Sunnyvale

Final Transportation Impact Analysis
Volume 1 of 2: Report

100-200 W Caribbean Drive

August 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

100-200 West Caribbean Drive TIA
Sunnyvale, CA

TRANSPORTATION IMPACT ANALYSIS

FINAL REPORT

Prepared For:

The City of Sunnyvale

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AUTO TRIP REDUCTION STATEMENT

UPDATED: October 2014

SANTA CLARA Valley Transportation Authority

PROJECT INFORMATION	*Relevant TIA Section:*	Project Description

Project Name: Google 100-200 W Caribbean Drive

Location: 100 & 200 W Caribbean Drive, Sunnyvale, CA

Description:

Two new five-story office buildings totaling 1,041,890 square feet, a four-level 371,034 square foot parking garage, and a 52,796 square foot Central Utility Plan (to support the completed Project) will replace 310,224 s.f. of existing occupied office buildings.

Size (net new):	*D.U. Residential*	731,666	*Sq. Ft. Comm.*	*Acres (Gr.)*
Density:	*D.U. / Acre*			*Floor Area Ratio (FAR)*

Located within 2000 feet walking distance of an LRT, BRT, BART or Caltrain station or major bus stop? Yes

PROJECT AUTO TRIP GENERATION	*Relevant TIA Section:*	Project Generated Trips		
Auto Trips Generated:	1,128 *AM Pk Hr*	1,176 *PM Pk Hr*	11,005 *Total Weekday*	
Methodology (check one)	☒ **ITE**	☐ **Other** *(Please describe below)*		

ITE methodology was used to calculate raw net new trips generated by the project (shown above). TDM reductions (based on VTA Guidelines) were applied to theses raw trips to get the final net new auto trips generated by the Project.

AUTO TRIP REDUCTION APPROACH	*Relevant TIA Section:*	Project Generated Trips	
☒ **Standard** *Complete Table A below*	☐ **Peer/Study-Based** *Complete Table B below*	☐ **Target-Based** *Complete Table C below*	☐ **None Taken**

TRIP REDUCTION REQUIREMENTS	*Relevant TIA Section:*	Project Generated Trips

Is the project required to meet any trip reduction requirements or targets? Yes **If so, specify percent:** 12.5%

Reference code or requirement: The VTA TIA Guidelines require a standard trip reductions based on transit and TDM goals.

TRIP REDUCTION APPROACHES

A. STANDARD APPROACH		*Relevant TIA Section:*			
Type of Reduction *Specify reduction. See Table 2 in TIA Guidelines*		**% Reduction from ITE Rates**	**Total Trips Reduced (AM/PM/Daily)**	**TOTAL REDUCTION CLAIMED**	
				%	**Trips**
Transit	Employment 2,000 ft walk of light rail station	6%	68/70/661	12.5% 12.5% 12.5%	1,376 (Daily) 141 (AM) 147 (PM)
Mixed-Use					
Financial Incentives	Financial incentives	5%	56/59/550		
Shuttle	Project funded dedicated shuttle	1.5%	17/18/165		

B. PEER/STUDY-BASED APPROACH	*Relevant TIA Section:*		
Basis of Reduction		**TOTAL REDUCTION CLAIMED**	
		%	**Trips**

Last updated 11/4/2014

C. TARGET-BASED APPROACH		Relevant TIA Section:	Project Generated Trips	
Type of Reduction (check all that apply)			TOTAL REDUCTION CLAIMED	
❒ % Trip Reduction	❒ % SOV mode share	❒ Trip Cap	%	Trips
Description				
Time period for reduction	Peak Hour	Peak Period	Full Day	
	❒ AM/PM	❒ AM/PM	▣	

OTHER TDM/REDUCTION MEASURES			
Bicycle/Pedestrian	Yes	Relevant TIA Section:	Transportation Demand Management Program
The proposed Project plans to install Class I bike paths and pedestrian pathways within the Project site, as well as bicycle parking and sharing, shower and changing facilities.			
Parking Management	Yes	Relevant TIA Section:	Transportation Demand Management Program
Priority parking for carpools, vanpools, and clean-fuel vehicles.			
Transit	Yes	Relevant TIA Section:	
Several VTA Light Rail and bus route stops are located within a quarter mile or less from the Project site. The light rail and bus routes can be used to connect to the Altamont Corridor Express Train, Caltrain, and BART.			
Site Planning and Design	No	Relevant TIA Section:	
TDM Program	Yes	Relevant TIA Section:	Transportation Demand Management Program
A draft TDM plan has been prepared for the Projected entitled "100&200 West Caribbean TDM Plan" (ARUP, April 21, 2018).			

IMPLEMENTATION	Relevant TIA Section:	
Have the project sponsor and Lead Agency agreed to any of the following measures?		
■Monitoring	The City's current TDM Monitoring Guidelines shall be followed.	
❒Enforcement		
❒Data Sharing		

EXECUTIVE SUMMARY

This report has been prepared in order to present the results of a Transportation Impact Analysis (TIA) performed by Wood Rodgers, Inc. (Wood Rodgers) for the proposed 100-200 West Caribbean Drive Development (Project) in Sunnyvale, California. This analysis has been performed in order to determine any impacts that the proposed Project may have on surrounding transportation facilities as well as any potential mitigation measures that could be implemented to address any significant impacts. This TIA report was prepared in accordance with City of Sunnyvale, City of Santa Clara, and Santa Clara Valley Transportation Authority (VTA) guidelines.

PROJECT DESCRIPTION

The Project site contains seven (7) vacant existing buildings totaling 400,157 square feet and six (6) occupied existing buildings totaling 310,224 square feet. Occupied building uses include industrial laboratory, warehouse, light manufacturing, and office. The Project would demolish the 13 existing buildings in order to accommodate the proposed new construction. The Project proposes construction of a new 536,750 square-foot five-story office building to be located at 100 West Caribbean Drive, and a new 505,140 square-foot five-story office building and a five-story parking garage with attached three-story central utility plant to be located at 200 West Caribbean Drive. The total proposed office gross floor area of the entire site is 1,041,890 square feet.

Based on the current Project site plan, the Project would gain access to the surrounding roadway network via 10 Project access driveways. Four (4) of the proposed driveways would provide access to on-site parking, three (3) of the proposed driveways would provide access for service vehicles only, and three (3) of the proposed driveways would provide access for Project-provided shuttles only. The proposed driveway on Caribbean Drive near the northwest corner of the Project site was considered under both right-in right-out (this is considered the proposed Project) and full-access (this is considered the Project Alternative) alternatives.

PROJECT GENERATED TRIPS

New trips generated by the proposed Project were estimated using rates from the *Institute of Transportation Engineers Trip Generation Manual, 10th Edition*. A 6 percent proximity to light rail stop reduction, a 5 percent financial incentives Travel Demand Management (TDM) program reduction, and a 1.5 percent Project-funded dedicated shuttle TDM program reduction (for a total 12.5 percent reduction) were applied to the trip generation estimates, consistent with the VTA Trip Reduction Statement and the VTA Standard Trip Reduction Method. Trips from existing occupied buildings on the Project site were subtracted from the proposed Project's trip generation. The proposed Project is anticipated to generate a total of 8,319 daily trips, 775 AM peak hour trips (671 inbound, 104 outbound), and 828 PM peak hour trips (119 inbound, 709 outbound) under typical traffic demand conditions.

INTERSECTION LEVEL OF SERVICE IMPACTS AND MITIGATION MEASURES

This TIA report analyzed 27 "study" intersections under "Existing", "Existing plus Project", "Existing plus Project Alternative", "Background", "Background plus Project", "Background plus Project Alternative", "Cumulative", "Cumulative plus Project", and "Cumulative plus Project Alternative" AM and PM peak hour conditions. *Highway Capacity Manual 2000* (HCM 2000) based analysis was performed using a TRAFFIX software model for all study intersections. A *California Manual on Uniform Traffic Control Devices* (CA MUTCD), last updated April 2017, based peak hour

signal warrant 3 was also checked for all unsignalized study intersections. Level of service standards and significance criteria used in this TIA were based on VTA and City of Sunnyvale guidelines.

Existing Conditions

The Project is projected to have a "significant impact" on the following one (1) intersection under "Existing plus Project Alternative" conditions:

- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

Background Conditions

The Project is projected to have a "significant impact" on the following one (1) intersection under "Background plus Project Alternative" conditions:

- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

Cumulative Conditions

The Project is projected to have a "significant impact" on one (1) intersection under "Cumulative plus Project" conditions and on two (2) intersections under "Cumulative plus Project Alternative" conditions:

- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive ("plus Project Alternative" only)
- #27 - Mathilda Avenue / Sunnyvale Saratoga Road-Talisman Drive

Mitigation Measures

A summary of recommended mitigation measures and partial mitigation measures for the intersections with significant impacts identified above is provided in **Table 1**. A mitigation is defined as an improvement which would bring the intersection back to acceptable LOS and delay, and a partial mitigation is defined as an improvement which would bring the intersection back to pre-Project LOS and delay. Needed mitigation measures are recommended for all impacts and assessed for feasibility. When no feasible mitigation could be identified, partial mitigations were identified where possible.

This Project is required to pay into the City's Transportation Impact Fee (TIF); a portion of this fee will be dedicated toward Intelligent Transportation System (ITS) strategies and projects. The Project applicant shall pay fair share cost toward any feasible mitigations or City/County planned improvements which have been identified in **Table 1**.

As shown in **Table 1**, Project impacts at the following one (1) intersection would be considered to be "**less than significant**" with implementation of the identified feasible mitigation measures:

- #2 - Caribbean Parking Garage Driveway / Caribbean Drive

As shown in **Table 1**, Project impacts at the following one (1) intersection is considered to be "**significant and unavoidable**" because no feasible mitigation measure could be identified:

- #27 - Mathilda Avenue / Sunnyvale Saratoga Road-Talisman Drive

Table 1. Summary of Intersection Impacts and Mitigation Measures

Intersection[1]	Significant and Unavoidable Impact? (Y/N)	Mitigation[2]	Mitigation Feasible? (Y/N)	Reason Mitigation Is Not Feasible	Partial Mitigation[3]	Conditions with Significant Impact					
						E+P		B+P		C+P	
						AM	PM	AM	PM	AM	PM
#2 Caribbean Parking Garage Driveway (Full-Access) / Caribbean Drive ("plus Project Alternative" only)	N	Install traffic signal and locate the intersection at least 960 feet east of the end of the Mathilda Avenue-Caribbean Drive curve. Any impacts to improvements on the north side of Caribbean Drive shall be mitigated by the Project. If parking spaces are removed or moved due to the installation of the signal, the Project shall provide parking spaces in the same quantity as those affected.	Y	n/a	None identified		X		X		X
#27 Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive	Y	Restripe the WB approach to have 2 left-turn lanes and 1 shared left-through-right lane	N	Would disrupt signal coordination	None identified						X

[1]All intersections listed below are projected to have significant impacts under both "plus Project" and "plus Project Alternative" scenarios, except for intersection #2, which only has significant impacts under "plus Project Alternative" scenarios.

[2]The proposed mitigations apply for all conditions in which a significant impact occurs.

[3]Partial Mitigations would return intersection operations to "No Project" conditions.

FREEWAY SEGMENT/RAMP IMPACTS AND MITIGATION MEASURES

The Project is projected to have significant impact on the following six (6) freeway segments under "Existing plus Project" and "Existing plus Project Alternative" conditions:

- Westbound SR 237 between Maude Avenue and US 101 during the PM peak hour.
- Westbound SR 237 between US 101 and Mathilda Avenue during the PM peak hour.
- Eastbound SR 237 between Lawrence Expressway and Great America Parkway during the PM peak hour.
- Westbound SR 237 between Lawrence Expressway and Great America Parkway during the AM peak hour.
- Southbound US 101 between Great America Parkway and Lawrence Expressway during the AM peak hour.
- Northbound US 101 between Great America Parkway and Lawrence Expressway during the PM peak hour.

The VTA's Valley Transportation Plan (VTP) 2040 identifies freeway express lane projects along SR 237 between North First Street and SR 85, and along US 101 between Cochrane Road and Whipple Avenue. On all identified freeway segments, the existing HOV lanes are proposed to be converted to express lanes. On US 101 along identified segments, a second express lane is proposed to be implemented in each direction for a total of two express lanes.

On SR 237, the existing HOV would already be operating over capacity under "Existing" conditions. Converting the HOV lanes to express lanes would not mitigate the Project impact. On US 101, converting the existing HOV lane to an express lane and adding an express lane in each direction would increase the capacity of the freeway and would fully mitigate the freeway impacts. The Project applicant shall pay a fair share contribution toward the cost of the identified express lane program along US 101.

However, capacity improvements on freeways are outside of the City of Sunnyvale's jurisdiction. Therefore, the freeway impacts would be "**significant and unavoidable**".

All Project study freeway ramps are projected to operate at acceptable V/C ratio standards under "Existing", "Existing plus Project", and "Existing plus Project Alternative" conditions. Therefore, the Project is not projected to have any impacts on Project study freeway ramps under "Existing plus Project" or "Existing plus Project Alternative" conditions.

PROJECT ACCESS DRIVEWAYS AND RECOMMENDED THROAT LENGTHS

The Project would gain access to the surrounding roadway network via the following 10 Project access driveways:

<u>100 West Caribbean Drive Driveways</u>:

- **#3 Caribbean Northeast (NE) Surface Lot Driveway:** One right-in right-out driveway on West Caribbean Drive west of Borregas Avenue.
- **#5 Borregas Northeast (NE) Surface Lot Driveway:** One full-access driveway on Borregas Avenue south of West Caribbean Drive.
- **#6 Borregas Service Ingress Driveway:** One inbound driveway for service vehicles only on Borregas Avenue.
- **#7 Borregas Service Egress Driveway:** One outbound driveway for service vehicles only on Borregas Avenue

- **#8 Borregas Shuttle Driveway:** One right-in right-out driveway for shuttle drop-offs and pick-ups only on Borregas Avenue north of Caspian Drive.

200 West Caribbean Drive Driveways:

- **#1 Mathilda Parking Garage Driveway:** One right-in right-out driveway on Mathilda Avenue.
- **#2 Caribbean Parking Garage Driveway:** One driveway on West Caribbean Drive with two alternatives:
    i. **Right-In Right Out:** A right-in right-out, one-way stop-controlled driveway, located approximately 425 feet east of the end of curve as Mathilda Avenue transitions into Caribbean Drive. This TIA assumes this is the proposed Project.
    ii. **Full Access:** A full-access, one-way stop-controlled driveway, located approximately 425 feet east of the end of curve as Mathilda Avenue transitions into Caribbean Drive. This TIA assumes this is the Project Alternative.
- **#11 Bordeaux Service Driveway:** One full-access driveway for service vehicles only on Bordeaux Drive.
- **#12 Bordeaux Shuttle Egress Driveway:** One outbound driveway for shuttle pick-ups/drop-offs only on Bordeaux Drive.
- **#13 Bordeaux Shuttle Ingress Driveway:** One inbound driveway for shuttle pick-ups/drop-offs only on Bordeaux Drive.

Minimum recommended throat lengths for the four driveways that provide access to the parking garage and surface lots – the Caribbean Northeast Surface Lot Driveway, the Borregas Northeast Surface Lot Driveway, the Mathilda Parking Garage Driveway, and the Caribbean Parking Garage Driveway – were calculated based on guidelines defined in the National Cooperative Highway Research Program (NCHRP) Report 659 (Transportation Research Board, 2010). Ingress stopping sight distance, ingress queuing, and egress queuing were considered. Service and shuttle driveways were not analyzed as they are not proposed to have typical internal conflicts (such as parking stalls or drive aisles) near the driveway throat and would experience minimal traffic.

Recommendations

The proposed Project shall construct the following driveways with throat lengths as identified:

- #1 Mathilda Parking Garage Driveway: 310 feet
- #2 Caribbean Parking Garage Driveway (Right-In Right-Out): 200 feet
- #2 Caribbean Parking Garage Driveway (Full-Access): 475 feet
- #3 Caribbean Northeast Surface Lot Driveway: 110 feet
- #5 Borregas Northeast Surface Lot Driveway: 115 feet

PROJECT ACCESS DRIVEWAY TURN POCKETS AND DECELERATION LANES

Adequate driveway throat lengths will not prevent vehicles entering the Project site from temporarily queuing in the adjacent public roadways while a pedestrian is crossing a driveway via the proposed pedestrian sidewalks and/or multi-use paths that will run along the perimeter of the site. Additionally, based on the proposed Project site plan, vehicles would have to slow down in a through lane to turn into the Project site on the relatively high speed Mathilda Avenue and Caribbean Drive, conflicting with through vehicles.

Assuming a design speed of approximately 50 miles per hour on Mathilda Avenue and Caribbean Drive, AASHTO Green Book Table 10-5 specifies a minimum deceleration lane length of at least

435 feet. However, for the Mathilda Parking Garage Driveway, the construction of a right-turn deceleration lane is not feasible due to right-of-way constraints. For the Caribbean Northeast Surface Lot Driveway, a 175 foot right-turn deceleration lane shall be constructed due to the proximity of the driveway to the SCVWD West Channel outfall.

Under the Project Alternative, the westbound left-turn pocket was determined to require a minimum of 100 feet of storage based on projected "Cumulative plus Project Alternative" conditions (i.e. worst case) 95th percentile queuing at Caribbean Parking Garage Driveway (full-access).

If the Caribbean Parking Garage Driveway were to be signalized, an eastbound right-turn pocket would requires a minimum of 150 feet of storage based on projected "Cumulative plus Project Alternative" conditions (i.e. worst case) 95th percentile queuing at Caribbean Parking Garage Driveway (signalized). Additionally, if this intersection were to be signalized, the westbound left-turn pocket requires a minimum of 225 feet of storage based on projected "Cumulative plus Project Alternative" conditions (i.e. worst case) 95th percentile queuing at Caribbean Parking Garage Driveway (signalized).

Recommendations

The Project shall install the following deceleration lanes and/or turn pockets at intersection #2 Caribbean Parking Garage Driveway / Caribbean Drive under the given conditions:

- "plus Project" (right-in/right-out, unsignalized) conditions:
  - Eastbound right-turn deceleration lane – 435 feet in length
- "plus Project Alternative" (full-access, unsignalized) conditions:
  - Eastbound right-turn deceleration lane – 435 feet in length
  - Westbound left-turn storage pocket – 100 feet in length
- "plus Project Alternative" (signalized) conditions:
  - Eastbound right-turn storage pocket – 150 feet in length
  - Westbound left-turn storage pocket – 225 feet in length

The project shall install a 175 foot right-turn deceleration lane at intersection #3 Caribbean Northeast Surface Lot Driveway under all Project conditions.

PROJECT DRIVEWAY SIGHT DISTANCE

Sight distance analysis was performed at all proposed Project access driveways. All sight distance analysis was performed based on standards contained in Chapters 3 and 9 of the AASHTO Green Book for typical roadway intersections.

The Caribbean Parking Garage Driveway does not have adequate decision sight distance to function as a right-in right-out or full-access intersection where it is currently proposed in the Project site plan. The Caribbean Parking Garage Driveway also does not have adequate intersection sight distance to function as a full-access intersection where it is currently proposed in the Project site plan. The Bordeaux Service Driveway does not have adequate left-turn egress intersection sight distance along westbound Bordeaux Drive due to vehicles that may park along the shoulder of Bordeaux Drive.

Recommendations/Mitigations

In order to meet AASHTO Green Book sight distance requirements, the Project shall implement the following in regards to the proposed Project driveways:

- The Caribbean Parking Garage Driveway shall be placed at least 960 feet east of the end of the Mathilda Avenue-Caribbean Drive curve.
- No tall obstructions shall be placed within the intersection sight distance triangles of the Project driveways, except objects which meet the criteria outlined in City of Sunnyvale Municipal Code 19.34.060(d).

It is recommended that the proposed Project implement the following:

- On-street parking may be restricted within the intersection sight distance triangles of all Project driveways.
- Parking shall be restricted along Project frontage on Bordeaux Drive.

INTERNAL CIRCULATION

The vehicular circulation plan included in the current Project site plan is shown in **Figure 20**. The majority of internal roadways are proposed to allow two-way traffic. The only one-way internal roadways proposed are the shuttle drop-off zones and the travel aisle serving the narrow surface parking lot located directly south of the parking garage. No traffic controls are indicated in the current site plan. Pedestrians and bicycles are projected to be able to navigate the proposed internal walkway and path system, shown in **Figure 23** and **Figure 24**, without issue.

Recommendations

The proposed Project shall install stop signs on the site's internal roadways at the locations shown in **Figure 21** (200 West Caribbean Drive) and **Figure 22** (100 West Caribbean Drive).

ON-SITE PARKING

Vehicle Parking

Based on the City of Sunnyvale Municipal Code Sections 19.29.140 for the Moffett Park Specific Plan, the development standard for minimum parking for R&D office uses is 1 space per 300 square feet (1 space per 250 square feet – maximum). For the Project site, this rate would result in a minimum 3,473 parking stalls required for the site. Additionally, 105 electric vehicle spaces and 174 car share spaces are required.

The current Project site plan proposes 2,089 total parking stalls, which would not meet Moffett Park Specific Plan standards, as stated above; however, the project would meet the Citywide parking standard. Per SMC 19.46 for R&D office uses, a minimum of 1 space per 500 square feet is required. Based on this rate, a minimum of 2,084 spaces, including at least 63 electric vehicle spaces and 105 car share spaces, would be required. The Project would provide 210 electric vehicle parking stalls and 81 car share parking stalls. The Project would meet the City parking requirements for electric vehicles, but would not meet the City parking requirement for car share.

Bicycle Parking

Based on the City of Sunnyvale Municipal Code Sections 19.29.140 and 19.46, and the Moffett Park Specific Plan, the Project site would be required to provide a minimum of 174 total bicycle spaces, including at least 131 Class I bicycle spaces and 43 Class II bicycle spaces. The current Project site plan proposes 460 Class I bicycle spaces and 530 Class II bicycle spaces, which exceed the City's requirements.

TRANSIT FACILITIES

Under the "Existing plus Project" condition, the maximum increase in transit vehicle delay is projected to be 5.9 seconds (Route 121 under PM peak hour conditions). Under the "Background

plus Project" condition, the maximum increase in transit vehicle delay is projected to be 40.6 seconds (Route 121 under AM peak hour conditions). Under the "Cumulative plus Project" condition, the maximum increase in transit vehicle delay is projected to be 75.1 seconds (Route 121 under AM peak hour conditions).

Under the "Existing plus Project Alternative" condition, the maximum increase in transit vehicle delay is projected to be 5.9 seconds (Route 121 under PM peak hour conditions). Under the "Background plus Project Alternative" condition, the maximum increase in transit vehicle delay is projected to be 38.1 seconds (Route 121 under AM peak hour conditions). Under the "Cumulative plus Project Alternative" condition, the maximum increase in transit vehicle delay is projected to be 74.5 seconds (Route 121 under AM peak hour conditions).All transit delay information is provided for informational purposes only.

Recommendations

None.

PEDESTRIAN FACILITIES

The City's proposed Caribbean Drive Parking and Trail Access Enhancements project would install a one-way multi-use path and new access point to the Bay Trail along the north side of Caribbean Drive (see **Appendix R** for conceptual layout). The Project proposes sidewalks along the perimeter of the Project site that fronts Borregas Avenue, Caspian Court, and Bordeaux Drive. The Project proposes a multi-use path along the western and northern sides of the Project site fronting Mathilda Avenue and Caribbean Drive. Proposed internal pedestrian paths provide Project employees and the public with multiple routes through the site to access the buildings, parking lots, and surrounding local roadways. The pedestrian improvements proposed as part of the Project can be seen in **Figure 23**.

Bordeaux Drive and Borregas Avenue have existing gaps in the sidewalks and pedestrian paths on both sides of the road between the Project site and Java Drive, and there are no existing crosswalks crossing Caspian Court. Therefore, pedestrians that travel between the south/east sides of the Project site and the major light rail and bus stops on Java Drive would have to walk through parking lots or potentially along the trails along the Santa Clara Valley Water District's (SCVWD) West Channel outfall.

Recommendations

None.

BICYCLE FACILITIES

The City's proposed Caribbean Drive Parking and Trail Access Enhancements project would install a one-way multi-use path and new access point to the Bay Trail along the north side of Caribbean Drive (see **Appendix R** for conceptual layout). The Project proposes a multi-use path along the western and northern side of the Project site fronting Mathilda Avenue and Caribbean Drive. Proposed internal pedestrian paths would provide Project employees and the public with multiple routes through the site to access the buildings, parking lots, and surrounding local roadways. The Project site will include both Class I and Class II bicycle parking for its employees.

Recommendations

None.

PEDESTRIAN HYBRID BEACON (HAWK)

A new midblock crossing with a pedestrian hybrid beacon (also known as a High-Intensity Activated Crosswalk, or HAWK) on Caribbean Drive near the SCVWD's West Channel outfall was analyzed. The midblock crossing would provide cyclists and pedestrians with more direct connectivity between the Project site, the local roadway system south of Caribbean Drive, and the Bay Trail located north of Caribbean Drive. In order to determine the need for a pedestrian hybrid beacon crossing at this location, guidelines in Chapter 4F-Pedestrian Hybrid Beacons of the CA MUTCD were applied.

Recommendations

As per guidelines defined in Section 4F.01.07 of the CA MUTCD, a pedestrian hybrid beacon shall be installed on Caribbean Drive near the SCVWD's West Channel outfall under existing and future conditions. However, since a signalized Caribbean Parking Garage Driveway / Caribbean Drive intersection is also recommended in close proximity to the potential pedestrian hybrid beacon location, the two traffic control devices would not meet typical intersection/signal spacing standards as defined in *Transportation Research Circular Number 456 – Driveway and Street Intersection Spacing* (Transportation Research Board, March 1996). It is recommended that the two traffic control devices be combined into a single signalized intersection with crosswalks and pedestrian push buttons on all legs, located near the SCVWD's West Channel outfall, which is approximately 960 feet east of the Mathilda Avenue-Caribbean Drive curve. The Project will pay for the installation of a signal at the Caribbean Parking Garage Driveway / Caribbean Drive intersection.

Installation of the new signalized Caribbean Parking Garage Driveway will impact the City's Caribbean Drive Parking and Trail Access Enhancement Project. Any impacts to improvements on the north side of Caribbean Drive shall be mitigated by the Project. If parking spaces are removed or moved due to the installation of the signal, the Project shall provide dedicated, convenient, and San Francisco Bay Conservation and Development (BCDC)-compliant parking spaces in the same quantity as those affected.

VEHICLE QUEUING

The Project is projected to cause queuing deficiencies at 13 study intersection turning movements under "Existing", "Existing plus Project", "Existing plus Project Alternative", "Background", "Background plus Project", "Background plus Project Alternative", "Cumulative", "Cumulative plus Project", and/or "Cumulative plus Project Alternative" AM and PM peak hour conditions. Improvements were recommended, and checked for feasibility, to address the queuing deficiencies. All identified queuing deficiencies and improvements are shown in **Table 27** and **Table 28**, located in Chapter 11 of this TIA report.

There are several locations where Project-related queuing deficiencies occur at intersections under City/County jurisdiction and where lengthening of the turn pockets/turn lanes are not feasible due to right-of-way constraints. At these locations, Project-related queuing deficiencies could be improved by implementation of planned ITS upgrades along major roadway corridors in the City or Countywide Intelligent Transportation System (ITS) upgrade projects. The Project applicant shall contribute to these ITS upgrade projects through the City's TIF and Santa Clara County's *Expressway Plan 2040* (County of Santa Clara Roads and Airports Department, Updated August 21, 2015).

Feasible queuing improvements were identified for two (2) intersection turning movements. The Project applicant shall implement the following:

- #4 - Borregas Avenue / Caribbean Drive—extend Eastbound Left-turn pocket by 215 feet (this improvement applies under the "plus Project" scenario).
- #10 - Mathilda Avenue / 1st Avenue-Bordeaux Drive—reconfigure striping on southbound inside through lane as a left-turn trap lane (this improvement applies under the "plus Project" scenario). The left-turn trap lane shall be signed and striped following the guidelines contained in the CA MUTCD.

The needed queuing improvements at the remaining 10 study intersection turning movements were determined to not be feasible.

1. INTRODUCTION

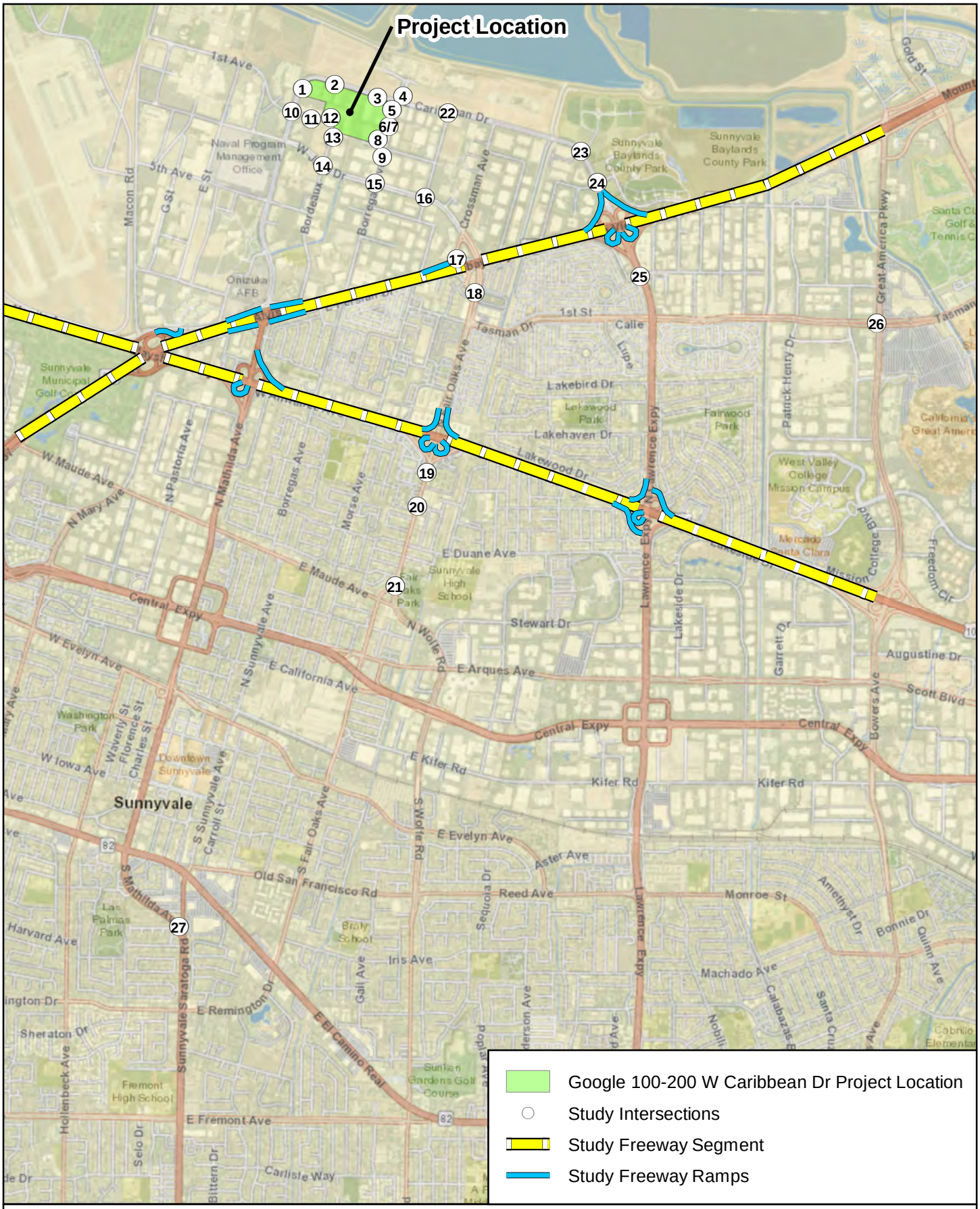
This report presents the results of a Transportation Impact Analysis (TIA) performed by Wood Rodgers, Inc. for the proposed 100-200 West Caribbean Drive Development in Sunnyvale, California. The analysis was performed to determine any impacts the proposed Project may have on the surrounding transportation facilities and potential mitigation measures that could be implemented to address any significant impacts. This TIA report was prepared in accordance with City of Sunnyvale, City of Santa Clara, and Santa Clara Valley Transportation Authority guidelines. This introduction outlines Project description, study area, analysis scenarios, analysis methods, significance criteria, and organization of the overall report.

1.1 PROJECT DESCRIPTION

The Project site consists of 10 existing lots containing 13 existing single story buildings (140-146, 360-364, 370-376, 380-382 and 390-394 West Caribbean Drive, 1393-1395, 1383 and 1325 Borregas Avenue, 141 Caspian Court, and 1330-1338, 1340-1346, 1350 and 1360-1368 Bordeaux Drive) located near Mathilda Avenue and Caribbean Drive in the Moffett Park Specific Plan area in Sunnyvale, CA (City). The site is proposed to be divided into two new parcels: 100 and 200 West Caribbean Drive. 100 West Caribbean Drive would be bounded by West Caribbean Drive to the north, Borregas Avenue to the east, Caspian Court to the south, and the Santa Clara Valley Water District's (SCVWD) West Channel outfall to the west. 200 West Caribbean Drive would be bounded by West Caribbean Drive to the north, SCVWD's West Channel outfall to the east, Bordeaux Drive to the south, and Mathilda Avenue to the west. The Project site location is shown on the map in **Figure 1**.

The latest proposed Project site plan (Planning Submission 06/19/2019), which incorporates the required Project mitigation measure that modifies the location of the Caribbean Parking Garage Driveway, is shown in **Figure 2**. The full version of the Project site plan is also included in **Appendix N**. The Project site contains seven (7) vacant existing buildings totaling 400,157 square feet and six (6) occupied existing buildings totaling 310,224 square feet. Occupied building uses include industrial laboratory, warehouse, light manufacturing, and office. The Project would demolish the 13 existing buildings to accommodate the proposed new construction. The Project proposes construction of a new a 536,750 square foot five-story office building on 100 West Caribbean Drive, and a new 505,140 square foot five-story office building and a five-story parking garage with an attached three-story central utility plant on 200 West Caribbean Drive. The top two floors of the central utility plant (52,796 square feet) would be dedicated to machinery supporting the development, while the bottom floor would be dedicated to parking for the central utility plant. Total proposed office gross floor area of entire site is 1,041,890 square feet. It is anticipated that both proposed office buildings would be occupied at roughly the same time.

100 West Caribbean Drive would contain 246 surface parking stalls, and 200 West Caribbean Drive would contain 426 surface and 1,417 garage parking stalls, for a total of 2,089 parking stalls for the entire proposed development. The Project includes a proposed Class I multi-use path along the project frontage on Mathilda Avenue and Caribbean Drive, which would be one-way eastbound for bikes west of the proposed Caribbean Parking Garage Driveway, and two-way for bikes east of the Caribbean Parking Garage Driveway. Additional multi-use paths would connect all parking areas and buildings, as well as provide a connection between the two parcels across the SCVWD West Channel outfall. The remaining parcel area would house landscaping and amenities such as sports courts.



Project Location and Study Facilities

Google 100-200 West Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 1

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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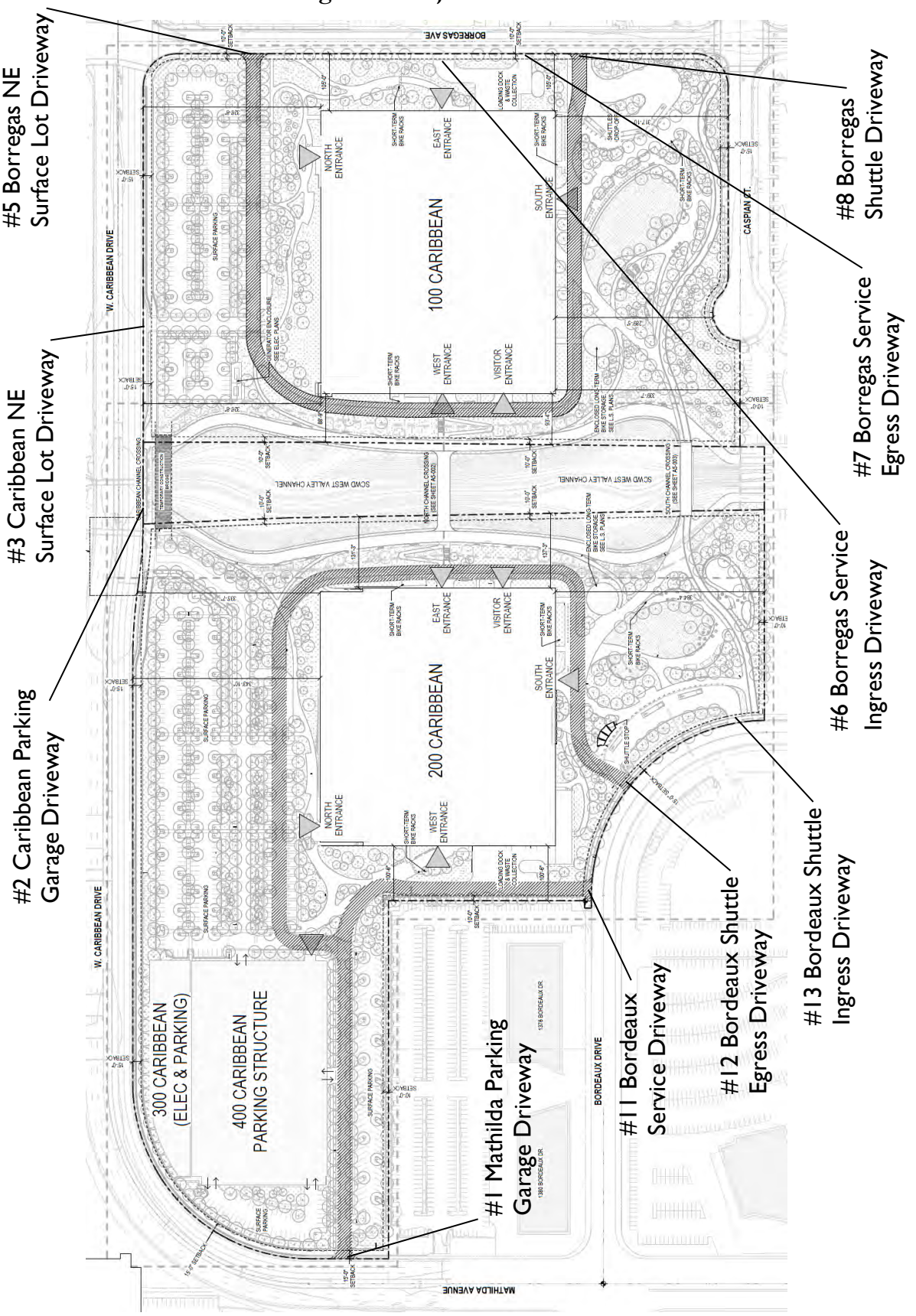
Figure 2. Project Site Plan



Based on the current Project site plan, the Project would gain access to the surrounding roadway network via the following 10 Project access driveways:

100 West Caribbean Drive Driveways:

- **#3 Caribbean Northeast (NE) Surface Lot Driveway:** One right-in right-out driveway on West Caribbean Drive west of Borregas Avenue.
- **#5 Borregas Northeast (NE) Surface Lot Driveway:** One full-access driveway on Borregas Avenue south of West Caribbean Drive.
- **#6 Borregas Service Ingress Driveway:** One inbound driveway for service vehicles only on Borregas Avenue.
- **#7 Borregas Service Egress Driveway:** One outbound driveway for service vehicles only on Borregas Avenue
- **#8 Borregas Shuttle Driveway:** One right-in right-out driveway for shuttle drop-offs and pick-ups only on Borregas Avenue north of Caspian Drive.

200 West Caribbean Drive Driveways:

- **#1 Mathilda Parking Garage Driveway:** One right-in right-out driveway on Mathilda Avenue.
- **#2 Caribbean Parking Garage Driveway:** One driveway on West Caribbean Drive with two alternatives:
    i. **Right-In Right Out:** A right-in right-out, one-way stop-controlled driveway, located approximately 425 feet east of the end of curve as Mathilda Avenue transitions into Caribbean Drive. This TIA assumes this is the proposed Project.
    ii. **Full Access:** A full-access, one-way stop-controlled driveway, located approximately 425 feet east of the end of curve as Mathilda Avenue transitions into Caribbean Drive. This TIA assumes this is the Project Alternative.
- **#11 Bordeaux Service Driveway:** One full-access driveway for service vehicles only on Bordeaux Drive.
- **#12 Bordeaux Shuttle Egress Driveway:** One outbound driveway for shuttle pick-ups/drop-offs only on Bordeaux Drive.
- **#13 Bordeaux Shuttle Ingress Driveway:** One inbound driveway for shuttle pick-ups/drop-offs only on Bordeaux Drive.

1.2 STUDY AREA

The study area generally extends along Mathilda Avenue between Caribbean Drive and Sunnyvale Saratoga Road, along Java Drive between Mathilda Avenue and Fair Oaks Avenue, along Fair Oaks Avenue between Java Drive and Wolfe Road, along Caribbean Drive between Mathilda Avenue and Lawrence Expressway, along Lawrence Expressway between Caribbean Drive and Tasman Drive, along Bordeaux Drive between Mathilda Avenue and Java Drive, along Borregas Avenue between Caribbean Drive and Java Drive, along SR 237 between Maude Avenue and Great America Parkway, and along US 101 between Great America Parkway and Moffett Boulevard.

Study facilities include the intersections, freeway segments, and freeway ramps as discussed below. The study area and study facilities are shown in **Figure 1**.

1.2.1 Intersections

Intersections were selected for analysis using *VTA TIA Guidelines* (adopted October 2014) criteria thresholds, engineering judgement, and coordination with City staff. All intersections that were projected to experience 10 or more Project peak hour vehicle trips per lane for any movement, based on Project trip generation and distribution, were included in this TIA, except those intersections that were analyzed in the *City of Sunnyvale Land Use and Transportation Element Draft Traffic Impact Analysis* (Hexagon Transportation Consultants, Inc., March 23, 2016) (Appendix C of the *City of Sunnyvale Land Use and Transportation Element Draft Environmental Impact Report*, by Michael Baker International, dated August 2016) or the *Traffic Operations Analysis Report: Mathilda Avenue Improvements between SR 237 and US 101 Project* (Fehr and Peers, June 2016) . The list of study intersections was reviewed and approved by City staff for use in this TIA. The 27 existing and proposed study intersections shown in **Table 2** were analyzed in this TIA.

Table 2. Study Intersections

#	Intersection	Jurisdiction	CMP Intersection?[1]	Regionally Significant?[2]
1	Mathilda Avenue / Mathilda Parking Garage Driveway*	City of Sunnyvale	-	Yes
2	Caribbean Parking Garage Driveway / Caribbean Drive*	City of Sunnyvale	-	Yes
3	Caribbean NE Surface Lot Driveway / Caribbean Drive*	City of Sunnyvale	-	Yes
4	Borregas Avenue / Caribbean Drive	City of Sunnyvale	-	Yes
5	Borregas Avenue / Borregas NE Surface Lot Driveway*	City of Sunnyvale	-	-
6	Borregas Avenue / Borregas Service Ingress Driveway*	City of Sunnyvale	-	-
7	Borregas Avenue / Borregas Service Egress Driveway*	City of Sunnyvale	-	-
8	Borregas Avenue / Borregas Shuttle Driveway*	City of Sunnyvale	-	-
9	Borregas Avenue / Caspian Court-Caspian Drive	City of Sunnyvale	-	-
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive	City of Sunnyvale	-	Yes
11	Bordeaux Service Driveway / Bordeaux Drive*	City of Sunnyvale	-	-
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive*	City of Sunnyvale	-	-
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive*	City of Sunnyvale	-	-
14	Bordeaux Drive / Java Drive	City of Sunnyvale	-	-
15	Borregas Avenue / Java Drive	City of Sunnyvale	-	-
16	Geneva Drive / Java Drive	City of Sunnyvale	-	-
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Caltrans	-	-
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	City of Sunnyvale	-	-
19	Fair Oaks Avenue / Ahwanee Avenue	City of Sunnyvale	-	-
20	Fair Oaks Avenue / Caliente Drive	City of Sunnyvale	-	-
21	Fair Oaks Avenue / Wolfe Road	City of Sunnyvale	-	-
22	Geneva Drive / Caribbean Drive	City of Sunnyvale	-	Yes
23	Caribbean Drive / Twin Creeks	City of Sunnyvale	-	Yes
24	Caribbean Drive / Moffett Park Drive-Baylands Park	City of Sunnyvale	-	Yes

Table 2. Study Intersections

#	Intersection	Jurisdiction	CMP Intersection?[1]	Regionally Significant?[2]
25	Lawrence Expressway / Persian Drive-Elko Drive	Santa Clara County	-	Yes
26	Great America Parkway / Tasman Drive	City of Santa Clara	Yes	Yes
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive	City of Sunnyvale	-	Yes

*Notes: *Future Intersection*
1. CMP Intersections = Congestion Management Program intersections that are monitored and analyzed by the Santa Clara Valley Transportation Authority. CMP Intersections are defined in the Santa Clara Valley Transportation Authority 2016 CMP Monitoring and Conformance Report.
2. Regionally significant intersections are defined by the City of Sunnyvale as any intersections along a CMP System Roadway. CMP System Roadways are listed in the Santa Clara Valley Transportation Authority 2016 CMP Monitoring and Conformance Report.

The above study intersections are also shown on the map in **Figure 1**. Intersection geometrics and controls are discussed in Chapter 2 of this TIA.

1.2.2 Freeway Segments

Freeway segments were selected for analysis based on *VTA TIA Guidelines,* engineering judgement, and coordination with City staff. The following 10 existing study freeway segments were analyzed in this TIA:

1. SR 237 – Between Maude Avenue and US 101
2. SR 237 – Between US 101 and Mathilda Avenue
3. SR 237 – Between Mathilda Avenue and Fair Oaks Avenue
4. SR 237 – Between Fair Oaks Avenue and Lawrence Expressway
5. SR 237 – Between Lawrence Expressway and Great America Parkway
6. US 101 – Between Great America Parkway and Lawrence Expressway
7. US 101 – Between Lawrence Expressway and Fair Oaks Avenue
8. US 101 – Between Fair Oaks Avenue and Mathilda Avenue
9. US 101 – Between Mathilda Avenue and SR 237
10. US 101 – Between SR 237 and Moffett Boulevard

1.2.3 Freeway Ramps

Freeway ramps were selected for analysis based on *VTA TIA Guidelines,* engineering judgement, input from Caltrans, and coordination with City staff. The following 20 existing study freeway ramps were analyzed in this TIA:

1. SR 237 Westbound On-Ramp from Mathilda Avenue
2. SR 237 Westbound Off-Ramp to Mathilda Avenue
3. SR 237 Eastbound Off-Ramp to Mathilda Avenue
4. SR 237 Eastbound On-Ramp from Mathilda Avenue
5. SR 237 Westbound On-Ramp from Crossman Avenue/Moffett Park Drive
6. SR 237 Westbound On-Ramp from Southbound Caribbean Drive/Lawrence Expressway
7. SR 237 Westbound Off-Ramp to Northbound Caribbean Drive/Lawrence Expressway
8. SR 237 Eastbound On-Ramp from Southbound Lawrence Expressway
9. SR 237 Eastbound Off-Ramp to Northbound Lawrence Expressway

10. US 101 Northbound On-Ramp from Southbound Lawrence Expressway
11. US 101 Northbound Off-Ramp to Lawrence Expressway
12. US 101 Southbound Off-Ramp to Lawrence Expressway
13. US 101 Southbound On-Ramp from Southbound Lawrence Expressway
14. US 101 Northbound On-Ramp from Fair Oaks Avenue
15. US 101 Northbound Off-Ramp to Fair Oaks Avenue
16. US 101 Southbound On-Ramp from Southbound Fair Oaks Avenue
17. US 101 Southbound Off-Ramp to Northbound Fair Oaks Avenue
18. US 101 Northbound Off-Ramp to Mathilda Avenue
19. US 101 Southbound On-Ramp from Southbound Mathilda Avenue
20. US 101 Northbound On-Ramp from Moffett Park Drive

1.2.4 Pedestrian, Bicycle, and Transit Facilities

This TIA analyzes Project impacts to pedestrian, bicycle, and transit facilities within an approximately half-mile radius around the Project site.

1.3 ANALYSIS SCENARIOS

The 27 study intersections were evaluated under AM and PM peak hour conditions for the following scenarios:

- **Existing Conditions:** Existing traffic volumes from counts.
- **Existing plus Project Conditions:** Existing traffic volumes plus traffic projected to be generated by the proposed Project assuming a right-in right-out Caribbean Parking Garage Driveway on West Caribbean Drive.
- **Existing plus Project Alternative Conditions:** Existing traffic volumes plus traffic projected to be generated by the proposed Project assuming a full-access Caribbean Parking Garage Driveway on West Caribbean Drive.
- **Background Conditions:** Existing volumes plus traffic from "approved but not yet constructed or occupied" developments within an approximately one-mile radius of the Project study intersections. Trips generated by the Project are **not** included.
- **Background plus Project Conditions:** Background volumes plus traffic projected to be generated by the proposed Project assuming a right-in right-out Caribbean Parking Garage Driveway on West Caribbean Drive.
- **Background plus Project Alternative Conditions:** Background traffic volumes plus traffic projected to be generated by the proposed Project assuming a full-access Caribbean Parking Garage Driveway on West Caribbean Drive.
- **Cumulative Conditions:** Existing volumes plus traffic from "approved but not yet constructed or occupied" and "pending" developments within an approximately one-mile radius of the Project study intersections plus an assumed yearly 1.5% growth rate to increase overall base Existing traffic volumes to cumulative conditions of year 2030.
- **Cumulative plus Project Conditions:** Cumulative traffic volumes plus traffic projected to be generated by the proposed Project assuming a right-in right-out Caribbean Parking Garage Driveway on West Caribbean Drive.

- **Cumulative plus Project Alternative Conditions:** Cumulative traffic volumes plus traffic projected to be generated by the proposed Project assuming a full-access Caribbean Parking Garage Driveway on West Caribbean Drive.

The 10 study freeway segments and 20 study freeway ramps were evaluated under Existing and Existing plus Project conditions only, per *VTA TIA guidelines*.

1.4 ANALYSIS METHODS

Traffic operations in this TIA have been quantified through the determination of "Level of Service" (LOS). Level of Service is a qualitative measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned to an intersection or roadway segment, representing progressively worsening traffic operations. Level of Service "A" represents free-flow conditions with little to no delays, while LOS "F" represents jammed or grid-lock conditions.

1.4.1 Signalized Intersections

Level of Service has been calculated for signalized intersections using methods documented in the Transportation Research Board Publication *Highway Capacity Manual, Fourth Edition, 2000* (HCM-2000), consistent with the *VTA Traffic Level of Service Analysis Guidelines* (last updated June 2003). For signalized intersections, the "average" intersection delay per vehicle, including all intersection movements, has been calculated and reported using TRAFFIX (version 8.0 revision 1) analysis software. The calculated signalized intersection delays correspond to the LOS designations shown in **Table 3**, which were derived from Exhibit 16-2 of HCM 2000 and are consistent with *VTA Traffic Level of Service Analysis Guidelines*.

All existing City of Sunnyvale controlled intersections were modeled in TRAFFIX software using collected peak hour factors and signal timing data provided by the City. The intersection operations analysis of all signalized intersections in the City of Sunnyvale's jurisdiction was calibrated against collected queues and delays.

All existing intersections in City of Santa Clara were modeled in TRAFFIX software. Per City of Santa Clara direction, City of Santa Clara intersections were modeled using actual peak hour factors and signal timing data, as well as *VTA Traffic Level of Service Analysis Guidelines*. Peak hour factors were counted in the field, and signal timing data was provided by City of Santa Clara.

All existing Caltrans intersections were modeled in TRAFFIX software following *VTA Traffic Level of Service Analysis Guidelines*.

All existing Santa Clara County controlled intersections were modeled in TRAFFIX software using signal timing data and TRAFFIX model settings provided by the County.

1.4.2 Unsignalized Intersections

Level of Service has been calculated for unsignalized intersections using methods documented in the Transportation Research Board Publication *Highway Capacity Manual, Fourth Edition, 2000* (HCM-2000), consistent with the *VTA Traffic Level of Service Analysis Guidelines*. For one-way-stop-controlled (OWSC) and two-way-stop-controlled (TWSC) unsignalized intersections, the "worst case" movement delay, i.e., delay per vehicle of the intersection's worst operating movement, has been calculated and reported using TRAFFIX analysis software (version 8.0 revision 1). The calculated unsignalized intersection delays correspond to the LOS designations shown in **Table 4**, which were derived from Exhibits 17-2 and 17-22 of HCM 2000 and are consistent with *VTA Traffic Level of Service Analysis Guidelines*.

1.4.3 Freeway Segments and Ramps

As required by the *VTA TIA Guidelines*, freeway segment and ramp LOS has been evaluated under Existing and Existing plus Project conditions. Freeway segment LOS has been evaluated using density expressed as passenger cars per mile per lane (pcpmpl), consistent with HCM methods and Santa Clara County standards. Density is used for evaluating freeways as it gives a good indication of a motorist's ability to maneuver in a traffic stream. The ranges of densities that correspond to each freeway segment LOS are shown in **Table 5**. These density ranges are consistent with *VTA Traffic Level of Service Analysis Guidelines*. The density values for the LOS A/B, B/C, and C/D thresholds are based on values from HCM 2000. The LOS D/E and E/F thresholds are essentially based on Santa Clara County conditions.

Freeway ramp LOS has been evaluated using volume to capacity ratios. Non-metered freeway ramp AM and PM peak hour capacities were derived from HCM 2000 Exhibit 25-3, as defined in the *VTA Traffic Level of Service Analysis Guidelines*. Metered freeway ramp AM and PM peak hour capacities were calculated based on actual metering rates and number of lanes. Actual ramp metering rates were provided by Caltrans.

Table 3. HCM-2000 Based Signalized Intersection LOS Thresholds

Level of Service	Description	Average Control Delay (seconds/vehicle)
A	Free-flow conditions with negligible to minimal delays. Excellent progression with most vehicles arriving during the green phase and not having to stop at all. Nearly all drivers find freedom of operation.	delay ≤ 10.0
B+	Good progression with slight delays. Short cycle-lengths typical. Relatively more vehicles stop than under LOS "A". Vehicle platoons are formed. Drivers begin to feel somewhat restricted within groups of vehicles.	10.0 < delay ≤ 12.0
B		12.0 < delay ≤ 18.0
B-		18.0 < delay ≤ 20.0
C+	Relatively higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear. The number of vehicles stopping is significant, although many still pass through without stopping. Most drivers feel somewhat restricted.	20.0 < delay ≤ 23.0
C		23.0 < delay ≤ 32.0
C-		32.0 < delay ≤ 35.0
D+	Somewhat congested conditions. Longer but tolerable delays may result from unfavorable progression, long cycle lengths, and/or high volume-to-capacity ratios. Many vehicles are stopped. Individual cycle failures may be noticeable. Drivers feel restricted during short periods due to temporary back-ups.	35.0 < delay ≤ 39.0
D		39.0 < delay ≤ 51.0
D-		51.0 < delay ≤ 55.0
E+	Congested conditions. Significant delays result from poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures occur frequently. There are typically long queues of vehicles waiting upstream of the intersection. Driver maneuverability is very restricted.	55.0 < delay ≤ 60.0
E		60.0 < delay ≤ 75.0
E-		75.0 < delay ≤ 80.0
F	Jammed or grid-lock type operating conditions. Generally considered to be unacceptable for most drivers. Zero or very poor progression, with over-saturation or high volume-to-capacity ratios. Several individual cycle failures occur. Queue spillovers from other locations restrict or prevent movement.	delay > 80.0

Source: Traffic Level of Service Analysis Guidelines, June 2003; HCM-2000 Exhibit 16-2.

Table 4. HCM-2000 Based Unsignalized Intersection LOS Thresholds

Level of Service	Description	Average Control Delay (seconds/vehicle)
A	Free-flow conditions with negligible to minimal delays.	delay ≤ 10.0
B	Good progression with slight delays.	10.0 < delay ≤ 15.0
C	Relatively higher delays.	15.0 < delay ≤ 25.0
D	Somewhat congested conditions with longer but tolerable delays.	25.0 < delay ≤ 35.0
E	Congested conditions with significant delays.	35.0 < delay ≤ 50.0
F	Jammed or grid-lock type operating conditions.	delay > 50.0
Source: Traffic Level of Service Analysis Guidelines, June 2003; HCM-2000 Exhibit 17-2 and 17-22.		

Table 5. HCM-2000 Based Freeway Segment LOS Thresholds

Level of Service	Density (passenger cars/mile/lane)
A	density ≤ 11.0
B	11.0 < density ≤ 18.0
C	18.0 < density ≤ 26.0
D	26.0 < density ≤ 46.0
E	46.0 < density ≤ 58.0
F	density > 58.0
Source: Traffic Level of Service Analysis Guidelines, June 2003; HCM-2000	

1.5 LEVEL OF SERVICE STANDARDS AND IMPACT CRITERIA

1.5.1 Intersection Level of Service Impact Criteria

1.5.1.1 Signalized Intersections

City of Sunnyvale Intersections (Not Regionally Significant):

The City of Sunnyvale currently utilizes LOS "D" as the minimum acceptable LOS threshold for signalized intersections within the City during the AM and PM peak periods, except for intersections that have been designated as regionally significant, that have been designated as part of the Congestion Management Plan (CMP), or which are controlled by Santa Clara County. This TIA assumes that Caltrans-controlled intersections within the City of Sunnyvale follow the City's LOS thresholds. Project impacts at City (not regionally significant) signalized intersections would be considered significant if one of the following criteria is met:

1. If the addition of project generated traffic to an intersection causes the AM or PM peak hour LOS of the intersection to degrade from an acceptable LOS "D" or better to an unacceptable LOS "E" or worse, then the impact is significant.
2. If an intersection operates at an unacceptable AM or PM peak hour LOS "E" or worse without the addition of project generated traffic, and the addition of project generated traffic increases the average control delay for critical movements by four (4) or more seconds and increases the critical volume-to-capacity (V/C) ratio by 0.01 or more, then the impact is significant.
3. If an intersection operates at an unacceptable AM or PM peak hour LOS "E" or worse without the addition of project generated traffic, and the addition of project generated

traffic reduces the amount of average control delay for critical movements (i.e. a negative change in delay) and the project increases the critical V/C ratio by 0.01 or more, then the impact is significant.

Regionally Significant City of Sunnyvale Intersections, Santa Clara County Intersections, and City of Santa Clara CMP Intersections:

The City of Sunnyvale currently utilizes LOS "E" as the minimum acceptable LOS threshold for signalized intersections in Sunnyvale that have been designated as regionally significant by the City, or which are controlled by Santa Clara County. The City of Santa Clara currently utilizes LOS "E" as the minimum acceptable LOS threshold for signalized intersections in Santa Clara that have been designated as part of the CMP. Regionally significant and CMP intersections in the Project study area are identified in **Table 3**. Project impacts at regionally significant City of Sunnyvale intersections, City of Santa Clara CMP intersections, and Santa Clara County operated intersections would be considered significant if one of the following criteria is met:

1. If the addition of Project-generated traffic to an intersection causes the AM or PM peak hour LOS of the intersection to degrade from an acceptable LOS "E" or better to an unacceptable LOS "F", then the impact is significant.
2. If an intersection operates at an unacceptable AM or PM peak hour LOS "F" without the addition of project generated traffic, and the addition of project generated traffic increases the average control delay for critical movements by four (4) or more seconds and increases the critical volume-to-capacity (V/C) ratio by 0.01 or more, then the impact is significant.
3. If an intersection operates at an unacceptable AM or PM peak hour LOS "F" without the addition of project generated traffic, and the addition of project generated traffic reduces the amount of average control delay for critical movements (i.e. a negative change in delay) and the project increases the critical V/C ratio by 0.01 or more, then the impact is significant.

