Downtown Auto Lane Reduction Study

Traffic Analysis Report

City of San Luis Obispo

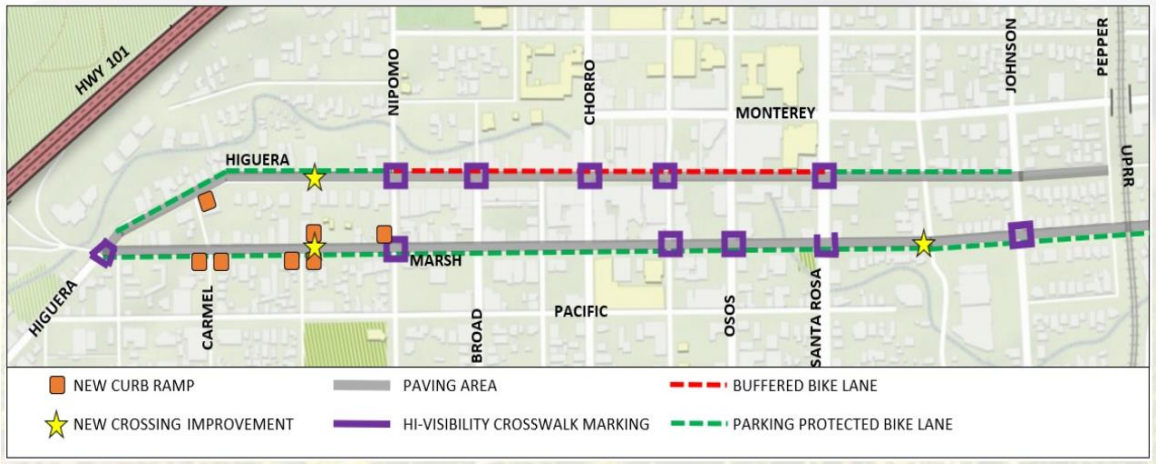
Table of Contents

Table Index

Appendix Index

1. Introduction

The City of San Luis Obispo is proposing to remove one automobile lane on both Marsh & Higuera Streets in the downtown core to address speeding, provide width for improved pedestrian & bicycle facilities, as well as existing and future parklets. The overall scope of this project is depicted below.



Visual Simulations of the Proposed Changes are also provided below.

Higuera South of Nipomo

Existing

Proposed

Higuera at Court Street

Existing

Proposed

Marsh Between Chorro & Morro

Existing

Proposed

Marsh at Torro

Existing

Proposed

The purpose of this study is to analyze the operational affects of reducing travel lanes as proposed on Marsh & Higuera within the Downtown Core following the City's adopted level of service and queue threshold policies. This Analysis has been conducted per the City's RFP and traffic impact study guidelines for 14 intersections and 12 segments within the scope of the proposed project under existing and cumulative conditions. For the purposes of this analysis Higuera & Marsh are considered East & West streets.

In addition, an assessment of a Bicycle scramble and a Bicycle Protected intersection phasing were conducted at Marsh & Higuera as well as Marsh & Johnson under the existing + project & cumulative + project scenarios.

This memorandum includes analysis scenarios as described below, using the City's master synchro network and most recent existing traffic volumes, GHD isolated the study area, validated and updated geometry, volumes, and signal timing to existing conditions to establish the existing conditions baseline conditions. GHD forecasted Existing + Project volumes based on a combination of the City's Traffic Model and most recent traffic volumes. For cumulative conditions GHD forecasted Cumulative and Cumulative + Project volumes based on a combination of the City's Traffic Model and professional judgement.

This analysis assesses the following four scenarios:

- Existing Conditions
- Existing Plus Project Conditions
- Year 2040 No Project Conditions
- Year 2040 Plus Project Conditions

2. Executive Summary

Reduction of travel lanes as proposed would not cause level of service in the downtown to exceed policy thresholds or create intersection queueing issues under current conditions. Under cumulative conditions the downtown core is forecasted to have queues at Marsh & Higuera side streets that exceed block lengths with and without the proposed project.

A Bicycle Scramble under current conditions at Marsh & Higuera & Marsh & Johnson would operate within City level of Service policy thresholds, however queuing at Higuera & Marsh would exceed capacity. Under Cumulative conditions Higuera & Marsh would exceed level of service thresholds and queuing capacity whereas Marsh & Johnson would operate within level of service thresholds.

A Protected bicycle phase under current conditions at Marsh & Higuera & Marsh & Johnson would operate within City level of Service policy thresholds. Under Cumulative conditions Higuera & Marsh would exceed level of service thresholds and queuing capacity whereas Marsh & Johnson would operate within level of service thresholds.

Vehicle Miles Travelled

The proposed project satisfies California Office of Planning and Research screening criteria for project type. *"Projects that would not likely lead to a substantial or measurable increase in vehicle travel, and therefore generally should not require and induced travel analysis, include: Reduction of through lanes"*

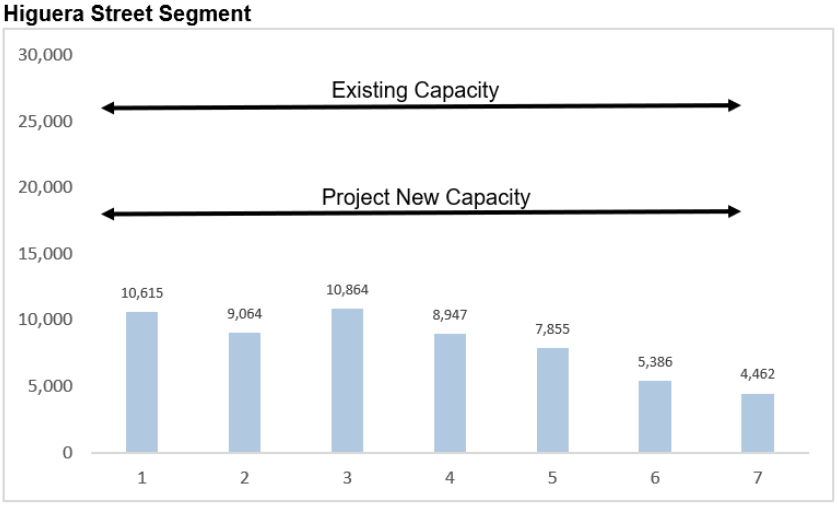
Existing Conditions (Pre-Covid)

- All intersections and segments meet LOS thresholds.
- **Higuera Street & Marsh Street** Intersection EBR turning movement (from Hwy 101 to SB Higuera) in the AM and PM peaks exceed turn pocket capacity. However, the right turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.
- **Higuera Street & Nipomo Street** Intersection NWL bound turning movements (NB Nipomo to WB Higuera) in the PM exceeds turn pocket capacity. However, average queue is calculated at 52 feet, only two feet over the current capacity. Effectively the current capacity is fully utilized.

