Technical Appendices (C through K)
Draft Transportation Environmental Impact Report

Google Caribbean Campus

Planning Project #2107-8042

SCH# 2007052121

November 2019

Sunnyvale

GOOGLE CARIBBEAN CAMPUS PROJECT

Draft

Transportation Environmental Impact Report

TECHNICAL APPENDICES

PROJECT NUMBER: 2107-8042

STATE CLEARINGHOUSE NO. 2007052121

City of Sunnyvale
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NOVEMBER 2019

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Traffic Impact Analysis

Sunnyvale

Final Transportation Impact Analysis
Volume 1 of 2: Report

100-200 W Caribbean Drive

August 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

100-200 West Caribbean Drive TIA
Sunnyvale, CA

TRANSPORTATION IMPACT ANALYSIS

FINAL REPORT

Prepared For:

The City of Sunnyvale

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August 2019

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AUTO TRIP REDUCTION STATEMENT

UPDATED: October 2014

SANTA CLARA Valley Transportation Authority

PROJECT INFORMATION	*Relevant TIA Section:*	Project Description

Project Name: Google 100-200 W Caribbean Drive

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

Description:

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

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

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

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

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

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

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

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

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

TRIP REDUCTION APPROACHES

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

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

Last updated 11/4/2014

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

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

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

EXECUTIVE SUMMARY

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

PROJECT DESCRIPTION

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

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

PROJECT GENERATED TRIPS

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

INTERSECTION LEVEL OF SERVICE IMPACTS AND MITIGATION MEASURES

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

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

Existing Conditions

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

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

Background Conditions

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

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

Cumulative Conditions

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

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

Mitigation Measures

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

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

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

- #2 - Caribbean Parking Garage Driveway / Caribbean Drive

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

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

Table 1. Summary of Intersection Impacts and Mitigation Measures

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

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

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

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

FREEWAY SEGMENT/RAMP IMPACTS AND MITIGATION MEASURES

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

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

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

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

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

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

PROJECT ACCESS DRIVEWAYS AND RECOMMENDED THROAT LENGTHS

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

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

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

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

200 West Caribbean Drive Driveways:

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

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

Recommendations

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

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

PROJECT ACCESS DRIVEWAY TURN POCKETS AND DECELERATION LANES

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

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

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

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

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

Recommendations

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

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

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

PROJECT DRIVEWAY SIGHT DISTANCE

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

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

Recommendations/Mitigations

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

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

It is recommended that the proposed Project implement the following:

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

INTERNAL CIRCULATION

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

Recommendations

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

ON-SITE PARKING

Vehicle Parking

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

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

Bicycle Parking

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

TRANSIT FACILITIES

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

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

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

Recommendations

None.

PEDESTRIAN FACILITIES

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

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

Recommendations

None.

BICYCLE FACILITIES

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

Recommendations

None.

PEDESTRIAN HYBRID BEACON (HAWK)

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

Recommendations

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

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

VEHICLE QUEUING

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

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

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

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

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

1. INTRODUCTION

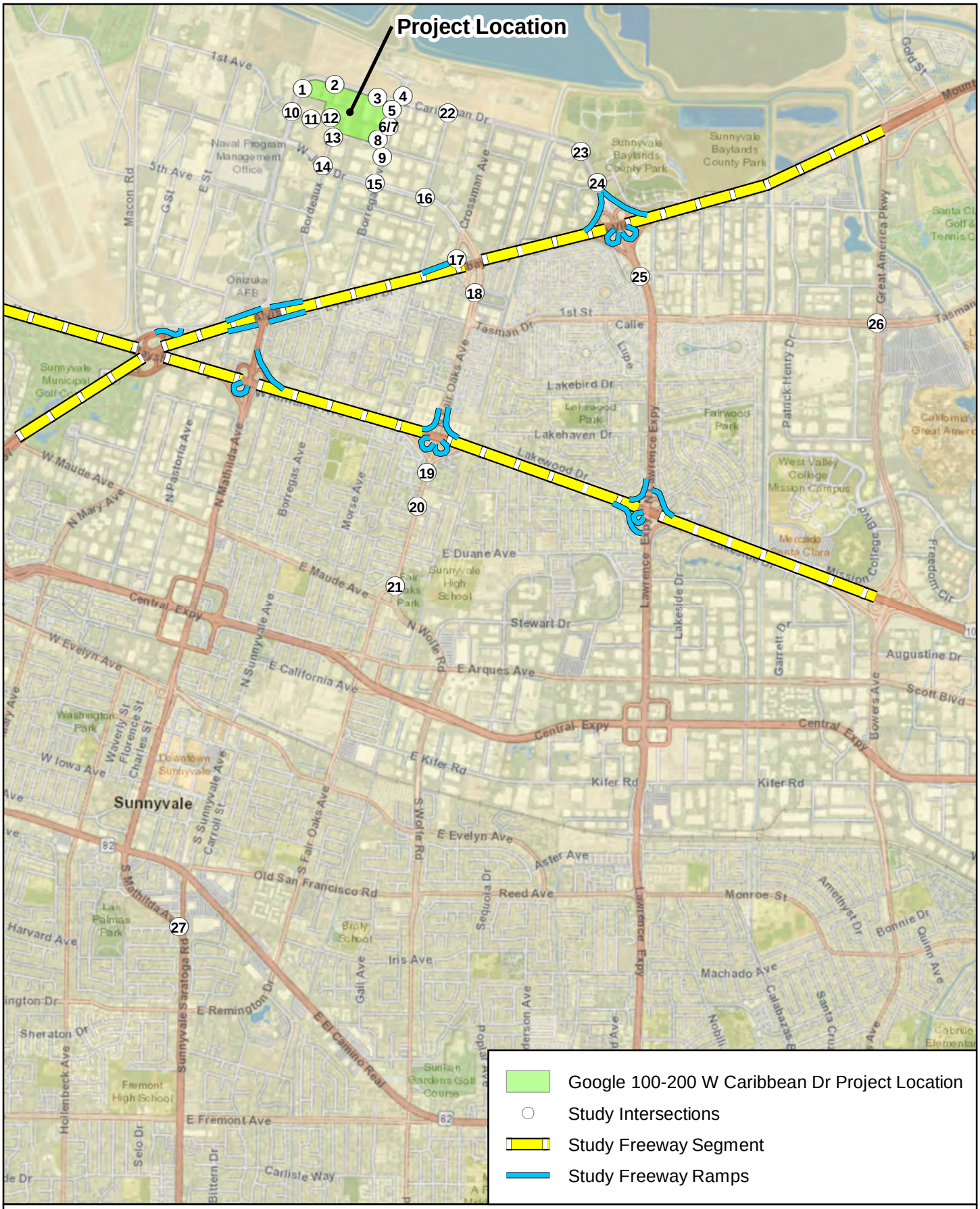
This report presents the results of a Transportation Impact Analysis (TIA) performed by Wood Rodgers, Inc. for the proposed 100-200 West Caribbean Drive Development in Sunnyvale, California. The analysis was performed to determine any impacts the proposed Project may have on the surrounding transportation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

1.1 PROJECT DESCRIPTION

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

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

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



Project Location and Study Facilities

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

Figure 1

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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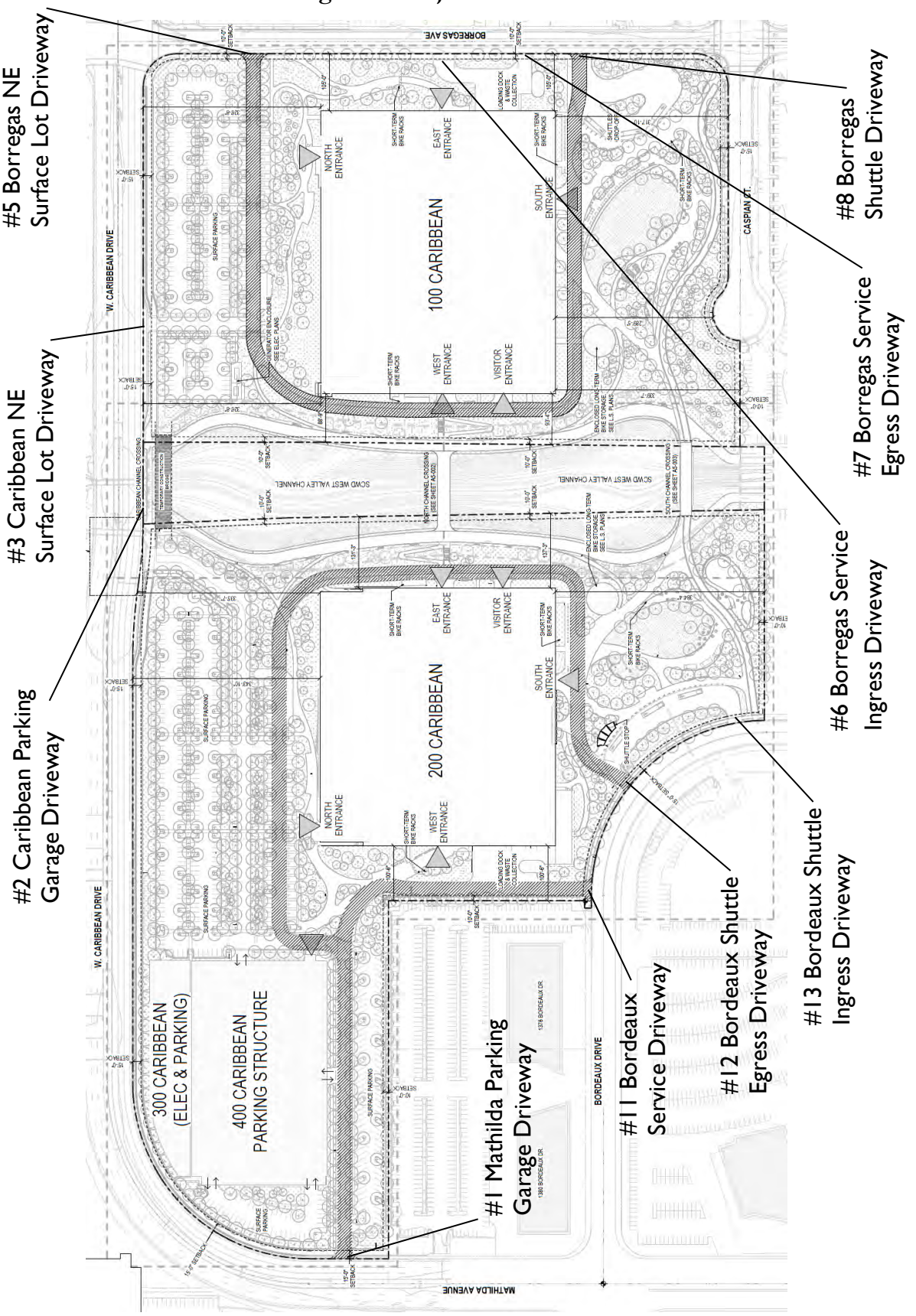
Figure 2. Project Site Plan



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

100 West Caribbean Drive Driveways:

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

200 West Caribbean Drive Driveways:

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

1.2 STUDY AREA

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

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

1.2.1 Intersections

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

Table 2. Study Intersections

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

Table 2. Study Intersections

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

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

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

1.2.2 Freeway Segments

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

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

1.2.3 Freeway Ramps

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

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

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

1.2.4 Pedestrian, Bicycle, and Transit Facilities

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

1.3 ANALYSIS SCENARIOS

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

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

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

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

1.4 ANALYSIS METHODS

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

1.4.1 Signalized Intersections

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

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

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

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

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

1.4.2 Unsignalized Intersections

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

1.4.3 Freeway Segments and Ramps

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

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

Table 3. HCM-2000 Based Signalized Intersection LOS Thresholds

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

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

Table 4. HCM-2000 Based Unsignalized Intersection LOS Thresholds

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

Table 5. HCM-2000 Based Freeway Segment LOS Thresholds

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

1.5 LEVEL OF SERVICE STANDARDS AND IMPACT CRITERIA

1.5.1 Intersection Level of Service Impact Criteria

1.5.1.1 Signalized Intersections

City of Sunnyvale Intersections (Not Regionally Significant):

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

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

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

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

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

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

1.5.1.2 Unsignalized Intersections

City of Sunnyvale Intersections (Not Regionally Significant):

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

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

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

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

Regionally Significant City of Sunnyvale Intersections:

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

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

1.5.1.3 Signal Warrants

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

1.5.2 Queuing

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

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

1.5.3 Freeway Segment Impact Criteria

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

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

1.5.4 Freeway Ramp Impact Criteria

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

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

1.6 Report Organization

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

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

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

2. EXISTING CONDITIONS

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

2.1 EXISTING ROADWAY NETWORK

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2.2 PEDESTRIAN FACILITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

2.3 BICYCLE FACILITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

2.4 EXISTING TRANSIT SERVICE

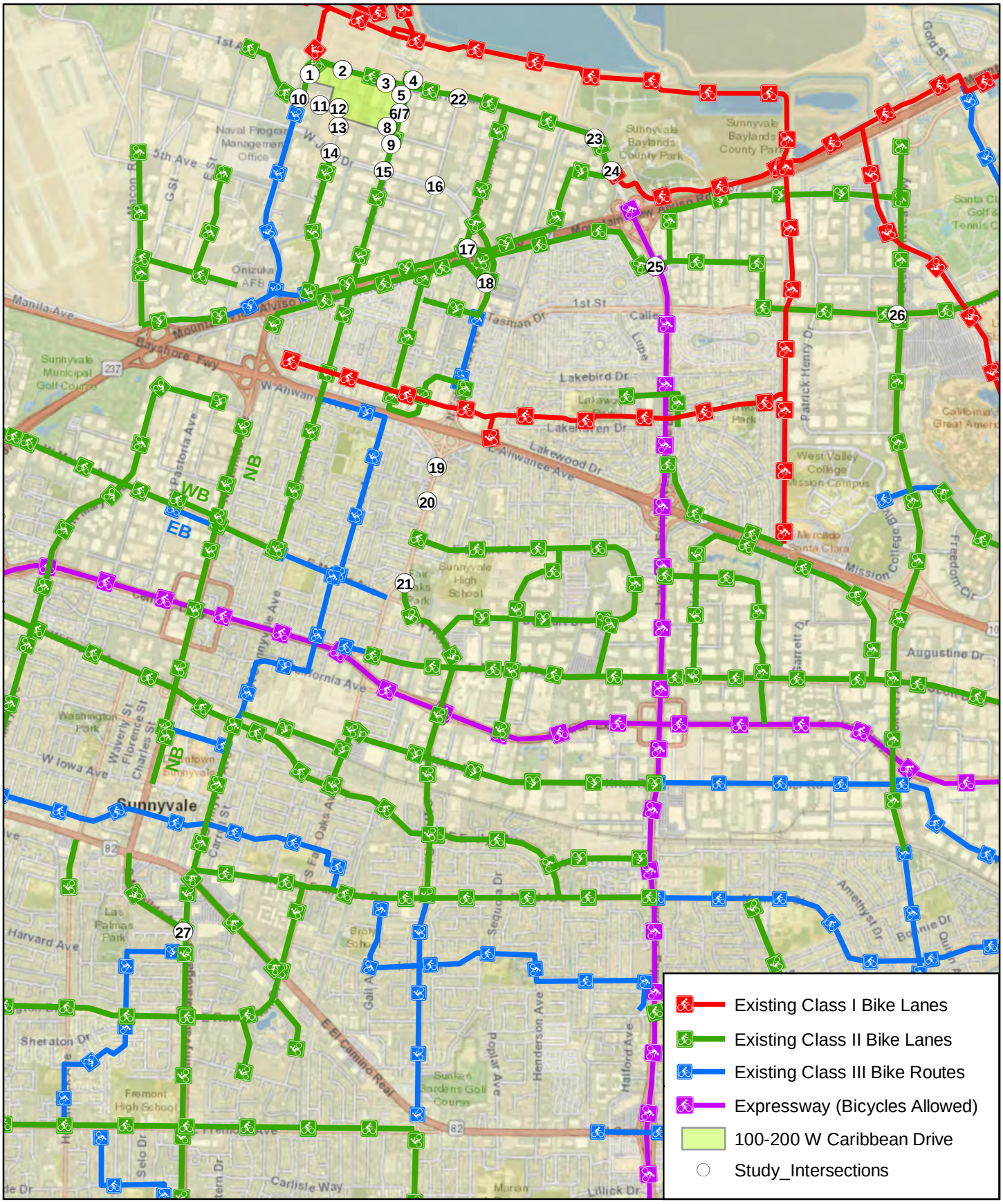
Existing transit service in the Project study area is provided by Caltrain and VTA bus routes. Existing Project study area transit services are shown in **Figure 4**. A description of transit services is provided below.

2.4.1 VTA Bus Service

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

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

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



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

Figure 3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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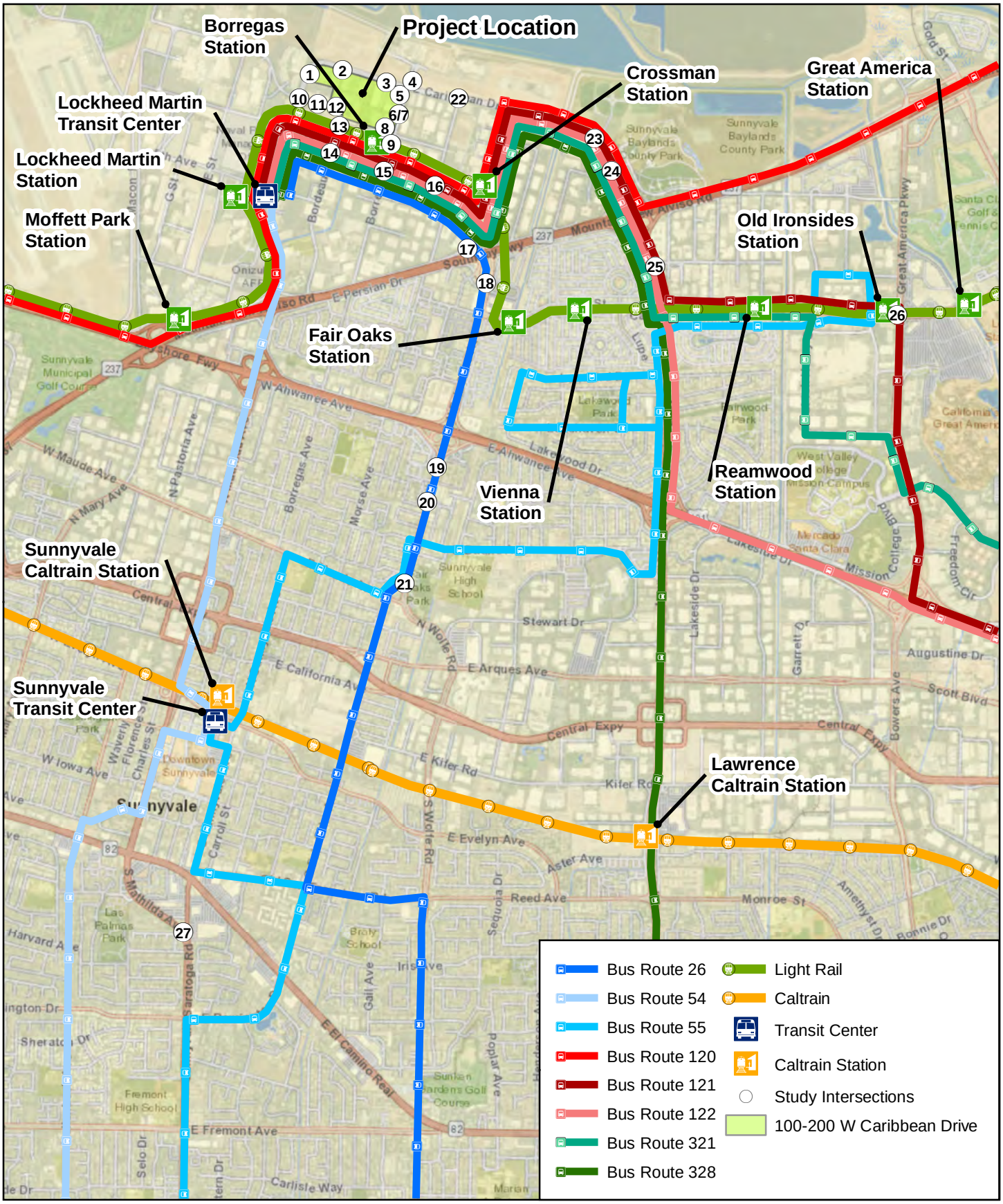

Existing Project Study Area Transit Services
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

0 1,500 3,000
Feet

NORTH

Figure 4

WOOD RODGERS

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

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

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

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

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

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

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

2.4.2 VTA Light Rail Service

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

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

2.4.3 Caltrain Service

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

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

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

2.5 EXISTING INTERSECTION VOLUMES AND LANE GEOMETRICS

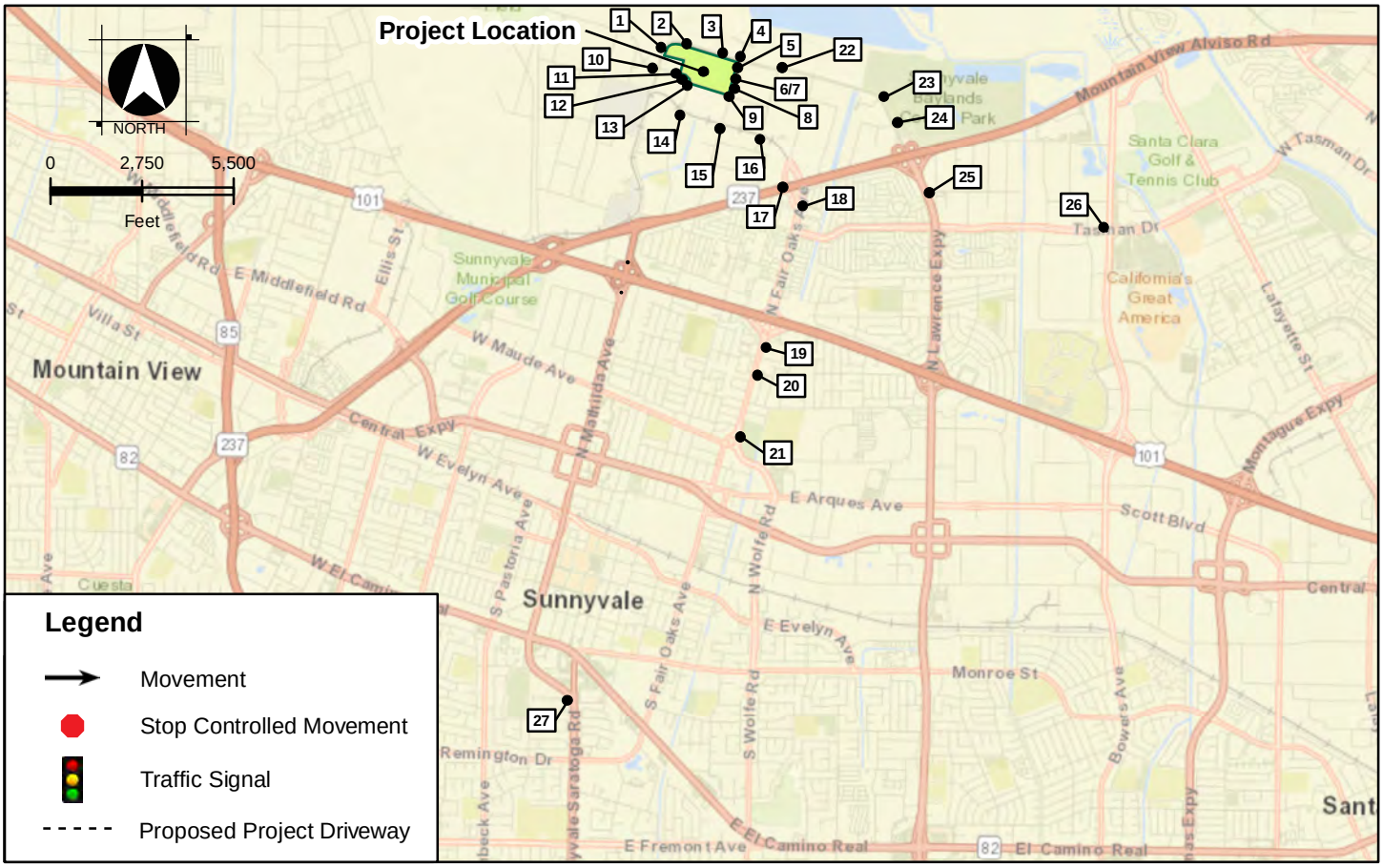
Project study intersection traffic operations were evaluated for the AM and PM peak hours under existing conditions. The AM and PM peak hours at City of Sunnyvale, City of Santa Clara, and Caltrans intersections were defined to be the highest one hour of traffic flow counted between 7:00 AM and 10:00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

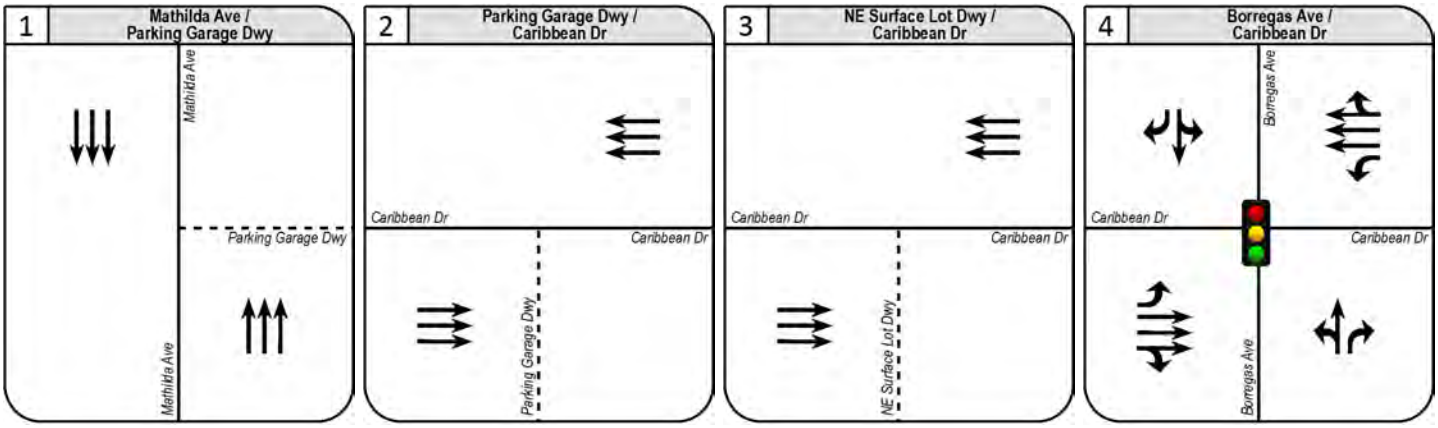
Existing AM and PM peak hour intersection counts were obtained from new intersection counts and recent counts provided by the City. Wood Rodgers conducted new three-hour AM (7:00 AM to 10:00 AM) and three-hour PM (4:00 PM to 7:00 PM) peak hour vehicular, pedestrian, and bicycle traffic counts at study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

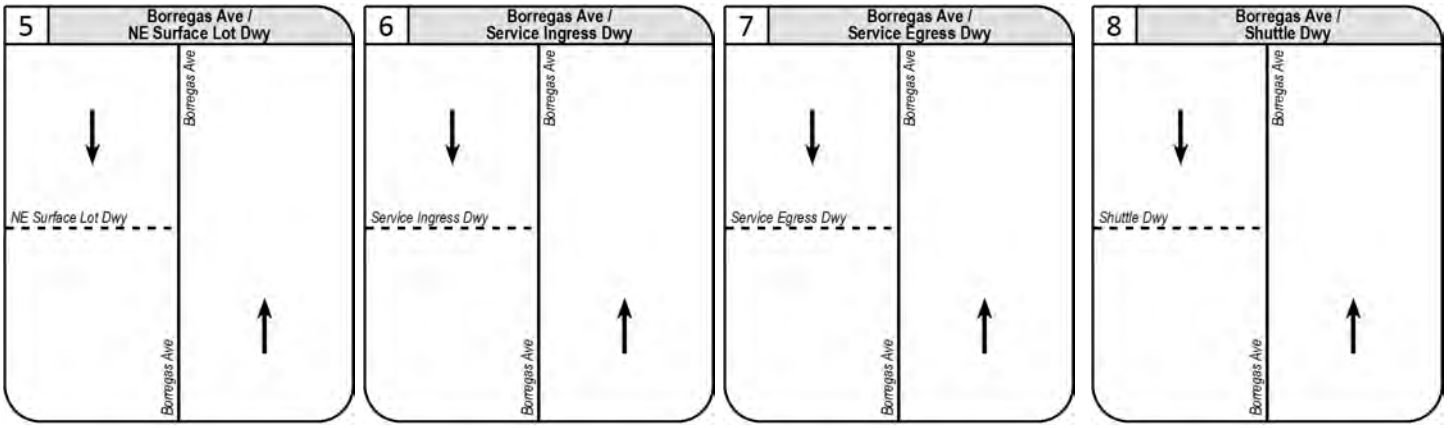
Traffic counts were balanced in areas with little or no access points. **Figure 5** illustrates "Existing" intersection lane geometrics and control and **Figure 6** illustrates "Existing" conditions study intersection traffic volumes. Study intersection raw count sheets are included in **Appendix A**.

2.6 "EXISTING" INTERSECTION OPERATIONS

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







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

Figure 5

WOOD RODGERS

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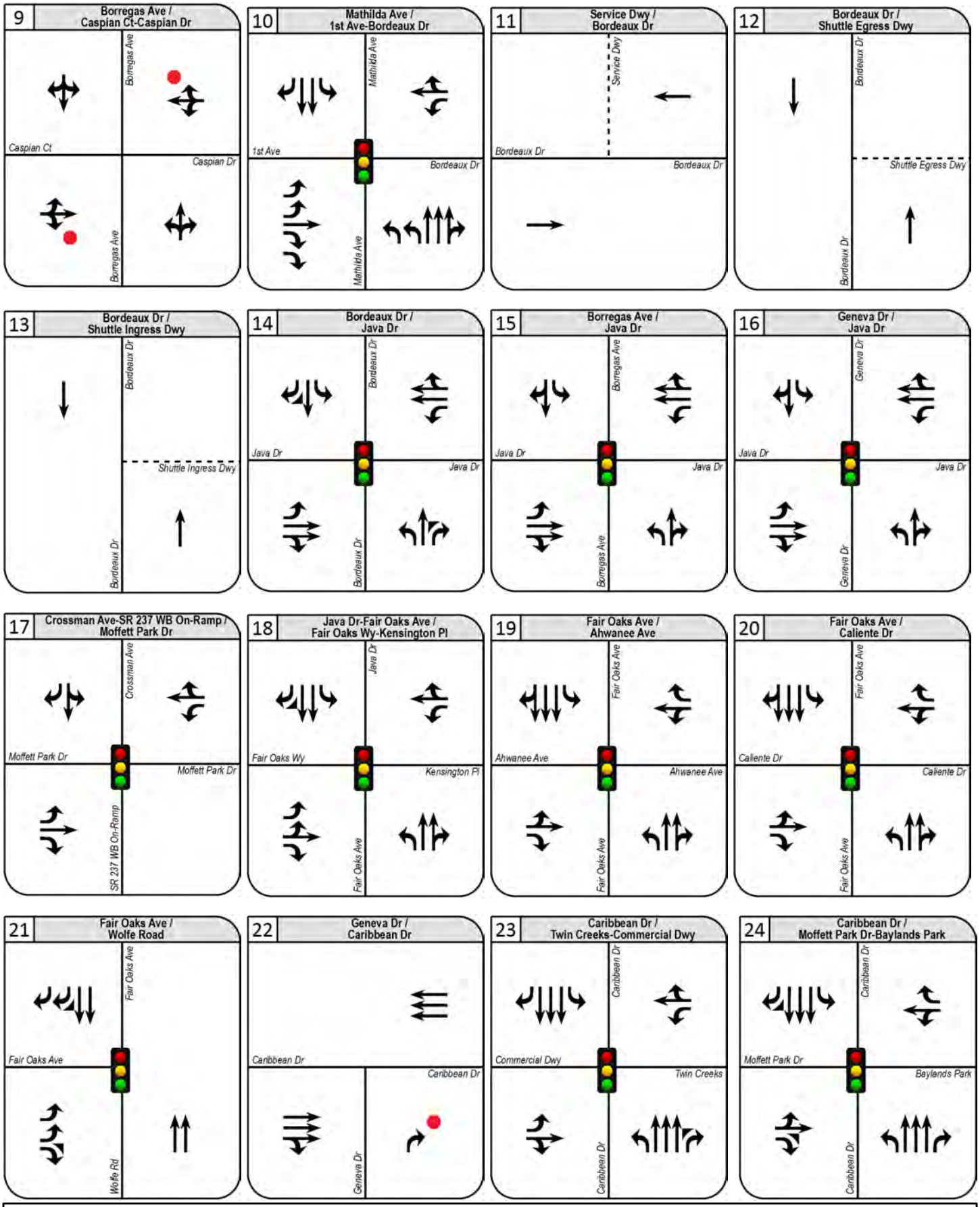
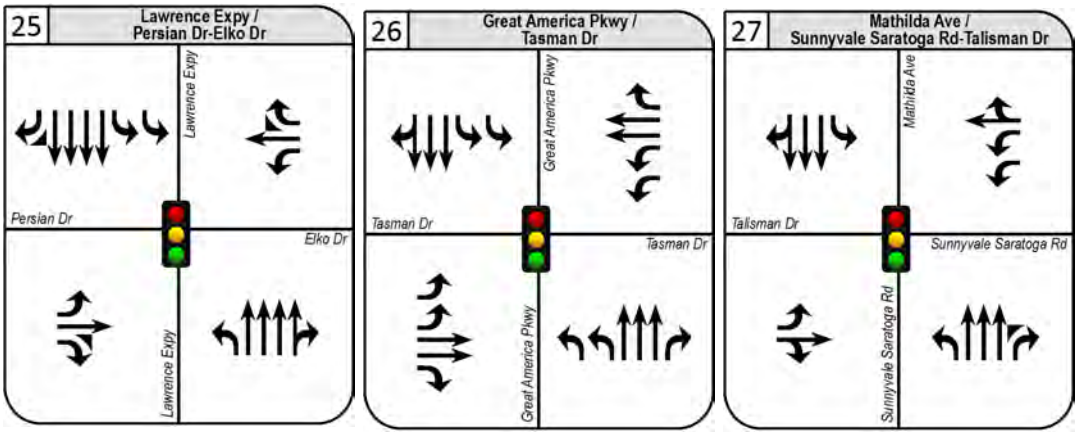


Existing Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 5-2

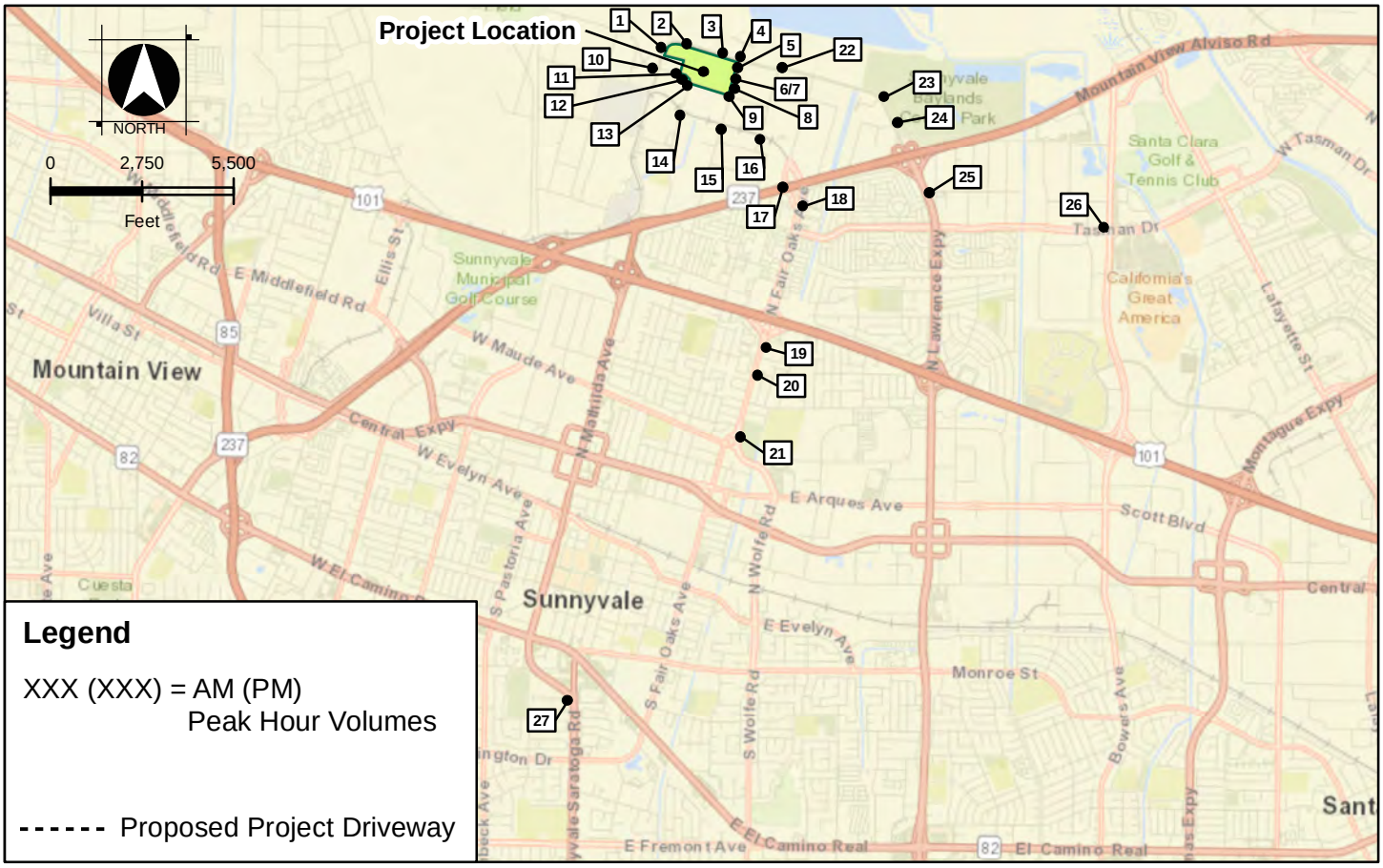
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

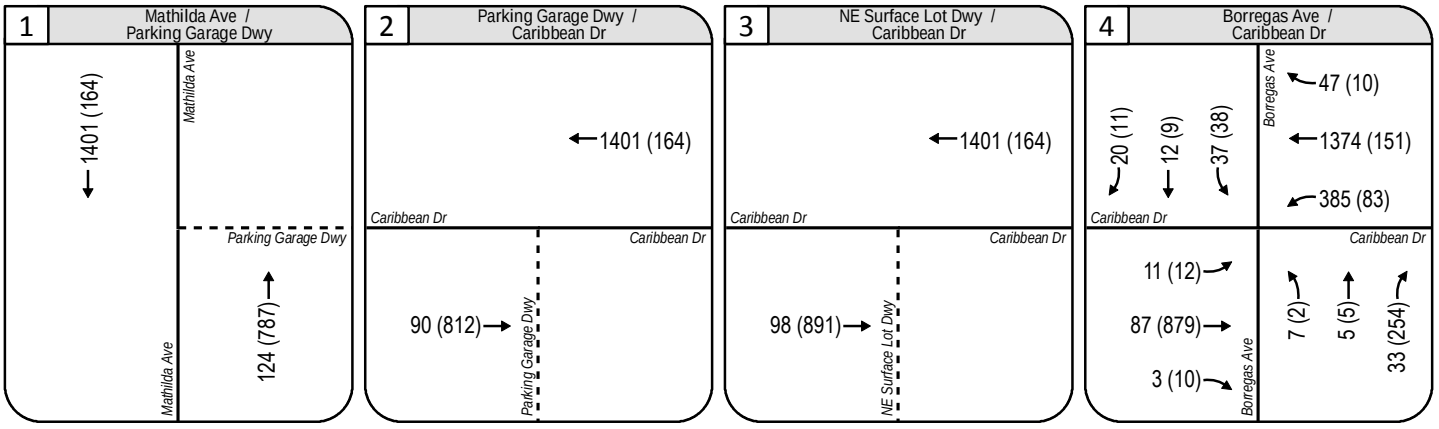


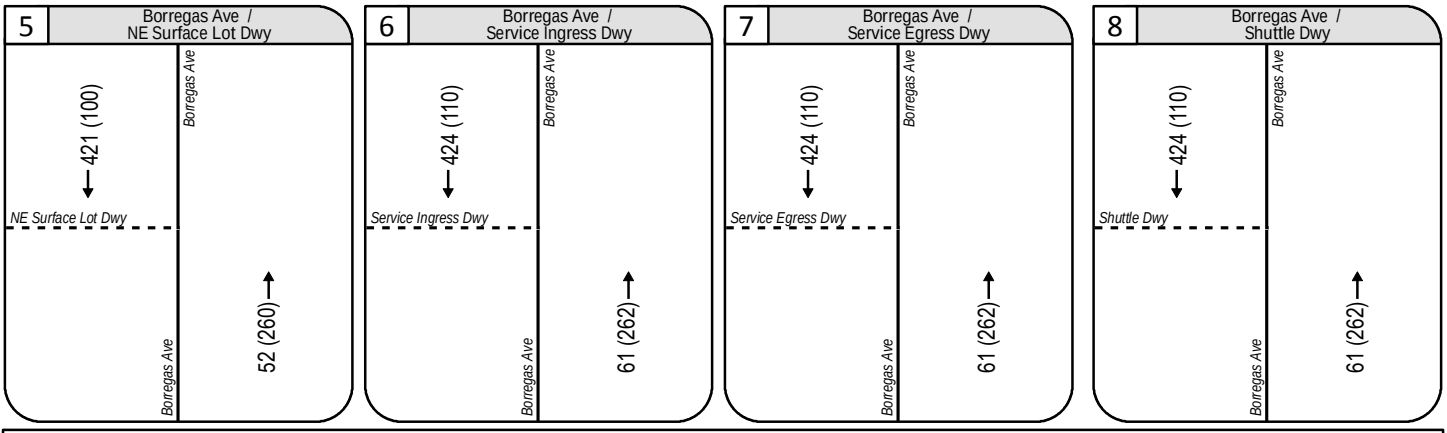
Existing Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 5-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



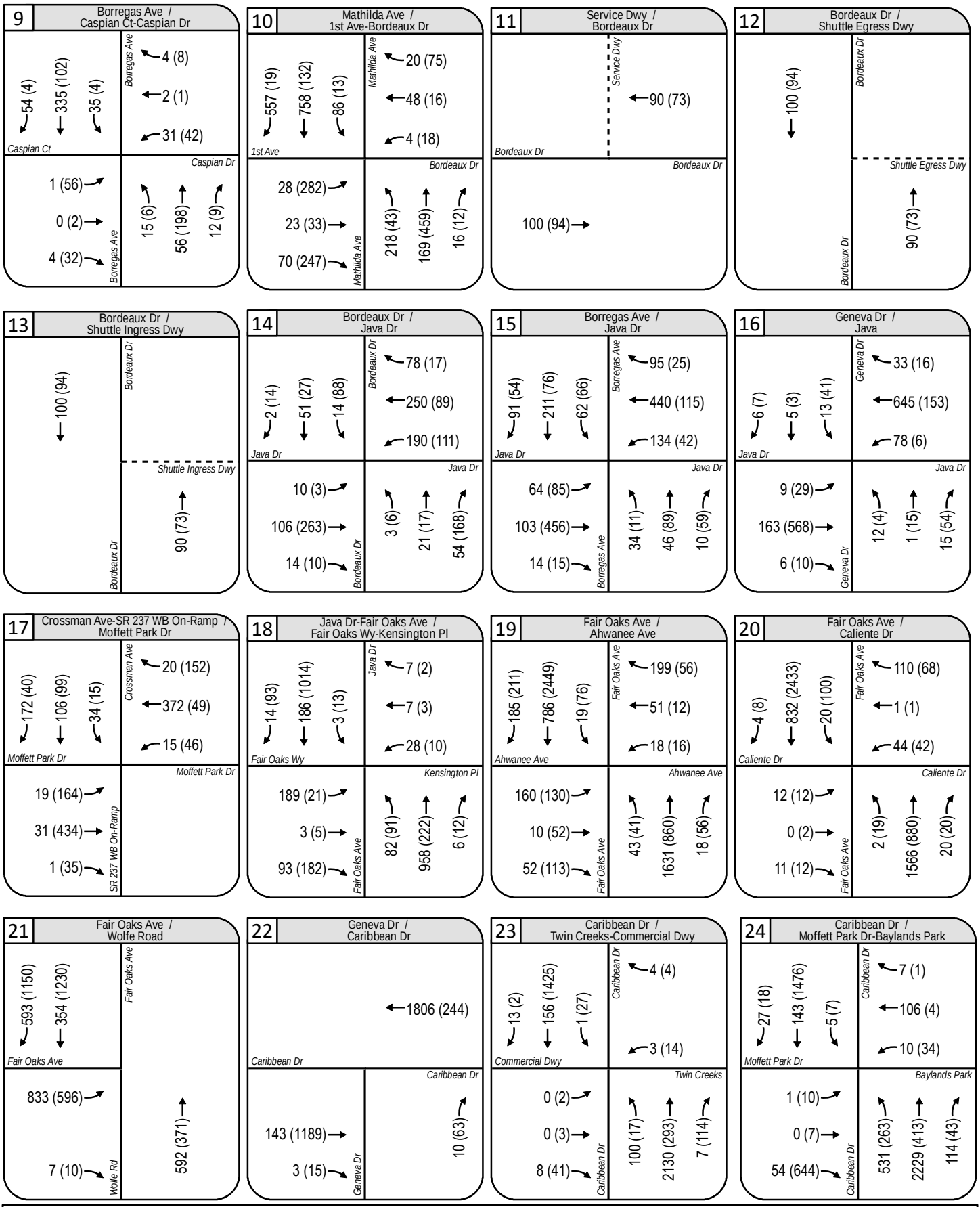




"Existing" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 6

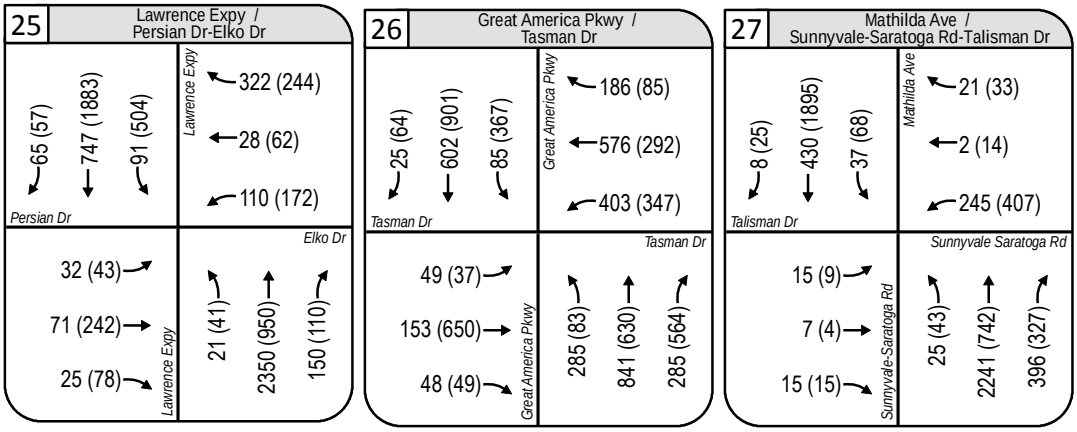
WOOD RODGERS



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

Figure 6-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



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

Figure 6-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

Table 6. "Existing" Conditions Intersection Traffic Operations

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

Table 6. "Existing" Conditions Intersection Traffic Operations

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

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

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

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

2.7 FIELD OBSERVATIONS

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

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

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

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

2.8 "EXISTING" FREEWAY SEGMENT OPERATIONS

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

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

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

Table 7. "Existing" Conditions Freeway Segment Traffic Operations

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

Table 7. "Existing" Conditions Freeway Segment Traffic Operations

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

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

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

2.9 "EXISTING" FREEWAY RAMP OPERATIONS

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

Table 8. "Existing" Conditions Freeway Ramp Traffic Operations

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

Table 8. "Existing" Conditions Freeway Ramp Traffic Operations

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

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

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

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

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

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

3. EXISTING PLUS PROJECT CONDITIONS

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

3.1 PROJECT SITE AND DEMAND MANAGEMENT

3.1.1 Project Site Description

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

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

Table 9. Project Site Details

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

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

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

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

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

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

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

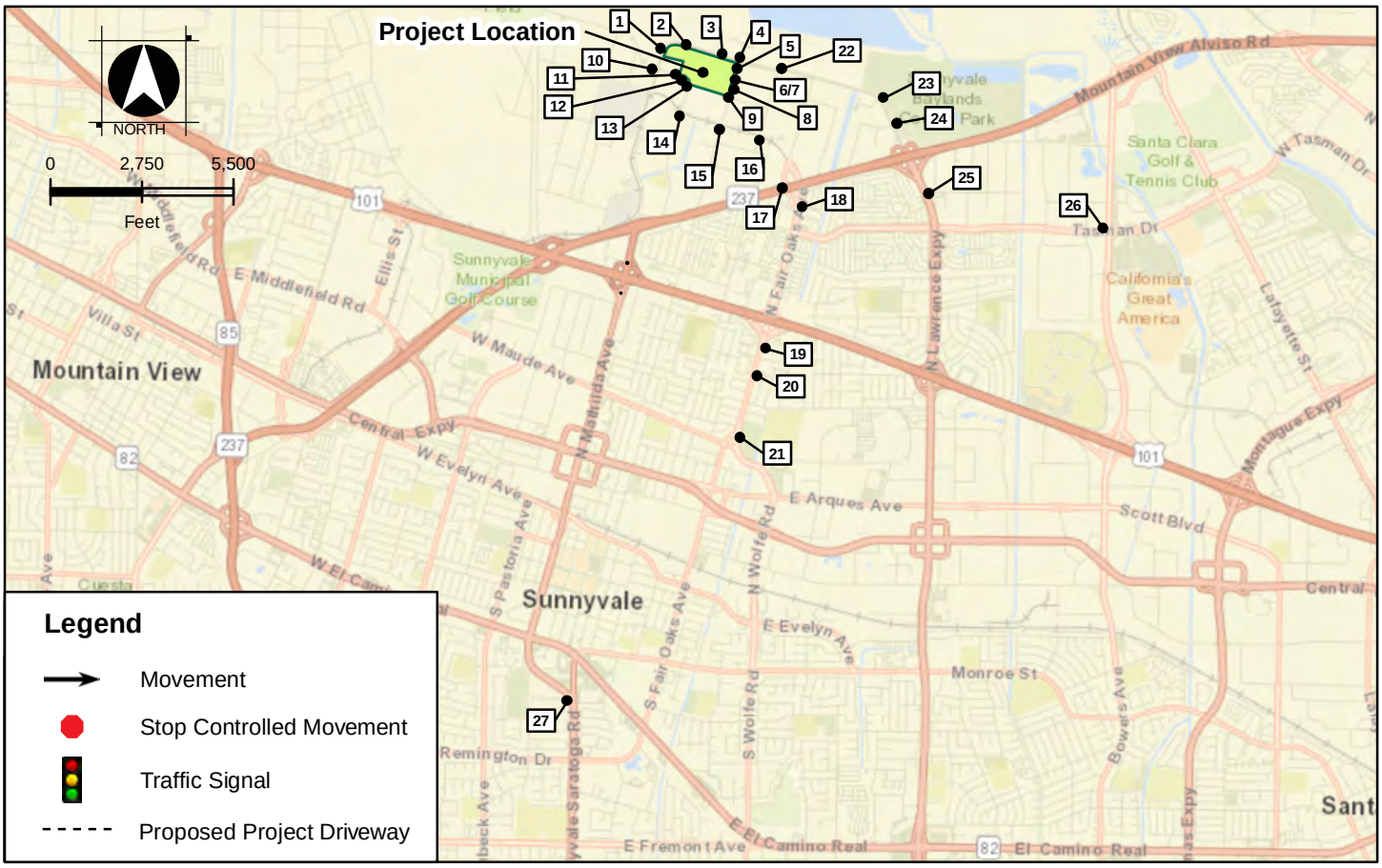
100 West Caribbean Drive Driveways:

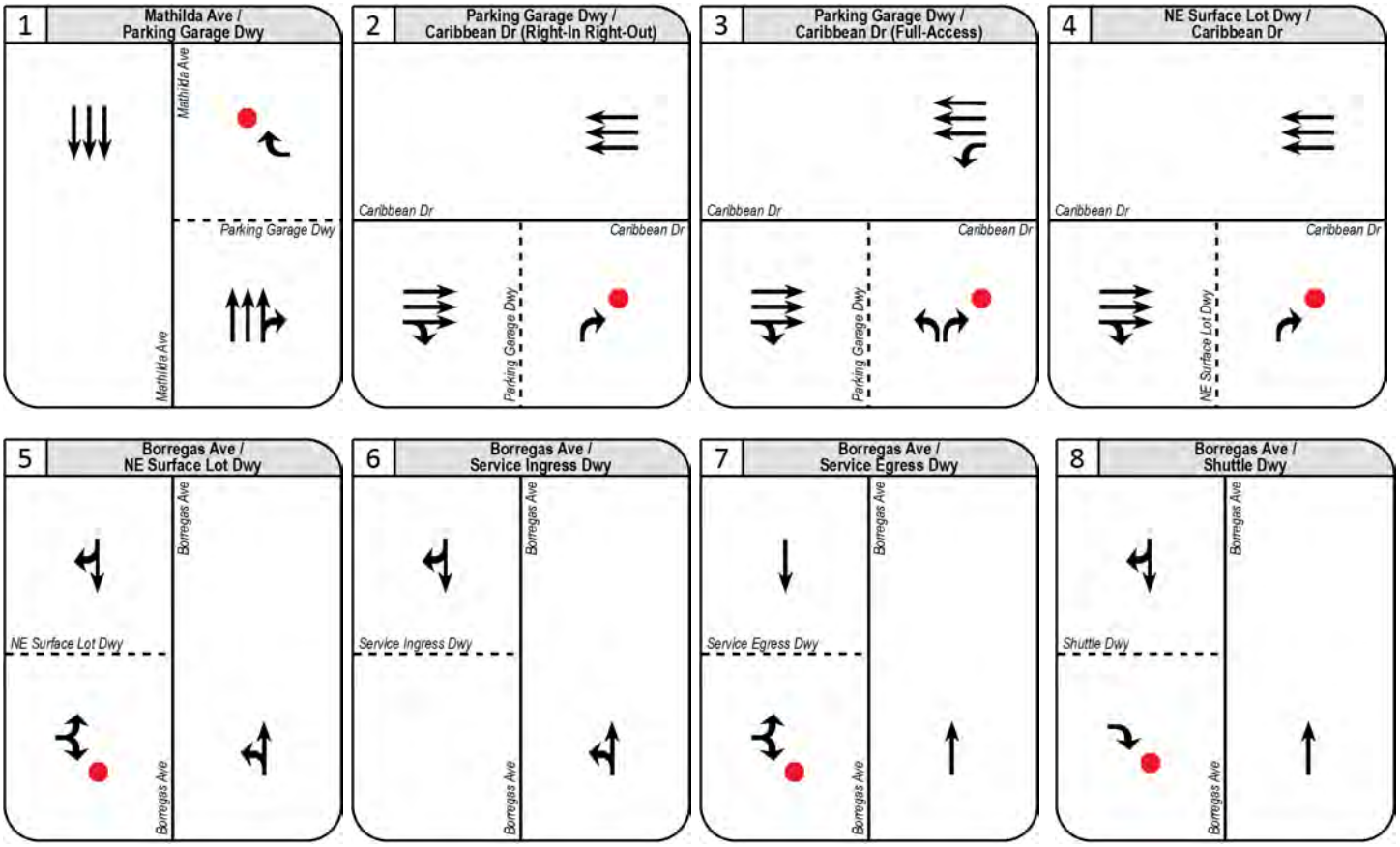
- **#3 Caribbean Northeast (NE) Surface Lot Driveway:** One right-in right-out driveway on West Caribbean Drive west of Borregas Avenue.
- **#5 Borregas Northeast (NE) Surface Lot Driveway:** One full-access driveway on Borregas Avenue south of West Caribbean Drive.
- **#6 Borregas Service Ingress Driveway:**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

200 West Caribbean Drive Driveways:

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

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





Proposed Project Driveway Lane Geometrics and Control

100-200 W Caribbean Drive TIA

Sunnyvale, CA

August 2019

Figure 7

WOOD RODGERS

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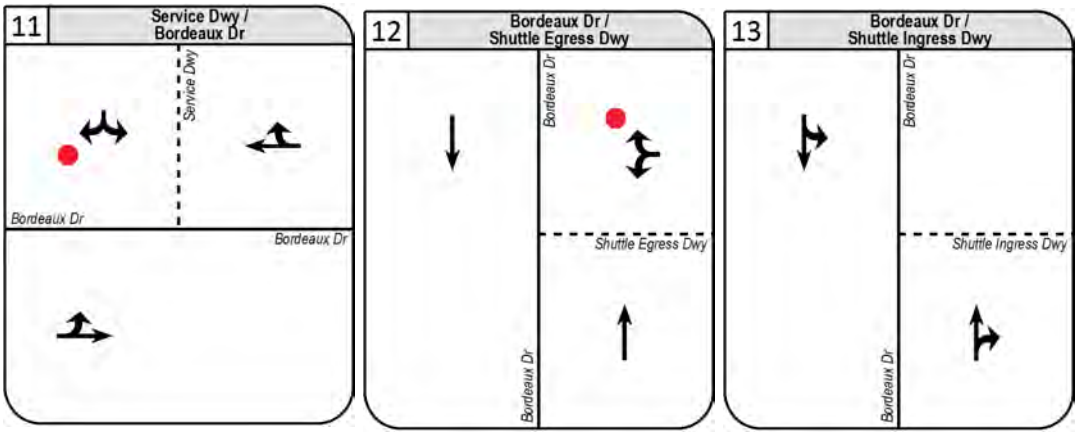

Proposed Project Driveway Lane Geometrics and Control
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 7-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

3.1.2 Transportation Demand Management Program

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

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

3.2 PROJECT GENERATED TRIPS

3.2.1 Trip Generation and Reductions

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

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

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

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

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

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

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

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

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

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

Table 10. Project Trip Generation Volumes

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

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

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

3.2.2 Project Trip Distribution and Assignment

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

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

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

Project Trip Distribution

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

Figure 8

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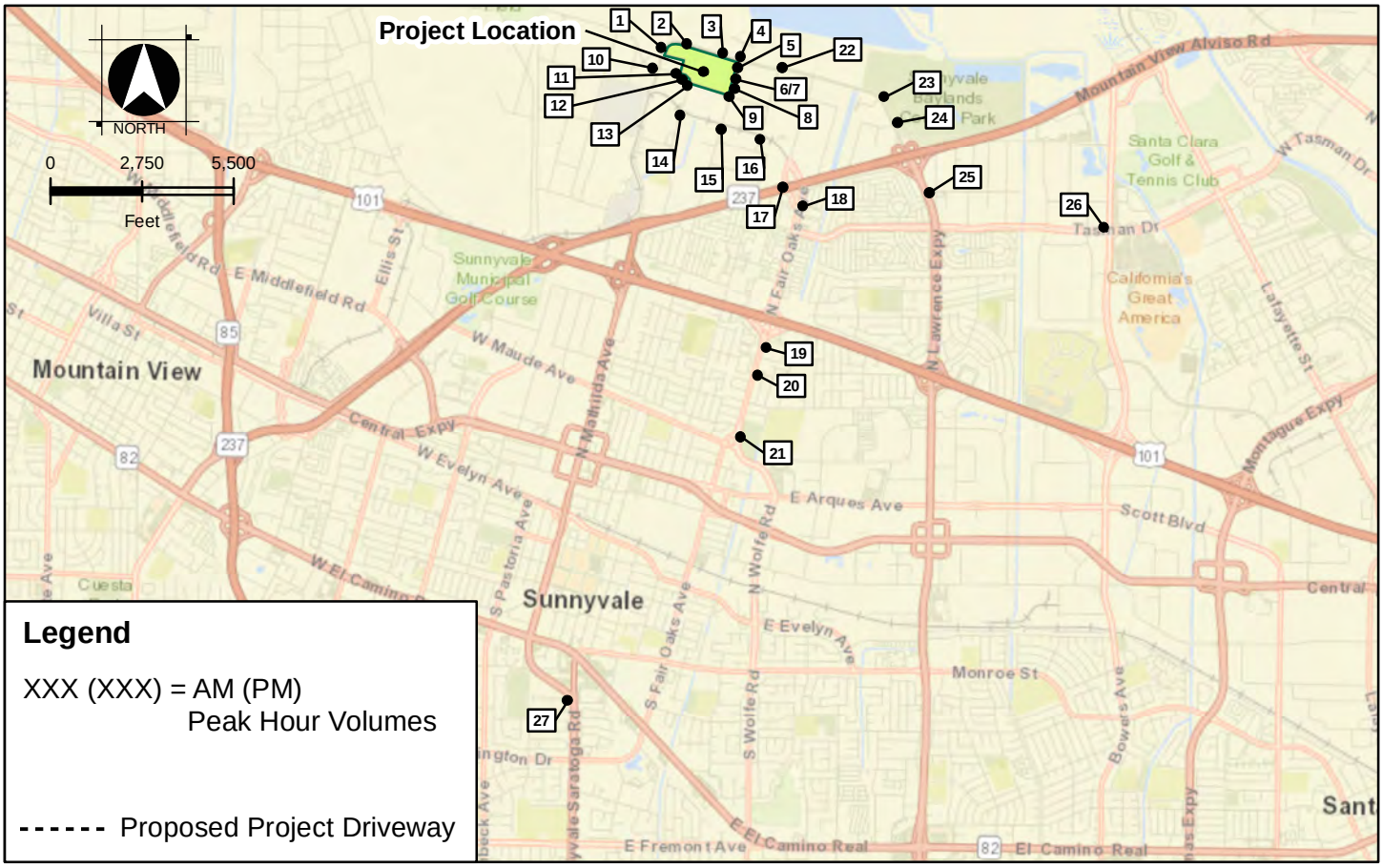
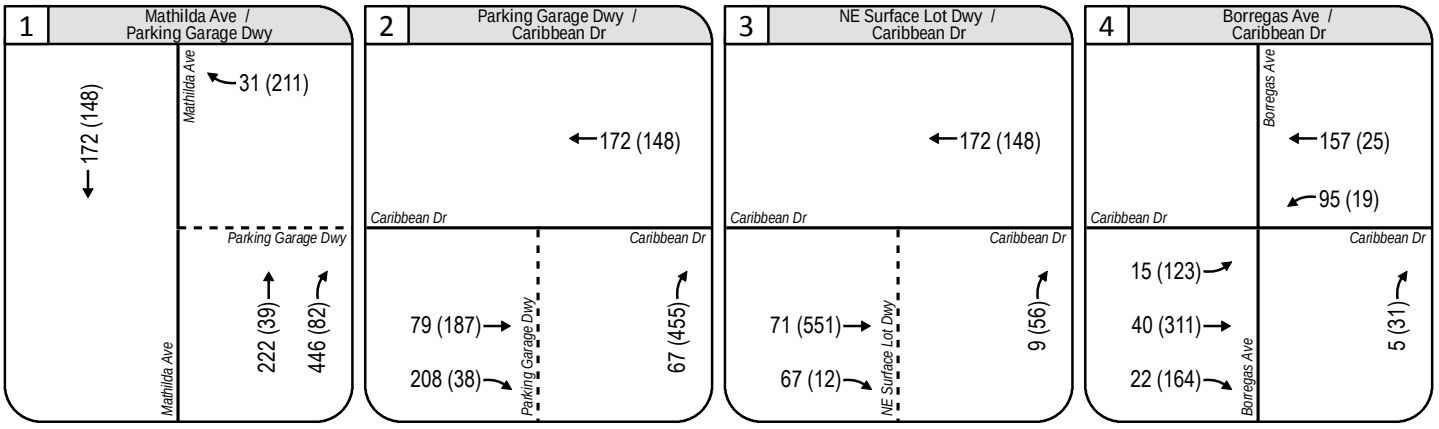
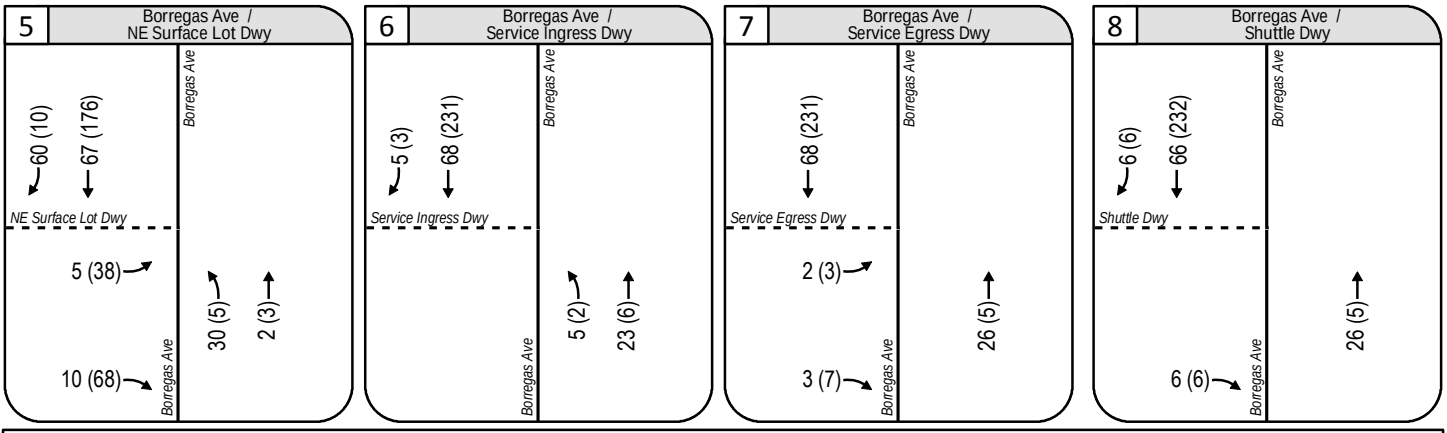


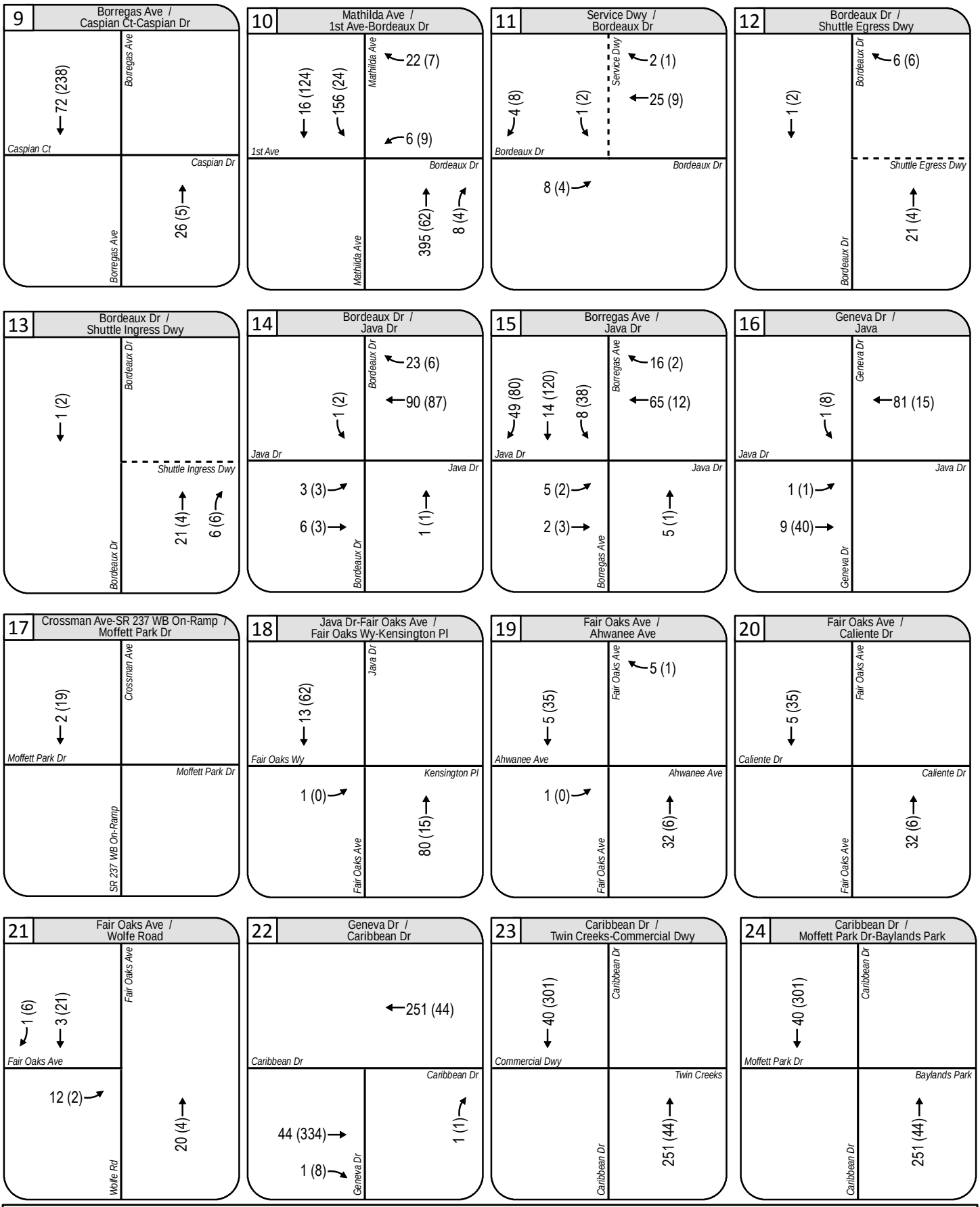




"Project Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 9

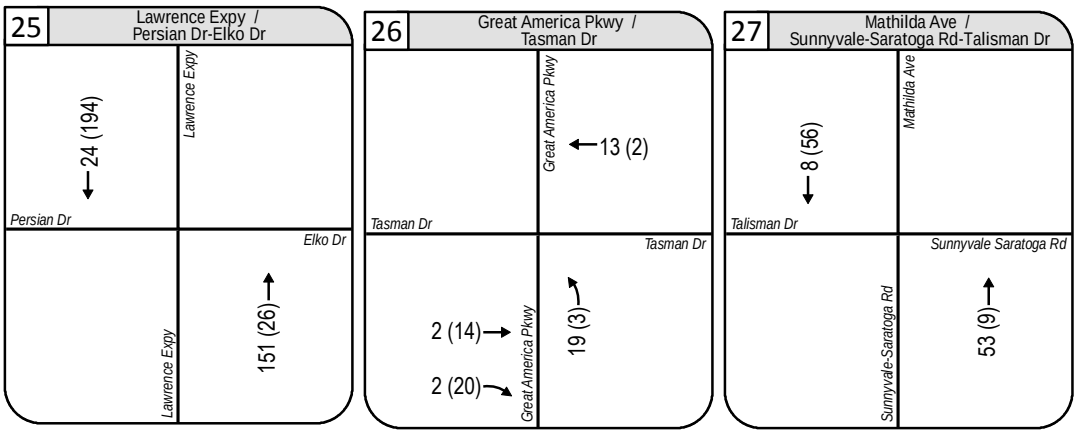
WOOD RODGERS



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

Figure 9-2

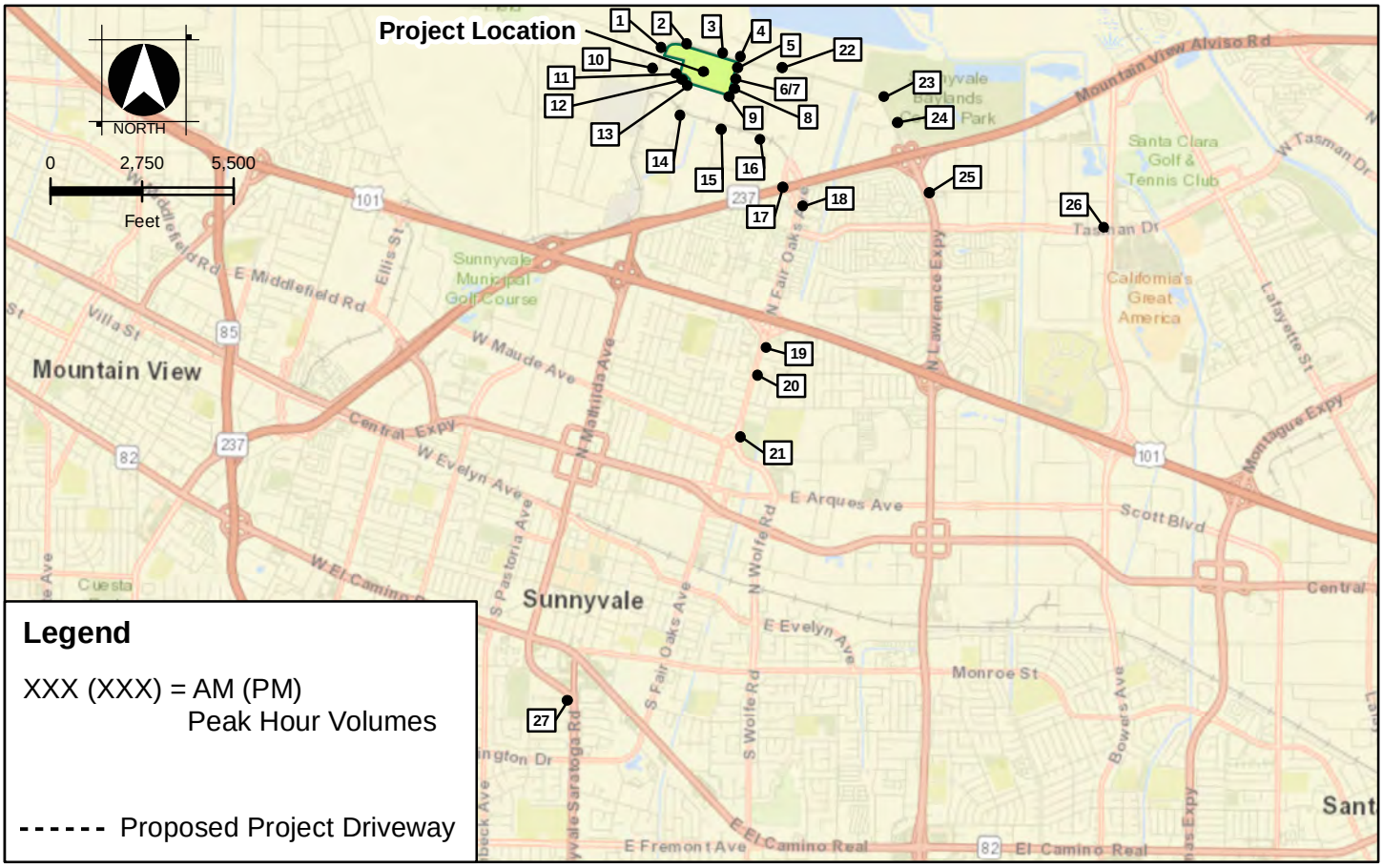
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

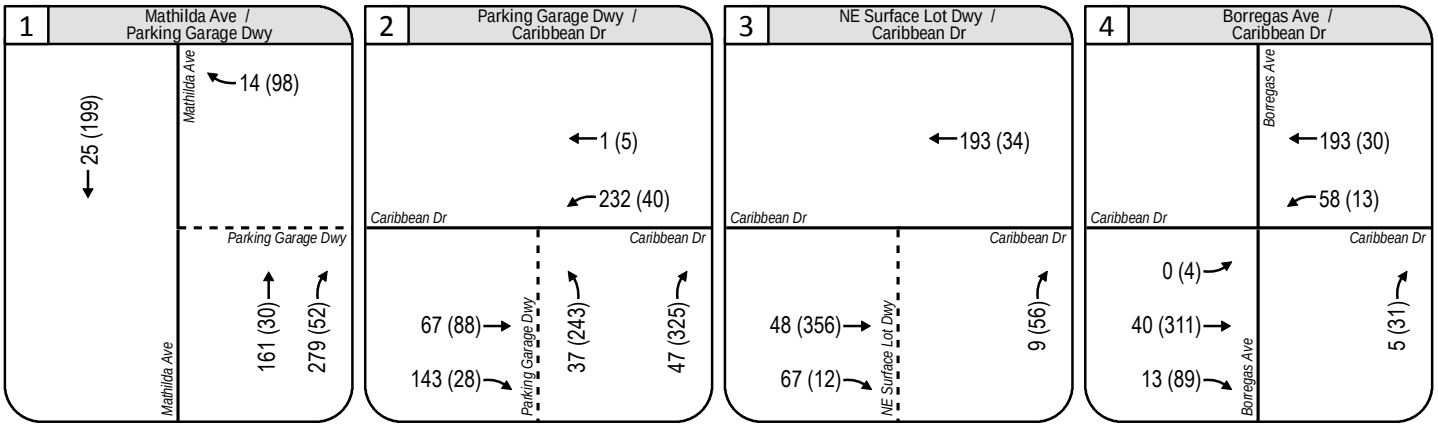


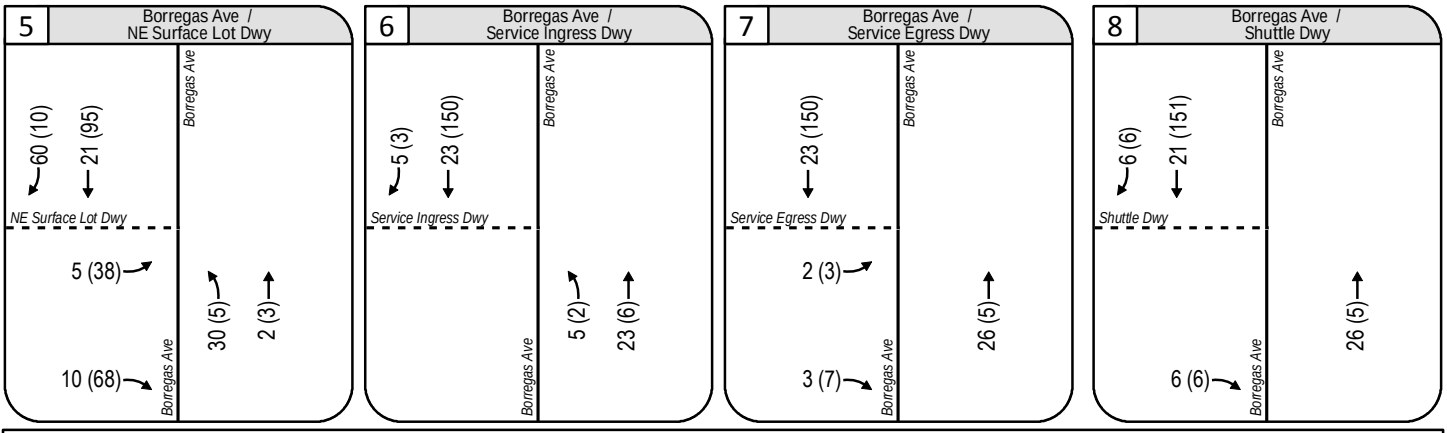
"Project Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 9-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







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

Figure 10

WOOD RODGERS

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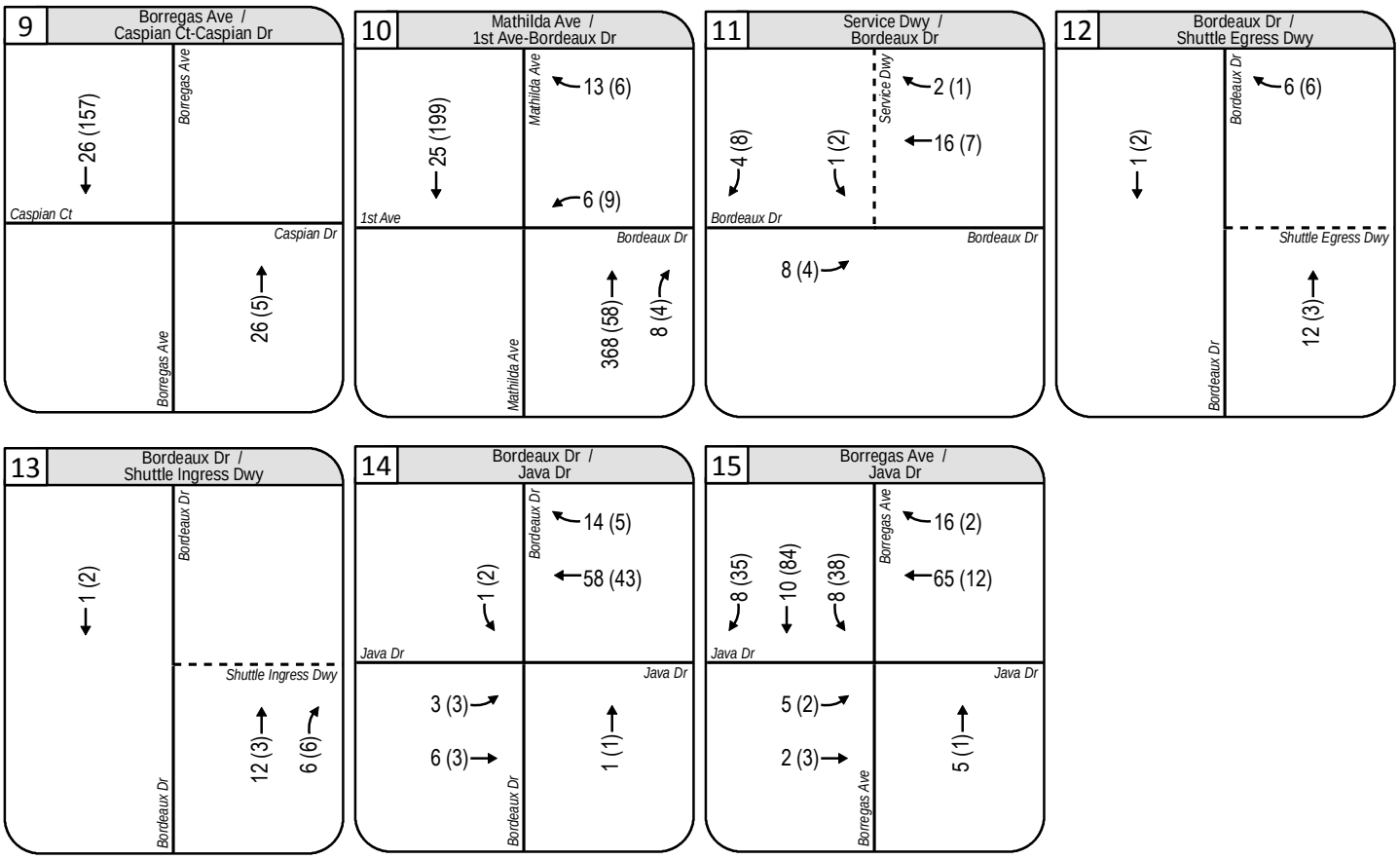
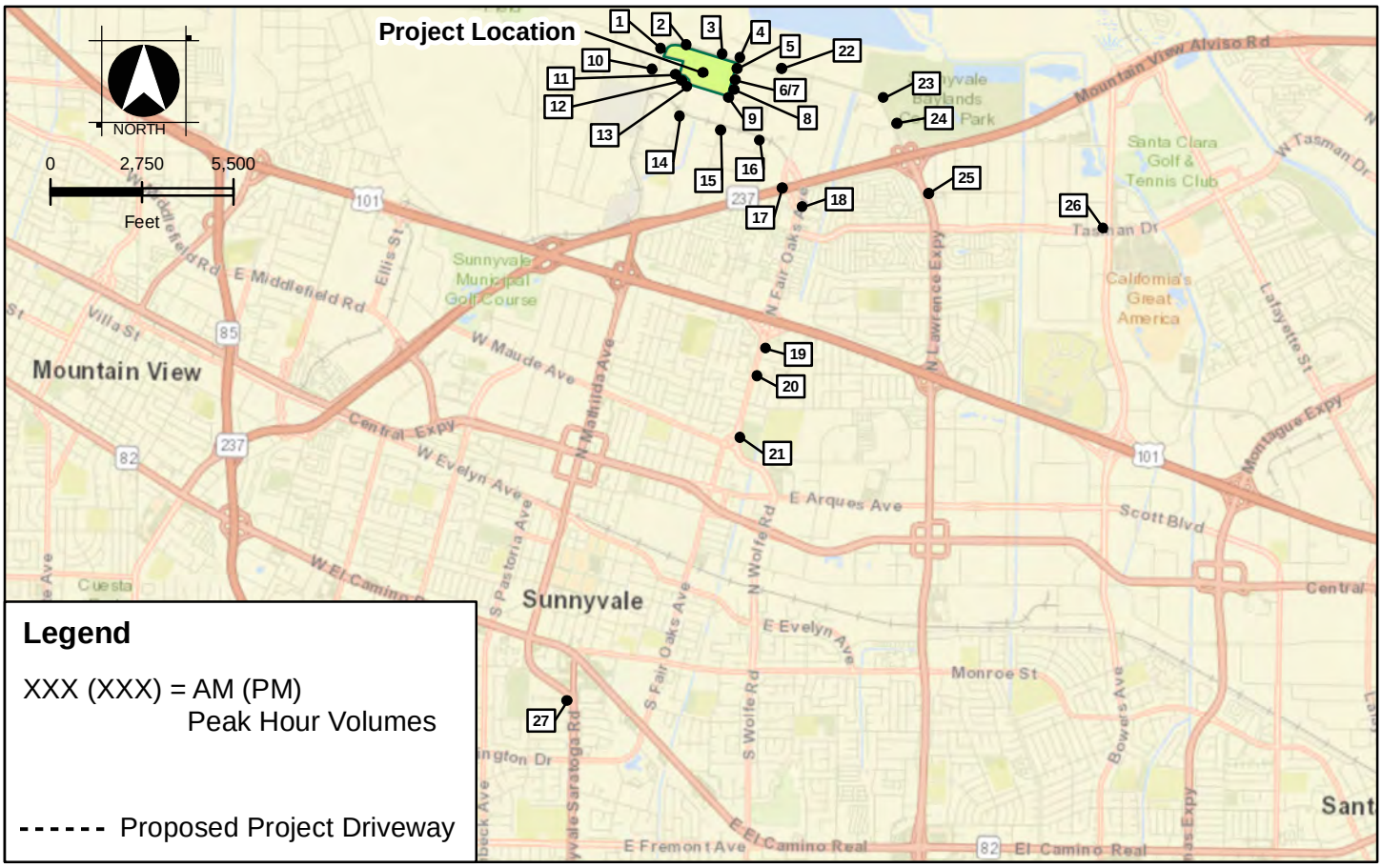
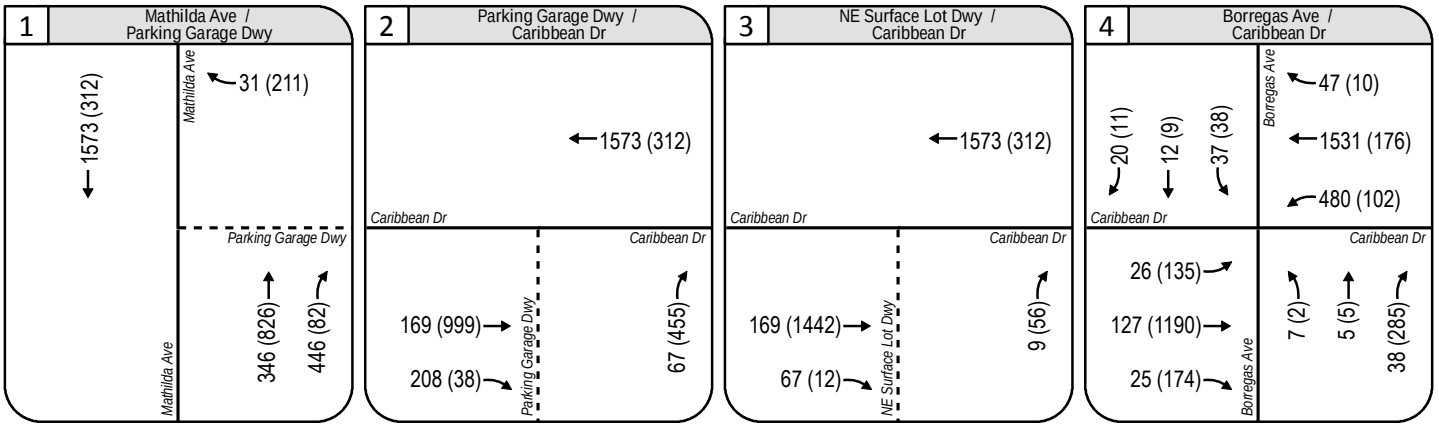


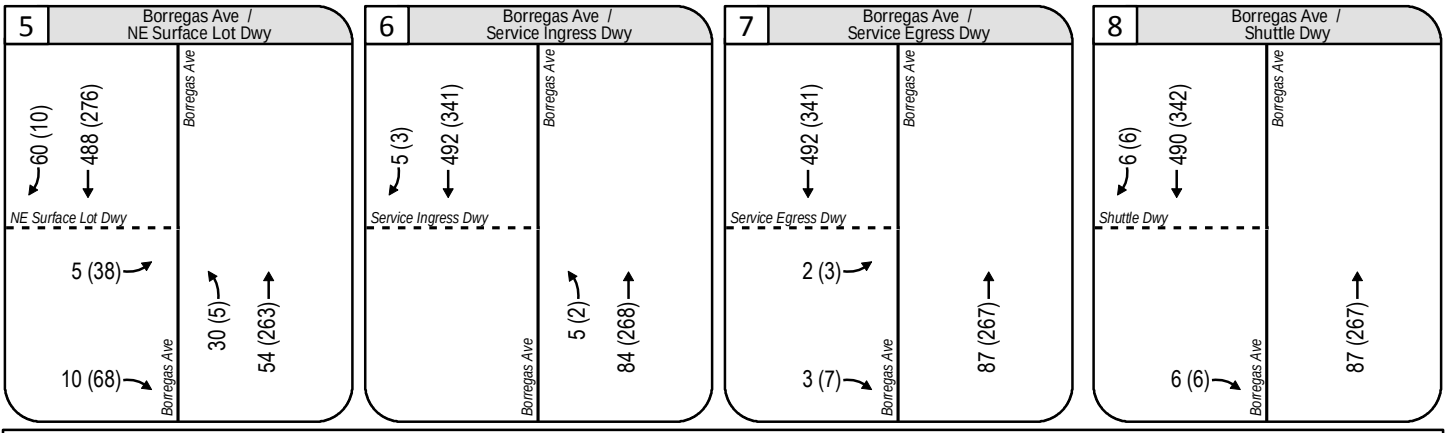
"Project Alternative Only" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 10-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







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

Figure 11

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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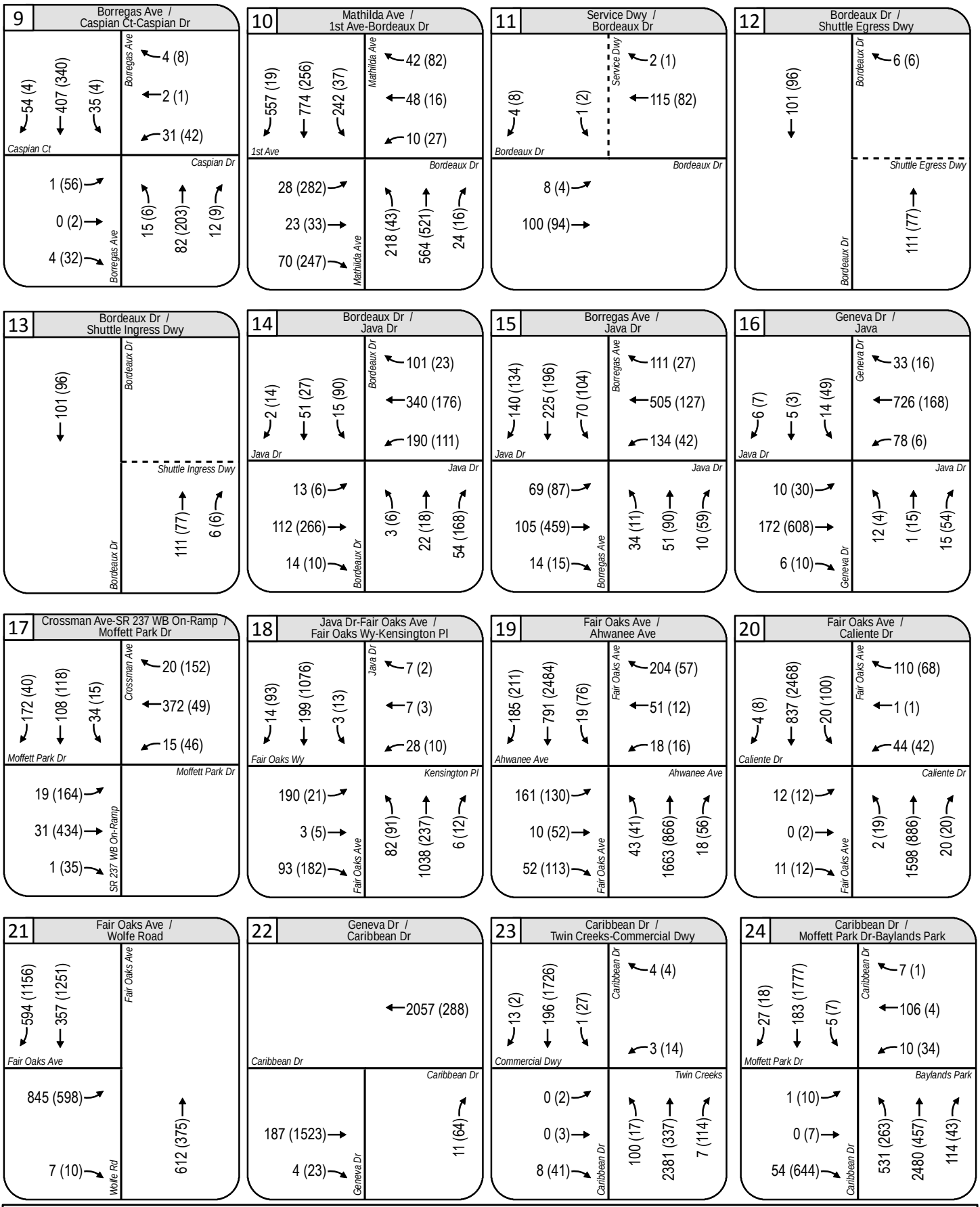
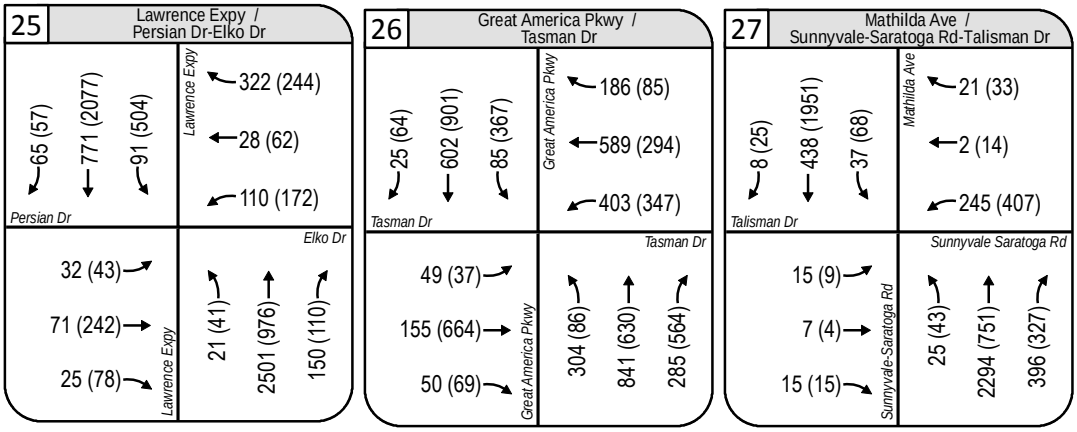


"Existing plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 11-2

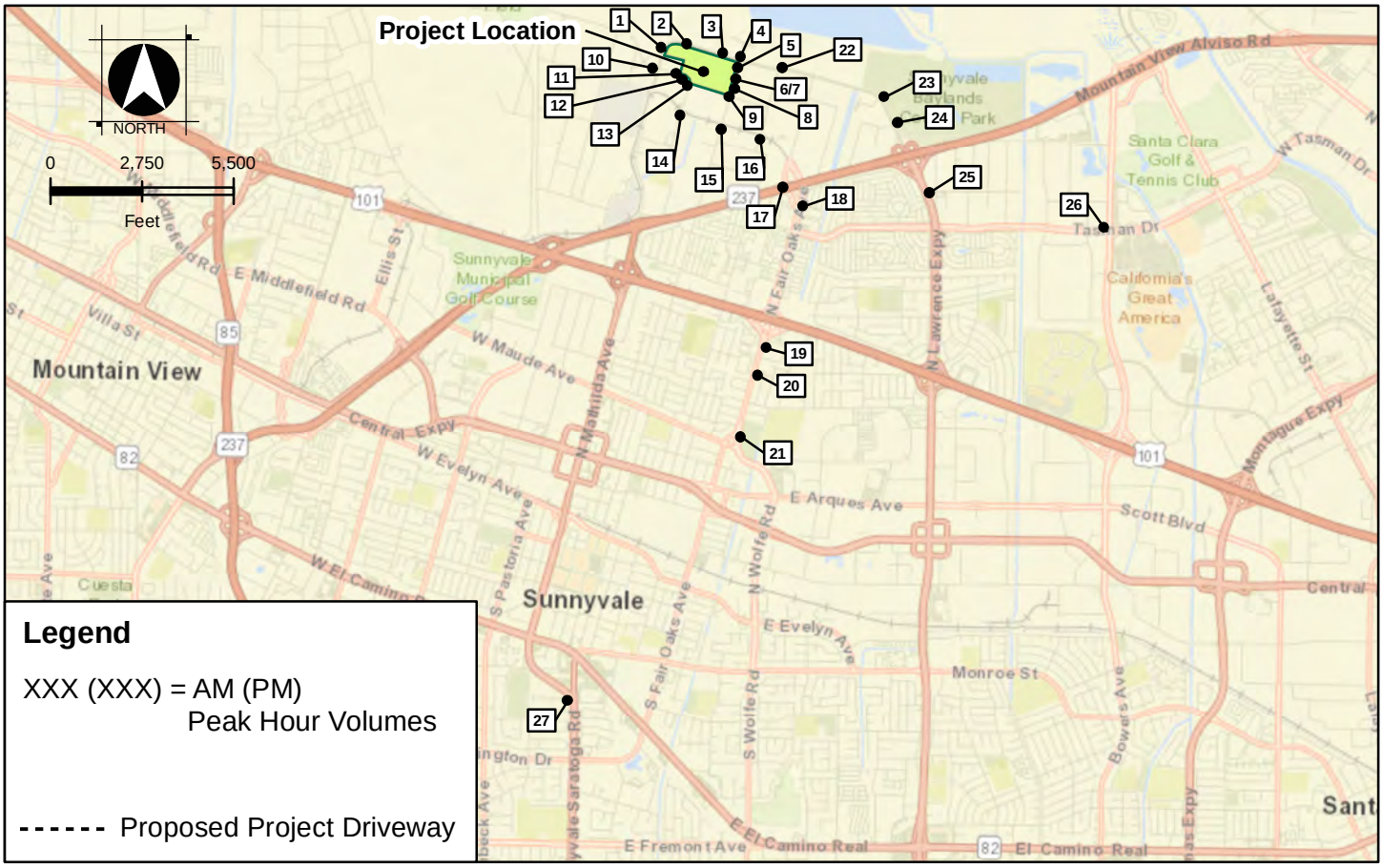
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

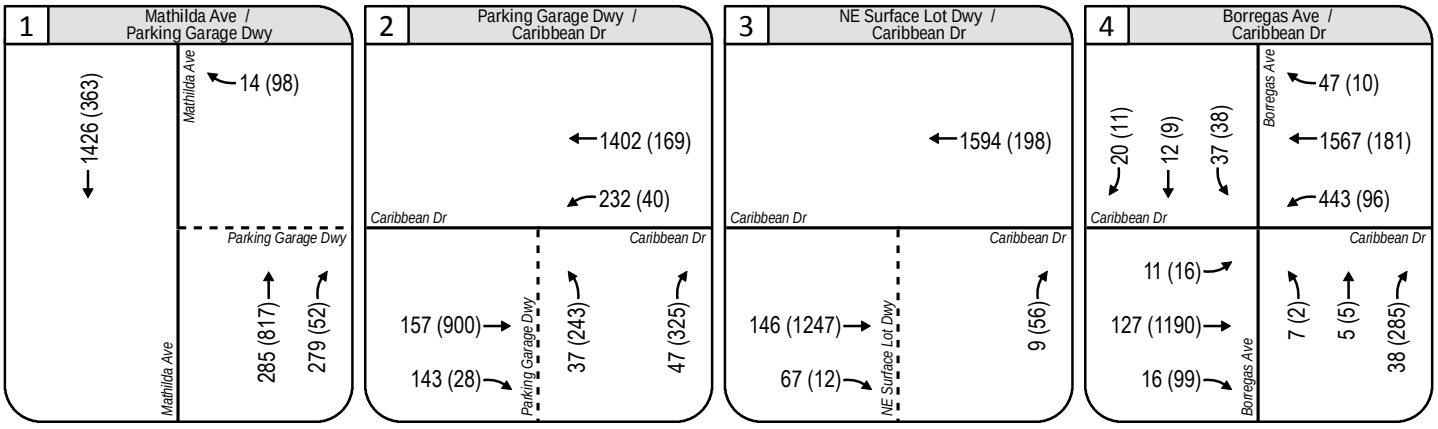


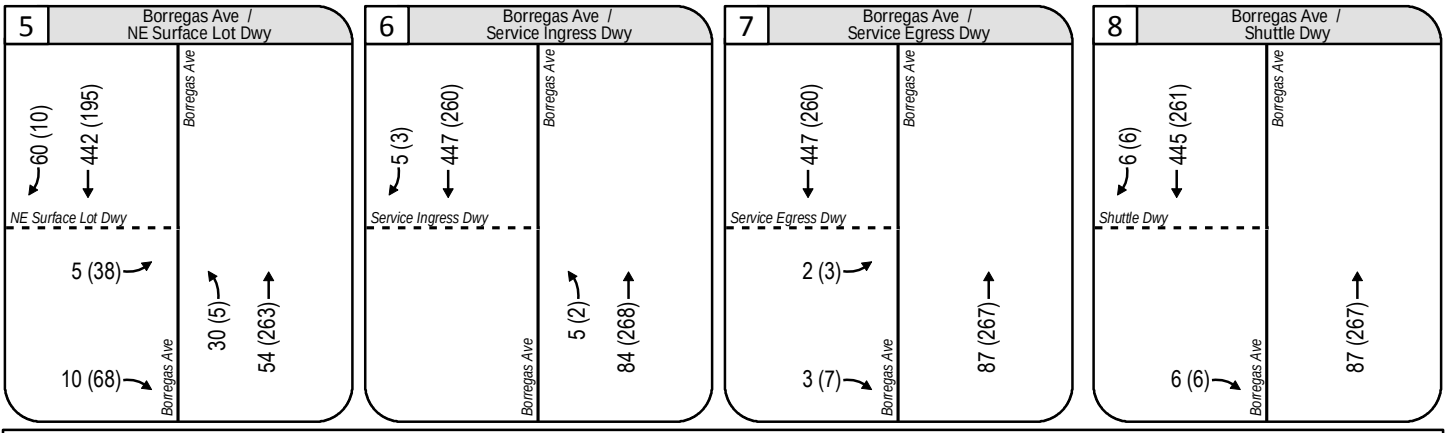
"Existing plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 11-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







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

Figure 12

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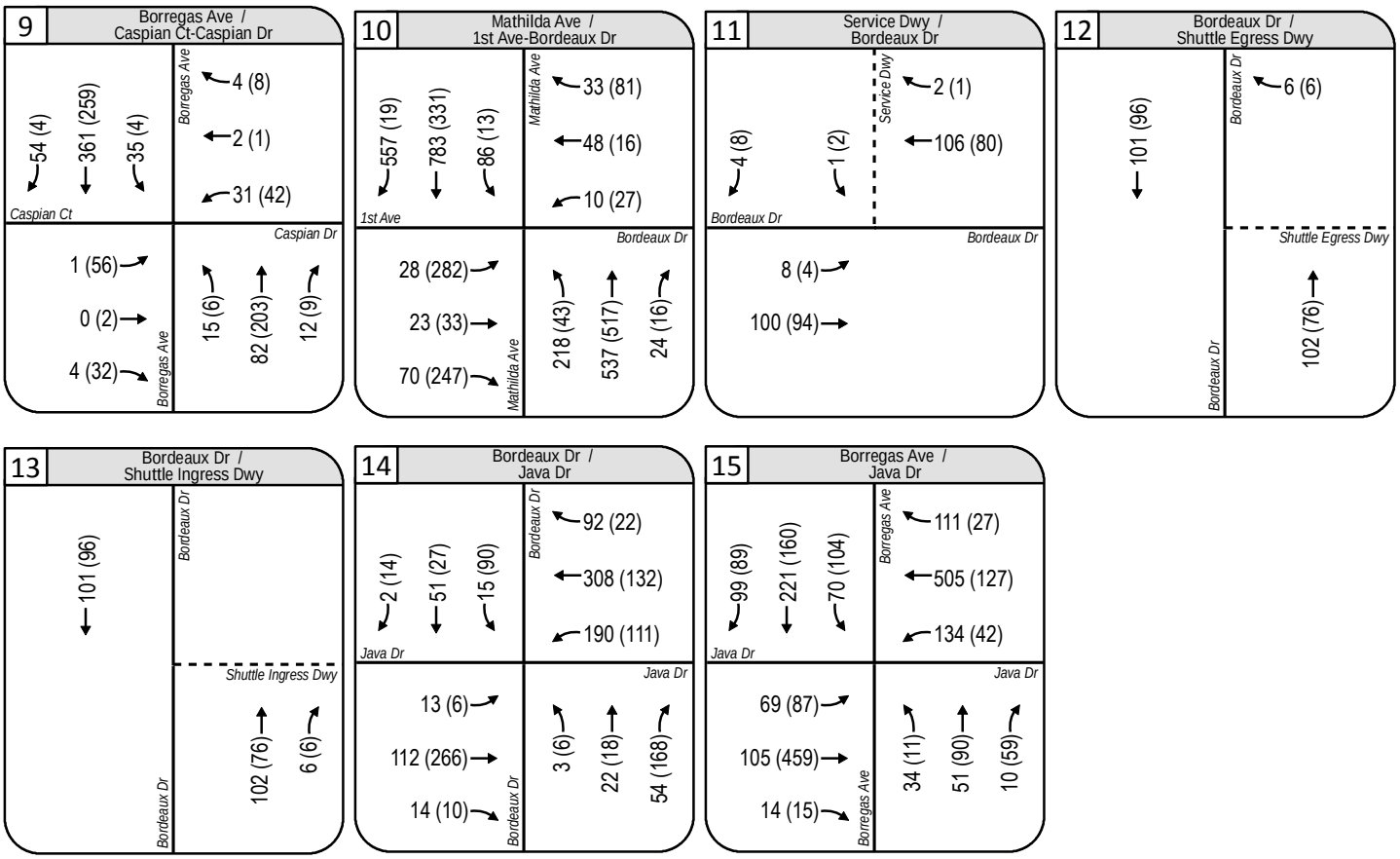


"Existing plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 12-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

3.3 "EXISTING PLUS PROJECT" INTERSECTION OPERATIONS

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

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

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

3.4 "EXISTING PLUS PROJECT ALTERNATIVE" INTERSECTION OPERATIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

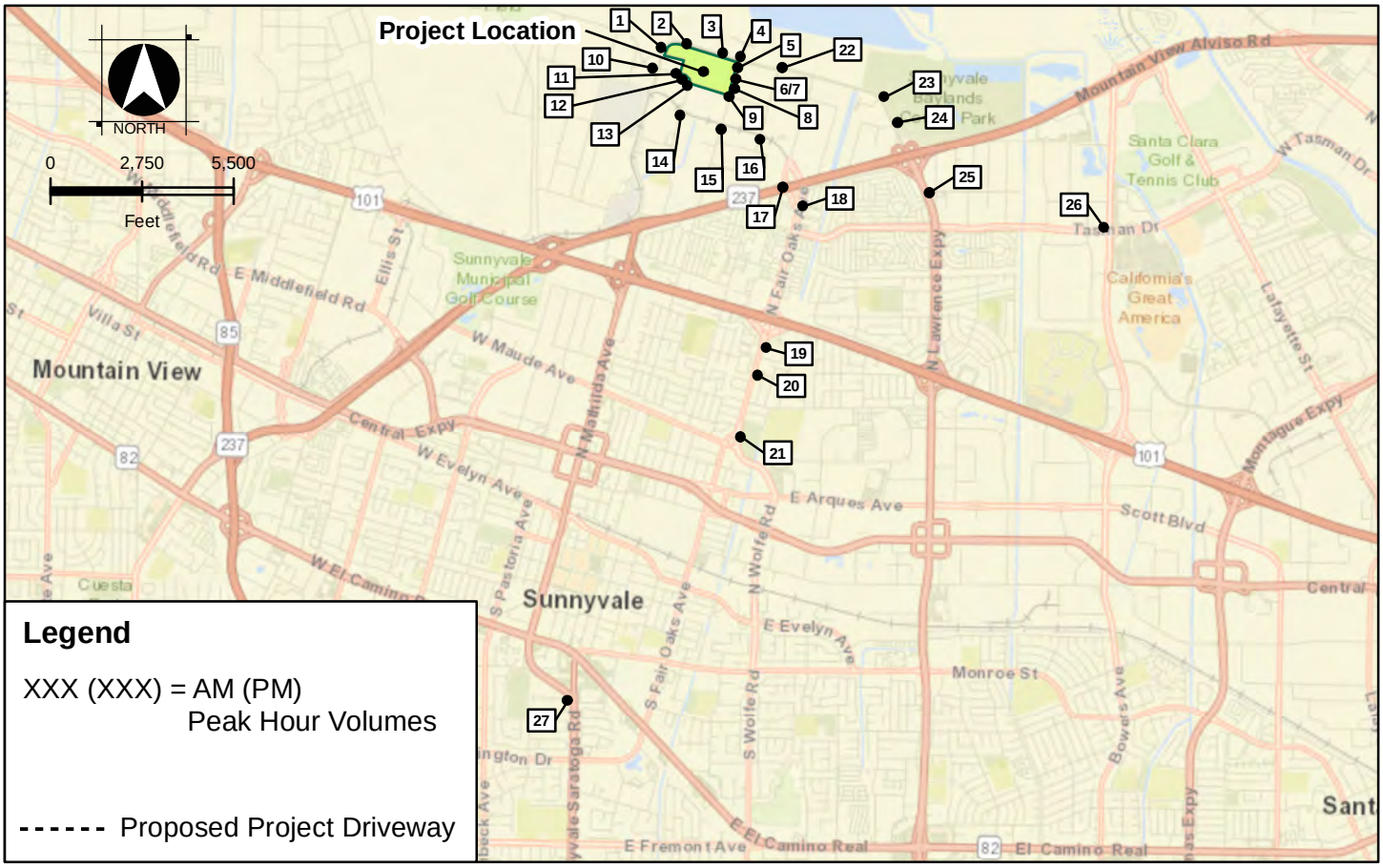
4. "BACKGROUND CONDITIONS"

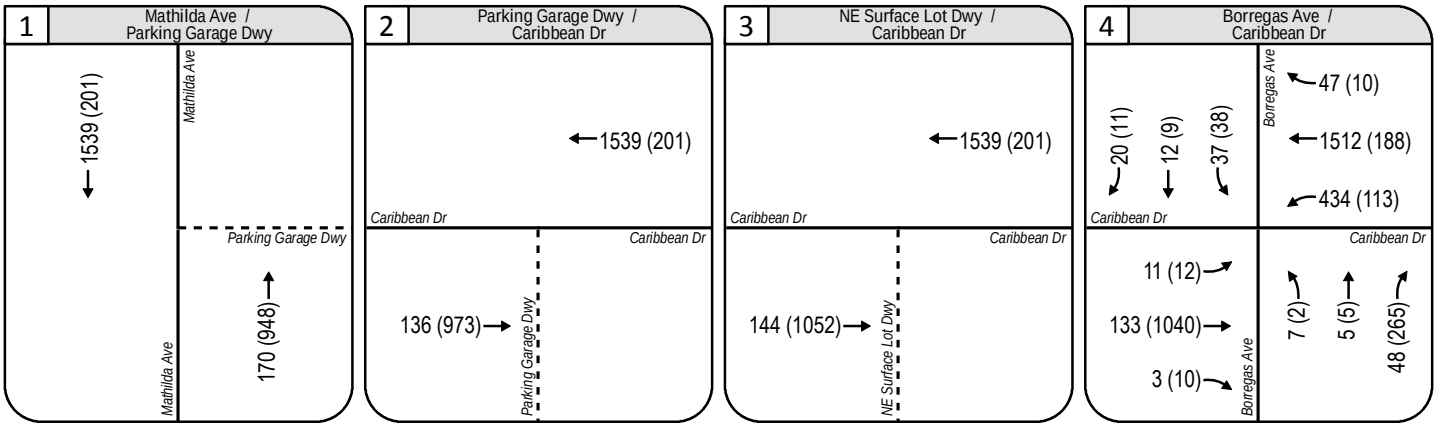
This chapter presents the study area intersection traffic operations results under "Background" conditions without Project generated trips. The City and the VTA define "Background" conditions as existing traffic volumes plus traffic generated by "approved but not yet constructed" developments within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

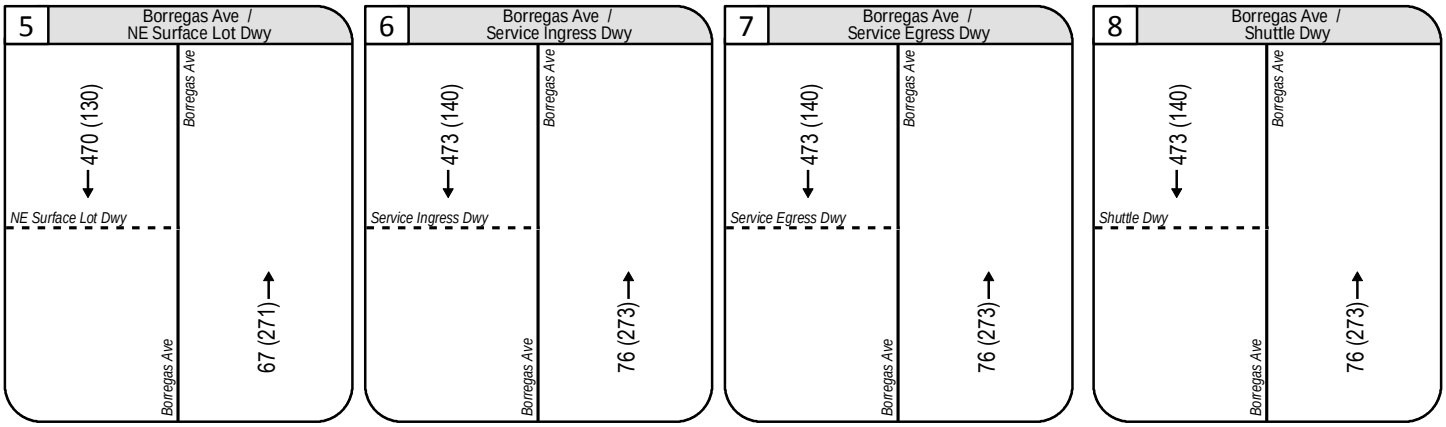
4.1 "BACKGROUND" (NO PROJECT) CONDITIONS VOLUMES

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

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



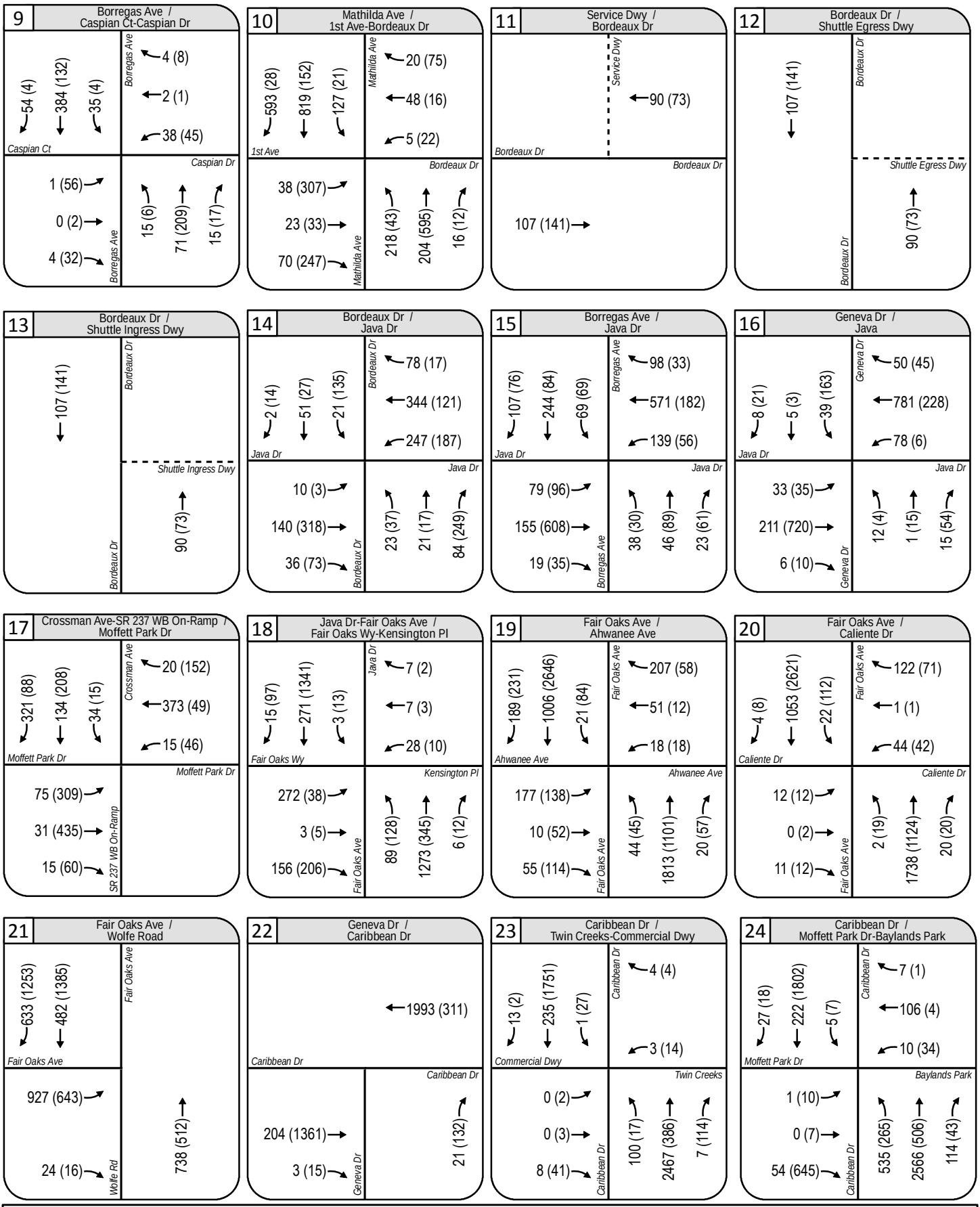




"Background" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 13

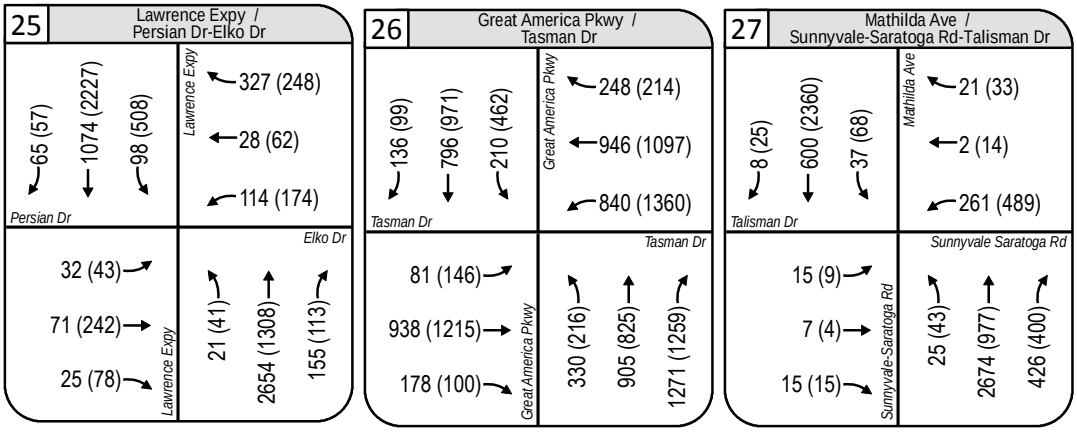
WOOD RODGERS



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

Figure 13-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



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

Figure 13-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

4.2 "BACKGROUND" (NO PROJECT) IMPROVEMENTS

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

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

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

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

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

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

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

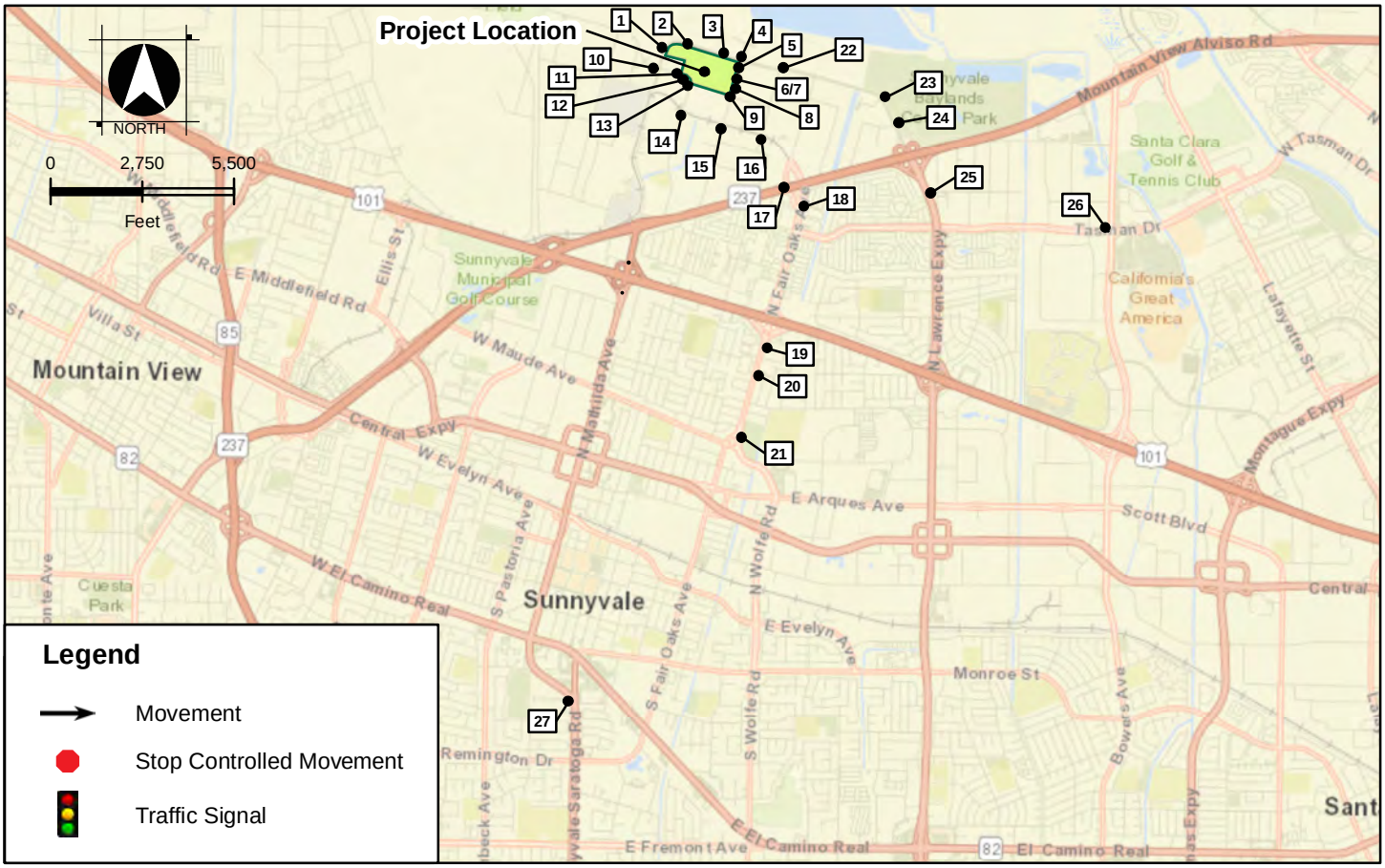
4.3 "BACKGROUND" (NO PROJECT) INTERSECTION OPERATIONS

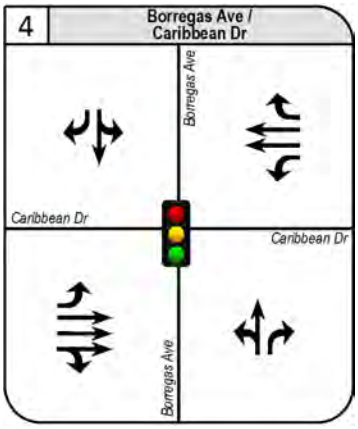
"Background" intersection operations were quantified under "Background" traffic volumes (shown in **Figure 13**) and "Background" intersection lane geometrics and control (shown in **Figure 14**). **Table 15** illustrates the resulting "Background" intersection LOS operations.

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

- #26 - Great America Parkway / Tasman Drive

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





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

Figure 14

Table 15. "Background" Conditions Intersection Traffic Operations

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

Table 15. "Background" Conditions Intersection Traffic Operations

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

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

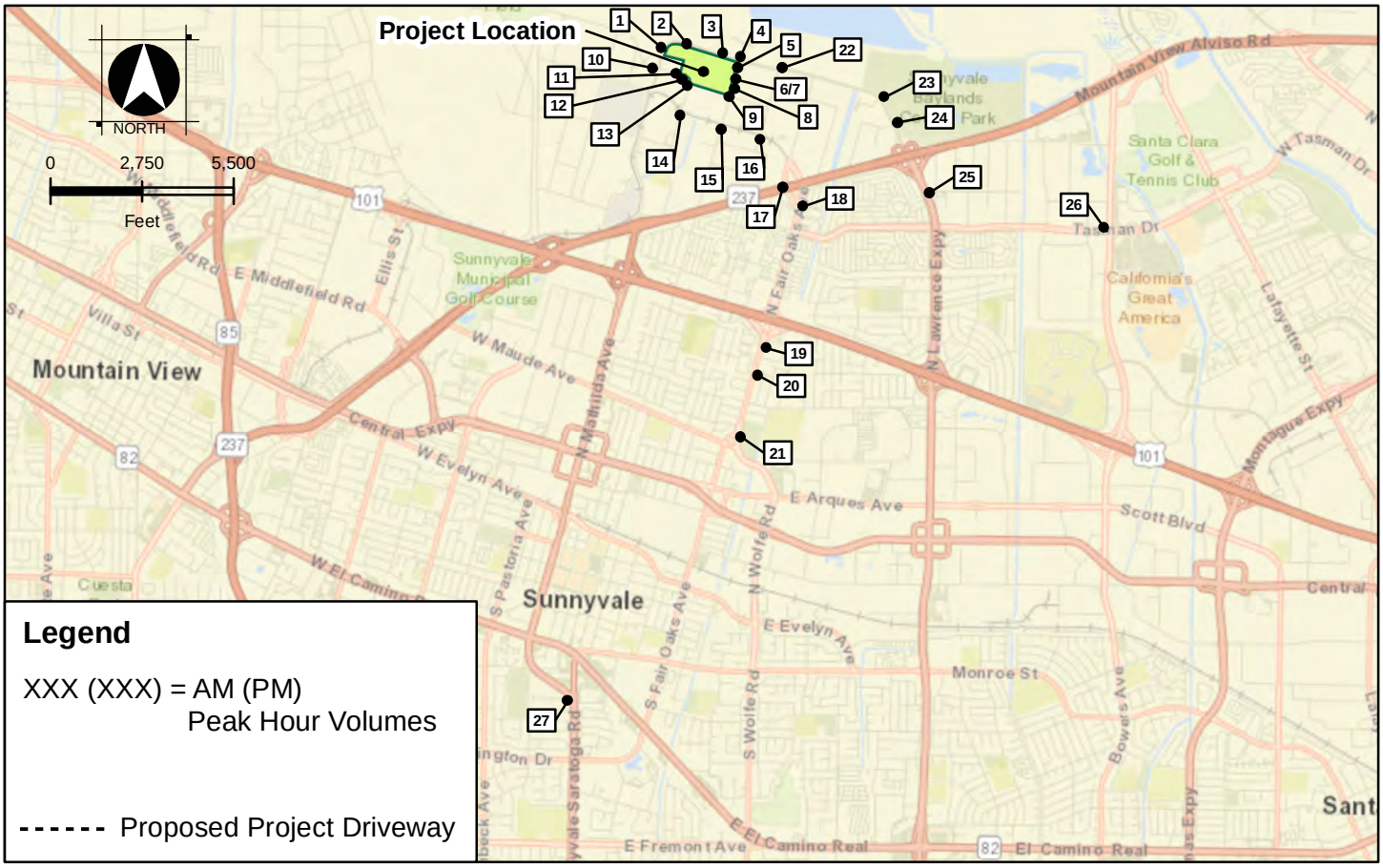
5. "BACKGROUND PLUS PROJECT" CONDITIONS

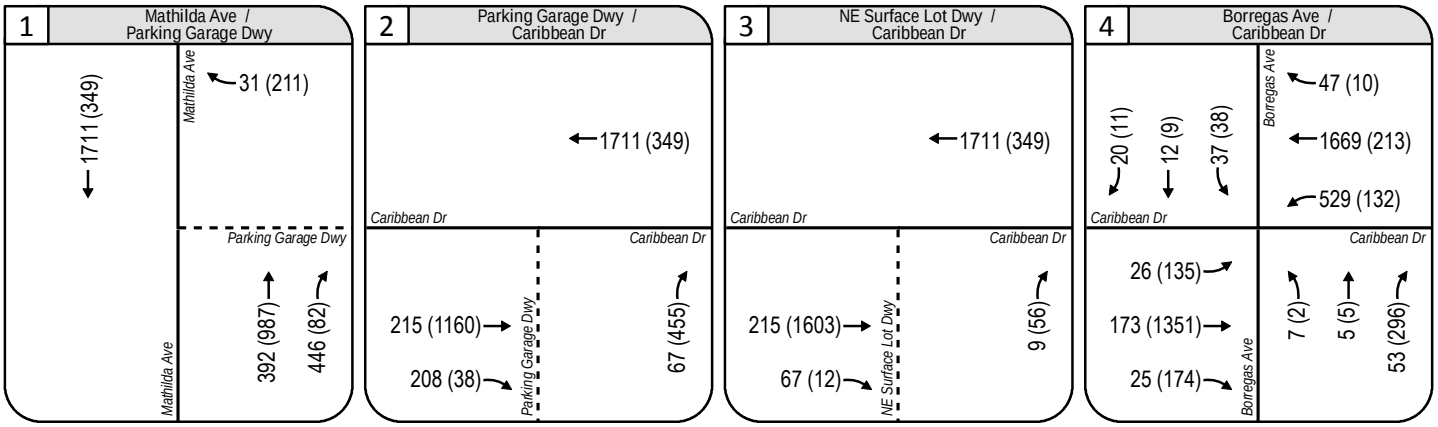
This chapter presents the study area intersection traffic operations results under "Background plus Project" conditions.