1.5.1.2 Unsignalized Intersections

City of Sunnyvale Intersections (Not Regionally Significant):

The City of Sunnyvale currently utilizes LOS "D" as the minimum acceptable LOS threshold for unsignalized intersections within the City, except for intersections that have been designated as regionally significant. Per City of Sunnyvale *Unsignalized Intersection Level of Service Guidelines* (dated June 28, 2018), for determining the level of service for unsignalized intersections, the average intersection delay is used for all-way stop controlled intersections, and the worst movement delay is used for side-street stop controlled intersections. Project impacts at the City's unsignalized (not regionally significant) intersections would be considered significant if one of the following criteria is met:

1. If an unsignalized intersection operates at an acceptable LOS (i.e. "D" or better) without the Project and degrades to an unacceptable LOS (i.e. LOS "E" or "F") with the addition of Project traffic, then it is a significant impact.
2. If an unsignalized intersection operates at an unacceptable LOS (i.e. LOS "E" or "F") without the Project, and the addition of Project traffic increases:
    a. the average intersection delay by four (4) seconds or more, and the volume-to-capacity (v/c) value by 0.01 or more for all-way stop controlled intersections; or

b. the worst movement delay by four (4) seconds or more, and the critical volume-to-capacity (v/c) value by 0.01 or more for side-street stop controlled intersections.

3. Intersection meets the warrant(s) for installation of a traffic signal as per the latest edition of *California Manual on Uniform Traffic Control Devices* (CA MUTCD), last updated April 2017.

Regionally Significant City of Sunnyvale Intersections:

The City of Sunnyvale currently utilizes LOS "E" as the minimum acceptable LOS threshold for unsignalized intersections in Sunnyvale that have been designated as regionally significant by the City. Regionally significant intersections in the Project study area are identified in **Table 3**. Project impacts at regionally significant unsignalized City of Sunnyvale intersections would be considered significant if one of the following criteria is met:

1. If an unsignalized intersection operates at an acceptable LOS (i.e. "E" or better) without the Project and degrades to an unacceptable LOS (i.e. LOS "F") with the addition of Project traffic, then it is a significant impact.
2. If an unsignalized intersection operates at an unacceptable LOS (i.e. LOS "F") without the Project, and the addition of Project traffic increases:
    a. the average intersection delay by four (4) seconds or more, and the volume-to-capacity (v/c) value by 0.01 or more for all-way stop controlled intersections; or
    b. the worst movement delay by four (4) seconds or more, and the critical volume-to-capacity (v/c) value by 0.01 or more for side-street stop controlled intersections.
3. Intersection meets the warrant(s) for installation of a traffic signal as per the latest edition of *California Manual on Uniform Traffic Control Devices* (CA MUTCD), last updated April 2017.

1.5.1.3 Signal Warrants

In order to determine whether traffic signals should be installed at currently unsignalized intersections, and to determine unsignalized intersections significance criteria, a CA MUTCD based traffic signal warrant analysis was completed. The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or ascertain the need for installation of a traffic signal at an unsignalized intersection location. The CA MUTCD signal warrant criteria are based upon several factors including volume of vehicular and pedestrian traffic, location of school areas, frequency and type of collisions, etc. This TIA evaluated CA MUTCD based Peak-Hour-Volume-based Warrant 3 as a representative type of warrant analysis. Per CA MUTCD and City of Sunnyvale standards, right-turn volumes were excluded from signal warrant analysis. However, the CA MUTCD indicates that "the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal." Therefore, even at locations that do meet one or more the CA MUTCD signal warrants, engineering studies and judgement should be considered/applied when determining whether or not a signal should be installed.

1.5.2 Queuing

Vehicle queuing deficiencies were analyzed at all study intersections. 95th percentile queue lengths were reported for all left-turn movements at all study intersections. 95th percentile queues essentially represent a worst case queue length that will be reached or exceeded only 5% of the time during the peak hour (i.e., 95% of queues would be less than this length). As per the City's Queuing Analysis Guideline, queuing deficiencies were considered to occur at study intersections when one of the following conditions is met:

1. A queuing deficiency would occur when the addition of project trips causes the 95th percentile queue to exceed available storage length (where the 95th percentile queue does not exceed the storage length under "No Project" conditions).
2. Where the 95th percentile queue already exceeds the turn pocket length under "no project" conditions, a queuing deficiency would occur if project traffic lengthens the 95th percentile queue by 25 feet or more.

1.5.3 Freeway Segment Impact Criteria

According to the *VTA Traffic Level of Service Analysis Guidelines*, the VTA currently utilizes LOS "E" as the minimum acceptable LOS threshold for CMP freeway segments. Project impacts at CMP freeway segments would be considered significant if one of the following criteria is met:

1. If the addition of project generated traffic to a CMP freeway segment causes the density-based LOS to degrade from an acceptable LOS "E" or better to an unacceptable LOS "F", then the impact is significant.
2. If CMP freeway segment operates at an unacceptable density-based LOS "F" without the addition of project generated traffic, and the addition of project generated traffic increases the traffic volume on this segment by more than one (1) percent of the capacity of the segment, then the impact is significant.

1.5.4 Freeway Ramp Impact Criteria

A freeway ramp analysis was performed as part of this TIA in order to verify that the freeway ramps would have sufficient capacity to serve the Existing and Existing plus Project traffic volumes. For this TIA, Project impacts at freeway ramps would be considered significant if one of the following criteria is met:

1. If the addition of Project-generated traffic to a freeway ramp causes the V/C ratio of the freeway ramp to exceed 1.0, then the impact is significant.
2. If the freeway ramp already has a V/C ratio of greater than 1.0 without the addition of Project-generated traffic, and the addition of Project-generated traffic increases the traffic volume on this ramp by more than one (1) percent of the capacity of the ramp, then the impact is significant.

1.6 Report Organization

The remainder of this report is divided into the following chapters:

- **Chapter 2: Existing Conditions** – Describes existing conditions and operations of the study area intersections, freeways, transit system, pedestrian facilities, and bicycle facilities.
- **Chapter 3: Existing Plus Project/Project Alternative Conditions** – Describes the methods used to estimate and distribute Project/Project Alternative generated traffic and the resulting study area operations.
- **Chapter 4: Background Conditions** – Describes projected conditions and operations of study area facilities under Background (without Project) conditions.
- **Chapter 5: Background Plus Project/Project Alternative Conditions** – Describes projected conditions and operations of study area facilities under Background plus Project /Project Alternative conditions.

- **Chapter 6: Cumulative Conditions** – Describes projected conditions and operations of study area facilities under Cumulative (without Project) conditions.
- **Chapter 7: Cumulative Plus Project/Project Alternative Conditions -** Describes projected conditions and operations of study area facilities under Cumulative plus Project/ Project Alternative conditions.
- **Chapter 8: Site Access and Circulation** – Describes site access and circulation for the Project site.
- **Chapter 9: Potential Effects on Transit, Bicycle, and Pedestrian Facilities and Services** – Describes potential effects the proposed Project will have on the transit system, pedestrian facilities, and bicycle facilities.
- **Chapter 10: Impacts and Mitigation Measures** – Describes the projected impacts the Project will have on study area facilities (if any) and presents potential mitigations.
- **Chapter 11: Queuing Analysis, Deficiencies, and Recommended Improvements** – Describes vehicle queuing analysis for the study intersections, the projected operational queue deficiencies caused by the addition of Project trips to study intersections, and presents recommendations for improvements.

2. EXISTING CONDITIONS

This chapter describes the existing roadway and freeway network, transit services, pedestrian facilities, and bicycle facilities within and near the study area. It also presents existing turning movement volumes at study intersections and TRAFFIX calculated intersection delays and LOS.

2.1 EXISTING ROADWAY NETWORK

This section provides descriptions of the roadways and freeways within and near the study area. Roadway classifications and destinations are based on the Land Use and Transportation Elements (LUTE) of the latest adopted *Sunnyvale General Plan* (last updated April 2017) and the latest adopted *Santa Clara General Plan* (last updated December 2014).

US 101 is an eight-lane freeway (three mixed-flow lanes and one HOV lane in each direction within the study area) that primarily runs north-south, but runs east-west to the south of the Project site. US 101 connects multiple Bay Area cities, from San Francisco in the north to Gilroy in the south. US 101 has interchanges with Mathilda Avenue, Fair Oaks Avenue, and Lawrence Expressway near the Project study area. The posted speed limit on US 101 near the Project study area is 65 miles per hour.

State Route (SR) 237 is a four to six-lane freeway near the Project study area that extends between State Route 82 in Mountain View and Interstate 880 in Milpitas. SR 237 has two mixed-flow lanes and one HOV lane in each direction east of Mathilda Avenue, and has just two mixed-flow lanes in each direction west of Mathilda Avenue. SR 237 has interchanges with Mathilda Avenue, Java Drive-Fair Oaks Avenue, and Caribbean Drive-Lawrence Expressway within the Project study area. The posted speed limit on SR 237 near the Project study area is 65 miles per hour.

Central Expressway is a four to six-lane county expressway that runs east-west between San Antonio Road in Mountain View (western limit) and Trimble Road/De La Cruz Boulevard in Santa Clara (eastern limit). Within the Project study area, Central Expressway has a four-lane cross section and a 50 mile per hour posted speed limit. Central Expressway has been designated as a regionally significant roadway/expressway by the City of Sunnyvale.

Lawrence Expressway (County Route G2) is a six to eight-lane north-south county expressway that runs from Saratoga Avenue (southern limit, and where it becomes Quito Road) to SR 237 (northern limit, and where it becomes Caribbean Drive). It has six-lanes between Saratoga Avenue and Stevens Creek Boulevard, while it has eight total lanes (three mixed-flow lanes and one HOV lane in both the northbound and southbound directions) between Stevens Creek Boulevard and SR 237. Lawrence Expressway has a posted speed limit of 50 miles per hour through the study area. Lawrence Expressway has been designated as a regionally significant roadway/expressway by the City of Sunnyvale.

Caribbean Drive is a six-lane Class I arterial in the Moffett Park Specific Plan area of Sunnyvale that generally runs east-west between Mathilda Avenue (western limit) and SR 237 (eastern limit) where it becomes Lawrence Expressway. Caribbean Drive has a posted speed limit of 45 mph. Caribbean Drive has been designated as a regionally significant roadway by the City of Sunnyvale.

El Camino Real (State Route 82) is a six-lane Class I arterial that runs northwest-southeast between A Street in Daly City (western limit, and where it becomes Mission Street) and The Alameda in Santa Clara (eastern limit, and where it becomes The Alameda), running through San Mateo, Palo Alto, Mountain View, and Sunnyvale along the way. El Camino Real has posted speed

limit of 40 miles per hour within the Project study area. El Camino Real has been designated as a regionally significant roadway by the City of Sunnyvale.

Fair Oaks Avenue is a four to six-lane north-south Class I arterial between Wolfe Road (Class I segment southern limit) and Fair Oaks Way (northern limit) where it becomes Java Drive. Fair Oaks Avenue has five lanes (two lanes northbound and three lanes southbound) between Wolfe Road and the US 101 southbound ramps, four lanes over US 101, six lanes between US 101 northbound ramps and Tasman Drive, and five lanes between Tasman Drive and Fair Oaks Way (two lanes northbound and three lanes southbound). South of Wolfe Road, Fair Oaks Avenue becomes a four-lane Class II arterial which runs generally north-south until El Camino Real (Class II segment southern limit) where it becomes Remington Drive. The posted speed limit along Fair Oaks Avenue is 35 miles per hour between El Camino Real and Old San Francisco Road, 30 miles per hour between Old San Francisco Road and US 101, and 45 miles per hour between US 101 and Fair Oaks Way.

Mathilda Avenue is a six to eight-lane Class I arterial that runs north-south through Sunnyvale between Sunnyvale Saratoga Road (southern limit) and Caribbean Drive (northern limit). Within the Project Study area, Mathilda Avenue has three lanes northbound and three lanes southbound between Sunnyvale Saratoga Road and Olive Avenue, four lanes northbound and three lanes southbound between Olive Avenue and Washington Avenue, three lanes northbound and three lanes southbound between Washington Avenue and Maude Avenue, three lanes northbound and four lanes southbound between Maude Avenue and Ahwanee Avenue, four lanes northbound and three lanes southbound between Ahwanee Avenue and the Moffett Park Drive, and three lanes northbound and three lanes southbound between Moffett Park Drive and Caribbean Drive. The posted speed limit along Mathilda Avenue is 40 miles per hour south of El Camino Real, 35 miles per hour between El Camino Real and Washington Avenue, and 45 miles per hour between Washington Avenue and Caribbean Drive. Mathilda Avenue has been designated as a regionally significant roadway by the City of Sunnyvale.

Java Drive is a four-lane Class I arterial in the Moffett Park Specific Plan area of Sunnyvale that generally runs east-west between Mathilda Avenue (western limit) and Fair Oaks Way (eastern limit) where it becomes Fair Oaks Avenue. Java Drive has a posted speed limit of 45 miles per hour.

Sunnyvale Saratoga Road is a four to six-lane Class I arterial that runs north-south through southern Sunnyvale between Homestead Road (southern limit) and El Camino Real (northern limit) where it becomes Sunnyvale Avenue. Sunnyvale Saratoga Road has six lanes between Homestead Road and Mathilda Avenue and four lanes between Mathilda Avenue and El Camino Real. The posted speed limit along Sunnyvale Saratoga Road is 40 miles per hour between Homestead Road and Mathilda Avenue and 35 miles per hour between Mathilda Avenue and El Camino Real. Sunnyvale Saratoga Road has been designated as a regionally significant roadway by the City of Sunnyvale.

Wolfe Road is a six-lane Class I north-south arterial in Sunnyvale between Old San Francisco Road-Reed Avenue (southern limit) and Fair Oaks Avenue (northern limit). South of Old San Francisco Road-Reed Avenue, Wolfe Road becomes a four-lane Class II arterial which runs north-south until Stevens Creek Boulevard in Cupertino (Class II segment southern limit) where it becomes Miller Avenue. Wolfe Road has a posted speed limit of 35 miles per hour.

Great America Parkway is a six to eight-lane arterial in the City of Santa Clara that runs north-south between SR 237 (northern limit) and US 101 (southern limit) where it becomes Bowers Avenue. Great America Parkway has six lanes between SR 237 and Tasman Drive, seven lanes (four lanes northbound and three lanes southbound) between Tasman Drive and Mission College Boulevard, and eight lanes between Mission College Boulevard and US 101. The posted speed limit on Great America Parkway is 40 miles per hour.

Arques Avenue is a four-lane east-west Class II arterial in Sunnyvale between Fair Oaks Avenue (western limit) and Oakmead Parkway (eastern limit) where it becomes Scott Boulevard. West of Fair Oaks Avenue, Arques Avenue becomes a two-lane local roadway which runs east-west until reaching a dead-end just east of San Bernardino Way. The posted speed limit along Arques Avenue is 25 miles per hour between the dead end east of San Bernardino Way and Fair Oaks Avenue, and 35 miles per hour between Fair Oaks Avenue and Oakmead Parkway.

Ahwanee Avenue is a two-lane collector that generally runs east-west in Sunnyvale, along the south side of US 101, between Mathilda Avenue (western limit) and San Tomas Street (eastern limit). Ahwanee Avenue has a posted speed limit of 35 miles per hour for most of its length, with one 25 mile per hour segment between approximately Fair Oaks Avenue and San Junipero Drive.

Almanor Avenue is a two-lane collector that generally runs east-west between Mary Avenue (western limit) and Mathilda Avenue (eastern limit). Almanor Avenue has one lane in each direction with a posted speed limit of 30 mph.

Bordeaux Drive is a two-lane collector in the Moffett Park Specific Plan area of Sunnyvale that begins at Mathilda Avenue/1st Avenue (northern limit) and continues east for a short distance before making a 90 degree turn and running south until Moffett Park Drive (southern limit). Bordeaux Drive has a posted speed limit of 30 miles per hour.

Borregas Avenue is a two-lane collector/local roadway that generally runs north-south in Sunnyvale and is split into three unconnected segments which are separated by US 101 and SR 237. The first segment is a two-lane collector between Maude Avenue (southern limit) and Ahwanee Avenue (northern limit) which has a posted speed limit of 25 miles per hour. The second segment is a two-lane local road between Weddell Drive (southern limit) and Persian Drive (northern limit) which has a posted speed limit of 25 miles per hour. The third segment is a two-lane collector between Moffett Park Drive (southern limit) and Caribbean Drive (northern limit) which has a posted speed limit of 35 miles per hour.

California Avenue is a two-lane collector that runs east-west between Mary Avenue (western limit) and Bartlett Avenue (eastern limit). It has a posted speed limit of 25 miles per hour within the Project study area. California Avenue has an at-grade signalized intersection with Mathilda Avenue and provides access to eastbound Central Expressway "box" ramps.

Crossman Avenue is a two to four-lane collector in the Moffett Park Specific Plan area of Sunnyvale that generally runs north-south between Moffett Park Drive (southern limit) and Caribbean Drive (northern limit). Crossman Avenue has two lanes between Moffett Park Drive and Java Drive and four lanes between Java Drive and Caribbean Drive. Crossman Avenue has a posted speed limit of 45 miles per hour.

Duane Avenue is a two-lane collector that generally runs east-west in Sunnyvale between Pine Avenue (western limit) and Lawrence Expressway (eastern limit) where it becomes Oakmead Parkway. The posted speed limit along Duane Avenue is 25 miles per hour between Pine Avenue and Fair Oaks Avenue and 35 miles per hour between Fair Oaks Avenue and Lawrence Expressway.

Elko Drive is a two to four-lane collector that generally runs east-west in Sunnyvale between Lawrence Expressway (western limit) and the Calabazas Creek (eastern limit). Elko Drive has four lanes between Lawrence Expressway and Anvilwood Avenue and two lanes between Anvilwood Avenue and the Calabazas Creek. Elko Drive has a posted speed limit of 25 miles per hour.

Iowa Avenue is a two to four-lane collector that runs east-west between Bernardo Avenue (western limit) and Flora Vista Avenue (eastern limit). Iowa Avenue has four lanes between Mathilda Avenue and Sunnyvale Avenue, and two lanes for the rest of its length. The posted speed limit is 25 miles per hour.

Lakehaven Drive is a two-lane collector that generally runs east-west in Sunnyvale. Lakehaven Drive begins at a cul-de-sac adjacent to Lakehaven Terrace (western limit) and runs east to Lawrence Expressway (eastern limit) where it becomes Sandia Drive. The posted speed limit on Lakehaven Drive is 25 miles per hour.

Maude Avenue is a two to four-lane collector that runs east-west between SR 237 (western limit) and Wolfe Road (eastern limit). Maude Avenue has four lanes and a posted speed limit of 35 miles per hour west of Mathilda Avenue, and two lanes and a posted speed limit of 30 miles per hour east of Mathilda Avenue. Maude Avenue has a single point intersection/interchange with the SR 237 ramps which is part of a split diamond interchange with SR 237.

Moffett Park Drive is a two to three-lane collector that runs east-west parallel to the north side of SR 237 between Enterprise Way (western limit, where it becomes Manila Drive) and Caribbean Drive (eastern limit). It generally has two-lanes, one in each direction, but has one segment of two westbound lanes and one eastbound lane between Innovation Way and Mathilda Avenue. Moffett Park Drive has a posted speed limit of 40 miles per hour within the Project study area.

Oakmead Parkway is a two to six-lane collector in Sunnyvale that begins at Lawrence Expressway (western limit, and where it becomes Duane Avenue) and continues east for a short distance before making a 90 degree turn and continuing south until Central Expressway (eastern limit, and where it becomes Corvin Drive). Oakmead Parkway has six lanes between Lawrence Expressway and Lakeside Drive, two lanes between Lakeside Drive and Arques Avenue, and four lanes between Arques Avenue and Central Expressway.

Olive Avenue is a two-lane collector in Sunnyvale that runs east-west between Bernardo Avenue (western limit) and Hawthorn Avenue (eastern limit). Olive Avenue has a posted speed limit of 25 miles per hour.

Persian Drive is a two-lane collector that generally runs east-west in Sunnyvale, along the south side of SR 237, between Mathilda Avenue/Ross Drive (western limit) and Lawrence Expressway (eastern limit). The posted speed limit along Persian Drive is 35 miles per hour between Mathilda Avenue/Ross Drive and Fair Oaks Way and 40 miles per hour between Fair Oaks Way and Lawrence Expressway.

Sandia Avenue is a two-lane collector in Sunnyvale that runs northwest/southeast in an arc between Lawrence Expressway (western limit, and where it becomes Lakehaven Drive) and Wildwood Avenue. The posted speed limit on Sandia Avenue is 25 miles per hour.

Tasman Drive is a two to six-lane collector that generally runs east-west from Morse Avenue in Sunnyvale (western limit) to I-880 in Milpitas (eastern limit) where it becomes Great Mall Parkway. Tasman Drive has two lanes between Morse Avenue and Fair Oaks Avenue, four lanes between Fair Oaks Avenue and Zanker Road (in San Jose), and six lanes between Zanker Road and I-880 (in Milpitas). The posted speed limit along Tasman Drive is 30 miles per hour between Morse Avenue

and Fair Oaks Avenue, 40 miles per hour between Fair Oaks Avenue and Zanker Road, and 45 miles per hour between Zanker Road and I-880.

Washington Avenue is a two-lane collector that runs east-west between a cul-de-sac west of Acalanes Drive (western limit) and a cul-de-sac east of Bayview Avenue (eastern limit). Washington Avenue has a posted speed limit of 25 miles per hour.

Weddell Drive is a two-lane collector that generally runs east-west in Sunnyvale, along the north side of US 101, between Mathilda Avenue/Ross Drive (western limit) and a cul-de-sac just east of Fair Oaks Avenue (eastern limit). The posted speed limit along Weddell Drive is 35 miles per hour between Mathilda Avenue/Ross Drive and Fair Oaks Avenue and 25 miles per hour between Fair Oaks Avenue and the cul-de-sac at its eastern terminus.

1st Avenue is a two to four-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that generally runs east-west between Patrol Road (western limit, and the Sunnyvale/Mountain View city border) and Mathilda Avenue (eastern limit). Access to 1st Avenue is restricted west of E Street via a checkpoint that is stationed just east of E Street. 1st Avenue has two lanes between Patrol Road and just west of E Street, and four lanes from west of E Street to Mathilda Avenue. 1st Avenue has a posted speed limit of miles per hour.

5th Avenue is a two to five-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that generally runs east-west between Enterprise Way (western limit) and Bordeaux Drive (eastern limit). 5th Avenue has four lanes between Enterprise Way at the all-way stop-controlled intersection 350 feet east of D Street, six lanes between the all-way stop-controlled intersection 350 feet east of D Street and Mathilda Avenue, and two lanes between Mathilda Avenue and Bordeaux Drive. 5th Avenue has a posted speed limit of 25 miles per hour.

Caliente Drive is a two-lane local roadway in Sunnyvale that generally runs east-west between San Conrado Terrace (western limit) and Johanna Avenue (eastern limit). Caliente Drive has a posted speed limit of 25 miles per hour.

Carl Road is a two to four-lane local roadway in northern Sunnyvale that generally runs east-west and provides roadway access to the City of Sunnyvale Water Pollution Control Plant. Carl Road forms a "T" intersection with the northern terminus of Borregas Avenue. Carl Road has a posted speed limit of 25 miles per hour.

Caspian Court is a short, two-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that runs east-west from a cul-de-sac 500 feet west of Borregas Avenue (western limit) to Borregas Avenue (eastern limit) where it becomes Caspian Drive. Caspian Court has a posted speed limit of 25 miles per hour.

Caspian Drive is a two-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that runs east-west from Borregas Avenue (western limit, and where it becomes Caspian Court) to Geneva Drive. Caspian Drive has a posted speed limit of 25 miles per hour.

Fair Oaks Way is a short, two-lane local roadway segment in Sunnyvale that connects Persian Drive (western limit) to Fair Oaks Avenue (eastern limit). Fair Oaks Way has a posted speed limit of 35 miles per hour.

Geneva Drive is a two-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that generally runs north-south between Gibraltar Drive (southern limit) and Caribbean Drive (northern limit). The posted speed limit along Geneva Drive is 25 miles per hour between Gibraltar Drive and Java Drive and 30 miles per hour between Java Drive and Caribbean Drive.

Indio Avenue is a two-lane local roadway in Sunnyvale that generally runs east-west between Soquel Way and San Bernardino Way and is part of the westbound Central Expressway "box" ramps. Indio Avenue has a posted speed limit of 25 miles per hour.

Innovation Way is a two-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that generally travels northeast-southwest between Moffett Park Drive (southwestern limit) and Mathilda Avenue (northeastern limit). Innovation Way has a posted speed limit of 25 miles per hour.

Lockheed Martin Way is a four to six lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that generally runs east-west between Enterprise way (western limit) and Mathilda Avenue (eastern limit) where it becomes Java Drive. Access to Lockheed Martin Way is restricted east of C Street via a checkpoint that is stationed just east of C Street. Lockheed Martin Way has four lanes between Enterprise Way and E Street, six lanes between E Street and the checkpoint east of C Street, and five lanes (three lanes westbound and two lanes eastbound) between the checkpoint east of C Street and Mathilda Avenue. The posted speed limit on Lockheed Martin Way is 25 miles per hour.

McKinley Avenue is a two-lane local roadway in Sunnyvale that runs east-west between Sunset Avenue (western limit) and Bayview Avenue (eastern limit). McKinley Avenue has a posted speed limit of 25 miles per hour.

Ross Drive is a two-lane local roadway in Sunnyvale that starts just east of Mathilda Avenue at Bradford Drive and runs west until it ends at an office park driveway just west of Hamlin Court. Ross Drive has a posted speed limit of 25 miles per hour.

San Aleso Avenue is a two lane local roadway in Sunnyvale that begins at Mathilda Avenue (southern limit) and continues east for a short distance before turning 90 degrees and running north until ending at Ahwanee Avenue (northern limit). San Aleso Avenue has a posted speed limit of 25 miles per hour.

Twin Creeks is a two-lane local roadway in the Moffett Park Specific Plan area of Sunnyvale that begins at Caribbean Drive and continues northeast to provide access to the Twin Creeks Sports Complex. Twin Creeks has a posted speed limit of 25 mile per hour.

2.2 PEDESTRIAN FACILITIES

Existing study area pedestrian facilities were considered within an approximately one-mile walk of the Project site. A small portion of Caribbean Drive has existing sidewalk. The south side of Caribbean Drive only has sidewalk between Geneva Drive and Crossman Avenue, while the north side of Caribbean Drive only has sidewalk between about 400 feet west of Crossman Avenue to about 600 feet east of Crossman Avenue and between Twin Creeks and Baylands Park. The existing buildings fronting Caribbean Drive on the Project site have detached pedestrian paths that will be demolished as part of the Project.

Mathilda Avenue has sidewalk on both sides of the street between Moffett Park Drive and 5th Avenue and between Java Drive and the southern limit of the Project site along Mathilda Avenue. Mathilda Avenue has sidewalk only on the east side of the street between Ross Drive and Moffett Park Drive, and between 5th Avenue and Java Drive. Mathilda Avenue has sidewalk only on the west side of the street along the directly adjacent to the Project site.

Bordeaux Drive has sidewalk on both sides of the street between Mathilda Avenue and the east end of the Yahoo lot (on the corner of Mathilda and Java) and between the planned Innovation Drive and the north end of the Sheraton Sunnyvale lot. Bordeaux Drive has sidewalk only on the east side

of the street between approximately 400 feet north of 5th Street to the planned Innovation Drive, and adjacent to the Sheraton Sunnyvale lot. The rest of Bordeaux Drive does not have sidewalks, including the portion fronting the Project site.

Borregas Avenue has sidewalk on both sides of the street for approximately 700 feet north of Moffett Park Drive and between Gibraltar Drive and about 400 feet north of Java Drive. Borregas Avenue has sidewalk only on the west side of the street from approximately 700 feet north of Moffett Park Drive to Gibraltar Drive. Borregas Avenue has sidewalk only on the east side of the street from about 400 feet north of Java Drive to Caribbean Drive, including area fronting the east edge of the Project site.

Java Drive has sidewalk/detached walkways on both sides of the street between Mathilda Avenue and the SCVWD's West Channel outfall and between approximately 500 feet west of Geneva Drive and Fair Oaks Way. Java Drive has sidewalk/detached walkways on only the north side of the street between the SCVWD's West Channel outfall and the approximately 500 feet west of Geneva Drive.

Caspian Court has no existing sidewalks. Caspian Drive has one 650 foot segment of sidewalk on the north side of the street, mid-block between Borregas Avenue and Geneva Drive.

Geneva Drive has sidewalk only on the east side of the street between Java Drive and Caribbean Drive (with an approximately 125 foot gap just north of Caspian Drive). Geneva Drive has no sidewalk between Gibraltar Drive and Java Drive.

Crossman Avenue has sidewalk on both sides of the street between Java Drive and Baltic Way. Crossman Avenue has sidewalk only on the west side of the street between Moffett Park Drive and Java Drive and between Baltic Way and Caribbean Drive.

Moffett Park Drive has sidewalk on only the north side of the street between Bordeaux Drive and approximately 800 feet west of Borregas Avenue, between Innsbruck Drive and Crossman Avenue, and between the Java Drive overcrossing and Orleans Drive. There is an existing pedestrian overcrossing over SR 237 that connects Moffett Park Drive at Borregas Avenue to Persian Drive at Borregas Avenue, with striped crosswalks providing access to the opposite site of either street. The rest of Moffett Park Drive does not have existing sidewalks.

1st Avenue has sidewalks on both sides of the street between E Street and Mathilda Avenue. Lockheed Martin Way has sidewalks on both sides of the street between the check point and Mathilda Avenue.

5th Avenue has sidewalks on both sides of the street between Mathilda Avenue and approximately 300 feet west of Bordeaux Drive. 5th Avenue has sidewalks on the south side of the street only between Enterprise Way and Mathilda Avenue.

Innovation Way has sidewalks on both sides of the street between Moffett Park Drive and approximately 400 feet north of 11th Avenue and between the driveway to 1133 Innovation Way (juniper Networks) and Mathilda Avenue. In the approximately 800 foot gap between these two segments, Innovation Way has sidewalks only on the east side of the street.

2.3 BICYCLE FACILITIES

The *VTA Bicycle Technical Guidelines* (December 2012) refers to the *Caltrans Highway Design Manual 6th Edition* (HDM) (last updated July 2, 2018), Chapter 1000 for standards on designing bicycle facilities. The Caltrans HDM classifies bikeways as follows:

Class I Bikeway (Bike Path) – Provides a completely separated right-of-way for the exclusive use of bicycles and pedestrians with crossflow by motorists minimized.

Class II Bikeway (Bike Lane) – Provides a striped lane for one-way bicycle travel on a street or highway. These lanes are generally adjacent to the outside vehicular travel lane and are marked by special lane marking and signs.

Class III Bikeway (Bike Route) – Provides for shared use with bicycle or motor vehicle traffic, typically on lower volume roadways. Class III bikeways are typically designated by signs and are used to provide continuity to other bicycle facilities.

Within or near the Project study area, Class I bikeways exist in the following locations:

- The Bay Trail is a paved path which runs east-west to the north of the Project study area, parallel to Caribbean Drive and SR 237. The Bay Trail begins at the Adobe Creek Loop Trail in Palo Alto, California (western limit) and runs east until ending at Lafayette Street in Santa Clara (eastern limit). Near the Project study area, there are Bay Trail access points at the Yahoo parking lot near where Mathilda Avenue becomes Caribbean Drive, and via Carl Road.
- The Baylands Park Trail is a paved path which runs east-west along the north side of SR 237 between the Caribbean Drive / Moffett Park Drive-Baylands Park intersection in Sunnyvale (western limit) and Lafayette Street in Santa Clara (eastern limit). The Baylands Park Trail overlaps with the Bay Trail within the City of Santa Clara. Near the Project study area, there is a Baylands Park Trail access point at the Caribbean Drive / Moffett Park Drive-Baylands Park intersection.
- The Calabazas Creek Trail is a mostly paved path which runs north-south along the east side of Calabazas Creek between the Bay Trail (northern limit) and US 101 (southern limit). Near the Project study area, there is a Calabazas Creek Trail access point at Tasman Drive.
- The John W. Christian Greenbelt is a paved path which runs east-west through the Project study area north of US 101, between Garner Drive just west of Borregas Avenue (western limit) and the Calabazas Creek Trail (eastern limit). There are gaps in the John W. Christian Greenbelt between Weddell Drive on either side of Fair Oaks Avenue and between Silverlake Drive and Blazingwood Drive on either side of Lawrence Expressway where a cyclist would have to ride along the nearby roadways to reach the next segment. The John W. Christian Greenbelt crosses all cross-streets at-grade, and therefore can be accessed at any cross-street.

Within or near the Project study area, Class II bikeways exist in the following locations:

- Caribbean Avenue between Mathilda Avenue and Moffett Park Drive
- Eastbound 1st Avenue between E Street and Mathilda Avenue
- Enterprise Way between Manila Drive / West Moffett Park Drive and 5th Avenue
- 11th Avenue between Enterprise Way and Innovation Way
- D Street between 11th Avenue and 5th Avenue
- Northbound Mathilda Avenue between Iowa Avenue and Ahwanee Avenue, southbound Mathilda Avenue between Washington Avenue and Del Rey Avenue, and northbound and southbound Mathilda Avenue between El Camino Real and Sunnyvale Saratoga Road, and between 1st Avenue and Caribbean Drive
- Bordeaux Drive between Moffett Park Drive and Java Drive
- Borregas Avenue between Maude Avenue and Ahwanee Avenue, Weddell Drive and Persian Drive, and Moffett Park Drive and Caribbean Drive
- Crossman Avenue between Moffett Park Drive and Caribbean Drive

- Moffett Park Drive between Enterprise Way and Innovation Way and between Bordeaux Drive and Caribbean Drive
- Persian Drive between Ross Drive and Lawrence Expressway
- Elko Drive between Lawrence Expressway and Reamwood Avenue
- Lawrence Station Road between Elko Drive and Mountain View-Alviso Road
- Mountain View-Alviso Road between Lawrence Station Road and Great America Parkway
- Reamwood Avenue between Tasman Drive and Elko Drive
- Great America Parkway between US 101 and Great America Way
- Tasman Drive between Reamwood Avenue and I-880
- Fair Oaks Avenue between El Camino Real and Old San Francisco Road, Evelyn Avenue and Kifer Road, and Tasman Drive and Fair Oaks Way
- Wolfe Road between Old San Francisco Road-Reed Avenue and Fair Oaks Avenue
- Almanor Avenue between North Mary Avenue and Vaqueros Avenue
- Mary Avenue between Homestead Road and Almanor Avenue
- Maude Avenue between Logue Avenue in Mountain View and Borregas Avenue (with the exception of eastbound Maude Avenue between Pastoria Avenue and Mathilda Avenue)
- Evelyn Avenue between Hope Street in Mountain View and Reed Avenue
- Hollenbeck Avenue between Danforth Drive and El Camino Real
- Sunnyvale Avenue between Evelyn Avenue and Sunnyvale Saratoga Road
- Hendy Avenue between Sunnyvale Avenue and Fair Oaks Avenue
- Old San Francisco Road between Sunnyvale Avenue and Wolfe Road
- El Camino Real between Sunnyvale Saratoga Road and Remington Drive-Fair Oaks Avenue
- Sunnyvale Saratoga Road between Homestead Road and Sunnyvale Saratoga Road
- Remington Drive between Bernardo Avenue and El Camino Real
- Fremont between Belleville Way and Wolfe Road
- Manet Drive between Crescent Avenue and Remington Drive
- Michelangelo Drive between Sunnyvale Community Center Driveway and Remington Drive
- Morse Avenue between Weddell Drive and Persian Drive
- Tasman Drive between Morse Avenue and Fair Oaks Avenue
- Weddell Drive between Morse Avenue and Fair Oaks Avenue
- Duane Avenue between Fair Oaks Avenue and Stewart Drive
- Stewart Drive between Wolfe Road and Duane Avenue
- Commercial Street between Central Expressway and Arques Avenue
- Deguigne Drive between Arques Avenue and Duane Avenue
- Santa Trinita Avenue between Arques Avenue and Stewart Drive
- Arques Avenue between Fair Oaks Avenue and Oakmead Parkway
- Kifer Road between Fair Oaks Avenue and Lawrence Expressway
- Aster Avenue between Evelyn Avenue and Willow Avenue
- Reed Avenue between Wolfe Road and Lawrence Expressway
- Lakedale Way between Stoneylake court and Lawrence Expressway
- Blazingwood Drive between Pecos Way and the John W Christian Greenbelt
- Wildwood Avenue between Bridgewood Way and the Calabazas Creek Trail
- Scott Boulevard between Bowers Avenue and Central Expressway

- Bowers Avenue between Chromite Drive and US 101
- Oakmead Parkway between Lawrence Expressway and Central Expressway
- Lakeside Drive between Arques Avenue and Scott Boulevard

Within the Project study area, the City has designated the following facilities as bike routes (i.e. Class III bikeways:

- Mathilda Avenue between Moffett Park Drive and 1st Avenue
- Moffett Park Drive between Innovation Way and Borregas Avenue
- Fair Oaks Avenue between Weddell Drive and Tasman Drive
- Maude Avenue between Borregas Avenue and Fair Oaks Avenue and eastbound Maude Avenue between Pastoria Avenue and Mathilda Avenue
- Ahwanee Avenue between Borregas Avenue and Morse Avenue
- Morse Avenue between California Avenue and Ahwanee Avenue
- California Avenue between Sunnyvale Avenue and Morse Avenue
- Sunnyvale Avenue between Evelyn Avenue and California Avenue
- Washington Avenue between Mathilda Avenue and Sunnyvale Avenue
- Olive Avenue between Bernardo Avenue and Firloch Avenue
- Firloch Avenue/Begonia Way/Grand Fir Avenue between Olive Avenue and Old San Francisco Road
- Hollenbeck Avenue between Fremont Avenue and Torrington Drive
- Torrington Drive between Hollenbeck Avenue and Snowberry Court
- Spinosa Drive between Snowberry Court and Crawford Drive
- Crawford Drive between Spinosa Drive and Sunnyvale Saratoga Road
- Wolfe Road between El Camino Real and Reed Avenue
- Gail Avenue between Old San Francisco Road and Iris Avenue
- Iris Avenue between Gail venue and Henderson Avenue
- Henderson Avenue between Iris Avenue and Lilly Avenue
- Lily Avenue between Henderson Avenue and White Oak Lane
- Kifer Road between Lawrence Expressway and Bowers Avenue
- Walsh Avenue between Bowers Avenue and Lafayette Street
- Monroe Street between Lawrence Expressway and San Tomas Aquino Creek Trail
- Bowers Avenue between El Camino Real and Chromite Drive

Bicycles are allowed to use the approximately seven- (7) foot shoulders on Central Expressway and Lawrence Expressway, however caution is advised due to high traffic. For all other Project study area roadways, it can be assumed that bicycles are allowed to share the roadway with vehicles. Existing Project study area bicycle facilities are shown in **Figure 3**.

2.4 EXISTING TRANSIT SERVICE

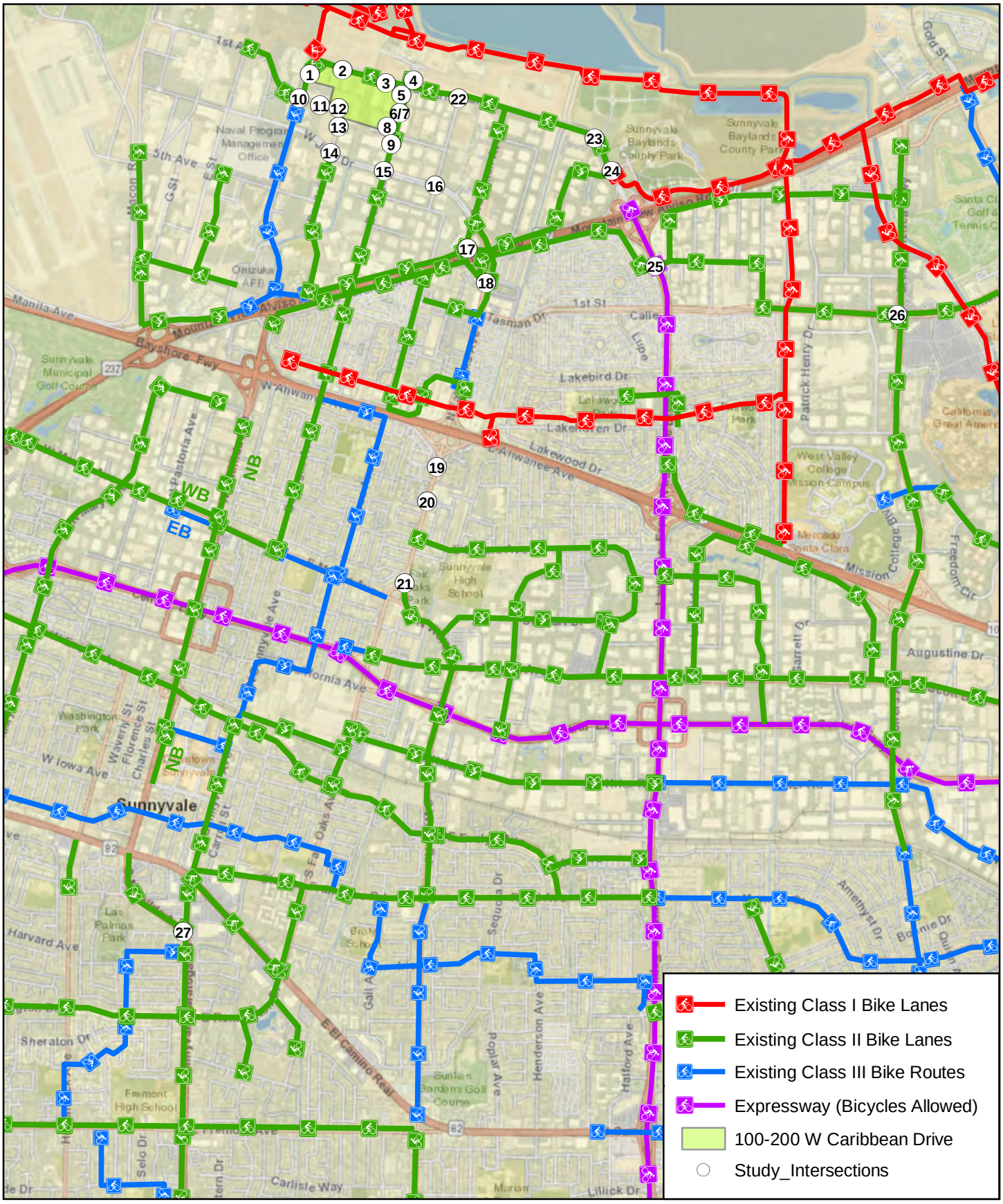
Existing transit service in the Project study area is provided by Caltrain and VTA bus routes. Existing Project study area transit services are shown in **Figure 4**. A description of transit services is provided below.

2.4.1 VTA Bus Service

VTA operates bus service within the Project study area. Local buses that have a stop within approximately one mile of the Project site include bus routes 26, 54, 55, 120, 121, 122, 321, and 328. A summary of each local route is included below:

Route 26 is a local service that runs between the Lockheed Martin Transit Center in Sunnyvale and the Eastridge Transit Center in San Jose. Within the Project study area, Route 26 primarily runs along Java Drive and Fair Oaks Avenue, with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site), as well as the Java Drive intersections with Mathilda Avenue (0.3 miles from the Project site), Bordeaux Drive (0.2 miles from the Project site), Borregas Avenue (0.2 miles from the Project site), Geneva Drive (0.4 miles from the Project site), and Crossman Avenue (0.6 miles from the Project site), as well as the Fair Oaks Avenue intersections with Fair Oaks Way (0.9 miles from the Project site) and Tasman Drive (1.0 miles from the Project site). On weekdays, eastbound and westbound Route 26 operate between approximately 5:14 AM and 11:50 PM on 30 minute headways, except for the last two busses of the day, which operate on approximately 60 minute headways. On weekends, eastbound and westbound Route 26 operate between approximately 6:16 AM and 10:54 PM on 30 minute headways, except for the last three busses of the day, which operate on approximately 60 minute headways.

Route 54 is a local service that runs between De Anza College in Cupertino and the Lockheed Martin Transit Center in Sunnyvale. Near the Project study area, Route 54 primarily runs along Mathilda Avenue, with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site) and the Mathilda Avenue / Moffett Park Drive intersection (0.8 miles from the Project site). On weekdays, northbound and southbound Route 54 operate between approximately 6:03 AM and 9:29 PM on 30 minute headways, except for the last two busses of the day, which operate on approximately 40 and 60 minute headways, respectively. On Saturday, northbound and southbound Route 54 operate between 7:54 AM and 7:50 PM on 45 to 60 minute headways. On Sunday, northbound and southbound Route 54 operate between 8:55 AM and 7:15 PM on 45 to 60 minute headways. Note that under the VTA Fiscal Year 2018-2019 Transit Service Plan, Route 54 will be discontinued with the introduction of the Rapid 523 line along Mathilda Avenue, Sunnyvale Avenue, and Sunnyvale-Saratoga Road.



Existing Project Study Area Bicycle Facilities
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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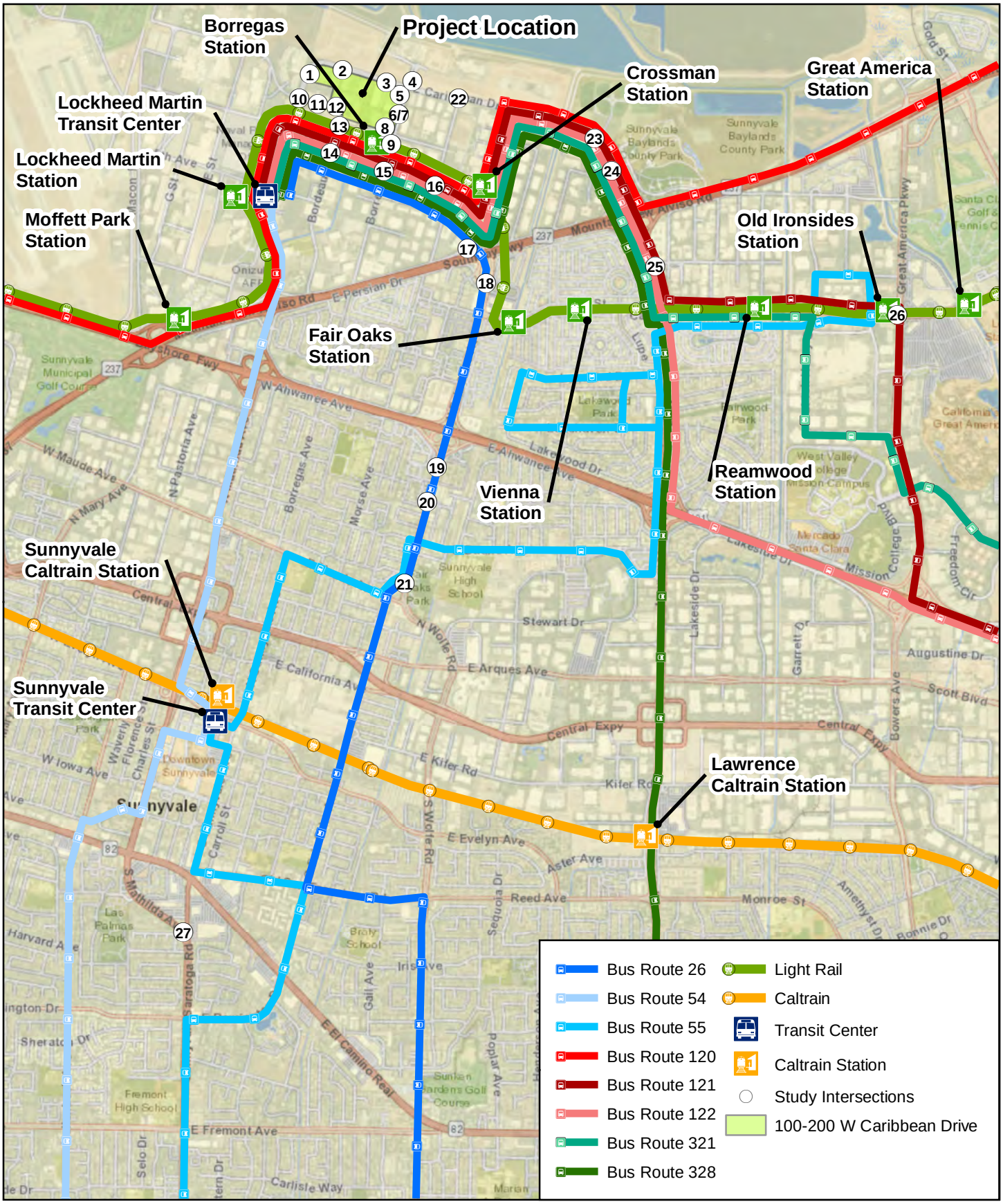

Existing Project Study Area Transit Services
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

0 1,500 3,000
Feet

NORTH

Figure 4

WOOD RODGERS

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Route 55 is a local service that runs between De Anza College in Cupertino and Great America in Santa Clara. Near the Project study area, Route 55 primarily runs along Lawrence Expressway and Fair Oaks Avenue, with stops at the Lawrence Expressway intersections with Tasman Drive (2.4 miles from the Project site) and Lakehaven Drive (2.5 miles from the Project site). On weekdays, northbound and southbound Route 55 operate between approximately 5:38 AM and 10:54 PM on approximately 15 to 30 minute headways, except for the last two busses of the day, which operate on approximately 60 minute headways. The 15 minute headways generally occur within the Project vicinity from approximately 7:30 AM to 9:30 AM and 2:30 PM to 6:00 PM. On Saturday, northbound and southbound Route 55 operate between approximately 7:43 AM and 9:09 PM on approximately 30 minute headways except for the first and last few busses of the day which operate on 60 minute headways. On Sunday, northbound and southbound Route 55 operate between approximately 7:52 AM and 8:34 PM on 45 to 60 minute headways.

Route 120 is an express bus route that runs from the Fremont BART station to the Lockheed Martin Transit Center in Sunnyvale. Near the Project study area, Route 120 primarily runs along SR 237, Mathilda Avenue, Java Drive, Crossman Avenue, and Caribbean Drive, with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site); the Java Drive intersections with Mathilda Avenue (0.3 miles from the Project site), Bordeaux Drive (0.2 miles from the Project site), Borregas Avenue (0.2 miles from the Project site), Geneva Drive (0.4 miles from the Project site), and Crossman Avenue (0.6 miles from the Project site); the Crossman Avenue intersections with Java Drive (0.7 miles from the Project site) and Baltic Way (0.7 miles from the Project site); and the Caribbean Drive / Moffett Park Drive intersection (1.0 mile from the Project site). On weekdays, northbound Route 120 operates from approximately 4:04 PM to 7:12 PM on approximately 30-minute headways. On weekdays, southbound Route 120 operates from approximately 6:16 AM to 9:30 AM on approximately 15 to 60 minute headways. Route 120 does not operate on Saturday or Sunday.

Route 121 is an express bus route that runs from the Gilroy Transit Center to the Lockheed Martin Transit Center in Sunnyvale. Near the Project study area, Route 121 primarily runs along Mathilda Avenue, Java Drive, Crossman Avenue, Caribbean Drive, Lawrence Expressway, and Tasman Drive with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site); the Java Drive intersections with Mathilda Avenue (0.3 miles from the Project site), Bordeaux Drive (0.2 miles from the Project site), Borregas Avenue (0.2 miles from the Project site), Geneva Drive (0.4 miles from the Project site), and Crossman Avenue (0.6 miles from the Project site); the Crossman Avenue intersections with Java Drive (0.7 miles from the Project site) and Baltic Way (0.7 miles from the Project site); and the Caribbean Drive / Moffett Park Drive intersection (1.0 mile from the Project site). On weekdays, northbound Route 121 operates from approximately 4:30 AM to 9:20 AM on approximately 15 to 45 minute headways. On weekdays, southbound Route 121 operates from approximately 2:51 PM to 7:36 PM on approximately 15 to 45 minute headways. Route 121 does not operate on Saturday or Sunday.

Route 122 is an express bus route that runs from South San Jose to the Lockheed Martin Transit Center in Sunnyvale. Near the Project study area, Route 122 primarily runs along Mathilda Avenue, Java Drive, Crossman Avenue, Caribbean Drive, Lawrence Expressway, and US 101, with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site); the Java Drive intersections with Mathilda Avenue (0.3 miles from the Project site), Bordeaux Drive (0.2 miles from the Project site), Borregas Avenue (0.2 miles from the Project site), Geneva Drive (0.4 miles from the Project site), and Crossman Avenue (0.6 miles from the Project site); the Crossman Avenue intersections with Java Drive (0.7 miles from the Project site) and Baltic Way (0.7 miles from the Project site); and the Caribbean Drive / Moffett Park Drive intersection (1.0 mile from the Project site). On

weekdays, northbound Route 122 operates from approximately 5:52 AM to 6:45 AM, with only one arrival per stop. On weekdays, southbound Route 122 operates from approximately 4:48 PM to 6:02 PM, with only one arrival per stop. Route 122 does not operate on Saturday or Sunday.

Route 321 is a limited stop bus route that runs from the Great Mall/Main Transit Center in Milpitas to the Lockheed Martin Transit Center in Sunnyvale. Near the Project study area, Route 55 primarily runs along Mathilda Avenue, Java Drive, Crossman Avenue, Caribbean Drive, Lawrence Expressway, and Tasman Drive, with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site); the Java Drive intersections with Mathilda Avenue (0.3 miles from the Project site), Bordeaux Drive (0.2 miles from the Project site), Borregas Avenue (0.2 miles from the Project site), Geneva Drive (0.4 miles from the Project site), and Crossman Avenue (0.6 miles from the Project site); the Crossman Avenue intersections with Java Drive (0.7 miles from the Project site) and Baltic Way (0.7 miles from the Project site); and the Caribbean Drive / Moffett Park Drive intersection (1.0 mile from the Project site). On weekdays, northbound Route 321 operates from approximately 5:52 PM to 6:38 PM, with only one arrival per stop. On weekdays, southbound Route 321 operates from approximately 8:11 AM to 8:50 AM, with only one arrival per stop. Route 321 does not operate on Saturday or Sunday.

Route 328 is a limited stop bus route that runs from Almaden Expressway and Camden Avenue in San Jose to the Lockheed Martin Transit Center in Sunnyvale. Near the Project study area, Route 55 primarily runs along Java Drive, Crossman Avenue, Caribbean Drive, and Lawrence Expressway, with stops at the Lockheed Martin Transit Center (0.6 miles from the Project site); the Java Drive intersections with Mathilda Avenue (0.3 miles from the Project site), Bordeaux Drive (0.2 miles from the Project site), Borregas Avenue (0.2 miles from the Project site), Geneva Drive (0.4 miles from the Project site), and Crossman Avenue (0.6 miles from the Project site); the Crossman Avenue intersections with Java Drive (0.7 miles from the Project site) and Baltic Way (0.7 miles from the Project site); and the Caribbean Drive / Moffett Park Drive intersection (1.0 mile from the Project site). On weekdays, northbound Route 328 operates from approximately 5:57 AM to 8:43 AM on approximately 80 minute headways, for a total of two arrivals per stop per day. On weekdays, southbound Route 328 operates from approximately 4:53 PM to 7:14 PM on approximately 60 minute headways, for a total of two arrivals per stop per day. Route 328 does not operate on Saturday or Sunday.

2.4.2 VTA Light Rail Service

VTA provides light rail service in the Project study area. The only light rail line close to the Project site is Line 902.

Route 902 runs between Downtown Mountain View and Winchester Avenue in Campbell and serves the northern areas of Sunnyvale. The closest light rail stations to the Project study area are the Lockheed Martin Transit Center (0.6 miles from the Project site), the Borregas Station (0.2 miles from the Project site), and the Crossman Station (0.6 miles from the Project site). On weekdays, northbound and southbound Route 902 operate between approximately 4:42 AM and 12:45 AM (of the next day) on 15 to 30-minute headways. On Saturday and Sunday, Route 902 operates between 6:01 AM and 12:43 AM (of the next day) on 30-minute headways.

2.4.3 Caltrain Service

Caltrain is a commuter rail line that runs between San Francisco and Santa Clara County. The nearest Caltrain station to the Project study area is the Sunnyvale Station, located on West Evelyn Avenue between South Mathilda Avenue and South Sunnyvale Avenue, approximately 3.0 miles from the Project site. The Sunnyvale Station is accessible to/from the Project site via VTA bus route

54, which stops at the Sunnyvale Transit Center located directly across Evelyn Avenue form the Sunnyvale Station. Parking is provided at the Sunnyvale Station.

The Sunnyvale Station provides Caltrain services with approximately 20 to 30-minute headways during the weekday AM and PM peak periods, and with approximately 60 minute headways during weekday off-peak hours (midday and evenings) and weekends. The Sunnyvale Station is utilized by local, limited, and baby bullet trains.

2.5 EXISTING INTERSECTION VOLUMES AND LANE GEOMETRICS

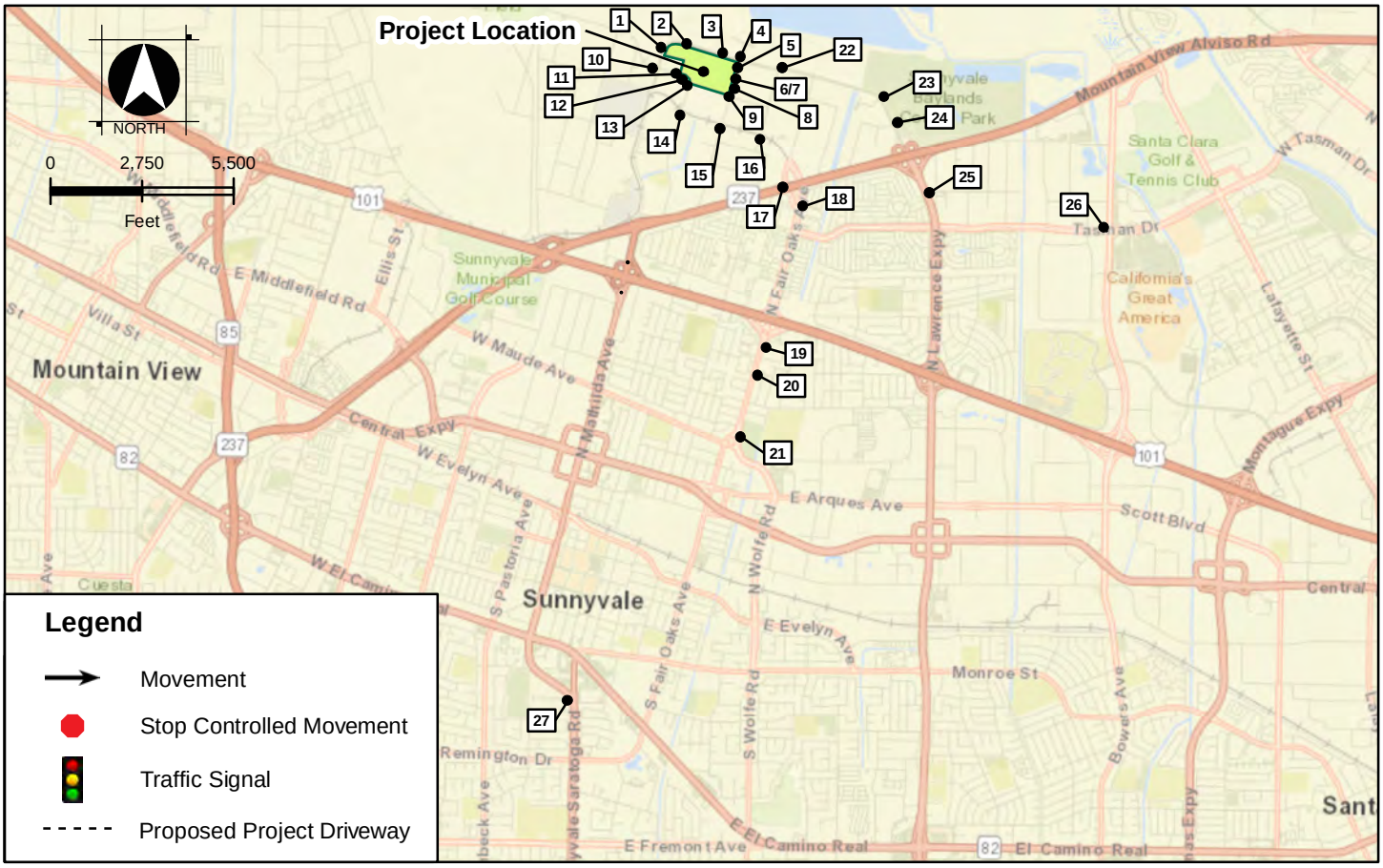
Project study intersection traffic operations were evaluated for the AM and PM peak hours under existing conditions. The AM and PM peak hours at City of Sunnyvale, City of Santa Clara, and Caltrans intersections were defined to be the highest one hour of traffic flow counted between 7:00 AM and 10:00 AM and between 4:00 PM and 7:00 PM, respectively, on a typical weekday. The AM and PM peak hours at County-controlled intersections (i.e., the study intersections along Lawrence Expressway) were defined to be the highest one hour of traffic flow counted between 7:00 AM and 9:00 AM and between 4:00 PM and 6:00 PM, respectively, on a typical weekday.