Existing Plus Project (Lane Reduction)

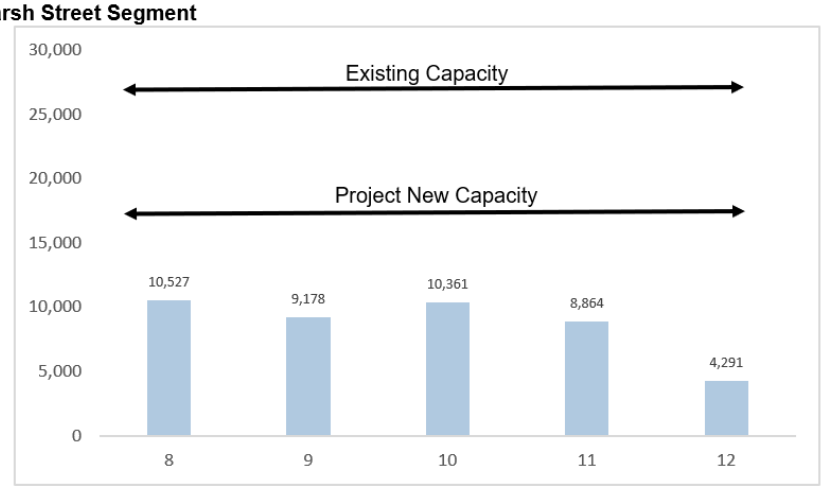
1. All intersections and segments meet LOS thresholds. The proposed project does not cause level of service thresholds to be exceeded.
2. **Higuera Street & Marsh Street** EBR turning movements in the AM and PM exceed turn pocket capacity. However, the right turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.
3. **Higuera Street & Nipomo Street** Due to forecasted volume redistributions the proposed project is forecasted to reduce NWL queuing at this intersection.
4. Forecasted volume and corridor capacities for both Marsh & Higuera are shown in the figures below. Overall capacities are reduced with the lane reduction, however existing volumes are still well within those capacities:

Higuera Street Segment



#	Segment	Limits	# of Lanes
1	Higuera Street	Marsh Street to Nipomo Street	2
2	Higuera Street	Nipomo Street to Broad Street	2
3	Higuera Street	Broad Street to Chorro Street	2
4	Higuera Street	Chorro Street to Osos Street	2
5	Higuera Street	Osos Street to Santa Rosa Street	2
6	Higuera Street	Santa Rosa Street Toro Street	2
7	Higuera Street	Toro Street to Johnson Street	2

Marsh Street Segment



#	Segment	Limits	# of Lanes
8	Marsh Street	Higuera Street to Nipomo Street	2
9	Marsh Street	Nipomo Street to Broad Street	2
10	Marsh Street	Broad Street to Osos Street	2
11	Marsh Street	Osos Street to Santa Rosa Street	2
12	Marsh Street	Santa Rosa Street to Johnson Street	3

Cumulative

1. All intersections and segments meet LOS thresholds.
2. **Higuera Street & Marsh Street** EBR (from Hwy 101 to SB Higuera) and NBL (From NB Higuera to Hwy 101) turning movements in the AM and PM peak hour exceeds turn pocket capacity.

   The EBR turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.

   The NBL (From NB Higuera to Hwy 101) queues are projected to exceed pocket capacity, extending approximately 489 feet which is south of Pacific Street. However, Intersection Widening and upgrades to roundabout control are identified in the City's concept plans.

   Recommendation: Prioritize future funding allocations for Higuera & Marsh Intersection Upgrades.
3. **Higuera Street & Nipomo Street** NWL bound (NB Nipomo to WB Higuera) turning movements in the AM and PM exceeds turn pocket capacity.

   Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current left turn pocket is approximately 50', under cumulative conditions Nipomo left turn queues are forecasted to extend into the prior intersection at Pacific.

   Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.
4. **Marsh Street & Nipomo Street** SEL bound (From SB Nipomo to EB Marsh) turning movement in the AM peak hour exceeds turn pocket capacity.

   Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current left turn pocket is approximately 50', under cumulative conditions Nipomo left turn queues are forecasted to extended into prior intersection at Higuera.

   Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.
5. **Marsh Street & Broad Street** NWR bound (From NB Broad to EB Marsh) turning movements in the AM peak hour exceed turn pocket capacity.

   Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current right turn pocket is approximately 50', under cumulative conditions Broad right turn queues are forecasted to extended into prior intersection at Pacific.

Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

6. **Higuera Street & Chorro Street** SBR bound (From SB Chorro to WB Higuera) turning movements in the AM and PM peak hour exceed turn pocket capacity.

   Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current right turn pocket is approximately 50', under cumulative conditions Chorro right turn queues are forecasted to extended into prior intersection at Monterey.

   Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

Cumulative Plus Project (Lane Reduction)

7. All intersection and segments meet LOS thresholds.

8. **Higuera Street & Marsh Street** EBR (from Hwy 101 to SB Higuera) and NBL (From NB Higuera to Hwy 101) turning movements in the AM and PM peak hour exceeds turn pocket capacity. However, Intersection Widening and upgrades to roundabout control are identified in the City's concept plans.

   The EBR turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.

   The NBL (From NB Higuera to Hwy 101) queues are projected to exceed pocket capacity, extending approximately 501 feet which is south of Pacific Street.

   Recommendation: Prioritize future funding allocations for Higuera & Marsh Intersection Upgrades.

9. **Higuera Street & Nipomo Street** NWL bound (NB Nipomo to WB Higuera) turning movements in the AM and PM exceeds turn pocket capacity.

   Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current left turn pocket is approximately 50', under cumulative conditions Nipomo left turn queues are forecasted to extend into the prior intersection at Pacific.

   Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

10. **Marsh Street & Nipomo Street** SEL bound (From SB Nipomo to EB Marsh) turning movement in the AM peak hour exceeds turn pocket capacity.

    Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current left turn pocket is approximately 50', under cumulative conditions Nipomo left turn queues are forecasted to extended into prior intersection at Higuera.

Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

11. **Marsh Street & Broad Street** NWR bound (From NB Broad to EB Marsh) turning movements in the AM peak hour exceed turn pocket capacity.

    Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current right turn pocket is approximately 50', under cumulative conditions Broad right turn queues are forecasted to extended into prior intersection at Pacific.

    Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

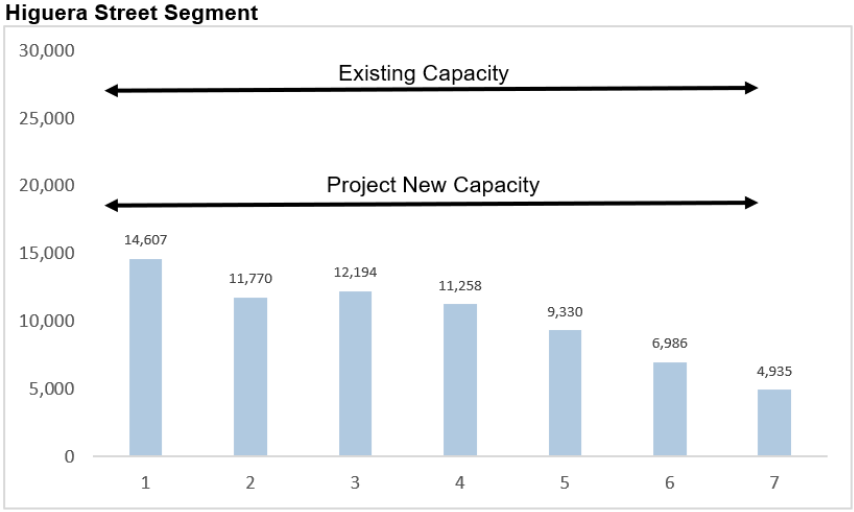
12. **Higuera Street & Chorro Street** SBR bound (From SB Chorror to WB Higuera) turning movements in the AM and PM peak hour exceed turn pocket capacity.

    Due to the closely spaced intersections in the downtown area, overall block lengths are approximately 250'. The current right turn pocket is approximately 50', under cumulative conditions Chorro right turn queues are forecasted to extended into prior intersection at Monterey.

