



HEXAGON TRANSPORTATION CONSULTANTS, INC.

Memorandum

Date: January 23, 2025

To: Tyler Rogers, David J. Powers & Associates, Inc.

From: Kai-Ling Kuo, Andrea Lin

Subject: Traffic Operations Study for the Proposed Field Lights at the San Lorenzo Valley Tri-Campus in Felton

Hexagon Transportation Consultants, Inc. has completed a traffic operations study for the proposed field lights at San Lorenzo Valley Tri-Campus (SLV) located at 7105 Highway 9 in the Town of Felton in California (see Figure 1). The project would add field lights at the SLV football field, baseball field, and two softball fields that do not currently have lighting. The field lights would provide for flexible nighttime use of the fields for various sporting and marching band activities, including practices and games (see Figure 2).

SLV currently hosts all sporting events during daylight hours with boys and girls soccer games in winter, baseball and softball games in spring and football games in fall. Football games are played on Saturdays, in late morning or early afternoon. In the past, SLV has played night football games on Friday or Saturday evenings as away games instead of on-campus. For football games held on campus, attendance ranges from 500 attendees for most football games up to 1,000 attendees for a rivalry or homecoming game. The football stadium has a capacity of 1,100 seats.

All other sporting events (e.g., soccer, baseball and softball games) are currently held on campus during daylight hours on weekdays with approximate attendance of up to 200 people. In winter months (January and February), boys and girls soccer games are played on Tuesdays and Wednesdays. In spring months (March to May), baseball games are played on Tuesdays and Fridays, and softball games are played on Tuesdays and Thursdays.

The use of the field lights would enable some sports games, practices, and events to occur in the evening on campus. There will be up to four games per annual season per sport being played on weekday evenings. The project is not expected to increase the number of attendees for these activities. Therefore, with lights, there would be up to 200 attendees for the soccer, baseball and softball games played on weekday evenings, and 500 attendees for most football games up to 1,000 attendees for a rivalry or homecoming football game on Friday evenings. Because football games have the highest attendance, the study only analyzes the traffic operations effect of football games.

All varsity football games would be hosted on SLV campus on Friday evenings around 6:30 PM. It is expected that with the project, attendees would arrive at the field during the hours of 5:00 PM to 7:00 PM. Therefore, the study focuses on evaluating the project's traffic operations effect during these hours on Friday evenings.

The results of the traffic operations study as presented in this memorandum show that the project would not have an adverse effect on traffic operations on the surrounding streets compared to existing conditions.



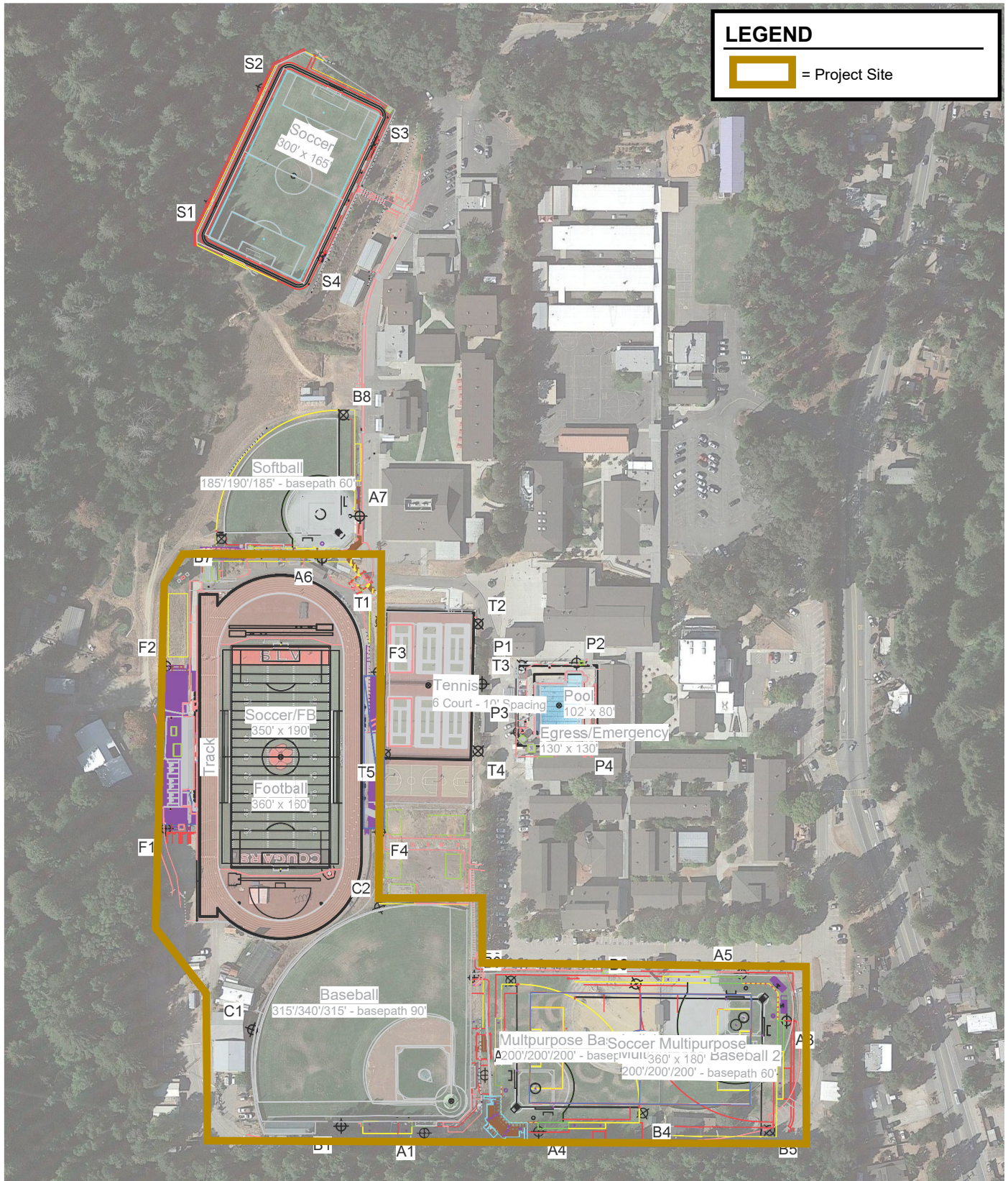


Figure 2
Site Plan

Study Intersections and Data Collection

This study was conducted to identify the potential traffic effects related to the project. These potential effects were evaluated in accordance with standards set forth by the County of Santa Cruz.

