

Date: January 10, 2017 **Project:** SUN007

To: Mr. Michael Fisher/CSG **From:** Steve Fitzsimons
sfitzsimons@w-trans.com

Subject: Level of Service Analysis for the Northern Segment of the Fair Oaks Avenue Corridor

There is currently no parking allowed along Fair Oaks Avenue between Ahwanee Avenue and Wolfe Road, so there would be no parking loss if the proposed bike lane were installed. The signalized intersections in the northern segment are shown in Attachment 1.

This memo details the LOS analysis for four scenarios. These scenarios are as follows:

- The following four signalized intersections in the northern segment of the Fair Oaks Corridor were included in the LOS analysis for all the listed scenarios:

1. North Fair Oaks Avenue/Wolfe Road
2. North Fair Oaks Avenue/Duane Avenue
3. North Fair Oaks Avenue/Caliente Drive
4. North Fair Oaks Avenue/Ahwanee Avenue

Fair Oaks Avenue is a north-south roadway with two through lanes in the northbound direction and three through lanes in the southbound direction. The main purpose of this analysis was to evaluate if there is an impact on intersection operation due to eliminating one southbound lane for the proposed bike lane. The existing and proposed striping at each of study intersections are shown in Attachment 2.

Relevant City Policies

The Land Use and Transportation Element (LUTE) of the City's *General Plan* (City of Sunnyvale, July 2011) contains the following relevant policies:

- Policy LT-1.9: Support flexible and appropriate alternative transportation modes and transportation system management measures that reduce reliance on the automobile and serve changing regional and Citywide land use and transportation needs. (Previously LUTE Policy R1.9)
- Policy LT-5.1: Achieve an operating level-of-service (LOS) of "D" or better on the City-wide roadways and intersections, as defined by the functional classification of the street system. (Previously LUTE Policy C3.1)
 - LT-5.1g: Minimize the total number of vehicle miles traveled by Sunnyvale residents and commuters. (Previously LUTE Action Strategy C3.1.7)
- Policy LT-5.5: Support a variety of transportation modes. (Previously LUTE Policy C3.5)
 - LT-5.5d: Maximize the provision of bicycle and pedestrian facilities. (Previously LUTE Action Strategy C3.5.4)
 - LT-5.5e: Implement the City of Sunnyvale Bicycle Plan. (Previously LUTE Action Strategy C3.5.5)
- Policy LT-5.12: City streets are public space dedicated to the movement of vehicles, bicycles and pedestrians. Providing safe accommodation for all transportation modes takes priority over non-transport uses. Facilities that meet minimum appropriate safety standards for transport uses shall be considered before non-transport uses are considered.
- Policy LT-5.13: Parking is the storage of transportation vehicles and shall not be considered a transport use.
- Policy LT-5.14: Historical precedence for street space dedicated for parking shall be a lesser consideration than providing street space for transportation uses when determining the appropriate future use of street space.
- Policy LT-5.18: The City Council shall make the final decisions on roadway space reconfiguration when roadway reconfiguration will result in changes to existing accommodations.
- Policy LT-5.21: Safety considerations of all modes shall take priority over capacity considerations of any one mode.

The LUTE also states "the amount of traffic congestion on a roadway is measured by its "level of service", or LOS. The LOS ranges from a free flowing LOS A, to a stop-and-go LOS F. Sunnyvale has established LOS D as an acceptable level of traffic congestion on most City streets, with LOS E the standard for roadways carrying heavy regional traffic." Fair Oaks Avenue is not considered a roadway that carries regional traffic, so LOS D is considered the limit of acceptable operations.

When traffic conditions may change due to increased volumes or changes in lane striping from proposed projects, the LUTE references regional publications to define the significance of the change. Proposed impacts are considered significant when any of the following conditions occur:

- An intersection is currently operating at an acceptable LOS (A-D) and a proposed project would change LOS to an unacceptable LOS (E or F).
- An intersection is currently operating at an unacceptable LOS and a proposed project would increase the average control delay by four seconds or more
- An intersection is currently operating at an unacceptable LOS and a proposed project would increase the critical volume-to-capacity value by 0.01 or more

(Source: *Transportation Impact Analysis Guidelines*, Santa Clara Valley Transportation Authority, October 2014)

Traffic Operations Analysis

The Synchro traffic simulation/optimization model was used to conduct the traffic operations analysis, per direction from City staff, based on the 2000 HCM methodology. The primary outputs from the Synchro model are intersection delay and level of service.

Traffic volume data, including pedestrians and bicycles, was obtained by the City of Sunnyvale in mid-October 2014 and early June 2015. Data were collected during the a.m. (7:00 – 9:00 a.m.) and p.m. (4:00 – 6:00 p.m.) peak periods; two hours in each peak period. Traffic counts show that volumes were higher during the p.m. peak period. The traffic counts and existing timing plans were obtained and coded in Synchro for the analysis.

Trips generated by the approved and pending projects were obtained from the historical Traffic Impact Analysis for each project from City files. The list of projects with added traffic volumes is included in Attachment 5.

For the Future Conditions analysis, an annual traffic growth rate of 1.5 percent was applied to the existing counts and traffic volumes from the approved and pending projects were added to obtain projected traffic volumes for a 10-year horizon. A growth factor of 1.16 was applied to the existing traffic counts to estimate future volumes.

Per City standard procedure, the existing counts and the projected future volumes were adjusted so the total traffic volumes leaving one study intersection in the direction of an adjacent study intersection would approximately balance with the volumes arriving at the adjacent intersection. Note that an exact balance is not required because there are driveways and minor cross streets between signalized intersections. Existing traffic counts and projected future volumes, with balancing adjustments, are shown in Attachments 3 and 4, respectively. A table with existing volumes, expected annual growth, and volumes from approved and pending projects is shown in Attachment 5.

LOS Results

The LOS analysis results are summarized in Table 1. The detailed Synchro output reports are included in Attachment 6. Operation at three of the study intersections is at an acceptable LOS D or better during both the a.m. and p.m. peak hours for the Existing Conditions scenario only. Existing conditions at the Fair Oaks Avenue/Duane Avenue intersection are unacceptable LOS E or F. It is important to note that the LOS values represent the entire intersection. The delay for individual movements may be worse. Details are available in Attachment 6.

In the Existing plus Project Conditions scenario, operations at the North Fair Oaks Avenue/Duane Avenue intersection would continue to operate at an unacceptable LOS and would deteriorate to LOS F in both peaks if the project is implemented as currently proposed. Other intersections remain at acceptable LOS values in this scenario.

In the Future Conditions scenario without the proposed bike lane, all study intersections are expected to deteriorate to unacceptable LOS values in the evening peak. The intersections of North Fair Oaks

Avenue/Ahwanee Avenue and North Fair Oaks Avenue/Duane Avenue are also expected to have unacceptable LOS values in the morning peak.

In the Future Conditions plus Project scenario, all four study intersections would continue to operate unacceptably and deteriorate if the proposed project is installed. All intersections except Fair Oaks Avenue/Ahwanee Avenue have an increased delay or worse level of service in the evening peak that the City defines as a significant impact. One of the four intersections has increased delay or worse level of service in the morning peak as well. Since the proposed project includes elimination of one southbound lane, except at Ahwanee Avenue intersection where conditions remain substantially the same as existing, and southbound traffic is heavy in the evening peak, the general trend of worsening LOS values in the evening peak period is understandable.

Providing LOS D or better at all intersections in both peaks would likely require additional lanes. However, adding lanes is not feasible since it would require additional roadway width and right-of-way.

Table 1- Existing and Future Conditions Peak Hour Level of Service

Study Intersection	Existing Conditions				Existing plus Project Conditions				Future Conditions with Approved and Pending Projects				Future Conditions with Approved and Pending Projects plus Project			
	AM Peak Delay	PM Peak Delay	AM Peak LOS	PM Peak LOS	AM Peak Delay	PM Peak Delay	AM Peak LOS	PM Peak LOS	AM Peak Delay	PM Peak Delay	AM Peak LOS	PM Peak LOS	AM Peak Delay	PM Peak Delay	AM Peak LOS	PM Peak LOS
1. N. Fair Oaks Ave/Ahwanee Ave	33.4	42.8	C	D	33.7	42.8	C	D	85.6	110.3	F	F	86.1	110.3	F	F
2. N. Fair Oaks Ave/Caliente Dr	8.9	10.1	A	B	9.4	10.7	A	B	16.6	151.4	B	F	19.1	168.3	B	F
3. N. Fair Oaks Ave/Duane Ave	75.7	101.9	E	F	88.4	115.0	F	F	175.0	310.2	F	F	211.4	334.0	F	F
4. N. Fair Oaks Ave/Wolfe Rd	16.9	37.2	B	D	17.0	43.6	B	D	17.9	76.1	B	E	18.0	83.8	B	F

Notes: Delay is measured in average seconds per vehicle;

LOS = Level of Service

LOS values that are considered unacceptable are shown in ***Bold Italics***. LOS values that are made significantly worse as a result of the project are shown in ***Shaded Bold Italics*** text.

Travel Time Comparisons

Another way to consider project impacts is through a travel time comparison. Travel time can be estimated as the free flow (no intersection delay) travel time plus the estimates of intersection delay at each intersection. Estimates of travel time are shown in Table 2. Estimates are based on travel between the US-101 southbound ramps and Maude Avenue, a distance of 3,285 feet. At the posted speed limit of 30 miles per hour, the free flow travel speed is 75 seconds, or 1.3 minutes.

Table 2- Travel Time Comparisons (minutes)

Direction	Existing Conditions		Existing plus Project Conditions		Future Conditions with Approved and Pending Projects		Future Conditions with Approved and Pending Projects plus Project	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Northbound	4.1	5.1	4.7	5.5	9.6	7.8	11.6	8.3
Southbound	2.2	4.0	2.2	4.7	2.9	16.2	2.9	17.8

Queue Length Requirements

A queue can generally be defined as a line of vehicles at a traffic signal, waiting for a green light. Queues typically start to accrue when a traffic signal display turns red and gradually increase during the red. They reach a maximum after the display turns green as the last car in the queue starts to move. Queue length is an important input to project design so the left turn pocket storage lengths will accommodate the projects queues.

SimTraffic, a supplement to the Synchro software, calculates a 95th percentile queue length in feet, which is rounded up to the nearest multiple of 25 feet, corresponding to the recommended length of a turn pocket. The “95th percentile queue length” is the maximum length that occurs in 95 out of 100 cycles of the traffic signal. In general, the calculation queue lengths increase as volumes increase. Queue lengths for each left turn pocket are summarized below. The largest value from each scenario is reported.

- Ahwanee Avenue northbound left turn: 100 feet existing, 125 feet future with project
- Ahwanee Avenue southbound left turn: 150 feet existing, 175 feet future with project
- Caliente Drive northbound left turn: 50 feet existing, 50 feet future with project
- Caliente Drive southbound left turn: 125 feet existing, 125 feet future with project
- Duane Avenue northbound left turn: 75 feet existing, 100 feet future with project
- Duane Avenue southbound left turn: 125 feet existing, 125 feet future with project
- Wolfe Road southbound left turn: 400 feet existing, 600 feet future with project

Conclusions

- With removal of one southbound lane on Fair Oaks Avenue to create room for the proposed bike lanes, All four study intersections experience an increase in delay and are expected to operate at an unacceptable LOS F in the Future Conditions plus Project scenario.
- Options for improving delay and LOS to acceptable LOS D or better all involve widening and associated secondary impacts such as right-of-way acquisition.

Recommendations

- One of two options are recommended to address unacceptable operations at each study intersection:
 - o Adopt a finding of an Unavoidable impact and proceed with design of the project as proposed.

- o At the North Fair Oaks Avenue/Ahwanee Drive, North Fair Oaks Avenue/Caliente Drive, and North Fair Oaks Avenue/Duane Avenue intersections, retain the third southbound through lane and install shared-lane markings (or sharrows) instead of bike lanes through the intersections. The Class 2 bike lanes would be installed between signalized intersections. Curb ramps on each side of the intersection could also be installed to allow bike riders to use the sidewalks. Use of sidewalks may require a City Council Resolution to allow bike riding on the sidewalks.
- o At the North Fair Oaks Avenue/Wolfe Road intersection where the worse LOS is caused by narrower lane widths, discontinue the proposed bicycle lanes north of the intersection and install shared-lane markings (or sharrows) instead of bike lanes at the intersections. Curb ramps on each side of the intersection could also be installed to allow bike riders to use the sidewalks. Use of sidewalks may require a City Council Resolution to allow bike riding on the sidewalks.

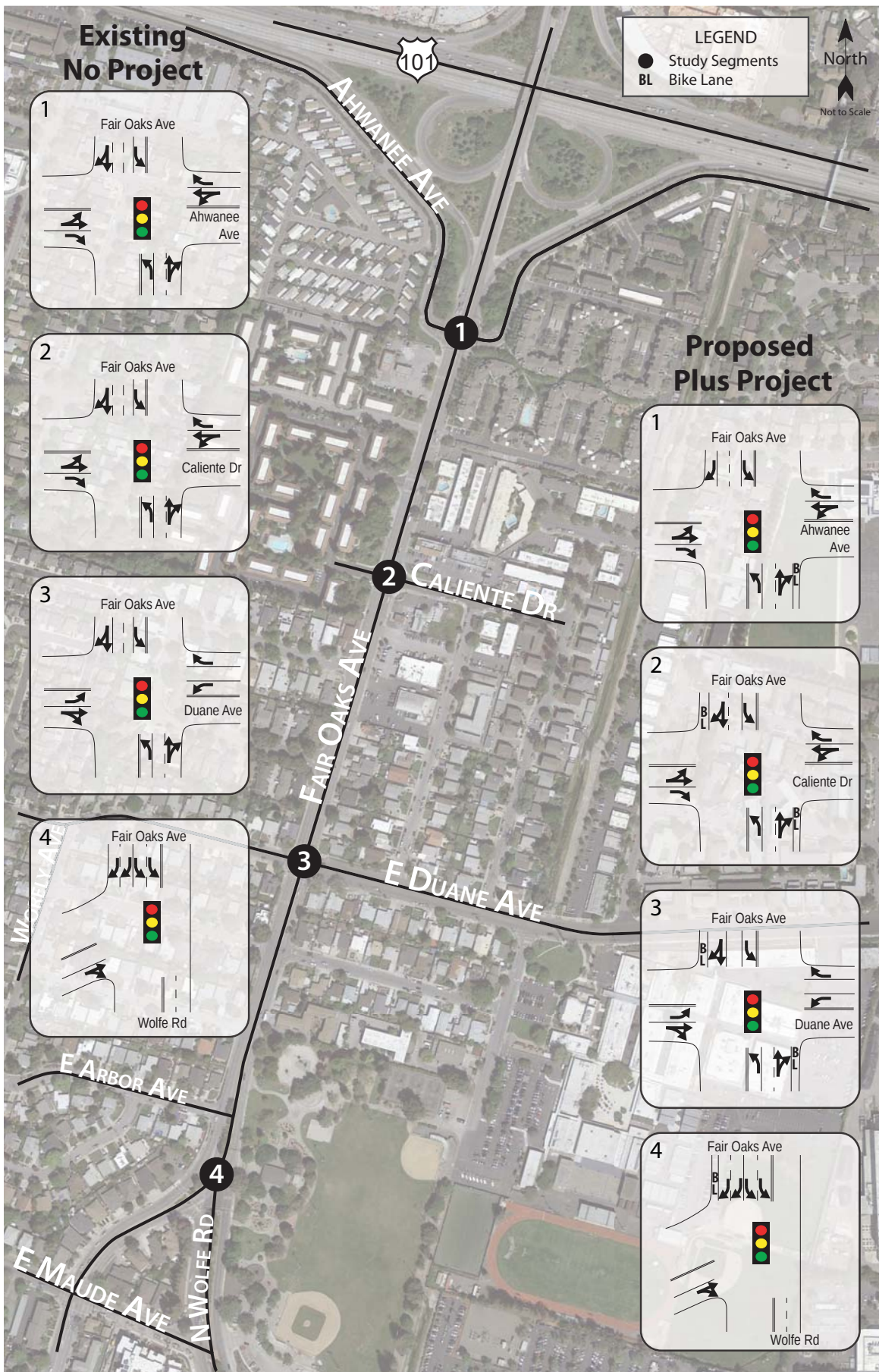
Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

