HEXAGON TRANSPORTATION CONSULTANTS, INC.

480 E. 4th Avenue Residential Development

General Plan Conformance Transportation Analysis

Prepared for:

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Executive Summary

This report presents the results of the transportation analysis conducted for the proposed residential development located at 480 E 4th Avenue in San Mateo, California. The project proposes a seven-story 225-unit residential complex to replace the existing parking lot on site. The project also proposes to construct a six-story 696-space parking garage to replace the existing parking lot at 400 E. 5th Avenue. The project would include a pedestrian bridge connecting the parking garage to the residential complex. 164 of the spaces in the parking garage would be reserved and gated for residential use, 234 spaces would be a replacement for the demolished parking lots, and the remaining 298 new spaces would be used as public parking for the downtown area. Access to the proposed parking garage would be provided via one driveway on E. 5th Avenue.

The purpose of the transportation study is to identify any potential transportation issues related to the proposed project and to review the proposed site access and circulation. Local intersection operations were evaluated following standards and methodologies set forth by the City of San Mateo. The transportation study includes an analysis of AM (7:00 – 9:00 AM) and PM (4:00 – 6:00 PM) peak hour traffic conditions during weekdays at 26 study intersections, 2 freeway segments and 4 freeway ramps in the vicinity of the project site.

Project Trip Estimates

Residential Trip Generation

Vehicle trips generated by the proposed residential component of the project were estimated using the trip rates published in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 10th Edition* (2017) for "Multifamily Housing Mid-Rise" (Land Use 221). As defined by the ITE, "mid-rise" multifamily housing are buildings that have between three and 10 floors.

Since this project is located in an urban area with proximity to transit and many destinations within walking and bicycling distance, Hexagon used US EPA's MXD model to determine the applicable trip reduction for the project. The MXD model (Mixed Use Trip Generation Model v 4.0, 2010) was developed by Fehr & Peers for the US EPA to account for internal trip capture and external walking, biking and transit trip reductions due to the nature of mixed-use developments and local area characteristics. It does not account for specific trip reduction strategies that the project might incorporate, such as shuttles, bus passes, or bike-share. Based on the MXD model, a 12% trip reduction during the AM peak hour, a 15% trip reduction during the PM peak hour, and a 16% daily trip reduction was applied. After crediting these reductions, the residential component of the proposed project (see Table ES-1) would generate 71 vehicle trips (18 inbound and 53 outbound trips) during the AM peak hour and 84 vehicle trips (51 inbound and 33 outbound trips) during the PM peak hour.

Reassigned Trips

Existing Parking Lot Trips

As discussed above, 234 parking spaces within the proposed garage would replace the existing parking lots on site. Trip generation of the existing parking lots on site was counted in May 2019. During the AM peak hour, the existing parking lots generated 73 trips (60 inbound and 13 outbound) and 72 trips (15 inbound and 57 outbound) during the PM peak hour. It is assumed that these parking spaces would generate the same number of trips under project conditions. These trips were reassigned to the new proposed driveway location on 5th Avenue.

In-Lieu Fee Office Trips

The City of San Mateo Municipal Code 27.64.100 states that projects within the central parking and improvement district (CPID) within the downtown specific planning area are allowed to satisfy their CPID-specific parking requirements through in-lieu fee payment. According to City staff, since year 2015, developments within the CPID district have paid for 325 in-lieu fee spaces:

- 221 S. El Camino Real – 92 in-lieu fee spaces
- 2 E. 3rd Avenue – 59 in-lieu fee spaces
- 405 E. 4th Avenue – 70 in-lieu fee spaces
- 406 E. 3rd Avenue – 104 in-lieu fee spaces

The 298 new parking spaces in the proposed garage are proposed to be built through the in-lieu parking program. Thus, these spaces can be associated with these developments. Since these 298 parking spaces are proposed to be delineated as 10-hour parking spaces, which are more catered towards employee parking, it is assumed that the office employees in these developments would utilize this garage. Based on the amount of in-lieu fee spaces paid by each project as well as each project's office trip generation during the peak hours (referencing the respective traffic studies), Hexagon reassigned office traffic to the project garage based on the proportions of office in-lieu spaces in the total parking spaces required by City code. It was estimated that approximately 127 trips (112 in and 15 out) during the AM peak hour and 123 trips (20 in and 103 out) during the PM peak hour would occur as a result of these office employees parking in the project garage. Table ES-1 shows the number of trips per approved project.

It should be noted that because the 405 E. 4th Avenue and 406 E. 3rd Avenue projects were not completed and occupied under existing conditions (base year 2018/2019), there is no traffic to be reassigned from these two projects under existing plus project conditions.

General Retail Trips

Later in the afternoon all 298 of the new spaces would not be occupied by office employees. Therefore, some would be used by downtown retail patrons. Using data provided by City staff on per-space trip generation for a 10-hour space during the PM peak hour, Hexagon derived an inbound trip generation rate of 0.085 trips and an outbound rate of 0.043 trips per 10-hour public space. Using these rates, Hexagon estimated that approximately 38 trips (25 in and 13 out) during the PM peak hour would occur as a result of general downtown retail patrons rerouting themselves to park in the project garage

Table ES- 1
Net Project Trip Generation

Land Use	Size	Unit	Daily Rate	Daily Total	AM Peak Hour Rate	AM In	AM Out	AM Total	PM Peak Hour Rate	PM %In	PM In	PM Out	PM Total
Proposed Uses													
Residential [1]	225	d.u.	5.44	1224	0.36	21	60	81	0.44	61%	60	39	99
Mixed-Use Reduction [2]				(196)		(3)	(7)	(10)			(9)	(6)	(15)
Residential Trips				1,028		18	53	71			51	33	84
Reassigned Trips													
298 Space - New 10-Hr Parking Spaces													
Reassigned In-Lieu Fee Office Trips [4]						112	15	127			20	103	123
221 S. El Camino Avenue (Clocktower bldg) [3]						*25*	*3*	*28*			*4*	*22*	*26*
2 E. 3rd Avenue (3rd and El Camino) [3]						*23*	*3*	*26*			*4*	*21*	*25*
405 E. 4th Ave. [3]						*32*	*4*	*36*			*6*	*29*	*35*
406 E 3rd Ave. [3]						*32*	*5*	*37*			*6*	*31*	*37*
Reassigned Retail Trips [3]						0	0	0			25	13	38
Replacement of Existing Parking Lot [5]						60	13	73		21%	15	57	72
Total Reassigned Trips [6]	532	Spaces	3.95	2,101		172	28	200			60	173	233

Notes:

1. Institute of Transportation Engineers, *Trip Generation* , 10th Edition, Land Use Code 221: Multifamily Housing (Mid-Rise), General Urban/Suburban (average rates, expressed in trips per dwelling unit)
2. Trip reduction of 12% in the AM and 15% in the PM, daily reduction calculated at 16%. Based on MXD model developed by Fehr & Peers for the US EPA to account for internal capture and external walking, biking, and transit trips due to mixed-use development and local area characteristics. (Mixed Use Trip Generation Model v 4.0, 2010)
3. It is assumed that some existing downtown retail patrons would choose to park in the proposed garage. Based on data provided by City staff for 10-hr public parking spaces, Hexagon estimated approximately 25 such vehicles. Outbound trips were estimated based on in-out split data provided by City staff for general retail parking (3-hr public spaces).
4. Since 2015, four projects have paid parking in-lieu fees. It is assumed that the office components of these developments would generate trips to this garage instead of to their project sites. Trip generation is estimated based on each development's development status, project size, and amount of paid in-lieu spaces.
5. The existing 234 parking spaces on-site would remain under project conditions. Peak hour trip generation was counted in May 2019.
6. Daily trip generation rates for 10-hr public parking spaces were based on observed data at the Main garage and Central garage as provided by City staff.

Intersection Level of Service Results

Existing plus Project Conditions

Under existing plus project conditions, the project would not generate substantial increases in intersection delays at any study intersection based on the City's General Plan criteria.

Background plus Project Conditions

Under background plus project conditions, the project would generate substantial increases in intersection delays based on the City's General Plan criteria at the following intersections:

- El Camino Real & 3rd Avenue – PM Peak Hour
- El Camino Real & 4th Avenue – PM Peak Hour
- El Camino Real & 5th Avenue – PM Peak Hour
- Delaware Street & 5th Avenue – PM Peak Hour
- Humboldt Street & 3rd Avenue – PM Peak Hour

Cumulative Conditions

Under cumulative conditions, the project would generate substantial increases in intersection delays based on the City's General Plan criteria at the following intersection:

- Delaware Street & 5th Avenue – AM & PM Peak Hours

Physical Improvements

The improvement required to address intersection deficiencies under background plus project conditions is restriping eastbound 5th Avenue with two through lanes. The two through lanes would be needed east of the proposed project driveway and would require the removal of the on-street parking spaces along eastbound 5th Avenue east of the proposed project driveway. At the Claremont Street intersection, eastbound 5th Avenue would be restriped with one shared left-through lane and one shared through-right lane. To allow for a second receiving lane along eastbound 5th Avenue, on-street parking spaces along eastbound 5th Avenue between Claremont Street and Delaware Street would need to be removed. At the Delaware Street intersection, eastbound 5th Avenue would be restriped with one left-turn lane and one shared through-right lane. To accommodate the expected volumes under background plus project conditions, the intersection of Delaware Street and 5th Avenue would require careful signal retiming.

The improvement required to address intersection deficiencies under cumulative plus project conditions is the same as under background plus project conditions. The improvements would resolve queueing issues on eastbound 5th Avenue near the project site. This would also eliminate the potential gridlock issues observed in the project condition simulations in downtown San Mateo. As a result, this improvement would also eliminate the substantial increases in intersection delays at the El Camino Real intersections and at Humboldt Street and 3rd Avenue.

Other Transportation Issues

Hexagon conducted a site plan review, queuing analysis as well as pedestrian, bicycle and transit facility analysis for the proposed project. Our recommendations are listed below.

Recommendations

- To prevent vehicle queueing on eastbound 5th Avenue in front of the project driveway, in addition to the proposed intersection improvement for a second eastbound through lane from the project driveway to Delaware Street, the project should also consider installing “Keep Clear” markings in front of the project driveway on eastbound 5th Avenue.
- The project should install crosswalks on all legs of the intersection at Claremont Street and 5th Avenue to complete the pedestrian network within the immediate project vicinity.
- To maintain adequate sight distance for vehicles exiting the project driveway, one parking space west of the driveway should be removed.
- The project should provide accessible parking spaces within the residential section of the parking garage in accordance with the CBC requirements.
- The project should establish a Transportation Demand Management (TDM) program to facilitate residents using alternative modes of transportation.

Table ES- 2
Intersection Levels of Service Summary

#	Intersection	Control	Peak Hour	Count Date	Note	Existing Avg. Delay (sec)	Existing LOS	Existing plus Project Avg. Delay (sec)	Existing plus Project LOS	Existing plus Project Incr. in Avg. Delay (3)	Background Avg. Delay (sec)	Background LOS	Background plus Project Avg. Delay (sec)	Background plus Project LOS	Background plus Project Incr. in Avg. Delay (3)	Improved Background plus Project Avg. Delay (sec)	Improved Background plus Project LOS	Improved Background plus Project Incr. in Avg. Delay (3)	Year 2030 no Project Conditions Avg. Delay (sec)	Year 2030 no Project Conditions LOS	Year 2030 GP Conditions Avg. Delay (sec)	Year 2030 GP Conditions LOS	Year 2030 GP Conditions Incr. in Avg. Delay (3)	Improved Year 2030 GP Conditions Avg. Delay (sec)	Improved Year 2030 GP Conditions LOS	Improved Year 2030 GP Conditions Incr. in Avg. Delay (3)
1	El Camino Real & 3rd Avenue	Signal	AM	05/16/19	(2)	14.9	B	14.7	B	-0.2	15.3	B	14.8	B	-0.5	14.9	B	-0.4	20.0	B	20.4	C	0.4	17.2	B	-2.8
			PM	05/16/19	(2)	19.3	B	19.3	B	0.0	27.5	C	**OVERSAT**	**F**	**53+**	26.5	C	-1.0	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.5**	23.6	C	-57
2	El Camino Real & 4th Avenue	Signal	AM	05/22/18	(2)	14.9	B	13.6	B	-1.3	14.2	B	13.0	B	-1.2	13.6	B	-0.6	16.0	B	14.6	B	-1.4	14.4	B	-1.6
			PM	05/22/18	(2)	14.9	B	15.8	B	0.9	17.8	B	**OVERSAT**	**F**	**63+**	17.7	B	-0.1	**OVERSAT**	**F**	**OVERSAT**	**F**	**-1.5**	28.2	C	-52
3	El Camino Real & 5th Avenue	Signal	AM	08/22/18	(2)	19.6	B	21.5	C	1.9	21.4	C	21.1	C	-0.3	21.7	C	0.3	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.4**	25.7	C	-55
			PM	08/22/18	(2)	18.4	B	25.0	C	6.6	34.1	C	**OVERSAT**	**F**	**46+**	29.1	C	-5.0	**OVERSAT**	**F**	**OVERSAT**	**F**	**3.0**	**46.3**	**D**	**-34**
4	El Camino Real & 9th Avenue	Signal	AM	05/16/19		6.6	A	6.6	A	0.0	7.3	A	7.3	A	0.0	7.3	A	0.0	7.9	A	7.9	A	0.0	7.9	A	0.0
			PM	05/16/19		7.6	A	7.6	A	0.0	8.9	A	9.0	A	0.1	9.0	A	0.1	9.8	A	9.8	A	0.0	9.8	A	0.0
5	San Mateo Drive & 5th Avenue	Signal	AM	05/22/18	(2)	11.9	B	13.4	B	1.5	13.5	B	13.4	B	-0.1	14.1	B	0.6	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.2**	**OVERSAT**	**F**	**0.2**
			PM	05/22/18	(2)	11.0	B	16.3	B	5.3	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.6**	**OVERSAT**	**F**	**0.6**	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.7**	**OVERSAT**	**F**	**0.7**
6	Ellsworth Avenue & 5th Avenue	TWCS (1)	AM	05/16/19	(2)	9.2	A	8.9	A	--	7.8	A	OVERSAT	F	--	8.9	A	--	OVERSAT	F	OVERSAT	F	0.6	OVERSAT	F	0.6
			PM	05/16/19	(2)	10.0	A	46.7	E	--	64.8	F	OVERSAT	F	--	OVERSAT	F	--	OVERSAT	F	OVERSAT	F	1.3	OVERSAT	F	1.3
7	B Street & 3rd Avenue	Signal	AM	05/16/19	(2)	13.1	B	13.5	B	0.4	14.4	B	14.1	B	-0.3	14.6	B	0.2	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.3**	**OVERSAT**	**F**	**-0.3**
			PM	05/16/19	(2)	15.8	B	21.9	C	6.1	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.3**	**OVERSAT**	**F**	**-0.3**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.4**	**OVERSAT**	**F**	**-0.4**
8	B Street & 4th Avenue	Signal	AM	05/22/18	(2)	12.1	B	13.4	B	1.3	12.9	B	13.7	B	0.8	13.6	B	0.7	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/22/18	(2)	18.5	B	22.8	C	4.3	**OVERSAT**	**F**	**OVERSAT**	**F**	**-1.0**	**OVERSAT**	**F**	**-1.0**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-3.4**	**OVERSAT**	**F**	**-3.4**
9	B Street & 5th Avenue	Signal	AM	05/22/18	(2)	14.5	B	15.3	B	0.8	15.6	B	14.5	B	-1.1	16.3	B	0.7	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.3**	**OVERSAT**	**F**	**0.3**
			PM	05/22/18	(2)	15.4	B	21.9	C	6.5	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.3**	**OVERSAT**	**F**	**1.3**	**OVERSAT**	**F**	**OVERSAT**	**F**	**2.2**	**OVERSAT**	**F**	**2.1**
10	B Street & 9th Avenue	Signal	AM	05/16/19		6.6	A	6.6	A	0.0	6.8	A	6.8	A	0.0	6.8	A	0.0	9.4	A	9.4	A	0.0	9.4	A	0.0
			PM	05/16/19		8.5	A	8.5	A	0.0	8.8	A	8.8	A	0.0	8.8	A	0.0	10.2	B	10.1	B	-0.1	10.1	B	-0.1
11	Claremont Street & 3rd Avenue	Signal	AM	05/22/18	(2)	7.8	A	8.3	A	0.5	8.6	A	8.0	A	-0.6	8.4	A	-0.2	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/22/18	(2)	11.8	B	23.5	C	11.7	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.2**	**OVERSAT**	**F**	**-0.2**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
12	Claremont Street & 4th Avenue	Signal	AM	05/22/18	(2)	17.6	B	18.0	B	0.4	18.1	B	17.7	B	-0.4	17.8	B	-0.3	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.4**	**OVERSAT**	**F**	**1.4**
			PM	05/22/18	(2)	41.9	D	44.5	D	2.6	**OVERSAT**	**F**	**OVERSAT**	**F**	**-20.8**	**OVERSAT**	**F**	**-20.8**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-31.3**	**OVERSAT**	**F**	**-31.3**
13	Claremont Street & 5th Avenue	AWCS	AM	05/22/18	(2)	12.7	B	15.6	C	--	13.9	B	17.1	C	--	15.8	C	--	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
			PM	05/22/18	(2)	31.1	D	37.0	E	--	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
14	Claremont Street & 9th Avenue	AWCS	AM	05/16/19		14.4	B	14.3	B	--	16.0	C	15.7	C	--	15.7	C	--	21.8	C	21.4	C	--	21.4	C	--
			PM	05/16/19		15.4	C	15.3	C	--	18.9	C	18.4	C	--	18.4	C	--	36.1	E	34.3	D	--	34.3	D	--
15	Delaware Street & 3rd Avenue	Signal	AM	05/16/19	(2)	26.8	C	25.8	C	-1.0	26.9	C	27.8	C	0.9	27.2	C	0.3	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/16/19	(2)	21.3	C	28.4	C	7.1	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
16	Delaware Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.2	C	20.0	B	-0.2	22.0	C	21.3	C	-0.7	21.7	C	-0.3	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/16/19	(2)	36.7	D	38.5	D	1.8	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.0**	**OVERSAT**	**F**	**0.0**	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.1**	**OVERSAT**	**F**	**0.1**
17	Delaware Street & 5th Avenue	Signal	AM	05/22/18	(2)	23.6	C	25.4	C	1.8	24.4	C	25.8	C	1.4	27.3	C	2.9	**OVERSAT**	**F**	**OVERSAT**	**F**	**12.1**	**OVERSAT**	**F**	**3.3**
			PM	05/22/18	(2)	26.8	C	34.0	C	7.2	**OVERSAT**	**F**	**OVERSAT**	**F**	**19.8**	**OVERSAT**	**F**	**3.2**	**OVERSAT**	**F**	**OVERSAT**	**F**	**27.1**	**OVERSAT**	**F**	**-1.8**
18	Delaware Street & 9th Avenue	Signal	AM	05/16/19		6.8	A	6.8	A	0.0	7.2	A	7.2	A	0.0	7.2	A	0.0	7.6	A	7.6	A	--	7.6	A	--
			PM	05/16/19		8.2	A	8.3	A	0.1	9.1	A	9.1	A	0.0	9.1	A	0.0	10.1	B	10.1	B	--	10.1	B	--
19	Fremont Street & 3rd Avenue	Signal	AM	05/16/19	(2)	11.6	B	11.1	B	-0.5	12.3	B	11.8	B	-0.5	12.1	B	-0.2	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.0**	**OVERSAT**	**F**	**0.0**
			PM	05/16/19	(2)	11.2	B	14.1	B	2.9	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.6**	26.3	C	0.6	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.8**	**OVERSAT**	**F**	**0.8**
20	Fremont Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.3	C	19.9	B	-0.4	21.7	C	19.9	B	-1.8	20.6	C	-1.1	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.3**	**OVERSAT**	**F**	**0.3**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.0**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-2.7**	**OVERSAT**	**F**	**-2.7**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-2.8**	**OVERSAT**	**F**	**-2.8**
21	Fremont Street & 5th Avenue	AWCS	AM	05/16/19	(2)	7.0	A	7.5	A	--	7.3	A	7.2	A	--	7.5	A	--	OVERSAT	F	OVERSAT	F	0.2	OVERSAT	F	0.2
			PM	05/16/19	(2)	8.3	A	8.2	A	--	OVERSAT	F	OVERSAT	F	--	8.8	A	--	OVERSAT	F	OVERSAT	F	0.3	OVERSAT	F	0.3
22	Humbolt Street & 3rd Avenue	Signal	AM	05/16/19	(2)	32.9	C	29.0	C	-3.9	**47.7**	**D**	36.1	D	-11.6	40.2	D	-7.5	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.9**	**OVERSAT**	**F**	**1.9**
			PM	05/16/19	(2)	**96.5**	**F**	**97.1**	**F**	**0.6**	**65.9**	**E**	**OVERSAT**	**F**	**15+**	**60.2**	**E**	**-5.7**	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.8**	**OVERSAT**	**F**	**0.8**
23	Humbolt Street & 4th Avenue	Signal	AM	05/16/19	(2)	21.8	C	20.9	C	-0.9	21.2	C	20.3	C	-0.9	21.4	C	0.2	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.9**	**OVERSAT**	**F**	**1.9**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.4**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-2.3**	**OVERSAT**	**F**	**-2.3**	**OVERSAT**	**F**	**OVERSAT**	**F**	**-1.7**	**OVERSAT**	**F**	**-1.7**
24	Humbolt Street & 5th Avenue	AWCS	AM	05/16/19	(2)	9.2	A	8.1	A	--	8.3	A	8.4	A	--	8.2	A	--	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
			PM	05/16/19	(2)	107.1	F	119.2	F	--	OVERSAT	F	OVERSAT	F	--	39.1	E	--	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
25	Humbolt Street & 9th Avenue	AWCS	AM	05/16/19		8.3	A	8.3	A	--	8.3	A	8.3	A	--	8.3	A	--	8.8	A	8.8	A	--	8.8	A	--
			PM	05/16/19		8.5	A	8.5	A	--	8.5	A	8.5	A	--	8.5	A	--	9.9	A	9.9	A	--	9.9	A	--
26	Norfolk Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**57.5**	**E**	**57.6**	**E**	**0.1**	**61.3**	**E**	**60.1**	**E**	**-1.2**	**63.9**	**E**	**2.6**	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.1**	**OVERSAT**	**F**	**0.1**
			PM	05/22/18	(2)	**64.0**	**E**	**63.4**	**E**	**-0.6**	**OVERSAT**	**F**	**62.2**	**E**	**0.2**	**63.6**	**E**	**0.2**	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.2**	**OVERSAT**	**F**	**0.2**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.
(3) A Synchro model calibrated based on existing simulation results is used to calculate increases in average delays for intersections that are oversaturated under both the "no project" and "project" scenarios.

BOLD indicates a substandard level of service.
boxed and BOLD indicates substantial increases in intersection delay.

1. Introduction

This report presents the results of the transportation analysis conducted for the proposed residential development located at 480 E 4th Avenue in San Mateo, California (see Figure 1). The project proposes a seven-story 225-unit residential complex to replace the existing parking lot on site. The project also proposes to construct a six-story 696-space parking garage to replace the existing parking lot at 400 E. 5th Avenue. The project would include a pedestrian bridge connecting the parking garage to the residential complex (see Figure 2). 164 of the spaces in the parking garage would be reserved and gated for residential use, 234 spaces would be a replacement for the demolished parking lots, and the remaining 298 new spaces would be used as public parking for the downtown area. Access to the proposed parking garage would be provided via one driveway on E. 5th Avenue.

Scope of Study

The purpose of the transportation study is to identify any potential transportation issues related to the proposed project and to review the proposed site access and circulation, with a description of project parking. Local intersection operations were evaluated following standards and methodologies set forth by the City of San Mateo. The transportation study includes an analysis of AM (7-9 AM) and PM (4-6 PM) peak hour traffic conditions during weekdays at the following study intersections:

Study Intersections

1. El Camino Real & 3rd Avenue
2. El Camino Real & 4th Avenue
3. El Camino Real & 5th Avenue
4. El Camino Real & 9th Avenue
5. San Mateo Drive & 5th Avenue
6. Ellswor th Avenue & 5th Avenue [unsignalized]
7. B Street & 3rd Avenue
8. B Street & 4th Avenue
9. B Street & 5th Avenue
10. B Street & 9th Avenue
11. Claremont Street & 3rd Avenue
12. Claremont Street & 4th Avenue
13. Claremont Street & 5th Avenue [unsignalized]
14. Claremont Street & 9th Avenue [unsignalized]
15. Delaware Street & 3rd Avenue
16. Delaware Street & 4th Avenue
17. Delaware Street & 5th Avenue

18. Delaware Street & 9th Avenue
19. Fremont Street & 3rd Avenue
20. Fremont Street & 4th Avenue
21. Fremont Street & 5th Avenue [unsignalized]
22. Humboldt Street & 3rd Avenue
23. Humboldt Street & 4th Avenue
24. Humboldt Street & 5th Avenue [unsignalized]
25. Humboldt Street & 9th Avenue [unsignalized]
26. Norfolk Street & 3rd Avenue

Study Freeway Segments

1. US 101 North of 3rd Avenue/4th Avenue
2. US 101 South of 3rd Avenue/4th Avenue

Study Freeway Ramps

1. US 101 Northbound Loop On-Ramp from 3rd Avenue
2. US 101 Northbound Loop Off-Ramp to 3rd Avenue
3. US 101 Southbound Diagonal Off-Ramp to 3rd Avenue
4. US 101 Southbound Diagonal On-Ramp from 4th Avenue

Traffic conditions at the study intersections were analyzed for the weekday AM and PM peak hours of adjacent street traffic. The AM peak hour of adjacent street traffic is generally between 7:00 and 9:00 AM, and the PM peak hour of adjacent street traffic is typically between 4:00 and 6:00 PM. It is during these periods on an average weekday that the most congested traffic conditions occur.

