DRAFT

TRANSPORTATION IMPACT ANALYSIS
MOFFETT PLACE OFFICE DEVELOPMENT

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EXECUTIVE SUMMARY

This report presents the results of the transportation impact analysis (TIA) for the proposed expansion of the Moffett Place Office Development (proposed project) located in the City of Sunnyvale, California. The project would replace 537,114 square feet (s.f.) of existing office space and a 60,000 s.f. community college uses (Cogswell College) with a total 1,799,554 s.f. of office space (research and development center) consisting of six eight-story buildings, plus an associated 50,000-s.f. amenities building. This analysis includes an evaluation of a proposed expansion of the existing hotel, located on the southern portion of the site, from 173 to 307 rooms resulting in an additional 134 hotel rooms. The project is located within the Moffett Park Specific Plan (MPSP) area and is generally bounded by Mathilda Avenue to the west, a Santa Clara Water District flood control channel to the north, Borregas Avenue to the east, and Moffett Park Drive to the south. The project site includes construction of two new parking garages and an east-west roadway that would provide a connection between Bordeaux Drive and Mathilda Avenue and align with the existing Mathilda Avenue/Innovation Way intersection. The roadway system was evaluated under No Project and plus Project scenarios for Existing, Background, and Cumulative Conditions. Site access for all modes and parking are also addressed.

PROJECT TRAFFIC ESTIMATES

The amount of traffic anticipated to be added to the surrounding roadway system by the proposed project was estimated based on data published in Institute of Transportation Engineers' (ITE) *Trip Generation* 9th Edition (2012). Trip generation estimates for the proposed project were developed by incorporating the site size both with the existing uses and with the proposed redevelopment into the trip generation equations for "Research and Development Center" (ITE Land Use 760), "Hotel" (ITE Land Use 310) and "Community College" (ITE Land Use 540) for each respective component of the project.

Peak hour trip reductions of 30 percent are required as part of the Transportation Demand Management (TDM) program for the MPSP; however, the Santa Clara Valley Transportation Authority (VTA) TIA guidelines, which the City is required to follow, allow for a maximum 9.5 percent reduction on vehicle trips for projects near a light rail station that have an effective TDM program. A 9.5 percent reduction was applied to the office portion of the project trip estimates to determine the number of net new trips generated by the project. Due to the discrepancies between the MPSP and VTA TDM standards, a sensitivity analysis was conducted at each location that was identified as being potentially impacted by project traffic. All identified potential impacts were reevaluated assuming the MPSP TDM trip reduction of 30 percent during the peak hours to identify any change to the impact under the MPSP standards. It should be noted that the 30 percent trip reduction consists of a 20 percent TDM trip reduction from the MPSP and a 10 percent trip reduction from meeting green building standards.

The proposed project is estimated to generate 5,820 net new daily trips, 1,040 net new AM peak-hour trips, and 1,595 net new PM peak-hour trips.

CITY OF SUNNYVALE'S DEFICIENCY PLAN AND TRANSPORTATION IMPACT FEE PROGRAM

In compliance with VTA, the City of Sunnyvale maintains a *Citywide Deficiency Plan* (CDP, September 2005) to address existing and anticipated deficiencies in the level of service of Congestion Management Program (CMP) intersections within the City. The objective of the CDP is to set forth a comprehensive citywide solution of offsetting improvements to LOS deficiencies at CMP facilities for which no localized mitigation is feasible. The CDP includes a list of transportation improvements to mitigate identified deficiencies. Improvements include intersection and roadway improvements, as well as, pedestrian, bicycle, and transit infrastructure improvements to facilitate multi-modal access throughout the City. In the vicinity the proposed project is the Mary Avenue Extension project, which will extend Mary Avenue from its current terminus at Almanor Avenue north over SR 237 and US 101 connecting to 11th Avenue. The new roadway connection will change travel patterns on adjacent streets (particularly the parallel arterials) and will reduce congestion on key facilities such as Mathilda Avenue as compared to conditions without the extension. The Mary Avenue Extension project is a large long-term project. The extension project is eligible for funding from the City's traffic impact fee (TIF), discussed in following paragraph, though the TIF assumes that 50 percent of the cost for extension project will be funded from outside sources. The City projects that the extension project will not move forward until closer to buildout of the General Plan (2035).

To facilitate implementation of the improvements identified in the CDP, the City of Sunnyvale has a two-tiered traffic impact fee (TIF), which identifies a separate fee structure for the Moffett Park Specific Plan area north of SR 237 and the remainder of the City south of SR 237. Fees are adopted pursuant to the Transportation Strategic Program to fund major transportation projects necessary to support land use plans; including major transportation improvements identified in the CDP. The purpose of the fee is to help provide adequate transportation-related improvements to serve cumulative development within the City. One of the identified projects of the Transportation Strategic Program near the project is the reconfiguration of the SR 237/Mathilda Avenue interchange. The SR 237 Mathilda Avenue project is a near-term project that currently in the conceptual design/environmental/Caltrans approval process. Funding is available to complete this project in a three to ten year time frame. The effects of the SR 237/Mathilda Avenue reconfiguration in the context of the proposed project are evaluated under Cumulative Conditions in Chapter 6 of this report.

INTERSECTION IMPACTS AND MITIGATION MEASURES

Intersection Impacts are evaluated under No Project and plus Project scenarios for Existing, Background, and Cumulative Conditions.

EXISTING PLUS PROJECT CONDITIONS

Based on the City of Sunnyvale's and VTA's impact criteria the project is expected to have a less-than-significant impact at all 42 study intersections evaluated in this TIA.

BACKGROUND PLUS PROJECT CONDITIONS

Based on the City of Sunnyvale's and VTA's impact criteria the project is expected to have a less-than-significant impact at all 42 study intersections evaluated in this TIA.

CUMULATIVE PLUS PROJECT CONDITIONS

Based on the City of Sunnyvale's and VTA's impact criteria the project is expected to have a significant impact at the following intersection:

Int. 22. Bordeaux Drive/Moffett Park Drive

The following mitigation measures are required to mitigate project impacts:

Int. 22. Bordeaux Drive/Moffett Park Drive

Under Cumulative plus Project Conditions the Bordeaux Drive/Moffett Park Drive intersection is projected to operate at unacceptable LOS F during the AM peak hour; however, is not projected to meet the MUTCD peak hour signal warrant volume threshold. In the PM peak hour, the intersection is projected to operate at unacceptable LOS F and is projected to meet the MUTCD peak hour signal warrant volume thresholds. Therefore, based on the City of Sunnyvale's intersection threshold, the Bordeaux Drive/Moffett Park Drive intersection would have a **significant** impact during the PM peak period.

Based on City standards, the project's impact would be mitigated to **less-than-significant** levels with the installation of a traffic signal. The signal is assumed to include a protected eastbound left-turn phase from Moffett Park Drive to northbound Bordeaux Drive and a southbound right-turn overlap phase.

Assuming that buildings B1, B2, and B5 would develop in phase one, the Moffett Park Drive/Bordeaux Drive intersection and would operate at LOS C and the project would have a **less-than-significant** impact.

With a 30 percent reduction in vehicle trips to account for the MPSP TDM requirement, the intersection would continue to operate at LOS F, and the impact at this intersection would remain **significant**.

The proposed realignment of the SR 237 Westbound Ramp/Moffett Park Drive off-ramp discussed in Chapter 6 and included in the City's TIF program, would require the closure of Moffett Park Drive between Mathilda Avenue and Bordeaux Drive. This closure would eliminate the eastbound approach of the Bordeaux Drive/Moffett Park Drive intersection, thus removing all conflict points and eliminating the entire intersection. Therefore, if the proposed off-ramp realignment is implemented no additional improvements would be required at this intersection. It should be noted that the specific modifications related to the reconfiguration of the SR 237/Mathilda Avenue interchange analyzed in this report are based on recommendations from the 2006 *Route 237 Corridor Study*. The SR 237/Mathilda Avenue project is currently under conceptual design review, and specific modifications to the SR 237/Mathilda Avenue intersections could change based on conclusions from the on-going analysis of this interchange.

MATHILDA AVENUE CORRIDOR ANALYSIS

Based on the City of Sunnyvale's and VTA's impact criteria the project is expected to have a significant impact at the following intersections:

Int. 6. Mathilda Avenue/Moffett Park Drive

Int. 7. Mathilda Avenue/SR 237 Westbound Ramps

Int. 6. Mathilda Avenue/Moffett Park Drive

Reconfiguration of the SR 237/Mathilda Avenue ramp intersections would reduce the impact to a less-than-significant level. Payment of the City's TIF would constitute the project's fair share contribution. Reconfiguration of the SR 237/Mathilda Avenue ramp intersections, based on the recommendations of the 2006 Route 237 Corridor Study and assumed in this analysis, would consist of:

- Shifting the SR 237 Westbound Off-ramp 150 feet to the north to align with Moffett Park/Mathilda Avenue;
- Removing SR 237Westbound On-ramp; and,
- Constructing a direct southbound right-turn on-ramp from Mathilda Avenue to US 101 north

These improvements are programmed in both the City's Transportation Strategic Program and the *Valley Transportation Plan (VTP) 2035* list of constrained projects.

Int. 7. Mathilda Avenue/SR 237 Westbound Ramps

Reconfiguration of the Mathilda Avenue/237 Ramps also mitigates the impacts identified for the Mathilda Avenue/SR 237 Westbound Ramp intersection, since the improvements include the elimination of this intersection. Payment of the City's TIF would constitute the project's fair share contribution. The hotel development represents approximately eight percent of the net new AM peak hour trips and ten percent of the net new PM peak hour trips; therefore the hotel development would be responsible for their relative contribution level to the TIF.

FREEWAY SEGMENT IMPACTS AND MITIGATION MEASURES

Under Existing plus Project Conditions, the proposed project would add trips greater than one percent of the freeway segment capacity to the following freeway segments already operating at LOS F:

- US 101, Northbound, Ellis Street to SR 237 (AM & PM peak hours)
- US 101, Northbound, SR 237 to Mathilda Avenue (AM & PM peak hours)
- US 101, Northbound, Mathilda Avenue to Fair Oaks Avenue (AM peak hour)
- US 101, Northbound Fair Oaks Avenue to Lawrence Expressway (AM peak hour)

- SR 237, Eastbound, US 101 to Maude Avenue (AM peak hour)
- SR 237, Westbound, US 101 to Maude Avenue (PM peak hour)
- SR 237, Eastbound, Mathilda Avenue to US 101 (AM peak hour)
- SR 237, Westbound, Mathilda Avenue to US 101 (AM peak hour)
- SR 237, Westbound, Fair Oaks Avenue to Mathilda Avenue (AM & PM peak hours)
- SR 237, Eastbound Fair Oaks Avenue to Lawrence Expressway (PM peak hour)
- SR 237, Westbound Fair Oaks Avenue to Lawrence Expressway (AM & PM peak hours)

Therefore, the project would have a **significant** impact at the identified study freeway segments.

Implementation of TDM measures to achieve the full 30 percent reduction in peak-hour vehicle trips would incrementally reduce traffic volumes on all freeway segments; however, it would not be sufficient to reduce the identified impacts to a less-than-significant level.

The mitigation for freeway impacts is typically the provision of additional capacity in the form of additional mainline or auxiliary lanes. Several freeway improvements were identified in the *Valley Transportation Plan* (VTP) 2035 to improve freeway operations on the affected segments:

- Convert HOV lanes to express lanes on US 101 from SR 85 in Mountain View to San Jose (VTP ID H5)
- Convert HOV lanes to express lanes on SR 237 from I-880 to Mathilda Avenue (VTP ID H9)
- Construct new HOV/express lanes on SR 237 between Mathilda Avenue and SR 85 (VTP H11).

The freeway improvement projects listed in the *VTP 2035* are financially constrained (financially constrained projects are planned project for which VTA anticipates full funding within the timeframe of the *VTP 2035*). These improvements are anticipated to relieve traffic congestion added by the project. Therefore a fair share contribution to these regional projects, which VTA is actively designing, would constitute mitigation toward the following identified freeway impacts:

- US 101: Convert HOV lanes to express lanes from SR 85 in Mountain View to San Jose (VTP ID H5)
    - Northbound, Ellis Street to SR 237
    - Northbound, Mathilda Avenue to Fair Oaks Avenue
    - Northbound Fair Oaks Avenue to Lawrence Expressway
- SR 237: Convert HOV lanes to express lanes from I-880 to Mathilda Avenue (VTP H9)
    - Westbound, Fair Oaks Avenue to Mathilda Avenue
    - Eastbound/Westbound, Fair Oaks Avenue to Lawrence Expressway
- SR 237 – Construct new HOV/express lanes between Mathilda Avenue and SR 85 (VTP H11)
    - Eastbound/Westbound, US 101 to Maude Avenue

- Eastbound, Mathilda Avenue to US 101

The project applicant will be required to work with the City of Sunnyvale and VTA to determine the amount of the fair share contribution. The hotel development represents approximately eight percent of the net new AM peak hour trips and ten percent of the net new PM peak hour trips; therefore the hotel development would be responsible for their relative level of the final share contribution to the regional projects.

TRANSIT SERVICE

The proposed project will generate demand for existing transit services in the area, which can be accommodated by the existing supply. Transit impacts are considered significant if the proposed project conflicts with existing or planned transit facilities or generates potential transit trips and does not provide adequate facilities for pedestrians and bicyclists to access transit routes and stops. Based on these criteria, the project would have a **less-than-significant** impact on transit service.

It is recommended that the project either subsidize an existing shuttle or provide a private shuttle to facilitate direct transit access between regional transit hubs (such as downtown Sunnyvale Caltrain Station) or other potential markets to the project site, based on a market analysis. The developer, in cooperation with the City and other potentially benefiting parties, should provide such an analysis and other logistical requirements for evaluating and establishing shuttle service.

BICYCLE AND PEDESTRIAN FACILITIES

The proposed Project would generate bicycle demand on-site and on the adjacent roadways, which generally have adequate bicycle facilities. Near the project site, there are bicycle lanes in both directions provided on both Bordeaux Drive between Moffett Park Drive and Java Drive and Borregas Avenue between Maude Avenue and Caribbean Drive. Bicycle lanes are provided on Mathilda Avenue (north of Bordeaux Drive) and Moffett Park Drive (east of Bordeaux Drive). A bicycle route is designated on Mathilda Avenue from Bordeaux Drive to Innovation. A bicycle path extends from the north-east of the US 101/Mathilda Avenue interchange along the John W. Christian Greenbelt from Garner Drive to Morse Avenue, where it connects with existing Class II bike lanes along Weddell Drive.

Sidewalks will be provided along the perimeter of the project along the north side of Moffett Park Drive, both sides of Bordeaux Drive, the west side of Borregas Avenue and both sides of the proposed new roadway. Pedestrian connections will be provided between the proposed buildings, parking lots, and parking garages. The project also includes two distinct internal pedestrian paths designed to provide a direct link through the project site between the buildings located east of Bordeaux Drive and Mathilda Avenue (located along the western boundary of the site) where the Lockheed Martin transit station is located. The pedestrian paths would terminate on Mathilda Avenue just south of the Mathilda Avenue/Innovation Way-Proposed New Roadway intersection, where pedestrians would need to cross to the west side of Mathilda Avenue and then travel north approximately 900 feet to reach the Lockheed Martin Transit station. Due to the potential increase in pedestrian traffic between the Lockheed Marin Transit station and the project site, it is recommended that countdown pedestrian signal heads be installed at the Mathilda Avenue/Innovation Way-Proposed New Roadway intersection when the westbound leg (Proposed New Roadway) of the intersection is implemented.

For the buildings along Borregas Avenue, the Borregas LRT station on Java Drive is closer than the Lockheed Martin station. For light rail trains traveling in the westbound direction on Java Drive, the Borregas LRT station is provided just west of the Borregas Avenue intersection, and for light rail trains traveling in the eastbound direction, the station is provided east of the Java Drive/Borregas Avenue intersection. No sidewalks are currently provided on the east side of Borregas Drive south of Gibraltar Drive. Due to the potential increase in pedestrian traffic between the Borregas LRT station and the project site, it is recommended that sidewalks be constructed on the east side of Borregas Avenue between Gibraltar Drive and Moffett Park Drive.

Based on an initial review of the project site plan the project would not generate any significant impacts associated with pedestrian of bicycle facilities.

Pedestrian/bicycle overcrossings are also provided along Borregas Avenue across both US 237 and US 101. However, no pedestrian facilities currently connect the project site or the Borregas Avenue Light Rail Station to the overcrossings. The proposed project will construct sidewalks on Borregas Avenue along its frontage; however, there will still be approximately an 800 foot gap along Borregas Avenue between the end of the project's property line and Gibraltar Court where no pedestrian facilities will be provided. There are numerous constraints to constructing sidewalks along this section of Borregas Avenue including acquiring right-of-way, grade changes between the parcel and the roadway, and numerous mature trees within the right-of-way that would need to be relocated. Because of these right-of-way constraints it is recommended that the on-street parking along the west side of Borregas Avenue be removed and a sidewalk be constructed in its place, or, if right of way or easements can be secured, that sidewalk be provided behind the existing curb. The developer should fund the coast of design and construction of these facilities.

To facilitate pedestrian and bicycle access to the SR 237 overcrossing, the existing crosswalk on the west-leg of the Moffett Park Drive/Borregas Avenue intersection should be enhanced. Currently, this crosswalk provides high-visibility ladder striping; however, this is an uncontrolled crossing that requires pedestrians to cross two lanes of vehicle traffic, which have no stop-control and should yield to pedestrians. Enhancements such as Rectangular Rapid Flashing Beacons (RRFB), In-roadway Warning lights (IRWL), or raised crosswalks should be considered for this pedestrian crossing. Additionally, it is recommended that the curb radii on north-east and north-west corners be reduced to slow vehicular turning speeds and increase pedestrian connectivity.

VEHICLE AND BICYCLE PARKING

Based on the requirements of the MPSP and the City of Sunnyvale's Municipal Code the project is required to provide a total of 5,766 parking spaces for the office development and 246 spaces for the hotel development. The Moffett Place Office Development proposes to provide 5,766 parking spaces, which satisfies the MPSP requirements. The hotel development proposes to provide 278 spaces, which exceeds the City of Sunnyvale Municipal Code requirement by 32 spaces.

The Moffett Park Office Development will need to supply 290 bicycle spaces on the project site Of these, 75 percent (218 spaces) will be Class I bicycle lockers and remaining 25 percent (72 spaces) will be Class II bicycle facilities. The hotel will be required to provide 13 Class I bicycle parking spaces. With the provision of these bicycle parking facilities the project will meet City and MPSP guidelines.

SITE ACCESS AND ON-SITE CIRCULATION

The following site-access and on-site circulation improvements are recommended to improve access to the Moffett Place Site:

- Align the southern pedestrian path across the project site with the edge of the parking aisle. While this location may result in additional conflict points between vehicles and pedestrians, drivers will already be looking for conflicting vehicular movements at this point and will naturally be more alert to pedestrian movements.

- Both internal paths would require midblock pedestrian crossings on Bordeaux Drive. Both crossing locations would be located to the north of the access point to Parking Structure #2, therefore high traffic volumes are not anticipated at either location. However, it is still recommended that stripped crosswalks and in pavement flashing yellow beacons be provided at both midblock crossing locations to help alert drivers of crossing pedestrians. Raised crosswalks would also be ideal at these locations and should be further evaluated if significant pedestrian volumes are observed with the implementation of the proposed project. Additional measures such as advanced limit lines and shark teeth could also be implemented to alert motorists of the crossing point.

CONSTRUCTION IMPACTS

The Moffett Place project will have minimal construction impacts to traffic and use of parking lots for construction related activity. However, the following measures are recommended to ensure adequate traffic operations during project construction:

- Restrict directional access to the construction site. In-bound traffic from Mathilda Avenue should be instructed to access the construction site via Mathilda Avenue or Moffett Park Drive, while outbound construction traffic should be restricted to the Mathilda Avenue intersection at Java Drive.

- Prohibit truck access to the site during peak commute times (7 AM to 9 AM and 4 PM to 6 PM) to limit potential impacts to the operations of Mathilda Avenue.

1. INTRODUCTION

This report presents the results of the transportation impact analysis (TIA) for the proposed expansion of the Moffett Place Office Park development (proposed project) located in the City of Sunnyvale, California. The 56-acre project site is located within the Moffett Park Specific Plan (MPSP) area and is generally bounded by Mathilda Avenue to the west, a Santa Clara Water District flood control channel to the north, Borregas Avenue to the east, and Moffett Park Drive to the south. Part of the project description includes the construction two new parking garages. The development site is located in close proximity to the Lockheed Martin light rail transit (LRT) station and the project would have a Transportation Demand Management (TDM) program, consistent with the TDM requirements outlined in the MPSP. The site location is shown on the map on **Figure 1.** The proposed site plan is included on **Figure 2**.

The purpose of this analysis is to identify potentially significant adverse impacts of the proposed project on the surrounding transportation system and to recommend measures to mitigate significant impacts. The TIA was prepared following the guidelines of the City of Sunnyvale and Santa Clara Valley Transportation Authority (VTA), the congestion management agency for Santa Clara County.

PROJECT DESCRIPTION

As proposed, the project would replace 537,114 s.f. of existing office space and 60,000 s.f. of community college uses (Cogswell College) with a total of 1,799,554 s.f. of office space (research and development center) consisting of six eight-story buildings, plus an associated 50,000-s.f. amenities building. This analysis includes an evaluation of a proposed expansion of the existing hotel, located on the southern portion of the site, from 173 to 307 rooms resulting in an additional 134 hotel rooms. Parking would be supplied via two new parking garages and surface parking lots surrounding the buildings. As proposed the project also includes the construction of a new east-west roadway that would provide a connection between Bordeaux Drive and Mathilda Avenue and align with the existing Mathilda Avenue/Innovation Way intersection.

DEFINITIONS

- Existing – Conditions of roadways and intersections as of March 2013, when data for the study area was collected.
- Project – Traffic associated with the proposed Moffett Place Office Park and hotel redevelopment.
- Background – Existing conditions plus growth associated with "approved and not built" and "not occupied" developments.
- Cumulative – Long-term 2035 conditions based on forecasted volumes from the City of Sunnyvale Transportation Forecast Model.
- Constrained Projects – Planned transportation improvement projects for which VTA anticipates full funding within the timeframe of the regional transportation plan ("*Valley Transportation Plan 2035*").

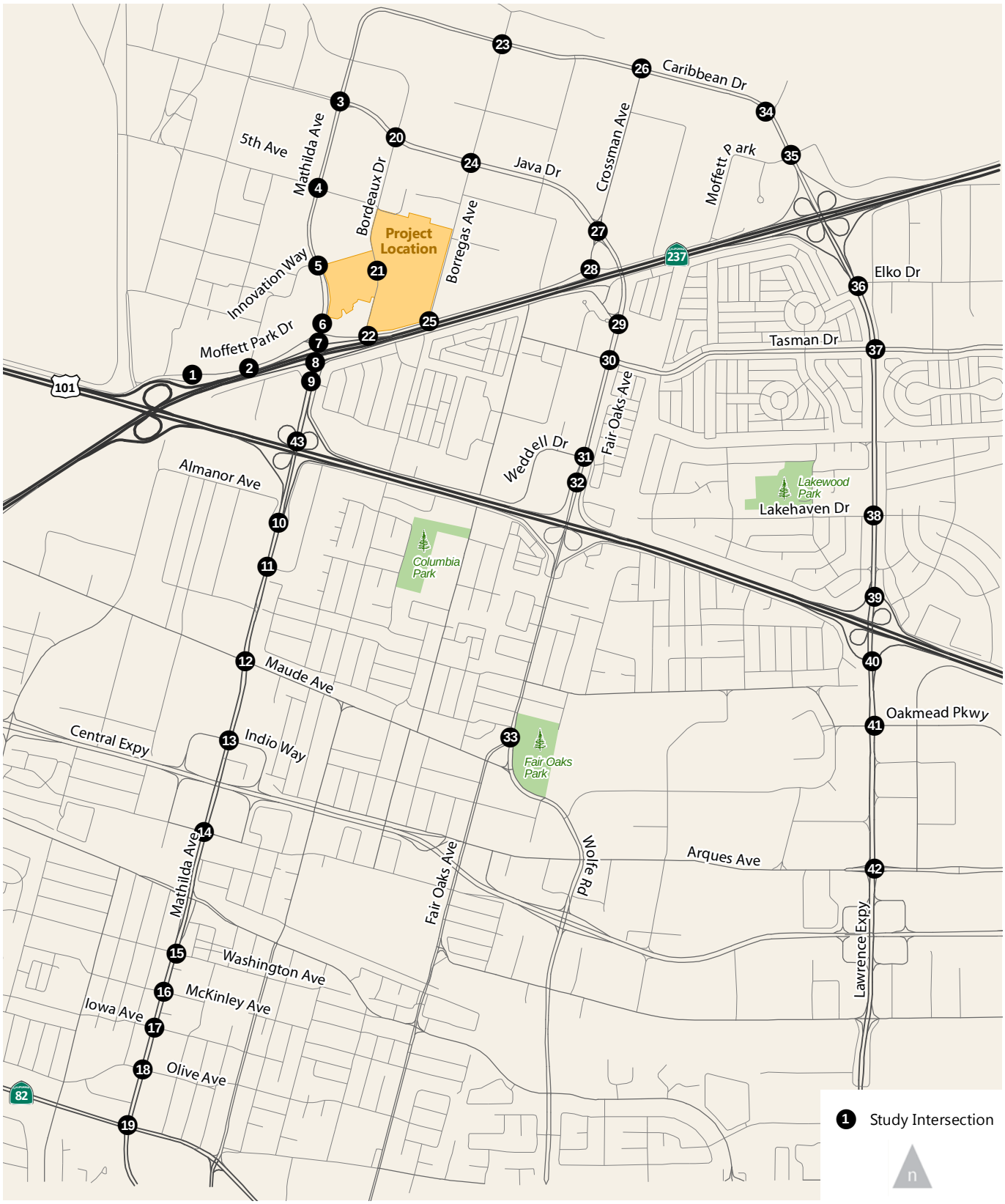

Figure 1.