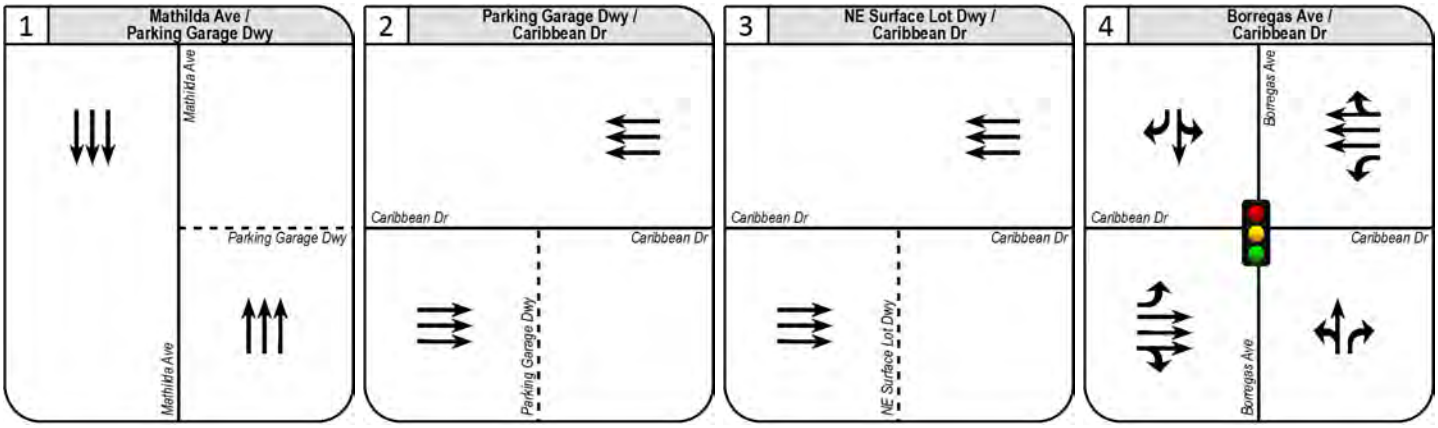
Existing AM and PM peak hour intersection counts were obtained from new intersection counts and recent counts provided by the City. Wood Rodgers conducted new three-hour AM (7:00 AM to 10:00 AM) and three-hour PM (4:00 PM to 7:00 PM) peak hour vehicular, pedestrian, and bicycle traffic counts at study intersections 4, 9, 10, and 14-26 on Tuesday May 15, 2018 through Thursday May 17, 2018. All other study area intersection counts were obtained from the City (these counts were collected in November of 2017).

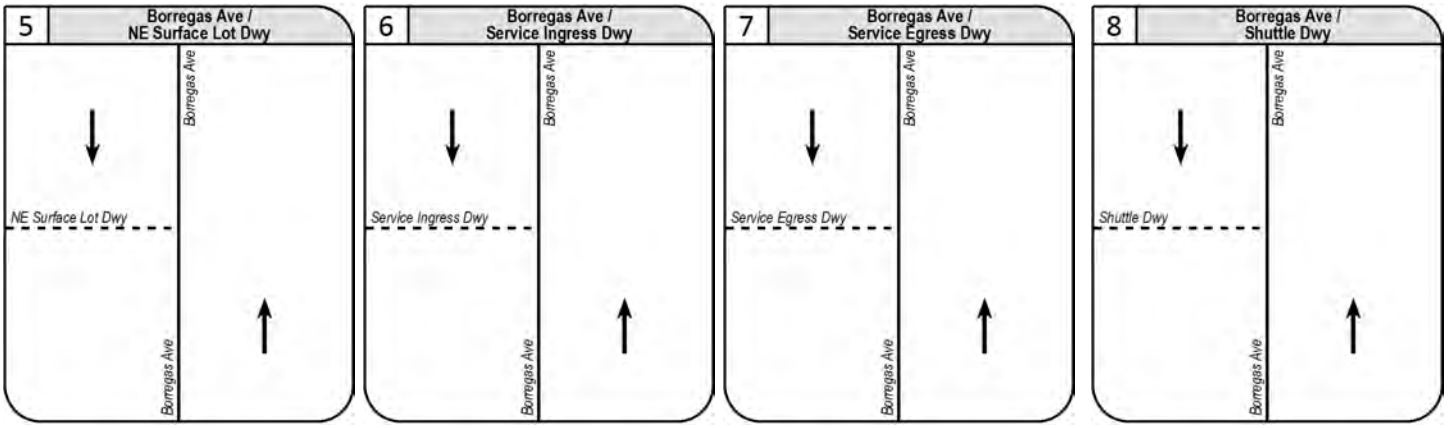
Traffic counts were balanced in areas with little or no access points. **Figure 5** illustrates "Existing" intersection lane geometrics and control and **Figure 6** illustrates "Existing" conditions study intersection traffic volumes. Study intersection raw count sheets are included in **Appendix A**.

2.6 "EXISTING" INTERSECTION OPERATIONS

"Existing" intersection operations were quantified under "Existing" traffic volumes (shown in **Figure 6**) and "Existing" intersection lane geometrics and control (shown in **Figure 5**). The intersection operations analysis of all signalized intersections in the City of Sunnyvale's jurisdiction was calibrated against collected queues and delays. **Table 6** illustrates the resulting "Existing" intersection LOS operations.







Existing Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 5

WOOD RODGERS

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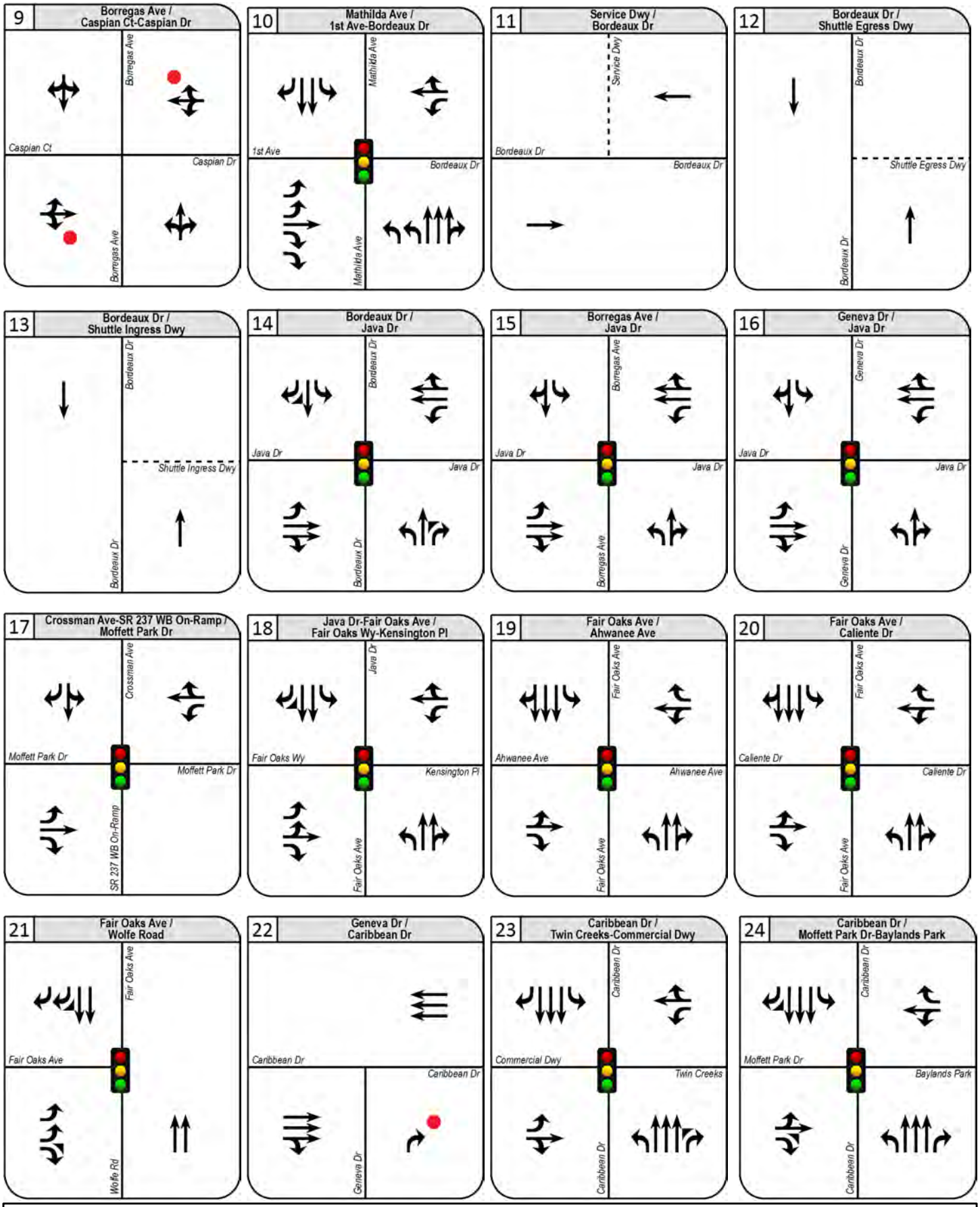
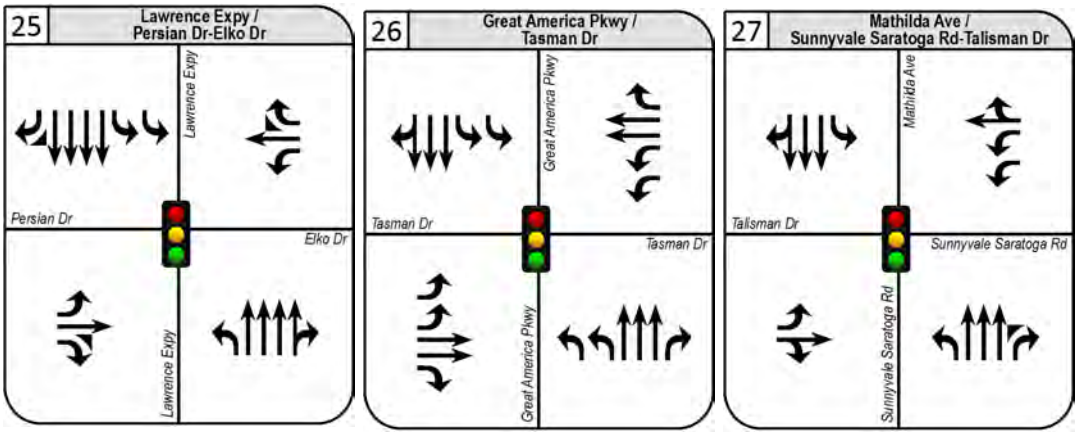


Existing Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 5-2

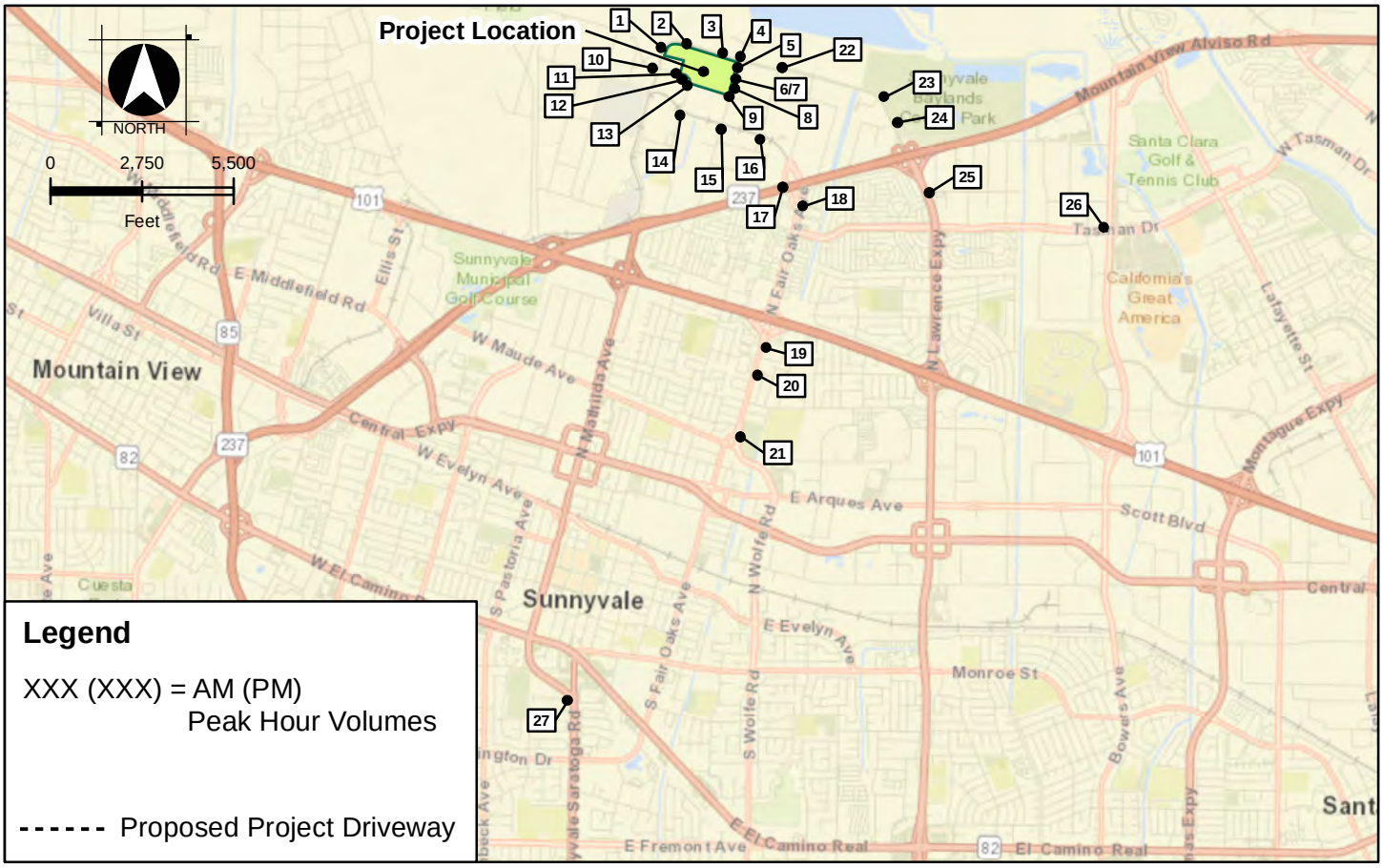
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

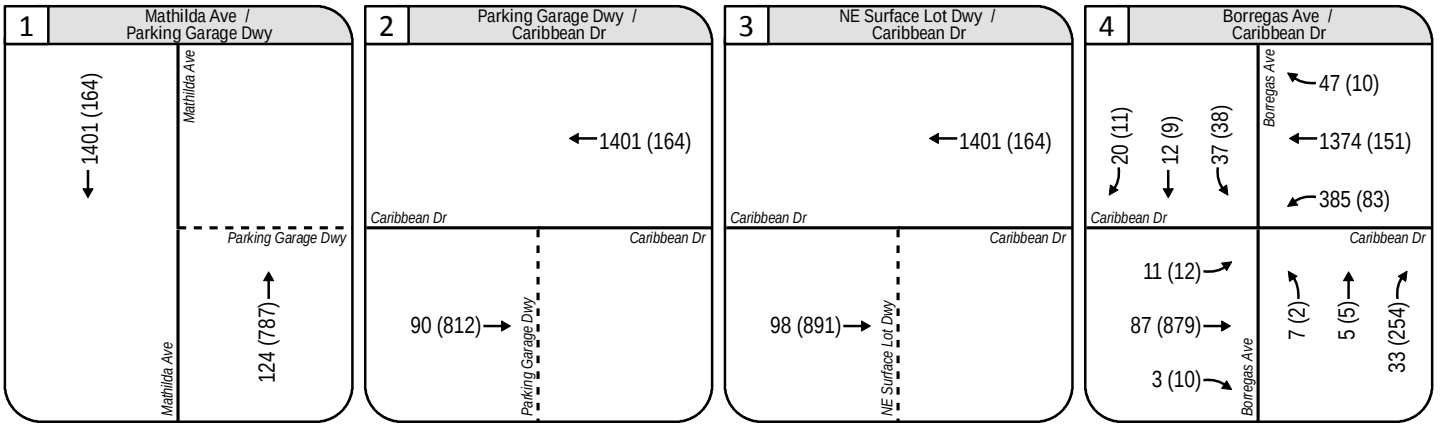


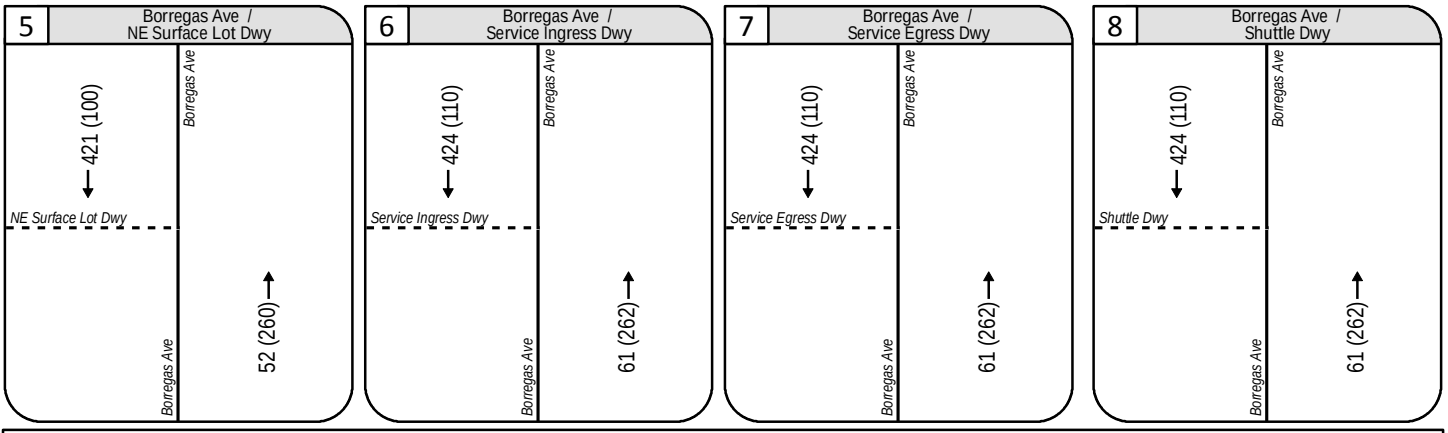
Existing Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 5-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



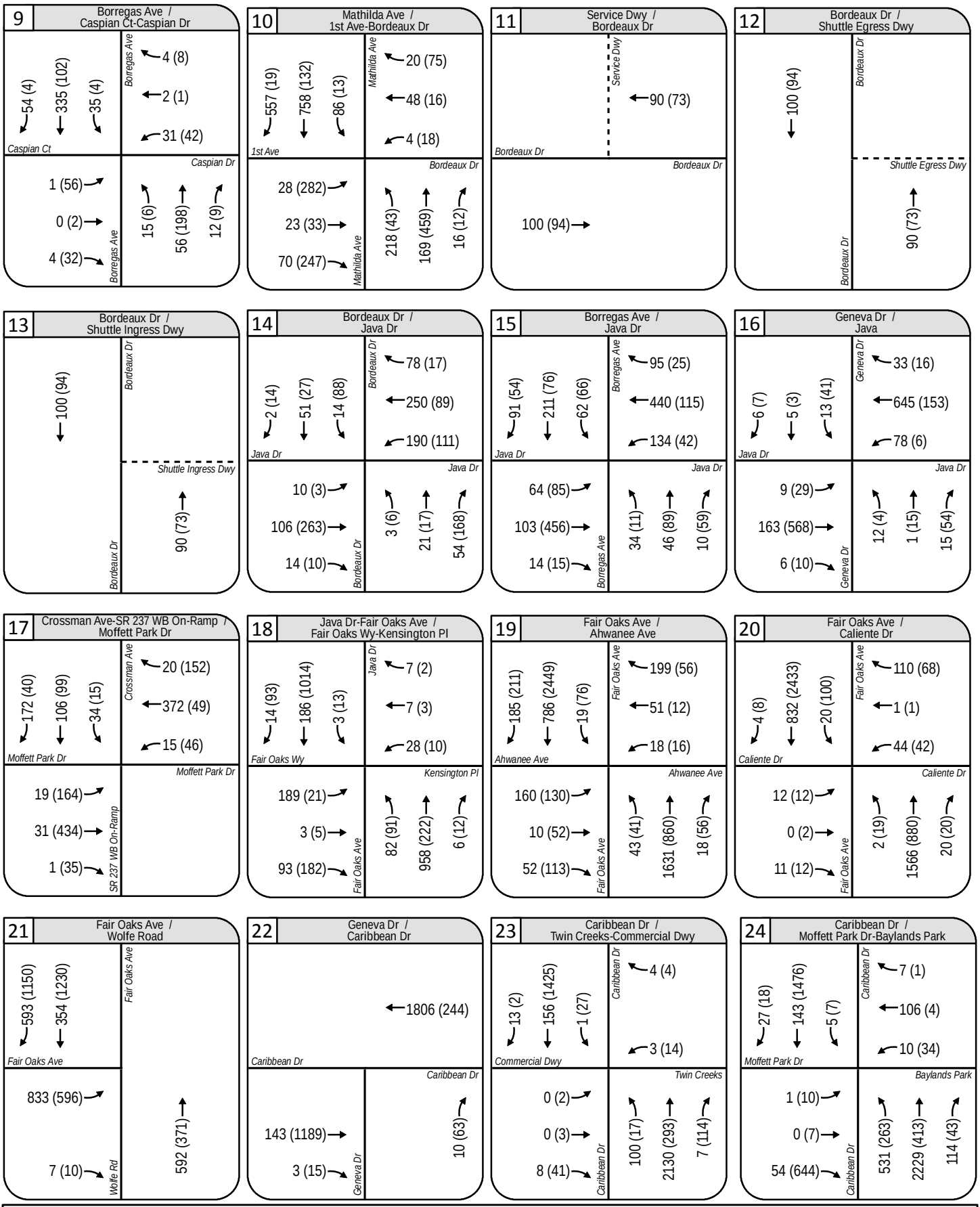




"Existing" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 6

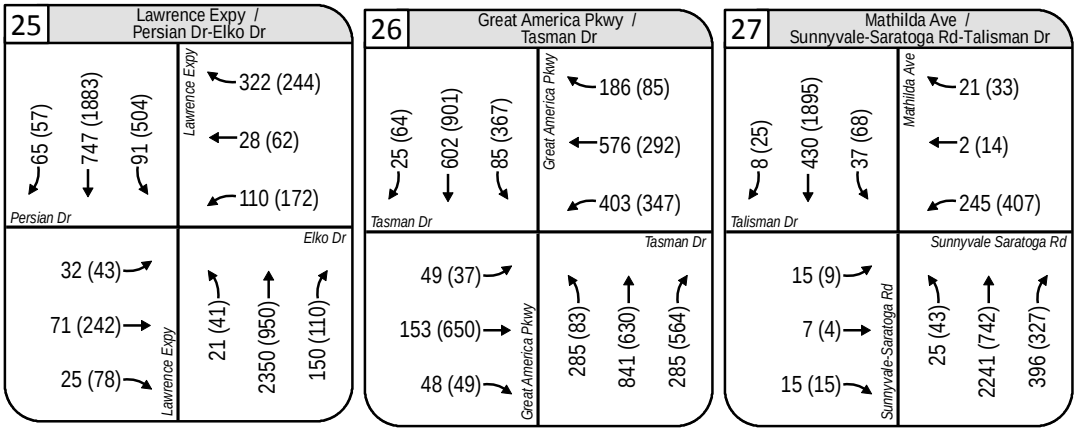
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



"Existing" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 6-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



"Existing" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 6-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

Table 6. "Existing" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Existing Conditions		
					Delay (S/V)[1]	LOS	Wrnt Met?[2]
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
2	Caribbean Parking Garage Driveway (right-in right-out) / Caribbean Drive[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	33.0	C-	-
				PM	23.6	C	-
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-
				PM	-	-	-
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	13.2	B	No
				PM	11.3	B	No
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	34.5	C-	-
				PM	39.2	D	-
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-
				PM	-	-	-
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-
				PM	-	-	-
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-
				PM	-	-	-
14	Bordeaux Drive / Java Drive	Signal	D	AM	30.0	C	-
				PM	31.3	C	-
15	Borregas Avenue / Java Drive	Signal	D	AM	35.2	D+	-
				PM	30.0	C	-
16	Geneva Drive / Java Drive	Signal	D	AM	30.2	C	-
				PM	26.2	C	-
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Signal	D	AM	17.9	B	-
				PM	14.5	B	-
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	Signal	D	AM	36.3	D+	-
				PM	28.7	C	-
19	Fair Oaks Avenue / Ahwanee Avenue	Signal	D	AM	22.5	C+	-
				PM	24.5	C	-
20	Fair Oaks Avenue / Caliente Drive	Signal	D	AM	16.0	B	-
				PM	17.5	B	-
21	Fair Oaks Avenue / Wolfe Road	Signal	D	AM	24.8	C	-
				PM	18.2	B-	-

Table 6. "Existing" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Existing Conditions		
					Delay (S/V)[1]	LOS	Wrnt Met?[2]
22	Geneva Drive / Caribbean Drive[4]	OWSC	E	AM	8.6	A	No
				PM	11.7	B	No
23	Caribbean Drive / Twin Creeks[4]	Signal	E	AM	19.4	B-	-
				PM	16.1	B	-
24	Caribbean Drive / Moffett Park Drive-Baylands Park[4]	Signal	E	AM	26.3	C	-
				PM	30.3	C	-
25	Lawrence Expressway / Persian Drive-Elko Drive[4]	Signal	E	AM	26.2	C	-
				PM	40.9	D	-
26	Great America Parkway / Tasman Drive[3 4]	Signal	E	AM	41.5	D	-
				PM	44.8	D	-
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive[4]	Signal	E	AM	34.3	C-	-
				PM	41.4	D	-

Notes: 1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3.
3. CMP Intersection(s).
4. Regionally significant intersection(s).

As shown in **Table 6**, all intersections are currently operating at acceptable level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hours. All delay and LOS results shown in **Table 6** were calculated using TRAFFIX software. CA MUTCD based peak hour signal warrant 3 is not currently met at any study unsignalized intersections. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C**.

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

2.7 FIELD OBSERVATIONS

Wood Rodgers traffic engineers conducted peak hour field observations of the study intersections on Tuesday July 10, 2018. Observed conditions appeared generally consistent with calculated "Existing" conditions levels of service shown in **Table 6**. A summary of specific observations made for certain study intersections is provided below:

- **Borregas Avenue / Caribbean Drive (#4):** During the AM peak hour the westbound left-turn experiences queuing of approximately 500 feet (or 20 vehicles). The southbound approach experiences single digit queues, mostly large trucks.
- **Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place (#18):** During the AM peak hour the northbound approach was backed up to Tasman Drive and the eastbound approach had a queue length of approximately eight (8) vehicles. During the PM peak hour the southbound approach was backed up beyond Crossman Drive while the northbound approach had a queue length of approximately eight (8) vehicles.
- **Fair Oaks Avenue / Ahwanee Avenue (#19):** During the AM peak hour the northbound and southbound approaches had queue lengths of approximately five (5) vehicles. During

the PM peak hour the southbound approach was backed up to the US 101 northbound ramps and the northbound approach had queue lengths of approximately five (5) vehicles.

- **Fair Oaks Avenue / Caliente Drive (#20):** During the AM peak hour the northbound approach was backed up to Duane Avenue and the southbound approach had queue lengths of approximately five (5) vehicles. During the PM peak hour the northbound approach was backed up to the southern edge of the Chavez Supermarket driveway and the southbound approach was backed up to Ahwanee Avenue.
- **Fair Oaks Avenue / Wolfe Road (#21):** During the AM peak hour the northbound approach had queue lengths of approximately 20 vehicles and the eastbound approach had queue lengths of approximately 8 vehicles. During the PM peak hour the southbound approach was backed up approximately half way to Duane Avenue (approximately 400 feet) and the northbound approach had queue lengths of approximately 10 vehicles.
- **Caribbean Drive / Twin Creeks (#23):** During the AM peak hour the northbound approach had queue lengths of approximately 20 vehicles and the southbound approach had queue lengths of approximately 4 vehicles. During the PM peak hour the south approach had queue lengths of approximately 15 vehicles and the northbound approach had minor queuing of only 1-2 vehicles.
- **Caribbean Drive / Moffett Park Drive-Baylands Park (#24):** During the AM peak hour the northbound approach had queue lengths of approximately 25 vehicles and the southbound, eastbound, and westbound approaches had minor queuing of less than 5 vehicle each. During the PM peak hour the eastbound approach had queue lengths of approximately 15 vehicles in the right turn lane and the southbound approach had queue lengths of approximately 12 vehicles.
- **Lawrence Expressway / Persian Drive-Elko Drive (#25):** During the AM peak hour the northbound approach was backed up to Tasman Drive and the westbound approach was backed up to Lawrence Station Road. During the PM peak hour the southbound approach was backed up to the SR 237 overcrossing and the northbound approach had queue lengths of approximately 12 vehicles.

2.8 "EXISTING" FREEWAY SEGMENT OPERATIONS

Ten (10) freeway segments near the Project study area were selected for analysis. **Table 7** summarizes "Existing" conditions freeway segment LOS based on segment density, for both mixed flow and HOV lanes. Detailed freeway segment operations calculation sheets are included in **Appendix P**. Existing freeway segment worst-case peak hour speeds, flows, and densities were obtained from the *2017 CMP Monitoring and Conformance Report (*Santa Clara Valley Transportation Authority, April 23, 2017), the most recently available VTA CMP monitoring report as of September 2018. As defined in the *VTA Traffic Level of Service Analysis Guidelines*, the minimum acceptable LOS threshold for CMP freeway segments is LOS "E". As shown in **Table 7**, the following freeway segments operate at unacceptable density-based LOS "F" under "Existing" AM and/or PM peak hour conditions:

- Eastbound SR 237 between Maude Avenue and US 101 during the PM peak hour.
- Westbound SR 237 between Maude Avenue and US 101 during the PM peak hour.
- Eastbound SR 237 between US 101 and Mathilda Avenue during the PM peak hour.
- Westbound SR 237 between US 101 and Mathilda Avenue during the AM and PM peak hours.

- Eastbound SR 237 between Mathilda Avenue and Fair Oaks Avenue during the PM peak hour.
- Westbound SR 237 between Mathilda Avenue and Fair Oaks Avenue during the AM and PM peak hours.
- Eastbound SR 237 between Fair Oaks Avenue and Lawrence Expressway during the PM peak hour.
- Westbound SR 237 between Fair Oaks Avenue and Lawrence Expressway during the AM and PM peak hours.
- Eastbound SR 237 between Lawrence Expressway and Great America Parkway during the PM peak hour.
- Westbound SR 237 between Lawrence Expressway and Great America Parkway during the AM peak hour.
- Southbound US 101 between Great America Parkway and Lawrence Expressway during the AM peak hour.
- Northbound US 101 between Great America Parkway and Lawrence Expressway during the PM peak hour.
- Southbound US 101 between Lawrence Expressway and Fair Oaks Avenue during the AM peak hour.
- Northbound US 101 between Lawrence Expressway and Fair Oaks Avenue during the PM peak hour.
- Southbound US 101 between Fair Oaks Avenue and Mathilda Avenue during the AM peak hour.
- Northbound US 101 between Fair Oaks Avenue and Mathilda Avenue during the PM peak hour (mixed-flow lanes only).
- Southbound US 101 between Mathilda Avenue and SR 237 during the AM peak hour.
- Northbound US 101 between Mathilda Avenue and SR 237 during the PM peak hour.
- Southbound US 101 between SR 237 and Moffett Boulevard during the AM peak hour.
- Northbound US 101 between SR 237 and Moffett Boulevard during the PM peak hour (mixed-flow lanes only).

Table 7. "Existing" Conditions Freeway Segment Traffic Operations

#	Freeway	Segment	Dir	Peak Hour	Capacity (vphpl)[1]		Lanes		Existing Peak Density (pc/mi/ln)[2]		Existing Peak LOS	
					Mixed	HOV	Mixed	HOV	Mixed	HOV	Mixed	HOV
1	SR 237	Between Maude Avenue and US 101	EB	AM	4,400	-	2	-	33.6	-	D	-
				PM	4,400	-	2	-	**94.7**	-	**F**	-
			WB	AM	4,400	-	2	-	39.8	-	D	-
				PM	4,400	-	2	-	**75.0**	-	**F**	-
2	SR 237	Between US 101 and Mathilda Avenue	EB	AM	4,400	-	2	-	51.2	-	E	-
				PM	4,400	-	2	-	**83.2**	-	**F**	-
			WB	AM	4,400	-	2	-	**61.2**	-	**F**	-
				PM	4,400	-	2	-	**69.7**	-	**F**	-
3	SR 237	Between Mathilda Avenue and Fair Oaks Avenue	EB	AM	4,400	1,650	2	1	32.4	26.0	D	C
				PM	4,400	1,650	2	1	**84.3**	**64.7**	**F**	**F**
			WB	AM	6,900	-	3	-	**76.4**	-	**F**	-
				PM	6,900	-	3	-	**79.6**	-	**F**	-
4	SR 237	Between Fair Oaks Avenue and Lawrence Expressway	EB	AM	4,400	1,650	2	1	27.9	16.2	D	B
				PM	4,400	1,650	2	1	**82.0**	**84.4**	**F**	**F**
			WB	AM	4,400	1,650	2	1	**79.0**	**83.3**	**F**	**F**
				PM	4,400	1,650	2	1	**78.4**	**65.7**	**F**	**F**
5	SR 237	Between Lawrence Expressway and Great America Parkway	EB	AM	4,400	1,650	2	1	32.0	15.3	D	B
				PM	4,400	1,650	2	1	**77.4**	**74.0**	**F**	**F**
			WB	AM	4,400	1,650	2	1	**66.2**	**58.3**	**F**	**F**
				PM	4,400	1,650	2	1	32.0	8.9	D	A
6	US 101	Between Great America Parkway and Lawrence Expressway	SB	AM	6,900	1,650	3	1	**72.4**	**79.3**	**F**	**F**
				PM	6,900	1,650	3	1	25.8	9.0	C	A
			NB	AM	6,900	1,650	3	1	32.1	16.3	D	B
				PM	6,900	1,650	3	1	**87.9**	**83.0**	**F**	**F**
7	US 101	Between Lawrence Expressway and Fair Oaks Avenue	SB	AM	6,900	1,650	3	1	**72.5**	**67.7**	**F**	**F**
				PM	6,900	1,650	3	1	25.1	8.9	C	A
			NB	AM	6,900	1,650	3	1	25.1	9.0	C	A
				PM	6,900	1,650	3	1	**75.0**	**87.4**	**F**	**F**
8	US 101	Between Fair Oaks Avenue and Mathilda Avenue	SB	AM	6,900	1,650	3	1	**60.4**	**70.1**	**F**	**F**
				PM	6,900	1,650	3	1	27.6	9.2	D	A
			NB	AM	6,900	1,650	3	1	26.3	8.9	D	A
				PM	6,900	1,650	3	1	**62.3**	55.4	**F**	E

Table 7. "Existing" Conditions Freeway Segment Traffic Operations

#	Freeway	Segment	Dir	Peak Hour	Capacity (vphpl)[1]		Lanes		Existing Peak Density (pc/mi/ln)[2]		Existing Peak LOS	
					Mixed	HOV	Mixed	HOV	Mixed	HOV	Mixed	HOV
9	US 101	Between Mathilda Avenue and SR 237	SB	AM	6,900	1,650	3	1	**58.4**	**58.7**	**F**	**F**
				PM	6,900	1,650	3	1	32.3	23.7	D	C
			NB	AM	6,900	1,650	3	1	32.2	13.4	D	B
				PM	6,900	1,650	3	1	**63.7**	**58.4**	**F**	**F**
10	US 101	Between SR 237 and Moffett Boulevard	SB	AM	6,900	1,650	3	1	**58.9**	**62.5**	**F**	**F**
				PM	6,900	1,650	3	1	43.8	9.8	D	A
			NB	AM	6,900	1,650	3	1	54.1	24.5	E	C
				PM	6,900	1,650	3	1	**67.1**	53.7	**F**	E

Notes: Freeway volumes were obtained from the 2017 CMP Monitoring and Conformance Report (Santa Clara Valley Transportation Authority, April 23, 2017)
1. Freeway segment capacities were based on VTA TIA Guidelines. Units are vehicles per hour per lane.
2. MF = Mixed Flow
3. HOV = High Occupancy Vehicle
*4. Density = Peak Hour Segment Volume / (Peak Hour Speed * Number of Lanes). Units are passenger cars per mile per lane.*
***BOLD** indicates unacceptable level of service*

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

2.9 "EXISTING" FREEWAY RAMP OPERATIONS

Twenty (20) freeway ramps near the Project site were selected for analysis. **Table 8** summarizes "Existing" conditions freeway segment volume to capacity (V/C) ratios. Detailed freeway ramp operations calculation sheets are included in **Appendix P**. Existing freeway ramp AM and PM peak hour volumes were obtained from intersection counts performed for this TIA, the Caltrans Performance Measurement System (PeMS) online database, and the 2016 Caltrans Traffic Census Program volumes available on the Caltrans website. If the latest available counts for a ramp facility were several years old, growth rates were applied to the count based on observed trends at nearby facilities. The fidelity of all data obtained from the Caltrans PeMS database was checked using methods outlined in the *PeMS User Guide* (Caltrans, May 2013). Ramp capacities were obtained from HCM 2000 Exhibit 25-3 and current ramp metering rates provided by Caltrans District 4, where applicable. VTA defines unacceptable ramp operations as any ramp with a V/C ratio greater than one (1.0).

Table 8. "Existing" Conditions Freeway Ramp Traffic Operations

#	Ramp	Type	Peak Hour	Lanes				Existing Peak	
				Mixed	HOV	Meter	Capacity[1]	Volume[2]	V/C[3]
1	SR 237 Westbound On-Ramp from Mathilda Avenue	Diamond	AM	1	-	-	2,000	326	0.16
			PM	1	-	-	2,000	760	0.38
2	SR 237 Westbound Off-Ramp to Mathilda Avenue	Diamond	AM	1	-	-	2,000	866	0.43
			PM	1	-	-	2,000	680	0.34
3	SR 237 Eastbound Off-Ramp to Mathilda Avenue	Diamond	AM	2	-	-	4,100	824	0.20
			PM	2	-	-	4,100	361	0.09
4	SR 237 Eastbound On-Ramp from Mathilda Avenue	Diamond	AM	1	-	-	2,000	636	0.32
			PM	1	-	-	2,000	875	0.44
5	SR 237 Westbound On-Ramp from Crossman Avenue/Moffett Park Drive	Diagonal	AM	1	-	-	2,000	122	0.06
			PM	1	-	-	2,000	180	0.09
6	SR 237 Westbound On-Ramp from Southbound Caribbean Drive	Diagonal	AM	1	-	ON	720	396	0.55
			PM	1	-	ON	720	216	0.30
7	SR 237 Westbound Off-Ramp to Northbound Caribbean Drive	Diagonal	AM	1	-	-	2,000	103	0.05
			PM	1	-	-	2,000	650	0.33
8	SR 237 Eastbound On-Ramp from Southbound Lawrence Expressway	Loop	AM	1	-	-	1,800	306	0.17
			PM	1	-	ON	550	420	0.76
9	SR 237 Eastbound Off-Ramp to Northbound Lawrence Expressway	Loop	AM	1	-	-	1,800	102	0.06
			PM	1	-	-	1,800	45	0.02
10	US 101 Northbound On-Ramp from Southbound Lawrence Expressway	Diagonal	AM	1	1	ON	1,140	505	0.44
			PM	1	1	-	2,900	349	0.12
11	US 101 Northbound Off-Ramp to Lawrence Expressway	Diagonal	AM	2	-	-	3,500	1136	0.32
			PM	2	-	-	3,500	1309	0.37
12	US 101 Southbound Off-Ramp to Lawrence Expressway	Diagonal	AM	2	-	-	3,500	811	0.23
			PM	2	-	-	3,500	1754	0.50
13	US 101 Southbound On-Ramp from Southbound Lawrence Expressway	Loop	AM	1	1	-	2,700	346	0.13
			PM	1	1	ON	1,180	206	0.17
14	US 101 Northbound On-Ramp from Fair Oaks Avenue	Diagonal	AM	1	1	-	2,900	1041	0.36
			PM	1	1	-	2,900	435	0.15
15	US 101 Northbound Off-Ramp to Fair Oaks Avenue	Diagonal	AM	1	-	-	2,000	448	0.22
			PM	1	-	-	2,000	1063	0.53
16	US 101 Southbound On-Ramp from Southbound Fair Oaks Avenue	Loop	AM	1	1	-	2,700	340	0.13
			PM	1	1	ON	1,240	198	0.16

Table 8. "Existing" Conditions Freeway Ramp Traffic Operations

#	Ramp	Type	Peak Hour	Lanes				Existing Peak	
				Mixed	HOV	Meter	Capacity[1]	Volume[2]	V/C[3]
17	US 101 Southbound Off-Ramp to Northbound Fair Oaks Avenue	Loop	AM	1	-	-	1,900	213	0.11
			PM	1	-	-	1,900	94	0.05
18	US 101 Northbound Off-Ramp to Northbound Mathilda Avenue	Diagonal	AM	1	-	-	2,000	334	0.17
			PM	1	-	-	2,000	262	0.13
19	US 101 Southbound On-Ramp from Southbound Mathilda Avenue	Loop	AM	1	1	-	2,700	178	0.07
			PM	1	1	ON	1,480	720	0.49
20	US 101 Northbound On-Ramp from Moffett Park Drive	Diagonal	AM	1	-	-	2,000	374	0.19
			PM	1	-	-	2,000	218	0.11

Notes: 1. Ramp Capacities were obtained from HCM 2000 Exhibit 25-3 and current ramp metering rates provided by Caltrans District 4, where applicable. Capacities represent the combined capacity of mixed-flow and HOV lanes where both exist.

2. Ramp Volumes were obtained from intersection counts performed for this TIA, the Caltrans Performance Measurement System (PeMS) online database, and the 2016 Caltrans Traffic Census Program volumes available on the Caltrans website. If the latest available counts for a ramp facility were several years old, growth rates were applied to the count based on observed trends at nearby facilities. Volumes represent the combined volumes of mixed-flow and HOV lanes where both exist.

3. V/C = Volume-to-capacity ratio.

***BOLD** indicates unacceptable level of service.*

As shown in **Table 8**, all study freeway ramps are currently operating at acceptable V/C ratios of less than 1.0.

3. EXISTING PLUS PROJECT CONDITIONS

This chapter provides a description of the proposed Project, a discussion of the trip generation and distribution/assignment methodology used to come up with Project only volumes at study intersections, and an analysis of projected traffic operations and impacts due to the proposed Project.

3.1 PROJECT SITE AND DEMAND MANAGEMENT

3.1.1 Project Site Description

The Project site consists of 10 existing lots containing 13 existing single story buildings (140-146, 360-364, 370-376, 380-382 and 390-394 West Caribbean Drive, 1393-1395, 1383 and 1325 Borregas Avenue, 141 Caspian Court, and 1330-1338, 1340-1346, 1350 and 1360-1368 Bordeaux Drive) located near Mathilda Avenue and Caribbean Drive in the Moffett Park Specific Plan area in Sunnyvale, CA (City). The site is proposed to be divided into two new parcels: 100 and 200 West Caribbean Drive. 100 West Caribbean Drive would be bound by West Caribbean Drive to the north, Borregas Avenue to the east, Caspian Court to the south, and the Santa Clara Valley Water District's West Channel outfall to the west. 200 West Caribbean Drive would be bound by West Caribbean Drive to the north, SCVWD's West Channel outfall to the east, Bordeaux Drive to the south, and Mathilda Avenue to the west.

The Project site contains seven (7) vacant existing buildings totaling 400,157 square feet and six (6) occupied existing buildings totaling 310,224 square feet. Occupied building uses include industrial laboratory, warehouse, light manufacturing, and office. The Project would demolish the 13 existing buildings to accommodate the proposed new construction. The Project proposes construction of a new a 536,750 square foot five-story office building on 100 West Caribbean Drive, and a new 505,140 square foot five-story office building and a five-story parking garage with attached three-story central utility plant on 200 West Caribbean Drive. The top two floors of the central utility plant (52,796 square feet) would be dedicated to machinery supporting the development, while the bottom floor would be dedicated to parking for the central utility plant. Total proposed office gross floor area of entire site is 1,041,890 square feet. It is anticipated that both proposed office buildings would be occupied at roughly the same time. Additional Project details from the latest site plan are shown in **Table 9**.

Table 9. Project Site Details

Project Data	100 Caribbean Drive	200 Caribbean Drive
Zoning District	MP-I & MP-T	MP-I
Lot Size (SF)	751,309	1,010,298
Gross Floor Area (SF)	536,750	505,140
Lot Coverage (%)	~32.8%	~33.3%
Floor Area Ratio (FAR)	0.72	0.51
Source: Project Site Plan dated 9/19/2018.		

100 West Caribbean Drive would contain 246 surface parking stalls, and 200 West Caribbean Drive would contain 426 surface and 1,417 garage parking stalls, for a total of 2,089 parking stalls for the entire proposed development. The Project would contain 482 Class I and 196 Class II bicycle parking stalls. The proposed Project includes a new Class I multi-use path along Project frontage on Mathilda Avenue and Caribbean Drive, which would be one-way eastbound for bikes west of the proposed Caribbean Parking Garage Driveway, and two-way for bikes east of the Caribbean Parking Garage Driveway. Additional multi-use paths would connect all parking areas and buildings, as well

as provide a connection between to two parcels across the SCVWD West Channel outfall. The remaining parcel area would house landscaping and amenities such as sports courts.

The *Moffett Park Specific Plan - Section 5.3* defines the different classifications of bicycle parking spaces as follows:

Class I Bicycle Parking Spaces – "facilities that protect the entire bicycle from theft, vandalism and inclement weather. Appropriate for long-term (2 or more hours). Examples include bike lockers, rooms with key access, guarded parking areas, and valet/check-in parking."

Class II Bicycle Parking Spaces – "bicycle rack to which the frame and at least one wheel can be secured with a user-provided U-lock or padlock and cable."

Based on the current Project site plan, the Project would gain access to the surrounding roadway network via the following 10 Project access driveways:

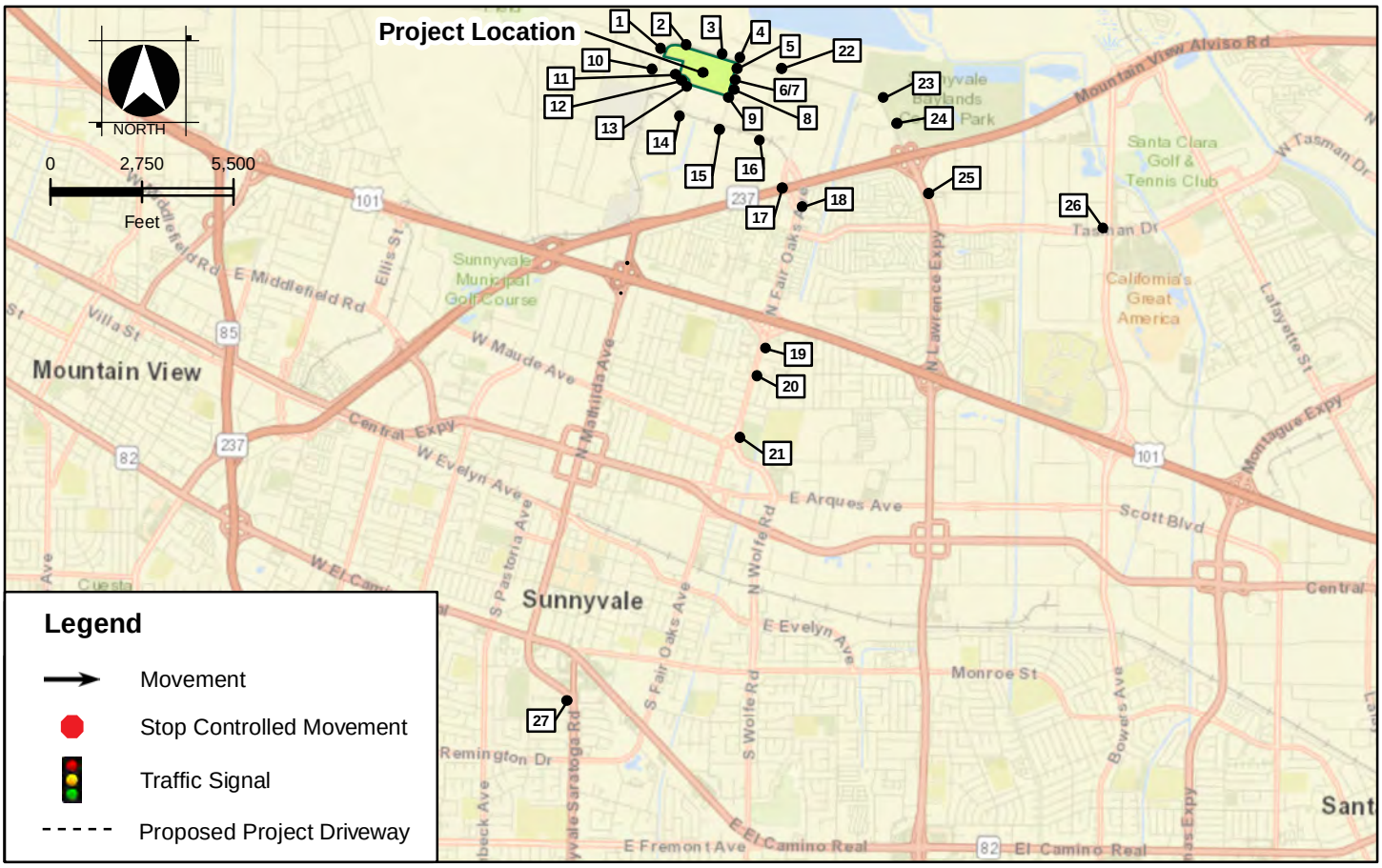
100 West Caribbean Drive Driveways:

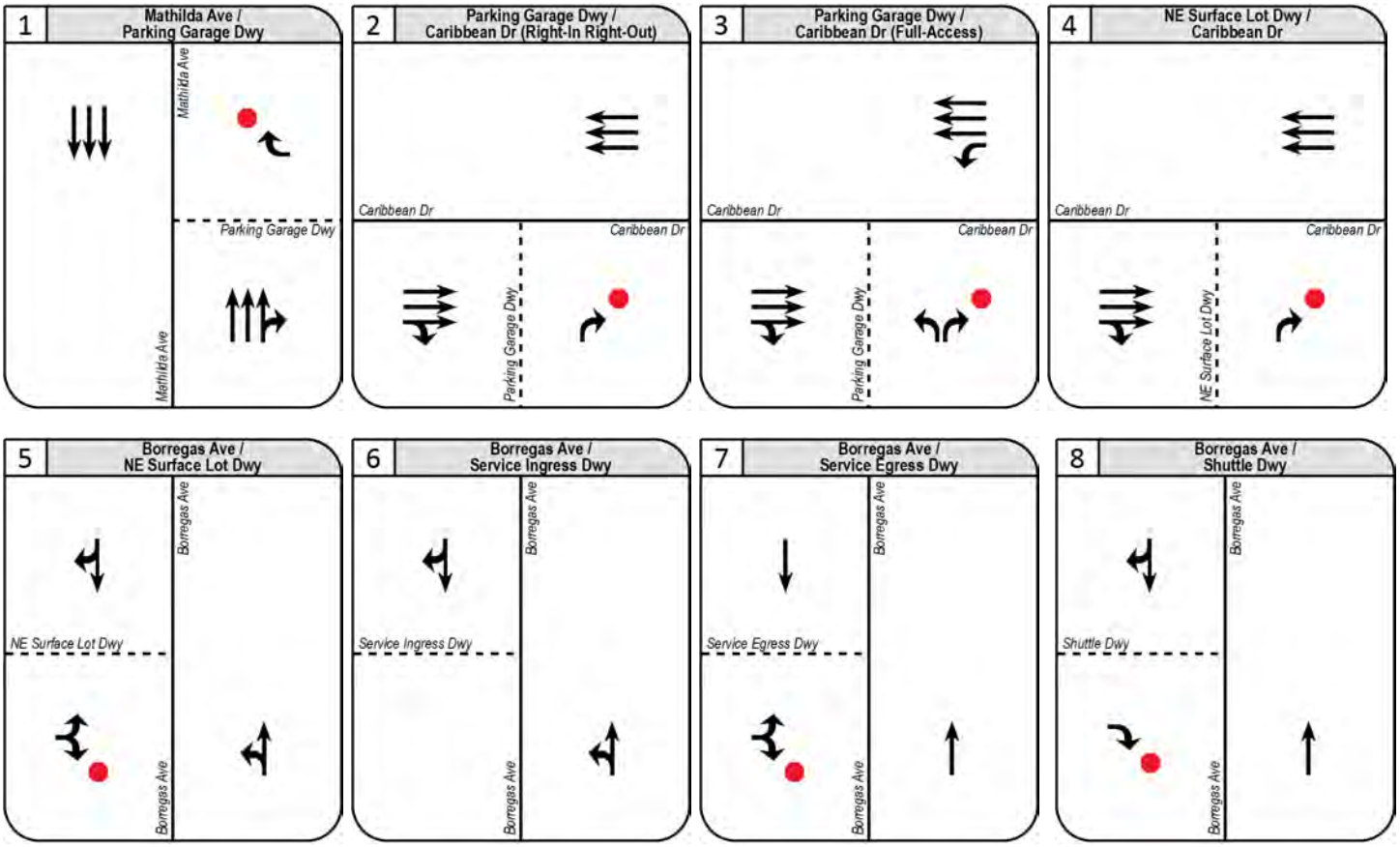
- **#3 Caribbean Northeast (NE) Surface Lot Driveway:** One right-in right-out driveway on West Caribbean Drive west of Borregas Avenue.
- **#5 Borregas Northeast (NE) Surface Lot Driveway:** One full-access driveway on Borregas Avenue south of West Caribbean Drive.
- **#6 Borregas Service Ingress Driveway:** One inbound driveway for service vehicles only on Borregas Avenue.
- **#7 Borregas Service Egress Driveway:** One outbound driveway for service vehicles only on Borregas Avenue
- **#8 Borregas Shuttle Driveway:** One right-in right-out driveway for shuttle drop-offs and pick-ups only on Borregas Avenue north of Caspian Drive.

200 West Caribbean Drive Driveways:

- **#1 Mathilda Parking Garage Driveway:** One right-in right-out driveway on Mathilda Avenue.
- **#2 Caribbean Parking Garage Driveway:** One driveway on West Caribbean Drive with two alternatives:
    i. **Right-In Right Out:** A right-in right-out, one-way stop-controlled driveway, located approximately 425 feet east of the end of curve as Mathilda Avenue transitions into Caribbean Drive. This TIA assumes this is the proposed Project.
    ii. **Full Access:** A full-access, one-way stop-controlled driveway, located approximately 425 feet east of the end of curve as Mathilda Avenue transitions into Caribbean Drive. This TIA assumes this is the Project Alternative.
- **#11 Bordeaux Service Driveway:** One full-access driveway for service vehicles only on Bordeaux Drive.
- **#12 Bordeaux Shuttle Egress Driveway:** One outbound driveway for shuttle pick-ups/drop-offs only on Bordeaux Drive.
- **#13 Bordeaux Shuttle Ingress Driveway:** One inbound driveway for shuttle pick-ups/drop-offs only on Bordeaux Drive.

The proposed configurations (number of lanes, access control, etc.) of the 10 proposed Project driveways, including the two alternatives for the Caribbean Parking Garage Driveway, are shown in **Figure 7**.





Proposed Project Driveway Lane Geometrics and Control

100-200 W Caribbean Drive TIA

Sunnyvale, CA

August 2019

Figure 7

WOOD RODGERS

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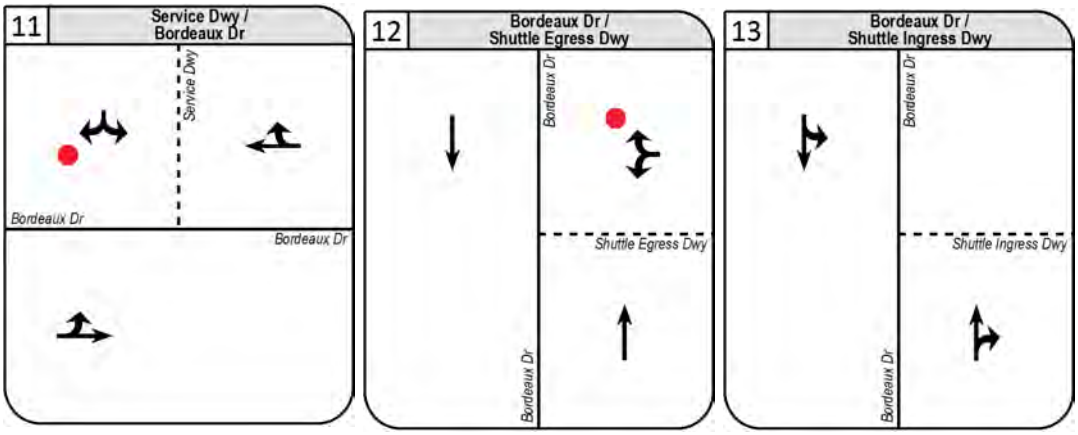

Proposed Project Driveway Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 7-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

3.1.2 Transportation Demand Management Program

A Transportation Demand Management (TDM) plan is in the process of being developed for the 100-200 W Caribbean Drive Project. The TDM plan is currently in a draft state not ready for public circulation, and has not committed the Project to any specific TDM strategies at this time. Trip reduction strategies which may be included in the Project specific TDM plan include:

- On-site TDM coordinator
- Membership in Transportation Management Association (TMA)
- Priority parking for carpools, vanpools, and clean-fuel vehicles
- Bicycle parking and sharing, shower changing facilities
- Rideshare matching services
- Pre-tax commuter benefits
- Marketing and information
- Employer commuter shuttle services
- Flexible work schedule program
- Subsidized or free vanpools or carpools
- Subsidized or free transit passes
- Bike helmets and locks
- On-site bike repair facilities
- Car sharing
- Other incentives and rewards.

3.2 PROJECT GENERATED TRIPS

3.2.1 Trip Generation and Reductions

Consistent with methods described in the *VTA TIA Guidelines*, *Institute of Transportation Engineers Trip Generation Manual* rates were used to estimate Project trip generation. The following trip generation rates from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition* were used to estimate proposed Project generated trips:

General Office Building – For the proposed 1,041,890 square feet of office space, the "General Office Building" (Use Code 710) trip generation rate is used. ITE Trip Generation describes General Office Building as: *"…a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted."*

Utility - For the proposed 52,796 square foot utility plant that would support the Project site, the "Utility" (Use Code 170) trip generation rate is used. ITE Trip Generation describes Utility as: "…*a free-standing building that can house office space, a storage area, and electromechanical or industrial equipment*…"

The following trip generation rates from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition* were used to estimate trips that are currently generated by the existing land uses on the Project site:

General Office Building – For the existing 25,200 square feet of occupied office space, the "General Office Building" (Use Code 710) trip generation rate is used. ITE Trip Generation describes General Office Building as: *"…a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted."*

General Light Industrial - For the existing 50,880 square feet of occupied industrial buildings, the "General Light Industrial" (Use Code 110) trip generation rate is used. ITE Trip Generation describes General Light Industrial as: "…*a free-standing facility devoted to a single use. The facility has an emphasis on activities other than manufacturing and typically has minimal office space.*"

Manufacturing - For the existing 125,643 square feet of occupied manufacturing buildings, the "Manufacturing" (Use Code 140) trip generation rate is used. ITE Trip Generation describes Manufacturing as: "…*an area where the primary activity is the conversion of raw materials or parts into finished products.*"

Warehousing - For the existing 54,000 square feet of occupied warehouse buildings, the "Warehousing" (Use Code 150) trip generation rate is used. ITE Trip Generation describes Warehousing as: "…*primarily devoted to the storage of materials, but it may also include office and maintenance areas*".