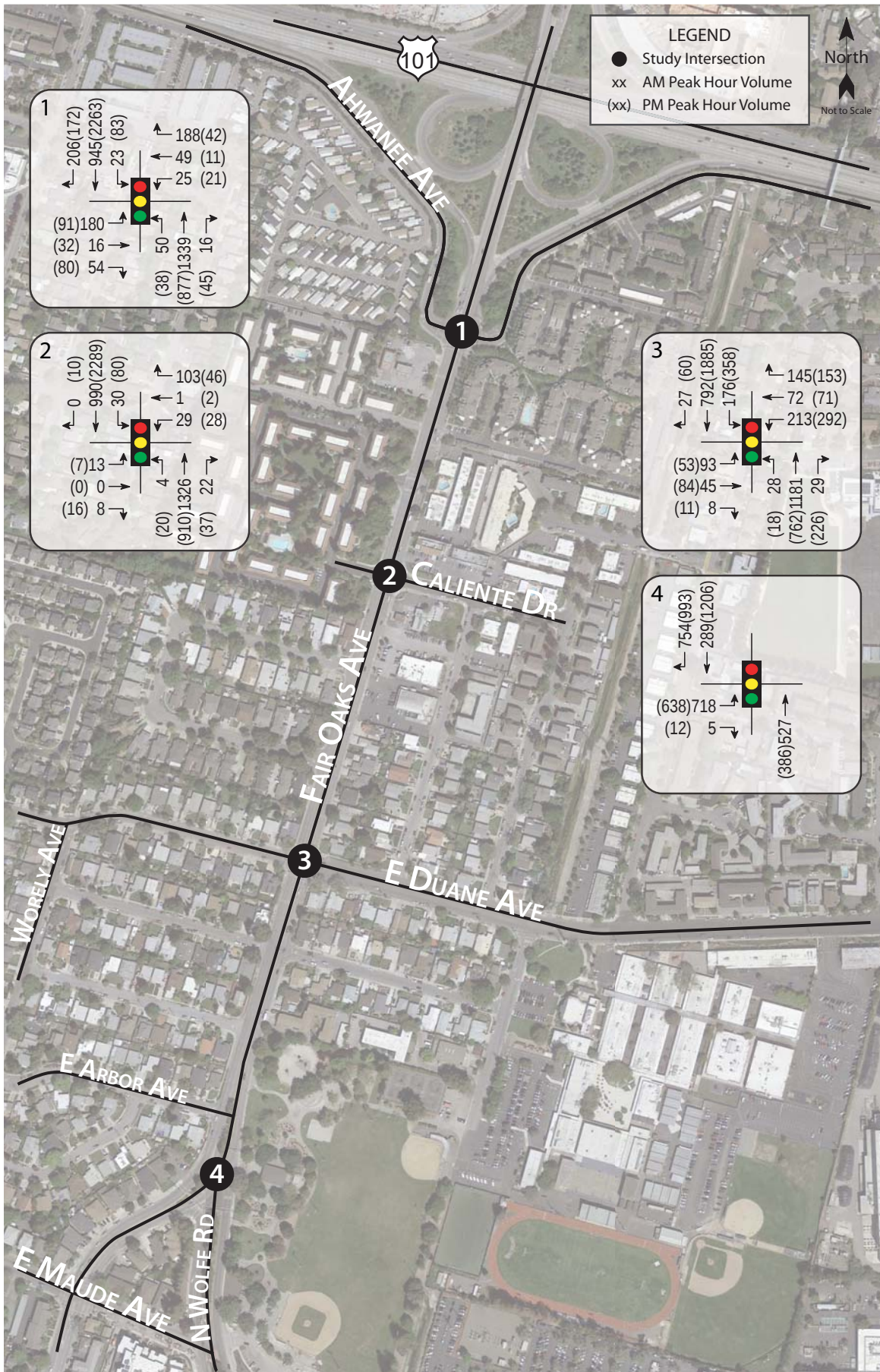
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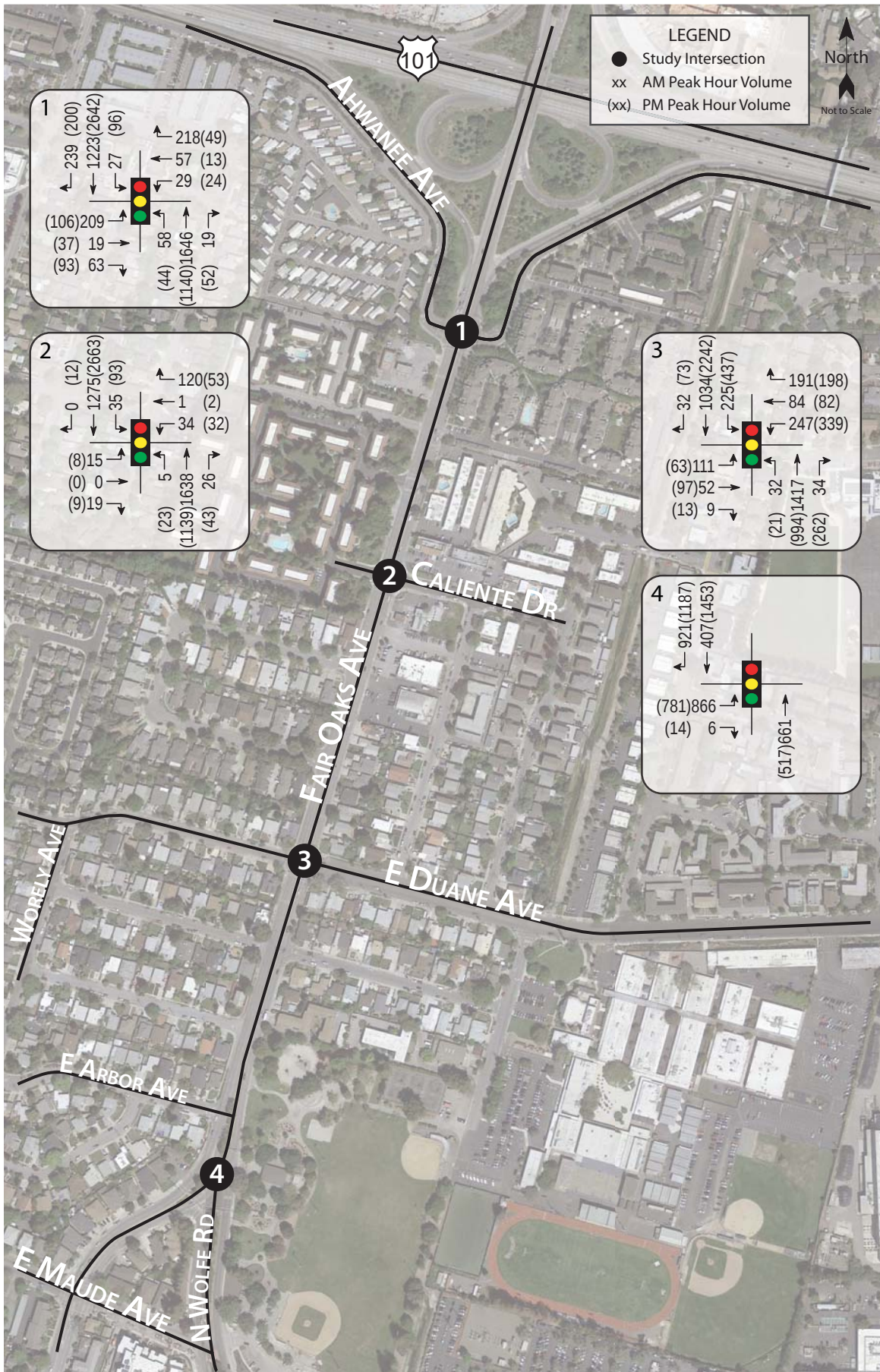
Attachments:

- 1 Study Intersection Locations
- 2. Existing and Proposed Lane Geometry
- 3 Existing traffic volumes
- 4 Projected future traffic volumes
- 5 Traffic volumes from the approved and pending projects
- 6 Synchro reports
- 7 SimTraffic queue length reports









S. No.	Project Type	Project Location	Proj. Number	Fair Oaks Avenue and Ahwanee Avenue								Fair Oaks Avenue and Caliente Drive								Fair Oaks Avenue and Duane Avenue								Fair Oaks Avenue and N Wolfe Road																																							
				Northbound				Southbound				Eastbound				Westbound				Northbound				Southbound				Eastbound				Westbound				Northbound				Southbound				Eastbound				Westbound																			
L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R																							
Existing Volumes				50	1339	16	23	945	206	180	16	54	25	49	188	4	1326	22	30	990	0	13	0	16	29	1	103	28	1181	29	176	792	27	93	45	8	213	72	145	527	289	754	718	5																							
Annual Growth Forecasts				8	215	3	4	152	33	29	3	9	4	8	30	1	213	4	5	159	0	2	0	3	5	0	17	4	190	5	28	127	4	15	7	1	34	12	23	0	85	0	0	46	121	115	0	1	0	0	0	0															
1	Industrial	615 N Mathilda Avenue	2015-7302 2013-7525 2013-7132 2012-7854 2014-7417 2013-7353																																																																
2	Industrial	221 N Mathilda Avenue																																																																	
3	Industrial	280 Santa Ana Court		9			41						9			41																																																			
4	Residential	520-550 E Weddell		0			85									85																																																			
5	Industrial	1152 Bordeaux Drive																																																																	
6	Residential	915 De Guigne Drive																																																																	
7	Industrial	1221 Crossman Avenue		66												66																																																			
Total				58	1629	19	27	1223	239	209	19	63	29	57	218	5	1614	26	35	1275	0	15	0	19	34	1	120	32	1417	34	225	1034	32	111	52	9	247	84	191	0	661	0	0	407	921	866	0	6	0	0	0	0															

[illegible]

