed Locations**

Fastest path speeds for the Roundabout Alternative are shown in Table 13A (West Roundabout) and Table 13B (East Roundabout). Exhibits illustrating the fastest path analysis for each roundabout can be found in Appendix G.



**Table 13A: West Roundabout Fastest Path Speeds (MPH)**

MOVEMENT	Northbound	Southbound	Southbound	Eastbound	Westbound
	Ontario Road	Ontario Road	US 101 SB Off-Ramp	to San Luis Bay Drive	San Luis Bay Drive
	(N#)	(S#)	(s#)	(E#)	(W#)
ENTERING (V1)	20.9	24.5	22.2	22.3	23.3*
CIRCULATING (V2)	15.4	17.6	18.6	15.4	18.3
EXITING (V3)	23.4	30.8	31.4	28.3	31.2
LEFT TURN (V4)	15.3	15.2	15.2	15.0	14.6
RIGHT TURN (V5)	26.8	19.7		18.7	17.6

Notes:

All values are in miles per hour

V3 exiting speeds are derived from vehicle acceleration formulas in NCHRP 672

V3 fast path speed measured at exit crosswalk or 100 feet downstream from V2.

N/A = Fastest path speed does not exist for this approach

2% cross-slope assumed for determining Fastest path

\* Based on approximately 20% realized reduction in entry speed for raised crosswalk Per NCHRP 674

As shown in Table 13A, the fastest path entering speeds are less than the desired maximum speeds for a single-lane approach. NCHRP 674 identifies that provision of raised crosswalks can realize up to a 20% reduction in entry speed. The westbound San Luis Bay Drive entry speed was calculated at 27.9 MPH. Then entry speed of 23.3 MPH shown in Table 13A is based on provision of a raised crosswalk across this approach. Finally, the speed differential between consecutive or conflicting fast path speeds shown in the table are less than the maximum of 15 mph.

**Table 13B: East Roundabout Fastest Path Speeds (MPH)**

MOVEMENT	Northbound	Eastbound	Westbound
	US 101 NB Off-Ramp	San Luis Bay Drive	San Luis Bay Drive
	(N#)	(E#)	(W#)
ENTERING (V1)	22.0	22.9	23.4
CIRCULATING (V2)	22.7	20.8	11.5
EXITING (V3)	34.0	25.8	27.7
LEFT TURN (V4)	13.7	14.3	
RIGHT TURN (V5)	20.4		18.8

Notes:

All values are in miles per hour

V3 exiting speeds are derived from vehicle acceleration formulas in NCHRP 672

V3 fast path speed measured at exit crosswalk or 100 feet downstream from V2.

N/A = Fastest path speed does not exist for this approach

2% cross-slope assumed for determining Fastest path

As shown in Table 13B, the fastest path entering speeds are less than the desired maximum speeds for a single-lane approach. The speed differential between consecutive or conflicting fast path speeds shown in the table are also less than the maximum of 15 mph.



## 6. Safety Considerations

Safety is a key evaluation factor brought forth in the Directive, and one of the goals of the ICE process is to identify projects that will ensure a reasonable level of safety and operational performance for all users

### 6.1 Historic Collision Data

Recent 5-year collision data was obtained from the Statewide Integrated Traffic Records System for the most recent 5-year period, dated from January 1, 2013 to December 31, 2017. Table 14 provides the summary of the type of collisions that occurred at the study intersections during this five-year period.

**Table 14: Intersection Collision Data**

#	Intersection	Total Collisions	Property Damage Only (PTO)	Fatal	Injury (Severe)	Injury (Other Visible)	Injury (Compliant of Pain)	Predominant Collision Factor	Predominant Collision Type
1	Ontario Road/ San Luis Bay Drive	21	12	0	1	3	5	Right of Way Violation (62%)	Broadside (57%)
2	US 101 SB Ramps/ San Luis Bay Drive	5	0	0	0	1	4	Right of Way Violation (80%)	Broadside (80%)
3	US 101 NB Ramps/ San Luis Bay Drive	1	0	0	1	0	0	Making Left Turn (100%)	Other (100%)

As shown in Table 14, there were no fatal collisions reported during the five-year period. There was one severe injury collision reported at both the Ontario Road/San Luis Bay Drive and US 101 NB Ramps/San Luis Bay Drive intersections. Nine of the collisions at the Ontario Road/San Luis Bay Drive intersection involved a reported injury while all five collisions at the US 101 SB Ramps/San Luis Bay Drive intersection involved a reported injury. The predominant primary collision factor at both intersections was “Auto Violation of Right of Way” (62% and 80% respectively) while the predominant collision type was “Broadside” (57% and 80% respectively).

### 6.2 Safety Analysis

#### 6.2.1 Collision Cost Analysis

Caltrans provides a Safety Performance/Collision Cost Analysis Tool on their website (<http://www.dot.ca.gov/trafficops/ice.html>) that is used to calculate the collision costs and projected savings for various intersection improvements. The Collision Costs are based on the existing intersection configuration, ADT, and existing collision data. The file has historical Crash Modification Factors (CMF) for conversion of an all-way stop control and two-way stop control to a roundabout and traffic signal control.

#### ***Ontario Road/San Luis Bay Drive***

This intersection was analyzed as an existing two-way stop controlled intersection. Conversion of the intersection to traffic signal control results in a CMF of 0.8 and an average reduction of \$68,600 (36%) per collision. A 20% reduction in collisions is also predicted with conversion of the intersection to traffic signal control.



Conversion of the intersection to a single-lane roundabout results in a CMF of 0.61 and an average reduction of \$156,200 (81%) per collision. A 39% reduction in collisions is also predicted with conversion of the intersection to roundabout control.

**US 101 SB Ramps/San Luis Bay Drive**

This intersection was analyzed as an existing two-way stop controlled intersection. Conversion of the intersection to traffic signal control results in a CMF of 0.8 and an average reduction of \$68,600 (36%) per collision. A 20% reduction in collisions is also predicted with conversion of the intersection to traffic signal control.

Conversion of the intersection to a single-lane roundabout results in a CMF of 0.61 and an average reduction of \$156,200 (81%) per collision. A 39% reduction in collisions is also predicted with conversion of the intersection to roundabout control.

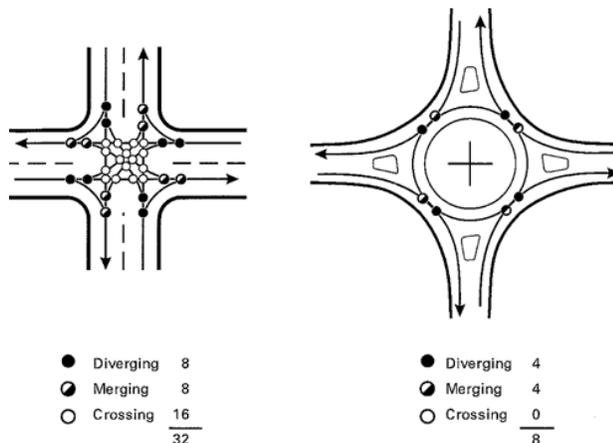
**US 101 NB Ramps/San Luis Bay Drive**

This intersection was analyzed as an existing two-way stop controlled intersection. Conversion of the intersection to traffic signal control results in a CMF of 0.8 and an average reduction of \$68,600 (36%) per collision. A 25% reduction in collisions is also predicted with conversion of the intersection to traffic signal control.

Conversion of the intersection to a single-lane roundabout results in a CMF of 0.61 and an average reduction of \$156,200 (81%) per collision. A 38% reduction in collisions is also predicted with conversion of the intersection to roundabout control.

**6.2.2 Number of Conflicting Points**

The number of conflicting points within an intersection directly correlates to the risk of an incident, especially at intersections. Conflict points are locations at which a roadway user can cross, merge, and diverge, etc. with another roadway user. A diagram of conflict locations at typical intersections are provided below.



The Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections are closely spaced intersections. The number of combined conflict points between these two



intersections for both the Traffic Signal Alternative (based on the proposed combined intersection control) and for the Roundabout Alternative are provided below:

Traffic Signal Alternative = **40** Conflicts

Roundabout Alternative = **10** Conflicts

For the US 101 NB Ramps/San Luis Bay Drive intersection, the number conflict points for both the Traffic Signal Alternative and for the Roundabout Alternative are provided below:

Traffic Signal Alternative = **14** Conflicts

Roundabout Alternative = **6** Conflicts

The above analysis illustrates the advantages that the Roundabout Alternative would provide by significantly reducing the number of conflict points between vehicles.

### **6.2.2 Reduced Speed Potential**

Typically the roundabout geometric design requires the driver to reduce the speed in the intersection to 15-25 MPH. Conversely, drivers can travel through a signalized intersection at speeds higher than posted speed limits due to lack of geometric constraints. Due to reduced travel speeds through the intersection and expected reduction in crashes, the roundabout alternative is likely to eliminate most severe crash types.

### **6.2.3 Pedestrian and Bike Safety**

A key component of roundabout design focuses on non-motorized vehicle facilities through shared-use paths and two-stage crossings. The shared-use path provides the opportunity for cyclists to ride with vehicle traffic through the roundabout or to exit the roadway via a bike ramp and navigate the intersection on the shared-use path. Crosswalks are split into two separate crossings through the provision of pedestrian refuges at the splitter islands. These two-stage crossings reduce the amount of sustained time a pedestrian is in potential conflict with motorized vehicles by limiting the length of each crossing, and limit each crossing to one direction of vehicle travel at a time.

## **7. Preliminary Capital Cost Estimates**

A preliminary opinion or probable capital costs (construction and right of way) has been estimated for the Interim Design Phase Traffic Signal Alternative based on the identified improvements. This preliminary cost estimate is provided in the Appendix I and the preliminary opinion of probable capital costs is provided below:

- Traffic Signal Alternative – Interim Design Year: \$1.21 Million

Preliminary opinion or probable capital costs (construction and right of way) have also been estimated for both the Traffic Signal Alternative and the Roundabout Alternative (both the West Roundabout and the East Roundabout) based on the identified Ultimate Design Phase improvements. The costs to install the three (3) traffic signals have also been included within the



Traffic Signal Alternative cost estimate. These preliminary cost estimates are provided in Appendix I.

The preliminary Ultimate Design Phase opinion of probable capital costs for each alternative are provided below:

- Traffic Signal Alternative: \$4.86 Million
- Roundabout Alternative: \$5.23 Million
  - *West Roundabout: \$3.82 Million*
  - *East Roundabout: \$1.41 Million*

As shown, the estimated Ultimate Design Phase capital costs are lower for the Traffic Signal Alternative when compared to the Roundabout Alternative.

## **8. Alternatives Comparison**

The capacity assessment/analysis provided in Section 4 identified that both the No Build Alternative and the AWSC Alternative were projected to operate at peak hour LOS worse than the target LOS thresholds for both Interim Design Year (2030) and Ultimate Design Year (2045) conditions. The conclusion was that neither alternative represents a viable alternative for these conditions.

For the Traffic Signal Alternative, the Baseline Conditions capacity assessment/analysis conducted in Section 4 concluded that acceptable peak hour intersection operations and queueing would occur with just the installation of the traffic signals. Both the Interim Design Year (2030) and Ultimate Design Year (2045) capacity assessments/ analysis, however, identified required roadway improvements. Finally, the capacity assessment/analysis for the Roundabout Alternative was only conducted for the Ultimate Design Year (2045).

As the capacity assessment/analysis was only conducted for the Ultimate Design Year for the Roundabout Alternative, Table 15 provides a comparative summary for both this alternative and the Traffic Signal Alternative for the Ultimate Design Year condition. For reference, the 6-legged roundabout proposed for the combined Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections is referred to as the West Roundabout while the 4-legged roundabout proposed for the US 101 NB Ramps/San Luis Bay Drive intersection is referred to as the East Roundabout.



**Table 15: Alternative Comparison Summary – Ultimate Design Year (2045)**

Intersections	Traffic Signal Alternative (also refer to Figure 5.2)	Roundabout Alternative (also refer to Figures 5.3 & 5.4)
Traffic Operations	<p><b>Ontario Road/San Luis Bay Drive:</b></p> <ul style="list-style-type: none"> <li>LOS D projected for both the weekday and Saturday PM peak hours. Vehicle storage available to accommodate projected 95% percentile queue for both peak hours.</li> </ul> <p><b>US 101 SB Ramps/San Luis Bay Drive:</b></p> <ul style="list-style-type: none"> <li>LOS B and C projected for both the weekday and Saturday PM peak hours. SB off-ramp shared through plus left-turn lane is extended to accommodate projected 95th percentile queue.</li> </ul> <p><b>US 101 SB Ramps/San Luis Bay Drive:</b></p> <ul style="list-style-type: none"> <li>LOS C and B projected for both the weekday and Saturday PM peak hours. Vehicle storage available to accommodate projected 95% percentile queues for both peak hours.</li> </ul>	<p><b>West Roundabout:</b></p> <ul style="list-style-type: none"> <li>LOS B projected for the weekday PM peak hours and LOS A projected for the Saturday PM peak hour. Vehicle storage available to accommodate projected 95% percentile queues for both peak hour periods.</li> </ul> <p><b>East Roundabout:</b></p> <ul style="list-style-type: none"> <li>LOS B projected for both the weekday and Saturday PM peak hours. Vehicle storage available to accommodate projected 95% percentile queues for both peak hour periods.</li> </ul>
Pedestrian/ Bicycle Access	<p><b>Pedestrian Access:</b></p> <ul style="list-style-type: none"> <li>Similar to No Build Conditions, pedestrian access is only provided across the south side of the San Luis Bay over crossing of US 101. Due to minimal pedestrian activity, no pedestrian crosswalks are provided.</li> </ul> <p><b>Bicycle Access:</b></p> <ul style="list-style-type: none"> <li>Per the current County Bikeways Plan, a Class II Bike Lane is proposed on San Luis Bay Drive beginning at the</li> </ul>	<p><b>Pedestrian Access:</b></p> <ul style="list-style-type: none"> <li>Similar to No Build Conditions, pedestrian access is only provided across the south side of the San Luis Bay over crossing of US 101. A pedestrian crossing connected by a shared use path is currently proposed at the East Roundabout. Pedestrian crossings connected by shared-use pathways are proposed on all legs of the West Roundabout (also refer to the following “Bicycle Access” discussion).</li> </ul> <p><b>Bicycle Access:</b></p> <ul style="list-style-type: none"> <li>Per the current County Bikeways Plan, a Class II Bike Lane is proposed on San Luis Bay Drive beginning at the</li> </ul>



Intersections	Traffic Signal Alternative (also refer to Figure 5.2)	Roundabout Alternative (also refer to Figures 5.3 & 5.4)
	<p>Ontario Road intersection and extending west to Avila Beach Drive while Ontario Road is proposed to be upgraded from Class III to Class II. Minimum of 5' shoulders are proposed along the widened sections of San Luis Bay Drive to within the study area to accommodate bicyclist.</p>	<p>Ontario Road intersection and extending west to Avila Beach Drive while Ontario Road is proposed to be upgraded from Class III to Class II. As bicyclist need to be accommodated, bicycles are accommodated at the West Roundabout by navigating through the roundabout in two ways. Cyclists may choose to take the travel lane and travel through the roundabout as a vehicle or may choose to take the separated bike ramp/shared use path and travel around the roundabout as a pedestrian.</p>
San Luis Bay Drive OC	<ul style="list-style-type: none"> <li>This alternative will require widening the south side of the existing OC of US 101 by 26'. Full structure replacement is not assumed at this time.</li> </ul>	<ul style="list-style-type: none"> <li>This alternative assumes that both roundabouts can be provided without modifying the existing OC.</li> </ul>
Potential Right-of-way Impacts	<ul style="list-style-type: none"> <li>Right-of-way impacts are not anticipated.</li> </ul>	<ul style="list-style-type: none"> <li>Would likely involve right-of-way take in the NW quadrant at the Ontario Road/San Luis Bay Drive intersection.</li> </ul>
Potential Utility Impacts	<ul style="list-style-type: none"> <li>Would likely require the relocation of overhead joint use utility poles along Ontario Road at San Luis Bay Drive.</li> </ul>	<ul style="list-style-type: none"> <li>Would likely require the relocation of overhead joint use utility poles along Ontario Road at San Luis Bay Drive.</li> </ul>
Safety	<p><b>Collision Cost Analysis</b>            Combined Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive Intersections:</p> <ul style="list-style-type: none"> <li>CMF – 0.8</li> <li>Average Collision Cost Reduction – 36%</li> <li>Reduction in Collisions – 20%</li> </ul> <p>US 101 SB Ramps/San Luis Bay Drive:</p> <ul style="list-style-type: none"> <li>CMF – 0.8</li> <li>Average Collision Cost Reduction – 36%</li> <li>Reduction in Collisions – 25%</li> </ul> <p><b>Number of Conflict Points</b></p>	<p><b>Collision Cost Analysis</b>            West Roundabout:</p> <ul style="list-style-type: none"> <li>CMF – 0.61</li> <li>Average Collision Cost Reduction – 81%</li> <li>Reduction in Collisions – 39%</li> </ul> <p>East Roundabout:</p> <ul style="list-style-type: none"> <li>CMF – 0.61</li> <li>Average Collision Cost Reduction – 81%</li> <li>Reduction in Collisions – 39%</li> </ul>



Intersections	Traffic Signal Alternative (also refer to Figure 5.2)	Roundabout Alternative (also refer to Figures 5.3 & 5.4)
	Combined Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive Intersections: <ul style="list-style-type: none"> <li>• 40 Conflict Points</li> </ul> US 101 SB Ramps/San Luis Bay Drive: <ul style="list-style-type: none"> <li>• 14 Conflict Points</li> </ul>	<b>Number of Conflict Points</b> Combined Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive Intersections: <ul style="list-style-type: none"> <li>• 10 Conflict Points</li> </ul> US 101 SB Ramps/San Luis Bay Drive: <ul style="list-style-type: none"> <li>• 6 Conflict Points</li> </ul>
Preliminary Capital Costs	<ul style="list-style-type: none"> <li>• Approximately \$4.86 Million</li> </ul>	<ul style="list-style-type: none"> <li>• Approximately \$5.23 Million (both West &amp; East Roundabouts)</li> </ul>

## 9. Non-Viable Build Alternative

The preceding alternatives analysis was prepared consistent with the California MUTCD 2014 Edition, Chapter 4C. Traffic Control Signal Needs, Section 4C.01 Studies and Factors for Justifying Traffic Control Signals. Per Section 4C.01, an engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location. This section also notes that on State highways, the engineering study shall include consideration of a roundabout. If a roundabout is determined to provide a viable and practical solution, it shall be studied in lieu of, or in addition to a traffic control signal.

During a meeting between the County and Caltrans held on March 26, 2019, the analysis and conclusions for both the Traffic Signal Alternative and Roundabout Alternative provided in the Draft US 101/San Luis Bay Drive ICE Step 1 report were reviewed. During this review, and in a subsequent email memo from Roger Barnes dated June 6, 2019 (copy provided in Appendix J), Caltrans concurred with the County that the Roundabout Alternative was not viable primarily due to potentially significant drainage impacts and environmental constraints especially in the northwest quadrant of the San Luis Bay Drive/Ontario Road intersection. As such, the Roundabout Alternative is not carried forward for further consideration as a viable build alternative.

## 10. Phasing Potential

The capacity assessment/analysis provided in Section 4 identified that both the No Build Alternative and the AWSC Alternative were projected to operate at peak hour LOS worse than the target LOS thresholds for both Interim Design Year (2030) and Ultimate Design Year (2045) conditions. The conclusion was that neither alternative represents a viable alternative for these conditions. The study intersection delay and LOS for both the Baseline and Interim Design Year conditions are provided in Table 16.



For the Traffic Signal Alternative capacity assessment/analysis, the study intersection controls are converted from existing control to a coordinated signalized intersection system between the three study intersections. For this alternative, one controller is assumed to control the traffic signal system between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections to provide for improved capacity, reduced delay and clear traffic between the two intersections. The Interim Design Year analysis initially assumed traffic signal control with existing approach geometrics at each of the study intersections. The weekday and Saturday PM peak hour analysis based on these assumptions projected that the Ontario Road/San Luis Bay Drive intersection would operate at LOS “E” during both peak hour periods as shown in Table 16. The analysis also projected that the US 101 SB Ramps/San Luis Bay Drive intersection would operate at LOS “D” during the Saturday PM peak hour as also shown in the table.

**Table 16: Phasing Potential – Alternatives LOS Comparison**

Baseline Conditions														
#	Intersection	Target LOS	No Build Alternative				AWSC Alternative				Traffic Signal Alternative <sup>1</sup>			
			PM Peak Hour		Saturday PM Peak Hour		PM Peak Hour		Saturday PM Peak Hour		PM Peak Hour		Saturday PM Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Ontario Road/ San Luis Bay Drive	D	19.7	C	16.0	C	12.6	B	15.1	C	31.8	C	29.3	C
2	US 101 SB Ramps/ San Luis Bay Drive	C	10.2	B	11.6	B	3.6	A	6.5	A	12.2	B	16.4	B
3	US 101 NB Ramps/ San Luis Bay Drive	C	23.3	C	18.7	C	7.5	A	8.5	A	8.6	A	9.1	A
Interim Design Year (2030)														
#	Intersection	Target LOS	No Build Alternative				AWSC Alternative				Traffic Signal Alternative <sup>1</sup>			
			PM Peak Hour		Saturday PM Peak Hour		PM Peak Hour		Saturday PM Peak Hour		PM Peak Hour		Saturday PM Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Ontario Road/ San Luis Bay Drive	D	92.8	<b>F</b>	62.3	<b>F</b>	98.9	<b>F</b>	72.9	<b>F</b>	68.1	<b>E</b>	62.4	<b>E</b>
2	US 101 SB Ramps/ San Luis Bay Drive	C	12.0	B	14.7	B	104.0	<b>F</b>	56.9	<b>F</b>	25.7	C	32.2	C
3	US 101 NB Ramps/ San Luis Bay Drive	C	247.3	<b>F</b>	106.8	<b>F</b>	49.8	<b>E</b>	17.7	C	18.6	B	22.4	C

1. Peak hour "Delay" and "LOS" with provision of traffic signals only with existing intersection geometrics.

**Bold** = LOS worse than "Target LOS"

As shown in Table 16, provision of AWSC (with existing intersection geometrics) at the three study intersections will not provide for acceptable intersection operations for the Interim Design Year conditions. Though the AWSC Alternative will not provide acceptable intersection operations, provision of AWSC is projected to operate at acceptable LOS based on the “Target LOS” at the study intersections as follows:

- Ontario Road/San Luis Bay Drive – Exceeds Target LOS D
  - Weekday PM Peak Hour – between 2025 and 2026
  - Saturday PM Peak Hour – between 2024 and 2025
- US 101 SB Ramps/San Luis Bay Drive – Exceeds Target LOS C
  - Weekday PM Peak Hour – between 2022 and 2023



- Saturday PM Peak Hour – between 2023 and 2024
- US 101 NB Ramps/San Luis Bay Drive – Exceeds Target LOS C
  - Weekday PM Peak Hour – between 2025 and 2026
  - Saturday PM Peak Hour – through 2030

Provision of AWSC would be cost effective at the Ontario Road/San Luis Bay Drive intersection in the short-term (up to 5-years) and would be expected to improve safety while longer term improvements are further analyzed and a preferred project is identified. A collision cost analysis was conducted based on AWSC which results in a CMF of 0.3 and an average reduction of \$98,500 (51%) per collision. A 69% reduction in collisions is also predicted with conversion of the intersection to AWSC.

As also shown in Table 16, provision of traffic signal control (with existing intersection geometrics) will provide for acceptable Interim Design Year intersection operations at both San Luis Bay Drive intersections with the US 101 SB Ramps and with the US 101 NB Ramps. The Ontario Road/San Luis Bay Drive intersection is projected to operate at LOS “E” during both PM peak hour periods, however, provision of the traffic signal is projected to operate acceptably as follows:

- Ontario Road/San Luis Bay Drive – Exceeds Target LOS D
  - Weekday PM Peak Hour – between 2028 and 2029
  - Saturday PM Peak Hour – between 2028 and 2029

The queuing analysis provided in Section 4 also indicated that this intersection will still provide sufficient storage to accommodate the projected queues and the signal system as a whole along San Luis Bay Drive is also projected to generally provide sufficient storage to accommodate the projected queues.

Because of the close spacing between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections, the Traffic Signal Alternative assumes that one controller will control the traffic signal system between these two intersections to provide for improved capacity and reduced delay. Installation of traffic signals at both the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections would likely occur at the same time and would provide improved operations and safety through the Interim Design Year. A collision cost analysis was conducted for the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections. Conversion of the intersection to traffic signal control results in a CMF of 0.8 and an average reduction of \$68,600 (36%) per collision. A 20% reduction in collisions is also predicted with conversion of the intersection to traffic signal control.

Provision of a traffic signal at the US 101 NB Ramps/San Luis Bay Drive could probably be deferred to a later construction phase.

## 11. Conclusions and Recommendation

The following four alternatives have been evaluated within this report:

- No Build
- All Way Stop Control (AWSC)



- Traffic Signal
- Roundabout (2045 Screening Assessment)

Section 9 in this report identified that the Roundabout Alternative was not viable due to potentially significant drainage impacts and environmental constraints especially in the northwest quadrant of the San Luis Bay Drive/Ontario Road intersection and this alternative is not carried forward for further consideration.

### **11.1 Baseline and Interim Design Year (2030) Conditions**

The capacity assessment/analysis provided in Section 4 identified that both the No Build Alternative and the AWSC Alternative currently operate at acceptable LOS for the Baseline Condition. Both the No Build Alternative and the AWSC Alternative were, however, projected to operate at peak hour LOS worse than the target LOS thresholds for the Interim Design Year (2030) Condition. The conclusion was that neither alternative represents a viable alternative for this condition. A phasing analysis provided in Section 9 however identified that provision of AWSC would operate acceptably at the Ontario Road/San Luis Bay Drive intersection through 2024/2025.

Provision of traffic signal control (Traffic Signal Alternative) was also evaluated for the Interim Design Year condition assuming existing intersection geometrics at the three study intersections. The capacity assessment/analysis provided in Section 4 identified that acceptable Interim Design Year intersection operations would be provided at both San Luis Bay Drive intersections with the US 101 SB Ramps and with the US 101 NB Ramps. The Ontario Road/San Luis Bay Drive intersection is projected to operate at LOS “E” during both PM peak hour period.

The phasing analysis provided in Section 9, however, identified that a traffic signal at the Ontario Road/San Luis Bay Drive is projected to operate at LOS “D” through 2028. The queuing analysis provided in Section 4 also indicated that this intersection will still provide sufficient storage to accommodate the projected queues and the signal system as a whole along San Luis Bay Drive is also projected to generally provide sufficient storage to accommodate the projected queues through the Interim Design Year. Because of the close spacing between the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections, the Traffic Signal Alternative assumes that one controller will control the traffic signal system between these two intersections. Installation of traffic signals at both the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections provided at the same time would improve operations and safety through the Interim Design Year.

Based on the analysis and conclusions provided in the report, it is recommended that provision of AWSC be provided at the Ontario Road/San Luis Bay Drive intersection as a cost effective, short-term improvement. Providing AWSC at this intersection would be expected to improve safety while viable longer term improvements are further analyzed and a preferred project is identified. A collision cost analysis was conducted based on AWSC which results in a CMF of 0.3 and an average reduction of \$98,500 (51%) per collision. A 69% reduction in collisions is also predicted with conversion of the intersection to AWSC.



## 11.2 Ultimate Design Year (2045) Conditions

The capacity assessment/analysis provided in Section 4 also identified that both the No Build Alternative and the AWSC Alternative were projected to operate at peak hour LOS worse than the target LOS thresholds for the Ultimate Design Year (2045) conditions. The conclusion was that neither alternative represents a viable alternative for this condition.

The capacity assessments/ analysis for the Traffic Signal Alternative identified that, with the traffic signals and identified roadway improvements, the target LOS can be met and projected 95<sup>th</sup> percentile queues accommodated. The collision cost analysis provided in Section 6 identified that this alternative would provide significant reductions in both the average cost per collision and number of collisions. In addition to calculating collision costs and projected saving for various intersection improvements. Caltrans Safety Performance/Collision Cost Analysis Tool also calculates Benefit/Cost (B/C) for various intersection improvements based on estimated capital costs.

Table 17A provides the calculated combined B/C ratio for both the Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive intersections using Caltrans Safety Performance/ Collision Cost Analysis Tool. The B/C ratios were calculated based on existing and forecasted traffic volumes, the historic intersection collision data provided in Section 6 and the preliminary opinion of probable capital costs. As shown in Table 17A, the Traffic Signal Alternative realizes a B/C ratio of 4.13.



**Table 17A: Ultimate Design Year - Ontario Road/San Luis Bay Drive and US 101 SB Ramps/San Luis Bay Drive Intersections Combined Collision Cost Analysis and B/C**

Intersection Control Evaluation Collision Cost Analysis and B/C -- Fill in tan boxes along with 'Area' --							
County	Rte	Postmile	Location Description				
SLO	Local		Ontario Rd & US 101 SB Ramps				
Existing Condition			# of Years for Analysis	Rate Group			
Stop Control (Minor Leg), Type F, M or S			25	112			
Existing ADT (x1000)		Future ADT (x1000)					
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF		
6.0	2.0	12.4	3.7	12.1	1.51		
Est. Capital Cost (x1000) for Desired Improvement				Existing Collision Data			
Desired Improvement	Const	R/W	Total	Number of Years	5	Total Collisions	26
Yield Control (Roundabout 1-Lane)	N/A		\$ -	Injury	14	PDO	12
Yield Control (Roundabout 2-Lane)	N/A		\$ -	Fatal	0	Fat + Inj	14
Traffic Signal, Type F, M or S	\$ 4,330	\$ 100	\$ 4,430				
Collision Cost (x1000)							B/C
	Existing Condition	Desired Improvement		Projected Savings			
<b>1</b>	Stop Control (Minor Leg), Type F, M or S	\$37,612	Traffic Signal, Type F, M or S	\$19,333	\$18,279		4.13

**NOTE: Only average collision costs are used for calculation purposes.**

Table 17B provides the calculated combined B/C ratio for the US 101 NB Ramps/San Luis Bay Drive intersection. As shown in Table 17B, the Traffic Signal Alternateve realizes a B/C ratio of -1.58. The negative B/C ratio is based on projected savings being less than the capital cost.



**Table 17B: Ultimate Design Year - US 101 NB Ramps/San Luis Bay Drive Intersection Collision Cost Analysis and B/C**

Intersection Control Evaluation Collision Cost Analysis and B/C							
-- Fill in tan boxes along with 'Area' --							
County	Rte	Postmile	Location Description				
Slo	101		I/S of NB Ramps/San Luis Bay Dr.				
Existing Condition			# of Years for Analysis	Rate Group			
Stop Control (Minor Leg), Type F, M or S			25	I12			
Existing ADT (x1000)			Future ADT (x1000)				
Mainline	Cross St	Mainline	Cross St	Average ADT		VCF	
5.0	0.4	10.0	1.2	8.3		1.54	
Est. Capital Cost (x1000) for Desired Improvement				Existing Collision Data			
Desired Improvement	Const	R/W	Total	Number of Years	5	Total Collisions	1
Yield Control (Roundabout 1-Lane)	N/A		\$ -	Injury	1	PDO	0
Yield Control (Roundabout 2-Lane)	N/A		\$ -	Fatal	0	Fat + Inj	1
Traffic Signal, Type F, M or S	\$ 432	\$ -	\$ 432				
Collision Cost (x1000)							B/C
	Existing Condition		Desired Improvement		Projected Savings		
<b>1</b>	Stop Control (Minor Leg), Type F, M or S	\$1,535	Traffic Signal, Type F, M or S	\$2,219	(\$684)		-1.58

NOTE: Only average collision costs are used for calculation purposes.