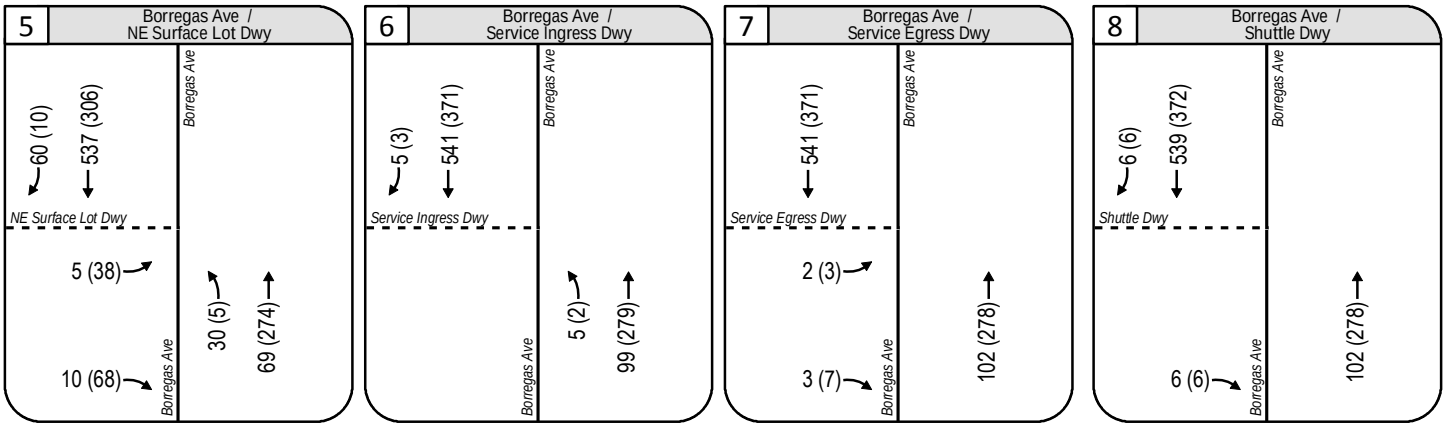
5.1 "BACKGROUND PLUS PROJECT" AND "BACKGROUND PLUS PROJECT ALTERNATIVE" CONDITIONS VOLUMES

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

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







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

Figure 15

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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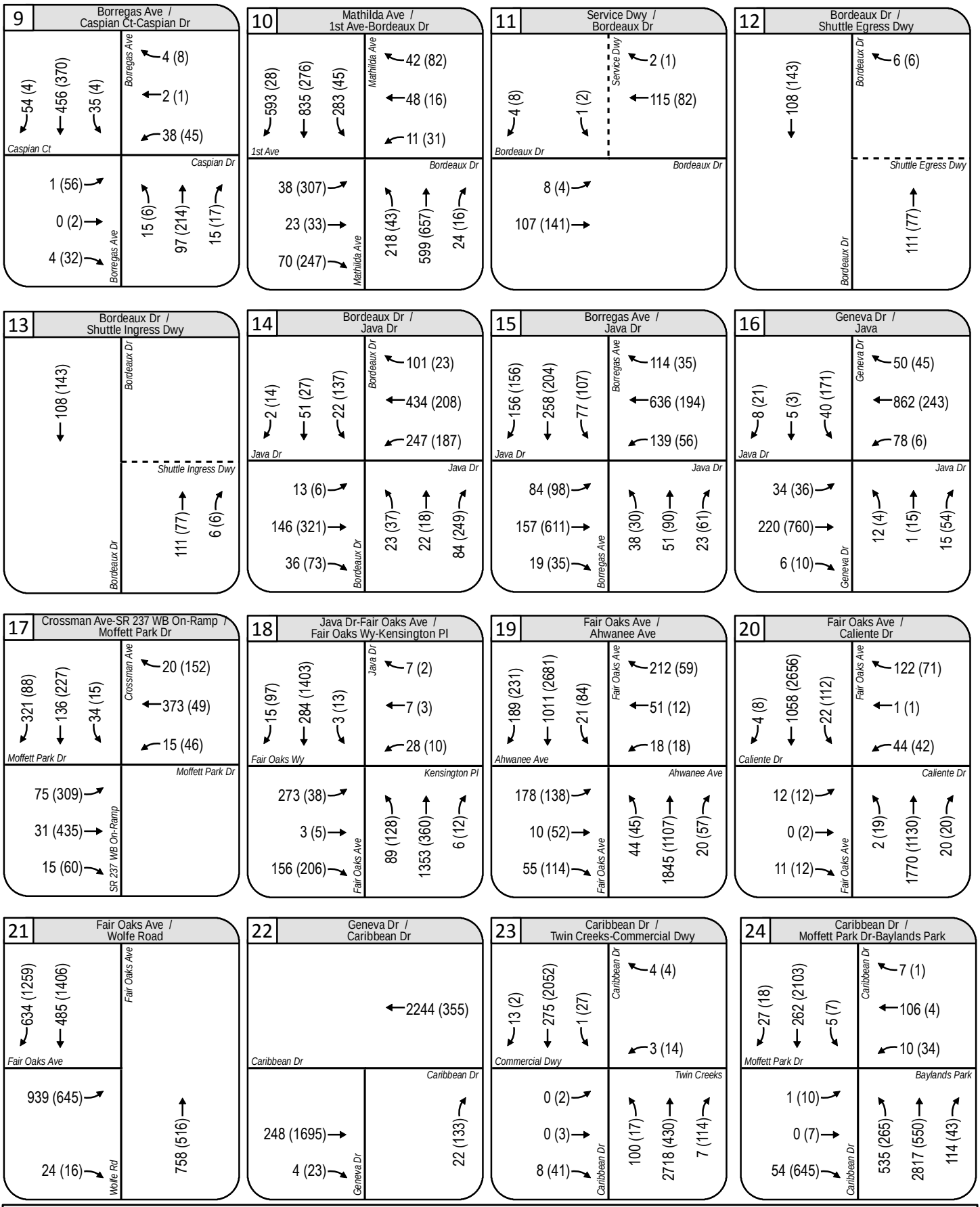
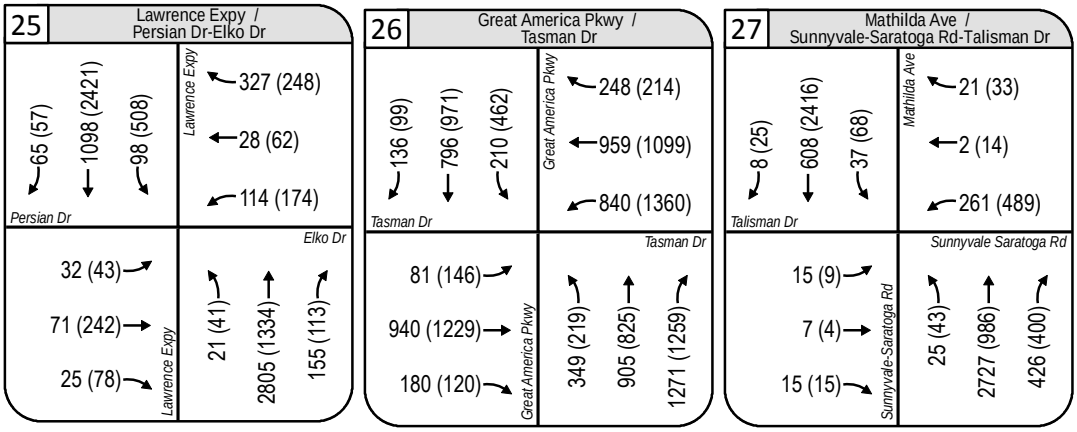


"Background plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 15-2

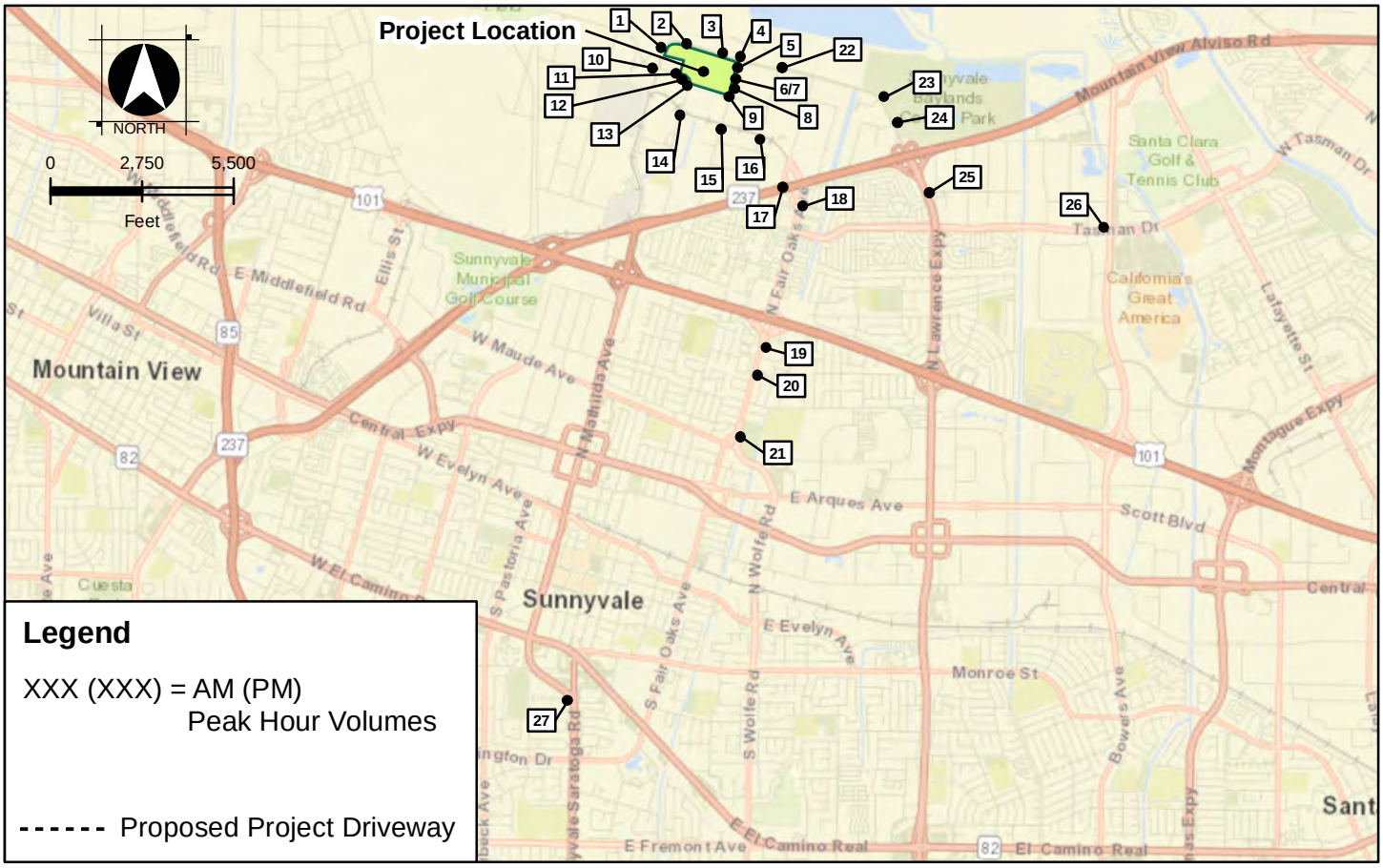
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

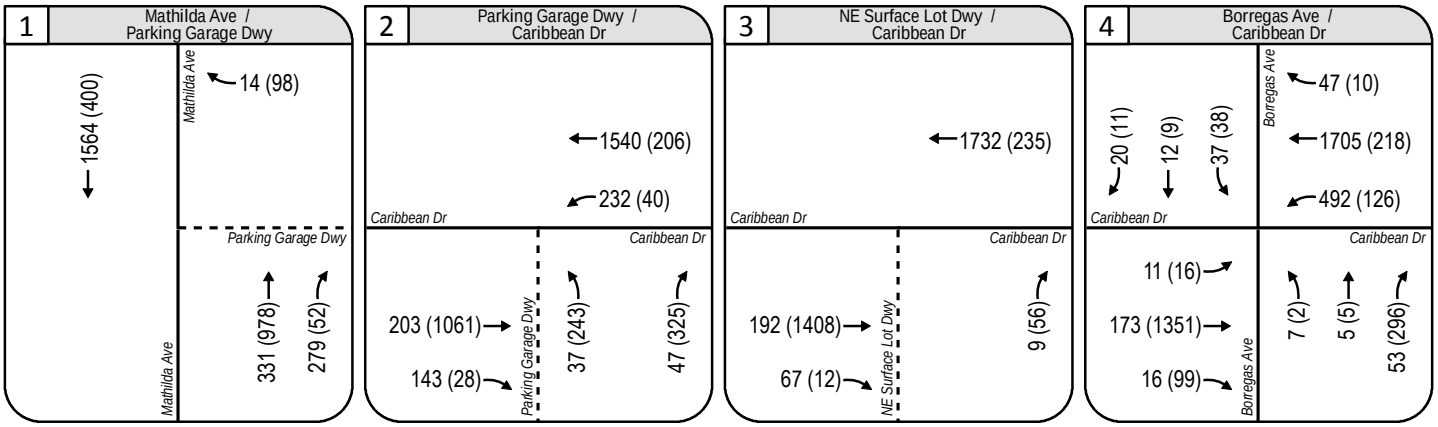


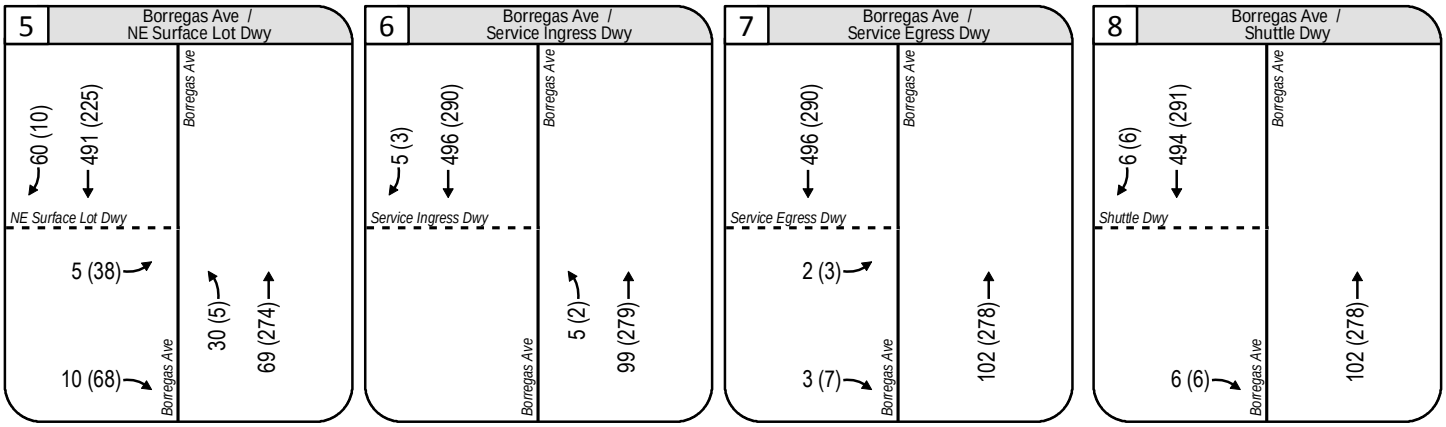
"Background plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 15-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







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

Figure 16

WOOD RODGERS

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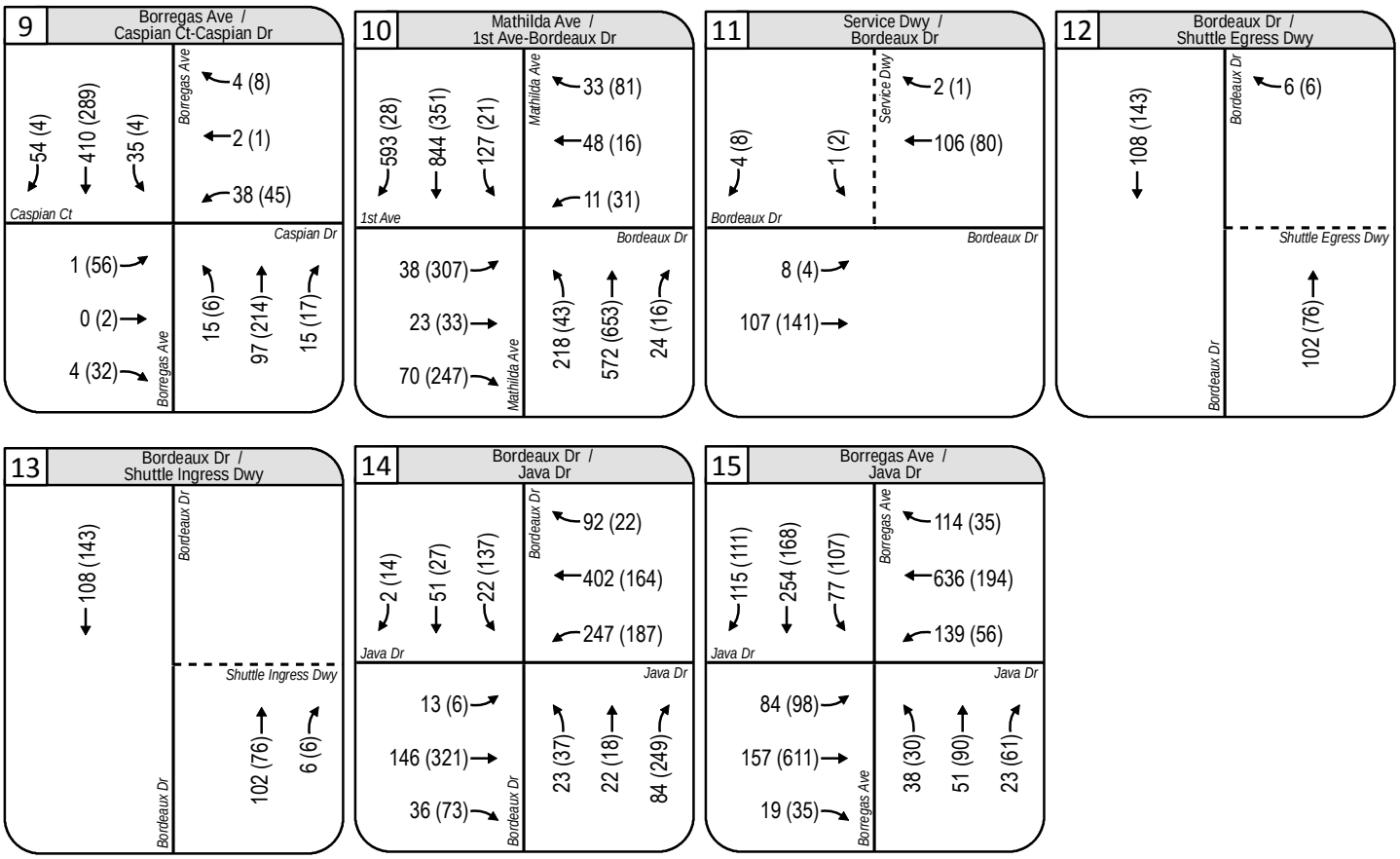


"Background plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 16-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

5.2 "BACKGROUND PLUS PROJECT" INTERSECTION OPERATIONS

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

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

- #26 - Great America Parkway / Tasman Drive

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

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

5.3 "BACKGROUND PLUS PROJECT ALTERNATIVE" INTERSECTION OPERATIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

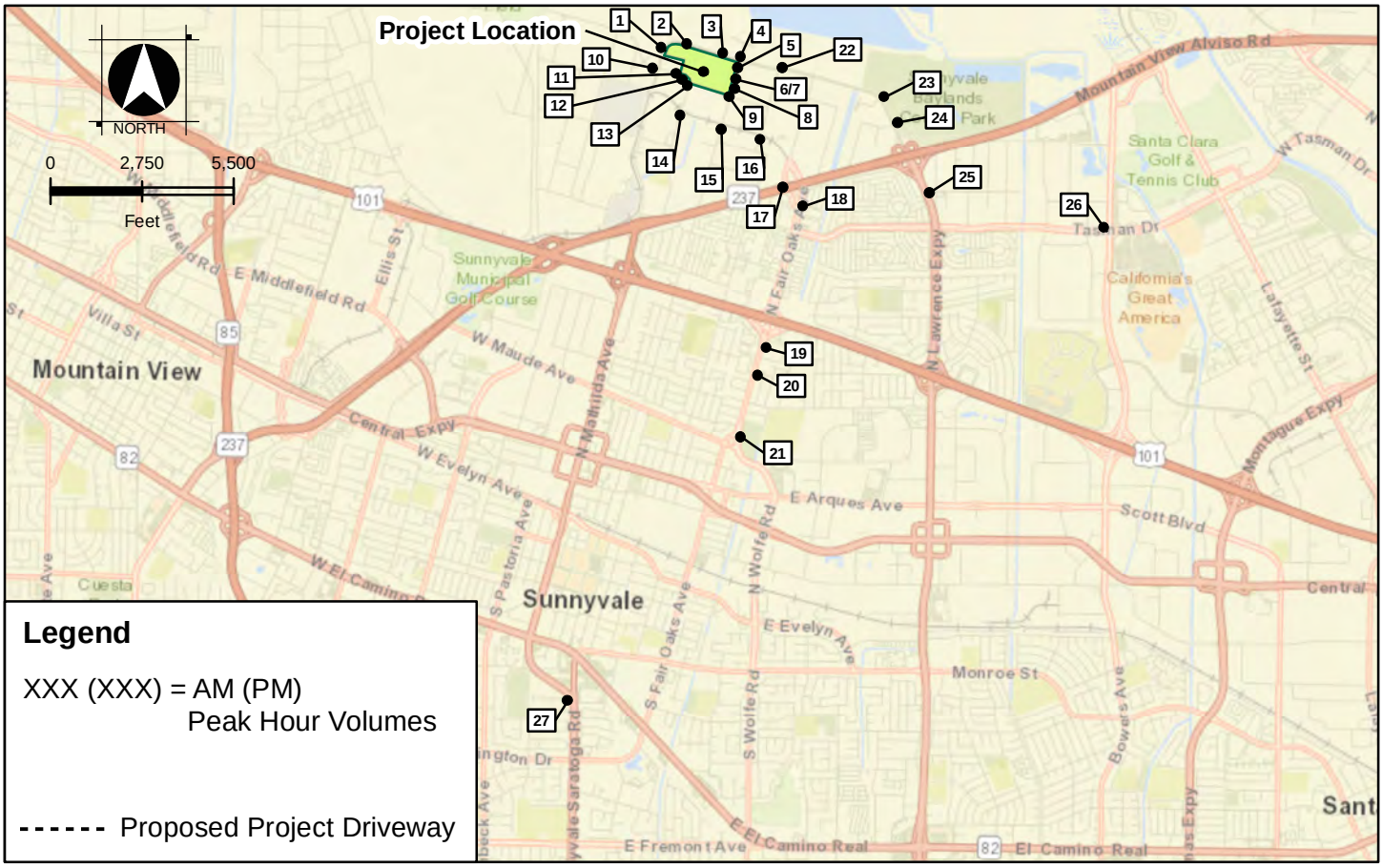
6. "CUMULATIVE CONDITIONS"

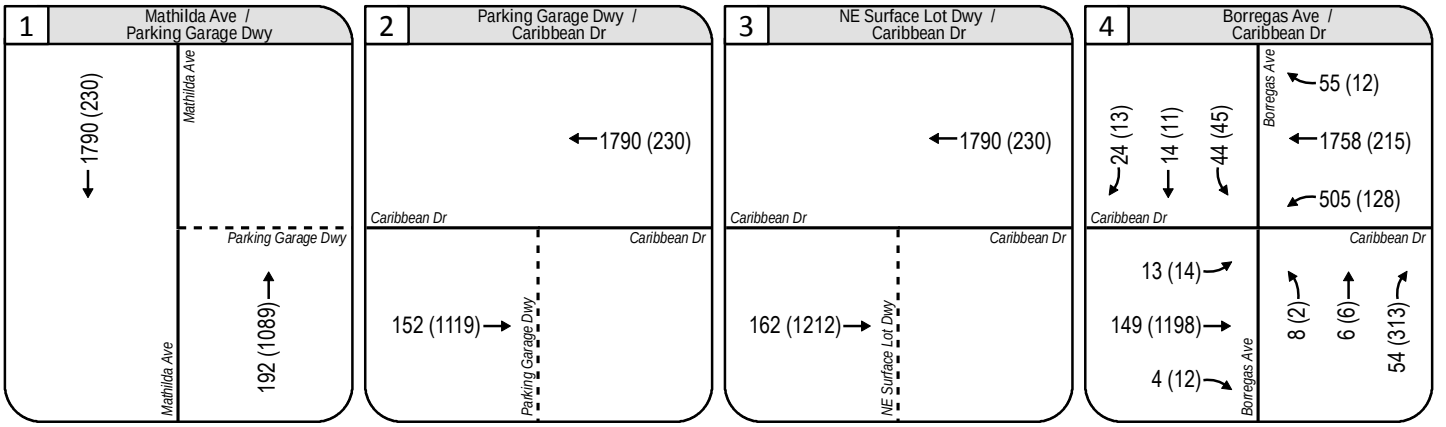
This chapter presents the study area intersection traffic operations results under "Cumulative" conditions without Project generated trips. Consistent with VTA guidelines, "Cumulative" conditions traffic volumes were obtained by applying a 1.5% per year growth rate to existing volumes between "Existing"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

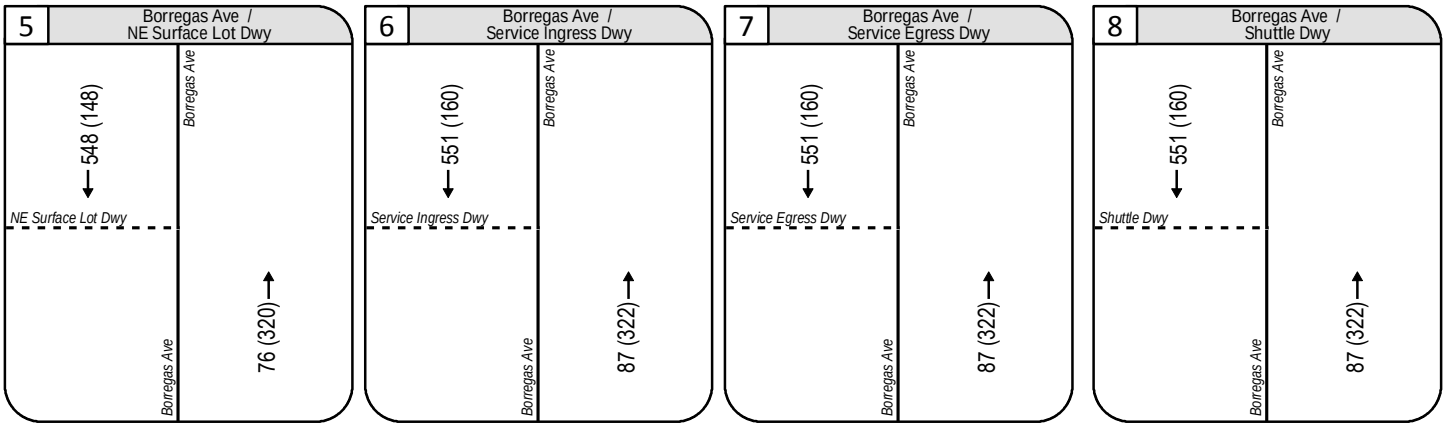
6.1 "CUMULATIVE" (NO PROJECT) CONDITIONS VOLUMES

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

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







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

Figure 17

WOOD RODGERS

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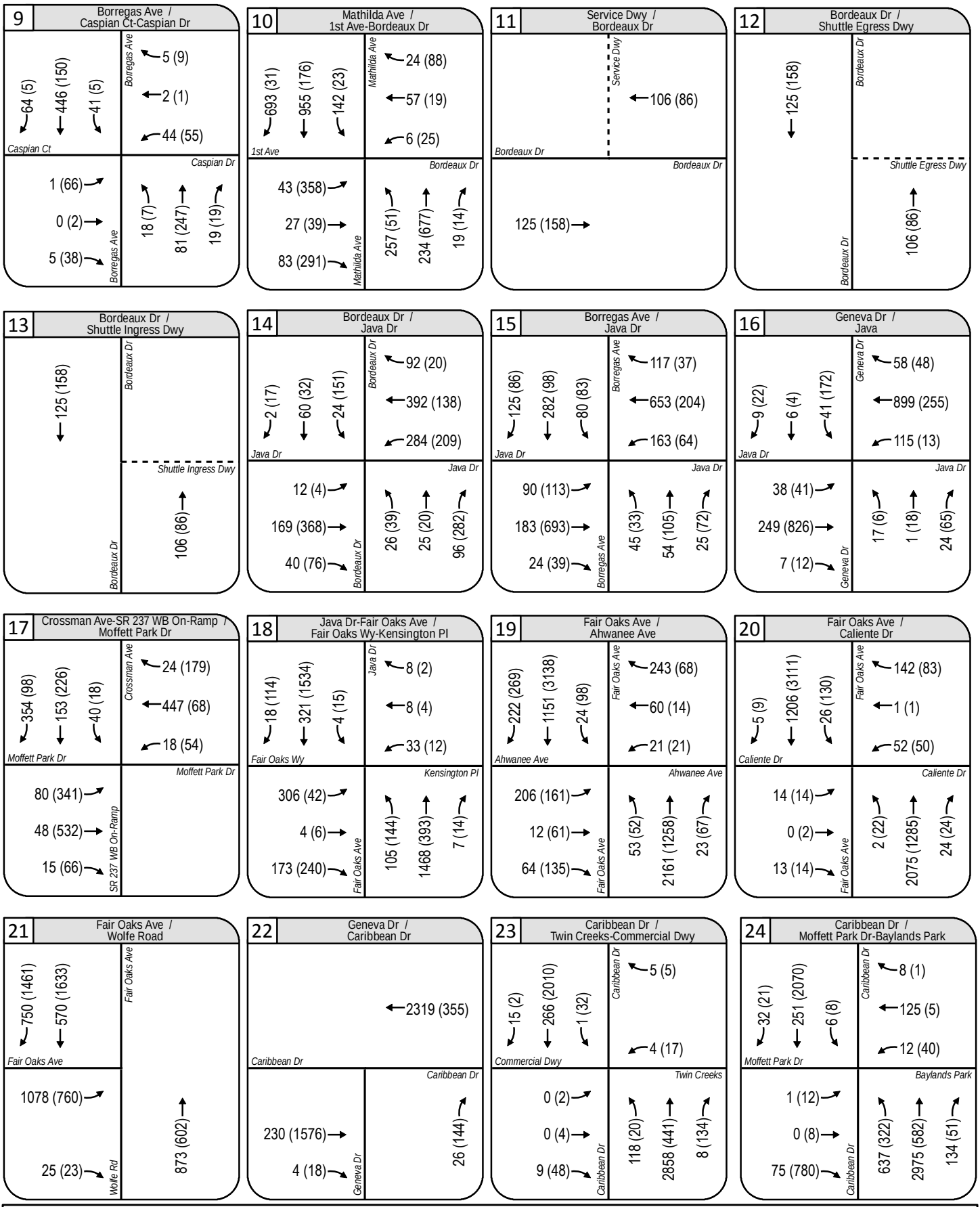
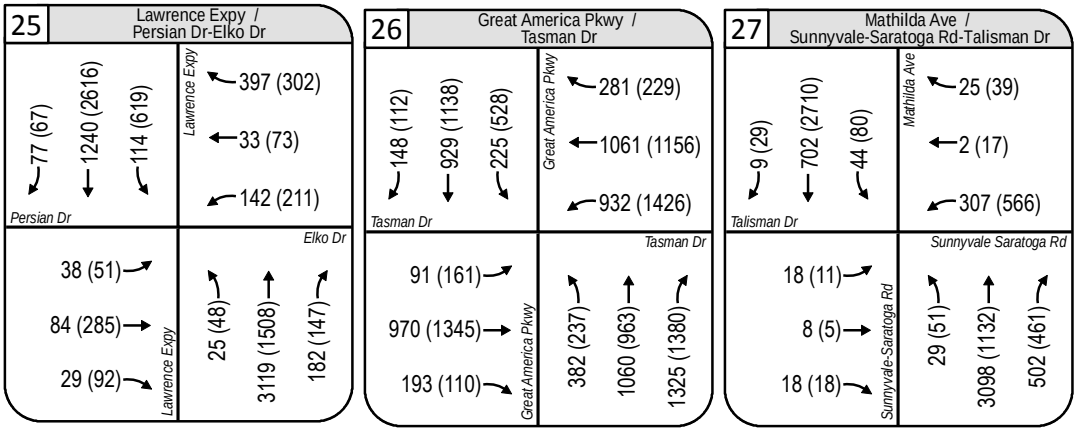


"Cumulative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 17-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME



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

Figure 17-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

6.2 "CUMULATIVE" (NO PROJECT) IMPROVEMENTS

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

6.3 "CUMULATIVE" (NO PROJECT) INTERSECTION OPERATIONS

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

Table 18. "Cumulative" Conditions Intersection Traffic Operations

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

Table 18. "Cumulative" Conditions Intersection Traffic Operations

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

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

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

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

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

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

7. "CUMULATIVE PLUS PROJECT" CONDITIONS

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

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

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

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

7.2 "CUMULATIVE PLUS PROJECT" INTERSECTION OPERATIONS

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

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

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

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

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

7.3 "CUMULATIVE PLUS PROJECT ALTERNATIVE" INTERSECTION OPERATIONS

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

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

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

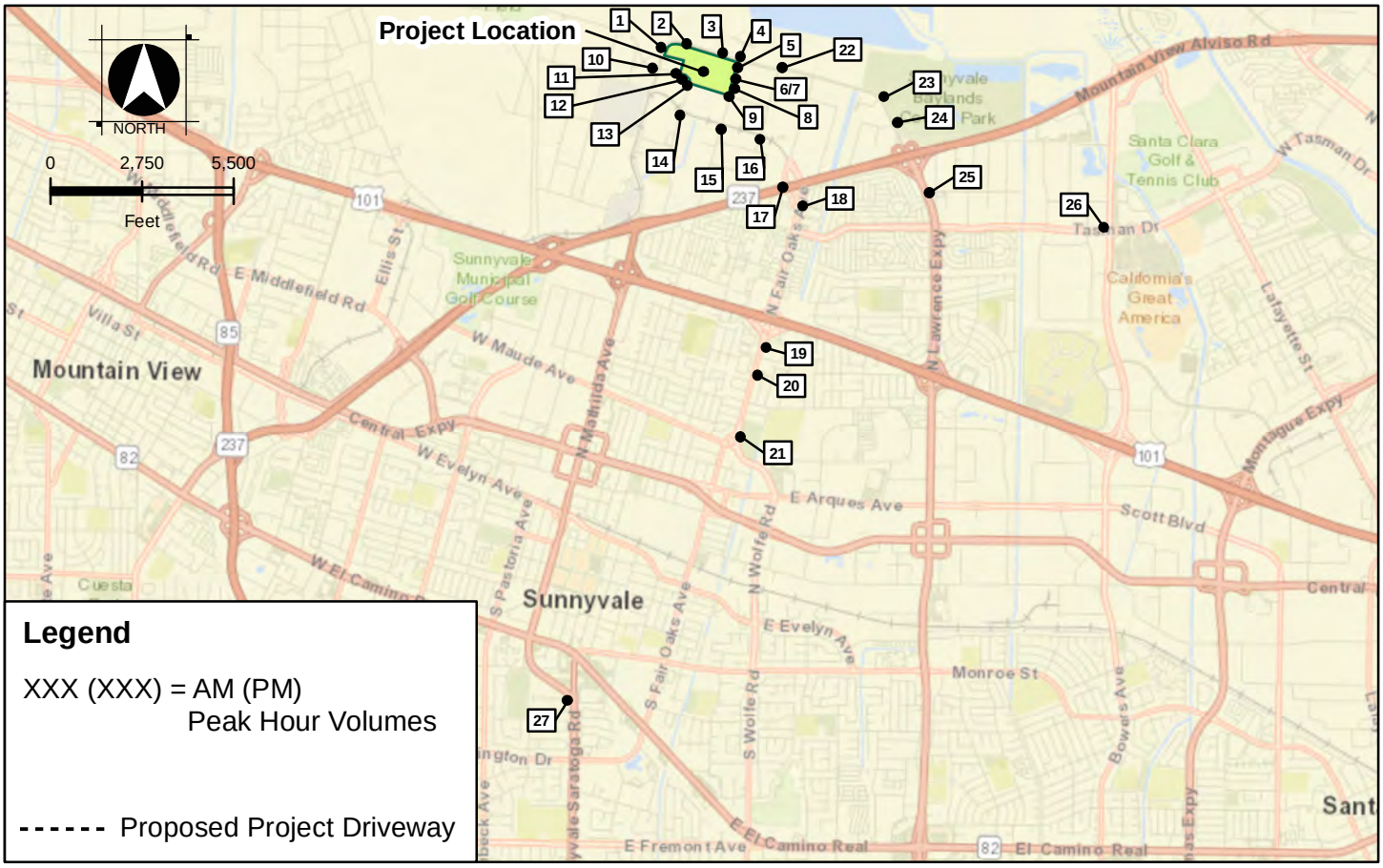
- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

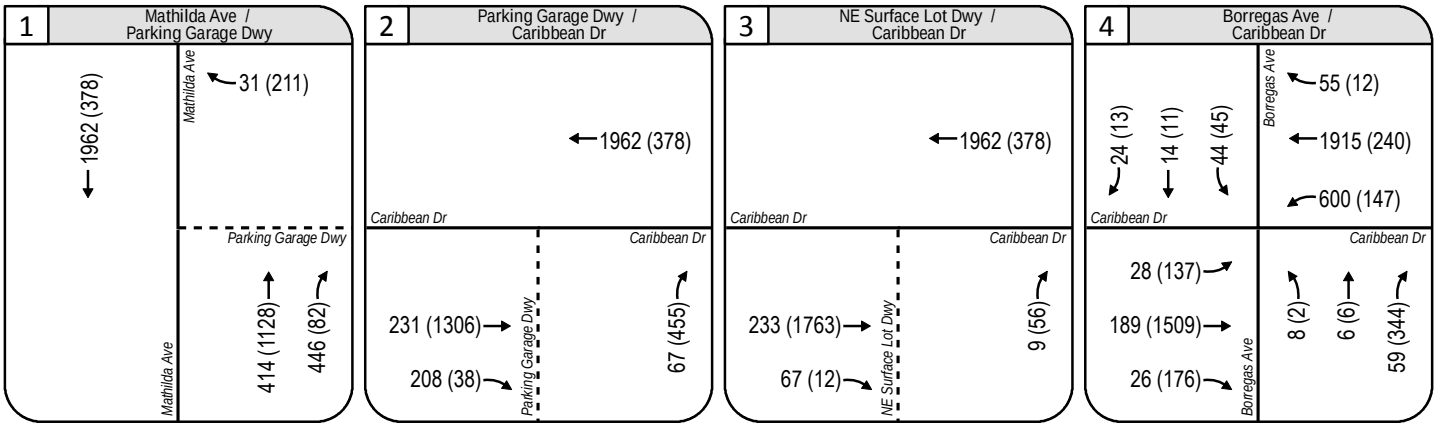
CA MUTCD based peak hour signal warrant 3 is projected to be met at the following unsignalized intersection under "Cumulative plus Project Alternative" PM peak hour conditions:

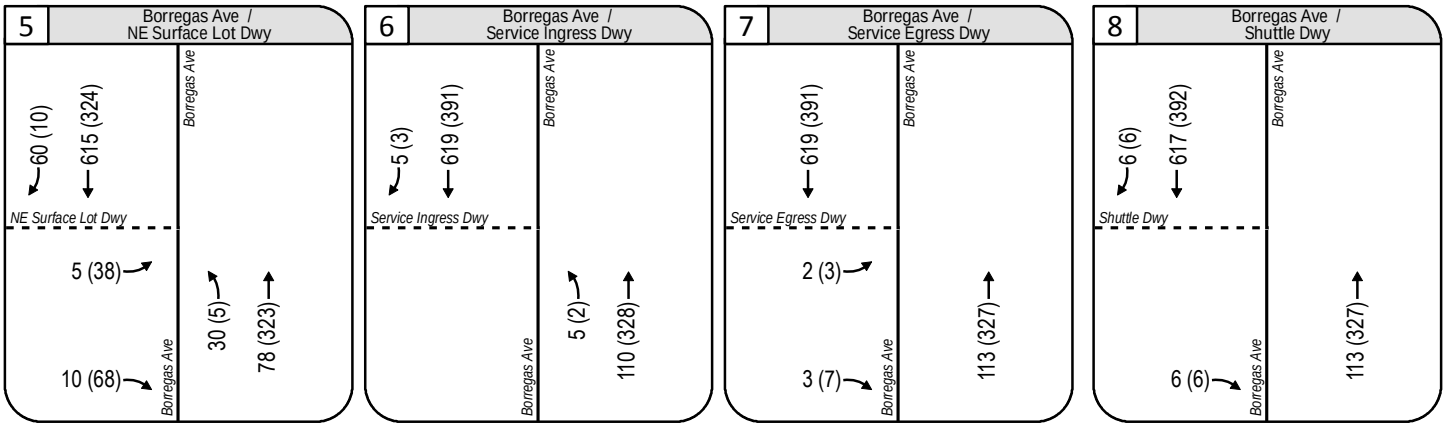
- #2 - Caribbean Parking Garage Driveway (full-access) / Caribbean Drive

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

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







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

Figure 18

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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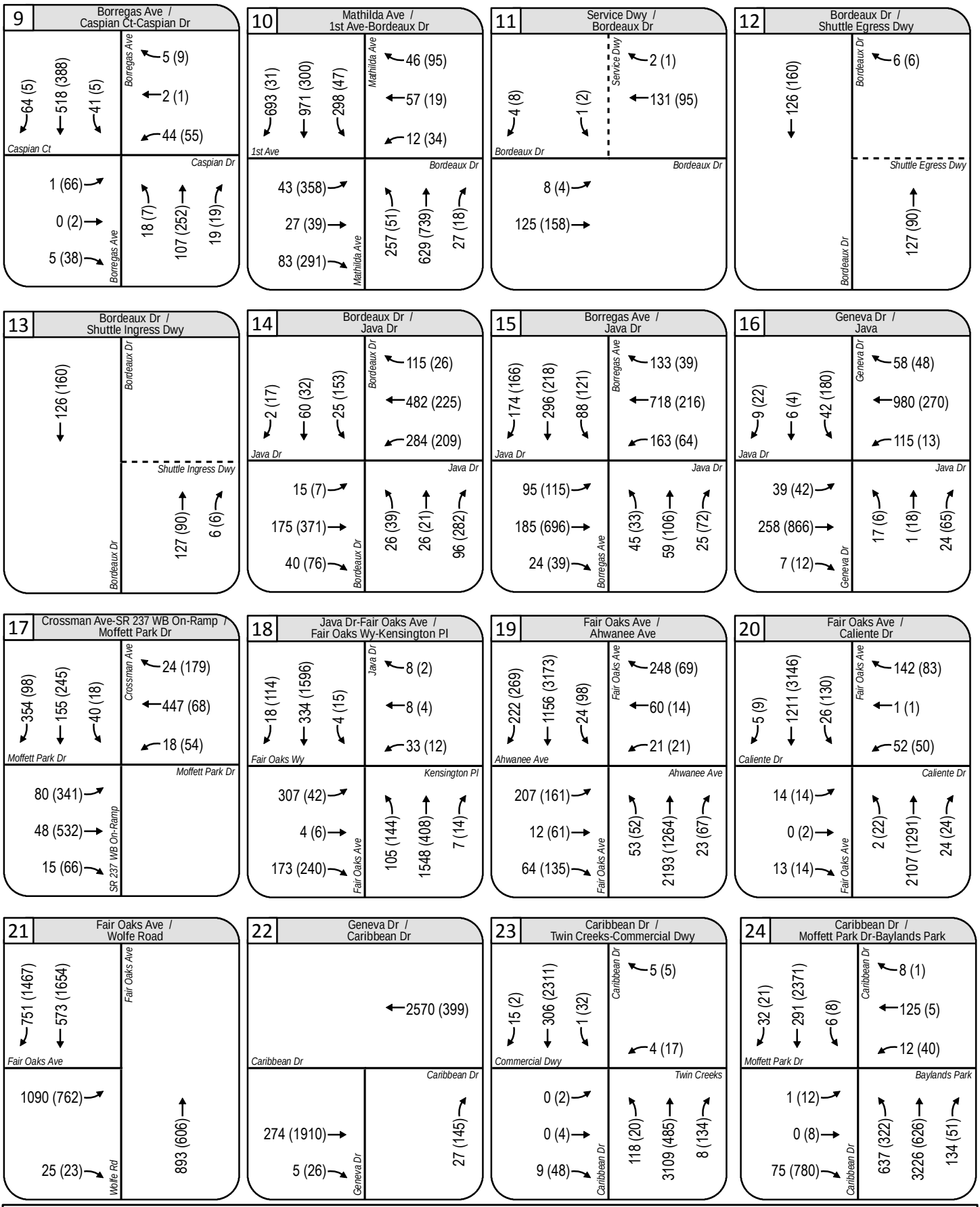
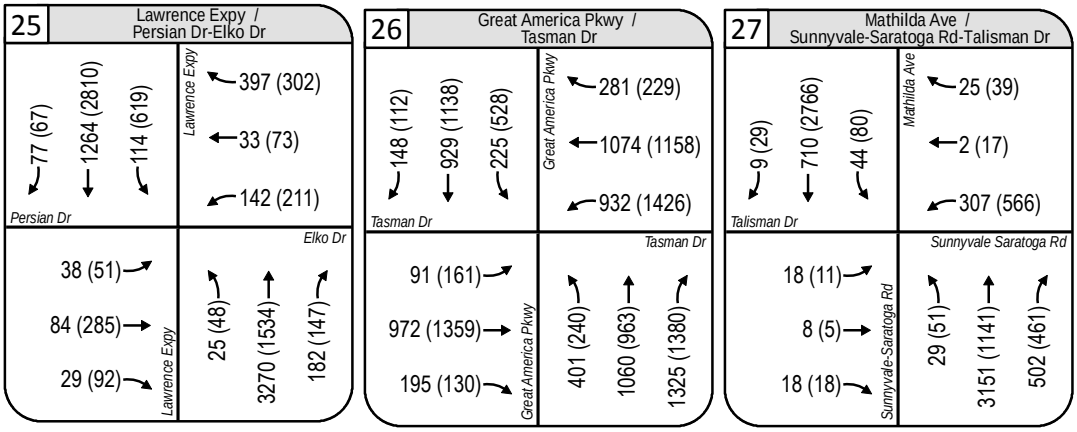


"Cumulative plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 18-2

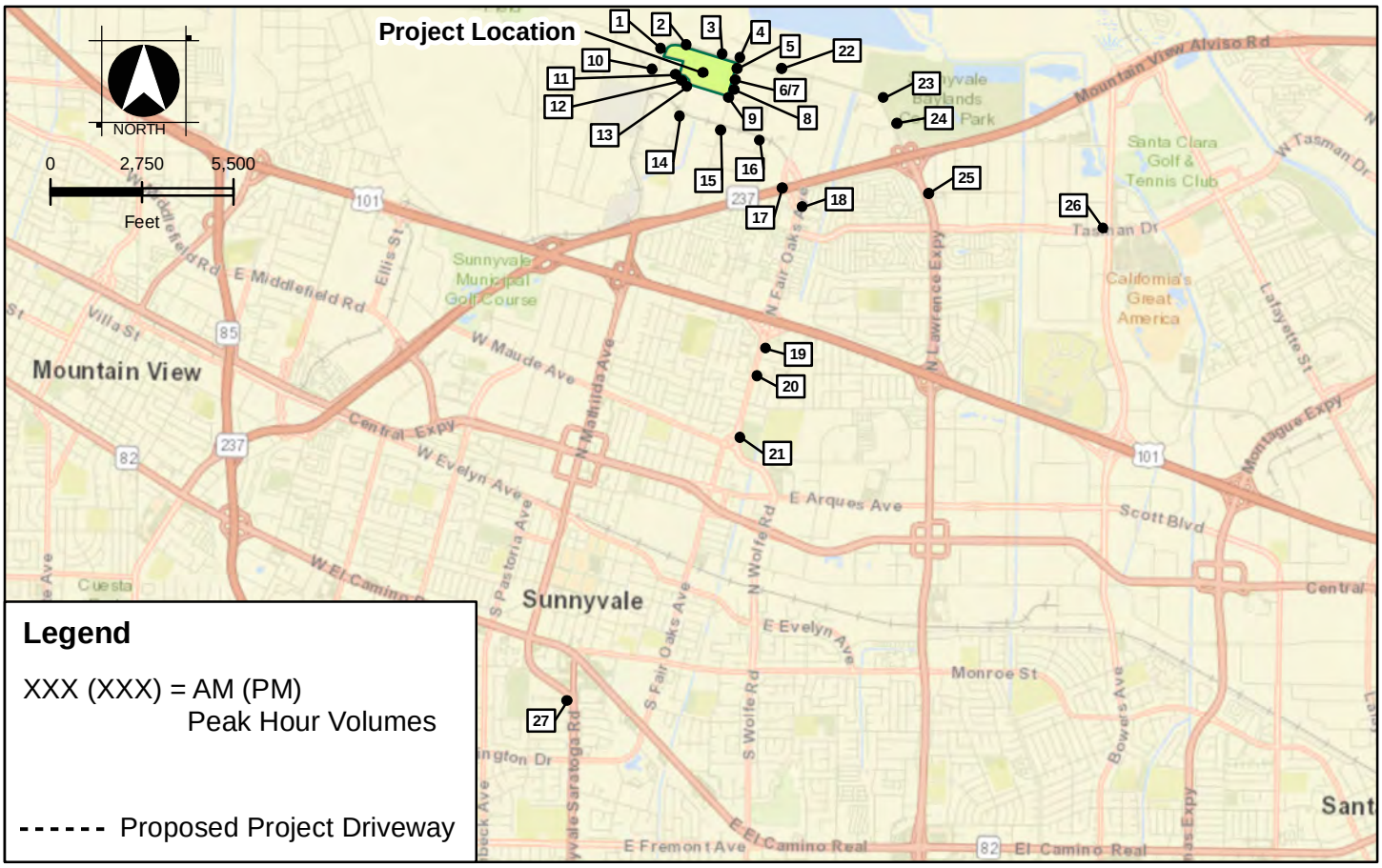
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

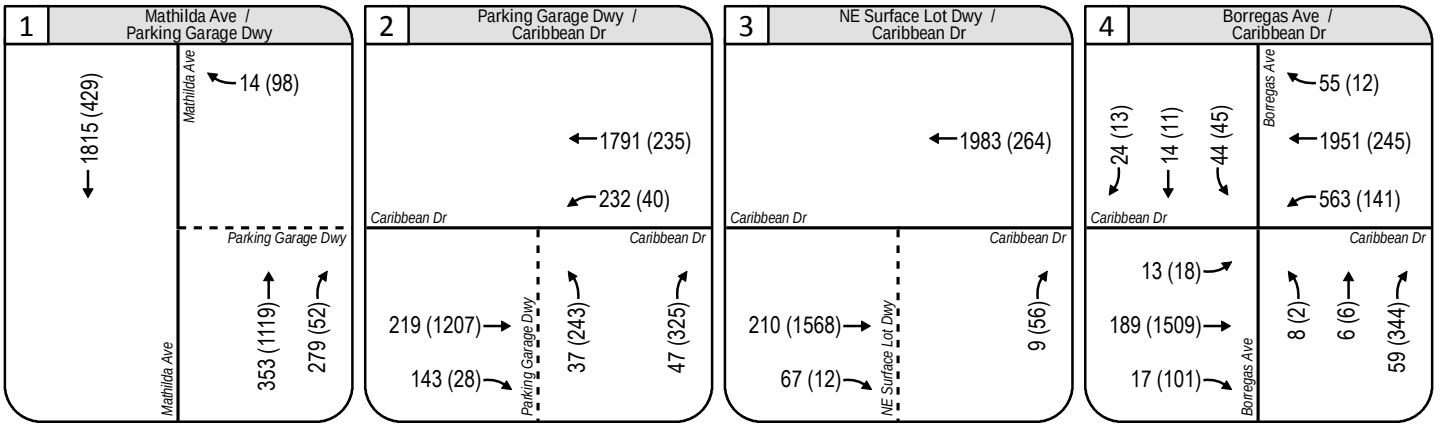


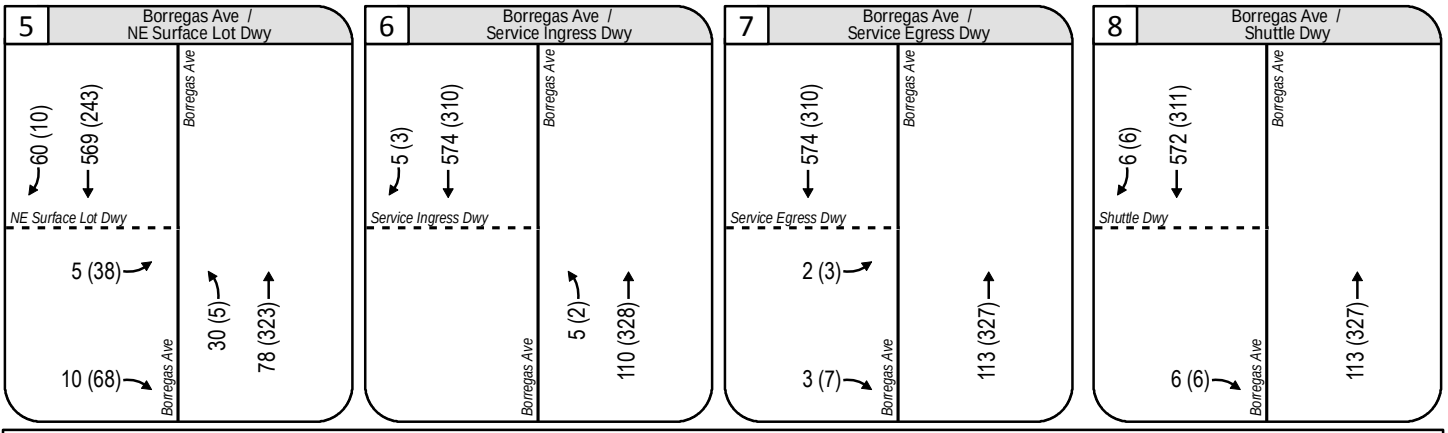
"Cumulative plus Project" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 18-3

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME







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

Figure 19

WOOD RODGERS

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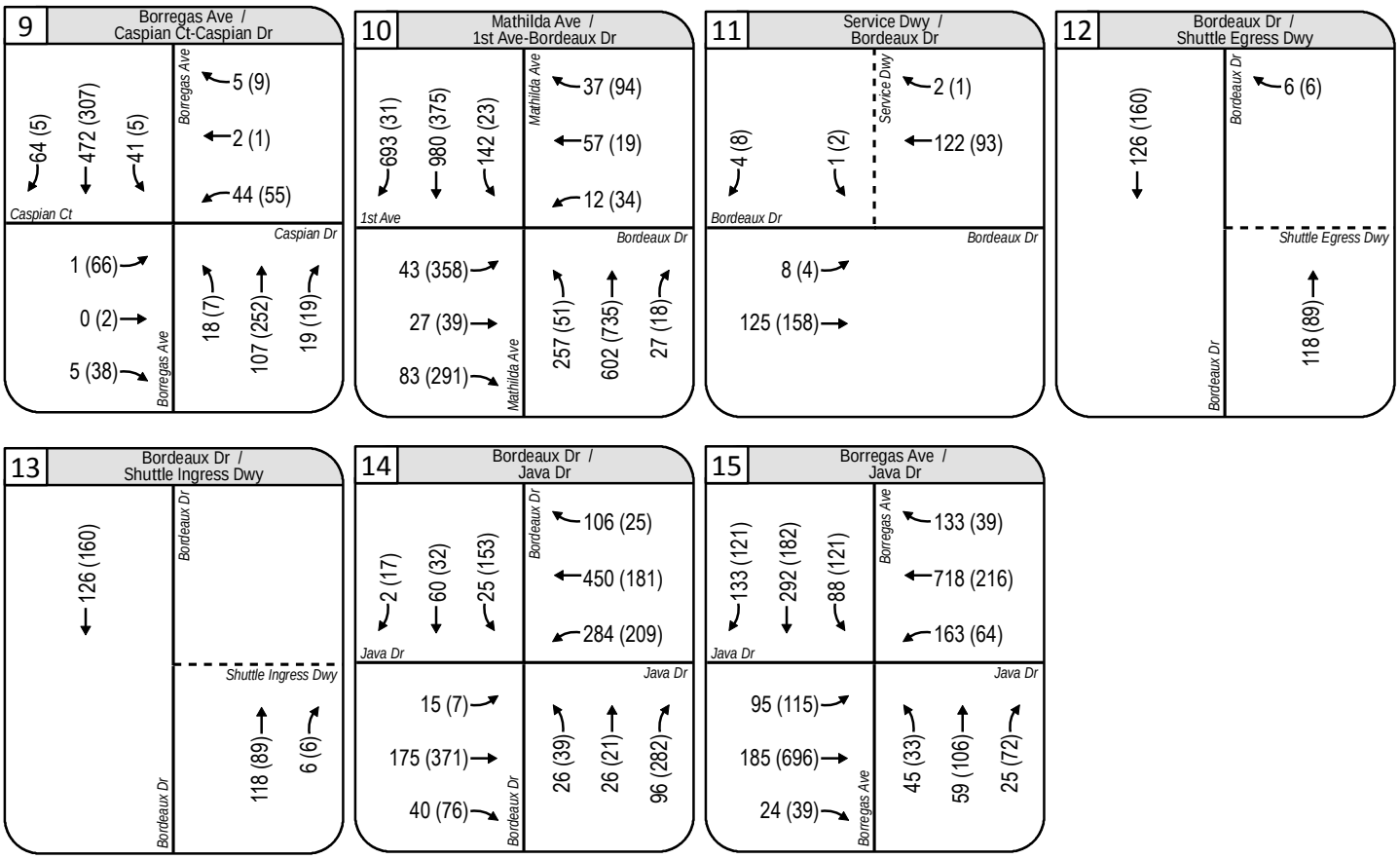


"Cumulative plus Project Alternative" Traffic Volumes
100-200 W Caribbean Drive TIA
Sunnyvale, CA
August 2019

Figure 19-2

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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

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

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

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

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

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

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

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

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

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

8. SITE ACCESS AND CIRCULATION

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

8.1 PROJECT ACCESS DRIVEWAYS

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

100 West Caribbean Drive Driveways:

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

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

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

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

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

200 West Caribbean Drive Driveways:

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

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

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

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

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

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

8.1.1 Project Access Driveway Throat Lengths

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

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

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

Ingress Stopping Sight Distance

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

Ingress Queuing

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

Egress Queuing

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

Table 21. Proposed and Minimum Required Driveway Throat Lengths

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

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

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

8.1.1.1 Recommendations

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

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

8.1.2 Project Driveway Turn Pockets and Deceleration Lanes

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

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

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

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

8.1.2.1 Recommendations

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

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

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

8.1.3 Sight Distance at Project Access Driveways

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

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

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

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

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

Table 22. Project Access Driveway Sight Distance Analysis

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

Table 22. Project Access Driveway Sight Distance Analysis

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

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

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

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

8.1.3.1 Recommendations/Mitigations

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

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

It is recommended that the proposed Project implement the following:

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

8.2 INTERNAL CIRCULATION

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

8.2.1 Recommendations

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

8.3 PEDESTRIAN AND BICYCLE ACCESS AND CIRCULATION

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

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

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

8.4 On-Site Parking

8.4.1 Vehicle Parking

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

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

8.4.2 Bicycle Parking

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

Figure 20. Vehicle Circulation Plan

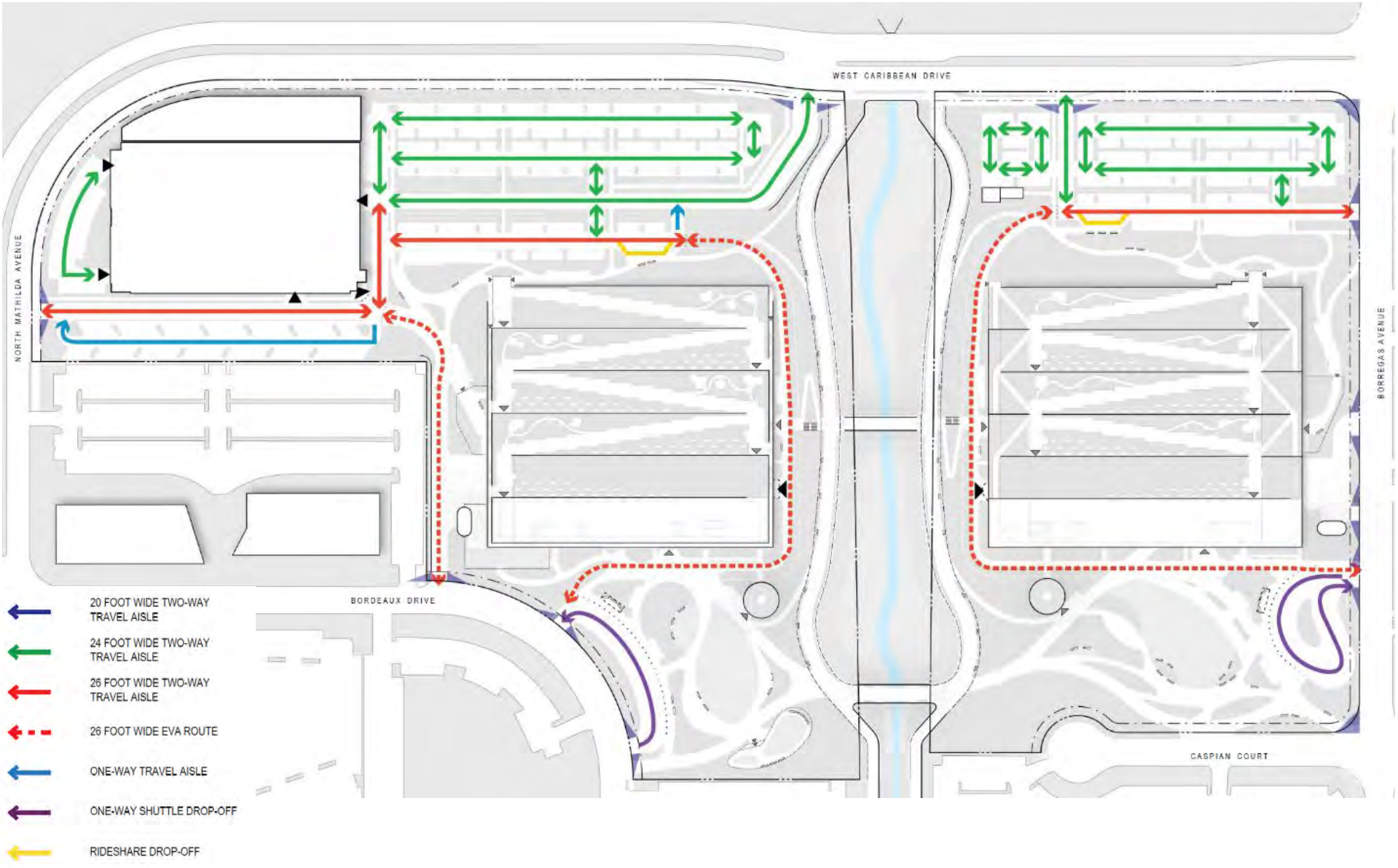


Figure 21. Recommended Internal Traffic Controls - 200 West Caribbean Drive

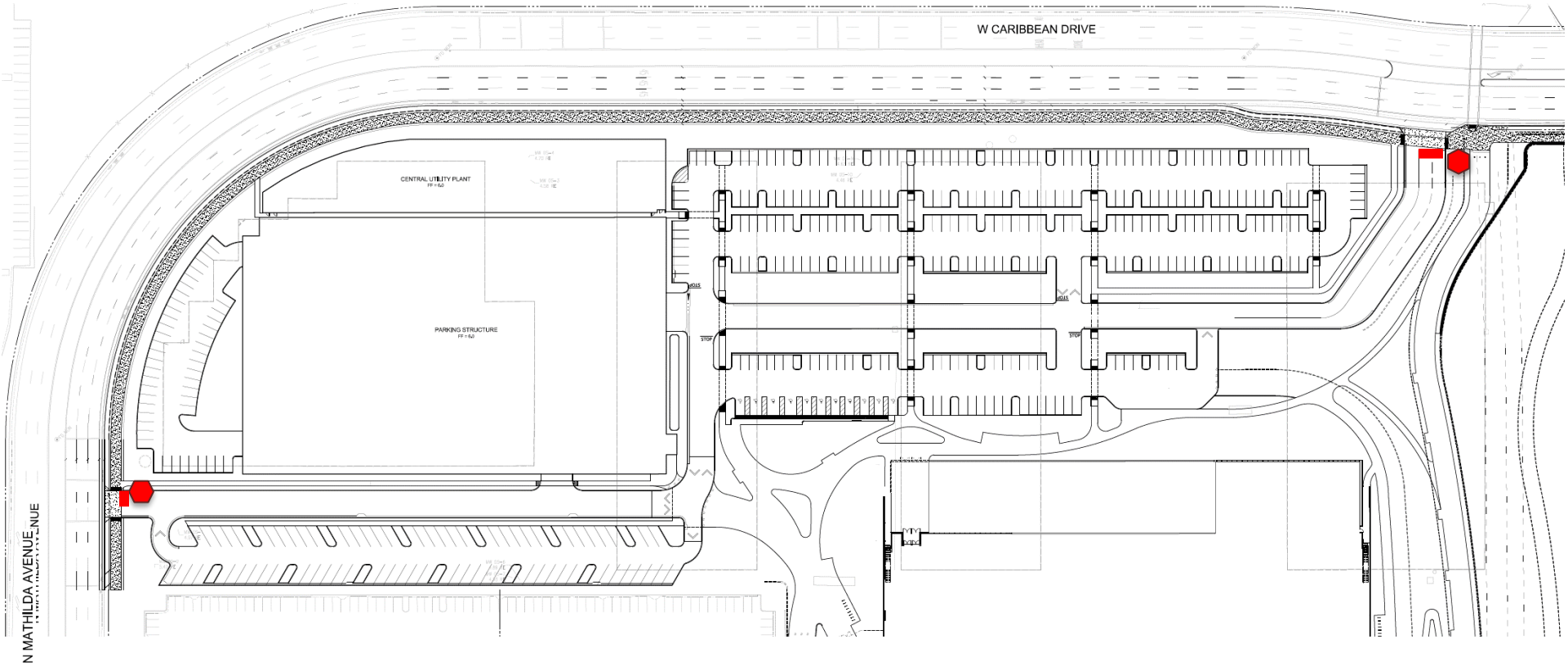
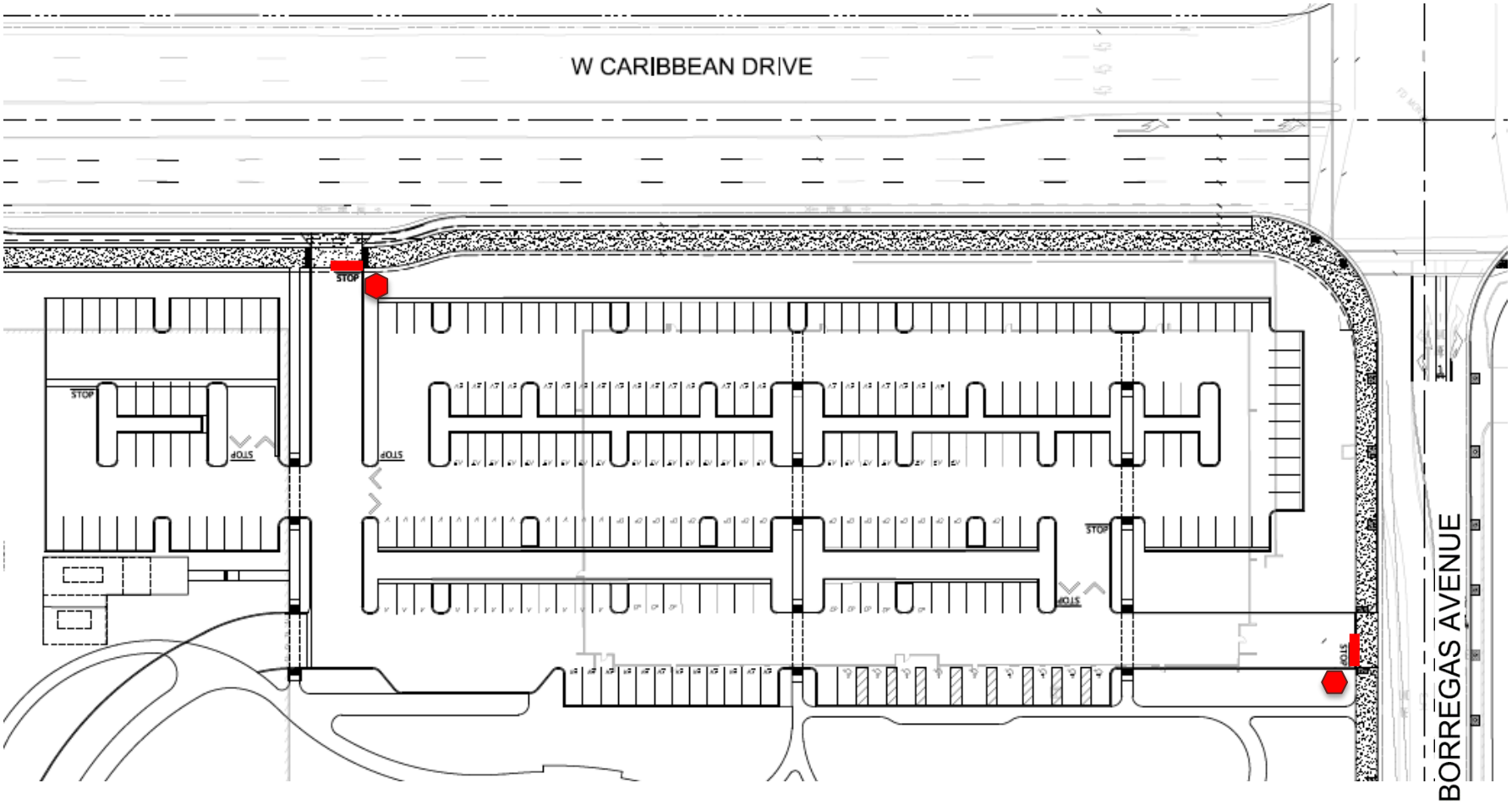


Figure 22. Recommended Internal Traffic Controls - 100 West Caribbean Drive



= Recommended Internal Stop Sign

Figure 23. Pedestrian Circulation Plan

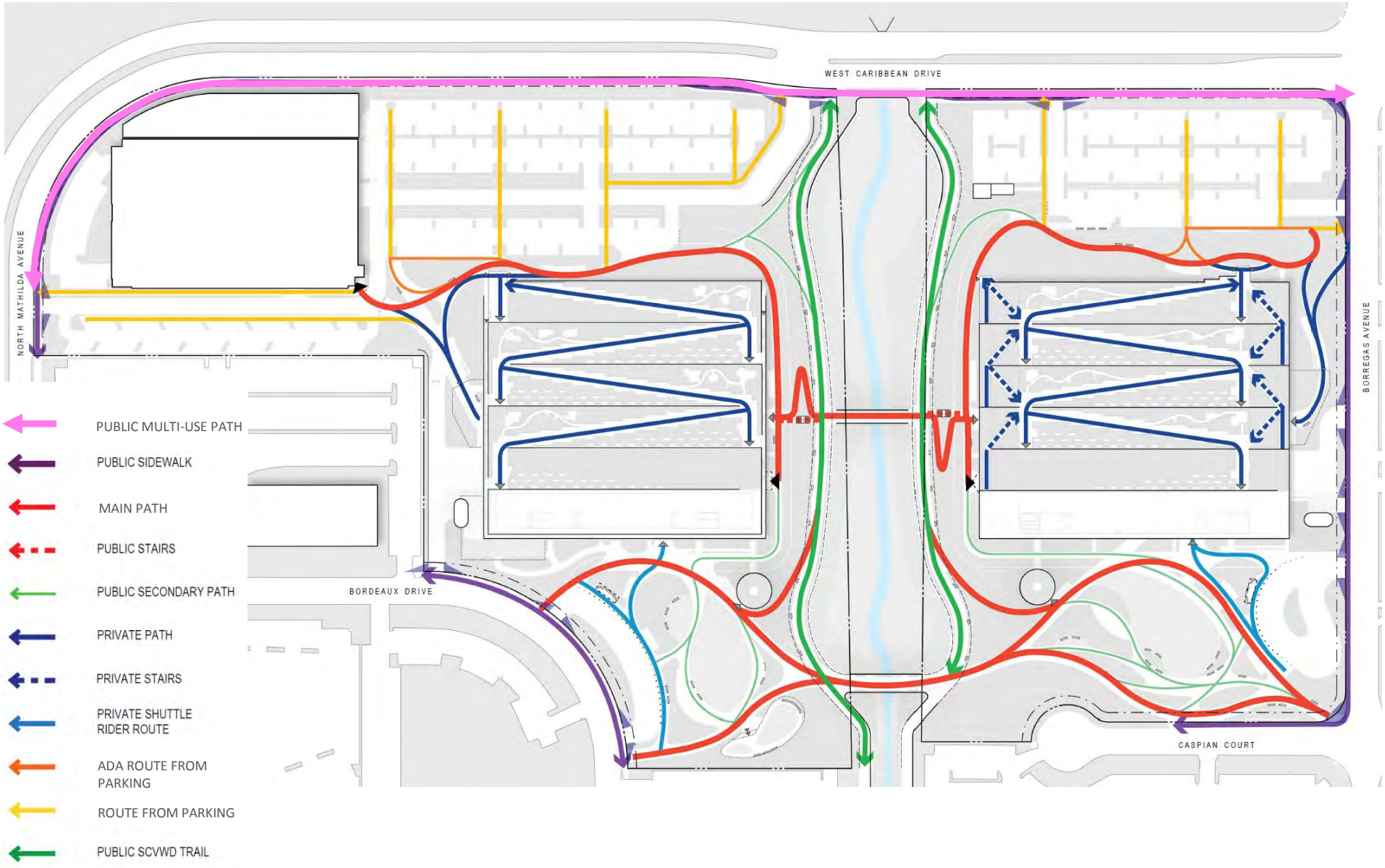
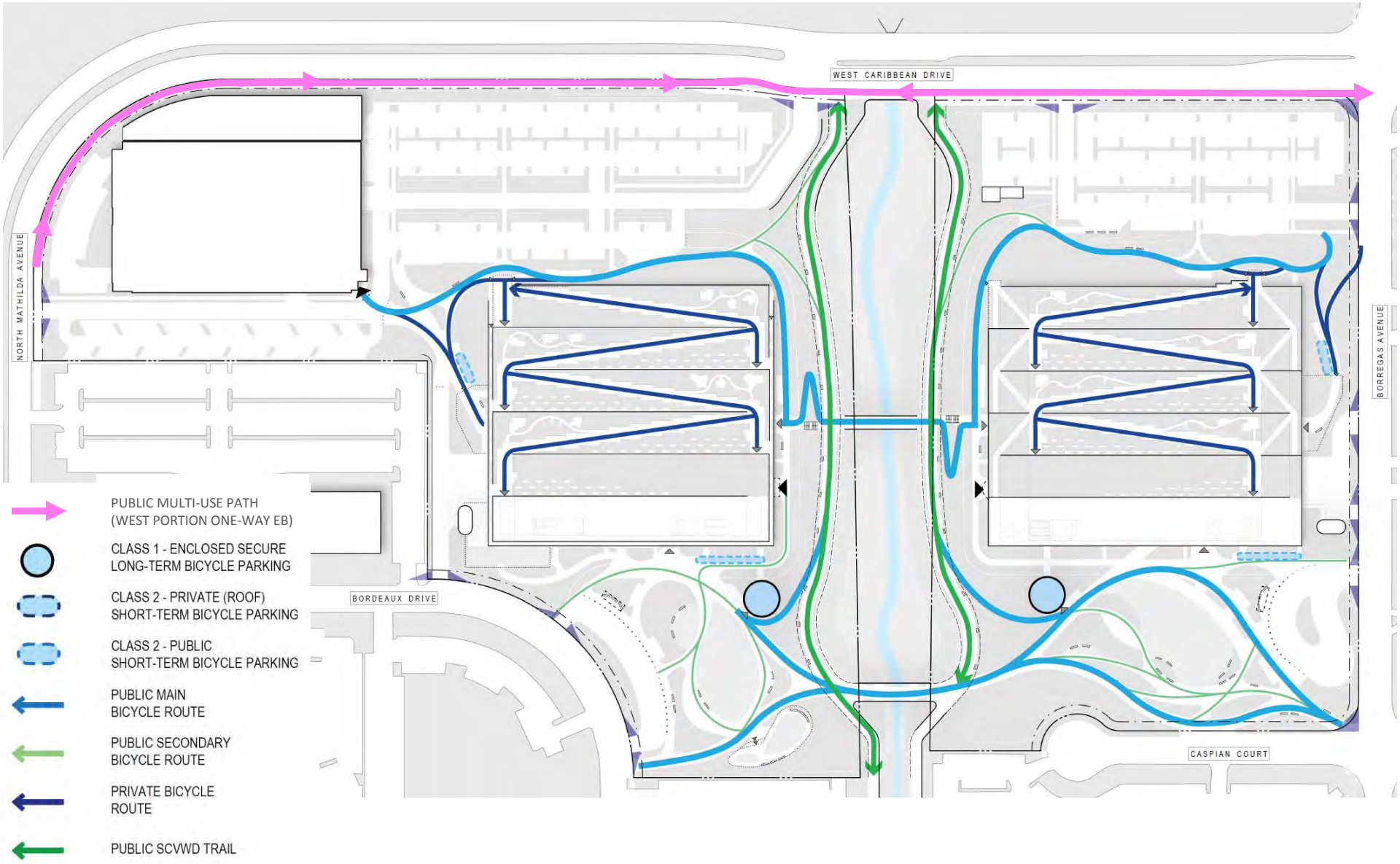


Figure 24. Bicycle Circulation Plan



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

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

9.1 TRANSIT FACILITIES

9.1.1 Transit Vehicle Delay (For Informational Purposes)

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

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

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

Table 23. Transit Delay - Plus Project Conditions

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

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

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

Table 24. Transit Delay - Plus Project Alternative Conditions

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

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

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

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

9.1.2 Recommendations

None.

9.2 PEDESTRIAN FACILITIES

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

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

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

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

9.2.1 Recommendations

None.

9.3 BICYCLE FACILITIES

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

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

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

9.3.1 Recommendations

None.

9.4 PEDESTRIAN HYBRID BEACON

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

Section 4F.01.07 of the CA MUTCD states:

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

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

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

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

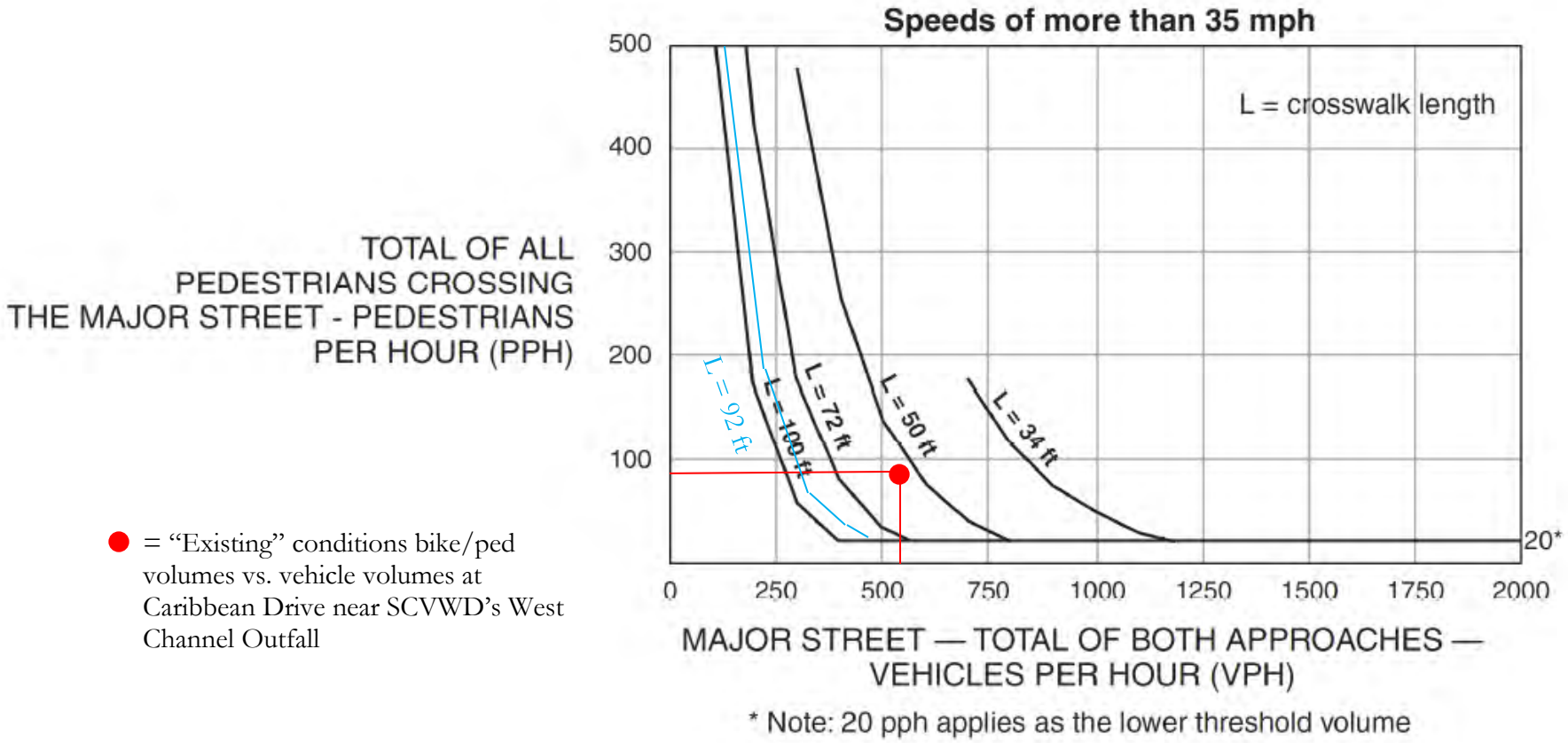
As shown in **Figure 25**, per guidelines defined in Section 4F.01.07 of the CA MUTCD, a pedestrian hybrid beacon should be considered on Caribbean Drive near the SCVWD's West Channel outfall under "Existing" conditions. Since the CA MUTCD's guidance for installation of a pedestrian hybrid beacon is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

9.4.1 Recommendations

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

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

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



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

Source: CA MUTCD Figure 4F-2

10. IMPACTS AND MITIGATION MEASURES

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

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

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

10.1.1 Intersections

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

Intersection #2 – Caribbean Parking Garage Driveway / Caribbean Drive

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

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

Mitigation:

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

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

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

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

10.1.2 Freeway Segments and Ramps

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

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

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

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

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

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

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

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

10.2.1 Intersections

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

Intersection #2 – Caribbean Parking Garage Driveway / Caribbean Drive

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

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

Mitigation:

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

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

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

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

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

Intersection #26 – Great America Parkway / Tasman Drive

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

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

10.3.1 Intersections

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

Intersection #2 – Caribbean Parking Garage Driveway / Caribbean Drive

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

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

Mitigation:

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

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

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

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

Intersection #19 – Fair Oaks Avenue / Ahwanee Avenue

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

Intersection #26 – Great America Parkway / Tasman Drive

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

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

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

Mitigation:

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

11. QUEUING ANALYSIS, DEFICIENCIES, AND RECOMMENDED IMPROVEMENTS

11.1 QUEUING ANALYSIS

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

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

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

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

11.2 PROJECT QUEUING DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

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

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

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

Table 25. Queuing Analysis – "plus Project" Scenarios

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

Table 25. Queuing Analysis – "plus Project" Scenarios

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

Table 25. Queuing Analysis – "plus Project" Scenarios

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

Table 25. Queuing Analysis – "plus Project" Scenarios

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

Table 25. Queuing Analysis – "plus Project" Scenarios

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Improvement:

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

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

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

Improvement:

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

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Appendix D

Air Quality and Greenhouse Gas Emissions Assessment

100 AND 200 W CARIBBEAN CAMPUS PROJECT - AIR QUALITY AND GREENHOUSE GAS EMISSIONS ASSESSMENT

Sunnyvale, California

May 10, 2018
Revised August 13, 2019

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Project: 18-072

EXECUTIVE SUMMARY

The proposed project would demolish existing light industrial and office uses to construct an office campus that includes 1,041,890 square feet of office space and amenities in Sunnyvale, CA ("City"). Air quality and greenhouse gas (GHG) emission impacts were evaluated in this report. The CalEEMod and EMFAC models were used to predict emissions of reactive organic gases (ROG) and nitrogen oxides (NOx), which are precursor pollutants to ground level ozone, and emissions of particulate matter (i.e., PM_{10} and $PM_{2.5}$). In addition, GHG emissions were also computed.

This project incorporates a *Construction Emissions Management Plan*, use of which will ensure the project's construction emissions are not significant. Development of the project would be consistent with land use and traffic assumptions in the City's Land Use and Transportation Element (LUTE) of its General Plan, which the City adopted in 2017. The Draft Environmental Impact Report (DEIR) for the LUTE identified mitigation measures to reduce emissions of air pollutants and GHG from both construction and operation of future projects, which are incorporated into the *Construction Emissions Management Plan*, as applicable. The *Construction Emissions Management Plan* also incorporates applicable policies, strategies, and measures from the Sunnyvale Climate Action Plan (CAP), which aims to reduce future GHG emissions, including emissions from anticipated new development and is intended to be implemented in the City. As detailed in this report, the *Construction Emissions Management Plan* also includes standard Best Management Practices for construction emissions recommended in the 2017 *BAAQMD CEQA Air Quality Guidelines*. Collectively, the measures in the *Construction Emissions Management Plan* ensure that the project's construction emissions would not be significant.

Operational emissions of air pollutants and their precursors were evaluated by computing the net increase between the proposed project and the existing uses that were assumed to continue operation. These emissions were found to be less than significant. Greenhouse gas emissions were evaluated based on the predicted emissions and considering the number of new workers, as well as consistency with the CAP. The project's per capita emissions[1] of greenhouse gases are considered less than significant for two reasons: (1) the project is subject to the City's CAP, under which City-wide emissions are substantially reduced, and (2) project emissions are predicted to be below current service population thresholds and projected 2030 thresholds that are intended to be consistent with State plans to meet 2030 GHG emission reduction goals. The project includes several features that support the City's CAP in reducing long-term GHG emissions. These include implementation of an aggressive Transportation Demand Program, construction of energy efficient buildings and infrastructure that include solar photovoltaic panels to generate renewable energy.

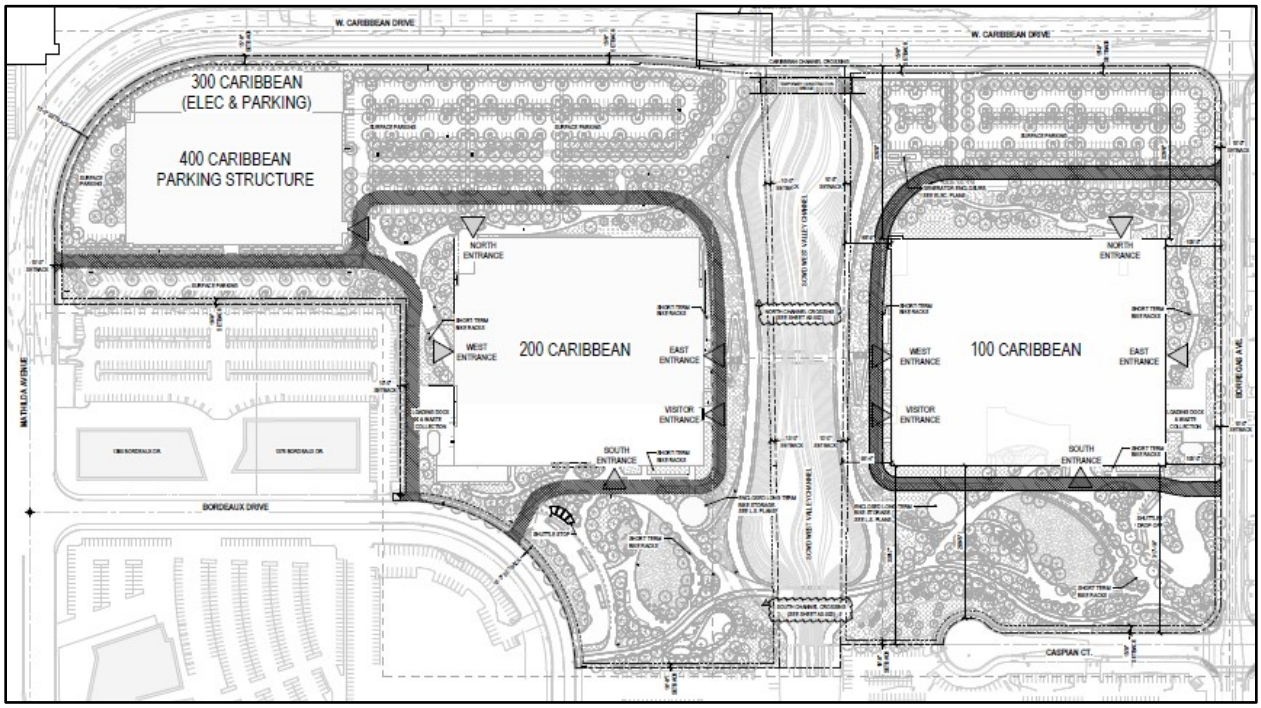
INTRODUCTION

This report examines air quality and greenhouse gas (GHG) emissions associated with the proposed 100 and 200 W. Caribbean Campus Project, which is the redevelopment of a 40.5-acre site for two new 5-story R&D office buildings totaling 1,041,890 square feet including a 4-level parking structure. The existing 710,381 square feet of office and manufacturing buildings (i.e., 10

[1] Per capita emissions are computed by dividing annual project emissions by the number of workers.

buildings) will be demolished. Figure 1 shows the project site plan. This report summarizes applicable air quality and GHG regulations, and the analysis of potential air quality and GHG impacts.

Figure 1. Project Site Plans



CONSTRUCTION EMISSIONS MANAGEMENT PLAN

The project includes a *Construction Emissions Management Plan* that reduces construction period emissions. It incorporates policies and measures from the City's CAP, the Mitigation Measures analyzed and adopted in the LUTE DEIR, and standard construction Best Management Practices, which together provide feasible measures that ensure that the project's emissions are minimized. This plan also includes all *Basic Measures* and *Enhanced Measures* recommended in the 2017 BAAQMD CEQA Air Quality Guidelines, as well as measures to reduce exhaust emissions from project construction equipment and haul trucks. The plan measures are as follows:

A. Basic Measures

During any construction period ground disturbance, the applicant shall ensure that the project contractor implement measures to control dust and exhaust. Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality impacts associated with grading and new construction to a less than significant level. The contractor shall implement the following best management practices that are required of all projects:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

4. All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph).

5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

B. Enhanced Control Measures

Applicable enhanced measures include:

1. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph and visible dust clouds cannot be confined to the site;
2. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6 to 12-inch compacted layer of wood chips, mulch, or gravel;

3. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent;

4. Minimizing the idling time of diesel-powered construction equipment to two minutes; and

5. The project shall develop a plan demonstrating that the combination of off-road equipment and on-road vehicle traffic that is part of the construction project (i.e.,

owned, leased, and subcontractor vehicles) would achieve a project wide 32-percent NOx reduction compared to the CalEEMod modeled average used in this report. There are several options available to meet this requirement. Acceptable options for reducing emissions include the use of late model engines and trucks, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available. The following are feasible methods:

i. All diesel construction equipment used at the site for more than two continuous days or 20 hours total shall meet U.S. EPA emission standards for Tier 4 engines, where not feasible, engines must meet Tier 3 standards. A plan showing that equipment usage, based on total horsepower hours will include at a minimum 80 percent Tier 4 equipment.

ii. Provide line power to the site during the early phases of construction to minimize the use of diesel-powered stationary equipment, such as generators, air compressors and welders. Where access to alternative sources of power are available, portable diesel engines shall be prohibited.

iii. Diesel engines, whether for off-road equipment or on-road vehicles, shall not be left idling for more than 2 minutes, except as provided in exceptions to the applicable state regulations (e.g., traffic conditions, safe operating conditions). The construction sites shall have posted legible and visible signs in designated queuing areas and at the construction site to clearly notify operators of idling limit.

iv. All on-road heavy-duty diesel trucks with a gross vehicle weight rating of 33,000 pounds or greater (EMFAC Category HDDT) used at the project site (such as haul trucks, water trucks, dump trucks, and concrete trucks) be model year 2010 or newer.

SETTING

Air Pollutants

Ozone

Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_X). The main sources of ROG and NO_X, often referred to as ozone precursors, are combustion processes (including combustion in motor vehicle engines) and the evaporation of solvents, paints, and fuels. In the Bay Area, automobiles are the single largest source of ozone precursors. Ozone is referred to as a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production through the photochemical reaction process. Ozone causes

eye irritation, airway constriction, shortness of breath, and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO is motor vehicles. While CO transport is limited, it disperses with distance from the source under normal meteorological conditions. However, under certain extreme meteorological conditions, CO concentrations near congested roadways or intersections may reach unhealthful levels that adversely affect local sensitive receptors (e.g., residents, schoolchildren, the elderly, hospital patients, etc.). Typically, high CO concentrations are associated with roadways or intersections operating at unacceptable levels of service (LOS) or with extremely high traffic volumes. Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood and can cause headaches, nausea, dizziness, fatigue, impair central nervous system function, and induce angina (chest pain) in persons with serious heart disease. Very high levels of CO can be fatal.

Nitrogen Dioxide

NO_2 is a reddish-brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, NO_2 also contribute to other pollution problems, including a high concentration of fine particulate matter, poor visibility, and acid deposition. NO_2 may be visible as a coloring component on high pollution days, especially in conjunction with high ozone levels. NO_2 decreases lung function and may reduce resistance to infection.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless, irritating gas formed primarily from incomplete combustion of fuels containing sulfur. Industrial facilities also contribute to gaseous SO_2 levels in the region. SO_2 irritates the respiratory tract, can injure lung tissue when combined with fine particulate matter, and reduces visibility and the level of sunlight. This pollutant would be emitted at negligible levels by the project and was not considered in the impact analysis.

Particulate Matter

Particulate matter is the term used for a mixture of solid particles and liquid droplets found in the air. Coarse particles are those that are larger than 2.5 microns but smaller than 10 microns (PM_{10}). $PM_{2.5}$ refers to fine suspended particulate matter with an aerodynamic diameter of 2.5 microns or less that is not readily filtered out by the lungs. Nitrates, sulfates, dust, and combustion particulates are major components of PM_{10} and $PM_{2.5}$. These small particles can be directly emitted into the atmosphere as by-products of fuel combustion, through abrasion, such as tire or brake lining wear, or through fugitive dust (wind or mechanical erosion of soil). They can also be formed in the atmosphere through chemical reactions. Particulates may transport carcinogens and other toxic compounds that adhere to the particle surfaces, and can enter the human body through the lungs.

Lead

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufactures. The phase out and eventual banning of the use of leaded gasoline in on-road vehicles in 1995 have caused lead levels in the air decreased dramatically. This pollutant would not be emitted by the project.

Toxic Air Contaminants (TACs)

In addition to the criteria pollutants discussed above, Toxic Air Contaminants (TACs) are another group of pollutants of concern. TACs are injurious in small quantities and are regulated by the EPA and the California Air Resources Board (CARB). Some examples of TACs include: benzene, butadiene, formaldehyde, and hydrogen sulfide. The identification, regulation, and monitoring of TACs is relatively recent compared to that for criteria pollutants.

High volume freeways, stationary diesel engines, and facilities attracting heavy and constant diesel vehicle traffic (distribution centers, truck stops) were identified as posing the highest risk to adjacent receptors. Other facilities associated with increased risk include warehouse distribution centers, large retail or industrial facilities, high volume transit centers, or schools with a high volume of bus traffic. Health risks from TACs are a function of both concentration and duration of exposure.

Sensitive Receptors

Some groups of people are more affected by air pollution than others. The State has identified the following people who are most likely to be affected by air pollution: children under 14, the elderly over 65, athletes, and people with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive receptors. Locations that may contain a high concentration of these sensitive population groups include residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, and parks. The closest sensitive receptors are over 3,000 feet from the project site.

Regional Air Quality

The project site is in the San Francisco Bay Area Air Basin. The Air Basin includes the counties of San Francisco, Santa Clara, San Mateo, Marin, Napa, Contra Costa, and Alameda, along with the southeast portion of Sonoma County and the southwest portion of Solano County.

The project site is within the jurisdiction of the BAAQMD. Air quality conditions in the San Francisco Bay Area have improved significantly since the BAAQMD was created in 1955. Ambient concentrations of air pollutants, and the number of days during which the region exceeds

air quality standards, have fallen dramatically. Exceedances of air quality standards occur primarily during meteorological conditions conducive to high pollution levels, such as cold, windless winter nights or hot, sunny summer afternoons.

Local Climate and Air Quality

Air quality is a function of both local climate and local sources of air pollution. Air quality is the balance of the natural dispersal capacity of the atmosphere and emissions of air pollutants from human uses of the environment. Climate and topography are major influences on air quality.

Climate and Meteorology

During the summer, mostly clear skies result in warm daytime temperatures and cool nights in the Santa Clara Valley. Winter temperatures are mild, except for very cool but generally frost-less mornings. Further inland where the moderating effect of the bay is not as strong, temperature extremes are greater. Wind patterns are influenced by local terrain, with a northwesterly sea breeze typically developing during the daytime. Winds are usually stronger in the spring and summer. Rainfall amounts are modest, ranging from 13 inches in the lowlands to 20 inches in the hills.

Air Pollution Potential

Ozone and fine particle pollution, or $PM_{2.5}$, are the major regional air pollutants of concern in the San Francisco Bay Area. Ozone is primarily a problem in the summer, and fine particle pollution in the winter. Most of Santa Clara County is well south of the cooler waters of the San Francisco Bay and far from the cooler marine air which usually reaches across San Mateo County in summer. Ozone frequently forms on hot summer days when the prevailing seasonal northerly winds carry ozone precursors southward across the county, causing health standards to be exceeded. Santa Clara County experiences many exceedances of the $PM_{2.5}$ standard each winter. This is due to the high population density, wood smoke, industrial and freeway traffic, and poor wintertime air circulation caused by extensive hills to the east and west that block wind flow into the region.

Greenhouse Gases

Global temperatures are affected by naturally occurring and anthropogenic-generated (generated by humankind) atmospheric gases, such as water vapor, carbon dioxide, methane, and nitrous oxide. Gases that trap heat in the atmosphere are called greenhouse gases (GHG). Solar radiation enters the earth's atmosphere from space, and a portion of the radiation is absorbed at the surface. The earth emits this radiation back toward space as infrared radiation. Greenhouse gases, which are mostly transparent to incoming solar radiation, are effective in absorbing infrared radiation and redirecting some of this back to the earth's surface. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This is known as the greenhouse effect. The greenhouse effect helps maintain a habitable climate. Emissions of GHGs from human activities, such as electricity production, motor vehicle use, and agriculture, are elevating the concentration of GHGs in the atmosphere, and are reported to have led to a trend of unnatural warming of the earth's natural climate, known as global warming or

global climate change. The term "global climate change" is often used interchangeably with the term "global warming," but "global climate change" is preferred because it implies that there are other consequences to the global climate in addition to rising temperatures. Other than water vapor, the primary GHGs contributing to global climate change include the following gases:

- Carbon dioxide (CO_2), primarily a byproduct of fuel combustion;
- Nitrous oxide (N_2O), a byproduct of fuel combustion; also associated with agricultural operations such as the fertilization of crops;
- Methane (CH_4), commonly created by off-gassing from agricultural practices (e.g. livestock), wastewater treatment and landfill operations;
- Chlorofluorocarbons (CFCs) were used as refrigerants, propellants and cleaning solvents, but their production has been mostly prohibited by international treaty;
- Hydrofluorocarbons (HFCs) are now widely used as a substitute for chlorofluorocarbons in refrigeration and cooling; and
- Perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6) emissions are commonly created by industries such as aluminum production and semiconductor manufacturing.

These gases vary considerably in terms of Global Warming Potential (GWP), a term developed to compare the propensity of each GHG to trap heat in the atmosphere relative to another GHG. GWP is based on several factors, including the relative effectiveness of a gas to absorb infrared radiation and the length of time of gas remains in the atmosphere. The GWP of each GHG is measured relative to CO_2. Accordingly, GHG emissions are typically measured and reported in terms of equivalent CO_2 (CO_2e). For instance, SF_6 is 22,800 times more intense in terms of global climate change contribution than CO_2.

An expanding body of scientific research supports the theory that global warming is currently affecting changes in weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates, and that it will increasingly do so in the future. The climate and several naturally-occurring resources within California could be adversely affected by the global warming trend. Increased precipitation and sea level rise could increase coastal flooding, saltwater intrusion, and degradation of wetlands. Mass migration and/or loss of plant and animal species could also occur. Potential effects of global climate change that could adversely affect human health include more extreme heat waves and heat-related stress; an increase in climate-sensitive diseases; more frequent and intense natural disasters such as flooding, hurricanes and drought; and increased levels of air pollution.

The California Greenhouse Gas Emission Inventory – 2017 Edition (released June 6, 2017) indicates that total California emissions in 2015 were 440.4 MMT of CO_2e[2]. Approximately 37 percent of these emissions were associated with transportation (i.e., all sectors), followed by the Industrial sector at 21 percent and the Electric Power sector at 19 percent. The statewide inventory was estimated to have peaked in 2004. The current 2015 inventory is estimated to represent an overall decrease of 10 percent from 2004 levels.

[2] See https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2015/ghg_inventory_trends_00-15.pdf accessed June 8, 2017

REGULATORY FRAMEWORK

Pursuant to the federal Clean Air Act (CAA) of 1970, the U.S. Environmental Protection Agency (EPA) established national ambient air quality standards (NAAQS). The NAAQS were established for major pollutants, termed "criteria" pollutants. Criteria pollutants are defined as those pollutants for which the Federal and State governments have established ambient air quality standards, or criteria, for outdoor concentrations in order to protect public health.

Both the EPA and the California Air Resources Board (CARB) have established ambient air quality standards for common pollutants: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and suspended particulate matter (PM). In addition, the State has set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles. These standards are designed to protect the health and welfare of the public with a reasonable margin of safety. These ambient air quality standards are levels of contaminants which represent safe levels that avoid specific adverse health effects associated with each criteria pollutant. Health effects of criteria pollutants and their potential sources are described below and summarized in Table 1.

Federal Air Quality Regulations

At the federal level, the EPA has been charged with implementing national air quality programs. EPA's air quality mandates are drawn primarily from the Federal Clean Air Act (FCAA), which was enacted in 1963. The FCAA was amended in 1970, 1977, and 1990.

The FCAA required EPA to establish primary and secondary NAAQS and required each state to prepare an air quality control plan referred to as a State Implement Plan (SIP). Federal standards include both primary and secondary standards. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.[3] The Federal Clean Air Act Amendments of 1990 (FCAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA has responsibility to review all state SIPs to determine conformity with the mandates of the FCAA and determine if implementation will achieve air quality goals.

[3] U.S. Environmental Protection Agency, 2013. Website: www.epa.gov/air/criteria.html. February.

TABLE 1 Health Effects of Air Pollutants

Pollutants	Sources	Primary Effects
Carbon Monoxide (CO)	• Incomplete combustion of fuels and other carbon-containing substances, such as motor exhaust. • Natural events, such as decomposition of organic matter.	• Chest pain in patients with heart disease • Headache • Light-headedness • Reduced mental alertness
Nitrogen Dioxide (NO_2)	• Motor vehicle exhaust. • High temperature stationary combustion. • Atmospheric reactions.	• Aggravation of respiratory illness. • Reduced visibility. • Reduced plant growth. • Formation of acid rain.
Ozone (O_3)	• Atmospheric reaction of organic gases with nitrogen oxides in sunlight.	• Respiratory symptoms • Worsening of lung disease leading to premature death • Damage to lung tissue • Crop, forest and ecosystem damage • Damage to a variety of materials, including rubber, plastics, fabrics, paint and metals
Lead (Pb)	• Contaminated soil.	• Impaired mental functioning in children • Learning disabilities in children • Brain and kidney damage
Suspended Particulate Matter ($PM_{2.5}$ and PM_{10})	• Stationary combustion of solid fuels. • Construction activities. • Industrial processes. • Atmospheric chemical reactions.	• Premature death • Hospitalization for worsening of cardiovascular disease • Hospitalization for respiratory disease • Asthma-related emergency room visits, • Increased symptoms, increased inhaler usage
Sulfur Dioxide (SO_2)	• Combustion of sulfur-containing fossil fuels. • Smelting of sulfur-bearing metal ores. • Industrial processes.	• Worsening of asthma: increased symptoms, increased medication usage, and emergency room visits
Toxic Air Contaminants	• Cars and trucks, especially diesels. • Industrial sources such as chrome platers. • Neighborhood businesses such as dry cleaners and service stations. • Building materials and product.	• Cancer. • Chronic eye, lung, or skin irritation. • Neurological and reproductive disorders.

Source: CARB, 2018: https://ww2.arb.ca.gov/resources/common-air-pollutants, accessed 5/18/2018.

The 1970 FCAA authorized the establishment of national health-based air quality standards and also set deadlines for their attainment. The FCAA Amendments of 1990 changed deadlines for attaining NAAQS as well as the remedial actions required of areas of the nation that exceed the standards. Under the FCAA, State and local agencies in areas that exceed the NAAQS are required to develop SIPs to show how they will achieve the NAAQS by specific dates. The FCAA requires that projects receiving federal funds demonstrate conformity to the approved SIP and local air quality attainment plan for the region. Conformity with the SIP requirements would satisfy the FCAA requirements.

State Air Quality Regulations

The CARB is the agency responsible for the coordination and oversight of State and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA), adopted in 1988. The CCAA requires that all air districts in the State achieve and maintain the California Ambient Air Quality Standards (CAAQS) by the earliest practical date. The CCAA specifies that districts should focus on reducing the emissions from transportation and air-wide emission sources, and provides districts with the authority to regulate indirect sources.

CARB is also responsible for developing and implementing air pollution control plans to achieve and maintain the NAAQS. CARB is primarily responsible for statewide pollution sources and produces a major part of the SIP. Local air districts provide additional strategies for sources under their jurisdiction. CARB combines this data and submits the completed SIP to the EPA.

Other CARB duties include monitoring air quality (in conjunction with air monitoring networks maintained by air pollution control and air quality management districts), establishing CAAQS (which in many cases are more stringent than the NAAQS), determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, and off-road vehicles.

Attainment Status Designations

The CARB is required to designate areas of the State as attainment, nonattainment, or unclassified for all State standards. An “attainment” designation for an area signifies that pollutant concentrations did not violate the standard for that pollutant in that area. A “nonattainment” designation indicates that a pollutant concentration violated the standard at least once, excluding those occasions when a violation was caused by an exceptional event, as defined in the criteria. An “unclassified” designation signifies that data does not support either an attainment or nonattainment status. The CCAA divides districts into moderate, serious, and severe air pollution categories, with increasingly stringent control requirements mandated for each category.

Table 2 shows the State and Federal standards for criteria pollutants and provides a summary of the attainment status for the San Francisco Bay Area with respect to National and State ambient air quality standards.

TABLE 2 San Francisco Bay Area Attainment Status

Pollutant	Averaging Time	California Standards		National Standards	
		Concentration	Attainment Status	Concentration	Attainment Status
Carbon Monoxide (CO)	8-Hour	9 ppm (10 mg/m^3)	Attainment	9 ppm (10 mg/m^3)	Attainment
	1-Hour	20 ppm (23 mg/m^3)	Attainment	35 ppm (40 mg/m^3)	Attainment
Nitrogen Dioxide (NO_2)	Annual Mean	0.030 ppm (57 mg/m^3)	Attainment	0.053 ppm (100 µg/m^3)	Attainment
	1-Hour	0.18 ppm (338 µg/m^3)	Attainment	0.100 ppm	Unclassified
Ozone (O_3)	8-Hour	0.07 ppm (137 µg/m^3)	Nonattainment	0.070 ppm	Nonattainment
	1-Hour	0.09 ppm (180 µg/m^3)	Nonattainment	Not Applicable	Not Applicable
Suspended Particulate Matter (PM_{10})	Annual Mean	20 µg/m^3	Nonattainment	Not Applicable	Not Applicable
	24-Hour	50 µg/m^3	Nonattainment	150 µg/m^3	Unclassified
Suspended Particulate Matter ($PM_{2.5}$)	Annual Mean	12 µg/m^3	Nonattainment	12 µg/m^3	Attainment
	24-Hour	Not Applicable	Not Applicable	35 µg/m^3	Nonattainment
Sulfur Dioxide (SO_2)	Annual Mean	Not Applicable	Not Applicable	80 µg/m^3 (0.03 ppm)	Attainment
	24-Hour	0.04 ppm (105 µg/m^3)	Attainment	365 µg/m^3 (0.14 ppm)	Attainment
	1-Hour	0.25 ppm (655 µg/m^3)	Attainment	0.075 ppm (196 µg/m^3)	Attainment

Lead (Pb) is not listed in the above table because it has been in attainment since the 1980s.
ppm = parts per million
mg/m^3 = milligrams per cubic meter
µg/m^3 = micrograms per cubic meter

Source: Bay Area Air Quality Management District, 2018: http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status , accessed 5/9/2018 .

California Clean Air Act

In 1988, the CCAA required that all air districts in the State endeavor to achieve and maintain CAAQS for carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) by the earliest practical date. The CCAA provides districts with authority to regulate indirect sources and mandates that air quality districts focus particular attention on reducing emissions from transportation and area-wide emission sources. Each nonattainment district is required to adopt a plan to achieve a 5 percent annual reduction, averaged over consecutive 3-year periods, in district-wide emissions of each nonattainment pollutant or its precursors. A Clean Air Plan shows how a district would reduce emissions to achieve air quality standards. Generally, the State standards for these pollutants are more stringent than the national standards.

California Air Resources Board Handbook

In 1998, CARB identified particulate matter from diesel-fueled engines as a toxic air contaminant. CARB has completed a risk management process that identified potential cancer risks for a range of activities using diesel-fueled engines.[4] CARB subsequently developed an Air Quality and Land Use Handbook[5] (Handbook) in 2005 that is intended to serve as a general reference guide for evaluating and reducing air pollution impacts associated with new projects that go through the land use decision-making process. The CARB Handbook recommends that planning agencies consider proximity to air pollution sources when considering new locations for "sensitive" land uses, such as residences, medical facilities, daycare centers, schools, and playgrounds.

Air pollution sources of concern include freeways, rail yards, ports, refineries, distribution centers, chrome plating facilities, dry cleaners, and large gasoline service stations. Key recommendations in the Handbook relative to the Plan Area include taking steps to consider or avoid siting new, sensitive land uses:

- Within 500 feet of a freeway, urban roads with 100,000 vehicles/day or rural roads with 50,000 vehicles/day.
- Within 300 feet of gasoline fueling stations.
- Within 300 feet of dry cleaning operations (note that dry cleaning with TACs is being phased out and will be prohibited in 2023).

Bay Area Air Quality Management District (BAAQMD)

The BAAQMD seeks to attain and maintain air quality conditions in the San Francisco Bay Area Air Basin (SFBAAB) through a comprehensive program of planning, regulation, enforcement, technical innovation, and education. The clean air strategy includes the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations, and issuance of permits for stationary sources. The BAAQMD also inspects stationary sources and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by law.

BAAQMD Regulatory Requirements

The combustion equipment associated with the proposed project that includes new diesel engines to power generators and possibly new natural gas-fired boilers would establish new sources of particulate matter and gaseous emissions. Emissions would primarily result from the testing of the emergency backup generators, operation of the boilers for space and water heating and some minor emissions from cooling towers. The project would also generate emissions from vehicles traveling to and from the project.

[4] California Air Resources Board, 2000. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*. October.
[5] California Air Resources Board, 2005. *Air Quality and Land Use Handbook: A Community Health Perspective.* April.

Certain emission sources would be subject to BAAQMD Regulations and Rules. The District's rules and regulations that may apply to the project include:

- Regulation 2 – Permits
  - Rule 2-1: General Requirements
  - Rule 2-2: New Source Review
- Regulation 6 – Particulate Matter and Visible Emissions
- Regulation 9 – Inorganic Gaseous Pollutants
  - Rule 9-1 : Sulfur Dioxide
  - Rule 9-7: Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, And Process Heaters
  - Rule 9-8: Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines

Permits – Rule 2-1-301 requires that any person installing, modifying, or replacing any equipment, the use of which may reduce or control the emission of air contaminants, shall first obtain an authority to construct (ATC).

Rule 2-1-302 requires that written authorization from the BAAQMD in the form of a permit to operate (PTO) be secured before any such equipment is used or operated.

Rule 2-1 lists sources that are exempt from permitting. At the proposed facility, the diesel fuel storage tanks are expected to be exempt from permitting.

New Source Review - Rule 2-2, New Source Review (NSR), applies to all new and modified sources or facilities that are subject to the requirements of Rule 2-1-301. The purpose of the rule is to provide for review of such sources and to provide mechanisms by which no net increase in emissions will result.

Rule 2-2-301 requires that an applicant for an Authority to Construct (ATC) or Permit to Operate (PTO) apply best available control technology (BACT) to any new or modified source that results in an increase in emissions and has emissions of precursor organic compounds, non-precursor organic compounds, NOx, SO_2, PM_{10}, or CO of 10.0 pounds or more per highest day. Based on the estimated emissions from the proposed project, BACT will be required for NOx emissions from the diesel-fueled generator engines.

BACT for Diesel Generator Engines – Since the generators will be used exclusively for emergency use during involuntary loss of power, the BACT 2 levels listed for IC compression engines in the BAAQMD BACT Guidelines would apply. The BACT 2 NOx emission factor limit is 6.9 grams per horsepower hour (g/hp-hr). The project's proposed engines will have emissions lower than the BACT 2 level and, as such, will comply with the BACT requirements.

Offsets - Rule 2-2-302 require that offsets be provided for a new or modified source that emits more than 10 tons per year of NOx or precursor organic compounds. It is not expected that

emissions of any pollutant will exceed the offset thresholds. Thus, is not expected that offsets for the proposed project would be required.

Prohibitory Rules - Regulation 6 pertains to particulate matter and visible emissions. Although the engines will be fueled with diesel, they will be modern, low emission engines. Thus, the engines are expected to comply with Regulation 6.

Rule 9-1 applies to sulfur dioxide. The engines will use ultra-low sulfur diesel fuel (less than 15 ppm sulfur) and will not be a significant source of sulfur dioxide emissions and are expected to comply with the requirements of Rule 9-1.

Rule 9-7 limits the emissions of NOx CO from industrial, institutional and commercial boilers, steam generators and process heaters. This regulation typically applies to boilers with a heat rating of 2 million British Thermal Units (BTU) per hour

Rule 9-8 prescribes NOx and CO emission limits for stationary internal combustion engines. Since the proposed engines will be used with emergency standby generators, Regulation 9-8-110 exempts the engines from the requirements of this Rule, except for the recordkeeping requirements (9-8-530) and limitations on hours of operation for reliability-related operation (maintenance and testing). The engines will not operate more than 50 hours per year, which will satisfy the requirements of 9-8-111.

Stationary Diesel Airborne Toxic Control Measure (ACTM) – The BAAQMD administers the State's ACTM for Stationary Diesel engines (section 93115, title 17 CA Code of Regulations). The project's engines will be new stationary emergency standby diesel engines larger than 50 hp. Since the engines will have an uncontrolled PM emission factor of less than 0.15 g/hp-hr and operate no more than 50 hours per year, the engines will comply with the requirements of the ACTM.

Clean Air Plan

The BAAQMD is responsible for developing a Clean Air Plan which guides the region's air quality planning efforts to attain the CAAQS. The BAAQMD's 2017 Clean Air Plan is the latest Clean Air Plan which contains district-wide control measures to reduce ozone precursor emissions (i.e., ROG and NO_X), particulate matter and greenhouse gas emissions. The Bay Area 2017 Clean Air Plan, which was adopted on April 19, 2017 by the BAAQMD's board of directors:

- Updates the Bay Area 2010 Clean Air Plan in accordance with the requirements of the California Clean Air Act to implement "all feasible measures" to reduce ozone;
- Provides a control strategy to reduce ozone, particulate matter (PM), air toxics, and greenhouse gases in a single, integrated plan;
- Reviews progress in improving air quality in recent years; and
- Continues and updates emission control measures.

BAAQMD CARE Program

The Community Air Risk Evaluation (CARE) program was initiated in 2004 to evaluate and reduce health risks associated with exposures to outdoor TACs in the Bay Area. The program examines TAC emissions from point sources, area sources and on-road and off-road mobile sources with an emphasis on diesel exhaust, which is a major contributor to airborne health risk in California. The CARE program is an on-going program that encourages community involvement and input. The technical analysis portion of the CARE program is being implemented in three phases that includes an assessment of the sources of TAC emissions, modeling and measurement programs to estimate concentrations of TAC, and an assessment of exposures and health risks. Throughout the program, information derived from the technical analyses will be used to focus emission reduction measures in areas with high TAC exposures and high density of sensitive populations. Risk reduction activities associated with the CARE program are focused on the most at-risk communities in the Bay Area. The BAAQMD has identified six communities as impacted: Concord, Richmond/San Pablo, Western Alameda County, San Jose, Redwood City/East Palo Alto, and Eastern San Francisco.

Planning Healthy Places

BAAQMD developed a guidebook that provides air quality and public health information intended to assist local governments in addressing potential air quality issues related to exposure of sensitive receptors to exposure of emissions from local sources of air pollutants. The guidance provides tools and recommended best practices that can be implemented to reduce exposures. The information is provided as recommendations to develop policies and implementing measures in city or county General Plans, neighborhood or specific plans, land use development ordinances, or into projects.

Odors

Odor impacts are subjective in nature and are generally regarded as an annoyance rather than a health hazard. The ability to detect and react to odors varies considerably among people. A strong or unfamiliar odor is more easily detected and are more likely to cause complaints. BAAQMD responds to odor complaints from the public and considers a source to have a substantial number of odor complaints if the complaint history includes five or more confirmed complaints per year averaged over a 3-year period. Facilities that are regulated by CalRecycle (e.g. landfill, composting, etc.) are required to have Odor Impact Minimization Plans in place.

BAAQMD California Environmental Quality Act (CEQA) Air Quality Guidelines

The BAAQMD *CEQA Air Quality Guidelines*[6] were prepared to assist in the evaluation of air quality impacts of projects and plans proposed within the Bay Area. The guidelines provide recommended procedures for evaluating potential air impacts during the environmental review process consistent with CEQA requirements including thresholds of significance, mitigation measures, and background air quality information. They also include assessment methodologies

[6] Bay Area Air Quality Management District, 2017. *CEQA Air Quality Guidelines*. May. See http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

for air toxics, odors, and greenhouse gas emissions. In June 2010, the BAAQMD's Board of Directors adopted CEQA thresholds of significance and an update of their *CEQA Guidelines*. In May 2011, the updated BAAQMD *CEQA Air Quality Guidelines* were amended to include a risk and hazards threshold for new receptors and modify procedures for assessing impacts related to risk and hazard impacts.

BAAQMD's adoption of significance thresholds contained in the 2011 CEQA Air Quality Guidelines was called into question by an order issued March 5, 2012, in California Building Industry Association (CBIA) v. BAAQMD (Alameda Superior Court Case No. RGI0548693). The order requires BAAQMD to set aside its approval of the thresholds until it has conducted environmental review under CEQA. The ruling made in the case concerned the environmental impacts of adopting the thresholds and how the thresholds would indirectly affect land use development patterns. In August 2013, the Appellate Court struck down the lower court's order to set aside the thresholds. However, the California Supreme Court accepted a portion of CBIA's petition to review the appellate court's decision to uphold BAAQMD's adoption of the thresholds. The specific portion of the argument considered was whether CEQA requires consideration of the effects of the environment on a project (as contrasted to the effects of a proposed project on the environment). On December 17, 2015, the California Supreme Court ruled that CEQA generally does not require an analysis of the effects of existing environmental conditions (e.g., air quality) on a project unless the project would exacerbate those conditions somehow through its construction and/or operation. In response to the legal issues, BAAQMD revised their CEQA Guidelines in May 2017. These guidelines were used to prepare this analysis.

Local Plans and Policies

City of Sunnyvale General Plan

The following air quality goals and policies contained in the City's General Plan[7] are applicable to the proposed project:

> Goal EM-11 Improved Air Quality: Improve Sunnyvale's Air Quality and Reduce the Exposure of its Citizens to Air Pollutants.
>
> - *Policy EM-11.1*: The City should actively participate in regional air quality planning. Future development within Sunnyvale impacts regional air quality. Indirect impacts are related to vehicle trips attracted to or generated by residential, commercial or employment-generating land uses. There are several methods in which land use regulations can be used to both reduce emissions and alleviate the impact on residences. By locating employment and retail services areas closer to residential areas, vehicle use can be reduced.
>
> - *Policy EM-11.2*: Utilize land use strategies to reduce air quality impact, including opportunities for citizens to live and work in close proximity.

[7] City of Sunnyvale, 2011. *Sunnyvale General Plan*.

- *Policy EM-11.3*: Require all new development to utilize site planning to protect citizens from unnecessary exposure to air pollutants.

- *Policy EM-11.4*: Apply the indirect source rule to new development with significant air quality impacts. Indirect source review would cover commercial and residential projects as well as other land uses that produce or attract motor vehicle traffic.

City of Sunnyvale Land Use and Transportation Element

In 2017, Sunnyvale adopted an update to the City's Land Use and Transportation Element (LUTE) of its General Plan. The LUTE combined the long-range planning requirements of both land use and circulation elements into one chapter of the General Plan. An environmental impact report for the LUTE evaluated the environmental impacts associated with development of the City based on the land use and transportation elements established in the LUTE. Air quality and greenhouse gas emissions associated with construction and operation of the LUTE were addressed in that EIR.

Much of the air quality impacts associated with this project were addressed under the *LUTE Draft EIR*[8]. Projects constructed in Sunnyvale are subject to the mitigation measures contained in the LUTE DEIR. Impacts and mitigation measures pertaining to the proposed DEIR were identified. This included project-specific impacts. The focus of this air quality study is to address impacts associated with criteria air pollutants and toxic air contaminant (TAC) exposure associated with project construction and exposure of project occupants to TAC sources near the project site (i.e., within 1,000 feet). This air quality report incorporates the mitigation measures (MM) described in the LUTE.

The LUTE DEIR identified significant and unavoidable impacts with respect to temporary construction period emissions (Impact 3.5.3). Potentially significant impacts were also identified in regard to exposing existing and new sensitive receptors to unhealthy levels of TACs and $PM_{2.5}$ (Impact 3.5.5 & 3.5.6).

MM 3.5.3 Violate an Air Quality Standard of Contribute Substantially to an Air Quality Violation During Short-Term Construction Activities

NEW POLICY: Prior to the issuance of grading or building permits, the City of Sunnyvale shall ensure that the BAAQMD basic construction mitigation measures from Table 8-1 of the BAAQMD 2011 CEQA Air Quality Guidelines (or subsequent updates) are noted on the construction documents.[9]

NEW POLICY: In the cases where construction projects are projected to exceed the BAAQMD's air pollutant significance thresholds for NO_X, PM_{10}, and/or $PM_{2.5}$, all off-road diesel-fueled equipment (e.g., rubber-tired dozers, graders, scrapers,

[8] City of Sunnyvale. 2016. *Land Use and Transportation Element Draft Environmental Impact Report* (SCH No.2012032003). August.

[9] Note that the BAAQMD Basic Construction Mitigation Measures Recommended for ALL Proposed Projects is listed as Table 8-2 in the BAAQMD 2017 CEQA Air Quality Guidelines.

excavators, asphalt paving equipment, cranes, tractors) shall be at least CARB Tier 3 Certified or better.

The DEIR identified potentially significant impacts associated with exposure of sensitive receptors to substantial pollutant concentrations because project may expose new sensitive receptors to significant health risks associated with TAC exposure. To address this issue, MM 3.5.6 requires future projects located within 1,000 feet of sensitive receptors to perform a construction health risk assessment:

MM 3.5.5 Exposure of Sensitive Receptors to Substantial Toxic Air Containments Concentrations During Construction

NEW POLICY: In the case when a subsequent project's construction span is greater than 5 acres and/or is scheduled to last more than two years, the subsequent project applicant shall be required to prepare a site-specific construction pollutant mitigation plan in consultation with Bay Area Air Quality Management District (BAAQMD) staff prior to the issuance of grading permits. A project-specific construction-related dispersion modeling acceptable to the BAAQMD shall be used to identify potential toxic air contaminant impacts, including diesel particulate matter. If BAAQMD risk thresholds (i.e., probability of contracting cancer is greater than 10 in one million) would be exceeded, mitigation measures shall be identified in the construction pollutant mitigation plan to address potential impacts and shall be based on site-specific information such as the distance to the nearest sensitive receptors, project site plan details, and construction schedule. The City shall ensure construction contracts include all identified measures and that the measures reduce the health risk below BAAQMD risk thresholds. Construction pollutant mitigation plan measures shall include but not be limited to:

1. Limiting the amount of acreage to be graded in a single day.
2. Restricting intensive equipment usage and intensive ground disturbance to hours outside of normal school hours
3. Notifying affected sensitive receptors one week prior to commencing onsite construction so that any necessary precautions (such as rescheduling or relocation of outdoor activities) can be implemented. The written notification shall include the name and telephone number of the individual empowered to manage construction of the project. In the event that complaints are received, the individual empowered to manage construction shall respond to the complaint within 24 hours. The response shall include identification of measures being taken by the project construction contractor to reduce construction-related air pollutants. Such a measure may include the relocation of equipment.

MM 3.5.6 Exposure of Sensitive Receptors to Substantial Toxic Air Contaminant Concentrations During Operation

NEW POLICY: The following measures shall be utilized in site planning and building designs to reduce TAC and $PM_{2.5}$ exposure where new receptors are located within 1,000 feet of emissions sources:

- Future development that includes sensitive receptors (such as residences, schools, hospitals, daycare centers, or retirement homes) located within 1,000 feet of Caltrain, Central Expressway, El Camino Real, Lawrence Expressway, Mathilda Avenue, Sunnyvale-Saratoga Road, US 101, State Route 237, State Route 85, and/or stationary sources shall require site-specific analysis to determine the level of health risk. This analysis shall be conducted following procedures outlined by the BAAQMD. If the site-specific analysis reveals significant exposures from all sources (i.e., health risk in terms of excess cancer risk greater than 100 in one million, acute or chronic hazards with a hazard Index greater than 10, or annual $PM_{2.5}$ exposures greater than 0.8 $\mu g/m^3$) measures shall be employed to reduce the risk to below the threshold (e.g., electrostatic filtering systems or equivalent systems and location of vents away from TAC sources). If this is not possible, the sensitive receptors shall be relocated.

- Future nonresidential developments identified as a permitted stationary TAC source or projected to generate more than 100 heavy-duty truck trips daily will be evaluated through the CEQA process or BAAQMD permit process to ensure they do not cause a significant health risk in terms of excess cancer risk greater than 10 in one million, acute or chronic hazards with a hazard Index greater than 1.0, or annual $PM_{2.5}$ exposures greater than 0.3 $\mu g/m^3$ through source control measures.

- For significant cancer risk exposure, as defined by the BAAQMD, indoor air filtration systems shall be installed to effectively reduce particulate levels to avoid adverse public health impacts. Projects shall submit performance specifications and design details to demonstrate that lifetime residential exposures would not result in adverse public health impacts (less than 10 in one million chances).

Note that the project would not include new sensitive receptors and sensitive receptors are not located within 1,000 feet of the project site; therefore, construction and operation of the project would not affect sensitive receptors.

Greenhouse Gas Regulatory Framework

This section summarizes key federal, State, and City statutes, regulations, and policies that would apply to the proposed project. Global climate change resulting from GHG emissions is an emerging environmental concern being raised and discussed at the international, national, and statewide level. At each level, agencies are considering strategies to control emissions of gases that contribute to global climate change.

Federal Regulations

The United States participates in the United Nations Framework Convention on Climate Change (UNFCCC). While the United States signed the Kyoto Protocol, which would have required reductions in GHGs, Congress never ratified the protocol. The federal government chose voluntary and incentive-based programs to reduce emissions and has established programs to promote climate technology and science. At this time, there are no federal regulations or policies pertaining to GHG emissions from proposed projects or plans.

State Regulations

The State of California is concerned about GHG emissions and their effect on global climate change. The State recognizes that "there appears to be a close relationship between the concentration of GHGs in the atmosphere and global temperatures" and that "the evidence for climate change is overwhelming." The effects of climate change on California, in terms of how it would affect the ecosystem and economy, remain uncertain. The State has many areas of concern regarding climate change with respect to global warming. According to the 2006 Climate Action Team Report, the following climate change effects and conditions can be expected in California over the course of the next century:

- A diminishing Sierra snowpack declining by 70 percent to 90 percent, effecting the state's water supply;
- Increasing temperatures from 8 to 10.4 degrees Fahrenheit (°F) under the higher emission scenarios, leading to a 25 to 35 percent increase in the number of days ozone pollution standards are exceeded in most urban areas;
- Coastal erosion along the length of California and seawater intrusion into the Sacramento River Delta from a 4- to 33-inch rise in sea level. This would exacerbate flooding in already vulnerable regions;
- Increased vulnerability of forests due to pest infestation and increased temperatures;
- Increased challenges for the state's important agricultural industry from water shortages, increasing temperatures, and saltwater intrusion into the Delta; and
- Increased electricity demand, particularly in the hot summer months.

Assembly Bill 1575 (1975)

In 1975, the Legislature created the California Energy Commission (CEC). The CEC regulates electricity production that is one of the major sources of GHGs.

Title 24, Part 6 of the California Code of Regulations (1978)

The Energy Efficiency Standards for Residential and Nonresidential Buildings were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards

are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods.

Assembly Bill 1493 (2002)

Assembly Bill (AB) 1493 required CARB to develop and adopt regulations that reduce GHG emitted by passenger vehicles and light duty trucks.

State of California Executive Order S-3-05 (2005)

The Governor's Executive Order established aggressive emissions reductions goals: by 2010, GHG emissions must be reduced to 2000 levels; by 2020, GHG emissions must be reduced to 1990 levels; and by 2050, GHG emissions must be reduced to 80 percent below 1990 levels.

In June 2005, the Governor of California signed Executive Order S-3-05, which identified Cal/EPA as the lead coordinating State agency for establishing climate change emission reduction targets in California. A "Climate Action Team," a multi-agency group of State agencies, was set up to implement Executive Order S-3-05. Under this order, the State plans to reduce GHG emissions to 80 percent below 1990 levels by 2050. GHG emission reduction strategies and measures to reduce global warming were identified by the California Climate Action Team in 2006.

Assembly Bill 32 (AB 32), California Global Warming Solutions Act (2006)

AB 32, the Global Warming Solutions Act of 2006, codifies the State's GHG emissions target by directing CARB to reduce the State's global warming emissions to 1990 levels by 2020. AB 32 was signed and passed into law by Governor Schwarzenegger on September 27, 2006. Since that time, the CARB, CEC, California Public Utilities Commission (CPUC), and Building Standards Commission have all been developing regulations that will help meet the goals of AB 32 and Executive Order S-3-05.

A Scoping Plan for AB 32 was adopted by CARB in December 2008. It contains the State's main strategies to reduce GHGs from business-as-usual emissions projected in 2020 back down to 1990 levels. Business-as-usual (BAU) is the projected emissions in 2020, including increases in emissions caused by growth, without any GHG reduction measures. The Scoping Plan has a range of GHG reduction actions, including direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system.

Senate Bill 375, California's Regional Transportation and Land Use Planning Efforts (2008)

California enacted legislation (SB 375) to expand the efforts of AB 32 by controlling indirect GHG emissions caused by urban sprawl. SB 375 provides incentives for local governments and applicants to implement new conscientiously planned growth patterns. This includes incentives for creating attractive, walkable, and sustainable communities and revitalizing existing communities. The legislation also allows applicants to bypass certain environmental reviews under CEQA if they

build projects consistent with the new sustainable community strategies. Development of more alternative transportation options that would reduce vehicle trips and miles traveled, along with traffic congestion, would be encouraged. SB 375 enhances CARB's ability to reach the AB 32 goals by directing the agency in developing regional GHG emission reduction targets to be achieved from the transportation sector for 2020 and 2035. CARB works with the metropolitan planning organizations (e.g. Association of Bay Area Governments [ABAG] and Metropolitan Transportation Commission [MTC]) to align their regional transportation, housing, and land use plans to reduce vehicle miles traveled and demonstrate the region's ability to attain its GHG reduction targets. A similar process is used to reduce transportation emissions of ozone precursor pollutants in the Bay Area.

Executive Order S-13-08 (2008)

This Executive Order directed California agencies to assess and reduce the vulnerability of future construction projects to impacts associated with sea-level rise.

SB 350 Renewable Portfolio Standards

In September 2015, the California Legislature passed SB 350, which increases the states Renewables Portfolio Standard (RPS) for content of electrical generation from the 33 percent target for 2020 to a 50 percent renewables target by 2030.

Executive Order EO-B-30-15 (2015) and SB 32 GHG Reduction Targets

In April 2015, Governor Brown signed Executive Order which extended the goals of AB 32, setting a greenhouse gas emissions target at 40 percent of 1990 levels by 2030. On September 8, 2016, Governor Brown signed SB 32, which legislatively established the GHG reduction target of 40 percent of 1990 levels by 2030. In November 2017, CARB issued *California's 2017 Climate Change Scoping Plan*. While the State is on track to exceed the AB 32 scoping plan 2020 targets, this plan is an update to reflect the enacted SB 32 reduction target.

The new Scoping Plan establishes a path that will reduce GHG emissions in California to meet the 2030 target (note that the AB 32 Scoping Plan only addressed 2020 targets and a long-term goal). Key features of this plan are:

- Cap and Trade program places a firm limit on 80 percent of the State's emissions;
- Achieving a 50-percent Renewable Portfolio Standard by 2030 (currently at about 29 percent statewide);
- Increase energy efficiency in existing buildings (note that new
- Develop fuels with an 18-percent reduction in carbon intensity;
- Develop more high-density, transit oriented housing;
- Develop walkable and bikeable communities
- Greatly increase the number of electric vehicles on the road and reduce oil demand in half;

- Increase zero-emissions transit so that 100 percent of new buses are zero emissions;
- Reduce freight-related emissions by transitioning to zero emissions where feasible and near-zero emissions with renewable fuels everywhere else; and
- Reduce "super pollutants" by reducing methane and hydrofluorocarbons or HFCs by 40 percent.

In the updated Scoping Plan, CARB recommends statewide targets of no more than 6 metric tons CO2e per capita by 2030 and no more than 2 metric tons CO2e per capita by 2050. The statewide per capita targets account for all emissions sectors in the State, statewide population forecasts, and the statewide reductions necessary to achieve the 2030 statewide target under SB 32 and the longer-term State emissions reduction goal of 80 percent below 1990 levels by 2050.

Bay Area Air Quality Management District

BAAQMD is the regional government agency that regulates sources of air pollution within the nine San Francisco Bay Area counties. The BAAQMD regulates GHG emissions through the following plans, programs, and guidelines.

Regional Clean Air Plans

BAAQMD and other air districts prepare clean air plans in accordance with the State and Federal Clean Air Acts. The Bay Area 2010 Clean Air Plan (CAP) is a comprehensive plan to improve Bay Area air quality and protect public health through implementation of a control strategy designed to reduce emissions and ambient concentrations of harmful pollutants. The most recent CAP also includes measures designed to reduce GHG emissions.

BAAQMD Climate Protection Program

The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the San Francisco Bay Area Air Basin. The climate protection program includes measures that promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy, all of which assist in reducing emissions of GHG and in reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

BAAQMD CEQA Air Quality Guidelines

The BAAQMD adopted revised CEQA Air Quality Guidelines on June 2, 2010 and then adopted a modified version of the Guidelines in May, 2011. The BAAQMD CEQA Air Quality Guidelines include thresholds of significance for greenhouse gas emissions. Under the latest CEQA Air Quality Guidelines, a local government may prepare a qualified greenhouse gas Reduction Strategy that is consistent with AB 32 goals. If a project is consistent with an adopted qualified greenhouse gas Reduction Strategy, it can be presumed that the project will not have significant

GHG emissions under CEQA.[10] The BAAQMD also developed a quantitative threshold for project- and plan-level analyses based on estimated GHG emissions, as well as per capita metrics.

City of Sunnyvale Climate Action Plan

In 2014, the City adopted the City of Sunnyvale Climate Action Plan (CAP).[11] The City has a GHG reduction target of reducing GHG levels by 15 percent from 2008 levels by 2020 and progress towards 80 percent below 1990 levels by 2050. To reach their 2020 goal, the City of Sunnyvale must reduce emissions by a minimum of 237,960 $MTCO_{2e}$ or 17 percent of total baseline emissions. This Climate Action Plan is intended to streamline future environmental review of development projects in Sunnyvale by following the BAAQMD CEQA Air Quality Guidelines for a Qualified GHG Reduction Strategy. The CAP includes a checklist that identifies the minimum criteria a project must demonstrate to use the City's CAP for purposes of streamlining the analysis of GHG emissions under CEQA. Minimum criteria outlined below includes: 1) consistency with CAP forecasts, and 2) incorporation of applicable Near-Term (prior to 2016) strategies and measures from the CAP as binding and enforceable components of the project. Any projects that exceed the 2020 forecasts may still rely on the CAP for identification of measures and standards for mitigation. However, since such projects would exceed the assumptions of the CAP forecast, the City requires that the project demonstrate anticipated project-level GHG emissions estimates using CalEEMod. An analysis of project-level GHG emissions was conducted using the BAAQMD CEQA Air Quality Guidelines. Emissions for the proposed project are discussed below and were analyzed using the methodology recommended in the BAAQMD CEQA Air Quality Guidelines.[12]

Climate Action Playbook (CAP 2.0)

The City of Sunnyvale is in the process of updating the CAP adopted May 2014. The Draft Climate Action Playbook is the City of Sunnyvale's next step to achieving carbon neutrality.[13] This document establishes new strategies, targets, and actions to reduce fossil fuel consumption and greenhouse gas emission at a local level. By 2050, the City seeks to reduce emission by 80 percent. The Climate Action Playbook is currently in the public review process and is scheduled to be considered for adoption by the City Council this summer (in 2019), and therefore the strategies within this document are not yet applicable to this report.

City of Sunnyvale Land Use and Transportation Element

As previously discussed, the City adopted the LUTE and accompanying EIR in 2017. The LUTE is intended to implement local land use and transportation planning efforts in a manner consistent with the Metropolitan Transportation Commission's (MTC) Sustainable Communities Strategy (SCS) and Plan Bay Area, which is a regional growth strategy required under Senate Bill (SB)

[10] Bay Area Air Quality Management District, 2017. *CEQA Air Quality Guidelines*. May.
[11] Available at: http://www.pmcworld.com/client/sunnyvale/documents/final-ClimateActionPlan.pdf. Accessed on June 16, 2017.
[12] BAAQMD, 2017. *Op cit.*
[13] City of Sunnyvale, 2019. *Climate Action Playbook Public Review Draft*. March. https://sunnyvale.ca.gov/civicax/filebank/blobdload.aspx?t=69582.16&BlobID=26319

375. The LUTE, in combination with transportation policies and programs, strives to reduce GHG emissions. The LUTE DEIR addressed impacts associated with GHG emissions from projects built-out under the LUTE. The DEIR found that the LUTE may conflict with the Sunnyvale Climate Action Plan (CAP), as it consists of growth beyond what was utilized in the CAP. Mitigation was adopted to address this impact.

MM 3.13.1 Upon adoption of the Draft LUTE, the City will update the Climate Action Plan to include the new growth projects of the Draft LUTE and make any necessary adjustments to the CAP to ensure year 2020 and 2035 greenhouse gas emission reduction targets are attained.

PROJECT IMPACTS AND MITIGATION MEASURES

Significance Criteria

Significance Thresholds

Per Appendix G of the CEQA Guidelines and BAAQMD recommendations, air quality and GHG impacts are considered significant if implementation of the Project would[14]:

1) Conflict with or obstruct implementation of an applicable air quality plan.
2) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
3) Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
4) Expose sensitive receptors to substantial pollutant concentrations.
5) Create objectionable odors affecting a substantial number of people.
6) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.
7) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA. These Thresholds were designed to establish the level at which BAAQMD believed air pollution emissions would cause significant environmental impacts under CEQA and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (updated May 2011). The City uses the significance thresholds recommended by BAAQMD. In response to the legal issues, BAAQMD revised their CEQA Guidelines in May 2017. The

[14] Note that updates to Appendix G of the CEQA Guidelines were adopted December 28, 2018, subsequent to this analysis. The changes in the CEQA Guidelines that pertain to air quality and greenhouse gas emissions as a result of this update do not change the conclusions identified in this report, nor, the measures in the Construction Emissions Management Plan prepared for the project.

thresholds identified in Table 3 represent the most recent guidance provided by BAAQMD that are used by the City of Sunnyvale.

TABLE 3 Air Quality Significance Thresholds

Criteria Air Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	**Average Daily Emissions (lbs./day)**	**Annual Average Emissions (tons/year)**
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82 (Exhaust)	82	15
$PM_{2.5}$	54 (Exhaust)	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards	**Single Sources Within 1,000-foot Zone of Influence**	**Combined Sources (Cumulative from all sources within 1,000-foot zone of influence)**	
Excess Cancer Risk	>10 per one million	>100 per one million	
Hazard Index	>1.0	>10.0	
Incremental annual $PM_{2.5}$	>0.3 µg/m^3	>0.8 µg/m^3	
Odors	**Complaints**	**Complaints**	
	No threshold	5 confirmed complaints per year averaged over three years	

Note: ROG = reactive organic gases, NOx = nitrogen oxides, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less.

Impact: Conflict with or obstruct implementation of an applicable air quality plan.

BAAQMD is the regional agency responsible for overseeing compliance with State and Federal laws, regulations, and programs within the San Francisco Bay Area Air Basin (SFBAAB). BAAQMD, with assistance from ABAG and MTC, has prepared and implements specific plans to meet the applicable laws, regulations, and programs. The most recent and comprehensive of which is the *Bay Area 2017 Clean Air Plan*.[15] This is the update to the *Bay Area 2010 Clean Air Plan*. BAAQMD's CEQA guidelines assist lead agencies in evaluating the significance of air quality

[15] Bay Area Air Quality Management District (BAAQMD), 2017. *Final 2017 Clean Air Plan.*. This is an update to the *Bay Area 2010 Clean Air Plan*

impacts. In formulating compliance strategies, BAAQMD relies on planned land uses established by local general plans. Land use planning can affect vehicle travel, which in turn affects region-wide emissions of air pollutants and GHGs. The effect of land use changes and implementation of control measures consistent with the Clean Air Plan is addressed under the *BAAQMD CEQA Air Quality Guidelines* for Plan impacts. Plan impacts were addressed for the LUTE, where the LUTE land uses plans and transportation circulation was determined not to conflict with the applicable Clean Air Plan. Because development of land uses contemplated and permitted in the LUTE would not conflict with the applicable Clean Air Plan, the impact was considered ***less-than-significant***, and no mitigation measures were identified.

Impact: Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable State or federal ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

The Bay Area is considered a non-attainment area for ground-level ozone and $PM_{2.5}$ under both the Federal Clean Air Act and the California Clean Air Act. The area is also considered non-attainment for PM_{10} under the California Clean Air Act, but not the federal act. The area has attained both State and federal ambient air quality standards for carbon monoxide. As part of an effort to attain and maintain ambient air quality standards for ozone, $PM_{2.5}$ and PM_{10}, the BAAQMD has established thresholds of significance for these air pollutants and their precursors. These thresholds are for ozone precursor pollutants (ROG and NOx), PM_{10}, and $PM_{2.5}$ and apply to both construction period and operational period impacts.

Emissions Modeling

The California Emissions Estimator Model (CalEEMod) Version 2016.3.2 was used to estimate emissions from construction and operation of the site assuming full build-out of the project. The project land use types and size, and anticipated construction schedule were input to CalEEMod. For construction impacts, separate modeling was conducted for the 100 Caribbean, 200 Caribbean and Construction Parking/Office areas. Operational emissions were modeled separately for two runs that included existing uses and the proposed project.

Construction Period Emissions

Equipment Emissions

CalEEMod was used to provide emission estimates for on-site construction activities. On-site activities are primarily made up of construction equipment emissions, while off-site activity includes worker, hauling, and vendor traffic. The proposed project land uses were input into CalEEMod for three different input files, which are described in Table 4.

A construction build-out scenario, including equipment list and schedule by phase, was provided by the project applicant. The schedule was provided by phase including the estimated start and end

dates along with the phase duration in days. Equipment usage was provided by phase that included the type and quantity of each piece of equipment along with the number of days during the phase it would operate and the average hours per operating day. The total number of hours was divided by the number of days in the phase to calculate the number of hours per day that was entered in CalEEMod. Traffic generated by construction, which included worker trips, vendor deliveries and material hauling were computed separately using the CARB EMFAC2017 model (discussed below). All other construction inputs were based on the CalEEMod model.

The construction emission computations with CalEEMod assume that construction begins in early 2019. This reflected the most aggressive construction schedule. Construction activities that occur in the timeframe beyond what the modeling reflects would likely be lower because emissions rates from construction equipment and traffic are lower due to improved emissions in newer equipment. Newer vehicles and construction equipment are assumed in the CalEEMod model for future years. The emissions presented in this analysis, are therefore, assumed to be an overestimate.

Construction Traffic Emissions

Construction would produce traffic in the form of worker trips and truck traffic. The traffic-related emissions are based on worker and vendor trip estimates produced by CalEEMod and haul trip that were computed based on the estimate of demolition material to be exported, soil material to be imported and the estimate of cement truck trips. CalEEMod provides daily estimates of worker and vendor trips for each applicable phase. The total trips for those were computed by multiplying the daily rate by the number of days in that phase. Haul trips for demolition were estimated from the provided demolition tonnage by assuming each truck could carry 10 tons per load. Truck trips for the provided quantity of imported of soil to the site were estimated based on a truck capacity of 15 tons per truckload. Note soil would be imported for the Site Preparation and Green Roof construction activities. The number of cement truckloads were provided with the construction information.

TABLE 4 Summary of CalEEMod Construction Model Runs

CalEEMod Run/Land Uses	Size	Units	Building Floor Area (sf)
Run: ***18-072 100 Caribbean Construction*** *-Area Size = 18.20 acres* *-Begin March 2020 end January 2023*			
General Office Building	536.75	1000sqft	536,750
Parking Lot	85.00	1000sqft	--
Run: ***18-072 200 Caribbean Construction*** *- Area Size = 26.70 acres* *- Begin January 2020 end September 2023*			
General Office Building	505.14	1000sqft	505,140
Parking Lot	85.00	1000sqft	--
Unenclosed Parking with Elevator	1,235.00	Space	376,145
Run: 18-072 Caribbean Construction Parking *– Area Size = 8.66 acres* *-Begin and end in 2019*			

Parking Lot	8.66	Acre	--

The traffic information was combined with motor vehicle emissions factors, based on the State's latest on-road mobile emission factor model. The latest version of the model made available by CARB is EMFAC2017[16]. EMFAC2017 provides aggregate emission rates in grams per mile for each vehicle type. The vehicle mix for this study was based on CalEEMod default assumptions, where worker trips are assumed to be comprised of light-duty autos (EMFAC category LDA) and light duty trucks (EMFAC category LDT1and LDT2). Vendor trips are comprised of delivery and large trucks (EMFAC category MHDT and HHDT) and haul trucks, including cement trucks, are comprised of large trucks (EMFAC category HHDT). Travel distances are based on CalEEMod default lengths, which are 10.8 miles for worker travel, 7.3 miles for vendor trips and 20 miles for hauling (demolition export and soil import). Since CalEEMod does not address cement trucks, these were treated as vendor travel distances. Each trip was assumed to include an idle time of 5 minutes. Emissions associated with vehicle starts were also included. Table 5 provides the traffic inputs that were combined with the EMFAC2017 emission database to compute vehicle emissions.

[16] See CARB's EMFAC2017 Web Database at https://www.arb.ca.gov/emfac/2017/, accessed May 1, 2018

TABLE 5 Traffic Data Used for EMFAC2017 Model Runs

CalEEMod Run/Land Uses and Construction Phase	Total Trips by Trip Type			Notes
	Worker[1]	Vendor[1]	Haul[2]	
Vehicle mix[1]	50% LDA 25% LDT1 25% LDT2	50% MHDT 50% HHDT	100% HDDT	
Trip Length (miles)	10.8	7.3	20.0 Demo & Soil 7.3 cement	truck idle time = 5 minutes
100 Caribbean Construction *-Area Size = 18.20 acres* *-Begin June 2019*				
Demolition and Site Work	2,275	-	1,400	18,000 tons building material and 7,000 tons pavement
Site Preparation/Grading/Soil Import	2,365	-	12,625	Import of 101,000 cy
Piles/Foundations/Utilities	3,360	-	2,640	540 + 780 cement trucks
Building Structures	79,695	39,270	1,840	920 cement trucks
Building Exterior and Green Roof	58,995	29,070	1,300	Import of 6,500 cy
Paving	3,280	-	-	
Building Interiors	10,865	-	-	
200 Caribbean Construction *- Area Size = 26.70 acres* *- Begin March 2019*				
Demolition and Site Work	2,975	-	1,600	24,000 tons building material and 8,000 tons pavement
Site Preparation/Grading/Soil Import	2,365	-	22,188	Export 15,000 cy Import 156,000 cy
Piles/Foundations/Utilities	4,515	-	2,458	461 + 684 + 84 cement trucks
Building Structures	70,700	30,975	3,110	920 + 635 cement trucks
Building Exterior and Green Roof	109,080	47,790	813	Import of 6,500 cy
Paving	6,800	-	-	
Building Interiors	19,440	-	-	
Run: 18-072 Caribbean Construction Parking *– Area Size = 8.66 acres* *-Begin January 2019*				
Demolition and Site Work	20	0	303	
Site Preparation/Grading/Soil Import	20	0	0	

Notes:
[1] Based on CalEEMod estimates
[2] Based on truck delivery estimates provided as part of the construction schedule and information

Construction Emissions Management Plan

The project includes measures to minimize construction emissions that pertain to dust generation, equipment exhaust and haul truck traffic exhaust. The effect of these measures was modeled as follows:

- The CalEEMod model mitigation module was used to model Tier 4 construction equipment. There are two types of Tier 4 equipment: Tier 4 interim and Tier 4 final. A combination of Tier 4 interim and Tier 4 final equipment was assumed.

- Measures that reduce dust generation were also modeled in the CalEEMod Mitigation modules, that reflect site watering and reduced on-site vehicle speeds.

- The EMFAC2017 model was used to compute emission factors for a fleet of haul trucks that are model year 2010 or newer. These rates were combined with the forecast of truck trips predicted by CalEEMod for material hauling.

Construction Period Emissions

The anticipated construction schedule assumes that the project would be built out over a period of approximately 3 years beginning as early as January 2019, or an estimated 780 construction workdays (assuming an average of 260 construction days per year for at least 3 years).

Average daily emissions were computed by dividing the total construction emissions by the number of construction days. Table 6 shows average daily construction emissions of ROG, NO_X, PM_{10} exhaust, and $PM_{2.5}$ exhaust during construction of the project. As indicated in Table 6, predicted project emissions would not exceed the BAAQMD significance thresholds. Construction period emissions are considered ***less than significant***.

TABLE 6 Construction Period Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust
Parking and Office construction emissions				
Equipment	0.13 tons	0.46 tons	0.06 tons	0.06 tons
Traffic	<0.01 tons	0.02 tons	<0.00 tons	<0.00 tons
100 Caribbean construction emissions				
Equipment	3.12 tons	4.85 tons	0.07 tons	0.08 tons
Traffic	0.35 tons	3.79 tons	0.07 tons	0.07 tons
200 Caribbean construction emissions				
Equipment	2.96 tons	3.12 tons	0.04 tons	0.04 tons
Traffic	0.46 tons	3.79 tons	0.10 tons	0.09 tons
Total construction emissions (tons)	7.01 tons	17.44 tons	0.35 tons	0.34 tons
Average daily emissions (pounds)[1]	18 lbs.	45 lbs.	1 lbs.	1 lbs.
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	**No**	**No**	**No**	**No**
Notes: [1]Assumes 3 years or 780 workdays.				

Construction activities, particularly during site preparation and grading, would temporarily generate fugitive dust in the form of PM_{10} and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are implemented to reduce these emissions. The *Construction Emissions Management Plan* for this project implements measures that are consistent with the latest version of the BAAQMD CEQA Air Quality Guidelines and the LUTE DEIR mitigation measure for construction period emissions (*MM 3.5.3)* that pertain to construction period emissions.

Operational Period Emissions

The CalEEMod model was used to compute operational air emissions from the project. These emissions would be generated primarily from autos driven by future employees and customers. Evaporative emissions from architectural coatings and maintenance products (classified as consumer products) are typical emissions from these types of uses. CalEEMod computed emissions from operation of the proposed project assuming full build-out.

Land Uses

The project land uses were input to CalEEMod for the full project build-out and the existing uses as shown in Table 7.

TABLE 7 Summary of CalEEMod Operational Model Runs

CalEEMod Run/Land Uses	Size	Units	Building Floor Area (sf)
Run: ***Google Caribbean Campuses*** *-Begin Operation = 2023*			
Office Park	1,041.89	1000sqft	1,041,890
Unenclosed Parking with Elevator	1,235	Space	379,145
Parking Lot	286.4	1000sqft	286,400
Run: ***Existing 100- 200 Caribbean Uses*** *- Begin Operation = 2023*			
General Light Industry	50.88	1000sqft	50,880
General Office Building	25.20	1000sqft	25,200
Unrefrigerated Warehouse-No Rail	108.51	1000sqft	108,510
Manufacturing	125.64	1000sqft	125,640

Model Year

Emissions associated with vehicle travel depend on the year of analysis because emission control technology requirements are phased-in over time. Therefore, the earlier the year analyzed in the model, the higher the emission rates utilized by CalEEMod. The earliest the project could possibly

be constructed and begin operating would be 2023. Emissions associated with build-out later than 2023 would be lower.

Trip Generation Rates

CalEEMod allows the user to enter specific vehicle trip generation rates, which were input to the model using the daily trip generation rate provided in the project trip generation table, which includes a 12.5-percent trip reduction due to implementation of a Transportation Demand Management (TDM) program used in the traffic analysis. Note that this project is planning to achieve a 25-percent TDM trip reduction (30-percent reduction for peak hour). When incorporating the effect of the TDM Plan, the project is predicted to generate 9,017 weekday trips[17]. The default trip lengths and trip types specified by CalEEMod were used.

Energy

CalEEMod defaults for energy use include the 2016 Title 24 building standards. The project would be designed to achieve LEED Gold and it is estimated that, in doing so, the project would exceed the 2016 Title 24 standards. For this analysis, the project was assumed to exceed 2016 Title 24 standards by 5 percent[18].

Project Generators

Stationary sources of air pollutants are one 600 kW and one 1,000 kW diesel engines that power generators to provide emergency backup power in the event of a power failure. These generators would be operated for testing and maintenance purposes, with a maximum of 50 hours each per year of non-emergency operation under normal conditions allowed by BAAQMD. During testing periods, the engine would typically be run for less than one hour. The engine would be required to meet CARB and EPA emission standards and consume commercially available California low-sulfur diesel fuel. The generator and boiler emissions were modeled using CalEEMod.

Other Inputs

Default model assumptions for emissions associated with solid waste generation and water/wastewater use were applied to the project.

Existing Land Uses

The project would replace existing land uses that are currently in operation. The primary source of emissions from these uses are traffic. The project traffic forecasts also include trip generation rates that were applied to the existing uses.

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[17] Wood-Rodgers. 2019. *100-200 W Caribbean Drive TIA Draft, Sunnyvale, CA.* February

[18] Note that the CEC predicts non-residential uses built in 2020 or later would have be 30-percent more energy efficient. See *2019 Building Energy Efficiency Standards* https://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_Standards_FAQ.pdf

Modeling Output and Assumptions

Emissions from existing uses were subtracted from the project emissions to predict the increase in pollutant emissions caused by the project. As shown in Table 8, operational emissions would not exceed the BAAQMD significance thresholds. This would be considered a *less-than-significant* impact. *Attachment 1* includes the CalEEMod output values and modeling assumptions for construction emissions.

TABLE 8 Operational Emissions

Scenario	ROG	NOx	PM_{10}	$PM_{2.5}$
2023 Project Operational Emissions (*tons/year*)	6.64 tons	7.29 tons	6.40 tons	1.82 tons
Existing Operational Emissions (*tons/year*)	1.65 tons	1.26 tons	1.16 tons	0.33 tons
Net Project Total Operational Emissions (*tons/year*)	4.99 tons	6.03 tons	5.24 tons	1.49 tons
BAAQMD Thresholds (tons /year)	*10 tons*	*10 tons*	*15 tons*	*10 tons*
Exceed Threshold?	**No**	**No**	**No**	**No**
Net Project Total Operational Emissions (*pounds/day*)	27 lbs.	33 lbs.	29 lbs.	8 lbs.
BAAQMD Thresholds (pounds/day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	**No**	**No**	**No**	**No**
[1] Assumes 365-day operation.				

Impact: Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Air Quality Standards for Regional Air Pollutants

Emissions of nonattainment pollutants and their precursors that affect air quality standards at the regional level were evaluated above. Although the project could cause a cumulatively considerable net increase in ozone precursor emissions (i.e., construction NOx emissions exceed significance thresholds), they are no expected to cause or substantially contribute to a violation of an ozone ambient air quality standard. The magnitude of the project NOx emissions compared to region-wide emissions that cause ozone ambient air quality standards to be exceeded is quite small. As described in the BAAQMD CEQA Air Quality Guidelines, "no single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards." So project emissions of NOx are not anticipated to cause or contribute substantially to an air quality violation.

At a local level, a project could affect ambient air quality standards for particulate matter (PM_{10} and to some extent $PM_{2.5}$); however, BAAQMD considers appropriate application of control measures to mitigate this impact (as previously described).

Carbon monoxide emissions from traffic generated by the project would be the pollutant of greatest concern at the local level. Congested intersections with a large volume of traffic have the greatest potential to cause high-localized concentrations of carbon monoxide. Air pollutant monitoring data indicate that carbon monoxide levels have been at healthy levels (i.e., below State and federal standards) in the Bay Area since the early 1990s. As a result, the region has been designated as

attainment for the standard. The highest measured level over any 8-hour averaging period during the last 3 years in the Bay Area is less than 3.0 parts per million (ppm), compared to the ambient air quality standard of 9.0 ppm. Intersections affected by the project would have traffic volumes well below the BAAQMD screening criteria of 44,000 vehicles during the peak hour, and thus, would not cause a violation of an ambient air quality standard or have a considerable contribution to cumulative violations of these standards.[19] The project would not cause the violation of an air quality standard or worsen an existing violation of an air quality standard.

Because appropriate dust control measures are required to ensure PM_{10} and $PM_{2.5}$ emissions are minimized, this impact is considered ***less than significant***.

Impact: Expose sensitive receptors to substantial pollutant concentrations?

BAAQMD has developed community risk thresholds that evaluate increased cancer risk, non-cancer adverse health impacts in terms of a hazard index and annual $PM_{2.5}$ concentrations (see Table 1). Project construction would be a temporary source of TAC and $PM_{2.5}$ emissions. Most on-site construction equipment would be diesel-powered. DPM that would be emitted from this equipment and trucks used during construction, is a TAC that can elevate cancer risk and $PM_{2.5}$ concentrations.

In applying the community risk thresholds, BAAQMD recommends that sensitive receptors within 1,000 feet of a project be considered. The closest sensitive receptors to the project are located well beyond 1,000 feet at more than 3,000 feet. Figure 2 shows the project affected areas and the area within 1,000 feet of the site. A health risk assessment of the project construction activities was not conducted since sensitive receptors are located far away from the site. Given the large distance and temporary nature of this impact, community risk caused by construction is considered ***less than significant***. It should be noted that Mitigation Measure AQ-1 would substantially reduce the emissions of TACs and $PM_{2.5}$ during construction.

[19] For a land-use project type, the BAAQMD CEQA Air Quality Guidelines state that a proposed project would result in a less than significant impact to localized carbon monoxide concentrations if the project would not increase traffic at affected intersections with more than 44,000 vehicles per hour.

Figure 2. Project Site and Approximate 1,000-foot Area of Influence for Assessing TAC Impacts

Long-term operational emissions from the project would include traffic (including delivery truck traffic), DPM emissions from routine testing and maintenance operation of diesel engines used to power the back-up emergency generators, and natural gas combustion from equipment used to provide space and water heating. Each of these sources would have minor emissions of TACs or $PM_{2.5}$. The emissions from generator operation (limited to 50 hours per year for non-emergency conditions) and natural gas combustion would be located more than 3,000 feet from sensitive receptors and have negligible effects. Traffic emissions would be spread out over a large area and have a negligible effect on any one sensitive receptor. In their guidance for evaluating traffic community risk thresholds, BAAQMD recommends projects evaluate roadways near sensitive receptors with over 10,000 average daily trips. The project would generate about 9,000 daily trips distributed over many roadways. The net increase in traffic when considering operation of the existing uses would be less.

The project in the short-term (i.e., during construction) or long-term (i.e., operation) would not cause cancer risk, non-cancer health effects or annual $PM_{2.5}$ concentrations to exceed the community risk thresholds. This would be a ***less-than-significant*** impact.

Impact: Create objectionable odors affecting a substantial number of people?

The project is not considered a source of odors that would result in frequent odor complaints. In addition, there are no sensitive receptors, such as residents, that would be sensitive to odors near the project. Project construction activities could result in odorous emissions from diesel exhaust associated with construction equipment, architectural coatings and application of asphalt during paving. However, because of the temporary nature of these emissions or activities and the highly

diffusive properties of diesel exhaust and fumes, exposure of sensitive receptors to these emissions would be limited. Odor impacts would be ***less-than-significant***.

> **Impact:** Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions associated with development of the proposed project would occur over the short-term from construction activities, consisting primarily of emissions from equipment exhaust and worker and vendor trips. There would also be long-term operational emissions associated with vehicular traffic within the project vicinity, energy and water usage, and solid waste disposal. Emissions for the proposed project are discussed below and were analyzed using the methodology recommended in the BAAQMD CEQA Air Quality Guidelines.

Significance Thresholds

The BAAQMD CEQA Air Quality Guidelines recommend GHG significance thresholds for land use projects and stationary sources (i.e., equipment that emits GHG and has to obtain a permit to operate from BAAQMD). BAAQMD's recommended GHG threshold of 1,100 metric tons or 4.6 metric tons per capita was developed based on meeting the 2020 GHG targets set in the scoping plan that addressed AB 32. Development of the project would occur beyond 2020, so a threshold that addresses a future target is appropriate. The basis of the BAAQMD thresholds were used to develop plan level thresholds for 2040. Although BAAQMD has not published a quantified threshold for 2030 yet, this assessment uses a "Substantial Progress" efficiency metric of 2.8 MT CO2e/year/service population (SP). This is calculated for 2030 based on the GHG reduction goals of EO B-30-15, taking into account the 1990 inventory and the projected 2030 statewide target goal of a 40-percent reduction of 1990 levels by 2030.[20] This analysis assumes that 2020 levels will be equal or below 1990 levels. CARB reports that California is on target for meeting the 2020 GHG emission reduction goal. Many of the GHG reduction measures (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted over the last five years and implementation activities are ongoing[21]. The threshold for stationary sources that are permitted by BAAQMD is 10,000 MT/year.

The 2018 updated CEQA Guidelines state that in determining the significance of a project's GHG emissions, the analysis should focus on predicting a reasonably foreseeable incremental contribution of the project's emissions to the effects of climate change. The agency's analysis should consider a timeframe that is appropriate for the project. The CEQA Guidelines recommend that the analysis must reasonably reflect evolving scientific knowledge and state regulatory schemes. For this analysis, a time frame that includes the first conceivable year of operation and year 2030 operating conditions were used. Year 2030 is considered to occur in an appropriate timeframe where reasonable predictions can be made using available modeling techniques that involve traffic and emission rate projections. Therefore, potential GHG emissions were predicted out to year 2030. The new Scoping Plan establishes a path that will reduce GHG emissions in

[20] Association of Environmental Professionals, 2016. *Beyond 2020 and Newhall: A Field Guide to New CEQA Greenhouse Gas Thresholds and Climate Action Plan Targets for California*. April.
[21] CARB. 2018. AB 32 Scoping Plan. See https://www.arb.ca.gov/cc/scopingplan/scopingplan.htm

California to meet the 2030 target that is 40 percent lower than 1990 levels. For this analysis, year 2020 levels are considered to be equivalent to 1990 levels.

Qualified GHG Reduction Plan

In 2014, the City adopted the City of Sunnyvale Climate Action Plan (CAP).[22] This plan contains strategies to reduce GHG emissions that achieve a 15 percent reduction below 2008 emissions levels by 2020. This Climate Action Plan is intended to streamline future environmental review of development projects in Sunnyvale by following the BAAQMD CEQA Air Quality Guidelines for a Qualified GHG Reduction Strategy. The CAP includes a checklist that identifies the minimum criteria a project must demonstrate to use the City's CAP for purposes of streamlining the analysis of GHG emissions under CEQA. Minimum criteria outlined below includes: 1) consistency with CAP forecasts, and 2) incorporation of applicable Near-Term (prior to 2016) strategies and measures from the CAP as binding and enforceable components of the project. Any projects that exceed the 2020 forecasts may still rely on the CAP for identification of measures and standards for mitigation. However, since such projects would exceed the assumptions of the CAP forecast, the City requires that the project demonstrate anticipated project-level GHG emissions estimates using CalEEMod. An analysis of project-level GHG emissions was conducted using the BAAQMD CEQA Air Quality Guidelines. Emissions for the proposed project are discussed below and were analyzed using the methodology recommended in the BAAQMD CEQA Air Quality Guidelines.[23]

CalEEMod Modeling

CalEEMod was used to predict GHG emissions from operation of the site assuming full build-out of the project. The project land use types and size and other project-specific information were input to the model, as described previously for computing criteria air pollutant emissions.

Several features to reduce GHG emissions were included in the CalEEMod modeling. The project proposes to install solar photovoltaic power systems at the parking facility that is estimated to produce 1,794,800 kilowatts of electricity annually. In addition, the project is intended to be designed LEED Gold and would likely exceed 2016 Title 24 standards for building efficiency by at least 5 percent[24]. Low-flow water fixtures and water-efficient irrigation systems would be included in the project. Since the project would have a high density of workers, the rate of solid waste generated was adjusted based on the applicant's projections of 42.8 cubic yards per workday.

GHG emissions modeling include the indirect emissions from electricity consumption. The electricity produced emission rate was modified in CalEEMod. CalEEMod has a default emission factor of 641.3 pounds of CO_2 per megawatt of electricity produced, which is based on PG&E's 2008 emissions rate. PG&E published 2016 emissions rates, which is the emission rate for delivered electricity had been reduced to 295 pounds of CO2 per megawatt of electricity

[22] Available at: http://www.pmcworld.com/client/sunnyvale/documents/final-ClimateActionPlan.pdf. Accessed on June 16, 2017.
[23] BAAQMD, 2017. *Op cit.*
[24] Note that the CEC predicts non-residential uses built in 2020 or later would have be 30-percent more energy efficient. See *2019 Building Energy Efficiency Standards*
https://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_Standards_FAQ.pdf

delivered[25]. The projected GHG intensity factor for the year 2020 is 290 pounds of CO_2 per megawatt of electricity produced, which was input to the model[26]. Note that PG&E's latest confirmed emission rate for 2016 just about achieves the projected 2020 rate[27].

Service Population Emissions

The project service population efficiency rate is based on the number of future full-time employees. According to the applicant, the number of future full-time employees is estimated at 4,500 workers.

Construction Emissions

GHG emissions associated with construction were computed to be 7,303 MT of CO_2e for the total construction period. These are the emissions from on-site operation of construction equipment, vendor and hauling truck trips, and worker trips. Neither the City nor BAAQMD have an adopted threshold of significance for construction-related GHG emissions, though BAAQMD recommends quantifying emissions and disclosing that GHG emissions would occur during construction. BAAQMD also encourages the incorporation of best management practices to reduce GHG emissions during construction where feasible and applicable. Best management practices assumed to be incorporated into construction of the proposed project include but are not limited to: using local building materials of at least 10 percent and recycling or reusing at least 50 percent of construction waste or demolition materials.

Operational Emissions

The LUTE DEIR identified GHG emissions associated with the LUTE as cumulatively considerable because of different methods between the LUTE and CAP analyses to GHG emissions per service population. The emissions for the LUTE were computed to be below the CAP threshold of 2.7 metric tons per service population. This analysis predicts the GHG emissions from the proposed project and compares them to a service population threshold that is based on the BAAQMD CEQA Guidelines, adjusted for the latest Statewide GHG reduction goals for 2030.

The CalEEMod model, along with the project vehicle trip generation rates, was used to estimate annual emissions associated with operation of the fully-developed site under the proposed project. In 2023 as shown in Table 10, annual emissions resulting from operation of the proposed project are predicted to be 11,019 MT of CO2e (plus 76 MT that is associated with stationary sources). The annual emissions from operation of the existing buildings are computed as 2,015 MT of CO2e. The net emissions resulting from the project would be 9,004 MT of CO2e. The service population threshold was used to determine the significance. Note that BAAQMD recommends that emissions from stationary sources that they permit be compared against a separate threshold of 10,000 MT/year. As shown in Table 10, service population emissions would be below the BAAQMD

[25] PG&E 2017. Climate Change. See https://www.pgecurrents.com/2018/03/26/independent-registry-confirms-record-low-carbon-emissions-for-pge/ accessed March 26, 2019.
[26] PG&E. 2015. Greenhouse Gas Emission Factors: Guidance for PG&E Customers
See: https://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf
[27] PG&E. 2018. *Independent Registry Confirms Record Low Carbon Emissions for PG&E* March 26. See https://www.pgecurrents.com/2018/03/26/independent-registry-confirms-record-low-carbon-emissions-for-pge/

threshold for 2020 and the projected future threshold (i.e., for 2030) and, therefore, this would be considered a *less-than-significant* impact.

TABLE 10 Annual Project GHG Emissions (CO_2e) in Metric Tons

Source Category	Existing in 2023	Proposed Project in 2023	Proposed Project in 2030
Area	0	0	0
Energy Consumption	677	3,588	3,588
Mobile	1,069	5,965	4,944
Solid Waste Generation	173	1,208	1,206
Water Usage	95	260	260
Total	2,015	11,019	9,998
Net New Emissions		**9,004**	
Service Population Emissions (New Emissions/Number of Employees)		**2.45**	**2.22**
Significance Threshold		4.6 in 2020 2.8 in 2030	2.8 in 2030
Permitted Stationary Sources	--	76	76
Significance Threshold		10,000	

Impact: Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

AB 32, the Global Warming Solutions Act of 2006, codifies the State of California's GHG emissions target by directing CARB to reduce the state's global warming emissions to 1990 levels by 2020. AB 32 was signed and passed into law by Governor Schwarzenegger on September 27, 2006. Since that time, CARB, CEC, the California Public Utilities Commission (CPUC), and the Building Standards Commission have all been developing regulations that will help meet the goals of AB 32 and Executive Order S-3-05. A Scoping Plan for AB 32 was adopted by CARB in December 2008. It contains the State of California's main strategies to reduce GHGs from BAU emissions projected in 2020 back down to 1990 levels. BAU is the projected emissions in 2020, including increases in emissions caused by growth, without any GHG reduction measures. The Scoping Plan has a range of GHG reduction actions, including direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. It required CARB and other state agencies to develop and adopt regulations and other initiatives reducing GHGs by 2012.

As directed by AB 32, CARB has also approved a statewide GHG emissions limit. On December 6, 2007, CARB staff resolved an amount of 427 MMT of CO_2e as the total statewide GHG 1990 emissions level and 2020 emissions limit. The limit is a cumulative statewide limit, not a sector- or facility-specific limit. CARB updated the future 2020 BAU annual emissions forecast, in light of the economic downturn, to 545 MMT of CO_2e. Two GHG emissions reduction measures currently enacted that were not previously included in the 2008 Scoping Plan baseline inventory were included, further reducing the baseline inventory to 507 MMT of CO_2e. Thus, an estimated reduction of 80 MMT of CO_2e is necessary to reduce statewide emissions to meet the AB 32 target by 2020. In, CARB issued *California's 2017 Climate Change Scoping Plan*. While the State is on

track to exceed the AB 32 scoping plan 2020 targets (i.e., meeting 1990 levels by 2020), this plan is an update to reflect the enacted SB 32 reduction target of reducing 1990 levels 40 percent by 2030.

The proposed project would not conflict or otherwise interfere with the statewide GHG reduction measures identified in CARB's Scoping Plan. The project would comply with requirements of the new Green Building Standards Code. For example, proposed buildings would be constructed in conformance with CALGreen and the Title 24 Building Code, which requires high-efficiency water fixtures and water-efficient irrigation systems. The project would be designed to meet the City's requirement of Gold certification under LEED v4 BD+C: New Construction as a condition of entitlement. The consistency of the project with respect to the City's Climate Action Plan, or CAP, is described in Attachment 2 along with the CAP CEQA Checklist.