    Recommendation: Consider future parking removal for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

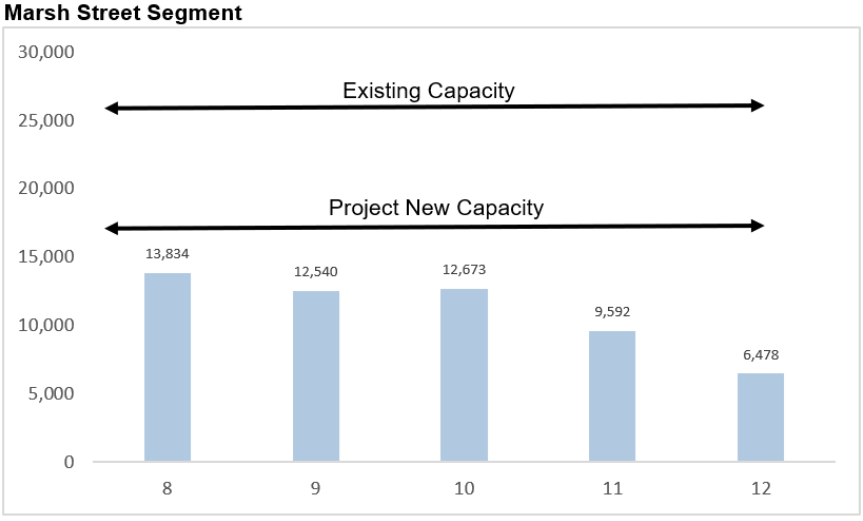
5. Forecasted volume and corridor capacities for both Marsh & Higuera are shown in the figures below. Overall capacities are reduced with the lane reduction, however future volumes are still well within those capacities:

Higuera Street Segment



#	Segment	Limits	# of Lanes
1	Higuera Street	Marsh Street to Nipomo Street	2
2	Higuera Street	Nipomo Street to Broad Street	2
3	Higuera Street	Broad Street to Chorro Street	2
4	Higuera Street	Chorro Street to Osos Street	2
5	Higuera Street	Osos Street to Santa Rosa Street	2
6	Higuera Street	Santa Rosa Street Toro Street	2
7	Higuera Street	Toro Street to Johnson Street	2

Marsh Street Segment



#	Segment	Limits	# of Lanes
8	Marsh Street	Higuera Street to Nipomo Street	2
9	Marsh Street	Nipomo Street to Broad Street	2
10	Marsh Street	Broad Street to Osos Street	2
11	Marsh Street	Osos Street to Santa Rosa Street	2
12	Marsh Street	Santa Rosa Street to Johnson Street	3

3. Analysis Methodology and Parameters

3.1 Study Intersections & Segments

The following 14 intersections and 12 roadway segments were established were analyzed under existing and cumulative conditions.

Study Intersections:

Table 3.1: Study Roadway Segments

#	Intersection	#	Intersection
1.	Higuera Street / Marsh Street	**8.**	Marsh Street / Osos Street
2.	Higuera Street / Nipomo Street	**9.**	Marsh Street / Chorro Street
3.	Marsh Street / Nipomo Street	**10.**	Marsh Street / Johnson Street
4.	Marsh Street / Broad Street	**11.**	Higuera Street / Morro Street
5.	Higuera Street / Broad Street	**12.**	Marsh Street / Morro Street
6.	Higuera Street / Chorro Street	**13.**	Higuera Street / Santa Rosa Street
7.	Higuera Street / Osos Street	**14.**	Marsh Street / Santa Rosa Street

Roadway Segments:

Table 3.2: Study Roadway Segments

#	Segment	Limits
1.	Higuera Street	Marsh Street to Nipomo Street
2.	Higuera Street	Nipomo Street to Broad Street
3.	Higuera Street	Broad Street to Chorro Street
4.	Higuera Street	Chorro Street to Osos Street
5.	Higuera Street	Osos Street to Santa Rosa Street
6.	Higuera Street	Santa Rosa Street Toro Street
7.	Higuera Street	Toro Street to Johnson Street
8.	Marsh Street	Higuera Street to Nipomo Street
9.	Marsh Street	Nipomo Street to Broad Street
10.	Marsh Street	Broad Street to Osos Street
11.	Marsh Street	Osos Street to Santa Rosa Street
12.	Marsh Street	Santa Rosa Street to Johnson Street

3.2 Data Collection and Analysis Time Periods

Traffic volume trends have been affected by COVID to some degree, the extent to which is temporary and permanent as part of a “new normal” is unknown. GHD used historical Weekday AM and PM peak hour counts conducted by Quality Traffic Data in October 2018.

All intersections have been analyzed during the AM and PM peak hour periods. The AM peak hour is defined as the highest continuous hour of peak traffic flow counted between 7:00 a.m. and 9:00 a.m. and the PM peak hour is defined as the highest continuous hour of peak traffic flow counted between 3:00 p.m. and 6:00 p.m. under typical weekday conditions.

3.3 Traffic Forecasts

Existing + Project volumes were forecasted using the City's TransCAD travel demand model, lane reductions were programmed in the base year scenario. Base Year and Base Year + Project volumes were compared to determine proportional volume redistributions that could be expected as a result of the lane reductions. Those proportional changes were then applied to existing volume to determine forecasted Existing + Project Average Daily Segment and Peak Hour Intersection Turning movement volumes.

Cumulative and Cumulative + Project volumes were also forecasted using the City's TransCAD travel demand model, lane reductions were programmed into the cumulative year scenario. Volume for both scenarios were extracted from the model reviewed and validated for relative accuracy.

3.4 CEQA & City Level of Service Policy

Due to the nature of the project and California Office of Planning & Research Guidance the project is presumed to have a less than significant impact on VMT, safety, & Induced Travel. The project is also consistent with the City's adopted withy City Adopted Transportation Plan & Policy and therefore would be exempt of Environmental Review.

The City has however adopted Level of Service and Queueing policy thresholds outside of CEQA which are primary focus of this transportation analysis.

3.5 Level of Service Methodologies

The following section outlines the methodology and analysis parameters that were used to quantify Existing and Year 2040 traffic operations at study intersections.

Table 3.3: LOS Criteria

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 and <20.0	>10.0 and <15.0	>10.0 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 and <35.0	>15.0 and <25.0	>15.0 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 and <55.0	>25.0 and <35.0	>25.0 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 and <80.0	>35.0 and <50.0	>35.0 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

Due to the signal phasing, the intersections of Higuera Street & Marsh Street and Marsh Street & Johnson Street was analyzed using the 2000 HCM methodology as the HCM 6 methodology does not support the intersection phasing.

For signalized intersections, the intersection delays are average values for all intersection movements. Table 3.3 (above) presents the delay-based LOS criteria for different types of intersection control.

3.6 Alternative Bicycle Phasing Scenarios

An additional consideration is the addition of a bicycle scramble phase and alternative protected bike signal scenario to the following signalized intersections for plus project scenarios only:

- Higuera Street & Marsh Street
- Marsh Street & Johnson Street

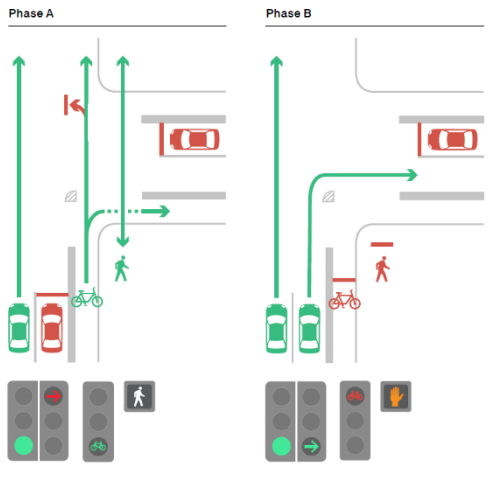
The above intersections were modified/analyzed to include a protected bicycle phase allowing bicycle movement through the intersection. Analysis was conducted using *Synchro 10.0* (Trafficware). As noted in Section 3.3, the intersections of Higuera Street & Marsh Street and Marsh Street & Johnson Street was analyzed using the 2000 HCM methodology as the HCM 6 methodology does not support the intersection phasing.

3.6.1 Bicycle Scramble Phase

Bicycle Scramble Scenario phase incorporates a dedicated bicycle phase into the intersection signal plan. Phase would prohibit turning movements for all other phases allowing for only thru movement thru the intersection for bikes only.

3.6.2 Alternative Protected Bike Signal Scenario

As cited in NACTO (National Association of City Transportation Officials), a protected bike signal is a fully separated signal phasing for bikes. For the protected intersection scenario, right turn on red (RTOR) is prohibited. Refer to Appendix A.



