DRAFT 2/22/16

Single-Access Subdivisions Assessment Project:

Developing a Planning Tool for Evaluating Proposed Developments Accessible by Dead-End Roads

Vol 2: APPENDICES

Prepared for

CAL FIRE and the California Board of Forestry and Fire Protection

By

California Polytechnic State University, San Luis Obispo

CAL POLY
SAN LUIS OBISPO

Appendix 1: Access Model Methodology & Case Study Applications

Single-Access Subdivisions Assessment Project:

Developing a Planning Tool for Evaluating Proposed Developments Accessible Solely by One Dead-End Road

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FULL 12.3

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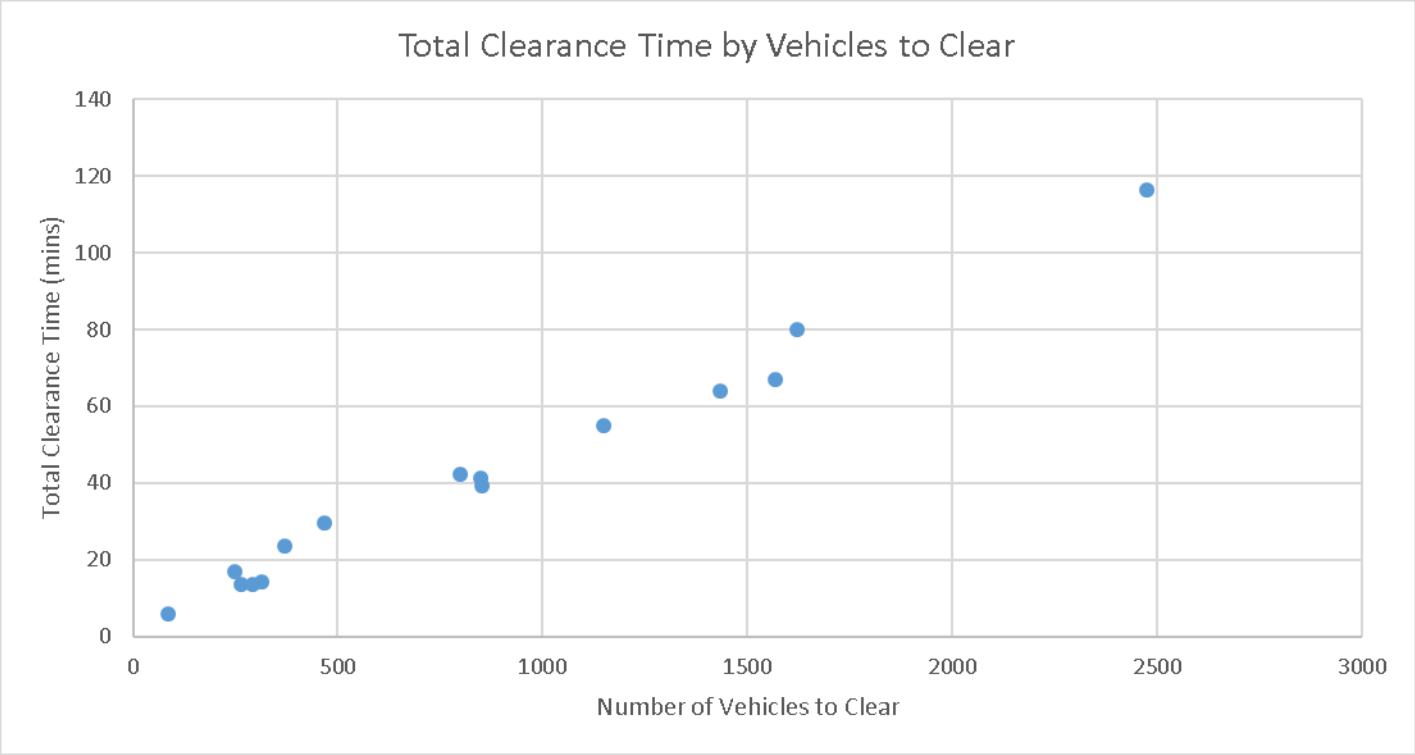
Summary of Case Applications of Access Model

Notes

1. Prototype tool designed to handle up to 250 roadway segments
2. Tool applied to: 1 hypothetical case; 12 existing cases; and 1 proposed case
3. Application to existing cases includes: 1 mixed-use case at Foothill and O'Connor location; cases with effect of dual entrances as at Heritage Ranch; 1 case with effect of smoke from wildland fire at Northwest Lake Tahoe; and 1 case with additional delay at primary through road intersection at Pismo Heights
4. Applications to multiple hypothetical configurations possible under the regulation (4290)

Association Reflected in Case Applications



Summary Table 1: Existing Cases

Case	Case Study	Farthest Vehicle Time (sec)	Farthest Vehicle Delay (sec)	Total Farthest Time (sec)	Vehicles to Clear Out	Average Network/Facility Operating Speed (MPH)	Total Clearance Time (min)
1	Stacked Single-Access – Conceptual sketch only	22	47	68	293	7	13
2	Oakhurst: Meadowview Dr. and Rd 426, Madera County	105	33	138	86	12	6
3	Foothill Blvd and O'Connor Way, SLO County Homes, School , Churches	367	248	615	466	8	30
4	Atascadero Rd and Mission Drive, Morro Bay, SLO County	33	33	66	315	5	14
5	Northwest Lake Tahoe, Truckee, Placer County	730	8	738	1621	8	80
6	Norris Canyon Estates, San Ramon, Contra Costa County	323	200	523	799	9	42
7	Pismo Heights, Pismo Beach, SLO County	217	200	417	1149	6	55
8	Highway 101 and Laetitia Vineyard Dr., Nipomo, SLO County	376	27	402	247	15	17
9	Mission Canyon, Santa Barbara,	190	23	214	853	13	39

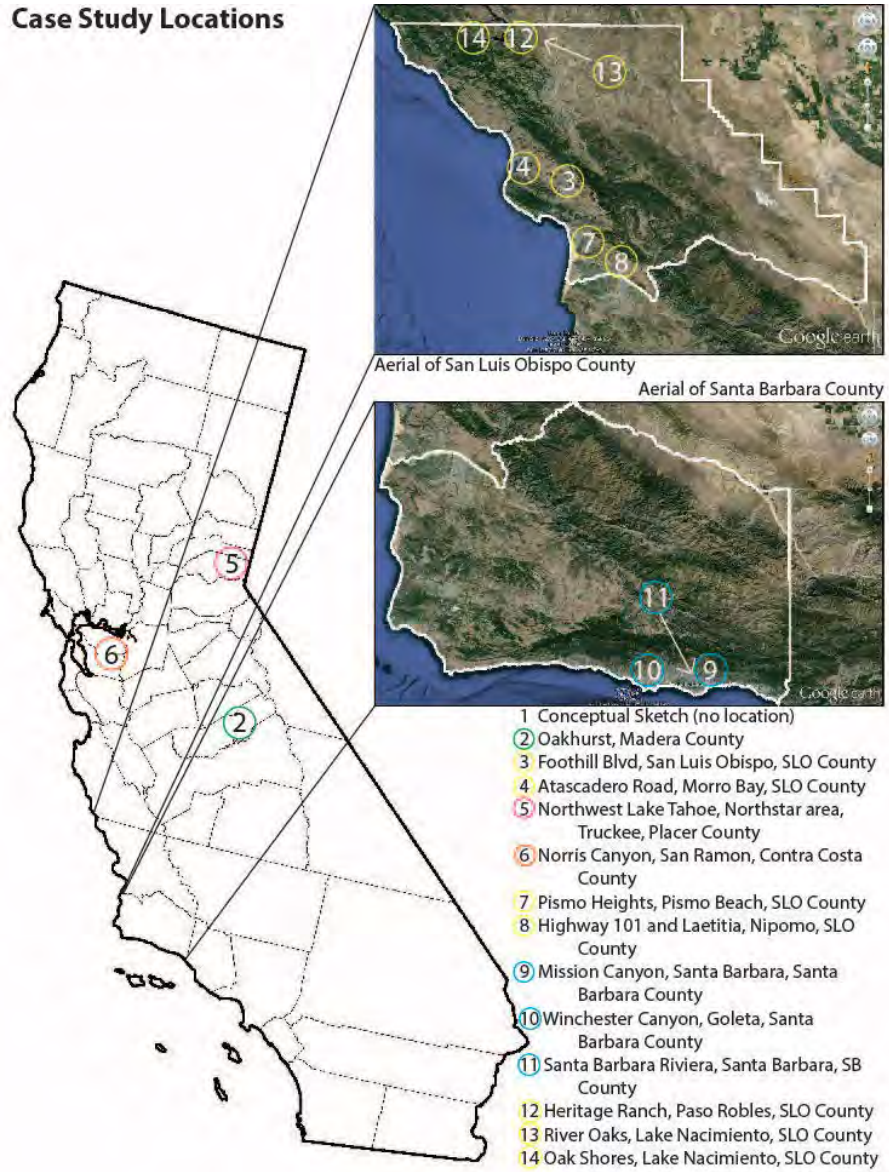
Case	Case Study	Farthest Vehicle Time (sec)	Farthest Vehicle Delay (sec)	Total Farthest Time (sec)	Vehicles to Clear Out	Average Network/Facility Operating Speed (MPH)	Total Clearance Time (min)
	SB County						
10	Westchester Canyon, Goleta Santa Barbara County	475	17	492	369	16	24
11	Santa Barbara Riviera, Santa Barbara, SB County	340	0	340	848	14	41
12.1	Heritage Ranch - Western Entrance, Paso Robles, SLO County	255	0	255	1435	4	64
12.2	Heritage Ranch - Eastern Entrance, Paso Robles, SLO County	765	33	799	2476	6	117
13	River Oaks, Lake Nacimiento, SLO County	122	37	159	264	17	14
14	Oak Shores, Lake Nacimiento, SLO County	44	50	94	1569	9	67

Key

	Homes Only		Mixed-use Development		Proposed Development

00 ~ Flagging: high clearance time estimates above 30 minutes

Locations of Case Studies



1

Case #	Case Study
1	Stacked Single-Access – Conceptual sketch only
2	Oakhurst: Meadowview Dr. and Rd 426, Madera County
3	Foothill Blvd and O'Connor Way, SLO County (Homes, School, Churches)
4	Atascadero Rd and Mission Drive, Morro Bay, SLO County
5	Northwest Lake Tahoe, Truckee, Placer County
6	Norris Canyon Estates, San Ramon, Contra Costa County
7	Pismo Heights, Pismo Beach, SLO County
8	Highway 101 and Laetitia Vineyard Dr., Nipomo, SLO County
9	Mission Canyon, Santa Barbara, SB County
10	Westchester Canyon, Goleta Santa Barbara County
11	Santa Barbara Riviera, Santa Barbara, SB County
12	Heritage Ranch, Paso Robles, SLO County
13	River Oaks, Lake Nacimiento, SLO County
14	Oak Shores, Lake Nacimiento, SLO County

Application Methodology

Input Data

The application of the Access Model requires taking a map of a subdivision and reducing it into a schematic of links and nodes. At a minimum, the information needed along each link includes:

1. Length of link (feet)
2. Directional lanes
3. Posted speed limit OR design speed (mph)
4. Number of houses (existing or proposed)

Several application examples follow.

Additional information required for background calculations of <u>roadway capacity</u> includes:

1. Lane width (feet)
2. Shoulder width (feet)
3. Access-point density (one side per mile)
4. Terrain (level, rolling)
5. Percent no-passing zone (20%, 40%, 80%)
6. Length of passing lane (if present)

Capacity Calculation

This is a multi-step process involving Highway Capacity Methods of the 2010 Highway Capacity Manual (HCM). Procedures are adapted from Chapter 15 of the 2010 HCM.

Capacity Calculation -1

Step 1 : Input Data

Geometric	Default	Entered
Highway class (I, II, or III)	III	III
Lane width (ft)	12	9
Shoulder width (ft)	6	0
Access-point density (one side per mile)	15	15
Terrain	rolling	rolling
Percent no-passing zone (20%, 40%, 80%)	100%	1
Speed limit (mph)	30	30
Base design speed (mph)	40	40
Length of passing lane (if present)	0	0
Pavement condition	4	
Demand Data		
Hourly automobile volume	696	696
Length of analysis period (hrs)	0.25	0.25
Peak hour factor	0.88	0.88
Directional split	0.5	0.5
Heavy vehicle percentage	10%	0.1
Percent occupied on-highway parking	0%	

Step 1: Geometric and Demand Data

↓

Step 2:

34

Capacity Calculation - 2

Step 2: Estimate FFS

A measured FFS is specified 40 mi/h.

Step 3: Demand Adjustment for ATS

3.1 Directional volumes

$V_1 = 900 \times 0.60 = 540$ veh/h — Dir 1:

$V_2 = 900 \times 0.40 = 360$ veh/h — Dir 2:

3.2 A grade adjustment factor is selected from Exhibit 15-9 — Dir 1: Dir 2:

3.3 passenger car equivalents for trucks are selected from Exhibit 15-11 — Dir 1: Dir 2:

3.4 Heavy vehicle factor (Equation 15-4) — Dir 1: Dir 2:

3.5 Demand flow rate (pcph) (Equation 15-3) — Dir 1: Dir 2:

Step 2: Free-Flow Speed

↓

Step 3: Adjust Demand for:

a. Grade
b. Passenger cars
c. Heavy vehicles

35

Capacity Calculation - 3

Step 4: Estimate ATS

Percent no passing zone factor (Exhibit 15-15) — Dir 1: / Dir 2:

Equation 15-6 gives

$ATS_1 = 40.0 - 0.00776(620 + 422) - 2.4 = 29.5$ mi/h — Dir 1:

$ATS_2 = 40.0 - 0.00776(422 + 620) - 1.6 = 30.3$ mi/h — Dir 2:

Steps 5 and 6

Steps 5 and 6 are not used for Class III highways

Step 7: Estimate PFFS

LOS for Class III facilities is based on PFFS achieved: PFFS = ATS/FFS

$PFFS_1 = 29.5/40.0 = 73.8\%$ — Dir 1:

$PFFS_2 = 30.3/40.0 = 75.8\%$ — Dir 2:

Step 4: Average Travel Speed

↓

[Skip 5 & 6]

↓

Step 7: Percent of Free-Flow Speed

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Capacity Calculation - 4

Step 8: Determine LOS and Capacity

$c_{ATS} = 1700 \times f_{g,ATS} \times f_{HV,ATS}$

8.1 Capacity — $c_{1,ATS} = c_{2,ATS} = 1{,}700 \times 1.00 \times 1.00 = 1{,}700$ veh/h — Dir 1:

The capacity in either direction is as follows: — Dir 2:

$C_{1,ATS} = C_{2,ATS} = 1{,}700 \times 1.00 \times 1.00 = 1{,}700$ veh/h

The two-way capacity values implied are 1,700/0.60 = 2,833 veh/h — 2-way volume

Direction 1 capacity = 1,700 veh/h — Dir 1:

Direction 2 capacity = 2,833 - 1,700 = 1,133 veh/h — Dir 2:

Primary direction capacity

8.2 LOS -- Exhibit 15-3

Direction 1 LOS = C based on 73.8 PFFS

Direction 1 LOS = D based on 75.8 PFFS

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50-55	>35-50	>40-55	>83.3-91.7
C	>45-50	>50-65	>55-70	>75.0-83.3
D	>40-45	>65-80	>70-85	>66.7-75.0
E	≤40	>80	>85	≤66.7

Exhibit 15-3
Automobile LOS for Two-Lane Highways

Step 8.1: Determine capacity

↓

Step 8.2: Determine LOS

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Speed and Travel Time Calculation

This is a multi-step process involving Highway Capacity Methods of the 2010 Highway Capacity Manual (HCM). Procedures are adapted from Chapter 16 of the 2010 HCM.

Speed & Travel Time Calculation -1

Step 1: Determine the Base Free-Flow Speed (Equation 16-2)

$$S_{f,i} = \frac{\sum_{i=1}^{m} L_i}{\sum_{i=1}^{m} \frac{L_i}{S_{f,i}}}$$

where

$S_{f,i}$ = base free-flow speed for the facility (mi/h),

L_i = length of segment i (ft),

m = number of segments on the facility, and

$S_{f,i}$ = base free-flow speed for segment i (mi/h).

Step 2: Determine Travel Speed (Equation 16-3)

$$S_{t,i} = \frac{\sum_{i=1}^{m} L_i}{\sum_{i=1}^{m} \frac{L_i}{S_{T,avg,i}}}$$

where $S_{t,i}$ is the travel speed for the facility (mi/h), $S_{T,avg,i}$ is the travel speed of through vehicles for segment i (mi/h), and other variables are as previously defined.

Step 1: Base Free-Flow Speed

↓

Step 2: Travel Speed

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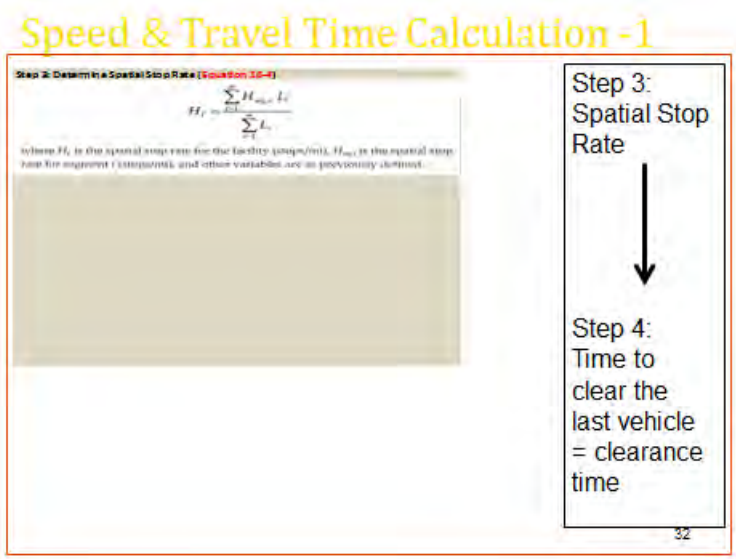


Step 4: Clearance Time

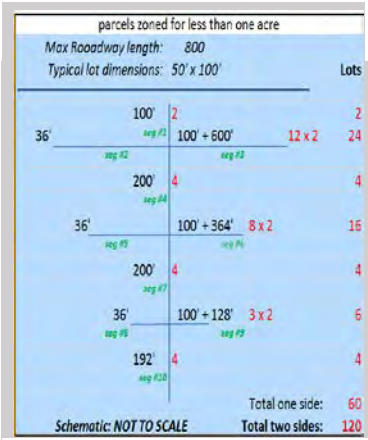
1. Convert number of houses on segment to number of cars to evacuate using UC Census average number of vehicles per house (2.2) for suburban and rural areas
2. Adjust for RVs and trailers in the mix by dividing number of vehicles by a default factor of 0.9, i.e. 10 percent heavy vehicles in the mix
3. Calculate directional queue length as number of vehicles times 25 feet {for average vehicle length with headway gap between vehicles) divided by number of directional lanes
4. Calculate delayed running time as directional queue length divided by segment length multiplied by segment running time
5. Calculate cumulative delay by summing over the series of segments the maximum of zero and the difference between delayed running time and segment running time
6. Bring in segment running speed from Steps 1 thru 3 of HCM Methods.
7. Calculate average roadway speed as the weighted average of segment running speeds
8. Identify the combination of segments that add up to the longest distance to the exit onto the main through road
9. Sum respective segment running times and delays for longest delayed vehicle route and sum for longest delayed vehicle
10. Calculate total vehicle clearance as the product of delay to traverse the through road intersection (of 2.5 seconds) and total number of vehicles plus total time for longest delayed vehicle

Step 5: Through Road Travel Time to "Safe Place"

Involves:

1. Calculation of clearance time from subdivision to a through road
2. Calculation of approach delay at exit point via HCM Methods
3. Adding respective approach delay per vehicle for all vehicles to Clearance Time
4. Application of Capacity and Speed Method (separately described) to determine total travel time on through road to "Safe Place"

The Prototype: Stacked Single Access Example



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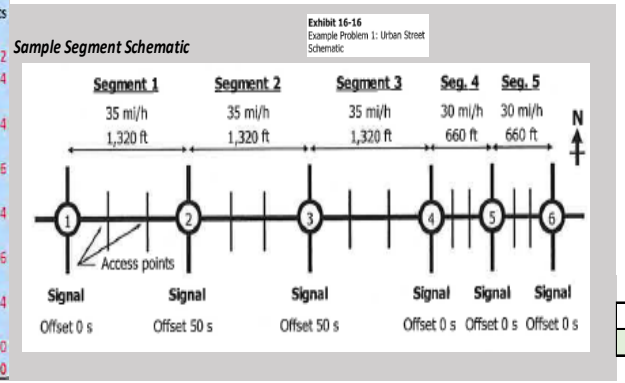
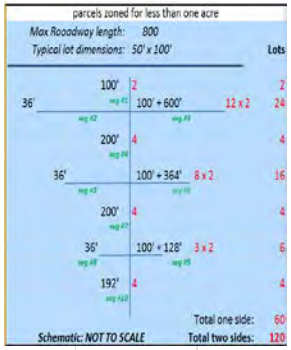
Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	47	68	293	13.4

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Summary

Number of Segments:	10

Average Network/Facility Operating Speed (MPH):	6.6

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	4	100	25	37.4	2.73	1	1	10	244	7	3.9	5.4
Segment 2	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 3	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 4	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 5	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 6	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 7	8	236	25	37.4	6.44	3	1	20	489	13	6.9	5.1
Segment 8	6	228	25	37.4	6.22	4	1	15	367	10	3.8	4.6
Segment 9	6	228	25	37.4	6.22	4	1	15	367	10	3.8	4.6
Segment 10	8	228	25.0	37.4	6.22	4	1	20	489	13	7.1	4.2

	PBFS	LOS		21.8	46.7
Facility	27%	F	Longest segment combo? (Y=1)	Longest combo run time	Longest combo delay
Segment 1	22%	F	1	2.7	6.7
Segment 2	37%	E			
Segment 3	37%	E			
Segment 4	25%	F	1	6.4	13.3
Segment 5	28%	F			
Segment 6	28%	F			
Segment 7	21%	F	1	6.4	13.3
Segment 8	18%	F			
Segment 9	18%	F			
Segment 10	17%	F	1	6.2	13.3

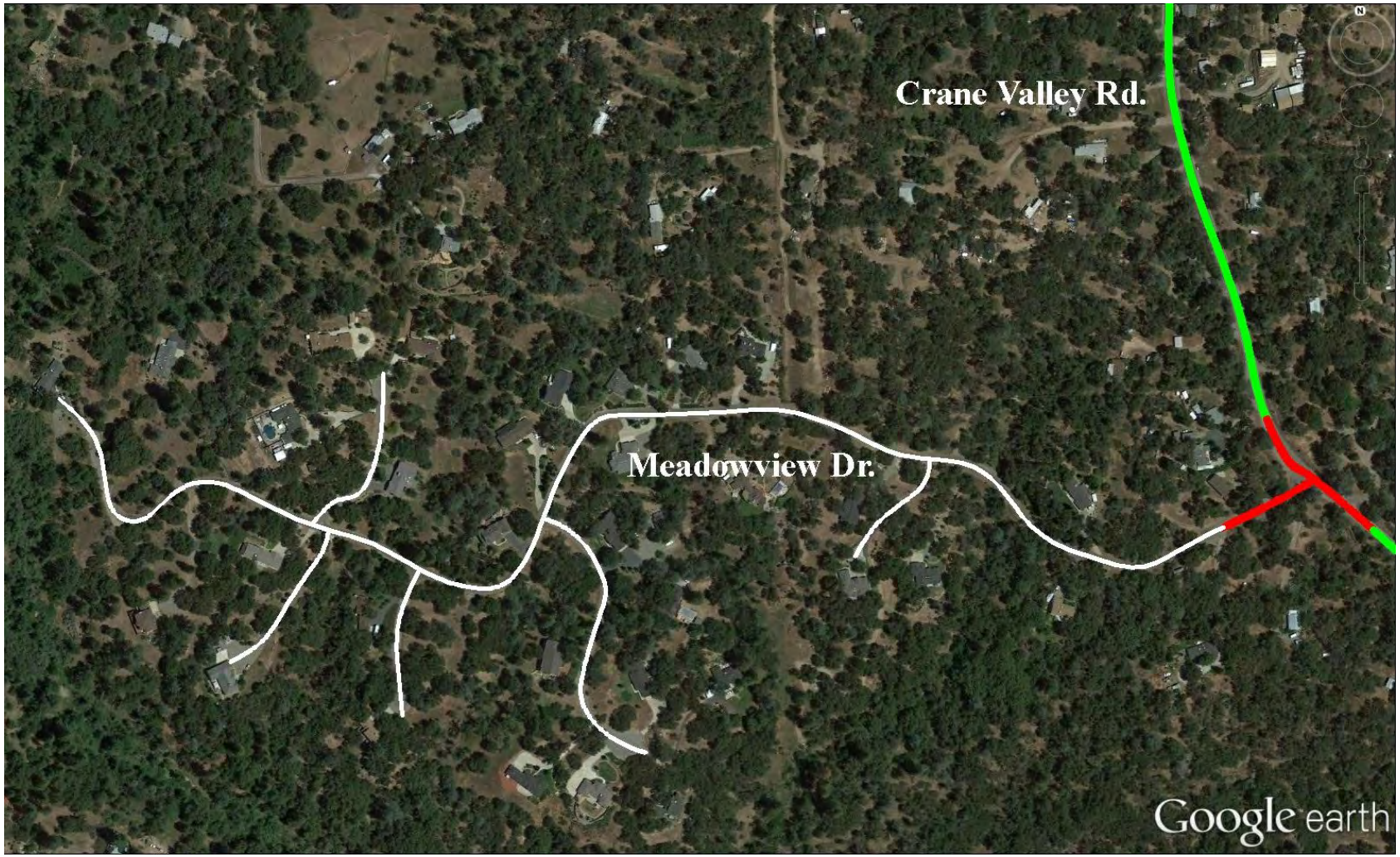
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	47	68	293	13.4