Attachment 1: CalEEMod Output Worksheets, Construction Schedule

Construction Information

Project Name: Google Caribbean Campus - 100 Site

Complete ALL Portions in Yellow

See Equipment Type TAB for type, horsepower and load factor

Google Caribbean Campus 100 Building

Project Size	0	Dwelling Units	Approx 18.2	total project acres disturbed
	0	s.f. residential		
	0	s.f. retail		
	536,750	s.f. office/commercial		
	0	s.f. other, specify:		
	0	s.f. parking garage		spaces
	85,000	s.f. parking lot		spaces

Pile Driving: (N) - Using Auger Displacement

Construction Hours 7 am to 5 pm

Qty	Description	HP	Load Factor		Hours/day	Total Work Days	Avg. Hours per day	Annual Hours	HP Hours	Comments	
	Demolition of Existing Buildings and Sitework	**Start Date:**		3/27/2020	**Total phase:**	85				**Demolition Volume**	
		End Date:		8/14/2020						Square footage of buildings to be demolished	
4	Concrete/Industrial Saws	81	0.73		10	30	4	1200	70,956	(*or* total tons to be hauled)	
1	Crushing/Proc. Equipment	85	0.78		10	40	5	400	26,520		
2	Rubber-Tired Dozers	255	0.4		10	50	6	1000	102,000	**309,440 (existing building)** square feet *or*	
2	Rubber Tired Loaders	199	0.36		10	50	6	1000	71,640	**Approx. 18,000** Hauling volume (tons)	
3	Excavators	162	0.38		10	50	6	1500	92,340	Any pavement demolished and hauled? **Apprx. 7,000 tons**	
2	Tractors/Loaders/Backhoes	97	0.37		10	40	5	800	28,712		
	Site Preparation / Grading / Import Soil	**Start Date:**		8/14/2020	**Total phase:**	55					
		End Date:		11/2/2020						**Soil Hauling Volume**	
4	Scrapers	361	0.48		10	40	7	1600	277,248	Export volume = **0** cubic yards	
2	Graders	174	0.41		10	45	8	900	64,206	Import volume = **101,000** cubic yards	
2	Excavators	162	0.38		10	40	7	800	49,248		
3	Rollers	80	0.38		10	55	10	1650	50,160		
2	Rubber Tired Loaders	199	0.36		10	40	7	800	57,312		
1	Sweepers/Scrubbers	64	0.46		10	55	10	550	16,192		
2	Skid Steer Loaders	64	0.37		10	55	10	1100	26,048		
1	Tractors/Loaders/Backhoes	97	0.37		10	30	5	300	10,767		
	Dumpers/Tenders	16	0.38		10	40				**Modeled as trucks in EMFAC2017**	
	Piles / Foundations / Utilities	**Start Date:**		10/13/2020	**Total phase:**	85					
		End Date:		1/25/2021							
2	Bore/Drill Rigs	205	0.5		10	45	5	900	92,250	**Cement Trucks: Approx. 540 Total Round-Trips**	Piles - Building
2	Cranes	226	0.29		10	45	5	900	58,986		
2	Forklifts	89	0.2		10	70	8	1400	24,920		
3	Excavators	162	0.38		10	50	6	1500	92,340		
2	Rubber Tired Loaders	199	0.36		10	50	6	1000	71,640		
2	Tractors/Loaders/Backhoes	97	0.37		10	50	6	1000	35,890		
3	Dumpers/Tenders	16	0.38		10	50	6	1500	9,120		
2	Concrete Pump	84	0.74		10	15	2	300	18,648		
	Other Construction Equipment (Concrete Truck)	171	0.42		10	30				**Cement Trucks: Approx. 780 Total Round-Trips**	Foundations - Building
2	Skid Steer Loaders	64	0.37		10	50	6	1000	23,680		
2	Sweepers/Scrubbers	64	0.46		10	55	6	1100	32,384		
	Building Structures	**Start Date:**		1/26/2021	**Total phase:**	175					
		End Date:		10/4/2021							
2	Cranes	226	0.29		10	35	2	700	45,878	Or temporary line power? (Y/N) ___	Building Steel
2	Forklifts	89	0.2		10	35	2	700	12,460	Electric? (Y/N) ___ Otherwise assumed diesel	
4	Generator Sets	84	0.74		10	40	2	1600	99,456	Liquid Propane (LPG)? (Y/N) ___ Otherwise Assumed diesel	
4	Welders	46	0.45		10	40	2	1600	33,120		
	Other Construction Equipment	171	0.42		10	30			-	**Modeled as trucks in EMFAC2017**	
1	Concrete Pump	84	0.74		10	60	3	600	37,296		
	Other Construction Equipment (Concrete Truck)	171	0.42		10	60				**Cement Trucks: Approx. 920 Total Round-Trips**	Building Concrete
	Other Construction Equipment	171	0.42		10	60			-	**Modeled as trucks in EMFAC2017**	
1	Tractors/Loaders/Backhoes	97	0.37		10	40	2	400	14,356		
	Building Exterior & Green Roof	**Start Date:**		7/26/2021	**Total phase:**	310					
		End Date:		10/18/2022							
1	Cranes	226	0.29		10	170	5	1700	111,418		
3	Forklifts	89	0.2		10	150	5	4500	80,100		
4	Aerial Lifts	62	0.31		10	125	4	5000	96,100		
	Other Construction Equipment	171	0.42		10	200			-	**Modeled as trucks in EMFAC2017**	
2	Skid Steer Loaders	64	0.37		10	50	2	1000	23,680		
1	Tractors/Loaders/Backhoes	97	0.37		10	50	2	500	17,945		
	Dumpers/Tenders	16	0.38		10	50				Import volume = **6,500** cubic yards	Green Roof
	Building Interiors	**Start Date:**		11/17/2021	**Total phase:**	265					
		End Date:		11/3/2022							
	Air Compressors	78	0.48		8	160	5	0	-	Can these be electric? - YES	
	Aerial Lift / Scissor Lift	62	0.31		8	200	6	0	-	Can these be electric? - YES	
3	Forklifts	89	0.2		8	160	5	3840	68,352		
1	Cranes	226	0.29		8	48	1	384	25,167		
1	Generator Sets	84	0.74		8	90	3	720	44,755		
1	Welders	46	0.45		8	90	3	720	14,904		
	Other General Industrial Equipment	150	0.34		8	240			-	**Modeled as trucks in EMFAC2017**	
	Paving / Site Work	**Start Date:**		5/20/2022	**Total phase:**	170					
		End Date:		1/24/2023							
1	Pavers	125	0.42		8	20	1	160	8,400		
1	Paving Equipment	130	0.36		8	20	1	160	7,488		
4	Plate Compactors	8	0.43		8	30	1	960	3,302		
3	Rollers	80	0.38		8	20	1	480	14,592		
1	Surfacing Equipment	253	0.3		8	20	1	160	12,144		
2	Sweepers/Scrubbers	64	0.46		8	40	2	640	18,842		
2	Skid Steer Loaders	64	0.37		8	80	4	1280	30,310		
2	Forklifts	89	0.2		8	40	2	640	11,392		
	Other Construction Equipment	171	0.42		8	80			-	**Modeled as trucks in EMFAC2017**	

Equipment types listed in "Equipment Types" worksheet tab.
Equipment listed in this sheet is to provide an example of inputs
It is assumed that water trucks would be used during grading
Add or subtract phases and equipment, as appropriate
Modify horepower or load factor, as appropriate

Project Name: Google Caribbean Campus - 200 Site (Includes West Channel)

Complete ALL Portions in Yellow

See Equipment Type TAB for type, horsepower and load factor

Google Caribbean Campus 200 Building

Project Size	0	Dwelling Units	Approx. 26.7	total project acres disturbed
	0	s.f. residential		
	0	s.f. retail		
	505,140	s.f. office/commercial		
	81,000	s.f. other, specify:	Central Utility Plant	
	379,145	s.f. parking garage	1,235	spaces
	201,400	s.f. parking lot		spaces

Pile Driving: (N) - Using Auger Displacement

Construction Hours 7 am to 5 pm

Qty	Description	HP	Load Factor		Hours/day	Total Work Days	Avg. Hours per day	Annual Hours	HP Hours	Comments	
	Demolition of Existing Buildings and Sitework	**Start Date:**		12/30/2019	**Total phase:**	85				**Demolition Volume**	
		End Date:		5/11/2020						Square footage of buildings to be demolished	
4	Concrete/Industrial Saws	81	0.73		10	30	4	1200	70,956	(*or* total tons to be hauled)	
1	Crushing/Proc. Equipment	85	0.78		10	40	5	400	26,520		
2	Rubber-Tired Dozers	255	0.4		10	50	6	1000	102,000	**399,900 (existing building)** square feet *or*	
2	Rubber Tired Loaders	199	0.36		10	55	6	1100	78,804	**Approx. 24,000** Hauling volume (tons)	
3	Excavators	162	0.38		10	55	6	1650	101,574	Any pavement demolished and hauled? **Apprx. 8,000 tons**	
2	Tractors/Loaders/Backhoes	97	0.37		10	40	5	800	28,712		
	Site Preparation / Grading / Import Soil	**Start Date:**		5/26/2020	**Total phase:**	55					
		End Date:		8/12/2020						**Soil Hauling Volume**	
4	Scrapers	361	0.48		10	40	7	1600	277,248	Export volume = **15,000** cubic yards	West Channel
2	Graders	174	0.41		10	45	8	900	64,206	Import volume = **156,000** cubic yards	
2	Excavators	162	0.38		10	40	7	800	49,248		
3	Rollers	80	0.38		10	55	10	1650	50,160		
2	Rubber Tired Loaders	199	0.36		10	40	7	800	57,312		
1	Sweepers/Scrubbers	64	0.46		10	55	10	550	16,192		
2	Skid Steer Loaders	64	0.37		10	55	10	1100	26,048		
1	Tractors/Loaders/Backhoes	97	0.37		10	30	5	300	10,767		
	Dumpers/Tenders	16	0.38		10	55				**Modeled as trucks in EMFAC2017**	
	Piles / Foundations / Utilities	**Start Date:**		7/23/2020	**Total phase:**	105					
		End Date:		12/15/2020							
2	Bore/Drill Rigs	205	0.5		10	45	4	900	92,250	**Cement Trucks: Approx. 461 Total Round-Trips**	Piles - Building
2	Cranes	226	0.29		10	45	4	900	58,986		
2	Forklifts	89	0.2		10	70	7	1400	24,920		
3	Excavators	162	0.38		10	50	5	1500	92,340		
2	Rubber Tired Loaders	199	0.36		10	50	5	1000	71,640		
2	Tractors/Loaders/Backhoes	97	0.37		10	50	5	1000	35,890		
3	Dumpers/Tenders	16	0.38		10	50	5	1500	9,120		
2	Concrete Pump	84	0.74		10	15	1	300	18,648		
	Other Construction Equipment (Concrete Truck)	171	0.42		10	30				**Cement Trucks: Approx. 684 Total Round-Trips**	Foundations - Building
	Other Construction Equipment (Concrete Truck)	171	0.42		10	4				**Cement Trucks: Approx. 84 Total Round-Trips**	Foundations - Parking Structure
2	Skid Steer Loaders	64	0.37		10	50	5	1000	23,680		
2	Sweepers/Scrubbers	64	0.46		10	55	5	1100	32,384		
	Building Structures	**Start Date:**		10/30/2020	**Total phase:**	175					
		End Date:		7/15/2021							
2	Cranes	226	0.29		10	35	2	700	45,878	Or temporary line power? (Y/N)	Building Steel
2	Forklifts	89	0.2		10	35	2	700	12,460	Electric? (Y/N) Otherwise assumed diesel	
4	Generator Sets	84	0.74		10	40	2	1600	99,456	Liquid Propane (LPG)? (Y/N) Otherwise Assumed diesel	
4	Welders	46	0.45		10	40	2	1600	33,120		
	Other Construction Equipment	171	0.42		10	30				**Modeled as trucks in EMFAC2017**	
1	Concrete Pump	84	0.74		10	60	3	600	37,296		
	Other Construction Equipment (Concrete Truck)	171	0.42		10	60				**Cement Trucks: Approx. 920 Total Round-Trips**	Building Concrete
	Other Construction Equipment	171	0.42		10	60				**Modeled as trucks in EMFAC2017**	
1	Cranes	226	0.29		10	30	2	300	19,662		Parking Structure Precast
2	Forklifts	89	0.2		10	30	2	600	10,680		
	Other Construction Equipment	171	0.42		10	30				**Modeled as trucks in EMFAC2017**	
1	Concrete Pump	84	0.74		10	24	1	240	14,918		
	Other Construction Equipment (Concrete Truck)	171	0.42		10	24				**Cement Trucks: Approx. 635 Total Round-Trips**	Parking Structure Concrete
1	Tractors/Loaders/Backhoes	97	0.37		10	40	2	400	14,356		
	Building Exterior & Green Roof	**Start Date:**		5/5/2021	**Total phase:**	270					
		End Date:		6/2/2022							
1	Cranes	226	0.29		10	150	6	1500	98,310		
3	Forklifts	89	0.2		10	150	6	4500	80,100		
4	Aerial Lifts	62	0.31		10	125	5	5000	96,100		
	Other Construction Equipment	171	0.42		10	200				**Modeled as trucks in EMFAC2017**	
2	Skid Steer Loaders	64	0.37		10	50	2	1000	23,680		
1	Tractors/Loaders/Backhoes	97	0.37		10	50	2	500	17,945		
	Dumpers/Tenders	16	0.38		10	50				Import volume = **6,500** cubic yards	Green Roof
	Building Interiors	**Start Date:**		8/27/2021	**Total phase:**	240					
		End Date:		8/16/2022							
0	Air Compressors	78	0.48		8	160	5	0	-	Can these be electric? - YES	
0	Aerial Lift / Scissor Lift	62	0.31		8	200	7	0	-	Can these be electric? - YES	
3	Forklifts	89	0.2		8	160	5	3840	68,352		
1	Cranes	226	0.29		8	48	2	384	25,167		
1	Generator Sets	84	0.74		8	90	3	720	44,755		
1	Welders	46	0.45		8	90	3	720	14,904		
	Other General Industrial Equipment	150	0.34		8	240				**Modeled as trucks in EMFAC2017**	
	Paving / Site Work	**Start Date:**		1/10/2022	**Total phase:**	170					
		End Date:		9/9/2022							
1	Pavers	125	0.42		8	20	1	160	8,400		
1	Paving Equipment	130	0.36		8	20	1	160	7,488		
4	Plate Compactors	8	0.43		8	30	1	960	3,302		
3	Rollers	80	0.38		8	20	1	480	14,592		
1	Surfacing Equipment	253	0.3		8	20	1	160	12,144		
2	Sweepers/Scrubbers	64	0.46		8	40	2	640	18,842		
2	Skid Steer Loaders	64	0.37		8	80	4	1280	30,310		
2	Forklifts	89	0.2		8	40	2	640	11,392		
	Other Construction Equipment	171	0.42		8	80				**Modeled as trucks in EMFAC2017**	

Equipment types listed in "Equipment Types" worksheet tab.
Equipment listed in this sheet is to provide an example of inputs
It is assumed that water trucks would be used during grading
Add or subtract phases and equipment, as appropriate
Modify horepower or load factor, as appropriate

Construction CalEEMod Output

100 & 200 Caribbean Office -Construction Emissions
T4interim Mitigation & Post 2010 HDDT Trucks

Emissions

Condition		ROG	NOx	PM10	PM2.5	CO2	
Demolition and Parking							
	2019	0.13	0.46	0.06	0.06		
	2020	0.00	0.00	0.00	0.00		
	2021	0.00	0.00	0.00	0.00		
100 Caribbean Construction							
	2020	0.11	2.21	0.02	0.03		
	2021	0.42	1.47	0.02	0.02		
	2022	2.63	3.19	0.07	0.07		
200 Caribbean Construction							
	2020	0.14	2.75	0.03	0.03		
	2021	1.10	1.14	0.02	0.02		
	2022	1.75	0.81	0.02	0.02		
Traffic							
Demolition and Parking		0.00	0.02	0.00	0.00		
100 Caribbean Construction		0.35	3.55	0.07	0.07		
200 Caribbean Construction		0.46	4.70	0.10	0.09		
Total		7.09	20.31	0.41	0.41		tons
		14177	40611	814	814		lbs
		18	52	1	1		lbs/day
Days:		780					
Demolition and Parking			0.46				
			0.02				
100 Caribbean Construction			6.87				
			3.55				
200 Caribbean Construction			4.70				
			4.70				
			20.31				

100 & 200 Caribbean Office -Construction Emissions
T4final Mitigation & Post 2010 HDDT Trucks

Emissions

Condition		ROG	NOx	PM10	PM2.5	CO2	
Demolition and Parking							
	2019	0.13	0.46	0.06	0.06		
	2020	0.00	0	0.00	0.00		
	2021	0.00	0	0.00	0.00		
100 Caribbean Construction							
	2020	0.08	0.56	0.01	0.01		
	2021	0.40	0.56	0.01	0.01		
	2022	2.59	1.71	0.01	0.01		
200 Caribbean Construction							
	2020	0.10	0.71	0.01	0.01		
	2021	1.08	0.44	0.00	0.00		
	2022	1.74	0.39	0.00	0.00		
Traffic							63%
Demolition and Parking		0.00	0.02	0.00	0.00		
100 Caribbean Construction		0.35	3.55	0.07	0.07		
200 Caribbean Construction		0.46	4.70	0.10	0.09		
Total		6.94	13.11	0.29	0.27	tons	
		13883	26216	573	547	lbs	
		18	34	1	1	lbs/day	
Days:		780					
Demolition and Parking			0.46				
			0.02				
100 Caribbean Construction			2.83				
			3.55				
200 Caribbean Construction			1.54				
			4.70				
			13.11				

100 & 200 Caribbean Office -Construction Emissions
50%T4int+50%T4fin Mitigation & Post 2010 HDDT Trucks

Emissions

Condition		ROG	NOx	PM10	PM2.5	CO2	
Demolition and Parking							
	2019	0.13	0.46	0.06	0.06		
	2020	0.00	0.00	0.00	0.00		
	2021	0.00	0.00	0.00	0.00		
100 Caribbean Construction							
	2019	0.10	1.39	0.02	0.02		
	2020	0.41	1.02	0.01	0.01		
	2021	2.61	2.45	0.04	0.04		
200 Caribbean Construction							
	2019	0.12	1.73	0.02	0.02		
	2020	1.09	0.79	0.01	0.01		
	2021	1.74	0.60	0.01	0.01		
Traffic							
Demolition and Parking		0.00	0.02	0.00	0.00		
100 Caribbean Construction		0.35	3.79	0.07	0.07		
200 Caribbean Construction		0.46	5.20	0.10	0.09		
Total		7.01	17.44	0.35	0.34	tons	
		14030	34887	693	680	lbs	
		18	**45**	**0.9**	**0.9**	**lbs/day**	
Days:		780					

18-072 100 Caribbean Construction

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	536.75	1000sqft	18.20	536,750.00	0
Parking Lot	85.00	1000sqft	0.00	85,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CO2 Intensity = 290

Land Use - Acres = 18.2

Construction Phase - Based on schedule provided using total workdays and start dates by phase

Off-road Equipment - Unit & hours changed according to client spreadsheet

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Unit & hours changed according to client spreadsheet

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided equipment list

Trips and VMT - Computing trips with EMFAC2017

Demolition - Demo Volume = 18,000 tons Hauling + 7,000 ton pavement demo

Grading - Import 101,000 cy during grading and 6,500cy import on building exterior green roof

Construction Off-road Equipment Mitigation - Tier 4, All Equipment Mitigated

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	14.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	13.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim

tblConstructionPhase	PhaseEndDate	10/20/2022	1/12/2023
tblConstructionPhase	PhaseEndDate	6/4/2020	2/8/2021
tblConstructionPhase	PhaseStartDate	10/21/2022	11/17/2021
tblConstructionPhase	PhaseStartDate	6/5/2020	1/28/2021
tblConstructionPhase	PhaseStartDate	7/30/2021	7/26/2021
tblConstructionPhase	PhaseStartDate	4/24/2020	8/14/2020
tblConstructionPhase	PhaseStartDate	9/23/2022	5/20/2022
tblConstructionPhase	PhaseStartDate	6/5/2020	10/13/2020
tblGrading	MaterialImported	0.00	107,500.00
tblLandUse	LotAcreage	12.32	18.20
tblLandUse	LotAcreage	1.95	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	8.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	5.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	HaulingTripNumber	2,472.00	0.00
tblTripsAndVMT	HaulingTripNumber	13,438.00	0.00
tblTripsAndVMT	VendorTripNumber	102.00	0.00
tblTripsAndVMT	VendorTripNumber	102.00	0.00

tblTripsAndVMT	WorkerTripNumber	35.00	0.00
tblTripsAndVMT	WorkerTripNumber	43.00	0.00
tblTripsAndVMT	WorkerTripNumber	48.00	0.00
tblTripsAndVMT	WorkerTripNumber	207.00	0.00
tblTripsAndVMT	WorkerTripNumber	207.00	0.00
tblTripsAndVMT	WorkerTripNumber	40.00	0.00
tblTripsAndVMT	WorkerTripNumber	41.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.4362	4.7127	3.2837	6.5600e-003	0.4194	0.2146	0.6339	0.0572	0.1991	0.2562	0.0000	575.4446	575.4446	0.1718	0.0000	579.7398
2021	0.5738	2.0639	2.0436	3.6300e-003	0.0000	0.1024	0.1024	0.0000	0.0976	0.0976	0.0000	313.4432	313.4432	0.0689	0.0000	315.1667
2022	2.8584	3.5113	4.5555	7.2900e-003	0.0000	0.1722	0.1722	0.0000	0.1653	0.1653	0.0000	632.0427	632.0427	0.1345	0.0000	635.4048
2023	1.5900e-003	0.0163	0.0207	3.0000e-005	0.0000	8.2000e-004	8.2000e-004	0.0000	7.5000e-004	7.5000e-004	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Maximum	**2.8584**	**4.7127**	**4.5555**	**7.2900e-003**	**0.4194**	**0.2146**	**0.6339**	**0.0572**	**0.1991**	**0.2562**	**0.0000**	**632.0427**	**632.0427**	**0.1718**	**0.0000**	**635.4048**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.1125	2.2067	4.0147	6.5600e-003	0.1887	0.0197	0.2085	0.0129	0.0197	0.0326	0.0000	575.4439	575.4439	0.1718	0.0000	579.7391
2021	0.4204	1.4650	2.3433	3.6300e-003	0.0000	0.0221	0.0221	0.0000	0.0221	0.0221	0.0000	313.4428	313.4428	0.0689	0.0000	315.1664
2022	2.6172	3.1696	4.9472	7.2900e-003	0.0000	0.0641	0.0641	0.0000	0.0641	0.0641	0.0000	632.0420	632.0420	0.1345	0.0000	635.4040
2023	6.7000e-004	0.0151	0.0231	3.0000e-005	0.0000	3.7000e-004	3.7000e-004	0.0000	3.7000e-004	3.7000e-004	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Maximum	**2.6172**	**3.1696**	**4.9472**	**7.2900e-003**	**0.1887**	**0.0641**	**0.2085**	**0.0129**	**0.0641**	**0.0641**	**0.0000**	**632.0420**	**632.0420**	**0.1718**	**0.0000**	**635.4040**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**18.59**	**33.46**	**-14.39**	**0.00**	**55.00**	**78.31**	**67.56**	**77.51**	**77.03**	**77.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	3-27-2020	6-26-2020	1.4566	0.6374
2	6-27-2020	9-26-2020	1.4730	0.6006
3	9-27-2020	12-26-2020	2.1342	1.0331
4	12-27-2020	3-26-2021	0.7633	0.4788
5	3-27-2021	6-26-2021	0.3446	0.2174
6	6-27-2021	9-26-2021	0.5264	0.3359
7	9-27-2021	12-26-2021	0.9601	0.7930

8	**12-27-2021**	**3-26-2022**	1.7123	1.5525
9	**3-27-2022**	**6-26-2022**	1.8026	1.6344
10	**6-27-2022**	**9-26-2022**	1.8847	1.7019
11	**9-27-2022**	**12-26-2022**	1.0833	0.9972
12	**12-27-2022**	**3-26-2023**	0.0246	0.0212
		Highest	2.1342	1.7019

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition and Sitework	Demolition	3/27/2020	6/25/2020	5	65	
2	Site Preparation/Grading/Soil Import	Grading	8/14/2020	10/29/2020	5	55	gap between demo and site prep
3	Piles/Foundations/Utilities	Trenching	10/13/2020	2/8/2021	5	85	some overlap
4	Building Structures	Building Construction	1/28/2021	9/29/2021	5	175	some overlap
5	Building Exterior and Green Roof	Building Construction	7/26/2021	9/30/2022	5	310	overlap
6	Paving	Paving	5/20/2022	1/12/2023	5	170	
7	Building Interiors	Architectural Coating	11/17/2021	11/22/2022	5	265	overlap

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 805,125; Non-Residential Outdoor: 268,375; Striped Parking

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition and Sitework	Concrete/Industrial Saws	4	4.00	81	0.73
Demolition and Sitework	Crushing/Proc. Equipment	1	5.00	85	0.78
Demolition and Sitework	Excavators	3	6.00	158	0.38
Demolition and Sitework	Rubber Tired Dozers	2	6.00	247	0.40
Demolition and Sitework	Rubber Tired Loaders	2	6.00	203	0.36
Demolition and Sitework	Tractors/Loaders/Backhoes	2	5.00	97	0.37
Site Preparation/Grading/Soil Import	Excavators	2	7.00	158	0.38
Site Preparation/Grading/Soil Import	Graders	2	8.00	187	0.41
Site Preparation/Grading/Soil Import	Rollers	3	10.00	80	0.38
Site Preparation/Grading/Soil Import	Rubber Tired Dozers	0	10.00	247	0.40
Site Preparation/Grading/Soil Import	Rubber Tired Loaders	2	7.00	203	0.36
Site Preparation/Grading/Soil Import	Scrapers	4	8.00	367	0.48
Site Preparation/Grading/Soil Import	Skid Steer Loaders	2	10.00	65	0.37
Site Preparation/Grading/Soil Import	Sweepers/Scrubbers	1	10.00	64	0.46
Site Preparation/Grading/Soil Import	Tractors/Loaders/Backhoes	1	5.00	97	0.37
Piles/Foundations/Utilities	Bore/Drill Rigs	2	5.00	221	0.50
Piles/Foundations/Utilities	Cranes	2	5.00	231	0.29
Piles/Foundations/Utilities	Excavators	3	6.00	158	0.38
Piles/Foundations/Utilities	Forklifts	2	6.00	89	0.20
Piles/Foundations/Utilities	Other Construction Equipment	0	0.00	172	0.42
Piles/Foundations/Utilities	Pumps	2	2.00	84	0.74
Piles/Foundations/Utilities	Rubber Tired Loaders	2	6.00	203	0.36
Piles/Foundations/Utilities	Skid Steer Loaders	2	6.00	65	0.37

Piles/Foundations/Utilities	Sweepers/Scrubbers	2	6.00	64	0.46
Piles/Foundations/Utilities	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Building Structures	Cranes	2	2.00	231	0.29
Building Structures	Forklifts	2	2.00	89	0.20
Building Structures	Generator Sets	4	2.00	84	0.74
Building Structures	Other Construction Equipment	0	2.00	172	0.42
Building Structures	Pumps	1	3.00	84	0.74
Building Structures	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Structures	Welders	4	2.00	46	0.45
Building Exterior and Green Roof	Aerial Lifts	4	4.00	63	0.31
Building Exterior and Green Roof	Cranes	1	5.00	231	0.29
Building Exterior and Green Roof	Forklifts	3	5.00	89	0.20
Building Exterior and Green Roof	Generator Sets	0	8.00	84	0.74
Building Exterior and Green Roof	Other Construction Equipment	0	7.00	172	0.42
Building Exterior and Green Roof	Skid Steer Loaders	2	2.00	65	0.37
Building Exterior and Green Roof	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Exterior and Green Roof	Welders	0	8.00	46	0.45
Paving	Forklifts	2	2.00	89	0.20
Paving	Other Construction Equipment	0	8.00	172	0.42
Paving	Pavers	1	1.00	130	0.42
Paving	Paving Equipment	1	1.00	132	0.36
Paving	Plate Compactors	4	1.00	8	0.43
Paving	Rollers	3	1.00	80	0.38
Paving	Skid Steer Loaders	2	4.00	65	0.37
Paving	Surfacing Equipment	1	1.00	263	0.30
Paving	Sweepers/Scrubbers	2	2.00	64	0.46
Building Interiors	Aerial Lifts	10	7.00	63	0.31
Building Interiors	Air Compressors	8	6.00	78	0.48
Building Interiors	Cranes	1	1.00	231	0.29
Building Interiors	Forklifts	4	7.00	89	0.20
Building Interiors	Generator Sets	1	3.00	84	0.74
Building Interiors	Other Construction Equipment	0	7.00	172	0.42
Building Interiors	Welders	1	3.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition and Sitework	14	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation/Grading/S	17	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Piles/Foundations/Utiliti es	19	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Structures	14	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Exterior and Green Roof	11	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	16	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Interiors	25	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition and Sitework - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2675	0.0000	0.2675	0.0405	0.0000	0.0405	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1357	1.3209	0.9408	1.7700e-003		0.0659	0.0659		0.0621	0.0621	0.0000	154.8073	154.8073	0.0379	0.0000	155.7554
Total	**0.1357**	**1.3209**	**0.9408**	**1.7700e-003**	**0.2675**	**0.0659**	**0.3334**	**0.0405**	**0.0621**	**0.1026**	**0.0000**	**154.8073**	**154.8073**	**0.0379**	**0.0000**	**155.7554**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1204	0.0000	0.1204	9.1100e-003	0.0000	9.1100e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0294	0.6081	1.1046	1.7700e-003		2.7400e-003	2.7400e-003		2.7400e-003	2.7400e-003	0.0000	154.8071	154.8071	0.0379	0.0000	155.7552
Total	**0.0294**	**0.6081**	**1.1046**	**1.7700e-003**	**0.1204**	**2.7400e-003**	**0.1231**	**9.1100e-003**	**2.7400e-003**	**0.0119**	**0.0000**	**154.8071**	**154.8071**	**0.0379**	**0.0000**	**155.7552**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation/Grading/Soil Import - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1519	0.0000	0.1519	0.0167	0.0000	0.0167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2050	2.3728	1.5545	3.1300e-003		0.0998	0.0998		0.0918	0.0918	0.0000	275.3366	275.3366	0.0891	0.0000	277.5629
Total	**0.2050**	**2.3728**	**1.5545**	**3.1300e-003**	**0.1519**	**0.0998**	**0.2517**	**0.0167**	**0.0918**	**0.1085**	**0.0000**	**275.3366**	**275.3366**	**0.0891**	**0.0000**	**277.5629**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0684	0.0000	0.0684	3.7500e-003	0.0000	3.7500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0542	0.9968	1.8506	3.1300e-003		0.0100	0.0100		0.0100	0.0100	0.0000	275.3363	275.3363	0.0891	0.0000	277.5625
Total	**0.0542**	**0.9968**	**1.8506**	**3.1300e-003**	**0.0684**	**0.0100**	**0.0784**	**3.7500e-003**	**0.0100**	**0.0138**	**0.0000**	**275.3363**	**275.3363**	**0.0891**	**0.0000**	**277.5625**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Piles/Foundations/Utilities - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0955	1.0190	0.7885	1.6600e-003		0.0489	0.0489		0.0452	0.0452	0.0000	145.3007	145.3007	0.0448	0.0000	146.4215
Total	**0.0955**	**1.0190**	**0.7885**	**1.6600e-003**		**0.0489**	**0.0489**		**0.0452**	**0.0452**	**0.0000**	**145.3007**	**145.3007**	**0.0448**	**0.0000**	**146.4215**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0289	0.6019	1.0595	1.6600e-003		6.9600e-003	6.9600e-003		6.9600e-003	6.9600e-003	0.0000	145.3005	145.3005	0.0448	0.0000	146.4213
Total	**0.0289**	**0.6019**	**1.0595**	**1.6600e-003**		**6.9600e-003**	**6.9600e-003**		**6.9600e-003**	**6.9600e-003**	**0.0000**	**145.3005**	**145.3005**	**0.0448**	**0.0000**	**146.4213**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Piles/Foundations/Utilities - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0404	0.4224	0.3625	7.7000e-004		0.0197	0.0197		0.0182	0.0182	0.0000	67.6799	67.6799	0.0209	0.0000	68.2015
Total	**0.0404**	**0.4224**	**0.3625**	**7.7000e-004**		**0.0197**	**0.0197**		**0.0182**	**0.0182**	**0.0000**	**67.6799**	**67.6799**	**0.0209**	**0.0000**	**68.2015**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0135	0.2802	0.4932	7.7000e-004		3.2400e-003	3.2400e-003		3.2400e-003	3.2400e-003	0.0000	67.6799	67.6799	0.0209	0.0000	68.2014
Total	**0.0135**	**0.2802**	**0.4932**	**7.7000e-004**		**3.2400e-003**	**3.2400e-003**		**3.2400e-003**	**3.2400e-003**	**0.0000**	**67.6799**	**67.6799**	**0.0209**	**0.0000**	**68.2014**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Structures - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0981	0.8196	0.7828	1.4000e-003		0.0417	0.0417		0.0405	0.0405	0.0000	118.4933	118.4933	0.0167	0.0000	118.9104
Total	**0.0981**	**0.8196**	**0.7828**	**1.4000e-003**		**0.0417**	**0.0417**		**0.0405**	**0.0405**	**0.0000**	**118.4933**	**118.4933**	**0.0167**	**0.0000**	**118.9104**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0255	0.5533	0.8555	1.4000e-003		5.7800e-003	5.7800e-003		5.7800e-003	5.7800e-003	0.0000	118.4932	118.4932	0.0167	0.0000	118.9103
Total	**0.0255**	**0.5533**	**0.8555**	**1.4000e-003**		**5.7800e-003**	**5.7800e-003**		**5.7800e-003**	**5.7800e-003**	**0.0000**	**118.4932**	**118.4932**	**0.0167**	**0.0000**	**118.9103**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Building Exterior and Green Roof - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0380	0.4266	0.3954	6.7000e-004		0.0202	0.0202		0.0186	0.0186	0.0000	58.8052	58.8052	0.0190	0.0000	59.2807
Total	**0.0380**	**0.4266**	**0.3954**	**6.7000e-004**		**0.0202**	**0.0202**		**0.0186**	**0.0186**	**0.0000**	**58.8052**	**58.8052**	**0.0190**	**0.0000**	**59.2807**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0143	0.2886	0.4610	6.7000e-004		6.4900e-003	6.4900e-003		6.4900e-003	6.4900e-003	0.0000	58.8052	58.8052	0.0190	0.0000	59.2806
Total	**0.0143**	**0.2886**	**0.4610**	**6.7000e-004**		**6.4900e-003**	**6.4900e-003**		**6.4900e-003**	**6.4900e-003**	**0.0000**	**58.8052**	**58.8052**	**0.0190**	**0.0000**	**59.2806**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Building Exterior and Green Roof - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0579	0.6432	0.6617	1.1400e-003		0.0293	0.0293		0.0269	0.0269	0.0000	99.7343	99.7343	0.0323	0.0000	100.5407
Total	**0.0579**	**0.6432**	**0.6617**	**1.1400e-003**		**0.0293**	**0.0293**		**0.0269**	**0.0269**	**0.0000**	**99.7343**	**99.7343**	**0.0323**	**0.0000**	**100.5407**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0243	0.4894	0.7817	1.1400e-003		0.0110	0.0110		0.0110	0.0110	0.0000	99.7342	99.7342	0.0323	0.0000	100.5406
Total	**0.0243**	**0.4894**	**0.7817**	**1.1400e-003**		**0.0110**	**0.0110**		**0.0110**	**0.0110**	**0.0000**	**99.7342**	**99.7342**	**0.0323**	**0.0000**	**100.5406**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0303	0.3124	0.3708	5.9000e-004		0.0165	0.0165		0.0152	0.0152	0.0000	50.9800	50.9800	0.0162	0.0000	51.3853
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0303**	**0.3124**	**0.3708**	**5.9000e-004**		**0.0165**	**0.0165**		**0.0152**	**0.0152**	**0.0000**	**50.9800**	**50.9800**	**0.0162**	**0.0000**	**51.3853**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0120	0.2695	0.4138	5.9000e-004		6.6500e-003	6.6500e-003		6.6500e-003	6.6500e-003	0.0000	50.9799	50.9799	0.0162	0.0000	51.3852
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0120**	**0.2695**	**0.4138**	**5.9000e-004**		**6.6500e-003**	**6.6500e-003**		**6.6500e-003**	**6.6500e-003**	**0.0000**	**50.9799**	**50.9799**	**0.0162**	**0.0000**	**51.3852**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Paving - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.5900e-003	0.0163	0.0207	3.0000e-005		8.2000e-004	8.2000e-004		7.5000e-004	7.5000e-004	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.5900e-003**	**0.0163**	**0.0207**	**3.0000e-005**		**8.2000e-004**	**8.2000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**2.8501**	**2.8501**	**9.1000e-004**	**0.0000**	**2.8727**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.7000e-004	0.0151	0.0231	3.0000e-005		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**6.7000e-004**	**0.0151**	**0.0231**	**3.0000e-005**		**3.7000e-004**	**3.7000e-004**		**3.7000e-004**	**3.7000e-004**	**0.0000**	**2.8501**	**2.8501**	**9.1000e-004**	**0.0000**	**2.8727**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Building Interiors - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3507					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0467	0.3953	0.5028	7.9000e-004		0.0208	0.0208		0.0203	0.0203	0.0000	68.4647	68.4647	0.0124	0.0000	68.7741
Total	**0.3975**	**0.3953**	**0.5028**	**7.9000e-004**		**0.0208**	**0.0208**		**0.0203**	**0.0203**	**0.0000**	**68.4647**	**68.4647**	**0.0124**	**0.0000**	**68.7741**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3507					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0164	0.3429	0.5337	7.9000e-004		6.6000e-003	6.6000e-003		6.6000e-003	6.6000e-003	0.0000	68.4646	68.4646	0.0124	0.0000	68.7740
Total	**0.3671**	**0.3429**	**0.5337**	**7.9000e-004**		**6.6000e-003**	**6.6000e-003**		**6.6000e-003**	**6.6000e-003**	**0.0000**	**68.4646**	**68.4646**	**0.0124**	**0.0000**	**68.7740**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Building Interiors - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.4658					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.3043	2.5557	3.5229	5.5600e-003		0.1265	0.1265		0.1231	0.1231	0.0000	481.3284	481.3284	0.0860	0.0000	483.4788
Total	**2.7702**	**2.5557**	**3.5229**	**5.5600e-003**		**0.1265**	**0.1265**		**0.1231**	**0.1231**	**0.0000**	**481.3284**	**481.3284**	**0.0860**	**0.0000**	**483.4788**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.4658					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1151	2.4107	3.7518	5.5600e-003		0.0464	0.0464		0.0464	0.0464	0.0000	481.3279	481.3279	0.0860	0.0000	483.4782
Total	**2.5809**	**2.4107**	**3.7518**	**5.5600e-003**		**0.0464**	**0.0464**		**0.0464**	**0.0464**	**0.0000**	**481.3279**	**481.3279**	**0.0860**	**0.0000**	**483.4782**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

18-072 100 Caribbean Construction

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	536.75	1000sqft	18.20	536,750.00	0
Parking Lot	85.00	1000sqft	0.00	85,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CO2 Intensity = 290

Land Use - Acres = 18.2

Construction Phase - Based on schedule provided using total workdays and start dates by phase

Off-road Equipment - Unit & hours changed according to client spreadsheet

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Unit & hours changed according to client spreadsheet

Off-road Equipment - Based on provided construction list

Off-road Equipment - Based on provided equipment list

Trips and VMT - Computing trips with EMFAC2017

Demolition - Demo Volume = 18,000 tons Hauling + 7,000 ton pavement demo

Grading - Import 101,000 cy during grading and 6,500cy import on building exterior green roof

Construction Off-road Equipment Mitigation - Tier 4, All Equipment Mitigated

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	14.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	13.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	5.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	HaulingTripNumber	2,472.00	0.00
tblTripsAndVMT	HaulingTripNumber	13,438.00	0.00
tblTripsAndVMT	VendorTripNumber	102.00	0.00
tblTripsAndVMT	VendorTripNumber	102.00	0.00
tblTripsAndVMT	WorkerTripNumber	35.00	0.00
tblTripsAndVMT	WorkerTripNumber	43.00	0.00
tblTripsAndVMT	WorkerTripNumber	48.00	0.00
tblTripsAndVMT	WorkerTripNumber	207.00	0.00
tblTripsAndVMT	WorkerTripNumber	207.00	0.00
tblTripsAndVMT	WorkerTripNumber	41.00	0.00
tblTripsAndVMT	WorkerTripNumber	40.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.4362	4.7127	3.2837	6.5600e-003	0.4194	0.2146	0.6339	0.0572	0.1991	0.2562	0.0000	575.4446	575.4446	0.1718	0.0000	579.7398
2021	0.5738	2.0639	2.0436	3.6300e-003	0.0000	0.1024	0.1024	0.0000	0.0976	0.0976	0.0000	313.4432	313.4432	0.0689	0.0000	315.1667
2022	2.8584	3.5113	4.5555	7.2900e-003	0.0000	0.1722	0.1722	0.0000	0.1653	0.1653	0.0000	632.0427	632.0427	0.1345	0.0000	635.4048
2023	1.5900e-003	0.0163	0.0207	3.0000e-005	0.0000	8.2000e-004	8.2000e-004	0.0000	7.5000e-004	7.5000e-004	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Maximum	**2.8584**	**4.7127**	**4.5555**	**7.2900e-003**	**0.4194**	**0.2146**	**0.6339**	**0.0572**	**0.1991**	**0.2562**	**0.0000**	**632.0427**	**632.0427**	**0.1718**	**0.0000**	**635.4048**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.0846	0.5620	3.6965	6.5600e-003	0.1887	0.0106	0.1993	0.0129	0.0106	0.0234	0.0000	575.4439	575.4439	0.1718	0.0000	579.7391
2021	0.4009	0.5616	2.2731	3.6300e-003	0.0000	5.4500e-003	5.4500e-003	0.0000	5.4500e-003	5.4500e-003	0.0000	313.4428	313.4428	0.0689	0.0000	315.1664
2022	2.5783	1.6161	4.9059	7.2900e-003	0.0000	0.0109	0.0109	0.0000	0.0109	0.0109	0.0000	632.0420	632.0420	0.1345	0.0000	635.4040
2023	5.7000e-004	9.3200e-003	0.0228	3.0000e-005	0.0000	5.0000e-005	5.0000e-005	0.0000	5.0000e-005	5.0000e-005	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Maximum	**2.5783**	**1.6161**	**4.9059**	**7.2900e-003**	**0.1887**	**0.0109**	**0.1993**	**0.0129**	**0.0109**	**0.0234**	**0.0000**	**632.0420**	**632.0420**	**0.1718**	**0.0000**	**635.4040**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**20.82**	**73.32**	**-10.05**	**0.00**	**55.00**	**94.49**	**76.28**	**77.51**	**94.16**	**92.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	3-27-2020	6-26-2020	1.4566	0.1096
2	6-27-2020	9-26-2020	1.4730	0.1857
3	9-27-2020	12-26-2020	2.1342	0.3351
4	12-27-2020	3-26-2021	0.7633	0.1526
5	3-27-2021	6-26-2021	0.3446	0.0598
6	6-27-2021	9-26-2021	0.5264	0.1285
7	9-27-2021	12-26-2021	0.9601	0.5593
8	12-27-2021	3-26-2022	1.7123	1.1289
9	3-27-2022	6-26-2022	1.8026	1.1838
10	6-27-2022	9-26-2022	1.8847	1.2262
11	9-27-2022	12-26-2022	1.0833	0.7286
12	12-27-2022	3-26-2023	0.0246	0.0133
		Highest	2.1342	1.2262

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description

1	Demolition and Sitework	Demolition	3/27/2020	6/25/2020	5	65	
2	Site Preparation/Grading/Soil Import	Grading	8/14/2020	10/29/2020	5	55	gap between demo and site prep
3	Piles/Foundations/Utilities	Trenching	10/13/2020	2/8/2021	5	85	some overlap
4	Building Structures	Building Construction	1/28/2021	9/29/2021	5	175	some overlap
5	Building Exterior and Green Roof	Building Construction	7/26/2021	9/30/2022	5	310	overlap
6	Building Interiors	Architectural Coating	11/17/2021	11/22/2022	5	265	overlap
7	Paving	Paving	5/20/2022	1/12/2023	5	170	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 805,125; Non-Residential Outdoor: 268,375; Striped Parking

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition and Sitework	Concrete/Industrial Saws	4	4.00	81	0.73
Demolition and Sitework	Crushing/Proc. Equipment	1	5.00	85	0.78
Demolition and Sitework	Excavators	3	6.00	158	0.38
Demolition and Sitework	Rubber Tired Dozers	2	6.00	247	0.40
Demolition and Sitework	Rubber Tired Loaders	2	6.00	203	0.36
Demolition and Sitework	Tractors/Loaders/Backhoes	2	5.00	97	0.37
Site Preparation/Grading/Soil Import	Excavators	2	7.00	158	0.38
Site Preparation/Grading/Soil Import	Graders	2	8.00	187	0.41
Site Preparation/Grading/Soil Import	Rollers	3	10.00	80	0.38
Site Preparation/Grading/Soil Import	Rubber Tired Dozers	0	10.00	247	0.40
Site Preparation/Grading/Soil Import	Rubber Tired Loaders	2	7.00	203	0.36
Site Preparation/Grading/Soil Import	Scrapers	4	8.00	367	0.48
Site Preparation/Grading/Soil Import	Skid Steer Loaders	2	10.00	65	0.37
Site Preparation/Grading/Soil Import	Sweepers/Scrubbers	1	10.00	64	0.46
Site Preparation/Grading/Soil Import	Tractors/Loaders/Backhoes	1	5.00	97	0.37
Piles/Foundations/Utilities	Bore/Drill Rigs	2	5.00	221	0.50
Piles/Foundations/Utilities	Cranes	2	5.00	231	0.29
Piles/Foundations/Utilities	Excavators	3	6.00	158	0.38
Piles/Foundations/Utilities	Forklifts	2	6.00	89	0.20
Piles/Foundations/Utilities	Other Construction Equipment	0	0.00	172	0.42
Piles/Foundations/Utilities	Pumps	2	2.00	84	0.74
Piles/Foundations/Utilities	Rubber Tired Loaders	2	6.00	203	0.36
Piles/Foundations/Utilities	Skid Steer Loaders	2	6.00	65	0.37
Piles/Foundations/Utilities	Sweepers/Scrubbers	2	6.00	64	0.46
Piles/Foundations/Utilities	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Building Structures	Cranes	2	2.00	231	0.29
Building Structures	Forklifts	2	2.00	89	0.20
Building Structures	Generator Sets	4	2.00	84	0.74
Building Structures	Other Construction Equipment	0	2.00	172	0.42
Building Structures	Pumps	1	3.00	84	0.74
Building Structures	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Structures	Welders	4	2.00	46	0.45
Building Exterior and Green Roof	Aerial Lifts	4	4.00	63	0.31
Building Exterior and Green Roof	Cranes	1	5.00	231	0.29
Building Exterior and Green Roof	Forklifts	3	5.00	89	0.20

Building Exterior and Green Roof	Generator Sets	0	8.00	84	0.74
Building Exterior and Green Roof	Other Construction Equipment	0	7.00	172	0.42
Building Exterior and Green Roof	Skid Steer Loaders	2	2.00	65	0.37
Building Exterior and Green Roof	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Exterior and Green Roof	Welders	0	8.00	46	0.45
Paving	Forklifts	2	2.00	89	0.20
Paving	Other Construction Equipment	0	8.00	172	0.42
Paving	Pavers	1	1.00	130	0.42
Paving	Paving Equipment	1	1.00	132	0.36
Paving	Plate Compactors	4	1.00	8	0.43
Paving	Rollers	3	1.00	80	0.38
Paving	Skid Steer Loaders	2	4.00	65	0.37
Paving	Surfacing Equipment	1	1.00	263	0.30
Paving	Sweepers/Scrubbers	2	2.00	64	0.46
Building Interiors	Aerial Lifts	10	7.00	63	0.31
Building Interiors	Air Compressors	8	6.00	78	0.48
Building Interiors	Cranes	1	1.00	231	0.29
Building Interiors	Forklifts	4	7.00	89	0.20
Building Interiors	Generator Sets	1	3.00	84	0.74
Building Interiors	Other Construction Equipment	0	7.00	172	0.42
Building Interiors	Welders	1	3.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition and Sitework	14	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation/Grading/S	17	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Piles/Foundations/Utiliti es	19	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Structures	14	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Exterior and Green Roof	11	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	16	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Interiors	25	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition and Sitework - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2675	0.0000	0.2675	0.0405	0.0000	0.0405	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	0.1357	1.3209	0.9408	1.7700e-003		0.0659	0.0659		0.0621	0.0621	0.0000	154.8073	154.8073	0.0379	0.0000	155.7554
Total	**0.1357**	**1.3209**	**0.9408**	**1.7700e-003**	**0.2675**	**0.0659**	**0.3334**	**0.0405**	**0.0621**	**0.1026**	**0.0000**	**154.8073**	**154.8073**	**0.0379**	**0.0000**	**155.7554**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1204	0.0000	0.1204	9.1100e-003	0.0000	9.1100e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0206	0.0890	1.0455	1.7700e-003		2.7400e-003	2.7400e-003		2.7400e-003	2.7400e-003	0.0000	154.8071	154.8071	0.0379	0.0000	155.7552
Total	**0.0206**	**0.0890**	**1.0455**	**1.7700e-003**	**0.1204**	**2.7400e-003**	**0.1231**	**9.1100e-003**	**2.7400e-003**	**0.0119**	**0.0000**	**154.8071**	**154.8071**	**0.0379**	**0.0000**	**155.7552**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation/Grading/Soil Import - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1519	0.0000	0.1519	0.0167	0.0000	0.0167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	0.2050	2.3728	1.5545	3.1300e-003		0.0998	0.0998		0.0918	0.0918	0.0000	275.3366	275.3366	0.0891	0.0000	277.5629
Total	**0.2050**	**2.3728**	**1.5545**	**3.1300e-003**	**0.1519**	**0.0998**	**0.2517**	**0.0167**	**0.0918**	**0.1085**	**0.0000**	**275.3366**	**275.3366**	**0.0891**	**0.0000**	**277.5629**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0684	0.0000	0.0684	3.7500e-003	0.0000	3.7500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0414	0.2836	1.6593	3.1300e-003		5.1400e-003	5.1400e-003		5.1400e-003	5.1400e-003	0.0000	275.3363	275.3363	0.0891	0.0000	277.5625
Total	**0.0414**	**0.2836**	**1.6593**	**3.1300e-003**	**0.0684**	**5.1400e-003**	**0.0735**	**3.7500e-003**	**5.1400e-003**	**8.8900e-003**	**0.0000**	**275.3363**	**275.3363**	**0.0891**	**0.0000**	**277.5625**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Piles/Foundations/Utilities - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0955	1.0190	0.7885	1.6600e-003		0.0489	0.0489		0.0452	0.0452	0.0000	145.3007	145.3007	0.0448	0.0000	146.4215

Total	**0.0955**	**1.0190**	**0.7885**	**1.6600e-003**		**0.0489**	**0.0489**		**0.0452**	**0.0452**	**0.0000**	**145.3007**	**145.3007**	**0.0448**	**0.0000**	**146.4215**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0227	0.1893	0.9917	1.6600e-003		2.6900e-003	2.6900e-003		2.6900e-003	2.6900e-003	0.0000	145.3005	145.3005	0.0448	0.0000	146.4213
Total	**0.0227**	**0.1893**	**0.9917**	**1.6600e-003**		**2.6900e-003**	**2.6900e-003**		**2.6900e-003**	**2.6900e-003**	**0.0000**	**145.3005**	**145.3005**	**0.0448**	**0.0000**	**146.4213**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Piles/Foundations/Utilities - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0404	0.4224	0.3625	7.7000e-004		0.0197	0.0197		0.0182	0.0182	0.0000	67.6799	67.6799	0.0209	0.0000	68.2015

Total	**0.0404**	**0.4224**	**0.3625**	**7.7000e-004**		**0.0197**	**0.0197**		**0.0182**	**0.0182**	**0.0000**	**67.6799**	**67.6799**	**0.0209**	**0.0000**	**68.2015**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0106	0.0881	0.4617	7.7000e-004		1.2500e-003	1.2500e-003		1.2500e-003	1.2500e-003	0.0000	67.6799	67.6799	0.0209	0.0000	68.2014
Total	**0.0106**	**0.0881**	**0.4617**	**7.7000e-004**		**1.2500e-003**	**1.2500e-003**		**1.2500e-003**	**1.2500e-003**	**0.0000**	**67.6799**	**67.6799**	**0.0209**	**0.0000**	**68.2014**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Structures - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0981	0.8196	0.7828	1.4000e-003		0.0417	0.0417		0.0405	0.0405	0.0000	118.4933	118.4933	0.0167	0.0000	118.9104

Total	**0.0981**	**0.8196**	**0.7828**	**1.4000e-003**		**0.0417**	**0.0417**		**0.0405**	**0.0405**	**0.0000**	**118.4933**	**118.4933**	**0.0167**	**0.0000**	**118.9104**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0165	0.1428	0.8348	1.4000e-003		1.9400e-003	1.9400e-003		1.9400e-003	1.9400e-003	0.0000	118.4932	118.4932	0.0167	0.0000	118.9103
Total	**0.0165**	**0.1428**	**0.8348**	**1.4000e-003**		**1.9400e-003**	**1.9400e-003**		**1.9400e-003**	**1.9400e-003**	**0.0000**	**118.4932**	**118.4932**	**0.0167**	**0.0000**	**118.9103**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Building Exterior and Green Roof - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0380	0.4266	0.3954	6.7000e-004		0.0202	0.0202		0.0186	0.0186	0.0000	58.8052	58.8052	0.0190	0.0000	59.2807

Total	**0.0380**	**0.4266**	**0.3954**	**6.7000e-004**		**0.0202**	**0.0202**		**0.0186**	**0.0186**	**0.0000**	**58.8052**	**58.8052**	**0.0190**	**0.0000**	**59.2807**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0113	0.1642	0.4440	6.7000e-004		1.1000e-003	1.1000e-003		1.1000e-003	1.1000e-003	0.0000	58.8052	58.8052	0.0190	0.0000	59.2806
Total	**0.0113**	**0.1642**	**0.4440**	**6.7000e-004**		**1.1000e-003**	**1.1000e-003**		**1.1000e-003**	**1.1000e-003**	**0.0000**	**58.8052**	**58.8052**	**0.0190**	**0.0000**	**59.2806**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Building Exterior and Green Roof - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0579	0.6432	0.6617	1.1400e-003		0.0293	0.0293		0.0269	0.0269	0.0000	99.7343	99.7343	0.0323	0.0000	100.5407

Total	**0.0579**	**0.6432**	**0.6617**	**1.1400e-003**		**0.0293**	**0.0293**		**0.0269**	**0.0269**	**0.0000**	**99.7343**	**99.7343**	**0.0323**	**0.0000**	**100.5407**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0192	0.2784	0.7529	1.1400e-003		1.8600e-003	1.8600e-003		1.8600e-003	1.8600e-003	0.0000	99.7342	99.7342	0.0323	0.0000	100.5406
Total	**0.0192**	**0.2784**	**0.7529**	**1.1400e-003**		**1.8600e-003**	**1.8600e-003**		**1.8600e-003**	**1.8600e-003**	**0.0000**	**99.7342**	**99.7342**	**0.0323**	**0.0000**	**100.5406**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Building Interiors - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3507					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	0.0467	0.3953	0.5028	7.9000e-004		0.0208	0.0208		0.0203	0.0203	0.0000	68.4647	68.4647	0.0124	0.0000	68.7741
Total	**0.3975**	**0.3953**	**0.5028**	**7.9000e-004**		**0.0208**	**0.0208**		**0.0203**	**0.0203**	**0.0000**	**68.4647**	**68.4647**	**0.0124**	**0.0000**	**68.7741**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3507					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0118	0.1666	0.5327	7.9000e-004		1.1600e-003	1.1600e-003		1.1600e-003	1.1600e-003	0.0000	68.4646	68.4646	0.0124	0.0000	68.7740
Total	**0.3625**	**0.1666**	**0.5327**	**7.9000e-004**		**1.1600e-003**	**1.1600e-003**		**1.1600e-003**	**1.1600e-003**	**0.0000**	**68.4646**	**68.4646**	**0.0124**	**0.0000**	**68.7740**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Building Interiors - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.4658					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	0.3043	2.5557	3.5229	5.5600e-003		0.1265	0.1265		0.1231	0.1231	0.0000	481.3284	481.3284	0.0860	0.0000	483.4788
Total	**2.7702**	**2.5557**	**3.5229**	**5.5600e-003**		**0.1265**	**0.1265**		**0.1231**	**0.1231**	**0.0000**	**481.3284**	**481.3284**	**0.0860**	**0.0000**	**483.4788**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	2.4658					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0830	1.1711	3.7449	5.5600e-003		8.1400e-003	8.1400e-003		8.1400e-003	8.1400e-003	0.0000	481.3279	481.3279	0.0860	0.0000	483.4782
Total	**2.5488**	**1.1711**	**3.7449**	**5.5600e-003**		**8.1400e-003**	**8.1400e-003**		**8.1400e-003**	**8.1400e-003**	**0.0000**	**481.3279**	**481.3279**	**0.0860**	**0.0000**	**483.4782**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0303	0.3124	0.3708	5.9000e-004		0.0165	0.0165		0.0152	0.0152	0.0000	50.9800	50.9800	0.0162	0.0000	51.3853

Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0303**	**0.3124**	**0.3708**	**5.9000e-004**		**0.0165**	**0.0165**		**0.0152**	**0.0152**	**0.0000**	**50.9800**	**50.9800**	**0.0162**	**0.0000**	**51.3853**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0103	0.1667	0.4082	5.9000e-004		9.3000e-004	9.3000e-004		9.3000e-004	9.3000e-004	0.0000	50.9799	50.9799	0.0162	0.0000	51.3852
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0103**	**0.1667**	**0.4082**	**5.9000e-004**		**9.3000e-004**	**9.3000e-004**		**9.3000e-004**	**9.3000e-004**	**0.0000**	**50.9799**	**50.9799**	**0.0162**	**0.0000**	**51.3852**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Paving - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.5900e-003	0.0163	0.0207	3.0000e-005		8.2000e-004	8.2000e-004		7.5000e-004	7.5000e-004	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727

Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.5900e-003**	**0.0163**	**0.0207**	**3.0000e-005**		**8.2000e-004**	**8.2000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**2.8501**	**2.8501**	**9.1000e-004**	**0.0000**	**2.8727**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.7000e-004	9.3200e-003	0.0228	3.0000e-005		5.0000e-005	5.0000e-005		5.0000e-005	5.0000e-005	0.0000	2.8501	2.8501	9.1000e-004	0.0000	2.8727
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.7000e-004**	**9.3200e-003**	**0.0228**	**3.0000e-005**		**5.0000e-005**	**5.0000e-005**		**5.0000e-005**	**5.0000e-005**	**0.0000**	**2.8501**	**2.8501**	**9.1000e-004**	**0.0000**	**2.8727**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

18-072 200 Caribbean Construction

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	505.14	1000sqft	26.70	505,140.00	0
General Light Industry	0.10	1000sqft	0.00	100.00	0
Parking Lot	201.40	1000sqft	0.00	201,400.00	0
Unenclosed Parking with Elevator	1,235.00	Space	0.00	376,145.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CO2 Intensity = 290

Land Use - Parking garage = 379,145 SF - acreage assigned to office

Construction Phase - Total Days altered to match Construction speadsheet filled out by client

Off-road Equipment - Unit & hours changed according to client spreadsheet

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Based on provided equipment list - appers cranes, forklifts and pump double counted

Off-road Equipment - Based on Provided Equipment list

Off-road Equipment - Based on provided equipment list

Off-road Equipment -

Off-road Equipment - Unit & hours changed according to client spreadsheet

Trips and VMT - Calculated using EMFAC

Demolition - Demo Volume = 24,000 tons Hauling + 8,000 ton pavement demo

Grading - Import 156,000 cy during grading and 6,500cy import on building exterior green roof =162,500 export 15,000

Construction Off-road Equipment Mitigation - Tier 4interim, All Equipment Mitigated

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	14.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	HaulingTripNumber	3,164.00	0.00
tblTripsAndVMT	HaulingTripNumber	22,188.00	0.00
tblTripsAndVMT	VendorTripNumber	177.00	0.00
tblTripsAndVMT	VendorTripNumber	177.00	0.00
tblTripsAndVMT	WorkerTripNumber	35.00	0.00
tblTripsAndVMT	WorkerTripNumber	43.00	0.00
tblTripsAndVMT	WorkerTripNumber	43.00	0.00
tblTripsAndVMT	WorkerTripNumber	404.00	0.00
tblTripsAndVMT	WorkerTripNumber	404.00	0.00
tblTripsAndVMT	WorkerTripNumber	81.00	0.00
tblTripsAndVMT	WorkerTripNumber	40.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.5399	5.6809	4.0192	8.0400e-003	0.4837	0.2641	0.7478	0.0675	0.2460	0.3136	0.0000	703.0814	703.0814	0.2017	0.0000	708.1244
2021	1.2263	1.7486	1.6131	2.8100e-003	0.0000	0.0879	0.0879	0.0000	0.0831	0.0831	0.0000	242.1203	242.1203	0.0565	0.0000	243.5327
2022	1.8162	1.0559	1.1262	1.8600e-003	0.0000	0.0534	0.0534	0.0000	0.0497	0.0497	0.0000	161.7845	161.7845	0.0466	0.0000	162.9496
Maximum	**1.8162**	**5.6809**	**4.0192**	**8.0400e-003**	**0.4837**	**0.2641**	**0.7478**	**0.0675**	**0.2460**	**0.3136**	**0.0000**	**703.0814**	**703.0814**	**0.2017**	**0.0000**	**708.1244**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.1376	2.7541	4.9410	8.0400e-003	0.2177	0.0253	0.2430	0.0152	0.0253	0.0405	0.0000	703.0806	703.0806	0.2017	0.0000	708.1235
2021	1.1000	1.1395	1.8197	2.8100e-003	0.0000	0.0173	0.0173	0.0000	0.0173	0.0173	0.0000	242.1200	242.1200	0.0565	0.0000	243.5324
2022	1.7485	0.8066	1.2710	1.8600e-003	0.0000	0.0156	0.0156	0.0000	0.0156	0.0156	0.0000	161.7843	161.7843	0.0466	0.0000	162.9494
Maximum	**1.7485**	**2.7541**	**4.9410**	**8.0400e-003**	**0.2177**	**0.0253**	**0.2430**	**0.0152**	**0.0253**	**0.0405**	**0.0000**	**703.0806**	**703.0806**	**0.2017**	**0.0000**	**708.1235**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**16.65**	**44.61**	**-18.84**	**0.00**	**55.00**	**85.64**	**68.97**	**77.51**	**84.62**	**83.54**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2020	3-31-2020	1.4566	0.6374
2	4-1-2020	6-30-2020	1.5715	0.6602
3	7-1-2020	9-30-2020	1.9477	0.9024
4	10-1-2020	12-31-2020	1.2384	0.6881
5	1-1-2021	3-31-2021	0.4437	0.2667
6	4-1-2021	6-30-2021	0.5986	0.3698
7	7-1-2021	9-30-2021	0.6728	0.5328
8	10-1-2021	12-31-2021	1.2576	1.0672
9	1-1-2022	3-31-2022	1.3015	1.1452
10	4-1-2022	6-30-2022	1.1963	1.0714
11	7-1-2022	9-30-2022	0.3789	0.3424
		Highest	1.9477	1.1452

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition of Existing Buildings and Sitework	Demolition	1/1/2020	4/28/2020	5	85	
2	Site Preparation/Grading	Grading	5/26/2020	8/10/2020	5	55	

3	Piles/Foundations/Utilities	Trenching	7/28/2020	12/21/2020	5	105	
4	Building Structures	Building Construction	10/20/2020	6/21/2021	5	175	
5	Building Exterior and Green Roofs	Building Construction	5/5/2021	5/17/2022	5	270	
6	Building Interiors	Architectural Coating	8/27/2021	7/28/2022	5	240	
7	Paving/Site Work	Paving	1/10/2022	9/2/2022	5	170	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 757,860; Non-Residential Outdoor: 252,620; Striped Parking

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition of Existing Buildings and Sitework	Concrete/Industrial Saws	4	4.00	81	0.73
Demolition of Existing Buildings and Sitework	Crushing/Proc. Equipment	1	5.00	85	0.78
Demolition of Existing Buildings and Sitework	Excavators	3	6.00	158	0.38
Demolition of Existing Buildings and Sitework	Rubber Tired Dozers	2	6.00	247	0.40
Demolition of Existing Buildings and Sitework	Rubber Tired Loaders	2	6.00	203	0.36
Demolition of Existing Buildings and Sitework	Tractors/Loaders/Backhoes	2	5.00	97	0.37
Site Preparation/Grading	Excavators	2	7.00	158	0.38
Site Preparation/Grading	Graders	2	8.00	187	0.41
Site Preparation/Grading	Rollers	3	10.00	80	0.38
Site Preparation/Grading	Rubber Tired Dozers	0	8.00	247	0.40
Site Preparation/Grading	Rubber Tired Loaders	2	7.00	203	0.36
Site Preparation/Grading	Scrapers	4	7.00	367	0.48
Site Preparation/Grading	Skid Steer Loaders	2	10.00	65	0.37
Site Preparation/Grading	Sweepers/Scrubbers	1	10.00	64	0.46
Site Preparation/Grading	Tractors/Loaders/Backhoes	1	5.00	97	0.37
Building Structures	Cranes	3	2.00	231	0.29
Building Structures	Forklifts	4	2.00	89	0.20
Building Structures	Generator Sets	4	2.00	84	0.74
Building Structures	Pumps	2	3.00	84	0.74
Building Structures	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Structures	Welders	4	2.00	46	0.45
Building Exterior and Green Roofs	Aerial Lifts	4	5.00	63	0.31
Building Exterior and Green Roofs	Cranes	1	6.00	231	0.29
Building Exterior and Green Roofs	Forklifts	3	6.00	89	0.20
Building Exterior and Green Roofs	Generator Sets	0	8.00	84	0.74
Building Exterior and Green Roofs	Skid Steer Loaders	2	2.00	65	0.37
Building Exterior and Green Roofs	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Exterior and Green Roofs	Welders	0	8.00	46	0.45
Paving/Site Work	Forklifts	2	2.00	89	0.20
Paving/Site Work	Pavers	1	1.00	130	0.42
Paving/Site Work	Paving Equipment	1	1.00	132	0.36
Paving/Site Work	Plate Compactors	4	1.00	8	0.43
Paving/Site Work	Rollers	3	1.00	80	0.38
Paving/Site Work	Skid Steer Loaders	2	4.00	65	0.37
Paving/Site Work	Surfacing Equipment	1	1.00	263	0.30
Paving/Site Work	Sweepers/Scrubbers	2	2.00	64	0.46
Building Interiors	Aerial Lifts	0	6.00	63	0.31

Building Interiors	Air Compressors	0	8.00	78	0.48
Building Interiors	Cranes	1	2.00	231	0.29
Building Interiors	Forklifts	3	5.00	89	0.20
Building Interiors	Generator Sets	1	3.00	84	0.74
Building Interiors	Welders	1	3.00	46	0.45
Piles/Foundations/Utilities	Bore/Drill Rigs	2	4.00	221	0.50
Piles/Foundations/Utilities	Cranes	2	4.00	231	0.29
Piles/Foundations/Utilities	Excavators	3	5.00	158	0.38
Piles/Foundations/Utilities	Forklifts	2	7.00	89	0.20
Piles/Foundations/Utilities	Pumps	2	1.00	84	0.74
Piles/Foundations/Utilities	Rubber Tired Loaders	2	5.00	203	0.36
Piles/Foundations/Utilities	Skid Steer Loaders	2	5.00	65	0.37
Piles/Foundations/Utilities	Sweepers/Scrubbers	2	5.00	64	0.46

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition of Existing Buildings and Sitework	14	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation/Grading	17	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Structures	18	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Exterior and Green Roofs	11	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving/Site Work	16	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Interiors	6	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Piles/Foundations/Utilities	17	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition of Existing Buildings and Sitework - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.3424	0.0000	0.3424	0.0518	0.0000	0.0518	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1775	1.7274	1.2302	2.3200e-003		0.0862	0.0862		0.0812	0.0812	0.0000	202.4403	202.4403	0.0496	0.0000	203.6801
Total	**0.1775**	**1.7274**	**1.2302**	**2.3200e-003**	**0.3424**	**0.0862**	**0.4286**	**0.0518**	**0.0812**	**0.1330**	**0.0000**	**202.4403**	**202.4403**	**0.0496**	**0.0000**	**203.6801**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1541	0.0000	0.1541	0.0117	0.0000	0.0117	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0384	0.7951	1.4445	2.3200e-003		3.5800e-003	3.5800e-003		3.5800e-003	3.5800e-003	0.0000	202.4401	202.4401	0.0496	0.0000	203.6799
Total	**0.0384**	**0.7951**	**1.4445**	**2.3200e-003**	**0.1541**	**3.5800e-003**	**0.1577**	**0.0117**	**3.5800e-003**	**0.0152**	**0.0000**	**202.4401**	**202.4401**	**0.0496**	**0.0000**	**203.6799**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation/Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1413	0.0000	0.1413	0.0157	0.0000	0.0157	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1914	2.2112	1.4520	2.9300e-003		0.0935	0.0935		0.0860	0.0860	0.0000	257.0374	257.0374	0.0831	0.0000	259.1157
Total	**0.1914**	**2.2112**	**1.4520**	**2.9300e-003**	**0.1413**	**0.0935**	**0.2347**	**0.0157**	**0.0860**	**0.1017**	**0.0000**	**257.0374**	**257.0374**	**0.0831**	**0.0000**	**259.1157**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0636	0.0000	0.0636	3.5300e-003	0.0000	3.5300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0508	0.9417	1.7395	2.9300e-003		9.6900e-003	9.6900e-003		9.6900e-003	9.6900e-003	0.0000	257.0371	257.0371	0.0831	0.0000	259.1154
Total	**0.0508**	**0.9417**	**1.7395**	**2.9300e-003**	**0.0636**	**9.6900e-003**	**0.0733**	**3.5300e-003**	**9.6900e-003**	**0.0132**	**0.0000**	**257.0371**	**257.0371**	**0.0831**	**0.0000**	**259.1154**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Piles/Foundations/Utilities - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1288	1.3828	1.0288	2.2400e-003		0.0650	0.0650		0.0600	0.0600	0.0000	196.9629	196.9629	0.0618	0.0000	198.5065
Total	**0.1288**	**1.3828**	**1.0288**	**2.2400e-003**		**0.0650**	**0.0650**		**0.0600**	**0.0600**	**0.0000**	**196.9629**	**196.9629**	**0.0618**	**0.0000**	**198.5065**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0384	0.8074	1.4219	2.2400e-003		0.0101	0.0101		0.0101	0.0101	0.0000	196.9626	196.9626	0.0618	0.0000	198.5063
Total	**0.0384**	**0.8074**	**1.4219**	**2.2400e-003**		**0.0101**	**0.0101**		**0.0101**	**0.0101**	**0.0000**	**196.9626**	**196.9626**	**0.0618**	**0.0000**	**198.5063**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Structures - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0423	0.3595	0.3082	5.5000e-004		0.0195	0.0195		0.0189	0.0189	0.0000	46.6409	46.6409	7.2500e-003	0.0000	46.8220
Total	**0.0423**	**0.3595**	**0.3082**	**5.5000e-004**		**0.0195**	**0.0195**		**0.0189**	**0.0189**	**0.0000**	**46.6409**	**46.6409**	**7.2500e-003**	**0.0000**	**46.8220**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0100	0.2099	0.3351	5.5000e-004		1.9300e-003	1.9300e-003		1.9300e-003	1.9300e-003	0.0000	46.6408	46.6408	7.2500e-003	0.0000	46.8220
Total	**0.0100**	**0.2099**	**0.3351**	**5.5000e-004**		**1.9300e-003**	**1.9300e-003**		**1.9300e-003**	**1.9300e-003**	**0.0000**	**46.6408**	**46.6408**	**7.2500e-003**	**0.0000**	**46.8220**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Structures - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0873	0.7547	0.6972	1.2600e-003		0.0387	0.0387		0.0374	0.0374	0.0000	107.3617	107.3617	0.0162	0.0000	107.7657
Total	**0.0873**	**0.7547**	**0.6972**	**1.2600e-003**		**0.0387**	**0.0387**		**0.0374**	**0.0374**	**0.0000**	**107.3617**	**107.3617**	**0.0162**	**0.0000**	**107.7657**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0230	0.4831	0.7714	1.2600e-003		4.4500e-003	4.4500e-003		4.4500e-003	4.4500e-003	0.0000	107.3616	107.3616	0.0162	0.0000	107.7656
Total	**0.0230**	**0.4831**	**0.7714**	**1.2600e-003**		**4.4500e-003**	**4.4500e-003**		**4.4500e-003**	**4.4500e-003**	**0.0000**	**107.3616**	**107.3616**	**0.0162**	**0.0000**	**107.7656**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Building Exterior and Green Roofs - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0674	0.7584	0.7015	1.1900e-003		0.0357	0.0357		0.0329	0.0329	0.0000	104.6807	104.6807	0.0339	0.0000	105.5271
Total	**0.0674**	**0.7584**	**0.7015**	**1.1900e-003**		**0.0357**	**0.0357**		**0.0329**	**0.0329**	**0.0000**	**104.6807**	**104.6807**	**0.0339**	**0.0000**	**105.5271**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0255	0.5133	0.8195	1.1900e-003		0.0116	0.0116		0.0116	0.0116	0.0000	104.6806	104.6806	0.0339	0.0000	105.5270
Total	**0.0255**	**0.5133**	**0.8195**	**1.1900e-003**		**0.0116**	**0.0116**		**0.0116**	**0.0116**	**0.0000**	**104.6806**	**104.6806**	**0.0339**	**0.0000**	**105.5270**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Building Exterior and Green Roofs - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0340	0.3781	0.3882	6.7000e-004		0.0171	0.0171		0.0158	0.0158	0.0000	58.7048	58.7048	0.0190	0.0000	59.1795
Total	**0.0340**	**0.3781**	**0.3882**	**6.7000e-004**		**0.0171**	**0.0171**		**0.0158**	**0.0158**	**0.0000**	**58.7048**	**58.7048**	**0.0190**	**0.0000**	**59.1795**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0143	0.2878	0.4595	6.7000e-004		6.5100e-003	6.5100e-003		6.5100e-003	6.5100e-003	0.0000	58.7048	58.7048	0.0190	0.0000	59.1794
Total	**0.0143**	**0.2878**	**0.4595**	**6.7000e-004**		**6.5100e-003**	**6.5100e-003**		**6.5100e-003**	**6.5100e-003**	**0.0000**	**58.7048**	**58.7048**	**0.0190**	**0.0000**	**59.1794**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Building Interiors - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.0446					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0270	0.2355	0.2144	3.5000e-004		0.0135	0.0135		0.0128	0.0128	0.0000	30.0779	30.0779	6.4800e-003	0.0000	30.2399
Total	**1.0716**	**0.2355**	**0.2144**	**3.5000e-004**		**0.0135**	**0.0135**		**0.0128**	**0.0128**	**0.0000**	**30.0779**	**30.0779**	**6.4800e-003**	**0.0000**	**30.2399**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.0446					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.8300e-003	0.1430	0.2288	3.5000e-004		1.2700e-003	1.2700e-003		1.2700e-003	1.2700e-003	0.0000	30.0778	30.0778	6.4800e-003	0.0000	30.2398
Total	**1.0514**	**0.1430**	**0.2288**	**3.5000e-004**		**1.2700e-003**	**1.2700e-003**		**1.2700e-003**	**1.2700e-003**	**0.0000**	**30.0778**	**30.0778**	**6.4800e-003**	**0.0000**	**30.2398**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Building Interiors - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.7104					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0398	0.3480	0.3465	5.8000e-004		0.0189	0.0189		0.0179	0.0179	0.0000	49.2499	49.2499	0.0105	0.0000	49.5124
Total	**1.7502**	**0.3480**	**0.3465**	**5.8000e-004**		**0.0189**	**0.0189**		**0.0179**	**0.0179**	**0.0000**	**49.2499**	**49.2499**	**0.0105**	**0.0000**	**49.5124**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.7104					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0112	0.2342	0.3746	5.8000e-004		2.0800e-003	2.0800e-003		2.0800e-003	2.0800e-003	0.0000	49.2498	49.2498	0.0105	0.0000	49.5123
Total	**1.7216**	**0.2342**	**0.3746**	**5.8000e-004**		**2.0800e-003**	**2.0800e-003**		**2.0800e-003**	**2.0800e-003**	**0.0000**	**49.2498**	**49.2498**	**0.0105**	**0.0000**	**49.5123**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Paving/Site Work - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0320	0.3299	0.3915	6.2000e-004		0.0174	0.0174		0.0161	0.0161	0.0000	53.8298	53.8298	0.0171	0.0000	54.2577
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0320**	**0.3299**	**0.3915**	**6.2000e-004**		**0.0174**	**0.0174**		**0.0161**	**0.0161**	**0.0000**	**53.8298**	**53.8298**	**0.0171**	**0.0000**	**54.2577**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0127	0.2846	0.4369	6.2000e-004		7.0200e-003	7.0200e-003		7.0200e-003	7.0200e-003	0.0000	53.8297	53.8297	0.0171	0.0000	54.2577
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0127**	**0.2846**	**0.4369**	**6.2000e-004**		**7.0200e-003**	**7.0200e-003**		**7.0200e-003**	**7.0200e-003**	**0.0000**	**53.8297**	**53.8297**	**0.0171**	**0.0000**	**54.2577**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

18-072 200 Caribbean Construction

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	505.14	1000sqft	26.70	505,140.00	0
General Light Industry	0.10	1000sqft	0.00	100.00	0
Parking Lot	201.40	1000sqft	0.00	201,400.00	0
Unenclosed Parking with Elevator	1,235.00	Space	0.00	376,145.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CO2 Intensity = 290

Land Use - Parking garage = 379,145 SF - acreage assigned to office

Construction Phase - Total Days altered to match Construction speadsheet filled out by client

Off-road Equipment - Unit & hours changed according to client spreadsheet

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Based on provided equipment list - appers cranes, forklifts and pump double counted

Off-road Equipment - Based on Provided Equipment list

Off-road Equipment - Based on provided equipment list

Off-road Equipment - Unit & hours changed according to client spreadsheet

Trips and VMT - Calculated using EMFAC

Demolition - Demo Volume = 24,000 tons Hauling + 8,000 ton pavement demo

Grading - Import 156,000 cy during grading and 6,500cy import on building exterior green roof =162,500 export 15,000

Construction Off-road Equipment Mitigation - Tier 4interim, All Equipment Mitigated

Off-road Equipment -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	14.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
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tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

tblConstructionPhase	PhaseStartDate	10/18/2023	8/27/2021
tblConstructionPhase	PhaseStartDate	4/15/2020	10/20/2020
tblConstructionPhase	PhaseStartDate	12/22/2021	5/5/2021
tblConstructionPhase	PhaseStartDate	2/12/2020	5/26/2020
tblConstructionPhase	PhaseStartDate	8/30/2023	1/10/2022
tblGrading	MaterialExported	0.00	15,000.00
tblGrading	MaterialImported	0.00	162,500.00
tblLandUse	LandUseSquareFeet	494,000.00	376,145.00
tblLandUse	LotAcreage	11.60	26.70
tblLandUse	LotAcreage	4.62	0.00
tblLandUse	LotAcreage	11.11	0.00
tblOffRoadEquipment	LoadFactor	0.36	0.36
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.36	0.36
tblOffRoadEquipment	LoadFactor	0.46	0.46
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.31	0.31
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tblOffRoadEquipment	LoadFactor	0.30	0.30
tblOffRoadEquipment	LoadFactor	0.46	0.46
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.20	0.20
tblOffRoadEquipment	LoadFactor	0.31	0.31
tblOffRoadEquipment	LoadFactor	0.20	0.20
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.20	0.20
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.36	0.36
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.46	0.46
tblOffRoadEquipment	OffRoadEquipmentType		Crushing/Proc. Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Rollers
tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Sweepers/Scrubbers
tblOffRoadEquipment	OffRoadEquipmentType		Skid Steer Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentType		Aerial Lifts
tblOffRoadEquipment	OffRoadEquipmentType		Skid Steer Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Plate Compactors
tblOffRoadEquipment	OffRoadEquipmentType		Surfacing Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Sweepers/Scrubbers
tblOffRoadEquipment	OffRoadEquipmentType		Skid Steer Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Forklifts
tblOffRoadEquipment	OffRoadEquipmentType		Aerial Lifts
tblOffRoadEquipment	OffRoadEquipmentType		Forklifts

tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentType		Bore/Drill Rigs
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Forklifts
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentType		Skid Steer Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Sweepers/Scrubbers
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
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tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	1.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	7.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	7.00	2.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	2.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	HaulingTripNumber	3,164.00	0.00
tblTripsAndVMT	HaulingTripNumber	22,188.00	0.00
tblTripsAndVMT	VendorTripNumber	177.00	0.00

tblTripsAndVMT	VendorTripNumber	177.00	0.00
tblTripsAndVMT	WorkerTripNumber	35.00	0.00
tblTripsAndVMT	WorkerTripNumber	43.00	0.00
tblTripsAndVMT	WorkerTripNumber	43.00	0.00
tblTripsAndVMT	WorkerTripNumber	404.00	0.00
tblTripsAndVMT	WorkerTripNumber	404.00	0.00
tblTripsAndVMT	WorkerTripNumber	40.00	0.00
tblTripsAndVMT	WorkerTripNumber	81.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.5397	5.6796	4.0170	8.0400e-003	0.4837	0.2639	0.7476	0.0675	0.2458	0.3133	0.0000	703.2244	703.2244	0.2018	0.0000	708.2685
2021	1.2262	1.7478	1.6118	2.8000e-003	0.0000	0.0879	0.0879	0.0000	0.0831	0.0831	0.0000	241.9227	241.9227	0.0564	0.0000	243.3336
2022	1.8161	1.0550	1.1249	1.8600e-003	0.0000	0.0534	0.0534	0.0000	0.0497	0.0497	0.0000	161.6014	161.6014	0.0465	0.0000	162.7650
Maximum	**1.8161**	**5.6796**	**4.0170**	**8.0400e-003**	**0.4837**	**0.2639**	**0.7476**	**0.0675**	**0.2458**	**0.3133**	**0.0000**	**703.2244**	**703.2244**	**0.2018**	**0.0000**	**708.2685**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.1032	0.7091	4.5800	8.0400e-003	0.2177	0.0128	0.2305	0.0152	0.0128	0.0280	0.0000	703.2236	703.2236	0.2018	0.0000	708.2676
2021	1.0837	0.4380	1.7605	2.8000e-003	0.0000	4.2500e-003	4.2500e-003	0.0000	4.2500e-003	4.2500e-003	0.0000	241.9224	241.9224	0.0564	0.0000	243.3333
2022	1.7395	0.3921	1.2376	1.8600e-003	0.0000	2.9300e-003	2.9300e-003	0.0000	2.9300e-003	2.9300e-003	0.0000	161.6012	161.6012	0.0465	0.0000	162.7648
Maximum	**1.7395**	**0.7091**	**4.5800**	**8.0400e-003**	**0.2177**	**0.0128**	**0.2305**	**0.0152**	**0.0128**	**0.0280**	**0.0000**	**703.2236**	**703.2236**	**0.2018**	**0.0000**	**708.2676**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**18.30**	**81.85**	**-12.21**	**0.00**	**55.00**	**95.06**	**73.27**	**77.51**	**94.72**	**92.11**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2020	3-31-2020	1.4574	0.1097
2	4-1-2020	6-30-2020	1.5703	0.1788
3	7-1-2020	9-30-2020	1.9463	0.2992
4	10-1-2020	12-31-2020	1.2388	0.2237
5	1-1-2021	3-31-2021	0.4437	0.0674
6	4-1-2021	6-30-2021	0.5984	0.1349
7	7-1-2021	9-30-2021	0.6724	0.4158
8	10-1-2021	12-31-2021	1.2573	0.8996
9	1-1-2022	3-31-2022	1.3010	0.9433

10	**4-1-2022**	**6-30-2022**	1.1959	0.9041
11	**7-1-2022**	**9-30-2022**	0.3788	0.2876
		Highest	1.9463	0.9433

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition of Existing Buildings and Sitework	Demolition	1/1/2020	4/28/2020	5	85	
2	Site Preparation/Grading	Grading	5/26/2020	8/10/2020	5	55	
3	Building Structures	Building Construction	10/20/2020	6/21/2021	5	175	
4	Building Exterior and Green Roofs	Building Construction	5/5/2021	5/17/2022	5	270	
5	Paving/Site Work	Paving	1/10/2022	9/2/2022	5	170	
6	Building Interiors	Architectural Coating	8/27/2021	7/28/2022	5	240	
7	Piles/Foundations/Utilities	Trenching	7/28/2020	12/21/2020	5	105	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 757,860; Non-Residential Outdoor: 252,620; Striped Parking

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition of Existing Buildings and Sitework	Concrete/Industrial Saws	4	4.00	81	0.73
Demolition of Existing Buildings and Sitework	Crushing/Proc. Equipment	1	5.00	85	0.78
Demolition of Existing Buildings and Sitework	Excavators	3	6.00	158	0.38
Demolition of Existing Buildings and Sitework	Rubber Tired Dozers	2	6.00	247	0.40
Demolition of Existing Buildings and Sitework	Rubber Tired Loaders	2	6.00	203	0.36
Demolition of Existing Buildings and Sitework	Tractors/Loaders/Backhoes	2	5.00	97	0.37
Site Preparation/Grading	Excavators	2	7.00	158	0.38
Site Preparation/Grading	Graders	2	8.00	187	0.41
Site Preparation/Grading	Rollers	3	10.00	80	0.38
Site Preparation/Grading	Rubber Tired Dozers	0	8.00	247	0.40
Site Preparation/Grading	Rubber Tired Loaders	2	7.00	203	0.36
Site Preparation/Grading	Scrapers	4	7.00	367	0.48
Site Preparation/Grading	Sweepers/Scrubbers	1	10.00	64	0.46
Site Preparation/Grading	Skid Steer Loaders	2	10.00	65	0.37
Site Preparation/Grading	Tractors/Loaders/Backhoes	1	5.00	97	0.37
Building Structures	Pumps	2	3.00	84	0.74
Building Exterior and Green Roofs	Aerial Lifts	4	5.00	63	0.31
Building Exterior and Green Roofs	Skid Steer Loaders	2	2.00	65	0.37
Paving/Site Work	Plate Compactors	4	1.00	8	0.43
Paving/Site Work	Surfacing Equipment	1	1.00	263	0.30
Paving/Site Work	Sweepers/Scrubbers	2	2.00	64	0.46
Paving/Site Work	Skid Steer Loaders	2	4.00	65	0.37
Paving/Site Work	Forklifts	2	2.00	89	0.20
Building Interiors	Aerial Lifts	0	6.00	63	0.31
Building Structures	Cranes	3	2.00	231	0.29
Building Structures	Forklifts	4	2.00	89	0.20

Building Structures	Generator Sets	4	2.00	84	0.74
Building Interiors	Forklifts	3	5.00	89	0.20
Building Interiors	Cranes	1	2.00	231	0.29
Building Structures	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Structures	Welders	4	2.00	46	0.45
Building Interiors	Generator Sets	1	3.00	84	0.74
Building Exterior and Green Roofs	Cranes	1	6.00	231	0.29
Building Exterior and Green Roofs	Forklifts	3	6.00	89	0.20
Building Exterior and Green Roofs	Generator Sets	0	8.00	84	0.74
Building Interiors	Welders	1	3.00	46	0.45
Piles/Foundations/Utilities	Bore/Drill Rigs	2	4.00	221	0.50
Building Exterior and Green Roofs	Tractors/Loaders/Backhoes	1	2.00	97	0.37
Building Exterior and Green Roofs	Welders	0	8.00	46	0.45
Piles/Foundations/Utilities	Cranes	2	4.00	231	0.29
Piles/Foundations/Utilities	Forklifts	2	7.00	89	0.20
Paving/Site Work	Pavers	1	1.00	130	0.42
Paving/Site Work	Paving Equipment	1	1.00	132	0.36
Piles/Foundations/Utilities	Excavators	3	5.00	158	0.38
Paving/Site Work	Rollers	3	1.00	80	0.38
Piles/Foundations/Utilities	Rubber Tired Loaders	2	5.00	203	0.36
Piles/Foundations/Utilities	Pumps	2	1.00	84	0.74
Piles/Foundations/Utilities	Skid Steer Loaders	2	5.00	65	0.37
Piles/Foundations/Utilities	Sweepers/Scrubbers	2	5.00	64	0.46
Building Interiors	Air Compressors	0	8.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition of Existing Buildings and Sitework	14	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation/Grading	17	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Piles/Foundations/Utilities	17	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Structures	18	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Exterior and Green Roofs	11	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving/Site Work	16	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Interiors	6	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition of Existing Buildings and Sitework - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					0.3424	0.0000	0.3424	0.0518	0.0000	0.0518	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1775	1.7283	1.2302	2.3200e-003		0.0862	0.0862		0.0812	0.0812	0.0000	202.5566	202.5566	0.0496	0.0000	203.7973
Total	**0.1775**	**1.7283**	**1.2302**	**2.3200e-003**	**0.3424**	**0.0862**	**0.4286**	**0.0518**	**0.0812**	**0.1330**	**0.0000**	**202.5566**	**202.5566**	**0.0496**	**0.0000**	**203.7973**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1541	0.0000	0.1541	0.0117	0.0000	0.0117	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0269	0.1165	1.3676	2.3200e-003		3.5800e-003	3.5800e-003		3.5800e-003	3.5800e-003	0.0000	202.5563	202.5563	0.0496	0.0000	203.7971
Total	**0.0269**	**0.1165**	**1.3676**	**2.3200e-003**	**0.1541**	**3.5800e-003**	**0.1577**	**0.0117**	**3.5800e-003**	**0.0152**	**0.0000**	**202.5563**	**202.5563**	**0.0496**	**0.0000**	**203.7971**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation/Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					0.1413	0.0000	0.1413	0.0157	0.0000	0.0157	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1911	2.2085	1.4489	2.9200e-003		0.0933	0.0933		0.0858	0.0858	0.0000	256.7452	256.7452	0.0830	0.0000	258.8211
Total	**0.1911**	**2.2085**	**1.4489**	**2.9200e-003**	**0.1413**	**0.0933**	**0.2345**	**0.0157**	**0.0858**	**0.1015**	**0.0000**	**256.7452**	**256.7452**	**0.0830**	**0.0000**	**258.8211**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0636	0.0000	0.0636	3.5300e-003	0.0000	3.5300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0387	0.2716	1.5623	2.9200e-003		4.7900e-003	4.7900e-003		4.7900e-003	4.7900e-003	0.0000	256.7449	256.7449	0.0830	0.0000	258.8208
Total	**0.0387**	**0.2716**	**1.5623**	**2.9200e-003**	**0.0636**	**4.7900e-003**	**0.0684**	**3.5300e-003**	**4.7900e-003**	**8.3200e-003**	**0.0000**	**256.7449**	**256.7449**	**0.0830**	**0.0000**	**258.8208**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Building Structures - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0423	0.3595	0.3082	5.5000e-004		0.0195	0.0195		0.0189	0.0189	0.0000	46.6409	46.6409	7.2500e-003	0.0000	46.8220
Total	**0.0423**	**0.3595**	**0.3082**	**5.5000e-004**		**0.0195**	**0.0195**		**0.0189**	**0.0189**	**0.0000**	**46.6409**	**46.6409**	**7.2500e-003**	**0.0000**	**46.8220**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.3700e-003	0.0492	0.3257	5.5000e-004		7.7000e-004	7.7000e-004		7.7000e-004	7.7000e-004	0.0000	46.6408	46.6408	7.2500e-003	0.0000	46.8220
Total	**6.3700e-003**	**0.0492**	**0.3257**	**5.5000e-004**		**7.7000e-004**	**7.7000e-004**		**7.7000e-004**	**7.7000e-004**	**0.0000**	**46.6408**	**46.6408**	**7.2500e-003**	**0.0000**	**46.8220**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Building Structures - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0873	0.7547	0.6972	1.2600e-003		0.0387	0.0387		0.0374	0.0374	0.0000	107.3617	107.3617	0.0162	0.0000	107.7657
Total	**0.0873**	**0.7547**	**0.6972**	**1.2600e-003**		**0.0387**	**0.0387**		**0.0374**	**0.0374**	**0.0000**	**107.3617**	**107.3617**	**0.0162**	**0.0000**	**107.7657**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0147	0.1132	0.7498	1.2600e-003		1.7800e-003	1.7800e-003		1.7800e-003	1.7800e-003	0.0000	107.3616	107.3616	0.0162	0.0000	107.7656
Total	**0.0147**	**0.1132**	**0.7498**	**1.2600e-003**		**1.7800e-003**	**1.7800e-003**		**1.7800e-003**	**1.7800e-003**	**0.0000**	**107.3616**	**107.3616**	**0.0162**	**0.0000**	**107.7656**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Exterior and Green Roofs - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0673	0.7574	0.6999	1.1900e-003		0.0357	0.0357		0.0328	0.0328	0.0000	104.4637	104.4637	0.0338	0.0000	105.3083
Total	**0.0673**	**0.7574**	**0.6999**	**1.1900e-003**		**0.0357**	**0.0357**		**0.0328**	**0.0328**	**0.0000**	**104.4637**	**104.4637**	**0.0338**	**0.0000**	**105.3083**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0202	0.2924	0.7870	1.1900e-003		1.9500e-003	1.9500e-003		1.9500e-003	1.9500e-003	0.0000	104.4635	104.4635	0.0338	0.0000	105.3082
Total	**0.0202**	**0.2924**	**0.7870**	**1.1900e-003**		**1.9500e-003**	**1.9500e-003**		**1.9500e-003**	**1.9500e-003**	**0.0000**	**104.4635**	**104.4635**	**0.0338**	**0.0000**	**105.3082**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Exterior and Green Roofs - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0340	0.3776	0.3873	6.7000e-004		0.0171	0.0171		0.0158	0.0158	0.0000	58.5831	58.5831	0.0190	0.0000	59.0568
Total	**0.0340**	**0.3776**	**0.3873**	**6.7000e-004**		**0.0171**	**0.0171**		**0.0158**	**0.0158**	**0.0000**	**58.5831**	**58.5831**	**0.0190**	**0.0000**	**59.0568**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0113	0.1639	0.4412	6.7000e-004		1.0900e-003	1.0900e-003		1.0900e-003	1.0900e-003	0.0000	58.5830	58.5830	0.0190	0.0000	59.0567
Total	**0.0113**	**0.1639**	**0.4412**	**6.7000e-004**		**1.0900e-003**	**1.0900e-003**		**1.0900e-003**	**1.0900e-003**	**0.0000**	**58.5830**	**58.5830**	**0.0190**	**0.0000**	**59.0567**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving/Site Work - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0320	0.3292	0.3906	6.2000e-004		0.0174	0.0174		0.0160	0.0160	0.0000	53.7365	53.7365	0.0171	0.0000	54.1636
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0320**	**0.3292**	**0.3906**	**6.2000e-004**		**0.0174**	**0.0174**		**0.0160**	**0.0160**	**0.0000**	**53.7365**	**53.7365**	**0.0171**	**0.0000**	**54.1636**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0108	0.1750	0.4301	6.2000e-004		9.8000e-004	9.8000e-004		9.8000e-004	9.8000e-004	0.0000	53.7364	53.7364	0.0171	0.0000	54.1636
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0108**	**0.1750**	**0.4301**	**6.2000e-004**		**9.8000e-004**	**9.8000e-004**		**9.8000e-004**	**9.8000e-004**	**0.0000**	**53.7364**	**53.7364**	**0.0171**	**0.0000**	**54.1636**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Building Interiors - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Archit. Coating	1.0446					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0270	0.2357	0.2147	3.5000e-004		0.0135	0.0135		0.0128	0.0128	0.0000	30.0974	30.0974	6.4900e-003	0.0000	30.2595
Total	**1.0716**	**0.2357**	**0.2147**	**3.5000e-004**		**0.0135**	**0.0135**		**0.0128**	**0.0128**	**0.0000**	**30.0974**	**30.0974**	**6.4900e-003**	**0.0000**	**30.2595**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.0446					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.2900e-003	0.0325	0.2237	3.5000e-004		5.2000e-004	5.2000e-004		5.2000e-004	5.2000e-004	0.0000	30.0973	30.0973	6.4900e-003	0.0000	30.2595
Total	**1.0489**	**0.0325**	**0.2237**	**3.5000e-004**		**5.2000e-004**	**5.2000e-004**		**5.2000e-004**	**5.2000e-004**	**0.0000**	**30.0973**	**30.0973**	**6.4900e-003**	**0.0000**	**30.2595**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Building Interiors - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Archit. Coating	1.7104					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0398	0.3482	0.3471	5.8000e-004		0.0189	0.0189		0.0179	0.0179	0.0000	49.2818	49.2818	0.0105	0.0000	49.5446
Total	**1.7502**	**0.3482**	**0.3471**	**5.8000e-004**		**0.0189**	**0.0189**		**0.0179**	**0.0179**	**0.0000**	**49.2818**	**49.2818**	**0.0105**	**0.0000**	**49.5446**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.7104					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.0200e-003	0.0532	0.3663	5.8000e-004		8.5000e-004	8.5000e-004		8.5000e-004	8.5000e-004	0.0000	49.2818	49.2818	0.0105	0.0000	49.5445
Total	**1.7174**	**0.0532**	**0.3663**	**5.8000e-004**		**8.5000e-004**	**8.5000e-004**		**8.5000e-004**	**8.5000e-004**	**0.0000**	**49.2818**	**49.2818**	**0.0105**	**0.0000**	**49.5445**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Piles/Foundations/Utilities - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.1288	1.3834	1.0297	2.2500e-003		0.0650	0.0650		0.0600	0.0600	0.0000	197.2818	197.2818	0.0619	0.0000	198.8280
Total	**0.1288**	**1.3834**	**1.0297**	**2.2500e-003**		**0.0650**	**0.0650**		**0.0600**	**0.0600**	**0.0000**	**197.2818**	**197.2818**	**0.0619**	**0.0000**	**198.8280**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0312	0.2718	1.3244	2.2500e-003		3.6700e-003	3.6700e-003		3.6700e-003	3.6700e-003	0.0000	197.2816	197.2816	0.0619	0.0000	198.8278
Total	**0.0312**	**0.2718**	**1.3244**	**2.2500e-003**		**3.6700e-003**	**3.6700e-003**		**3.6700e-003**	**3.6700e-003**	**0.0000**	**197.2816**	**197.2816**	**0.0619**	**0.0000**	**198.8278**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

EMFAC2017 Construction Emissions

TRAFFIC EMISSIONS using EMFAC2017 **w/Mitigation**

100 Caribbean

Year	Duration	Phase	Total Trips Worker Tri	Vendor Trip	Haul		Trip Length Worker Tri	Vendor Trip	Haul Trip L	VMT Worker	Vendor	Haul	Hauling Based Upon…	Emissions tons/day ROG	NOx	PM10ex	PM2.5ex	Start Emissions tons/day ROG	NOx	PM10ex	PM2.5ex	Idle Emissions (tons/day ROG	NOx	PM10ex	PM2.5ex
		Vehicle Type	LDA,LDT1,LDT2 Worker	HHDT,MHDT	HHDT																				
2020	65	Demolition and Sitework	35	0	2,275	-	1,400	10.8	7.3	20	24,570	-	28,000	7,000 demo tons at 10tons/load		0.10				0.00		0.00		0.01		
2020	55	Site Preparation/Grading/Soil Import	43	0	2,365	-	12,625	10.8	7.3	20	25,542	-	252,500	118,000cy at 15 cy/load		0.88				0.03		0.00		0.05		
2020	70	Piles/Foundations/Utilities	48	0	3,360	-	2,640	10.8	7.3	7.3	36,288	-	19,272	540+780 loads cement		0.07				0.01		0.00		0.01		
2020	385	Building Structures	207	102	79,695	39,270	1,840	10.8	7.3	7.3	860,706	286,671	13,432	920 loads cement		1.16				0.10		0.00		0.10		
2021	285	Building Exterior and Green Roof	207	102	58,995	29,070	1,300	10.8	7.3	7.3	637,146	212,211	9,490	6,500 soil at 10 cy/load		0.86				0.07		0.00		0.07		
2021	82	Paving	40	0	3,280	-	-	10.8	7.3	7.3	35,424	-	-			0.00				0.00		0.00		0.00		
2021	265	Building Interiors	41	0	10,865	-	-	10.8	7.3	7.3	117,342	-	-			0.01				0.00		0.00		0.00		
					160,835	68,340	19,805	VMT =			1,737,018	498,882	322,694													
														sum		3.08			0.00	0.22	0.00	0.00		0.24		

		50%LDA,25%LDT1,25%LDT2	50%HHDT,50%MHDT	HHDT
	~~2019 Rate~~		2020	
ROG				
NOx		0.081232258	3.279696	3.170481
PM10ex				
PM2.5ex				
CO2				
	2020 Rate			
ROG				
NOx		0.081232258	3.279696	3.170481
PM10ex				
PM2.5ex				
	Mitigated Rate			
NOx				3.170481

run+start+idle **3.55**

Start/RL factors g/trip

		50%LDA,25%LDT1,25%LDT2	50%HHDT,50%MHDT	HHDT
	~~2019 Rate~~		2020	
ROG				
NOx		0.2712	1.6729	2.1952
PM10ex				
PM2.5ex				
CO2				
	Idle Rate			
NOx			25.59323	45.23874
	2020 Rate			
ROG				
NOx		0.2712	1.672914	2.195164
PM10ex				
PM2.5ex				
CO2				
	Idle Rate			
NOx			25.59323	45.23874
	Mitigated Rate			
NOx	Start			2.195164
	Idle Rate		25.59323	45.23874

TRAFFIC EMISSIONS using EMFAC2017 **w/Mitigation**

200 Caribbean

	Duration	Phase	Total Trips Worker Tri	Vendor Tri	Worker LDA,LDT1,LDT2	Vendor HHDT,MHDT	Haul/Cement trips HHDT	Trip Length Worker Tri	Vendor Tri	Haul Trip L	VMT Worker	Vendor	Haul	Hauling Based Upon…
		Vehicle Type												
2020	85	Demolition of Existing Buildings and Sitework	35	0	2,975	-	1,600	10.8	7.3	20	32,130	-	32,000	8,000 demo tons at 10tons/load
2020	55	Site Preparation/Grading	43	0	2,365	-	22,188	10.8	7.3	20	25,542	-	443,760	196,500cy at 15 cy/load
2020	105	Piles/Foundations/Utilities	43	0	4,515	-	2,458	10.8	7.3	7.3	48,762	-	17,943	461+684+84 loads cement
2020	175	Building Structures	404	177	70,700	30,975	3,110	10.8	7.3	7.3	763,560	226,118	22,703	920+635 loads cement
2021	270	Building Exterior and Green Roofs	404	177	109,080	47,790	813	10.8	7.3	7.3	1,178,064	348,867	5,935	6,500 soil at 10 cy/load
2021	170	Paving/Site Work	40	0	6,800	-	-	10.8	7.3	7.3	73,440	-	-	
2021	240	Building Interiors	81	0	19,440	-	-	10.8	7.3	7.3	209,952	-	-	
					215,875	78,765	30,169				2,331,450	574,985	522,341	

Emissions tons/day

	ROG	NOx	PM10ex	PM2.5ex
		0.11		
		1.55		
		0.07		
		0.96		
		1.39		
		0.01		
		0.02		
sum		4.11		

Start Emissions tons/day

ROG	NOx	PM10ex	PM2.5ex
	0.00		0.00
	0.05		0.00
	0.01		0.00
	0.09		0.00
	0.12		0.00
	0.00		0.00
	0.01		0.00
0.00	0.28	0.00	0.00

Idle Emissions (tons/day

ROG	NOx	PM10ex	PM2.5ex
	0.01		
	0.09		
	0.01		
	0.09		
	0.12		
	0.00		
	0.00		
	0.31		

run+start+idle **4.70**

	50%LDA,25%LDT1,25%LDT2	50%HHDT,50%MHDT	HHDT
	~~2019 Rate~~	2020	
ROG			
NOx	0.081232258	3.279696	3.170481
PM10ex			
PM2.5ex			
CO2			
	2020 Rate		
ROG			
NOx	0.081232258	3.279696	3.170481
PM10ex			
PM2.5ex			
	Mitigated Rate		
NOx			3.170481

Start/RL factors g/trip

	50%LDA,25%LDT1,25%LDT2	50%HHDT,50%MHDT	HHDT
	~~2019 Rate~~	2020	
ROG			
NOx	0.2712	1.6729	2.1952
PM10ex			
PM2.5ex			
CO2			
	Idle Rate		
NOx		25.59323	45.23874
	2020 Rate		
ROG			
NOx	0.2712	1.672914	2.195164
PM10ex			
PM2.5ex			
CO2			
	Idle Rate		
NOx		25.59323	45.23874
	Mitigated Rate		
NOx	Start		2.195164
	Idle Rate	25.59323	45.23874

TRAFFIC EMISSIONS using EMFAC2017 **w/Mitigation**

Parking Areas

Duration	Phase	Worker Trip	Vendor Trip	Total Trips Worker	Vendor	Haul/Cement trips total	Trip Length Worker Trip	Vendor Trip	Haul Trip Le	VMT Worker	Vendor	Haul	Hauling Based Upon…
	Vehicle Type			LDA,LDT1,LDT2	HHDT,MHDT	HHDT							
20	Demolition			20	0	303	10.8	7.3	20	216	0	6060	from CalEEMod
30	Site Preparation/Grading			20	0	0	10.8	7.3	20	216	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				40	0	303				432	0	6060	

Rate

Emissions in tons

	50%LDA,25%LDT1,25% LDT2	50%HHDT, 50%MHDT	HHDT	Worker	Vendor	Haul	**Total**	
ROG	0.021838399	0.262295	0.224409	1.03901E-05	0	0.001498	**0.0015081**	0.001508
NOx	0.095339954	4.571228	3.170481	4.536E-05	0	0.02116	**0.0212052**	0.034992
PM10ex	0.001791745	0.10539	0.09303	8.5246E-07	0	0.000621	**0.0006217**	0.000622
PM2.5ex	0.001650314	0.100827	0.089006	7.85171E-07	0	0.000594	**0.0005948**	0.000595
CO2	305.8939925	1402.489	1611.111	0.145535468	0	10.75257	**10.898102**	0.000595

Mitigated Rate

NOx		3.170481

TRAFFIC EMISSIONS using EMFAC2017 **Uncontrolled**

100 Caribbean

Year	Duration	Phase	Total Trips Worker Tri	Vendor Tri	Haul	Trip Length Worker Tri	Vendor Tri	Haul Trip L	VMT Worker	Vendor	Haul	Hauling Based Upon…	Running Emissions tons/day ROG	NOx	PM10ex	PM2.5ex	CO2	Start Emissions tons/day ROG	NOx	PM10ex	PM2.5ex	Idle Emissions (tons/day ROG	NOx	PM10ex	PM2.5ex
		Vehicle Type	Worker LDA,LDT1, LDT2	Vendor HHDT,MH DT	HHDT																				
2020	65	Demolition and Sitework	35	0	2275	0	1,400	10.8	7.3	20	24570	0	28000	7,000 demo tons at 10tons/load	0.01	0.14	0.00	0.00	57.96	0.00	0.00	0.00	0.00		0.01		
2020	55	Site Preparation/Grading/Soil Import	43	0	2365	0	12,625	10.8	7.3	20	25542	0	252500	118,000cy at 15 cy/load	0.05	1.29	0.02	0.02	456.63	0.00	0.02	0.00	0.00		0.07		
2020	70	Piles/Foundations/Utilities	48	0	3360	0	2640	10.8	7.3	7.3	36288	0	19272	540+780 loads cement	0.00	0.10	0.00	0.00	46.42	0.00	0.01	0.00	0.00		0.02		
2020	385	Building Structures	207	102	79695	39270	1840	10.8	7.3	7.3	860706	286671	13432	920 loads cement	0.08	1.41	0.03	0.03	756.58	0.07	0.09	0.00	0.00		0.14		
2021	285	Building Exterior and Green Roof	207	102	58995	29070	1300	10.8	7.3	7.3	637146	212211	9490	6,500 soil at 10 cy/load	0.06	1.04	0.02	0.02	559.26	0.05	0.07	0.00	0.00		0.10		
2021	82	Paving	40	0	3280	0	0	10.8	7.3	7.3	35424	0	0		0.00	0.00	0.00	0.00	11.93	0.00	0.00	0.00	0.00		0.00		
2021	265	Building Interiors	41	0	10865	0	0	10.8	7.3	7.3	117342	0	0		0.00	0.01	0.00	0.00	39.53	0.01	0.00	0.00	0.00		0.00		
			160835	68340	19805	VMT =					1737018	498882	322694														
														sum	0.21	4.00	0.07	0.07		0.14	0.19	0.00	0.00		0.34		
															0.35	4.53	0.07	0.07	1928.32								

Running factors g/mi

	50%LDA,25%LDT1,25% LDT2	50%HHDT ,50%MHDT	HHDT
	~~2019 Rate~~	2020	
ROG	0.018208608	0.205635	0.171747
NOx	0.081232258	4.004334	4.619756
PM10ex	0.001732182	0.083115	0.072838
PM2.5ex	0.001595236	0.079516	0.069687
CO2	305.8939925	1402.489	1611.111
	2020 Rate		
ROG	0.018208608	0.205635	0.171747
NOx	0.081232258	4.004334	4.619756
PM10ex	0.001732182	0.083115	0.072838
PM2.5ex	0.001595236	0.079516	0.069687
	Mitigated Rate		
NOx			3.170481

Start/RL factors g/trip

	50%LDA,25%LDT1,25% LDT2	50%HHDT ,50%MHDT	HHDT
	2020 Rate		
ROG	0.7641	0.0501	0.0005
NOx	0.2712	1.4415	1.7324
PM10ex	0.0000	0.0000	0.0000
PM2.5ex	0.0000	0.0000	0.0000
CO2	63.7272	2.3566	0.0225
	Idle Rate		
NOx		36.04452	63.59231
	2020 Rate		
ROG	0.7641	0.050125	0.000519
NOx	0.2712	1.441523	1.732384
PM10ex	0.0000	0	0
PM2.5ex	0.0000	0	0
CO2	63.7272	2.35663	0.022535
	Idle Rate		
NOx		36.04452	63.59231
	Mitigated Rate		
NOx	Start		2.195164
	Idle Rate	25.59323	45.23874

TRAFFIC EMISSIONS using EMFAC2017 **Uncontrolled**

200 Caribbean

	Duration	Phase	Total Trips					Trip Length			VMT				Emissions tons/day					Start Emissions tons/day				Idle Emissions (tons/day			
			Worker Tri	Vendor Tri	Worker LDA,LDT1, LDT2	Vendor HHDT,MHDT	Haul/Cement trips HHDT	Worker Tri	Vendor Tri	Haul Trip L	Worker	Vendor	Haul	Hauling Based Upon…	ROG	NOx	PM10ex	PM2.5ex	CO2	ROG	NOx	PM10ex	PM2.5ex	ROG	NOx	PM10ex	PM2.5ex
		Vehicle Type																									
2020	85	Demolition of Existing Buildings and Sitework	35	0	2975	0	1,600	10.8	7.3	20	32130	0	32,000	8,000 demo tons at 10tons/load	0.01	0.17	0.00	0.00	67.60	0.00	0.00	0.00	0.00		0.01		
2020	55	Site Preparation/Grading	43	0	2365	0	22,188	10.8	7.3	20	25542	0	443,760	196,500cy at 15 cy/load	0.08	2.26	0.04	0.03	795.99	0.00	0.04	0.00	0.00		0.13		
2020	105	Piles/Foundations/Utilities	43	0	4515	0	2458	10.8	7.3	7.3	48762	0	17,943	461+684+84 loads cement	0.00	0.10	0.00	0.00	48.27	0.00	0.01	0.00	0.00		0.01		
2020	175	Building Structures	404	177	70700	30975	3110	10.8	7.3	7.3	763560	226,118	22,703	920+635 loads cement	0.07	1.18	0.02	0.02	646.78	0.06	0.08	0.00	0.00		0.12		
2021	270	Building Exterior and Green Roofs	404	177	109080	47790	813	10.8	7.3	7.3	1178064	348,867	5,935	6,500 soil at 10 cy/load	0.10	1.67	0.03	0.03	946.26	0.09	0.11	0.00	0.00		0.16		
2021	170	Paving/Site Work	40	0	6800	0	0	10.8	7.3	7.3	73440	0	0		0.00	0.01	0.00	0.00	24.74	0.01	0.00	0.00	0.00		0.00		
2021	240	Building Interiors	81	0	19440	0	0	10.8	7.3	7.3	209952	0	0		0.00	0.02	0.00	0.00	70.73	0.02	0.01	0.00	0.00		0.00		
					215875	78765	30169				2331450	574,985	522,341														
														sum	0.28	5.40	0.10	0.09		0.19	0.25	0.00	0.00		0.44		

	50%LDA,25%LDT1,25% LDT2	50%HHDT ,50%MHDT	HHDT
~~2019 Rate~~		2020	
ROG	0.018208608	0.205635	0.171747
NOx	0.081232258	4.004334	4.619756
PM10ex	0.001732182	0.083115	0.072838
PM2.5ex	0.001595236	0.079516	0.069687
CO2	305.8939925	1402.489	1611.111
2020 Rate			
ROG	0.018208608	0.205635	0.171747
NOx	0.081232258	4.004334	4.619756
PM10ex	0.001732182	0.083115	0.072838
PM2.5ex	0.001595236	0.079516	0.069687
Mitigated Rate			
NOx			3.170481

Start/RL factors g/trip

	50%LDA,25%LDT1,25% LDT2	50%HHDT ,50%MHDT	HHDT
2019 Rate			
ROG	0.7641	0.0501	0.0005
NOx	0.2712	1.4415	1.7324
PM10ex	0.0000	0.0000	0.0000
PM2.5ex	0.0000	0.0000	0.0000
CO2	63.7272	2.3566	0.0225
Idle Rate			
NOx		36.04452	63.59231
2020 Rate			
ROG	0.7641	0.050125	0.000519
NOx	0.2712	1.441523	1.732384
PM10ex	0.0000	0	0
PM2.5ex	0.0000	0	0
CO2	63.7272	2.35663	0.022535
Idle Rate			
NOx		36.04452	63.59231
Mitigated Rate			
NOx	Start		2.195164
	Idle Rate	25.59323	45.23874

0.46 6.09 0.10 0.09 2600.37

TRAFFIC EMISSIONS using EMFAC2017 **Uncontrolled**

Parking Areas

Duration	Phase	Worker Trip	Vendor Trip	Total Trips Worker	Vendor	Haul/Cement trips total	Trip Length Worker Trip	Vendor Trip	Haul Trip Le	VMT Worker	Vendor	Haul	Hauling Based Upon…
	Vehicle Type			LDA,LDT1,LDT2	HHDT,MHDT	HHDT							
20	Demolition			20	0	303	10.8	7.3	20	216	0	6060	from CalEEMod
30	Site Preparation/Grading			20	0	0	10.8	7.3	20	216	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				0	0		10.8	7.3	7.3	0	0	0	
				40	0	303				432	0	6060	

Rate

Emissions in tons

	50%LDA,25%LDT1,25% LDT2	50%HHDT, 50%MHDT	HHDT	Worker	Vendor	Haul	**Total**	
ROG	0.021838399	0.262295	0.224409	1.03901E-05	0	0.001498	**0.0015081**	0.001508
NOx	0.095339954	4.571228	5.23616	4.536E-05	0	0.034946	**0.0349915**	0.034992
PM10ex	0.001791745	0.10539	0.09303	8.5246E-07	0	0.000621	**0.0006217**	0.000622
PM2.5ex	0.001650314	0.100827	0.089006	7.85171E-07	0	0.000594	**0.0005948**	0.000595
CO2	305.8939925	1402.489	1611.111	0.145535468	0	10.75257	**10.898102**	0.000595

Mitigated Rate

NOx	3.170481

| | | | | Run | Start/RL | Idle | | | |

EMFAC2017 (v1.0.2) Emission Rates

Region Type: County

Region: SANTA CLARA

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

| | | |

Operational Emissions

Proposed Project

Google Carribean Campuses - Santa Clara County, Annual

Google Carribean Campuses

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Office Park	1,041.89	1000sqft	45.00	1,041,890.00	4700
General Heavy Industry	0.00	1000sqft	0.00	52,800.00	0
Parking Lot	286.40	1000sqft	0.00	286,400.00	0
Unenclosed Parking with Elevator	1,235.00	Space	0.00	379,145.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E's 2020 emission rate

Land Use - Office park at 536,750sf + 505,140sf = 1,041,890sf, 81,000sf CentralPlant, Parking structure=379,400sf,Parkinglot = 201,400sf+85,000= 286,400sf

Construction Phase - Operational Run only

Off-road Equipment - Operational run only

Grading -

Vehicle Trips - w/TDM =7641trips per 1,081ksf = 7.31 weekday trips (City=8.65,1.24,0.58) (Utility = 11.59)

Woodstoves -

Energy Use - Natural gas usage must meet 15.6 HVAC + 2.5 DWH = 18.1 kBtu/sf/yr

Water And Wastewater - Assume wastewater treatment plant

Solid Waste - 20.8+22.0 cy/day@0.218t/cy*250days=2,333

Construction Off-road Equipment Mitigation -

Energy Mitigation - PV system for 200 Caribbean = 4,632,700 kwh, for 100 Caribbean = same as 200 Caribbean

Assume 5% reduction for LEED Gold (meet 2010 building code standard)

Water Mitigation - some water efficiency

Stationary Sources - Emergency Generators and Fire Pumps - 1 600kW gen and 1 1,000kW gen, assume two 1,000Hp gens

Stationary Sources - Process Boilers - No data, use default natural gas

Table Name	Column Name	Default Value	New Value
tblEnergyUse	T24NG	21.04	18.10
tblLandUse	LandUseSquareFeet	0.00	52,800.00
tblLandUse	LandUseSquareFeet	494,000.00	379,145.00
tblLandUse	LotAcreage	23.92	45.00
tblLandUse	LotAcreage	6.57	0.00
tblLandUse	LotAcreage	11.11	0.00
tblLandUse	Population	0.00	4,700.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblSolidWaste	SolidWasteGenerationRate	0.00	65.47
tblSolidWaste	SolidWasteGenerationRate	968.96	2,333.00
tblStationaryBoilersUse	NumberOfEquipment	0.00	9.00
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	2,000.00
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	50.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblTripsAndVMT	WorkerTripNumber	0.00	18.00

tblVehicleTrips	ST_TR	1.50	11.59
tblVehicleTrips	ST_TR	1.64	1.24
tblVehicleTrips	SU_TR	1.50	11.59
tblVehicleTrips	SU_TR	0.76	0.58
tblVehicleTrips	WD_TR	1.50	11.59
tblVehicleTrips	WD_TR	11.42	8.65
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	IndoorWaterUseRate	0.00	12,210,000.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Area	4.9052	2.1000e-004	0.0236	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Energy	0.1097	0.9968	0.8373	5.9800e-003		0.0758	0.0758		0.0758	0.0758	0.0000	3,931.7996	3,931.7996	0.3055	0.0788	3,962.9158
Mobile	1.4688	5.6051	17.8401	0.0651	6.2517	0.0503	6.3020	1.6734	0.0469	1.7203	0.0000	5,960.6131	5,960.6131	0.1874	0.0000	5,965.2970
Stationary	0.1641	0.7339	0.4184	7.9000e-004		0.0241	0.0241		0.0241	0.0241	0.0000	76.1594	76.1594	0.0107	0.0000	76.4264
Waste						0.0000	0.0000		0.0000	0.0000	486.8677	0.0000	486.8677	28.7731	0.0000	1,206.1942
Water						0.0000	0.0000		0.0000	0.0000	69.8365	192.7496	262.5862	0.2596	0.1559	315.5234
Total	**6.6478**	**7.3360**	**19.1194**	**0.0718**	**6.2517**	**0.1503**	**6.4020**	**1.6734**	**0.1469**	**1.8203**	**556.7043**	**10,161.3675**	**10,718.0718**	**29.5363**	**0.2347**	**11,526.4057**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.9052	2.1000e-004	0.0236	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Energy	0.1043	0.9480	0.7963	5.6900e-003		0.0721	0.0721		0.0721	0.0721	0.0000	3,559.6010	3,559.6010	0.2725	0.0712	3,587.6366
Mobile	1.4688	5.6051	17.8401	0.0651	6.2517	0.0503	6.3020	1.6734	0.0469	1.7203	0.0000	5,960.6131	5,960.6131	0.1874	0.0000	5,965.2970
Stationary	0.1641	0.7339	0.4184	7.9000e-004		0.0241	0.0241		0.0241	0.0241	0.0000	76.1594	76.1594	0.0107	0.0000	76.4264
Waste						0.0000	0.0000		0.0000	0.0000	486.8677	0.0000	486.8677	28.7731	0.0000	1,206.1942
Water						0.0000	0.0000		0.0000	0.0000	55.8692	161.4629	217.3322	0.2084	0.1248	259.7449
Total	**6.6424**	**7.2872**	**19.0784**	**0.0715**	**6.2517**	**0.1466**	**6.3983**	**1.6734**	**0.1431**	**1.8166**	**542.7370**	**9,757.8823**	**10,300.6193**	**29.4522**	**0.1961**	**11,095.3479**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.08**	**0.66**	**0.21**	**0.40**	**0.00**	**2.47**	**0.06**	**0.00**	**2.53**	**0.20**	**2.51**	**3.97**	**3.89**	**0.28**	**16.45**	**3.74**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.4688	5.6051	17.8401	0.0651	6.2517	0.0503	6.3020	1.6734	0.0469	1.7203	0.0000	5,960.6131	5,960.6131	0.1874	0.0000	5,965.2970
Unmitigated	1.4688	5.6051	17.8401	0.0651	6.2517	0.0503	6.3020	1.6734	0.0469	1.7203	0.0000	5,960.6131	5,960.6131	0.1874	0.0000	5,965.2970

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	0.00	0.00	0.00		
Office Park	9,012.35	1,291.94	604.30	16,812,617	16,812,617
Parking Lot	0.00	0.00	0.00		
Unenclosed Parking with Elevator	0.00	0.00	0.00		
Total	9,012.35	1,291.94	604.30	16,812,617	16,812,617

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	9.50	7.30	7.30	59.00	28.00	13.00	92	5	3
Office Park	9.50	7.30	7.30	33.00	48.00	19.00	82	15	3
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Unenclosed Parking with	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720
Office Park	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720
Parking Lot	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720
Unenclosed Parking with Elevator	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Exceed Title 24

Install High Efficiency Lighting

Kilowatt Hours of Renewable Electricity Generated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2,527.5728	2,527.5728	0.2528	0.0523	2,549.4755
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2,846.6773	2,846.6773	0.2847	0.0589	2,871.3452
NaturalGas Mitigated	0.1043	0.9480	0.7963	5.6900e-003		0.0721	0.0721		0.0721	0.0721	0.0000	1,032.0283	1,032.0283	0.0198	0.0189	1,038.1611
NaturalGas Unmitigated	0.1097	0.9968	0.8373	5.9800e-003		0.0758	0.0758		0.0758	0.0758	0.0000	1,085.1223	1,085.1223	0.0208	0.0199	1,091.5707

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	1.39286e+006	7.5100e-003	0.0683	0.0574	4.1000e-004		5.1900e-003	5.1900e-003		5.1900e-003	5.1900e-003	0.0000	74.3285	74.3285	1.4200e-003	1.3600e-003	74.7702
Office Park	1.89416e+007	0.1021	0.9285	0.7800	5.5700e-003		0.0706	0.0706		0.0706	0.0706	0.0000	1,010.7938	1,010.7938	0.0194	0.0185	1,016.8004
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.1097**	**0.9968**	**0.8373**	**5.9800e-003**		**0.0758**	**0.0758**		**0.0758**	**0.0758**	**0.0000**	**1,085.1223**	**1,085.1223**	**0.0208**	**0.0199**	**1,091.5707**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	1.34083e+006	7.2300e-003	0.0657	0.0552	3.9000e-004		5.0000e-003	5.0000e-003		5.0000e-003	5.0000e-003	0.0000	71.5518	71.5518	1.3700e-003	1.3100e-003	71.9770
Office Park	1.79986e+007	0.0971	0.8823	0.7411	5.2900e-003		0.0671	0.0671		0.0671	0.0671	0.0000	960.4765	960.4765	0.0184	0.0176	966.1841
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.1043**	**0.9480**	**0.7963**	**5.6800e-003**		**0.0721**	**0.0721**		**0.0721**	**0.0721**	**0.0000**	**1,032.0283**	**1,032.0283**	**0.0198**	**0.0189**	**1,038.1611**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	436128	57.3691	5.7400e-003	1.1900e-003	57.8662
Office Park	2.03689e+007	2,679.3680	0.2679	0.0554	2,702.5861
Parking Lot	100240	13.1858	1.3200e-003	2.7000e-004	13.3000
Unenclosed Parking with Elevator	735541	96.7544	9.6800e-003	2.0000e-003	97.5928
Total		**2,846.6773**	**0.2847**	**0.0589**	**2,871.3452**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	-24610.4	-3.2373	-0.0003	-0.0001	-3.2654
Office Park	1.93394e+007	2,543.9387	0.2544	0.0526	2,565.9832
Parking Lot	-353472	-46.4963	-0.0047	-0.0010	-46.8993
Unenclosed Parking with Elevator	253666	33.3677	3.3400e-003	6.9000e-004	33.6568
Total		**2,527.5727**	**0.2528**	**0.0523**	**2,549.4755**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.9052	2.1000e-004	0.0236	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Unmitigated	4.9052	2.1000e-004	0.0236	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.5847					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.3183					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1800e-003	2.1000e-004	0.0236	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Total	**4.9052**	**2.1000e-004**	**0.0236**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0458**	**0.0458**	**1.2000e-004**	**0.0000**	**0.0488**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.5847					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.3183					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1800e-003	2.1000e-004	0.0236	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Total	**4.9052**	**2.1000e-004**	**0.0236**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0458**	**0.0458**	**1.2000e-004**	**0.0000**	**0.0488**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	217.3322	0.2084	0.1248	259.7449
Unmitigated	262.5862	0.2596	0.1559	315.5234

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	12.21 / 0	13.0107	0.0157	9.5700e-003	16.2572
Office Park	185.179 / 113.497	249.5755	0.2439	0.1463	299.2662
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**262.5862**	**0.2597**	**0.1559**	**315.5234**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	9.768 / 0	10.4085	0.0126	7.6600e-003	13.0058
Office Park	148.143 / 106.574	206.9236	0.1959	0.1172	246.7391
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**217.3322**	**0.2084**	**0.1248**	**259.7449**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	486.8677	28.7731	0.0000	1,206.1942
Unmitigated	486.8677	28.7731	0.0000	1,206.1942

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	65.47	13.2898	0.7854	0.0000	32.9250
Office Park	2333	473.5779	27.9877	0.0000	1,173.2692
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Total		**486.8677**	**28.7731**	**0.0000**	**1,206.1942**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	65.47	13.2898	0.7854	0.0000	32.9250
Office Park	2333	473.5779	27.9877	0.0000	1,173.2692
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Total		**486.8677**	**28.7731**	**0.0000**	**1,206.1942**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0	50	2000	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
Boiler	9	0	0	0	CNG

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Boiler - CNG (0 - 2 MMBTU)	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Emergency Generator - Diesel (750 - 9999 HP)	0.1641	0.7339	0.4184	7.9000e-004		0.0241	0.0241		0.0241	0.0241	0.0000	76.1594	76.1594	0.0107	0.0000	76.4264
Total	**0.1641**	**0.7339**	**0.4184**	**7.9000e-004**		**0.0241**	**0.0241**		**0.0241**	**0.0241**	**0.0000**	**76.1594**	**76.1594**	**0.0107**	**0.0000**	**76.4264**

11.0 Vegetation

Google Carribean Campuses - Santa Clara County, Annual

Google Carribean Campuses

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Office Park	1,041.89	1000sqft	45.00	1,041,890.00	4700
General Heavy Industry	0.00	1000sqft	0.00	52,800.00	0
Parking Lot	286.40	1000sqft	0.00	286,400.00	0
Unenclosed Parking with Elevator	1,235.00	Space	0.00	379,145.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2030
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E's 2020 emission rate

Land Use - Office park at 536,750sf + 505,140sf = 1,041,890sf, 81,000sf CentralPlant, Parking structure=379,400sf,Parkinglot = 201,400sf+85,000= 286,400sf

Construction Phase - Operational Run only

Off-road Equipment - Operational run only

Grading -

Vehicle Trips - w/TDM =7641trips per 1,081ksf = 7.31 weekday trips (City=8.65,1.24,0.58) (Utility = 11.59)

Woodstoves -

Energy Use - Natural gas usage must meet 15.6 HVAC + 2.5 DWH = 18.1 kBtu/sf/yr

Water And Wastewater - Assume wastewater treatment plant

Solid Waste - 20.8+22.0 cy/day@0.218t/cy*250days=2,333

Construction Off-road Equipment Mitigation -

Energy Mitigation - PV system for 200 Caribbean = 4,632,700 kwh, for 100 Caribbean = same as 200 Caribbean

Assume 5% reduction for LEED Gold (meet 2010 building code standard)

Water Mitigation - some water efficiency

Stationary Sources - Emergency Generators and Fire Pumps - 1 600kW gen and 1 1,000kW gen, assume two 1,000Hp gens

Stationary Sources - Process Boilers - No data, use default natural gas

Table Name	Column Name	Default Value	New Value
tblEnergyUse	T24NG	21.04	18.10
tblLandUse	LandUseSquareFeet	0.00	52,800.00
tblLandUse	LandUseSquareFeet	494,000.00	379,145.00
tblLandUse	LotAcreage	23.92	45.00
tblLandUse	LotAcreage	6.57	0.00
tblLandUse	LotAcreage	11.11	0.00
tblLandUse	Population	0.00	4,700.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblSolidWaste	SolidWasteGenerationRate	0.00	65.47
tblSolidWaste	SolidWasteGenerationRate	968.96	2,333.00
tblStationaryBoilersUse	NumberOfEquipment	0.00	9.00
tblStationaryGeneratorsPumpsEF	CH4_EF	0.07	0.07
tblStationaryGeneratorsPumpsEF	ROG_EF	2.2480e-003	2.2477e-003
tblStationaryGeneratorsPumpsUse	HorsePowerValue	0.00	2,000.00
tblStationaryGeneratorsPumpsUse	HoursPerYear	0.00	50.00
tblStationaryGeneratorsPumpsUse	NumberOfEquipment	0.00	2.00
tblTripsAndVMT	WorkerTripNumber	0.00	18.00

tblVehicleTrips	ST_TR	1.50	11.59
tblVehicleTrips	ST_TR	1.64	1.24
tblVehicleTrips	SU_TR	1.50	11.59
tblVehicleTrips	SU_TR	0.76	0.58
tblVehicleTrips	WD_TR	1.50	11.59
tblVehicleTrips	WD_TR	11.42	8.65
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	IndoorWaterUseRate	0.00	12,210,000.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Area	4.9052	2.1000e-004	0.0234	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Energy	0.1097	0.9968	0.8373	5.9800e-003		0.0758	0.0758		0.0758	0.0758	0.0000	3,931.7996	3,931.7996	0.3055	0.0788	3,962.9158
Mobile	1.0346	4.4872	12.3000	0.0537	6.2504	0.0358	6.2861	1.6727	0.0333	1.7060	0.0000	4,940.8325	4,940.8325	0.1403	0.0000	4,944.3411
Stationary	0.1641	0.7339	0.4184	7.9000e-004		0.0241	0.0241		0.0241	0.0241	0.0000	76.1594	76.1594	0.0107	0.0000	76.4264
Waste						0.0000	0.0000		0.0000	0.0000	486.8677	0.0000	486.8677	28.7731	0.0000	1,206.1942
Water						0.0000	0.0000		0.0000	0.0000	69.8365	192.7496	262.5862	0.2596	0.1559	315.5234
Total	**6.2135**	**6.2181**	**13.5792**	**0.0605**	**6.2504**	**0.1358**	**6.3861**	**1.6727**	**0.1332**	**1.8059**	**556.7043**	**9,141.5869**	**9,698.2912**	**29.4893**	**0.2347**	**10,505.4497**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.9052	2.1000e-004	0.0234	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Energy	0.1043	0.9480	0.7963	5.6900e-003		0.0721	0.0721		0.0721	0.0721	0.0000	3,559.6010	3,559.6010	0.2725	0.0712	3,587.6366
Mobile	1.0346	4.4872	12.3000	0.0537	6.2504	0.0358	6.2861	1.6727	0.0333	1.7060	0.0000	4,940.8325	4,940.8325	0.1403	0.0000	4,944.3411
Stationary	0.1641	0.7339	0.4184	7.9000e-004		0.0241	0.0241		0.0241	0.0241	0.0000	76.1594	76.1594	0.0107	0.0000	76.4264
Waste						0.0000	0.0000		0.0000	0.0000	486.8677	0.0000	486.8677	28.7731	0.0000	1,206.1942
Water						0.0000	0.0000		0.0000	0.0000	55.8692	161.4629	217.3322	0.2084	0.1248	259.7449
Total	**6.2081**	**6.1693**	**13.5382**	**0.0602**	**6.2504**	**0.1320**	**6.3824**	**1.6727**	**0.1295**	**1.8022**	**542.7370**	**8,738.1017**	**9,280.8387**	**29.4052**	**0.1961**	**10,074.3920**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.09**	**0.78**	**0.30**	**0.48**	**0.00**	**2.73**	**0.06**	**0.00**	**2.78**	**0.21**	**2.51**	**4.41**	**4.30**	**0.29**	**16.45**	**4.10**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.0346	4.4872	12.3000	0.0537	6.2504	0.0358	6.2861	1.6727	0.0333	1.7060	0.0000	4,940.8325	4,940.8325	0.1403	0.0000	4,944.3411
Unmitigated	1.0346	4.4872	12.3000	0.0537	6.2504	0.0358	6.2861	1.6727	0.0333	1.7060	0.0000	4,940.8325	4,940.8325	0.1403	0.0000	4,944.3411

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	0.00	0.00	0.00		
Office Park	9,012.35	1,291.94	604.30	16,812,617	16,812,617
Parking Lot	0.00	0.00	0.00		
Unenclosed Parking with Elevator	0.00	0.00	0.00		
Total	9,012.35	1,291.94	604.30	16,812,617	16,812,617

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	9.50	7.30	7.30	59.00	28.00	13.00	92	5	3
Office Park	9.50	7.30	7.30	33.00	48.00	19.00	82	15	3
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

Unenclosed Parking with	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.621541	0.034056	0.180136	0.101248	0.011859	0.005060	0.013110	0.022881	0.002221	0.001470	0.005122	0.000646	0.000651
Office Park	0.621541	0.034056	0.180136	0.101248	0.011859	0.005060	0.013110	0.022881	0.002221	0.001470	0.005122	0.000646	0.000651
Parking Lot	0.621541	0.034056	0.180136	0.101248	0.011859	0.005060	0.013110	0.022881	0.002221	0.001470	0.005122	0.000646	0.000651
Unenclosed Parking with Elevator	0.621541	0.034056	0.180136	0.101248	0.011859	0.005060	0.013110	0.022881	0.002221	0.001470	0.005122	0.000646	0.000651

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Exceed Title 24

Install High Efficiency Lighting

Kilowatt Hours of Renewable Electricity Generated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2,527.5728	2,527.5728	0.2528	0.0523	2,549.4755
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2,846.6773	2,846.6773	0.2847	0.0589	2,871.3452
NaturalGas Mitigated	0.1043	0.9480	0.7963	5.6900e-003		0.0721	0.0721		0.0721	0.0721	0.0000	1,032.0283	1,032.0283	0.0198	0.0189	1,038.1611
NaturalGas Unmitigated	0.1097	0.9968	0.8373	5.9800e-003		0.0758	0.0758		0.0758	0.0758	0.0000	1,085.1223	1,085.1223	0.0208	0.0199	1,091.5707

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	1.39286e+006	7.5100e-003	0.0683	0.0574	4.1000e-004		5.1900e-003	5.1900e-003		5.1900e-003	5.1900e-003	0.0000	74.3285	74.3285	1.4200e-003	1.3600e-003	74.7702
Office Park	1.89416e+007	0.1021	0.9285	0.7800	5.5700e-003		0.0706	0.0706		0.0706	0.0706	0.0000	1,010.7938	1,010.7938	0.0194	0.0185	1,016.8004
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.1097**	**0.9968**	**0.8373**	**5.9800e-003**		**0.0758**	**0.0758**		**0.0758**	**0.0758**	**0.0000**	**1,085.1223**	**1,085.1223**	**0.0208**	**0.0199**	**1,091.5707**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	1.34083e+006	7.2300e-003	0.0657	0.0552	3.9000e-004		5.0000e-003	5.0000e-003		5.0000e-003	5.0000e-003	0.0000	71.5518	71.5518	1.3700e-003	1.3100e-003	71.9770
Office Park	1.79986e+007	0.0971	0.8823	0.7411	5.2900e-003		0.0671	0.0671		0.0671	0.0671	0.0000	960.4765	960.4765	0.0184	0.0176	966.1841
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.1043**	**0.9480**	**0.7963**	**5.6800e-003**		**0.0721**	**0.0721**		**0.0721**	**0.0721**	**0.0000**	**1,032.0283**	**1,032.0283**	**0.0198**	**0.0189**	**1,038.1611**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	436128	57.3691	5.7400e-003	1.1900e-003	57.8662
Office Park	2.03689e+007	2,679.3680	0.2679	0.0554	2,702.5861
Parking Lot	100240	13.1858	1.3200e-003	2.7000e-004	13.3000
Unenclosed Parking with Elevator	735541	96.7544	9.6800e-003	2.0000e-003	97.5928
Total		**2,846.6773**	**0.2847**	**0.0589**	**2,871.3452**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	-24610.4	-3.2373	-0.0003	-0.0001	-3.2654
Office Park	1.93394e+007	2,543.9387	0.2544	0.0526	2,565.9832
Parking Lot	-353472	-46.4963	-0.0047	-0.0010	-46.8993
Unenclosed Parking with Elevator	253666	33.3677	3.3400e-003	6.9000e-004	33.6568
Total		**2,527.5727**	**0.2528**	**0.0523**	**2,549.4755**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.9052	2.1000e-004	0.0234	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Unmitigated	4.9052	2.1000e-004	0.0234	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.5847					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.3183					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1400e-003	2.1000e-004	0.0234	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Total	**4.9052**	**2.1000e-004**	**0.0234**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0458**	**0.0458**	**1.2000e-004**	**0.0000**	**0.0488**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.5847					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.3183					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.1400e-003	2.1000e-004	0.0234	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.0458	0.0458	1.2000e-004	0.0000	0.0488
Total	**4.9052**	**2.1000e-004**	**0.0234**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0458**	**0.0458**	**1.2000e-004**	**0.0000**	**0.0488**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	217.3322	0.2084	0.1248	259.7449
Unmitigated	262.5862	0.2596	0.1559	315.5234

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	12.21 / 0	13.0107	0.0157	9.5700e-003	16.2572
Office Park	185.179 / 113.497	249.5755	0.2439	0.1463	299.2662
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**262.5862**	**0.2597**	**0.1559**	**315.5234**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	9.768 / 0	10.4085	0.0126	7.6600e-003	13.0058
Office Park	148.143 / 106.574	206.9236	0.1959	0.1172	246.7391
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**217.3322**	**0.2084**	**0.1248**	**259.7449**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	486.8677	28.7731	0.0000	1,206.1942
Unmitigated	486.8677	28.7731	0.0000	1,206.1942

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	65.47	13.2898	0.7854	0.0000	32.9250
Office Park	2333	473.5779	27.9877	0.0000	1,173.2692
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Total		**486.8677**	**28.7731**	**0.0000**	**1,206.1942**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	65.47	13.2898	0.7854	0.0000	32.9250
Office Park	2333	473.5779	27.9877	0.0000	1,173.2692
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Unenclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Total		**486.8677**	**28.7731**	**0.0000**	**1,206.1942**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	2	0	50	2000	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
Boiler	9	0	0	0	CNG

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Boiler - CNG (0 - 2 MMBTU)	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Emergency Generator - Diesel (750 - 9999 HP)	0.1641	0.7339	0.4184	7.9000e-004		0.0241	0.0241		0.0241	0.0241	0.0000	76.1594	76.1594	0.0107	0.0000	76.4264
Total	**0.1641**	**0.7339**	**0.4184**	**7.9000e-004**		**0.0241**	**0.0241**		**0.0241**	**0.0241**	**0.0000**	**76.1594**	**76.1594**	**0.0107**	**0.0000**	**76.4264**

11.0 Vegetation

Operational Emissions

Existing Uses

Existing 100-200 Caribbean Uses

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	25.20	1000sqft	0.58	25,200.00	0
General Light Industry	50.88	1000sqft	1.17	50,880.00	0
Unrefrigerated Warehouse-No Rail	108.51	1000sqft	2.49	108,510.00	0
Manufacturing	125.64	1000sqft	2.88	125,640.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E 2020 rate

Land Use - Based on traffic report land uses

Construction Phase - Operational only

Off-road Equipment - Operational only

Demolition -

Vehicle Trips - assume default conditions LI=4.64,0.88,0.45 off=10.39,2.32,0.99war=2.59,2.59.2.59Man=4.33,1.13,0.47

Energy Use - historical use

Water And Wastewater - wtp treatment

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	0.00
tblConstructionPhase	PhaseEndDate	5/15/2018	5/1/2018
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	WorkerTripNumber	0.00	18.00
tblVehicleTrips	ST_TR	1.32	0.88
tblVehicleTrips	ST_TR	2.46	2.32
tblVehicleTrips	ST_TR	1.49	1.13
tblVehicleTrips	ST_TR	1.68	2.59
tblVehicleTrips	SU_TR	0.68	0.45
tblVehicleTrips	SU_TR	1.05	0.99
tblVehicleTrips	SU_TR	0.62	0.47
tblVehicleTrips	SU_TR	1.68	2.59
tblVehicleTrips	WD_TR	6.97	4.64
tblVehicleTrips	WD_TR	11.03	10.39
tblVehicleTrips	WD_TR	3.82	4.33
tblVehicleTrips	WD_TR	1.68	2.59
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00

tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.3736	3.0000e-005	2.8500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5400e-003	5.5400e-003	1.0000e-005	0.0000	5.9100e-003
Energy	0.0331	0.3005	0.2524	1.8000e-003		0.0228	0.0228		0.0228	0.0228	0.0000	672.1952	672.1952	0.0408	0.0131	677.1295
Mobile	0.2460	0.9575	3.1325	0.0117	1.1285	8.9500e-003	1.1374	0.3021	8.3400e-003	0.3104	0.0000	1,068.0340	1,068.0340	0.0329	0.0000	1,068.8574
Waste						0.0000	0.0000		0.0000	0.0000	69.8939	0.0000	69.8939	4.1306	0.0000	173.1591
Water						0.0000	0.0000		0.0000	0.0000	24.9048	51.3670	76.2718	0.0909	0.0552	94.9996
Total	**1.6527**	**1.2580**	**3.3877**	**0.0135**	**1.1285**	**0.0318**	**1.1603**	**0.3021**	**0.0312**	**0.3333**	**94.7987**	**1,791.6017**	**1,886.4004**	**4.2952**	**0.0684**	**2,014.1514**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Area	1.3736	3.0000e-005	2.8500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5400e-003	5.5400e-003	1.0000e-005	0.0000	5.9100e-003
Energy	0.0331	0.3005	0.2524	1.8000e-003		0.0228	0.0228		0.0228	0.0228	0.0000	672.1952	672.1952	0.0408	0.0131	677.1295
Mobile	0.2460	0.9575	3.1325	0.0117	1.1285	8.9500e-003	1.1374	0.3021	8.3400e-003	0.3104	0.0000	1,068.0340	1,068.0340	0.0329	0.0000	1,068.8574
Waste						0.0000	0.0000		0.0000	0.0000	69.8939	0.0000	69.8939	4.1306	0.0000	173.1591
Water						0.0000	0.0000		0.0000	0.0000	24.9048	51.3670	76.2718	0.0909	0.0552	94.9996
Total	**1.6527**	**1.2580**	**3.3877**	**0.0135**	**1.1285**	**0.0318**	**1.1603**	**0.3021**	**0.0312**	**0.3333**	**94.7987**	**1,791.6017**	**1,886.4004**	**4.2952**	**0.0684**	**2,014.1514**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.2460	0.9575	3.1325	0.0117	1.1285	8.9500e-003	1.1374	0.3021	8.3400e-003	0.3104	0.0000	1,068.0340	1,068.0340	0.0329	0.0000	1,068.8574
Unmitigated	0.2460	0.9575	3.1325	0.0117	1.1285	8.9500e-003	1.1374	0.3021	8.3400e-003	0.3104	0.0000	1,068.0340	1,068.0340	0.0329	0.0000	1,068.8574

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	236.08	44.77	22.90	520,543	520,543
General Office Building	261.83	58.46	24.95	475,408	475,408
Manufacturing	544.02	141.97	59.05	1,218,325	1,218,325
Unrefrigerated Warehouse-No Rail	281.04	281.04	281.04	820,502	820,502
Total	1,322.97	526.25	387.94	3,034,778	3,034,778

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	9.50	7.30	7.30	59.00	28.00	13.00	92	5	3
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4
Manufacturing	9.50	7.30	7.30	59.00	28.00	13.00	92	5	3
Unrefrigerated Warehouse-No Rail	9.50	7.30	7.30	59.00	0.00	41.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720
General Office Building	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720
Manufacturing	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720
Unrefrigerated Warehouse-No Rail	0.612822	0.036208	0.182365	0.105071	0.013933	0.005011	0.012748	0.021514	0.002168	0.001529	0.005280	0.000629	0.000720

5.0 Energy Detail

Historical Energy Use: Y

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	345.0996	345.0996	0.0345	7.1400e-003	348.0901
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	345.0996	345.0996	0.0345	7.1400e-003	348.0901
NaturalGas Mitigated	0.0331	0.3005	0.2524	1.8000e-003		0.0228	0.0228		0.0228	0.0228	0.0000	327.0956	327.0956	6.2700e-003	6.0000e-003	329.0394
NaturalGas Unmitigated	0.0331	0.3005	0.2524	1.8000e-003		0.0228	0.0228		0.0228	0.0228	0.0000	327.0956	327.0956	6.2700e-003	6.0000e-003	329.0394

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	1.48824e+006	8.0200e-003	0.0730	0.0613	4.4000e-004		5.5400e-003	5.5400e-003		5.5400e-003	5.5400e-003	0.0000	79.4182	79.4182	1.5200e-003	1.4600e-003	79.8901
General Office Building	502992	2.7100e-003	0.0247	0.0207	1.5000e-004		1.8700e-003	1.8700e-003		1.8700e-003	1.8700e-003	0.0000	26.8416	26.8416	5.1000e-004	4.9000e-004	27.0011
Manufacturing	3.67497e+006	0.0198	0.1802	0.1513	1.0800e-003		0.0137	0.0137		0.0137	0.0137	0.0000	196.1104	196.1104	3.7600e-003	3.6000e-003	197.2758
Unrefrigerated Warehouse-No Rail	463338	2.5000e-003	0.0227	0.0191	1.4000e-004		1.7300e-003	1.7300e-003		1.7300e-003	1.7300e-003	0.0000	24.7255	24.7255	4.7000e-004	4.5000e-004	24.8724
Total		**0.0331**	**0.3005**	**0.2524**	**1.8100e-003**		**0.0228**	**0.0228**		**0.0228**	**0.0228**	**0.0000**	**327.0956**	**327.0956**	**6.2600e-003**	**6.0000e-003**	**329.0394**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	1.48824e+006	8.0200e-003	0.0730	0.0613	4.4000e-004		5.5400e-003	5.5400e-003		5.5400e-003	5.5400e-003	0.0000	79.4182	79.4182	1.5200e-003	1.4600e-003	79.8901
General Office Building	502992	2.7100e-003	0.0247	0.0207	1.5000e-004		1.8700e-003	1.8700e-003		1.8700e-003	1.8700e-003	0.0000	26.8416	26.8416	5.1000e-004	4.9000e-004	27.0011
Manufacturing	3.67497e+006	0.0198	0.1802	0.1513	1.0800e-003		0.0137	0.0137		0.0137	0.0137	0.0000	196.1104	196.1104	3.7600e-003	3.6000e-003	197.2758
Unrefrigerated Warehouse-No Rail	463338	2.5000e-003	0.0227	0.0191	1.4000e-004		1.7300e-003	1.7300e-003		1.7300e-003	1.7300e-003	0.0000	24.7255	24.7255	4.7000e-004	4.5000e-004	24.8724
Total		**0.0331**	**0.3005**	**0.2524**	**1.8100e-003**		**0.0228**	**0.0228**		**0.0228**	**0.0228**	**0.0000**	**327.0956**	**327.0956**	**6.2600e-003**	**6.0000e-003**	**329.0394**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	479798	63.1135	6.3100e-003	1.3100e-003	63.6605
General Office Building	518364	68.1865	6.8200e-003	1.4100e-003	68.7774
Manufacturing	1.18479e+006	155.8488	0.0156	3.2200e-003	157.1993
Unrefrigerated Warehouse-No Rail	440551	57.9508	5.8000e-003	1.2000e-003	58.4530
Total		**345.0996**	**0.0345**	**7.1400e-003**	**348.0901**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	479798	63.1135	6.3100e-003	1.3100e-003	63.6605
General Office Building	518364	68.1865	6.8200e-003	1.4100e-003	68.7774
Manufacturing	1.18479e+006	155.8488	0.0156	3.2200e-003	157.1993
Unrefrigerated Warehouse-No Rail	440551	57.9508	5.8000e-003	1.2000e-003	58.4530
Total		**345.0996**	**0.0345**	**7.1400e-003**	**348.0901**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.3736	3.0000e-005	2.8500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5400e-003	5.5400e-003	1.0000e-005	0.0000	5.9100e-003
Unmitigated	1.3736	3.0000e-005	2.8500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5400e-003	5.5400e-003	1.0000e-005	0.0000	5.9100e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1618					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.2116					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.6000e-004	3.0000e-005	2.8500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5400e-003	5.5400e-003	1.0000e-005	0.0000	5.9100e-003
Total	**1.3736**	**3.0000e-005**	**2.8500e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.5400e-003**	**5.5400e-003**	**1.0000e-005**	**0.0000**	**5.9100e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1618					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.2116					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.6000e-004	3.0000e-005	2.8500e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5400e-003	5.5400e-003	1.0000e-005	0.0000	5.9100e-003
Total	**1.3736**	**3.0000e-005**	**2.8500e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.5400e-003**	**5.5400e-003**	**1.0000e-005**	**0.0000**	**5.9100e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	76.2718	0.0909	0.0552	94.9996
Unmitigated	76.2718	0.0909	0.0552	94.9996

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	11.766 / 0	12.5376	0.0152	9.2300e-003	15.6661
General Office Building	4.47889 / 2.74513	6.0364	5.9000e-003	3.5400e-003	7.2383
Manufacturing	29.0543 / 0	30.9595	0.0375	0.0228	38.6848
Unrefrigerated Warehouse-No Rail	25.0929 / 0	26.7384	0.0323	0.0197	33.4104
Total		**76.2718**	**0.0909**	**0.0552**	**94.9996**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			

General Light Industry	11.766 / 0	12.5376	0.0152	9.2300e-003	15.6661
General Office Building	4.47889 / 2.74513	6.0364	5.9000e-003	3.5400e-003	7.2383
Manufacturing	29.0543 / 0	30.9595	0.0375	0.0228	38.6848
Unrefrigerated Warehouse-No Rail	25.0929 / 0	26.7384	0.0323	0.0197	33.4104
Total		**76.2718**	**0.0909**	**0.0552**	**94.9996**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	69.8939	4.1306	0.0000	173.1591
Unmitigated	69.8939	4.1306	0.0000	173.1591

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			

General Light Industry	63.09	12.8067	0.7569	0.0000	31.7281
General Office Building	23.44	4.7581	0.2812	0.0000	11.7880
Manufacturing	155.79	31.6240	1.8689	0.0000	78.3470
Unrefrigerated Warehouse-No Rail	102	20.7051	1.2236	0.0000	51.2960
Total		**69.8939**	**4.1306**	**0.0000**	**173.1591**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	63.09	12.8067	0.7569	0.0000	31.7281
General Office Building	23.44	4.7581	0.2812	0.0000	11.7880
Manufacturing	155.79	31.6240	1.8689	0.0000	78.3470
Unrefrigerated Warehouse-No Rail	102	20.7051	1.2236	0.0000	51.2960
Total		**69.8939**	**4.1306**	**0.0000**	**173.1591**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Table 10. Project Trip Generation Volumes

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

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

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

3.2.2 Project Trip Distribution and Assignment

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

Attachment 2: Climate Action Plan CEQA Checklist

Summary

This checklist identifies the minimum criteria a project must demonstrate to use the City's CAP for purposes of streamlining the analysis of greenhouse gas emissions under CEQA. Minimum criteria outlined below includes: 1) consistency with CAP forecasts, and 2) incorporation of applicable Near-Term (prior to 2016) strategies and measures from the CAP as binding and enforceable components of the project.

Section 1: Consistency with CAP Forecasts

The CAP's achievement of the 15% reduction below 2008 target is based on growth assumptions in the City's General Plan and regional growth forecasts. For eligibility to streamline from the CAP for purposes of an environmental analysis, projects must demonstrate consistency with CAP forecast assumptions using the criteria listed below. As appropriate, these criteria should be cited as evidence in any subsequent environmental document.

1A. Does the project include large stationary emissions sources that would be regulated by the Air District?

☐ Yes ☒ No

*If **no**, then the project may be eligible to claim consistency with growth assumptions that were used for CAP modeling. Skip to question **1C** to determine consistency with CAP forecasts.*

If *yes, the project may trigger additional changes to the physical environment that were not considered in the CAP and would otherwise by regulated by the Bay Area Air Quality Management District. Complete **1B**.*

1B. If this project is a stationary source emitter as outlined under 1A, does it also include any of the following emissions sources?

Residential uses	☐ Yes	☐ No
Commercial uses	☐ Yes	☐ No

*If **no**, the project does not include any emissions sources that were assumed in CAP growth forecasts. Therefore, the project may trigger additional changes to the physical environment that were not considered in the CAP. CAP measures may be used to mitigate GHG emissions, but project-level analysis of GHG emissions using the California Emissions Estimator Model (CALEEMod) or another method must be prepared by a qualified air quality consultant.*
*If **yes**, the project may include emissions sources mitigated by the CAP. Therefore, any sources identified in 1B may be eligible to claim consistency with the CAP. All stationary sources regulated by the Bay Area Air Quality Management District shall be analyzed separately. Other sources that were analyzed in the CAP may still qualify for streamlining, should the project demonstrate consistency with the CAP as outlined in **1C** and following sections below.*

1C. Does the project trigger an amendment to or adoption of any of the following planning documents?