Project Location and Study Area

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SCVWD
New Roadway
SCVWD
Humboldt Court
B4
8 story
E
B6
8 story
E
B5
8 story
E
B3
8 story
E
Parking
Structure B
(S+2)
Amenities
2 story
Borregas Avenue
N. Mathilda
B2
8 story
E
Bordeaux Drive
Parking
Structure A
(S+2-3/4)
B1
8 story
HWY 237
Moffett Park Drive

Figure 2.

STUDY AREA

The roadway impacts of the proposed project were evaluated for the following intersections and freeway segments:

Study Intersections

1. Northbound US 101 Ramps/Moffett Park Drive
2. Lockheed Martin Way/Moffett Park Drive
3. Mathilda Avenue/Java Drive (CMP intersection)
4. Mathilda Avenue/5th Avenue
5. Mathilda Avenue/Innovation Way
6. Mathilda Avenue/Moffett Park Drive
7. Mathilda Ave/Westbound SR 237 Ramps
8. Mathilda Ave/Eastbound SR 237 Ramps
9. Mathilda Avenue/Ross Drive
10. Mathilda Avenue/Ahwanee Avenue
11. Mathilda Avenue/San Aleso Avenue
12. Mathilda Avenue/Maude Avenue (CMP intersection)
13. Mathilda Avenue/Indio Way
14. Mathilda Avenue/California Ave
15. Mathilda Avenue/Washington Avenue
16. Mathilda Avenue/West McKinley Avenue
17. Mathilda Avenue/Iowa Avenue
18. Mathilda Avenue/Olive Drive
19. Mathilda Avenue/El Camino Real (CMP intersection)
20. Bordeaux Drive/ Java Drive
21. Bordeaux Drive/New Roadway (future)
22. Bordeaux Drive/Moffett Park Drive
23. Borregas Avenue/Caribbean Drive
24. Borregas Avenue/Java Drive
25. Borregas Avenue/Moffett Park Drive
26. Crossman Avenue/Caribbean Drive
27. Crossman Avenue/Java Drive
28. Crossman Avenue/Moffett Park Drive
29. Fair Oaks Avenue/Fair Oaks Way
30. Fair Oaks Avenue/Tasman Drive
31. Fair Oaks Avenue/East Weddell Drive
32. Fair Oaks Ave/Northbound US 101 Ramps
33. Fair Oaks Avenue/Wolfe Road
34. Twin Creeks Entrance/Caribbean Drive
35. Moffett Park Drive/Caribbean Drive
36. Lawrence Expressway/Persian Drive-Elko Drive
37. Lawrence Expressway/Tasman Drive (CMP intersection)
38. Lawrence Expressway/Lakehaven Drive
39. Lawrence Expressway/NB US 101 Ramps
40. Lawrence Expressway/SB US 101 Ramps
41. Lawrence Expressway/Duane Avenue/Oakmead Parkway
42. Lawrence Expressway/Arques Avenue (CMP intersection)

The listed intersections were selected in consultation with the City of Sunnyvale and determined based on VTA's ten trip per lane guideline, which indicates that intersections should be included if the proposed project adds 10 or more peak hour vehicles per lane to any intersection movement.

Freeway Segments

US 101 (Northbound and Southbound)

- Between Ellis Street and SR 237
- Between SR 237 and Mathilda Street
- Between Mathilda Avenue and Fair Oaks Avenue
- Between Fair Oaks Avenue and Lawrence Expressway

SR 237 (Eastbound and Westbound)

- Between Maude Avenue and US 101
- Between US 101 and Mathilda Avenue
- Between Mathilda Avenue and Fair Oaks Ave
- Between Fair Oaks Avenue and Lawrence Expressway

Project impacts to pedestrian facilities, bicycle facilities, and transit service and facilities are also addressed.

ANALYSIS SCENARIOS

The operations of the study intersections were evaluated during the weekday morning (AM) and weekday evening (PM) peak hours for the following scenarios:

Scenario 1: *Existing Conditions* - Existing volumes obtained from counts.

Scenario 2: *Existing plus Project Conditions* - Scenario 1 volumes plus traffic generated by the proposed project.

Scenario 3: *Background Conditions* - Existing volumes plus traffic from "approved but not yet built" and "not occupied" developments in the area plus ambient growth to the anticipated completion year of the project.

Scenario 4: *Background plus Project Conditions* - Scenario 3 volumes plus traffic generated by the proposed project.

Scenario 5: *Cumulative No Project Conditions* - Background No Project volumes (Scenario 3) including pending developments in the area plus ambient growth to the year 2035.

Scenario 6A: *Cumulative plus Project Conditions – Existing Mathilda Avenue/SR 237 Ramp Configuration* - Scenario 5 volumes plus traffic from the development with no changes to Mathilda Avenue/SR 237 ramp alignments.

Scenario 6B: *Cumulative plus Project Conditions - Mathilda Avenue/SR 237 Ramp Realignment* - Scenario 5 volumes plus traffic from the development with the following changes to the Mathilda Avenue/SR 237 ramps:

- Reconfiguration of Mathilda Avenue/SR 237 to eliminate the traffic signal aligning with the Route 237 WB off and on ramps
- Shifting of the westbound 237 off ramp to an alignment approximating the current alignment of Moffett Park Drive
- Restriction of access to the westbound 237 on ramp to southbound Mathilda and eastbound Moffett Park Drive traffic only – no northbound Mathilda access

- Elimination of eastbound Moffett Park Drive access from Mathilda Avenue, tying of westbound Moffett Park Drive into the westbound 237 ramp via a stop or signal
- Elimination of the northbound 101 to northbound Mathilda free right turn ramp and northbound 101 to southbound Mathilda loop ramp, replacement with a traffic signal serving both movements

Scenario 6C: *Cumulative plus Project Conditions Traffic Sensitivity & Diversion Analysis* – A comparison of the traffic operations and required traffic controls under the following three scenarios:

- Retaining westbound Moffett Park Drive access to Mathilda Avenue via a tie to the westbound 237 off ramps
- Providing alternative access via the proposed new Bordeaux/Innovation roadway
- No Moffett Park Drive access/no new road/traffic diversion to Java Drive, other routes

Six or the study intersections on the Mathilda Avenue corridor are closely spaced and the corridor experiences operational issues beyond isolated intersection LOS. A more comprehensive analysis for the following six Mathilda Avenue intersections is presented in a separate chapter (Mathilda Avenue Corridor Analysis):

1. Mathilda Avenue/Innovation Way
2. Mathilda Avenue/Moffett Park Drive
3. Mathilda Ave/Westbound SR 237 Ramps
4. Mathilda Ave/Eastbound SR 237 Ramps
5. Mathilda Avenue/Ross Drive
6. Mathilda Avenue/Ahwanee Avenue

The Mathilda Avenue corridor analysis presents standard TRAFFIX level of service analysis, which is augmented with micro simulation analysis using SimTraffic.

ANALYSIS METHODS

The operations of roadway facilities are described with the term *level of service*. Level of Service (LOS) is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, as the best operating conditions, to LOS F, or the worst operating conditions. LOS E represents "at-capacity" operations. When traffic volumes exceed the intersection capacity, stop-and-go conditions result, and operations are designated as LOS F.

SIGNALIZED INTERSECTIONS

The method described in Chapter 16 of the 2000 *Highway Capacity Manual* (HCM) (Special Report 209, Transportation Research Board) was used to prepare the level of service calculations for the study inter sections. This level of service method, which is approved by the City of Sunnyvale and VTA, analyzes a signalized intersection's operation based on average control delay per vehicle. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using TRAFFIX analysis software and is correlated to a LOS designation as shown in **Table 1**.

The City of Sunnyvale's minimum threshold for acceptable signalized intersection operations is LOS D, except for regionally significant roadways. Regionally significant roadways are generally CMP roadways and relevant to this TIA include the corridors along Mathilda Avenue, Lawrence Expressway, Caribbean Drive, and El Camino Real. The threshold for regionally significant roadway intersections, consistent with Santa Clara County CMP intersections, is LOS E. Designated CMP intersections within the study area include Mathilda Avenue/Java Drive (#3), Mathilda Avenue/Maude Avenue (#12), Mathilda Avenue/El Camino Real (#19), Lawrence Expressway/Tasman Drive (#37), and Lawrence Expressway/Arques Avenue (#42).

UNSIGNALIZED INTERSECTIONS

The operations of the unsignalized intersections were evaluated using the method contained in Chapter 17 of the *2000 HCM*. LOS ratings for stop-sign-controlled intersections are based on the average control delay expressed in seconds per vehicle. At two-way or side-street-controlled intersections, the average control delay is calculated for each stopped movement, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. **Table 2** summarizes the relationship between delay and LOS for unsignalized intersections. The City of Sunnyvale does not have an officially adopted significance criteria for unsignalized intersections; though based on previous studies, a threshold of LOS E and *Manual on Uniform Traffic Control Devices* (MUTCD) signal warrant analysis are used to evaluate impacts at unsignalized intersections.

FREEWAY SEGMENTS

Freeway segments are evaluated using VTA's analysis procedure, which is based on the density of the traffic flow using methods described in the *2000 HCM*. Density is expressed in passenger cars per mile per lane. The Congestion Management Program ranges of densities for each freeway segment level of service are shown in **Table 3**. The LOS standard for the freeway segments is LOS E.

TABLE 1
SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS
USING AVERAGE CONTROL VEHICULAR DELAY

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B+	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 to 12.0
B		12.1 to 18.0
B-		18.1 to 20.0
C+	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 to 23.0
C		23.1 to 32.0
C-		32.1 to 35.0
D+	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 39.0
D		39.1 to 51.0
D-		51.1 to 55.0
E+	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	55.1 to 60.0
E		60.1 to 75.0
E-		75.1 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	> 80.0

Source: *Traffic Level of Service Analysis Guidelines*, VTA Congestion Management Program, June 2003; *Highway Capacity Manual*, Transportation Research Board, 2000.

TABLE 2
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS
USING AVERAGE CONTROL VEHICULAR DELAY

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no delay.	≤ 10.0
B	Short traffic delay.	10.1 to 15.0
C	Average traffic delays.	15.1 to 25.0
D	Long traffic delays.	25.1 to 35.0
E	Very long traffic delays.	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded.	> 50.0

Sources: *Traffic Level of Service Analysis Guidelines*, VTA Congestion Management Program, June 2003; *Highway Capacity Manual*, Transportation Research Board, 2000.

TABLE 3
FREEWAY SEGMENT LEVEL OF SERVICE DEFINITIONS

Level of Service	Density (passenger cars per mile per lane)
A	≤ 11
B	11.1 to 18.0
C	18.1 to 26.0
D	26.1 to 46.0
E	46.1 to 58.0
F	> 58.0

Sources: *Traffic Level of Service Analysis Guidelines*, VTA Congestion Management Program, June 2003; *Highway Capacity Manual*, Transportation Research Board, 2000.

IMPACT CRITERIA

INTERSECTION IMPACT CRITERIA

Santa Clara County Valley Transportation Authority (VTA) and Santa Clara County Expressway Intersections

The LOS standard for CMP intersections is LOS E. Traffic impacts at CMP intersections would occur when the addition of traffic associated with implementation of a Project causes:

1. Intersection operations to deteriorate from an acceptable level (LOS E or better) under the Existing Conditions to an unacceptable level (LOS F); or
2. Exacerbation of unacceptable operations by increasing the average critical delay by more than 4 seconds and increasing the critical volume-to-capacity (V/C) ratio by 0.01 or more at an intersection operating at LOS F.
3. The V/C ratio increases by 0.01 or more at an intersection with unacceptable operations (LOS F) when the change in critical delay is negative (i.e., decreases). This can occur if the critical movements change.

The following CMP intersections were analyzed for this report:

- Mathilda Avenue/Java Drive (#3)
- Mathilda Avenue/Maude Avenue (#12)
- Mathilda Avenue/El Camino Real (#19)
- Lawrence Expressway/Tasman Drive (#37)
- Lawrence Expressway/Arques Avenue (#42)

Like most jurisdictions within Santa Clara County, the City of Sunnyvale defers to CMP LOS standards for CMP intersections within their boundaries.

CITY OF SUNNYVALE

Signalized Intersections

The LOS standard for City of Sunnyvale intersections is LOS D except for City of Sunnyvale intersections that are designated regionally significant. Regionally significant roadways are generally CMP roadways and relevant to this TIA include the corridors along Mathilda Avenue, Lawrence Expressway, Caribbean Drive, and El Camino Real. The threshold for regionally significant roadway intersections, consistent with Santa Clara County CMP intersections, is LOS E. Traffic impacts at City of Sunnyvale would occur when the addition of traffic associated with implementation of the Project causes:

1. Intersection (except those on designated regionally significant roads) operations to deteriorate from an acceptable level (LOS D or better) under the Existing Conditions to an unacceptable level (LOS E or LOS F); or,

2. Operations for regionally significant designated intersections to deteriorate from an acceptable level (LOS E or better) under the Existing Conditions to an unacceptable level (LOS F); or,
3. Exacerbation of unacceptable operations by increasing the average critical delay by more than 4 seconds and increasing the critical volume-to-capacity (V/C) ratio by 0.01 or more at an intersection operating at LOS E or F (LOS F for regionally significant roads).

Unsignalized Intersections

Levels of service analysis at unsignalized intersections are generally used to determine the need for modification in type of intersection control (i.e., all-way stop or signalization). As part of this evaluation traffic volumes, delays, and traffic signal warrants are evaluated to determine if the existing intersection control is appropriate.

The City of Sunnyvale do not have an officially adopted significance criteria for unsignalized intersections. Based on previous studies, significant impacts are defined to occur when the addition of project traffic causes the average intersection delay for all-way stop-controlled intersection or the worst movement/approach for side-street stop-controlled intersections to degrade to LOS F and the intersection satisfies any traffic signal warrant from the MUTCD.

FREEWAY IMPACT CRITERIA

The LOS standard for CMP freeway segments is LOS E. Traffic impacts on a CMP freeway segment occurs when the addition of project traffic causes:

- Freeway segment operations to deteriorate from an acceptable level (LOS E or better) under Existing Conditions to an unacceptable level (LOS F); or
- An increase in traffic of more than one percent of the capacity of a segment that operates at LOS F under Existing Conditions.

MOFFETT PARK SPECIFIC PLAN (MPSP)

The Moffett Park Specific Plan (MPSP) was adopted by the City of Sunnyvale on April 27, 2004. The MPSP defines goals and objectives for future development, community and design guidelines, infrastructure improvements, and development standards for the Moffett Park area. The Moffett Park area is located in the northern most portion of the City of Sunnyvale and is generally bounded by the Moffett Federal Airfield in the west, the San Francisco Bay to the north, SR 237 to the south and Sunnyvale Baylands Park to the east. In regards to transportation, the MPSP includes guidelines for mandatory transportation demand management programs, parking requirements for both vehicles and bicycles, planned roadway improvements to accommodate vehicles, transit, bicyclists, and pedestrians with the proposed buildout of Moffett Park.

CITY OF SUNNYVALE'S DEFICIENCY PLAN AND TRANSPORTATION IMPACT FEE PROGRAM

In compliance with VTA, the City of Sunnyvale maintains a *Citywide Deficiency Plan* (CDP, September 2005) to address existing and anticipated deficiencies in the level of service of Congestion Management Program

(CMP) intersections within the City. The objective of the CDP is to set forth a comprehensive citywide solution of offsetting improvements to LOS deficiencies at CMP facilities for which no localized mitigation is feasible. The CDP includes a list of transportation improvements to mitigate identified deficiencies. Improvements include intersection and roadway improvements, as well as, pedestrian, bicycle, and transit infrastructure improvements to facilitate multi-modal access throughout the City. In the vicinity of the proposed project is the Mary Avenue Extension project, which will extend Mary Avenue from its current terminus at Almanor Avenue north over SR 237 and US 101 connecting to 11th Avenue. The new roadway connection will change travel patterns on adjacent streets (particularly the parallel arterials) and will reduce congestion on key facilities such as Mathilda Avenue as compared to conditions without the extension. The Mary Avenue Extension project is a large long-term project. The extension project is eligible for funding from the City's traffic impact fee (TIF), discussed in following paragraph, though the TIF assumes that 50 percent of the cost for extension project will be funded from outside sources. The City projects that the extension project will not move forward until closer to buildout of the General Plan (2035).

To facilitate implementation of the improvements identified in the CDP, the City of Sunnyvale has a two-tiered traffic impact fee (TIF), which identifies a separate fee structure for the Moffett Park Specific Plan area north of SR 237 and the remainder of the City south of SR 237. Fees are adopted pursuant to the Transportation Strategic Program to fund major transportation projects necessary to support land use plans; including major transportation improvements identified in the CDP. The purpose of the fee is to help provide adequate transportation-related improvements to serve cumulative development within the City. One of the identified projects of the Transportation Strategic Program near the project site is the reconfiguration of the SR 237/Mathilda Avenue interchange. The SR 237 Mathilda Avenue project is a near-term project that currently in the conceptual design/environmental/Caltrans approval process. Funding is available to complete this project in a three to ten year time frame. The effects of the SR 237/Mathilda Avenue reconfiguration in the context of the proposed project are evaluated in Chapter 6 of this report.

REPORT ORGANIZATION

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

- ***Chapter 2*** describes the **existing transportation system** near the project site and the current operating conditions of the key intersections and freeway segments.
- ***Chapter 3*** describes **Existing plus Project Conditions**, including the method used to estimate the amount of traffic added to the surrounding roadways by the proposed project and its impacts on the transportation system.
- ***Chapter 4*** describes **Background Conditions**.
- ***Chapter 5*** describes **Cumulative Conditions**.
- ***Chapter 6*** presents level of service calculations for the **Mathilda Avenue study corridor** between Innovation Way and Ahwanee Avenue for all plus project analysis scenarios using TRAFFIX and SimTraffic level of service software tools. This chapter also describes operations of the Mathilda Avenue corridor with reconfiguration of the SR 237/Mathilda Avenue interchange, based on recommendations from the 2006 *Route 237 Corridor Study*.
- ***Chapter 7*** provides an assessment of **site access, on-site circulation, multi-modal transportation, and parking**.
- ***Chapter 8*** discusses **construction** related impacts.

2. EXISTING CONDITIONS

This chapter describes the existing conditions of the roadway facilities, pedestrian and bicycle facilities, and transit service. It also presents existing traffic volumes and operations for the study intersections and freeway segments with the results of level of service calculations.

EXISTING ROADWAY NETWORK

State Route 237 (SR 237), US 101, Lawrence Expressway and Central Expressway provide regional access to the project site. The following streets provide local access: Mathilda Avenue, Moffett Park Drive, Innovation Way, Borregas Avenue, Bordeaux Drive, Java Drive, Caribbean Drive, Crossman Avenue and Fair Oaks Avenue. Descriptions of these roadways are presented below. **Figure 1** shows the locations of these facilities in relation to the project site.

SR 237 is located immediately south of the project site and provides regional freeway access between the Cities of Mountain View and Milpitas. SR 237 is an east-west freeway with two mixed-flow lanes in each direction. High occupancy vehicle (HOV) lane are provided in each direction of SR 237 east of Mathilda Avenue HOV lanes, also known as diamond or carpool lanes, restrict use to vehicles with two or more persons (carpool, vanpool, and buses) or motorcycles during the morning (5:00 AM to 9:00 AM) and evening (3:00 PM to 7:00 PM) commute periods. Access from SR 237 is provided via its interchanges with US 101, Mathilda Avenue, Fair Oaks Avenue, and Lawrence Expressway. Near the project site SR 237 has an average daily traffic (ADT) volume of approximately 90,000 vehicles.

US 101 extends north through San Francisco and south through San Jose. Near the project site, US 101 travels in an east-west direction with approximately 140,000 daily vehicles. The freeway has three mixed-flow lanes and one HOV lane in each direction. Similar to SR 237, interchanges at Ellis Street, Mathilda Avenue, Fair Oaks Avenue, and Lawrence Expressway provide local access to the project site.

Central Expressway is a divided four-lane east-west expressway between San Antonio Road in the City of Mountain View and De La Cruz Boulevard in the City of Santa Clara. West of San Antonio Road, Central Expressway continues to Menlo Park as Alma Road. Central Expressway provides local access to the site via interchanges at Mary Avenue, Mathilda Avenue, Fair Oaks Avenue, Wolfe Road, and Lawrence Expressway. Near the project site, Central Expressway carries about 42,000 daily vehicles.

Lawrence Expressway is a divided eight-lane north-south expressway extending between Saratoga Avenue to the south and SR 237 to the north. Lawrence Expressway continues north as East Caribbean Drive and to the south it is a continuation of Quito Road. Lawrence Expressway provides region north-south access throughout the City of Sunnyvale.

Mathilda Avenue is a major six-lane north-south arterial that also provides regional access to SR 237 and US 101. North of SR 237, Mathilda Avenue connects to Caribbean Drive, which is the extension of Lawrence Expressway. To the south, Mathilda Avenue passes through central Sunnyvale and becomes Sunnyvale-Saratoga Road ultimately connecting to I-280 and SR 85. Mathilda Avenue is one of the City of Sunnyvale's designated truck routes for trucks over three tons in weight. Approximately 45,000 daily vehicles travel on Mathilda Avenue south of SR 237 on an average weekday.

Moffett Park Drive is a two-lane east-west roadway that runs along the southern border of the MPSP. Moffett Park Drive/Manila Drive provides direct regional access to the project site at the SR 237 interchange and US 101 interchange and has an ADT of approximately 5,000 vehicles. Moffett Park Drive connects to Mathilda Avenue west of the project area and extends east to Caribbean Drive. No access is provided to Moffett Park Drive west of Mathilda Avenue from the SR 237 westbound off-ramp; vertical delineators currently prevent access to the northbound left-turn lanes.

Innovation Way is a four-lane, north-south roadway that extends from Moffett Park Drive to Mathilda Avenue. The proposed New Roadway will connect with Innovation Way at the Mathilda Avenue intersection.

Java Drive is a four-lane, east-west roadway divided by light rail tracks in the City of Sunnyvale. Java Drive extends between SR 237 to the east and North Mathilda Avenue to the west. In the east Java Drive continues as North Fair Oaks Avenue and in the west it continues as Lockheed Martin Way.

Caribbean Drive is a divided four-lane east-west roadway, which is the extension of Lawrence Expressway and continues as Mathilda Avenue to the east in the City of Sunnyvale.

Fair Oaks Avenue is a four to five-lane north-south roadway extending from SR 237 in the north and continuing as West Remington Drive in the south.

PEDESTRIAN FACILITIES

Pedestrian facilities consist of sidewalks, crosswalks, and pedestrian signals at signalized intersections. In the vicinity of the project site, sidewalks are provided on the both sides of Mathilda Avenue along the project frontage and on the north side of Gibraltar Court. There are no sidewalks on Moffett Park Drive, Bordeaux Drive or Borregas Avenue along the project frontage, though the City has identified sidewalks on Moffett Park Drive as a future pedestrian improvement. Most study intersections include crosswalks and pedestrian signals on all approaches.