At SLV, a total of 446 standard parking stalls and nine accessible stalls are available for attendees of sporting events. Available parking is distributed between four parking lots on-campus: elementary school lot, middle school lot, high school lot, and staff parking lot (see Figure 1). There is no additional parking proposed as part of the project.

This study analyzed the traffic effect of the project on three key intersections that provide access to the school campus and parking lots. The study intersections are listed below and shown in Figure 1.

1. State Route 9 & El Solvo Heights Drive (Unsignalized)
2. State Route 9 & San Lorenzo Valley Elementary School Driveway (Unsignalized)
3. State Route 9 & San Lorenzo Valley High School Driveway

Traffic conditions at the study intersections were analyzed for a Friday from 5:00 PM to 7:00 PM, which is when the traffic increase due to the project is expected to be the greatest.

Traffic conditions were evaluated for the following scenarios:

- **Existing Conditions.** Existing traffic volumes for 5:00 PM to 7:00 PM were obtained from turning-movement counts conducted on a typical Friday on November 15, 2024.
- **Existing Plus Project Conditions.** Existing plus project conditions reflect the existing traffic volumes with sports events occurring in the evening with up to 1,000 attendees. Existing plus project conditions were evaluated relative to existing conditions to determine potential project adverse effects.

Intersection Operations Analysis Methodology

This section presents the methods used to determine the traffic conditions at the study intersections. It includes descriptions of the data requirements, the analysis methodologies, and the applicable level of service standards.

Data Requirements

The data required for the analysis were obtained from the new traffic counts and field observations. The following data were obtained from these sources:

- Existing peak-hour intersection turning-movement volumes,
- Existing lane configurations, and
- Signal timing and phasing.

Intersection Level of Service Analysis Methodologies and Standards

Traffic conditions at the study intersections were evaluated using level of service (LOS). Level of Service is a qualitative description of operating conditions ranging from LOS A, or free-flow conditions with little or no delay, to LOS F, or jammed conditions with excessive delays.

This study utilizes Synchro software and the 7th Edition *Highway Capacity Manual* (HCM) methods for signalized and unsignalized intersections to determine intersection level of service.

According to the Santa Cruz County General Plan, “LOS C should be considered the objective, with LOS D as the minimum acceptable standard.” Similarly, the Caltrans Guide for the Preparation of Traffic Impact Studies aims to maintain a target level of service at the transition between LOS C and LOS D on state facilities.

Signalized Intersection Level of Service

The HCM method assesses signalized intersection operations based on the average control delay time for all vehicles at the intersection. The correlation between average control delay and level of service is shown in Table 1.

Table 1
Signalized Intersection Level of Service Definition

Level of Service	Description	Average Control Delay per Vehicle (sec.)
A	Signal progression is extremely favorable. Most vehicles arrive during the green phase and do not stop at all. Short cycle lengths may also contribute to the very low vehicle delay.	10.0 or less
B	Operations characterized by good signal progression and/or short cycle lengths. More vehicles stop than with LOS A, causing higher levels of average vehicle delay.	10.1 to 20.0
C	Higher delays may result from fair signal progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though some vehicles may still pass through the intersection without stopping.	20.1 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable signal progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	This is considered to be the limit of acceptable delay. These high delay values generally indicate poor signal progression, long cycle lengths, and high volume-to-capacity (V/C) ratios. Individual cycle failures occur frequently.	55.1 to 80.0
F	This level of delay is considered unacceptable by most drivers. This condition often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes of such delay.	greater than 80.0

Source: Transportation Research Board, *Highway Capacity Manual*, 7th Edition (Washington, D.C., 2022).

Unsignalized Intersection Level of Service

Level of service analysis at unsignalized intersections is generally used to determine the need for modification in the type of intersection control (i.e., all-way stop or signalization). As part of the evaluation, traffic volumes and delays are evaluated to determine if the existing intersection control is appropriate.

For unsignalized intersections, level of service depends on the average delay experienced by vehicles on the stop-controlled approaches. Thus, for all-way stop controlled intersections, level of service is determined by the average delay for all movements through the intersection. For side street stop-controlled intersections (two-way or T-intersections), operations are defined by the

average control delay experienced by vehicles entering the intersection from the stop-controlled approaches on minor streets or from left-turn approaches on major streets. For side street stop-controlled intersections, the level of service is reported based on the average delay for the worst approach. The level of service definitions for unsignalized intersections is shown in Table 2.

Table 2

Unsignalized Intersection Level of Service Definitions Based on Average Delay

Level of Service	Description	Average Delay Per Vehicle (Sec.)
A	Little or no traffic delay	10.0 or less
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	Extreme traffic delays	greater than 50.0

Source: Transportation Research Board, *Highway Capacity Manual*, 7th Edition (Washington, D.C., 2022).

Intersection Vehicle Queuing Analysis

The analysis of intersection operations is typically supplemented with a vehicle queuing analysis at study intersections where the project would add a substantial number of vehicle trips to the left-turn movements or stop-controlled approaches. The vehicle queuing analysis is used to determine the appropriate storage lengths for the high demand turn lanes where the project would add a substantial number of trips. Vehicle queues were estimated using Synchro software, which accounts for the effects of upstream intersections and intersection signal timing.

The basis of the analysis is as follows: (1) the Synchro software is used to estimate the 95th percentile number of queued vehicles for a particular movement; (2) the estimated 95th percentile number of vehicles in the queue is translated into a queue length, assuming 25 feet per vehicle; and (3) the estimated 95th percentile queue length is compared to the existing or planned available storage capacity for the left and right-turn movements. This analysis thus provides a basis for estimating future turn pocket storage requirements at the project entrance.

The 95th percentile queue length value indicates that during the peak hour, a queue of this length or less would occur on 95 percent of the signal cycles. Or, a queue length larger than the 95th percentile queue would only occur on 5 percent of the signal cycles (about 3 cycles during the peak hour for a signal with a 60-second cycle length). Thus, turn pocket storage designs based on the 95th percentile queue length would ensure that storage space would be exceeded only 5 percent of the time for a signalized movement.