General Plan	☐ Yes	☒ No

Specific Plan	☐ Yes	☒ No
Precise Plan for El Camino Real	☐ Yes	☒ No

Please describe any amendments or adoption of new specific plans or special planning areas, as applicable:

*If **no**, then the project is eligible to claim consistency with growth assumptions that were used for CAP forecasts.*

*If **yes**, the project would trigger an amendment to or adoption of one or more of the documents list above, complete **1D** below.*

1D. If the project triggers an amendment to the General Plan, specific plans, and/or special planning areas, complete the following table:

	Existing & Proposed Project			Proposed Project's Net Effect on Citywide Forecasts		
	Existing or Allowed Under Existing Zoning (A)	**Proposed Project (B)**	**Net Change from Existing Zoning (C=B-A)**	**2020 CAP Forecast (D)**	**Proposed Project's Net Effect on Citywide 2020 Forecast (E = D+C)**	**Would Net Effect of Project Exceed the Citywide 2020 CAP Forecast?**
Population						
Jobs						
Households / Dwelling Units						

Please describe any assumptions used to calculate existing, allowed, or proposed conditions:

*If **no for all indicators above**, then the project may be eligible to claim consistency with CAP growth assumptions. The project's assumed residents, employees, and households would not create a net increase on community-wide growth assumed in the CAP. The CAP uses these community-wide growth indicators to forecast community-wide emissions from residential energy use, nonresidential energy use, water-related emissions, and waste. Because the CAP uses these comparable indicators to forecast non-transportation related emissions, and the project would not exceed the CAP's assumed 2020 residents, employees, and dwelling units, the project's non-transportation emissions are therefore consistent with CAP growth assumptions and captured within the CAP's emissions forecast. Complete **1E** below.*

*If **yes to one or more indicators above**, the proposed project's net effect on citywide 2020 forecasts would exceed the 2020 CAP forecast assumptions. Therefore, the project may trigger additional emissions not assumed in CAP growth forecasts.*
Any projects that exceed the 2020 forecasts may still rely on the CAP for identification of measures and standards for mitigation. However, since such projects exceed the assumptions of the CAP forecast, it is recommended that the project demonstrate anticipated project-level GHG emissions estimates using CALEEMod or another tool. (estimates prepared by consultant).

- SEE AIR QUALITY ANALYSIS for GHG emissions assessment that shows the project level increase is less than significant because it does not exceed the most stringent BAAQMD project level emission threshold of 1,100 metric tons of CO_2e per year.

1E. If the project is consistent with CAP growth forecasts as identified in 1D above, provide the following information.

Would the project have a potentially significant impact after mitigation on any of the following standards of significance identified in the State CEQA Guidelines, Appendix G?

a) Conflict with an applicable plan, program, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐ Yes	☒ No
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐ Yes	☒ No
c) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐ Yes	☒ No

*If **yes to one or more standards above**, the proposed project's net effect on citywide 2020 forecasts is inconsistent with plans, programs, or policies that informed the assumptions for the 2020 transportation forecast. Therefore, the project is inconsistent with transportation emissions forecasts and is not eligible to claim consistency with the CAP for purposes of GHG emissions and impacts on climate change.*

*If **no for all standards above**, then the project is consistent with the plans, programs, policies, or ordinances that informed the travel demand model for the 2020 transportation forecast of the CAP. Therefore, the project is consistent with CAP growth assumptions for transportation emissions in the CAP and is eligible to claim consistency with CAP transportation forecasts.*

Section 2: Consistency with CAP Measures

The CAP provides measures that achieve a 15% reduction below 2008 emissions levels by 2020. Each of the measures contains a bulleted list of action items/project standards that help projects achieve that goal. Projects that wish to demonstrate consistency with the CAP must demonstrate consistency with all applicable measures and action items/project standards from the CAP. Consistency with all applicable measures should be cited as evidence to support tiering from the CAP.

2A. Using the action items/project standards identified on the following pages, identify all measures and action items/project standards that are applicable to the project. Identify applicability and project compliance with each action item/project standard.

If a project demonstrates all applicable mandatory standards, the project is eligible to claim consistency with CAP measures and is eligible for CAP streamlining.

If a project does not integrate all applicable mandatory standards, the project is ineligible to claim consistency with CAP measures and is not eligible for CAP streamlining.

Additional voluntary measures may also be recommended. Projects inconsistent with growth forecasts should consider integrating all feasible voluntary and mandatory CAP measures.

Standards for Climate Action Plan Consistency/Private Development

(Includes Near-Term Action Items and Action Items Already Implemented by the City)

Applicable? (Yes or No)	Measure	Action Item/Project Standard	Describe whether standards are applicable and how the project demonstrates consistency with applicable standards
Yes	OS-2	Provide availability and access to outdoor space for recreation or social purposes, including access to public open spaces on privately owned property such as retail shopping centers	
Yes	OS-3.1	Continue to implement the City's Tree Preservation requirements.	The project would be subject to City requirements

Yes	EC-2.2	Continue to require energy-efficient siting of buildings. Buildings should be oriented and landscape material should be selected to provide maximum energy efficiency for the buildings	The project would be subject to City and State requirements
Yes	WC-2.3	Require new open space and street trees to be drought-tolerant	The landscape plans provide for trees and water-conserving plants
No	LW-2.1	Require multi-family homes to participate in the City's Multi-family Recycling Program	
Yes	LW-2.2	Select materials to be targeted for diversion methods, services or technologies based on the results of the Zero Waste Strategic Plan	The Zero Waste Strategic Plan is already being implemented.
Yes	CA-1.7	Actively promote the use of alternative modes of transportation as safe modes of travel. When applicable, promote viable programs sponsored by 511.org, the BAAQMD and other recognized agencies on the City's website and publications	Project would implement a TDM Program acceptable to the City
No	CTO-1.1	Incorporate the provisions of AB 1358, the California Complete Streets Act of 2008, into roadway design, construction and maintenance activities	
No	CTO-1.2	Implement the street space allocation policy (RTC 8-085, April 28, 2009) in coordination with road reconstruction or resurfacing projects to provide road configurations that accommodate all travel modes.	
Yes	CTO-1.3	Require new development to provide cross-parcel access and linkages from the development entrance to the public sidewalk system, transit stops, nearby employment and shopping centers, schools, parks and other parcels for ease of pedestrian and cyclist access	Included in project design/concept
Yes	CTO-1.4	Improve pedestrian safety and comfort through design elements such as landscaped medians, pedestrian-level amenities, sidewalk	Included in project design/concept. The project would be subject to City and requirements

		improvements and compliance with ADA design standards, particularly for areas serving high volumes of traffic.	
No	CTO-1.5	Improve bicycle facilities and perceptions of comfort through pavement marking/coloring, physical separation, specialized signs and markings and other design elements.	
Yes	CTO-1.6	Require sidewalks to be a minimum of 6 feet wide in order to allow side-by-side walking at identified locations that currently serve high pedestrian traffic volumes or locations planned to serve high volumes of pedestrian traffic.	The project would be subject to City and requirements
Yes	CTO-2.1	Require public areas and new development to provide bicycle parking consistent with the VTA Bicycle Technical Guidelines, as amended.	Included in project design/concept. The project would provide secure bicycle parking spots
No	CTO-3.1	Continue sponsoring projects to provide transit rider amenities at bus stops and rail stations.	
Yes	CTO-4.1	Require existing and future major employers to utilize a variety of transportation demand management measures such as flexible work schedules, telecommuting, guaranteed rides home, low or no cost transit passes, parking “cash-out” incentives and other programs that provide employees with alternatives to single-occupant commutes.	Project would implement a TDM Program acceptable to the City
Yes	EP-2.3	Prevent buildings and additions from shading more than 10% of roofs of other structures.	A solar study will be required per City standards during the SDP process.
Yes	EP-2.3	Continue to allow and encourage solar facilities above paved parking areas.	Solar power being designed into project
Yes	OR-1.3	In project review, encourage the replacement of high-maintenance landscapes (like grass turf) with native vegetation to reduce the need for gas-powered lawn and garden equipment.	The project is required to comply with the Water-Efficient Landscaping requirements, and details will be finalized during the SDP review process.

Appendix E-1

Google Caribbean Campus Biological Resources Report

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google Caribbean Campus
200 Caribbean
Biological Resources Report

Project #3475-45

Prepared for:

Kathy Popovec
Google. LLC

Prepared by:

H. T. Harvey & Associates

August 8, 2019

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Appendices

Appendix A. Caribbean Campus Arborist Report A-1

List of Preparers

Dan Stephens, B.S., Principal/Senior Restoration Ecologist

Scott Terrill, Ph.D., Principal/Senior Wildlife Ecologist

Robin Carle, M.S., Project Manager/Senior Wildlife Ecologist

Section 1. Introduction

This report provides a preliminary assessment of special-status and protected plant and wildlife species that potentially occur in the area of Google's Caribbean Campus.

The approximately 32.4 -acre project site is located in Sunnyvale, California on the *Mountain View, California* U.S. Geological Survey quadrangle, and is bounded to the north by West Caribbean Drive, to the west by North Mathilda Avenue, to the south by commercial development and Bordeaux Drive, and to the east by the Sunnyvale West Channel (Figure 1). The City of Sunnyvale Water Pollution Control Plant (WPCP) is located to the north across West Caribbean Drive from the site. The project site is developed with light industrial and commercial uses, and the current buildings on the site are generally offices and warehouses with associated parking.

In addition to this site, a Biological Resources Report was developed for the Google West Borregas Campus across the West Channel (east) from the Caribbean project site (H. T. Harvey & Associates 2019a). The Sunnyvale West Channel, which is owned and maintained by the Santa Clara Valley Water District (SCVWD), flows south to north along the eastern boundary of the Caribbean project site. The overall project comprises the Caribbean project site, the West Borregas project site and the portion of the Caribbean Campus project site bounded by both projects. As is the case with West Borregas, the West Channel portion of the overall project is covered under a separate biological resources report (H. T. Harvey & Associates, 2019b). Thus, biological resources for the entire project comprising the three project components, Caribbean, West Borregas and the relevant portion of the Sunnyvale West Channel were all addressed.

It is our understanding that Google is considering redevelopment of the Caribbean Campus and that the City of Sunnyvale is expected to require the submittal of a biological resources report analyzing potential impacts on nesting birds and other special-status and protected plant and wildlife species. This report evaluates the special-status and protected plant and wildlife species that may potentially be impacted by future redevelopment of Google's Caribbean Campus.

The City of Sunnyvale Land Use and Transportation Element Environmental Impact Report (LUTE EIR) analyzes the potential environmental effects associated with the implementation of the LUTE, which is an element of the City of Sunnyvale General Plan. The EIR analysis focuses on environmental impacts that could arise through development of the land uses in Sunnyvale as regulated and guided by the LUTE. The EIR was prepared as a program EIR per CEQA guidelines Section 15168. Thus, any impacts previously analyzed by the LUTE EIR will be acknowledged, in this report, as being covered under the LUTE program EIR. Any impacts not covered by the LUTE EIR will be identified as such within this report.

N:\Projects3400\3475-01\45\Report\Fig 1 Habitats Map.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Habitats Map

Google Caribbean Campus Biological Resources Report (3475-45)

August 2019

1.1 Special-Status and Protected Species

For the purpose of this assessment, *special-status* and *protected* plants are considered plant species that are:

- Listed under the Federal Endangered Species Act (FESA) as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under the California Endangered Species Act (CESA) as threatened, endangered, rare, or a candidate species.
- Listed by the California Native Plant Society (CNPS) as California Rare Plant Rank (CRPR) 1A, 1B, 2, 3, or 4.

For the purpose of this assessment, *special-status* and *protected* animals are considered animal species that are:

- Listed under FESA as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under CESA as threatened, endangered, or a candidate threatened or endangered species. Designated by the California Department of Fish and Wildlife (CDFW) as a California species of special concern.
- Listed in the California Fish and Game Code as fully protected species (fully protected birds are provided in Section 3511, mammals in Section 4700, reptiles and amphibians in Section 5050, and fish in Section 5515).
- Bird species protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code.
- Bat species protected under the California Fish and Game Code.

Section 2. Methods

Prior to conducting field work, H. T. Harvey & Associates ecologists reviewed aerial images (Google Inc. 2017); a U.S. Geological Survey (USGS) topographic map; the CDFW's California Natural Diversity Database (CNDDB) (2017); and other relevant reports, scientific literature, and technical databases. Previous reports prepared for the project site and vicinity were also reviewed, including the *Google Caribbean Campus Arborist Report* (H. T. Harvey & Associates 2019c; Appendix A) and *Sunnyvale East and West Channels Flood Protection Project Final Environmental Impact Report* (SCVWD 2014). For the purposes of this report, the "site vicinity" encompasses a 5-mile radius surrounding the project site.

In addition, for plants, we reviewed all species on current CNPS CRPR 1A, 1B, 2A, and 2B lists occurring in the project region, which is defined as the *Mountain View, California* USGS 7.5-minute quadrangle and surrounding eight quadrangles (*Redwood Point, Newark, Niles, Palo Alto, Milpitas, Mindego Hill, Cupertino, and San Jose West*). Quadrangle-level results are not maintained for CRPR 3 and 4 species, so we also conducted a search of the CNPS Inventory records for these species occurring in Santa Clara County (CNPS 2017). For birds, we also perused records reported in nearby areas, such as at the Sunnyvale Baylands Park and Sunnyvale Water Pollution Control Plant on eBird (Cornell Lab of Ornithology 2017) and on the South-Bay-Birds List Serve (2017).

Following our background review, H. T. Harvey & Associates wildlife ecologist Robin Carle, M.S., conducted a reconnaissance-level survey of the Caribbean Campus site upland areas and the West Channel on March 24, 2017 and the West Channel additionally on July 18, 2017 and Scott Terrill, Ph.D., conducted a site visit on February 5, 209 to evaluate the current habitats associated with the channel. The purpose of these surveys was to identify existing biological conditions and the site's potential to support special-status and protected plants and animals. The surveys included an assessment of habitats for these species both on the Caribbean campus site, the West Channel and adjacent areas (e.g., in developed and landscaped areas on adjacent properties) that could be impacted either directly or indirectly by proposed activities, as well as an assessment of adjacent habitats that could potentially support source populations of sensitive species that could be affected by future redevelopment of the site (e.g., habitat on adjacent sites that may be used as breeding habitat by burrowing owls [*Athene cunicularia*]). The biological resources of the West Channel are covered in a separate biological resources report (H. T. Harvey & Associates 2109a).

Section 3. Existing Conditions

The project site and surrounding areas have been heavily disturbed by anthropogenic activities as a result of urbanization and the development of commercial buildings.

The reconnaissance-level survey identified two general habitat types on the site: developed/landscaped and ruderal grassland. Approximately 32.2 acres, or 99%, of the site is developed, consisting of asphalt pavement and existing commercial buildings with associated landscaping (Photos 1 and 2). A complete list of trees on the project site is provided in the arborist report for the project (Appendix A). Non-native tree species on the site include Canary Island pine (*Pinus canariensis*), lemonwood (*Pittosporum eugenioides*), glossy privet (*Ligustrum lucidum*), carob (*Ceratonia siliqua*), eucalyptus (*Eucalyptus* spp.), and liquidambar (*Liquidambar styraciflua*). The only locally native trees on the site are four coast live oaks (*Quercus agrifolia*) located on the eastern boundary of the site along the Sunnyvale West Channel. Landscaped areas also contained a variety of non-native plants and shrubs, such as oleander (*Nerium oleander*), as well as ground cover, such as grass lawns and English ivy (*Hedera helix*). The existing conditions of the West Channel are covered in H. T. Harvey & Associates 2019).

Photo 1. Developed/Landscaped Land Cover Type on the Project Site

Photo 2. Typical Non-Native Trees on the Site

The areas of ruderal grassland habitat on the site are extremely small, comprising 0.1 acre (1% of the project site), and are associated with a long strip of ruderal grassland habitat that occurs along the Sunnyvale West Channel (Photo 3, Figure 1). This habitat is dominated by non-native grasses such as wild oat (*Avena* sp.) and ripgut brome (*Bromus diandrus*), as well as weedy forbs such as wild radish (*Raphanus sativus*), sow thistle (*Sonchus* sp.), cutleaf geranium (*Geranium dissectum*), and cheeseweed (*Malva parviflora*).

Wildlife species that are associated with the project site include species that are accustomed to urban environments and high levels of human disturbance. Native bird species observed during the March 2017 site visit included the black phoebe (*Sayornis nigricans*), mourning dove (*Zenaida macroura*), lesser goldfinch (*Spinus psaltria*), Anna's hummingbird (*Calypte anna*), dark-eyed junco (*Junco hyemalis*), bushtit (*Psaltriparus minimus*), house finch (*Haemorhous mexicanus*), California scrub-jay (*Aphelocoma californica*), and California towhee (*Melozone crissalis*). Each of these species may use the trees, shrubs, or ground vegetation on the site for nesting. Mammal species expected to use the site include the nonnative black rat (*Rattus rattus*) and Virginia opossum (*Didelphis virginiana*), as well as the native striped skunk (*Mephitis mephitis*) and raccoon (*Procyon lotor*). Native western fence lizards (*Sceloporus occidentalis*) are also common in developed areas.

Photo 3. Ruderal Grassland Habitat on the Project Site

Wildlife use of grasslands on the project site is limited by human disturbance, the small extent of the grassland area, and the isolation of these habitat remnants from more extensive grasslands. Many of the species that occur in this habitat occur primarily in adjacent urban areas and use these grasslands for foraging. Such species include the house finch, bushtit, and lesser goldfinch, which forage on seeds in ruderal areas, and the black phoebe, cliff swallow (*Petrochelidon pyrrhonota*), and Mexican free-tailed bat (*Tadarida brasiliensis*), which forage aerially over ruderal habitats for insects. Burrows of small mammals, including California ground squirrels, were not present in this area during the March 2017 focused survey.

No nests of raptors (e.g., hawks, falcons, and owls) were observed on the site or in adjacent areas. A red-tailed hawk (*Buteo jamaicensis*) carrying nesting material was observed flying to the north of the site, but this bird carried the material off to the west and did not land in any trees on the project site. Numerous large trees on the site are suitable for nesting by raptors, and due to the presence of large areas of open grassland foraging habitat for these species associated with the WPCP immediately to the north, there is a moderate possibility that raptors may nest on or near the project site.

No signs of the presence of roosting bats (e.g., guano, urine staining, or visual or auditory detections of bats) were observed on the existing buildings on the site. The majority of these buildings are occupied and are unlikely to provide suitable roosting habitat for bats due to regular human disturbances and a lack of crevices through which bats can potentially enter.

Section 4. Summary of Special-Status and Protected Plant and Wildlife Species with Potential to be Impacted by the Project

4.1 Special-Status and Protected Plants

The CNDDB (2017) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2017) were queried for rare plant species that occur in the project region. The majority of potentially occurring rare plant species were determined to be absent from the project site for at least one of the following reasons: (1) absence of suitable habitat types; (2) lack of specific microhabitat or edaphic requirements, such as serpentine soils; (3) the elevation range of the species is outside of the range on the site; and/or (4) the species is presumed extirpated from the project region. Based on this analysis and the habitat types observed during the site survey, Congdon's tarplant, which has a CNPS Rare Plant Ranking of 1B.1 (seriously threatened in California), was the only special-status plant species determined to have the potential to occur on the site. A discussion of this species follows.

4.1.1 Congdon's Tarplant

Congdon's tarplant is an annual herb in the composite family (Asteraceae) that is endemic to California. It has a variable blooming period extending from May through November. Congdon's tarplant occurs in valley and foothill grassland habitat, floodplains, and swales (particularly those with alkaline substrates) and in disturbed areas with non-native grasses (CNDDB 2017, CNPS 2017, Baldwin et al. 2012). The CNDDB has recorded two occurrences of Congdon's tarplant in buffer lands within 2.0 mile of the site (CNDDB 2017), and the species can persist in disturbed grassland habitats such as the ruderal habitat on the project site. The closest occurrences of the species to the project site (CNDDB occurrences #41 and 102) are located approximately 1.3 mile to the west at Moffett Federal Airfield and 1.3 mile to the east at the Sunnyvale Baylands Park in disturbed grasslands (CNDDB 2017). Thus, the ruderal grassland habitat on the project site could potentially support this special-status plant species, as suitable habitat is present on the site and populations of the species are present in similar habitats nearby. However, protocol-level surveys conducted by H. T. Harvey & Associates staff in August 2012 along the Sunnyvale West Channel, which included the area of ruderal grassland habitat on the project site, did not detect this species (SCVWD 2014), and there have been no changes to this habitat since the surveys were performed to indicate the species would now be present. Thus, **Congdon's tarplant is determined to be absent** from the project site.

4.2 Special-Status and Protected Animals

The dense urban surroundings and absence of specific habitat features favored by various special-status wildlife species make the site unsuitable for the vast majority of special-status wildlife species that occur in the region. The only special-status animal species that could potentially reside on the site or close enough to the site to be affected by the project are the burrowing owl and white-tailed kite (*Elanus leucurus*).

4.2.1 Burrowing Owl

The burrowing owl, a California species of special concern, occurs year-round in the Santa Clara Valley (Trulio 2007) and is commonly present in open, agricultural, or grassland areas with active burrows of California ground squirrels. They exhibit strong site fidelity, and may return to a nesting site and attempt to nest even after the site has been developed. However, burrowing owls are increasingly disappearing from "infill" locations on the urban Santa Clara Valley floor. In the 1990s, prior to development of the site, burrowing owls were known to occur on, or at least in the immediate vicinity of, a larger tract of land that included the project site. There are no recent records of burrowing owls from the project site, although burrowing owls are known to currently occur in several locations in the site vicinity. Burrowing owls are known to occur in grassland areas surrounding the WPCP within 0.2 mile of the project site (Cornell Lab of Ornithology 2017). Several historical records of burrowing owls overlap the project site, and burrowing owls are known to occur more recently at the Moffett Federal Airfield 1.0 mile to the west, the WPCP to the north, and Twin Creeks Sports Complex/Sunnyvale Baylands Park 0.9 mile to the east (CNDDB 2017). However, our focused survey of the project site in March 2017 did not detect any burrowing owls, suitable habitat for owls (i.e., burrows of California ground squirrels) or signs of owl presence (e.g., feathers, whitewash, or pellets) on the project site.

Suitable nesting and roosting habitat for burrowing owls is absent from the site due to the lack of burrows of California ground squirrels and the extremely narrow strip of ruderal habitat available to support this species. However, this ruderal habitat provides ostensibly suitable foraging habitat for burrowing owls that may nest or roost in nearby areas at the WPCP. Albion Environmental (2008) assessed the potential impact of the SCVWD's proposed burrow management under the Stream Maintenance Program on burrowing owls, which included an assessment of the Sunnyvale West Channel. Because no evidence existed that SCVWD levees provided important burrowing owl nesting or roosting habitat (i.e., used regularly or by a sizeable proportion of the South San Francisco Bay population), Albion Environmental concluded that management of burrows on the SCVWD's levees would not result in a substantial impact on burrowing owl habitat. Thus, although ostensibly suitable foraging habitat for burrowing owls occurs along the Sunnyvale West Channel on the project site, the potential for project activities to impact burrowing owls and their habitat is expected to be relatively low.

Burrowing Owls are a special-status species covered under the LUTE EIR. This species (including eggs and young) is protected under the federal Migratory Bird Treaty Act and under Section 3503 and 3513 of the California Fish and Game code. Suitable nesting and roosting habitat for burrowing owls occurs within 250 feet of the site at the WPCP and burrowing owls are known to occur in this area. There is some potential for construction activities that occur in close proximity to active burrows to disturb owls to the point of abandoning their burrows. Based on the density of known occurrences of burrowing owls at the WPCP, up to one pair of owls could potentially nest or roost at the WPCP within 250 feet of the site. Therefore, to comply with federal and state law, pre-construction surveys for burrowing owls shall be conducted prior to the initiation of all Project activities within suitable burrowing owl habitat (i.e., ruderal/grassland habitat with burrows of California ground squirrels on the WPCP/Landfill site) within 250 feet of project activities. Pre-construction surveys will be completed in conformance with the CDFW's 2012 guidelines (CDFG 2012). An initial habitat

assessment will be conducted by a qualified biologist to determine if suitable burrowing owl habitat (suitable burrows) is present in the buffer zone as access is allowed. During the initial site visit, a qualified biologist will survey the entire buffer area for suitable burrows that could be used by burrowing owls for nesting or roosting. If no suitable burrowing owl habitat (i.e., ruderal grasslands with burrows of California ground squirrels) is present within the 250 buffer zone area, no additional surveys will be required. If suitable burrows are determined to be present within 250 feet of work areas, a qualified biologist will conduct three additional surveys to investigate each burrow within the survey area for signs of owl use, and to determine whether owls are present in areas where they could be affected by proposed activities. The final survey shall be conducted within the 24-hour period prior to the initiation of Project activities in any given area. Because Project activities may be phased, these survey efforts may also need to be performed in phases to ensure that burrowing owls are not present within 250 feet of work areas when Project activities commence.

If burrowing owls are present during the non-breeding season (generally September 1 to January 31), a 150-foot buffer zone shall be maintained around the occupied burrow(s), if feasible. If maintaining such a buffer is not feasible, then the buffer must be great enough to avoid injury or mortality of individual owls, or else the owls should be passively relocated in consultation with the California Department of Fish and Wildlife. During the breeding season (generally February 1 to August 31), a 250-foot buffer, within which no new Project-related activities will be permissible, will be maintained between Project activities and occupied burrows. Owls present between February 1 and August 31 will be assumed to be nesting, and the 250-foot protected area will remain in effect until August 31. If monitoring evidence indicates that the owls are no longer nesting or the young owls are foraging independently, the buffer may be reduced or the owls may be relocated prior to August 31, in consultation with the CDFW.

4.2.2 White-Tailed Kite

As noted in the LUTE EIR, the white-tailed kite is a state fully protected species, and, this species (including eggs and young) is protected under the federal Migratory Bird Treaty Act and under Section 3503 and 3513 of the California Fish and Game code. In California, white-tailed kites can be found in the Central Valley and along the coast in grasslands, agricultural fields, cismontane woodlands, and other open habitats (Zeiner et al. 1990, Dunk 1995, Erichsen et al. 1996). White-tailed kites are year-round residents of the state, establishing nesting territories that encompass open areas with healthy prey populations and snags, shrubs, trees, or other substrates for nesting (Dunk 1995). Nonbreeding birds typically remain in the same area over the winter, although some movements do occur (Polite 1990). The presence of white-tailed kites is closely tied to the presence of prey species, particularly voles, and prey base may be the most important factor in determining habitat quality for white-tailed kites (Dunk and Cooper 1994, Skonieczny and Dunk 1997). Although the species recovered after population declines during the early 20th century, its populations may be exhibiting new declines because of recent increases in habitat loss and disturbance (Dunk 1995, Erichsen et al. 1996).

White-tailed kites are common residents in less-developed portions of the project region where open grassland, ruderal, or agricultural habitats are present. No white-tailed kites, or potential nests of this species, were observed on the site during the March 2017 focused survey. However, this species occurs year-round at the

WPCP to the north and at the Sunnyvale Baylands Park approximately 1.1 mile to the east. Large trees on the site, especially along West Caribbean Drive, provide potential nesting sites for this species, and additional large trees are present along the north side of West Caribbean Drive at the southern boundary of the WPCP. These trees provide suitable sites for nesting by up to one pair of white-tailed kites, and this species may forage in the open grassland habitat along the Sunnyvale West Channel on the project site year-round.

Based on our site observations, the areal extent of the study area, and known breeding densities of these species, it is likely that no more than one pair of white-tailed kites could potentially nest in the vicinity of the project site. Therefore, to comply with state and federal law, if project construction cannot occur outside the breeding season (February 1 to August 31) surveys will be conducted for active white-tailed kite nests within 300 feet of the project construction area. If an active kite nest is found, a 300 foot (or an alternative buffer area established via consultation with the California Department of Fish and Wildlife) non-construction buffer area shall be established between the nest and project construction activities.

4.2.3 Nesting Birds

As noted in the LUTE EIR, native bird species are protected under the Migratory Bird Treaty Act and the California Fish and Game Code and protected species may nest in trees, shrubs, or on buildings on or immediately adjacent to the project site. Redevelopment of the site has the potential to result in the direct injury or mortality of common, native birds, especially eggs or young in nests. For instance, disturbance, building demolition, and vegetation removal that takes place during the nesting season (i.e., February 1 through August 31) could result in the removal of active bird nests. In addition, increased disturbance near active nests could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Common (i.e., non-special-status) bird species that may nest on the site include the black phoebe, mourning dove, lesser goldfinch, Anna's hummingbird, dark-eyed junco, bushtit, house finch, California scrub-jay, and California towhee. All of these species are abundant to fairly common in the region (Bousman 2007). Based on site observations, the areal extent of the site, and the density at which these birds typically nest in the region, one to a few pairs of each of these species could potentially nest on or adjacent to the site.

The removal of vegetation or demolition of a building supporting active nests may cause the direct loss of eggs or young, while construction-related activities located near an active nest may cause adults to abandon their eggs or young. This type of impact would not be significant under CEQA, in our opinion, because of the local and regional abundances of the species that could potentially nest on the site and the very low magnitude of the potential impact of development on these species (i.e., the project is expected to impact only a few pairs of these species, at most, which is not a substantial impact on their regional populations). However, the following measures should be implemented to ensure that project activities do not violate the MBTA or California Fish and Game Code.

Measure 1. Avoidance of the Nesting Season. To the extent feasible, commencement of demolition and construction activities should be scheduled to avoid the nesting season. If demolition and construction activities are scheduled to take place outside the nesting season, all potential demolition/construction impacts on nesting

birds protected under the MBTA and California Fish and Game Code will be avoided. The nesting season for most birds in Santa Clara County extends from February 1 through August 31.

Measure 2. Pre-Activity/Pre-Disturbance Surveys. If it is not possible to schedule demolition and construction activities between September 1 and January 31, then pre-activity surveys for nesting birds should be conducted by a qualified ornithologist to ensure that no nests will be disturbed during project implementation. We recommend that these surveys be conducted no more than seven days prior to the initiation of demolition or construction activities. During this survey the ornithologist will inspect all trees and other potential nesting habitats (e.g., trees, shrubs, and buildings) in and immediately adjacent to the impact areas for nests.

Measure 3. Non-Disturbance Buffers. If an active nest is found sufficiently close to work areas to be disturbed by these activities, the ornithologist will determine the extent of a construction-free buffer zone to be established around the nest (typically 300 feet for diurnal raptors, including the white-tailed kite, 250 feet for burrowing owl nests and active burrows, and 100 feet for other species), to ensure that no nests of species protected by the MBTA and California Fish and Game Code will be disturbed during project implementation.

Measure 4. Inhibition of Nesting. If construction activities will not be initiated until after the start of the nesting season, all potential nesting substrates (e.g., bushes, trees, grasses, and other vegetation) that are scheduled to be removed by the project may be removed prior to the start of the nesting season (e.g., prior to February 1). This will preclude the initiation of nests in this vegetation, and minimize the potential delay of the project due to the presence of active nests in these substrates.

4.2.4 Roosting Bats

The office buildings on the site provide ostensibly suitable roosting habitat for colonies of common species of bats, possibly including the Yuma myotis (*Myotis yumanensis*) and Mexican free-tailed bat. All bat species in California are protected under the California Fish and Game Code. Bats do not commonly roost in office buildings and warehouses such as those on the project site, but if these buildings are unoccupied for extended periods of time and crevices are present through which bats can enter and exit, there is a very low possibility that bats could colonize one or more of these buildings.

4.3 Potential Impacts Due to Avian Collisions with New Buildings

It has been well documented that glass windows and building facades can result in injury or mortality of birds due to birds' collisions with these surfaces. Because birds do not perceive glass as an obstruction the way humans do, they may collide with glass when the sky or vegetation is reflected in glass (e.g., they see the glass as sky or vegetated areas); when transparent windows allow birds to perceive an unobstructed flight route through the glass (such as at corners); and when the combination of transparent glass and interior vegetation (such as in planted atria) results in attempts by birds to fly through glass to reach that vegetation. Building exterior and interior lighting can also attract birds, causing them to collide with structures. The greatest risk of

avian collisions with buildings occurs in the area within 40–60 feet of the ground, because this is the area in which most bird activity occurs (Sheppard and Phillips 2015). Very tall buildings (e.g., buildings 500 feet or higher) may pose a threat to birds that are migrating through the area, particularly to nocturnal migrants that may not see the buildings or that may be attracted to lights on the buildings (San Francisco Planning Department 2011). These risks are highest for buildings in or near areas of high avian activity or movement, such as migratory corridors, large open spaces, large water bodies, and riparian habitats.

Under existing conditions, terrestrial land uses and habitat conditions on the project site and in surrounding areas consist primarily of urban development such as low- and mid-rise buildings (i.e., 1–6 stories), parking lots, and roads. Vegetation in these areas is very limited in extent, and consists primarily of non-native landscaped trees and shrubs. Non-native vegetation supports fewer of the resources required by native birds than native vegetation, and the structural simplicity of the vegetation (without well-developed ground cover, understory, and canopy layers) further limits resources available to birds. In contrast, the buffer lands of the WPCP, located approximately 95 feet north of the project site across West Caribbean Drive, provide an area of extensive grassland habitat for large numbers of resident and migratory bird species. Birds attracted to the extensive grasslands north of the project site may utilize or fly through urban areas, but are expected to do so primarily when large natural areas are present on or immediately adjacent to a site to provide resources for these species. The Sunnyvale West Channel is located immediately adjacent to the site, but this channel does not provide important habitat for birds (i.e., extensive tree cover), although the planned increased landscaping with native vegetation will result in increased habitat value to birds, or a migratory corridor via which birds can travel to reach other natural areas upstream, No parks or other natural areas are located on or immediately adjacent to the project site. The nearest natural areas the Sunnyvale Baylands Park approximately 1.1 mile to the east and Moffett Federal Airfield located approximately 0.7 mile to the west. These areas provide important habitat for birds, but are separated from the project site by dense urban development, and the site is not located in an area where large numbers of birds traveling between the WPCP buffer lands, Sunnyvale Baylands Park, and/or Moffett Federal Airfield are expected to travel. Thus, the large numbers of birds expected to occur in the region in association with the WPCP buffer lands, Sunnyvale Baylands Park, and Moffett Federal Airfield are not expected to make substantial use of the site or travel through the site when en route between natural areas in the region. However, resident, wintering and migrant birds attracted to local habitats, including vegetation on the site could be a risk of collisions with buildings. Therefore, in accordance with The Sunnyvale Bird Safe Building Guidelines and the LUTE EIR, which refers to these guidelines, The Google Caribbean design team worked with Senior Ornithologist Scott Terrill, PhD and Ornithologist Robin Carle, both of whom have worked on bird-safe design and management for a number of projects in the South Bay region, to identify areas of the buildings that were likely to pose a notable risk to birds (transparent glass facades near vegetation and open space areas, transparent corners, etc. The ornithologists worked with the design team to incorporate bird-safe cues into the glass in those areas. The ornithologists also advised on the placement of vegetation to minimize bird strikes and on bird-safe lighting, all of which have been incorporated into the project. This approach was based on the overall approach developed by the City of San Francisco Standards for Bird-Safe Buildings (San Francisco Planning Department 2011) and the American Bird Conservancy (Sheppard, C. and

G. Phillips 2015), and conforms to the City of Sunnyvale's Bird Safe Building Design Guidelines, which are referenced in the LUTE EIR.

Section 5. Conclusion

Overall, the potential for the project to impact special-status and protected plant and wildlife species is relatively low. Potential impact issues, such as nearby nesting white-tailed kites, burrowing owls, and other birds protected under federal and state law, and bird-window interactions, would be minimized through project design and/or the implementation of standard avoidance and minimization measures (e.g., preconstruction surveys), the City's existing Sunnyvale Bird Safe Building Design Guidelines, and/or applicable measures previously identified, analyzed, and adopted in the LUTE EIR to address these potential impacts.

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Appendix A. Caribbean Campus Arborist Report

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google Caribbean Campus

Arborist Report

Project #3475-45

Prepared for:

Google DevCo

Prepared by:

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Section 1. Introduction

H. T. Harvey & Associates has prepared this preliminary arborist report, which describes current conditions on a complex of light-industrial properties (collectively referred to as the site) located in Sunnyvale, California (Table 1). This report provides an inventory of all trees on the project site (with diameter at breast height [DBH] greater than 4 inches) including species, DBH, an assessment of each tree's health and structural condition, and figures showing the location of each tree in the inventory. In addition, this arborist report includes a list of trees to be removed. Appropriate mitigation measures are also provided, per the City of Sunnyvale (City) Municipal Code (code). This arborist report is sufficient to submit with initial planning applications to the City.

Table 1. Properties Included in this Report

Street Address	Assessor's Parcel Number
390 - 394 Caribbean Drive	110 - 26 - 020
380 - 382 Caribbean Drive	110 - 26 - 021
370 - 376 Caribbean Drive	110 - 26 - 022
360 - 364 Caribbean Drive	110 - 26 - 023
1330 - 1370 Bordeaux Drive	110 - 26 - 025
140 - 146 Caribbean Drive	110 - 26 - 027
1393 - 1395 Borregas Avenue	110 - 26 - 028
1383 Borregas Avenue	110 - 26 - 029
1325 Borregas Avenue and 133 Caspian Court	110 - 26 - 030
141 Caspian Court	110 - 26 - 031

Section 2. Methods

This report is based on a tree inventory that was completed in November 2016, with a follow up site visit on January 8, 2019 to document any changes in tree health, structure or survival. H. T. Harvey & Associates' arborist Matt Pollock performed both the inventory and follow-up visit. Matt is an American Society of Consulting Arborists (ASCA) Registered Consulting Arborist (#631) and an International Society of Arboriculture (ISA) Certified Arborist (WE-11610A). All trees with a DBH greater than 4 inches were included in the inventory. Tasks conducted during the tree inventory consisted of the following:

- identifying each tree to species (scientific name and common name);
- tagging each tree with an identifying number;
- recording the approximate location of each tree;
- measuring tree trunk diameter at 54 inches above finish grade (DBH);
- determining the protected status of each tree; and
- evaluating tree health and structural condition using a scale of 0 to 5 as shown in Table 2.

Tree assessments were based on ground-level visual observations and physical measurements. Field data collection was conducted using a diameter tape to measure DBH. A Trimble Geo 7X GPS with laser offset capability was used to determine and record the location of each tree. Evaluations of tree health considered crown indicators such as vigor, density, leaf size and quality, and stem shoot extensions. Evaluations of tree structural condition considered root condition/form, trunk condition/form, and branch assembly and arrangement as well as any visible indicators of diminished structural integrity including cavities, dead limbs, and excessive leaning.

An advanced assessment to quantify interior wood structure, root condition, and upper canopy condition was not performed as part of this assessment. Therefore, tasks performed did not include an excavation of the root zones of the trees, drilling for decay detection, collecting soil samples for laboratory testing, sending animal or vegetative material for laboratory testing, climbing the trees for an aerial inspection, a tree risk assessment, or a valuation (see Appendix A: Assumptions and Limiting Conditions and Appendix B: Certification of Performance). These tasks are not typically included in a standard arborist report.

Table 2. Tree Health and Structural Condition Evaluation Criteria

Condition Rating	Tree Health	Tree Structure
5	A healthy, vigorous tree with a well-balanced crown. No apparent pest problems or signs and symptoms of disease. Normal to exceeding shoot length on new growth. Leaf size and color normal. Exceptional life expectancy for the species.	Root plate undisturbed and clear of any obstructions. Root flare has normal development. Trunk is sound and solid. No visible trunk defects or cavities. Branch spacing / structure and attachments are free of any defects.
4	Tree with slight decline in vigor. Imperfect canopy density in few parts of the tree, 10% or less, lacking natural symmetry. Less than half normal growth rate and minor deficiency in leaf development. Few pest issues or damage, controllable. Normal branch and stem development with healthy growth. Small amount of twig dieback. Typical life expectancy for the species.	Root plate appears normal; only minor damage may be found. Possible signs of root dysfunction around trunk flare. Minor trunk defects from previous injury, with good closure; less than 25% of bark section missing. Good branch habit, minor dieback with some signs of previous pruning. Co-dominant stem formation may be present. Minor corrections required.
3	Tree with moderate vigor. Crown decline and dieback up to 30% of the canopy. Overall poor symmetry. Leaf color somewhat chlorotic with smaller leaves. Shoot extensions indicate some stunting and stressed growing conditions. Obvious signs of pest problems contributing to lesser condition. Some decay areas found in main stem and branches. Below average life expectancy.	Root plate reveals previous damage or disturbance and dysfunctional roots may be visible around main stem. Evidence of trunk damage or cavities with decay or defects present. Less than 30% of bark sections missing on trunk. Co-dominant stems are present. Branching habit and attachments indicate poor pruning or damage, which requires moderate corrections.
2	Tree in decline. Epicormic growth. Lacking full crown, more than 50% decline and dieback, especially affecting larger branches. Stunting obvious with little evidence of growth on smaller stems. Leaf size and color reveal overall stress in the plant. Insect or disease infestation may be severe. Overmature. Life expectancy is low.	Root plate disturbance and defects indicate major damage with girdling roots around the trunk flare. Trunk reveals more than 50% of bark section missing. Branch structure has poor attachments, with several structurally important dead or broken branches. Canopy reveals signs of severe damage or topping, with major corrective actions required. Extensive decay or hollow.
1	Tree in severe decline. Crown has very little vigor and/or has a disease or insect problem that is ultimately fatal and, if not corrected, may threaten other nearby trees.	Root plate has major structural problems that present an unacceptable risk. Tree is in severe decline, with dieback of scaffold branches and/or trunk.
0	Dead	Dead

Section 3. Results

3.1 Site History and General Condition

The site is located on land historically used for agriculture (row crops) (Google Earth 2019). The buildings that currently occupy the site were constructed prior to 1991 and the configuration of planting beds appears largely unchanged since that time. Therefore, some trees on the site could potentially be more than 27 years old.

3.2 Summary of Findings

Four hundred and twenty-five trees were identified on the site (Figures 1a and 1b). Descriptions of each tree are included in Appendix C (Tree Assessment), including DBH, tree health and structural scores, and protected status. Table 3 provides a summary of the assessed trees, which represent 35 species. Of the 425 trees located on the site, 293 (69%) met the City of Sunnyvale's criteria for protected trees (see Section 3.4 below). The most common species on the site (27%) was Canary Island pine (*Pinus canariensis*). Forty-three percent of trees were in good condition, 48% were in fair condition, and 9% were in poor condition. Many of the trees in fair or poor condition were overmature, short-lived species such as lemonwood (*Pittosporum eugenioides*), sweetgum (*Liquidamber styraciflua*), and glossy privet (*Ligustrum lucidum*). However, 52 of the 116 Canary Island pines were also in fair or poor condition due to excessive pruning or other visible flaws.

3.3 Tree Condition

A summary of tree condition ratings is provided in Table 3. The condition ratings in the table are based on both the tree health and structural ratings from Appendix C. Tree condition was rated as follows:

- *Poor* if their combined rating was less than 40%.
- *Fair* if their combined rating was between 40% and 60%; or
- *Good* if their combined rating was 60% or greater;

Table 3. Tree Condition Summary

Scientific Name	Common Name	Poor	Fair	Good	Total Trees
Afrocarpus falcatus	African fern pine	0	11	7	18
Alnus rubra	Red alder	3	6	0	9
Betula pendula	White birch	1	2	2	5
Ceratonia siliqua	carob tree	2	13	5	20
Corymbia citriodora	lemon scented gum	0	1	1	2
Eriobotrya japonica	Loquat	0	1	0	1

Scientific Name	Common Name	Poor	Fair	Good	Total Trees
Eucalyptus nicholii	peppermint eucalypt	0	2	2	4
Eucalyptus polyanthemos	silver dollar eucalypt	1	9	11	21
Eucalyptus sideroxylon	red ironbark	2	7	2	11
Eucalyptus sp.	Eucalyptus sp.	0	1	1	2
Fraxinus uhdei	shamel ash	0	1	6	7
Gleditsia triacanthos 'inermis'	thornless honey locust	0	1	2	3
Jacaranda mimosifolia	Jacaranda	1	2	4	7
Juniperus chinensis	Hollywood juniper	0	1	1	2
Ligustrum lucidum	glossy privet	1	15	7	23
Liquidamber styraciflua	Sweetgum	1	14	23	38
Maytenus boaria	Mayten tree	0	1	2	3
Olea europaea	Olive	0	1	2	3
Osmanthus fragrans	Fragrant Olive	0	8	5	13
Picea pungens glauca	Blue Spruce	1	0	0	1
Pinus canariensis	Canary Island pine	3	49	64	116
Pinus halapensis	Aleppo pine	0	2	0	2
Pinus mugo	Mugho pine	0	1	0	1
Pinus pinea	Italian stone pine	1	3	2	6
Pittosporum eugenioides	Lemonwood	13	27	6	46
Populus nigra 'italica'	Lombardy poplar	4	5	3	12
Prunus cerasifera	purple leaf plum	2	4	3	9
Prunus serrulata	Kwanzan cherry	0	0	0	0
Pyrus calleryana	Callery pear	0	1	0	1
Quercus agrifolia	California live oak	0	2	3	5
Quercus ilex	Holly oak	0	3	3	6
Salix lasiandra	Pacific willow	1	0	0	1
Schinus molle	Peruvian pepper	0	1	0	1
Sequoia sempervirens	Coast redwood	0	7	9	16
Ulmus parvifolia	Chinese elm	1	3	6	10
Total		**38**	**205**	**182**	**425**

3.4 Protected Trees

The protected status of trees is defined under items 3 and 4 in the City of Sunnyvale Municipal Code (code), Section 19.94.030 as:

3) *"Protected tree" means a tree of significant size.*

4) *"Significant size" means a tree thirty-eight inches or greater in circumference measured four and one-half feet above ground for single-trunk trees. For multi-trunk trees "significant size" means a tree which has at least one trunk with a circumference thirty-eight inches or greater measured four and one-half feet above ground level, or in which the measurements of the*

circumferences of each of the multi-trunks, when measured four and one-half feet above the ground level, added together equal an overall circumference one hundred thirteen inches or greater.

Based on this definition, 293 protected trees were identified on the site. Protected trees include 112 Canary Island pine, 35 sweetgum, and 20 silver dollar eucalypt (*Eucalyptus polyanthemos*) (see Appendix C: Tree Assessment).

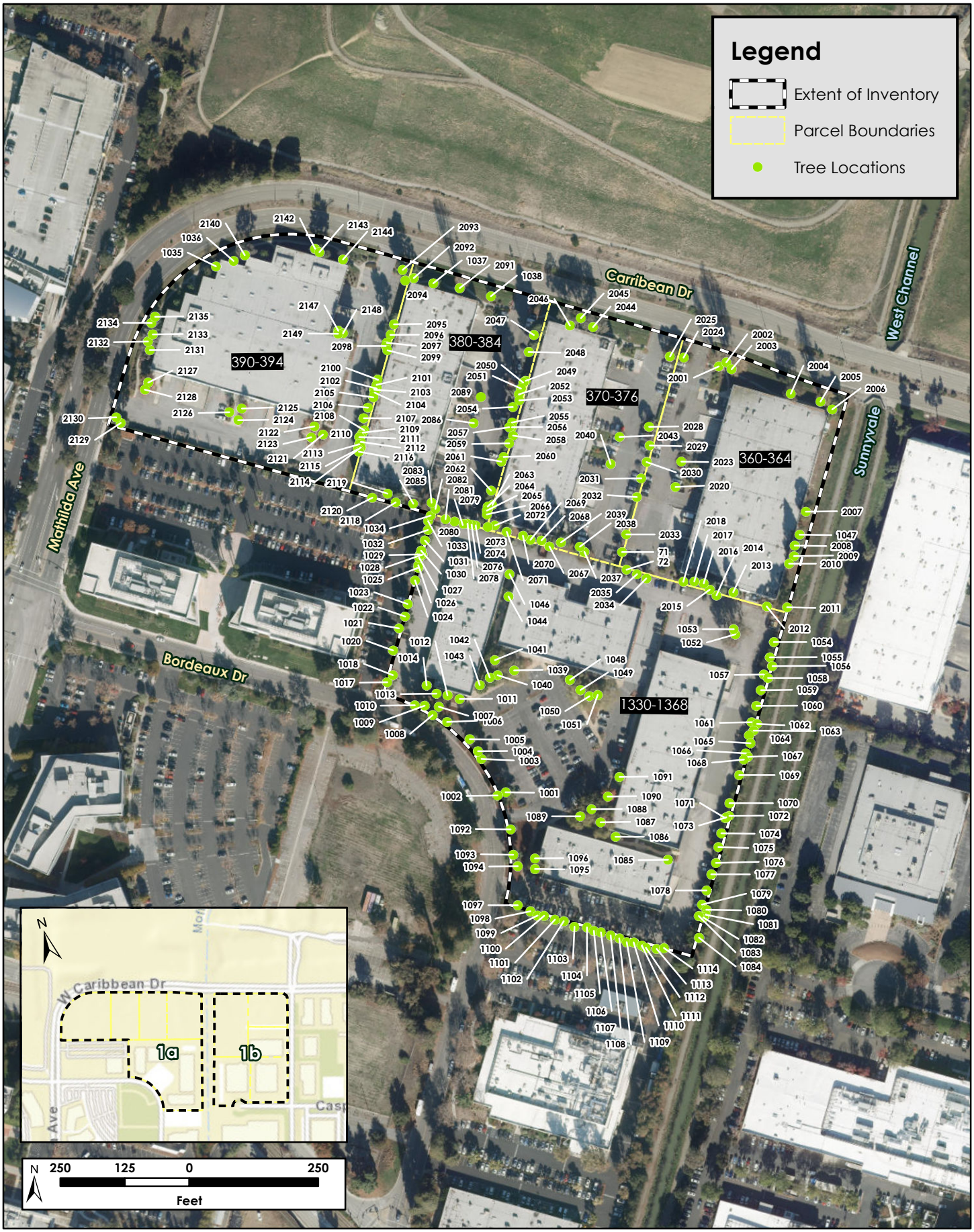
If redevelopment of this parcel creates impacts to or requires removal of protected status trees, the City may require reasonable alterations to the project design in order to retain protected trees per Section 19.94.110 of the Code. For protected trees to be preserved, a tree protection plan is required. For protected trees to be removed, a replanting plan is required, per Section 19.94.090 of the Code. Typically, the minimum size for the replacement of a protected tree is a standard twenty-four inch box size tree, subject to review by the city's director of community development. Tree removal, replacement, and preservation are discussed in further detail in Section 4.

3.5 Invasive Trees

Of the 425 trees (35 species) on the site, 36 trees (4 species) are listed by the California Invasive Plant Council (Cal-IPC, 2019) as a limited invasive species. A single Callery pear (*Pyrus calleryana*) on the site is watch-listed by Cal-IPC as a species of potential concern. These results are shown in Table 4.

Table 4. Invasive Species

Scientific Name	Common Name	Count	Cal-IPC Rating
Ligustrum lucidum	glossy privet	23	Limited
Olea europaea	Olive	3	Limited
Prunus cerasifera	purple leaf plum	9	Limited
Pyrus calleryana	Callery pear	1	Watch
Schinus molle	Peruvian pepper	1	Limited
Total		**37**	



N:\Projects3400\3475-01145\Report\Figure 1a. Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1a. Locations of Existing Trees
Google Caribbean Campus Draft Arborist Report (3475-45)
July 2019

N:\Projects3400\3475-01145\Report\Figure 1b. Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1b. Locations of Existing Trees
Google Caribbean Campus Draft Arborist Report (3475-45)
July 2019

Section 4. Tree Removal, Replacement, and Preservation

4.1 Tree Removal

There were 425 trees (35 species) identified on the site. According to the Planning Submittal dated October 26, 2018, 382 trees will be removed. Table 5 provides a summary of the trees to be removed. Two hundred and fifty of the trees to be removed are of sufficient size to be "protected" under the City's Code (see Section 3.4 above).

Table 5. Tree Removal

			Non-Protected Trees		Protected Trees	
Scientific Name	**Common Name**	**Total**	**Preserve**	**Remove**	**Preserve**	**Remove**
Afrocarpus falcatus	African fern pine	18	0	11	0	7
Alnus rubra	Red alder	9	0	0	0	9
Betula pendula	White birch	5	0	4	0	1
Ceratonia siliqua	carob tree	20	0	4	0	16
Corymbia citriodora	lemon scented gum	2	0	0	0	2
Eriobotrya japonica	Loquat	1	0	1	0	0
Eucalyptus nicholii	peppermint eucalypt	4	0	1	0	3
Eucalyptus polyanthemos	silver dollar eucalypt	21	0	1	2	18
Eucalyptus sideroxylon	red ironbark	11	0	0	0	11
Eucalyptus sp.	Eucalyptus sp.	2	0	0	0	2
Fraxinus uhdei	shamel ash	7	0	4	3	0
Gleditsia triacanthos 'inermis'	thornless honey locust	3	0	0	0	3
Jacaranda mimosifolia	Jacaranda	7	0	5	0	2
Juniperus chinensis	Hollywood juniper	2	0	0	0	2
Ligustrum lucidum	glossy privet	23	0	15	0	8
Liquidamber styraciflua	Sweetgum	38	0	3	1	34
Maytenus boaria	Mayten tree	3	0	1	0	2
Olea europaea	Olive	3	0	3	0	0
Osmanthus fragrans	Fragrant Olive	13	0	13	0	0
Picea pungens glauca	Blue Spruce	1	0	1	0	0
Pinus canariensis	Canary Island pine	116	0	4	28	84
Pinus halapensis	Aleppo pine	2	0	0	0	2
Pinus mugo	Mugho pine	1	0	1	0	0
Pinus pinea	Italian stone pine	6	0	0	0	6
Pittosporum eugenioides	Lemonwood	46	0	45	0	1
Populus nigra 'italica'	Lombardy poplar	12	0	0	0	12

			Non-Protected Trees		Protected Trees	
Scientific Name	**Common Name**	**Total**	**Preserve**	**Remove**	**Preserve**	**Remove**
Prunus cerasifera	purple leaf plum	9	0	9	0	0
Prunus serrulata	Kwanzan cherry	0	0	0	0	0
Pyrus calleryana	Callery pear	1	0	0	0	1
Quercus agrifolia	California live oak	5	0	4	0	1
Quercus ilex	Holly oak	6	0	2	0	4
Salix lasiandra	Pacific willow	1	0	0	0	1
Schinus molle	Peruvian pepper	1	0	0	0	1
Sequoia sempervirens	Coast redwood	16	0	0	9	7
Ulmus parvifolia	Chinese elm	10	0	0	0	10
Total - Trees to be Preserved		**43**	**0**	**-**	**43**	**-**
Total - Trees to be Removed		**382**	**-**	**132**	**-**	**250**
Total - All Trees		**425**				

4.2 Tree Replacement

The 250 protected trees to be removed are to be replaced per the City's Code, Section 19.94.080, which considers factors such as the following:

(1) The number, species, size and location of existing trees on the site; and

(2) Good forestry practices such as, but not limited to, the number of healthy trees a given parcel of land will support.

The City typically requires planting of a replacement tree somewhere on the property as a standard condition of approval for removal of each protected tree. At the time of writing this report, a detailed planting plan was not available. To meet the City's requirements for replacement of protected trees, the Project will need to include a minimum of 250 new trees with a container size of 24-inches or larger.

4.3 Tree Preservation

A total of 43 trees will be preserved on the site, as shown in Table 6. The tree protection measures described in Section 5 will apply to these trees.

Table 6. Tree Preservation

Tree Tag	Scientific Name	Common Name	Protected?
82	*Pinus canariensis*	Canary Island pine	Yes
1006	*Pinus canariensis*	Canary Island pine	Yes
1009	*Pinus canariensis*	Canary Island pine	Yes
1020	*Pinus canariensis*	Canary Island pine	Yes
1021	*Pinus canariensis*	Canary Island pine	Yes

Tree Tag	Scientific Name	Common Name	Protected?
1022	*Pinus canariensis*	Canary Island pine	Yes
1023	*Pinus canariensis*	Canary Island pine	Yes
1024	*Pinus canariensis*	Canary Island pine	Yes
1025	*Pinus canariensis*	Canary Island pine	Yes
1026	*Sequoia sempervirens*	Coast redwood	Yes
1027	*Sequoia sempervirens*	Coast redwood	Yes
1028	*Pinus canariensis*	Canary Island pine	Yes
1029	*Sequoia sempervirens*	Coast redwood	Yes
1030	*Sequoia sempervirens*	Coast redwood	Yes
1031	*Pinus canariensis*	Canary Island pine	Yes
1032	*Pinus canariensis*	Canary Island pine	Yes
1033	*Sequoia sempervirens*	Coast redwood	Yes
1034	*Sequoia sempervirens*	Coast redwood	Yes
1097	*Pinus canariensis*	Canary Island pine	Yes
1099	*Pinus canariensis*	Canary Island pine	Yes
1100	*Pinus canariensis*	Canary Island pine	Yes
1101	*Pinus canariensis*	Canary Island pine	Yes
1102	*Pinus canariensis*	Canary Island pine	Yes
1103	*Pinus canariensis*	Canary Island pine	Yes
1105	*Pinus canariensis*	Canary Island pine	Yes
1107	*Pinus canariensis*	Canary Island pine	Yes
1108	*Pinus canariensis*	Canary Island pine	Yes
1109	*Pinus canariensis*	Canary Island pine	Yes
1110	*Pinus canariensis*	Canary Island pine	Yes
1111	*Pinus canariensis*	Canary Island pine	Yes
1112	*Pinus canariensis*	Canary Island pine	Yes
1113	*Pinus canariensis*	Canary Island pine	Yes
1114	*Pinus canariensis*	Canary Island pine	Yes
1241	*Sequoia sempervirens*	Coast redwood	Yes
1242	*Sequoia sempervirens*	Coast redwood	Yes
1243	*Sequoia sempervirens*	Coast redwood	Yes
1320	*Fraxinus uhdei*	shamel ash	Yes
1321	*Fraxinus uhdei*	shamel ash	Yes
1322	*Fraxinus uhdei*	shamel ash	Yes
1323	*Pinus canariensis*	Canary Island pine	Yes
2196	*Eucalyptus polyanthemos*	silver dollar eucalypt	Yes
2197	*Eucalyptus polyanthemos*	silver dollar eucalypt	Yes
2301	*Liquidamber styraciflua*	Sweetgum	Yes

Section 5. Tree Protection

5.1 Tree Protection Plan

The City of Sunnyvale requires a Tree Protection Plan to safeguard the health of Protected trees before and during construction (Municipal Code Sections 19.94.110, 19.94.120, and 19.94.140).

5.2 Tree Protection Zones (TPZ)

For each tree to be preserved, a Tree Protection Zone (TPZ) will be established. The size and layout of each TPZ are required by the City of Sunnyvale to be no smaller than the dripline of each protected tree to be preserved. However, we recommend that the size of each TPZ be increased based on each species' sensitivity to construction impacts, the health and age of the tree, the root and crown conformation, and development constraints. It may be necessary to identify where roots actually are through hand excavation in order to properly protect a highly valued tree (Matheny and Clark 1998). The following activities shall be prohibited within each Tree Protection Zone:

- Storage of construction materials, debris, excavated material, waste, or washout water.
- Parking construction trailers, vehicles, or equipment.
- Foot traffic.
- Erection of sheds or structures.
- Impoundment of water.
- Excavation for underground utilities, drain or irrigation lines, or other digging unless approved by the City or Consulting Arborist.
- Attachment of signs to or wrapping materials around trees or plants unless approved by the City or Consulting Arborist.

5.3 Requirements for Tree Protection during Construction

Protected trees designated for preservation shall be protected during construction by use of the following methods:

- Protective fencing shall be installed no closer to the trunk than the dripline, and far enough from the trunk to protect the integrity of the tree. The fence shall be a minimum of four (4) feet in height and shall be set securely in place. The fence shall be of a sturdy but open material (i.e., chain link) to allow visibility to the trunk for inspections and safety.

- The existing grade level around a tree shall normally be maintained out to the dripline of the tree. Alternate grade levels, as described in the tree protection plan, may be approved by the director of community development.
- Drain wells shall be installed whenever impervious surfaces will be placed over the root system of a tree (the root system generally extends to the outermost edges of the branches).
- Pruning that is necessary to accommodate a project feature, such as a building, road or walkway shall be reviewed and approved by the department of community development and the department of public works. Pruning, if necessary, shall be reviewed and approved by the City Arborist.
- New landscaping installed within the dripline of an existing tree shall be designed to reproduce a similar environment to that which existed prior to construction.
- Appropriate city staff shall be authorized to conduct on-site inspections during construction to ensure that tree preservation procedures are being followed and replanting plans implemented.

5.3.1 Recommendations for Tree Protection during Construction

The following recommendations are intended to supplement City requirements.

- Protective fencing should completely enclose the Tree Protection Zone and should be installed prior to demolition, grubbing, or grading. Protective fencing should be maintained in good condition and free of trash, debris, excess soil, chemicals, or equipment until construction is completed and accepted by the City inspector.
- Pruning prior to construction with the intent of improving tree health is not recommended. Where temporary clearance is needed for access, tree branches should be tied back to provide clearance. If any tree to be preserved requires pruning to provide construction clearance, the work must be approved in advance by the City or Consulting Arborist and performed by a Certified Arborist or Tree Worker according to the latest edition of the ANSI Z133 and A300 standards as well as the *Best Management Practices—Tree Pruning* published by the International Society of Arboriculture. Pruning should not occur during periods of flight of adult boring insects.
- Any work that is expected to encounter tree roots should be monitored by the City or Consulting Arborist.
- Excavation at the edge of Tree Protection Zones should include the following tree protection measures:
    - Hand excavate under or around tree roots to depth of three (3) feet.
    - Tunneling should only be employed with approval of the City or Consulting Arborist.
    - Do not cut main lateral tree roots or taproots. When main lateral tree roots or taproots are exposed, excavation should be discontinued until instructions to resolve the conditions are received from the City or Consulting Arborist.
    - Redirect roots in backfill areas where possible.

  - Expose main lateral roots beyond excavation limits as required to bend and redirect them without breaking.
  - If redirection is not practical, cut roots approximately three (3) inches back from new construction.
  - Protect exposed roots from drying out before placing permanent backfill.
- Prune roots that are affected by temporary and permanent construction only with the prior approval of the City or Consulting Arborist. Prune roots as follows:
  - Cut roots manually.
  - Cleanly cut exposed roots one (1) inch diameter and greater with sharp pruning instrument.
  - Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - Do not paint cut root ends.
- Injuries to any Protected trees during construction should be reported to the City or Consulting Arborist, who can evaluate the injury and recommend appropriate treatments.

Section 6. References

[Cal-IPC] California Invasive Plant Council. 2019. California Invasive Plant Inventory Database. Accessed online at http://cal-ipc.org/paf/ [January 2019].

Google Earth. 2019. Aerial imagery of project site in Sunnyvale, California. <https://www.google.com/earth/>. Accessed March 13, 2019.

Matheny, N. and J.R. Clark. 1998. Trees and Development: A Technical Guide to Preservation of Trees during Land Development. Champaign, IL: International Society of Arboriculture.

Sunnyvale [City of]. *Municipal Code*. Title 19. Zoning, Article 6, Discretionary Permits and Procedures, Chapter 19.94. Tree Preservation. Accessed online at qcode.us/codes/sunnyvale.

Appendix A. Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. No responsibility is assumed for matters legal in character. Any and all property is appraised or evaluated as though free and clear, under responsible ownership and competent management.
2. Property lines were not clearly surveyed or marked in the field by the owner, consultant attempted to provide as accurate of boundary for the inventory as possible using the limited data available.
3. Care has been taken to obtain all information from reliable sources. All data have been verified insofar as possible; however, the consultant can neither guarantee nor be responsible for the accuracy of information provided by others.
4. The consultant shall not be required to give testimony or attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
5. Loss or alteration of any part of this report invalidates the entire report.
6. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant.
7. Neither all nor any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales, or other media, without the prior expressed written or verbal consent of the consultant particularly as to value conclusions, identity of the consultant, or any reference to any professional society or institute or to any initialed designation conferred upon the consultant as stated in her qualifications.
8. This report and values expressed herein represent the opinion of the consultant, and the consultant's fee is in no way contingent upon the reporting of specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
9. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
10. Unless expressed otherwise: a) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection and b) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.

Appendix B. Certification of Performance

I, Matthew Pollock, certify that:

I have personally inspected the trees and the property referred to in this report and have stated my findings accurately. The extent of the evaluation is stated in the attached report and the terms of the assignment.

I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.

The analysis, opinions, and conclusions stated herein are my own and are based on current scientific procedures and facts.

My analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices.

No one provided significant professional assistance to me, except as indicated within the report.

Compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.

Matthew Pollock

ASCA-Registered Consulting Arborist #631

ISA-Certified Arborist WE-11610A

Appendix C. Tree Assessment

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
71	*Jacaranda mimosifolia*	Jacaranda	12	2	4	Yes	Fair	-
72	*Ligustrum lucidum*	glossy privet	10, 10, 9, 7, 4, 3	4	3	Yes	Fair	-
82	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	Yes
1001	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
1002	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
1003	*Pinus canariensis*	Canary Island pine	24	3	3	Yes	Fair	-
1004	*Pinus canariensis*	Canary Island pine	21	3	3	Yes	Fair	-
1005	*Pinus canariensis*	Canary Island pine	23	3	3	Yes	Fair	-
1006	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	Yes
1007	*Eucalyptus sp.*	Eucalyptus sp.	22	4	4	Yes	Good	-
1008	*Pinus canariensis*	Canary Island pine	29	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1009	*Pinus canariensis*	Canary Island pine	21	3	4	Yes	Fair	Yes
1010	*Pinus canariensis*	Canary Island pine	20	4	4	Yes	Good	-
1011	*Prunus cerasifera*	purple leaf plum	9	3	4	No	Fair	-
1012	*Prunus cerasifera*	purple leaf plum	9	4	4	No	Good	-
1013	*Prunus cerasifera*	purple leaf plum	6	2	4	No	Fair	-
1014	*Olea europaea*	Olive	7, 7, 6	5	5	No	Good	-
1017	*Pinus canariensis*	Canary Island pine	22	5	4	Yes	Good	-
1018	*Pinus canariensis*	Canary Island pine	9	4	4	No	Good	-
1020	*Pinus canariensis*	Canary Island pine	18	4	3	Yes	Fair	Yes
1021	*Pinus canariensis*	Canary Island pine	12	3	4	Yes	Fair	Yes
1022	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	Yes
1023	*Pinus canariensis*	Canary Island pine	15	5	4	Yes	Good	Yes
1024	*Pinus canariensis*	Canary Island pine	14	5	5	Yes	Good	Yes
1025	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	Yes

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1026	*Sequoia sempervirens*	Coast redwood	15	5	4	Yes	Good	Yes
1027	*Sequoia sempervirens*	Coast redwood	12	5	3	Yes	Good	Yes
1028	*Pinus canariensis*	Canary Island pine	13	3	4	Yes	Fair	Yes
1029	*Sequoia sempervirens*	Coast redwood	12	5	4	Yes	Good	Yes
1030	*Sequoia sempervirens*	Coast redwood	14	5	3	Yes	Good	Yes
1031	*Pinus canariensis*	Canary Island pine	25	5	4	Yes	Good	Yes
1032	*Pinus canariensis*	Canary Island pine	15	5	5	Yes	Good	Yes
1033	*Sequoia sempervirens*	Coast redwood	16	3	4	Yes	Fair	Yes
1034	*Sequoia sempervirens*	Coast redwood	17	5	4	Yes	Good	Yes
1035	*Fraxinus uhdei*	shamel ash	6	5	4	No	Good	-
1036	*Fraxinus uhdei*	shamel ash	5	5	4	No	Good	-
1037	*Fraxinus uhdei*	shamel ash	6	5	4	No	Good	-
1038	*Fraxinus uhdei*	shamel ash	7	4	2	No	Fair	-
1039	*Ulmus parvifolia*	Chinese elm	18	4	3	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1040	*Ulmus parvifolia*	Chinese elm	14	5	4	Yes	Good	-
1041	*Ulmus parvifolia*	Chinese elm	17	5	4	Yes	Good	-
1042	*Afrocarpus falcatus*	African fern pine	15	5	3	Yes	Good	-
1043	*Afrocarpus falcatus*	African fern pine	35, 11, 9	5	3	Yes	Good	-
1044	*Afrocarpus falcatus*	African fern pine	11	3	3	No	Fair	-
1046	*Prunus cerasifera*	purple leaf plum	9	2	2	No	Poor	-
1047	*Eucalyptus nicholii*	peppermint eucalypt	8	4	5	No	Good	-
1048	*Ulmus parvifolia*	Chinese elm	15	5	3	Yes	Good	-
1049	*Ulmus parvifolia*	Chinese elm	18	5	3	Yes	Good	-
1050	*Ulmus parvifolia*	Chinese elm	17	5	3	Yes	Good	-
1051	*Ulmus parvifolia*	Chinese elm	17	5	3	Yes	Good	-
1052	*Eucalyptus sideroxylon*	red ironbark	28	4	4	Yes	Good	-
1053	*Eucalyptus sideroxylon*	red ironbark	19	4	3	Yes	Fair	-
1054	*Quercus agrifolia*	California live oak	6	4	5	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1055	*Ceratonia siliqua*	carob tree	22	4	3	Yes	Fair	-
1056	*Quercus agrifolia*	California live oak	9	5	4	No	Good	-
1057	*Ceratonia siliqua*	carob tree	15	4	3	Yes	Fair	-
1058	*Prunus cerasifera*	purple leaf plum	8, 6, 3	4	4	No	Good	-
1059	*Ceratonia siliqua*	carob tree	25	3	3	Yes	Fair	-
1060	*Ceratonia siliqua*	carob tree	29	3	3	Yes	Fair	-
1061	*Ligustrum lucidum*	glossy privet	4	4	5	No	Good	-
1062	*Quercus agrifolia*	California live oak	4	3	3	No	Fair	-
1063	*Olea europaea*	Olive	5, 4, 4, 3, 2	5	3	No	Good	-
1064	*Ceratonia siliqua*	carob tree	21	4	4	Yes	Good	-
1065	*Quercus agrifolia*	California live oak	4, 4	5	4	No	Good	-
1066	*Prunus cerasifera*	purple leaf plum	6, 4	4	3	No	Fair	-
1067	*Quercus ilex*	Holly oak	14	5	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1068	*Ceratonia siliqua*	carob tree	21	3	4	Yes	Fair	-
1069	*Ceratonia siliqua*	carob tree	12	4	5	Yes	Good	-
1070	*Ceratonia siliqua*	carob tree	15	4	3	Yes	Fair	-
1071	*Ligustrum lucidum*	glossy privet	6, 2	5	5	No	Good	-
1072	*Ligustrum lucidum*	glossy privet	7, 6, 4, 4, 3	5	5	No	Good	-
1073	*Ceratonia siliqua*	carob tree	16	4	5	Yes	Good	-
1074	*Ceratonia siliqua*	carob tree	18	4	4	Yes	Good	-
1075	*Ceratonia siliqua*	carob tree	18	3	4	Yes	Fair	-
1076	*Ceratonia siliqua*	carob tree	5, 4, 4	3	4	No	Fair	-
1077	*Ceratonia siliqua*	carob tree	12	3	4	Yes	Fair	-
1078	*Ceratonia siliqua*	carob tree	20	4	5	Yes	Good	-
1079	*Ceratonia siliqua*	carob tree	13	4	3	Yes	Fair	-
1080	*Ceratonia siliqua*	carob tree	6	5	1	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1081	*Ceratonia siliqua*	carob tree	10, 7, 7, 5	4	2	No	Fair	-
1082	*Ceratonia siliqua*	carob tree	10	3	2	No	Fair	-
1083	*Ceratonia siliqua*	carob tree	25	1	1	Yes	Poor	-
1084	*Ceratonia siliqua*	carob tree	23	1	2	Yes	Poor	-
1085	*Prunus cerasifera*	purple leaf plum	6	1	1	No	Poor	-
1086	*Prunus cerasifera*	purple leaf plum	6	4	1	No	Fair	-
1087	*Ulmus parvifolia*	Chinese elm	20	2	1	Yes	Poor	-
1088	*Ulmus parvifolia*	Chinese elm	15	3	3	Yes	Fair	-
1089	*Ulmus parvifolia*	Chinese elm	19	4	2	Yes	Fair	-
1090	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
1091	*Afrocarpus falcatus*	African fern pine	17	5	2	Yes	Fair	-
1092	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
1093	*Pinus canariensis*	Canary Island pine	26	4	1	Yes	Fair	-
1094	*Pinus canariensis*	Canary Island pine	11	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1095	*Olea europaea*	Olive	7, 7, 6, 5, 4, 4	4	3	No	Fair	-
1096	*Eucalyptus nicholii*	peppermint eucalypt	28	5	1	Yes	Fair	-
1097	*Pinus canariensis*	Canary Island pine	18	4	4	Yes	Good	Yes
1098	*Pinus canariensis*	Canary Island pine	18	4	1	Yes	Fair	-
1099	*Pinus canariensis*	Canary Island pine	19	5	4	Yes	Good	Yes
1100	*Pinus canariensis*	Canary Island pine	26	4	4	Yes	Good	Yes
1101	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1102	*Pinus canariensis*	Canary Island pine	27	4	4	Yes	Good	Yes
1103	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1104	*Pinus canariensis*	Canary Island pine	9	4	2	No	Fair	-
1105	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1106	*Pinus canariensis*	Canary Island pine	15	1	4	Yes	Fair	-
1107	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	Yes

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1108	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	Yes
1109	*Pinus canariensis*	Canary Island pine	14	3	4	Yes	Fair	Yes
1110	*Pinus canariensis*	Canary Island pine	17	5	3	Yes	Good	Yes
1111	*Pinus canariensis*	Canary Island pine	18	5	5	Yes	Good	Yes
1112	*Pinus canariensis*	Canary Island pine	23	5	5	Yes	Good	Yes
1113	*Pinus canariensis*	Canary Island pine	20	5	5	Yes	Good	Yes
1114	*Pinus canariensis*	Canary Island pine	15	5	5	Yes	Good	Yes
1184	*Quercus ilex*	Holly oak	17	5	5	Yes	Good	-
1185	*Ligustrum lucidum*	glossy privet	5, 4, 3	5	5	No	Good	-
1186	*Salix lasiandra*	Pacific willow	19	3	1	Yes	Poor	-
1187	*Osmanthus fragrans*	Fragrant Olive	4, 4, 3, 3	4	3	No	Fair	-
1188	*Pinus canariensis*	Canary Island pine	19	3	4	Yes	Fair	-
1189	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
1190	*Afrocarpus falcatus*	African fern pine	7	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1191	*Afrocarpus falcatus*	African fern pine	11	3	5	No	Good	-
1192	*Afrocarpus falcatus*	African fern pine	8, 7, 6, 5	3	4	No	Fair	-
1193	*Afrocarpus falcatus*	African fern pine	9	3	4	No	Fair	-
1194	*Afrocarpus falcatus*	African fern pine	11	5	4	No	Good	-
1195	*Afrocarpus falcatus*	African fern pine	11	3	4	No	Fair	-
1196	*Afrocarpus falcatus*	African fern pine	12	4	4	Yes	Good	-
1197	*Afrocarpus falcatus*	African fern pine	13	4	3	Yes	Fair	-
1198	*Pinus canariensis*	Canary Island pine	26	4	3	Yes	Fair	-
1199	*Pinus canariensis*	Canary Island pine	26	4	4	Yes	Good	-
1200	*Pinus canariensis*	Canary Island pine	20	4	5	Yes	Good	-
1201	*Afrocarpus falcatus*	African fern pine	9	3	4	No	Fair	-
1202	*Afrocarpus falcatus*	African fern pine	9	4	5	No	Good	-
1203	*Afrocarpus falcatus*	African fern pine	12	4	3	Yes	Fair	-
1204	*Pinus mugo*	Mugho pine	11	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1205	*Afrocarpus falcatus*	African fern pine	6, 5	3	3	No	Fair	-
1206	*Afrocarpus falcatus*	African fern pine	11	5	4	No	Good	-
1207	*Afrocarpus falcatus*	African fern pine	13	4	3	Yes	Fair	-
1208	*Eriobotrya japonica*	Loquat	9, 5	5	2	No	Fair	-
1209	*Maytenus boaria*	Mayten tree	17, 14	2	3	Yes	Fair	-
1210	*Maytenus boaria*	Mayten tree	21	5	3	Yes	Good	-
1211	*Maytenus boaria*	Mayten tree	3, 3	5	3	No	Good	-
1212	*Pinus canariensis*	Canary Island pine	23	3	4	Yes	Fair	-
1213	*Pinus canariensis*	Canary Island pine	23	3	4	Yes	Fair	-
1214	*Eucalyptus sideroxylon*	red ironbark	21	4	3	Yes	Fair	-
1215	*Sequoia sempervirens*	Coast redwood	12	3	5	Yes	Good	-
1216	*Sequoia sempervirens*	Coast redwood	19	4	4	Yes	Good	-
1217	*Sequoia sempervirens*	Coast redwood	15	5	4	Yes	Good	-
1218	*Sequoia sempervirens*	Coast redwood	20	4	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1219	*Populus nigra 'italica'*	Lombardy poplar	53, 21, 20, 18, 11	3	1	Yes	Poor	-
1221	*Betula pendula*	White birch	11	3	4	No	Fair	-
1222	*Betula pendula*	White birch	6	3	1	No	Poor	-
1228	*Juniperus chinensis*	Hollywood juniper	15	5	4	Yes	Good	-
1229	*Juniperus chinensis*	Hollywood juniper	15	4	1	Yes	Fair	-
1230	*Betula pendula*	White birch	12, 10	5	4	Yes	Good	-
1231	*Betula pendula*	White birch	9	3	4	No	Fair	-
1232	*Betula pendula*	White birch	11	5	5	No	Good	-
1233	*Pinus pinea*	Italian stone pine	31	4	3	Yes	Fair	-
1234	*Pinus pinea*	Italian stone pine	25	3	2	Yes	Fair	-
1235	*Pinus pinea*	Italian stone pine	25	3	1	Yes	Poor	-
1236	*Pinus pinea*	Italian stone pine	28	3	3	Yes	Fair	-
1237	*Alnus rubra*	Red alder	24	2	1	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1238	*Alnus rubra*	Red alder	24	3	2	Yes	Fair	-
1239	*Alnus rubra*	Red alder	22	3	2	Yes	Fair	-
1240	*Alnus rubra*	Red alder	26	3	1	Yes	Poor	-
1241	*Sequoia sempervirens*	Coast redwood	13	4	3	Yes	Fair	Yes
1242	*Sequoia sempervirens*	Coast redwood	13	4	3	Yes	Fair	Yes
1243	*Sequoia sempervirens*	Coast redwood	14	4	3	Yes	Fair	Yes
1244	*Pyrus calleryana*	Callery pear	15	4	3	Yes	Fair	-
1245	*Alnus rubra*	Red alder	19	4	2	Yes	Fair	-
1256	*Pinus pinea*	Italian stone pine	32	4	4	Yes	Good	-
1257	*Pinus pinea*	Italian stone pine	29	5	4	Yes	Good	-
1258	*Alnus rubra*	Red alder	26	3	1	Yes	Poor	-
1259	*Pinus halapensis*	Aleppo pine	23	3	2	Yes	Fair	-
1261	*Sequoia sempervirens*	Coast redwood	26	3	4	Yes	Fair	-
1262	*Sequoia sempervirens*	Coast redwood	24	3	4	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1263	*Sequoia sempervirens*	Coast redwood	26	3	4	Yes	Fair	-
1264	*Pinus halapensis*	Aleppo pine	24	3	3	Yes	Fair	-
1271	*Alnus rubra*	Red alder	15	3	4	Yes	Fair	-
1273	*Alnus rubra*	Red alder	21	5	1	Yes	Fair	-
1276	*Alnus rubra*	Red alder	23	4	1	Yes	Fair	-
1277	*Liquidamber styraciflua*	Sweetgum	16	3	3	Yes	Fair	-
1278	*Liquidamber styraciflua*	Sweetgum	16	4	2	Yes	Fair	-
1279	*Liquidamber styraciflua*	Sweetgum	22	3	3	Yes	Fair	-
1280	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
1281	*Liquidamber styraciflua*	Sweetgum	14	5	3	Yes	Good	-
1282	*Liquidamber styraciflua*	Sweetgum	12	5	4	Yes	Good	-
1283	*Liquidamber styraciflua*	Sweetgum	12	4	4	Yes	Good	-
1284	*Liquidamber styraciflua*	Sweetgum	20	5	3	Yes	Good	-
1285	*Liquidamber styraciflua*	Sweetgum	12	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1286	*Liquidamber styraciflua*	Sweetgum	14	4	4	Yes	Good	-
1318	*Picea pungens glauca*	Blue Spruce	6	2	1	No	Poor	-
1319	*Liquidamber styraciflua*	Sweetgum	5, 4	3	4	No	Fair	-
1320	*Fraxinus uhdei*	shamel ash	21	4	4	Yes	Good	Yes
1321	*Fraxinus uhdei*	shamel ash	17	5	4	Yes	Good	Yes
1322	*Fraxinus uhdei*	shamel ash	23	4	4	Yes	Good	Yes
1323	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	Yes
1324	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	-
2001	*Populus nigra 'italica'*	Lombardy poplar	49	3	1	Yes	Poor	-
2002	*Populus nigra 'italica'*	Lombardy poplar	53	3	4	Yes	Fair	-
2003	*Populus nigra 'italica'*	Lombardy poplar	58, 35	5	3	Yes	Good	-
2004	*Corymbia citriodora*	lemon scented gum	22	5	4	Yes	Good	-
2005	*Populus nigra 'italica'*	Lombardy poplar	52	5	4	Yes	Good	-
2006	*Schinus molle*	Peruvian pepper	54	4	3	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2007	*Eucalyptus nicholii*	peppermint eucalypt	46	4	2	Yes	Fair	-
2008	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
2009	*Pinus canariensis*	Canary Island pine	21	2	3	Yes	Fair	-
2010	*Pinus canariensis*	Canary Island pine	15	2	4	Yes	Fair	-
2011	*Eucalyptus sp.*	Eucalyptus sp.	28, 21	4	3	Yes	Fair	-
2012	*Eucalyptus nicholii*	peppermint eucalypt	31	5	4	Yes	Good	-
2013	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	-
2014	*Pinus canariensis*	Canary Island pine	30	4	2	Yes	Fair	-
2015	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	-
2016	*Pinus canariensis*	Canary Island pine	21	4	3	Yes	Fair	-
2017	*Pinus canariensis*	Canary Island pine	23	4	3	Yes	Fair	-
2018	*Ligustrum lucidum*	glossy privet	11	3	3	No	Fair	-
2020	*Ligustrum lucidum*	glossy privet	6	4	3	No	Fair	-
2023	*Ligustrum lucidum*	glossy privet	13	4	2	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2024	*Ligustrum lucidum*	glossy privet	17	4	4	Yes	Good	-
2025	*Ligustrum lucidum*	glossy privet	13	3	4	Yes	Fair	-
2028	*Ligustrum lucidum*	glossy privet	15	3	3	Yes	Fair	-
2029	*Jacaranda mimosifolia*	Jacaranda	13	2	2	Yes	Poor	-
2030	*Jacaranda mimosifolia*	Jacaranda	10	4	4	No	Good	-
2031	*Jacaranda mimosifolia*	Jacaranda	8	4	4	No	Good	-
2032	*Jacaranda mimosifolia*	Jacaranda	11	4	4	No	Good	-
2033	*Jacaranda mimosifolia*	Jacaranda	9	2	3	No	Fair	-
2034	*Ligustrum lucidum*	glossy privet	9	4	3	No	Fair	-
2035	*Ligustrum lucidum*	glossy privet	10	4	1	No	Fair	-
2037	*Ligustrum lucidum*	glossy privet	16	4	3	Yes	Fair	-
2038	*Pinus canariensis*	Canary Island pine	19	4	5	Yes	Good	-
2039	*Pinus canariensis*	Canary Island pine	25	4	3	Yes	Fair	-
2040	*Ligustrum lucidum*	glossy privet	6	4	3	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2043	*Ligustrum lucidum*	glossy privet	8	2	2	No	Poor	-
2044	*Eucalyptus polyanthemos*	silver dollar eucalypt	35	5	4	Yes	Good	-
2045	*Corymbia citriodora*	lemon scented gum	23	5	2	Yes	Fair	-
2046	*Eucalyptus polyanthemos*	silver dollar eucalypt	24	3	4	Yes	Fair	-
2047	*Pinus canariensis*	Canary Island pine	33	5	4	Yes	Good	-
2048	*Pinus canariensis*	Canary Island pine	26	2	3	Yes	Fair	-
2049	*Pittosporum eugenioides*	Lemonwood	6, 3, 3	1	1	No	Poor	-
2050	*Pittosporum eugenioides*	Lemonwood	7, 6, 6	1	1	No	Poor	-
2051	*Pittosporum eugenioides*	Lemonwood	5, 4	1	1	No	Poor	-
2052	*Pinus canariensis*	Canary Island pine	27	4	3	Yes	Fair	-
2053	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2054	*Pinus canariensis*	Canary Island pine	25	4	2	Yes	Fair	-
2055	*Pittosporum eugenioides*	Lemonwood	6	0	0	No	Poor	-
2056	*Pittosporum eugenioides*	Lemonwood	7, 6	1	1	No	Poor	-
2057	*Pittosporum eugenioides*	Lemonwood	9, 6, 5	1	1	No	Poor	-
2058	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2059	*Pinus canariensis*	Canary Island pine	23	5	4	Yes	Good	-
2060	*Pittosporum eugenioides*	Lemonwood	7	0	0	No	Poor	-
2061	*Pittosporum eugenioides*	Lemonwood	8, 7	0	0	No	Poor	-
2062	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	-
2063	*Pittosporum eugenioides*	Lemonwood	9, 5	2	1	No	Poor	-
2064	*Pittosporum eugenioides*	Lemonwood	5, 4	4	2	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2065	*Pittosporum eugenioides*	Lemonwood	7	3	1	No	Poor	-
2066	*Pittosporum eugenioides*	Lemonwood	10, 10, 5	4	3	No	Fair	-
2067	*Ligustrum lucidum*	glossy privet	12	4	3	Yes	Fair	-
2068	*Pinus canariensis*	Canary Island pine	24	5	3	Yes	Good	-
2069	*Pinus canariensis*	Canary Island pine	22	4	3	Yes	Fair	-
2070	*Pinus canariensis*	Canary Island pine	19	4	3	Yes	Fair	-
2071	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	-
2072	*Eucalyptus polyanthemos*	silver dollar eucalypt	29	5	3	Yes	Good	-
2073	*Pinus canariensis*	Canary Island pine	14	3	4	Yes	Fair	-
2074	*Pittosporum eugenioides*	Lemonwood	6, 5, 5, 3, 3	3	4	No	Fair	-
2076	*Pittosporum eugenioides*	Lemonwood	6, 5, 5	1	2	No	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2078	*Pittosporum eugenioides*	Lemonwood	6	1	2	No	Poor	-
2079	*Ligustrum lucidum*	glossy privet	10	5	4	No	Good	-
2080	*Ligustrum lucidum*	glossy privet	7	3	4	No	Fair	-
2081	*Ligustrum lucidum*	glossy privet	13	3	4	Yes	Fair	-
2082	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2083	*Eucalyptus sideroxylon*	red ironbark	27	4	4	Yes	Good	-
2085	*Ligustrum lucidum*	glossy privet	9	4	5	No	Good	-
2086	*Ligustrum lucidum*	glossy privet	5	3	2	No	Fair	-
2089	*Ligustrum lucidum*	glossy privet	5	4	2	No	Fair	-
2091	*Populus nigra 'italica'*	Lombardy poplar	51	5	3	Yes	Good	-
2092	*Pinus canariensis*	Canary Island pine	31	5	5	Yes	Good	-
2093	*Pinus canariensis*	Canary Island pine	17	5	4	Yes	Good	-
2094	*Pinus canariensis*	Canary Island pine	18	5	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2095	*Pinus canariensis*	Canary Island pine	23	5	4	Yes	Good	-
2096	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	-
2097	*Pittosporum eugenioides*	Lemonwood	7, 6, 6, 5, 5	4	3	No	Fair	-
2098	*Pittosporum eugenioides*	Lemonwood	7, 6, 6, 5, 3	4	3	No	Fair	-
2099	*Pittosporum eugenioides*	Lemonwood	7, 7, 6	4	1	No	Fair	-
2100	*Pittosporum eugenioides*	Lemonwood	7, 5, 5	4	3	No	Fair	-
2101	*Pittosporum eugenioides*	Lemonwood	6, 4, 4	2	4	No	Fair	-
2102	*Pittosporum eugenioides*	Lemonwood	7, 4	4	3	No	Fair	-
2103	*Pittosporum eugenioides*	Lemonwood	5, 3	4	3	No	Fair	-
2104	*Pittosporum eugenioides*	Lemonwood	6, 6	4	3	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2105	*Pinus canariensis*	Canary Island pine	22	5	5	Yes	Good	-
2106	*Pinus canariensis*	Canary Island pine	17	5	4	Yes	Good	-
2107	*Pinus canariensis*	Canary Island pine	26	5	5	Yes	Good	-
2108	*Pittosporum eugenioides*	Lemonwood	6, 5, 4, 4, 4, 3	4	4	No	Good	-
2109	*Pittosporum eugenioides*	Lemonwood	8, 5, 5, 4, 4, 3	3	4	No	Fair	-
2110	*Pittosporum eugenioides*	Lemonwood	4, 3, 2	3	4	No	Fair	-
2111	*Pittosporum eugenioides*	Lemonwood	8, 5, 3, 3, 3, 3	3	3	No	Fair	-
2112	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3, 3	4	4	No	Good	-
2113	*Pittosporum eugenioides*	Lemonwood	9, 4, 4, 2, 2	4	3	No	Fair	-
2114	*Pittosporum eugenioides*	Lemonwood	5, 2, 2, 2	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2115	*Pittosporum eugenioides*	Lemonwood	9, 8, 7, 5	3	4	No	Fair	-
2116	*Pittosporum eugenioides*	Lemonwood	5	0	0	Yes	Poor	-
2118	*Pinus canariensis*	Canary Island pine	22	5	4	Yes	Good	-
2119	*Pinus canariensis*	Canary Island pine	19	4	4	Yes	Good	-
2120	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	4	3	Yes	Fair	-
2121	*Liquidamber styraciflua*	Sweetgum	14	5	4	Yes	Good	-
2122	*Liquidamber styraciflua*	Sweetgum	17	5	3	Yes	Good	-
2123	*Liquidamber styraciflua*	Sweetgum	15	4	4	Yes	Good	-
2124	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
2125	*Liquidamber styraciflua*	Sweetgum	16	5	4	Yes	Good	-
2126	*Liquidamber styraciflua*	Sweetgum	12	5	3	Yes	Good	-
2127	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2128	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-
2129	*Pinus canariensis*	Canary Island pine	25	3	4	Yes	Fair	-
2130	*Pinus canariensis*	Canary Island pine	20	4	5	Yes	Good	-
2131	*Eucalyptus polyanthemos*	silver dollar eucalypt	18	5	4	Yes	Good	-
2132	*Eucalyptus polyanthemos*	silver dollar eucalypt	20	4	5	Yes	Good	-
2133	*Eucalyptus polyanthemos*	silver dollar eucalypt	25	4	3	Yes	Fair	-
2134	*Pinus canariensis*	Canary Island pine	16	3	4	Yes	Fair	-
2135	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	-
2140	*Eucalyptus polyanthemos*	silver dollar eucalypt	9	4	4	No	Good	-
2142	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	-
2143	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	-
2144	*Jacaranda mimosifolia*	Jacaranda	9	5	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2147	*Pinus canariensis*	Canary Island pine	27	3	3	Yes	Fair	-
2148	*Pinus canariensis*	Canary Island pine	27	5	5	Yes	Good	-
2149	*Pittosporum eugenioides*	Lemonwood	4, 4, 2	5	4	No	Good	-
2151	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	4	4	Yes	Good	-
2152	*Liquidamber styraciflua*	Sweetgum	16	5	4	Yes	Good	-
2153	*Liquidamber styraciflua*	Sweetgum	18	3	4	Yes	Fair	-
2154	*Liquidamber styraciflua*	Sweetgum	18	5	4	Yes	Good	-
2156	*Liquidamber styraciflua*	Sweetgum	15	3	1	Yes	Poor	-
2157	*Liquidamber styraciflua*	Sweetgum	17	3	2	Yes	Fair	-
2158	*Liquidamber styraciflua*	Sweetgum	16	4	3	Yes	Fair	-
2159	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2160	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
2161	*Pinus canariensis*	Canary Island pine	22	4	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2162	*Eucalyptus sideroxylon*	red ironbark	19	4	2	Yes	Fair	-
2163	*Pinus canariensis*	Canary Island pine	28	4	5	Yes	Good	-
2164	*Pinus canariensis*	Canary Island pine	22	4	3	Yes	Fair	-
2165	*Pinus canariensis*	Canary Island pine	24	5	2	Yes	Fair	-
2166	*Eucalyptus sideroxylon*	red ironbark	35	5	2	Yes	Fair	-
2167	*Eucalyptus sideroxylon*	red ironbark	19	5	2	Yes	Fair	-
2168	*Eucalyptus sideroxylon*	red ironbark	22	5	2	Yes	Fair	-
2170	*Quercus ilex*	Holly oak	5, 4	5	2	No	Fair	-
2172	*Quercus agrifolia*	California live oak	16, 15, 13	4	3	Yes	Fair	-
2173	*Liquidamber styraciflua*	Sweetgum	12	5	2	Yes	Fair	-
2174	*Liquidamber styraciflua*	Sweetgum	10	4	4	No	Good	-
2175	*Liquidamber styraciflua*	Sweetgum	14	5	2	Yes	Fair	-
2176	*Liquidamber styraciflua*	Sweetgum	9	5	2	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2177	*Liquidamber styraciflua*	Sweetgum	13	4	3	Yes	Fair	-
2180	*Pinus canariensis*	Canary Island pine	25	3	4	Yes	Fair	-
2181	*Pinus canariensis*	Canary Island pine	19	4	4	Yes	Good	-
2182	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	-
2183	*Pittosporum eugenioides*	Lemonwood	6, 5	3	2	No	Fair	-
2184	*Eucalyptus sideroxylon*	red ironbark	23	2	2	Yes	Poor	-
2185	*Pittosporum eugenioides*	Lemonwood	5, 3, 2	4	3	No	Fair	-
2186	*Pittosporum eugenioides*	Lemonwood	3, 2, 2, 1	4	3	No	Fair	-
2187	*Pittosporum eugenioides*	Lemonwood	4, 3	5	3	No	Good	-
2188	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	-
2189	*Pinus canariensis*	Canary Island pine	18	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2190	*Pittosporum eugenioides*	Lemonwood	3, 3	3	3	No	Fair	-
2191	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3, 3	3	3	No	Fair	-
2192	*Pittosporum eugenioides*	Lemonwood	3, 3, 2	3	2	No	Fair	-
2193	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	5	4	Yes	Good	-
2194	*Liquidamber styraciflua*	Sweetgum	13	5	3	Yes	Good	-
2195	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-
2196	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	4	3	Yes	Fair	Yes
2197	*Eucalyptus polyanthemos*	silver dollar eucalypt	24	4	3	Yes	Fair	Yes
2198	*Eucalyptus polyanthemos*	silver dollar eucalypt	22	2	3	Yes	Fair	-
2199	*Eucalyptus sideroxylon*	red ironbark	17	2	2	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2200	*Eucalyptus polyanthemos*	silver dollar eucalypt	20	2	3	Yes	Fair	-
2201	*Eucalyptus polyanthemos*	silver dollar eucalypt	28	5	3	Yes	Good	-
2202	*Populus nigra 'italica'*	Lombardy poplar	71	3	1	Yes	Poor	-
2203	*Populus nigra 'italica'*	Lombardy poplar	37, 36	3	3	Yes	Fair	-
2204	*Populus nigra 'italica'*	Lombardy poplar	27	3	4	Yes	Fair	-
2205	*Populus nigra 'italica'*	Lombardy poplar	57	3	4	Yes	Fair	-
2206	*Populus nigra 'italica'*	Lombardy poplar	29	3	1	Yes	Poor	-
2207	*Populus nigra 'italica'*	Lombardy poplar	60	3	4	Yes	Fair	-
2208	*Pinus canariensis*	Canary Island pine	9	3	2	No	Fair	-
2209	*Pinus canariensis*	Canary Island pine	29	4	4	Yes	Good	-
2210	*Eucalyptus sideroxylon*	red ironbark	20	3	4	Yes	Fair	-
2213	*Pinus canariensis*	Canary Island pine	20	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2214	*Prunus cerasifera*	purple leaf plum	4, 3, 3, 2, 2	5	4	No	Good	-
2218	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3	4	2	No	Fair	-
2219	*Pinus canariensis*	Canary Island pine	15	3	1	Yes	Poor	-
2220	*Pinus canariensis*	Canary Island pine	27	4	4	Yes	Good	-
2221	*Pinus canariensis*	Canary Island pine	19	3	4	Yes	Fair	-
2222	*Pinus canariensis*	Canary Island pine	17	3	4	Yes	Fair	-
2223	*Pittosporum eugenioides*	Lemonwood	5, 5, 4, 3	3	2	No	Fair	-
2224	*Eucalyptus polyanthemos*	silver dollar eucalypt	21	4	2	Yes	Fair	-
2225	*Pittosporum eugenioides*	Lemonwood	7	4	4	No	Good	-
2226	*Eucalyptus polyanthemos*	silver dollar eucalypt	29	4	4	Yes	Good	-
2227	*Osmanthus fragrans*	Fragrant Olive	6, 4	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2228	*Osmanthus fragrans*	Fragrant Olive	8, 6, 2, 1	4	4	No	Good	-
2229	*Eucalyptus polyanthemos*	silver dollar eucalypt	23	5	3	Yes	Good	-
2230	*Eucalyptus polyanthemos*	silver dollar eucalypt	22	4	4	Yes	Good	-
2231	*Osmanthus fragrans*	Fragrant Olive	5, 4, 3	3	3	No	Fair	-
2232	*Osmanthus fragrans*	Fragrant Olive	6, 6, 1	3	3	No	Fair	-
2233	*Osmanthus fragrans*	Fragrant Olive	7, 5, 4	3	3	No	Fair	-
2234	*Pinus canariensis*	Canary Island pine	30	4	4	Yes	Good	-
2235	*Pinus canariensis*	Canary Island pine	26	4	5	Yes	Good	-
2236	*Liquidamber styraciflua*	Sweetgum	18	4	2	Yes	Fair	-
2238	*Osmanthus fragrans*	Fragrant Olive	10	4	3	No	Fair	-
2239	*Osmanthus fragrans*	Fragrant Olive	11	4	2	No	Fair	-
2240	*Osmanthus fragrans*	Fragrant Olive	9, 8, 4, 4	4	2	No	Fair	-
2241	*Osmanthus fragrans*	Fragrant Olive	9, 8, 4	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2242	*Liquidamber styraciflua*	Sweetgum	15	4	4	Yes	Good	-
2243	*Osmanthus fragrans*	Fragrant Olive	7, 7, 6	4	4	No	Good	-
2244	*Osmanthus fragrans*	Fragrant Olive	6, 5, 4	4	3	No	Fair	-
2245	*Osmanthus fragrans*	Fragrant Olive	6, 5, 5	4	4	No	Good	-
2246	*Liquidamber styraciflua*	Sweetgum	12	5	4	Yes	Good	-
2247	*Quercus ilex*	Holly oak	17	5	4	Yes	Good	-
2248	*Quercus ilex*	Holly oak	11	3	4	No	Fair	-
2249	*Quercus ilex*	Holly oak	21	4	2	Yes	Fair	-
2250	*Eucalyptus polyanthemos*	silver dollar eucalypt	33	4	4	Yes	Good	-
2251	*Pinus canariensis*	Canary Island pine	21	3	3	Yes	Fair	-
2252	*Pinus canariensis*	Canary Island pine	26	1	1	Yes	Poor	-
2253	*Eucalyptus polyanthemos*	silver dollar eucalypt	27	2	1	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2254	*Eucalyptus polyanthemos*	silver dollar eucalypt	26	4	3	Yes	Fair	-
2255	*Eucalyptus polyanthemos*	silver dollar eucalypt	18	4	5	Yes	Good	-
2256	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	3	2	Yes	Fair	-
2257	*Liquidamber styraciflua*	Sweetgum	12	4	3	Yes	Fair	-
2259	*Pittosporum eugenioides*	Lemonwood	9, 4, 3	3	2	No	Fair	-
2260	*Pittosporum eugenioides*	Lemonwood	7, 5, 4, 4	4	2	No	Fair	-
2261	*Pittosporum eugenioides*	Lemonwood	6, 5	3	2	No	Fair	-
2301	*Liquidamber styraciflua*	Sweetgum	14	3	3	Yes	Fair	Yes
2302	*Pinus canariensis*	Canary Island pine	23	2	2	Yes	Poor	-

Appendix D. Representative Photos

Photo 1. Tree #1043, African fern pine (*Afrocarpus falcatus*).

Photo 2. Tree 1006 (left side), Canary Island pine (*Pinus canariensis*). Tree #1011 (right side), purple leaf plum (*Prunus cerasifera*).

Photo 3. Tress 1048-1051 (left to right), all are Chinese elm (*Ulmus parvifolia*).

Photo 4. Trees 2124-2126 (left to right), all are sweetgum (*Liquidamber styraciflua*).

Photo 5. Tree 2144 (foreground), jacaranda (*Jacaranda mimosifolia*) and Trees 2142-2143 (background), Canary Island pine (*Pinus canariensis*).

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Appendix E-2

Google West Borregas Campus Biological Resources Report

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google West Borregas Campus
100 Caribbean
Biological Resources Report

Project #3475-49

Prepared for:

Kathleen Popovec
Google, LLC

Prepared by:

H. T. Harvey & Associates

August 8, 2019

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Appendices

Appendix A. Caribbean Campus Arborist Report A-1

List of Preparers

Dan Stephens, Principal/Senior Restoration Ecologist

Scott Terrill, Ph.D., Principal/Senior Wildlife Ecologist

Robin Carle, M.S., Project Manager/Senior Wildlife Ecologist

Joe Howard, MLA, Principal/Senior Landscape Architect

Section 1. Introduction

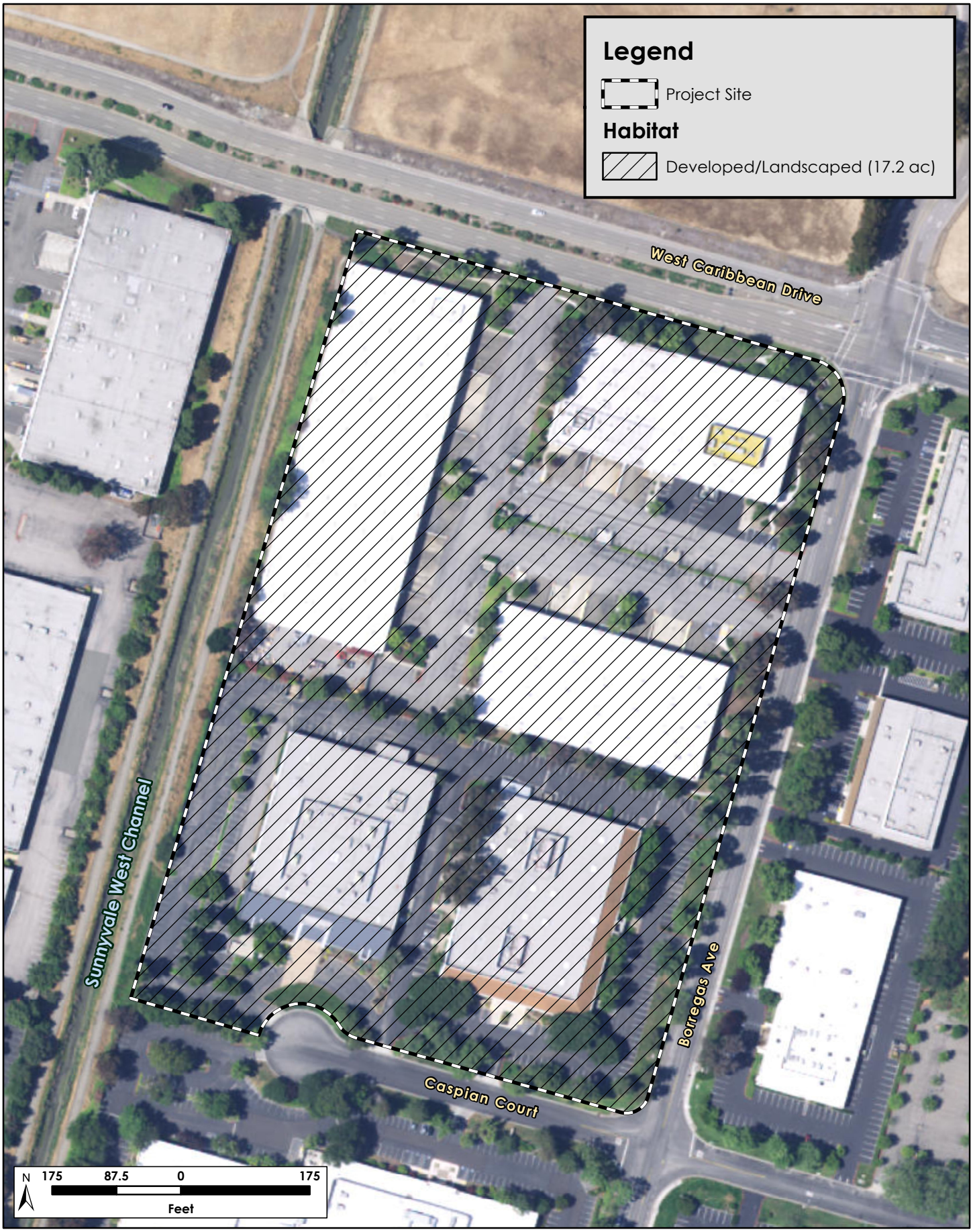
This report provides a preliminary assessment of special-status and protected plant and wildlife species that potentially occur in the area of Google's West Borregas Campus.

The approximately 17.2-acre project site is located in Sunnyvale, California on the *Mountain View, California* U.S. Geological Survey quadrangle, and is bounded to the north by West Caribbean Drive, to the west by the Sunnyvale West Channel, to the south by Caspian Court, and to the east by Borregas Avenue (Figure 1). The City of Sunnyvale Water Pollution Control Plant (WPCP) is located to the north across West Caribbean Drive from the site. The project site is developed with light industrial and commercial uses, and the current buildings on the site are generally offices and warehouses with associated parking.

In addition to this site, a Biological Resources Report was developed for the Google Caribbean Campus across the West Channel (west) from the West Borregas project site (H. T. Harvey & Associates 2019a).The Sunnyvale West Channel, which is owned and maintained by the Santa Clara Valley Water District, flows south to north along the western boundary of the West Borregas project site. The overall project comprises the Caribbean project site, the West Borregas project site and the portion of the Caribbean Campus project site bounded by both projects. As is the case with West Borregas, the West Channel portion of the overall project is covered under a separate biological resources report (H. T. Harvey & Associates, 2019b). Thus, biological resources for the entire project comprising the three project components, West Borregas, Caribbean, and the relevant portion of the Sunnyvale West Channel were all addressed.

It is our understanding that Google is considering redevelopment of the West Borregas Campus and that the City of Sunnyvale is expected to require the submittal of a biological resources report analyzing potential impacts on nesting birds and other special-status and protected plant and wildlife species. This report evaluates the special-status and protected plant and wildlife species that may potentially be impacted by future redevelopment of Google's West Borregas Campus. In addition to this site, a Biological Resources Report was developed for the Google Caribbean Campus project across the West Channel (west of) from the Caribbean project site (H. T. Harvey & Associates 2019a).

The City of Sunnyvale Land Use and Transportation Element Environmental Impact Report (LUTE EIR) analyzes the potential environmental effects associated with the implementation of the LUTE, which is an element of the City of Sunnyvale General Plan. The EIR analysis focuses on environmental impacts that could arise through development of the land uses in Sunnyvale as regulated and guided by the LUTE. The EIR was prepared as a program EIR per CEQA guidelines Section 15168. Thus, any impacts previously analyzed by the LUTE EIR will be acknowledged, in this report, as being covered under the LUTE program EIR. Any impacts not covered by the LUTE EIR will be identified as such within this report.



N:\Projects3400\3475-01\49\Reports\Figure 1 Habitat Map.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Habitat Map
Google West Borregas Campus Biological Resources Report (3475-49)
August 2019

1.1 Special-Status and Protected Species

For the purpose of this assessment, *special-status* and *protected* plants are considered plant species that are:

- Listed under the Federal Endangered Species Act (FESA) as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under the California Endangered Species Act (CESA) as threatened, endangered, rare, or a candidate species.
- Listed by the California Native Plant Society (CNPS) as California Rare Plant Rank (CRPR) 1A, 1B, 2, 3, or 4.

For the purpose of this assessment, *special-status* and *protected* animals are considered animal species that are:

- Listed under FESA as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under CESA as threatened, endangered, or a candidate threatened or endangered species.
- Designated by the California Department of Fish and Wildlife (CDFW) as a California species of special concern.
- Listed in the California Fish and Game Code as fully protected species (fully protected birds are provided in Section 3511, mammals in Section 4700, reptiles and amphibians in Section 5050, and fish in Section 5515).
- Bird species protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code.
- Bat species protected under the California Fish and Game Code.

Section 2. Methods

Prior to conducting field work, H. T. Harvey & Associates ecologists reviewed aerial images (Google, LLC. 2017); a U.S. Geological Survey (USGS) topographic map; the CDFW's California Natural Diversity Database (CNDDB) (2017); and other relevant reports, scientific literature, and technical databases. Previous reports prepared for the project site and vicinity were also reviewed, including the *Google Caribbean Campus Arborist Report* (H. T. Harvey & Associates 2019c; Appendix A) and *Sunnyvale East and West Channels Flood Protection Project Final Environmental Impact Report* (Santa Clara Valley Water District 2014). For the purposes of this report, the "site vicinity" encompasses a 5-mile radius surrounding the project site.

In addition, for plants, we reviewed all species on current CNPS CRPR 1A, 1B, 2A, and 2B lists occurring in the project region, which is defined as the *Mountain View, California* USGS 7.5-minute quadrangle and surrounding eight quadrangles (*Redwood Point, Newark, Niles, Palo Alto, Milpitas, Mindego Hill, Cupertino, and San Jose West*). Quadrangle-level results are not maintained for CRPR 3 and 4 species, so we also conducted a search of the CNPS Inventory records for these species occurring in Santa Clara County (CNPS 2017). For birds, we also perused records reported in nearby areas, such as at the Sunnyvale Baylands Park and Sunnyvale Water Pollution Control Plant on eBird (Cornell Lab of Ornithology 2017) and on the South-Bay-Birds List Serve (2017).

Following our background review, H. T. Harvey & Associates wildlife ecologist Robin Carle, M.S., conducted a reconnaissance-level survey of the site on July 18, 2017. The purpose of this survey was to identify existing biological conditions and the site's potential to support special-status and protected plants and animals. The survey included an assessment of habitats for these species both on the site and in adjacent areas (e.g., in developed and landscaped areas on adjacent properties) that could be impacted either directly or indirectly by proposed activities, as well as an assessment of adjacent habitats that could potentially support source populations of sensitive species that could be affected by future redevelopment of the site (e.g., habitat on adjacent sites that may be used as breeding habitat by burrowing owls [*Athene cunicularia*]).

Section 3. Existing Conditions

The project site and surrounding areas have been heavily disturbed by anthropogenic activities as a result of urbanization and the development of commercial buildings.

The reconnaissance-level survey identified one general habitat type on the site: developed/landscaped. The site consists of asphalt pavement and existing commercial buildings with associated landscaping (Photos 1 and 2). A complete list of trees on the project site is provided in the arborist report for the project (Appendix A). Non-native tree species on the site include Canary Island pine (*Pinus canariensis*), sweetgum (*Liquidambar styraciflua*), silver dollar eucalyptus (*Eucalyptus polyanthemos*), red alder (*Alnus rubra*), African fern pine (*Afrocarpus falcatus*), holly oak (*Quercus ilex*) and fragrant olive (*Osmanthus fragrans*). The only locally native tree on the site is one coast live oak (*Quercus agrifolia*). Landscaped areas also contained a variety of non-native plants and shrubs, such as oleander (*Nerium oleander*), as well as ground cover, such as grass lawns, cape weed (*Arctotheca calendula*), and English ivy (*Hedera helix*).

Photo 1. Developed/Landscaped Land Cover Type on the Project Site

Photo 2. Typical Non-Native Trees on the Site

Wildlife species associated with the project site include species accustomed to urban environments and high levels of human disturbance. Native bird species observed during the July 2017 site visit include the black phoebe (*Sayornis nigricans*), lesser goldfinch (*Spinus psaltria*), dark-eyed junco (*Junco hyemalis*), house finch (*Haemorhous mexicanus*), Anna's hummingbird (*Calypte anna*), Bullock's oriole (*Icterus bullockii*), bushtit (*Psaltriparus minimus*), chestnut-backed chickadee (*Poecile rufescens*), Bewick's wren (*Thryomanes bewickii*), Nuttall's woodpecker (*Picoides nuttallii*), mourning dove (*Zenaida macroura*), and American crow (*Corvus brachyrhynchos*). Each of these species may use the trees, shrubs, or ground vegetation on the site for nesting. Mammal species expected to use the site include the nonnative black rat (*Rattus rattus*) and Virginia opossum

(*Didelphis virginiana*), as well as the native striped skunk (*Mephitis mephitis*) and raccoon (*Procyon lotor*). Native western fence lizards (*Sceloporus occidentalis*) are also common in developed areas.

No nests of raptors (e.g., hawks, falcons, and owls) were observed on the site or in adjacent areas. Numerous large trees on the site are suitable for nesting by raptors, and due to the presence of large areas of open grassland foraging habitat for these species associated with the WPCP immediately to the north, there is a moderate possibility that raptors may nest on or near the project site.

No signs of the presence of roosting bats (e.g., guano, urine staining, or visual or auditory detections of bats) were observed on the existing buildings on the site. The majority of these buildings were recently occupied and are unlikely to provide suitable roosting habitat for bats due to regular human disturbances and a lack of crevices through which bats can potentially enter.

Section 4. Summary of Special-Status and Protected Plant and Wildlife Species with Potential to Be Impacted by the Project

4.1 Special-Status and Protected Plants

The CNDDB (2017) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2017) were queried for rare plant species that occur in the project region. All potentially occurring rare plant species were determined to be absent from the project site for at least one of the following reasons: (1) absence of suitable habitat types; (2) lack of specific microhabitat or edaphic requirements, such as serpentine soils; (3) the elevation range of the species is outside of the range on the site; and/or (4) the species is presumed extirpated from the project region. Based on this analysis and the habitat types observed during the site survey, Congdon's tarplant, which has a CNPS Rare Plant Ranking of 1B.1 (seriously threatened in California), was the only special-status plant species determined to have the potential to occur in the project vicinity. However, Congdon's tarplant is determined to be absent from the site because the site is entirely developed, and suitable habitat to support this species (e.g., ruderal grassland habitat) is absent from the site.

4.2 Special-Status and Protected Animals

The dense urban surroundings and absence of specific habitat features favored by various special-status wildlife species make the site unsuitable for the vast majority of special-status wildlife species that occur in the region. The only special-status animal species that could potentially reside on the site or close enough to the site to be affected by the project are the burrowing owl and white-tailed kite (*Elanus leucurus*).

4.2.1 Burrowing Owl

The burrowing owl, a California species of special concern, occurs year-round in the Santa Clara Valley (Trulio 2007) and is commonly present in open, agricultural, or grassland areas with active burrows of California ground squirrels. They exhibit strong site fidelity, and may return to a nesting site and attempt to nest even after the site has been developed. However, burrowing owls are increasingly disappearing from "infill" locations on the urban Santa Clara Valley floor. In the 1990s, prior to development of the site, burrowing owls were known to occur on, or at least in the immediate vicinity of, a larger tract of land that included the project site. There are no recent records of burrowing owls from the project site, although burrowing owls are known to currently occur in several locations in the site vicinity. Burrowing owls are known to occur in grassland areas surrounding the WPCP within 0.2 mile of the project site (Cornell Lab of Ornithology 2017). Several historical records of burrowing owls overlap the project site, and burrowing owls are known to occur more recently at the Moffett Federal Airfield 1.0 mile to the west, the WPCP to the north, and Twin Creeks Sports Complex/Sunnyvale Baylands Park 0.9 mile to the east (CNDDB 2017). However, our focused survey of the project site in August

2017 did not detect any burrowing owls, suitable habitat for owls (i.e., burrows of California ground squirrels) or signs of owl presence (e.g., feathers, whitewash, or pellets) on the project site.

Suitable nesting and roosting habitat for burrowing owls is absent from the site due to the lack of suitable grassland habitat and burrows of California ground squirrels. Ruderal grassland habitat along the immediately adjacent Sunnyvale West Channel provides ostensibly suitable foraging habitat for burrowing owls that may nest or roost in nearby areas at the WPCP. Albion Environmental (2008) assessed the potential impact of the SCVWD's proposed burrow management under the Stream Maintenance Program on burrowing owls, which included an assessment of the Sunnyvale West Channel. Because no evidence existed that SCVWD levees provided important burrowing owl nesting or roosting habitat (i.e., used regularly or by a sizeable proportion of the South San Francisco Bay population), Albion Environmental concluded that management of burrows on the SCVWD's levees would not result in a substantial impact on burrowing owl habitat. Thus, although ostensibly suitable foraging habitat for burrowing owls occurs along the Sunnyvale West Channel immediately adjacent to the project site, the potential for project activities to impact burrowing owls and their habitat within this area is expected to be relatively low.

Burrowing Owls are a special-status species covered under the LUTE EIR. This species (including eggs and young) is protected under the federal Migratory Bird Treaty Act and under Section 3503 and 3513 of the California Fish and Game code. Suitable nesting and roosting habitat for burrowing owls occurs within 250 feet of the site at the WPCP and burrowing owls are known to occur in this area. There is some potential for construction activities that occur in close proximity to active burrows to disturb owls to the point of abandoning their burrows. Based on the density of known occurrences of burrowing owls at the WPCP, up to one pair of owls could potentially nest or roost at the WPCP within 250 feet of the site. Therefore, to comply with federal and state law, pre-construction surveys for burrowing owls shall be conducted prior to the initiation of all Project activities within suitable burrowing owl habitat (i.e., ruderal/grassland habitat with burrows of California ground squirrels on the WPCP/Landfill site) within 250 feet of project activities. Pre-construction surveys will be completed in conformance with the CDFW's 2012 guidelines (CDFW 2012). An initial habitat assessment will be conducted by a qualified biologist to determine if suitable burrowing owl habitat (suitable burrows) is present in the buffer zone as access is allowed. During the initial site visit, a qualified biologist will survey the entire buffer area for suitable burrows that could be used by burrowing owls for nesting or roosting. If no suitable burrowing owl habitat (i.e., ruderal grasslands with burrows of California ground squirrels) is present within the 250 buffer zone area, no additional surveys will be required. If suitable burrows are determined to be present within 250 feet of work areas, a qualified biologist will conduct three additional surveys to investigate each burrow within the survey area for signs of owl use, and to determine whether owls are present in areas where they could be affected by proposed activities. The final survey shall be conducted within the 24-hour period prior to the initiation of Project activities in any given area. Because Project activities may be phased, these survey efforts may also need to be performed in phases to ensure that burrowing owls are not present within 250 feet of work areas when Project activities commence.

If burrowing owls are present during the non-breeding season (generally September 1 to January 31), a 150-foot buffer zone shall be maintained around the occupied burrow(s), if feasible. If maintaining such a buffer is not feasible, then the buffer must be great enough to avoid injury or mortality of individual owls, or else the owls should be passively relocated in consultation with the California Department of Fish and Wildlife. During the breeding season (generally February 1 to August 31), a 250-foot buffer, within which no new Project-related activities will be permissible, will be maintained between Project activities and occupied burrows. Owls present between February 1 and August 31 will be assumed to be nesting, and the 250-foot protected area will remain in effect until August 31. If monitoring evidence indicates that the owls are no longer nesting or the young owls are foraging independently, the buffer may be reduced or the owls may be relocated prior to August 31, in consultation with the CDFW.

4.2.2 White-Tailed Kite

As noted in the LUTE EIR, the white-tailed kite is a state fully protected species, and, this species (including eggs and young) is protected under the federal Migratory Bird Treaty Act and under Section 3503 and 3513 of the California Fish and Game code. In California, white-tailed kites can be found in the Central Valley and along the coast in grasslands, agricultural fields, cismontane woodlands, and other open habitats (Zeiner et al. 1990, Dunk 1995, Erichsen et al. 1996). White-tailed kites are year-round residents of the state, establishing nesting territories that encompass open areas with healthy prey populations and snags, shrubs, trees, or other substrates for nesting (Dunk 1995). Nonbreeding birds typically remain in the same area over the winter, although some movements do occur (Polite 1990). The presence of white-tailed kites is closely tied to the presence of prey species, particularly voles, and prey base may be the most important factor in determining habitat quality for white-tailed kites (Dunk and Cooper 1994, Skonieczny and Dunk 1997). Although the species recovered after population declines during the early 20th century, its populations may be exhibiting new declines because of recent increases in habitat loss and disturbance (Dunk 1995, Erichsen et al. 1996).

White-tailed kites are common residents in less-developed portions of the project region where open grassland, ruderal, or agricultural habitats are present. No white-tailed kites, or potential nests of this species, were observed on the site during the August 2017 focused survey. However, this species occurs year-round at the WPCP to the north and at the Sunnyvale Baylands Park approximately 0.9 mile to the east. Large trees on the site provide potential nesting sites for this species, and additional large trees are present north of West Caribbean Drive along Borregas Avenue at the entrance to the WPCP. These trees provide suitable sites for nesting by up to one pair of white-tailed kites, and this species may forage in the open grassland habitat along the Sunnyvale West Channel on the project site year-round.

Based on our site observations, the areal extent of the study area, and known breeding densities of these species, it is likely that no more than one pair of white-tailed kites could potentially nest in the vicinity of the project site. Therefore, to comply with federal and state law, if project construction cannot occur outside the breeding season (February 1 to August 31) surveys will be conducted for active white-tailed kite nests within 300 feet of the project construction area. If an active kite nest is found, a 300 foot (or an alternative buffer area established

via consultation with the California Department of Fish and Wildlife) non-construction buffer area shall be established between the nest and project construction activities.

4.2.3 Nesting Birds

Several species of common native bird protected under the MBTA and California Fish and Game Code may nest in trees, shrubs, or on buildings on or immediately adjacent to the project site. Redevelopment of the site has the potential to result in the direct injury or mortality of common, native birds, especially eggs or young in nests. For instance, disturbance, building demolition, and vegetation removal that takes place during the nesting season (i.e., February 1 through August 31) could result in the removal of active bird nests. In addition, increased disturbance near active nests could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Common (i.e., non-special-status) bird species that may nest on the site include the black phoebe, mourning dove, lesser goldfinch, Anna's hummingbird, dark-eyed junco, bushtit, and house finch. All of these species are abundant to fairly common in the region (Bousman 2007). Based on site observations, the areal extent of the site, and the density at which these birds typically nest in the region, a few pairs of each of these species could potentially nest on or adjacent to the site.

4.2.4 Roosting Bats

The office buildings on the site provide ostensibly suitable roosting habitat for colonies of common species of bats, possibly including the Yuma myotis (*Myotis yumanensis*) and Mexican free-tailed bat (*Tadarida brasiliensis*). All bat species in California are protected under the California Fish and Game Code. Bats do not commonly roost in office buildings such as those on the project site, but if these buildings are unoccupied for extended periods of time and crevices are present through which bats can enter and exit, there is a very low possibility that bats could colonize one or more of these buildings.

4.3 Potential Impacts Due to Avian Collisions with New Buildings

It has been well documented that glass windows and building facades can result in injury or mortality of birds due to birds' collisions with these surfaces. Because birds do not perceive glass as an obstruction the way humans do, they may collide with glass when the sky or vegetation is reflected in glass (e.g., they see the glass as sky or vegetated areas); when transparent windows allow birds to perceive an unobstructed flight route through the glass (such as at corners); and when the combination of transparent glass and interior vegetation (such as in planted atria) results in attempts by birds to fly through glass to reach that vegetation. Building exterior and interior lighting can also attract birds, causing them to collide with structures. The greatest risk of avian collisions with buildings occurs in the area within 40–60 feet of the ground, because this is the area in which most bird activity occurs (Sheppard and Phillips 2015). Very tall buildings (e.g., buildings 500 feet or higher) may pose a threat to birds that are migrating through the area, particularly to nocturnal migrants that may not see the buildings or that may be attracted to lights on the buildings (San Francisco Planning Department 2011). These risks are highest for buildings in or near areas of high avian activity or movement, such as migratory corridors, large open spaces, large water bodies, and riparian habitats.

Under existing conditions, terrestrial land uses and habitat conditions on the project site and in surrounding areas consist primarily of urban development such as low- and mid-rise buildings (i.e., 1–6 stories), parking lots, and roads. Vegetation in these areas is very limited in extent, and consists primarily of non-native landscaped trees and shrubs. Non-native vegetation supports fewer of the resources required by native birds than native vegetation, and the structural simplicity of the vegetation (without well-developed ground cover, understory, and canopy layers) further limits resources available to birds. In contrast, the buffer lands of the WPCP, located approximately 95 feet north of the project site across West Caribbean Drive, provide an area of extensive grassland habitat for large numbers of resident and migratory bird species. Birds attracted to the extensive grasslands north of the project site may utilize or fly through urban areas, but are expected to do so primarily when large natural areas are present on or immediately adjacent to a site to provide resources for these species. The Sunnyvale West Channel is located immediately adjacent to the site, but this channel does not provide important habitat for birds (i.e., extensive tree cover), although the planned increased landscaping with native vegetation will result in increased habitat value to birds, or a migratory corridor via which birds can travel to reach other natural areas upstream. No parks or other natural areas are located on or immediately adjacent to the project site. The nearest natural areas the Sunnyvale Baylands Park approximately 0.9 mile to the east and Moffett Federal Airfield located approximately 1.0 mile to the west. These areas provide important habitat for birds, but are separated from the project site by dense urban development, and the site is not located in an area where large numbers of birds traveling between the WPCP buffer lands, Sunnyvale Baylands Park, and/or Moffett Federal Airfield are expected to travel. Thus, the large numbers of birds expected to occur in the region in association with the WPCP buffer lands, Sunnyvale Baylands Park, and Moffett Federal Airfield are not expected to make substantial use of the site or travel through the site when en route between natural areas in the region. However, resident, wintering and migrant birds attracted to local habitats, including vegetation on the site could be a risk of collisions with buildings. Therefore, in accordance with The Sunnyvale Bird Safe Building Guidelines and the LUTE EIR, which refers to these guidelines, The Google Caribbean design team worked with Senior Ornithologist Scott Terrill, PhD and Ornithologist Robin Carle, both of whom have worked on bird-safe design and management for a number of projects in the South Bay region, to identify areas of the buildings that were likely to pose a notable risk to birds (transparent glass facades near vegetation and open space areas, transparent corners, etc. The ornithologists worked with the design team to incorporate bird-safe cues into the glass in those areas. The ornithologists also advised on the placement of vegetation to minimize bird strikes and on bird-safe lighting, all of which have been incorporated into the project. This approach was based on the overall approach developed by the City of San Francisco Standards for Bird-Safe Buildings (San Francisco Planning Department 2011) and the American Bird Conservancy (Sheppard, C. and G. Phillips 2015), and conforms to the City of Sunnyvale's Bird Safe Building Design Guidelines, which are referenced in the LUTE EIR.

Section 5. Conclusion

Overall, the potential for the project to impact special-status and protected plant and wildlife species is relatively low. Potential project impacts on nesting or roosting burrowing owls, nesting white-tailed kites, other nesting birds protected under federal and state laws as well as impacts due to avian collisions with new buildings, would be minimized through project design and/or the implementation of standard avoidance and minimization measures (e.g., preconstruction surveys), the City's existing Bird Safe Building Design Guidelines and/or applicable measures previously identified, analyzed and adopted in the LUTE EIR to address these potential impacts.

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Appendix A. Caribbean Campus Arborist Report

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google Caribbean Campus

Arborist Report

Project #3475-45

Prepared for:

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Section 1. Introduction

H. T. Harvey & Associates has prepared this preliminary arborist report, which describes current conditions on a complex of light-industrial properties (collectively referred to as the site) located in Sunnyvale, California (Table 1). This report provides an inventory of all trees on the project site (with diameter at breast height [DBH] greater than 4 inches) including species, DBH, an assessment of each tree's health and structural condition, and figures showing the location of each tree in the inventory. In addition, this arborist report includes a list of trees to be removed. Appropriate mitigation measures are also provided, per the City of Sunnyvale (City) Municipal Code (code). This arborist report is sufficient to submit with initial planning applications to the City.

Table 1. Properties Included in this Report

Street Address	Assessor's Parcel Number
390 - 394 Caribbean Drive	110 - 26 - 020
380 - 382 Caribbean Drive	110 - 26 - 021
370 - 376 Caribbean Drive	110 - 26 - 022
360 - 364 Caribbean Drive	110 - 26 - 023
1330 - 1370 Bordeaux Drive	110 - 26 - 025
140 - 146 Caribbean Drive	110 - 26 - 027
1393 - 1395 Borregas Avenue	110 - 26 - 028
1383 Borregas Avenue	110 - 26 - 029
1325 Borregas Avenue and 133 Caspian Court	110 - 26 - 030
141 Caspian Court	110 - 26 - 031

Section 2. Methods

This report is based on a tree inventory that was completed in November 2016, with a follow up site visit on January 8, 2019 to document any changes in tree health, structure or survival. H. T. Harvey & Associates' arborist Matt Pollock performed both the inventory and follow-up visit. Matt is an American Society of Consulting Arborists (ASCA) Registered Consulting Arborist (#631) and an International Society of Arboriculture (ISA) Certified Arborist (WE-11610A). All trees with a DBH greater than 4 inches were included in the inventory. Tasks conducted during the tree inventory consisted of the following:

- identifying each tree to species (scientific name and common name);
- tagging each tree with an identifying number;
- recording the approximate location of each tree;
- measuring tree trunk diameter at 54 inches above finish grade (DBH);
- determining the protected status of each tree; and
- evaluating tree health and structural condition using a scale of 0 to 5 as shown in Table 2.

Tree assessments were based on ground-level visual observations and physical measurements. Field data collection was conducted using a diameter tape to measure DBH. A Trimble Geo 7X GPS with laser offset capability was used to determine and record the location of each tree. Evaluations of tree health considered crown indicators such as vigor, density, leaf size and quality, and stem shoot extensions. Evaluations of tree structural condition considered root condition/form, trunk condition/form, and branch assembly and arrangement as well as any visible indicators of diminished structural integrity including cavities, dead limbs, and excessive leaning.

An advanced assessment to quantify interior wood structure, root condition, and upper canopy condition was not performed as part of this assessment. Therefore, tasks performed did not include an excavation of the root zones of the trees, drilling for decay detection, collecting soil samples for laboratory testing, sending animal or vegetative material for laboratory testing, climbing the trees for an aerial inspection, a tree risk assessment, or a valuation (see Appendix A: Assumptions and Limiting Conditions and Appendix B: Certification of Performance). These tasks are not typically included in a standard arborist report.

Table 2. Tree Health and Structural Condition Evaluation Criteria

Condition Rating	Tree Health	Tree Structure
5	A healthy, vigorous tree with a well-balanced crown. No apparent pest problems or signs and symptoms of disease. Normal to exceeding shoot length on new growth. Leaf size and color normal. Exceptional life expectancy for the species.	Root plate undisturbed and clear of any obstructions. Root flare has normal development. Trunk is sound and solid. No visible trunk defects or cavities. Branch spacing / structure and attachments are free of any defects.
4	Tree with slight decline in vigor. Imperfect canopy density in few parts of the tree, 10% or less, lacking natural symmetry. Less than half normal growth rate and minor deficiency in leaf development. Few pest issues or damage, controllable. Normal branch and stem development with healthy growth. Small amount of twig dieback. Typical life expectancy for the species.	Root plate appears normal; only minor damage may be found. Possible signs of root dysfunction around trunk flare. Minor trunk defects from previous injury, with good closure; less than 25% of bark section missing. Good branch habit, minor dieback with some signs of previous pruning. Co-dominant stem formation may be present. Minor corrections required.
3	Tree with moderate vigor. Crown decline and dieback up to 30% of the canopy. Overall poor symmetry. Leaf color somewhat chlorotic with smaller leaves. Shoot extensions indicate some stunting and stressed growing conditions. Obvious signs of pest problems contributing to lesser condition. Some decay areas found in main stem and branches. Below average life expectancy.	Root plate reveals previous damage or disturbance and dysfunctional roots may be visible around main stem. Evidence of trunk damage or cavities with decay or defects present. Less than 30% of bark sections missing on trunk. Co-dominant stems are present. Branching habit and attachments indicate poor pruning or damage, which requires moderate corrections.
2	Tree in decline. Epicormic growth. Lacking full crown, more than 50% decline and dieback, especially affecting larger branches. Stunting obvious with little evidence of growth on smaller stems. Leaf size and color reveal overall stress in the plant. Insect or disease infestation may be severe. Overmature. Life expectancy is low.	Root plate disturbance and defects indicate major damage with girdling roots around the trunk flare. Trunk reveals more than 50% of bark section missing. Branch structure has poor attachments, with several structurally important dead or broken branches. Canopy reveals signs of severe damage or topping, with major corrective actions required. Extensive decay or hollow.
1	Tree in severe decline. Crown has very little vigor and/or has a disease or insect problem that is ultimately fatal and, if not corrected, may threaten other nearby trees.	Root plate has major structural problems that present an unacceptable risk. Tree is in severe decline, with dieback of scaffold branches and/or trunk.
0	Dead	Dead

Section 3. Results

3.1 Site History and General Condition

The site is located on land historically used for agriculture (row crops) (Google Earth 2019). The buildings that currently occupy the site were constructed prior to 1991 and the configuration of planting beds appears largely unchanged since that time. Therefore, some trees on the site could potentially be more than 27 years old.

3.2 Summary of Findings

Four hundred and twenty-five trees were identified on the site (Figures 1a and 1b). Descriptions of each tree are included in Appendix C (Tree Assessment), including DBH, tree health and structural scores, and protected status. Table 3 provides a summary of the assessed trees, which represent 35 species. Of the 425 trees located on the site, 293 (69%) met the City of Sunnyvale's criteria for protected trees (see Section 3.4 below). The most common species on the site (27%) was Canary Island pine (*Pinus canariensis*). Forty-three percent of trees were in good condition, 48% were in fair condition, and 9% were in poor condition. Many of the trees in fair or poor condition were overmature, short-lived species such as lemonwood (*Pittosporum eugenioides*), sweetgum (*Liquidamber styraciflua*), and glossy privet (*Ligustrum lucidum*). However, 52 of the 116 Canary Island pines were also in fair or poor condition due to excessive pruning or other visible flaws.

3.3 Tree Condition

A summary of tree condition ratings is provided in Table 3. The condition ratings in the table are based on both the tree health and structural ratings from Appendix C. Tree condition was rated as follows:

- *Poor* if their combined rating was less than 40%.
- *Fair* if their combined rating was between 40% and 60%; or
- *Good* if their combined rating was 60% or greater;

Table 3. Tree Condition Summary

Scientific Name	Common Name	Poor	Fair	Good	Total Trees
Afrocarpus falcatus	African fern pine	0	11	7	18
Alnus rubra	Red alder	3	6	0	9
Betula pendula	White birch	1	2	2	5
Ceratonia siliqua	carob tree	2	13	5	20
Corymbia citriodora	lemon scented gum	0	1	1	2
Eriobotrya japonica	Loquat	0	1	0	1

Scientific Name	Common Name	Poor	Fair	Good	Total Trees
Eucalyptus nicholii	peppermint eucalypt	0	2	2	4
Eucalyptus polyanthemos	silver dollar eucalypt	1	9	11	21
Eucalyptus sideroxylon	red ironbark	2	7	2	11
Eucalyptus sp.	Eucalyptus sp.	0	1	1	2
Fraxinus uhdei	shamel ash	0	1	6	7
Gleditsia triacanthos 'inermis'	thornless honey locust	0	1	2	3
Jacaranda mimosifolia	Jacaranda	1	2	4	7
Juniperus chinensis	Hollywood juniper	0	1	1	2
Ligustrum lucidum	glossy privet	1	15	7	23
Liquidamber styraciflua	Sweetgum	1	14	23	38
Maytenus boaria	Mayten tree	0	1	2	3
Olea europaea	Olive	0	1	2	3
Osmanthus fragrans	Fragrant Olive	0	8	5	13
Picea pungens glauca	Blue Spruce	1	0	0	1
Pinus canariensis	Canary Island pine	3	49	64	116
Pinus halapensis	Aleppo pine	0	2	0	2
Pinus mugo	Mugho pine	0	1	0	1
Pinus pinea	Italian stone pine	1	3	2	6
Pittosporum eugenioides	Lemonwood	13	27	6	46
Populus nigra 'italica'	Lombardy poplar	4	5	3	12
Prunus cerasifera	purple leaf plum	2	4	3	9
Prunus serrulata	Kwanzan cherry	0	0	0	0
Pyrus calleryana	Callery pear	0	1	0	1
Quercus agrifolia	California live oak	0	2	3	5
Quercus ilex	Holly oak	0	3	3	6
Salix lasiandra	Pacific willow	1	0	0	1
Schinus molle	Peruvian pepper	0	1	0	1
Sequoia sempervirens	Coast redwood	0	7	9	16
Ulmus parvifolia	Chinese elm	1	3	6	10
Total		**38**	**205**	**182**	**425**

3.4 Protected Trees

The protected status of trees is defined under items 3 and 4 in the City of Sunnyvale Municipal Code (code), Section 19.94.030 as:

3) *"Protected tree" means a tree of significant size.*

4) *"Significant size" means a tree thirty-eight inches or greater in circumference measured four and one-half feet above ground for single-trunk trees. For multi-trunk trees "significant size" means a tree which has at least one trunk with a circumference thirty-eight inches or greater measured four and one-half feet above ground level, or in which the measurements of the*

circumferences of each of the multi-trunks, when measured four and one-half feet above the ground level, added together equal an overall circumference one hundred thirteen inches or greater.

Based on this definition, 293 protected trees were identified on the site. Protected trees include 112 Canary Island pine, 35 sweetgum, and 20 silver dollar eucalypt (*Eucalyptus polyanthemos*) (see Appendix C: Tree Assessment).

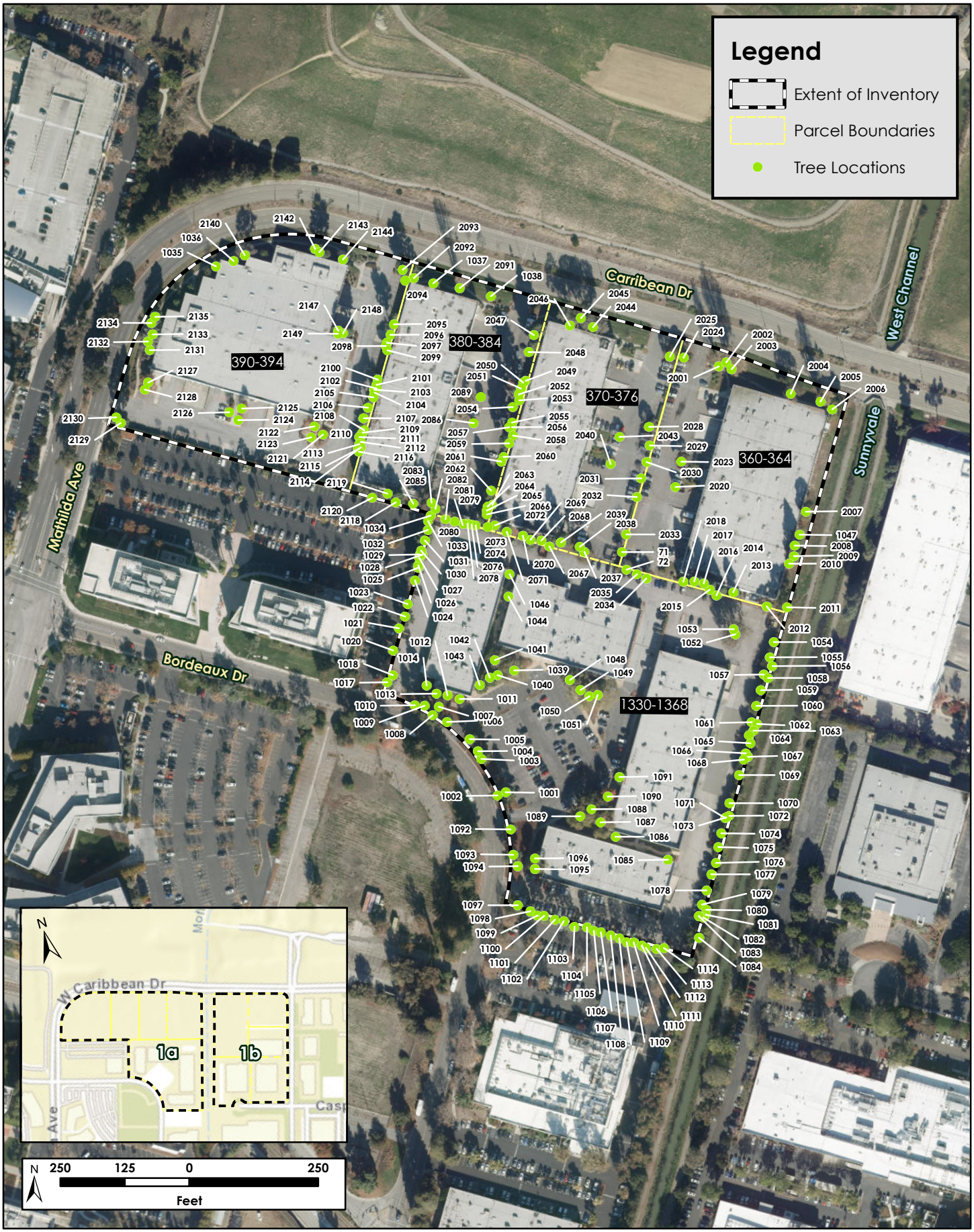
If redevelopment of this parcel creates impacts to or requires removal of protected status trees, the City may require reasonable alterations to the project design in order to retain protected trees per Section 19.94.110 of the Code. For protected trees to be preserved, a tree protection plan is required. For protected trees to be removed, a replanting plan is required, per Section 19.94.090 of the Code. Typically, the minimum size for the replacement of a protected tree is a standard twenty-four inch box size tree, subject to review by the city's director of community development. Tree removal, replacement, and preservation are discussed in further detail in Section 4.

3.5 Invasive Trees

Of the 425 trees (35 species) on the site, 36 trees (4 species) are listed by the California Invasive Plant Council (Cal-IPC, 2019) as a limited invasive species. A single Callery pear (*Pyrus calleryana*) on the site is watch-listed by Cal-IPC as a species of potential concern. These results are shown in Table 4.

Table 4. Invasive Species

Scientific Name	Common Name	Count	Cal-IPC Rating
Ligustrum lucidum	glossy privet	23	Limited
Olea europaea	Olive	3	Limited
Prunus cerasifera	purple leaf plum	9	Limited
Pyrus calleryana	Callery pear	1	Watch
Schinus molle	Peruvian pepper	1	Limited
Total		**37**	



N:\Projects3400\3475-01145\Report\Figure 1a. Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1a. Locations of Existing Trees
Google Caribbean Campus Draft Arborist Report (3475-45)
July 2019

N:\Projects3400\3475-01145\Report\Figure 1b. Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1b. Locations of Existing Trees
Google Caribbean Campus Draft Arborist Report (3475-45)
July 2019

Section 4. Tree Removal, Replacement, and Preservation

4.1 Tree Removal

There were 425 trees (35 species) identified on the site. According to the Planning Submittal dated October 26, 2018, 382 trees will be removed. Table 5 provides a summary of the trees to be removed. Two hundred and fifty of the trees to be removed are of sufficient size to be "protected" under the City's Code (see Section 3.4 above).

Table 5. Tree Removal

			Non-Protected Trees		Protected Trees	
Scientific Name	**Common Name**	**Total**	**Preserve**	**Remove**	**Preserve**	**Remove**
Afrocarpus falcatus	African fern pine	18	0	11	0	7
Alnus rubra	Red alder	9	0	0	0	9
Betula pendula	White birch	5	0	4	0	1
Ceratonia siliqua	carob tree	20	0	4	0	16
Corymbia citriodora	lemon scented gum	2	0	0	0	2
Eriobotrya japonica	Loquat	1	0	1	0	0
Eucalyptus nicholii	peppermint eucalypt	4	0	1	0	3
Eucalyptus polyanthemos	silver dollar eucalypt	21	0	1	2	18
Eucalyptus sideroxylon	red ironbark	11	0	0	0	11
Eucalyptus sp.	Eucalyptus sp.	2	0	0	0	2
Fraxinus uhdei	shamel ash	7	0	4	3	0
Gleditsia triacanthos 'inermis'	thornless honey locust	3	0	0	0	3
Jacaranda mimosifolia	Jacaranda	7	0	5	0	2
Juniperus chinensis	Hollywood juniper	2	0	0	0	2
Ligustrum lucidum	glossy privet	23	0	15	0	8
Liquidamber styraciflua	Sweetgum	38	0	3	1	34
Maytenus boaria	Mayten tree	3	0	1	0	2
Olea europaea	Olive	3	0	3	0	0
Osmanthus fragrans	Fragrant Olive	13	0	13	0	0
Picea pungens glauca	Blue Spruce	1	0	1	0	0
Pinus canariensis	Canary Island pine	116	0	4	28	84
Pinus halapensis	Aleppo pine	2	0	0	0	2
Pinus mugo	Mugho pine	1	0	1	0	0
Pinus pinea	Italian stone pine	6	0	0	0	6
Pittosporum eugenioides	Lemonwood	46	0	45	0	1
Populus nigra 'italica'	Lombardy poplar	12	0	0	0	12

			Non-Protected Trees		Protected Trees	
Scientific Name	**Common Name**	**Total**	**Preserve**	**Remove**	**Preserve**	**Remove**
Prunus cerasifera	purple leaf plum	9	0	9	0	0
Prunus serrulata	Kwanzan cherry	0	0	0	0	0
Pyrus calleryana	Callery pear	1	0	0	0	1
Quercus agrifolia	California live oak	5	0	4	0	1
Quercus ilex	Holly oak	6	0	2	0	4
Salix lasiandra	Pacific willow	1	0	0	0	1
Schinus molle	Peruvian pepper	1	0	0	0	1
Sequoia sempervirens	Coast redwood	16	0	0	9	7
Ulmus parvifolia	Chinese elm	10	0	0	0	10
Total - Trees to be Preserved		**43**	**0**	**-**	**43**	**-**
Total - Trees to be Removed		**382**	**-**	**132**	**-**	**250**
Total - All Trees		**425**				

4.2 Tree Replacement

The 250 protected trees to be removed are to be replaced per the City's Code, Section 19.94.080, which considers factors such as the following:

(1) The number, species, size and location of existing trees on the site; and

(2) Good forestry practices such as, but not limited to, the number of healthy trees a given parcel of land will support.

The City typically requires planting of a replacement tree somewhere on the property as a standard condition of approval for removal of each protected tree. At the time of writing this report, a detailed planting plan was not available. To meet the City's requirements for replacement of protected trees, the Project will need to include a minimum of 250 new trees with a container size of 24-inches or larger.

4.3 Tree Preservation

A total of 43 trees will be preserved on the site, as shown in Table 6. The tree protection measures described in Section 5 will apply to these trees.

Table 6. Tree Preservation

Tree Tag	Scientific Name	Common Name	Protected?
82	*Pinus canariensis*	Canary Island pine	Yes
1006	*Pinus canariensis*	Canary Island pine	Yes
1009	*Pinus canariensis*	Canary Island pine	Yes
1020	*Pinus canariensis*	Canary Island pine	Yes
1021	*Pinus canariensis*	Canary Island pine	Yes

Tree Tag	Scientific Name	Common Name	Protected?
1022	*Pinus canariensis*	Canary Island pine	Yes
1023	*Pinus canariensis*	Canary Island pine	Yes
1024	*Pinus canariensis*	Canary Island pine	Yes
1025	*Pinus canariensis*	Canary Island pine	Yes
1026	*Sequoia sempervirens*	Coast redwood	Yes
1027	*Sequoia sempervirens*	Coast redwood	Yes
1028	*Pinus canariensis*	Canary Island pine	Yes
1029	*Sequoia sempervirens*	Coast redwood	Yes
1030	*Sequoia sempervirens*	Coast redwood	Yes
1031	*Pinus canariensis*	Canary Island pine	Yes
1032	*Pinus canariensis*	Canary Island pine	Yes
1033	*Sequoia sempervirens*	Coast redwood	Yes
1034	*Sequoia sempervirens*	Coast redwood	Yes
1097	*Pinus canariensis*	Canary Island pine	Yes
1099	*Pinus canariensis*	Canary Island pine	Yes
1100	*Pinus canariensis*	Canary Island pine	Yes
1101	*Pinus canariensis*	Canary Island pine	Yes
1102	*Pinus canariensis*	Canary Island pine	Yes
1103	*Pinus canariensis*	Canary Island pine	Yes
1105	*Pinus canariensis*	Canary Island pine	Yes
1107	*Pinus canariensis*	Canary Island pine	Yes
1108	*Pinus canariensis*	Canary Island pine	Yes
1109	*Pinus canariensis*	Canary Island pine	Yes
1110	*Pinus canariensis*	Canary Island pine	Yes
1111	*Pinus canariensis*	Canary Island pine	Yes
1112	*Pinus canariensis*	Canary Island pine	Yes
1113	*Pinus canariensis*	Canary Island pine	Yes
1114	*Pinus canariensis*	Canary Island pine	Yes
1241	*Sequoia sempervirens*	Coast redwood	Yes
1242	*Sequoia sempervirens*	Coast redwood	Yes
1243	*Sequoia sempervirens*	Coast redwood	Yes
1320	*Fraxinus uhdei*	shamel ash	Yes
1321	*Fraxinus uhdei*	shamel ash	Yes
1322	*Fraxinus uhdei*	shamel ash	Yes
1323	*Pinus canariensis*	Canary Island pine	Yes
2196	*Eucalyptus polyanthemos*	silver dollar eucalypt	Yes
2197	*Eucalyptus polyanthemos*	silver dollar eucalypt	Yes
2301	*Liquidamber styraciflua*	Sweetgum	Yes

Section 5. Tree Protection

5.1 Tree Protection Plan

The City of Sunnyvale requires a Tree Protection Plan to safeguard the health of Protected trees before and during construction (Municipal Code Sections 19.94.110, 19.94.120, and 19.94.140).

5.2 Tree Protection Zones (TPZ)

For each tree to be preserved, a Tree Protection Zone (TPZ) will be established. The size and layout of each TPZ are required by the City of Sunnyvale to be no smaller than the dripline of each protected tree to be preserved. However, we recommend that the size of each TPZ be increased based on each species' sensitivity to construction impacts, the health and age of the tree, the root and crown conformation, and development constraints. It may be necessary to identify where roots actually are through hand excavation in order to properly protect a highly valued tree (Matheny and Clark 1998). The following activities shall be prohibited within each Tree Protection Zone:

- Storage of construction materials, debris, excavated material, waste, or washout water.
- Parking construction trailers, vehicles, or equipment.
- Foot traffic.
- Erection of sheds or structures.
- Impoundment of water.
- Excavation for underground utilities, drain or irrigation lines, or other digging unless approved by the City or Consulting Arborist.
- Attachment of signs to or wrapping materials around trees or plants unless approved by the City or Consulting Arborist.

5.3 Requirements for Tree Protection during Construction

Protected trees designated for preservation shall be protected during construction by use of the following methods:

- Protective fencing shall be installed no closer to the trunk than the dripline, and far enough from the trunk to protect the integrity of the tree. The fence shall be a minimum of four (4) feet in height and shall be set securely in place. The fence shall be of a sturdy but open material (i.e., chain link) to allow visibility to the trunk for inspections and safety.

- The existing grade level around a tree shall normally be maintained out to the dripline of the tree. Alternate grade levels, as described in the tree protection plan, may be approved by the director of community development.
- Drain wells shall be installed whenever impervious surfaces will be placed over the root system of a tree (the root system generally extends to the outermost edges of the branches).
- Pruning that is necessary to accommodate a project feature, such as a building, road or walkway shall be reviewed and approved by the department of community development and the department of public works. Pruning, if necessary, shall be reviewed and approved by the City Arborist.
- New landscaping installed within the dripline of an existing tree shall be designed to reproduce a similar environment to that which existed prior to construction.
- Appropriate city staff shall be authorized to conduct on-site inspections during construction to ensure that tree preservation procedures are being followed and replanting plans implemented.

5.3.1 Recommendations for Tree Protection during Construction

The following recommendations are intended to supplement City requirements.

- Protective fencing should completely enclose the Tree Protection Zone and should be installed prior to demolition, grubbing, or grading. Protective fencing should be maintained in good condition and free of trash, debris, excess soil, chemicals, or equipment until construction is completed and accepted by the City inspector.
- Pruning prior to construction with the intent of improving tree health is not recommended. Where temporary clearance is needed for access, tree branches should be tied back to provide clearance. If any tree to be preserved requires pruning to provide construction clearance, the work must be approved in advance by the City or Consulting Arborist and performed by a Certified Arborist or Tree Worker according to the latest edition of the ANSI Z133 and A300 standards as well as the *Best Management Practices—Tree Pruning* published by the International Society of Arboriculture. Pruning should not occur during periods of flight of adult boring insects.
- Any work that is expected to encounter tree roots should be monitored by the City or Consulting Arborist.
- Excavation at the edge of Tree Protection Zones should include the following tree protection measures:
    - Hand excavate under or around tree roots to depth of three (3) feet.
    - Tunneling should only be employed with approval of the City or Consulting Arborist.
    - Do not cut main lateral tree roots or taproots. When main lateral tree roots or taproots are exposed, excavation should be discontinued until instructions to resolve the conditions are received from the City or Consulting Arborist.
    - Redirect roots in backfill areas where possible.