An ICE Step 2 evaluation will need to be performed to arrive at a more affirmative recommendation that the Traffic Signal Alternative represents the preferred Ultimate Design Year alternative. Under this step, additional analysis that will assist with providing this recommendation will be performed including, but not limited to, the following:

- Signal warrant analysis for the three study intersections
- Life-cycle cost analysis



## **Appendix Index**

Appendix A	Level of Service (LOS) Definitions
Appendix B	No Build Alternative Synchro/Sim-Traffic Reports
Appendix C	All Way Stop Control (AWSC) Alternative Synchro/Sim-Traffic Reports
Appendix D	Traffic Signal Alternative Synchro/Sim-Traffic Reports
Appendix E	Roundabout Alternative Sidra Reports
Appendix F	Traffic Signal Alternative Truck Turn Exhibits (To be provided)
Appendix G	Roundabout Alternative Fast Path and Truck Turn Exhibits
Appendix H	Existing Utilities Exhibit
Appendix I	Preliminary Opinion of Probable Capital Cost Estimates
Appendix J	Caltrans June 6, 2019 Email Memo



# **Appendix A**

## **Level of Service (LOS) Definitions**



**Table A1  
Level of Service (LOS) Definitions**

Level of Service	Type of Flow	Delay	Maneuverability	Stopped Delay/Vehicle		
				Signalized	Un-signalized	All-Way Stop
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	<10.0	<10.0	<10.0
B	Stable Flow	Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	>10.0	>10.0	>10.0
				and <20.0	and <15.0	and <15.0
C	Stable Flow	Higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted	>20.0	>15.0	>15.0
				and <35.0	and <25.0	and <25.0
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	>35.0	>25.0	>25.0
				and <55.0	and <35.0	and <35.0
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	>55.0	>35.0	>35.0
				and <80.0	and <50.0	and <50.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	>80.0	>50.0	>50.0



# **Appendix B**

## **No Build Alternative**

### **Synchro/Sim-Traffic Reports**

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	409	5	25	233	7	3	7	28	26	37	31
Future Vol, veh/h	12	409	5	25	233	7	3	7	28	26	37	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	465	6	28	265	8	3	8	32	30	42	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	273	0	0	471	0	0	860	825	468	841	824	269
Stage 1	-	-	-	-	-	-	496	496	-	325	325	-
Stage 2	-	-	-	-	-	-	364	329	-	516	499	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1290	-	-	1091	-	-	276	308	595	284	308	770
Stage 1	-	-	-	-	-	-	556	545	-	687	649	-
Stage 2	-	-	-	-	-	-	655	646	-	542	544	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1290	-	-	1091	-	-	227	294	595	254	294	770
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	294	-	254	294	-
Stage 1	-	-	-	-	-	-	548	537	-	677	630	-
Stage 2	-	-	-	-	-	-	566	627	-	498	536	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.8			13.8			19.7		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	452	1290	-	-	1091	-	-	350
HCM Lane V/C Ratio	0.096	0.011	-	-	0.026	-	-	0.305
HCM Control Delay (s)	13.8	7.8	0	-	8.4	0	-	19.7
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	1.3

HCM 6th TWSC  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions  
PM Peak

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	437	25	15	24	0	0	0	0	32	2	240
Future Vol, veh/h	0	437	25	15	24	0	0	0	0	32	2	240
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	502	29	17	28	0	0	0	0	37	2	276

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	531	0	0		579	593	28
Stage 1	-	-	-	-	-	-		62	62	-
Stage 2	-	-	-	-	-	-		517	531	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1036	-	0		477	418	1047
Stage 1	0	-	-	-	-	0		961	843	-
Stage 2	0	-	-	-	-	0		598	526	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	1036	-	-		469	0	1047
Mov Cap-2 Maneuver	-	-	-	-	-	-		469	0	-
Stage 1	-	-	-	-	-	-		945	0	-
Stage 2	-	-	-	-	-	-		598	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	3.3	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	1036	-	469	1047
HCM Lane V/C Ratio	-	-	0.017	-	0.083	0.263
HCM Control Delay (s)	-	-	8.5	0	13.4	9.7
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0.1	-	0.3	1.1

Intersection												
Int Delay, s/veh	7.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	403	66	0	0	15	19	24	0	10	0	0	0
Future Vol, veh/h	403	66	0	0	15	19	24	0	10	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	463	76	0	0	17	22	28	0	11	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	39	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1571	0	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1571	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	7.1	0	23.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	236	1571	-	-	-
HCM Lane V/C Ratio	0.166	0.295	-	-	-
HCM Control Delay (s)	23.3	8.2	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	0.6	1.2	-	-	-

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:15	4:15	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	874	968	878	846	877	887
Vehs Exited	877	963	881	843	873	888
Starting Vehs	10	9	9	11	5	7
Ending Vehs	7	14	6	14	9	7
Travel Distance (mi)	254	281	253	242	253	257
Travel Time (hr)	9.9	11.1	9.9	9.4	10.0	10.1
Total Delay (hr)	1.6	1.9	1.6	1.5	1.6	1.7
Total Stops	452	526	495	439	469	476
Fuel Used (gal)	11.3	12.5	11.4	11.1	11.2	11.5

Interval #0 Information Seeding

Start Time	4:15
End Time	4:30
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:30
End Time	5:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	874	968	878	846	877	887
Vehs Exited	877	963	881	843	873	888
Starting Vehs	10	9	9	11	5	7
Ending Vehs	7	14	6	14	9	7
Travel Distance (mi)	254	281	253	242	253	257
Travel Time (hr)	9.9	11.1	9.9	9.4	10.0	10.1
Total Delay (hr)	1.6	1.9	1.6	1.5	1.6	1.7
Total Stops	452	526	495	439	469	476
Fuel Used (gal)	11.3	12.5	11.4	11.1	11.2	11.5

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	21	49	51	56
Average Queue (ft)	1	14	21	23
95th Queue (ft)	9	40	45	45
Link Distance (ft)	409	42	740	666
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		1		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	WB	SB	SB
Directions Served	LT	LT	R
Maximum Queue (ft)	26	54	87
Average Queue (ft)	4	21	38
95th Queue (ft)	19	45	67
Link Distance (ft)	460		647
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	NB
Directions Served	LT	LTR
Maximum Queue (ft)	58	57
Average Queue (ft)	13	20
95th Queue (ft)	43	47
Link Distance (ft)	460	810
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

Network wide Queuing Penalty: 1
---------------------------------

HCM 6th TWSC  
1: Ontario Rd & San Luis Bay Dr

Existing Conditions  
Saturday Peak Hour

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	281	14	16	480	7	8	13	40	11	9	28
Future Vol, veh/h	15	281	14	16	480	7	8	13	40	11	9	28
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	290	14	16	495	7	8	13	41	11	9	29

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	502	0	0	304	0	0	877	861	297	885	865	499
Stage 1	-	-	-	-	-	-	327	327	-	531	531	-
Stage 2	-	-	-	-	-	-	550	534	-	354	334	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1062	-	-	1257	-	-	269	293	742	266	292	572
Stage 1	-	-	-	-	-	-	686	648	-	532	526	-
Stage 2	-	-	-	-	-	-	519	524	-	663	643	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1062	-	-	1257	-	-	242	283	742	236	282	572
Mov Cap-2 Maneuver	-	-	-	-	-	-	242	283	-	236	282	-
Stage 1	-	-	-	-	-	-	674	637	-	523	517	-
Stage 2	-	-	-	-	-	-	475	515	-	603	632	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.3			14.1			16		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	459	1062	-	-	1257	-	-	377
HCM Lane V/C Ratio	0.137	0.015	-	-	0.013	-	-	0.131
HCM Control Delay (s)	14.1	8.4	0	-	7.9	0	-	16
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0.4

HCM 6th TWSC  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions  
 Saturday Peak Hour

Intersection												
Int Delay, s/veh	6.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	317	15	14	61	0	0	0	0	24	5	442
Future Vol, veh/h	0	317	15	14	61	0	0	0	0	24	5	442
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	330	16	15	64	0	0	0	0	25	5	460

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	346	0	0		432	440	64
Stage 1	-	-	-	-	-	-		94	94	-
Stage 2	-	-	-	-	-	-		338	346	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1213	-	0		581	511	1000
Stage 1	0	-	-	-	-	0		930	817	-
Stage 2	0	-	-	-	-	0		722	635	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	1213	-	-		573	0	1000
Mov Cap-2 Maneuver	-	-	-	-	-	-		573	0	-
Stage 1	-	-	-	-	-	-		918	0	-
Stage 2	-	-	-	-	-	-		722	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.5	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	1213	-	573	1000
HCM Lane V/C Ratio	-	-	0.012	-	0.053	0.46
HCM Control Delay (s)	-	-	8	0	11.6	11.6
HCM Lane LOS	-	-	A	A	B	B
HCM 95th %tile Q(veh)	-	-	0	-	0.2	2.5

HCM 6th TWSC  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Existing Conditions  
 Saturday Peak Hour

Intersection												
Int Delay, s/veh	8.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	321	20	0	0	19	21	56	0	6	0	0	0
Future Vol, veh/h	321	20	0	0	19	21	56	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	338	21	0	0	20	22	59	0	6	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	42	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1567	0	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1567	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	7.5	0	18.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	328	1567	-	-	-
HCM Lane V/C Ratio	0.199	0.216	-	-	-
HCM Control Delay (s)	18.7	7.9	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	0.7	0.8	-	-	-

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	1:00	1:00	1:00	1:00	1:00	1:00
End Time	2:15	2:15	2:15	2:15	2:15	2:15
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1009	999	991	1009	981	997
Vehs Exited	1011	994	994	1010	977	997
Starting Vehs	13	10	15	13	6	9
Ending Vehs	11	15	12	12	10	12
Travel Distance (mi)	279	274	272	279	269	275
Travel Time (hr)	11.8	11.4	11.2	11.5	11.3	11.4
Total Delay (hr)	2.2	1.9	1.9	1.9	2.0	2.0
Total Stops	704	686	685	705	692	696
Fuel Used (gal)	13.5	13.3	13.2	13.6	13.1	13.4

Interval #0 Information Seeding

Start Time	1:00
End Time	1:15
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	1:15
End Time	2:15
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1009	999	991	1009	981	997
Vehs Exited	1011	994	994	1010	977	997
Starting Vehs	13	10	15	13	6	9
Ending Vehs	11	15	12	12	10	12
Travel Distance (mi)	279	274	272	279	269	275
Travel Time (hr)	11.8	11.4	11.2	11.5	11.3	11.4
Total Delay (hr)	2.2	1.9	1.9	1.9	2.0	2.0
Total Stops	704	686	685	705	692	696
Fuel Used (gal)	13.5	13.3	13.2	13.6	13.1	13.4

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	21	51	65	38
Average Queue (ft)	1	16	27	13
95th Queue (ft)	11	43	51	28
Link Distance (ft)	409	42	740	666
Upstream Blk Time (%)		1		
Queuing Penalty (veh)		4		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	R
Maximum Queue (ft)	20	32	41	158
Average Queue (ft)	1	4	17	66
95th Queue (ft)	7	20	40	123
Link Distance (ft)	42	460		647
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)			100	
Storage Blk Time (%)				2
Queuing Penalty (veh)				0

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	NB
Directions Served	LT	LTR
Maximum Queue (ft)	60	62
Average Queue (ft)	15	30
95th Queue (ft)	44	52
Link Distance (ft)	460	810
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

Network wide Queuing Penalty: 4
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Intersection												
Int Delay, s/veh	14.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	728	13	71	288	14	12	13	79	24	58	87
Future Vol, veh/h	17	728	13	71	288	14	12	13	79	24	58	87
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	791	14	77	313	15	13	14	86	26	63	95

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	328	0	0	805	0	0	1388	1316	798	1359	1316	321
Stage 1	-	-	-	-	-	-	834	834	-	475	475	-
Stage 2	-	-	-	-	-	-	554	482	-	884	841	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1232	-	-	819	-	-	120	158	386	126	158	720
Stage 1	-	-	-	-	-	-	362	383	-	570	557	-
Stage 2	-	-	-	-	-	-	517	553	-	340	380	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1232	-	-	819	-	-	60	136	386	81	136	720
Mov Cap-2 Maneuver	-	-	-	-	-	-	60	136	-	81	136	-
Stage 1	-	-	-	-	-	-	352	373	-	555	493	-
Stage 2	-	-	-	-	-	-	347	489	-	247	370	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1.9			41.2			92.8		
HCM LOS							E			F		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	208	1232	-	-	819	-	-	200
HCM Lane V/C Ratio	0.543	0.015	-	-	0.094	-	-	0.918
HCM Control Delay (s)	41.2	8	0	-	9.9	0	-	92.8
HCM Lane LOS	E	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	2.9	0	-	-	0.3	-	-	7.3

HCM 6th TWSC  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 No Build  
 PM Peak

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	711	119	15	78	0	0	0	0	42	8	295
Future Vol, veh/h	0	711	119	15	78	0	0	0	0	42	8	295
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	773	129	16	85	0	0	0	0	46	9	321

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	902	0	0		955	1019	85
Stage 1	-	-	-	-	-	-		117	117	-
Stage 2	-	-	-	-	-	-		838	902	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	754	-	0		287	237	974
Stage 1	0	-	-	-	-	0		908	799	-
Stage 2	0	-	-	-	-	0		424	356	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	754	-	-		281	0	974
Mov Cap-2 Maneuver	-	-	-	-	-	-		281	0	-
Stage 1	-	-	-	-	-	-		888	0	-
Stage 2	-	-	-	-	-	-		424	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.6	12
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	754	-	281	974
HCM Lane V/C Ratio	-	-	0.022	-	0.193	0.329
HCM Control Delay (s)	-	-	9.9	0	20.9	10.5
HCM Lane LOS	-	-	A	A	C	B
HCM 95th %tile Q(veh)	-	-	0.1	-	0.7	1.4

Intersection												
Int Delay, s/veh	31.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	687	66	0	0	41	41	52	8	29	0	0	0
Future Vol, veh/h	687	66	0	0	41	41	52	8	29	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	747	72	0	0	45	45	57	9	32	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	90	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1505	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1505	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.9	0	247.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	82	1505	-	-	-
HCM Lane V/C Ratio	1.18	0.496	-	-	-
HCM Control Delay (s)	247.3	9.7	0	-	-
HCM Lane LOS	F	A	A	-	-
HCM 95th %tile Q(veh)	7	2.9	-	-	-

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

Intersection												
Int Delay, s/veh	10.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	22	468	36	44	567	13	31	25	112	14	17	76
Future Vol, veh/h	22	468	36	44	567	13	31	25	112	14	17	76
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	509	39	48	616	14	34	27	122	15	18	83

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	630	0	0	548	0	0	1347	1303	529	1370	1315	623
Stage 1	-	-	-	-	-	-	577	577	-	719	719	-
Stage 2	-	-	-	-	-	-	770	726	-	651	596	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	952	-	-	1021	-	-	128	161	550	124	158	486
Stage 1	-	-	-	-	-	-	502	502	-	420	433	-
Stage 2	-	-	-	-	-	-	393	430	-	457	492	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	952	-	-	1021	-	-	88	144	550	76	141	486
Mov Cap-2 Maneuver	-	-	-	-	-	-	88	144	-	76	141	-
Stage 1	-	-	-	-	-	-	484	484	-	405	401	-
Stage 2	-	-	-	-	-	-	288	399	-	324	474	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.6			62.3			35.2		
HCM LOS							F			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	230	952	-	-	1021	-	-	232
HCM Lane V/C Ratio	0.794	0.025	-	-	0.047	-	-	0.501
HCM Control Delay (s)	62.3	8.9	0	-	8.7	0	-	35.2
HCM Lane LOS	F	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	5.8	0.1	-	-	0.1	-	-	2.6

HCM 6th TWSC  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 No Build  
Saturday Peak

Intersection												
Int Delay, s/veh	6.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	518	76	18	120	0	0	0	0	32	18	504
Future Vol, veh/h	0	518	76	18	120	0	0	0	0	32	18	504
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	563	83	20	130	0	0	0	0	35	20	548

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	646	0	0		775	816	130
Stage 1	-	-	-	-	-	-		170	170	-
Stage 2	-	-	-	-	-	-		605	646	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	939	-	0		366	311	920
Stage 1	0	-	-	-	-	0		860	758	-
Stage 2	0	-	-	-	-	0		545	467	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	939	-	-		358	0	920
Mov Cap-2 Maneuver	-	-	-	-	-	-		358	0	-
Stage 1	-	-	-	-	-	-		840	0	-
Stage 2	-	-	-	-	-	-		545	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.2	14.7
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	939	-	358	920
HCM Lane V/C Ratio	-	-	0.021	-	0.152	0.595
HCM Control Delay (s)	-	-	8.9	0	16.8	14.5
HCM Lane LOS	-	-	A	A	C	B
HCM 95th %tile Q(veh)	-	-	0.1	-	0.5	4.1

HCM 6th TWSC  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2030 No Build  
 Saturday Peak

Intersection												
Int Delay, s/veh	22.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	515	35	0	0	41	42	97	0	20	0	0	0
Future Vol, veh/h	515	35	0	0	41	42	97	0	20	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	560	38	0	0	45	46	105	0	22	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	91	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1504	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1504	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	8.2	0	106.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	144	1504	-	-	-
HCM Lane V/C Ratio	0.883	0.372	-	-	-
HCM Control Delay (s)	106.8	8.8	0	-	-
HCM Lane LOS	F	A	A	-	-
HCM 95th %tile Q(veh)	5.9	1.8	-	-	-

Intersection												
Int Delay, s/veh	116											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	22	865	17	94	320	16	17	17	105	28	72	110
Future Vol, veh/h	22	865	17	94	320	16	17	17	105	28	72	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	940	18	102	348	17	18	18	114	30	78	120

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	365	0	0	958	0	0	1657	1566	949	1624	1567	357
Stage 1	-	-	-	-	-	-	997	997	-	561	561	-
Stage 2	-	-	-	-	-	-	660	569	-	1063	1006	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1194	-	-	718	-	-	78	111	316	82	111	687
Stage 1	-	-	-	-	-	-	294	322	-	512	510	-
Stage 2	-	-	-	-	-	-	452	506	-	270	319	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1194	-	-	718	-	-	~ 12	87	316	37	87	687
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 12	87	-	37	87	-
Stage 1	-	-	-	-	-	-	281	308	-	490	419	-
Stage 2	-	-	-	-	-	-	249	415	-	155	305	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	2.4	\$ 645.6	\$ 496.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	71	1194	-	-	718	-	-	120
HCM Lane V/C Ratio	2.128	0.02	-	-	0.142	-	-	1.902
HCM Control Delay (s)	\$ 645.6	8.1	0	-	10.8	0	-	\$ 496.6
HCM Lane LOS	F	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	14	0.1	-	-	0.5	-	-	18.2

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

HCM 6th TWSC  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 No Build  
 PM Peak

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	843	155	22	99	0	0	0	0	50	11	331
Future Vol, veh/h	0	843	155	22	99	0	0	0	0	50	11	331
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	916	168	24	108	0	0	0	0	54	12	360

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	1084	0	0		1156	1240	108
Stage 1	-	-	-	-	-	-		156	156	-
Stage 2	-	-	-	-	-	-		1000	1084	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	643	-	0		217	175	946
Stage 1	0	-	-	-	-	0		872	769	-
Stage 2	0	-	-	-	-	0		356	293	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	643	-	-		208	0	946
Mov Cap-2 Maneuver	-	-	-	-	-	-		208	0	-
Stage 1	-	-	-	-	-	-		837	0	-
Stage 2	-	-	-	-	-	-		356	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	2	14.1
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	643	-	208	946
HCM Lane V/C Ratio	-	-	0.037	-	0.319	0.38
HCM Control Delay (s)	-	-	10.8	0	30.2	11.1
HCM Lane LOS	-	-	B	A	D	B
HCM 95th %tile Q(veh)	-	-	0.1	-	1.3	1.8

HCM 6th TWSC  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2045 No Build  
PM Peak

Intersection												
Int Delay, s/veh	127.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	815	78	0	0	55	50	66	11	39	0	0	0
Future Vol, veh/h	815	78	0	0	55	50	66	11	39	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	886	85	0	0	60	54	72	12	42	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	114	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1475	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1475	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.1	0	\$ 1142.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	41	1475	-	-	-
HCM Lane V/C Ratio	3.075	0.601	-	-	-
HCM Control Delay (s)	\$ 1142.5	11	0	-	-
HCM Lane LOS	F	B	A	-	-
HCM 95th %tile Q(veh)	14	4.3	-	-	-

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

Intersection												
Int Delay, s/veh	91											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	28	596	50	61	663	17	44	33	155	17	22	105
Future Vol, veh/h	28	596	50	61	663	17	44	33	155	17	22	105
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	30	648	54	66	721	18	48	36	168	18	24	114

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	739	0	0	702	0	0	1666	1606	675	1699	1624	730
Stage 1	-	-	-	-	-	-	735	735	-	862	862	-
Stage 2	-	-	-	-	-	-	931	871	-	837	762	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	867	-	-	895	-	-	77	105	454	73	102	422
Stage 1	-	-	-	-	-	-	411	425	-	350	372	-
Stage 2	-	-	-	-	-	-	320	368	-	361	414	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	867	-	-	895	-	-	~ 38	87	454	27	84	422
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 38	87	-	27	84	-
Stage 1	-	-	-	-	-	-	388	401	-	330	325	-
Stage 2	-	-	-	-	-	-	189	322	-	195	390	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.8	\$ 558.4	225.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	123	867	-	-	895	-	-	126
HCM Lane V/C Ratio	2.05	0.035	-	-	0.074	-	-	1.242
HCM Control Delay (s)	\$ 558.4	9.3	0	-	9.3	0	-	225.7
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	20.7	0.1	-	-	0.2	-	-	9.8

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

HCM 6th TWSC  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 No Build  
 Saturday Peak

Intersection												
Int Delay, s/veh	8.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	652	116	22	158	0	0	0	0	39	28	583
Future Vol, veh/h	0	652	116	22	158	0	0	0	0	39	28	583
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	709	126	24	172	0	0	0	0	42	30	634

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	835	0	0		992	1055	172
Stage 1	-	-	-	-	-	-		220	220	-
Stage 2	-	-	-	-	-	-		772	835	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	798	-	0		272	226	872
Stage 1	0	-	-	-	-	0		817	721	-
Stage 2	0	-	-	-	-	0		456	383	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	798	-	-		263	0	872
Mov Cap-2 Maneuver	-	-	-	-	-	-		263	0	-
Stage 1	-	-	-	-	-	-		790	0	-
Stage 2	-	-	-	-	-	-		456	0	-

Approach	EB		WB		SB	
HCM Control Delay, s	0		1.2		19.8	
HCM LOS					C	

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	798	-	263	872
HCM Lane V/C Ratio	-	-	0.03	-	0.277	0.727
HCM Control Delay (s)	-	-	9.7	0	23.8	19.3
HCM Lane LOS	-	-	A	A	C	C
HCM 95th %tile Q(veh)	-	-	0.1	-	1.1	6.5

HCM 6th TWSC  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2045 No Build  
 Saturday Peak

Intersection												
Int Delay, s/veh	109.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	652	39	0	0	57	55	123	0	28	0	0	0
Future Vol, veh/h	652	39	0	0	57	55	123	0	28	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	709	42	0	0	62	60	134	0	30	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	122	0	- - - 0 1552 1582 42
Stage 1	-	-	- - - 1460 1460 -
Stage 2	-	-	- - - 92 122 -
Critical Hdwy	4.12	-	- - - 6.42 6.52 6.22
Critical Hdwy Stg 1	-	-	- - - 5.42 5.52 -
Critical Hdwy Stg 2	-	-	- - - 5.42 5.52 -
Follow-up Hdwy	2.218	-	- - - 3.518 4.018 3.318
Pot Cap-1 Maneuver	1465	- 0 0	- - ~ 125 109 1029
Stage 1	-	- 0 0	- - 213 194 -
Stage 2	-	- 0 0	- - 932 795 -
Platoon blocked, %	-	-	- -
Mov Cap-1 Maneuver	1465	- - - -	- ~ 63 0 1029
Mov Cap-2 Maneuver	-	- - - -	- ~ 63 0 -
Stage 1	-	- - - -	- ~ 107 0 -
Stage 2	-	- - - -	- 932 0 -

Approach	EB	WB	NB
HCM Control Delay, s	9.2	0	\$ 651.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	76	1465	-	-	-
HCM Lane V/C Ratio	2.16	0.484	-	-	-
HCM Control Delay (s)	\$ 651.1	9.7	0	-	-
HCM Lane LOS	F	A	A	-	-
HCM 95th %tile Q(veh)	15.1	2.7	-	-	-

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



**Appendix C**  
**All Way Stop Control (AWSC) Alternative**  
**Synchro/Sim-Traffic Reports**

Intersection	
Intersection Delay, s/veh	12.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	409	5	25	233	7	3	7	28	26	37	31
Future Vol, veh/h	12	409	5	25	233	7	3	7	28	26	37	31
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	445	5	27	253	8	3	8	30	28	40	34
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.5	11	8.9	9.7
HCM LOS	B	B	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	3%	9%	28%
Vol Thru, %	18%	96%	88%	39%
Vol Right, %	74%	1%	3%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	38	426	265	94
LT Vol	3	12	25	26
Through Vol	7	409	233	37
RT Vol	28	5	7	31
Lane Flow Rate	41	463	288	102
Geometry Grp	1	1	1	1
Degree of Util (X)	0.063	0.599	0.388	0.161
Departure Headway (Hd)	5.509	4.657	4.85	5.656
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	653	769	735	638
Service Time	3.514	2.73	2.932	3.657
HCM Lane V/C Ratio	0.063	0.602	0.392	0.16
HCM Control Delay	8.9	14.5	11	9.7
HCM Lane LOS	A	B	B	A
HCM 95th-tile Q	0.2	4.1	1.8	0.6

HCM 6th TWSC  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions with AWSC  
PM Peak

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↷	↶
Traffic Vol, veh/h	0	437	25	5	61	0	0	0	0	32	2	240
Future Vol, veh/h	0	437	25	5	61	0	0	0	0	32	2	240
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	475	27	5	66	0	0	0	0	35	2	261

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	502	0	0		565	578	66
Stage 1	-	-	-	-	-	-		76	76	-
Stage 2	-	-	-	-	-	-		489	502	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1062	-	0		486	427	998
Stage 1	0	-	-	-	-	0		947	832	-
Stage 2	0	-	-	-	-	0		616	542	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	1062	-	-		484	0	998
Mov Cap-2 Maneuver	-	-	-	-	-	-		484	0	-
Stage 1	-	-	-	-	-	-		942	0	-
Stage 2	-	-	-	-	-	-		616	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.6	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	1062	-	484	998
HCM Lane V/C Ratio	-	-	0.005	-	0.076	0.261
HCM Control Delay (s)	-	-	8.4	0	13.1	9.9
HCM Lane LOS	-	-	A	A	B	A
HCM 95th %tile Q(veh)	-	-	0	-	0.2	1.1

HCM 6th TWSC  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Existing Conditions with AWSC  
 PM Peak

Intersection												
Int Delay, s/veh	7.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	403	66	0	0	15	19	24	0	10	0	0	0
Future Vol, veh/h	403	66	0	0	15	19	24	0	10	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	438	72	0	0	16	21	26	0	11	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	37	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1574	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1574	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	7	0	21.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	259	1574	-	-	-
HCM Lane V/C Ratio	0.143	0.278	-	-	-
HCM Control Delay (s)	21.2	8.2	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	0.5	1.1	-	-	-

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:15	4:15	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	895	914	961	980	958	940
Vehs Exited	899	913	961	984	959	943
Starting Vehs	14	12	12	12	8	10
Ending Vehs	10	13	12	8	7	9
Travel Distance (mi)	250	259	271	278	268	265
Travel Time (hr)	11.9	12.3	12.8	13.4	12.8	12.6
Total Delay (hr)	3.8	4.0	4.2	4.4	4.1	4.1
Total Stops	1083	1098	1138	1168	1161	1128
Fuel Used (gal)	12.5	12.8	13.4	13.8	13.3	13.2

Interval #0 Information Seeding

Start Time	4:15
End Time	4:30
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:30
End Time	5:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	895	914	961	980	958	940
Vehs Exited	899	913	961	984	959	943
Starting Vehs	14	12	12	12	8	10
Ending Vehs	10	13	12	8	7	9
Travel Distance (mi)	250	259	271	278	268	265
Travel Time (hr)	11.9	12.3	12.8	13.4	12.8	12.6
Total Delay (hr)	3.8	4.0	4.2	4.4	4.1	4.1
Total Stops	1083	1098	1138	1168	1161	1128
Fuel Used (gal)	12.5	12.8	13.4	13.8	13.3	13.2

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	136	69	51	54
Average Queue (ft)	70	46	21	20
95th Queue (ft)	105	65	44	38
Link Distance (ft)	409	42	740	666
Upstream Blk Time (%)		7		
Queuing Penalty (veh)		22		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	WB	SB	SB
Directions Served	LT	LT	R
Maximum Queue (ft)	40	54	104
Average Queue (ft)	3	20	46
95th Queue (ft)	21	46	84
Link Distance (ft)	460		647
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)			1
Queuing Penalty (veh)			0

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	NB
Directions Served	LT	LTR
Maximum Queue (ft)	66	53
Average Queue (ft)	16	20
95th Queue (ft)	50	47
Link Distance (ft)	460	810
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

Network wide Queuing Penalty: 22

Intersection	
Intersection Delay, s/veh	15.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	281	14	16	480	7	8	13	40	11	9	28
Future Vol, veh/h	15	281	14	16	480	7	8	13	40	11	9	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	305	15	17	522	8	9	14	43	12	10	30
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12	18.2	9.4	9.4
HCM LOS	B	C	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	13%	5%	3%	23%
Vol Thru, %	21%	91%	95%	19%
Vol Right, %	66%	5%	1%	58%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	61	310	503	48
LT Vol	8	15	16	11
Through Vol	13	281	480	9
RT Vol	40	14	7	28
Lane Flow Rate	66	337	547	52
Geometry Grp	1	1	1	1
Degree of Util (X)	0.106	0.454	0.705	0.085
Departure Headway (Hd)	5.747	4.851	4.645	5.846
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	627	735	771	616
Service Time	3.75	2.937	2.72	3.849
HCM Lane V/C Ratio	0.105	0.459	0.709	0.084
HCM Control Delay	9.4	12	18.2	9.4
HCM Lane LOS	A	B	C	A
HCM 95th-tile Q	0.4	2.4	5.9	0.3

HCM 6th TWSC  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions with AWSC  
 Saturday Peak

Intersection												
Int Delay, s/veh	6.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↻			↻						↻	↻
Traffic Vol, veh/h	0	317	15	14	61	0	0	0	0	24	5	442
Future Vol, veh/h	0	317	15	14	61	0	0	0	0	24	5	442
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop							
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	345	16	15	66	0	0	0	0	26	5	480

Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	-	0	0	361	0	0		449	457	66
Stage 1	-	-	-	-	-	-		96	96	-
Stage 2	-	-	-	-	-	-		353	361	-
Critical Hdwy	-	-	-	4.12	-	-		6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-		5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-		5.42	5.52	-
Follow-up Hdwy	-	-	-	2.218	-	-		3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1198	-	0		568	500	998
Stage 1	0	-	-	-	-	0		928	815	-
Stage 2	0	-	-	-	-	0		711	626	-
Platoon blocked, %	-	-	-	-	-	-		-	-	-
Mov Cap-1 Maneuver	-	-	-	1198	-	-		561	0	998
Mov Cap-2 Maneuver	-	-	-	-	-	-		561	0	-
Stage 1	-	-	-	-	-	-		916	0	-
Stage 2	-	-	-	-	-	-		711	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.5	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	1198	-	561	998
HCM Lane V/C Ratio	-	-	0.013	-	0.056	0.481
HCM Control Delay (s)	-	-	8	0	11.8	11.9
HCM Lane LOS	-	-	A	A	B	B
HCM 95th %tile Q(veh)	-	-	0	-	0.2	2.7

HCM 6th TWSC  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Existing Conditions with AWSC  
 Saturday Peak

Intersection												
Int Delay, s/veh	8.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	321	20	0	0	19	21	56	0	6	0	0	0
Future Vol, veh/h	321	20	0	0	19	21	56	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	349	22	0	0	21	23	61	0	7	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	44	0	- - - 0 753 764 22
Stage 1	-	-	- - - 720 720 -
Stage 2	-	-	- - - 33 44 -
Critical Hdwy	4.12	-	- - - 6.42 6.52 6.22
Critical Hdwy Stg 1	-	-	- - - 5.42 5.52 -
Critical Hdwy Stg 2	-	-	- - - 5.42 5.52 -
Follow-up Hdwy	2.218	-	- - - 3.518 4.018 3.318
Pot Cap-1 Maneuver	1564	-	0 0 - - 377 334 1055
Stage 1	-	-	0 0 - - 482 432 -
Stage 2	-	-	0 0 - - 989 858 -
Platoon blocked, %	-	-	- -
Mov Cap-1 Maneuver	1564	-	- - - 292 0 1055
Mov Cap-2 Maneuver	-	-	- - - 292 0 -
Stage 1	-	-	- - - 373 0 -
Stage 2	-	-	- - - 989 0 -

Approach	EB	WB	NB
HCM Control Delay, s	7.5	0	19.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	314	1564	-	-	-
HCM Lane V/C Ratio	0.215	0.223	-	-	-
HCM Control Delay (s)	19.6	8	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	0.8	0.9	-	-	-

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	1:00	1:00	1:00	1:00	1:00	1:00
End Time	2:15	2:15	2:15	2:15	2:15	2:15
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1009	999	991	1009	981	997
Vehs Exited	1003	997	992	1007	979	995
Starting Vehs	14	13	16	13	8	12
Ending Vehs	20	15	15	15	10	15
Travel Distance (mi)	278	275	272	279	269	274
Travel Time (hr)	14.6	13.8	14.0	14.0	14.4	14.2
Total Delay (hr)	5.3	4.5	4.8	4.7	5.3	4.9
Total Stops	1333	1312	1327	1317	1314	1321
Fuel Used (gal)	14.7	14.5	14.5	14.6	14.3	14.5

Interval #0 Information Seeding

Start Time	1:00
End Time	1:15
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	1:15
End Time	2:15
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1009	999	991	1009	981	997
Vehs Exited	1003	997	992	1007	979	995
Starting Vehs	14	13	16	13	8	12
Ending Vehs	20	15	15	15	10	15
Travel Distance (mi)	278	275	272	279	269	274
Travel Time (hr)	14.6	13.8	14.0	14.0	14.4	14.2
Total Delay (hr)	5.3	4.5	4.8	4.7	5.3	4.9
Total Stops	1333	1312	1327	1317	1314	1321
Fuel Used (gal)	14.7	14.5	14.5	14.6	14.3	14.5

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	102	59	52	38
Average Queue (ft)	55	51	27	13
95th Queue (ft)	86	61	47	27
Link Distance (ft)	409	42	740	666
Upstream Blk Time (%)	14			
Queuing Penalty (veh)	70			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	R
Maximum Queue (ft)	5	37	84	241
Average Queue (ft)	0	3	21	103
95th Queue (ft)	3	19	69	203
Link Distance (ft)	42	460		647
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				13
Queuing Penalty (veh)				4

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	NB
Directions Served	LT	LTR
Maximum Queue (ft)	48	58
Average Queue (ft)	13	30
95th Queue (ft)	41	52
Link Distance (ft)	460	810
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

Network wide Queuing Penalty: 74
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Intersection	
Intersection Delay, s/veh	98.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	728	13	71	288	14	12	13	79	24	58	87
Future Vol, veh/h	17	728	13	71	288	14	12	13	79	24	58	87
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	791	14	77	313	15	13	14	86	26	63	95
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	167.3	22.2	12.7	14.4
HCM LOS	F	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	2%	19%	14%
Vol Thru, %	12%	96%	77%	34%
Vol Right, %	76%	2%	4%	51%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	104	758	373	169
LT Vol	12	17	71	24
Through Vol	13	728	288	58
RT Vol	79	13	14	87
Lane Flow Rate	113	824	405	184
Geometry Grp	1	1	1	1
Degree of Util (X)	0.217	1.305	0.679	0.346
Departure Headway (Hd)	7.644	5.703	6.504	7.474
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	473	634	559	485
Service Time	5.644	3.761	4.504	5.474
HCM Lane V/C Ratio	0.239	1.3	0.725	0.379
HCM Control Delay	12.7	167.3	22.2	14.4
HCM Lane LOS	B	F	C	B
HCM 95th-tile Q	0.8	33.1	5.2	1.5

Intersection

Intersection Delay, s/veh 104

Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↷	↶
Traffic Vol, veh/h	0	711	120	15	78	0	0	0	0	42	8	295
Future Vol, veh/h	0	711	120	15	78	0	0	0	0	42	8	295
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	773	130	16	85	0	0	0	0	46	9	321
Number of Lanes	0	1	0	0	1	0	0	0	0	0	1	1

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	1
HCM Control Delay	151.2	10.8	15.5
HCM LOS	F	B	C