Traffic conditions were evaluated for the following scenarios:

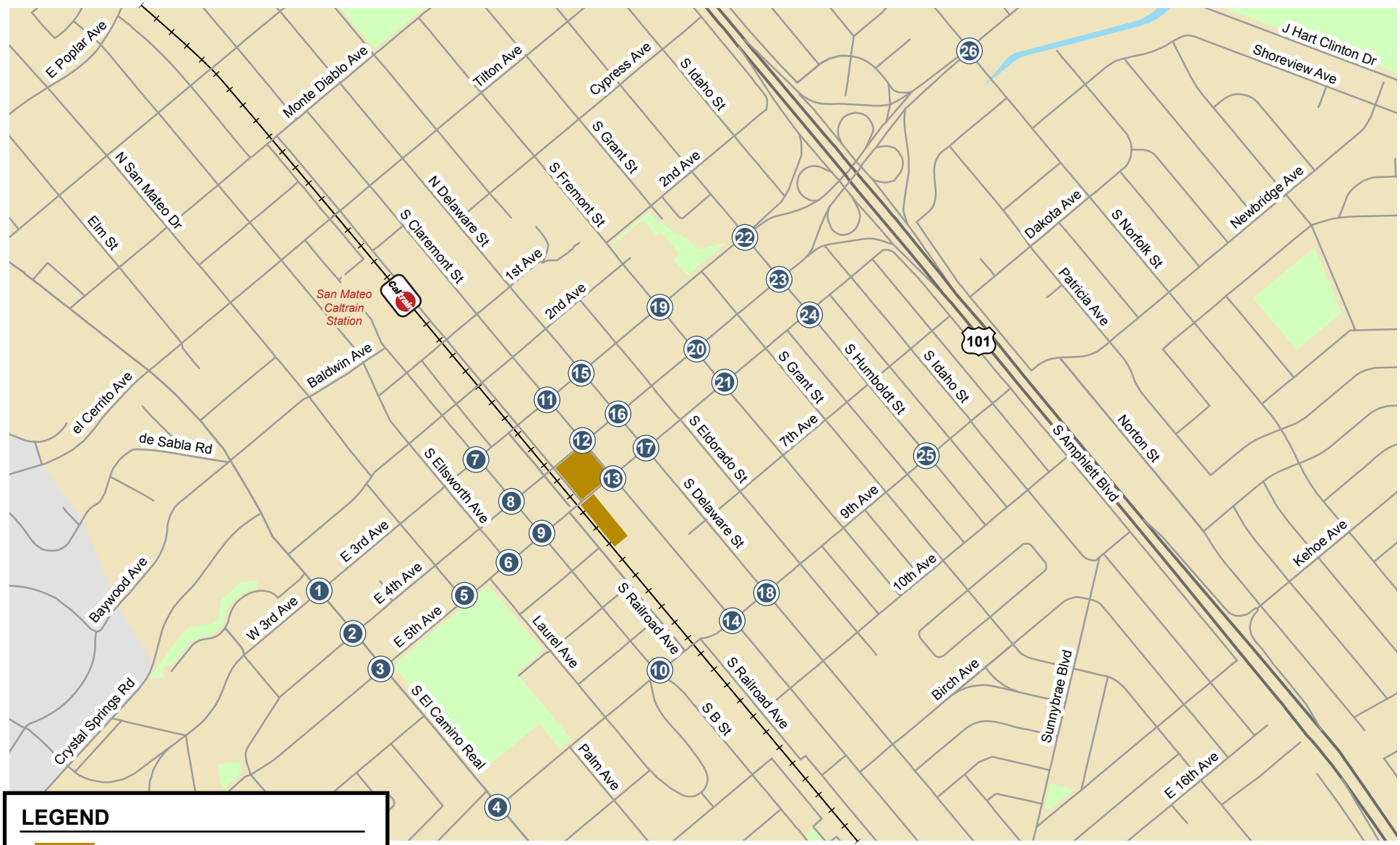
Scenario 1: *Existing Conditions.* Existing traffic volumes were obtained from new manual turning movement counts conducted in February and May of 2018 and January of 2019. All traffic count data are contained in Appendix A.

Scenario 2: *Existing Plus Project Conditions.* Existing plus project traffic volumes were estimated by adding to existing traffic volumes the trips associated with the proposed project. Existing plus project conditions were evaluated relative to existing conditions in order to determine potential project-generated substantial increases in intersection delay.

Scenario 3: *Background Conditions.* Background traffic volumes were estimated by adding to existing peak hour volumes the projected volumes from approved but not yet completed developments.

Scenario 4: *Background Plus Project Conditions.* Background plus project traffic volumes were estimated by adding to background traffic volumes the trips associated with the proposed project. Background plus project conditions were evaluated relative to background conditions in order to determine potential project-generated substantial increases in intersection delay.

Scenario 5: *2030 Cumulative Conditions*. 2030 Cumulative conditions represent future traffic volumes on the future transportation network in accordance with the San Mateo General Plan. The 2030 AM and PM peak hour traffic volumes were based on the City of San Mateo General Plan 2030 travel demand forecasting model. Cumulative no project conditions were evaluated by subtracting the net project trips generated at the study intersections from the General Plan conditions traffic volumes. Physical improvements were identified to eliminate project-generated substantial increases in intersection delay.



LEGEND

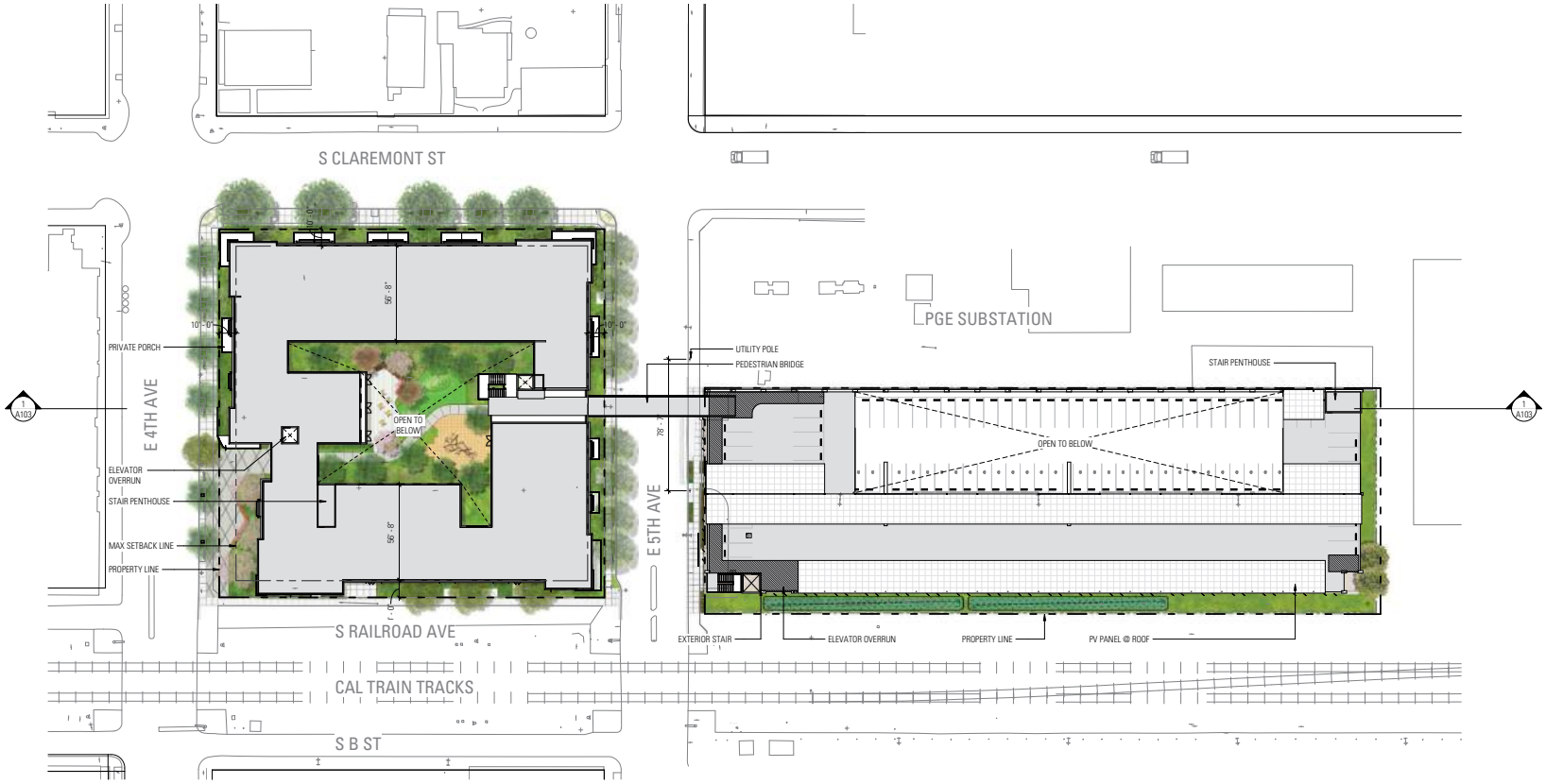
= Site Location

X = Study Intersection

Figure 1
Site Location and Study Intersections

HEXAGON

NORTH
Not to Scale



1 A102 **SITE PLAN** 1" = 30'-0"

SCALE: 1" = 30'-0"

DOWNTOWN SAN MATEO OPPORTUNITY SITES SAN MATEO, CA				SITE PLAN - ROOF PLAN
	07.10.19	17009	BAR architects / MidPen Housing	A102

Figure 2
Site Plan

NORTH
Not to Scale

Methodology

This section describes 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 field observations, new traffic counts, previous traffic studies, the City of San Mateo, and the Institute of Transportation Engineers (ITE) *Trip Generation, 10th Edition*. The following data were collected from these sources:

- Existing traffic volumes
- Existing lane geometries
- Signal timing and phasing
- Approved but not yet completed projects
- Applicable trip generation rates

Analysis Methodologies and Level of Service Standards

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

City of San Mateo Intersections

This study utilizes the 2010 Highway Capacity Manual (HCM) methodology for signalized intersections, calculated with Synchro software. This method evaluates intersection operations on the basis of average control delay time for all vehicles at the intersection. This average delay can then be correlated to a level of service. Table 1 presents the level of service definitions for signalized intersections. The City of San Mateo level of service standard is mid-LOS D (delay of 45 seconds) or better for all of the signalized study intersections.

It should be noted that intersections along the 3rd Avenue, 4th Avenue, and 5th Avenue corridors experience feedback queue issues beyond what is reflected in the typical HCM level of service calculations by Synchro. Therefore, a microsimulation model of the corridors was developed using the SimTraffic software to better reflect intersection operating conditions. Unlike the typical intersection analysis models such as the Highway Capacity Manual that analyze intersections in isolation, SimTraffic is a model that measures the full impact of queuing and blocking attributed to closely spaced intersections by simulating the travel of each vehicle. In addition to reporting statistics such as average vehicle delay, the simulation software produces visual animation files that depict traffic operations. AM and PM peak hour existing traffic models were calibrated based on observed queuing and field signal timing data.

Unsignalized Intersections

Levels of service at the unsignalized intersections were based on the 2010 *Highway Capacity Manual* method, calculated with Synchro software. This method is applicable for both two-way and all-way stop-controlled intersections. One unsignalized study intersection operates with side-street stop control, and the remaining five operate with all-way stop control. For side-street stop-controlled intersections, the reported levels of service are based on the worst approach delay at the intersection. The level of service for the all-way stop-controlled intersections are based on the average delay for all the intersection approaches. The City of San Mateo does not have a level of service standard for

unsignalized intersections. Therefore, intersection levels of service for unsignalized intersections are reported for informational purposes only. The correlation between average control delay and LOS for unsignalized intersections is shown in Table 2.

Table 1
Signalized Intersection Level of Service Definition Based on Average 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. More vehicles stop than with LOS A, causing higher levels of average vehicle delay.	10.1 to 20.0
C	Higher delays may result from fair signal progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.	20.1 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable signal progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	This is considered to be the limit of acceptable delay. These high delay values generally indicate poor signal progression, long cycle lengths, and high volume-to-capacity (V/C) ratios. Individual cycle failures occur frequently.	55.1 to 80.0
F	This level of delay is considered unacceptable by most drivers. This condition often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major-contributing causes of such delay levels.	greater than 80.0

Source: Transportation Research Board, *2010 Highway Capacity Manual* (Washington, D.C., 2010) p18-6.

Table 2
Unsignalized Intersection Level of Service Definition Based on Average Delay

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

Source: Transportation Research Board, *2010 Highway Capacity Manual* (Washington, D.C., 2010) p20-3.

Freeway Segments

Per CMP technical guidelines, a freeway segment LOS analysis is required when a project is expected to add trips greater than one percent of a segment's capacity. Per the C/CAG *Final San Mateo County Congestion Management Program 2017 Appendix B*, freeways with six or more lanes are assumed to have a capacity of 2,300 vehicles per lane. Given that the number of project trips added to the freeways in the area is estimated to be less than the one percent threshold of freeway capacity, a detailed analysis of freeway segment levels of service was not performed. A simple freeway segment capacity evaluation to substantiate this determination is presented in Table 3.

Table 3
Freeway Check

				Existing Conditions[1]			Project Conditions		
Freeway	Segment	Dir	Peak Hour	# of Lanes	Capacity	LOS	Project Trips	% Capacity	Impact
US 101	SR 92 to Peninsula Avenue	NB/SB	AM	4	9,200	F	15	0.16%	NO
			PM	4	9,200	F	17	0.18%	NO

Notes:
1. Existing freeway conditions references San Mateo County Congestion Management Program 2017

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. Hexagon observed the study freeway ramps in May of 2019 and observed that some on-ramps are metered during certain peak periods. Therefore, this analysis consisted of a volume-to-capacity ratio evaluation for all study ramps to determine whether the ramps would have sufficient capacity to serve the additional project traffic. Additionally, a queuing analysis was performed for the metered on-ramps to determine the adequacy of ramp queue space under project conditions. The ramp capacities were obtained from the *Highway Capacity Manual 2000*, and considered the free-flow speed, the number of lanes on the ramp, and ramp metering. The *Highway Capacity Manual 2010* was not referenced because it does not report ramp capacities.

Report Organization

This report has a total of seven chapters. Chapter 2 describes existing conditions including the existing roadway network, transit service, bicycle and pedestrian facilities. Chapter 3 presents the traffic conditions in the study area under background conditions. Chapter 4 describes the methods used to estimate the project traffic on the roadway network and presents the intersection operations under background plus project and existing plus project conditions. Year 2030 cumulative conditions are presented in Chapter 5. Chapter 6 provides an evaluation of other transportation-related issues, such as vehicle queuing, potential project impacts on bicycle, pedestrian, and transit facilities, site access, on-site circulation, and parking. Chapter 7 presents the study conclusions including a summary of any proposed mitigation measures and recommended improvements.

2. Existing Conditions

This chapter describes the existing conditions for all of the major transportation facilities in the vicinity of the project site, including the roadway network, transit service, and bicycle and pedestrian facilities. Also included are the existing levels of service of the study intersections.

Existing Roadway Network

Regional access to the project study area is provided by US 101. These facilities are described below.

US 101 is an eight-lane north-south freeway in the vicinity of the site. US 101 extends northward through San Francisco and southward through San Jose. Access to and from the project study area is provided via its interchange at 3rd Avenue.

Local access to the project site is provided via El Camino Real, 3rd Avenue, 4th Avenue, 5th Avenue, 9th Avenue, B Street, Claremont Street and Delaware Street. These roadways are described below.

El Camino Real is a six-lane north-south arterial within the project vicinity with a posted speed limit at 35 miles per hour (mph). El Camino Real extends from Santa Clara County through San Mateo County. On-street parking is permitted along El Camino Real from Mission Drive to 9th Avenue in the project vicinity. Sidewalks are present on both sides of the road within the vicinity of the project. All signalized intersections along El Camino Real within the project vicinity have crosswalks with actuated pedestrian push buttons and signal heads. El Camino Real provides access to the project site via the intersections at 3rd Avenue, 4th Avenue, 5th Avenue, and 9th Avenue

Delaware Street is a two- to four-lane north-south arterial extending from 25th Avenue in the south to Peninsula Avenue in the north. On-street parking is allowed only north of Second Avenue and south of 5th Avenue. There are sidewalks along both sides of Delaware Street. All intersections along Delaware Street within the project vicinity have crosswalks on all legs with actuated pedestrian push buttons and signal heads. Delaware Street provides project access via 5th Avenue.

B Street is a two-lane north-south roadway within the project vicinity. Sidewalks are present on both sides of the street for its entirety. On-street parking is permitted on both sides of the street for its entirety within the project vicinity. B Street provides project access via the 5th Avenue intersection.

Claremont Street is a two-lane north-south roadway within the project vicinity. Sidewalks are present on both sides of the street for its entirety. On-street parking is permitted on both sides of the street for its entirety within the project vicinity. Claremont Street provides project access via the 5th Avenue intersection.

3rd Avenue is a two-lane east-west arterial from El Camino Real to Delaware Street. From Delaware Street to the US 101 interchange, 3rd Avenue is a westbound two- to three-lane arterial. East of the US interchange, 3rd Avenue is a two-way street with two- to three-lanes in each direction. Sidewalks are present on both sides of the street for its entirety. On-street parking is permitted on both sides of the street along most segments of the roadway from El Camino Real to Fremont Street and only along the south side of 3rd Avenue from Fremont Street to Humboldt Street. 3rd Avenue provides project access via B Street and Claremont Street.

4th Avenue is a three- to four-lane east-west arterial from El Camino Real to Delaware Street. From Delaware Street to the US 101 interchange, 4th Avenue is an eastbound two- to three-lane arterial. East of the US 101 interchange, 4th Avenue merges with 3rd Avenue. Sidewalks are present on both sides of the street for its entirety. On-street parking is permitted on both sides of the street within the project vicinity. 4th Avenue provides project access via B Street and Claremont Street.

5th Avenue is a two-lane east-west roadway within the project vicinity. Sidewalks are present on both sides of the street for its entirety. On-street parking is permitted on the westbound side of the street for its entirety except from B Street to Laurel Street. On-street parking is permitted along both sides of the street for most segments of the roadway. 5th Avenue provides direct project access.

9th Avenue is a two-lane east-west roadway within the project vicinity spanning from El Camino Real to Amphlett Boulevard. Sidewalks are present on both sides of the street for its entirety. On-street parking is permitted on both sides of the street for its entirety. 9th Avenue provides project access via Claremont Street and B Street.

Existing Pedestrian and Bicycle Facilities

The City-designated bicycle facilities in the project vicinity include Class I bike paths, Class II bike lanes, and Class III bike routes (see Figure 3). Bike paths are shared between pedestrians and bicyclists and separated from motor vehicle traffic. Bike lanes are lanes on roadways designated for use by bicycles with special lane markings, pavement legends, and signage. Bike routes are existing streets that accommodate bicycles but are not separate from the existing travel lanes. Bike routes are typically designated only with signs or pavement markings.

The City of San Mateo *Bicycle Master Plan (2011)* indicates there is a Class I bike path on 3rd Avenue/4th Avenue across US 101. This bike path is mainly along the center of the road between Humboldt Street and Norfolk Street. The Class II bike lanes and Class III bike routes that exist within the project vicinity are shown on Figure 3. Overall, the north-south bicycle connectivity within the project vicinity is adequate. The east-west bicycle connectivity within the project vicinity is minimal. However, continuous bicycle facilities are present between the project site and the nearby San Mateo Caltrain station. At the time of this report, the City of San Mateo is currently updating its citywide Bicycle Master Plan.

Pedestrian facilities near the project site consist of sidewalks along both sides of all roadways, as well as crosswalks at all signalized intersections. Signalized intersections in downtown San Mateo between San Mateo Drive and Delaware Street all have a pedestrian leading interval. Within the immediate vicinity of the project site, the intersections along Claremont Street at 3rd Avenue and at 4th Avenue both have bulbouts that reduce the crosswalk lengths and pedestrian exposure to traffic. There are no crosswalks at the all-way stop controlled intersection of Claremont Street and 5th Avenue. Continuous pedestrian facilities are present between the residential component of the project and the nearby San Mateo Caltrain station.

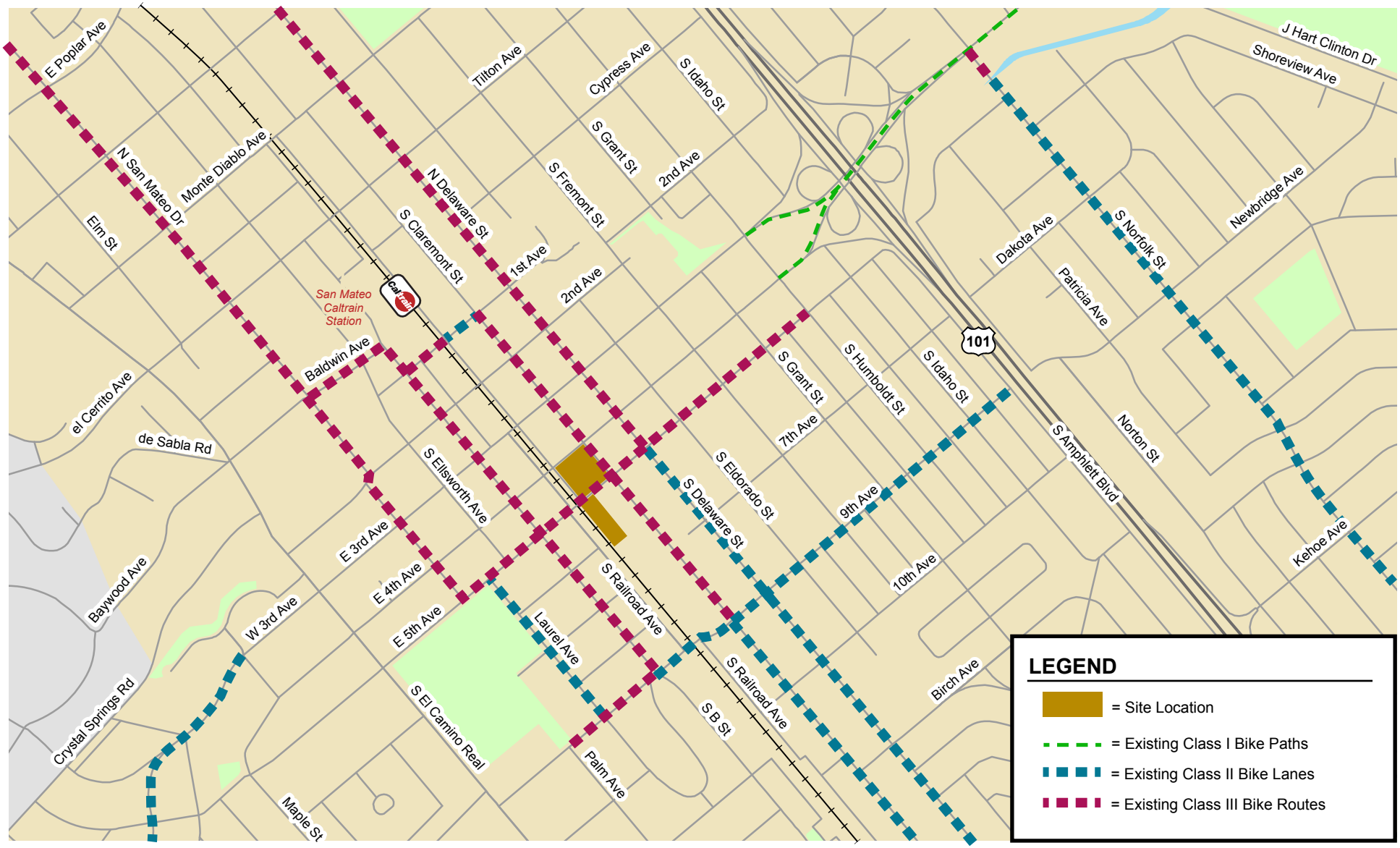


Figure 3
Existing Bicycle Facilities

NORTH
Not to Scale

Existing Transit Service

Existing transit service to the study area is provided by the San Mateo County Transit District (SamTrans) and Caltrain. The bus routes that provide peak-hour services near the project site are described in Table 4 and shown on Figure 4.

Table 4
Existing Bus Service

Bus Route	Description	Operating Hours	Peak-Hour Headway	Closest Bus Stop	Walk Distance to Project Site
53*^	Between Peninsula/Humbolt and Borel School	7:15 AM to 7:50 AM (12:50 PM to 1:20 PM)^ (1 PM to 3:30 PM)*	3-4 min.	2nd Avenue & Delaware Street	1,584 feet
59*^	Between Norfolk/Hillsdale and Aragon High School	(7:20 AM to 7:45 AM)* (8:50 AM to 9:15 AM)^ 3:30 PM to 4:00 PM	N/A	4th Avenue & Delaware Street	528 feet
250	Between College of San Mateo and 5th/El Camino	5:40 AM to 11:00 PM	30 min.	4th Avenue & Delaware Street	528 feet
292	Between Downtown San Francisco and Hillsdale Mall	4:00 AM to 2:30 AM	30 min.	2nd Avenue & Delaware Street	1,584 feet
295	Between Redwood City Caltran and San Mateo Caltrain	6:20 AM to 7:30 PM	60 min.	4th Avenue & Ellsworth Avenue	528 feet

Notes:
*School Days only - Monday, Tuesday, Thursday, Friday
^School Days only - Wednesday

Caltrain Service

Commuter rail service between San Francisco and Gilroy is provided by Caltrain. The project site is located about 1,600 feet south of the San Mateo Caltrain station, which is about a 7-minute walk or a 3-minute bike ride. Caltrain provides service with approximately 15 to 60-minute headways during the weekday AM and PM commute hours, midday, and at nights. Service is provided with approximately 40 to 90-minute headways on weekends. Continuous pedestrian facilities exist between the project site and the Caltrain station. SamTrans routes 59, 250, 292, and 295 all stop at the San Mateo Caltrain Station.

Existing Intersection Lane Configurations and Traffic Volumes

The existing lane configurations at the study intersections were confirmed by observations in the field and are shown on Figure 5. Existing traffic volumes were obtained from new peak hour counts collected in May 2018 and 2019. The existing AM and PM peak hour intersection volumes are shown in Figure 6. Intersection turning-movement count data are presented in Appendix A.

