

Appendix D

Transportation Impact Analysis



HEXAGON TRANSPORTATION CONSULTANTS, INC.

El Camino Real Corridor Specific Plan

Draft Transportation Impact Analysis

Prepared for:

M-Group

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DRAFT

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Table of Contents

Executive Summary	i
1. Introduction	1
2. Existing Conditions	9
3. Year 2035 Cumulative Conditions	34

Appendices

Appendix A	Traffic Counts
Appendix B	Level of Service Calculations
Appendix C	City of Sunnyvale Land Use Summary

List of Tables

Table ES- 1 Intersection Levels of Service Summary	iii
Table 1 ECRCSP Area Land Use Summary	1
Table 2 Signalized Intersection Level of Service Definitions Based on Control Delay	7
Table 3 Freeway Segment Level of Service Definition	8
Table 4 Existing Transit Services	15
Table 5 Existing Intersection Levels of Service	25
Table 6 Existing Freeway Ramp Capacity Analysis	33
Table 7 Socioeconomic Data Model Inputs – Bay Area Counties	37
Table 8 Year 2035 Cumulative Conditions Levels of Service	50
Table 9 Intersection Impact Improvements Summary	55
Table 10 Year 2035 Cumulative Conditions Ramp Capacity Analysis	68
Table 11 Transit Travel Time Analysis	71

List of Figures

Figure 1	Plan Area and Study Intersections	2
Figure 2	Existing Bicycle Facilities	14
Figure 3	Existing Transit Services	16
Figure 4	Existing Intersection Lane Configurations	18
Figure 5	Existing Traffic Volumes.....	21
Figure 6	Existing Intersection Levels of Service Summary	28
Figure 7	Existing Freeway Levels of Service Summary – AM Peak Hour – Mixed Flow Lanes.....	29
Figure 8	Existing Freeway Levels of Service Summary – AM Peak Hour – HOV Lanes.....	30
Figure 9	Existing Freeway Levels of Service Summary – PM Peak Hour – Mixed Flow Lanes.....	31
Figure 10	Existing Freeway Levels of Service Summary – PM Peak Hour – HOV Lanes.....	32
Figure 11	Sunnyvale Land Use Growth – Households – Year 2035 Compared to Year 2013	35
Figure 12	Sunnyvale Land Use Growth – Jobs – Year 2035 Compared to Year 2013.....	36
Figure 13	Roadway Improvements Within Close Proximity of Sunnyvale Assumed in the Model	38
Figure 14	Year 2035 Cumulative Conditions Traffic Volumes.....	39
Figure 15	Cumulative no ECRCSP Volumes.....	42
Figure 16	Year 2035 Cumulative Conditions Intersection Lane Configurations	46
Figure 17	Year 2035 Cumulative Conditions Intersection Levels of Service Summary	53
Figure 18	Potential Improvement at Wolfe Road and Fremont Avenue	58
Figure 19	ECRCSP Freeway Impact Analysis Summary – AM Peak Hour – Mixed Flow Lanes	64
Figure 20	ECRCSP Freeway Impact Analysis Summary – AM Peak Hour – HOV Lanes.....	65
Figure 21	ECRCSP Freeway Impact Analysis Summary – PM Peak Hour – Mixed Flow Lanes	66
Figure 22	ECRCSP Freeway Impact Analysis Summary – PM Peak Hour – HOV Lanes.....	67
Figure 23	Planned Improvement at Mathilda Avenue/US 101/SR 237 Interchanges	69

Executive Summary

This report presents the results of the transportation impact analysis conducted for the proposed El Camino Real Corridor Specific Plan (ECRCSP) in Sunnyvale, California. The proposed El Camino Real Corridor Specific Plan (ECRCSP) study area comprises approximately 350 acres along the 4-mile Sunnyvale El Camino Real frontage, with properties within ¼ mile on either side of the roadway centerline generally included in the study area. Currently, the ECRCSP area consists of approximately 3.25-million square feet (sf) of commercial development and approximately 1,600 residential units. According to the Land Use and Transportation Element (LUTE) of the Sunnyvale General Plan, the ECRCSP area has a buildout potential of 4.2-million sf of commercial development and 5,800 residential units. The proposed ECRCSP proposes a buildout potential of 3.98-million sf of commercial development and 8,500 residential units. The proposed ECRCSP represents an increase of 730,000 sf of commercial development and 6,900 residential units over existing conditions, or a decrease of 220,000 sf of commercial development and an increase of 2,700 residential units over the adopted LUTE.

This study was conducted for the purpose of identifying the potential long-term traffic impacts of the proposed ECRCSP. The potential impacts of the proposed ECRCSP were evaluated in accordance with the standards set forth by the City of Sunnyvale and the Santa Clara County Valley Transportation Authority (VTA) Congestion Management Program (CMP). The proposed ECRCSP is estimated to generate more than 100 peak hour trips. The traffic analysis is based on the AM and PM peak hour levels of service for 56 signalized intersections. Three of the study intersections are within the City of Mountain View, one is within the City of Cupertino, and six are within the City of Santa Clara. 14 of the study intersections are CMP intersections. The study intersections were selected to include locations where the proposed ECRCSP is expected to generate 10 or more peak-hour trips per lane.

Year 2035 Cumulative Conditions Travel Demand Model Forecasts

The year 2035 forecasts of intersection turning movements, freeway traffic, ramp volumes, and vehicle miles traveled were completed using the Sunnyvale Travel Demand Forecast Model (STFM). The STFM is a mathematical representation of travel within the nine counties in the San Francisco Bay Area and is calibrated to represent travel within the City of Sunnyvale. The model uses socioeconomic data, such as number of jobs and households, for difference geographic areas (transportation analysis zones) to predict the travel from place to place in the future. There are 172 transportation analysis zones within the model to represent the City of Sunnyvale.

The year 2035 socioeconomic data are generated by the Association of Bay Area Governments and refined by VTA. For the year 2035 cumulative conditions model forecasts, socioeconomic data within the City of Sunnyvale were supplied by city staff. Socioeconomic data within the City of Sunnyvale assumed the buildout of the current general plan, the proposed ECRCSP, the proposed update to the Lawrence Station Area Plan, the proposed Fortinet Precise Plan and the proposed update to the Downtown Specific Plan.

Intersection Levels of Service under Year 2035 Cumulative Conditions

To determine potential impacts generated by the ECRCSF, a separate model run was conducted assuming no growth in the ECRCSF area beyond the current general plan. The cumulative scenario was compared to the cumulative no ECRCSF scenario to disclose impacts. The Sunnyvale Travel Demand Forecasting Model (STFM) for year 2035 was used to forecast the year 2035 cumulative traffic volumes. Model assumptions and inputs are described in this chapter as well.

As shown on Table ES-1, comparing the intersection level of service results for the study intersections between the year 2035 cumulative conditions and Cumulative no ECRCSF conditions show that the proposed ECRCSF would generate intersection impacts at the following intersections:

City of Sunnyvale Intersections:

- Mary Avenue & Fremont Avenue (#19) – AM & PM Peak Hours
- Fair Oaks Avenue & Arques Avenue (#42) – AM Peak Hour
- Wolfe Road & Arques Avenue (#43) – AM & PM Peak Hours
- Wolfe Road & Kifer Road (#44) – PM Peak Hour
- Wolfe Road & Reed Avenue (#45) – PM Peak Hour

City of Mountain View Intersections:

- Ellis Street & Middlefield Road (#14) – PM Peak Hour

County of Santa Clara Intersections:

- Mary Avenue & Central Expressway (#15) – PM Peak Hour
- Lawrence Expressway & Benton Street (#54) – PM Peak Hour
- Lawrence Expressway & Homestead Road (#55) – PM Peak Hour
- Lawrence Expressway & Pruneridge Avenue (#56) – AM Peak Hour

Caltrans Intersections:

- Pastoria Avenue & El Camino Real (#5) – PM Peak Hour
- Mathilda Avenue & El Camino Real (#6) – AM Peak Hour
- Sunnyvale Avenue & El Camino Real (#7) – PM Peak Hour
- Fair Oaks Avenue & El Camino Real (#8) – PM Peak Hour
- Wolfe Road & El Camino Real (#9) – PM Peak Hour
- SR 85 Southbound Ramps & Fremont Avenue (#21) – PM Peak Hour

It should be noted that the intersections on Lawrence Expressway at Arques Avenue, Kifer Road and Reed Avenue are planned for an interchange. At the time of this study, the interchange designs have not been finalized. It is assumed that with the planned interchanges, these intersections would operate at acceptable levels of service.

**Table ES- 1
Intersection Levels of Service Summary**

#	Intersection	Peak Hour	Count Date	LOS Std.	Existing Conditions		Cumulative no ECRSP		Cumulative Conditions			
					Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
1	SR 237 & El Camino Real (MV*)	AM	11/14/17	E	69.9	E	83.5	F	84.2	F	1.7	0.005
		PM	10/30/18		56.7	E+	74.1	E	74.9	E	2.4	0.008
2	Sylvan Avenue & El Camino Real (MV)	AM	11/14/17	D	35.3	D+	41.5	D	41.7	D	0.3	0.005
		PM	11/14/17		36.0	D+	43.1	D	43.8	D	1.6	0.016
3	Bernardo Avenue & El Camino Real (+)	AM	11/14/17	E	44.6	D	50.7	D	51.9	D-	1.5	0.016
		PM	11/14/17		43.3	D	53.5	D-	56.1	E+	2.8	0.023
4	Mary Avenue & El Camino Real (*)	AM	11/14/17	E	41.7	D	52.4	D-	58.2	E+	10.5	0.055
		PM	10/30/18		39.1	D	64.7	E	79.2	E-	26.3	0.071
5	Pastoria Avenue & El Camino Real (+)	AM	11/14/17	E	34.3	C-	69.4	E	72.3	E	6.2	0.018
		PM	11/14/17		38.8	D+	94.0	F	110.3	F	23.0	0.054
6	Mathilda Avenue & El Camino Real (*)	AM	11/14/17	E	47.9	D	84.3	F	97.7	F	33.1	0.083
		PM	10/30/18		45.7	D	105.1	F	113.1	F	-3.4	-0.010
7	Sunnyvale Avenue & El Camino Real (+)	AM	11/14/17	E	33.4	C-	44.7	D	46.2	D	5.5	0.038
		PM	11/14/17		40.3	D	72.7	E	85.1	F	19.0	0.053
8	Fair Oaks Avenue & El Camino Real (*)	AM	05/08/18	E	41.0	D	55.9	E+	60.9	E	4.9	0.026
		PM	10/30/18		41.8	D	>120	F	>120	F	21.6	0.048
9	Wolfe Road & El Camino Real (*)	AM	11/14/17	E	53.5	D-	66.8	E	65.6	E	-4.0	-0.020
		PM	10/30/18		46.4	D	76.3	E-	85.5	F	10.0	0.026
10	Poplar Avenue & El Camino Real (+)	AM	11/14/17	E	19.0	B-	22.5	C+	22.7	C+	0.3	0.000
		PM	11/14/17		12.0	B	17.4	B	18.2	B-	0.8	0.007
11	Henderson Avenue & El Camino Real (+)	AM	11/14/17	E	17.2	B	19.6	B-	19.6	B-	0.0	-0.002
		PM	11/14/17		22.7	C+	22.6	C+	22.7	C+	0.2	0.003
12	Halford Avenue & El Camino Real (SC)	AM	11/14/17	D	20.6	C+	25.5	C	26.5	C	1.2	0.012
		PM	11/14/17		44.5	D	45.7	D	45.4	D	-0.3	0.001
13	Lawrence Expressway Ramps & El Camino Real (SC*)	AM	11/14/17	E	34.5	C-	40.1	D	40.4	D	0.3	0.007
		PM	11/15/18		28.8	C	34.7	C-	34.1	C-	-1.1	-0.008
14	Ellis Street & Middlefield Road (MV)	AM	11/14/17	D	15.0	B	88.2	F	88.9	F	1.5	0.003
		PM	11/14/17		21.4	C+	82.1	F	91.8	F	12.0	0.047
15	Mary Avenue & Central Expressway (County*)	AM	11/14/17	E	51.5	D-	93.5	F	94.5	F	-0.5	-0.023
		PM	12/13/18		60.1	E	99.4	F	101.5	F	5.1	0.011
16	Mary Avenue & Evelyn Avenue	AM	11/14/17	D	40.4	D	49.4	D	49.1	D	-0.3	-0.002
		PM	11/14/17		43.3	D	47.6	D	48.2	D	0.8	0.021
17	Mary Avenue & Washington Avenue	AM	11/14/17	D	13.4	B	20.9	C+	21.6	C+	0.9	0.008
		PM	11/14/17		16.1	B	23.4	C	24.0	C	0.9	0.018
18	Mary Avenue & Remington Drive	AM	11/14/17	D	31.7	C	44.4	D	44.9	D	1.0	0.007
		PM	11/14/17		28.9	C	47.6	D	49.3	D	2.8	0.010

Notes:

* = CMP, + = Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara

">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.

BOLD indicates unacceptable level of service

BOLD and boxed indicates a significant cumulative impact

**Table ES-1 (continued)
Intersection Levels of Service Summary**

#	Intersection	Peak Hour	Count Date	Existing Conditions		Cumulative no ECRSP		Cumulative Conditions				
				LOS Std.	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
19	Mary Avenue & Fremont Avenue	AM	11/14/17	D	41.9	D	>120	F	>120	F	7.6	0.018
		PM	11/14/17		43.3	D	>120	F	>120	F	14.2	0.032
20	Mary Avenue & Homestead Road	AM	11/14/17	D	36.6	D+	37.5	D+	36.8	D+	-1.7	-0.009
		PM	11/14/17		30.0	C	39.2	D	39.9	D	1.2	0.022
21	SR 85 SB Ramps & Fremont Avenue	AM	11/14/17	D	23.3	C	87.6	F	89.0	F	1.1	0.002
		PM	11/14/17		19.9	B-	>120	F	>120	F	13.7	0.031
22	SR 85 NB Ramps & Fremont Avenue	AM	11/14/17	D	20.6	C+	63.6	E	55.1	E+	-11.8	-0.033
		PM	11/14/17		24.9	C	77.9	E-	72.7	E	-4.1	-0.011
23	SR 85 SB Ramps & Homestead Road	AM	11/14/17	D	19.2	B-	32.6	C-	31.9	C	-0.6	-0.002
		PM	11/14/17		38.9	D+	37.3	D+	37.6	D+	-0.2	-0.004
24	SR 85 NB Ramps & Homestead Road	AM	11/14/17	D	21.6	C+	22.5	C+	24.4	C	3.8	0.023
		PM	11/14/17		14.9	B	14.2	B	14.5	B	-0.2	-0.009
25	Hollenbeck Avenue & Fremont Avenue	AM	11/14/17	D	39.4	D	49.3	D	49.7	D	0.4	0.012
		PM	11/14/17		45.0	D	52.1	D-	51.9	D-	-0.8	-0.005
26	Hollenbeck Avenue & Homestead Road	AM	11/14/17	D	42.3	D	45.0	D	45.8	D	0.1	0.004
		PM	11/14/17		51.9	D-	67.0	E	68.5	E	2.8	0.008
27	Mathilda Avenue & Almanor Avenue (+)	AM	11/14/17	E	26.7	C	33.9	C-	33.8	C-	0.0	-0.001
		PM	11/14/17		30.4	C	38.3	D+	37.6	D+	-1.9	-0.016
28	Mathilda Avenue & San Aleso Avenue (+)	AM	11/14/17	E	7.3	A	12.2	B	12.2	B	0.0	0.005
		PM	11/14/17		7.2	A	20.3	C+	19.9	B-	-0.7	0.001
29	Mathilda Avenue & Maude Avenue (*)	AM	11/14/17	E	43.6	D	55.4	E+	55.5	E+	0.1	0.004
		PM	10/30/18		47.2	D	58.1	E+	58.3	E+	2.1	0.012
30	Mathilda Avenue & Indio Way (+)	AM	11/14/17	E	36.3	D+	63.2	E	66.1	E	3.8	0.010
		PM	11/14/17		22.9	C+	84.5	F	84.2	F	-0.4	-0.001
31	Mathilda Avenue & California Avenue (+)	AM	11/14/17	E	24.2	C	65.9	E	68.4	E	3.5	0.007
		PM	11/14/17		32.1	C-	54.8	D-	59.1	E+	7.0	0.023
32	Mathilda Avenue & Washington Avenue (+)	AM	11/14/17	E	34.3	C-	98.8	F	97.6	F	-1.6	-0.004
		PM	11/14/17		34.5	C-	54.6	D-	54.7	D-	-1.1	-0.006
33	Mathilda Avenue & McKinley Avenue (+)	AM	11/14/17	E	14.1	B	29.1	C	30.9	C	2.4	0.019
		PM	11/14/17		17.4	B	26.3	C	25.4	C	-1.4	-0.013
34	Mathilda Avenue & Iowa Avenue (+)	AM	11/14/17	E	15.7	B	20.2	C+	21.1	C+	-1.4	0.023
		PM	11/14/17		16.0	B	43.8	D	44.7	D	1.5	0.004
35	Mathilda Avenue & Olive Avenue (+)	AM	11/14/17	E	15.5	B	27.9	C	31.6	C	4.4	0.034
		PM	11/14/17		18.4	B-	34.1	C-	35.5	D+	2.5	0.012
36	Mathilda Avenue & Sunnyvale-Saratoga Road (+)	AM	11/14/17	E	22.7	C+	27.3	C	28.9	C	1.8	0.012
		PM	11/14/17		28.5	C	30.6	C	31.9	C	1.2	0.007
37	Sunnyvale-Saratoga Road & Remington Drive (*)	AM	11/14/17	E	42.9	D	63.7	E	71.0	E	15.3	0.054
		PM	10/30/18		43.6	D	108.7	F	106.0	F	-5.2	-0.012
38	Sunnyvale-Saratoga Road & Fremont Avenue (*)	AM	11/14/17	E	49.0	D	58.7	E+	59.0	E+	0.5	-0.003
		PM	10/30/18		47.8	D	68.3	E	69.2	E	0.6	0.002

Notes:

* = CMP, + = Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara

">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.

BOLD indicates unacceptable level of service

BOLD and boxed indicates a significant cumulative impact

**Table ES-1 (continued)
Intersection Levels of Service Summary**

#	Intersection	Peak Hour	Count Date	LOS Std.	Existing Conditions		Cumulative no ECRSP		Cumulative Conditions			
					Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
39	Sunnyvale-Saratoga Road & Homestead Road (CU*)	AM	11/14/17	E	44.8	D	61.9	E	63.4	E	2.3	0.008
		PM	10/30/18		40.0	D	60.5	E	60.6	E	-1.5	-0.005
40	Sunnyvale Avenue & McKinley Avenue	AM	11/14/17	D	9.8	A	16.6	B	16.7	B	0.2	0.009
		PM	11/14/17		16.8	B	27.1	C	28.1	C	1.3	0.016
41	Fair Oaks Avenue & Duane Avenue	AM	05/08/18	D	32.1	C-	39.9	D	40.5	D	0.7	0.004
		PM	05/08/18		30.2	C	38.1	D+	38.4	D+	0.6	0.005
42	Fair Oaks Avenue & Arques Avenue	AM	05/08/18	D	34.8	C-	91.4	F	97.1	F	12.8	0.032
		PM	05/08/18		44.5	D	112.2	F	109.7	F	-10.0	-0.020
43	Wolfe Road & Arques Avenue	AM	11/14/17	D	35.6	D+	86.4	F	90.6	F	5.5	0.012
		PM	11/14/17		40.8	D	66.6	E	72.6	E	9.0	0.039
44	Wolfe Road & Kifer Road	AM	11/14/17	D	29.0	C	>120	F	>120	F	-9.7	-0.020
		PM	11/14/17		43.1	D	>120	F	>120	F	6.1	0.013
45	Wolfe Road & Reed Avenue	AM	11/14/17	D	37.0	D+	64.7	E	66.3	E	2.3	0.007
		PM	11/14/17		38.9	D+	54.8	D-	56.2	E+	3.2	0.018
46	Wolfe Road & Fremont Avenue	AM	11/14/17	D	43.7	D	55.4	E+	56.0	E+	0.7	0.013
		PM	11/14/17		47.5	D	59.5	E+	60.7	E	3.0	0.024
47	Wolfe Road & Homestead Road	AM	11/14/17	D	35.4	D+	40.5	D	40.5	D	0.5	0.012
		PM	11/14/17		35.1	D+	43.4	D	45.9	D	5.1	0.028
48	Tantau Avenue & Homestead Road	AM	11/14/17	D	26.0	C	37.3	D+	36.9	D+	-0.2	0.002
		PM	11/14/17		39.6	D	67.4	E	70.3	E	2.1	0.007
49	Lawrence Expressway & Oakmead Parkway (County)	AM	05/23/19	E	40.4	D	>120	F	>120	F	2.3	0.016
		PM	05/23/19		52.3	D-	>120	F	>120	F	-3.9	-0.005
50	Lawrence Expressway & Arques Avenue (County*)	AM	04/04/17	E	48.2	D	Future Interchange		Future Interchange			
		PM	11/13/18		71.6	E						
51	Lawrence Expressway & Kifer Road (County)	AM	03/07/18	E	54.4	D-	Future Interchange		Future Interchange			
		PM	03/07/18		101.6	F						
52	Lawrence Expressway & Monroe Street (County*)	AM	03/07/18	E	114.8	F	Future Interchange		Future Interchange			
		PM	11/13/18		61.8	E						
53	Lawrence Expressway & Cabrillo Avenue (County)	AM	03/07/18	E	52.1	D-	>120	F	>120	F	-1.3	0.001
		PM	03/07/18		48.6	D	>120	F	>120	F	-2.9	-0.021
54	Lawrence Expressway & Benton Street (County)	AM	11/14/17	E	53.7	D-	>120	F	>120	F	-19.1	-0.035
		PM	11/14/17		40.5	D	>120	F	>120	F	15.0	0.023
55	Lawrence Expressway & Homestead Road (County*)	AM	11/14/17	E	56.8	E+	>120	F	>120	F	-8.4	-0.011
		PM	11/15/18		65.9	E	117.5	F	>120	F	11.2	0.028
56	Lawrence Expressway & Pruneridge Avenue (County)	AM	11/14/17	E	61.2	E	>120	F	>120	F	9.5	0.037
		PM	11/14/17		43.8	D	>120	F	>120	F	4.4	0.006

Notes:
 * = CMP, + = Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara
 ">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.
BOLD indicates unacceptable level of service
BOLD and boxed indicates a significant cumulative impact

Potential Improvements Strategies for Intersection Impacts

Improvement options were studied for each intersection experiencing impacts under the year 2035 cumulative conditions when compared to cumulative no ECRCSF conditions. An intersection impact can be satisfactorily addressed by implementing measures that would restore intersection conditions to Cumulative no ECRCSF conditions.

Pastoria Avenue & El Camino Real (#5)

Potential Improvement: Potential improvement would require restriping the southbound approach to include 2 left-turn lanes, one through lane and one right-turn lane. This improvement would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. However, this intersection is outside of City of Sunnyvale jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Mathilda Avenue & El Camino Real (#6) [CMP]

Potential Improvement: Potential improvement would require a third left-turn lane for the northbound and eastbound approaches. The northbound approach would also need to be widened for a dedicated right-turn lane. This improvement would require right-of-way acquisitions at multiple quadrants of the intersection.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the AM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. However, the widened approach would increase traffic exposure time for pedestrians by 3 to 8 seconds and 1 to 4 seconds for bicyclists. It is also uncertain whether the required right-of-way can be acquired. For these reasons, the proposed potential improvement is considered infeasible. This intersection is also in Caltrans' jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Sunnyvale Avenue & El Camino Real (#7)

Potential Improvement: Potential improvement would require widening the westbound approach to include a second left-turn lane. This improvement could potentially be accommodated within the existing right-of-way and would not increase the pedestrian and bicycle exposure time to traffic at the intersection.

With the proposed improvement, the intersection would operate at an acceptable LOS E under cumulative conditions during the PM peak hour. However, this intersection is in Caltrans' jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Fair Oaks Avenue & El Camino Real (#8) [CMP]

Potential Improvement: The Sunnyvale Traffic Impact Fee (TIF) identifies an improvement at this intersection to widen eastbound and westbound El Camino Real to include a second left-turn lane. Depending on the extent of the median that could be removed, El Camino Real east of Fair Oaks Avenue could require widening by up to 8 feet and El Camino Real west of Fair Oaks Avenue could require widening by up to 11 feet. The east-west through lanes would also require re-alignment. The widened approach would increase traffic exposure time for pedestrians by 3 to 4 seconds and 1 to 2 seconds for bicyclists.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. Since this improvement is identified in the TIF, the ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Wolfe Road & El Camino Real (#9)

Potential Improvement: According to the *Wolfe Road Corridor Traffic Improvement Study*, prepared by Kimley Horn, dated February 2016, Wolfe Road between Homestead Road and El Camino Real is recommended for multimodal improvements to improve vehicle operations as well as bicycle and pedestrian facilities. At the time of this report, the multimodal improvements have not been finalized, but the Sunnyvale TIF project list includes this project assuming the most aggressive alternative (Triangle - Alternative 3). This alternative includes improving the Wolfe Road intersections with El Camino Real and with Fremont Avenue, as well as signaling the intersection at Fremont Avenue and El Camino Real. Right-of-way acquisition would be required. Bicycle improvements including extended bike lanes and bike boxes would also be included as part of the improvement project and are detailed in the corridor improvement study report. This improvement (Triangle – Alternative 3) would require signal coordination between the two Wolfe Road intersections and the new signaled Fremont Avenue and El Camino Real intersection.

With the proposed improvement, the intersection would operate at an acceptable LOS E under cumulative conditions during the PM peak hour. The ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Ellis Street & Middlefield Road (#14)

Potential Improvement: Potential improvement would require widening the eastbound approach to include a second left-turn lane. This improvement could potentially be accommodated within the existing right-of-way and would not increase the pedestrian and bicycle exposure time to traffic at the intersection.

With the proposed improvement, the intersection would operate at an unacceptable LOS E under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. However, this intersection is in City of Mountain View jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Mary Avenue & Central Expressway (#15) [CMP]

Potential Improvement: The Sunnyvale Traffic Impact Fee (TIF) identifies an improvement at this intersection to widen westbound Central Expressway to include a third westbound left-turn lane. This improvement could potentially be accommodated within the existing right-of-way and would not increase the pedestrian and bicycle exposure time to traffic at the intersection.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. Since this improvement is identified in the TIF, the ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Mary Avenue & Fremont Avenue (#19)

Potential Improvement: Potential improvement would require restriping the eastbound and westbound approaches with 1 left-turn lane, 1 shared left-through lane, 1 through lane and 1 shared through-right lane. The eastbound and westbound approaches would need to operate with split phasing. This mitigation would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required. It should be noted that split phasing operates favorably to protected phasing only under certain circumstances. This improvement should be implemented only if cumulative volumes are realized.

With the proposed improvement, the intersection would operate at LOS E during the AM peak hour and LOS F during the PM peak hour under cumulative conditions, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The ECRCSF shall require projects within the plan area to contribute their fair share towards the identified improvement.

SR 85 Southbound Ramps & Fremont Avenue (#21)

Potential Improvement: Improvement would require widening the SR 85 off-ramp to include a left-turn lane, a shared left-through-right lane, and a right-turn lane. The eastbound leg would require restriping to include a bike box in advance of the stop-line to allow right-turn vehicles to bypass the through vehicles in the curb lane. The off-ramp would need to be widened to the proposed three lanes approximately 370 feet back from the intersection. The length of the north sidewalk would not be lengthened, but the pedestrian refuge island would be removed. The off-ramp would also need to be realigned with the SR 85 southbound on-ramp. Widening the off-ramp could be accommodated within the existing right-of-way. Within the existing right-of-way, the required eastbound right-turn lane could be achieved via providing a bike box east of the stop-line to allow bicyclists to clear the right-turn area. The eastbound curb lane is 20 feet wide under existing conditions. With the bike box, right-turn vehicles would be able to bypass the through vehicles. The existing stop-line for the eastbound leg would need to be moved back by approximately 15 feet. This improvement is identified in the TIF.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Fair Oaks Avenue & Arques Avenue (#42)

Potential Improvement: Improvement would require widening the eastbound and westbound approaches to include a separate right-turn lane. One eastbound receiving lane would need to be eliminated. This improvement can be accommodated within the existing right-of-way. However, the eastbound and westbound through movements would be offset with their receiving lanes and would require lane extensions to delineate the travel path for the eastbound and westbound through movements.

With the proposed improvement, the intersection would operate at LOS E under cumulative conditions during the AM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The TIF identified improvements at this intersection, but the required improvement is beyond the TIF improvements. The ECRCSF shall require projects within the plan area to contribute their fair share towards the identified improvement.

Wolfe Road & Arques Avenue (#43)

Potential Improvement: Improvement would require restriping the northbound approach to include 2 left-turn lanes, 2 through lanes and 1 dedicated right-turn lane. The northbound bike lane would need to be moved to the west side of the proposed right-turn lane. The westbound approach would require restriping to include 2 left-turn lanes, 1 shared left-through lane and 1 shared through-right lane. Eastbound and westbound approaches would need to operate with split phasing. This improvement would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required. It should be noted that split phasing operates favorably to protected phasing only under certain circumstances. This improvement should be implemented only if cumulative volumes are realized.

With the proposed improvement, the intersection would operate at LOS E under cumulative conditions during both the AM and PM peak hours, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The TIF identified improvements at this intersection, but the required improvement is beyond the TIF improvements. The ECRCSF shall require projects within the plan area to contribute their fair share towards the identified improvement.

Wolfe Road & Kifer Road (#44)

Potential Improvement: The Sunnyvale Traffic Impact Fee (TIF) identifies an improvement at this intersection to widen all approaches to include a second left-turn lane. All legs of the intersection could require widening by up to 12 feet. The widened approaches would increase traffic exposure time for pedestrians by 3 to 5 seconds and 1 to 3 seconds for bicyclists crossing the intersection.

With the proposed improvement, the intersection would remain operating at an unacceptable LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Wolfe Road & Reed Avenue (#45)

Potential Improvement: Potential improvement would require restriping the westbound approach with 1 left-turn lane, 1 through lane, and 1 right-turn lane. This mitigation would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required.

With the proposed improvement, the intersection would operate at an acceptable LOS D under cumulative conditions during the PM peak hour.

Lawrence Expressway at Benton Street, at Homestead Road, and at Pruneridge Avenue (#54, 55, 56)

Potential Improvement: The County of Santa Clara has identified a future project to provide a grade separation at all these intersections. These would significantly improve the north-south flow of traffic and potentially address the project's impacts.

The ECRCSF shall require projects within the plan area to contribute their fair share towards the cost of these grade separations. These intersections are under Santa Clara County's jurisdiction; therefore, it is up to the County to approve and advance the proposed improvement at the intersection. Future project applicants within the ECRCSF area shall coordinate with the County on these improvements.

ECRCSF Freeway Impacts

VTA CMP guidelines define that a project would cause a freeway impact if the project deteriorates freeway levels of service from an acceptable level to an unacceptable level, or if the freeway already operates at an unacceptable level under existing conditions, the project would add traffic exceeding 1% of the capacity. To determine the ECRCSF potential freeway impacts, a select zone analysis within the Sunnyvale Travel Demand Forecast Model was performed to estimate the increase in ECRCSF traffic volume between the Cumulative no ECRCSF and cumulative conditions. Freeway segments that would experience a significant ECRCSF impact are identified below:

Mixed Flow Lanes – AM Peak Hour

- SR 85, northbound from Central Expressway to Moffett Boulevard
- SR 237, eastbound from Fair Oaks Avenue to Lawrence Expressway
- SR 237, eastbound from Great America Parkway to First Street

Mixed-Flow Lanes – PM Peak Hour

- SR 237, westbound from Zanker Road to Lawrence Expressway

The VTA's Valley Transportation Plan (VTP) 2040 identifies freeway express lane projects along SR 237 between N. First Street and SR 85, and along all of SR 85. On all identified freeway segments, the existing HOV lanes are proposed to be converted to express lanes. On SR 85 along the identified segments, a second express lane is proposed to be implemented for a total of two express lanes in each direction.