Lane	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	16%	84%	0%
Vol Thru, %	86%	84%	16%	0%
Vol Right, %	14%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	831	93	50	295
LT Vol	0	15	42	0
Through Vol	711	78	8	0
RT Vol	120	0	0	295
Lane Flow Rate	903	101	54	321
Geometry Grp	2	2	7	7
Degree of Util (X)	1.272	0.169	0.106	0.526
Departure Headway (Hd)	5.068	6.482	7.645	6.5
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	714	557	472	558
Service Time	3.154	4.482	5.345	4.2
HCM Lane V/C Ratio	1.265	0.181	0.114	0.575
HCM Control Delay	151.2	10.8	11.2	16.2
HCM Lane LOS	F	B	B	C
HCM 95th-tile Q	33.6	0.6	0.4	3

Intersection												
Intersection Delay, s/veh	49.8											
Intersection LOS	E											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	687	66	0	0	41	41	52	8	29	0	0	0
Future Vol, veh/h	687	66	0	0	41	41	52	8	29	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	747	72	0	0	45	45	57	9	32	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	59	8.5	10.1
HCM LOS	F	A	B

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	58%	91%	0%
Vol Thru, %	9%	9%	50%
Vol Right, %	33%	0%	50%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	89	753	82
LT Vol	52	687	0
Through Vol	8	66	41
RT Vol	29	0	41
Lane Flow Rate	97	818	89
Geometry Grp	1	1	1
Degree of Util (X)	0.159	1.024	0.119
Departure Headway (Hd)	5.929	4.502	4.802
Convergence, Y/N	Yes	Yes	Yes
Cap	601	802	742
Service Time	4.004	2.538	2.866
HCM Lane V/C Ratio	0.161	1.02	0.12
HCM Control Delay	10.1	59	8.5
HCM Lane LOS	B	F	A
HCM 95th-tile Q	0.6	18.7	0.4

Intersection	
Intersection Delay, s/veh	72.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	22	468	36	44	567	13	31	25	112	14	17	76
Future Vol, veh/h	22	468	36	44	567	13	31	25	112	14	17	76
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	509	39	48	616	14	34	27	122	15	18	83
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	54	114.7	14.9	13.5
HCM LOS	F	F	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	18%	4%	7%	13%
Vol Thru, %	15%	89%	91%	16%
Vol Right, %	67%	7%	2%	71%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	168	526	624	107
LT Vol	31	22	44	14
Through Vol	25	468	567	17
RT Vol	112	36	13	76
Lane Flow Rate	183	572	678	116
Geometry Grp	1	1	1	1
Degree of Util (X)	0.362	0.961	1.166	0.243
Departure Headway (Hd)	7.642	6.404	6.187	7.94
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	473	572	590	455
Service Time	5.642	4.404	4.196	5.94
HCM Lane V/C Ratio	0.387	1	1.149	0.255
HCM Control Delay	14.9	54	114.7	13.5
HCM Lane LOS	B	F	F	B
HCM 95th-tile Q	1.6	12.9	23.1	0.9

Intersection												
Intersection Delay, s/veh 56.9												
Intersection LOS F												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↶	↷
Traffic Vol, veh/h	0	518	76	18	120	0	0	0	0	32	18	504
Future Vol, veh/h	0	518	76	18	120	0	0	0	0	32	18	504
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	563	83	20	130	0	0	0	0	35	20	548
Number of Lanes	0	1	0	0	1	0	0	0	0	0	1	1

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	1
HCM Control Delay	80.9	12.9	42.1
HCM LOS	F	B	E

Lane	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	13%	64%	0%
Vol Thru, %	87%	87%	36%	0%
Vol Right, %	13%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	594	138	50	504
LT Vol	0	18	32	0
Through Vol	518	120	18	0
RT Vol	76	0	0	504
Lane Flow Rate	646	150	54	548
Geometry Grp	2	2	7	7
Degree of Util (X)	1.07	0.286	0.107	0.921
Departure Headway (Hd)	5.967	7.115	7.313	6.272
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	607	509	493	581
Service Time	4.025	5.115	5.013	3.972
HCM Lane V/C Ratio	1.064	0.295	0.11	0.943
HCM Control Delay	80.9	12.9	10.9	45.2
HCM Lane LOS	F	B	B	E
HCM 95th-tile Q	18.3	1.2	0.4	11.5

Intersection

Intersection Delay, s/veh 17.7

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	515	35	0	0	41	42	97	0	20	0	0	0
Future Vol, veh/h	515	35	0	0	41	42	97	0	20	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	560	38	0	0	45	46	105	0	22	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	20.7	8.3	10
HCM LOS	C	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	83%	94%	0%
Vol Thru, %	0%	6%	49%
Vol Right, %	17%	0%	51%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	117	550	83
LT Vol	97	515	0
Through Vol	0	35	41
RT Vol	20	0	42
Lane Flow Rate	127	598	90
Geometry Grp	1	1	1
Degree of Util (X)	0.197	0.761	0.117
Departure Headway (Hd)	5.587	4.58	4.654
Convergence, Y/N	Yes	Yes	Yes
Cap	638	789	765
Service Time	3.653	2.618	2.713
HCM Lane V/C Ratio	0.199	0.758	0.118
HCM Control Delay	10	20.7	8.3
HCM Lane LOS	A	C	A
HCM 95th-tile Q	0.7	7.3	0.4

Intersection	
Intersection Delay, s/veh	209.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	22	865	17	94	320	16	17	17	105	28	72	110
Future Vol, veh/h	22	865	17	94	320	16	17	17	105	28	72	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	940	18	102	348	17	18	18	114	30	78	120
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	364.4	39.9	16.2	19
HCM LOS	F	E	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	2%	22%	13%
Vol Thru, %	12%	96%	74%	34%
Vol Right, %	76%	2%	4%	52%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	139	904	430	210
LT Vol	17	22	94	28
Through Vol	17	865	320	72
RT Vol	105	17	16	110
Lane Flow Rate	151	983	467	228
Geometry Grp	1	1	1	1
Degree of Util (X)	0.311	1.757	0.844	0.458
Departure Headway (Hd)	9.111	6.438	7.659	8.762
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	397	570	477	413
Service Time	7.111	4.438	5.659	6.762
HCM Lane V/C Ratio	0.38	1.725	0.979	0.552
HCM Control Delay	16.2	364.4	39.9	19
HCM Lane LOS	C	F	E	C
HCM 95th-tile Q	1.3	59.1	8.4	2.3

Intersection												
Intersection Delay, s/veh 199.3												
Intersection LOS F												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↷	↶
Traffic Vol, veh/h	0	843	155	22	99	0	0	0	0	50	11	331
Future Vol, veh/h	0	843	155	22	99	0	0	0	0	50	11	331
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	916	168	24	108	0	0	0	0	54	12	360
Number of Lanes	0	1	0	0	1	0	0	0	0	0	1	1

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	1
HCM Control Delay	292.9	12.1	18.7
HCM LOS	F	B	C

Lane	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	18%	82%	0%
Vol Thru, %	84%	82%	18%	0%
Vol Right, %	16%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	998	121	61	331
LT Vol	0	22	50	0
Through Vol	843	99	11	0
RT Vol	155	0	0	331
Lane Flow Rate	1085	132	66	360
Geometry Grp	2	2	7	7
Degree of Util (X)	1.602	0.228	0.131	0.597
Departure Headway (Hd)	5.317	7.045	8.298	7.157
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	683	513	435	507
Service Time	3.363	5.045	5.998	4.857
HCM Lane V/C Ratio	1.589	0.257	0.152	0.71
HCM Control Delay	292.9	12.1	12.2	19.9
HCM Lane LOS	F	B	B	C
HCM 95th-tile Q	57.5	0.9	0.4	3.9

Intersection												
Intersection Delay, s/veh	114.9											
Intersection LOS	F											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	815	78	0	0	55	50	66	11	39	0	0	0
Future Vol, veh/h	815	78	0	0	55	50	66	11	39	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	886	85	0	0	60	54	72	12	42	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	140.8	9.2	11.1
HCM LOS	F	A	B

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	57%	91%	0%
Vol Thru, %	9%	9%	52%
Vol Right, %	34%	0%	48%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	116	893	105
LT Vol	66	815	0
Through Vol	11	78	55
RT Vol	39	0	50
Lane Flow Rate	126	971	114
Geometry Grp	1	1	1
Degree of Util (X)	0.207	1.252	0.155
Departure Headway (Hd)	6.46	4.645	5.205
Convergence, Y/N	Yes	Yes	Yes
Cap	559	786	694
Service Time	4.46	2.669	3.205
HCM Lane V/C Ratio	0.225	1.235	0.164
HCM Control Delay	11.1	140.8	9.2
HCM Lane LOS	B	F	A
HCM 95th-tile Q	0.8	34.7	0.5

Intersection	
Intersection Delay, s/veh	209.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	22	865	17	94	320	16	17	17	105	28	72	110
Future Vol, veh/h	22	865	17	94	320	16	17	17	105	28	72	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	940	18	102	348	17	18	18	114	30	78	120
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	364.4	39.9	16.2	19
HCM LOS	F	E	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	2%	22%	13%
Vol Thru, %	12%	96%	74%	34%
Vol Right, %	76%	2%	4%	52%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	139	904	430	210
LT Vol	17	22	94	28
Through Vol	17	865	320	72
RT Vol	105	17	16	110
Lane Flow Rate	151	983	467	228
Geometry Grp	1	1	1	1
Degree of Util (X)	0.311	1.757	0.844	0.458
Departure Headway (Hd)	9.111	6.438	7.659	8.762
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	397	570	477	413
Service Time	7.111	4.438	5.659	6.762
HCM Lane V/C Ratio	0.38	1.725	0.979	0.552
HCM Control Delay	16.2	364.4	39.9	19
HCM Lane LOS	C	F	E	C
HCM 95th-tile Q	1.3	59.1	8.4	2.3

Intersection												
Intersection Delay, s/veh 199.3												
Intersection LOS F												

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↷	↶
Traffic Vol, veh/h	0	843	155	22	99	0	0	0	0	50	11	331
Future Vol, veh/h	0	843	155	22	99	0	0	0	0	50	11	331
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	916	168	24	108	0	0	0	0	54	12	360
Number of Lanes	0	1	0	0	1	0	0	0	0	0	1	1

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	1
HCM Control Delay	292.9	12.1	18.7
HCM LOS	F	B	C

Lane	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	18%	82%	0%
Vol Thru, %	84%	82%	18%	0%
Vol Right, %	16%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	998	121	61	331
LT Vol	0	22	50	0
Through Vol	843	99	11	0
RT Vol	155	0	0	331
Lane Flow Rate	1085	132	66	360
Geometry Grp	2	2	7	7
Degree of Util (X)	1.602	0.228	0.131	0.597
Departure Headway (Hd)	5.317	7.045	8.298	7.157
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	683	513	435	507
Service Time	3.363	5.045	5.998	4.857
HCM Lane V/C Ratio	1.589	0.257	0.152	0.71
HCM Control Delay	292.9	12.1	12.2	19.9
HCM Lane LOS	F	B	B	C
HCM 95th-tile Q	57.5	0.9	0.4	3.9

Intersection												
Intersection Delay, s/veh	114.9											
Intersection LOS	F											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				
Traffic Vol, veh/h	815	78	0	0	55	50	66	11	39	0	0	0
Future Vol, veh/h	815	78	0	0	55	50	66	11	39	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	886	85	0	0	60	54	72	12	42	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	140.8	9.2	11.1
HCM LOS	F	A	B

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	57%	91%	0%
Vol Thru, %	9%	9%	52%
Vol Right, %	34%	0%	48%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	116	893	105
LT Vol	66	815	0
Through Vol	11	78	55
RT Vol	39	0	50
Lane Flow Rate	126	971	114
Geometry Grp	1	1	1
Degree of Util (X)	0.207	1.252	0.155
Departure Headway (Hd)	6.46	4.645	5.205
Convergence, Y/N	Yes	Yes	Yes
Cap	559	786	694
Service Time	4.46	2.669	3.205
HCM Lane V/C Ratio	0.225	1.235	0.164
HCM Control Delay	11.1	140.8	9.2
HCM Lane LOS	B	F	A
HCM 95th-tile Q	0.8	34.7	0.5



# **Appendix D**

## **Traffic Signal Alternative**

### **Synchro/Sim-Traffic Reports**

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Existing Conditions with Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	12	409	5	25	233	7	3	7	28	26	37	31
Future Volume (vph)	12	409	5	25	233	7	3	7	28	26	37	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>		0.999			0.996			0.901			0.955	
Fl <sub>t</sub> Protected		0.999			0.995			0.996			0.986	
Satd. Flow (prot)	0	1859	0	0	1846	0	0	1672	0	0	1754	0
Fl <sub>t</sub> Permitted		0.999			0.995			0.962			0.893	
Satd. Flow (perm)	0	1859	0	0	1846	0	0	1615	0	0	1589	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			2			30			20	
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		437			123			768			710	
Travel Time (s)		6.0			1.7			11.6			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	445	5	27	253	8	3	8	30	28	40	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	463	0	0	288	0	0	41	0	0	102	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA		Perm	NA	
Protected Phases	2	2		10	10			5			5	
Permitted Phases							5			5		
Detector Phase	2	2		10	10		5	5		5	5	
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	1.0		5.0	5.0		5.0	5.0	

Lane Group	Ø3	Ø4	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphp)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	3	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	4.0	8.0	15.0

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

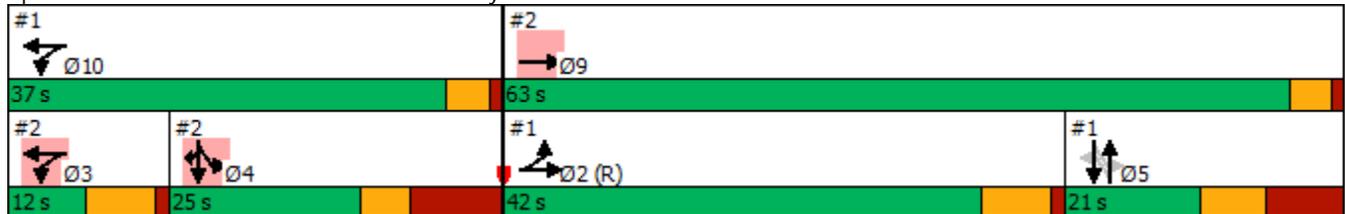
Existing Conditions with Signal  
PM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	11.2	11.2		12.0	12.0		15.8	15.8		15.8	15.8	
Total Split (s)	42.0	42.0		37.0	37.0		21.0	21.0		21.0	21.0	
Total Split (%)	42.0%	42.0%		37.0%	37.0%		21.0%	21.0%		21.0%	21.0%	
Maximum Green (s)	35.8	35.8		32.8	32.8		10.2	10.2		10.2	10.2	
Yellow Time (s)	5.2	5.2		3.2	3.2		4.8	4.8		4.8	4.8	
All-Red Time (s)	1.0	1.0		1.0	1.0		6.0	6.0		6.0	6.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.2			4.2			10.8			10.8	
Lead/Lag	Lead	Lead					Lag	Lag		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes					Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		None	None		None	None		None	None	
Act Effct Green (s)		47.9			24.7			9.5			9.5	
Actuated g/C Ratio		0.48			0.25			0.10			0.10	
v/c Ratio		0.52			0.63			0.23			0.61	
Control Delay		24.8			31.3			22.5			49.8	
Queue Delay		0.0			6.8			0.0			0.0	
Total Delay		24.8			38.1			22.5			49.8	
LOS		C			D			C			D	
Approach Delay		24.8			38.1			22.5			49.8	
Approach LOS		C			D			C			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.66  
 Intersection Signal Delay: 31.8  
 Intersection LOS: C  
 Intersection Capacity Utilization 50.5%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Ontario Rd & San Luis Bay Dr



Lane Group	Ø3	Ø4	Ø9
Minimum Split (s)	10.2	18.7	21.2
Total Split (s)	12.0	25.0	63.0
Total Split (%)	12%	25%	63%
Maximum Green (s)	5.8	14.3	58.8
Yellow Time (s)	5.2	3.7	3.2
All-Red Time (s)	1.0	7.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions with Signal  
PM Peak

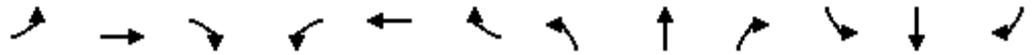


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	437	25	15	24	0	0	0	0	32	2	240
Future Volume (vph)	0	437	25	15	24	0	0	0	0	32	2	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	410		0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25			25			25			120		
Lane Util. 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
Frt		0.993										0.850
Flt Protected					0.981						0.955	
Satd. Flow (prot)	0	1850	0	0	1827	0	0	0	0	0	1779	1583
Flt Permitted					0.981						0.955	
Satd. Flow (perm)	0	1850	0	0	1827	0	0	0	0	0	1779	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5										261
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		123			507			757			683	
Travel Time (s)		1.7			6.9			17.2			15.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	475	27	16	26	0	0	0	0	35	2	261
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	502	0	0	42	0	0	0	0	0	37	261
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	1
Detector Template		Thru		Left	Thru					Left	Thru	Right
Leading Detector (ft)		100		20	100					20	100	20
Trailing Detector (ft)		0		0	0					0	0	0
Detector 1 Position(ft)		0		0	0					0	0	0
Detector 1 Size(ft)		6		20	6					20	6	20
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94							94
Detector 2 Size(ft)		6			6							6
Detector 2 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							0.0
Turn Type		NA		Split	NA					Split	NA	Prot
Protected Phases		9		3	3					4	4	4
Permitted Phases												

Lane Group	Ø2	Ø5	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	5	10
Permitted Phases			

Lanes, Volumes, Timings  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions with Signal  
 PM Peak

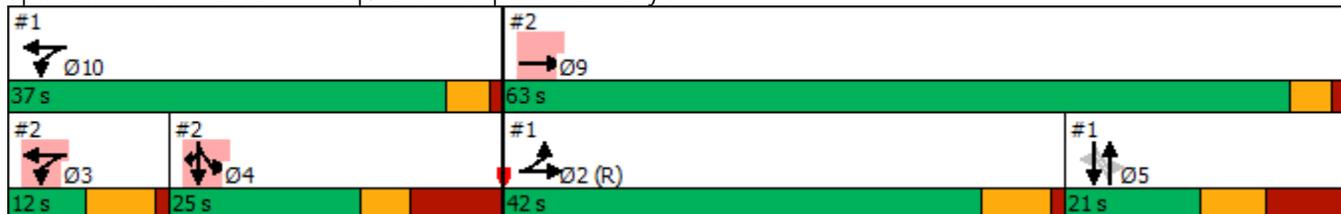


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		9		3	3					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		4.0	4.0					8.0	8.0	8.0
Minimum Split (s)		21.2		10.2	10.2					18.7	18.7	18.7
Total Split (s)		63.0		12.0	12.0					25.0	25.0	25.0
Total Split (%)		63.0%		12.0%	12.0%					25.0%	25.0%	25.0%
Maximum Green (s)		58.8		5.8	5.8					14.3	14.3	14.3
Yellow Time (s)		3.2		5.2	5.2					3.7	3.7	3.7
All-Red Time (s)		1.0		1.0	1.0					7.0	7.0	7.0
Lost Time Adjust (s)		0.0			0.0						0.0	0.0
Total Lost Time (s)		4.2			6.2						10.7	10.7
Lead/Lag				Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Recall Mode		None		None	None					None	None	None
Act Effect Green (s)		66.9			6.7						10.2	10.2
Actuated g/C Ratio		0.67			0.07						0.10	0.10
v/c Ratio		0.41			0.34						0.20	0.66
Control Delay		1.1			47.2						43.2	13.9
Queue Delay		0.4			0.2						0.0	8.6
Total Delay		1.6			47.4						43.2	22.5
LOS		A			D						D	C
Approach Delay		1.6			47.4						25.1	
Approach LOS		A			D						C	

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	12.2
Intersection LOS:	B
Intersection Capacity Utilization	43.6%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr



Lane Group	Ø2	Ø5	Ø10
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	1.0
Minimum Split (s)	11.2	15.8	12.0
Total Split (s)	42.0	21.0	37.0
Total Split (%)	42%	21%	37%
Maximum Green (s)	35.8	10.2	32.8
Yellow Time (s)	5.2	4.8	3.2
All-Red Time (s)	1.0	6.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

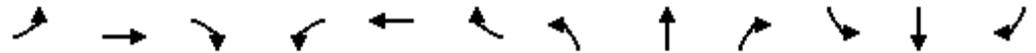
Existing Conditions with Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Volume (vph)	403	66	0	0	15	19	24	0	10	0	0	0
Future Volume (vph)	403	66	0	0	15	19	24	0	10	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>					0.923			0.960				
Fl <sub>t</sub> Protected		0.959						0.966				
Satd. Flow (prot)	0	1786	0	0	1719	0	0	1727	0	0	0	0
Fl <sub>t</sub> Permitted		0.959						0.966				
Satd. Flow (perm)	0	1786	0	0	1719	0	0	1727	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					21			65				
Link Speed (mph)		50			50			30				30
Link Distance (ft)		507			439			841				647
Travel Time (s)		6.9			6.0			19.1				14.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	438	72	0	0	16	21	26	0	11	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	510	0	0	37	0	0	37	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Split	NA			NA		Perm	NA				
Protected Phases	2	2			6			4				
Permitted Phases							4					
Detector Phase	2	2			6		4	4				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0		5.0	5.0				

Lanes, Volumes, Timings  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Existing Conditions with Signal  
 PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5				
Total Split (s)	54.0	54.0			23.0		23.0	23.0				
Total Split (%)	54.0%	54.0%			23.0%		23.0%	23.0%				
Maximum Green (s)	49.5	49.5			18.5		18.5	18.5				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		4.5			4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	C-Min	C-Min			None		None	None				
Walk Time (s)	7.0	7.0			7.0		7.0	7.0				
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0				
Pedestrian Calls (#/hr)	0	0			0		0	0				
Act Effct Green (s)		83.8			6.8			5.7				
Actuated g/C Ratio		0.84			0.07			0.06				
v/c Ratio		0.34			0.27			0.23				
Control Delay		7.0			30.2			7.7				
Queue Delay		0.2			0.0			0.0				
Total Delay		7.1			30.2			7.7				
LOS		A			C			A				
Approach Delay		7.1			30.2			7.7				
Approach LOS		A			C			A				

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.34
Intersection Signal Delay:	8.6
Intersection LOS:	A
Intersection Capacity Utilization:	44.1%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr



Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:15	4:15	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	874	968	878	846	877	887
Vehs Exited	860	962	879	847	861	882
Starting Vehs	10	14	13	21	11	11
Ending Vehs	24	20	12	20	27	17
Travel Distance (mi)	252	281	253	242	251	256
Travel Time (hr)	16.9	21.6	18.8	16.2	18.0	18.3
Total Delay (hr)	8.6	12.3	10.5	8.4	9.7	9.9
Total Stops	737	893	858	760	807	809
Fuel Used (gal)	13.5	15.8	14.2	13.4	13.7	14.1

Interval #0 Information Seeding

Start Time	4:15
End Time	4:30
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:30
End Time	5:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	874	968	878	846	877	887
Vehs Exited	860	962	879	847	861	882
Starting Vehs	10	14	13	21	11	11
Ending Vehs	24	20	12	20	27	17
Travel Distance (mi)	252	281	253	242	251	256
Travel Time (hr)	16.9	21.6	18.8	16.2	18.0	18.3
Total Delay (hr)	8.6	12.3	10.5	8.4	9.7	9.9
Total Stops	737	893	858	760	807	809
Fuel Used (gal)	13.5	15.8	14.2	13.4	13.7	14.1

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	365	30	60	144
Average Queue (ft)	187	1	22	47
95th Queue (ft)	301	14	50	104
Link Distance (ft)	409	42	740	666
Upstream Blk Time (%)	0	0		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	R
Maximum Queue (ft)	43	67	67	240
Average Queue (ft)	10	30	23	131
95th Queue (ft)	34	63	56	225
Link Distance (ft)	42	460		647
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	4			
Storage Bay Dist (ft)			410	
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

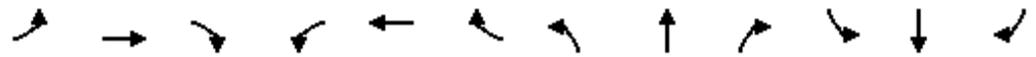
Movement	EB	WB	NB
Directions Served	LT	TR	LTR
Maximum Queue (ft)	224	71	48
Average Queue (ft)	52	22	20
95th Queue (ft)	150	52	45
Link Distance (ft)	460	411	810
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 5
---------------------------------

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Existing Conditions with Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	15	281	14	16	480	7	8	13	40	11	9	28
Future Volume (vph)	15	281	14	16	480	7	8	13	40	11	9	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>		0.994			0.998			0.912			0.922	
Fl <sub>t</sub> Protected		0.998			0.998			0.993			0.989	
Satd. Flow (prot)	0	1848	0	0	1855	0	0	1687	0	0	1699	0
Fl <sub>t</sub> Permitted		0.998			0.998			0.942			0.901	
Satd. Flow (perm)	0	1848	0	0	1855	0	0	1600	0	0	1547	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			1			43			30	
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		437			123			768			710	
Travel Time (s)		6.0			1.7			11.6			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	305	15	17	522	8	9	14	43	12	10	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	336	0	0	547	0	0	66	0	0	52	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA		Perm	NA	
Protected Phases	2	2		10	10			5			5	
Permitted Phases							5			5		
Detector Phase	2	2		10	10		5	5		5	5	
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	1.0		5.0	5.0		5.0	5.0	

Lane Group	Ø3	Ø4	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphp)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	3	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	4.0	8.0	15.0

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

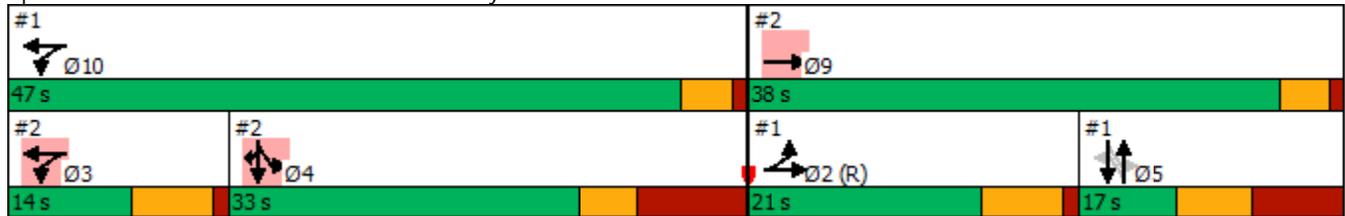
Existing Conditions with Signal  
Saturday Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	11.2	11.2		12.0	12.0		15.8	15.8		15.8	15.8	
Total Split (s)	21.0	21.0		47.0	47.0		17.0	17.0		17.0	17.0	
Total Split (%)	24.7%	24.7%		55.3%	55.3%		20.0%	20.0%		20.0%	20.0%	
Maximum Green (s)	14.8	14.8		42.8	42.8		6.2	6.2		6.2	6.2	
Yellow Time (s)	5.2	5.2		3.2	3.2		4.8	4.8		4.8	4.8	
All-Red Time (s)	1.0	1.0		1.0	1.0		6.0	6.0		6.0	6.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.2			4.2			10.8			10.8	
Lead/Lag	Lead	Lead					Lag	Lag		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes					Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		None	None		None	None		None	None	
Act Effct Green (s)		29.8			31.4			5.9			5.9	
Actuated g/C Ratio		0.35			0.37			0.07			0.07	
v/c Ratio		0.52			0.80			0.44			0.39	
Control Delay		30.7			26.8			28.0			29.5	
Queue Delay		0.1			1.9			0.0			0.0	
Total Delay		30.7			28.6			28.0			29.5	
LOS		C			C			C			C	
Approach Delay		30.7			28.6			28.0			29.5	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 85  
 Actuated Cycle Length: 85  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 29.3  
 Intersection LOS: C  
 Intersection Capacity Utilization 48.2%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Ontario Rd & San Luis Bay Dr



Lane Group	Ø3	Ø4	Ø9
Minimum Split (s)	10.2	18.7	21.2
Total Split (s)	14.0	33.0	38.0
Total Split (%)	16%	39%	45%
Maximum Green (s)	7.8	22.3	33.8
Yellow Time (s)	5.2	3.7	3.2
All-Red Time (s)	1.0	7.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions with Signal  
Saturday Peak

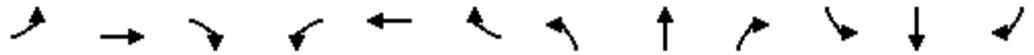


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗			↖						↘	↙
Traffic Volume (vph)	0	317	15	14	61	0	0	0	0	24	5	442
Future Volume (vph)	0	317	15	14	61	0	0	0	0	24	5	442
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	410		0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25			25			25			120		
Lane Util. 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
Frt		0.994										0.850
Flt Protected					0.991						0.960	
Satd. Flow (prot)	0	1852	0	0	1846	0	0	0	0	0	1788	1583
Flt Permitted					0.991						0.960	
Satd. Flow (perm)	0	1852	0	0	1846	0	0	0	0	0	1788	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3										480
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		123			507			757			683	
Travel Time (s)		1.7			6.9			17.2			15.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	345	16	15	66	0	0	0	0	26	5	480
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	361	0	0	81	0	0	0	0	0	31	480
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	1
Detector Template		Thru		Left	Thru					Left	Thru	Right
Leading Detector (ft)		100		20	100					20	100	20
Trailing Detector (ft)		0		0	0					0	0	0
Detector 1 Position(ft)		0		0	0					0	0	0
Detector 1 Size(ft)		6		20	6					20	6	20
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94							94
Detector 2 Size(ft)		6			6							6
Detector 2 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							0.0
Turn Type		NA		Split	NA					Split	NA	Prot
Protected Phases		9		3	3					4	4	4
Permitted Phases												

Lane Group	Ø2	Ø5	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	5	10
Permitted Phases			

Lanes, Volumes, Timings  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Existing Conditions with Signal  
 Saturday Peak

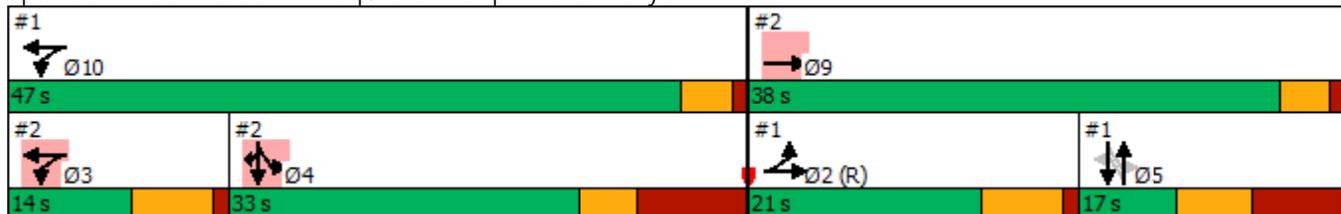


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		9		3	3					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		4.0	4.0					8.0	8.0	8.0
Minimum Split (s)		21.2		10.2	10.2					18.7	18.7	18.7
Total Split (s)		38.0		14.0	14.0					33.0	33.0	33.0
Total Split (%)		44.7%		16.5%	16.5%					38.8%	38.8%	38.8%
Maximum Green (s)		33.8		7.8	7.8					22.3	22.3	22.3
Yellow Time (s)		3.2		5.2	5.2					3.7	3.7	3.7
All-Red Time (s)		1.0		1.0	1.0					7.0	7.0	7.0
Lost Time Adjust (s)		0.0			0.0						0.0	0.0
Total Lost Time (s)		4.2			6.2						10.7	10.7
Lead/Lag				Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Recall Mode		None		None	None					None	None	None
Act Effect Green (s)		45.2			7.4						13.7	13.7
Actuated g/C Ratio		0.53			0.09						0.16	0.16
v/c Ratio		0.37			0.51						0.11	0.73
Control Delay		2.3			43.7						29.8	10.2
Queue Delay		0.7			0.2						0.0	10.8
Total Delay		3.0			43.9						29.8	21.0
LOS		A			D						C	C
Approach Delay		3.0			43.9						21.6	
Approach LOS		A			D						C	

Intersection Summary

Area Type:	Other
Cycle Length:	85
Actuated Cycle Length:	85
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.80
Intersection Signal Delay:	16.4
Intersection LOS:	B
Intersection Capacity Utilization:	45.4%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr



Lane Group	Ø2	Ø5	Ø10
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	1.0
Minimum Split (s)	11.2	15.8	12.0
Total Split (s)	21.0	17.0	47.0
Total Split (%)	25%	20%	55%
Maximum Green (s)	14.8	6.2	42.8
Yellow Time (s)	5.2	4.8	3.2
All-Red Time (s)	1.0	6.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

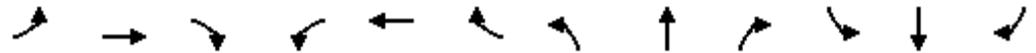
Existing Conditions with Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Volume (vph)	321	20	0	0	19	21	56	0	6	0	0	0
Future Volume (vph)	321	20	0	0	19	21	56	0	6	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>					0.929			0.986				
Fl <sub>t</sub> Protected		0.955						0.957				
Satd. Flow (prot)	0	1779	0	0	1730	0	0	1758	0	0	0	0
Fl <sub>t</sub> Permitted		0.955						0.957				
Satd. Flow (perm)	0	1779	0	0	1730	0	0	1758	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					23			77				
Link Speed (mph)		50			50			30				30
Link Distance (ft)		507			439			841				647
Travel Time (s)		6.9			6.0			19.1				14.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	349	22	0	0	21	23	61	0	7	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	371	0	0	44	0	0	68	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Split	NA			NA		Perm	NA				
Protected Phases	2	2			6			4				
Permitted Phases							4					
Detector Phase	2	2			6		4	4				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0		5.0	5.0				

Lanes, Volumes, Timings  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Existing Conditions with Signal  
 Saturday Peak

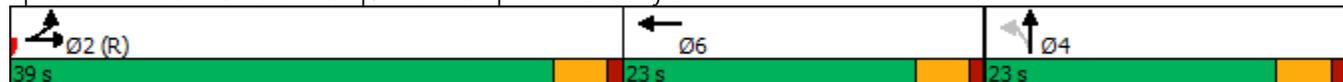


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5				
Total Split (s)	39.0	39.0			23.0		23.0	23.0				
Total Split (%)	45.9%	45.9%			27.1%		27.1%	27.1%				
Maximum Green (s)	34.5	34.5			18.5		18.5	18.5				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		4.5			4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	C-Min	C-Min			None		None	None				
Walk Time (s)	7.0	7.0			7.0		7.0	7.0				
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0				
Pedestrian Calls (#/hr)	0	0			0		0	0				
Act Effect Green (s)		65.3			6.8			6.3				
Actuated g/C Ratio		0.77			0.08			0.07				
v/c Ratio		0.27			0.28			0.34				
Control Delay		6.4			26.1			12.9				
Queue Delay		0.0			0.0			0.0				
Total Delay		6.4			26.1			12.9				
LOS		A			C			B				
Approach Delay		6.4			26.1			12.9				
Approach LOS		A			C			B				