Existing Conditions

Existing Intersection Lane Configurations

The existing lane configurations at the study intersections were determined by observations in the field and are shown in Figure 3.

Existing Traffic Volumes

Existing traffic volumes at the study intersections were obtained from turning movement counts collected during a typical Friday on November 15, 2024, between 5:00 PM and 7:00 PM, which is when night game traffic would be highest. There were no sporting events at the school during the count collection. The existing PM intersection volumes are shown in Figure 3. The peak-hour traffic occurred from 5:00 PM to 6:00 PM at all three study intersections. Intersection turning-movement counts conducted for this analysis are presented in Appendix A.

Existing Intersection Levels of Service

The results of the intersection levels of service analysis (Table 3) show all intersections currently operate at acceptable level of service during the PM peak hour on a typical Friday without sporting events. The intersection levels of service calculation sheets are included in Appendix B.

Table 3
Existing Intersection Levels of Service

#	Intersection	LOS Standard	Control	Peak Hour	Count Date	Delay ¹ (sec)	LOS
1	Hwy 9 and El Solvo Heights Dr	D	TWSC	PM	11/15/24	18.4	C
2	Hwy 9 and SLV ES Drwy	D	TWSC	PM	11/15/24	17.3	C
3	Hwy 9 and SLV HS Drwy	D	Signal	PM	11/15/24	6.8	A

Notes:
 SCC = Santa Cruz County, TWSC = Two-Way Stop-Control
 1. Average delay (seconds per vehicle) for all approaches at the intersection is reported for signalized intersections. The approach with the highest (worst) delay (seconds per vehicle) is reported for TWSC intersections.

Observed Existing Traffic Conditions

Traffic conditions were observed in the field to identify existing operational deficiencies and to confirm the accuracy of calculated levels of service. The purpose of this effort was (1) to identify any existing traffic problems that may not be directly related to intersection level of service, and (2) to identify any locations where the level of service analysis does not accurately reflect level of service in the field.

Overall, the level of service analysis appears to reflect actual existing traffic conditions at the study intersections. No intersection operational deficiencies were observed during the 5:00 to 6:00 PM period.

SLV Campus Field Lights Project Traffic Operations Analysis

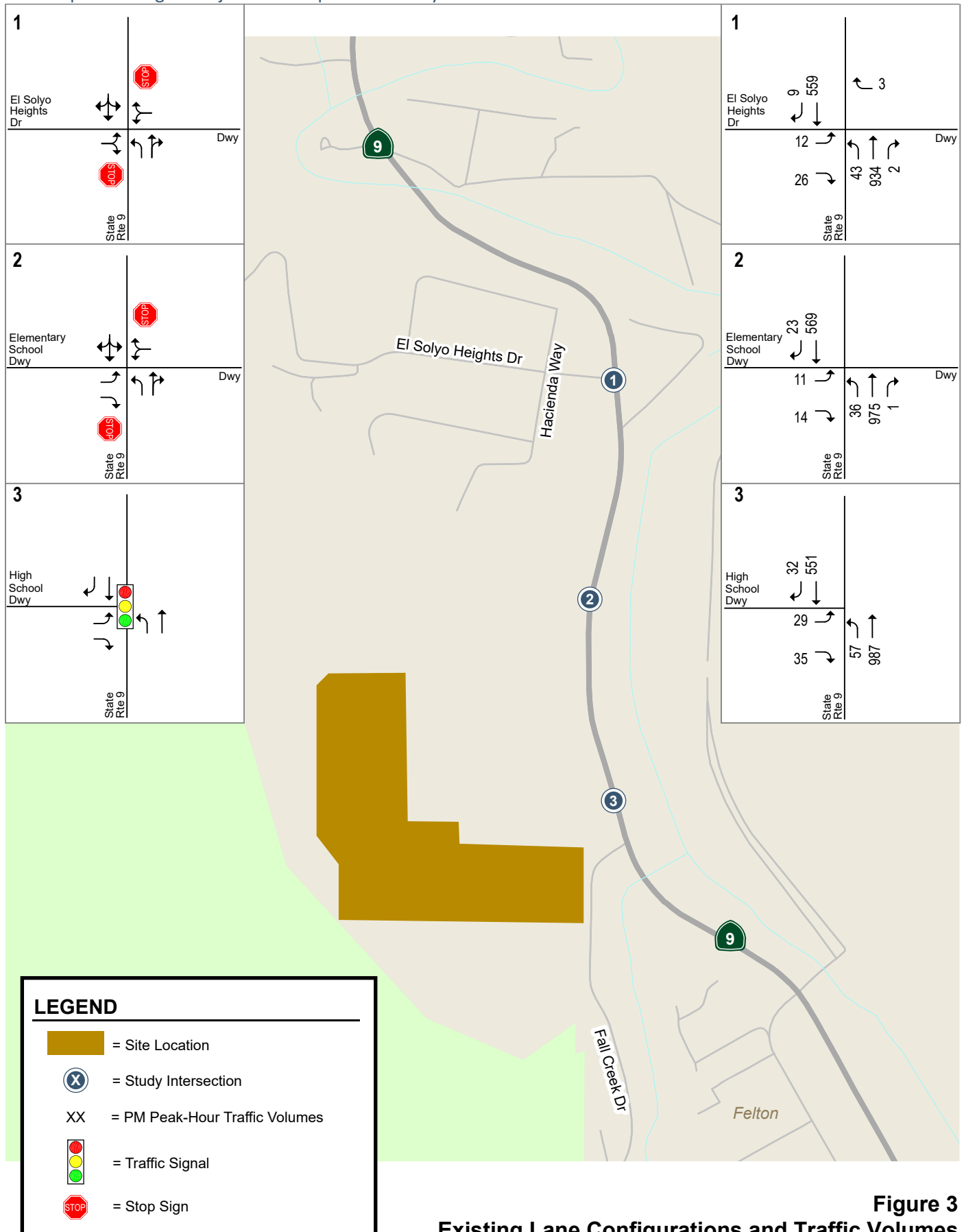


Figure 3
Existing Lane Configurations and Traffic Volumes

Project Trip Estimates

The magnitude of traffic produced by a new development and the locations where that traffic would appear were estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. In determining project trip generation, the traffic related to the proposed field light installation at SLV was estimated for the PM peak hour. As part of the project trip distribution, an estimate is made of the directions to and from which the project trips would travel. In the project trip assignment, the project trips were assigned to specific streets and intersections. These procedures are described below.