On SR 237, the existing HOV lanes would be operating over capacity under the year 2035 cumulative conditions. Converting the HOV lanes to express lanes would not mitigate the project impact. On SR 85, converting the existing HOV lane to an express lane and adding an express lane in each direction would increase the capacity of the freeway and would fully mitigate the freeway impacts. The ECRCSF should require future projects within the proposed plan area to make a fair-share contribution toward the cost of the identified express lane programs along SR 85, which is not part of the TIF.

However, capacity improvements on freeways are beyond the capabilities of the City of Sunnyvale. Furthermore, freeways are under Caltrans jurisdiction. It should be noted that all of these freeways have been identified with impacts under the *City of Sunnyvale Land Use and Transportation (LUTE) Element Final Environmental Impact Report*, dated January 2017.

Freeway Ramp Capacity Analysis

For the purpose of this study, the ECRCSF is said to create a significant adverse impact on a freeway ramp if its implementation:

1. Causes the volume-to-capacity (V/C) ratio of the freeway ramp to exceed 1.0; or
2. Increases the amount of traffic on a freeway ramp that is already exceeding its capacity by more than one percent (1%) of the ramp's capacity.

The freeway ramp volumes under year 2035 cumulative conditions were estimated using the Sunnyvale Travel Demand Forecast Model. The study freeway ramps at the US 101/Lawrence Expressway and US 101/Fair Oaks Avenue interchanges are assumed the same as under existing conditions. The US 101/Mathilda Avenue interchange is proposed for reconfiguration. This interchange improvement is identified in the Valley Transportation Plan 2040 (project H33).

All study freeway ramps would continue to operate below capacity and the ECRCSF impact on freeway ramps would be *less than significant*.

ECRCSF Impact to Transit Travel Time

Currently 6 VTA bus routes travel within the ECRCSF project area. To assess the transit travel time impacts, the bus route travel times in the study area under year 2035 cumulative conditions were compared to existing conditions. Bus route travel times are estimated used published schedules and adjusted based on delays experienced at study intersections. VTA does not have established criteria to determine impact to transit services. Therefore, this analysis is presented for information purposes only.

The results show that all studied transit routes under year 2035 cumulative conditions are expected to experience increases in travel times of less than 2 minutes in comparison to cumulative no ECRCSF conditions. The Sunnyvale Traffic Impact Fee (TIF) contains many projects that are aimed at relieving congestion along major corridors. Projects within the ECRCSF study area would be required to pay the TIF and would constitute the ECRCSF fair share contribution to relieving traffic congestion and improving transit travel times.

The ECRCSF Draft Plan also identifies various policies prioritizing consideration of mass transit vehicles to single-occupant vehicles. These policies would shift the design and policy decisions regarding El Camino Real to reflect multimodal priorities, including transit.

ECRCSP Impact to Pedestrian and Bicycle Facilities

The ECRCSP Draft Plan identifies various policies to improve pedestrian and bicycle facilities within the El Camino Real Corridor Specific Plan area. The relevant policies are listed below:

Circ-1: Promote modes of travel and actions that provide safe access to city streets and reduce single occupant vehicle trips and trip lengths locally and regionally.

The priority order of consideration of transportation users shall be:

- A. Pedestrians
- B. Non-automotive
- C. Mass transit vehicles
- D. Delivery Vehicles
- E. Single-occupant automobiles

Circ-2: Further develop El Camino Real as a Complete Street, with a focus on:

- A. Providing safe, convenient, accessible facilities for all modes including motor vehicles, transit, pedestrians and cyclists.
- ...
- C. Design and policy decisions regarding El Camino Real will reflect multimodal priorities and provide for safe, convenient and accessible travel by all modes of transportation including driving, walking, bicycling and riding transit.
- D. In making decisions regarding El Camino Real, the needs of more vulnerable road users such as children, seniors, and people with disabilities will be prioritized.
- E. Design and policy decisions regarding El Camino Real will seek to increase pedestrian activity, reduce pedestrian-related collisions, and enhance pedestrian-friendly conditions along the corridor.

The implementation of these policies would enhance pedestrian and bicycle safety, convenience and comfort levels. Therefore, the ECRCSP cumulative impact on pedestrian and bicycle facilities would be *less than significant*.

1. Introduction

This report presents the results of the transportation impact analysis conducted for the proposed El Camino Real Corridor Specific Plan (ECRCSP) in Sunnyvale, California (see Figure 1). The proposed El Camino Real Corridor Specific Plan (ECRCSP) study area comprises approximately 350 acres along the 4-mile Sunnyvale El Camino Real frontage, with properties within ¼ mile on either side of the roadway centerline generally included in the study area. Currently, the ECRCSP area consists of approximately 3.25-million square feet (sf) of commercial development and approximately 1,600 residential units. According to the adopted LUTE, the ECRCSP area has a buildout potential of 4.2-million sf of commercial development and 5,800 residential units. The proposed ECRCSP proposes a buildout potential of 3.98-million sf of commercial development and 8,500 residential units. As shown on Table 1, the proposed ECRCSP represents an increase of 730,000 sf of commercial development and 6,900 residential units over existing conditions, or a decrease of 220,000 sf of commercial development and an increase of 2,700 residential units over the adopted LUTE.

Table 1
ECRCSP Area Land Use Summary

	ECRSP Area Land Use Summary			Comparison	
	Existing Built	Current General Plan	Proposed ECRSP	ECRSP - Existing	ECRSP - Current GP
Commerical Uses (estimated sf)	3,250,000	4,200,000	3,980,000	730,000	(220,000)
Residential Uses (estimated housing units)	1,600	5,800	8,500	6,900	2,700

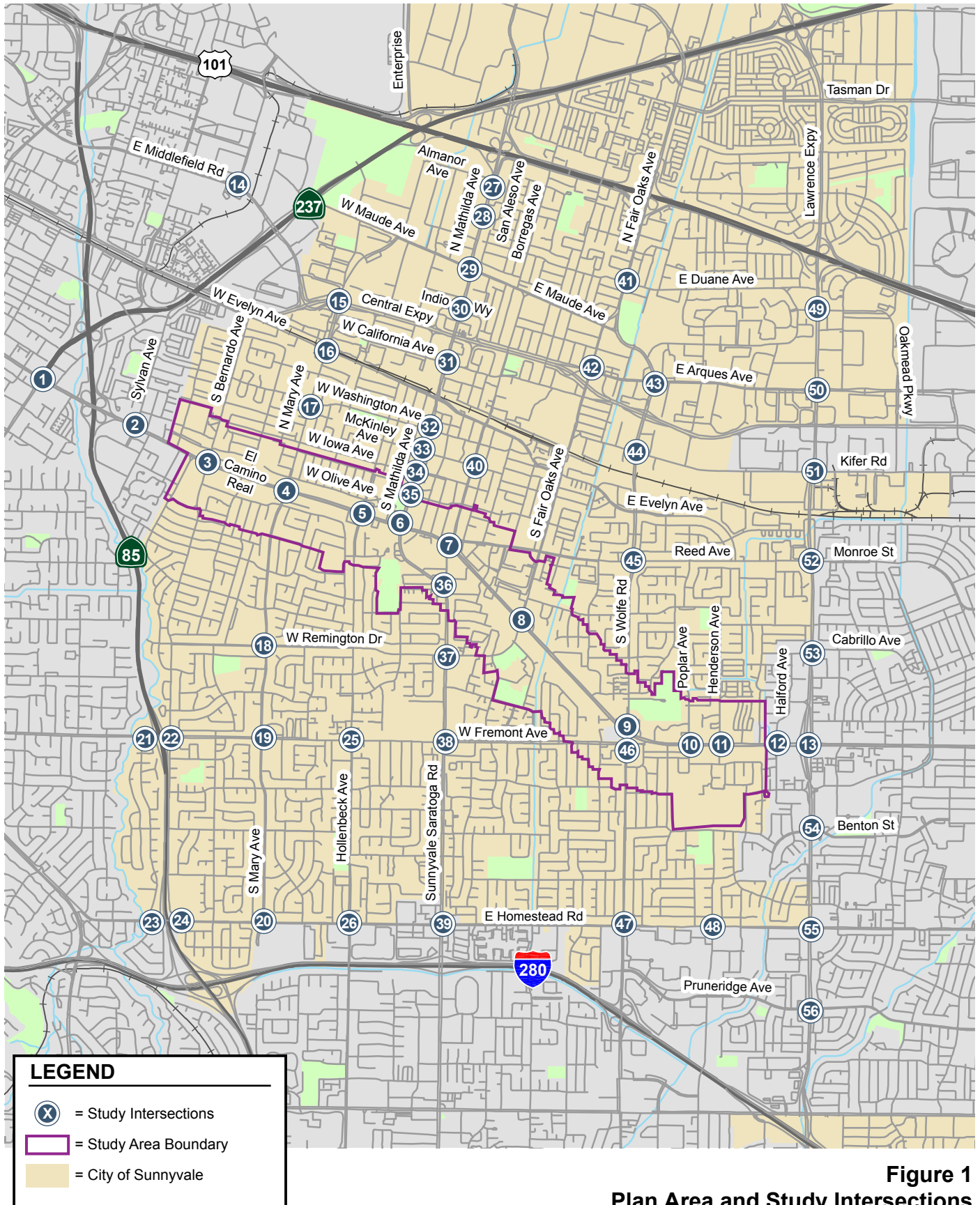


Figure 1
Plan Area and Study Intersections

Scope of Study

This study was conducted for the purpose of identifying the potential long-term traffic impacts of the proposed ECRCSF. The potential impacts of the proposed ECRCSF were evaluated in accordance with the standards set forth by the City of Sunnyvale and the Santa Clara County Valley Transportation Authority (VTA) Congestion Management Program (CMP). The proposed ECRCSF is estimated to generate more than 100 peak hour trips. The traffic analysis is based on the AM and PM peak hour levels of service for 56 signalized intersections. Three of the study intersections are within the City of Mountain View, one is within the City of Cupertino, and six are within the City of Santa Clara. 14 of the study intersections are CMP intersections. The study intersections were selected to include locations where the proposed ECRCSF is expected to generate 10 or more peak-hour trips per lane.

The Santa Clara County VTA CMP guidelines require that the CMP freeway segments be evaluated to determine the impact of added traffic for projects that generate trips equal to or greater than one percent of the freeway segment's capacity. The proposed ECRCSF is expected to generate added traffic volume on multiple freeway segments along US 101, SR 237, I-280 and SR 85. Therefore, a freeway analysis was conducted on these freeway segments in accordance with the VTA CMP guidelines. The traffic analysis also includes a capacity analysis for 14 freeway ramps.

Study Intersections

1. SR 237 & El Camino Real [Mountain View] (CMP)
2. Sylvan Avenue & El Camino Real [Mountain View] (CMP)
3. Bernardo Avenue & El Camino Real
4. Mary Avenue & El Camino Real (CMP)
5. Pastoria Avenue & El Camino Real
6. Mathilda Avenue & El Camino Real (CMP)
7. Sunnyvale Avenue & El Camino Real
8. Fair Oaks Avenue & El Camino Real (CMP)
9. Wolfe Road & El Camino Real (CMP)
10. Poplar Avenue & El Camino Real
11. Henderson Avenue & El Camino Real
12. Halford Avenue & El Camino Real [Santa Clara]
13. Lawrence Expressway Ramps & El Camino Real [Santa Clara] (CMP)
14. Ellis Street & Middlefield Road [Mountain View]
15. Mary Avenue & Central Expressway (CMP)
16. Mary Avenue & Evelyn Avenue
17. Mary Avenue & Washington Avenue
18. Mary Avenue & Remington Drive
19. Mary Avenue & Fremont Avenue
20. Mary Avenue & Homestead Road
21. SR 85 Southbound Ramps & Fremont Avenue
22. SR 85 Northbound Ramps & Fremont Avenue
23. SR 85 Southbound Ramps & Homestead Road
24. SR 85 Northbound Ramps & Homestead Road
25. Hollenbeck Avenue & Fremont Avenue
26. Hollenbeck Avenue & Homestead Road
27. Mathilda Avenue & Almanor Avenue
28. Mathilda Avenue & San Aleso Avenue
29. Mathilda Avenue & Maude Avenue (CMP)
30. Mathilda Avenue & Indio Avenue

31. Mathilda Avenue & California Avenue
32. Mathilda Avenue & Washington Avenue
33. Mathilda Avenue & McKinley Avenue
34. Mathilda Avenue & Iowa Avenue
35. Mathilda Avenue & Olive Avenue
36. Mathilda Avenue & Sunnyvale-Saratoga Road
37. Sunnyvale-Saratoga Road & Remington Drive (CMP)
38. Sunnyvale-Saratoga Road & Fremont Avenue (CMP)
39. Sunnyvale-Saratoga Road & Homestead Road [Cupertino] (CMP)
40. Sunnyvale Avenue & McKinley Avenue
41. Fair Oaks Avenue & Duane Avenue
42. Fair Oaks Avenue & Arques Avenue
43. Wolfe Road & Arques Avenue
44. Wolfe Road & Kifer Road
45. Wolfe Road & Reed Avenue
46. Wolfe Road & Fremont Avenue
47. Wolfe Road & Homestead Road
48. Tantau Avenue & Homestead Road
49. Lawrence Expressway & Oakmead Parkway
50. Lawrence Expressway & Arques Avenue (CMP)
51. Lawrence Expressway & Kifer Road
52. Lawrence Expressway & Reed Avenue/Monroe Street (CMP)
53. Lawrence Expressway & Cabrillo Avenue [Santa Clara]
54. Lawrence Expressway & Benton Street [Santa Clara]
55. Lawrence Expressway & Homestead Road [Santa Clara] (CMP)
56. Lawrence Expressway & Pruneridge Avenue [Santa Clara]

Study Freeway Segments

1. US 101 between SR 87 and Embarcadero Road
2. SR 237 between SR 85 and I-880
3. I-280 between SR 87 and El Monte Road
4. SR 85 between I-280 and US 101 (North)

Study Freeway Ramps

1. US 101 southbound on-ramp from northbound Lawrence Expressway
2. US 101 northbound on-ramp from northbound Lawrence Expressway
3. US 101 northbound off-ramp to Lawrence Expressway
4. US 101 southbound off-ramp to Lawrence Expressway
5. US 101 southbound on-ramp from northbound Fair Oaks Avenue
6. US 101 northbound off-ramp to Fair Oaks Avenue
7. US 101 northbound on-ramp from Fair Oaks Avenue
8. US 101 southbound off-ramp to southbound Fair Oaks Avenue
9. US 101 southbound on-ramp from northbound Mathilda Avenue
10. US 101 northbound on-ramp from northbound Mathilda Avenue
11. US 101 northbound off-ramp to southbound Mathilda Avenue
12. US 101 southbound off-ramp to southbound Mathilda Avenue
13. US 101 northbound off-ramp to Mathilda Avenue [future ramp]
14. US 101 southbound off-ramp to Mathilda Avenue [future ramp]

Traffic conditions at the study intersections were analyzed for both the weekday AM and PM peak hours of adjacent street traffic. The AM peak hour is expected to occur between 7:00 AM and 10:00 AM and the PM peak hour is expected to occur between 4:00 PM and 7:00 PM on a regular weekday. These are the peak commute hours during which most traffic congestion occurs on the roadways.

Traffic conditions were evaluated for the following scenarios:

Scenario 1: Existing Conditions. Existing traffic volumes at study intersections were based on traffic counts conducted in 2017 and 2018, as well as the 2018 CMP TRAFFIX database. The study intersections were evaluated with a level of service analysis using TRAFFIX software in accordance with the *2000 Highway Capacity Manual* methodology. Study freeway segments were analyzed in accordance with the VTA CMP method, and study freeway ramps were analyzed using demand to capacity ratios.

Scenario 2: 2035 Cumulative Conditions. The 2035 cumulative conditions traffic volumes were estimated using the Sunnyvale Traffic Demand Forecast Model for year 2035. In addition to land uses assumed under the current General Plan, the cumulative conditions include the proposed ECRCSPP, the proposed Lawrence Station Area Plan Update, the proposed Fortinet Specific Plan and the proposed Downtown Specific Plan Update. To determine potential impacts generated by the ECRCSPP, a separate model run was conducted assuming no growth in the ECRCSPP area beyond the current general plan. The cumulative scenario was compared to the cumulative no ECRCSPP scenario to disclose impacts.

Methodology

This section presents the methods used to determine the traffic conditions for each scenario described above. It includes descriptions of the data requirements, the analysis methodologies, and the applicable level of service standards.

Data Requirements

The data required for the analysis were obtained from new traffic counts, the City of Sunnyvale, the VTA CMP TRAFFIX database, and field observations. The following data were collected from these sources:

- existing traffic volumes,
- existing lane configurations, and
- signal timing and phasing.

Level of Service Standards and Analysis Methodologies

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

Signalized Study Intersections

All City of Sunnyvale, Mountain View, Cupertino and Santa Clara level of service analysis methodologies for signalized intersections are the *Highway Capacity Manual* (HCM) 2000 operations method. This method is applied using the TRAFFIX software. The HCM 2000 operations method evaluates signalized intersection operations on the basis of average control delay time for all vehicles at the intersection. Since TRAFFIX is also the CMP-designated traffic impact analysis tool, the City of Sunnyvale employs the CMP default values for the analysis parameters within the software.

The City of Sunnyvale, Mountain View and Santa Clara level of service standards for signalized intersections are all LOS D or better. Within the City of Sunnyvale, intersections on roadways considered to be “regionally significant” have a standard of LOS E. In the study area, signalized intersections within Sunnyvale along El Camino Real, Sunnyvale-Saratoga Road, and Mathilda Avenue are considered regionally significant. The correlation between average control delay and level of service is shown in Table 2.

CMP Intersections

The designated level of service analysis methodology for the CMP is also the HCM 2000 operations method for signalized intersections, using TRAFFIX. The CMP level of service standard for signalized intersections within the City of Sunnyvale, Mountain View, Cupertino and Santa Clara is LOS E or better.

Freeway Segments

Within Santa Clara County, freeway segments are analyzed as prescribed in the Santa Clara County CMP technical guideline. The level of service for freeway segments is estimated based on vehicle density. Density is calculated by the following formula:

$$D = V / (N * S)$$

Where:

- D = density, in vehicles per mile per lane (vpmpl)
- V = peak hour volume, in vehicle per hour (vph)
- N = number of travel lanes
- S = average travel speed, in miles per hour (mph)

The vehicle density on a segment is correlated to level of service as shown in Table 3. The CMP requires that mixed-flow lanes and auxiliary lanes be analyzed separately from high-occupancy vehicle (HOV) lanes (otherwise known as carpool lanes). The CMP specifies that a capacity of 2,300 vehicles per hour per lane (vphpl) be used for segments three lanes or wider in one direction, and a capacity of 2,200 vphpl be used for segments two lanes wide in one direction. HOV lanes are specified as having a capacity of 1,650 vphpl.

**Table 2
Signalized Intersection Level of Service Definitions Based on Control Delay**

Level of Service	Description	Average Control Delay Per Vehicle (sec.)
A	Signal progression is extremely favorable. Most vehicles arrive during the green phase and do not stop at all. Short cycle lengths may also contribute to the very low vehicle delay.	10.0 or less
B+	Operations characterized by good signal progression and/or short cycle lengths.	10.1 to 12.0
B	More vehicles stop than with LOS A, causing higher levels of average vehicle delay.	12.1 to 18.0
B-		18.1 to 20.0
C+	Higher delays may result from fair signal progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though many still pass through the	20.1 to 23.0
C		23.1 to 32.0
C-		32.1 to 35.0
D+	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable signal progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and	35.1 to 39.0
D		39.1 to 51.0
D-		51.1 to 55.0
E+	This is considered to be the limit of acceptable delay. These high delay values generally indicate poor signal progression, long cycle lengths, and high volume-to-capacity (V/C) ratios. Individual cycle failures occur frequently.	55.1 to 60.0
E		60.1 to 75.0
E-		75.1 to 80.0
F	This level of delay is considered unacceptable by most drivers. This condition often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major-contributing causes of such delay levels.	greater than 80.0

Source: Transportation Research Board, *Highway Capacity Manual 2000* (Washington, D.C., 2000) p10-16.

Freeway Ramps

A freeway ramp analysis was performed in order to verify that the freeway ramps would have sufficient capacity to serve the expected traffic volumes with and without the project. This analysis consisted of a volume-to-capacity ratio evaluation of the freeway ramps at the study interchanges. The ramp capacities were obtained from the *Highway Capacity Manual 2000*, and considered the free-flow speed, number of lanes on the ramp, and ramp metering.

**Table 3
Freeway Segment Level of Service Definition**

Level of Service	Description	Density (vehicles/mile/lane)
A	Average operating speeds at the free-flow speed generally prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	11.0 or less
B	Speeds at the free-flow speed are generally maintained. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high.	11.0 to 18.0
C	Speeds at or near the free-flow speed of the freeway prevail. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more vigilance on the part of the driver.	18.0 to 26.0
D	Speeds begin to decline slightly with increased flows at this level. Freedom to maneuver within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels.	26.0 to 46.0
E	At this level, the freeway operates at or near capacity. Operations in this level are volatile, because there are virtually no usable gaps in the traffic stream, leaving little room to maneuver within the traffic stream.	46.0 to 58.0
F	Vehicular flow breakdowns occurs. Large queues form behind breakdown points.	greater than 58.0

Source: Santa Clara County Valley Transportation Authority, Transportation Impact Analysis Guidelines, Updated March 2009 (Based on the *Highway Capacity Manual (2000)*, Washington, D.C.)

Report Organization

The remainder of this report is divided into two chapters. Chapter 2 describes the existing roadway network, transit services, and pedestrian facilities. Chapter 3 presents the traffic conditions in the ECRCSF study area under the year 2035 cumulative conditions, the project impacts on the transportation system, and any recommended improvement measures.

2. Existing Conditions

This chapter describes the existing conditions for transportation facilities in the vicinity of the ECRCSF study area, including the roadway network, transit service, pedestrian and bicycle facilities.

Existing Roadway Network

The proposed El Camino Real Corridor Specific Plan (ECRCSF) study area comprises approximately 350 acres along the 4-mile Sunnyvale El Camino Real frontage, with properties within ¼ mile on either side of the roadway centerline generally included in the study area. Regional access to the study area is provided by US 101 to the north, I-280 to the south and SR 85 and SR 237 to the west. These facilities are described below.

US 101 is an eight-lane freeway (three mixed-flow lanes and one HOV lane in each direction) within the vicinity of Sunnyvale. ECRCSF study area access to and from US 101 is provided via its interchanges at SR 237, Mathilda Avenue, Fair Oaks Avenue and Lawrence Expressway.

I-280 is an eight-lane freeway (three mixed-flow lanes and one HOV lane in each direction) within the vicinity of Sunnyvale. I-280 provides regional freeway access between the cities of San Francisco and San Jose. ECRCSF study area access to and from I-280 is provided via its interchanges at SR 85, De Anza Boulevard, Wolfe Road, Stevens Creek Boulevard and Lawrence Expressway.

SR 237 is a four to six-lane freeway within the vicinity of Sunnyvale that extends west to El Camino Real and east to I-880 in Milpitas. East of Mathilda Avenue, SR 237 has two mixed-flow lanes and one HOV lane in each direction. West of Mathilda Avenue, SR 237 has two mixed-flow lanes in each direction. ECRCSF study area access to and from SR 237 is provided via its interchange at SR 85, Sylvan Avenue, Middlefield Road/Maude Avenue, Mathilda Avenue, Fair Oaks Avenue and Lawrence Expressway.

SR 85 is a six-lane freeway (two mixed-flow lanes and one HOV lane in each direction) that begins at the US 101 interchange east of Shoreline Boulevard, and extends south towards San Jose and terminates at the US 101 interchange south of Silicon Valley Boulevard/Bernal Road. ECRCSF study area access to and from SR 85 is provided via interchanges with Fremont Avenue and El Camino Real.

Major roadways within or near the ECRCSF study area include El Camino Real, Lawrence Expressway, Central Expressway, Bernardo Avenue, Mary Avenue, Hollenbeck Avenue/Pastoria Avenue, Mathilda Avenue, Sunnyvale Avenue, Fair Oaks Avenue, Wolfe Road, Evelyn Avenue, Remington Drive, Fremont Avenue and Homestead Road.

El Camino Real is a six-lane divided arterial that extends from Mission Street in Colma to The Alameda in Santa Clara. Within the vicinity of Sunnyvale, El Camino Real has a posted speed limit of 40 miles per hour (mph). Sidewalks are present along both sides of the roadway, and all major signalized intersections have crosswalks and pedestrian push buttons and signal heads across all legs. Bike lanes are present between Fair Oaks Avenue and Sunnyvale Avenue. On-street parking is permitted along certain segments of the roadway. El Camino Real provides regional access to the ECRCSF study area via its interchanges with SR 85 and Lawrence Expressway, as well as its intersections with SR 237, Mathilda Avenue Fair Oaks Avenue and Wolfe Road.

Lawrence Expressway is a north-south, eight-lane expressway with a raised median and a posted speed limit of 50 mph. It begins at Saratoga Avenue in the south, crosses through Sunnyvale, and extends northward and transitions into Caribbean Drive. HOV lanes are present between Stevens Creek Boulevard and US 101. Lawrence Expressway connects with US 101 via full-access freeway interchanges. Lawrence Expressway includes sidewalks along both sides on most segments and crosswalks at signalized intersections. There are no bike lanes on Lawrence Expressway, but bikes are allowed to ride on the shoulders. On-street parking is not permitted on this roadway. Lawrence Expressway provides regional access to the ECRCSF study area via its interchanges with SR 237, US 101, Central Expressway and I-280.

Central Expressway is an east-west, four-lane to six-lane expressway. It begins at Trimble Road in the east, crosses Sunnyvale, extends westward and transitions into Alma Street. In the study area, Central Expressway has two eastbound lanes and two westbound lanes and a posted speed limit of 50 mph. Central Expressway is mostly grade-separated within Sunnyvale except at Mary Avenue. The Mary Avenue intersection has crosswalks with pedestrian push buttons and signal heads across all legs. There are no sidewalks or bike lanes along Central Expressway, but bikes are allowed to ride on the shoulders. On-street parking is not permitted on this roadway. Central Expressway has an intersection at Mary Avenue and interchanges at Mathilda Avenue, Fair Oaks Avenue, Wolfe Road and Lawrence Expressway.

Bernardo Avenue is a north-south, two- to four-lane roadway with a posted speed limit of 30 mph. It begins at Evelyn Avenue and extends south through El Camino Real to Homestead Road. Bernardo Avenue has sidewalks in the northbound direction south of Fremont Avenue and sidewalks on both sides north of Fremont Avenue. Intersections with major roadways have crosswalks, pedestrian push buttons, and signal heads. Bike lanes are present along Bernardo Avenue between Remington Drive and El Camino Real. On-street parking is permitted along most segments of Bernardo Avenue.

Mary Avenue is a north-south, two to six-lane roadway with a posted speed limit of 35 to 40 mph. It extends from Almanor Avenue south to Homestead Road. Mary Avenue has sidewalks and bike lanes along both sides throughout Sunnyvale. Intersections with major roadways have crosswalks, pedestrian push buttons, and signal heads. On-street parking is generally permitted along the roadway segments within the residential neighborhood. Mary Avenue provides regional access to the study area via its intersection with Central Expressway.

Hollenbeck Avenue/Pastoria Avenue is a north-south, two-lane roadway with a posted speed limit of 25 to 30 mph. S. Pastoria Avenue extends from E Evelyn Avenue south to El Camino Real, transitions to Hollenbeck Avenue and extends south to Homestead Road. Hollenbeck Avenue/Pastoria Avenue has sidewalks along both sides of the roadway. Intersections with major roadways have crosswalks, pedestrian push buttons, and signal heads. Bike lanes are present on Hollenbeck Avenue between Danforth Drive and El Camino Real as well as south of Alberta Avenue. On-street parking is permitted along most segments of the roadway.

Mathilda Avenue/Sunnyvale-Saratoga Road is a north-south, six-lane roadway with a posted speed limit of 35 to 45 mph. It extends from E Caribbean Drive (north of US 237) south past El Camino Real, transitions to Sunnyvale-Saratoga Road and extends south into Cupertino and Saratoga. There are sidewalks on both sides of the street for the whole length of the roadway with crosswalks, pedestrian push buttons, and signal heads at all major intersections. Bike lanes are generally present along Mathilda Avenue north of Iowa Avenue. Bike lanes are present along Mathilda Avenue/Sunnyvale-Saratoga Road south of El Camino Real. Within the immediate vicinity of the ECRCSF study area, on-street parking is not permitted along the roadway. Mathilda Avenue provides regional access to the ECRCSF study area via its interchanges with SR 237, US 101, Central Expressway and I-280.

Sunnyvale Avenue is a north-south, two-lane roadway with a posted speed limit of 30 mph. It extends from E Maude Avenue south to El Camino Real. Sunnyvale Road has sidewalks on both sides of the roadway through all segments with crosswalks, pedestrian push buttons, and signal heads at all major intersections. Bike lanes are present along Sunnyvale Avenue south of Evelyn Avenue. Within the immediate vicinity of the ECRCSF study area, on-street parking is not permitted along the roadway.

Fair Oaks Avenue is a north-south, four- to six-lane roadway with a posted speed limit of 30 mph. It extends from SR 237 to El Camino Real and transitions into Remington Drive. Sidewalks exist on both sides for most of the segments along with crosswalks, pedestrian push buttons, and signal heads at all major intersections. Bike lanes are present along Fair Oaks Avenue between Evelyn Avenue and Kifer Road as well as south of Old San Francisco Road. On-street parking is generally permitted north of Old San Francisco Road. Fair Oaks Avenue provides regional access to the ECRCSF study area via its interchanges with SR 237, US 101 and Central Expressway.

Wolfe Road is a four-lane to six-lane, north-south arterial that begins north at N. Fair Oaks Avenue, and extends south into the City of Cupertino, ending at Stevens Creek Boulevard (its transition point into Miller Avenue). Wolfe Road has a posted speed limit of 35 mph in the study area. Wolfe Road includes sidewalks along most segments on both directions of travel and crosswalks at signalized intersections. Bike lanes are present along Wolfe Road north of Reed Avenue as well as south of Fremont Avenue. On-street parking is permitted along only certain segments of the roadway. Wolfe Road provides regional access to the ECRCSF study area via its interchanges with Central Expressway and I-280.

Evelyn Avenue is a two-lane to four-lane roadway that begins west at Castro Street in the City of Mountain View and extends east to its terminal at Reed Avenue in the City of Sunnyvale. Within Sunnyvale, Evelyn Avenue includes generally two travel lanes and a center two-way left-turn lane and has a posted speed limit of 30 mph in the study area. Evelyn includes sidewalks and bicycle lanes on both directions of travel and crosswalks at signalized intersections. On-street parking is permitted along most segments of this roadway.

Remington Drive is an east-west, two to four-lane roadway that begins west at S Bernardo Avenue and ends at El Camino Real before transitioning into Fair Oaks Avenue. It has bike lanes and sidewalks along both directions of the roadway on all segments and has crosswalks, pedestrian push buttons, and signal heads at major intersections. On-street parking is permitted west of Sunnyvale-Saratoga Road.