NACTO

3.7 Significance and Mitigation Thresholds

The following thresholds of significance or deficiencies were used to determine if the impact is projected to have a significant impact and requires mitigation or operates below the City's level of service policy on study intersections and roadway segments.

3.7.1 Intersection Level of Service Thresholds

Under Senate Bill 743, automobile level of service is no longer considered an environmental impact. However, the City of San Luis Obispo's General Plan Circulation Element contains the following policy pertaining to LOS standards in the City. Because these level of service thresholds are no longer subject to CEQA, deficiencies are not considered an environmental impact. Rather inconsistency with local level of service policy should be addressed with conditions approval outside of CEQA.

3.7.1.1 Agency Intersection Level of Service Guidelines and Polices

Section 6.1.2: Establish the following peak-hour LOS standards for multimodal objectives, service standards, and significance criteria. They reflect the special circumstances of various areas of the community. Table 3.4 identifies the LOS objectives and minimum LOS standards.

Table 3.4: MMLOS Objectives and Service Standards

Travel Mode	LOS Objective	Minimum LOS Standard
Bicycle	B	D
Pedestrian	B	C
Transit	C	Baseline LOS or LOS D, whichever is lower
Vehicle	C	E (Downtown), D (All Other Routes)

The City of San Luis Obispo's General Plan Circulation Element is accessible via the following internet site: https://www.slocity.org/home/showdocument?id=6637.

3.7.2 LOS Thresholds Based on AADT

The following AADT thresholds of significance were estimated using the City of San Luis Obispo's General Plan Circulation Element methodologies based on Urban (>5,000 Population) Interrupted Flow Arterial (Signalized) roadways as listed in Table 3.5 below.

Table 3.5: LOS AADT Thresholds

Urban (>5,000 Population) Interrupted Flow Arterial (Signalized)						
		Level of Service				
Lanes	Divided	A	B	C	D	E
2	Undivided	0	3,200	10,480	12,400	13,040
2	Undivided	0	4,000	13,100	15,500	16,300
2	Divided	0	4,200	13,755	16,275	17,115
4	Undivided	3,450	20,925	24,600	25,650	25,650
4	Undivided	4,370	26,505	31,160	32,490	32,490
4	Divided	4,600	27,900	32,800	34,200	34,200

Urban (>5,000 Population) Interrupted Flow Arterial (Signalized)						
		Level of Service				
Lanes	Divided	A	B	C	D	E
6	Undivided	5,175	32,100	36,975	38,550	38,550
6	Undivided	6,555	40,660	46,835	48,830	48,830
6	Divided	6,900	42,800	49,300	51,400	51,400

For purposes of this study and existing study roadway segment one-way orientation, Table 3.5 above, highlighted in red, is modified below to represent one-way orientation thresholds. Modification thresholds shown in Table 3.6 are half the values highlighted in red.

Table 3.6: LOS AADT Thresholds

Urban (>5,000 Population) Interrupted Flow Arterial (Signalized)						
		Level of Service				
Lanes	Divided	A	B	C	D	E
1	Undivided	0	2,100	6,878	8,138	8,558
2	Undivided	2,300	13,950	16,400	17,100	17,100
3	Undivided	3,450	21,400	24,650	25,700	25,700

3.7.3 Vehicle Queue Standards

Vehicle queues are considered acceptable within this report if the queues are accommodated within the available storage for left- and right turn lanes. Queues are based on Synchro que length (95th) percentile and queues values were rounded to the nearest 25th foot (in the queue table analysis) as the default value for passenger cars, for queue value outputs less than 25 feet.

3.8 Technical Analysis Parameters

This TAR provides an evaluation of traffic operating conditions by incorporating appropriate heavy vehicle adjustment factors and peak hour factors. The resulting intersection delays and LOS are estimated using HCM 6 based analysis methodologies.

Table 3.7 presents various parameters that are be applied to study intersections within this analysis.

Table 3.7: MMLOS Objectives and Service Standards

Technical Parameters	City Intersections
Grade	Level
% Trucks	From Traffic Counts
PHF for Existing & Existing Plus Project	From Traffic Counts
PHF for Future Conditions	0.92 of higher

The Synchro 10 (Trafficware) software suite will be used to implement the HCM 6 analysis methodologies.

4. Existing Conditions

The Existing conditions scenario represent current study intersections and traffic volumes are analyzed and establishes the baseline traffic performance.

4.1 Existing Intersection Operations

Table 4.1 summarizes the intersection performance during the AM and PM peak hour at Existing Conditions.

Table 4.1: Existing Intersection Level of Service

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Higuera St / Marsh St	Signal	E	16.1	B	-	19.2	B	-
2	Higuera St / Nipomo St	Signal	E	14.9	B	-	14.9	B	-
3	Marsh St / Nipomo St	Signal	E	12.1	B	-	12.7	B	-
4	Marsh St / Broad St	Signal	E	15.4	B	-	15.8	B	-
5	Higuera St / Broad St	Signal	E	15.7	B	-	16.2	B	-
6	Higuera St / Chorro St	Signal	E	10.9	B	-	11.6	B	-
7	Higuera St / Osos St	Signal	E	8.9	A	-	9.0	A	-
8	Marsh St / Osos St	Signal	E	9.6	A	-	9.9	A	-
9	Marsh St / Chorro St	Signal	E	16.9	B	-	17.3	B	-
10	Marsh St / Johnson St	Signal	E	48.8	D	-	37.3	D	-
11	Higuera St to Morro St	Signal	E	18.6	B	-	18.6	B	-
12	Marsh St / Morro St	Signal	E	11.0	B	-	11.7	B	-
13	Higuera St / Santa Rosa St	Signal	E	8.2	A	-	9.2	A	-
14	Marsh St / Santa Rosa St	Signal	E	13.2	B	-	13.7	B	-

Notes: *1. LOS = Delay based on average of all approaches for AWSC, Signal, RNDBT*
*2. **Bold** = Unacceptable Conditions*
3. OVR = Delay over 300 seconds

As presented in Table 4.1, all study intersections are currently found to operate at or above the target threshold LOS.

4.2 Existing Roadway Operations

Table 4.2 presents roadway facility characteristics and a summary of the Existing Plus Project segment operations.

Table 4.2: Existing Roadway Level of Service

Exiting Segment AADT Volumes (2019)					Urban (>5000 Population) Interupted Flow Arterial (Signalized)		
#	Segment	Limits	Divided	Direction	# of Lanes	AADT	LOS
1	Higuera Street	Marsh Street to Nipomo Street	Undivided	West	2	10,561	B
2	Higuera Street	Nipomo Street to Broad Street	Undivided	West	3	9,384	B
3	Higuera Street	Broad Street to Chorro Street	Undivided	West	3	11,858	B
4	Higuera Street	Chorro Street to Osos Street	Undivided	West	3	10,112	B
5	Higuera Street	Osos Street to Santa Rosa Street	Undivided	West	3	8,841	B
6	Higuera Street	Santa Rosa Street Toro Street	Undivided	West	3	5,069	B
7	Higuera Street	Toro Street to Johnson Street	Undivided	West	2	4,321	B
8	Marsh Street	Higuera Street to Nipomo Street	Undivided	East	3	10,878	B
9	Marsh Street	Nipomo Street to Broad Street	Undivided	East	3	9,578	B
10	Marsh Street	Broad Street to Osos Street	Undivided	East	3	10,823	B
11	Marsh Street	Osos Street to Santa Rosa Street	Undivided	East	3	8,825	B
12	Marsh Street	Santa Rosa Street to Johnson Stre	Undivided	East	3	4,463	B

As presented in Table 4.2, the study roadway segments is currently operating at acceptable LOS.