Summary

Average Network/Facility Operating Speed (MPH):	6.6

FULL 12.3

Oakhurst: Meadowview Dr. and Rd 426



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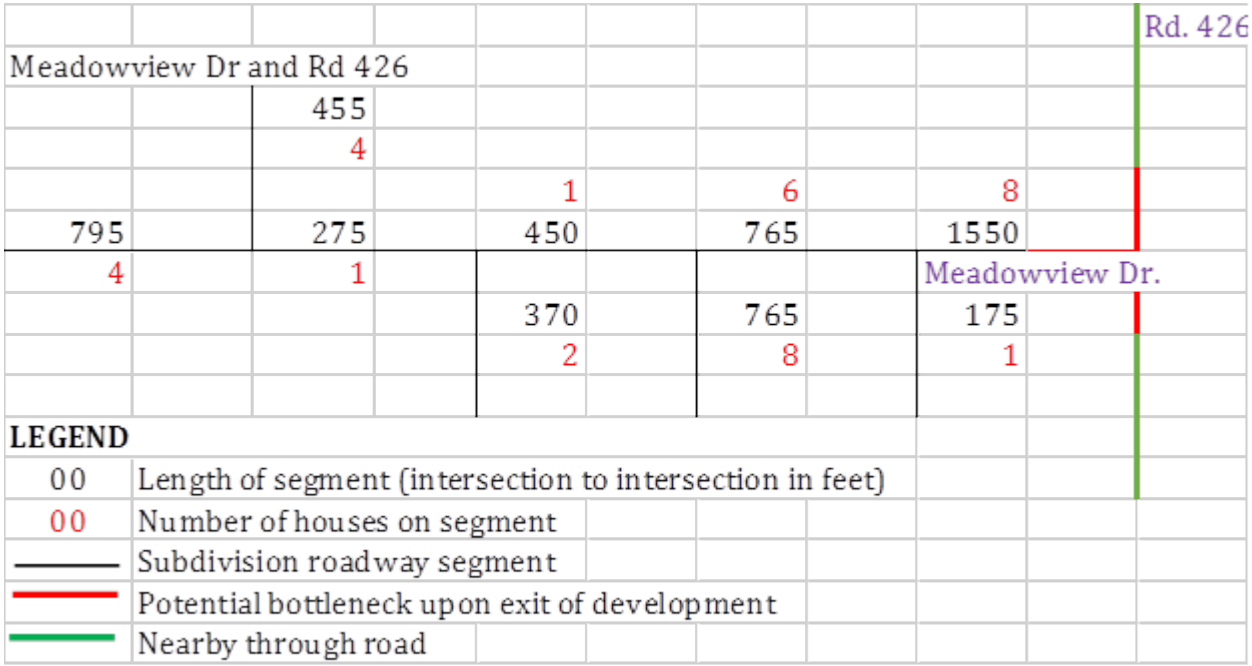
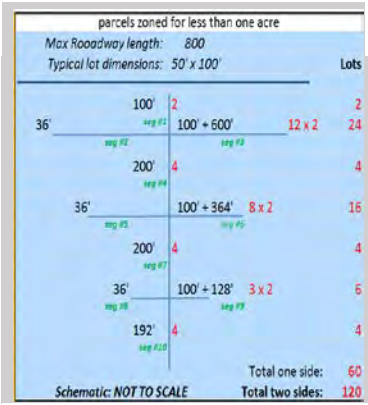


Oakhurst: Meadowview Dr. and Rd 426



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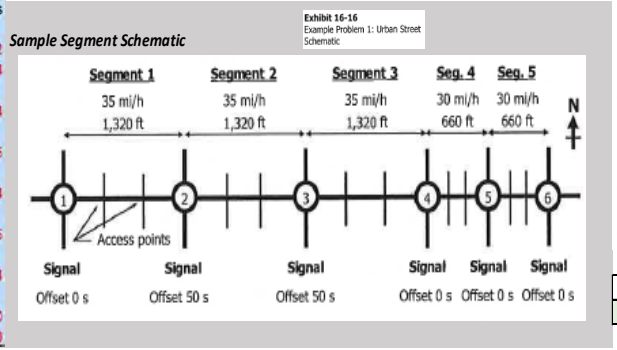
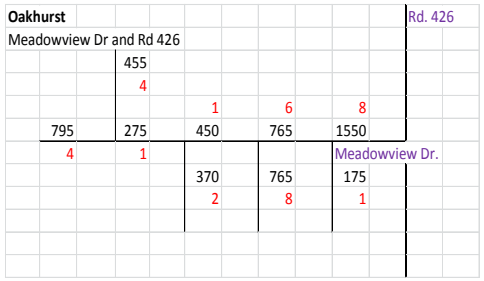
Application Schematic >>>





Legend of Cell Colors	
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	References -- Do not touch

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
105	33	138	86	5.9

Input

Summary

Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				11.7
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	8	1550	25	37.4	42.27	1	1	20	489	13	0.0	21.9
Segment 2	1	175	25	37.4	4.77	2	1	2	61	2	0.0	7.1
Segment 3	6	765	25	37.4	20.86	2	1	15	367	10	0.0	15.9
Segment 4	8	765	25	37.4	20.86	3	1	20	489	13	0.0	13.4
Segment 5	1	450	25	37.4	12.27	3	1	2	61	2	0.0	10.1
Segment 6	2	370	25	37.4	10.09	4	1	5	122	3	0.0	7.4
Segment 7	1	275	25	37.4	7.50	4	1	2	61	2	0.0	6.0
Segment 8	4	455	25	37.4	12.41	5	1	10	244	7	0.0	7.3
Segment 9	4	795	25	37.4	21.68	5	1	10	244	7	0.0	10.5
Segment 10												

	PBFS	LOS		104.6	33.3
Facility	47%	D	Longest segment combo? (Y=1)	Longest combo run time	Longest combo delay
Segment 1	88%	A	1	42.3	13.3
Segment 2	28%	F			
Segment 3	63%	C	1	20.9	10.0
Segment 4	54%	C			
Segment 5	41%	D	1	12.3	1.7
Segment 6	30%	F			
Segment 7	24%	F	1	7.5	1.7
Segment 8	29%	F			
Segment 9	42%	D	1	21.7	6.7
Segment 10					

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
105	33	138	86	5.9

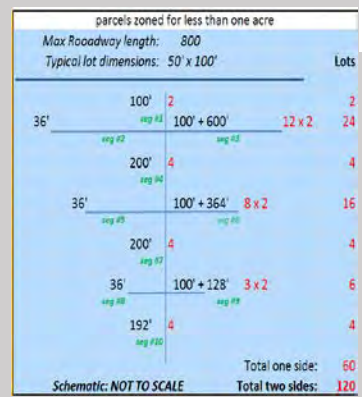
Summary

Average Network/Facility Operating Speed (MPH):	11.7

Foothill Blvd and O'Connor Way – Mixed Use

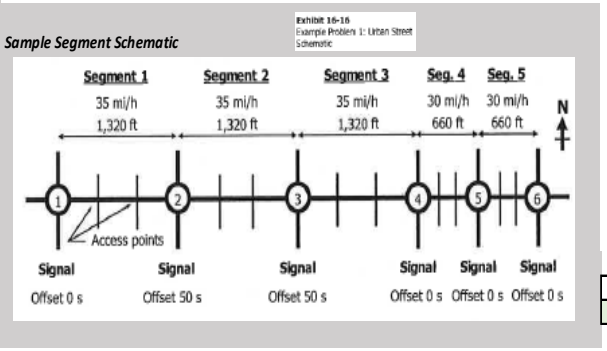
Foothill Blvd and O'Connor Way																				Foothill Blvd.
		1	3		2	2		1	4	2	2		4	5		3	4	1	0	
																Temple Ner Shalom	The Laureate School			
		480	1525		850	1260		650	500	3400	1750		2150	4430		1650	1015	890	1415	
																	Agape Church			
	1030	1215	1335	250	390	410	450	520	1270	1325	375	1300	1320	920	700	385	855	465	1122	
																			O'Connor Way	
				440			1325					1675			2050					
Schools and Churches:				2			3					1			3					
	Agape Church Congregation: 400-440																			
	Temple Ner Shalom:																			
	The Laureate School Population: 120																			

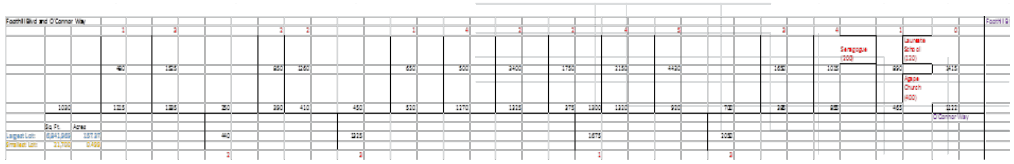
Foothill Blvd and O'Connor Way – Mixed Use



<<<< Schematic Key

Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
367	248	615	466	29.7

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Foothill and O'Connor with Churches and School

Number of Segments:	38											
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	1122	35	42.1	21.86	1	1	0	0	0	0.0	27.5
Segment 2	107	1415	25	37.4	38.59	2	1	263	6566	179	140.5	5.0
Segment 3	0	465	35	42.1	9.06	2	1	0	0	0	0.0	15.1
Segment 4	41	890	25	37.4	24.27	3	1	101	2525	69	44.6	7.0
Segment 5	0	855	35	42.1	16.66	3	1	0	0	0	0.0	16.8
Segment 6	4	1015	25	37.4	27.68	4	1	10	244	7	0.0	13.4
Segment 7	0	385	35	42.1	7.50	4	1	0	0	0	0.0	8.3
Segment 8	3	1650	25	37.4	45.00	5	1	7	183	5	0.0	15.0
Segment 9	0	700	35	42.1	13.64	5	1	0	0	0	0.0	10.9
Segment 10	3	2050	25.0	37.4	55.91	6	1	7	183	5	0.0	15.2

Summary

Average Network/Facility Operating Speed (MPH):	8.4

Facility	PBFS 30%	LOS E	Longest segment combo? (Y=1)	367.5 Longest combo run time	247.9 Longest combo delay
Segment 1	78%	B	1	21.9	0.0
Segment 2	20%	F	1	38.6	179.1
Segment 3	43%	D	1	9.1	0.0
Segment 4	28%	F	1	24.3	68.9
Segment 5	48%	D	1	16.7	0.0
Segment 6	54%	C			
Segment 7	24%	F	1	7.5	0.0
Segment 8	60%	C			
Segment 9	31%	E	1	13.6	0.0
Segment 10	61%	C			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
367	248	615	466	29.7

Summary

Average Network/Facility Operating Speed (MPH):	8.4

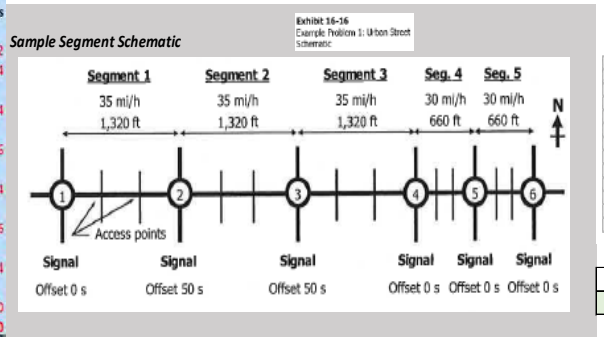
Atascadero Rd and Mission Drive – Mobile Home Park

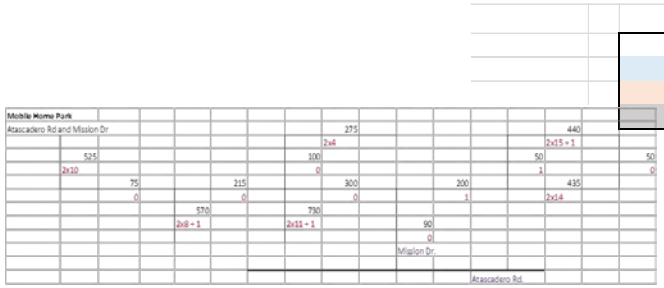
Mobile Home Park															
Atascadero Rd and Mission Dr								275						440		
								2x4						2x15 + 1		
	525						100						50			50
	2x10						0						1			0
		75			215			300			200			435		
		0			0			0			1			2x14		
				570			730									
				2x8 + 1			2x11 + 1			90						
										0						
										Mission Dr.						
												Atascadero Rd.				

Atascadero Rd and Mission Drive – Mobile Home Park

<<<< Schematic Key

Application Schematic >>>





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Enter input data
Calculations -- browse
References -- Do not touch

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
33	33	66	315	14.3

Input

Number of Segments:	15											
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	90	25	37.4	2.45	1	1	0	0	0	0.0	7.3
Segment 2	0	300	25	37.4	8.18	2	1	0	0	0	0.0	10.1
Segment 3	0	100	25	37.4	2.73	3	1	0	0	0	0.0	3.3
Segment 4	8	275	25	37.4	7.50	4	1	20	489	13	5.8	5.0
Segment 5	23	730	25	37.4	19.91	3	1	56	1406	38	18.4	8.8
Segment 6	0	215	25	37.4	5.86	3	1	0	0	0	0.0	6.1
Segment 7	17	570	25	37.4	15.55	4	1	42	1039	28	12.8	7.4
Segment 8	0	75	25	37.4	2.05	4	1	0	0	0	0.0	2.0
Segment 9	20	525	25	37.4	14.32	5	1	49	1222	33	19.0	5.7
Segment 10	1	200	25.0	37.4	5.45	2	1	2	61	2	0.0	7.8

Summary

Average Network/Facility Operating Speed (MPH):	5.4

Facility	PBFS 22%	LOS F	Longest segment combo? (Y=1)	Longest combo run time (32.9)	Longest combo delay (33.3)
Segment 1	29%	F	1	2.5	0.0
Segment 2	41%	D	1	8.2	0.0
Segment 3	13%	F			
Segment 4	20%	F			
Segment 5	35%	E			
Segment 6	25%	F	1	5.9	0.0
Segment 7	30%	F			
Segment 8	8%	F	1	2.0	0.0
Segment 9	23%	F	1	14.3	33.3
Segment 10	31%	E			

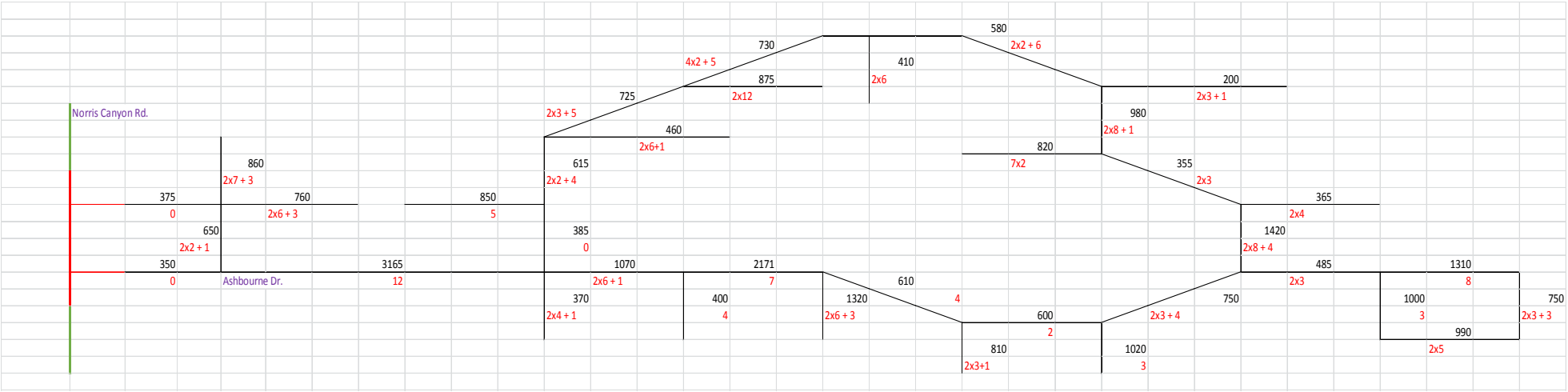
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
33	33	66	315	14.3

Summary

Average Network/Facility Operating Speed (MPH):	5.4

Norris Canyon Estates

Norris Canyon Estates

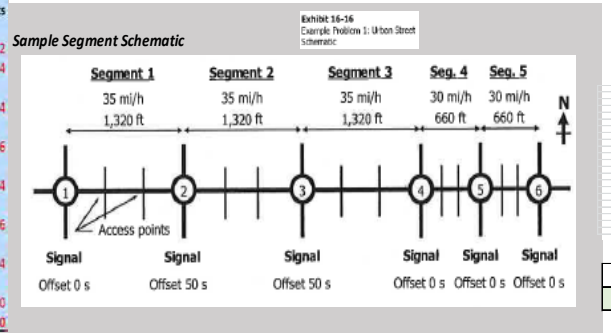


FULL 12.3

Norris Canyon Estates

<<<< Schematic Key

Application Schematic >>>



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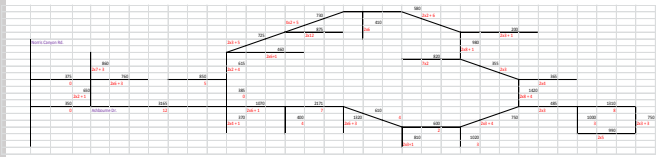
Enter input data
Calculations -- browse
References -- Do not touch



Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
323	200	523	799	42.1

Input

Number of Segments:	38											
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	375	25	37.4	10.23	1	1	0	0	0	0.0	15.8
Segment 2	17	860	25	37.4	23.45	2	1	42	1039	28	4.9	14.5
Segment 3	15	760	25	37.4	20.73	2	1	37	917	25	4.3	14.0
Segment 4	5	650	25	37.4	17.73	2	1	12	306	8	0.0	14.9
Segment 5	0	350	25	37.4	9.55	1	1	0	0	0	0.0	15.4
Segment 6	12	3165	25	37.4	86.32	2	1	29	733	20	0.0	21.9
Segment 7	0	385	25	37.4	10.50	3	1	0	0	0	0.0	9.2
Segment 8	5	850	25	37.4	23.18	4	1	12	306	8	0.0	12.3
Segment 9	8	615	25	37.4	16.77	4	1	20	489	13	0.0	10.3
Segment 10	13	460	25.0	37.4	12.55	5	1	32	794	22	9.1	6.1

Summary

Average Network/Facility Operating Speed (MPH):	9.0

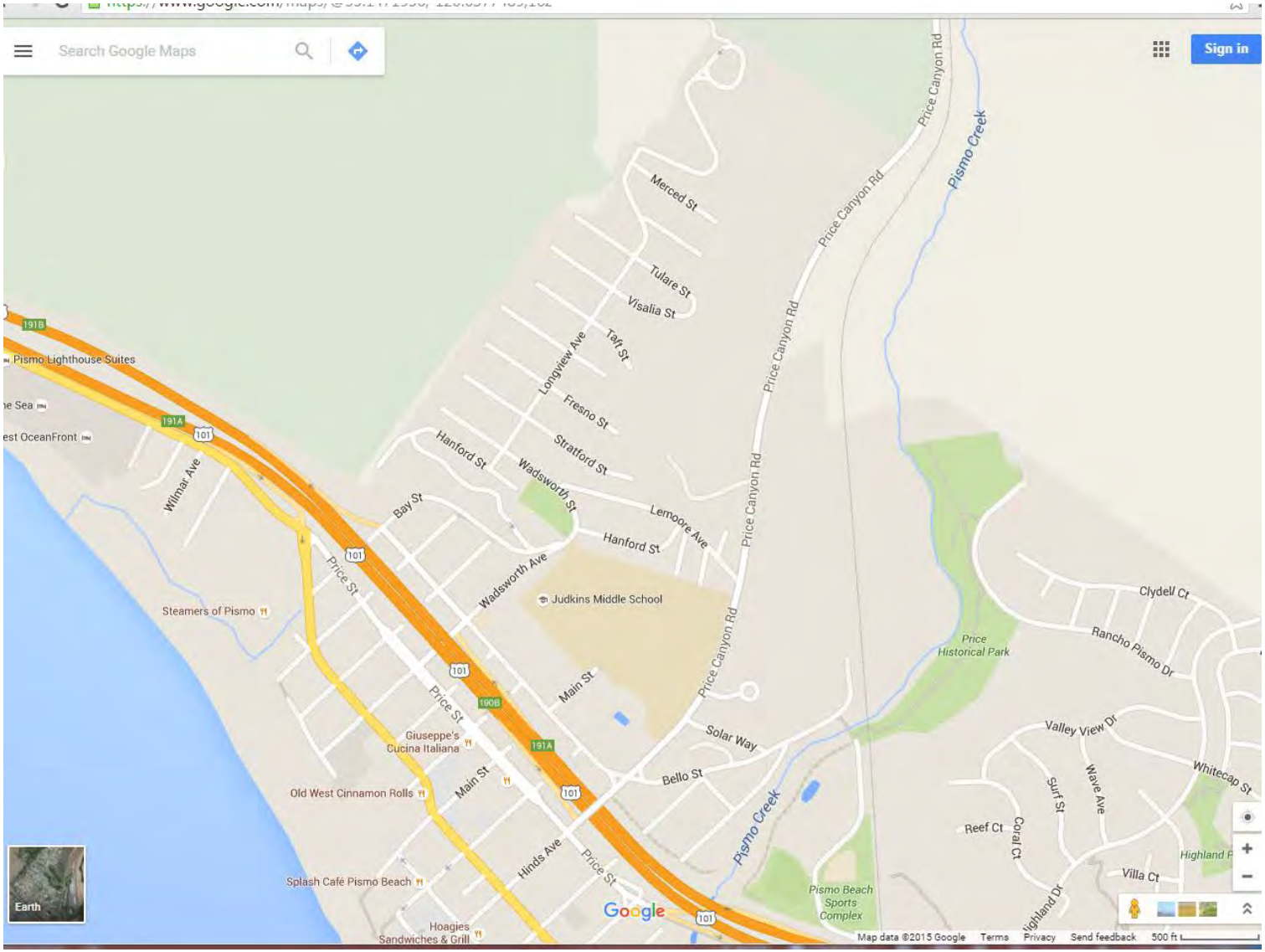
Facility	PBFS 36%	LOS E	Longest segment combo? (Y=1)	Longest combo run time (323.2)	Longest combo delay (200.0)
Segment 1	63%	C			
Segment 2	58%	C			
Segment 3	56%	C			
Segment 4	60%	C			
Segment 5	61%	C	1	9.5	0.0
Segment 6	88%	A	1	86.3	20.0
Segment 7	37%	E	1	10.5	0.0
Segment 8	49%	D			
Segment 9	41%	D	1	16.8	13.3
Segment 10	24%	F			

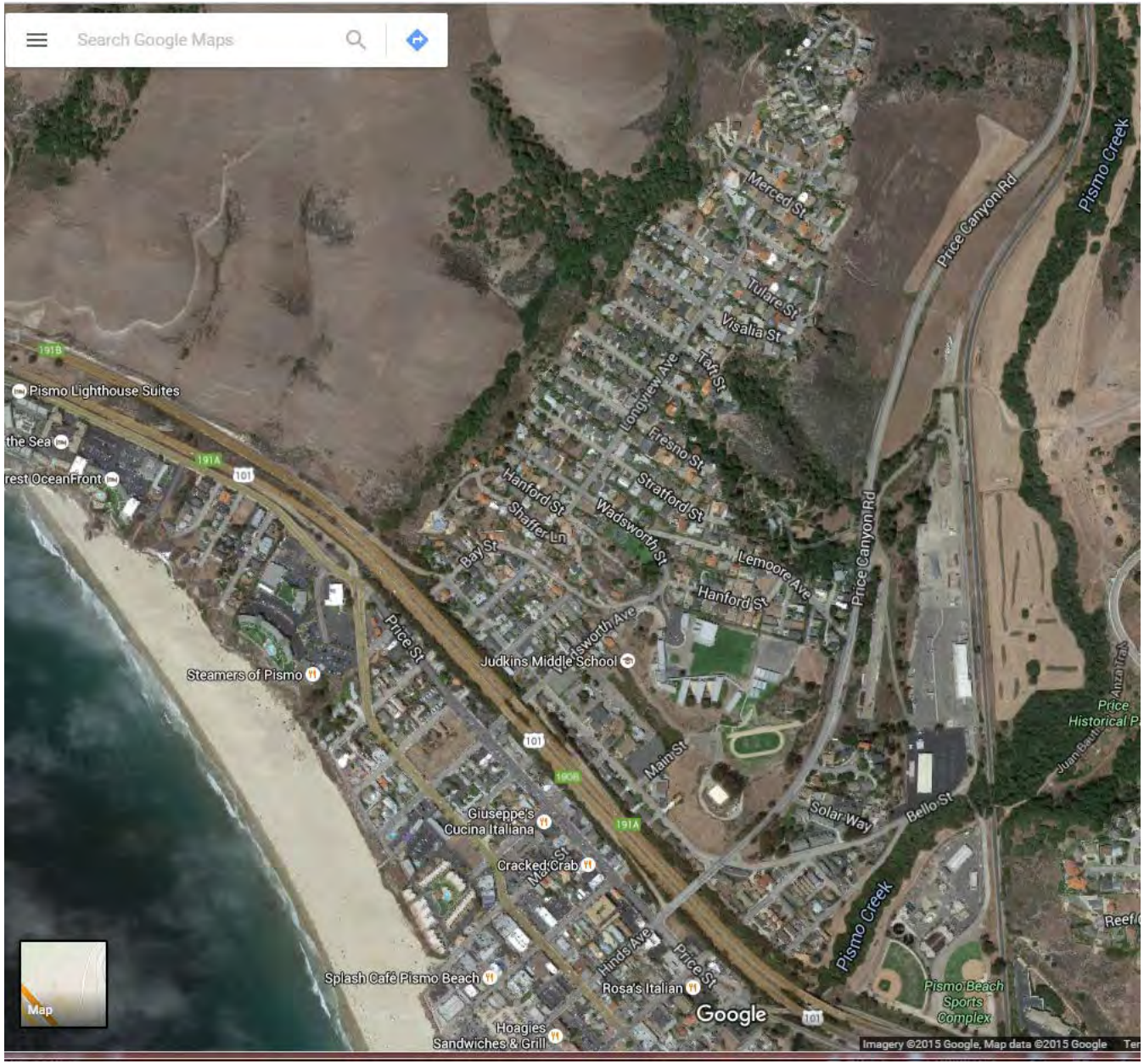
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
323	200	523	799	42.1