Fremont Avenue is an east-west, two to six-lane roadway with a posted speed limit of 30 mph that begins west along Foothill Expressway in Los Altos and ends as it joins El Camino Real. It has bike lanes along the full length of the roadway. There are sidewalks on both sides of the roadway along some segments and there are crosswalks, pedestrian push buttons, and signal heads at major intersections. On-street parking is not permitted on this roadway. Fremont Avenue provides regional access to the ECRCSF study area via its interchange with SR 85.

Homestead Road is an east-west, two to four-lane roadway with a posted speed limit of 30 mph that begins west at Foothill Expressway in Los Altos through Sunnyvale to Lafayette Street in Santa Clara. There are bike lanes and sidewalks on both sides along certain segments of the road and crosswalks, pedestrian push buttons, and signal heads at major intersections. On-street parking is generally not permitted on this roadway. Homestead Road provides regional access to the ECRCSF study area via its interchange with SR 85 and intersection with Lawrence Expressway.

Existing Bicycle Facilities

Bicycle facilities in the vicinity of the ECRCSF study area include bike lanes and bike routes. Bike lanes are lanes on roadways designated for use by bicycles with special lane markings, pavement legends, and signage. Bike routes are streets that accommodate bicycles with pavement markings and signage but are not separate from the travel lanes.

The existing bicycle facilities in the study area are shown on Figure 2. Information about bicycle facilities in the study area is published in the *Sunnyvale Bike Map & Guide to Safe Cycling*, published by the City of Sunnyvale in 2018. The following bicycle facilities exist within the immediate vicinity of the ECRCSF study area:

Bike Lanes:

- El Camino real between Fair Oaks Avenue and Sunnyvale Avenue
- Bernardo Avenue between Remington Drive and El Camino Real
- Mary Avenue
- Hollenbeck Avenue between Danforth Drive and El Camino Real
- Mathilda Avenue northbound between Iowa Avenue and Washington Avenue
- Mathilda Avenue/Sunnyvale-Saratoga Road south of El Camino Real
- Sunnyvale Avenue
- Cezanne Drive between El Camino Real and Old San Francisco Road
- Remington Drive
- Evelyn Avenue
- Old San Francisco Road/Reed Avenue west of Lawrence Expressway
- Fremont Avenue

Bike routes are present along Wolfe Road between Fremont Avenue and Reed Avenue, and on Fair Oaks Avenue between Old San Francisco Road and Evelyn Avenue and between Kifer Road and Ahwanee Avenue. According to the *City of Sunnyvale Bike Map, 2018 Edition*, there are three guided bike routes within the City. Each guided route is briefly described below and shown on Figure 2:

- **Bike Route 352:** This is a generally north-south bike route that extends north from the southern City limits into the Moffett Park area. North of El Camino Real, this route travels along Sunnyvale Avenue until Evelyn Avenue and transitions into Bike Route 353 (described below). South of El Camino Real, this bike route zigzags along local roadways west of Sunnyvale-Saratoga Road, providing access to Fremont High School and Nimitz Elementary School.
- **Bike Route 353:** This is a generally north-south bike route that extends north from the southern City limits into the Moffett Park area. South of Evelyn Avenue, this route transitions into Bike Route 352 (described above). North of Evelyn Avenue, this route travels mostly along Morse Avenue south of US 101 and along Borregas Avenue north of US 101. Bike Route 353 provides access to Bishop Elementary School and Columbia Middle School.
- **Bike Route 600:** This is a generally east-west bike route that extends east from the intersection at Bernardo Avenue and El Camino Real and ending east at Poinciana Drive. This route travels parallel and north of El Camino Real along residential roadways (mainly Olive Avenue, Gail Avenue, Iris Avenue and Lily Avenue). This route provides access to the Civic Center, Ellis Elementary School, Braly Elementary School and Ponderosa Elementary School.

Overall, the existing bicycle facilities in the ECRCSPP study area provide adequate connection for bicycles travelling in the north-south direction. Along El Camino Real, bike lanes are present along only a short segment between Fair Oaks Avenue and Sunnyvale Avenue. On other segments of El Camino Real, bicycles have to travel in the curb lanes. Although the curb lanes are generally wider than other travel lanes, factors such as high travel speeds, high vehicular volumes, presence of on-street parking (along certain segments) and the number of driveways can discourage bicycle travel along El Camino Real. Bicycles travelling in the east-west direction have to resort to Bike Route 600, which is slightly circuitous and involves many turns.

Existing Pedestrian Facilities

Within the immediate vicinity of the ECRCSPP study area, sidewalks are present along both sides of all major roadways. Pedestrian crosswalks and signal heads are present at all major signalized intersections along El Camino Real. Currently, sidewalks along El Camino Real are generally six feet wide. According to the City's current General Plan Land Use and Transportation Element, El Camino Real, which is a Class I arterial, should have sidewalks with a width of 11 to 13 feet. The current sidewalk widths along El Camino Real do not comply with General Plan standards.

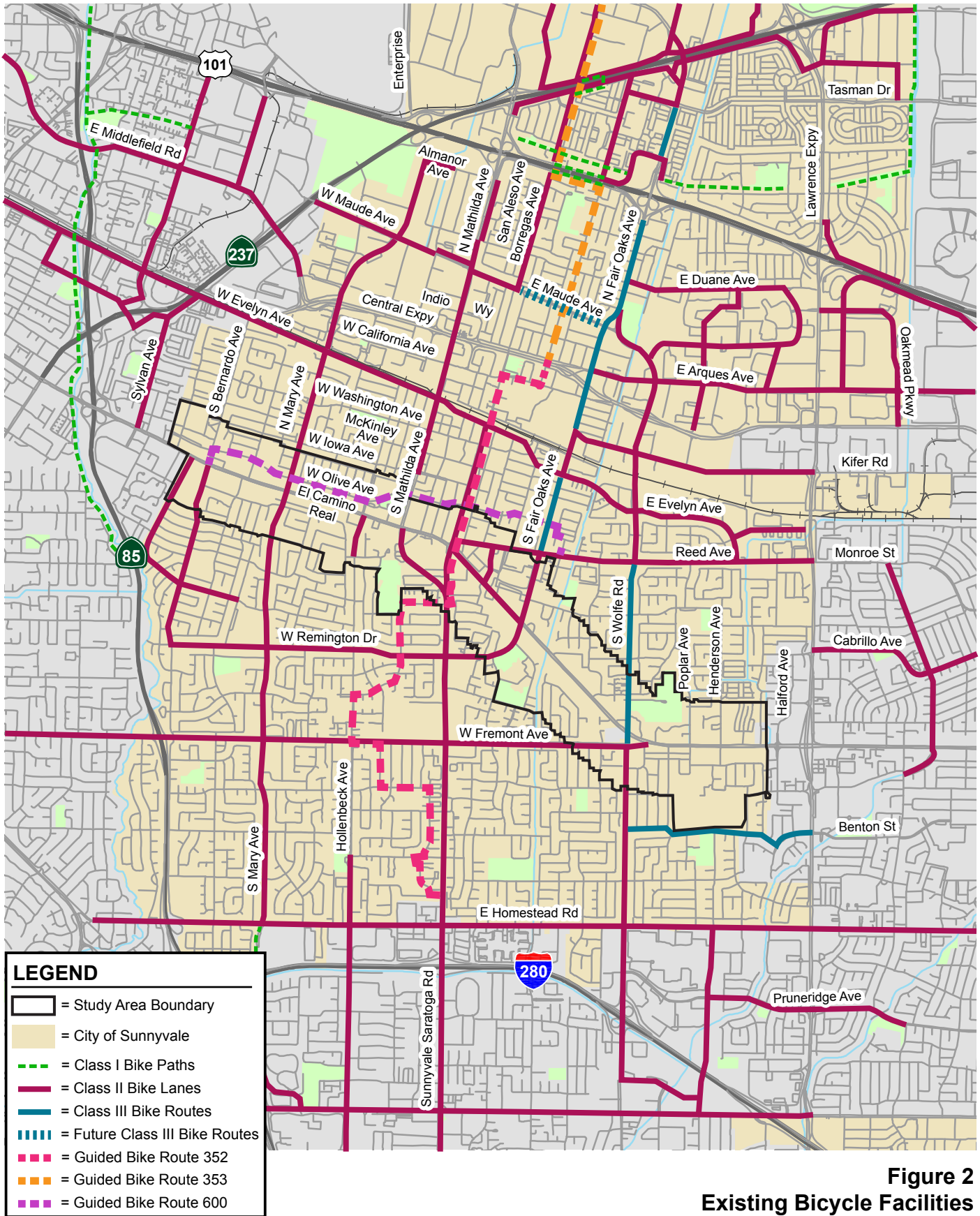


Figure 2
Existing Bicycle Facilities

Existing Transit Service

Existing transit services in the vicinity of the El Camino Real Corridor Specific Plan (ECRCSP) study area are provided by VTA and the City of Mountain View. VTA bus routes serving the ECRCSP study area are described in Table 4 and shown on Figure 3. Bus routes 22 and 522 provide service along the entire length of El Camino Real within the City of Sunnyvale. Bus routes 53, 55, 56, and 523 provide service within the City of Sunnyvale in mostly a north-south direction and stop within the El Camino Real Corridor Specific Plan (ECRCSP) study area. The Mountain View Community Shuttle provides service in the City of Mountain View and stops within ¼ mile of the ECRCSP study area.

Table 4
Existing Transit Services

Bus Route	Route Description	Closest Bus Stops	Weekday Hours of Operation	Headway
Local Route 22	Palo Alto Transit Center to Eastridge Transit Center via El Camino	El Camino Real at Bernardo Avenue, Grape Avenue, Mary Avenue, Pastoria Avenue, Mathilda Avenue, Sunnyvale Avenue, Cezanne Drive, Fair Oaks Avenue, Maria Lane, Wolfe Road, Poplar Avenue, and Sycamore Terrace	All Day	15 min
Local Route 53	Downtown Sunnyvale to Santa Clara Transit Center	Bernardo Avenue & El Camino Real, Bernado Avenue & Iowa Avenue	6:30 AM - 8:00 PM	30 min
Local Route 55	De Anza College to Old Ironsides Station	Sunnyvale-Saratoga Avenue & El Camino Real, Sunnyvale Avenue & Olive Avenue	5:30 AM - 10:00 PM	30 min
Local Route 56	Lockheed Martin Transit Center to Tamien Station	Wolfe Road & Fremont Avenue/Eleanor Way, Wolfe Road & El Camino Real	5:30 AM - 10:00 PM	30 min
Rapid Route 522	Palo Alto Transit Center to Eastridge Transit Center	El Camino Real at Bernardo Avenue, Sunnyvale Avenue, Fair Oaks Avenue, Wolfe Road,	5:00 AM - 11:00 PM	12 min
Rapid Route 523	Berryessa BART to Lockheed Martin	Sunnyvale-Saratoga Avenue & El Camino Real	5:30 AM - 10:30 PM	15 min
Mountain View Community Shuttle	Loop including Mountain View Transit Center, San Antonio Center, and Sylvan Park	Sylvan Avenue & El Camino Real	10:00 AM - 6:00 PM	30 min

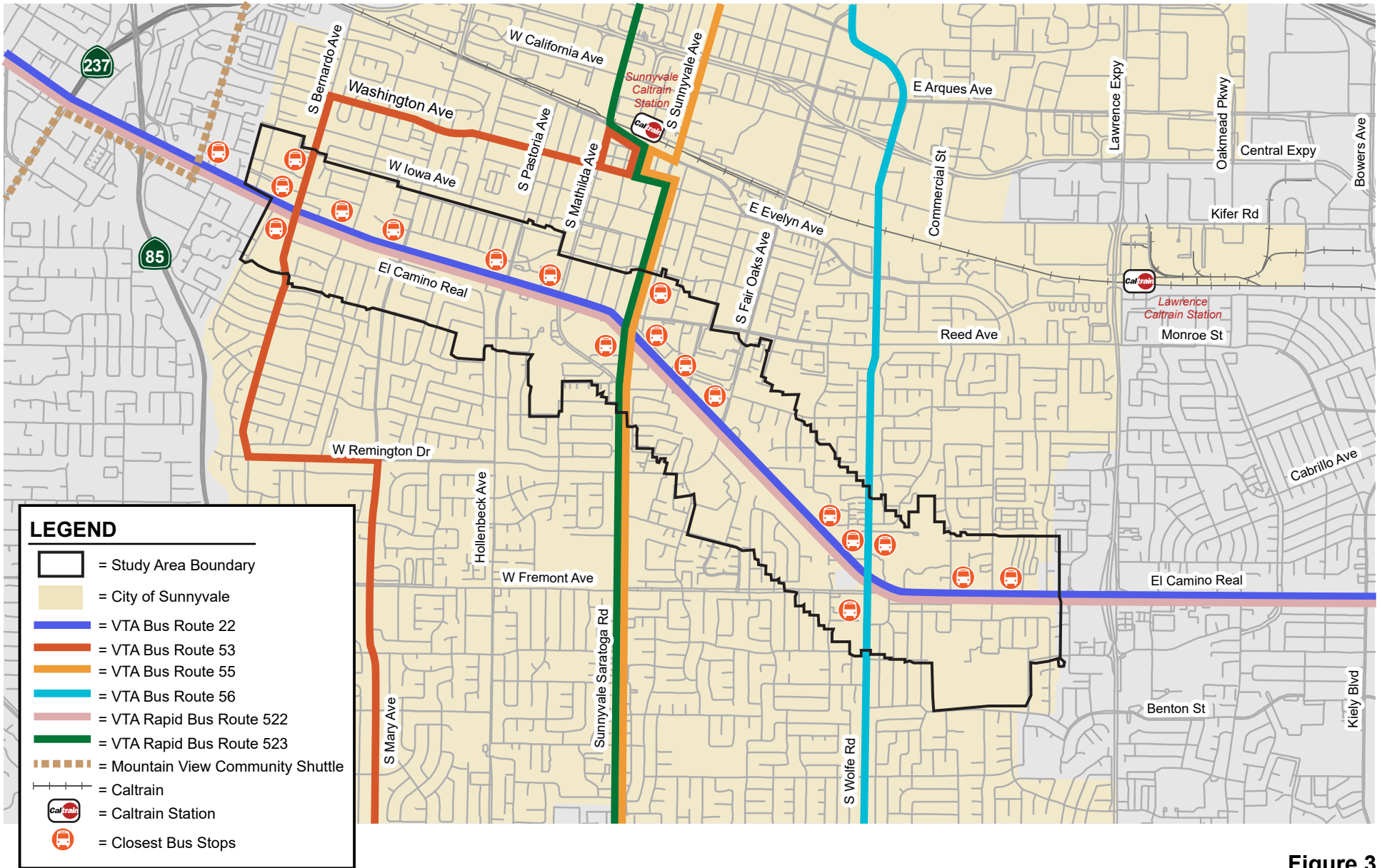


Figure 3
Existing Transit Services

Caltrain Service

Commuter rail service between San Francisco and Gilroy is provided by Caltrain. There are two Caltrain stations within the City of Sunnyvale: the Sunnyvale Caltrain Station and the Lawrence Caltrain Station.

Sunnyvale Caltrain Station

The Sunnyvale Caltrain Station, located near the intersection of Frances Street and Evelyn Avenue, provides Caltrain service with approximately 15- to 30-minute headways during the weekday AM and PM commute hours and 60-minute headways during weekday midday and night hours as well as on weekends. The Sunnyvale Caltrain Station provides service for all Local, Limited-Stop, and Baby-Bullet trains. VTA bus routes 53, 55 and 523 all stop at the Sunnyvale Transit Center, which is across street from the Sunnyvale Caltrain Station. The Sunnyvale Caltrain Station is located approximately 4,000 feet from El Camino Real (measured from the intersection at Mathilda Avenue), approximately a 15- to 20-minute walking distance.

Lawrence Caltrain Station

The Lawrence Caltrain Station, located beneath the Lawrence Expressway overcrossing between Reed Avenue and Kifer Road, provides Caltrain service with approximately 20- to 30-minute headways during the weekday AM and PM commute hours and 60-minute headways during weekday midday and night hours as well as on weekends. The Lawrence Caltrain Station provides service for only Local and Limited-Stop trains. The Baby-Bullet train does not stop at the Lawrence Caltrain Station. The Lawrence Caltrain Station is located approximately 1.25 miles from El Camino Real (measured from the interchange at Lawrence Expressway).

Three free public Caltrain shuttles provide service at the Lawrence Caltrain Station: the Duane Avenue shuttle, the Bowers-Walsh shuttle, and the Mission shuttle. These shuttles are funded jointly by the Bay Area Air Quality Management District, the Peninsula Corridor Joint Powers Board and private employers. None of these shuttles provide service to the ECRCSP study area.

Existing Intersection Lane Configurations

The existing lane configurations at the study intersections were determined by observations in the field and are shown on Figure 4.

Existing Traffic Volumes

Existing traffic volumes were obtained from peak hour counts collected in 2017 and 2018 as well as the 2018 CMP TRAFFIX database. The existing peak-hour intersection volumes are shown in Figure 5. Intersection turning-movement counts conducted for this analysis are presented in Appendix A.

El Camino Real Corridor Specific Plan

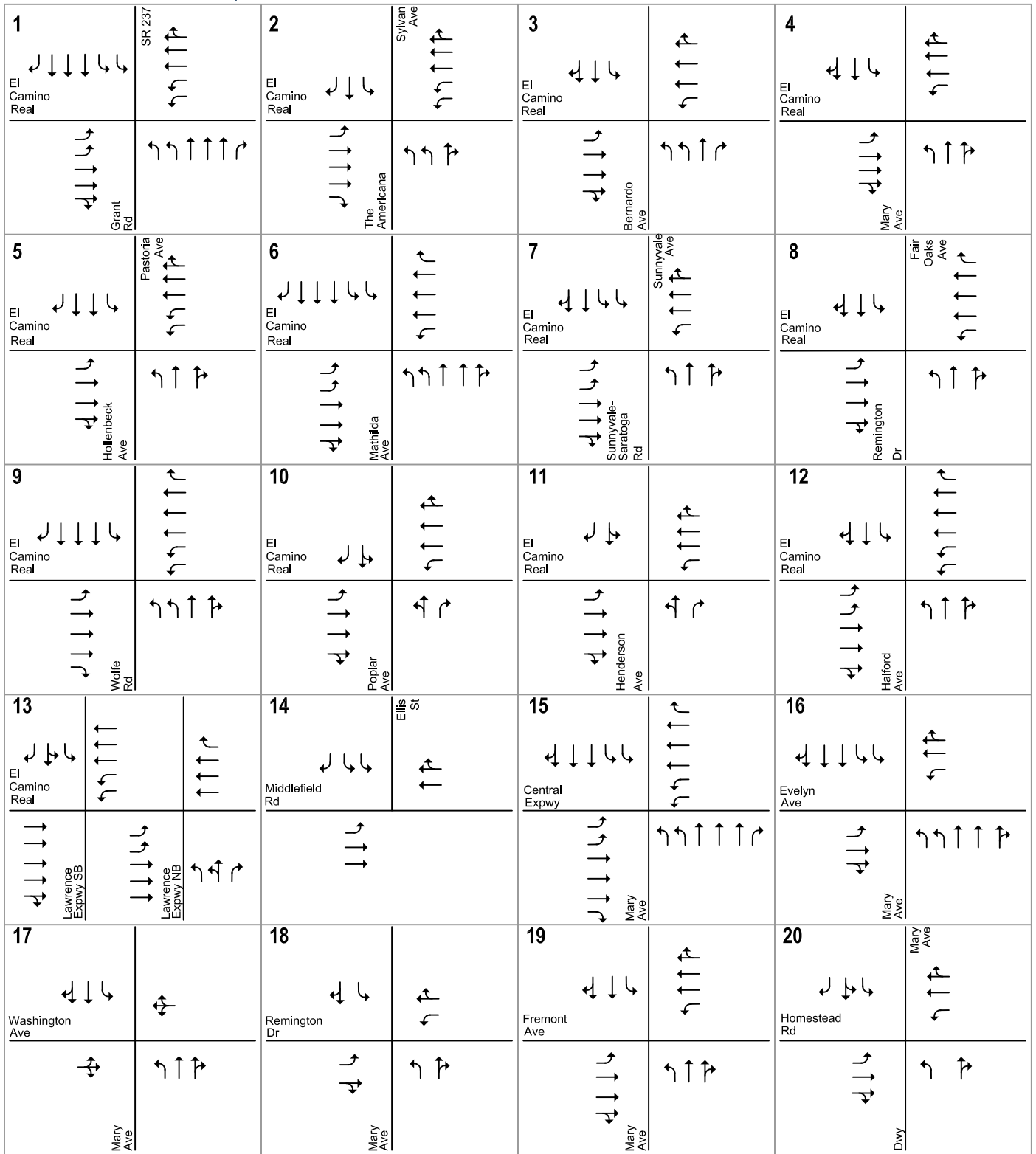


Figure 4
Existing Lane Configurations

El Camino Real Corridor Specific Plan

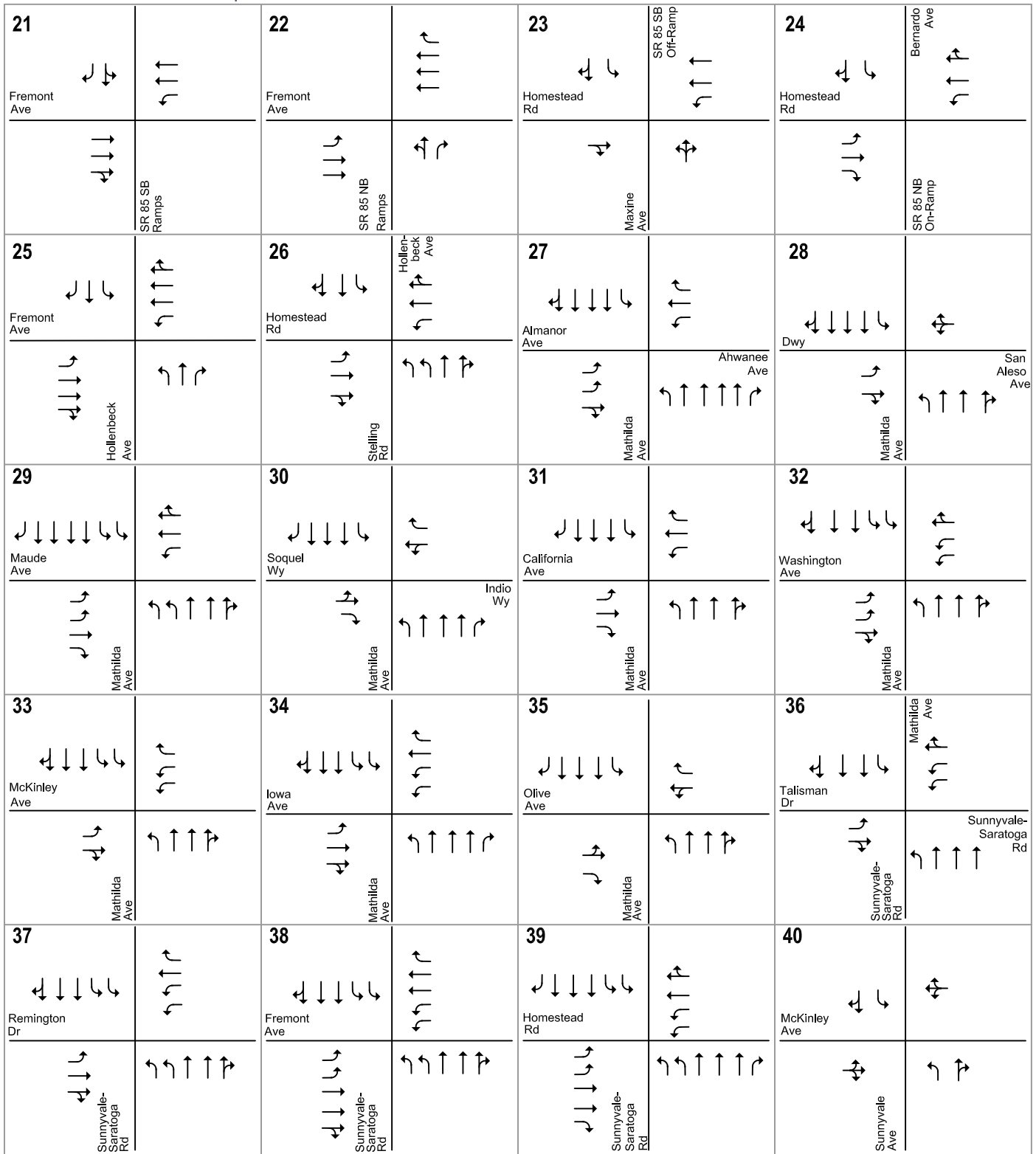
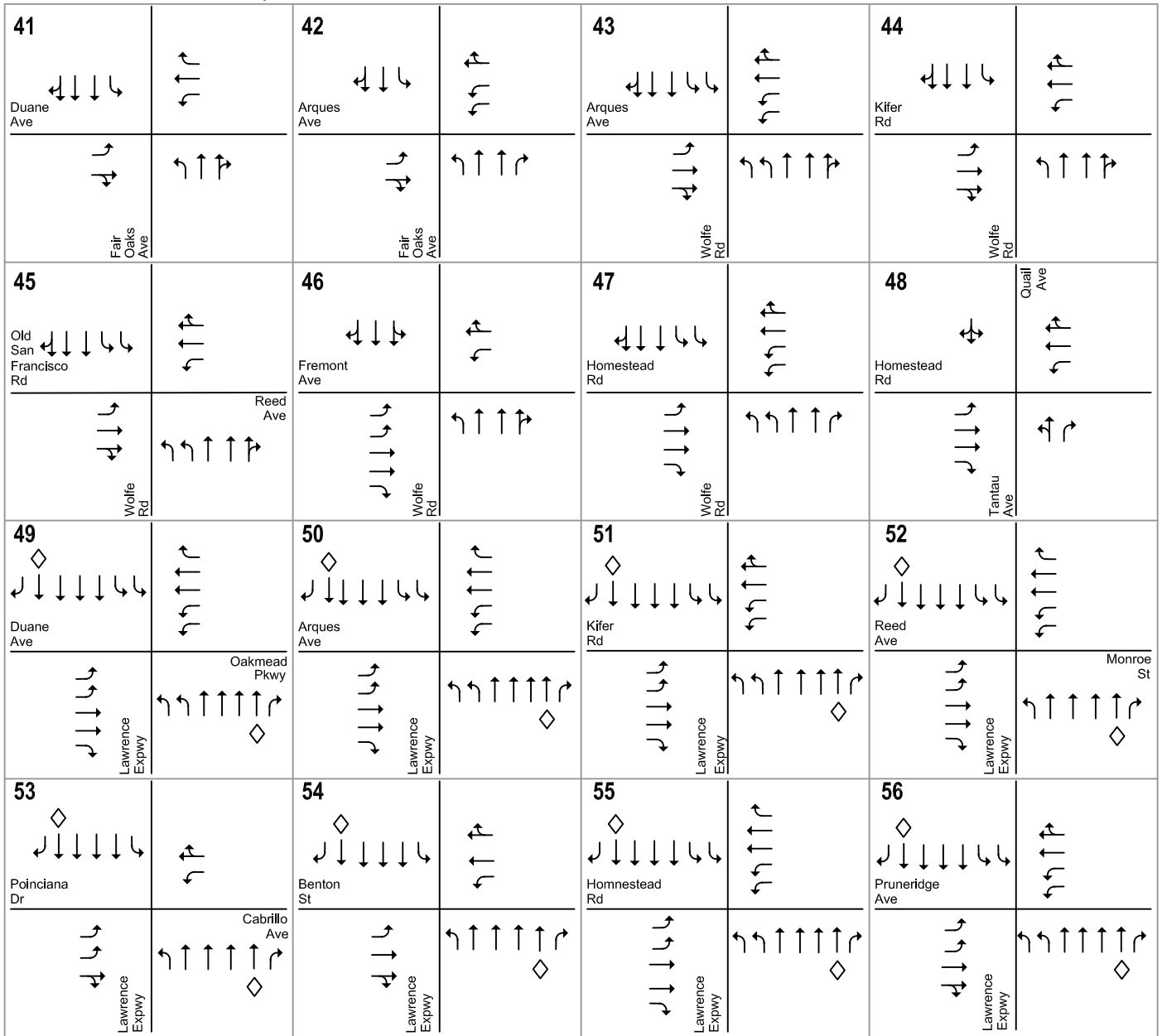