Trip Generation

Typically, the magnitude of traffic generated by a project can be estimated by applying to the size of the development the applicable trip generation rates published in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual* for the proposed land uses. However, the *Trip Generation Manual* does not have trip generation rates specially for the proposed sporting events/games that would occur in the evening. Therefore, vehicle trips that would be generated by the evening sporting events at the school were estimated based on data collected for a study done at Mitty High School in San Jose, California. The study determined that the vehicle occupancy rate was an average of 3.24 persons per vehicle for game attendees.

This vehicle occupancy rate was used to estimate the number of vehicle trips that would be generated by the new evening sports games. With the proposed field lights, some sports games, practices, and events would shift to evening hours. The highest attendance is typically for football games, with up to 500 attendees for most football games, increasing to 1,000 attendees for a rivalry or homecoming game on Friday evenings. Therefore, trip generation was estimated for the PM peak hour when a homecoming game would occur with up to 1,000 attendees.

The football games typically have the junior varsity (JV) games played prior to the varsity game, and the JV games typically have fewer attendees. It is assumed that there would be 200 attendees for the JV game and 100 of these attendees would stay for the evening game. Thus, before the varsity game starts, there would be an additional 1,000 inbound attendees for the varsity game (for a total of 1,100 attendees) and 100 outbound attendees leaving after the JV game. Based on the rate of 3.24 persons per vehicle, a homecoming game is expected to generate 309 inbound trips and 31 outbound trips during the busiest hour. This probably would occur from 5:30 to 6:30 PM, but to be conservative, these trips were added to the peak hour of 5:00 to 6:00 PM (see Table 4).

Table 4
Project Trip Generation Estimate

Land Use	Size	Peak Friday Evening			Total Trips
		Rate ¹ (persons/veh)	In	Out	
Proposed Field Lights Project ²					
Junior Varsity Games	100 outbound attendees	3.24	--	31	31
Varsity Games	1,000 inbound attendees	3.24	309	--	309
Total Project Trips			309	31	340
Notes:					
1. Average rate is based on counts conducted in October 2018 for a Friday night football game at Mitty High School in San Jose.					
2. Under project conditions, it was assumed that 200 attendees would attend the JV game starting at 3 pm, 100 out of 200 attendees leave after the JV game, 100 attendees stay for the varsity game starting at 6:30 pm, and 1,000 additional attendees would attend the varsity game for a total of 1,100 attendees for the varsity game.					

Trip Distribution and Assignment

The trip distribution patterns for the project were estimated based on existing travel patterns on the surrounding roadway network (See Figure 4). The trips generated by these sporting events are primarily from students within the school district.

The peak-hour project trips were assigned to the study intersections based on the trip distribution pattern and the number of parking spaces in the parking lots within the campus. Available parking is distributed between four parking lots on-campus: elementary school lot, middle school lot, high school lot, and staff parking lot. Most sporting event attendees are expected to park in the high school lot, accessible via the intersection of Highway 9 & SLV High School Driveway. The access for the elementary school lot is at Highway 9 & SLV Elementary School Driveway. The access for the middle school lot is through the residential streets of El Solvo Heights Drive and Hacienda Way.

Existing Plus Project Conditions

Existing Plus Project Traffic Volumes

Project trips, as represented in the above project trip assignment, were added to existing traffic volumes to obtain existing plus project traffic volumes (see Figure 5).