Attachment 5

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

1/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖ ↗	↖ ↗		↖ ↗	↖ ↗	↖ ↗	↖ ↗		↖ ↗	↖ ↗ ↘ ↙	
Traffic Volume (vph)	180	16	54	25	49	188	50	1339	16	23	945	206
Future Volume (vph)	180	16	54	25	49	188	50	1339	16	23	945	206
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.97	
Flt Protected		0.96	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1500	1294		1542	1306	1391	2874		1391	4029	
Flt Permitted		0.66	1.00		0.78	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1040	1294		1218	1306	1391	2874		1391	4029	
Peak-hour factor, PHF	0.69	0.69	0.69	0.76	0.76	0.76	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	261	23	78	33	64	247	60	1594	19	27	1125	245
RTOR Reduction (vph)	0	0	39	0	0	128	0	0	0	0	24	0
Lane Group Flow (vph)	0	284	39	0	97	119	60	1613	0	27	1346	0
Confl. Peds. (#/hr)			14			4			20			
Confl. Bikes (#/hr)						6			1			
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		37.8	37.8		37.8	37.8	9.0	73.5		5.9	70.4	
Effective Green, g (s)		37.8	37.8		37.8	37.8	9.0	73.5		5.9	70.4	
Actuated g/C Ratio		0.29	0.29		0.29	0.29	0.07	0.57		0.05	0.54	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		302	376		354	379	96	1624		63	2181	
v/s Ratio Prot							c0.04	c0.56		0.02	0.33	
v/s Ratio Perm		c0.27	0.03		0.08	0.09						
v/c Ratio		0.94	0.10		0.27	0.31	0.62	0.99		0.43	0.62	
Uniform Delay, d1		45.0	33.7		35.5	36.0	58.9	28.0		60.4	20.5	
Progression Factor		1.00	1.00		1.00	1.00	1.27	0.51		1.00	1.00	
Incremental Delay, d2		36.2	0.1		0.4	0.5	8.9	17.5		4.6	1.3	
Delay (s)		81.2	33.8		35.9	36.4	83.5	31.9		65.0	21.8	
Level of Service		F	C		D	D	F	C		E	C	
Approach Delay (s)		71.0			36.3			33.7			22.7	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			33.4									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			130.0							12.8		
Intersection Capacity Utilization			87.4%									ICU Level of Service E
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	0	8	29	1	103	4	1326	22	30	990	0
Future Volume (vph)	13	0	8	29	1	103	4	1326	22	30	990	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.98		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1470	1305		1482	1299	1490	2959		1490	4271	
Flt Permitted		0.73	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1136	1305		1165	1299	1490	2959		1490	4271	
Peak-hour factor, PHF	0.73	0.73	0.73	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	18	0	11	34	1	121	5	1560	26	35	1165	0
RTOR Reduction (vph)	0	0	10	0	0	107	0	1	0	0	0	0
Lane Group Flow (vph)	0	18	1	0	35	14	5	1585	0	35	1165	0
Confl. Peds. (#/hr)	9		6	6		9			8			12
Confl. Bikes (#/hr)									7			2
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.0	15.0		15.0	15.0	1.6	96.8		6.0	101.2	
Effective Green, g (s)		15.0	15.0		15.0	15.0	1.6	96.8		6.0	101.2	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.01	0.74		0.05	0.78	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		131	150		134	149	18	2203		68	3324	
v/s Ratio Prot							0.00	c0.54		c0.02	0.27	
v/s Ratio Perm		0.02	0.00		c0.03	0.01						
v/c Ratio		0.14	0.01		0.26	0.09	0.28	0.72		0.51	0.35	
Uniform Delay, d1		51.7	50.9		52.4	51.4	63.6	9.1		60.6	4.4	
Progression Factor		1.00	1.00		1.00	1.00	1.31	0.73		0.96	0.61	
Incremental Delay, d2		0.5	0.0		1.0	0.3	0.8	0.2		5.4	0.2	
Delay (s)		52.2	50.9		53.5	51.7	84.3	6.9		63.6	2.9	
Level of Service		D	D		D	D	F	A		E	A	
Approach Delay (s)		51.7			52.1			7.1			4.7	
Approach LOS		D			D			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.9										
HCM 2000 Volume to Capacity ratio		0.65										
Actuated Cycle Length (s)		130.0										
Intersection Capacity Utilization		75.3%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	45	8	213	72	145	28	1181	29	176	792	27
Future Volume (vph)	93	45	8	213	72	145	28	1181	29	176	792	27
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1527		1490	1569	1293	1490	2955		1490	4255	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1527		1490	1569	1293	1490	2955		1490	4255	
Peak-hour factor, PHF	0.76	0.76	0.76	0.85	0.85	0.85	0.85	0.85	0.85	0.78	0.78	0.78
Adj. Flow (vph)	122	59	11	251	85	171	33	1389	34	226	1015	35
RTOR Reduction (vph)	0	6	0	0	0	144	0	1	0	0	2	0
Lane Group Flow (vph)	122	64	0	251	85	27	33	1422	0	226	1048	0
Confl. Peds. (#/hr)			1			9			6			5
Confl. Bikes (#/hr)			2			3			3			6
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	15.4	14.5		21.1	20.2	20.2	5.6	54.9		22.7	72.0	
Effective Green, g (s)	15.4	14.5		21.1	20.2	20.2	5.6	54.9		22.7	72.0	
Actuated g/C Ratio	0.12	0.11		0.16	0.16	0.16	0.04	0.42		0.17	0.55	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	176	170		241	243	200	64	1247		260	2356	
v/s Ratio Prot	0.08	0.04		c0.17	c0.05		0.02	c0.48		c0.15	0.25	
v/s Ratio Perm						0.02						
v/c Ratio	0.69	0.38		1.04	0.35	0.13	0.52	1.14		0.87	0.44	
Uniform Delay, d1	55.0	53.5		54.5	49.0	47.3	60.9	37.5		52.2	17.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.16	1.09		0.81	1.44	
Incremental Delay, d2	10.4	1.0		69.2	0.6	0.2	4.4	71.8		24.2	0.6	
Delay (s)	65.4	54.6		123.7	49.7	47.6	74.7	112.8		66.3	25.3	
Level of Service	E	D		F	D	D	E	F		E	C	
Approach Delay (s)		61.4			85.6			112.0			32.6	
Approach LOS		E			F			F			C	
Intersection Summary												
HCM 2000 Control Delay			75.7									HCM 2000 Level of Service E
HCM 2000 Volume to Capacity ratio			0.97									
Actuated Cycle Length (s)			130.0									Sum of lost time (s) 16.8
Intersection Capacity Utilization			82.8%									ICU Level of Service E
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	718	5	0	527	289	754
Future Volume (vph)	718	5	0	527	289	754
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.97		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1288		2980	2980	2212
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1288		2980	2980	2212
Peak-hour factor, PHF	0.84	0.84	0.85	0.85	0.85	0.85
Adj. Flow (vph)	855	6	0	620	340	887
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	855	5	0	620	340	887
Confl. Peds. (#/hr)		16				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	651		1269	1269	2212
v/s Ratio Prot	c0.30			c0.21	0.11	
v/s Ratio Perm		0.00				0.40
v/c Ratio	0.58	0.01		0.49	0.27	0.40
Uniform Delay, d1	22.5	15.9		27.0	24.2	0.0
Progression Factor	1.00	1.00		1.00	0.83	1.00
Incremental Delay, d2	1.7	0.0		1.3	0.4	0.5
Delay (s)	24.2	15.9		28.4	20.4	0.5
Level of Service	C	B		C	C	A
Approach Delay (s)	24.2			28.4	6.0	
Approach LOS	C			C	A	
Intersection Summary						
HCM 2000 Control Delay		16.9		HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio		0.54				
Actuated Cycle Length (s)		130.0		Sum of lost time (s)		8.8
Intersection Capacity Utilization		50.5%		ICU Level of Service		A
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	32	80	21	11	42	38	877	45	83	2263	172
Future Volume (vph)	91	32	80	21	11	42	38	877	45	83	2263	172
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1513	1302		1519	1311	1490	2952		1490	4230	
Flt Permitted		0.76	1.00		0.78	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1187	1302		1222	1311	1490	2952		1490	4230	
Peak-hour factor, PHF	0.89	0.89	0.89	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	102	36	90	26	14	52	45	1032	53	98	2662	202
RTOR Reduction (vph)	0	0	76	0	0	45	0	2	0	0	5	0
Lane Group Flow (vph)	0	138	14	0	40	8	45	1083	0	98	2859	0
Confl. Peds. (#/hr)			7			2			9			
Confl. Bikes (#/hr)			2			1			2			4
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		20.6	20.6		20.6	20.6	8.4	83.6		13.0	88.2	
Effective Green, g (s)		20.6	20.6		20.6	20.6	8.4	83.6		13.0	88.2	
Actuated g/C Ratio		0.16	0.16		0.16	0.16	0.06	0.64		0.10	0.68	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		188	206		193	207	96	1898		149	2869	
v/s Ratio Prot							0.03	0.37		c0.07	c0.68	
v/s Ratio Perm		c0.12	0.01		0.03	0.01						
v/c Ratio		0.73	0.07		0.21	0.04	0.47	0.57		0.66	1.00	
Uniform Delay, d1		52.1	46.5		47.6	46.3	58.6	13.1		56.4	20.7	
Progression Factor		1.00	1.00		1.00	1.00	0.92	1.79		1.00	1.00	
Incremental Delay, d2		13.8	0.1		0.5	0.1	3.1	1.1		10.0	16.0	
Delay (s)		65.9	46.7		48.1	46.4	57.0	24.6		66.4	36.7	
Level of Service		E	D		D	D	E	C		E	D	
Approach Delay (s)		58.3			47.2			25.9			37.7	
Approach LOS		E			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			35.9				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			130.0				Sum of lost time (s)			12.8		
Intersection Capacity Utilization			92.3%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	7	0	16	28	2	46	4	16	910	37	80	2289
Future Volume (vph)	7	0	16	28	2	46	4	16	910	37	80	2289
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.91
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.99		1.00	1.00
Flt Protected		0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1490	1285		1498	1285		1490	2944		1490	4267
Flt Permitted		0.73	1.00		0.75	1.00		0.42	1.00		0.95	1.00
Satd. Flow (perm)		1152	1285		1184	1285		654	2944		1490	4267
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	9	0	21	33	2	54	5	19	1071	44	94	2693
RTOR Reduction (vph)	0	0	19	0	0	48	0	0	2	0	0	0
Lane Group Flow (vph)	0	9	2	0	35	6	0	24	1113	0	94	2705
Confl. Peds. (#/hr)			15			16				14		
Confl. Bikes (#/hr)										5		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	custom	Prot	NA		Prot	NA
Protected Phases		4			8			1	6		5	2
Permitted Phases	4		4	8		8	1					
Actuated Green, G (s)		13.4	13.4		13.4	13.4		9.6	90.9		13.5	94.8
Effective Green, g (s)		13.4	13.4		13.4	13.4		9.6	90.9		13.5	94.8
Actuated g/C Ratio		0.10	0.10		0.10	0.10		0.07	0.70		0.10	0.73
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	6.0		3.0	6.0
Lane Grp Cap (vph)		118	132		122	132		48	2058		154	3111
v/s Ratio Prot									c0.38		0.06	c0.63
v/s Ratio Perm		0.01	0.00		c0.03	0.00		0.04				
v/c Ratio		0.08	0.02		0.29	0.04		0.50	0.54		0.61	0.87
Uniform Delay, d1		52.7	52.4		53.9	52.5		57.9	9.5		55.7	13.0
Progression Factor		1.00	1.00		1.00	1.00		0.54	0.27		1.11	0.61
Incremental Delay, d2		0.3	0.1		1.3	0.1		0.7	0.1		2.4	1.2
Delay (s)		53.0	52.4		55.2	52.7		31.9	2.6		64.4	9.2
Level of Service		D	D		E	D		C	A		E	A
Approach Delay (s)		52.6			53.6				3.3			11.1
Approach LOS		D			D				A			B
Intersection Summary												
HCM 2000 Control Delay			10.1		HCM 2000 Level of Service				B			
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			130.0		Sum of lost time (s)				12.2			
Intersection Capacity Utilization			97.4%		ICU Level of Service				F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

Movement	SBR
Approach Configurations	
Traffic Volume (vph)	10
Future Volume (vph)	10
Ideal Flow (vphpl)	1600
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.85
Adj. Flow (vph)	12
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	17
Confl. Bikes (#/hr)	4
Bus Blockages (#/hr)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	84	11	292	71	153	18	762	226	358	1885	60
Future Volume (vph)	53	84	11	292	71	153	18	762	226	358	1885	60
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.95	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1537		1490	1569	1271	1490	2830		1490	4252	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1537		1490	1569	1271	1490	2830		1490	4252	
Peak-hour factor, PHF	0.69	0.69	0.69	0.82	0.82	0.82	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	77	122	16	356	87	187	21	896	266	421	2218	71
RTOR Reduction (vph)	0	4	0	0	0	146	0	21	0	0	2	0
Lane Group Flow (vph)	77	134	0	356	87	41	21	1141	0	421	2287	0
Confl. Peds. (#/hr)			7			20			10			17
Confl. Bikes (#/hr)			2			3			9			11
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	10.3	17.8		21.0	28.5	28.5	5.1	40.0		34.4	69.3	
Effective Green, g (s)	10.3	17.8		21.0	28.5	28.5	5.1	40.0		34.4	69.3	
Actuated g/C Ratio	0.08	0.14		0.16	0.22	0.22	0.04	0.31		0.26	0.53	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	118	210		240	343	278	58	870		394	2266	
v/s Ratio Prot	0.05	c0.09		c0.24	0.06		0.01	c0.40		c0.28	0.54	
v/s Ratio Perm						0.03						
v/c Ratio	0.65	0.64		1.48	0.25	0.15	0.36	1.31		1.07	1.01	
Uniform Delay, d1	58.1	53.0		54.5	42.0	40.9	60.9	45.0		47.8	30.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.93	0.79		1.34	0.77	
Incremental Delay, d2	11.0	5.4		238.5	0.3	0.2	2.5	147.4		53.1	16.2	
Delay (s)	69.1	58.5		293.0	42.2	41.1	58.9	183.1		117.0	39.6	
Level of Service	E	E		F	D	D	E	F		F	D	
Approach Delay (s)		62.3			183.6			180.9			51.6	
Approach LOS		E			F			F			D	
Intersection Summary												
HCM 2000 Control Delay			101.9									
HCM 2000 Volume to Capacity ratio			1.16									
Actuated Cycle Length (s)			130.0									
Intersection Capacity Utilization			93.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		→→	→→	←←
Traffic Volume (vph)	638	12	0	386	1206	993
Future Volume (vph)	638	12	0	386	1206	993
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.98		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1303		2980	2980	2212
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1303		2980	2980	2212
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	751	14	0	454	1419	1168
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	751	12	0	454	1419	1168
Confl. Peds. (#/hr)		7				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	659		1269	1269	2212
v/s Ratio Prot	0.26			0.15	c0.48	
v/s Ratio Perm		0.01				c0.53
v/c Ratio	0.51	0.02		0.36	1.12	0.53
Uniform Delay, d1	21.4	16.0		25.3	37.3	0.0
Progression Factor	1.00	1.00		1.00	0.67	1.00
Incremental Delay, d2	1.3	0.0		0.8	54.4	0.1
Delay (s)	22.7	16.0		26.0	79.2	0.1
Level of Service	C	B		C	E	A
Approach Delay (s)	22.6			26.0	43.5	
Approach LOS	C			C	D	
Intersection Summary						
HCM 2000 Control Delay		37.2		HCM 2000 Level of Service		D
HCM 2000 Volume to Capacity ratio		0.82				
Actuated Cycle Length (s)		130.0		Sum of lost time (s)		8.8
Intersection Capacity Utilization		72.8%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↘	↗↘		↘	↗↘↘	
Traffic Volume (vph)	180	16	54	25	49	188	50	1339	16	23	945	206
Future Volume (vph)	180	16	54	25	49	188	50	1339	16	23	945	206
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.97	
Flt Protected		0.96	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1500	1294		1542	1306	1391	2874		1391	4029	
Flt Permitted		0.66	1.00		0.78	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1040	1294		1218	1306	1391	2874		1391	4029	
Peak-hour factor, PHF	0.69	0.69	0.69	0.76	0.76	0.76	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	261	23	78	33	64	247	60	1594	19	27	1125	245
RTOR Reduction (vph)	0	0	39	0	0	128	0	0	0	0	24	0
Lane Group Flow (vph)	0	284	39	0	97	119	60	1613	0	27	1346	0
Confl. Peds. (#/hr)			14			4			20			
Confl. Bikes (#/hr)						6			1			
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		37.8	37.8		37.8	37.8	9.0	73.5		5.9	70.4	
Effective Green, g (s)		37.8	37.8		37.8	37.8	9.0	73.5		5.9	70.4	
Actuated g/C Ratio		0.29	0.29		0.29	0.29	0.07	0.57		0.05	0.54	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		302	376		354	379	96	1624		63	2181	
v/s Ratio Prot							c0.04	c0.56		0.02	0.33	
v/s Ratio Perm		c0.27	0.03		0.08	0.09						
v/c Ratio		0.94	0.10		0.27	0.31	0.62	0.99		0.43	0.62	
Uniform Delay, d1		45.0	33.7		35.5	36.0	58.9	28.0		60.4	20.5	
Progression Factor		1.00	1.00		1.00	1.00	1.25	0.55		1.00	1.00	
Incremental Delay, d2		36.2	0.1		0.4	0.5	8.6	17.2		4.6	1.3	
Delay (s)		81.2	33.8		35.9	36.4	82.2	32.5		65.0	21.8	
Level of Service		F	C		D	D	F	C		E	C	
Approach Delay (s)		71.0			36.3			34.3			22.7	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			33.7									
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			130.0							12.8		
Intersection Capacity Utilization			87.4%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	0	8	29	1	103	4	1326	22	30	990	0
Future Volume (vph)	13	0	8	29	1	103	4	1326	22	30	990	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.98		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1470	1305		1482	1299	1391	2860		1391	4129	
Flt Permitted		0.73	1.00		0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1136	1305		1165	1299	1391	2860		1391	4129	
Peak-hour factor, PHF	0.73	0.73	0.73	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	18	0	11	34	1	121	5	1560	26	35	1165	0
RTOR Reduction (vph)	0	0	10	0	0	107	0	1	0	0	0	0
Lane Group Flow (vph)	0	18	1	0	35	14	5	1585	0	35	1165	0
Confl. Peds. (#/hr)	9		6	6		9			8			12
Confl. Bikes (#/hr)									7			2
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.0	15.0		15.0	15.0	1.6	96.6		6.2	101.2	
Effective Green, g (s)		15.0	15.0		15.0	15.0	1.6	96.6		6.2	101.2	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.01	0.74		0.05	0.78	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		131	150		134	149	17	2125		66	3214	
v/s Ratio Prot							0.00	c0.55		c0.03	0.28	
v/s Ratio Perm		0.02	0.00		c0.03	0.01						
v/c Ratio		0.14	0.01		0.26	0.09	0.29	0.75		0.53	0.36	
Uniform Delay, d1		51.7	50.9		52.4	51.4	63.6	9.6		60.5	4.4	
Progression Factor		1.00	1.00		1.00	1.00	1.31	0.78		0.95	0.61	
Incremental Delay, d2		0.5	0.0		1.0	0.3	0.9	0.2		6.6	0.3	
Delay (s)		52.2	50.9		53.5	51.7	84.0	7.7		64.1	3.0	
Level of Service		D	D		D	D	F	A		E	A	
Approach Delay (s)		51.7			52.1			8.0			4.7	
Approach LOS		D			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			9.4									
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			130.0									
Intersection Capacity Utilization			75.3%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	45	8	213	72	145	28	1181	29	176	792	27
Future Volume (vph)	93	45	8	213	72	145	28	1181	29	176	792	27
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1527		1490	1569	1293	1391	2857		1391	4113	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1527		1490	1569	1293	1391	2857		1391	4113	
Peak-hour factor, PHF	0.76	0.76	0.76	0.85	0.85	0.85	0.85	0.85	0.85	0.78	0.78	0.78
Adj. Flow (vph)	122	59	11	251	85	171	33	1389	34	226	1015	35
RTOR Reduction (vph)	0	6	0	0	0	144	0	1	0	0	2	0
Lane Group Flow (vph)	122	64	0	251	85	27	33	1422	0	226	1048	0
Confl. Peds. (#/hr)			1			9			6			5
Confl. Bikes (#/hr)			2			3			3			6
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	15.4	14.5		21.1	20.2	20.2	5.8	53.5		24.1	71.8	
Effective Green, g (s)	15.4	14.5		21.1	20.2	20.2	5.8	53.5		24.1	71.8	
Actuated g/C Ratio	0.12	0.11		0.16	0.16	0.16	0.04	0.41		0.19	0.55	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	176	170		241	243	200	62	1175		257	2271	
v/s Ratio Prot	0.08	0.04		c0.17	c0.05		0.02	c0.50		c0.16	0.25	
v/s Ratio Perm						0.02						
v/c Ratio	0.69	0.38		1.04	0.35	0.13	0.53	1.21		0.88	0.46	
Uniform Delay, d1	55.0	53.5		54.5	49.0	47.3	60.8	38.2		51.5	17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.16	1.09		0.80	1.42	
Incremental Delay, d2	10.4	1.0		69.2	0.6	0.2	5.6	101.5		26.1	0.7	
Delay (s)	65.4	54.6		123.7	49.7	47.6	76.3	143.1		67.4	25.5	
Level of Service	E	D		F	D	D	E	F		E	C	
Approach Delay (s)		61.4			85.6			141.6			32.9	
Approach LOS		E			F			F			C	
Intersection Summary												
HCM 2000 Control Delay			88.4									F
HCM 2000 Volume to Capacity ratio			1.00									
Actuated Cycle Length (s)			130.0							16.8		
Intersection Capacity Utilization			82.8%							E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	718	5	0	527	289	754
Future Volume (vph)	718	5	0	527	289	754
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Lane Width	12	12	10	11	11	11
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.97		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1288		2881	2881	2138
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1288		2881	2881	2138
Peak-hour factor, PHF	0.84	0.84	0.85	0.85	0.85	0.85
Adj. Flow (vph)	855	6	0	620	340	887
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	855	5	0	620	340	887
Confl. Peds. (#/hr)		16				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	651		1227	1227	2138
v/s Ratio Prot	c0.30			c0.22	0.12	
v/s Ratio Perm		0.00				0.41
v/c Ratio	0.58	0.01		0.51	0.28	0.41
Uniform Delay, d1	22.5	15.9		27.3	24.3	0.0
Progression Factor	1.00	1.00		1.00	0.81	1.00
Incremental Delay, d2	1.7	0.0		1.5	0.5	0.5
Delay (s)	24.2	15.9		28.8	20.2	0.5
Level of Service	C	B		C	C	A
Approach Delay (s)	24.2			28.8	6.0	
Approach LOS	C			C	A	