Intersection Summary

Area Type: Other  
 Cycle Length: 85  
 Actuated Cycle Length: 85  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.34  
 Intersection Signal Delay: 9.1  
 Intersection Capacity Utilization 37.2%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr



Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	1:00	1:00	1:00	1:00	1:00	1:00
End Time	2:15	2:15	2:15	2:15	2:15	2:15
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	999	999	991	1009	981	995
Vehs Exited	968	997	989	1005	971	985
Starting Vehs	17	20	24	18	20	17
Ending Vehs	48	22	26	22	30	27
Travel Distance (mi)	271	275	271	279	269	273
Travel Time (hr)	25.5	31.6	27.6	25.8	29.3	28.0
Total Delay (hr)	16.2	22.0	18.2	16.2	20.0	18.5
Total Stops	1032	1028	1087	1127	1012	1060
Fuel Used (gal)	17.0	18.7	17.8	17.5	17.9	17.8

Interval #0 Information Seeding

Start Time	1:00
End Time	1:15
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	1:15
End Time	2:15
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	999	999	991	1009	981	995
Vehs Exited	968	997	989	1005	971	985
Starting Vehs	17	20	24	18	20	17
Ending Vehs	48	22	26	22	30	27
Travel Distance (mi)	271	275	271	279	269	273
Travel Time (hr)	25.5	31.6	27.6	25.8	29.3	28.0
Total Delay (hr)	16.2	22.0	18.2	16.2	20.0	18.5
Total Stops	1032	1028	1087	1127	1012	1060
Fuel Used (gal)	17.0	18.7	17.8	17.5	17.9	17.8

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	354	57	86	90
Average Queue (ft)	179	6	36	22
95th Queue (ft)	316	33	73	59
Link Distance (ft)	409	42	740	666
Upstream Blk Time (%)	0	0		
Queuing Penalty (veh)	0	1		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	R
Maximum Queue (ft)	58	132	429	643
Average Queue (ft)	20	53	70	363
95th Queue (ft)	48	105	332	650
Link Distance (ft)	42	460		647
Upstream Blk Time (%)	3			10
Queuing Penalty (veh)	11			0
Storage Bay Dist (ft)			410	
Storage Blk Time (%)				20
Queuing Penalty (veh)				6

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	WB	NB
Directions Served	LT	TR	LTR
Maximum Queue (ft)	210	80	99
Average Queue (ft)	72	27	37
95th Queue (ft)	168	60	73
Link Distance (ft)	460	411	810
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 18

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2030 Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	17	728	13	71	288	14	12	13	79	24	58	87
Future Volume (vph)	17	728	13	71	288	14	12	13	79	24	58	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Flt		0.998			0.995			0.897			0.930	
Flt Protected		0.999			0.991			0.994			0.993	
Satd. Flow (prot)	0	1857	0	0	1837	0	0	1661	0	0	1720	0
Flt Permitted		0.999			0.991			0.855			0.943	
Satd. Flow (perm)	0	1857	0	0	1837	0	0	1429	0	0	1634	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			2			86			35	
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		370			123			768			710	
Travel Time (s)		5.0			1.7			11.6			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	791	14	77	313	15	13	14	86	26	63	95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	823	0	0	405	0	0	113	0	0	184	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA		Perm	NA	
Protected Phases	2	2		10	10			5			5	
Permitted Phases							5			5		
Detector Phase	2	2		10	10		5	5		5	5	
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	1.0		5.0	5.0		5.0	5.0	

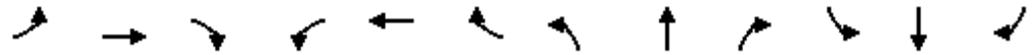
Lanes, Volumes, Timings  
 1: Ontario Rd & San Luis Bay Dr

Year 2030 Signal  
 PM Peak

Lane Group	Ø3	Ø4	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphp)			
Lane Util. Factor			
Fr1			
Fl1 Protected			
Satd. Flow (prot)			
Fl1 Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	3	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	4.0	8.0	15.0

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2030 Signal  
PM Peak

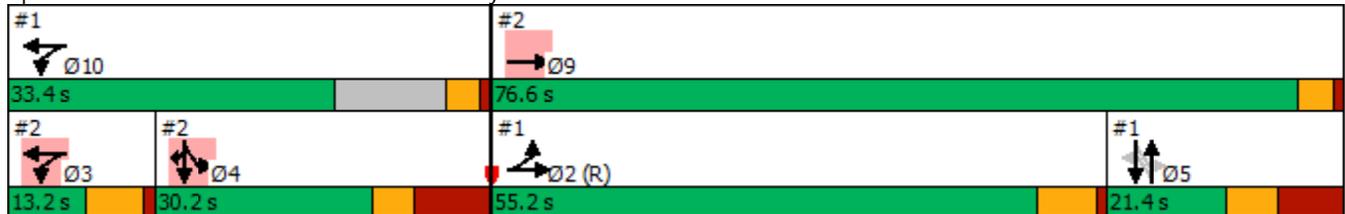


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	11.2	11.2		12.0	12.0		15.8	15.8		15.8	15.8	
Total Split (s)	55.2	55.2		33.4	33.4		21.4	21.4		21.4	21.4	
Total Split (%)	46.0%	46.0%		27.8%	27.8%		17.8%	17.8%		17.8%	17.8%	
Maximum Green (s)	49.0	49.0		29.2	29.2		10.6	10.6		10.6	10.6	
Yellow Time (s)	5.2	5.2		3.2	3.2		4.8	4.8		4.8	4.8	
All-Red Time (s)	1.0	1.0		1.0	1.0		6.0	6.0		6.0	6.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.2			4.2			10.8			10.8	
Lead/Lag	Lead	Lead					Lag	Lag		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes					Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		None	None		None	None		None	None	
Act Effct Green (s)		56.2			32.0			10.6			10.6	
Actuated g/C Ratio		0.47			0.27			0.09			0.09	
v/c Ratio		0.95			0.83			0.55			1.05	
Control Delay		51.6			41.8			27.9			123.2	
Queue Delay		15.6			13.6			0.2			1.9	
Total Delay		67.2			55.3			28.1			125.2	
LOS		E			E			C			F	
Approach Delay		67.2			55.3			28.1			125.2	
Approach LOS		E			E			C			F	

Intersection Summary

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 110  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.05  
 Intersection Signal Delay: 68.1      Intersection LOS: E  
 Intersection Capacity Utilization 81.6%      ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 1: Ontario Rd & San Luis Bay Dr



Lane Group	Ø3	Ø4	Ø9
Minimum Split (s)	10.2	18.7	21.2
Total Split (s)	13.2	30.2	76.6
Total Split (%)	11%	25%	64%
Maximum Green (s)	7.0	19.5	72.4
Yellow Time (s)	5.2	3.7	3.2
All-Red Time (s)	1.0	7.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	711	120	15	78	0	0	0	0	42	8	295
Future Volume (vph)	0	711	120	15	78	0	0	0	0	42	8	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	120		0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25			25			25			120		
Lane Util. 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
Frt		0.981										0.850
Flt Protected					0.992						0.960	
Satd. Flow (prot)	0	1827	0	0	1848	0	0	0	0	0	1788	1583
Flt Permitted					0.992						0.960	
Satd. Flow (perm)	0	1827	0	0	1848	0	0	0	0	0	1788	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13										321
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		123			507			757			697	
Travel Time (s)		1.7			6.9			17.2			15.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	773	130	16	85	0	0	0	0	46	9	321
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	903	0	0	101	0	0	0	0	0	55	321
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	1
Detector Template		Thru		Left	Thru					Left	Thru	Right
Leading Detector (ft)		100		20	100					20	100	20
Trailing Detector (ft)		0		0	0					0	0	0
Detector 1 Position(ft)		0		0	0					0	0	0
Detector 1 Size(ft)		6		20	6					20	6	20
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94							94
Detector 2 Size(ft)		6			6							6
Detector 2 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							0.0
Turn Type		NA		Split	NA					Split	NA	Prot
Protected Phases		9		3	3					4	4	4
Permitted Phases												

Lanes, Volumes, Timings  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 Signal  
 PM Peak

Lane Group	Ø2	Ø5	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	5	10
Permitted Phases			

Lanes, Volumes, Timings  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 Signal  
 PM Peak

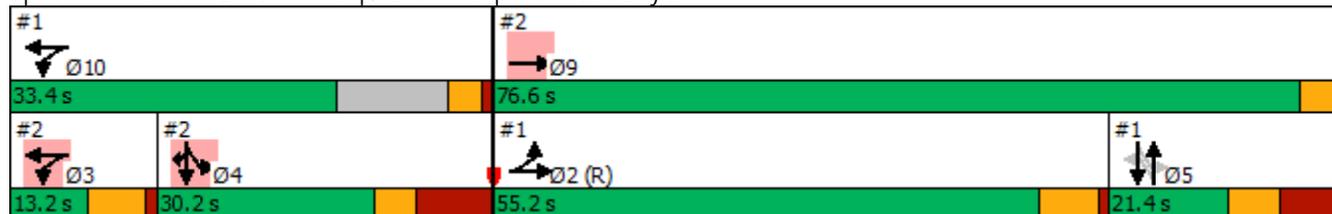


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		9		3	3					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		4.0	4.0					8.0	8.0	8.0
Minimum Split (s)		21.2		10.2	10.2					18.7	18.7	18.7
Total Split (s)		76.6		13.2	13.2					30.2	30.2	30.2
Total Split (%)		63.8%		11.0%	11.0%					25.2%	25.2%	25.2%
Maximum Green (s)		72.4		7.0	7.0					19.5	19.5	19.5
Yellow Time (s)		3.2		5.2	5.2					3.7	3.7	3.7
All-Red Time (s)		1.0		1.0	1.0					7.0	7.0	7.0
Lost Time Adjust (s)		0.0			0.0						0.0	0.0
Total Lost Time (s)		4.2			6.2						10.7	10.7
Lead/Lag				Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Recall Mode		None		None	None					None	None	None
Act Effect Green (s)		79.6			7.0						12.3	12.3
Actuated g/C Ratio		0.66			0.06						0.10	0.10
v/c Ratio		0.74			0.94						0.30	0.71
Control Delay		4.9			117.4						52.3	14.6
Queue Delay		3.3			8.6						0.0	24.4
Total Delay		8.2			125.9						52.3	38.9
LOS		A			F						D	D
Approach Delay		8.2			125.9						40.9	
Approach LOS		A			F						D	

Intersection Summary

Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	110
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.05
Intersection Signal Delay:	25.7
Intersection LOS:	C
Intersection Capacity Utilization:	63.8%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr



Lane Group	Ø2	Ø5	Ø10
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	1.0
Minimum Split (s)	11.2	15.8	12.0
Total Split (s)	55.2	21.4	33.4
Total Split (%)	46%	18%	28%
Maximum Green (s)	49.0	10.6	29.2
Yellow Time (s)	5.2	4.8	3.2
All-Red Time (s)	1.0	6.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

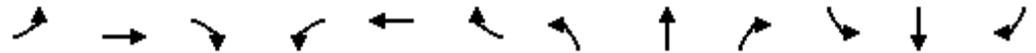
Year 2030 Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	687	66	0	0	41	41	52	8	29	0	0	0
Future Volume (vph)	687	66	0	0	41	41	52	8	29	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>					0.932			0.956				
Fl <sub>t</sub> Protected		0.956						0.972				
Satd. Flow (prot)	0	1781	0	0	1736	0	0	1731	0	0	0	0
Fl <sub>t</sub> Permitted		0.956						0.972				
Satd. Flow (perm)	0	1781	0	0	1736	0	0	1731	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					35			17				
Link Speed (mph)		50			50			30				30
Link Distance (ft)		507			439			841				647
Travel Time (s)		6.9			6.0			19.1				14.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	747	72	0	0	45	45	57	9	32	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	819	0	0	90	0	0	98	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Split	NA			NA		Perm	NA				
Protected Phases	2	2			6			4				
Permitted Phases							4					
Detector Phase	2	2			6		4	4				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0		5.0	5.0				

Lanes, Volumes, Timings  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2030 Signal  
 PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5				
Total Split (s)	75.0	75.0			22.5		22.5	22.5				
Total Split (%)	62.5%	62.5%			18.8%		18.8%	18.8%				
Maximum Green (s)	70.5	70.5			18.0		18.0	18.0				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		4.5			4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	C-Min	C-Min			None		None	None				
Walk Time (s)	7.0	7.0			7.0		7.0	7.0				
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0				
Pedestrian Calls (#/hr)	0	0			0		0	0				
Act Effct Green (s)		86.1			9.4			11.0				
Actuated g/C Ratio		0.72			0.08			0.09				
v/c Ratio		0.64			0.54			0.56				
Control Delay		10.7			44.7			54.8				
Queue Delay		0.7			0.0			0.0				
Total Delay		11.4			44.7			54.8				
LOS		B			D			D				
Approach Delay		11.4			44.7			54.8				
Approach LOS		B			D			D				

Intersection Summary

Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.64
Intersection Signal Delay:	18.6
Intersection LOS:	B
Intersection Capacity Utilization:	60.8%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:15	4:15	4:15	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	1359	1472	1411	1421	1428	1416	1434
Vehs Exited	1359	1438	1415	1409	1428	1403	1411
Starting Vehs	53	44	56	48	59	47	42
Ending Vehs	53	78	52	60	59	60	65
Travel Distance (mi)	385	405	397	397	400	397	396
Travel Time (hr)	150.5	146.4	174.2	194.4	143.7	145.0	169.1
Total Delay (hr)	137.7	132.8	160.9	181.2	130.4	131.8	156.0
Total Stops	1376	1411	1454	1390	1452	1359	1413
Fuel Used (gal)	49.0	48.9	54.8	59.2	48.0	48.1	53.7

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1440	1434	1408	1423
Vehs Exited	1425	1421	1410	1411
Starting Vehs	48	45	75	48
Ending Vehs	63	58	73	60
Travel Distance (mi)	404	399	396	398
Travel Time (hr)	125.8	94.0	198.7	154.2
Total Delay (hr)	112.3	80.7	185.6	140.9
Total Stops	1505	1456	1358	1419
Fuel Used (gal)	44.0	36.7	60.3	50.3

Interval #0 Information Seeding

Start Time	4:15
End Time	4:30
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

**Interval #1 Information Recording**

Start Time	4:30
End Time	5:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1359	1472	1411	1421	1428	1416	1434
Vehs Exited	1359	1438	1415	1409	1428	1403	1411
Starting Vehs	53	44	56	48	59	47	42
Ending Vehs	53	78	52	60	59	60	65
Travel Distance (mi)	385	405	397	397	400	397	396
Travel Time (hr)	150.5	146.4	174.2	194.4	143.7	145.0	169.1
Total Delay (hr)	137.7	132.8	160.9	181.2	130.4	131.8	156.0
Total Stops	1376	1411	1454	1390	1452	1359	1413
Fuel Used (gal)	49.0	48.9	54.8	59.2	48.0	48.1	53.7

**Interval #1 Information Recording**

Start Time	4:30
End Time	5:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1440	1434	1408	1423
Vehs Exited	1425	1421	1410	1411
Starting Vehs	48	45	75	48
Ending Vehs	63	58	73	60
Travel Distance (mi)	404	399	396	398
Travel Time (hr)	125.8	94.0	198.7	154.2
Total Delay (hr)	112.3	80.7	185.6	140.9
Total Stops	1505	1456	1358	1419
Fuel Used (gal)	44.0	36.7	60.3	50.3

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	389	45	261	397
Average Queue (ft)	360	3	103	209
95th Queue (ft)	373	22	248	450
Link Distance (ft)	342	42	740	666
Upstream Blk Time (%)	65	0		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	R
Maximum Queue (ft)	62	184	240	703
Average Queue (ft)	34	86	143	658
95th Queue (ft)	63	163	321	787
Link Distance (ft)	42	460		661
Upstream Blk Time (%)	10			83
Queuing Penalty (veh)	81			0
Storage Bay Dist (ft)			120	
Storage Blk Time (%)			1	88
Queuing Penalty (veh)			3	44

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	WB	NB
Directions Served	LT	TR	LTR
Maximum Queue (ft)	446	131	156
Average Queue (ft)	163	58	63
95th Queue (ft)	366	110	123
Link Distance (ft)	460	411	810
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	1		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 130

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2030 Signal  
Saturday Peak

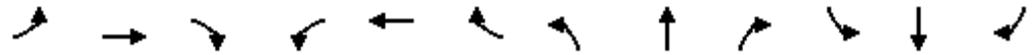


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	22	468	36	44	567	13	31	25	112	14	17	76
Future Volume (vph)	22	468	36	44	567	13	31	25	112	14	17	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>		0.991			0.997			0.910			0.903	
Fl <sub>t</sub> Protected		0.998			0.996			0.991			0.994	
Satd. Flow (prot)	0	1842	0	0	1850	0	0	1680	0	0	1672	0
Fl <sub>t</sub> Permitted		0.998			0.996			0.916			0.812	
Satd. Flow (perm)	0	1842	0	0	1850	0	0	1553	0	0	1366	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			1			60			76	
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		372			123			768			710	
Travel Time (s)		5.1			1.7			11.6			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	509	39	48	616	14	34	27	122	15	18	83
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	572	0	0	678	0	0	183	0	0	116	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA		Perm	NA	
Protected Phases	2	2		10	10			5			5	
Permitted Phases							5			5		
Detector Phase	2	2		10	10		5	5		5	5	
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	1.0		5.0	5.0		5.0	5.0	

Lane Group	Ø3	Ø4	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Util. Factor			
Frts			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	3	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	4.0	8.0	15.0

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2030 Signal  
Saturday Peak

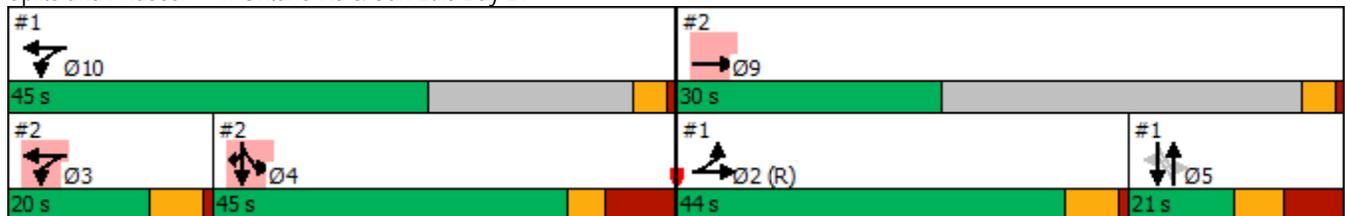


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	11.2	11.2		12.0	12.0		15.8	15.8		15.8	15.8	
Total Split (s)	44.0	44.0		45.0	45.0		21.0	21.0		21.0	21.0	
Total Split (%)	33.8%	33.8%		34.6%	34.6%		16.2%	16.2%		16.2%	16.2%	
Maximum Green (s)	37.8	37.8		40.8	40.8		10.2	10.2		10.2	10.2	
Yellow Time (s)	5.2	5.2		3.2	3.2		4.8	4.8		4.8	4.8	
All-Red Time (s)	1.0	1.0		1.0	1.0		6.0	6.0		6.0	6.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.2			4.2			10.8			10.8	
Lead/Lag	Lead	Lead					Lag	Lag		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes					Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		None	None		None	None		None	None	
Act Effct Green (s)		48.4			50.2			10.2			10.2	
Actuated g/C Ratio		0.37			0.39			0.08			0.08	
v/c Ratio		0.83			0.95			1.03			0.66	
Control Delay		50.1			50.5			115.5			41.0	
Queue Delay		0.0			11.1			1.8			0.1	
Total Delay		50.1			61.5			117.4			41.1	
LOS		D			E			F			D	
Approach Delay		50.1			61.5			117.4			41.1	
Approach LOS		D			E			F			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.03  
 Intersection Signal Delay: 62.4  
 Intersection LOS: E  
 Intersection Capacity Utilization 74.9%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 1: Ontario Rd & San Luis Bay Dr



Lane Group	Ø3	Ø4	Ø9
Minimum Split (s)	10.2	18.7	21.2
Total Split (s)	20.0	45.0	30.0
Total Split (%)	15%	35%	23%
Maximum Green (s)	13.8	34.3	25.8
Yellow Time (s)	5.2	3.7	3.2
All-Red Time (s)	1.0	7.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	518	76	18	120	0	0	0	0	32	18	504
Future Volume (vph)	0	518	76	18	120	0	0	0	0	32	18	504
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	120		0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25			25			25			120		
Lane Util. 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
Frt		0.983										0.850
Flt Protected					0.993						0.969	
Satd. Flow (prot)	0	1831	0	0	1850	0	0	0	0	0	1805	1583
Flt Permitted					0.993						0.969	
Satd. Flow (perm)	0	1831	0	0	1850	0	0	0	0	0	1805	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8										548
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		123			507			757			683	
Travel Time (s)		1.7			6.9			17.2			15.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	563	83	20	130	0	0	0	0	35	20	548
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	646	0	0	150	0	0	0	0	0	55	548
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	1
Detector Template		Thru		Left	Thru					Left	Thru	Right
Leading Detector (ft)		100		20	100					20	100	20
Trailing Detector (ft)		0		0	0					0	0	0
Detector 1 Position(ft)		0		0	0					0	0	0
Detector 1 Size(ft)		6		20	6					20	6	20
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94							94
Detector 2 Size(ft)		6			6							6
Detector 2 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							0.0
Turn Type		NA		Split	NA					Split	NA	Prot
Protected Phases		9		3	3					4	4	4
Permitted Phases												

Lane Group	Ø2	Ø5	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	5	10
Permitted Phases			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2030 Signal  
Saturday Peak

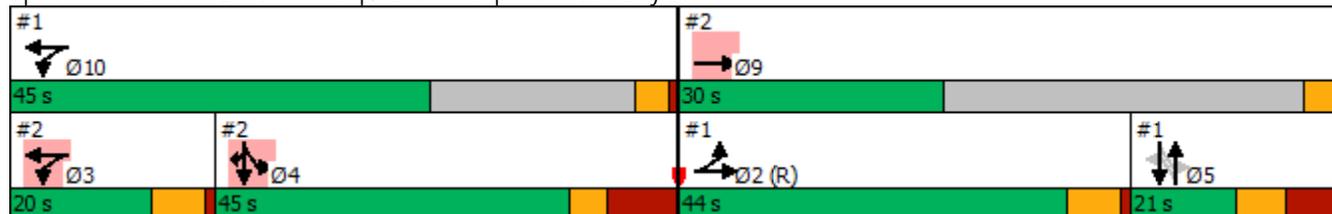


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		9		3	3					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		4.0	4.0					8.0	8.0	8.0
Minimum Split (s)		21.2		10.2	10.2					18.7	18.7	18.7
Total Split (s)		30.0		20.0	20.0					45.0	45.0	45.0
Total Split (%)		23.1%		15.4%	15.4%					34.6%	34.6%	34.6%
Maximum Green (s)		25.8		13.8	13.8					34.3	34.3	34.3
Yellow Time (s)		3.2		5.2	5.2					3.7	3.7	3.7
All-Red Time (s)		1.0		1.0	1.0					7.0	7.0	7.0
Lost Time Adjust (s)		0.0			0.0						0.0	0.0
Total Lost Time (s)		4.2			6.2						10.7	10.7
Lead/Lag				Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Recall Mode		None		None	None					None	None	None
Act Effect Green (s)		71.4			13.2						24.3	24.3
Actuated g/C Ratio		0.55			0.10						0.19	0.19
v/c Ratio		0.64			0.80						0.16	0.74
Control Delay		3.8			67.5						42.7	9.9
Queue Delay		3.2			0.4						0.0	41.3
Total Delay		7.0			68.0						42.7	51.2
LOS		A			E						D	D
Approach Delay		7.0			68.0						50.4	
Approach LOS		A			E						D	

Intersection Summary

Area Type:	Other
Cycle Length:	130
Actuated Cycle Length:	130
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.03
Intersection Signal Delay:	32.2
Intersection LOS:	C
Intersection Capacity Utilization	52.6%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr



Lane Group	Ø2	Ø5	Ø10
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	1.0
Minimum Split (s)	11.2	15.8	12.0
Total Split (s)	44.0	21.0	45.0
Total Split (%)	34%	16%	35%
Maximum Green (s)	37.8	10.2	40.8
Yellow Time (s)	5.2	4.8	3.2
All-Red Time (s)	1.0	6.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

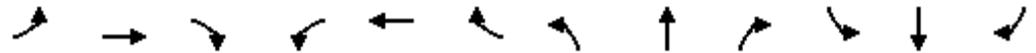
Year 2030 Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Volume (vph)	515	35	0	0	41	42	97	0	20	0	0	0
Future Volume (vph)	515	35	0	0	41	42	97	0	20	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>					0.932			0.977				
Fl <sub>t</sub> Protected		0.955						0.960				
Satd. Flow (prot)	0	1779	0	0	1736	0	0	1747	0	0	0	0
Fl <sub>t</sub> Permitted		0.955						0.960				
Satd. Flow (perm)	0	1779	0	0	1736	0	0	1747	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					33			50				
Link Speed (mph)		50			50			30				30
Link Distance (ft)		507			439			841				647
Travel Time (s)		6.9			6.0			19.1				14.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	560	38	0	0	45	46	105	0	22	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	598	0	0	91	0	0	127	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Split	NA			NA		Perm	NA				
Protected Phases	2	2			6			4				
Permitted Phases							4					
Detector Phase	2	2			6		4	4				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0		5.0	5.0				

Lanes, Volumes, Timings  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2030 Signal  
 Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5				
Total Split (s)	81.0	81.0			24.0		25.0	25.0				
Total Split (%)	62.3%	62.3%			18.5%		19.2%	19.2%				
Maximum Green (s)	76.5	76.5			19.5		20.5	20.5				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		4.5			4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	C-Min	C-Min			None		None	None				
Walk Time (s)	7.0	7.0			7.0		7.0	7.0				
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0				
Pedestrian Calls (#/hr)	0	0			0		0	0				
Act Effect Green (s)		95.4			9.9			11.2				
Actuated g/C Ratio		0.73			0.08			0.09				
v/c Ratio		0.46			0.56			0.65				
Control Delay		11.9			50.0			49.1				
Queue Delay		0.6			0.0			0.0				
Total Delay		12.5			50.0			49.1				
LOS		B			D			D				
Approach Delay		12.5			50.0			49.1				
Approach LOS		B			D			D				

Intersection Summary

Area Type: Other  
 Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.65  
 Intersection Signal Delay: 22.4  
 Intersection LOS: C  
 Intersection Capacity Utilization 51.1%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	1:00	1:00	1:00	1:00	1:00	1:00	1:00
End Time	2:15	2:15	2:15	2:15	2:15	2:15	2:15
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	1371	1424	1393	1390	1403	1371	1418
Vehs Exited	1367	1386	1387	1385	1396	1374	1396
Starting Vehs	64	52	54	58	67	64	78
Ending Vehs	68	90	60	63	74	61	100
Travel Distance (mi)	373	387	384	377	385	380	380
Travel Time (hr)	156.5	141.5	165.6	174.8	168.6	142.4	171.7
Total Delay (hr)	143.8	128.2	152.5	161.8	155.4	129.3	158.7
Total Stops	1481	1766	1605	1521	1622	1664	1568
Fuel Used (gal)	50.6	47.6	53.3	55.0	53.6	47.6	54.3

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	1:00	1:00	1:00	1:00
End Time	2:15	2:15	2:15	2:15
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1399	1395	1379	1393
Vehs Exited	1347	1369	1341	1375
Starting Vehs	47	58	58	57
Ending Vehs	99	84	96	77
Travel Distance (mi)	373	378	368	378
Travel Time (hr)	187.7	149.5	152.3	161.1
Total Delay (hr)	174.9	136.5	139.7	148.1
Total Stops	1485	1624	1533	1586
Fuel Used (gal)	57.8	49.0	49.3	51.8

Interval #0 Information Seeding

Start Time	1:00
End Time	1:15
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

**Interval #1 Information Recording**

Start Time	1:15
End Time	2:15
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1371	1424	1393	1390	1403	1371	1418
Vehs Exited	1367	1386	1387	1385	1396	1374	1396
Starting Vehs	64	52	54	58	67	64	78
Ending Vehs	68	90	60	63	74	61	100
Travel Distance (mi)	373	387	384	377	385	380	380
Travel Time (hr)	156.5	141.5	165.6	174.8	168.6	142.4	171.7
Total Delay (hr)	143.8	128.2	152.5	161.8	155.4	129.3	158.7
Total Stops	1481	1766	1605	1521	1622	1664	1568
Fuel Used (gal)	50.6	47.6	53.3	55.0	53.6	47.6	54.3

**Interval #1 Information Recording**

Start Time	1:15
End Time	2:15
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1399	1395	1379	1393
Vehs Exited	1347	1369	1341	1375
Starting Vehs	47	58	58	57
Ending Vehs	99	84	96	77
Travel Distance (mi)	373	378	368	378
Travel Time (hr)	187.7	149.5	152.3	161.1
Total Delay (hr)	174.9	136.5	139.7	148.1
Total Stops	1485	1624	1533	1586
Fuel Used (gal)	57.8	49.0	49.3	51.8

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	392	54	609	186
Average Queue (ft)	359	10	370	63
95th Queue (ft)	396	42	724	146
Link Distance (ft)	344	42	740	666
Upstream Blk Time (%)	69	1	4	
Queuing Penalty (veh)	0	6	0	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	WB	SB	SB
Directions Served	TR	LT	LT	R
Maximum Queue (ft)	59	254	240	694
Average Queue (ft)	37	127	106	665
95th Queue (ft)	65	218	289	679
Link Distance (ft)	42	460		647
Upstream Blk Time (%)	25			87
Queuing Penalty (veh)	148			0
Storage Bay Dist (ft)			120	
Storage Blk Time (%)				80
Queuing Penalty (veh)				40

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	WB	NB
Directions Served	LT	TR	LTR
Maximum Queue (ft)	423	137	160
Average Queue (ft)	181	54	71
95th Queue (ft)	369	107	128
Link Distance (ft)	460	411	810
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 194

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2045 Signal  
PM Peak

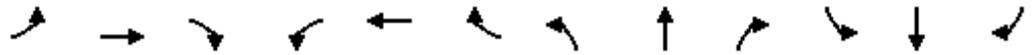


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕			↕			↕	
Traffic Volume (vph)	22	865	17	94	320	16	17	17	105	28	72	110
Future Volume (vph)	22	865	17	94	320	16	17	17	105	28	72	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.995			0.897			0.929	
Flt Protected		0.999			0.989			0.994			0.993	
Satd. Flow (prot)	0	3525	0	0	3483	0	0	1661	0	0	1718	0
Flt Permitted		0.999			0.989			0.841			0.924	
Satd. Flow (perm)	0	3525	0	0	3483	0	0	1405	0	0	1599	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			4			113			40	
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		203			123			768			710	
Travel Time (s)		2.8			1.7			11.6			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	940	18	102	348	17	18	18	114	30	78	120
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	982	0	0	467	0	0	150	0	0	228	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA		Perm	NA	
Protected Phases	2	2		10	10			5			5	
Permitted Phases							5			5		
Detector Phase	2	2		10	10		5	5		5	5	
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	1.0		5.0	5.0		5.0	5.0	

Lane Group	Ø3	Ø4	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Util. Factor			
Fr't			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	3	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	4.0	8.0	15.0

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2045 Signal  
PM Peak

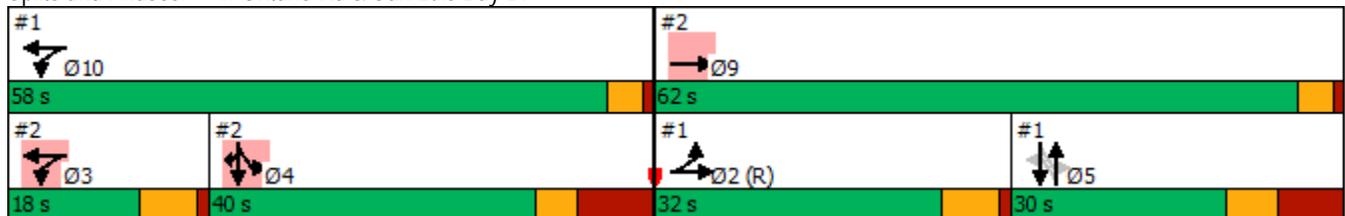


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	11.2	11.2		12.0	12.0		15.8	15.8		15.8	15.8	
Total Split (s)	32.0	32.0		58.0	58.0		30.0	30.0		30.0	30.0	
Total Split (%)	26.7%	26.7%		48.3%	48.3%		25.0%	25.0%		25.0%	25.0%	
Maximum Green (s)	25.8	25.8		53.8	53.8		19.2	19.2		19.2	19.2	
Yellow Time (s)	5.2	5.2		3.2	3.2		4.8	4.8		4.8	4.8	
All-Red Time (s)	1.0	1.0		1.0	1.0		6.0	6.0		6.0	6.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.2			4.2			10.8			10.8	
Lead/Lag	Lead	Lead					Lag	Lag		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes					Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		None	None		None	None		None	None	
Act Effct Green (s)		45.8			35.6			17.4			17.4	
Actuated g/C Ratio		0.38			0.30			0.14			0.14	
v/c Ratio		0.73			0.45			0.50			0.86	
Control Delay		37.1			24.4			20.1			69.3	
Queue Delay		0.1			0.5			0.0			0.0	
Total Delay		37.1			24.9			20.1			69.3	
LOS		D			C			C			E	
Approach Delay		37.1			24.9			20.1			69.3	
Approach LOS		D			C			C			E	

Intersection Summary

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.86  
 Intersection Signal Delay: 36.6  
 Intersection LOS: D  
 Intersection Capacity Utilization 71.4%  
 ICU Level of Service C  
 Analysis Period (min) 15

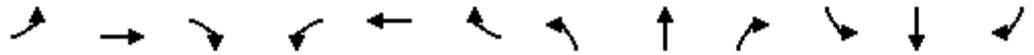
Splits and Phases: 1: Ontario Rd & San Luis Bay Dr