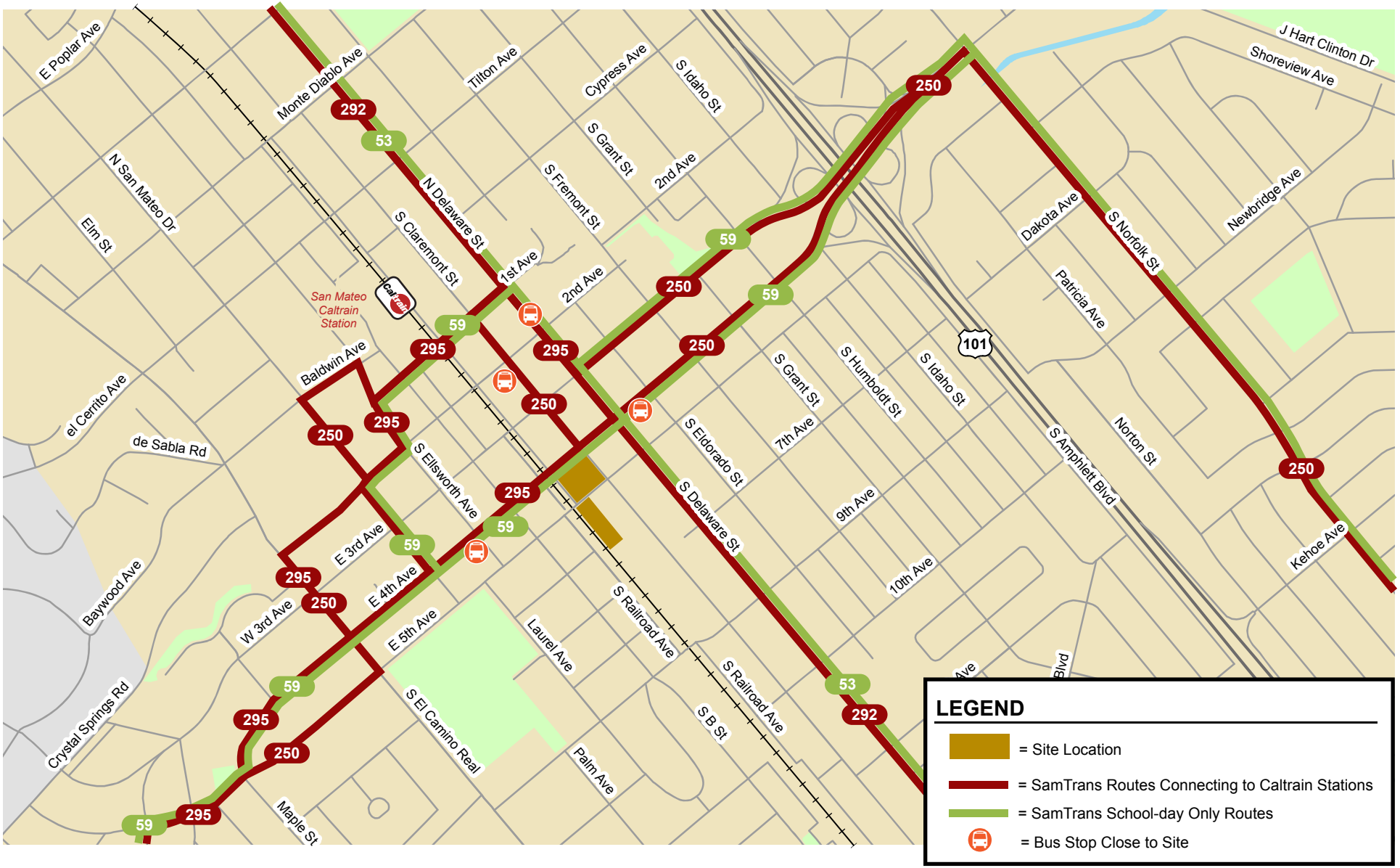
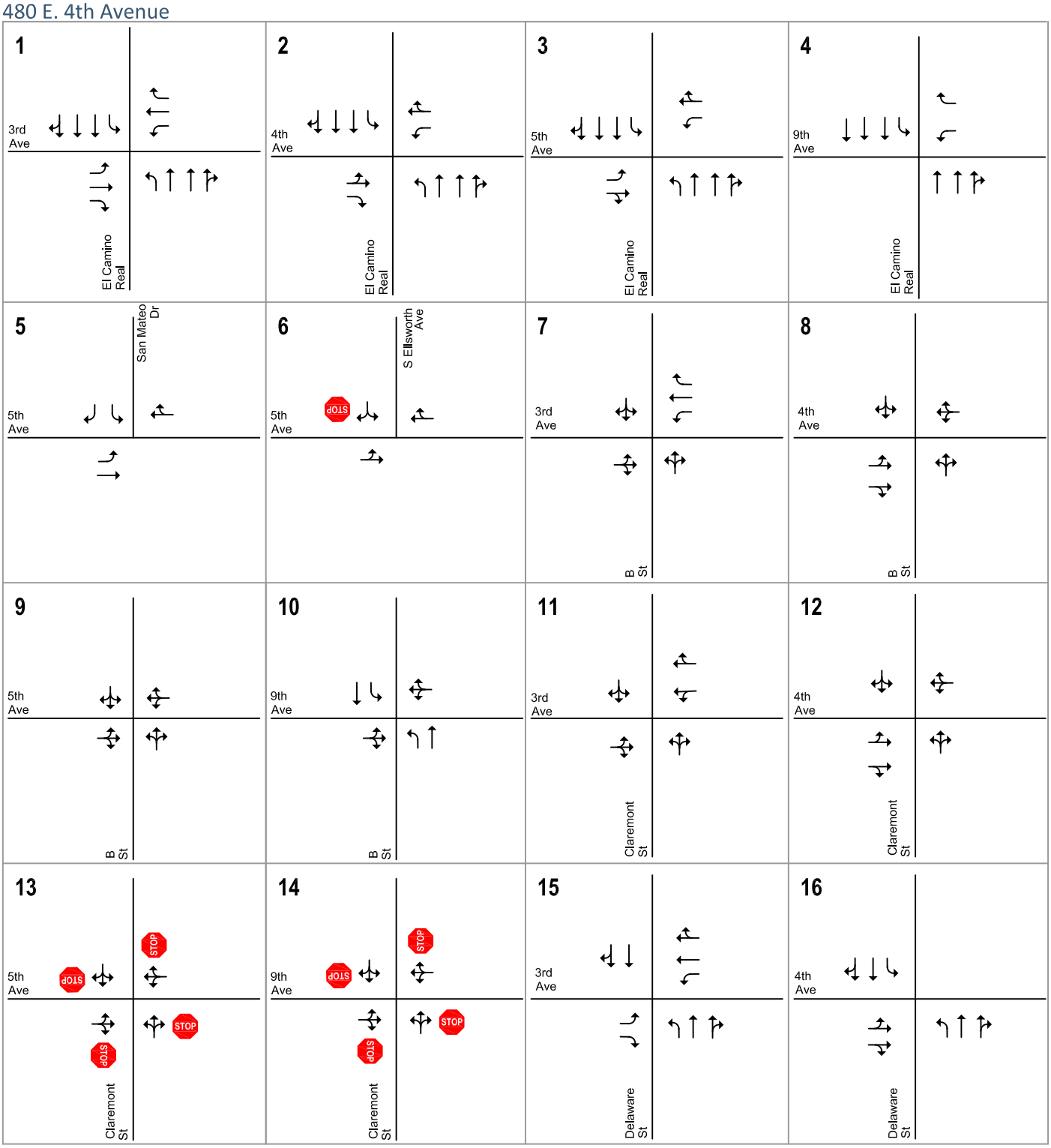


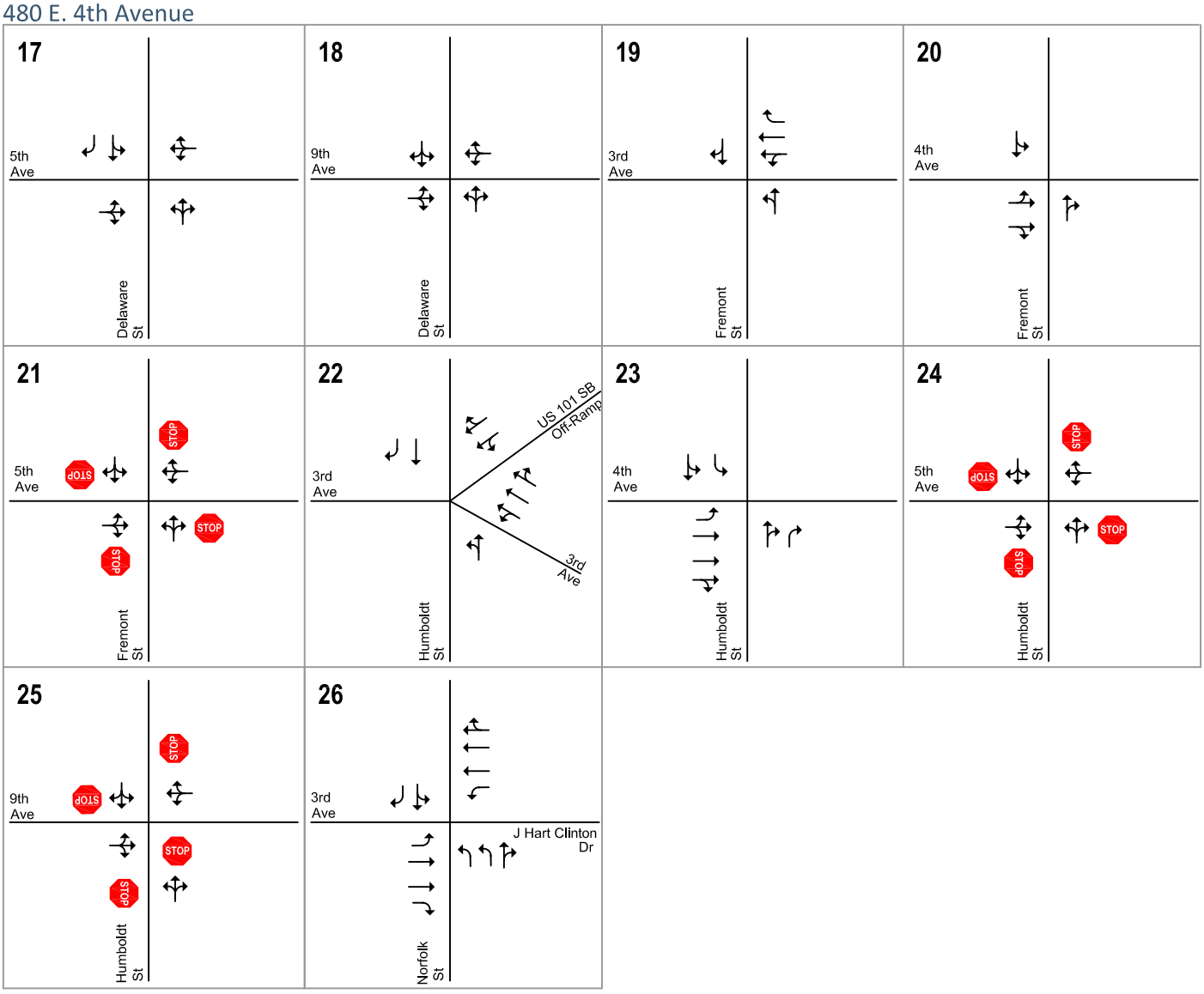
Figure 4
Existing Transit Services



LEGEND

STOP = Stop Controlled Intersection

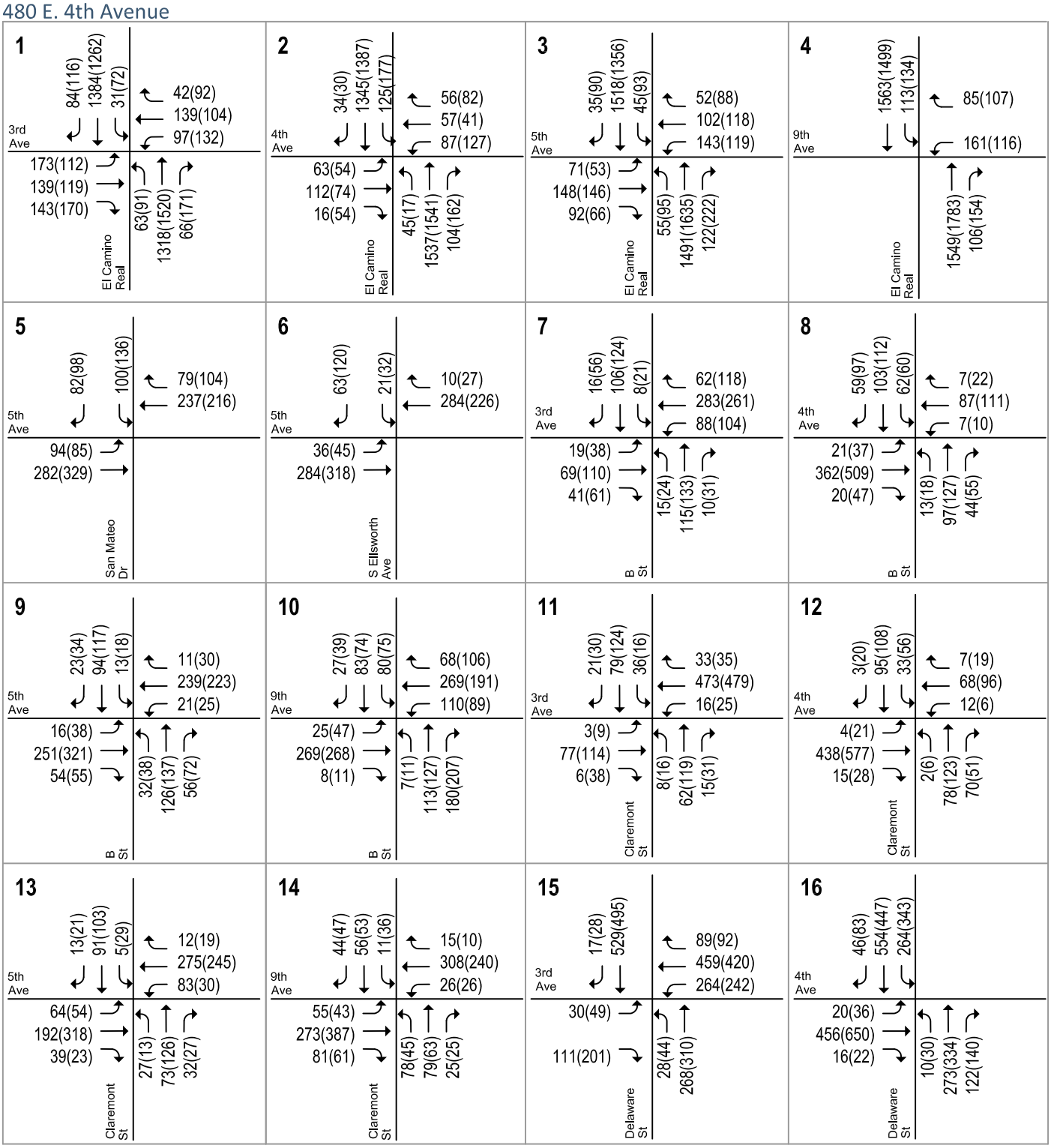
Figure 5
Existing Lane Configurations



LEGEND

STOP = Stop Controlled Intersection

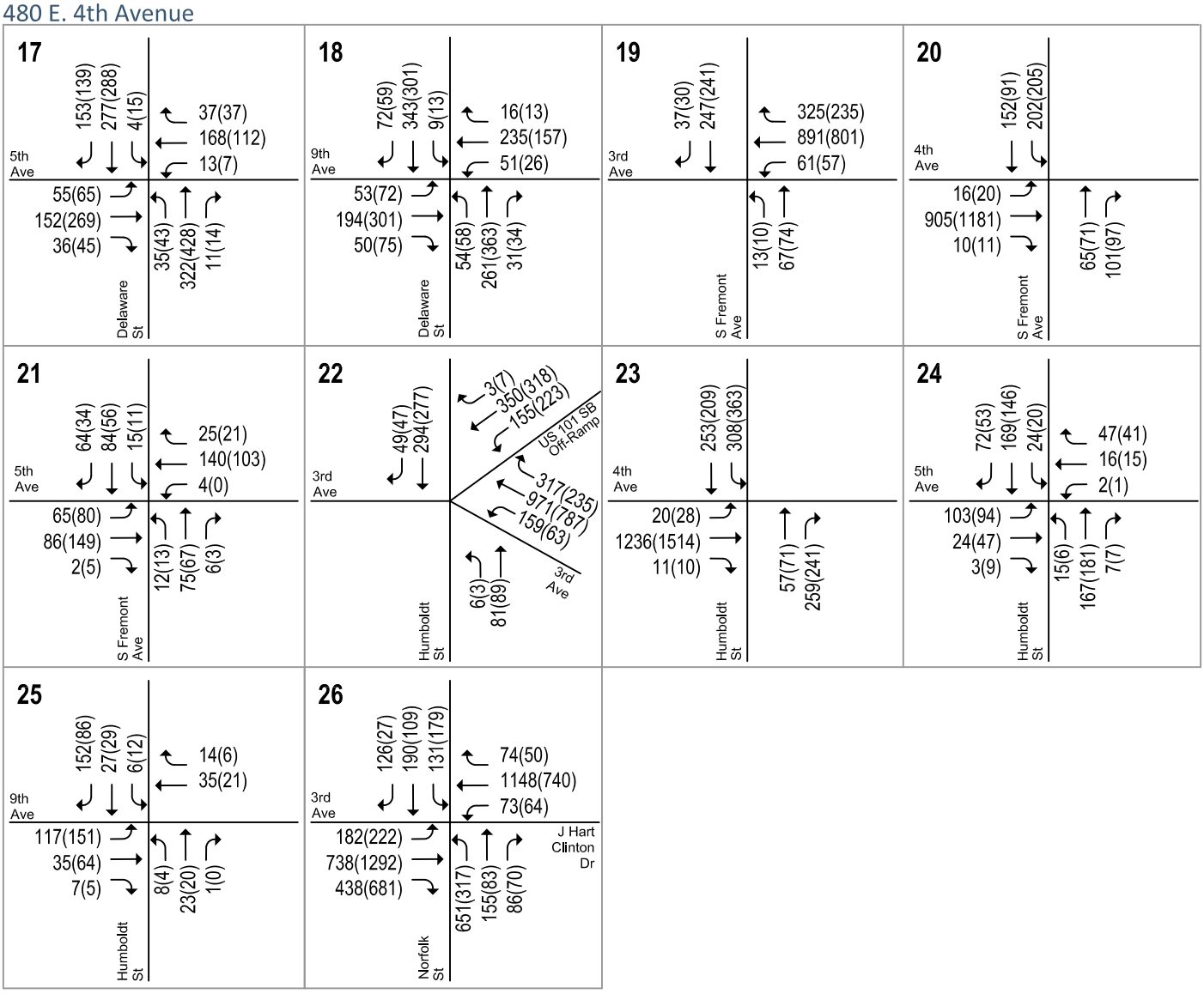
Figure 5
Existing Lane Configurations



LEGEND

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

Figure 6
Existing Traffic Volumes



LEGEND

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

Figure 6
Existing Traffic Volumes

Existing Intersection Levels of Service

The results show that the following intersections are currently operating at unacceptable levels of service (see Table 5):

- Fremont Street & 4th Avenue – PM Peak Hour (LOS F)
- Humboldt Street & 3rd Avenue – PM Peak Hour (LOS F)
- Humboldt Street & 4th Avenue – PM Peak Hour (LOS F)
- Norfolk Street & 3rd Avenue – AM & PM Peak Hours (LOS E)

Intersection level of service calculation sheets are provided in Appendix C for all scenarios.

Simulation Analysis

It should be noted that intersections along the 3rd Avenue, 4th Avenue and 5th Avenue corridors currently experience feedback queue issues beyond what is reflected in the typical HCM level of service calculations. Therefore, a microsimulation model of the corridor was developed using SimTraffic software to better reflect existing intersection operating conditions (see Table 5 for a full list of intersections analyzed using SimTraffic and the resulting delays). Unlike the typical intersection analysis models such as the Highway Capacity Manual that analyze intersections in isolation, SimTraffic is a model that measures the full impact of queuing and blocking attributed to closely spaced intersections by simulating the travel of each vehicle. In addition to reporting statistics such as average vehicle delay, the simulation software produces visual animation files that depict traffic operations. The AM and PM peak hour models of existing traffic were calibrated based on observed queuing and field signal timing data.

As shown on Table 5, several intersections along the simulated corridors are experiencing oversaturated conditions where the demand cannot be served by the intersection due to downstream congestion. These intersections are considered to operate at LOS F.

Unsignalized Intersections

The unsignalized intersection at Humboldt Street and 5th Avenue was analyzed using the SimTraffic microsimulation model. Due to existing congestion at the Humboldt Street and 4th Avenue intersection during the PM peak hour, the microsimulation model was unable to fully serve all traffic at this intersection. Therefore, the intersection is considered to operate at LOS F. Hexagon conducted a signal warrant analysis for this intersection using the CA MUTCD Peak Hour Signal Warrant. The intersection does not warrant a traffic signal under existing conditions based on both the AM and PM peak hour traffic volumes.

Table 5
Existing Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Existing Avg. Delay (sec)	Existing LOS
1	El Camino Real & 3rd Avenue	Signal	AM	05/16/19	(2)	14.9	B
			PM	05/16/19	(2)	19.3	B
2	El Camino Real & 4th Avenue	Signal	AM	05/22/18	(2)	14.9	B
			PM	05/22/18	(2)	14.9	B
3	El Camino Real & 5th Avenue	Signal	AM	08/22/18	(2)	19.6	B
			PM	08/22/18	(2)	18.4	B
4	El Camino Real & 9th Avenue	Signal	AM	05/16/19		6.6	A
			PM	05/16/19		7.6	A
5	San Mateo Drive & 5th Avenue	Signal	AM	05/22/18	(2)	11.9	B
			PM	05/22/18	(2)	11.0	B
6	Ellsworth Avenue & 5th Avenue	TWCS (1)	AM	05/16/19	(2)	9.2	A
			PM	05/16/19	(2)	10.0	A
7	B Street & 3rd Avenue	Signal	AM	05/16/19	(2)	13.1	B
			PM	05/16/19	(2)	15.8	B
8	B Street & 4th Avenue	Signal	AM	05/22/18	(2)	12.1	B
			PM	05/22/18	(2)	18.5	B
9	B Street & 5th Avenue	Signal	AM	05/22/18	(2)	14.5	B
			PM	05/22/18	(2)	15.4	B
10	B Street & 9th Avenue	Signal	AM	05/16/19		6.6	A
			PM	05/16/19		8.5	A
11	Claremont Street & 3rd Avenue	Signal	AM	05/22/18	(2)	7.8	A
			PM	05/22/18	(2)	11.8	B
12	Claremont Street & 4th Avenue	Signal	AM	05/22/18	(2)	17.6	B
			PM	05/22/18	(2)	41.9	D
13	Claremont Street & 5th Avenue	AWCS	AM	05/22/18	(2)	12.7	B
			PM	05/22/18	(2)	31.1	D
14	Claremont Street & 9th Avenue	AWCS	AM	05/16/19		14.4	B
			PM	05/16/19		15.4	C
15	Delaware Street & 3rd Avenue	Signal	AM	05/16/19	(2)	26.8	C
			PM	05/16/19	(2)	21.3	C
16	Delaware Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.2	C
			PM	05/16/19	(2)	36.7	D

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.

BOLD indicates a substandard level of service.

Table 5 continued
Existing Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Existing Avg. Delay (sec)	Existing LOS
17	Delaware Street & 5th Avenue	Signal	AM	05/22/18	(2)	23.6	C
			PM	05/22/18	(2)	26.8	C
18	Delaware Street & 9th Avenue	Signal	AM	05/16/19		6.8	A
			PM	05/16/19		8.2	A
19	Fremont Street & 3rd Avenue	Signal	AM	05/16/19	(2)	11.6	B
			PM	05/16/19	(2)	11.2	B
20	Fremont Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.3	C
			PM	05/16/19	(2)	**OVERSAT**	**F**
21	Fremont Street & 5th Avenue	AWCS	AM	05/16/19	(2)	7.0	A
			PM	05/16/19	(2)	8.3	A
22	Humbolt Street & 3rd Avenue	Signal	AM	05/16/19	(2)	32.9	C
			PM	05/16/19	(2)	**96.5**	**F**
23	Humbolt Street & 4th Avenue	Signal	AM	05/16/19	(2)	21.8	C
			PM	05/16/19	(2)	**OVERSAT**	**F**
24	Humbolt Street & 5th Avenue	AWCS	AM	05/16/19	(2)	9.2	A
			PM	05/16/19	(2)	107.1	F
25	Humbolt Street & 9th Avenue	AWCS	AM	05/16/19		8.3	A
			PM	05/16/19		8.5	A
26	Norfolk Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**57.5**	**E**
			PM	05/22/18	(2)	**64.0**	**E**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.

BOLD indicates a substandard level of service.

Existing Freeway Ramp Capacity Analysis

This analysis consisted of a volume-to-capacity ratio evaluation of four freeway ramps at the interchange of US 101 and 3rd Avenue/4th Avenue. The ramp capacities were obtained from the *Highway Capacity Manual 2000*, which considers both the free-flow speed and the number of lanes on the study ramps.

Hexagon conducted field observations at the study on-ramps in May of 2019 and found that the US 101 northbound loop on-ramp and the US 101 southbound diagonal on-ramp were metered during the PM peak hour. Caltrans could turn on the ramp meter at these on-ramps during the AM peak hour in the future. As a conservative approach, it is assumed that both on-ramps are metered during both the AM and PM peak hours.

It is assumed that the metered on-ramps would each have a capacity of 900 vehicles per hour. The peak-hour freeway ramp volumes were derived from the collected traffic counts. As shown in Table 6, all freeway ramps currently have sufficient capacity to serve the existing traffic volumes, with volume-to-capacity ratios that are below 1.0, which means that the existing traffic demand is lower than the ramp capacity during both the AM and PM peak hours.

Hexagon observed that the currently metered US-101 northbound and southbound on-ramps had only minimal periodic queues during the PM peak hour (0-5 vehicle queue). For the currently metered on-ramps, a ramp queuing analysis is conducted in Chapter 4.