Intersection Summary

HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.8
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↗	↕		↗	↕	↘
Traffic Volume (vph)	91	32	80	21	11	42	38	877	45	83	2263	172
Future Volume (vph)	91	32	80	21	11	42	38	877	45	83	2263	172
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1513	1302		1519	1311	1391	2854		1391	4089	
Flt Permitted		0.76	1.00		0.78	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1187	1302		1222	1311	1391	2854		1391	4089	
Peak-hour factor, PHF	0.89	0.89	0.89	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	102	36	90	26	14	52	45	1032	53	98	2662	202
RTOR Reduction (vph)	0	0	76	0	0	45	0	2	0	0	5	0
Lane Group Flow (vph)	0	138	14	0	40	8	45	1083	0	98	2859	0
Confl. Peds. (#/hr)			7			2			9			
Confl. Bikes (#/hr)			2			1			2			4
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		20.6	20.6		20.6	20.6	8.5	83.1		13.5	88.1	
Effective Green, g (s)		20.6	20.6		20.6	20.6	8.5	83.1		13.5	88.1	
Actuated g/C Ratio		0.16	0.16		0.16	0.16	0.07	0.64		0.10	0.68	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		188	206		193	207	90	1824		144	2771	
v/s Ratio Prot							0.03	0.38		c0.07	c0.70	
v/s Ratio Perm		c0.12	0.01		0.03	0.01						
v/c Ratio		0.73	0.07		0.21	0.04	0.50	0.59		0.68	1.03	
Uniform Delay, d1		52.1	46.5		47.6	46.3	58.7	13.6		56.2	21.0	
Progression Factor		1.00	1.00		1.00	1.00	0.94	1.78		1.00	1.00	
Incremental Delay, d2		13.8	0.1		0.5	0.1	3.7	1.2		12.4	25.9	
Delay (s)		65.9	46.7		48.1	46.4	58.6	25.4		68.6	46.9	
Level of Service		E	D		D	D	E	C		E	D	
Approach Delay (s)		58.3			47.2			26.8			47.6	
Approach LOS		E			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			42.8									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			130.0							12.8		
Intersection Capacity Utilization			92.3%									ICU Level of Service F
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	7	0	16	28	2	46	4	16	910	37	80	2289
Future Volume (vph)	7	0	16	28	2	46	4	16	910	37	80	2289
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	10	11	11	10	11
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.91
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.99		1.00	1.00
Flt Protected		0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1490	1285		1498	1285		1391	2846		1391	4125
Flt Permitted		0.73	1.00		0.75	1.00		0.42	1.00		0.95	1.00
Satd. Flow (perm)		1152	1285		1184	1285		610	2846		1391	4125
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	9	0	21	33	2	54	5	19	1071	44	94	2693
RTOR Reduction (vph)	0	0	19	0	0	48	0	0	2	0	0	0
Lane Group Flow (vph)	0	9	2	0	35	6	0	24	1113	0	94	2705
Confl. Peds. (#/hr)			15			16				14		
Confl. Bikes (#/hr)										5		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	custom	Prot	NA		Prot	NA
Protected Phases		4			8			1	6		5	2
Permitted Phases	4		4	8		8	1					
Actuated Green, G (s)		13.4	13.4		13.4	13.4		9.6	90.6		13.8	94.8
Effective Green, g (s)		13.4	13.4		13.4	13.4		9.6	90.6		13.8	94.8
Actuated g/C Ratio		0.10	0.10		0.10	0.10		0.07	0.70		0.11	0.73
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	6.0		3.0	6.0
Lane Grp Cap (vph)		118	132		122	132		45	1983		147	3008
v/s Ratio Prot								c0.39			0.07	c0.66
v/s Ratio Perm		0.01	0.00		c0.03	0.00		0.04				
v/c Ratio		0.08	0.02		0.29	0.04		0.53	0.56		0.64	0.90
Uniform Delay, d1		52.7	52.4		53.9	52.5		58.0	9.8		55.7	13.8
Progression Factor		1.00	1.00		1.00	1.00		0.54	0.29		1.11	0.62
Incremental Delay, d2		0.3	0.1		1.3	0.1		1.1	0.1		2.4	1.4
Delay (s)		53.0	52.4		55.2	52.7		32.6	2.9		64.3	10.0
Level of Service		D	D		E	D		C	A		E	B
Approach Delay (s)		52.6			53.6			3.5				11.8
Approach LOS		D			D			A				B
Intersection Summary												
HCM 2000 Control Delay		10.7										
HCM 2000 Volume to Capacity ratio		0.81										
Actuated Cycle Length (s)		130.0							12.2			
Intersection Capacity Utilization		97.4%							F			
Analysis Period (min)		15										
c Critical Lane Group												

11/8/2016

Sunnyvale - Fair Oaks Corridor LOS Analysis 9/6/2016 Existing Conditions with Project - PM Peak
W-Trans
Attachment 6

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	84	11	292	71	153	18	762	226	358	1885	60
Future Volume (vph)	53	84	11	292	71	153	18	762	226	358	1885	60
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.95	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1537		1490	1569	1271	1391	2736		1391	4110	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1537		1490	1569	1271	1391	2736		1391	4110	
Peak-hour factor, PHF	0.69	0.69	0.69	0.82	0.82	0.82	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	77	122	16	356	87	187	21	896	266	421	2218	71
RTOR Reduction (vph)	0	4	0	0	0	146	0	21	0	0	2	0
Lane Group Flow (vph)	77	134	0	356	87	41	21	1141	0	421	2287	0
Confl. Peds. (#/hr)			7			20			10			17
Confl. Bikes (#/hr)			2			3			9			11
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	10.3	17.8		21.0	28.5	28.5	5.2	40.0		34.4	69.2	
Effective Green, g (s)	10.3	17.8		21.0	28.5	28.5	5.2	40.0		34.4	69.2	
Actuated g/C Ratio	0.08	0.14		0.16	0.22	0.22	0.04	0.31		0.26	0.53	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	118	210		240	343	278	55	841		368	2187	
v/s Ratio Prot	0.05	c0.09		c0.24	0.06		0.02	c0.42		c0.30	0.56	
v/s Ratio Perm						0.03						
v/c Ratio	0.65	0.64		1.48	0.25	0.15	0.38	1.36		1.14	1.05	
Uniform Delay, d1	58.1	53.0		54.5	42.0	40.9	60.8	45.0		47.8	30.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.92	0.80		1.32	0.79	
Incremental Delay, d2	11.0	5.4		238.5	0.3	0.2	2.9	167.3		80.3	27.5	
Delay (s)	69.1	58.5		293.0	42.2	41.1	58.9	203.2		143.5	51.5	
Level of Service	E	E		F	D	D	E	F		F	D	
Approach Delay (s)		62.3			183.6			200.7			65.8	
Approach LOS		E			F			F			E	
Intersection Summary												
HCM 2000 Control Delay			115.0									F
HCM 2000 Volume to Capacity ratio			1.20									
Actuated Cycle Length (s)			130.0							16.8		
Intersection Capacity Utilization			93.9%							F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	638	12	0	386	1206	993
Future Volume (vph)	638	12	0	386	1206	993
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Lane Width	12	12	10	11	11	11
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.98		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1303		2881	2881	2138
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1303		2881	2881	2138
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	751	14	0	454	1419	1168
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	751	12	0	454	1419	1168
Confl. Peds. (#/hr)		7				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	659		1227	1227	2138
v/s Ratio Prot	0.26			0.16	c0.49	
v/s Ratio Perm		0.01				c0.55
v/c Ratio	0.51	0.02		0.37	1.16	0.55
Uniform Delay, d1	21.4	16.0		25.4	37.3	0.0
Progression Factor	1.00	1.00		1.00	0.67	1.00
Incremental Delay, d2	1.3	0.0		0.9	71.4	0.1
Delay (s)	22.7	16.0		26.3	96.3	0.1
Level of Service	C	B		C	F	A
Approach Delay (s)	22.6			26.3	52.9	
Approach LOS	C			C	D	