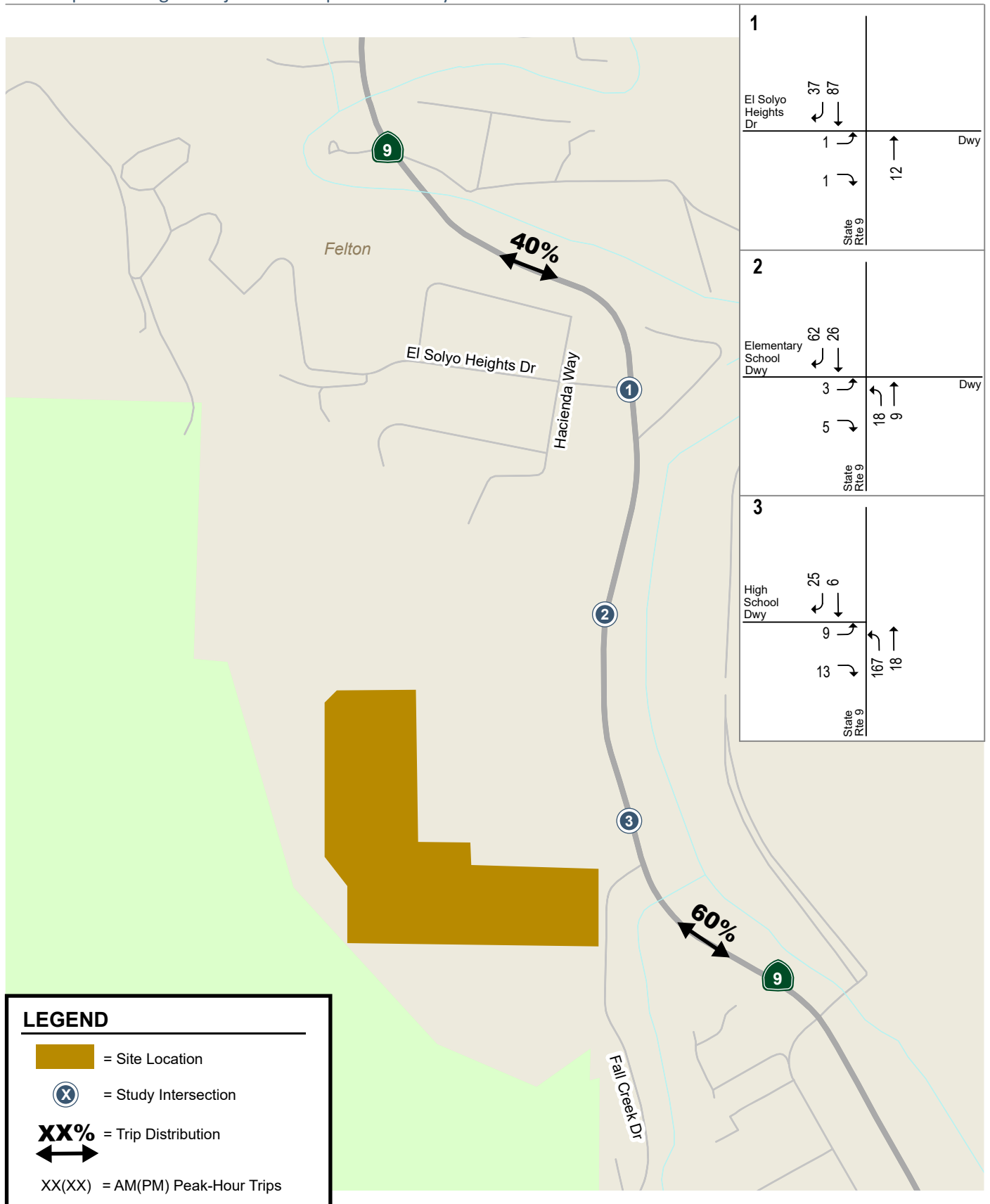


Figure 4
Trip Distribution and Trip Assignment

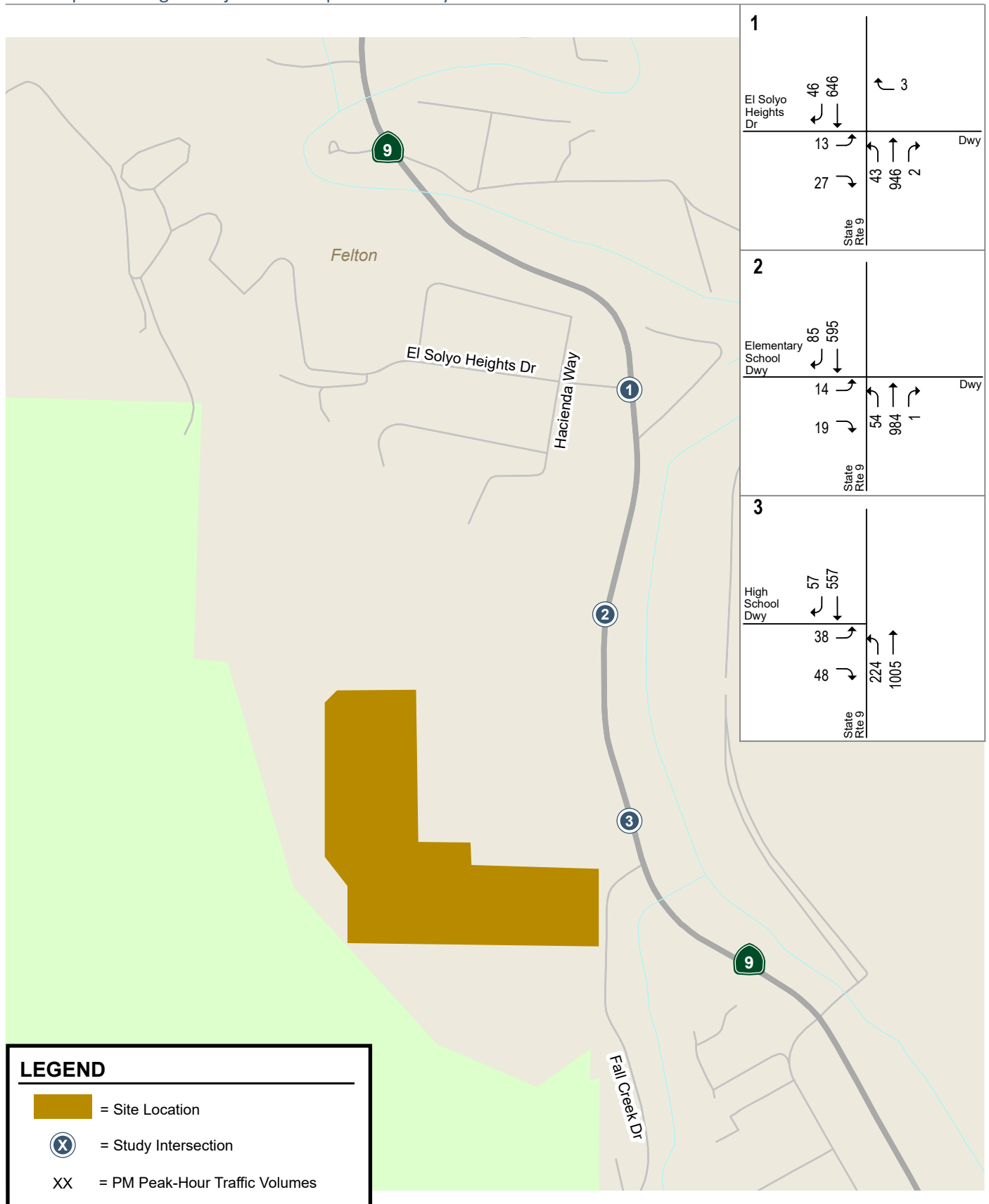


Figure 5
Existing Plus Project Traffic Volumes

Existing Plus Project Intersection Analysis

The results of the level of service analysis (see Table 5) show that all study intersections would operate at an adequate level of service during the PM peak hour of traffic under existing plus project conditions. The intersection level of service calculation sheets are included in Appendix B.

Table 5
Existing Plus Project Intersection Levels of Service

#	Intersection	LOS Standard	Control	Peak Hour	Existing		Existing plus Project	
					Delay ¹ (sec)	LOS	Delay ¹ (sec)	LOS
1	Hwy 9 and El Solvo Heights Dr	D	TWSC	PM	18.4	C	20.6	C
2	Hwy 9 and SLV ES Drwy	D	TWSC	PM	17.3	C	18.5	C
3	Hwy 9 and SLV HS Drwy	D	Signal	PM	6.8	A	9.8	A

Notes:

SCC = Santa Cruz County, TWSC = Two-Way Stop-Control

1. Average delay (seconds per vehicle) for all approaches at the intersection is reported for signalized intersections. The approach with the highest (worst) delay (seconds per vehicle) is reported for TWSC intersections.