Table 6
Existing Freeway Ramp Capacity Analysis

				Lanes			Existing Conditions		
Interchange	Ramp	Type	Pk Hr	Mixed	HOV	Meter	Capacity [1]	Peak Volume	V/C
US 101/3rd Ave/4th Ave	NB On-Ramp from EB 3rd Ave [3]	Loop	AM	1		ON [2]	900	817	0.91
			PM	1		ON	900	657	0.73
	NB Off-Ramp to WB 3rd Ave [3]	Loop	AM	1			1800	73	0.04
			PM	1			1800	195	0.11
	SB Off-Ramp to WB 3rd Ave [4]	Diagonal	AM	1			2000	508	0.25
			PM	1			2000	548	0.27
	SB On-Ramp from EB 4th Ave [3]	Diagonal	AM	1		ON [2]	900	598	0.66
			PM	1		ON	900	584	0.65

Notes:
1. Ramp capacities were obtained from the Highway Capacity Manual 2000 (pg. 25-4), and considered the free-flow speed, the number of lanes on the ramp, and ramp metering. HCM 2010 was not referenced because it does not report ramp capacities.
2. On-ramps during the AM peak hour were not metered during field observations. However, because ramp meter equipment is installed, this study assumes that the on-ramps are metered during the AM peak hours as well.
3. Ramp volumes were obtained from Caltrans PeMS website.
4. Ramp volumes were obtained from intersection counts.

Observed Existing Traffic Conditions

Traffic conditions were observed in the field at each study intersection in order to identify existing operational deficiencies and to confirm the accuracy of the calculated level of service. The purpose of this effort was (1) to identify any existing traffic problems that may not be directly related to level of service, (2) identify any locations where the level of service analysis does not accurately reflect existing traffic conditions. Hexagon conducted field observations on a regular weekday during the AM and PM peak hours in May of 2019. Some of the study intersections had no significant operational issues, and vehicular queues on all approaches were mostly able to clear in one cycle. The observed operational issues at the remaining study intersections are identified below (Figure 7 graphically illustrates the main areas of congestion in downtown San Mateo during the PM peak hour).

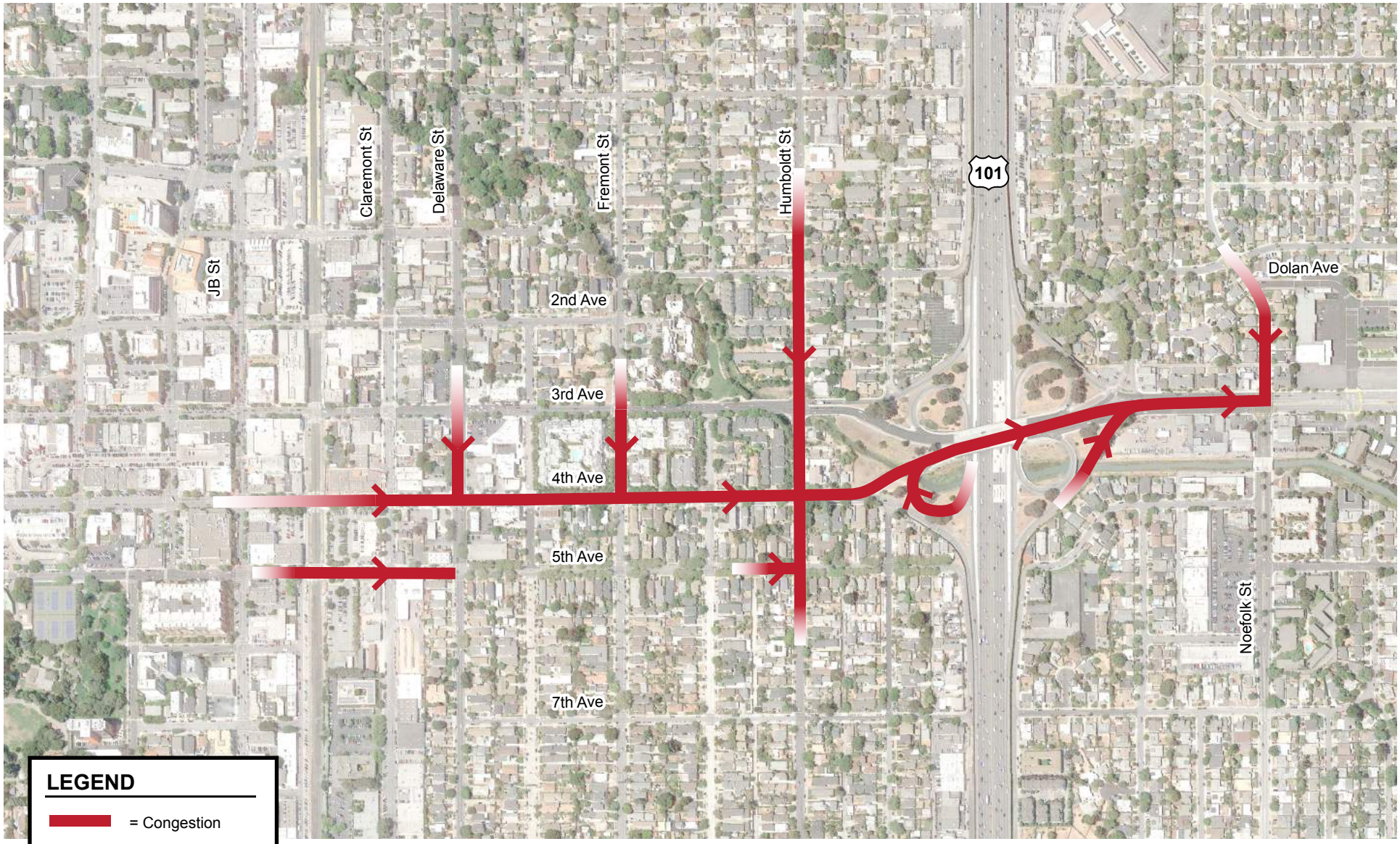


Figure 7
Downtown San Mateo Main Areas of Traffic Congestion During the PM Peak-Hour

Norfolk Street and 3rd Avenue

During the AM peak hour, southbound vehicles frequently queue past 2nd Avenue and require two signal cycles to clear during the peak 15 minutes of school operations at the nearby St. Timothy School. Southbound queues do not extend past 2nd Avenue outside of the peak 15 minutes. The eastbound left-turn movement receives heavy demand and frequently queues out of the turn pocket, requiring two signal cycles to clear. The eastbound through movement frequently queues towards the 3rd Avenue/4th Avenue merge point and requires multiple cycles to clear. The northbound left turn movement receives heavy demand during the peak 10 to 15 minutes period and queues past Beacon Avenue, requiring two signal cycles to clear. Outside of the peak 10 to 15 minutes period, most northbound left-turn vehicles can clear within one signal cycle.

During the PM peak hour, southbound vehicles frequently queue past 2nd Avenue and require multiple signal cycles to clear during the peak 15 minutes. The eastbound through movement receives heavy demand that frequently queues towards Idaho Street and 4th Avenue. Vehicles at the back of the eastbound through movement queue require multiple cycles to clear the Norfolk Street intersection. This queue causes operational issues for upstream intersections.

Humboldt Street and 3rd Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, southbound spillback queues from the Humboldt Street and 4th Avenue intersection affect traffic operations at this intersection. At the Humboldt Street and 3rd Avenue intersection, the southbound vehicles frequently queue past 2nd Avenue and require multiple signal cycles to clear. The inner lane on the US 101 southbound off-ramp leg also sometimes requires two cycles to clear because vehicles turning left onto southbound Humboldt Street sometimes cannot make the turn due to downstream spillback issues.

Humboldt Street and 4th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, eastbound spillback queues from the Norfolk Street and 3rd Avenue intersection affect traffic operations at this intersection. At the Humboldt Street and 4th Avenue intersection, the eastbound vehicles frequently queue past upstream intersections and require two signal cycles to clear. Most of the vehicles on the southbound and northbound approaches at this intersection are turning onto eastbound 4th Avenue, and often require two signal cycles to clear the intersection because of downstream queuing issues.

Humboldt Street and 5th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, northbound spillback queues from the Humboldt Street and 4th Avenue intersection affect traffic operations at this intersection. At the Humboldt Street and 5th Avenue intersection, the northbound and eastbound vehicles frequently cannot clear the intersection within one minute because of downstream spillback queues.

Fremont Street and 3rd Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, the southbound through movement experiences queue spillback issue from the downstream intersection at Fremont Street and 4th Avenue. Vehicles at the end of the queue sometimes require multiple cycles to the intersection.

Fremont Street and 4th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, eastbound traffic on 4th Avenue queues from the downstream Humboldt Street intersection past the Fremont Street intersection. As a result, the southbound left-turn and eastbound through movements frequently require multiple cycles to clear the intersection.

Delaware Street and 3rd Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, the southbound through movement experiences spillback issues from the downstream intersection at Delaware Street and 4th Avenue. Vehicles at the end of the queue sometimes require two signal cycles to clear the intersection. The downstream southbound vehicle queues on Delaware Street also affect the eastbound right-turn movement at the Delaware Street and 3rd Avenue intersection. Vehicles at the end of the queue also require two signal cycles to clear the intersection.

Delaware Street and 4th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, because the eastbound through movement congestion on 4th Avenue at downstream intersections frequently queues towards Delaware Street, the southbound left-turn movement at the Delaware Street and 4th Avenue intersection frequently queues past the upstream intersection at 3rd Avenue. The eastbound through movement also frequently extends into the upstream intersection at Claremont Street.

Claremont Street and 4th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, because of downstream eastbound through movement queues at the Delaware Street intersection, the eastbound through movement queues at the Claremont Street intersection sometimes require two signal cycles to clear the intersection.

Claremont Street and 5th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, occasionally when the eastbound movement at the downstream Delaware Street intersection queues towards Claremont Street, the eastbound queue at Claremont Street would extend past the rail tracks.

B Street and 3rd Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, queues from the upstream intersection at Ellsworth Avenue and 3rd Avenue would occasionally spillback and prevent westbound vehicles from completing their movement.

B Street and 4th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, the downstream eastbound queue on 4th Avenue at Delaware Street and/or Claremont Street occasionally spills into the B Street intersection, preventing the eastbound and southbound vehicles from clearing the intersection in one signal cycle.

El Camino Real and 4th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, the southbound left-turn queue occasionally spills out of the turn pocket and requires two signal cycles to clear.

El Camino Real and 5th Avenue

During the AM peak hour, there are no significant operational issues at this intersection. During the PM peak hour, the southbound left turn queue frequently spills out of the turn pocket and requires two signal cycles to clear. The westbound left-turn queue, due to the permitted phasing for 5th Avenue, also sometimes requires two signal cycles to clear.

B Street and 9th Avenue

During both the AM and PM peak hours, the eastbound queues occasionally extend into the upstream intersection at Laurel Avenue and require two signal cycles to clear.

During the PM peak hour, the westbound queues occasionally extend into the upstream intersections towards Delaware Street and require multiple cycles for vehicles at the back of queue to clear.

Claremont Street and 9th Avenue

During both the AM and PM peak hours, the eastbound queues occasionally extend into the upstream intersection at B Street, and westbound queues occasionally extend into the upstream intersection at Delaware Street.

Delaware Street and 9th Avenue

During the AM peak hour, when the downstream westbound queue on 9th Avenue extends from Claremont Street towards Delaware Street, the turning movements at the Delaware Street and 9th Avenue intersection turning onto westbound 9th Avenue occasionally require multiple cycles to clear.

During the PM peak hour, the northbound left-turn and eastbound left-turn queues occasionally require more than one signal cycle to clear. When downstream queues on westbound 9th Avenue occasionally extend toward Delaware Street, the westbound traffic at the Delaware Street intersection cannot clear in one signal cycle.

Accident Analysis

Accident data for study intersections were obtained from the California Highway Patrol's Statewide Integrated Traffic Records System. The records include years 2017 and 2018. The accident data record is included in Appendix E and summarized in Table 7. As shown on Table 7, the actual accident rates at 2 of the study intersections are higher than the California state-wide average accident rates at similar intersections.

Table 7
Accident Data

			Accident Data [2]			Accident Rates (per mil. Vehicles)			Average Rates (per mil. Vehicles) [3]		
#	Intersection	ADT [1]	Total # of Accidents	Fatality Accounts	Injury Accounts	All	Fatality	Fatality + Injury	All	Fatality	Fatality + Injury
1	El Camino Real & 3rd Avenue	39,610	1	0	0	0.03	0	0	0.24	0.001	0.108
2	El Camino Real & 4th Avenue	37,460	3	0	2	0.11	0	0.07	0.24	0.001	0.108
3	El Camino Real & 5th Avenue	40,810	3	0	3	0.1	0	0.1	0.24	0.001	0.108
4	El Camino Real & 9th Avenue	37,930	1	0	1	0.04	0	0.04	0.24	0.001	0.108
5	San Mateo Drive & 5th Avenue	9,680	1	0	0	0.14	0	0	0.24	0.001	0.108
6	Ellsworth Avenue & 5th Avenue [unsignalized]	7,680	0	0	0	0	0	0	0.19	0.001	0.055
7	B Street & 3rd Avenue	10,810	1	0	1	0.13	0	**0.13**	0.24	0.001	0.108
8	B Street & 4th Avenue	12,050	0	0	0	0	0	0	0.24	0.001	0.108
9	B Street & 5th Avenue	11,080	0	0	0	0	0	0	0.24	0.001	0.108
10	B Street & 9th Avenue	12,450	1	0	1	0.11	0	**0.11**	0.24	0.001	0.108
11	Claremont Street & 3rd Avenue	10,360	0	0	0	0	0	0	0.24	0.001	0.108
12	Claremont Street & 4th Avenue	11,110	0	0	0	0	0	0	0.24	0.001	0.108
13	Claremont Street & 5th Avenue [unsignalized]	10,080	0	0	0	0	0	0	0.19	0.001	0.055
14	Claremont Street & 9th Avenue [unsignalized]	10,360	0	0	0	0	0	0	0.19	0.001	0.055
15	Delaware Street & 3rd Avenue	18,810	0	0	0	0	0	0	0.24	0.001	0.108
16	Delaware Street & 4th Avenue	20,850	0	0	0	0	0	0	0.24	0.001	0.108
17	Delaware Street & 5th Avenue	14,620	0	0	0	0	0	0	0.24	0.001	0.108
18	Delaware Street & 9th Avenue	14,720	1	0	0	0.09	0	0	0.24	0.001	0.108
19	Fremont Street & 3rd Avenue	14,480	0	0	0	0	0	0	0.24	0.001	0.108
20	Fremont Street & 4th Avenue	16,760	1	0	0	0.08	0	0	0.24	0.001	0.108
21	Fremont Street & 5th Avenue [unsignalized]	5,420	0	0	0	0	0	0	0.19	0.001	0.055
22	Humboldt Street & 3rd Avenue	20,490	2	0	0	0.13	0	0	0.24	0.001	0.108
23	Humboldt Street & 4th Avenue	24,360	1	0	0	0.06	0	0	0.24	0.001	0.108
24	Humboldt Street & 5th Avenue [unsignalized]	6,200	0	0	0	0	0	0	0.19	0.001	0.055
25	Humboldt Street & 9th Avenue [unsignalized]	3,980	0	0	0	0	0	0	0.19	0.001	0.055
26	Norfolk Street & 3rd Avenue	38,340	1	0	1	0.04	0	0.04	0.24	0.001	0.108

Notes:
1. ADT (Average Daily Traffic) is estimated using peak hour intersection volumes.
2. Accident data are obtained from the CHP SWITRS database for years 2017 and 2018.
3. Average accident rates are based on California average rates for multi-legged signalized and 4-way stop intersections in urban areas as indicated in *2016 Collision data on California State Highways.*

Bold and boxed indicates that the intersection accident rate is higher than the state average.

3. Background Conditions

This chapter presents background traffic conditions, which are defined as conditions just prior to completion of the proposed project. Traffic volumes for background conditions comprise volumes from existing traffic counts and traffic generated by other approved developments in the vicinity of the site. This chapter describes the procedure used to determine background traffic volumes and the resulting traffic conditions.

Background Transportation Network

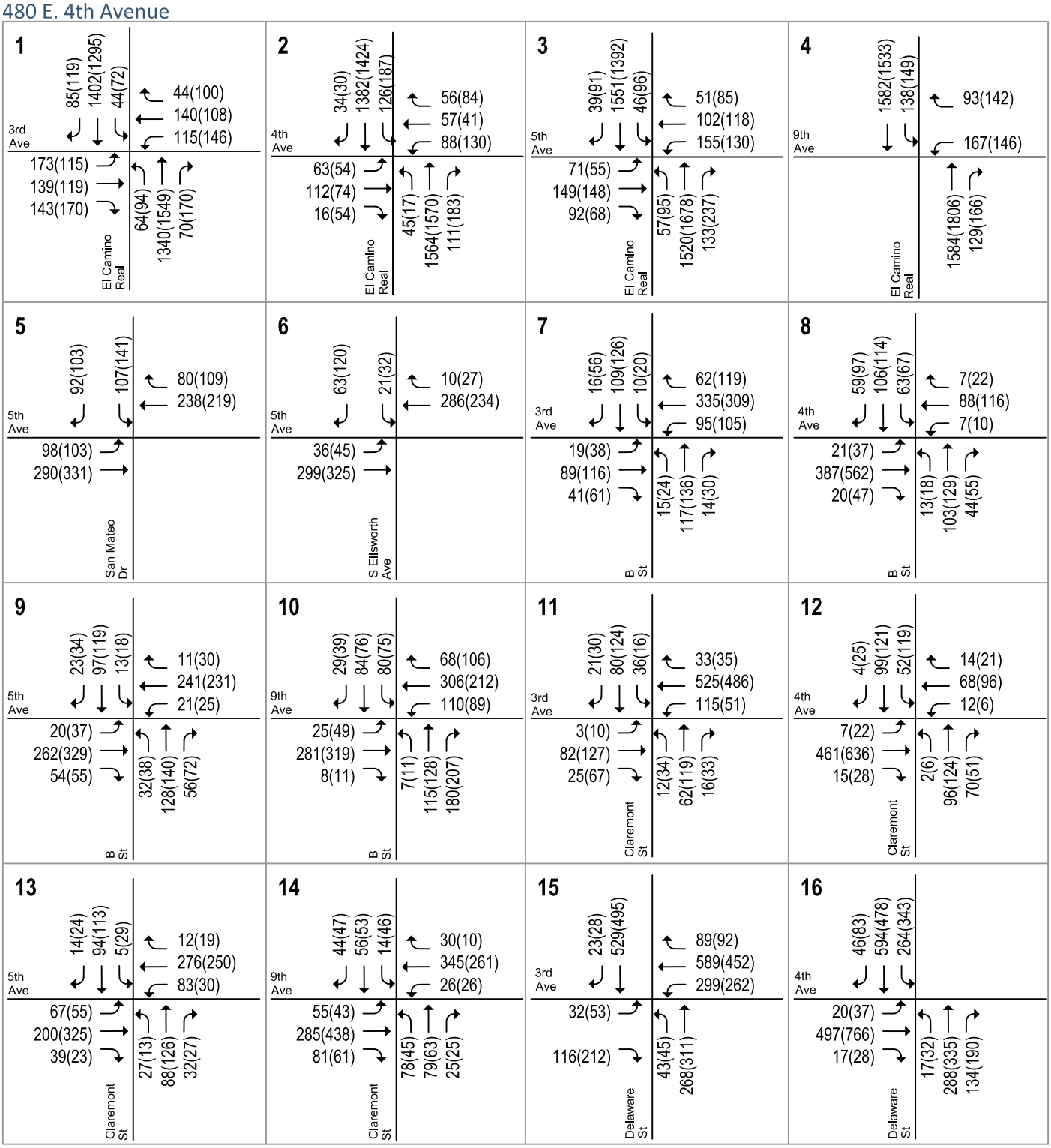
It is assumed in this analysis that the transportation network under background conditions, including roadways and intersection lane configurations, would be the same as that described under existing conditions at all study intersections

Background Traffic Volumes

Background traffic volumes were estimated for the project completion year by adding traffic from approved but not yet completed developments in the project area. The approved and under-construction developments included in this study are listed below.

- Central Park South: develop a 33,500 s.f. office building and a 60-unit apartment building
- 210 S. Fremont Street: develop a 15-unit condominium building
- 737 2nd Avenue: develop a 7-unit multi-family residential building
- 405 E. 4th Avenue: develop a mixed-use building with 55,300 s.f. of office and 15 residential units
- 333-345 South B Street: develop an additional floor consisting of 7,000 s.f. of office space
- 303 Baldwin Avenue: develop a 64-unit apartment building with 60,664 s.f. of office space and 19,952 s.f. of retail space
- Essex at Central Park: develop an 80-unit apartment building with 7,000 s.f. of retail space
- 520 El Camino Real: 6,379 s.f. office expansion
- 406 E. 3rd Avenue: develop a 25-unit apartment building with 103,020 s.f. of office space

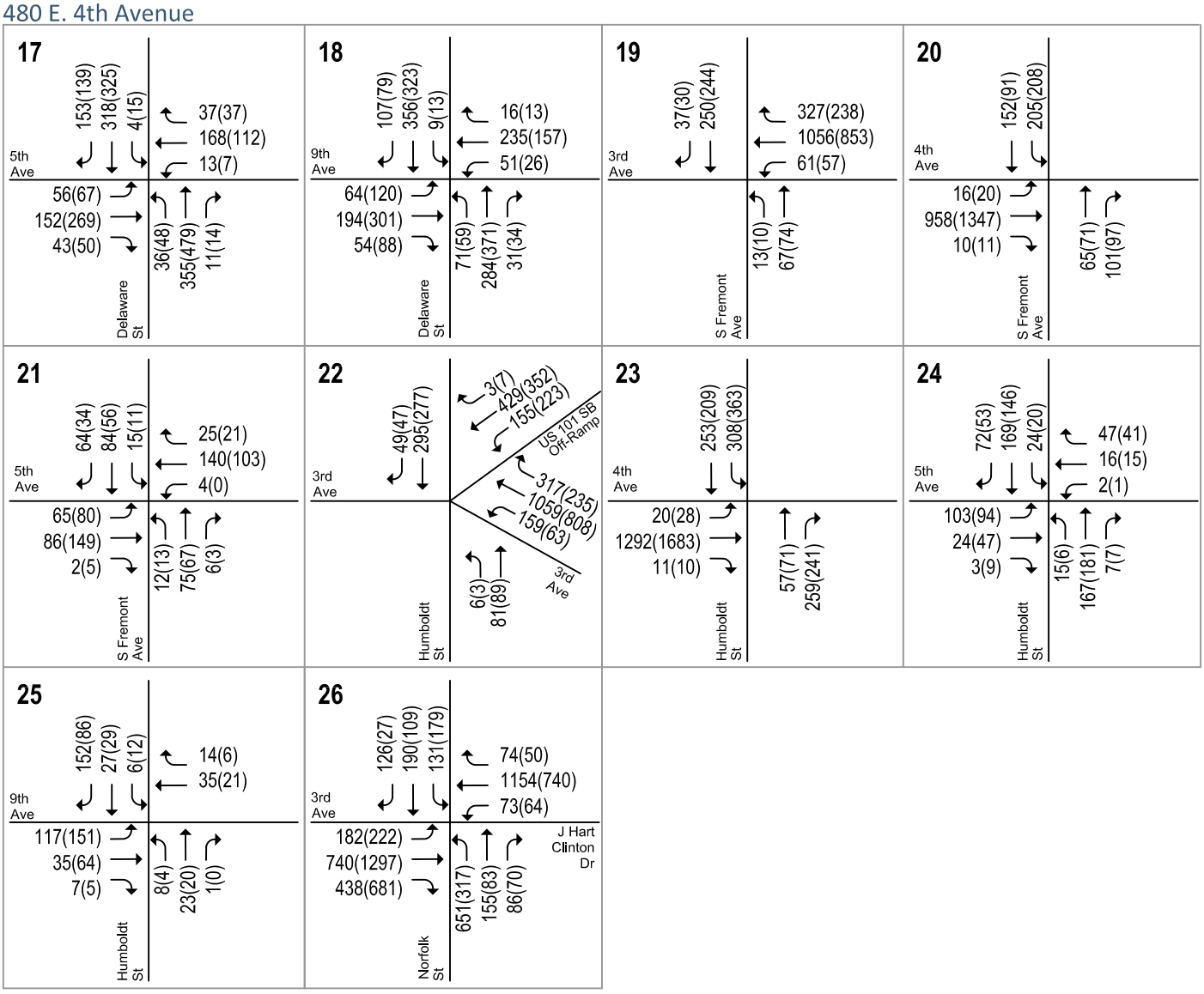
Background traffic volumes were obtained by combining existing traffic volumes with the additional trips generated from the approved projects. The AM and PM peak hour traffic volumes under background conditions are shown on Figure 8.



LEGEND

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

Figure 8
Background Traffic Volumes



LEGEND

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

Figure 8
Background Traffic Volumes

Background Intersection Levels of Service

The following intersections would operate at unacceptable levels of service under background conditions (see Table 8):

- San Mateo Drive & 5th Avenue – PM Peak Hour (LOS F)
- B Street & 3rd Avenue – PM Peak Hour (LOS F)
- B Street & 4th Avenue – PM Peak Hour (LOS F)
- B Street & 5th Avenue – PM Peak Hour (LOS F)
- Claremont Street & 3rd Avenue – PM Peak Hour (LOS F)
- Claremont Street & 4th Avenue – PM Peak Hour (LOS F)
- Delaware Street & 3rd Avenue – PM Peak Hour (LOS F)
- Delaware Street & 4th Avenue – PM Peak Hour (LOS F)
- Delaware Street & 5th Avenue – PM Peak Hour (LOS F)
- Fremont Street & 3rd Avenue – PM Peak Hour (LOS F)
- Fremont Street & 4th Avenue – PM Peak Hour (LOS F)
- Humboldt Street & 3rd Avenue – AM & PM Peak Hours (low LOS D & LOS E, respectively)
- Humboldt Street & 4th Avenue – PM Peak Hour (LOS F)
- Norfolk Street & 3rd Avenue – AM & PM Peak Hours (LOS E & LOS F, respectively)

Simulation Analysis

During the PM peak hour under background conditions, the simulation results show that there would be heavy congestion along eastbound 4th Avenue. The bottleneck at the Norfolk Street intersection would cause spillback queues past B Street. As a result, vehicles along the side streets turning onto eastbound 4th Avenue also would experience heavy congestion, resulting in spillback issues at intersections along 3rd Avenue and 5th Avenue.