Intersection Summary

HCM 2000 Control Delay	43.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.8
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	19	63	29	57	218	58	1646	19	27	1223	239
Future Volume (vph)	209	19	63	29	57	218	58	1646	19	27	1223	239
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.98	
Flt Protected		0.96	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1500	1294		1543	1307	1391	2874		1391	4038	
Flt Permitted		0.64	1.00		0.70	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1007	1294		1102	1307	1391	2874		1391	4038	
Peak-hour factor, PHF	0.69	0.69	0.69	0.76	0.76	0.76	0.84	0.84	0.84	0.84	0.84	0.84
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	303	28	91	38	75	287	69	1960	23	32	1456	285
RTOR Reduction (vph)	0	0	38	0	0	120	0	0	0	0	22	0
Lane Group Flow (vph)	0	331	53	0	113	167	69	1983	0	32	1719	0
Confl. Peds. (#/hr)			14			4			20			
Confl. Bikes (#/hr)						6			1			
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		40.4	40.4		40.4	40.4	9.2	70.7		6.1	67.6	
Effective Green, g (s)		40.4	40.4		40.4	40.4	9.2	70.7		6.1	67.6	
Actuated g/C Ratio		0.31	0.31		0.31	0.31	0.07	0.54		0.05	0.52	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		312	402		342	406	98	1563		65	2099	
v/s Ratio Prot							c0.05	c0.69		0.02	0.43	
v/s Ratio Perm		c0.33	0.04		0.10	0.13						
v/c Ratio		1.06	0.13		0.33	0.41	0.70	1.27		0.49	0.82	
Uniform Delay, d1		44.8	32.2		34.4	35.4	59.1	29.6		60.4	26.1	
Progression Factor		1.00	1.00		1.00	1.00	1.19	0.66		1.00	1.00	
Incremental Delay, d2		67.9	0.1		0.6	0.7	10.7	123.4		5.8	3.7	
Delay (s)		112.7	32.3		35.0	36.1	81.0	143.0		66.2	29.8	
Level of Service		F	C		C	D	F	F		E	C	
Approach Delay (s)		95.4			35.8			140.9			30.5	
Approach LOS		F			D			F			C	
Intersection Summary												
HCM 2000 Control Delay			85.6				HCM 2000 Level of Service			F		
HCM 2000 Volume to Capacity ratio			1.18									
Actuated Cycle Length (s)			130.0				Sum of lost time (s)			12.8		
Intersection Capacity Utilization			101.1%				ICU Level of Service			G		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	19	34	1	120	5	1638	26	35	1275	0
Future Volume (vph)	15	0	19	34	1	120	5	1638	26	35	1275	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1470	1305		1482	1299	1490	2959		1490	2968	
Flt Permitted		0.73	1.00		0.74	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1130	1305		1146	1299	1490	2959		1490	2968	
Peak-hour factor, PHF	0.73	0.73	0.73	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	21	0	26	40	1	141	6	1927	31	41	1500	0
RTOR Reduction (vph)	0	0	23	0	0	125	0	1	0	0	0	0
Lane Group Flow (vph)	0	21	3	0	41	16	6	1957	0	41	1500	0
Confl. Peds. (#/hr)	9		6	6		9			8			12
Confl. Bikes (#/hr)									7			2
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.2	15.2		15.2	15.2	2.5	92.3		10.3	100.1	
Effective Green, g (s)		15.2	15.2		15.2	15.2	2.5	92.3		10.3	100.1	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.02	0.71		0.08	0.77	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		132	152		133	151	28	2100		118	2285	
v/s Ratio Prot							0.00	c0.66		c0.03	c0.51	
v/s Ratio Perm		0.02	0.00		c0.04	0.01						
v/c Ratio		0.16	0.02		0.31	0.11	0.21	0.93		0.35	0.66	
Uniform Delay, d1		51.6	50.8		52.6	51.3	62.8	16.2		56.7	7.0	
Progression Factor		1.00	1.00		1.00	1.00	0.90	1.13		0.59	0.80	
Incremental Delay, d2		0.6	0.1		1.3	0.3	0.3	1.0		1.1	0.9	
Delay (s)		52.2	50.9		53.9	51.7	56.6	19.4		34.6	6.5	
Level of Service		D	D		D	D	E	B		C	A	
Approach Delay (s)		51.5			52.2			19.5			7.2	
Approach LOS		D			D			B			A	
Intersection Summary												
HCM 2000 Control Delay		16.4										
HCM 2000 Volume to Capacity ratio		0.82										
Actuated Cycle Length (s)		130.0										
Intersection Capacity Utilization		86.6%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	52	9	247	84	191	32	1417	34	225	1034	32
Future Volume (vph)	111	52	9	247	84	191	32	1417	34	225	1034	32
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1529		1490	1569	1293	1490	2955		1490	2963	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1529		1490	1569	1293	1490	2955		1490	2963	
Peak-hour factor, PHF	0.76	0.76	0.76	0.85	0.85	0.85	0.85	0.85	0.85	0.78	0.78	0.78
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	146	68	12	291	99	225	38	1667	40	288	1326	41
RTOR Reduction (vph)	0	5	0	0	0	190	0	1	0	0	1	0
Lane Group Flow (vph)	146	75	0	291	99	35	38	1706	0	288	1366	0
Confl. Peds. (#/hr)			1			9			6			5
Confl. Bikes (#/hr)			2			3			3			6
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	17.0	16.5		21.0	20.5	20.5	7.5	45.5		30.2	68.2	
Effective Green, g (s)	17.0	16.5		21.0	20.5	20.5	7.5	45.5		30.2	68.2	
Actuated g/C Ratio	0.13	0.13		0.16	0.16	0.16	0.06	0.35		0.23	0.52	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	194	194		240	247	203	85	1034		346	1554	
v/s Ratio Prot	0.10	0.05		c0.20	c0.06		0.03	c0.58		c0.19	c0.46	
v/s Ratio Perm						0.03						
v/c Ratio	0.75	0.39		1.21	0.40	0.17	0.45	1.65		0.83	0.88	
Uniform Delay, d1	54.5	52.1		54.5	49.2	47.4	59.2	42.2		47.5	27.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.12	1.05		0.68	1.47	
Incremental Delay, d2	14.5	0.9		127.7	0.8	0.3	2.0	295.6		12.9	6.2	
Delay (s)	69.0	53.0		182.2	50.0	47.7	68.3	340.0		45.3	46.1	
Level of Service	E	D		F	D	D	E	F		D	D	
Approach Delay (s)		63.3			111.7			334.1			46.0	
Approach LOS		E			F			F			D	
Intersection Summary												
HCM 2000 Control Delay			175.0									F
HCM 2000 Volume to Capacity ratio			1.16									
Actuated Cycle Length (s)			130.0							16.8		
Intersection Capacity Utilization			96.2%							F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

01/10/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	866	6	0	661	407	921
Future Volume (vph)	866	6	0	661	407	921
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.97		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1288		2980	2980	2212
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1288		2980	2980	2212
Peak-hour factor, PHF	0.84	0.84	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	1031	7	0	778	479	1084
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	1031	6	0	778	479	1084
Confl. Peds. (#/hr)		16				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	651		1269	1269	2212
v/s Ratio Prot	c0.36			c0.26	0.16	
v/s Ratio Perm		0.00				0.49
v/c Ratio	0.70	0.01		0.61	0.38	0.49
Uniform Delay, d1	24.6	15.9		29.0	25.5	0.0
Progression Factor	1.00	1.00		1.00	0.59	1.00
Incremental Delay, d2	2.9	0.0		2.2	0.3	0.3
Delay (s)	27.5	16.0		31.2	15.3	0.3
Level of Service	C	B		C	B	A
Approach Delay (s)	27.4			31.2	4.9	
Approach LOS	C			C	A	

Intersection Summary

HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.8
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	19	34	1	120	5	1614	26	35	1275	0
Future Volume (vph)	15	0	19	34	1	120	5	1614	26	35	1275	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1470	1305		1482	1299	1490	2959		1490	2968	
Flt Permitted		0.73	1.00		0.74	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1130	1305		1146	1299	1490	2959		1490	2968	
Peak-hour factor, PHF	0.73	0.73	0.73	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	21	0	26	40	1	141	6	1899	31	41	1500	0
RTOR Reduction (vph)	0	0	23	0	0	125	0	1	0	0	0	0
Lane Group Flow (vph)	0	21	3	0	41	16	6	1929	0	41	1500	0
Confl. Peds. (#/hr)	9		6	6		9			8			12
Confl. Bikes (#/hr)									7			2
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.2	15.2		15.2	15.2	2.5	92.3		10.3	100.1	
Effective Green, g (s)		15.2	15.2		15.2	15.2	2.5	92.3		10.3	100.1	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.02	0.71		0.08	0.77	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		132	152		133	151	28	2100		118	2285	
v/s Ratio Prot							0.00	c0.65		c0.03	c0.51	
v/s Ratio Perm		0.02	0.00		c0.04	0.01						
v/c Ratio		0.16	0.02		0.31	0.11	0.21	0.92		0.35	0.66	
Uniform Delay, d1		51.6	50.8		52.6	51.3	62.8	15.7		56.7	7.0	
Progression Factor		1.00	1.00		1.00	1.00	0.90	1.11		0.61	0.87	
Incremental Delay, d2		0.6	0.1		1.3	0.3	0.3	0.9		1.2	1.0	
Delay (s)		52.2	50.9		53.9	51.7	56.6	18.2		35.6	7.0	
Level of Service		D	D		D	D	E	B		D	A	
Approach Delay (s)		51.5			52.2			18.4			7.8	
Approach LOS		D			D			B			A	
Intersection Summary												
HCM 2000 Control Delay		16.0										
HCM 2000 Volume to Capacity ratio		0.81										
Actuated Cycle Length (s)		130.0										
Intersection Capacity Utilization		85.9%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	52	9	247	84	191	32	1417	34	225	1034	32
Future Volume (vph)	111	52	9	247	84	191	32	1417	34	225	1034	32
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1529		1490	1569	1293	1490	2955		1490	2963	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1529		1490	1569	1293	1490	2955		1490	2963	
Peak-hour factor, PHF	0.76	0.76	0.76	0.85	0.85	0.85	0.85	0.85	0.85	0.78	0.78	0.78
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	146	68	12	291	99	225	38	1667	40	288	1326	41
RTOR Reduction (vph)	0	5	0	0	0	190	0	1	0	0	1	0
Lane Group Flow (vph)	146	75	0	291	99	35	38	1706	0	288	1366	0
Confl. Peds. (#/hr)			1			9			6			5
Confl. Bikes (#/hr)			2			3			3			6
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	17.0	16.5		21.0	20.5	20.5	7.5	45.5		30.2	68.2	
Effective Green, g (s)	17.0	16.5		21.0	20.5	20.5	7.5	45.5		30.2	68.2	
Actuated g/C Ratio	0.13	0.13		0.16	0.16	0.16	0.06	0.35		0.23	0.52	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	194	194		240	247	203	85	1034		346	1554	
v/s Ratio Prot	0.10	0.05		c0.20	c0.06		0.03	c0.58		c0.19	c0.46	
v/s Ratio Perm						0.03						
v/c Ratio	0.75	0.39		1.21	0.40	0.17	0.45	1.65		0.83	0.88	
Uniform Delay, d1	54.5	52.1		54.5	49.2	47.4	59.2	42.2		47.5	27.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.12	1.05		0.68	1.47	
Incremental Delay, d2	14.5	0.9		127.7	0.8	0.3	2.0	295.6		12.9	6.2	
Delay (s)	69.0	53.0		182.2	50.0	47.7	68.3	340.0		45.3	46.2	
Level of Service	E	D		F	D	D	E	F		D	D	
Approach Delay (s)		63.3			111.7			334.1			46.1	
Approach LOS		E			F			F			D	
Intersection Summary												
HCM 2000 Control Delay			175.0									HCM 2000 Level of Service F
HCM 2000 Volume to Capacity ratio			1.16									
Actuated Cycle Length (s)			130.0									Sum of lost time (s) 16.8
Intersection Capacity Utilization			96.2%									ICU Level of Service F
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		→→	→→	←←
Traffic Volume (vph)	866	6	0	661	407	921
Future Volume (vph)	866	6	0	661	407	921
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.97		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1288		2980	2980	2212
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1288		2980	2980	2212
Peak-hour factor, PHF	0.84	0.84	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	1031	7	0	778	479	1084
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	1031	6	0	778	479	1084
Confl. Peds. (#/hr)		16				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	651		1269	1269	2212
v/s Ratio Prot	c0.36			c0.26	0.16	
v/s Ratio Perm		0.00				0.49
v/c Ratio	0.70	0.01		0.61	0.38	0.49
Uniform Delay, d1	24.6	15.9		29.0	25.5	0.0
Progression Factor	1.00	1.00		1.00	0.59	1.00
Incremental Delay, d2	2.9	0.0		2.2	0.3	0.3
Delay (s)	27.5	16.0		31.2	15.3	0.3
Level of Service	C	B		C	B	A
Approach Delay (s)	27.4			31.2	4.9	
Approach LOS	C			C	A	

Intersection Summary

HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.8
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	37	93	24	13	49	44	1140	52	96	2642	200
Future Volume (vph)	106	37	93	24	13	49	44	1140	52	96	2642	200
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1513	1302		1519	1312	1391	2857		1391	4090	
Flt Permitted		0.75	1.00		0.73	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1180	1302		1151	1312	1391	2857		1391	4090	
Peak-hour factor, PHF	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	125	44	109	30	16	61	52	1341	61	113	3108	235
RTOR Reduction (vph)	0	0	89	0	0	50	0	2	0	0	5	0
Lane Group Flow (vph)	0	169	20	0	46	11	52	1400	0	113	3338	0
Confl. Peds. (#/hr)			7			2			9			
Confl. Bikes (#/hr)			2			1			2			4
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		24.2	24.2		24.2	24.2	9.6	80.2		12.8	83.4	
Effective Green, g (s)		24.2	24.2		24.2	24.2	9.6	80.2		12.8	83.4	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.07	0.62		0.10	0.64	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		219	242		214	244	102	1762		136	2623	
v/s Ratio Prot							0.04	0.49		c0.08	c0.82	
v/s Ratio Perm		c0.14	0.02		0.04	0.01						
v/c Ratio		0.77	0.08		0.21	0.05	0.51	0.79		0.83	1.27	
Uniform Delay, d1		50.3	43.7		44.8	43.4	57.9	18.7		57.5	23.3	
Progression Factor		1.00	1.00		1.00	1.00	1.32	1.76		1.00	1.00	
Incremental Delay, d2		15.4	0.1		0.5	0.1	3.1	3.0		33.0	125.8	
Delay (s)		65.7	43.9		45.4	43.5	79.7	36.0		90.6	149.1	
Level of Service		E	D		D	D	E	D		F	F	
Approach Delay (s)		57.1			44.3			37.5			147.2	
Approach LOS		E			D			D			F	
Intersection Summary												
HCM 2000 Control Delay		110.3								F		
HCM 2000 Volume to Capacity ratio		1.14										
Actuated Cycle Length (s)		130.0								12.8		
Intersection Capacity Utilization		102.7%								G		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	8	0	9	32	2	53	4	19	1139	43	93	2663
Future Volume (vph)	8	0	9	32	2	53	4	19	1139	43	93	2663
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.99		1.00	1.00
Flt Protected		0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1490	1285		1497	1285		1490	2946		1490	2966
Flt Permitted		0.73	1.00		0.74	1.00		0.42	1.00		0.95	1.00
Satd. Flow (perm)		1147	1285		1166	1285		654	2946		1490	2966
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	11	0	12	38	2	62	5	22	1340	51	109	3133
RTOR Reduction (vph)	0	0	11	0	0	56	0	0	2	0	0	0
Lane Group Flow (vph)	0	11	1	0	40	6	0	27	1389	0	109	3147
Confl. Peds. (#/hr)			15			16				14		
Confl. Bikes (#/hr)										5		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	custom	Prot	NA		Prot	NA
Protected Phases		4			8			1	6		5	2
Permitted Phases	4		4	8		8	1					
Actuated Green, G (s)		13.5	13.5		13.5	13.5		9.6	89.9		14.4	94.7
Effective Green, g (s)		13.5	13.5		13.5	13.5		9.6	89.9		14.4	94.7
Actuated g/C Ratio		0.10	0.10		0.10	0.10		0.07	0.69		0.11	0.73
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	6.0		3.0	6.0
Lane Grp Cap (vph)		119	133		121	133		48	2037		165	2160
v/s Ratio Prot								c0.47			0.07	c1.06
v/s Ratio Perm		0.01	0.00		c0.03	0.01		0.04				
v/c Ratio		0.09	0.01		0.33	0.05		0.56	0.68		0.66	1.46
Uniform Delay, d1		52.7	52.3		54.1	52.5		58.2	11.7		55.5	17.6
Progression Factor		1.00	1.00		1.00	1.00		0.54	0.67		1.17	0.94
Incremental Delay, d2		0.3	0.0		1.6	0.2		1.4	0.2		0.9	205.8
Delay (s)		53.0	52.3		55.7	52.6		32.8	8.0		65.7	222.4
Level of Service		D	D		E	D		C	A		E	F
Approach Delay (s)		52.6			53.8			8.5				217.2
Approach LOS		D			D			A				F
Intersection Summary												
HCM 2000 Control Delay		151.3										
HCM 2000 Volume to Capacity ratio		1.28										
Actuated Cycle Length (s)		130.0										
Intersection Capacity Utilization		126.4%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