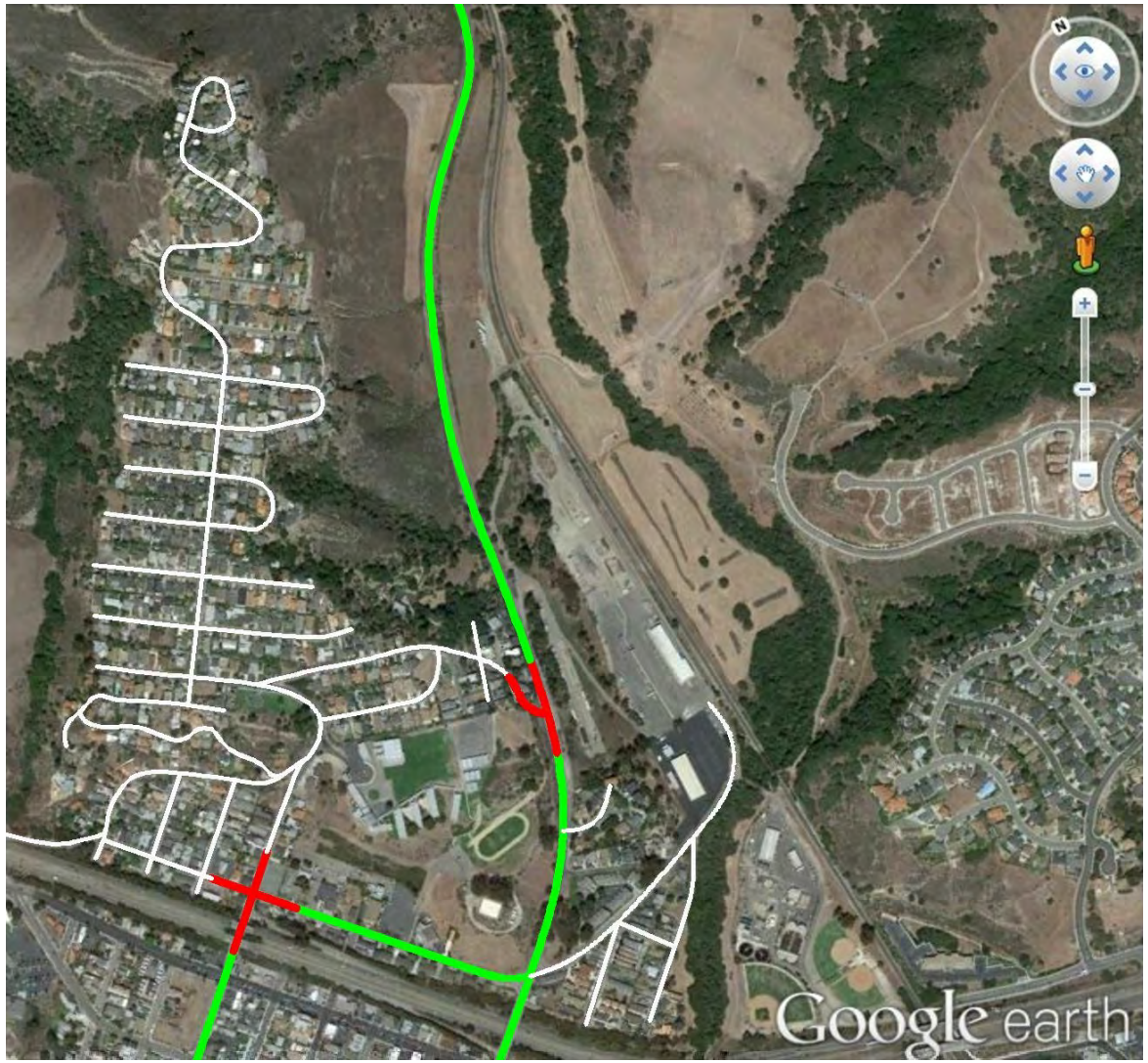
Summary

	Average Network/Facility Operating Speed (MPH):	9.0

Pismo Heights




Search Google Maps
Pismo Lighthouse Suites
the Sea
rest OceanFront
Steamers of Pismo
Judkins Middle School
Giuseppe's Cucina Italiana
Cracked Crab
Splash Café Pismo Beach
Hoagies Sandwiches & Grill
Rosa's Italian
Merced St
Tulare St
Visalia St
Taft St
Longview Ave
Fresno St
Stratford St
Hanford St
Shaffer Ln
Wadsworth St
Bay St
Lemoore Ave
Price St
Main St
Hinds Ave
Solar Way
Bello St
Price Canyon Rd
Pismo Creek
Pismo Beach Sports Complex
Price Historical P
Anza Trail
Juan Bautista
Reef
191B
191A
101
Map
Google
Imagery ©2015 Google, Map data ©2015 Google


Google earth

Pismo Heights

Pismo Heights

Churches and school:

First Church - Christ Scientist: 8-12
St. Pauls Catholic Church: 700-800

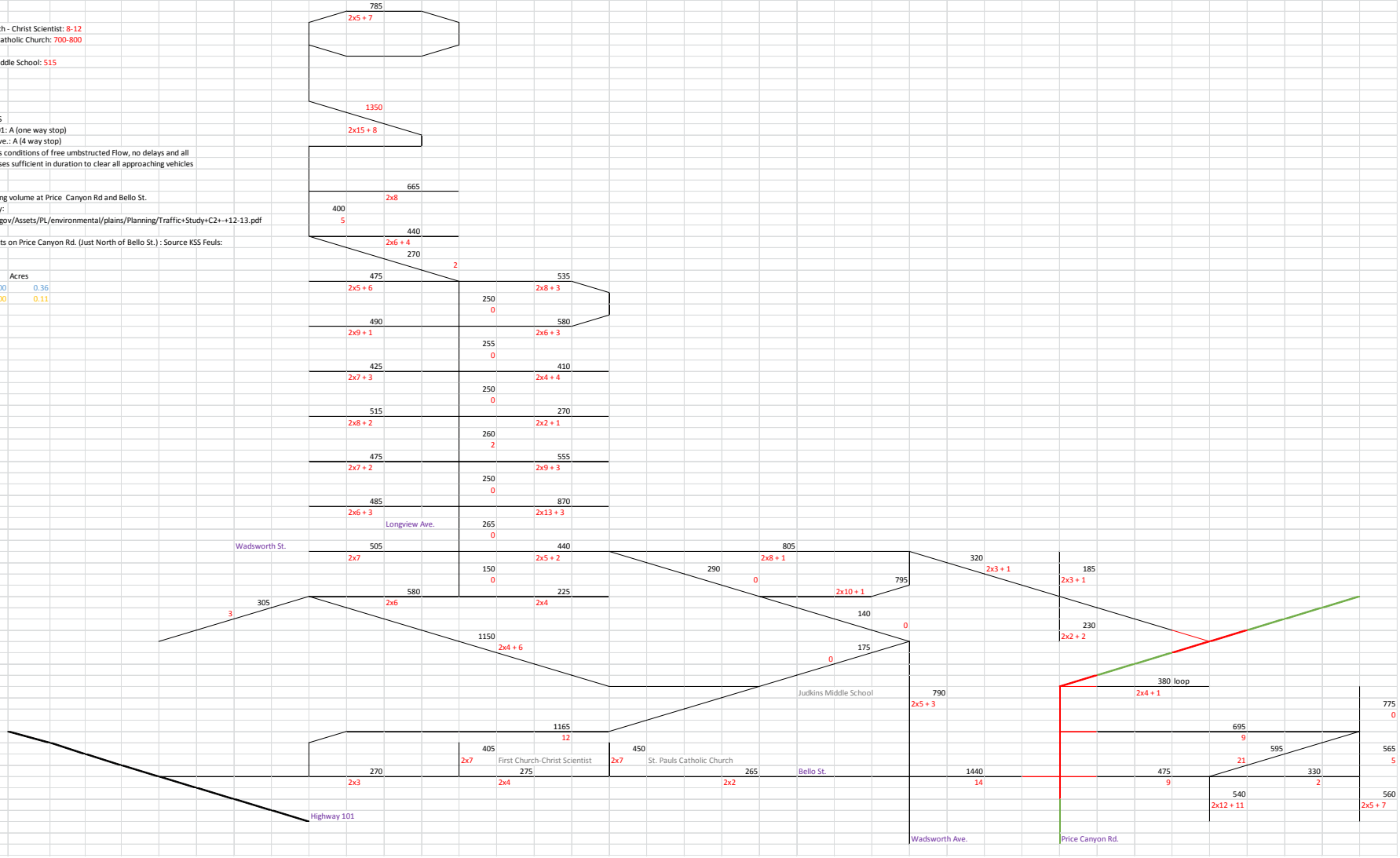
Judkins Middle School: 515

Peak hour intersection LOS
Bello St./Bay St. and US 101: A (one way stop)
Bello St and Wadsworth Ave.: A (4 way stop)
A indicates conditions of free umbstructed Flow, no delays and all signal phases sufficient in duration to clear all approaching vehicles

Peak hour traffic and turning volume at Price Canyon Rd and Bello St.
See PDF from Impact Study:
http://www.slocounty.ca.gov/Assets/PL/environmental/plains/Planning/Traffic+Study+C2+-+12-13.pdf

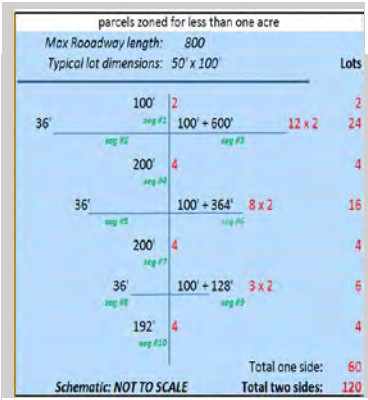
Average Daily Traffic Counts on Price Canyon Rd. (Just North of Bello St.) : Source KSS Feuls:
9854 (2012)

	Sq. Ft.	Acres
Largest Lot:	15,700	0.36
Smallest Lot:	5,000	0.11



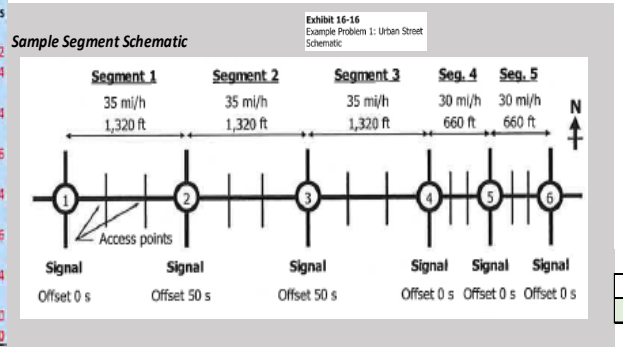
FULL 12.3

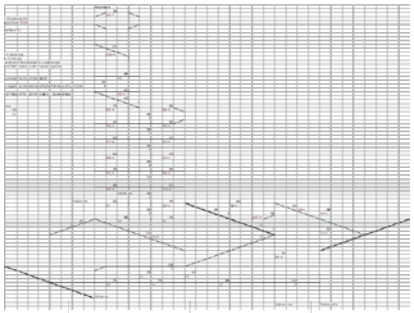
Pismo Heights



<<<< Schematic Key

Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
217	200	417	1149	54.9

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Pismo Heights Homes Only

Number of Segments:	45

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes
Segment 1	14	1440	25	37.4	39.27	1	1
Segment 2	4	265	25	37.4	7.23	1	1
Segment 3	14	450	25	37.4	12.27	2	1
Segment 4	8	275	25	37.4	7.50	2	1
Segment 5	14	405	25	37.4	11.05	3	1
Segment 6	6	270	25	37.4	7.36	3	1
Segment 7	12	1165	25	37.4	31.77	3	1
Segment 8	0	175	25	37.4	4.77	2	1
Segment 9	14	1150	25	37.4	31.36	3	1
Segment 10	3	305	25.0	37.4	8.32	4	1

Summary

Average Network/Facility Operating Speed (MPH):	6.0

Segment	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	34	856	23	0.0	21.7
Segment 2	10	244	7	0.0	13.7
Segment 3	34	856	23	11.1	8.7
Segment 4	20	489	13	5.8	7.4
Segment 5	34	856	23	12.3	6.7
Segment 6	15	367	10	2.6	6.6
Segment 7	29	733	20	0.0	16.0
Segment 8	0	0	0	0.0	7.1
Segment 9	34	856	23	0.0	15.9
Segment 10	7	183	5	0.0	6.4

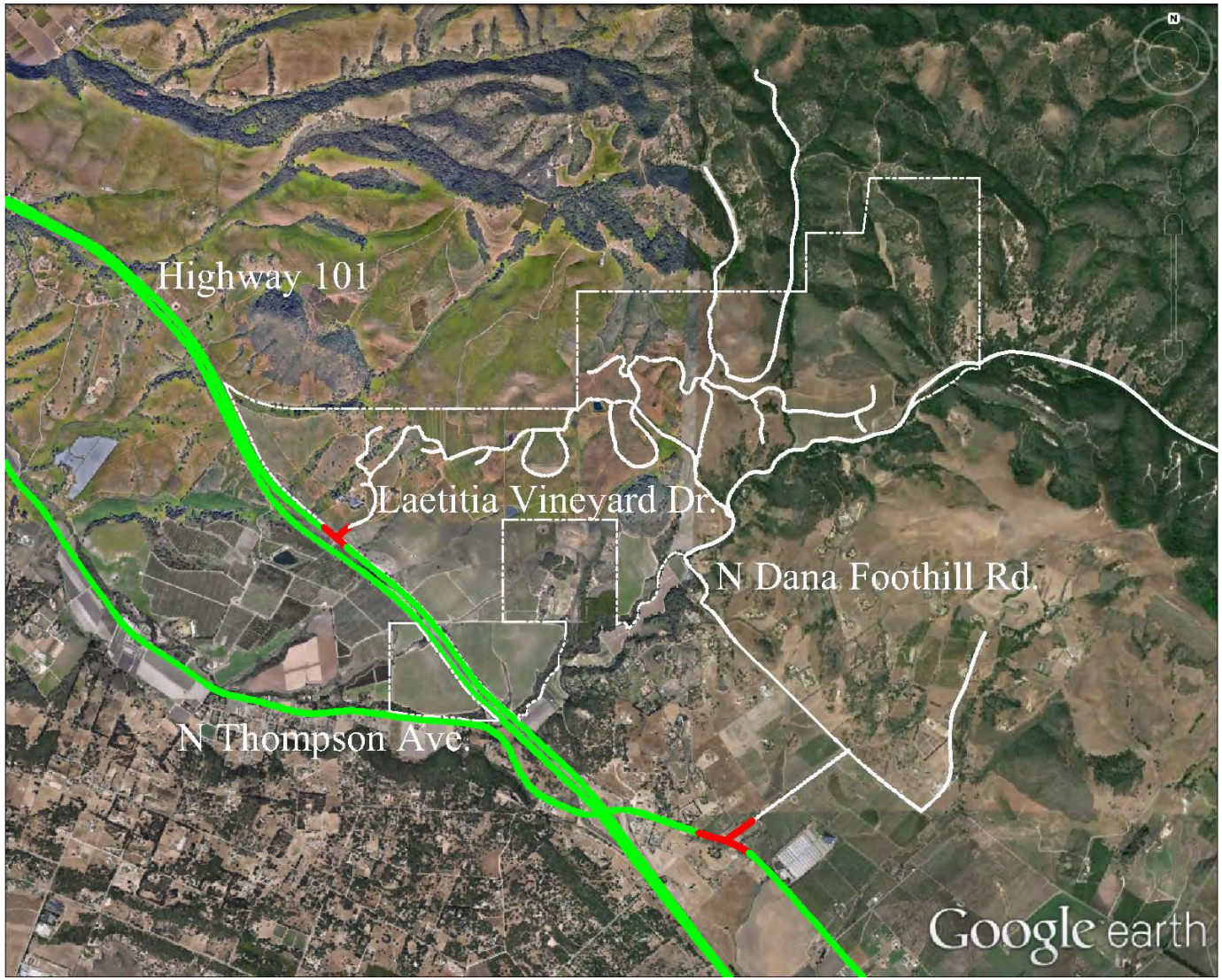
Facility	PBFS 24%	LOS F	Longest segment combo? (Y=1)	216.5 Longest combo run time	200.0 Longest combo delay
Segment 1	87%	A			
Segment 2	55%	C	1	7.2	6.7
Segment 3	35%	E			
Segment 4	30%	F	1	7.5	13.3
Segment 5	27%	F			
Segment 6	26%	F	1	7.4	10.0
Segment 7	64%	C	1	31.8	20.0
Segment 8	28%	F			
Segment 9	64%	C	1	31.4	23.3
Segment 10	26%	F			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
217	200	417	1149	54.9

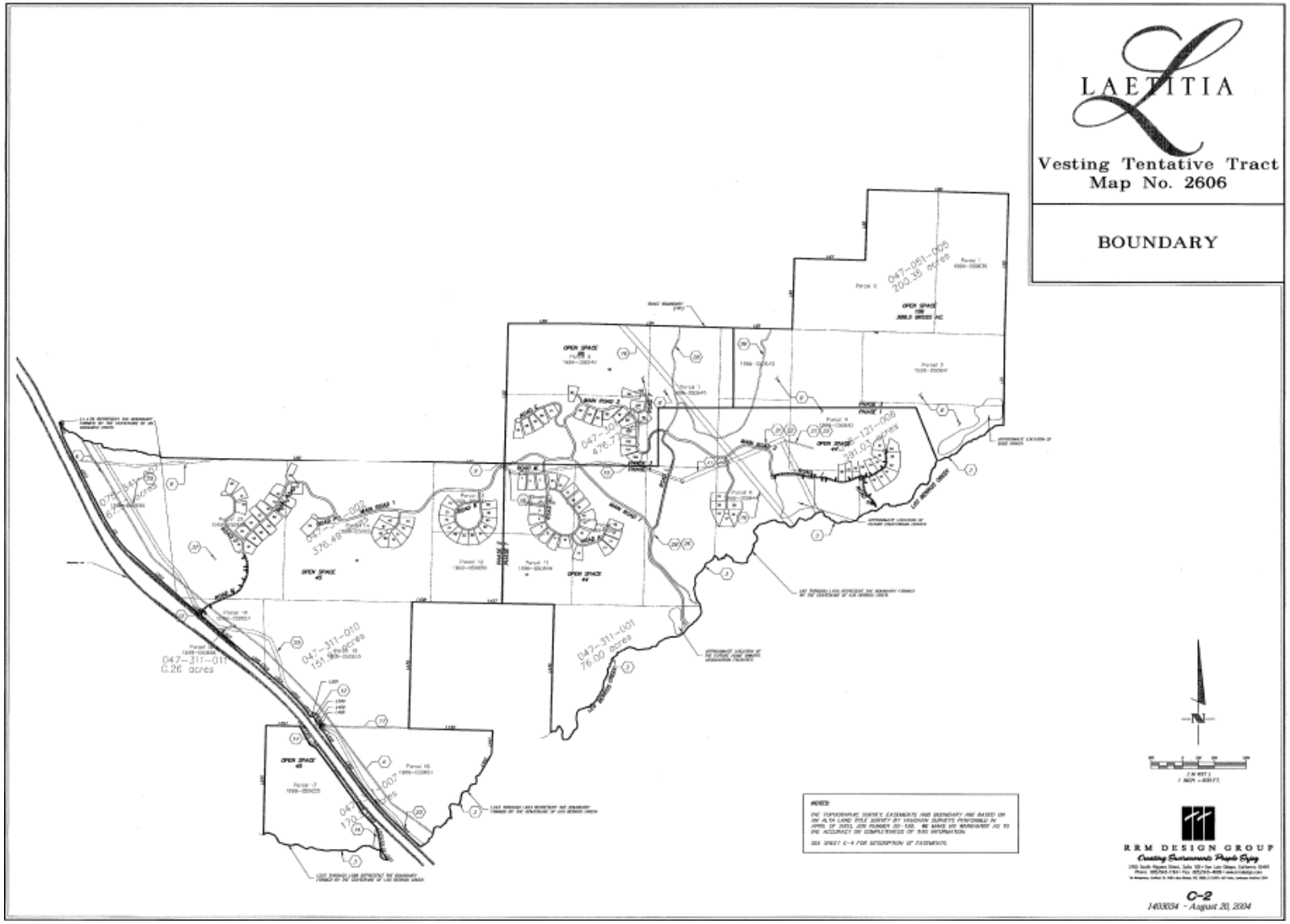
Summary

Average Network/Facility Operating Speed (MPH):	6.0

Proposed Development: Laetitia Vineyard Drive



Proposed Development: Laetitia Vineyard Drive



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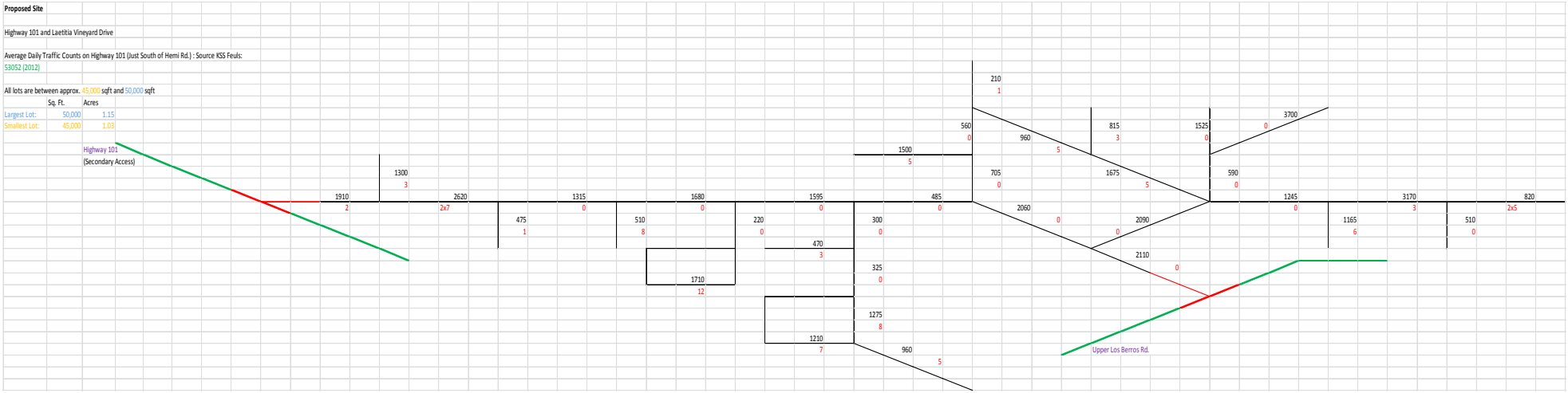
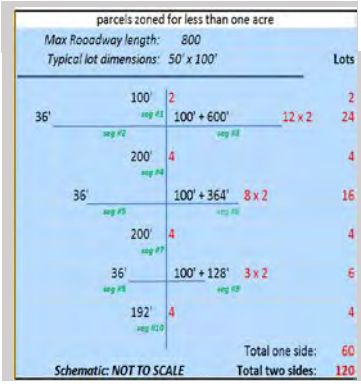
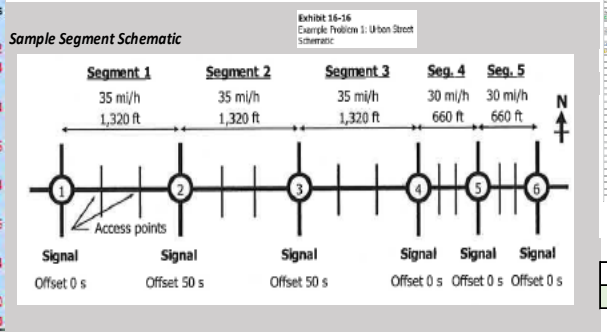


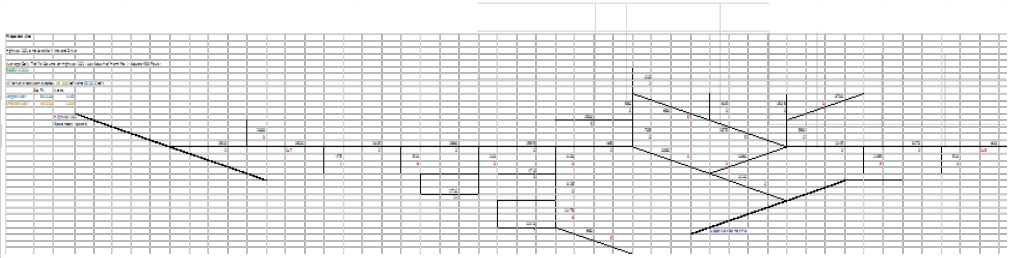
Proposed Development: Laetitia Vineyard Drive



<< << Schematic Key

Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
376	27	402	247	17.0

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Number of Segments:	36											
												Average Network/Facility Operating Speed (MPH):	14.9
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	2110	25	37.4	57.55	1	1	0	0	0	0.0	22.6
Segment 2	0	2090	25	37.4	57.00	2	1	0	0	0	0.0	20.7
Segment 3	0	2060	25	37.4	56.18	2	1	0	0	0	0.0	20.6
Segment 4	0	485	25	37.4	13.23	3	1	0	0	0	0.0	10.6
Segment 5	0	300	25	37.4	8.18	4	1	0	0	0	0.0	6.4
Segment 6	3	470	25	37.4	12.82	5	1	7	183	5	0.0	7.5
Segment 7	0	325	25	37.4	8.86	5	1	0	0	0	0.0	5.7
Segment 8	8	1275	25	37.4	34.77	6	1	20	489	13	0.0	12.3
Segment 9	7	1210	25	37.4	33.00	6	1	17	428	12	0.0	12.0
Segment 10	5	960	25.0	37.4	26.18	7	1	12	306	8	0.0	9.6

Summary

Facility	PBFS 60%	LOS C	Longest segment combo? (Y=1)	Longest combo run time	Longest combo delay
				375.7	26.7
Segment 1	91%	A	1	57.5	0.0
Segment 2	83%	B			
Segment 3	82%	B	1	56.2	0.0
Segment 4	42%	D	1	13.2	0.0
Segment 5	25%	F			
Segment 6	30%	F			
Segment 7	23%	F			
Segment 8	49%	D			
Segment 9	48%	D			
Segment 10	38%	E			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
376	27	402	247	17.0

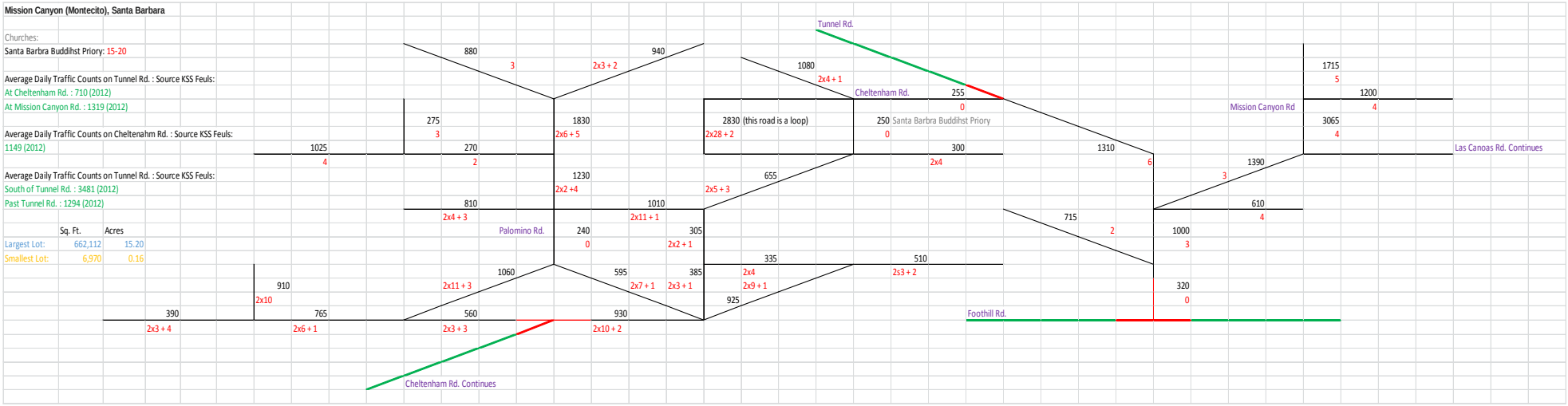
Summary

Average Network/Facility Operating Speed (MPH):	14.9

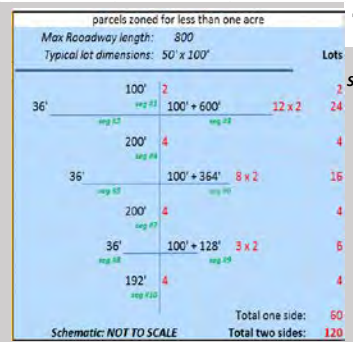
FULL 12.3

Mission Canyon, Santa Barbara

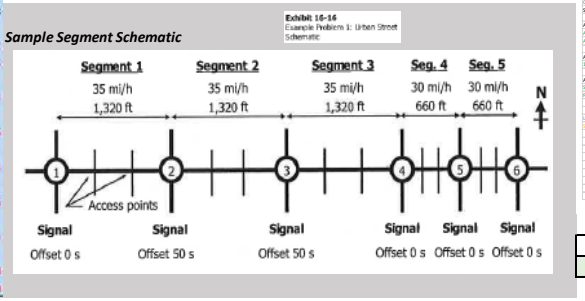
Mission Canyon, Santa Barbara

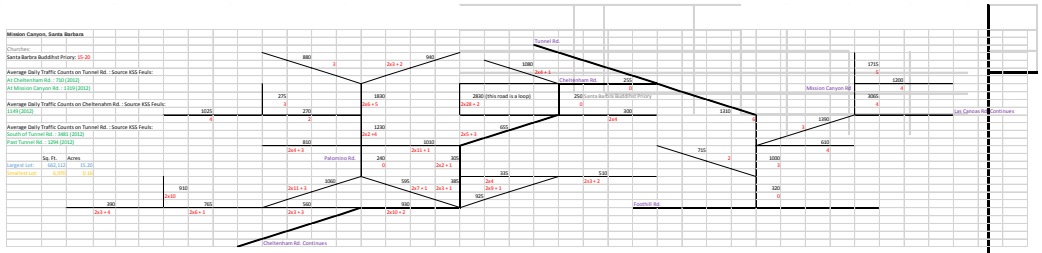


Mission Canyon, Santa Barbara



<<<< Schematic Key **Application Schematic >>>**





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
190	23	214	853	39.2

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Number of Segments:	38

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes
Segment 1	9	560	25	37.4	15.27	1	1
Segment 2	13	765	25	37.4	20.86	2	1
Segment 3	20	910	25	37.4	24.82	3	1
Segment 4	10	390	25	37.4	10.64	3	1
Segment 5	25	1060	25	37.4	28.91	2	1
Segment 6	15	595	25	37.4	16.23	2	1
Segment 7	0	240	25	37.4	6.55	3	1
Segment 8	11	810	25	37.4	22.09	4	1
Segment 9	23	1010	25	37.4	27.55	4	1
Segment 10	8	1230	25.0	37.4	33.55	3	1