Unsignalized Intersections

Under background conditions, the unsignalized intersections along 5th Avenue at Ellsworth Avenue, Claremont Street, Fremont Street and Humboldt Street would operate at LOS F. These unsignalized intersections were analyzed using the SimTraffic microsimulation model. Due to the congestion along 4th Avenue creating spillback queues onto the crossing streets during the PM peak hour, the microsimulation model was unable to fully serve all traffic at these unsignalized intersections. Therefore, these intersections are considered to operate at LOS F. Hexagon conducted a signal warrant analysis for these intersections using the CA MUTCD Peak Hour Signal Warrant. These intersections would not warrant a traffic signal under background conditions based on both the AM and PM peak hour traffic volumes.

Table 8
Background Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Existing Avg. Delay (sec)	Existing LOS	Background Avg. Delay (sec)	Background LOS
1	El Camino Real & 3rd Avenue	Signal	AM	05/16/19	(2)	14.9	B	15.3	B
			PM	05/16/19	(2)	19.3	B	27.5	C
2	El Camino Real & 4th Avenue	Signal	AM	05/22/18	(2)	14.9	B	14.2	B
			PM	05/22/18	(2)	14.9	B	17.8	B
3	El Camino Real & 5th Avenue	Signal	AM	08/22/18	(2)	19.6	B	21.4	C
			PM	08/22/18	(2)	18.4	B	34.1	C
4	El Camino Real & 9th Avenue	Signal	AM	05/16/19		6.6	A	7.3	A
			PM	05/16/19		7.6	A	8.9	A
5	San Mateo Drive & 5th Avenue	Signal	AM	05/22/18	(2)	11.9	B	13.5	B
			PM	05/22/18	(2)	11.0	B	**OVERSAT**	**F**
6	Ellsworth Avenue & 5th Avenue	TWCS (1)	AM	05/16/19	(2)	9.2	A	7.8	A
			PM	05/16/19	(2)	10.0	A	64.8	F
7	B Street & 3rd Avenue	Signal	AM	05/16/19	(2)	13.1	B	14.4	B
			PM	05/16/19	(2)	15.8	B	**OVERSAT**	**F**
8	B Street & 4th Avenue	Signal	AM	05/22/18	(2)	12.1	B	12.9	B
			PM	05/22/18	(2)	18.5	B	**OVERSAT**	**F**
9	B Street & 5th Avenue	Signal	AM	05/22/18	(2)	14.5	B	15.6	B
			PM	05/22/18	(2)	15.4	B	**OVERSAT**	**F**
10	B Street & 9th Avenue	Signal	AM	05/16/19		6.6	A	6.8	A
			PM	05/16/19		8.5	A	8.8	A
11	Claremont Street & 3rd Avenue	Signal	AM	05/22/18	(2)	7.8	A	8.6	A
			PM	05/22/18	(2)	11.8	B	**OVERSAT**	**F**
12	Claremont Street & 4th Avenue	Signal	AM	05/22/18	(2)	17.6	B	18.1	B
			PM	05/22/18	(2)	41.9	D	**OVERSAT**	**F**
13	Claremont Street & 5th Avenue	AWCS	AM	05/22/18	(2)	12.7	B	13.9	B
			PM	05/22/18	(2)	31.1	D	OVERSAT	F
14	Claremont Street & 9th Avenue	AWCS	AM	05/16/19		14.4	B	16.0	C
			PM	05/16/19		15.4	C	18.9	C
15	Delaware Street & 3rd Avenue	Signal	AM	05/16/19	(2)	26.8	C	26.9	C
			PM	05/16/19	(2)	21.3	C	**OVERSAT**	**F**
16	Delaware Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.2	C	22.0	C
			PM	05/16/19	(2)	36.7	D	**OVERSAT**	**F**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.

BOLD indicates a substandard level of service.

Table 8 continued
Background Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Existing Avg. Delay (sec)	Existing LOS	Background Avg. Delay (sec)	Background LOS
17	Delaware Street & 5th Avenue	Signal	AM	05/22/18	(2)	23.6	C	24.4	C
			PM	05/22/18	(2)	26.8	C	**OVERSAT**	**F**
18	Delaware Street & 9th Avenue	Signal	AM	05/16/19		6.8	A	7.2	A
			PM	05/16/19		8.2	A	9.1	A
19	Fremont Street & 3rd Avenue	Signal	AM	05/16/19	(2)	11.6	B	12.3	B
			PM	05/16/19	(2)	11.2	B	**OVERSAT**	**F**
20	Fremont Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.3	C	21.7	C
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**
21	Fremont Street & 5th Avenue	AWCS	AM	05/16/19	(2)	7.0	A	7.3	A
			PM	05/16/19	(2)	8.3	A	OVERSAT	F
22	Humbolt Street & 3rd Avenue	Signal	AM	05/16/19	(2)	32.9	C	**47.7**	**D**
			PM	05/16/19	(2)	**96.5**	**F**	**65.9**	**E**
23	Humbolt Street & 4th Avenue	Signal	AM	05/16/19	(2)	21.8	C	21.2	C
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**
24	Humbolt Street & 5th Avenue	AWCS	AM	05/16/19	(2)	9.2	A	8.3	A
			PM	05/16/19	(2)	107.1	F	OVERSAT	F
25	Humbolt Street & 9th Avenue	AWCS	AM	05/16/19		8.3	A	8.3	A
			PM	05/16/19		8.5	A	8.5	A
26	Norfolk Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**57.5**	**E**	**61.3**	**E**
			PM	05/22/18	(2)	**64.0**	**E**	**OVERSAT**	**F**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.

BOLD indicates a substandard level of service.

4. Project Conditions

This chapter describes traffic conditions with the project and includes: (1) the method by which project traffic is estimated and (2) a level of service summary. Existing plus project conditions are represented by existing traffic conditions with the addition of traffic generated by the project. Existing plus project traffic conditions could potentially occur if the project were to be occupied prior to the other approved projects in the area. Background plus project conditions are represented by background traffic conditions with the addition of traffic generated by the project.

Transportation Network under Project Conditions

Under project conditions, it is assumed in this analysis that the transportation network for the existing plus project scenario as well as the background plus project scenario would be the same as the existing and background transportation network, respectively.

Project Description

The project proposes a seven-story 225-unit residential complex to replace the existing parking lot on site. The project also proposes to construct a six-story 696-space parking garage to replace the existing parking lot at 400 E. 5th Avenue. The project would include a pedestrian bridge connecting the parking garage to the residential complex (see Figure 2). 164 of the spaces in the parking garage would be reserved and gated for residential use, 234 spaces would be a replacement for the demolished parking lots, and the remaining 298 new spaces would be used as public parking for the downtown area. Access to the proposed parking garage would be provided via one driveway on E. 5th Avenue.

Project Trip Estimates

The magnitude of traffic produced by a new development and the locations where that traffic would appear were estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. In determining project trip generation, the magnitude of traffic entering and exiting the site was estimated for the AM and PM peak hours. As part of the project trip distribution, the directions to and from which the project trips would travel were estimated. In the project trip assignment, the project trips were assigned to specific streets and intersections. These procedures are described below.

Trip Generation

Residential Trip Generation

Vehicle trips generated by the proposed residential component of the project were estimated using the trip rates published in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 10th Edition* (2017) for "Multifamily Housing Mid-Rise" (Land Use 221). As defined by the ITE, "mid-rise" multifamily housing are buildings that have between three and 10 floors.

Since this project is located in an urban area with proximity to transit and many destinations within walking and bicycling distance, Hexagon used US EPA's MXD model to determine the applicable trip reduction for the project. The MXD model (Mixed Use Trip Generation Model v 4.0, 2010) was developed by Fehr & Peers for the US EPA to account for internal trip capture and external walking, biking and transit trip reductions due to the nature of mixed-use developments and local area characteristics. It does not account for specific trip reduction strategies that the project might incorporate, such as shuttles, bus passes, or bike-share. Based on the MXD model, a 12% trip reduction during the AM peak hour, a 15% trip reduction during the PM peak hour, and a 16% daily trip reduction was applied. After crediting these reductions, the residential component of the proposed project (see Table 9) would generate 71 vehicle trips (18 inbound and 53 outbound trips) during the AM peak hour and 84 vehicle trips (51 inbound and 33 outbound trips) during the PM peak hour.

Reassigned Trips

Existing Parking Lot Trips

As discussed above, 234 parking spaces within the proposed garage would replace the existing parking lots on site. Trip generation of the existing parking lots on site was counted in May 2019. During the AM peak hour, the existing parking lots generated 73 trips (60 inbound and 13 outbound) and 72 trips (15 inbound and 57 outbound) during the PM peak hour. It is assumed that these parking spaces would generate the same number of trips under project conditions These trips were reassigned to the new proposed driveway location on 5th Avenue.

In-Lieu Fee Office Trips

The City of San Mateo Municipal Code 27.64.100 states that projects within the central parking and improvement district (CPID) within the downtown specific planning area are allowed to satisfy their CPID-specific parking requirements through in-lieu fee payment. According to City staff, since year 2015, developments within the CPID district have paid for 325 in-lieu fee spaces:

- 221 S. El Camino Real – 92 in-lieu fee spaces
- 2 E. 3rd Avenue – 59 in-lieu fee spaces
- 405 E. 4th Avenue – 70 in-lieu fee spaces
- 406 E. 3rd Avenue – 104 in-lieu fee spaces

The 298 new parking spaces in the proposed garage are proposed to be built through the in-lieu parking program. Thus, these spaces can be associated with these developments. Since these 298 parking spaces are proposed to be delineated as 10-hour parking spaces, which are more catered towards employee parking, it is assumed that the office employees in these developments would utilize this garage. Based on the amount of in-lieu fee spaces paid by each project as well as each project's office trip generation during the peak hours (referencing the respective traffic studies), Hexagon estimated the amount of reassigned office traffic to the project garage based on the proportions of office in-lieu spaces in the total parking spaces required by City code. It was estimated that approximately 127 trips (112 in and 15 out) during the AM peak hour and 123 trips (20 in and 103 out)

during the PM peak hour would occur as a result of these office employees parking in the project garage. Table 9 shows the number of trips per approved project.

It should be noted that because the 405 E. 4th Avenue and 406 E. 3rd Avenue projects were not completed and occupied under existing conditions (base year 2018/2019), there is no traffic to be reassigned from these two projects under existing plus project conditions.

General Retail Trips

Later in the afternoon all 298 of the new spaces would not be occupied by office employees. Therefore, some would be used by downtown retail patrons. Using data provided by City staff on per-space trip generation for a 10-hour space during the PM peak hour, Hexagon derived an inbound trip generation rate of 0.085 trips and an outbound rate of 0.043 trips per 10-hour public space. Using these rates, Hexagon estimated that approximately 38 trips (25 in and 13 out) during the PM peak hour would occur as a result of general downtown retail patrons rerouting themselves to park in the project garage

Table 9
Net Project Trip Generation

			Daily		AM Peak Hour				PM Peak Hour				
Land Use	Size	Unit	Rate	Total	Rate	In	Out	Total	Rate	%In	In	Out	Total
Proposed Uses													
Residential [1]	225	d.u.	5.44	1224	0.36	21	60	81	0.44	61%	60	39	99
Mixed-Use Reduction [2]				(196)		(3)	(7)	(10)			(9)	(6)	(15)
Residential Trips				1,028		18	53	71			51	33	84
Reassigned Trips													
298 Space - New 10-Hr Parking Spaces													
Reassigned In-Lieu Fee Office Trips [4]						112	15	127			20	103	123
221 S. El Camino Avenue (Clocktower bldg) [3]						*25*	*3*	*28*			*4*	*22*	*26*
2 E. 3rd Avenue (3rd and El Camino) [3]						*23*	*3*	*26*			*4*	*21*	*25*
405 E. 4th Ave. [3]						*32*	*4*	*36*			*6*	*29*	*35*
406 E 3rd Ave. [3]						*32*	*5*	*37*			*6*	*31*	*37*
Reassigned Retail Trips [3]						0	0	0			25	13	38
Replacement of Existing Parking Lot [5]						60	13	73		21%	15	57	72
Total Reassigned Trips [6]	532	Spaces	3.95	2,101		172	28	200			60	173	233

Notes:

1. Institute of Transportation Engineers, *Trip Generation* , 10th Edition, Land Use Code 221: Multifamily Housing (Mid-Rise), General Urban/Suburban (average rates, expressed in trips per dwelling unit)
2. Trip reduction of 12% in the AM and 15% in the PM, daily reduction calculated at 16%. Based on MXD model developed by Fehr & Peers for the US EPA to account for internal capture and external walking, biking, and transit trips due to mixed-use development and local area characteristics. (Mixed Use Trip Generation Model v 4.0, 2010)
3. It is assumed that some existing downtown retail patrons would choose to park in the proposed garage. Based on data provided by City staff for 10-hr public parking spaces, Hexagon estimated approximately 25 such vehicles. Outbound trips were estimated based on in-out split data provided by City staff for general retail parking (3-hr public spaces).
4. Since 2015, four projects have paid parking in-lieu fees. It is assumed that the office components of these developments would generate trips to this garage instead of to their project sites. Trip generation is estimated based on each development's development status, project size, and amount of paid in-lieu spaces.
5. The existing 234 parking spaces on-site would remain under project conditions. Peak hour trip generation was counted in May 2019.
6. Daily trip generation rates for 10-hr public parking spaces were based on observed data at the Main garage and Central garage as provided by City staff.

Trip Distribution and Assignment

Trips generated by the proposed project were distributed to the study network based on the existing travel patterns on the surrounding roadway system and the locations of complementary land uses (see Figures 9 and 10). The proposed residential use would typically generate outbound trips in the morning to employment areas and inbound trips in the evening from employment areas. The proposed garage would generate trips from both the nearby residential areas as well as the regional area. For the

reassigned office trips, trip distribution assumptions referenced the respective traffic studies (see Appendix G.

The peak-hour trips generated by the existing and proposed uses were assigned to the roadway network based on the directions of approach and departure, the roadway network connections, and the location of project driveways. The trips generated by the existing uses to be removed were subtracted from the roadway network prior to assigning project trips. The reassigned office trips were rerouted to access the garage instead of their project sites. The reassigned retail trips were reassigned from the Central Garage. Figure 11 shows the net project trip assignment at the study intersections.

Substantial Intersection Delay Criteria

Per the City's General Plan Policy C 2.7, all projects are required, at a minimum, to pay a transportation mitigation fee. The transportation mitigation fee is used to fund planned transportation improvements that are identified in the City of San Mateo Traffic Mitigation Program.

In addition to paying the transportation impact fee, a development project may be required to fund off-site circulation improvements which are needed as a result of project generated traffic if:

a) The level of service at the intersection drops below mid-level LOS D (average delay of more than 45 seconds) when the project traffic is added, and

b) An intersection that operates below its level of service standard under the base year conditions experiences an increase in delay of four or more seconds, and

c) The needed improvement of the intersection(s) is not funded in the applicable five-year City Capital Improvement Program from the date of application approval.

The cost of the off-site improvements may be reimbursed by the City if a reimbursement program is established throughout the timeframe of the City of San Mateo's current Traffic Mitigation Program or at the time when the improvement was initially scheduled.

Unsignalized Intersections

The City of San Mateo does not have a level of service standard for unsignalized intersections. Transportation studies typically evaluate whether unsignalized intersections are functioning adequately and whether signalization is warranted using the peak-hour volume signal warrant described in the CA MUTCD. Signal warrant worksheets are provided in Appendix E

Existing Plus Project Traffic Volumes

Project trips, as represented in the above project trip assignment, were added to existing traffic volumes to obtain existing plus project traffic volumes. The existing plus project traffic volumes are shown on Figure 12.

Existing plus Project Conditions Intersection Levels of Service

Compared to existing conditions, the project would not generate a substantial increase in intersection delay at any study intersections.

Unsignalized Intersections

Under existing plus project conditions, the unsignalized intersection at Humboldt Street and 5th Avenue would operate at LOS F. Due to the simulated congestion at the Humboldt Street and 4th Avenue intersection during the PM peak hour, the microsimulation model was unable to fully serve all traffic at this intersection. Therefore, the intersection is considered to operate at LOS F. Hexagon conducted a signal warrant analysis for this intersection using the CA MUTCD Peak Hour Signal Warrant. The intersection would not warrant a traffic signal under existing plus project conditions based on both the AM and PM peak hour traffic volumes.

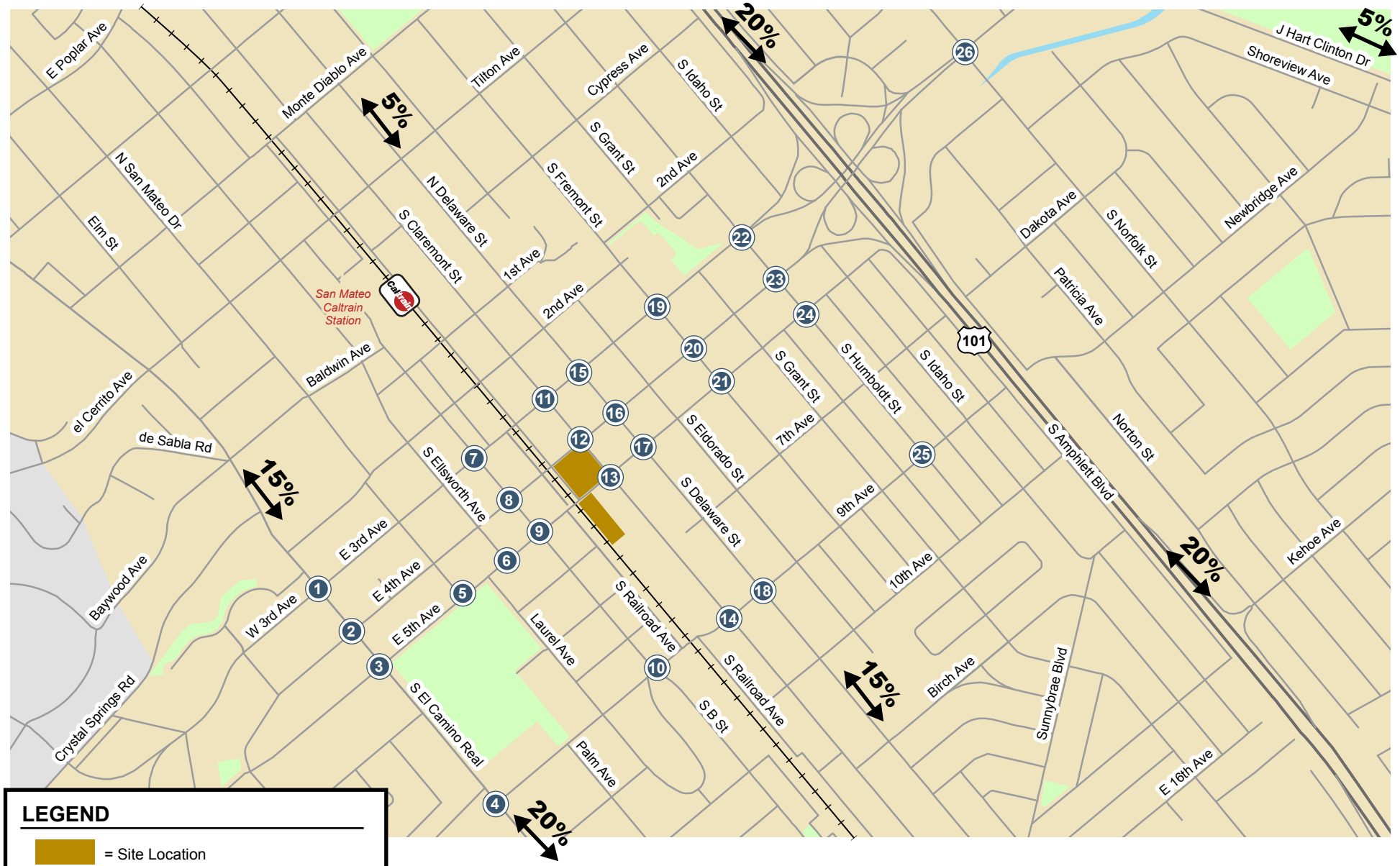


Figure 9
Residential Trip Distribution

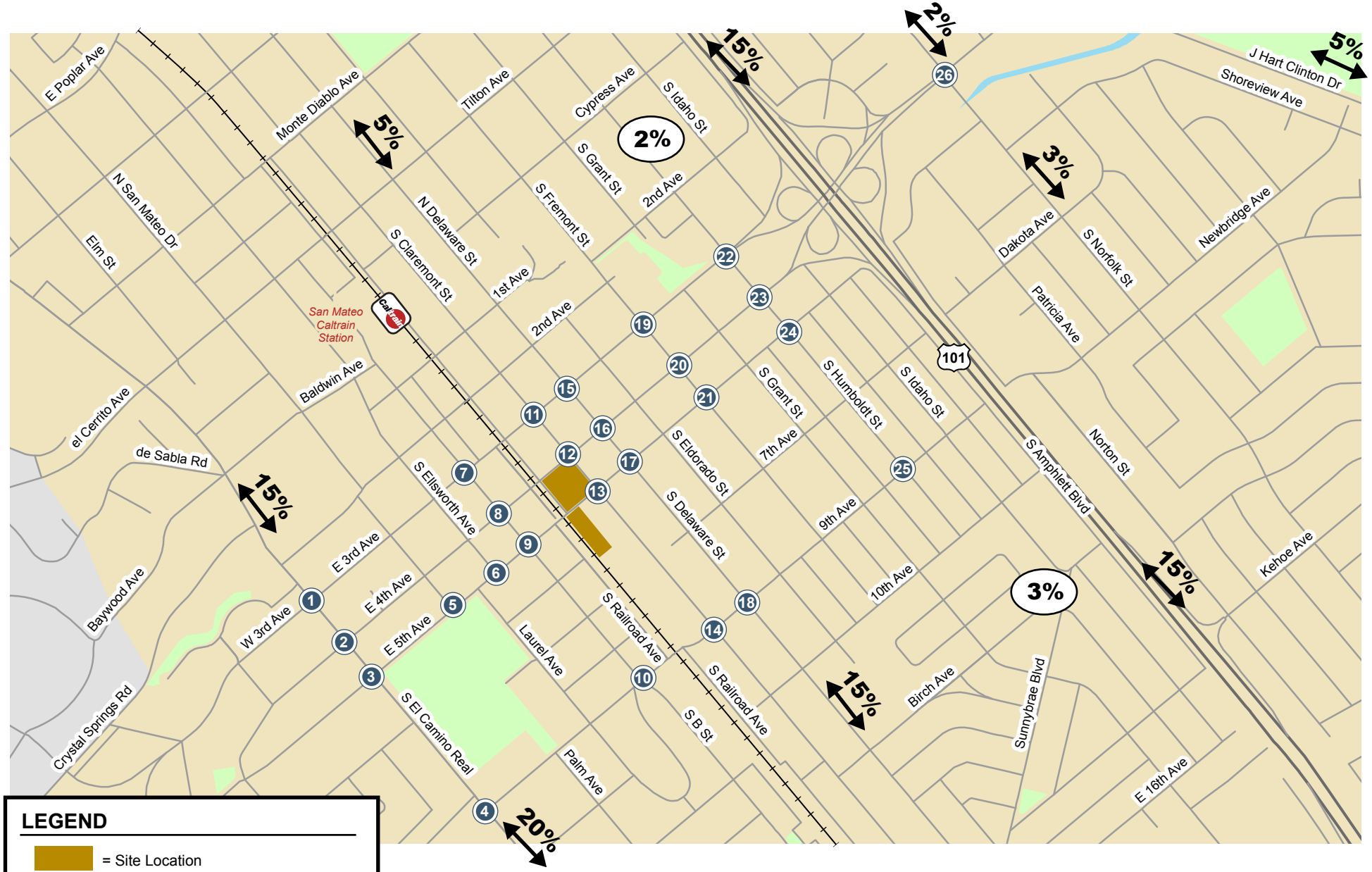
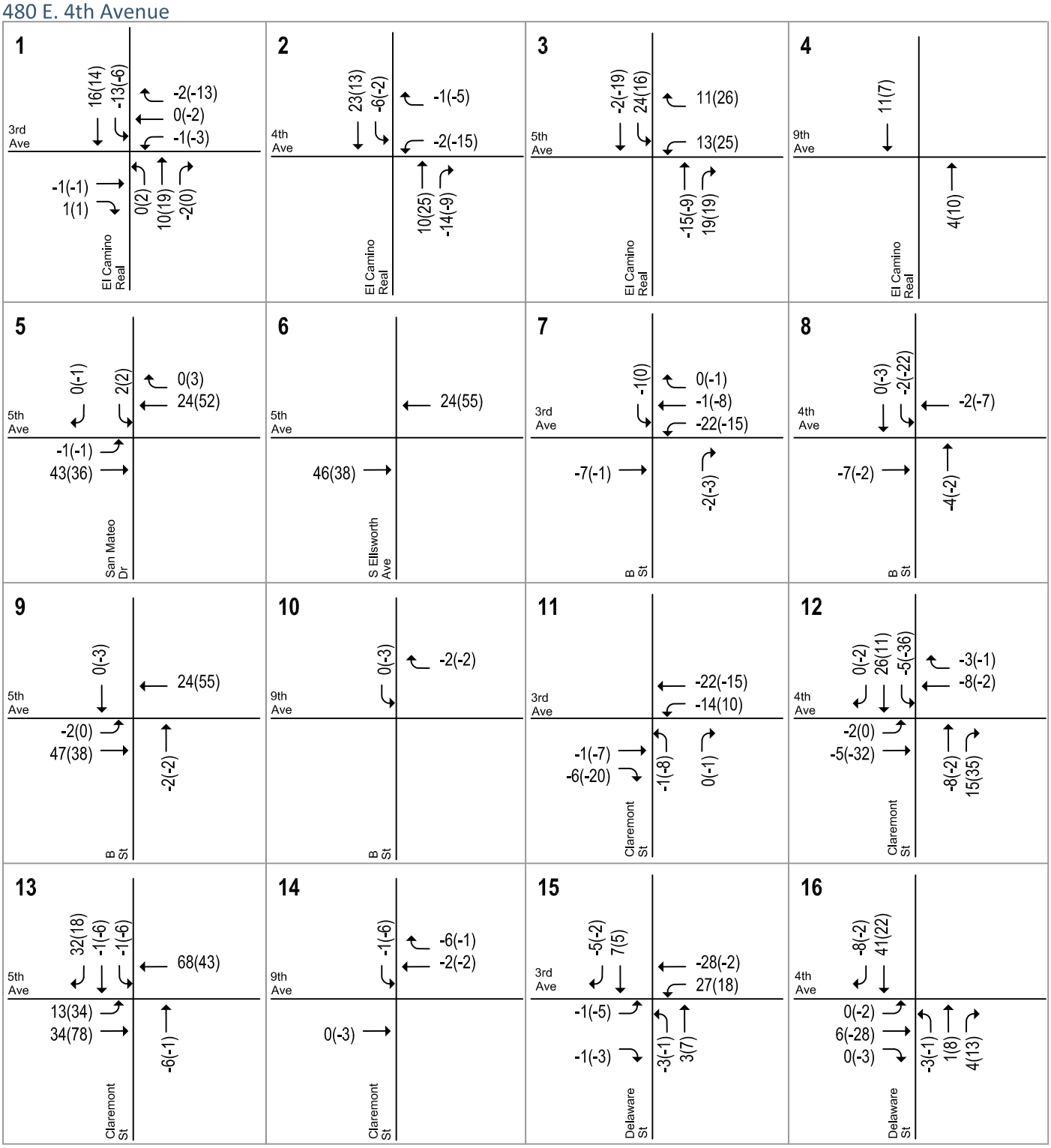