01/10/2017

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	12
Future Volume (vph)	12
Ideal Flow (vphpl)	1600
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.85
Growth Factor (vph)	100%
Adj. Flow (vph)	14
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	17
Confl. Bikes (#/hr)	4
Bus Blockages (#/hr)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	97	13	339	82	198	21	994	262	437	2242	73
Future Volume (vph)	63	97	13	339	82	198	21	994	262	437	2242	73
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.95	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1536		1490	1569	1271	1490	2843		1490	2959	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1536		1490	1569	1271	1490	2843		1490	2959	
Peak-hour factor, PHF	0.69	0.69	0.69	0.82	0.82	0.82	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	91	141	19	413	100	241	25	1169	308	514	2638	86
RTOR Reduction (vph)	0	4	0	0	0	192	0	19	0	0	1	0
Lane Group Flow (vph)	91	156	0	413	100	49	25	1458	0	514	2723	0
Confl. Peds. (#/hr)			7			20			10			17
Confl. Bikes (#/hr)			2			3			9			11
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	12.9	18.3		21.0	26.4	26.4	5.3	40.8		33.1	68.6	
Effective Green, g (s)	12.9	18.3		21.0	26.4	26.4	5.3	40.8		33.1	68.6	
Actuated g/C Ratio	0.10	0.14		0.16	0.20	0.20	0.04	0.31		0.25	0.53	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	147	216		240	318	258	60	892		379	1561	
v/s Ratio Prot	0.06	c0.10		c0.28	0.06		0.02	0.51		c0.34	c0.92	
v/s Ratio Perm						0.04						
v/c Ratio	0.62	0.72		1.72	0.31	0.19	0.42	1.64		1.36	1.74	
Uniform Delay, d1	56.2	53.4		54.5	44.1	42.9	60.8	44.6		48.5	30.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.95	0.81		1.27	0.91	
Incremental Delay, d2	6.5	10.6		341.4	0.4	0.3	2.8	290.0		161.9	335.1	
Delay (s)	62.7	64.0		395.9	44.5	43.2	60.5	326.3		223.5	363.2	
Level of Service	E	E		F	D	D	E	F		F	F	
Approach Delay (s)		63.5			236.6			321.9			341.0	
Approach LOS		E			F			F			F	
Intersection Summary												
HCM 2000 Control Delay			310.2									
HCM 2000 Volume to Capacity ratio			1.57									
Actuated Cycle Length (s)			130.0									
Intersection Capacity Utilization			122.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

01/10/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱		↕↕	↕↕	↱↱
Traffic Volume (vph)	781	14	0	517	1453	1187
Future Volume (vph)	781	14	0	517	1453	1187
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.98		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1303		2980	2980	2218
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1303		2980	2980	2218
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	919	16	0	608	1709	1396
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	919	14	0	608	1709	1396
Confl. Peds. (#/hr)		7				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						2
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	659		1269	1269	2218
v/s Ratio Prot	0.32			0.20	c0.57	
v/s Ratio Perm		0.01				c0.63
v/c Ratio	0.63	0.02		0.48	1.35	0.63
Uniform Delay, d1	23.2	16.0		26.9	37.3	0.0
Progression Factor	1.00	1.00		1.00	0.71	1.00
Incremental Delay, d2	2.1	0.1		1.3	156.5	0.1
Delay (s)	25.3	16.1		28.2	183.1	0.1
Level of Service	C	B		C	F	A
Approach Delay (s)	25.1			28.2	100.8	
Approach LOS	C			C	F	

Intersection Summary

HCM 2000 Control Delay	76.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.8
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	8	0	9	32	2	53	4	19	1097	43	93	2663
Future Volume (vph)	8	0	9	32	2	53	4	19	1097	43	93	2663
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.99		1.00	1.00
Flt Protected		0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1490	1285		1497	1285		1490	2945		1490	2966
Flt Permitted		0.73	1.00		0.74	1.00		0.42	1.00		0.95	1.00
Satd. Flow (perm)		1147	1285		1166	1285		654	2945		1490	2966
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	11	0	12	38	2	62	5	22	1291	51	109	3133
RTOR Reduction (vph)	0	0	11	0	0	56	0	0	2	0	0	0
Lane Group Flow (vph)	0	11	1	0	40	6	0	27	1340	0	109	3147
Confl. Peds. (#/hr)			15			16				14		
Confl. Bikes (#/hr)										5		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	custom	Prot	NA		Prot	NA
Protected Phases		4			8			1	6		5	2
Permitted Phases	4		4	8		8	1					
Actuated Green, G (s)		13.5	13.5		13.5	13.5		9.6	89.9		14.4	94.7
Effective Green, g (s)		13.5	13.5		13.5	13.5		9.6	89.9		14.4	94.7
Actuated g/C Ratio		0.10	0.10		0.10	0.10		0.07	0.69		0.11	0.73
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	6.0		3.0	6.0
Lane Grp Cap (vph)		119	133		121	133		48	2036		165	2160
v/s Ratio Prot								c0.46			0.07	c1.06
v/s Ratio Perm		0.01	0.00		c0.03	0.01		0.04				
v/c Ratio		0.09	0.01		0.33	0.05		0.56	0.66		0.66	1.46
Uniform Delay, d1		52.7	52.3		54.1	52.5		58.2	11.4		55.5	17.6
Progression Factor		1.00	1.00		1.00	1.00		0.54	0.58		1.17	0.95
Incremental Delay, d2		0.3	0.0		1.6	0.2		1.4	0.2		0.9	205.8
Delay (s)		53.0	52.3		55.7	52.6		32.8	6.7		65.6	222.6
Level of Service		D	D		E	D		C	A		E	F
Approach Delay (s)		52.6			53.8			7.2				217.3
Approach LOS		D			D			A				F
Intersection Summary												
HCM 2000 Control Delay		152.5										
HCM 2000 Volume to Capacity ratio		1.28										
Actuated Cycle Length (s)		130.0										
Intersection Capacity Utilization		126.4%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	12
Future Volume (vph)	12
Ideal Flow (vphpl)	1600
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.85
Growth Factor (vph)	100%
Adj. Flow (vph)	14
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	17
Confl. Bikes (#/hr)	4
Bus Blockages (#/hr)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	97	13	339	82	198	21	994	262	437	2242	73
Future Volume (vph)	63	97	13	339	82	198	21	994	262	437	2242	73
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.95	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1536		1490	1569	1271	1490	2843		1490	2959	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1536		1490	1569	1271	1490	2843		1490	2959	
Peak-hour factor, PHF	0.69	0.69	0.69	0.82	0.82	0.82	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	91	141	19	413	100	241	25	1169	308	514	2638	86
RTOR Reduction (vph)	0	4	0	0	0	192	0	19	0	0	1	0
Lane Group Flow (vph)	91	156	0	413	100	49	25	1458	0	514	2723	0
Confl. Peds. (#/hr)			7			20			10			17
Confl. Bikes (#/hr)			2			3			9			11
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	12.9	18.3		21.0	26.4	26.4	5.3	40.8		33.1	68.6	
Effective Green, g (s)	12.9	18.3		21.0	26.4	26.4	5.3	40.8		33.1	68.6	
Actuated g/C Ratio	0.10	0.14		0.16	0.20	0.20	0.04	0.31		0.25	0.53	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	147	216		240	318	258	60	892		379	1561	
v/s Ratio Prot	0.06	c0.10		c0.28	0.06		0.02	0.51		c0.34	c0.92	
v/s Ratio Perm						0.04						
v/c Ratio	0.62	0.72		1.72	0.31	0.19	0.42	1.64		1.36	1.74	
Uniform Delay, d1	56.2	53.4		54.5	44.1	42.9	60.8	44.6		48.5	30.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.95	0.81		1.27	0.91	
Incremental Delay, d2	6.5	10.6		341.4	0.4	0.3	2.8	290.0		161.9	335.1	
Delay (s)	62.7	64.0		395.9	44.5	43.2	60.5	326.3		223.5	363.1	
Level of Service	E	E		F	D	D	E	F		F	F	
Approach Delay (s)		63.5			236.6			321.9			341.0	
Approach LOS		E			F			F			F	
Intersection Summary												
HCM 2000 Control Delay			310.2									F
HCM 2000 Volume to Capacity ratio			1.57									
Actuated Cycle Length (s)			130.0									
Intersection Capacity Utilization			122.7%									H
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	781	14	0	517	1453	1187
Future Volume (vph)	781	14	0	517	1453	1187
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.98		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1303		2980	2980	2218
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1303		2980	2980	2218
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	919	16	0	608	1709	1396
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	919	14	0	608	1709	1396
Confl. Peds. (#/hr)		7				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						2
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	659		1269	1269	2218
v/s Ratio Prot	0.32			0.20	c0.57	
v/s Ratio Perm		0.01				c0.63
v/c Ratio	0.63	0.02		0.48	1.35	0.63
Uniform Delay, d1	23.2	16.0		26.9	37.3	0.0
Progression Factor	1.00	1.00		1.00	0.71	1.00
Incremental Delay, d2	2.1	0.1		1.3	156.5	0.1
Delay (s)	25.3	16.1		28.2	183.1	0.1
Level of Service	C	B		C	F	A
Approach Delay (s)	25.1			28.2	100.9	
Approach LOS	C			C	F	

Intersection Summary

HCM 2000 Control Delay	76.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.8
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

01/10/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	↱
Traffic Volume (vph)	209	19	63	29	57	218	58	1646	19	27	1223	239
Future Volume (vph)	209	19	63	29	57	218	58	1646	19	27	1223	239
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.98	
Flt Protected		0.96	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1500	1294		1543	1307	1391	2874		1391	4038	
Flt Permitted		0.64	1.00		0.70	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1007	1294		1102	1307	1391	2874		1391	4038	
Peak-hour factor, PHF	0.69	0.69	0.69	0.76	0.76	0.76	0.84	0.84	0.84	0.84	0.84	0.84
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	303	28	91	38	75	287	69	1960	23	32	1456	285
RTOR Reduction (vph)	0	0	38	0	0	120	0	0	0	0	22	0
Lane Group Flow (vph)	0	331	53	0	113	167	69	1983	0	32	1719	0
Confl. Peds. (#/hr)			14			4			20			
Confl. Bikes (#/hr)						6			1			
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		40.4	40.4		40.4	40.4	9.2	70.7		6.1	67.6	
Effective Green, g (s)		40.4	40.4		40.4	40.4	9.2	70.7		6.1	67.6	
Actuated g/C Ratio		0.31	0.31		0.31	0.31	0.07	0.54		0.05	0.52	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		312	402		342	406	98	1563		65	2099	
v/s Ratio Prot							c0.05	c0.69		0.02	0.43	
v/s Ratio Perm		c0.33	0.04		0.10	0.13						
v/c Ratio		1.06	0.13		0.33	0.41	0.70	1.27		0.49	0.82	
Uniform Delay, d1		44.8	32.2		34.4	35.4	59.1	29.6		60.4	26.1	
Progression Factor		1.00	1.00		1.00	1.00	1.18	0.71		1.00	1.00	
Incremental Delay, d2		67.9	0.1		0.6	0.7	9.7	123.1		5.8	3.7	
Delay (s)		112.7	32.3		35.0	36.1	79.3	144.3		66.2	29.8	
Level of Service		F	C		C	D	E	F		E	C	
Approach Delay (s)		95.4			35.8			142.1			30.5	
Approach LOS		F			D			F			C	
Intersection Summary												
HCM 2000 Control Delay			86.1									F
HCM 2000 Volume to Capacity ratio			1.18									
Actuated Cycle Length (s)			130.0								12.8	
Intersection Capacity Utilization			101.1%								G	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	19	34	1	120	5	1614	26	35	1275	0
Future Volume (vph)	15	0	19	34	1	120	5	1614	26	35	1275	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		0.99	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1470	1305		1482	1299	1391	2861		1391	2870	
Flt Permitted		0.73	1.00		0.74	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1130	1305		1146	1299	1391	2861		1391	2870	
Peak-hour factor, PHF	0.73	0.73	0.73	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	21	0	26	40	1	141	6	1899	31	41	1500	0
RTOR Reduction (vph)	0	0	23	0	0	125	0	1	0	0	0	0
Lane Group Flow (vph)	0	21	3	0	41	16	6	1929	0	41	1500	0
Confl. Peds. (#/hr)	9		6	6		9			8			12
Confl. Bikes (#/hr)									7			2
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	2	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		15.2	15.2		15.2	15.2	2.6	92.1		10.5	100.0	
Effective Green, g (s)		15.2	15.2		15.2	15.2	2.6	92.1		10.5	100.0	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.02	0.71		0.08	0.77	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		132	152		133	151	27	2026		112	2207	
v/s Ratio Prot							0.00	c0.67		c0.03	c0.52	
v/s Ratio Perm		0.02	0.00		c0.04	0.01						
v/c Ratio		0.16	0.02		0.31	0.11	0.22	0.95		0.37	0.68	
Uniform Delay, d1		51.6	50.8		52.6	51.3	62.7	17.0		56.6	7.3	
Progression Factor		1.00	1.00		1.00	1.00	0.90	1.31		0.59	0.90	
Incremental Delay, d2		0.6	0.1		1.3	0.3	0.4	1.5		1.3	1.1	
Delay (s)		52.2	50.9		53.9	51.7	56.5	23.8		34.8	7.6	
Level of Service		D	D		D	D	E	C		C	A	
Approach Delay (s)		51.5			52.2			23.9			8.3	
Approach LOS		D			D			C			A	
Intersection Summary												
HCM 2000 Control Delay			19.1									
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			130.0							12.2		
Intersection Capacity Utilization			85.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	52	9	247	84	191	32	1417	34	225	1034	32
Future Volume (vph)	111	52	9	247	84	191	32	1417	34	225	1034	32
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1529		1490	1569	1293	1391	2857		1391	2865	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1529		1490	1569	1293	1391	2857		1391	2865	
Peak-hour factor, PHF	0.76	0.76	0.76	0.85	0.85	0.85	0.85	0.85	0.85	0.78	0.78	0.78
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	146	68	12	291	99	225	38	1667	40	288	1326	41
RTOR Reduction (vph)	0	5	0	0	0	190	0	1	0	0	1	0
Lane Group Flow (vph)	146	75	0	291	99	35	38	1706	0	288	1366	0
Confl. Peds. (#/hr)			1			9			6			5
Confl. Bikes (#/hr)			2			3			3			6
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	17.0	16.5		21.0	20.5	20.5	7.7	42.1		33.6	68.0	
Effective Green, g (s)	17.0	16.5		21.0	20.5	20.5	7.7	42.1		33.6	68.0	
Actuated g/C Ratio	0.13	0.13		0.16	0.16	0.16	0.06	0.32		0.26	0.52	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	194	194		240	247	203	82	925		359	1498	
v/s Ratio Prot	0.10	0.05		c0.20	c0.06		0.03	c0.60		c0.21	c0.48	
v/s Ratio Perm						0.03						
v/c Ratio	0.75	0.39		1.21	0.40	0.17	0.46	1.84		0.80	0.91	
Uniform Delay, d1	54.5	52.1		54.5	49.2	47.4	59.2	44.0		45.1	28.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.11	1.04		0.70	1.45	
Incremental Delay, d2	14.5	0.9		127.7	0.8	0.3	2.2	382.9		9.7	8.2	
Delay (s)	69.0	53.0		182.2	50.0	47.7	67.8	428.7		41.2	49.3	
Level of Service	E	D		F	D	D	E	F		D	D	
Approach Delay (s)		63.3			111.7			420.9			47.9	
Approach LOS		E			F			F			D	
Intersection Summary												
HCM 2000 Control Delay			211.4									F
HCM 2000 Volume to Capacity ratio			1.21									
Actuated Cycle Length (s)			130.0							16.8		
Intersection Capacity Utilization			96.2%									F
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	866	6	0	661	407	921
Future Volume (vph)	866	6	0	661	407	921
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Lane Width	12	12	10	11	11	11
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.97		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1288		2881	2881	2138
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1288		2881	2881	2138
Peak-hour factor, PHF	0.84	0.84	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	1031	7	0	778	479	1084
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	1031	6	0	778	479	1084
Confl. Peds. (#/hr)		16				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						3
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	651		1227	1227	2138
v/s Ratio Prot	c0.36			c0.27	0.17	
v/s Ratio Perm		0.00				0.51
v/c Ratio	0.70	0.01		0.63	0.39	0.51
Uniform Delay, d1	24.6	15.9		29.3	25.7	0.0
Progression Factor	1.00	1.00		1.00	0.57	1.00
Incremental Delay, d2	2.9	0.0		2.5	0.3	0.3
Delay (s)	27.5	16.0		31.8	15.0	0.3
Level of Service	C	B		C	B	A
Approach Delay (s)	27.4			31.8	4.8	
Approach LOS	C			C	A	
Intersection Summary						
HCM 2000 Control Delay		18.0		HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio		0.67				
Actuated Cycle Length (s)		130.0		Sum of lost time (s)		8.8
Intersection Capacity Utilization		58.4%		ICU Level of Service		B
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