Summary

Average Network/Facility Operating Speed (MPH):	12.8

Segment	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	22	550	15	0.0	17.9
Segment 2	32	794	22	0.8	15.5
Segment 3	49	1222	33	8.5	12.1
Segment 4	24	611	17	6.0	7.7
Segment 5	61	1528	42	12.8	13.5
Segment 6	37	917	25	8.8	11.0
Segment 7	0	0	0	0.0	6.7
Segment 8	27	672	18	0.0	12.0
Segment 9	56	1406	38	10.8	11.0
Segment 10	20	489	13	0.0	16.3

Facility	PBFS 51%	LOS C	Longest segment combo? (Y=1)	Longest combo run time 190.2	Longest combo delay 23.3
Segment 1	72%	B			
Segment 2	62%	C			
Segment 3	48%	D			
Segment 4	31%	E			
Segment 5	54%	C			
Segment 6	44%	D			
Segment 7	27%	F			
Segment 8	48%	D			
Segment 9	44%	D			
Segment 10	65%	C			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
190	23	214	853	39.2

Summary

Average Network/Facility Operating Speed (MPH):	12.8

Westchester Canyon, Goleta

Westchester Canyon, Goleta

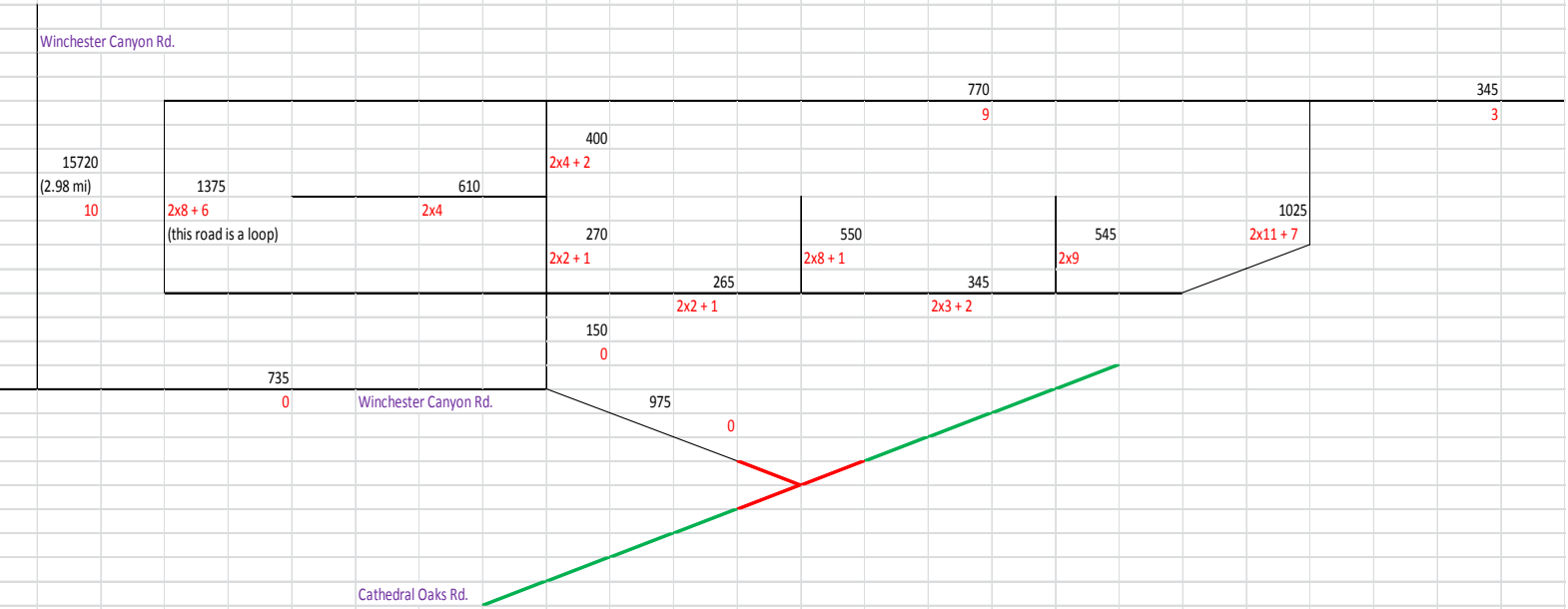
Westchester Canyon, Goleta

Winchester Canyon Rd. and Cathedral Oaks Rd.

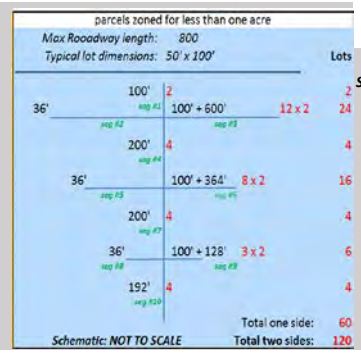
Average Daily Traffic Counts on Winchester Valley Rd. : Source KSS Feuls:

1042 (2000)

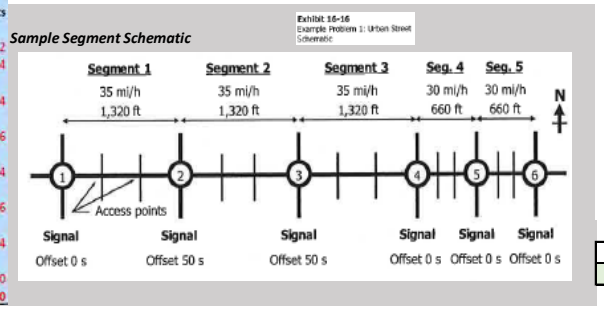
	Sq. Ft.	Acres
Largest Lot:	2,336,994	53.65
Smallest Lot:	5,663	0.13

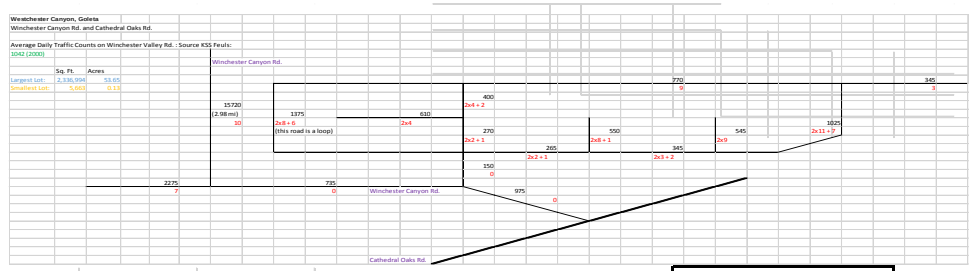


Westchester Canyon, Goleta



<<<< Schematic Key Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
475	17	492	369	23.6

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Number of Segments:	17

Summary

Average Network/Facility Operating Speed (MPH):	16.0

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	975	25	37.4	26.59	1	1	0	0	0	0.0	20.4
Segment 2	0	735	25	37.4	20.05	2	1	0	0	0	0.0	15.6
Segment 3	7	2275	25	37.4	62.05	3	1	17	428	12	0.0	19.4
Segment 4	10	15720	25	37.4	428.73	3	1	24	611	17	0.0	24.0
Segment 5	0	150	25	37.4	4.09	2	1	0	0	0	0.0	6.4
Segment 6	22	1375	25	37.4	37.50	3	1	54	1344	37	0.0	16.9
Segment 7	5	270	25	37.4	7.36	3	1	12	306	8	1.0	7.0
Segment 8	8	610	25	37.4	16.64	4	1	20	489	13	0.0	10.2
Segment 9	10	400	25	37.4	10.91	4	1	24	611	17	5.8	6.7
Segment 10	9	700	25.0	37.4	19.09	5	1	22	550	15	0.0	9.7

Facility	PBFS 64%	LOS C	Longest segment combo? (Y=1)	Longest combo run time	Longest combo delay
				475.4	16.7
Segment 1	82%	B	1	26.6	0.0
Segment 2	63%	C	1	20.0	0.0
Segment 3	78%	B			
Segment 4	96%	A	1	428.7	16.7
Segment 5	25%	F			
Segment 6	68%	B			
Segment 7	28%	F			
Segment 8	41%	D			
Segment 9	27%	F			
Segment 10	39%	E			

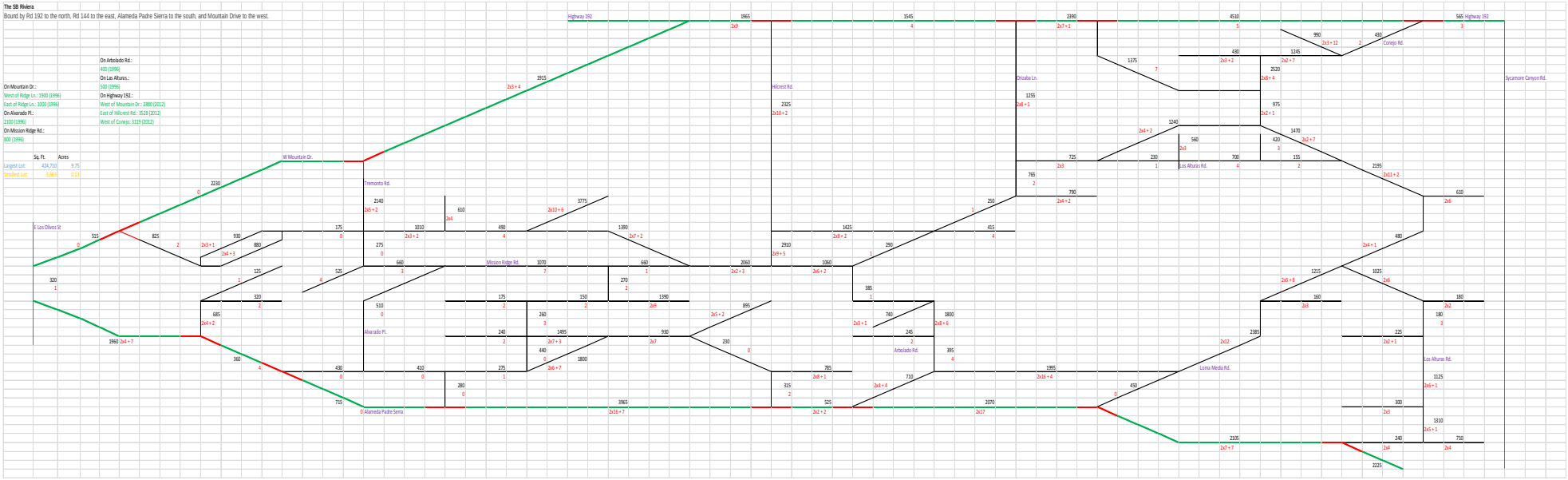
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
475	17	492	369	23.6

Summary

Average Network/Facility Operating Speed (MPH):	16.0

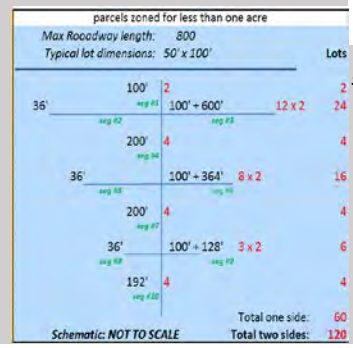
The Santa Barbara Riviera

The Santa Barbara Riviera

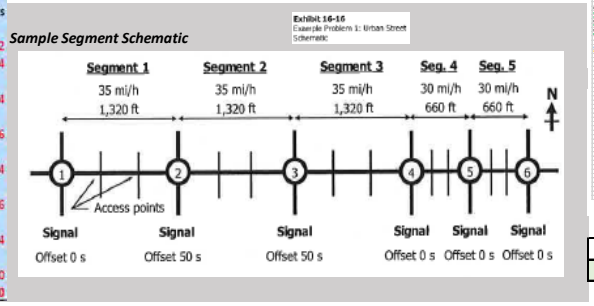


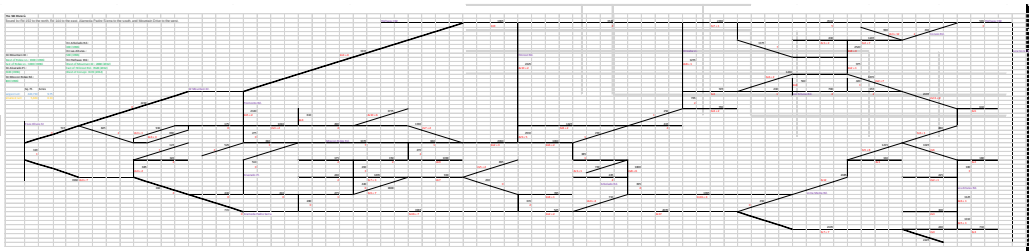
FULL 12.3

The Santa Barbara Riviera



<<<< Schematic Key **Application Schematic >>>**





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
340	0	340	848	41.1

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Summary

Number of Segments:	90

Average Network/Facility Operating Speed (MPH): 14.2

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	2	430	25	37.4	11.73	1	1	5	122	3	0.0	16.5
Segment 2	18	990	25	37.4	27.00	2	1	44	1100	30	3.0	16.1
Segment 3	11	1245	25	37.4	33.95	2	1	27	672	18	0.0	18.5
Segment 4	8	430	25	37.4	11.73	3	1	20	489	13	1.6	9.4
Segment 5	20	2520	25	37.4	68.73	2	1	49	1222	33	0.0	21.3
Segment 6	7	1375	25	37.4	37.50	1	1	17	428	12	0.0	21.6
Segment 7	5	975	25	37.4	26.59	2	1	12	306	8	0.0	17.2
Segment 8	10	1240	25	37.4	33.82	3	1	24	611	17	0.0	16.3
Segment 9	11	470	25	37.4	12.82	3	1	27	672	18	5.5	8.8
Segment 10	24	2195	25.0	37.4	59.86	4	1	59	1467	40	0.0	17.8

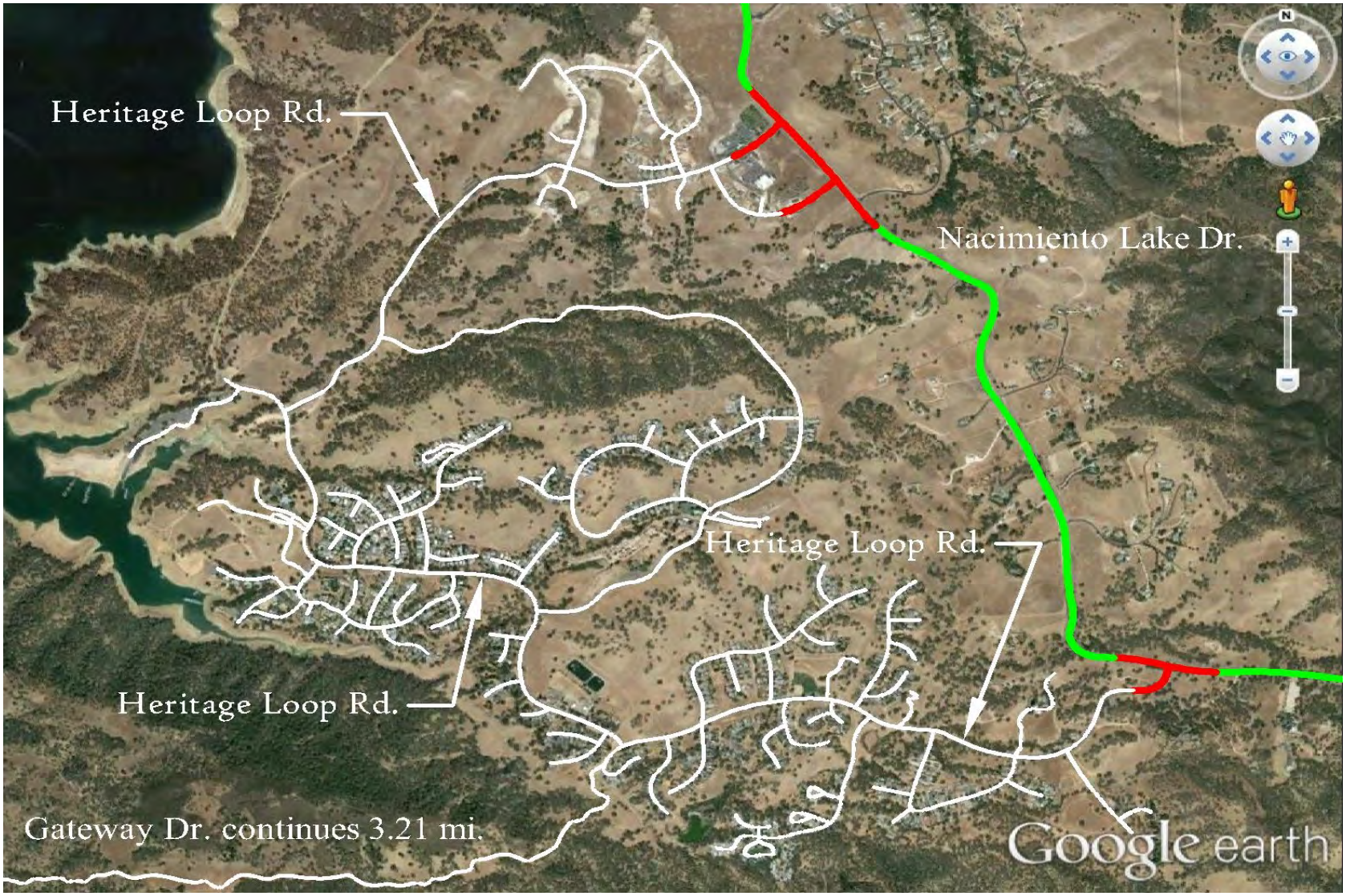
	PBFS	LOS		339.8	0.0
Facility	57%	C	Longest segment combo? (Y=1)	Longest combo run time	Longest combo delay
Segment 1	66%	C			
Segment 2	64%	C			
Segment 3	74%	B			
Segment 4	37%	E			
Segment 5	85%	A			
Segment 6	86%	A			
Segment 7	69%	B			
Segment 8	65%	C			
Segment 9	35%	E			
Segment 10	71%	B			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
340	0	340	848	41.1

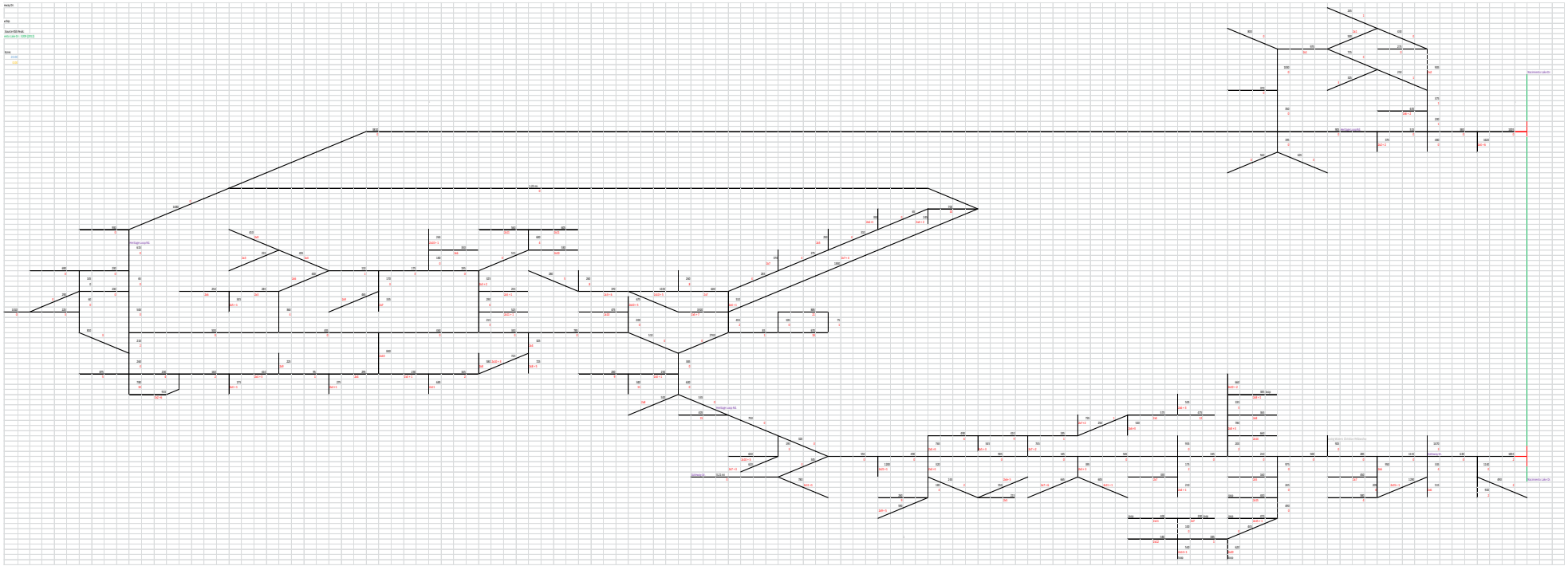
Summary

Average Network/Facility Operating Speed (MPH):	14.2

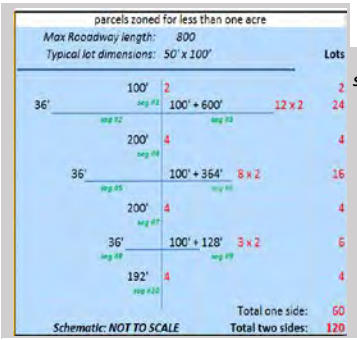
Heritage Ranch



Heritage Ranch

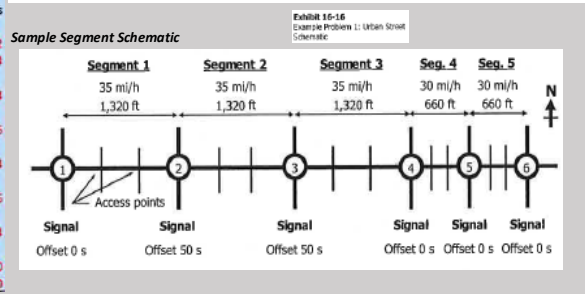


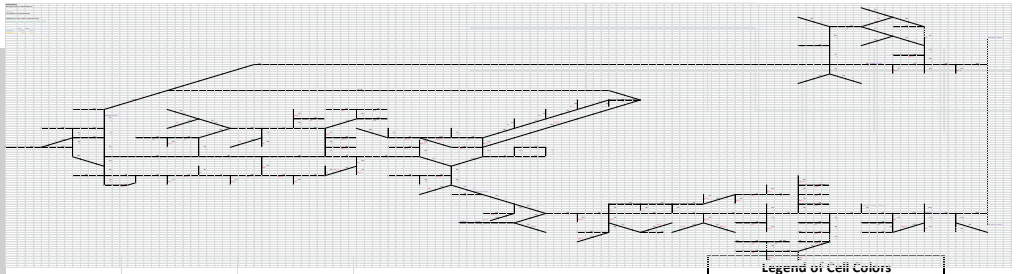
Heritage Ranch – Western Entrance



<<<< Schematic Key

Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
255	0	255	1435	64.1

Legend of Cell Colors
- Enter input data
- Calculations -- browse
- References -- Do not touch

Input

Number of Segments:	100

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	1005	25	37.4	27.41	1	1	0	0	0	0.0	20.5
Segment 2	14	1620	25	37.4	44.18	2	1	34	856	23	0.0	19.7
Segment 3	0	380	25	37.4	10.36	2	1	0	0	0	0.0	11.6
Segment 4	0	480	25	37.4	13.09	3	1	0	0	0	0.0	10.5
Segment 5	0	515	25	37.4	14.05	3	1	0	0	0	0.0	11.0
Segment 6	6	375	25	37.4	10.23	4	1	15	367	10	0.0	7.5
Segment 7	0	345	25	37.4	9.41	4	1	0	0	0	0.0	7.0
Segment 8	1	200	25	37.4	5.45	3	1	2	61	2	0.0	5.8
Segment 9	14	635	25	37.4	17.32	4	1	34	856	23	6.0	9.1
Segment 10	1	375	25.0	37.4	10.23	4	1	2	61	2	0.0	7.5
Segment 11	1	250	25.0	37.4	6.82	5	1	2	61	2	0.0	4.6
Segment 12	3	325	25.0	37.4	8.86	6	1	7	183	5	0.0	4.9
Segment 13	3	715	25.0	37.4	19.50	6	1	7	183	5	0.0	8.8
Segment 14	4	905	25.0	37.4	24.68	5	1	10	244	7	0.0	11.3
Segment 15	0	275	25.0	37.4	7.50	6	1	0	0	0	0.0	4.3

Summary

Average Network/Facility Operating Speed (MPH):	4.0

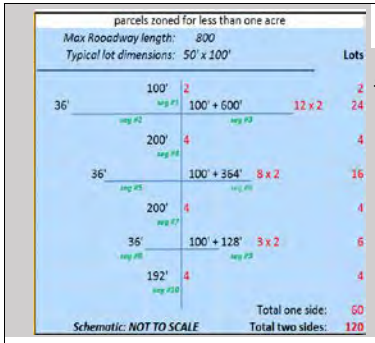
Facility	PBFS 16%	LOS F	Longest segment combo? (Y=1)	Longest combo run time (255.1)	Longest combo delay (0.0)
Segment 1	82%	B	1	27.4	0.0
Segment 2	79%	B			
Segment 3	46%	D	1	10.4	0.0
Segment 4	42%	D			
Segment 5	44%	D	1	14.0	0.0
Segment 6	30%	F			
Segment 7	28%	F			
Segment 8	23%	F			
Segment 9	37%	E			
Segment 10	30%	F			
Segment 11	19%	F			
Segment 12	20%	F			
Segment 13	35%	E			
Segment 14	45%	D			
Segment 15	17%	F			