Trip reductions were considered and applied to the Project generated trips as recommended in the VTA TIA Guidelines. Reductions are typically applied for factors such as mixed-use developments, Project features that encourage walking, biking, and transit usage, or other factors that help to decrease the number of vehicles generated by the Project.

This TIA utilizes the Standard Trip Reduction Approach as defined in the *VTA TIA Guidelines*. Trip reductions were applied to the Project's trip generation based on the Standard Auto Trip Reduction Rates found in Table 1 of the *VTA TIA Guidelines*. A six (6) percent reduction was applied as the Project is within 2,000 feet of a light rail stop. A five (5) percent reduction was applied for financial incentives which are likely to be included in the Project's TDM program. A 1.5 percent reduction was applied for a Project-funded dedicated shuttle which is likely to be included in the Project's TDM program (1.5 percent was taken instead of 3 percent as a reduction for employment near light rail was also applied, per VTA ITA Guidelines). Overall, a 12.5 percent reduction was applied to the Project using the Standard Trip Reduction method. A VTA Trip Reduction Statement form was filled out for this Project, and is attached at the beginning of this TIA, which documents the trip reductions applied to this Project. The Project shall follow the City's current TDM Monitoring Guideline. **Table 10** summarizes the trip generation volumes and reductions for the proposed Project.

Table 10. Project Trip Generation Volumes

Land Use Category	ITE Code	Units	Quantity	Daily Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
					Total	In	Out	Total	In	Out
Proposed Office Buildings	710[1]	KSF[3]	1,041.890	10,305	1,006	865	141	1,056	169	887
12.5% Standard Trip Reduction[4]				*-1,288*	*-126*	*-108*	*-18*	*-132*	*-21*	*-111*
Net Total Proposed Office Buildings Trips				9,017	880	757	123	924	148	776
Proposed Utility Plant	170[2]	KSF	52.796	700	122	98	24	120	24	96
12.5% Standard Trip Reduction[4]				*-88*	*-15*	*-12*	*-3*	*-15*	*-3*	*-12*
Net Total Proposed Utility Plant Trips				612	107	86	21	105	21	84
Existing Office Building (1330-1338 Bordeaux Drive)	710[1]	KSF	-25.200	-279	-50	-43	-7	-31	-5	-26
6% Standard Trip Reduction[5]				*17*	*3*	*3*	*0*	*2*	*0*	*2*
Existing Light Industrial (1393-1395 Borregas Avenue)	110[1]	KSF	-50.880	-251	-27	-24	-3	-23	-3	-20
6% Standard Trip Reduction[5]				*15*	*2*	*1*	*1*	*1*	*0*	*1*
Existing Warehousing (1383 Borregas Avenue)	150[1]	KSF	-54.501	-132	-32	-26	-6	-34	-7	-27
6% Standard Trip Reduction[5]				*8*	*2*	*2*	*0*	*2*	*0*	*2*
Existing Manufacturing (360-364 & 370-376 Caribbean Drive)	140[2]	KSF	-125.643	-557	-78	-60	-18	-84	-26	-58
Existing Warehousing (380-382 Caribbean Drive)	150[1]	KSF	-54.000	-131	-32	-25	-7	-34	-9	-25
Net Total Existing Buildings Trips				-1,310	-212	-172	-40	-201	-50	-151
Net New Project Trip Generation				**8,319**	**775**	**671**	**104**	**828**	**119**	**709**

Notes:
[1]The trip rates used for this ITE Code were based on ITE Trip Generation (10th Edition) fitted curve equations.
[2]The trip rates used for this ITE Code were based on ITE Trip Generation (10th Edition) average rates.
[3]KSF = 1,000 Sq. feet gross floor area
[4]Standard Trip Reduction based on VTA TIA Guidelines. Strategies assumed: TDM Financial Incentives, TDM Shuttle Program, Employment within a 2,000-foot walk of a Light Rail Station.
[5]Standard Trip Reduction based on VTA TIA Guidelines. Strategies assumed: Employment within a 2,000-foot walk of a Light Rail Station.

As illustrated in **Table 10**, the proposed Project is anticipated to generate a total of 8,319 daily trips, 775 AM peak hour trips (671 inbound, 104 outbound), and 828 PM peak hour trips (119 inbound, 709 outbound) under typical traffic demand conditions. These trips would be considered "new" (or incremental) trips on the City's immediate local circulation system.

3.2.2 Project Trip Distribution and Assignment

The Project trip distribution was based on existing conditions traffic volumes and patterns, engineering judgement, and distributions from recently approved traffic studies for similar proposed developments in the Moffett Park Specific Plan area, including the *1111 Lockheed Martin Way TIA* (Kimley Horn, November 2015) and the *Moffett Place TIA* (Fehr & Peers, August 2013). **Figure 8** illustrates the estimated Project directional trip distribution and assignment patterns projected to be

generally applicable for the Project under existing, near-term, and long-term conditions, on an annualized average usage basis.

Project trips were assigned to the study area network based on the trip distribution discussed above via the Project driveway configurations proposed under both the "proposed Project" (i.e. a right-in right-out Caribbean Parking Garage Driveway) and the "Project Alternative" (i.e. a full-access Caribbean Parking Garage Driveway). **Figure 9** illustrates the estimated AM and PM peak hour "Project Only" (i.e. assuming a right-in right-out Caribbean Parking Garage Driveway) traffic volumes projected to be applicable under existing and future conditions. **Figure 10** illustrates the AM and PM peak hour "Project Alternative Only" (i.e. assuming a full-access Caribbean Parking Garage Driveway) traffic volumes projected to be applicable under existing and future conditions. Note that the traffic assignments for the "proposed Project" and "Project Alternative" only differ at study intersections 1-15 due to traffic entering/exiting the Project site via different routes under the different Caribbean Paring Garage Driveway configurations, and therefore "Project Alternative Only" traffic volumes are only shown for study intersections 1-15 in **Figure 10**. "Project Only" traffic volumes were added on top of "Existing" conditions traffic volumes at study intersections, freeway segments, and freeway ramps to create "Existing plus Project" conditions traffic volumes. **Figure 11** illustrates the AM and PM peak hour "Existing plus Project" conditions traffic volumes at study intersections. "Project Alternative Only" traffic volumes were also added on top of "Existing" conditions traffic volumes at study intersections to create "Existing plus Project Alternative" conditions traffic volumes. **Figure 12** illustrates the estimated AM and PM peak hour "Existing plus Project Alternative" conditions traffic volumes at study intersections.

Project Trip Distribution

Google 100-200 West Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 8

WOOD RODGERS

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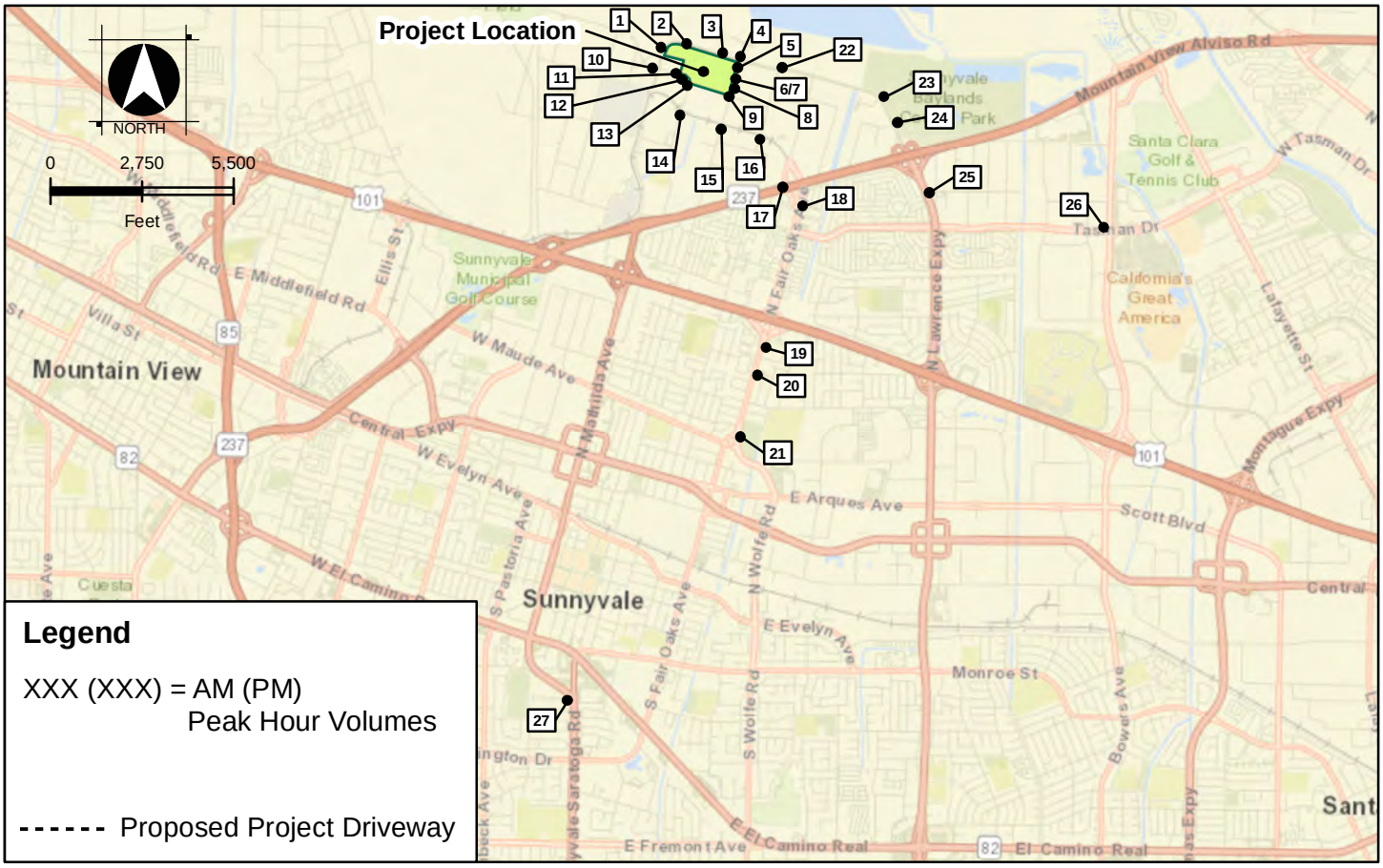

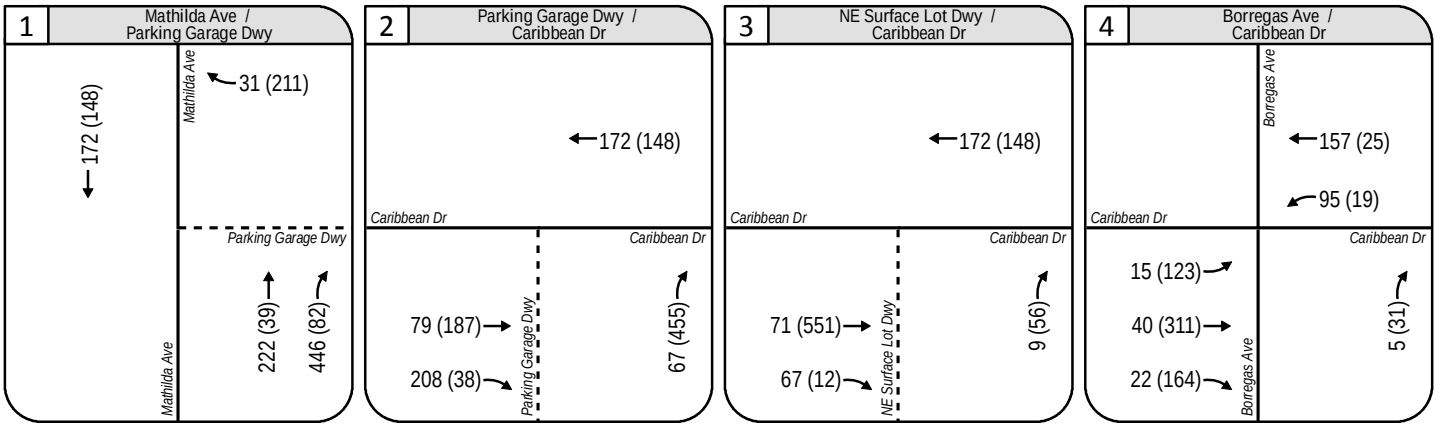

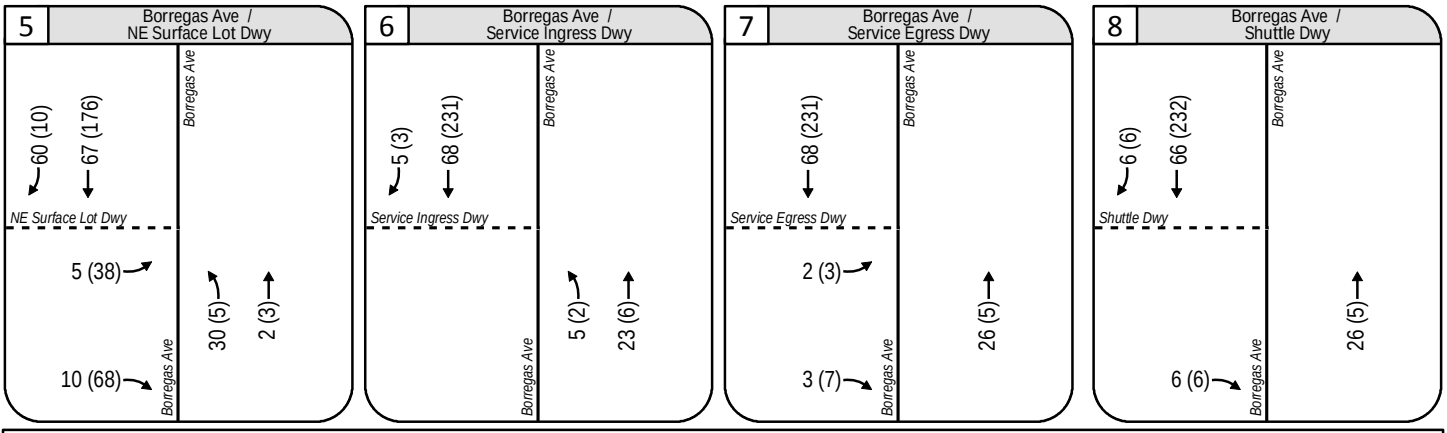

"Project Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 9

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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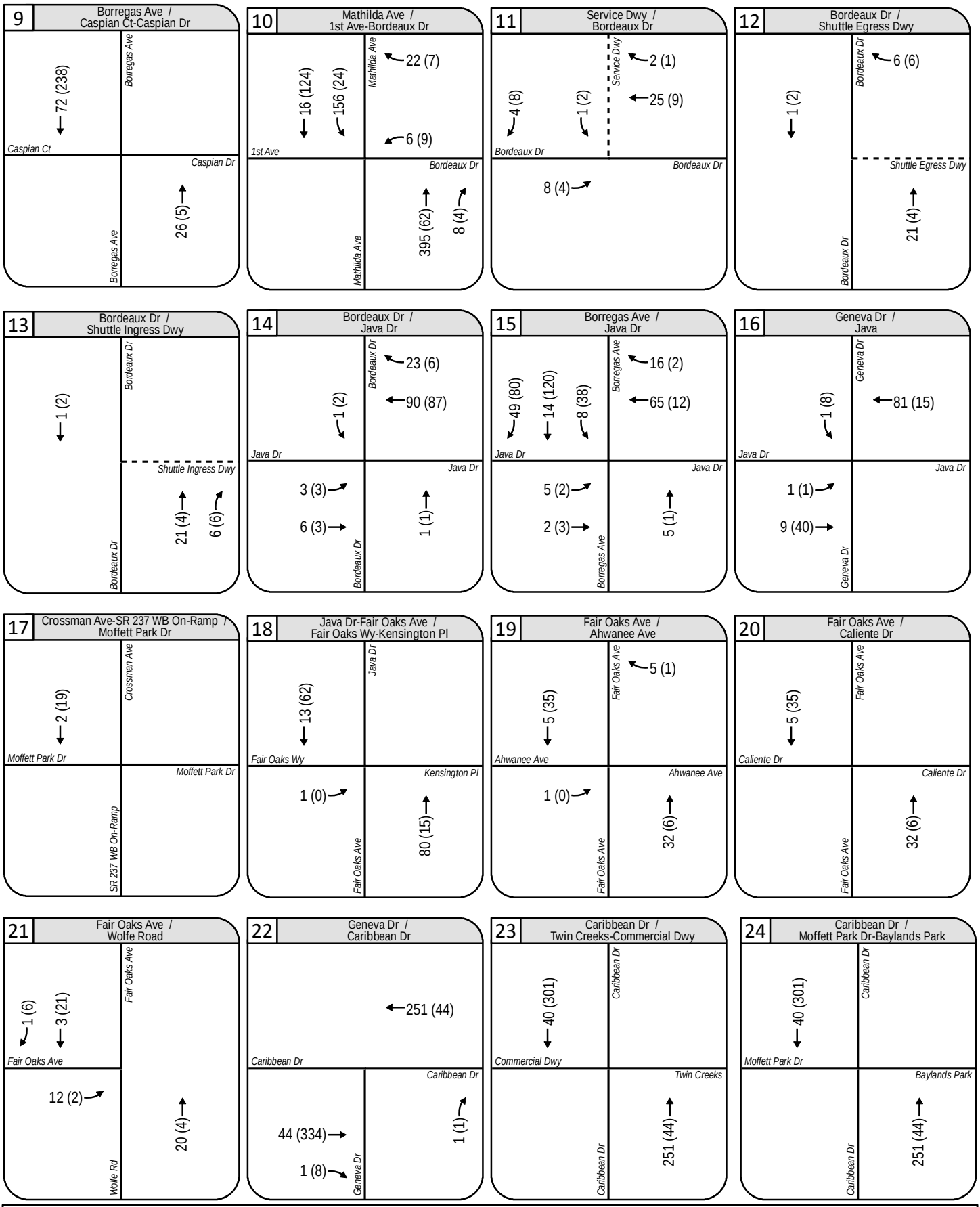
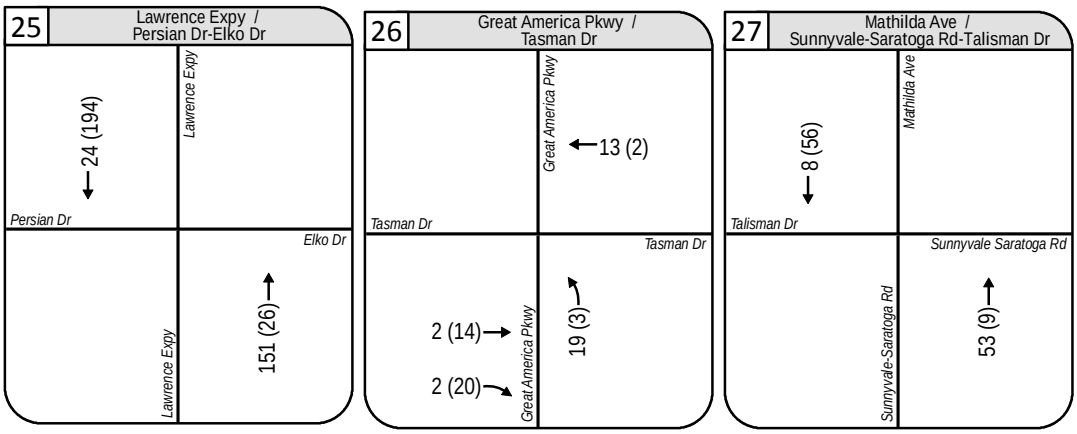


"Project Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 9-2

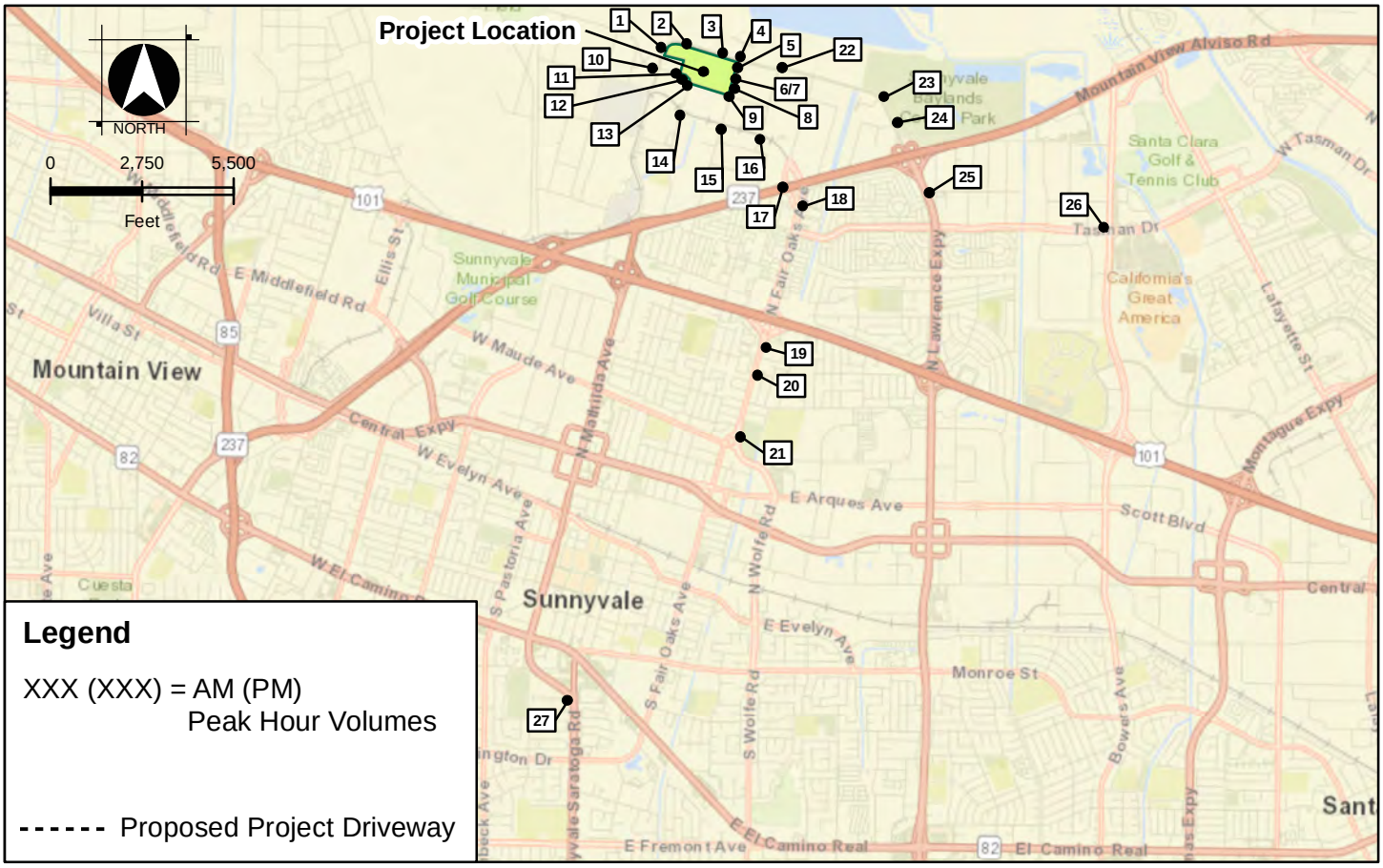
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

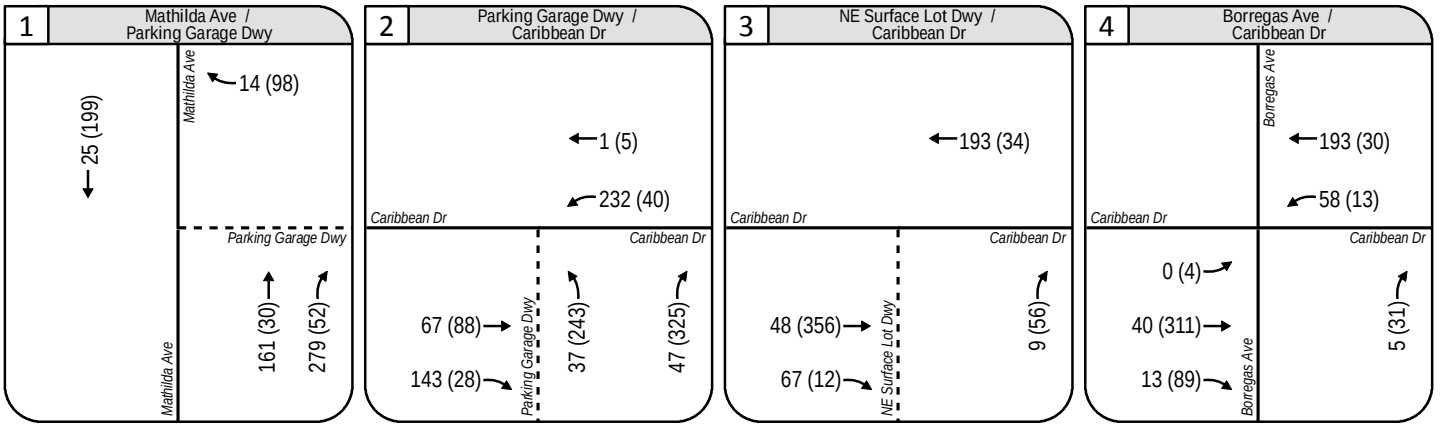


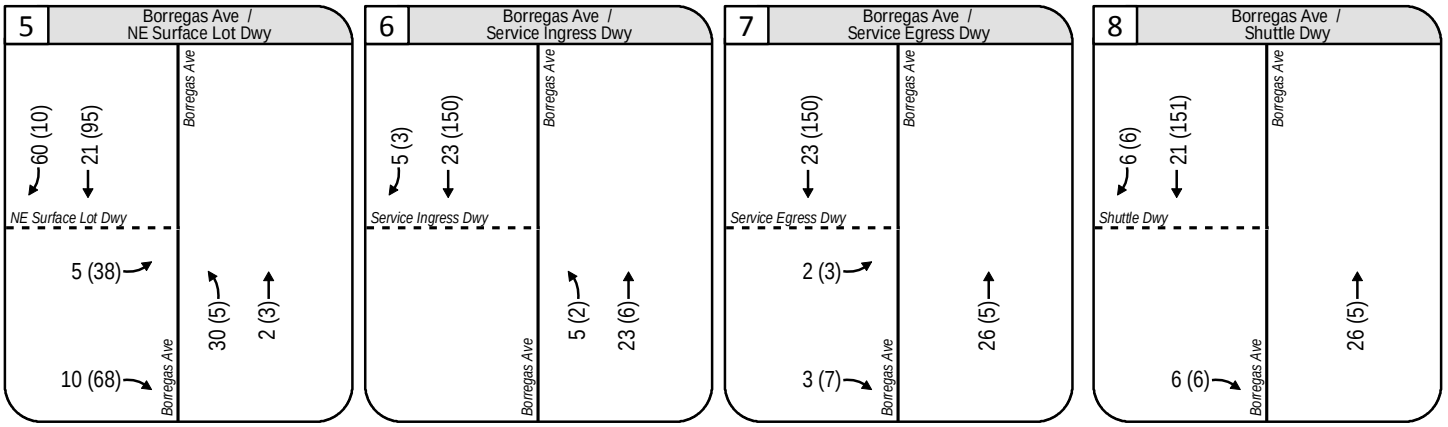
"Project Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 9-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







"Project Alternative Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 10

WOOD RODGERS

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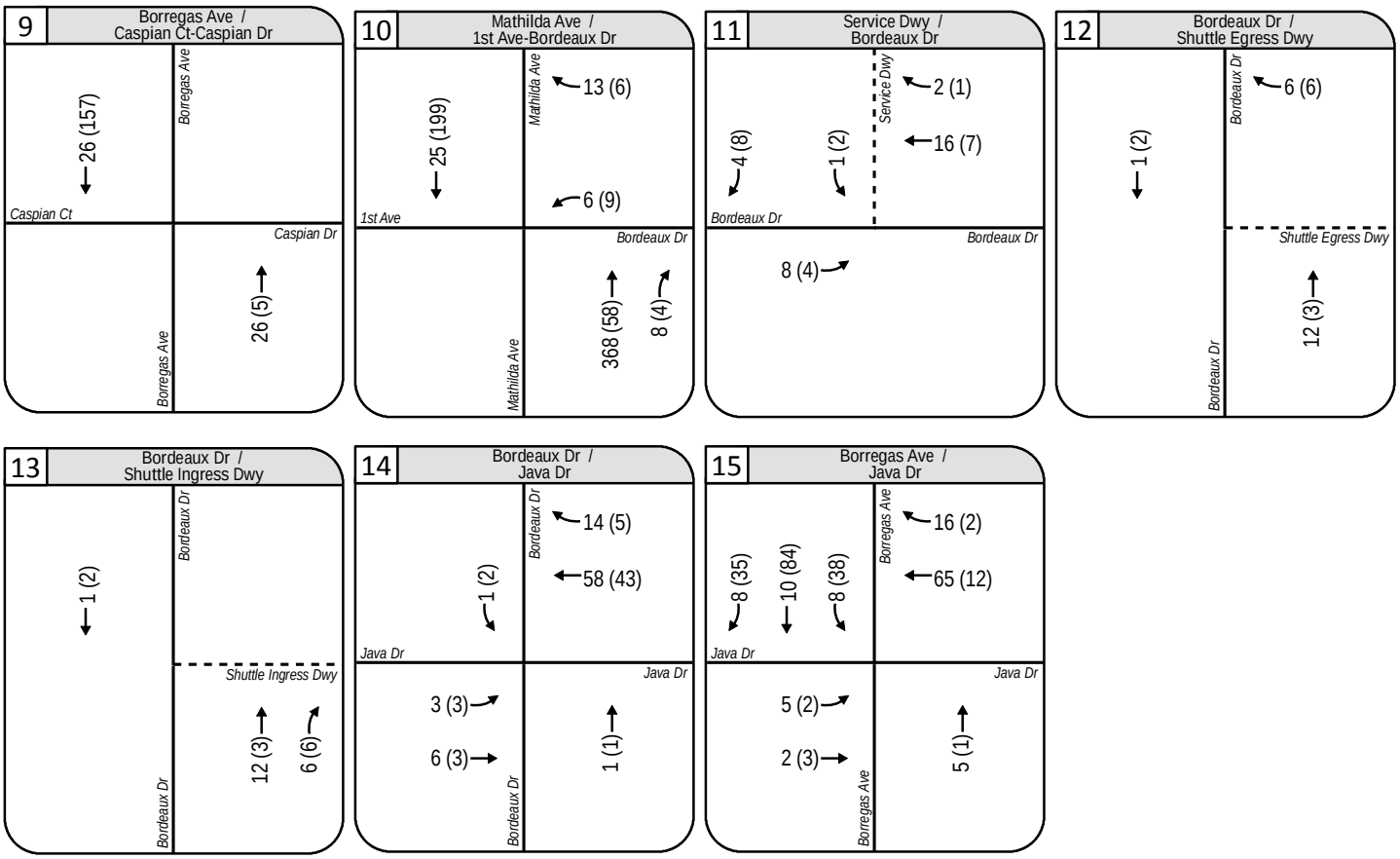
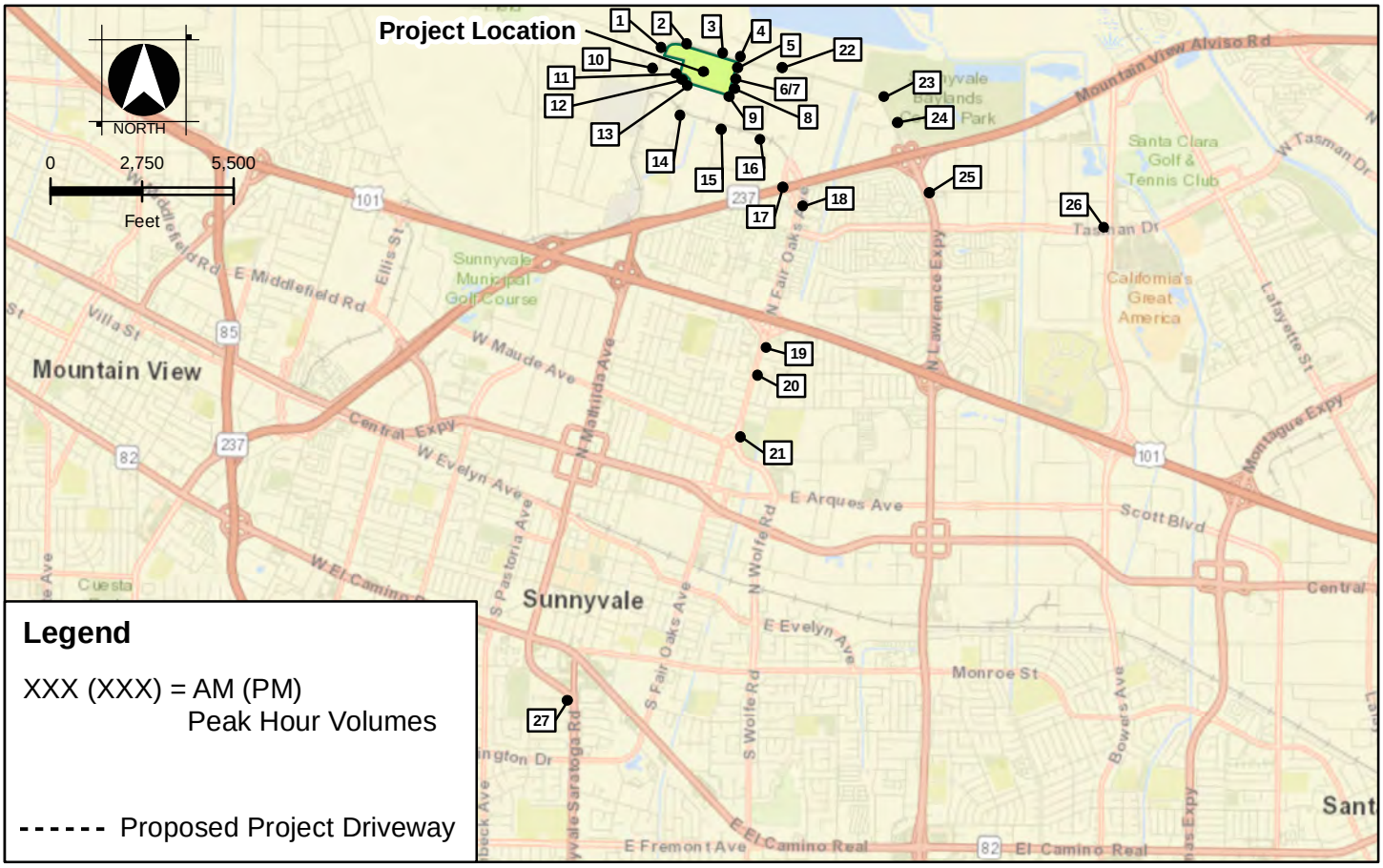
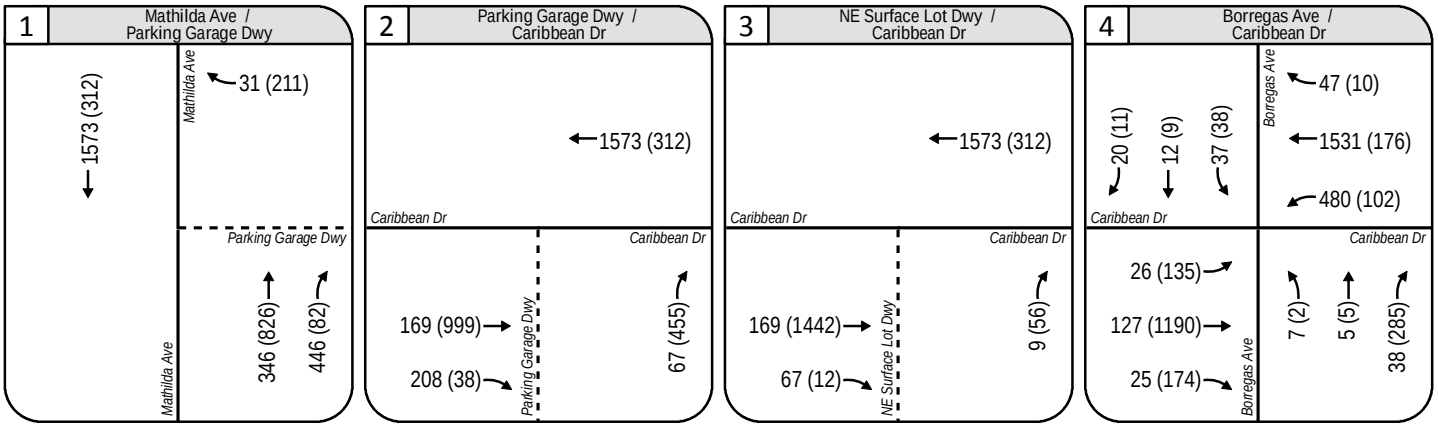


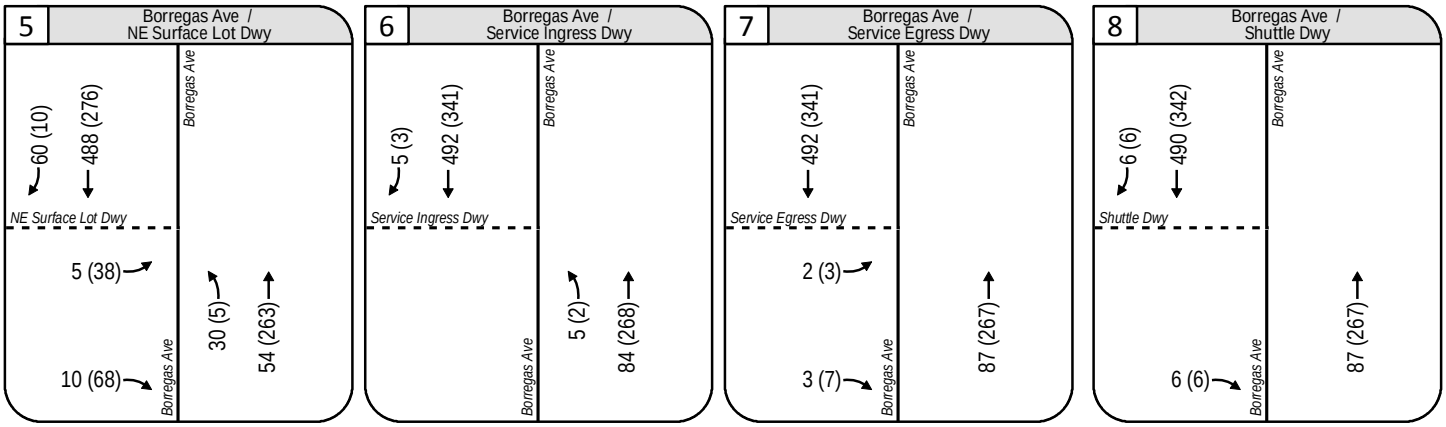
"Project Alternative Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 10-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



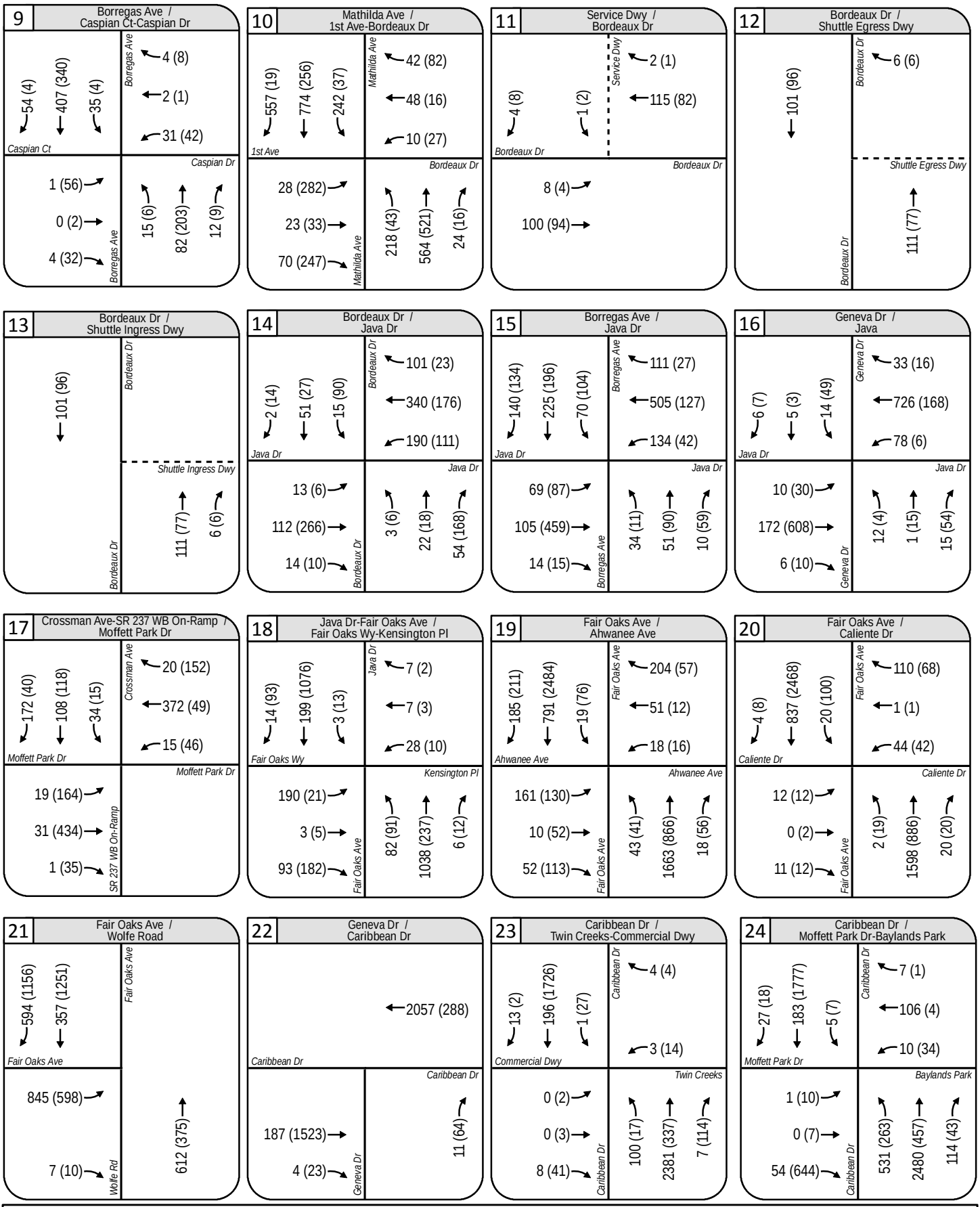




"Existing plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 11

WOOD RODGERS



"Existing plus Project" Traffic Volumes

100-200 W Caribbean Drive TIA

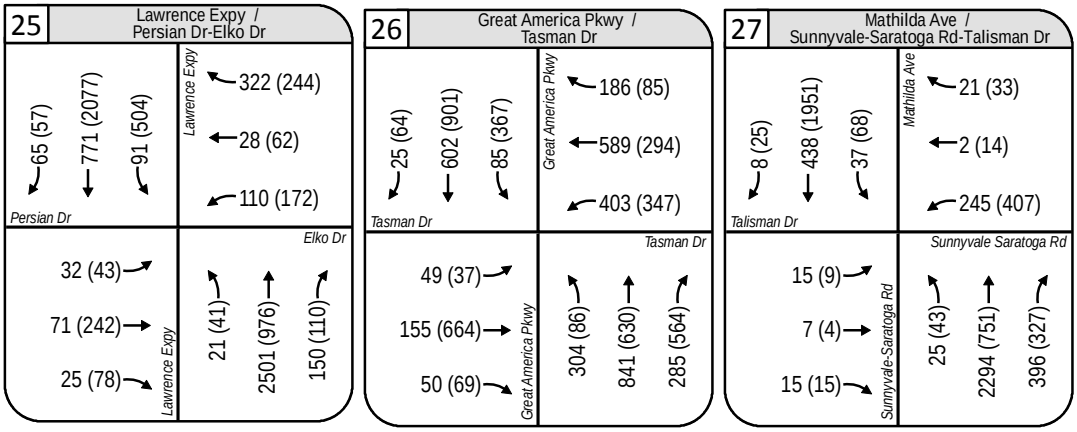
Sunnyvale, CA

August 2019

Figure 11-2

WOOD RODGERS

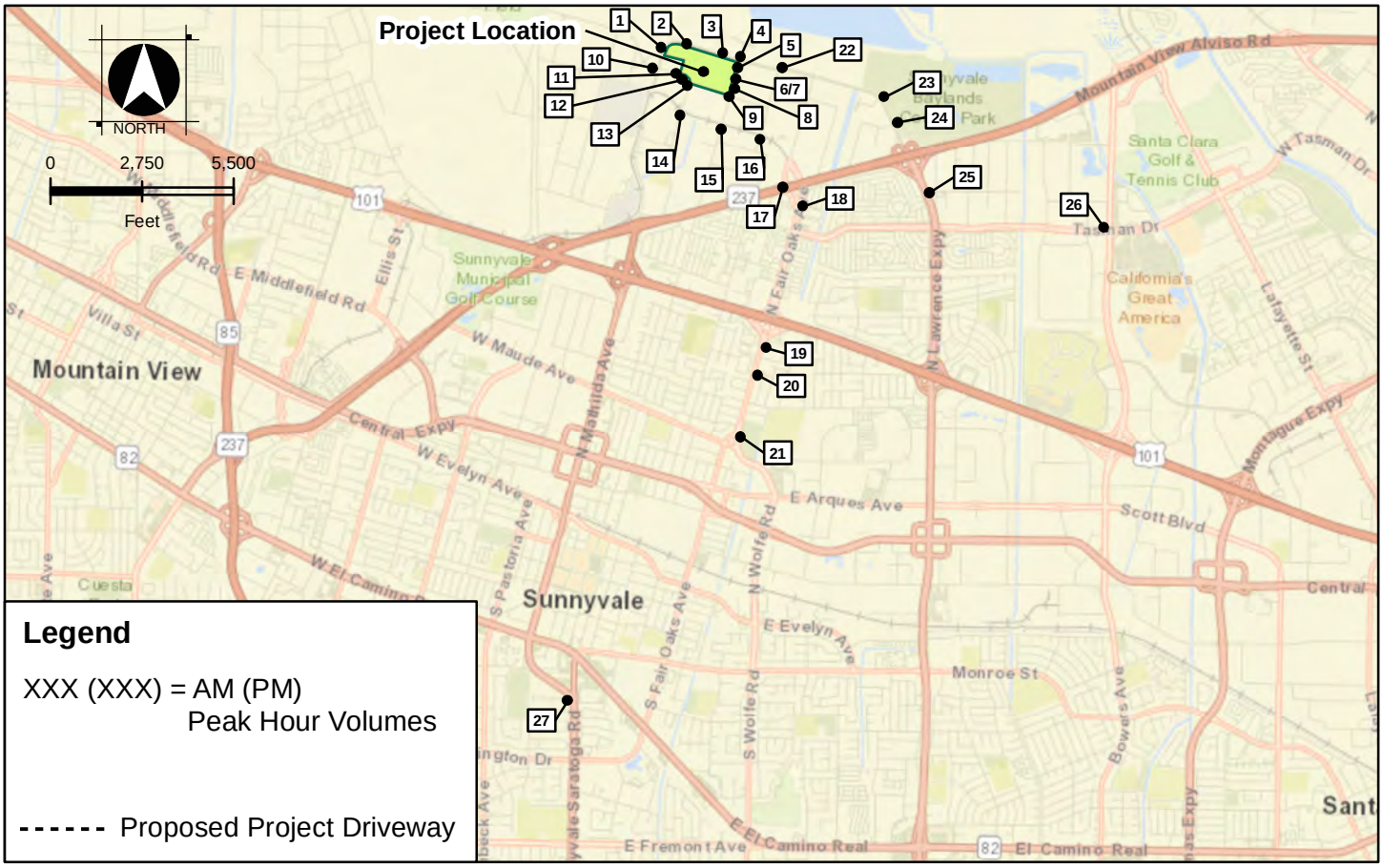
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

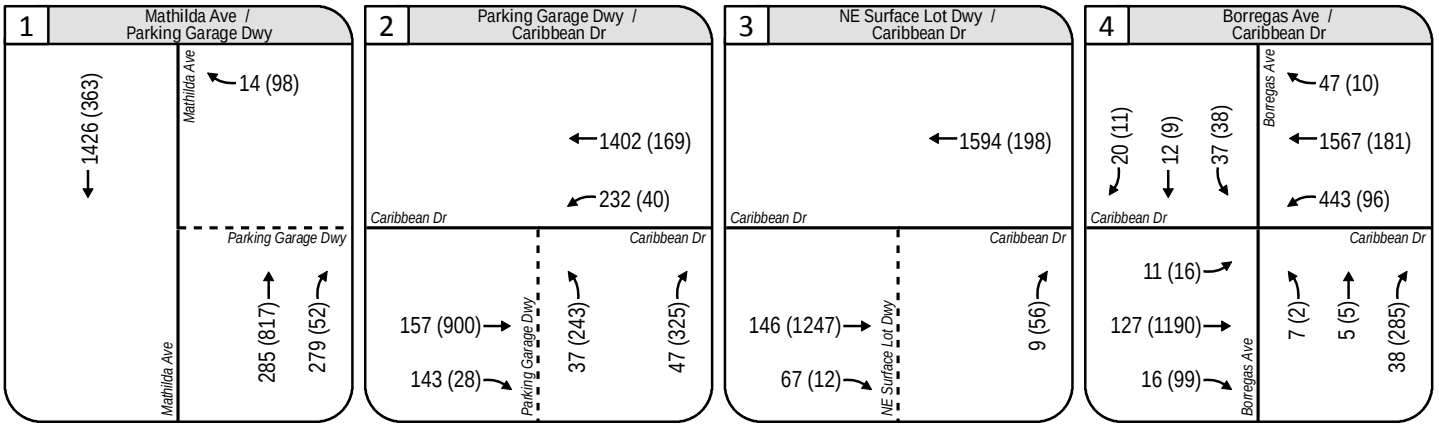


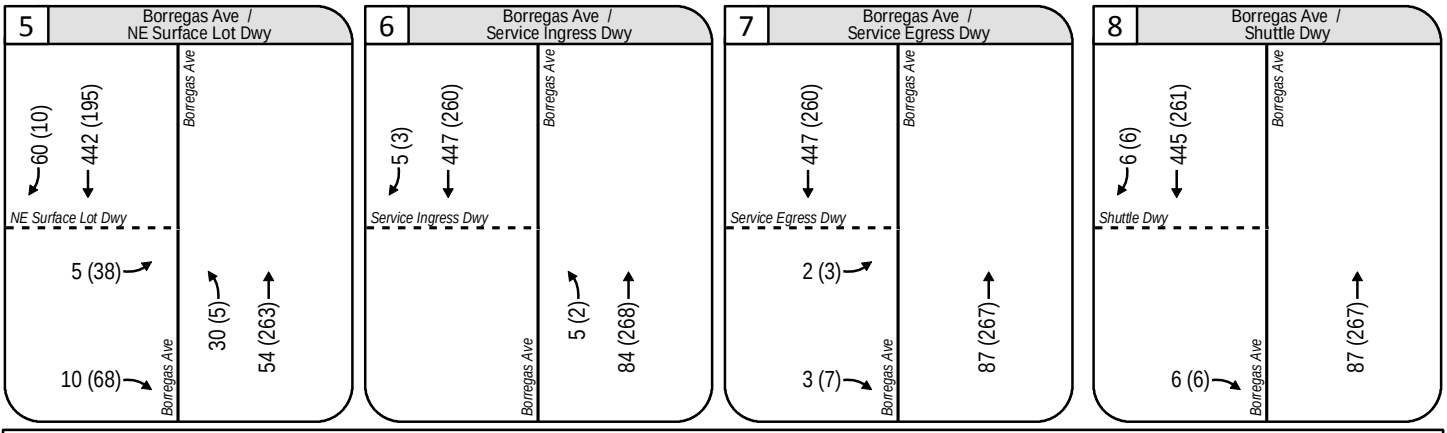
"Existing plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 11-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







"Existing plus Project Alternative" Traffic Volumes

100-200 W Caribbean Drive TIA

Sunnyvale, CA

August 2019

Figure 12

WOOD RODGERS

BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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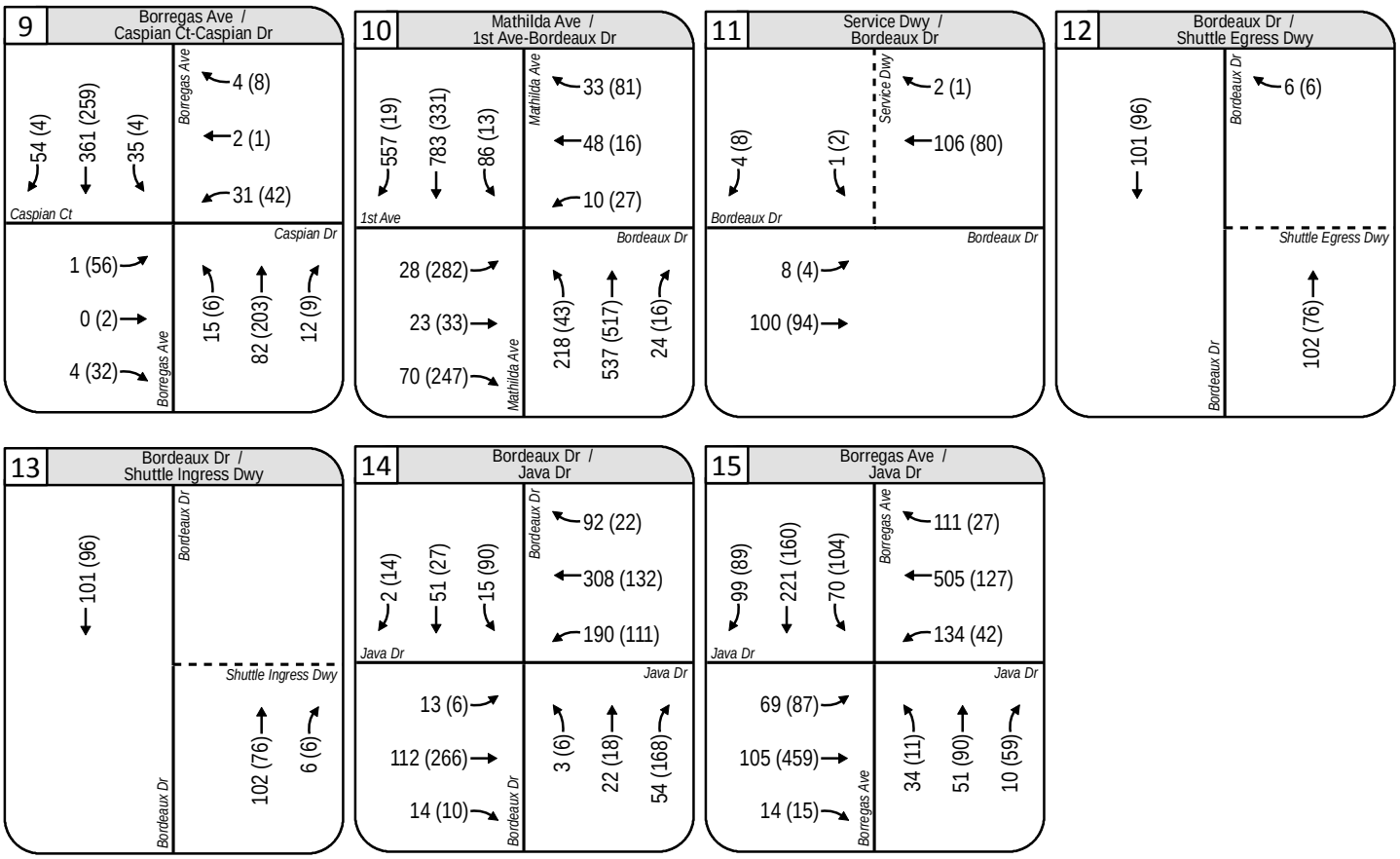


"Existing plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 12-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

3.3 "EXISTING PLUS PROJECT" INTERSECTION OPERATIONS

"Existing plus Project" intersection operations were quantified under "Existing plus Project" traffic volumes (shown in **Figure 11**), "Existing" intersection lane geometrics and control (shown in **Figure 5**), and proposed Project driveway configurations (shown in **Figure 7**). **Table 11** illustrates the resulting "Existing plus Project" intersection LOS operations. **Table 11** also contains "Existing" conditions intersection delays and LOS for comparison purposes, as well as the projected change in delay of critical movements and critical V/C ratio caused by the addition of Project generated trips. The projected change in delay of critical movements and critical V/C ratio were reported for use in identifying significant impacts.

As shown in **Table 11**, all study intersections are projected to operate at acceptable "Existing plus Project" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hours. All delay and LOS results shown were calculated using TRAFFIX software**.** CA MUTCD based peak hour signal warrant 3 is not projected to be met at any study unsignalized intersections under "Existing plus Project" AM and PM peak hour conditions. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

3.4 "EXISTING PLUS PROJECT ALTERNATIVE" INTERSECTION OPERATIONS

"Existing plus Project Alternative" intersection operations were quantified under "Existing plus Project Alternative" traffic volumes (shown in **Figure 12**), "Existing" intersection lane geometrics and control (shown in **Figure 5**), and proposed Project driveway configurations (shown in **Figure 7**). **Table 12** illustrates the resulting "Existing plus Project Alternative" intersection LOS operations. LOS operations are only shown at study intersections 1-15 as these are the only locations where "Existing plus Project Alternative" results differ from "Existing plus Project Results". **Table 12** also contains "Existing" conditions intersection delays and LOS for comparison purposes, as well as the projected change in delay of critical movements and critical V/C ratio caused by the addition of Project Alternative generated trips. The projected change in delay of critical movements and critical V/C ratio were reported for use in identifying significant impacts.