At the Mathilda Avenue/SR 237 interchange, north-south pedestrian movements are limited to the east side of Mathilda Avenue and east-west crossing of Mathilda Avenue is prohibited within the interchange area. Pedestrians crossing Mathilda (east-west) have to use the crosswalk on the north leg of the Mathilda Avenue/Moffett Park Drive intersection. Sidewalks continue on the east side of Mathilda Avenue from the SR 237 interchange to south of the US 101 interchange, at which point sidewalks continue on both sides of Mathilda Avenue. The City has identified providing sidewalks on both sides of Mathilda Avenue between Moffett Park Drive and US 101 as future pedestrian improvements and are included in the TIF program.

A multi-use pedestrian/bicycle bridge crosses SR 237 and US 101 east of Mathilda Avenue providing a pedestrian/bicycle connection between Moffett Park to the north and the residential neighborhood to the south. There is currently an uncontrolled crosswalk located on the west leg of the Moffett Park Drive/Borregas Avenue intersection connecting the proposed project site to the pedestrian bridge; however, there are currently no sidewalks connecting to the crosswalk at any point of the intersection, as shown in the picture below:

Crosswalk at the west leg of the Moffett Park Drive/ Borregas Avenue intersection

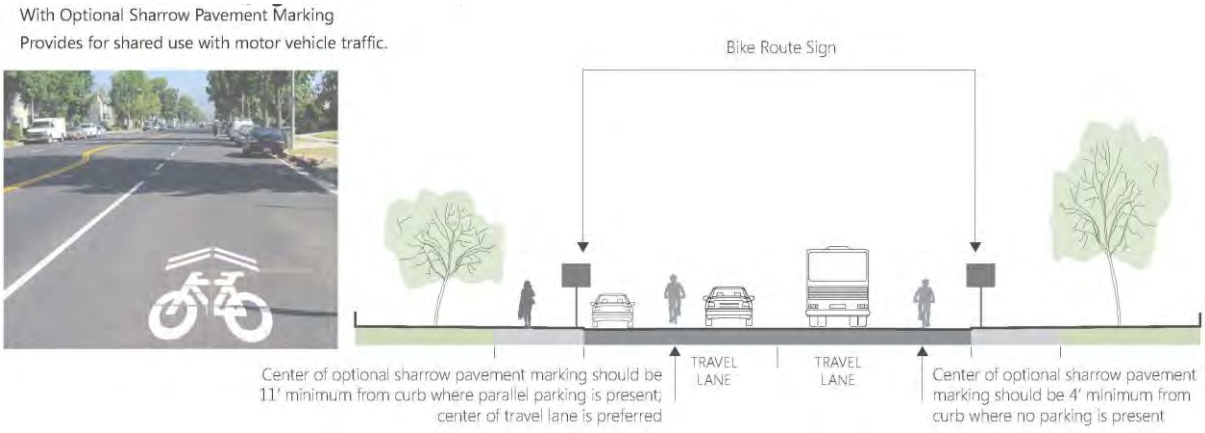
BICYCLE FACILITIES

Bikeway planning and design in California typically relies on guidelines and design standards established by California Department of Transportation (Caltrans) in the *Highway Design Manual* (Chapter 1000: Bikeway Planning and Design). Caltrans provides for three distinct types of bikeway facilities, as described below and shown on the accompanying figures.

- *Class I Bikeway (Bike Path)* provides a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized. In general, bike paths serve corridors not served by streets and highways or where sufficient right-of-way exists to allow such facilities to be constructed away from the influence of parallel streets and vehicle conflicts.

- *Class II Bikeways (Bike Lanes)* are lanes for bicyclists generally adjacent to the outer vehicle travel lanes. These lanes have special lane markings, pavement legends, and signage. Bicycle lanes are generally five (5) feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.

- *Class III Bikeway (Bike Route)* are designated by signs or pavement markings for shared use with pedestrians or motor vehicles, but have no separated bike right-of-way or lane striping. Bike routes serve either to: a) provide continuity to other bicycle facilities, or b) designate preferred routes through high demand corridors.



The *VTA Bicycle Technical Guidelines* (December 2007) recommends that Caltrans standards regarding bicycle facility dimension be used as a minimum and provides supplemental information and guidance on when and how to better accommodate the many types of bicyclists. **Figure 3** shows the location of the existing bicycle facilities within the project study area.

Bicycle lanes are provided in both directions on both Bordeaux Drive (between Moffett Park Drive and Java Drive) and Borregas Avenue (between Maude Avenue and Caribbean Drive). Bicycle lanes are provided on Mathilda Avenue (north of Bordeaux Drive) and Moffett Park Drive (east of Bordeaux Drive). A bicycle route is designated on Mathilda Avenue from Bordeaux Drive to Innovation Way. A bicycle path extends from the north-east of the US 101/Mathilda Avenue interchange along the John W. Christian Greenbelt from Garner Drive to Morse Avenue, where it connects with existing Class II bike lanes along Weddell Drive.

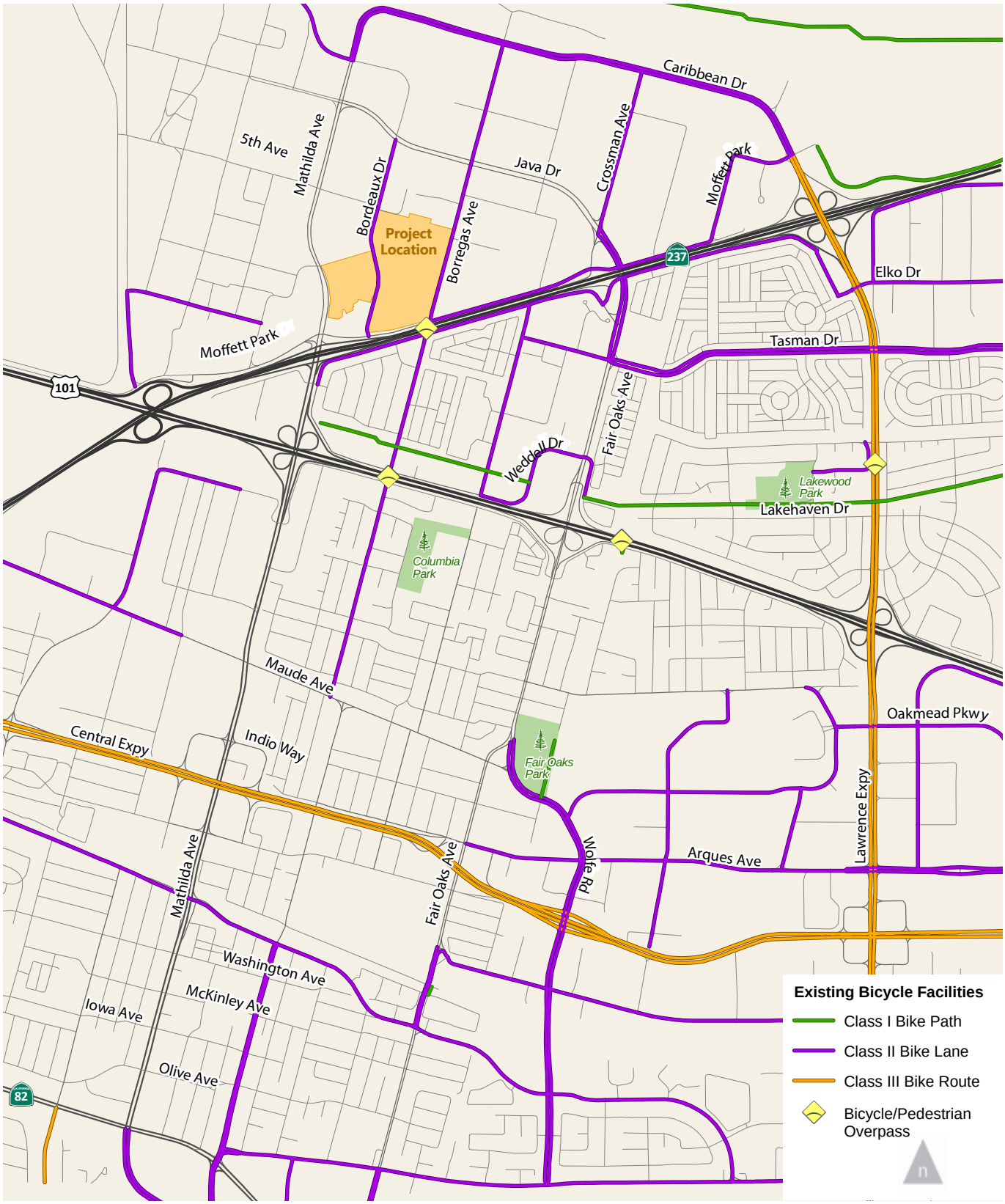


Figure 3.

Existing Bicycle Facilities

FEHR PEERS

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Multi-use Class I bicycle/pedestrian trails are provided along the San Francisco Bay Trail toward the north of the MPSP area and the Calabazas Creek parallel and east of Lawrence Expressway along the eastern border of the City of Sunnyvale.

VTA has adopted the Santa Clara Countywide Bicycle Plan (CBP). The CBP guides the development of major bicycling facilities by identifying Cross County Bicycle Corridors and other projects of countywide or intercity significance. Several of these routes travel through the study area, including routes along Mary Avenue, Maude Avenue, Middlefield Road, Ellis Street, and Manila Drive/Moffett Park Drive.

Pedestrian and bicycle volumes were collected at most study intersections in March 2013. Pedestrian and bicycle count worksheets are provided in **Appendix A**. There is moderate bicycle use along Moffett Park Drive during the peak hours; most other movements have only a few cyclists. Along Mathilda Avenue pedestrian volumes are low and due to the lack of pedestrian facilities on the project's frontage streets (Borregas Avenue, Bordeaux Drive, Moffett Park Drive) pedestrian activity is almost non-existent. It appears that pedestrians only cross at marked crossings at most intersections.

EXISTING TRANSIT SERVICE

The project site is located near the Lockheed Martin light rail transit (LRT) station, which is on the Mountain View to Winchester Avenue LRT (Line 902) operated by the VTA. VTA also operates bus service in the area. **Figure 4** shows the existing transit service near the project site, which are described in detail below and summarized in **Table 4.** The table includes the origin and destination, the operating hours, the headways, and the average peak load factors. The average peak load factor is a measure of resource utilization. It compares the supply of seats on a bus versus the average peak number of on-board passengers aboard at any time during the peak period. For all-day service, the average peak load factor is based on the average peak load factor over the entire day. For reference a load factor of 1.0 indicates that all seats are full.

VTA LRT and Local Bus Routes

The VTA Mountain View to Winchester Avenue LRT (Line 902) runs along Java Drive, Mathilda Avenue, Moffett Park Drive, and Manila Drive near the project sites. LRT Line 902 stops at the Lockheed Martin LRT station, which is within walking distance to the project site. The Moffett Park station is also in close proximity to the project site; however there is no direct pedestrian access from the project site to the Moffett Park LRT station.

Bus Route 26 operates on Mathilda Avenue, Java Drive, and Fair Oaks Avenue. Route 26 provides service between the Eastridge Mall and Lockheed Martin/Moffett Park transit centers. Route 26 follows major arterials and travels through Sunnyvale, Cupertino, San Jose, and Campbell. Bus stops for Route 26 are provided at Java Drive and the Lockheed Martin/Moffett Park Transit Center.

Similar to Bus Route 26, *Bus Route 54* operates on Mathilda Avenue, Java Drive, and Fair Oaks Avenue. Route 54 provides service between De Anza College and Sunnyvale/Fair Oaks Avenue. Bus stops for Route 54 are provided along Mathilda Avenue near Maude Avenue, Ahwanee Avenue, Ross Drive, and north of Moffett Park Drive at the Lockheed Martin/Moffett Park Transit Center.

Bus Route 32 operates on Central Expressway and Mathilda Avenue and could be used as a connection to Bus Route 54. Route 32 provides service between the San Antonio and Santa Clara transit centers. Route 32 follows major arterials and travels through Mountain View, Sunnyvale, and Santa Clara.

TABLE 4
EXISTING TRANSIT SERVICE

Route	From	To	Weekdays			Weekends	
			Load Factor[1]	Operating Hours	Peak Headway[2] (minutes)	Operating Hours	Headway[2] (minutes)
Bus Service (VTA)							
26	Eastridge Transit Center	Lockheed Martin Transit Center	0.49	5:22 a – 10:38 p	30	6:26 a – 9:37 p	30 – 60
54	De Anza College		0.33	6:01 a – 8:24 p	30	7:57 a – 7:25p	45 – 60
120	Fremont BART Station		0.49	6:12 a – 8:28 a 4:05 p – 6:15 p	4 SB Runs – AM 5 NB Runs – PM	No Service	
121	Gilroy Transit Center		0.52	4:30 a – 7:53 a 2:51 p – 6:10 p	25-30 15-45	No Service	
122	Santa Teresa LRT Station		0.38	5:51 a – 7:36 a 4:48 p – 6:07 p	1 NB Run – AM 1 SB Run – PM	No Service	
321	Great Mall/Main Transit Center		0.08	8:10 a – 8:44 a 5:50 p – 6:32 p	1 WB Run – AM 1 EB Run – PM	No Service	
328	South San Jose		0.24	6:00 a – 7:28 a 4:50 p – 6:00 p	1 NB Run – AM 1 SB Run – PM	No Service	
826 (ACE)	ACE Great America Station		N/A	6:16 a – 9:20 a 3:12 p – 6:03 p	3 WB Runs – AM 3 EB Runs – PM	No Service	
Mary/Moffett Area Caltrain Shuttle	Mountain View Caltrain Station	Alma Plaza	N/A	6:35 a – 10:23 a 3:00 p – 6:30 p	4 NB Runs – AM 4 SB Runs – PM	No Service	
Light Rail Service (VTA)							
902	Downtown Mountain View	Winchester	0.34	5:09 a – 10:50p	15	6:54 a – 10:50 p	30

Notes:
1. Average peak load factor is the ratio of the average peak number of on-board passengers aboard during the peak period to supply of seats.
2. Headways are defined as the time interval between two transit vehicles traveling in the same direction over the same route.
Source: VTA, Caltrain, April 2013.

Figure 4.

Existing Transit Service

Express and Limited Stop Bus Routes

The VTA also runs several express bus routes and limited stop bus routes throughout the project area.

Bus Route 120 is an express bus route that operates on SR 237, Caribbean Drive, Java Drive, and Mathilda Avenue; it connects Fremont (Fremont BART Station) to the Lockheed Martin Transit Center. Four Route 120 runs occur during each weekday peak period (to the project area in the morning and from it in the afternoon).

Bus Route 121 is an express bus route that operates on Lawrence Expressway, Caribbean Drive, Java Drive, and Mathilda Avenue; it connects Gilroy (Gilroy Transit Center) and Morgan Hill (Morgan Hill Caltrain Station) to the Lockheed Martin Transit Center. Seven Route 121 runs occur during each weekday peak period (to the project area in the morning and from it in the afternoon).

Bus Route 122 is an express bus route that operates on US 101, Lawrence Expressway, Caribbean Drive, Java Drive, and Mathilda Avenue; it connects south San Jose (Santa Teresa LRT Station) to the Lockheed Martin Transit Center.

Bus Route 321 is a limited stop bus route that operates on the Lawrence Expressway, Caribbean Drive, Java Drive, and Mathilda Avenue; it connects Milpitas (Great Mall Transit Center) to the Lockheed Martin Transit Center. One Route 321 run occurs during each weekday peak period (away from the project area in the morning and to it in the afternoon).

Bus Route 328 is a limited stop bus route that operates on the Lawrence Expressway, Caribbean Drive, Java Drive, and Mathilda Avenue; it connects south San Jose (near Almaden Expressway) to the Lockheed Martin Transit Center.

Additionally, *Bus Route 104* passes the project site on US 101 and SR 237; it connects Palo Alto, Mountain View, Milpitas, and San Jose.

Caltrain and ACE Shuttles

Caltrain provides intercity passenger rail service between San Francisco and San Jose, with extended service to Morgan Hill and Gilroy during weekday commute hours. Four *Mary/Moffett Area Caltrain Shuttle* runs connect the Mountain View Caltrain Station with office buildings in the Mary Avenue and Moffett Park areas. During weekday AM and PM commute periods, the Caltrain shuttle operates every 50 to 60 minutes on Mathilda Avenue with a stop near Ahwanee Avenue; there is another stop on Hamlin Court off Ross Drive. The Mountain View station is a designated express train station for Caltrain. Bus service between the Sunnyvale Caltrain Station and the Moffett Park area is provided by VTA Route 54. Additional private shuttles to the Moffett Park area from the Sunnyvale Caltrain Station are operated by local employers. These services are generally limited to the specific employer(s).

The *Altamont Commuter Express* provides passenger rail service between Stockton and San Jose. The *Altamont Commuter Express Red Line Shuttle (Route 826)* provides free shuttle service between buildings in the Moffett Park and the ACE Great America Station in Santa Clara. This shuttle operates on Mathilda Avenue north of the study area. Shuttle stops are provided at the Lockheed Martin/Moffett Park Transit Center. Three shuttle runs operate during each commute period with 60-minute headways.

Local Shuttles

There are a number of local shuttles specific to Moffett Park Area that provide service within Moffett Park and to surrounding neighborhoods and major transit facilities. The Moffett Park Business & Transportation Association provides information on the shuttle programs to the tenants in Moffett Park.

EXISTING TRANSPORTATION DEMAND MANAGEMENT PROGRAMS

The MPSP requires all new projects in the Moffett Park area of Sunnyvale to have transportation demand management (TDM) programs that reduce daily vehicle trips by a minimum of 20 percent and peak hour vehicle trips by at least 30 percent from ITE trip generation estimates. Based on the MPSP, TDM programs need to provide detailed descriptions of the employed TDM strategies and should address penalties for non-compliance. TDM programs include an annual review of employee commuting patterns and need to be submitted to City staff for review.

To meet the MPSP TDM requirements the project applicant has developed a TDM plan for the project site, which has been included in **Appendix B**. Below is a brief summary of the proposed measures included in the plan:

TDM Plan Elements - Program and Service Measures

Financial Incentives - Tenants provide *VTA Eco Passes*, which give holders unlimited rides on VTA light rail, bus, and express bus services, and *Guaranteed Ride Home services*, for their employees.

Work Schedule Options - TDM Coordinators assist employees with telecommuting and compressed/alternative work schedule activities.

Carpool Matching - TDM Coordinators assist employees with carpool matching.

Supplementary TDM Plan Elements - Planning and Design Measures

Transit Service - The project provides direct access to VTA bus and LRT service on Mathilda Avenue via public pathways and private sidewalks, and improved sidewalk access to VTA bus and LRT service on Java Drive via public sidewalks on Borregas Avenue.

Bike and Pedestrian Facilities - The project includes the following elements to enhance bike and pedestrian access:

- Public sidewalks along the proposed new street connection between Bordeaux Drive and Mathilda Avenue;
- Formal pedestrian pathways connecting all buildings and parking facilities;
- Designated passenger loading and unloading zones at all main building entries;
- Public trail improvements along the Water District drainage creek within the project boundary;
- Two public pathways through the site between Mathilda Avenue and Borregas Avenue.

As noted above, the proposed project will construct sidewalks on Borregas Avenue along its frontage; however, there will still be approximately an 800-foot gap along Borregas Avenue between the end of the project's property line and Gibraltar Court where no pedestrian facilities will be provided. There are numerous constraints to constructing sidewalks along this section of Borregas Avenue, including acquiring right-of-way, grade changes between the parcel and the roadway, and numerous mature trees within the right-of-way that would need to be relocated. Because of these right-of-way constraints it is recommended that the on-street parking along the west side of Borregas Avenue be removed and a sidewalk be constructed in its place, or, if right of way or easements can be secured, that sidewalk be provided behind the existing curb. The developer should fund the coast of design and construction of these facilities.

Bicycle Parking Facilities - Class I (secure enclosures) and Class II (lockable racks), located at key locations within the project site to enhance usefulness.

Preferential Parking for Carpool and Vanpool Users – some of the more desirable parking spaces (those closest to buildings access points) within the project site will be reserved for carpool and vanpool users.

Project Amenities Facility- includes a 50,000-s.f. building with fitness center (including changing facilities and showers) and cafe, and extensive outdoor features including a pool and basketball courts.

Monitoring, Reporting, and Assurance of Success

Tenants of the project site will develop and maintain a monitoring program that will review of employee commuting patterns and report penalties for non-compliance based on the TDM requirements defined in the MPSP. This report will be submitted to City staff for review on an annual basis.

EXISTING INTERSECTION VOLUMES AND LANE CONFIGURATIONS

The existing operations of the study intersections were evaluated for the highest one-hour volume during the weekday morning and evening peak periods. AM and PM peak-hour intersection turning movement counts were conducted in March 2013. Copies of new traffic counts are included in **Appendix A**. **Figure 5** presents the existing AM and PM peak-hour turning movement volumes, lane configurations, and traffic control devices at the study intersections.

EXISTING INTERSECTION LEVELS OF SERVICE

Existing intersection lane configurations, signal timings, and peak-hour turning movement volumes were used to calculate the levels of service for the key intersections during each peak hour. The results of the LOS analysis using the TRAFFIX software program for Existing Conditions are presented in **Table 5**. **Appendix C** contains the corresponding calculation sheets. The results indicate that all study intersections operate at acceptable service levels (LOS D or better for City intersections and LOS E or better for regionally significant and CMP intersections) during the AM and PM peak hours.