1: Fair Oaks Ave & Ahwanee Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	37	93	24	13	49	44	1140	52	96	2642	200
Future Volume (vph)	106	37	93	24	13	49	44	1140	52	96	2642	200
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.91	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1513	1302		1519	1312	1391	2857		1391	4090	
Flt Permitted		0.75	1.00		0.73	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1180	1302		1151	1312	1391	2857		1391	4090	
Peak-hour factor, PHF	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	125	44	109	30	16	61	52	1341	61	113	3108	235
RTOR Reduction (vph)	0	0	89	0	0	50	0	2	0	0	5	0
Lane Group Flow (vph)	0	169	20	0	46	11	52	1400	0	113	3338	0
Confl. Peds. (#/hr)			7			2			9			
Confl. Bikes (#/hr)			2			1			2			4
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)		24.2	24.2		24.2	24.2	9.6	80.2		12.8	83.4	
Effective Green, g (s)		24.2	24.2		24.2	24.2	9.6	80.2		12.8	83.4	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.07	0.62		0.10	0.64	
Clearance Time (s)		4.6	4.6		4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		219	242		214	244	102	1762		136	2623	
v/s Ratio Prot							0.04	0.49		c0.08	c0.82	
v/s Ratio Perm		c0.14	0.02		0.04	0.01						
v/c Ratio		0.77	0.08		0.21	0.05	0.51	0.79		0.83	1.27	
Uniform Delay, d1		50.3	43.7		44.8	43.4	57.9	18.7		57.5	23.3	
Progression Factor		1.00	1.00		1.00	1.00	1.31	1.75		1.00	1.00	
Incremental Delay, d2		15.4	0.1		0.5	0.1	3.2	3.0		33.0	125.8	
Delay (s)		65.7	43.9		45.4	43.5	79.1	35.8		90.6	149.1	
Level of Service		E	D		D	D	E	D		F	F	
Approach Delay (s)		57.1			44.3			37.4			147.2	
Approach LOS		E			D			D			F	
Intersection Summary												
HCM 2000 Control Delay		110.2										
HCM 2000 Volume to Capacity ratio		1.14										
Actuated Cycle Length (s)		130.0								12.8		
Intersection Capacity Utilization		102.7%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	8	0	9	32	2	53	4	19	1097	43	93	2663
Future Volume (vph)	8	0	9	32	2	53	4	19	1097	43	93	2663
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	10	11	11	10	11
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.99		1.00	1.00
Flt Protected		0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1490	1285		1497	1285		1391	2847		1391	2867
Flt Permitted		0.73	1.00		0.74	1.00		0.42	1.00		0.95	1.00
Satd. Flow (perm)		1147	1285		1166	1285		610	2847		1391	2867
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	11	0	12	38	2	62	5	22	1291	51	109	3133
RTOR Reduction (vph)	0	0	11	0	0	56	0	0	2	0	0	0
Lane Group Flow (vph)	0	11	1	0	40	6	0	27	1340	0	109	3147
Confl. Peds. (#/hr)			15			16				14		
Confl. Bikes (#/hr)										5		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	custom	Prot	NA		Prot	NA
Protected Phases		4			8			1	6		5	2
Permitted Phases	4		4	8		8	1					
Actuated Green, G (s)		13.5	13.5		13.5	13.5		9.6	89.3		15.0	94.7
Effective Green, g (s)		13.5	13.5		13.5	13.5		9.6	89.3		15.0	94.7
Actuated g/C Ratio		0.10	0.10		0.10	0.10		0.07	0.69		0.12	0.73
Clearance Time (s)		4.0	4.0		4.0	4.0		4.0	4.2		4.0	4.2
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	6.0		3.0	6.0
Lane Grp Cap (vph)		119	133		121	133		45	1955		160	2088
v/s Ratio Prot								c0.47			0.08	c1.10
v/s Ratio Perm		0.01	0.00		c0.03	0.01		0.04				
v/c Ratio		0.09	0.01		0.33	0.05		0.60	0.69		0.68	1.51
Uniform Delay, d1		52.7	52.3		54.1	52.5		58.3	12.0		55.2	17.6
Progression Factor		1.00	1.00		1.00	1.00		0.54	0.66		1.16	0.99
Incremental Delay, d2		0.3	0.0		1.6	0.2		1.9	0.2		1.1	228.4
Delay (s)		53.0	52.3		55.7	52.6		33.6	8.1		65.3	245.8
Level of Service		D	D		E	D		C	A		E	F
Approach Delay (s)		52.6			53.8			8.6				239.8
Approach LOS		D			D			A				F
Intersection Summary												
HCM 2000 Control Delay		168.3										
HCM 2000 Volume to Capacity ratio		1.32										
Actuated Cycle Length (s)		130.0							12.2			
Intersection Capacity Utilization		126.4%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Fair Oaks Ave & Caliente Dr

11/8/2016

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	12
Future Volume (vph)	12
Ideal Flow (vphpl)	1600
Lane Width	11
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.85
Growth Factor (vph)	100%
Adj. Flow (vph)	14
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	17
Confl. Bikes (#/hr)	4
Bus Blockages (#/hr)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

3: Fair Oaks Ave & E Duane Ave

11/8/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	97	13	339	82	198	21	994	262	437	2242	73
Future Volume (vph)	63	97	13	339	82	198	21	994	262	437	2242	73
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Width	12	12	12	12	12	12	10	11	11	10	11	11
Total Lost time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.95	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1490	1536		1490	1569	1271	1391	2748		1391	2860	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1490	1536		1490	1569	1271	1391	2748		1391	2860	
Peak-hour factor, PHF	0.69	0.69	0.69	0.82	0.82	0.82	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	91	141	19	413	100	241	25	1169	308	514	2638	86
RTOR Reduction (vph)	0	4	0	0	0	192	0	19	0	0	1	0
Lane Group Flow (vph)	91	156	0	413	100	49	25	1458	0	514	2723	0
Confl. Peds. (#/hr)			7			20			10			17
Confl. Bikes (#/hr)			2			3			9			11
Bus Blockages (#/hr)	0	0	0	0	0	0	0	2	0	0	0	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases						8						
Actuated Green, G (s)	12.9	18.3		21.0	26.4	26.4	5.4	40.8		33.1	68.5	
Effective Green, g (s)	12.9	18.3		21.0	26.4	26.4	5.4	40.8		33.1	68.5	
Actuated g/C Ratio	0.10	0.14		0.16	0.20	0.20	0.04	0.31		0.25	0.53	
Clearance Time (s)	4.0	4.6		4.0	4.6	4.6	4.0	4.2		4.0	4.2	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.5	6.0		2.5	6.0	
Lane Grp Cap (vph)	147	216		240	318	258	57	862		354	1507	
v/s Ratio Prot	0.06	c0.10		c0.28	0.06		0.02	0.53		c0.37	c0.95	
v/s Ratio Perm						0.04						
v/c Ratio	0.62	0.72		1.72	0.31	0.19	0.44	1.69		1.45	1.81	
Uniform Delay, d1	56.2	53.4		54.5	44.1	42.9	60.8	44.6		48.5	30.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.94	0.82		1.27	0.92	
Incremental Delay, d2	6.5	10.6		341.4	0.4	0.3	3.2	315.5		204.8	363.2	
Delay (s)	62.7	64.0		395.9	44.5	43.2	60.5	352.2		266.1	391.4	
Level of Service	E	E		F	D	D	E	F		F	F	
Approach Delay (s)		63.5			236.6			347.4			371.5	
Approach LOS		E			F			F			F	
Intersection Summary												
HCM 2000 Control Delay			334.0									F
HCM 2000 Volume to Capacity ratio			1.62									
Actuated Cycle Length (s)			130.0							16.8		
Intersection Capacity Utilization			122.7%								H	
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: N Wolf Ave & Fair Oaks Ave

11/8/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←←
Traffic Volume (vph)	781	14	0	517	1453	1187
Future Volume (vph)	781	14	0	517	1453	1187
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600
Lane Width	12	12	10	11	11	11
Total Lost time (s)	4.2	4.2		4.6	4.6	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	0.88
Frpb, ped/bikes	1.00	0.98		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	2891	1303		2881	2881	2144
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	2891	1303		2881	2881	2144
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor (vph)	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	919	16	0	608	1709	1396
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	919	14	0	608	1709	1396
Confl. Peds. (#/hr)		7				
Confl. Bikes (#/hr)		5				
Parking (#/hr)						2
Turn Type	Prot	Perm		NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	65.8	65.8		55.4	55.4	130.0
Effective Green, g (s)	65.8	65.8		55.4	55.4	130.0
Actuated g/C Ratio	0.51	0.51		0.43	0.43	1.00
Clearance Time (s)	4.2	4.2		4.6	4.6	
Vehicle Extension (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	1463	659		1227	1227	2144
v/s Ratio Prot	0.32			0.21	0.59	
v/s Ratio Perm		0.01				0.65
v/c Ratio	0.63	0.02		0.50	1.39	0.65
Uniform Delay, d1	23.2	16.0		27.1	37.3	0.0
Progression Factor	1.00	1.00		1.00	0.71	1.00
Incremental Delay, d2	2.1	0.1		1.4	177.2	0.1
Delay (s)	25.3	16.1		28.6	203.8	0.1
Level of Service	C	B		C	F	A
Approach Delay (s)	25.1			28.6	112.3	
Approach LOS	C			C	F	
Intersection Summary						
HCM 2000 Control Delay		83.8		HCM 2000 Level of Service		F
HCM 2000 Volume to Capacity ratio		1.01				
Actuated Cycle Length (s)		130.0		Sum of lost time (s)		8.8
Intersection Capacity Utilization		81.5%		ICU Level of Service		D
Analysis Period (min)		15				
c Critical Lane Group						

Queuing and Blocking Report
Existing Conditions - AM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	232	123	190	84	80	158	163	70	193	181	184	41
Average Queue (ft)	155	68	110	69	52	99	106	30	147	130	134	11
95th Queue (ft)	270	153	254	101	98	177	189	78	215	198	196	63
Link Distance (ft)	430		430			723	723		139	139	139	1121
Upstream Blk Time (%)								0	10	5	7	
Queuing Penalty (veh)								0	0	0	0	
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	32	0	6	23	2	9			14			
Queuing Penalty (veh)	17	0	11	17	11	5			3			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	60
Average Queue (ft)	16
95th Queue (ft)	93
Link Distance (ft)	1121
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR
Maximum Queue (ft)	28	34	60	80	14	49	55	50	67	64	83
Average Queue (ft)	11	10	21	56	4	16	28	29	34	34	40
95th Queue (ft)	36	38	66	92	19	59	66	61	78	77	95
Link Distance (ft)	115		494			835	835		723	723	723
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		40		70	50			70			
Storage Blk Time (%)	1	0	1	10	1	1		3	2		
Queuing Penalty (veh)	0	0	1	3	5	0		10	1		

Queuing and Blocking Report
Existing Conditions - AM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	TR
Maximum Queue (ft)	71	131	183	331	80	61	473	480	94	219	289	338
Average Queue (ft)	57	70	156	155	58	24	344	340	84	152	175	259
95th Queue (ft)	85	159	209	365	97	76	530	529	106	262	308	383
Link Distance (ft)		502		451			941	941		835	835	835
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	50		160		60	75			70			
Storage Blk Time (%)	39	19	24	11	10	4	43		33	3		
Queuing Penalty (veh)	20	18	51	40	28	22	12		88	5		

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	242	205	25	225	188	137	155	278	12
Average Queue (ft)	191	144	7	176	135	88	97	57	3
95th Queue (ft)	273	243	35	243	214	149	167	391	17
Link Distance (ft)	436	436		478	478	941	941	941	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)			40					60	
Storage Blk Time (%)		26	0					0	
Queuing Penalty (veh)		1	0					0	

Network Summary

Network wide Queuing Penalty: 369

Queuing and Blocking Report
Existing Conditions - PM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	190	116	54	32	76	271	290	117	221	210	206	498
Average Queue (ft)	109	61	28	19	34	195	215	73	205	176	170	309
95th Queue (ft)	202	135	66	42	99	324	339	134	248	233	231	743
Link Distance (ft)	430		430			723	723		139	139	139	1121
Upstream Blk Time (%)								0	21	13	15	
Queuing Penalty (veh)								0	0	0	0	
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	18	0	4	0	1	14		5	23			
Queuing Penalty (veh)	15	0	2	0	3	5		38	19			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	585
Average Queue (ft)	325
95th Queue (ft)	822
Link Distance (ft)	1121
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	UL	T	TR	L	T	T	TR
Maximum Queue (ft)	27	26	62	51	33	57	85	88	379	405	385
Average Queue (ft)	8	11	28	26	14	22	45	64	179	182	177
95th Queue (ft)	30	35	79	62	43	61	93	108	424	436	428
Link Distance (ft)	115		494			835	835		723	723	723
Upstream Blk Time (%)										0	0
Queuing Penalty (veh)										0	0
Storage Bay Dist (ft)		40		70	50			70			
Storage Blk Time (%)	2	2	2	0	5	2		26	7		
Queuing Penalty (veh)	0	0	1	0	24	0		196	5		

Queuing and Blocking Report
Existing Conditions - PM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	TR
Maximum Queue (ft)	71	147	184	450	80	54	375	399	95	685	708	635
Average Queue (ft)	41	89	178	354	54	21	269	285	93	514	508	451
95th Queue (ft)	81	178	207	608	99	65	413	438	98	761	794	732
Link Distance (ft)		502		451			941	941		835	835	835
Upstream Blk Time (%)				19						0	0	0
Queuing Penalty (veh)				0						1	2	2
Storage Bay Dist (ft)	50		160		60	75			70			
Storage Blk Time (%)	24	32	59	10	3		39		72	6		
Queuing Penalty (veh)	23	17	133	44	12		7		455	21		