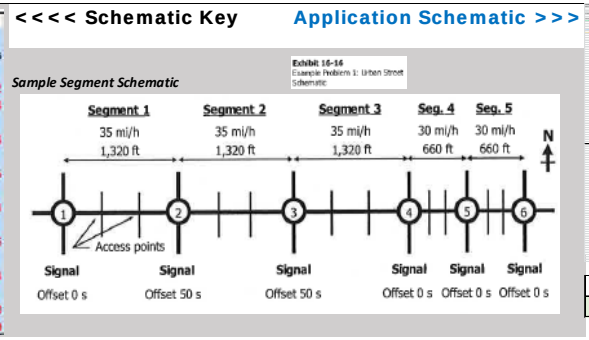
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
255	0	255	1435	64.1

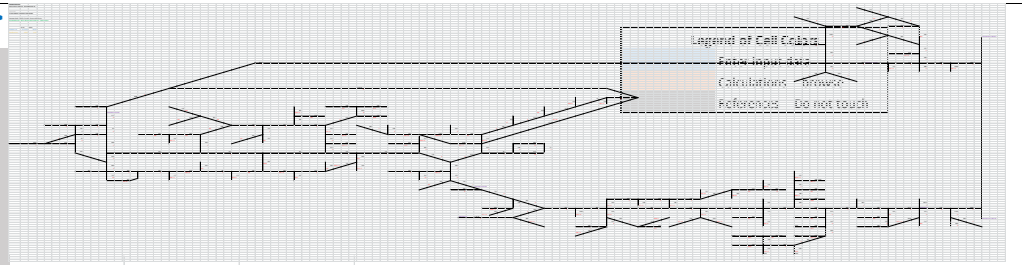
Summary

Average Network/Facility Operating Speed (MPH):	4.0

Heritage Ranch – Eastern Entrance







Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
765	33	799	2476	116.5

Input

Number of Segments:	107						
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*
Segment 1	1	75	25	37.4	2.05	14	1
Segment 2	2	455	25	37.4	12.41	11	1
Segment 3	9	510	25	37.4	13.91	12	1
Segment 4	18	1830	25	37.4	49.91	9	1
Segment 5	17	1920	25	37.4	52.36	10	1
Segment 6	12	370	25	37.4	10.09	11	1
Segment 7	8	260	25	37.4	7.09	12	1
Segment 8	5	280	25	37.4	7.64	12	1
Segment 9	25	1335	25	37.4	36.41	11	1
Segment 10	8	260	25.0	37.4	7.09	11	1
Segment 11	14	600	25.0	37.4	16.36	12	1
Segment 12	4	285	25.0	37.4	7.77	13	1
Segment 13	14	370	25.0	37.4	10.09	13	1
Segment 14	4	275	25.0	37.4	7.50	12	1
Segment 15	10	250	25.0	37.4	6.82	12	1

Summary

Average Network/Facility Operating Speed (MPH):	5.8

Segment	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	61	2	0.0	0.6
Segment 2	122	3	0.0	4.0
Segment 3	550	15	1.1	4.0
Segment 4	1100	30	0.0	12.0
Segment 5	1039	28	0.0	11.7
Segment 6	733	20	9.9	2.9
Segment 7	489	13	6.2	2.1
Segment 8	306	8	0.7	2.4
Segment 9	1528	42	5.3	8.5
Segment 10	489	13	6.2	2.2
Segment 11	856	23	7.0	4.3
Segment 12	244	7	0.0	2.3
Segment 13	856	23	13.2	2.5
Segment 14	244	7	0.0	2.4
Segment 15	611	17	9.8	1.9

Facility	PBFS 23%	LOS F	Longest segment combo? (Y=1)	Longest combo run time (765.4)	Longest combo delay (33.3)
Segment 1	2%	F			
Segment 2	16%	F	1	12.4	3.3
Segment 3	16%	F			
Segment 4	48%	D	1	49.9	30.0
Segment 5	47%	D			
Segment 6	12%	F			
Segment 7	8%	F			
Segment 8	10%	F			
Segment 9	34%	E			
Segment 10	9%	F			
Segment 11	17%	F			
Segment 12	9%	F			
Segment 13	10%	F			
Segment 14	9%	F			
Segment 15	8%	F			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
765	33	799	2476	116.5

Summary

Average Network/Facility Operating Speed (MPH):	5.8

River Oaks

River Oaks

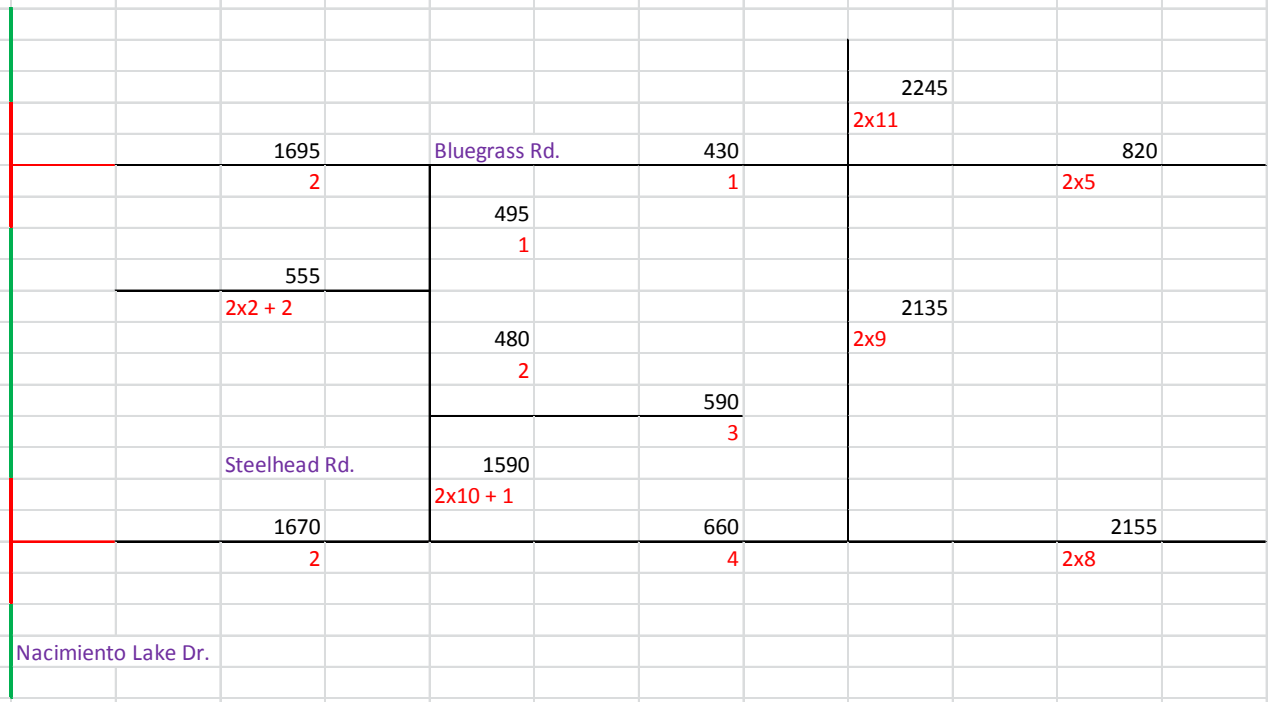
River Oaks

Nacimiento Lake Dr. at Bluegrill Dr. and Steelhead Rd.

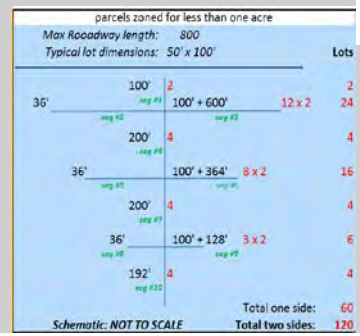
Average Daily Traffic Counts: Source KSS Feuls:

OnNacimiento Lake Dr.: 1296 (1996)

	Sq. Ft.	Acres
Largest Lot:	77,101	1.77
Smallest Lot:	43,560	1.00

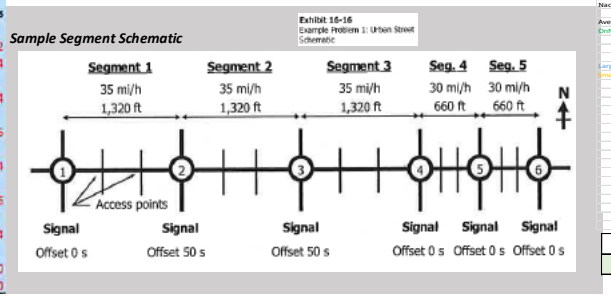


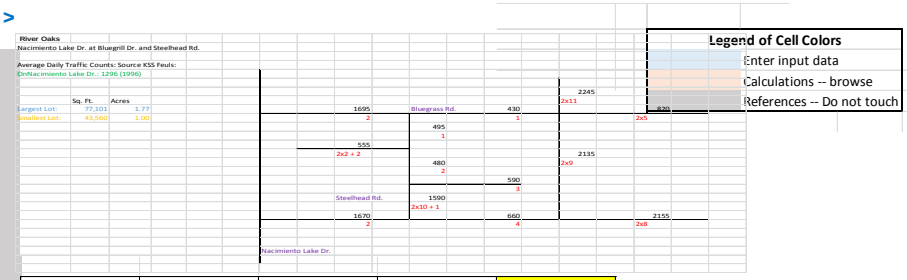
River Oaks



<<<< Schematic Key

Application Schematic >>>





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
122	37	159	264	13.7

Input

Number of Segments:	14											
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	2	1695	25	37.4	46.23	1	1	5	122	3	0.0	22.1
Segment 2	1	430	25	37.4	11.73	2	1	2	61	2	0.0	12.4
Segment 3	22	2245	25	37.4	61.23	3	1	54	1344	37	0.0	19.3
Segment 4	10	820	25	37.4	22.36	3	1	24	611	17	0.0	13.9
Segment 5	1	495	25	37.4	13.50	2	1	2	61	2	0.0	13.2
Segment 6	6	555	25	37.4	15.14	3	1	15	367	10	0.0	11.4
Segment 7	2	480	25	37.4	13.09	3	1	5	122	3	0.0	10.5
Segment 8	3	590	25	37.4	16.09	3	1	7	183	5	0.0	11.8
Segment 9	21	1590	25	37.4	43.36	2	1	51	1283	35	0.0	19.6
Segment 10	2	1670	25.0	37.4	45.55	1	1	5	122	3	0.0	22.1
Segment 11	4	660	25.0	37.4	18.00	2	1	10	244	7	0.0	15.0
Segment 12	16	2155	25.0	37.4	58.77	3	1	39	978	27	0.0	19.1
Segment 13	18	2135	25.0	37.4	58.23	3	1	44	1100	30	0.0	19.1

Summary

Average Network/Facility Operating Speed (MPH):	17.4

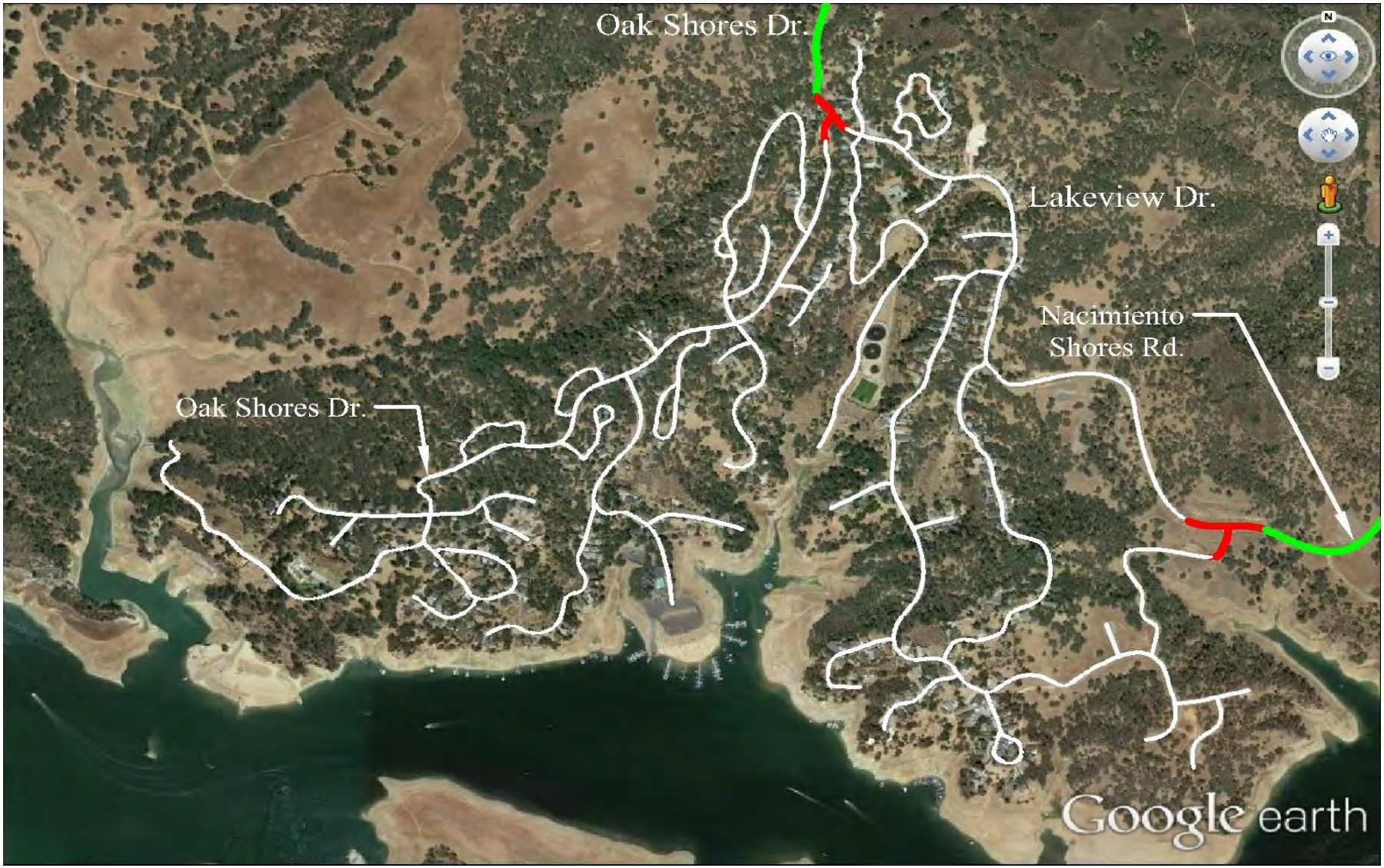
Facility	PBFS 69%	LOS B	Longest segment combo? (Y=1)	Longest combo run time (122.3)	Longest combo delay (36.7)
Segment 1	89%	A			
Segment 2	49%	D			
Segment 3	77%	B			
Segment 4	55%	C			
Segment 5	53%	C			
Segment 6	46%	D			
Segment 7	42%	D			
Segment 8	47%	D			
Segment 9	78%	B			
Segment 10	88%	A	1	45.5	3.3
Segment 11	60%	C	1	18.0	6.7
Segment 12	77%	B	1	58.8	26.7
Segment 13	76%	B			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
122	37	159	264	13.7

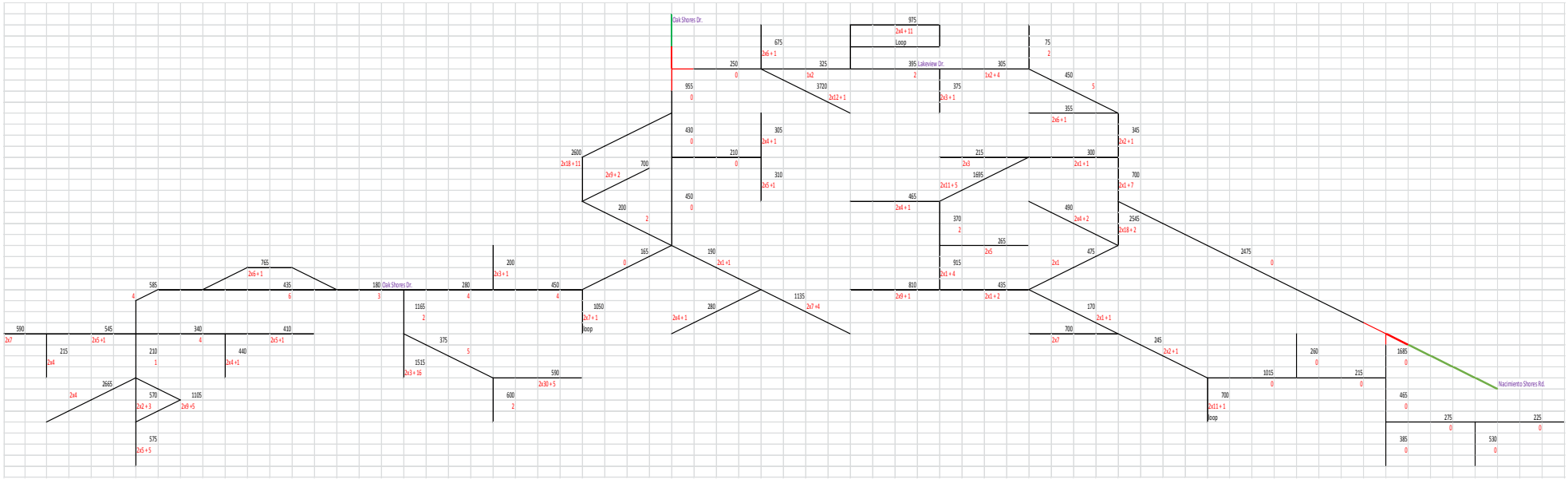
Summary

Average Network/Facility Operating Speed (MPH):	17.4

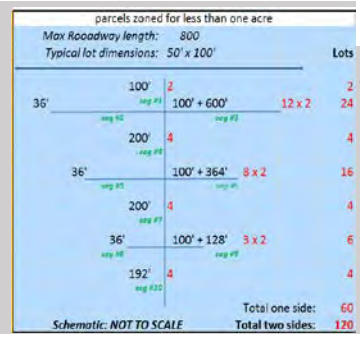
Oak Shores


Oak Shores Dr.
Lakeview Dr.
Nacimiento
Shores Rd.
Oak Shores Dr.
Google earth

Oak Shores


Oak Shores Dr.
Lakeview Dr.
Oak Shores Dr.
Nacimiento Shores Rd.
975
2x4 + 11
Loop
675
2x6 + 1
75
2
250
0
325
1x2
395
2
305
1x2 + 4
450
5
955
0
3720
2x12 + 1
375
2x3 + 1
355
2x6 + 1
430
0
305
2x4 + 1
345
1x2 + 1
2600
2x18 + 11
700
2x9 + 2
210
0
310
2x5 + 1
215
2x3
1695
2x11 + 5
300
2x1 + 1
700
2x1 + 7
450
0
465
2x4 + 1
200
2
370
2
490
2x4 + 2
2545
2x18 + 2
265
2x5
475
2x1
2475
0
165
0
190
2x1 + 1
915
2x1 + 4
765
2x6 + 1
200
2x3 + 1
585
4
435
6
180
3
280
4
450
4
1050
2x7 + 1
loop
1135
2x7 + 4
810
2x9 + 1
435
2x1 + 2
280
2x4 + 1
170
2x1 + 1
590
2x7
545
2x5 + 1
340
4
410
2x5 + 1
1165
2
700
2x7
245
2x2 + 1
215
2x4
210
1
440
2x4 + 1
375
5
1515
2x3 + 36
590
2x30 + 5
600
2
260
0
1015
0
215
0
1685
0
2665
2x4
570
2x2 + 3
1105
2x9 + 5
700
2x11 + 1
loop
465
0
575
2x5 + 5
275
0
225
0
385
0
530
0

Oak Shores



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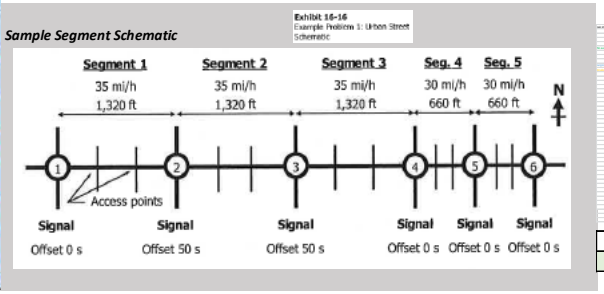
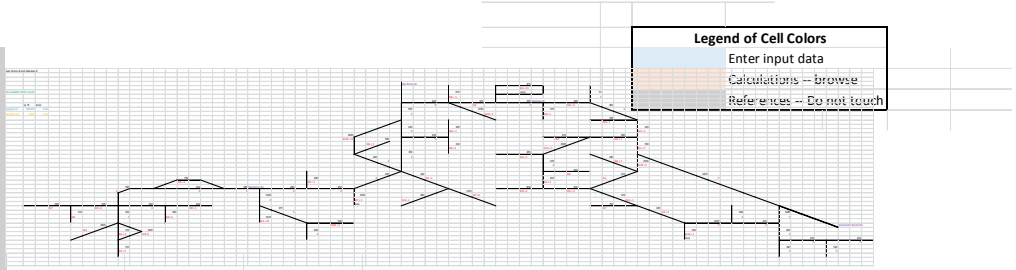




Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
44	50	94	1569	67.0

Input

Number of Segments:	76											
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	950	25	37.4	25.91	1	1	0	0	0	0.0	20.3
Segment 2	0	430	25	37.4	11.73	2	1	0	0	0	0.0	12.4
Segment 3	47	2600	25	37.4	70.91	2	1	115	2872	78	7.4	19.6
Segment 4	20	700	25	37.4	19.09	3	1	49	1222	33	14.2	9.3
Segment 5	2	200	25	37.4	5.45	3	1	5	122	3	0.0	5.8
Segment 6	0	210	25	37.4	5.73	3	1	0	0	0	0.0	6.0
Segment 7	9	305	25	37.4	8.32	4	1	22	550	15	6.7	5.3
Segment 8	11	310	25	37.4	8.45	4	1	27	672	18	9.9	5.0
Segment 9	0	450	25	37.4	12.27	3	1	0	0	0	0.0	10.1
Segment 10	3	190	25.0	37.4	5.18	4	1	7	183	5	0.0	4.4
Segment 11	9	280	25.0	37.4	7.64	5	1	22	550	15	7.4	4.2
Segment 12	18	1135	25.0	37.4	30.95	5	1	44	1100	30	0.0	12.7
Segment 13	0	165	25.0	37.4	4.50	4	1	0	0	0	0.0	3.9
Segment 14	15	1050	25.0	37.4	28.64	5	1	37	917	25	0.0	12.2
Segment 15	4	450	25.0	37.4	12.27	5	1	10	244	7	0.0	7.3

Summary

Average Network/Facility Operating Speed (MPH):	8.7

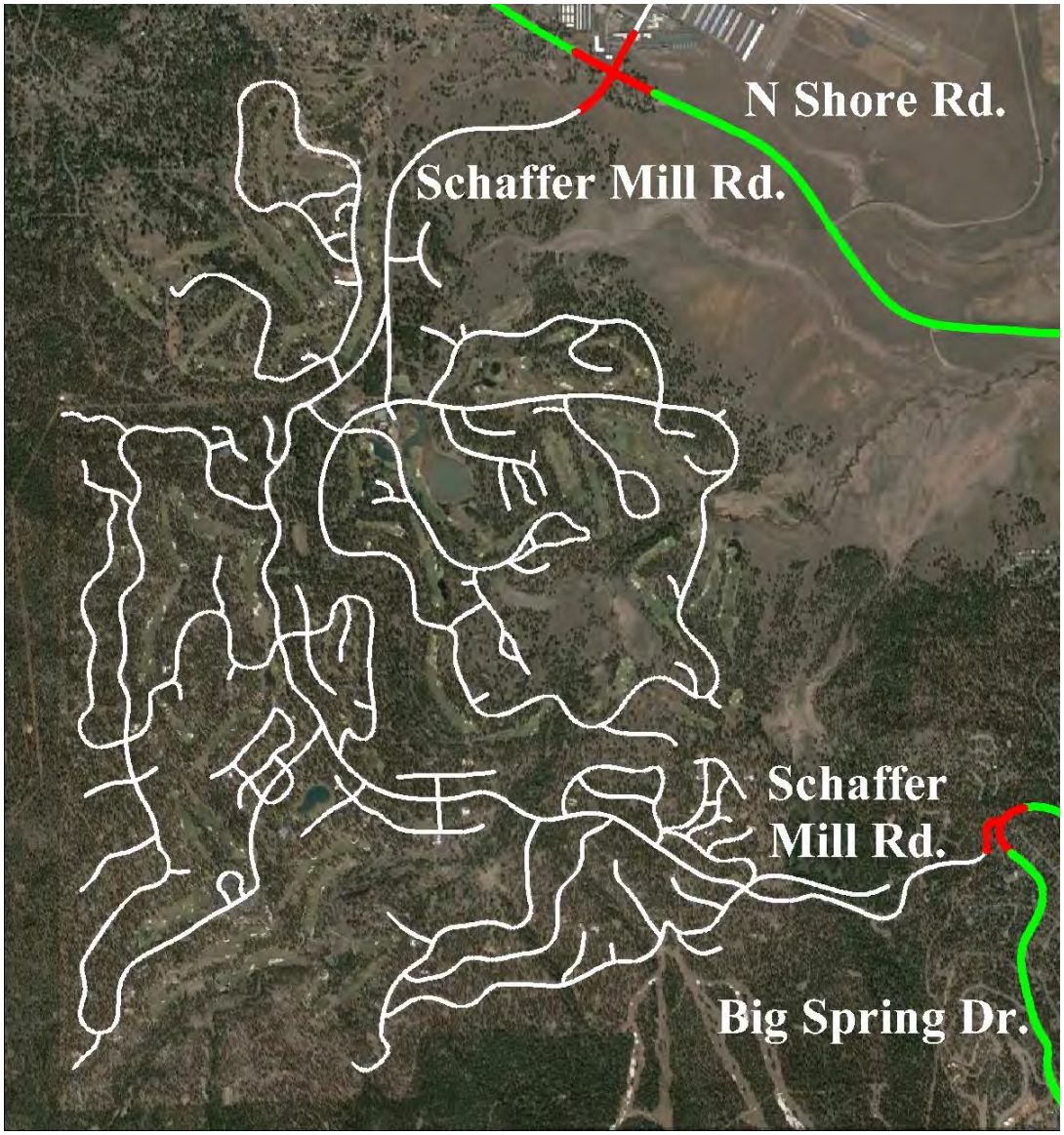
Facility	PBFS 35%	LOS E	Longest segment combo? (Y=1)	43.8 Longest combo run time	50.0 Longest combo delay
Segment 1	81%	B			
Segment 2	49%	D			
Segment 3	78%	B			
Segment 4	37%	E			
Segment 5	23%	F			
Segment 6	24%	F			
Segment 7	21%	F			
Segment 8	20%	F			
Segment 9	41%	D			
Segment 10	18%	F	1	5.2	5.0
Segment 11	17%	F	1	7.6	15.0
Segment 12	51%	C	1	31.0	30.0
Segment 13	16%	F			
Segment 14	49%	D			
Segment 15	29%	F			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
44	50	94	1569	67.0