TABLE 5
EXISTING INTERSECTION LEVELS OF SERVICE

Intersection		Peak Hour[1]	Intersection Control	Delay[2]	LOS[3]
1	Northbound US 101 Ramps/Moffett Park Drive	AM PM	Signal	1.9 7.5	A A
2	Lockheed Martin Way/Moffett Park Drive	AM PM	Signal	5.6 7.8	A A
3	Mathilda Avenue/Java Drive*	AM PM	Signal	18.8 21.0	B- C+
4	Mathilda Avenue/5th Avenue**	AM PM	Signal	11.0 21.4	B+ C+
5	Mathilda Avenue/Innovation Way**	AM PM	Signal	7.9 13.5	A B
6	Mathilda Avenue/Moffett Park Drive**	AM PM	Signal	18.1 19.1	B- B-
7	Mathilda Ave/Westbound SR 237 Ramps**	AM PM	Signal	12.1 15.4	B B
8	Mathilda Ave/Eastbound SR 237 Ramps**	AM PM	Signal	12.9 11.8	B B+
9	Mathilda Avenue/Ross Drive**	AM PM	Signal	12.9 13.0	B B
10	Mathilda Avenue/Ahwanee Avenue**	AM PM	Signal	17.2 20.3	B C+
11	Mathilda Avenue/San Aleso Avenue**	AM PM	Signal	8.6 8.2	A A
12	Mathilda Avenue/Maude Avenue*	AM PM	Signal	24.2 25.8	C C
13	Mathilda Avenue/Indio Way**	AM PM	Signal	11.1 13.5	B+ B
14	Mathilda Avenue/California Ave**	AM PM	Signal	16.2 18.7	B B-
15	Mathilda Avenue/Washington Avenue**	AM PM	Signal	18.5 18.1	B- B-

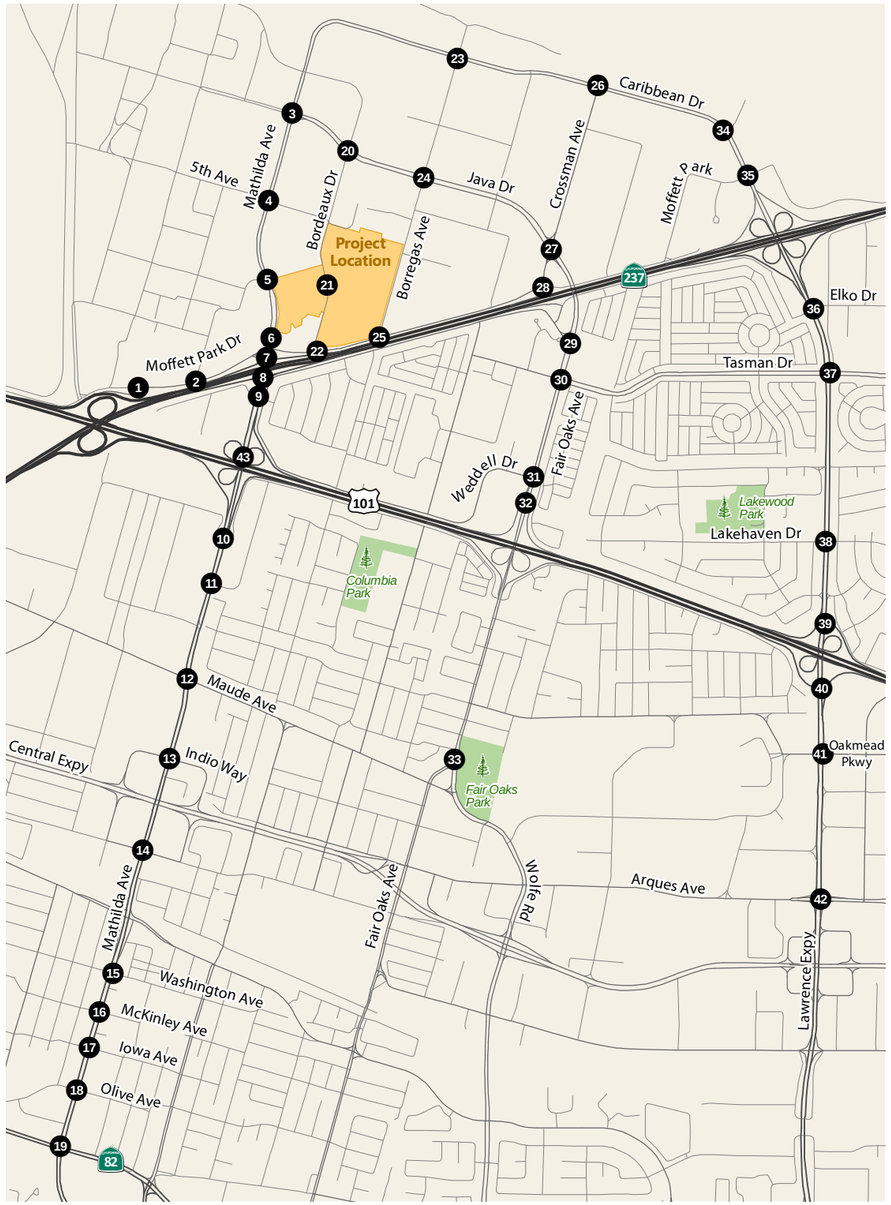
TABLE 5
EXISTING INTERSECTION LEVELS OF SERVICE

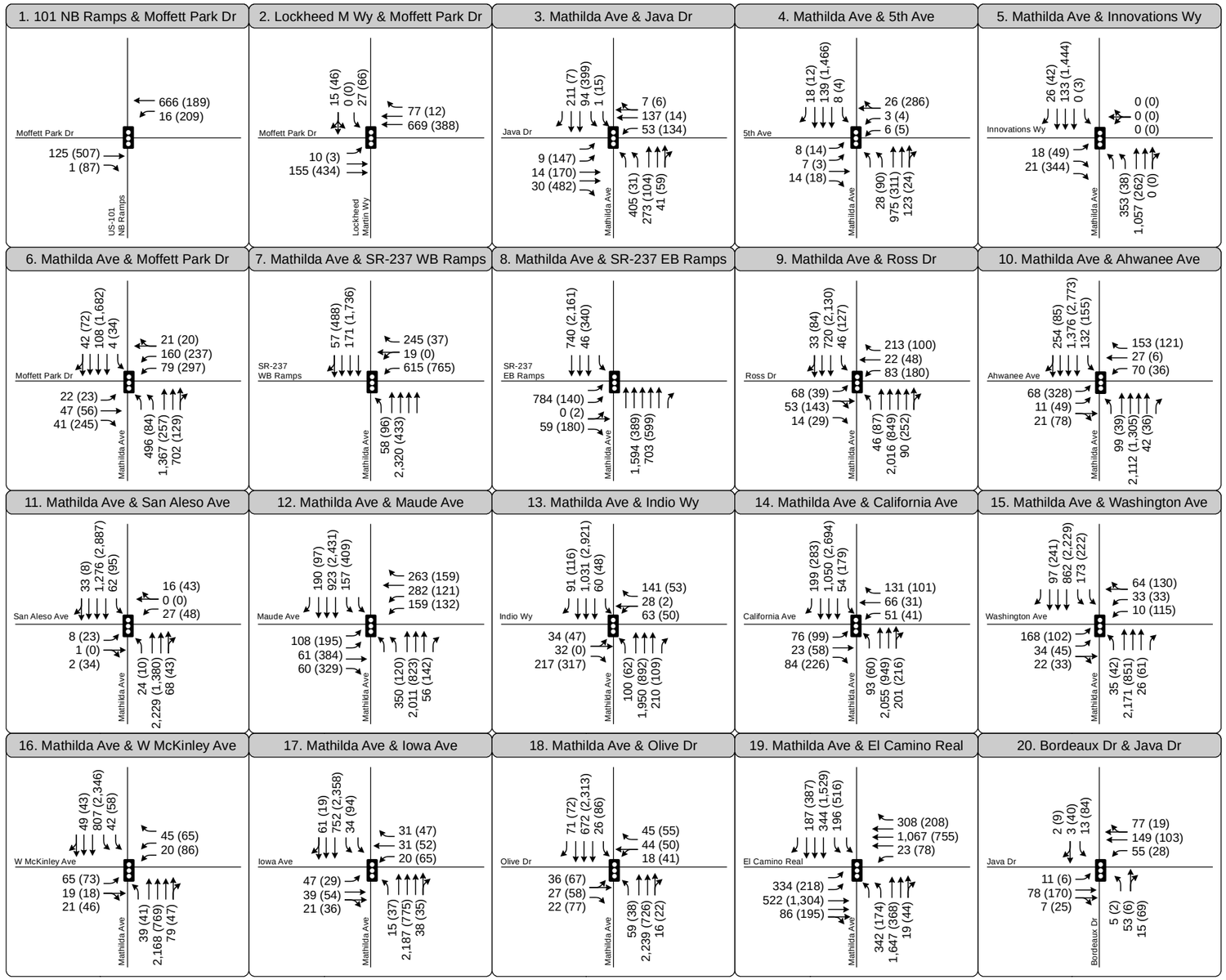
Intersection		Peak Hour[1]	Intersection Control	Delay[2]	LOS[3]
16	Mathilda Avenue/West McKinley Avenue**	AM	Signal	13.8	B
		PM		16.4	B
17	Mathilda Avenue/Iowa Avenue**	AM	Signal	12.9	B
		PM		16.1	B
18	Mathilda Avenue/Olive Drive**	AM	Signal	10.3	B+
		PM		11.8	B+
19	Mathilda Avenue/El Camino Real*	AM	Signal	28.5	C
		PM		26.3	C
20	Bordeaux Drive/ Java Drive	AM	Signal	16.3	B
		PM		19.0	B-
21	Bordeaux Drive/New Roadway (future)	AM	SSSC	N/A	N/A
		PM		N/A	N/A
22	Bordeaux Drive /Moffett Park Drive	AM	SSSC	22.1	C
		PM		14.1	B
23	Borregas Avenue/Caribbean Drive**	AM	Signal	13.3	B
		PM		13.8	B
24	Borregas Avenue/Java Drive	AM	Signal	16.8	B
		PM		17.4	B
25	Borregas Avenue/Moffett Park Drive	AM	SSSC	20.2	C
		PM		11.7	B
26	Crossman Avenue/Caribbean Drive**	AM	Signal	6.6	A
		PM		18.0	B-
27	Crossman Avenue/Java Drive	AM	Signal	14.7	B
		PM		22.1	C+
28	Crossman Avenue/Moffett Park Drive	AM	Signal	14.8	B
		PM		17.0	B
29	Fair Oaks Avenue/Fair Oaks Way	AM	Signal	17.8	B
		PM		24.1	C
30	Fair Oaks Avenue/Tasman Drive	AM	Signal	18.3	B-
		PM		21.3	C+

TABLE 5
EXISTING INTERSECTION LEVELS OF SERVICE

Intersection		Peak Hour[1]	Intersection Control	Delay[2]	LOS[3]
31	Fair Oaks Avenue/East Weddell Drive	AM	Signal	15.3	B
		PM		21.0	C+
32	Fair Oaks Ave/Northbound US 101 Ramps	AM	Signal	18.0	B-
		PM		22.9	C+
33	Fair Oaks Avenue/Wolfe Road	AM	Signal	13.6	B
		PM		11.9	B+
34	Twin Creeks Entrance/Caribbean Drive**	AM	Signal	8.8	A
		PM		10.1	B+
35	Moffett Park Drive/Caribbean Drive**	AM	Signal	16.1	B
		PM		16.4	B
36	Lawrence Expressway/Persian Drive-Elko Drive**	AM	Signal	20.8	C+
		PM		19.3	B-
37	Lawrence Expressway/Tasman Drive*	AM	Signal	49.1	D
		PM		39.3	E+
38	Lawrence Expressway/Lakehaven Drive**	AM	Signal	24.6	C
		PM		39.3	D
39	Lawrence Expressway/NB US 101 Ramps**	AM	Signal	16.2	B
		PM		17.4	B
40	Lawrence Expressway/SB US 101 Ramps**	AM	Signal	13.1	B
		PM		21.3	C+
41	Lawrence Expressway/Duane Avenue/Oakmead Parkway**	AM	Signal	38.1	D+
		PM		44.4	D
42	Lawrence Expressway/Arques Avenue*	AM	Signal	27.9	C
		PM		44.6	D

Notes:
1 AM = morning peak hour, PM = afternoon peak hour.
2 Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections. Signalized intersections include adjusted saturation flow rates to reflect Santa Clara County Conditions per VTA guidelines. Total control delay for the worst movement is presented for side-street stop-controlled intersections
3 LOS = Level of Service. LOS calculations conducted using the TRAFFIX level of service analysis software package, which applies the methodology described in the *2000 HCM*.
* CMP intersection with LOS E threshold.
** Regionally significant intersection with LOS E threshold.
Source: Fehr & Peers, July 2013.





Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
Stop Sign

Figure 5.

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

FEHR PEERS

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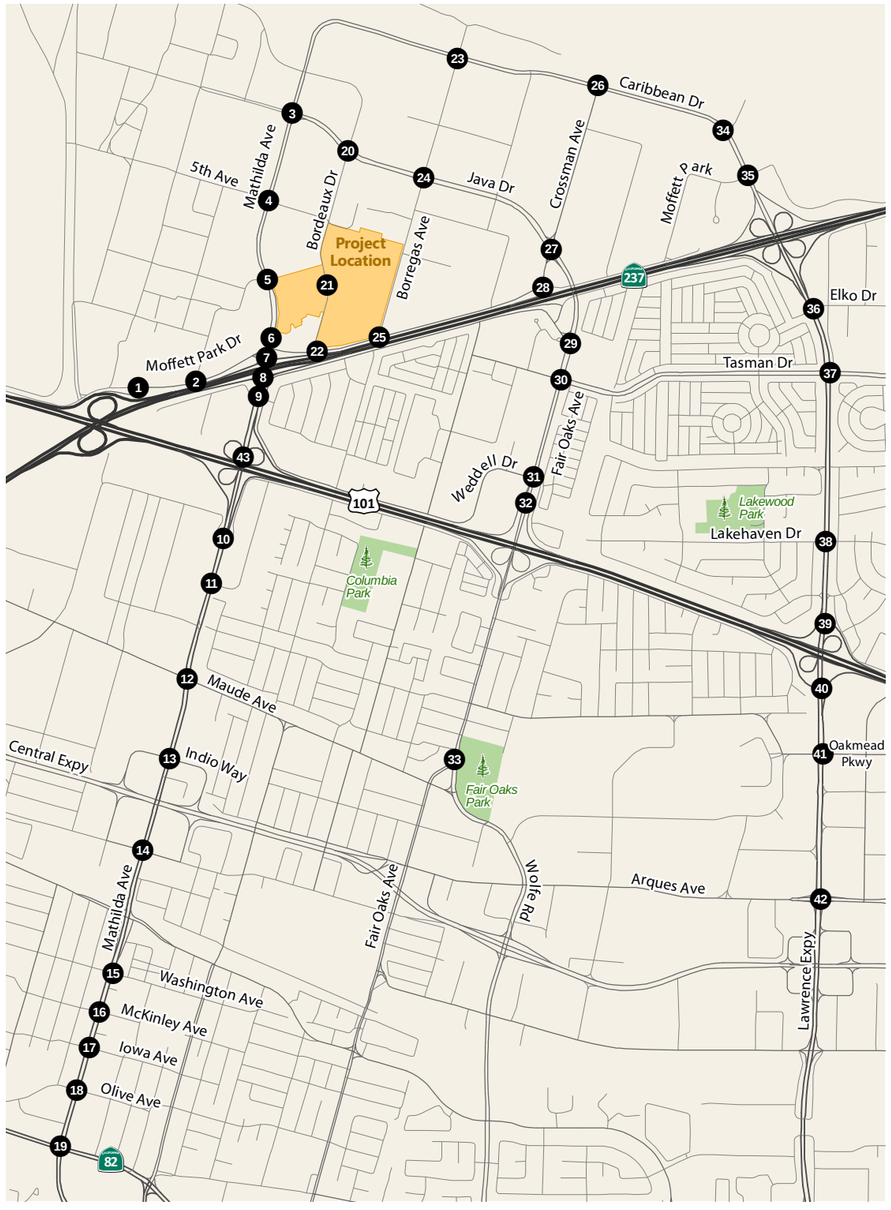

21. Bordeaux Dr & New Roadway	22. Bordeaux Dr & Moffett Park Dr	23. Borregas Ave & Caribbean Dr	24. Borregas Ave & Java Dr	25. Borregas Ave & Moffett Park Dr
Intersection does not exist under this condition	Moffett Park Dr: 19 (166), 5 (30); 15 (18), 145 (412); 223 (38), 479 (154); Bordeaux Ave	Caribbean Dr: 41 (10), 7 (9), 42 (29); 46 (5), 681 (72), 251 (25); 56 (12), 90 (584), 12 (18); Borregas Ave: 1 (2), 11 (6), 17 (175)	Java Dr: 41 (29), 47 (33), 16 (43); 66 (18), 276 (65), 53 (30); 27 (24), 54 (321), 22 (8); Borregas Ave: 24 (18), 59 (31), 15 (73)	Moffett Park Dr: 35 (198), 5 (59); 26 (5), 96 (126); 316 (47), 181 (180); Borregas Ave
26. Crossman Ave & Caribbean Dr	**27. Crossman Ave & Java Dr**	**28. Crossman Ave & Moffett Park Dr**	**29. Fair Oaks Ave & Fairoaks Wy**	**30. Fair Oaks Ave & Tasman Dr**
Caribbean Dr: 0 (0), 0 (0), 0 (0); 0 (0), 1,027 (96), 409 (44); 0 (1), 82 (829), 30 (80); Crossman Ave: 10 (10), 47 (408)	Java Dr: 29 (8), 22 (242), 20 (374); 479 (45), 514 (75), 173 (25); 20 (13), 36 (569), 16 (45); Crossman Ave: 15 (2), 45 (6), 12 (7)	Moffett Park Dr: 71 (34), 99 (285), 25 (20); 19 (74), 136 (67), 13 (85); 44 (115), 98 (165), 2 (48); Crossman Ave	Fairoaks Wy: 8 (35), 67 (1,063), 1 (7); 4 (1), 0 (2), 26 (21); 199 (40), 2 (5), 67 (297); Fair Oaks Ave: 32 (56), 1,049 (140), 5 (12)	Tasman Dr: 8 (34), 96 (948), 23 (258); 145 (24), 54 (66), 220 (343); 15 (7), 79 (55), 165 (73); Fair Oaks Ave: 74 (121), 871 (151), 303 (356)
31. Fair Oaks Ave & Weddell Dr	**32. Fair Oaks Ave & 101 NB Ramps**	**33. Fair Oaks Ave & Wolfe Rd**	**34. Caribbean Dr & Twin Creeks Ent**	**35. Caribbean Dr & Moffett Park Dr**
Weddell Dr: 15 (31), 498 (1,327), 12 (22); 15 (13), 0 (1), 62 (30); 9 (23), 0 (3), 168 (114); Fair Oaks Ave: 157 (212), 1,159 (501), 4 (30)	US-101 NB Ramps: 261 (122), 500 (1,333); 622 (231), 0 (1), 368 (574); Fair Oaks Ave: 410 (235), 762 (569)	Wolfe Rd: 683 (1,333), 291 (1,065); 764 (751), 0 (6); Fair Oaks Ave: 491 (408)	Twin Creeks Entrance: 8 (3), 143 (1,349), 8 (4); 4 (2), 1 (0), 3 (5); 3 (1), 0 (0), 3 (43); Caribbean Dr: 59 (14), 1,443 (161), 6 (0)	Moffett Park Dr: 11 (6), 156 (1,350), 1 (7); 4 (6), 15 (7), 11 (10); 12 (5), 6 (2), 44 (453); Caribbean Dr: 594 (361), 1,410 (358), 23 (39)
36. Lawrence Exp & Persian Dr	**37. Lawrence Exp & Tasman Dr**	**38. Lawrence Exp & Lakehaven Dr**	**39. Lawrence Exp & 101 NB Ramps**	**40. Lawrence Exp & 101 SB Ramps**
Persian Dr: 27 (67), 847 (1,919), 156 (331); 323 (243), 8 (36), 106 (177); 59 (37), 56 (134), 31 (52); Elko Dr; Lawrence Expressway: 7 (17), 2,017 (824), 108 (60)	Tasman Dr: 11 (386), 903 (1,590), 66 (351); 104 (69), 124 (252), 246 (600); 374 (275), 199 (335), 336 (270); Lawrence Expressway: 110 (263), 1,636 (959), 415 (322)	Lakehaven Dr: 10 (32), 1,222 (2,137), 54 (123); 29 (31), 77 (107), 317 (165); 90 (86), 32 (60), 287 (205); Lawrence Expressway: 267 (528), 2,277 (1,355), 110 (199)	US-101 NB Ramps: 394 (229), 1,592 (2,316); 397 (422), 0 (0), 845 (996); Lawrence Expressway: 2,228 (1,901), 595 (425)	US-101 SB Ramps: 306 (217), 2,239 (3,030); 208 (420), 473 (1,114); Lawrence Expressway: 2,717 (1,932), 1,022 (598)

Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
Stop Sign

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Figure 5.

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

FEHR PEERS

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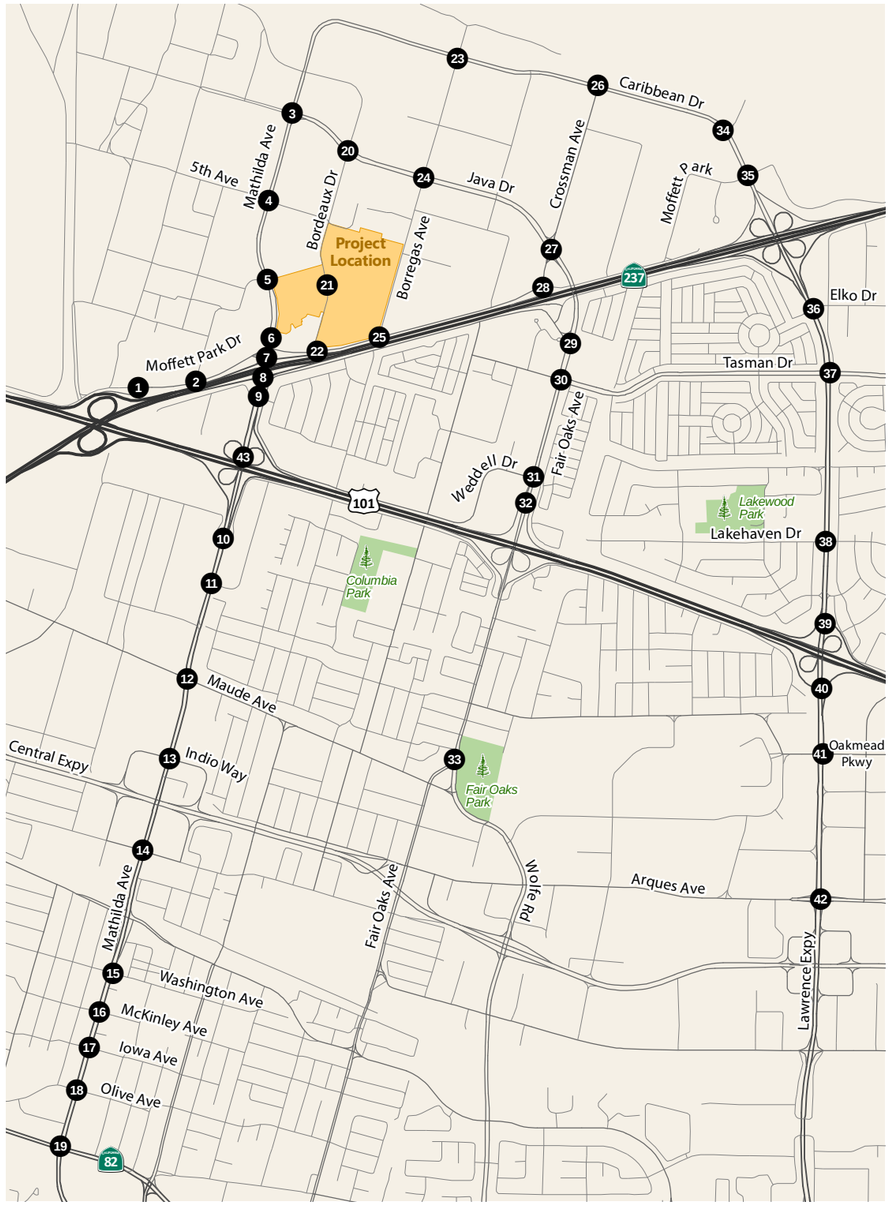

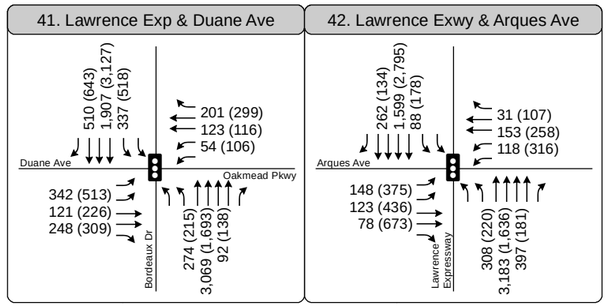

Turn Lane
AM (PM) Peak Hour Traffic Volume
Study Intersection
Traffic Signal
Stop Sign

Figure 5.

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

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FIELD OBSERVATIONS

Field observations of the study intersections were conducted during the morning and evening peak hours in March 2013. In most cases, the intersections were observed to operate at the calculated levels of service for each peak hour. However, in some locations there were differences between the observed and calculated operations. During both AM and PM peak commute periods operations at the intersections of Mathilda Avenue/Moffett Park Drive, Mathilda Avenue/SR 237 westbound ramps, and Mathilda Avenue/SR 237 eastbound ramps experienced high traffic volumes that caused long queues and congestion.

Mathilda Avenue/Moffett Park Drive – In the AM peak hour, at the Mathilda Avenue/Moffett Park Drive intersection, the heaviest movements are the northbound through and left-turn movements. Due to the short storage length (90 feet) between Moffett Park Drive and the westbound SR 237 ramps, northbound traffic frequently spill backed into the Mathilda Avenue/SR 237 westbound ramps intersection.

During the PM peak commute period, southbound Mathilda through traffic does not efficiently utilize the available green time due to queue spill back from the downstream intersection at Mathilda Avenue/SR 237 Eastbound ramp intersection. This frequently leads to southbound through traffic blocking the intersection, which in turn hinders westbound traffic from making left-turns. It was observed that the westbound left-turn movement had a large queue and only about half of the queue was able to clear during each green phase (cycle). This standing queue resulted in two to three cars per cycle that entered the intersection under the red at the end of each phase serving westbound Moffett Park Drive.

Mathilda Avenue/SR 237 Westbound Ramps – Westbound SR 237 off-ramp traffic cannot access westbound Moffett Park Drive; vertical delineators prohibit the right-turn movement into those lanes. Vehicles would have to cross three lanes of through traffic on Mathilda Avenue in less than 100 feet to access the northbound left-turn lane.

Mathilda Avenue/SR 237 Eastbound Ramps – During the AM peak period, traffic was heavy at the intersection of Mathilda Avenue/SR 237 Eastbound ramps; however, there was little congestion and illegal movements were not observed. During the PM peak period, the southbound through and left-turn lanes have limited storage capacity, which causes vehicles to spill back into the upstream intersection at Moffett Park Drive.

Mathilda Avenue/Ross Drive - During the AM peak period, traffic is heaviest in the northbound direction (through movements). Specifically, lane utilization is the heaviest in the outer through lane, with vehicles lining up to access the SR 237 eastbound on-ramp at the next intersection. Queues occasionally backed up near the northbound off-ramp, but cleared within two minutes. The queues did affect freeway or ramp operations. In the PM peak hour, no major queues or delays were observed. Southbound traffic is held at the signal for the SR 237 eastbound off-ramp and approaches the Mathilda Avenue/Ross Drive intersection in smaller platoons (groups), which minimizes potential delay and queuing problems.