  - Expose main lateral roots beyond excavation limits as required to bend and redirect them without breaking.
  - If redirection is not practical, cut roots approximately three (3) inches back from new construction.
  - Protect exposed roots from drying out before placing permanent backfill.
- Prune roots that are affected by temporary and permanent construction only with the prior approval of the City or Consulting Arborist. Prune roots as follows:
  - Cut roots manually.
  - Cleanly cut exposed roots one (1) inch diameter and greater with sharp pruning instrument.
  - Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - Do not paint cut root ends.
- Injuries to any Protected trees during construction should be reported to the City or Consulting Arborist, who can evaluate the injury and recommend appropriate treatments.

Section 6. References

[Cal-IPC] California Invasive Plant Council. 2019. California Invasive Plant Inventory Database. Accessed online at http://cal-ipc.org/paf/ [January 2019].

Google Earth. 2019. Aerial imagery of project site in Sunnyvale, California. <https://www.google.com/earth/>. Accessed March 13, 2019.

Matheny, N. and J.R. Clark. 1998. Trees and Development: A Technical Guide to Preservation of Trees during Land Development. Champaign, IL: International Society of Arboriculture.

Sunnyvale [City of]. *Municipal Code*. Title 19. Zoning, Article 6, Discretionary Permits and Procedures, Chapter 19.94. Tree Preservation. Accessed online at qcode.us/codes/sunnyvale.

Appendix A. Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. No responsibility is assumed for matters legal in character. Any and all property is appraised or evaluated as though free and clear, under responsible ownership and competent management.
2. Property lines were not clearly surveyed or marked in the field by the owner, consultant attempted to provide as accurate of boundary for the inventory as possible using the limited data available.
3. Care has been taken to obtain all information from reliable sources. All data have been verified insofar as possible; however, the consultant can neither guarantee nor be responsible for the accuracy of information provided by others.
4. The consultant shall not be required to give testimony or attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
5. Loss or alteration of any part of this report invalidates the entire report.
6. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant.
7. Neither all nor any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales, or other media, without the prior expressed written or verbal consent of the consultant particularly as to value conclusions, identity of the consultant, or any reference to any professional society or institute or to any initialed designation conferred upon the consultant as stated in her qualifications.
8. This report and values expressed herein represent the opinion of the consultant, and the consultant's fee is in no way contingent upon the reporting of specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
9. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
10. Unless expressed otherwise: a) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection and b) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.

Appendix B. Certification of Performance

I, Matthew Pollock, certify that:

I have personally inspected the trees and the property referred to in this report and have stated my findings accurately. The extent of the evaluation is stated in the attached report and the terms of the assignment.

I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.

The analysis, opinions, and conclusions stated herein are my own and are based on current scientific procedures and facts.

My analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices.

No one provided significant professional assistance to me, except as indicated within the report.

Compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.

Matthew Pollock

ASCA-Registered Consulting Arborist #631

ISA-Certified Arborist WE-11610A

Appendix C. Tree Assessment

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
71	*Jacaranda mimosifolia*	Jacaranda	12	2	4	Yes	Fair	-
72	*Ligustrum lucidum*	glossy privet	10, 10, 9, 7, 4, 3	4	3	Yes	Fair	-
82	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	Yes
1001	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
1002	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
1003	*Pinus canariensis*	Canary Island pine	24	3	3	Yes	Fair	-
1004	*Pinus canariensis*	Canary Island pine	21	3	3	Yes	Fair	-
1005	*Pinus canariensis*	Canary Island pine	23	3	3	Yes	Fair	-
1006	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	Yes
1007	*Eucalyptus sp.*	Eucalyptus sp.	22	4	4	Yes	Good	-
1008	*Pinus canariensis*	Canary Island pine	29	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1009	*Pinus canariensis*	Canary Island pine	21	3	4	Yes	Fair	Yes
1010	*Pinus canariensis*	Canary Island pine	20	4	4	Yes	Good	-
1011	*Prunus cerasifera*	purple leaf plum	9	3	4	No	Fair	-
1012	*Prunus cerasifera*	purple leaf plum	9	4	4	No	Good	-
1013	*Prunus cerasifera*	purple leaf plum	6	2	4	No	Fair	-
1014	*Olea europaea*	Olive	7, 7, 6	5	5	No	Good	-
1017	*Pinus canariensis*	Canary Island pine	22	5	4	Yes	Good	-
1018	*Pinus canariensis*	Canary Island pine	9	4	4	No	Good	-
1020	*Pinus canariensis*	Canary Island pine	18	4	3	Yes	Fair	Yes
1021	*Pinus canariensis*	Canary Island pine	12	3	4	Yes	Fair	Yes
1022	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	Yes
1023	*Pinus canariensis*	Canary Island pine	15	5	4	Yes	Good	Yes
1024	*Pinus canariensis*	Canary Island pine	14	5	5	Yes	Good	Yes
1025	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	Yes

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1026	*Sequoia sempervirens*	Coast redwood	15	5	4	Yes	Good	Yes
1027	*Sequoia sempervirens*	Coast redwood	12	5	3	Yes	Good	Yes
1028	*Pinus canariensis*	Canary Island pine	13	3	4	Yes	Fair	Yes
1029	*Sequoia sempervirens*	Coast redwood	12	5	4	Yes	Good	Yes
1030	*Sequoia sempervirens*	Coast redwood	14	5	3	Yes	Good	Yes
1031	*Pinus canariensis*	Canary Island pine	25	5	4	Yes	Good	Yes
1032	*Pinus canariensis*	Canary Island pine	15	5	5	Yes	Good	Yes
1033	*Sequoia sempervirens*	Coast redwood	16	3	4	Yes	Fair	Yes
1034	*Sequoia sempervirens*	Coast redwood	17	5	4	Yes	Good	Yes
1035	*Fraxinus uhdei*	shamel ash	6	5	4	No	Good	-
1036	*Fraxinus uhdei*	shamel ash	5	5	4	No	Good	-
1037	*Fraxinus uhdei*	shamel ash	6	5	4	No	Good	-
1038	*Fraxinus uhdei*	shamel ash	7	4	2	No	Fair	-
1039	*Ulmus parvifolia*	Chinese elm	18	4	3	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1040	*Ulmus parvifolia*	Chinese elm	14	5	4	Yes	Good	-
1041	*Ulmus parvifolia*	Chinese elm	17	5	4	Yes	Good	-
1042	*Afrocarpus falcatus*	African fern pine	15	5	3	Yes	Good	-
1043	*Afrocarpus falcatus*	African fern pine	35, 11, 9	5	3	Yes	Good	-
1044	*Afrocarpus falcatus*	African fern pine	11	3	3	No	Fair	-
1046	*Prunus cerasifera*	purple leaf plum	9	2	2	No	Poor	-
1047	*Eucalyptus nicholii*	peppermint eucalypt	8	4	5	No	Good	-
1048	*Ulmus parvifolia*	Chinese elm	15	5	3	Yes	Good	-
1049	*Ulmus parvifolia*	Chinese elm	18	5	3	Yes	Good	-
1050	*Ulmus parvifolia*	Chinese elm	17	5	3	Yes	Good	-
1051	*Ulmus parvifolia*	Chinese elm	17	5	3	Yes	Good	-
1052	*Eucalyptus sideroxylon*	red ironbark	28	4	4	Yes	Good	-
1053	*Eucalyptus sideroxylon*	red ironbark	19	4	3	Yes	Fair	-
1054	*Quercus agrifolia*	California live oak	6	4	5	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1055	*Ceratonia siliqua*	carob tree	22	4	3	Yes	Fair	-
1056	*Quercus agrifolia*	California live oak	9	5	4	No	Good	-
1057	*Ceratonia siliqua*	carob tree	15	4	3	Yes	Fair	-
1058	*Prunus cerasifera*	purple leaf plum	8, 6, 3	4	4	No	Good	-
1059	*Ceratonia siliqua*	carob tree	25	3	3	Yes	Fair	-
1060	*Ceratonia siliqua*	carob tree	29	3	3	Yes	Fair	-
1061	*Ligustrum lucidum*	glossy privet	4	4	5	No	Good	-
1062	*Quercus agrifolia*	California live oak	4	3	3	No	Fair	-
1063	*Olea europaea*	Olive	5, 4, 4, 3, 2	5	3	No	Good	-
1064	*Ceratonia siliqua*	carob tree	21	4	4	Yes	Good	-
1065	*Quercus agrifolia*	California live oak	4, 4	5	4	No	Good	-
1066	*Prunus cerasifera*	purple leaf plum	6, 4	4	3	No	Fair	-
1067	*Quercus ilex*	Holly oak	14	5	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1068	*Ceratonia siliqua*	carob tree	21	3	4	Yes	Fair	-
1069	*Ceratonia siliqua*	carob tree	12	4	5	Yes	Good	-
1070	*Ceratonia siliqua*	carob tree	15	4	3	Yes	Fair	-
1071	*Ligustrum lucidum*	glossy privet	6, 2	5	5	No	Good	-
1072	*Ligustrum lucidum*	glossy privet	7, 6, 4, 4, 3	5	5	No	Good	-
1073	*Ceratonia siliqua*	carob tree	16	4	5	Yes	Good	-
1074	*Ceratonia siliqua*	carob tree	18	4	4	Yes	Good	-
1075	*Ceratonia siliqua*	carob tree	18	3	4	Yes	Fair	-
1076	*Ceratonia siliqua*	carob tree	5, 4, 4	3	4	No	Fair	-
1077	*Ceratonia siliqua*	carob tree	12	3	4	Yes	Fair	-
1078	*Ceratonia siliqua*	carob tree	20	4	5	Yes	Good	-
1079	*Ceratonia siliqua*	carob tree	13	4	3	Yes	Fair	-
1080	*Ceratonia siliqua*	carob tree	6	5	1	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1081	*Ceratonia siliqua*	carob tree	10, 7, 7, 5	4	2	No	Fair	-
1082	*Ceratonia siliqua*	carob tree	10	3	2	No	Fair	-
1083	*Ceratonia siliqua*	carob tree	25	1	1	Yes	Poor	-
1084	*Ceratonia siliqua*	carob tree	23	1	2	Yes	Poor	-
1085	*Prunus cerasifera*	purple leaf plum	6	1	1	No	Poor	-
1086	*Prunus cerasifera*	purple leaf plum	6	4	1	No	Fair	-
1087	*Ulmus parvifolia*	Chinese elm	20	2	1	Yes	Poor	-
1088	*Ulmus parvifolia*	Chinese elm	15	3	3	Yes	Fair	-
1089	*Ulmus parvifolia*	Chinese elm	19	4	2	Yes	Fair	-
1090	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
1091	*Afrocarpus falcatus*	African fern pine	17	5	2	Yes	Fair	-
1092	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
1093	*Pinus canariensis*	Canary Island pine	26	4	1	Yes	Fair	-
1094	*Pinus canariensis*	Canary Island pine	11	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1095	*Olea europaea*	Olive	7, 7, 6, 5, 4, 4	4	3	No	Fair	-
1096	*Eucalyptus nicholii*	peppermint eucalypt	28	5	1	Yes	Fair	-
1097	*Pinus canariensis*	Canary Island pine	18	4	4	Yes	Good	Yes
1098	*Pinus canariensis*	Canary Island pine	18	4	1	Yes	Fair	-
1099	*Pinus canariensis*	Canary Island pine	19	5	4	Yes	Good	Yes
1100	*Pinus canariensis*	Canary Island pine	26	4	4	Yes	Good	Yes
1101	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1102	*Pinus canariensis*	Canary Island pine	27	4	4	Yes	Good	Yes
1103	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1104	*Pinus canariensis*	Canary Island pine	9	4	2	No	Fair	-
1105	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1106	*Pinus canariensis*	Canary Island pine	15	1	4	Yes	Fair	-
1107	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	Yes

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1108	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	Yes
1109	*Pinus canariensis*	Canary Island pine	14	3	4	Yes	Fair	Yes
1110	*Pinus canariensis*	Canary Island pine	17	5	3	Yes	Good	Yes
1111	*Pinus canariensis*	Canary Island pine	18	5	5	Yes	Good	Yes
1112	*Pinus canariensis*	Canary Island pine	23	5	5	Yes	Good	Yes
1113	*Pinus canariensis*	Canary Island pine	20	5	5	Yes	Good	Yes
1114	*Pinus canariensis*	Canary Island pine	15	5	5	Yes	Good	Yes
1184	*Quercus ilex*	Holly oak	17	5	5	Yes	Good	-
1185	*Ligustrum lucidum*	glossy privet	5, 4, 3	5	5	No	Good	-
1186	*Salix lasiandra*	Pacific willow	19	3	1	Yes	Poor	-
1187	*Osmanthus fragrans*	Fragrant Olive	4, 4, 3, 3	4	3	No	Fair	-
1188	*Pinus canariensis*	Canary Island pine	19	3	4	Yes	Fair	-
1189	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
1190	*Afrocarpus falcatus*	African fern pine	7	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1191	*Afrocarpus falcatus*	African fern pine	11	3	5	No	Good	-
1192	*Afrocarpus falcatus*	African fern pine	8, 7, 6, 5	3	4	No	Fair	-
1193	*Afrocarpus falcatus*	African fern pine	9	3	4	No	Fair	-
1194	*Afrocarpus falcatus*	African fern pine	11	5	4	No	Good	-
1195	*Afrocarpus falcatus*	African fern pine	11	3	4	No	Fair	-
1196	*Afrocarpus falcatus*	African fern pine	12	4	4	Yes	Good	-
1197	*Afrocarpus falcatus*	African fern pine	13	4	3	Yes	Fair	-
1198	*Pinus canariensis*	Canary Island pine	26	4	3	Yes	Fair	-
1199	*Pinus canariensis*	Canary Island pine	26	4	4	Yes	Good	-
1200	*Pinus canariensis*	Canary Island pine	20	4	5	Yes	Good	-
1201	*Afrocarpus falcatus*	African fern pine	9	3	4	No	Fair	-
1202	*Afrocarpus falcatus*	African fern pine	9	4	5	No	Good	-
1203	*Afrocarpus falcatus*	African fern pine	12	4	3	Yes	Fair	-
1204	*Pinus mugo*	Mugho pine	11	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1205	*Afrocarpus falcatus*	African fern pine	6, 5	3	3	No	Fair	-
1206	*Afrocarpus falcatus*	African fern pine	11	5	4	No	Good	-
1207	*Afrocarpus falcatus*	African fern pine	13	4	3	Yes	Fair	-
1208	*Eriobotrya japonica*	Loquat	9, 5	5	2	No	Fair	-
1209	*Maytenus boaria*	Mayten tree	17, 14	2	3	Yes	Fair	-
1210	*Maytenus boaria*	Mayten tree	21	5	3	Yes	Good	-
1211	*Maytenus boaria*	Mayten tree	3, 3	5	3	No	Good	-
1212	*Pinus canariensis*	Canary Island pine	23	3	4	Yes	Fair	-
1213	*Pinus canariensis*	Canary Island pine	23	3	4	Yes	Fair	-
1214	*Eucalyptus sideroxylon*	red ironbark	21	4	3	Yes	Fair	-
1215	*Sequoia sempervirens*	Coast redwood	12	3	5	Yes	Good	-
1216	*Sequoia sempervirens*	Coast redwood	19	4	4	Yes	Good	-
1217	*Sequoia sempervirens*	Coast redwood	15	5	4	Yes	Good	-
1218	*Sequoia sempervirens*	Coast redwood	20	4	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1219	*Populus nigra 'italica'*	Lombardy poplar	53, 21, 20, 18, 11	3	1	Yes	Poor	-
1221	*Betula pendula*	White birch	11	3	4	No	Fair	-
1222	*Betula pendula*	White birch	6	3	1	No	Poor	-
1228	*Juniperus chinensis*	Hollywood juniper	15	5	4	Yes	Good	-
1229	*Juniperus chinensis*	Hollywood juniper	15	4	1	Yes	Fair	-
1230	*Betula pendula*	White birch	12, 10	5	4	Yes	Good	-
1231	*Betula pendula*	White birch	9	3	4	No	Fair	-
1232	*Betula pendula*	White birch	11	5	5	No	Good	-
1233	*Pinus pinea*	Italian stone pine	31	4	3	Yes	Fair	-
1234	*Pinus pinea*	Italian stone pine	25	3	2	Yes	Fair	-
1235	*Pinus pinea*	Italian stone pine	25	3	1	Yes	Poor	-
1236	*Pinus pinea*	Italian stone pine	28	3	3	Yes	Fair	-
1237	*Alnus rubra*	Red alder	24	2	1	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1238	*Alnus rubra*	Red alder	24	3	2	Yes	Fair	-
1239	*Alnus rubra*	Red alder	22	3	2	Yes	Fair	-
1240	*Alnus rubra*	Red alder	26	3	1	Yes	Poor	-
1241	*Sequoia sempervirens*	Coast redwood	13	4	3	Yes	Fair	Yes
1242	*Sequoia sempervirens*	Coast redwood	13	4	3	Yes	Fair	Yes
1243	*Sequoia sempervirens*	Coast redwood	14	4	3	Yes	Fair	Yes
1244	*Pyrus calleryana*	Callery pear	15	4	3	Yes	Fair	-
1245	*Alnus rubra*	Red alder	19	4	2	Yes	Fair	-
1256	*Pinus pinea*	Italian stone pine	32	4	4	Yes	Good	-
1257	*Pinus pinea*	Italian stone pine	29	5	4	Yes	Good	-
1258	*Alnus rubra*	Red alder	26	3	1	Yes	Poor	-
1259	*Pinus halapensis*	Aleppo pine	23	3	2	Yes	Fair	-
1261	*Sequoia sempervirens*	Coast redwood	26	3	4	Yes	Fair	-
1262	*Sequoia sempervirens*	Coast redwood	24	3	4	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1263	*Sequoia sempervirens*	Coast redwood	26	3	4	Yes	Fair	-
1264	*Pinus halapensis*	Aleppo pine	24	3	3	Yes	Fair	-
1271	*Alnus rubra*	Red alder	15	3	4	Yes	Fair	-
1273	*Alnus rubra*	Red alder	21	5	1	Yes	Fair	-
1276	*Alnus rubra*	Red alder	23	4	1	Yes	Fair	-
1277	*Liquidamber styraciflua*	Sweetgum	16	3	3	Yes	Fair	-
1278	*Liquidamber styraciflua*	Sweetgum	16	4	2	Yes	Fair	-
1279	*Liquidamber styraciflua*	Sweetgum	22	3	3	Yes	Fair	-
1280	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
1281	*Liquidamber styraciflua*	Sweetgum	14	5	3	Yes	Good	-
1282	*Liquidamber styraciflua*	Sweetgum	12	5	4	Yes	Good	-
1283	*Liquidamber styraciflua*	Sweetgum	12	4	4	Yes	Good	-
1284	*Liquidamber styraciflua*	Sweetgum	20	5	3	Yes	Good	-
1285	*Liquidamber styraciflua*	Sweetgum	12	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1286	*Liquidamber styraciflua*	Sweetgum	14	4	4	Yes	Good	-
1318	*Picea pungens glauca*	Blue Spruce	6	2	1	No	Poor	-
1319	*Liquidamber styraciflua*	Sweetgum	5, 4	3	4	No	Fair	-
1320	*Fraxinus uhdei*	shamel ash	21	4	4	Yes	Good	Yes
1321	*Fraxinus uhdei*	shamel ash	17	5	4	Yes	Good	Yes
1322	*Fraxinus uhdei*	shamel ash	23	4	4	Yes	Good	Yes
1323	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	Yes
1324	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	-
2001	*Populus nigra 'italica'*	Lombardy poplar	49	3	1	Yes	Poor	-
2002	*Populus nigra 'italica'*	Lombardy poplar	53	3	4	Yes	Fair	-
2003	*Populus nigra 'italica'*	Lombardy poplar	58, 35	5	3	Yes	Good	-
2004	*Corymbia citriodora*	lemon scented gum	22	5	4	Yes	Good	-
2005	*Populus nigra 'italica'*	Lombardy poplar	52	5	4	Yes	Good	-
2006	*Schinus molle*	Peruvian pepper	54	4	3	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2007	*Eucalyptus nicholii*	peppermint eucalypt	46	4	2	Yes	Fair	-
2008	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
2009	*Pinus canariensis*	Canary Island pine	21	2	3	Yes	Fair	-
2010	*Pinus canariensis*	Canary Island pine	15	2	4	Yes	Fair	-
2011	*Eucalyptus sp.*	Eucalyptus sp.	28, 21	4	3	Yes	Fair	-
2012	*Eucalyptus nicholii*	peppermint eucalypt	31	5	4	Yes	Good	-
2013	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	-
2014	*Pinus canariensis*	Canary Island pine	30	4	2	Yes	Fair	-
2015	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	-
2016	*Pinus canariensis*	Canary Island pine	21	4	3	Yes	Fair	-
2017	*Pinus canariensis*	Canary Island pine	23	4	3	Yes	Fair	-
2018	*Ligustrum lucidum*	glossy privet	11	3	3	No	Fair	-
2020	*Ligustrum lucidum*	glossy privet	6	4	3	No	Fair	-
2023	*Ligustrum lucidum*	glossy privet	13	4	2	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2024	*Ligustrum lucidum*	glossy privet	17	4	4	Yes	Good	-
2025	*Ligustrum lucidum*	glossy privet	13	3	4	Yes	Fair	-
2028	*Ligustrum lucidum*	glossy privet	15	3	3	Yes	Fair	-
2029	*Jacaranda mimosifolia*	Jacaranda	13	2	2	Yes	Poor	-
2030	*Jacaranda mimosifolia*	Jacaranda	10	4	4	No	Good	-
2031	*Jacaranda mimosifolia*	Jacaranda	8	4	4	No	Good	-
2032	*Jacaranda mimosifolia*	Jacaranda	11	4	4	No	Good	-
2033	*Jacaranda mimosifolia*	Jacaranda	9	2	3	No	Fair	-
2034	*Ligustrum lucidum*	glossy privet	9	4	3	No	Fair	-
2035	*Ligustrum lucidum*	glossy privet	10	4	1	No	Fair	-
2037	*Ligustrum lucidum*	glossy privet	16	4	3	Yes	Fair	-
2038	*Pinus canariensis*	Canary Island pine	19	4	5	Yes	Good	-
2039	*Pinus canariensis*	Canary Island pine	25	4	3	Yes	Fair	-
2040	*Ligustrum lucidum*	glossy privet	6	4	3	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2043	*Ligustrum lucidum*	glossy privet	8	2	2	No	Poor	-
2044	*Eucalyptus polyanthemos*	silver dollar eucalypt	35	5	4	Yes	Good	-
2045	*Corymbia citriodora*	lemon scented gum	23	5	2	Yes	Fair	-
2046	*Eucalyptus polyanthemos*	silver dollar eucalypt	24	3	4	Yes	Fair	-
2047	*Pinus canariensis*	Canary Island pine	33	5	4	Yes	Good	-
2048	*Pinus canariensis*	Canary Island pine	26	2	3	Yes	Fair	-
2049	*Pittosporum eugenioides*	Lemonwood	6, 3, 3	1	1	No	Poor	-
2050	*Pittosporum eugenioides*	Lemonwood	7, 6, 6	1	1	No	Poor	-
2051	*Pittosporum eugenioides*	Lemonwood	5, 4	1	1	No	Poor	-
2052	*Pinus canariensis*	Canary Island pine	27	4	3	Yes	Fair	-
2053	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2054	*Pinus canariensis*	Canary Island pine	25	4	2	Yes	Fair	-
2055	*Pittosporum eugenioides*	Lemonwood	6	0	0	No	Poor	-
2056	*Pittosporum eugenioides*	Lemonwood	7, 6	1	1	No	Poor	-
2057	*Pittosporum eugenioides*	Lemonwood	9, 6, 5	1	1	No	Poor	-
2058	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2059	*Pinus canariensis*	Canary Island pine	23	5	4	Yes	Good	-
2060	*Pittosporum eugenioides*	Lemonwood	7	0	0	No	Poor	-
2061	*Pittosporum eugenioides*	Lemonwood	8, 7	0	0	No	Poor	-
2062	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	-
2063	*Pittosporum eugenioides*	Lemonwood	9, 5	2	1	No	Poor	-
2064	*Pittosporum eugenioides*	Lemonwood	5, 4	4	2	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2065	*Pittosporum eugenioides*	Lemonwood	7	3	1	No	Poor	-
2066	*Pittosporum eugenioides*	Lemonwood	10, 10, 5	4	3	No	Fair	-
2067	*Ligustrum lucidum*	glossy privet	12	4	3	Yes	Fair	-
2068	*Pinus canariensis*	Canary Island pine	24	5	3	Yes	Good	-
2069	*Pinus canariensis*	Canary Island pine	22	4	3	Yes	Fair	-
2070	*Pinus canariensis*	Canary Island pine	19	4	3	Yes	Fair	-
2071	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	-
2072	*Eucalyptus polyanthemos*	silver dollar eucalypt	29	5	3	Yes	Good	-
2073	*Pinus canariensis*	Canary Island pine	14	3	4	Yes	Fair	-
2074	*Pittosporum eugenioides*	Lemonwood	6, 5, 5, 3, 3	3	4	No	Fair	-
2076	*Pittosporum eugenioides*	Lemonwood	6, 5, 5	1	2	No	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2078	*Pittosporum eugenioides*	Lemonwood	6	1	2	No	Poor	-
2079	*Ligustrum lucidum*	glossy privet	10	5	4	No	Good	-
2080	*Ligustrum lucidum*	glossy privet	7	3	4	No	Fair	-
2081	*Ligustrum lucidum*	glossy privet	13	3	4	Yes	Fair	-
2082	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2083	*Eucalyptus sideroxylon*	red ironbark	27	4	4	Yes	Good	-
2085	*Ligustrum lucidum*	glossy privet	9	4	5	No	Good	-
2086	*Ligustrum lucidum*	glossy privet	5	3	2	No	Fair	-
2089	*Ligustrum lucidum*	glossy privet	5	4	2	No	Fair	-
2091	*Populus nigra 'italica'*	Lombardy poplar	51	5	3	Yes	Good	-
2092	*Pinus canariensis*	Canary Island pine	31	5	5	Yes	Good	-
2093	*Pinus canariensis*	Canary Island pine	17	5	4	Yes	Good	-
2094	*Pinus canariensis*	Canary Island pine	18	5	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2095	*Pinus canariensis*	Canary Island pine	23	5	4	Yes	Good	-
2096	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	-
2097	*Pittosporum eugenioides*	Lemonwood	7, 6, 6, 5, 5	4	3	No	Fair	-
2098	*Pittosporum eugenioides*	Lemonwood	7, 6, 6, 5, 3	4	3	No	Fair	-
2099	*Pittosporum eugenioides*	Lemonwood	7, 7, 6	4	1	No	Fair	-
2100	*Pittosporum eugenioides*	Lemonwood	7, 5, 5	4	3	No	Fair	-
2101	*Pittosporum eugenioides*	Lemonwood	6, 4, 4	2	4	No	Fair	-
2102	*Pittosporum eugenioides*	Lemonwood	7, 4	4	3	No	Fair	-
2103	*Pittosporum eugenioides*	Lemonwood	5, 3	4	3	No	Fair	-
2104	*Pittosporum eugenioides*	Lemonwood	6, 6	4	3	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2105	*Pinus canariensis*	Canary Island pine	22	5	5	Yes	Good	-
2106	*Pinus canariensis*	Canary Island pine	17	5	4	Yes	Good	-
2107	*Pinus canariensis*	Canary Island pine	26	5	5	Yes	Good	-
2108	*Pittosporum eugenioides*	Lemonwood	6, 5, 4, 4, 4, 3	4	4	No	Good	-
2109	*Pittosporum eugenioides*	Lemonwood	8, 5, 5, 4, 4, 3	3	4	No	Fair	-
2110	*Pittosporum eugenioides*	Lemonwood	4, 3, 2	3	4	No	Fair	-
2111	*Pittosporum eugenioides*	Lemonwood	8, 5, 3, 3, 3, 3	3	3	No	Fair	-
2112	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3, 3	4	4	No	Good	-
2113	*Pittosporum eugenioides*	Lemonwood	9, 4, 4, 2, 2	4	3	No	Fair	-
2114	*Pittosporum eugenioides*	Lemonwood	5, 2, 2, 2	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2115	*Pittosporum eugenioides*	Lemonwood	9, 8, 7, 5	3	4	No	Fair	-
2116	*Pittosporum eugenioides*	Lemonwood	5	0	0	Yes	Poor	-
2118	*Pinus canariensis*	Canary Island pine	22	5	4	Yes	Good	-
2119	*Pinus canariensis*	Canary Island pine	19	4	4	Yes	Good	-
2120	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	4	3	Yes	Fair	-
2121	*Liquidamber styraciflua*	Sweetgum	14	5	4	Yes	Good	-
2122	*Liquidamber styraciflua*	Sweetgum	17	5	3	Yes	Good	-
2123	*Liquidamber styraciflua*	Sweetgum	15	4	4	Yes	Good	-
2124	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
2125	*Liquidamber styraciflua*	Sweetgum	16	5	4	Yes	Good	-
2126	*Liquidamber styraciflua*	Sweetgum	12	5	3	Yes	Good	-
2127	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2128	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-
2129	*Pinus canariensis*	Canary Island pine	25	3	4	Yes	Fair	-
2130	*Pinus canariensis*	Canary Island pine	20	4	5	Yes	Good	-
2131	*Eucalyptus polyanthemos*	silver dollar eucalypt	18	5	4	Yes	Good	-
2132	*Eucalyptus polyanthemos*	silver dollar eucalypt	20	4	5	Yes	Good	-
2133	*Eucalyptus polyanthemos*	silver dollar eucalypt	25	4	3	Yes	Fair	-
2134	*Pinus canariensis*	Canary Island pine	16	3	4	Yes	Fair	-
2135	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	-
2140	*Eucalyptus polyanthemos*	silver dollar eucalypt	9	4	4	No	Good	-
2142	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	-
2143	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	-
2144	*Jacaranda mimosifolia*	Jacaranda	9	5	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2147	*Pinus canariensis*	Canary Island pine	27	3	3	Yes	Fair	-
2148	*Pinus canariensis*	Canary Island pine	27	5	5	Yes	Good	-
2149	*Pittosporum eugenioides*	Lemonwood	4, 4, 2	5	4	No	Good	-
2151	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	4	4	Yes	Good	-
2152	*Liquidamber styraciflua*	Sweetgum	16	5	4	Yes	Good	-
2153	*Liquidamber styraciflua*	Sweetgum	18	3	4	Yes	Fair	-
2154	*Liquidamber styraciflua*	Sweetgum	18	5	4	Yes	Good	-
2156	*Liquidamber styraciflua*	Sweetgum	15	3	1	Yes	Poor	-
2157	*Liquidamber styraciflua*	Sweetgum	17	3	2	Yes	Fair	-
2158	*Liquidamber styraciflua*	Sweetgum	16	4	3	Yes	Fair	-
2159	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2160	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
2161	*Pinus canariensis*	Canary Island pine	22	4	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2162	*Eucalyptus sideroxylon*	red ironbark	19	4	2	Yes	Fair	-
2163	*Pinus canariensis*	Canary Island pine	28	4	5	Yes	Good	-
2164	*Pinus canariensis*	Canary Island pine	22	4	3	Yes	Fair	-
2165	*Pinus canariensis*	Canary Island pine	24	5	2	Yes	Fair	-
2166	*Eucalyptus sideroxylon*	red ironbark	35	5	2	Yes	Fair	-
2167	*Eucalyptus sideroxylon*	red ironbark	19	5	2	Yes	Fair	-
2168	*Eucalyptus sideroxylon*	red ironbark	22	5	2	Yes	Fair	-
2170	*Quercus ilex*	Holly oak	5, 4	5	2	No	Fair	-
2172	*Quercus agrifolia*	California live oak	16, 15, 13	4	3	Yes	Fair	-
2173	*Liquidamber styraciflua*	Sweetgum	12	5	2	Yes	Fair	-
2174	*Liquidamber styraciflua*	Sweetgum	10	4	4	No	Good	-
2175	*Liquidamber styraciflua*	Sweetgum	14	5	2	Yes	Fair	-
2176	*Liquidamber styraciflua*	Sweetgum	9	5	2	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2177	*Liquidamber styraciflua*	Sweetgum	13	4	3	Yes	Fair	-
2180	*Pinus canariensis*	Canary Island pine	25	3	4	Yes	Fair	-
2181	*Pinus canariensis*	Canary Island pine	19	4	4	Yes	Good	-
2182	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	-
2183	*Pittosporum eugenioides*	Lemonwood	6, 5	3	2	No	Fair	-
2184	*Eucalyptus sideroxylon*	red ironbark	23	2	2	Yes	Poor	-
2185	*Pittosporum eugenioides*	Lemonwood	5, 3, 2	4	3	No	Fair	-
2186	*Pittosporum eugenioides*	Lemonwood	3, 2, 2, 1	4	3	No	Fair	-
2187	*Pittosporum eugenioides*	Lemonwood	4, 3	5	3	No	Good	-
2188	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	-
2189	*Pinus canariensis*	Canary Island pine	18	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2190	*Pittosporum eugenioides*	Lemonwood	3, 3	3	3	No	Fair	-
2191	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3, 3	3	3	No	Fair	-
2192	*Pittosporum eugenioides*	Lemonwood	3, 3, 2	3	2	No	Fair	-
2193	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	5	4	Yes	Good	-
2194	*Liquidamber styraciflua*	Sweetgum	13	5	3	Yes	Good	-
2195	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-
2196	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	4	3	Yes	Fair	Yes
2197	*Eucalyptus polyanthemos*	silver dollar eucalypt	24	4	3	Yes	Fair	Yes
2198	*Eucalyptus polyanthemos*	silver dollar eucalypt	22	2	3	Yes	Fair	-
2199	*Eucalyptus sideroxylon*	red ironbark	17	2	2	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2200	*Eucalyptus polyanthemos*	silver dollar eucalypt	20	2	3	Yes	Fair	-
2201	*Eucalyptus polyanthemos*	silver dollar eucalypt	28	5	3	Yes	Good	-
2202	*Populus nigra 'italica'*	Lombardy poplar	71	3	1	Yes	Poor	-
2203	*Populus nigra 'italica'*	Lombardy poplar	37, 36	3	3	Yes	Fair	-
2204	*Populus nigra 'italica'*	Lombardy poplar	27	3	4	Yes	Fair	-
2205	*Populus nigra 'italica'*	Lombardy poplar	57	3	4	Yes	Fair	-
2206	*Populus nigra 'italica'*	Lombardy poplar	29	3	1	Yes	Poor	-
2207	*Populus nigra 'italica'*	Lombardy poplar	60	3	4	Yes	Fair	-
2208	*Pinus canariensis*	Canary Island pine	9	3	2	No	Fair	-
2209	*Pinus canariensis*	Canary Island pine	29	4	4	Yes	Good	-
2210	*Eucalyptus sideroxylon*	red ironbark	20	3	4	Yes	Fair	-
2213	*Pinus canariensis*	Canary Island pine	20	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2214	*Prunus cerasifera*	purple leaf plum	4, 3, 3, 2, 2	5	4	No	Good	-
2218	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3	4	2	No	Fair	-
2219	*Pinus canariensis*	Canary Island pine	15	3	1	Yes	Poor	-
2220	*Pinus canariensis*	Canary Island pine	27	4	4	Yes	Good	-
2221	*Pinus canariensis*	Canary Island pine	19	3	4	Yes	Fair	-
2222	*Pinus canariensis*	Canary Island pine	17	3	4	Yes	Fair	-
2223	*Pittosporum eugenioides*	Lemonwood	5, 5, 4, 3	3	2	No	Fair	-
2224	*Eucalyptus polyanthemos*	silver dollar eucalypt	21	4	2	Yes	Fair	-
2225	*Pittosporum eugenioides*	Lemonwood	7	4	4	No	Good	-
2226	*Eucalyptus polyanthemos*	silver dollar eucalypt	29	4	4	Yes	Good	-
2227	*Osmanthus fragrans*	Fragrant Olive	6, 4	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2228	*Osmanthus fragrans*	Fragrant Olive	8, 6, 2, 1	4	4	No	Good	-
2229	*Eucalyptus polyanthemos*	silver dollar eucalypt	23	5	3	Yes	Good	-
2230	*Eucalyptus polyanthemos*	silver dollar eucalypt	22	4	4	Yes	Good	-
2231	*Osmanthus fragrans*	Fragrant Olive	5, 4, 3	3	3	No	Fair	-
2232	*Osmanthus fragrans*	Fragrant Olive	6, 6, 1	3	3	No	Fair	-
2233	*Osmanthus fragrans*	Fragrant Olive	7, 5, 4	3	3	No	Fair	-
2234	*Pinus canariensis*	Canary Island pine	30	4	4	Yes	Good	-
2235	*Pinus canariensis*	Canary Island pine	26	4	5	Yes	Good	-
2236	*Liquidamber styraciflua*	Sweetgum	18	4	2	Yes	Fair	-
2238	*Osmanthus fragrans*	Fragrant Olive	10	4	3	No	Fair	-
2239	*Osmanthus fragrans*	Fragrant Olive	11	4	2	No	Fair	-
2240	*Osmanthus fragrans*	Fragrant Olive	9, 8, 4, 4	4	2	No	Fair	-
2241	*Osmanthus fragrans*	Fragrant Olive	9, 8, 4	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2242	*Liquidamber styraciflua*	Sweetgum	15	4	4	Yes	Good	-
2243	*Osmanthus fragrans*	Fragrant Olive	7, 7, 6	4	4	No	Good	-
2244	*Osmanthus fragrans*	Fragrant Olive	6, 5, 4	4	3	No	Fair	-
2245	*Osmanthus fragrans*	Fragrant Olive	6, 5, 5	4	4	No	Good	-
2246	*Liquidamber styraciflua*	Sweetgum	12	5	4	Yes	Good	-
2247	*Quercus ilex*	Holly oak	17	5	4	Yes	Good	-
2248	*Quercus ilex*	Holly oak	11	3	4	No	Fair	-
2249	*Quercus ilex*	Holly oak	21	4	2	Yes	Fair	-
2250	*Eucalyptus polyanthemos*	silver dollar eucalypt	33	4	4	Yes	Good	-
2251	*Pinus canariensis*	Canary Island pine	21	3	3	Yes	Fair	-
2252	*Pinus canariensis*	Canary Island pine	26	1	1	Yes	Poor	-
2253	*Eucalyptus polyanthemos*	silver dollar eucalypt	27	2	1	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2254	*Eucalyptus polyanthemos*	silver dollar eucalypt	26	4	3	Yes	Fair	-
2255	*Eucalyptus polyanthemos*	silver dollar eucalypt	18	4	5	Yes	Good	-
2256	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	3	2	Yes	Fair	-
2257	*Liquidamber styraciflua*	Sweetgum	12	4	3	Yes	Fair	-
2259	*Pittosporum eugenioides*	Lemonwood	9, 4, 3	3	2	No	Fair	-
2260	*Pittosporum eugenioides*	Lemonwood	7, 5, 4, 4	4	2	No	Fair	-
2261	*Pittosporum eugenioides*	Lemonwood	6, 5	3	2	No	Fair	-
2301	*Liquidamber styraciflua*	Sweetgum	14	3	3	Yes	Fair	Yes
2302	*Pinus canariensis*	Canary Island pine	23	2	2	Yes	Poor	-

Appendix D. Representative Photos

Photo 1. Tree #1043, African fern pine (*Afrocarpus falcatus*).

Photo 2. Tree 1006 (left side), Canary Island pine (*Pinus canariensis*). Tree #1011 (right side), purple leaf plum (*Prunus cerasifera*).

Photo 3. Tress 1048-1051 (left to right), all are Chinese elm (*Ulmus parvifolia*).

Photo 4. Trees 2124-2126 (left to right), all are sweetgum (*Liquidamber styraciflua*).

Photo 5. Tree 2144 (foreground), jacaranda (*Jacaranda mimosifolia*) and Trees 2142-2143 (background), Canary Island pine (*Pinus canariensis*).

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Appendix E-3

Google West Channel Enhancement Project

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google West Channel Enhancement Project
Biological Resources Report

Project #3475-54

Prepared for:

Google Devco

Prepared by:

H. T. Harvey & Associates

August 22, 2019

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Section 1. Introduction

1.1 Project Location

The Sunnyvale West Channel (storm drain channel) bisects Google's proposed Caribbean Campus/West Channel Enhancement Project in Sunnyvale, California (Figure 1). The campus is bordered by Caribbean Drive to the north, Borregas Avenue to the east, Caspian Court and Bordeaux Drive to the south, and North Mathilda Avenue to the west. The Channel Enhancement portion of the Project is 8.10 ac, while the larger campus Project area is 43.89 ac. Outside of the Sunnyvale West Channel, the site is fully developed. The Project area is between West Caribbean Drive and Caspian Court and is located within the *Mountain View, California* U.S. Geological Survey (USGS) 7.5-minute quadrangle.

The Project area is accessible from U.S. Highway 101 via State Route 237, which is approximately 1.5 miles (mi) to the north. Regional access to the storm drain channel is from North Mathilda Street or East Java Street via State Route 237. Caspian Court and West Caribbean Drive provide the primary access points to the Project area.

The Project area encompasses the following parcels: 11026028, 11026025, 11026029, 11026031, 11026030, 11026049, 11026027, 11026020, 11026021, 11026022, and 11026023.

1.1 Project Purpose

The project purpose is to enhance the storm drain channel through restoring and enhancing areas of tidal aquatic, estuarine wetland and riparian habitats, as well as to provide enhanced pedestrian connections over the channel. The project will also provide 100-year flood protection for the city of Sunnyvale and facilitate redevelopment of several commercial/office parcels surrounding the Sunnyvale West Channel.

Valley Water Sunnyvale East and West Channel Flood Protection Project. The existing Sunnyvale East and West Channels were constructed by Valley Water in the 1960's and 1970's to alleviate local ponding resulting from historic ground subsidence and in cooperation with the local storm drain systems of Sunnyvale and Cupertino designed for a 10-year storm by directing the flows through the channels to San Francisco Bay. Since construction of the channels, the project area has experienced flooding during major storm events in 1963, 1968, 1983, 1986 and 1998.

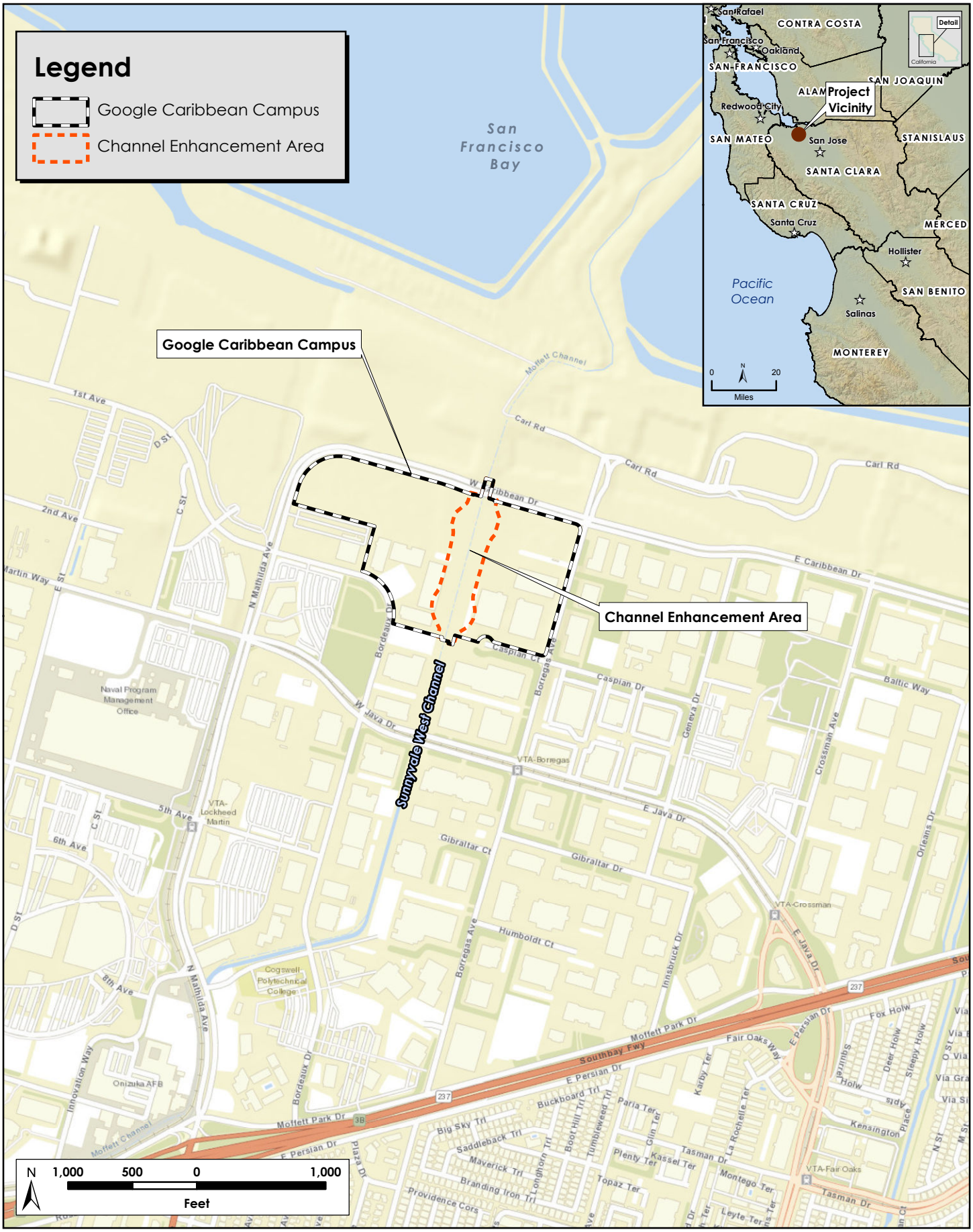
The proposed Google Caribbean Campus, West Channel Enhancement Project has modified a part of Valley Water's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan to provide 100-yearflood protection to approximately 1,618 properties and 47 acres within the city of Sunnyvale. Valley Water's Project involves constructing a series of infrastructure upgrades to provide additional flood protection and improve water quality and is intended to meet the following objectives:

- Provide flood protection where historic flooding has occurred and future flooding is possible from a 100-year storm event.
- Provide a basis to update Federal Emergency Management Agency flood hazard maps to reflect a 100-year flood protection along the improved storm drain channels and reduce or eliminate flood insurance requirements in the communities surrounding the Sunnyvale storm drain channels.
- Provide infrastructure improvements beyond 100-year flood protection as necessary to meet the Valley Water's freeboard standards.
- Provide water quality improvements by repairing/stabilizing existing erosion sites.
- Provide recommendations for recreational enhancements in coordination with flood and water quality improvements.

In lieu of conventional flood protection improvements planned by Valley Water's Flood Protection Project, Google's proposed Project, which is part of the development of their Caribbean Campus, includes an enhanced drainage corridor that will provide flood protection while improving campus aesthetics, increasing recreational opportunities, and enhancing wildlife habitat. The proposed Project will meet Valley Water's design criteria and Federal Emergency Management Agency's requirements for flood protection throughout the Project reach, including 100-year storm events and sea level rise, while enhancing tidal aquatic, estuarine wetland and riparian habitats.

1.2 Project Description

The Google Sunnyvale Caribbean Campus/West Channel Enhancement Project (Project) involves both landward and in-channel components encompassing 43.89 acres. The proposed Project includes two new five story office buildings totaling over 1,000,000 sq ft of space, a parking garage, and central utility plant. The Campus portion of the Project replaces thirteen existing office/research & development buildings. This will enhance the area by replacing a collection of aging, low density structures with two new buildings and a redesigned site. The Project responds to the City of Sunnyvale's goals set forth in the Moffett Park Specific Plan to increase development density of office and research & development in the area. In addition, the buildings are designed to minimize footprint through innovative sustainability strategies. For example, a series of cascading green roofs respond to the adjacent San Francisco Bay condition and reduce the carbon footprint of the Project. Planned central utility plants will optimize efficient building power and support future net positive water strategies.



N:\Projects3400\3475-01\54\Reports\BRR\Fig 1 Vicinity Map.mxd mchilds

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Vicinity Map
Google West Channel Enhancement Project - Biological Resources Report (3475-54)
August 2019

The storm drain channel reach through the project site consists of an earthen channel with wetland patches along the length of the invert and ruderal grasslands on the existing levee slopes and banks. There are no trees or shrubs located within the bed and banks; however, there are several trees located beyond the top of bank along the toe of the outboard levee as part of landscaping for the adjacent, developed properties. Most of these trees are nonnative species and are too distant from the channel to provide substantial benefits to the aquatic habitats therein, or to be considered riparian woodland habitat and are scheduled for removal as part of the Caribbean campus project. All trees, including those mentioned in this report, were analyzed in the attached arborist report (Appendix A).

It is understood that the U.S. Army Corps of Engineers (USACE) is preparing a jurisdictional determination for this reach of the storm drain channel, based on Valley Water's submission of the *Preliminary Identification of Wetlands and Other Waters for the Sunnyvale East and West Channels Flood Protection Project* (H. T. Harvey & Associates 2013). Existing habitat areas and impact assessments herein are based on the 2013 delineation report. The storm drain channel reach in the project site supports a mix of tidal aquatic habitat (other waters) (0.73 ac), estuarine wetland (0.17) and ruderal riparian (0.44 ac) habitats and is hydrologically connected to San Francisco Bay through Guadalupe Slough and Moffett Channel. These habitats fall under the jurisdiction of USACE, San Francisco Bay Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW).

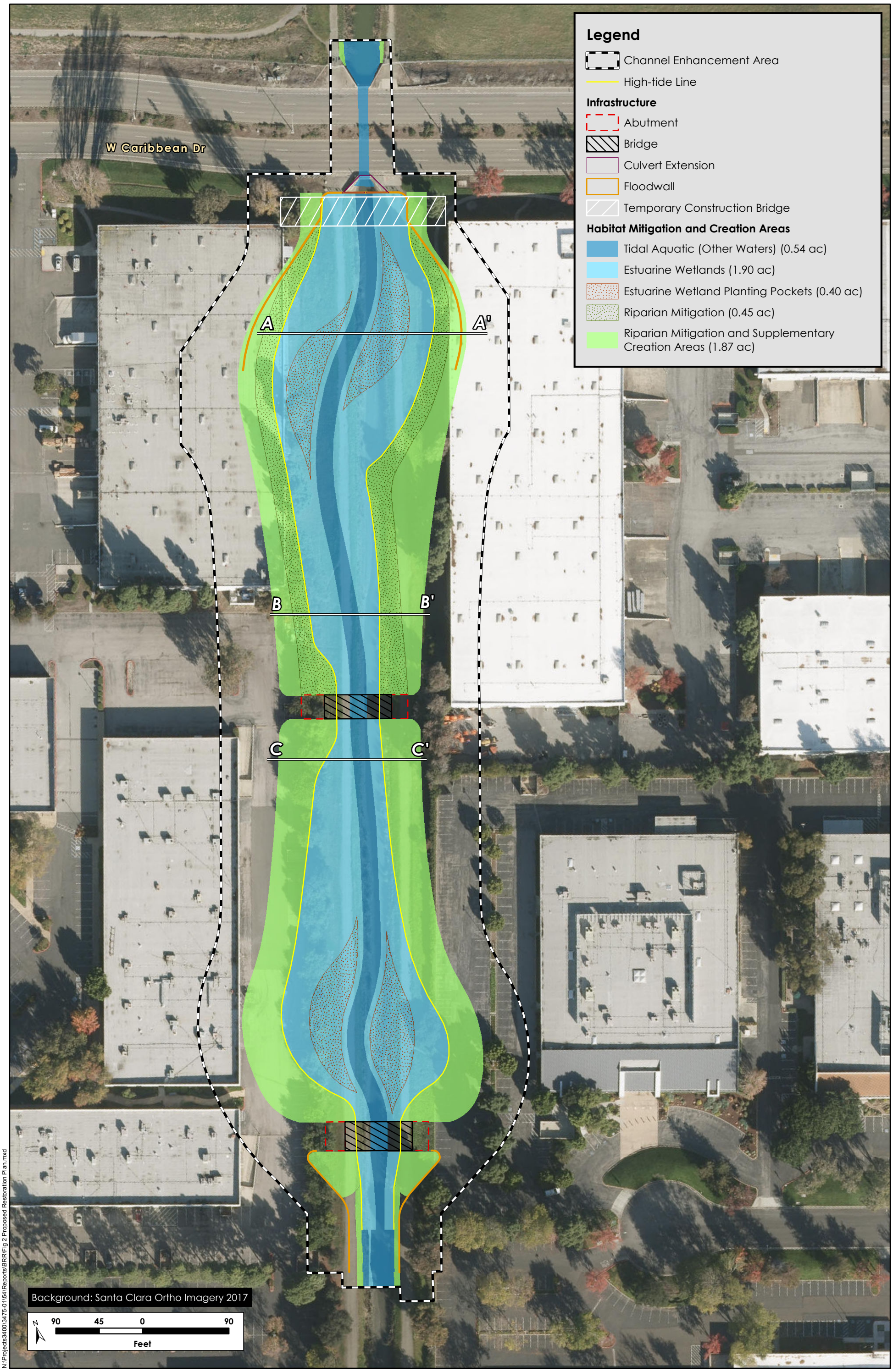
Google's proposed storm drain channel enhancement involves both landward and in-channel components, including the following:

- temporarily dewatering the storm drain channel during construction
- excavating the existing channel to meet new design grades
- building set-back levees
- grading a new storm drain channel with associated low-flow channel and floodplains
- constructing short sections of floodwalls at the upstream extent of the project reach to conform to Valley Water floodwall design elevations
- constructing two new bridge crossings (one exclusively for pedestrian use and one pedestrian-engineered to support emergency vehicle access at the Caspian Court extension)
- extending the box culvert with new headwall/floodwall to accommodate a sidewalk along West Caribbean Drive (as required by the City of Sunnyvale) and conform to the new earthen levee top
- relocating an existing storm drain pipe
- constructing a temporary bridge to accommodate a 3-year construction period
- implementing habitat mitigation and additional habitat creation

The project design (channel realignment, floodplain creation and levee reconstruction) will create conditions conducive to supporting diverse habitats, including tidal aquatic, estuarine wetland, willow-cottonwood riparian forest, oak riparian forest, and bayside scrub. Setting back the levees will allow creation of a more natural, meandering channel, with relatively broad hydrologically-connected floodplains that will be set at elevations below the high-tide line and provide conditions favorable for the natural recruitment of estuarine wetland plant species. It is anticipated that adjacent wetland plants located throughout the west channel will provide adequate seed sources to allow passive restoration (i.e., natural recolonization) within the project reach, although the project design does include installing small pockets of native wetland plantings. Four distinct native plant palettes are proposed for the levee banks. At the lower elevations along the banks, patches of willow-cottonwood riparian forest and a mesic mix of bayside scrub species will be installed. At the upper elevations but below the tops of banks, oak riparian forest will be interspersed with a mix of more drought-tolerant bayside scrub species. The patches of willow-cottonwood and oak riparian forest will be intermingled and discontinuous to create canopy gaps and provide view corridors into and across the channel enhancement area. All installed plants will be native to California and appropriate to the regional setting and habitat types. Levee slopes will also be seeded with an appropriate native grass and forb seed mix.

Project construction within the channel enhancement area will affect wetlands and waters of the United State/state and will result in temporary impacts on 0.72 ac of tidal aquatic habitat (other waters) and 0.16 ac of estuarine wetlands. In addition, there will be a small area of permanent impact to tidal aquatic habitat (0.01 ac) from the culvert extension. There will also be permanent changes to channel conditions from the realignment of the channel and from channel shading by the two proposed bridges, resulting in 0.01 ac of permanent impact to estuarine wetland habitat. Additional temporary impacts to existing habitats will include the removal of 0.43 ac of ruderal riparian grassland habitat associated with reconstruction of the levees and permanent conversion of 0.01 ac of ruderal riparian habitat to hardscape to accommodate construction of headwalls/floodwalls, one bridge abutment and the culvert extension.

The project proposes to provide onsite mitigation for temporary tidal aquatic impacts at a 1:1 ratio and permanent impacts at 2:1, through a combination of restored tidal aquatic (0.54 ac) and estuarine wetland habitats (0.24 ac) and increasing the linear footage of tidal aquatic habitat from 1,299 ln ft to 1,325 ln ft (Figure 2). The project proposes to mitigate for temporary estuarine wetland habitat impacts (dewatering and grading) at a 1.2:1 ratio and permanent impacts (shading from bridges) at a 2:1 ratio, totaling 0.21 ac of estuarine wetland. These mitigation ratios represent a total of 0.54 ac of tidal aquatic habitat and 0.45 ac of estuarine wetland habitat. Temporary impacts on ruderal riparian habitat will be mitigated at a 1:1 ratio and permanent impacts at a 2:1 ratio, resulting in a total of 0.46 ac. The actual area to be tracked for ruderal riparian habitat mitigation will be a dedicated zone along the lower levee slopes on both sides of the channel from the West Caribbean Drive culvert upstream to the first new pedestrian bridge. This area will provide stable vegetated slopes. Although woody species will be installed throughout this zone, they will not be linked to any specific monitoring or success criteria metrics because there will be no impacts on woody plants within existing jurisdictional areas.



H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 2. Proposed Restoration Plan
Google West Channel Enhancement Project - Biological Resources Report (3475-54)
August 2019

The project will create approximately 1.85 ac of additional estuarine wetland habitat on the expanded floodplains adjacent to the channel, resulting in a total of 2.30 ac of restored and created estuarine wetland habitat. In all, the area of waters of the United States/state (tidal aquatic habitat and estuarine wetlands) will be more than doubled, with a final anticipated area of 2.84 ac. The project will also create an additional 1.34 ac of riparian habitat for a total of 1.80 ac of restored riparian habitat along the banks. Through the implementation of the measures outlined in this report, replacement and enhancement of temporarily impacted habitats, and additional habitat creation, the project will substantially increase the area and quality of jurisdictional habitats through the project reach as compared to the current conditions. In addition, as detailed in this report, all potentially significant impacts identified in this report were previously identified and analyzed in prior EIRs, which also included mitigation prescriptions. Therefore, this report applies the previously adopted mitigation prescriptions to the project's potential impacts

The project will require the following regulatory agency permits or approvals:

- USACE – Clean Water Act (CWA) Section 404 Nationwide Permit 27 and Section 10 Letter of Permission
- CDFW – California Fish and Game Code Section 1600 Lake and Streambed Alteration Agreement
- San Francisco Bay RWQCB – CWA Section 401 Water Quality Certification

The Google Sunnyvale West Channel Enhancement Project is designed to conform to the requirements and measures for the Santa Clara Valley Water District's Sunnyvale East and West Channels Flood Control Project. All project actions will be executed in conformance with all requirements of the larger project and will apply all relevant avoidance measures and mitigation measures prescribed by the *Sunnyvale East and West Storm Drain Channels Flood Protection Project Environmental Impact Report* (SEWSDC EIR) (SCVWD 2014). There are no impacts to biological resources or mitigation measures relative to those impacts in this report that are not covered under the SEWSDC EIR and impacts and mitigation measures presented in this report conform to the impacts and mitigations to the same specific resources covered under the SEWSDC EIR. In addition, The City of Sunnyvale Land Use and Transportation Element Environmental Impact Report (LUTE EIR) analyzes the potential environmental effects associated with the implementation of the LUTE, which is an element of the City of Sunnyvale General Plan. The EIR analysis focuses on environmental impacts that could arise through development of the land uses in Sunnyvale as regulated and guided by the LUTE. The EIR was prepared as a program EIR per CEQA guidelines Section 15168. Thus, any impacts previously analyzed by the LUTE EIR will be acknowledged, in this report, as being covered under the LUTE program EIR.

1.2.1 In-Channel Components

1.2.1.1 Water Diversion

A temporary water diversion plan for the Project has been prepared that will maintain the work area as water-free as possible. The plan addresses the placement of cofferdams, cofferdam construction, best management practices (BMPs) to avoid discharge of sediment into waters of the United States, construction phasing and

timing, placement of a water diversion pipe that will maintain upstream flow into the lower reaches of the storm drain channel, and the removal of the water diversion equipment after construction ends. In-channel work will require two April – October construction seasons to complete, and dewatering will occur during both seasons (Appendix B).

The full width and length of the storm drain channel through the Channel Enhancement reach will be dewatered and all construction and grading work will be implemented under dewatered conditions during both years. Water encroachment is expected from bay tides and urban runoff flows from upstream. Cofferdams will be placed downstream and upstream of the Channel Enhancement reach to prevent tidal and stream flows from entering the work site.

The anticipated maximum storm drain channel flow during the construction period (from April 15 to October 15) is 12 cubic feet per second (cfs). This flow estimate is based on an upstream drainage area of 2.87 square miles and weighted based on drainage area to the maximum summer flows recorded in nearby San Francisquito Creek.

Each construction season, an aquadam or sheet pile cofferdam will be placed on the bay side of West Caribbean Drive and will prevent bay tidal waters from entering the work site from the downstream side. The aquadam will be inflated to a height of 9 ft North American Vertical Datum (NAVD88) from the existing downstream invert of the West Caribbean bridge culvert. The upstream cofferdam will prevent stream flows from entering the work site. The upstream cofferdam will be constructed using earthen materials or an aqua dam.

A 28-inch (in) diameter fused high-density polyethylene (HDPE) pipe or multiple pipes with an equivalent carrying capacity will be installed to bypass the construction area. The pipe(s) will use gravity to convey water impounded by the upstream cofferdam to the low-flow storm drain channel below the lower cofferdam. If gravity is not effective in conveying water due to tidal influence, pumps will be used as necessary. Riprap (up to ½ ton) will be placed at the downstream discharge point of the pipe to prevent erosion of the storm drain channel bed. The pipe outlets will be placed above the mean high water (MHW) line. Additionally, an energy flow dissipater will be installed downstream of the aquadam or sheet pile cofferdam to reduce erosion, sedimentation, and siltation associated with the diversion. The riprap and energy dissipater are temporary fills and will be fully removed from the channel following each construction season.

A dry season contingency plan will be in place to mitigate a dry season precipitation event or high tide event that could exceed the design capacity of the dewatering system. If the volume of water impounded at the upstream coffer dam or tide levels at the downstream aquadam exceeds the capacity of the dewatering system, the excess water will be pumped into baker tanks for temporary storage and then pumped back into the dewatering system when the system returns to normal capacity. Additionally, if groundwater seepage occurs within the dewatered reach, pumps will be used to discharge the seepage flows into the intakes of the HDPE pipe(s).

A contingency plan will be in place in case of failure of the dewatering system. The dewatering system could fail due to mechanical problems or unusually heavy flows exceeding the design flow. Spare pipe materials, fittings, and pumps will be stored on site to facilitate timely repairs of damaged parts, thereby ensuring that the system has a high degree of reliability and operability. Additional pumps and baker tanks will also be maintained on site. Excess flows will be filtered through the baker tanks and appropriately discharged downstream of the active reach.

In the case of actual or incipient system failure, the contractor will immediately perform all practical actions to remove sources of pollutants associated with the construction effort from the storm drain channel or prevent their entrainment by water flowing in the storm drain channel. This includes removing equipment and vehicles from the storm drain channel and protecting material stockpiles from in-channel flows.

Dewatering is expected to occur from April 15 – October 15 in both year 1 and year 2 of in-stream construction. When all work within the construction area is complete and no access to the storm drain channel will be required for that winter, the temporary water diversion system and cofferdams will be removed. Dewatering infrastructure removal will occur within 48 hours after construction work ends for the season and no later than October 15, unless permitted by the San Francisco Bay Regional Water Quality Control Board. Flows will be restored within the new construction area in a manner that minimizes erosion and any ponded waters will be directed into the established storm drain channel. Dewatering infrastructure removal will start with the riprap/energy flow dissipater and downstream aquadam, followed by pipe sections moving up to the upstream cofferdam.

1.2.2 Excavation and Grading

The storm drain channel will expand from 52–65 ft wide from top of bank to top of bank to a varying bank-to-bank width of 127–187 ft. The levees will be widened and raised to an elevation of 18 ft NAVD88. The design incorporates a low-flow storm drain channel with a broadened floodplain and laid-back levees banks. The proposed storm drain channel is generally straight through the reach with small meander bends and the variance mostly associated with coming from width. Storm drain channel invert elevations are designed to match the existing channel invert, which is estimated to be the long term sedimentation elevation. Spoils from this excavation and grading will be reused to re-contour the new channel and spoils not used will be off-hauled from the Project site and legally disposed of at an approved landfill facility.

As described above, excavation and grading of the channel will occur over two construction seasons. During the first year, expected to occur in spring – fall of 2021 all major grading and structures such as bridges and the culvert extension would be constructed. During the second year, finish grading, completion of floodwalls and installation of irrigation and plantings would occur. At the end of the first season of construction, the channel will be re-watered during the winter months; it will be dewatered again before the start of the second season. Dewatering and re-watering will be completed according to the procedure outlined in the water diversion section above and included in the Dewatering Plan for the Google West Channel Enhancement (Schaaf & Wheeler 2019).

1.2.3 Transportation and Utility Components

1.2.3.1 Bridge Crossings

The Project includes two proposed permanent bridges and one temporary bridge for construction access. The two permanent bridges will consist of a pedestrian bridge in the middle of campus measuring 70 ft long by 22 ft wide and a pedestrian/emergency vehicle bridge at Caspian Court measuring 70 ft long by 30 ft wide. The bridges will be designed to freespan the storm drain channel with 4 feet of freeboard to account for the 100-year high discharge rate of 380 cfs, which is 13.87 ft NAVD88 upstream of the Channel Enhancement reach. Due to the urbanized source of the flow to the storm drain channel and no natural upstream watershed, it is unlikely that large debris (e.g., trees) would be carried in the storm drain channel and cause an obstruction of flow at the bridges. The freespan design will not result in impacts to the storm drain channel hydraulics or the target design water surface criteria.

A total of four cast-in-place concrete sill abutments (two per permanent bridge) will be constructed to support the bridge decks. Each abutment measures approximately 15 ft wide by 18 ft tall by 19 ft long and will be supported by driven steel pile foundations (24" diameter steel pipe or H-pile). All four abutments will be placed outside of waters of the U.S. The bridges will be constructed in the first season of in-channel construction, expected to be spring – fall 2021.

The temporary construction bridge will be installed near West Caribbean Drive and will not result in impacts to waters of the United States. It is required to allow access between the Caribbean 100 and 200 work areas over the channel during construction of the larger campus. It will be a freespan design (railroad Flatcar Bridge) over the storm drain channel supported by earthen abutments constructed on top of the current levees. The bridge would be installed when construction of campus elements begins, anticipated in spring of 2020, and would remain in place for the duration of the channel enhancement project. This bridge would have greater freeboard than the bankfull capacity of the existing channel, so no blockages or impacts to winter flows are anticipated.

1.2.4 Culvert Extension/Headwall and Floodwalls

The culvert extension will be a cast-in-place concrete structure, new cast-in-place headwall, and the existing box culvert. Temporary shoring and falsework will be erected to support the culvert extension during construction. Construction equipment will include a land-based crane, concrete transit trucks, concrete pumpers, material delivery trucks, air compressors, generators, loaders, backhoes, and dump trucks.

1.2.5 Storm Drain Relocation

The Project will require the relocation of a 48-inch diameter City of Sunnyvale storm drain line which runs within a City easement parallel to the Valley Water right-of-way on the west side of the storm drain channel, along the outboard side of the levee. The storm drain line will be relocated outside of the proposed realignment of the storm drain channel and levee. No storm drain outfalls that flow into the storm drain channel are

proposed by the Project; therefore, the storm drain relocation will not result in impacts to waters of the United States.

1.3 Construction Methods

1.3.1 Vegetation Removal

Delays in construction could jeopardize the ability of the project to complete rough/mass grading of the channel during the first construction season. Therefore, due to the density of existing emergent wetland vegetation throughout the channel enhancement reach, the project proposes to remove channel vegetation outside the nesting bird season, prior to February 1, 2021, in preparation for year 1 construction. Vegetation will be cut at the mudline at low tide using hand tools and removed from the channel. Because substantial disturbance of the channel bottom is not anticipated, no turbidity curtains will be necessary. The in-channel vegetation will then be maintained at a very low height unsuitable for nesting birds until April 15, 2021 in preparation for year 1 dewatering activities. Due to mass grading of the channel during year 1, the channel is likely to remain unvegetated or very sparsely vegetated during the winter of 2021-2022 in between the two in-channel construction seasons. However, if this is not the case and suitable substrate for nesting birds develops quickly during the 2021-2022 winter, vegetation removal would again be necessary prior to February 1, 2022 and then maintained until April 2022 in anticipation of dewatering activities for year 2.

Installation of the temporary bridge will be necessary in 2020, the year prior to commencing instream earthwork, to facilitate movement of construction vehicles and workers associated with campus construction activities. As previously described, installation of the temporary bridge will not result in any impacts to waters of the U.S.

1.3.2 Grading and Earthwork

The entire storm drain channel will be contour graded by a combination of removing and reusing existing material, as appropriate, and importing earthen fill to construct the levees. The Project will match the existing invert of the channel, widen the channel cross-section, and raise the levee elevations. It is anticipated that cutting to the finish grade within floodplain areas (i.e. estuarine wetland habitat) will expose suitable soil conditions that will not require any additional treatment or amendments and will support both actively planted and naturally recruited tidal wetland species. However, a project specific site management plan will be prepared that outlines the protocol to ensure floodplain soils meet appropriate requirements for soil and sediment characteristics for areas subject to tidal inundation. The levees will be constructed to meet geotechnical stability requirements and will include placement of a stable 3 ft deep zone of horticulturally suitable soil as the final series of lifts across the inboard levee slopes to facilitate long-term establishment of the riparian plantings. The project's construction documents will provide detailed drawings and specifications for the grading and soil preparation. Rough grading will be performed prior to construction of bridge, culvert extension/headwall or floodwall construction and after dewatering activities. Construction equipment will include bulldozers, excavators, soil compactors, air compressors, generators, loaders, backhoes, and dump trucks.

1.3.3 Bridge Construction

The proposed pedestrian bridges will be single-span, cast-in-place reinforced concrete slab structures and the abutments will be cast-in-place concrete structures supported by piles. After excavation and grading, the piles will be installed with specialized equipment. Once the piles are driven, formwork for the abutments and header cap for the bent will be installed on top of the piles. The formwork will subsequently be removed and falsework will be installed on the abutments and header cap to support the bridge during construction. After completion of the bridge, the falsework will be removed. Construction equipment will include a land-based crane, concrete transit trucks, concrete pumpers, material delivery trucks, air compressors, generators, loaders, backhoes, and dump trucks.

1.3.4 Culvert Extension/Headwall

The culvert extension will be a cast-in-place concrete structure supported by a steel beam, new headwall, and the existing box culvert. Once the steel support beam is installed on the existing headwall, falsework will be erected to support the culvert extension during construction. Construction equipment will include a land-based crane, concrete transit trucks, concrete pumpers, material delivery trucks, air compressors, generators, loaders, backhoes, and dump trucks.

1.3.5 Floodwall Construction

The floodwalls will be cast-in-place concrete structures. After excavation and grading, formwork for the floodwalls will be installed and concrete poured using land-based concrete transit trucks. Once the concrete has gained adequate strength, the formwork will be removed. Construction equipment will include a land-based crane, concrete transit trucks, concrete pumpers, material delivery trucks, air compressors, generators, loaders, backhoes, and dump trucks.

1.3.6 Construction Staging

Equipment and construction materials will be staged in existing open areas above the top of the bank.

1.3.7 Construction Schedule

Construction is expected to begin in 2020 with landside elements, including installation of the temporary bridge over the channel. The first activities to impact regulated habitats specific to the channel enhancement would be vegetation removal prior to the nesting bird season prior to February 1, 2021. Construction would then be completed over the next 2 years (2021-2022). The storm drain channel will be excavated and contoured, and the bridges and culvert extension will be built during the first in-channel construction season from April 15 – October 15, 2021. Finish grading, completions of floodwalls, and other final improvements such as the installation of irrigation and plantings would occur during the second in-channel construction season, anticipated in April 15 – October 15, 2022.

Ground-disturbing work within the storm drain channel and wetland areas will only occur in the dry season (i.e., between April 15 and October 15). Additionally, once the new topography of the storm drain channel is established, this temporal restriction will extend to all areas within the new top of bank. Work in areas outside the current and proposed top of bank, and access over the temporary bridge, may take place in the wet season. Best management practices and measures to protect potential fish, wildlife, and plant resources for wet season work are included in Box 9 Attachment below. Specific activities are discussed in further detail below:

Work to Occur in Waters or Wetland Areas between April 15 and October 15

- All grading, excavation, and dewatering related to widening the storm drain channel
- Grading and dewatering related to bridge abutment construction, placement of abutment structures, and placement of bridge decks
- Culvert extension and headwall construction
- Floodwall construction

Work that May Occur in Waters or Wetland Areas between October 15 and April 15

- Installation of erosion control measures and BMPs within completed work areas for the season
- Planting and/or seeding of restored areas
- All campus development beyond the top of the enclosing levee (either current or proposed levee, whichever is existing at that time)
- Construction of and/or access over the temporary construction bridge
- Vegetation removal using hand tools

Section 2. Methods

2.1 Background Review

Prior to conducting field work, H. T. Harvey & Associates ecologists reviewed aerial images (Google Inc. 2019) of the project area; a U.S. Geological Survey (USGS) topographic map; the California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Database (CNDDB 2019); and other relevant scientific literature and technical databases. Previous reports prepared for the project vicinity were also reviewed, including the Final Environmental Impact Reports (EIR) for the SCVWD Sunnyvale East and West Channels Flood Protection Project (SCVWD 2014); the Sunnyvale East and West Channels Flood Protection Project – Preliminary Identification of Wetland and Other Waters (H. T. Harvey and Associates 2013); and Biological Resources Reports for the Google West Borregas Campus (H.T. Harvey and Associates 2017a) and Google Caribbean Campus Project (H.T. Harvey and Associates 2017b). In addition, for plants, we reviewed all species on current California Native Plant Society (CNPS) California Rare Plant Rank (CRPR) 1A, 1B, 2A, and 2B lists occurring in the *Mountain View, California* 7.5-minute USGS quadrangle and surrounding eight quadrangles (*San Jose West, Palo Alto, Redwood Point, Niles, Milpitas, Newark, Cupertino, Mindego Hill,* and *La Honda*). Quadrangle-level results are not maintained for CRPR 3 and 4 species, so we also conducted a search of the CNPS Inventory records for these species occurring in Santa Clara County (CNPS 2019). In addition, we queried the CNDDB (2019) for natural communities of special concern that occur in the project region. For the purposes of this report, the "project vicinity" encompasses a 5-mi radius surrounding the study area.

2.2 Site Visits

Reconnaissance-level field surveys of the study area were conducted by H. T. Harvey & Associates senior wildlife ecologist Robin Carle on March 24 and July 18, 2017 and an additional visit by senior wildlife ecologist Scott Terrill, Ph.D. on February 5, 2019 to evaluate the current habitats associated with the channel. Specifically, surveys were conducted to (1) assess existing biotic habitats and general plant and wildlife communities in the study area, (2) assess the potential for the project to impact special-status species and/or their habitats, and (3) identify potential jurisdictional habitats, such as waters of the U.S./State and riparian habitat.

Section 3. Regulatory Setting

Biological resources in the study area are regulated by a number of federal, state, and local laws and ordinances, as described below.

3.1 Federal

3.1.1 Clean Water Act

The Clean Water Act (CWA) functions to maintain and restore the physical, chemical, and biological integrity of waters of the U.S., which include, but are not limited to, tributaries to traditionally navigable waters currently or historically used for interstate or foreign commerce, and adjacent wetlands. Historically, in non-tidal waters, U.S. Army Corp of Engineers (USACE) jurisdiction extends to the ordinary high water (OHW) mark, which is defined in Title 33, Code of Federal Regulations (CFR), Part 328.3. If there are wetlands adjacent to channelized features, the limits of USACE jurisdiction extend beyond the OHW mark to the outer edges of the wetlands. Wetlands that are not adjacent to waters of the U.S. are termed "isolated wetlands" and, depending on the circumstances, may be subject to USACE jurisdiction. In tidal waters, USACE jurisdiction extends to the landward extent of vegetation associated with salt or brackish water or the high tide line. The high tide line is defined in 33 CFR Part 328.3 as "the line of intersection of the land with the water's surface at the maximum height reached by a rising tide." If there are wetlands adjacent to channelized features, the limits of USACE jurisdiction extend beyond the OHW mark or high tide line to the outer edges of the wetlands.

Construction activities within jurisdictional waters are regulated by the USACE. The placement of fill into such waters must comply with permit requirements of the USACE. No USACE permit will be effective in the absence of Section 401 Water Quality Certification. The State Water Resources Control Board (SWRCB) is the state agency (together with the Regional Water Quality Control Boards [RWQCBs]) charged with implementing water quality certification in California.

Project Applicability: A jurisdictional wetland delineation has identified portions of the study area that contain wetlands which are considered waters of the U.S by the USACE. Any placement of fill within waters of the U.S. would likely be considered a significant impact under CEQA unless mitigated and would require a Section 404 permit from the USACE. Ultimately the project will result in a net gain of acreage of waters and wetlands as well as a functional enhancement of existing waters.

3.1.2 Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 prohibits the creation of any obstruction to the navigable capacity of waters of the U.S., including discharge of fill and the building of any wharfs, piers, jetties, and other structures without Congressional approval or authorization by the Chief of Engineers and Secretary of the Army (33 U.S.C. 403).

Navigable waters of the U.S., which are defined in 33 CFR, Part 329.4, include all waters subject to the ebb and flow of the tide, and/or those which are presently or have historically been used to transport commerce. The shoreward jurisdictional limit of tidal waters is further defined in 33 CFR, Part 329.12 as "the line on the shore reached by the plane of the mean (average) high water." It is important to understand that the USACE does not regulate wetlands under Section 10, only the aquatic or open waters component of bay habitat, and that there is overlap between Section 10 jurisdiction and Section 404 jurisdiction. According to 33 CFR, Part 329.9, a waterbody that was once navigable in its natural or improved state retains its character as "navigable in law" even though it is not presently used for commerce as a result of changed conditions and/or the presence of obstructions. Historical Section 10 waters may occur behind levees in areas that are not currently exposed to tidal or muted-tidal influence, and meet the following criteria: (1) the area is presently at or below the mean high water line; (2) the area was historically at or below mean high water in its "unobstructed, natural state"; and (3) there is no evidence that the area was ever above mean high water.

As mentioned above, Section 404 of the CWA authorizes the USACE to issue permits to regulate the discharge of dredged or fill material into waters of the U.S. If a project also proposes to discharge dredged or fill material and/or introduce other potential obstructions in navigable waters of the U.S., a Letter of Permission authorizing these impacts must be obtained from the USACE under Section 10 of the Rivers and Harbors Act.

Project Applicability: Northern portions of the study area overlap with historical bay lands (Nichols and Wright 1971), are below the mean high water elevation, and are separated from tidal influence by dikes or levees. Therefore, historical Section 10 Waters are present in the study area. If direct project impacts fall within these areas, a Letter of Permission would be required from the USACE. Current Section 10 Waters are not present in the study area.

3.1.3 Federal Endangered Species Act

The Federal Endangered Species Act (FESA) protects federally listed wildlife species from harm or "take", which is broadly defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct." Take can also include habitat modification or degradation that directly results in death or injury of a listed wildlife species. An activity can be defined as "take" even if it is unintentional or accidental. Listed plant species are provided less protection than listed wildlife species. Listed plant species are legally protected from take under FESA only if they occur on federal lands.

The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) have jurisdiction over federally listed, threatened, and endangered species under FESA. The USFWS also maintains lists of proposed and candidate species. Species on these lists are not legally protected under FESA, but may become listed in the near future and are often included in their review of a project.

Project Applicability: The *Sunnyvale East and West Storm Drain Channels Flood Protection Project Environmental Impact Report* (SEWSDC EIR) reviews the status of all the special-status species that are known to occur in the

Sunnyvale West Channel site, that may occur on the site, and that occur regionally, but are not likely to occur on the site (SCVWD 2013). Only those species determined to be present or likely to be present along the project reach of the Sunnyvale West Channel are covered in this Biological Resources Report. Two federally listed species and/or their critical habitat have the potential to occur in the project site: Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and North American green sturgeon (*Acipenser medirostris*). The project reach of the Sunnyvale West Channel comprises critical habitat for both the federally listed species. Longfin smelt (*Spirinchus thaleichthys*), a species listed as threatened under the California Endangered Species Act and a Candidate for listing under the Federal Endangered Species Act, also has the potential to occur in the project area.

Due to the marginal quality of the habitat and very low summer flows, as well as inclusion of avoidance measures designed to protect fish, the USACE previously concluded that the SCVWD Flood Protection project would not require Section 7 Consultation for activities in this reach (pers. communication between SCVWD and Keith Hess of the USACE, July 29, 2017).

3.1.4 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act governs all fishery management activities that occur in federal waters within the United States' 200-nautical-mile limit. The Act establishes eight Regional Fishery Management Councils responsible for the preparation of fishery management plans (FMPs) to achieve the optimum yield from U.S. fisheries in their regions. These councils, with assistance from the NMFS, establish Essential Fish Habitat (EFH) in FMPs for all managed species. Federal agencies that fund, permit, or implement activities that may adversely affect EFH are required to consult with the NMFS regarding potential adverse effects of their actions on EFH, and respond in writing to recommendations by the NMFS.

Project Applicability: Due to the marginal quality of the habitat and very low summer flows, as well as inclusion of avoidance measures designed to protect fish, the USACE previously concluded that the SCVWD Flood Protection project would not require Section 7 Consultation for activities in this reach (pers. communication between SCVWD and Keith Hess of the USACE, July 29, 2017). Several project measures, intended to protect aquatic wildlife and habitat that require passive fish relocation and measures to prevent entrapment, will be implemented to avoid and minimize impacts to Essential Fish Habitat (EFH) within the project reach and any fish regulated by the Coastal Pelagics and Pacific Groundfish Fishery Management Plan. Dewatering and other BMPs, as described in the project's regulatory permit applications, will further be used to prevent water-quality impacts. In-channel work will be restricted to the dry season from April 15 to October 15, when flows are low and warm within the channel and listed fish are not expected to occur.

3.1.5 Federal Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA), 16 U.S.C. Section703, prohibits killing, possessing, or trading of migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. The MBTA protects whole birds, parts of birds, and bird eggs and nests, and prohibits the possession of all nests of

protected bird species whether they are active or inactive. An active nest is defined as having eggs or young, as described by the Department of the Interior in its April 16, 2003 Migratory Bird Permit Memorandum. Nest starts (nests that are under construction and do not yet contain eggs) are not protected from destruction. Per a December 22, 2017 memorandum issued by the U.S. Department of the Interior, the MBTA's prohibition on taking migratory birds and their active nests applies only to direct, purposeful actions, and does not include take incidental to other activities. However, native birds are protected from direct take and take incidental to other activities by California state law under the California Department of Fish and Wildlife Code (see below).

Project Applicability: All native bird species that occur in the study area are protected under the MBTA and the state Fish and Wildlife Code. "Take –avoidance" measures for these species are presented below. These measures are taken to comply with relevant regulations.

3.2 State

3.2.1 Clean Water Act Section 401/Porter-Cologne Water Quality Control Act

The SWRCB works in coordination with the nine RWQCBs to preserve, protect, enhance, and restore water quality. Each RWQCB makes decisions related to water quality for its region, and may approve, with or without conditions, or deny projects that could affect waters of the State. Their authority comes from the CWA and the State's Porter-Cologne Water Quality Control Act (Porter-Cologne). Porter-Cologne broadly defines waters of the State as "any surface water or groundwater, including saline waters, within the boundaries of the state." Because Porter-Cologne applies to any water, whereas the CWA applies only to certain waters, California's jurisdictional reach overlaps and may exceed the boundaries of waters of the U.S. For example, Water Quality Order No. 2004-0004-DWQ states that "shallow" waters of the State include headwaters, wetlands, and riparian areas. Moreover, the San Francisco Bay Region RWQCB's Assistant Executive Director, has stated that, in practice, the RWQCBs claim jurisdiction over riparian areas. Where riparian habitat is not present, such as may be the case at headwaters, jurisdiction is taken to the top of bank.

Pursuant to the CWA, projects that are regulated by the USACE must also obtain a Section 401 Water Quality Certification permit from the RWQCB. This certification ensures that the proposed project will uphold state water quality standards. Because California's jurisdiction to regulate its water resources is much broader than that of the federal government, proposed impacts on waters of the State require Water Quality Certification even if the area occurs outside of USACE jurisdiction. Moreover, the RWQCB may impose mitigation requirements even if the USACE does not. Under the Porter-Cologne, the SWRCB and the nine regional boards also have the responsibility of granting CWA National Pollutant Discharge Elimination System (NPDES) permits and Waste Discharge Requirements for certain point-source and non-point discharges to waters. These regulations limit impacts on aquatic and riparian habitats from a variety of urban sources.

Project Applicability: A verified jurisdictional wetland delineation has identified portions of the study area that contain wetlands which are considered waters of the State by the RWQCB. Such areas would fall under jurisdiction of the San Francisco RWQCB, and a Section 401 Water Quality Certification would be required if

any impacts on these waters would occur. Ultimately the project will result in a net gain of acreage wetlands as well as a functional enhancement of these areas.

3.2.2 California Endangered Species Act

The California Endangered Species Act (CESA; California Fish and Game Code, Chapter 1.5, Sections 2050-2116) prohibits the take of any plant or animal listed or proposed for listing as rare (plants only), threatened, or endangered. In accordance with CESA, the CDFW has jurisdiction over state-listed species (Fish and Game Code 2070). The CDFW regulates activities that may result in "take" of individuals (i.e., "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill"). Habitat degradation or modification is not expressly included in the definition of "take" under the California Fish and Game Code. The CDFW, however, has interpreted "take" to include the "killing of a member of a species which is the proximate result of habitat modification."

Project Applicability: No suitable habitat for any state listed plant species occurs in the study area. Thus, no state listed plant species are expected to occur in the study area. One California Endangered Species Act avian species listed as threatened, the tricolored blackbird (*Agelaius tricolor*), has the potential to be present in the project area, and is discussed below.

3.2.3 California Environmental Quality Act

CEQA is a state law that requires state and local agencies to document and consider the environmental implications of their actions and to refrain from approving projects with significant environmental effects if there are feasible alternatives or mitigation measures that can substantially lessen or avoid those effects. CEQA requires the full disclosure of the environmental effects of agency actions, such as approval of a general plan update or the projects covered by that plan, on resources such as air quality, water quality, cultural resources, and biological resources. The State Resources Agency promulgated guidelines for implementing CEQA are known as the State CEQA Guidelines.

Section 15380(b) of the State CEQA Guidelines provides that a species not listed on the federal or state lists of protected species may be considered rare if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definitions in FESA and CESA and the section of the California Fish and Game Code dealing with rare or endangered plants and animals. This section was included in the guidelines primarily to deal with situations in which a public agency is reviewing a project that may have a significant effect on a species that has not yet been listed by either the USFWS or CDFW or species that are locally or regionally rare.

The CDFW has produced three lists (amphibians and reptiles, birds, and mammals) of "species of special concern" that serve as "watch lists". Species on these lists are of limited distribution or the extent of their habitats has been reduced substantially, such that threat to their populations may be imminent. Thus, their populations should be monitored. They may receive special attention during environmental review as potential

rare species, but do not have specific statutory protection. All potentially rare or sensitive species, or habitats capable of supporting rare species, are considered for environmental review per the CEQA Section 15380(b). The CNPS, a non-governmental conservation organization, has developed CRPRs for plant species of concern in California in the Inventory of Rare and Endangered Plants (CNPS 2019). The CRPRs include lichens, vascular, and non-vascular plants, and are defined as follows:

- CRPR 1A Plants considered extinct.
- CRPR 1B Plants rare, threatened, or endangered in California and elsewhere.
- CRPR 2A Plants considered extinct in California but more common elsewhere.
- CRPR 2B Plants rare, threatened, or endangered in California but more common elsewhere.
- CRPR 3 Plants about which more information is needed - review list.
- CRPR 4 Plants of limited distribution-watch list.

The CRPRs are further described by the following threat code extensions:

- .1—seriously endangered in California;
- .2—fairly endangered in California;
- .3—not very endangered in California.

Although the CNPS is not a regulatory agency and plants on these lists have no formal regulatory protection, plants appearing as CRPR 1B or 2 are, in general, considered to meet CEQA's Section 15380 criteria, and adverse effects on these species may be considered significant. Impacts on plants that are listed by the CNPS as CRPR 3 or 4 are also considered during CEQA review, although because these species are typically not as rare as those of CRPR 1B or 2, impacts on them are less frequently considered significant.

Rare Plants Project Applicability: The CNDDB (2017) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2017) were queried for rare plant species that occur in the project region. The majority of potentially occurring rare plant species were determined to be absent from the project site for at least one of the following reasons: (1) absence of suitable habitat types; (2) lack of specific microhabitat or edaphic requirements, such as serpentine soils; (3) the elevation range of the species is outside of the range on the site; and/or (4) the species is presumed extirpated from the project region. Based on this analysis and the habitat types observed during the site survey, Congdon's tarplant, which has a CNPS Rare Plant Ranking of 1B.1 (seriously threatened in California), was the only special-status plant species determined to have the potential to occur on the site, but determined to be absent from the site (see below).

Compliance with CEQA Guidelines Section 15065(a) requires consideration of natural communities of special concern, in addition to plant and wildlife species. Vegetation types of "special concern" are tracked in Rarefind

(CNDDB 2019). Further, the CDFW ranks sensitive vegetation alliances based on their global (G) and state (S) rankings analogous to those provided in the CNDDB. Global rankings (G1–G5) of natural communities reflect the overall condition (rarity and endangerment) of a habitat throughout its range, whereas S rankings reflect the condition of a habitat within California. If an alliance is marked as a G1–G3, all the associations within it would also be of high priority. The CDFW provides the Vegetation Classification and Mapping Program's currently accepted list of vegetation alliances and associations (CDFW 2019).

Project Applicability: All potential impacts on biological resources will be considered during CEQA review of the project. This Biological Resources Report assesses these impacts to facilitate project planning and CEQA review of the project by the City of Sunnyvale. Project impacts are discussed in Section 6 below.

3.2.4 California Fish and Game Code

Ephemeral and intermittent streams, rivers, creeks, dry washes, sloughs, blue line streams on USGS maps, and watercourses with subsurface flows fall under CDFW jurisdiction. Canals, aqueducts, irrigation ditches, and other means of water conveyance may also be considered streams if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife. A *stream* is defined in Title 14, California Code of Regulations Section 1.72, as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and that supports fish and other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation." Using this definition, the CDFW extends its jurisdiction to encompass riparian habitats that function as part of a watercourse. California Fish and Game Code Section 2786 defines *riparian habitat* as "lands which contain habitat which grows close to and which depends upon soil moisture from a nearby freshwater source." The lateral extent of a stream and associated riparian habitat that would fall under the jurisdiction of the CDFW can be measured in several ways, depending on the particular situation and the type of fish or wildlife at risk. At minimum, the CDFW would claim jurisdiction over a stream's bed and bank. In areas that lack a vegetated riparian corridor, CDFW jurisdiction would be the same as USACE jurisdiction. Where riparian habitat is present, the outer edge of riparian vegetation is generally used as the line of demarcation between riparian and upland habitats.

Pursuant to California Fish and Game Code Section 1603, the CDFW regulates any project proposed by any person that will "substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated by the department, or use any material from the streambeds." California Fish and Game Code Section 1602 requires an entity to notify the CDFW of any proposed activity that may modify a river, stream, or lake. If the CDFW determines that proposed activities may substantially adversely affect fish and wildlife resources, a Lake and Streambed Alteration Agreement (LSAA) must be prepared. The LSAA sets reasonable conditions necessary to protect fish and wildlife, and must comply with CEQA. The applicant may then proceed with the activity in accordance with the final LSAA.

Specific sections of the California Fish and Game Code describe regulations pertaining to protection of certain wildlife species. For example, Code Section 2000 prohibits take of any bird, mammal, fish, reptile, or amphibian except as provided by other sections of the code.

The California Fish and Game Code Sections 3503, 3513, and 3800 (and other sections and subsections) protect native birds, including their nests and eggs, from all forms of take. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "take" by the CDFW. Raptors (i.e., eagles, hawks, and owls) and their nests are specifically protected in California under Code Section 3503.5. Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto."

Bats and other non-game mammals are protected by California Fish and Game Code Section 4150, which states that all non-game mammals or parts thereof may not be taken or possessed except as provided otherwise in the code or in accordance with regulations adopted by the commission. Activities resulting in mortality of non-game mammals (e.g., destruction of an occupied nonbreeding bat roost, resulting in the death of bats), or disturbance that causes the loss of a maternity colony of bats (resulting in the death of young), may be considered "take" by the CDFW.

Project Applicability: The west Sunnyvale channel would be considered a river or streams regulated by the CDFW under California Fish and Game Code Section 1603 and therefore any work on this channel would require a LSAA from CDFW. Most native bird, mammal, and other wildlife species that occur in the study area and in the immediate vicinity are protected by the California Fish and Game Code. Measures to comply with the relevant migratory bird sections of the code are presented below.

3.3 Local

3.3.1 Santa Clara Valley Water District

The project is designed to conform to the requirements and measures for the SCVWD's Sunnyvale East and West Channels Flood Control Project. The existing Sunnyvale East and West Channels were constructed by the SCVWD in the 1960's and 1970's to alleviate local ponding resulting from historic ground subsidence and in cooperation with the local storm drain systems of Sunnyvale and Cupertino designed for a 10-year storm by directing the flows through the channels to San Francisco Bay. Since construction of the channels, the project area has experienced flooding during major storm events in 1963, 1968, 1983, 1986 and 1998.

The proposed Caribbean Campus/West Channel Enhancement Project has modified a part of SCVWD's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan to provide 100-yearflood protection to approximately 1,618 properties and 47 acres within the city of Sunnyvale. The SCVWD's Project involves constructing a series of infrastructure upgrades to provide additional flood protection and improve water quality and is intended to meet the following objectives:

- Provide flood protection where historic flooding has occurred and future flooding is possible from a 100-year storm event.

- Provide a basis to update Federal Emergency Management Agency flood hazard maps to reflect a 100-year flood protection along the improved storm drain channels and reduce or eliminate flood insurance requirements in the communities surrounding the Sunnyvale storm drain channels.
- Provide infrastructure improvements beyond 100-year flood protection as necessary to meet the SCVWD's freeboard standards.
- Provide water quality improvements by repairing/stabilizing existing erosion sites.
- Provide recommendations for recreational enhancements in coordination with flood and water quality improvements.
- This SCVWD Project does not provide for protection from tidal flooding. Potential flood damages from tidal flooding will be addressed with the pending SCVWD/USACE Shoreline Project.

In lieu of conventional flood protection improvements planned by the SCVWD's Flood Protection Project, Google's proposed Project, which is part of the development of their Caribbean Campus, includes an enhanced drainage corridor that will provide flood protection while improving campus aesthetics, increasing recreational opportunities, and enhancing wildlife habitat. The proposed Project will meet SCVWD's design criteria and Federal Emergency Management Agency's requirements for flood protection throughout the Project reach, including 100-year storm events and sea level rise, while enhancing tidal aquatic, estuarine wetland and riparian habitats.

Project Applicability: As mentioned above, the project is designed to conform to the requirements and measures for the SCVWD's Sunnyvale East and West Channels Flood Control Project. All project actions will be executed in conformance with all requirements of the larger project and will apply all relevant avoidance measures and mitigation measures prescribed by the District EIR.

3.3.2 City of Sunnyvale General Plan

The City of Sunnyvale General Plan, adopted in 2011, specifies goals, policies and programs that convey a long-term vision for the Sunnyvale community and guides local decision-making to advance that vision (City of Sunnyvale 2011). The Land Use and Transpiration Element, updated in April 2017, lays out goals and policies related to biological resources that are relevant to the proposed project (City of Sunnyvale 2017). They include the following;

- *Goal LT-1: Coordinated Regional and Local Planning:* Environmentally sustainable land use and transportation planning and development; Participate in federal, state, and regional programs and processes in order to protect the natural and human environment in Sunnyvale and the region.
    - Policy LT-1.10a: Protect and preserve the diked wetland areas in the baylands to preserve or enhance flood protection.

- Policy LT-1.10b: Coordinate with regional agencies such as the Bay Area Conservation and Development Commission (BCDC) regarding new and changing land uses proposed along the San Francisco Bay.
- Policy LT-1.10c: Advocate the City's interests to regional, state, and federal agencies that have influence over the natural environment in Sunnyvale.
- Policy LT-1.10d: Work with regional agencies on land use and transportation issues that affect the human environment, such as air, water, and noise, for Sunnyvale residents and businesses.
- Policy LT-1.10e: Continue to evaluate and ensure mitigation of potential biological impacts of future development and redevelopment projects in a manner consistent with applicable local, state, and federal laws and regulations.
- Policy LT-1.10f: Continue to condition projects to halt all ground-disturbing activities when unusual amounts of shell or bone, isolated artifacts, or other similar features are discovered. Retain an archaeologist to determine the significance of the discovery. Mitigation of discovered significant cultural resources shall be consistent with Public Resources Code Section 21083.2 to ensure protection of the resource.

- ***Goal LT-2: Environmentally Sustainable Land Use and Transportation Planning and Development;*** Streamside development: Streamside development can affect the health, safety, and general welfare of the city's residents and environment. The following policies are intended to mitigate negative effects of streamside development by avoiding impacts of projects located in proximity to streams.
  - Policy LT-2.6: Address sea level rise, increased rainfall, and other impacts of climate change when reviewing new development near creeks, and consider the projected flood levels over the economic lifespan of the project.

Project Applicability: The project is located within the City of Sunnyvale General Plan area and would need to conform to all applicable requirements. The project will include restoration of tidal aquatic, estuarine wetland, and riparian habitat to compensate for impacts to sensitive habitats, incorporates measures to prevent impacts to water quality within the channel and the lagoon, and will reduce siltation, and will therefore be in line with the vision of City of Sunnyvale. Further, this project will result in a net ecological benefit.

3.3.3 Sunnyvale Tree Ordinance

The City of Sunnyvale's Tree Preservation Ordinance (Sunnyvale Municipal Code, Chapter 19.94) provides for protection, installation, removal, and long-term management of significantly sized trees on private property and on City-owned golf courses and parks. The ordinance defines "protected tree" as a tree of "significant size" (i.e., a tree which has at least one trunk with a circumference 38 inches or greater measured 4.5 feet above ground level, or in which the measurements of the circumferences of each of the multi-trunks, when measured 4.5 feet above the ground level, added together equal an overall circumference of 113 inches or greater). The ordinance sets standards and criteria for issuance of tree removal permits, criteria for replacement trees, and

requirements for replanting programs, tree relocation, and tree protection during site development or modification.

Project Applicability: Arborist reports for two adjacent projects, the Google Caribbean Campus Project and the West Borregas Campus Project, which overlap completely with the Google Sunnyvale West Channel Enhancement Project site have been completed. The results of those reports are provided in Appendix A. The Proposed Project is expected to impact several trees of municipal ordinance size. The loss of non-native ornamental tree species will be compensated by planting of native, riparian trees as part of the riparian mitigation plan.

Section 4. Environmental Setting

4.1 General Project Area Description

The project site and surrounding areas have been heavily disturbed by anthropogenic activities as a result of urbanization and the development of commercial buildings. The project site is located in the city of Sunnyvale in Santa Clara County, California, and is surrounded by dense commercial development. A review of historical aerial photographs indicates that land use within the project region was previously agricultural, but the site has been developed for at least 40 years. The Natural Resource Conservation Service has mapped two soil units for the project: Urbanland-Hangerone complex, 0–2 % slopes, and Urbanland-Embarcadero complex, 0–2 % slopes (Natural Resource Conservation Service 2018). These soil type have variable profiles to a depth of more than 80 inches, with alluvial material generally occurring throughout the soil profile, and are considered a poorly drained soil.

4.2 Biotic Habitats

Reconnaissance level surveys of the site have identified four general habitat types on the site: tidal aquatic and estuarine wetland in the channel itself, ruderal riparian grassland on the banks of the levee, and developed/landscaped outside the levee (Figure 3).

4.2.1 Estuarine Wetlands

Vegetation. Wetlands within the site are classified in the National Wetlands Inventory as Estuarine and Marine Wetland (E2SBNx) (USFWS 2019). Wetlands with this classification are estuarine and intertidal, occurring within a streambed that is completely dewatered at low tide but is regularly flooded and was originally excavated by humans. There is 0.17 acre of estuarine wetlands on the site, consisting of several discontinuous patches of hydrophytic wetland vegetation along either side of the channel (Photo 1). Wetland plant species include California bulrush (*Schoenoplectus californicus*) and alkali bulrush (*Bolboschoenus maritimus*).

Photo 1. Estuarine wetlands occur along the fringes of the channel and are dominated by bulrushes.

Wildlife. This habitat is relatively narrow and linear in the project site and is located adjacent to maintenance road with disturbance from pedestrians and, to some degree, vehicles. Channel maintenance activities by

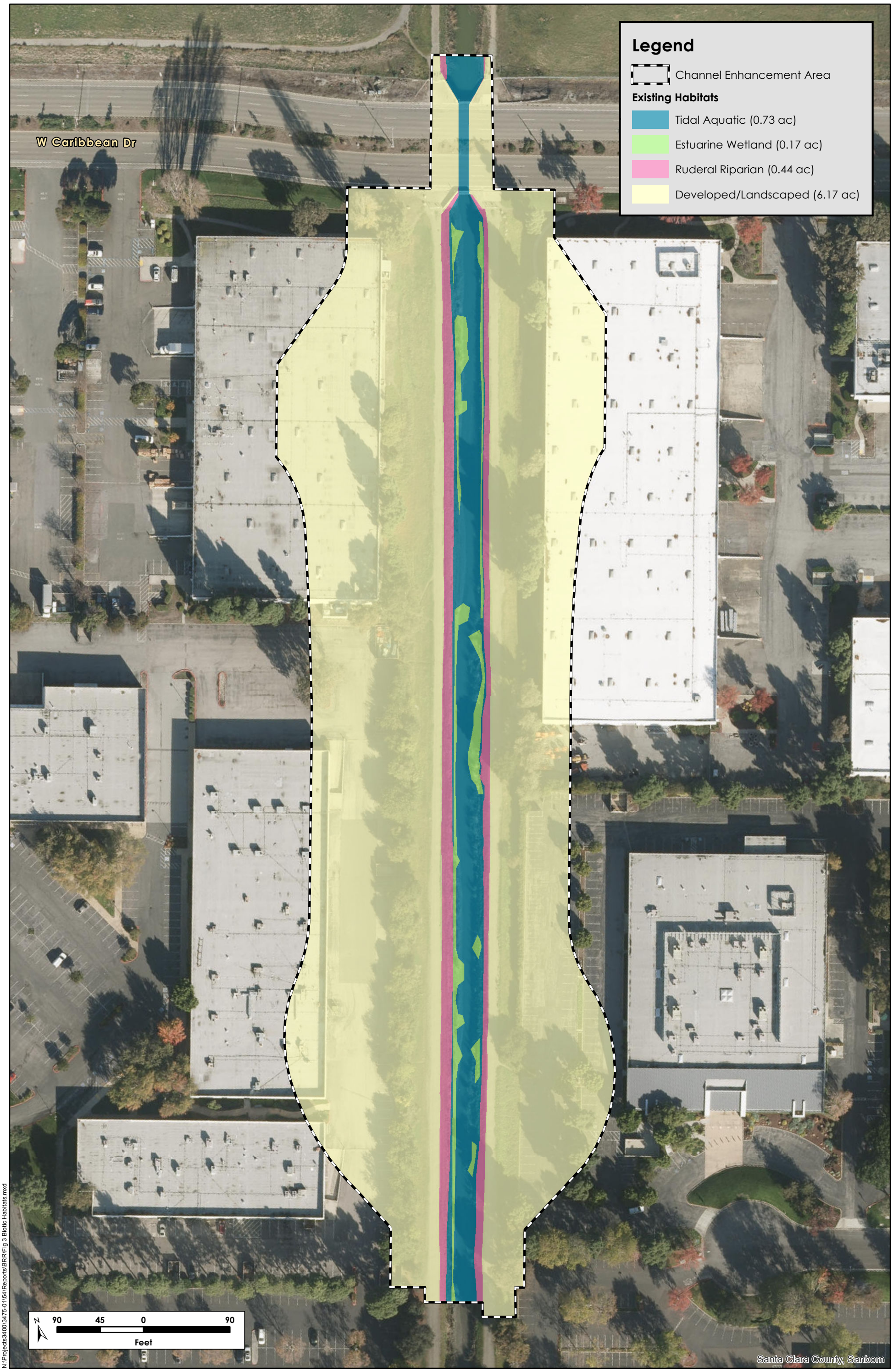
SCVWD periodically reduce the amount of vegetation in the channel. At the time of the preparation of this biological resources report (February 2019), the channel was fairly well grown with bulrush (Photo 1).

Two state taxa of special concern, the Alameda song sparrow, *Melospiza melodia pusillula,* (but see further discussion of the song sparrow taxonomic complex below) and the San Francisco common yellowthroat (*Geothlypis trichas sinuosa*) breed downstream from the project site and the yellowthroat may breed in the project section of the channel when vegetation is extensive enough to provide nesting and foraging habitat. Other species such Pied-billed grebes (*Podilymbus Podiceps*) and American coots (*Fulica americana*) forage in and around clumps of emergent vegetation, as do various herons and egrets, including green herons (*Butorides virescens*) and snowy egrets (*Egretta thula*). The California vole (*Microtus californicus*) occurs in terrestrial habitats and will forage in adjacent brackish marshes.

The narrow, tidal aquatic channel and its adjacent habitats have been subjected to moderate to high levels of disturbance as a result of anthropogenic channelization, hardening of streambanks, installation of culverts, and other factors associated with major human influences. The channel is confined on both sides by urban development and lacks native habitats associated with more natural channel systems. The relatively low-quality habitats currently associated with the channel are reflective of those influences, and include: a narrow, linear channel; relatively steep banks dominated by low, ruderal riparian vegetation lacking woody species; an unvegetated top of bank supporting roads on both levees; and ruderal, nonnative grassland and scattered nonnative trees on the outboard sides. These conditions contribute to low wildlife value for the channel system as a whole.

The combination of the absence of channel diversity and the narrow nature of the channel substantially diminish the value of the channel to wildlife compared to more naturally formed channels, due to the lack of high-quality habitat complexity such as riffle and pool complexes, the relatively shallow water (and thus relatively high temperatures in summer), and regular disturbance of habitats and associated species due to anthropogenic activities. The channel supports few aquatic species, but nonnative crayfish (*Procambarus clarkia*) are present and birds such as mallards (*Anas platyrhynchos*), American coots (*Fulica americana*) and great blue herons (*Ardea herodias*) and other common, widespread wetland species occur. Mammals such as raccoons (*Procyon lotor*), introduced eastern gray squirrels (*Sciurus carolinensis*), and introduced rodents (*Rattus spp.* and *Mus musculus*) likely use the channels for drinking water and foraging. Common, widespread amphibians such as the Pacific treefrog (*Hyliola regilla*) occur in the channel. Wider, more natural channels would support a richer assemblage of species, especially with respect to avian fauna, such as marsh wrens that use emergent marsh habitats.

The lack of quality habitat associated with the other areas of the existing channel system also translates into a less diverse species community relative to more diverse, native marsh, riparian, and upland habitats associated with more natural river and stream systems in the region.



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H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 3. Biotic Habitats

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This project will result in a net increase in wetland and associated upland habitat functions and values for native wildlife associated with the site, as well as increasing the diversity of wildlife that will use the site.

4.2.2 Tidal Aquatic

Vegetation. There is 0.73 acre of tidal aquatic habitat on the site (Figure 3). Tidal aquatic habitat consists entirely of the unvegetated muddy channel bed subject to tidal inundation (Photo 2). This habitat type is located in the middle of the storm drain channel.

Photo 2. Tidal aquatic habitat consists of the unvegetated muddy channel bed that subject to tidal inundation.

Wildlife. Although quite limited in extent in the project area, the unvegetated tidal aquatic habitat provides foraging opportunities for shorebirds such as the spotted sandpiper (*Actitis macularius*), least sandpiper (*Calidris minutilla*) and greater yellowlegs (*Tringa melanoleuca*) when water levels allow for foraging in the channel. Song sparrows and other species of sparrows and red-winged blackbirds (*Agelaius phoeniceus*) forage on mudflats adjacent to terrestrial and emergent vegetation.

4.2.3 Ruderal Riparian Grassland

Vegetation. There is 0.44 acre of ruderal riparian habitat on the site (Photo 3). This habitat type occurs on the banks and levees of the channel, from the high tide line to top of bank. This habitat consist of predominantly nonnative herbaceous species, such as wild oats (*Avena* sp.), ripgut brome (*Bromus diandrus)*, soft chess (*Bromus hordeaceous*), yellow star thistle (*Centaurea solstitialis*), and black mustard (*Brassica nigra*) and is routinely mowed as part of SCVWD's routine channel maintenance program. There are no woody plants present within the existing riparian habitat.

Photo 3. Ruderal riparian habitat on the banks of the channel levee.

Wildlife. Wildlife use of the ruderal riparian grassland on the project area is limited not only by the limited and isolated extent of the habitat in the project area, but by frequent human disturbance and an abundance of non-native and invasive species. Resident species that occur in this habitat include the mourning dove, (*Zenaida*

macroura), bushtit (*Psaltriparus minimus*), lesser goldfinch (*Spinus psaltria*), and Brewer's blackbird (*Euphagus cyanocephalus*). A number of other avian species use this habitat during the migration and wintering periods, including the warbling vireo, yellow warbler (*Setophaga petechia*), golden-crowned sparrow (*Zonotrichia atricapilla*), white-crowned sparrow (*Z. leucophrys*) and Lincoln's sparrow (*Melospiza lincolnii*).

Few species of reptiles and amphibians occur in the ruderal riparian grassland in the study area due to its limited extent and disturbed nature. Reptiles such as the western fence lizard (*Sceloporus occidentalis*) and gopher snake (*Pituophis melanoleucus*) occur in this habitat type. Small mammals expected to be present include the native western harvest mouse (*Reithrodontomys megalotis*) and nonnative house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), and black rat (*Rattus rattus*) and larger mammals, such as the striped skunk, Virginia opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*) are likely to occur in this habitat.

4.2.4 Developed/Landscaped

Vegetation. Beyond the top of the levee the habitat type is characterized as developed/ landscaped, consisting of asphalt pavement and existing commercial buildings with associated landscaping (Photo 4). A complete list of trees on the project site is provided in the arborist report for the project (Appendix A). Non-native tree species on the site include Canary Island pine (*Pinus canariensis*), lemonwood (*Pittosporum eugenioides*), glossy privet (*Ligustrum lucidum*), carob (*Ceratonia siliqua*), eucalyptus (*Eucalyptus* spp.), and liquidambar (*Liquidambar styraciflua*). Landscaped areas also contained a variety of non-native plants and shrubs, such as oleander (*Nerium oleander*), as well as ground cover, such as grass lawns and English ivy (*Hedera helix*).

Photo 4. Developed and landscaped areas adjacent the channel levee.

Wildlife. The wildlife associated with the developed/landscaped areas on the project site primarily represent species that are widespread, common, urban-adapted species. Such resident bird species include American Crows (*Corvus brachyrhynchos*), Anna's hummingbirds (*Calypte anna*), chestnut-backed chickadees (*Poecile rufescens*), black phoebes (*Sayornis nigricans*), house finches (*Haemorhous mexicanus*), dark-eyed juncos (*Junco hyemalis*) and, house sparrows (*Passer domesticus*). Avian species that use this habitat during migration or winter include species such as the yellow-rumped warbler (*Setophaga coronata*) and white-crowned sparrow. Mammals and reptiles that use this habitat are the same as those described for ruderal riparian grassland habitat on the site.

Section 5. Special-Status Species and Sensitive Habitats

CEQA requires assessment of the effects of a project on species that are protected by state, federal, or local governments as "threatened, rare, or endangered"; such species are typically described as "special-status species". For the purpose of the environmental review of the project, special-status species have been defined as described below. Impacts on these species are regulated by some of the federal, state, and local laws and ordinances described in Section 3.0 above.

For purposes of this analysis, "special-status" plants are considered plant species that are:

- Listed under FESA as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under CESA as threatened, endangered, rare, or a candidate species.
- Listed by the CNPS as CRPR 1A, 1B, 2, 3, or 4.

For purposes of this analysis, "special-status" animals are considered animal species that are:

- Listed under FESA as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under CESA as threatened, endangered, or a candidate threatened or endangered species.
- Designated by the CDFW as a California species of special concern.
- Listed in the California Fish and Game Code as fully protected species (fully protected birds are provided in Section 3511, mammals in Section 4700, reptiles and amphibians in Section 5050, and fish in Section 5515).

Information concerning threatened, endangered, and other special-status species that potentially occur in the study area was collected from several sources and reviewed by H. T. Harvey & Associates biologists as described in Section 2.1 above. Figure 4 depicts CNDDB records of special-status plant species in the general vicinity of the study area and Figure 5 depicts CNDDB records of special-status animal species. These generalized maps show areas where special-status species are known to occur or have occurred historically.

5.1 Special-Status Plant Species

The CNDDB (2019) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2019) were queried for rare plant species that occur in the project region. The majority of potentially occurring rare plant species were determined to be absent from the project site for at least one of the following reasons: (1) absence of suitable habitat types; (2) lack of specific microhabitat or edaphic requirements, such as serpentine soils; (3) the elevation

range of the species is outside of the range on the site; and/or (4) the species is presumed extirpated from the project region. Based on this analysis and the habitat types observed during the site survey, Congdon's tarplant, which has a CNPS Rare Plant Ranking of 1B.1 (seriously threatened in California), was the only special-status plant species determined to have the potential to occur on the site.

Congdon's tarplant is an annual herb in the composite family (Asteraceae) that is endemic to California. It has a variable blooming period extending from May through November. Congdon's tarplant occurs in valley and foothill grassland habitat, floodplains, and swales (particularly those with alkaline substrates) and in disturbed areas with non-native grasses (CNDDB 2019, CNPS 2019, Baldwin et al. 2012). The CNDDB has recorded two occurrences of Congdon's tarplant in buffer lands within 2.0 mile of the site (CNDDB 2019), and the species can persist in disturbed grassland habitats such as the ruderal habitat on the project site. The closest occurrences of the species to the project site (CNDDB occurrences #41 and #102) are located approximately 1.3 mile to the west at Moffett Federal Airfield and 1.3 mile to the east at the Sunnyvale Baylands Park in disturbed grasslands (CNDDB 2019). Thus, the ruderal grassland habitat on the project site could potentially support this special-status plant species, as suitable habitat is present on the site and populations of the species are present in similar habitats nearby. However, protocol-level surveys conducted by H. T. Harvey & Associates staff in August 2012 along the Sunnyvale West Channel, which included the area of ruderal grassland habitat on the project site, did not detect this species (SCVWD 2014), and there have been no changes to this habitat since the surveys were performed to indicate the species would now be present. Thus, **Congdon's tarplant is determined to be absent** from the project site.

5.2 Special-Status Animal Species

The SEWSDC EIR reviews the status of all the special-status species that are known to occur in the Sunnyvale West Channel site, that may occur on the site, and that occur regionally, but are not likely to occur on the site (SCVWD 2014). Only those species determined to be present or likely to be present along the project reach of the Sunnyvale West Channel are covered in this BRR, and the reader is referred to the SEWSDC EIR for further information on species determined to be absent from the site. Two federally listed species and/or their critical habitat have the potential to occur in the project site: Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and North American green sturgeon (*Acipenser medirostris*). The project reach of the Sunnyvale West Channel comprises critical habitat for both the federally listed species. Longfin smelt (*Spirinchus thaleichthys*), a species listed as threatened under the California Endangered Species Act and a Candidate for listing under the Federal Endangered Species Act, also has the potential to occur in the project area.

Due to the marginal quality of the habitat and very low summer flows, as well as inclusion of avoidance measures designed to protect fish, the USACE previously concluded that the SCVWD Flood Protection project would not require Section 7 Consultation for activities in this reach (pers. communication between SCVWD and Keith Hess of the USACE, July 29, 2017). Several project measures, intended to protect aquatic wildlife and habitat that require passive fish relocation and measures to prevent entrapment, will be implemented to avoid and minimize impacts to Essential Fish Habitat (EFH) within the project reach and any fish regulated by

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Figure 4. CNDDB plants
Google West Channel Enhancement Project Biological Resources Report (3475-54)
July 2019

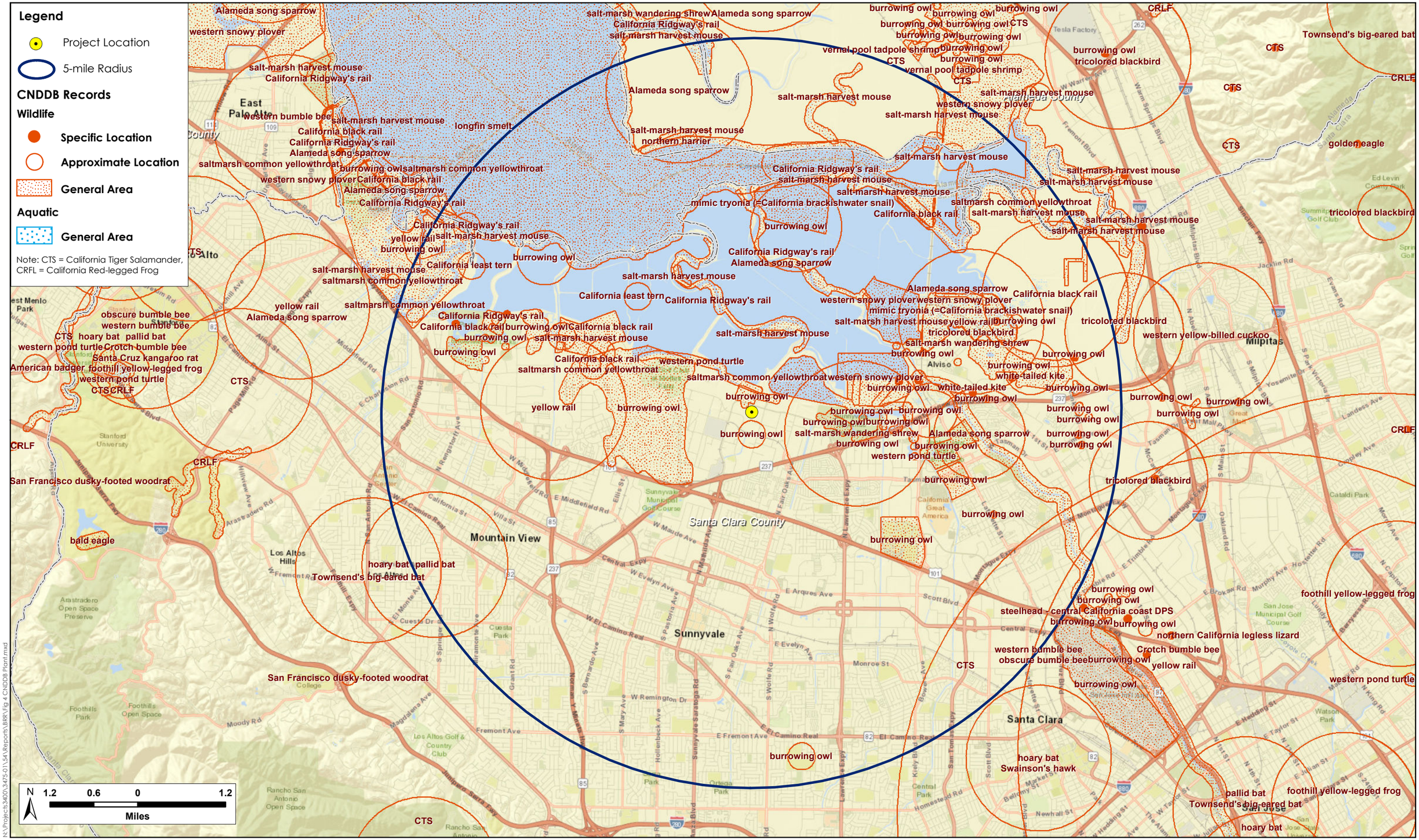

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Figure 5. CNDDB animals
Google West Channel Enhancement Project Biological Resources Report (3475-54)
July 2019

the Coastal Pelagics and Pacific Groundfish Fishery Management Plan. Dewatering and other BMPs as described in the project's regulatory permit applications will further be used to prevent water-quality impacts. In-channel work will be restricted to the dry season from April 15 to October 15, when flows are low and warm within the channel and listed fish are not expected to occur.

Native nesting birds, including special-status species, are protected under the federal Migratory Bird Treaty Act and the California Department of Fish and Wildlife code. Loss of eggs or nestlings ("take") via project activities would violate these laws. Take-avoidance measures for these species are presented below. The LUTE EIR includes the protection of nesting native species of birds under the federal Migratory Bird Treaty Act and the California Fish and Game Code.

One California Endangered Species Act species listed as threatened, the tricolored blackbird (*Agelaius tricolor*) and several California Species of Special Concern (CSSC) that are not state or federally listed as threatened or endangered that are known to be, or have the potential to be, present in the project area, and are discussed below. Impacts on these and other special-status species were discussed in the SEWSDC EIR, which addressed potential environmental impacts of the Flood Protection Project that is part of the SCVWD's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan. The goal of the CSC Plan is to provide 100-year riverine flood protection to approximately 1,618 properties and 47 acres within the city of Sunnyvale. The SEWSDC EIR considered activities that would potentially modify habitat in and around the storm drain channels, including earthen storm drain channel restoration, installation of rock slope protection, floodwall construction, bridge/culvert modifications, and other storm drain channel modifications.

The following descriptions comprise an overview of the existing habitat value for the special-status species wildlife that occur, or might occur, within the project area.

5.2.1 Tricolored Blackbird (*Agelaius tricolor*)

Federal Listing Status: None; State Listing Status: Threatened—This species was listed as a threatened species by the California Fish and Game Commission on April 19, 2018. Tricolored blackbirds are found primarily in the Central Valley and in central and southern coastal areas of California. Suitable nesting habitat for the tricolored blackbird is not present in the project site; however, the species is known to forage on the lower reaches of the Sunnyvale West Channel and the former landfills just north of the project site during the nonbreeding season (Santa Clara Valley Water District Sunnyvale East and West Channels Flood Protection Project Draft Environmental Impact Report (SEWSDCEIR – SCVWD 2013). Lack of breeding habitat on the project site indicates that this species will not be significantly impacted by the project.

5.2.2 Western Pond Turtle (*Actinemys marmorata*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—The western pond turtle may be present in the project site. Western pond turtles still occur in urban streams and ponds in the region. Ponds or slack-water pools with suitable basking sites (e.g., logs, banks) are an important habitat component

for this species. Nesting habitat is typically found within 600 feet of aquatic habitat (Jennings and Hayes 1994), but if no suitable nesting habitat can be found close by, adults may travel overland considerable distances to nest. Females lay eggs in upland habitats with clay or silty soils in unshaded, often south-facing areas up to 0.25 mile from aquatic habitat (Jennings and Hayes 1994). Juveniles feed and grow in shallow aquatic habitats (often creeks) with emergent vegetation and ample invertebrate prey.

In the project vicinity, the western pond turtle has been documented within the Lockheed Channel and North Moffett Channel west of the Sunnyvale West Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006, as cited in EDAW 2007). Consequently, although no western pond turtles were observed in the lower reaches of the project area during focused surveys in 2012 for the SEWSDCEIR (SCVWD 2013), it is likely that small numbers of pond turtles occur in channels in the project region, including the Sunnyvale West Channel, especially in the northern portion of the channel given its hydrological connection to North Moffett Channel. The channel does not currently provide optimal habitat for western pond turtle. Both adults and juveniles prefer deep, slow water and suitable basking sites. The project site is of marginal habitat quality due to the narrow width and relatively shallow nature of the channel, lacking structural complexity that would provide refugia and basking sites.

5.2.3 Northern Harrier (*Circus cyaneus*)

Federal Listing Status: None; State Listing Status: Species of Special Concern (Nesting)—The northern harrier is not expected to nest within the project site due to the absence of suitable nesting substrate or habitat; however, this species is known to breed in the vicinity of the project site. Breeding individuals may at least occasionally forage within the project site boundary, but the site does not provide important or extensive foraging habitat used regularly by this species.

5.2.4 Burrowing Owl (*Athene cunicularia*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—The burrowing owl, a CSSC, occurs in the project region. The abundance of this species has decreased dramatically in the South Bay region, including the project vicinity. During surveys conducted in the winter of 2007–2008 (EDAW 2008), a burrowing owl was detected on the west bank of the Sunnyvale East Channel opposite the Twin Creeks Sports Complex; a burrow with evidence of owl use (i.e., whitewash) was documented along the Sunnyvale West Channel. During 2012 and early 2013, one to two burrowing owls were reported on the landfill (north of the project site) just west of the Sunnyvale West Channel, north of Caribbean Drive (South Bay Birds List-serve 2013), although the last successful nesting attempts occurred on the landfill in 1999 and inside the Water Pollution Control Plant in 2004 (H. T. Harvey & Associates 2015). In addition, in November 2012 the SCVWD reported a burrowing owl on the west side of the Sunnyvale West Channel just upstream of the Carl Road Bridge (Hernandez pers. comm. 2012). The CNDDB (2019) includes two records of burrowing owls along the northernmost portion of the West Channel, and one record adjacent to the northernmost portion of the Sunnyvale East Channel. Although burrows of California ground squirrels were observed along the Sunnyvale East and West Channels throughout the project area for the SEWSDC EIR during surveys conducted in January

2013, burrowing owls are unlikely to nest in such limited habitat areas surrounded by dense development and large trees and buildings that provide perches for predatory raptors. Nevertheless, owls are known to use extremely small areas of ruderal habitat in the South Bay, and it is possible that owls could occasionally roost along the Sunnyvale West Channel in developed areas.

5.2.5 Loggerhead Shrike (*Lanius ludovicianus*)

Federal Listing Status: None; State Listing Status: Species of Special Concern (Nesting)—Loggerhead shrikes nest in a number of locations in the project region where open grassland, ruderal, or agricultural habitat with scattered brush, chaparral, or trees that provide perches and nesting sites, occur (Bousman 2007a). This species occurs slightly more widely (i.e., in smaller patches of open areas providing foraging habitat) during the nonbreeding season. Ruderal habitats near the project site, particularly those on the former landfills surrounding the City of Sunnyvale Recycle Center and Water Pollution Control Plant (WPCP), provide suitable nesting, roosting, and foraging habitat for one or two pairs of loggerhead shrikes, but the species is not expected to breed on the project site due to the limited extent of open habitat in the surrounding area.

5.2.6 Yellow Warbler (*Setophaga petechia*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—Small numbers of yellow warblers still nest in remnant riparian areas within Santa Clara County (Bousman 2007b). Suitable nesting habitat consists of riparian corridors, often with an overstory of mature cottonwoods (*Populus* sp.) and sycamores (*Platanus* sp.), a midstory of box elder (*Acer negundo*) and willow (*Salix* sp.), and a substantial shrub understory (Bousman 2007b). Riparian areas with a reduced understory due to grazing or disturbance are generally not used by this species, and riparian corridors lacking open ruderal or herbaceous vegetation along the edges of the corridors, or with development up to the corridor edge, are often avoided as well. Thus, suitable nesting habitat for yellow warbler is absent from the project site. However, the yellow warbler is an abundant migrant throughout the project region during the spring and especially in fall, and it occurs along the Sunnyvale Channels as an occasional forager during the nonbreeding season.

5.2.7 San Francisco Common Yellowthroat (*Geothlypis trichas sinuosa*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—The San Francisco common yellowthroat inhabits emergent vegetation, and nests in freshwater and brackish marshes and moist floodplain vegetation around San Francisco Bay. Common yellowthroats will use small and isolated patches of habitat as long as groundwater is close enough to the surface to encourage the establishment of dense stands of rushes (*Scirpus* and *Juncus* spp.), cattails (*Typha* spp.), willows, and other emergent vegetation (Nur et al. 1997, Terrill 2000, Gardali and Evens 2008). Ideal habitat comprises extensive and thick riparian, marsh, or herbaceous floodplain vegetation in perpetually moist areas, where populations of brown-headed cowbirds are low (Menges 1998). San Francisco common yellowthroats nest primarily in freshwater and brackish marshes, although they also nest in salt marsh habitats that support tall vegetation. This subspecies builds open-cup nests low in the vegetation, and nests from mid-March through late July (Gardali and Evens 2008).

In the South Bay, the San Francisco common yellowthroat is a fairly common breeder in freshwater and brackish marshes. This species is known to nest near the edge of the South Bay, as well as in herbaceous riparian habitat and ruderal floodplain habitat along streams entering the bay. Within the project vicinity, the species has been recorded in both the spring and summer in Pond A4, as well as along Moffett Channel and Guadalupe Slough. The lower, tidal reaches of the Sunnyvale West Channel also provide suitable nesting and foraging habitat for this species. However, the limited amount of vegetation along the project section of the channel and the narrow swaths of channel habitat confined by the levees limit the extent of breeding habitat, and the quality and extent of foraging habitat, on the project site. However, this taxon may breed in the project reach when emergent vegetation is sufficiently dense.

5.2.8 Alameda Song Sparrow (*Melospiza melodia pusillula*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—Prime habitat for the Alameda song sparrow is fully tidal salt marsh consisting of large areas of tidally influenced salt marsh vegetation dominated by cordgrass (*Spartina* sp.) and gumplant (*Grindelia* sp.) and intersected by tidal sloughs, offering dense vegetative cover and singing perches. Although the special-status *pusillula* subspecies of song sparrow is occasionally found in brackish marshes dominated by bulrushes, it is apparently very sedentary and is not known to disperse upstream into freshwater habitats (Basham and Mewaldt 1987). Where suitable nesting habitat is continuous along creeks, song sparrows appear to nest continuously from tidal salt marshes, where the breeding subspecies is *pusillula*, upstream to freshwater marsh and woody riparian habitats, where the breeding subspecies is an upland or freshwater associated subspecies *gouldii*. The line of demarcation (or perhaps more accurately, the zone of intergradation) along these sloughs between these two subspecies is unknown (Rottenborn 2007); a recent study indicates that song sparrows nesting along the lower portions of the Sunnyvale Channels may belong to the *pusillula* or *gouldii* subspecies, or may be intergrades between the two (SFBBO 2012). .

5.2.9 American Peregrine Falcon (*Falco peregrinus anatum*)

Federal Listing Status: None; State Listing Status: Fully Protected—The only locations in the project vicinity where peregrine falcons have been detected nesting are old raven and hawk nests on electrical transmission towers within managed ponds in the Mountain View/Alviso area, more than 2 miles north of the project site. The species is not known or expected to nest in the immediate project area; however, peregrine falcons nesting elsewhere in the South Bay, as well as migrants and wintering birds, forage occasionally in the project region, particularly in the vicinity of Pond A4 and the WPCP ponds.

5.2.10 Golden Eagle (*Aquila chrysaetos*)

Federal Listing Status: None; State Listing Status: Fully Protected—Suitable foraging habitat for golden eagles occurs in the northern portion of the project region (i.e., north of Caribbean Drive), and nonbreeding eagles may occasionally forage there. For example, an immature golden eagle was observed along the canals west of the WPCP in January 2012 (South Bay Birds List-serve 2013). However, this species occurs very rarely around the immediate edge of the baylands in the South Bay, and based on the infrequency with which it has been reported in this area (which is heavily used by birders), it is expected to forage infrequently in open habitats

within and adjacent to the project area (such as on the old landfills). The reach of the Sunnyvale West Channel associated with this project offers extremely limited foraging habitat for this species and the developed nature of much of the surroundings further limits the value of the site to the species.

5.2.11 White-Tailed Kite (*Elanus leucurus*)

Federal Listing Status: None; State Listing Status: Fully Protected—In the project vicinity, white-tailed kites are known to nest along the northern edge of Santa Clara County throughout the open areas edging the San Francisco Bay (Bousman 2007c). Although neither the Breeding Bird Atlas of Santa Clara County, California (Bousman 2007c) nor the Santa Clara County Bird Data (unpublished) contained specific mention of the species as occurring at the project site, there are a number of records from Moffett Field to the west and some from Sunnyvale Baylands Park to the east (South Bay Birds List-serve 2013). White-tailed kites nest in trees or shrubs, typically in areas away from high human activity, and those with extensive open foraging habitat with adequate prey. Thus, the project site may provide some limited foraging opportunities for this species, but it does not provide breeding habitat, and the quality of the foraging habitat is quite limited. However, there are trees within the 300 foot buffer zone of the limit of project activities that provide potential breeding sites.

5.3 Sensitive Natural Communities, Habitats, and Vegetation Alliances

Natural communities have been considered part of the Natural Heritage Conservation triad, along with plants and animals of conservation significance, since the state inception of the Natural Heritage Program in 1979. The CDFW determines the level of rarity and imperilment of vegetation types, and tracks sensitive communities in its Rarefind database (CNDDB 2019). Global rankings (G) of natural communities reflect the overall condition (rarity and endangerment) of a habitat throughout its range, whereas state (S) rankings are a reflection of the condition of a habitat within California. Natural communities are defined using NatureServe's standard heritage program methodology as follows (Faber-Langendoen et al. 2012):

G1/S1: Critically imperiled.

G2/S2: Imperiled.

G3/S3: Vunerable.

G4/S4: Apparently secure.

G5/S4: Secure.

In addition to tracking sensitive natural communities, the CDFW also ranks vegetation alliances, defined by repeating patterns of plants across a landscape that reflect climate, soil, water, disturbance, and other environmental factors (Sawyer et al. 2009). If an alliance is marked G1-G3, all of the vegetation associations within it will also be of high priority (CDFW 2019). The CDFW provides the Vegetation Classification and Mapping Program's (VegCAMP) currently accepted list of vegetation alliances and associations (CDFW 2019).

Impacts on CDFW sensitive natural communities, vegetation alliances/associations, or any such community identified in local or regional plans, policies, and regulations, must be considered and evaluated under CEQA (Title 14, Division 6, Chapter 3, Appendix G of the California Code of Regulations). Furthermore, aquatic, wetland and riparian habitats are also protected under applicable federal, state, or local regulations, and are generally subject to regulation, protection, or consideration by the USACE, RWQCB, CDFW, and/or the USFWS.

Sensitive Natural Communities. A query of sensitive habitats in Rarefind (CNDDB 2019) identified three sensitive habitats as occurring within the nine USGS quadrangles containing or surrounding the study area: serpentine bunchgrass (Rank G2/S2.2), valley oak woodland (G3/S2.1), and northern coastal salt marsh (Rank G3/S3.2). Serpentine bunchgrass occurs only on serpentine soils, which do not occur in the study area. Valley oak woodland is characterized by valley oak (*Quercus lobata*) as the dominant or co-dominant species in the tree canopy. While some valley oak trees do occur in the study area, they are ornamental plantings along buildings and roadways, and thus do not constitute this sensitive habitat type. The last sensitive habitat type, northern coastal salt marsh, is described by Holland (1986) as occurring along sheltered inland margins of bays, often co-dominated by pickleweed (*Salicornia* spp.), cordgrass (*Spartina* spp.), and sometimes saltgrass (*Distichlis spicata*). Northern coastal salt marsh occurs north of the project in channel but does not occur in the study area (Figure 3).

Sensitive Vegetation Alliances. There are no sensitive vegetation alliances in the study area.

Sensitive Habitats (Waters of the U.S./State). The tidal aquatic and estuarine wetlands in the study area may be considered waters of the U.S./state. Any impacts on verified waters of the U.S./state within the study area would require a Section 404 permit from the USACE and Section 401 Water Quality Certification from the San Francisco RWQCB.

Section 6. Impacts and Mitigation Measures

The State CEQA Guidelines provide direction for evaluating the impacts of projects on biological resources and determining which impacts will be significant. CEQA defines a "significant effect on the environment" as "a substantial adverse change in the physical conditions which exist in the area affected by the proposed project." Under State CEQA Guidelines Section 15065, a project's impacts on biological resources are deemed significant if the project would:

A. "substantially reduce the habitat of a fish or wildlife species"

B. "cause a fish or wildlife population to drop below self-sustaining levels"

C. "threaten to eliminate a plant or animal community"

D. "reduce the number or restrict the range of a rare or endangered plant or animal"

In addition to the Section 15065 criteria that trigger mandatory findings of significance, Appendix G of State CEQA Guidelines provides a checklist of other potential impacts to consider when analyzing the significance of project effects. The impacts listed in Appendix G may or may not be significant, depending on the level of the impact. For biological resources, these impacts include whether the project would:

A. "have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service"

B. "have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service"

C. "have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means"

D. "interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites"

E. "conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance"

F. "conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan"

6.1 Approach to the Analysis

Project construction will result in temporary impacts on 0.73 ac of tidal aquatic habitat, 0.17 ac of estuarine wetland, and 0.44 ac of ruderal riparian habitat (Figure 2). No permanent loss of wetlands or waters of the United States/state will result from implementation of this project; however, there will be two permanent changes to channel conditions. These changes will consist of the realignment of the channel and the channel shading by the two proposed bridges and the cantilevered culvert extension at West Caribbean Drive. There is also a small area (less than 0.01 ac; 13 sq ft) of ruderal riparian habitat that will be converted to hardscape associated with construction of a floodwall.

6.1.1 Temporary Impacts

In order to achieve project design goals, extensive grading is required on the site. Grading will result in temporarily affecting 100% of the tidal aquatic habitat, estuarine wetland, and ruderal riparian habitat types on site. The grading will require dewatering the entire project reach, removing all existing vegetation, and importing soil to build up the new, larger earthen levees.

6.1.2 Permanent Impacts

The addition of two new bridges across the project reach and the culvert extension at West Caribbean Drive will not require placement of fill within existing tidal aquatic or estuarine wetland habitats. However, the installation of these structures will result in some shading of estuarine wetlands, which is considered a permanent impact. There will also be a small permanent conversion of less than 0.01 ac (13 sq ft) of existing ruderal riparian habitat to hardscape for floodwall construction.

6.2 Impacts on Special-Status Species: Will the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS? (Less than Significant with Mitigation)

6.2.1 Impacts on Steelhead, Green Sturgeon, and Longfin Smelt (Less than Significant with Mitigation)

As indicated earlier, two federally listed species and/or their critical habitat have the potential to occur in the project site: Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and North American green sturgeon (*Acipenser medirostris*). In addition, the longfin smelt (*Spirinchus thaleichthys*), a species listed as threatened under the California Endangered Species Act and a Candidate for listing under the Federal Endangered Species Act, also has the potential to occur in the project area.

Due to the marginal quality of the habitat and very low summer flows, as well as inclusion of avoidance measures designed to protect fish, the USACE previously concluded that the SCVWD Flood Protection project

would not require Section 7 Consultation for activities in this reach (pers. communication between SCVWD and Keith Hess of the USACE, July 29, 2017).

Several project mitigation measures, intended to protect aquatic wildlife and habitat that require passive fish relocation and measures to prevent entrapment, will be implemented to avoid and minimize impacts to EFH within the project reach and any fish regulated by the Coastal Pelagics and Pacific Groundfish Fishery Management Plan. Dewatering and other BMPs as described in the project's regulatory permit applications will further be used to prevent water-quality impacts. In-channel work will be restricted to the dry season from April 15 to October 15, when flows are low and warm within the channel and listed fish are not expected to occur. Dewatering and Best Management Practices will follow those covered in the SEWSDC EIR (BMP-2).

6.2.2 Western Pond Turtle (Less than Significant with Mitigation)

A small population of western pond turtles is known to be present within the Lockheed Channel and North Moffett Channel west of the Sunnyvale West Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006 as cited in EDAW 2007; Santa Clara Valley Water District 3.3 Biological Resources Sunnyvale East and West Channels Flood Protection Project Draft Environmental Impact Report 3.3-63 October 2013). Consequently, it is likely that small numbers of western pond turtles occur in the Sunnyvale Channels, especially in the northern portion of the West Channel given its hydrological connection to North Moffett Channel. However, given that no western pond turtles were observed in these lower portions of the Sunnyvale Channels during a focused survey for the species in by H. T. Harvey& Associates in 2012, and given that urbanization likely precludes the maintenance of a viable population in the upper portions of these channels, western pond turtles are expected to occur in the Sunnyvale Channels infrequently and in low numbers. Dewatering and other BMPs as described in the project's regulatory permit applications that cover applicable best management practices (see below) for performing project activities within and adjacent to an active channel will further be used to prevent water-quality impacts, including those to western pond turtles and the channel habitat.

Although western pond turtles are widespread in the project region, the species is not particularly abundant. Because individuals of this species can be long-lived, the widespread nature of the species in the project region may belie a population that likely would decline substantially in the future because of poor reproduction, as young turtles are seen in relatively few parts of the project region. Therefore, the loss of individuals could reduce the viability of a population to the extent that it would be extirpated. This impact would be considered significant under CEQA and is covered under the SEWSDC EIR (Impact BIO-5)

Implementation of the mitigation measure below would reduce these impacts to a less-than-significant level by minimizing the potential for the loss of individual western pond turtles and their nests as covered under Mitigation Measure BIO-3 of the SEWSDC EIR (which the mitigation measures in the document conform to) and was determined to be less than significant with mitigation.

A qualified biologist shall conduct a pre-activity survey for western pond turtles and their nests within 48 hours prior to the commencement of project work, including dewatering, within the Sunnyvale West Channel. If an

adult or juvenile western pond turtle is found, project activities in the vicinity of the turtle shall cease until the individual has either left the work area on its own, or it has been relocated to an appropriate site outside the project area by a qualified biologist. If an active western pond turtle nest is detected within the activity area, a 25-foot buffer zone around the nest will be established and maintained during the nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist.

Following the initial survey, a construction crewmember who has been trained to identify western pond turtles by a qualified biologist shall conduct a survey of the in-channel activity area each morning prior to the onset of construction activities. If a turtle is located, all work in the vicinity shall immediately cease, and a qualified biologist shall be contacted. Work within the area shall not resume until the turtle has been relocated or has moved out of the area where it could be impacted.

6.2.3 White-Tailed Kite (Less than Significant with Mitigation)

The white-tailed kite is a state fully protected species. In California white-tailed kites can be found in the Central Valley and along the coast in grasslands, agricultural fields, cismontane woodlands, and other open habitats (Zeiner et al. 1990, Dunk 1995, Erichsen et al. 1996). White-tailed kites are year-round residents of the state, establishing nesting territories that encompass open areas with healthy prey populations and snags, shrubs, trees, or other substrates for nesting (Dunk 1995). Nonbreeding birds typically remain in the same area over the winter, although some movements do occur (Polite 1990). The presence of white-tailed kites is closely tied to the presence of prey species, particularly voles, and prey base may be the most important factor in determining habitat quality for white-tailed kites (Dunk and Cooper 1994, Skonieczny and Dunk 1997). Although the species recovered after population declines during the early 20th century, its populations may be exhibiting new declines because of recent increases in habitat loss and disturbance (Dunk 1995, Erichsen et al. 1996).

White-tailed kites are common residents in less-developed portions of the project region where open grassland, ruderal, or agricultural habitats are present. Although there is not breeding habitat for this species in the project area, white-tailed kites occur year-round at the WPCP and at the Sunnyvale Baylands Park. Large trees near the project site provide potential nesting sites for up to one pair of kites, and the species may nest in these trees and forage over the open grassland areas at the Landfill/WPCP. Based on site observations, the areal extent of the study area, and known breeding densities of these species, it is likely that no more than one pair of white-tailed kites could potentially nest in the vicinity of the project site. If project construction cannot occur outside the breeding season (February 1 to August 31), surveys will be conducted for active white-tailed kite nests within 300 feet of the project construction area. If an active kite nest is found, a 300 foot (or an alternative buffer area established via consultation with the California Department of Fish and Wildlife) non-construction buffer area shall be established between the nest and project construction activities. Impacts to white-tailed kites in the SEWSDC EIR are covered under Impact BIO-7 and the mitigation measures outlined above fit within the applicable best management practices BMP BIO-8 and BMP BIO-9 in the SEWSDC EIR. In

addition, these best management practices comply with federal (the Migratory Bird Treaty Act) and State (The California Department of Fish and Game Code) laws as presented in the LUTE EIR.

6.2.4 Burrowing Owl (Less than Significant with Mitigation)

Pre-construction surveys for burrowing owls shall be conducted prior to the initiation of all Project activities within suitable burrowing owl habitat (i.e., ruderal/grassland habitat with burrows of California ground squirrels)[1]. Pre-construction surveys will be completed in conformance with the CDFW's 2012 guidelines (CDFG 2012). An initial habitat assessment will be conducted by a qualified biologist to determine if suitable burrowing owl habitat is present in a given area. During the initial site visit, a qualified biologist will survey the entire activity area and (to the extent that access allows) the area within 250 feet of the site for suitable burrows that could be used by burrowing owls for nesting or roosting. If no suitable burrowing owl habitat (i.e., ruderal grasslands with burrows of California ground squirrels) is present within a given area, no additional surveys will be required. If suitable burrows are determined to be present within 250 feet of work areas, a qualified biologist will conduct three additional surveys to investigate each burrow within the survey area for signs of owl use and to determine whether owls are present in areas where they could be affected by proposed activities. The final survey shall be conducted within the 24-hour period prior to the initiation of Project activities in any given area. Because Project activities may be phased, these survey efforts may also need to be performed in phases to ensure that burrowing owls are not present in work areas when Project activities commence. This measure applies to the staging areas as well as the Project areas along the Sunnyvale Channels.

If burrowing owls are present during the non-breeding season (generally September 1 to January 31), a 150-foot buffer zone shall be maintained around the occupied burrow(s), if feasible. If maintaining such a buffer is not feasible, then the buffer must be great enough to avoid injury or mortality of individual owls, or else the owls should be passively relocated in consultation with CDFW. During the breeding season (generally February 1 to August 31), a 250-foot buffer, within which no new Project-related activities will be permissible, will be maintained between Project activities and occupied burrows. Owls present between February 1 and August 31 will be assumed to be nesting, and the 250-foot protected area will remain in effect until August 31. If monitoring evidence indicates that the owls are no longer nesting or the young owls are foraging independently, the buffer may be reduced or the owls may be relocated prior to August 31, in consultation with the CDFW.

If construction will directly impact occupied burrows, a qualified biologist will passively evict owls from burrows during the nonbreeding season (September 1 to January 31). No burrowing owls will be evicted during the nesting season (February 1 through August 31) except with the CDFW's concurrence that evidence demonstrates that nesting is not actively occurring (e.g., because the owls have not yet begun nesting early in the season, or because young have already fledged late in the season). Eviction will occur through the use of

[1] Although burrowing owls are not expected to breed on the Project site and suitable habitat for owls on the Project site south of Caribbean is limited to the storm drain channel banks, there is possibility an owl could use the site during the winter non-breeding season if ground squirrel burrows are present. If in the very unlikely event a burrowing owl nest is established on the Project site, see Impact BIO-8 in the Sunnyvale East and West Channels Flood Protection Project EIR for the full suite of required burrowing owl mitigation measures.

one-way doors inserted into the occupied burrow and all burrows within impact areas that are within 250 feet of the occupied burrow (to prevent occupation of other burrows that will be impacted). One-way doors will be installed by a qualified biologist and left in place for at least 48 hours before they are removed. The burrows will then be back-filled to prevent re-occupation.

Although relocation of owls may be necessary to avoid the direct injury or mortality of owls during construction, relocated owls may suffer predation, competition with other owls, or reduced health or reproductive success as a result of being relegated to more marginal habitat. However, the benefits of such relocation, in terms of avoiding direct injury or mortality, would outweigh any adverse effects.

Impacts to burrowing owls in the SEWSDC EIR are covered under Impact BIO-8 and the mitigation measures outlined above fit within the applicable best management practice BMP BIO-8 in the SEWSDC EIR to reduce impacts to a less than significant level. In addition, these best management practices comply with federal (the Migratory Bird Treaty Act) and State (The California Department of Fish and Game Code) laws as presented in the LUTE EIR.

6.2.5 San Francisco Common Yellowthroat and Alameda Song Sparrow (Less than Significant)

Two state taxa of special concern, the Alameda song sparrow (*Melospiza melodia pusillula*) and the San Francisco common yellowthroat (*Geothlypis trichas sinuosa*) breed downstream from the project site and the yellowthroat may breed in the project section of the channel when vegetation is extensive enough to provide nesting and foraging habitat. Where suitable nesting habitat is continuous along creeks, the song sparrows appear to nest continuously from tidal salt marshes, where the breeding subspecies is *pusillula* (the Alameda song sparrow), upstream to freshwater marsh and woody riparian habitats, where the breeding subspecies is an upland or freshwater associated subspecies *gouldii* (not a species of special concern). The line of demarcation (or perhaps more accurately, the zone of intergradation) along these sloughs between these two subspecies is unknown (Rottenborn 2007); a recent study indicates that song sparrows nesting along the lower portions of the Sunnyvale Channels may belong to the *pusillula* or *gouldii* subspecies, or may be intergrades between the two (SFBBO 2012).

Regardless of the uncertainty regarding the exact distribution of the Alameda Song Sparrow along the Sunnyvale West Channel, both song sparrows and yellowthroats will benefit from the project-related improvement in habitat quality. Because the number of nesting pairs that could be disturbed is very small (the current channel area is very limited relative to the regional populations of both these taxa), the projects impacts would not substantially reduce regional populations of these birds, and thus, the impacts would not meet the CEQA standard of having a substantial adverse effects. In addition, project impacts to habitat will be temporary and impacts to habitat occur currently under the District maintenance program. Finally, although the project will increase the extent and quality of habitat for yellowthroats and song sparrows, a loss of nestlings or eggs ("take") due to project activities would be a violation of federal and state laws. Thus, compliance measures to avoid the loss of eggs and nestlings will be implemented. It should be noted that these measures would extend to avoiding

the loss of eggs or nestlings of other species of birds not considered special status. Although these other species are common and loss of individuals or eggs would not be considered significant under CEQA, such a loss would violate federal and state laws. The measures implemented to avoid take of salt marsh common yellowthroat and Alameda song sparrow extended to cover all native birds that might be breeding on the project site will allow the project to avoid violating state and federal laws protecting these other species as well. Impacts to these taxa are covered under the SEWSDC EIR under BMP BIO-8 and BMP BIO-9 and correspond to the following measures:

Measure 1. Avoidance of the Nesting Season. To the extent feasible, commencement of demolition and construction activities should be scheduled to avoid the nesting season. If demolition and construction activities are scheduled to take place outside the nesting season, all potential demolition/construction impacts on nesting birds protected under the MBTA and California Fish and Game Code will be avoided. The nesting season for most birds in Santa Clara County extends from February 1 through August 31.

Measure 2. Pre-Activity/Pre-Disturbance Surveys. If it is not possible to schedule demolition and construction activities between September 1 and January 31, then pre-activity surveys for nesting birds should be conducted by a qualified ornithologist to ensure that no nests will be disturbed during project implementation. We recommend that these surveys be conducted no more than seven days prior to the initiation of demolition or construction activities. During this survey the ornithologist will inspect all trees and other potential nesting habitats (e.g., trees, shrubs, and buildings) in and immediately adjacent to the impact areas for nests.

Measure 3. Non-Disturbance Buffers. If an active nest is found sufficiently close to work areas to be disturbed by these activities, the ornithologist will determine the extent of a construction-free buffer zone to be established around the nest (typically 300 feet for diurnal raptors, including the white-tailed kite, 250 feet for burrowing owl nests and active burrows, and 100 feet for other species), to ensure that no nests of species protected by the MBTA and California Fish and Game Code will be disturbed during project implementation.

Measure 4. Inhibition of Nesting. If construction activities will not be initiated until after the start of the nesting season, all potential nesting substrates (e.g., bushes, trees, grasses, and other vegetation) that are scheduled to be removed by the project may be removed prior to the start of the nesting season (e.g., prior to February 1). This will preclude the initiation of nests in this vegetation, and minimize the potential delay of the project due to the presence of active nests in these substrates.

In addition, these measures comply with federal (the Migratory Bird Treaty Act) and State (The California Department of Fish and Game Code) laws as presented in the LUTE EIR.

6.2.6 Pallid Bat (Less than Significant)

Historically, pallid bats *(Antrozous pallidus)*, a California species of special concern, were likely present in a number of locations throughout the project region, but their populations have declined in recent decades. No known maternity colonies are present on the project site or within the general area of the project site, and this species has been extirpated as a breeder from urban areas close to the Bay, as in the case of the project site. There is a low probability that the species occurs in the project vicinity at all due to urbanization; however, individuals from more remote areas could potentially forage in the project region on rare occasions, especially over the Sunnyvale West Channel. However, because of that low frequency of occurrence the project is not expected to have a significant impact on this species.

6.2.7 Impacts on Non-Special-Status Species (Less than Significant)

Impacts to non-special-status species, typically common to abundant and urban adapted in the project area, would not reach CEQA significance thresholds due to their local population levels and the relative narrow, linear, and small total area comprising the project, and high degree of ongoing anthropogenic disturbance in and around the site. Nevertheless, "take' of most of these species would violate federal and state laws as described above. Therefore, to comply with federal and state law, the nest-take-avoidance measures described immediately above will be applied to all species of covered native birds that potentially breed within the project activity zone and adjacent areas.