Lane Group	Ø3	Ø4	Ø9
Minimum Split (s)	10.2	18.7	21.2
Total Split (s)	18.0	40.0	62.0
Total Split (%)	15%	33%	52%
Maximum Green (s)	11.8	29.3	57.8
Yellow Time (s)	5.2	3.7	3.2
All-Red Time (s)	1.0	7.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑						↑	↑
Traffic Volume (vph)	0	843	155	22	99	0	0	0	0	50	11	331
Future Volume (vph)	0	843	155	22	99	0	0	0	0	50	11	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	325		0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25			25			25			120		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977										0.850
Flt Protected					0.991						0.961	
Satd. Flow (prot)	0	3458	0	0	1846	0	0	0	0	0	1790	1583
Flt Permitted					0.991						0.961	
Satd. Flow (perm)	0	3458	0	0	1846	0	0	0	0	0	1790	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24										360
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		123			507			757			703	
Travel Time (s)		1.7			6.9			17.2			16.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	916	168	24	108	0	0	0	0	54	12	360
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1084	0	0	132	0	0	0	0	0	66	360
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	1
Detector Template		Thru		Left	Thru					Left	Thru	Right
Leading Detector (ft)		100		20	100					20	100	20
Trailing Detector (ft)		0		0	0					0	0	0
Detector 1 Position(ft)		0		0	0					0	0	0
Detector 1 Size(ft)		6		20	6					20	6	20
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94							94
Detector 2 Size(ft)		6			6							6
Detector 2 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							0.0
Turn Type		NA		Split	NA					Split	NA	Prot
Protected Phases		9		3	3					4	4	4
Permitted Phases												

Lanes, Volumes, Timings  
 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 Signal  
 PM Peak

Lane Group	Ø2	Ø5	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	5	10
Permitted Phases			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 Signal  
PM Peak

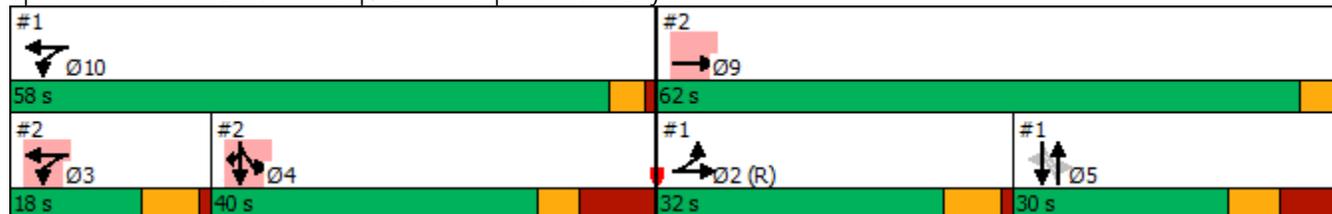


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		9		3	3					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		4.0	4.0					8.0	8.0	8.0
Minimum Split (s)		21.2		10.2	10.2					18.7	18.7	18.7
Total Split (s)		62.0		18.0	18.0					40.0	40.0	40.0
Total Split (%)		51.7%		15.0%	15.0%					33.3%	33.3%	33.3%
Maximum Green (s)		57.8		11.8	11.8					29.3	29.3	29.3
Yellow Time (s)		3.2		5.2	5.2					3.7	3.7	3.7
All-Red Time (s)		1.0		1.0	1.0					7.0	7.0	7.0
Lost Time Adjust (s)		0.0			0.0					0.0	0.0	0.0
Total Lost Time (s)		4.2			6.2					10.7	10.7	10.7
Lead/Lag				Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Recall Mode		None		None	None					None	None	None
Act Effect Green (s)		76.0			11.4					11.5	11.5	11.5
Actuated g/C Ratio		0.63			0.10					0.10	0.10	0.10
v/c Ratio		0.49			0.76					0.39	0.75	0.75
Control Delay		1.6			90.5					56.0	15.7	15.7
Queue Delay		0.7			1.2					0.0	2.7	2.7
Total Delay		2.2			91.6					56.0	18.4	18.4
LOS		A			F					E	B	B
Approach Delay		2.2			91.6					24.2		
Approach LOS		A			F					C		

Intersection Summary

Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.86
Intersection Signal Delay:	15.1
Intersection LOS:	B
Intersection Capacity Utilization:	47.3%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr



Lane Group	Ø2	Ø5	Ø10
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	1.0
Minimum Split (s)	11.2	15.8	12.0
Total Split (s)	32.0	30.0	58.0
Total Split (%)	27%	25%	48%
Maximum Green (s)	25.8	19.2	53.8
Yellow Time (s)	5.2	4.8	3.2
All-Red Time (s)	1.0	6.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

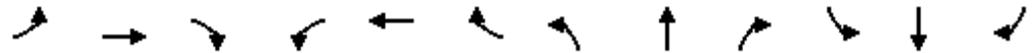
Year 2045 Signal  
PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	815	78	0	0	55	50	66	11	39	0	0	0
Future Volume (vph)	815	78	0	0	55	50	66	11	39	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>					0.936			0.955				
Fl <sub>t</sub> Protected	0.950							0.972				
Satd. Flow (prot)	1770	1863	0	0	1744	0	0	1729	0	0	0	0
Fl <sub>t</sub> Permitted	0.950							0.972				
Satd. Flow (perm)	1770	1863	0	0	1744	0	0	1729	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					32			18				
Link Speed (mph)		50			50			30				30
Link Distance (ft)		507			439			841				647
Travel Time (s)		6.9			6.0			19.1				14.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	886	85	0	0	60	54	72	12	42	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	886	85	0	0	114	0	0	126	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Split	NA			NA		Perm	NA				
Protected Phases	2	2			6			4				
Permitted Phases							4					
Detector Phase	2	2			6		4	4				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0		5.0	5.0				

Lanes, Volumes, Timings  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2045 Signal  
 PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5				
Total Split (s)	75.0	75.0			22.5		22.5	22.5				
Total Split (%)	62.5%	62.5%			18.8%		18.8%	18.8%				
Maximum Green (s)	70.5	70.5			18.0		18.0	18.0				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.5	4.5			4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	C-Min	C-Min			None		None	None				
Walk Time (s)	7.0	7.0			7.0		7.0	7.0				
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0				
Pedestrian Calls (#/hr)	0	0			0		0	0				
Act Effct Green (s)	82.6	82.6			11.1			12.8				
Actuated g/C Ratio	0.69	0.69			0.09			0.11				
v/c Ratio	0.73	0.07			0.60			0.63				
Control Delay	13.2	1.3			49.9			57.0				
Queue Delay	0.1	0.0			0.0			0.0				
Total Delay	13.3	1.3			49.9			57.0				
LOS	B	A			D			E				
Approach Delay		12.3			49.9			57.0				
Approach LOS		B			D			E				

Intersection Summary

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 100  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 20.5  
 Intersection Capacity Utilization 65.9%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service C

Splits and Phases: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:15	4:15	4:15	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	1527	1496	1534	1529	1531	1494	1532
Vehs Exited	1519	1482	1530	1537	1541	1485	1512
Starting Vehs	41	46	52	50	60	50	49
Ending Vehs	49	60	56	42	50	59	69
Travel Distance (mi)	465	453	471	468	472	457	465
Travel Time (hr)	356.0	305.5	322.1	315.9	257.9	268.3	281.4
Total Delay (hr)	339.9	289.6	305.7	299.6	241.5	252.5	265.2
Total Stops	2125	2060	2129	2146	2128	2057	2214
Fuel Used (gal)	97.9	85.6	90.3	88.6	75.8	77.2	80.6

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:15	4:15	4:15	4:15
End Time	5:30	5:30	5:30	5:30
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1542	1516	1526	1521
Vehs Exited	1536	1499	1529	1518
Starting Vehs	44	46	45	45
Ending Vehs	50	63	42	51
Travel Distance (mi)	470	463	469	465
Travel Time (hr)	302.7	285.7	272.3	296.8
Total Delay (hr)	286.3	269.6	256.0	280.6
Total Stops	2052	2051	2099	2107
Fuel Used (gal)	85.4	81.6	78.6	84.2

Interval #0 Information Seeding

Start Time	4:15
End Time	4:30
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

**Interval #1 Information Recording**

Start Time	4:30
End Time	5:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	1527	1496	1534	1529	1531	1494	1532
Vehs Exited	1519	1482	1530	1537	1541	1485	1512
Starting Vehs	41	46	52	50	60	50	49
Ending Vehs	49	60	56	42	50	59	69
Travel Distance (mi)	465	453	471	468	472	457	465
Travel Time (hr)	356.0	305.5	322.1	315.9	257.9	268.3	281.4
Total Delay (hr)	339.9	289.6	305.7	299.6	241.5	252.5	265.2
Total Stops	2125	2060	2129	2146	2128	2057	2214
Fuel Used (gal)	97.9	85.6	90.3	88.6	75.8	77.2	80.6

**Interval #1 Information Recording**

Start Time	4:30
End Time	5:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	1542	1516	1526	1521
Vehs Exited	1536	1499	1529	1518
Starting Vehs	44	46	45	45
Ending Vehs	50	63	42	51
Travel Distance (mi)	470	463	469	465
Travel Time (hr)	302.7	285.7	272.3	296.8
Total Delay (hr)	286.3	269.6	256.0	280.6
Total Stops	2052	2051	2099	2107
Fuel Used (gal)	85.4	81.6	78.6	84.2

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	EB	B7	WB	WB	NB	SB
Directions Served	LT	TR	T	LT	TR	LTR	LTR
Maximum Queue (ft)	230	174	417	31	16	170	285
Average Queue (ft)	217	83	386	3	1	72	133
95th Queue (ft)	228	156	400	18	10	137	238
Link Distance (ft)	147	147	367	43	43	728	653
Upstream Blk Time (%)	72	4	77	0	0		
Queuing Penalty (veh)	0	0	0	0	0		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	EB	WB	SB	SB
Directions Served	T	TR	LT	LT	R
Maximum Queue (ft)	62	59	207	208	488
Average Queue (ft)	31	14	101	49	264
95th Queue (ft)	61	45	176	167	462
Link Distance (ft)	43	43	460		669
Upstream Blk Time (%)	9	2			1
Queuing Penalty (veh)	43	9			0
Storage Bay Dist (ft)				325	
Storage Blk Time (%)					9
Queuing Penalty (veh)					5

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	407	117	138	154
Average Queue (ft)	189	19	62	65
95th Queue (ft)	387	74	118	123
Link Distance (ft)	460	460	411	804
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

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Intersection: 7: Bend

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Movement	WB	WB
Directions Served	T	
Maximum Queue (ft)	4	4
Average Queue (ft)	0	0
95th Queue (ft)	4	4
Link Distance (ft)	147	147
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

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Network Summary

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Network wide Queuing Penalty: 57

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2045 Signal  
Saturday Peak

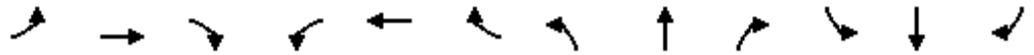


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Volume (vph)	28	596	50	61	663	17	44	33	155	17	22	105
Future Volume (vph)	28	596	50	61	663	17	44	33	155	17	22	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.989			0.997			0.910			0.901	
Fl <sub>t</sub> Protected		0.998			0.996			0.991			0.994	
Satd. Flow (prot)	0	3493	0	0	3514	0	0	1680	0	0	1668	0
Fl <sub>t</sub> Permitted		0.998			0.996			0.909			0.845	
Satd. Flow (perm)	0	3493	0	0	3514	0	0	1541	0	0	1418	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			3			82			111	
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		204			123			768			710	
Travel Time (s)		2.8			1.7			11.6			10.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	648	54	66	721	18	48	36	168	18	24	114
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	732	0	0	805	0	0	252	0	0	156	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru										
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex										
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA		Perm	NA	
Protected Phases	2	2		10	10			5			5	
Permitted Phases							5			5		
Detector Phase	2	2		10	10		5	5		5	5	
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	1.0		5.0	5.0		5.0	5.0	

Lane Group	Ø3	Ø4	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphp)			
Lane Util. Factor			
Flt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	3	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	4.0	8.0	15.0

Lanes, Volumes, Timings  
1: Ontario Rd & San Luis Bay Dr

Year 2045 Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	11.2	11.2		12.0	12.0		15.8	15.8		15.8	15.8	
Total Split (s)	20.0	20.0		57.0	57.0		23.0	23.0		23.0	23.0	
Total Split (%)	20.0%	20.0%		57.0%	57.0%		23.0%	23.0%		23.0%	23.0%	
Maximum Green (s)	13.8	13.8		52.8	52.8		12.2	12.2		12.2	12.2	
Yellow Time (s)	5.2	5.2		3.2	3.2		4.8	4.8		4.8	4.8	
All-Red Time (s)	1.0	1.0		1.0	1.0		6.0	6.0		6.0	6.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.2			4.2			10.8			10.8	
Lead/Lag	Lead	Lead					Lag	Lag		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes					Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		None	None		None	None		None	None	
Act Effct Green (s)		26.2			40.4			12.2			12.2	
Actuated g/C Ratio		0.26			0.40			0.12			0.12	
v/c Ratio		0.80			0.57			0.97			0.58	
Control Delay		43.8			17.9			80.7			23.6	
Queue Delay		1.0			1.6			0.8			0.1	
Total Delay		44.8			19.5			81.5			23.6	
LOS		D			B			F			C	
Approach Delay		44.8			19.5			81.5			23.6	
Approach LOS		D			B			F			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.97  
 Intersection Signal Delay: 37.4  
 Intersection LOS: D  
 Intersection Capacity Utilization 78.8%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 1: Ontario Rd & San Luis Bay Dr



Lane Group	Ø3	Ø4	Ø9
Minimum Split (s)	10.2	18.7	21.2
Total Split (s)	21.0	36.0	43.0
Total Split (%)	21%	36%	43%
Maximum Green (s)	14.8	25.3	38.8
Yellow Time (s)	5.2	3.7	3.2
All-Red Time (s)	1.0	7.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↔						↔	↔
Traffic Volume (vph)	0	652	116	22	158	0	0	0	0	39	28	583
Future Volume (vph)	0	652	116	22	158	0	0	0	0	39	28	583
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	325		0
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25			25			25			120		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977										0.850
Flt Protected					0.994						0.972	
Satd. Flow (prot)	0	3458	0	0	1852	0	0	0	0	0	1811	1583
Flt Permitted					0.994						0.972	
Satd. Flow (perm)	0	3458	0	0	1852	0	0	0	0	0	1811	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24										634
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		123			507			757			683	
Travel Time (s)		1.7			6.9			17.2			15.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	709	126	24	172	0	0	0	0	42	30	634
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	835	0	0	196	0	0	0	0	0	72	634
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	1
Detector Template		Thru		Left	Thru					Left	Thru	Right
Leading Detector (ft)		100		20	100					20	100	20
Trailing Detector (ft)		0		0	0					0	0	0
Detector 1 Position(ft)		0		0	0					0	0	0
Detector 1 Size(ft)		6		20	6					20	6	20
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94							94
Detector 2 Size(ft)		6			6							6
Detector 2 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							0.0
Turn Type		NA		Split	NA					Split	NA	Perm
Protected Phases		9		3	3					4	4	
Permitted Phases												4

Lane Group	Ø2	Ø5	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	5	10
Permitted Phases			

Lanes, Volumes, Timings  
2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr

Year 2045 Signal  
Saturday Peak

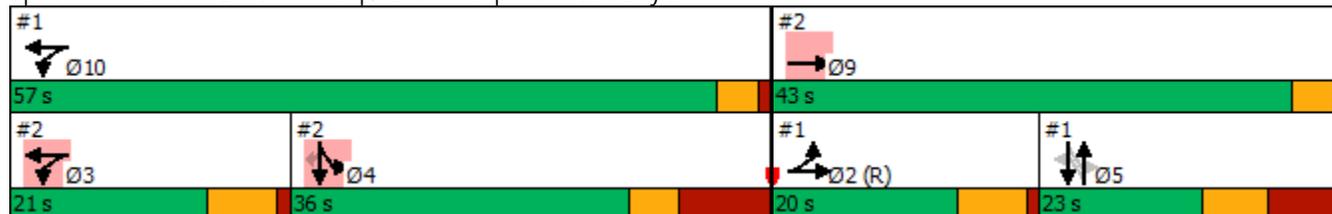


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		9		3	3					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		4.0	4.0					8.0	8.0	8.0
Minimum Split (s)		21.2		10.2	10.2					18.7	18.7	18.7
Total Split (s)		43.0		21.0	21.0					36.0	36.0	36.0
Total Split (%)		43.0%		21.0%	21.0%					36.0%	36.0%	36.0%
Maximum Green (s)		38.8		14.8	14.8					25.3	25.3	25.3
Yellow Time (s)		3.2		5.2	5.2					3.7	3.7	3.7
All-Red Time (s)		1.0		1.0	1.0					7.0	7.0	7.0
Lost Time Adjust (s)		0.0			0.0						0.0	0.0
Total Lost Time (s)		4.2			6.2						10.7	10.7
Lead/Lag				Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Recall Mode		None		None	None					None	None	None
Act Effect Green (s)		51.2			13.7						14.0	14.0
Actuated g/C Ratio		0.51			0.14						0.14	0.14
v/c Ratio		0.47			0.77						0.29	0.83
Control Delay		2.4			69.3						38.8	13.1
Queue Delay		1.7			0.4						0.0	50.8
Total Delay		4.1			69.7						38.8	63.9
LOS		A			E						D	E
Approach Delay		4.1			69.7						61.3	
Approach LOS		A			E						E	

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.97
Intersection Signal Delay:	34.7
Intersection LOS:	C
Intersection Capacity Utilization:	59.7%
ICU Level of Service:	B
Analysis Period (min):	15

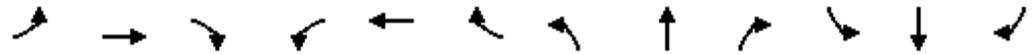
Splits and Phases: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr



Lane Group	Ø2	Ø5	Ø10
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	1.0
Minimum Split (s)	11.2	15.8	12.0
Total Split (s)	20.0	23.0	57.0
Total Split (%)	20%	23%	57%
Maximum Green (s)	13.8	12.2	52.8
Yellow Time (s)	5.2	4.8	3.2
All-Red Time (s)	1.0	6.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Min	None	None
Act Effect Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

Lanes, Volumes, Timings  
3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

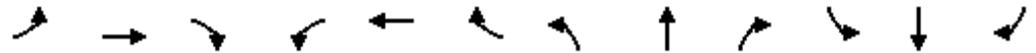
Year 2045 Signal  
Saturday Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	652	39	0	0	57	55	123	0	28	0	0	0
Future Volume (vph)	652	39	0	0	57	55	123	0	28	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Fr <sub>t</sub>					0.934			0.975				
Fl <sub>t</sub> Protected	0.950							0.961				
Satd. Flow (prot)	1770	1863	0	0	1740	0	0	1745	0	0	0	0
Fl <sub>t</sub> Permitted	0.950							0.961				
Satd. Flow (perm)	1770	1863	0	0	1740	0	0	1745	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					47			65				
Link Speed (mph)		50			50			30				30
Link Distance (ft)		507			439			841				647
Travel Time (s)		6.9			6.0			19.1				14.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	709	42	0	0	62	60	134	0	30	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	709	42	0	0	122	0	0	164	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Split	NA			NA		Perm	NA				
Protected Phases	2	2			6			4				
Permitted Phases							4					
Detector Phase	2	2			6		4	4				
Switch Phase												
Minimum Initial (s)	5.0	5.0			5.0		5.0	5.0				

Lanes, Volumes, Timings  
 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr

Year 2045 Signal  
 Saturday Peak

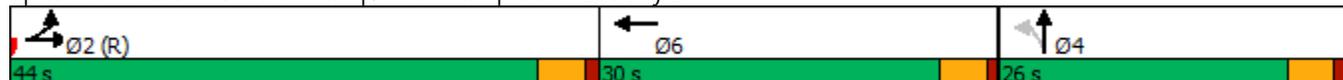


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5			22.5		22.5	22.5				
Total Split (s)	44.0	44.0			30.0		26.0	26.0				
Total Split (%)	44.0%	44.0%			30.0%		26.0%	26.0%				
Maximum Green (s)	39.5	39.5			25.5		21.5	21.5				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.5	4.5			4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	C-Min	C-Min			None		None	None				
Walk Time (s)	7.0	7.0			7.0		7.0	7.0				
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0				
Pedestrian Calls (#/hr)	0	0			0		0	0				
Act Effct Green (s)	65.4	65.4			9.9			11.2				
Actuated g/C Ratio	0.65	0.65			0.10			0.11				
v/c Ratio	0.61	0.03			0.57			0.65				
Control Delay	11.0	1.2			36.6			36.7				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	11.0	1.2			36.6			36.7				
LOS	B	A			D			D				
Approach Delay		10.4			36.6			36.7				
Approach LOS		B			D			D				

Intersection Summary

Area Type:	Other
Cycle Length:	100
Actuated Cycle Length:	100
Offset:	0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.65
Intersection Signal Delay:	17.7
Intersection LOS:	B
Intersection Capacity Utilization	58.8%
ICU Level of Service	B
Analysis Period (min)	15

Splits and Phases: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr



Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	1:00	1:00	1:00	1:00	1:00	1:00
End Time	2:15	2:15	2:15	2:15	2:15	2:15
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1639	1639	1645	1602	1602	1625
Vehs Exited	1640	1615	1655	1612	1609	1626
Starting Vehs	64	49	61	66	63	61
Ending Vehs	63	73	51	56	56	58
Travel Distance (mi)	479	475	483	471	470	475
Travel Time (hr)	345.4	311.3	315.5	278.2	251.3	300.4
Total Delay (hr)	328.3	294.4	298.2	261.5	234.5	283.4
Total Stops	2110	2288	2384	2273	2256	2262
Fuel Used (gal)	95.6	87.6	88.5	80.1	73.7	85.1

Interval #0 Information Seeding

Start Time	1:00
End Time	1:15
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	1:15
End Time	2:15
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1639	1639	1645	1602	1602	1625
Vehs Exited	1640	1615	1655	1612	1609	1626
Starting Vehs	64	49	61	66	63	61
Ending Vehs	63	73	51	56	56	58
Travel Distance (mi)	479	475	483	471	470	475
Travel Time (hr)	345.4	311.3	315.5	278.2	251.3	300.4
Total Delay (hr)	328.3	294.4	298.2	261.5	234.5	283.4
Total Stops	2110	2288	2384	2273	2256	2262
Fuel Used (gal)	95.6	87.6	88.5	80.1	73.7	85.1

**Intersection: 1: Ontario Rd & San Luis Bay Dr**

Movement	EB	EB	B7	WB	WB	NB	SB
Directions Served	LT	TR	T	LT	TR	LTR	LTR
Maximum Queue (ft)	240	155	372	80	68	320	143
Average Queue (ft)	220	65	344	48	44	168	51
95th Queue (ft)	230	128	357	64	64	292	110
Link Distance (ft)	148	148	326	43	43	728	653
Upstream Blk Time (%)	86	1	93	38	30		
Queuing Penalty (veh)	0	0	0	141	113		
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

**Intersection: 2: SB On-Ramp/SB Off-Ramp & San Luis Bay Dr**

Movement	EB	EB	WB	SB	SB
Directions Served	T	TR	LT	LT	R
Maximum Queue (ft)	69	69	236	378	652
Average Queue (ft)	36	21	120	152	449
95th Queue (ft)	67	61	208	459	747
Link Distance (ft)	43	43	460		649
Upstream Blk Time (%)	20	7			16
Queuing Penalty (veh)	75	26			0
Storage Bay Dist (ft)				325	
Storage Blk Time (%)					42
Queuing Penalty (veh)					28

**Intersection: 3: NB Off-Ramp/NB On-Ramp & San Luis Bay Dr**

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	346	53	165	191
Average Queue (ft)	194	13	66	86
95th Queue (ft)	313	43	123	159
Link Distance (ft)	460	460	411	804
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

---

Intersection: 7: Bend

---

Movement	WB	WB
Directions Served	T	
Maximum Queue (ft)	12	9
Average Queue (ft)	0	0
95th Queue (ft)	7	6
Link Distance (ft)	148	148
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

---

Network Summary

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Network wide Queuing Penalty: 384



# **Appendix E**

## **Roundabout Alternative**

### **Sidra Reports**

# LANE LEVEL OF SERVICE

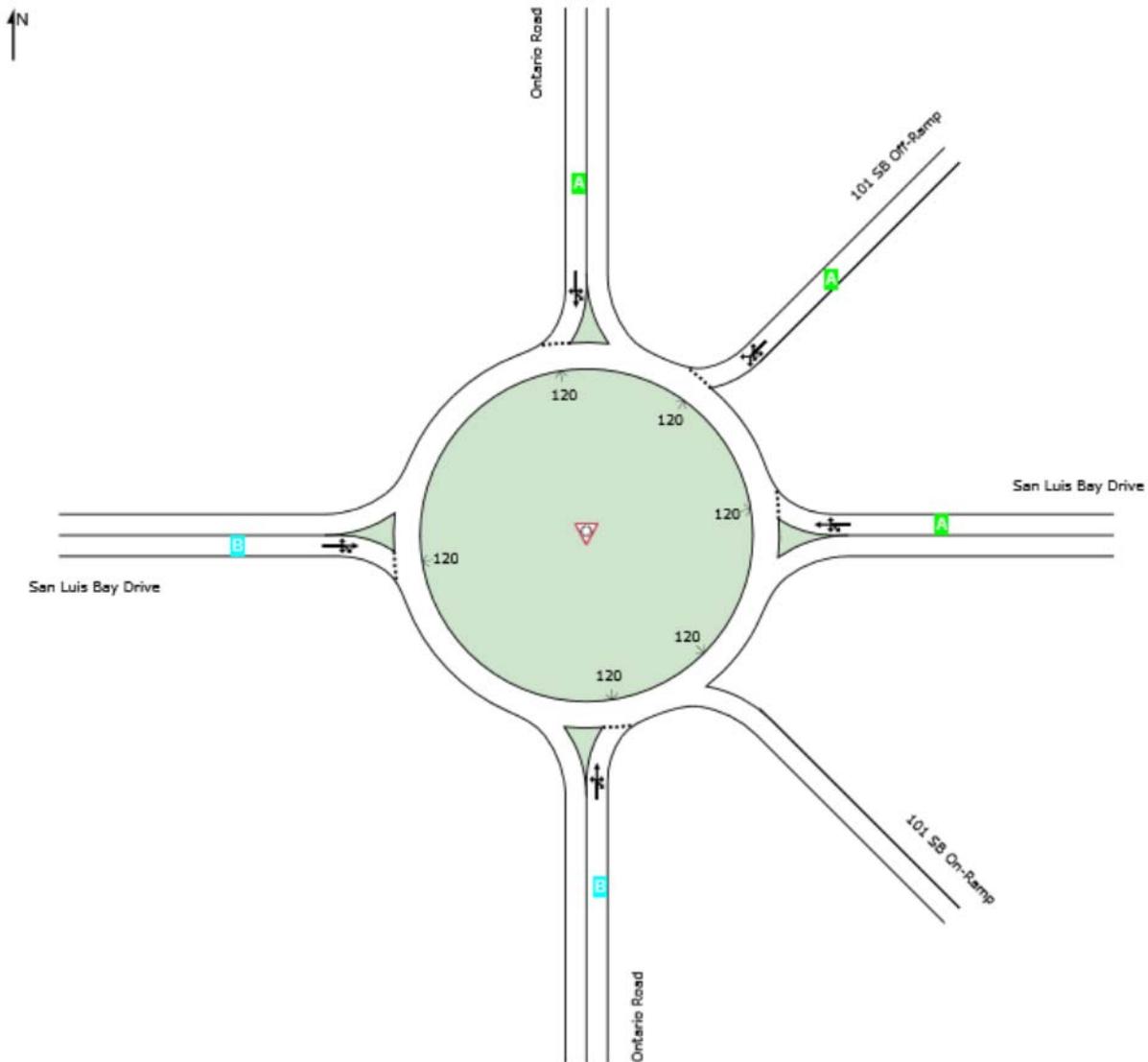
Lane Level of Service

Network: N101 [2045 PM]

Site: 101 [2045 PM SB]

New Site  
 Site Category: (None)  
 Roundabout

LOS	Approaches					Intersection
	South	East	Northeast	North	West	
B	A	A	A	A	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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# LANE SUMMARY

Site: 101 [2045 PM SB]

Network: N101 [2045 PM]

New Site  
Site Category: (None)  
Roundabout

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %						Veh	Dist ft				
South: Ontario Road															
Lane 1 <sup>d</sup>	151	3.0	151	3.0	398	0.380	100	16.0	LOS B	1.3	32.4	Full	1600	0.0	0.0
Approach	151	3.0	151	3.0		0.380		16.0	LOS B	1.3	32.4				
East: San Luis Bay Drive															
Lane 1 <sup>d</sup>	132	3.0	132	3.0	1401	0.094	100	7.5	LOS A	0.2	5.6	Full	425	0.0	0.0
Approach	132	3.0	132	3.0		0.094		7.5	LOS A	0.2	5.6				
NorthEast: 101 SB Off-Ramp															
Lane 1 <sup>d</sup>	426	3.0	426	3.0	1269	0.336	100	4.1	LOS A	0.9	22.0	Full	1600	0.0	0.0
Approach	426	3.0	426	3.0		0.336		4.1	LOS A	0.9	22.0				
North: Ontario Road															
Lane 1 <sup>d</sup>	228	3.0	228	3.0	919	0.248	100	8.5	LOS A	0.6	16.1	Full	1600	0.0	0.0
Approach	228	3.0	228	3.0		0.248		8.5	LOS A	0.6	16.1				
West: San Luis Bay Drive															
Lane 1 <sup>d</sup>	983	3.0	983	3.0	1180	0.833	100	12.7	LOS B	5.8	149.6	Full	1600	0.0	0.0
Approach	983	3.0	983	3.0		0.833		12.7	LOS B	5.8	149.6				
Intersection	1920	3.0	1920	3.0		0.833		10.2	LOS B	5.8	149.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach

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# INTERSECTION SUMMARY

 Site: 101 [2045 PM SB]

 Network: N101 [2045 PM]

New Site  
Site Category: (None)  
Roundabout

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	33.6 mph	33.6 mph
Travel Distance (Total)	893.8 veh-mi/h	1072.5 pers-mi/h
Travel Time (Total)	26.6 veh-h/h	32.0 pers-h/h
Demand Flows (Total)	1920 veh/h	2303 pers/h
Arrival Flows (Total)	1920 veh/h	2303 pers/h
Percent Heavy Vehicles (Demand)	3.0 %	
Percent Heavy Vehicles (Arrivals)	3.0 %	
Degree of Saturation	0.833	
Practical Spare Capacity	2.1 %	
Effective Intersection Capacity	2306 veh/h	
Control Delay (Total)	5.43 veh-h/h	6.51 pers-h/h
Control Delay (Average)	10.2 sec	10.2 sec
Control Delay (Worst Lane)	16.0 sec	
Control Delay (Worst Movement)	21.9 sec	21.9 sec
Geometric Delay (Average)	5.0 sec	
Stop-Line Delay (Average)	5.2 sec	
Idling Time (Average)	0.6 sec	
Intersection Level of Service (LOS)	LOS B	
Aver. Back of Queue - Vehicles (Worst Lane)	5.8 veh	
Aver. Back of Queue - Distance (Worst Lane)	149.6 ft	
Queue Storage Ratio (Worst Lane)	0.09	
Total Effective Stops	1440 veh/h	1728 pers/h
Effective Stop Rate	0.75	0.75
Proportion Queued	0.75	0.75
Performance Index	107.4	107.4
Cost (Total)	526.32 \$/h	526.32 \$/h
Fuel Consumption (Total)	47.1 gal/h	
Carbon Dioxide (Total)	421.1 kg/h	
Hydrocarbons (Total)	0.042 kg/h	
Carbon Monoxide (Total)	0.581 kg/h	
NOx (Total)	0.626 kg/h	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site Model Variability Index (Iterations 3 to N): 6.7 %

Number of Iterations: 8 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 3.4% 1.8% 0.9%

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	921,391 veh/y	1,105,670 pers/y
Arrival Flows (Total)	921,391 veh/y	
Delay	2,605 veh-h/y	3,126 pers-h/y
Effective Stops	691,001 veh/y	829,202 pers/y
Travel Distance	429,016 veh-mi/y	514,819 pers-mi/y

Travel Time	12,784 veh-h/y	15,341 pers-h/y
Cost	252,632 \$/y	252,632 \$/y
Fuel Consumption	22,595 gal/y	
Carbon Dioxide	202,146 kg/y	
Hydrocarbons	20 kg/y	
Carbon Monoxide	279 kg/y	
NOx	301 kg/y	