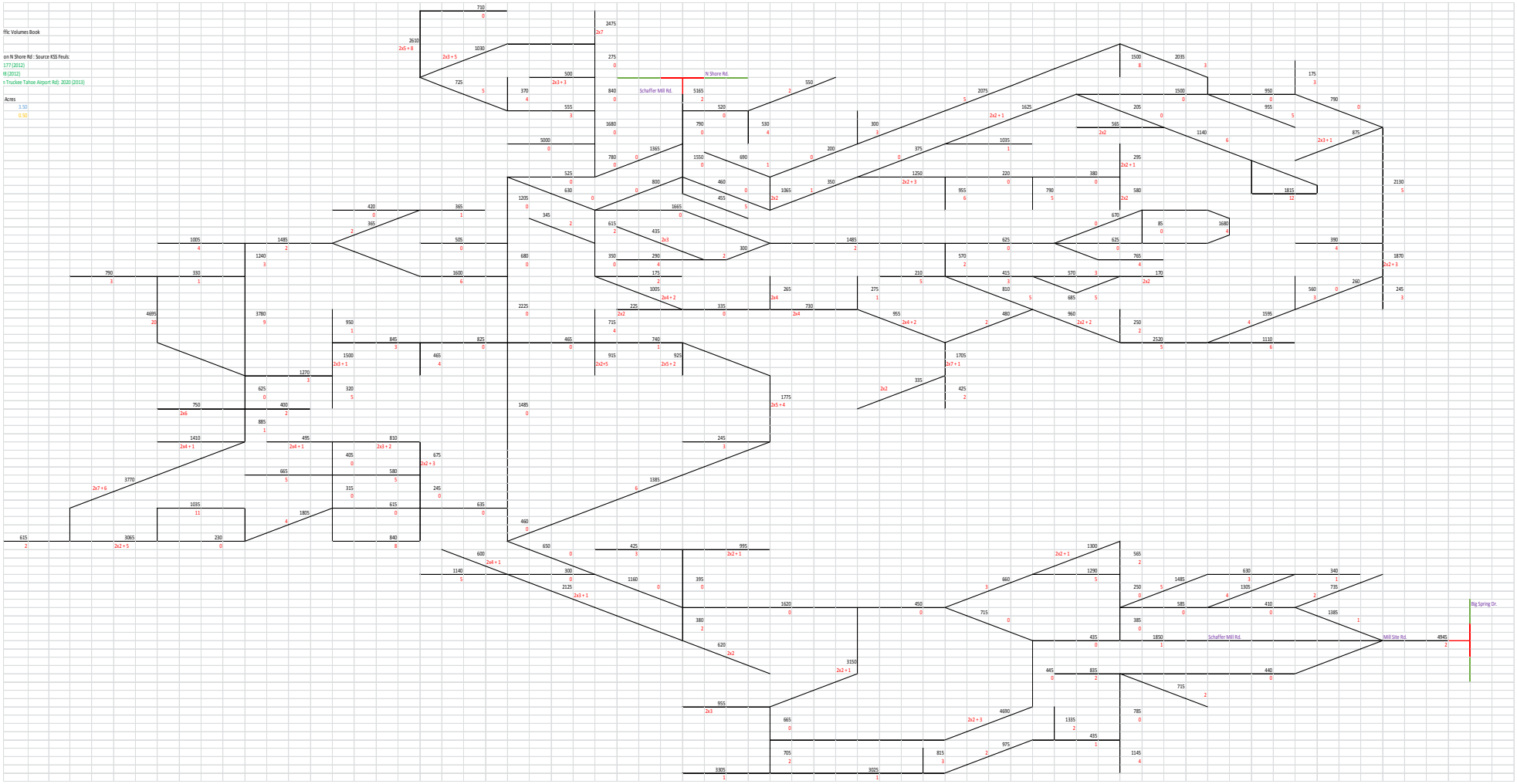
Summary

Average Network/Facility Operating Speed (MPH):	8.7

Northwest Lake Tahoe

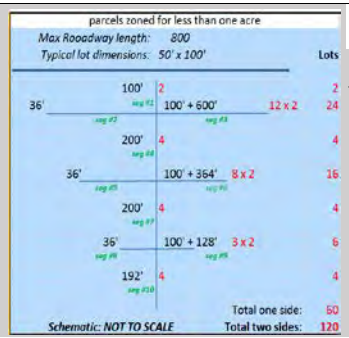


Northwest Lake Tahoe



FULL 12.3

Northwest Lake Tahoe



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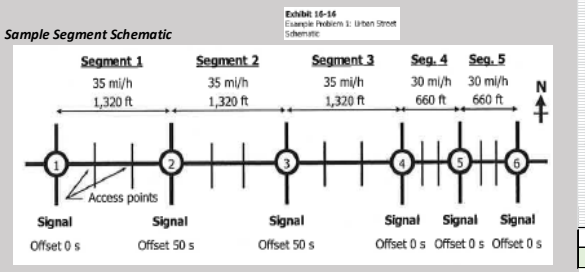
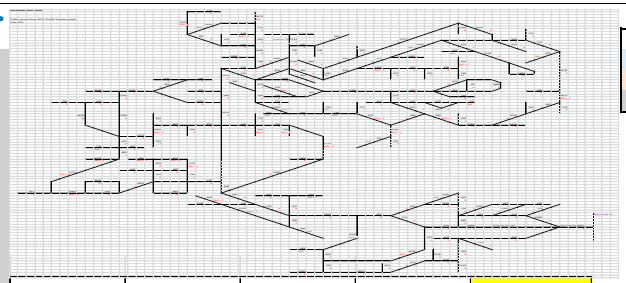




Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
730	8	738	1621	79.9

Legend of Cell Colors
Enter input data
Calculations -- browse
References -- Do not touch

Input

Number of Segments:	200

Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes
Segment 1	2	5165	25	37.4	140.86	1	1
Segment 2	0	520	25	37.4	14.18	2	1
Segment 3	2	5165	25	37.4	140.86	3	1
Segment 4	2	550	25	37.4	15.00	3	1
Segment 5	0	790	25	37.4	21.55	2	1
Segment 6	0	1550	25	37.4	42.27	3	1
Segment 7	0	1365	25	37.4	37.23	3	1
Segment 8	0	525	25	37.4	14.32	3	1
Segment 9	0	780	25	37.4	21.27	4	1
Segment 10	0	5000	25.0	37.4	136.36	5	1
Segment 11	0	1680	25.0	37.4	45.82	5	1
Segment 12	3	555	25.0	37.4	15.14	6	1
Segment 13	4	370	25.0	37.4	10.09	7	1

Summary

Average Network/Facility Operating Speed (MPH): 7.6

Segment	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	122	3	0.0	24.0
Segment 2	0	0	0.0	13.5
Segment 3	122	3	0.0	22.2
Segment 4	122	3	0.0	11.4
Segment 5	0	0	0.0	16.1
Segment 6	0	0	0.0	17.5
Segment 7	0	0	0.0	16.9
Segment 8	0	0	0.0	11.1
Segment 9	0	0	0.0	11.7
Segment 10	0	0	0.0	20.5
Segment 11	0	0	0.0	15.1
Segment 12	183	5	0.0	7.4
Segment 13	244	7	0.0	4.8

Facility	PBFS 30%	LOS E	Longest segment combo? (Y=1)	Longest combo run time (729.7)	Longest combo delay (8.3)
Segment 1	96%	A	1	140.9	3.3
Segment 2	54%	C			
Segment 3	89%	A			
Segment 4	45%	D			
Segment 5	64%	C	1	21.5	0.0
Segment 6	70%	B	1	42.3	0.0
Segment 7	67%	B			
Segment 8	44%	D	1	14.3	0.0
Segment 9	47%	D			
Segment 10	82%	B			
Segment 11	60%	C			
Segment 12	30%	F			
Segment 13	19%	F			

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
730	8	738	1621	79.9

Summary

Average Network/Facility Operating Speed (MPH):	7.6

Comparisons

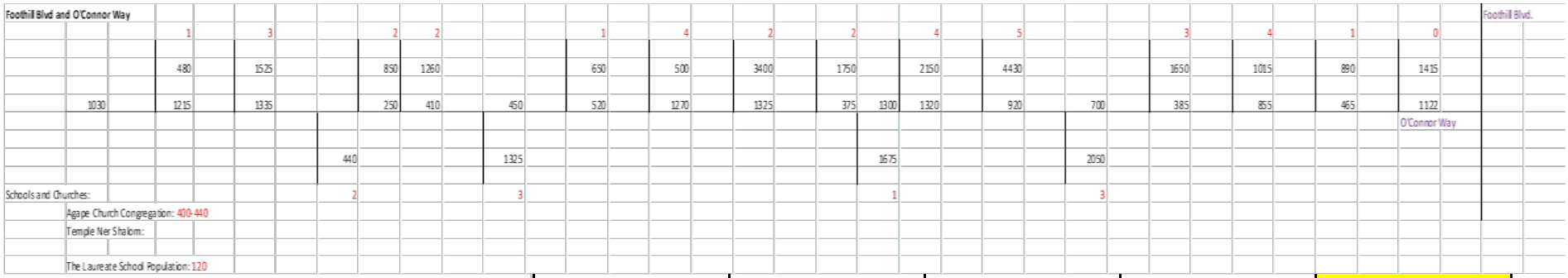
Single vs. Mixed Use – Foothill Boulevard at O'Connor Way

Notes:

- Threefold increase in clearance time from 10 minutes (residential single use) to 30 minutes (mixed use)
- Mixed use is the presence of two churches (on segment 2) and a synagogue (on segment 4)

Conclusion: *It may not be wise to ignore type and intensity of land use in single-access subdivisions*

Single Use



Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
305	0	305	105	9.5

Input **Summary**

Number of Segments:	38							Average Network/Facility Operating Speed (MPH):				8.8
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	0	1122	35	42.1	21.86	1	1	0	0	0	0.0	27.5
Segment 2	0	1415	25	37.4	38.59	2	1	0	0	0	0.0	19.1
Segment 3	0	465	35	42.1	9.06	2	1	0	0	0	0.0	15.1
Segment 4	1	890	25	37.4	24.27	3	1	2	61	2	0.0	14.4
Segment 5	0	855	35	42.1	16.66	3	1	0	0	0	0.0	16.8

Mixed Use

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
367	248	615	466	29.7

Input

Foothill and O'Connor with Churches and School

Summary

Number of Segments:	38							Average Network/Facility Operating Speed (MPH):				8.4
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	0	1122	35	42.1	21.86	1	1	0	0	0	0.0	27.5
Segment 2	107	1415	25	37.4	38.59	2	1	263	6566	179	140.5	5.0
Segment 3	0	465	35	42.1	9.06	2	1	0	0	0	0.0	15.1
Segment 4	41	890	25	37.4	24.27	3	1	101	2525	69	44.6	7.0

Single vs. Multiple Entrances – Heritage Ranch, Nacimiento Lake Area

Notes:

Division of evacuated vehicles **by distance to nearest exit** produced highly varied clearance times: 64 minutes for western entrance with fewer vehicles; 117 minutes for eastern entrance with many more vehicles. Even if with constant communications residents are able to switch routes to balance exit times, the average by each exit would be approximately 90 minutes.

Conclusion: *Simply providing two entrances for uncontrolled size of development may not be wise.*

Potential Effects of Fire – Smoke Limiting Visibility in Northwest Lake Tahoe

Notes:

- Studies of fog (a surrogate for thick smoke during wildland fires) suggest increases of 10% to 50% in travel time when visibility is limited (FHWA website: http://www.ops.fhwa.dot.gov/weather/q1_roadimpact.htm.
- Assuming a 50% increase in travel time due to thick smoke, clearance time of the Northwest Lake Tahoe development would worsen from 80 minutes on an average normal severe day to 92 minutes.
- This is a 24% reduction in network travel speed (from 7.6 mph to 5.8 mph) and a 15% increase in clearance time.

Conclusion: *Potential effects of fire in terms of visibility can add significantly to clearance times*

	Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Average Network/Facility Operating Speed (MPH)	Total Clear (min)
Average Normal Severe Day	730	8	738	1621	**7.6**	**79.9**
Smoke-Engulfed Day	1459	17	1476	1621	**5.8**	**92.2**

Potential Effects of Delay at Main Through road Intersection – Pismo Heights

Notes:

- Pismo Heights is a single-access subdivision along Longview Avenue until its intersection with Wadsworth Street. At that intersection, residents have two route choices for exit:
  - East on Lemoore Avenue to Price Canyon Road
  - South on Wadsworth Street with three choices at Bello Street:
    - Left on Bello Street to Price Canyon Road
    - Right on Bello Street to US 101 northbound on-ramp at Bay Street
    - Straight on Wadsworth Street toward the Beach
- Using existing intersection analysis for Bello Street at Price Canyon Road as a surrogate for constrained delay at a main through road intersection . . . . .
- Vehicles on the eastbound approach are estimated to experience about 15 seconds of delay during AM and PM peak periods. Each vehicle ahead of the last vehicle to exit the development would experience that level of delay.
- If all 1149 vehicles to exit the development were equally divided among the four available route choices then 287 vehicles would have to navigate the Bello Street intersection. This calculates to 4310 seconds or 72 minutes.
- Total clearance time would go up by more than an hour due to delay at the main through road intersection from 55 minutes to 127 minutes. Anecdotal information confirms that it takes that long to exit this development on such holidays as 4th of July when many residents are heading out to the fireworks on the beach.

Conclusion: *Potential effects of perennial delay at primary through road intersection can add significantly to clearance times*

	Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Average Network/Facility Operating Speed (MPH)	Total Clear (min)
Unconstrained at through road intersection	217	200	417	1149	6	55
Delay at through road intersection						127

Simplest Case: Single-driveway, Single access Subdivision – Rock Creek Ranch

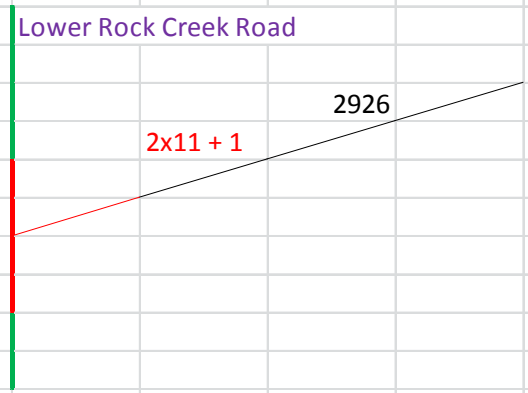
Analysis is only for one row (single driveway) of development

Rock Creek Ranch

Lower Rock Creek Road and a proposed road

No available traffic counts

	Sq. Ft.	Acres
Largest Lot:	101,594	2.33
Smallest Lot:	52,987	1.22



Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
80	38	118	56	4.4

Input

Summary

Number of Segments:	2							Average Network/Facility Operating Speed (MPH):				23.3
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	23	2926	25	37.4	79.80	1	1	56	1406	38	0.0	23.3
Segment 2												

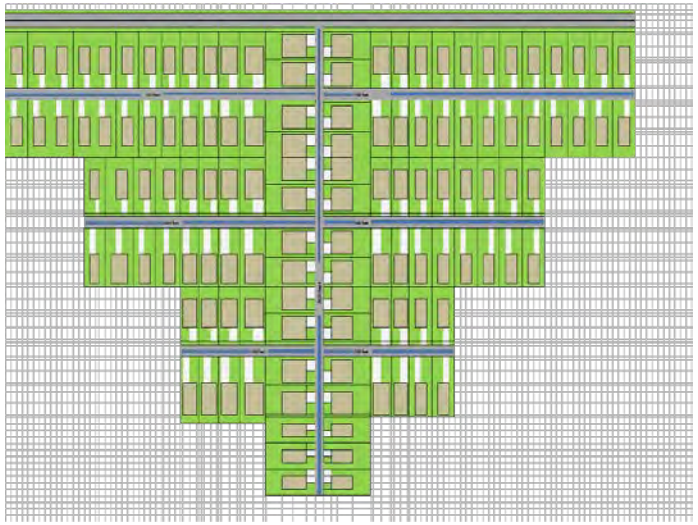
Application to Hypothetical Cases

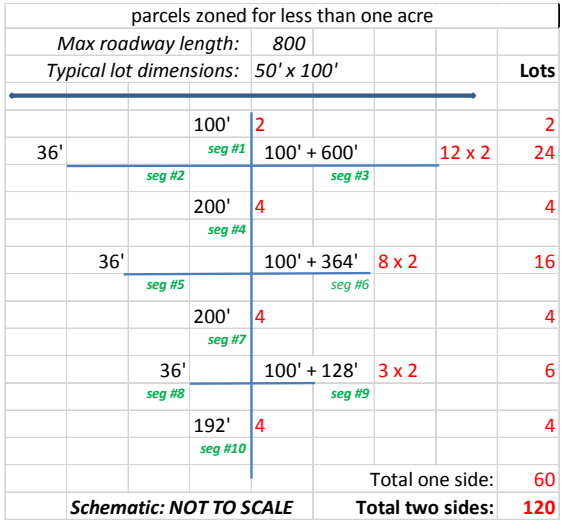
Summary Table 2: Potential Effects of Delay at Main Through Road Intersection on Hypothetical Cases

	Normal travel time of farthest vehicle	Delay to farthest vehicle	Total travel time for farthest vehicle (sec)	Number of vehicles to clear	Average network/facility operating speed (mph)	Total Clearance Time -- no delay at through road intersection (min)	Total Clearance Time -- with delay at through road intersection (min)[1]
Various parcel sizes -- without mitigation options							
< 1acre; 120 DU	22	47	68	293	7	13	87
1 to 4.99 acres; 44 DU	36	10	46	112	14	6	34
5 to 19.99 acres; 34 DU	72	23	95	83	20	5	26
20 acres +; 36 DU	144	47	191	88	22	7	29
Parcels zoned for less than 1 acre -- with potential mitigation options							
240 dwelling units (DU)	22	93	115	587	4	26	173
120 DU; 1 exit lane	22	47	68	293	7	13	87
120 DU; 2 exit lanes	22	23	45	293	9	13	86
120 DU; 1 lane; 2 exits	22	47	68	147	8	7	44
120 DU + school; 1 lane	22	127	148	538	5	25	159
120 DU + school; 2 lanes	22	63	85	538	7	24	158
120 DU + school; 2 exits	22	130	152	269	5	14	81

[1] *Assumes an average of 15 seconds of delay per vehicle accumulated from first exiting to last exiting vehicle*

Parcels zoned for less than 1 acre





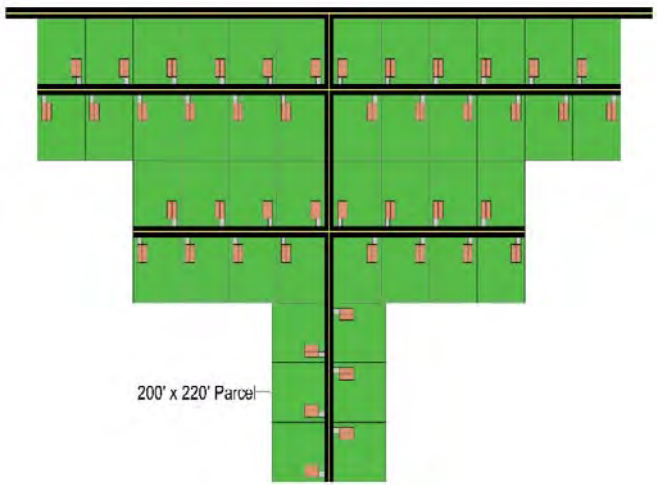
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	47	68	293	13.4

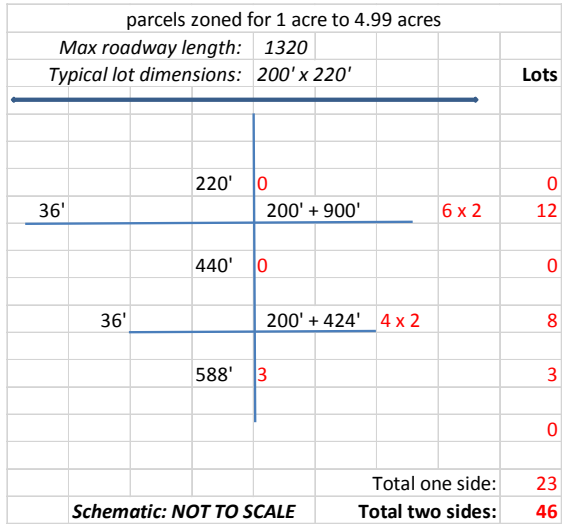
Input

Summary

Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				6.6
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	4	100	25	37.4	2.73	1	1	10	244	7	3.9	5.4
Segment 2	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 3	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 4	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 5	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 6	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 7	8	236	25	37.4	6.44	3	1	20	489	13	6.9	5.1
Segment 8	6	228	25	37.4	6.22	4	1	15	367	10	3.8	4.6
Segment 9	6	228	25	37.4	6.22	4	1	15	367	10	3.8	4.6
Segment 10	8	228	25.0	37.4	6.22	4	1	20	489	13	7.1	4.2

Parcels zoned for 1 acre to 5 acres





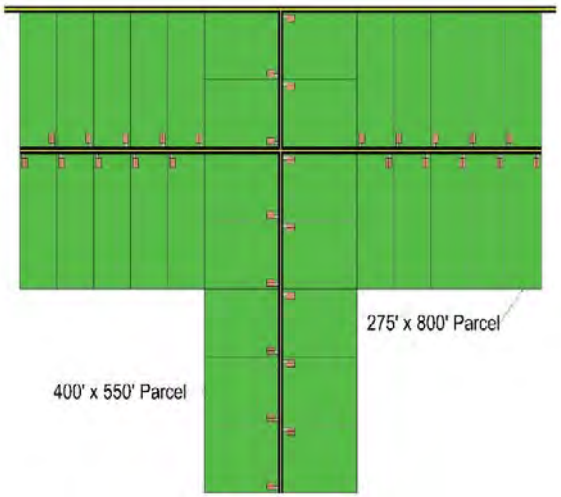
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
36	10	46	112	5.5

Input

Summary

Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				14.4
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	0	220	25	37.4	6.00	1	1	0	0	0	0.0	12.5
Segment 2	12	1100	25	37.4	30.00	2	1	29	733	20	0.0	17.9
Segment 3	12	1100	25	37.4	30.00	2	1	29	733	20	0.0	17.9
Segment 4	0	476	25	37.4	12.98	2	1	0	0	0	0.0	13.0
Segment 5	8	624	25	37.4	17.02	3	1	20	489	13	0.0	12.1
Segment 6	8	624	25	37.4	17.02	3	1	20	489	13	0.0	12.1
Segment 7	6	624	25	37.4	17.02	3	1	15	367	10	0.0	12.1
Segment 8												

Parcels zoned for 5 acres to 20 acres



parcels zoned for 5 acres to 19.99 acres					
Max roadway length:		*2640*			
Typical lot dimensions:		*400' x 550' & 275' x 800'*			**Lots**
	800'	2			2
36'		550' + 1290'		5 x 2	10
	800'	2			2
	800'	2			2
	204'	1			1
				Total one side:	17
Schematic: NOT TO SCALE				**Total two sides:**	**34**

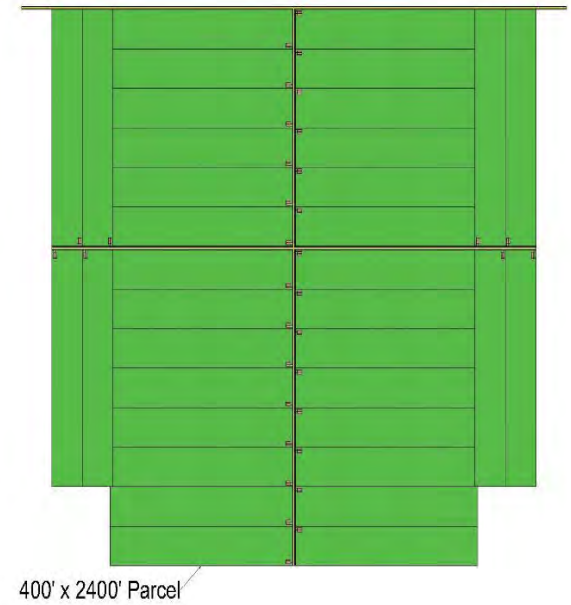
Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
72	23	95	83	**5.1**

Input

Summary

Number of Segments:	*10*							**Average Network/Facility Operating Speed (MPH):**				20.1
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	***Segment Operation Speed***
Segment 1	4	800	25	37.4	21.82	1	1	10	244	7	0.0	**19.6**
Segment 2	10	1840	25	37.4	50.18	2	1	24	611	17	0.0	**20.2**
Segment 3	10	1840	25	37.4	50.18	2	1	24	611	17	0.0	**20.2**
Segment 4	10	1840	25	37.4	50.18	2	1	24	611	17	0.0	**20.2**
Segment 5												

Parcels zoned for 20 acres or larger



parcels zoned for 20 acres or larger				
Max roadway length:	*5280*			
Typical lot dimensions:	*400' x 2400'*			**Lots**
	2400'	6		6
36'		2400' + 480'	2 x 2	4
	2400'	6		6
	444'	2		2
			Total one side:	18
Schematic: NOT TO SCALE			**Total two sides:**	**36**

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
144	47	191	88	**6.9**

Input

Summary

Number of Segments:	*10*							**Average Network/Facility Operating Speed (MPH):**				21.9
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	***Segment Operation Speed***
Segment 1	12	2400	25	37.4	65.45	1	1	29	733	20	0.0	22.9
Segment 2	4	2880	25	37.4	78.55	2	1	10	244	7	0.0	21.7
Segment 3	4	2880	25	37.4	78.55	2	1	10	244	7	0.0	21.7
Segment 4	16	2880	25	37.4	78.55	2	1	39	978	27	0.0	21.7
Segment 5												

Varied Treatments on Parcels zoned for less than 1 acre

240 Dwelling Units

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	93	115	587	26.4

Input

Summary

Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				4.3
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	8	100	25	37.4	2.73	1	1	20	489	13	10.6	3.5
Segment 2	48	700	25	37.4	19.09	2	1	117	2933	80	60.9	5.2
Segment 3	48	700	25	37.4	19.09	2	1	117	2933	80	60.9	5.2
Segment 4	16	236	25	37.4	6.44	2	1	39	978	27	20.2	4.2
Segment 5	32	464	25	37.4	12.65	3	1	78	1956	53	40.7	4.4
Segment 6	32	464	25	37.4	12.65	3	1	78	1956	53	40.7	4.4
Segment 7	16	236	25	37.4	6.44	3	1	39	978	27	20.2	3.6
Segment 8	12	228	25	37.4	6.22	4	1	29	733	20	13.8	3.5
Segment 9	12	228	25	37.4	6.22	4	1	29	733	20	13.8	3.5
Segment 10	16	228	25.0	37.4	6.22	4	1	39	978	27	20.4	3.1

120 Dwelling Units & 2 Exit Lanes

Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	23	45	293	13.0

Input

Summary

Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				9.0
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	4	100	25	37.4	2.73	1	2	10	122	3	0.6	7.3
Segment 2	24	700	25	37.4	19.09	2	2	59	733	20	0.9	14.9
Segment 3	24	700	25	37.4	19.09	2	2	59	733	20	0.9	14.9
Segment 4	8	236	25	37.4	6.44	2	2	20	244	7	0.2	8.6
Segment 5	16	464	25	37.4	12.65	3	2	39	489	13	0.7	10.1
Segment 6	16	464	25	37.4	12.65	3	2	39	489	13	0.7	10.1
Segment 7	8	236	25	37.4	6.44	3	2	20	244	7	0.2	6.5
Segment 8	6	228	25	37.4	6.22	4	2	15	183	5	0.0	5.1
Segment 9	6	228	25	37.4	6.22	4	2	15	183	5	0.0	5.1
Segment 10	8	228	25.0	37.4	6.22	4	2	20	244	7	0.4	5.1