Figure 4
Existing Lane Configurations

El Camino Real Corridor Specific Plan

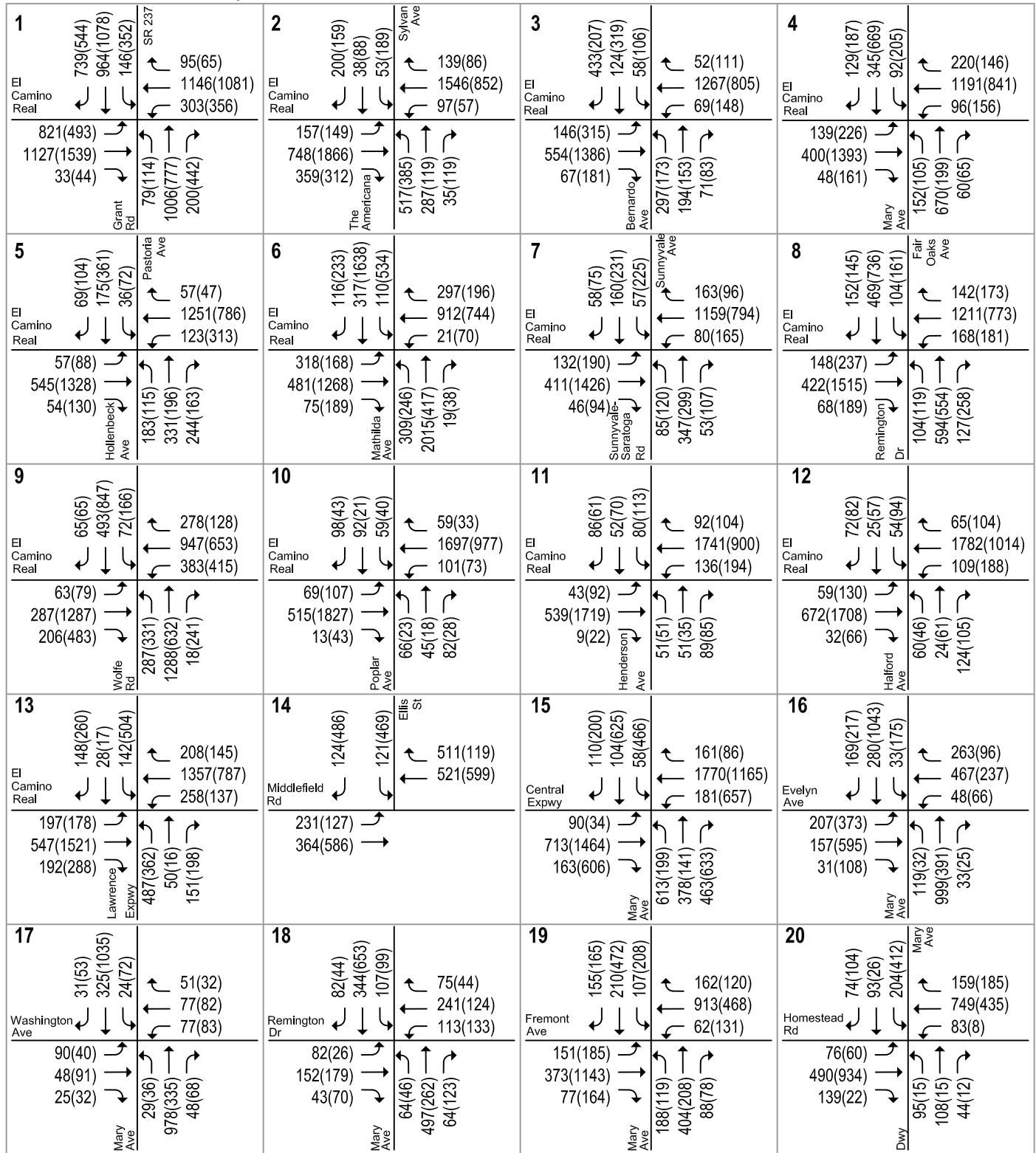


LEGEND

◇ = HOV Lane

Figure 4
Existing Lane Configurations

El Camino Real Corridor Specific Plan

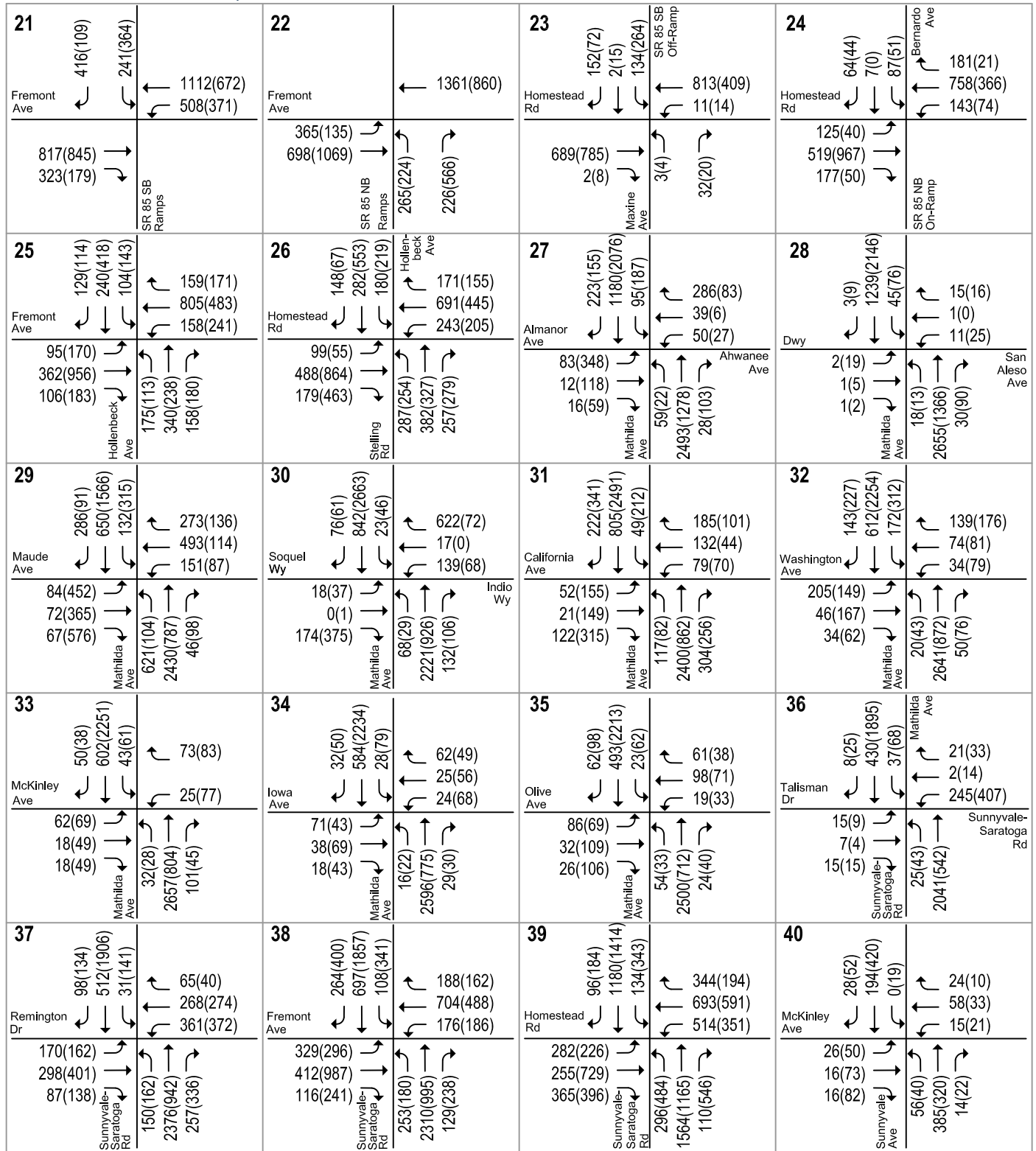


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 5
Existing Intersection Volumes

El Camino Real Corridor Specific Plan

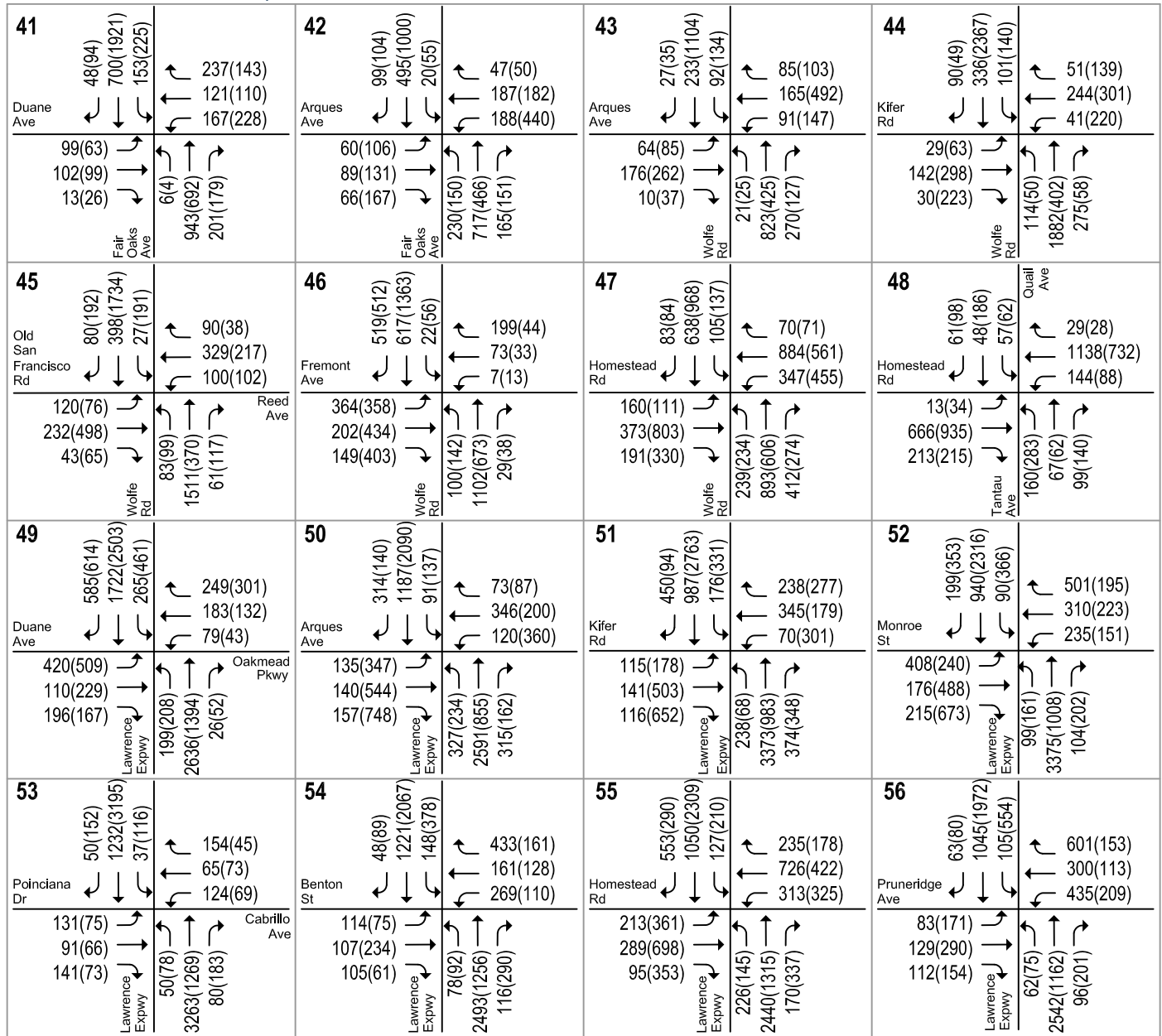


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 5 Existing Intersection Volumes

El Camino Real Corridor Specific Plan



LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 5
Existing Intersection Volumes

Existing Intersection Levels of Service

Intersection levels of service were evaluated against the respective city and CMP standards. The results of the intersection level of service analysis under existing conditions are summarized in Table 5 and shown on Figure 6. The results of the analysis show that the following intersections currently operate at unacceptable levels:

County of Santa Clara Intersections:

- Lawrence Expressway & Kifer Road (#51) – PM Peak Hour (LOS F)
- Lawrence Expressway & Reed Avenue/Monroe Road (#52) – AM Peak Hour (LOS F)

The intersection levels of service calculation sheets are included in Appendix C.

Existing Freeway Levels of Service

Existing weekday AM and PM peak-hour traffic volumes on the study freeway segments were obtained from the 2017 CMP Annual Monitoring Report. The existing freeway levels of service during the weekday peak hours of traffic are summarized in Figures 7 to 10.

**Table 5
Existing Intersection Levels of Service**

#	Intersection	Peak Hour	Count Date	LOS Std.	Existing Conditions	
					Avg. Delay (sec)	LOS
1	SR 237 & El Camino Real (MV*)	AM	11/14/17	E	69.9	E
		PM	10/30/18		56.7	E+
2	Sylvan Avenue & El Camino Real (MV)	AM	11/14/17	D	35.3	D+
		PM	11/14/17		36.0	D+
3	Bernardo Avenue & El Camino Real (+)	AM	11/14/17	E	44.6	D
		PM	11/14/17		43.3	D
4	Mary Avenue & El Camino Real (*)	AM	11/14/17	E	41.7	D
		PM	10/30/18		39.1	D
5	Pastoria Avenue & El Camino Real (+)	AM	11/14/17	E	34.3	C-
		PM	11/14/17		38.8	D+
6	Mathilda Avenue & El Camino Real (*)	AM	11/14/17	E	47.9	D
		PM	10/30/18		45.7	D
7	Sunnyvale Avenue & El Camino Real (+)	AM	11/14/17	E	33.4	C-
		PM	11/14/17		40.3	D
8	Fair Oaks Avenue & El Camino Real (*)	AM	05/08/18	E	41.0	D
		PM	10/30/18		41.8	D
9	Wolfe Road & El Camino Real (*)	AM	11/14/17	E	53.5	D-
		PM	10/30/18		46.4	D
10	Poplar Avenue & El Camino Real (+)	AM	11/14/17	E	19.0	B-
		PM	11/14/17		12.0	B
11	Henderson Avenue & El Camino Real (+)	AM	11/14/17	E	17.2	B
		PM	11/14/17		22.7	C+
12	Halford Avenue & El Camino Real (SC)	AM	11/14/17	D	20.6	C+
		PM	11/14/17		44.5	D
13	Lawrence Expressway Ramps & El Camino Real (SC*)	AM	11/14/17	E	34.5	C-
		PM	11/15/18		28.8	C
14	Ellis Street & Middlefield Road (MV)	AM	11/14/17	D	15.0	B
		PM	11/14/17		21.4	C+
15	Mary Avenue & Central Expressway (County*)	AM	11/14/17	E	51.5	D-
		PM	12/13/18		60.1	E
16	Mary Avenue & Evelyn Avenue	AM	11/14/17	D	40.4	D
		PM	11/14/17		43.3	D
17	Mary Avenue & Washington Avenue	AM	11/14/17	D	13.4	B
		PM	11/14/17		16.1	B
18	Mary Avenue & Remington Drive	AM	11/14/17	D	31.7	C
		PM	11/14/17		28.9	C
19	Mary Avenue & Fremont Avenue	AM	11/14/17	D	41.9	D
		PM	11/14/17		43.3	D
20	Mary Avenue & Homestead Road	AM	11/14/17	D	36.6	D+
		PM	11/14/17		30.0	C

Notes:

* = *CMP*, + = *Regionally Significant Intersection*, *MV* = *Mountain View*, *SC* = *Santa Clara*, *County* = *County of Santa Clara*
 ">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.

Table 5 (continued)
Existing Intersection Levels of Service

#	Intersection	Peak Hour	Count Date	LOS Std.	Existing Conditions	
					Avg. Delay (sec)	LOS
21	SR 85 SB Ramps & Fremont Avenue	AM	11/14/17	D	23.3	C
		PM	11/14/17		19.9	B-
22	SR 85 NB Ramps & Fremont Avenue	AM	11/14/17	D	20.6	C+
		PM	11/14/17		24.9	C
23	SR 85 SB Ramps & Homestead Road	AM	11/14/17	D	19.2	B-
		PM	11/14/17		38.9	D+
24	SR 85 NB Ramps & Homestead Road	AM	11/14/17	D	21.6	C+
		PM	11/14/17		14.9	B
25	Hollenbeck Avenue & Fremont Avenue	AM	11/14/17	D	39.4	D
		PM	11/14/17		45.0	D
26	Hollenbeck Avenue & Homestead Road	AM	11/14/17	D	42.3	D
		PM	11/14/17		51.9	D-
27	Mathilda Avenue & Almanor Avenue (+)	AM	11/14/17	E	26.7	C
		PM	11/14/17		30.4	C
28	Mathilda Avenue & San Aleso Avenue (+)	AM	11/14/17	E	7.3	A
		PM	11/14/17		7.2	A
29	Mathilda Avenue & Maude Avenue (*)	AM	11/14/17	E	43.6	D
		PM	10/30/18		47.2	D
30	Mathilda Avenue & Indio Way (+)	AM	11/14/17	E	36.3	D+
		PM	11/14/17		22.9	C+
31	Mathilda Avenue & California Avenue (+)	AM	11/14/17	E	24.2	C
		PM	11/14/17		32.1	C-
32	Mathilda Avenue & Washington Avenue (+)	AM	11/14/17	E	34.3	C-
		PM	11/14/17		34.5	C-
33	Mathilda Avenue & McKinley Avenue (+)	AM	11/14/17	E	14.1	B
		PM	11/14/17		17.4	B
34	Mathilda Avenue & Iowa Avenue (+)	AM	11/14/17	E	15.7	B
		PM	11/14/17		16.0	B
35	Mathilda Avenue & Olive Avenue (+)	AM	11/14/17	E	15.5	B
		PM	11/14/17		18.4	B-
36	Mathilda Avenue & Sunnyvale-Saratoga Road (+)	AM	11/14/17	E	22.7	C+
		PM	11/14/17		28.5	C
37	Sunnyvale-Saratoga Road & Remington Drive (*)	AM	11/14/17	E	42.9	D
		PM	10/30/18		43.6	D
38	Sunnyvale-Saratoga Road & Fremont Avenue (*)	AM	11/14/17	E	49.0	D
		PM	10/30/18		47.8	D
39	Sunnyvale-Saratoga Road & Homestead Road (CU*)	AM	11/14/17	E	44.8	D
		PM	10/30/18		40.0	D
40	Sunnyvale Avenue & McKinley Avenue	AM	11/14/17	D	9.8	A
		PM	11/14/17		16.8	B

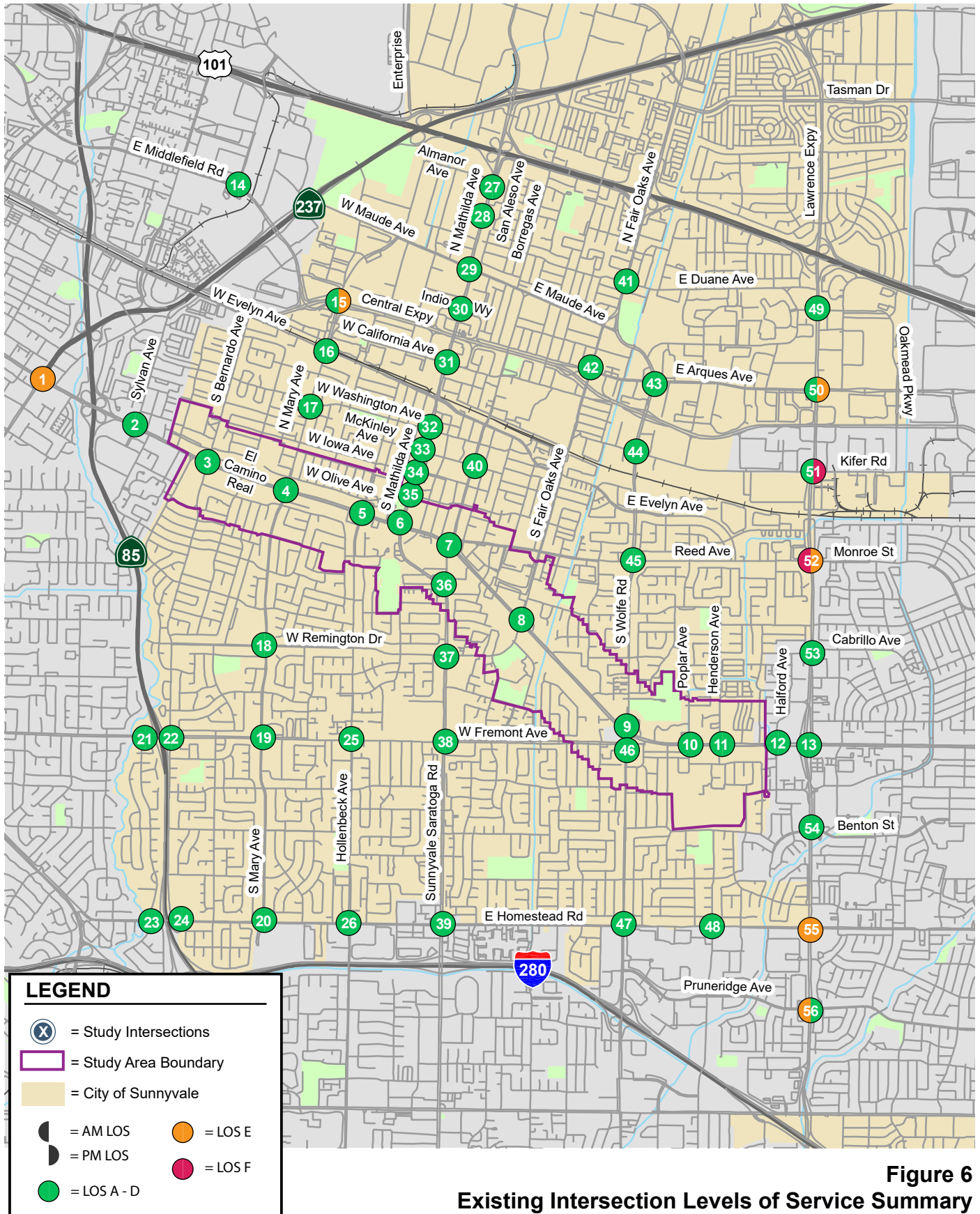
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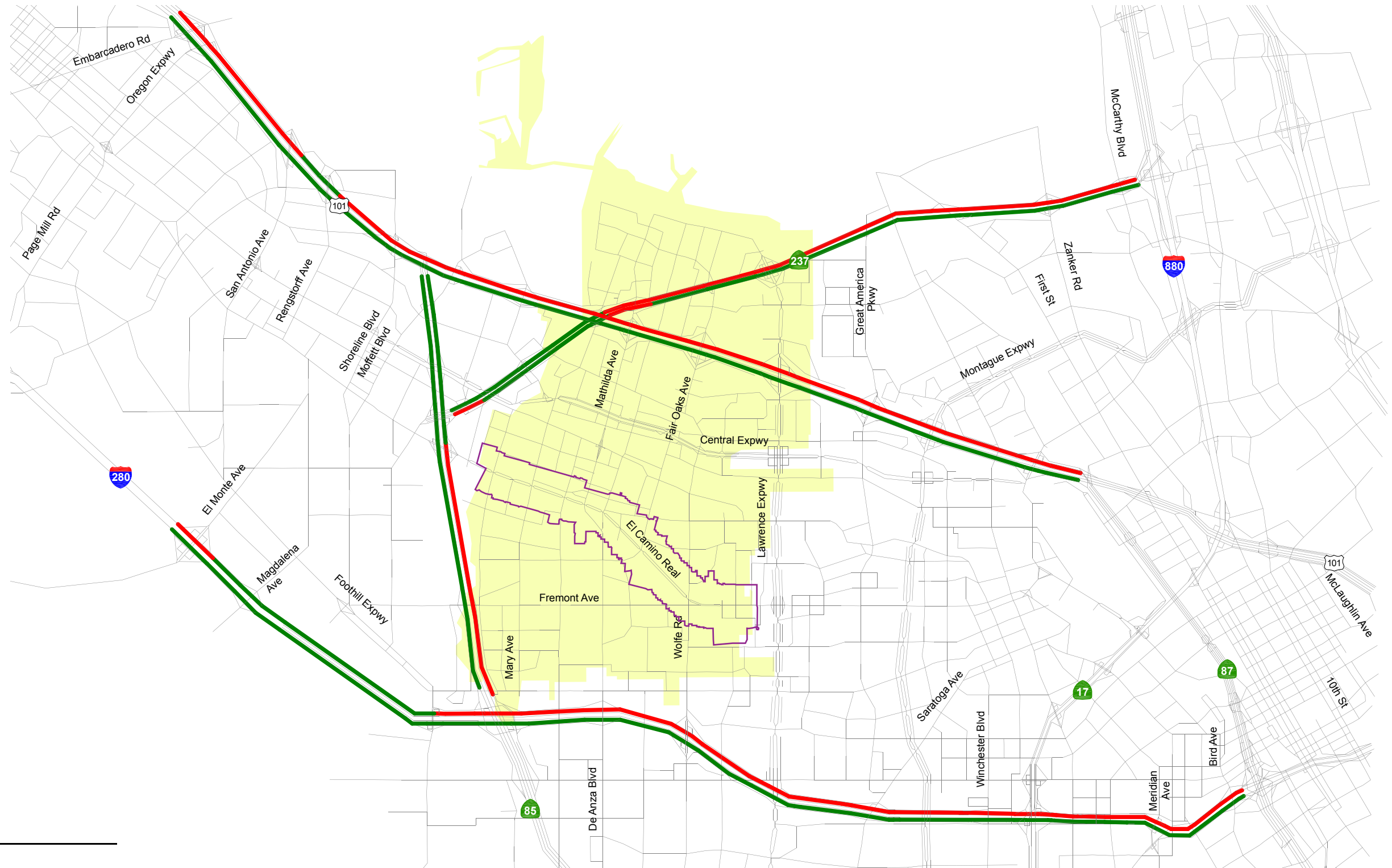
* = CMP, += Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara
 ">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.

Table 5 (continued)
Existing Intersection Levels of Service

#	Intersection	Peak Hour	Count Date	LOS Std.	Existing Conditions	
					Avg. Delay (sec)	LOS
41	Fair Oaks Avenue & Duane Avenue	AM	05/08/18	D	32.1	C-
		PM	05/08/18		30.2	C
42	Fair Oaks Avenue & Arques Avenue	AM	05/08/18	D	34.8	C-
		PM	05/08/18		44.5	D
43	Wolfe Road & Arques Avenue	AM	11/14/17	D	35.6	D+
		PM	11/14/17		40.8	D
44	Wolfe Road & Kifer Road	AM	11/14/17	D	29.0	C
		PM	11/14/17		43.1	D
45	Wolfe Road & Reed Avenue	AM	11/14/17	D	37.0	D+
		PM	11/14/17		38.9	D+
46	Wolfe Road & Fremont Avenue	AM	11/14/17	D	43.7	D
		PM	11/14/17		47.5	D
47	Wolfe Road & Homestead Road	AM	11/14/17	D	35.4	D+
		PM	11/14/17		35.1	D+
48	Tantau Avenue & Homestead Road	AM	11/14/17	D	26.0	C
		PM	11/14/17		39.6	D
49	Lawrence Expressway & Oakmead Parkway (County)	AM	05/23/19	E	40.4	D
		PM	05/23/19		52.3	D-
50	Lawrence Expressway & Arques Avenue (County*)	AM	04/04/17	E	48.2	D
		PM	11/13/18		71.6	E
51	Lawrence Expressway & Kifer Road (County)	AM	03/07/18	E	54.4	D-
		PM	03/07/18		101.6	F
52	Lawrence Expressway & Monroe Street (County*)	AM	03/07/18	E	114.8	F
		PM	11/13/18		61.8	E
53	Lawrence Expressway & Cabrillo Avenue (County)	AM	03/07/18	E	52.1	D-
		PM	03/07/18		48.6	D
54	Lawrence Expressway & Benton Street (County)	AM	11/14/17	E	53.7	D-
		PM	11/14/17		40.5	D
55	Lawrence Expressway & Homestead Road (County*)	AM	11/14/17	E	56.8	E+
		PM	11/15/18		65.9	E
56	Lawrence Expressway & Pruneridge Avenue (County)	AM	11/14/17	E	61.2	E
		PM	11/14/17		43.8	D

Notes:
 * = *CMP*, + = *Regionally Significant Intersection*, *MV* = *Mountain View*, *SC* = *Santa Clara*, *County* = *County of Santa Clara*
 ">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.
BOLD indicates unacceptable level of service

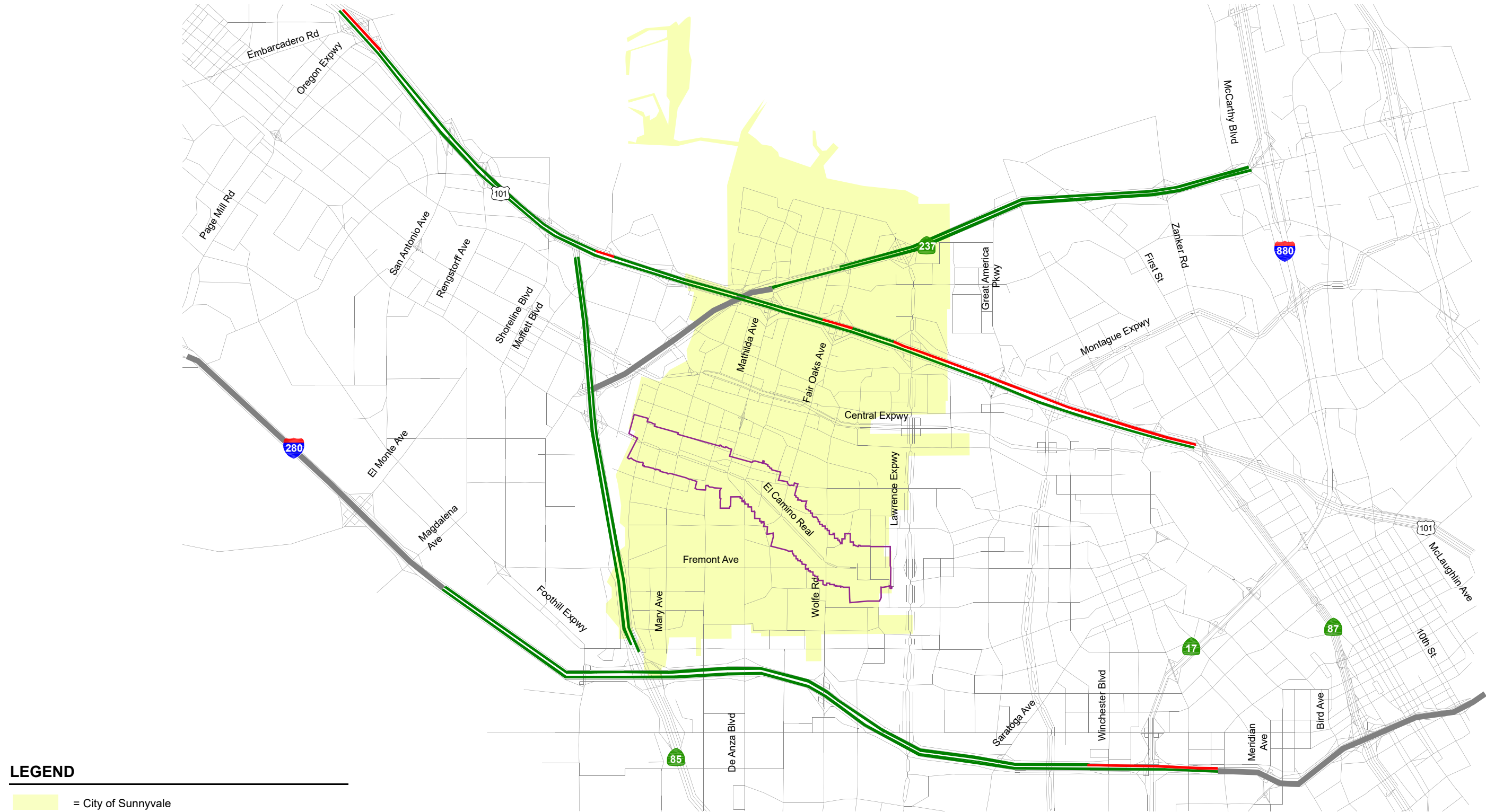




LEGEND

- = City of Sunnyvale
- = El Camino Real Specific Plan Study Area Boundary
- = Unacceptable LOS (LOS F)
- = Acceptable LOS (LOS E or Better)

Figure 7
Existing Freeway Levels of Service Summary - AM Peak-Hour - Mixed-Flow Lanes



- LEGEND**
- = City of Sunnyvale
 - = El Camino Real Specific Plan Study Area Boundary
 - = Unacceptable LOS (LOS F)
 - = Acceptable LOS (LOS E or Better)
 - = Freeway Segment has No HOV Lanes