Queuing Analysis at Highway 9 and SLV High School Driveway

The analysis of intersection levels of service was supplemented with a vehicle queuing analysis for the inbound/northbound left-turn movement from Highway 9 to the SLV High School Driveway where the project would add a substantial number of trips to the left-turn movement (see Table 6). Vehicle queues were estimated using Synchro software as described previously.

The northbound left-turn lane on Highway 9 is approximately 150 feet long and provides storage for approximately 6 vehicles. The queuing analysis found that it is adequate to serve existing traffic volumes. The 95th percentile queue length (3 vehicles) is shorter than the length of the left-turn lane. The result is consistent with field observations: all vehicles were able to clear the intersection in one signal cycle.

Under existing plus project conditions where there is an evening football game, the 95th percentile queue would extend past the storage capacity by 2 vehicles. However, this would occur infrequently, only on Friday evenings when there were homecoming games at the school. It should also be noted that by definition, the 95th percentile queue only occurs on 5 percent of the signal cycles, and the 95th percentile queue only occurs for a very brief period at the end of the signal cycle (an estimated 5 to 10 seconds). Therefore, although the vehicle queues would exceed the storage pocket length, the increase in queue length would have a negligible effect on traffic operations at this intersection.

Table 6
Queuing Analysis Summary

Movement Peak Hour Period	Highway 9 and San Lorenzo Valley High School Driveway
	NBL
	PM
Existing	
Volume (vphpl)	57
95th %. Queue (ft/ln) ¹	66
95th %. Queue (veh/ln) ¹	3
Storage (ft./ln)	150
Adequate (Y/N)	Y
Existing Plus Project	
Volume (vphpl)	224
95th %. Queue (ft/ln) ¹	190
95th %. Queue (veh/ln) ¹	8
Storage (ft./ln)	150
Adequate (Y/N)	N
Notes: NBL = northbound left-turn movement 1. Vehicle queues are from Synchro outputs and are rounded to the whole number. Assumes one vehicle equals 25 feet of queue.	

Appendix A

Traffic Counts



ALL TRAFFIC DATA SERVICES

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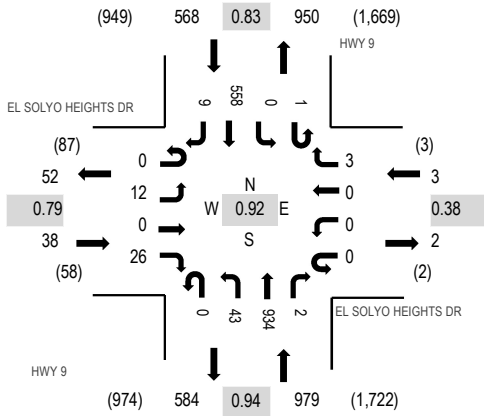
Location: 3 HWY 9 & EL SOLYO HEIGHTS DR PM

Date: Friday, November 15, 2024

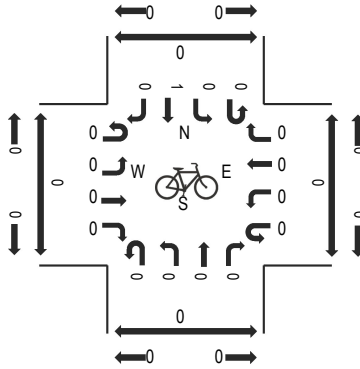
Peak Hour: 05:00 PM - 06:00 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

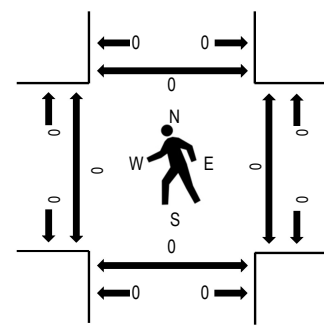
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	EL SOLYO HEIGHTS DR				EL SOLYO HEIGHTS DR				HWY 9				HWY 9				Total	Rolling Hour	Pedestrian Crossings			
	Eastbound				Westbound				Northbound				Southbound						West	East	South	North
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right						
5:00 PM	0	6	0	6	0	0	0	0	0	8	240	1	0	0	169	2	432	1,588	0	0	0	0
5:15 PM	0	1	0	7	0	0	0	0	0	6	242	1	0	0	147	1	405	1,512	0	0	0	0
5:30 PM	0	2	0	8	0	0	0	2	0	19	242	0	0	0	141	3	417	1,405	0	0	0	0
5:45 PM	0	3	0	5	0	0	0	1	0	10	210	0	1	0	101	3	334	1,242	0	0	0	0
6:00 PM	0	0	0	3	0	0	0	0	0	10	223	0	0	0	119	1	356	1,144	0	0	0	0
6:15 PM	0	5	0	5	0	0	0	0	0	5	191	0	0	0	89	3	298		0	0	0	0
6:30 PM	0	1	0	2	0	0	0	0	0	10	152	0	0	0	89	0	254		0	0	0	0
6:45 PM	0	1	0	3	0	0	0	0	0	6	146	0	0	0	80	0	236		0	0	0	0

Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights	0	12	0	26	0	0	0	3	0	43	930	2	1	0	552	9	1,578
Mediums	0	0	0	0	0	0	0	0	0	0	4	0	0	0	6	0	10
Total	0	12	0	26	0	0	0	3	0	43	934	2	1	0	558	9	1,588

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights	0	11	0	14	0	0	0	0	1	36	970	1	0	0	563	23	1,619
Mediums	0	0	0	0	0	0	0	0	0	0	4	0	0	0	6	0	10
Total	0	11	0	14	0	0	0	0	1	36	974	1	0	0	569	23	1,629



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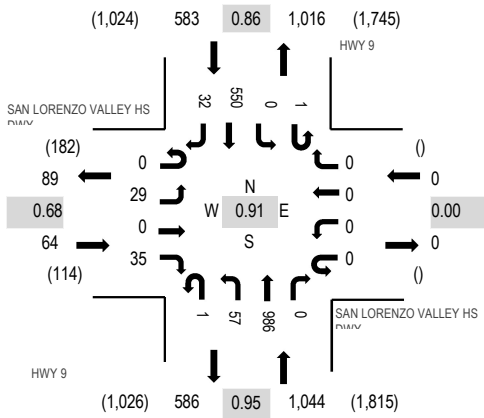
Location: 1 HWY 9 & SAN LORENZO VALLEY HS DWY PM