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# LANE LEVEL OF SERVICE

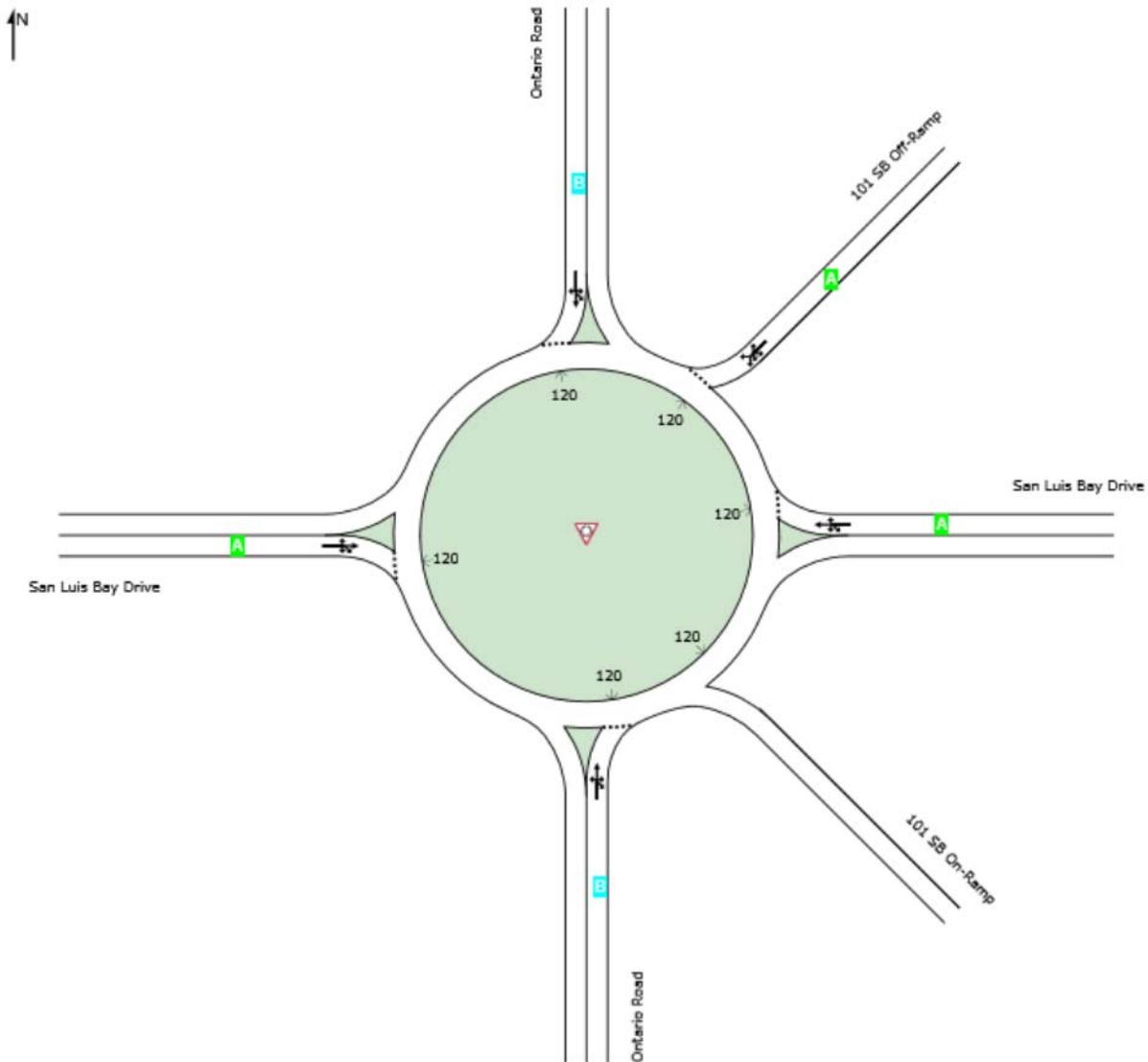
Lane Level of Service

Network: N101 [2045 SAT]

Site: 101 [2045 SAT SB]

New Site  
 Site Category: (None)  
 Roundabout

LOS	Approaches					Intersection
	South	East	Northeast	North	West	
A	B	A	A	B	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if  $v/c > 1$  irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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# LANE SUMMARY

Site: 101 [2045 SAT SB]

Network: N101 [2045 SAT]

New Site  
Site Category: (None)  
Roundabout

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %						Veh	Dist ft				
South: Ontario Road															
Lane 1 <sup>d</sup>	252	3.0	252	3.0	698	0.361	100	11.4	LOS B	1.1	27.3	Full	1600	0.0	0.0
Approach	252	3.0	252	3.0		0.361		11.4	LOS B	1.1	27.3				
East: San Luis Bay Drive															
Lane 1 <sup>d</sup>	196	3.0	196	3.0	1316	0.149	100	6.6	LOS A	0.4	9.2	Full	425	0.0	0.0
Approach	196	3.0	196	3.0		0.149		6.6	LOS A	0.4	9.2				
NorthEast: 101 SB Off-Ramp															
Lane 1 <sup>d</sup>	707	3.0	707	3.0	1157	0.611	100	4.9	LOS A	2.3	57.6	Full	1600	0.0	0.0
Approach	707	3.0	707	3.0		0.611		4.9	LOS A	2.3	57.6				
North: Ontario Road															
Lane 1 <sup>d</sup>	157	3.0	157	3.0	591	0.265	100	12.4	LOS B	0.8	20.0	Full	1600	0.0	0.0
Approach	157	3.0	157	3.0		0.265		12.4	LOS B	0.8	20.0				
West: San Luis Bay Drive															
Lane 1 <sup>d</sup>	733	3.0	733	3.0	1265	0.579	100	7.1	LOS A	2.1	52.6	Full	1600	0.0	0.0
Approach	733	3.0	733	3.0		0.579		7.1	LOS A	2.1	52.6				
Intersection	2043	3.0	2043	3.0		0.611		7.2	LOS A	2.3	57.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach

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# INTERSECTION SUMMARY

 Site: 101 [2045 SAT SB]

 Network: N101 [2045 SAT]

New Site  
Site Category: (None)  
Roundabout

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	34.5 mph	34.5 mph
Travel Distance (Total)	1021.4 veh-mi/h	1225.7 pers-mi/h
Travel Time (Total)	29.6 veh-h/h	35.5 pers-h/h
Demand Flows (Total)	2043 veh/h	2452 pers/h
Arrival Flows (Total)	2043 veh/h	2452 pers/h
Percent Heavy Vehicles (Demand)	3.0 %	
Percent Heavy Vehicles (Arrivals)	3.0 %	
Degree of Saturation	0.611	
Practical Spare Capacity	39.2 %	
Effective Intersection Capacity	3347 veh/h	
Control Delay (Total)	4.11 veh-h/h	4.93 pers-h/h
Control Delay (Average)	7.2 sec	7.2 sec
Control Delay (Worst Lane)	12.4 sec	
Control Delay (Worst Movement)	18.3 sec	18.3 sec
Geometric Delay (Average)	4.3 sec	
Stop-Line Delay (Average)	2.9 sec	
Idling Time (Average)	0.5 sec	
Intersection Level of Service (LOS)	LOS A	
Aver. Back of Queue - Vehicles (Worst Lane)	2.3 veh	
Aver. Back of Queue - Distance (Worst Lane)	57.6 ft	
Queue Storage Ratio (Worst Lane)	0.04	
Total Effective Stops	1344 veh/h	1613 pers/h
Effective Stop Rate	0.66	0.66
Proportion Queued	0.67	0.67
Performance Index	94.9	94.9
Cost (Total)	561.62 \$/h	561.62 \$/h
Fuel Consumption (Total)	52.6 gal/h	
Carbon Dioxide (Total)	471.1 kg/h	
Hydrocarbons (Total)	0.046 kg/h	
Carbon Monoxide (Total)	0.653 kg/h	
NOx (Total)	0.716 kg/h	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site Model Variability Index (Iterations 3 to N): 3.9 %

Number of Iterations: 7 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 2.9% 1.5% 0.8%

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	980,870 veh/y	1,177,044 pers/y
Arrival Flows (Total)	980,870 veh/y	
Delay	1,972 veh-h/y	2,366 pers-h/y
Effective Stops	645,138 veh/y	774,165 pers/y
Travel Distance	490,286 veh-mi/y	588,343 pers-mi/y

Travel Time	14,206 veh-h/y	17,048 pers-h/y
Cost	269,576 \$/y	269,576 \$/y
Fuel Consumption	25,265 gal/y	
Carbon Dioxide	226,131 kg/y	
Hydrocarbons	22 kg/y	
Carbon Monoxide	313 kg/y	
NOx	344 kg/y	

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Project: K:\PRJ\2527\T2527\Sidra\2527 Roundabout Analysis.sip8

# LANE LEVEL OF SERVICE

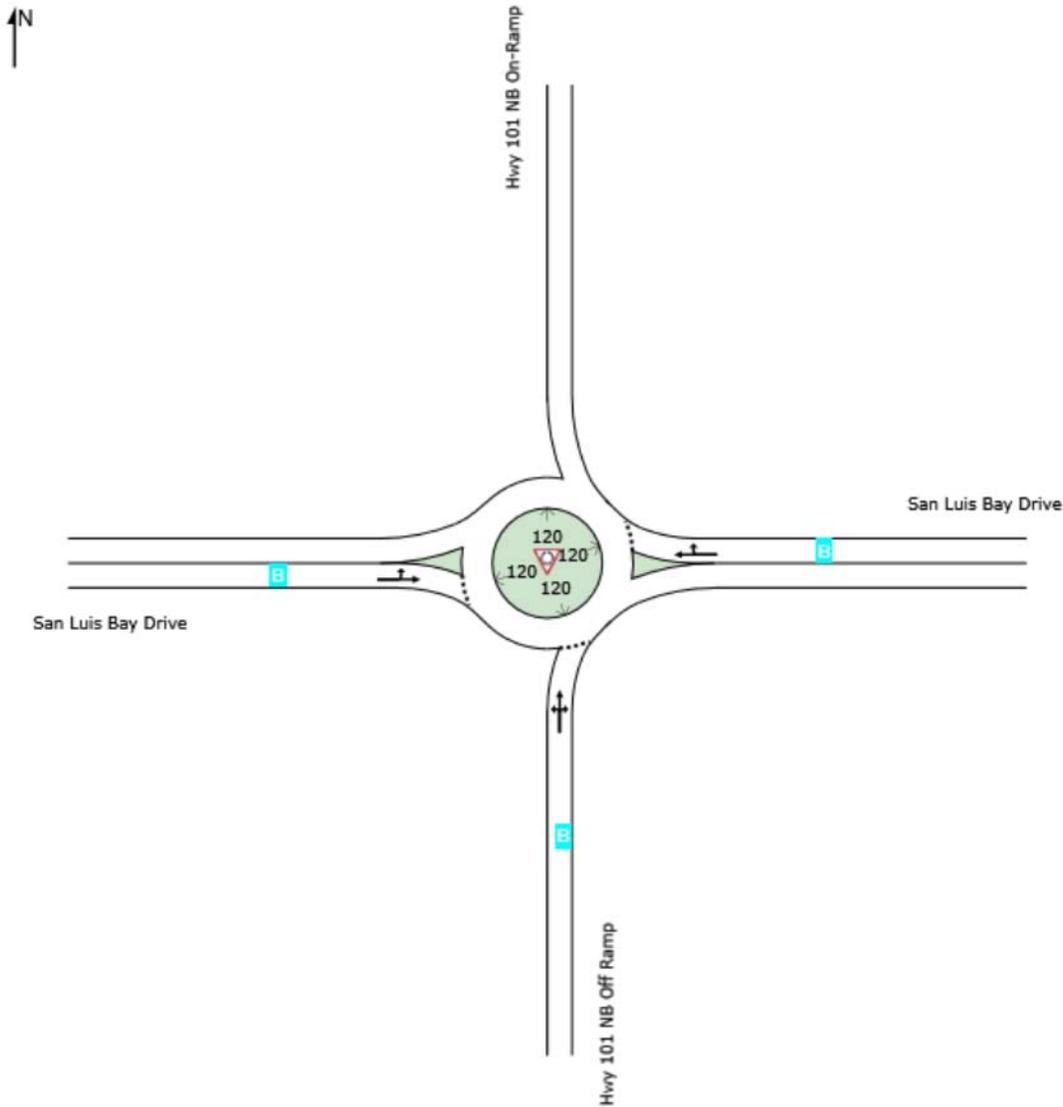
Lane Level of Service

Network: N101 [2045 PM]

Site: 101 [2045 PM NB]

New Site  
 Site Category: (None)  
 Roundabout

	Approaches			Intersection
	South	East	West	
LOS	B	B	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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# LANE SUMMARY

 Site: 101 [2045 PM NB]

 Network: N101 [2045 PM]

New Site  
Site Category: (None)  
Roundabout

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %						Veh	Dist ft				
South: Hwy 101 NB Off Ramp															
Lane 1 <sup>d</sup>	126	3.0	126	3.0	695	0.182	100	12.4	LOS B	0.5	11.9	Full	1600	0.0	0.0
Approach	126	3.0	126	3.0		0.182		12.4	LOS B	0.5	11.9				
East: San Luis Bay Drive															
Lane 1 <sup>d</sup>	114	3.0	114	3.0	682	0.167	100	12.8	LOS B	0.4	11.2	Full	1600	0.0	0.0
Approach	114	3.0	114	3.0		0.167		12.8	LOS B	0.4	11.2				
West: San Luis Bay Drive															
Lane 1 <sup>d</sup>	971	3.0	971	3.0	1746	0.556	100	10.8	LOS B	0.0	0.0	Full	425	0.0	0.0
Approach	971	3.0	971	3.0		0.556		10.8	LOS B	0.0	0.0				
Intersection	1211	3.0	1211	3.0		0.556		11.1	LOS B	0.5	11.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach

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# INTERSECTION SUMMARY

 Site: 101 [2045 PM NB]

 Network: N101 [2045 PM]

New Site  
Site Category: (None)  
Roundabout

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	30.2 mph	30.2 mph
Travel Distance (Total)	532.1 veh-mi/h	638.6 pers-mi/h
Travel Time (Total)	17.6 veh-h/h	21.1 pers-h/h
Demand Flows (Total)	1211 veh/h	1453 pers/h
Arrival Flows (Total)	1211 veh/h	1453 pers/h
Percent Heavy Vehicles (Demand)	3.0 %	
Percent Heavy Vehicles (Arrivals)	3.0 %	
Degree of Saturation	0.556	
Practical Spare Capacity	52.9 %	
Effective Intersection Capacity	2178 veh/h	
Control Delay (Total)	3.75 veh-h/h	4.50 pers-h/h
Control Delay (Average)	11.1 sec	11.1 sec
Control Delay (Worst Lane)	12.8 sec	
Control Delay (Worst Movement)	14.8 sec	14.8 sec
Geometric Delay (Average)	9.6 sec	
Stop-Line Delay (Average)	1.5 sec	
Idling Time (Average)	0.7 sec	
Intersection Level of Service (LOS)	LOS B	
Aver. Back of Queue - Vehicles (Worst Lane)	0.5 veh	
Aver. Back of Queue - Distance (Worst Lane)	11.9 ft	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	874 veh/h	1048 pers/h
Effective Stop Rate	0.72	0.72
Proportion Queued	0.16	0.16
Performance Index	24.6	24.6
Cost (Total)	222.20 \$/h	222.20 \$/h
Fuel Consumption (Total)	21.6 gal/h	
Carbon Dioxide (Total)	194.3 kg/h	
Hydrocarbons (Total)	0.016 kg/h	
Carbon Monoxide (Total)	0.181 kg/h	
NOx (Total)	0.276 kg/h	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site Model Variability Index (Iterations 3 to N): 1.0 %

Number of Iterations: 4 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 93.1% 1.3% 0.7%

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	581,217 veh/y	697,461 pers/y
Arrival Flows (Total)	581,217 veh/y	
Delay	1,799 veh-h/y	2,158 pers-h/y
Effective Stops	419,383 veh/y	503,260 pers/y
Travel Distance	255,426 veh-mi/y	306,512 pers-mi/y

Travel Time	8,446 veh-h/y	10,135 pers-h/y
Cost	106,657 \$/y	106,657 \$/y
Fuel Consumption	10,388 gal/y	
Carbon Dioxide	93,243 kg/y	
Hydrocarbons	8 kg/y	
Carbon Monoxide	87 kg/y	
NOx	132 kg/y	

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# LANE LEVEL OF SERVICE

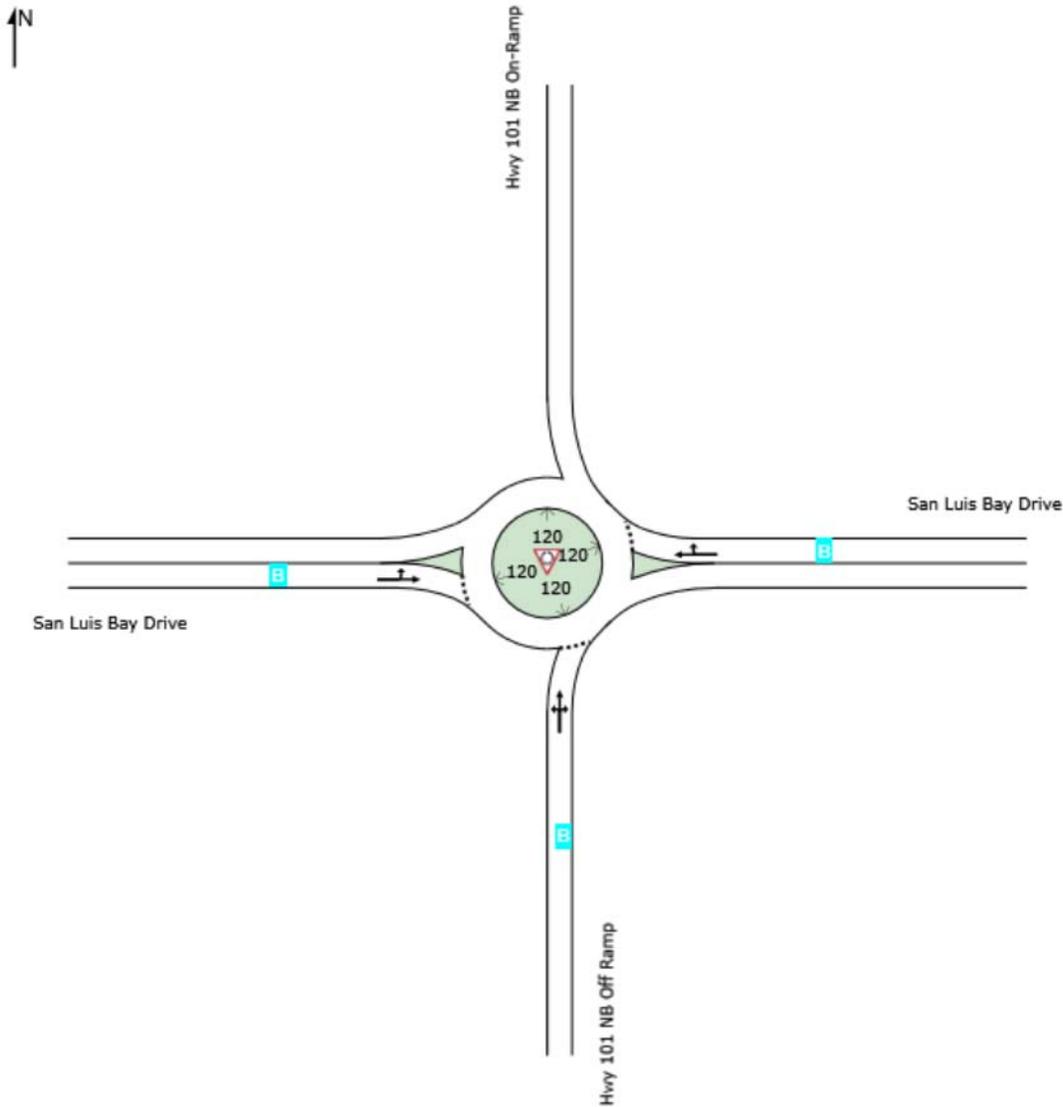
Lane Level of Service

Network: N101 [2045 SAT]

Site: 101 [2045 SAT NB]

New Site  
 Site Category: (None)  
 Roundabout

	Approaches			Intersection
	South	East	West	
LOS	B	B	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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# LANE SUMMARY

Site: 101 [2045 SAT NB]

Network: N101 [2045 SAT]

New Site  
Site Category: (None)  
Roundabout

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %						Veh	Dist ft				
South: Hwy 101 NB Off Ramp															
Lane 1 <sup>d</sup>	165	3.0	165	3.0	844	0.196	100	10.9	LOS B	0.5	12.0	Full	1600	0.0	0.0
Approach	165	3.0	165	3.0		0.196		10.9	LOS B	0.5	12.0				
East: San Luis Bay Drive															
Lane 1 <sup>d</sup>	122	3.0	122	3.0	761	0.160	100	10.9	LOS B	0.4	10.4	Full	1600	0.0	0.0
Approach	122	3.0	122	3.0		0.160		10.9	LOS B	0.4	10.4				
West: San Luis Bay Drive															
Lane 1 <sup>d</sup>	751	3.0	751	3.0	1746	0.430	100	11.0	LOS B	0.0	0.0	Full	425	0.0	0.0
Approach	751	3.0	751	3.0		0.430		11.0	LOS B	0.0	0.0				
Intersection	1038	3.0	1038	3.0		0.430		11.0	LOS B	0.5	12.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach

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# INTERSECTION SUMMARY

Site: 101 [2045 SAT NB]

Network: N101 [2045 SAT]

New Site  
 Site Category: (None)  
 Roundabout

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Travel Speed (Average)	29.9 mph	29.9 mph
Travel Distance (Total)	449.4 veh-mi/h	539.3 pers-mi/h
Travel Time (Total)	15.1 veh-h/h	18.1 pers-h/h
Demand Flows (Total)	1038 veh/h	1246 pers/h
Arrival Flows (Total)	1038 veh/h	1246 pers/h
Percent Heavy Vehicles (Demand)	3.0 %	
Percent Heavy Vehicles (Arrivals)	3.0 %	
Degree of Saturation	0.430	
Practical Spare Capacity	97.6 %	
Effective Intersection Capacity	2413 veh/h	
Control Delay (Total)	3.16 veh-h/h	3.80 pers-h/h
Control Delay (Average)	11.0 sec	11.0 sec
Control Delay (Worst Lane)	11.0 sec	
Control Delay (Worst Movement)	11.9 sec	11.9 sec
Geometric Delay (Average)	9.5 sec	
Stop-Line Delay (Average)	1.4 sec	
Idling Time (Average)	0.4 sec	
Intersection Level of Service (LOS)	LOS B	
Aver. Back of Queue - Vehicles (Worst Lane)	0.5 veh	
Aver. Back of Queue - Distance (Worst Lane)	12.0 ft	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	748 veh/h	898 pers/h
Effective Stop Rate	0.72	0.72
Proportion Queued	0.20	0.20
Performance Index	21.6	21.6
Cost (Total)	204.74 \$/h	204.74 \$/h
Fuel Consumption (Total)	18.9 gal/h	
Carbon Dioxide (Total)	169.4 kg/h	
Hydrocarbons (Total)	0.014 kg/h	
Carbon Monoxide (Total)	0.157 kg/h	
NOx (Total)	0.237 kg/h	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: Same as Signalised Intersections.

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site Model Variability Index (Iterations 3 to N): 1.3 %

Number of Iterations: 4 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 92.2% 1.8% 0.9%

Intersection Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	498,261 veh/y	597,913 pers/y
Arrival Flows (Total)	498,261 veh/y	
Delay	1,519 veh-h/y	1,822 pers-h/y
Effective Stops	359,266 veh/y	431,119 pers/y
Travel Distance	215,724 veh-mi/y	258,869 pers-mi/y

Travel Time	7,226 veh-h/y	8,671 pers-h/y
Cost	98,276 \$/y	98,276 \$/y
Fuel Consumption	9,066 gal/y	
Carbon Dioxide	81,332 kg/y	
Hydrocarbons	7 kg/y	
Carbon Monoxide	75 kg/y	
NOx	114 kg/y	

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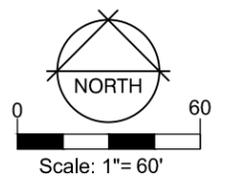
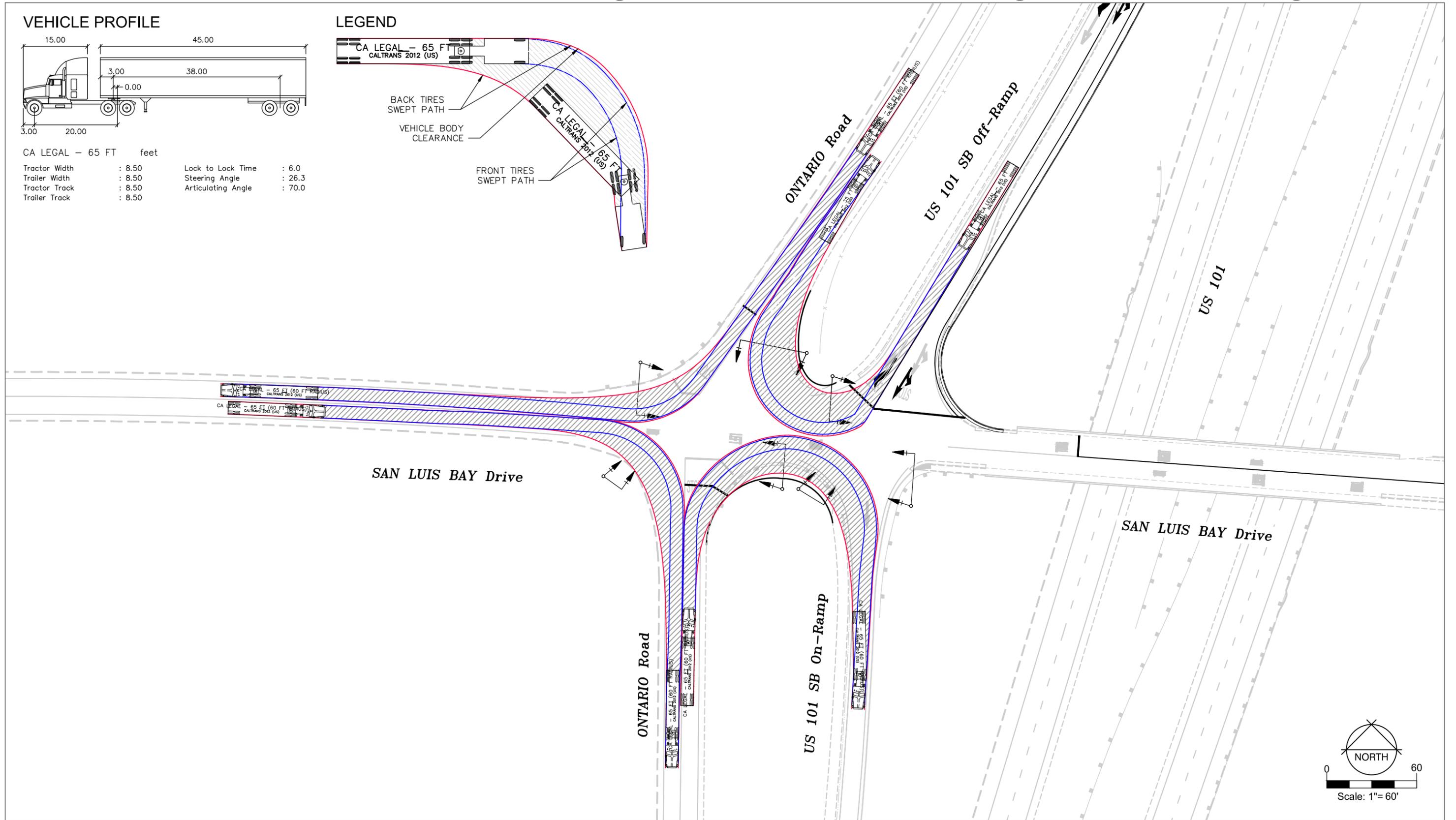
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Project: K:\PRJ2527\T2527\Sidra\2527 Roundabout Analysis.sip8

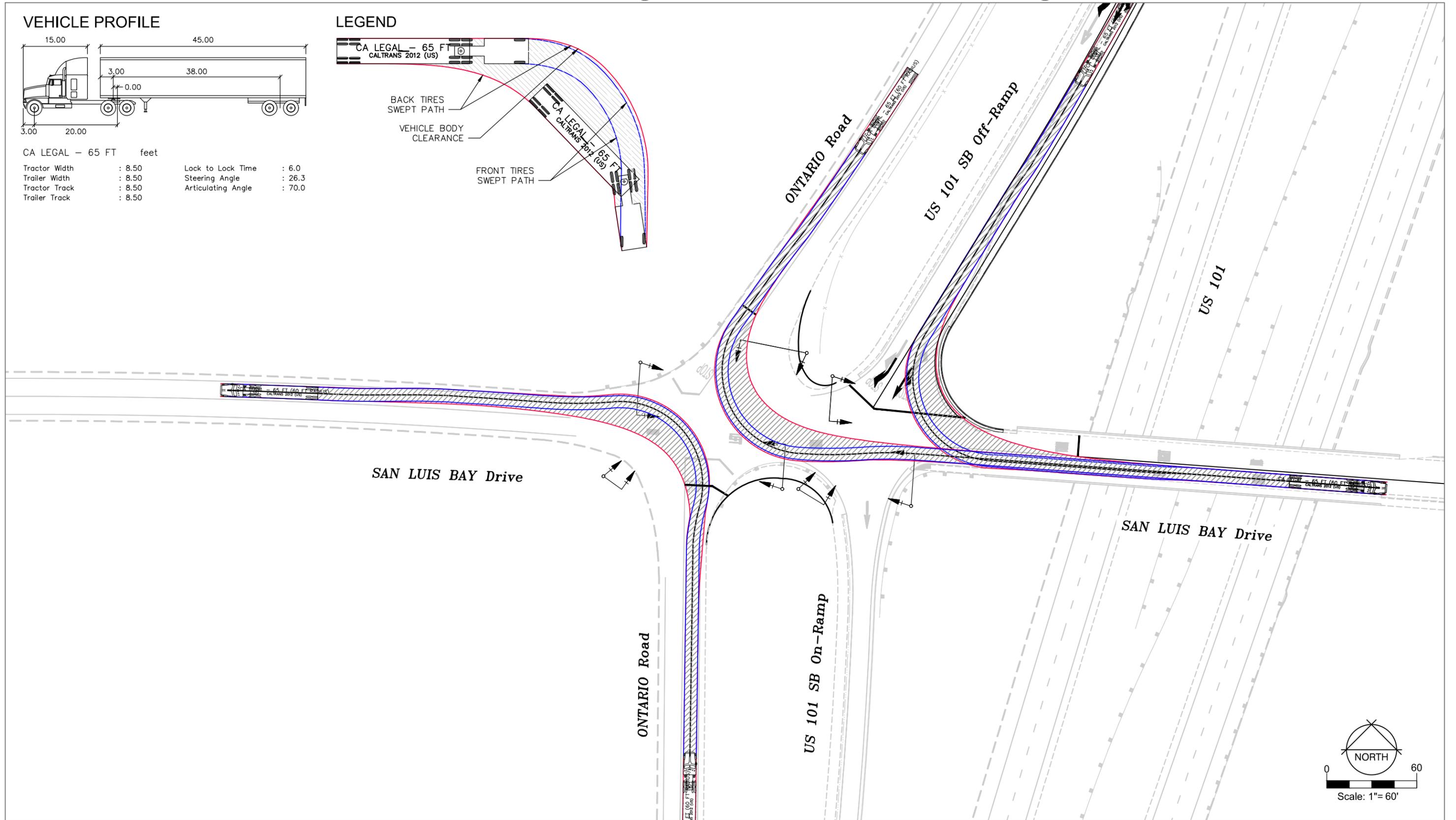


Appendix F  
Traffic Signal Alternative  
Truck Turn Exhibits

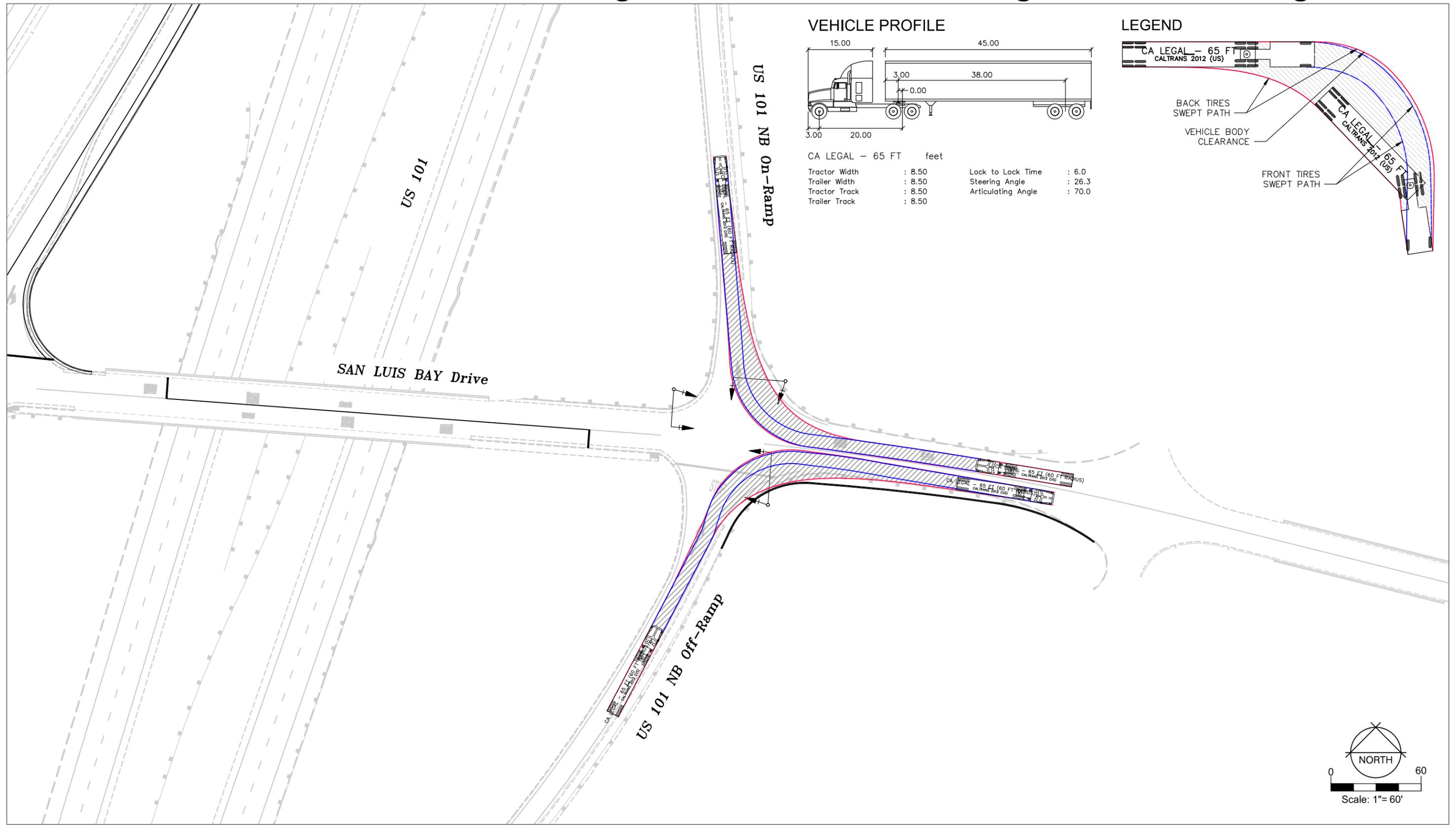
# Interim Traffic Signal Alternative - CA-Legal 65 Truck - Right Turns