6.3 Impacts on Sensitive Communities: Will the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

6.3.1 Impacts on Ruderal Riparian Habitat or Other Sensitive Natural Communities (Less than Significant with Mitigation)

The proposed Project would result in temporary impacts to the 0.43 acre of ruderal riparian habitat currently existing on the site. This habitat type occurs on the banks and levees of the channel, from the high tide line to top of bank and consists of predominantly nonnative herbaceous species, such as wild oats (*Avena* sp.), ripgut brome (*Bromus diandrus)*, soft chess (*Bromus hordeaceous*), yellow star thistle (*Centaurea solstitialis*), and black mustard (*Brassica nigra*). There are no woody plants present within the existing ruderal riparian habitat and the area is routinely mowed as part of SCVWD's routine channel maintenance program. The Project would also result in a small (less than 0.01 ac; 13 square [sq] feet) permanent conversion of ruderal riparian habitat to hardscape to accommodate construction of a floodwall.

The existing banks will be contoured to create a wider storm drain channel and the top of bank will be raised from the existing elevation of 11 ft NAVD88 to an elevation of 18 ft NAVD88 (Figure 2). As a result, the proposed Project would substantially alter and enlarge the banks of the existing storm drain channel, affecting ruderal riparian habitat as summarized in Tables 1 and 2 and shown in Figure 2. Project activities would not

alter bank stability of the waterways or result in effects on adjacent properties upstream or downstream of the affected waters. Indirect effects could include possible water quality effects from both landward and in-channel construction activities (though these will be minimized and avoided by the use of BMPs and erosion and sedimentation controls).

Temporary impacts on ruderal riparian habitat will be mitigated at 1:1, for a baseline mitigation requirement of 0.44 ac. This baseline mitigation will be increased by an additional 0.01 ac (total of 0.45 ac) to compensate for less than 0.01 acre (13 sq ft) of permanent impacts, which exceeds a 2:1 mitigation ratio that would typically apply to permanent impacts on riparian habitat. The actual area to be tracked for ruderal riparian habitat mitigation will be a dedicated zone along the lower levee slopes on both sides of the channel from the West Caribbean Drive culvert upstream to the first new pedestrian bridge. This area will provide stable vegetated slopes. Although woody species will be installed throughout this zone, they will not be linked to any specific monitoring or success criteria metrics because there will be no impacts on woody plants within existing jurisdictional areas.

In addition, project mitigation will restore and enhance riparian habitats within the project site. There will be a 0.75-ac, 1,360 ln ft low-flow storm drain channel, bordered on both sides by a wetland floodplain bench set at elevations below the high-tide line and subject to regular tidal inundation, and the levee banks will be laid back to provide stable slopes where a mix of native riparian trees, shrubs, grasses, and forbs can be established. The project will provide all necessary mitigation per the description above, as well as voluntarily create 1.41 acres of additional riparian habitat (total of 1.86 ac). The following mitigation ratios were determined in keeping with the applicable best management practices required by the SEWSDC EIR (see SEWSDC list below under "Applicable Best Management Practices") and in response to comments submitted on the SWESDC Draft EIR by the California Department of Fish and Wildlife. These requirements also fit the objectives and requirements of the federal Clean Water Act Section 404 and the state Clean Water Act, Section 401 as covered in the LUTE EIR. As described in the LUTE EIR, the overall goal of the California Wetlands Conservation Strategy is to ensure "no overall net loss and achieve a long-term net gain in the quantity, quality and performance of wetlands acreage and values in California in a manner that fosters creativity, stewardship and respect of private property."

Table 1. Habitat Impacts and U.S. Army Corps of Engineers Permitting Mitigation Requirements

Impacted Habitat Type	Acreage	Mitigation Ratio	Mitigation Requirement (acres)
Temporary Impacts			
Tidal Aquatic (Dewatering and Grading)	0.72 ac	1:1	0.54 ac in-kind (plus 0.18 ac included in estuarine wetland below)
Estuarine Wetland (Dewatering and Grading)	0.16 ac (plus 0.18 to compensate for tidal aquatic)	1.2:1 (accounts for temporal loss due to 2-year construction period)	0.20 ac in-kind

Ruderal Riparian (Grading)	0.43 ac	1:1	0.43 ac riparian
Permanent Impacts			
Estuarine Wetland (Shading)	0.01 ac (573 sq ft)	2:1	0.02 ac in-kind
Ruderal Riparian (Conversion to hardscape)	<0.01 ac (457 sq ft)	2:1	0.02 ac riparian

Table 2. Habitat Mitigation and Creation Summary

Habitat Type	Mitigation Requirement	Additional Habitat Creation	Total Habitat Mitigation and Creation
Total Mitigation and Additional Creation			
Tidal Aquatic	0.54 ac	N/A	0.54 ac
Estuarine Wetland	0.45 ac	1.85 ac	2.30 ac
Total Jurisdictional Waters of the United States/state (including wetlands)	0.99 ac	1.52 ac	2.47 ac
Riparian	0.45 ac	1.34 ac	1.80 ac

Applicable Best Management Practices. The project would implement the BMPs described in the SEWSDC EIR. The following list of BMPs would be implemented to avoid and minimize any temporary or permanent impacts to water quality, riparian or wetland habitat. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description." of the SEWSDC EIR:

BMP BIO-4: Minimize Waterway Access Impacts
BMP BIO-5: Remove Temporary Fills as Appropriate
BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes
BMP HM-9: Clean Vehicles and Equipment
BMP HM-10: Assure Proper Vehicle and Equipment Fueling
BMP HM-11: Assure Proper Vehicle and Equipment Maintenance
BMP HM-13: Prevent Spills
BMP HM-12: Know the Spill Kit Location
BMP WQ-1: Conduct Work from Top of Bank
BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms
BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance
BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts
BMP WQ-5: Avoid Runoff from Soil Stockpiles
BMP WQ-6: Stabilize Construction Entrances and Exits
BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites
BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal
BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways

BMP WQ-11: Use Coffer Dams for Tidal Work Areas
BMP WQ-13: Minimize Hardscape in Bank Protection Design
BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate
BMP WQ-15: Manage Groundwater at Work Sites
BMP WQ-16: Avoid Erosion When Restoring Flows
BMP WQ-17: Prevent Scour Downstream of Sediment Removal
BMP WQ-18: Maintain Clean Conditions at Work Sites
BMP WQ-19: Control Emergency Discharges
BMP WQ-20: Control Unplanned Discharges
BMP WQ-21: Control Sediment/Turbidity for Discharges Less than 50 NTU
BMP WQ-22: Control Sediment/Turbidity for Discharge Greater than 50 NTU
BMP WQ-23: Evaluate Use of Flow Path - Vegetation Filtration
BMP WQ-24: Evaluate Use of Flow Path - Check Filters
BMP WQ-25: Evaluate Use of On-Line Filter Systems
BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection
BMP WQ-27: Evaluate Use of Surface Protection - Armoring
BMP WQ-28: Evaluate Use of Surface Protection - Flow Diversion
BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System
BMP WQ-40: Prevent Water Pollution
BMP WQ-41: Prevent Stormwater Pollution
BMP WQ-42: Prevent Sedimentation of Aquatic Habitats during Construction

Conclusion. Water quality and habitat values in the ruderal riparian habitats subject to temporary disturbance are expected to return to pre-project condition following the completion of Project activities. Implementation of the BMPs listed above would minimize changes to water quality by reducing erosion, controlling sediment and preventing spills. Nevertheless, the proposed project would result in temporal loss of habitat functions and values, provided by ruderal riparian habitat, such as sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, and aquatic and terrestrial wildlife species habitat. Thus, in the absence of any mitigation measures, temporary impacts on ruderal riparian is considered potentially significant because it could result in the temporal loss of ecologically valuable habitat (Significance Criteria B and C).

The proposed project would also result in the permanent loss of 13 square feet of ruderal riparian habitat that are ecologically valuable from conversion to hardscape for the construction of the headwalls and bridge abutments. Thus, permanent impacts on even a small amount of ruderal riparian habitat is considered significant (Significance Criteria B and C). Impacts on special-status wildlife species resulting from disturbance or loss of riparian habitat are addressed in separate impact discussions above.

The above-described project mitigation would be implemented to reduce residual impacts on ruderal riparian habitats to a less-than-significant level by compensating for temporary impacts on estuarine wetlands and tidal aquatic habitat and permanent impacts on estuarine wetland habitats. These mitigation measures correspond

to mitigation measures in the SEWSDC EIR (as modified in response to CDFW comments) for corresponding impacts and are consistent with the LUTE EIR adopted goal of "no overall net loss" of wetland values.

Mitigation Measure: Implement Compensatory Mitigation for Temporal and Permanent Loss of Ruderal Riparian Habitat (Less than Significant with Mitigation)

Mitigation for impacts on ruderal riparian habitat shall be provided at a ratio of 1:1 (1 acre of mitigation for every 1 acre of disturbed) for temporary impacts and 2:1 for permanent impacts. Mitigation shall be provide via creation and restoration of riparian habitat in the restored West Sunnyvale channel. In all, the area of riparian habitat will be more than doubled, with a final anticipated area of 1.86 ac. The project will substantially increase the area and quality of jurisdictional habitat through the project reach as compared to the current conditions. Riparian plantings will include a mosaic of native species associated with willow-cottonwood forest, oak riparian forest, and bayside scrub communities. This net increase in the area and quality of riparian habitat as a result of this project meets the goals of the California Wetlands Conservation Policy as described in the LUTE EIR: "*Ensure no overall net loss and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California…"*

A mitigation and monitoring plan (MMP) has been developed for the West Channel Enhancement project and is attached to this report as Appendix C. The MMP contains the following components:

- Summary of habitat impacts and proposed mitigation ratios.
- Goal of the restoration to achieve no net loss of habitat functions and values.
- Location of mitigation site(s) and description of existing site conditions.
- Mitigation design describing the following:
  - Existing and proposed site hydrology
  - Grading plan if appropriate, including bank stabilization or other site stabilization features
  - Soil amendments and other site preparation elements as appropriate
  - Planting plan
  - Irrigation and maintenance plan
  - Remedial measures/adaptive management, etc.
- Monitoring plan (including final and performance criteria, monitoring methods, data analysis, reporting requirements, monitoring schedule, etc.). The success criteria includes quantifiable measurements of wetland vegetation type (e.g., dominance by native hydrophytes) and extent appropriate for the wetland restoration location, and provision of ecological functions and values equal to or exceeding those in the wetlands and waters that are impacted.
- Contingency plan for mitigation elements that do not meet performance or final success criteria.

The project proponent shall implement the MMP and will be a Condition of Approval by the City of Sunnyvale, thereby achieving the recommended environmental protections. Monitoring shall be conducted annually to document whether the success criteria are achieved, and to identify any remedial actions that must be taken if the identified success criteria are not met. Monitoring shall continue until the mitigation has been determined to be successful per project permit requirements (i.e., success criteria are achieved).

Implementation of MM BIO-1 would result in the creation, restoration, and enhancement of wetlands, and would reduce this potential impact to a less-than-significant level.

6.3.2 Impacts Caused by Non-Native and Invasive Species (Less than Significant)

In order to achieve project design goals, extensive grading is required on the site. Grading will result in temporarily affecting all habitat types on site, removing all existing vegetation, and importing soil to build up the new, larger earthen levee. Several non-native, invasive plant species occur in the natural habitats located throughout the study area. Following such large grading efforts, invasive species that occur in the vicinity have the potential to colonize newly created bare ground and spread quickly. Disturbed areas are highly susceptible to colonization by non-native, invasive species that occur locally, or whose propagules are transported by personnel, vehicles, and other equipment. Activities such as grading, equipment staging and vegetation removal are all factors that would contribute to disturbance. Invasive species can have an adverse effect on native species and habitats in several ways, including by altering nutrient cycles, fire frequency and/or intensity, and hydrologic cycles; by creating changes in sediment deposition and erosion; by dominating habitats and displacing native species; by hybridizing with native species; and by promoting non-native animal species (Bossard et al. 2000). The study area contains invasive species with the potential to invade other sensitive riparian and wetland habitats if not prevented. Therefore, this impact would be considered significant if not mitigated. However, the project also includes implementation of a MMP for the newly planted and revegetated areas within the channel, includes success criteria limiting the cover of weed species within the project area and will include maintenance weed removal, if needed, for at least five years post-construction. Therefore potential weed-related impacts on sensitive habitats and the species they support are considered less-than-significant.

6.4 Impacts on Wetlands: Will the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act? (Less than Significant with Mitigation)

Construction activities associated with the proposed project would result in both temporary and permanent disturbance to wetland and aquatic communities as noted above. Wetlands often serve a variety of important functions, such as sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, and aquatic and terrestrial wildlife species habitat. The tidal aquatic and estuarine wetland habitat within the Sunnyvale Channel within the project study area are of relatively low quality as they are entirely within constructed linear flood control channels. Nevertheless, wetland and aquatic habitats in these channels are important within the urban matrix of the Project vicinity.

As described above Project activities will result in temporary direct impacts on wetlands and other waters in the form of hydrologic interruption (e.g., dewatering or diversion), vegetation removal, degradation of water quality (e.g., increased sedimentation and turbidity). In total, the Project would result in direct temporary impacts on 0.73 acres of tidal aquatic habitat and 0.17 acres of estuarine wetlands. In addition there will be permanent impacts on 0.01 ac (472 sq ft) of estuarine wetlands associated with shading from the two bridges and culvert extension.

The project will restore and enhance tidal aquatic and estuarine wetland habitats within the project site. There will be a 0.75-ac, 1,360 ln ft low-flow storm drain channel, bordered on both sides by a wetland floodplain bench set at elevations below the high-tide line and subject to regular tidal inundation, and the levee banks will be laid back to provide stable slopes where a mix of native riparian trees, shrubs, grasses, and forbs can be established. The project will provide all necessary mitigation per the description above, as well as voluntarily create 0.02 ac of additional tidal aquatic habitat (total of 0.75 ac) and 1.50 ac of additional estuarine wetland habitat (total of 1.72 ac). Figure 2 shows the habitat mitigation. Tables 1 and 2 summarize habitat impacts, mitigation ratios and requirements, and additional habitat creation for tidal aquatic and estuarine wetland habitat.

Applicable Best Management Practices. As mentioned above under impact 6.3.1, the project would implement the BMPs described in the SEWSDC EIR. The list of BMPs mentioned above would similarly avoid and minimize temporary and permanent water quality impacts on tidal aquatic and estuarine wetland habitat.

The BMPs listed above would be incorporated into the project's Storm Water Pollution Prevention Plan (SWPPP) in compliance with State requirements to control discharge of stormwater pollutants under the NPDES *General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities* (Construction General Permit; Water Board Order No. 2009-0009-DWQ). Standard permit conditions under the Construction General Permit require that the applicant utilize various measures including: on-site sediment control best management practices, damp street sweeping, temporary cover of disturbed land surfaces to control erosion during construction, and utilization of stabilized construction entrances and/or wash racks, among other factors. In many Bay Area counties, including Santa Clara County, projects must also comply with the *California Regional Water Quality Control Board, San Francisco Bay Region, Municipal Regional Stormwater NPDES Permit* (MRP) (Water Board Order No. R2-2015-0049). This MRP requires that all projects implement BMPs and incorporate Low Impact Development practices into the design to prevent stormwater runoff pollution, promote infiltration, and hold/slow down the volume of water coming from a site after construction has been completed. To meet these permit and policy requirements, projects must incorporate the use of green roofs, impervious surfaces, tree planters, grassy swales, bioretention and/or detention basins, among other factors. These same features will be used to treat any stormwater that flows to the wetland habitat during large storm events. With the above BMPs, impacts on water quality would be reduced to a level of less-than-significant.

Conclusion. Water quality and habitat values in unvegetated aquatic habitats subject to temporary disturbance are expected to quickly return to pre-construction conditions following the completion of Project activities.

Thus, no mitigation is necessary for temporary impacts to unvegetated tidal aquatic habitats. Even in the vegetated wetlands, recolonization is expected to occur relatively quickly. Implementation of the BMPs listed above would minimize changes to water quality by reducing erosion, controlling sediment and preventing spills. Nevertheless, the proposed project would result in temporal loss of habitat functions and values, provided by tidal aquatic and estuarine wetland habitat, such as sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, and aquatic and terrestrial wildlife species habitat. Thus, in the absence of any mitigation measures, temporary impacts on estuarine wetlands is considered potentially significant because it could result in the temporal loss of ecologically valuable habitat (Significance Criteria B and C).

The proposed project would also result in the permanent loss of 472 square feet estuarine wetland that are ecologically valuable from shading. Thus, permanent impacts on even a small amount of estuarine wetland habitat is considered significant (Significance Criteria B and C). Impacts on special-status wildlife species resulting from disturbance or loss of estuarine wetland and tidal aquatic habitat are addressed in separate impact discussions below.

The following Mitigation Measure would be implemented to reduce residual impacts on estuarine wetland and tidal aquatic habitats to a less-than-significant level by compensating for temporary impacts on estuarine wetlands and tidal aquatic habitat and permanent impacts on estuarine wetland habitats.

Mitigation Measure: Implement Compensatory Mitigation for Temporal Loss of Estuarine Wetlands and Tidal Aquatic and Permanent Loss of Estuarine Wetlands (Less than Significant with Mitigation) Consistent with the mitigation measures in the SEWSDC EIR (as modified in response to CDFW comments) and the LUTE EIR's adopted goal of "no overall net loss" of wetland values, mitigation for temporary impacts on tidal aquatic habitat shall be provided at a ratio of 1:1 (1 acre of mitigation for every 1 acre of disturbed). Mitigation for impacts on estuarine wetland habitat shall be provided at a ratio of 1.2:1 for temporary impacts and at ratio of 2:1 for permanent impacts. Mitigation shall be provided via creation and restoration of wetlands/other waters in the restored West Sunnyvale channel. In all, the area of waters of the United States/state (tidal aquatic habitat and estuarine wetlands) will be more than doubled, with a final anticipated area of 2.47 ac. Along with an anticipated 1.86 ac of riparian habitat (described above in Impact 6.3.1), the project will substantially increase the area and quality of jurisdictional habitat through the project reach as compared to the current conditions. Estuarine wetland habitat will be passively restored by allowing sedimentation and plant detritus accumulation to restore the intertidal elevations, and natural colonization to establish the plant and wildlife communities. However, a few pockets will be planted with California bulrush and alkali bulrush.

As described above in Impact 6.3.1, the project-specific MMP describes in detail how the project proponent shall implement the compensatory mitigation required, as well as the monitoring plan required to ensure the success of the mitigation.

Implementation of this mitigation measure would result in the creation, restoration, and enhancement of wetlands, and would reduce this potential impact to a less-than-significant level.

6.5 Will the project have significant impacts on Wildlife Movement: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? (Less than Significant)

This project could temporarily effect movement of aquatic species through the project site during the dewatering periods. However, the conditions associated with the project post construction would not interfere with the movement of any native fish or wildlife species.

6.6 Will the project have Impacts due to Conflicts with Local Policies: Will the project conflict with any local policies or ordinances protecting biological resources? (Less than Significant)

6.6.1 Impacts Related to Compliance with City of Sunnyvale General Plan Policy (Less than Significant)

General Plan Policies LT-1.10, LT-1.10e and LT-2.6 are relevant to the proposed project. Each policy is briefly discussed below, including a discussion of how the project will comply with each policy.

- Policy LT-1.10a seeks to protect and preserve the diked wetland areas in the baylands to preserve or enhance flood protection. This report serves an analysis to determine the effects of the proposed project on the aforementioned resources. As discussed above the stated purpose of this project is habitat enhancement and the end result of the project will result in a net gain of tidal aquatic, estuarine wetland, and riparian habitat that is of functionally higher quality than the existing condition on the site.
- Policy LT-1.10e seeks to continue to evaluate and ensure mitigation of potential biological impacts of future development and redevelopment projects in a manner consistent with applicable local, state, and federal laws and regulations. Mitigation proposed for this project is in line with the policy goal of the city's general plan.
- Policy LT-2.6 seeks to address sea level rise, increased rainfall, and other impacts of climate change when reviewing new development near creeks, and consider the projected flood levels over the economic lifespan of the project. The proposed project is in line with and part of the SCVWD's larger Sunnyvale East and West Channel Flood Protection Project with aims to provide increased flood protection and water quality improvements to the City of Sunnyvale.

6.6.2 Municipal Code Chapter 19.94, Tree Preservation (Less than Significant)

An Arborist report for the two adjacent projects, the Google Caribbean Campus Project and the West Borregas Campus Project have been completed (Appendix A). The areas covered by this arborist report overlaps completely with the Google Sunnyvale West Channel Enhancement Project site. Per City of Sunnyvale Municipal Code, Chapter 19.94, Tree Preservation, tree removal permits, criteria for replacement trees, and requirements for replanting programs, tree relocation, and tree protection during site development would be required for the removal of any trees which meets the definition of heritage tree, as defined in Section 3.3.3 above. The removal or pruning of trees protected by the City of Sunnyvale municipal code is considered potentially significant under CEQA (Criterion I). As such, the project would need to comply with the City's tree preservation ordinance, including obtaining a permit from the City to remove protected trees and paying any applicable fee if impacts to heritage trees are proposed. The project plan includes the planting of native trees to compensate for the removal of non-native ornamental landscape trees. Therefore, any potential impacts related to conflict with local policies or ordinances protecting trees would be less than significant.

6.7 Will the project result in Impacts due to Conflicts with an Adopted Habitat Conservation Plan: Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan? (No Impact)

The study area is not located within an area covered by an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. Therefore, the project would not conflict with any such documents.

6.8 Cumulative Impacts

Cumulative impacts arise due to the linking of impacts from past, current, and reasonably foreseeable future projects in the region. Future development activities in the City of Sunnyvale will result in impacts on the same habitat types and species that will be affected by the project. Project development, in combination with other projects in the area and other activities that impact the species that are affected by this project, could contribute to cumulative effects on special-status species. Other projects in the area include office and commercial development (e.g., various Google properties in between Caribbean Dr., North Mathilda Ave. and Highway 237), as well SCVWD projects (e.g. the Sunnyvale East and West Channels Flood Protection Project) that could adversely affect these species, as well as restoration projects (e.g., the South Bay Salt Pond Restoration Project Phase 2, SAFER Bay Project) that will benefit these species.

The cumulative impact on biological resources resulting from the project in combination with other projects in the project area and larger region would be dependent on the relative magnitude of adverse effects of these projects on biological resources compared to the relative benefit of impact avoidance and minimization efforts prescribed by planning documents, CEQA mitigation measures, and permit requirements for each project; compensatory mitigation and proactive conservation measures associated with each project. In the absence of

such avoidance, minimization, compensatory mitigation, and conservation measures, cumulatively significant impacts on biological resources would occur.

However, the City of Sunnyvale General Plan contains conservation measures that would benefit biological resources, as well as measures to avoid, minimize, and mitigate impacts on these resources. Further, the proposed project would result in net beneficial enhancement habitat for special-status species and biological resources in general. Thus, provided that this project successfully incorporates the mitigation measures described in this biological resources report and that the project is executed as described, the project will not contribute to substantial cumulative effects on biological resources.

6.9 Net Ecological Benefit of the Project

Riparian ecosystems support some of the highest wildlife species diversity and abundance in North America, and are particularly important in the western portion of the continent (Poff et al. 2011). For example, riparian zones in many areas of the western United States comprise less than 1% of the total land area, yet these areas are used by more species of breeding birds than any other habitat in North America (Knopf et al. 1988, as cited in Fischer 2000). Riparian zones provide valuable habitat and resources to a rich diversity of fish and wildlife, including a number of species dependent on riparian habitat. For example, resident and migratory birds use riparian areas for breeding, nesting, and foraging, while providing refuge and foraging for mammals, reptiles and amphibians. Riparian habitats also provide critical elements for fish habitat, including shading the channel, large woody debris to form pools, and floodplain habitat for rearing, spawning, and resources (Opperman and Merenlender 2011).

Unfortunately, riparian ecosystems are one of the most heavily degraded ecosystems, as is the current case with the Sunnyvale West Channel. Vast amounts of this important habitat have been lost to development through the construction of dams, river and stream channelization, grazing, agriculture, cities, urban landscaping, invasive species, and other anthropogenic activities over the past several hundred years of human expansion in North America. For example, around 95% of the riparian habitat in the Sacramento Valley has been lost (Gardali et al. 2004) and such amounts of loss are common throughout the West (Poff et al. 2011). In a study of the effects of urbanization on riparian habitats in Silicon Valley, Rottenborn (1999) found that bird species richness and density decreased as the volume of native riparian decreased. In Silicon Valley, riparian corridors along the Guadalupe River in San Jose have shrunk from vast riparian willow complexes over 0.5 kilometer wide, to a strip between ~20-50 meters wide in most places (Beller et al. 2010). Thus, the vast majority of this valuable habitat has been lost both regionally and locally, which emphasizes the importance of riparian habitat conservation and restoration.

This project will increase the habitat value of this reach of the Sunnyvale West Channel substantially relative to existing conditions, and contribute to the ongoing restoration of native habitat (including riparian habitat) that is occurring in the South Bay, which will result in a local and a cumulative benefit to the suite of species that utilizes this habitat. In particular note, Neotropical migrants that utilize riparian habitats for breeding, migratory

stopovers, and wintering will benefit from the project mitigation. Neotropical migrants are showing significant declines and thus, are of conservation concern in general.

The net increase in riparian habitat will also help special-status species known to occur, or likely to occur, on the project site following project completion. Migrant yellow warblers will benefit from the additional native riparian habitat. San Francisco common yellowthroats will benefit from the additional willow and estuarine wetland habitats. Although the northern harrier, American peregrine falcon, and white-tailed kite are not anticipated to nest on the project site, the potential for an increased prey base associated with the additional native vegetation may provide some benefit to these species. Western pond turtles would benefit from the increased vegetation providing cover from predators.

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Appendix A. Arborist Report

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google Caribbean Campus

Arborist Report

Project #3475-45

Prepared for:

Google DevCo

Prepared by:

H. T. Harvey & Associates
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March 15, 2019

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Section 1. Introduction

H. T. Harvey & Associates has prepared this preliminary arborist report, which describes current conditions on a complex of light-industrial properties (collectively referred to as the site) located in Sunnyvale, California (Table 1). This report provides an inventory of all trees on the project site (with diameter at breast height [DBH] greater than 4 inches) including species, DBH, an assessment of each tree's health and structural condition, and figures showing the location of each tree in the inventory. In addition, this arborist report includes a list of trees to be removed. Appropriate mitigation measures are also provided, per the City of Sunnyvale (City) Municipal Code (code). This arborist report is sufficient to submit with initial planning applications to the City.

Table 1. Properties Included in this Report

Street Address	Assessor's Parcel Number
390 - 394 Caribbean Drive	110 - 26 - 020
380 - 382 Caribbean Drive	110 - 26 - 021
370 - 376 Caribbean Drive	110 - 26 - 022
360 - 364 Caribbean Drive	110 - 26 - 023
1330 - 1370 Bordeaux Drive	110 - 26 - 025
140 - 146 Caribbean Drive	110 - 26 - 027
1393 - 1395 Borregas Avenue	110 - 26 - 028
1383 Borregas Avenue	110 - 26 - 029
1325 Borregas Avenue and 133 Caspian Court	110 - 26 - 030
141 Caspian Court	110 - 26 - 031

Section 2. Methods

This report is based on a tree inventory that was completed in November 2016, with a follow up site visit on January 8, 2019 to document any changes in tree health, structure or survival. H. T. Harvey & Associates' arborist Matt Pollock performed both the inventory and follow-up visit. Matt is an American Society of Consulting Arborists (ASCA) Registered Consulting Arborist (#631) and an International Society of Arboriculture (ISA) Certified Arborist (WE-11610A). All trees with a DBH greater than 4 inches were included in the inventory. Tasks conducted during the tree inventory consisted of the following:

- identifying each tree to species (scientific name and common name);
- tagging each tree with an identifying number;
- recording the approximate location of each tree;
- measuring tree trunk diameter at 54 inches above finish grade (DBH);
- determining the protected status of each tree; and
- evaluating tree health and structural condition using a scale of 0 to 5 as shown in Table 2.

Tree assessments were based on ground-level visual observations and physical measurements. Field data collection was conducted using a diameter tape to measure DBH. A Trimble Geo 7X GPS with laser offset capability was used to determine and record the location of each tree. Evaluations of tree health considered crown indicators such as vigor, density, leaf size and quality, and stem shoot extensions. Evaluations of tree structural condition considered root condition/form, trunk condition/form, and branch assembly and arrangement as well as any visible indicators of diminished structural integrity including cavities, dead limbs, and excessive leaning.

An advanced assessment to quantify interior wood structure, root condition, and upper canopy condition was not performed as part of this assessment. Therefore, tasks performed did not include an excavation of the root zones of the trees, drilling for decay detection, collecting soil samples for laboratory testing, sending animal or vegetative material for laboratory testing, climbing the trees for an aerial inspection, a tree risk assessment, or a valuation (see Appendix A: Assumptions and Limiting Conditions and Appendix B: Certification of Performance). These tasks are not typically included in a standard arborist report.

Table 2. Tree Health and Structural Condition Evaluation Criteria

Condition Rating	Tree Health	Tree Structure
5	A healthy, vigorous tree with a well-balanced crown. No apparent pest problems or signs and symptoms of disease. Normal to exceeding shoot length on new growth. Leaf size and color normal. Exceptional life expectancy for the species.	Root plate undisturbed and clear of any obstructions. Root flare has normal development. Trunk is sound and solid. No visible trunk defects or cavities. Branch spacing / structure and attachments are free of any defects.
4	Tree with slight decline in vigor. Imperfect canopy density in few parts of the tree, 10% or less, lacking natural symmetry. Less than half normal growth rate and minor deficiency in leaf development. Few pest issues or damage, controllable. Normal branch and stem development with healthy growth. Small amount of twig dieback. Typical life expectancy for the species.	Root plate appears normal; only minor damage may be found. Possible signs of root dysfunction around trunk flare. Minor trunk defects from previous injury, with good closure; less than 25% of bark section missing. Good branch habit, minor dieback with some signs of previous pruning. Co-dominant stem formation may be present. Minor corrections required.
3	Tree with moderate vigor. Crown decline and dieback up to 30% of the canopy. Overall poor symmetry. Leaf color somewhat chlorotic with smaller leaves. Shoot extensions indicate some stunting and stressed growing conditions. Obvious signs of pest problems contributing to lesser condition. Some decay areas found in main stem and branches. Below average life expectancy.	Root plate reveals previous damage or disturbance and dysfunctional roots may be visible around main stem. Evidence of trunk damage or cavities with decay or defects present. Less than 30% of bark sections missing on trunk. Co-dominant stems are present. Branching habit and attachments indicate poor pruning or damage, which requires moderate corrections.
2	Tree in decline. Epicormic growth. Lacking full crown, more than 50% decline and dieback, especially affecting larger branches. Stunting obvious with little evidence of growth on smaller stems. Leaf size and color reveal overall stress in the plant. Insect or disease infestation may be severe. Overmature. Life expectancy is low.	Root plate disturbance and defects indicate major damage with girdling roots around the trunk flare. Trunk reveals more than 50% of bark section missing. Branch structure has poor attachments, with several structurally important dead or broken branches. Canopy reveals signs of severe damage or topping, with major corrective actions required. Extensive decay or hollow.
1	Tree in severe decline. Crown has very little vigor and/or has a disease or insect problem that is ultimately fatal and, if not corrected, may threaten other nearby trees.	Root plate has major structural problems that present an unacceptable risk. Tree is in severe decline, with dieback of scaffold branches and/or trunk.
0	Dead	Dead

Section 3. Results

3.1 Site History and General Condition

The site is located on land historically used for agriculture (row crops) (Google Earth 2019). The buildings that currently occupy the site were constructed prior to 1991 and the configuration of planting beds appears largely unchanged since that time. Therefore, some trees on the site could potentially be more than 27 years old.

3.2 Summary of Findings

Four hundred and twenty-five trees were identified on the site (Figures 1a and 1b). Descriptions of each tree are included in Appendix C (Tree Assessment), including DBH, tree health and structural scores, and protected status. Table 3 provides a summary of the assessed trees, which represent 35 species. Of the 425 trees located on the site, 293 (69%) met the City of Sunnyvale's criteria for protected trees (see Section 3.4 below). The most common species on the site (27%) was Canary Island pine (*Pinus canariensis*). Forty-three percent of trees were in good condition, 48% were in fair condition, and 9% were in poor condition. Many of the trees in fair or poor condition were overmature, short-lived species such as lemonwood (*Pittosporum eugenioides*), sweetgum (*Liquidamber styraciflua*), and glossy privet (*Ligustrum lucidum*). However, 52 of the 116 Canary Island pines were also in fair or poor condition due to excessive pruning or other visible flaws.

3.3 Tree Condition

A summary of tree condition ratings is provided in Table 3. The condition ratings in the table are based on both the tree health and structural ratings from Appendix C. Tree condition was rated as follows:

- *Poor* if their combined rating was less than 40%.
- *Fair* if their combined rating was between 40% and 60%; or
- *Good* if their combined rating was 60% or greater;

Table 3. Tree Condition Summary

Scientific Name	Common Name	Poor	Fair	Good	Total Trees
Afrocarpus falcatus	African fern pine	0	11	7	18
Alnus rubra	Red alder	3	6	0	9
Betula pendula	White birch	1	2	2	5
Ceratonia siliqua	carob tree	2	13	5	20
Corymbia citriodora	lemon scented gum	0	1	1	2
Eriobotrya japonica	Loquat	0	1	0	1

Scientific Name	Common Name	Poor	Fair	Good	Total Trees
Eucalyptus nicholii	peppermint eucalypt	0	2	2	4
Eucalyptus polyanthemos	silver dollar eucalypt	1	9	11	21
Eucalyptus sideroxylon	red ironbark	2	7	2	11
Eucalyptus sp.	Eucalyptus sp.	0	1	1	2
Fraxinus uhdei	shamel ash	0	1	6	7
Gleditsia triacanthos 'inermis'	thornless honey locust	0	1	2	3
Jacaranda mimosifolia	Jacaranda	1	2	4	7
Juniperus chinensis	Hollywood juniper	0	1	1	2
Ligustrum lucidum	glossy privet	1	15	7	23
Liquidamber styraciflua	Sweetgum	1	14	23	38
Maytenus boaria	Mayten tree	0	1	2	3
Olea europaea	Olive	0	1	2	3
Osmanthus fragrans	Fragrant Olive	0	8	5	13
Picea pungens glauca	Blue Spruce	1	0	0	1
Pinus canariensis	Canary Island pine	3	49	64	116
Pinus halapensis	Aleppo pine	0	2	0	2
Pinus mugo	Mugho pine	0	1	0	1
Pinus pinea	Italian stone pine	1	3	2	6
Pittosporum eugenioides	Lemonwood	13	27	6	46
Populus nigra 'italica'	Lombardy poplar	4	5	3	12
Prunus cerasifera	purple leaf plum	2	4	3	9
Prunus serrulata	Kwanzan cherry	0	0	0	0
Pyrus calleryana	Callery pear	0	1	0	1
Quercus agrifolia	California live oak	0	2	3	5
Quercus ilex	Holly oak	0	3	3	6
Salix lasiandra	Pacific willow	1	0	0	1
Schinus molle	Peruvian pepper	0	1	0	1
Sequoia sempervirens	Coast redwood	0	7	9	16
Ulmus parvifolia	Chinese elm	1	3	6	10
Total		**38**	**205**	**182**	**425**

3.4 Protected Trees

The protected status of trees is defined under items 3 and 4 in the City of Sunnyvale Municipal Code (code), Section 19.94.030 as:

3) *"Protected tree" means a tree of significant size.*

4) *"Significant size" means a tree thirty-eight inches or greater in circumference measured four and one-half feet above ground for single-trunk trees. For multi-trunk trees "significant size" means a tree which has at least one trunk with a circumference thirty-eight inches or greater measured four and one-half feet above ground level, or in which the measurements of the*

circumferences of each of the multi-trunks, when measured four and one-half feet above the ground level, added together equal an overall circumference one hundred thirteen inches or greater.

Based on this definition, 293 protected trees were identified on the site. Protected trees include 112 Canary Island pine, 35 sweetgum, and 20 silver dollar eucalypt (*Eucalyptus polyanthemos*) (see Appendix C: Tree Assessment).

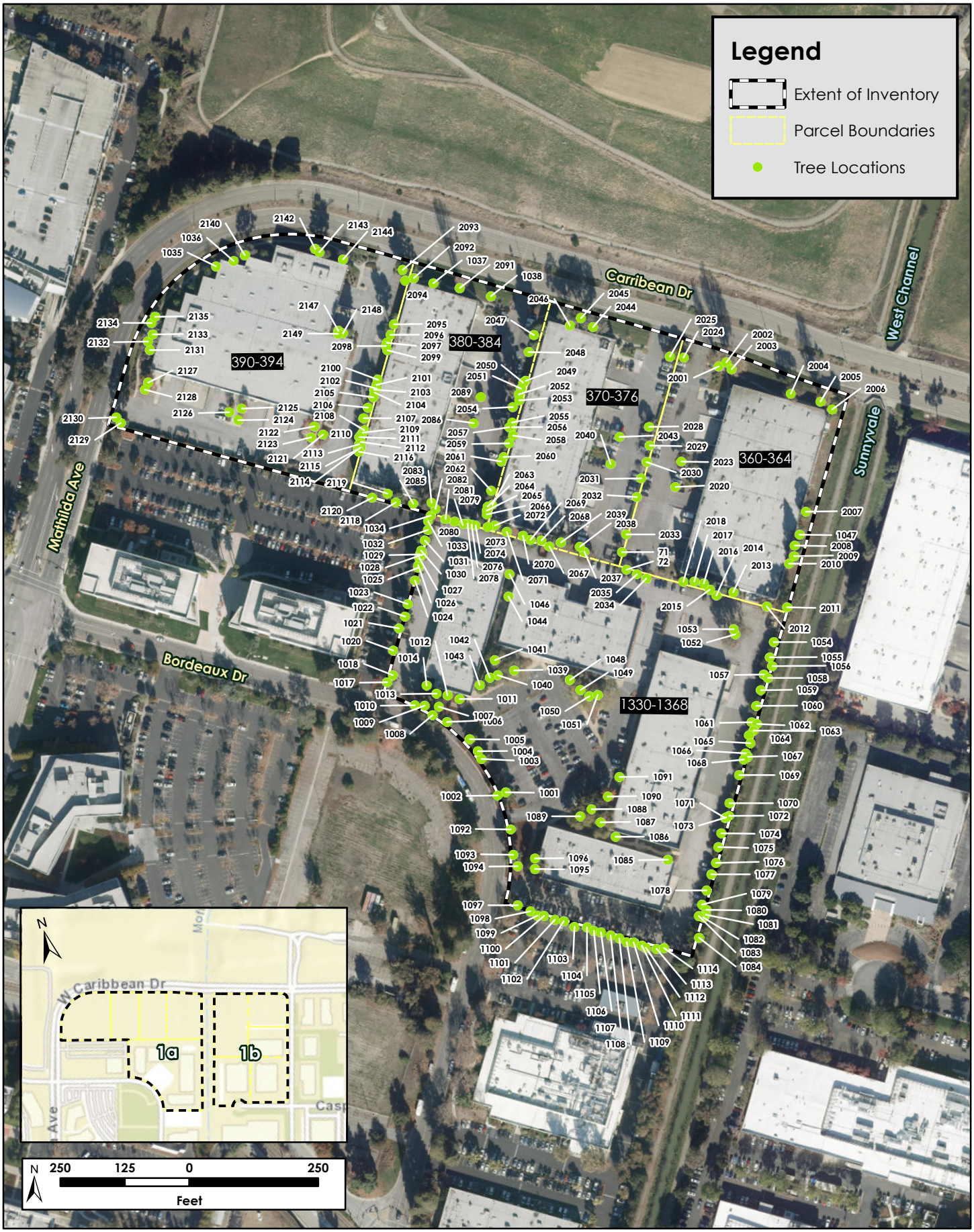
If redevelopment of this parcel creates impacts to or requires removal of protected status trees, the City may require reasonable alterations to the project design in order to retain protected trees per Section 19.94.110 of the Code. For protected trees to be preserved, a tree protection plan is required. For protected trees to be removed, a replanting plan is required, per Section 19.94.090 of the Code. Typically, the minimum size for the replacement of a protected tree is a standard twenty-four inch box size tree, subject to review by the city's director of community development. Tree removal, replacement, and preservation are discussed in further detail in Section 4.

3.5 Invasive Trees

Of the 425 trees (35 species) on the site, 36 trees (4 species) are listed by the California Invasive Plant Council (Cal-IPC, 2019) as a limited invasive species. A single Callery pear (*Pyrus calleryana*) on the site is watch-listed by Cal-IPC as a species of potential concern. These results are shown in Table 4.

Table 4. Invasive Species

Scientific Name	Common Name	Count	Cal-IPC Rating
Ligustrum lucidum	glossy privet	23	Limited
Olea europaea	Olive	3	Limited
Prunus cerasifera	purple leaf plum	9	Limited
Pyrus calleryana	Callery pear	1	Watch
Schinus molle	Peruvian pepper	1	Limited
Total		**37**	



N:\Projects3400\3475-01145\Report\Figure 1a. Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1a. Locations of Existing Trees
Google Caribbean Campus Draft Arborist Report (3475-45)
July 2019

N:\Projects3400\3475-01145\Report\Figure 1b. Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1b. Locations of Existing Trees
Google Caribbean Campus Draft Arborist Report (3475-45)
July 2019

Section 4. Tree Removal, Replacement, and Preservation

4.1 Tree Removal

There were 425 trees (35 species) identified on the site. According to the Planning Submittal dated October 26, 2018, 382 trees will be removed. Table 5 provides a summary of the trees to be removed. Two hundred and fifty of the trees to be removed are of sufficient size to be "protected" under the City's Code (see Section 3.4 above).

Table 5. Tree Removal

			Non-Protected Trees		Protected Trees	
Scientific Name	**Common Name**	**Total**	**Preserve**	**Remove**	**Preserve**	**Remove**
Afrocarpus falcatus	African fern pine	18	0	11	0	7
Alnus rubra	Red alder	9	0	0	0	9
Betula pendula	White birch	5	0	4	0	1
Ceratonia siliqua	carob tree	20	0	4	0	16
Corymbia citriodora	lemon scented gum	2	0	0	0	2
Eriobotrya japonica	Loquat	1	0	1	0	0
Eucalyptus nicholii	peppermint eucalypt	4	0	1	0	3
Eucalyptus polyanthemos	silver dollar eucalypt	21	0	1	2	18
Eucalyptus sideroxylon	red ironbark	11	0	0	0	11
Eucalyptus sp.	Eucalyptus sp.	2	0	0	0	2
Fraxinus uhdei	shamel ash	7	0	4	3	0
Gleditsia triacanthos 'inermis'	thornless honey locust	3	0	0	0	3
Jacaranda mimosifolia	Jacaranda	7	0	5	0	2
Juniperus chinensis	Hollywood juniper	2	0	0	0	2
Ligustrum lucidum	glossy privet	23	0	15	0	8
Liquidamber styraciflua	Sweetgum	38	0	3	1	34
Maytenus boaria	Mayten tree	3	0	1	0	2
Olea europaea	Olive	3	0	3	0	0
Osmanthus fragrans	Fragrant Olive	13	0	13	0	0
Picea pungens glauca	Blue Spruce	1	0	1	0	0
Pinus canariensis	Canary Island pine	116	0	4	28	84
Pinus halapensis	Aleppo pine	2	0	0	0	2
Pinus mugo	Mugho pine	1	0	1	0	0
Pinus pinea	Italian stone pine	6	0	0	0	6
Pittosporum eugenioides	Lemonwood	46	0	45	0	1
Populus nigra 'italica'	Lombardy poplar	12	0	0	0	12

			Non-Protected Trees		Protected Trees	
Scientific Name	**Common Name**	**Total**	**Preserve**	**Remove**	**Preserve**	**Remove**
Prunus cerasifera	purple leaf plum	9	0	9	0	0
Prunus serrulata	Kwanzan cherry	0	0	0	0	0
Pyrus calleryana	Callery pear	1	0	0	0	1
Quercus agrifolia	California live oak	5	0	4	0	1
Quercus ilex	Holly oak	6	0	2	0	4
Salix lasiandra	Pacific willow	1	0	0	0	1
Schinus molle	Peruvian pepper	1	0	0	0	1
Sequoia sempervirens	Coast redwood	16	0	0	9	7
Ulmus parvifolia	Chinese elm	10	0	0	0	10
Total - Trees to be Preserved		**43**	**0**	**-**	**43**	**-**
Total - Trees to be Removed		**382**	**-**	**132**	**-**	**250**
Total - All Trees		**425**				

4.2 Tree Replacement

The 250 protected trees to be removed are to be replaced per the City's Code, Section 19.94.080, which considers factors such as the following:

(1) The number, species, size and location of existing trees on the site; and

(2) Good forestry practices such as, but not limited to, the number of healthy trees a given parcel of land will support.

The City typically requires planting of a replacement tree somewhere on the property as a standard condition of approval for removal of each protected tree. At the time of writing this report, a detailed planting plan was not available. To meet the City's requirements for replacement of protected trees, the Project will need to include a minimum of 250 new trees with a container size of 24-inches or larger.

4.3 Tree Preservation

A total of 43 trees will be preserved on the site, as shown in Table 6. The tree protection measures described in Section 5 will apply to these trees.

Table 6. Tree Preservation

Tree Tag	Scientific Name	Common Name	Protected?
82	*Pinus canariensis*	Canary Island pine	Yes
1006	*Pinus canariensis*	Canary Island pine	Yes
1009	*Pinus canariensis*	Canary Island pine	Yes
1020	*Pinus canariensis*	Canary Island pine	Yes
1021	*Pinus canariensis*	Canary Island pine	Yes

Tree Tag	Scientific Name	Common Name	Protected?
1022	*Pinus canariensis*	Canary Island pine	Yes
1023	*Pinus canariensis*	Canary Island pine	Yes
1024	*Pinus canariensis*	Canary Island pine	Yes
1025	*Pinus canariensis*	Canary Island pine	Yes
1026	*Sequoia sempervirens*	Coast redwood	Yes
1027	*Sequoia sempervirens*	Coast redwood	Yes
1028	*Pinus canariensis*	Canary Island pine	Yes
1029	*Sequoia sempervirens*	Coast redwood	Yes
1030	*Sequoia sempervirens*	Coast redwood	Yes
1031	*Pinus canariensis*	Canary Island pine	Yes
1032	*Pinus canariensis*	Canary Island pine	Yes
1033	*Sequoia sempervirens*	Coast redwood	Yes
1034	*Sequoia sempervirens*	Coast redwood	Yes
1097	*Pinus canariensis*	Canary Island pine	Yes
1099	*Pinus canariensis*	Canary Island pine	Yes
1100	*Pinus canariensis*	Canary Island pine	Yes
1101	*Pinus canariensis*	Canary Island pine	Yes
1102	*Pinus canariensis*	Canary Island pine	Yes
1103	*Pinus canariensis*	Canary Island pine	Yes
1105	*Pinus canariensis*	Canary Island pine	Yes
1107	*Pinus canariensis*	Canary Island pine	Yes
1108	*Pinus canariensis*	Canary Island pine	Yes
1109	*Pinus canariensis*	Canary Island pine	Yes
1110	*Pinus canariensis*	Canary Island pine	Yes
1111	*Pinus canariensis*	Canary Island pine	Yes
1112	*Pinus canariensis*	Canary Island pine	Yes
1113	*Pinus canariensis*	Canary Island pine	Yes
1114	*Pinus canariensis*	Canary Island pine	Yes
1241	*Sequoia sempervirens*	Coast redwood	Yes
1242	*Sequoia sempervirens*	Coast redwood	Yes
1243	*Sequoia sempervirens*	Coast redwood	Yes
1320	*Fraxinus uhdei*	shamel ash	Yes
1321	*Fraxinus uhdei*	shamel ash	Yes
1322	*Fraxinus uhdei*	shamel ash	Yes
1323	*Pinus canariensis*	Canary Island pine	Yes
2196	*Eucalyptus polyanthemos*	silver dollar eucalypt	Yes
2197	*Eucalyptus polyanthemos*	silver dollar eucalypt	Yes
2301	*Liquidamber styraciflua*	Sweetgum	Yes

Section 5. Tree Protection

5.1 Tree Protection Plan

The City of Sunnyvale requires a Tree Protection Plan to safeguard the health of Protected trees before and during construction (Municipal Code Sections 19.94.110, 19.94.120, and 19.94.140).

5.2 Tree Protection Zones (TPZ)

For each tree to be preserved, a Tree Protection Zone (TPZ) will be established. The size and layout of each TPZ are required by the City of Sunnyvale to be no smaller than the dripline of each protected tree to be preserved. However, we recommend that the size of each TPZ be increased based on each species' sensitivity to construction impacts, the health and age of the tree, the root and crown conformation, and development constraints. It may be necessary to identify where roots actually are through hand excavation in order to properly protect a highly valued tree (Matheny and Clark 1998). The following activities shall be prohibited within each Tree Protection Zone:

- Storage of construction materials, debris, excavated material, waste, or washout water.
- Parking construction trailers, vehicles, or equipment.
- Foot traffic.
- Erection of sheds or structures.
- Impoundment of water.
- Excavation for underground utilities, drain or irrigation lines, or other digging unless approved by the City or Consulting Arborist.
- Attachment of signs to or wrapping materials around trees or plants unless approved by the City or Consulting Arborist.

5.3 Requirements for Tree Protection during Construction

Protected trees designated for preservation shall be protected during construction by use of the following methods:

- Protective fencing shall be installed no closer to the trunk than the dripline, and far enough from the trunk to protect the integrity of the tree. The fence shall be a minimum of four (4) feet in height and shall be set securely in place. The fence shall be of a sturdy but open material (i.e., chain link) to allow visibility to the trunk for inspections and safety.

- The existing grade level around a tree shall normally be maintained out to the dripline of the tree. Alternate grade levels, as described in the tree protection plan, may be approved by the director of community development.
- Drain wells shall be installed whenever impervious surfaces will be placed over the root system of a tree (the root system generally extends to the outermost edges of the branches).
- Pruning that is necessary to accommodate a project feature, such as a building, road or walkway shall be reviewed and approved by the department of community development and the department of public works. Pruning, if necessary, shall be reviewed and approved by the City Arborist.
- New landscaping installed within the dripline of an existing tree shall be designed to reproduce a similar environment to that which existed prior to construction.
- Appropriate city staff shall be authorized to conduct on-site inspections during construction to ensure that tree preservation procedures are being followed and replanting plans implemented.

5.3.1 Recommendations for Tree Protection during Construction

The following recommendations are intended to supplement City requirements.

- Protective fencing should completely enclose the Tree Protection Zone and should be installed prior to demolition, grubbing, or grading. Protective fencing should be maintained in good condition and free of trash, debris, excess soil, chemicals, or equipment until construction is completed and accepted by the City inspector.
- Pruning prior to construction with the intent of improving tree health is not recommended. Where temporary clearance is needed for access, tree branches should be tied back to provide clearance. If any tree to be preserved requires pruning to provide construction clearance, the work must be approved in advance by the City or Consulting Arborist and performed by a Certified Arborist or Tree Worker according to the latest edition of the ANSI Z133 and A300 standards as well as the *Best Management Practices—Tree Pruning* published by the International Society of Arboriculture. Pruning should not occur during periods of flight of adult boring insects.
- Any work that is expected to encounter tree roots should be monitored by the City or Consulting Arborist.
- Excavation at the edge of Tree Protection Zones should include the following tree protection measures:
    - Hand excavate under or around tree roots to depth of three (3) feet.
    - Tunneling should only be employed with approval of the City or Consulting Arborist.
    - Do not cut main lateral tree roots or taproots. When main lateral tree roots or taproots are exposed, excavation should be discontinued until instructions to resolve the conditions are received from the City or Consulting Arborist.
    - Redirect roots in backfill areas where possible.

  - Expose main lateral roots beyond excavation limits as required to bend and redirect them without breaking.
  - If redirection is not practical, cut roots approximately three (3) inches back from new construction.
  - Protect exposed roots from drying out before placing permanent backfill.
- Prune roots that are affected by temporary and permanent construction only with the prior approval of the City or Consulting Arborist. Prune roots as follows:
  - Cut roots manually.
  - Cleanly cut exposed roots one (1) inch diameter and greater with sharp pruning instrument.
  - Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - Do not paint cut root ends.
- Injuries to any Protected trees during construction should be reported to the City or Consulting Arborist, who can evaluate the injury and recommend appropriate treatments.

Section 6. References

[Cal-IPC] California Invasive Plant Council. 2019. California Invasive Plant Inventory Database. Accessed online at http://cal-ipc.org/paf/ [January 2019].

Google Earth. 2019. Aerial imagery of project site in Sunnyvale, California. <https://www.google.com/earth/>. Accessed March 13, 2019.

Matheny, N. and J.R. Clark. 1998. Trees and Development: A Technical Guide to Preservation of Trees during Land Development. Champaign, IL: International Society of Arboriculture.

Sunnyvale [City of]. *Municipal Code*. Title 19. Zoning, Article 6, Discretionary Permits and Procedures, Chapter 19.94. Tree Preservation. Accessed online at qcode.us/codes/sunnyvale.

Appendix A. Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. No responsibility is assumed for matters legal in character. Any and all property is appraised or evaluated as though free and clear, under responsible ownership and competent management.
2. Property lines were not clearly surveyed or marked in the field by the owner, consultant attempted to provide as accurate of boundary for the inventory as possible using the limited data available.
3. Care has been taken to obtain all information from reliable sources. All data have been verified insofar as possible; however, the consultant can neither guarantee nor be responsible for the accuracy of information provided by others.
4. The consultant shall not be required to give testimony or attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
5. Loss or alteration of any part of this report invalidates the entire report.
6. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant.
7. Neither all nor any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales, or other media, without the prior expressed written or verbal consent of the consultant particularly as to value conclusions, identity of the consultant, or any reference to any professional society or institute or to any initialed designation conferred upon the consultant as stated in her qualifications.
8. This report and values expressed herein represent the opinion of the consultant, and the consultant's fee is in no way contingent upon the reporting of specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
9. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
10. Unless expressed otherwise: a) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection and b) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.

Appendix B. Certification of Performance

I, Matthew Pollock, certify that:

I have personally inspected the trees and the property referred to in this report and have stated my findings accurately. The extent of the evaluation is stated in the attached report and the terms of the assignment.

I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.

The analysis, opinions, and conclusions stated herein are my own and are based on current scientific procedures and facts.

My analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices.

No one provided significant professional assistance to me, except as indicated within the report.

Compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.

Matthew Pollock

ASCA-Registered Consulting Arborist #631

ISA-Certified Arborist WE-11610A

Appendix C. Tree Assessment

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
71	*Jacaranda mimosifolia*	Jacaranda	12	2	4	Yes	Fair	-
72	*Ligustrum lucidum*	glossy privet	10, 10, 9, 7, 4, 3	4	3	Yes	Fair	-
82	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	Yes
1001	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
1002	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
1003	*Pinus canariensis*	Canary Island pine	24	3	3	Yes	Fair	-
1004	*Pinus canariensis*	Canary Island pine	21	3	3	Yes	Fair	-
1005	*Pinus canariensis*	Canary Island pine	23	3	3	Yes	Fair	-
1006	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	Yes
1007	*Eucalyptus sp.*	Eucalyptus sp.	22	4	4	Yes	Good	-
1008	*Pinus canariensis*	Canary Island pine	29	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1009	*Pinus canariensis*	Canary Island pine	21	3	4	Yes	Fair	Yes
1010	*Pinus canariensis*	Canary Island pine	20	4	4	Yes	Good	-
1011	*Prunus cerasifera*	purple leaf plum	9	3	4	No	Fair	-
1012	*Prunus cerasifera*	purple leaf plum	9	4	4	No	Good	-
1013	*Prunus cerasifera*	purple leaf plum	6	2	4	No	Fair	-
1014	*Olea europaea*	Olive	7, 7, 6	5	5	No	Good	-
1017	*Pinus canariensis*	Canary Island pine	22	5	4	Yes	Good	-
1018	*Pinus canariensis*	Canary Island pine	9	4	4	No	Good	-
1020	*Pinus canariensis*	Canary Island pine	18	4	3	Yes	Fair	Yes
1021	*Pinus canariensis*	Canary Island pine	12	3	4	Yes	Fair	Yes
1022	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	Yes
1023	*Pinus canariensis*	Canary Island pine	15	5	4	Yes	Good	Yes
1024	*Pinus canariensis*	Canary Island pine	14	5	5	Yes	Good	Yes
1025	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	Yes

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1026	*Sequoia sempervirens*	Coast redwood	15	5	4	Yes	Good	Yes
1027	*Sequoia sempervirens*	Coast redwood	12	5	3	Yes	Good	Yes
1028	*Pinus canariensis*	Canary Island pine	13	3	4	Yes	Fair	Yes
1029	*Sequoia sempervirens*	Coast redwood	12	5	4	Yes	Good	Yes
1030	*Sequoia sempervirens*	Coast redwood	14	5	3	Yes	Good	Yes
1031	*Pinus canariensis*	Canary Island pine	25	5	4	Yes	Good	Yes
1032	*Pinus canariensis*	Canary Island pine	15	5	5	Yes	Good	Yes
1033	*Sequoia sempervirens*	Coast redwood	16	3	4	Yes	Fair	Yes
1034	*Sequoia sempervirens*	Coast redwood	17	5	4	Yes	Good	Yes
1035	*Fraxinus uhdei*	shamel ash	6	5	4	No	Good	-
1036	*Fraxinus uhdei*	shamel ash	5	5	4	No	Good	-
1037	*Fraxinus uhdei*	shamel ash	6	5	4	No	Good	-
1038	*Fraxinus uhdei*	shamel ash	7	4	2	No	Fair	-
1039	*Ulmus parvifolia*	Chinese elm	18	4	3	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1040	*Ulmus parvifolia*	Chinese elm	14	5	4	Yes	Good	-
1041	*Ulmus parvifolia*	Chinese elm	17	5	4	Yes	Good	-
1042	*Afrocarpus falcatus*	African fern pine	15	5	3	Yes	Good	-
1043	*Afrocarpus falcatus*	African fern pine	35, 11, 9	5	3	Yes	Good	-
1044	*Afrocarpus falcatus*	African fern pine	11	3	3	No	Fair	-
1046	*Prunus cerasifera*	purple leaf plum	9	2	2	No	Poor	-
1047	*Eucalyptus nicholii*	peppermint eucalypt	8	4	5	No	Good	-
1048	*Ulmus parvifolia*	Chinese elm	15	5	3	Yes	Good	-
1049	*Ulmus parvifolia*	Chinese elm	18	5	3	Yes	Good	-
1050	*Ulmus parvifolia*	Chinese elm	17	5	3	Yes	Good	-
1051	*Ulmus parvifolia*	Chinese elm	17	5	3	Yes	Good	-
1052	*Eucalyptus sideroxylon*	red ironbark	28	4	4	Yes	Good	-
1053	*Eucalyptus sideroxylon*	red ironbark	19	4	3	Yes	Fair	-
1054	*Quercus agrifolia*	California live oak	6	4	5	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1055	*Ceratonia siliqua*	carob tree	22	4	3	Yes	Fair	-
1056	*Quercus agrifolia*	California live oak	9	5	4	No	Good	-
1057	*Ceratonia siliqua*	carob tree	15	4	3	Yes	Fair	-
1058	*Prunus cerasifera*	purple leaf plum	8, 6, 3	4	4	No	Good	-
1059	*Ceratonia siliqua*	carob tree	25	3	3	Yes	Fair	-
1060	*Ceratonia siliqua*	carob tree	29	3	3	Yes	Fair	-
1061	*Ligustrum lucidum*	glossy privet	4	4	5	No	Good	-
1062	*Quercus agrifolia*	California live oak	4	3	3	No	Fair	-
1063	*Olea europaea*	Olive	5, 4, 4, 3, 2	5	3	No	Good	-
1064	*Ceratonia siliqua*	carob tree	21	4	4	Yes	Good	-
1065	*Quercus agrifolia*	California live oak	4, 4	5	4	No	Good	-
1066	*Prunus cerasifera*	purple leaf plum	6, 4	4	3	No	Fair	-
1067	*Quercus ilex*	Holly oak	14	5	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1068	*Ceratonia siliqua*	carob tree	21	3	4	Yes	Fair	-
1069	*Ceratonia siliqua*	carob tree	12	4	5	Yes	Good	-
1070	*Ceratonia siliqua*	carob tree	15	4	3	Yes	Fair	-
1071	*Ligustrum lucidum*	glossy privet	6, 2	5	5	No	Good	-
1072	*Ligustrum lucidum*	glossy privet	7, 6, 4, 4, 3	5	5	No	Good	-
1073	*Ceratonia siliqua*	carob tree	16	4	5	Yes	Good	-
1074	*Ceratonia siliqua*	carob tree	18	4	4	Yes	Good	-
1075	*Ceratonia siliqua*	carob tree	18	3	4	Yes	Fair	-
1076	*Ceratonia siliqua*	carob tree	5, 4, 4	3	4	No	Fair	-
1077	*Ceratonia siliqua*	carob tree	12	3	4	Yes	Fair	-
1078	*Ceratonia siliqua*	carob tree	20	4	5	Yes	Good	-
1079	*Ceratonia siliqua*	carob tree	13	4	3	Yes	Fair	-
1080	*Ceratonia siliqua*	carob tree	6	5	1	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1081	*Ceratonia siliqua*	carob tree	10, 7, 7, 5	4	2	No	Fair	-
1082	*Ceratonia siliqua*	carob tree	10	3	2	No	Fair	-
1083	*Ceratonia siliqua*	carob tree	25	1	1	Yes	Poor	-
1084	*Ceratonia siliqua*	carob tree	23	1	2	Yes	Poor	-
1085	*Prunus cerasifera*	purple leaf plum	6	1	1	No	Poor	-
1086	*Prunus cerasifera*	purple leaf plum	6	4	1	No	Fair	-
1087	*Ulmus parvifolia*	Chinese elm	20	2	1	Yes	Poor	-
1088	*Ulmus parvifolia*	Chinese elm	15	3	3	Yes	Fair	-
1089	*Ulmus parvifolia*	Chinese elm	19	4	2	Yes	Fair	-
1090	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
1091	*Afrocarpus falcatus*	African fern pine	17	5	2	Yes	Fair	-
1092	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
1093	*Pinus canariensis*	Canary Island pine	26	4	1	Yes	Fair	-
1094	*Pinus canariensis*	Canary Island pine	11	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1095	*Olea europaea*	Olive	7, 7, 6, 5, 4, 4	4	3	No	Fair	-
1096	*Eucalyptus nicholii*	peppermint eucalypt	28	5	1	Yes	Fair	-
1097	*Pinus canariensis*	Canary Island pine	18	4	4	Yes	Good	Yes
1098	*Pinus canariensis*	Canary Island pine	18	4	1	Yes	Fair	-
1099	*Pinus canariensis*	Canary Island pine	19	5	4	Yes	Good	Yes
1100	*Pinus canariensis*	Canary Island pine	26	4	4	Yes	Good	Yes
1101	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1102	*Pinus canariensis*	Canary Island pine	27	4	4	Yes	Good	Yes
1103	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1104	*Pinus canariensis*	Canary Island pine	9	4	2	No	Fair	-
1105	*Pinus canariensis*	Canary Island pine	18	5	4	Yes	Good	Yes
1106	*Pinus canariensis*	Canary Island pine	15	1	4	Yes	Fair	-
1107	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	Yes

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1108	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	Yes
1109	*Pinus canariensis*	Canary Island pine	14	3	4	Yes	Fair	Yes
1110	*Pinus canariensis*	Canary Island pine	17	5	3	Yes	Good	Yes
1111	*Pinus canariensis*	Canary Island pine	18	5	5	Yes	Good	Yes
1112	*Pinus canariensis*	Canary Island pine	23	5	5	Yes	Good	Yes
1113	*Pinus canariensis*	Canary Island pine	20	5	5	Yes	Good	Yes
1114	*Pinus canariensis*	Canary Island pine	15	5	5	Yes	Good	Yes
1184	*Quercus ilex*	Holly oak	17	5	5	Yes	Good	-
1185	*Ligustrum lucidum*	glossy privet	5, 4, 3	5	5	No	Good	-
1186	*Salix lasiandra*	Pacific willow	19	3	1	Yes	Poor	-
1187	*Osmanthus fragrans*	Fragrant Olive	4, 4, 3, 3	4	3	No	Fair	-
1188	*Pinus canariensis*	Canary Island pine	19	3	4	Yes	Fair	-
1189	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
1190	*Afrocarpus falcatus*	African fern pine	7	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1191	*Afrocarpus falcatus*	African fern pine	11	3	5	No	Good	-
1192	*Afrocarpus falcatus*	African fern pine	8, 7, 6, 5	3	4	No	Fair	-
1193	*Afrocarpus falcatus*	African fern pine	9	3	4	No	Fair	-
1194	*Afrocarpus falcatus*	African fern pine	11	5	4	No	Good	-
1195	*Afrocarpus falcatus*	African fern pine	11	3	4	No	Fair	-
1196	*Afrocarpus falcatus*	African fern pine	12	4	4	Yes	Good	-
1197	*Afrocarpus falcatus*	African fern pine	13	4	3	Yes	Fair	-
1198	*Pinus canariensis*	Canary Island pine	26	4	3	Yes	Fair	-
1199	*Pinus canariensis*	Canary Island pine	26	4	4	Yes	Good	-
1200	*Pinus canariensis*	Canary Island pine	20	4	5	Yes	Good	-
1201	*Afrocarpus falcatus*	African fern pine	9	3	4	No	Fair	-
1202	*Afrocarpus falcatus*	African fern pine	9	4	5	No	Good	-
1203	*Afrocarpus falcatus*	African fern pine	12	4	3	Yes	Fair	-
1204	*Pinus mugo*	Mugho pine	11	3	4	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1205	*Afrocarpus falcatus*	African fern pine	6, 5	3	3	No	Fair	-
1206	*Afrocarpus falcatus*	African fern pine	11	5	4	No	Good	-
1207	*Afrocarpus falcatus*	African fern pine	13	4	3	Yes	Fair	-
1208	*Eriobotrya japonica*	Loquat	9, 5	5	2	No	Fair	-
1209	*Maytenus boaria*	Mayten tree	17, 14	2	3	Yes	Fair	-
1210	*Maytenus boaria*	Mayten tree	21	5	3	Yes	Good	-
1211	*Maytenus boaria*	Mayten tree	3, 3	5	3	No	Good	-
1212	*Pinus canariensis*	Canary Island pine	23	3	4	Yes	Fair	-
1213	*Pinus canariensis*	Canary Island pine	23	3	4	Yes	Fair	-
1214	*Eucalyptus sideroxylon*	red ironbark	21	4	3	Yes	Fair	-
1215	*Sequoia sempervirens*	Coast redwood	12	3	5	Yes	Good	-
1216	*Sequoia sempervirens*	Coast redwood	19	4	4	Yes	Good	-
1217	*Sequoia sempervirens*	Coast redwood	15	5	4	Yes	Good	-
1218	*Sequoia sempervirens*	Coast redwood	20	4	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1219	*Populus nigra 'italica'*	Lombardy poplar	53, 21, 20, 18, 11	3	1	Yes	Poor	-
1221	*Betula pendula*	White birch	11	3	4	No	Fair	-
1222	*Betula pendula*	White birch	6	3	1	No	Poor	-
1228	*Juniperus chinensis*	Hollywood juniper	15	5	4	Yes	Good	-
1229	*Juniperus chinensis*	Hollywood juniper	15	4	1	Yes	Fair	-
1230	*Betula pendula*	White birch	12, 10	5	4	Yes	Good	-
1231	*Betula pendula*	White birch	9	3	4	No	Fair	-
1232	*Betula pendula*	White birch	11	5	5	No	Good	-
1233	*Pinus pinea*	Italian stone pine	31	4	3	Yes	Fair	-
1234	*Pinus pinea*	Italian stone pine	25	3	2	Yes	Fair	-
1235	*Pinus pinea*	Italian stone pine	25	3	1	Yes	Poor	-
1236	*Pinus pinea*	Italian stone pine	28	3	3	Yes	Fair	-
1237	*Alnus rubra*	Red alder	24	2	1	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1238	*Alnus rubra*	Red alder	24	3	2	Yes	Fair	-
1239	*Alnus rubra*	Red alder	22	3	2	Yes	Fair	-
1240	*Alnus rubra*	Red alder	26	3	1	Yes	Poor	-
1241	*Sequoia sempervirens*	Coast redwood	13	4	3	Yes	Fair	Yes
1242	*Sequoia sempervirens*	Coast redwood	13	4	3	Yes	Fair	Yes
1243	*Sequoia sempervirens*	Coast redwood	14	4	3	Yes	Fair	Yes
1244	*Pyrus calleryana*	Callery pear	15	4	3	Yes	Fair	-
1245	*Alnus rubra*	Red alder	19	4	2	Yes	Fair	-
1256	*Pinus pinea*	Italian stone pine	32	4	4	Yes	Good	-
1257	*Pinus pinea*	Italian stone pine	29	5	4	Yes	Good	-
1258	*Alnus rubra*	Red alder	26	3	1	Yes	Poor	-
1259	*Pinus halapensis*	Aleppo pine	23	3	2	Yes	Fair	-
1261	*Sequoia sempervirens*	Coast redwood	26	3	4	Yes	Fair	-
1262	*Sequoia sempervirens*	Coast redwood	24	3	4	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1263	*Sequoia sempervirens*	Coast redwood	26	3	4	Yes	Fair	-
1264	*Pinus halapensis*	Aleppo pine	24	3	3	Yes	Fair	-
1271	*Alnus rubra*	Red alder	15	3	4	Yes	Fair	-
1273	*Alnus rubra*	Red alder	21	5	1	Yes	Fair	-
1276	*Alnus rubra*	Red alder	23	4	1	Yes	Fair	-
1277	*Liquidamber styraciflua*	Sweetgum	16	3	3	Yes	Fair	-
1278	*Liquidamber styraciflua*	Sweetgum	16	4	2	Yes	Fair	-
1279	*Liquidamber styraciflua*	Sweetgum	22	3	3	Yes	Fair	-
1280	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
1281	*Liquidamber styraciflua*	Sweetgum	14	5	3	Yes	Good	-
1282	*Liquidamber styraciflua*	Sweetgum	12	5	4	Yes	Good	-
1283	*Liquidamber styraciflua*	Sweetgum	12	4	4	Yes	Good	-
1284	*Liquidamber styraciflua*	Sweetgum	20	5	3	Yes	Good	-
1285	*Liquidamber styraciflua*	Sweetgum	12	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
1286	*Liquidamber styraciflua*	Sweetgum	14	4	4	Yes	Good	-
1318	*Picea pungens glauca*	Blue Spruce	6	2	1	No	Poor	-
1319	*Liquidamber styraciflua*	Sweetgum	5, 4	3	4	No	Fair	-
1320	*Fraxinus uhdei*	shamel ash	21	4	4	Yes	Good	Yes
1321	*Fraxinus uhdei*	shamel ash	17	5	4	Yes	Good	Yes
1322	*Fraxinus uhdei*	shamel ash	23	4	4	Yes	Good	Yes
1323	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	Yes
1324	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	-
2001	*Populus nigra 'italica'*	Lombardy poplar	49	3	1	Yes	Poor	-
2002	*Populus nigra 'italica'*	Lombardy poplar	53	3	4	Yes	Fair	-
2003	*Populus nigra 'italica'*	Lombardy poplar	58, 35	5	3	Yes	Good	-
2004	*Corymbia citriodora*	lemon scented gum	22	5	4	Yes	Good	-
2005	*Populus nigra 'italica'*	Lombardy poplar	52	5	4	Yes	Good	-
2006	*Schinus molle*	Peruvian pepper	54	4	3	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2007	*Eucalyptus nicholii*	peppermint eucalypt	46	4	2	Yes	Fair	-
2008	*Pinus canariensis*	Canary Island pine	26	3	3	Yes	Fair	-
2009	*Pinus canariensis*	Canary Island pine	21	2	3	Yes	Fair	-
2010	*Pinus canariensis*	Canary Island pine	15	2	4	Yes	Fair	-
2011	*Eucalyptus sp.*	Eucalyptus sp.	28, 21	4	3	Yes	Fair	-
2012	*Eucalyptus nicholii*	peppermint eucalypt	31	5	4	Yes	Good	-
2013	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	-
2014	*Pinus canariensis*	Canary Island pine	30	4	2	Yes	Fair	-
2015	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	-
2016	*Pinus canariensis*	Canary Island pine	21	4	3	Yes	Fair	-
2017	*Pinus canariensis*	Canary Island pine	23	4	3	Yes	Fair	-
2018	*Ligustrum lucidum*	glossy privet	11	3	3	No	Fair	-
2020	*Ligustrum lucidum*	glossy privet	6	4	3	No	Fair	-
2023	*Ligustrum lucidum*	glossy privet	13	4	2	Yes	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2024	*Ligustrum lucidum*	glossy privet	17	4	4	Yes	Good	-
2025	*Ligustrum lucidum*	glossy privet	13	3	4	Yes	Fair	-
2028	*Ligustrum lucidum*	glossy privet	15	3	3	Yes	Fair	-
2029	*Jacaranda mimosifolia*	Jacaranda	13	2	2	Yes	Poor	-
2030	*Jacaranda mimosifolia*	Jacaranda	10	4	4	No	Good	-
2031	*Jacaranda mimosifolia*	Jacaranda	8	4	4	No	Good	-
2032	*Jacaranda mimosifolia*	Jacaranda	11	4	4	No	Good	-
2033	*Jacaranda mimosifolia*	Jacaranda	9	2	3	No	Fair	-
2034	*Ligustrum lucidum*	glossy privet	9	4	3	No	Fair	-
2035	*Ligustrum lucidum*	glossy privet	10	4	1	No	Fair	-
2037	*Ligustrum lucidum*	glossy privet	16	4	3	Yes	Fair	-
2038	*Pinus canariensis*	Canary Island pine	19	4	5	Yes	Good	-
2039	*Pinus canariensis*	Canary Island pine	25	4	3	Yes	Fair	-
2040	*Ligustrum lucidum*	glossy privet	6	4	3	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2043	*Ligustrum lucidum*	glossy privet	8	2	2	No	Poor	-
2044	*Eucalyptus polyanthemos*	silver dollar eucalypt	35	5	4	Yes	Good	-
2045	*Corymbia citriodora*	lemon scented gum	23	5	2	Yes	Fair	-
2046	*Eucalyptus polyanthemos*	silver dollar eucalypt	24	3	4	Yes	Fair	-
2047	*Pinus canariensis*	Canary Island pine	33	5	4	Yes	Good	-
2048	*Pinus canariensis*	Canary Island pine	26	2	3	Yes	Fair	-
2049	*Pittosporum eugenioides*	Lemonwood	6, 3, 3	1	1	No	Poor	-
2050	*Pittosporum eugenioides*	Lemonwood	7, 6, 6	1	1	No	Poor	-
2051	*Pittosporum eugenioides*	Lemonwood	5, 4	1	1	No	Poor	-
2052	*Pinus canariensis*	Canary Island pine	27	4	3	Yes	Fair	-
2053	*Pinus canariensis*	Canary Island pine	21	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2054	*Pinus canariensis*	Canary Island pine	25	4	2	Yes	Fair	-
2055	*Pittosporum eugenioides*	Lemonwood	6	0	0	No	Poor	-
2056	*Pittosporum eugenioides*	Lemonwood	7, 6	1	1	No	Poor	-
2057	*Pittosporum eugenioides*	Lemonwood	9, 6, 5	1	1	No	Poor	-
2058	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2059	*Pinus canariensis*	Canary Island pine	23	5	4	Yes	Good	-
2060	*Pittosporum eugenioides*	Lemonwood	7	0	0	No	Poor	-
2061	*Pittosporum eugenioides*	Lemonwood	8, 7	0	0	No	Poor	-
2062	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	-
2063	*Pittosporum eugenioides*	Lemonwood	9, 5	2	1	No	Poor	-
2064	*Pittosporum eugenioides*	Lemonwood	5, 4	4	2	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2065	*Pittosporum eugenioides*	Lemonwood	7	3	1	No	Poor	-
2066	*Pittosporum eugenioides*	Lemonwood	10, 10, 5	4	3	No	Fair	-
2067	*Ligustrum lucidum*	glossy privet	12	4	3	Yes	Fair	-
2068	*Pinus canariensis*	Canary Island pine	24	5	3	Yes	Good	-
2069	*Pinus canariensis*	Canary Island pine	22	4	3	Yes	Fair	-
2070	*Pinus canariensis*	Canary Island pine	19	4	3	Yes	Fair	-
2071	*Pinus canariensis*	Canary Island pine	22	4	4	Yes	Good	-
2072	*Eucalyptus polyanthemos*	silver dollar eucalypt	29	5	3	Yes	Good	-
2073	*Pinus canariensis*	Canary Island pine	14	3	4	Yes	Fair	-
2074	*Pittosporum eugenioides*	Lemonwood	6, 5, 5, 3, 3	3	4	No	Fair	-
2076	*Pittosporum eugenioides*	Lemonwood	6, 5, 5	1	2	No	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2078	*Pittosporum eugenioides*	Lemonwood	6	1	2	No	Poor	-
2079	*Ligustrum lucidum*	glossy privet	10	5	4	No	Good	-
2080	*Ligustrum lucidum*	glossy privet	7	3	4	No	Fair	-
2081	*Ligustrum lucidum*	glossy privet	13	3	4	Yes	Fair	-
2082	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2083	*Eucalyptus sideroxylon*	red ironbark	27	4	4	Yes	Good	-
2085	*Ligustrum lucidum*	glossy privet	9	4	5	No	Good	-
2086	*Ligustrum lucidum*	glossy privet	5	3	2	No	Fair	-
2089	*Ligustrum lucidum*	glossy privet	5	4	2	No	Fair	-
2091	*Populus nigra 'italica'*	Lombardy poplar	51	5	3	Yes	Good	-
2092	*Pinus canariensis*	Canary Island pine	31	5	5	Yes	Good	-
2093	*Pinus canariensis*	Canary Island pine	17	5	4	Yes	Good	-
2094	*Pinus canariensis*	Canary Island pine	18	5	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2095	*Pinus canariensis*	Canary Island pine	23	5	4	Yes	Good	-
2096	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	-
2097	*Pittosporum eugenioides*	Lemonwood	7, 6, 6, 5, 5	4	3	No	Fair	-
2098	*Pittosporum eugenioides*	Lemonwood	7, 6, 6, 5, 3	4	3	No	Fair	-
2099	*Pittosporum eugenioides*	Lemonwood	7, 7, 6	4	1	No	Fair	-
2100	*Pittosporum eugenioides*	Lemonwood	7, 5, 5	4	3	No	Fair	-
2101	*Pittosporum eugenioides*	Lemonwood	6, 4, 4	2	4	No	Fair	-
2102	*Pittosporum eugenioides*	Lemonwood	7, 4	4	3	No	Fair	-
2103	*Pittosporum eugenioides*	Lemonwood	5, 3	4	3	No	Fair	-
2104	*Pittosporum eugenioides*	Lemonwood	6, 6	4	3	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2105	*Pinus canariensis*	Canary Island pine	22	5	5	Yes	Good	-
2106	*Pinus canariensis*	Canary Island pine	17	5	4	Yes	Good	-
2107	*Pinus canariensis*	Canary Island pine	26	5	5	Yes	Good	-
2108	*Pittosporum eugenioides*	Lemonwood	6, 5, 4, 4, 4, 3	4	4	No	Good	-
2109	*Pittosporum eugenioides*	Lemonwood	8, 5, 5, 4, 4, 3	3	4	No	Fair	-
2110	*Pittosporum eugenioides*	Lemonwood	4, 3, 2	3	4	No	Fair	-
2111	*Pittosporum eugenioides*	Lemonwood	8, 5, 3, 3, 3, 3	3	3	No	Fair	-
2112	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3, 3	4	4	No	Good	-
2113	*Pittosporum eugenioides*	Lemonwood	9, 4, 4, 2, 2	4	3	No	Fair	-
2114	*Pittosporum eugenioides*	Lemonwood	5, 2, 2, 2	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2115	*Pittosporum eugenioides*	Lemonwood	9, 8, 7, 5	3	4	No	Fair	-
2116	*Pittosporum eugenioides*	Lemonwood	5	0	0	Yes	Poor	-
2118	*Pinus canariensis*	Canary Island pine	22	5	4	Yes	Good	-
2119	*Pinus canariensis*	Canary Island pine	19	4	4	Yes	Good	-
2120	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	4	3	Yes	Fair	-
2121	*Liquidamber styraciflua*	Sweetgum	14	5	4	Yes	Good	-
2122	*Liquidamber styraciflua*	Sweetgum	17	5	3	Yes	Good	-
2123	*Liquidamber styraciflua*	Sweetgum	15	4	4	Yes	Good	-
2124	*Liquidamber styraciflua*	Sweetgum	18	5	3	Yes	Good	-
2125	*Liquidamber styraciflua*	Sweetgum	16	5	4	Yes	Good	-
2126	*Liquidamber styraciflua*	Sweetgum	12	5	3	Yes	Good	-
2127	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2128	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-
2129	*Pinus canariensis*	Canary Island pine	25	3	4	Yes	Fair	-
2130	*Pinus canariensis*	Canary Island pine	20	4	5	Yes	Good	-
2131	*Eucalyptus polyanthemos*	silver dollar eucalypt	18	5	4	Yes	Good	-
2132	*Eucalyptus polyanthemos*	silver dollar eucalypt	20	4	5	Yes	Good	-
2133	*Eucalyptus polyanthemos*	silver dollar eucalypt	25	4	3	Yes	Fair	-
2134	*Pinus canariensis*	Canary Island pine	16	3	4	Yes	Fair	-
2135	*Pinus canariensis*	Canary Island pine	23	4	4	Yes	Good	-
2140	*Eucalyptus polyanthemos*	silver dollar eucalypt	9	4	4	No	Good	-
2142	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	-
2143	*Pinus canariensis*	Canary Island pine	21	5	4	Yes	Good	-
2144	*Jacaranda mimosifolia*	Jacaranda	9	5	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2147	*Pinus canariensis*	Canary Island pine	27	3	3	Yes	Fair	-
2148	*Pinus canariensis*	Canary Island pine	27	5	5	Yes	Good	-
2149	*Pittosporum eugenioides*	Lemonwood	4, 4, 2	5	4	No	Good	-
2151	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	4	4	Yes	Good	-
2152	*Liquidamber styraciflua*	Sweetgum	16	5	4	Yes	Good	-
2153	*Liquidamber styraciflua*	Sweetgum	18	3	4	Yes	Fair	-
2154	*Liquidamber styraciflua*	Sweetgum	18	5	4	Yes	Good	-
2156	*Liquidamber styraciflua*	Sweetgum	15	3	1	Yes	Poor	-
2157	*Liquidamber styraciflua*	Sweetgum	17	3	2	Yes	Fair	-
2158	*Liquidamber styraciflua*	Sweetgum	16	4	3	Yes	Fair	-
2159	*Pinus canariensis*	Canary Island pine	24	5	4	Yes	Good	-
2160	*Pinus canariensis*	Canary Island pine	22	3	4	Yes	Fair	-
2161	*Pinus canariensis*	Canary Island pine	22	4	5	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2162	*Eucalyptus sideroxylon*	red ironbark	19	4	2	Yes	Fair	-
2163	*Pinus canariensis*	Canary Island pine	28	4	5	Yes	Good	-
2164	*Pinus canariensis*	Canary Island pine	22	4	3	Yes	Fair	-
2165	*Pinus canariensis*	Canary Island pine	24	5	2	Yes	Fair	-
2166	*Eucalyptus sideroxylon*	red ironbark	35	5	2	Yes	Fair	-
2167	*Eucalyptus sideroxylon*	red ironbark	19	5	2	Yes	Fair	-
2168	*Eucalyptus sideroxylon*	red ironbark	22	5	2	Yes	Fair	-
2170	*Quercus ilex*	Holly oak	5, 4	5	2	No	Fair	-
2172	*Quercus agrifolia*	California live oak	16, 15, 13	4	3	Yes	Fair	-
2173	*Liquidamber styraciflua*	Sweetgum	12	5	2	Yes	Fair	-
2174	*Liquidamber styraciflua*	Sweetgum	10	4	4	No	Good	-
2175	*Liquidamber styraciflua*	Sweetgum	14	5	2	Yes	Fair	-
2176	*Liquidamber styraciflua*	Sweetgum	9	5	2	No	Fair	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2177	*Liquidamber styraciflua*	Sweetgum	13	4	3	Yes	Fair	-
2180	*Pinus canariensis*	Canary Island pine	25	3	4	Yes	Fair	-
2181	*Pinus canariensis*	Canary Island pine	19	4	4	Yes	Good	-
2182	*Pinus canariensis*	Canary Island pine	24	4	4	Yes	Good	-
2183	*Pittosporum eugenioides*	Lemonwood	6, 5	3	2	No	Fair	-
2184	*Eucalyptus sideroxylon*	red ironbark	23	2	2	Yes	Poor	-
2185	*Pittosporum eugenioides*	Lemonwood	5, 3, 2	4	3	No	Fair	-
2186	*Pittosporum eugenioides*	Lemonwood	3, 2, 2, 1	4	3	No	Fair	-
2187	*Pittosporum eugenioides*	Lemonwood	4, 3	5	3	No	Good	-
2188	*Pinus canariensis*	Canary Island pine	20	4	3	Yes	Fair	-
2189	*Pinus canariensis*	Canary Island pine	18	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2190	*Pittosporum eugenioides*	Lemonwood	3, 3	3	3	No	Fair	-
2191	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3, 3	3	3	No	Fair	-
2192	*Pittosporum eugenioides*	Lemonwood	3, 3, 2	3	2	No	Fair	-
2193	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	5	4	Yes	Good	-
2194	*Liquidamber styraciflua*	Sweetgum	13	5	3	Yes	Good	-
2195	*Liquidamber styraciflua*	Sweetgum	16	5	3	Yes	Good	-
2196	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	4	3	Yes	Fair	Yes
2197	*Eucalyptus polyanthemos*	silver dollar eucalypt	24	4	3	Yes	Fair	Yes
2198	*Eucalyptus polyanthemos*	silver dollar eucalypt	22	2	3	Yes	Fair	-
2199	*Eucalyptus sideroxylon*	red ironbark	17	2	2	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2200	*Eucalyptus polyanthemos*	silver dollar eucalypt	20	2	3	Yes	Fair	-
2201	*Eucalyptus polyanthemos*	silver dollar eucalypt	28	5	3	Yes	Good	-
2202	*Populus nigra 'italica'*	Lombardy poplar	71	3	1	Yes	Poor	-
2203	*Populus nigra 'italica'*	Lombardy poplar	37, 36	3	3	Yes	Fair	-
2204	*Populus nigra 'italica'*	Lombardy poplar	27	3	4	Yes	Fair	-
2205	*Populus nigra 'italica'*	Lombardy poplar	57	3	4	Yes	Fair	-
2206	*Populus nigra 'italica'*	Lombardy poplar	29	3	1	Yes	Poor	-
2207	*Populus nigra 'italica'*	Lombardy poplar	60	3	4	Yes	Fair	-
2208	*Pinus canariensis*	Canary Island pine	9	3	2	No	Fair	-
2209	*Pinus canariensis*	Canary Island pine	29	4	4	Yes	Good	-
2210	*Eucalyptus sideroxylon*	red ironbark	20	3	4	Yes	Fair	-
2213	*Pinus canariensis*	Canary Island pine	20	4	4	Yes	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2214	*Prunus cerasifera*	purple leaf plum	4, 3, 3, 2, 2	5	4	No	Good	-
2218	*Pittosporum eugenioides*	Lemonwood	4, 3, 3, 3, 3	4	2	No	Fair	-
2219	*Pinus canariensis*	Canary Island pine	15	3	1	Yes	Poor	-
2220	*Pinus canariensis*	Canary Island pine	27	4	4	Yes	Good	-
2221	*Pinus canariensis*	Canary Island pine	19	3	4	Yes	Fair	-
2222	*Pinus canariensis*	Canary Island pine	17	3	4	Yes	Fair	-
2223	*Pittosporum eugenioides*	Lemonwood	5, 5, 4, 3	3	2	No	Fair	-
2224	*Eucalyptus polyanthemos*	silver dollar eucalypt	21	4	2	Yes	Fair	-
2225	*Pittosporum eugenioides*	Lemonwood	7	4	4	No	Good	-
2226	*Eucalyptus polyanthemos*	silver dollar eucalypt	29	4	4	Yes	Good	-
2227	*Osmanthus fragrans*	Fragrant Olive	6, 4	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2228	*Osmanthus fragrans*	Fragrant Olive	8, 6, 2, 1	4	4	No	Good	-
2229	*Eucalyptus polyanthemos*	silver dollar eucalypt	23	5	3	Yes	Good	-
2230	*Eucalyptus polyanthemos*	silver dollar eucalypt	22	4	4	Yes	Good	-
2231	*Osmanthus fragrans*	Fragrant Olive	5, 4, 3	3	3	No	Fair	-
2232	*Osmanthus fragrans*	Fragrant Olive	6, 6, 1	3	3	No	Fair	-
2233	*Osmanthus fragrans*	Fragrant Olive	7, 5, 4	3	3	No	Fair	-
2234	*Pinus canariensis*	Canary Island pine	30	4	4	Yes	Good	-
2235	*Pinus canariensis*	Canary Island pine	26	4	5	Yes	Good	-
2236	*Liquidamber styraciflua*	Sweetgum	18	4	2	Yes	Fair	-
2238	*Osmanthus fragrans*	Fragrant Olive	10	4	3	No	Fair	-
2239	*Osmanthus fragrans*	Fragrant Olive	11	4	2	No	Fair	-
2240	*Osmanthus fragrans*	Fragrant Olive	9, 8, 4, 4	4	2	No	Fair	-
2241	*Osmanthus fragrans*	Fragrant Olive	9, 8, 4	4	4	No	Good	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2242	*Liquidamber styraciflua*	Sweetgum	15	4	4	Yes	Good	-
2243	*Osmanthus fragrans*	Fragrant Olive	7, 7, 6	4	4	No	Good	-
2244	*Osmanthus fragrans*	Fragrant Olive	6, 5, 4	4	3	No	Fair	-
2245	*Osmanthus fragrans*	Fragrant Olive	6, 5, 5	4	4	No	Good	-
2246	*Liquidamber styraciflua*	Sweetgum	12	5	4	Yes	Good	-
2247	*Quercus ilex*	Holly oak	17	5	4	Yes	Good	-
2248	*Quercus ilex*	Holly oak	11	3	4	No	Fair	-
2249	*Quercus ilex*	Holly oak	21	4	2	Yes	Fair	-
2250	*Eucalyptus polyanthemos*	silver dollar eucalypt	33	4	4	Yes	Good	-
2251	*Pinus canariensis*	Canary Island pine	21	3	3	Yes	Fair	-
2252	*Pinus canariensis*	Canary Island pine	26	1	1	Yes	Poor	-
2253	*Eucalyptus polyanthemos*	silver dollar eucalypt	27	2	1	Yes	Poor	-

Tree Tag	Scientific Name	Common Name	DBH	Health	Structure	Protected Tree?	Health and Structure Rating	Preserve?
2254	*Eucalyptus polyanthemos*	silver dollar eucalypt	26	4	3	Yes	Fair	-
2255	*Eucalyptus polyanthemos*	silver dollar eucalypt	18	4	5	Yes	Good	-
2256	*Gleditsia triacanthos 'inermis'*	thornless honey locust	12	3	2	Yes	Fair	-
2257	*Liquidamber styraciflua*	Sweetgum	12	4	3	Yes	Fair	-
2259	*Pittosporum eugenioides*	Lemonwood	9, 4, 3	3	2	No	Fair	-
2260	*Pittosporum eugenioides*	Lemonwood	7, 5, 4, 4	4	2	No	Fair	-
2261	*Pittosporum eugenioides*	Lemonwood	6, 5	3	2	No	Fair	-
2301	*Liquidamber styraciflua*	Sweetgum	14	3	3	Yes	Fair	Yes
2302	*Pinus canariensis*	Canary Island pine	23	2	2	Yes	Poor	-

Appendix D. Representative Photos

Photo 1. Tree #1043, African fern pine (*Afrocarpus falcatus*).

Photo 2. Tree 1006 (left side), Canary Island pine (*Pinus canariensis*). Tree #1011 (right side), purple leaf plum (*Prunus cerasifera*).

Photo 3. Tress 1048-1051 (left to right), all are Chinese elm (*Ulmus parvifolia*).

Photo 4. Trees 2124-2126 (left to right), all are sweetgum (*Liquidamber styraciflua*).

Photo 5. Tree 2144 (foreground), jacaranda (*Jacaranda mimosifolia*) and Trees 2142-2143 (background), Canary Island pine (*Pinus canariensis*).

Appendix B. Dewatering Plan for the Google West Channel Enhancement

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Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS

MEMORANDUM

TO:	Scott Smithwick, DEVCON Construction Virginia Calkins, SRGNC	DATE:	August 15, 2019
FROM:	Caitlin Gilmore, PE Chuck Anderson, PE	JOB#:	GOOG.03.18
SUBJECT:	Dewatering Plan for the Google West Channel Enhancement		

The following conceptual dewatering plan was developed based on the draft 50% Design Development (DD) plan set dated June 29, 2018 and is intended to be used as an internal document to support environmental permit applications. This draft plan does not consider construction scheduling with the adjacent Santa Clara Valley Water District (District) West Channel Flood Control Project nor does it consider the development of the Google properties 100 and 200 Caribbean adjacent to the channel enhancement project reach.

Objectives

- Temporarily divert water from the project reach of Sunnyvale West Channel from upstream of the project to downstream of Caribbean Drive, a total length of approximately 1,300 feet.
- Create a dewatered work area and facilitate construction by dewatering the entire length of the channel within the project site.
- Prevent erosion, sedimentation and siltation from occurring in the upstream or downstream channel reach under active construction.

Design Event

The anticipated channel flow during construction is 1.4 cubic feet per second (cfs) which is the likely average flow in West Channel during the construction period from April 15th to October 15th with a maximum flow of 12 cfs. This is based on an upstream drainage area of 2.87 square miles and a flow of 0.5 cfs per square mile in urban areas drained by gravity based on the approximate pumping needed from the urbanized City of Milpitas storm drainage systems. There is no natural upstream watershed to the Sunnyvale West urbanized channel system.

There are no storm drainage outfalls within the project reach.

Schedule

The dewatering system will be in place and functioning prior to the start of in-channel construction work and will be removed only after all construction work at a dewatered reach is complete with a maximum duration of 6 months. The contractor may dewater the project areas in phases or all at once. The construction period will be during the dry season from April 15th to October 15th 2019.

Installation of the dewatering system will take approximately one week, and will commence at an allowed start date per the regulatory approvals. After construction activities at a reach are completed, the AquaDam and earthen coffer dams and diversion system will be removed within 48 hours. Flows will be

restored to the new construction reach in a manner that minimizes erosion. Ponded water will be re-directed into the established low-flow channel in a gradual manner to avoid an erosive surge of water.

The dewatering and system removal schedule will be coordinated with the upstream and downstream District project as well as the onsite construction.

Description of Dewatering System

System Overview

The dewatering system will be composed of an AquaDam spanning the full width of the channel located at the downstream boundary of the construction reach (i.e. just downstream of Caribbean Drive bridge — see Location A in *Appendix A*) and an earthen coffer dam spanning the full width of the channel located at the upstream limits of the construction reach (i.e. upstream of the Caspian Drive Bridge — see Location B in *Appendix A*); 28-inch diameter fused high-density polyethylene (HDPE) pipes (or multiple pipes of the same carrying capacity) to convey the diverted water around the construction reach; and riprap or equivalent erosion protection for the system discharge point (i.e. energy flow dissipater—see Table 1 BMPs below).

AquaDam Coffer Dam

A plastic water filled AquaDam will be inflated to a height of 9 feet from the existing downstream invert of the Caribbean bridge culvert and set at a minimum of elevation 7.4 feet NAVD88 (see Tidal Influences below) to prevent the intrusion of tidal water upstream from the coffer dam. The coffer dam must not exhibit UV corrosion for the duration of their installation. The cofferdam must be installed per manufacturer's instruction. Contractor will provide shoring behind the AquaDam as needed (see Detail 2 in *Appendix B*).

Earthen Coffer Dam

Earthen coffer dam will constructed using a combination of gravel-filled sandbags and sheet plastic with a minimum thickness of 6 mil. The gravel fill for the sandbags will contain no more than 15% fines. The gravel-filled sandbags will be placed on top of the plastic material, which will be laid above the invert for the 28-inch HDPE pipe. The width of the invert must be enough to wrap the installed sandbags in a "burrito-wrap" configuration. The sandbags will stack in a staggered pyramid-like fashion (see Detail 1 in *Appendix B*). After the design height has been reached, the original sheet plastic shall be placed on top of the sandbags and secured with additional sand bags. Sandbags on top of the sheet plastic will be spaced no more than 3 feet apart. To maximize flow inflow through the 28-inch HDPE pipe, the upstream configuration of the coffer dam will have a funnel shape with the portions closest to the channel banks wider than the mid-channel portion of the coffer dam. The top of the dam will be lowest in height at the center of the dam and increase in height towards the banks, thereby directing overtopping water into the centerline of the channel. See *Appendix E (to be included in final version)* for coffer dam height calculations.

Pipe System

The pipe system will be composed of a 28-inch diameter fused HDPE pipe trunk line, or two smaller pipes with equivalent capacity. The system will use gravity to convey water impounded by the upstream coffer dam and water collected from storm drain outlets to the low flow channel below the lower coffer dam. The bypass system can be located either to the east or west of the channel. If gravity flow is not effective in conveying water due to tidal influence, pumps will be used as necessary. Riprap (1/4 to 1/2 ton) will be placed at the downstream discharge point of the HDPE pipe to prevent erosion of the channel

bed. If necessary, one or more check dams, composed of straw/hale bales secured by wooden stakes (straw/hale bales) would be installed to slowly reduce water velocities and prevent bed erosion.

Energy Flow Dissipater

Diversion pipe flow energy (velocity) dissipater will be installed downstream of the AquaDam coffer dam on existing channel invert and banks. Pipe discharges will occur from low to high tide, and outlets shall be located above Mean Higher High Water. Dissipater may be under tide water and shall be designed to resist degradation by tidal movement. Dissipater shall be installed from pipe outlet to channel invert. Design shall be in accordance with CASQA Construction BMP EC-10 (see *Appendix C*).

Groundwater

All construction work will be implemented under dewatered channel conditions. If groundwater seepage occurs within the dewatered reach, pumps will be used to discharge the seepage flows to intakes of the 28-inch HDPE trunk line. When discharging into the intakes of the 28-inch pipe, the top opening of the intake will be sealed.

Tidal Influences

The maximum water surface elevation (WSEL) for the mean higher high water (MHHW) is approximately 7.4 feet NAVD88 (Schaaf & Wheeler, Draft West Channel Enhancement for Google Hydraulic Basis of Design). This tidal influence WSEL is at the mouth of Guadalupe Slough. The downstream AquaDam coffer dam would be set at elevation 7.4 feet NAVD88 to prevent the intrusion of tidal water upstream from the coffer dam. Since tidal waters can potentially reduce the flows downstream or even back up the flows upstream, pumps will be on standby to transfer excess flows downstream of the coffer dam.

System Removal

Once the construction work is completed at a dewatered reach, the diversion system and coffer dams will be removed within 48 hours of completion. Removal of the diversion pipe will start at the downstream terminus of the system and proceed upstream. Flows will be restored within the new construction area in a manner that minimizes erosion. Ponded flows will be re-directed into the established low-flow channel. Flows will be gradually restored to the channel to avoid a potentially erosive surge of water. All equipment and materials used in the dewatering system will be removed from the channel for re-use or proper disposal.

Water Quality Monitoring

The dewatering contractor will be responsible for visual observations, collection of water samples, and transportation of samples in a timely manner to an accredited laboratory testing. Water samples will be collected from the channel 100’ above and below the dewatered zone and from the HDPE pipe system within the dewatered zone. The HDPE pipe system will include air vents at maximum intervals of 500 feet in to allow collection of water samples from the pipes. During normal operation, the air vents will remain closed; the vents will be opened to obtain water sample. A section of clear pipe shall be installed on groundwater pump discharges to monitor turbidity.

Water quality testing will commence two days prior to installation of the dewatering system and will continue until one day after the dewatering system is completely removed. Observations, testing and sampling will be performed for the parameters listed in Table 1. Water quality readings will be submitted as part of daily QA/QC reports.

Table 1 – Water Quality Testing Parameters

Parameter	Frequency of Sampling/Testing	Exceedance Limit
Turbidity	Twice Daily	Incremental increase by 5 NTUs if background <50 NTUs and 10 percent if background >=50 NTUs
pH	Twice Daily	>0.5 units deviation above or below ambient levels
Dissolved Oxygen	Twice Daily	Minimum of 5.0 mg/l or no change if background <5.0mg/l
Temperature	Twice Daily	Increase by more than 5 degrees Fahrenheit above natural temperatures
Floating matter, foam, alteration of color, visible oil or other petroleum products	Daily	Visual observations only

Daily is defined as each day is which construction work occurs in the channel reach. Typically, this will be Monday through Friday except for holidays. If any construction occurs on a Saturday, Sunday or holiday, water quality monitoring will occur on that day also.

If water quality testing parameters are exceeded, the contractor will immediately investigate the potential source of the problem. The contractor shall at a minimum pump effluent from dewatered areas to baker tanks for settling prior to discharge to the 28-in HDPE pipe if turbidity is exceeded. If the contractor's operations are causing the problem, then the issue will be corrected immediately.

If the source is outside of/beyond the project limits, the contractor will notify the Water District, who will then notify the regulatory agencies of the situation, so that the regulatory agencies can determine the proper response to the water quality issue.

Best Management Practices

Applicable BMPs

The design and operation of the West Channel dewatering system will conform to the applicable SCVWD BMPs to prevent adverse impacts to water quality. Table 2 lists the applicable BMPs as detailed in *Appendix D (to be included in final version)*.

Table 2 – Water Quality BMPs Applicable to West Channel Enhancement Dewatering System

BMP No.	Title
WQ-1	Limit Impact of Pump and Generator Operation and Maintenance
WQ-2	Limit Impacts of Sediments on Water Quality
WQ-3	Limit Impacts from Staging and Stockpiling Materials
WQ-4	Stabilize Construction Entrances and Exits
WQ-5	Limit Impact of Concrete Near Waterways
WQ-6	Isolate Work in Tidal Areas with Use of Coffer Dam
WQ-7	Use Seeding for Erosion Control, Weed Suppression and Site Improvement
WQ-8	Manage Exposed Groundwater at Work Sites
WQ-9	Maintain Clean Conditions at Work Sites

BMP No.	Title
WQ-10	Control Sediment/Turbidity from Discharges
WQ-11	Prevent Water Pollution
WQ-12	Prevent Stormwater Pollution

Contingency Plans

Storm Event

It is unlikely, but possible, that a dry season precipitation event or high tide event could be of sufficient magnitude to exceed the design capacity of the dewatering system. To prevent damage to the system and adverse environmental impacts, the contractor will adhere to the requirements in Table 3.

If the volume of water impounded at the upstream coffer dam or tide levels at the downstream coffer dam exceeds the capacity of the dewatering system, the excess water will be pumped into baker tanks for temporary storage and proper disposal.

Table 3 – Dry Season Contingency Plan

Event	Response
>30% likelihood of significant precipitation	Inspect all BMPs and remedy identified deficiencies
>50% likelihood of significant precipitation or tides above MHHW	Maintain baker tanks and pumps at dewatering site and collect excess water as required
Precipitation causes violation of water quality standard	All construction operations cease until applicable water quality parameter is met

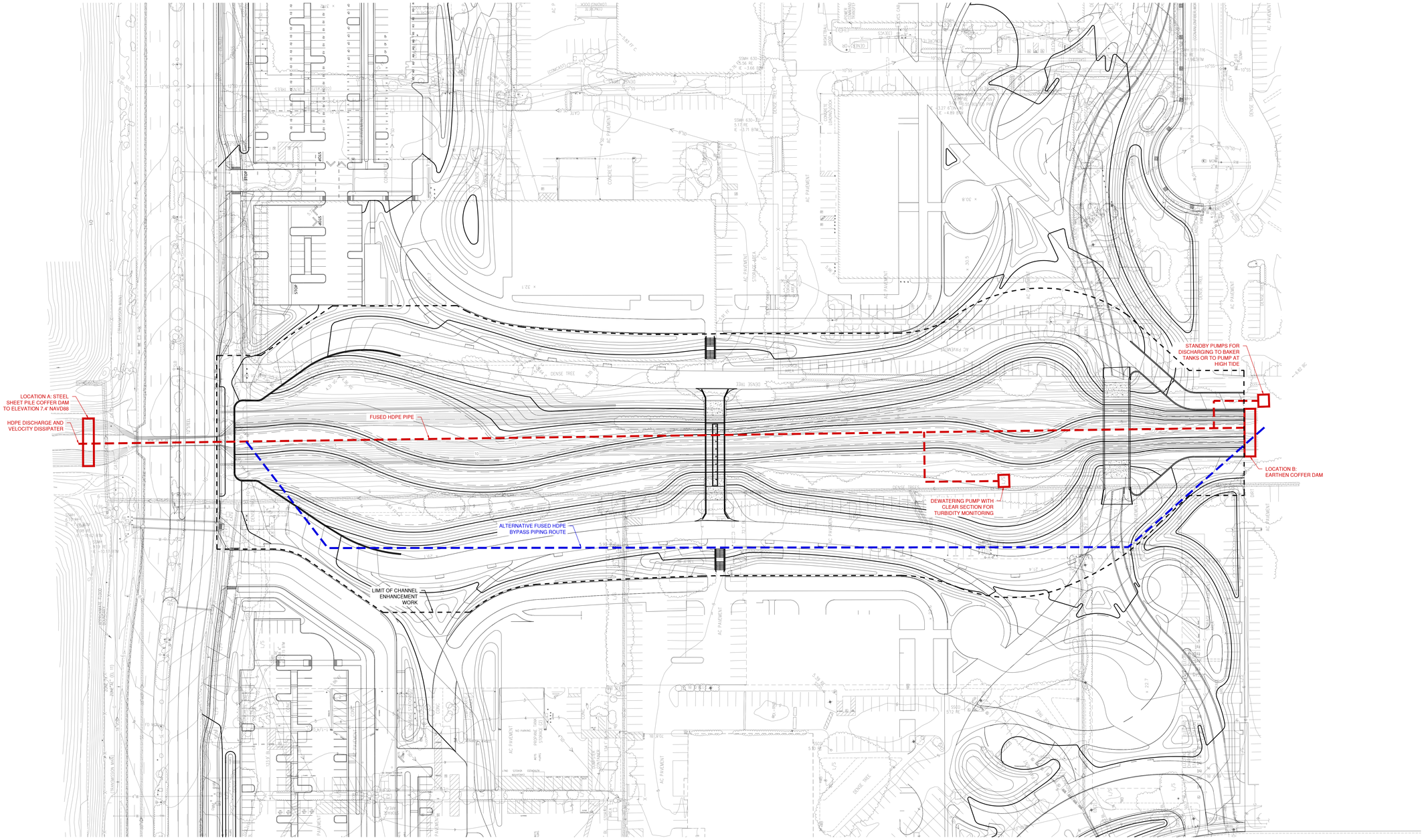
System Failure

The dewatering system could fail due to mechanical problems or unusually heavy flows exceeding the design flow. As a contingency, spare pipe materials, fittings, and pumps will be stored on site to facilitate timely repairs of damaged parts, thereby ensuring that the systems have a high degree of reliability and operability. In addition, additional pumps and baker tanks will be maintained on site. Excess flows will be filtered through the baker tanks and appropriately discharged downstream of the active reach.

In the case of actual or incipient system failure, the contractor will immediately perform all practical actions to remove sources of pollutants associated with the construction effort from the channel or prevent their entrainment by water flowing in the channel. This includes removing equipment and vehicles from the channel and protecting material stockpiles from in-channel flows.

Appendices

- Appendix A – Site Plans
- Appendix B – Coffer Dam Details
- Appendix C – Velocity Dissipation Detail
- Appendix D – BMPs (to be included in final)
- Appendix E – Coffer Dam Calculations (to be included in final)



DEWATERING PLAN

SCALE: 1" = 40'

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perform BIG24
design BIG24
sustain BIG24
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acco engineered systems
ACCO ENGINEERED SYSTEMS
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ELECTRICAL DESIGN/BUILD ENGINEER
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NO	DATE	REVISION
H	08.26.19	ADDENDUM H

SEAL

THESE DRAWINGS ARE INSTRUMENTS OF SERVICE AND AS SUCH MAY NOT BE USED FOR OTHER PROJECTS, FOR ADDITIONS TO THIS PROJECT OR COMPLETION OF THIS PROJECT BY OTHERS.

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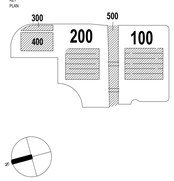
KEY PLAN



SHEET NAME

DEWATERING PLAN

PROJECT NO
11-185
CSW ID

SCALE
1" = 40'

ISSUE
ADDENDUM H

DATE
08.26.2019

SHEET NO

APPENDIX A

CPRA CONFIDENTIAL TREATMENT REQUEST
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CONFIDENTIAL & PROPRIETARY BUSINESSSTING INFO
PRE-OCCSIONAL DRAFT FOR REVIEW ONLY

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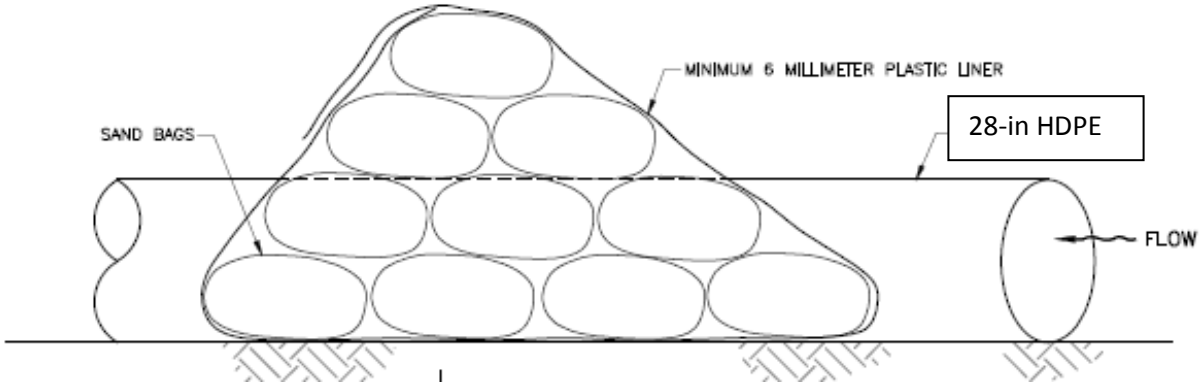
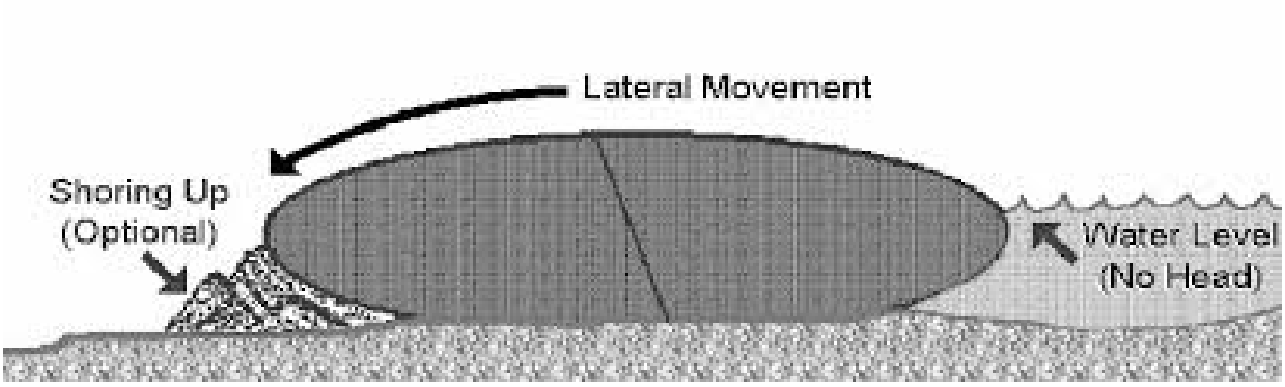


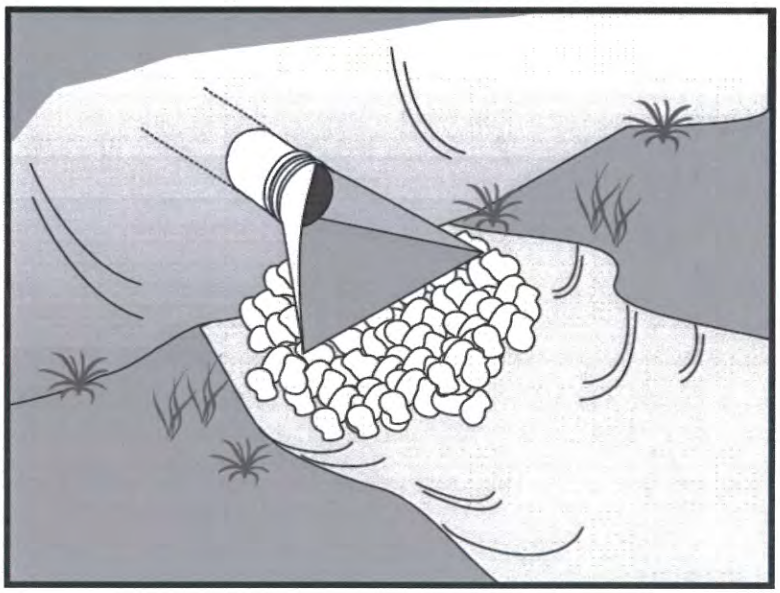
Detail 1 – Typical Earthen Coffer Dam (N.T.S)



Detail 2 – Typical AquaDam Coffer Dam (N.T.S)

Appendix C

Velocity Dissipation Devices EC-10



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

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- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.
    - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
    - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

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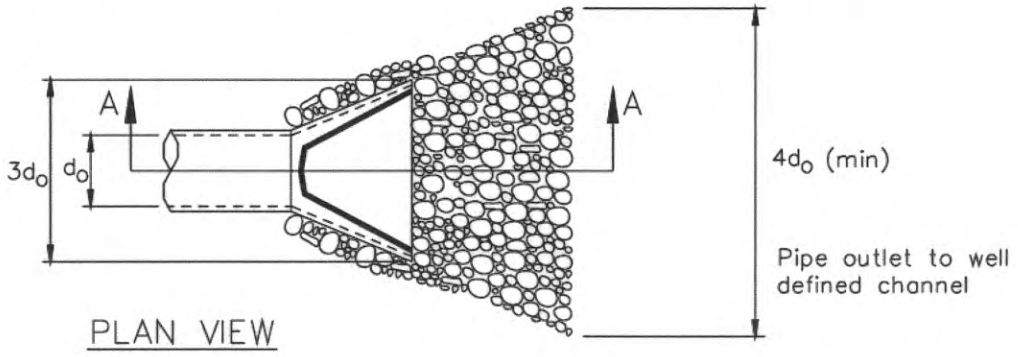
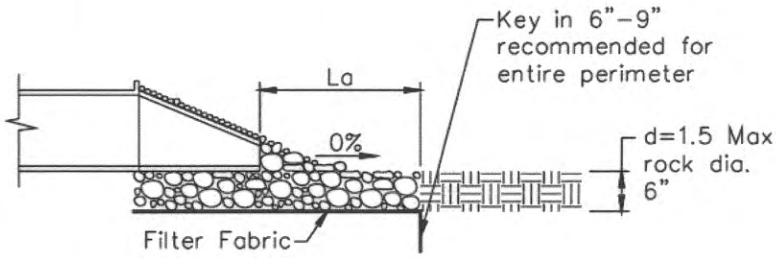


PLAN VIEW

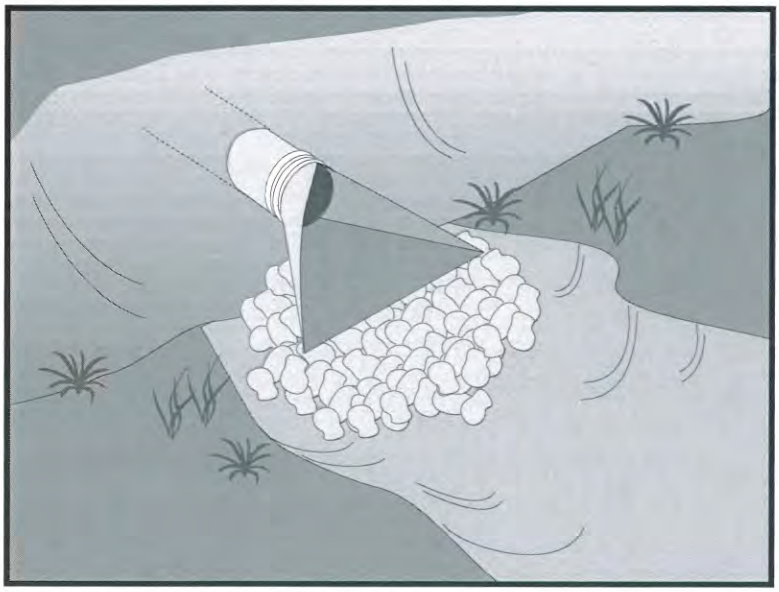


SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Velocity Dissipation Devices EC-10



Categories

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Legend:

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☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

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Limitations

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- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

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- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

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Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

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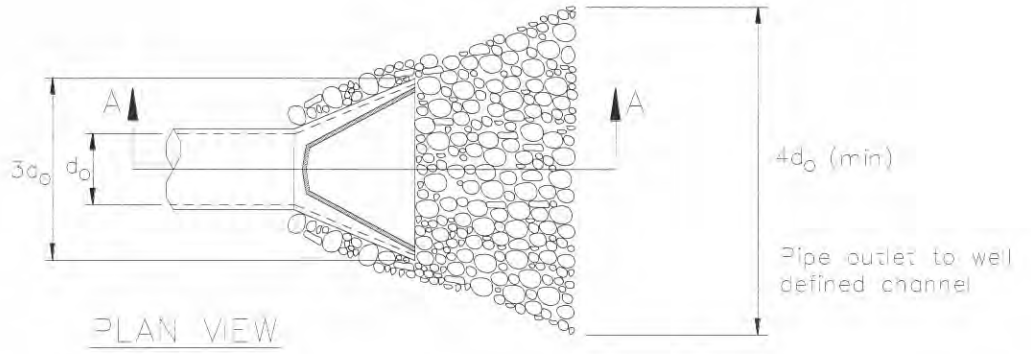
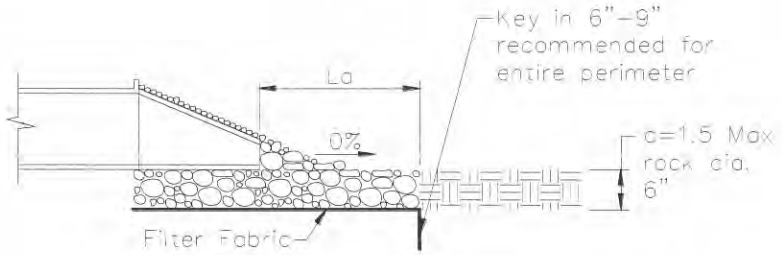


PLAN VIEW



SECTION A–A

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	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Appendix C. Mitigation and Monitoring Plan

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Google Caribbean Campus, West Channel Enhancement Mitigation and Monitoring Plan

Project # 3475-54

Prepared for:

Andy Springer
Google

Prepared by:

H. T. Harvey & Associates

August 15, 2019

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Appendices

Appendix A. Photodocumentation A-1

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Section 1.0 Project Description

1.1 Project Summary

Google LLC (Google) has proposed the Google Caribbean Campus, West Channel Enhancement Project (project) to improve a portion of the Sunnyvale West Storm Drain Channel (storm drain channel) through restoring and enhancing areas of tidal aquatic, estuarine wetland and riparian habitats, as well as providing enhanced pedestrian connections over the channel. The project will also provide 100-year flood protection for the city of Sunnyvale. The project reach of the storm drain channel bisects Google's Caribbean Campus, which is divided into the Caribbean 100 and Caribbean 200 properties. The campus is bordered by West Caribbean Drive to the north, Borregas Avenue to the east, Caspian Court and Bordeaux Drive to the south, and North Mathilda Avenue and Bordeaux Drive to the west (Figure 1). The storm drain channel is on Santa Clara Valley Water District (Valley Water) property and the project reach is approximately 1,299 feet (ft) long. The channel was constructed in the 1960s in response to flooding caused by major storm events, land subsidence, and inadequate drainage to San Francisco Bay. The channel was constructed in a straight alignment with a trapezoidal cross-section and confined by earthen levees. Google and Valley Water entered into a memorandum of understanding (MOU) in order for the project to be integrated into Valley Water's larger Sunnyvale East and West Channels Flood Protection Project (Flood Protection Project).

The entire Caribbean Campus project site encompasses 43.89 acres (ac), which includes an approximately 7.50 ac channel enhancement area (Figure 2). The storm drain channel reach through the project site consists of an earthen channel with wetland patches along the length of the invert and ruderal grasslands on the existing levee slopes and banks. There are no trees or shrubs located within the bed and banks; however, there are several trees located beyond the top of bank along the toe of the outboard levee as part of landscaping for the adjacent, developed properties. Most of these trees are nonnative species and are too distant from the channel to provide substantial benefits to the aquatic habitats therein, or to be considered riparian woodland habitat and are scheduled for removal as part of the Caribbean campus project.

It is understood that the U.S. Army Corps of Engineers (USACE) is preparing a jurisdictional determination for this reach of the storm drain channel, based on Valley Water's submission of the *Preliminary Identification of Wetlands and Other Waters for the Sunnyvale East and West Channels Flood Protection Project* (H. T. Harvey & Associates 2013). Existing habitat areas and impact assessments herein are based on the 2013 delineation report. The storm drain channel reach in the project site supports a mix of tidal aquatic habitat (other waters) (0.73 ac), estuarine wetland (0.17) and ruderal riparian (0.44 ac) habitats and is hydrologically connected to San Francisco Bay through Guadalupe Slough and Moffett Channel. These habitats fall under the jurisdiction of USACE, San Francisco Bay Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW).

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Valley Water is in the process of obtaining regulatory permits that will allow the construction of a channel improvement project for flood control and erosion protection on Sunnyvale West Channel within the city of Sunnyvale, including the project reach. In adjacent reaches of the channel, the Valley Water's project involves the construction of floodwalls atop existing earthen levees, as well as bridge improvements. Google proposes to provide, at a minimum, an equivalent level of flood protection through the project reach while providing enhanced ecological function. Channel invert and levee top elevations at the upper and lower ends of the project reach will match the design elevations of Valley Water's Flood Protection Project. In lieu of the floodwall dependent flood protection improvements planned by Valley Water, a widened naturalized channel corridor extending beyond Valley Water's parcel will become part of the development and provide flood protection while enhancing aesthetics and increasing habitat functions and values.

Google's proposed storm drain channel enhancement involves both landward and in-channel components, including the following:

- temporarily dewatering the storm drain channel during construction
- excavating the existing channel to meet new design grades
- building set-back levees
- grading a new storm drain channel with associated low-flow channel and floodplains
- constructing short sections of floodwalls at the upstream extent of the project reach to conform to Valley Water floodwall design elevations
- constructing two new bridge crossings (one exclusively for pedestrian use and one pedestrian-engineered to support emergency vehicle access at the Caspian Court extension)
- extending the box culvert with new headwall/floodwall to accommodate a multi-use pathway along West Caribbean Drive (as required by the City of Sunnyvale) and conform to the new earthen levee top
- relocating an existing storm drain pipe
- constructing a temporary bridge to accommodate a 3-year construction period
- implementing habitat mitigation and additional habitat creation

The project design (channel realignment, floodplain creation and levee reconstruction) will create conditions conducive to supporting diverse habitats, including tidal aquatic, estuarine wetland, willow-cottonwood riparian forest, oak riparian forest, and bayside scrub. Setting back the levees will allow creation of a more natural, meandering channel, with relatively broad hydrologically-connected floodplains that will be set at elevations below the high-tide line and provide conditions favorable for the natural recruitment of estuarine wetland plant species. It is anticipated that adjacent wetland plants located throughout the west channel will provide adequate seed sources to allow passive restoration (i.e., natural recolonization) within the project reach, although the project design does include installing small pockets of native wetland plantings. Four distinct native plant

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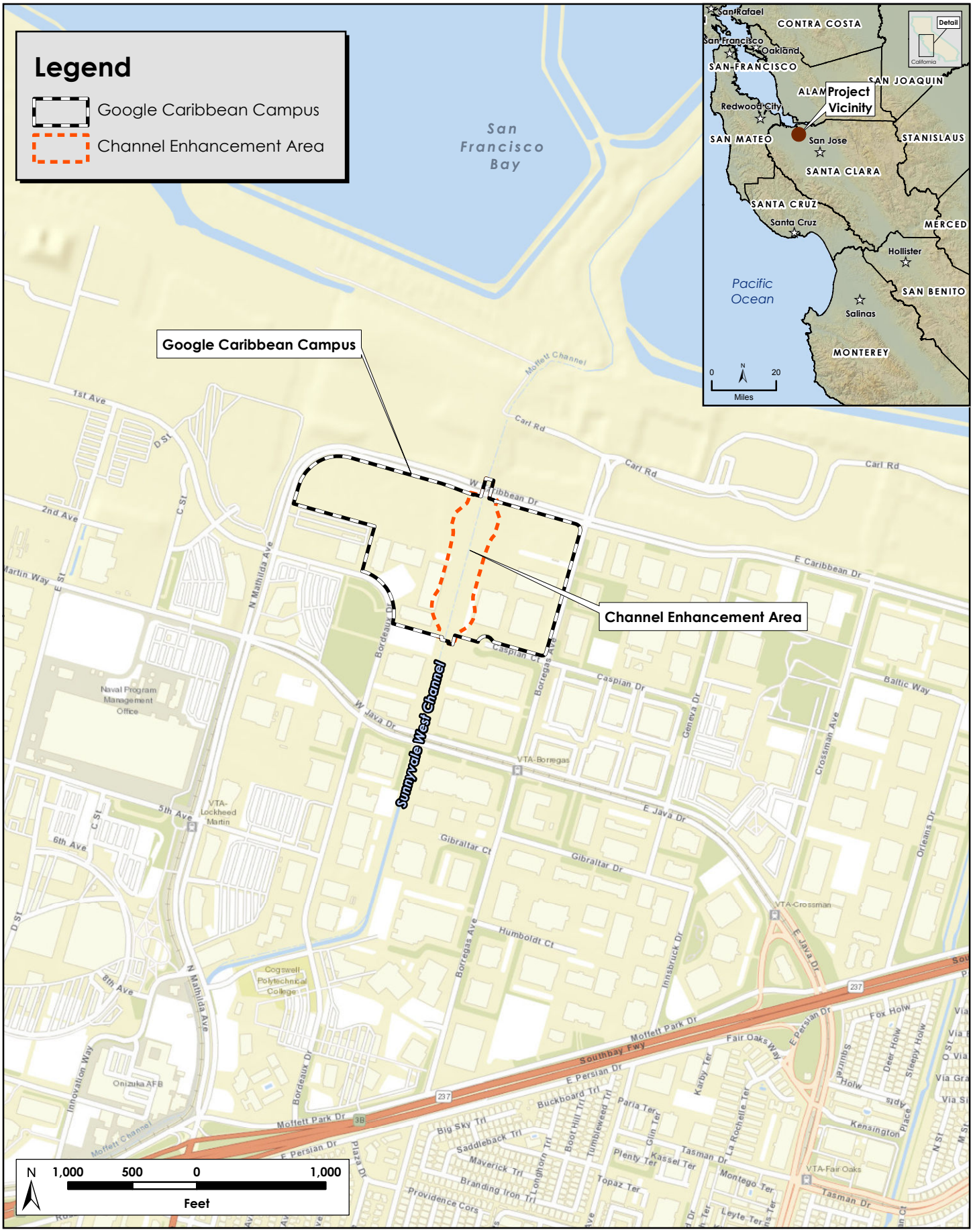

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H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Vicinity Map
Google West Channel Enhancement Project - Mitigation and Monitoring Plan (3475-54)
August 2019

N:\Projects3400\3475-01\54\Reports\MMP\Fig 2 Site Map.mxd mchilds

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 2. Site Map
Google West Channel Enhancement Project - Mitigation and Monitoring Plan (3475-54)
August 2019

palettes are proposed for the levee banks. At the lower elevations along the banks, patches of willow-cottonwood riparian forest and a mesic mix of bayside scrub species will be installed. At the upper elevations but below the tops of banks, oak riparian forest will be interspersed with a mix of more drought-tolerant bayside scrub species. The patches of willow-cottonwood and oak riparian forest will be intermingled and discontinuous to create canopy gaps and provide view corridors into and across the channel enhancement area. All installed plants will be native to California and appropriate to the regional setting and habitat types. Levee slopes will also be seeded with an appropriate native grass and forb seed mix.

Project construction within the channel enhancement area will affect wetlands and waters of the United State/state and will result in temporary impacts on 0.72 ac of tidal aquatic habitat (other waters) and 0.16 ac of estuarine wetlands. In addition, there will be a small area of permanent impact to tidal aquatic habitat (0.01 ac) from the culvert extension. There will also be permanent changes to channel conditions from the realignment of the channel and from channel shading by the two proposed bridges, resulting in 0.01 ac of permanent impact to estuarine wetland habitat. Additional temporary impacts to existing habitats will include the removal of 0.43 ac of ruderal riparian grassland habitat associated with reconstruction of the levees and permanent conversion of 0.01 ac of ruderal riparian habitat to hardscape to accommodate construction of headwalls/floodwalls, one bridge abutment and the culvert extension.

The project proposes to provide onsite mitigation for temporary tidal aquatic impacts at a 1:1 ratio and permanent impacts at 2:1, through a combination of restored tidal aquatic (0.54 ac) and estuarine wetland habitats (0.24 ac) and increasing the linear footage of tidal aquatic habitat from 1,299 ln ft to 1,325 ln ft. The project proposes to mitigate for temporary estuarine wetland habitat impacts (dewatering and grading) at a 1.2:1 ratio and permanent impacts (shading from bridges) at a 2:1 ratio, totaling 0.21 ac of estuarine wetland. These mitigation ratios represent a total project mitigation obligation of 0.54 ac of tidal aquatic habitat and 0.45 ac of estuarine wetland habitat. Temporary impacts on ruderal riparian habitat will be mitigated at a 1:1 ratio and permanent impacts at a 2:1 ratio, resulting in a total of 0.46 ac. The actual area to be tracked for ruderal riparian habitat mitigation will be a dedicated zone along the lower levee slopes on both sides of the channel from the West Caribbean Drive culvert upstream to the first new pedestrian bridge. This area will provide stable vegetated slopes. Although woody species will be installed throughout this zone, they will not be linked to any specific monitoring or success criteria metrics because there will be no impacts on woody plants within existing jurisdictional areas.

The project will create approximately 1.85 ac of additional estuarine wetland habitat on the expanded floodplains adjacent to the channel, resulting in a total of 2.30 ac of restored and created estuarine wetland habitat. In all, the area of waters of the United States/state (tidal aquatic habitat and estuarine wetlands) will be more than doubled, with a final anticipated area of 2.84 ac. The project will also create an additional 1.34 ac of riparian habitat for a total of 1.80 ac of restored riparian habitat along the banks. Through the implementation of the project specific mitigation, replacement and enhancement of temporarily impacted habitats, and additional habitat creation, the project will substantially increase the area and quality of jurisdictional habitats through the project reach as compared to the current conditions.

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The applicant's MOU with Valley Water requires that this restored reach provide some of the required mitigation for permanent impacts related to Valley Water's Flood Protection Project, which targets mitigation ratios of 1.2:1 for wetlands and 1:1 for tidal aquatic habitat. The exact amount of mitigation that will be provided to Valley Water will be determined based on the excess available after meeting project mitigation obligations.

The project will require the following regulatory agency permits or approvals:

- USACE – Clean Water Act (CWA) Section 404 Nationwide Permit 27 and Section 10 Letter of Permission
- CDFW – California Fish and Game Code Section 1600 Lake and Streambed Alteration Agreement
- San Francisco Bay RWQCB – CWA Section 401 Water Quality Certification

1.2 Purpose of this Mitigation and Monitoring Plan

This Mitigation and Monitoring Plan (MMP) describes the habitat mitigation proposed by the project proponent (Google) to offset project impacts on habitats regulated by USACE, RWQCB, and CDFW. This MMP describes the mitigation approach, standards for success, and details how restored and created habitats will be established, maintained, and monitored. The proposed mitigation will be implemented on site on properties owned by both Valley Water and Google; however, the project proponent will be responsible for implementing this MMP.

1.3 Type, Functions, and Values of Existing Habitats

Table 1 provides a summary of the existing jurisdictional habitats and Figure 3 shows the locations of these habitats within the channel enhancement area. Appendix A includes representative photos of the existing conditions.

Table 1. Acreages of Existing Jurisdictional Habitats

Habitat Type (Agency Jurisdiction)	Acreage
Estuarine Wetlands (USACE, RWQCB, CDFW)	0.17
Tidal Aquatic (Other Waters) (USACE, RWQCB, CDFW)	0.73
Ruderal Riparian (RWQCB, CDFW)	0.44

1.3.1 Wetlands

Wetlands within the site are classified in the National Wetlands Inventory as Estuarine and Marine Wetland (E2SBNx) (USFWS 2018). Wetlands with this classification are estuarine and intertidal, occurring within a channel bed that is completely dewatered at low tide but is regularly flooded and was originally excavated by humans. There is 0.17 acre of jurisdictional wetlands on the site, consisting of several discontinuous patches of hydrophytic wetland vegetation along either side of the channel (Figure 3). Wetland plant species include

N:\Projects3400\3475-01\54\Reports\MMP\Fig 3 Existing Conditions.mxd

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Figure 3. Existing Habitats

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California bulrush (*Schoenoplectus californicus*) and alkali bulrush (*Bolboschoenus maritimus*). A formal wetland delineation was completed and it is understood that a jurisdictional determination is currently being prepared by the USACE that will cover the project reach of the storm drain channel based on Valley Water's submission of the *Preliminary Identification of Wetlands and Other Waters for the Sunnyvale East and West Channels Flood Protection Project* (H. T. Harvey & Associates 2013).

1.3.2 Tidal Aquatic Habitat (Other Waters)

There is 0.73 acre of jurisdictional tidal aquatic habitat (i.e., other waters) on the site (Figure 3). Tidal aquatic habitat consists entirely of the unvegetated muddy channel bed, subject to tidal inundation.

1.3.3 Ruderal Riparian

There is 0.44 acre of ruderal riparian habitat on the site (Figure 3). This habitat type occurs on the banks and levees of the channel, from the high tide line to top of bank. This habitat consist of predominantly nonnative herbaceous species, such as wild oats (*Avena* sp.), ripgut brome (*Bromus diandrus)*, soft chess (*Bromus hordeaceous*), yellow star thistle (*Centaurea solstitialis*), and black mustard (*Brassica nigra*) and is routinely mowed as part of Valley Water's routine channel maintenance program. There are no woody plants present within the existing riparian habitat.

1.3.4 Uplands

There is also upland habitat beyond the top of bank consisting of the access roads along each levee top, the ruderal grasslands on the outboard levee slopes, and some nonnative trees along the toe of the outboard levee slopes.

1.3.5 Developed

A combination of asphalt parking areas and existing commercial buildings dominates the project site beyond the toe of the outboard levee slopes that are within the project boundary.

1.3.6 Existing Topography and Hydrology

The existing storm drain channel through the project reach is confined by an earthen levee system with a top-of-levee elevation of approximately 11 ft North American Vertical Datum of 1988 (NAVD 88) and adjacent (outboard) elevation of approximately 6 ft NAVD 88. The channel is trapezoidal in cross-section and has a straight alignment throughout the reach. The entire project reach is tidally influenced, ranging from an elevation of -1.3 ft NAVD 88 at mean lower low water (MLLW) to 7.4 ft NAVD 88 at mean higher high water (MHHW); the latter equates to a maximum water depth of 5.1 ft above the invert of the West Caribbean Drive culvert. More details are provided in the *West Channel Enhancement for Google Hydraulic Basis of Design* (Schaaf & Wheeler 2019a).

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1.3.7 Existing Soil/Substrate

According to the Natural Resources Conservation Service (NRCS), there are two soil mapping units that occur onsite: unit #150 (Urbanland-Embarcadero complex, 0–2% slopes, drained) and unit #145 (Urbanland-Hangerone complex, 0–2% slopes, drained) (NRCS 2018). Both soil mapping units are typically comprised of approximately 70% Urbanland soils, which are often disturbed soils containing unknown quantities of imported fill material. The Embarcadero soil series consists of very deep, naturally poorly-drained soils that may now be artificially drained. Embarcadero soils occur in geologic basins near the edge of marshes. The Hangerone soil series consists of very deep, poorly drained soils that may now be artificially drained. Hangerone soils occur in geologic basins. Mapping unit #150 covers the northern one-third of the site, while unit #145 covers the southern two-thirds.

1.4 Wildlife

The narrow, tidal aquatic channel and its adjacent habitats have been subjected to moderate to high levels of disturbance as a result of anthropogenic channelization, hardening of streambanks, installation of culverts, and other factors associated with major human influences. The channel is confined on both sides by urban development and lacks native habitats associated with more natural channel systems. The relatively low-quality habitats currently associated with the channel are reflective of those influences, and include: a narrow, linear channel; relatively steep banks dominated by low, ruderal riparian vegetation lacking woody species; an unvegetated top of bank supporting roads on both levees; and ruderal, nonnative grassland and scattered nonnative trees on the outboard sides. These conditions contribute to low wildlife value for the channel system as a whole.

The combination of the absence of channel diversity and the narrow nature of the channel substantially diminish the value of the channel to wildlife compared to more naturally formed channels, due to the lack of high-quality habitat complexity such as riffle and pool complexes, the relatively shallow water (and thus relatively high temperatures in summer), and regular disturbance of habitats and associated species due to anthropogenic activities. The channel supports few aquatic species, but nonnative crayfish (*Procambarus clarkia*) are present and birds such as mallards (*Anas platyrhynchos*), American coots (*Fulica americana*) and great blue herons (*Ardea herodias*) and other common, widespread wetland species occur. Mammals such as raccoons (*Procyon lotor*), introduced eastern gray squirrels (*Sciurus carolinensis*), and introduced rodents (*Rattus spp.* and *Mus musculus*) likely use the channels for drinking water and foraging. Common, widespread amphibians such as the Pacific treefrog (*Hyliola regilla*) occur in the channel. Wider, more natural channels would support a richer assemblage of species, especially with respect to avian fauna, such as marsh wrens that use emergent marsh habitats.

The lack of quality habitat associated with the other areas of the existing channel system also translates into a less diverse species community relative to more diverse native marsh, riparian, and upland habitats associated with more natural river and stream systems in the region.

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This project will result in a net increase in wetland and associated upland habitat functions and values for native wildlife associated with the site, as well as increasing the diversity of wildlife that will use the site.

1.4.1 Special-Status Species

The *Sunnyvale East and West Storm Drain Channels Flood Protection Project Environmental Impact Report* (SEWSDC EIR) reviews the status of all the special-status species that are known to occur in the Sunnyvale West Channel site, that may occur on the site, and that occur regionally, but are not likely to occur on the site (Valley Water 2013). Only those species determined to be present or likely to be present along the project reach of the Sunnyvale West Channel are covered in this MMP, and the reader is referred to the SEWSDC EIR for further information on species determined to be absent from the site. Two federally listed species and/or their critical habitat have the potential to occur in the project site: Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and North American green sturgeon (*Acipenser medirostris*). The project reach of the Sunnyvale West Channel comprises critical habitat for both the federally listed species. Longfin smelt (*Spirinchus thaleichthys*), a species listed as threatened under the California Endangered Species Act and a Candidate for listing under the Federal Endangered Species Act, also has the potential to occur in the project area.

Due to the marginal quality of the habitat and very low summer flows, as well as inclusion of avoidance measures designed to protect fish, the USACE previously concluded that the Valley Water Flood Protection project would not require Section 7 Consultation for activities in this reach (pers. communication between Valley Water and Keith Hess of the USACE, July 29, 2017). Several project measures, intended to protect aquatic wildlife and habitat that require passive fish relocation and measures to prevent entrapment, will be implemented to avoid and minimize impacts to Essential Fish Habitat (EFH) within the project reach and any fish regulated by the Coastal Pelagics and Pacific Groundfish Fishery Management Plan. Dewatering and other BMPs as described in the project's regulatory permit applications will further be used to prevent water-quality impacts. In-channel work will be restricted to the dry season from April 15 to October 15, when flows are low and warm within the channel and listed fish are not expected to occur.

Native nesting birds, including special-status species, are protected under the federal Migratory Bird Treaty Act and the California Department of Fish and Wildlife code. Loss of eggs or nestlings ("take") via project activities would violate these laws. Take-avoidance measures for these species are presented in the *Impacts Requiring Mitigation* section below.

One California Endangered Species Act species listed as threatened, the tricolored blackbird (*Agelaius tricolor*) and several California Species of Special Concern (CSSC) that are not state or federally listed as threatened or endangered that are known to be, or have the potential to be, present in the project area, and are discussed below. Impacts on these and other special-status species were discussed in the SEWSDC EIR, which addressed potential environmental impacts of the Flood Protection Project that is part of Valley Water's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan. The goal of the CSC Plan is to provide 100-year riverine flood protection to approximately 1,618 properties and 47 acres within the city of Sunnyvale. The SEWSDC EIR considered activities that would potentially modify habitat in and around the storm drain channels,

including earthen storm drain channel restoration, installation of rock slope protection, floodwall construction, bridge/culvert modifications, and other storm drain channel modifications. Impacts and avoidance measures associated with special-status species in the project site are described in the project's regulatory permit applications.

The following descriptions comprise an overview of the existing habitat value for the special-status species wildlife that occur, or might occur, within the project area.

1.4.1.1 Tricolored Blackbird *(Agelaius tricolor)*

Federal Listing Status: None; State Listing Status: Threatened—This species was listed as a threatened species by the California Fish and Game Commission on April 19, 2018. Tricolored blackbirds are found primarily in the Central Valley and in central and southern coastal areas of California. Suitable nesting habitat for the tricolored blackbird is not present in the project site; however, the species is known to forage on the lower reaches of the Sunnyvale West Channel during the nonbreeding season.

1.4.1.2 Western Pond Turtle (*Actinemys marmorata*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—The western pond turtle may be present in the project site. Western pond turtles still occur in urban streams and ponds in the region. Ponds or slack-water pools with suitable basking sites (e.g., logs, banks) are an important habitat component for this species. Nesting habitat is typically found within 600 feet of aquatic habitat (Jennings and Hayes 1994), but if no suitable nesting habitat can be found close by, adults may travel overland considerable distances to nest. Females lay eggs in upland habitats with clay or silty soils in unshaded, often south-facing areas up to 0.25 mile from aquatic habitat (Jennings and Hayes 1994). Juveniles feed and grow in shallow aquatic habitats (often creeks) with emergent vegetation and ample invertebrate prey.

In the project vicinity, the western pond turtle has been documented within the Lockheed Channel and North Moffett Channel west of the Sunnyvale West Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006 as cited in EDAW 2007). Consequently, although no western pond turtles were observed in the lower reaches of the project area for the SEWSDCEIR during focused surveys in 2012, it is likely that small numbers of pond turtles occur in channels in the project region, including the Sunnyvale West Channel, especially in the northern portion of the channel given its hydrological connection to North Moffett Channel. The channel does not currently provide optimal habitat for western pond turtle. Both adults and juveniles prefer deep, slow water and suitable basking sites. The project site is of marginal habitat quality due to the narrow width and relatively shallow nature of the channel, lacking structural complexity that would provide refugia and basking sites.

1.4.1.3 Northern Harrier (*Circus cyaneus*)

Federal Listing Status: None; State Listing Status: Species of Special Concern (Nesting)—The northern harrier is not expected to nest within the project site due to the absence of suitable nesting substrate or habitat; however, this species is known to breed in the vicinity of the project site. Breeding individuals may

at least occasionally forage within the project site boundary, but the site does not provide important or extensive foraging habitat used regularly by this species.

1.4.1.4 Burrowing Owl (*Athene cunicularia*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—The burrowing owl, a CSSC, occurs in the project region. The abundance of this species has decreased dramatically in the South Bay region, including the project vicinity. During surveys conducted in the winter of 2007–2008 (EDAW 2008), a burrowing owl was detected on the west bank of the Sunnyvale East Channel opposite the Twin Creeks Sports Complex; a burrow with evidence of owl use (i.e., whitewash) was documented along the Sunnyvale West Channel. During 2012 and early 2013, one to two burrowing owls were reported on the landfill (north of the project site) just west of the Sunnyvale West Channel, north of Caribbean Drive (South Bay Birds List-serve 2013), although the last successful nesting attempts occurred on the landfill in 1999 and inside the Water Pollution Control Plant in 2004 (H. T. Harvey & Associates 2015). In addition, in November 2012 Valley Water reported a burrowing owl on the west side of the Sunnyvale West Channel just upstream of the Carl Road Bridge (Hernandez pers. comm. 2012). The CNDDB (2013) includes two records of burrowing owls along the northernmost portion of the West Channel, and one record adjacent to the northernmost portion of the Sunnyvale East Channel. Although burrows of California ground squirrels were observed along the Sunnyvale East and West Channels throughout the project area for the SEWSDC EIR during surveys conducted in January 2013, burrowing owls are unlikely to nest in such limited habitat areas surrounded by dense development and large trees and buildings that provide perches for predatory raptors. Nevertheless, owls are known to use extremely small areas of ruderal habitat in the South Bay, and it is possible that owls could occasionally roost along the Sunnyvale West Channel in developed areas.

1.4.1.5 Loggerhead Shrike (*Lanius ludovicianus*)

Federal Listing Status: None; State Listing Status: Species of Special Concern (Nesting)—Loggerhead shrikes nest in a number of locations in the project region where open grassland, ruderal, or agricultural habitat with scattered brush, chaparral, or trees that provide perches and nesting sites, occur (Bousman 2007a). This species occurs slightly more widely (i.e., in smaller patches of open areas providing foraging habitat) during the nonbreeding season. Ruderal habitats near the project site, particularly those on the former landfills surrounding the City of Sunnyvale Recycle Center and Water Pollution Control Plant (WPCP), provide suitable nesting, roosting, and foraging habitat for one or two pairs of loggerhead shrikes, but the species is not expected to breed on the project site due to the limited extent of open habitat in the surrounding area.

1.4.1.6 Yellow Warbler (*Setophaga petechia*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—Small numbers of yellow warblers still nest in remnant riparian areas within Santa Clara County (Bousman 2007b). Suitable nesting habitat consists of riparian corridors, often with an overstory of mature cottonwoods (*Populus* sp.) and sycamores (*Platanus* sp.), a midstory of box elder (*Acer negundo*) and willow (*Salix* sp.), and a substantial shrub understory (Bousman 2007b). Riparian areas with a reduced understory due to grazing or disturbance are

generally not used by this species, and riparian corridors lacking open ruderal or herbaceous vegetation along the edges of the corridors, or with development up to the corridor edge, are often avoided as well. Thus, suitable nesting habitat for yellow warbler is absent from the project site. However, the yellow warbler is an abundant migrant throughout the project region during the spring and fall, and it occurs along the Sunnyvale Channels as an occasional forager during the nonbreeding season.

1.4.1.7 San Francisco Common Yellowthroat (*Geothlypis trichas sinuosa*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—The San Francisco common yellowthroat inhabits emergent vegetation, and nests in freshwater and brackish marshes and moist floodplain vegetation around San Francisco Bay. Common yellowthroats will use small and isolated patches of habitat as long as groundwater is close enough to the surface to encourage the establishment of dense stands of rushes (*Scirpus* and *Juncus* spp.), cattails (*Typha* spp.), willows, and other emergent vegetation (Nur et al. 1997, Terrill 2000, Gardali and Evens 2008). Ideal habitat comprises extensive and thick riparian, marsh, or herbaceous floodplain vegetation in perpetually moist areas, where populations of brown-headed cowbirds are low (Menges 1998). San Francisco common yellowthroats nest primarily in freshwater and brackish marshes, although they also nest in salt marsh habitats that support tall vegetation). This subspecies builds open-cup nests low in the vegetation, and nests from mid-March through late July (Gardali and Evens 2008).

In the South Bay, the San Francisco common yellowthroat is a fairly common breeder in freshwater and brackish marshes. This species is known to nest near the edge of the South Bay, as well as in herbaceous riparian habitat and ruderal floodplain habitat along streams entering the bay. Within the project vicinity, the species has been recorded in both the spring and summer in Pond A4, as well as along Moffett Channel and Guadalupe Slough. The lower, tidal reaches of the Sunnyvale West Channel also provide suitable nesting and foraging habitat for this species, and it breeds in small numbers on the project site. However, the limited amount of vegetation along the channel and the narrow swaths of channel habitat that are confined by the levees limit the extent of breeding habitat, and the quality and extent of foraging habitat, on the project site.

1.4.1.8 Alameda Song Sparrow (*Melospiza melodia pusillula*)

Federal Listing Status: None; State Listing Status: Species of Special Concern—Prime habitat for the Alameda song sparrow is fully tidal salt marsh consisting of large areas of tidally influenced salt marsh vegetation dominated by cordgrass (*Spartina* sp.) and gumplant (*Grindelia* sp.) and intersected by tidal sloughs, offering dense vegetative cover and singing perches. Although the special-status *pusillula* subspecies of song sparrow is occasionally found in brackish marshes dominated by bulrushes, it is apparently very sedentary and is not known to disperse upstream into freshwater habitats (Basham and Mewaldt 1987). Where suitable nesting habitat is continuous along creeks, the species appears to nest continuously from tidal salt marshes, where the breeding subspecies is *pusillula*, upstream to freshwater marsh and woody riparian habitats, where the breeding subspecies is an upland or freshwater associated subspecies *gouldii*. The line of demarcation (or perhaps more accurately, the zone of intergradation) along these sloughs between these two subspecies is unknown (Rottenborn 2007); a recent study indicates that song sparrows nesting along the lower portions of the Sunnyvale Channels may

belong to the *pusillula* or *gouldii* subspecies, or may be intergrades between the two (SFBBO 2012). The Alameda song sparrow is thus presumed to be present in the project site in brackish marsh habitat.

1.4.1.9 American Peregrine Falcon (*Falco peregrinus anatum*)

Federal Listing Status: None; State Listing Status: Fully Protected—The only locations in the project vicinity where peregrine falcons have been detected nesting are old raven and hawk nests on electrical transmission towers within managed ponds in the Mountain View/Alviso area, more than 2 miles north of the project site. The species is not known or expected to nest in the immediate project area; however, peregrine falcons nesting elsewhere in the South Bay, as well as migrants and wintering birds, forage occasionally in the project region, particularly in the vicinity of Pond A4 and the WPCP ponds.

1.4.1.10 Golden Eagle (*Aquila chrysaetos*)

Federal Listing Status: None; State Listing Status: Fully Protected—Suitable foraging habitat for golden eagles occurs in the northern portion of the project region (i.e., north of Caribbean Drive), and nonbreeding eagles may occasionally forage there. For example, an immature golden eagle was observed along the canals west of the WPCP in January 2012 (South Bay Birds List-serve 2013). However, this species occurs very rarely around the immediate edge of the baylands in the South Bay, and based on the infrequency with which it has been reported in this area (which is heavily used by birders), it is expected to forage infrequently in open habitats within and adjacent to the project area (such as on the old landfills). The reach of the Sunnyvale West Channel associated with this project offers extremely limited foraging habitat for this species and the developed nature of much of the surroundings further limits the value of the site to the species.

1.4.1.11 White-Tailed Kite (*Elanus leucurus*)

Federal Listing Status: None; State Listing Status: Fully Protected—In the project vicinity, white-tailed kites are known to nest along the northern edge of Santa Clara County throughout the open areas edging the San Francisco Bay (Bousman 2007c). Although neither the Breeding Bird Atlas of Santa Clara County, California (Bousman 2007c) nor the Santa Clara County Bird Data (unpublished) contained specific mention of the species as occurring at the project site, there are a number of records from Moffett Field to the west and some from Sunnyvale Baylands Park to the east (South Bay Birds List-serve 2013). White-tailed kites nest in trees or shrubs, typically in areas away from high human activity, and those with extensive open foraging habitat with adequate prey. Thus, the project site may provide some limited foraging opportunities for this species, but it does not provide breeding habitat, and the quality of the foraging habitat is quite limited.

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Section 2.0 Impacts Requiring Mitigation

Project construction will result in temporary impacts on 0.72 ac of tidal aquatic habitat, 0.16 ac of estuarine wetland, and 0.43 ac of ruderal riparian habitat (Figure 4). The project will also result in small areas of permanent impacts including, 0.01 ac of tidal aquatic habitat, 0.01 ac of estuarine wetland habitat and 0.01 ac of ruderal riparian.

2.1 Temporary Impacts

In order to achieve project design goals, extensive grading is required on the site. Grading will result in temporarily affecting nearly the entirety of the tidal aquatic habitat, estuarine wetland, and ruderal riparian habitat types on site (Table 1 and Figure 4). Small areas of permanent impacts, as described below, account for the remaining surface area of the jurisdictional areas within the site. The grading will require dewatering the entire project reach, removing all existing vegetation, removing portions of the existing levees, and importing soil to build up the new, larger earthen levees.

2.2 Permanent Impacts

The culvert extension, headwalls/floodwalls and bridge construction will result in small areas of permanent impacts to tidal aquatic, estuarine and ruderal riparian habitats, as described below and shown on Figure 4.

2.2.1 Tidal Aquatic

A small 0.01 ac (573 sq ft) area of tidal aquatic habitat will be permanently impacted by construction of the culvert extension at West Caribbean Drive.