4.3 Existing - Queue Operations

Existing intersection queuing analysis focuses on the locations where queuing is most likely to occur along the study intersections. Table 4.3 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 4.3: Existing Conditions Queuing Analysis

Existing Conditions - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	117	104	50
	NBL	153	222	250
	NBR	56	61	-
	SBL			-
	SBR	42	75	-
89	Higuera St / Nipomo St			
	SER	25	27	65
	NWL	41	52	50
	SWL	25	25	**440**
	SWR			**440**
90	Marsh St / Nipomo St			
	SEL	25	25	40
	NWR			-
	NEL			**+1000**
	NER			**+1000**
96	Marsh St / Broad St			
	SEL	25	25	45
	NWR	25	36	90
	NEL			**440**
	NER			**440**
97	Higuera St / Broad St			
	SER	25	25	70

		NWL			-
		SWL			**615**
		SWR			**615**
99	Higuera St / Chorro St				
		NBL	25	25	50
		SBR	25	25	65
		SWL			**430**
		SWR			**430**
102	Higuera St / Osos St				
		WBL			**495**
		WBR			**495**
		SER			-
		NWL			-
103	Marsh St / Osos St				
		SEL	25	25	-
		NWR	33	43	100
		NEL			**340**
		NER			**340**
115	Marsh St / Chorro St				
		NBR	25	25	75
		SBL	52	56	75
		NEL			**600**
		NER			**600**
124	Marsh St / Johnson St				
		SEL	25	25	75
		NWR			75
		NEL	88	154	**+1000**
		NER	42	39	**+1000**
		SWL	151	132	**+1000**
		SWR			100
134	Higuera St to Morro St				
		WBL			**335**
		WBR			**335**
		NBL			-
		SBR	25	25	75
135	Marsh St / Morro St				
		EBL			**440**
		EBR			**440**
		SEL			-
		NWR			-
154	Higuera St / Santa Rosa St				
		WBL			**550**
		WBR			**550**
		NBL	25	25	100
		SBR	34	35	-
155	Marsh St / Santa Rosa St				
		EBL	68	75	**490**
		EBR	25	25	**490**
		SEL	25	25	75
		NWR			-

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 4.3 all the intersection queuing movements did not exceed the storage capacity except for the following intersections:

- Higuera Street & Marsh Street in the AM and PM peak hour: Significant eastbound traffic turning right movement exceeds the queue storage capacity. However, the right turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.

- Higuera Street & Nipomo Street in the PM peak hour: Northwest bound traffic turning left exceeds the queue storage capacity by 2', effectively utilizing the full capacity of the turning movement.

Recommendations: Both intersections are at full queueing capacity, the City should actively monitor these locations and optimize signal timing frequently.

5. Project Description

5.1 Project Proposal

Consistent with the Downtown Concept Plan, the paving project proposes removal of one auto travel lane on Marsh and Higuera in order to reduce illegal speeding and provide more street width for pedestrian and bicycle facilities, as well as existing and future parklets. These modifications would retain sufficient traffic capacity to accommodate existing and future auto traffic volumes. These plans would extend the current pilot lane reductions and bikeway enhancements on Higuera Street (Santa Rosa to Nipomo) to a permanent configuration. Existing pilot parklet installations will be retained and may become permanent pending City Council approval. Final designs will be refined based on community input.

6. Existing Plus Project Conditions

The Existing Plus Project conditions presents traffic impacts after superimposing the additional increment traffic generated by the proposed project onto Existing traffic volumes, intersection lane geometrics, and controls. This scenario assumes no additional background development to occur beyond the proposed project.

6.1 Existing Intersection Operations

Table 6.1 presents a summary of the intersection operations for the weekday AM and PM peak hour scenarios for the Existing Plus Project Scenarios.

Table 6.1: Existing Plus Project Intersection Level of Service

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Higuera St / Marsh St	Signal	E	16.4	B	-	19.5	B	-
2	Higuera St / Nipomo St	Signal	E	13.8	B	-	15.9	B	-
3	Marsh St / Nipomo St	Signal	E	14.3	B	-	15.5	B	-
4	Marsh St / Broad St	Signal	E	17.2	B	-	17.9	B	-
5	Higuera St / Broad St	Signal	E	16.7	B	-	18.2	B	-
6	Higuera St / Chorro St	Signal	E	9.5	A	-	13.0	B	-
7	Higuera St / Osos St	Signal	E	10.2	B	-	10.1	B	-
8	Marsh St / Osos St	Signal	E	4.2	A	-	11.5	B	-
9	Marsh St / Chorro St	Signal	E	18.7	B	-	18.8	B	-
10	Marsh St / Johnson St	Signal	E	55.2	E	-	41.7	D	-
11	Higuera St to Morro St	Signal	E	20.5	C	-	21.1	C	-
12	Marsh St / Morro St	Signal	E	12.3	B	-	13.6	B	-
13	Higuera St / Santa Rosa St	Signal	E	56.1	E	-	20.9	C	-
14	Marsh St / Santa Rosa St	Signal	E	13.9	B	-	17.4	B	-

Notes: *1. LOS = Delay based on average of all approaches for AWSC, Signal, RNDBT*
*2. **Bold** = Unacceptable Conditions*
3. OVR = Delay over 300 seconds

As presented in Table 6.1, all study intersections are projected to operate at or above the target threshold LOS.

6.2 Existing Plus Project Roadway Operations

Table 6.2 presents roadway facility characteristics and a summary of the Existing Plus Project segment operations.

Table 6.2: Existing Roadway Level of Service

Exiting plus Project Segment AADT Volumes (2019)					Urban (>5000 Population) Interupted Flow Arterial (Signalized)		
#	Segment	Limits	Divided	Direction	# of Lanes	AADT	LOS
1	Higuera Street	Marsh Street to Nipomo Street	Undivided	West	2	10,615	B
2	Higuera Street	Nipomo Street to Broad Street	Undivided	West	2	9,064	B
3	Higuera Street	Broad Street to Chorro Street	Undivided	West	2	10,864	B
4	Higuera Street	Chorro Street to Osos Street	Undivided	West	2	8,947	B
5	Higuera Street	Osos Street to Santa Rosa Street	Undivided	West	2	7,855	B
6	Higuera Street	Santa Rosa Street Toro Street	Undivided	West	2	5,386	B
7	Higuera Street	Toro Street to Johnson Street	Undivided	West	1	4,462	B
8	Marsh Street	Higuera Street to Nipomo Street	Undivided	East	2	10,527	B
9	Marsh Street	Nipomo Street to Broad Street	Undivided	East	2	9,178	B
10	Marsh Street	Broad Street to Osos Street	Undivided	East	2	10,361	B
11	Marsh Street	Osos Street to Santa Rosa Street	Undivided	East	2	8,864	B
12	Marsh Street	Santa Rosa Street to Johnson Stre	Undivided	East	3	4,291	B

As presented in Table 6.2, the study roadway segments are projected to operate at acceptable LOS.

6.3 Existing plus Project - Queue Operations

Existing plus Project intersection queuing analysis focuses on the locations where queuing is most likely to occur along the study intersections. Table 6.3 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 6.3: Existing plus Project Conditions Queuing Analysis

Existing + Project - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	**121**	**103**	50
	NBL	155	221	250
	NBR	55	61	-
	SBL			-
	SBR	42	75	-
89	Higuera St / Nipomo St			
	SER	25	28	65
	NWL	35	41	50
	SWL			**440**
	SWR			**440**
90	Marsh St / Nipomo St			
	SEL	25	25	40
	NWR			-
	NEL			**+1000**
	NER			**+1000**
96	Marsh St / Broad St			
	SEL	25	27	45
	NWR	25	28	90
	NEL			**440**
	NER			**440**
97	Higuera St / Broad St			
	SER	25	25	70
	NWL			-
	SWL			**615**
	SWR			**615**
99	Higuera St / Chorro St			
	NBL	25	48	50
	SBR	25	25	65
	SWL			**430**
	SWR			**430**
102	Higuera St / Osos St			
	WBL			**495**
	WBR			**495**
	SER			-
	NWL			-
103	Marsh St / Osos St			
	SEL	25	25	-
	NWR	26	44	100
	NEL			**340**
	NER			**340**
115	Marsh St / Chorro St			
	NBR	25	25	75
	SBL	55	57	75
	NEL			**600**
	NER			**600**

124	Marsh St / Johnson St			
	SEL	25	25	75
	NWR			75
	NEL	88	154	**+1000**
	NER	43	40	**+1000**
	SWL	171	160	**+1000**
	SWR			100
134	Higuera St to Morro St			
	WBL			**335**
	WBR			**335**
	NBL			-
	SBR		25	75
135	Marsh St / Morro St			
	EBL			**440**
	EBR			**440**
	SEL			-
	NWR			-
154	Higuera St / Santa Rosa St			
	WBL			**550**
	WBR			**550**
	NBL	27	31	100
	SBR	45	37	
155	Marsh St / Santa Rosa St			
	EBL			**490**
	EBR			**490**
	SEL	25	25	75
	NWR			-

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 6.3 all the intersection queuing movements did not exceed the storage capacity except for the following intersection:

6. Higuera Street & Marsh Street in the AM and PM peak hour: Significant eastbound traffic turning right movement exceeds the queue storage capacity. However, the right turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.