As shown in **Table 12**, the Caribbean Parking Garage Driveway (full-access, one-way stop-controlled) / Caribbean Drive intersection is projected to operate at unacceptable LOS "F", but is not projected to meet CA MUTCD based peak hour signal warrant 3, under "Existing plus Project Alternative" PM peak hour conditions. All other "Project Alternative" study intersections (i.e. intersections 1 and 3-15) are projected to operate at acceptable "Existing plus Project Alternative" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hours. All delay and LOS results shown were calculated using TRAFFIX software**.** CA MUTCD based peak hour signal warrant 3 is not projected to be met at any study unsignalized intersections under "Existing plus Project Alternative" AM and PM peak hour conditions. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

Table 11. "Existing plus Project" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Existing Conditions			Existing plus Project Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-	10.7	B	No	0.047	0.1
				PM	-	-	-	12.6	B	No	0.308	1.9
2	Caribbean Parking Garage Driveway (right-in right-out) / Caribbean Drive[4]	OWSC	E	AM	-	-	-	9.5	A	No	0.078	0.3
				PM	-	-	-	22.4	C	No	0.700	5.7
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-	8.8	A	No	0.009	0.0
				PM	-	-	-	12.6	B	No	0.105	0.4
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	33.0	C-	-	50.3	D	-	0.077	53.5
				PM	23.6	C	-	27.0	C	-	0.116	1.4
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-	11.9	B	No	0.029	0.7
				PM	-	-	-	11.7	B	No	0.089	1.9
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-	8.4	A	-	0.005	0.1
				PM	-	-	-	7.9	A	-	0.002	0.0
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-	11.8	B	No	0.005	0.1
				PM	-	-	-	11.0	B	No	0.010	0.2
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-	11.3	B	No	0.010	0.1
				PM	-	-	-	10.2	B	No	0.009	0.1
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	13.2	B	No	14.6	B	No	0.011	-0.2
				PM	11.3	B	No	14.3	B	No	0.041	-0.6
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	34.5	C-	-	36.2	D+	-	0.020	0.0
				PM	39.2	D	-	40.3	D	-	0.053	0.7
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	9.0	A	No	0.005	0.5
				PM	-	-	-	8.9	A	No	0.008	0.6
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	8.8	A	No	0.006	0.2
				PM	-	-	-	8.7	A	No	0.006	0.3
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-	0.0	A	-	0.000	0.0
				PM	-	-	-	0.0	A	-	0.000	0.0
14	Bordeaux Drive / Java Drive	Signal	D	AM	30.0	C	-	30.2	C	-	0.003	0.0
				PM	31.3	C	-	31.2	C	-	0.003	0.1
15	Borregas Avenue / Java Drive	Signal	D	AM	35.2	D+	-	36.9	D+	-	0.046	-0.8
				PM	30.0	C	-	31.2	C	-	0.030	2.2

Table 11. "Existing plus Project" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Existing Conditions			Existing plus Project Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
16	Geneva Drive / Java Drive	Signal	D	AM	30.2	C	-	26.1	C	-	0.155	-13.6
				PM	26.2	C	-	27.0	C	-	0.019	1.0
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Signal	D	AM	17.9	B	-	18.0	B	-	0.002	0.1
				PM	14.5	B	-	15.1	B	-	0.012	0.8
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	Signal	D	AM	36.3	D+	-	36.7	D+	-	0.027	0.6
				PM	28.7	C	-	29.0	C	-	0.019	0.3
19	Fair Oaks Avenue / Ahwanee Avenue	Signal	D	AM	22.5	C+	-	22.8	C+	-	0.010	0.4
				PM	24.5	C	-	25.0	C	-	0.008	0.7
20	Fair Oaks Avenue / Caliente Drive	Signal	D	AM	16.0	B	-	16.1	B	-	0.009	0.2
				PM	17.5	B	-	17.7	B	-	0.008	0.4
21	Fair Oaks Avenue / Wolfe Road	Signal	D	AM	24.8	C	-	25.0	C	-	0.004	0.1
				PM	18.2	B-	-	18.3	B-	-	0.002	0.0
22	Geneva Drive / Caribbean Drive[4]	OWSC	E	AM	8.6	A	No	8.7	A	No	0.001	0.0
				PM	11.7	B	No	13.1	B	No	0.021	-0.1
23	Caribbean Drive / Twin Creeks[4]	Signal	E	AM	19.4	B-	-	21.5	C+	-	0.054	2.5
				PM	16.1	B	-	17.1	B	-	0.067	1.3
24	Caribbean Drive / Moffett Park Drive-Baylands Park[4]	Signal	E	AM	26.3	C	-	28.2	C	-	0.123	-6.4
				PM	30.3	C	-	31.5	C	-	0.063	1.6
25	Lawrence Expressway / Persian Drive-Elko Drive[4]	Signal	E	AM	26.2	C	-	26.1	C	-	0.022	-0.2
				PM	40.9	D	-	41.0	D	-	0.004	0.0
26	Great America Parkway / Tasman Drive[3 4]	Signal	E	AM	41.5	D	-	41.9	D	-	0.008	0.8
				PM	44.8	D	-	44.9	D	-	0.004	0.1
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive[4]	Signal	E	AM	34.3	C-	-	34.6	C-	-	0.011	0.3
				PM	41.4	D	-	41.7	D	-	0.012	0.5

Notes:
1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3;
3. CMP Intersection(s);
4. Regionally significant intersection(s).

Table 12. "Existing plus Project Alternative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Existing Conditions			Existing plus Project Alternative Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-	9.7	A	No	0.018	0.1
				PM	-	-	-	10.9	B	No	0.139	0.8
2	Caribbean Parking Garage Driveway (full-access) / Caribbean Drive[4]	OWSC	E	AM	-	-	-	19.7	C	No	0.224	1.8
				PM	-	-	-	**70.5**	**F**	No	**1.122**	**23.7**
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-	8.8	A	No	0.009	0.0
				PM	-	-	-	11.8	B	No	0.096	0.4
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	33.0	C-	-	41.9	D	-	0.050	28.4
				PM	23.6	C	-	24.7	C	-	0.096	0.7
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-	11.5	B	No	0.028	0.7
				PM	-	-	-	10.9	B	No	0.080	2.1
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-	8.2	A	No	0.004	0.1
				PM	-	-	-	7.7	A	No	0.002	0.0
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-	11.4	B	No	0.005	0.1
				PM	-	-	-	10.4	B	No	0.009	0.2
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-	10.9	B	No	0.010	0.1
				PM	-	-	-	9.7	A	No	0.008	0.1
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	13.2	B	No	13.9	B	No	0.006	-0.1
				PM	11.3	B	No	13.2	B	No	0.025	-0.5
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	34.5	C-	-	33.5	C-	-	0.017	0.2
				PM	39.2	D	-	39.6	D	-	0.081	1.1
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	9.0	A	No	0.005	0.5
				PM	-	-	-	8.9	A	No	0.008	0.6
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	8.8	A	No	0.006	0.3
				PM	-	-	-	8.7	A	No	0.006	0.3
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-	0.0	A	No	0.000	0.0
				PM	-	-	-	0.0	A	No	0.000	0.0

Table 12. "Existing plus Project Alternative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Existing Conditions			Existing plus Project Alternative Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
14	Bordeaux Drive / Java Drive	Signal	D	AM	30.0	C	-	30.1	C	-	0.003	0.0
				PM	31.3	C	-	31.2	C	-	0.003	0.1
15	Borregas Avenue / Java Drive	Signal	D	AM	35.2	D+	-	36.6	D+	-	0.013	-0.3
				PM	30.0	C	-	31.7	C	-	0.030	2.2

Notes:
1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3.
3. CMP Intersection(s).
4. Regionally significant intersection(s).
***BOLD** indicates unacceptable level of service.*
***SHADED** indicates a significant impact.*

3.5 "EXISTING PLUS PROJECT/PROJECT ALTERNATIVE" FREEWAY SEGMENT OPERATIONS

The 10 study freeway segments were analyzed under "Existing plus Project" AM and PM peak hour conditions. Detailed freeway segment operations calculation sheets are included in **Appendix P**. "Existing plus Project" freeway segment volumes were developed by estimating how many peak hour trips the Project would add to each freeway segment, using the Project trip generation values and trip distribution percentages discussed in Section 3.2, and adding those Project trips on top of the existing freeway segment counts. Project traffic was assigned to HOV lanes using HOV percentages calculated for each segment from existing freeway counts. The Project Alternative would result in the same number of trips added to each study freeway segment as the propose Project, and therefore was not analyzed separately. **Table 13** presents the projected study freeway segment densities and LOS under "Existing plus Project" conditions, as well as the number of Project generated trips added to each segment.

As shown in **Table 13**, the following freeway segments are projected to operate at unacceptable density-based LOS "F" under "Existing plus Project" and "Existing plus Project Alternative" AM and/or PM peak hour conditions:

- Eastbound SR 237 between Maude Avenue and US 101 during the PM peak hour.
- Westbound SR 237 between Maude Avenue and US 101 during the PM peak hour.
- Eastbound SR 237 between US 101 and Mathilda Avenue during the PM peak hour.
- Westbound SR 237 between US 101 and Mathilda Avenue during the AM and PM peak hours.
- Eastbound SR 237 between Mathilda Avenue and Fair Oaks Avenue during the PM peak hour.
- Westbound SR 237 between Mathilda Avenue and Fair Oaks Avenue during the AM and PM peak hours.
- Eastbound SR 237 between Fair Oaks Avenue and Lawrence Expressway during the PM peak hour.
- Westbound SR 237 between Fair Oaks Avenue and Lawrence Expressway during the AM and PM peak hours.
- Eastbound SR 237 between Lawrence Expressway and Great America Parkway during the PM peak hour.
- Westbound SR 237 between Lawrence Expressway and Great America Parkway during the AM peak hour.
- Southbound US 101 between Great America Parkway and Lawrence Expressway during the AM peak hour.
- Northbound US 101 between Great America Parkway and Lawrence Expressway during the PM peak hour.
- Southbound US 101 between Lawrence Expressway and Fair Oaks Avenue during the AM peak hour.
- Northbound US 101 between Lawrence Expressway and Fair Oaks Avenue during the PM peak hour.

- Southbound US 101 between Fair Oaks Avenue and Mathilda Avenue during the AM peak hour.
- Northbound US 101 between Fair Oaks Avenue and Mathilda Avenue during the PM peak hour (mixed-flow lanes only).
- Southbound US 101 between Mathilda Avenue and SR 237 during the AM peak hour.
- Northbound US 101 between Mathilda Avenue and SR 237 during the PM peak hour.
- Southbound US 101 between SR 237 and Moffett Boulevard during the AM peak hour.
- Northbound US 101 between SR 237 and Moffett Boulevard during the PM peak hour (mixed-flow lanes only).

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

3.6 "EXISTING PLUS PROJECT/PROJECT ALTERNATIVE" FREEWAY RAMP OPERATIONS

The 20 study freeway ramps were analyzed under "Existing plus Project" AM and PM peak hour conditions. Detailed freeway ramp operations calculation sheets are included in **Appendix P**. "Existing plus Project" freeway ramp volumes were developed by estimating how many peak hour trips the Project would add to each freeway ramp, using the Project trip generation values and trip distribution percentages discussed in Section 3.2, and adding those Project trips on top of the existing freeway ramp counts. The Project Alternative would result in the same number of trips added to each study freeway ramp as the proposed Project, and therefore was not analyzed separately. **Table 14** presents the projected study freeway ramp V/C ratios under "Existing plus Project" conditions, as well as the number of Project generated trips added to each ramp.

As shown in **Table 14**, all study freeway ramps are projected to operate at acceptable V/C ratios of less than 1.0 under "Existing plus Project" and "Existing plus Project Alternative" AM and PM peak hour conditions.

Table 13. "Existing plus Project" Conditions Freeway Segment Traffic Operations

#	Fwy	Segment	Dir	Pk Hr	Capacity (vphpl)[1]		Lanes		Existing Peak Density (pc/mi/ln) [4]		Existing Peak LOS		Trips Added from Project		Existing plus Project Density (pc/mi/ln)		Existing plus Project LOS		% of Capacity[5]	
					MF[2]	HOV[3]	MF	HOV	MF	HOV	MF	HOV	MF	HOV	MF	HOV	MF	HOV	MF	HOV
1	SR 237	Between Maude Avenue and US 101	EB	AM	4,400	-	2	-	33.6	-	D	-	103	0	34.5	-	D	-	2.3%	-
				PM	4,400	-	2	-	**94.7**	-	**F**	-	19	0	**96.1**	-	**F**	-	0.4%	-
			WB	AM	4,400	-	2	-	39.8	-	D	-	17	0	40.0	-	D	-	0.4%	-
				PM	4,400	-	2	-	**75.0**	-	**F**	-	108	0	**78.4**	-	**F**	-	2.5%	-
2	SR 237	Between US 101 and Mathilda Avenue	EB	AM	4,400	-	2	-	51.2	-	E	-	205	0	54.0	-	E	-	4.7%	-
				PM	4,400	-	2	-	**83.2**	-	**F**	-	38	0	**85.3**	-	**F**	-	0.9%	-
			WB	AM	4,400	-	2	-	**61.2**	-	**F**	-	19	0	**61.6**	-	**F**	-	0.4%	-
				PM	4,400	-	2	-	**69.7**	-	**F**	-	128	0	**73.3**	-	**F**	-	2.9%	-
3	SR 237	Between Mathilda Avenue and Fair Oaks Avenue	EB	AM	4,400	1,650	2	1	32.4	26.0	D	C	0	0	32.4	26.0	D	C	0.0%	0.0%
				PM	4,400	1,650	2	1	**84.3**	**64.7**	**F**	**F**	0	0	**84.3**	**64.7**	**F**	**F**	0.0%	0.0%
			WB	AM	6,900	-	3	-	**76.4**	-	**F**	-	4	0	**76.5**	-	**F**	-	0.1%	-
				PM	6,900	-	3	-	**79.6**	-	**F**	-	20	0	**80.1**	-	**F**	-	0.3%	-
4	SR 237	Between Fair Oaks Avenue and Lawrence Expressway	EB	AM	4,400	1,650	2	1	27.9	16.2	D	B	0	0	27.9	16.2	D	B	0.0%	0.0%
				PM	4,400	1,650	2	1	**82.0**	**84.4**	**F**	**F**	0	0	**82.0**	**84.4**	**F**	**F**	0.0%	0.0%
			WB	AM	4,400	1,650	2	1	**79.0**	**83.3**	**F**	**F**	1	1	**79.0**	**83.4**	**F**	**F**	0.0%	0.1%
				PM	4,400	1,650	2	1	**78.4**	**65.7**	**F**	**F**	1	0	**78.4**	**65.7**	**F**	**F**	0.0%	0.0%
5	SR 237	Between Lawrence Expressway and Great America Parkway	EB	AM	4,400	1,650	2	1	32.0	15.3	D	B	13	4	32.1	15.4	D	B	0.3%	0.2%
				PM	4,400	1,650	2	1	**77.4**	**74.0**	**F**	**F**	70	38	**80.1**	**76.5**	**F**	**F**	1.6%	2.3%
			WB	AM	4,400	1,650	2	1	**66.2**	**58.3**	**F**	**F**	66	37	**67.7**	**59.6**	**F**	**F**	1.5%	2.2%
				PM	4,400	1,650	2	1	32.0	8.9	D	A	16	3	32.2	9.0	D	A	0.4%	0.2%

Table 13. "Existing plus Project" Conditions Freeway Segment Traffic Operations

#	Fwy	Segment	Dir	Pk Hr	Capacity (vphpl)[1]		Lanes		Existing Peak Density (pc/mi/ln) [4]		Existing Peak LOS		Trips Added from Project		Existing plus Project Density (pc/mi/ln)		Existing plus Project LOS		% of Capacity[5]	
					MF[2]	HOV[3]	MF	HOV	MF	HOV	MF	HOV	MF	HOV	MF	HOV	MF	HOV	MF	HOV
6	US 101	Between Great America Parkway and Lawrence Expressway	SB	AM	6,900	1,650	3	1	**72.4**	**79.3**	**F**	**F**	79	24	**74.1**	**81.2**	**F**	**F**	1.1%	1.5%
				PM	6,900	1,650	3	1	25.8	9.0	C	A	17	2	25.9	9.0	C	A	0.2%	0.1%
			NB	AM	6,900	1,650	3	1	32.1	16.3	D	B	14	3	32.1	16.3	D	B	0.2%	0.2%
				PM	6,900	1,650	3	1	**87.9**	**83.0**	**F**	**F**	79	29	**91.6**	**86.6**	**F**	**F**	1.1%	1.8%
7	US 101	Between Lawrence Expressway and Fair Oaks Avenue	SB	AM	6,900	1,650	3	1	**72.5**	**67.7**	**F**	**F**	31	11	**73.1**	**68.2**	**F**	**F**	0.4%	0.7%
				PM	6,900	1,650	3	1	25.1	8.9	C	A	7	1	25.1	8.9	C	A	0.1%	0.1%
			NB	AM	6,900	1,650	3	1	25.1	9.0	C	A	4	1	25.1	9.0	C	A	0.1%	0.1%
				PM	6,900	1,650	3	1	**75.0**	**87.4**	**F**	**F**	11	3	**75.3**	**87.8**	**F**	**F**	0.2%	0.2%
8	US 101	Between Fair Oaks Avenue and Mathilda Avenue	SB	AM	6,900	1,650	3	1	**60.4**	**70.1**	**F**	**F**	12	3	**60.5**	**70.2**	**F**	**F**	0.2%	0.2%
				PM	6,900	1,650	3	1	27.6	9.2	D	A	2	0	27.7	9.2	D	A	0.0%	0.0%
			NB	AM	6,900	1,650	3	1	26.3	8.9	D	A	0	0	26.3	8.9	D	A	0.0%	0.0%
				PM	6,900	1,650	3	1	**62.3**	55.4	**F**	E	0	0	**62.3**	55.4	**F**	E	0.0%	0.0%
9	US 101	Between Mathilda Avenue and SR 237	SB	AM	6,900	1,650	3	1	**58.4**	**58.7**	**F**	**F**	0	0	**58.4**	**58.7**	**F**	**F**	0.0%	0.0%
				PM	6,900	1,650	3	1	32.3	23.7	D	C	0	0	32.3	23.7	D	C	0.0%	0.0%
			NB	AM	6,900	1,650	3	1	32.2	13.4	D	B	0	0	32.2	13.4	D	B	0.0%	0.0%
				PM	6,900	1,650	3	1	**63.7**	**58.4**	**F**	**F**	0	0	**63.7**	**58.4**	**F**	**F**	0.0%	0.0%
10	US 101	Between SR 237 and Moffett Boulevard	SB	AM	6,900	1,650	3	1	**58.9**	**62.5**	**F**	**F**	13	4	**59.1**	**62.6**	**F**	**F**	0.2%	0.2%
				PM	6,900	1,650	3	1	43.8	9.8	D	A	97	11	44.6	10.0	D	A	1.4%	0.7%
			NB	AM	6,900	1,650	3	1	54.1	24.5	E	C	80	23	54.9	24.8	E	C	1.2%	1.4%
				PM	6,900	1,650	3	1	**67.1**	53.7	**F**	E	13	6	**67.3**	53.8	**F**	E	0.2%	0.4%

Notes: Freeway volumes were obtained from the 2017 CMP Monitoring and Conformance Report (Santa Clara Valley Transportation Authority, April 23, 2017)
1. Freeway segment capacities were based on VTA TIA Guidelines. Units are vehicles per hour per lane.
2. MF = Mixed Flow
3. HOV = High Occupancy Vehicle
*4. Density = Peak Hour Segment Volume / (Peak Hour Speed * Number of Lanes). Units are passenger cars per mile per lane.*
***BOLD** indicates unacceptable level of service. **SHADED** indicates a significant impact.*

Table 14. "Existing plus Project" Conditions Freeway Ramp Traffic Operations

#	Ramp	Type	Peak Hour	Lanes				Existing Peak		Trips Added by Project	Existing plus Project Peak		% of Capacity[4]
				Mixed	HOV	Meter	Capacity[1]	Volume[2]	V/C[3]	Volume	Volume	V/C	
1	SR 237 Westbound On-Ramp from Mathilda Avenue	Diamond	AM	1	-	-	2,000	326	0.16	17	343	0.17	0.9%
			PM	1	-	-	2,000	760	0.38	110	870	0.44	5.5%
2	SR 237 Westbound Off-Ramp to Mathilda Avenue	Diamond	AM	1	-	-	2,000	866	0.43	2	868	0.43	0.1%
			PM	1	-	-	2,000	680	0.34	1	681	0.34	0.1%
3	SR 237 Eastbound Off-Ramp to Mathilda Avenue	Diamond	AM	2	-	-	4,100	824	0.20	205	1029	0.25	5.0%
			PM	2	-	-	4,100	361	0.09	38	399	0.10	0.9%
4	SR 237 Eastbound On-Ramp from Mathilda Avenue	Diamond	AM	1	-	-	2,000	636	0.32	0	636	0.32	0.0%
			PM	1	-	-	2,000	875	0.44	0	875	0.44	0.0%
5	SR 237 Westbound On-Ramp from Crossman Avenue/Moffett Park	Diagonal	AM	1	-	-	2,000	122	0.06	2	124	0.06	0.1%
			PM	1	-	-	2,000	180	0.09	19	199	0.10	1.0%
6	SR 237 Westbound On-Ramp from Southbound Caribbean Drive	Diagonal	AM	1	-	ON	720	396	0.55	0	396	0.55	0.0%
			PM	1	-	ON	720	216	0.30	0	216	0.30	0.0%
7	SR 237 Westbound Off-Ramp to Northbound Caribbean Drive	Diagonal	AM	1	-	-	2,000	103	0.05	101	204	0.10	5.1%
			PM	1	-	-	2,000	650	0.33	18	668	0.33	0.9%
8	SR 237 Eastbound On-Ramp from Southbound Lawrence Expressway	Loop	AM	1	-	-	1,800	306	0.17	17	323	0.18	0.9%
			PM	1	-	ON	550	420	0.76	108	528	0.96	19.6%
9	SR 237 Eastbound Off-Ramp to Northbound Lawrence Expressway	Loop	AM	1	-	-	1,800	102	0.06	0	102	0.06	0.0%
			PM	1	-	-	1,800	45	0.02	0	45	0.02	0.0%
10	US 101 Northbound On-Ramp from Southbound Lawrence	Diagonal	AM	1	1	ON	1,140	505	0.44	0	505	0.44	0.0%
			PM	1	1	-	2,900	349	0.12	0	349	0.12	0.0%
11	US 101 Northbound Off-Ramp to Lawrence Expressway	Diagonal	AM	2	-	-	3,500	1136	0.32	61	1197	0.34	1.7%
			PM	2	-	-	3,500	1309	0.37	11	1320	0.38	0.3%

Table 14. "Existing plus Project" Conditions Freeway Ramp Traffic Operations

#	Ramp	Type	Peak Hour	Lanes				Existing Peak		Trips Added by Project	Existing plus Project Peak		% of Capacity[4]
				Mixed	HOV	Meter	Capacity[1]	Volume[2]	V/C[3]	Volume	Volume	V/C	
12	US 101 Southbound Off-Ramp to Lawrence Expressway	Diagonal	AM	2	-	-	3,500	811	0.23	0	811	0.23	0.0%
			PM	2	-	-	3,500	1754	0.50	1	1755	0.50	0.0%
13	US 101 Southbound On-Ramp from Southbound Lawrence	Loop	AM	1	1	-	2,700	346	0.13	12	358	0.13	0.4%
			PM	1	1	ON	1,180	206	0.17	96	302	0.26	8.1%
14	US 101 Northbound On-Ramp from Fair Oaks Avenue	Diagonal	AM	1	1	-	2,900	1041	0.36	0	1041	0.36	0.0%
			PM	1	1	-	2,900	435	0.15	0	435	0.15	0.0%
15	US 101 Northbound Off-Ramp to Fair Oaks Avenue	Diagonal	AM	1	-	-	2,000	448	0.22	26	474	0.24	1.3%
			PM	1	-	-	2,000	1063	0.53	6	1069	0.53	0.3%
16	US 101 Southbound On-Ramp from Southbound Fair Oaks	Loop	AM	1	1	-	2,700	340	0.13	5	345	0.13	0.2%
			PM	1	1	ON	1,240	198	0.16	14	212	0.17	1.1%
17	US 101 Southbound Off-Ramp to Northbound Fair Oaks	Loop	AM	1	-	-	1,900	213	0.11	0	213	0.11	0.0%
			PM	1	-	-	1,900	94	0.05	0	94	0.05	0.0%
18	US 101 Northbound Off-Ramp to Northbound Mathilda	Diagonal	AM	1	-	-	2,000	334	0.17	15	349	0.17	0.8%
			PM	1	-	-	2,000	262	0.13	2	264	0.13	0.1%
19	US 101 Southbound On-Ramp from Southbound Mathilda	Loop	AM	1	1	-	2,700	178	0.07	0	178	0.07	0.0%
			PM	1	1	ON	1,480	720	0.49	0	720	0.49	0.0%
20	US 101 Northbound On-Ramp from Moffett Park Drive	Diagonal	AM	1	-	-	2,000	374	0.19	14	388	0.19	0.7%
			PM	1	-	-	2,000	218	0.11	88	306	0.15	4.4%

Notes:
1. Ramp Capacities were obtained from HCM 2000 Exhibit 25-3 and current ramp metering rates provided by Caltrans District 4, where applicable. Capacities represent the combined capacity of mixed-flow and HOV lanes where both exist.
2. Ramp Volumes were obtained from intersection counts performed for this TIA, the Caltrans Performance Measurement System (PeMS) online database, and the 2016 Caltrans Traffic Census Program volumes available on the Caltrans website. If the latest available counts for a ramp facility were several years old, growth rates were applied to the count based on observed trends at nearby facilities. Volumes represent the combined volumes of mixed-flow and HOV lanes where both exist.
3. V/C = Volume-to-capacity ratio.
4. % of Capacity = Number of Project trips added / Capacity

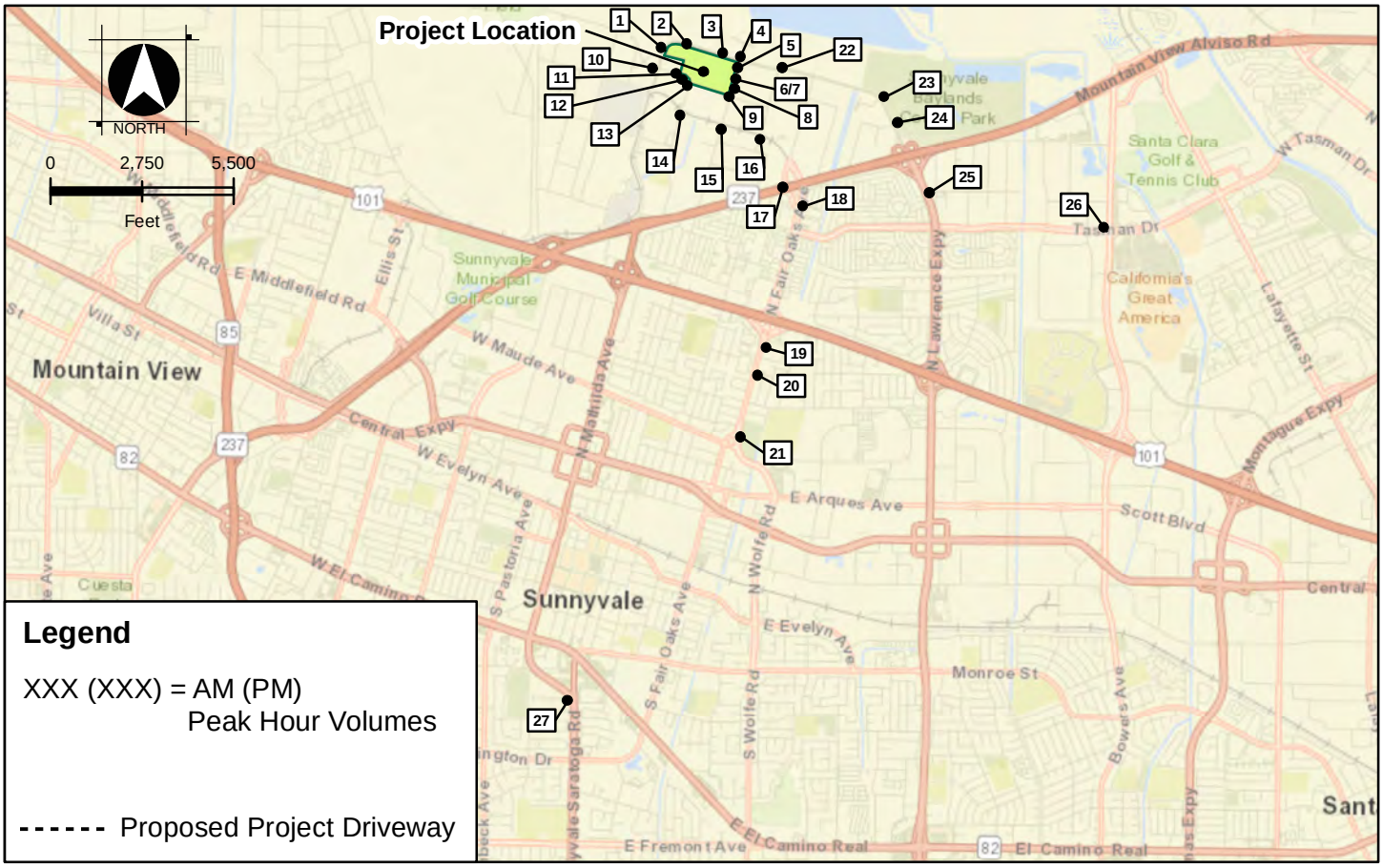
4. "BACKGROUND CONDITIONS"

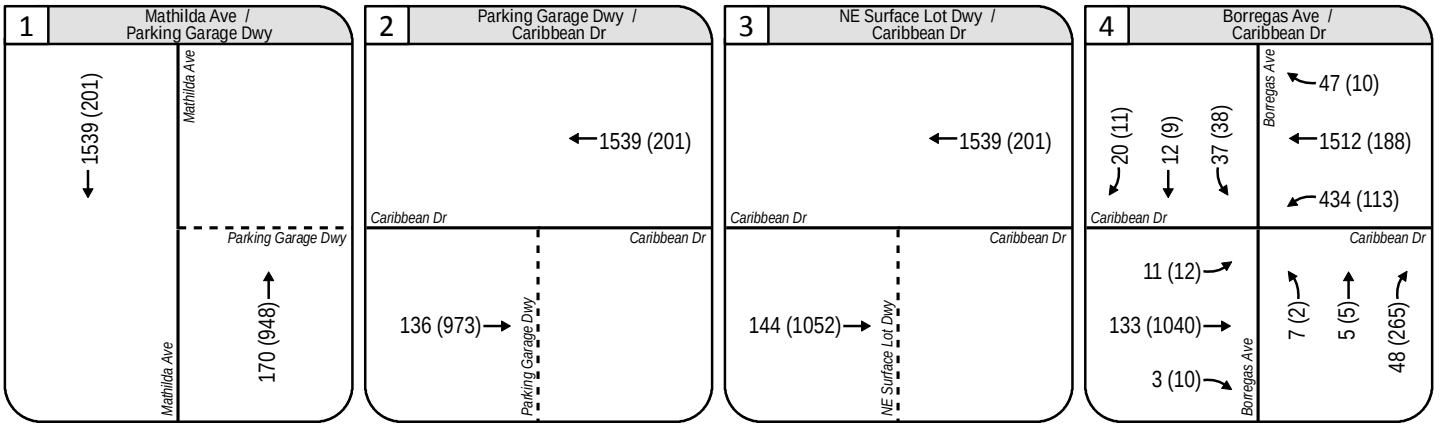
This chapter presents the study area intersection traffic operations results under "Background" conditions without Project generated trips. The City and the VTA define "Background" conditions as existing traffic volumes plus traffic generated by "approved but not yet constructed" developments within the vicinity of the Project study area. "Background" conditions are a near-term future condition that could reasonably represent study area conditions at the time of Project completion.

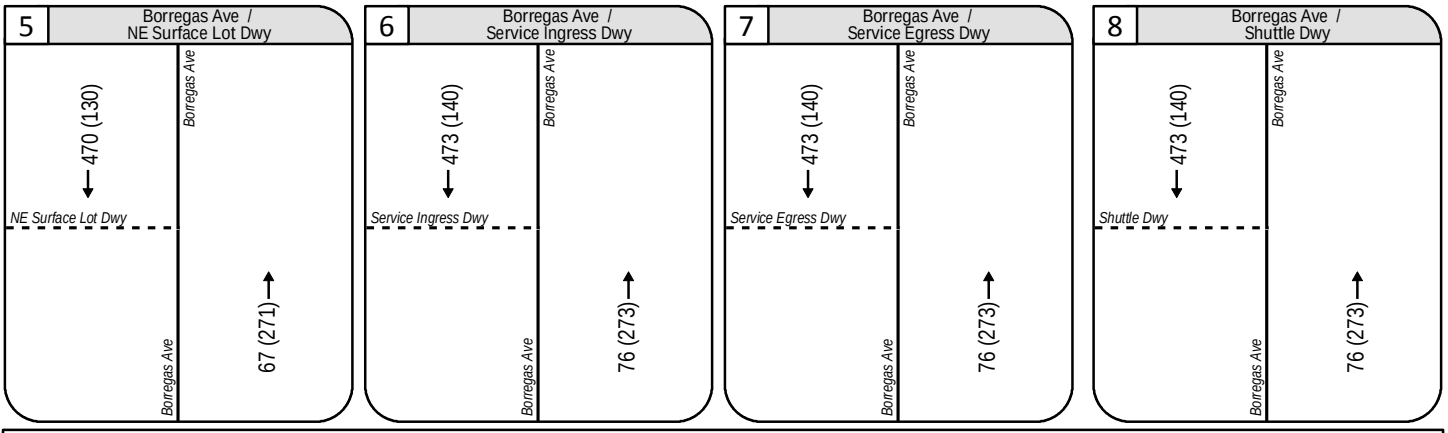
4.1 "BACKGROUND" (NO PROJECT) CONDITIONS VOLUMES

"Background" conditions traffic volumes were developed by adding trips generated by nearby "approved but not constructed" developments to the "Existing" conditions traffic volumes. In order to determine which nearby developments to include in "Background" conditions, lists of approved and pending development projects were obtained from City of Sunnyvale (dated June 15, 2018) and City of Santa Clara (dated April 30, 2018). As per City of Sunnyvale policy, only projects that were designated as "approved" on the list of approved and pending projects, that consisted of land uses larger than 20 residential units or 10,000 square-feet of office/commercial space, and which were located within or nearby the Project study area were selected to be a part of "Background" conditions volumes.

Net new trips from the "approved" developments within the Project study area vicinity were either obtained from approved traffic studies or environmental documents for the development (when available) or estimated using typical *ITE Trip Generation Manual 10th Edition* rates and City of Sunnyvale and VTA trip reduction guidelines/ targets. These "approved" development trips were then assigned to the study area network using existing traffic volume patterns and available planning documents, and added to "Existing" traffic volumes to obtain "Background" traffic volumes. Future volumes for the proposed Mathilda Avenue signalized intersections with US 101 Northbound Ramps and US 101 Southbound Ramps were provided by the City and balanced/adjusted to be consistent with "Background" volumes at adjacent intersections. A full list of "approved but not constructed" developments assumed under "Background" conditions is included in **Appendix D**. "Approved" development trip generation worksheets are included in **Appendix E**, "approved" development trip distributions are included in **Appendix F**, and total "approved" development volumes are included in **Appendix G**. "Background" study intersection turning movement volumes are presented in **Figure 13**.







"Background" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 13

WOOD RODGERS

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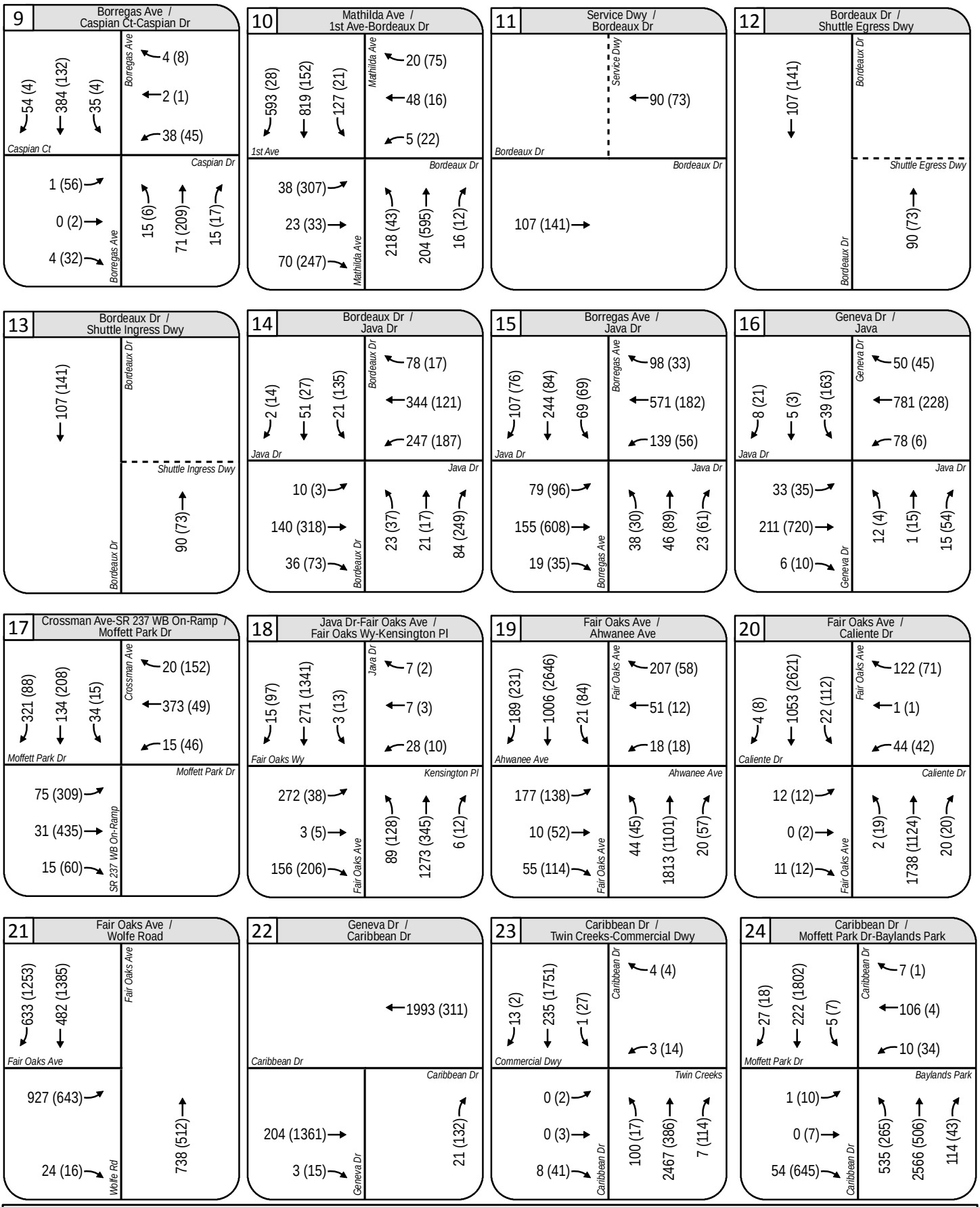
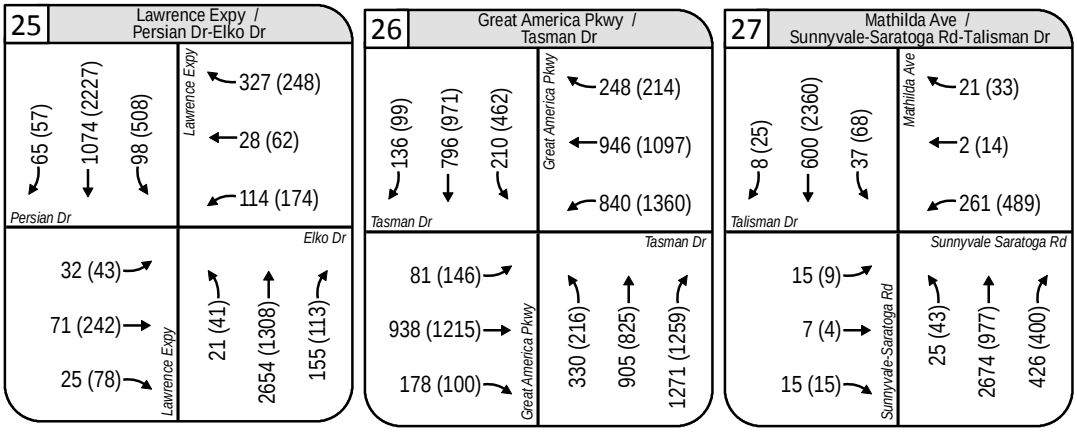


"Background" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 13-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



"Background" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 13-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

4.2 "BACKGROUND" (NO PROJECT) IMPROVEMENTS

Based on direction from the City, the following two (2) roadway improvement projects were assumed to be completed by near-term future "Background" conditions within the Project study area:

Background Improvement Project #1 – Sunnyvale-Saratoga Road Traffic Signal, Bicycle and Pedestrian Safety Project

This is a City project which proposes to install new traffic signal equipment and bicycle/pedestrian enhancements at the Mathilda Avenue / Sunnyvale Saratoga Road-Talisman Drive intersection. The intersection lane geometrics will remain the same.

Background Improvement Project #2 – Caribbean Drive Parking and Trail Access Enhancements

This project proposes to enhance parking and access to the Bay Trail on Caribbean Drive, and is projected to be completed by 2022. The project consists of a road diet on westbound Caribbean Drive which would reduce the number of westbound travel lanes from three to two. The Project would add buffered parking spaces, bio retention planters filled with native species (to clean and treat stormwater), and a one-way multi-use path on the north side of Caribbean Drive. A conceptual layout of the Caribbean Drive Parking and Trail Access Enhancements project is included as **Appendix R**. The following intersection will be reconfigured as listed below under "Background Conditions":

Borregas Avenue / Caribbean Drive: The existing outside westbound through-right lane will be converted to a right-turn only lane.

"Background" lane geometrics are shown in **Figure 14**. Only intersections with geometrics different than "Existing" conditions are shown.

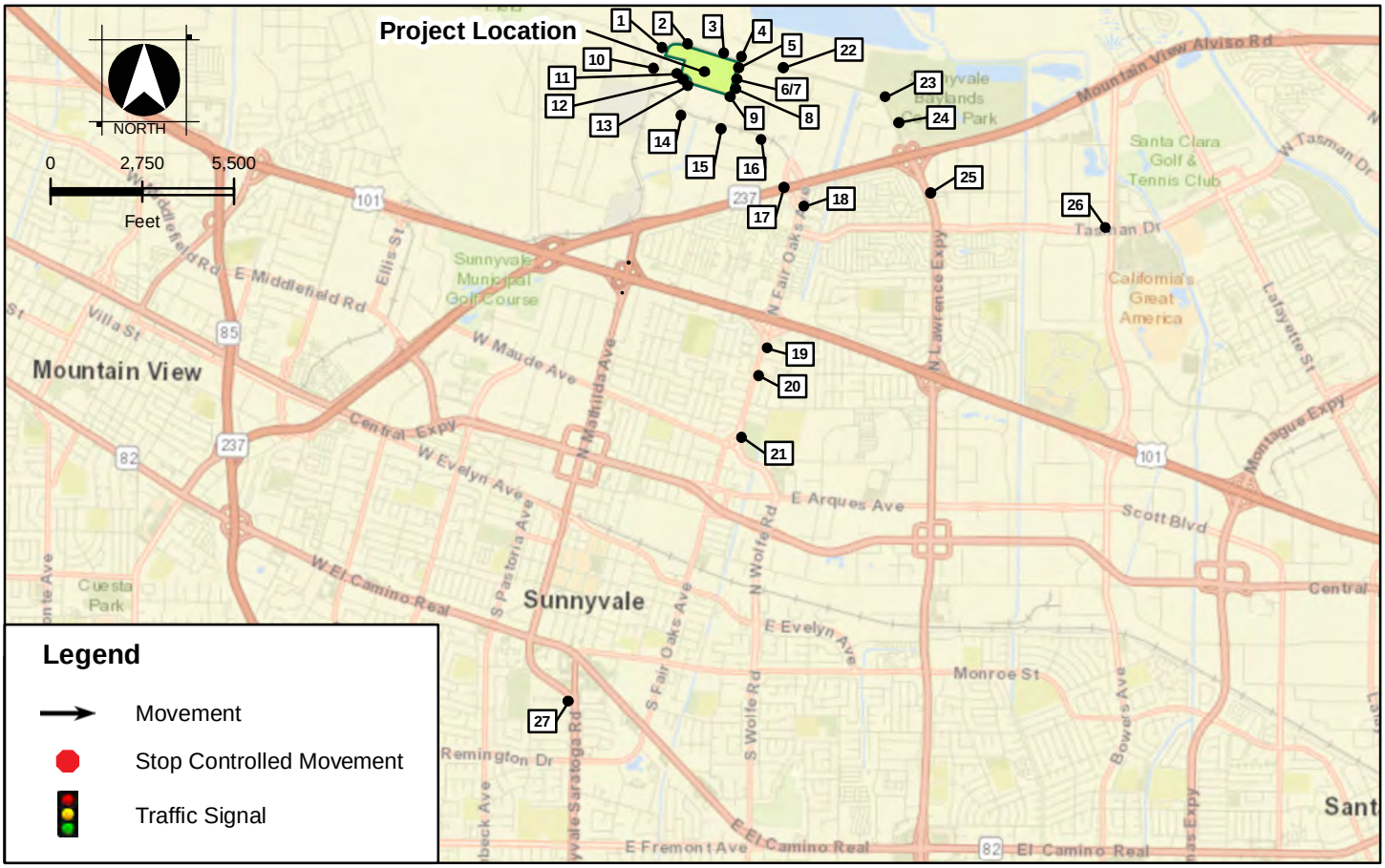
4.3 "BACKGROUND" (NO PROJECT) INTERSECTION OPERATIONS

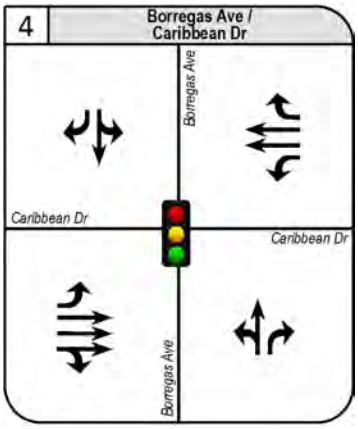
"Background" intersection operations were quantified under "Background" traffic volumes (shown in **Figure 13**) and "Background" intersection lane geometrics and control (shown in **Figure 14**). **Table 15** illustrates the resulting "Background" intersection LOS operations.

As shown in **Table 15**, the following signalized intersection is projected to operate at unacceptable average intersection LOS "F" under "Background" AM and PM peak hour conditions:

- #26 - Great America Parkway / Tasman Drive

All of the remaining study intersections are projected to operate at acceptable "Background" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hours. All delay and LOS results shown in **Table 15** were calculated using TRAFFIX software**.** CA MUTCD based peak hour signal warrant 3 is not projected to be met at any study unsignalized intersections under "Background" AM and PM peak hour conditions. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.** All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.





"Background" Conditions Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 14

Table 15. "Background" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Background Conditions		
					Delay (S/V)[1]	LOS	Wrnt Met?[2]
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
2	Caribbean Parking Garage Driveway (right-in right-out) / Caribbean Drive[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	46.1	D	-
				PM	25.1	C	-
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-
				PM	-	-	-
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	14.3	B	No
				PM	11.9	B	No
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	35.5	D+	-
				PM	40.7	D	-
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-
				PM	-	-	-
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-
				PM	-	-	-
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-
				PM	-	-	-
14	Bordeaux Drive / Java Drive	Signal	D	AM	33.6	C-	-
				PM	39.0	D	-
15	Borregas Avenue / Java Drive	Signal	D	AM	37.8	D+	-
				PM	30.5	C	-
16	Geneva Drive / Java Drive	Signal	D	AM	27.8	C	-
				PM	36.3	D+	-
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Signal	D	AM	21.1	C+	-
				PM	17.6	B	-
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	Signal	D	AM	40.1	D	-
				PM	34.0	C-	-
19	Fair Oaks Avenue / Ahwanee Avenue	Signal	D	AM	23.7	C	-
				PM	28.8	C	-
20	Fair Oaks Avenue / Caliente Drive	Signal	D	AM	16.7	B	-
				PM	19.3	B-	-
21	Fair Oaks Avenue / Wolfe Road	Signal	D	AM	26.3	C	-
				PM	18.9	B-	-
22	Geneva Drive / Caribbean Drive[4]	OWSC	E	AM	8.7	A	No
				PM	13.5	B	No

Table 15. "Background" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Background Conditions		
					Delay (S/V)[1]	LOS	Wrnt Met?[2]
23	Caribbean Drive / Twin Creeks[4]	Signal	E	AM	22.5	C+	-
				PM	17.2	B	-
24	Caribbean Drive / Moffett Park Drive-Baylands Park[4]	Signal	E	AM	29.5	C	-
				PM	31.4	C	-
25	Lawrence Expressway / Persian Drive-Elko Drive[4]	Signal	E	AM	25.8	C	-
				PM	42.4	D	-
26	Great America Parkway / Tasman Drive[3 4]	Signal	E	AM	**106.5**	**F**	-
				PM	**168.8**	**F**	-
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive[4]	Signal	E	AM	38.3	D+	-
				PM	55.0	E+	-

Notes:
1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3.
3. CMP Intersection(s).
4. Regionally significant intersection(s).
***BOLD** indicates unacceptable level of service.*

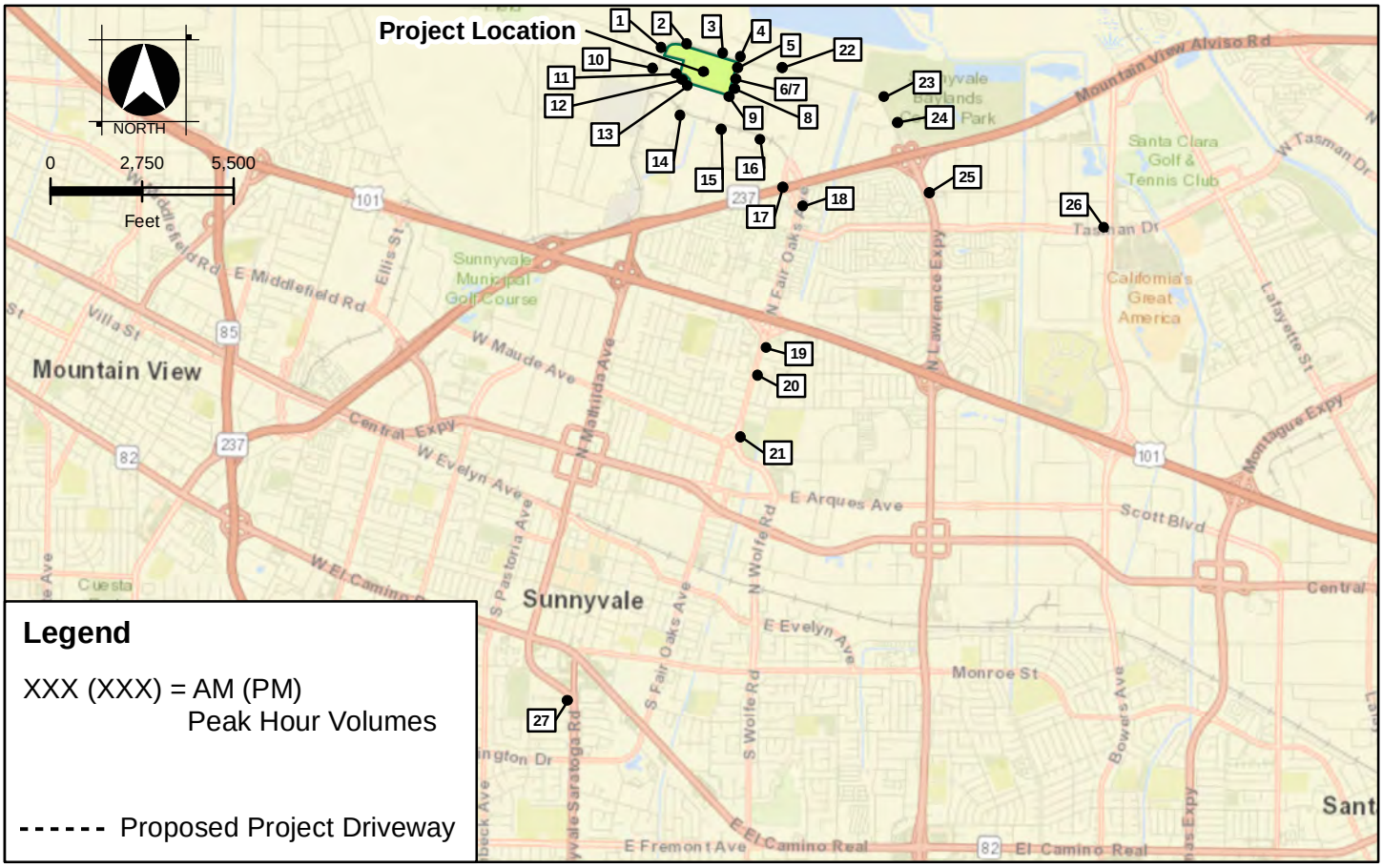
5. "BACKGROUND PLUS PROJECT" CONDITIONS

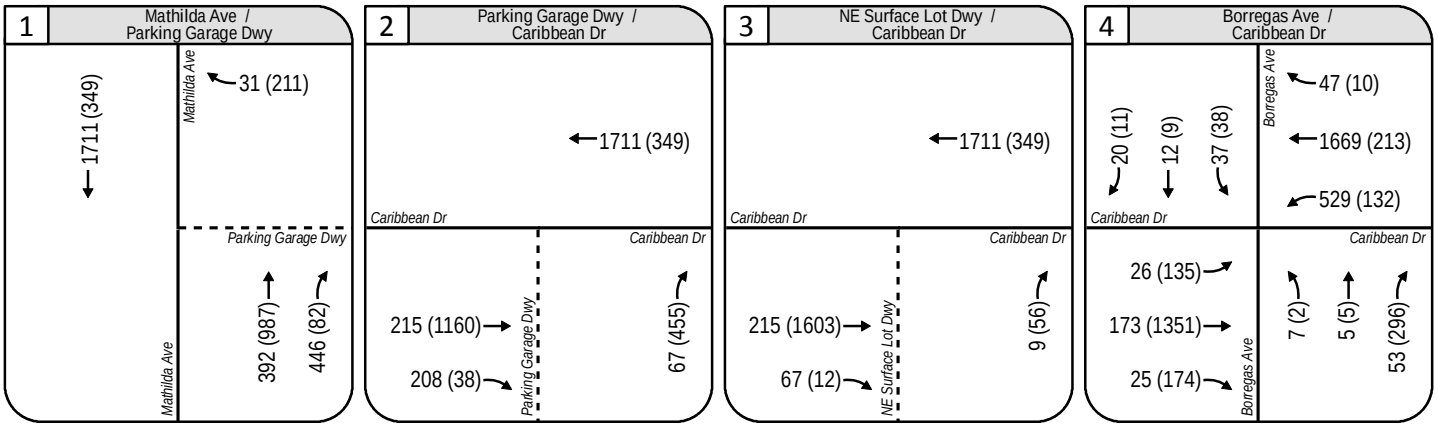
This chapter presents the study area intersection traffic operations results under "Background plus Project" conditions.

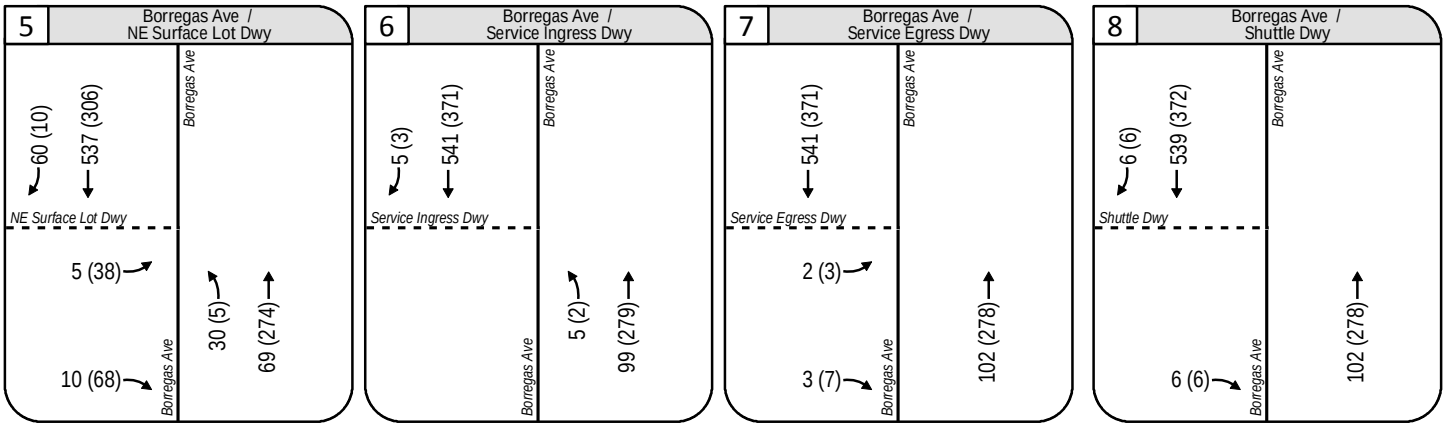
5.1 "BACKGROUND PLUS PROJECT" AND "BACKGROUND PLUS PROJECT ALTERNATIVE" CONDITIONS VOLUMES

"Project Only" traffic volumes under "Background" lane geometrics and control were added on top of "Background" conditions traffic volumes at study intersections to generate "Background plus Project" conditions traffic volumes. **Figure 15** illustrates the estimated AM and PM peak hour "Background plus Project" conditions traffic volumes at study intersections.

"Project Alternative Only" traffic volumes under "Background" lane geometrics and control were also added on top of "Background" conditions traffic volumes at study intersections to create "Background plus Project Alternative" conditions traffic volumes. **Figure 16** illustrates the estimated AM and PM peak hour "Background plus Project Alternative" conditions traffic volumes at study intersections.