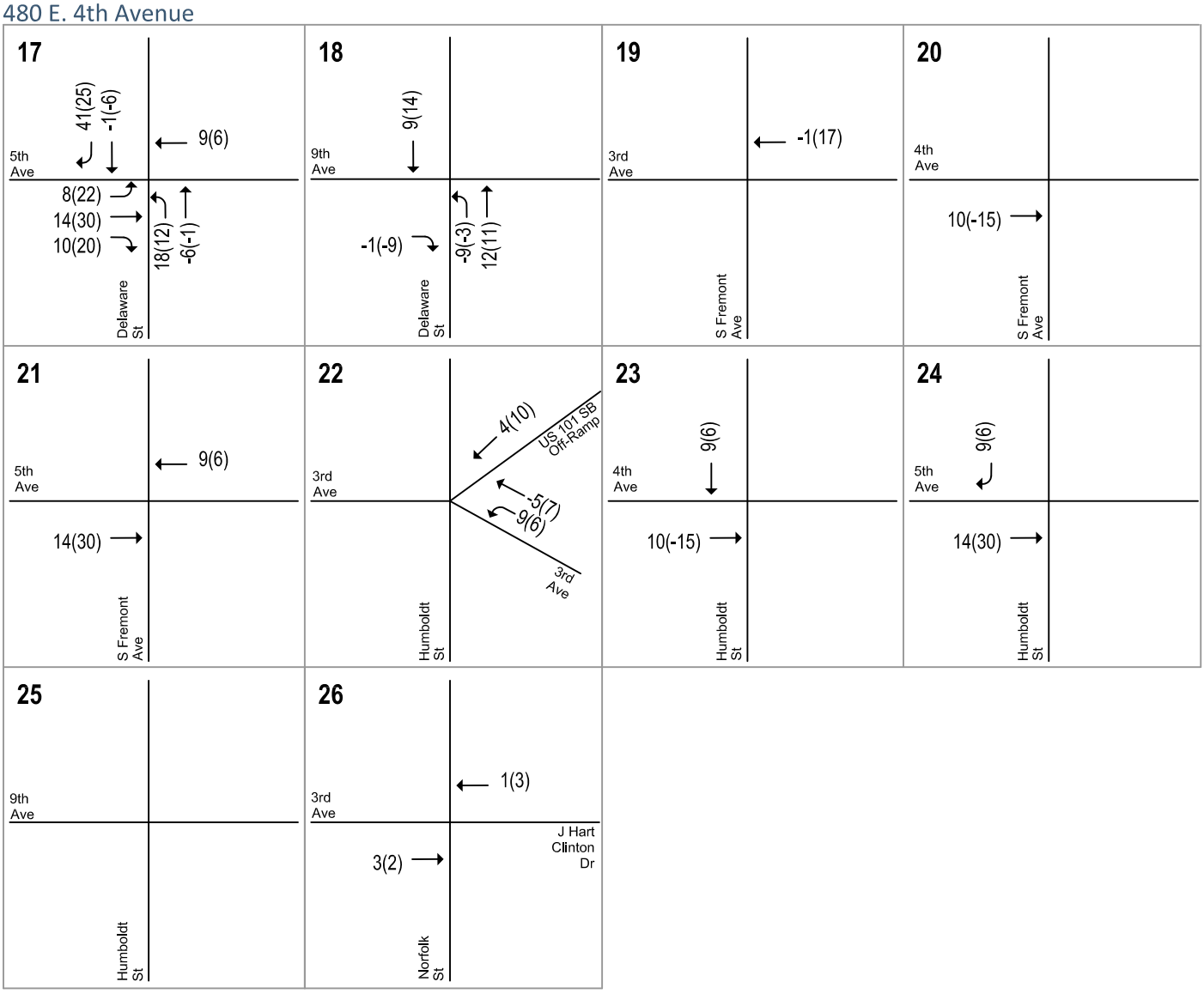
Figure 10
Garage Trip Distribution



LEGEND

XX(XX) = AM(PM) Peak-Hour Trips

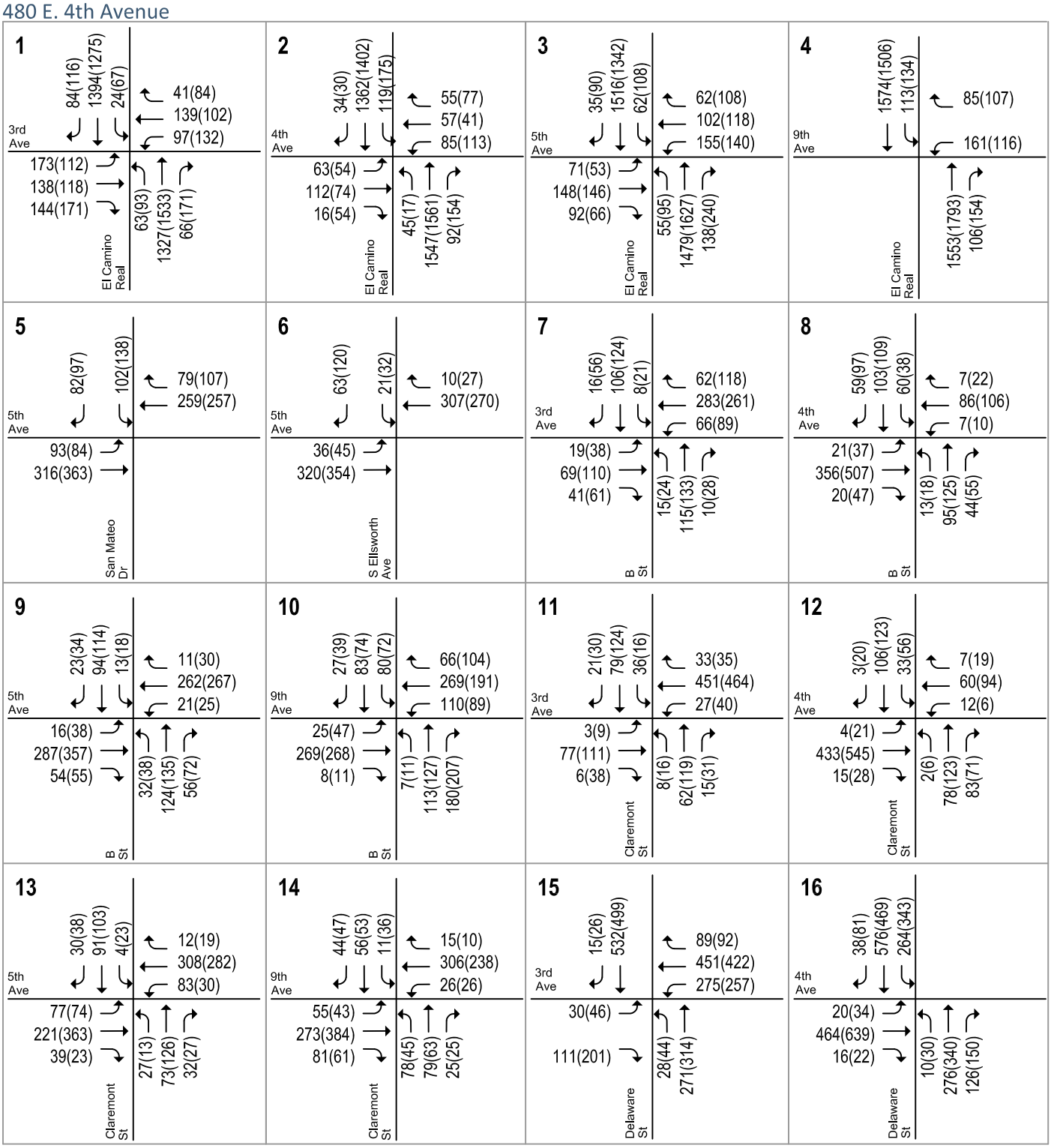
Figure 11
Net Project Trip Assignment



LEGEND

XX(XX) = AM(PM) Peak-Hour Trips

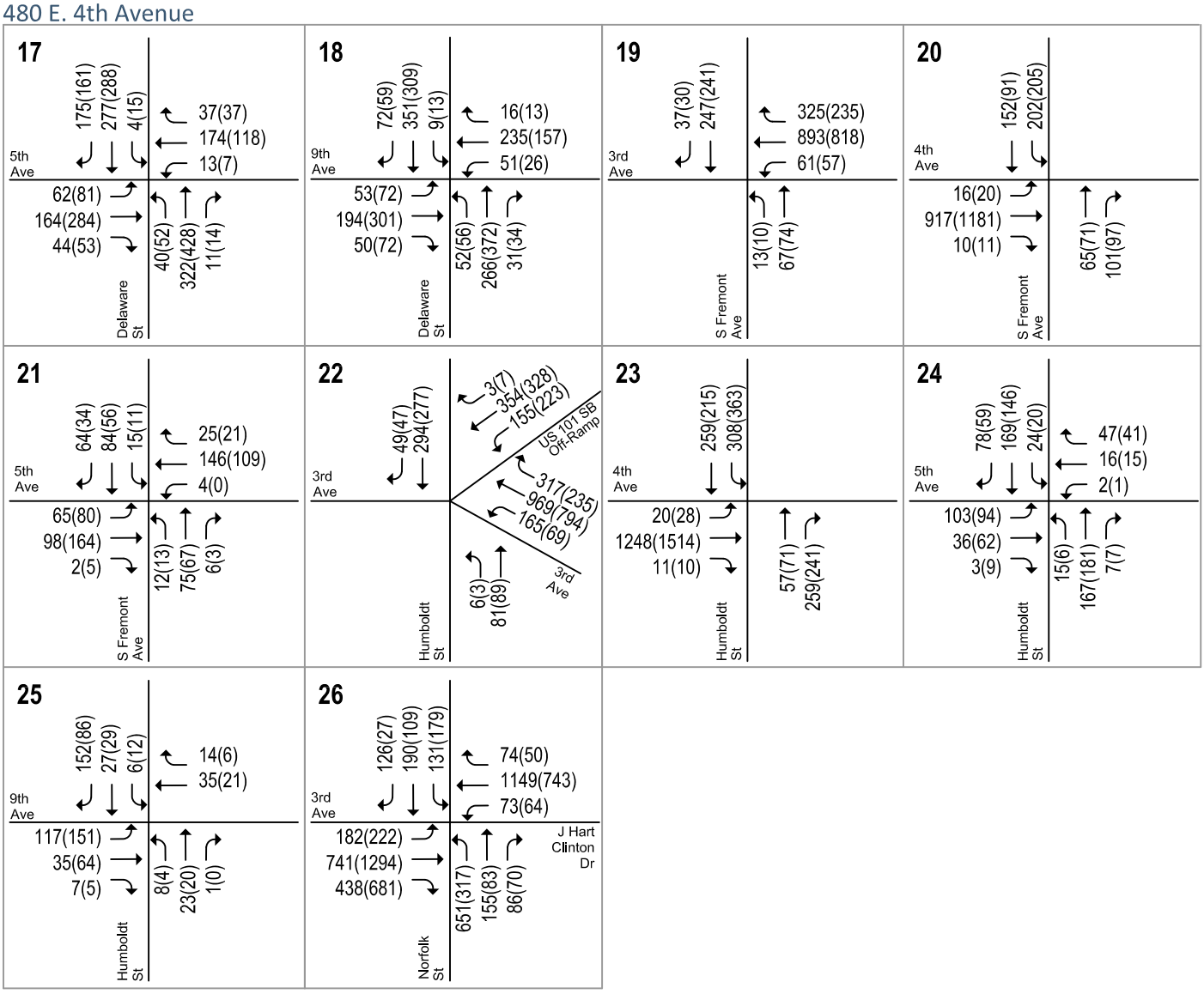
Figure 11
Net Project Trip Assignment



LEGEND

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

Figure 12
Existing Plus Project Traffic Volumes



LEGEND

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

Figure 12
Existing Plus Project Traffic Volumes

Table 10
Existing plus Project Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Existing Avg. Delay (sec)	Existing LOS	Existing plus Project Avg. Delay (sec)	Existing plus Project LOS	Incr. in Avg. Delay (3)
1	El Camino Real & 3rd Avenue	Signal	AM	05/16/19	(2)	14.9	B	14.7	B	-0.2
			PM	05/16/19	(2)	19.3	B	19.3	B	0.0
2	El Camino Real & 4th Avenue	Signal	AM	05/22/18	(2)	14.9	B	13.6	B	-1.3
			PM	05/22/18	(2)	14.9	B	15.8	B	0.9
3	El Camino Real & 5th Avenue	Signal	AM	08/22/18	(2)	19.6	B	21.5	C	1.9
			PM	08/22/18	(2)	18.4	B	25.0	C	6.6
4	El Camino Real & 9th Avenue	Signal	AM	05/16/19		6.6	A	6.6	A	0.0
			PM	05/16/19		7.6	A	7.6	A	0.0
5	San Mateo Drive & 5th Avenue	Signal	AM	05/22/18	(2)	11.9	B	13.4	B	1.5
			PM	05/22/18	(2)	11.0	B	16.3	B	5.3
6	Ellsworth Avenue & 5th Avenue	TWCS (1)	AM	05/16/19	(2)	9.2	A	8.9	A	--
			PM	05/16/19	(2)	10.0	A	46.7	E	--
7	B Street & 3rd Avenue	Signal	AM	05/16/19	(2)	13.1	B	13.5	B	0.4
			PM	05/16/19	(2)	15.8	B	21.9	C	6.1
8	B Street & 4th Avenue	Signal	AM	05/22/18	(2)	12.1	B	13.4	B	1.3
			PM	05/22/18	(2)	18.5	B	22.8	C	4.3
9	B Street & 5th Avenue	Signal	AM	05/22/18	(2)	14.5	B	15.3	B	0.8
			PM	05/22/18	(2)	15.4	B	21.9	C	6.5
10	B Street & 9th Avenue	Signal	AM	05/16/19		6.6	A	6.6	A	0.0
			PM	05/16/19		8.5	A	8.5	A	0.0
11	Claremont Street & 3rd Avenue	Signal	AM	05/22/18	(2)	7.8	A	8.3	A	0.5
			PM	05/22/18	(2)	11.8	B	23.5	C	11.7
12	Claremont Street & 4th Avenue	Signal	AM	05/22/18	(2)	17.6	B	18.0	B	0.4
			PM	05/22/18	(2)	41.9	D	44.5	D	2.6
13	Claremont Street & 5th Avenue	AWCS	AM	05/22/18	(2)	12.7	B	15.6	C	--
			PM	05/22/18	(2)	31.1	D	37.0	E	--
14	Claremont Street & 9th Avenue	AWCS	AM	05/16/19		14.4	B	14.3	B	--
			PM	05/16/19		15.4	C	15.3	C	--
15	Delaware Street & 3rd Avenue	Signal	AM	05/16/19	(2)	26.8	C	25.8	C	-1.0
			PM	05/16/19	(2)	21.3	C	28.4	C	7.1
16	Delaware Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.2	C	20.0	B	-0.2
			PM	05/16/19	(2)	36.7	D	38.5	D	1.8
17	Delaware Street & 5th Avenue	Signal	AM	05/22/18	(2)	23.6	C	25.4	C	1.8
			PM	05/22/18	(2)	26.8	C	34.0	C	7.2
18	Delaware Street & 9th Avenue	Signal	AM	05/16/19		6.8	A	6.8	A	0.0
			PM	05/16/19		8.2	A	8.3	A	0.1
19	Fremont Street & 3rd Avenue	Signal	AM	05/16/19	(2)	11.6	B	11.1	B	-0.5
			PM	05/16/19	(2)	11.2	B	14.1	B	2.9
20	Fremont Street & 4th Avenue	Signal	AM	05/16/19	(2)	20.3	C	19.9	B	-0.4
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.0**
21	Fremont Street & 5th Avenue	AWCS	AM	05/16/19	(2)	7.0	A	7.5	A	--
			PM	05/16/19	(2)	8.3	A	8.2	A	--
22	Humbolt Street & 3rd Avenue	Signal	AM	05/16/19	(2)	32.9	C	29.0	C	-3.9
			PM	05/16/19	(2)	**96.5**	**F**	**97.1**	**F**	**0.6**
23	Humbolt Street & 4th Avenue	Signal	AM	05/16/19	(2)	21.8	C	20.9	C	-0.9
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.4**
24	Humbolt Street & 5th Avenue	AWCS	AM	05/16/19	(2)	9.2	A	8.1	A	--
			PM	05/16/19	(2)	107.1	F	119.2	F	--
25	Humbolt Street & 9th Avenue	AWCS	AM	05/16/19		8.3	A	8.3	A	--
			PM	05/16/19		8.5	A	8.5	A	--
26	Norfolk Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**57.5**	**E**	**57.6**	**E**	**0.1**
			PM	05/22/18	(2)	**64.0**	**E**	**63.4**	**E**	**-0.6**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control

"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.

(2) The intersection level of service is calculated using the SimTraffic microsimulation model.

(3) A Synchro model calibrated based on existing simulation results is used to calculate increases in average delays for intersections that are oversaturated under both the "no project" and "project" scenarios.

BOLD indicates a substandard level of service.

Background Plus Project Traffic Volumes

Project trips, as previously shown on Figure 11, were added to background traffic volumes to obtain background plus project traffic volumes. The background plus project traffic volumes at the study intersections are shown on Figure 13. Traffic volumes for all components of traffic are tabulated in Appendix B.

Background plus Project Intersection Levels of Service

Simulation Analysis

The micro-simulation models were run under background plus project conditions, and the reported intersection delays reflect an average of 10 model runs to account for variations in vehicle simulation. Because of the simulated queuing issue along eastbound 5th Avenue near the project driveway, the feedback queues consistently spilled back to downtown intersections and caused gridlock conditions in the entire network as a result.

Substantial Increases in Intersection Delay

Under background plus project conditions, the project would generate substantial increases in intersection delays based on the City's General Plan criteria at the following intersections (see Table 11):

- El Camino Real & 3rd Avenue – PM Peak Hour
- El Camino Real & 4th Avenue – PM Peak Hour
- El Camino Real & 5th Avenue – PM Peak Hour
- Delaware Street & 5th Avenue – PM Peak Hour
- Humboldt Street & 3rd Avenue – PM Peak Hour

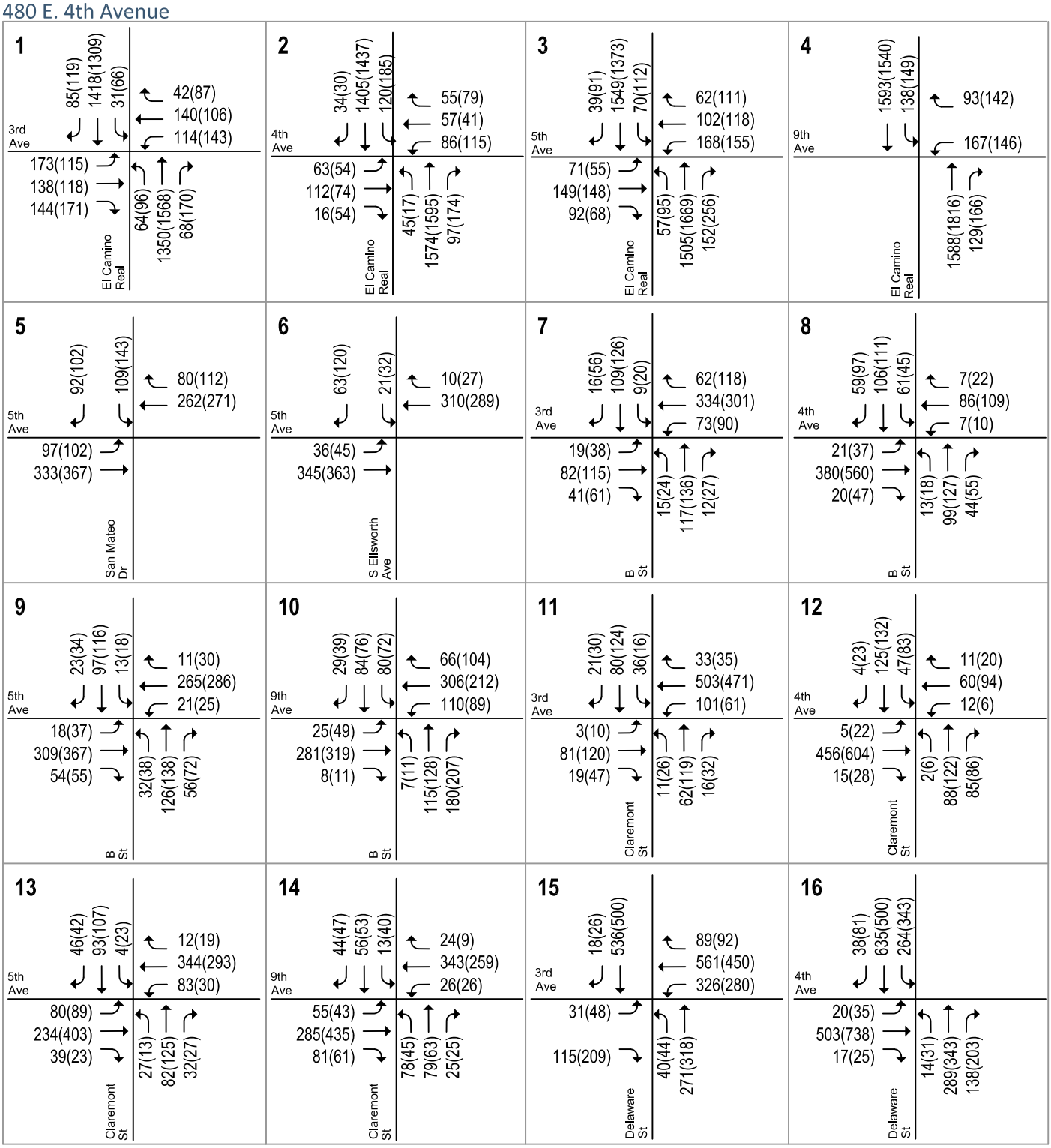
Physical Improvements

The improvement required to address intersection deficiencies under background plus project conditions is restriping eastbound 5th Avenue with two through lanes. The two through lanes would be needed east of the proposed project driveway and would require the removal of the on-street parking spaces along eastbound 5th Avenue east of the proposed project driveway. At the Claremont Street intersection, eastbound 5th Avenue would be restriped with one shared left-through lane and one shared through-right lane. To allow for a second receiving lane along eastbound 5th Avenue, on-street parking spaces along eastbound 5th Avenue between Claremont Street and Delaware Street would need to be removed. At the Delaware Street intersection, eastbound 5th Avenue would be restriped with one left-turn lane and one shared through-right lane. To accommodate the expected volumes under background plus project conditions, the intersection of Delaware Street and 5th Avenue would require careful signal retiming. The *San Mateo Bicycle Master Plan 2020* proposes a bike lane on 5th Avenue west of Delaware Street and a bike boulevard on 5th Avenue east of Delaware Street, which the proposed physical improvements would not affect.

With the proposed physical improvements, all project-generated substantial increases in intersection delays would be eliminated. The improvements would resolve queueing issues on eastbound 5th Avenue near the project site. This would also eliminate the potential gridlock issues observed in the project condition simulations in downtown San Mateo. As a result, this improvement would also eliminate the substantial increases in intersection delays at the El Camino Real intersections and at Humboldt Street and 3rd Avenue.