Recommendations: This intersection is at full queueing capacity; the City should actively monitor these locations and optimize signal timing frequently.

6.4 Existing Plus Project w/ Bicycle Scramble Phase

Table 6.4 presents a summary of the intersection operations for the weekday AM and PM peak hour scenarios for the Existing Plus Project w/Bicycle Scramble Phase Scenario.

Table 6.4: Existing Plus Project w/Bicycle Scramble Phase

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Higuera St / Marsh St	Signal	E	35.5	D	-	73.9	E	-
10	Marsh St / Johnson St	Signal	E	63.2	E	-	44.3	D	-

As presented in Table 6.4, both study intersections are projected to operate at or above the target threshold LOS.

6.5 Existing Plus Project w/ Bicycle Scramble Phase – Queue Operations

Table 6.5 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections for Existing Plus Project w/ Bicycle Scramble Phase. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 6.5: Existing Plus Project w/Bicycle Scramble Phase

Existing + Project (w/bicycle phase) - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	**209**	**146**	50
	NBL2	223	**286**	250
	NBR			-
	SBL			-
	SBR	262	849	-
124	Marsh St / Johnson St			
	SEL2	25	25	75
	NWR	34		75
	NEL	80	141	**+1000**
	NER2	41	36	**+1000**
	SWL	157	148	**+1000**
	SWR			100

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 6.5, only Higuera Street & Marsh Street in both the AM and PM peak hour exceed storage capacity. The intersection had significant eastbound traffic turning right in the AM and PM peak hour and just slightly northbound traffic turning left in the PM peak hour.

6.6 Existing Plus Project w/ Alternative Protected Bike Signal

Table 6.6 presents a summary of the intersection operations for the weekday AM and PM peak hour scenarios for the Existing Plus Project w/Alternative Protected Bike Signal Scenario.

Table 6.6: Existing Plus Project w/ Alternative Protected Bike Signal

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Higuera St / Marsh St	Signal	E	19.5	B	-	31.4	C	-
10	Marsh St / Johnson St	Signal	E	56.7	E	-	42.2	D	-

As presented in Table 6.6, both study intersections are projected to operate at or above the target threshold LOS.

6.7 Existing Plus Project w/ Alternative Protected Bike Signal – Queue Operations

Table 6.7 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections for Existing Plus Project w/ Alternative Protected Bike Signal. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 6.7: Existing Plus Project w/Alternative Bicycle Protected Phase

Existing + Project (w/bicycle phase) - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	**226**	**208**	50
	NBL	170	238	250
	NBR		251	-
	SBL			-
	SBR	172	666	-
124	Marsh St / Johnson St			
	SEL	25	25	75
	NWR	37		75
	NEL	88	154	**+1000**
	NER	264	179	**+1000**
	SWL	171	160	**+1000**
	SWR		50	100

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 6.7, only Higuera Street & Marsh Street in both the AM and PM peak hour exceed storage capacity. However, the right turn turning movement is consolidated with the eastbound thru movements, EBR turns do not occlude or impact overall approach operations.

7. Year 2040 Conditions

Year 2040 conditions refer to an analysis scenario approximately 20 years in the future. For cumulative conditions GHD forecasted Cumulative and Cumulative + Project volumes based on a combination of the City's Traffic Model and professional judgement.

7.1 Year 2040 No Project Conditions

Table 7.1 summarizes the intersection performance during the AM and PM peak hour for projected Year 2040 No Project Conditions.

Table 7.1: Year 2040 No Project Conditions Level of Service

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Higuera St / Marsh St	Signal	E	33.0	C	-	44.9	D	-
2	Higuera St / Nipomo St	Signal	E	16.0	B	-	18.2	B	-
3	Marsh St / Nipomo St	Signal	E	14.0	B	-	13.9	B	-
4	Marsh St / Broad St	Signal	E	17.6	B	-	18.3	B	-
5	Higuera St / Broad St	Signal	E	18.4	B	-	21.4	C	-
6	Higuera St / Chorro St	Signal	E	13.5	B	-	15.4	B	-
7	Higuera St / Osos St	Signal	E	12.1	B	-	11.8	B	-
8	Marsh St / Osos St	Signal	E	3.6	A	-	3.8	A	-
9	Marsh St / Chorro St	Signal	E	3.5	A	-	3.1	A	-
10	Marsh St / Johnson St	Signal	E	17.5	B	-	26.7	C	-
11	Higuera St to Morro St	Signal	E	19.1	B	-	20.8	C	-
12	Marsh St / Morro St	Signal	E	13.0	B	-	13.9	B	-
13	Higuera St / Santa Rosa St	Signal	E	12.1	B	-	11.6	B	-
14	Marsh St / Santa Rosa St	Signal	E	14.5	B	-	15.1	B	-

Notes: 1. LOS = Delay based on average of all approaches for AWSC, Signal, RNDBT
*2. **Bold** = Unacceptable Conditions*
3. OVR = Delay over 300 seconds

As presented in Table 7.1, all study intersections are expected to operate at or above the threshold LOS.

7.2 Year 2040 No Project Roadway Operations

Table 7.2 presents roadway facility characteristics and a summary of the Year 2040 No Project segment operations.

Table 7.2: Year 2040 No Project Conditions Roadway Level of Service

Cumulative Base AADT Volumes (2040)							
#	Segment	Limits	Divided	Direction	# of Lanes	AADT	LOS
1	Higuera Street	Marsh Street to Nipomo Street	Undivided	West	2	14,799	C
2	Higuera Street	Nipomo Street to Broad Street	Undivided	West	3	12,982	B
3	Higuera Street	Broad Street to Chorro Street	Undivided	West	3	14,164	C
4	Higuera Street	Chorro Street to Osos Street	Undivided	West	3	12,795	B
5	Higuera Street	Osos Street to Santa Rosa Street	Undivided	West	3	10,759	B
6	Higuera Street	Santa Rosa Street Toro Street	Undivided	West	3	7,227	B
7	Higuera Street	Toro Street to Johnson Street	Undivided	West	2	5,259	B
8	Marsh Street	Higuera Street to Nipomo Street	Undivided	East	3	14,721	C
9	Marsh Street	Nipomo Street to Broad Street	Undivided	East	3	13,141	B
10	Marsh Street	Broad Street to Osos Street	Undivided	East	3	14,003	C
11	Marsh Street	Osos Street to Santa Rosa Street	Undivided	East	3	10,854	B
12	Marsh Street	Santa Rosa Street to Johnson Stre	Undivided	East	3	6,902	B

As presented in Table 7.2, the study roadway segments are projected to operate at acceptable LOS.