120 Dwelling Units & 2 Exits

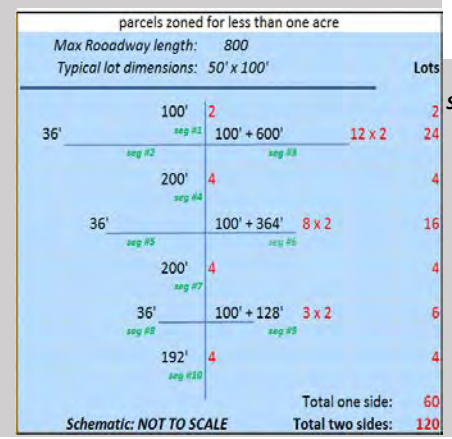
	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	47	68	147	7.3

Input

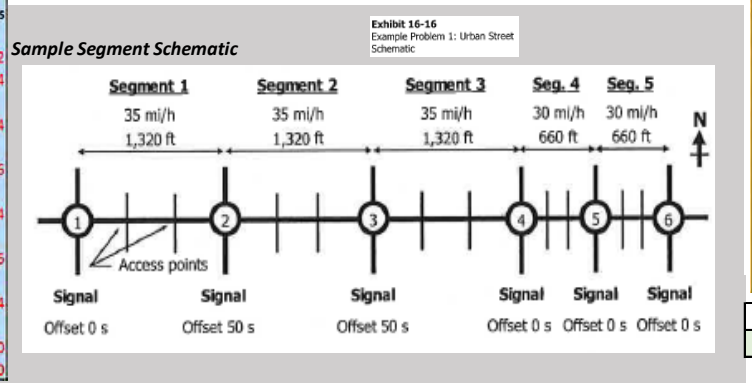
Summary

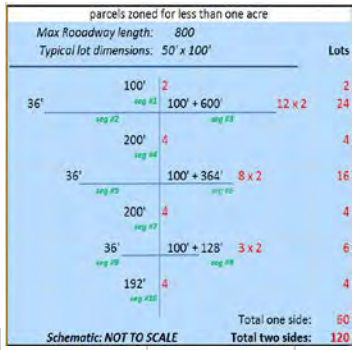
Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				7.6
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	*Segment Operation Speed*
Segment 1	4	100	25	37.4	2.73	1	1	10	244	7	3.9	5.4
Segment 2	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 3	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 4	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 5	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 6	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 7	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 8	6	228	25	37.4	6.22	2	1	15	367	10	3.8	7.1
Segment 9	6	228	25	37.4	6.22	2	1	15	367	10	3.8	7.1
Segment 10	8	228	25.0	37.4	6.22	1	1	20	489	13	7.1	8.0

120 Dwelling Units & School & 1 Exit Lane



<<<< Schematic Key **Application Schematic >>>**





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	127	148	538	24.9

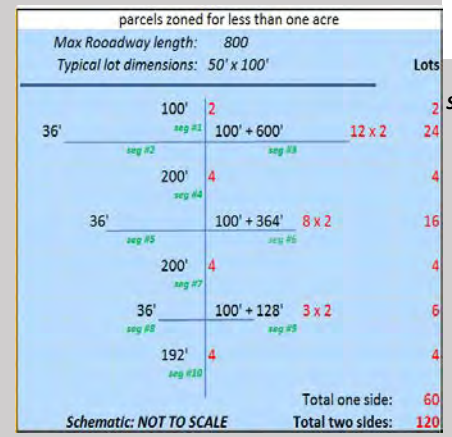
Input

School: access from links 6 and 9; 240 kids = 50% INTERNAL & 50% EXTERNAL = 120 kids -30 on bus = 90 picked + 10 staff = 100 veh @ 50 veh per link OUT

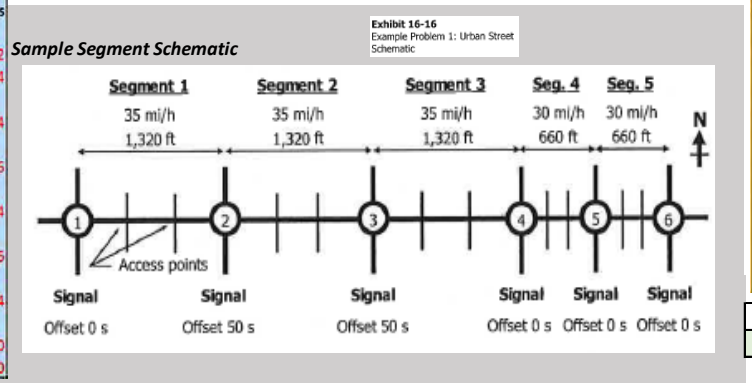
Summary

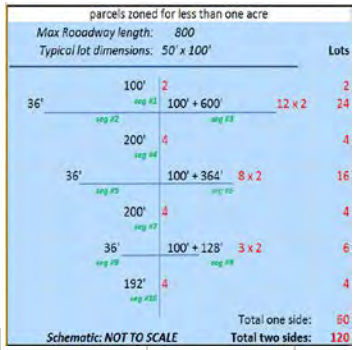
Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				4.6
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	4	100	25	37.4	2.73	1	1	10	244	7	3.9	5.4
Segment 2	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 3	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 4	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 5	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 6	66	464	25	37.4	12.65	3	1	161	4033	110	97.3	2.5
Segment 7	8	236	25	37.4	6.44	3	1	20	489	13	6.9	5.1
Segment 8	6	228	25	37.4	6.22	4	1	15	367	10	3.8	4.6
Segment 9	56	228	25	37.4	6.22	4	1	137	3422	93	87.1	1.3
Segment 10	8	228	25.0	37.4	6.22	4	1	20	489	13	7.1	4.2

120 Dwelling Units & School & 2 Exit Lanes



<<<< Schematic Key **Application Schematic >>>**





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	63	85	538	23.9

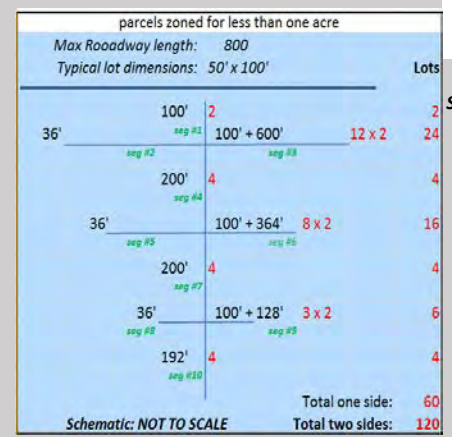
Input

School: access from links 6 and 9; 240 kids = 50% INTERNAL & 50% EXTERNAL = 120 kids -30 on bus = 90 picked + 10 staff = 100 veh @ 50 veh per link OUT

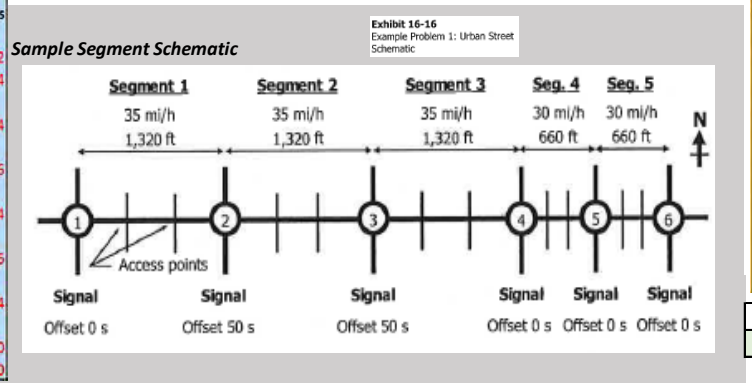
Summary

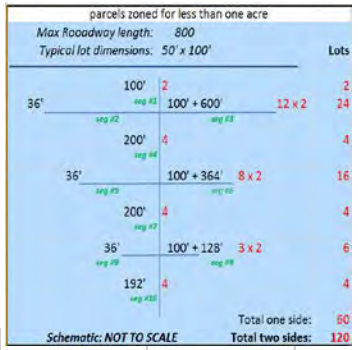
Number of Segments:	10							Average Network/Facility Operating Speed (MPH):				6.9
Segment	Houses on Segment	Segment Length (L_i)	Segment Speed Limit ($S_{fo,i}$)	Speed Constant (Exhibit 17-11)	Segment Running Time (t_R) -- (sec)	Full Stop Rate (intersections traversed)	Segment Directional Lanes	Segment Volume (pax cars)	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	Segment Operation Speed
Segment 1	4	100	25	37.4	2.73	1	2	10	122	3	0.6	7.3
Segment 2	24	700	25	37.4	19.09	2	2	59	733	20	0.9	14.9
Segment 3	24	700	25	37.4	19.09	2	2	59	733	20	0.9	14.9
Segment 4	8	236	25	37.4	6.44	2	2	20	244	7	0.2	8.6
Segment 5	16	464	25	37.4	12.65	3	2	39	489	13	0.7	10.1
Segment 6	66	464	25	37.4	12.65	3	2	161	2017	55	42.3	4.3
Segment 7	8	236	25	37.4	6.44	3	2	20	244	7	0.2	6.5
Segment 8	6	228	25	37.4	6.22	4	2	15	183	5	0.0	5.1
Segment 9	56	228	25	37.4	6.22	4	2	137	1711	47	40.4	2.2
Segment 10	8	228	25.0	37.4	6.22	4	2	20	244	7	0.4	5.1

120 Dwelling Units & School & 2 Exits



<<<< Schematic Key **Application Schematic >>>**





Far veh time	Far veh delay	Tot Far time (sec)	Vehs	Total Clear (min)
22	130	152	269	13.8

Input

School: access from links 6 and 9; 240 kids = 50% INTERNAL & 50% EXTERNAL = 120 kids -30 on bus = 90 picked + 10 staff = 100 veh @ 50 veh per link OUT

Summary

Number of Segments:	*10*							**Average Network/Facility Operating Speed (MPH):**				**5.0**
Segment	*Houses on Segment*	*Segment Length (L_i)*	*Segment Speed Limit ($S_{fo,i}$)*	*Speed Constant (Exhibit 17-11)*	*Segment Running Time (t_R) -- (sec)*	*Full Stop Rate (intersections traversed)*	*Segment Directional Lanes*	*Segment Volume (pax cars)*	Queue Length (feet)	Delayed Running Time (sec)	Cumul. Delay (sec)	***Segment Operation Speed***
Segment 1	4	100	25	37.4	2.73	1	1	10	244	7	3.9	5.4
Segment 2	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 3	24	700	25	37.4	19.09	2	1	59	1467	40	20.9	9.2
Segment 4	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 5	16	464	25	37.4	12.65	3	1	39	978	27	14.0	7.1
Segment 6	66	464	25	37.4	12.65	3	1	161	4033	110	97.3	2.5
Segment 7	8	236	25	37.4	6.44	2	1	20	489	13	6.9	6.4
Segment 8	6	228	25	37.4	6.22	2	1	15	367	10	3.8	7.1
Segment 9	56	228	25	37.4	6.22	2	1	137	3422	93	87.1	1.5
Segment 10	8	228	25.0	37.4	6.22	1	1	20	489	13	7.1	8.0

Background Information

Background 1: Census Data on Household Size & Auto Availability

AVERAGE HOUSEHOLD SIZE OF OCCUPIED HOUSING UNITS BY TENURE

Universe: Occupied housing units

2009-2013 American Community Survey 5-Year Estimates

	California	
	Estimate	Margin of Error
Total:	2.94	+/-0.01
Owner occupied	2.98	+/-0.01
Renter occupied	2.88	+/-0.01

Average household size

2.98

TENURE BY VEHICLES AVAILABLE

Universe: Occupied housing units

2009-2013 American Community Survey 5-Year Estimates

	California	
	Estimate	Margin of Error
Total:	12,542,460	+/-20,542
Owner occupied:	6,939,104	+/-35,627

Owners

Average autos per HH 2.206482

6,939,104

No vehicle available	190,309	+/-3,088	0
1 vehicle available	1,609,048	+/-9,435	1,609,048
2 vehicles available	2,936,622	+/-18,207	5,873,244
3 vehicles available	1,440,200	+/-11,562	4,320,600
4 vehicles available	534,717	+/-6,149	2,138,868
5 or more vehicles available	228,208	+/-3,149	1,369,248
Renter occupied:	5,603,356	+/-19,367	15,311,008
No vehicle available	783,643	+/-5,203	
1 vehicle available	2,436,631	+/-11,478	
2 vehicles available	1,757,120	+/-10,360	
3 vehicles available	454,628	+/-6,314	
4 vehicles available	125,119	+/-2,947	
5 or more vehicles available	46,215	+/-1,663	

HOUSEHOLD SIZE BY VEHICLES AVAILABLE

Universe: Households

2009-2013 American Community Survey 5-Year Estimates

	California	
	Estimate	Margin of Error
Total:	12,542,460	+/-20,542
No vehicle available	973,952	+/-5,927
1 vehicle available	4,045,679	+/-10,805
2 vehicles available	4,693,742	+/-15,712
3 vehicles available	1,894,828	+/-10,177
4 or more vehicles available	934,259	+/-7,267
1-person household:	3,040,221	+/-9,441
No vehicle available	536,599	+/-4,131

1 vehicle available	2,050,833	+/-8,494
2 vehicles available	364,812	+/-4,172
3 vehicles available	62,165	+/-1,731
4 or more vehicles available	25,812	+/-1,066
2-person household:	3,749,732	+/-10,400
No vehicle available	211,328	+/-3,146
1 vehicle available	971,950	+/-6,474
2 vehicles available	1,980,069	+/-8,509
3 vehicles available	457,793	+/-4,380
4 or more vehicles available	128,592	+/-2,619
3-person household:	2,048,520	+/-11,352
No vehicle available	92,441	+/-2,096
1 vehicle available	445,940	+/-5,082
2 vehicles available	842,637	+/-7,558
3 vehicles available	515,344	+/-5,598
4 or more vehicles available	152,158	+/-2,472
4-or-more-person household:	3,703,987	+/-11,416
No vehicle available	133,584	+/-2,658
1 vehicle available	576,956	+/-5,395
2 vehicles available	1,506,224	+/-8,962
3 vehicles available	859,526	+/-6,704
4 or more vehicles available	627,697	+/-5,527

3-psn Households

Average autos per HH 2.16646

2,048,520

0

445,940

1,685,274

1,546,032

760,790

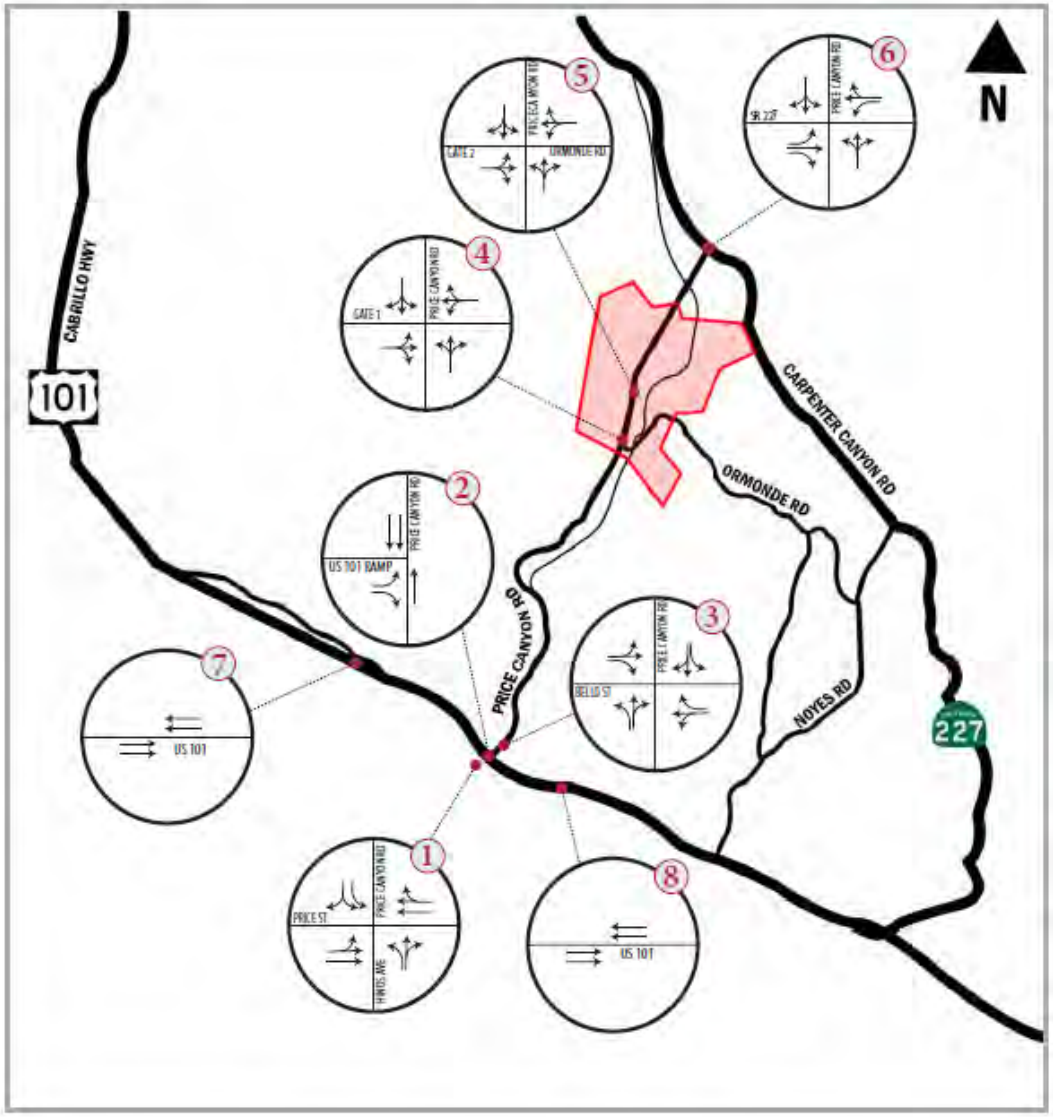
4,438,036

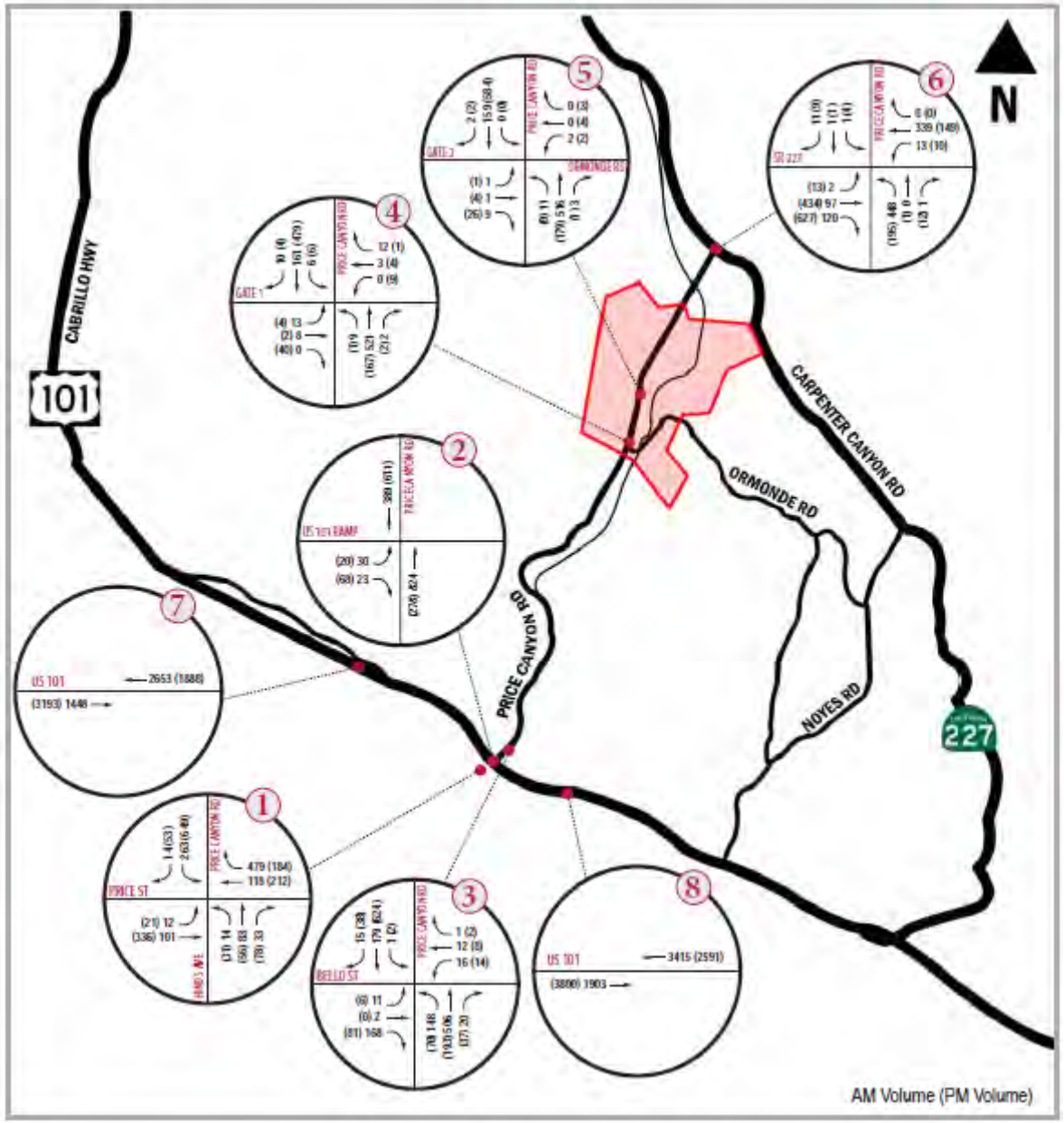
2.16646

Background 2: Excerpts from Price Canyon Traffic Impact Study

FM O&G - Arroyo Grande Oil Field - Phase V Development Project
San Luis Obispo County, California

Table 5: Existing Level of Service Conditions		**Level of Service** (Delay in Seconds)	
		AM	**PM**
1. Price Street and Price Canyon Road (Hinds Avenue) *Signalized*	Intersection	B (19)	C (26)
2. SB US 101 Ramp and Price Canyon Road *One-Way Southbound Stop Control*	**Eastbound**	**D (29)**	C (17)
3. Bello Street and Price Canyon Road *Two-Way North-South Stop Control*	Northbound Left	A (8)	A (9)
	Southbound Left	A (9)	A (8)
	Westbound	**F (61)**	**D (27)**
	Eastbound	B (14)	C (15)
4. Ormonde Rd/Gate #1 and Price Canyon Road *Two-Way North-South Stop Control*	Northbound	A (8)	A (9)
	Southbound	A (9)	A (8)
	Westbound	B (14)	C (17)
	Eastbound	C (20)	B (13)
5. Gate #2 and Price Canyon Road *Two-Way North-South Stop Control*	Northbound	A (8)	A (9)
	Southbound	A (9)	A (8)
	Westbound	C (16)	C (16)
	Eastbound	B (10)	B (14)
6. SR 227 and Price Canyon Road *Signalized*	Intersection	B (14)	A (9)


N
CABRILLO HWY
101
PRICE CANYON RD
CARPENTER CANYON RD
ORMONDE RD
NOYES RD
227
1
PRICE ST
PRICE CANYON RD
HWY 101 AVE
2
US 101 RAMP
PRICE CANYON RD
3
BELLO ST
PRICE CANYON RD
4
GATE 1
PRICE CANYON RD
5
GATE 2
ORMONDE RD
PRICE CANYON RD
6
SR 227
PRICE CANYON RD
7
US 101
8
US 101


N
CABRILLO HWY
101
CARPENTER CANYON RD
ORMONDE RD
PRICE CANYON RD
NOYES RD
227
1
2
3
4
5
6
7
8
AM Volume (PM Volume)

APPENDIX 2: Fire Behavior Appendix Materials

This appendix includes multiple items associated with the the fire behavior predictions in this document, including:

- Inputs utilized in NEXUS software for fire behavior predictions
  - Mature vegetation condition
  - Mitigated vegetation condition

- Photoguide of mature and mitigated vegetation types
  - Grass
  - Shrubs
  - Conifer forest
  - Broadleaf forest

- Fire behavior predictions for mature and mitigated vegetation types
  - Rate of spread
  - Flame Length

- Fire behavior lookup tables for all vegetation types under both mature and mitigated conditions

Inputs utilized for fire behavior predictions in mature vegetation types within NEXUS software.

Vegetation Type	Grass	Shrub	Coniferous Forest	Broadleaf Forest
Simulation Type	Surface	Shrub	Conifer	Conifer
Fuel Model	GR4: Moderately Coarse Continutous Grass	SH5: Heavy, grass/shrub load	TL4: Moderate load, includes small diamater downed logs	TL6: Moderate load, less compact broadleaf litter
Low Fuel Model				
Wind Reduction Factor	0.1	0.1	0.1	0.1
Spread Rate Multiplier	1	1	1	1
Fuel Load Multiplier	1	1	1	1
Intensity Multiplier	1	1	1	1
High Fuel Model				
Wind Reduction Factor		0.1		
Spread Rate Multiplier		1	1	1
Fuel Load Multiplier		1		
Intensity Multiplier		1		
Dead Moisture (%)				
1-hr	3	3	3	3
10-hr		4	4	4
100-hr			5	5
Live Moisture (%)				
Live Herbaceous	30	30		
Live Woody		60	60	60
Canopy Fuels				
Canopy Bulk Density (kg/m3)		0.3	0.3	0.1
Canopy Base Height (feet)			5	5
Available Canopy Fuel Load (tons/acre)			10	10
Foliar Moisture Content (%)			100	100
Miscellaneous				
Shrub Transition Flame Length (feet)		0		
Wind & Slope				
Open Wind Speed (mph)	0-60	0-60	0-60	0-60
Slope (%)	0, 13, 33, 48, 65, 85	0, 13, 33, 48, 65, 85	0, 13, 33, 48, 65, 85	0, 13, 33, 48, 65, 85
Wind Direction (degrees)	0	0	0	0

Inputs utilized for fire behavior predictions in mature vegetation types within NEXUS software.