EXISTING FREEWAY SEGMENT LEVELS OF SERVICE

According to VTA's *Transportation Impact Analysis Guidelines* (VTA, 2009) a freeway segment analysis should be included if the project meets one of the following requirements:

1. The proposed development project is expected to add traffic equal to at least one percent of a freeway segment's capacity.
2. The proposed development project is adjacent to one of the freeway segment's access or egress points
3. Based on engineering judgment, Lead Agency staff determines that the freeway segment should be included in the analysis.

For mixed-flow lanes, freeway segment capacities are defined as 2,200 vehicles per hour per lane (vphpl) for four-lane freeway segments and 2,300 vphpl for six-lane freeway segments. HOV lane capacities are defined between 1,800 to 1,900 vphpl. The project meets all three criteria so a freeway segment analysis was conducted.

Table 6 contains the existing freeway segment levels of service for the mixed-flow and HOV lanes based on the segment densities reported in the VTA's *2011 CMP Monitoring and Conformance Report,* which is the most recent report available as of April 2013.

The following mixed-flow freeway segments exceed VTA's LOS E standard during the specified peak hour:

- US 101, Northbound, Ellis Street to SR 237 (AM & PM peak hours)
- US 101-HOV, Northbound, Ellis Street to SR 237 (AM peak hour)
- US 101, Northbound, SR 237 to Mathilda Avenue (AM & PM peak hours)
- US 101, Northbound, Mathilda Avenue to Fair Oaks Avenue (AM peak hour)
- US 101, Northbound Fair Oaks Avenue to Lawrence Expressway (AM peak hour)
- SR 237, Eastbound, US 101 to Maude Avenue (AM peak hour)
- SR 237, Westbound, US 101 to Maude Avenue (PM peak hour)
- SR 237, Eastbound, Mathilda Avenue to US 101 (AM peak hour)
- SR 237, Westbound, Fair Oaks Avenue to Mathilda Avenue (AM & PM peak hours)
- SR 237, Eastbound Fair Oaks Avenue to Lawrence Expressway (PM peak hour)
- SR 237, Westbound Fair Oaks Avenue to Lawrence Expressway (PM peak hour)

All other freeway segments operate at acceptable LOS E or better during both peak periods.

TABLE 6
EXISTING FREEWAY SEGMENT LEVELS OF SERVICE

Freeway Segment	Direction	Peak Hour[1]	Lanes		Density[2]		LOS[3]	
			Mixed	HOV	Mixed	HOV	Mixed	HOV
US 101, Ellis Street to SR 237	NB	AM	3	1	**101**	**65**	**F**	**F**
		PM	3	1	**81**	22	**F**	C
	SB	AM	3	1	37	20	D	C
		PM	3	1	39	19	D	C
US 101, SR 237 to Mathilda Avenue	NB	AM	3	1	**71**	40	**F**	D
		PM	3	1	**34**	22	**F**	C
	SB	AM	3	1	26	27	C	D
		PM	3	1	25	30	C	D
US 101, Mathilda Avenue to Fair Oaks Avenue	NB	AM	3	1	**74**	30	**F**	D
		PM	3	1	26	10	C	A
	SB	AM	3	1	27	20	D	C
		PM	3	1	32	14	D	B
US 101, Fair Oaks Avenue to Lawrence Expressway	NB	AM	3	1	**61**	32	**F**	D
		PM	3	1	28	13	D	B
	SB	AM	3	1	30	16	D	B
		PM	3	1	38	17	D	B
SR 237, Maude Avenue to US 101	EB	AM	2	0	**60**	0	**F**	N/A
		PM	2	0	25	0	C	N/A
	WB	AM	2	0	31	0	D	N/A
		PM	2	0	**60**	0	**F**	N/A
SR 237, US 101 to Mathilda Avenue	EB	AM	2	0	**74**	0	**F**	N/A
		PM	2	0	32	0	D	N/A
	WB	AM	2	0	57	0	E	N/A
		PM	2	0	42	0	D	N/A
SR 237, Mathilda Avenue to Fair Oaks Ave	EB	AM	2	1	58	27	E	D
		PM	2	1	47	18	E	B
	WB	AM	3	0	**86**	0	**F**	N/A
		PM	3	0	**100**	0	**F**	N/A
SR 237, Fair Oaks Avenue to Lawrence Expressway	EB	AM	2	1	37	17	D	B
		PM	2	1	**87**	23	**F**	C
	WB	AM	2	1	58	50	E	E
		PM	2	1	**75**	38	**F**	D

Notes:
1 AM = morning peak hour, PM = afternoon peak hour.
2 Measured in passenger cars per mile per lane.
3 LOS = level of service.
N/A = Not applicable. Freeway Segment does not have HOV lanes.
Bold font indicates unacceptable operations based on VTA's LOS E Standard.
Source: *2011 Monitoring and Conformance Report*, VTA, June 2012.

The following mixed-flow freeway segments exceed VTA's LOS E standard during the specified peak hour:

- US 101, Northbound, Ellis Street to SR 237 (AM & PM peak hours)
- US 101-HOV, Northbound, Ellis Street to SR 237 (AM peak hour)
- US 101, Northbound, SR 237 to Mathilda Avenue (AM & PM peak hours)
- US 101, Northbound, Mathilda Avenue to Fair Oaks Avenue (AM peak hour)
- US 101, Northbound Fair Oaks Avenue to Lawrence Expressway (AM peak hour)
- SR 237, Eastbound, US 101 to Maude Avenue (AM peak hour)
- SR 237, Westbound, US 101 to Maude Avenue (PM peak hour)
- SR 237, Eastbound, Mathilda Avenue to US 101 (AM peak hour)
- SR 237, Westbound, Fair Oaks Avenue to Mathilda Avenue (AM & PM peak hours)
- SR 237, Eastbound Fair Oaks Avenue to Lawrence Expressway (PM peak hour)
- SR 237, Westbound Fair Oaks Avenue to Lawrence Expressway (PM peak hour)

All other freeway segments operate at acceptable LOS E or better during both peak periods.

3. EXISTING PLUS PROJECT CONDITIONS

The impacts of the proposed project on the transportation system are discussed in this chapter. First, the method used to estimate the amount of traffic generated by the project is described. Then, the results of the level of service calculations for Existing plus Project Conditions are presented. (Project Conditions are defined as Existing Conditions plus traffic generated by the proposed project). A comparison of intersection operations under Existing plus Project Conditions and Existing Conditions is presented and the impacts of the project on the study intersections are discussed. Project impacts on freeways are also addressed.

PROJECT TRAFFIC ESTIMATES

The amount of traffic added to the roadway system by proposed development is estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. The first step estimates the amount of traffic added to the roadway network. The second step estimates the directions of travel to and from the project site. The new trips are assigned to specific street segments and intersection turning movements during the third step. The results of the process for the proposed project are described in the following sections.

TRIP GENERATION

The amount of traffic anticipated to be added to the surrounding roadway system by the proposed project was estimated based on data published in Institute of Transportation Engineers' (ITE) *Trip Generation* 9th Edition (2012). The results are presented in **Table 7.**

The proposed project will replace 537,114 s.f. of existing office space and 60,000 s.f. of community college uses (Cogswell College) with a total of 1,799,554 s.f. of office space (research and development center) consisting of six eight-story buildings, plus an associated 50,000-s.f. amenities building. The project also proposes to expand the existing hotel, located on the southern portion of the site, from 173 to 307 rooms resulting in an additional 134 hotel rooms. The trip generation estimates for the proposed project were developed using the trip generation equations for "Research and Development Center" (ITE Land Use 760). "Hotel" (ITE Land Use 310) and "Community College" (ITE Land Use 540) for each respective component of the project. Trip generation estimates for existing land uses, based on ITE rates, were credited to the new project land uses to determine the number of net new vehicle trips that would access the project site.

As discussed under Existing Conditions, the MPSP requires all new projects in the Moffett Park area of Sunnyvale to have transportation demand management (TDM) programs that reduce daily and peak hour vehicle trips. The existing Moffett Place site has an active TDM program and the proposed project will fully participate in the TDM program. Based on the guidelines from the MPSP, the Moffett Place TDM program is required to reduce daily trips by 20 percent and peak hour trips by 30 percent. However, VTA guidelines only allow for a maximum 9.5 percent reduction on vehicle trips for projects near a light rail station that have an effective TDM program. Therefore, the more conservative 9.5 percent reduction was applied to the office trips. A TDM reduction was not applied to the hotel uses as most of its peak hour vehicle trips would be generated by visitors whose travel would not be affected by the TDM strategies. As shown in **Table 7**, the proposed project is estimated to generate 5,820 net new daily trips, 852 net new AM peak-hour trips (705 inbound and 148 outbound), and 1,390 net new PM peak-hour trips (179 inbound and 1,211 outbound).

TABLE 7
TRIP GENERATION – MOFFETT PLACE SITE EXPANSION

Land Use	ITE Code[1]	Size/ Units[2]	Daily		AM Peak Hour				PM Peak Hour			
			Rate	Trips	Rate[3]	In	Out	Total	Rate[3]	In	Out	Total
PROJECT SITE EXISTING LAND USES												
R&D	760	537.114 ksf	7.55	4,054	1.04	466	95	561	0.99	80	452	532
Cogswell College	540	61.000 ksf	27.49	1,677	2.99	135	47	182	2.54	90	65	155
9.5% TDM Program Reduction[4]				(539)		(57)	(14)	(71)		(16)	(49)	(66)
Net Existing R&D/College Trips				**5,188**		**544**	**128**	**672**		**154**	**468**	**621**
Hotel	310	173 Rooms	6.79	1,175	0.53	56	36	92	0.60	55	49	104
PROJECT SITE EXISTING VEHICLE TRIPS (A)				**6,363**		**600**	**164**	**764**		**209**	**517**	**725**
PROJECT SITE PROPOSED LAND USES												
Moffett Place Office Development	760	1,799.554 ksf	6.15	11,060	0.89	1,332	273	1,605	0.81	218	1,235	1,453
9.5% TDM Program Reduction[4]				(1,051)		(127)	(25)	(152)		(21)	(117)	(138)
Net Proposed R&D Trips				**10,009**		**1,304**	**312**	**1,616**		**295**	**1,204**	**1,499**
Hotel Development	310	307 Rooms	7.73	2,374	0.53	99	64	163	0.60	98	86	184
PROJECT SITE NEW FUTURE MOFFETT PLACE VEHICLE TRIPS (B)				**12,383**		**1,304**	**312**	**1,616**		**295**	**1,204**	**1,499**
TOTAL NET NEW MOFFETT PLACE VEHICLE TRIPS (C = B – A)				**6,020**		**704**	**148**	**852**		**86**	**687**	**774**

Notes:
1. ITE Code 760 – R&D Office Building, ITE Code 760 – Hotel.
2. ksf = 1,000 square feet
3. Rate per unit (ksf or hotel room)
4. Based on allowable TDM and employment near light rail reductions per VTA guidelines. Reduction was not applied to Hotel uses.
Sources: *Trip Generation Manual* (9th Edition), ITE, 2012; *Transportation Impact Analysis Guidelines*, VTA Congestion Management Program, March 2004.

TRIP DISTRIBUTION AND ASSIGNMENT

To estimate the project trip distribution a select zone analysis was conducted for the project site using the City of Sunnyvale Transportation Forecast Model. The trip distribution pattern is shown on **Figure 6**.

Project trips were assigned to the roadway network based on the trip distribution pattern discussed above. **Figure 7** shows the AM and PM peak-hour project trips assigned to each turning movement at the study intersections. The trip assignment was added to the existing volumes to establish volumes under Existing plus Project Conditions, as shown on **Figure 8**.

EXISTING PLUS PROJECT INTERSECTION LEVELS OF SERVICE

Intersection levels of service were calculated with the new traffic added by the proposed project to evaluate the operating conditions of the intersections and identify potential impacts to the roadway system. The results of the intersection level of service calculations for Existing plus Project Conditions are presented in **Table 8**. **Appendix C** contains the corresponding calculation sheets. The results for Existing Conditions are included for comparison purposes, along with the projected increases in critical delay and critical volume-to-capacity (V/C) ratios. Critical delay represents the delay associated with the critical movements of the intersection, or the movements that require the most "green time" and have the greatest effect on overall intersection operations. The changes in critical delay and critical V/C ratio between Existing and Existing plus Project Conditions are used to identify significant impacts.

The results of the LOS calculations indicate that all study intersections operate at acceptable service levels (LOS D or better for signalized City intersections and LOS E or better for regionally significant, CMP intersections, and unsignalized City intersections) during the AM and PM peak hours with the exception of the following:

Int. 22. Bordeaux Drive/Moffett Park Drive: during the AM peak hour the addition of project traffic degrades intersection operation from LOS C to LOS F.

Int. 25. Borregas Avenue/Moffett Park Drive: during the AM peak hour the addition of project traffic degrades intersection operation from LOS C to LOS F.

PEAK-HOUR SIGNAL WARRANT ANALYSIS

The California *Manual of Uniform Traffic Control Devices* (MUTCD) contains a number of guidelines, called warrants, to determine whether the installation of a traffic signal at a particular location is appropriate. The peak-hour volume signal warrant, one of eight warrants, was evaluated for the unsignalized intersections of Bordeaux Drive/Moffett Park Drive and Borregas Avenue/Moffett Park Drive under Existing and Existing plus Project Conditions.[2] The results indicate the Bordeaux Drive/Moffett Park Drive intersection satisfies the peak-hour volume signal warrant under Existing plus Project Conditions during the PM peak hour. The Borregas

[2] The peak-hour signal warrant analysis should not serve as the only basis for deciding whether and when to install a traffic signal. To reach such a decision, the full set of warrants should be investigated based on a thorough study of traffic and roadway conditions by an experienced engineer. The decision to install a signal should not be based solely upon the warrants, since the installation of signals can lead to certain types of collisions. The responsible state or local agency should undertake regular monitoring of actual traffic conditions and accident data and timely re-evaluation of the full set of warrants in order to prioritize and program intersections for signalization.

Avenue/Moffett Park Drive intersection does not satisfy the peak-hour volume warrant during either peak period. **Appendix D** contains the peak-hour signal warrants.

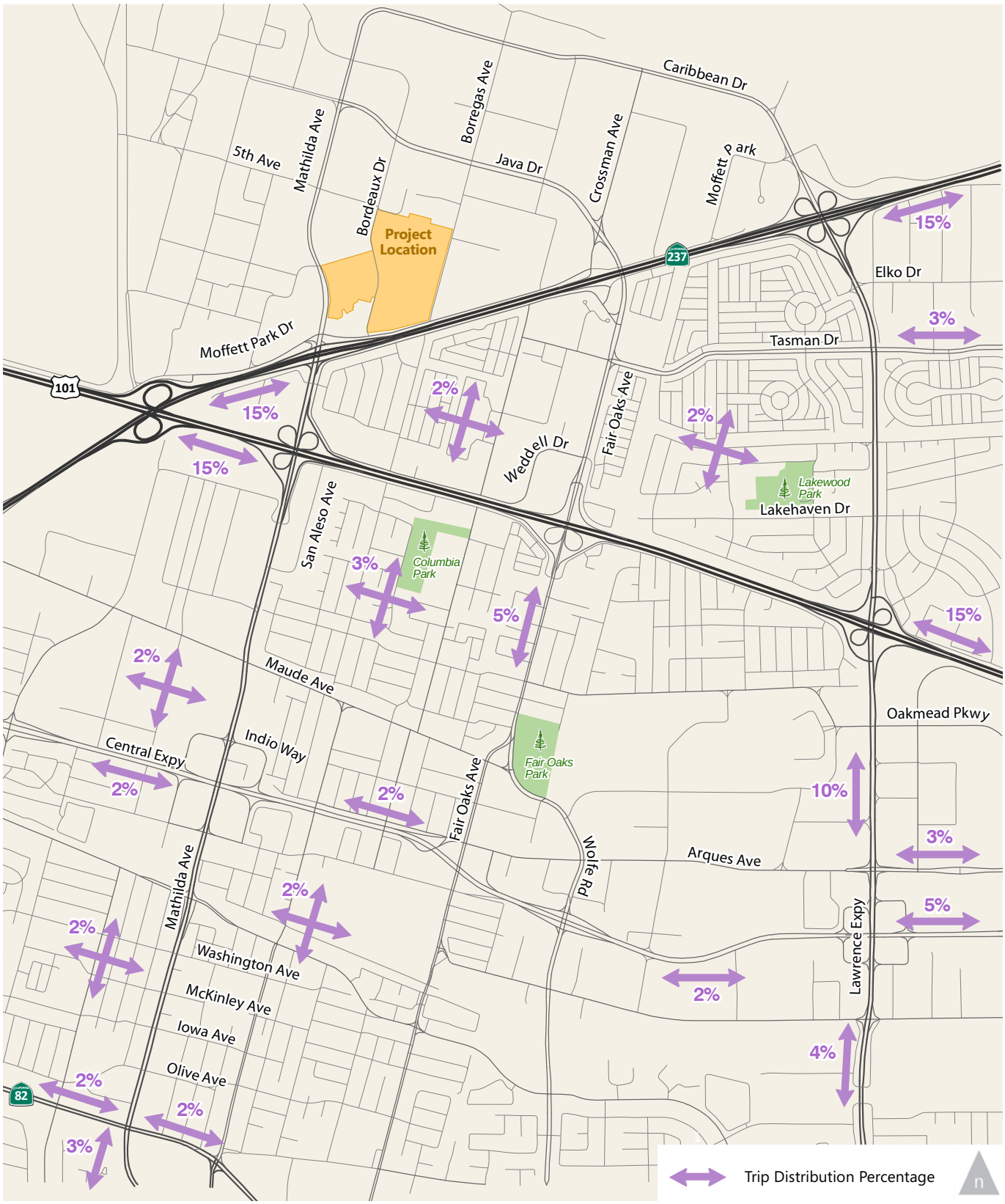

Figure 6.

Trip Distribution

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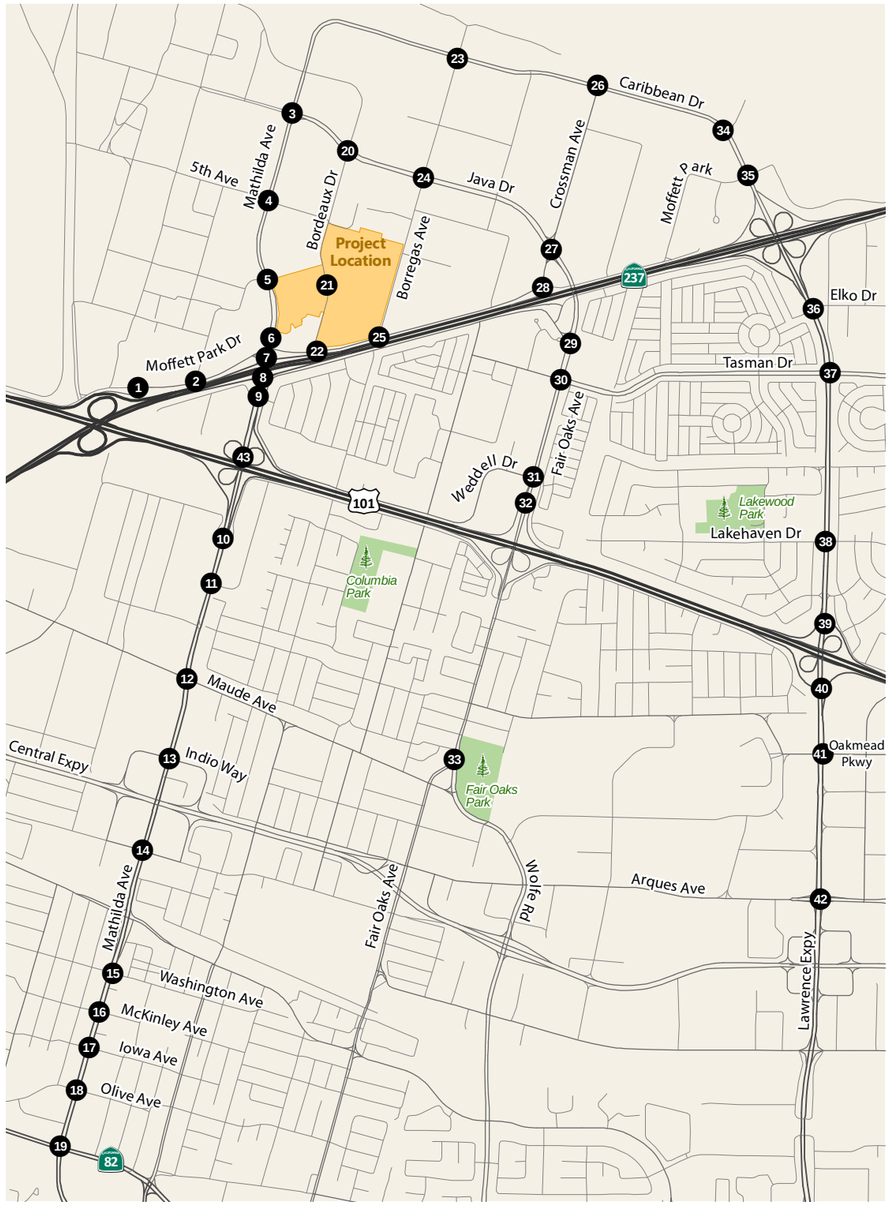
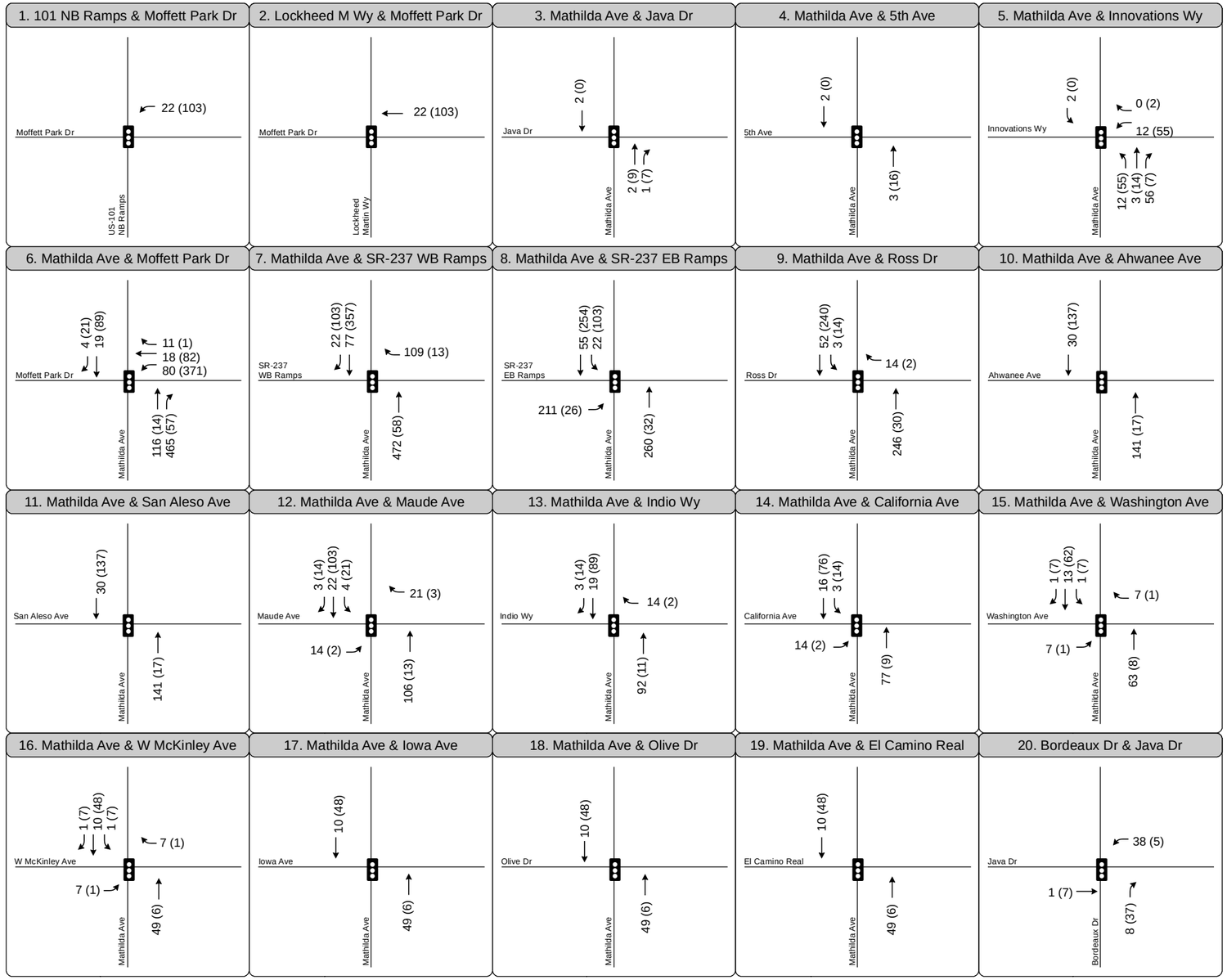
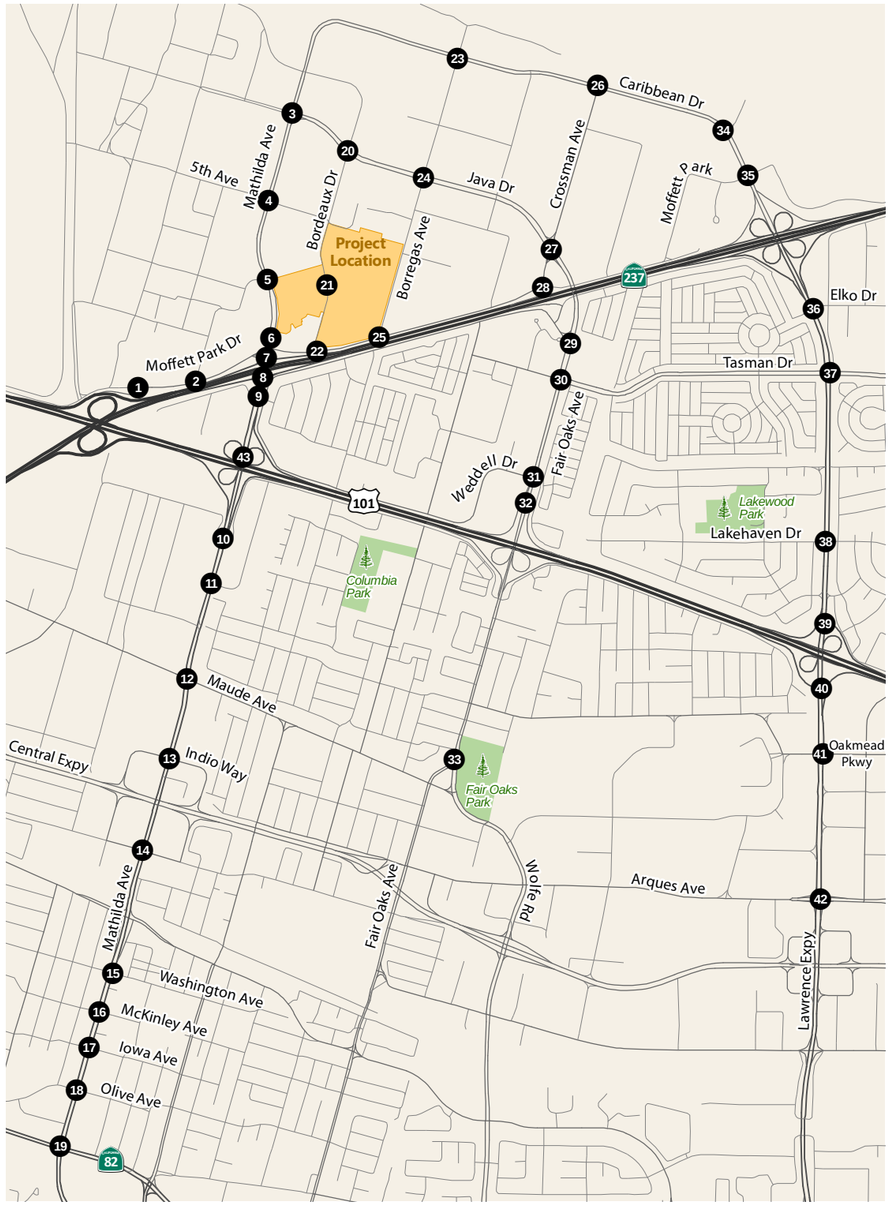