Figure 8
Existing Freeway Levels of Service Summary - AM Peak-Hour - HOV Lanes

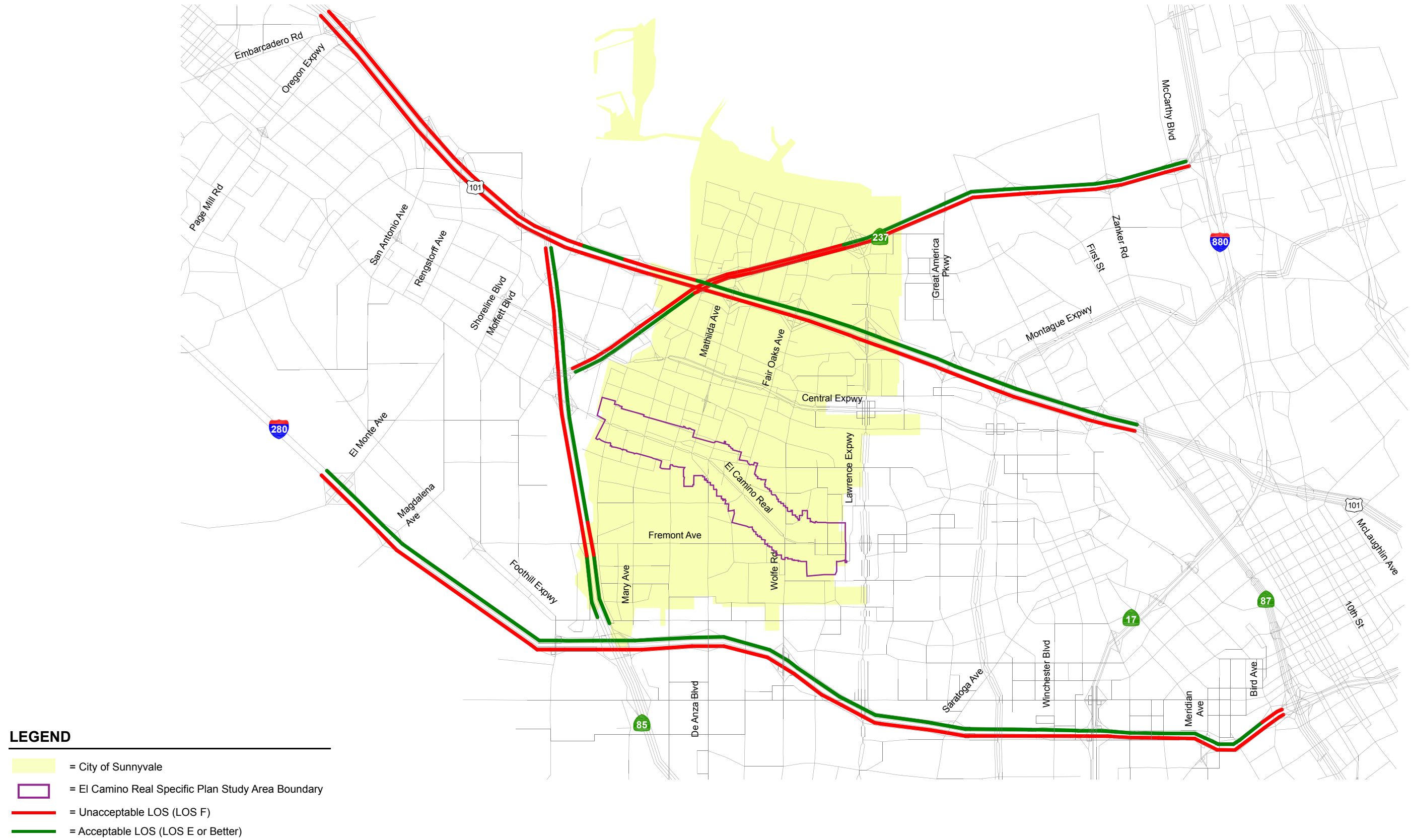
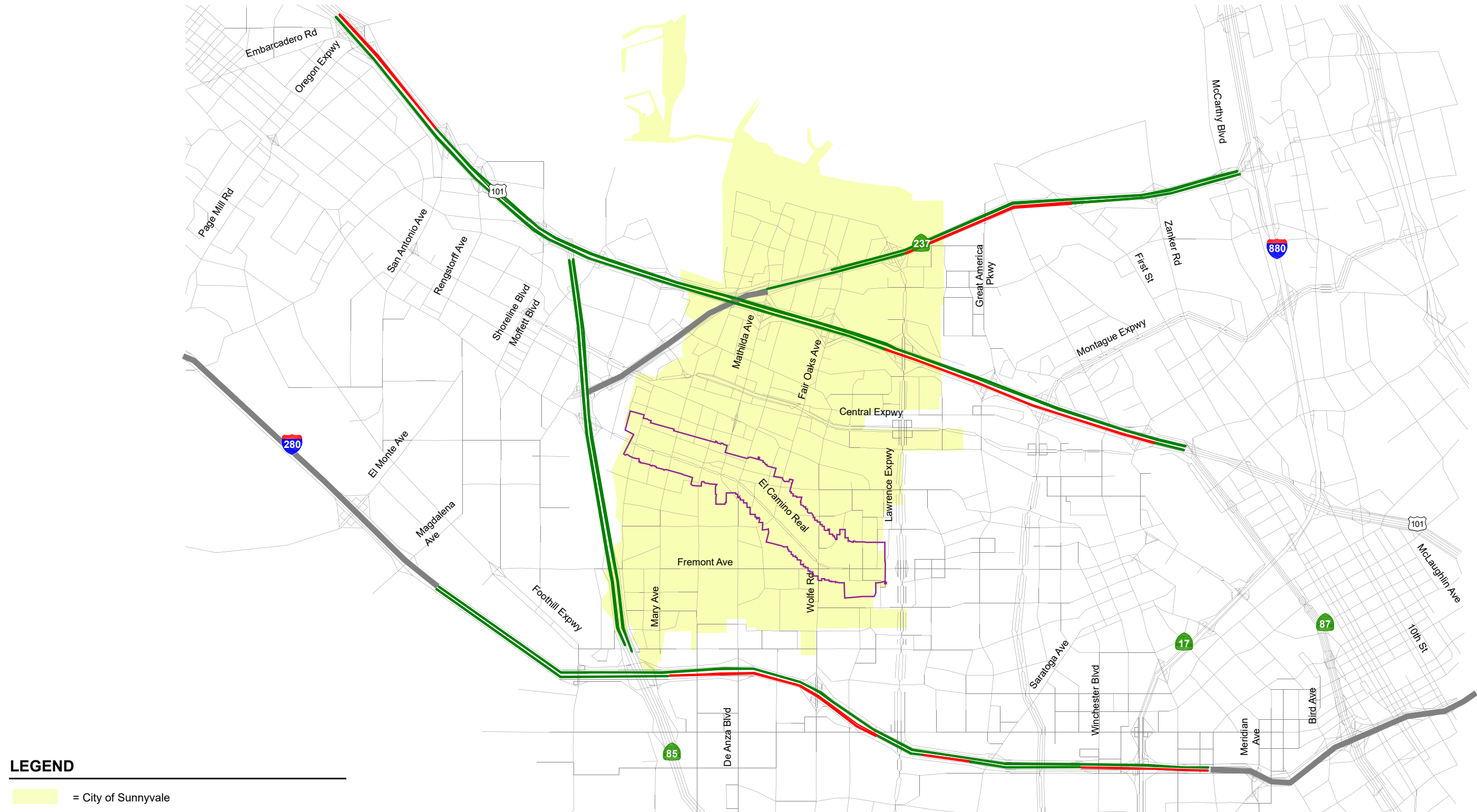


Figure 9
Existing Freeway Levels of Service Summary - PM Peak-Hour - Mixed-Flow Lanes



- LEGEND**
- = City of Sunnyvale
 - = El Camino Real Specific Plan Study Area Boundary
 - = Unacceptable LOS (LOS F)
 - = Acceptable LOS (LOS E or Better)
 - = Freeway Segment has No HOV Lanes

Figure 10
Existing Freeway Levels of Service Summary - PM-Peak Hour - HOV Lanes

Existing Freeway Ramp Capacity Analysis

This analysis consists of a volume-to-capacity ratio evaluation of the study freeway ramps. The ramp capacities were obtained from the *Highway Capacity Manual 2000* (Chapter 25), which considers both the free-flow speed and the number of lanes on the study ramps. As a conservative approach, on-ramps that currently have ramp meter equipment are analyzed with a capacity of 900 vehicles per hour for the mixed-flow lanes. The peak-hour freeway ramp volumes were obtained from recent traffic counts and Caltrans (see Table 6).

The ramp analysis shows that the freeway ramps currently have sufficient capacity to serve the existing traffic volumes. The study ramps have a volume-to-capacity (V/C) ratio that is well below 1.0, which means that the existing traffic demand is lower than the ramp capacity.

**Table 6
Existing Freeway Ramp Capacity Analysis**

Interchange	Ramp	Type	Peak Hour	Lanes		Existing Conditions			
				Mixed	HOV		Meter ¹	Capacity ²	Volume ³
US 101/Lawrence Expwy	SB On-Ramp fr. NB Lawrence Expwy	Diagonal	AM	2	1	Equipment Present	1,800	584	0.32
			PM				352	0.20	
	NB On-Ramp fr. NB Lawrence Expwy	Loop	AM	1	1	Equipment Present	1,800	484	0.27
			PM				378	0.21	
	NB Off-Ramp to Lawrence Expwy	Diagonal	AM	2	-	-	3,800	1278	0.34
PM							1185	0.31	
SB Off-Ramp to Lawrence Expwy	Diagonal	AM	2	-	-	3,800	738	0.19	
		PM					1753	0.46	
US 101/Fair Oaks Ave	SB On-Ramp fr. NB Fair Oaks Ave	Diagonal	AM	1	1	Equipment Present	1,800	616	0.34
			PM					225	0.13
	NB Off-Ramp to Fair Oaks Ave	Diagonal	AM	1	-	-	2,000	414	0.21
			PM					894	0.45
	NB On-Ramp fr. Fair Oaks Ave	Diagonal	AM	1	1	Equipment Present	1,800	1057	0.59
PM							416	0.23	
SB Off-Ramp to SB Fair Oaks Ave	Diagonal	AM	1	-	-	2,000	363	0.18	
		PM					893	0.45	
US 101/Mathilda Ave	SB On-Ramp fr. NB Mathilda Ave	Diagonal	AM	1	1	Equipment Present	1,800	478	0.27
			PM					532	0.30
	NB On-Ramp fr. NB Mathilda Ave	Loop	AM	1	1	Equipment Present	1,800	287	0.16
			PM					295	0.16
	NB Off-Ramp to SB Mathilda Ave	Loop	AM	1	-	-	1,800	722	0.40
PM							729	0.41	
SB Off-Ramp to SB Mathilda Ave	Diagonal	AM	1	-	-	2,000	404	0.20	
		PM					448	0.22	

Notes:

NB = Northbound, SB = Southbound, fr. = from

- As a conservative approach, if an on-ramp has meter equipment present, the ramp is analyzed assuming it is metered.
- Ramp capacities were obtained from *Highway Capacity Manual, 2000*, and considered the free-flow speed, the number of lanes on the ramp, and ramp metering.
- Existing peak hour volumes are obtained through intersection counts and Caltrans.

3.

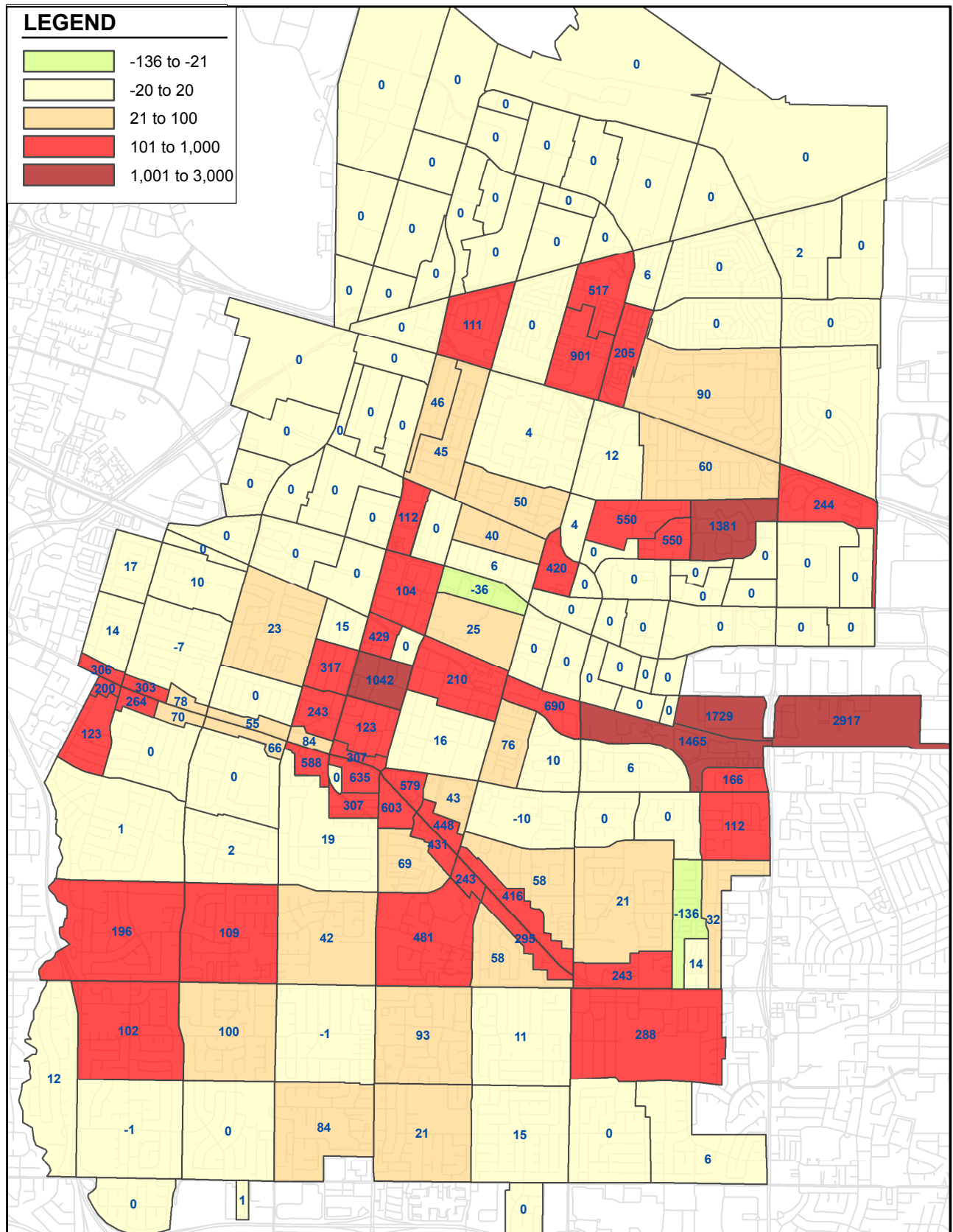
Year 2035 Cumulative Conditions

This chapter presents a summary of the cumulative traffic conditions that would occur in year 2035 with the proposed El Camino Real Corridor Specific Plan (ECRCSP). The year 2035 cumulative scenario assumes buildout of the current general plan, the proposed ECRCSP, the proposed update to the Lawrence Station Area Plan, the proposed Fortinet Precise Plan, the proposed update to the Downtown Specific Plan, as well as regional growth. To determine potential impacts generated by the ECRCSP, a separate model run was conducted assuming no growth in the ECRCSP area beyond the current general plan. The cumulative scenario was compared to the cumulative no ECRCSP scenario to disclose impacts. The Sunnyvale Travel Demand Forecasting Model (STFM) for year 2035 was used to forecast the year 2035 cumulative traffic volumes. Model assumptions and inputs are described in this chapter as well.

Traffic Volumes and Roadway Network

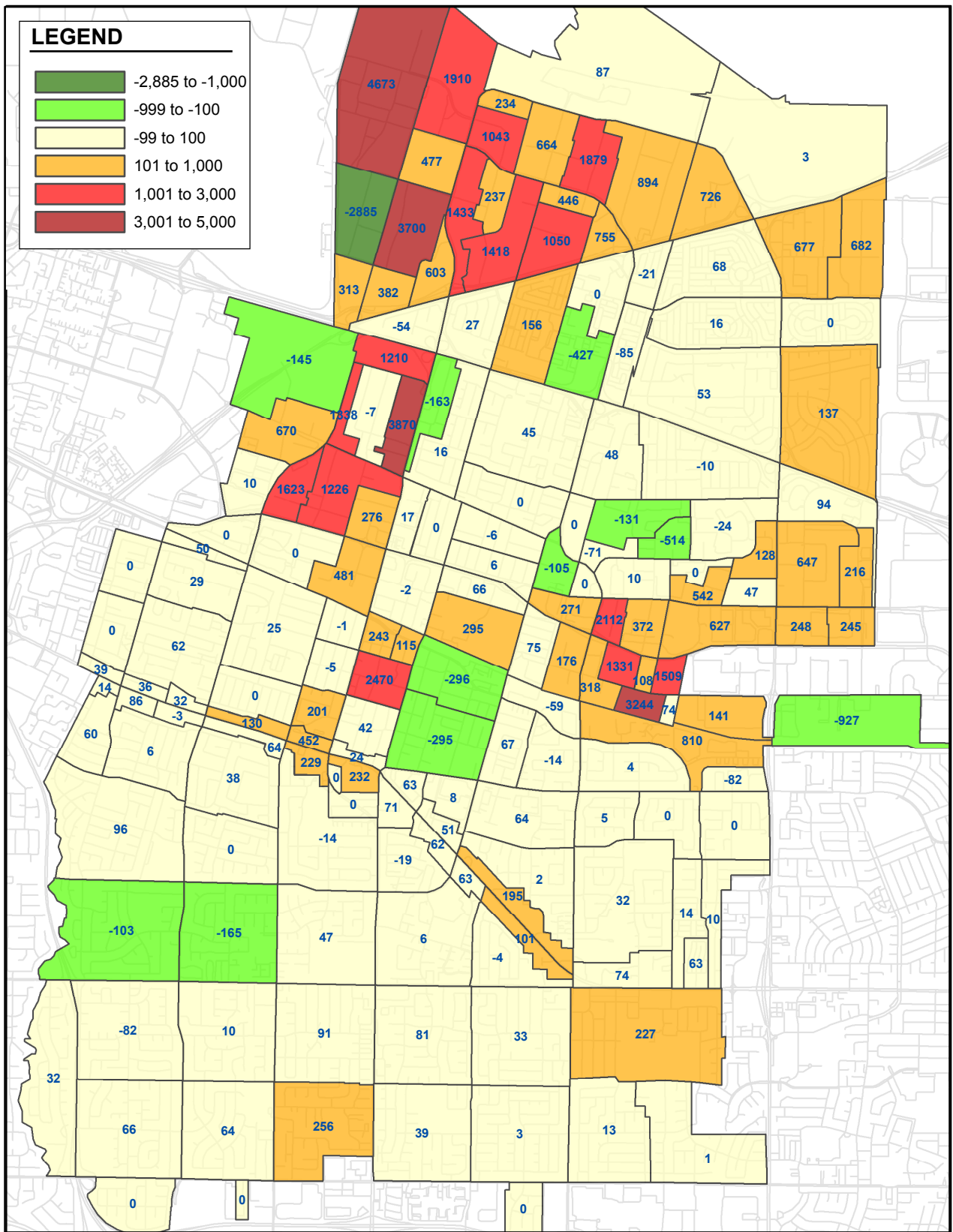
The year 2035 forecasts of intersection turning movements, freeway traffic, ramp volumes, and vehicle miles traveled were completed using the Sunnyvale Travel Demand Forecast Model (STFM). The STFM is a mathematical representation of travel within the nine counties in the San Francisco Bay Area and is calibrated to represent travel within the City of Sunnyvale. The model uses socioeconomic data, such as number of jobs and households, for different geographic areas (transportation analysis zones) to predict the travel from place to place in the future. There are 172 transportation analysis zones within the model to represent the City of Sunnyvale.

The year 2035 socioeconomic data are generated by the Association of Bay Area Governments and refined by VTA. For the year 2035 cumulative conditions model forecasts, socioeconomic data within the City of Sunnyvale were supplied by city staff. Socioeconomic data within the City of Sunnyvale assumed the buildout of the current general plan, the proposed ECRCSP, the proposed update to the Lawrence Station Area Plan, the proposed Fortinet Precise Plan and the proposed update to the Downtown Specific Plan (see Figures 11 and 12 for the housing and jobs growth by TAZ). The existing and year 2035 cumulative conditions jobs and housing data (by TAZ) are provided in the Appendix. Table 7 shows the model inputs for the entire bay area separated by counties.



NOTE:
 Year 2035 land use includes the adopted LUTE,
 proposed ECRCS, LSAP update, Fortinet
 Precise Plan, and Downtown Specific Plan.

Figure 11
Sunnyvale Land Use Growth - Households
Year 2035 Compared to Year 2013



NOTE:
 Year 2035 land use includes the adopted LUTE,
 proposed ECRCSF, LSAP update, Fortinet
 Precise Plan, and Downtown Specific Plan.

Figure 12
Sunnyvale Land Use Growth - Jobs
Year 2035 Compared to Year 2013

**Table 7
Socioeconomic Data Model Inputs – Bay Area Counties**

County	Year 2035 Cumulative Conditions Socioeconomic Data ¹					
	Households		Population		Jobs	
	Yr 2035	Incr. Over Yr 2013	Yr 2035	Incr. Over Yr 2013	Yr 2035	Incr. Over Yr 2013
San Francisco	429,886	+ 91,185	1,023,992	+ 226,19	733,565	+ 164,69
San Mateo	305,826	+ 45,546	864,870	+ 142,670	433,295	+ 97,840
Santa Clara ²	819,224	+ 192,678	2,356,670	+ 529,157	1,296,139	+ 321,970
Alameda	677,886	+ 135,346	1,877,079	+ 360,980	910,613	+ 163,95
Contra Costa	447,099	+ 78,329	1,269,299	+ 253,999	448,001	+ 75,0
Solano	164,049	+ 23,949	476,887	+ 57,507	172,676	+ 24,39
Napa	55,018	+ 6,728	153,791	+ 20,691	86,887	+ 15,740
Sonoma	214,729	+ 32,229	570,296	+ 93,596	248,147	+ 24,179
Marin	110,513	+ 7,263	268,668	+ 17,268	125,569	-10,038

Notes:
 1. Year 2035 land uses referenced the ABAG Projections 2013.
 2. Sunnyvale land uses included the adopted LUTE, proposed ECRCS, LUTE update, Fortinet Precise Plan and Downtown Specific Plan.

The SFTM includes improvements to the roadway network as part of the 2040 Valley Transportation Plan (VTP) and the Sunnyvale Transportation Impact Fee (TIF). Significant roadway improvements that are funded or planned to be funded within or near Sunnyvale are shown on Figure 13:

A separate model run was conducted for the Cumulative no ECRCS scenario assuming no growth in the ECRCS area beyond the current general plan levels. The same roadway improvements shown on Figure 13 were assumed in the Cumulative no ECRCS model run. The forecast intersection turning movement volumes were adjusted based on intersection counts to generate the year 2035 cumulative conditions and Cumulative no ECRCS traffic volumes (see Figures 14 and 15).

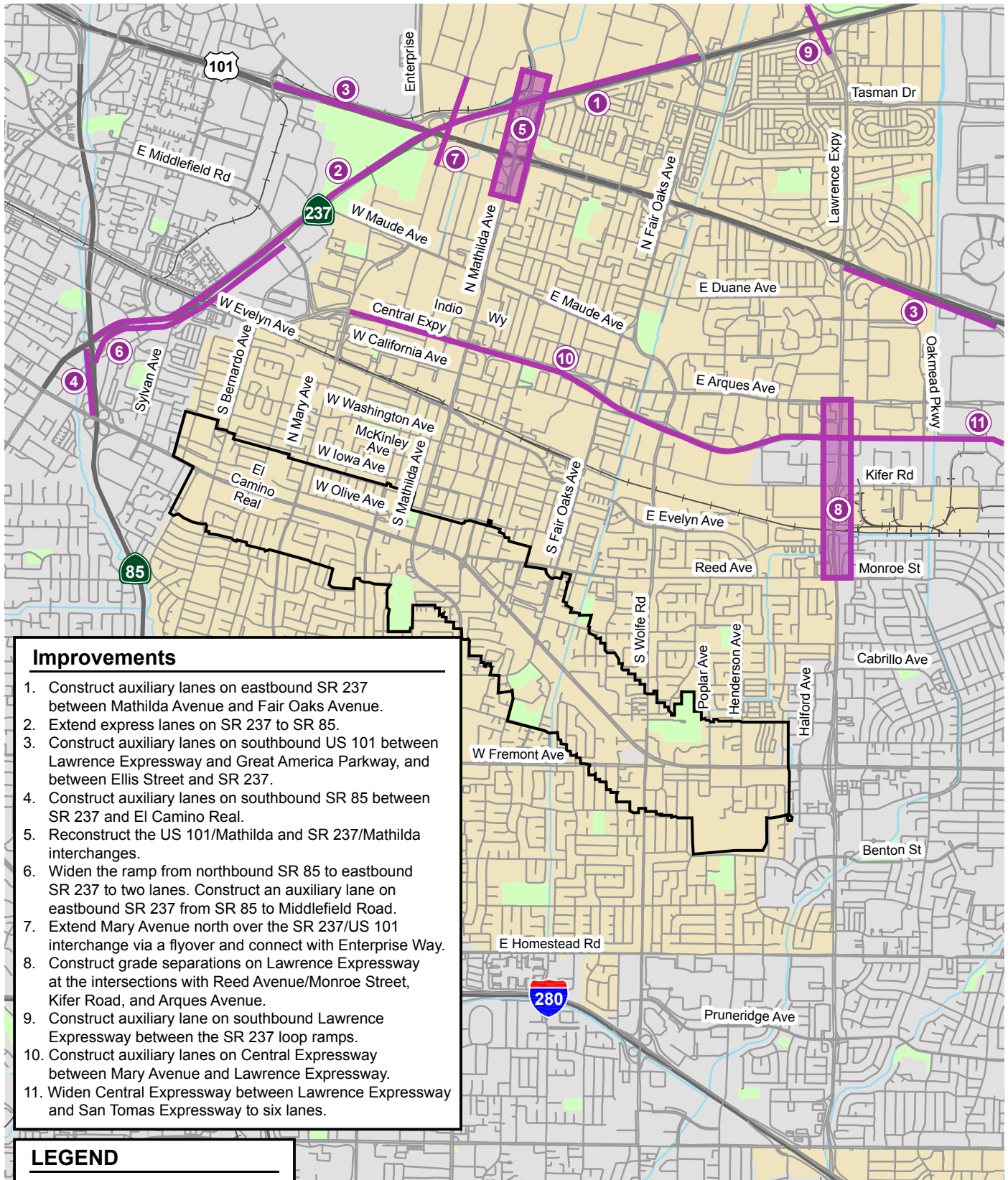
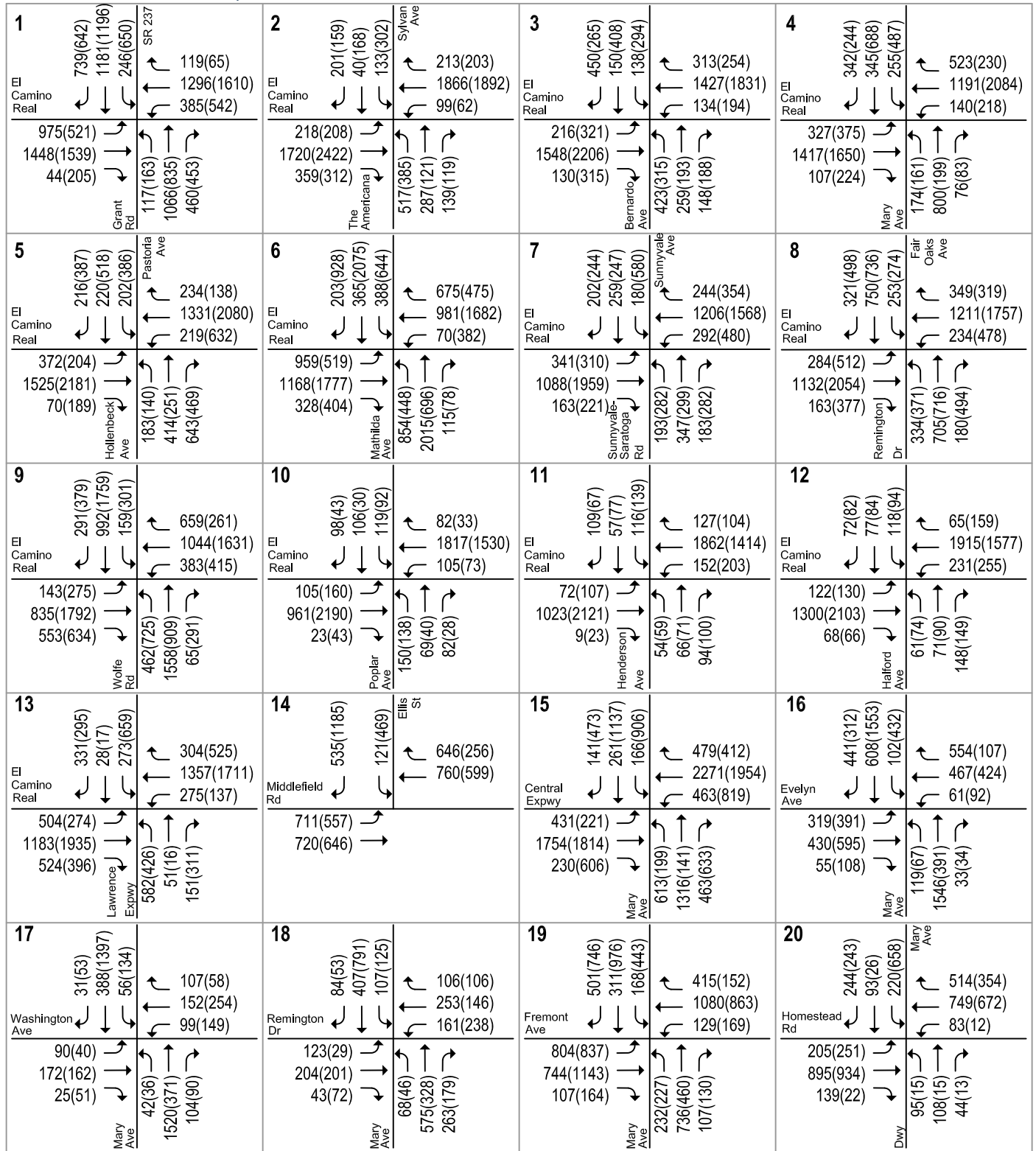


Figure 13
Roadway Improvements Within Close Proximity of Sunnyvale Assumed in the Model

El Camino Real Corridor Specific Plan

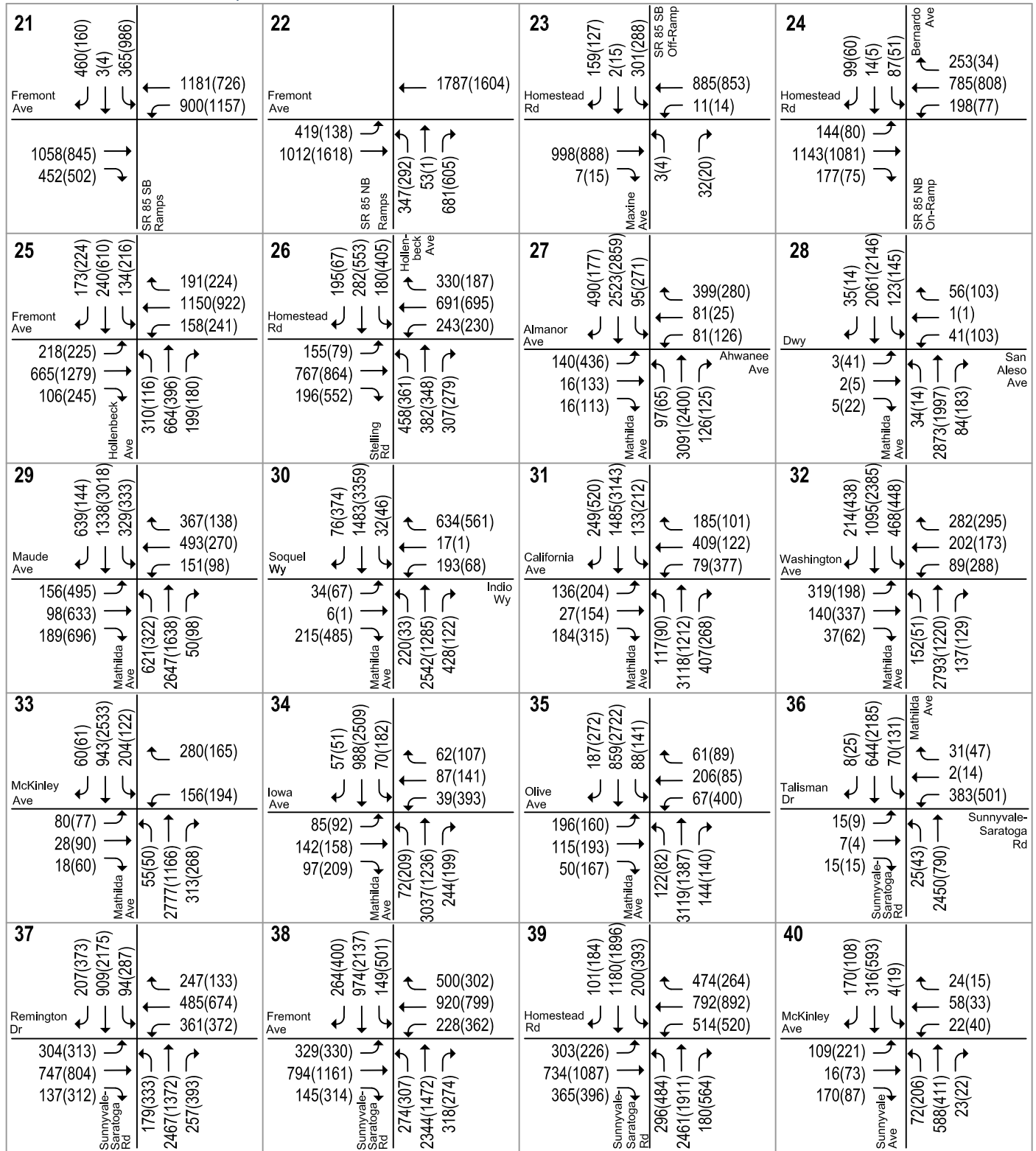


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 14
2035 Cumulative Traffic Volumes