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	197	198	48	151	124	256	271	114	30
Average Queue (ft)	148	141	16	112	77	180	193	26	10
95th Queue (ft)	230	233	55	171	143	301	314	233	36
Link Distance (ft)	436	436		478	478	941	941	941	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)			40					60	
Storage Blk Time (%)		32	0					0	0
Queuing Penalty (veh)		4	1					0	0

Network Summary

Network wide Queuing Penalty: 1031

Queuing and Blocking Report
Existing Conditions with Project - AM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	222	110	195	85	82	181	194	84	189	157	179	23
Average Queue (ft)	152	52	114	73	48	113	126	38	136	113	117	5
95th Queue (ft)	261	131	235	104	92	205	217	93	216	183	191	28
Link Distance (ft)	434		433			722	722		139	139	139	1121
Upstream Blk Time (%)								0	7	4	6	
Queuing Penalty (veh)								0	0	0	0	
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	26	0	12	19	2	14			12			
Queuing Penalty (veh)	14	0	22	14	14	7			3			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	41
Average Queue (ft)	8
95th Queue (ft)	53
Link Distance (ft)	1121
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR
Maximum Queue (ft)	34	25	77	87	15	82	111	50	51	60	73
Average Queue (ft)	13	7	28	54	5	26	43	26	28	25	39
95th Queue (ft)	39	33	87	95	20	92	124	63	62	65	87
Link Distance (ft)	118		498			835	835		722	722	722
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		40		70	50			70			
Storage Blk Time (%)	2	0	2	10		2		2	1		
Queuing Penalty (veh)	0	0	2	3		0		6	0		

Queuing and Blocking Report
Existing Conditions with Project - AM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	TR
Maximum Queue (ft)	74	152	182	308	83	68	483	491	94	229	243	307
Average Queue (ft)	58	78	158	183	65	34	370	384	87	168	179	243
95th Queue (ft)	87	169	212	408	101	80	576	594	108	290	299	369
Link Distance (ft)		506		454			938	938		835	835	835
Upstream Blk Time (%)				2								
Queuing Penalty (veh)				0								
Storage Bay Dist (ft)	50		160		60	75			70			
Storage Blk Time (%)	48	17	28	12	12	1	45		37	1		
Queuing Penalty (veh)	26	15	60	44	33	9	13		98	2		

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	250	213	21	257	214	111	128	112	13
Average Queue (ft)	191	147	6	187	142	74	87	23	3
95th Queue (ft)	265	237	33	272	245	129	140	246	23
Link Distance (ft)	436	436		478	478	938	938	938	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)			40						60
Storage Blk Time (%)		27	0						
Queuing Penalty (veh)		1	0						

Network Summary

Network wide Queuing Penalty: 387

Queuing and Blocking Report
Existing Conditions with Project - PM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	160	117	45	43	68	298	304	134	215	209	205	492
Average Queue (ft)	101	63	25	21	34	195	216	78	202	180	166	294
95th Queue (ft)	178	135	58	52	87	352	365	142	248	232	224	732
Link Distance (ft)	434		433			722	722		139	139	139	1121
Upstream Blk Time (%)								0	19	15	12	0
Queuing Penalty (veh)								0	0	0	0	0
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	18	0	1	0	0	12		2	20			
Queuing Penalty (veh)	15	0	0	0	0	5		17	17			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	531
Average Queue (ft)	300
95th Queue (ft)	785
Link Distance (ft)	1121
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	UL	T	TR	L	T	T	TR
Maximum Queue (ft)	28	37	36	43	31	74	94	86	347	371	348
Average Queue (ft)	7	14	22	23	15	26	48	60	194	207	199
95th Queue (ft)	29	45	51	53	39	84	110	99	405	427	389
Link Distance (ft)	118		498			835	835		722	722	722
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		40		70	50			70			
Storage Blk Time (%)	1	2	0	0	3	3		23	10		
Queuing Penalty (veh)	0	0	0	0	15	1		177	8		

Queuing and Blocking Report
Existing Conditions with Project - PM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	T	TR
Maximum Queue (ft)	62	158	184	413	80	55	399	404	95	756	771	705
Average Queue (ft)	39	88	173	299	53	25	286	305	92	529	529	484
95th Queue (ft)	78	190	207	577	92	76	457	459	101	831	870	823
Link Distance (ft)		506		454			938	938		835	835	835
Upstream Blk Time (%)				9						0	1	1
Queuing Penalty (veh)				0						2	6	5
Storage Bay Dist (ft)	50		160		60	75			70			
Storage Blk Time (%)	27	36	51	8	4	4	43		71	7		
Queuing Penalty (veh)	26	19	114	37	16	13	8		445	25		

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	206	178	50	168	148	282	291	25	31
Average Queue (ft)	144	125	20	120	94	179	190	10	10
95th Queue (ft)	218	208	60	191	176	306	314	33	32
Link Distance (ft)	436	436		478	478	938	938	938	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			40					60	
Storage Blk Time (%)		29	0				0	0	
Queuing Penalty (veh)		4	1				0	0	

Network Summary

Network wide Queuing Penalty: 974

Queuing and Blocking Report
Future Conditions - AM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	246	114	175	84	93	241	251	88	212	195	196	92
Average Queue (ft)	178	61	102	71	57	156	163	38	182	157	152	34
95th Queue (ft)	322	143	207	100	117	269	273	96	245	224	230	108
Link Distance (ft)	430		430			722	722		139	139	139	1121
Upstream Blk Time (%)								0	19	13	15	
Queuing Penalty (veh)								0	0	0	0	
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	32	0	9	19	5	19			22			
Queuing Penalty (veh)	20	0	21	16	37	11			6			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	142
Average Queue (ft)	46
95th Queue (ft)	160
Link Distance (ft)	1121
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	34	40	82	82	13	68	89	47	88	122
Average Queue (ft)	14	17	47	54	3	36	52	27	42	77
95th Queue (ft)	40	50	101	100	15	84	109	57	110	153
Link Distance (ft)	126		494			835	835		722	722
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		40		70	50			70		
Storage Blk Time (%)	1	2	3	9		6		2	4	
Queuing Penalty (veh)	0	0	4	3		0		11	1	

Queuing and Blocking Report
Future Conditions - AM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	74	165	184	398	85	61	794	793	94	624	666
Average Queue (ft)	61	97	168	252	63	31	573	572	91	456	548
95th Queue (ft)	90	201	218	502	105	82	923	920	100	718	739
Link Distance (ft)		514		451			940	940		835	835
Upstream Blk Time (%)				9			3	3			1
Queuing Penalty (veh)				0			21	20			4
Storage Bay Dist (ft)	50		160		60	75			70		
Storage Blk Time (%)	45	17	32	13	15	2	54		68	5	
Queuing Penalty (veh)	28	19	88	57	49	14	17		351	12	

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	317	276	31	264	235	176	338	85	68
Average Queue (ft)	253	207	7	204	162	112	184	80	55
95th Queue (ft)	382	348	37	284	264	184	384	96	93
Link Distance (ft)	436	436		478	478	940	940		
Upstream Blk Time (%)	3	2							
Queuing Penalty (veh)	0	0							
Storage Bay Dist (ft)			40					60	60
Storage Blk Time (%)		38	0			12	2	2	
Queuing Penalty (veh)		2	0			106	4	3	

Network Summary

Network wide Queuing Penalty: 926

Queuing and Blocking Report
Future Conditions - PM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	173	122	64	48	85	388	402	132	229	214	218	1160
Average Queue (ft)	113	79	26	26	40	266	290	78	217	201	199	1021
95th Queue (ft)	192	151	69	63	99	442	451	157	238	236	241	1429
Link Distance (ft)	430		430			722	722		139	139	139	1121
Upstream Blk Time (%)								1	45	40	45	42
Queuing Penalty (veh)								0	0	0	0	0
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	17	6	2	1	0	16		1	45			
Queuing Penalty (veh)	16	9	1	0	0	7		13	43			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	1156
Average Queue (ft)	1027
95th Queue (ft)	1423
Link Distance (ft)	1121
Upstream Blk Time (%)	44
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	UL	T	TR	L	T	TR
Maximum Queue (ft)	31	15	55	50	34	90	106	91	718	727
Average Queue (ft)	10	5	27	32	14	33	50	51	530	550
95th Queue (ft)	37	23	70	61	40	123	133	105	938	937
Link Distance (ft)	126		494			835	835		722	722
Upstream Blk Time (%)									5	6
Queuing Penalty (veh)									64	85
Storage Bay Dist (ft)		40		70	50			70		
Storage Blk Time (%)	2	0	4	0	2	4		8	44	
Queuing Penalty (veh)	0	0	2	0	12	1		101	41	

Queuing and Blocking Report
Future Conditions - PM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	70	168	185	472	82	47	752	752	95	851	854
Average Queue (ft)	48	112	179	392	54	23	560	575	92	757	764
95th Queue (ft)	85	210	202	604	100	63	883	889	100	988	978
Link Distance (ft)		514		451			940	940		835	835
Upstream Blk Time (%)				37			1	1		7	9
Queuing Penalty (veh)				0			7	4		97	116
Storage Bay Dist (ft)	50		160		60	75			70		
Storage Blk Time (%)	30	33	61	10	7	0	54		70	4	
Queuing Penalty (veh)	33	21	171	56	29	1	11		780	18	

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	244	233	40	220	193	330	419	85	59
Average Queue (ft)	189	167	13	170	141	228	280	84	39
95th Queue (ft)	279	259	49	239	216	421	511	90	87
Link Distance (ft)	436	436		478	478	940	940		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			40					60	60
Storage Blk Time (%)		36	0			39	1	1	
Queuing Penalty (veh)		5	0			461	10	4	

Network Summary

Network wide Queuing Penalty: 2219

Queuing and Blocking Report
Future Conditions with project - AM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	240	109	177	84	88	253	272	112	211	197	197	97
Average Queue (ft)	169	62	102	74	55	181	198	46	175	144	149	31
95th Queue (ft)	291	147	226	97	115	307	343	114	241	220	221	115
Link Distance (ft)	434		433			721	721		139	139	139	1121
Upstream Blk Time (%)								0	17	13	13	
Queuing Penalty (veh)								0	0	0	0	
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	35	0	7	27	4	26			21			
Queuing Penalty (veh)	22	0	15	23	34	15			6			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	141
Average Queue (ft)	46
95th Queue (ft)	161
Link Distance (ft)	1121
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	35	48	103	88	15	71	72	44	113	152
Average Queue (ft)	16	15	44	60	4	32	35	22	52	82
95th Queue (ft)	46	49	116	97	20	90	88	53	134	180
Link Distance (ft)	130		498			834	834		721	721
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		40		70	50			70		
Storage Blk Time (%)	2	2	3	15		3		1	4	
Queuing Penalty (veh)	0	0	4	5		0		7	2	

Queuing and Blocking Report
 Future Conditions with project - AM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	73	183	184	391	82	81	782	792	94	516	574
Average Queue (ft)	61	113	172	254	65	36	566	573	87	409	490
95th Queue (ft)	92	242	209	512	98	87	913	918	109	618	674
Link Distance (ft)		517		454			938	938		834	834
Upstream Blk Time (%)				5			2	2			
Queuing Penalty (veh)				0			16	18			
Storage Bay Dist (ft)	50		160		60	75			70		
Storage Blk Time (%)	47	24	40	6	18	1	52		59	5	
Queuing Penalty (veh)	28	27	111	28	58	8	17		305	12	

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	305	245	24	292	234	206	400	85	68
Average Queue (ft)	234	184	8	220	174	127	212	80	60
95th Queue (ft)	361	299	36	312	253	234	457	93	86
Link Distance (ft)	436	436		478	478	938	938		
Upstream Blk Time (%)	2	2							
Queuing Penalty (veh)	0	0							
Storage Bay Dist (ft)			40					60	60
Storage Blk Time (%)		34	0				13	3	1
Queuing Penalty (veh)		2	0				119	6	3

Network Summary

Network wide Queuing Penalty: 892

Queuing and Blocking Report
 Future Conditions with project - PM Peak

11/8/2016

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	B15
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	TR	T
Maximum Queue (ft)	194	119	72	51	81	366	382	127	220	214	216	1153
Average Queue (ft)	120	69	33	27	40	270	290	65	214	200	201	1037
95th Queue (ft)	219	142	79	65	97	438	452	145	226	241	234	1363
Link Distance (ft)	434		433			721	721		139	139	139	1121
Upstream Blk Time (%)								0	47	37	46	41
Queuing Penalty (veh)								0	0	0	0	0
Storage Bay Dist (ft)		100		60	100			115				
Storage Blk Time (%)	24	3	6	0	1	17		3	47			
Queuing Penalty (veh)	22	5	3	0	5	8		25	45			

Intersection: 1: Fair Oaks Ave & Ahwanee Ave

Movement	B15
Directions Served	T
Maximum Queue (ft)	1154
Average Queue (ft)	1036
95th Queue (ft)	1359
Link Distance (ft)	1121
Upstream Blk Time (%)	42
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Fair Oaks Ave & Caliente Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	UL	T	TR	L	T	TR
Maximum Queue (ft)	31	34	67	47	40	60	83	94	682	695
Average Queue (ft)	9	12	37	33	16	24	43	65	498	510
95th Queue (ft)	35	41	78	71	45	68	95	114	929	947
Link Distance (ft)	130		498			834	834		721	721
Upstream Blk Time (%)									3	5
Queuing Penalty (veh)									43	62
Storage Bay Dist (ft)		40		70	50			70		
Storage Blk Time (%)	2	2	4	1	4	3		18	40	
Queuing Penalty (veh)	0	0	2	0	21	1		234	37	

Queuing and Blocking Report
Future Conditions with project - PM Peak

11/8/2016

Intersection: 3: Fair Oaks Ave & E Duane Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	69	169	184	476	75	50	630	646	95	853	855
Average Queue (ft)	47	112	183	446	44	19	460	472	92	752	764
95th Queue (ft)	93	213	194	563	89	60	799	809	100	993	969
Link Distance (ft)		517		454			938	938		834	834
Upstream Blk Time (%)				44			1	1		5	9
Queuing Penalty (veh)				0			6	3		73	124
Storage Bay Dist (ft)	50		160		60	75			70		
Storage Blk Time (%)	41	38	73	5	3		51		70	4	
Queuing Penalty (veh)	45	24	204	27	13		11		782	15	

Intersection: 4: N Wolf Ave & Fair Oaks Ave

Movement	EB	EB	EB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	T	T	T	T	R	R
Maximum Queue (ft)	253	235	44	196	170	336	519	85	67
Average Queue (ft)	185	157	13	151	126	222	311	80	40
95th Queue (ft)	273	261	49	220	200	408	600	105	89
Link Distance (ft)	436	436		478	478	938	938		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)			40				60	60	
Storage Blk Time (%)		33	0			37	2	1	
Queuing Penalty (veh)		5	0			434	13	6	

Network Summary

Network wide Queuing Penalty: 2299