Unsignalized Intersections

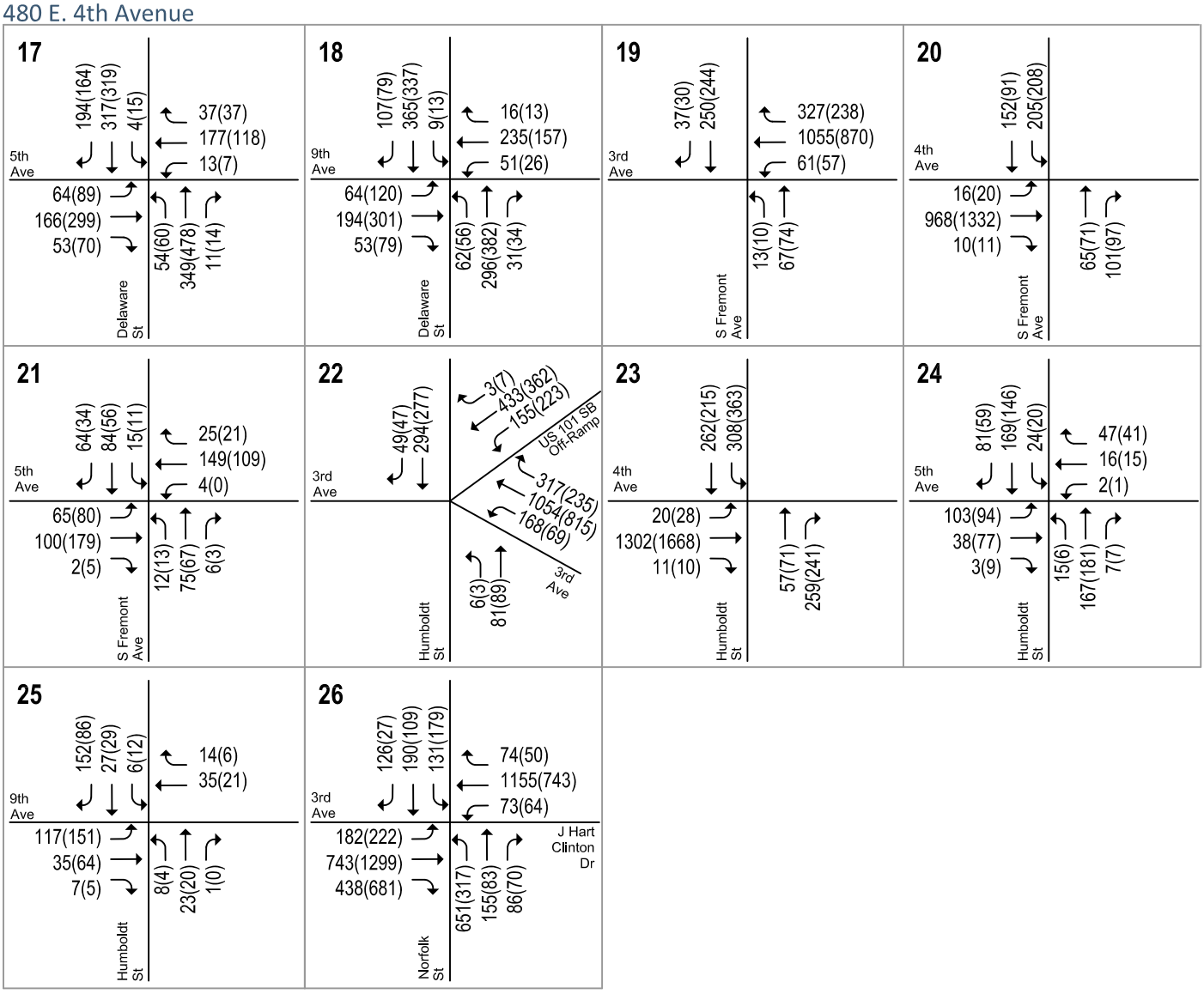
Under background plus project conditions, the unsignalized intersections along 5th Avenue at Ellsworth Avenue, Claremont Street, Fremont Street and Humboldt Street would operate at LOS F. These unsignalized intersections were analyzed using the SimTraffic microsimulation model. Due to the simulated congestion along 4th Avenue creating spillback queues onto the crossing streets during the PM peak hour, the microsimulation model was unable to fully serve all traffic at these unsignalized intersection. Therefore, these intersections are considered to operate at LOS F. Hexagon conducted a signal warrant analysis for these intersections using the CA MUTCD Peak Hour Signal Warrant. The intersections would not warrant a traffic signal under background plus project conditions based on both the AM and PM peak hour traffic volumes.



LEGEND

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

Figure 13
Background Plus Project Traffic Volumes



LEGEND

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

Figure 13
Background Plus Project Traffic Volumes

Table 11
Background plus Project Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Background Avg. Delay (sec)	Background LOS	Background plus Project Avg. Delay (sec)	Background plus Project LOS	Background plus Project Incr. in Avg. Delay [3]	Improved Background plus Project Avg. Delay (sec)	Improved Background plus Project LOS	Improved Background plus Project Incr. in Avg. Delay [3]
1	El Camino Real & 3rd Avenue	Signal	AM	05/16/19	(2)	15.3	B	14.8	B	-0.5	14.9	B	-0.4
			PM	05/16/19	(2)	27.5	C	**OVERSAT**	**F**	**53+**	26.5	C	-1.0
2	El Camino Real & 4th Avenue	Signal	AM	05/22/18	(2)	14.2	B	13.0	B	-1.2	13.6	B	-0.6
			PM	05/22/18	(2)	17.8	B	**OVERSAT**	**F**	**63+**	17.7	B	-0.1
3	El Camino Real & 5th Avenue	Signal	AM	08/22/18	(2)	21.4	C	21.1	C	-0.3	21.7	C	0.3
			PM	08/22/18	(2)	34.1	C	**OVERSAT**	**F**	**46+**	29.1	C	-5.0
4	El Camino Real & 9th Avenue	Signal	AM	05/16/19		7.3	A	7.3	A	0.0	7.3	A	0.0
			PM	05/16/19		8.9	A	9.0	A	0.1	9.0	A	0.1
5	San Mateo Drive & 5th Avenue	Signal	AM	05/22/18	(2)	13.5	B	13.4	B	-0.1	14.1	B	0.6
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.6**	**OVERSAT**	**F**	**0.6**
6	Ellsworth Avenue & 5th Avenue	TWCS (1)	AM	05/16/19	(2)	7.8	A	OVERSAT	F	--	8.9	A	--
			PM	05/16/19	(2)	64.8	F	OVERSAT	F	--	OVERSAT	F	--
7	B Street & 3rd Avenue	Signal	AM	05/16/19	(2)	14.4	B	14.1	B	-0.3	14.6	B	0.2
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.3**	**OVERSAT**	**F**	**-0.3**
8	B Street & 4th Avenue	Signal	AM	05/22/18	(2)	12.9	B	13.7	B	0.8	13.6	B	0.7
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-1.0**	**OVERSAT**	**F**	**-1.0**
9	B Street & 5th Avenue	Signal	AM	05/22/18	(2)	15.6	B	14.5	B	-1.1	16.3	B	0.7
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.3**	**OVERSAT**	**F**	**1.3**
10	B Street & 9th Avenue	Signal	AM	05/16/19		6.8	A	6.8	A	0.0	6.8	A	0.0
			PM	05/16/19		8.8	A	8.8	A	0.0	8.8	A	0.0
11	Claremont Street & 3rd Avenue	Signal	AM	05/22/18	(2)	8.6	A	8.0	A	-0.6	8.4	A	-0.2
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.2**	**OVERSAT**	**F**	**-0.2**
12	Claremont Street & 4th Avenue	Signal	AM	05/22/18	(2)	18.1	B	17.7	B	-0.4	17.8	B	-0.3
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-20.8**	**OVERSAT**	**F**	**-20.8**
13	Claremont Street & 5th Avenue	AWCS	AM	05/22/18	(2)	13.9	B	17.1	C	--	15.8	C	--
			PM	05/22/18	(2)	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
14	Claremont Street & 9th Avenue	AWCS	AM	05/16/19		16.0	C	15.7	C	--	15.7	C	--
			PM	05/16/19		18.9	C	18.4	C	--	18.4	C	--
15	Delaware Street & 3rd Avenue	Signal	AM	05/16/19	(2)	26.9	C	27.8	C	0.9	27.2	C	0.3
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
16	Delaware Street & 4th Avenue	Signal	AM	05/16/19	(2)	22.0	C	21.3	C	-0.7	21.7	C	-0.3
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.0**	**OVERSAT**	**F**	**0.0**
17	Delaware Street & 5th Avenue	Signal	AM	05/22/18	(2)	24.4	C	25.8	C	1.4	27.3	C	2.9
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**19.8**	**OVERSAT**	**F**	**3.2**
18	Delaware Street & 9th Avenue	Signal	AM	05/16/19		7.2	A	7.2	A	0.0	7.2	A	0.0
			PM	05/16/19		9.1	A	9.1	A	0.0	9.1	A	0.0
19	Fremont Street & 3rd Avenue	Signal	AM	05/16/19	(2)	12.3	B	11.8	B	-0.5	12.1	B	-0.2
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.6**	26.3	C	0.6
20	Fremont Street & 4th Avenue	Signal	AM	05/16/19	(2)	21.7	C	19.9	B	-1.8	20.6	C	-1.1
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-2.7**	**OVERSAT**	**F**	**-2.7**
21	Fremont Street & 5th Avenue	AWCS	AM	05/16/19	(2)	7.3	A	7.2	A	--	7.5	A	--
			PM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	--	8.8	A	--
22	Humbolt Street & 3rd Avenue	Signal	AM	05/16/19	(2)	**47.7**	**D**	36.1	D	-11.6	40.2	D	-7.5
			PM	05/16/19	(2)	**65.9**	**E**	**OVERSAT**	**F**	**15+**	**60.2**	**E**	**-5.7**
23	Humbolt Street & 4th Avenue	Signal	AM	05/16/19	(2)	21.2	C	20.3	C	-0.9	21.4	C	0.2
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-2.3**	**OVERSAT**	**F**	**-2.3**
24	Humbolt Street & 5th Avenue	AWCS	AM	05/16/19	(2)	8.3	A	8.4	A	--	8.2	A	--
			PM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	--	39.1	E	--
25	Humbolt Street & 9th Avenue	AWCS	AM	05/16/19		8.3	A	8.3	A	--	8.3	A	--
			PM	05/16/19		8.5	A	8.5	A	--	8.5	A	--
26	Norfolk Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**61.3**	**E**	**60.1**	**E**	**-1.2**	**63.9**	**E**	**2.6**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**62.2**	**E**	**0.2**	**63.6**	**E**	**0.2**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.
(3) A Synchro model calibrated based on existing simulation results is used to calculate increases in average delays for intersections that are oversaturated under both the "no project" and "project" scenarios.

BOLD indicates a substandard level of service.
boxed and BOLD indicates substantial increases in intersection delay.

Project Conditions Freeway Ramp Analysis

Freeway ramp volumes under background plus project conditions were estimated by adding project trips and additional traffic generated by approved projects to existing volumes at the freeway ramps (see Table 12). The ramp analysis shows that under background plus project conditions all studied ramps would continue to have sufficient capacity to serve the projected traffic volumes.

Table 12
Freeway Ramp Capacity Check

				Existing Conditions			Background Conditions		Background plus Project Conditions		
Interchange	Ramp	Type	Pk Hr	Capacity [1]	Peak Volume	V/C	Peak Volume	V/C	Project Trips	Peak Volume	V/C
US 101/3rd Ave/4th Ave	NB On-Ramp from EB 3rd Ave [3]	Loop	AM	900	817	0.91	844	0.94	11	855	0.95
			PM	900	657	0.73	739	0.82	7	746	0.83
	NB Off-Ramp to WB 3rd Ave [3]	Loop	AM	1800	73	0.04	155	0.09	4	159	0.09
			PM	1800	195	0.11	216	0.12	10	226	0.13
	SB Off-Ramp to WB 3rd Ave [4]	Diagonal	AM	2000	508	0.25	587	0.29	4	591	0.30
			PM	2000	548	0.27	582	0.29	10	592	0.30
	SB On-Ramp from EB 4th Ave [3]	Diagonal	AM	900	598	0.66	625	0.69	11	636	0.71
			PM	900	584	0.65	666	0.74	7	673	0.75

Notes:
1. Ramp capacities were obtained from the Highway Capacity Manual 2000 (pg. 25-4), and considered the free-flow speed, the number of lanes on the ramp, and ramp metering. HCM 2010 was not referenced because it does not report ramp capacities.
2. On-ramps during the AM peak hour were not metered during field observations. However, because ramp meter equipment is installed, this study assumes that the on-ramps are metered during the AM peak hours as well.
3. Existing Ramp volumes were obtained from Caltrans PeMS website.
4. Existing Ramp volumes were obtained from intersection counts.

On-Ramp Queues

The queues at the on-ramps under background plus project conditions were estimated based on the ratio between the existing ramp volume and the estimate volume under background plus project conditions. As shown in Table 13, vehicle queues at the on-ramps would increase only slightly (up to 1 vehicle) for the study on-ramps. The study on-ramps have the capacity to accommodate the anticipated vehicle queues during the PM peak hours.

Table 13
Freeway On-Ramp Queuing Analysis

			Existing [1]		Background [2]		Background Plus Project Conditions [2]	
Interchange	Ramp	Peak Hour	Volume	Queue Length (veh.)	Volume	Queue Length (veh.)	Volume	Queue Length (veh.)
US 101/3rd Ave/4th Ave	NB On-Ramp from EB 3rd Ave	PM	657	5	739	6	746	6
	SB On-Ramp from EB 4th Ave	PM	584	5	666	6	673	6

Notes:
1. Existing queue length represents the longest queue observed during the peak-hour period.
2. Queue lengths under background and project conditions were estimated based on the ratio between the existing ramp volume and the estimated future ramp volume, respectively.

5. Cumulative Conditions

This chapter presents a summary of the traffic conditions that would occur under cumulative conditions with the proposed project. Cumulative conditions represent future traffic conditions with expected growth in the area. The expected future growth under cumulative conditions was obtained from the City of San Mateo General Plan 2030 model. Thus, cumulative conditions reflect a horizon year of 2030.

Roadway Network and Traffic Volumes

The intersection lane configurations under cumulative conditions were assumed to be the same as described under background conditions.

Cumulative Conditions Traffic Volumes

Cumulative 2030 traffic conditions were evaluated for the AM and PM peak hours. The 2030 AM and PM peak hour traffic volumes were based on the City of San Mateo General Plan 2030 model. The traffic growth at each study intersection reported in the current General Plan was first linearly proportioned to account for only the remaining years until year 2030. The traffic growth was then added onto the existing intersection volumes. As a conservative approach, the intersection volumes were set to be not lower than background plus project conditions traffic volumes. Hexagon has determined that the proposed project is included in the Year 2030 forecasts.

Cumulative No Project Conditions Traffic Volumes

The cumulative no project conditions were evaluated by subtracting the net project trips generated at the study intersections from the General Plan conditions traffic volumes.

Intersection Levels of Service Analysis

Simulation Analysis

The micro-simulation models were run under cumulative and cumulative no project conditions, and the reported intersection delays reflect an average of 10 model runs to account for variations in vehicle simulation. During the PM peak hour under cumulative no project and cumulative with project conditions, the simulation results show that all simulated study intersections would experience lengthy delays and/or throughput issues where the added demand cannot be accommodated by the model. During the AM peak hour, the simulation results show that all simulated study intersections except the

El Camino Real and 3rd Avenue and El Camino Real and 4th Avenue intersections would experience lengthy delays and/or throughput issues where the added demand cannot be accommodated by the model. Therefore, all of these intersections are considered to operate at LOS F.

Substantial Increases in Intersection Delay

Under cumulative plus project conditions, the project would generate substantial increases in intersection delays based on the City's General Plan criteria at Delaware Street & 5th Avenue during both peak hours when compared against cumulative no project conditions (see Table 14).

Physical Improvements

The improvement required to address the intersection deficiencies under cumulative conditions is the same as under background plus project conditions. As shown on Table 14, with the proposed improvements, the project generated intersection deficiencies can be eliminated.

Unsignalized Intersections

The unsignalized intersection results under background plus project conditions remain the same under cumulative plus project conditions. Hexagon conducted a signal warrant analysis for these intersections using the CA MUTCD Peak Hour Signal Warrant. The intersections would not warrant a traffic signal under cumulative conditions based on both the AM and PM peak hour traffic volumes.

Table 14
Cumulative Conditions Intersection Levels of Service

#	Intersection	Control	Peak Hour	Count Date	Note	Year 2030 no Project Conditions Avg. Delay (sec)	LOS	Year 2030 GP Conditions Avg. Delay (sec)	LOS	Incr. in Avg. Delay (3)	Improved Year 2030 GP Conditions Avg. Delay (sec)	LOS	Incr. in Avg. Delay (3)
1	El Camino Real & 3rd Avenue	Signal	AM	05/16/19	(2)	20.0	B	20.4	C	0.4	17.2	B	-2.8
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.5**	23.6	C	-57
2	El Camino Real & 4th Avenue	Signal	AM	05/22/18	(2)	16.0	B	14.6	B	-1.4	14.4	B	-1.6
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-1.5**	28.2	C	-52
3	El Camino Real & 5th Avenue	Signal	AM	08/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.4**	25.7	C	-55
			PM	08/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**3.0**	**46.3**	**D**	**-34**
4	El Camino Real & 9th Avenue	Signal	AM	05/16/19		7.9	A	7.9	A	0.0	7.9	A	0.0
			PM	05/16/19		9.8	A	9.8	A	0.0	9.8	A	0.0
5	San Mateo Drive & 5th Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.2**	**OVERSAT**	**F**	**0.2**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.7**	**OVERSAT**	**F**	**0.7**
6	Ellsworth Avenue & 5th Avenue	TWCS (1)	AM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	0.6	OVERSAT	F	0.6
			PM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	1.3	OVERSAT	F	1.3
7	B Street & 3rd Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.3**	**OVERSAT**	**F**	**-0.3**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.4**	**OVERSAT**	**F**	**-0.4**
8	B Street & 4th Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-3.4**	**OVERSAT**	**F**	**-3.4**
9	B Street & 5th Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.3**	**OVERSAT**	**F**	**0.3**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**2.2**	**OVERSAT**	**F**	**2.1**
10	B Street & 9th Avenue	Signal	AM	05/16/19		9.4	A	9.4	A	0.0	9.4	A	0.0
			PM	05/16/19		10.2	B	10.1	B	-0.1	10.1	B	-0.1
11	Claremont Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
12	Claremont Street & 4th Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.4**	**OVERSAT**	**F**	**1.4**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-31.3**	**OVERSAT**	**F**	**-31.3**
13	Claremont Street & 5th Avenue	AWCS	AM	05/22/18	(2)	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
			PM	05/22/18	(2)	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
14	Claremont Street & 9th Avenue	AWCS	AM	05/16/19		21.8	C	21.4	C	--	21.4	C	--
			PM	05/16/19		36.1	E	34.3	D	--	34.3	D	--
15	Delaware Street & 3rd Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
16	Delaware Street & 4th Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-0.1**	**OVERSAT**	**F**	**-0.1**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.1**	**OVERSAT**	**F**	**0.1**
17	Delaware Street & 5th Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**12.1**	**OVERSAT**	**F**	**3.3**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**27.1**	**OVERSAT**	**F**	**-1.8**
18	Delaware Street & 9th Avenue	Signal	AM	05/16/19		7.6	A	7.6	A	--	7.6	A	--
			PM	05/16/19		10.1	B	10.1	B	--	10.1	B	--
19	Fremont Street & 3rd Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.0**	**OVERSAT**	**F**	**0.0**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.8**	**OVERSAT**	**F**	**0.8**
20	Fremont Street & 4th Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.3**	**OVERSAT**	**F**	**0.3**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-2.8**	**OVERSAT**	**F**	**-2.8**
21	Fremont Street & 5th Avenue	AWCS	AM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	0.2	OVERSAT	F	0.2
			PM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	0.3	OVERSAT	F	0.3
22	Humbolt Street & 3rd Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.9**	**OVERSAT**	**F**	**1.9**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.8**	**OVERSAT**	**F**	**0.8**
23	Humbolt Street & 4th Avenue	Signal	AM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**1.9**	**OVERSAT**	**F**	**1.9**
			PM	05/16/19	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**-1.7**	**OVERSAT**	**F**	**-1.7**
24	Humbolt Street & 5th Avenue	AWCS	AM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
			PM	05/16/19	(2)	OVERSAT	F	OVERSAT	F	--	OVERSAT	F	--
25	Humbolt Street & 9th Avenue	AWCS	AM	05/16/19		8.8	A	8.8	A	--	8.8	A	--
			PM	05/16/19		9.9	A	9.9	A	--	9.9	A	--
26	Norfolk Street & 3rd Avenue	Signal	AM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.1**	**OVERSAT**	**F**	**0.1**
			PM	05/22/18	(2)	**OVERSAT**	**F**	**OVERSAT**	**F**	**0.2**	**OVERSAT**	**F**	**0.2**

Notes:
AWSC = All-Way Stop Control
TWSC = Two-Way Stop Control
"OVERSAT" indicates that the SimTraffic microsimulation model indicates that the intersection would experience capacity issues where the demand cannot be served by the intersection. Oversaturated intersections would operate at LOS F.

(1) Delays and LOS reported for side-street and two-way stop controlled intersections are for the worst approach.
(2) The intersection level of service is calculated using the SimTraffic microsimulation model.
(3) A Synchro model calibrated based on existing simulation results is used to calculate increases in average delays for intersections that are oversaturated under both the "no project" and "project" scenarios.

BOLD indicates a substandard level of service.
boxed and BOLD indicates substantial increases in intersection delay.

6. Other Transportation Issues

This chapter presents an analysis of other transportation issues associated with the project site, including:

- Operations analysis – vehicle queuing and storage at selected intersections,
- Potential impacts to transit, pedestrian and bicycle facilities,
- Site access, on-site circulation, and
- Parking.

Unlike the level of service methodology, which is specified in the City of San Mateo General Plan, the analyses in this chapter are based on professional judgment in accordance with the standards and methods employed by the traffic engineering community.

Although operational issues are not considered CEQA impacts, they do describe traffic conditions that are relevant to describing the project environment.

Vehicle Queuing

Vehicle queues were estimated using a Poisson probability distribution, which estimates the probability of "n" vehicles for a vehicle movement using the following formula:

$$P(x = n) = \frac{\lambda^n e^{-(\lambda)}}{n!}$$

Where:

$P(x = n)$ = probability of "n" vehicles in queue per lane

n = number of vehicles in the queue per lane

λ = Average number of vehicles in the queue per lane (vehicles per hour per lane/signal cycles per hour)

The operations analysis is based on vehicle queuing for high-demand left-turn movements at intersections where 10 or more project trips were added. Vehicle queues were estimated using a Poisson probability distribution. The basis of the analysis is as follows: (1) the Poisson probability distribution is used to estimate the 95th percentile maximum number of queued vehicles for a particular movement; (2) the estimated maximum number of vehicles in the queue is translated into a queue length, assuming 25 feet per vehicle; and (3) the estimated maximum queue length is compared to the existing or planned available storage capacity for the movement to determine if adequate storage is available to accommodate the 95th percentile queues. This analysis thus provides a basis for determining whether the addition of project trips would exacerbate peak hour queues and delays, as well as estimating future storage requirements at intersections.

Based on the selection criteria of 10 or more project trips per left-turn lane, the following lanes were analyzed:

- El Camino Real & 5th Avenue – southbound left-turn and westbound left-turn lanes
- Claremont Street & 5th Avenue – eastbound lane
- Delaware Street & 3rd Avenue – westbound left-turn lane
- Delaware Street & 5th Avenue – eastbound and northbound lanes

Hexagon conducted field observations during both the AM and PM peak commute periods and calibrated the queuing results to match existing conditions observed in the field. The vehicle queuing estimates at these locations are provided in Tables 15 and 16. The queuing results for the background plus project scenario are compared to the background scenario to determine whether the project would cause extensive queuing issues. For the following turn lanes with 95th percentile queues exceeding the existing storages under background conditions, the project would lengthen the 95th percentile queues by at least one vehicle during at least one study period:

- El Camino Real & 5th Avenue – southbound left-turn – PM Peak Hour
- Delaware Street & 3rd Street – westbound left-turn – AM & PM Peak Hours
- Claremont Street & 5th Avenue – eastbound lane – PM Peak Hour
- Delaware Street & 5th Avenue – eastbound lane – AM & PM Peak Hours

Below is a detailed discussion of the above identified locations under background plus project conditions.

Table 15
Queuing Analysis

Measurement	El Camino Real & 5th Ave			
	SBL		WBL	
	AM	PM	AM	PM
Existing				
Cycle/Delay[1] (sec)	95	90	95	90
Volume (vphpl)	45	93	143	119
Avg. Queue (veh/ln.)	1.0	4.0	4.0	4.0
Avg. Queue[2] (ft./ln)	25	100	100	100
95th %. Queue (veh/ln.)	3	8	7	8
95th %. Queue (ft./ln)	75	200	175	200
Storage (ft./ ln.)	85	85	450	450
Adequate (Y/N)	Y	**N**	Y	Y
Background				
Cycle/Delay[1] (sec)	95	90	95	90
Volume (vphpl)	46	96	155	130
Avg. Queue (veh/ln.)	1.0	4.0	4.0	4.0
Avg. Queue[2] (ft./ln)	25	100	100	100
95th %. Queue (veh/ln.)	3	8	8	8
95th %. Queue (ft./ln)	75	200	200	200
Storage (ft./ ln.)	85	85	450	450
Adequate (Y/N)	Y	**N**	Y	Y
Background plus Project				
Cycle/Delay[1] (sec)	95	90	95	90
Volume (vphpl)	70	112	168	155
Avg. Queue (veh/ln.)	2.0	5.0	4.0	5.0
Avg. Queue[2] (ft./ln)	50	125	100	125
95th %. Queue (veh/ln.)	4	9	8	9
95th %. Queue (ft./ln)	100	225	200	225
Storage (ft./ ln.)	85	85	450	450
Adequate (Y/N)	N	**N**	Y	Y

1. Vehicle queue calculations based on cycle length for signalized intersections.
2. Assumes 25 Feet Per Vehicle Queued

BOLD indicates the storage capacity would be inadequate to accommodate the 95th percentile queue.