El Camino Real Corridor Specific Plan

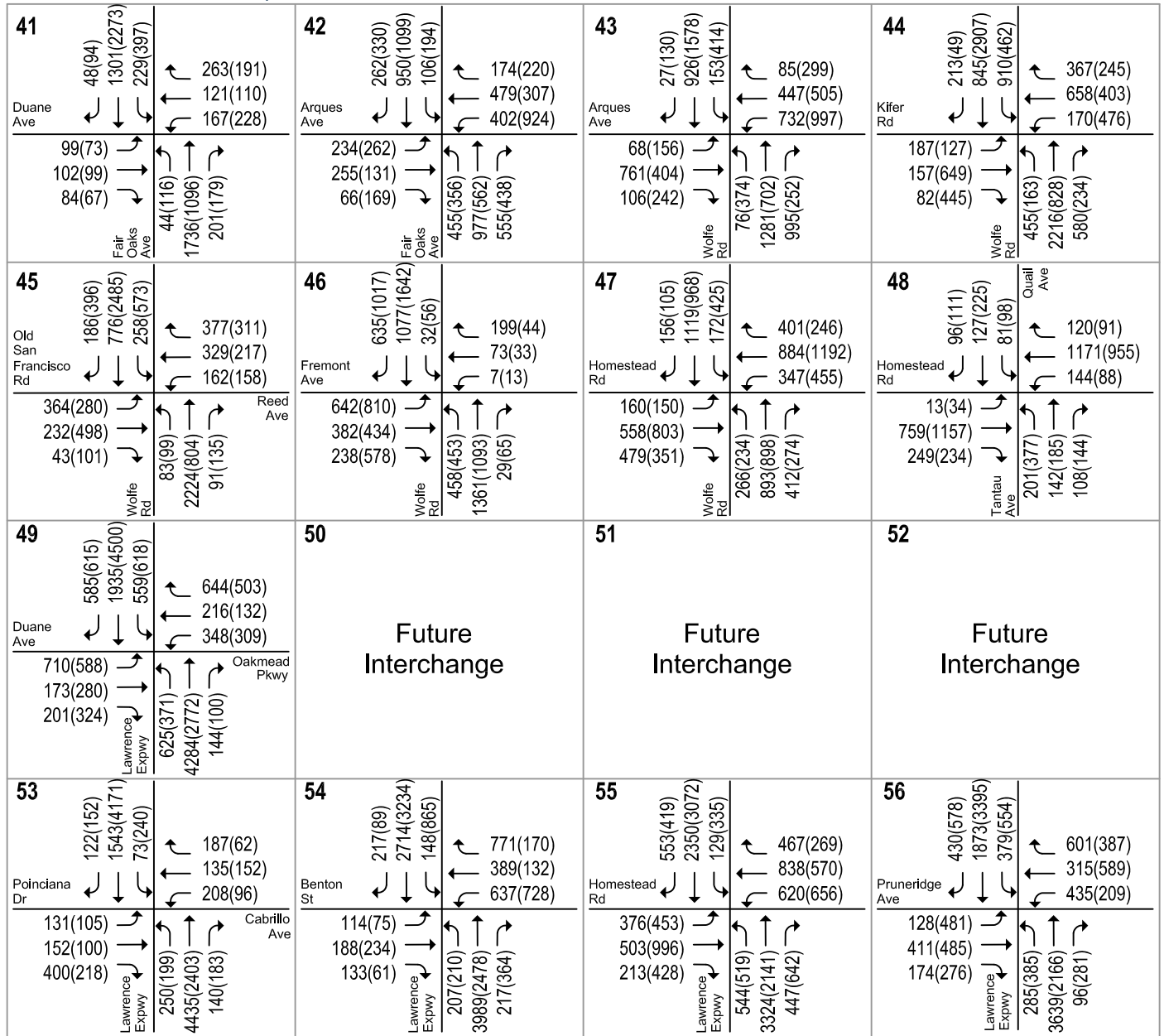


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 14
2035 Cumulative Traffic Volumes

El Camino Real Corridor Specific Plan

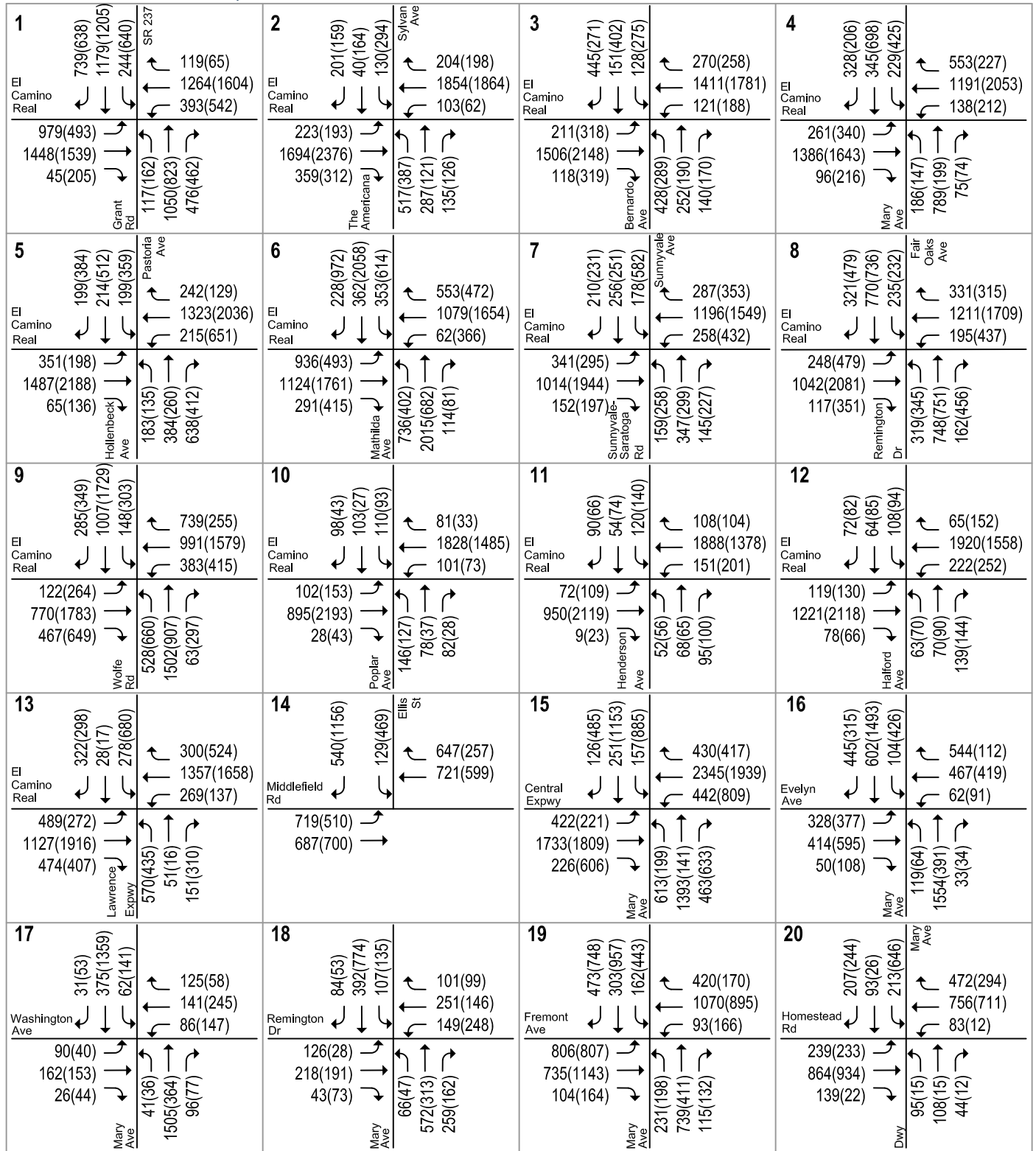


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 14
2035 Cumulative Traffic Volumes

El Camino Real Corridor Specific Plan

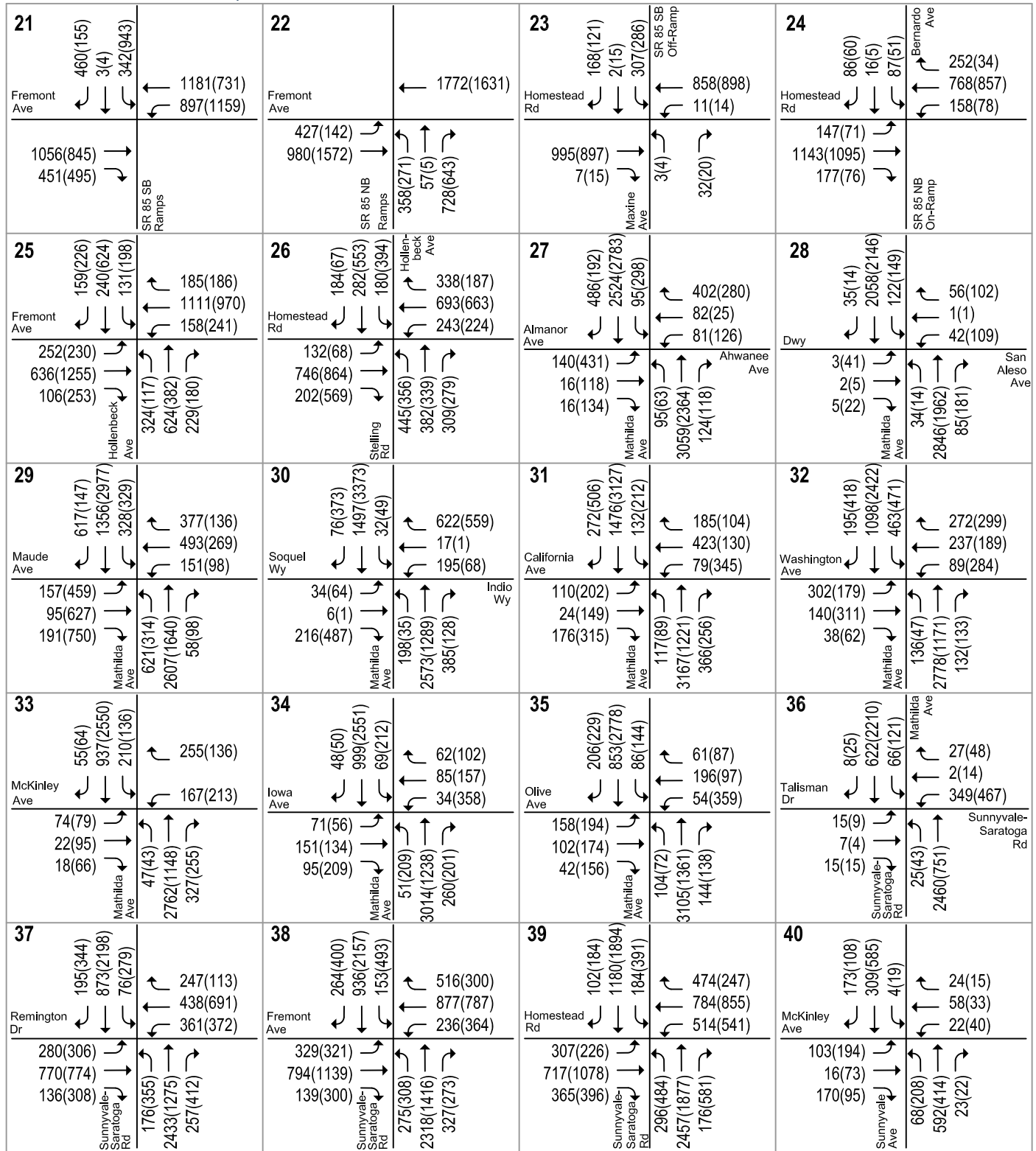


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 15
2035 Cumulative No ECR CSP Volumes

El Camino Real Corridor Specific Plan

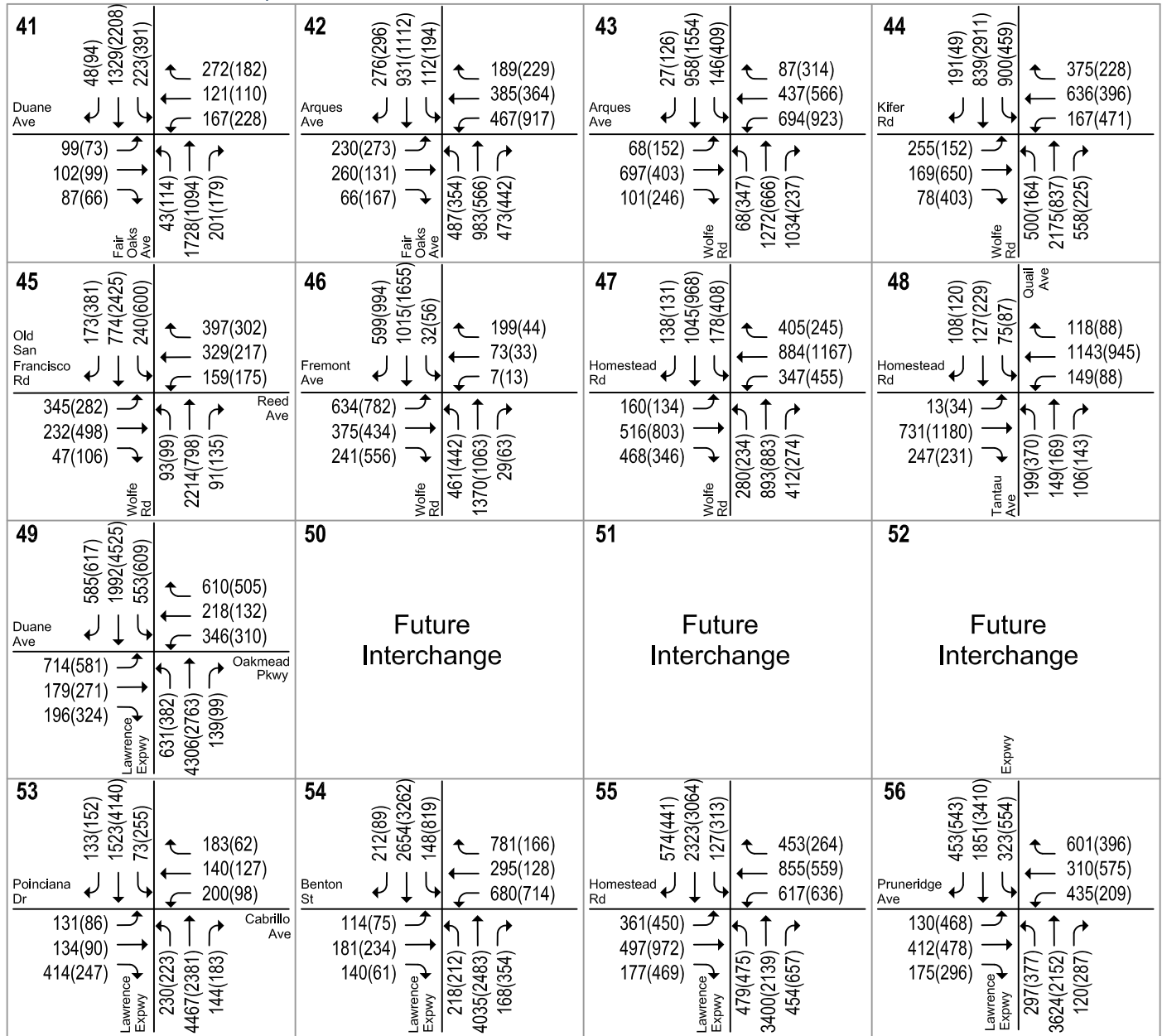


LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 15
2035 Cumulative No ECRCSF Volumes

El Camino Real Corridor Specific Plan



LEGEND

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

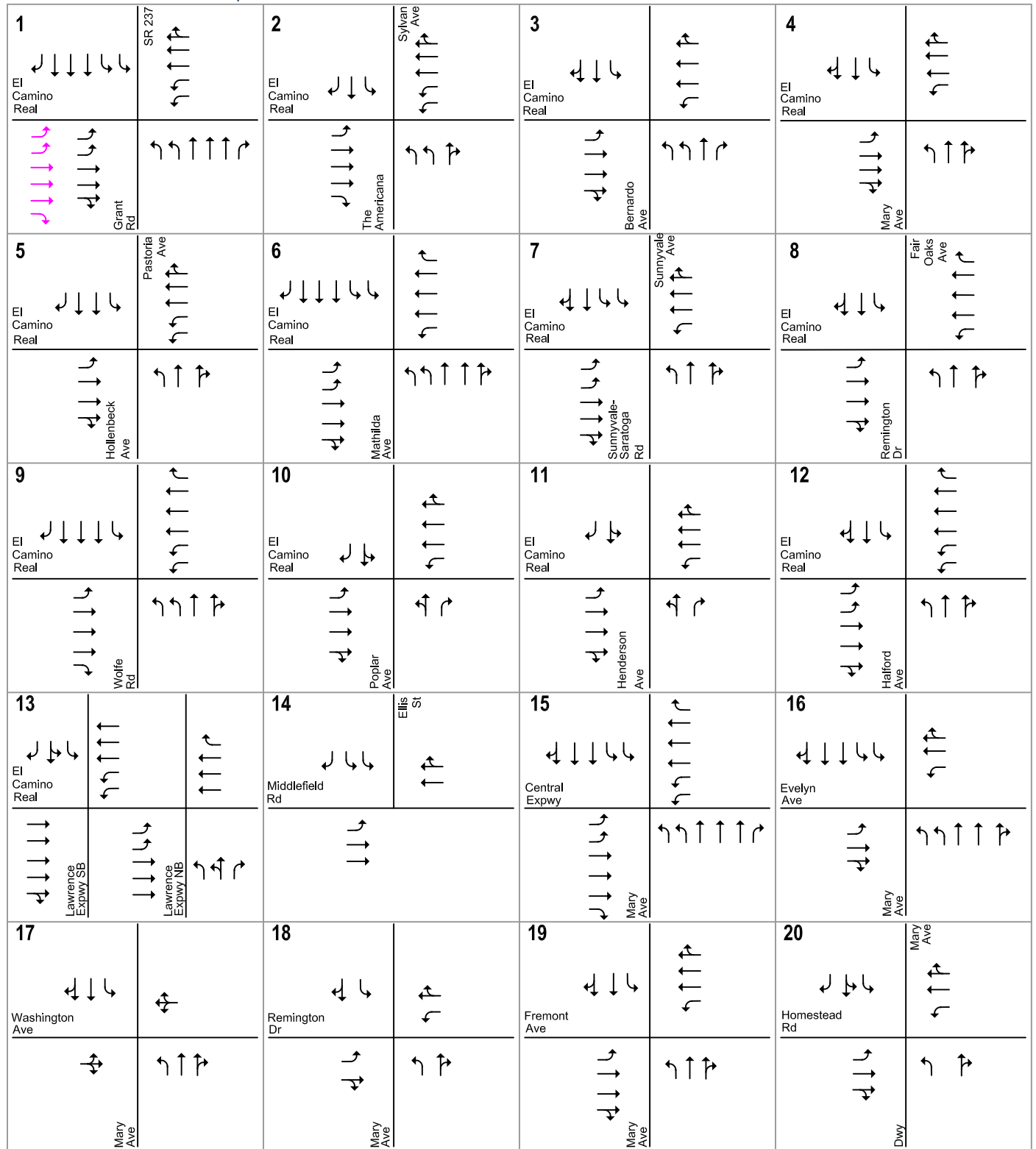
Figure 15
2035 Cumulative No ECRCSF Volumes

Intersection Lane Configurations

Intersection lane configurations under year 2035 cumulative conditions are shown on Figure 16. The following intersection improvements were assumed under the year 2035 cumulative conditions:

- As documented in the *Valley Transportation Plan 2040*, eastbound El Camino Real at the SR 237 intersection in the City of Mountain View is planned to be widened to include an exclusive right-turn lane. Both left-turn lanes at southbound SR 237 and the westbound right-turn lane on El Camino Real are all planned to be lengthened.
- As documented in the *Adopted Budget and Resource Allocation Plan, City of Sunnyvale, California – Fiscal Year 2017/2018*, the Indio Avenue approaches at Mathilda Avenue are planned to be restriped to include one left-turn lane and one shared through-right turn lane.
- As documented in the *Comprehensive County Expressway Planning Study, 2008 Update*, the three Lawrence Expressway intersections at Reed Avenue/Monroe Road, Kifer Road and at Arques Avenue are all planned for grade separations. At the time of this study, the interchange designs have not been finalized.
- As part of the approved Butcher's Corner project, the project will be providing the right-of-way necessary along the project frontage on Wolfe Road to allow south Wolfe Road to be widened to include a southbound right-turn lane at the intersection of Wolfe Road and Fremont Avenue.
- As documented in the City of Santa Clara *Multimodal Improvement Plan*, adopted by the City Council in September 2018, the City Place project will be fully responsible for implementing the following intersection improvements at the following study intersections within the City of Santa Clara:
 - Lawrence Expressway & Benton Street: Add a second southbound left-turn lane and a second eastbound left-turn lane.
 - Lawrence Expressway & Homestead Road: Add a third eastbound through lane and a third westbound through lane.

El Camino Real Corridor Specific Plan



LEGEND



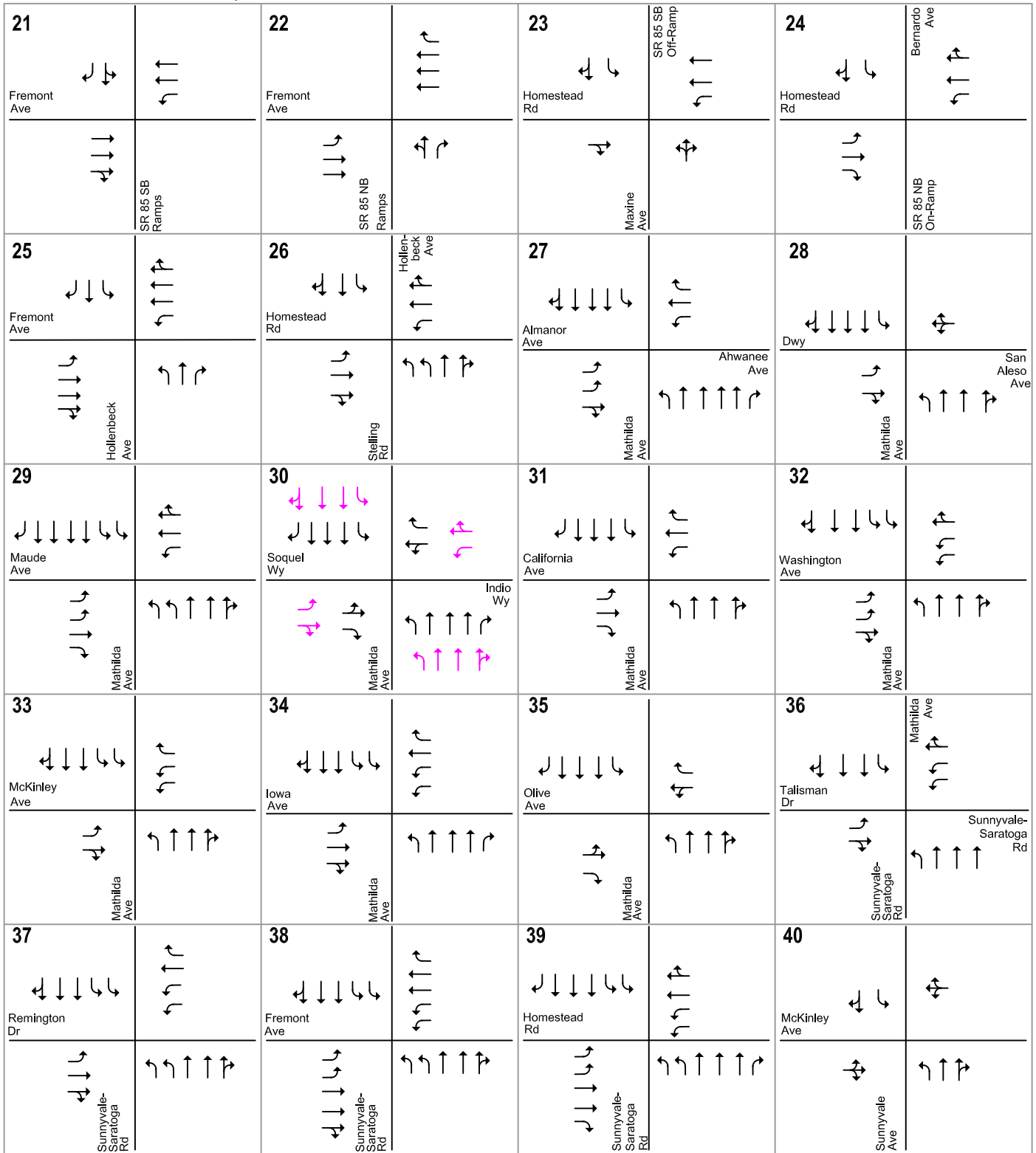
-  = HOV Lane
-  = Improvement

Figure 16
Year 2035 Cumulative Lane Configurations

El Camino Real Corridor Specific Plan

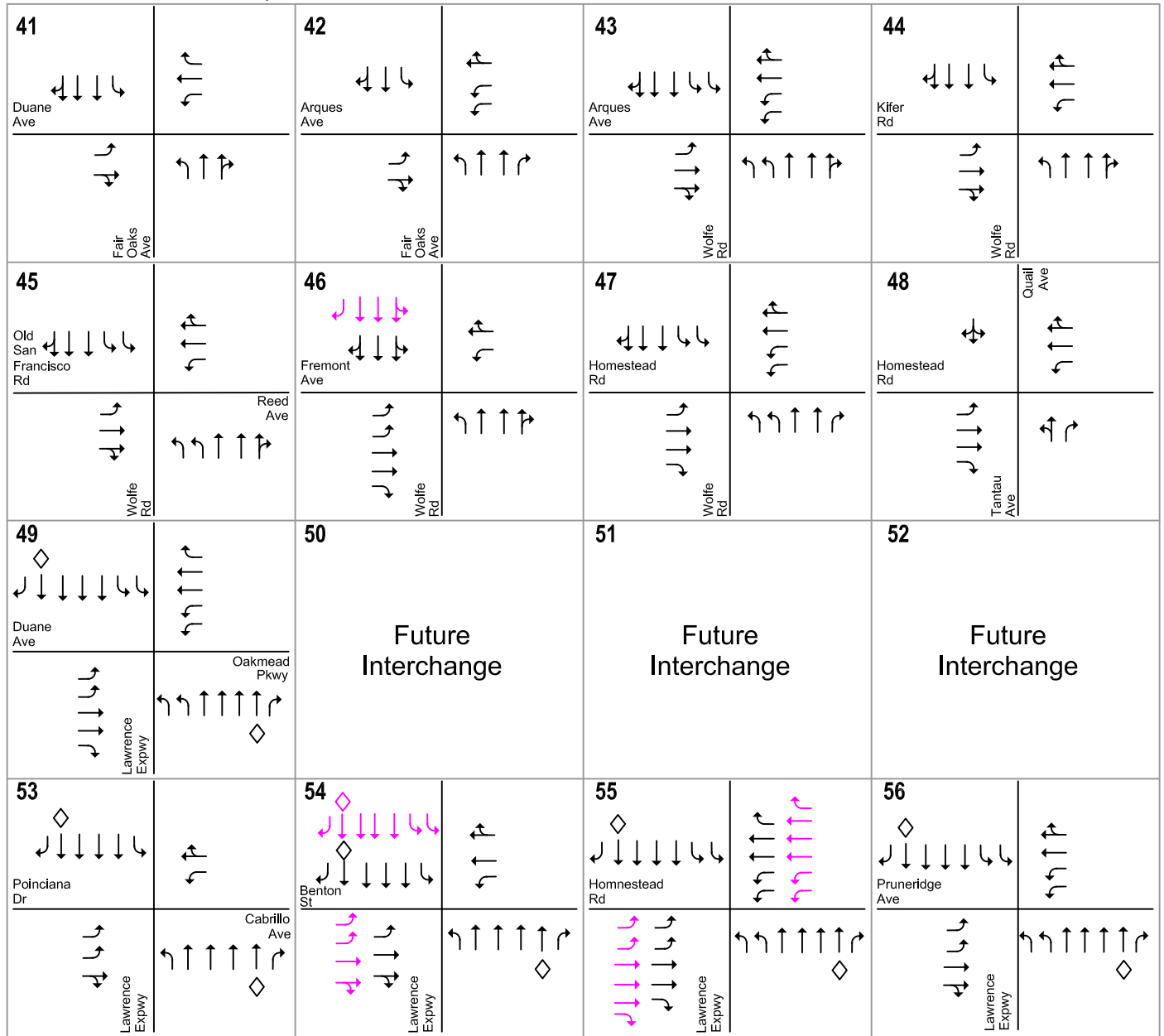


LEGEND

- ◇ = HOV Lane
- = Improvement

Figure 16
Year 2035 Cumulative Lane Configurations

El Camino Real Corridor Specific Plan



LEGEND

- = HOV Lane
- = Improvement

Figure 16
Year 2035 Cumulative Lane Configurations

Definition of Intersection Impacts at Signalized Intersections

The ECRCSF is said to create an adverse impact on traffic conditions at a signalized intersection if for the study peak hour:

1. The level of service at the intersection drops below its respective level of service standard when project traffic is added; or
2. An intersection that operates below its level of service standard under no project conditions experiences an increase in critical-movement delay of four (4) or more seconds, *and* the critical volume-to-capacity ratio (v/c) is increased by 0.01 or more when project traffic is added.

The exception to this threshold is when the addition of project traffic reduces the amount of average control delay for critical movements, i.e., the change in average control delay for critical movements are negative. In this case, the threshold is when the project increases the critical V/C value by 0.01 or more.

An impact by the City of Sunnyvale, City of Santa Clara and CMP standards is said to be satisfactorily addressed when measures are implemented that would restore intersection conditions to its LOS standard *or* to an average delay equal to without-project conditions or better.