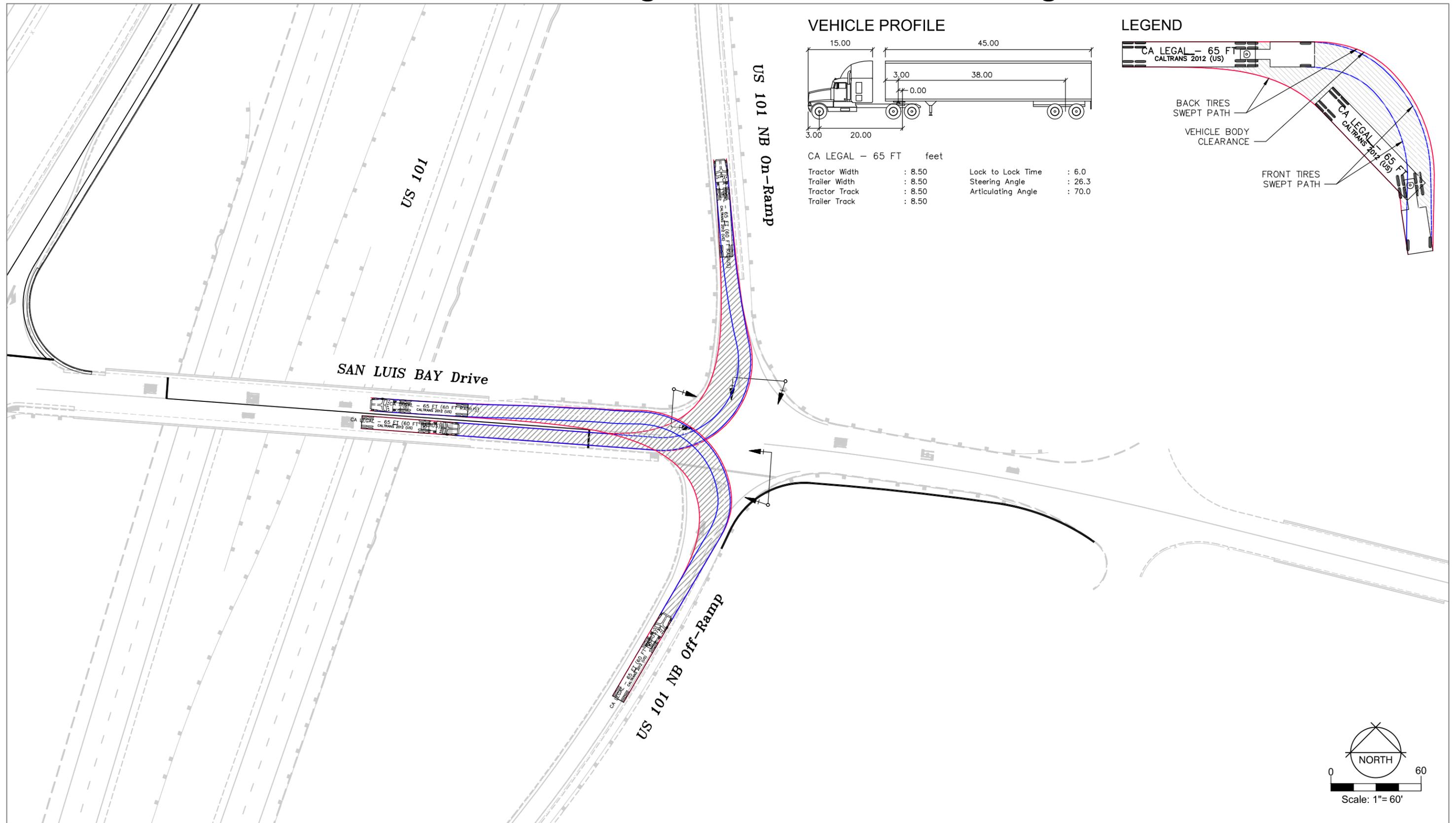
# Interim Traffic Signal Alternative - CA-Legal 65 Truck - Left Turns



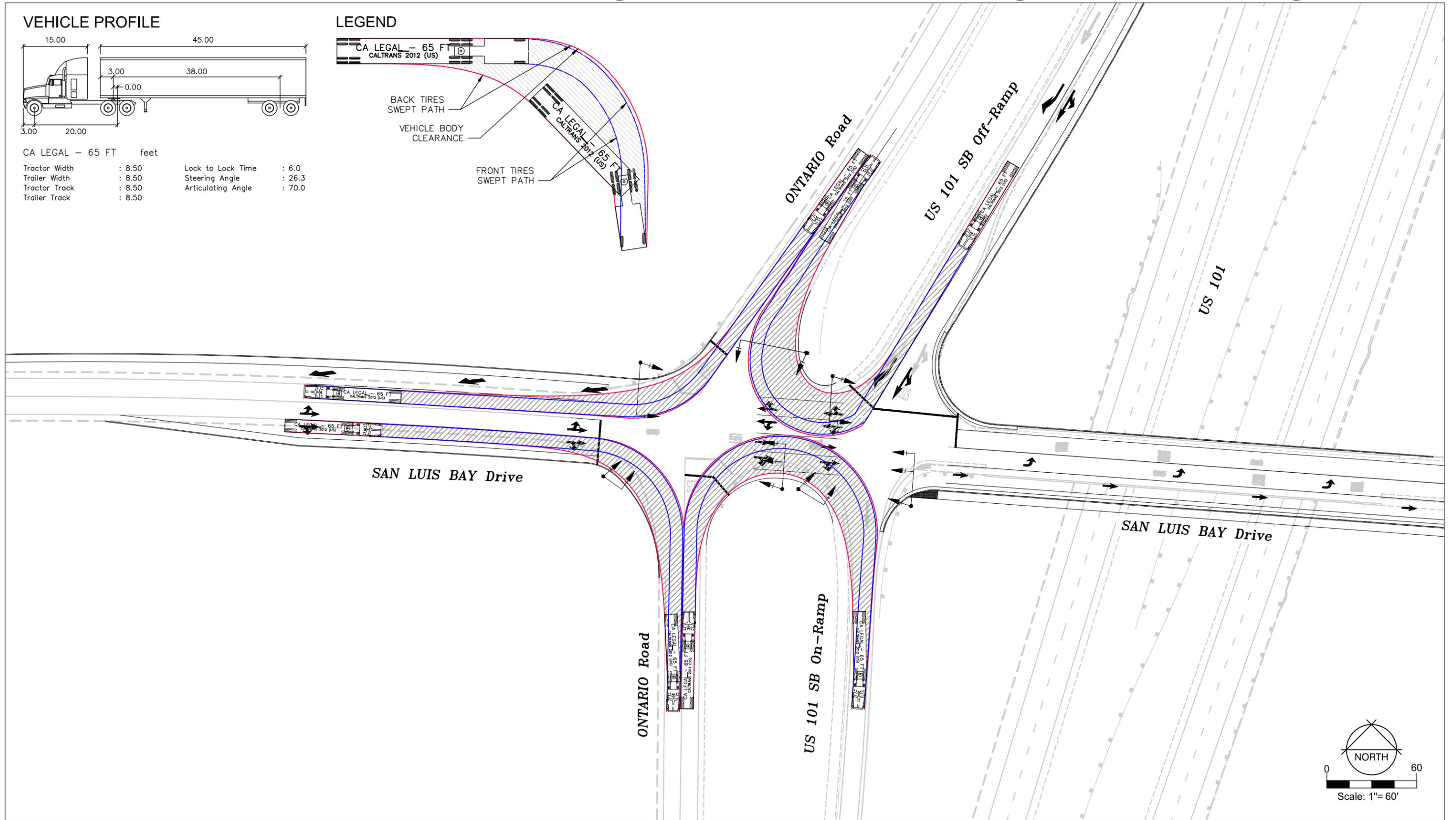
# Interim Traffic Signal Alternative - CA-Legal 65 Truck - Right Turns



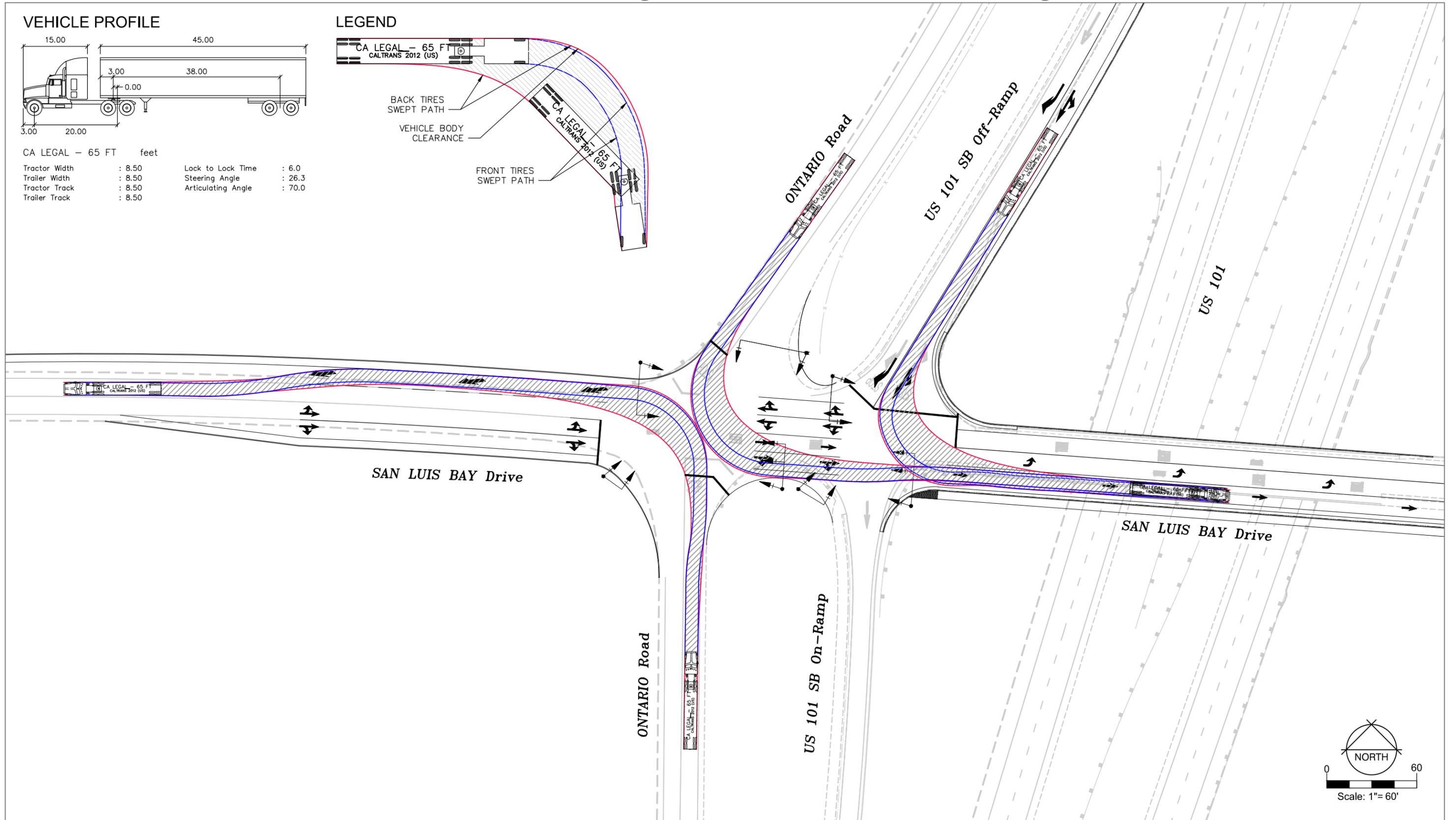
# Interim Traffic Signal Alternative - CA-Legal 65 Truck - Left Turns



# Ultimate Traffic Signal Alternative - CA-Legal 65 Truck - Right Turns



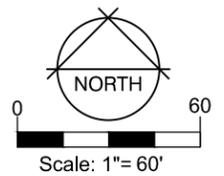
# Ultimate Traffic Signal Alternative - CA-Legal 65 Truck - Left Turns



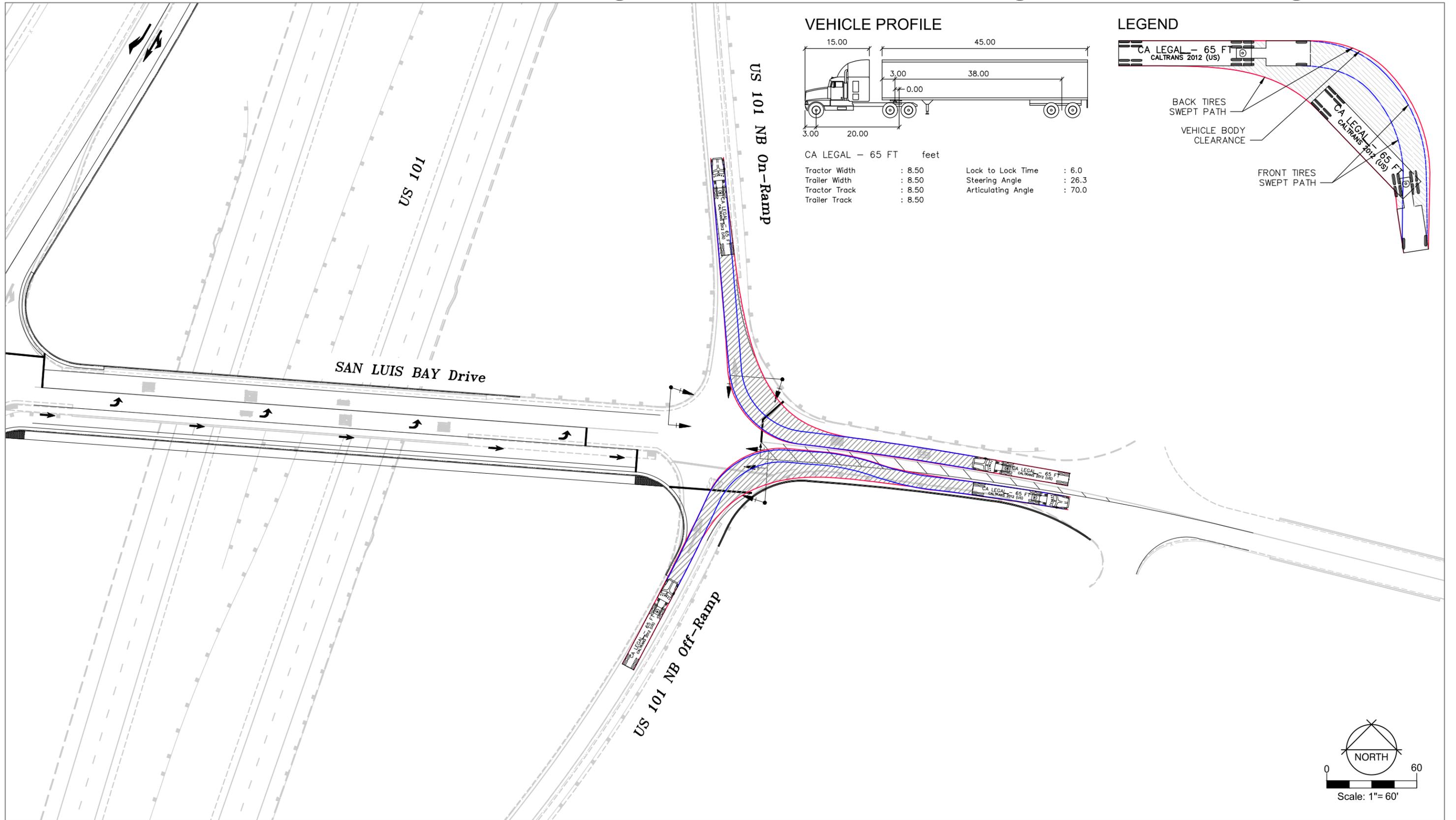
US 101/ San Luis Bay Drive ICE Study

County of San Luis Obispo

Figure F6



# Ultimate Traffic Signal Alternative - CA-Legal 65 Truck - Right Turns

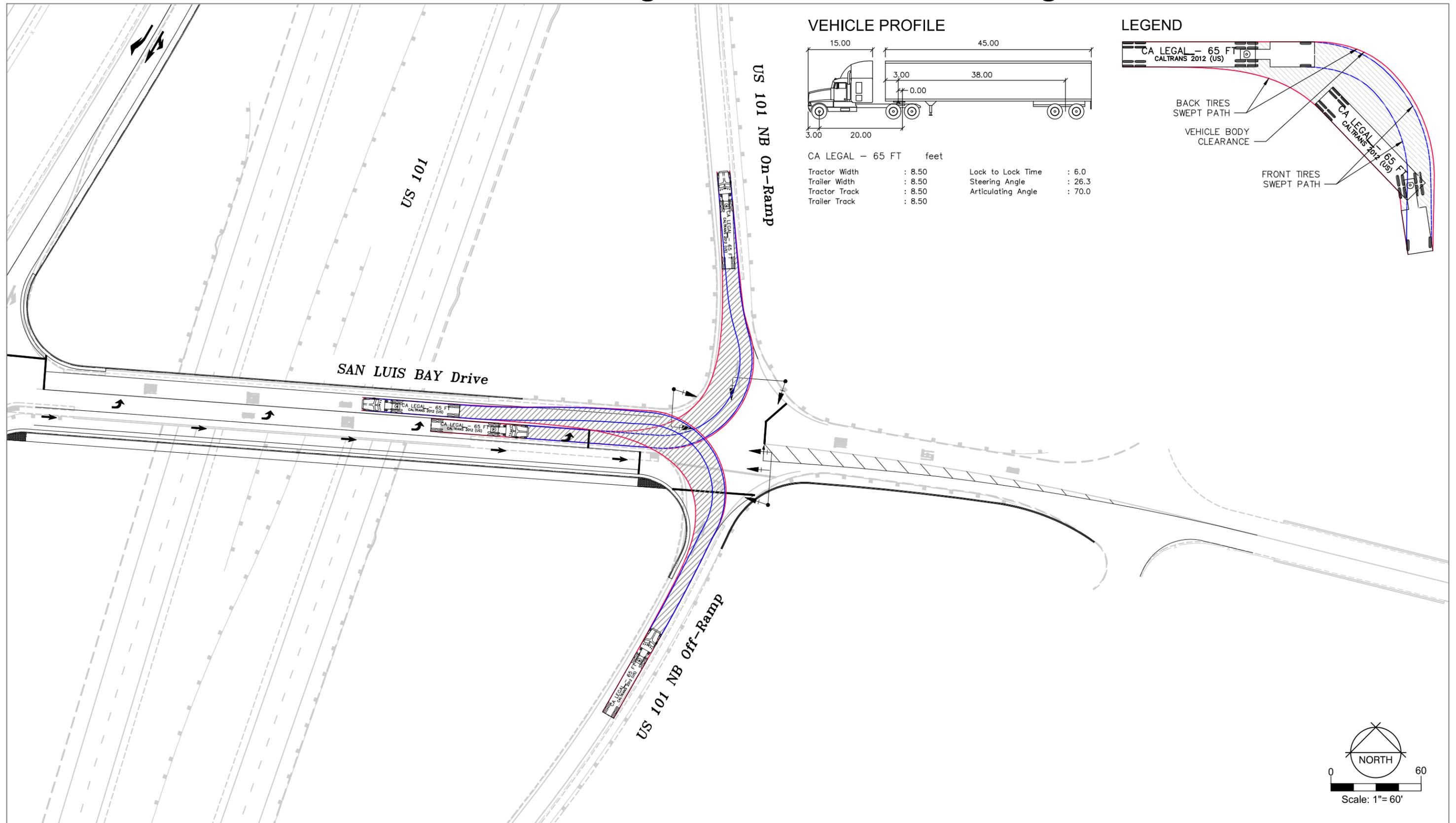


US 101/ San Luis Bay Drive ICE Study

County of San Luis Obispo

Figure F7

# Ultimate Traffic Signal Alternative - CA-Legal 65 Truck - Left Turns





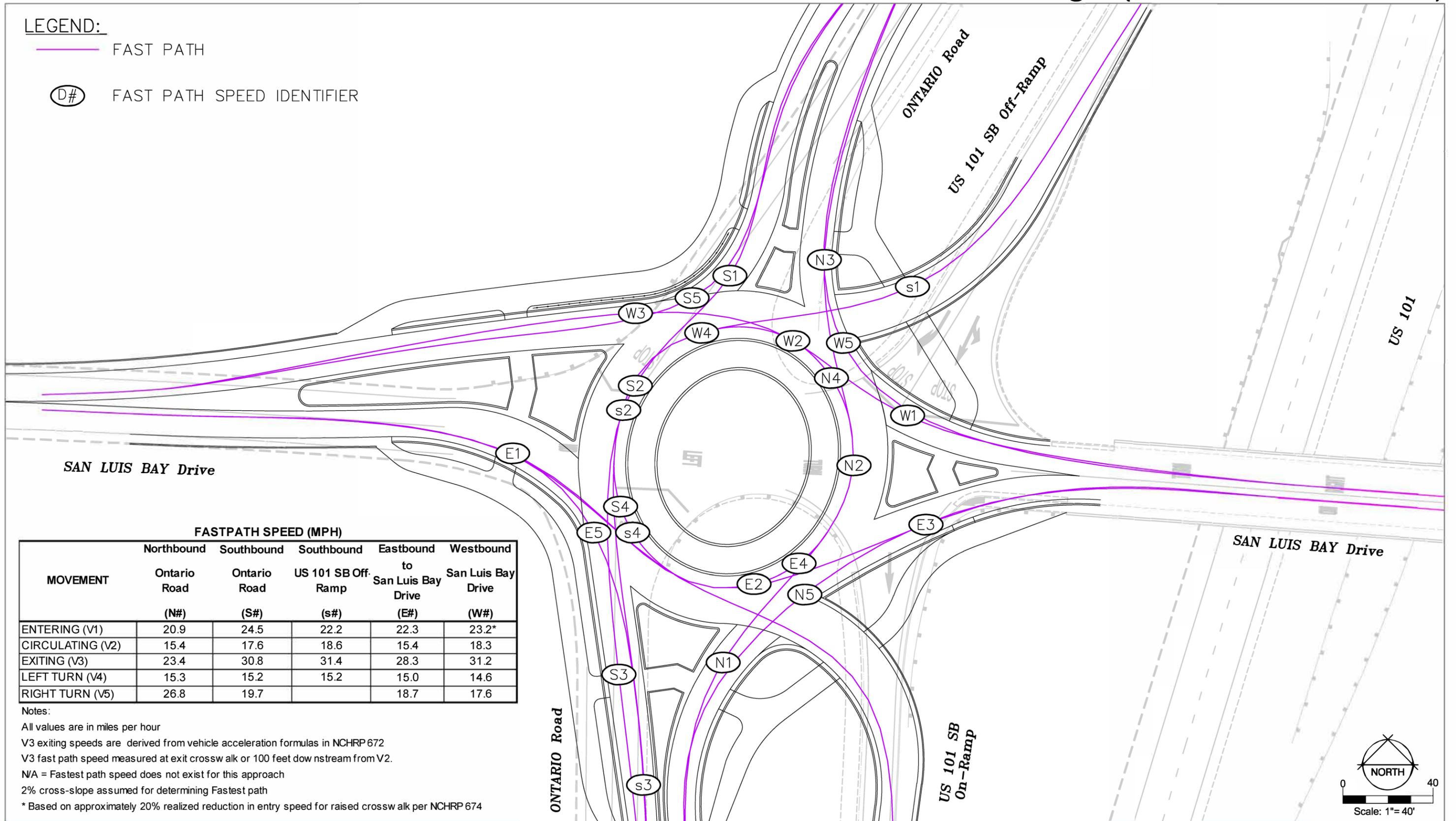
# **Appendix G**

## **Roundabout Alternative**

### **Fast Path and Truck Turn Exhibits**

# Fastest Path Design (West Roundabout)

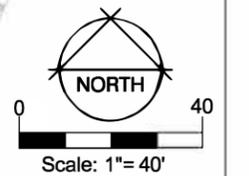
**LEGEND:**  
 FAST PATH  
 FAST PATH SPEED IDENTIFIER



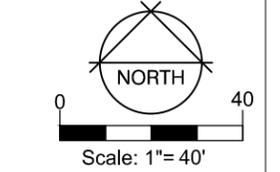
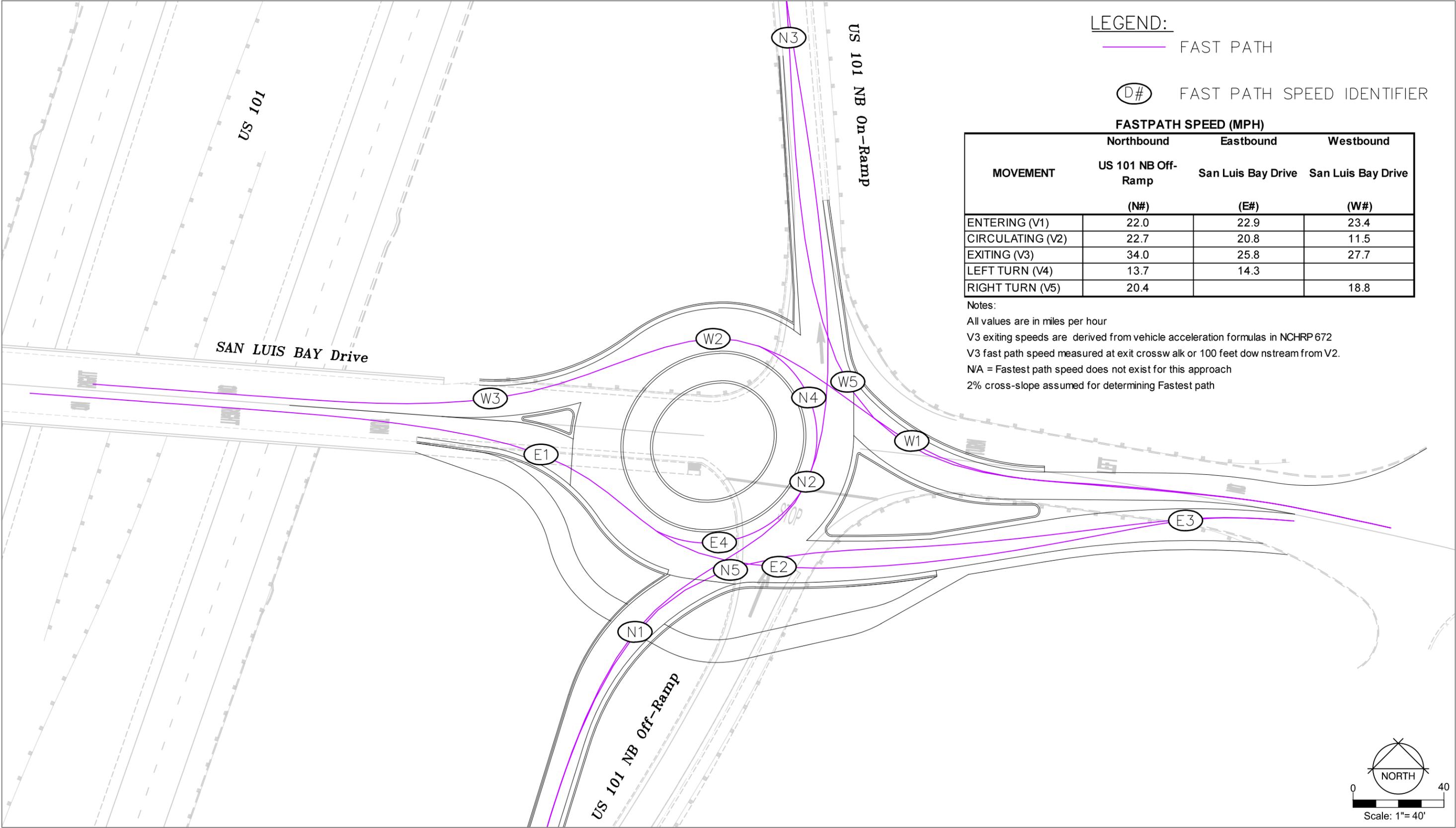
**FASTPATH SPEED (MPH)**

MOVEMENT	Northbound	Southbound	Southbound	Eastbound	Westbound
	Ontario Road	Ontario Road	US 101 SB Off-Ramp	to San Luis Bay Drive	San Luis Bay Drive
	(N#)	(S#)	(s#)	(E#)	(W#)
ENTERING (V1)	20.9	24.5	22.2	22.3	23.2*
CIRCULATING (V2)	15.4	17.6	18.6	15.4	18.3
EXITING (V3)	23.4	30.8	31.4	28.3	31.2
LEFT TURN (V4)	15.3	15.2	15.2	15.0	14.6
RIGHT TURN (V5)	26.8	19.7		18.7	17.6

Notes:  
 All values are in miles per hour  
 V3 exiting speeds are derived from vehicle acceleration formulas in NCHRP 672  
 V3 fast path speed measured at exit crosswalk or 100 feet downstream from V2.  
 N/A = Fastest path speed does not exist for this approach  
 2% cross-slope assumed for determining Fastest path  
 \* Based on approximately 20% realized reduction in entry speed for raised crosswalk per NCHRP 674

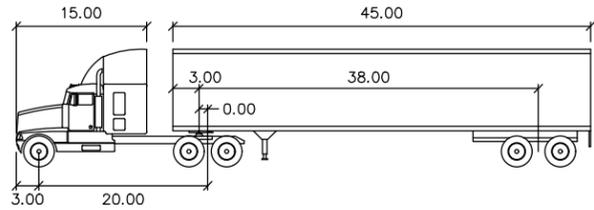


# Fastest Path Design (East Roundabout)



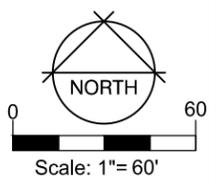
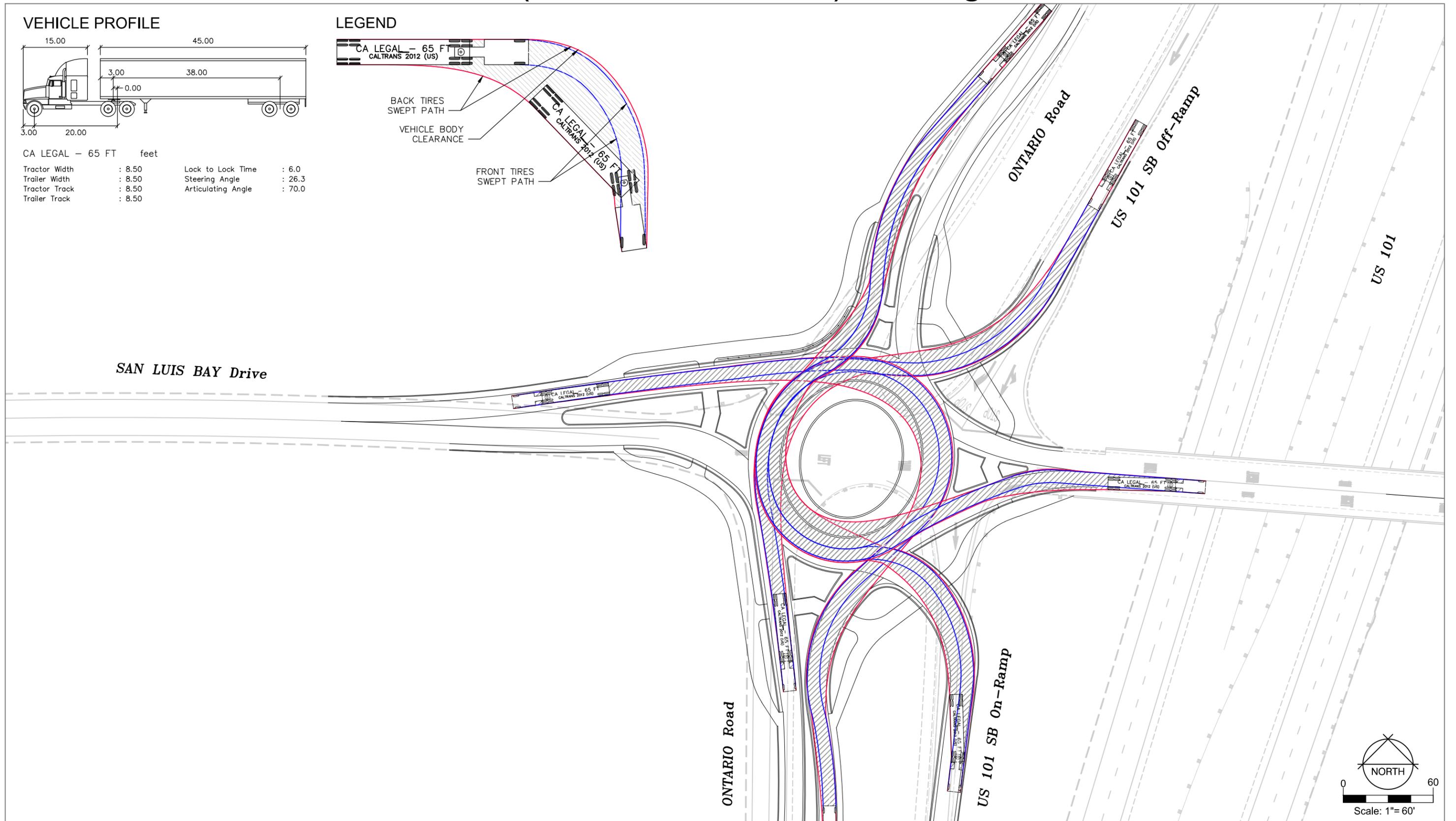
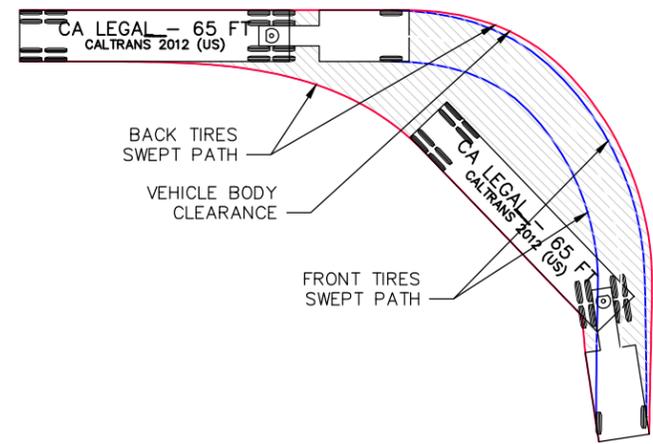
# Roundabout Alternative (West Roundabout) CA-Legal 65 Truck - Left N/S Turns