2.2.2 Estuarine Wetlands

Although construction of the two new bridges across the project reach will not require placement of fill within existing estuarine wetland habitat, the installation of these structures will result in shading approximately 0.01 ac (520 sq ft) of estuarine wetlands, which is considered a permanent impact.

2.2.3 Ruderal Riparian

A total of 0.01 ac (457 sq ft) of ruderal riparian habitat will be permanently impacted through construction of the culvert extension, headwalls/floodwalls, and one bridge abutment.

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2.3 Wildlife

2.3.1 Central California Coast Steelhead, North American Green Sturgeon and Longfin Smelt

As indicated earlier, two federally listed species and/or their critical habitat have the potential to occur in the project site: Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and North American green sturgeon (*Acipenser medirostris*). In addition, the longfin smelt (*Spirinchus thaleichthys*), a species listed as threatened under the California Endangered Species Act and a Candidate for listing under the Federal Endangered Species Act, also has the potential to occur in the project area.

Due to the marginal quality of the habitat and very low summer flows, as well as inclusion of avoidance measures designed to protect fish, the USACE previously concluded that the Valley Water Flood Protection project would not require Section 7 Consultation for activities in this reach (pers. communication between Valley Water and Keith Hess of the USACE, July 29, 2017).

Several project mitigation measures, intended to protect aquatic wildlife and habitat that require passive fish relocation and measures to prevent entrapment, will be implemented to avoid and minimize impacts to EFH within the project reach and any fish regulated by the Coastal Pelagics and Pacific Groundfish Fishery Management Plan. Dewatering and other BMPs as described in the project's regulatory permit applications will further be used to prevent water-quality impacts. In-channel work will be restricted to the dry season from April 15 to October 15, when flows are low and warm within the channel and listed fish are not expected to occur.

2.3.2 Western Pond Turtle

A small population of western pond turtles is known to be present within the Lockheed Channel and North Moffett Channel west of the Sunnyvale West Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006 as cited in EDAW 2007). Santa Clara Valley Water District 3.3 Biological Resources Sunnyvale East and West Channels Flood Protection Project Draft Environmental Impact Report 3.3-63 October 2013 Consequently, it is likely that small numbers of western pond turtles occur in the Sunnyvale Channels (H. T. Harvey & Associates 2012b), especially in the northern portion of the West Channel given its hydrological connection to North Moffett Channel. However, given that no western pond turtles were observed in these lower portions of the Sunnyvale Channels during a focused survey for the species in 2012 (H. T. Harvey & Associates 2012b), and given that urbanization likely precludes the maintenance of a viable population in the upper portions of these channels, western pond turtles are expected to occur in the Sunnyvale Channels infrequently and in low numbers. Dewatering and other BMPs as described in the project's regulatory permit applications that cover applicable best management practices for performing project activities within and adjacent to an active channel will further be used to prevent water-quality impacts, including those to western pond turtles and the channel habitat.

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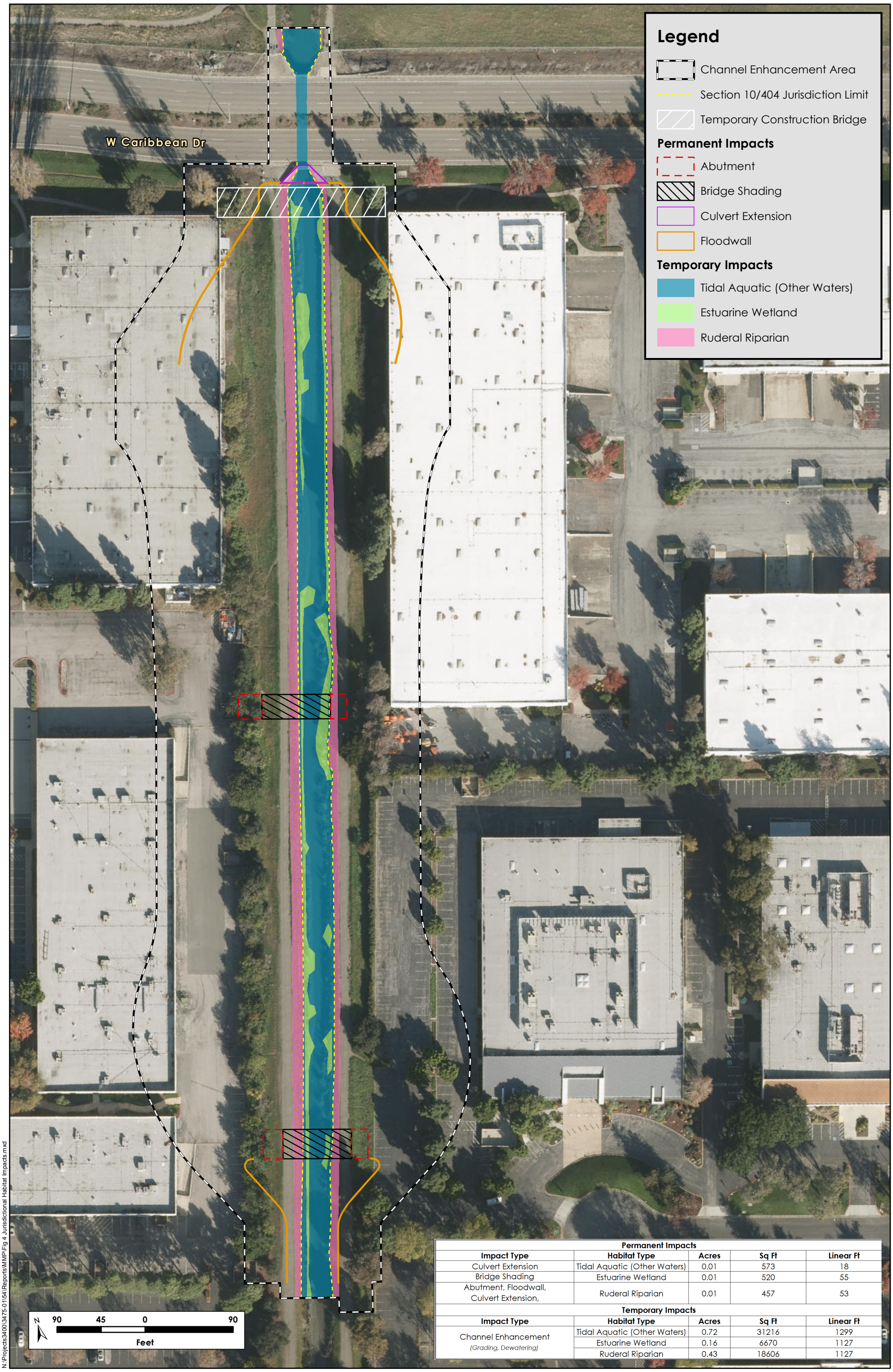

Permanent Impacts				
Impact Type	**Habitat Type**	**Acres**	**Sq Ft**	**Linear Ft**
Culvert Extension	Tidal Aquatic (Other Waters)	0.01	573	18
Bridge Shading	Estuarine Wetland	0.01	520	55
Abutment, Floodwall, Culvert Extension,	Ruderal Riparian	0.01	457	53
Temporary Impacts				
Impact Type	**Habitat Type**	**Acres**	**Sq Ft**	**Linear Ft**
Channel Enhancement *(Grading, Dewatering)*	Tidal Aquatic (Other Waters)	0.72	31216	1299
	Estuarine Wetland	0.16	6670	1127
	Ruderal Riparian	0.43	18606	1127

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Figure 4. Jurisdictional Habitat Impacts
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Although western pond turtles are widespread in the project region, the species is not particularly abundant. Because individuals of this species can be long-lived, the widespread nature of the species in the project region may belie a population that likely would decline substantially in the future because of poor reproduction, as young turtles are seen in relatively few parts of the project region. Therefore, the loss of individuals could reduce the viability of a population to the extent that it would be extirpated. This impact would be considered significant under CEQA.

Implementation of the mitigation measure below would reduce these impacts to a less-than-significant level by minimizing the potential for the loss of individual western pond turtles and their nests.

A qualified biologist shall conduct a pre-activity survey for western pond turtles and their nests within 48 hours prior to the commencement of project work, including dewatering, within the Sunnyvale West Channel. If an adult or juvenile western pond turtle is found, project activities in the vicinity of the turtle shall cease until the individual has either left the work area on its own, or it has been relocated to an appropriate site outside the project area by a qualified biologist. If an active western pond turtle nest is detected within the activity area, a 25-foot buffer zone around the nest will be established and maintained during the nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist.

Following the initial survey, a construction crewmember who has been trained to identify western pond turtles by a qualified biologist shall conduct a survey of the in-channel activity area each morning prior to the onset of construction activities. If a turtle is located, all work in the vicinity shall immediately cease, and a qualified biologist shall be contacted. Work within the area shall not resume until the turtle has been relocated or has moved out of the area where it could be impacted.

2.3.3 Burrowing Owl

Pre-construction surveys for burrowing owls shall be conducted prior to the initiation of all Project activities within suitable burrowing owl habitat (i.e., ruderal/ grassland habitat with burrows of California ground squirrels)[1]. Pre-construction surveys will be completed in conformance with the CDFW's 2012 guidelines (CDFG 2012). An initial habitat assessment will be conducted by a qualified biologist to determine if suitable burrowing owl habitat is present in a given area. During the initial site visit, a qualified biologist will survey the entire activity area and (to the extent that access allows) the area within 250 feet of the site for suitable burrows that could be used by burrowing owls for nesting or roosting. If no suitable burrowing owl habitat (i.e., ruderal grasslands with burrows of California ground squirrels) is present within a given area, no additional surveys will be required. If suitable burrows are determined to be present within 250 feet of work areas, a qualified biologist

[1] Although burrowing owls are not expected to breed on the Project site and suitable habitat for owls on the Project site south of Caribbean is limited to the storm drain channel banks, there is possibility an owl could use the site during the winter non-breeding season if ground squirrel burrows are present. If in the very unlikely event a burrowing owl nest is established on the Project site, see Impact BIO-8 in the Sunnyvale East and West Channels Flood Protection Project EIR for the full suite of required burrowing owl mitigation measures.

will conduct three additional surveys to investigate each burrow within the survey area for signs of owl use and to determine whether owls are present in areas where they could be affected by proposed activities. The final survey shall be conducted within the 24-hour period prior to the initiation of Project activities in any given area. Because Project activities may be phased, these survey efforts may also need to be performed in phases to ensure that burrowing owls are not present in work areas when Project activities commence. This measure applies to the staging areas as well as the Project areas along the Sunnyvale Channels.

If burrowing owls are present during the non-breeding season (generally September 1 to January 31), a 150-foot buffer zone shall be maintained around the occupied burrow(s), if feasible. If maintaining such a buffer is not feasible, then the buffer must be great enough to avoid injury or mortality of individual owls, or else the owls should be passively relocated as described in MM BIO-9 below. During the breeding season (generally February 1 to August 31), a 250-foot buffer, within which no new Project-related activities will be permissible, will be maintained between Project activities and occupied burrows. Owls present between February 1 and August 31 will be assumed to be nesting, and the 250-foot protected area will remain in effect until August 31. If monitoring evidence indicates that the owls are no longer nesting or the young owls are foraging independently, the buffer may be reduced or the owls may be relocated prior to August 31, in consultation with the CDFW.

If construction will directly impact occupied burrows, a qualified biologist will passively evict owls from burrows during the nonbreeding season (September 1 to January 31). No burrowing owls will be evicted during the nesting season (February 1 through August 31) except with the CDFW's concurrence that evidence demonstrates that nesting is not actively occurring (e.g., because the owls have not yet begun nesting early in the season, or because young have already fledged late in the season). Eviction will occur through the use of one-way doors inserted into the occupied burrow and all burrows within impact areas that are within 250 feet of the occupied burrow (to prevent occupation of other burrows that will be impacted). One-way doors will be installed by a qualified biologist and left in place for at least 48 hours before they are removed. The burrows will then be back-filled to prevent re-occupation.

Although relocation of owls may be necessary to avoid the direct injury or mortality of owls during construction, relocated owls may suffer predation, competition with other owls, or reduced health or reproductive success as a result of being relegated to more marginal habitat. However, the benefits of such relocation, in terms of avoiding direct injury or mortality, would outweigh any adverse effects.

2.3.4 Salt Marsh Common Yellowthroat and Alameda Song Sparrow (and other Native Nesting Birds)

Although both of these taxa nest within the project area of the Sunnyvale West Channel, both will benefit from the improvement in habitat quality. However, loss of nests or eggs would be a violation of federal and state law. Thus, measures to avoid the loss of eggs and nestlings will be implemented. It should be noted that these measures would extend to avoiding the loss of eggs or nestlings of other species of birds not considered special status. Although these other species are common and loss of individuals or eggs would not be considered

significant under CEQA, such a loss would violate federal and state laws. The compliance measures implemented to avoid take of salt marsh common yellowthroat and Alameda song sparrow, extended to cover all native birds that might be breeding on the project site, will allow the project to avoid violating state and federal laws protecting these other species as well.

To the extent possible, project activities that could result in direct loss of eggs or young, or in indirect loss through abandonment as a result of disturbance, should be scheduled outside the nesting season (February 1 through August 31 in this region). If project activities cannot be scheduled between September 1 and January 31 season, then pre-activity/pre-disturbance surveys for nesting birds will be conducted by a qualified ornithologist to ensure that no nests will be disturbed during project implementation. The surveys will be conducted no more than seven days prior to the initiation of project activities. The ornithologist will inspect all potential nesting sites in and immediately adjacent to the impact area. If an active nest is found sufficiently close to work areas to be disturbed by these activities, the ornithologist will determine the extent of a construction-free buffer zone to be established around the nest (typically 300 feet for raptors and 100 feet for other species), to ensure that no nest of protected species will be disturbed during project implementation.

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Section 3.0 Mitigation Approach

3.1 Proposed Mitigation

The project proposes to provide onsite mitigation for temporary and permanent impacts to tidal aquatic, estuarine wetland and ruderal riparian habitats, as described below.

The project proposes to mitigate the temporary tidal aquatic impacts at a 1:1 ratio and permanent impacts at 2:1, through a combination of restored tidal aquatic (0.54 ac) and estuarine wetland habitats (0.24 ac) and increasing the linear footage of tidal aquatic habitat from 1,299 ln ft to 1,325 ln ft (Tables 2 and 3). The project proposes to mitigate for temporary estuarine wetland habitat impacts (dewatering) at a 1.2:1 ratio and permanent impacts (shading from bridges) at a 2:1 ratio (Tables 2 and 3).

These mitigation ratios represent a total project mitigation requirement of approximately 0.99 ac of jurisdictional wetlands and waters of the United States/state as a mix of estuarine wetland and tidal aquatic habitat.

Temporary impacts on ruderal riparian habitat will be mitigated at a 1:1 ratio and permanent impacts at a 2:1 ratio. The actual area to be tracked for ruderal riparian habitat mitigation will be a dedicated zone along the lower levee slopes on both sides of the channel from the West Caribbean Drive culvert upstream to the first new pedestrian bridge (Figure 5). This area will provide stable vegetated slopes. Although woody species will be installed throughout this zone, they will not be linked to any specific monitoring or success criteria metrics because there will be no impacts on woody plants within existing jurisdictional areas.

Project mitigation will restore and enhance tidal aquatic, estuarine wetland, and riparian habitats within the project site. There will be a 0.54-ac, 1,325 ln ft low-flow storm drain channel, bordered on both sides by a wetland floodplain bench set at elevations below the high-tide line and subject to regular tidal inundation, and the levee banks will be laid back to provide stable slopes where a mix of native riparian trees, shrubs, grasses, and forbs can be established. The project will provide all necessary mitigation per the descriptions above, as well as voluntarily create additional habitat. In all, the area of waters of the United States/state (tidal aquatic habitat and estuarine wetlands) will be more than doubled, with a final anticipated area of 2.84 ac (Tables 2 and 3 and Figure 5). Along with an anticipated 1.80 ac of riparian habitat, the project will substantially increase the area and quality of jurisdictional habitat through the project reach as compared to the current conditions (Tables 2 and 3 and Figure 5). Estuarine wetland habitat will be passively restored by allowing sedimentation and plant detritus accumulation to restore the intertidal elevations, and natural colonization to establish the plant and wildlife communities. However, a few pockets will be planted with California bulrush and alkali bulrush. Riparian plantings will include a mosaic of native species associated with willow-cottonwood forest, oak riparian forest, and bayside scrub communities. Figure 6 provides conceptual cross-sections through the channel enhancement reach.

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Table 2. Habitat Impacts and Mitigation Requirements

Impacted Habitat Type	Acreage	Mitigation Ratio	Mitigation Requirement (acres)
Temporary Impacts			
Tidal Aquatic (Dewatering and Grading)	0.72 ac	1:1	0.54 ac in-kind plus 0.18 ac included in estuarine wetland below)
Estuarine Wetland (Dewatering and Grading)	0.16 ac plus 0.18 to compensate for tidal aquatic	1.2:1 (accounts for temporal loss due to 2-year construction period	0.41 ac in-kind
Ruderal Riparian (Grading)	0.43 ac	1:1	0.43 ac riparian
Permanent Impacts			
Tidal Aquatic (Culvert Extension)	0.01 ac (573 sq ft)	2:1	0.02 ac as estuarine wetland
Estuarine Wetland (Shading)	0.01 ac (520 sq ft)	2:1	0.02 ac in-kind
Ruderal Riparian (Conversion to hardscape)	0.01 ac (457 sq ft)	2:1	0.02 ac riparian

Table 3. Habitat Mitigation and Creation Summary

Habitat Type	Mitigation Requirement	Additional Habitat Creation	Total Habitat Mitigation and Creation
Total Mitigation and Additional Creation			
Tidal Aquatic	0.54 ac	N/A	0.54 ac
Estuarine Wetland	0.45 ac	1.85 ac	2.30 ac
Total Jurisdictional Waters of the United States/state (including wetlands)	**0.99 ac**	**1.85 ac**	**2.84 ac**
Riparian	0.46 ac	1.34 ac	1.80 ac

3.2 Mitigation Goals

The project design allows for full compensation for all temporary and permanent impacts on jurisdictional habitats as described above. The project will result in creating and enhancing tidal aquatic, estuarine wetland, and riparian habitats. The created estuarine and riparian habitats that are in excess of project needs will be available for potential use as mitigation, as yet to be determined, for Valley Water's Flood Protection Project.

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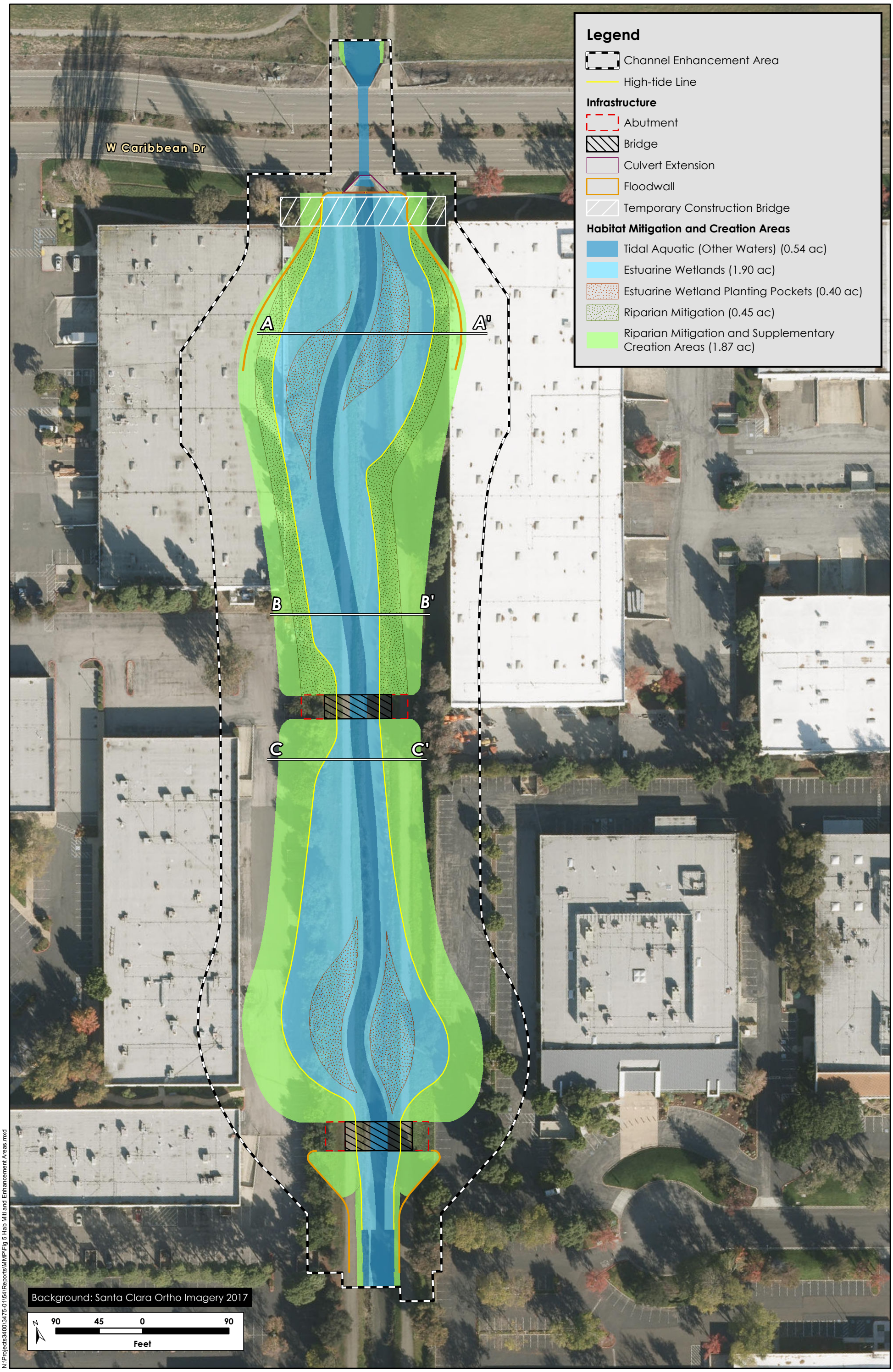

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Figure 5. Habitat Mitigation and Enhancement Areas
Google West Channel Enhancement Project - Mitigation and Monitoring Plan (3475-54)
August 2019

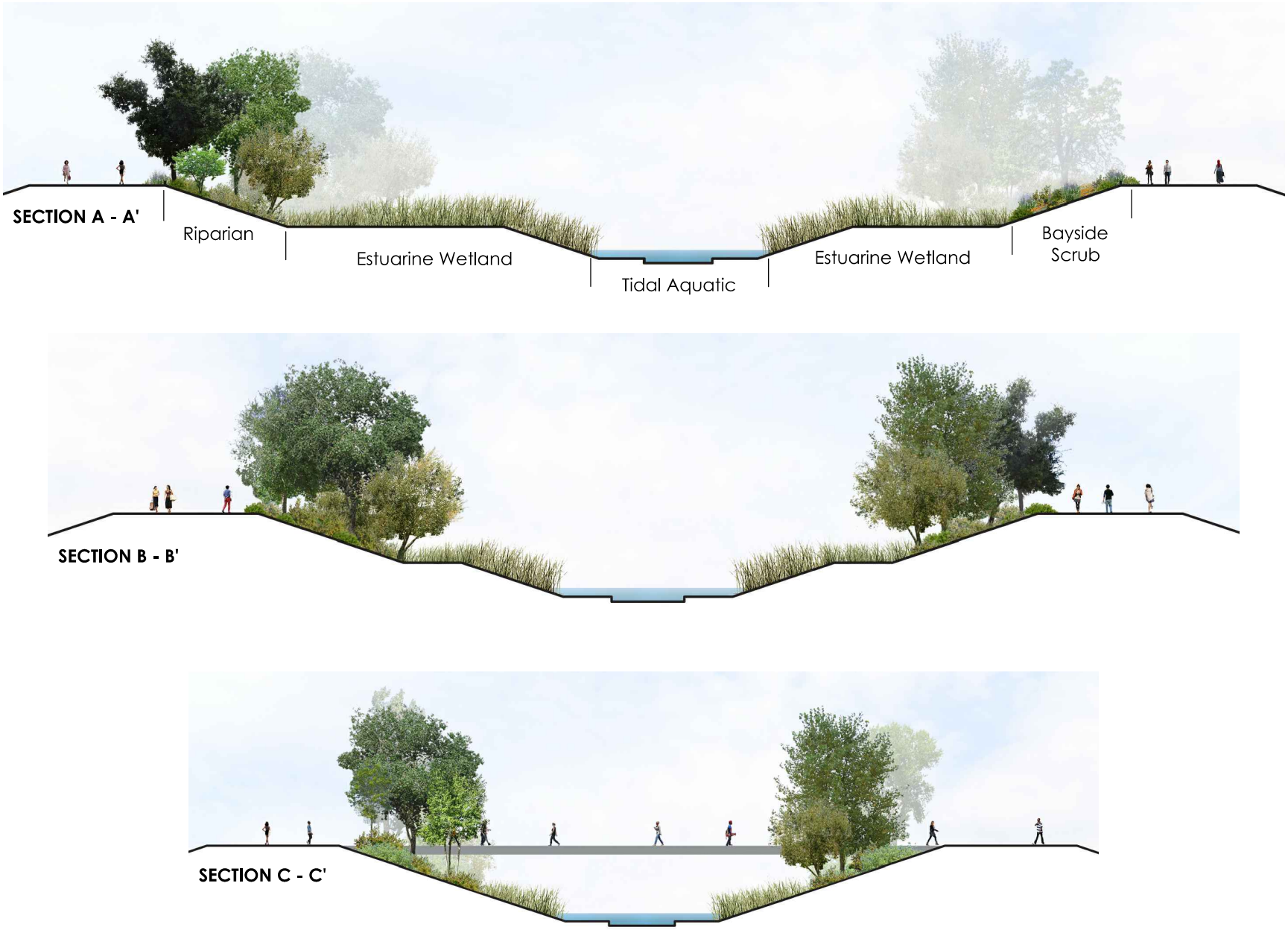

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Figure 6. Conceptual Cross Sections
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3.3 Basis of Design

As part of its Flood Protection Project, Valley Water plans to increase the flood conveyance capacity of the Sunnyvale West Channel, including through the project reach. The Flood Protection Project includes increasing the height of existing levees and installing new floodwalls atop the levees. Within the project reach, Google proposes to widen the channel and to construct raised and widened earthen levees to provide a carrying capacity equivalent to Valley Water's Sunnyvale West Channel design. The project will limit the use of concrete levee walls to small areas of headwall/floodwall construction associated with the culvert extension at West Caribbean Drive and to conform to upstream Valley Water floodwalls.

The project design incorporates setting back and widening the levees and raising the top of bank elevation to create a low-flow storm drain channel with adjacent, broadened floodplains set at elevations below the high-tide line. These floodplains will be subject to regular tidal inundation to facilitate colonization with estuarine wetland species. It is anticipated that robust populations of estuarine plants located downstream of the project reach will provide adequate seed sources that will be introduced to the site with daily tides and facilitate passive restoration of estuarine wetlands across the floodplains. In order to further facilitate revegetation of the floodplains, pockets of appropriate estuarine wetland species will be planted in strategic locations to provide onsite seed/propagule sources. The levee slopes will be constructed with an earthen core that meets all regulatory agency requirements for structural stability. The outer 3 feet of the inboard levee slopes will be constructed with horticulturally suitable soils to support establishment of mixed riparian and bayside scrub habitats. The placement of the horticulturally suitable soil will be designed in consultation with a qualified geotechnical engineer to ensure stability. While only a relatively small area of vegetated, stable riparian habitat is required for project mitigation the entire surface area of the inboard levee slopes will be planted with a mosaic of four native plant palettes. At the lower elevations (high-tide line to approximately mid-slope), patches of willow-cottonwood riparian forest and mesic bayside scrub will be planted. At the upper elevations (approximately mid-slope to top of bank), oak riparian forest will be interspersed with dry bayside scrub. The patches of willow-cottonwood and oak riparian forest will be intermingled and discontinuous to create canopy gaps and provide view corridors into and across the project reach.

3.3.1 Habitat Types

3.3.1.1 Estuarine Wetlands

The project reach will include 2.30 ac of estuarine wetland habitat, to be established across the surface of tidally inundated floodplains located along both sides of the storm drain channel. The total wetland acreage will be increased by 2.14 acres compared to existing conditions.

3.3.1.2 Tidal Aquatic (Other Waters)

The project reach will include 0.54 ac of tidal aquatic habitat (other waters), occurring over approximately 1,325 ln ft of the storm drain channel. This represents a 26 ln ft increase of the storm drain channel and a 0.19 ac

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decrease of tidal aquatic habitat compared to existing conditions. However, the decrease in tidal aquatic habitat will be compensated by providing new jurisdictional estuarine wetland habitat.

3.3.1.3 Riparian

The project reach will include 1.80 ac of mixed riparian habitat on the inboard side of the reconstructed levee slopes. This total includes the required 0.46 ac of mitigation area and an additional 1.34 ac of riparian habitat creation. The entire 1.80 ac area will be maintained by Google for habitat and aesthetic values, but the 1.34 ac of creation is not required or included as part of the project's mitigation obligation.

3.4 Topography and Hydrology

The project reach will include levee reconstruction that will raise the levee-top elevations and have top of bank to top of bank widths between 127 and 187 feet, compared to Valley Water's design width of 52 to 65 feet in adjacent reaches. The channel will be slightly realigned, with an increase in total linear footage through the reach, but the invert elevations will conform to the existing invert elevation, estimated to be the long term sedimentation level. The project reach is designed to convey the design 100-year discharge and will be of sufficient height to contain the design event based on a coincident 1% high-tide elevation of 10 feet NAVD88 with 2 feet of sea level rise and at least 4 feet of freeboard. Transition zones are included at the upstream and downstream ends of the project reach to reduce hydraulic losses and minimize sediment accumulation within the active channel. Further details are provided in the *West Channel Enhancement for Google Hydraulic Basis of Design* (Schaaf & Wheeler 2019a).

3.5 Vegetation

The project design focuses on creating appropriate floodplain elevations to facilitate passive recruitment as the dominant mode of plant establishment within the created and restored estuarine wetlands. Adjacent, upstream and downstream reaches of the storm drain channel provide an abundant source of wetland plant seed. It is anticipated that passive recruitment will be sufficient to rapidly establish a wetland plant community, with vegetative cover expanding over time. The design grades of the floodplain surface range from approximately 1 ft below mean tidal level (MTL) up to approximately 1 ft above MHW. This tidal range captures the extent of the natural elevational gradient of estuarine wetland habitat and was designed to facilitate natural recolonization with the target wetland species. In addition, pockets of native wetland plants (California bulrush and alkali bulrush) will be strategically installed on the floodplain to provide onsite seed/propagule sources and to augment the aesthetic of the project reach during the plant recruitment and establishment period. Both species will be planted near the upper edge of their known tidal elevation ranges to facilitate establishment under limited inundation stress and allow natural expansion into lower elevations as site conditions equilibrate.

In the riparian areas, which extend from the inboard toe of each levee slope up to the top of bank, a mosaic of four distinct native plant palettes will be installed from container stock (see Section 4.5). In addition to the container stock, a native grass and forb seed mix will be applied across the slopes.

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3.6 Wildlife

Riparian ecosystems support some of the highest wildlife species diversity and abundance in North America, and are particularly important in the western portion of the continent (Poff et al. 2011). For example, riparian zones in many areas of the western United States comprise less than 1% of the total land area, yet these areas are used by more species of breeding birds than any other habitat in North America (Knopf et al. 1988 as cited in Fischer 2000). Riparian zones provide valuable habitat and resources to a rich diversity of fish and wildlife, including a number of species dependent on riparian habitat. For example, resident and migratory birds use riparian areas for breeding, nesting, and foraging, while providing refuge and foraging for mammals, reptiles and amphibians. Riparian habitats also provide critical elements for fish habitat, including shading the channel, large woody debris to form pools, and floodplain habitat for rearing, spawning, and resources (Opperman and Merenlender 2011).

Unfortunately, riparian ecosystems are one of the most heavily degraded ecosystems, as is the current case with the Sunnyvale West Channel. Vast amounts of this important habitat have been lost to development through the construction of dams, river and stream channelization, grazing, agriculture, cities, urban landscaping, invasive species, and other anthropogenic activities over the past several hundred years of human expansion in North America. For example, around 95% of the riparian habitat in the Sacramento Valley has been lost (Gardali et al. 2004) and such amounts of loss are common throughout the West (Poff et al. 2011). In a study of the effects of urbanization on riparian habitats in Silicon Valley, Rottenborn (1999) found that bird species richness and density decreased as the volume of native riparian decreased. In Silicon Valley, riparian corridors along the Guadalupe River in San Jose have shrunk from vast riparian willow complexes over 0.5 kilometer wide, to a strip between ~20-50 meters wide in most places (Beller et al. 2010). Thus, the vast majority of this valuable habitat has been lost both regionally and locally, which emphasizes the importance of riparian habitat conservation and restoration.

This project will increase the habitat value of this reach of the Sunnyvale West Channel substantially relative to existing conditions, and contribute to the ongoing restoration of native habitat (including riparian habitat) that is occurring in the South Bay, which will result in a local and a cumulative benefit to the suite of species that utilizes this habitat. In particular note, Neotropical migrants that utilize riparian habitats for breeding, migratory stopovers, and wintering will benefit from the project mitigation. Neotropical migrants are showing significant declines and thus are of conservation concern in general.

The net increase in riparian habitat will also help special-status species known to occur, or likely to occur, on the project site following project completion. Migrant yellow warblers will benefit from the additional native riparian habitat. Nesting and resident San Francisco common yellowthroats will benefit from the additional willow and estuarine wetland habitats, and the Alameda song sparrow will benefit from the additional tidal aquatic and estuarine wetland habitats. Although the northern harrier, American peregrine falcon, and white-tailed kite are not anticipated to nest on the project site, the potential for an increased prey base associated with

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the additional native vegetation may provide some benefit to these species. Western pond turtles would benefit from the increased vegetation providing cover from predators.

As discussed earlier, the site provides only marginal habitat for burrowing owls. None are known to nest along the Sunnyvale West Channel, and although owls could occasionally forage or roost there, none have been recorded along the project reach (they occur primarily downstream from the site, on the old Sunnyvale Landfill). The addition of riparian vegetation along the levee will decrease the likelihood that burrowing owls would forage or roost on the site given their affinity for open areas free of tall vegetation. However, given that this species is not currently expected to use the site regularly, an increase in riparian vegetation would not substantively affect this species. The additional vegetation and increased ecological functions and values associated with the project may increase the potential prey base for owls in the area due to increased prey productivity.

3.7 Mitigation Site Location and Ownership Status

The mitigation site is located within the project footprint on Valley Water lands, as well as on adjacent parcels owned by Google (Assessor's Parcel Numbers 110-26-027, 110-26-031, 110-26-023, and 110-26-025). All required mitigation will be implemented within the bed and banks of the reconstructed levees and storm drain channel on these properties.

3.8 Time Lapse

Tidal aquatic habitat will be established immediately following removal of dewatering infrastructure. Estuarine wetland habitat is expected to become established within 2 to 3 growing seasons. Vegetative cover on stable riparian slopes will become established after 1 growing season.

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Section 4.0 Implementation Plan

4.1 Wildlife Avoidance and Minimization Measures

All required pre-construction wildlife surveys and avoidance and minimization measures will be implemented per the project's permits.

4.2 Mitigation Construction Schedule

Construction is expected to begin in 2020 with landside elements, including installation of the temporary bridge over the channel. The first activities to impact regulated habitats specific to the channel enhancement would be vegetation removal prior to the nesting bird season prior to February 1, 2021. Construction would then be completed over the next 2 years (2021-2022). The storm drain channel will be excavated and contoured, and the bridges and culvert extension will be built during the first in-channel construction season from April 15 – October 15, 2021. Finish grading, completions of floodwalls, and other final improvements such as the installation of irrigation and plantings would occur during the second in-channel construction season, anticipated in April 15 – October 15, 2022.

Ground-disturbing work within jurisdictional habitat areas will occur in the dry season (i.e., between April 15 and October 15). Additionally, once the new topography of the project reach is established, this temporal restriction will extend to all areas within the new top of bank. Work in areas outside the current and proposed top of bank may take place in the wet season and use the temporary bridge during the construction period.

During construction, the project reach will be dewatered via temporary coffer dams located above and below the site and an enclosed pipe to convey flow through the project reach. Rough grading will include reconstructing the storm drain channel with broadened floodplains and constructing larger levees. Following rough grading, bridge abutments and decks will be constructed. Finish grading will include establishing final grades within the channel and floodplains and preparing the levee slopes for planting, including placement of horticulturally suitable topsoil. Planting of wetland pockets will occur immediately prior to removing dewatering infrastructure. Installation of riparian plants is anticipated to occur in late fall following completion of construction. The order of events for mitigation implementation is roughly as follows:

1. Remove in-channel vegetation prior to first construction season.
2. Install erosion control measures and channel dewatering.
3. Clearing and grubbing of project reach.
4. Rough grading and construction of new levees.
5. Construction of bridge abutments and decks.

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6. Remove channel dewatering infrastructure and install temporary erosion control measures at end of first construction season.
7. Reinstall channel dewatering infrastructure at beginning of second construction season.
8. Final grading, completion of floodwall construction, and soil preparation.
9. Install wetland plantings.
10. Remove dewatering infrastructure.
11. Installation of irrigation lines and planting basins in riparian areas.
12. Apply native seed in riparian areas.
13. Install container plants in riparian areas.
14. Prepare biological as-built report.

4.3 Implementation Monitoring

A qualified biologist/ecologist will monitor mitigation implementation to ensure that the site is installed as described in this plan.

4.4 Site Preparation

4.4.1 Vegetation Removal

Delays in construction could jeopardize the ability of the project to complete rough/mass grading of the channel during the first construction season. Therefore, due to the density of existing emergent wetland vegetation throughout the channel enhancement reach, the project proposes to remove channel vegetation outside the nesting bird season, prior to February 1, 2021, in preparation for year 1 construction. Vegetation will be cut at the mudline at low tide using hand tools and removed from the channel. Because substantial disturbance of the channel bottom is not anticipated, no measures such as turbidity curtains will be necessary. The in-channel vegetation will then be maintained at a very low height unsuitable for nesting birds until April 15, 2021 in preparation for year 1 dewatering activities. Due to mass grading of the channel during year 1, the channel is likely to remain unvegetated or very sparsely vegetated during the winter of 2021-2022 in between the two in-channel construction seasons. However, if this is not the case and suitable substrate for nesting birds develops quickly during the 2021-2022 winter, vegetation removal would again be necessary prior to February 1, 2022 and then maintained until April 2022 in anticipation of dewatering activities for year 2.

Installation of the temporary bridge will be necessary in 2020, the year prior to commencing instream earthwork, to facilitate movement of construction vehicles and pedestrians associated with landward construction activities. Installation of the temporary bridge will not result in any impacts to waters of the U.S.

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4.4.2 Erosion Control

Temporary silt fencing, wattles, and/or suitable alternatives will be installed on or within the project boundary (outboard of new levees) to ensure that sediment is contained within the project footprint during construction. No erosion control infrastructure will be installed within the inboard slopes of new or existing levees because this entire area will be subject to grading. Dust suppression will be achieved and maintained during all earthmoving activities by using water trucks, as required. Standard construction site best management practices (BMPs) will be implemented to protect offsite areas and waterways; these BMPs will include the use of exit grids and street sweepers at project site ingress/egress points.

4.4.3 Channel Dewatering

The project reach will be dewatered to maintain the work area as water-free as possible during construction. A conceptual dewatering plan has been prepared that addresses the placement of cofferdams, cofferdam construction, BMPs to avoid discharge of sediment into waters of the United States/state, construction phasing and timing, placement of a water diversion pipe that will maintain upstream flow into the lower reaches of the storm drain channel, and the removal of the water diversion equipment after construction ends (Schaaf & Wheeler 2019b).

Channel dewatering will create a dewatered work area through the entire length of the project reach. An earthen coffer or aqua dam will be installed at the upstream limits of construction. The coffer dam will span the full width of the channel and convey all surface flows from the creek into a 28-inch-diameter, fused high-density polyethylene (HDPE) pipe. Alternatively, multiple pipes may be used that provide the equivalent carrying capacity as a single 28-inch pipe. The HDPE pipe(s) will carry the collected water approximately 1,300 ln ft through the project reach and the culvert beneath West Caribbean Drive. The pipe will discharge below an aqua dam to be installed on the downstream side of West Caribbean Drive. Suitable erosion protection will be installed at the discharge point. If gravity is not effective in conveying water due to tidal influence, pumps will be used as necessary. Detailed information is provided in the *Dewatering Plan for the Google West Channel Enhancement* (Schaaf & Wheeler 2019b).

4.4.4 Grading and Soil Preparation

The project design includes setting back the levees to allow grading of a new storm drain channel and establishing adjacent floodplains at elevations ranging from approximately 1 ft below MTL up to approximately 1 ft above MHW to facilitate colonization of the floodplains with the target estuarine wetland plant community. Figure 7 provides a plan view of the landform grading. It is anticipated that cutting to the finish grade will expose suitable soil conditions that will not require any additional treatment or amendments and will support both actively planted and naturally recruited estuarine wetland species. However, a project specific site management plan will be prepared that outlines the protocol to ensure floodplain soils meet appropriate requirements for soil and sediment characteristics for areas subject to tidal inundation. The levees will be constructed to meet geotechnical stability requirements and will include placement of a stable 3 ft deep zone of horticulturally suitable soil as the final series of lifts across the inboard levee slopes to facilitate long-term

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establishment of the riparian plantings. The project's construction documents will provide detailed drawings and specifications for the grading and soil preparation. The levees will be constructed to meet geotechnical stability requirements and will include placement of a stable 3 ft deep zone of horticulturally suitable soil as the final series of lifts across the inboard levee slopes to facilitate long-term establishment of the riparian plantings. The project's construction documents will provide detailed drawings and specifications for the grading and soil preparation.

4.5 Planting and Seeding Plan

4.5.1 Overview

The project design includes relying primarily on passive revegetation of the estuarine wetland areas and utilizing native seed from adjacent reaches that will be naturally dispersed to the site from upstream storm drain flows and from downstream through tidal action. However, revegetation of the floodplains will also be supplemented by installing pockets of native wetland plants. Supplemental plantings will be installed after all mitigation site construction is complete and immediately prior to removing dewatering infrastructure. The two most common species anticipated to colonize the floodplains include California bulrush and alkali bulrush. Planting pockets will be planted with these two species from 1-gallon container stock. Both species will be installed near the upper edge of the known tidal elevation ranges to allow establishment under limited inundation stress. Figure 5 provides a conceptual plan view of the likely locations and sizes of the planting pockets. Within each pocket, plants will be installed in clusters spaced approximately 20 ft apart that contain 8–12 individuals.

On the inboard levee slopes, a combination of native riparian and bayside scrub container plants and a native grass and forb mix will be used to achieve a vegetated condition suitable to prevent excessive erosion and provide high quality riparian habitat. Plant palettes for the levee slope riparian areas are provided in Table 4. The exact proportions and locations of each species will be provided in the detailed construction documents. The native riparian seed mix to be used for all riparian areas is provided in Table 5.

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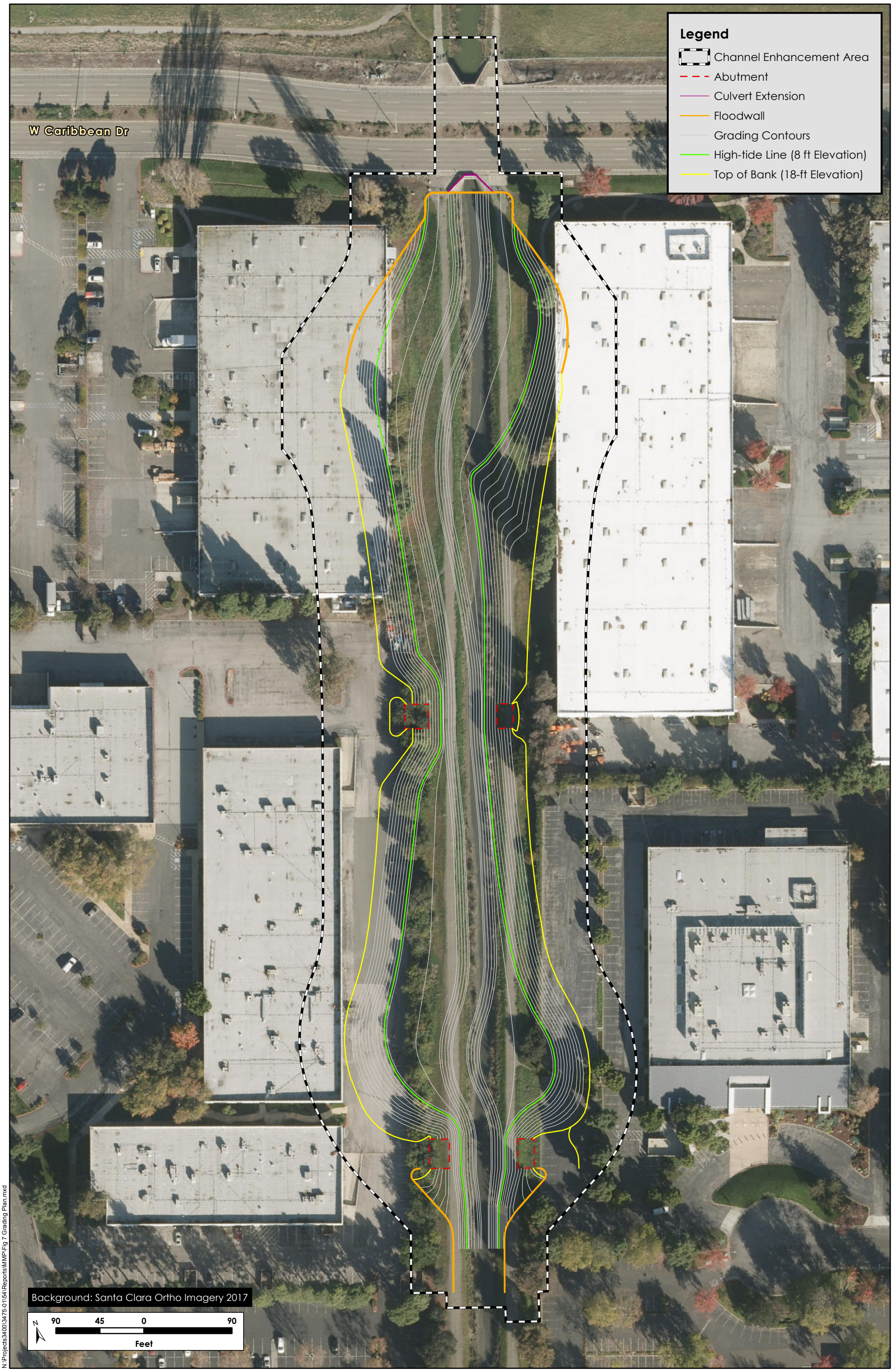

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Figure 7. Grading Plan
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Table 4. Native Riparian Woody Plant Palettes

Riparian Habitat Type	Stature	Scientific Name	Common Name
Willow-Cottonwood Riparian Forest	Understory	*Baccharis douglasii*	Marsh baccharis
		Ribes sanguineum	Flowering currant
		Rosa californica	California rose
		Rubus ursinus	California blackberry
	Trees	*Populus fremontii*	Fremont cottonwood
		Salix lasiolepis	Arroyo willow
		Sambucus nigra	Elderberry
Oak Riparian Forest	Understory	*Ceanothus thyrsiflorus*	Blue blossom ceanothus
		Frangula californica	Coffeeberry
		Heteromeles arbutifolia	Toyon
		Monardella villosa	Coyote mint
		Ribes sanguineum	Flowering currant
		Rosa californica	California rose
		Salvia mellifera	Black sage
	Trees	*Acer negundo*	Boxelder
		Aesculus californica	California buckeye
		Populus fremontii	Fremont cottonwood
		Sambucus nigra	Elderberry
		Quercus agrifolia	Coast live oak
		Quercus lobata	Valley oak
Mesic Bayside Scrub		*Asclepias fascicularis*	Narrow leaf milkweed
		Baccharis glutinosa	Marsh baccharis
		Ribes sanguineum	Flowering currant
		Rosa californica	California rose
		Rubus ursinus	California blackberry
Dry Bayside Scrub		*Asclepias californica*	California milkweed
		Asclepias fascicularis	Narrow leaf milkweed
		Epilobium canum	California fuchsia
		Eriophyllum confertiflorum	Golden yarrow
		Monardella villosa	Coyote mint
		Salvia clevelandii	Cleveland sage
		Salvia spathacea	Hummingbird sage

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Table 5. Native Riparian Seed Mix

Scientific Name	Common Name	PLS[1]/Acre
Achillea millefolium	Yarrow	0.5
Acmispon glaber	Deerweed	1
Artemisia douglasiana	Mugwort	0.5
Bromus carinatus	California brome	5
Clarkia rubicunda	Farewell to spring	1
Elymus glaucus	Blue wildrye	5
Elymus triticoides	Creeping wildrye	5
Eriogonum fasciculatum	California buckwheat	1.5
Eschscholzia californica	California poppy	2
Festuca microstachys	Three weeks fescue	4
Festuca rubra	Red fescue	3
Hordeum brachyantherum	Meadow barley	5
Layia platyglossa	Tidy tips	2
Lupinus succulentus	Arroyo lupine	3
Nemophila menziesii	Baby blue eyes	1
Stipa pulchra	Purple needle grass	5
Symphyotrichum chilense	Pacific aster	0.25
	Total	**44.75**

[1] PLS = pure live seed

4.5.1.1 Plant Procurement

Locally appropriate plants will be sourced for the project. When possible, plant propagules will be collected from within Santa Clara County or adjacent counties and contract grown for the project. Container plants will be sourced from nursery stock grown in accordance with established *Phytophthora* prevention BMPs to prevent the introduction of contaminated plant material at the project site. The Working Group for *Phytophthoras* in Native Habitats provides a set of applicable guidelines (WGPNH 2016). Willow cuttings, if used, will be harvested from nearby riparian habitats along similar bayside stream corridors.

4.5.2 Container Plant Installation

4.5.2.1 Estuarine Wetlands

Wetland container stock will be installed directly into design grade soils. Planting holes will be hand excavated to approximately twice the diameter of the root ball. Container stock will be installed with the top of the rootball at grade and excavated soil will be used to backfill around each planting. Immediately prior to installing each container stock plant, the root mass will be inspected, and any matted, dead, diseased, broken, twisted, or circling roots will be pruned. No mulch or constructed irrigation basins will be used in this area.

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4.5.2.2 Riparian

Planting basin locations and dimensions will be determined as part of development of the project's detailed construction documents. Planting basins will be constructed to accommodate installation of the varying container sizes with a raised berm, approximately 4 inches high, on the downslope side to concentrate irrigation water and prevent washout. Soil amendments may be included, if determined to be necessary, and suitable topsoil may be placed as the final lift of levee construction. Immediately prior to installing each container stock plant, the root mass will be inspected, and any matted, dead, diseased, broken, twisted, or circling roots will be pruned. Following plant installation, 3 inches of wood chip mulch will be applied within each planting basin. Mulch will be pulled 2–3 inches away from plant stems to prevent rot. All container plants will be irrigated immediately following installation.

4.5.3 Irrigation

No irrigation will be provided to the estuarine wetland areas. A temporary drip or bubbler irrigation system will be constructed to provide water to riparian plantings during a 3–5 year plant establishment period. The type and location of irrigation infrastructure will be shown in the project's construction documents. The irrigation system will be designed to deliver approximately 10 gallons of water to each planting basin. The frequency and duration of irrigation events will be determined in consultation with a qualified restoration ecologist and applied in a manner to promote deep root development.

4.5.4 Herbivory Protection

It is anticipated that herbivory protection will not be necessary at the site. However, if there is substantial herbivory of the estuarine wetland areas from waterfowl, adaptive measures may be taken to protect the establishing plants. These measures would be presented to the regulatory agencies for approval prior to implementation.

4.6 Biological As-Built Report

Within 8 weeks of the completion of the last phase of mitigation site installation, a biological as-built report will be prepared and submitted to the USACE, RWQCB, and CDFW. The biological as-built report provides a description of the biological conditions of the mitigation site immediately following installation relative to the conceptual design presented in this MMP. The intent of the biological as-built report is to document substantive biological deviations from the permitted design for regulatory agency consideration and to serve as the baseline condition for future analysis/comparison of the site to performance and final success criteria. The report does not provide detailed as-built conditions of the engineered site infrastructure, such as bridges, and does not replace either the construction as-built drawings or the construction record drawings typically prepared by the contractor, project owner, or owner's representative.

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Section 5.0 Maintenance Plan

5.1 Overview

This section outlines the maintenance required at the mitigation site to facilitate meeting the project's annual performance and final success criteria. Maintenance actions performed in the riparian areas to promote woody plant establishment are to be performed 'at-will' and are considered outside the scope of this MMP.

5.2 Maintenance Schedule

Maintenance within the mitigation site will occur at least 4 times per year, based on quarterly site inspections and recommendations to be provided by a qualified restoration ecologist. Additional maintenance may be required based on specific circumstances, such as heavy precipitation events, fire, and vandalism. Maintenance activities will occur throughout the 5-year monitoring period.

5.3 Tidal Aquatic Habitat and Estuarine Wetlands

Mitigation maintenance measures within the tidal aquatic habitat and estuarine wetlands will consist of, trash and debris removal, and natural recruit protection/avoidance.

5.3.1 Trash and Debris Removal

Because the project reach is tidally influenced and receives runoff from a highly urbanized watershed, the presence of inorganic trash and debris cannot be completely eliminated. Any substantial accumulations of inorganic trash and debris that occur within the tidal aquatic habitat or estuarine wetlands during the monitoring period will be removed. All removed material will be disposed of appropriately at an off-site location.

5.3.2 Natural Recruit Protection/Avoidance

Any naturally recruiting native plants observed within the estuarine wetlands will be identified and protected. Passive recruitment of estuarine wetland species across the floodplains is anticipated to be the primary method by which the habitat will establish. Therefore, the protection and avoidance of naturally recruited native species is a high priority.

5.4 Riparian

The project is not specifically required to provide riparian habitat that includes native woody species. Although the project design includes the establishment of a mosaic of riparian vegetation across the inboard levee slopes, the maintenance measures required to facilitate achievement of the mitigation obligations in this MMP (i.e., 0.46 ac of stable, vegetated riparian levee slopes as shown on Figure 5) are limited to erosion protection, invasive weed control, and trash and debris removal.

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5.4.1 Erosion Protection

The inboard levee slopes will be visually inspected for signs of erosion, which could include: rilling, slumping, gully formation, or other indicators of soil loss. If soil erosion or bank instability is observed, appropriate remedial actions will be developed to stabilize levee slope soils and prevent further soil losses. Remedial actions will minimize disturbance to planting basins and installed plants. Treatments may include: installing wattles perpendicular to the levee slope, broadcast or hydro-seeding with an approved native seed mix, and minor soil movement (e.g., raking the soil surface, repairing irrigation basins). Treated areas will be mapped, monitored, and documented in annual monitoring reports.

5.4.2 Invasive Weed Control

If the riparian mitigation areas are observed to support more than 5% absolute invasive plant cover during the monitoring period, invasive weed control measures will be implemented. Invasive plants are considered to be species identified by California Invasive Plant Council (Cal-IPC) as having a "high" invasive potential (Cal-IPC 2018). Control of invasive species may include manual removal efforts or the use of an herbicide approved by the U.S. Environmental Protection Agency for aquatic use. If an herbicide is used, it will be based on a recommendation from a certified pest advisor and applied by a licensed herbicide applicator.

5.4.3 Trash and Debris Removal

Any substantial accumulations of inorganic trash and debris that occur on the levee slopes during the monitoring period will be removed during scheduled maintenance activities. All removed materials will be disposed of appropriately at an off-site location.

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Section 6.0 Monitoring Plan

6.1 Overview

This MMP defines the objective, measurable success criteria that will be used to determine if the mitigation site is on a trajectory towards meeting long-term habitat goals. Monitoring data collected by a qualified restoration ecologist will be used to evaluate the success of the mitigation site relative to the project's success criteria. Monitoring will be conducted annually over a 5-year period. Information obtained through the monitoring program will provide feedback to direct necessary maintenance and help ensure successful habitat establishment. The intermediary performance criteria have been established to serve as references to inform site management and ensure that the final success criteria are met. It will not be considered a site failure if individual performance criteria are not met. Site success will be determined by meeting or exceeding final success criteria. If the final success criteria are not met, Google or its representative will consult with the regulatory agencies to identify appropriate remedial measures.

6.1.1 Long-Term Habitat Goals and Success Criteria

The long-term habitat goals of this MMP are to fully compensate for all impacts on jurisdictional areas associated with the construction of the proposed project and secondarily to provide supplemental mitigation for impacts associated with Valley Water's Flood Protection Project.

This MMP presents objective performance and final success criteria for measuring progress toward the long-term habitat goals. At maturity, the project reach will support tidal aquatic habitat within the storm drain channel, estuarine wetland habitat across the floodplains, and stable, vegetated riparian levee slopes. The target habitats will be considered to be on a successful restoration trajectory when monitoring (as described in this section) demonstrates that final success criteria have been met. It is anticipated that the mitigation site conditions (i.e., hydrology, soils, and geomorphology) and planned maintenance will support the rapid establishment of the target habitats.

6.1.2 Monitoring Schedule and Process

The mitigation site will be monitored annually by a qualified biologist/ecologist over a 5-year period. Monitoring data will be collected and compared to the performance and success criteria to determine whether the mitigation site is performing adequately. Monitoring data will also inform maintenance actions and potential remedial measures needed to ensure the success of the mitigation.

Google will use the Year 5 final success criteria and an overall assessment of site performance by a qualified restoration ecologist to determine compliance with mitigation requirements and inform the regulatory agencies. If the final success criteria have not been met by Year 5, the regulatory agencies will be informed of the likely causes and proposed remedial actions, if warranted. If remedial actions are determined to be necessary, they

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will be implemented following approval from the regulatory agencies and monitoring will continue until the final success criteria have been met.

6.2 Monitoring Performance and Success Criteria

The annual performance and final success criteria for the habitat mitigation areas are presented in Table 6. Each monitoring metric is explained in further detail in the following sections.

Table 6. Annual Performance and Final Success Criteria

Monitoring Metric	Year 1	Year 2	Year 3	Year 5
Estuarine Wetland				
% Wetland Plant Cover	N/A	≥10%	≥15%	≥25%
Acreage of Jurisdictional Tidal Aquatic and Estuarine Wetlands				0.99
Riparian Levee Slopes				
% Plant Cover	N/A	30%	50%	75%
Soil Stability	See description below			
Acreage of Vegetated Stable Riparian Levee Slopes				0.46

6.2.1 Performance and Final Success Criteria

6.2.1.1 Estuarine Wetland—Percent Wetland Plant Cover

The absolute percent cover of planted and naturally recruited wetland plant species will be assessed in Years 1–5. There is no cover criterion in Year 1. Percent wetland plant cover shall show an increasing trend, as shown in Table 6 and meet the final success criterion of 25% cover in Year 5.

6.2.1.2 Tidal Aquatic and Estuarine Wetland—Acreage

In Year 5, 0.99 ac of jurisdictional tidal aquatic and estuarine wetland habitats will provided to fully compensate for project impacts. Additional jurisdictional estuarine wetland habitat within the project reach will be documented at this time and may be provided as mitigation for Valley Water's Flood Protection Project, to be negotiated separately.

6.2.1.3 Riparian Levee Slopes—Percent Plant Cover and Soil Stability

The absolute percent cover of seeded, planted, and naturally recruited plant species on the levee slopes will be assessed in Years 1–5. There is no cover criterion in Year 1. Percent plant cover will show an increasing trend (Table 6), meet the final success criterion of 75% cover in Year 5, and be adequate to support a stable soil surface without any signs of substantial erosion. Substantial erosion would include rilling or gullying that directly deposits sediment onto the floodplains or into the storm drain channel.

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6.2.1.4 Riparian—Acreage

In Year 5, 0.46 ac of vegetated, stable riparian levee slopes will be provided as project mitigation. Although the entire levee slope is required to be stable, the project mitigation requirement is only 0.46 ac of riparian habitat (as described in Section 3.1 and shown on Figure 5) to compensate for impacts on ruderal riparian habitat. The area provided for this mitigation will be documented in the biological as-built report.

6.3 Monitoring Methods and Schedule

Monitoring will be conducted in Years 1–5 and results will be compiled in a report for submittal to the regulatory agencies by December 31 of each reporting year. Specific monitoring tasks are described below.

6.3.1 Percent Wetland Plant Cover

The absolute percent cover of wetland plant species across the wetland areas will be assessed annually near the peak of the growing season (i.e., from May through July) by a qualified restoration ecologist. These cover assessments will involve a combination of direct observations, ground-level photodocumentation, high-resolution aerial imagery, or satellite imagery. If aerial or satellite imagery is used, it will be supplemented with sufficient ground-level observations to facilitate the identification of plant species.

6.3.2 Riparian Levee Percent Plant Cover and Soil Stability

Ground-level visual inspections of the levee slopes will be performed quarterly by a qualified restoration ecologist as part of planned maintenance inspections, and following any large storm events that could destabilize the soil surface. The absolute percent cover of vegetation will be visually assessed and recorded, and documented with photographs. If any indicators of considerable soil loss are observed, their locations and extents will be recorded and the appropriate remedial actions will be prepared in consultation with a qualified engineer; these proposed actions will be provided to regulatory agencies for approval prior to implementation. Indicators of substantial soil instability will include, but are not limited to, rills, gullies, and/or slumps that directly deposit sediment on the floodplains or into the storm drain channel. All significant soil loss, as well as any implemented remedial actions, will be documented in annual monitoring reports.

6.3.3 Acreage of Jurisdictional Tidal Aquatic and Estuarine Wetlands

A formal delineation of tidal aquatic and estuarine wetland habitats will be completed in Year 5 in accordance with the guidelines outlined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010). Habitat acreages will be calculated from the Year 5 delineation and those acreages will be compared to the final success criteria. Habitat acreage in excess of the mitigation requirements may be provided as mitigation for Valley Water's Flood Protection Project.

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6.3.4 Photodocumentation

Photodocumentation of the mitigation site will be conducted following installation (part of the biological as-built report) and in Years 1–5 during maintenance inspections and annual monitoring events. Photographs will also be taken to record any event that may substantially affect the success of the mitigation, such as flood, fire, or vandalism. The locations of photodocumentation points will be selected following mitigation implementation and will be identified in the biological as-built report.

6.3.5 Site Maintenance

Maintenance inspections will be performed at least four times per year (quarterly) in Years 1–5. A qualified restoration ecologist will inspect the site to ensure that maintenance activities are biologically appropriate and providing the best opportunity for the site to meet performance criteria. The restoration ecologist will assess the need for invasive weed control, erosion control measures, and trash and debris removal. The restoration ecologist will prepare a memorandum with recommended maintenance activities following each inspection. If remedial erosion control measures are needed, the memorandum presenting these measures will be submitted to the regulatory agencies for approval prior to implementation.

6.4 Reporting

An annual monitoring report will be submitted to the regulatory agencies (i.e., USACE, CDFW, and RQWCB) by December 31 of each monitoring year. The report will include a description of the monitoring methods, a discussion of monitoring results, and a list of any management recommendations. Maps showing monitoring locations and copies of photodocumentation will be included in each report. Field data sheets will be available for review upon request.

Annual monitoring reports will be prepared in the following format:

1. Report Summary
2. Introduction
3. Methods
4. Results
5. Discussion
6. Management Recommendations
7. References
8. Appendices

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6.5 Completion of Mitigation

At a minimum, monitoring will be conducted over a 5-year period. If the mitigation site successfully achieves the final success criteria, the Year 5 report will document completion of the project. If remedial measures were implemented and additional monitoring and reporting were required in order to meet the final success criteria, then Google will submit a letter to the regulatory agencies with the final monitoring report requesting final "sign-off" on the project.

6.6 Contingencies and Remedial Actions

If the failure to meet annual performance criteria or other site conditions indicate that the site will not meet final success criteria or the final success criteria are not met in Year 5, Google will prepare an analysis of the cause(s) of failure and propose remedial actions to the regulatory agencies. Google will provide funding for the planning, implementation, and monitoring of any remedial actions determined to be necessary to meet the mitigation goals. Additionally, if during the maintenance period, significant and prolonged flooding event(s) adversely affect the establishment of estuarine wetland vegetation, then an adaptive management plan will be submitted to the regulatory agencies for review. This plan will describe the impact(s) on the project and detail any planned remedial action(s). The plan will also present modified annual performance and final success criteria, if necessary.

6.7 Statement of Financial Commitment

Google is financially responsible for the successful implementation of this MMP. This financial responsibility extends to the long-term monitoring described herein, as well as to any proposed remedial actions.

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Appendix A. Photodocumentation

Photo 1. Project Reach Facing South (Upstream) from West Caribbean Drive

Photo 2. Culvert Opening at Downstream End of Project Reach, at West Caribbean Drive

Photo 3. Project Reach as Seen from the Existing East Levee Adjacent to Caspian Court, Facing North

Photo 4. Project Reach as Seen from the Existing West Levee Adjacent to West Caribbean Drive, Facing South

Appendix E-4

Google Caribbean Campus Construction Office and Parking Site Arborist Report

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Google Caribbean Campus
Construction Office and Parking Site
Arborist Report

Proposal #9274

Prepared for:

Johnson Chang
SARES-REGIS
at Google

Prepared by:

H. T. Harvey & Associates
Matt Pollock
ASCA Registered Consulting Arborist #631
ISA-Certified Arborist WE-11610A

March 30, 2018

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Section 1.0 Introduction

H. T. Harvey & Associates has prepared this arborist report for the proposed redevelopment project site (site), which spans four separate but conterminous parcels, identified as:

- 1390-1398 Borregas Avenue in Sunnyvale, California (APN 110-33-014)
- 1376-1380 Borregas Avenue in Sunnyvale, California (APN 110-33-036)
- 1362-1366 Borregas Avenue in Sunnyvale, California (APN 110-33-011)
- 245 Caspian Drive in Sunnyvale, California (APN 110-33-037)

H. T. Harvey & Associates' arborists performed an inventory of all trees on these and other adjacent parcels in November 2016. We visited the site again on March 26, 2018 to update the inventory and assess current site conditions. This report provides an inventory of each tree on the project site, including physical location, diameter at breast height (DBH), height, species, a figure showing the location of each surveyed tree, and an assessment of each tree's health and structural condition.

Section 2.0 Methods

This report is based on observations made during site visits conducted in November 2016 and on March 26, 2018 by H. T. Harvey & Associates arborist Matt Pollock, an American Society of Consulting Arborists (ASCA) Registered Consulting Arborist (#631) and International Society of Arboriculture (ISA) Certified Arborist (WE-11610A). All trees with a DBH greater than 4 inches were included in the inventory. Tasks conducted during the site visits consisted of the following:

- identifying each tree to species (scientific name and common name);
- tagging each tree with an identifying number (sequential numbering assigned to the project);
- recording the approximate location of each tree;
- measuring tree trunk diameter at 54 inches above finish grade (DBH); and
- evaluating tree condition (i.e., tree health and tree structure) using a scale of 0 to 5 as shown in Table 1.

Tree assessments were based on ground-level visual observations and physical measurements. Field data collection was conducted using a diameter tape to measure DBH. Tree height was measured with a hypsometer, using the 3-point method. A Trimble Geo 7X GPS with laser offset capability was used to determine and record the location of each tree. Evaluations of tree health considered crown indicators such as vigor, density, leaf size, quality, and stem shoot extensions. Evaluations of tree structural condition considered root condition/formation, trunk condition, and branch assembly and arrangement.

An advanced assessment to quantify interior wood structure, root condition, and upper canopy condition was not performed as part of this assessment. Therefore, tasks performed did not include an excavation of the root zones of the trees, drilling for decay detection, collecting soil samples for laboratory testing, sending animal or vegetative material for laboratory testing, climbing the trees for an aerial inspection, a tree risk assessment, or a valuation (see Appendix A: Assumptions and Limiting Conditions and Appendix B: Certification of Performance). These tasks are not typically included in a standard arborist report.

Table 1. Tree Health and Structural Condition Evaluation Criteria

Condition Rating	Tree Health	Tree Structure
5	A healthy, vigorous tree with a well-balanced crown. No apparent pest problems or signs and symptoms of disease. Normal to exceeding shoot length on new growth. Leaf size and color normal. Exceptional life expectancy for the species.	Root plate undisturbed and clear of any obstructions. Root flare has normal development. Trunk is sound and solid. No visible trunk defects or cavities. Branch spacing / structure and attachments are free of any defects.
4	Tree with slight decline in vigor. Imperfect canopy density in few parts of the tree, 10% or less, lacking natural symmetry. Less than half normal growth rate and minor deficiency in leaf development. Few pest issues or damage, controllable. Normal branch and stem development with healthy growth. Small amount of twig dieback. Typical life expectancy for the species.	Root plate appears normal; only minor damage may be found. Possible signs of root dysfunction around trunk flare. Minor trunk defects from previous injury, with good closure; less than 25% of bark section missing. Good branch habit, minor dieback with some signs of previous pruning. Co-dominant stem formation may be present. Minor corrections required.
3	Tree with moderate vigor. Crown decline and dieback up to 30% of the canopy. Overall poor symmetry. Leaf color somewhat chlorotic with smaller leaves. Shoot extensions indicate some stunting and stressed growing conditions. Obvious signs of pest problems contributing to lesser condition. Some decay areas found in main stem and branches. Below average life expectancy.	Root plate reveals previous damage or disturbance and dysfunctional roots may be visible around main stem. Evidence of trunk damage or cavities with decay or defects present. Less than 30% of bark sections missing on trunk. Co-dominant stems are present. Branching habit and attachments indicate poor pruning or damage, which requires moderate corrections.
2	Tree in decline. Epicormic growth. Lacking full crown, more than 50% decline and dieback, especially affecting larger branches. Stunting obvious with little evidence of growth on smaller stems. Leaf size and color reveal overall stress in the plant. Insect or disease infestation may be severe. Overmature. Life expectancy is low.	Root plate disturbance and defects indicate major damage with girdling roots around the trunk flare. Trunk reveals more than 50% of bark section missing. Branch structure has poor attachments, with several structurally important dead or broken branches. Canopy reveals signs of severe damage or topping, with major corrective actions required. Extensive decay or hollow.
1	Tree in severe decline. Crown has very little vigor and/or has a disease or insect problem that is ultimately fatal and, if not corrected, may threaten other nearby trees.	Root plate has major structural problems that present an unacceptable risk. Tree is in severe decline, with dieback of scaffold branches and/or trunk.
0	Dead	Dead

Section 3.0 Results

3.1 Site History and General Condition

On three of the four site parcels (APNs 110-33-014, 110-33-036, and 110-33-011), there is a single-story commercial building surrounded by surface parking. These parcels are dominated by hardscaping, with narrow planting beds about the buildings and running parallel to streets and parcel boundaries. One of the parcels (APN 110-33-037) includes a parking area and large empty lot. The parking area has several small planting areas containing trees. The empty lot is soil with herbaceous cover. The parcel also has trees lining the northern and western perimeter, as well as a stand of trees along the Caspian Drive frontage. The majority of trees on the site are mature.

3.2 Summary of Findings

One hundred and thirty-seven trees were identified on the property (Figure 1). Descriptions of each tree are included in Appendix C (Tree Assessment), including DBH, height, and tree condition score. A summary of the 137 trees, representing fourteen species, is provided in Table 2. Of the 137 trees located on the property, 72 (53%) meet the City's criteria for protected status (see Section 3.4 below). The most common trees on the site are Southern magnolia (*Magnolia grandiflora*) and shamel ash (*Fraxinus uhdei*).

3.3 Tree Condition

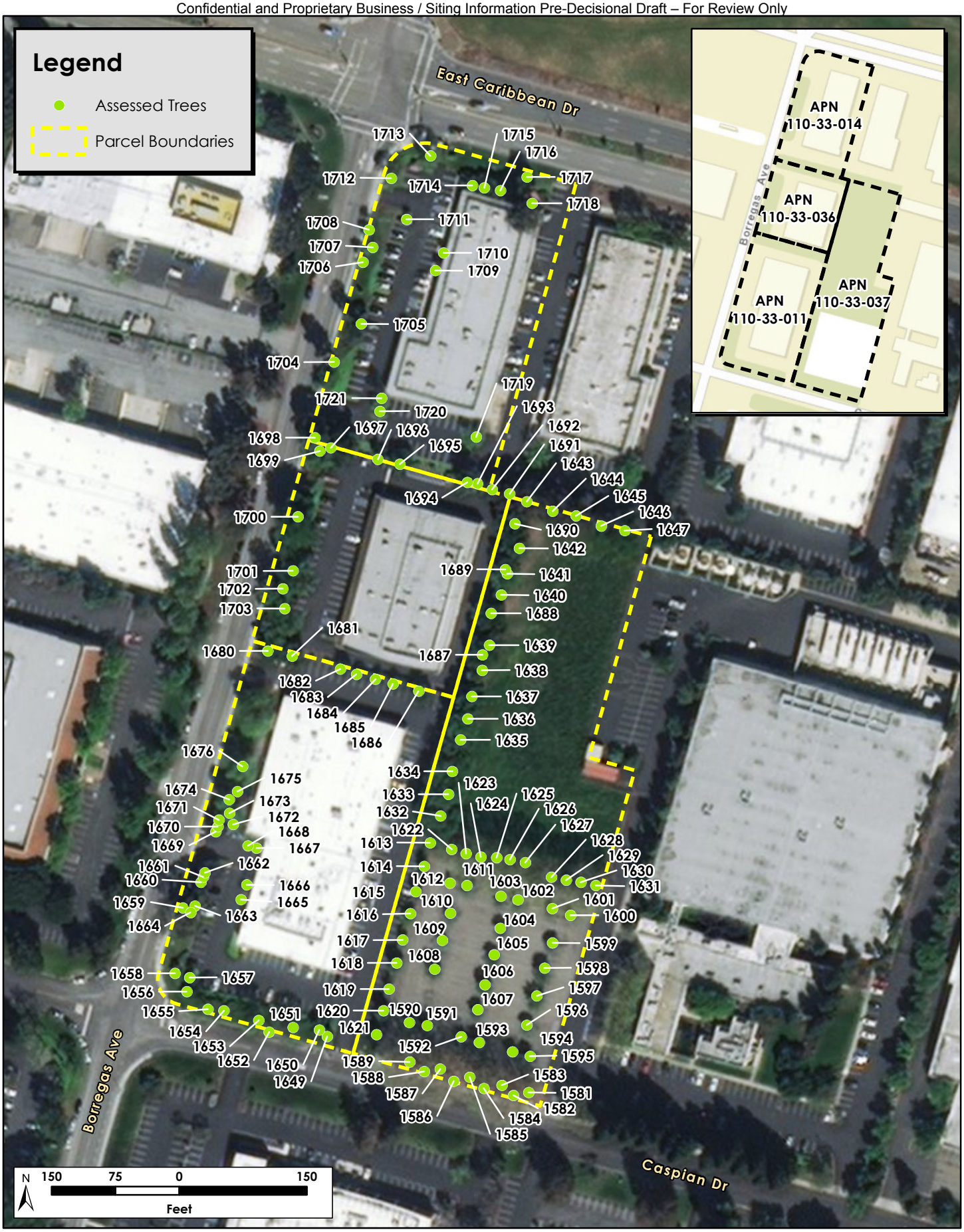
The majority of trees were in good condition (93%) as shown in Table 2. The condition ratings below are based on both the tree health and structural ratings from Appendix C. The condition of the trees was rated as follows:

- *Good* if their combined rating was 60% or greater;
- *Fair* if their combined rating was between 40% and 60%; or
- *Poor* if their combined rating was less than 40%.

Table 2. Tree Condition Summary

		Tree Condition			
Scientific Name	**Common Name**	**Poor**	**Fair**	**Good**	**Total Trees**
Quercus agrifolia	California live oak	-	1	14	15
Pyrus calleryana	Callery pear	-	-	1	1
Pinus canariensis	Canary Island pine	-	1	1	2
Pistacia chinensis	Chinese pistache	-	1	1	2
Lagerstroemia indica	crape myrtle	-	-	2	2
Quercus ilex	holly oak	-	-	2	2
Platanus hybrida	London plane	-	1	18	19
Maytenus boaria	Mayten tree	-	1	7	8
Prunus cerasifera	purple leaf plum	-	-	9	9
Fraxinus uhdei	shamel ash	-	4	17	21
Eucalyptus polyanthemos	silver dollar eucalyptus	-	-	5	5
Magnolia grandiflora	Southern magnolia	-	-	32	32
Liquidamber styraciflua	sweetgum	-	-	14	14
Liriodendron tulipifera	tulip tree	-	-	5	5
	All Tree Species	**-**	**9**	**128**	**137**

CPRA Confidential Treatment Request Not for Public Release – CPRA Exempt
Confidential and Proprietary Business / Siting Information Pre-Decisional Draft – For Review Only



N:\Proposals\9274\Reports\Appendix A Locations of Existing Trees.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Locations of Existing Trees
Google Caribbean Campus Construction Office and Parking Site
Arborist Report (Proposal 9274)
March 2018

3.4 Significant Trees

The City of Sunnyvale provides special provisions for protected trees, which are defined as either:

- A single-trunk tree with a circumference of at least 38 inches, measured at a point 4.5 feet above the ground, or
- A multi-trunk tree where one trunk has a circumference of at least 38 inches or the sum of all trunk circumferences is at least 113 inches, measured at a point 4.5 feet above the ground.

Based on this definition, seventy-two significant trees were identified on the site. (see Appendix C: Tree Assessment).

Section 4.0 References

[Cal-IPC] California Invasive Plant Council. 2017. California Invasive Plant Inventory Database. Accessed online at http://cal-ipc.org/paf/ [October 2017].

City of Sunnyvale. 2018. Homes, Streets and property>Trees>Tree Removal. Accessed March 27, 2018. https://sunnyvale.ca.gov/property/trees/removal.htm

Appendix A. Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. No responsibility is assumed for matters legal in character. Any and all property is appraised or evaluated as though free and clear, under responsible ownership and competent management.
2. Property lines were not clearly surveyed or marked in the field by the owner, consultant attempted to provide as accurate of boundary for the inventory as possible using the limited data available.
3. Care has been taken to obtain all information from reliable sources. All data have been verified insofar as possible; however, the consultant can neither guarantee nor be responsible for the accuracy of information provided by others.
4. The consultant shall not be required to give testimony or attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
5. Loss or alteration of any part of this report invalidates the entire report.
6. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant.
7. Neither all nor any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales, or other media, without the prior expressed written or verbal consent of the consultant particularly as to value conclusions, identity of the consultant, or any reference to any professional society or institute or to any initialed designation conferred upon the consultant as stated in his/her qualifications.
8. This report and values expressed herein represent the opinion of the consultant, and the consultant's fee is in no way contingent upon the reporting of specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
9. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
10. Unless expressed otherwise: a) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection and b) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.

Appendix B. Certification of Performance

I certify that:

I have personally inspected the trees and the property referred to in this report and have stated my findings accurately. The extent of the evaluation is stated in the attached report and the terms of the assignment.

I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.

The analysis, opinions, and conclusions stated herein are my own and are based on current scientific procedures and facts.

My analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices.

No one provided significant professional assistance to me, except as indicated within the report.

Compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.

Matt Pollock
ASCA Registered Consulting Arborist #631
ISA-Certified Arborist WE-11610A

Appendix C. Tree Assessment

Tree Tag	Scientific Name	Common Name	DBH	Height (feet)	Health	Structure	City of Sunnyvale Protected Tree
1581	*Platanus hybrida*	London plane	22	76	5	4	Yes
1582	*Platanus hybrida*	London plane	22	79	5	4	Yes
1583	*Platanus hybrida*	London plane	23	78	5	5	Yes
1584	*Platanus hybrida*	London plane	11	37	5	4	No
1585	*Platanus hybrida*	London plane	22	70	5	3	Yes
1586	*Platanus hybrida*	London plane	19	79	5	4	Yes
1587	*Platanus hybrida*	London plane	21	70	5	5	Yes
1588	*Platanus hybrida*	London plane	19	62	5	4	Yes
1589	*Platanus hybrida*	London plane	26	67	5	5	Yes
1590	*Magnolia grandiflora*	Southern magnolia	7	21	5	4	No
1591	*Magnolia grandiflora*	Southern magnolia	6	22	5	4	No
1592	*Magnolia grandiflora*	Southern magnolia	5	16	5	4	No
1593	*Magnolia grandiflora*	Southern magnolia	8	23	5	4	No
1594	*Magnolia grandiflora*	Southern magnolia	5	18	5	4	No
1595	*Magnolia grandiflora*	Southern magnolia	6	23	5	4	No
1596	*Magnolia grandiflora*	Southern magnolia	6	19	5	4	No
1597	*Magnolia grandiflora*	Southern magnolia	9	22	5	4	No
1598	*Magnolia grandiflora*	Southern magnolia	9	23	5	4	No
1599	*Magnolia grandiflora*	Southern magnolia	7	16	5	4	No
1600	*Magnolia grandiflora*	Southern magnolia	5	18	5	4	No
1601	*Magnolia grandiflora*	Southern magnolia	5	17	5	4	No
1602	*Magnolia grandiflora*	Southern magnolia	7	20	5	4	No
1603	*Magnolia grandiflora*	Southern magnolia	8	21	5	4	No
1604	*Magnolia grandiflora*	Southern magnolia	7	15	5	4	No
1605	*Magnolia grandiflora*	Southern magnolia	7	17	5	4	No
1606	*Magnolia grandiflora*	Southern magnolia	11	22	5	4	No
1607	*Magnolia grandiflora*	Southern magnolia	7	17	5	4	No
1608	*Magnolia grandiflora*	Southern magnolia	10	21	5	4	No
1609	*Magnolia grandiflora*	Southern magnolia	5	13	5	4	No
1610	*Magnolia grandiflora*	Southern magnolia	9	18	5	4	No
1611	*Magnolia grandiflora*	Southern magnolia	7	22	5	4	No
1612	*Magnolia grandiflora*	Southern magnolia	6	17	5	4	No
1613	*Magnolia grandiflora*	Southern magnolia	9	23	5	4	No
1614	*Magnolia grandiflora*	Southern magnolia	10	24	5	4	No

Tree Tag	Scientific Name	Common Name	DBH	Height (feet)	Health	Structure	City of Sunnyvale Protected Tree
1615	*Magnolia grandiflora*	Southern magnolia	11	27	5	4	No
1616	*Magnolia grandiflora*	Southern magnolia	9	22	5	4	No
1617	*Magnolia grandiflora*	Southern magnolia	7	17	5	4	No
1618	*Magnolia grandiflora*	Southern magnolia	11	24	5	4	No
1619	*Magnolia grandiflora*	Southern magnolia	7	19	5	4	No
1620	*Magnolia grandiflora*	Southern magnolia	12	30	5	4	Yes
1621	*Magnolia grandiflora*	Southern magnolia	7	20	5	4	No
1622	*Platanus hybrida*	London plane	13	40	5	4	Yes
1623	*Platanus hybrida*	London plane	11	55	3	3	No
1624	*Platanus hybrida*	London plane	21	76	5	5	Yes
1625	*Platanus hybrida*	London plane	13	75	2	3	Yes
1626	*Platanus hybrida*	London plane	21	73	5	5	Yes
1627	*Platanus hybrida*	London plane	21	70	5	4	Yes
1628	*Platanus hybrida*	London plane	21	67	5	4	Yes
1629	*Platanus hybrida*	London plane	11	50	3	4	No
1630	*Platanus hybrida*	London plane	20	68	4	5	Yes
1631	*Platanus hybrida*	London plane	19	73	5	5	Yes
1632	*Fraxinus uhdei*	shamel ash	28	56	5	5	Yes
1633	*Fraxinus uhdei*	shamel ash	22	55	5	4	Yes
1634	*Fraxinus uhdei*	shamel ash	32	59	5	5	Yes
1635	*Fraxinus uhdei*	shamel ash	22	46	5	4	Yes
1636	*Fraxinus uhdei*	shamel ash	22	48	5	4	Yes
1637	*Fraxinus uhdei*	shamel ash	27	53	5	4	Yes
1638	*Fraxinus uhdei*	shamel ash	19	38	2	3	Yes
1639	*Fraxinus uhdei*	shamel ash	25	52	4	4	Yes
1640	*Fraxinus uhdei*	shamel ash	13	25	2	3	Yes
1641	*Fraxinus uhdei*	shamel ash	19	39	3	4	Yes
1642	*Fraxinus uhdei*	shamel ash	24	36	3	3	Yes
1643	*Fraxinus uhdei*	shamel ash	18	38	3	2	Yes
1644	*Fraxinus uhdei*	shamel ash	21	52	5	4	Yes
1645	*Fraxinus uhdei*	shamel ash	16	37	4	4	Yes
1646	*Fraxinus uhdei*	shamel ash	15	37	5	5	Yes
1647	*Fraxinus uhdei*	shamel ash	31	52	5	4	Yes
1649	*Maytenus boaria*	Mayten tree	7	13	3	4	No
1650	*Maytenus boaria*	Mayten tree	12	17	2	4	Yes
1651	*Liriodendron tulipifera*	Tulip tree	19	44	5	3	Yes
1652	*Liriodendron tulipifera*	Tulip tree	12	40	5	4	Yes
1653	*Liriodendron tulipifera*	Tulip tree	16	53	4	4	Yes

Tree Tag	Scientific Name	Common Name	DBH	Height (feet)	Health	Structure	City of Sunnyvale Protected Tree
1654	*Liriodendron tulipifera*	Tulip tree	20	50	5	3	Yes
1655	*Liriodendron tulipifera*	Tulip tree	14	45	4	4	Yes
1656	*Maytenus boaria*	Mayten tree	9	14	3	4	No
1657	*Maytenus boaria*	Mayten tree	6	12	3	4	No
1658	*Maytenus boaria*	Mayten tree	8	12	4	4	No
1659	*Eucalyptus polyanthemos*	silver dollar eucalypt	23	73	5	3	Yes
1660	*Prunus cerasifera*	purple leaf plum	9	26	2	4	No
1661	*Prunus cerasifera*	purple leaf plum	8	25	2	4	No
1662	*Prunus cerasifera*	purple leaf plum	11	23	5	4	No
1663	*Eucalyptus polyanthemos*	silver dollar eucalypt	30	61	5	4	Yes
1664	*Eucalyptus polyanthemos*	silver dollar eucalypt	25	65	5	3	Yes
1665	*Lagerstroemia indica*	crape myrtle	4	17	5	4	No
1666	*Lagerstroemia indica*	crape myrtle	5	17	5	5	No
1667	*Pistacia chinensis*	Chinese pistache	5	21	3	2	No
1668	*Pistacia chinensis*	Chinese pistache	7	23	4	3	No
1669	*Prunus cerasifera*	purple leaf plum	7	27	3	5	No
1670	*Prunus cerasifera*	purple leaf plum	7	25	3	5	No
1671	*Prunus cerasifera*	purple leaf plum	10	22	5	4	No
1672	*Liquidamber styraciflua*	Sweetgum	8	27	4	5	No
1673	*Liquidamber styraciflua*	Sweetgum	10	39	5	4	No
1674	*Liquidamber styraciflua*	Sweetgum	13	42	4	4	Yes
1675	*Prunus cerasifera*	purple leaf plum	11	26	3	4	No
1676	*Liquidamber styraciflua*	Sweetgum	19, 9	51	4	2	No
1680	*Quercus agrifolia*	California live oak	18	36	5	4	Yes
1681	*Quercus agrifolia*	California live oak	16	30	4	4	Yes
1682	*Quercus agrifolia*	California live oak	9	19	5	4	No
1683	*Quercus ilex*	Holly oak	5	19	4	5	No
1684	*Quercus ilex*	Holly oak	4	16	5	5	No
1685	*Quercus agrifolia*	California live oak	6	17	4	4	No
1686	*Quercus agrifolia*	California live oak	14	25	3	4	Yes
1687	*Quercus agrifolia*	California live oak	14	31	1	3	Yes
1688	*Quercus agrifolia*	California live oak	23	38	4	4	Yes
1689	*Quercus agrifolia*	California live oak	15	38	1	5	Yes
1690	*Quercus agrifolia*	California live oak	26	44	5	4	Yes
1691	*Quercus agrifolia*	California live oak	18	35	3	3	Yes

Tree Tag	Scientific Name	Common Name	DBH	Height (feet)	Health	Structure	City of Sunnyvale Protected Tree
1692	*Quercus agrifolia*	California live oak	15	32	4	4	Yes
1693	*Liquidamber styraciflua*	Sweetgum	11	48	5	5	No
1694	*Quercus agrifolia*	California live oak	20	44	3	4	Yes
1695	*Quercus agrifolia*	California live oak	13	26	4	4	Yes
1696	*Quercus agrifolia*	California live oak	9	18	3	4	No
1697	*Quercus agrifolia*	California live oak	30	58	3	3	Yes
1698	*Pinus canariensis*	Canary Island pine	27	69	4	5	Yes
1699	*Fraxinus uhdei*	shamel ash	26	54	4	4	Yes
1700	*Fraxinus uhdei*	shamel ash	32	66	5	5	Yes
1701	*Fraxinus uhdei*	shamel ash	43	57	3	2	Yes
1702	*Fraxinus uhdei*	shamel ash	28	67	5	4	Yes
1703	*Fraxinus uhdei*	shamel ash	30	63	5	4	Yes
1704	*Pinus canariensis*	Canary Island pine	29	76	2	3	Yes
1705	*Eucalyptus polyanthemos*	silver dollar eucalypt	26	67	4	4	Yes
1706	*Liquidamber styraciflua*	Sweetgum	8	33	4	4	No
1707	*Liquidamber styraciflua*	Sweetgum	10	35	5	4	No
1708	*Liquidamber styraciflua*	Sweetgum	8	30	4	3	No
1709	*Prunus cerasifera*	purple leaf plum	5	18	4	5	No
1710	*Prunus cerasifera*	purple leaf plum	4	17	4	5	No
1711	*Pyrus calleryana*	Callery pear	5	10	3	4	No
1712	*Liquidamber styraciflua*	Sweetgum	14	41	5	4	Yes
1713	*Liquidamber styraciflua*	Sweetgum	16	43	4	4	Yes
1714	*Maytenus boaria*	Mayten tree	14	22	2	3	Yes
1715	*Maytenus boaria*	Mayten tree	15	24	3	4	Yes
1716	*Maytenus boaria*	Mayten tree	14	20	2	4	Yes
1717	*Liquidamber styraciflua*	Sweetgum	16	45	4	4	Yes
1718	*Eucalyptus polyanthemos*	silver dollar eucalypt	32	72	4	4	Yes
1719	*Liquidamber styraciflua*	Sweetgum	15	37	4	4	Yes
1720	*Liquidamber styraciflua*	Sweetgum	10	34	3	3	No
1721	*Liquidamber styraciflua*	Sweetgum	15	43	4	4	Yes

Appendix F

Google Caribbean Campus Project Cultural Resources Technical Report

Google Caribbean Campus Project Cultural Resources Technical Report, Sunnyvale, Santa Clara County, California

APRIL 2019

PREPARED FOR

Kimley-Horn and Associate, Inc.

PREPARED BY

SWCA Environmental Consultants

GOOGLE CARIBBEAN CAMPUS PROJECT CULTURAL RESOURCES TECHNICAL REPORT, SUNNYVALE, SANTA CLARA COUNTY, CALIFORNIA

Prepared for

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Prepared by

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SWCA Project No. 51728

SWCA Cultural Resources Report No. 2019-161

April 2019

Keywords: Google project; cultural resources survey; positive results; CEQA; P-43-003980 / CA-SCL-992H; Sunnyvale; Santa Clara County; Mountain View Quadrangle; Township 6 South, Range 1 West; California.

ABSTRACT/EXECUTIVE SUMMARY

Purpose and Scope: Kimley-Horn and Associates, Inc. (Kimley-Horn) retained SWCA Environmental Consultants (SWCA) to prepare a cultural resources technical report in support of the proposed Google Caribbean Campus Project (project) located at 100 and 200 Caribbean Drive, within the Moffett Park Specific Plan (MPSP) area in the city of Sunnyvale, Santa Clara County, California. Google proposes to redevelop the site to facilitate construction of the new Google campus on approximately 40.44 acres within 10 existing parcels (project area).

SWCA conducted the following study to determine whether any significant cultural resources are present or are likely to occur in the project area, and to make recommendations for avoiding impacts to those resources as a result of project implementation. The study included the following tasks: (1) cultural resources records search and literature review, including Sacred Lands File (SLF) search; (2) an intensive-level built environment survey; and (3) an evaluation to determine if the identified built environment resource is eligible for listing in the National Register of Historic Places (NRHP) or in the California Register of Historical Resources (CRHR), and therefore constitutes a historical resource for the purposes of the California Environmental Quality Act (CEQA).

Regulatory Setting: This evaluation was completed under the provisions of CEQA. Public Resources Code (PRC) Section 5024.1, Title 14 California Code of Regulations (CCR) Section 15064.5 of the CEQA Guidelines, and PRC Sections 21083.2 and 21084.1 were also used as the basic guidelines for the cultural resources study. SWCA Architectural Historian Nelson White, MSHP, conducted the architectural and historical evaluations of the built environment resource. Mr. White has a master's degree in historic preservation and meets and exceeds the Secretary of the Interior's Professional Qualifications Standards for architectural history. Senior Archaeologist Mandi Martinez, M.A., Registered Professional Archaeologist (RPA), managed the project and co-authored the report. Cultural Resources Principal Investigator Heather Gibson, Ph.D., RPA, provided technical review.

Dates of Investigation: SWCA requested a search of the SLF and list of Native American contacts through the California Native American Heritage Commission (NAHC) on January 28, 2019. The NAHC emailed a response on March 26, 2019, and stated that the SLF search was completed with negative results. The NAHC also provided a contact list of six Native American tribes that may have knowledge of cultural resources in or near the project area. On January 28, 2019, SWCA requested a cultural resources records search for the current project area (plus a 0.8-km [0.5-mile] radius) at the Northwest information Center (NWIC). This search was conducted of the California Historical Resources Information System (CHRIS) located on the campus of Sonoma State University in Rohnert Park, California. SWCA conducted an archival research to examine historical maps and aerial photographs obtained through Environmental Data Resources, Inc. (EDR), or retrieved online through the U.S. Geological Survey (USGS). The intensive-level built environment survey was conducted on February 22, 2019.

Findings: The CHRIS records search identified 10 previously conducted cultural resources studies within a 0.8-km (0.5-mile) radius of the project area; two of these, S-043999 and S-046899, include a portion of the project area. There are two previously recorded archaeological sites that were identified during the records search. P-43-000421 is a multicomponent site that does not intersect the project area. The other site, Sunnyvale West Channel, does not have a primary number and was never formally recorded on California Department of Parks and Recreation (DPR) Series 523 forms. However, it is mentioned in an environmental document for the Sunnyvale East and West Channels Flood Protection Project. SWCA has formally recorded the site on DPR forms and received permanent CHRIS designations of P-43-003980 / CA-SCL-992H.

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SWCA conducted an intensive-level built environment survey of the project area to document the current conditions. Current land uses in the project vicinity include mostly commercial and industrial development. As a result of this survey, SWCA updated the recordation of one previously recorded resource: Sunnyvale West Channel. Based on this survey and evaluation, the resource is recommended ineligible for listing in the NRHP, the CRHR, or for designation as a Sunnyvale Heritage resource. The resource is not eligible for listing under Criteria A/1 because it lacks association with events significant to national, state, or local history. It is not eligible for listing under Criteria B/2 because it lacks association with persons significant to national, state, or local history. The resource is not eligible under Criteria C/3 because it lacks distinctive characteristics of a type, period, or method of construction; is not the work of a master; and does not possess high artistic values. Finally, the identified resource is not eligible under Criteria D/4 because it does not have the potential to yield information important in prehistory or history.

Recommendations: There is one known historic resource recorded within the project area, Sunnyvale West Channel. However, the resource is ineligible for listing in the NRHP, CRHR, or for designation as a Sunnyvale Heritage resource. In addition, there is a low potential for encountering intact archaeological resources on the property. As proposed, the present project would not result in an impact to a historical resource. Therefore, no further cultural resources work is recommended for the current project.

If archaeological resources are exposed during construction, work in the immediate vicinity of the find must stop until a qualified archaeologist can evaluate its significance. In the event that human remains are encountered during construction, the Santa Clara County Coroner should be contacted in compliance with State of California Health and Safety Code Section 7050.5 and PRC Section 5097.98.

Disposition of Data: The final cultural resources survey report and any subsequent related reports will be filed at the Northwest Information Center (NWIC) located at Sonoma State University and with SWCA's Pasadena, California, office. All field notes, photographs, and records related to the current study are on file at the SWCA Pasadena office.

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INTRODUCTION

Kimley-Horn and Associates, Inc. (Kimley-Horn) retained SWCA Environmental Consultants (SWCA) to prepare a cultural resources technical report in support of the proposed Google Caribbean Campus Project (project) located at 100 and 200 Caribbean Drive (project area; Figure 1). The project area is within the Moffett Park Specific Plan (MPSP) area in the city of Sunnyvale on approximately 40.44 acres within 10 existing parcels (Figure 2 and Figure 3). Google proposes to redevelop the site to facilitate construction of the new Google campus. The current study includes the following: (1) cultural resources records search and literature review, including Sacred Lands File (SLF) search; (2) an intensive-level built environment survey; and (3) an evaluation to determine if the identified built environment resource is eligible for listing in the National Register of Historic Places (NRHP) or in the California Register of Historical Resources (CRHR), and therefore constitutes a historical resource for the purposes of the California Environmental Quality Act (CEQA).

This evaluation was completed under the provisions of CEQA. Basic guidelines for the cultural resources study include Public Resources Code (PRC) Section 5024.1, Title 14 California Code of Regulations (CCR) Section 15064.5 of the CEQA Guidelines, and PRC Sections 21083.2 and 21084.1. SWCA Architectural Historian Nelson White, MSHP, conducted the architectural and historical evaluations of the built environment resource. Mr. White has a master's degree in historic preservation and meets and exceeds the Secretary of the Interior's Professional Qualifications Standards for architectural history. Senior Archaeologist Mandi Martinez, M.A., Registered Professional Archaeologist (RPA), managed the project and co-authored the report. Cultural Resources Principal Investigator Heather Gibson, Ph.D., RPA, provided technical review.

Project Description

Google proposes to redevelop the project area, which is located at 100 and 200 Caribbean Drive on 40.44 acres within 10 existing assessor parcels in the city of Sunnyvale, California,. The project is bound on the north by Caribbean Drive, on the east by Borregas Avenue, on the south by Caspian Court, and the east by Mathilda Avenue. The project is located on an unsectioned portion of the USGS Mountain View 7.5-minute Quadrangle in Township 6 South, Range 1 West. The project area currently contains 13 single-story structures, which are used as commercial business, for research and development, and for industrial uses. The area also contains parking lots, access roads, sidewalks, and landscaped areas. Redevelopment of this area would include demolition of the existing structures, removal of materials, excavation, and grading to facilitate construction of the new Google campus.

Once the site is prepared, the construction phase would be implemented, and as proposed, the site would be developed with two new main buildings. The buildings would be readdressed and designated as 100 West Caribbean Drive and 200 West Caribbean Drive. The site is currently bisected roughly in half from south to north by the Santa Clara Valley Water District's (SCVWD) West Channel. The buildings would be on either side of the West Channel; the project applicant is working closely with SCVWD on enhancements. Improvements to the West Channel are proposed as part of the project, but its function would not be changed. The two sides of the campus would be connected by pedestrian bridges as part of the pedestrian circulation plan for the project site.

Figure 1. Project area and vicinity.

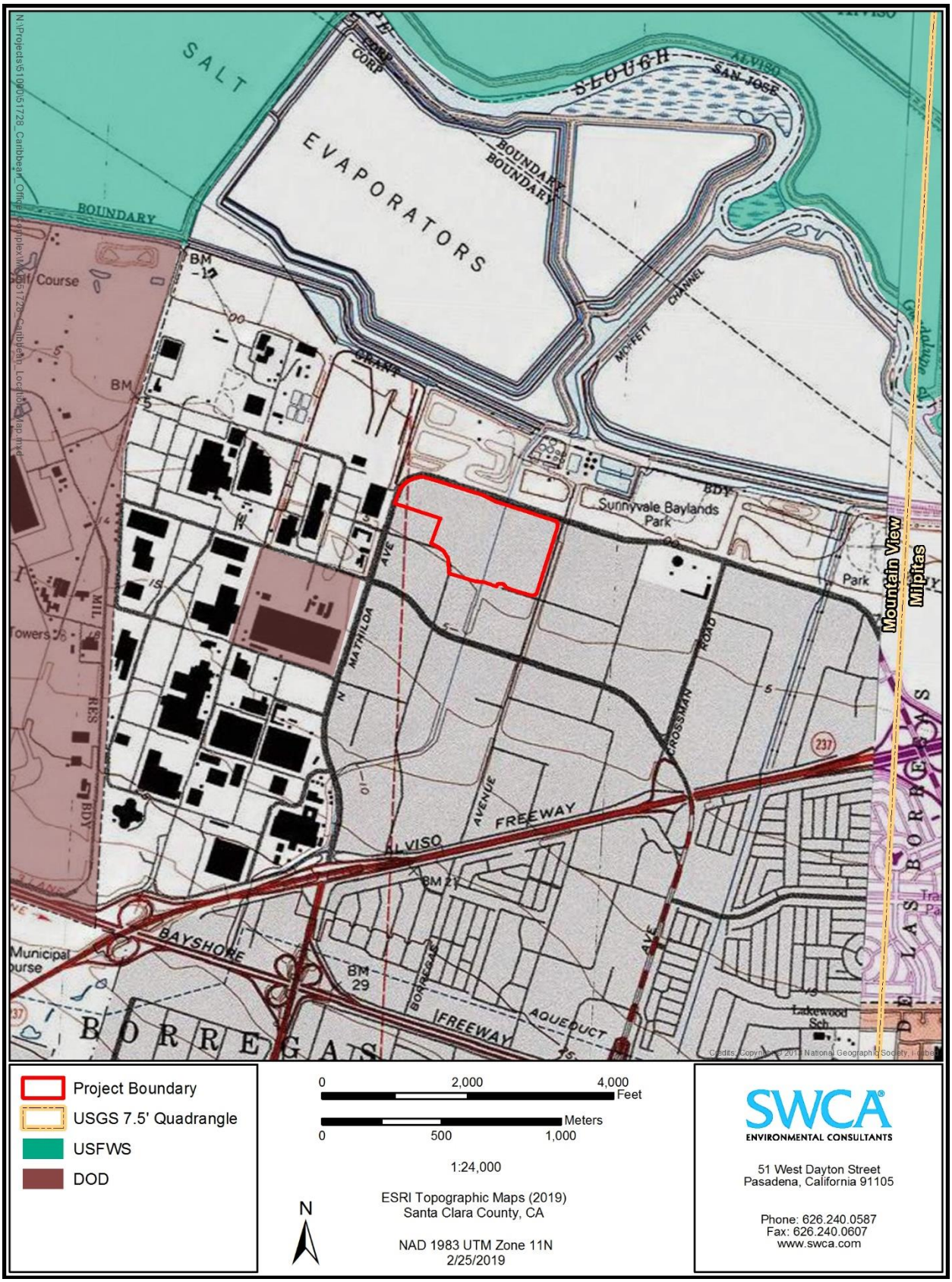

Figure 2. Project location on topographic map.

Figure 3. Project location on aerial photograph.

REGULATORY FRAMEWORK

This section includes a discussion of the applicable state and local laws, ordinances, regulations, and standards informing the identification of eligible historic resources.

Federal Regulations

National Register of Historic Places (NRHP)

The NRHP was established by the National Historic Preservation Act of 1966 as "an authoritative guide to be used by Federal, State, and local governments, private groups and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" (36 Code of Federal Regulations [CFR] 60.2). The NRHP recognizes properties that are significant at the national, state, and local levels. In general, a resource must be 50 years of age to be considered for the NRHP, unless it satisfies a standard of exceptional importance. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. A property is eligible for the NRHP if it is significant under one or more of the following criteria:

- Criterion A: It is associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion B: It is associated with the lives of persons who are significant in our past;
- Criterion C: It embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; and/or
- Criterion D: It has yielded, or may be likely to yield, information important in prehistory or history.

In addition to meeting these criteria, a property must retain historic integrity, which is defined in National Register Bulletin 15 as the "ability of a property to convey its significance."[1] In order to assess integrity, the National Park Service recognizes seven aspects or qualities that, considered together, define historic integrity. To retain integrity, a property must possess several, if not all, of these seven qualities:

1. Location – the place where the historic property was constructed or the place where the historic event occurred;
2. Design – the combination of elements that create the form, plan, space, structure, and style of a property;
3. Setting – the physical environment of a historic property;

[1] National Park Service. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation* (Washington, D.C.: National Park Service, 2002).

4. Materials – the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property;

5. Workmanship – the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;

6. Feeling – a property's expression of the aesthetic or historic sense of a particular period of time; and

7. Association – the direct link between an important historic event or person and a historic property.

State Regulations

The California Office of Historic Preservation, a division of the California Department of Parks and Recreation (DPR), is responsible for carrying out the duties described in the California PRC and maintaining the California Historic Resources Inventory and the CRHR. The state-level regulatory framework also includes CEQA.

California Environmental Quality Act

CEQA requires a lead agency to consider project effects on historical resources (which is understood to include significant archaeological resources). Under CEQA, a "project that may cause a substantial adverse change in the significance of a historic resource is a project that may have a significant effect on the environment" (PRC Section 21084.1). Analysis is a two-part process: first, the determination must be made as to whether historical resources are present in the project area. Second, if such resources are present, the proposed project must be analyzed for its potential to cause a "substantial adverse change in the significance" of the resource.

HISTORICAL RESOURCES

According to CEQA Guidelines Section 15064.5, for the purposes of CEQA, historical resources are:

1. A resource listed in, or formally determined eligible…for listing in the CRHR (PRC Section 5024.1, 14 CCR 4850 et seq.).
2. A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significance in a historic resources survey meeting the requirements of PRC Section 5024.1(g).
3. Any object, building, structure, site, area, place, record, or manuscript that the lead agency determines to be eligible for national, state, or local landmark listing; generally, a resource shall be considered by the lead agency to be historically significant (and therefore a historic resource under CEQA) if the resource meets the criteria for listing on the CRHR (as defined in PRC Section 5024.1, 14 CCR 4852).

Resources nominated to the CRHR must retain enough of their historic character or appearance to convey the reasons for their significance. Resources whose historic integrity (as defined above) does not meet NRHP criteria may still be eligible for listing in the CRHR.

According to CEQA, the fact that a resource is not listed in or determined eligible for listing in the CRHR or is not included in a local register or survey shall not preclude the lead agency from determining that the resource may be a historical resource (PRC Section 5024.1).

Substantial Adverse Change and Indirect Impacts to Historical Resources

CEQA Guidelines define a "substantial adverse change in the significance of an historical resource" as "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines, Section 15064.5). Material impairment occurs when a project alters in an adverse manner or demolishes "those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion" or eligibility for inclusion in the NRHP, CRHR, or local register. In addition, pursuant to CEQA Guidelines Section 15126.2, the "direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects."

The following guides and requirements are of particular relevance to this study's analysis of indirect impacts to historic resources. Pursuant to CEQA Guidelines (Section 15378), study of a project under CEQA requires consideration of "the whole of an action, which has the potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment." CEQA Guidelines (Section 15064[d]) further define direct and indirect impacts:

1. A direct physical change in the environment is a physical change in the environment which is caused by and immediately related to the project.
2. An indirect physical change in the environment is a physical change in the environment which is not immediately related to the project, but which is caused indirectly by the project. If a direct physical change in the environment in turn causes another change in the environment, then the other change is an indirect physical change in the environment.
3. An indirect physical change is to be considered only if that change is a reasonably foreseeable impact which may be caused by the project.

ARCHAEOLOGICAL RESOURCES

In terms of archaeological resources, PRC Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

If it can be demonstrated that a proposed project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (PRC Sections 21083.2[a], [b], and [c]). CEQA notes if an archaeological resource is neither a unique archaeological resource nor a historical resource, the effects of the project on those resources shall not be considered to be a significant effect on the environment (CEQA Guidelines Section 15064.5[c][4]).

CALIFORNIA STATE ASSEMBLY BILL 52

Assembly Bill 52 of 2014 (AB 52) amended PRC Section 5097.94 and added PRC Sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3.

Consultation with Native Americans

AB 52 formalizes the lead agency–tribal consultation process, requiring the lead agency to initiate consultation with California Native American groups that are traditionally and culturally affiliated with the project, including tribes that may not be federally recognized. Lead agencies are required to begin consultation prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report.

Tribal Cultural Resources

Section 4 of AB 52 adds Sections 21074 (a) and (b) to the PRC, which address tribal cultural resources and cultural landscapes. Section 21074 (a) defines tribal cultural resources as one of the following:

(1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:

(A) Included or determined to be eligible for inclusion in the California Register of Historical Resources.

(B) Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.

(2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

Section 1 (a)(9) of AB 52 establishes that "a substantial adverse change to a tribal cultural resource has a significant effect on the environment." Effects on tribal cultural resources should be considered under CEQA. Section 6 of AB 52 adds Section 21080.3.2 to the PRC, which states that parties may propose mitigation measures "capable of avoiding or substantially lessening potential significant impacts to a tribal cultural resource or alternatives that would avoid significant impacts to a tribal cultural resource." Further, if a California Native American tribe requests consultation regarding project alternatives, mitigation measures, or significant effects to tribal cultural resources, the consultation shall include those topics (PRC Section 21080.3.2[a]). The environmental document and the mitigation monitoring and reporting program (where applicable) shall include any mitigation measures that are adopted (PRC Section 21082.3[a]).

California Register of Historical Resources

Created in 1992 and implemented in 1998, the CRHR is "an authoritative guide in California to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Sections 21083.2 and 21084.1). Certain properties, including those listed in or formally determined eligible for listing in the NRHP and California Historical Landmarks numbered 770 and higher, are automatically included in the CRHR. Other properties recognized under the California Points of Historical Interest program, identified as significant in historical resources surveys, or designated by

local landmarks programs, may be nominated for inclusion in the CRHR. According to PRC Section 5024.1(c), a resource, either an individual property or a contributor to a historic district, may be listed in the CRHR if the State Historical Resources Commission determines that it meets one or more of the following criteria, which are modeled on NRHP criteria:

- **Criterion 1:** It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
- **Criterion 2:** It is associated with the lives of persons important in our past.
- **Criterion 3:** It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
- **Criterion 4:** It has yielded, or may be likely to yield, information important in history or prehistory.

Resources nominated to the CRHR must retain enough of their historic character or appearance to convey the reasons for their significance. Resources whose historic integrity does not meet NRHP criteria may still be eligible for listing in the CRHR.

Treatment of Human Remains

The disposition of burials falls first under the general prohibition on disturbing or removing human remains under California Health and Safety Code (CHSC) Section 7050.5. More specifically, remains suspected to be Native American are treated under CEQA at CCR Section 15064.5; PRC Section 5097.98 illustrates the process to be followed in the event that remains are discovered. If human remains are discovered during construction, no further disturbance to the site shall occur, and the County Coroner must be notified (CCR 15064.5 and PRC 5097.98).

Local Regulations

City of Sunnyvale General Plan

The City of Sunnyvale General Plan (CSGP) is the city's long-term blueprint for the community and the vision for future growth. The General Plan includes goals, policies, and programs that convey long-term planning for the Sunnyvale community and guides local decision-making to advance that vision. Accordingly, the General Plan is the basis for determining acceptable land uses and related park, road, and other infrastructure needs. Sunnyvale's General Plan consists of a Community Vision and five supporting chapters addressing the physical development of the city. These chapters group related topics together such as Community Character, Safety and Noise, and Environmental Management.

Chapter 4 contains a discussion of Community Character with a goal (CC-1) of preserving historic buildings, which make the city unique. Additionally, Goal CC-5 is to enhance, preserve, and protect Sunnyvale's heritage, including natural features, the built environment, and significant artifacts. This goal includes preserving existing landmarks, preserving diverse architectural styles, resolving conflicts between preservation of heritage and alternative land uses, evaluating heritage resources for significance, and preserving archaeological resources.

City of Sunnyvale Municipal Code

Zoning of the Sunnyvale Municipal Code is referred to as the Uniform Planning and Zoning Code of the City of Sunnyvale (UPZC). As defined in Title 19. 02.030 Purpose, the UPZC has three main purposes that include the following:

(a) To protect and promote the public health, safety, peace, comfort and general welfare;

(b) To establish the procedure for adoption of the general plan for the physical development of the city of Sunnyvale and land outside its corporate limits which may be included within the city of Sunnyvale at a future time, and adoption of specific plans, precise plans, including precise zoning plans, and amendments thereof; and

(c) To create zoning districts and regulations applicable thereto;

The Municipal Code accounts for the preservation of "heritage resources", which are defined as natural objects, buildings, structures, or otherwise that have architectural or historical significance. Designation as a heritage resource can be done under the city council pursuant to provisions of Chapter 19.96.050 of the Municipal Code.

Sunnyvale Heritage Preservation

According to Sunnyvale Municipal Code, Title 19. Zoning, heritage resources are divided into three levels of significance they are: 1) Local landmark resource/Local landmark district, 2) Designated heritage resource/designated heritage resource district, and 3) Heritage resource/heritage resource district Sunnyvale Municipal Code, Title 19 Zoning, Chapter 19.96. Heritage Preservation).

1a. "Local landmark" means a heritage resource which is significant in that the resource materially benefits the historical character of a neighborhood or area, or the resource in its location represents an established and familiar visual feature of the community or city, and has been designated and determined to be appropriate for preservation by the city council.

1b. "Local landmark district" means a heritage resources district which demonstrates a higher collective integrity of location, design, setting, materials, workmanship, feeling, and association which is essential to the sustained value of the separate individual resources and which has been designated and determined to be appropriate for preservation by the city council. A local landmark district possesses a significant concentration or continuity of heritage resources unified by past events, or aesthetically by plan or physical development; or the collective value of the local landmark district as a whole may be greater that the value of each individual heritage resource within it.

2a. "Designated heritage resource" means a heritage resource which has specific elements which are expressly found to meet one or more of the Criteria of the National Register of Historic Places as established by the Secretary of the Interior and incorporated by reference into this code and which has designated and determined to be appropriate for preservation by the city council, and has been recognized by the state or the nation to be historically significant.

2b. "Designated heritage resource district" means a heritage resources district which has specific elements which are expressly found to meet one or more of the Criteria of the National Register of Historic Places as established by the Secretary of the Interior and incorporated by reference into this code and which has been designated and determined to be appropriate for preservation by the city council, and has been recognized by the state or the nation to be historically significant.

> **3a.** "Heritage resource" means improvements, buildings, portions of buildings, structures, signs, features, sizes, scenic areas, views and vistas, places, areas, landscapes, trees, or other natural objects or objects of scientific, aesthetic, educational, political, social, cultural, architectural, or historical significance to the citizens of the city, the Santa Clara Valley region, the state, or the nation, which are designated and determined to be appropriate for preservation by the city council.
>
> **3b.** "Heritage resource district" means any geographically definable area containing a centration or continuity of heritage resources which are thematically related, or which contribute to each other and are unified by a special character, historical interest, aesthetic value, or which represents one of more architectural periods or styles typical to the city, and that has been designated and determined to be appropriate for preservation by the city council, pursuant to provisions in this chapter.

As explained in Sunnyvale Municipal Code Title 19: Zoning, Chapter 19.96. Heritage Preservation, "any improvement, building, portion of buildings, structures, signs, features, sites, scenic views, views, vistas, places, areas, landscapes, trees, or other natural objects or objects of scientific, aesthetic, educational, political, social, cultural, architectural, or historical significance" is eligible for designation as a heritage resource or heritage resource district "if it meets the Criteria of National Register of Historic Places or one or more of the following:"

(a) It exemplifies or reflects special elements of the city's cultural, social, economic, political, aesthetic engineering, architectural, or natural history;

(b) It is identified with persons or events significant in local, state, or national history;

(c) It embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship;

(d) It is representative of the work of a notable builder, designer, or architect;

(e) It contributes to the significance of an historic area, being a geographically definable area possessing a concentration of historic or scenic properties or thematically related grouping of properties which contribute to each other and are unified aesthetically or by plan or physical development;

(f) It has a unique location or singular physical characteristic or is a view or vista representing an established and familiar visual feature of a neighborhood, community, or the city of Sunnyvale;

(g) It embodies elements of architectural design, detail, materials, or craftsmanship that represents a significant structural or architectural achievement or innovation;

(h) It is similar to other distinctive properties, sites, areas, or objects based on a historic, cultural, or architectural motif;

(i) It reflects significant geographical patterns, including those associated with different eras of settlement and growth, particular transportation modes, or distinctive examples of park or community planning;

(j) It is one of the few remaining examples in the city, region, state, or nation possessing distinguishing characteristics of an architectural or historic type or specimen;

(k) With respect to a local landmark, it is significant in that the resource materially benefits the historical character of a neighborhood or area, or the resource in its location represents an established and familiar visual feature of the community or city;

(l) With respect to a local landmark district, a collective high integrity of the district is essential to the sustained value of the separate individual resources;

(m) With respect to a designated landmark and designated landmark district, the heritage resource shall meet Criteria of the National Register of Historical Places, which are incorporated by reference into this chapter. (Ord. 2623-99 § 1; prior zoning code § 19.80.060).

Moffett Park Specific Plan

The City originally adopted the MPSP in July of 2004, which has been revised four times: [November 2006 (Resolution No. 244-06), March 2009 (Resolution No. 369-09), September 2011 (Resolution No. 498-11, and most recently updated in December 2013 (Resolution No. 622-13)]. The MPSP area is located in the northwestern portion of the city of Sunnyvale and generally occupies approximately 1,156 acres, of which 1,068 acres are developable. The MPSP is does not contain consideration for historic or archaeological resources.

METHODS

Records Search

SWCA requested a cultural resources records search for the current project area (plus a 0.8-km [0.5-mile] radius) at the Northwest information Center (NWIC) on January 28, 2019. This search was conducted at the California Historical Resources Information System (CHRIS) located on the campus of Sonoma State University in Rohnert Park, California. The search included any previously recorded cultural resources and investigations within a 0.5-mile radius of the project area. The CHRIS search also included a review of the NRHP, CRHR, California Points of Historical Interest list, California Historical Landmarks list, Archaeological Determinations of Eligibility list, and California State Inventory of Historic Resources.

Archival Research

In addition to reviewing prior studies and previously recorded site records, SWCA examined historical maps and aerial photographs obtained through Environmental Data Resources, Inc. (EDR), or retrieved online through the U.S. Geological Survey (USGS). These included topographic and street maps. Additional online resources came from the Oakland Museum of California and the Santa Clara Valley Water District.

Sacred Lands File Search

As part of the process of identifying cultural resources in or near the project area, SWCA contacted the Native American Heritage Commission (NAHC) to request a Sacred Lands File (SLF) review and list of contacts that may have knowledge of cultural resources in or near the project area on January 28, 2019. The NAHC emailed a response on March 26, 2019, stating the SLF search was completed with negative results, but noted it is always possible for cultural resources to be unearthed during construction activities. The NAHC also provided a contact list of six Native American tribes that may have knowledge of cultural resources in or near the project area. The list is attached to this report as Confidential Appendix A. SWCA understands that the City of Sunnyvale, as the lead CEQA agency, will conduct their own Native American outreach to satisfy Assembly Bill (AB) 52 outreach. The NAHC has cautioned that the list of contacts provided to SWCA, differs from the list of tribal governments that are empowered to initiate or conduct government-to-government consultation (usually only the tribal chair and possibly one

additional person). Therefore, the City will want to conduct another NAHC request as the lead CEQA agency.

SETTING

Environmental Setting

Regionally, the proposed project is on the southern edge of the San Francisco Bay, in the northwestern portion of the city of Sunnyvale, in Santa Clara County. Santa Clara County is bounded by Alameda County to the north, San Mateo and Santa Cruz counties to the west, San Benito County to the south, and Merced and Stanislaus counties to the east. The proposed project site is is part of a mostly continuous urban landscape; neighboring cities include Mountain View, Los Altos, Cupertino, and Santa Clara. Santa Clara County and the area known as "Silicon Valley" have a diverse urban and natural landscape unique to the southern region of the San Francisco Bay area. The area tends to be highly urbanized, , with concentrations of high-technology centers, old and new residential areas, transportation infrastructure, and downtown settings. Surrounding the high-density uses there are large natural areas, including the San Francisco Bay to the north, the Santa Cruz Mountains to the southwest, and the Diablo Mountain Range to the east.

The climate around the project area is characterized by mild, dry summers and cool, moist winters. Because the area falls within a coastal region, winters are typically warmer, and summers tend to be milder. When California initially was occupied, the climate was moister and cooler than today's Mediterranean climate (Major 1988). Annual temperatures average 14.1 degrees Celsius (57.4 degrees Fahrenheit). Precipitation ranges between 25 and 128 cm (10 and 50 inches; Bailey 1995:50).

Current land uses in the project vicinity include mostly commercial and industrial development. Plant communities present within and adjacent to the area include coastal and valley freshwater marsh, eucalyptus woodland, northern coastal scrub, nonnative grassland/ruderal, and willow riparian scrub. Ruderal vegetation is usually found in disturbed areas that have been significantly altered by construction, landscaping, or other types of land-clearing activities. Plant species found within this habitat are typically introduced Mediterranean species that exhibit clinging seeds, adhesive stems, and rough leaves that assist their invasion and colonization of disturbed lands. Prior to landscape and vegetation modifications during the Historic period, the predominant potential natural plant communities would likely have included interior live oak, mixed chaparral, bluegrass, and valley needlegrass series (Bailey 1995:50). Historically, land mammals in the area included mule deer, pronghorn, tule elk, coyotes, bobcats, ground squirrels, and kangaroo rats. A variety of birds were known to inhabit the area, including hawks, eagles, owls, quail, mourning doves, mockingbirds, scrub jays, gulls, herons, crows, finches, and sparrows. The proximity of the Pacific Ocean would have provided prehistoric peoples with access to sea lions, seals, mussels, abalone, and fish, etc. With this mosaic of ecological communities, the area would have provided a very productive environment for its prehistoric occupants, one well suited to a hunting-gathering economy with a variety of birds, small and large mammals, fish, reptiles, amphibians, and edible plant species.

Cultural Setting

Prehistory

The project site lies in what generally is described as the San Francisco Bay Region, which is one of eight arbitrary organizational divisions of the state (Moratto 1984). This archaeological region includes all of today's San Mateo and Marin counties and western, northern, or southern portions of Alameda, Contra

Costa, Napa, Santa Clara, Santa Cruz, Solano, and Sonoma counties bordering the Bay Area (Moratto 1984). The prehistory of this region is divided into six periods: Early Holocene (Lower Archaic; 8000–3500 calibrated [cal] BC), Early period (Middle Archaic; 3500–500 cal BC), Lower Middle period (Initial Upper Archaic; 500 cal BC–cal AD 430), Upper Middle period (Late Upper Archaic, cal AD 430–1050), Initial Late period (Lower Emergent; cal AD 1050–1550), and Terminal Late period (cal AD 1550–1776; Milliken et al. 2007:101, 114–118). The San Francisco Bay area is where two different systems for organizing the archaeological record meet; therefore, a variety of period names within each section are mentioned below.

EARLY HOLOCENE/LOWER ARCHAIC (8000–3500 CAL BC)

Occupation in the San Francisco Bay area during the Prehistoric period may have occurred as early as 8,000 years ago, when sea levels were some 15 to 20 m (49–66 feet) lower than today (Bickel 1978:7), but the earliest archaeological sites in this area date to only 6,000 years ago during the Middle Holocene. It is likely that Holocene alluvial deposits buried many prehistoric sites in this area (Moratto 1984:221, 277; Ragir 1972). To the east in the Los Vaqueros region of Contra Costa County, closer to the Sacramento–San Joaquin Delta, for example, is one of the few Early Holocene age sites in the region, CA-CCO-696. This site provides one of the earliest dates from a site with a millingstone component (Milliken et al. 2007:114). To the south at an inland site in Santa Cruz County (Scotts Valley site, CA-SCR-177), stone tools have been found in deposits dating to more than 6,000 years ago (Breschini and Haversat 1991:128–129). Data from coastal sites in central and southern California during the Paleo-Coastal Tradition of the Paleoindian period indicate the economy was a diverse mixture of hunting and gathering, with a major emphasis on aquatic resources in many coastal areas (e.g., Jones et al. 2002). The few Bay Area sites include two in the Santa Clara Valley (CA-SCL-65 and CA-SCL-178) and one on the peninsula coast of Santa Cruz County (CA-SCR-7; Hylkema 2002:233–235). The artifact assemblages in these Bay Area sites have large numbers of handstones and milling slabs, as well as core and flake tools. Dates from CA-SCR-7, the Sand Hill Bluff shell mound, range from 4100 to 1400 BC; the site includes large corner- and side-notched projectile points. There is abundant evidence that marine resources such as fish, sea mammals, and shellfish were exploited at coastal sites.

EARLY PERIOD/MIDDLE ARCHAIC (3500–500 CAL BC)

Sites characteristic of the Early period/Middle Archaic in the San Mateo County area date to as early as 5,500 years ago and as late as 2,500 years ago (3500–500 cal BC). Such sites often contain manos and metates (grinding stones), as well as many mortar fragments, indicating that acorns and/or various seeds formed an important part of the diet (Moratto 1984:201). The period is marked by the first cut bead, the grooved *Olivella biplicata* rectangle bead. Mortars and pestles appear in the Bay Area archaeological record during this time period. A wooden mortar and stone pestle were recovered from CA-CCO-637; these artifacts date to 3800 cal BC (Milliken et al. 2007:115).

The University Village site (CA-SMA-77) in San Mateo County and the lower levels of the West Berkeley site (CA-ALA-307) in Alameda County may represent an Early Bay culture coeval with the Windmiller Pattern (Gerow with Force 1968). The lowest level of the West Berkeley site has recently been radiocarbon dated from 3030 to 2890 cal BC (see Lightfoot and Luby 2002:270). Gerow (1974) further suggested that the Early Bay culture had more in common with southern California coastal cultures rather than the Windmiller Pattern diagnostic of the Early Horizon in the Delta area. Additional artifact assemblages, such as from CA-SCL-354 in the Los Altos foothills, imply that characteristics of Windmiller assemblages were present on the South Bay peninsula (Hylkema 2002:244). Also on the peninsula coast, *Olivella* rectangular beads (type L1) and Rossi square-stemmed and large side-notched projectile points are diagnostic of the Early period (Hylkema 2002:250).

LOWER MIDDLE PERIOD/INITIAL UPPER ARCHAIC (500 CAL BC–CAL AD 430),

People inhabiting the San Francisco Bay region during the Lower Middle period (also known as the Berkeley period) practiced a maritime hunting and gathering economy. Large accumulations of shellfish remains, or "shell mounds," formed over hundreds, or even thousands, of years through accretion at village sites fronting the Bay that were reused seasonally or year-round (Lightfoot 1997:135). Numerous shell mounds contain hundreds of burials as well as ceremonial items, house floors, hearths, and storage pits, indicating they were used as burial, ceremonial, and residential places (Lightfoot 1997:131–136; Lightfoot and Luby 2002:276–277).

The well-known Emeryville shell mound (CA-ALA-309) and Ellis Landing site (CA-CCO-295) date to this period (see discussion in Lightfoot and Luby 2002:270; Nelson 1909). In 1902, Max Uhle initially excavated the Emeryville shell mound (CA-ALA-309), revealing a stratified deposit with numerous cultural sequences (Uhle 1907). The Emeryville shell mound was one of the largest in the Bay Area, with estimated size of at least 100 by 300 m, with a maximum depth of nearly 10 m (Moratto 1984:227–228). The lower levels contained flexed burials associated with artifacts such as pointed bone implements, chert bifaces, perforate charmstones, red ochre, and a predominance of bay oyster shells (Moratto, 1984:229). Upper levels appeared to have cremation burials, polished stone artifacts, flaked obsidian tools, and more clam than oyster. In 1924, Schenck discovered approximately 700 burials, most interred in a flexed position, when he "rescued" materials from the site as it was being leveled during construction of a paint factory (Schenck 1926).

Artifacts typical of the Lower Middle period include spire-lopped *Olivella*, *Olivella* saucer beads, and circular *Haliotis* ornaments (Milliken et al. 2007:115). Assemblages generally have a relatively small frequency of flaked stone points; projectile points are commonly contracting stemmed and lanceolate types, some of which are made from obsidian (Hylkema 2002). Burials are variable flexed and semiflexed with inconsistent orientation,

Milling implements include large and small boulder or cobble mortars and various types of pestles, indicating that acorns formed an important part of the diet. In the South Bay, processing of hard seeds continued to be important throughout this period, as evidenced by the number of milling slabs and handstones in the artifact assemblages from that area (Hylkema 2002:244–245, 252). Other plant resources included hazel nuts, cattail seeds, grass, and soaproot bulbs; the latter were roasted in earth ovens.

Shellfish species exploited varied depending on location within the Bay Area (Hylkema 2002:252). Along the West Bay in San Mateo County and the East Bay of Alameda County, bay mussel, oyster, and clam are more prevalent. In contrast, horn snail, oyster, and bay mussel are the principal shellfish recovered from South Bay mounds. Temporal variation in shellfish species is also present in the mound assemblages.

UPPER MIDDLE PERIOD/LATE UPPER ARCHAIC (CAL AD 430–1050)

The Upper Middle period/Late Upper Archaic period is marked by the collapse of the *Olivella* saucer bead trade network at cal AD 430 around the Bay Region (Milliken et al. 2007:116). The period is also evidenced by a number of changes in subsistence, foraging, and land use patterns that begin to reflect the use pattern known from Historic period Native American groups in the area. A substantial increase in the intensity of subsistence exploitation, including fishing, hunting, and gathering (particularly the acorn), evidenced in the archaeological record, correlates directly with population growth (Moratto 1984:211–214). Bow and arrow technology, the use of harpoons, and tubular tobacco pipes appear during this period. However, a greater emphasis is placed on the procurement and processing of vegetal foods,

especially acorns, as evidenced in the increase of milling tools, especially the mortar and pestle. Both coiled and twined basketry were used as domestic and ceremonial items. Population size and the number of settlements increased during this period, although the large shell mound villages of the Lower Middle period were apparently no longer favored residential places (Lightfoot and Luby 2002:264, 277). There is an increase in grave goods, particularly during the Upper Middle period, compared with few grave goods identified during the Lower Middle period in Bay Area sites.

During the Upper Middle period, the climate fluctuated between cooler, wetter periods and warmer, drier periods. During cooler, wetter periods, alluvial deposition increased; comparatively little deposition occurred in the drier intervals. Extended periods of relatively little rainfall, referred to as the Medieval Climatic Anomaly (MCA), produced droughts across the West between about AD 650 to 850 and again in the Late period AD 1150–1250 (Jones et al. 1999). The dry conditions during the MCA may be related to the abandonment of shell mound villages as primary residential locations, which began around AD 700 (Lightfoot and Luby 2002:277, 279). Settlement strategies were apparently reorganized and focused on a dispersed pattern, with the establishment of both coastal and interior habitation areas, coinciding with the exploitation of seasonally available resources.

INITIAL LATE PERIOD/LOWER EMERGENT (CAL AD 1050–1550)

The Late period ushers in a time of status differentiation and the rise of secret societies and cults and associated traits. Exchange networks, with the use of clamshell disk beads as a form of currency, expanded during this period. Exchange items included magnesite, steatite, *Olivella* beads, and obsidian. Compared with the Middle period, the use and occurrence of shell beads with burials blossomed (Milliken and Bennyhoff 1993). *Haliotis* banjo pendants may represent the introduction and spread of the Kuksu cult, beginning during the transition from the Middle to Late period in the Bay Area (Hylkema 2002:260). The magnitude of non-dietary *Olivella* shells in coastal sites during the Late period, coupled with a concomitant increase of the shells in mortuary contexts throughout central California during this period, attests to the rise of both exchange networks and status differentiation, with coastal peoples supplying the shells to the interior groups. Partial cremation appears or reappears during this time and also marks the stratification with the diversity of grave goods included in the wealthiest of graves (Milliken 2007:217).

During the Late period in the peninsula coast, site assemblages indicate there is an increase in the diet of birds and marine species, especially sea otters. At the same time, there is a decrease in terrestrial fauna in the archaeological record (Hylkema 2002:254–255). Further inland at large residential, upland meadows sites in Santa Cruz County (CA-SCR-9 and CA-SCR-20), both dense shell and abundant deer and elk bone are present, suggesting these areas were continuously reoccupied on a seasonal basis.

TERMINAL LATE PERIOD/PROTOHISTORIC AMBIGUITIES (CAL AD 1550–1776)

The Terminal Late period is marked by the abrupt disappearance of the *Olivella* sequin and cup beads ca. AD 1500 to 1550 (Milliken et al. 2007:117). During this period and before the Spanish arrived in full force, a cultural shift was occurring. The North Bay began to take a more dominant role in the production of new technology and trade items, including clamshell disk beads, the toggle harpoon, hopper mortar, corner-notched projectile points, and magnesite tube beads. The precise reason for this cultural shift is unknown, but could have been driven by conflict between groups or the spread of European diseases northward from Mexico prior to AD 1776 (Milliken et al. 2007:117–118.)

Ethnographic Overview

The project is in an area historically occupied by the tribelets of the Costanoan linguistic group (Levy 1978). Descendants of Costanoan speakers prefer to be called by the name of the tribelet from which they

are descended. When their heritage is mixed or the specifics have been lost over generations, they prefer the use of a native term, *Ohlone,* rather than the European-imposed term Costanoan ("coastal dwellers") (Margolin 1978).

Costanoan territory extended between the Carquinez Strait and San Pablo Bay on the north, southward along the coast beyond Monterey Bay to Carmel Valley, and inland to the coast range (Levy 1978:485). Neighboring groups included the Coast Miwok north across the Carquinez Strait, the Miwok and Northern Valley Yokuts to the east, and the Salinan and Esselen to the south.

Spanish mission records, diaries, and journals provide most of the information about the Costanoans, because little ethnographical research has been conducted in the twentieth century (Levy 1978:495). The most thorough study, by Milliken (1995), used mission records, and Margolin (1978) reconstructed Native American life in the Bay Area.

The numerous Costanoan social groups in this region were organized by tribelets, each of which could have several villages or a main village with a number of camps (Levy 1978:487). Tribelets were also political units structured by similarities in language and ethnicity, each holding claim to a designated portion of territory. Topographic features, such as rivers, watersheds, and ridgelines, defined tribelet territories, and the boundaries were strictly respected.

Linguistically, these tribelets belong to the Utian, or Miwok-Costanoan, language family, part of a hypothesized larger Penutian linguistic stock (Mithun 2001:309). The Costanoan family is broken down into four branches: the Karkin, in the Carquinez Strait area; the Northern Costanoan, consisting of the Chocheno (with four dialects), Ramaytush, Tamyen, and Awaswas languages; the Soledad, seen only in Cholon; and the Southern Costanoan branch, consisting of Rumsen and Mutsun (Mithun 2001:535). Speakers of these languages and dialects, in various configurations, have been treated as tribes in the past in accordance with anecdotal reports. Through detailed examination of mission records, marriage patterns, and dialect variation seen in personal names, Milliken (1995:229) delineated 43 separate political entities (tribelets) in the San Francisco Bay, Santa Cruz, and inland area, with an additional six or so tribelets in the south Monterey Bay and Carmel Valley region.

Each tribelet's territory contained a main village and smaller satellite villages. The villages were typically located along a river or stream for easy access to water (Levy 1978:487). Coastal people did not build right on the shoreline but usually on an overlooking bluff. Dwellings were domed structures consisting of a tule- or grass-covered framework of poles, with rectangular doorways and central hearths (Levy 1978:492). Villages often contained specific enclosures for dancing. Assembly halls in the center of the settlement were common; some halls were large enough to contain the entire village population of 200 people. Each community had a sweat lodge, placed near a stream. The Costanoans either buried or cremated the deceased, sometimes depending on firewood availability. There is no mention of cemeteries associated with villages (Levy 1978:490–491).

The rich resources of the ocean, bays, valleys, and mountains provided Ohlone-speaking peoples with food and all their material needs (Levy 1978:491–492). The primary food staple was the acorn, supplemented by a great variety of animal and plant resources. Depending on species availability and desirability, Costanoans used four oak species, including coast live, valley, tanbark, and black. Collected nuts included buckeye, laurel, pine nuts, and hazelnuts. Seeds from dock, chia and other salvias, tarweed, and holly-leaf cherry were collected and ground into meal. Vegetal resources also included several berry-producing plants, wild onions, carrots, tule roots, and greens of clover and other annuals. Large and small game, including deer, elk, antelope, bears, mountain lions, raccoons, ground squirrels, woodrats, mice, moles, dogs, rabbits, and jackrabbits, plus seals and stranded whales, were part of their diet. Migrating waterfowl were an important resource, and included geese, ducks, and coots. Pigeons, quails, and hawks were also consumed, but not eagles, owls, ravens, or turkey vultures. Rivers and streams provided

freshwater fish, including steelhead, salmon, and sturgeon, whereas the ocean provided sharks, sardines, and lampreys. The Costanoan diet also included a variety of insects and reptiles, but not amphibians.

For hunting and gathering natural resources, Costanoans used a wide array of tools, implements, and enclosures. Among those used for hunting land mammals and birds were bows and arrows, traps and snares, deer-head disguises, bolas, nets and net sinkers, and enclosures/blinds. Communal hunting drives were used to catch rabbits, whereas nets and poisons were used to harvest fish. Tule watercraft were used for transportation and for hunting fish and waterfowl on enclosed bays and marshes. Many plants were collected using wooden tools: long poles for dislodging acorns and pinecones, fire-hardened digging sticks for obtaining roots, and beaters for dislodging seeds. Once collected, seeds, roots, and nuts were placed in burden baskets and transported for processing or storage (Levy 1978:491).

Costanoans used a variety of tools to process food resources. These tools included portable stone mortars and pestles, bedrock mortars, hopper mortars, anvils, woven strainers and winnowers, leaching and boiling baskets, woven drying trays, and knives. Various foods were baked in earthen ovens. Wooden paddles were carved for stirring food in the boiling baskets. There were shell spoons, basket dippers, and mush bowls for serving food, and woven water jugs and storage containers for storing food.

The presence of exotic items such as obsidian, steatite, and shell indicates Costanoan tribelets traded with coastal groups and mountain tribes (Levy 1978:493). Dietary items were also traded with the Plains Miwok, Sierra Miwok, and Yokuts. Costanoans provided mussels, abalone shells, dried abalone, and salt to the Yokuts and *Olivella* shells to the Miwok. They received pine nuts from the Yokuts, but other food resources received by the Costanoan tribelets are unrecorded.

The Native American population in this region came into contact with European culture at the beginning of Spain's land exploration and settlement in AD 1769. Traditional lifeways were altered drastically during the late 1700s to early 1800s when the Spanish placed their capital at Monterey, built forts at Monterey and San Francisco, and established seven Franciscan missions to convert native peoples to Christianity and the European way of life. Large-scale epidemics soon swept through the mission population and remaining villages (Milliken 1995). Subsequent Spanish colonial towns at Santa Cruz and Yerba Buena (San Francisco), followed by large Mexican land grants, separated Costanoans from their harvesting grounds and hunting parks. Many surviving Native Americans were pulled away from their own villages to the new Euro-American settlements. It is estimated that the combined Costanoan population fell from a pre-Contact total of 10,000 down to 2,000 by the end of the mission period in 1834 (Levy 1978:486). Also during the mission period, the dwindling Costanoan population intermarried within other interior tribes at the missions, mixing their cultural identities.

During the late 1800s, several Native American communities of mixed heritage remained in rural areas, with Pleasanton, Monterey, and San Juan Bautista the best known (Levy 1978:487). Even these groups continued to shrink as young people married into other groups and moved away. Estimates of the total remaining population of people with recognizable Costanoan descent were fewer than 300 in 1973 (Levy 1978:487). According to Levy:

> In 1971 descendants of the Costanoan united in a corporate entity, the Ohlone Indian Tribe, and received title to the Ohlone Indian Cemetery where their ancestors who died at Mission San José are buried (Levy 1978:487).

Since that time, other descendants of Costanoan tribelets have organized political and cultural heritage organizations that are active locally and statewide. All are concerned with revitalizing aspects of their culture, learning the language through notes collected by anthropologist John Harrington, and preserving the natural resources that played a vital role in traditional culture. Some Costanoan groups also are

seeking federal recognition of their tribe, petitioning the Bureau of Indian Affairs with reconstructed tribal histories and genealogies, records that will be a great resource for future generations of Costanoans.

Historic Context

Post-Contact history for the state of California generally is divided into three periods: the Spanish period (1769–1822), the Mexican period (1822–1848), and the American period (1848–present). Although there were brief visits by Spanish, Russian, and British explorers from 1529 to 1769, the beginning of Spanish settlement in California occurred in 1769 with a settlement at San Diego and the first (Mission San Diego de Alcalá) of 21 missions established from 1769 to 1823. Word of Mexican victory after a decade of revolt against the Spanish crown reached California in 1822, marking the beginning of the Mexican period. This period was marked by an extensive era of land grants, most of which were in the interior of the state, and by exploration by American fur trappers west of the Sierra Nevada.

With the signing of the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican-American War, California became a territory of the United States. The discovery of gold in 1848 at Sutter's Mill near Sacramento and the resulting Gold Rush influenced the history of the state and the nation. The rush of tens of thousands of people to the goldfields also had a devastating impact on the lives of indigenous Californians, with the introduction and concentration of diseases, the loss of land and territory (including traditional hunting and gathering locales), violence, malnutrition, and starvation. Thousands of settlers and immigrants continued to pour into the state, particularly after the completion of the transcontinental railroad in 1869.

With continued growth, California continues to be a national leader in agriculture and poultry production, ranching (cattle and sheep), and aerospace and communications industries, as well as the film and entertainment business. The wealth of California's natural resources (e.g., lumber, petroleum deposits, minerals, and fish) also continues to contribute to its growth and development.

Local Context

The city of Sunnyvale is located immediately south of the San Francisco Bay and occupies approximately 22 square miles. As discussed above, the city contains a mix of land uses from residential, commercial, industrial, and major transportation corridors. The city of Sunnyvale's history is parallel to that of neighboring areas in Northern California. Before it was called Sunnyvale, it part of the Mission Santa Clara de Asis in 1777. During the Mexican Period, it was part of the Rancho Pastoria de los Borregas land grant. During the American Period, Irishman Martin Murphy Jr. purchased half of the Rancho; during which time Murphy and Encinal were established as townships, but never made the way to be established as a city until Sunnyvale was incorporated. The city of Sunnyvale wasn't incorporated until 1912.

Agricultural land was ubiquitous in the vicinity of Sunnyvale and most of the city consisted of it pre-World War II. By World War II, the Moffett Naval Air Field was established (in 1933). Agriculture and canning were lucrative enterprises during World War II and during the Great Depression immediately following. World War II brought not only the new Moffett Air Field, but also the need for Hendy Ironworks. The existence of both the ironworks and canning facilities allowed Sunnyvale to be declared a Critical Defense Area during the War. After this time, industrial and commercial development remained a profitable enterprise in Sunnyvale through the present day.

METHODS

SWCA completed a records search at the NWIC, an SLF search at the NAHC, and conducted a built environment survey. The following sections discuss the methods used for these efforts.

Records Search

On January 28, 2019, SWCA requested a CHRIS records search at the NWIC for previous cultural resources studies and previously recorded cultural resources within a 0.8-km (0.5-mile) radius of the project area. The CHRIS search also included a review of the NRHP the CRHR, the California Points of Historical Interest list, the California Historical Landmarks list, the Archaeological Determinations of Eligibility list, and the California State Historic Resources Inventory. The results of the record search were received on February 21, 2019 and are described below.

Native American Contact Program

SWCA contacted the NAHC requesting an SLF search as well as contact information for Native American groups or individuals that may have concerns about cultural resources in the project area. SWCA prepared and emailed a request letter to the NAHC in January 2019; the letter included a request to include tribal consulting parties for the purposes of AB 52. The NAHC responded to the request in an email dated January 31, 2019. The NAHC indicated that AB 52 results are usually provided directly to the lead CEQA agency. SWCA subsequently requested that the NAHC provide the list of all Native American tribes or entities that might have information about the project area. The results of the SLF search were negative. SWCA did not conduct any outreach to tribal parties as part of this effort; the City of Sunnyvale will conduct such outreach in compliance with AB 52 in their capacity as the CEQA lead agency.

Field Survey

Because the entire project area is previously developed and paved, the ground surface is obscured, and archaeological survey was not conducted. SWCA architectural historian Nelson White, MSHP, conducted a built environment survey of the project area on February 22, 2019. He revisited the previously recorded resource within the project area and checked for any built environment resources that might be historic in age (e.g., more than 50 years old) or of significance. No DPR Series 523 forms were on file at the NWIC for the known resource within the project area. Therefore, SWCA formally documented the site on DPR forms as part of the current effort. The current condition was compared with that in the description in the EIR. The site area and identified resource were photographed using a digital camera. Updated site records were completed on DPR forms and submitted to the NWIC. All field notes, photographs, and records related to the current study are on file at the SWCA Pasadena, California, office.

RESULTS

Records Search

Previously Conducted Cultural Resource Studies

Results of the CHRIS records search at the NWIC indicate that two previous cultural resource studies have been conducted within the project area, and additional eight studies have been conducted within a 0.8-km (0.5-mile) radius of the project area. Table 1 and **Error! Reference source not found.** show details of these previous studies.

Table 1. Previous Studies within a 0.5-mile Radius of the Project Area

Report No.	Report Title (Year)	Report Type	Author (Affiliation)	Proximity to Project Area
S-005317	*Archaeological Survey of Building 158 Site* (1980)	Archaeological, Field study	David Chavez (David Chavez & Associates)	Outside (within 0.5-buffer)
S-010200	*Cultural Resources Evaluation for the Fremont-South Bay Corridor Study: Alternatives Analysis, Alameda and Santa Clara Counties, California* (1988)	Archaeological, Architectural/historical, Field study	David Chavez, Sally B. Woodbridge, and Jan M. Hupman (David Chavez & Associates)	Outside (within 0.5-buffer)
S-012294	*Archaeological Survey Report, Tasman Corridor Project, Santa Clara County, California (1990); Historic Architectural Survey Report, Tasman Corridor Project, Santa Clara County, California* (1991); *Final Report, Addendum to Archaeological Survey Report, Tasman Corridor Project, Santa Clara County, California* (1991); *Archaeological Testing at CA-SCL-20* (1991); *Finding of Effect for the Tasman Corridor Light Rail Project* (1992); *UMTA891122A, UMTA890407A: Tasman Corridor, Santa Clara County; Santa Clara Valley Transportation Authority* (1991)	Archaeological, Field study; Architectural/historical, Evaluation, Field study; Archaeological Excavation; Archaeological, Architectural/historical, Evaluation; Office of Historic Preservation (OHP) Correspondence	Suzanne Baker and Laurence H. Shoup (Archaeological/Historical Consultants); Mark Brack, Laurence H. Shoup, and Suzanne Baker (Archaeological/Historical Consultants); Suzanne Baker (Archaeological/Historical Consultants); Unknown (Archaeological/Historical Consultants; Woodward-Clyde Consultants); Kathryn Gualtieri, Steade R. Craigo, Daniel Abeyta, and Roy Molseed (Office of Historic Preservation; Santa Clara Valley Transportation Authority)	Outside (within 0.5-buffer)
S-016658	*Final Archaeological Monitoring Report, City of Sunnyvale Reclaimed Water Pipeline Through Sunnyvale Municipal Golf Course and Moffett Field Naval Air Station, Santa Clara County, California* (1995)	Archaeological, Excavation, Monitoring	Sally Morgan and Barb Voss (Woodward-Clyde Consultants)	Outside (within 0.5-buffer)
S-043585	*Historic American Landscapes Survey, Alviso Salt Works, HALS #CA-92* (2014)	Architectural/historical, Field study	Laura Watt, Marie Galvin, David Blau, Charlane Gross, Aki Omi, Donna Plunkett, Lou Ann Speulda-Drews, and Nicholas Valentine (EDAW; US Fish & Wildlife Service)	Outside (within 0.5-buffer)

Report No.	Report Title (Year)	Report Type	Author (Affiliation)	Proximity to Project Area
S-043999	*Cultural Resources Analysis, Sunnyvale/West/Java/CN4050, 141 Caspian Court, Sunnyvale, Santa Clara County, California, California, 94089, EBI Project No. 61110913* (2011)	Archaeological, Field study	Aniela Travers (EBI Consulting)	Within
S-045701	*Sunnyvale Water Pollution Control Plant Master Plan, Cultural Resources Survey Report* (2014)	Archaeological, Field study	Heidi Koenig (Environmental Science Associates)	Outside (within 0.5-buffer)
S-045748	*Archaeological Testing Report, 1221 Crossman Avenue, Moffett Gateway Project, Sunnyvale, California* (2014)	Archaeological Excavation, Field study	Allen Estes and Nazih Fino (William Self Associates, Inc.)	Outside (within 0.5-buffer)
S-046899	*Cultural Resources Assessment, South San Francisco Bay Shoreline Interim Feasibility Study* (2009); *South San Francisco Bay Shoreline Study, Alviso Ponds and Santa Clara County Area Interim Feasibility Study, Environmental Settings Report* (2010); *Appendix E: Identification and Evaluation of the South San Francisco Bay Solar Salt Industry Landscape. Alameda, Santa Clara, and San Mateo Counties, California* (2009); *Historic American Landscape Survey for Alviso Salt Works, HALS No. CA-92, 1751 Grand Boulevard, Alviso, Alameda County, Santa Clara County, California* (2009); *Memorandum of Agreement and Historic Property Treatment Plan for the Salt Works within the South Bay Salt Pond Restoration Project at the Alviso Unit, Don Edwards San Francisco Bay National Wildlife Refuge, and the Eden Landing Ecological Reserve, California* (2012); *Draft South San Francisco Bay Shoreline Phase I Study, Draft Integrated Document Cultural Resources Report Section Chapter 4.15* (2014); *Draft South San Francisco Shoreline Phase I Study - Draft Integrated Document Aesthetics Chapter 4.12 (2014);* *COE_2014_1219_001; South San Francisco Bay Phase I Shoreline Study* (2015)	Archaeological, Architectural/historical, Field study; Archaeological, Field study; Archaeological Evaluation; Architectural/historical, Field study; Management/planning; Archaeological, Other research; Other research; OHP Correspondence	Unknown (Basin Research Associates, Inc.); Unknown (MWH); Lou Ann Speulda-Drews and Nicholas Valentine (US Fish and Wildlife Service, Region 8); Laura Watt, Marie Galvin, David Blau, Charlane Gross, Aki Omi, Donna Plunkett, Lou Ann Speulda-Drews, and Nicholas Valentine (EDAW, US Fish and Wildlife Service); Mendel Stewart (US Fish and Wildlife Service); Unknown (USACE - San Francisco District); Unknown (USACE - San Francisco District); Thomas R. Kendall (Department of the Army)	Within
S-048386	*Historic & Cultural Resources Evaluation, Historic Resources Evaluation for Section 106 Review, Edwina Benner Plaza, 460 Persian Drive, Sunnyvale, CA 94089* (2016); *Development of Multi-Family Housing of 469 Persian Drive, Sunnyvale* (2016)	Archaeological, Architectural/historical, Field study; OHP Correspondence	Unknown (AEM Consulting); Julianne Polanco (California Office of Historic Preservation)	Outside (within 0.5-buffer)

Previously Recorded Cultural Resources

There are two previously recorded sites that were identified during research of the project area. The first was identified during the records search. P-43-000421; it is a multi-component site that does not intersect the project area. The other site was identified during research of the project area: The Sunnyvale West Channel, which does intersect the project area. This resource had been noted in a Environmental Impact Report (EIR) written by Horizon Water and Environment, LLC (2013). During this recordation, the resource was not documented on DPR forms, but it was evaluated for listing on the NRHP and CRHR; it was recommended ineligible.

Archaeological Resource Sensitivity

Review of historic aerial photographs and aerial maps indicate that the project area (100 and 200 Caribbean Drive) were developed as agricultural land by 1948. Agricultural development with tractors and other equipment can often destroy archaeological resources to a shallow depth of only 6 inches. However, after the agricultural development, Moffett Naval Air Station was established by 1956 in the project vicinity, though not within the project area. At that time, some agricultural fields became air strips and others remained agricultural with more intensive agricultural efforts, including green houses. By 1980, the buildings that currently stand within the project area were erected. This current commercial and industrial development would have likely destroyed any archaeological materials that would have been present. Therefore, this project area has low sensitivity for encountering intanct archaeological resources.

Field Survey

SWCA conducted a built environment survey of the project area on February 22, 2019. As a result of this survey, SWCA updated recordation of one previously recorded site: Sunnyvale West Channel (Figure 5 and Figure 5).

Following fieldwork, SWCA formally recorded the Sunnyvale West Channel on DPR Series 523 forms, including primary record, location map, linear feature record, and sketch map forms. The completed DPR Series 523 forms can be found in Confidential Appendix B. The DPR forms for the Sunnyvale West Channel will be submitted to the NWIC, which will issue a primary number.