Date: Friday, November 15, 2024

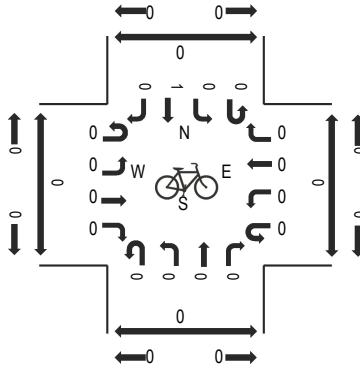
Peak Hour: 05:00 PM - 06:00 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

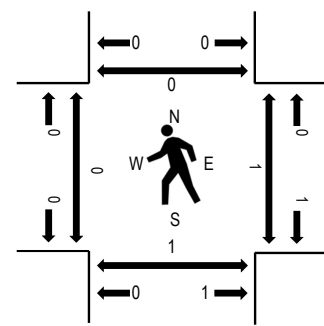
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	SAN LORENZO VALLEY HS				SAN LORENZO VALLEY HS				HWY 9				HWY 9				Total	Rolling Hour	Pedestrian Crossings			
	Eastbound				Westbound				Northbound				Southbound						West	East	South	North
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right						
5:00 PM	0	10	0	8	0	0	0	0	0	25	251	0	0	0	158	11	463	1,691	0	0	0	0
5:15 PM	0	8	0	14	0	0	0	0	0	17	253	0	0	0	137	9	438	1,611	0	0	1	0
5:30 PM	0	5	0	8	0	0	0	0	0	7	259	0	1	0	150	5	435	1,493	0	0	0	0
5:45 PM	0	6	0	5	0	0	0	0	1	8	223	0	0	0	105	7	355	1,347	0	1	0	0
6:00 PM	0	12	0	15	0	0	0	0	0	12	216	0	0	0	119	9	383	1,262	0	0	2	0
6:15 PM	0	3	0	8	0	0	0	0	0	10	187	0	0	0	104	8	320		0	0	0	0
6:30 PM	0	1	0	4	0	0	0	0	0	21	160	0	0	0	92	11	289		0	0	0	2
6:45 PM	0	1	0	6	0	0	0	0	0	16	149	0	0	0	92	6	270		0	0	0	0

Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lights	0	29	0	35	0	0	0	0	1	57	982	0	1	0	544	32	1,681
Mediums	0	0	0	0	0	0	0	0	0	0	4	0	0	0	6	0	10
Total	0	29	0	35	0	0	0	0	1	57	986	0	1	0	550	32	1,691

Appendix B

LOS Summary

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕			↕	
Traffic Vol, veh/h	12	0	26	0	0	3	43	934	2	0	559	9
Future Vol, veh/h	12	0	26	0	0	3	43	934	2	0	559	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	125	-	-	-	-	-
Veh in Median Storage, #	-	1	-	-	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	13	0	28	0	0	3	47	1015	2	0	608	10

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1721	1723	613	1717	1727	1016	617	0	0	1017	0	0
Stage 1	613	613	-	1110	1110	-	-	-	-	-	-	-
Stage 2	1109	1111	-	608	617	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	70	89	493	71	89	289	963	-	-	682	-	-
Stage 1	480	484	-	254	285	-	-	-	-	-	-	-
Stage 2	254	285	-	483	481	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	66	85	493	63	84	289	963	-	-	682	-	-
Mov Cap-2 Maneuver	172	193	-	63	84	-	-	-	-	-	-	-
Stage 1	480	484	-	242	271	-	-	-	-	-	-	-
Stage 2	239	271	-	455	481	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	18.39		17.61		0.39		0	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	963	-	-	310	289	682	-
HCM Lane V/C Ratio	0.049	-	-	0.133	0.011	-	-
HCM Ctrl Dly (s/v)	8.9	-	-	18.4	17.6	0	-
HCM Lane LOS	A	-	-	C	C	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.5	0	0	-

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	14	36	975	569	23
Future Vol, veh/h	11	14	36	975	569	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	150	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	15	39	1060	618	25
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1769	631	643	0	-	0
Stage 1	631	-	-	-	-	-
Stage 2	1138	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	92	481	941	-	-	-
Stage 1	530	-	-	-	-	-
Stage 2	306	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	88	481	941	-	-	-
Mov Cap-2 Maneuver	211	-	-	-	-	-
Stage 1	508	-	-	-	-	-
Stage 2	306	-	-	-	-	-
Approach	EB	NB		SB		
HCM Ctrl Dly, s/v	17.28	0.32		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	941	-	211	481	-	-
HCM Lane V/C Ratio	0.042	-	0.057	0.032	-	-
HCM Ctrl Dly (s/v)	9	-	23.1	12.7	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	0.1	-	-

HCM 7th Signalized Intersection Summary 3: HWY 9 & SLV HS DWY

SLV Campus Field Lights Project
Existing

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	29	35	57	987	551	32
Future Volume (veh/h)	29	35	57	987	551	32
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	32	38	62	1073	599	35
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	118	105	109	1345	1029	872
Arrive On Green	0.07	0.07	0.06	0.72	0.55	0.55
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	32	38	62	1073	599	35
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	0.7	1.0	1.4	15.9	8.9	0.4
Cycle Q Clear(g_c), s	0.7	1.0	1.4	15.9	8.9	0.4
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	118	105	109	1345	1029	872
V/C Ratio(X)	0.27	0.36	0.57	0.80	0.58	0.04
Avail Cap(c_a), veh/h	764	680	369	2809	2221	1882
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.6	18.7	19.1	3.9	6.2	4.3
Incr Delay (d2), s/veh	1.2	2.1	4.6	1.1	0.5	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.1	0.6	0.8	2.0	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	19.8	20.8	23.7	5.0	6.8	4.4
LnGrp LOS	B	C	C	A	A	A
Approach Vol, veh/h	70			1135	634	
Approach Delay, s/veh	20.3			6.0	6.6	
Approach LOS	C			A	A	
Timer - Assigned Phs	2			4	5	6
Phs Duration (G+Y+Rc), s	34.7			7.3	7.1	27.6
Change Period (Y+Rc), s	4.5			4.5	4.5	4.5
Max Green Setting (Gmax), s	63.0			18.0	8.7	49.8
Max Q Clear Time (g_c+I1), s	17.9			3.0	3.4	10.9
Green Ext Time (p_c), s	12.3			0.1	0.0	4.5
Intersection Summary						
HCM 7th Control Delay, s/veh			6.8			
HCM 7th LOS			A			