## VEHICLE PROFILE

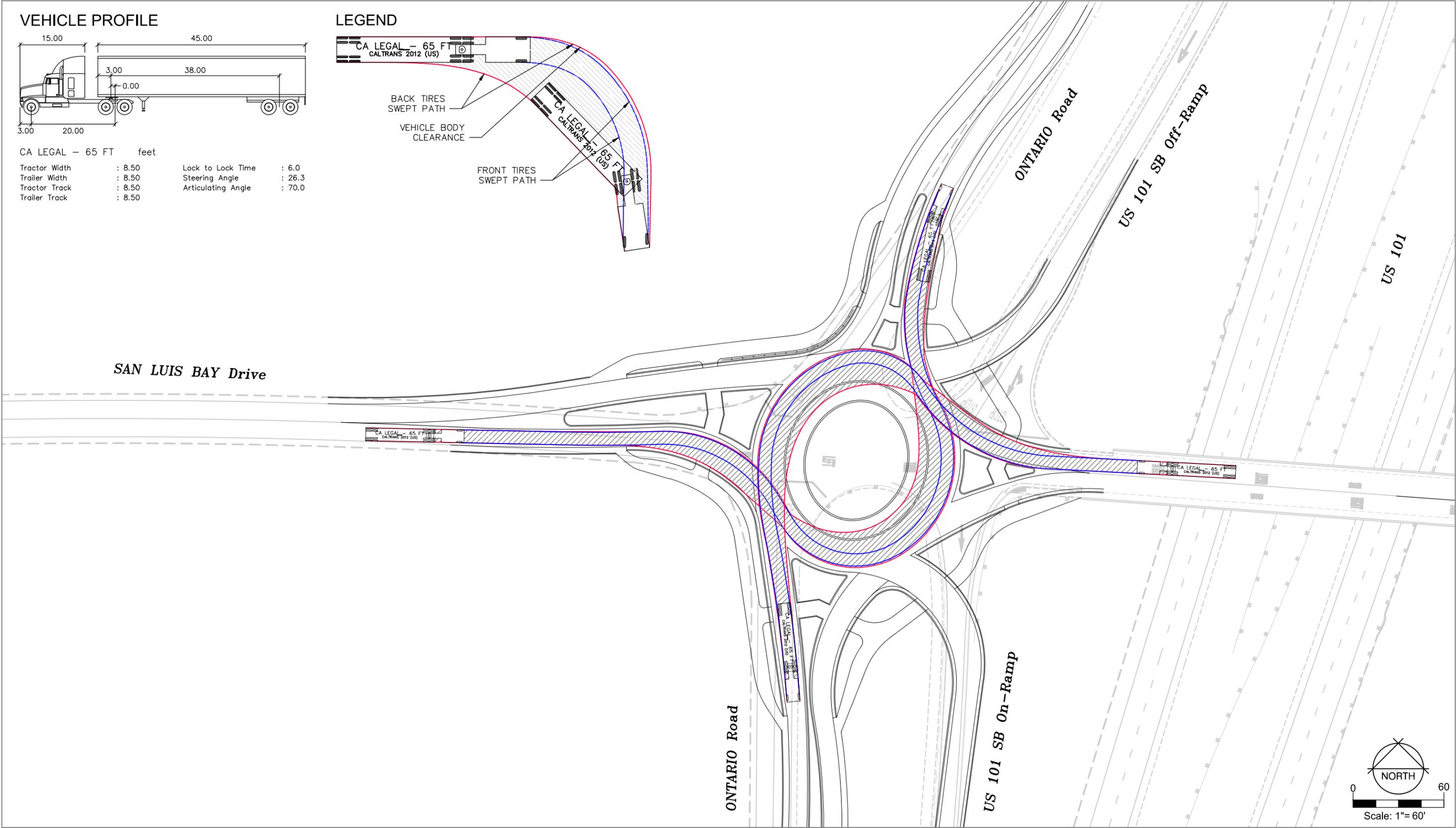


CA LEGAL - 65 FT		feet	
Tractor Width	: 8.50	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 26.3
Tractor Track	: 8.50	Articulating Angle	: 70.0
Trailer Track	: 8.50		

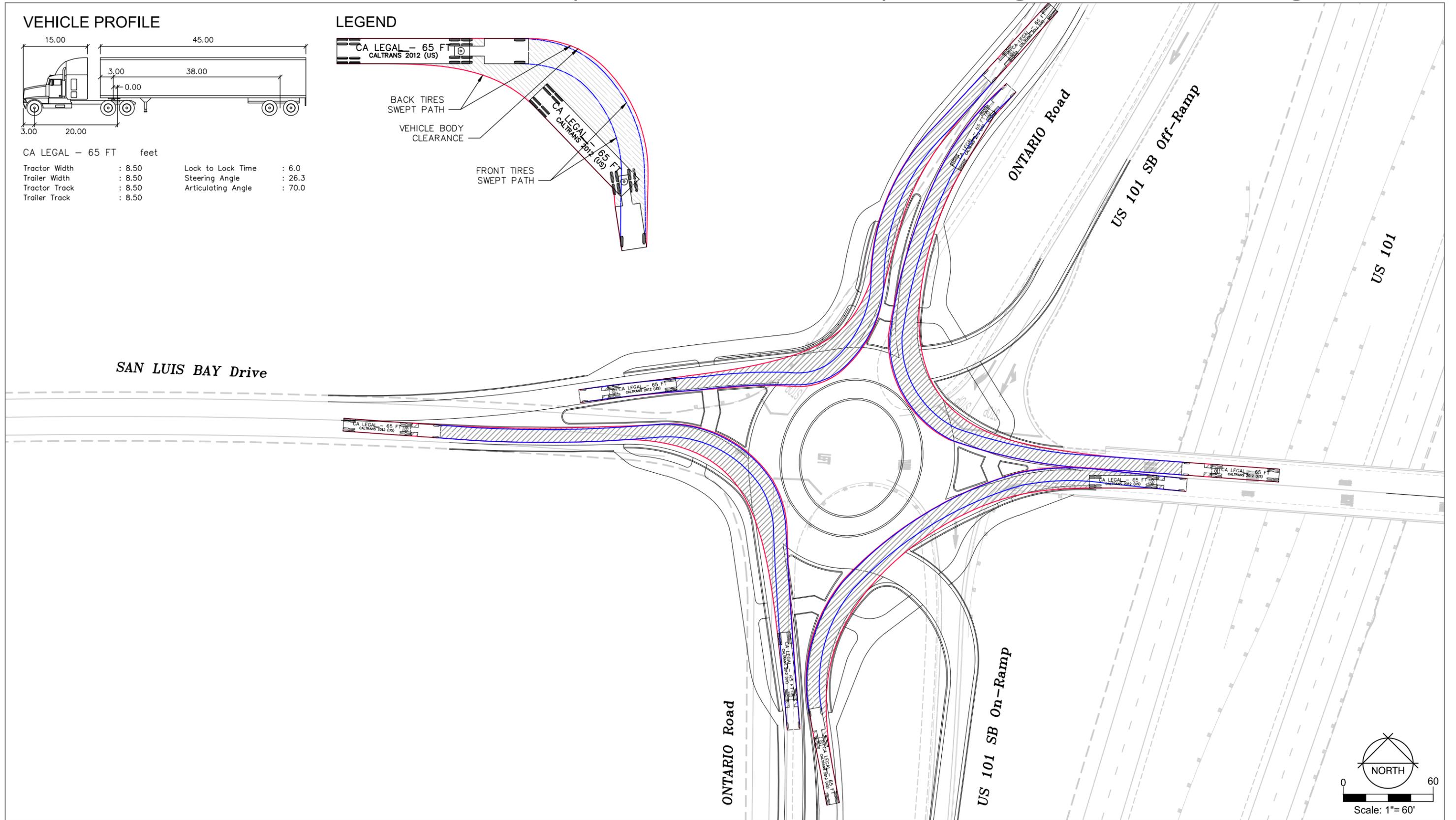
## LEGEND



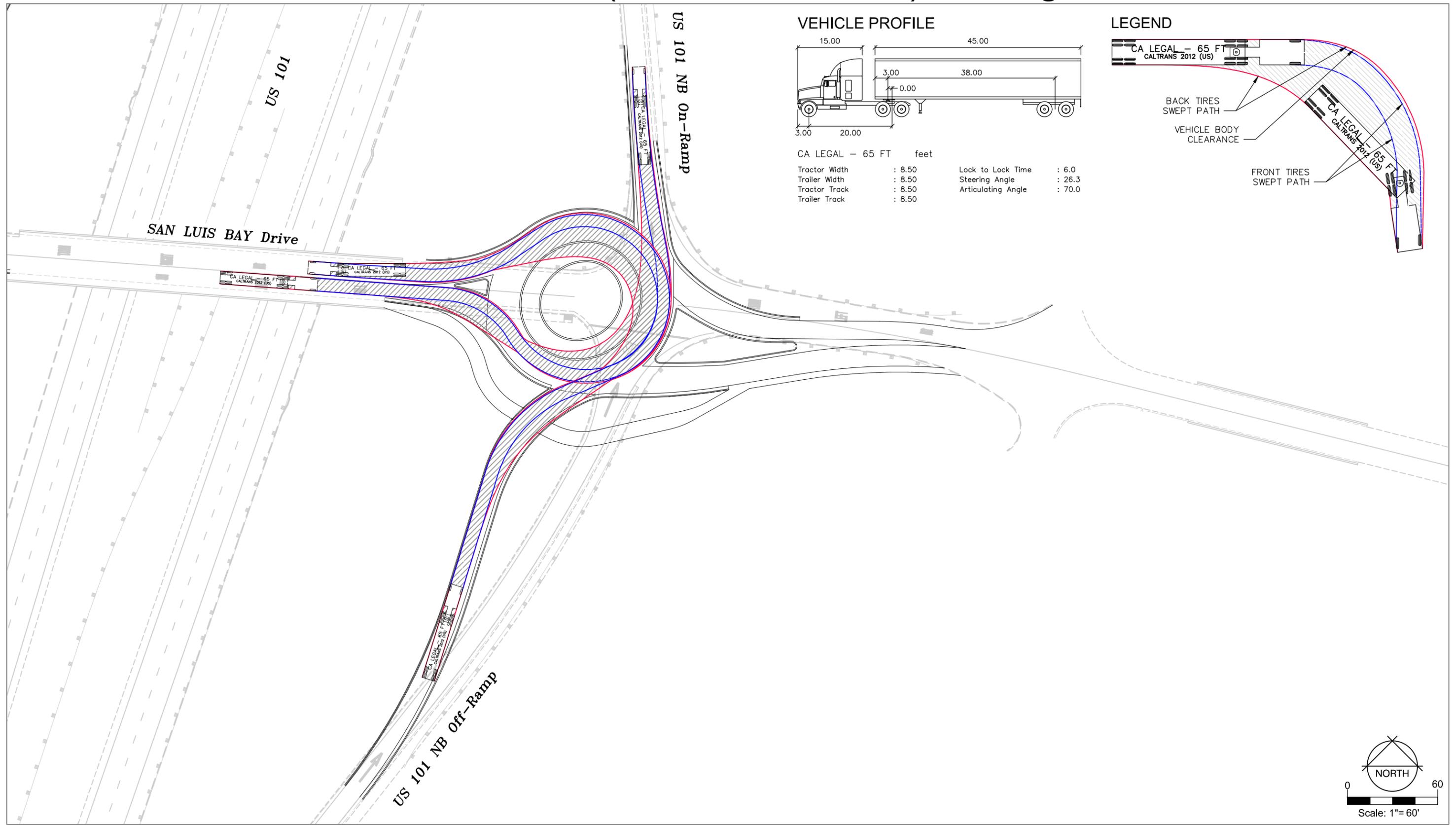
# Roundabout Alternative (West Roundabout) CA-Legal 65 Truck - Left E/W Turns



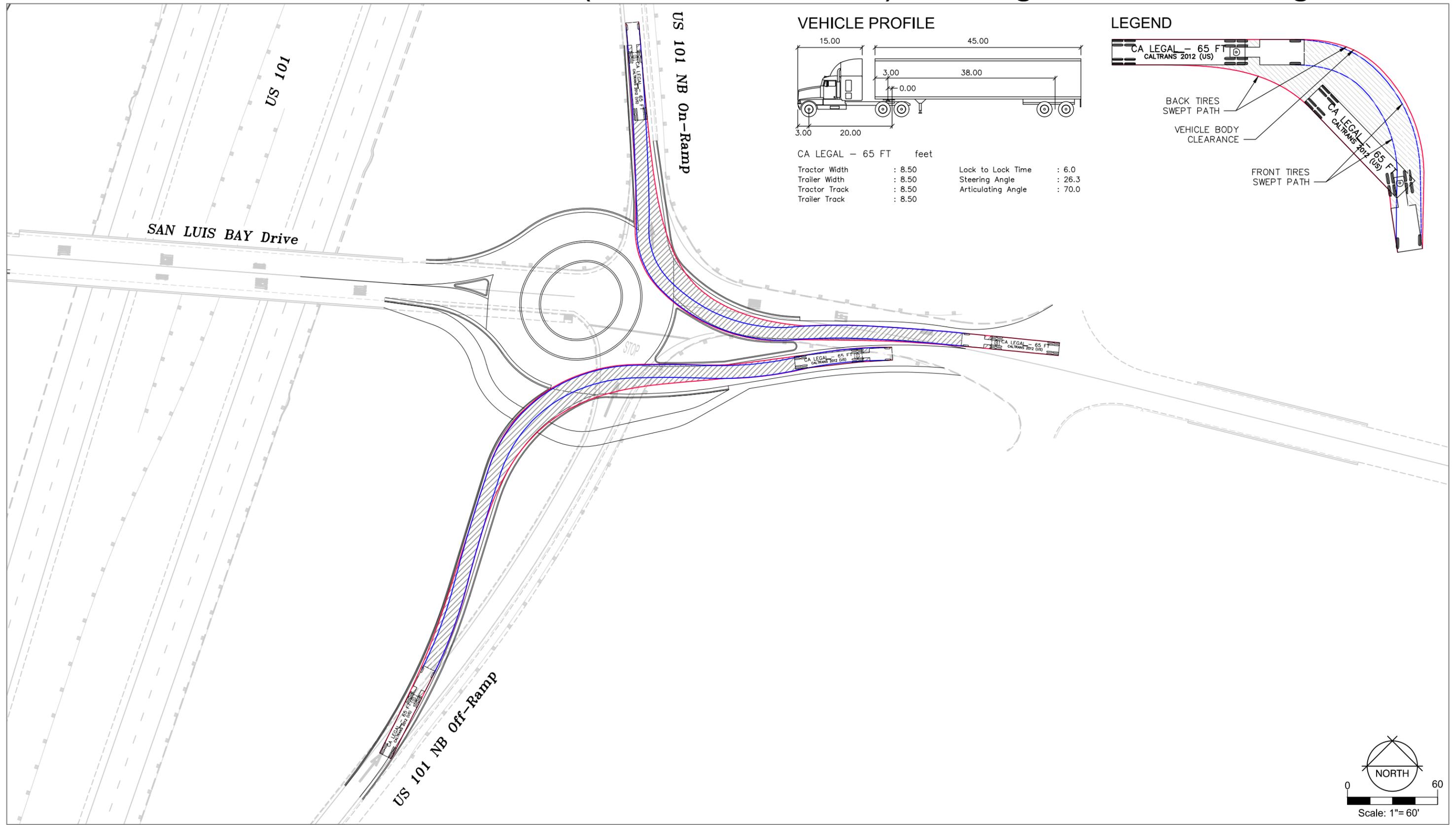
# Roundabout Alternative (West Roundabout) CA-Legal 65 Truck - Right Turns



# Roundabout Alternative (East Roundabout) CA-Legal 65 Truck - Left Turns



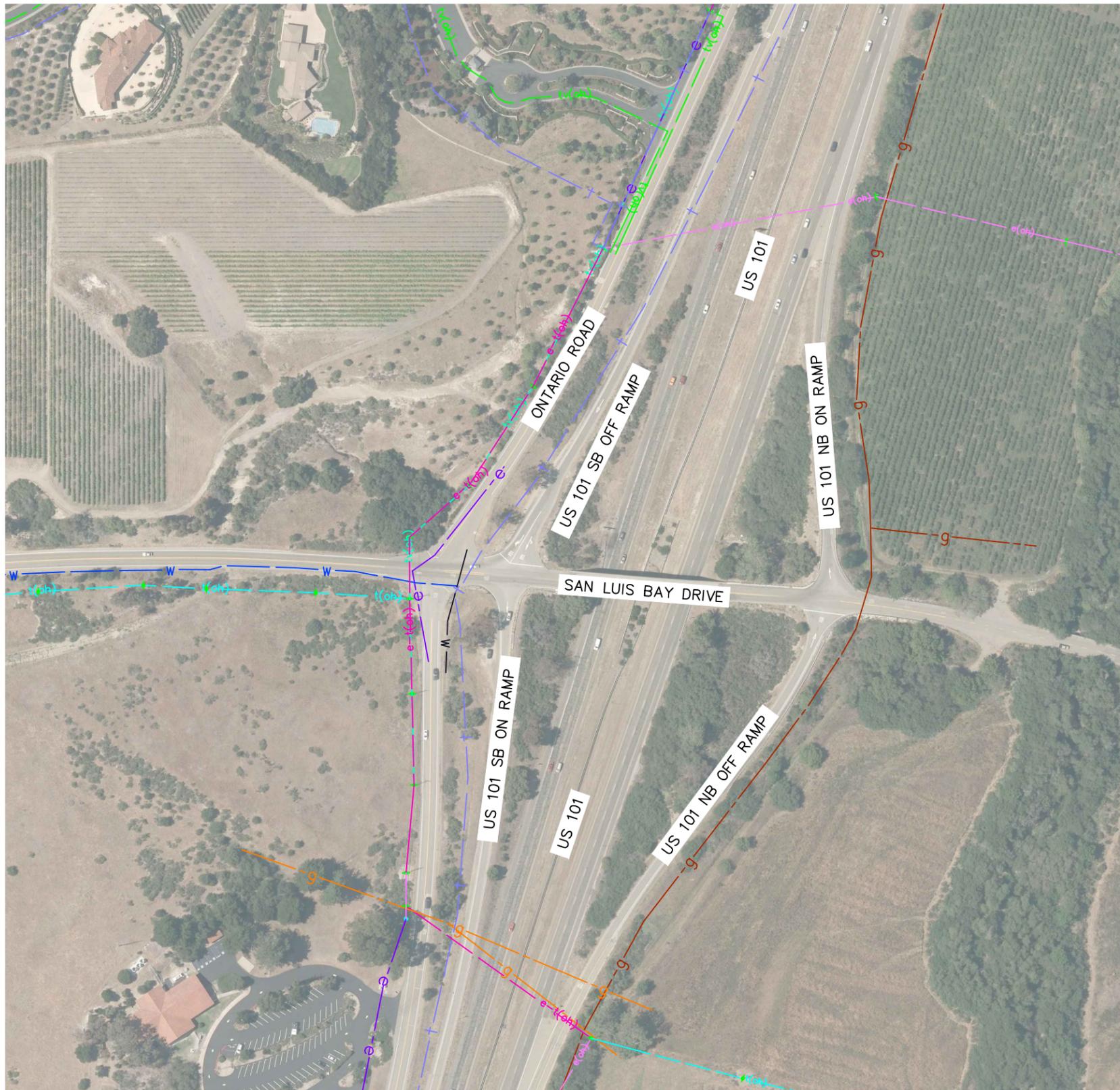
# Roundabout Alternative (East Roundabout) CA-Legal 65 Truck - Right Turns





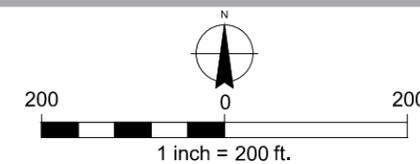
# **Appendix H**

## **Existing Utilities Exhibit**



**LEGEND**

- - + - EXISTING UNDERGROUND TELEPHONE (AT&T)
- t(oh) - EXISTING OVERHEAD TELEPHONE (AT&T)
- e - EXISTING UNDERGROUND CONDUIT (PG&E)
- e(oh) - EXISTING OVERHEAD ELECTRICAL (PG&E)
- e-t(oh) - EXISTING OVERHEAD ELECTRICAL (PG&E) AND TELEPHONE (AT&T)
- - g - EXISTING GASLINE (PHILLIP 66, OUT OF SERVICE)
- - g - EXISTING GASLINE (SO CAL GAS)
- - + v - EXISTING CABLE TV (CHARTER)
- tv(oh) - EXISTING OVERHEAD CABLE TV (CHARTER)
- w - EXISTING 8" PVC WATER TRANSMISSION PIPELINE
- w - EXISTING 6" PVC WATER TRANSMISSION PIPELINE
- EXISTING UTILITY POLES



County of San Luis Obispo  
US 101/San Luis Bay Drive ICE

Existing Utilities

Project No. 11177692  
Report No. XXXXXX  
Date 11/08/2018

**Figure X**  
Source: GHD



# **Appendix I**

## **Preliminary Opinion of Probable Capital Cost Estimates**



**Traffic Signal Alternative - Interim Design Year (2030)**

Preliminary Opinion of Costs  
 US 101/San Luis Bay Dr ICE  
 County of San Luis Obispo

1/23/2019  
 11177692/2527

**Construction Costs:**

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	\$30,000.00	\$30,000.00
2	Imported Fill	CY	850	\$25.00	\$21,250.00
3	Roadway Excavation	CY	170	\$60.00	\$10,200.00
4	Aggregate Sub-base	CY	50	\$60.00	\$3,000.00
5	Aggregate Base	CY	40	\$70.00	\$2,800.00
6	Rubberized Hot Mix Asphalt	TON	80	\$120.00	\$9,600.00
10	Traffic Stripe/Marking/Signs	LS	1	\$5,000.00	\$5,000.00
11	Traffic Signal (3)	LS	1	\$800,000.00	\$800,000.00
14	Mobilization (10%)	LS	1	\$88,200.00	\$88,200.00
	Subtotal (Construction Costs)				\$ 970,050.00
	Construction Contingency			25%	\$ 242,513.00
	<b>Total Construction Costs</b>				<b>\$ 1,212,563.00</b>
<b>Right of Way (Capital) and Utility Relocation Costs:</b>					
	<b>Total Right of Way (Capital) and Utility Relocation Costs</b>				<b>\$ -</b>
	<b>Total Project Capital Cost</b>				<b>\$ 1,212,563.00</b>
	<b>Total Estimated Capital Costs (Rounded)</b>				<b>\$ 1,213,000.00</b>

Assumptions

- Shoulder has same structural section as that of travelled way.



## Traffic Signal Alternative - Ultimate Design Year (2045)

Preliminary Opinion of Costs  
 US 101/San Luis Bay Dr ICE  
 County of San Luis Obispo

12/28/2019  
 11177692/2527

### Construction Costs:

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	\$125,000.00	\$125,000.00
2	Imported Fill	CY	13,970	\$25.00	\$349,250.00
3	Roadway Excavation	CY	1,890	\$60.00	\$113,400.00
4	Aggregate Sub-base	CY	590	\$60.00	\$35,400.00
5	Aggregate Base	CY	460	\$70.00	\$32,200.00
6	Rubberized Hot Mix Asphalt	TON	850	\$120.00	\$102,000.00
7	Minor Concrete (Sidewalk)	CY	20	\$800.00	\$16,000.00
8	Minor Concrete (Curb and Gutter)	LF	200	\$55.00	\$11,000.00
9	Storm Drain System	LS	1	\$50,000.00	\$50,000.00
10	Traffic Stripe/Marking/Signs	LS	1	\$25,000.00	\$25,000.00
11	Traffic Signal (3)	LS	1	\$800,000.00	\$800,000.00
12	US 101 Structure Widening	LS	1	\$1,500,000.00	\$1,500,000.00
13	Minor/ Supplemental Items	%	10%	\$3,034,250.00	\$303,425.00
14	Mobilization (10%)	LS	1	\$346,300.00	\$346,300.00
	Subtotal (Construction Costs)				\$ 3,808,975.00
	Construction Contingency			25%	\$ 952,244.00
	<b>Total Construction Costs</b>				<b>\$ 4,761,219.00</b>
<b>Right of Way (Capital) and Utility Relocation Costs:</b>					
1	Right Of Way	LS	0	\$ -	\$ -
2	Utility Relocation	LS	1	\$ 100,000.00	\$ 100,000.00
	<b>Total Right of Way (Capital) and Utility Relocation Costs</b>				<b>\$ 100,000.00</b>
	<b>Total Project Capital Cost</b>				<b>\$ 4,861,219.00</b>
	<b>Total Estimated Capital Costs (Rounded)</b>				<b>\$ 4,862,000.00</b>

### Assumptions

- Shoulder has same structural section as that of travelled way.



**San Luis Bay Dr/Ontario Rd/SB Ramps - West Roundabout Alternative**

Preliminary Opinion of Costs  
 US 101/San Luis Bay Dr ICE  
 County of San Luis Obispo

12/28/2018  
 11177692/2527

**Construction Costs:**

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	\$225,000.00	\$225,000.00
2	Imported Fill	CY	26,050	\$25.00	\$651,250.00
3	Roadway Excavation	CY	3,950	\$60.00	\$237,000.00
4	Aggregate Sub-base	CY	1,460	\$60.00	\$87,600.00
5	Aggregate Base	CY	1,240	\$70.00	\$86,800.00
6	Rubberized Hot Mix Asphalt	CY	1,070	\$120.00	\$128,400.00
7	Minor Concrete (Truck Apron, Sidewalk)	CY	210	\$800.00	\$168,000.00
8	Truck Apron Curb	LF	550	\$55.00	\$30,250.00
9	Median Curb	LF	2,390	\$65.00	\$155,350.00
10	Curb and Gutter	LF	1,390	\$55.00	\$76,450.00
11	Storm Drain System	LS	1	\$200,000.00	\$200,000.00
12	Traffic Stripe/Marking/Signs	LS	1	\$30,000.00	\$30,000.00
13	Lighting & Electrical	LS	1	\$200,000.00	\$200,000.00
14	Planting and Irrigation	LS	1	\$100,000.00	\$100,000.00
15	Minor/ Supplemental Items	%	10%	\$2,151,100.00	\$215,110.00
16	Mobilization (10%)	LS	1	\$259,200.00	\$259,200.00
	Subtotal (Construction Costs)				\$ 2,850,410.00
	Construction Contingency			25%	\$ 712,603.00
	<b>Total Construction Costs</b>				<b>\$ 3,563,013.00</b>
<b>Right of Way (Capital) and Utility Relocation Costs:</b>					
1	Right Of Way	SF	2,350	\$ 25.00	\$ 58,750.00
2	Utility Relocation	LS	1	\$ 200,000.00	\$ 200,000.00
	<b>Total Right of Way (Capital) and Utility Relocation Costs</b>				<b>\$ 258,750.00</b>
	<b>Total Project Capital Cost</b>				<b>\$ 3,821,763.00</b>
	<b>Total Estimated Capital Costs (Rounded)</b>				<b>\$ 3,822,000.00</b>

Assumptions

- Shoulder has same structural section as that of travelled way.
- Median islands to be landscaped/bouldered along with Central Island



**San Luis Bay Dr/NB Ramps - East Roundabout Alternative**

Preliminary Opinion of Costs  
 US 101/San Luis Bay Dr ICE  
 County of San Luis Obispo

12/28/2018  
 11177692/2527

**Construction Costs:**

No.	Item Description	Units	Quantity	Unit Cost	Total
1	Traffic Control	LS	1	\$100,000.00	\$100,000.00
2	Imported Fill	CY	8,480	\$25.00	\$212,000.00
3	Roadway Excavation	CY	1,520	\$60.00	\$91,200.00
4	Aggregate Sub-base	CY	600	\$60.00	\$36,000.00
5	Aggregate Base	CY	490	\$70.00	\$34,300.00
6	Rubberized Hot Mix Asphalt	CY	440	\$120.00	\$52,800.00
7	Minor Concrete (Truck Apron, Sidewalk)	CY	90	\$800.00	\$72,000.00
8	Truck Apron Curb	LF	424	\$55.00	\$23,320.00
9	Median Curb	LF	705	\$65.00	\$45,825.00
10	Curb and Gutter	LF	865	\$55.00	\$47,575.00
11	Storm Drain System	LS	1	\$50,000.00	\$50,000.00
12	Traffic Stripe/Marking/Signs	LS	1	\$10,000.00	\$10,000.00
13	Lighting & Electrical	LS	1	\$100,000.00	\$100,000.00
14	Planting and Irrigation	LS	1	\$50,000.00	\$50,000.00
15	Minor/ Supplemental Items	%	10%	\$825,020.00	\$82,510.00
16	Mobilization (10%)	LS	1	\$100,800.00	\$100,800.00
	Subtotal (Construction Costs)				\$ 1,108,330.00
	Construction Contingency			25%	\$ 277,083.00
	<b>Total Construction Costs</b>				<b>\$ 1,385,413.00</b>
<b>Right of Way (Capital) and Utility Relocation Costs:</b>					
1	Right Of Way	LS	1	\$ -	\$ -
2	Utility Relocation	LS	1	\$ 25,000.00	\$ 25,000.00
	<b>Total Right of Way (Capital) and Utility Relocation Costs</b>				<b>\$ 25,000.00</b>
	<b>Total Project Capital Cost</b>				<b>\$ 1,410,413.00</b>
	<b>Total Estimated Capital Costs (Rounded)</b>				<b>\$ 1,411,000.00</b>

Assumptions

- Shoulder has same structural section as that of travelled way.
- Median islands to be landscaped/bouldered along with Central Island



# Appendix J

## Caltrans June 6, 2019 Email Memo

**From:** Barnes, Roger D@DOT <[roger.d.barnes@dot.ca.gov](mailto:roger.d.barnes@dot.ca.gov)>  
**Sent:** Thursday, June 6, 2019 11:06 AM  
**To:** Michael Britton <[mbritton@co.slo.ca.us](mailto:mbritton@co.slo.ca.us)>  
**Cc:** Joshua R. Roberts <[jrroberts@co.slo.ca.us](mailto:jrroberts@co.slo.ca.us)>; Dave Flynn <[dflynn@co.slo.ca.us](mailto:dflynn@co.slo.ca.us)>  
**Subject:** [EXT]RE: San Luis Bay Drive ICE Step 1

**ATTENTION:** This email originated from outside the County's network. Use caution when opening attachments or links.

Hi Michael,

I would have GHD include a discussion regarding the 2014 CA MUTCD requirements of Section 4C.01. This shows why a roundabout is being considered. In Figure 5.3 (below), GHD should determine in STEP 1 if the roundabout alternative is viable from both an operations and design standpoint. This is the intent of the ICE STEP 1 process. We do not want to move an alternative forward that has known geometric constraints and is going to be cost prohibitive in comparison to a signal. There is a cost associated with moving 2 alternatives forward so it is best to try and eliminate an alternative early on. The main thing is meeting the considerations of a roundabout requirement of Section 4C.01. This may be something your Board would take action on once the ICE STEP 1 process has been completed. I know there are probably environmental, topography, and underground utility issues that would present a challenge to constructing a roundabout at this location. The STEP 1 evaluation is very detailed so these are my only comments. Please let me know if you have any questions or need further assistance.

Best Regards,

Roger Barnes

## CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

### Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

#### Standard:

**01 An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.**

**01a On State highways, the engineering study shall include consideration of a roundabout (yield control). If a roundabout is determined to provide a viable and practical solution, it shall be studied in lieu of, or in addition to a traffic control signal.**

#### Guidance:

*01b On local streets and highways, the engineering study should include consideration of a roundabout (yield control). If a roundabout is determined to provide a viable and practical solution, it should be studied in lieu of, or in addition to a traffic control signal.*

#### Support:

**01c Refer to Caltrans' website (<http://www.dot.ca.gov/hq/traffops/liaisons/ice.html>) for more information on the Traffic Operations Policy Directive 13-02, Intersection Control Evaluation (ICE), and other resources for the evaluation of intersection traffic control strategies.**

Figure 5.3 also shows that the West Roundabout's conceptual layout and geometrics are mostly located within existing County and State right-of-ways. Additional right-of-way will though be required in the NW quadrant of the roundabout as shown on the figure.

Potential utility impacts are similar to those described with the Traffic Signal Alternative. Provision of this roundabout will require encroaching into the adjacent drainage area on the south side of San Luis Bay Drive at the approach to Ontario Road. The extent of the encroachment into this drainage area and any potential environmental impacts will need to be evaluated during future project phases. Provision of this roundabout will also require encroaching significantly into the existing drainage area (shown in adjacent photo) located in the NW quadrant of the roundabout, adjacent to both San Luis Bay Drive and Ontario Road. The extent of the encroachment into this drainage area and

any potential environmental impacts will need to be evaluated during future project phases. There may also be additional environmental impacts that will be evaluated during future project phases.



Best Regards,

*Roger D. Barnes*

Roger D. Barnes, R.C.E., T.E.  
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Traffic Operations Branch Chief  
Caltrans, District 5 – San Luis Obispo  
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**From:** Michael Britton <[mbritton@co.slo.ca.us](mailto:mbritton@co.slo.ca.us)>  
**Sent:** Monday, June 3, 2019 5:27 PM  
**To:** Barnes, Roger D@DOT <[roger.d.barnes@dot.ca.gov](mailto:roger.d.barnes@dot.ca.gov)>  
**Cc:** Joshua R. Roberts <[jrroberts@co.slo.ca.us](mailto:jrroberts@co.slo.ca.us)>; Dave Flynn <[dflynn@co.slo.ca.us](mailto:dflynn@co.slo.ca.us)>  
**Subject:** San Luis Bay Drive ICE Step 1

Roger,

In our meeting back on March 26, 2019, we had presented to Caltrans a variety of issues. Within that meeting, we had provided a copy of the ICE Step 1 we had asked a consultant to perform, and discussed

the San Luis Bay Drive at 101 interchange. I am attaching a copy of that draft document as a reminder. Within that meeting we had agreed that a roundabout was not a particularly feasible alternative, and that we would pursue having our consultant speak to that within the document.

Before we close the loop with our consultant on the document, we were hoping to get any additional comments, questions or concerns you or your staff might have. Is there any chance you have gathered any comments? If so, can you forward those to me? If not, can you give me an idea on when we might expect some comments?

We do not want to let this linger too much longer, and would look to close this out. At an appropriate later date, we would return to Caltrans to discuss any further developments, or alternatives that would need to be considered, when appropriate.

Thank you for you and your staff's time and attention.

Mike



**Michael Britton**

Transportation Planning & Operations Supervisor

Public Works, County of San Luis Obispo

Tel: (805) 788-2318 | *An APWA Accredited Agency*

[Website](#) | [Twitter](#) | [Map](#)





## about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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