Intersection Levels of Service Under Year 2035 Cumulative Conditions

As shown on Table 8 and Figure 17, comparing the intersection level of service results for the study intersections between the year 2035 cumulative conditions and Cumulative no ECRCSF conditions show that the proposed ECRCSF would generate intersection impacts at the following intersections:

City of Sunnyvale Intersections:

- Mary Avenue & Fremont Avenue (#19) – AM & PM Peak Hours
- Fair Oaks Avenue & Arques Avenue (#42) – AM Peak Hour
- Wolfe Road & Arques Avenue (#43) – AM & PM Peak Hours
- Wolfe Road & Kifer Road (#44) – PM Peak Hour
- Wolfe Road & Reed Avenue (#45) – PM Peak Hour

City of Mountain View Intersections:

- Ellis Street & Middlefield Road (#14) – PM Peak Hour

County of Santa Clara Intersections:

- Mary Avenue & Central Expressway (#15) – PM Peak Hour
- Lawrence Expressway & Benton Street (#54) – PM Peak Hour
- Lawrence Expressway & Homestead Road (#55) – PM Peak Hour
- Lawrence Expressway & Pruneridge Avenue (#56) – AM Peak Hour

Caltrans Intersections:

- Pastoria Avenue & El Camino Real (#5) – PM Peak Hour
- Mathilda Avenue & El Camino Real (#6) – AM Peak Hour
- Sunnyvale Avenue & El Camino Real (#7) – PM Peak Hour
- Fair Oaks Avenue & El Camino Real (#8) – PM Peak Hour
- Wolfe Road & El Camino Real (#9) – PM Peak Hour
- SR 85 Southbound Ramps & Fremont Avenue (#21) – PM Peak Hour

It should be noted that the intersections on Lawrence Expressway at Arques Avenue, Kifer Road and Reed Avenue are planned for an interchange. At the time of this study, the interchange designs have not been finalized. It is assumed that with the planned interchanges, these intersections would operate at acceptable levels of service.

Table 8
Year 2035 Cumulative Conditions Levels of Service

#	Intersection	Peak Hour	Cumulative no ECRSP		Cumulative Conditions				
			LOS Std.	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
1	SR 237 & El Camino Real (MV*)	AM	E	83.5	F	84.2	F	1.7	0.005
		PM		74.1	E	74.9	E	2.4	0.008
2	Sylvan Avenue & El Camino Real (MV)	AM	D	41.5	D	41.7	D	0.3	0.005
		PM		43.1	D	43.8	D	1.6	0.016
3	Bernardo Avenue & El Camino Real (+)	AM	E	50.7	D	51.9	D-	1.5	0.016
		PM		53.5	D-	56.1	E+	2.8	0.023
4	Mary Avenue & El Camino Real (*)	AM	E	52.4	D-	58.2	E+	10.5	0.055
		PM		64.7	E	79.2	E-	26.3	0.071
5	Pastoria Avenue & El Camino Real (+)	AM	E	69.4	E	72.3	E	6.2	0.018
		PM		94.0	F	110.3	F	23.0	0.054
6	Mathilda Avenue & El Camino Real (*)	AM	E	84.3	F	97.7	F	33.1	0.083
		PM		105.1	F	113.1	F	-3.4	-0.010
7	Sunnyvale Avenue & El Camino Real (+)	AM	E	44.7	D	46.2	D	5.5	0.038
		PM		72.7	E	85.1	F	19.0	0.053
8	Fair Oaks Avenue & El Camino Real (*)	AM	E	55.9	E+	60.9	E	4.9	0.026
		PM		>120	F	>120	F	21.6	0.048
9	Wolfe Road & El Camino Real (*)	AM	E	66.8	E	65.6	E	-4.0	-0.020
		PM		76.3	E-	85.5	F	10.0	0.026
10	Poplar Avenue & El Camino Real (+)	AM	E	22.5	C+	22.7	C+	0.3	0.000
		PM		17.4	B	18.2	B-	0.8	0.007
11	Henderson Avenue & El Camino Real (+)	AM	E	19.6	B-	19.6	B-	0.0	-0.002
		PM		22.6	C+	22.7	C+	0.2	0.003
12	Halford Avenue & El Camino Real (SC)	AM	D	25.5	C	26.5	C	1.2	0.012
		PM		45.7	D	45.4	D	-0.3	0.001
13	Lawrence Expressway Ramps & El Camino Real (SC*)	AM	E	40.1	D	40.4	D	0.3	0.007
		PM		34.7	C-	34.1	C-	-1.1	-0.008
14	Ellis Street & Middlefield Road (MV)	AM	D	88.2	F	88.9	F	1.5	0.003
		PM		82.1	F	91.8	F	12.0	0.047
15	Mary Avenue & Central Expressway (County*)	AM	E	93.5	F	94.5	F	-0.5	-0.023
		PM		99.4	F	101.5	F	5.1	0.011
16	Mary Avenue & Evelyn Avenue	AM	D	49.4	D	49.1	D	-0.3	-0.002
		PM		47.6	D	48.2	D	0.8	0.021
17	Mary Avenue & Washington Avenue	AM	D	20.9	C+	21.6	C+	0.9	0.008
		PM		23.4	C	24.0	C	0.9	0.018
18	Mary Avenue & Remington Drive	AM	D	44.4	D	44.9	D	1.0	0.007
		PM		47.6	D	49.3	D	2.8	0.010
19	Mary Avenue & Fremont Avenue	AM	D	>120	F	>120	F	7.6	0.018
		PM		>120	F	>120	F	14.2	0.032

Notes:

* = CMP, + = Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara

">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.

BOLD indicates unacceptable level of service

BOLD and boxed indicates a significant cumulative impact

Table 8 (continued)
Year 2035 Cumulative Conditions Levels of Service

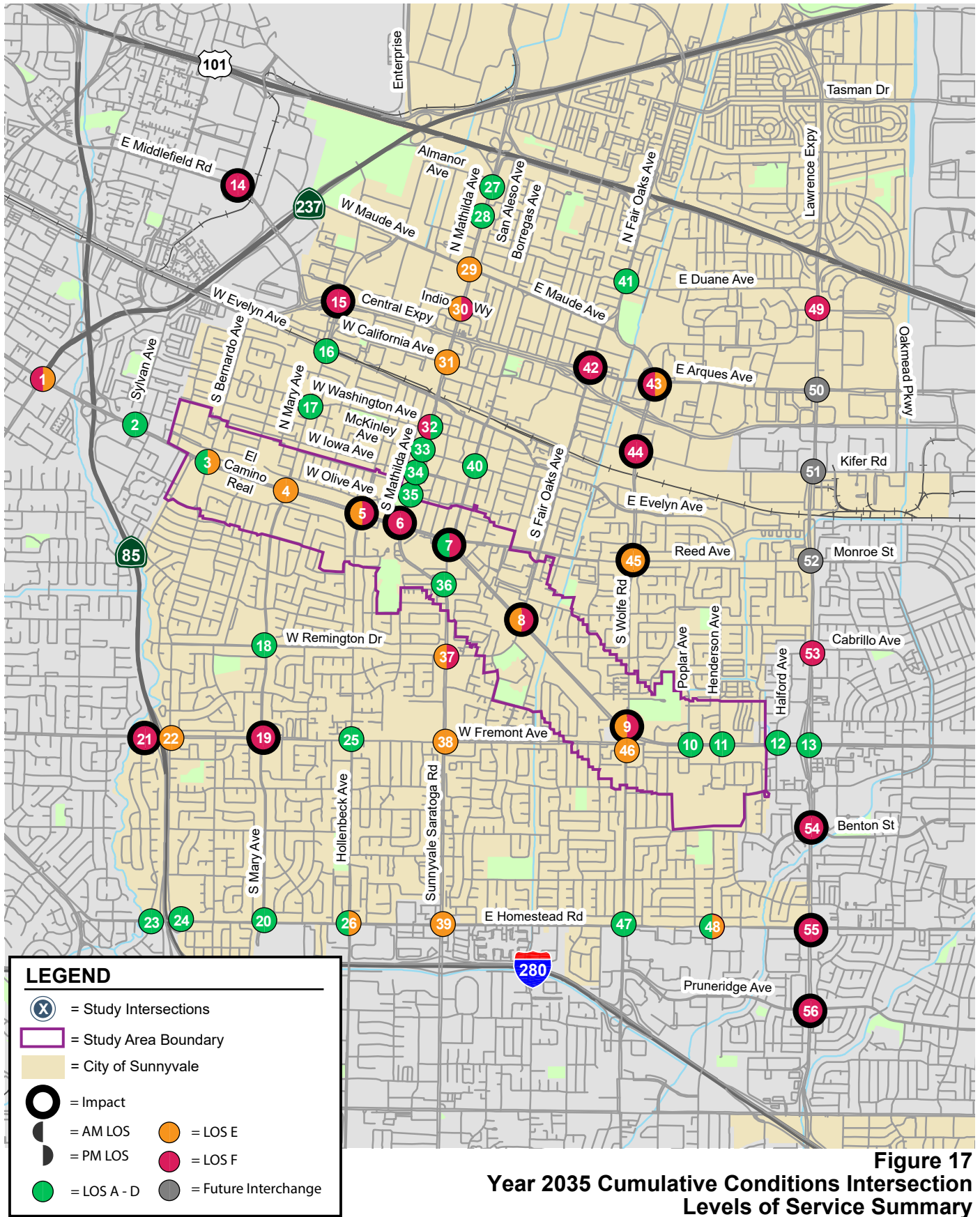
#	Intersection	Peak Hour	Cumulative no ECRSP		Cumulative Conditions				
			LOS Std.	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
20	Mary Avenue & Homestead Road	AM	D	37.5	D+	36.8	D+	-1.7	-0.009
		PM		39.2	D	39.9	D	1.2	0.022
21	SR 85 SB Ramps & Fremont Avenue	AM	D	87.6	F	89.0	F	1.1	0.002
		PM		>120	F	>120	F	13.7	0.031
22	SR 85 NB Ramps & Fremont Avenue	AM	D	63.6	E	55.1	E+	-11.8	-0.033
		PM		77.9	E-	72.7	E	-4.1	-0.011
23	SR 85 SB Ramps & Homestead Road	AM	D	32.6	C-	31.9	C	-0.6	-0.002
		PM		37.3	D+	37.6	D+	-0.2	-0.004
24	SR 85 NB Ramps & Homestead Road	AM	D	22.5	C+	24.4	C	3.8	0.023
		PM		14.2	B	14.5	B	-0.2	-0.009
25	Hollenbeck Avenue & Fremont Avenue	AM	D	49.3	D	49.7	D	0.4	0.012
		PM		52.1	D-	51.9	D-	-0.8	-0.005
26	Hollenbeck Avenue & Homestead Road	AM	D	45.0	D	45.8	D	0.1	0.004
		PM		67.0	E	68.5	E	2.8	0.008
27	Mathilda Avenue & Almanor Avenue (+)	AM	E	33.9	C-	33.8	C-	0.0	-0.001
		PM		38.3	D+	37.6	D+	-1.9	-0.016
28	Mathilda Avenue & San Aleso Avenue (+)	AM	E	12.2	B	12.2	B	0.0	0.005
		PM		20.3	C+	19.9	B-	-0.7	0.001
29	Mathilda Avenue & Maude Avenue (*)	AM	E	55.4	E+	55.5	E+	0.1	0.004
		PM		58.1	E+	58.3	E+	2.1	0.012
30	Mathilda Avenue & Indio Way (+)	AM	E	63.2	E	66.1	E	3.8	0.010
		PM		84.5	F	84.2	F	-0.4	-0.001
31	Mathilda Avenue & California Avenue (+)	AM	E	65.9	E	68.4	E	3.5	0.007
		PM		54.8	D-	59.1	E+	7.0	0.023
32	Mathilda Avenue & Washington Avenue (+)	AM	E	98.8	F	97.6	F	-1.6	-0.004
		PM		54.6	D-	54.7	D-	-1.1	-0.006
33	Mathilda Avenue & McKinley Avenue (+)	AM	E	29.1	C	30.9	C	2.4	0.019
		PM		26.3	C	25.4	C	-1.4	-0.013
34	Mathilda Avenue & Iowa Avenue (+)	AM	E	20.2	C+	21.1	C+	-1.4	0.023
		PM		43.8	D	44.7	D	1.5	0.004
35	Mathilda Avenue & Olive Avenue (+)	AM	E	27.9	C	31.6	C	4.4	0.034
		PM		34.1	C-	35.5	D+	2.5	0.012
36	Mathilda Avenue & Sunnyvale-Saratoga Road (+)	AM	E	27.3	C	28.9	C	1.8	0.012
		PM		30.6	C	31.9	C	1.2	0.007
37	Sunnyvale-Saratoga Road & Remington Drive (*)	AM	E	63.7	E	71.0	E	15.3	0.054
		PM		108.7	F	106.0	F	-5.2	-0.012
38	Sunnyvale-Saratoga Road & Fremont Avenue (*)	AM	E	58.7	E+	59.0	E+	0.5	-0.003
		PM		68.3	E	69.2	E	0.6	0.002
39	Sunnyvale-Saratoga Road & Homestead Road (CU*)	AM	E	61.9	E	63.4	E	2.3	0.008
		PM		60.5	E	60.6	E	-1.5	-0.005
40	Sunnyvale Avenue & McKinley Avenue	AM	D	16.6	B	16.7	B	0.2	0.009
		PM		27.1	C	28.1	C	1.3	0.016

Notes:
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 ">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.
BOLD indicates unacceptable level of service
BOLD and boxed indicates a significant cumulative impact

Table 8 (continued)
Year 2035 Cumulative Conditions Levels of Service

#	Intersection	Peak Hour	Cumulative no ECRSP		Cumulative Conditions				
			LOS Std.	Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
41	Fair Oaks Avenue & Duane Avenue	AM	D	39.9	D	40.5	D	0.7	0.004
		PM		38.1	D+	38.4	D+	0.6	0.005
42	Fair Oaks Avenue & Arques Avenue	AM	D	91.4	F	97.1	F	12.8	0.032
		PM		112.2	F	109.7	F	-10.0	-0.020
43	Wolfe Road & Arques Avenue	AM	D	86.4	F	90.6	F	5.5	0.012
		PM		66.6	E	72.6	E	9.0	0.039
44	Wolfe Road & Kifer Road	AM	D	>120	F	>120	F	-9.7	-0.020
		PM		>120	F	>120	F	6.1	0.013
45	Wolfe Road & Reed Avenue	AM	D	64.7	E	66.3	E	2.3	0.007
		PM		54.8	D-	56.2	E+	3.2	0.018
46	Wolfe Road & Fremont Avenue	AM	D	55.4	E+	56.0	E+	0.7	0.013
		PM		59.5	E+	60.7	E	3.0	0.024
47	Wolfe Road & Homestead Road	AM	D	40.5	D	40.5	D	0.5	0.012
		PM		43.4	D	45.9	D	5.1	0.028
48	Tantau Avenue & Homestead Road	AM	D	37.3	D+	36.9	D+	-0.2	0.002
		PM		67.4	E	70.3	E	2.1	0.007
49	Lawrence Expressway & Oakmead Parkway (County)	AM	E	>120	F	>120	F	2.3	0.016
		PM		>120	F	>120	F	-3.9	-0.005
50	Lawrence Expressway & Arques Avenue (County*)	AM	E	Future Interchange		Future Interchange			
		PM							
51	Lawrence Expressway & Kifer Road (County)	AM	E	Future Interchange		Future Interchange			
		PM							
52	Lawrence Expressway & Monroe Street (County*)	AM	E	Future Interchange		Future Interchange			
		PM							
53	Lawrence Expressway & Cabrillo Avenue (County)	AM	E	>120	F	>120	F	-1.3	0.001
		PM		>120	F	>120	F	-2.9	-0.021
54	Lawrence Expressway & Benton Street (County)	AM	E	>120	F	>120	F	-19.1	-0.035
		PM		>120	F	>120	F	15.0	0.023
55	Lawrence Expressway & Homestead Road (County*)	AM	E	>120	F	>120	F	-8.4	-0.011
		PM		117.5	F	>120	F	11.2	0.028
56	Lawrence Expressway & Pruneridge Avenue (County)	AM	E	>120	F	>120	F	9.5	0.037
		PM		>120	F	>120	F	4.4	0.006

Notes:
 * = CMP, + = Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara
 ">120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM2000 methodology.
BOLD indicates unacceptable level of service
BOLD and boxed indicates a significant cumulative impact



The ECRCSPP shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards improvements for impacted intersections that have already been identified in the TIF. For improvements addressing impacted intersections that were not included in the TIF but are now identified in this study, the ECRCSPP shall require projects within the plan area to make a fair share contribution toward the cost of the identified improvements.

Most of the intersections impacted by the ECRCSPP have been identified with impacts under the *City of Sunnyvale Land Use and Transportation (LUTE) Element Final Environmental Impact Report*. The following intersections impacted by the ECRCSPP were not identified with an intersection impact under the LUTE:

- Pastoria Avenue & El Camino Real
- Sunnyvale Avenue & El Camino Real
- Wolfe Road & El Camino Real
- Ellis Street & Middlefield Road
- Wolfe Road & Arques Avenue
- Wolfe Road & Kifer Road
- Wolfe Road & Reed Avenue

Potential improvement strategies are discussed below.

Potential Improvements Strategies for Intersection Impacts

Improvement options were studied for each intersection experiencing impacts under the year 2035 cumulative conditions when compared to cumulative no ECRSP conditions. An intersection impact can be satisfactorily addressed by implementing measures that would restore intersection conditions to Cumulative no ECRSP conditions. The LOS results under the improved year 2035 cumulative conditions are summarized in Table 9.

Table 9
Intersection Impact Improvements Summary

#	Intersection	Peak Hour	LOS Std.	Cumulative no ECRSP		Cumulative Conditions				Cumulative Improved			
				Avg. Delay (sec)	LOS	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C	Avg. Delay (sec)	LOS	In Crit. Delay (sec)	Incr. In Crit. V/C
5	Pastoria Avenue & El Camino Real (+)	AM	E	69.4	E	72.3	E	6.2	0.018	62.0	E	-12.5	-0.038
		PM		94.0	F	110.3	F	23.0	0.054	85.5	F	-22.3	-0.052
6	Mathilda Avenue & El Camino Real (*)	AM	E	84.3	F	97.7	F	33.1	0.083	No Feasible Improvement			
		PM		105.1	F	113.1	F	-3.4	-0.010				
7	Sunnyvale Avenue & El Camino Real (+)	AM	E	44.7	D	46.2	D	5.5	0.038	44.0	D	1.5	0.013
		PM		72.7	E	85.1	F	19.0	0.053	60.6	E	-23.3	-0.080
8	Fair Oaks Avenue & El Camino Real (*)	AM	E	55.9	E+	60.9	E	4.9	0.026	52.4	D-	-7.3	-0.050
		PM		>120	F	>120	F	21.6	0.048	>120	F	-38.8	-0.087
9	Wolfe Road & El Camino Real (*)	AM	E	66.8	E	65.6	E	-4.0	-0.020	53.8	D-	-14.3	-0.035
		PM		76.3	E-	85.5	F	10.0	0.026	78.6	E-	22.7	0.082
14	Ellis Street & Middlefield Road (MV)	AM	D	88.2	F	88.9	F	1.5	0.003	42.1	D	-60.5	-0.200
		PM		82.1	F	91.8	F	12.0	0.047	69.2	E	-21.0	-0.108
15	Mary Avenue & Central Expressway (County*)	AM	E	93.5	F	94.5	F	-0.5	-0.023	85.4	F	-0.5	-0.023
		PM		99.4	F	101.5	F	5.1	0.011	95.2	F	-10.9	-0.074
19	Mary Avenue & Fremont Avenue	AM	D	>120	F	>120	F	7.6	0.018	70.5	E	-92.2	-0.235
		PM		>120	F	>120	F	14.2	0.032	>120	F	-75.1	-0.167
21	SR 85 SB Ramps & Fremont Avenue	AM	D	87.6	F	89.0	F	1.1	0.002	63.3	E	0.3	-0.011
		PM		>120	F	>120	F	13.7	0.031	>120	F	-124.4	-0.280
42	Fair Oaks Avenue & Arques Avenue	AM	D	91.4	F	97.1	F	12.8	0.032	68.5	E	-33.9	-0.090
		PM		112.2	F	109.7	F	-10.0	-0.020	71.8	E	-50.8	-0.127
43	Wolfe Road & Arques Avenue	AM	D	86.4	F	90.6	F	5.5	0.012	55.6	E+	-70.4	-0.239
		PM		66.6	E	72.6	E	9.0	0.039	65.1	E	-5.2	-0.014
44	Wolfe Road & Kifer Road	AM	D	>120	F	>120	F	-9.7	-0.020	>120	F	-145.6	-0.321
		PM		>120	F	>120	F	6.1	0.013	91.5	F	-72.0	-0.162
45	Wolfe Road & Reed Avenue	AM	D	64.7	E	66.3	E	2.3	0.007	59.1	E+	-9.8	-0.038
		PM		54.8	D-	56.2	E+	3.2	0.018	47.8	D	-11.8	-0.050
54	Lawrence Expressway & Benton Street (County)	AM	E	>120	F	>120	F	-19.1	-0.035	Potential Future Interchange			
		PM		>120	F	>120	F	15.0	0.023				
55	Lawrence Expressway & Homestead Road (County*)	AM	E	>120	F	>120	F	-8.4	-0.011	Potential Future Interchange			
		PM		117.5	F	>120	F	11.2	0.028				
56	Lawrence Expressway & Pruneridge Avenue (County)	AM	E	>120	F	>120	F	9.5	0.037	Potential Future Interchange			
		PM		>120	F	>120	F	4.4	0.006				

Notes:

* = CMP, += Regionally Significant Intersection, MV = Mountain View, SC = Santa Clara, County = County of Santa Clara

>120" indicates this signalized intersection experiences lengthy delay that is beyond the reasonable calculation range of the HCM 2000 methodology.

BOLD indicates unacceptable level of service

BOLD and boxed indicates a significant cumulative impact

Pastoria Avenue & El Camino Real (#5)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet City of Sunnyvale's significant intersection impact criteria.

Potential Improvement: Potential improvement would require restriping the southbound approach to include 2 left-turn lanes, one through lane and one right-turn lane. This improvement would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. However, this intersection is outside of City of Sunnyvale jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Mathilda Avenue & El Camino Real (#6) [CMP]

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the AM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet VTA's CMP significant intersection impact criteria.

Potential Improvement: Potential improvement would require a third left-turn lane for the northbound and eastbound approaches. The northbound approach would also need to be widened for a dedicated right-turn lane. This improvement would require right-of-way acquisitions at multiple quadrants of the intersection.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the AM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. However, the widened approach would increase traffic exposure time for pedestrians by 3 to 8 seconds and 1 to 4 seconds for bicyclists. It is also uncertain whether the required right-of-way can be acquired. For these reasons, the proposed potential improvement is considered infeasible. This intersection is also in Caltrans' jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Sunnyvale Avenue & El Camino Real (#7)

Under Cumulative no ECRCSF conditions, the LOS would be an acceptable LOS E during the PM peak hour. With the addition of ECRCSF traffic, the intersection operations would deteriorate to an unacceptable LOS F, which would meet Sunnyvale's significant intersection impact criteria.

Potential Improvement: Potential improvement would require widening the westbound approach to include a second left-turn lane. This improvement could potentially be accommodated within the existing right-of-way and would not increase the pedestrian and bicycle exposure time to traffic at the intersection.

With the proposed improvement, the intersection would operate at an acceptable LOS E under cumulative conditions during the PM peak hour. However, this intersection is in Caltrans' jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Fair Oaks Avenue & El Camino Real (#8) [CMP]

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet VTA's CMP significant intersection impact criteria.

Potential Improvement: The Sunnyvale Traffic Impact Fee (TIF) identifies an improvement at this intersection to widen eastbound and westbound El Camino Real to include a second left-turn lane. Depending on the extent of the median that could be removed, El Camino Real east of Fair Oaks Avenue could require widening by up to 8 feet and El Camino Real west of Fair Oaks Avenue could require widening by up to 11 feet. The east-west through lanes would also require re-alignment. The widened approach would increase traffic exposure time for pedestrians by 3 to 4 seconds and 1 to 2 seconds for bicyclists.

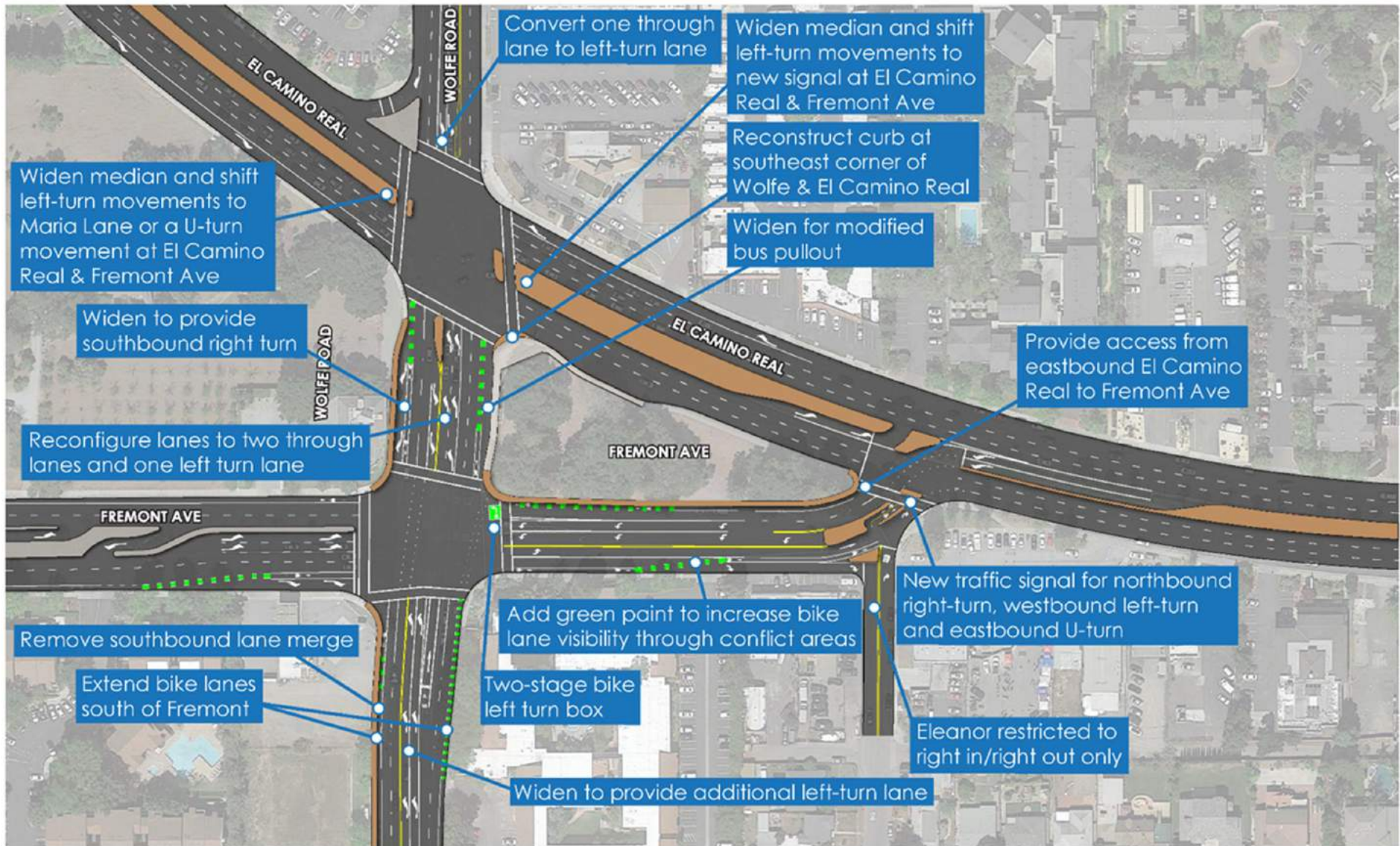
With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. Since this improvement is identified in the TIF, the ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Wolfe Road & El Camino Real (#9)

Under Cumulative no ECRCSF conditions, the LOS would be an acceptable LOS E during the PM peak hour. With the addition of ECRCSF traffic, the intersection operations would deteriorate to an unacceptable LOS F, which would meet VTA's CMP significance intersection impact criteria.

Potential Improvement: According to the *Wolfe Road Corridor Traffic Improvement Study*, prepared by Kimley Horn, dated February 2016, Wolfe Road between Homestead Road and El Camino Real is recommended for multimodal improvements to improve vehicle operations as well as bicycle and pedestrian facilities. At the time of this report, the multimodal improvements have not been finalized, but the Sunnyvale TIF project list includes this project assuming the most aggressive alternative (Triangle - Alternative 3). This alternative includes improving the Wolfe Road intersections with El Camino Real and with Fremont Avenue, as well as signaling the intersection at Fremont Avenue and El Camino Real (see Figure 18). Right-of-way acquisition would be required. Bicycle improvements including extended bike lanes and bike boxes would also be included as part of the improvement project and are detailed in the corridor improvement study report. This improvement (Triangle – Alternative 3) would require signal coordination between the two Wolfe Road intersections and the new signalized Fremont Avenue and El Camino Real intersection.

With the proposed improvement, the intersection would operate at an acceptable LOS E under cumulative conditions during the PM Peak hour. The ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.



SOURCE: Wolfe Road Corridor Traffic Improvement Study, February, 2016.

Figure 18
Potential Mitigation at Wolfe Road and Fremont Avenue

Ellis Street & Middlefield Road (#14)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet the City of Mountain View's significant intersection impact criteria.

Potential Improvement: Potential improvement would require widening the eastbound approach to include a second left-turn lane. This improvement could potentially be accommodated within the existing right-of-way and would not increase the pedestrian and bicycle exposure time to traffic at the intersection.

With the proposed improvement, the intersection would operate at an unacceptable LOS E under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. However, this intersection is in City of Mountain View jurisdiction, so the City cannot ensure the implementation of the potential improvement.

Mary Avenue & Central Expressway (#15) [CMP]

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet VTA's CMP significant intersection impact criteria.

Potential Improvement: The Sunnyvale Traffic Impact Fee (TIF) identifies an improvement at this intersection to widen westbound Central Expressway to include a third westbound left-turn lane. This improvement could potentially be accommodated within the existing right-of-way and would not increase the pedestrian and bicycle exposure time to traffic at the intersection.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. Since this improvement is identified in the TIF, the ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Mary Avenue & Fremont Avenue (#19)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during both the AM and PM peak hours. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet the City of Sunnyvale's significant intersection impact criteria.

Potential Improvement: Potential improvement would require restriping the eastbound and westbound approaches with 1 left-turn lane, 1 shared left-through lane, 1 through lane and 1 shared through-right lane. The eastbound and westbound approaches would need to operate with split phasing. This mitigation would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required. It should be noted that split phasing operates favorably to protected phasing only under certain circumstances. This improvement should be implemented only if cumulative volumes are realized.

With the proposed improvement, the intersection would operate at LOS E during the AM peak hour and LOS F during the PM peak hour under cumulative conditions, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The ECRCSF shall require projects within the plan area to contribute their fair share towards the identified improvement.

SR 85 Southbound Ramps & Fremont Avenue (#21)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet the City of Sunnyvale's significant intersection impact criteria.

Potential Improvement: Improvement would require widening the SR 85 off-ramp to include a left-turn lane, a shared left-through-right lane, and a right-turn lane. The eastbound leg would require restriping to include a bike box in advance of the stop-line to allow right-turn vehicles to bypass the through vehicles in the curb lane. The off-ramp would need to be widened to the proposed three lanes approximately 370 feet back from the intersection. The length of the north sidewalk would not be lengthened, but the pedestrian refuge island would be removed. The off-ramp would also need to be realigned with the SR 85 southbound on-ramp. Widening the off-ramp could be accommodated within the existing right-of-way. Within the existing right-of-way, the required eastbound right-turn lane could be achieved via providing a bike box east of the stop-line to allow bicyclists to clear the right-turn area. The eastbound curb lane is 20 feet wide under existing conditions. With the bike box, right-turn vehicles would be able to bypass the through vehicles. The existing stop-line for the eastbound leg would need to be moved back by approximately 15 feet. This improvement is identified in the TIF.

With the proposed improvement, the intersection would remain operating at LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Fair Oaks Avenue & Arques Avenue (#42)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the AM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet the City of Sunnyvale's significant intersection impact criteria.