7.3 Year 2040 No Project - Queue Operations

Year 2040 No Project intersection queuing analysis focuses on the locations where queuing is most likely to occur along the study intersections. Table 7.3 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 7.3: Year 2040 No Project Conditions Queuing Analysis

Cumulative Conditions - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	462	173	50
	NBL	262	489	250
	NBR	212	214	-
	SBL			-
	SBR	65	173	-
89	Higuera St / Nipomo St			
	SER	25	29	65
	NWL	129	177	50
	SWL	25	25	**440**
	SWR			**440**
90	Marsh St / Nipomo St			
	SEL	58	86	40
	NWR			-
	NEL			**+1000**
	NER			**+1000**
96	Marsh St / Broad St			
	SEL	25	25	45
	NWR	92	77	90
	NEL			**440**
	NER			**440**

97	Higuera St / Broad St			
	SER	25	31	70
	NWL			-
	SWL			**615**
	SWR			**615**
99	Higuera St / Chorro St			
	NBL	25	25	50
	SBR	**87**	**94**	65
	SWL			**430**
	SWR			**430**
102	Higuera St / Osos St			
	WBL			**495**
	WBR			**495**
	SER			-
	NWL			-
103	Marsh St / Osos St			
	SEL	33	33	-
	NWR	64	72	100
	NEL			**340**
	NER			**340**
115	Marsh St / Chorro St			
	NBR	47	37	75
	SBL	66	33	75
	NEL			**600**
	NER			**600**
124	Marsh St / Johnson St			
	SEL	25	25	75
	NWR			75
	NEL	89	201	**+1000**
	NER	34	59	**+1000**
	SWL	33	35	**+1000**
	SWR			100
134	Higuera St to Morro St			
	WBL			**335**
	WBR			**335**
	NBL			-
	SBR	49	52	75
135	Marsh St / Morro St			
	EBL			**440**
	EBR			**440**
	SEL			-
	NWR			-
154	Higuera St / Santa Rosa St			
	WBL			**550**
	WBR			**550**
	NBL	25	25	100
	SBR	159	193	-
155	Marsh St / Santa Rosa St			
	EBL	81	72	**490**
	EBR	25	25	**490**
	SEL	25	25	75
	NWR			-

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 7.3 all the intersection queuing movements did not exceed the storage capacity except for the following intersections:

- Higuera Street & Marsh Street in the AM and PM peak hour: Significant eastbound traffic turning right movement exceeds the queue storage capacity. Additionally, substantial northbound traffic turning left movement also exceeds the queue storage capacity.

- Higuera Street & Nipomo Street in the AM and PM peak hour: Significant northwest bound traffic turning left movement exceeds the queue storage capacity.
- Marsh Street & Nipomo Street in the AM peak hour: Southeast bound traffic turning left exceeds the queue storage capacity.
- Marsh Street & Broad Street in the AM peak hour: Northwest bound traffic turning right narrowly exceeds the queue storage capacity.
- Higuera Street & Chorro Street in the AM and PM peak hour: Significant southbound traffic turning right movement exceeds the queue storage capacity.

Recommendation: Consider future parking removal on side streets for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

8. Year 2040 Plus Project Conditions

Year 2040 Plus Project conditions refer to an analysis scenario approximately 20 years in the future with project. Cumulative Plus Project volumes based on a combination of the City's Traffic Model and professional judgement.

8.1 Year 2040 Plus Project Conditions

Table 8.1 summarizes the intersection performance during the AM and PM peak hour for projected Year 2040 Plus Project Conditions.

Table 8.1: Year 2040 Plus Project Conditions Level of Service

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	Higuera St / Marsh St	Signal	E	33.1	C	-	45.2	D	-
2	Higuera St / Nipomo St	Signal	E	15.9	B	-	19.3	B	-
3	Marsh St / Nipomo St	Signal	E	13.6	B	-	14.8	B	-
4	Marsh St / Broad St	Signal	E	19.7	B	-	23.1	C	-
5	Higuera St / Broad St	Signal	E	18.0	B	-	24.6	C	-
6	Higuera St / Chorro St	Signal	E	14.8	B	-	20.5	C	-
7	Higuera St / Osos St	Signal	E	15.7	B	-	14.8	B	-
8	Marsh St / Osos St	Signal	E	6.0	A	-	3.9	A	-
9	Marsh St / Chorro St	Signal	E	3.6	A	-	4.7	A	-
10	Marsh St / Johnson St	Signal	E	17.8	B	-	26.2	C	-
11	Higuera St to Morro St	Signal	E	19.7	B	-	23.6	C	-
12	Marsh St / Morro St	Signal	E	15.4	B	-	19.2	B	-
13	Higuera St / Santa Rosa St	Signal	E	40.9	D	-	11.4	B	-
14	Marsh St / Santa Rosa St	Signal	E	13.6	B	-	16.5	B	-

Notes: 1. LOS = Delay based on average of all approaches for AWSC, Signal, RNDBT
*2. **Bold** = Unacceptable Conditions*
3. OVR = Delay over 300 seconds

As presented in Table 8.1, all study intersections are projected to operate at or above the target LOS threshold.

8.2 Year 2040 Plus Project Roadway Operations

Table 8.2 presents roadway facility characteristics and a summary of the Year 2040 Plus Project segment operations.

Table 8.2: Year 2040 Plus Project Conditions Roadway Level of Service

Cumulative Base plus Project AADT Volumes (2040)							
#	Segment	Limits	Divided	Direction	# of Lanes	AADT	LOS
1	Higuera Street	Marsh Street to Nipomo Street	Undivided	West	2	14,607	C
2	Higuera Street	Nipomo Street to Broad Street	Undivided	West	2	11,770	B
3	Higuera Street	Broad Street to Chorro Street	Undivided	West	2	12,194	B
4	Higuera Street	Chorro Street to Osos Street	Undivided	West	2	11,258	B
5	Higuera Street	Osos Street to Santa Rosa Street	Undivided	West	2	9,330	B
6	Higuera Street	Santa Rosa Street Toro Street	Undivided	West	2	6,986	B
7	Higuera Street	Toro Street to Johnson Street	Undivided	West	1	4,935	B
8	Marsh Street	Higuera Street to Nipomo Street	Undivided	East	2	13,834	B
9	Marsh Street	Nipomo Street to Broad Street	Undivided	East	2	12,540	B
10	Marsh Street	Broad Street to Osos Street	Undivided	East	2	12,673	B
11	Marsh Street	Osos Street to Santa Rosa Street	Undivided	East	2	9,592	B
12	Marsh Street	Santa Rosa Street to Johnson Stre	Undivided	East	3	6,478	B

As presented in Table 8.2, the study roadway segment is projected to operate at acceptable LOS.

8.3 Year 2040 Plus Project - Queue Operations

Year 2040 Plus Project intersection queuing analysis focuses on the locations where queuing is most likely to occur along the study intersections. Table 8.3 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 8.3: Year 2040 Plus Project Conditions Queuing Analysis

Cumulative + Project - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	471	175	50
	NBL	263	501	250
	NBR	203	215	-
	SBL			-
	SBR	65	169	-
89	Higuera St / Nipomo St			
	SER	25	32	65
	NWL	134	208	50
	SWL	23	25	**440**
	SWR			**440**
90	Marsh St / Nipomo St			
	SEL	53	83	40
	NWR			-
	NEL	195	175	200
	NER			**+1000**
96	Marsh St / Broad St			
	SEL	25	25	45
	NWR	94	66	90
	NEL			**440**
	NER			**440**
97	Higuera St / Broad St			