"Background plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 15

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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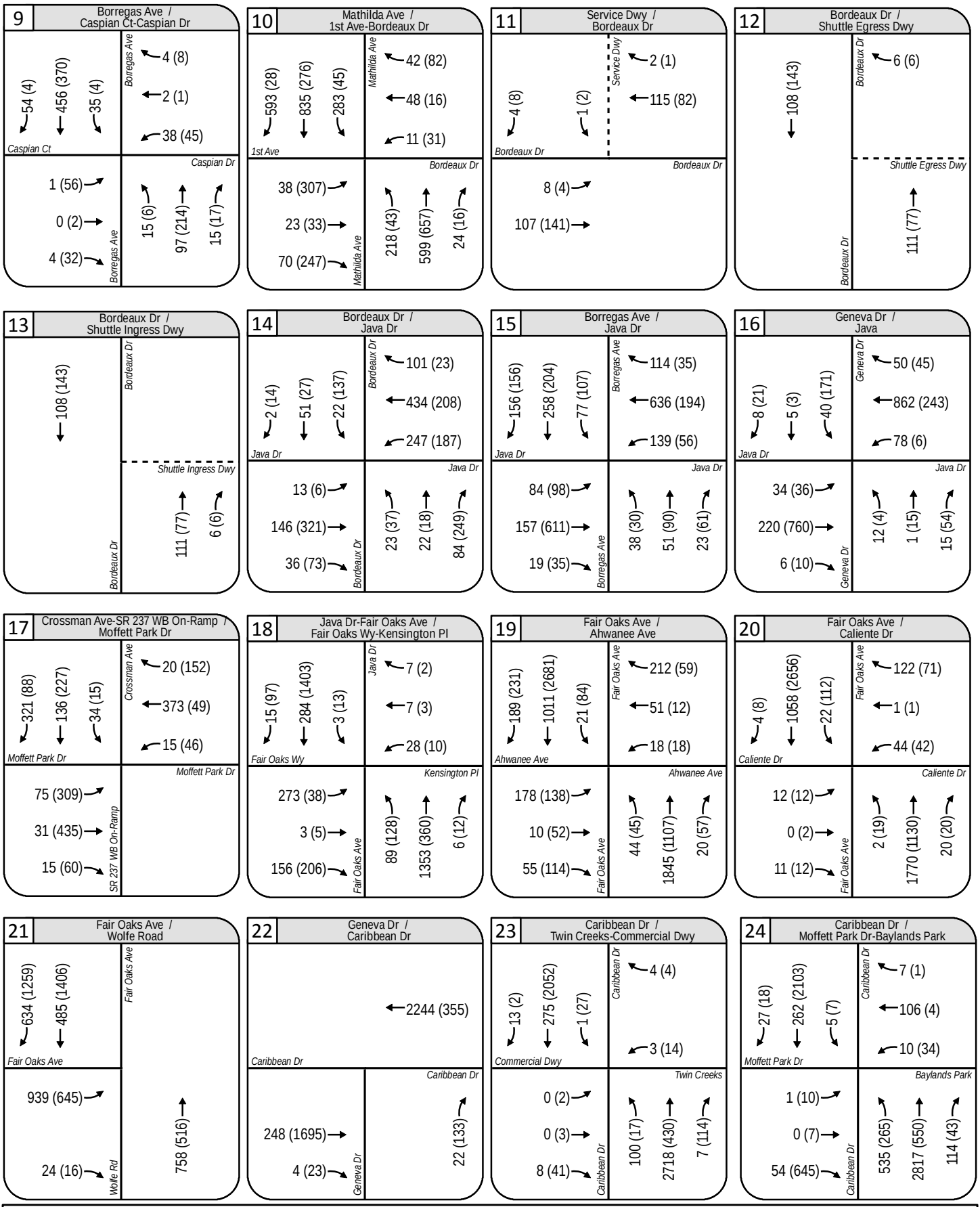
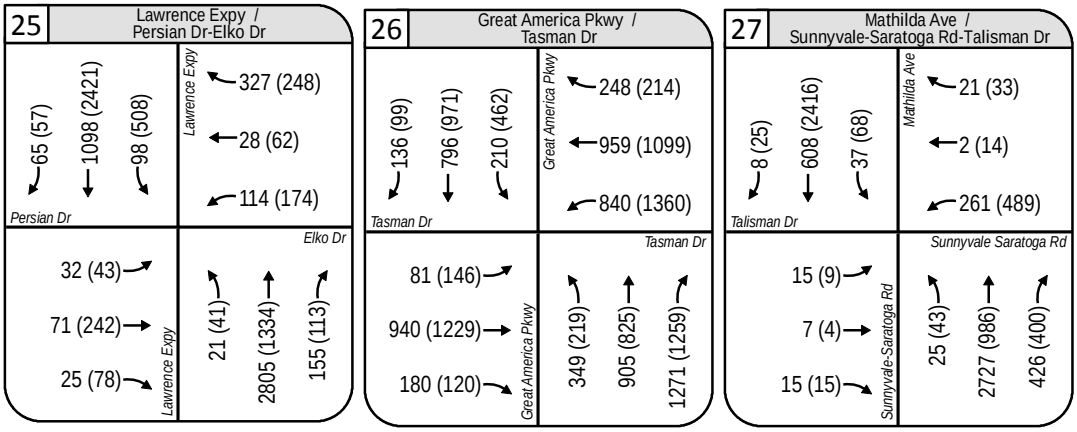


"Background plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 15-2

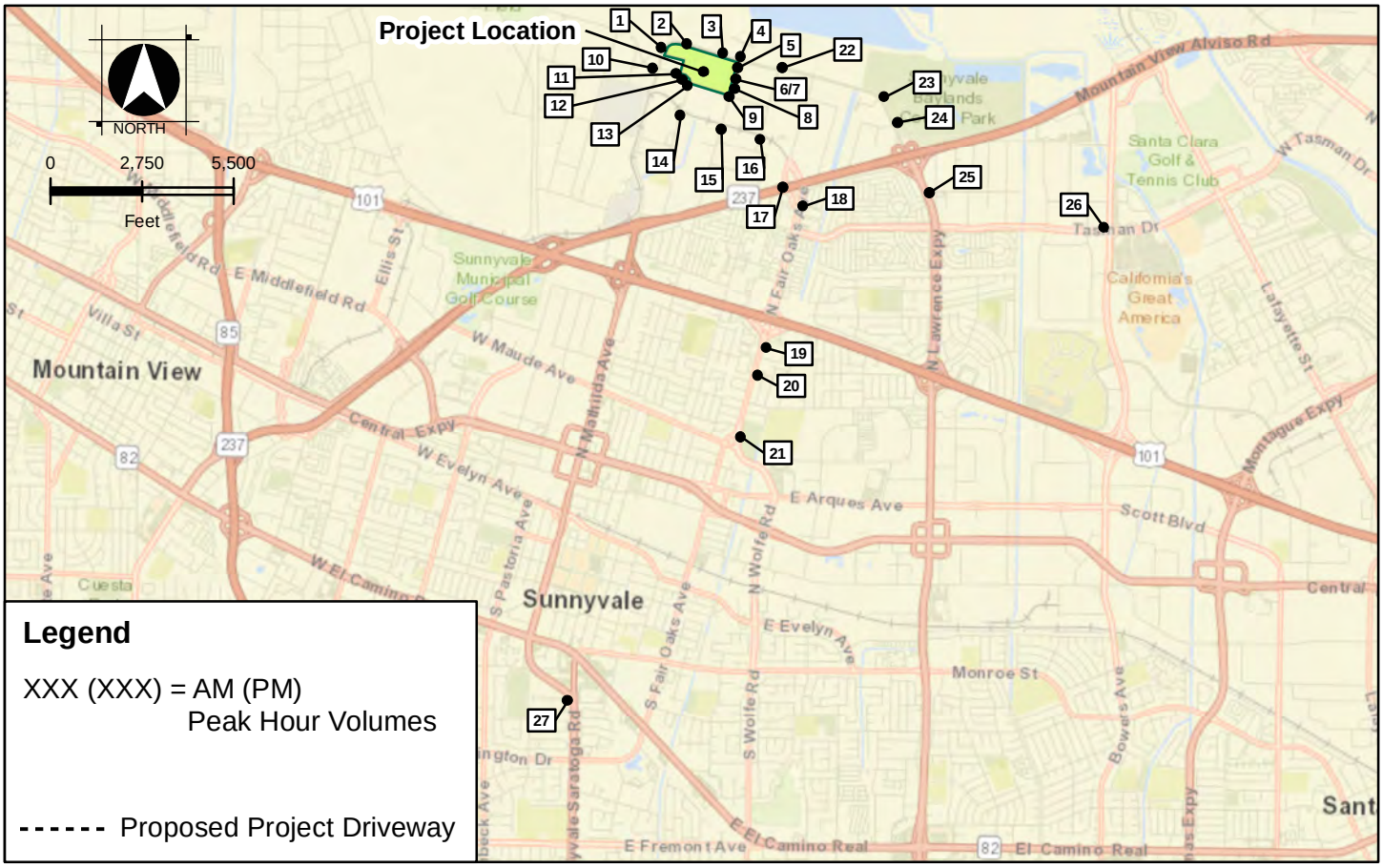
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

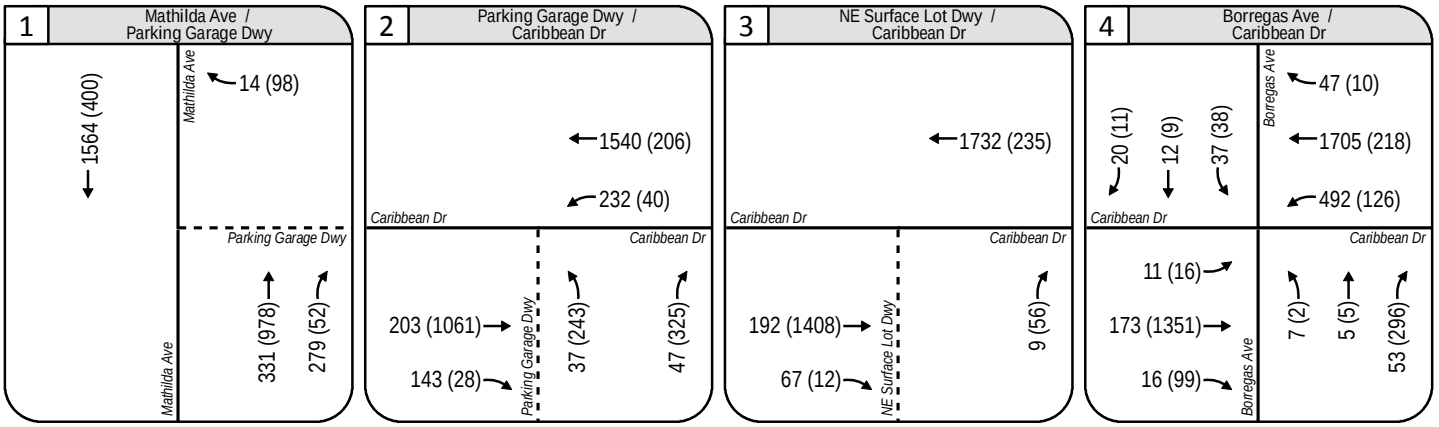


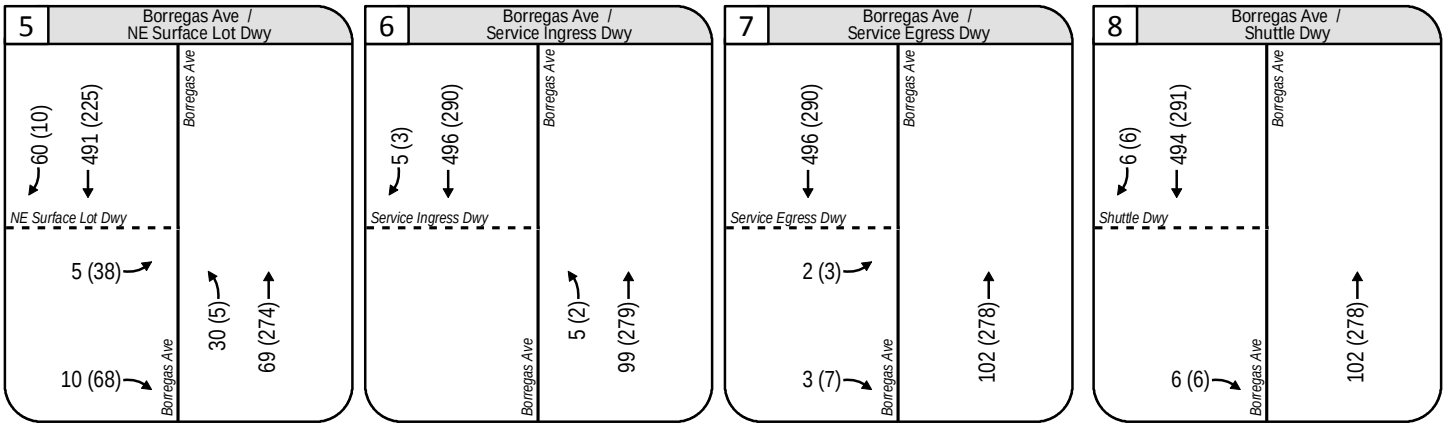
"Background plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 15-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







"Background plus Project Alternative" Traffic Volumes

100-200 W Caribbean Drive TIA

Sunnyvale, CA

August 2019

Figure 16

WOOD RODGERS

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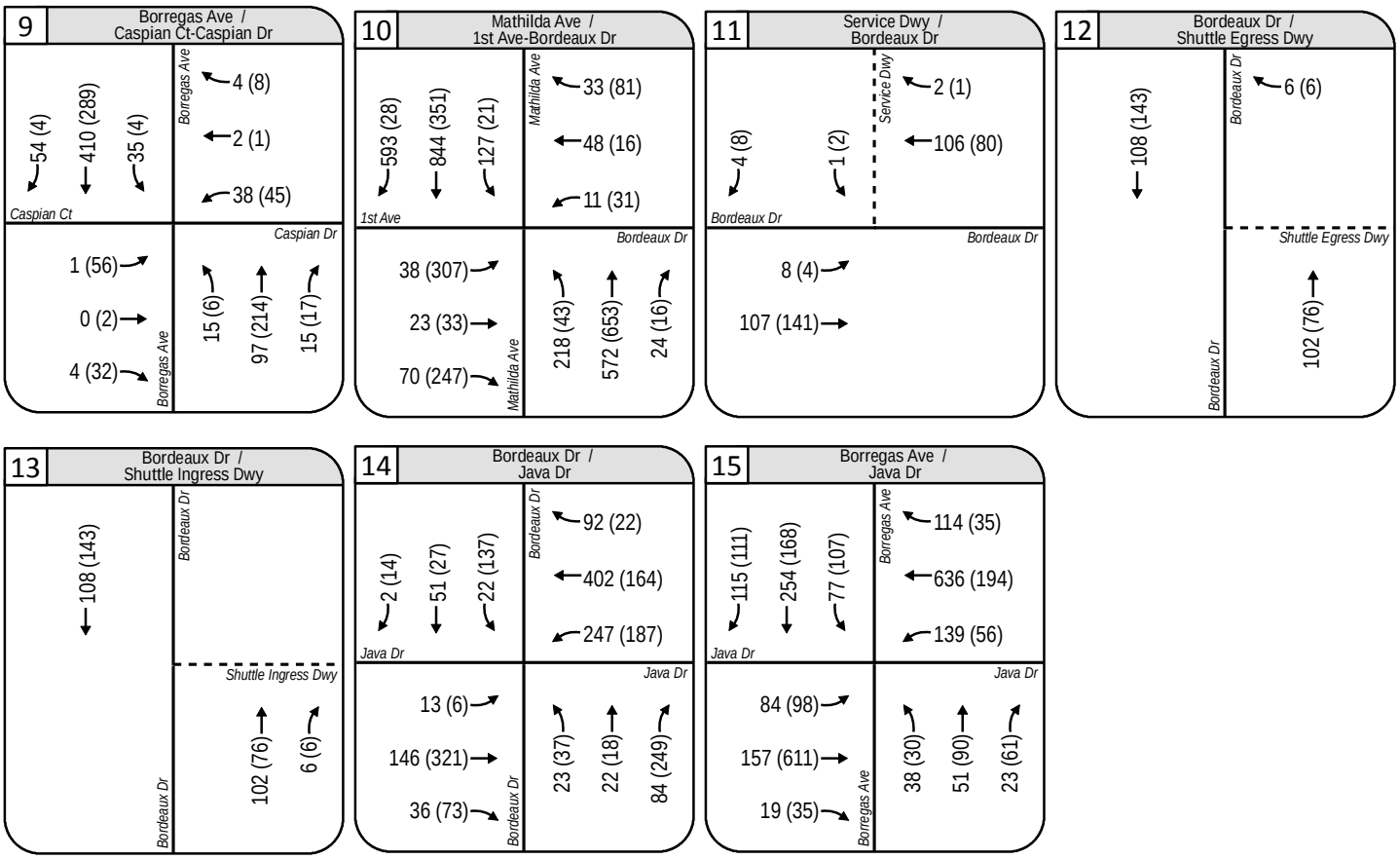


"Background plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 16-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

5.2 "BACKGROUND PLUS PROJECT" INTERSECTION OPERATIONS

"Background plus Project" intersection operations were quantified under "Background plus Project" traffic volumes (shown in **Figure 15**), "Background" intersection lane geometrics and control (shown in **Figure 14**), and proposed Project driveway configurations (shown in **Figure 7**). **Table 16** illustrates the resulting "Background plus Project" intersection LOS operations. **Table 16** also contains "Background" conditions intersection delays and LOS for comparison purposes, as well as the projected change in delay of critical movements and critical V/C ratio caused by the addition of Project generated trips. The projected change in delay of critical movements and critical V/C ratio were reported for use in identifying significant impacts.

As shown in **Table 16**, the following signalized intersection is projected to operate at unacceptable average intersection LOS "F" under "Background plus Project" AM and PM peak hour conditions:

- #26 - Great America Parkway / Tasman Drive

All of the remaining study intersections are projected to operate at acceptable "Background plus Project" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hour. All delay and LOS results shown in **Table 16** were calculated using TRAFFIX software. CA MUTCD based peak hour signal warrant 3 is not projected to be met at any study unsignalized intersections under "Background plus Project" AM and PM peak hour conditions. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

5.3 "BACKGROUND PLUS PROJECT ALTERNATIVE" INTERSECTION OPERATIONS

"Background plus Project Alternative" intersection operations were quantified under "Background plus Project Alternative" traffic volumes (shown in **Figure 16**), "Background" intersection lane geometrics and control (shown in **Figure 14**), and proposed Project driveway configurations (shown in **Figure 7**). **Table 17** illustrates the resulting "Background plus Project Alternative" intersection LOS operations. LOS operations are only shown at study intersections 1-15as these are the only locations where "Background plus Project Alternative" results differ from "Background plus Project" results. **Table 17** also contains "Background" conditions intersection delays and LOS for comparison purposes, as well as the projected change in delay of critical movements and critical V/C ratio caused by the addition of Project generated trips. The projected change in delay of critical movements and critical V/C ratio were reported for use in identifying significant impacts.

As shown in **Table 17**, the following unsignalized intersection is projected to operate at unacceptable worst-case movement LOS "F" under "Background plus Project Alternative" PM peak hour conditions:

- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

CA MUTCD based peak hour signal warrant 3 is projected to be met at the following unsignalized intersection under "Background plus Project Alternative" PM peak hour conditions:

- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

All of the remaining "Project Alternative" study intersections (i.e. intersections 1 and 3-15) are projected to operate at acceptable "Background plus Project Alternative" level of service conditions

(LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hour. CA MUTCD based peak hour signal warrant 3 is not projected to be met at any of the remaining study unsignalized intersections under "Background plus Project" AM and PM peak hour conditions. All delay and LOS results shown in **Table 17** were calculated using TRAFFIX software. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

Table 16. "Background plus Project" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Background Conditions			Background plus Project Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-	10.8	B	No	0.048	0.1
				PM	-	-	-	13.5	B	No	0.333	1.7
2	Caribbean Parking Garage Driveway (right-in right-out) / Caribbean Drive[4]	OWSC	E	AM	-	-	-	9.6	A	No	0.079	0.3
				PM	-	-	-	27.3	D	No	0.758	6.2
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-	8.9	A	No	0.010	0.0
				PM	-	-	-	13.3	B	No	0.114	0.4
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	46.1	D	-	73.9	E	-	0.076	61.9
				PM	25.1	C	-	29.1	C	-	0.116	2.2
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-	12.5	B	No	0.030	0.6
				PM	-	-	-	12.1	B	No	0.092	1.9
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-	8.5	A	-	0.005	0.1
				PM	-	-	-	8.0	A	-	0.002	0.0
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-	12.3	B	No	0.006	0.1
				PM	-	-	-	11.3	B	No	0.010	0.2
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-	11.7	B	No	0.011	0.1
				PM	-	-	-	10.4	B	No	0.009	0.1
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	14.3	B	No	16.0	C	No	0.016	-0.1
				PM	11.9	B	No	15.2	C	No	0.044	-0.5
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	35.5	D+	-	37.5	D+	-	0.015	-0.3
				PM	40.7	D	-	41.8	D	-	0.053	0.7
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	9.0	A	No	0.005	0.4
				PM	-	-	-	8.9	A	No	0.008	0.5
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	8.8	A	No	0.006	0.2
				PM	-	-	-	8.7	A	No	0.006	0.2
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-	0.0	A	-	0.000	0.0
				PM	-	-	-	0.0	A	-	0.000	0.0
14	Bordeaux Drive / Java Drive	Signal	D	AM	33.6	C-	-	33.6	C-	-	0.003	-0.1
				PM	39.0	D	-	38.6	D+	-	0.003	0.3

Table 16. "Background plus Project" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Background Conditions			Background plus Project Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
15	Borregas Avenue / Java Drive	Signal	D	AM	37.8	D+	-	40.6	D	-	0.046	-0.3
				PM	30.5	C	-	32.0	C	-	0.029	2.8
16	Geneva Drive / Java Drive	Signal	D	AM	27.8	C	-	28.2	C	-	0.029	0.7
				PM	36.3	D+	-	36.9	D+	-	0.019	0.7
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Signal	D	AM	21.1	C+	-	21.1	C+	-	0.001	0.0
				PM	17.6	B	-	18.0	B-	-	0.012	0.4
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	Signal	D	AM	40.1	D	-	41.1	D	-	0.027	1.3
				PM	34.0	C-	-	35.0	D+	-	0.019	1.4
19	Fair Oaks Avenue / Ahwanee Avenue	Signal	D	AM	23.7	C	-	24.1	C	-	0.010	0.6
				PM	28.8	C	-	29.9	C	-	0.008	1.7
20	Fair Oaks Avenue / Caliente Drive	Signal	D	AM	16.7	B	-	16.8	B	-	0.010	0.4
				PM	19.3	B-	-	19.7	B-	-	0.008	0.6
21	Fair Oaks Avenue / Wolfe Road	Signal	D	AM	26.3	C	-	26.6	C	-	0.005	0.0
				PM	18.9	B-	-	19.0	B-	-	0.003	0.0
22	Geneva Drive / Caribbean Drive[4]	OWSC	E	AM	8.7	A	No	8.8	A	No	0.002	0.0
				PM	13.5	B	No	15.8	C	No	0.047	0.0
23	Caribbean Drive / Twin Creeks[4]	Signal	E	AM	22.5	C+	-	28.3	C	-	0.054	6.7
				PM	17.2	B	-	18.7	B-	-	0.067	1.9
24	Caribbean Drive / Moffett Park Drive-Baylands Park[4]	Signal	E	AM	29.5	C	-	35.7	D+	-	0.049	8.3
				PM	31.4	C	-	33.6	C-	-	0.063	2.8
25	Lawrence Expressway / Persian Drive-Elko Drive[4]	Signal	E	AM	25.8	C	-	25.2	C	-	0.022	-0.1
				PM	42.4	D	-	42.7	D	-	0.003	0.2
26	Great America Parkway / Tasman Drive[3] [4]	Signal	E	AM	**106.5**	**F**	-	**107.6**	**F**	-	0.000	0.1
				PM	**168.8**	**F**	-	**169.5**	**F**	-	0.005	1.7
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive[4]	Signal	E	AM	38.3	D+	-	39.0	D	-	0.010	0.9
				PM	55.0	E+	-	58.0	E+	-	0.012	4.1

Notes: 1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3;
3. CMP Intersection(s);
4. Regionally significant intersection(s);
***BOLD** indicates unacceptable level of service;*
***SHADED** indicates a significant impact.*

Table 17. "Background plus Project Alternative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Background Conditions			Background plus Project Alternative Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-	9.9	A	No	0.019	0.1
				PM	-	-	-	11.5	B	No	0.151	0.7
2	Caribbean Parking Garage Driveway (full-access) / Caribbean Drive[4]	OWSC	E	AM	-	-	-	22.3	C	No	0.259	1.8
				PM	-	-	-	**133.1**	**F**	Yes	1.463	40.0
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-	8.8	A	No	0.010	0.0
				PM	-	-	-	12.4	B	No	0.103	0.4
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	46.1	D	-	67.8	E	-	0.050	34.7
				PM	25.1	C	-	26.8	C	-	0.096	1.4
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-	12.0	B	No	0.029	0.7
				PM	-	-	-	11.2	B	No	0.083	2.0
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-	8.4	A	No	0.005	0.1
				PM	-	-	-	7.8	A	No	0.002	0.0
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-	11.9	B	No	0.005	0.1
				PM	-	-	-	10.6	B	No	0.009	0.2
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-	11.3	B	No	0.010	0.1
				PM	-	-	-	9.8	A	No	0.008	0.1
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	14.3	B	No	15.2	C	No	0.008	-0.1
				PM	11.9	B	No	13.9	B	No	0.028	-0.4
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	35.5	D+	-	34.9	C-	-	0.009	-0.2
				PM	40.7	D	-	40.8	D	-	0.081	1.2
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	9.0	A	No	0.005	0.5
				PM	-	-	-	8.9	A	No	0.008	0.5
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	8.8	A	No	0.006	0.2
				PM	-	-	-	8.7	A	No	0.006	0.2
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-	0.0	A	No	0.000	0.0
				PM	-	-	-	0.0	A	No	0.000	0.0

Table 17. "Background plus Project Alternative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Background Conditions			Background plus Project Alternative Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
14	Bordeaux Drive / Java Drive	Signal	D	AM	33.6	C-	-	33.6	C-	-	0.003	-0.1
				PM	39.0	D	-	38.9	D+	-	0.003	0.3
15	Borregas Avenue / Java Drive	Signal	D	AM	37.8	D+	-	39.9	D	-	0.014	-0.1
				PM	30.5	C	-	32.3	C-	-	0.029	2.8

Notes:
1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3.
3. CMP Intersection(s).
4. Regionally significant intersection(s).
***BOLD** indicates unacceptable level of service.*
***SHADED** indicates a significant impact.*

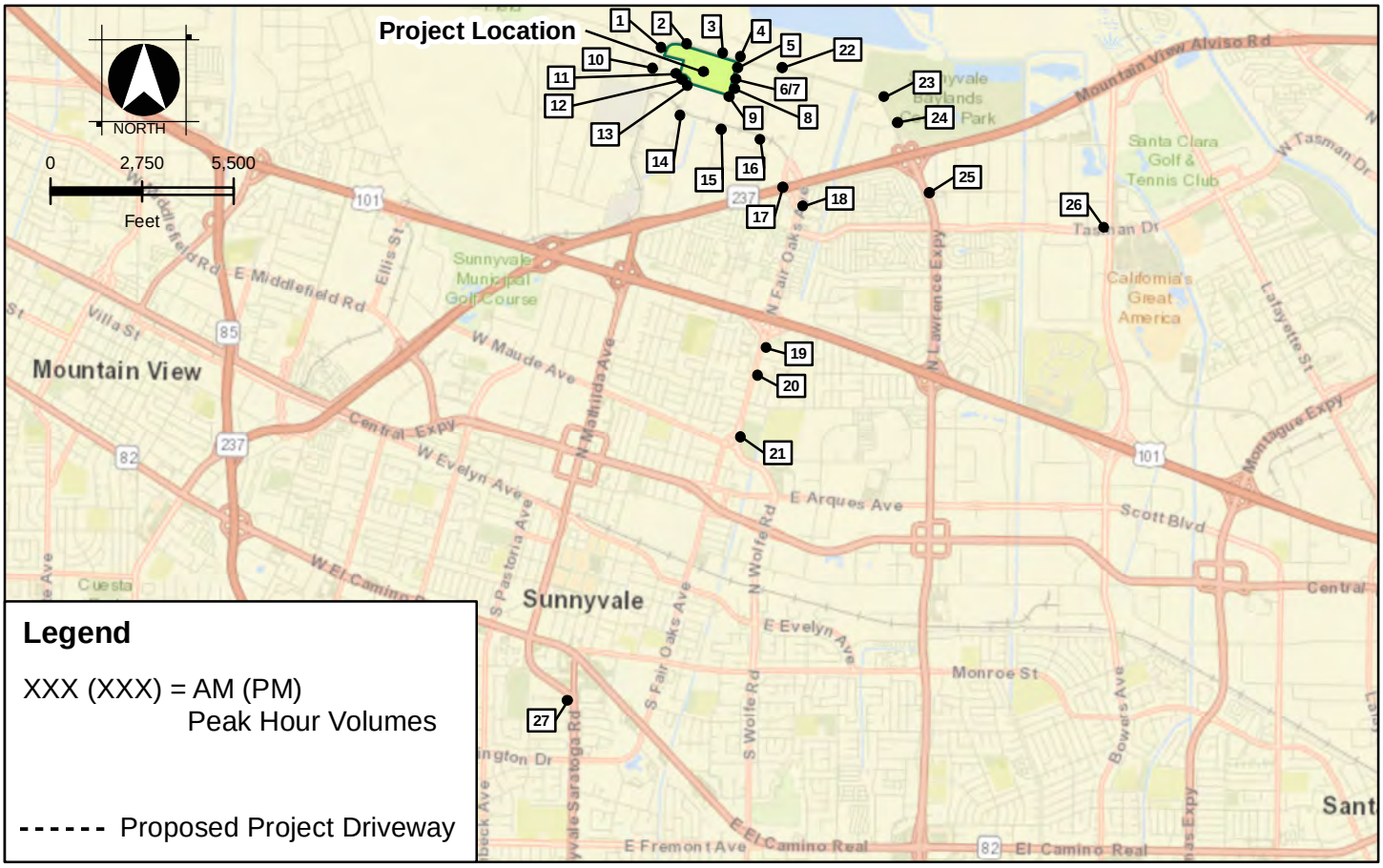
6. "CUMULATIVE CONDITIONS"

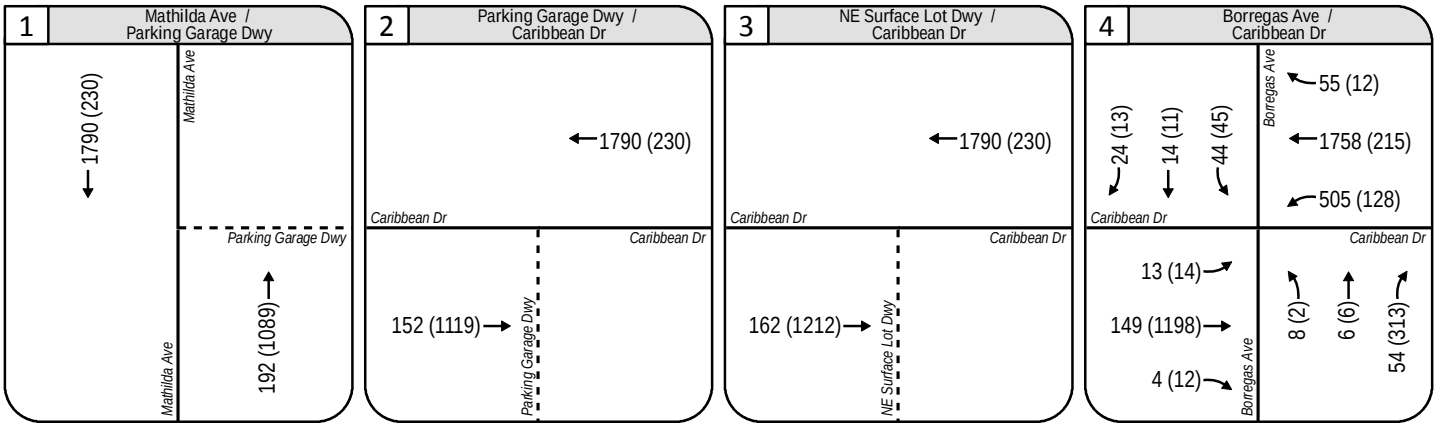
This chapter presents the study area intersection traffic operations results under "Cumulative" conditions without Project generated trips. Consistent with VTA guidelines, "Cumulative" conditions traffic volumes were obtained by applying a 1.5% per year growth rate to existing volumes between "Existing" year 2018 conditions and year 2030 (i.e., over 12 years), and then adding traffic generated by "approved but not yet constructed" and "pending" developments within the vicinity of the Project study area. "Cumulative" conditions are a long-term future condition that could reasonably represent study area conditions in the future year 2030. "Cumulative" conditions analysis has been included in this TIA as the proposed land uses on the Project site would generate more traffic than what is currently assumed in the Moffett Park Specific Plan.

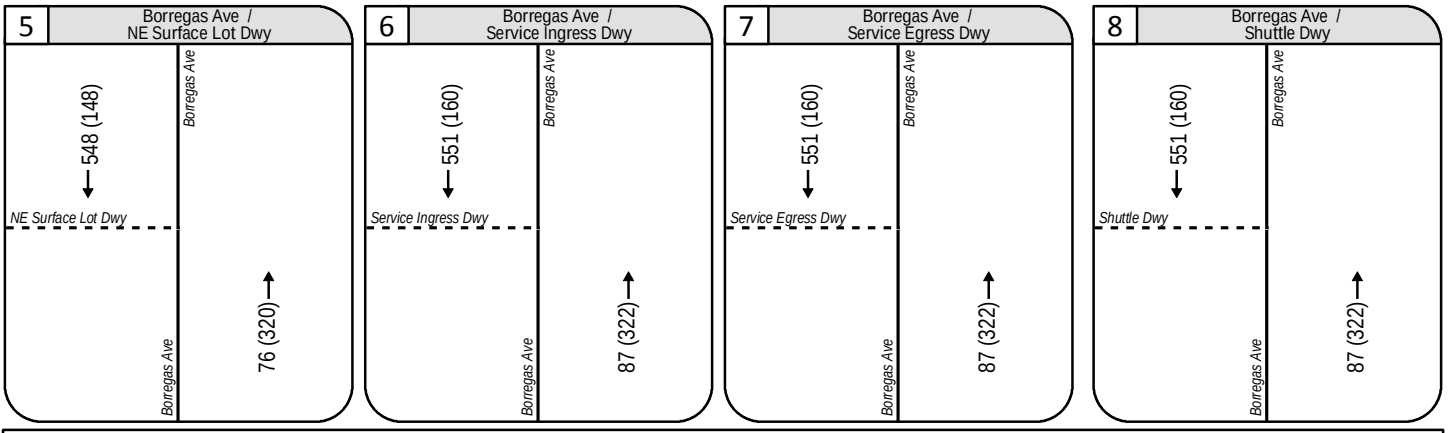
6.1 "CUMULATIVE" (NO PROJECT) CONDITIONS VOLUMES

"Cumulative" conditions traffic volumes were developed by adding trips generated by nearby "approved but not constructed" and "pending" developments to growth rated "Existing" conditions traffic volumes. In order to determine which nearby developments to include in "Cumulative" conditions, lists of approved and pending projects were obtained from City of Sunnyvale (dated June 15, 2018) and City of Santa Clara (dated April 30, 2018). As per City of Sunnyvale policy, projects that were designated as "approved" or "pending" on the list of approved and pending projects, that consisted of land uses larger than 20 residential units or 10,000 square-feet of office/commercial space, and which were located within or nearby the Project study area were selected to be a part of "Cumulative" conditions volumes.

Net new trips from "approved" developments within the Project vicinity were obtained from "Background" conditions, discussed in Section 4.1 of this TIA, and are included in **Appendix G.** Net new trips from the "pending" developments within the Project study area vicinity were either obtained from approved traffic studies or environmental documents for the development (when available) or estimated using typical *ITE Trip Generation Manual 10th Edition* rates and City of Sunnyvale and VTA trip reduction guidelines/ targets. These "pending" development trips were then assigned to the study area network using existing traffic volume patterns and available planning documents. "Cumulative" traffic volumes were obtained by applying a 1.5% per year growth rate to "Existing" traffic volumes and adding the assigned "pending" development trips and "approved" development trips. A full list of "pending" developments assumed under "Cumulative" conditions is included in **Appendix H**. "Pending" development trip generation worksheets are included in **Appendix I**, "pending" development trip distributions are included in **Appendix J**, and total "pending" development volumes are included in **Appendix K**. "Cumulative" study intersection turning movement volumes are presented in **Figure 17**.



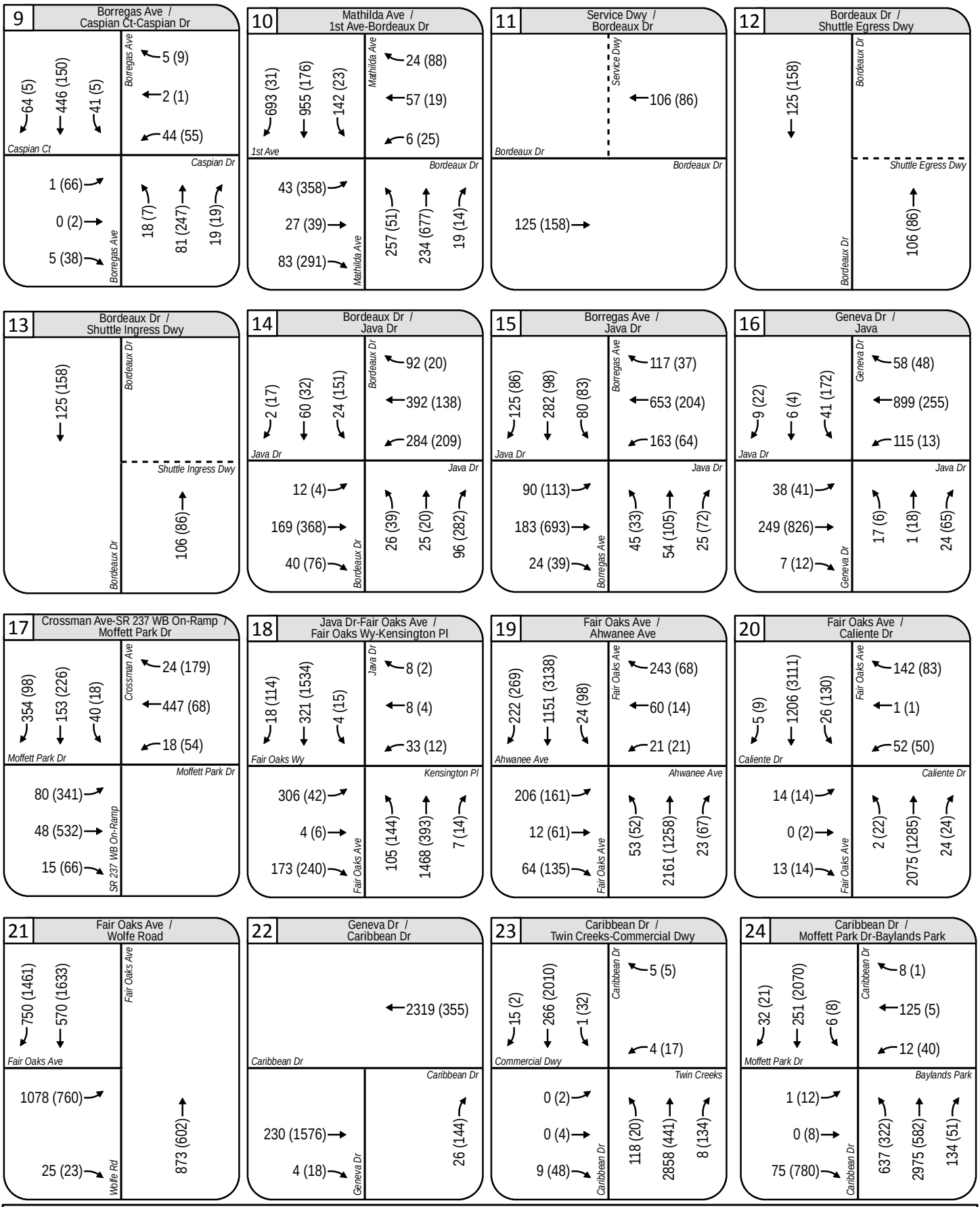




"Cumulative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 17

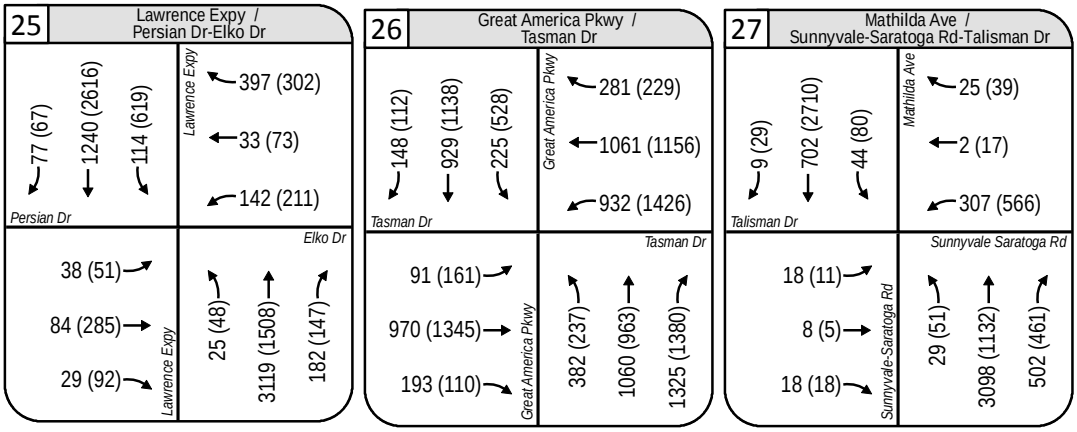
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



"Cumulative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 17-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



"Cumulative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 17-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

6.2 "CUMULATIVE" (NO PROJECT) IMPROVEMENTS

There are no identified roadway improvement projects assumed to be complete by long-term future "Cumulative" conditions within the Project study area beyond those identified under "Background" conditions. As such, "Cumulative" conditions intersection operations were quantified under the "Background" intersection lane geometrics and control shown in **Figure 14**.

6.3 "CUMULATIVE" (NO PROJECT) INTERSECTION OPERATIONS

"Cumulative" intersection operations were quantified under "Cumulative" traffic volumes (shown in **Figure 17**) and "Background" intersection lane geometrics and control (shown in **Figure 14**). **Table 18** illustrates the resulting "Cumulative" intersection LOS operations.

Table 18. "Cumulative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Cumulative Conditions		
					Delay (S/V)[1]	LOS	Wrnt Met?[2]
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
2	Caribbean Parking Garage Driveway (right-in right-out) / Caribbean Drive[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-
				PM	-	-	-
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	44.7	D	-
				PM	26.0	C	-
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-
				PM	-	-	-
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-
				PM	-	-	-
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	16.3	C	No
				PM	12.9	B	No
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	41.8	D	-
				PM	41.2	D	-
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-
				PM	-	-	-
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-
				PM	-	-	-
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-
				PM	-	-	-
14	Bordeaux Drive / Java Drive	Signal	D	AM	38.4	D+	-
				PM	44.7	D	-
15	Borregas Avenue / Java Drive	Signal	D	AM	40.7	D	-
				PM	31.9	C	-

Table 18. "Cumulative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Cumulative Conditions		
					Delay (S/V)[1]	LOS	Wrnt Met?[2]
16	Geneva Drive / Java Drive	Signal	D	AM	29.7	C	-
				PM	37.3	D+	-
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Signal	D	AM	21.3	C+	-
				PM	17.9	B	-
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	Signal	D	AM	43.9	D	-
				PM	44.2	D	-
19	Fair Oaks Avenue / Ahwanee Avenue	Signal	D	AM	29.5	C	-
				PM	**65.1**	**E**	-
20	Fair Oaks Avenue / Caliente Drive	Signal	D	AM	20.0	C+	-
				PM	33.5	C-	-
21	Fair Oaks Avenue / Wolfe Road	Signal	D	AM	28.0	C	-
				PM	21.8	C+	-
22	Geneva Drive / Caribbean Drive[4]	OWSC	E	AM	8.8	A	No
				PM	15.2	C	No
23	Caribbean Drive / Twin Creeks[4]	Signal	E	AM	36.7	D+	-
				PM	18.6	B-	-
24	Caribbean Drive / Moffett Park Drive-Baylands Park[4]	Signal	E	AM	45.8	D	-
				PM	44.0	D	-
25	Lawrence Expressway / Persian Drive-Elko Drive[4]	Signal	E	AM	31.6	C	-
				PM	46.1	D	-
26	Great America Parkway / Tasman Drive[3 4]	Signal	E	AM	**122.0**	**F**	-
				PM	**155.3**	**F**	-
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive[4]	Signal	E	AM	56.3	E+	-
				PM	**90.4**	**F**	-

Notes:
1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3.
3. CMP Intersection(s).
4. Regionally significant intersection(s).
***BOLD** indicates unacceptable level of service.*

As shown in **Table 18**, the following three (3) signalized intersections are projected to operate at unacceptable average intersection LOS "E/F" under "Cumulative" AM and/or PM peak hour conditions:

- #19 – Fair Oaks Avenue / Ahwanee Avenue
- #26 - Great America Parkway / Tasman Drive
- #27 - Mathilda Avenue / Sunnyvale Saratoga Road-Talisman Drive

All of the remaining study intersections are projected to operate at acceptable "Cumulative" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hour. All delay and LOS results shown in **Table 18** were calculated using TRAFFIX software. CA MUTCD based peak hour signal warrant 3 is not projected to be met at any study unsignalized intersections under "Cumulative" AM and PM peak hour conditions. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

7. "CUMULATIVE PLUS PROJECT" CONDITIONS

This chapter presents the study area intersection traffic operations results under "Cumulative plus Project" conditions.

7.1 "CUMULATIVE PLUS PROJECT" AND "CUMULATIVE PLUS PROJECT ALTERNATIVE" CONDITIONS VOLUMES

"Project Only" traffic volumes were added on top of "Cumulative" conditions traffic volumes at study intersections to generate "Cumulative plus Project" conditions traffic volumes. **Figure 18** illustrates the estimated AM and PM peak hour "Cumulative plus Project" conditions traffic volumes at study intersections.

"Project Alternative Only" traffic volumes were also added on top of "Cumulative" conditions traffic volumes at study intersections to create "Cumulative plus Project Alternative" conditions traffic volumes. **Figure 19** illustrates the estimated AM and PM peak hour "Cumulative plus Project Alternative" conditions traffic volumes at study intersections.

7.2 "CUMULATIVE PLUS PROJECT" INTERSECTION OPERATIONS

"Cumulative plus Project" intersection operations were quantified under "Cumulative plus Project" traffic volumes (shown in **Figure 18**), "Background" intersection lane geometrics and control (shown in **Figure 14**), and proposed Project driveway configurations (shown in **Figure 7**). **Table 19** illustrates the resulting "Cumulative plus Project" intersection LOS operations. **Table 19** also contains "Cumulative" conditions intersection delays and LOS for comparison purposes, as well as the projected change in delay of critical movements and critical V/C ratio caused by the addition of Project generated trips. The projected change in delay of critical movements and critical V/C ratio were reported for use in identifying significant impacts.

As shown in **Table 19**, the following three (3) signalized intersections are projected to operate at unacceptable average intersection LOS "E/F" under "Cumulative plus Project" AM and/or PM peak hour conditions:

- #19 - Fair Oaks Avenue / Ahwanee Avenue
- #26 - Great America Parkway / Tasman Drive
- #27 - Mathilda Avenue / Sunnyvale Saratoga Road-Talisman Drive

All of the remaining study intersections are projected to operate at acceptable "Cumulative plus Project" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hour. All delay and LOS results shown in **Table 19** were calculated using TRAFFIX software. CA MUTCD based peak hour signal warrant 3 is not projected to be met at any study unsignalized intersections under "Cumulative plus Project" AM and PM peak hour conditions. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.

7.3 "CUMULATIVE PLUS PROJECT ALTERNATIVE" INTERSECTION OPERATIONS

"Cumulative plus Project Alternative" intersection operations were quantified under "Cumulative plus Project Alternative" traffic volumes (shown in **Figure 19**), "Background" intersection lane

geometrics and control (shown in **Figure 14**), and proposed Project driveway configurations (shown in **Figure 7**). **Table 20** illustrates the resulting "Cumulative plus Project Alternative" intersection LOS operations. LOS operations are only shown at study intersections 1-15 as these are the only locations where "Cumulative plus Project Alternative" results differ from "Cumulative plus Project" results. **Table 20** also contains "Cumulative" conditions intersection delays and LOS for comparison purposes, as well as the projected change in delay of critical movements and critical V/C ratio caused by the addition of Project generated trips. The projected change in delay of critical movements and critical V/C ratio were reported for use in identifying significant impacts.

As shown in **Table 20**, the following unsignalized intersection is projected to operate at unacceptable worst-case movement LOS "F" under "Cumulative plus Project Alternative" PM peak hour conditions:

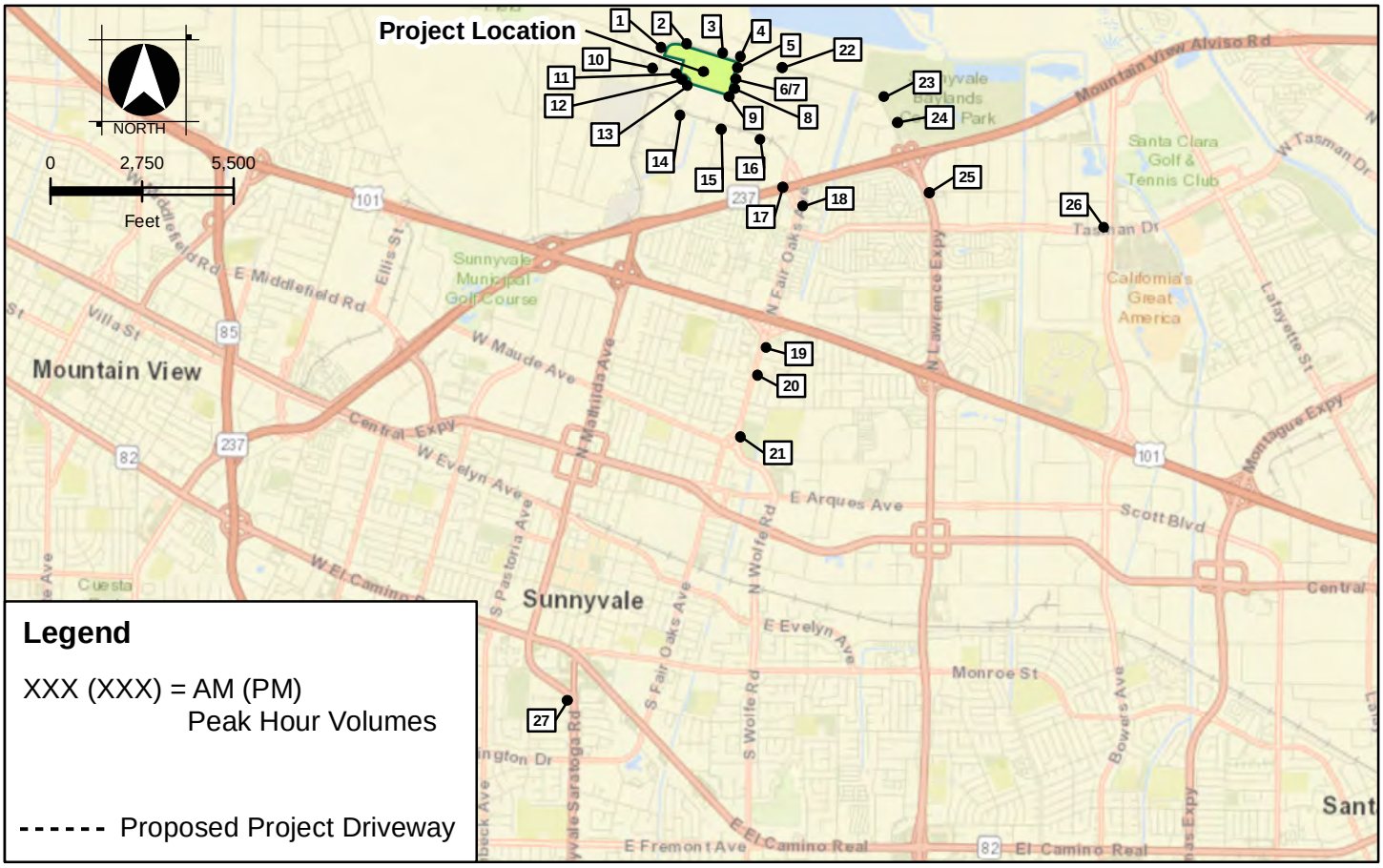
- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

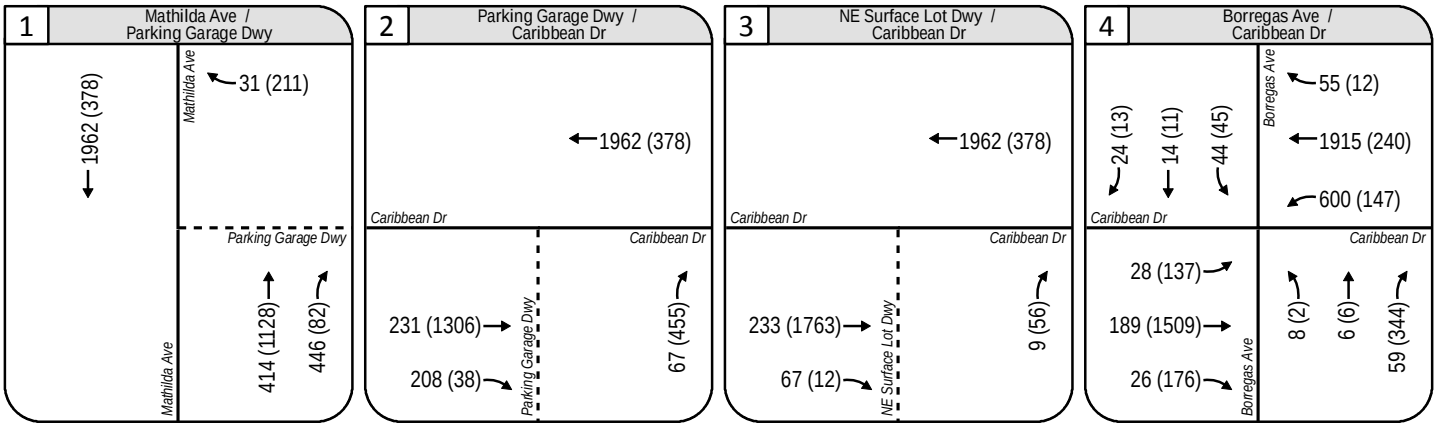
CA MUTCD based peak hour signal warrant 3 is projected to be met at the following unsignalized intersection under "Cumulative plus Project Alternative" PM peak hour conditions:

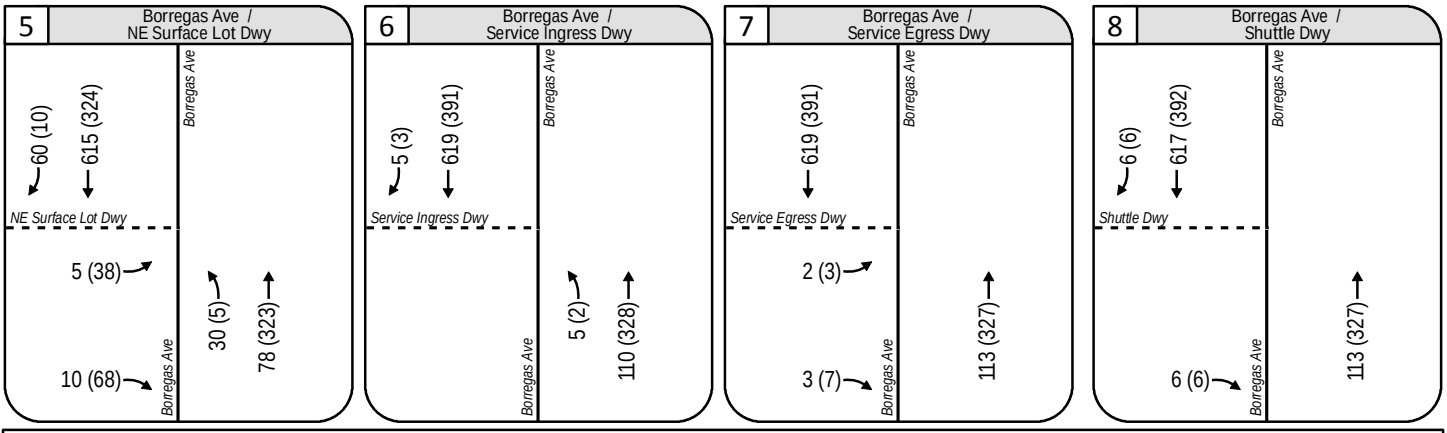
- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

All of the remaining "Project Alternative" study intersections (i.e. intersections 1, and 3-15) are projected to operate at acceptable "Cumulative plus Project Alternative" level of service conditions (LOS "D" or better for City of Sunnyvale intersections and LOS "E" or better for Santa Clara County, regionally significant, and CMP intersections) during the AM and PM peak hour. CA MUTCD based peak hour signal warrant 3 is not projected to be met at any of the remaining study unsignalized intersections under "Cumulative plus Project" AM and PM peak hour conditions. All delay and LOS results shown in **Table 20** were calculated using TRAFFIX software. TRAFFIX software intersection LOS outputs can be found in **Appendix B**, and CA MUTCD signal warrant 3 worksheets can be found in **Appendix C.**

All recommended improvements and mitigation measures are discussed in a subsequent section of this TIA report.