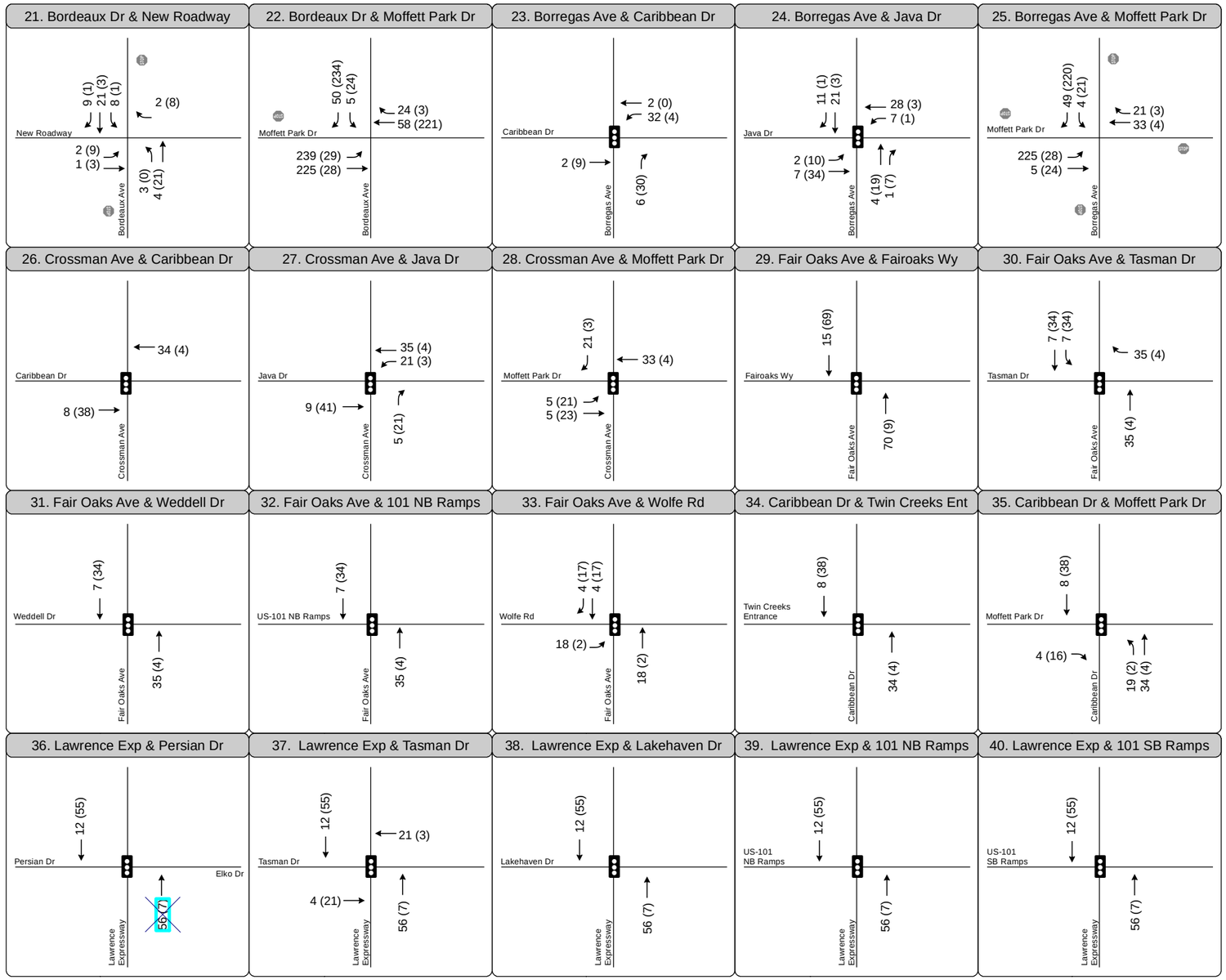


Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
Stop Sign

Figure 8.

Project Trip Assignment





Turn Lane

AM (PM) Peak Hour Traffic Volume

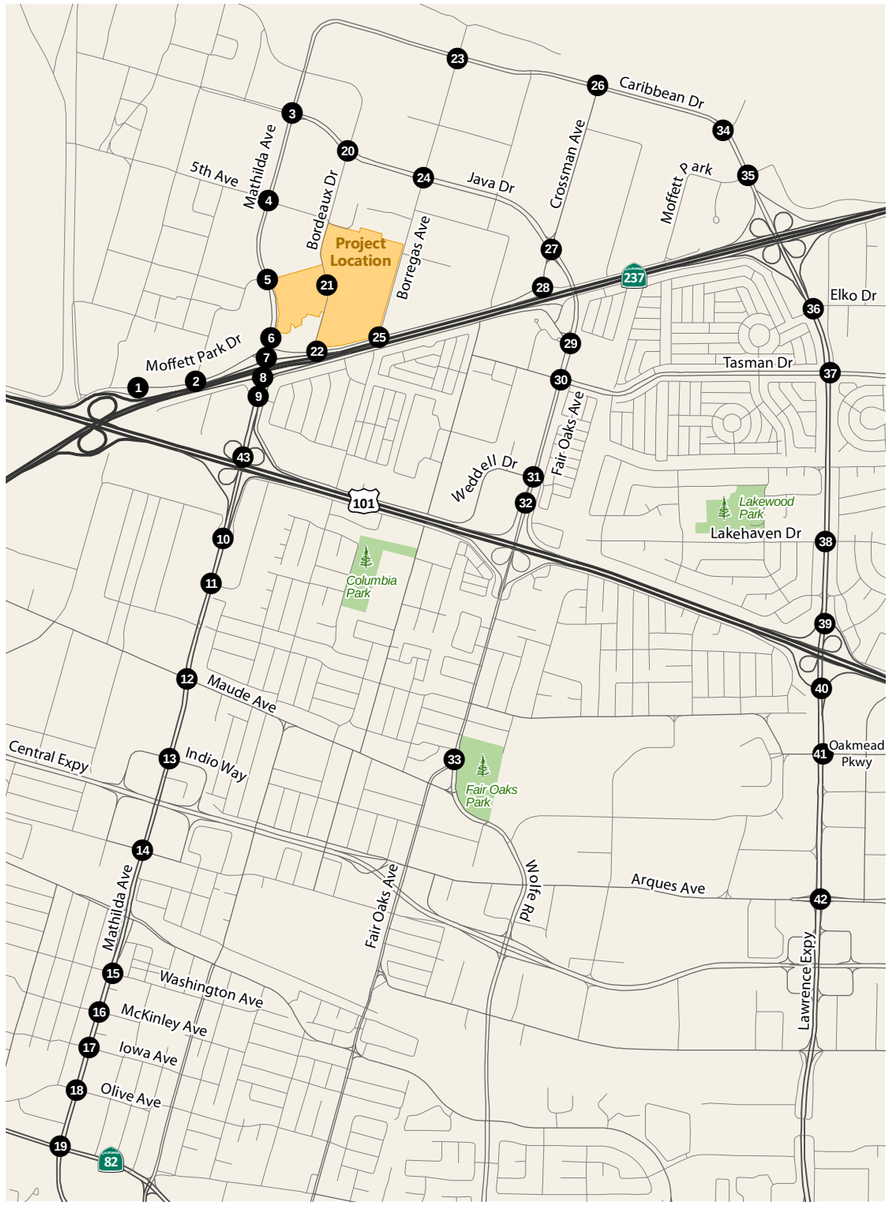
1 Study Intersection

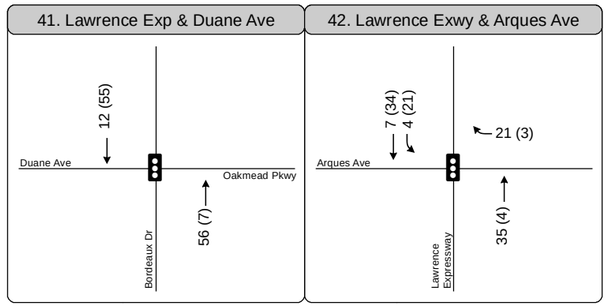
Traffic Signal

Stop Sign

Figure 8.

Project Trip Assignment





Turn Lane
AM (PM) Peak Hour Traffic Volume
Study Intersection
Traffic Signal
Stop Sign

Figure 8.

Project Trip Assignment

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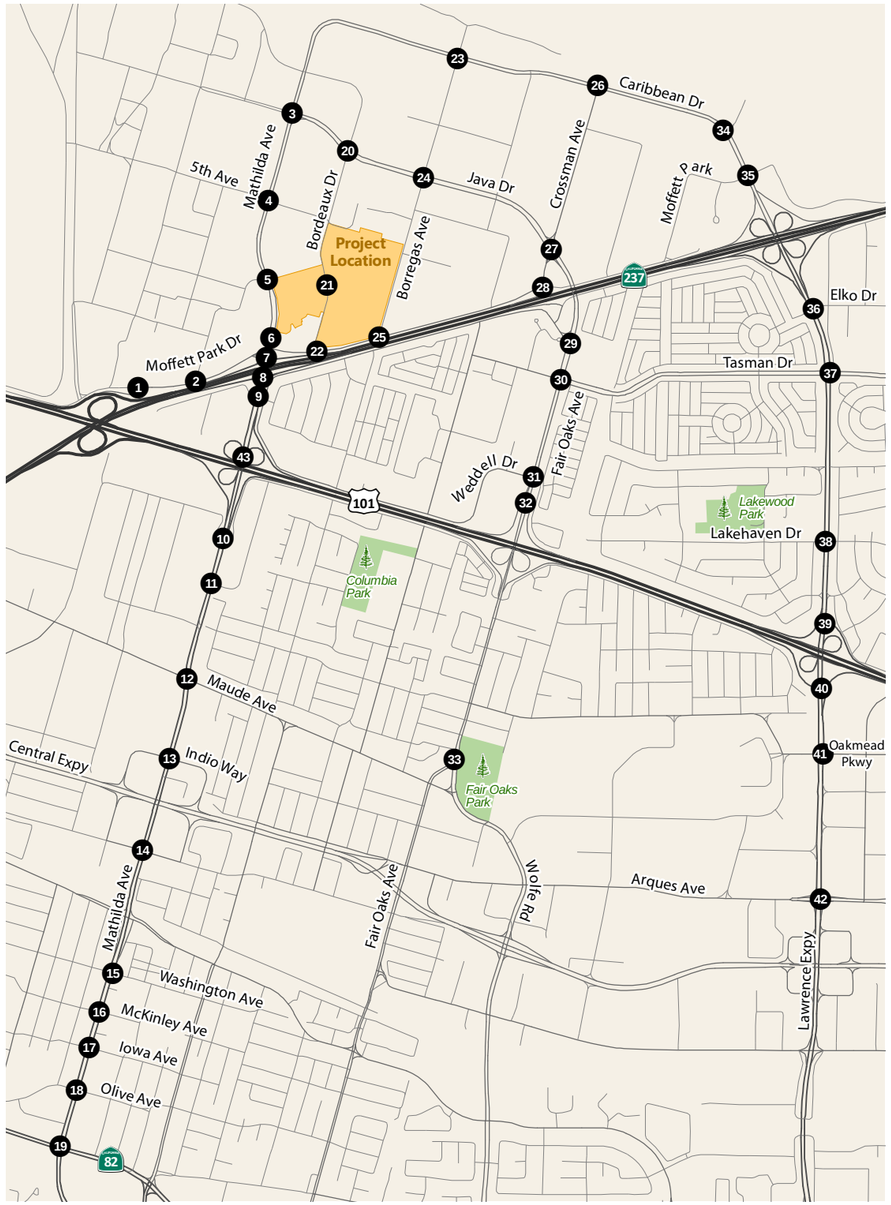

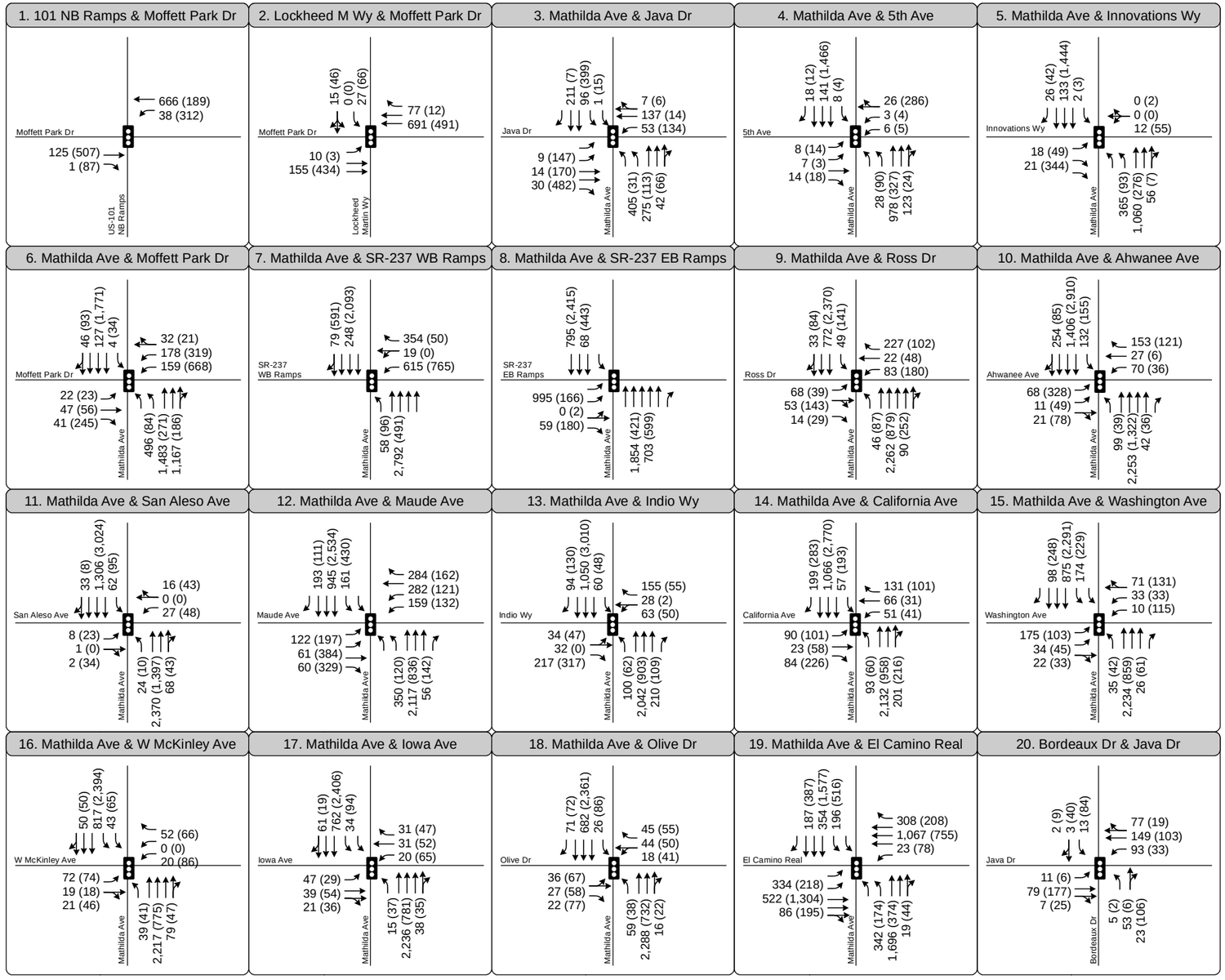

Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
STOP Stop Sign

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Figure 9.

Peak Hour Traffic Volumes and Lane Configurations - Existing plus Project Conditions

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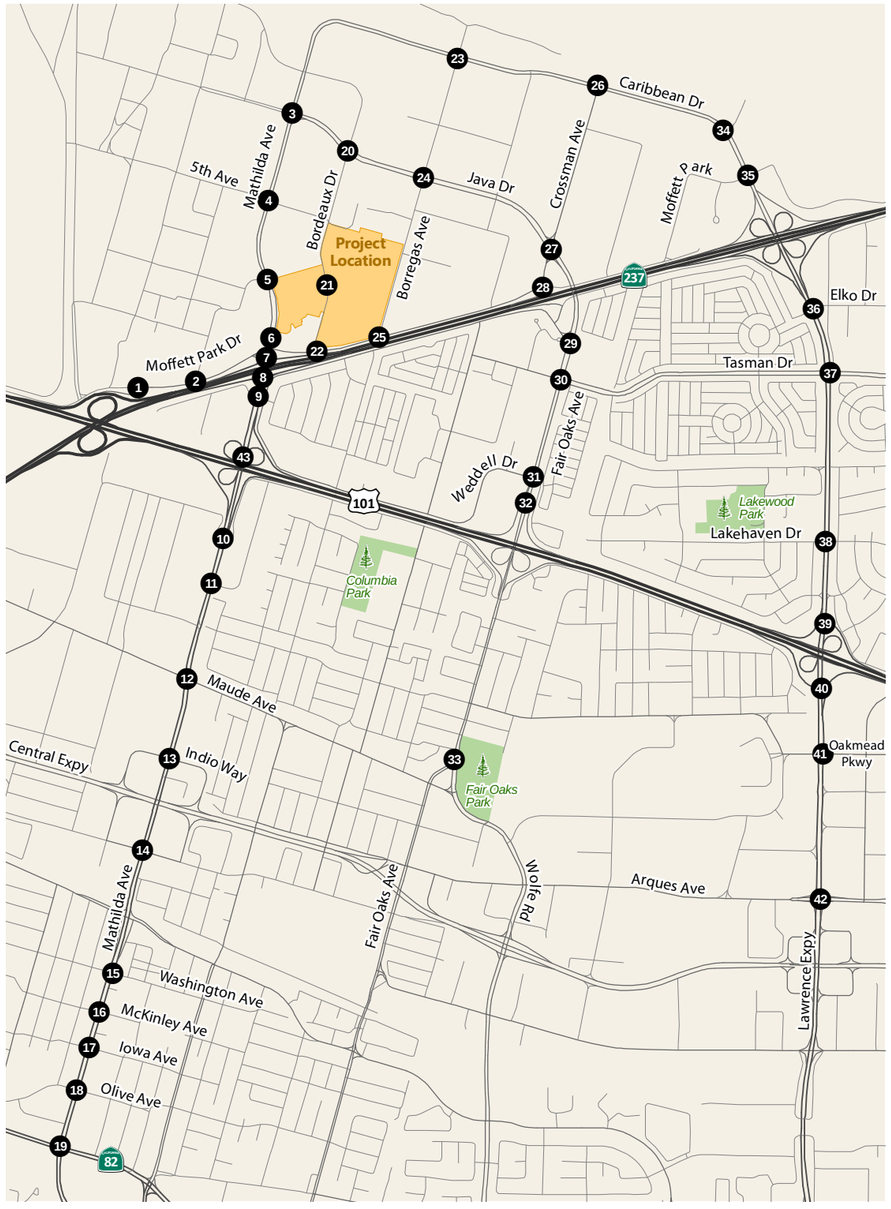
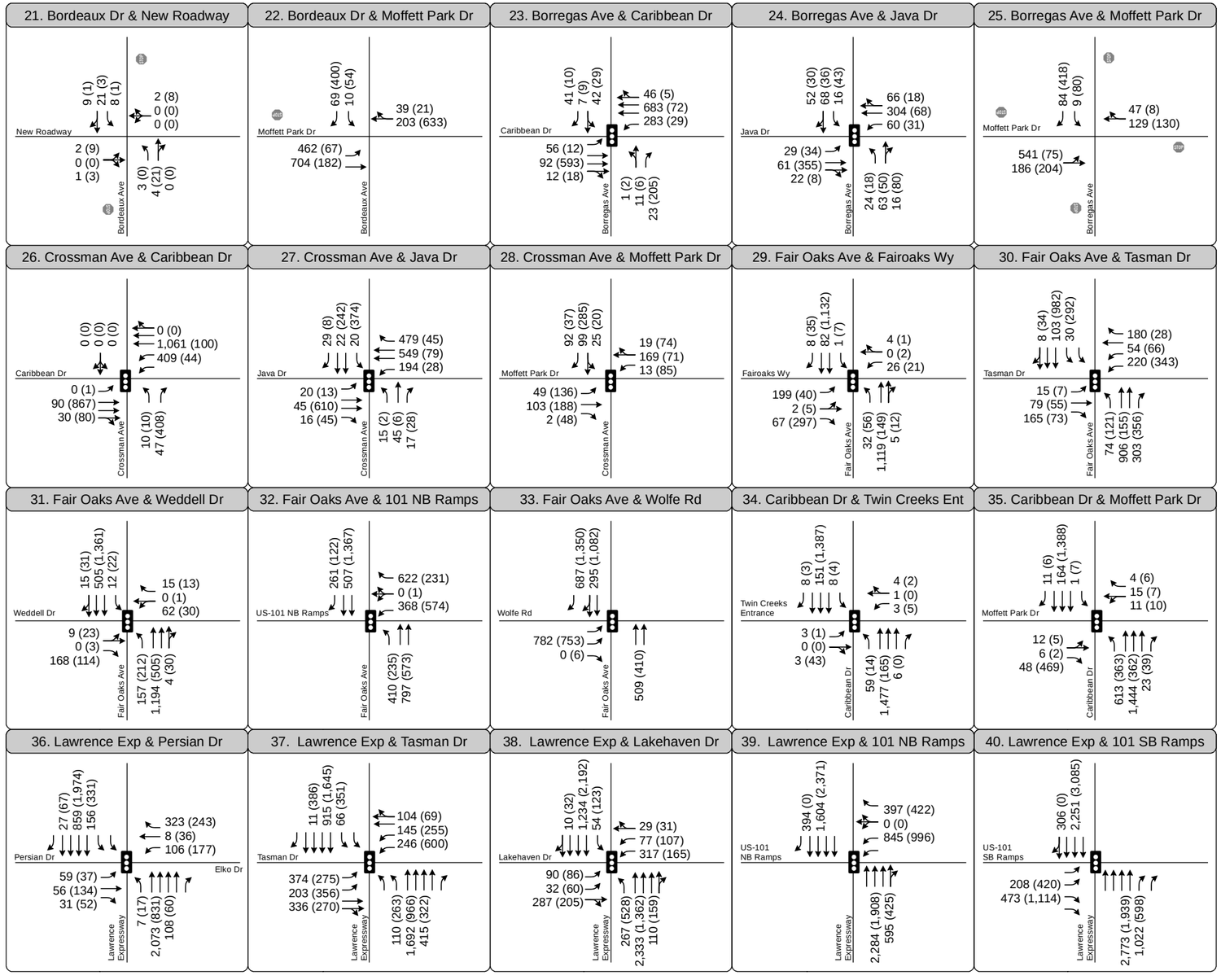
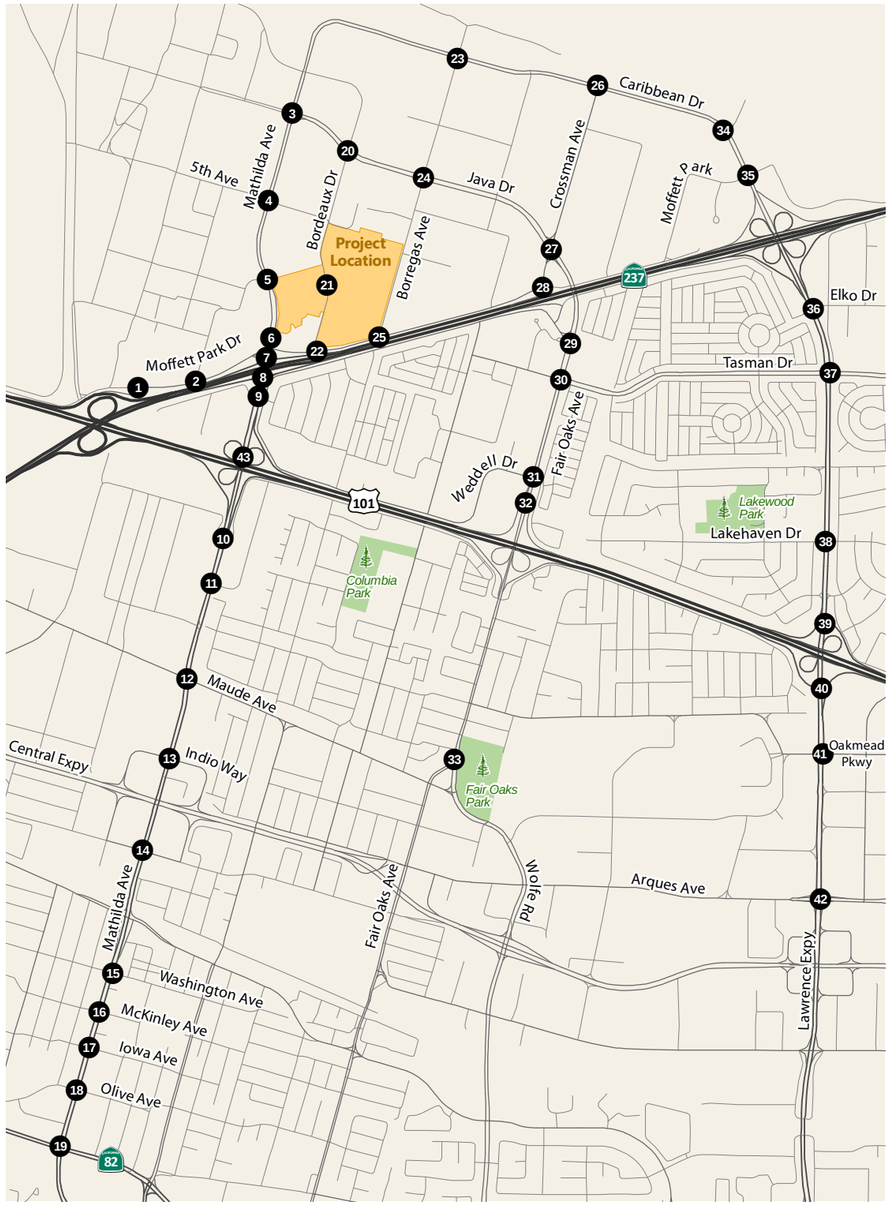