		SER	25	32	70
		NWL			-
		SWL	126	105	**200**
		SWR			**615**
99	Higuera St / Chorro St				
		NBL	25	25	50
		SBR	**73**	**98**	65
		SWL			**430**
		SWR			**430**
102	Higuera St / Osos St				
		WBL			**495**
		WBR			**495**
		SER			-
		NWL			-
103	Marsh St / Osos St				
		SEL	25	25	-
		NWR	27	74	100
		NEL			**340**
		NER			**340**
115	Marsh St / Chorro St				
		NBR	46	49	75
		SBL	72	40	75
		NEL			**600**
		NER			**600**
124	Marsh St / Johnson St				
		SEL			75
		NWR			75
		NEL	88	198	**+1000**
		NER	34	59	**+1000**
		SWL	33	36	**+1000**
		SWR			100
134	Higuera St to Morro St				
		WBL	25	25	**200**
		WBR	25	25	**200**
		NBL			-
		SBR	35	54	75
135	Marsh St / Morro St				
		EBL			**440**
		EBR			**440**
		SEL			-
		NWR			-
154	Higuera St / Santa Rosa St				
		WBL			**550**
		WBR			**550**
		NBL	30	25	100
		SBR			-
155	Marsh St / Santa Rosa St				
		EBL			**490**
		EBR			**490**
		SEL	25	25	75
		NWR			-

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity
Bold = Lane Improvement

As presented in Table 8.3 all the intersection queuing movements did not exceed the storage capacity except for the following intersections:

- Higuera Street & Marsh Street in the AM and PM peak hour: Substantial eastbound traffic turning right movement exceeds the queue storage capacity. Additionally, substantial northbound traffic turning left movement also exceeds the queue storage capacity.

- Higuera Street & Nipomo Street in the AM and PM peak hour: Significant northwest bound traffic turning left movement exceeds the queue storage capacity.
- Marsh Street & Nipomo Street in the AM and PM peak hour: Considerable southeast bound traffic turning left movement exceeds the queue storage capacity.
- Marsh Street & Broad Street in the AM and PM peak hour: Considerable northwest bound traffic turning right movement narrowly exceeds the queue storage capacity.
- Higuera Street & Chorro Street in the AM and PM peak hour: Significant southbound traffic turning right movement exceeds the queue storage capacity.

Recommendation: Consider future parking removal on side streets for installation of TWLTL and upgrading signal controls in the downtown core to an adaptive system.

8.4 Year 2040 Plus Project w/ Bicycle Scramble Phase

Table 8.4 presents a summary of the intersection operations for the weekday AM and PM peak hour scenarios for the Year 2040 Plus Project w/Bicycle Scramble Phase Scenario.

Table 8.4: Year 2040 Plus Project w/Bicycle Scramble Phase

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	**Higuera St / Marsh St**	**Signal**	**E**	**71.2**	**E**	**-**	**139.1**	**F**	**-**
10	Marsh St / Johnson St	Signal	E	35.2	D	-	28.3	C	-

As presented in Table 8.4, only the intersection of Marsh Street & Johnson Street is projected to operate at or above the target threshold LOS. The intersection of Higuera Street & Marsh Street in the PM peak hour is projected to experience LOS F, not operating at or above the target threshold.

8.5 Year 2040 Plus Project w/ Bicycle Scramble Phase – Queue Operations

Table 8.5 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections for Year 2040 Plus Project w/ Bicycle Scramble Phase. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 8.5: Year 2040 Plus Project w/Bicycle Scramble Phase

Cum + Project (w/bicycle phase) - Queuing Analysis (95th %)				
		AM Peak	PM Peak	Storage Capacity
84	Higuera St / Marsh St			
	EBR	**668**	**212**	50
	NBL2	**328**	**650**	250
	NBR	169	185	-
	SBL			-
	SBR	489	1036	-
124	Marsh St / Johnson St			
	SEL2			75
	NWR			75

	NEL	121	184	**+1000**
	NER2	25	57	**+1000**
	SWL	40	35	**+1000**
	SWR			100

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 8.5, Higuera Street & Marsh Street in the AM and PM peak exceeds the storage capacity. There is substantial eastbound traffic movement turning right and significant northbound traffic movement turning left, exceeding the queue storage capacity.

Recommendation: A Bicycle Scramble Phase at Marsh & Higuera locations is not recommended under cumulative conditions without other significant intersection and corridor improvements.

8.6 Year 2040 Plus Project w/ Alternative Protected Bike Signal

Table 8.6 presents a summary of the intersection operations for the weekday AM and PM peak hour scenarios for the Year 2040 Plus Project w/ Alternative Protected Bike Signal Scenario.

Table 8.6: Year 2040 Plus Project w/ Alternative Protected Bike Signal

#	Intersection	Control Type[1,2]	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met?[3]	Delay	LOS	Warrant Met?[3]
1	**Higuera St / Marsh St**	**Signal**	**E**	**80.1**	**F**	**-**	**123.3**	**F**	**-**
10	Marsh St / Johnson St	Signal	E	17.8	B	-	26.8	C	-

As presented in Table 8.6, only the intersection of Marsh Street & Johnson Street is projected to operate at or above the target threshold LOS. The intersection of Higuera Street & Marsh Street in the AM and PM peak hour is projected to experience LOS F, operating below the target threshold.

8.7 Year 2040 Plus Project w/ Alternative Protected Bike Signal – Queue Operations

Table 8.7 presents the 95th percentile queuing analysis for the weekday AM and PM peak hours at the study intersections for Year 2040 Plus Project w/ Alternative Protected Bike Signal Scenario. Approach orientation description was listed as coded in the Synchro file provided by the City.

Table 8.7: Year 2040 Plus Project w/ Alternative Protected Bike Signal

Cum + Project (w/bicycle phase) - Queuing Analysis (95th %)				
		AM Peak	**PM Peak**	**Storage Capacity**
84	Higuera St / Marsh St			
	EBR	**734**	**271**	50
	NBL	**263**	**501**	250
	NBR	812	831	-
	SBL			-
	SBR	334	806	-
124	Marsh St / Johnson St			
	SEL2			75
	NWR			75
	NEL	121	198	**+1000**

NER	84	212	**+1000**
SWL	33	36	**+1000**
SWR		49	100

Notes:
Bold = Overall Segment Length
Bold = Exceeds Storage Capacity

As presented in Table 8.7, Higuera Street & Marsh Street in the AM and PM peak exceeds the storage capacity. There is substantial eastbound traffic movement turning right and significant northbound traffic movement turning left, exceeding the queue storage capacity. However, this would only occur during bicycle activations.

Recommendation: With conditional bike phase programming these intersections would function adequately during cycles without bicycle activation. However, during phases with Bicycle Activation Higuera & Marsh would operate below City level of Service Thresholds and queueing would exceed capacities.

9. Overall Findings

The proposed lane reductions in the Downtown Core would not cause congestions levels to exceed City level of service thresholds under both current and future conditions. Higuera & Marsh and Marsh & Nipomo are currently at queueing capacity for particular movements with or without the proposed land reduction.

In general, downtown queueing under cumulative conditions is projected to exceed block lengths on most side street approaches to the Higuera & Marsh segments. This will occur with or without the proposed project. There are limited solutions given the short block lengths; some options the City may consider is future on-street parking removal for the installation of Two-Way Left Turn Lanes or upgrading to an adaptive signal system in the downtown core.

A bicycle scramble operation would operate within level of service thresholds at both locations under current conditions. However, a bicycle scramble at Marsh & Higuera would exceed level of service thresholds at some point between now and projected buildout of the City. Therefore, a bicycle scramble is not recommended at Marsh & Higuera without other significant intersection or corridor improvements. The City's Mid-Higuera and downtown concept plans contemplates widening and roundabout controls at Higuera & Marsh, including Class I circulating lanes around such a roundabout would be an effective solution for this location.

Protected Bicycle Phasing operation would also operate within level of service thresholds at both locations under current conditions. However, protected bicycle phasing at Marsh & Higuera would also exceed level of service thresholds at some point between now and projected buildout of the City. Therefore, protected bicycle phasing is not recommended at Marsh & Higuera without other significant intersection or corridor improvements. The City's Mid-Higuera and downtown concept plans contemplates widening and roundabout controls at Higuera & Marsh, including Class I circulating lanes around such a roundabout would be an effective solution for this location.

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