Potential Improvement: Improvement would require widening the eastbound and westbound approaches to include a separate right-turn lane. One eastbound receiving lane would need to be eliminated. This improvement can be accommodated within the existing right-of-way. However, the eastbound and westbound through movements would be offset with their receiving lanes and would require lane extensions to delineate the travel path for the eastbound and westbound through movements.

With the proposed improvement, the intersection would operate at LOS E under cumulative conditions during the AM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The TIF identified improvements at this intersection, but the required improvement is beyond the TIF improvements. The ECRCSF shall require projects within the plan area to contribute their fair share towards the identified improvement.

Wolfe Road & Arques Avenue (#43)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the AM peak hour and an unacceptable LOS E during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet the City of Sunnyvale's significant intersection impact criteria.

Potential Improvement: Improvement would require restriping the northbound approach to include 2 left-turn lanes, 2 through lanes and 1 dedicated right-turn lane. The northbound bike lane would need to be moved to the west side of the proposed right-turn lane. The westbound approach would require restriping to include 2 left-turn lanes, 1 shared left-through lane and 1 shared through-right lane. Eastbound and westbound approaches would need to operate with split phasing. This improvement would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required. It should be noted that split phasing operates favorably to protected phasing only under certain circumstances. This improvement should be implemented only if cumulative volumes are realized.

With the proposed improvement, the intersection would operate at LOS E under cumulative conditions during both the AM and PM peak hours, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The TIF identified improvements at this intersection, but the required improvement is beyond the TIF improvements. The ECRCSF shall require projects within the plan area to contribute their fair share towards the identified improvement.

Wolfe Road & Kifer Road (#44)

Under Cumulative no ECRCSF conditions, the LOS would be an unacceptable LOS F during the PM peak hour. The addition of ECRCSF traffic would increase both the critical-movement delay and V/C ratio to meet the City of Sunnyvale's significant intersection impact criteria.

Potential Improvement: The Sunnyvale Traffic Impact Fee (TIF) identifies an improvement at this intersection to widen all approaches to include a second left-turn lane. All legs of the intersection could require widening by up to 12 feet. The widened approaches would increase traffic exposure time for pedestrians by 3 to 5 seconds and 1 to 3 seconds for bicyclists crossing the intersection.

With the proposed improvement, the intersection would remain operating at an unacceptable LOS F under cumulative conditions during the PM peak hour, but the intersection operations would improve in comparison to the Cumulative no ECRCSF conditions. The ECRCSF shall require projects within the plan area to contribute to the TIF, which would constitute their fair share contribution towards the identified improvement.

Wolfe Road & Reed Avenue (#45)

Under Cumulative no ECRCSF conditions, the LOS would be an acceptable LOS D during the PM peak hour. With the addition of ECRCSF traffic, the intersection operations would deteriorate to an unacceptable LOS E, which would meet Sunnyvale's significant intersection impact criteria.

Potential Improvement: Potential improvement would require restriping the westbound approach with 1 left-turn lane, 1 through lane, and 1 right-turn lane. This mitigation would not increase the pedestrian and bicycle exposure time to traffic at the intersection. No right-of-way acquisitions would be required.

With the proposed improvement, the intersection would operate at an acceptable LOS D under cumulative conditions during the PM peak hour.

Lawrence Expressway at Benton Street, at Homestead Road, and at Pruneridge Avenue (#54, 55, 56)

Under Cumulative no ECRCSP conditions, the LOS would be an unacceptable LOS F during the PM peak hour at all three intersections. The addition of ECRCSP traffic would increase both the critical-movement delay and V/C ratio to meet the City of Santa Clara's significant intersection impact criteria.

Potential Improvement: The County of Santa Clara has identified a future project to provide a grade separation at all these intersections. These would significantly improve the north-south flow of traffic and potentially address the project's impacts.

The ECRCSP shall require projects within the plan area to contribute their fair share towards the cost of these grade separations. These intersections are under Santa Clara County's jurisdiction; therefore, it is up to the County to approve and advance the proposed improvement at the intersection. Future project applicants within the ECRCSP area shall coordinate with the County on these improvements.

Freeway Levels of Service

In analyzing the freeway segments, the Sunnyvale Travel Demand Forecast Model (STFM) was used to project the increase in traffic volumes between existing and the year 2035 cumulative conditions. VTA CMP guidelines require freeway levels of service to be calculated based on density. However, congested freeway speed (used to measure density) cannot be accurately modeled. For the purpose of this study, freeway levels of service under the year 2035 cumulative conditions are instead calculated based on volume to capacity (V/C) ratio. A freeway segment is assumed to operate at LOS F under the year 2035 cumulative conditions if,

- The freeway segment already operates at LOS F under existing conditions, or
- The STFM forecasts the freeway segment to operate at a V/C ratio above 1 under the year 2035 cumulative conditions.

ECRCSP Freeway Impact Analysis

VTA CMP guidelines define that a project would cause a freeway impact if the project deteriorates freeway levels of service from an acceptable level to an unacceptable level, or if the freeway already operates at an unacceptable level under existing conditions, the project would add traffic exceeding 1% of the capacity. To determine the ECRCSP potential freeway impacts, a select zone analysis within the Sunnyvale Travel Demand Forecast Model was performed to estimate the increase in ECRCSP traffic volume between the Cumulative no ECRCSP and cumulative conditions. Freeway segments that would experience a significant ECRCSP impact are shown on Figures 19 to 22 and are identified below:

Mixed Flow Lanes – AM Peak Hour

- SR 85, northbound from Central Expressway to Moffett Boulevard
- SR 237, eastbound from Fair Oaks Avenue to Lawrence Expressway
- SR 237, eastbound from Great America Parkway to First Street

Mixed-Flow Lanes – PM Peak Hour

- SR 237, westbound from Zanker Road to Lawrence Expressway

The VTA's Valley Transportation Plan (VTP) 2040 identifies freeway express lane projects along SR 237 between N. First Street and SR 85, and along all of SR 85. On all identified freeway segments, the existing HOV lanes are proposed to be converted to express lanes. On SR 85 along the identified segments, a second express lane is proposed to be implemented for a total of two express lanes in each direction.

On SR 237, the existing HOV lanes would be operating over capacity under the year 2035 cumulative conditions. Converting the HOV lanes to express lanes would not mitigate the project impact. On SR 85, converting the existing HOV lane to an express lane and adding an express lane in each direction would increase the capacity of the freeway and would fully mitigate the freeway impacts. The ECRCSF should require future projects within the proposed plan area to make a fair-share contribution toward the cost of the identified express lane programs along SR 85, which is not part of the TIF.

However, capacity improvements on freeways are beyond the capabilities of the City of Sunnyvale. Furthermore, freeways are under Caltrans jurisdiction. It should be noted that all of these freeways have been identified with impacts under the *City of Sunnyvale Land Use and Transportation (LUTE) Element Final Environmental Impact Report*, dated January 2017.

DRAFT

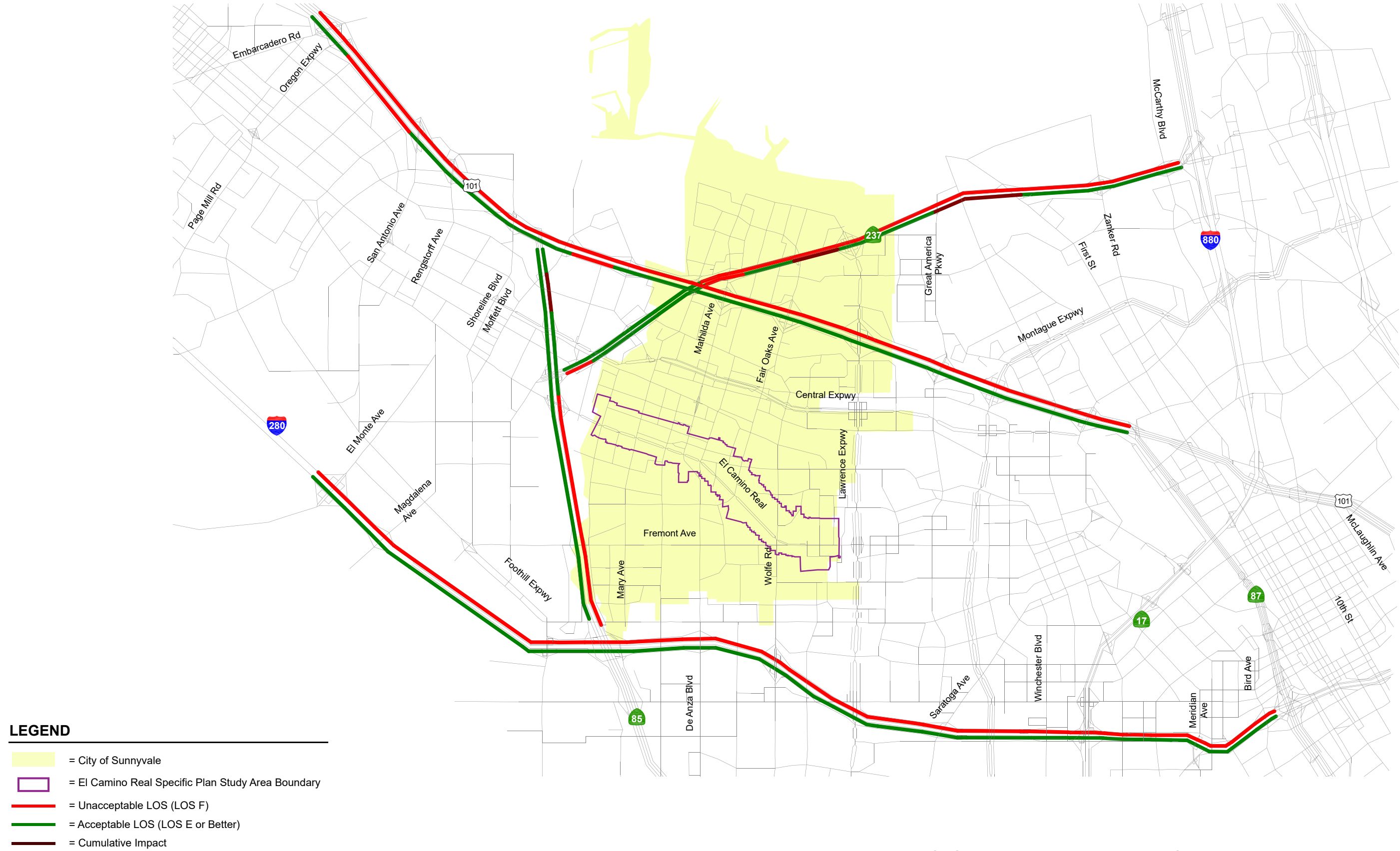
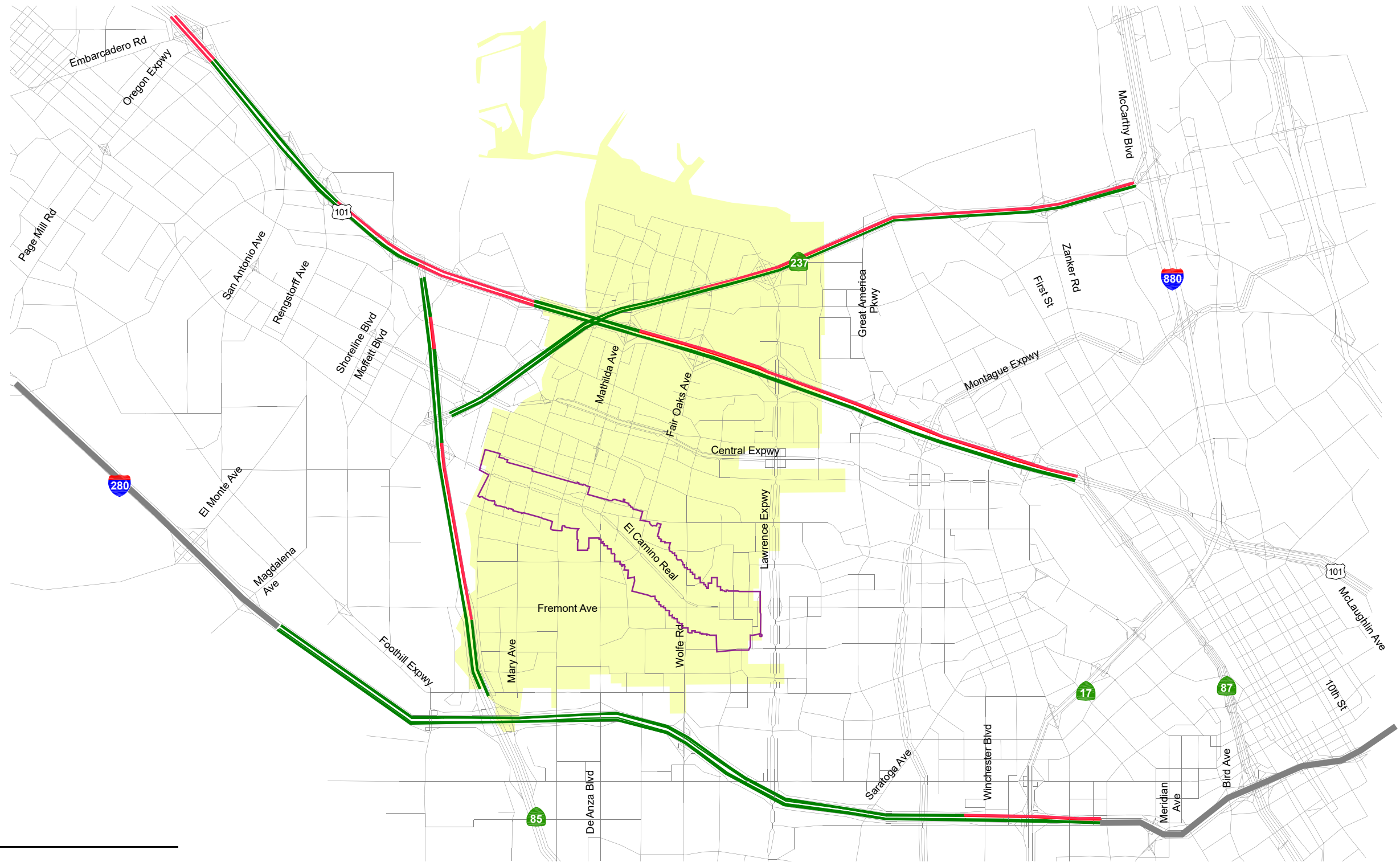


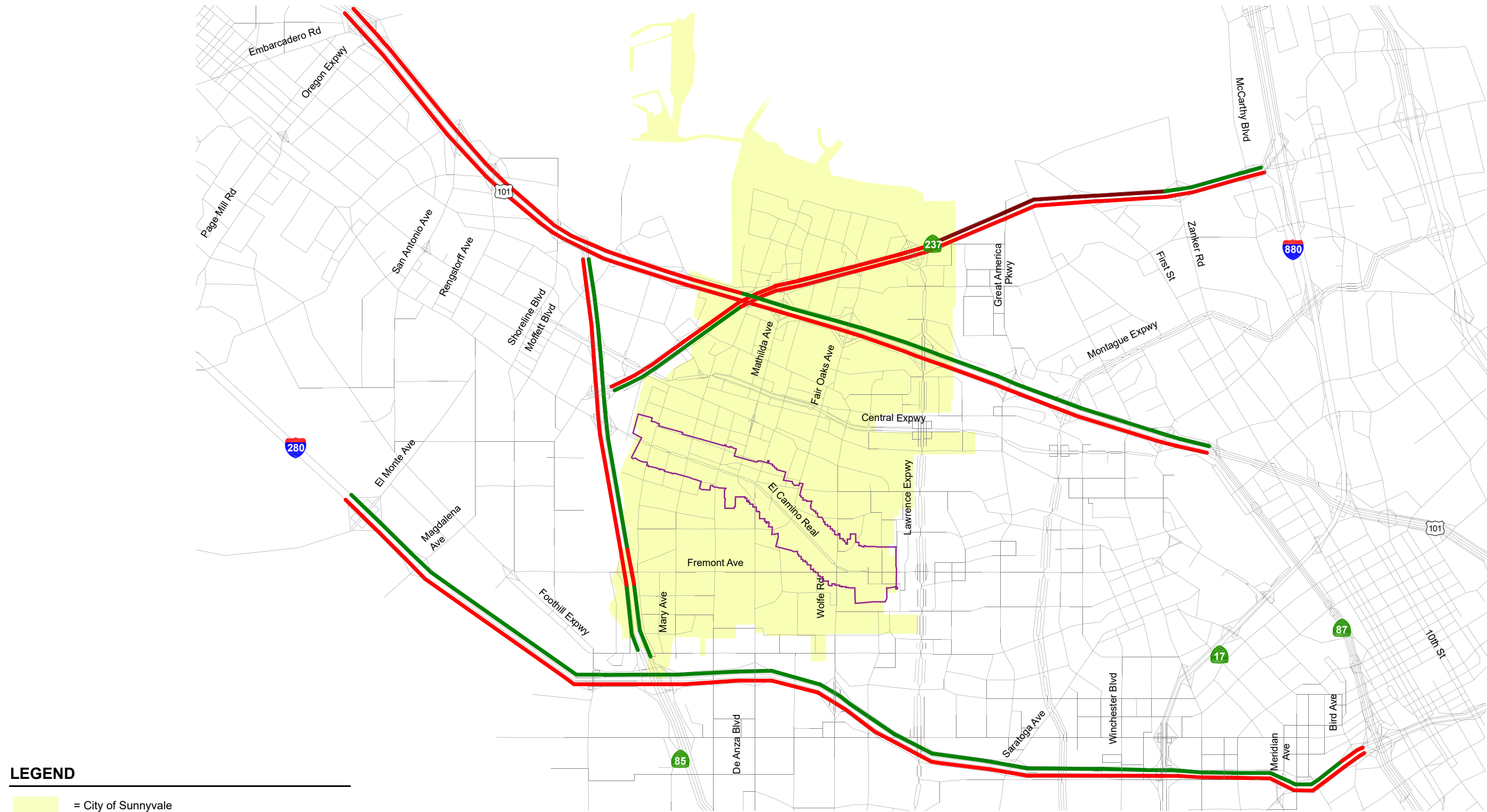
Figure 19
ECRSP Freeway Impact Analysis Summary - AM Peak-Hour - Mixed-Flow Lanes



LEGEND

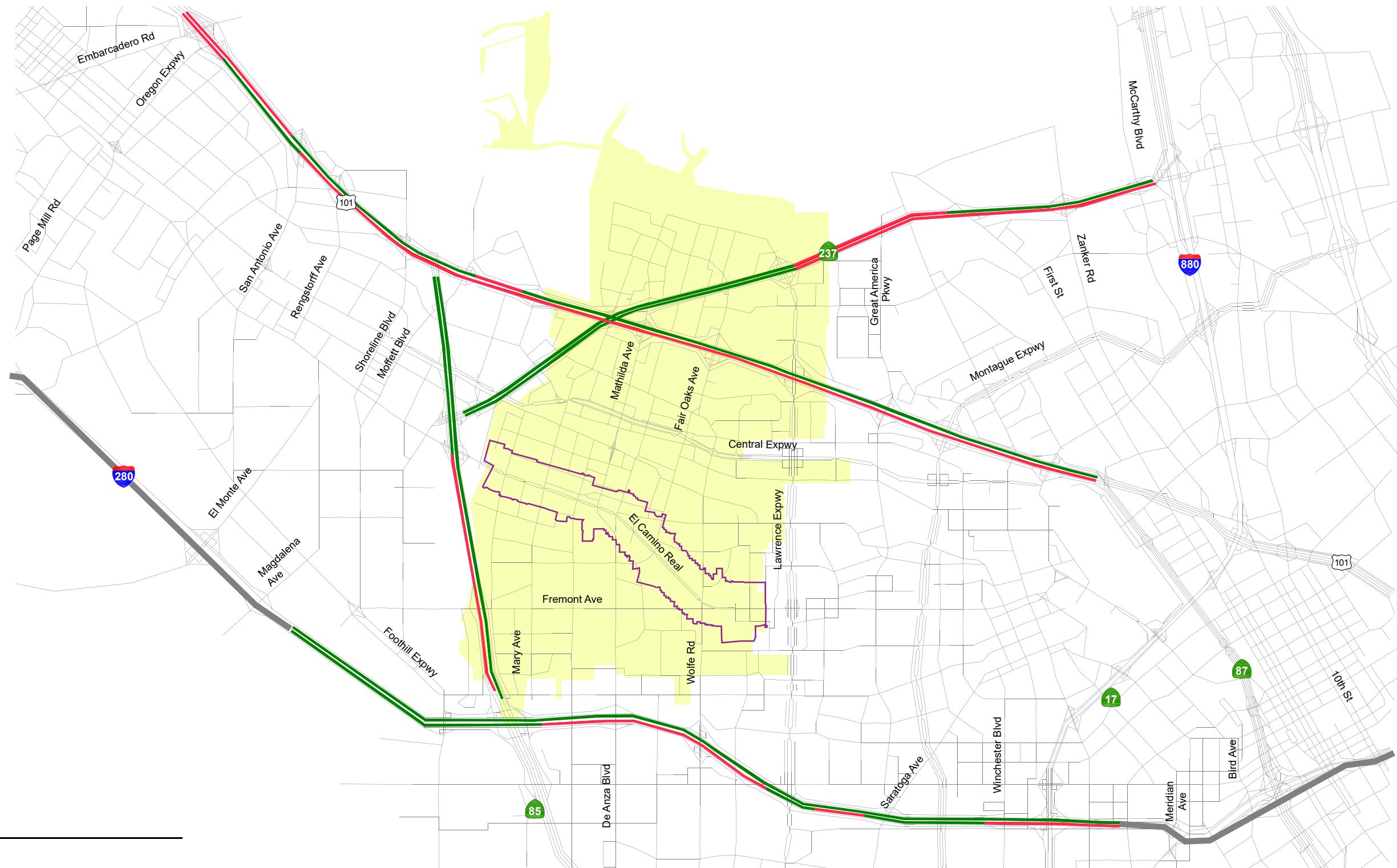
- = City of Sunnyvale
- = El Camino Real Specific Plan Study Area Boundary
- = Unacceptable LOS (LOS F)
- = Acceptable LOS (LOS E or Better)
- = Cumulative Impact
- = Freeway Segment has No HOV Lanes

Figure 20
ECRSP Freeway Impact Analysis Summary - AM Peak-Hour - HOV Lanes



- LEGEND**
- = City of Sunnyvale
 - = El Camino Real Specific Plan Study Area Boundary
 - = Unacceptable LOS (LOS F)
 - = Acceptable LOS (LOS E or Better)
 - = Cumulative Impact

Figure 21
ECRSP Freeway Impact Analysis Summary - PM Peak-Hour - Mixed-Flow Lanes



LEGEND

- = City of Sunnyvale
- = El Camino Real Specific Plan Study Area Boundary
- = Unacceptable LOS (LOS F)
- = Acceptable LOS (LOS E or Better)
- = Cumulative Impact
- = Freeway Segment has No HOV Lanes

Figure 22
ECRSP Freeway Impact Analysis Summary - PM Peak-Hour - HOV Lanes

Freeway Ramp Capacity Analysis

Definition of Significant Freeway Ramp Impacts

For the purpose of this study, the ECRCSP is said to create a significant adverse impact on a freeway ramp if its implementation:

1. Causes the volume-to-capacity (V/C) ratio of the freeway ramp to exceed 1.0; or
2. Increases the amount of traffic on a freeway ramp that is already exceeding its capacity by more than one percent (1%) of the ramp's capacity.

The freeway ramp volumes under year 2035 cumulative conditions were estimated using the Sunnyvale Travel Demand Forecast Model. The study freeway ramps at the US 101/Lawrence Expressway and US 101/Fair Oaks Avenue interchanges are assumed the same as under existing conditions. The US 101/Mathilda Avenue interchange is proposed for reconfiguration. This interchange improvement is identified in the Valley Transportation Plan 2040 (project H33). At the US 101/Mathilda Avenue interchange, the interchange would be reconfigured to a partial cloverleaf interchange. The US 101 northbound and southbound off-ramps would be improved to allow full access onto Mathilda Avenue and the existing US 101 northbound off-ramp to southbound Mathilda Avenue would be demolished (see Figure 23).

As shown on Table 10, all study freeway ramps would continue to operate below capacity.

Table 10
Year 2035 Cumulative Conditions Ramp Capacity Analysis

Interchange	Ramp	Type	Peak Hour	Existing Conditions		Year 2035 Cumulative Conditions		
				Volume ³	V/C	Volume	Capacity	V/C
US 101/Lawrence Expwy	SB On-Ramp fr. NB Lawrence Expwy	Diagonal	AM	584	0.32	800	1,800	0.44
			PM	352	0.20	884		0.49
	NB On-Ramp fr. NB Lawrence Expwy	Loop	AM	484	0.27	640	1,800	0.36
			PM	378	0.21	436		0.24
	NB Off-Ramp to Lawrence Expwy	Diagonal	AM	1,278	0.34	1,891	3,800	0.50
			PM	1,185	0.31	1,722		0.45
SB Off-Ramp to Lawrence Expwy	Diagonal	AM	738	0.19	1,099	3,800	0.29	
		PM	1,753	0.46	1,753		0.46	
US 101/Fair Oaks Ave	SB On-Ramp fr. NB Fair Oaks Ave	Diagonal	AM	616	0.34	550	1,800	0.31
			PM	225	0.13	223		0.12
	NB Off-Ramp to Fair Oaks Ave	Diagonal	AM	414	0.21	1,083	2,000	0.54
			PM	894	0.45	1,153		0.58
	NB On-Ramp fr. Fair Oaks Ave	Diagonal	AM	1,057	0.59	1,156	1,800	0.64
			PM	416	0.23	1,131		0.63
SB Off-Ramp to SB Fair Oaks Ave	Diagonal	AM	363	0.18	453	2,000	0.23	
		PM	893	0.45	1,099		0.55	
US 101/Mathilda Ave	SB On-Ramp fr. NB Mathilda Ave	Diagonal	AM	478	0.27	728	1,800	0.40
			PM	532	0.30	795		0.44
	NB On-Ramp fr. NB Mathilda Ave	Loop	AM	287	0.16	818	1,800	0.45
			PM	295	0.16	465		0.26
	NB Off-Ramp to Mathilda Ave *	Diagonal	AM	Future Ramp		1,607	3,800	0.42
			PM	Future Ramp		1,043		0.27
SB Off-Ramp to Mathilda Ave *	Diagonal	AM	Future Ramp		1,509	2,000	0.75	
		PM	Future Ramp		1,264		0.63	

Notes:

NB = Northbound, SB = Southbound, fr. = from

* Indicates newly constructed ramp under year 2035 conditions.

1. As a conservative approach, if an on-ramp has meter equipment present, the ramp is analyzed assuming it is metered.
2. Ramp capacities were obtained from *Highway Capacity Manual, 2000*, and considered the free-flow speed, the number of lanes on the ramp, and ramp metering.
3. Existing peak hour volumes are obtained through intersection counts and Caltrans.



Figure 23
 Planned Improvement at Mathilda Avenue/US 101/SR 237 Interchanges

ECRCSP Impact to Transit Travel Time

Currently 6 VTA bus routes travel within the ECRCSP project area. To assess the transit travel time impacts, the bus route travel times in the study area under year 2035 cumulative conditions were compared to existing conditions. Bus route travel times are estimated using published schedules and adjusted based on delays experienced at study intersections. VTA does not have established criteria to determine impact to transit services. Therefore, this analysis is presented for information purposes only.

As shown on Table 11, The results show that all studied transit routes under year 2035 cumulative conditions are expected to experience increases in travel times of less than 2 minutes in comparison to cumulative no ECRCSP conditions. The Sunnyvale Traffic Impact Fee (TIF) contains many projects that are aimed at relieving congestion along major corridors. Projects within the ECRCSP study area would be required to pay the TIF and would constitute the ECRCSP fair share contribution to relieving traffic congestion and improving transit travel times.

The ECRCSP Draft Plan also identifies various policies prioritizing consideration of mass transit vehicles to single-occupant vehicles. These policies would shift the design and policy decisions regarding El Camino Real to reflect multimodal priorities, including transit.

ECRCSP Impact to Pedestrian and Bicycle Facilities

The ECRCSP Draft Plan identifies various policies to improve pedestrian and bicycle facilities within the El Camino Real Corridor Specific Plan area. The relevant policies are listed below:

Circ-1: Promote modes of travel and actions that provide safe access to city streets and reduce single occupant vehicle trips and trip lengths locally and regionally.

The priority order of consideration of transportation users shall be:

- A. Pedestrians
- B. Non-automotive
- C. Mass transit vehicles
- D. Delivery Vehicles
- E. Single-occupant automobiles

Circ-2: Further develop El Camino Real as a Complete Street, with a focus on:

- A. Providing safe, convenient, accessible facilities for all modes including motor vehicles, transit, pedestrians and cyclists.
- ...
- C. Design and policy decisions regarding El Camino Real will reflect multimodal priorities and provide for safe, convenient and accessible travel by all modes of transportation including driving, walking, bicycling and riding transit.
- D. In making decisions regarding El Camino Real, the needs of more vulnerable road users such as children, seniors, and people with disabilities will be prioritized.
- E. Design and policy decisions regarding El Camino Real will seek to increase pedestrian activity, reduce pedestrian-related collisions, and enhance pedestrian-friendly conditions along the corridor.

The implementation of these policies would enhance pedestrian and bicycle safety, convenience and comfort levels. Therefore, the ECRCSP cumulative impact on pedestrian and bicycle facilities would be *less than significant*.

**Table 11
Transit Travel Time Analysis**

Route	Peak Hour	Existing		Cumulative no ECRCS	Cumulative Conditions		
		Travel Time (min)	Delay in the Study Area (min)	Delay in the Study Area (sec)	Delay in the Study Area (min)	Compared to Cumulative no ECRCS	
					Delay (min)	% Change	
<u>VTA 22</u>							
Eastbound	AM	120	8.2	8.2	8.3	0.1	0%
	PM	155	7.2	15.8	17.0	1.2	1%
Westbound	AM	135	7.9	11.3	11.3	0.0	0%
	PM	135	7.0	10.6	12.1	1.5	1%
<u>VTA 53</u>							
Northbound	AM	50	7.1	8.6	8.6	0.0	0%
	PM	60	7.7	9.6	10.2	0.6	1%
Southbound	AM	50	7.1	8.3	8.3	0.0	0%
	PM	45	7.9	13.6	14.1	0.5	1%
<u>VTA 55</u>							
Northbound	AM	60	5.1	11.3	11.5	0.2	0%
	PM	65	4.9	7.2	7.7	0.5	1%
Southbound	AM	50	5.1	6.2	6.3	0.1	0%
	PM	50	5.0	8.8	8.8	0.0	0%
<u>VTA 56</u>							
Northbound	AM	90	3.2	4.5	4.4	-0.1	0%
	PM	80	4.3	5.2	5.2	0.0	0%
Southbound	AM	80	4.0	6.6	6.7	0.1	0%
	PM	90	4.2	7	7.0	0.0	0%
<u>VTA 522</u>							
Eastbound	AM	105	8.2	8.2	8.3	0.1	0%
	PM	130	7.2	15.8	17.0	1.2	1%
Westbound	AM	110	7.9	11.3	11.3	0.0	0%
	PM	105	7.0	10.6	12.1	1.5	1%
<u>VTA 523</u>							
Northbound	AM	95	5.4	9.3	9.7	0.4	0%
	PM	115	7.1	9.6	10.1	0.5	0%
Southbound	AM	95	6.8	7.4	7.5	0.1	0%
	PM	100	6.6	12.6	12.8	0.2	0%

El Camino Real Corridor Specific Plan
Technical Appendices

January 27, 2020

Appendix A

Traffic Counts

Appendix B
Level of Service Calculations

Appendix C
City of Sunnyvale Land Use Summary