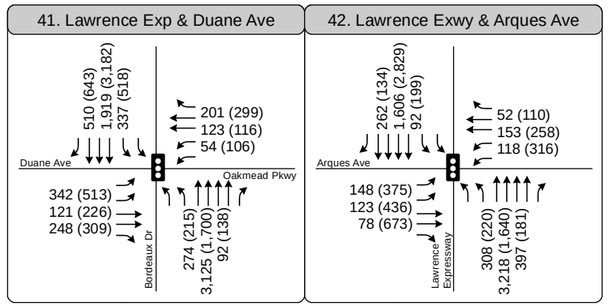


Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
Stop Sign

Figure 9.

Peak Hour Traffic Volumes and Lane Configurations - Existing plus Project Conditions





Turn Lane
AM (PM) Peak Hour Traffic Volume
Study Intersection
Traffic Signal
Stop Sign

Figure 9.

Peak Hour Traffic Volumes and Lane Configurations - Existing plus Project Conditions

FEHR PEERS

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TABLE 8
EXISTING AND EXISTING PLUS PROJECT INTERSECTION LEVELS OF SERVICE

	Intersection	Peak Hour[1]	Inter-section Control	Existing Conditions		Existing plus Project Conditions				
				Delay[2]	LOS[3]	Delay[2]	LOS[3]	Change in Crit. V/C[4]	Change in Crit. Delay[5]	Signal Warrant Met?[6]
1	Northbound US 101 Ramps/Moffett Park Drive	AM	Signal	1.9	A	2.1	A	0.000	0.0	N/A
		PM		7.5	A	9.2	A	0.065	1.8	N/A
2	Lockheed Martin Way/Moffett Park Drive	AM	Signal	5.6	A	5.6	A	0.006	-0.1	N/A
		PM		7.8	A	8.4	A	0.032	0.2	N/A
3	Mathilda Avenue/Java Drive*	AM	Signal	17.5	B	17.5	B	0.001	0.0	N/A
		PM		21.0	C+	21.0	C+	0.000	0.0	N/A
4	Mathilda Avenue/5th Avenue**	AM	Signal	10.6	B+	10.6	B+	0.001	0.0	N/A
		PM		28.2	C	28.2	C	0.000	0.0	N/A
5	Mathilda Avenue/Innovation Way**	The Mathilda Avenue study intersections between Innovation Way and Ahwanee Avenue are discussed in more detail in Chapter 6 of this report.								
6	Mathilda Avenue/Moffett Park Drive**									
7	Mathilda Ave/Westbound SR 237 Ramps**									
8	Mathilda Ave/Eastbound SR 237 Ramps**									
9	Mathilda Avenue/Ross Drive**									
10	Mathilda Avenue/Ahwanee Avenue**									
11	Mathilda Avenue/San Aleso Avenue**	AM	Signal	8.5	A	8.4	A	0.027	0.0	N/A
		PM		8.2	A	8.1	A	0.02	0.1	N/A
12	Mathilda Avenue/Maude Avenue*	AM	Signal	24.2	C	24.4	C	0.028	0.3	N/A
		PM		25.8	C	25.9	C	0.016	0.1	N/A
13	Mathilda Avenue/Indio Way**	AM	Signal	13.8	B	13.8	B	0.019	0.0	N/A
		PM		18.8	B-	19.5	B-	0.018	1.1	N/A
14	Mathilda Avenue/California Ave**	AM	Signal	16.1	B	16.7	B	0.027	1.0	N/A
		PM		18.6	B-	19.5	B-	0.03	1.1	N/A
15	Mathilda Avenue/Washington Avenue**	AM	Signal	18.5	B-	18.8	B-	0.02	0.5	N/A
		PM		18.0	B	18.1	B-	0.014	0.2	N/A
16	Mathilda Avenue/West	AM	Signal	13.7	B	14.1	B	0.017	0.5	N/A

TABLE 8
EXISTING AND EXISTING PLUS PROJECT INTERSECTION LEVELS OF SERVICE

	McKinley Avenue**	PM		16.5	B	16.6	B	0.012	0.2	N/A
17	Mathilda Avenue/Iowa Avenue**	AM	Signal	12.9	B	12.8	B	0.007	0.0	N/A
		PM		16.2	B	16.2	B	0.01	0.1	N/A
18	Mathilda Avenue/Olive Drive**	AM	Signal	10.4	B+	10.3	B+	0.01	0.1	N/A
		PM		11.8	B+	11.8	B+	0.009	0.1	N/A
19	Mathilda Avenue/El Camino Real*	AM	Signal	28.8	C	29.4	C	0.011	0.7	N/A
		PM		26.4	C	26.7	C	0.01	0.6	N/A
20	Bordeaux Drive/ Java Drive	AM	Signal	16.4	B	17.1	B	0.006	0.4	N/A
		PM		18.9	B-	19.4	B-	0.032	0.5	N/A
21	Bordeaux Drive/New Roadway (future)	AM	SSSC	N/A	N/A	11.0	B	N/A	N/A	No
		PM		N/A	N/A	9.5	A	N/A	N/A	No
22	Bordeaux Drive /Moffett Park Drive	AM	SSSC	22.1	C	**76.0**	**F**	N/A	N/A	No
		PM		14.1	B	40.8	E	N/A	N/A	Yes
23	Borregas Avenue/Caribbean Drive**	AM	Signal	13.3	B	13.3	B	0.022	-0.2	N/A
		PM		13.8	B	14.3	B	0.025	0.7	N/A
24	Borregas Avenue/Java Drive	AM	Signal	16.8	B	17.4	B	0.033	0.9	N/A
		PM		17.3	B	17.7	B	0.03	0.5	N/A
25	Borregas Avenue/Moffett Park Drive	AM	SSSC	20.2	C	**51.7**	**F**	0.169	1.7	No
		PM		11.7	B	13.2	B	0.241	2.4	Yes
26	Crossman Avenue/Caribbean Drive**	AM	Signal	6.6	A	6.6	A	0.000	0.2	N/A
		PM		18.0	B-	18.0	B-	0.003	0.0	N/A
27	Crossman Avenue/Java Drive	AM	Signal	13.3	B	13.3	B	0.000	0.0	N/A
		PM		21.4	C+	21.9	C+	0.016	0.6	N/A
28	Crossman Avenue/Moffett Park Drive	AM	Signal	14.8	B	14.8	B	0.025	-0.1	N/A
		PM		17.1	B	17.3	B	0.017	0.5	N/A
29	Fair Oaks Avenue/Fair Oaks Way	AM	Signal	17.9	B	18.0	B-	0.022	0.2	N/A
		PM		24.1	C	24.6	C	0.022	0.6	N/A

TABLE 8
EXISTING AND EXISTING PLUS PROJECT INTERSECTION LEVELS OF SERVICE

30	Fair Oaks Avenue/Tasman Drive	AM	Signal	16.0	B	16.2	B	0.014	0.1	N/A
		PM		18.5	B-	18.6	B-	0.008	0	N/A
31	Fair Oaks Avenue/East Weddell Drive	AM	Signal	16.2	B	16.0	B	0.007	-0.2	N/A
		PM		21.1	C+	21.2	C+	0.007	0.1	N/A
32	Fair Oaks Ave/Northbound US 101 Ramps	AM	Signal	17.1	B	17.1	B	0.002	0.1	N/A
		PM		22.7	C+	23.3	C	0.011	1.1	N/A
33	Fair Oaks Avenue/Wolfe Road	AM	Signal	13.6	B	13.7	B	0.013	0.1	N/A
		PM		11.9	B+	12.0	B+	0.006	0.0	N/A
34	Twin Creeks Entrance/ Caribbean Drive**	AM	Signal	8.8	A	8.8	A	0.006	0.0	N/A
		PM		10.1	B+	10.1	B+	0.007	0.0	N/A
35	Moffett Park Drive/Caribbean Drive**	AM	Signal	15.9	B	16.0	B	0.013	0.2	N/A
		PM		15.4	B	15.6	B	0.009	0.1	N/A
36	Lawrence Expressway/Persian Drive-Elko Drive**	AM	Signal	20.8	C+	24.6	C	0.009	-0.1	N/A
		PM		19.3	B-	19.4	B-	0.009	0.1	N/A
37	Lawrence Expressway/Tasman Drive*	AM	Signal	46.8	D	47.0	D	0.000	0.0	N/A
		PM		58.2	E+	58.9	E+	0.014	1.1	N/A
38	Lawrence Expressway/ Lakehaven Drive**	AM	Signal	49.9	D	49.6	D	0.008	-0.2	N/A
		PM		55.9	E+	56.1	E+	0.008	0.3	N/A
39	Lawrence Expressway/NB US 101 Ramps**	AM	Signal	14.9	B	14.8	B	0.008	0.0	N/A
		PM		17.5	B	17.4	B	0.008	0.0	N/A
40	Lawrence Expressway/SB US 101 Ramps**	AM	Signal	13.1	B	13.1	B	0.008	-0.1	N/A
		PM		21.3	C+	21.4	C+	0.008	0.1	N/A
41	Lawrence Expressway/Duane Avenue/Oakmead Parkway**	AM	Signal	36.4	D+	36.3	D+	0.008	-0.1	N/A
		PM		44.4	D	44.8	D	0.001	-0.1	N/A
42	Lawrence Expressway/Arques Avenue*	AM	Signal	27.9	C	28.2	C	0.001	0.0	N/A
		PM		44.4	D	44.6	D	0.006	0.1	N/A

Notes:

Bold font indicates unacceptable operations based on City of Sunnyvale and VTA's LOS standards. **Bold and highlighted** indicates significant impacts.

[1] AM = morning peak hour, PM = afternoon peak hour.

[2] Whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop-controlled intersections. Signalized intersections include adjusted saturation flow rates to reflect Santa Clara County Conditions per VTA guidelines. Total control delay

TABLE 8
EXISTING AND EXISTING PLUS PROJECT INTERSECTION LEVELS OF SERVICE

for the worst movement is presented for side-street stop-controlled intersections.

[3] LOS = Level of Service. LOS calculations conducted using the TRAFFIX level of service analysis software package, which applies the methodology described in the *2000 HCM*.

[4] Change in the critical volume-to-capacity ratio (V/C) between Existing and Project Conditions.

[5] Change in critical movement delay between Existing and Project Conditions.

[6] Signal warrant based CA MUTCD Warrant 3, Peak Hour Volume (Urban Area)

* CMP intersection with LOS E threshold.

** Regionally significant intersection with LOS E threshold.

Source: Fehr & Peers, August 2013.

Some of the study intersections show a reduction in average delay with the addition of project traffic, which is counter-intuitive. The average delay values in the table are weighted averages. Weighted average delays will be reduced when traffic is added to a movement with a low delay, such as the through movements in the non-peak direction on Mathilda Avenue.[3] Conversely, relatively small volume increases to movements with high delays can substantially increase the weighted average delay.

EXISTING PLUS PROJECT INTERSECTION IMPACTS AND MITIGATION MEASURES

This section of the report evaluates the intersection LOS results presented in **Table 8** against the City of Sunnyvale's and VTA's criteria for significant impacts and presents mitigation measures for identified impacts. Peak hour LOS calculation worksheets incorporating the recommended mitigation measures are provided in **Appendix E**.

INT. 22. BORDEAUX DRIVE/MOFFETT PARK DRIVE

Under Existing plus Project Conditions the Bordeaux Drive/Moffett Park Drive intersection is projected to operate at unacceptable LOS F during the AM peak hour; however, is not projected to meet the MUTCD peak hour signal warrant volume threshold. In the PM peak hour, the intersection is projected to operate at acceptable LOS E and is projected to meet the MUTCD peak hour signal warrant volume thresholds.. While the intersection operates at an unacceptable LOS during the AM peak hour and meets the peak hour volume signal warrant during the PM peak hour, the intersection does not meet the both impact thresholds (LOS F and peak hour signal warrant) during either the AM and PM peak hours. Therefore, based on the City of Sunnyvale's intersection threshold, the Bordeaux Drive/Moffett Park Drive intersection would have a **less-than-significant** impact.

[3] For example, if you have one movement with 10 vehicles with a delay of 100 seconds and another movement with 400 vehicles and 10 seconds of delay, the weighted average delay is calculated as (100 seconds X 10 vehicles + 10 seconds X 400 vehicles) /410 vehicles = 12.2 seconds per vehicle. Now if you add 100 vehicles to the movement with 10 seconds of delay, the weight average is calculated as (100 seconds X 10 vehicles + 10 seconds X 500 vehicles)/510 vehicles = 11.8 seconds per vehicle. The weighted average delay improves, even though more vehicles are added.

It should be noted that during the AM peak hour, the worst movement for this side-street stop controlled intersection is the southbound left-turn lane (LOS F with 76.0 seconds of delay), which is projected to have 10 vehicles; thus the LOS F operations only applies to those 10 vehicles. The total delay for the southbound approach (combined southbound left-turns and right-turn movement) is projected to be 18.2 seconds of delay (LOS C). In the PM peak hour, the worst movement is the southbound right-turn lane (LOS E with 40.8 seconds of delay), which is projected to carry 400 vehicles. The total delay for the southbound approach (combined southbound left-turns and right-turn movement) is projected to be 38.5 seconds of delay (LOS E).

INT. 25. BORREGAS AVENUE/MOFFETT PARK DRIVE

Under Existing plus Project Conditions the Borregas Avenue/Moffett Park Drive intersection is projected to operate at unacceptable LOS F during the AM peak hour, while the intersection is not projected to meet the MUTCD peak hour signal warrant volume threshold. Therefore, based on the City of Sunnyvale's intersection threshold the Borregas Avenue/Moffett Park Drive intersection would have a **less-than-significant** impact at this location.

It should be noted that during the AM peak hour, the worst movement for this side-street stop controlled intersection is the southbound left-turn lane (LOS F with 51.7 seconds of delay), which is projected to have 9 vehicles; thus the LOS F operations only applies to those 9 vehicles. The total delay for the southbound approach (combined southbound left-turns and right-turn movement) is projected to be 13.5 seconds of delay (LOS B).

EXISTING PLUS PROJECT FREEWAY SEGMENT LEVELS OF SERVICE

Freeway segments of US 101 and SR 237 were analyzed during the AM and PM peak hours by calculating the amount of project traffic projected to be added to these freeway segments. To be conservative, no project trips were assigned to HOV lanes.

Table 9 presents the estimated number of trips added to the freeway segments under Existing plus Project Conditions and the estimated densities and service levels.

TABLE 9
EXISTING PLUS PROJECT FREEWAY SEGMENT LEVELS OF SERVICE

Freeway Segment	Direction	Peak Hour[1]	Capacity (vph)[2]	Existing Conditions		Existing plus Project Conditions			
				Density[3]	LOS[4]	Trips[5]	Density	LOS	% Impact[6]
US 101, Ellis Street to SR 237	NB	AM	6900	**101**	**F**	22	101	F	0.32%
		PM	6900	**81**	**F**	103	**84**	**F**	**1.49%**
	SB	AM	6900	37	D	106	38	D	1.54%
		PM	6900	39	D	13	39	D	0.19%
US 101, SR 237 to Mathilda Avenue	NB	AM	6900	**71**	**F**	0	**71**	**F**	0.00%
		PM	6900	**34**	**F**	0	34	D	0.00%
	SB	AM	6900	26	C	0	26	C	0.00%
		PM	6900	25	C	0	25	C	0.00%
US 101, Mathilda Avenue to Fair Oaks Avenue	NB	AM	6900	**74**	**F**	106	**75**	**F**	**1.54%**
		PM	6900	26	C	13	26	C	0.19%
	SB	AM	6900	27	D	22	27	D	0.32%
		PM	6900	32	D	103	33	D	1.49%
US 101, Fair Oaks Avenue to Lawrence Expressway	NB	AM	6900	**61**	**F**	106	**62**	**F**	**1.54%**
		PM	6900	28	D	13	28	D	0.19%
	SB	AM	6900	30	D	22	30	D	0.32%
		PM	6900	38	D	103	39	D	1.49%
SR 237, Maude Avenue to US 101	EB	AM	4400	**60**	**F**	106	**61**	**F**	**2.41%**
		PM	4400	25	C	26	25	C	0.59%
	WB	AM	4400	31	D	22	31	D	0.50%
		PM	4400	**60**	**F**	103	**63**	**F**	**2.34%**
SR 237, US 101 to Mathilda Avenue	EB	AM	4400	**74**	**F**	211	**78**	**F**	**4.80%**
		PM	4400	32	D	13	32	D	0.30%
	WB	AM	4400	57	E	22	57	E	0.50%
		PM	4400	42	D	181	44	D	4.11%
SR 237, Mathilda Avenue to Fair Oaks Ave	EB	AM	4600	58	E	22	58	E	0.48%
		PM	4600	47	E	103	49	E	2.24%
	WB	AM	6900	**86**	**F**	109	**88**	**F**	**1.58%**
		PM	6900	**100**	**F**	13	**100**	**F**	0.19%

TABLE 9
EXISTING PLUS PROJECT FREEWAY SEGMENT LEVELS OF SERVICE

Freeway Segment	Direction	Peak Hour[1]	Capacity (vph)[2]	Existing Conditions		Existing plus Project Conditions			
				Density[3]	LOS[4]	Trips[5]	Density	LOS	% Impact[6]
SR 237, Fair Oaks Avenue to Lawrence Expressway	EB	AM	4600	37	D	22	37	D	0.48%
		PM	4600	**87**	**F**	103	**93**	**F**	**2.24%**
	WB	AM	4600	**58**	**E**	109	**60**	**F**	**2.37%**
		PM	4600	**75**	**F**	13	**75**	**F**	0.28%

Notes:

Bold font indicates unacceptable operations based on VTA's LOS E Standard. **Bold and highlighted** indicates significant impacts.

1 AM = morning peak hour, PM = afternoon peak hour.

2 vph = vehicles per hour per

3 Measured in passenger cars per mile per lane.

4 LOS = level of service.

5 Project trips added to individual freeway segments

6 Percent impact on mixed flow lanes determined by dividing the number of project trips by the freeway segment's capacity.

Source: 2010 Monitoring and Conformance Report, VTA, May 2011.

EXISTING FREEWAY IMPACTS AND MITIGATION MEASURES

The proposed project would add trips greater than one percent of the freeway segment capacity to the following freeway segments already operating at LOS F:

- US 101, Northbound, Ellis Street to SR 237 (PM peak hour)
- US 101, Northbound, Mathilda Avenue to Fair Oaks Avenue (AM peak hour)
- US 101, Northbound Fair Oaks Avenue to Lawrence Expressway (AM peak hour)
- SR 237, Eastbound, US 101 to Maude Avenue (AM peak hour)
- SR 237, Westbound, US 101 to Maude Avenue (PM peak hour)
- SR 237, Eastbound, Mathilda Avenue to US 101 (AM peak hour)
- SR 237, Westbound, Fair Oaks Avenue to Mathilda Avenue (AM peak hour)
- SR 237, Eastbound Fair Oaks Avenue to Lawrence Expressway (PM peak hour)
- SR 237, Westbound Fair Oaks Avenue to Lawrence Expressway (AM peak hour)

Therefore, the project would have a **significant impact** at the identified study freeway segments.

Implementation of TDM measures to achieve the full 30 percent reduction in peak-hour vehicle trips would incrementally reduce traffic volumes on all freeway segments; however, it would not be sufficient to reduce the identified impacts to a less-than-significant level.