"Cumulative plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 18

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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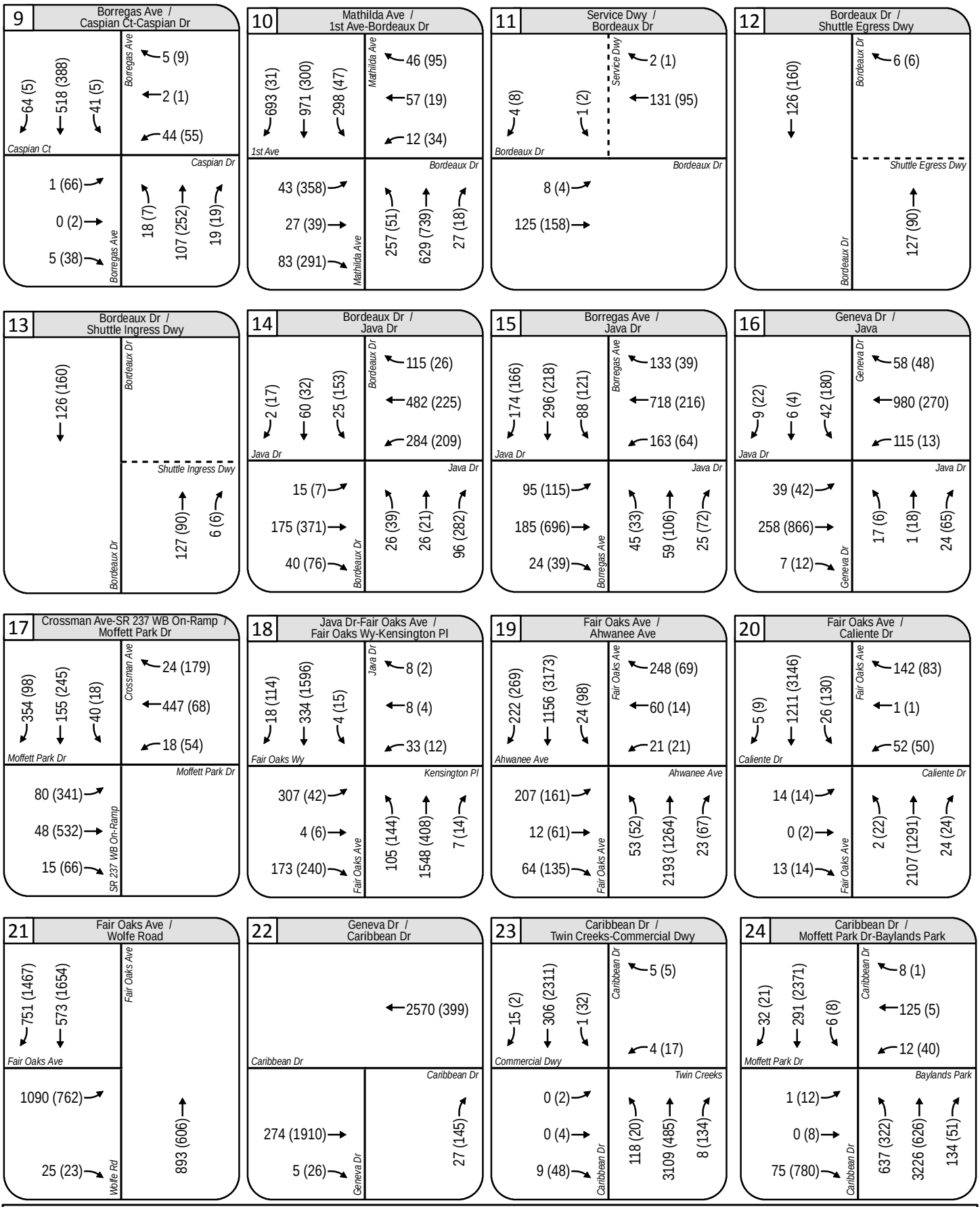
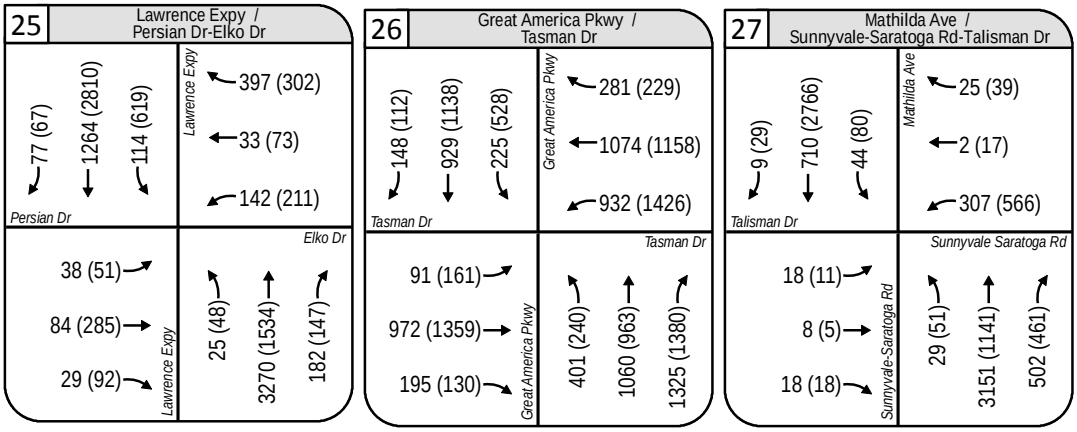


"Cumulative plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 18-2

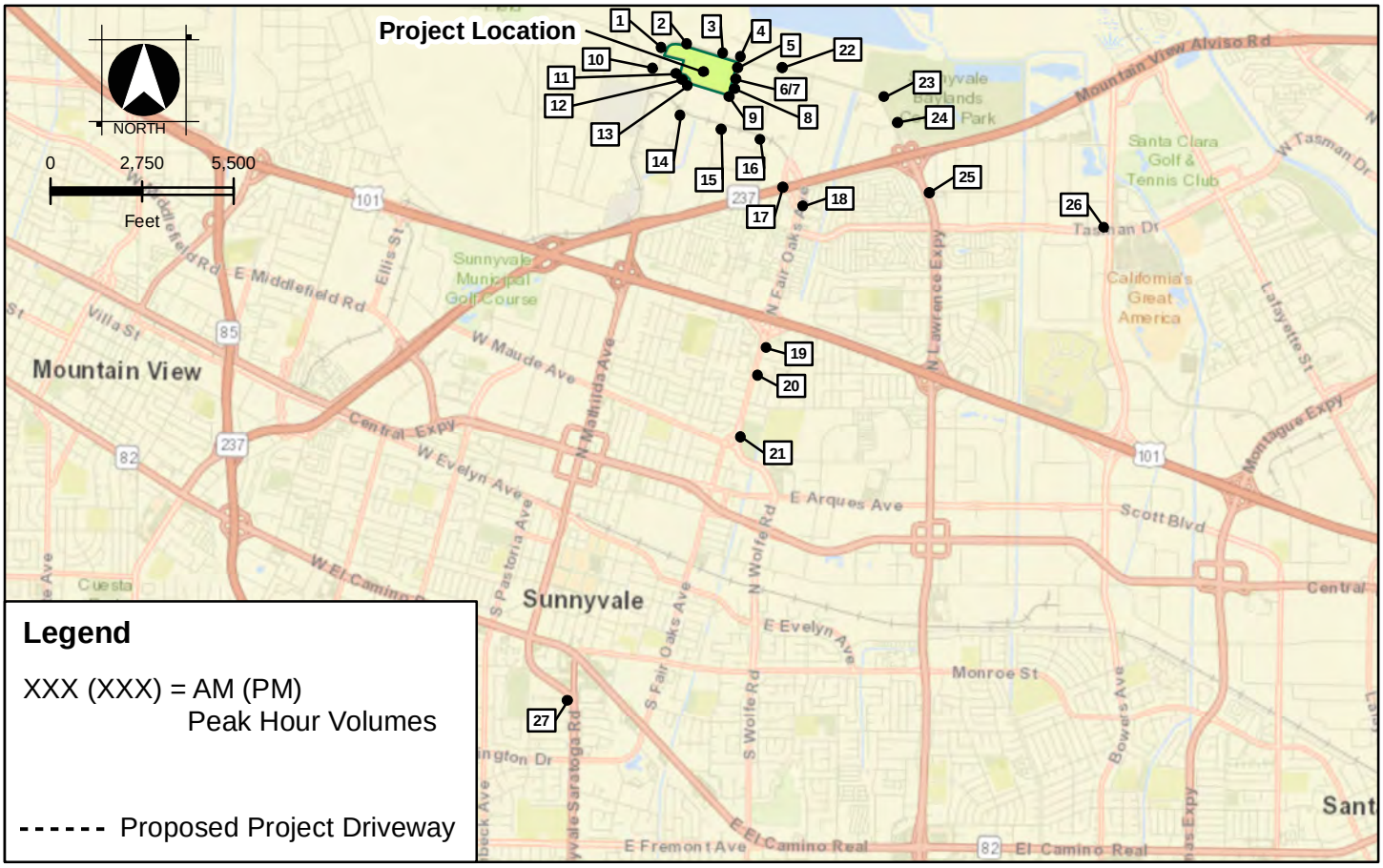
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

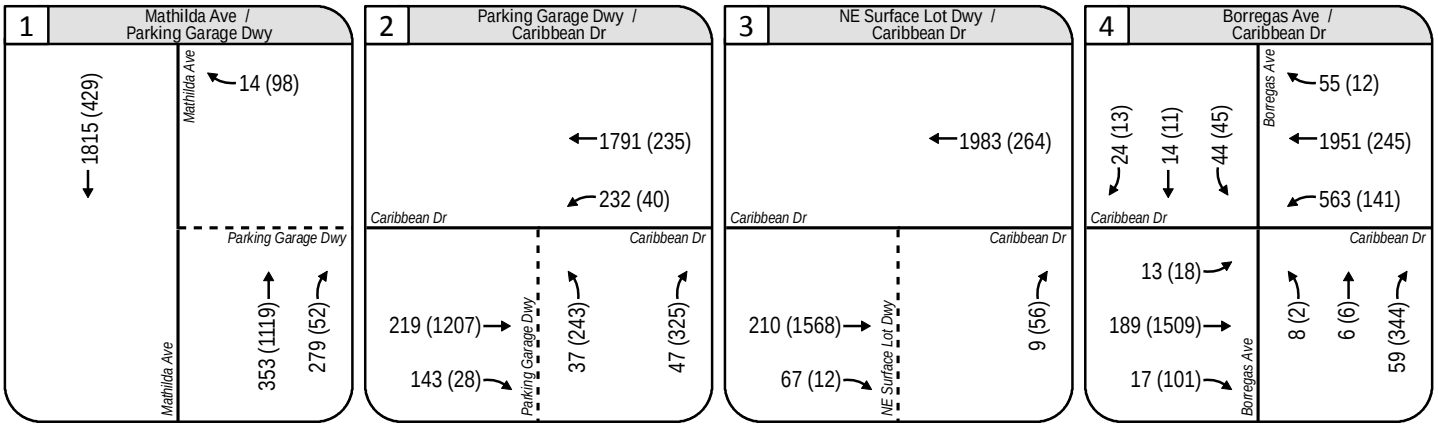


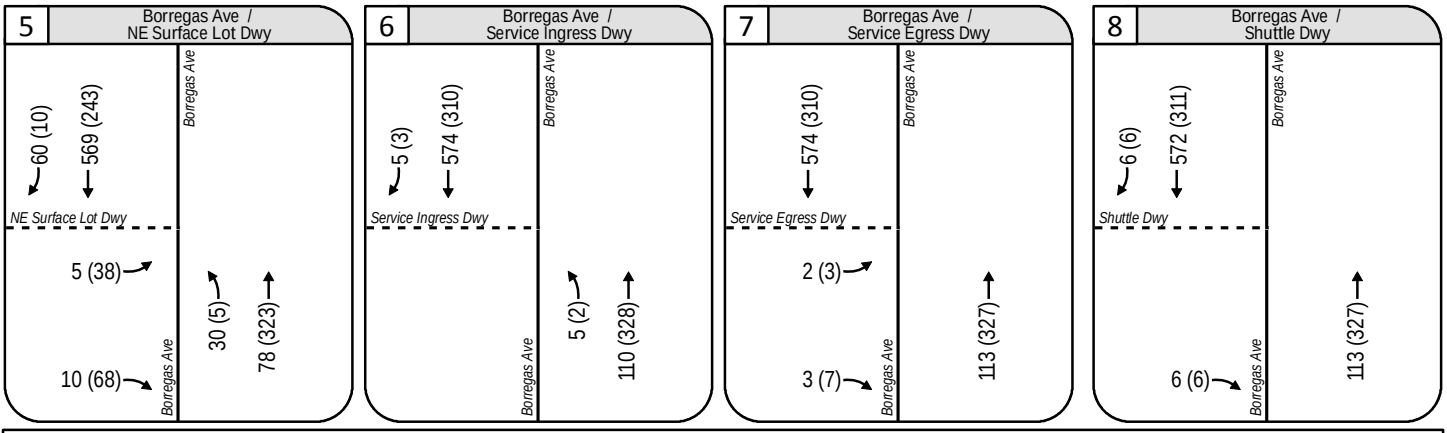
"Cumulative plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 18-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







"Cumulative plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 19

WOOD RODGERS

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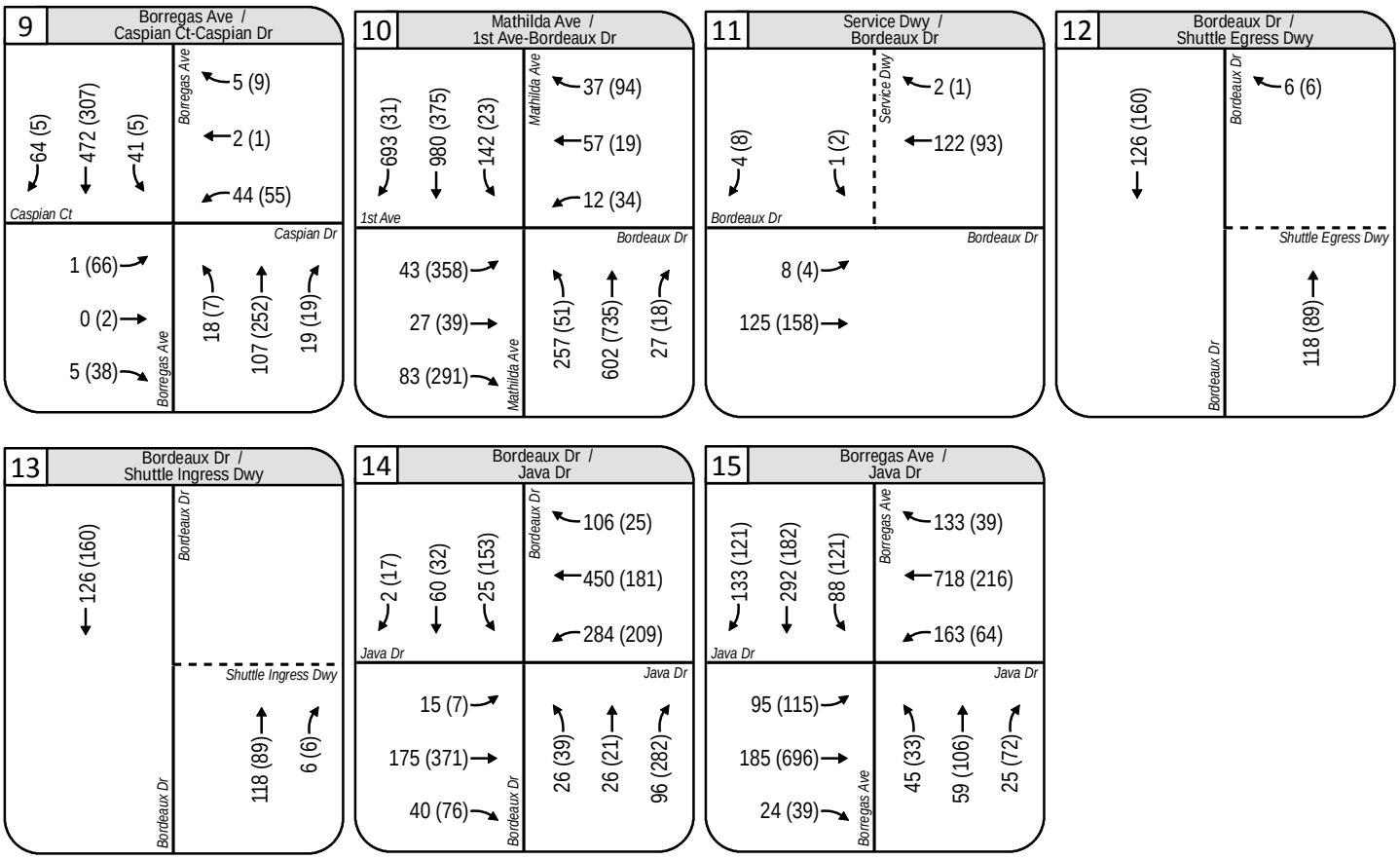


"Cumulative plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 19-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

Table 19. "Cumulative plus Project" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Cumulative Conditions			Cumulative plus Project Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-	10.9	B	No	0.048	0.1
				PM	-	-	-	14.5	B	No	0.357	1.7
2	Caribbean Parking Garage Driveway (right-in right-out) / Caribbean Drive[4]	OWSC	E	AM	-	-	-	9.7	A	No	0.080	0.3
				PM	-	-	-	33.8	D	No	0.815	7.1
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-	8.9	A	No	0.010	0.0
				PM	-	-	-	14.1	B	No	0.124	0.4
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	44.7	D	-	71.0	E	-	0.076	43.9
				PM	26.0	C	-	30.7	C	-	0.116	3.4
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-	13.4	B	No	0.032	0.6
				PM	-	-	-	12.6	B	No	0.094	1.8
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-	8.7	A	-	0.005	0.1
				PM	-	-	-	8.1	A	-	0.002	0.0
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-	13.2	B	No	0.006	0.1
				PM	-	-	-	11.6	B	No	0.011	0.2
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-	12.4	B	No	0.012	0.1
				PM	-	-	-	10.5	B	No	0.009	0.1
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	16.3	C	No	18.4	C	No	0.021	-0.1
				PM	12.9	B	No	17.0	C	No	0.058	-0.3
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	41.8	D	-	42.8	D	-	0.015	-0.4
				PM	41.2	D	-	42.6	D	-	0.053	0.6
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	9.1	A	No	0.005	0.4
				PM	-	-	-	9.0	A	No	0.008	0.4
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	8.9	A	No	0.006	0.2
				PM	-	-	-	8.7	A	No	0.006	0.2
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-	0.0	A	-	0.000	0.0
				PM	-	-	-	0.0	A	-	0.000	0.0
14	Bordeaux Drive / Java Drive	Signal	D	AM	38.4	D+	-	38.1	D+	-	0.004	-0.2
				PM	44.7	D	-	44.1	D	-	0.003	0.5

Table 19. "Cumulative plus Project" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Cumulative Conditions			Cumulative plus Project Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
15	Borregas Avenue / Java Drive	Signal	D	AM	40.7	D	-	39.8	D	-	-0.025	1.5
				PM	31.9	C	-	32.8	C-	-	0.034	2.3
16	Geneva Drive / Java Drive	Signal	D	AM	29.7	C	-	30.3	C	-	0.029	0.9
				PM	37.3	D+	-	38.1	D+	-	0.019	1.0
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	Signal	D	AM	21.3	C+	-	21.4	C+	-	0.000	0.0
				PM	17.9	B	-	18.4	B-	-	0.012	0.5
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	Signal	D	AM	43.9	D	-	46.1	D	-	0.026	2.9
				PM	44.2	D	-	47.7	D	-	0.019	4.7
19	Fair Oaks Avenue / Ahwanee Avenue	Signal	D	AM	29.5	C	-	29.4	C	-	0.014	0.8
				PM	**65.1**	**E**	-	**68.4**	**E**	-	0.008	4.6
20	Fair Oaks Avenue / Caliente Drive	Signal	D	AM	20.0	C+	-	20.6	C+	-	0.010	0.9
				PM	33.5	C-	-	35.5	D+	-	0.008	3.0
21	Fair Oaks Avenue / Wolfe Road	Signal	D	AM	28.0	C	-	28.4	C	-	0.001	0.4
				PM	21.8	C+	-	21.9	C+	-	0.003	0.1
22	Geneva Drive / Caribbean Drive[4]	OWSC	E	AM	8.8	A	No	8.9	A	No	0.001	0.0
				PM	15.2	C	No	18.2	C	No	0.057	0.1
23	Caribbean Drive / Twin Creeks[4]	Signal	E	AM	36.7	D+	-	62.1	E	-	0.054	29.1
				PM	18.6	B-	-	20.9	C+	-	0.067	2.9
24	Caribbean Drive / Moffett Park Drive-Baylands Park[4]	Signal	E	AM	45.8	D	-	68.4	E	-	0.050	30.3
				PM	44.0	D	-	55.5	E+	-	0.063	14.1
25	Lawrence Expressway / Persian Drive-Elko Drive[4]	Signal	E	AM	31.6	C	-	31.8	C	-	0.022	0.4
				PM	46.1	D	-	46.6	D	-	0.004	0.2
26	Great America Parkway / Tasman Drive[3 4]	Signal	E	AM	**122.0**	**F**	-	**124.0**	**F**	-	0.001	0.1
				PM	**155.3**	**F**	-	**156.2**	**F**	-	0.005	1.9
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive[4]	Signal	E	AM	56.3	E+	-	59.5	E+	-	0.010	3.9
				PM	**90.4**	**F**	-	**95.4**	**F**	-	0.012	6.8

Notes: 1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3;
3. CMP Intersection(s);
4. Regionally significant intersection(s).
***BOLD** indicates unacceptable level of service.*
***SHADED** indicates a significant impact.*

Table 20. "Cumulative plus Project Alternative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Cumulative Conditions			Cumulative plus Project Alternative Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
1	Mathilda Avenue / Mathilda Parking Garage Driveway[4]	OWSC	E	AM	-	-	-	9.9	A	No	0.019	0.1
				PM	-	-	-	12.1	B	No	0.162	0.7
2	Caribbean Parking Garage Driveway (full-access) / Caribbean Drive[4]	OWSC	E	AM	-	-	-	25.7	D	No	0.302	1.7
				PM	-	-	-	**212.5**	**F**	Yes	1.861	58.3
3	Caribbean NE Surface Lot Driveway / Caribbean Drive[4]	OWSC	E	AM	-	-	-	8.9	A	No	0.010	0.0
				PM	-	-	-	13.1	B	No	0.112	0.4
4	Borregas Avenue / Caribbean Drive[4]	Signal	E	AM	44.7	D	-	68.8	E	-	0.049	23.8
				PM	26.0	C	-	28.4	C	-	0.096	2.3
5	Borregas Avenue / Borregas NE Surface Lot Driveway	OWSC	D	AM	-	-	-	12.9	B	No	0.031	0.6
				PM	-	-	-	11.7	B	No	0.085	1.9
6	Borregas Avenue / Borregas Service Ingress Driveway	None	D	AM	-	-	-	8.6	A	No	0.005	0.1
				PM	-	-	-	7.9	A	No	0.002	0.0
7	Borregas Avenue / Borregas Service Egress Driveway	OWSC	D	AM	-	-	-	12.7	B	No	0.006	0.1
				PM	-	-	-	11.0	B	No	0.010	0.2
8	Borregas Avenue / Borregas Shuttle Driveway	OWSC	D	AM	-	-	-	12.0	B	No	0.012	0.1
				PM	-	-	-	10.0	A	No	0.008	0.1
9	Borregas Avenue / Caspian Court-Caspian Drive	TWSC	D	AM	16.3	C	No	17.3	C	No	0.010	-0.1
				PM	12.9	B	No	15.4	C	No	0.036	-0.3
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive[4]	Signal	E	AM	41.8	D	-	40.8	D	-	0.009	-0.3
				PM	41.2	D	-	41.7	D	-	0.081	1.2
11	Bordeaux Service Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	9.1	A	No	0.005	0.4
				PM	-	-	-	9.0	A	No	0.008	0.4
12	Bordeaux Shuttle Egress Driveway / Bordeaux Drive	OWSC	D	AM	-	-	-	8.9	A	No	0.006	0.2
				PM	-	-	-	8.7	A	No	0.006	0.2
13	Bordeaux Shuttle Ingress Driveway / Bordeaux Drive	None	D	AM	-	-	-	0.0	A	No	0.000	0.0
				PM	-	-	-	0.0	A	No	0.000	0.0

Table 20. "Cumulative plus Project Alternative" Conditions Intersection Traffic Operations

#	Intersection	Control Type	LOS Criteria	Peak Hour	Cumulative Conditions			Cumulative plus Project Alternative Conditions				
					Delay (S/V)[1]	LOS	Wrnt Met?[2]	Delay (S/V)[1]	LOS	Wrnt Met?[2]	Δ in Critical V/C	Δ in Critical Delay
14	Bordeaux Drive / Java Drive	Signal	D	AM	38.4	D+	-	38.1	D+	-	0.004	-0.2
				PM	44.7	D	-	44.5	D	-	0.003	0.5
15	Borregas Avenue / Java Drive	Signal	D	AM	40.7	D	-	38.5	D+	-	-0.025	1.5
				PM	31.9	C	-	33.1	C-	-	0.034	2.3

Notes:
1. For OWSC (One-Way-Stop-Control) and TWSC (Two-Way-Stop-Control) intersections, "worst-case" movement delay is indicated. "Average" control delays (in seconds/vehicle) are indicated for signal-Control intersections.
2. Wrnt Met? = CA MUTCD based Peak-hour-Volume Warrant #3.
3. CMP Intersection(s).
4. Regionally significant intersection(s).
***BOLD** indicates unacceptable level of service.*
***SHADED** indicates a significant impact.*

8. SITE ACCESS AND CIRCULATION

This chapter reviews the proposed Project site plan, including discussion of site access driveways, internal queuing, internal circulation, pedestrian and bicycle facilities, on-site parking, and potential aisle or parking conflicts.

8.1 PROJECT ACCESS DRIVEWAYS

Based on the current Project site plan, the proposed Project would gain access to the nearby roadway network via 10 proposed Project access driveways. The 10 project access driveways are described below:

100 West Caribbean Drive Driveways:

#3 Caribbean Northeast Surface Lot Driveway: A right-in right-out driveway that would extend south from Caribbean Drive approximately 450 feet west of Borregas Avenue. An existing raised median along Caribbean Drive would prevent any left-turn movements at this driveway. This driveway would provide access to the surface parking lot on the northeast corner of the 100 West Caribbean Drive Parcel. The Caribbean Northeast Surface Lot Driveway would be single lane in, single lane out, and egress stop-controlled, with Caribbean Drive traffic having the right-of-way.

#5 Borregas Northeast Surface Lot Driveway: A full-access driveway that would extend west from Borregas Avenue approximately 150 feet south of Caribbean Drive. This driveway would provide access to the surface parking lot on the northeast corner of the 100 West Caribbean Drive parcel. The Borregas Northeast Surface Lot Driveway would be single lane in, single lane out, and egress stop-controlled, with Borregas Avenue traffic having the right-of-way.

#6 Borregas Service Ingress Driveway: An ingress-only service driveway that would extend west from Borregas Avenue approximately 500 feet south of Caribbean Drive. Right and left turns into this driveway would be allowed. This driveway would be restricted to service vehicles only and provide access to the loading dock and waste collection area. This driveway should experience minimal traffic during the peak hours. The Borregas Service Ingress Driveway would be single lane in and uncontrolled.

#7 Borregas Service Egress Driveway: An egress-only service driveway that would extend west from Borregas Avenue approximately 650 feet south of Caribbean Drive. Right and left turns out of this driveway would be allowed. This driveway would be restricted to service vehicles only and therefore is anticipated to experience minimal traffic during the peak hours. The Borregas Service Egress Driveway would be single lane out and egress stop-controlled, with Caribbean Drive traffic having the right-of-way.

#8 Borregas Shuttle Driveway: A right-in right-out shuttle driveway that would extend west from Borregas Avenue approximately 225 feet north of Caspian Drive. This driveway would be utilized by arriving and departing shuttles only and would provide access to a shuttle drop off loop on the southeast corner of the 100 Caribbean Drive parcel. The site plan currently does not identify preventing left-turns at this driveway, however shuttle drivers would presumably drive on routes and only make right turns in and out of this driveway. Volumes at this driveway would be controlled by frequency of the shuttles. The Borregas Shuttle Driveway would be single lane in, single lane out, and egress stop-controlled, with Borregas Avenue traffic having the right-of-way.

200 West Caribbean Drive Driveways:

#1 Mathilda Parking Garage Driveway: A right-in right-out driveway that would extend east from Mathilda Avenue approximately 425 feet north of Bordeaux Drive. An existing raised median along Mathilda Avenue would prevent left-turn movements at this driveway. This driveway would provide access to the parking garage and surface lots on the northwest corner of the 200 West Caribbean Drive parcel. The Mathilda Parking Garage Driveway would be single lane in, single lane out, and egress stop-controlled, with Mathilda Avenue traffic having the right-of-way.

#2 Caribbean Parking Garage Driveway: A driveway that would extend south from Caribbean Drive approximately 425 feet east of the end of the Mathilda Avenue-Caribbean Drive curve. There is currently an existing raised median along Caribbean Drive adjacent to where this driveway would be located. This driveway would provide access to the parking garage and surface lots on the northwest corner of the 200 West Caribbean Drive parcel. Caribbean Parking Garage Driveway would be configured as one of two potential alternatives:

i. Caribbean Parking Garage Driveway Alternative 1 is a right-in right-out, one-way stop-controlled driveway. The driveway would be single lane in, single lane out, and egress stop controlled, with Caribbean Drive traffic having the right-of-way. This is considered the proposed Project.
ii. Caribbean Parking Garage Driveway Alternative 2 is a full-access, one-way stop-controlled driveway. The driveway would have one egress left-turn lane, one egress right-turn pocket, and one receiving lane. The driveway would be egress stop controlled, with Caribbean Drive traffic having the right-of-way. A westbound left turn pocket would be constructed in the current center median of Caribbean Drive to allow vehicles to make a westbound-left into the Project site. This is considered the Project Alternative.

#11 Bordeaux Service Driveway: A full access service driveway that would extend north from Bordeaux Drive approximately 650 feet east of Mathilda Avenue. This driveway would be restricted to service vehicles only and therefore should experience minimal traffic during the peak hours. The Bordeaux Service Driveway would be single lane in, single lane out and egress stop-controlled, with Bordeaux Drive traffic having the right-of-way.

#12 Bordeaux Shuttle Egress Driveway: A right-out, egress only shuttle driveway that would extend east from Bordeaux Drive approximately 900 feet north of Java Drive. This driveway would be utilized by departing shuttles only and would provide access from a shuttle drop off loop on the southwest corner of the 200 Caribbean Drive parcel. The site plan currently does not show anything that would prevent left-turns at this driveway, however shuttle drivers would presumably drive on routes and only make right turns out of this driveway. Volumes at this driveway would be controlled by frequency of the shuttles. The Bordeaux Shuttle Egress Driveway would be single lane out and egress stop-controlled, with Bordeaux Drive traffic having the right-of-way.

#13 Bordeaux Shuttle Ingress Driveway: A right-in, ingress only shuttle driveway that would extend east from Bordeaux Drive approximately 725 feet north of Java Drive. This driveway would be utilized by arriving shuttles only and would provide access to a shuttle drop off loop on the southwest corner of the 200 Caribbean Drive parcel. The site plan currently does identify preventing left-turns at this driveway, however shuttle drivers would presumably drive on routes and only make right turns into this driveway. Volumes at this driveway would be controlled by frequency of the shuttles. The Bordeaux Shuttle Ingress Driveway would be single lane in and uncontrolled.

8.1.1 Project Access Driveway Throat Lengths

Driveway throat length is defined in the *National Cooperative Highway Research Program* (NCHRP) *Report 659* (Transportation Research Board, 2010) as the distance from the outer edge of the traveled way of the intersecting roadway to the first point along the driveway at which there are conflicting vehicular traffic movements. Proposed driveway throat lengths were measured off of the current Project site plan and are shown in **Table 21**.

The adequacy of the proposed throat length of each of the four primary Project driveways (i.e. driveways that provide access to the parking lots) was analyzed using methodologies defined in NCHRP 659. Service and shuttle driveways were not analyzed as they are not proposed to have typical internal conflicts (such as parking stalls or drive aisles) near the driveway throat and would experience minimal traffic.

Per the NCHRP 659 section on "Minimum Length of Driveway Throat" (pages 57-63), three primary factors were considered: sufficient length for ingress vehicles to react to conflicts (Ingress Stopping Sight Distance), sufficient length to avoid spillback onto public roads (Ingress Queuing), and sufficient length to avoid spillback into the internal circulation (Egress Queuing). These three factors were analyzed as follows:

Ingress Stopping Sight Distance

Ingress stopping sight distance is the amount of distance a vehicle entering the site would need to be able to identify and stop for a conflict in the internal circulation system, such as a vehicle backing out of a parking stall or an internal intersection. Required ingress stopping sight distance at each project driveway was calculated using the stopping sight distance equation provided on page 63 of NCHRP 659. All variables used in this equation were based on default values defined in NCHRP 659, *A Policy on Geometric Design of Highways and Streets 2011 6th Edition* (AASHTO Green Book, by American Association of State Highway and Transportation Officials, last updated November 2013), or the current Project site plan. Calculations for ingress stopping sight distance are included in **Appendix L**. Calculated required stopping sight distances are shown in **Table 21**.

Ingress Queuing

Potential on-site queue lengths of ingress vehicles were approximated by looking at the average queue lengths at the upstream signal under "Existing plus Project" AM peak hour conditions, the capacity of the corresponding signal phase, and the percentage of traffic that would turn into each driveway, to approximate the size of a platoon of vehicles that could potentially enter the site at one time. It was assumed that if this platoon of vehicles encountered a conflict on-site, the driveway throat length would have to be a sufficient length to allow the entire platoon to stop on-site temporarily without traffic spilling back to the adjacent public roads. Queue lengths and signal phase capacities were estimated from TRAFFIX software. Calculations for ingress queue lengths are included in **Appendix M**. Calculated required internal queue storage lengths are shown in **Table 21**.

Egress Queuing

Per NCHRP 659, driveway throat length needs to be long enough to prevent egress queues from spilling back to and blocking internal circulation roads. Egress 95th percentile queues at each driveway were estimated under "Cumulative plus Project" (i.e. worst-case) conditions at each Project driveway using TRAFFIX software. TRAFFIX software intersection queuing outputs can be found in **Appendix B**. Egress 95th percentile queues at Project driveways are shown in **Table 21** below.

Table 21. Proposed and Minimum Required Driveway Throat Lengths

Intx. #	Project Driveway	Proposed Throat Length (ft)[1]	Required Throat Length Egress		Required Throat Length Ingress			Does Proposed Throat Length Meet Minimum Required?
			AM Egress Queue Length (ft)[2]	PM Egress Queue Length (ft)[2]	Stopping Sight Distance (ft)[3]	AM Ingress Queuing (ft)	Minimum Ingress Throat Length (ft)[4]	
1	Mathilda Parking Garage Dwy	180	25	50	60	250	**310**	No
2	Caribbean Parking Garage Dwy (Right-In Right-Out Alt.)	190	25	**225**	60	125	185	No
	Caribbean Parking Garage Dwy (Full Access Alt.)	190	50	**475**	65	125	190	No
3	Caribbean NE Surface Lot Dwy	50	25	25	60	50	**110**	No
5	Borregas NE Surface Lot Dwy	50	25	25	65	50	**115**	No

Notes:
1. Based on proposed site plan (Bjarke Ingels Group, et al., Rev. 07/11/2018). Proposed throat length calculated based on NCHRP Report 659, Exhibit 5-52.
2. Projected queue length calculated using TRAFFIX software.
3. Per National Cooperative Highway Research program (NCHRP) Report 659, equation on page 63.
4. Minimum Ingress Throat Length = Stopping Sight Distance + AM Ingress Queuing
***BOLD** = Minimum Required Throat Length. (The longest of the Required Throat Length Egress and Required Throat Length Ingress values is selected as the overall Minimum Required Throat Length for each driveway)*

Per NCHRP 659, the longest required egress or ingress throat length for each driveway shown in **Table 21** above would typically be considered the minimum required throat length for the driveway. The minimum egress throat length is the higher of the AM egress queue length and the PM egress queue length. The minimum ingress throat length is calculated by summing stopping sight distance and AM queue lengths. Minimum ingress throat length is projected to provide sufficient space to accommodate AM ingress queuing and allow vehicles approaching the queue enough time to stop before reaching the end of the ingress queue. The proposed Project driveway throat lengths would not meet the minimum required throat lengths shown in **Table 21**.

8.1.1.1 Recommendations

The proposed Project shall construct driveways with the following minimum throat lengths at these driveway locations:

- #1 Mathilda Parking Garage Driveway: 310 feet
- #2 Caribbean Parking Garage Driveway (Right-In Right-Out): 200 feet
- #2 Caribbean Paring Garage Driveway (Full-Access): 475 feet
- #3 Caribbean Northeast Surface Lot Driveway: 110 feet
- #5 Borregas Northeast Surface Lot Driveway: 115 feet

8.1.2 Project Driveway Turn Pockets and Deceleration Lanes

Adequate driveway throat lengths (discussed in Section 8.1.1) will not prevent vehicles entering the Project site from temporarily queuing in the adjacent public roadways while a pedestrian is crossing a driveway via the proposed pedestrian sidewalks and/or multi-use paths that will run along the perimeter of the site. Additionally, based on the proposed Project site plan, vehicles would have to slow down in a through lane to turn right into the Project site on the relatively high speed Mathilda Avenue and Caribbean Drive, conflicting with through vehicles.

Construction of right-turn deceleration lanes, under both the Project and Project Alternative, at the Mathilda Parking Garage Driveway, Caribbean Parking Garage Driveway, and Caribbean Northeast Surface Lot Driveway would help alleviate vehicles queuing and the slowing down of traffic in through lanes on Mathilda Avenue and Caribbean Drive. Assuming a design speed of approximately 50 miles per hour on Mathilda Avenue and Caribbean Drive, AASHTO Green Book Table 10-5 specifies a minimum deceleration lane length of at least 435 feet. However, for the Mathilda Parking Garage Driveway, the construction of a right-turn deceleration lane is not feasible due to right-of-way constraints. For the Caribbean Northeast Surface Lot Driveway, a 175 foot right-turn deceleration lane shall be constructed due to the proximity of the driveway to the SCVWD West Channel outfall.

Under the Project Alternative, a westbound left-turn pocket is proposed to be constructed in the current center median of Caribbean Drive to allow vehicles to make a westbound-left into the Project site without queuing in the through lanes. Based on projected "Cumulative plus Project Alternative" conditions (i.e. worst case) 95th percentile queuing at Caribbean Parking Garage Driveway (full-access), the westbound left-turn pocket requires a minimum of 100 feet of storage.

If the Caribbean Parking Garage Driveway were to be signalized, an eastbound right-turn pocket would be needed. Based on projected "Cumulative plus Project Alternative" conditions (i.e. worst case) 95th percentile queuing at Caribbean Parking Garage Driveway (signalized), the eastbound right- turn pocket requires a minimum of 150 feet of storage. Additionally, if this intersection were to be signalized, the westbound left-turn pocket requires a minimum of 225 feet of storage based on projected "Cumulative plus Project Alternative" conditions (i.e. worst case) 95th percentile queuing at Caribbean Parking Garage Driveway (signalized).

8.1.2.1 Recommendations

The Project shall install the following deceleration lanes and/or turn pockets at intersection #2 Caribbean Parking Garage Driveway / Caribbean Drive under the given conditions:

- "plus Project" (right-in/right-out, unsignalized) conditions:
    - Eastbound right-turn deceleration lane – 435 feet in length
- "plus Project Alternative" (full-access, unsignalized) conditions:
    - Eastbound right-turn deceleration lane – 435 feet in length
    - Westbound left-turn storage pocket – 100 feet in length
- "plus Project Alternative" (signalized) conditions:
    - Eastbound right-turn storage pocket – 150 feet in length
    - Westbound left-turn storage pocket – 225 feet in length

The project shall install a 175 foot right-turn deceleration lane at intersection #3 Caribbean Northeast Surface Lot Driveway under all Project conditions.

8.1.3 Sight Distance at Project Access Driveways

Sight distance analysis was performed at all proposed Project access driveways. All sight distance analyses were performed based on standards contained in Chapters 3 and 9 of the AASHTO Green Book for typical roadway intersections. Section 9.11.6 of the AASHTO Green Book states the following regarding driveways:

> *"It is desirable that they [driveways] be designed and located to meet criteria for intersection sight distance and other design elements set forth in this chapter. However, where this is not practical, they should be located to provide the best reasonable sight distance and meet other design criteria to the extent practicable considering such factors as functional class, speed, and traffic volume of the roadway relative to the volume and type of vehicles using the driveway."*

In the analysis below, "Intersection Sight Distance" refers to the distance a vehicle stopped on the minor leg of an intersection (in this case the driveway) needs to be able to see along the major (perpendicular) leg of the intersection (in this case the street) to be able to safely complete their movement. "Stopping Sight Distance" refers to the distance a vehicle traveling down a street needs to be able to see an obstacle in front of them (such as a vehicle entering or exiting a driveway) in order to stop in time to avoid a collision. "Decision Sight Distance" refers to the distance a vehicle traveling down a street needs to be able to see an obstacle in front of them (such as a vehicle entering or exiting a driveway) in order to stop in time to avoid a collision under conditions where the driver must make complex or instantaneous decisions, where information is difficult to perceive, or when unexpected or unusual maneuvers are needed. The Project access driveway sight distance analysis below focuses on sight distance cases where potential issues could exist.

Stopping sight distance was used at all proposed Project driveways with the exception of the Caribbean Parking Garage Driveway where decision sight distance was used. Decision sight distance was used at the Caribbean Parking Garage Driveway due to the high speed of traffic on Caribbean Drive as well as the proximity of the driveway to the Mathilda Avenue-Caribbean Drive curve near the northwest corner of the Project site. It was determined that this combination of factors along Caribbean Drive near the northwest corner of the Project site could be considered as conditions where "information is difficult to perceive" and therefore this area would fall under the decision sight distance case according to the AASHTO Green Book.

Minimum intersection sight distances (for right-turn egress and left-turn egress), stopping sight distances, and decision sight distances were calculated per the AASHTO Green Book and are summarized in **Table 22** below. Minimum Intersection Sight Distance – Right Turn Egress values were based on "Table 9-8. Design Intersection Sight Distance-Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver" in the AASHTO Green Book. Minimum Intersection Sight Distance – Left Turn Egress values were based on "Table 9-6. Design Intersection Sight Distance-Case B1, Left Turn from Stop" in the AASHTO Green Book. Minimum stopping sight distance values were based on Table 9-8 in the AASHTO Green Book. Minimum decision sight distance values were based on Avoidance Maneuver B "Stop on urban road" in Table 3-3 in the AASHTO Green Book. All sight distance calculations used default and calculated variables from Sections 3.2.3, 3.3.2, 3.3.3, and 9.5 of the AASHTO Green Book, as well as existing roadway characteristics (such as the posted speed limit) and characteristics of the Project site defined by the current Project site plan. The speeds used in all sight distance calculations are the estimated 85th percentile speeds of the oncoming traffic. 85th percentile speeds of traffic were conservatively estimated as posted speed limit plus seven (7) miles per hour. Sight distances of the proposed Project at the Project driveways were measured from the current Project site plan and Google Earth aerials. Distance to nearest intersection was considered when determining proposed sight distances. Minimum intersection sight distance triangles for the eight driveways with egress movements are shown in **Appendix O**.

Table 22. Project Access Driveway Sight Distance Analysis

Intx. #	Project Driveway	Case	Origin of Oncoming Traffic	85th Percentile Speed of Oncoming Traffic (mph)[7]	Minimum Required Sight Distance (ft)[4]	Sight Distance of Proposed Project (ft)[5]
1	Mathilda Parking Garage Driveway	ISD[1] – Right Turn Egress (with trees west of driveway)[8]	NB Mathilda Ave	52	500	**50**
		ISD[1] – Right Turn Egress (without trees west of driveway)[8]	NB Mathilda Ave	52	500	>500
		SSD[2]	NB Mathilda Ave	52	455	>455
2	Caribbean Parking Garage Driveway[6]	ISD[1] – Left Turn Egress (with trees east/west of driveway)[8]	EB Caribbean Dr	52	650	**100**
			WB Caribbean Dr	52	650	**280**
		ISD[1] – Left Turn Egress (without trees east/west of driveway)[8]	EB Caribbean Dr	52	650	**500**
			WB Caribbean Dr	52	650	**500**
		ISD[1] – Right Turn Egress (with trees west of driveway)[8]	EB Caribbean Dr	52	500	**280**
		ISD[1] – Right Turn Egress (without trees west of driveway)[8]	EB Caribbean Dr	52	500	500
		DSD[3]	EB Caribbean Dr	52	960	**470**
			WB Caribbean Dr	52	960	**480**
3	Caribbean NE Surface Lot Driveway	ISD[1] – Right Turn Egress (with trees west of driveway)[8]	EB Caribbean Dr	52	500	**50**
		ISD[1] – Right Turn Egress (without trees west of driveway)[8]	EB Caribbean Dr	52	500	>500
		SSD[2]	EB Caribbean Dr	52	455	670
5	Borregas NE Surface Lot Driveway	ISD[1] – Left Turn Egress (with trees north/south of driveway)[8]	NB Borregas Ave	42	465	**180**
			SB Borregas Ave	32	355	**120**
		ISD[1] – Left Turn Egress (without trees north/south of driveway)[8]	NB Borregas Ave	42	465	>465
			SB Borregas Ave	32	355	>355
		SSD[2]	NB Borregas Ave	42	325	850
			SB Borregas Ave	32	220	>220
6	Borregas Service Ingress Driveway	SSD[2]	SB Borregas Ave	42	325	500
7	Borregas Service Egress Driveway	ISD[1] – Left Turn Egress (with trees north of driveway)[8]	NB Borregas Ave	42	465	**390**
			SB Borregas Ave	42	465	**130**
		ISD[1] – Left Turn Egress (without trees north of driveway)[8]	NB Borregas Ave	42	465	>465
			SB Borregas Ave	42	465	>465
		SSD[2]	NB Borregas Ave	42	325	350
			SB Borregas Ave	42	325	650

Table 22. Project Access Driveway Sight Distance Analysis

Intx. #	Project Driveway	Case	Origin of Oncoming Traffic	85th Percentile Speed of Oncoming Traffic (mph)[7]	Minimum Required Sight Distance (ft)[4]	Sight Distance of Proposed Project (ft)[5]
8	Borregas Shuttle Driveway	ISD[1] – Right Turn Egress	SB Borregas Ave	42	405	>405
		SSD[2]	SB Borregas Ave	42	325	750
11	Bordeaux Service Driveway	ISD[1] – Left Turn Egress	EB Bordeaux Dr	37	410	>410
			WB Bordeaux Dr	37	410	**300**
		SSD[2]	EB Bordeaux Dr	37	270	650
			WB Bordeaux Dr	37	270	280
12	Bordeaux Shuttle Egress Driveway	ISD[1] – Right Turn Egress	NB Bordeaux Dr	37	355	355
		SSD[2]	NB Bordeaux Dr	37	270	320
13	Bordeaux Shuttle Ingress Driveway	SSD[2]	NB Bordeaux Dr	37	355	700

Notes:
1. ISD = Intersection Sight Distance. The distance a vehicle stopped on the minor leg of an intersection (in this case the driveway) needs to be able to see along the major (perpendicular) leg of the intersection (in this case the street) to be able to safely complete their movement.
2. SSD = Stopping Sight Distance. The distance a vehicle traveling down a street needs to be able to see an obstacle in front of them (such as a vehicle entering or exiting a driveway) in order to stop in time to avoid a collision.
3. DSD = Decision Sight Distance. The distance a vehicle traveling down a street needs to be able to see an obstacle in front of them (such as a vehicle entering or exiting a driveway) in order to stop in time to avoid a collision under conditions where the driver must make complex or instantaneous decisions, where information is difficult to perceive, or when unexpected or unusual maneuvers are needed.
4. All Minimum Sight Distances were based on guidelines found in the AASHTO Green Book.
5. All Sight Distance of Proposed Project values were based on the current Project Site Plan and Google Earth aerials.
6. Assumes Caribbean Parking Garage Driveway is located 425 feet from the Mathilda Avenue-Caribbean Drive curve.
7. Estimated 85th percentile speed of the oncoming traffic (posted speed limit plus seven (7) mph).
8. "With/without trees near driveway" refers to any trees proposed by the Project site plan which fall within the required intersection sight distance triangles shown in Appendix O.
***BOLD** indicates Proposed Sight Distances which are less than Minimum Sight Distances.*

The current Project site plan proposes trees that would conflict with the sight distances at the Caribbean Northeast Surface Lot Driveway, Borregas Northeast Surface Lot Driveway, Borregas Service Egress Driveway, Mathilda Parking Garage Driveway, and Caribbean Parking Garage Driveway. Sight distance analysis was performed for these driveways under two possible scenarios: 1. with the proposed trees in place, and 2. without the proposed trees in place.

Per the sight distance analysis results in **Table 22**, The Caribbean Parking Garage Driveway does not have adequate decision sight distance to function as a right-in right-out or full-access intersection where it is currently proposed in the Project site plan. The Caribbean Parking Garage Driveway also does not have adequate intersection sight distance (with or without proposed trees near the driveway) to function as a full-access intersection where it is currently proposed in the Project site plan. The Bordeaux Service Driveway does not have adequate left-turn egress intersection sight distance along westbound Bordeaux Drive due to vehicles that may park along the shoulder of Bordeaux Drive.

8.1.3.1 Recommendations/Mitigations

In order to meet AASHTO Green Book sight distance requirements, the Project shall implement the following:

- The Caribbean Parking Garage Driveway shall be placed at least 960 feet east of the end of the Mathilda Avenue-Caribbean Drive curve.
- No tall obstructions shall be placed within the intersection sight distance triangles of the Project driveways, except objects which meet the criteria outlined in City of Sunnyvale Municipal Code 19.34.060(d).

It is recommended that the proposed Project implement the following:

- On-street parking may be restricted within the intersection sight distance triangles of all Project driveways.
- Parking shall be restricted along the Project frontage on Bordeaux Drive.

8.2 INTERNAL CIRCULATION

The vehicular circulation plan included in the current Project site plan is shown in **Figure 20**. As shown in **Figure 20**, the majority of internal roadways are proposed to allow two-way traffic. The only one-way internal roadways proposed are the shuttle drop-off zones and the travel aisle serving the narrow surface parking lot located directly south of the parking garage. No traffic controls are indicated in the current site plan.

8.2.1 Recommendations

The proposed Project shall install stop signs on the site's internal roadways at the locations shown in **Figure 21** (200 West Caribbean Drive) and **Figure 22** (100 West Caribbean Drive). Additional internal controls could also be considered to allow ingress vehicles to enter the Project site with minimal conflicts and help prevent ingress queues from spilling back to the public roadways.

8.3 PEDESTRIAN AND BICYCLE ACCESS AND CIRCULATION

The pedestrian circulation plan included in the current Project site plan is shown in **Figure 23**. As shown in **Figure 23**, the Project proposes to construct sidewalks along most of its perimeter fronting public roadways, including along Borregas Avenue, Caspian Court, and Bordeaux Drive. These proposed sidewalks would connect to the segments of existing sidewalk along Borregas Avenue, and Java Drive in the vicinity of the Project. The Project also proposes to construct a multi-

use trail along the Project frontage on Mathilda Avenue and Caribbean Drive. The multi-use path would begin just north of the Mathilda Parking Garage Driveway and end at the Borregas Avenue / Caribbean Drive intersection. Each end of the proposed multi-use path would tie into existing or proposed sidewalks and Class II bike lanes. The multi-use path would be for both pedestrian and bicycle use. The bicycle use will be for one-way eastbound bicycle traffic only from the Mathilda Parking Garage Driveway to the Caribbean Parking Garage Driveway (where a new signal is recommended). East of the Caribbean Parking Garage Driveway, the multi-use path will provide bi-directional bicycle access. The on-site parking lots would be connected to main public paths via general and ADA routes. The proposed main paths would connect the parking lots, office buildings, and access points to Bordeaux Drive, Caspian Court, and Borregas Avenue. The main paths would also cross the SCVWD's West Channel outfall at two locations. Shuttle riders would have private routes from the shuttle pick-up/drop-off loops to the buildings. Two public secondary paths (the SCVWD Trail) would also be provided which would run north-south for the length of the Project site on either side of the SCVWD's West Channel outfall. The proposed pedestrian facilities would allow site employees and the general public to traverse around or through the site.

The bicycle circulation plan included in the current Project site plan is shown in **Figure 24**. As shown in **Figure 24**, main public bicycle routes would connect the parking lots, office buildings, and access points to Bordeaux Drive, Caspian Court, and Borregas Avenue. Public secondary bicycle routes would connect the parking lot areas to Mathilda Avenue and Caribbean Drive, as well as provide additional internal connections. Two parallel segments of the SCVWD Trail would run north-south for the length of the Project site on either side of the SCVWD's West Channel outfall. The SCVWD Trail would provide access to Caribbean Drive and Java Drive, and secondary bicycle routes would connect it to the main public bike routes.

8.4 On-Site Parking

8.4.1 Vehicle Parking

Based on the City of Sunnyvale Municipal Code Sections 19.29.140 for the Moffett Park Specific Plan, the development standard for minimum parking for R&D office uses is 1 space per 300 square feet (1 space per 250 square feet – maximum). For the Project site, this rate would result in a minimum 3,473 parking stalls required for the site. Additionally, 105 electric vehicle spaces and 174 car share spaces are required.

The current Project site plan proposes 2,089 total parking stalls, which would not meet Moffett Park Specific Plan standards, as stated above; however, the project would meet the Citywide parking standard. Per SMC 19.46 for R&D office uses, a minimum of 1 space per 500 square feet is required. Based on this rate, a minimum of 2,084 spaces, including at least 63 electric vehicle spaces and 105 car share spaces, would be required. The Project would provide 212 electric vehicle parking stalls and 174 car share parking stalls. The Project would meet the City parking requirements for electric vehicles and car share.

8.4.2 Bicycle Parking

Based on the City of Sunnyvale Municipal Code Sections 19.29.140 and 19.46, and the Moffett Park Specific Plan, the Project site would be required to provide a minimum of 174 total bicycle spaces, including at least 131 Class I bicycle spaces and 43 Class II bicycle spaces. The current Project site plan proposes 482 Class I bicycle spaces and 196 Class II bicycle spaces, which exceed the City's requirements.

Figure 20. Vehicle Circulation Plan

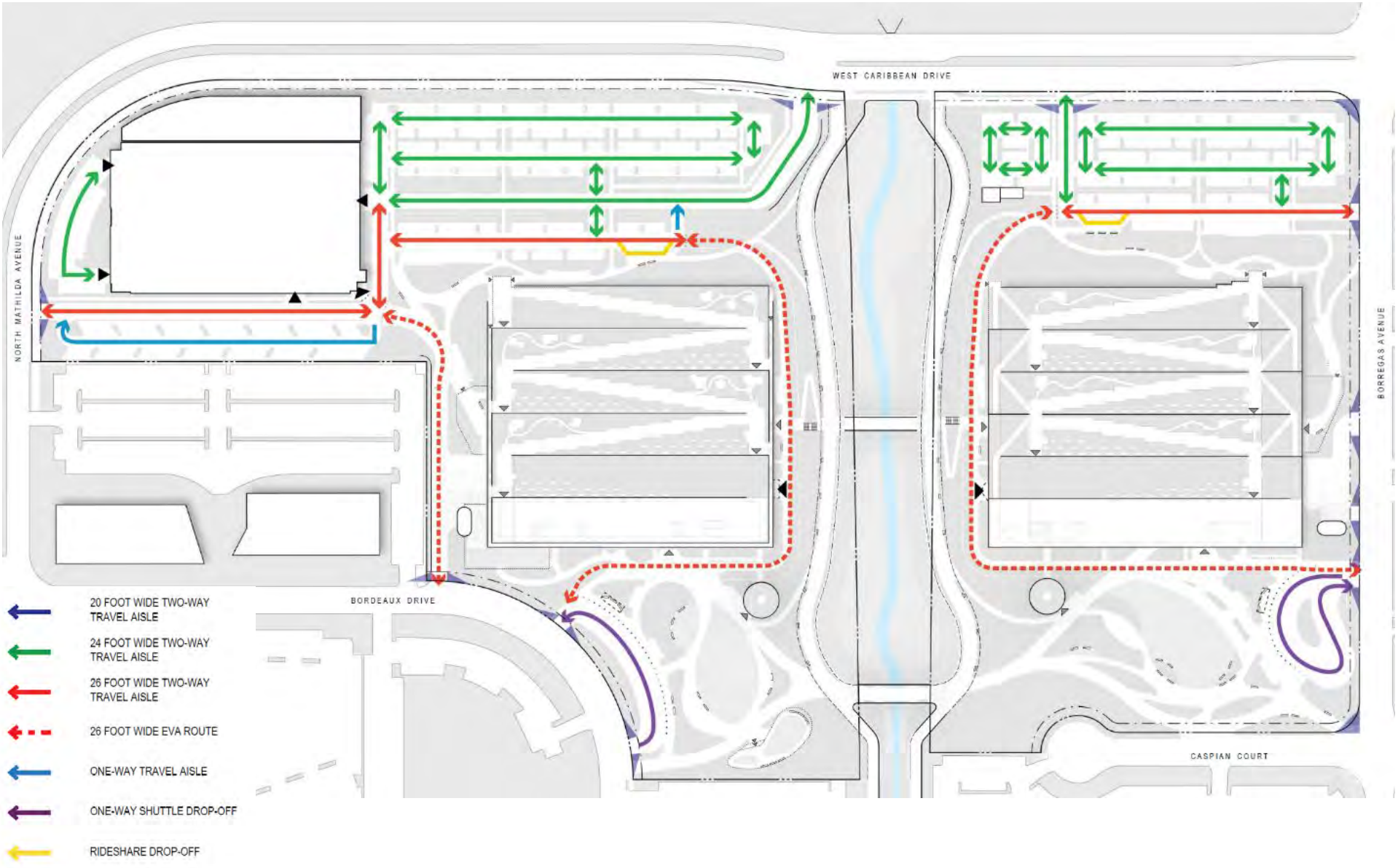


Figure 21. Recommended Internal Traffic Controls - 200 West Caribbean Drive

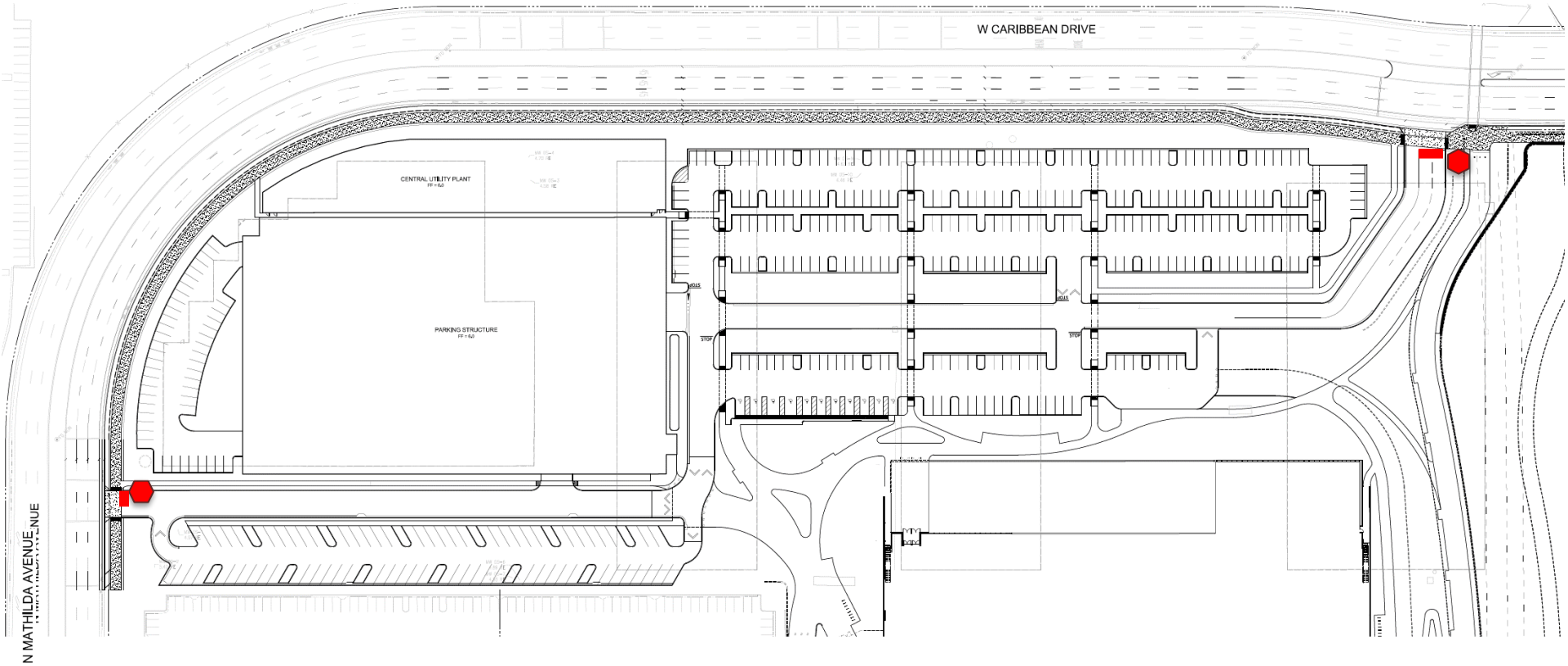
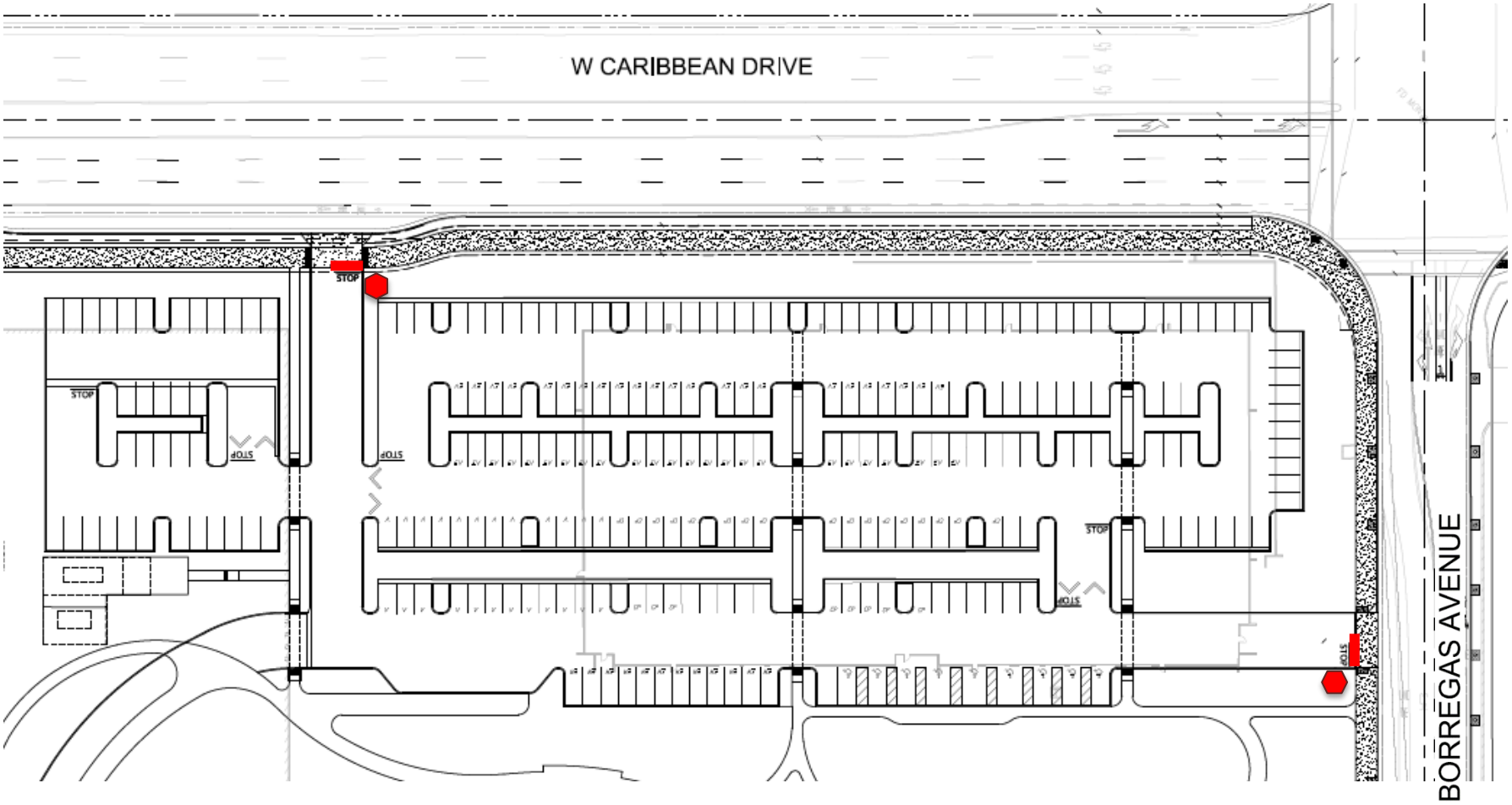


Figure 22. Recommended Internal Traffic Controls - 100 West Caribbean Drive



= Recommended Internal Stop Sign

Figure 23. Pedestrian Circulation Plan

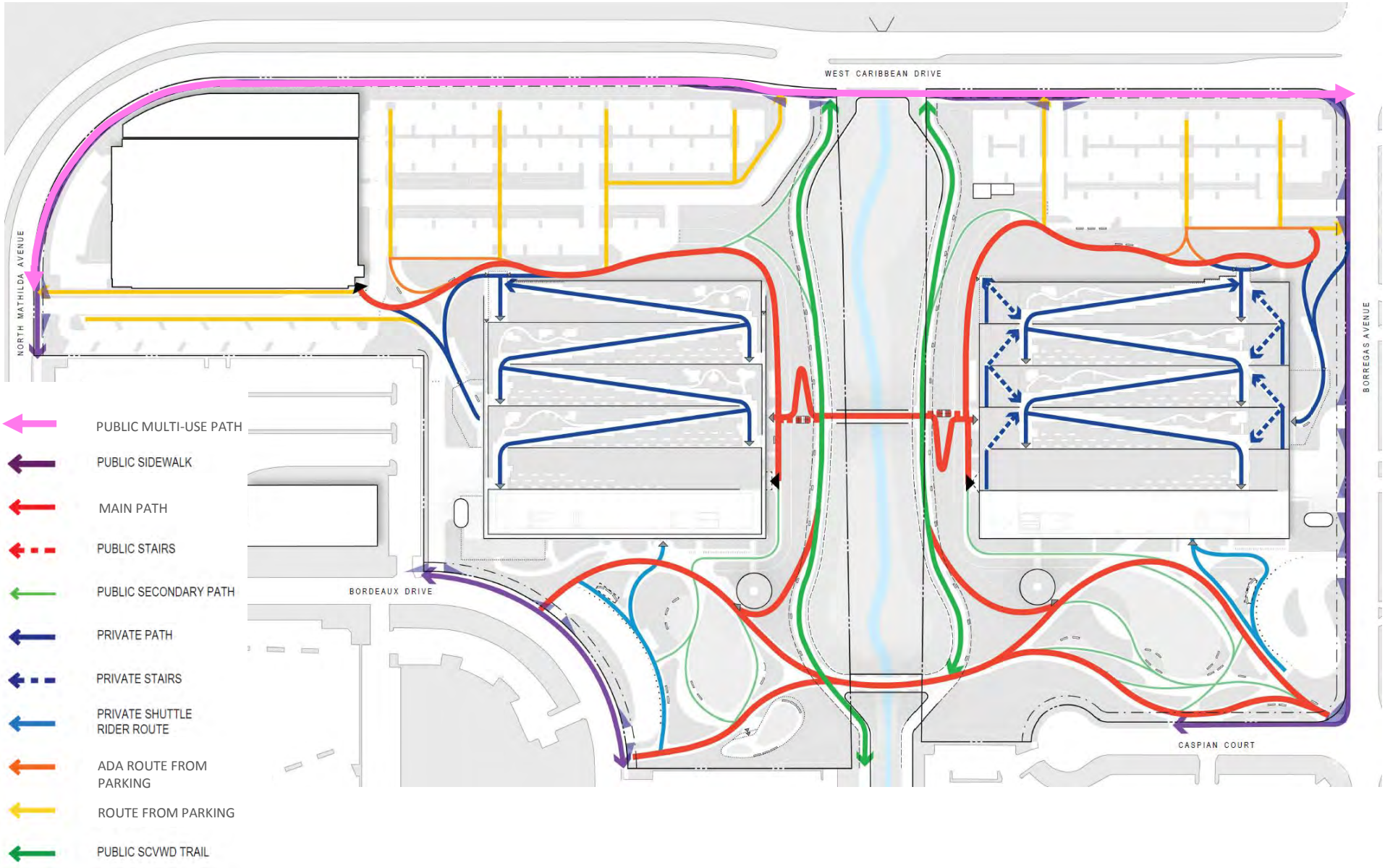
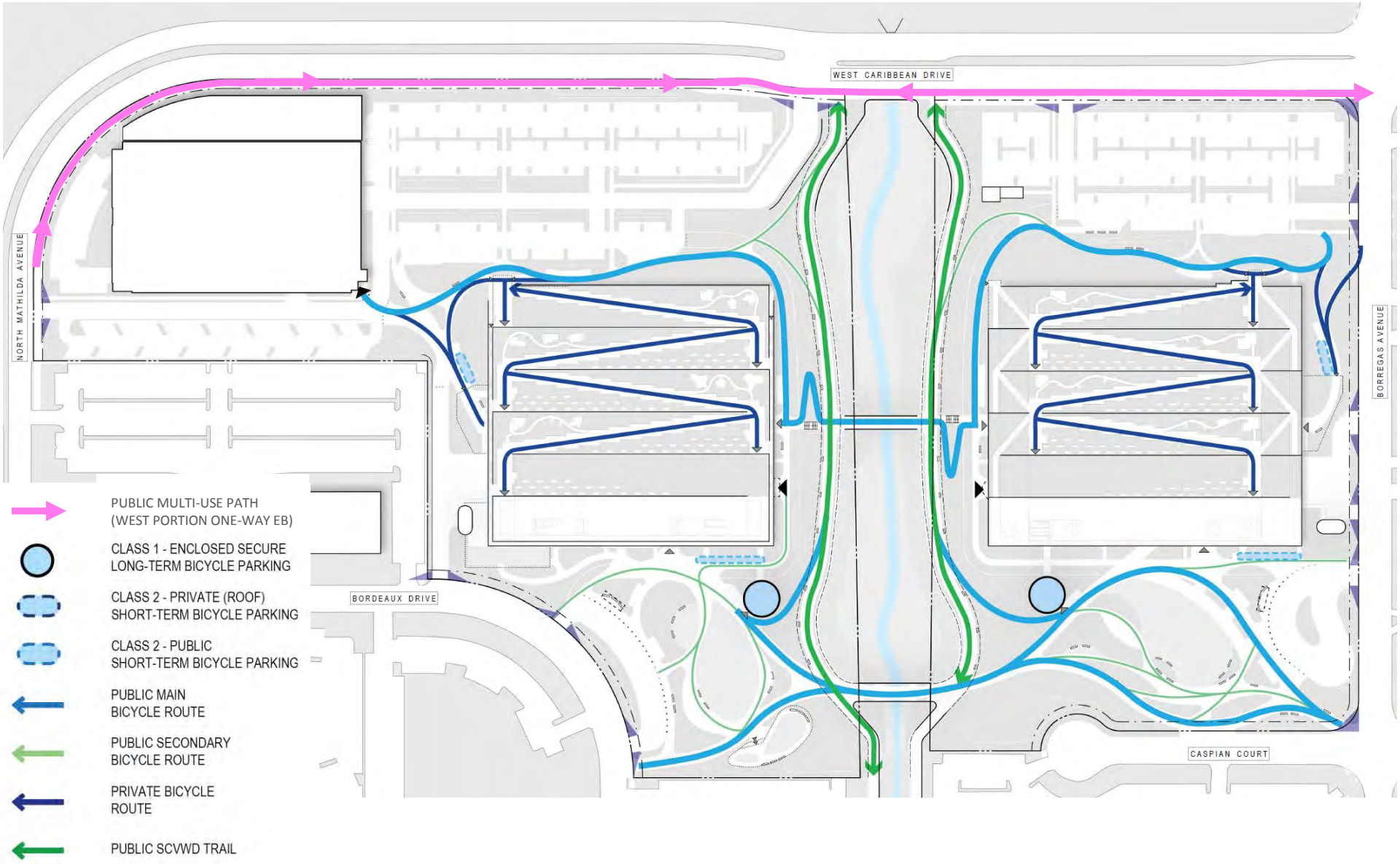


Figure 24. Bicycle Circulation Plan



9. POTENTIAL EFFECTS ON TRANSIT, BICYCLE, AND PEDESTRIAN FACILITIES AND SERVICES

This section discusses projected Project impacts on study area transit, bicycle, and pedestrian facilities.