Vegetation Type	Grass	Shrub	Coniferous Forest	Broadleaf Forest
Simulation Type	Surface	Shrub	Conifer	Conifer
Fuel Model	GR1: Short, sparse dry climate grass	SH1: Low load dry climate shrub	TL1: Low load compact conifer litter	TL2: Low load broadleaf litter
Low Fuel Model				
Wind Reduction Factor	0.1	0.1	0.1	0.1
Spread Rate Multiplier	1	1	1	1
Fuel Load Multiplier	1	1	1	1
Intensity Multiplier	1	1	1	1
High Fuel Model				
Wind Reduction Factor		0.1		
Spread Rate Multiplier		1	1	1
Fuel Load Multiplier		1		
Intensity Multiplier		1		
Dead Moisture (%)				
1-hr	3	3	3	3
10-hr		4	4	4
100-hr			5	5
Live Moisture (%)				
Live Herbaceous	30	30		
Live Woody		60	60	60
Canopy Fuels				
Canopy Bulk Density (kg/m3)		0.1	0.04	0.04
Canopy Base Height (feet)			50	20
Available Canopy Fuel Load (tons/acre)			2	2
Foliar Moisture Content (%)			100	100
Miscellaneous				
Shrub Transition Flame Length (feet)		0		
Wind & Slope				
Open Wind Speed (mph)	0-60	0-60	0-60	0-60
Slope (%)	0, 13, 33, 48, 65, 85	0, 13, 33, 48, 65, 85	0, 13, 33, 48, 65, 85	0, 13, 33, 48, 65, 85
Wind Direction (degrees)	0	0	0	0

Examples of Mature Grass Vegetation Class

Examples of mature grass vegetation class: *Potential examples include grasslands, oak savannahs, meadows, and others. Photos obtained from the Natural Fuels Photo Series published by the Pacific Northwest Forest Fire Laboratory (http://www.fs.fed.us/pnw/fera/publications/photo_series_pubs.shtml).*

Examples of Mitigated Grass Vegetation Class

Examples of mitigated grass vegetation class: *Potential examples include grasslands, oak savannahs, meadows, and others. Photos obtained from the Natural Fuels Photo Series published by the Pacific Northwest Forest Fire Laboratory and by the Fire Adapted Network.*

Examples of Mature Shrub Vegetation Class

***Mature shrub vegetation class**: Potential examples include chaparral, coastal sage scrub, Great Basin sagebrush, and others. Photos obtained from the Natural Fuels Photo Series published by the Pacific Northwest Forest Fire Laboratory.*

Examples of Mitigated Shrub Vegetation Class

Mitigated shrub vegetation class*: Potential examples include chaparral, coastal sage scrub, Great Basin sagebrush, and others. Photos obtained from the Natural Fuels Photo Series published by the Pacific Northwest Forest Fire Laboratory.*

Examples of Mature Conifer Vegetation Class

Mature Coniferous vegetation type: ***Potential examples include mixed-conifers, ponderosa pine, redwood, Douglas-fir, and others.***

Examples of Mitigated Coniferous Vegetation Class

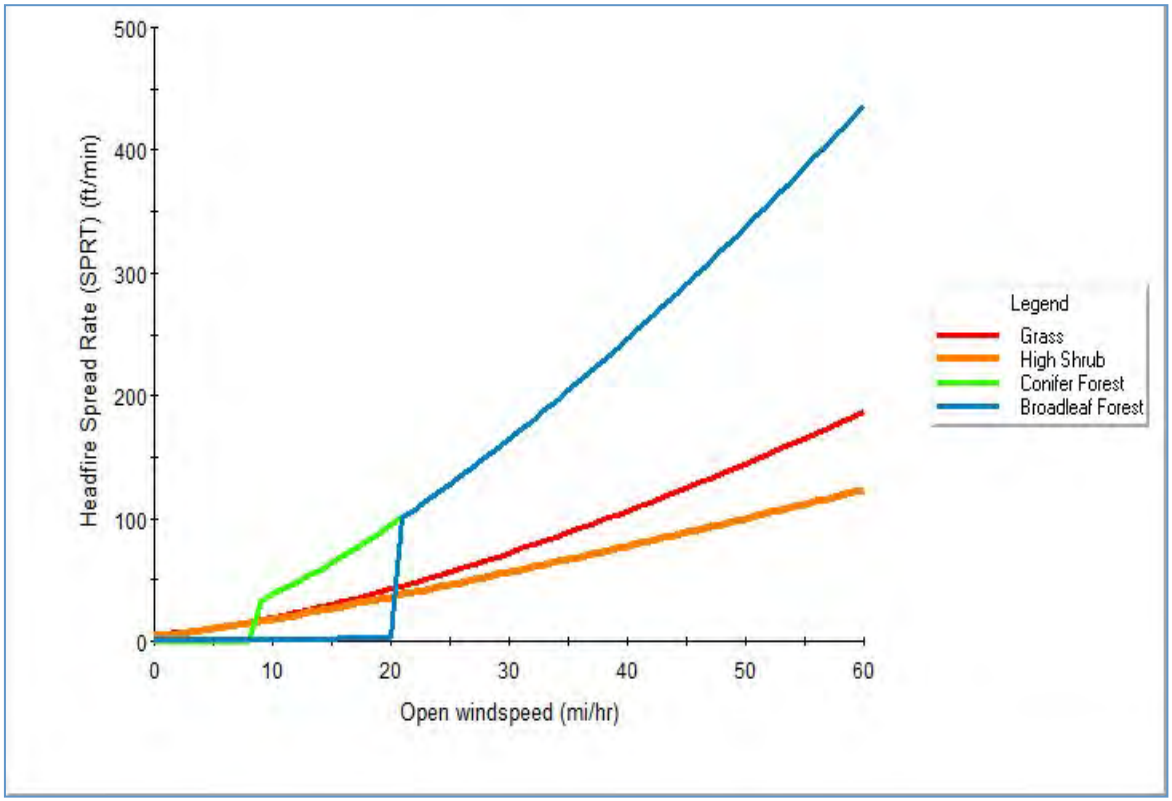
Mitigated Coniferous vegetation type*: Potential examples include mixed-conifers, ponderosa pine, redwood, Douglas-fir, and others.*

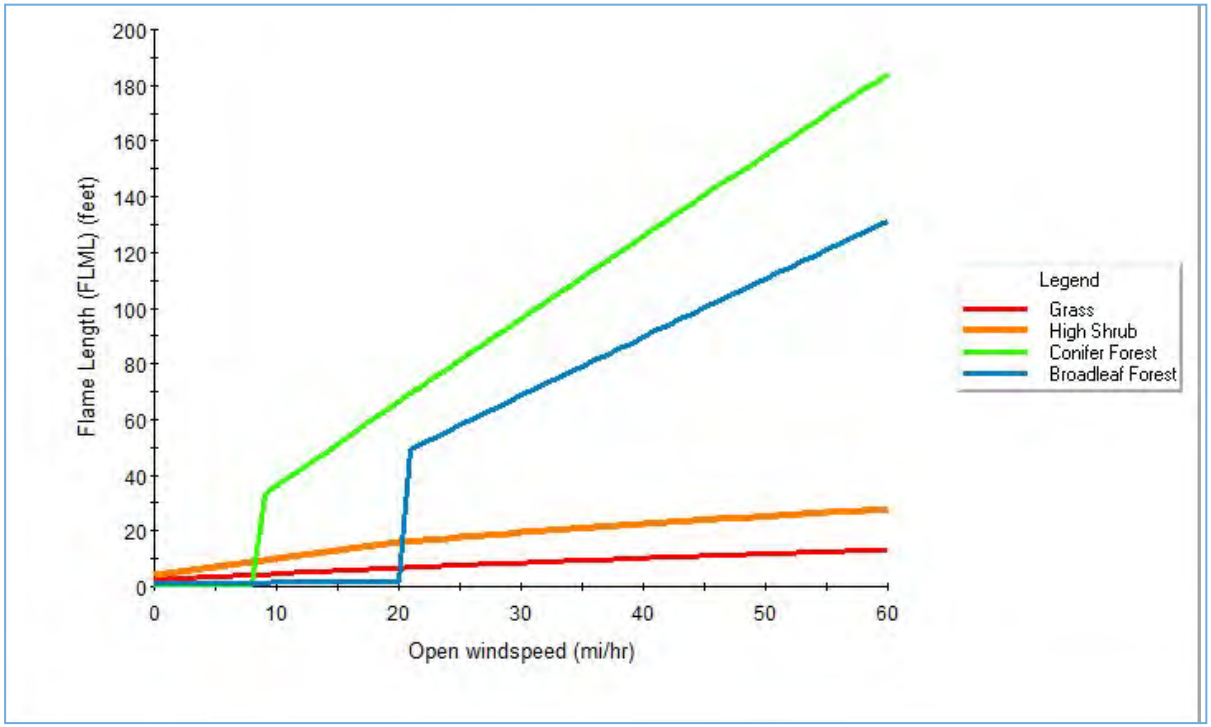
Examples of Mature Broadleaf Vegetation Class

Example of Mitigated Broadleaf Forest Vegetation Class

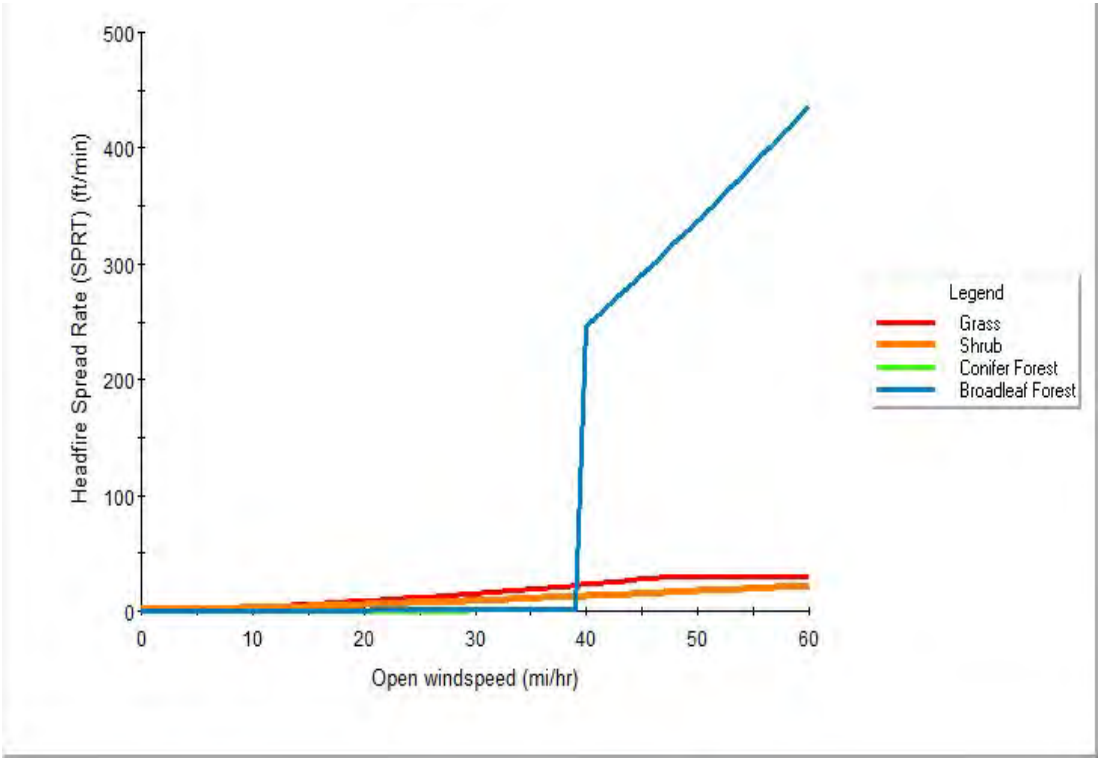
Mitigated Broadleaf Forest vegetation type (adjacent to an untreated, mature broadleaf forest)*: Potential examples include closed canopy oak, madrone, tanoak, bay laurel. (Photo: C.A. Dicus)*

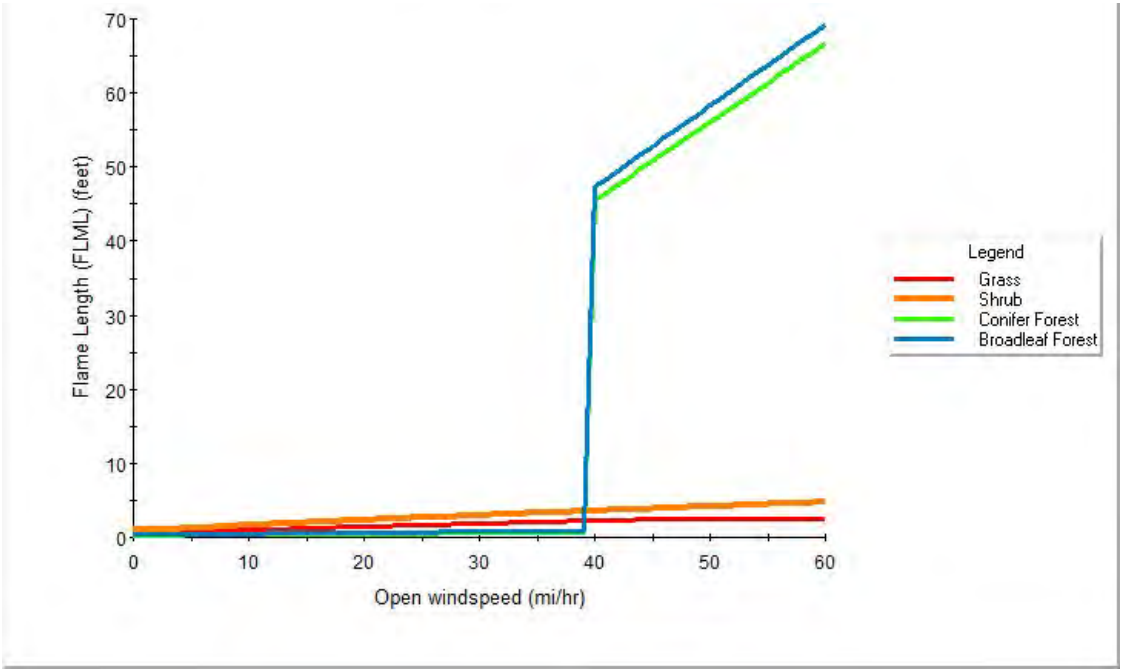
Predicted rate of spread and flame length for mature vegetation conditions.




Flame Length (FLML) (feet)
200
180
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
Open windspeed (mi/hr)
Legend
Grass
High Shrub
Conifer Forest
Broadleaf Forest

Predicted rate of spread and flame length for mitigated vegetation conditions.




Flame Length (FLML) (feet)
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Open windspeed (mi/hr)
Legend
Grass
Shrub
Conifer Forest
Broadleaf Forest

Fire behavior lookup tables for mature and mitigated grass vegetation types

Vegetation: Grass (Mature)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: 6'/min FL: 3'	ROS: 19'/min FL: 5'	ROS: 42'/min FL: 7'	ROS: 71'/min FL: 9'	ROS: 106'/min FL: 10'	ROS: 144'/min FL: 12'
1-25	ROS: 9'/min FL: 3'	ROS: 23'/min FL: 5'	ROS: 46'/min FL: 7'	ROS: 75'/min FL: 9'	ROS: 110'/min FL: 10'	ROS: 148'/min FL: 12'
26-40	ROS: 29'/min FL: 6'	ROS: 42'/min FL: 7'	ROS: 65'/min FL: 8'	ROS: 95'/min FL: 10'	ROS: 129'/min FL: 11'	ROS: 168'/min FL: 13'
41-55	ROS: 55'/min FL: 8'	ROS: 69'/min FL: 8'	ROS: 91'/min FL: 10'	ROS: 121'/min FL: 11'	ROS: 155'/min FL: 12'	ROS: 194'/min FL: 14'
56-75	ROS: 96'/min FL: 10'	ROS: 109'/min FL: 10'	ROS: 132'/min FL: 11'	ROS: 162'/min FL: 12'	ROS: 196'/min FL: 14'	ROS: 234'/min FL: 15'
>75	ROS: 159'/min FL: 12'	ROS: 173'/min FL: 13'	ROS: 196'/min FL: 14'	ROS: 225'/min FL: 14'	ROS: 260'/min FL: 15'	ROS: 298'/min FL: 16'

Vegetation: Grass (Mitigated)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: 1'/min FL: 0'	ROS: 4'/min FL: 1'	ROS: 9'/min FL: 2'	ROS: 15'/min FL: 3'	ROS: 23'/min FL: 4'	ROS: 30'/min FL: 5'
1-25	ROS: 2'/min FL: 0'	ROS: 5'/min FL: 1'	ROS: 10'/min FL: 2'	ROS: 16'/min FL: 3'	ROS: 23'/min FL: 4'	ROS: 30'/min FL: 5'
26-40	ROS: 7'/min FL: 2'	ROS: 9'/min FL: 2'	ROS: 14'/min FL: 3'	ROS: 21'/min FL: 4'	ROS: 28'/min FL: 5'	ROS: 35'/min FL: 5'
41-55	ROS: 7'/min FL: 3'	ROS: 9'/min FL: 3'	ROS: 14'/min FL: 4'	ROS: 21'/min FL: 4'	ROS: 28'/min FL: 5'	ROS: 35'/min FL: 6'
56-75	ROS: 22'/min FL: 4'	ROS: 25'/min FL: 4'	ROS: 30'/min FL: 5'	ROS: 36'/min FL: 5'	ROS: 44'/min FL: 6'	ROS: 51'/min FL: 7'
>75	ROS: 37'/min FL: 5'	ROS: 40'/min FL: 6'	ROS: 44'/min FL: 7'	ROS: 51'/min FL: 14'	ROS: 59'/min FL: 7'	ROS: 66'/min FL: 8'

Fire behavior lookup tables for mature and mitigated shrub vegetation types

Vegetation: Shrubs (Mature)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: 4'/min FL: 4'	ROS: 18'/min FL: 10'	ROS: 36'/min FL: 16'	ROS: 56'/min FL: 19'	ROS: 78'/min FL: 22'	ROS: 145'/min FL: 25'
1-25	ROS: 6'/min FL: 5'	ROS: 20'/min FL: 11'	ROS: 38'/min FL: 16'	ROS: 58'/min FL: 20'	ROS: 80'/min FL: 23'	ROS: 102'/min FL: 25'
26-40	ROS: 18'/min FL: 10'	ROS: 32'/min FL: 15'	ROS: 50'/min FL: 18	ROS: 70'/min FL: 21'	ROS: 92'/min FL: 24'	ROS: 114'/min FL: 27'
41-55	ROS: 33'/min FL: 15'	ROS: 47'/min FL: 18'	ROS: 66'/min FL: 21'	ROS: 86'/min FL: 23'	ROS: 107'/min FL: 26'	ROS: 130'/min FL: 28'
56-75	ROS: 96'/min FL: 20'	ROS: 72'/min FL: 22'	ROS: 90'/min FL: 24'	ROS: 110'/min FL: 26'	ROS: 132'/min FL: 29'	ROS: 154'/min FL: 31'
>75	ROS: 96'/min FL: 25'	ROS: 110'/min FL: 26'	ROS: 129'/min FL: 28'	ROS: 149'/min FL: 30'	ROS: 170'/min FL: 32'	ROS: 193'/min FL: 34'

Vegetation: Shrubs (Mitigated)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: 1'/min FL: 0'	ROS: 3'/min FL: 1'	ROS: 5'/min FL: 2'	ROS: 9'/min FL: 3'	ROS: 13'/min FL: 4'	ROS: 17'/min FL: 5'
1-25	ROS: 1'/min FL: 0'	ROS: 3'/min FL: 1'	ROS: 6'/min FL: 2'	ROS: 9'/min FL: 3'	ROS: 13'/min FL: 4'	ROS: 18'/min FL: 5'
26-40	ROS: 4'/min FL: 1'	ROS: 5'/min FL: 2'	ROS: 8'/min FL: 3'	ROS: 9'/min FL: 4'	ROS: 16'/min FL: 5'	ROS: 20'/min FL: 6'
41-55	ROS: 4'/min FL: 2'	ROS: 5'/min FL: 3'	ROS: 8'/min FL: 4'	ROS: 12'/min FL: 4'	ROS: 16'/min FL: 5'	ROS: 20'/min FL: 6'
56-75	ROS: 12'/min FL: 4'	ROS: 13'/min FL: 4'	ROS: 16'/min FL: 5'	ROS: 20'/min FL: 6'	ROS: 23'/min FL: 6'	ROS: 28'/min FL: 7'
>75	ROS: 19'/min FL: 6'	ROS: 21'/min FL: 7'	ROS: 24'/min FL: 7'	ROS: 27'/min FL: 8'	ROS: 31'/min FL: 19'	ROS: 35'/min FL: 22'

Fire behavior lookup tables for mature and mitigated conifer forest vegetation types

Vegetation: Coniferous Forest (Mature)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: <1'/min FL: <1'	ROS: 38'/min FL: 36'	ROS: 94'/min FL: 66'	ROS: 165'/min FL: 96'	ROS: 246'/min FL: 126'	ROS: 337'/min FL: 155'
1-25	ROS: <1'/min FL: <1'	ROS: 39'/min FL: 37'	ROS: 96'/min FL: 67'	ROS: 166'/min FL: 97'	ROS: 248'/min FL: 126'	ROS: 338'/min FL: 156'
26-40	ROS: 1'/min FL: 1'	ROS: 47'/min FL: 42'	ROS: 103'/min FL: 71'	ROS: 174'/min FL: 100'	ROS: 255'/min FL: 129'	ROS: 346'/min FL: 158'
41-55	ROS: 2'/min FL: 1'	ROS: 57'/min FL: 48'	ROS: 114'/min FL: 75'	ROS: 184'/min FL: 104'	ROS: 266'/min FL: 132'	ROS: 356'/min FL: 161'
56-75	ROS: 40'/min FL: 37'	ROS: 73'/min FL: 56'	ROS: 130'/min FL: 82'	ROS: 200'/min FL: 110'	ROS: 282'/min FL: 138'	ROS: 372'/min FL: 166'
>75	ROS: 65'/min FL: 52'	ROS: 98'/min FL: 68'	ROS: 155'/min FL: 92'	ROS: 225'/min FL: 118'	ROS: 307'/min FL: 146'	ROS: 398'/min FL: 173'

Vegetation: Coniferous Forest (Mitigated)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: <1'/min FL: <1'	ROS: <1'/min FL: 1'	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 3'	ROS: 246'/min FL: 16'	ROS: 337'/min FL: 20'
1-25	ROS: <1'/min FL: <1'	ROS: <1'/min FL: 1'	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 3'	ROS: 248'/min FL: 16'	ROS: 339'/min FL: 20'
26-40	ROS: <1'/min FL: 2'	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 3'	ROS: 1'/min FL: 4'	ROS: 255'/min FL: 16'	ROS: 346'/min FL: 20'
41-55	ROS: <1'/min FL: 3'	ROS: 1'/min FL: 3'	ROS: 1'/min FL: 4'	ROS: 1'/min FL: 5'	ROS: 255'/min FL: 17'	ROS: 346'/min FL: 21'
56-75	ROS: 1'/min FL: 4'	ROS: 1'/min FL: 5'	ROS: 1'/min FL: 5'	ROS: 2'/min FL: 6'	ROS: 282'/min FL: 18'	ROS: 372'/min FL: 21'
>75	ROS: 2'/min FL: 7'	ROS: 2'/min FL: 7'	ROS: 2'/min FL: 7'	ROS: 2'/min FL: 8'	ROS: 307'/min FL: 19'	ROS: 398'/min FL: 22'

Fire behavior lookup tables for mature and mitigated broadleaf forest vegetation types

Vegetation: Broadleaf Forest (Mature)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: 1'/min FL: 1'	ROS: 2'/min FL: 2'	ROS: 3'/min FL: 2'	ROS: 165'/min FL: 69'	ROS: 246'/min FL: 90'	ROS: 337'/min FL: 111'
1-25	ROS: 1'/min FL: 1'	ROS: 2'/min FL: 2'	ROS: 3'/min FL: 2'	ROS: 166'/min FL: 69'	ROS: 248'/min FL: 90'	ROS: 338'/min FL: 111'
26-40	ROS: 2'/min FL: 2'	ROS: 3'/min FL: 2'	ROS: 103'/min FL: 50'	ROS: 174'/min FL: 71'	ROS: 255'/min FL: 92'	ROS: 346'/min FL: 112'
41-55	ROS: 4'/min FL: 2'	ROS: 5'/min FL: 3'	ROS: 114'/min FL: 54'	ROS: 184'/min FL: 74'	ROS: 266'/min FL: 94'	ROS: 356'/min FL: 115'
56-75	ROS: 7'/min FL: 3'	ROS: 8'/min FL: 3'	ROS: 130'/min FL: 58'	ROS: 200'/min FL: 78'	ROS: 282'/min FL: 98'	ROS: 372'/min FL: 118'
>75	ROS: 45'/min FL: 19'	ROS: 98'/min FL: 48'	ROS: 155'/min FL: 66'	ROS: 225'/min FL: 84'	ROS: 307'/min FL: 104'	ROS: 398'/min FL: 123'

Vegetation: Broadleaf Forest (Mitigated)						
	Open Wind Speed (mph)					
Slope (%)	0	10	20	30	40	50
0	ROS: <1'/min FL: <1'	ROS: <1'/min FL: 1'	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 3'	ROS: 246'/min FL: 16'	ROS: 337'/min FL: 20'
1-25	ROS: <1'/min FL: <1'	ROS: <1'/min FL: 1'	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 3'	ROS: 248'/min FL: 16'	ROS: 338'/min FL: 20'
26-40	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 2'	ROS: 1'/min FL: 3'	ROS: 2'/min FL: 4'	ROS: 255'/min FL: 16'	ROS: 346'/min FL: 20'
41-55	ROS: 1'/min FL: 3'	ROS: 1'/min FL: 3'	ROS: 1'/min FL: 4'	ROS: 2'/min FL: 5'	ROS: 255'/min FL: 17'	ROS: 346'/min FL: 21'
56-75	ROS: 2'/min FL: 4'	ROS: 2'/min FL: 5'	ROS: 2'/min FL: 5'	ROS: 3'/min FL: 6'	ROS: 282'/min FL: 18'	ROS: 372'/min FL: 21'
>75	ROS: 3'/min FL: 6'	ROS: 3'/min FL: 7'	ROS: 3'/min FL: 7'	ROS: 4'/min FL: 8'	ROS: 307'/min FL: 19'	ROS: 398'/min FL: 22'

APPENDIX 3: Cal Poly Study Team

W. David Conn, D.Phil., *Principal Investigator*

- Professor Emeritus, City & Regional Planning, Cal Poly
- Director, Cal Poly support team for preparation of 2013 and 2018 California State Multi-Hazard Mitigation Plans
- 44 years of experience at UCLA, Virginia Tech, and Cal Poly as a faculty member, administrator, and consultant

Cornelius Nuworsoo, Ph.D., AICP, *Co-Principal Investigator*

- Professor & Graduate Program Coordinator, City and Regional Planning, Cal Poly
- 14 years of field experience (transportation planning and traffic engineering)
- 10 years of teaching (transportation and land use planning)
- Developer of Access Model

Christopher A. Dicus, Ph.D., *Co-Principal Investigator*

- Interim Associate Dean, Research & Graduate Programs, College of Agriculture, Food & Environmental Sciences
- Coordinator: WUI Module of the California Fire Science Consortium
- Board of Directors: Association for Fire Ecology
- California Registered Professional Forester
- Certified Senior Fire Ecologist

Kenneth C. Topping, FAICP, *Senior Advisor*

- Member and former Chair, San Luis Obispo County Planning Commission
- Senior Advisor, Cal Poly support team for preparation of 2013 and 2018 California State Multi-Hazard Mitigation Plans
- Director, Cal Poly support team for preparation of 2007 and 2010 California State Multi-Hazard Mitigation Plans
- Part-time Lecturer, City & Regional Planning, Cal Poly
- Former Visiting Professor, Research Center for Disaster Reduction Studies, Disaster Prevention Research Institute, Kyoto University, Kyoto, Japan
- Former General Manager, Cambria Community Services District
- Former Planning Director, City of Los Angeles, 1986-1990

Dan Turner, *Senior Consultant*

- Unit Chief (retired), San Luis Obispo Unit, CAL FIRE
- Executive Director, Urban Forest Ecosystem Institute, Natural Resources and Environmental Science Department, Cal Poly
- Manager, San Luis Obispo County Community Fire Safe Council
- Emergency Services Coordinator, County of San Luis Obispo, Office of Emergency Services