The mitigation for freeway impacts is typically the provision of additional capacity in the form of additional mainline or auxiliary lanes. Several freeway improvements were identified in the *Valley Transportation Plan* (VTP) 2035 to improve freeway operations on the affected segments:

- Convert HOV lanes to express lanes on US 101 from SR 85 in Mountain View to San Jose (VTP ID H5)
- Convert HOV lanes to express lanes on SR 237 from I-880 to Mathilda Avenue (VTP ID H9)
- Construct new HOV/express lanes on SR 237 between Mathilda Avenue and SR 85 (VTP H11).

The freeway improvement projects listed in the *VTP 2035* are financially constrained (financially constrained projects are planned project for which VTA anticipates full funding within the timeframe of the *VTP 2035*). These improvements are anticipated to relieve traffic congestion added by the project. Therefore a fair share contribution to these regional projects, which VTA is actively designing, would constitute mitigation toward the following identified freeway impacts:

- US 101: Convert HOV lanes to express lanes from SR 85 in Mountain View to San Jose (VTP ID H5)
    - Northbound, Ellis Street to SR 237
    - Northbound, Mathilda Avenue to Fair Oaks Avenue
    - Northbound Fair Oaks Avenue to Lawrence Expressway
- SR 237: Convert HOV lanes to express lanes from I-880 to Mathilda Avenue (VTP H9)
    - Westbound, Fair Oaks Avenue to Mathilda Avenue
    - Eastbound/Westbound, Fair Oaks Avenue to Lawrence Expressway
- SR 237 – Construct new HOV/express lanes between Mathilda Avenue and SR 85 (VTP H11)
    - Eastbound/Westbound, US 101 to Maude Avenue
    - Eastbound, Mathilda Avenue to US 101

The project applicant will be required to work with the City of Sunnyvale and VTA to determine the amount of the fair share contribution. The hotel development represents approximately eight percent of the net new AM peak hour trips and ten percent of the net new PM peak hour trips; therefore the hotel development would be responsible for their relative level of the final share contribution to the regional projects.

4. BACKGROUND CONDITIONS

This chapter presents the results of the level of service calculations under Background Conditions with and without the project. Background No Project Conditions are defined as conditions in 2015, the projected completion date for the proposed project. Traffic volumes for Background No Project Conditions comprise existing volumes plus traffic generated by "approved but not yet built" and "not occupied" development in the area to account for local growth in the study area. Background plus Project Conditions are defined as Background No Project Conditions plus traffic generated by the proposed project.

BACKGROUND NO PROJECT TRAFFIC VOLUMES

Vehicle trips from "approved but not yet built" and "not occupied" development projects in the study area were added. Staff from the City of Sunnyvale provided a list of "approved but not yet built" and "not occupied" development projects. Trip generation estimates from approved and not occupied projects that would add traffic to the study intersections were obtained from their respective traffic reports or estimated based on trip generation rates published in the Institute of Transportation Engineers *Trip Generation* (9th Edition). The trips for each of the background projects were then assigned to the roadway network based on the relative locations of complementary land uses, as well as existing and estimated future travel patterns.

Appendix G contains a list of approved and not occupied projects from each City and their trip generation estimates. The trips for each of the background projects were added to the existing volumes discussed above to represent Background Conditions, as shown on **Figure 9**.

BACKGROUND NO PROJECT IMPROVEMENTS

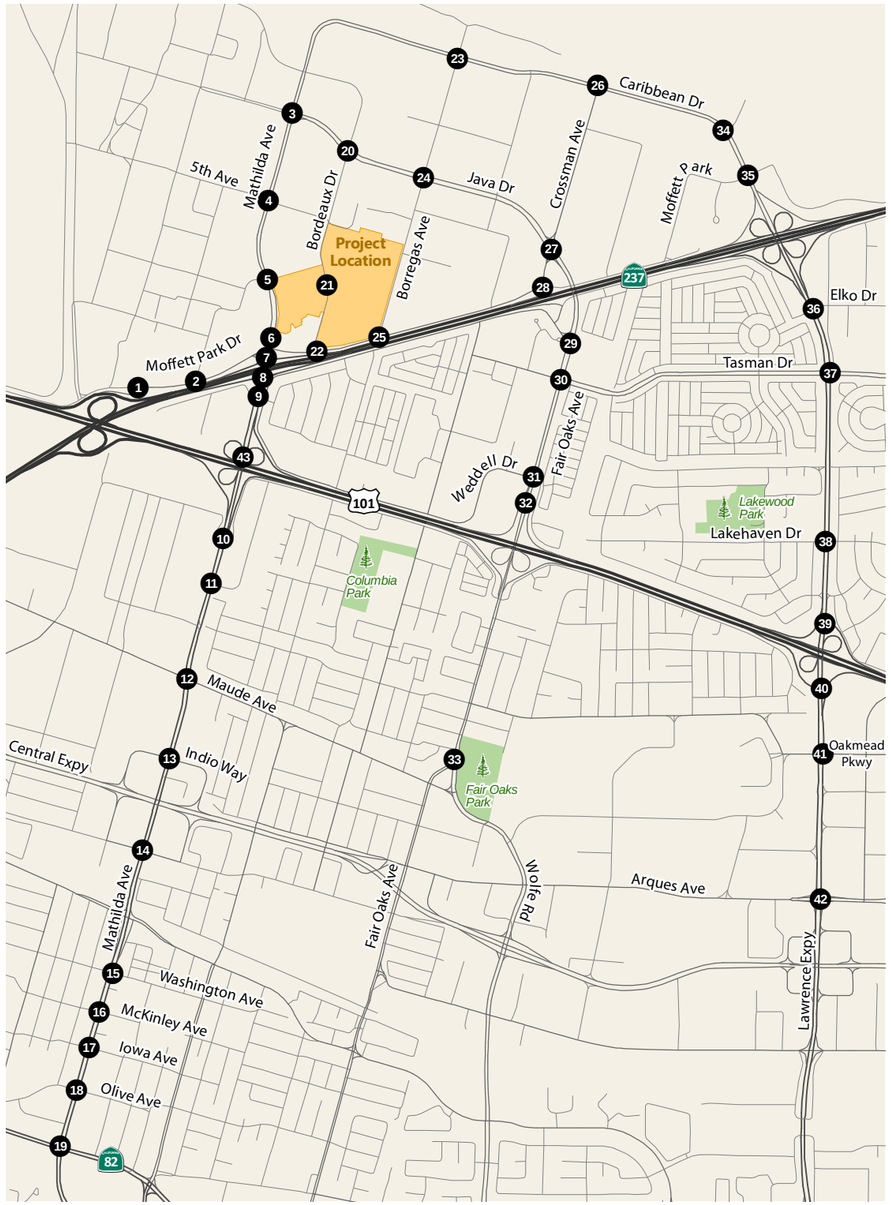
Given that the projected completion year of the project is 2015, no approved and funded transportation network improvements were assumed to be constructed prior to project completion. Therefore, the existing roadway network was used for the background analysis.

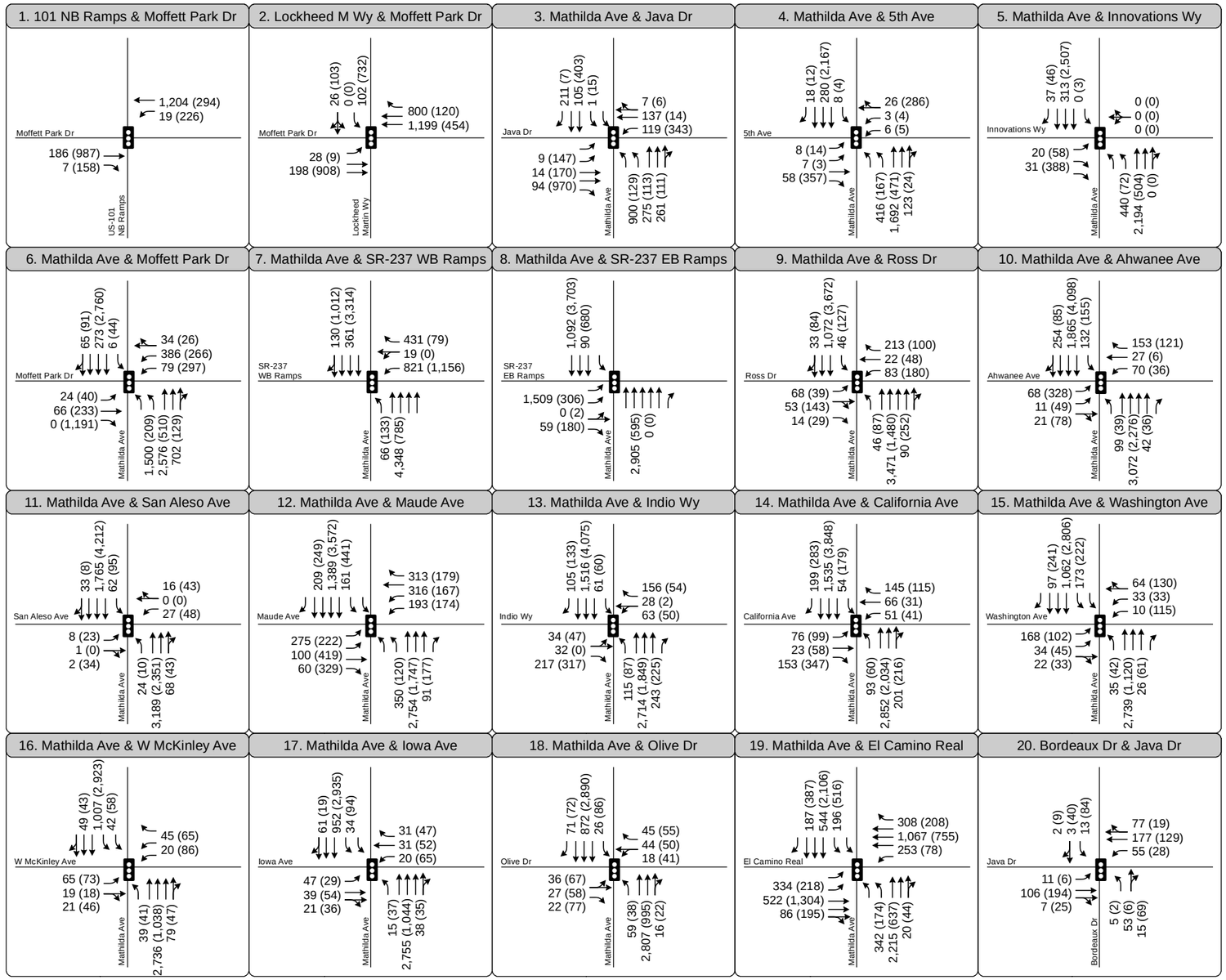
BACKGROUND PLUS PROJECT TRAFFIC VOLUMES

Trips generated from the proposed project (**Table 7**) were added to the Background traffic projections to develop traffic volumes for Background plus Project Conditions. The resulting volumes are shown on **Figure 10**.

BACKGROUND INTERSECTION LEVELS OF SERVICE

Table 10 presents the level of service calculations for the study intersections under Background No Project and Background plus Project Conditions. **Appendix C** contains the corresponding calculation sheets.





Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
Stop Sign

Figure 10.

Peak Hour Traffic Volumes and Lane Configurations - Background No Project Conditions

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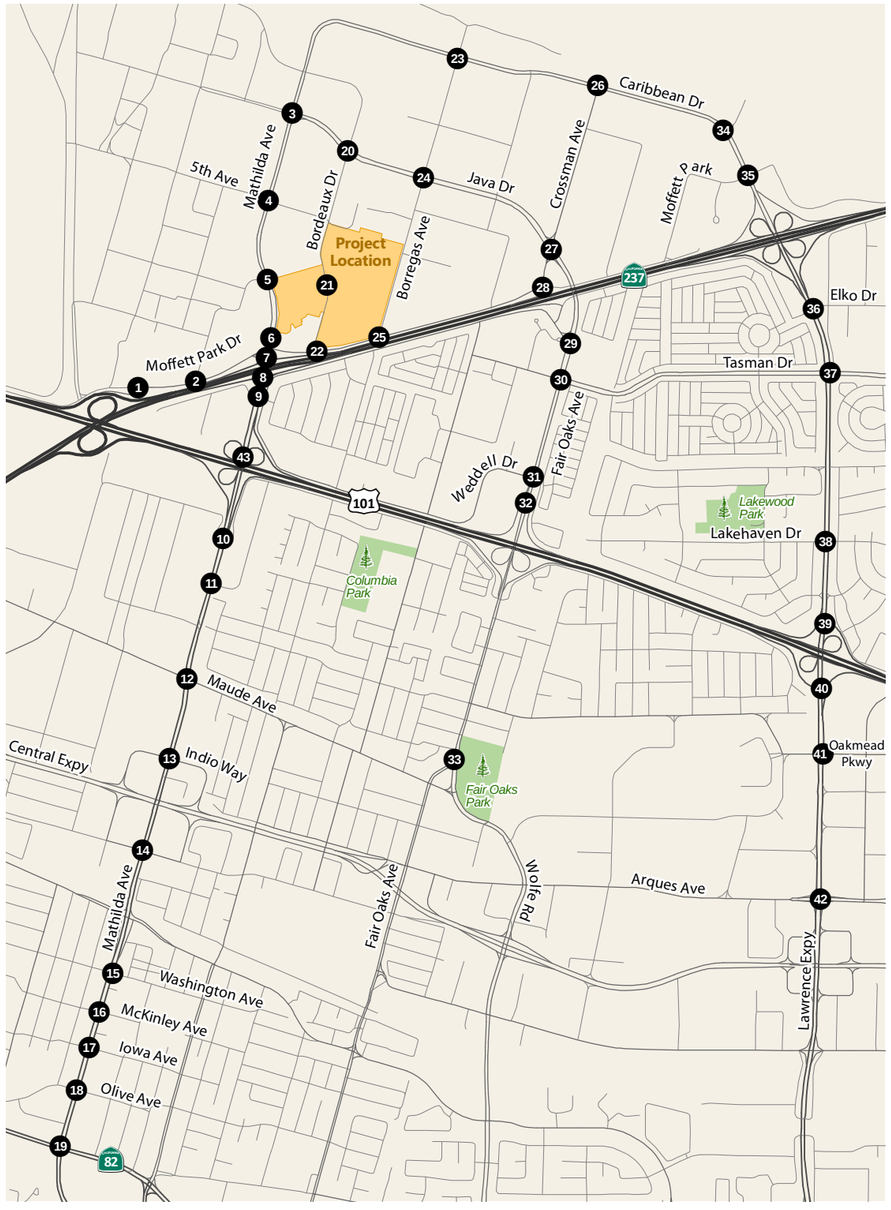
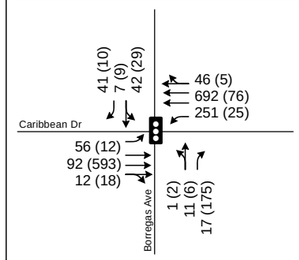


21. Bordeaux Dr & New Roadway

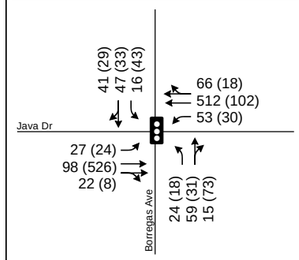
Intersection does not exist under this condition

22. Bordeaux Dr & Moffett Park Dr

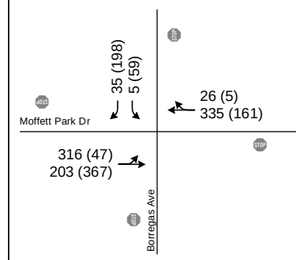
23. Borregas Ave & Caribbean Dr



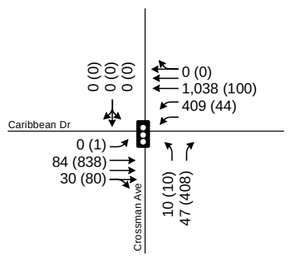
24. Borregas Ave & Java Dr



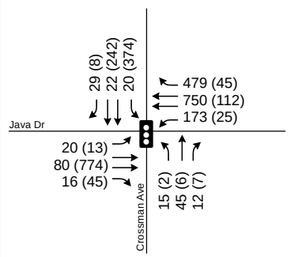
25. Borregas Ave & Moffett Park Dr



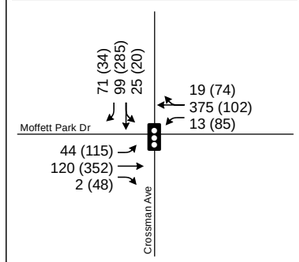
26. Crossman Ave & Caribbean Dr



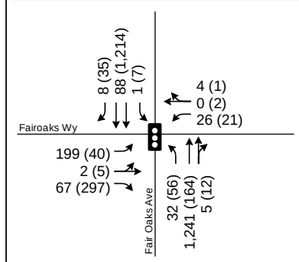
27. Crossman Ave & Java Dr



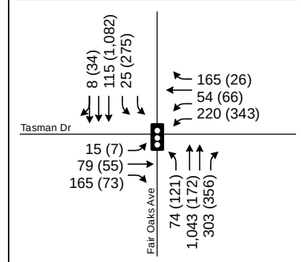
28. Crossman Ave & Moffett Park Dr



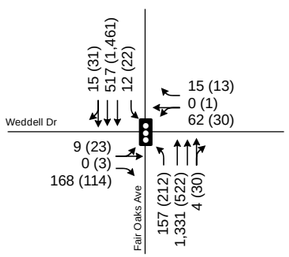
29. Fair Oaks Ave & Fairoaks Wy



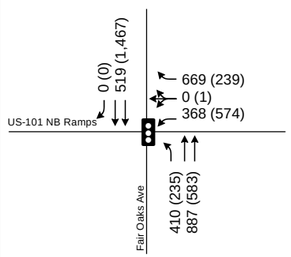
30. Fair Oaks Ave & Tasman Dr



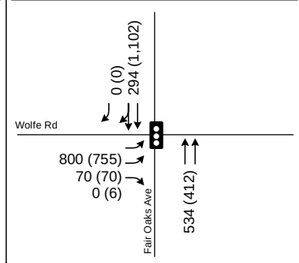
31. Fair Oaks Ave & Weddell Dr



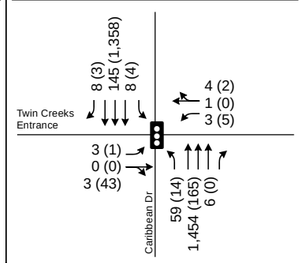
32. Fair Oaks Ave & 101 NB Ramps



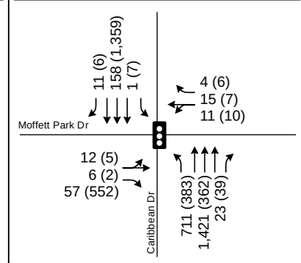
33. Fair Oaks Ave & Wolfe Rd



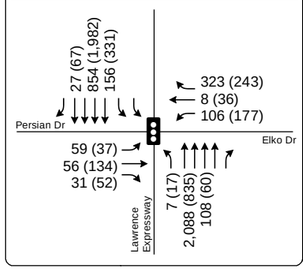
34. Caribbean Dr & Twin Creeks Ent



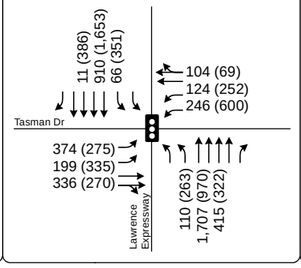
35. Caribbean Dr & Moffett Park Dr



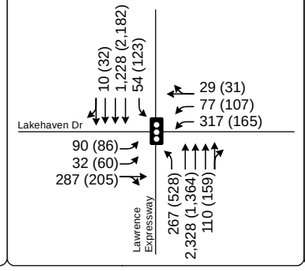
36. Lawrence Exp & Persian Dr



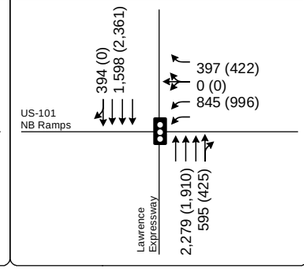
37. Lawrence Exp & Tasman Dr



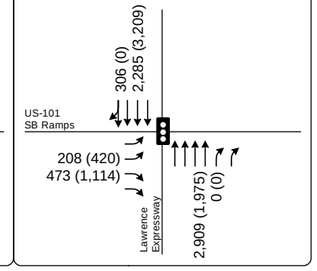
38. Lawrence Exp & Lakehaven Dr



39. Lawrence Exp & 101 NB Ramps



40. Lawrence Exp & 101 SB Ramps



Turn Lane
AM (PM) Peak Hour Traffic Volume
1 Study Intersection
Traffic Signal
Stop Sign

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Figure 10.

Peak Hour Traffic Volumes and Lane Configurations - Background No Project Conditions

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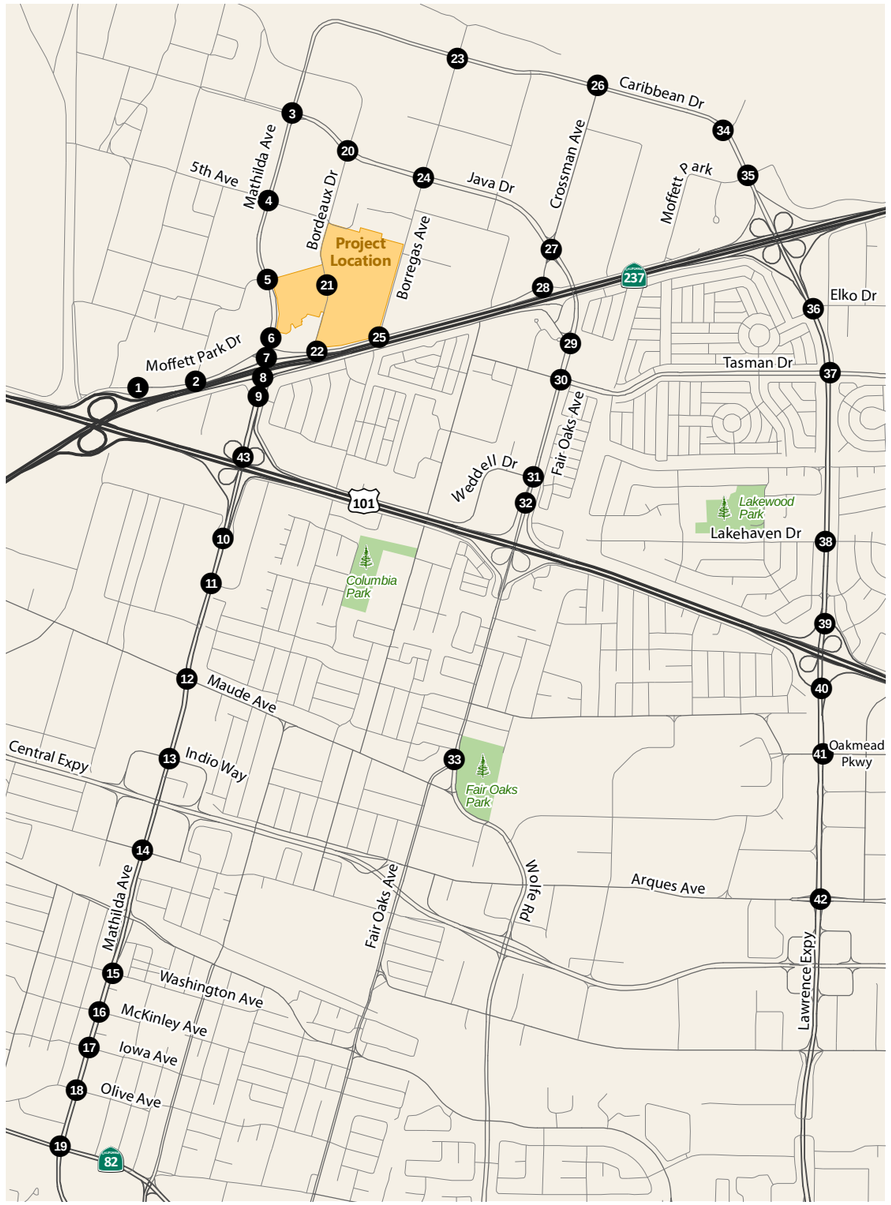

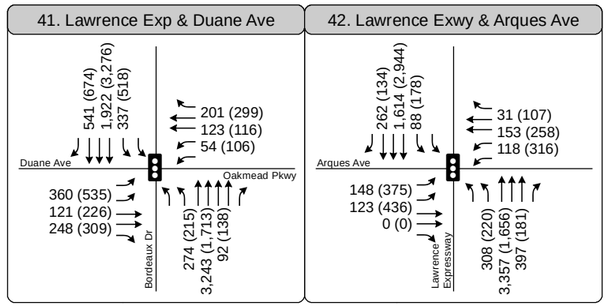

Turn Lane
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Figure 10.

Peak Hour Traffic Volumes and Lane Configurations - Background No Project Conditions

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