9.1 TRANSIT FACILITIES

9.1.1 Transit Vehicle Delay (For Informational Purposes)

Transit vehicle delay was considered for transit routes that operate within the study area. Transit vehicles for the transit routes in the study area are expected to use the shared right-of-way with other motorists. Since the proposed project is anticipated to increase the vehicle delay at study intersections, transit vehicle delay may increase. It should be noted that there are no impact thresholds for transit delay and therefore the transit delay is provided for informational purposes only.

Buses operating on study roadway facilities could experience increased delay due to the addition of Project trips to study intersections. The seven (7) bus routes that would serve the Project and travel through multiple Project study area intersections are Routes 26, 55, 120, 121, 122, 321, and 328. These seven (7) bus routes run through study area intersections on Java Drive, Crossman Avenue, Caribbean Drive, Lawrence Expressway, Tasman Drive, and Fair Oaks Avenue.

The AM and PM peak hour delay experienced by each bus route within the Project study area was determined by summing the average peak hour delays for each study intersection movement that a bus would use along its route under No Project and Plus Project conditions. The difference in No Project and Plus Project scenarios' through movement delays was calculated to determine how much peak hour delay the Project would add to study area transit routes. The additional delays experienced by study area transit routes due to the Project generated trips are shown in **Table 23**. The additional delays experienced by study area transit routes due to the Project Alternative generated trips are shown in **Table 24**.

Table 23. Transit Delay - Plus Project Conditions

Transit Route	Peak Hour	Additional Transit Delay with Project Generated Traffic (seconds)					
		"Existing plus Project"		"Background plus Project"		"Cumulative plus Project"	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
26	AM	2.7	-13.4	10.1	0.6	0.0	-10.0
	PM	4.2	5.4	3.3	7.1	1.4	16.3
55	AM	0.0	0.3	0.0	0.3	0.0	0.7
	PM	0.0	0.0	0.0	0.1	0.0	0.0
120	AM	-17.4	4.5	0.6	19.4	-9.7	44.4
	PM	4.5	3.0	6.4	2.4	19.8	0.6
121	AM	-18.1	5.0	0.4	40.6	-10.1	75.1
	PM	5.9	3.4	8.2	3.0	22.2	1.6
122	AM	4.5	-17.7	19.5	0.3	44.7	-10.1
	PM	3.2	5.7	2.7	7.8	1.0	21.7
321	AM	-10.4	4.5	12.6	19.5	40.0	44.7
	PM	2.9	3.2	3.0	2.7	3.3	1.0
328	AM	4.5	-17.7	19.5	0.3	44.7	-10.1
	PM	3.2	5.7	2.7	7.8	1.0	21.7

Note: All delay values were obtained using TRAFFIX software and represent average peak hour delays.

As shown in **Table 23** under the "Existing plus Project" condition, the maximum increase in transit vehicle delay is projected to be 5.9 seconds (Route 121 under PM peak hour conditions). Under the "Background plus Project" condition, the maximum increase in transit vehicle delay is projected to be 40.6 seconds (Route 121 under AM peak hour conditions). Under the "Cumulative plus Project" condition, the maximum increase in transit vehicle delay is projected to be 75.1 seconds (Route 121 under AM peak hour conditions).

Table 24. Transit Delay - Plus Project Alternative Conditions

Transit Route	Peak Hour	Additional Transit Delay with Project Generated Traffic (seconds)					
		"Existing plus Project Alternative"		"Background plus Project Alternative"		"Cumulative plus Project Alternative"	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
26	AM	0.6	-13.4	7.6	0.6	-0.6	-10.0
	PM	3.8	5.4	2.8	7.1	0.9	16.3
55	AM	0.0	0.3	0.0	0.3	0.0	0.7
	PM	0.0	0.0	0.0	0.1	0.0	0.0
120	AM	-17.4	2.4	0.6	16.9	-9.7	43.8
	PM	4.5	2.6	6.4	1.9	19.8	0.1
121	AM	-18.1	2.9	0.4	38.1	-10.1	74.5
	PM	5.9	3.0	8.2	2.5	22.2	1.1
122	AM	2.4	-17.7	17.0	0.3	44.1	-10.1
	PM	2.8	5.7	2.2	7.8	0.5	21.7
321	AM	-10.4	2.4	12.6	17.0	40.0	44.1
	PM	2.9	2.8	3.0	2.2	3.3	0.5
328	AM	2.4	-17.7	17.0	0.3	44.1	-10.1
	PM	2.8	5.7	2.2	7.8	0.5	21.7

Note: All delay values were obtained using TRAFFIX software and represent average peak hour delays.

As shown in **Table 24**, under the "Existing plus Project Alternative" condition, the maximum increase in transit vehicle delay is projected to be 5.9 seconds (Route 121 under PM peak hour conditions). Under the "Background plus Project Alternative" condition, the maximum increase in transit vehicle delay is projected to be 38.1 seconds (Route 121 under AM peak hour conditions). Under the "Cumulative plus Project Alternative" condition, the maximum increase in transit vehicle delay is projected to be 74.5 seconds (Route 121 under AM peak hour conditions).

It should be noted that some changes in transit delay were calculated to be negative. This is due to how the analysis software calculates delay, and should be interpreted as showing that the Project trips would not increase transit delay.

9.1.2 Recommendations

None.

9.2 PEDESTRIAN FACILITIES

The City's proposed Caribbean Drive Parking and Trail Access Enhancements project will install a one-way multi-use path and new access point to the Bay Trail along the north side of Caribbean Drive. A conceptual layout of the Caribbean Drive Parking and Trail Access Enhancements project is included as **Appendix R**. The Project proposes sidewalks along the perimeter of the Project site that fronts Borregas Avenue, Caspian Court, and Bordeaux Drive. The Project proposes a multi-use

path along the western and northern sides of the Project site frontage along Mathilda Avenue and Caribbean Drive. Proposed internal pedestrian paths will provide Project employees and the public with multiple routes through the site to access the buildings, parking lots, and surrounding local roadways. To access the Lockheed Martin Transit Center and Lockheed Martin Station from the west side of the Project site, pedestrians can use the continuous sidewalks and/or pedestrian paths on Mathilda Avenue between the Project site and 5th Avenue, as well as the pedestrian crosswalks with push buttons which exist on three of the four legs of the Mathilda Avenue / 1st Avenue-Bordeaux Drive intersection and all four legs of the Mathilda Avenue / Lockheed Martin Way-Java Drive and Mathilda Avenue / 5th Avenue intersections.

Bordeaux Drive and Borregas Avenue have existing gaps in the sidewalks and pedestrian paths on both sides of the road between the Project site and Java Drive and there are no existing crosswalks crossing Caspian Court. Therefore, pedestrians that travel between the south/east sides of the Project site and the major light rail and bus stops on Java Drive would have to walk through parking lots or potentially along the trails along the SCVWD's West Channel outfall. The Java Drive intersections with Bordeaux Drive, Borregas Avenue, Geneva Drive, and Crossman Avenue all have existing pedestrian crosswalks with push buttons on all four legs which pedestrians could use to reach the transit stops at these intersections. The north side of Java Drive has existing continuous (but poorly maintained in some segments) sidewalks and pedestrian paths between Mathilda Avenue and Crossman Avenue which pedestrians could use to access major transit stops on Java Drive. The south side of Java Drive between Mathilda Avenue and Crossman Avenue has existing gaps in the sidewalk.

Pedestrians could travel between the Project site and the Bay Trail via the proposed multi-use path along Caribbean Drive and the pedestrian crosswalks with push buttons which exist on all four legs of the Borregas Avenue / Caribbean Avenue intersection. Pedestrian crosswalks with push buttons would be installed at the recommended signalized Caribbean Parking Garage Driveway / Caribbean Drive intersection, and the new access point to the Bay Trail on the north side of Caribbean Drive as proposed as part of the City's Caribbean Drive Parking and Trail Access Enhancements project.

9.2.1 Recommendations

None.

9.3 BICYCLE FACILITIES

The City's proposed Caribbean Drive Parking and Trail Access Enhancements project will install a one-way multi-use path and new access point to the Bay Trail along the north side of Caribbean Drive. A conceptual layout of the Caribbean Drive Parking and Trail Access Enhancements project is included as **Appendix R**. The Project proposes a multi-use path along the western and northern side of the Project site fronting Mathilda Avenue and Caribbean Drive. This multi-use path is for two-way pedestrian use, one-way eastbound bicycle use west of the proposed Caribbean Parking Garage Driveway (where a signal is recommended), and two-way bicycle use east of the proposed Caribbean Parking Garage Driveway. Bicyclists traveling westbound on the proposed multi-use path along the Project frontage could use the recommended signal and crosswalks at the Caribbean Parking Garage Driveway / Caribbean Drive intersection to cross to the north side of Caribbean Drive and continue westbound (this westbound route should be appropriately signed).

Proposed internal bicycle paths will provide Project employees and the public with multiple routes through the site to access the buildings, parking lots, and surrounding local roadways. The Project site will include both Class I and Class II bicycle parking for its employees. Bicyclists will be able to use existing or planned Class I/II bicycle facilities or multi-use paths on Mathilda Avenue, Borregas Avenue, Caribbean Drive, and Crossman Avenue to travel between the Project site and the Lockheed Martin Transit Center, Lockheed Martin Station, and nearby bus stops. Bicyclists will have to share the road with vehicles along Bordeaux Drive north of Java Drive and along Java Drive.

Bicyclists could travel between the Project site and the Bay Trail via the proposed multi-use paths along Caribbean Drive, the pedestrian crosswalks with push buttons which exist on all four legs of the Borregas Avenue / Caribbean Avenue intersection and which would be installed at the recommended signalized Caribbean Parking Garage Driveway / Caribbean Drive intersection, and the new access point to the Bay Trail on the north side of Caribbean Drive proposed as part of the City's Caribbean Drive Parking and Trail Access Enhancements project.

9.3.1 Recommendations

None.

9.4 PEDESTRIAN HYBRID BEACON

A new mid-block crossing with pedestrian hybrid beacon (also known as a High-Intensity Activated Crosswalk, or HAWK) on Caribbean Drive near the SCVWD's West Channel outfall was analyzed. The mid-block crossing would provide cyclists and pedestrians with more direct connectivity between the Project site, the local roadway system south of Caribbean Drive, and the Bay Trail located north of Caribbean Drive. In order to determine the need for a pedestrian hybrid beacon crossing at this location, guidelines in Chapter 4F-Pedestrian Hybrid Beacons of the CA MUTCD were applied.

Section 4F.01.07 of the CA MUTCD states:

> *"For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 35 mph, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-2 for the length of the crosswalk."*

Bicycle and pedestrian counts were collected on Thursday September 6, 2018 from 6:30AM to 7:30 PM at the intersection of the Bay Trail and Carl Road near the SCVWD's West Channel Outfall (between the Sunnyvale Landfill and the City of Sunnyvale Water Pollution Control Plant). It was assumed that any bicycles and pedestrians traveling to/from Carl Road would likely cross Caribbean Drive at some point as Carl Road does not lead to other destinations. Based on the collected data, it was determined that 89 bicycles and pedestrians crossed Caribbean Drive during the PM peak hour (6:00 PM to 7:00 PM).

Based on vehicular counts along Caribbean Drive which were obtained at the Borregas Avenue / Caribbean Drive intersection for this TIA, approximately 530 vehicles travel eastbound-westbound along Caribbean Drive between 6:00 PM and 7:00 PM. The posted speed limit on Caribbean Drive is 45 miles per hour. The length of the proposed crosswalk that would cross Caribbean Drive near the SCVWD's West Channel outfall would be approximately 92 feet, based on curb-to-curb measurements from Google Earth. All of the above "Existing" conditions data was entered into the

CA MUTCD Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways figure, as shown in **Figure 25** below, to determine if a pedestrian hybrid beacon should be considered on Caribbean Drive near the SCVWD's West Channel outfall.

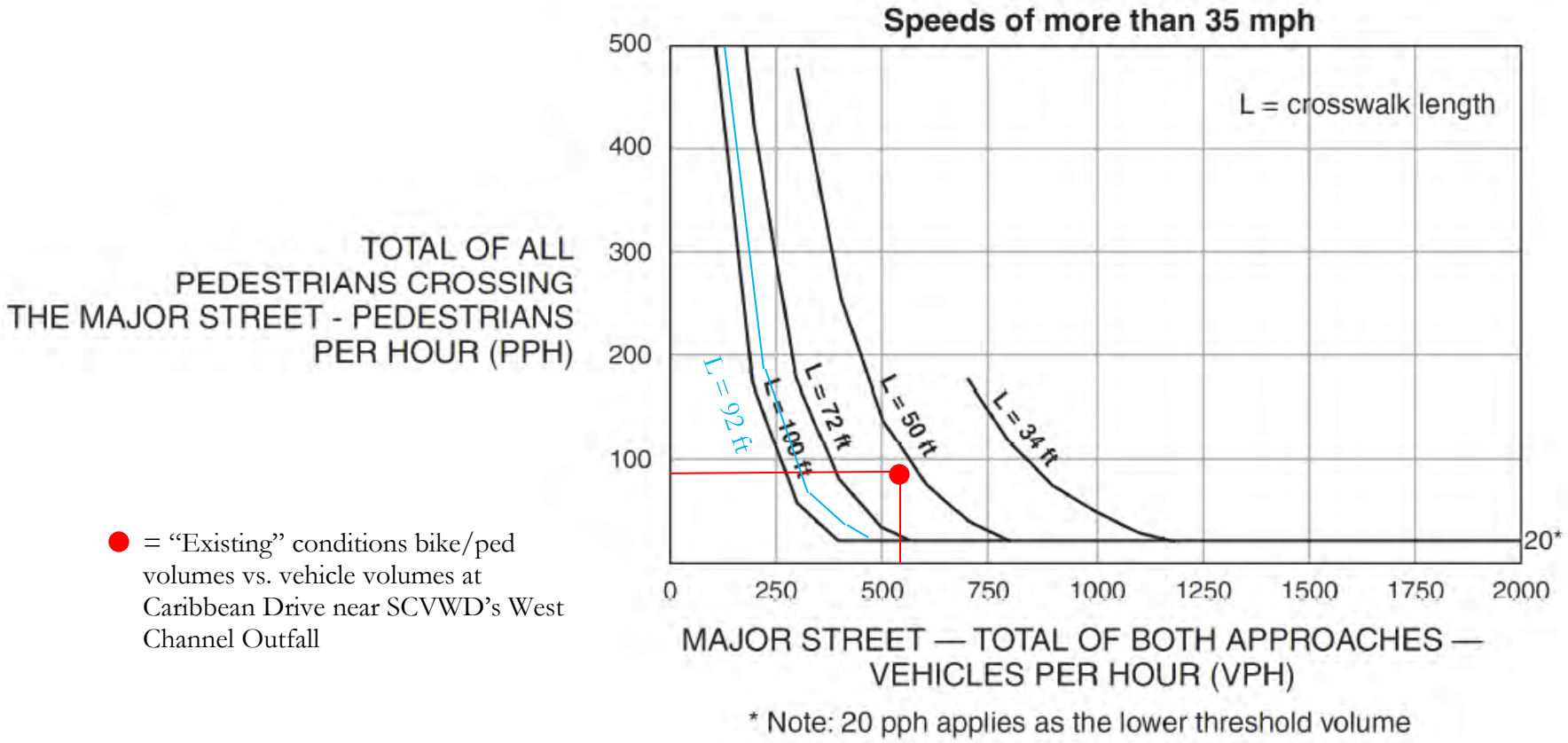
As shown in **Figure 25**, per guidelines defined in Section 4F.01.07 of the CA MUTCD, a pedestrian hybrid beacon should be considered on Caribbean Drive near the SCVWD's West Channel outfall under "Existing" conditions. Since the CA MUTCD's guidance for installation of a pedestrian hybrid beacon is met under "Existing" conditions, it would be met under future conditions as well.

9.4.1 Recommendations

As per guidelines defined in Section 4F.01.07 of the CA MUTCD, a pedestrian hybrid beacon shall be installed on Caribbean Drive near the SCVWD's West Channel outfall under existing and future conditions. However, since a signalized Caribbean Parking Garage Driveway / Caribbean Drive intersection is also recommended in close proximity to the potential pedestrian hybrid beacon location (see Chapter 10.1.1), the two traffic control devices would not meet typical intersection/signal spacing standards as defined in *Transportation Research Circular Number 456 – Driveway and Street Intersection Spacing* (Transportation Research Board, March 1996). It is recommended that the two traffic control devices be combined into a single signalized intersection with crosswalks and pedestrian push buttons on all legs, located near the SCVWD's West Channel outfall, which is approximately 960 feet east of the Mathilda Avenue-Caribbean Drive curve. The Project will pay for the installation of a signal at the Caribbean Parking Garage Driveway / Caribbean Drive intersection.

Installation of the new signalized Caribbean Parking Garage Driveway will impact the City's Caribbean Drive Parking and Trail Access Enhancement Project. Any impacts to improvements on the north side of Caribbean Drive shall be mitigated by the Project. If parking spaces are removed or moved due to the installation of the signal, the Project shall provide dedicated, convenient, and BCDC-compliant parking spaces in the same quantity as those affected.

Figure 25. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways



● = "Existing" conditions bike/ped volumes vs. vehicle volumes at Caribbean Drive near SCVWD's West Channel Outfall

Source: CA MUTCD Figure 4F-2

10. IMPACTS AND MITIGATION MEASURES

This chapter of the TIA evaluates the study intersection operations results presented in **Table 11** ("Existing plus Project" conditions), **Table 12** ("Existing plus Project Alternative" conditions), **Table 16** ("Background plus Project" conditions), **Table 17** ("Background plus Project Alternative" conditions), **Table 19** ("Cumulative plus Project" conditions), and **Table 20** ("Cumulative plus Project Alternative" conditions) against the LOS impact criteria defined in the City and *VTA TIA Guidelines* and summarized in Section 1.5 of this report. "Existing plus Project" study freeway segment operations results (shown in **Table 13**) and study freeway ramp operations results (shown in **Table 14**) are also evaluated against VTA and City impact criteria.

Mitigation measures are identified, and assessed for feasibility, for each impact. This Project is required to pay into the City's Transportation Impact Fee (TIF); a portion of this fee will be dedicated toward Intelligent Transportation System (ITS) strategies and projects.

10.1 "EXISTING PLUS PROJECT/PROJECT ALTERNATIVE" IMPACTS AND MITIGATION MEASURES

10.1.1 Intersections

No impacts were identified for study intersections under "Existing plus Project" conditions. The following intersection was projected to operate at unacceptable LOS conditions or meet CA MUTCD signal warrant 3 under "Existing plus Project Alternative" PM peak hour conditions as illustrated in **Table 11** and **Table 12**:

Intersection #2 – Caribbean Parking Garage Driveway / Caribbean Drive

The Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to operate at unacceptable "Existing plus Project Alternative" PM peak hour LOS "F" conditions. The Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is not projected to meet CA MUTCD signal warrant 3 under "Existing plus Project Alternative" PM peak hour conditions. Since the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection would be a new intersection constructed because of the Project, and based on City of Sunnyvale unsignalized intersection traffic impact criteria, Project impact at the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to be "**significant**" under "Existing plus Project Alternative" conditions.

According to the Project driveway sight distance analysis contained in Section 8.1.3 of this TIA, the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection would not meet AASHTO Green Book sight distance requirements at its currently proposed location in the Project site plan, whether it was configured as right-in right-out or full-access.

Mitigation:

Since the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is not projected to meet CA MUTCD signal warrant 3 under "Existing plus Project Alternative" conditions, but is projected to meet CA MUTCD signal warrant 3 under "Background plus Project Alternative" and "Cumulative plus Project Alternative" analysis scenarios, it is recommended that the City should monitor traffic volumes at this intersection and install a signal at the intersection when a signal is warranted.

The Caribbean Parking Garage Driveway / Caribbean Drive intersection shall be located at least 960 feet east of the end of the Mathilda Avenue-Caribbean Drive curve in order to meet sight distance requirements contained in the AASHTO Green Book. This would place the Caribbean Parking Garage Driveway / Caribbean Drive intersection in close proximity to the proposed pedestrian hybrid beacon as discussed in Section 9.4 of this TIA. Due to the close proximity of the Caribbean Parking Garage Driveway / Caribbean Drive intersection and the proposed pedestrian hybrid beacon, the driveway and the pedestrian hybrid beacon would not meet typical intersection/signal spacing standards as defined in *Transportation Research Circular Number 456 – Driveway and Street Intersection Spacing* (Transportation Research Board, March 1996). Therefore, the driveway and pedestrian hybrid beacon shall be combined into a single signalized intersection. The Project applicant shall pay for the installation of a traffic signal at the Caribbean Parking Garage Driveway / Caribbean Drive intersection. As per Section 8.1.1 of this TIA, the Caribbean Parking Garage Driveway shall have a throat length of at least 475 feet.

Installation of the new signalized Caribbean Parking Garage Driveway will impact the City's Caribbean Drive Parking and Trail Access Enhancement Project. Any impacts to improvements on the north side of Caribbean Drive shall be mitigated by the Project. If parking spaces are removed or moved due to the installation of the signal, the Project shall provide dedicated, convenient, and BCDC-compliant parking spaces in the same quantity as those affected.

With the proposed mitigation in place, the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to operate at acceptable LOS "B" or better conditions and will meet sight distance requirements. Therefore, impacts at this intersection would be considered "**less than significant**" with the proposed mitigation.

10.1.2 Freeway Segments and Ramps

As illustrated in **Table 13**, the following freeway segments operate at unacceptable density-based LOS "F" under "Existing plus Project" AM and/or PM peak hour conditions, and the addition of Project generated trips is projected to increase the traffic volume on the following segments by more than one (1) percent of the capacity of the segment:

- Westbound SR 237 between Maude Avenue and US 101 during the PM peak hour.
- Westbound SR 237 between US 101 and Mathilda Avenue during the PM peak hour.
- Eastbound SR 237 between Lawrence Expressway and Great America Parkway during the PM peak hour.
- Westbound SR 237 between Lawrence Expressway and Great America Parkway during the AM peak hour.
- Southbound US 101 between Great America Parkway and Lawrence Expressway during the AM peak hour.
- Northbound US 101 between Great America Parkway and Lawrence Expressway during the PM peak hour.

Therefore, based on VTA freeway segment traffic impact criteria, Project impact at these study freeway segments is projected to be "**significant**".

The VTA's Valley Transportation Plan (VTP) 2040 identifies freeway express lane projects along SR 237 between North First Street and SR 85, and along US 101 between Cochrane Road and Whipple Avenue. On all identified freeway segments, the existing HOV lanes are proposed to be converted to express lanes. On US 101 along identified segments, a second express lane is proposed to be implemented in each direction for a total of two express lanes.

On SR 237, the existing HOV would already be operating over capacity under "Existing" conditions. Converting the HOV lanes to express lanes would not mitigate the Project impact. On US 101, converting the existing HOV lane to an express lane and adding an express lane in each direction would increase the capacity of the freeway and would fully mitigate the freeway impacts. The Project applicant shall make a fair share contribution toward the cost of the identified express lane program along US 101.

However, capacity improvements on freeways are outside of the City of Sunnyvale's jurisdiction. Therefore, the freeway impacts would be "**significant and unavoidable**".

As illustrated in **Table 14**, all Project study freeway ramps are projected to operate at acceptable V/C ratio standards under "Existing" and "Existing plus Project" AM and PM peak hour conditions. Therefore, the Project is not projected to have any impacts on Project study freeway ramps under "Existing plus Project" conditions.

10.2 "BACKGROUND PLUS PROJECT/PROJECT ALTERNATIVE" IMPACTS AND MITIGATIONS MEASURES

10.2.1 Intersections

The following intersections were projected to operate at unacceptable LOS conditions or meet CA MUTCD signal warrant 3 under "Background plus Project" and "Background plus Project Alternative" AM and/or PM peak hour conditions as illustrated in **Table 16** and **Table 17**:

Intersection #2 – Caribbean Parking Garage Driveway / Caribbean Drive

The Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to operate at unacceptable "Background plus Project Alternative" PM peak hour LOS "F" conditions. The Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to meet CA MUTCD signal warrant 3 under "Background plus Project Alternative" PM peak hour conditions. Therefore, based on City of Sunnyvale unsignalized intersection traffic impact criteria, Project impact at the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to be "**significant**" under "Background plus Project Alternative" conditions.

According to the Project driveway sight distance analysis contained in Section 8.1.3 of this TIA, the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection would not meet AASHTO Green Book sight distance requirements at its currently proposed location in the Project site plan, whether it was configured as right-in right-out or full-access.

Mitigation:

To mitigate the impact, the Project shall install a signal at the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection. Based on "Cumulative plus Project/Project Alternative" 95th percentile egress queues estimated with TRAFFIX software, the Caribbean Parking Garage Driveway would have a minimum required throat depth of 300 feet after installation of a signal.

The Caribbean Parking Garage Driveway / Caribbean Drive intersection shall be located at least 960 feet east of the Mathilda Avenue-Caribbean Drive curve in order to meet sight distance requirements contained in the AASHTO Green Book. This would place the Caribbean Parking Garage Driveway / Caribbean Drive intersection in close proximity to the proposed pedestrian hybrid beacon as discussed in Section 9.4 of this TIA. Due to the close proximity of the Caribbean Parking Garage Driveway / Caribbean Drive intersection and the potential pedestrian hybrid

beacon, the two traffic control devices would not meet typical intersection/signal spacing standards as defined in *Transportation Research Circular Number 456 – Driveway and Street Intersection Spacing* (Transportation Research Board, March 1996). Therefore, the two traffic control devices shall be combined into a single signalized intersection. The Project applicant shall pay for the installation of a signal at the Caribbean Parking Garage Driveway / Caribbean Drive intersection. As per Section 8.1.1 of this TIA, it is recommended that the Caribbean Parking Garage Driveway shall have a throat length of at least 475 feet.

Installation of the new signalized Caribbean Parking Garage Driveway will impact the City's Caribbean Drive Parking and Trail Access Enhancement Project. Any impacts to improvements on the north side of Caribbean Drive shall be mitigated by the Project. If parking spaces are removed or moved due to the installation of the signal, the Project shall provide dedicated, convenient, and BCDC-compliant parking spaces in the same quantity as those affected.

With the proposed mitigation in place, the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to operate at acceptable LOS "B" or better conditions. Therefore, impacts at this intersection would be considered "**less than significant**" with the proposed mitigation.

Intersection #26 – Great America Parkway / Tasman Drive

The Great America Parkway / Tasman Drive intersection is projected to operate at unacceptable "Background" and "Background plus Project/Project Alternative" AM and PM peak hour LOS "F" conditions. The addition of Project/Project Alternative generated trips is not projected to increase the average delay of critical movements by four (4) or more seconds and increase the critical V/C ratio by 0.01 or more. Therefore, based on City Santa Clara intersection traffic impact criteria, Project/Project Alternative impact at the Great America Parkway / Tasman Drive intersection is considered "**less than significant**".

10.3 "CUMULATIVE PLUS PROJECT/PROJECT ALTERNATIVE" IMPACTS AND MITIGATIONS MEASURES

10.3.1 Intersections

The following intersections were projected to operate at unacceptable LOS conditions or meet CA MUTCD signal warrant 3 under "Cumulative plus Project" and "Cumulative plus Project Alternative" AM and/or PM peak hour conditions as illustrated in **Table 19** and **Table 20**:

Intersection #2 – Caribbean Parking Garage Driveway / Caribbean Drive

The Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to operate at unacceptable "Cumulative plus Project Alternative" PM peak hour LOS "F" conditions. The Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to meet CA MUTCD signal warrant 3 under "Cumulative plus Project Alternative" PM peak hour conditions. Therefore, based on City of Sunnyvale unsignalized intersection traffic impact criteria, Project impact at the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to be "**significant**" under "Cumulative plus Project Alternative" conditions.

According to the Project driveway sight distance analysis contained in Section 8.1.3 of this TIA, the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection would not meet AASHTO Green Book sight distance requirements at its currently proposed location in the Project site plan, whether it was configured as right-in right-out or full-access.

Mitigation:

To mitigate the impact, the Project shall install a signal at the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection. Based on "Cumulative plus Project/Project Alternative" 95th percentile egress queues estimated with TRAFFIX software, the Caribbean Parking Garage Driveway would have a minimum required throat depth of 300 feet after installation of a signal.

The Caribbean Parking Garage Driveway / Caribbean Drive intersection shall be located at least 960 feet east of the Mathilda Avenue-Caribbean Drive curve in order to meet sight distance requirements contained in the AASHTO Green Book. This would place the Caribbean Parking Garage Driveway / Caribbean Drive intersection in close proximity to the proposed pedestrian hybrid beacon as discussed in Section 9.4 of this TIA. Due to the close proximity of the Caribbean Parking Garage Driveway / Caribbean Drive intersection and the potential pedestrian hybrid beacon, the two traffic control devices would not meet typical intersection/signal spacing standards as defined in *Transportation Research Circular Number 456 – Driveway and Street Intersection Spacing* (Transportation Research Board, March 1996). Therefore, the two traffic control devices shall be combined into a single signalized intersection. The Project applicant shall pay for the installation of a signal at the Caribbean Parking Garage Driveway / Caribbean Drive intersection. As per Section 8.1.1 of this TIA, it is recommended that the Caribbean Parking Garage Driveway shall have a throat length of at least 475 feet.

Installation of the new signalized Caribbean Parking Garage Driveway will impact the City's Caribbean Drive Parking and Trail Access Enhancement Project. Any impacts to improvements on the north side of Caribbean Drive shall be mitigated by the Project. If parking spaces are removed or moved due to the installation of the signal, the Project shall provide dedicated, convenient, and BCDC compliant parking spaces in the same quantity as those affected.

With the proposed mitigation in place, the Caribbean Parking Garage Driveway (full-access) / Caribbean Drive intersection is projected to operate at acceptable LOS "B" or better conditions. Therefore, impacts at this intersection would be considered "**less than significant**" with the proposed mitigation.

Intersection #19 – Fair Oaks Avenue / Ahwanee Avenue

The Fair Oaks Avenue / Ahwanee Avenue intersection is projected to operate at unacceptable "Cumulative" and "Cumulative plus Project/Project Alternative" PM peak hour LOS "E" conditions. The addition of Project/Project Alternative generated trips is not projected to increase the average delay of critical movements by four (4) or more seconds and increase the critical V/C ratio by 0.01 or more. Therefore, based on City of Sunnyvale intersection traffic impact criteria, Project/Project Alternative impact at the Fair Oaks Avenue / Ahwanee Avenue intersection is considered "**less than significant**".

Intersection #26 – Great America Parkway / Tasman Drive

The Great America Parkway / Tasman Drive intersection is projected to operate at unacceptable "Cumulative" and "Cumulative plus Project/Project Alternative" AM and PM peak hour LOS "F" conditions. The addition of Project/Project Alternative generated trips is not projected to increase the average delay of critical movements by four (4) or more seconds and increase the critical V/C ratio by 0.01 or more. Therefore, based on City of Santa Clara and VTA intersection traffic impact criteria, Project/Project Alternative impact at the Great America Parkway / Tasman Drive intersection is considered "**less than significant**".

Intersection #27 – Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive

The Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive intersection is projected to operate at unacceptable "Cumulative" and "Cumulative plus Project/Project Alternative" PM peak hour LOS "F" conditions. The addition of Project/Project Alternative generated trips is projected to increase the average delay of critical movements by four (4) or more seconds and increase the critical V/C ratio by 0.01 or more. Therefore, based on City of Sunnyvale intersection traffic impact criteria, Project/Project Alternative impact at the Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive intersection is projected to be "**significant**".

Mitigation:

Restriping the westbound approach to have two left-turn lanes and one shared left-through-right lane would be needed to improve operations of this intersection to acceptable LOS "E" or better under "Cumulative plus Project/Project Alternative" PM peak hour conditions. This improvement is not considered feasible as it would require signal timing changes that would disrupt the current signal coordination of the Mathilda Avenue-Sunnyvale Saratoga Road corridor. Therefore, Project/Project Alternative impact at this intersection is considered "**significant and unavoidable**".

11. QUEUING ANALYSIS, DEFICIENCIES, AND RECOMMENDED IMPROVEMENTS

11.1 QUEUING ANALYSIS

Queuing analysis for left-turn movements was performed at all signalized study intersection approaches that contained one or more left-turn pockets. Queuing analysis for overall approach queues was performed for one-way stop-controlled intersections. **Table 25** shows total available storage length and total projected 95th percentile left-turn queues for each approach under "Existing", "Existing plus Project", "Background", "Background plus Project", "Cumulative", and "Cumulative plus Project" AM and PM peak hour conditions.

As shown in **Table 25**, left-turn queues are projected to exceed the available storage length at 12 intersections and 17 movements under "Existing" conditions, at 11 intersections and 17 movements under "Existing plus Project" conditions, at 14 intersections and 21 movements under "Background" conditions, at 14 intersections and 22 movements under "Background plus Project" conditions, at 15 intersections and 26 movements under "Cumulative" conditions, and at 16 intersections and 28 movements under "Cumulative plus Project" conditions.

Table 26 shows total available storage length and total projected 95th percentile left-turn queues for each approach under "Existing plus Project Alternative", "Background plus Project Alternative", and "Cumulative plus Project Alternative" AM and PM peak hour conditions. "Existing", "Background", and "Cumulative" conditions queues are also shown for comparison.

As shown in **Table 26**, left-turn queues are projected to exceed the available storage length at 3 intersections and 4 movements under "Existing plus Project Alternative" conditions, at 5 intersections and 7 movements under "Background plus Project Alternative" conditions, and at 5 intersections and 8 movements under "Cumulative plus Project Alternative" conditions.

11.2 PROJECT QUEUING DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

This section of the TIA evaluates the study intersection queue results presented in **Table 25** and **Table 26** against the queuing deficiency criteria summarized in Section 1.5.2 of this report. Identified queuing deficiencies and potential improvements (where feasible) are summarized in **Table 27** ("plus Project" Scenarios), and **Table 28** ("plus Project Alternative" Scenarios).

There are several turn pockets at intersections under the County's jurisdiction where lengthening of the turn pockets/turn lanes are not feasible due to right-of-way constraints. At these locations, Project-related queuing deficiencies could be improved by implementation of Countywide Intelligent Transportation System (ITS) upgrade projects. The Project applicant shall make fair share contributions toward these ITS upgrade projects.

There are several locations where Project-related queuing deficiencies occur at intersections under City jurisdiction and where lengthening of the turn pockets/turn lanes are not feasible due to right-of-way constraints. At these locations, Project-related queuing deficiencies could be improved by implementation of planned ITS upgrades along major roadway corridors in the City, which is included in the City's TIF.

Table 25. Queuing Analysis – "plus Project" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+P	Background	B+P	Cumulative	C+P
1	Mathilda Avenue / Mathilda Parking Garage Driveway	WB	180	AM	31	0	25	0	25	0	25
			180	PM	211	0	50	0	50	0	50
2	Caribbean Parking Garage Driveway / Caribbean Drive	NB	190	AM	67	0	25	0	25	0	25
			190	PM	455	0	150	0	175	0	**225**
3	Caribbean NE Surface Lot Driveway / Caribbean Drive	NB	50	AM	9	0	25	0	25	0	25
			50	PM	56	0	25	0	25	0	25
4	Borregas Avenue / Caribbean Drive	EBL	110	AM	15	25	75	50	75	50	100
			110	PM	123	50	**325**	50	**325**	50	**325**
		WBL	105	AM	95	**750**	**1250**	**975**	**1525**	**1025**	**1525**
			105	PM	19	**175**	**225**	**250**	**300**	**275**	**325**
5	Borregas Avenue / Borregas NE Surface Lot Driveway	NB	300	AM	32	0	25	0	25	0	25
			300	PM	8	0	25	0	25	0	25
		EB	50	AM	15	0	25	0	25	0	25
			50	PM	106	0	25	0	25	0	25
6	Borregas Avenue / Borregas Service Ingress Driveway	NB	100	AM	28	0	25	0	25	0	25
			100	PM	8	0	25	0	25	0	25
7	Borregas Avenue / Borregas Service Egress Driveway	EB	25	AM	5	0	25	0	25	0	25
			25	PM	10	0	25	0	25	0	25
9	Borregas Avenue / Caspian Court-Caspian Drive	EB	190	AM	0	25	25	25	25	25	25
			190	PM	0	25	25	25	25	25	25
		WB	85	AM	0	25	25	25	25	25	25
			85	PM	0	25	25	25	25	25	25

Table 25. Queuing Analysis – "plus Project" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+P	Background	B+P	Cumulative	C+P
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive	NBL	525	AM	0	500	500	525	500	**650**	**650**
			525	PM	0	125	125	125	125	150	150
		SBL	190	AM	156	**200**	**475**	**275**	**550**	**300**	**600**
			190	PM	24	50	100	75	125	75	125
		EBL	320	AM	0	75	75	125	125	125	125
			320	PM	0	**600**	**600**	**650**	**650**	**775**	**775**
		WBL	200	AM	6	25	25	25	25	25	25
			200	PM	9	50	75	50	75	50	75
11	Bordeaux Service Driveway / Bordeaux Drive	SB	120	AM	5	0	25	0	25	0	25
			120	PM	10	0	25	0	25	0	25
		EB	25	AM	8	0	25	0	25	0	25
			25	PM	4	0	25	0	25	0	25
14	Bordeaux Drive / Java Drive	NBL	155	AM	0	25	25	50	50	75	75
			155	PM	0	25	25	100	100	100	100
		SBL	200	AM	1	50	50	50	50	75	75
			200	PM	2	200	200	**375**	**375**	**450**	**450**
		EBL	125	AM	3	25	25	25	25	25	25
			125	PM	3	25	25	25	25	25	25
		WBL	315	AM	0	**325**	300	**425**	**425**	**525**	**525**
			315	PM	0	200	200	**375**	**375**	**450**	**450**
15	Borregas Avenue / Java Drive	NBL	215	AM	0	125	125	125	125	150	150
			215	PM	0	25	25	75	75	100	100
		SBL	290	AM	8	150	175	175	200	200	225
			290	PM	38	125	200	150	200	150	225
		EBL	200	AM	5	150	175	200	**225**	**225**	**225**
			200	PM	2	175	200	200	200	200	**225**
		WBL	400	AM	0	275	275	275	300	325	350
			400	PM	0	100	100	125	125	125	150

Table 25. Queuing Analysis – "plus Project" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+P	Background	B+P	Cumulative	C+P
16	Geneva Drive / Java Drive	NBL	180	AM	0	50	50	50	50	75	75
			180	PM	0	25	25	25	25	25	25
		SBL	200	AM	1	50	50	150	150	150	150
			200	PM	8	125	150	**400**	**425**	**425**	**450**
		EBL	220	AM	1	25	25	100	100	100	100
			220	PM	1	75	75	100	100	100	100
		WBL	225	AM	0	150	200	175	175	**250**	**250**
			225	PM	0	25	25	25	25	50	50
17	Crossman Avenue-SR 237 WB On-Ramp / Moffett Park Drive	EBL	210	AM	0	50	50	150	150	150	150
			210	PM	0	175	175	**325**	**325**	**350**	**350**
		WBL	150	AM	0	25	25	25	25	25	25
			150	PM	0	75	75	75	75	100	100
18	Java Drive-Fair Oaks Avenue / Fair Oaks Way-Kensington Place	NBL	150	AM	0	**225**	**225**	**250**	**250**	**275**	**275**
			150	PM	0	**200**	**200**	**300**	**300**	**375**	**375**
		SBL	170	AM	0	25	25	25	25	25	25
			170	PM	0	25	25	25	25	50	50
		EBL	310	AM	1	275	275	**400**	**400**	**475**	**475**
			310	PM	0	50	50	50	50	75	75
		WBL	100	AM	0	100	100	100	100	100	100
			100	PM	0	25	25	25	25	25	25
19	Fair Oaks Avenue / Ahwanee Avenue	NBL	125	AM	0	100	100	100	100	100	100
			125	PM	0	100	100	100	100	125	125
		SBL	130	AM	0	50	50	75	75	75	75
			130	PM	0	**175**	**175**	**225**	**225**	**275**	**275**

Table 25. Queuing Analysis – "plus Project" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+P	Background	B+P	Cumulative	C+P
20	Fair Oaks Avenue / Caliente Drive	NBL	75	AM	0	25	25	25	25	25	25
			75	PM	0	50	50	50	50	50	50
		SBL	80	AM	0	50	50	50	50	75	75
			80	PM	0	**200**	**200**	**225**	**225**	**250**	**250**
21	Fair Oaks Avenue / Wolfe Road	EBL	770	AM	12	**1175**	**1175**	**1325**	**1325**	**1625**	**1650**
			770	PM	2	**1175**	**1175**	**1300**	**1300**	**1625**	**1625**
22	Geneva Drive / Caribbean Drive	NB	200	AM	1	25	25	25	25	25	25
			200	PM	1	25	25	25	50	50	50
23	Caribbean Drive / Twin Creeks	NBL	150	AM	0	**175**	**175**	**175**	150	**175**	**175**
			150	PM	0	50	50	50	50	50	50
		SBL	275	AM	0	25	25	25	25	25	25
			275	PM	0	75	75	75	75	75	75
		EBL	25	AM	0	0	0	0	0	0	0
			25	PM	0	25	25	25	25	25	25
		WBL	75	AM	0	25	25	25	25	25	25
			75	PM	0	50	50	50	50	50	50
24	Caribbean Drive / Moffett Park Drive-Baylands Park	NBL	750	AM	0	**800**	**875**	**900**	**900**	**1150**	**1150**
			750	PM	0	575	600	600	650	**800**	**875**
		SBL	210	AM	0	25	25	25	25	25	25
			210	PM	0	25	25	25	25	25	25
25	Lawrence Expressway / Persian Drive-Elko Drive	NBL	200	AM	0	75	75	75	75	75	75
			200	PM	0	125	125	125	125	125	125
		SBL	830	AM	0	300	300	325	325	400	400
			830	PM	0	**1300**	**1300**	**1300**	**1300**	**1700**	**1700**
		EBL	100	AM	0	100	100	100	100	**125**	**125**
			100	PM	0	**125**	**125**	**125**	**125**	**150**	**150**
		WBL	155	AM	0	**325**	**325**	**325**	**350**	**400**	**400**
			155	PM	0	**475**	**475**	**500**	**500**	**625**	**625**

Table 25. Queuing Analysis – "plus Project" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+P	Background	B+P	Cumulative	C+P
26	Great America Parkway / Tasman Drive	NBL	400	AM	19	**950**	**1000**	**1400**	**1525**	**1925**	**2075**
			400	PM	3	300	325	**925**	**950**	**1125**	**1125**
		SBL	460	AM	0	350	350	**1175**	**1175**	**1275**	**1275**
			460	PM	0	**1050**	**1050**	**2450**	**2450**	**2525**	**2525**
		EBL	540	AM	0	150	150	250	250	275	275
			540	PM	0	125	125	425	425	450	450
		WBL	540	AM	0	**1200**	**1200**	**3500**	**3500**	**3975**	**3975**
			540	PM	0	**1000**	**1025**	**6400**	**6400**	**6050**	**6050**
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive	NBL	150	AM	0	75	75	75	75	75	75
			150	PM	0	125	125	125	125	150	150
		SBL	175	AM	0	125	125	125	125	150	150
			175	PM	0	175	175	175	175	**200**	**200**
		EBL	55	AM	0	50	50	50	50	**75**	**75**
			55	PM	0	50	50	50	50	50	50
		WBL	480	AM	0	**850**	**850**	**975**	**1000**	**1225**	**1250**
			480	PM	0	**1200**	**1225**	**1625**	**1650**	**2050**	**2075**

Notes: ***Bold*** *values show queues projected to exceed available storage.*
Highlighted *values show queuing deficiencies exacerbated by Project generated traffic.*
1. Total storage length provided by all left-turn pockets (signalized intersections) and approach/throat depth (two-way stop-controlled intersections).
2. Total queued vehicle lengths in all pockets. All queue lengths were rounded up to the nearest 25 foot increment.

Table 26. Queuing Analysis – "plus Project Alternative" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+PA	Background	B+PA	Cumulative	C+PA
1	Mathilda Avenue / Mathilda Parking Garage Driveway	WB	180	AM	19	0	25	0	25	0	25
			180	PM	133	0	25	0	25	0	25
2	Caribbean Parking Garage Driveway / Caribbean Drive	NB	190	AM	37	0	25	0	25	0	50
			190	PM	243	0	**300**	0	**400**	0	**475**
3	Caribbean NE Surface Lot Driveway / Caribbean Drive	NB	50	AM	9	0	25	0	25	0	25
			50	PM	56	0	25	0	25	0	25
4	Borregas Avenue / Caribbean Drive	EBL	110	AM	0	25	25	25	50	50	50
			110	PM	4	50	50	50	50	50	50
		WBL	105	AM	58	**750**	**1025**	**975**	**1300**	**1025**	**1300**
			105	PM	13	**175**	**225**	**250**	**275**	**275**	**325**
5	Borregas Avenue / Borregas NE Surface Lot Driveway	NB	300	AM	32	0	25	0	25	0	25
			300	PM	8	0	25	0	25	0	25
		EB	50	AM	15	0	25	0	25	0	25
			50	PM	106	0	25	0	25	0	25
6	Borregas Avenue / Borregas Service Ingress Driveway	NB	100	AM	28	0	25	0	25	0	25
			100	PM	8	0	25	0	25	0	25
7	Borregas Avenue / Borregas Service Egress Driveway	EB	25	AM	5	0	25	0	25	0	25
			25	PM	10	0	25	0	25	0	25
9	Borregas Avenue / Caspian Court-Caspian Drive	EB	190	AM	0	25	25	25	25	25	25
			190	PM	0	25	25	25	25	25	25
		WB	85	AM	0	25	25	25	25	25	25
			85	PM	0	25	25	25	25	25	25
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive	NBL	520	AM	0	500	500	**525**	500	**650**	**650**
			520	PM	0	125	125	125	125	150	150
		SBL	190	AM	0	**200**	**200**	**275**	**275**	**300**	**300**
			190	PM	0	50	50	75	75	75	75
		EBL	320	AM	0	75	75	125	125	125	125
			320	PM	0	**600**	**650**	**650**	**700**	**775**	**800**
		WBL	200	AM	6	25	25	25	25	25	25
			200	PM	9	50	75	50	75	50	75

Table 26. Queuing Analysis – "plus Project Alternative" Scenarios

#	Intersection	Movement	Storage Length (ft)[1]	Peak Hour	# of Project Trips Added	Projected Queue Length (ft)[2]					
						Existing	E+PA	Background	B+PA	Cumulative	C+PA
11	Bordeaux Service Driveway / Bordeaux Drive	SB	120	AM	5	0	25	0	25	0	25
			120	PM	10	0	25	0	25	0	25
		EB	25	AM	8	0	25	0	25	0	25
			25	PM	4	0	25	0	25	0	25
14	Bordeaux Drive / Java Drive	NBL	155	AM	0	25	25	50	50	75	75
			155	PM	0	25	25	100	100	100	100
		SBL	200	AM	1	50	50	50	50	75	75
			200	PM	2	200	200	**375**	**375**	**450**	**450**
		EBL	125	AM	3	25	25	25	25	25	25
			125	PM	3	25	25	25	25	25	25
		WBL	315	AM	0	**325**	300	**425**	**425**	**525**	**525**
			315	PM	0	200	200	**375**	**375**	**450**	**450**
15	Borregas Avenue / Java Drive	NBL	215	AM	0	125	125	125	125	150	150
			215	PM	0	25	25	75	75	100	100
		SBL	290	AM	8	150	175	175	200	200	225
			290	PM	38	125	200	150	200	150	225
		EBL	200	AM	5	150	175	200	**225**	**225**	**225**
			200	PM	2	175	200	200	200	200	**225**
		WBL	400	AM	0	275	275	275	275	325	350
			400	PM	0	100	100	125	125	125	150

Notes: ***Bold*** *values show queues projected to exceed available storage.*
Highlighted *values show queuing deficiencies exacerbated by Project generated traffic.*
1. Total storage length provided by all left-turn pockets (signalized intersections) and approach/throat depth (two-way stop-controlled intersections).
2. Total queued vehicle lengths in all pockets. All queue lengths were rounded up to the nearest 25 foot increment.

Table 27. Queue Deficiencies and Improvements – "plus Project" Scenarios

#	Intersection	Mvt	Peak Hour	Scenarios with Deficiencies			Additional Storage Length Needed (ft)	Recommended Improvement	Improvement Feasible?	Reason Improvement Is Not Feasible	Total Feasible Storage Length Extension
				E+P	B+P	C+P					
4	Borregas Avenue / Caribbean Drive	EBL	AM				215	Extend left turn pocket by 215 ft	Yes	n/a	750
			PM	X	X	X					
		WBL	AM	X	X	X	1420	Extend left turn pocket by 1420 ft	No	Existing geometry restrictions	655
			PM	X	X	X					
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive	SBL	AM	X	X	X	410	Reconfigure inside thru lane as a left-turn trap lane	Yes	n/a	500
			PM								
15	Borregas Avenue / Java Drive	EBL	AM		X		25	Extend left turn pocket by 25 ft	No	Right-of-way constraints	0
			PM			X					
16	Geneva Drive / Java Drive	SBL	AM				250	Extend left turn pocket by 250 ft	No	Right-of-way constraints	0
			PM		X	X					
21	Fair Oaks Avenue / Wolfe Road	EBL	AM			X	880	Extend each left turn pocket by 440 ft	No	Right-of-way constraints	0
			PM								
24	Caribbean Drive / Moffett Park Drive-Baylands Park	NBL	AM	X			125	Extend left turn pocket by 125 ft	No	Right-of-way constraints	0
			PM			X					
25	Lawrence Expressway / Persian Drive-Elko Drive	WBL	AM				195	Extend turn pocket by 195 ft	No	Outside of City's jurisdiction	0
			PM		X						
26	Great America Parkway / Tasman Drive	NBL	AM	X	X	X	1675	Extend each left turn pocket by 838 ft	No	Outside of City's jurisdiction	0
			PM		X						
		WBL	AM				485	Extend each left turn pocket by 242 ft	No	Outside of City's jurisdiction	0
			PM	X							
27	Mathilda Avenue / Sunnyvale Saratoga Road - Talisman Drive	EBL	AM	X	X	X	1595	Extend each left turn pocket by 798 ft	No	Right-of-way constraints	0
			PM								

Table 28. Queue Deficiencies and Improvements – "plus Project Alternative" Scenarios

#	Intersection	Mvt	Peak Hour	Scenarios with Deficiencies			Additional Storage Length Needed (ft)	Recommended Improvement	Improvement Feasible?	Reason Improvement is Not Feasible	Total Feasible Storage Length Extension
				E+PA	B+PA	C+PA					
4	Borregas Avenue / Caribbean Drive	WBL	AM	X	X	X	1195	Extend left turn pocket by 1195 ft	No	Existing geometry restrictions	655
			PM	X	X	X					
10	Mathilda Avenue / 1st Avenue-Bordeaux Drive	EBL	AM				480	Extend each left turn pocket by 240 ft	No	Existing geometry restrictions	0
			PM	X	X	X					
15	Borregas Avenue / Java Drive	EBL	AM		X		25	Extend left turn pocket by 25 ft	No	Right-of-way constraints	0
			PM			X					

As shown in **Table 27** and **Table 28**, the following turning movements are projected to operate with queuing deficiencies under "Existing plus Project", "Existing plus Project Alternative", "Background plus Project", "Background plus Project Alternative", "Cumulative plus Project" and/or "Cumulative plus Project Alternative" conditions, and have potentially feasible improvements available to alleviate queuing deficiencies:

Intersection #4 – Borregas Avenue / Caribbean Drive Eastbound Left-turn Queue

The Borregas Avenue / Caribbean Drive intersection is projected to experience a queuing deficiency for the eastbound left-turn movement under "Existing plus Project", "Background plus Project", and "Cumulative plus Project" PM peak hour conditions. An additional 215 feet of storage length would be needed to accommodate the worst-case projected queue at this movement.

Improvement:

The total feasible amount that the eastbound left-turn pocket at this intersection could be lengthened is estimated to be 750 feet. The Project applicant shall extend the eastbound left turn pocket by 215 feet. Implementation of this improvement will accommodate the worst-case projected queue at this movement.

Intersection #10 – Mathilda Avenue / 1st Avenue-Bordeaux Drive Southbound Left-turn Queue

The Mathilda Avenue / 1st Avenue-Bordeaux Drive intersection is projected to experience a queuing deficiency for the southbound left-turn movement under "Existing plus Project", "Background plus Project", and "Cumulative plus Project" AM peak hour conditions. An additional 410 feet of storage length would be needed to accommodate the worst-case projected queue at this movement under "plus Project" conditions and.

Improvement:

A feasible improvement to accommodate the worst-case projected queue at this movement is to reconfigure the southbound inside through-lane as a left-turn trap lane (i.e., a through traffic lane which terminates in a mandatory left-turn lane), therefore providing the required additional queue storage length for this movement. The left-turn trap lane shall be signed and striped following the guidelines contained in the CA MUTCD. The Project applicant shall implement this improvement to mitigate the queuing deficiency at this intersection.

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