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	0	27	0	0	3	43	946	2	0	646	46
Future Vol, veh/h	13	0	27	0	0	3	43	946	2	0	646	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	125	-	-	-	-	-
Veh in Median Storage, #	-	1	-	-	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	14	0	29	0	0	3	47	1028	2	0	702	50
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1849	1851	727	1825	1875	1029	752	0	0	1030	0	0
Stage 1	727	727	-	1123	1123	-	-	-	-	-	-	-
Stage 2	1122	1124	-	702	752	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	57	74	424	59	72	284	858	-	-	674	-	-
Stage 1	415	429	-	250	281	-	-	-	-	-	-	-
Stage 2	250	281	-	429	418	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	53	70	424	52	68	284	858	-	-	674	-	-
Mov Cap-2 Maneuver	159	179	-	52	68	-	-	-	-	-	-	-
Stage 1	415	429	-	236	266	-	-	-	-	-	-	-
Stage 2	234	265	-	399	418	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Ctrl Dly, s/v	20.56		17.84		0.41		0					
HCM LOS	C		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	858	-	-	275	284	674	-	-				
HCM Lane V/C Ratio	0.055	-	-	0.158	0.011	-	-	-				
HCM Ctrl Dly (s/v)	9.4	-	-	20.6	17.8	0	-	-				
HCM Lane LOS	A	-	-	C	C	A	-	-				
HCM 95th %tile Q(veh)	0.2	-	-	0.6	0	0	-	-				

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	14	19	54	984	595	85
Future Vol, veh/h	14	19	54	984	595	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	150	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	21	59	1070	647	92
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1880	693	739	0	-	0
Stage 1	693	-	-	-	-	-
Stage 2	1187	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	78	443	867	-	-	-
Stage 1	496	-	-	-	-	-
Stage 2	290	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	73	443	867	-	-	-
Mov Cap-2 Maneuver	194	-	-	-	-	-
Stage 1	463	-	-	-	-	-
Stage 2	290	-	-	-	-	-
Approach	EB	NB		SB		
HCM Ctrl Dly, s/v	18.46	0.49		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	867	-	194	443	-	-
HCM Lane V/C Ratio	0.068	-	0.079	0.047	-	-
HCM Ctrl Dly (s/v)	9.5	-	25.2	13.5	-	-
HCM Lane LOS	A	-	D	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.3	0.1	-	-

HCM 7th Signalized Intersection Summary 3: HWY 9 & SLV HS DWY

SLV Campus Field Lights Project Existing + Project

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	38	48	224	1005	557	57
Future Volume (veh/h)	38	48	224	1005	557	57
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	41	52	243	1092	605	62
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	137	122	314	1349	830	703
Arrive On Green	0.08	0.08	0.18	0.72	0.44	0.44
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	41	52	243	1092	605	62
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	1.0	1.4	5.8	17.4	11.8	1.0
Cycle Q Clear(g_c), s	1.0	1.4	5.8	17.4	11.8	1.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	137	122	314	1349	830	703
V/C Ratio(X)	0.30	0.43	0.77	0.81	0.73	0.09
Avail Cap(c_a), veh/h	720	641	700	2647	1722	1460
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.4	19.6	17.5	4.2	10.2	7.2
Incr Delay (d2), s/veh	1.2	2.4	4.1	1.2	1.3	0.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.1	2.3	1.4	3.7	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	20.6	22.0	21.5	5.4	11.4	7.2
LnGrp LOS	C	C	C	A	B	A
Approach Vol, veh/h	93			1335	667	
Approach Delay, s/veh	21.4			8.3	11.0	
Approach LOS	C			A	B	
Timer - Assigned Phs	2			4	5	6
Phs Duration (G+Y+Rc), s	36.6			7.9	12.4	24.2
Change Period (Y+Rc), s	4.5			4.5	4.5	4.5
Max Green Setting (Gmax), s	63.0			18.0	17.5	41.0
Max Q Clear Time (g_c+I1), s	19.4			3.4	7.8	13.8
Green Ext Time (p_c), s	12.7			0.2	0.5	4.4
Intersection Summary						
HCM 7th Control Delay, s/veh			9.8			
HCM 7th LOS			A			

Queues
3: HWY 9 & SLV HS DWY

SLV Campus Field Lights Project
Existing

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	29	35	57	987	551	32
Future Volume (vph)	29	35	57	987	551	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	150			150
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	25			35	35	
Link Distance (ft)	612			539	501	
Travel Time (s)	16.7			10.5	9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	32	38	62	1073	599	35
v/c Ratio	0.13	0.15	0.24	0.68	0.45	0.03
Control Delay (s/veh)	28.9	13.1	29.0	6.9	9.1	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	28.9	13.1	29.0	6.9	9.1	2.7
Queue Length 50th (ft)	9	0	18	170	134	0
Queue Length 95th (ft)	41	27	66	347	235	10
Internal Link Dist (ft)	532			459	421	
Turn Bay Length (ft)			150			150
Base Capacity (vph)	660	614	319	1780	1624	1385
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.06	0.19	0.60	0.37	0.03
Intersection Summary						

Area Type: Other

Queues
3: HWY 9 & SLV HS DWY

SLV Campus Field Lights Project
Existing + Project

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	38	48	224	1005	557	57
Future Volume (vph)	38	48	224	1005	557	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	150			150
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	25			35	35	
Link Distance (ft)	612			539	501	
Travel Time (s)	16.7			10.5	9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	52	243	1092	605	62
v/c Ratio	0.19	0.22	0.60	0.74	0.69	0.08
Control Delay (s/veh)	31.6	12.6	31.0	8.6	19.4	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	31.6	12.6	31.0	8.6	19.4	4.5
Queue Length 50th (ft)	14	0	79	184	181	2
Queue Length 95th (ft)	49	32	190	385	328	20
Internal Link Dist (ft)	532			459	421	
Turn Bay Length (ft)			150			150
Base Capacity (vph)	550	527	534	1736	1317	1134
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.10	0.46	0.63	0.46	0.05
Intersection Summary						

Area Type: Other