Table 16
Queuing Analysis (continued)

Measurement	Delaware St & 3rd St WBL Lane AM	Delaware St & 3rd St WBL Lane PM	Claremont St & 5th Ave EB Lane AM	Claremont St & 5th Ave EB Lane PM	Delaware St & 5th Ave EB Lane AM	Delaware St & 5th Ave EB Lane PM	Delaware St & 5th Ave NB Lane AM	Delaware St & 5th Ave NB Lane PM
Existing								
Cycle/Delay[1] (sec)	80	80	11.9	45.1	80	80	80	80
Volume (vphpl)	264	242	295	395	243	379	368	485
Avg. Queue (veh/ln.)	6.0	5.0	1.0	5.0	5.0	8.0	8.0	11.0
Avg. Queue[2] (ft./ln)	150	125	25	125	125	200	200	275
95th %. Queue (veh/ln.)	10	9	3	9	9	13	13	16
95th %. Queue (ft./ln)	250	225	75	225	225	325	325	400
Storage (ft./ ln.)	250	250	470	470	210	210	570	570
Adequate (Y/N)	Y	Y	Y	Y	**N**	**N**	Y	Y
Background								
Cycle/Delay[1] (sec)	80	80	12.4	52.6	80	80	80	80
Volume (vphpl)	299	262	306	403	251	386	402	541
Avg. Queue (veh/ln.)	7.0	6.0	1.0	6.0	6.0	9.0	9.0	12.0
Avg. Queue[2] (ft./ln)	175	150	25	150	150	225	225	300
95th %. Queue (veh/ln.)	11	10	3	10	10	14	14	18
95th %. Queue (ft./ln)	275	250	75	250	250	350	350	450
Storage (ft./ ln.)	250	250	470	470	210	210	570	570
Adequate (Y/N)	**N**	Y	Y	Y	**N**	**N**	Y	Y
Background plus Project								
Cycle/Delay[1] (sec)	80	80	14.9	154.2	80	80	80	80
Volume (vphpl)	326	280	353	515	283	458	414	552
Avg. Queue (veh/ln.)	7.2	6.2	1.5	22.1	6.3	10.2	9.2	12.3
Avg. Queue[2] (ft./ln)	175	150	25	550	150	250	225	300
95th %. Queue (veh/ln.)	12	11	4	30	11	16	14	18
95th %. Queue (ft./ln)	300	275	100	750	275	400	350	450
Storage (ft./ ln.)	250	250	470	470	210	210	570	570
Adequate (Y/N)	**N**	**N**	Y	**N**	**N**	**N**	Y	Y

1. Vehicle queue calculations based on cycle length for signalized intersections, and movement delay for unsignalized intersections.
2. Assumes 25 Feet Per Vehicle Queued

BOLD indicates the storage capacity would be inadequate to accommodate the 95th percentile queue.

El Camino Real & 5th Avenue – southbound left-turn lane

This left-turn movement has one turn lane with approximately 85 feet of available queue storage space. Under background conditions during the PM peak hour, the 95th percentile queue length would be 200 feet, with back-of-queue extending out of the turn pocket. Under background plus project conditions, the proposed project would add 16 southbound left-turn vehicles during the PM peak hour. The 95th percentile queue length would be extended by 25 feet to 225 feet. There is no room to further extend this turn pocket.

Delaware Street & 3rd Avenue – westbound left-turn lane

This left-turn movement has one turn lane with approximately 250 feet of available queue storage space. Under background conditions during the AM peak hour, the 95th percentile queue length would be 275 feet, with the back-of-queue extending out of the turn pocket. Under background plus project conditions, the proposed project would add 27 westbound left-turn vehicles during the AM peak hour. The 95th percentile queue length would be extended by 25 feet to 300 feet. Under background plus project conditions during the PM peak hour, the 95th percentile queue would be 275 feet, with the back-of-queue extending out of the pocket. There is no room to further extend this turn pocket.

Claremont Street & 5th Avenue – eastbound lane

Eastbound 5th Avenue at Claremont Street has one travel lane for all turning movements. The rail tracks are located approximately 235 feet west of the intersection. B Street is located approximately 235 feet west of the rail tracks. Under background conditions during the PM peak hour, the 95th percentile queue length would be 250 feet, with back-of-queue extending past the rail tracks. Under background plus project conditions, the proposed project would add 112 eastbound vehicles during the PM peak hour. The 95th percentile queue length would be extended by 500 feet to 750 feet and would be extended into the B Street and 5th Avenue intersection. The project driveway is located approximately 115 feet west of Claremont Street and would also be blocked by the queues.

Potential Improvement

The lengthy 95th percentile queue under background plus project conditions is due to the extended delay for eastbound vehicles. One potential improvement is the proposed measure under cumulative conditions to widen eastbound 5th Avenue with two lanes between the proposed project driveway and Delaware Street. With this improvement, the 95th percentile queue length would be reduced to 125 feet. While this queue would still block the project driveway, it would not extend beyond B Street. “Keep Clear” markings could be considered along eastbound 5th Avenue in front of the proposed project driveway to facilitate vehicles accessing the proposed garage.

Delaware Street & 5th Avenue – eastbound lane

This discussion focuses on queuing during the PM peak hour, which is anticipated to be worse than conditions during the AM peak hour.

Eastbound 5th Avenue at Delaware Street has one travel lane for all turning movements. Claremont Street is located approximately 210 feet west of the intersection. Under background conditions during the PM peak hour, the 95th percentile queue length would be 350 feet, with back-of-queue extending into the Claremont Street intersection. Under background plus project conditions, the proposed project would add 72 eastbound vehicles during the PM peak hour. The 95th percentile queue length would be extended by 50 feet to 400 feet and would be extended west farther past Claremont Street.

Potential Improvement

As discussed above, by removing on-street parking along eastbound 5th Avenue from Claremont Street to Delaware Street, eastbound 5th Avenue can be widened to accommodate one dedicated left-turn lane and one shared through-right lane. This would reduce the eastbound per-lane demand volume on the roadway and improve queuing to better than existing conditions.

Bicycles, Pedestrians and Transit

Pedestrian Facilities

Pedestrian facilities near the project site consist of sidewalks along both sides of all roadways, as well as crosswalks at all signalized intersections. Signalized intersections in downtown San Mateo between San Mateo Drive and Delaware Street all have a pedestrian leading interval. Within the immediate vicinity of the project site, the intersections along Claremont Street at 3rd Avenue and at 4th Avenue both have bulbouts that reduce the crosswalk lengths and pedestrian exposure to traffic. There are no crosswalks at the all-way stop controlled intersection of Claremont Street and 5th Avenue. Continuous pedestrian facilities are present between the residential component of the project and the nearby San Mateo Caltrain station.

The project proposes detached sidewalks along the streets fronting the residential component of the project site. Detached sidewalks provide barriers between pedestrians and roadway traffic and would improve pedestrian safety and comfort levels.

Outside of trips to and from transit stops, the project is expected to generate some pedestrian traffic to nearby schools. The project is located approximately 2,500 feet northwest of the Sunnybrae Elementary School. Aside from the missing crosswalks at the intersection at Claremont Street and 5th Avenue, continuous pedestrian facilities exist between the project site and the elementary school. Borel Middle School and Aragon High School are both located approximately 1.5 mile southwest of the project site and are not assumed to be within walking distance.

Recommendations

The project should install crosswalks on all legs of the intersection at Claremont Street and 5th Avenue to complete the pedestrian network within the immediate project vicinity.

Bicycle Facilities

The project could potentially generate bicycle traffic between the project site, nearby schools, and the San Mateo Caltrain station. Continuous bicycle facilities existing between the project site and the Caltrain station, as well as with the Sunnybrae Elementary School. Continuous bicycle facilities do not exist between the project site and Aragon High School or Borel Middle School. The *San Mateo Bicycle Master Plan 2020* shows there are proposed plans that would provide continuous bicycle facilities from the project site to these two schools in the future. The plan also proposes a bike lane along 5th Avenue west of Delaware Street. East of Delaware Street, the plan proposes a bicycle boulevard on 5th Avenue. A separated bike lane has been proposed on 4th Avenue between Delaware Street and Humboldt Street and 3rd Avenue west of Humboldt Street. Other bike facilities proposed in the vicinity of the project include a buffered bike lane on Delaware Street and B street south of 5th Avenue, separated bike lane on B Street north of 5th Avenue, bike boulevard on Claremont Street north of 9th Avenue, and bike boulevard along the rail tracks north of 5th Avenue and south of 9th Avenue.

On-Site Bicycle Facilities

Per City requirements, the project is required to provide 19 short-term and 267 long-term bicycle parking spaces for the proposed residential use (see Table 17). The project site plan shows a secured 267-space bike room south of the proposed lobby near 4th Avenue, meeting City requirements. This bike room would be located in an easily accessible location. The project site plan shows 20 short-term bicycle parking spaces along the project frontage on 5th Avenue, meeting City requirements.

Table 17
City of San Mateo Off-Street Bicycle Parking Requirements

Use Type	Size	Units	Bicycle Parking Requirement[1] Short-Term Ratio	Short-Term Spaces	Long-Term Ratio	Long-Term Spaces
Residential Use						
Studio	67	du	0.05/unit	3	1.0/unit	67
1 Bedroom	49	du	0.05/unit	2	1.0/unit	49
2 Bedrooms	49	du	0.10/unit	5	1.25/unit	61
3 Bedrooms	60	du	0.15/unit	9	1.5/unit	90
Required Residential Spaces				**19**		**267**
Total Proposed Parking Spaces				*20 spaces*		*267 spaces*

Notes:
1. Parking requirements based on City of San Mateo Zoning Code Section 27.64.262.

Transit Facilities

As discussed in Chapter 2 and shown in Figure 4, the project site is served by three bus routes (five routes on school days), and all buses stop within walking distance of the project site. In addition, the San Mateo Caltrain station is located approximately 1,600 feet north of the project site and is also within walking distance. There are continuous pedestrian facilities connecting the residential component of the project site to the various bus stops and the San Mateo Caltrain station. The project is anticipated to generate additional transit ridership on the buses and Caltrain. The Caltrain electrification project would enable Caltrain to provide more frequent train service. Caltrain predicts an initial capacity increase of over 30%. It is expected that the Caltrain electrification project would accommodate the potential increase in transit ridership generated by the project.

Site Access and Circulation

This section describes the site access and circulation of the proposed project. This review is based on project site plans prepared by BAR Architects dated December 20, 2019 (see Figure 2).

Site Access

Site access was evaluated to determine the adequacy of the site driveway regarding traffic volumes. The project proposes a parking garage on the existing Claremont and 5th parking lot. This parking garage also would include parking spaces for the residential component of the project. Pedestrian access from the residential parking spaces to the residential building would be provided via a pedestrian bridge.

Driveway Sight Distance

According to the Caltrans *Highway Design Manual*, the minimum stopping sight distance is the distance required by the user, traveling at a given speed, to bring the vehicle or bicycle to a stop after an object ½-foot high on the road becomes visible. Stopping sight distance for motorists is measured from the driver's eyes, which are assumed to be 3 ½ feet above the pavement surface, to an object ½-foot high on the road. The required stopping sight distances are based on the Caltrans *Highway Design Manual*, Table 201.1. The project driveway is located on 5th Avenue, which has a speed limit of 25 mph, the Caltrans stopping sight distance requirement is 200 feet (based on a design speed of 30 mph).

There are no roadway curves or vegetation along either side of the driveway, but there are on-street parking spaces located on both sides of the driveway. To maintain adequate sight distance, one parking space west of the driveway should be removed.

Driveway Queuing

As discussed above in the Queuing section, the eastbound vehicle queues on 5th Avenue at Claremont Street would block the driveway location. To ensure vehicles can adequately maneuver into and out of the driveway without blocking the roadway, the project should consider striping eastbound 5th Avenue with "Keep Clear" markings in front of the project driveway.

The westbound left-turn movement into the project site is a shared through and left-turn lane with approximately 100 feet of available queue storage space from the intersection at S. Claremont Street. Under background plus project conditions, the 95th percentile queue length would be 50 feet in the AM peak hour and 75 feet in the PM peak hour. The available storage length is sufficient to accommodate the back-of-queue under both peak periods.

On-Site Circulation

On-site vehicular circulation was reviewed in accordance with the City of San Mateo Zoning Code and generally accepted traffic engineering standards. Generally, the proposed site plan would provide vehicles with adequate connectivity through the parking areas. The parking aisle widths all meet the San Mateo parking design standards. Sufficient turnaround spaces are also provided for parking spaces at dead-end aisles. A security gate is shown on the fourth level separating the public parking spaces from the residential spaces, meeting City requirements.

Loading Vehicles Access and Circulation

Per City of San Mateo Municipal Code Section 27.64.390, the project site should provide one loading zone. The site plan does not indicate a loading zone. However, the municipal code (Section 27.64.390 a1) allows the Development Review Board to modify the loading requirements if there is adequate on-street parking along the project frontage to accommodate a loading vehicle. The residential building is surrounded by on-street parking spaces along its building frontage on 4th Avenue, 5th Avenue, and Claremont Street. Therefore, the loading zone requirement for this project may be modified.

Garbage Trucks Access and Circulation

The project site plan proposes a trash room along the south side of the residential building with access from 5th Avenue. On garbage collection days, the trash bins would be pushed onto 5th Avenue to be picked up.

Parking

The proposed parking garage would provide a total of 696 parking spaces, of which 164 spaces would be gated for residential use. Of the remaining 532 public parking spaces, 234 spaces would be replacing the existing parking lots on site. The residential project is an affordable housing project and qualifies for the state density bonus law parking requirement of 0.5 space per unit. Therefore, the project proposing 225 residential units would be required to provide 113 parking spaces. The project is proposing 164 spaces, which would meet the parking requirement.

Hexagon has counted numerous residential complexes in the Bay Area within recent years, and we have found that residential units typically generate a peak parking demand of 0.8 space per bedroom (see Appendix F). The project is proposing 225 bedrooms, which would generate a peak parking demand of 180 spaces. This exceeds the 164 spaces provided for residents. However, the proposed parking garage would remain open to the public overnight and could be used to accommodate the

additional residential parking demand that cannot be met in the gated residential section. These vehicles are expected to vacate the garage in the early morning hours before free parking ends. Since the parking garage would be located on the periphery of downtown, it is assumed that it would not be as heavily utilized as the more centrally located garages and could accommodate the unmet residential demand of 26 vehicles within the 532 public parking spaces during the evening hours when residential parking demand peaks.

Recommendations

Hexagon recommends the project establish a Transportation Demand Management (TDM) program to facilitate residents using alternative modes of transportation and to encourage forgoing vehicle ownership. This could include providing free transit passes, Zipcar memberships, and other incentives.

ADA Spaces

Table 18 summarizes the accessible parking requirements for each parking facility according to the California Building Code (CBC) Section 11-B-208. As shown, the project proposing 164 residential parking spaces would be required to provide 6 accessible parking spaces. The project proposes 4 accessible parking spaces for the residential component and would not meet the CBC requirements.

Table 18
Accessible Parking Spaces

Parking Section	Total Parking Spaces	ADA Spaces		Van Accessible	
		Required [1]	Proposed	Required [1]	Proposed
Residential	164	6	4	1	1
Public Parking	532	11	13	2	3

Notes:
1. Parking requirements based on California Building Code Section 11B-208.2.

7. Conclusions

This report presents the results of the transportation analysis conducted for the proposed residential development located at 480 E 4th Avenue in San Mateo, California. The project proposes a seven-story 225-unit residential complex to replace the existing parking lot on site. The project also proposes to construct a six-story 696-space parking garage to replace the existing parking lot at 400 E. 5th Avenue. The project would include a pedestrian bridge connecting the parking garage to the residential complex. 164 of the spaces in the parking garage would be reserved and gated for residential use, 234 spaces would be a replacement for the demolished parking lots, and the remaining 298 new spaces would be used as public parking for the downtown area. Access to the proposed parking garage would be provided via one driveway on E. 5th Avenue.

The purpose of the transportation study is to identify any potential transportation issues related to the proposed project and to review the proposed site access and circulation, with a description of project parking. Local intersection operations were evaluated following standards and methodologies set forth by the City of San Mateo.

Intersection Level of Service Results

Existing plus Project Conditions

Under existing plus project conditions, the project would not generate substantial increases in intersection delays at any study intersection based on the City's General Plan criteria.

Background plus Project Conditions

Under background plus project conditions, the project would generate substantial increases in intersection delays based on the City's General Plan criteria at the following intersections:

- El Camino Real & 3rd Avenue – PM Peak Hour
- El Camino Real & 4th Avenue – PM Peak Hour
- El Camino Real & 5th Avenue – PM Peak Hour
- Delaware Street & 5th Avenue – PM Peak Hour
- Humboldt Street & 3rd Avenue – PM Peak Hour

Cumulative Conditions

Under cumulative conditions, the project would generate substantial increases in intersection delays based on the City's General Plan criteria at the following intersection:

- Delaware Street & 5th Avenue – AM & PM Peak Hours

Physical Improvements

The improvement required to address intersection deficiencies under background plus project conditions is restriping eastbound 5th Avenue with two through lanes. The two through lanes would be needed east of the proposed project driveway and would require the removal of the on-street parking spaces along eastbound 5th Avenue east of the proposed project driveway. At the Claremont Street intersection, eastbound 5th Avenue would be restriped with one shared left-through lane and one shared through-right lane. To allow for a second receiving lane along eastbound 5th Avenue, on-street parking spaces along eastbound 5th Avenue between Claremont Street and Delaware Street would need to be removed. At the Delaware Street intersection, eastbound 5th Avenue would be restriped with one left-turn lane and one shared through-right lane. To accommodate the expected volumes under background plus project conditions, the intersection of Delaware Street and 5th Avenue would require careful signal retiming.

The improvement required to address intersection deficiencies under cumulative plus project conditions is the same as under background plus project conditions.

Other Transportation Issues

Hexagon conducted a site plan review, queuing analysis as well as pedestrian, bicycle and transit facility analysis for the proposed project. Our recommendations are listed below.

Recommendations

- To prevent vehicle queueing on eastbound 5th Avenue in front of the project driveway, in addition to the proposed intersection improvement for a second eastbound through lane from the project driveway to Delaware Street, the project should also consider installing “Keep Clear” markings in front of the project driveway on eastbound 5th Avenue.
- The project should install crosswalks on all legs of the intersection at Claremont Street and 5th Avenue to complete the pedestrian network within the immediate project vicinity.
- To maintain adequate sight distance for vehicles exiting the project driveway, one parking space west of the driveway should be removed.
- The project should provide accessible parking spaces within the residential section of the parking garage in accordance with the CBC requirements.
- The project should establish a Transportation Demand Management (TDM) program to facilitate residents using alternative modes of transportation.

480 E 4th Avenue
Transportation Impact Analysis
Technical Appendices

June 5, 2020

Appendix A
Traffic Counts

Appendix B
Volume Summary

Appendix C
Intersection Level of Service Calculations

Appendix D
Signal Warrant Results

Appendix E
Accident Data

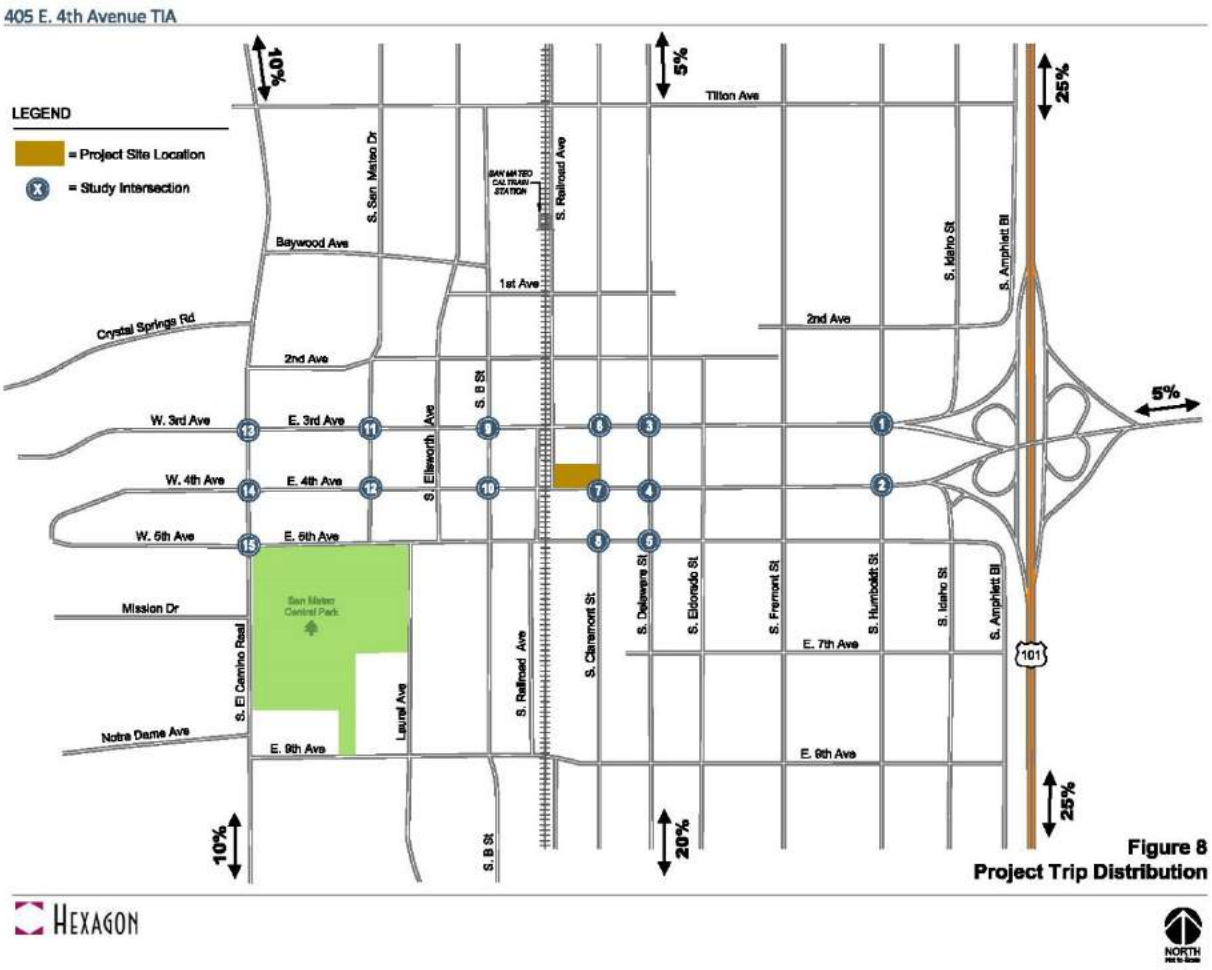
Appendix F
Residential Parking Counts

Appendix G
Traffic Assignment and Distribution Assumptions

Project Garage Traffic Assignment Assumptions

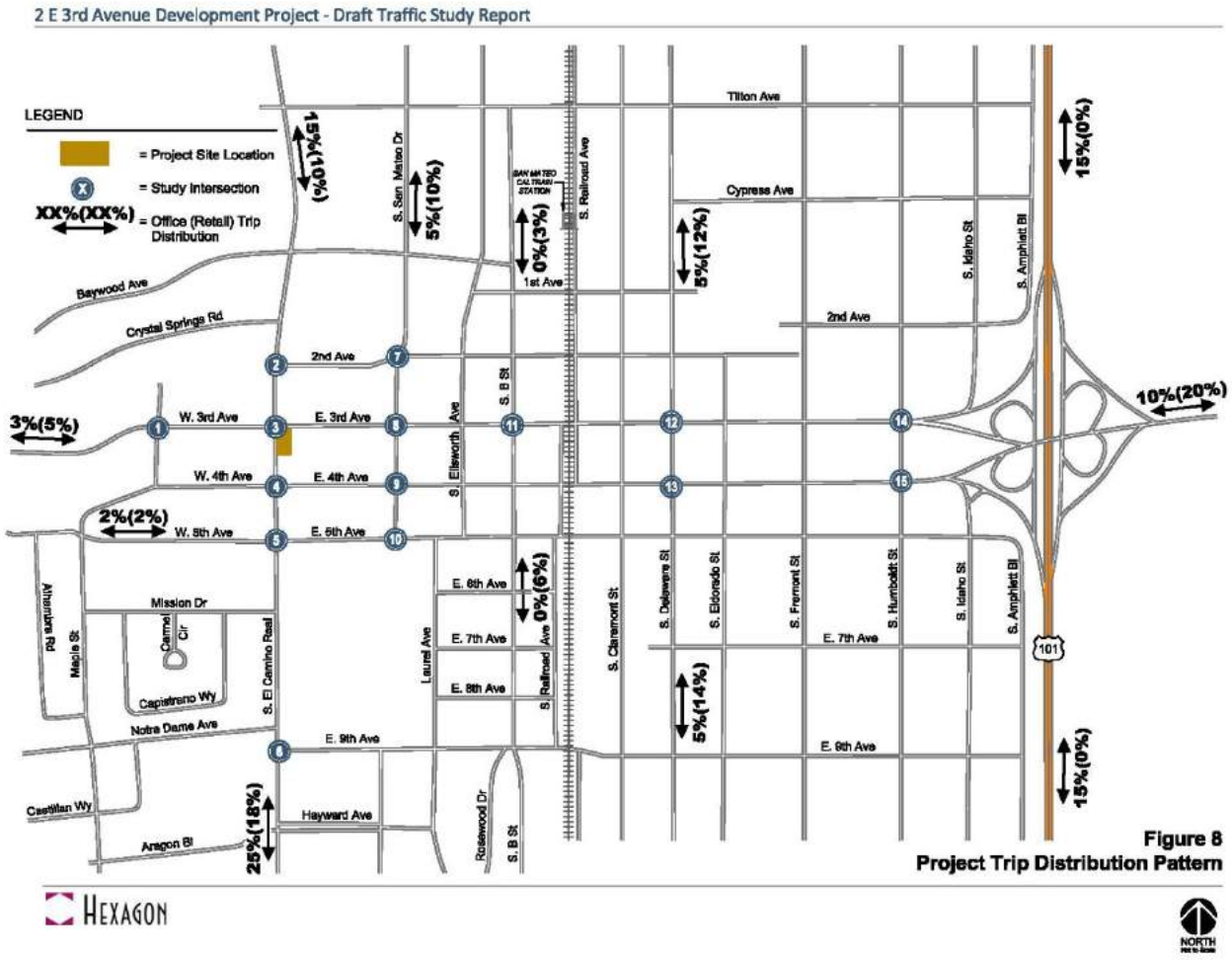
- N ECR:
  - ECR to 5th
- N Delaware:
  - Delaware to 5th
- N 101:
  - IN: 3rd to Delaware to 5th
  - OUT: 5th to Claremont to 4th
- S 101:
  - IN: 3rd to Claremont to 5th
  - OUT: 5th to Idaho
- E 3rd:
  - IN: 3rd to Humboldt to 5th
  - OUT: 5th to Delaware to 4th
- N Norfolk and S Norfolk:
  - IN: Norfolk to 3rd to Humboldt to 5th
  - OUT: 5th to Delaware to 4th to Norfolk
- N Humboldt:
  - Humboldt to 5th
- S Delaware/ Sunnybrae Neighborhood:
  - Delaware to 5th
- S ECR:
  - ECR to 5th
- W 3rd:
  - 3rd to ECR to 5th
- W 5th:
  - 5th
- N San Mateo:
  - San Mateo to 5th

405 E 4th Ave Project Trip Distribution



406 E 3rd Ave Project Trip Distribution

2 E 3rd Ave Project Trip Distribution



221 El Camino Real Project Trip Distribution