Sunnyvale West Channel

The segment of the Sunnyvale West Channel within the project area is approximately 1,150 feet long, running in a straight line between the point it intersects with West Caribbean Drive to the north and the point it intersects with a line projecting west from the southern edge of Caspian Court to the south. The channel is approximately 35 feet wide at the top, with the bottom flow of water varying in width. As described by Horizon Water and Environment, LLC in their 2013 *Sunnyvale East and West Channels Flood Protection Project, Draft Environmental Impact Report* (*EIR*), "The Sunnyvale East and West Channels are engineered water conveyance channels that collect and transport stormwater runoff from urban areas in the cities of Sunnyvale and Cupertino to the southern portion of the San Francisco Bay. The Sunnyvale East and West Channels are primarily open-water channel features, with subsurface culverts at road crossings in several locations" (Horizon Water and Environment, LLC 2013:2-1). The Sunnyvale West Channel watershed drains 7.5 square miles into the San Francisco Bay by way of the Guadalupe Slough (Oakland Museum of California [OMCA] n.d. and SCVWD 2019).

Figure 4. Caribbean Campus Project results with Sunnyvale West Channel in green.

HISTORY

The Sunnyvale East and West Channels result from early twentieth-century issues with flooding due to land uses. Horizon Water and Environment, LLC's 2013 EIR for the Sunnyvale East and West Channels Flood Protection Project discusses the early historical context that precipitated the development of the channels.

> Unlike many of the flood control channels in Santa Clara County, where engineered systems replaced a historic creek alignment, the Sunnyvale East and West Channels (Sunnyvale Channels) are not located in the vicinity of a historic creek. Between the early 1900s and 1950s, land surface subsidence caused by groundwater extraction from artesian wells and groundwater pumping altered the area's drainage. Consequently, runoff from portions of the watershed that would have drained to Stevens Creek or Calabazas Creek became isolated and ponded, and caused flooding (Horizon Water and Environment, LLC 2013:2-1).

The document further explains:

> Floods caused damage in Sunnyvale in 1940, 1942, and 1943. A flood around Christmas in 1955 damaged thousands of homes, leaving residents homeless (SCVWD 2012). In response to this flooding, the SCVWD constructed the Sunnyvale Channels between 1959 and 1976. The channels were designed with a capacity to convey runoff from the 10-year storm event. Since construction of the channels, the Project Area experienced flooding during major storm events in 1963, 1968, 1983, 1986, and 1998 (Horizon Water and Environment, LLC 2013:3.4-10).

The Sunnyvale East and West Channels were constructed in 1959 and 1964, respectively, by the Santa Clara Valley Water District "to alleviate the storm drain systems of Sunnyvale and Cupertino during a 10-year storm by directing the overflow through the channels to San Francisco Bay" (SCVWD 2019). The EIR confirmed *"*[the West Channel north of Hwy 101] was confirmed as being over 50 years of age and the portion south of 101 as being less than 50 years of age, by a qualified Architectural Historian" (Horizon Water and Environment, LLC 2013:3.4). A 1963 aerial image of the project area reveals the West Channel within the area was complete by 1963. Aerial images further reveal that development within the project area largely occurred between 1974 and 1979.

EVALUATION

NRHP and CRHR

As part of the Horizon Water and Environment, LLC 2013 EIR for the Sunnyvale East and West Channels Flood Protection Project, the Sunnyvale East and West Channels were evaluated for eligibility under federal and state criteria of significance. Best industry practices uphold evaluations of six years when the resource and it's setting have not visibly changed. Therefore, SWCA did not reevaluate the Sunnyvale West Channel. The EIR's evaluation that follows here, found the Channel was not eligible for listing in the NRHP or the CRHR under any criteria.

> Because a portion of the Channel is over 50 years of age, both the Sunnyvale Channels have been formally evaluated for their historic significance and were not found to be historic resources for the purposes of Section 106 of the NHPA or CEQA. The Sunnyvale Channels do not appear to be eligible for listing individually or as part of a historic district in the NRHP or CRHR. The Sunnyvale Channels are not associated with any events important in national, regional, or local history and do not appear eligible for

listing in the NRHP under Criterion A, or the CRHR under Criterion 1. They are not associated with any persons important in national, regional or local history and do not appear eligible for listing in the NRHP under Criterion B or the CRHR under Criterion 2. The channels do not embody a distinctive characteristic of its type, are not the works of a master architect or builder, and do not possess high artistic value; therefore, they do not appear eligible for listing in the NRHP under Criterion C or the CRHR under Criterion 3. The Channels are not likely to yield information important to pre-history or history, and do not appear eligible for listing in the NRHP under Criterion D or the CRHR under Criterion 4 (Horizon Water and Environment, LLC 2013:3.4-14).

Sunnyvale Heritage Resource

Based on the findings and evaluation of the 2013 EIR, the Sunnyvale West Channel is not eligible for designation as a Sunnyvale heritage resource. Sunnyvale criteria for designation provide for a resource to either meet the criteria of the NRHP or one of its ten (10) criteria (Criteria A-J) that re-divide and expand upon the established criteria of both the NRHP and the CRHR. The West Channel does not exemplify or reflect special elements of the city's cultural, social, economic, political, aesthetic, engineering, architectural, natural history (Criteria A), nor is it associated with persons or events significant to local, state, or national history (Criteria B). The Channel does not embody distinctive characteristics of a style, type, period, or method of construction, or a valuable example of the use of indigenous materials or craftsmanship (Criteria C). The Channel is not the work of a master (Criteria D). It does not contribute to the significance of an historic area (Criteria E), nor does it possess a unique location or constitute a singular physical characteristic, view or vista (Criteria F). The Channel does represent an architectural or engineering achievement (Criteria G). It is not similar to other distinctive properties (Criteria H) nor does it reflect significant geographical patterns (Criteria I). Lastly, the Channel is not the last few remaining drainage channels (Criteria J).

Figure 5. Sunnyvale West Channel overview.

RECOMMENDATIONS

In 2013 Horizon Water and Environment, LLC evaluated the Sunnyvale West Channel located within the project area for eligibility for listing in the NRHP and CRHR, and recommended it not eligible for either register under any criterion. Based on the findings and evaluation of Horizon Water and Environment, LLC, SWCA evaluated the Channel under local Sunnyvale criteria and recommend it is not eligible locally. Because the previous evaluation was completed within the last six years, SWCA did not re-evaluate the channel, but concurs with the existing evaluation. Therefore, no known historical resources would be affected by the proposed project.

Unanticipated Discovery of Archaeological Resources

However unlikely, if archaeological resources are exposed during construction, work in the immediate vicinity of the find must stop until a qualified archaeologist can evaluate the significance of the find. Construction activities may continue in other areas. If the discovery proves significant under CEQA (Section 15064.5[f]; PRC 21082), additional work such as testing or data recovery may be warranted.

Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground disturbances; CHSC Section 7050.5 states that no further disturbance shall occur until the Santa Clara County Coroner has made a determination of origin and disposition pursuant to PRC Section 5097.98. The Santa Clara County Coroner must be notified of the find immediately. If the human remains are determined to be prehistoric, the Coroner will notify the NAHC, which will determine and notify a Most Likely Descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

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CONFIDENTIAL APPENDIX A:

NAHC SLF Results

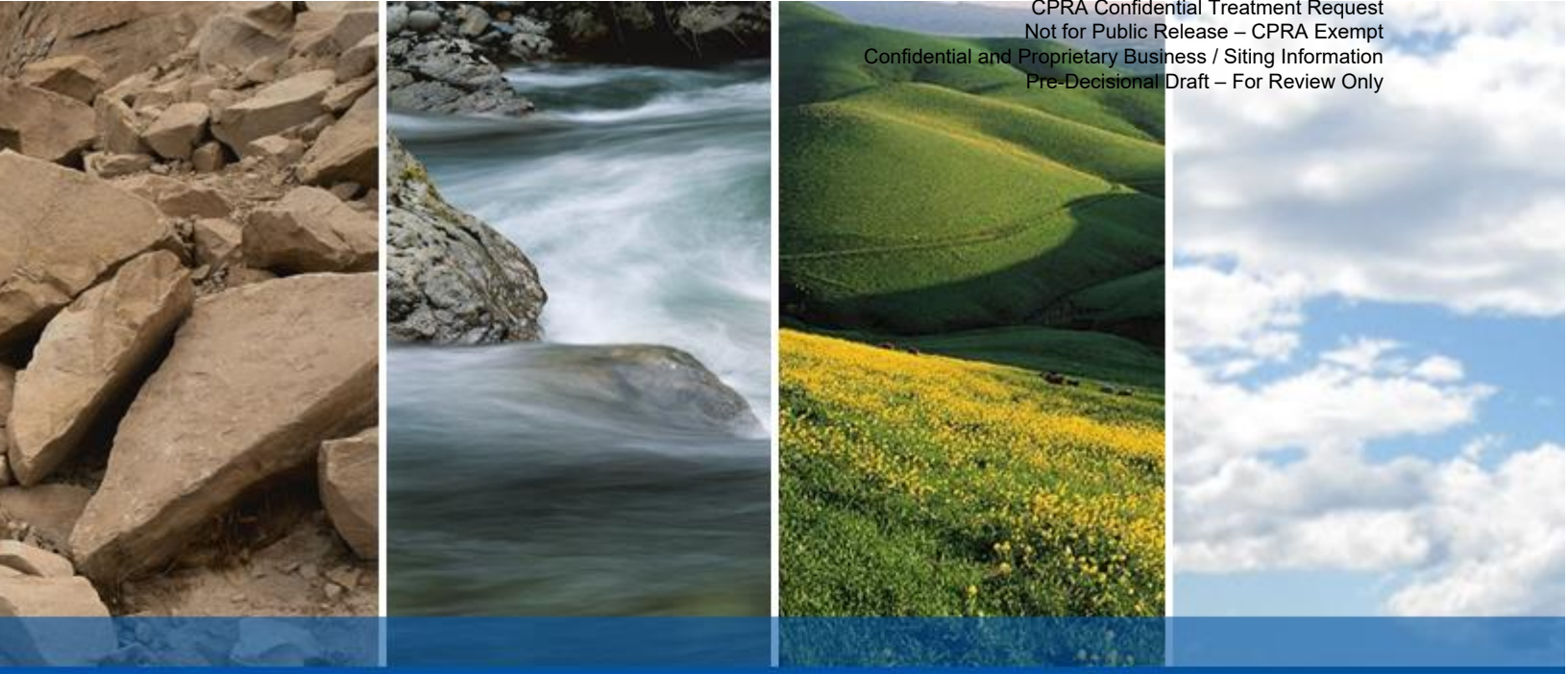
CONFIDENTIAL APPENDIX B:

DPR Forms

Appendix G-1

Preliminary Geotechnical Report

CPRA Confidential Treatment Request
Not for Public Release – CPRA Exempt
Confidential and Proprietary Business / Siting Information
Pre-Decisional Draft – For Review Only



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CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PRELIMINARY GEOTECHNICAL REPORT

Submitted to
Google, Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043

Prepared by
ENGEO Incorporated

February 5, 2018

Project No.
14505.000.000

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Expect Excellence

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
14505.000.000

February 5, 2018

Mr. Peter McDonnell
Google, Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043

Subject: Caribbean 100
Sunnyvale, California

PRELIMINARY GEOTECHNICAL REPORT

Dear Mr. McDonnell:

We are pleased to present this Preliminary Geotechnical Report for the proposed Caribbean 100 project located in Sunnyvale, California. This report presents our geotechnical observations, as well as our preliminary conclusions and recommendations for the project. We also provide preliminary site grading, drainage, and foundation recommendations for use during land planning.

Based upon our initial assessment, the site is suitable for the planned development from a geotechnical standpoint provided the conclusions and preliminary recommendations presented in this report are incorporated into preliminary design. A design-level study is currently in-progress to assess the identified geotechnical concerns.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

David Teague, EIT, PhD

Jeanine Ruffoni, PE

Yan Lap Janet Kan, GE, CEG

Jeff Fippin, GE

dt/jr/jk/jf/jf

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this preliminary geotechnical report for the Caribbean 100 project is to provide an assessment of potential geotechnical concerns associated with the use of the site for the proposed campus development. We performed the following tasks:

- Review available literature and geologic maps.
- Review available geotechnical explorations and geophysical data.
- Perform subsurface field exploration.
- Analyze preliminary data.
- Provide preliminary recommendations.

For our use, we received the following:

1. Caribbean 100 Concept Design dated December 21, 2017.
2. Topographic survey prepared by Kier & Wright Civil Engineers and Surveyors, Inc. dated August 2017.
3. L400 Grading Plan prepared by Olin Partnership LTD dated December 22, 2017.
4. Utility Plans prepared by BESS Utility Solutions dated November 1, 2017.

This report was prepared for the exclusive use of our client and its consultants for design of this project. In the event that any changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

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1.2 SITE LOCATION AND DESCRIPTION

The site is located in Sunnyvale, California approximately ¼ mile south of the San Francisco Bay and is bounded by West Caribbean Drive to the north, the Sunnyvale West Channel operated by the Santa Clara Valley Water District to the west, Caspian Court to the south, and Borregas Avenue to the east as shown in our Vicinity Map (Figure 1). The site is approximately 17.2 acres in area and is currently occupied by five office structures along with surface parking. The Site Plan (Figure 2) shows site boundaries and approximate locations of our explorations.

The Sunnyvale West Channel bounds the western edge of the site. This man-made channel extends approximately 3 miles from the San Francisco Bay and drains a watershed of approximately 7.6 square miles (Horizon Water and Environment, 2013). The channel is protected by a system of earthen embankment/levees with a crest at approximately Elevation 11 to 12 feet (NAVD88), which is approximately 5 to 6 feet above the existing ground surface. The water surface elevation associated with the 100-year flood is approximately 12.4 feet (Horizon Water and Environment, LLC, 2013). It should be noted that the site is located in flood zone “AE” and subject to inundation by the 100-year flood; the terminology “100-year flood” refers to a flood event that has approximately a 1 percent chance of being equaled or exceeded in a given year.

1.3 PROPOSED DEVELOPMENT

Based on our discussions with the project team and review of the information provided, we understand the following site improvements are proposed:

1. A five-story, approximately 540,000-square-foot office structure.
2. Planned fill up to 7 feet high.
3. Paved streets, parking, and drive lanes.
4. Utilities and other infrastructure improvements.
5. Landscaping and landscape structures, including on top of the building roof.

1.4 AVAILABLE GEOTECHNICAL INFORMATION

BSK Associates (BSK) performed a preliminary geotechnical investigation for the Caribbean 200 project located immediately adjacent to the west of this site. Their field exploration involved drilling three exploratory borings (B-1 through B-3) and performing three CPTs (CPT-1 through CPT-3). The borings were drilled to depths ranging from 41½ to 50 feet and all CPTs were advanced to approximately 75 feet below existing ground surface (bgs).

Additionally, we performed six cone penetration tests (CPTs), designated 1-CPT01 through 1-CPT06, at the adjacent Caribbean 200 project. We show the locations of the subsurface explorations within the subject site as well as the adjacent Caribbean 200 project on the Site Plan (Figure 2).

2.0 FINDINGS

2.1 SITE HISTORY

We reviewed historic aerial photographs of the site (www.historicalaerials.com) from dates ranging from 1948 to present. Topographic maps suggest that the site may have been used for agricultural purposes prior to being developed in the late 1900s. Currently, the project site encompasses five commercial structures as well as surface parking.

2.2 REGIONAL AND SITE GEOLOGY

The site is located at the northwestern end of the Santa Clara Valley in the Coast Ranges geomorphic province of California. The Coast Ranges are dominated by a series of northwest-trending ridges and valleys formed by faulting and folding of the earth's crust. The Santa Clara Valley region lies to the east of the San Andreas Fault and to the west of the Hayward and Calaveras Faults.

Geologic mapping prepared by Brabb et al. (2000) (Figure 3) indicates that the northern portion of the site is underlain by Holocene-age basin deposits (Qhbs) consisting primarily of very fine silty clay to clay deposits and the southern portion of the site is underlain by Holocene-age basin deposits (Qhb) consisting of very fine silty clay to clay deposits occupying flat-floored basins at the distal edge of alluvial fans adjacent to bay mud. These deposits are known to contain unconsolidated, locally organic, plastic silt and silty clay. Additionally, carbonate nodules and iron-stained mottling may be present in some locations.

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2.3 SEISMICITY

Numerous small earthquakes occur every year in the San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of active faults and significant historic earthquakes recorded within the San Francisco Bay Region. The Sunnyvale area contains numerous active earthquake faults. The nearest active faults are the Monte Vista-Shannon, Hayward-Rogers Creek, Northern San Andreas, and Calaveras faults, which are capable of producing earthquakes with moment magnitudes of 6.5, 7.3, 8.1, and 7.0, respectively. Other active faults within 30 miles of the site are summarized in the table below. An active fault is defined by the State Mining and Geology Board as one that has had surface displacement within Holocene time (about the last 11,000 years) (Bryant and Hart, 2007).

TABLE 2.3-1: Seismic Sources Within 30 Miles of the Site

SOURCE	CLOSEST DISTANCE (Miles)	MOMENT MAGNITUDE (M_W)	FAULT MECHANISM	SITE LIES
Monte Vista-Shannon	7.4	6.5	Reverse	Northeast
Hayward-Rodgers Creek	8.9	7.3	Strike Slip	Southwest
Northern San Andreas	10.3	8.1	Strike Slip	Northeast
Calaveras	11.7	7.0	Strike Slip	West
San Gregorio Connected	22.3	7.5	Strike Slip	East
Zayante-Vergeles	22.7	7.0	Strike Slip	North
Mount Diablo Thrust	24.7	6.7	Reverse	Southwest
Greenville Connected	25.9	7.0	Strike Slip	Southwest
San Andreas Creeping Section Gridded	27.9	6.0	Strike Slip	Northwest
Great Valley 7	29.6	6.9	Reverse	Southwest

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The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site; as such, the risk of fault rupture through the site is considered low.

2.4 FIELD EXPLORATION

Our field exploration included advancing six CPTs, designated 1-CPT07 through 1-CPT12, at various locations on the site. We performed our field exploration on December 14 and 15, 2017. We located the CPTs and estimated elevations using a handheld GPS device; they should be considered accurate to the degree implied by the method used. The locations of the explorations are shown in Figure 2.

We retained the services of a contractor with a CPT rig to perform CPTs in general accordance with ASTM D-5778. Measurements include the tip resistance to penetration of the cone (Qc), the resistance of the surface sleeve (Fs), and pore pressure (U) (Robertson and Campanella, 1988). The CPT logs are presented in Appendix A.

We performed a design-level exploration consisting of seven borings between December 7, 2017, and January 5, 2018. Samples collected from the design-level exploration are currently being

tested and findings will be included in a design-level geotechnical exploration report to be published at a later date.

2.5 SURFACE AND SUBSURFACE CONDITIONS

We anticipate up to 12 inches of combined asphalt and aggregate base at the paved areas of the site. Although the CPT probes do not provide soil samples for visual classification and testing, material type and properties can be inferred from CPT data. Based on the CPT results, we anticipate medium stiff to stiff sandy clay and silt interlayered with medium dense to dense clayey sand to a depth of approximately 40 feet. Between 40 and 95 feet, we anticipate medium stiff to very stiff clay. Several CPTs suggest a transition to a sandier material at approximately 95 to 100 feet. We terminated all the CPTs at a depth of approximately 100 feet.

2.6 GROUNDWATER CONDITIONS

Based on the site location, we anticipate shallow groundwater. The pore pressure dissipation tests performed in our CPTs suggest that the groundwater level is approximately 3½ to 7½ feet bgs, which corresponds to elevations ranging from approximately -3½ to 1½ feet (refer to Table 2.6-1 below). Plate 1.2 of the Seismic Hazard Zone Report for the Mountain View Quadrangle (2006) maps the highest historical groundwater within the site vicinity approximately less than 5 feet below the ground surface. For the purpose of preliminary analyses and recommendations, we consider a design groundwater depth of 3½ feet appropriate.

TABLE 2.6-1: Recorded Groundwater Levels (at Time of Exploration)

CPT	GROUNDWATER DEPTH (FEET BGS)	GROUNDWATER ELEVATION (NAVD 88, FEET)
1-CPT01	8.5	-3.5
1-CPT02	5.5	-0.5
1-CPT03	5.5	-0.5
1-CPT04	8.5	-3.5
1-CPT05	7.0	-2.0
1-CPT06	7.7	-1.7
1-CPT07	6.7	-1.7
1-CPT08	7.0	-2.0
1-CPT09	7.2	-2.2
1-CPT10	3.7	1.3
1-CPT11	4.0	1.0
1-CPT12	7.3	-2.3

Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made. Excavations for utility installation may encounter groundwater, depending upon the time of year of construction.

3.0 DISCUSSION AND PRELIMINARY CONCLUSIONS

Based on this preliminary study, the project site is feasible for the proposed development provided the preliminary recommendations contained in this report and future design-level geotechnical studies are incorporated into the design plans.

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The primary geotechnical concerns for the proposed site redevelopment include:

- The presence of non-engineered fill.
- The presence of potentially expansive near-surface soil.
- The presence of compressible soil susceptible to consolidation settlement.
- The presence of soil susceptible to liquefaction and/or cyclic softening and associated settlement.
- The presence of shallow groundwater.

We summarize our preliminary conclusions and recommendations below.

3.1 EXISTING FILL

In general, we could not determine the presence of fill due to our exploration type; however, minor fill likely exists associated with the existing structures and prior site development. The presence of existing fill can lead to differential foundation movement due to the unknown density of the fill and due to differences in material properties for structures that span from the fill to native materials. Mitigation can include removal and recompaction of the fill.

3.2 POTENTIALLY EXPANSIVE SOIL

The CPT data indicate clayey near-surface soil. Some of these materials may exhibit a high shrink/swell potential and could potentially change in volume with changes in moisture. Such soil can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. The shrink/swell potential of near-surface soil will be assessed with additional laboratory testing during the design-level study.

Successful performance of structures on expansive soil requires special attention during construction. It is imperative that exposed soil be kept moist prior to placement of concrete for foundation construction. It can be difficult to remoisturize clayey soil without excavation, moisture conditioning, and recompaction. We also provide specific grading recommendations for compaction of clay soil at the site. The purpose of these recommendations is to reduce the swell potential of the clay by compacting the soil at a high moisture content and controlling the amount of compaction.

3.3 STATIC CONSOLIDATION SETTLEMENT

Our explorations did not encounter highly compressible clay layers. Provided that the maximum allowable bearing pressure is not exceeded, we expect total consolidation settlements to be 1 inch or less. We expect differential consolidation settlement on the order of approximately half of the total settlement over a distance of 30 feet. We are currently performing consolidation testing on relatively undistributed samples recovered from our design-level boring exploration. We will consider the results of this testing in the design-level geotechnical report.

3.4 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, and liquefaction. The following sections present a discussion of these hazards as they apply to the site. Based on

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topographic and lithologic data, the risk of regional subsidence or uplift, lurching, landslides, tsunamis, or seiches is considered low to negligible at the site.

3.4.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, ground rupture is unlikely at the subject property.

3.4.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the ground shaking effects, all structures should be designed using sound engineering judgment and the latest California Building Code (CBC) requirements as a minimum. We provide appropriate 2016 CBC Seismic Design Parameters below in a subsequent section of this report.

Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

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3.4.3 Liquefaction / Cyclic Softening

The site is located within a State of California Seismic Hazard Zone (CGS, 2006) for areas that may be susceptible to liquefaction (Figure 5).

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded fine sand below the groundwater table. Empirical evidence indicates that loose silty sand is also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop. If excess hydrostatic pressures exceed the effective confining stress from the overlying soil, the sand may undergo deformation. If the sand undergoes virtually unlimited deformation without developing significant resistance, it is said to have liquefied, and if the sand consolidates or vents to the surface during and following liquefaction, ground settlement and surface deformation may occur.

In addition to liquefaction of sandy materials, clayey soil can also undergo “cyclic softening” or strength loss as a result of cyclic loading. Since the site is composed of many thick clay layers, it is also important to consider potential cyclic softening.

We performed a liquefaction potential analysis of the CPTs to estimate liquefaction potential using the computer software CLiq Version 1.7 developed by GeoLogismiki. The software incorporates the procedure introduced by the 1996 National Center for Earthquake Engineering Research

(NCEER) workshop and the 1998 NCEER/National Science Foundation (NSF) workshop. The workshops are summarized by Youd et al. (2001) and updated by Robertson (2009). This software also incorporates the method introduced by Idriss and Boulanger (2008) and updated by Boulanger and Idriss (2014). We estimated the Cyclic Stress Ratio (CSR) for a Peak Ground Acceleration (PGA_M) value of 0.50g as outlined in the latest building code with an earthquake magnitude of 8.1. We used a groundwater depth of 3½ feet for this analysis.

We performed our analysis of liquefaction and cyclic-softening analyses using the Robertson (2009) and Boulanger and Idriss (2014) methods. Both methods have a means of accounting for cyclic softening of clay. Interestingly, the results of these two procedures vary. The Robertson (2009) method predicts 4 to 6 inches of seismically induced settlement, which results primarily from cyclic softening in clay materials at depths below 30 feet. Conversely, the Boulanger and Idriss (2014) method estimates approximately 1½ to 3 inches of seismically induced settlement resulting from liquefaction of sand materials at depths above 30 feet. The Boulanger and Idriss (2014) method typically considers soil layers with a soil behavior type index (Ic) less than 2.6 to be “sandy” and greater than 2.6 to be “clayey”. It is important to note that many of the soils in the upper 30 to 40 feet have Ic values in the range of 2.5 to 2.8 and are thus at the boundary of sandy and clayey. If the Ic cutoff is marginally increased to 2.7, seismically induced settlements increase to 4 to 6 inches, primarily in the upper 30 feet.

In order to address the disparity between the two liquefaction analyses, additional geotechnical laboratory testing should be performed. The plasticity, water content, and fines content of the soil should be assessed. This will allow for refinement of the liquefaction settlements estimated from the Boulanger and Idriss (2014) method. Additionally, shear strength and consolidation testing should be performed on the clayey materials below 30 feet to refine the cyclic softening estimates obtained from the Robertson (2009) method. For preliminary purposes, we recommend considering that up to 6 inches of seismically induced settlement is possible.

We provide the results of our calculations in Appendices B and C, with our estimate of post-earthquake settlements. The analysis sheets in Appendices B and C summarize the CPT tip resistance, computed factor of safety, volumetric strain, and resulting settlement as a function of depth for each CPT. The plots directly show which soil layers liquefy and which do not. They also relate soil behavior type zones that may contribute to site settlement, as well as the relative contribution of each zone, and the distribution of settlements with depth.

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3.4.4 Treatment of Potentially Liquefiable Soil

As discussed above, liquefaction-induced settlements may range between approximately 1½ to 6 inches. The higher end of this range of settlement would be unsuitable for performance of the planned building if unmitigated. While other options exist, on a preliminary basis, we estimate that founding the building on a shallow foundation system in conjunction with ground improvement will likely be the most efficient means of achieving appropriate levels of seismic foundation performance. We provide preliminary ground improvement considerations in Section 5.1.3 of this report.

Alternatively, the building can be supported on a deep foundation system without mitigating the potentially liquefiable soil. Deep foundation design should consider downdrag contributions of the potentially liquefiable soil.

3.4.5 Lateral Spreading

Lateral spreading is a failure within a nearly horizontal soil zone (possibly due to liquefaction) that causes the overlying soil mass to move toward a free face or down a gentle slope. Minor movements in the direction of the Sunnyvale West Creek are possible. However, based on our observations of the relatively flat site topography, the potential for significant lateral spreading is low to negligible. However, the embankment adjacent to the Sunnyvale West Creek could potentially undergo deformations as a result of strong ground shaking. Detailed geologic assessment and stability analyses of the embankment were outside the scope of services for this study.

3.4.6 Flooding

Federal Emergency Management Agency (FEMA) Flood Map Number 06085C0045H (https://msc.fema.gov/portal) indicates that the site is within a special flood hazard area subject to inundation by the 1 percent annual chance flood. The Civil Engineer should review pertinent information relating to possible flood levels for the subject site based on final pad elevations and provide appropriate design measures for development of the project.

3.5 2016 CBC SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions at the site, including liquefiable soils, we characterized the site as Site Class F in accordance with the 2016 CBC. However, if liquefaction potential is mitigated as part of the site development, the site can be reclassified as a Site Class D.

We provide the 2016 CBC seismic design parameters in the table below, which includes design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters.

Site-specific ground response seismic hazard analyses will be performed as part of design-level studies depending on results of more rigorous liquefaction susceptibility screening.

TABLE 3.5-1: 2016 CBC Seismic Design Parameters
Latitude: 37.41567 and Longitude: -122.01824

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.50
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.60
Site Coefficient, F_A	1.0
Site Coefficient, F_V	1.5
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.50
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	0.90
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.00
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	0.60
Mapped MCE Geometric Mean Peak Ground Acceleration (g)	0.50
Site Coefficient, F_{PGA}	1.00
MCE Geometric Mean Peak Ground Acceleration, PGA_M (g)	0.50
Long period transition-period, T_L	12 sec

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3.6 GROUNDWATER

Groundwater may impact any excavation below the design groundwater level depth of 3½ feet, (Elevation 1½ feet). Where the planned bottom of the excavations or trenches extend below the groundwater level, the following should be considered.

1. Construction dewatering.
2. Unstable conditions at the base of excavation requiring stabilization prior to foundation construction.
3. Transmission of moisture vapor through slabs causing excessive mold/mildew build-up, fogging of windows, damage to computers and sensitive floor coverings.

3.7 SOIL CORROSION POTENTIAL

As part of the design-level study, we will send representative soil samples obtained from our borings to a California State certified analytical lab for determination of redox potential, pH, resistivity, sulfate, and chloride. These tests will provide an indication of the corrosion potential of the soil on buried concrete structures and metal pipes.

4.0 PRELIMINARY EARTHWORK RECOMMENDATIONS

The following recommendations are for initial land planning and preliminary estimating purposes. Final recommendations regarding site grading and foundation construction will be provided after the additional site-specific exploration has been completed.

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4.1 DEMOLITION AND STRIPPING

Grading operations should be observed and tested by our qualified field representative. We should be notified a minimum of three days prior to grading in order to coordinate its schedule with the grading contractor.

Site development should commence with the removal of structures, foundations, and buried structures, including abandoned utilities and septic tanks and their leach fields, if any exist. All debris and soft compressible soils should be removed from any location to be graded, from areas to receive fill or structures, or those areas to serve as borrow. The depth of removal of such materials should be determined by our representative in the field at the time of grading.

Existing vegetation should be removed from areas to receive fill or improvements, or those areas to serve for borrow. Tree roots should be removed down to a depth of at least 3 feet below existing grade. Any topsoil that will be retained for future use in landscape areas should be stockpiled in areas where it will not interfere with grading operations. All excavations from demolition below design grades should be cleaned to a firm undisturbed native soil surface determined by our representative. This surface should then be scarified, moisture conditioned, and backfilled with compacted engineered fill. All backfill materials should be placed and compacted as engineered fill according to the recommendations in a subsequent section.

Materials and debris should be removed from the project site. With the exception of construction debris (wood, brick, asphalt, concrete, metal, etc.), organically contaminated materials (soil which contains more than 3 percent organic content by weight), and environmentally impacted soils (if

any), it is possible that the upper 10 feet of subsurface material is suitable for use as engineered fill.

4.2 EXISTING FILL

As stated previously, existing fill should be anticipated at the site due to existing development conditions. Existing fill is considered non-engineered and should be subexcavated to expose underlying firm native soil that are approved by our representative. If in a fill area, the base of the subexcavations should be processed, moisture conditioned (as needed) and compacted in accordance with the recommendations for engineered fill.

4.3 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Wet soil can make proper compaction difficult or impossible. Wet soil conditions can be mitigated by:

1. Frequent spreading and mixing during warm dry weather.
2. Mixing with drier materials.
3. Mixing with a lime, lime-flyash, or cement product; or
4. Stabilizing with aggregate, geotextile stabilization fabric, or both.

We should evaluate Options 3 and 4 prior to implementation.

4.4 ACCEPTABLE FILL

Onsite soil material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension.

Imported fill materials should meet the above requirements and have a plasticity index less than 12 and at least 20 percent passing the No. 200 sieve. Allow us to sample and test proposed imported fill materials at least 5 days prior to delivery to the site.

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4.5 REUSE OF ONSITE RECYCLED MATERIALS

If desired, the existing asphalt concrete and aggregate can be considered for use as recycled aggregate to replace some of the import aggregate base for pavements as well as for structural fill. The material will need to be broken down, but not pulverized, to have a maximum particle size less than 6 inches if used for fill and should conform to the gradations of aggregate base if used to substitute for roadway base.

4.6 FILL COMPACTION

4.6.1 Grading in Structural Areas

When using the expansive, onsite soil as fill material, perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade the contractor should:

1. Scarify to a depth of at least 8 inches.

2. Moisture condition soil to at least 4 percentage points over the optimum moisture content; **and**

3. Compact the soil to between 87 and 92 percent relative compaction. Compact the upper 6 inches of finish pavement subgrade to at least 90 percent relative compaction prior to aggregate base placement.

After the subgrade has been compacted, the contractor should place and compact acceptable fill as follows:

1. Spread fill in loose lifts that do not exceed 8 inches.

2. Moisture condition lifts to at least 4 percentage points over the optimum moisture content; **and**

3. Compact fill to between 87 and 92 percent relative compaction; compact the upper 6 inches of fill in pavement areas to at least 90 percent relative compaction prior to aggregate base placement.

Where lime treatment of the soil is used to mitigate expansive soil conditions, we recommend uniformly mixing the subgrade soil with 4 percent high calcium lime by dry weight. The soil should be moisture conditioned to at least 3 percentage points above the optimum moisture content before mixing. The mixing should be performed in accordance with the current version of Caltrans Standard Specifications with the following exceptions:

1. Following mixing, the treated soils should be allowed to fully hydrate prior to compaction.

2. Following hydration, the treated soil should be compacted according to ASTM D-1557 to not less than 95 percent relative compaction at a moisture content at least 2 percentage points above the optimum to a non-yielding surface.

If importing non- or low-expansive fill material, perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade, the contractor should:

1. Scarify to a depth of at least 8 inches.

2. Moisture condition soil to at least 2 percentage point above the optimum moisture content; **and**

3. Compact the subgrade to at least 90 percent relative compaction. Compact the upper 6 inches of finish pavement subgrade to at least 95 percent relative compaction prior to aggregate base placement.

After the subgrade soil has been compacted, the contractor should place and compact acceptable fill as follows:

1. Spread fill in loose lifts that do not exceed 8 inches.

2. Moisture condition lifts to at least 2 percentage point above the optimum moisture content; **and**

3. Compact fill to a minimum of 90 percent relative compaction; Compact the upper 6 inches of fill in pavement areas to 95 percent relative compaction prior to aggregate base placement.

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The contractor should compact the pavement Caltrans Class 2 Aggregate Base section to at least 95 percent relative compaction (ASTM D1557). Moisture condition aggregate base to or slightly above the optimum moisture content prior to compaction.

4.6.2 Underground Utility Backfill

The contractor is responsible for conducting trenching and shoring in accordance with CALOSHA requirements. Project consultants involved in utility design should specify pipe-bedding materials.

Utility trench backfill should conform to the recommendations in Section 4.6.1.

Where utility trenches cross underneath buildings, we recommend that a plug be placed within the trench backfill to help prevent the normally granular bedding materials from acting as a conduit for water to enter beneath the building. The plug should be constructed using a sand cement slurry (minimum 28-day compressive strength of 500 psi) or relatively impermeable native soil for pipe bedding and backfill. We recommend that the plug extend for a distance of at least 3 feet in each direction from the point where the utility enters the building perimeter.

Jetting of backfill is not an acceptable means of compaction. We may allow thicker loose lift thicknesses based on acceptable density test results, where increased effort is applied to rocky fill, or for the first lift of fill over pipe bedding.

4.7 SLOPE GRADIENTS

Final slope gradients should be compacted to 2:1 (horizontal:vertical) or flatter. The contractor is responsible to construct temporary construction slopes in accordance with CALOSHA requirements.

4.8 STORMWATER BIORETENTION AREAS

If bioretention areas are implemented, we recommend that, when practical, they be planned a minimum of 5 feet away from property lines and structural site improvements, such as buildings, streets, retaining walls, and sidewalks/driveways. When this is not practical, bioretention areas located within 5 feet of structural site improvements can either:

1. Be constructed with structural side walls capable of withstanding the loads from the adjacent improvements, or

2. Incorporate filter material compacted to between 85 and 90 percent relative compaction (ASTM D1557, latest edition) and a waterproofing system designed to reduce the potential for moisture transmission into the subgrade soil beneath the adjacent improvement.

In addition, site improvements located adjacent to bioretention areas that are underlain by base rock, sand, or other imported granular materials, should be designed with a deepened edge that extends to the bottom of the imported material underlying the improvement.

Where adjacent site improvements include buildings greater than three stories, streets steeper than 3 percent, or design elements that will experience lateral loads (such as from impact or traffic), additional design considerations may be required. In addition, although not recommended, if trees are to be planted within bioretention areas, HDPE Tree Boxes that extend below the bottom of the bioretention system should be installed to reduce potential impact to subdrain

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systems that may be part of the bioretention area design. For this condition, the waterproofing system should be connected to the HPDE Tree Box with a waterproof seal.

Given the nature of bioretention systems and possible proximity to improvements, we recommend that we be retained to review design plans and provide testing and observation services during the installation of linings, compaction of the filter material, and connection of designed drains.

It should be noted that the contractor is responsible for conducting all excavation and shoring in a manner that does not cause damage to adjacent improvements during construction and future maintenance of the bioretention areas. As with any excavation adjacent to improvements, the contractor should minimize the exposure time such that the improvements are not detrimentally impacted.

5.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

The main considerations in foundation design for this project are the potentially expansive near-surface soils and the potential for seismically induced settlements. We developed preliminary foundation recommendations using data obtained from our CPT field exploration and engineering analysis.

The following recommended foundation options address the effects of the near-surface expansive soil and differential soil movement:

1. Structural mat foundation in conjunction with ground improvement.
2. Shallow footings with slabs-on-grade in conjunction with ground improvement.
3. Deep foundation system such as auger-cast piles.

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5.1 SHALLOW FOUNDATIONS WITH GROUND IMPROVEMENT

Considering the degree of estimated seismically induced settlement, it is our opinion the proposed building can be supported by a shallow foundation in conjunction with ground improvement.

We recommend shallow foundation design consider an allowance for ½ inch of total seismically induced settlement after ground improvement is implemented and an allowance for 1 inch of total consolidation settlement. We preliminarily anticipate differential settlements approximately half of the total settlement when ground improvement elements are constructed through the liquefiable soil.

5.1.1 Structural Mat Foundation

The structure may be supported on a rigid mat foundation over improved ground. The thickness of the mat will be driven by the structural design. With consideration of ground improvement, the mat may be preliminarily designed for a maximum bearing pressure of 4,000 pounds per square foot (psf) for dead-plus-live loads. This allowable bearing pressure may be increased to 5,300 psf in areas of loading concentration. The allowable bearing pressure can be increased by one-third for short-term loading that includes wind or seismic load combinations.

5.1.2 Shallow Footings Combined with Floor Slab-on-Grade

As an alternative to a structural mat foundation system, conventional footings with slab-on-grade floors may be used. We recommend the following minimum footing dimensions.

TABLE 5.1.2-1: Minimum Footing Dimensions

FOOTING TYPE	*MINIMUM DEPTH (INCHES)	MINIMUM WIDTH (INCHES)
Continuous	30	12
Isolated	30	12

* below lowest adjacent pad grade

The minimum footing depths shown above are taken from lowest adjacent pad grade. With consideration of ground improvement, foundations recommended above can be designed for a maximum allowable bearing pressure of 4,000 pounds per square foot for dead-plus-live loads. This bearing capacity can be increased by one-third for the short-term effects of wind or seismic loading. The maximum allowable bearing pressure is a net value; the weight of the footing may be neglected for design purposes. Footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1:1 (horizontal:vertical) plane projected upward from the bottom edge of the trench to the footing.

If a two-pour system is used for footings and slab, the cold joint between the exterior footing and slab-on-grade should be located at least 4 inches above adjacent finish exterior grade. If this is not done, then we recommend the addition of a waterstop between the two pours to reduce moisture penetration through the cold joint and migration under the slab. Use of a monolithic pour would eliminate the need for the waterstop.

The Structural Engineer should design footing reinforcement to support the intended structural loads without excessive settlement. Continuous footings should be reinforced with top and bottom steel to provide structural continuity and to permit spanning of local irregularities. At a minimum, continuous footings should be designed to structurally span a clear distance of 5 feet.

Lateral loads may be resisted by friction along the base and by passive pressure along the sides of foundations. The passive pressure is based on an equivalent fluid pressure in pounds per cubic foot (pcf). We recommend the following allowable values for design:

- Passive Lateral Pressure: 250 pcf
- Coefficient of Friction: 0.30

5.1.3 Ground Improvement Options

Considering the degree of estimated liquefaction-induced settlement at this preliminary stage, the use of either the shallow foundation systems listed above requires ground improvement to achieve appropriate levels of performance. If subsequent testing indicates some of the soil identified as liquefiable based on CPTs only, it may be feasible to eliminate the ground improvement.

Liquefaction mitigation can be accomplished through various means such as by soil-cement mixing, vibratory replacement (stone columns), drilled displacement columns, and rammed aggregate piers (RAPs). For planning purposes, a treatment depth ranging from approximately

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40 to 80 feet below existing ground surface is anticipated to mitigate the impacts of intolerable liquefaction-induced settlement and to provide relatively uniform foundation support.

Ground improvement would only be required within the building pad, leaving a greater amount of settlement within the planned surface parking and landscape areas of the site. The soil above the potentially liquefiable soil is insufficient to resist upward pressure. Accordingly, localized occurrence of sand boils may be expected in unmitigated areas should liquefaction occur. Landscaped and walkway areas may be impacted by these surface expressions. If the design team considers foregoing ground improvement measures in unmitigated areas, maintenance and repairs should be expected in future seismic events to repair improvements such as sidewalks and walkways should sand boils occur.

Soil improvement is typically procured as a design-build element of a project. This allows consideration of individual contractors' proprietary means and methods in selecting the most cost-effective approach that meets specific project performance and quality objectives. Conceptual ground improvement plans should show the extent of the work, coordination with other elements, including foundations, utilities, and project phasing requirements. We can assist in the preparation of a design-build RFP for the ground improvement and should review the design submittal prior to construction. During ground improvement selection, we should be consulted regarding the selection's load-transfer considering the recommended allowable bearing capacity and differential settlement recommendations provided in this report may need to be readdressed.

The selection and design of the ground improvement system should be determined by an experienced ground improvement designer/contractor. Ground improvement recommendations will be provided in the design-level study.

5.2 DEEP FOUNDATIONS

A deep foundation system may be used to support the proposed structure as an alternative to shallow foundations. We understand that the design team would like to consider 18-inch-diameter auger-cast piles. Auger-cast piles, also known as continuous flight auger piles (CFA), are deep foundation elements that are installed by rotating a continuous flight hollow-stem auger into the soil. Concrete or grout is pumped under pressure through the hollow stem as the auger is withdrawn and a reinforcing cage can be installed while the concrete or grout is still in a fluid condition. CFA piles would be used under pile caps that are connected by grade beams. CFA piles will likely be designed and installed by a specialty trade partner to the contractor using proprietary means and methods. The specialty trade partner's design should be verified via full-scale load tests to assess the axial capacity.

For preliminary purposes, we provide the below vertical capacities and downdrag considerations:

TABLE 5.2-1: Preliminary Auger-Cast Pile Design

CONDITION	SKIN FRICTION	
	DEPTH RANGE	ULTIMATE CAPACITY
Static	Upper 10 feet	750 psf
	10 to 30 feet	560 psf
	≥ 30 feet	750 psf
Seismic	Upper 30 feet	52.3 kips liquefaction-induced downdrag
	≥ 30 feet	975 psf

1. All capacities and loads are ultimate values.
2. Depths are relative to the proposed grade considering 7 feet of planned fill.

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Additional geotechnical laboratory testing should be performed in order to refine the above capacities and assess the downdrag concerns.

Other deep foundation systems, such as concrete piles and steel piles are also feasible from a geotechnical engineering standpoint.

6.0 RETAINING WALLS

Unrestrained drained retaining walls constructed on level ground may be designed using an active equivalent fluid pressure of 50 pounds per cubic foot (pcf). Restrained drained site retaining walls should be designed for an equivalent fluid pressure of 70 pcf.

Passive pressure acting on foundations may be calculated using an equivalent fluid pressure of 250 pcf. The upper 1 foot of soil should be excluded from passive pressure computations. The friction factor for sliding resistance may be assumed as 0.30. Retaining walls can be supported on either footings or pile foundations. Please refer to Section 5.1.2 for preliminary footing recommendations. Due to the expansive soil at the site, wall footings should extend to a depth of at least 24 inches. Appropriate safety factors against overturning and sliding should be incorporated into the design calculations.

All walls retaining more than 2 feet of soil should be provided with drainage facilities to prevent the build-up of hydrostatic pressures behind the walls. Wall drainage may be provided using a 4-inch-diameter perforated pipe embedded in either free-draining gravel surrounded by synthetic filter fabric (minimum 6-ounce) or Class 2 permeable material. The width of the drain blanket should be at least 12 inches, and the drain blanket should extend to about 1 foot below the finished grades. The upper 1 foot of wall backfill should consist of compacted site soils. As an alternative, prefabricated synthetic wall drain panels can be used. Drainage should be collected into solid pipes and directed to an outlet approved by the Civil Engineer.

All backfill should be placed in accordance with the recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to reduce possible overstressing of the walls. The foundation details and structural calculations for retaining walls should be submitted for review.

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7.0 SECONDARY SLABS-ON-GRADE

Exterior flatwork includes items such as concrete sidewalks, steps, and outdoor courtyards exposed to foot traffic only. Concrete flatwork should have a minimum thickness of 4 inches and include control and construction joints in accordance with current Portland Cement Association Guidelines.

Exterior slabs should slope away from the building to prevent water from flowing toward the foundations. Site soils should be moistened just prior to concrete placement.

8.0 PRELIMINARY PAVEMENT DESIGN

We prepared preliminary pavement design recommendations based on assumed Traffic Index and subgrade resistance values (R-value). The Traffic Index should be determined by the Civil Engineer or appropriate public agency. The sections provided below should be reviewed and

revised, if applicable, based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading.

8.1 FLEXIBLE PAVEMENTS

We developed the following preliminary pavement sections for parking areas and access streets Traffic Indices of 5 to 9, based on an assumed R-value of 5 and Topic 633 of the Caltrans Highway Design Manual (including the asphalt factor of safety).

TABLE 8.1-1: Recommended Asphalt Concrete Pavement Sections

TRAFFIC INDEX	SECTION	
	ASPHALT CONCRETE (AC) (INCHES)	CLASS 2 AGGREGATE BASE (INCHES)
5	4	7½
6	4	11½
7	4	15½
8	4½	18½
9	5	21½

The civil engineer should determine the appropriate traffic indices based on the estimated traffic loads and frequencies.

We recommend that representative bulk samples of subgrade soil be obtained during rough grading to allow confirmation R-value testing for the design R-value assumed above.

8.2 RIGID PAVEMENTS

Concrete pavement sections can be used to resist heavy loads and turning forces in areas such as fire lanes or trash enclosures. Final design of rigid pavement sections and accompanying reinforcement should be performed based on estimated traffic loads and frequencies. We recommend the following minimum design sections for rigid pavements:

- Use a minimum section of 6 inches of Portland Cement concrete over 6 inches of Caltrans Class 2 Aggregate Base.
- Concrete pavement should have a minimum 28-day compressive strength of 3,500 psi.
- Provide minimum control joint spacing in accordance with Portland Cement Association guidelines.

8.3 PAVEMENT SUBGRADE PREPARATION

The contractor should compact finished subgrade and aggregate base in accordance with Section 4.6.1. Aggregate Base should meet the requirements for ¾-inch maximum Class 2 AB in accordance with Section 26-1.02a of the latest Caltrans Standard Specifications.

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9.0 DESIGN GEOTECHNICAL REPORT

We are currently completing a site-specific, design-level geotechnical exploration. The exploration includes borings and laboratory soil testing to provide data for preparation of specific recommendations regarding grading, foundation design, and drainage for the proposed development. The exploration allows for more detailed evaluations of the geotechnical issues discussed in this report and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards.

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This preliminary report presents geotechnical recommendations for preliminary design of the Caribbean 100 project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional unexpected costs may be incurred in completing the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO should be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials should be notified immediately.

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Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's recommendations. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such

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services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

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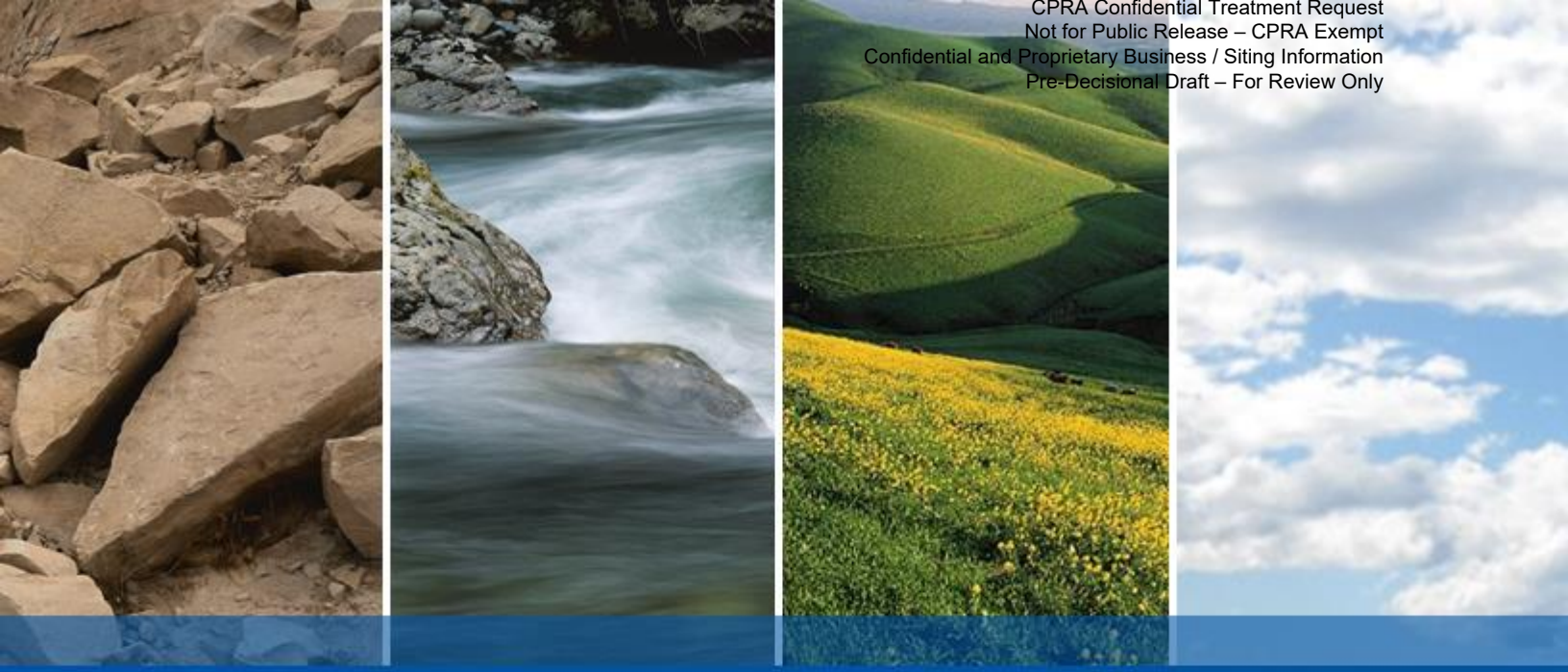

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FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Regional Geologic Map
FIGURE 4: Regional Faulting and Seismicity
FIGURE 5: Seismic Hazard Zones Map

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N

0 FEET 2000
0 METERS 1000

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

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VICINITY MAP
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000
SCALE: AS SHOWN
DRAWN BY: SRP
CHECKED BY: JK

FIGURE NO. 1

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G:\Drafting\DRAFTING2_Dwg_13000 Plus\14505\000\GEX\14505000000-GEX-1-VicinityMap-0118.dwg Plot Date: 1-31-18 gjaffe

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EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

1-CPT12 — CONE PENETRATION TEST (ENGEO, 2017)

CPT-3 — CONE PENETRATION TEST (BSK, 2017)

B-3 — BORING (BSK, 2017)

N

0 FEET 200

0 METERS 100

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

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SITE PLAN
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000
SCALE: AS SHOWN
DRAWN BY: GLJ CHECKED BY: JK

FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR

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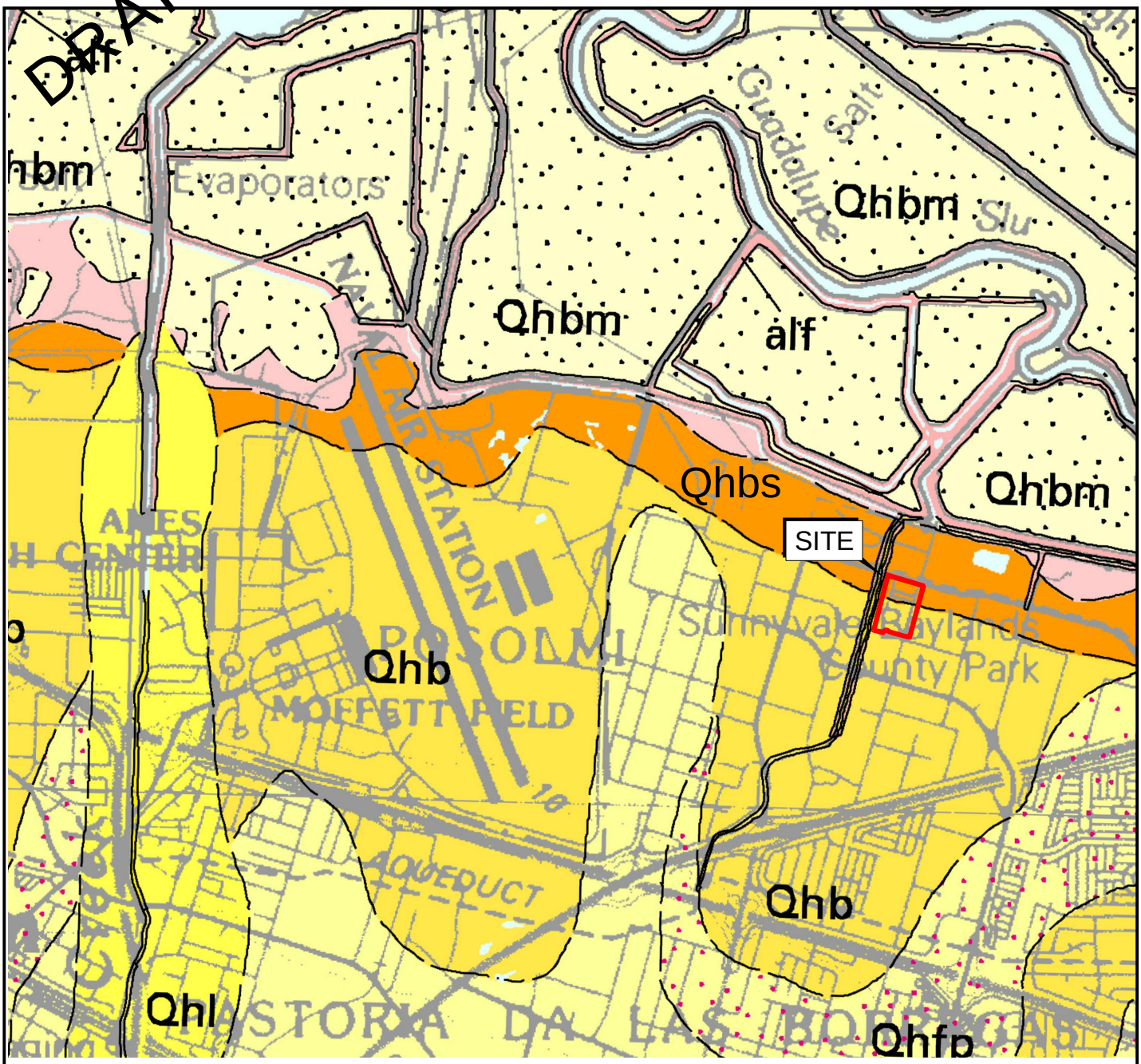

N

0 FEET 3000
0 METERS 1500

EXPLANATION

——— – – – –	GEOLOGIC CONTACT-DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED
alf	ARTIFICIAL FILL
Qhb	BASIN DEPOSITS
Qhbm	BAY MUD
Qhl	NATURAL LEVEE DEPOSITS
Qhbs	BASIN DEPOSITS, SALT-AFFECTED

BASE MAP SOURCE: BRABB, 2000

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REGIONAL GEOLOGIC MAP
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000
SCALE: AS SHOWN
DRAWN BY: SRP
CHECKED BY: JK

FIGURE NO. 3

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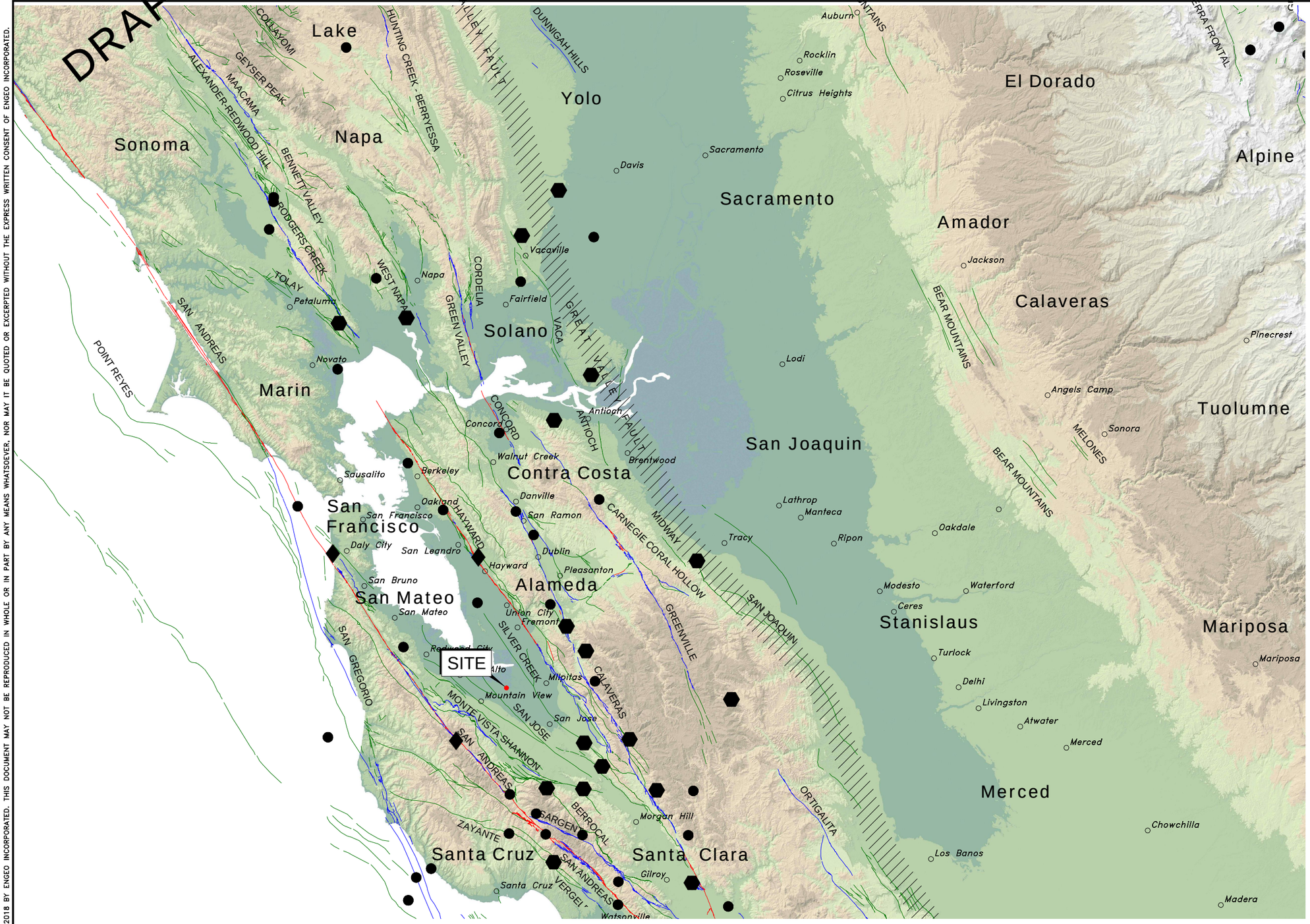

BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800–2000)

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REGIONAL FAULTING AND SEISMICITY

CARIBBEAN 100

SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000
SCALE: AS SHOWN
DRAWN BY: SRP CHECKED BY: JK
FIGURE NO. 4

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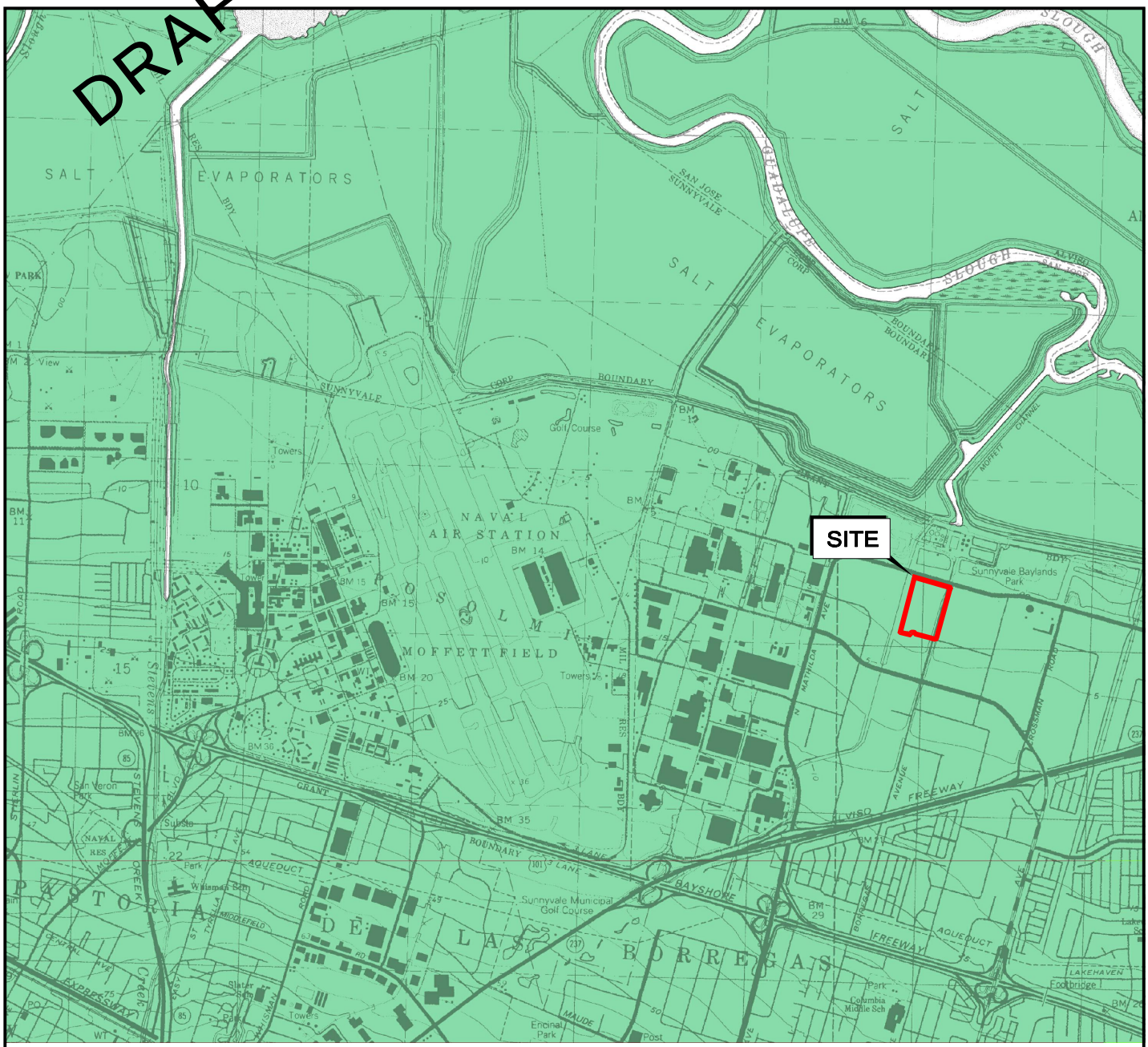

EXPLANATION

LIQUEFACTION

AREAS WHERE HISTORIC OCCURRENCE OF LIQUEFACTION, OR LOCAL GEOLOGICAL, GEOTECHNICAL AND GROUNDWATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(c) WOULD BE REQUIRED

N

0 FEET 3000
0 METERS 1500

BASE MAP SOURCE: CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY, 2006

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SEISMIC HAZARD ZONES MAP
CARIBBEAN 100
SUNNYVALE, CALIFORNIA

PROJECT NO.: 14505.000.000
SCALE: AS SHOWN
DRAWN BY: SRP
CHECKED BY: JK

FIGURE NO. 5

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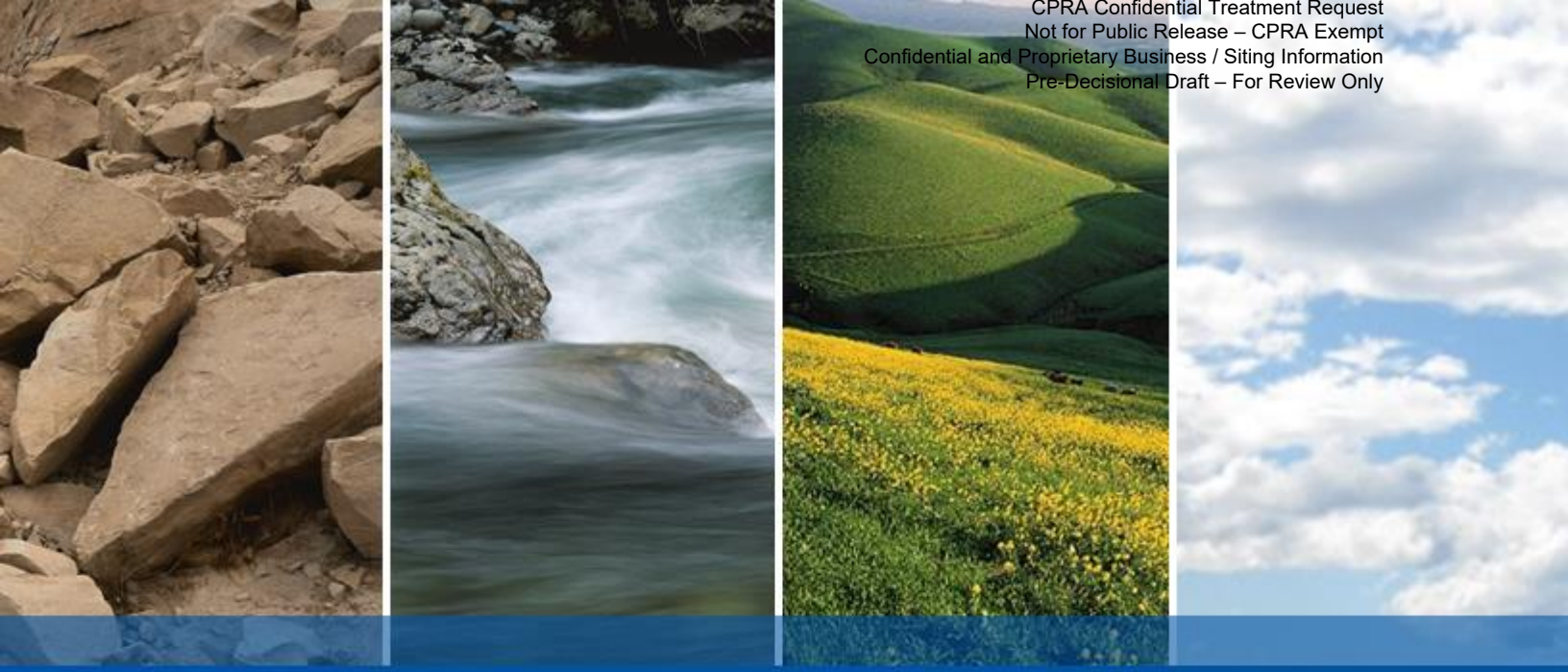

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APPENDIX A

CONE PENETRATION TEST LOGS

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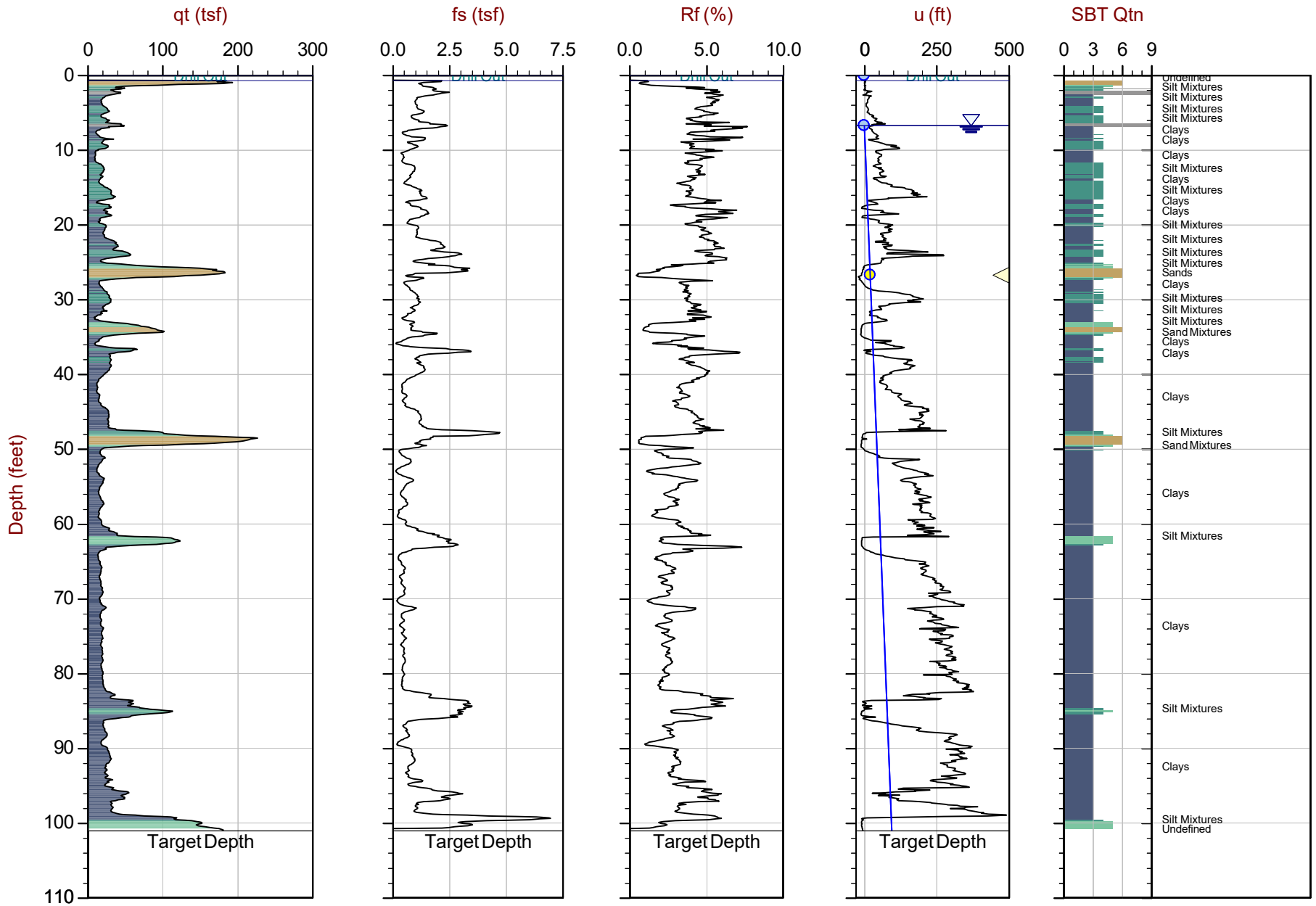
CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 08:44
Site: West Caribbean and Borregas Campuses

Sounding: 1-CPT07
Cone: 447:T1500F15U500



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Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-56142_CP07.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141539m E: 586894m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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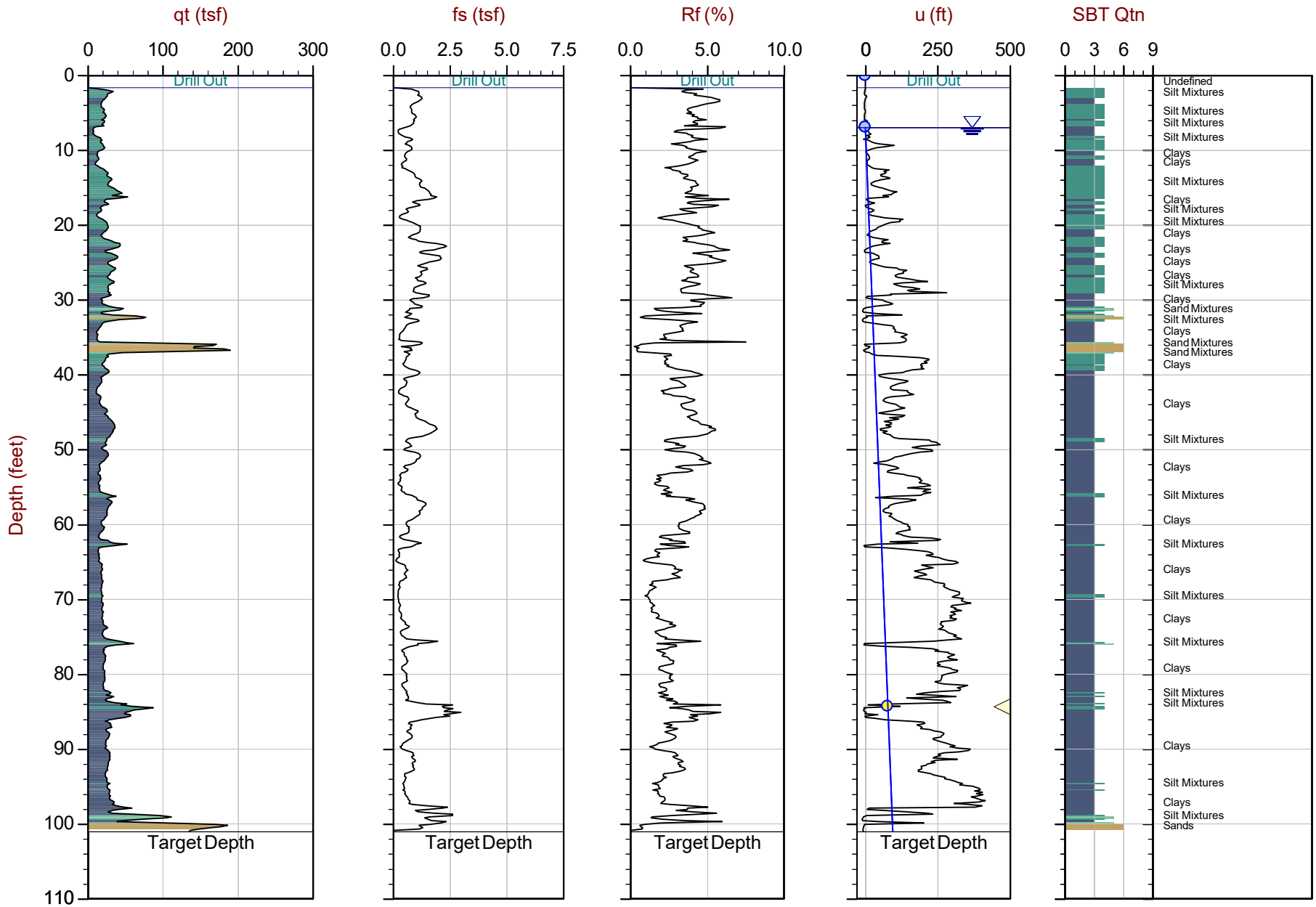
CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 10:08
Site: West Caribbean and Borregas Campuses

Sounding: 1-CPT08
Cone: 494:T1500F15U500



Max Depth: 30.800 m / 101.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_CP08.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141466m E: 586957m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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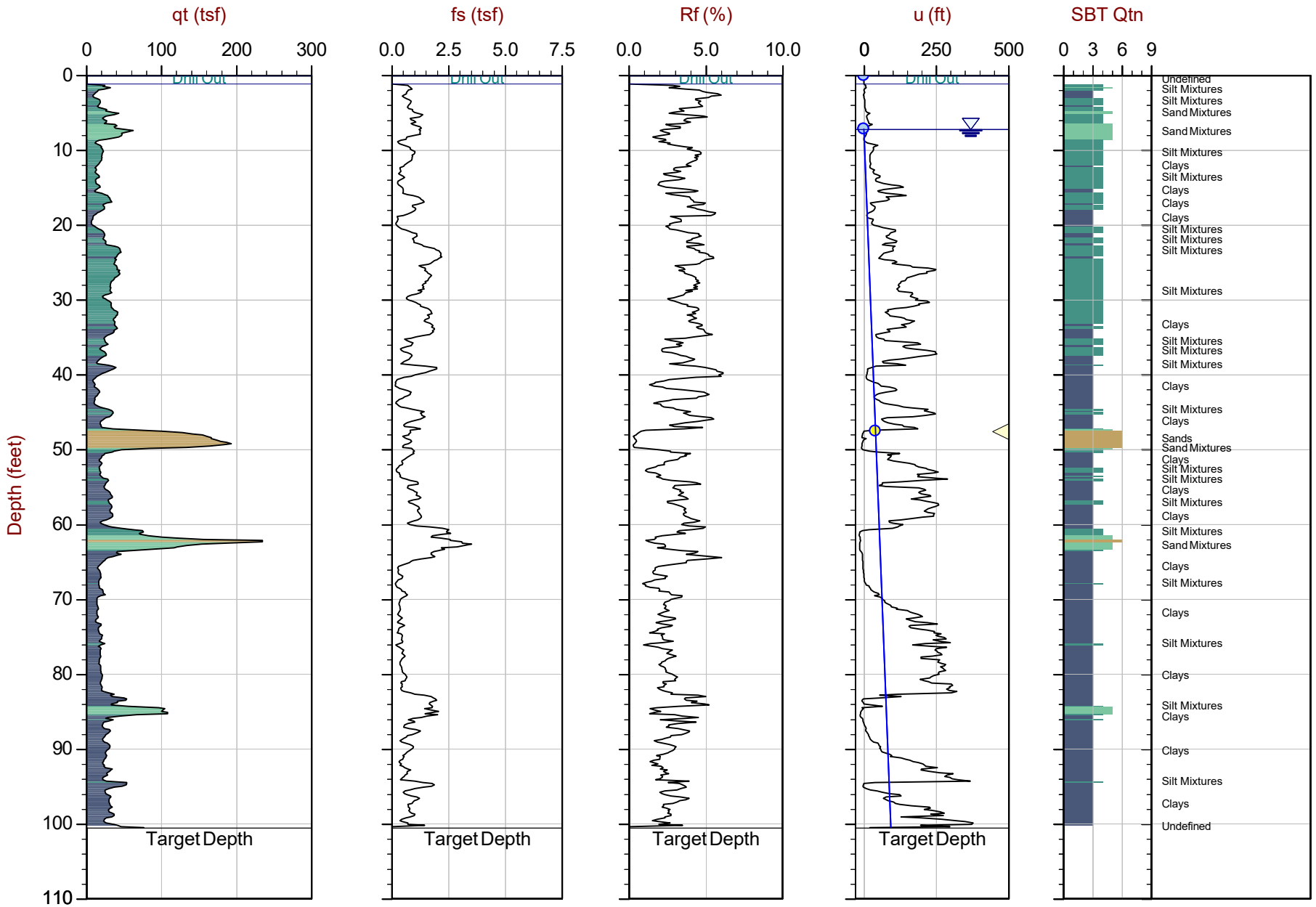
CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 12:49
Site: West Caribbean and Borregas Campuses

Sounding: 1-CPT09
Cone: 494:T1500F15U500



Max Depth: 30.650 m / 100.56 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

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SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141431m E: 586767m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

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CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 11:21
Site: West Caribbean and Borregas Campuses

Sounding: 1-CPT10
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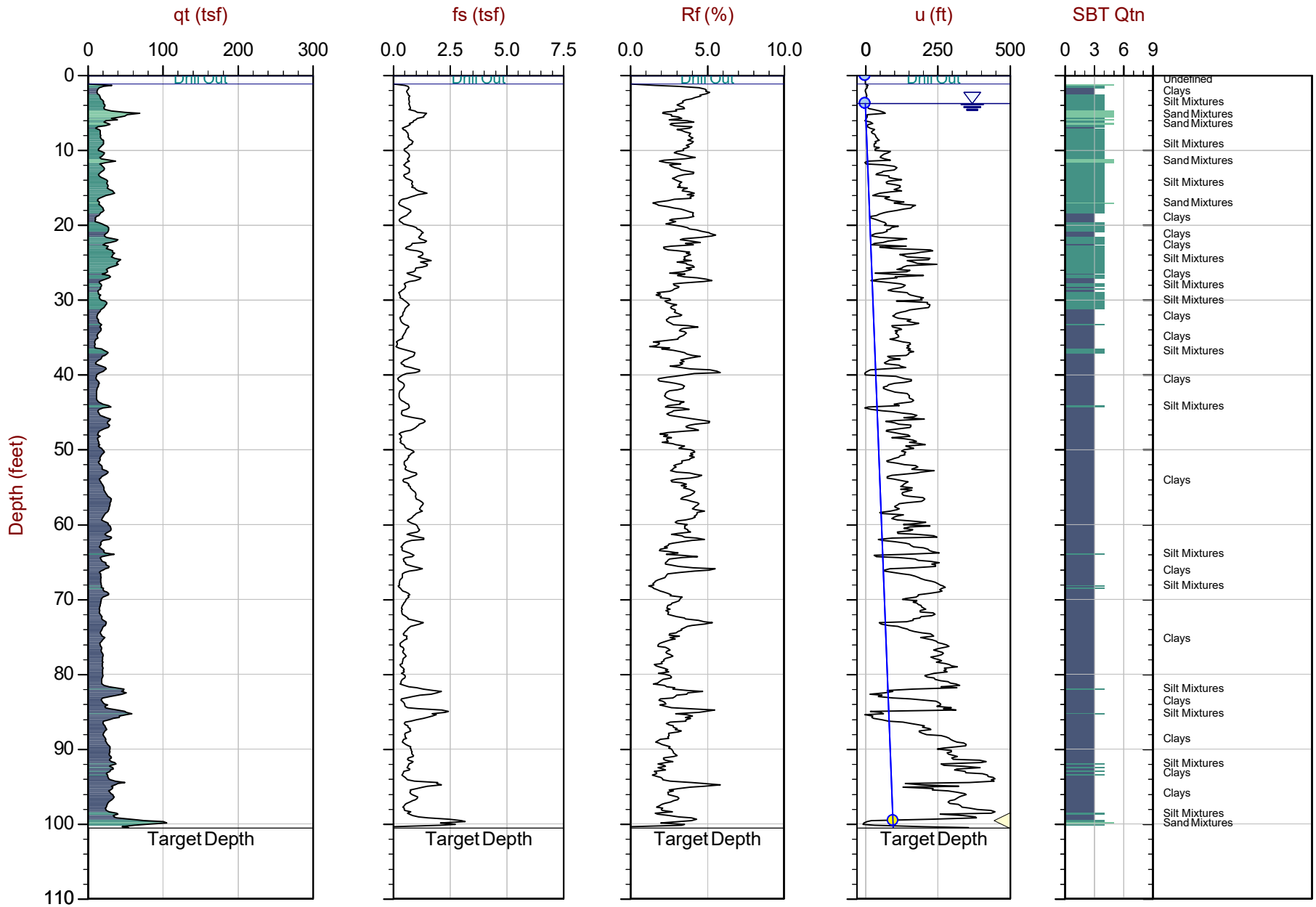

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Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_SP10.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141387m E: 586879m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

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CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

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Date: 2017-12-15 14:07
Site: West Caribbean and Borregas Campuses

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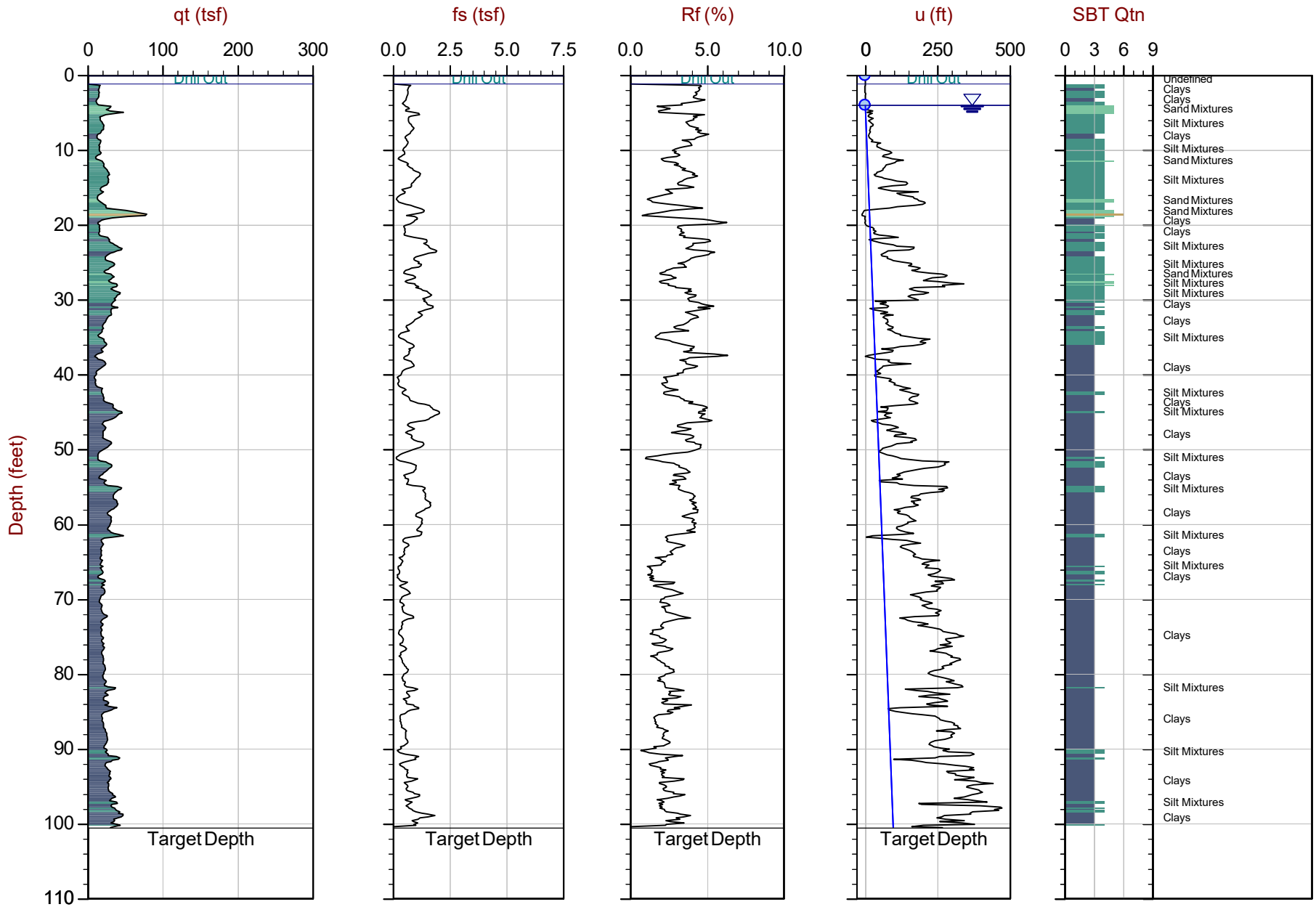

Max Depth: 30.650 m / 100.56 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-56142_CP11.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141273m E: 586939m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Dissipation, equilibrium assumed Hydrostatic Line

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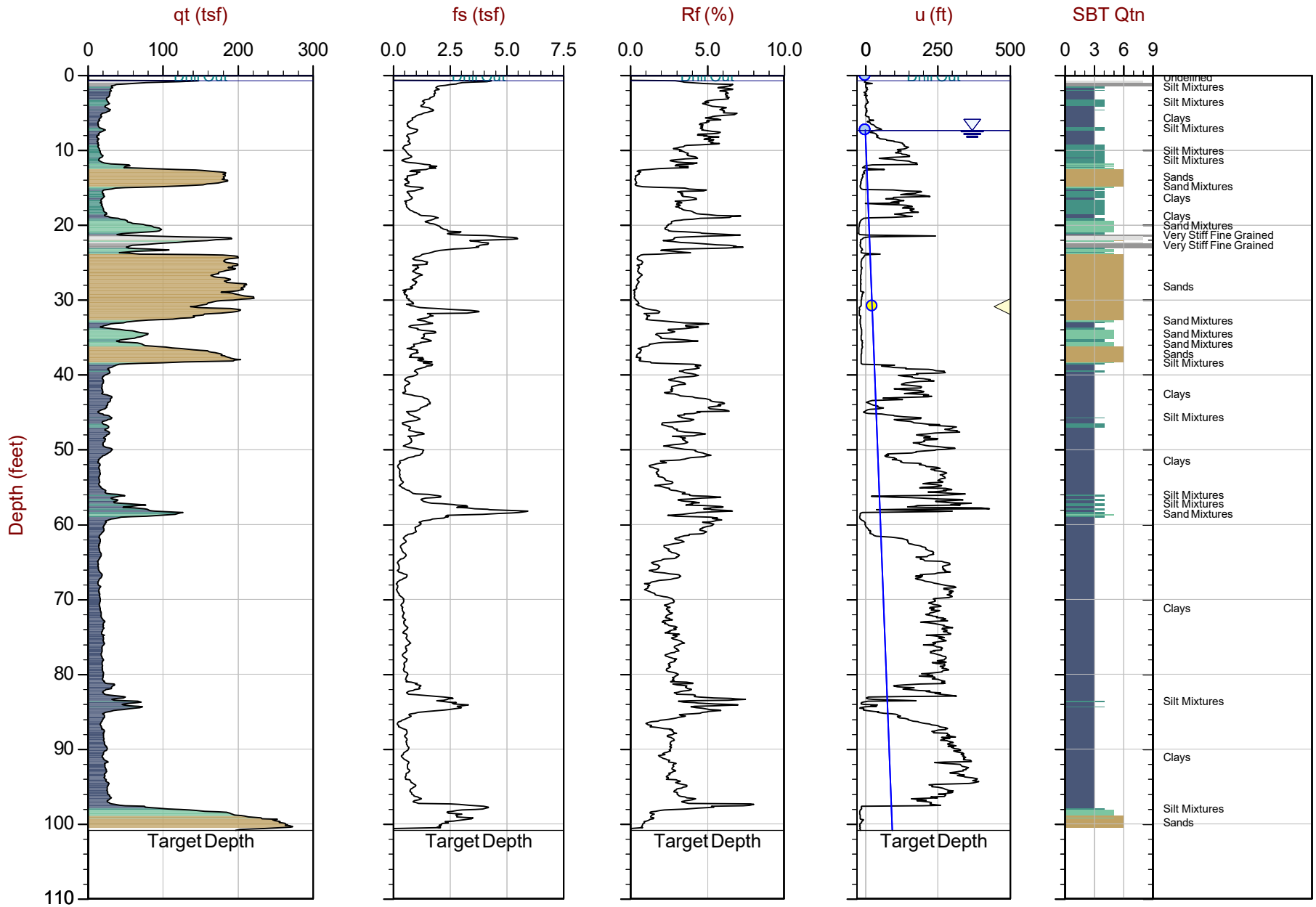
CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56142
Date: 2017-12-15 09:51
Site: West Caribbean and Borregas Campuses

Sounding: 1-CPT12
Cone: 447:T1500F15U500



Max Depth: 30.750 m / 100.88 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-56142_CP12.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4141307m E: 586756m
Sheet No: 1 of 1

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Dissipation, equilibrium assumed | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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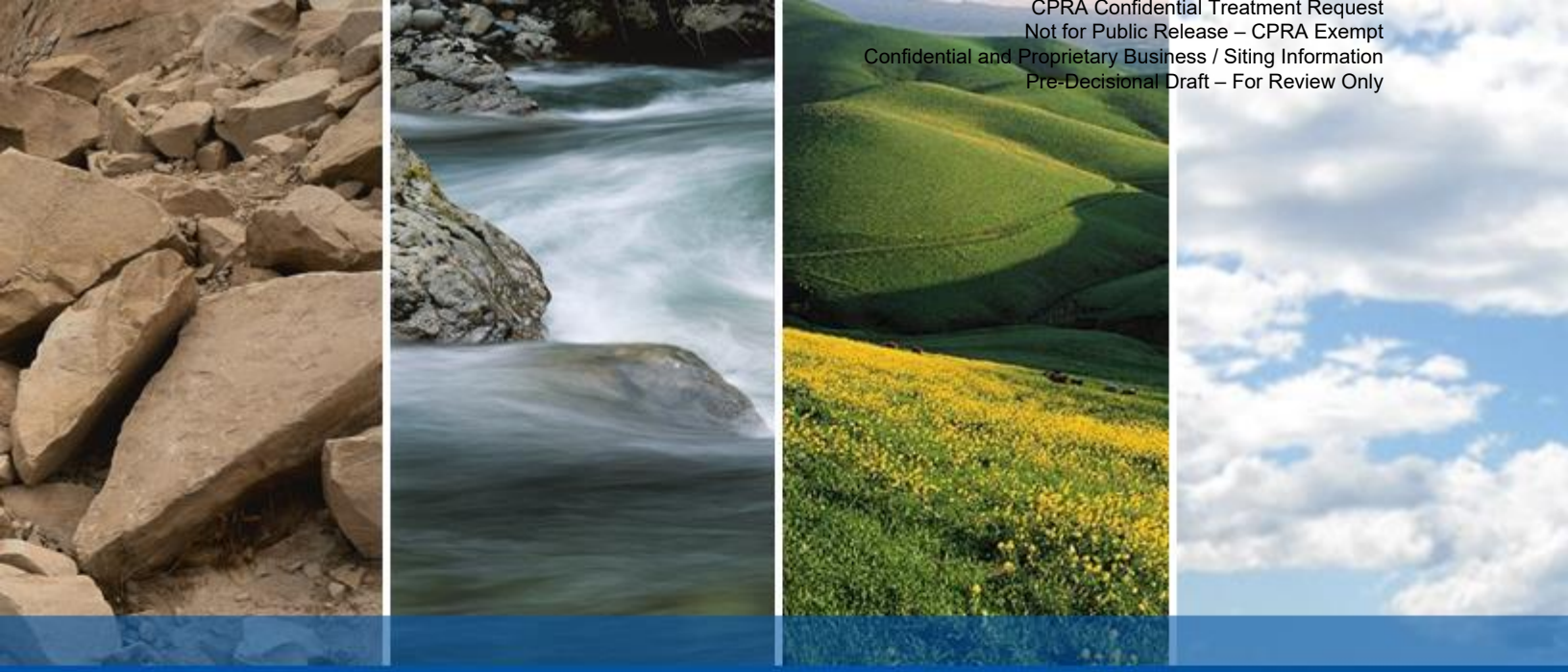

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APPENDIX B

PRELIMINARY LIQUEFACTION ANALYSIS (ROBERTSON, 2009)

ENGEO Incorporated
Expect Excellence
www.engeo.com

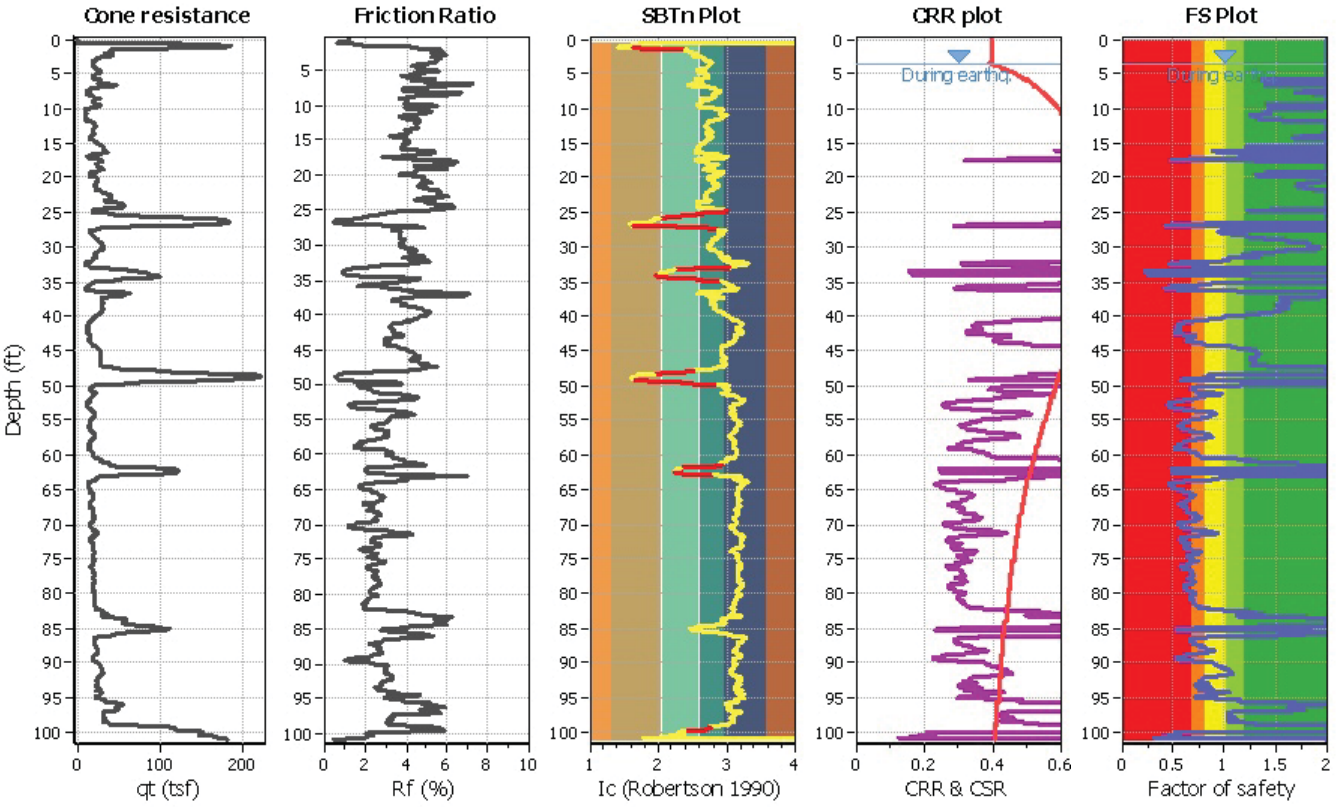
LIQUEFACTION ANALYSIS REPORT

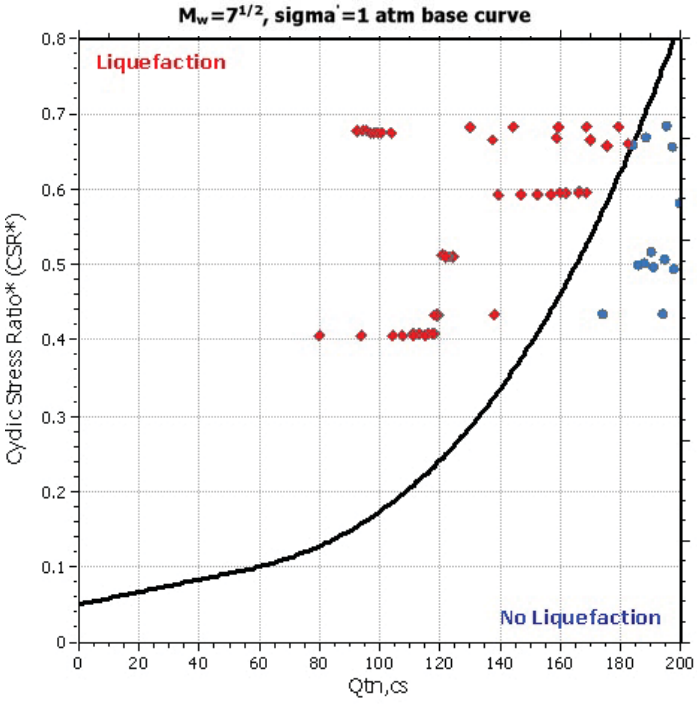
Project title : Caribbean 100 **Location : Sunnyvale, CA**

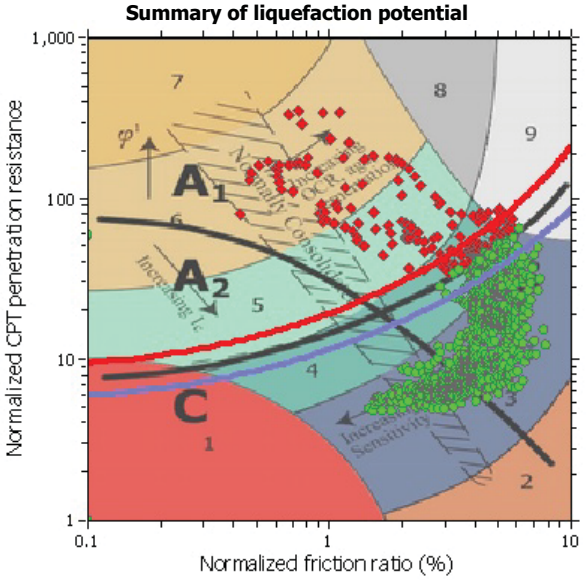
CPT file : 1-CPT07

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.70 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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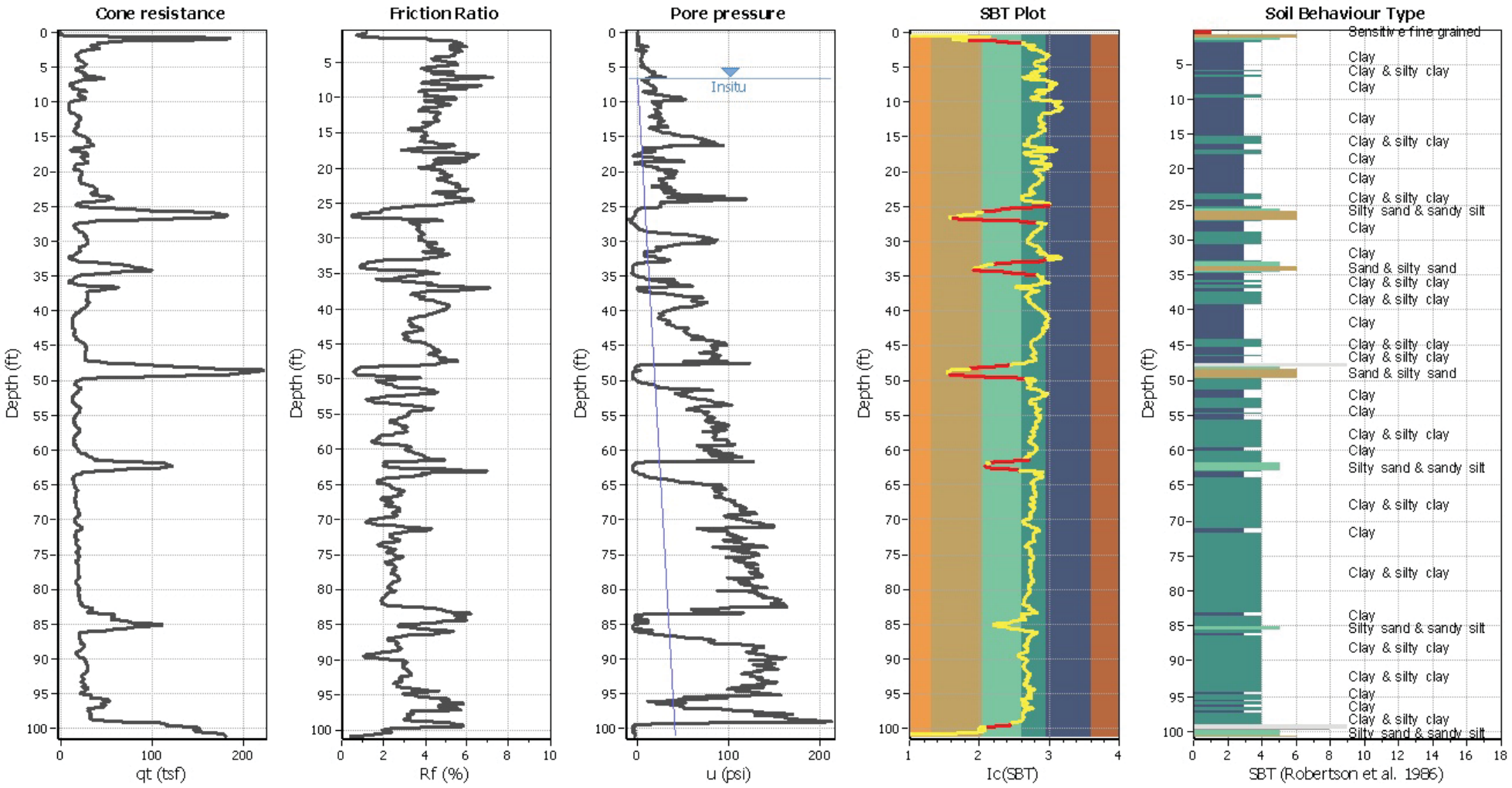
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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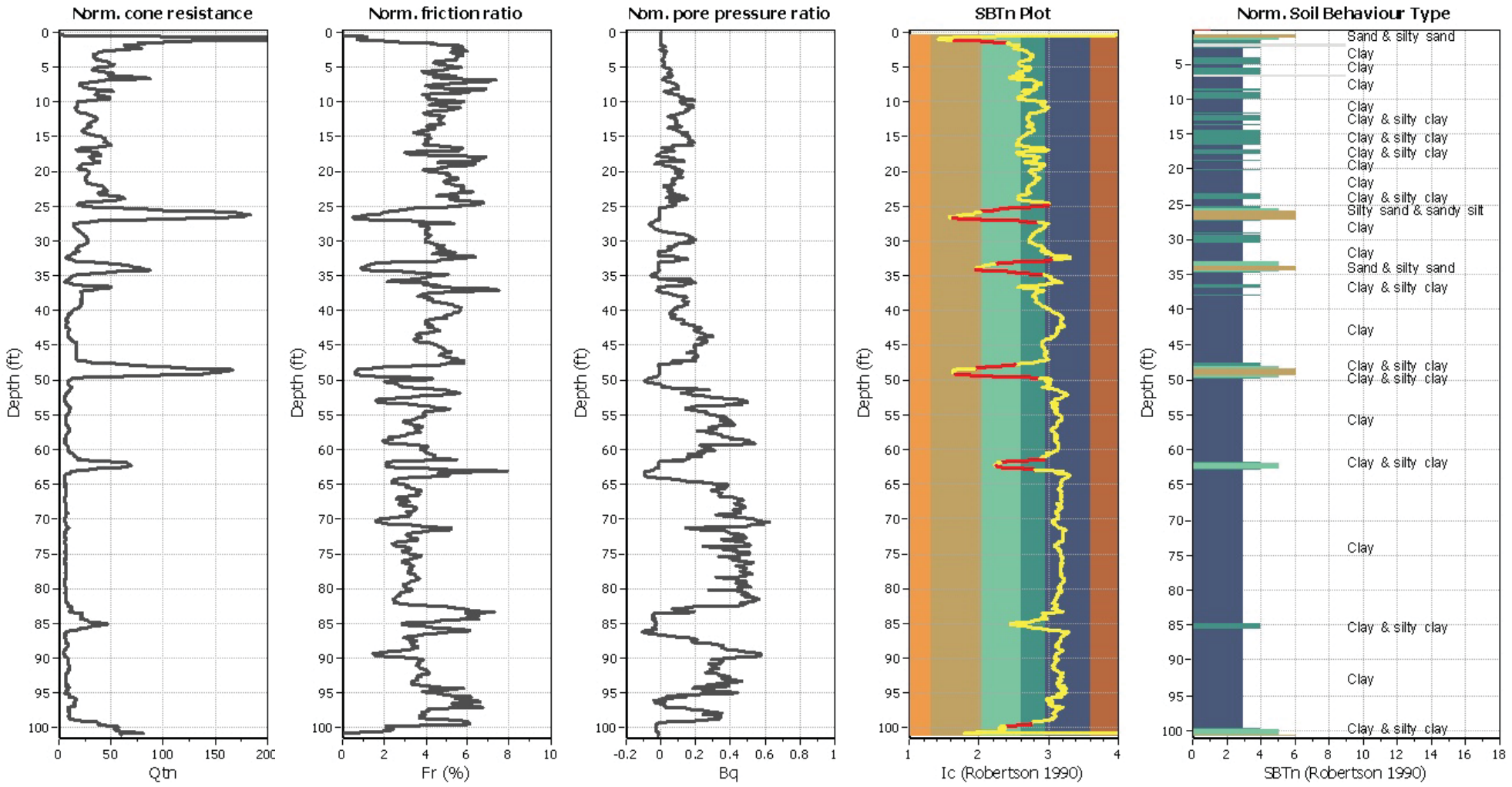
CPT name: 1-CPT07

CPT basic interpretation plots (normaliz



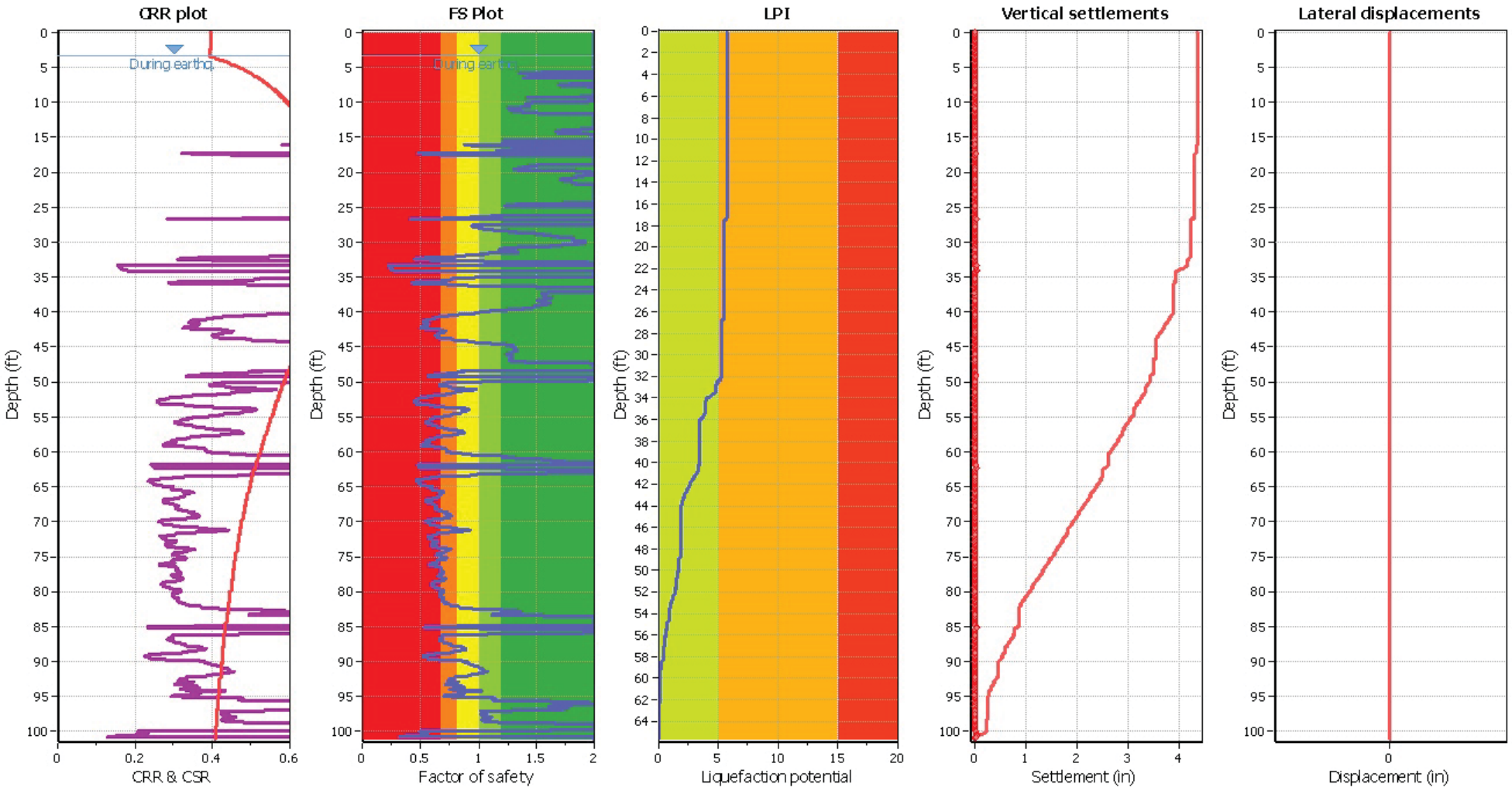
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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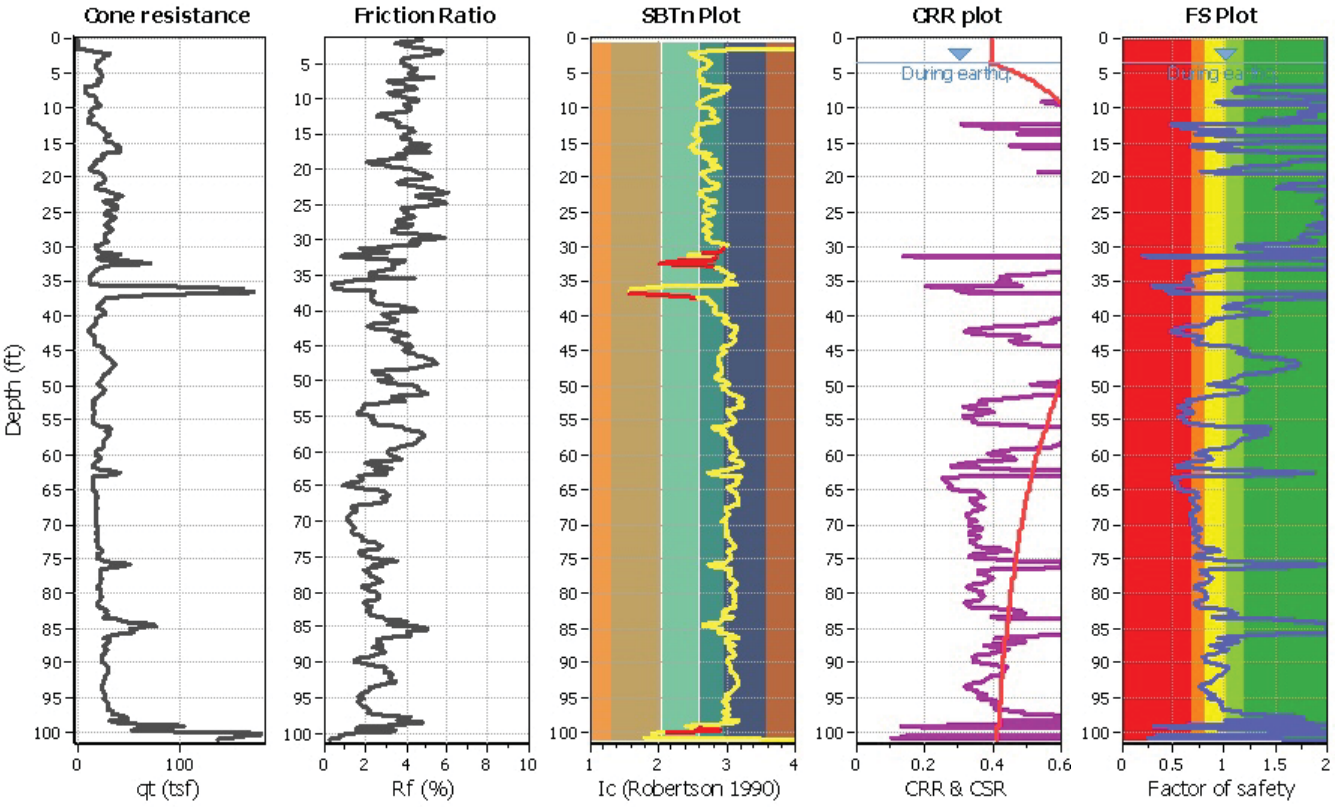
LIQUEFACTION ANALYSIS REPORT

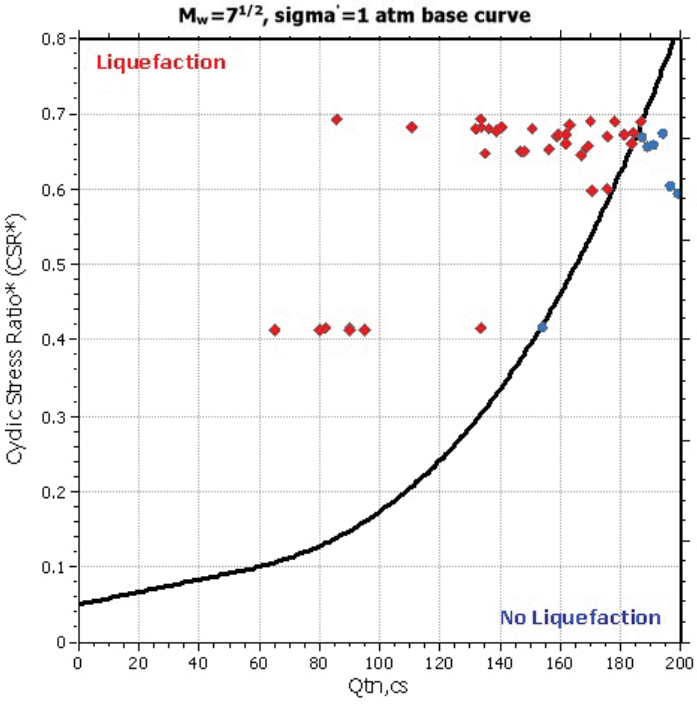
Project title : Caribbean 100 **Location : Sunnyvale, CA**

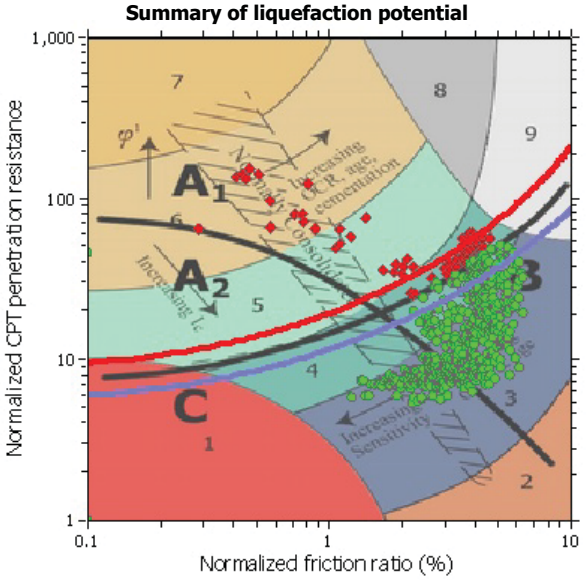
CPT file : 1-CPT08

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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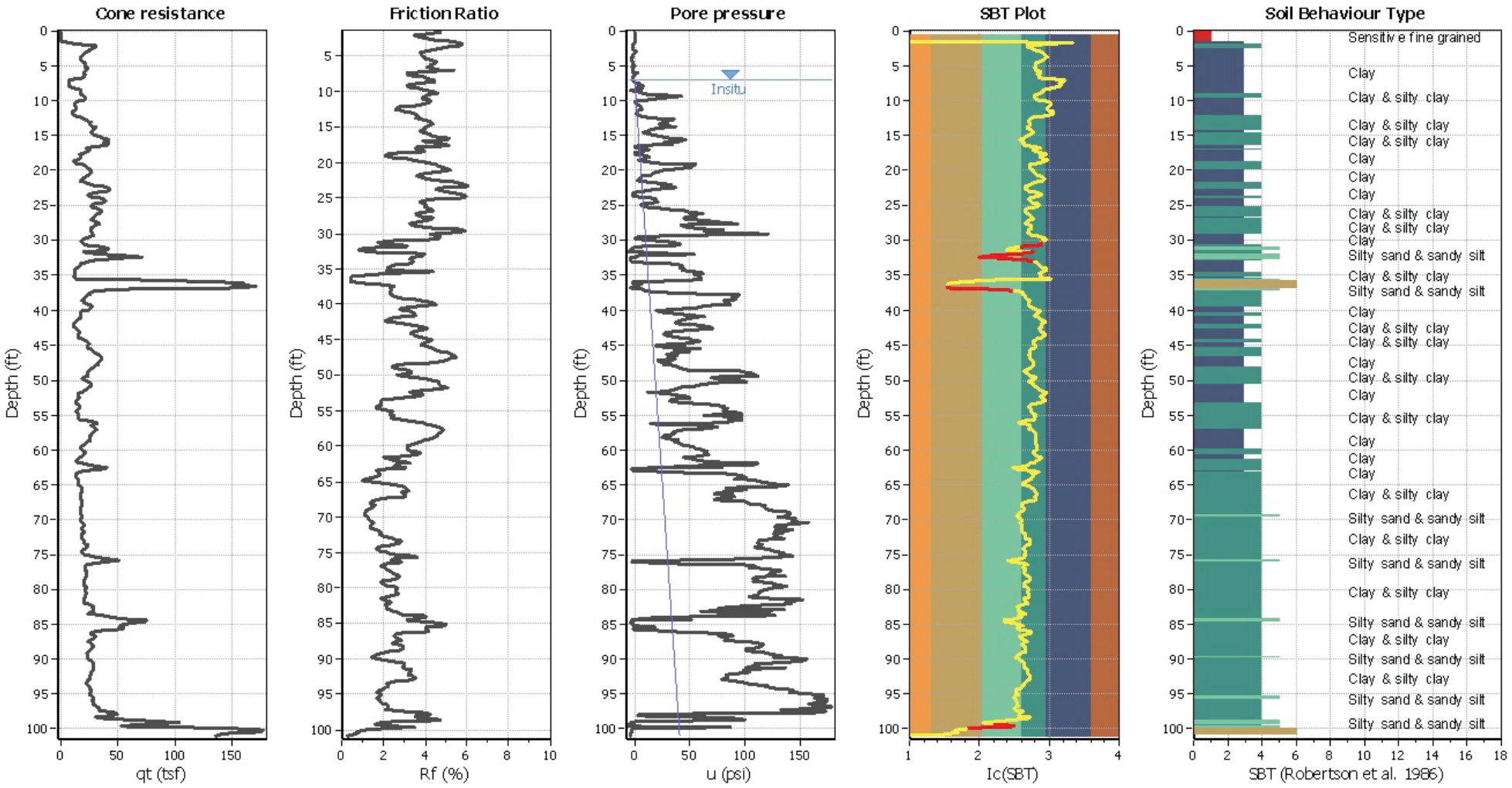
CPT basic interpretation plo



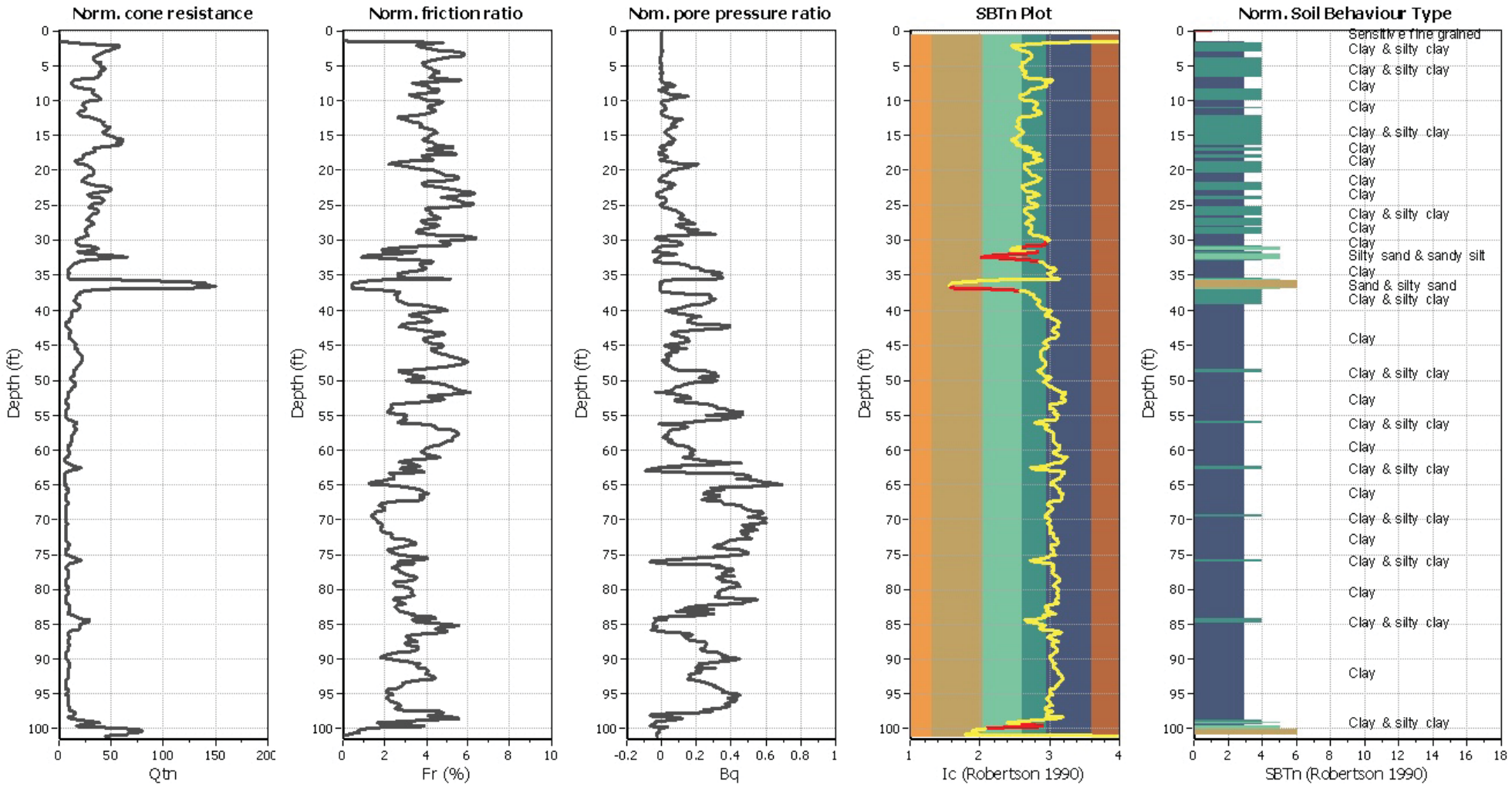
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



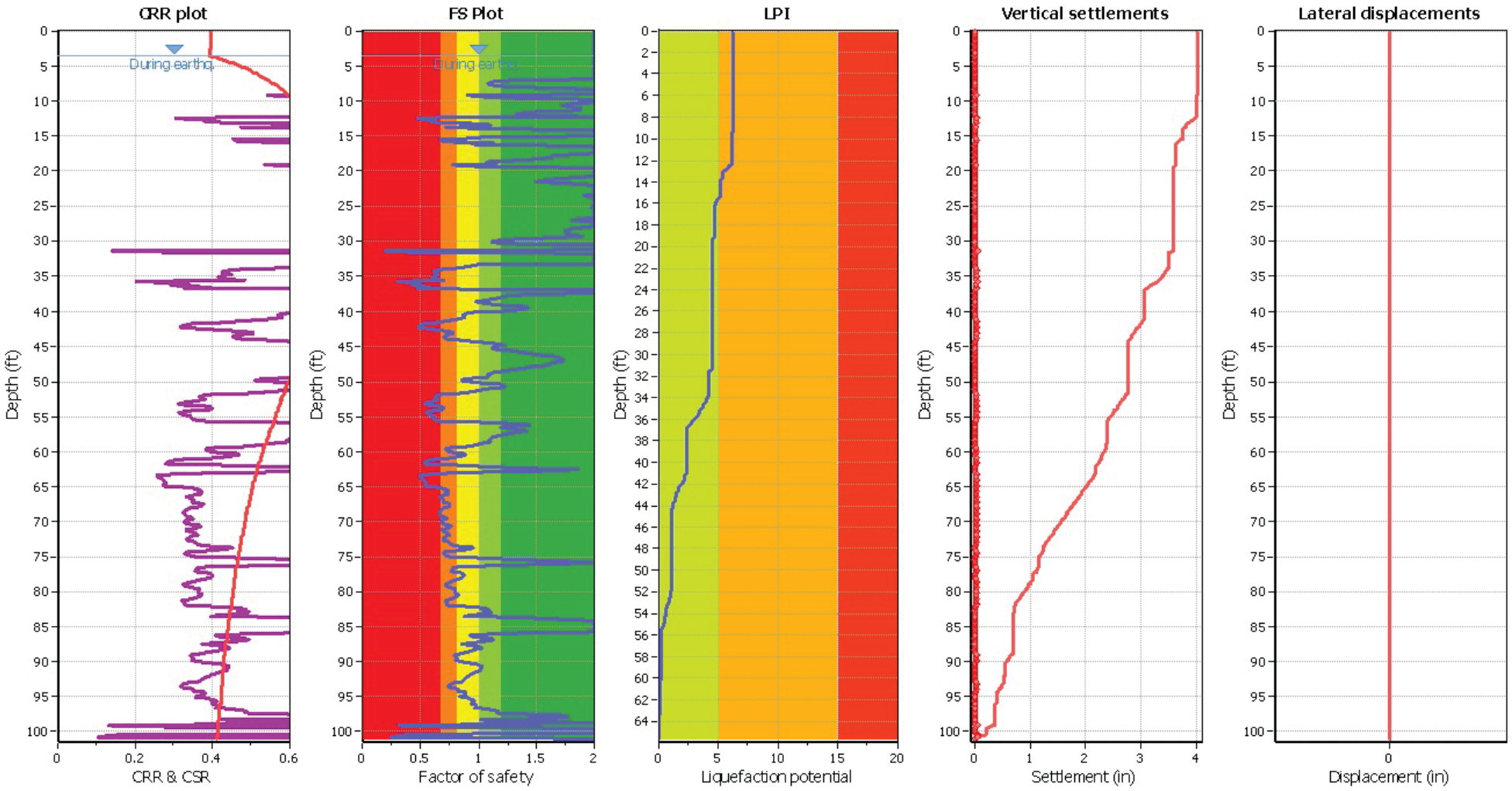
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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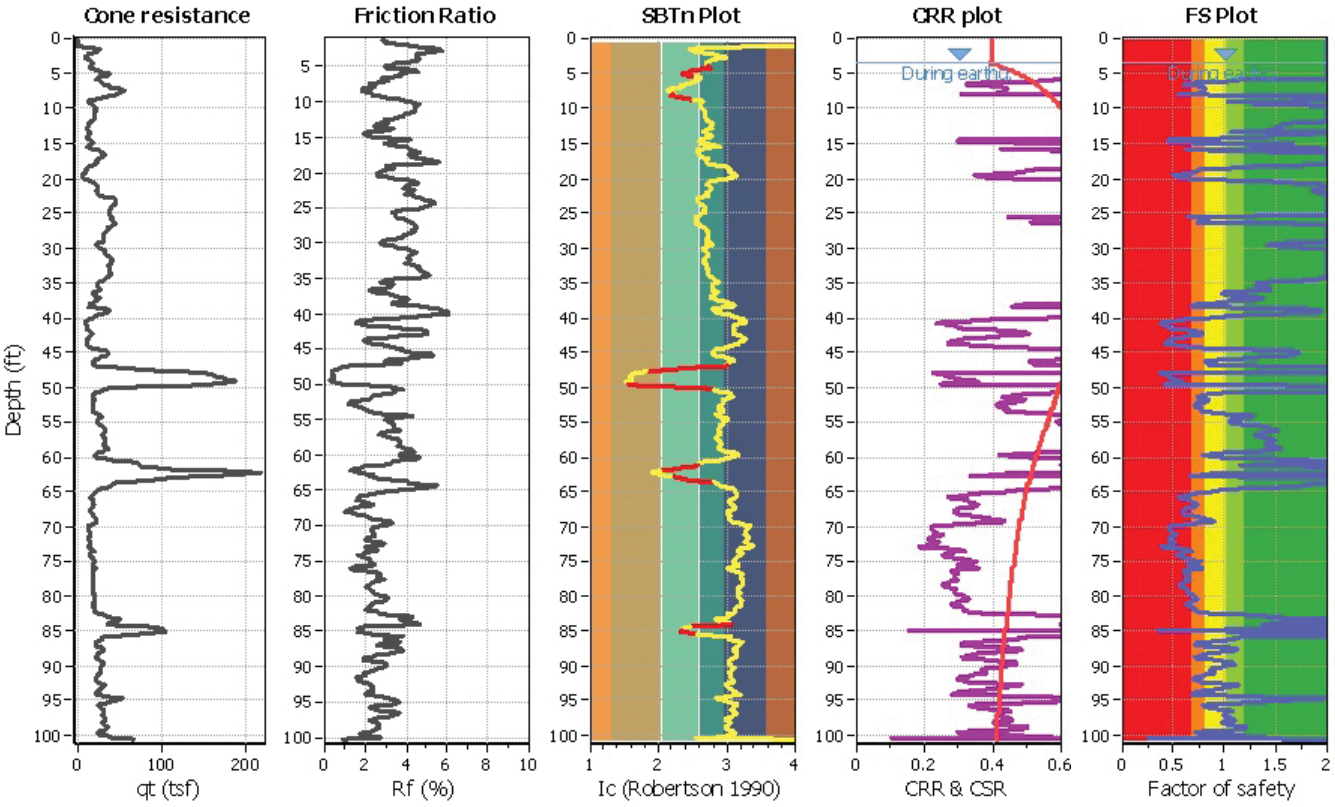
LIQUEFACTION ANALYSIS REPORT

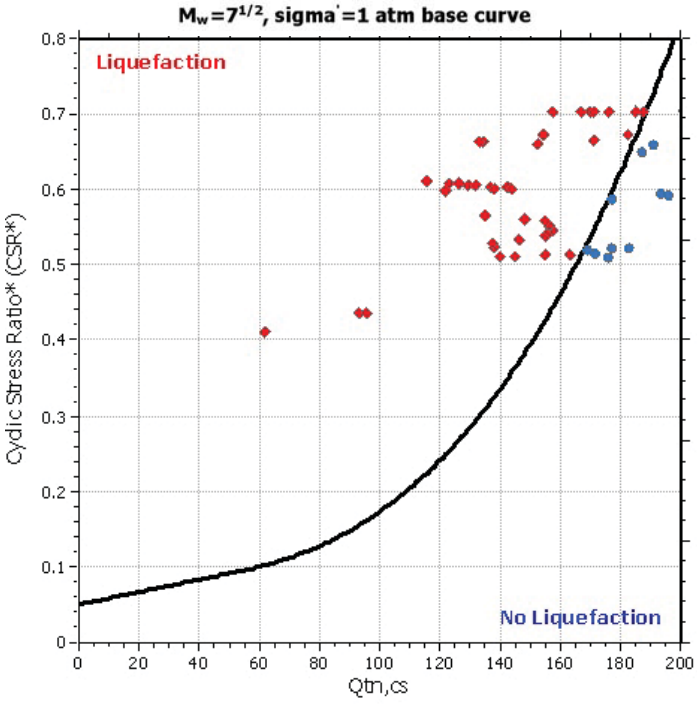
Project title : Caribbean 100 **Location : Sunnyvale, CA**

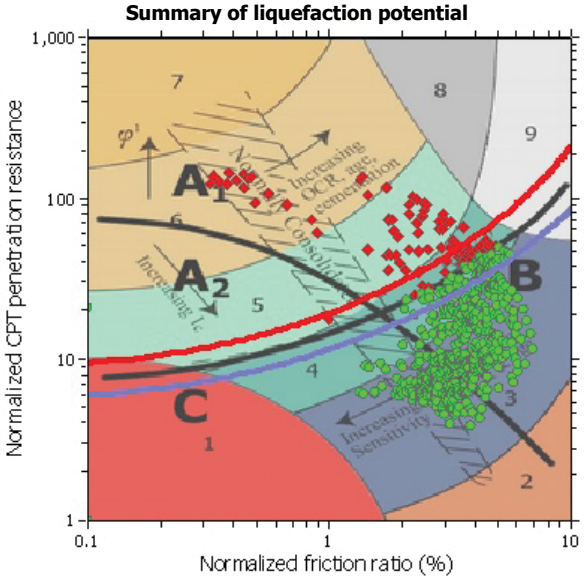
CPT file : 1-CPT09

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.20 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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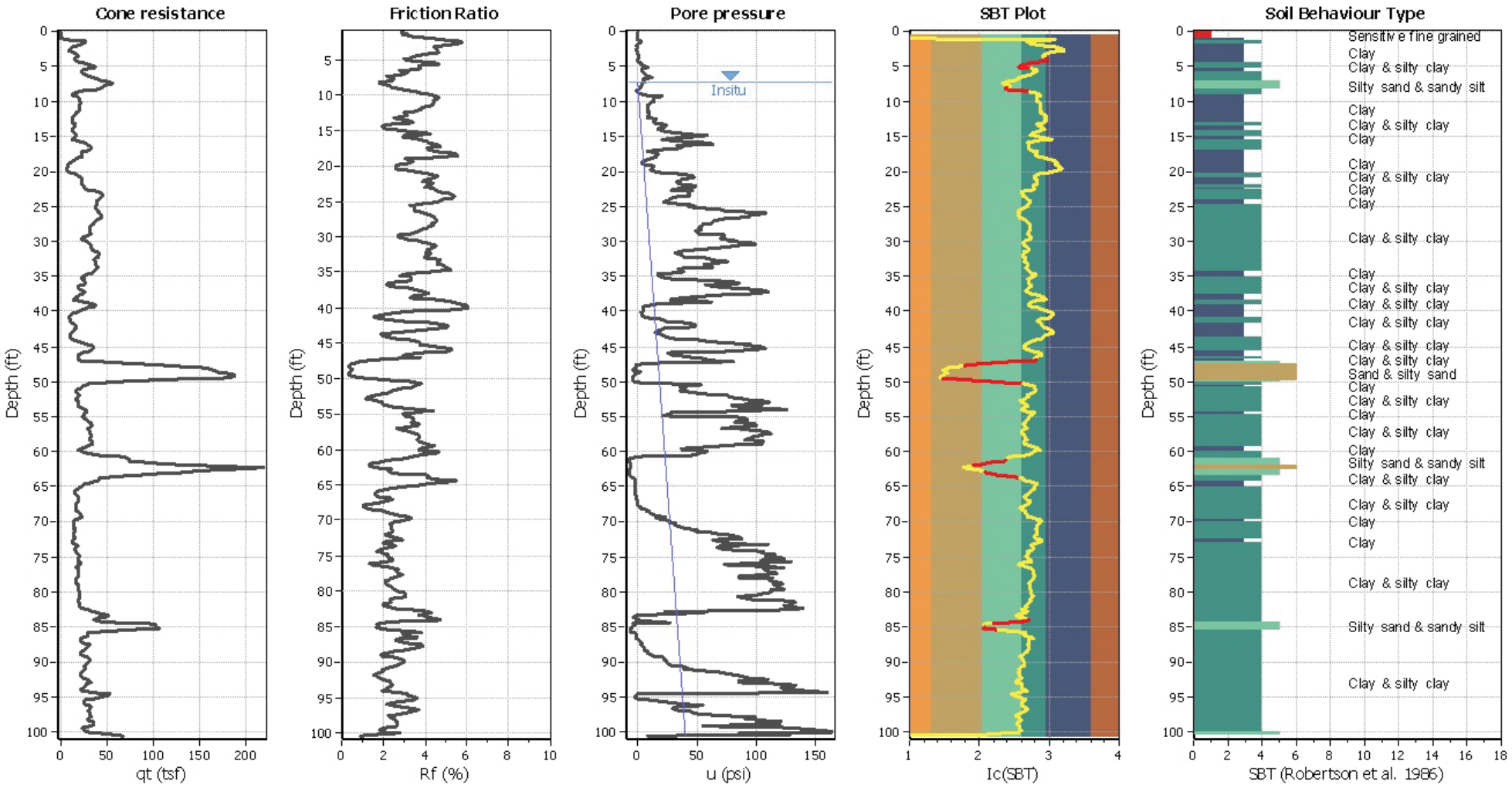
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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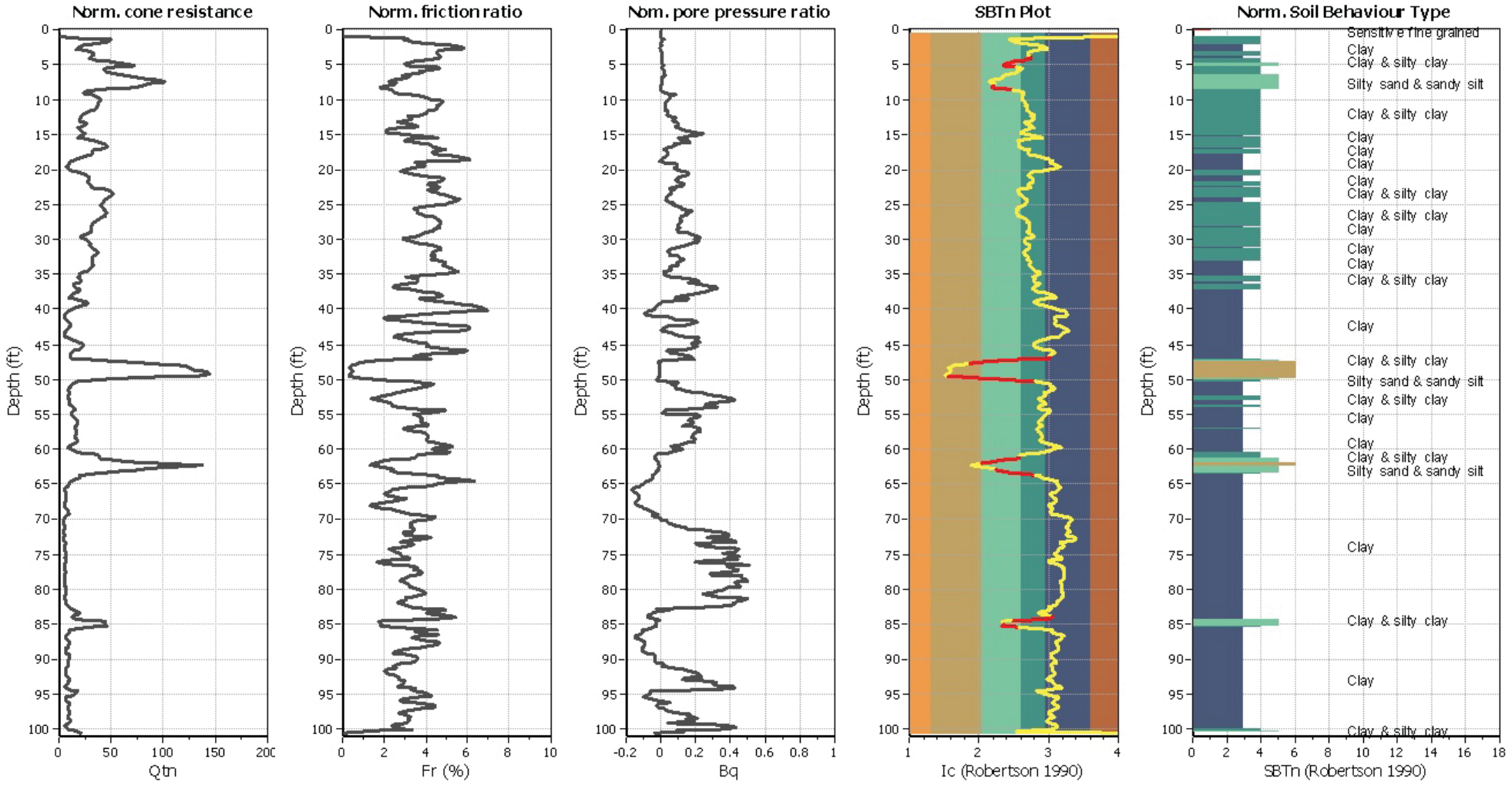
CPT basic interpretation plots (normaliz



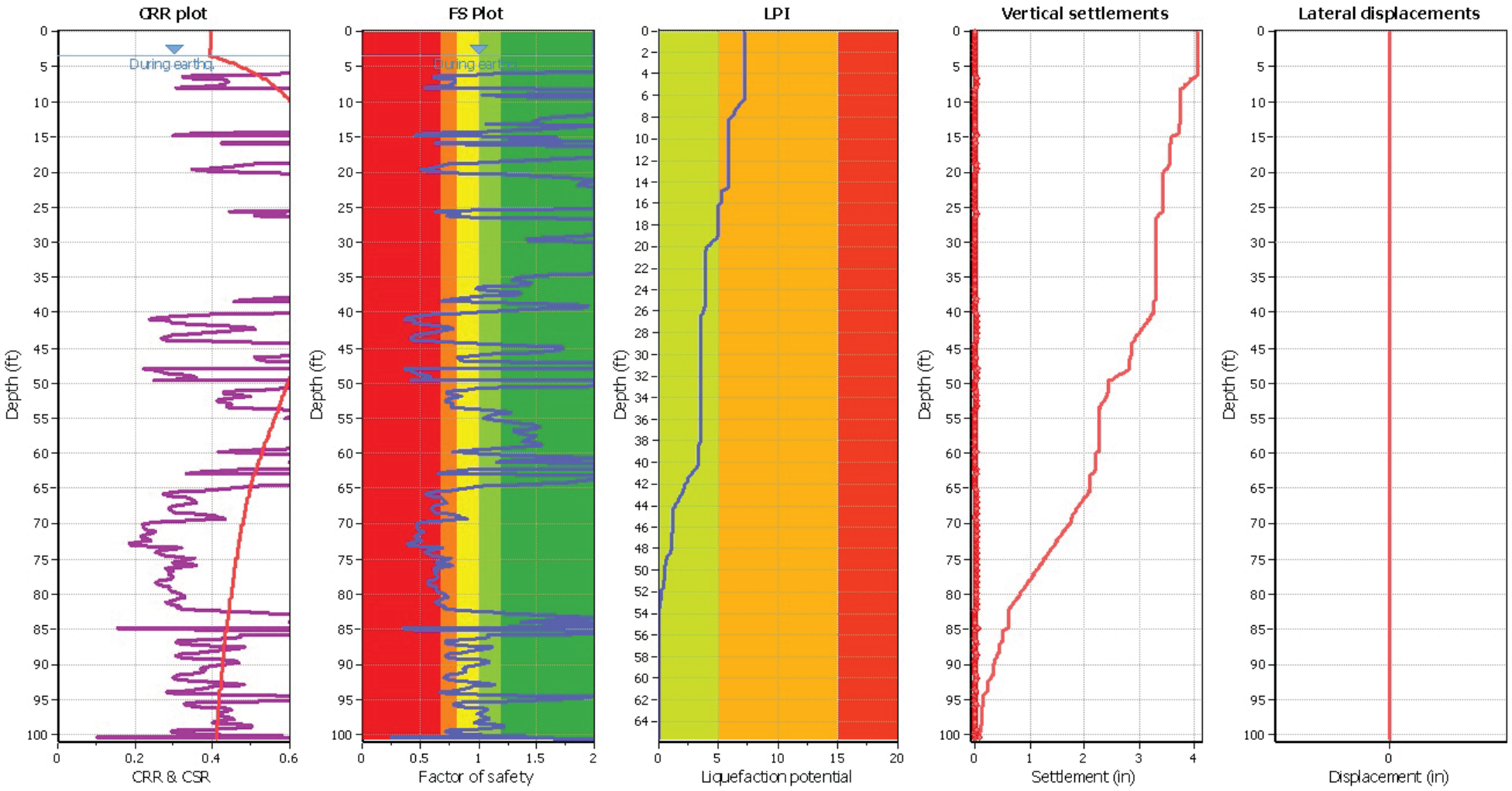
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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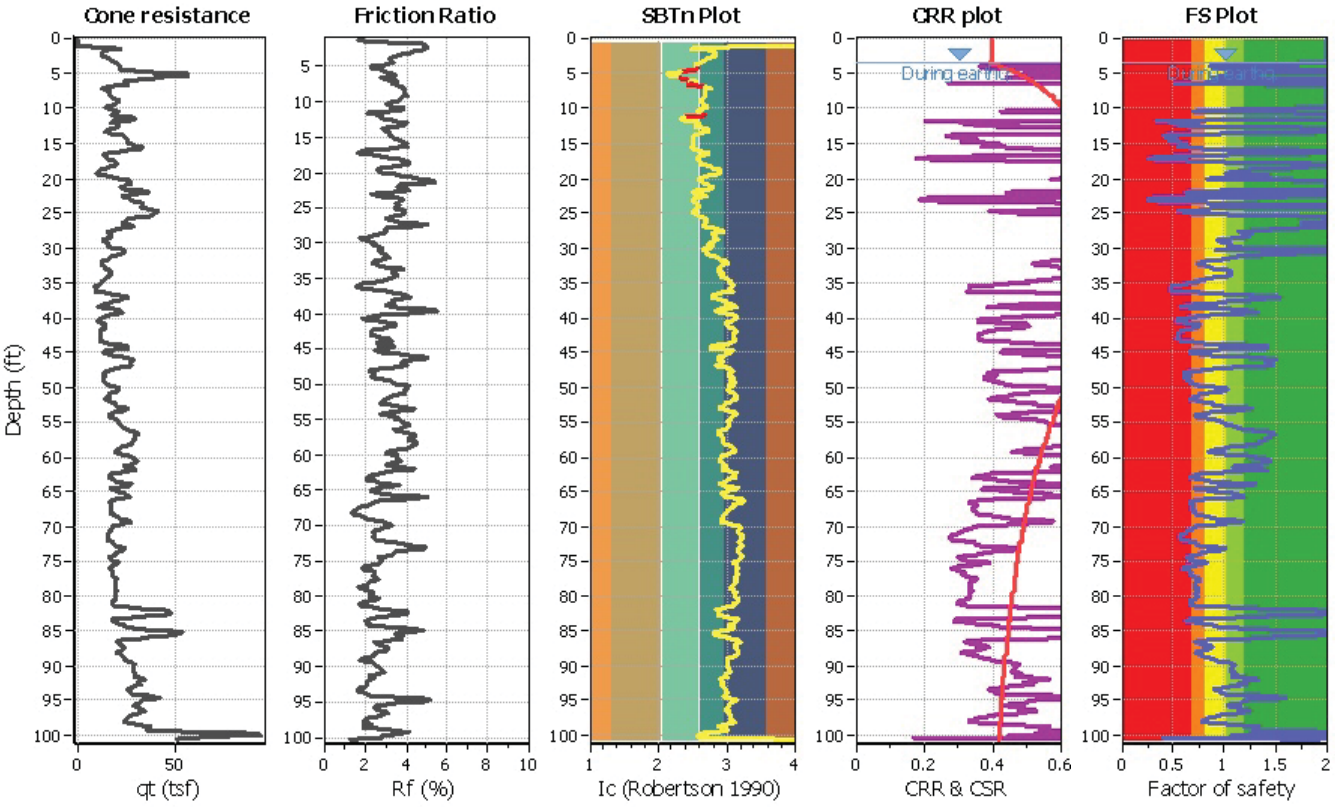
LIQUEFACTION ANALYSIS REPORT

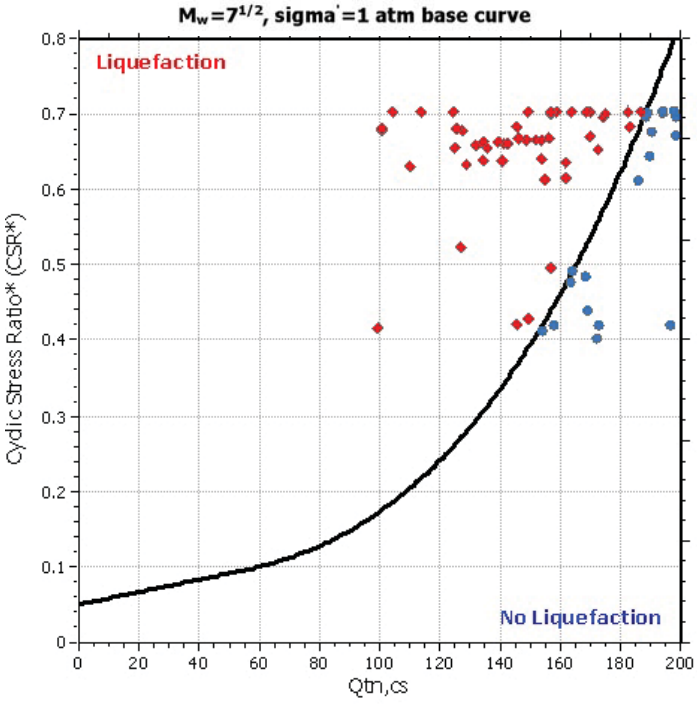
Project title : Caribbean 100 **Location : Sunnyvale, CA**

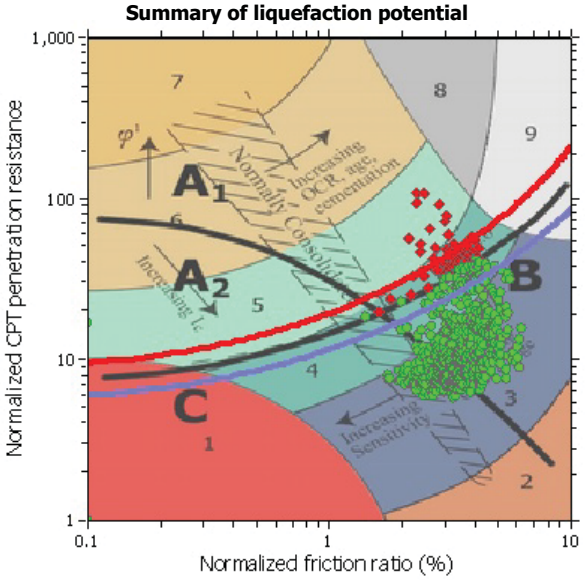
CPT file : 1-CPT10

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	3.70 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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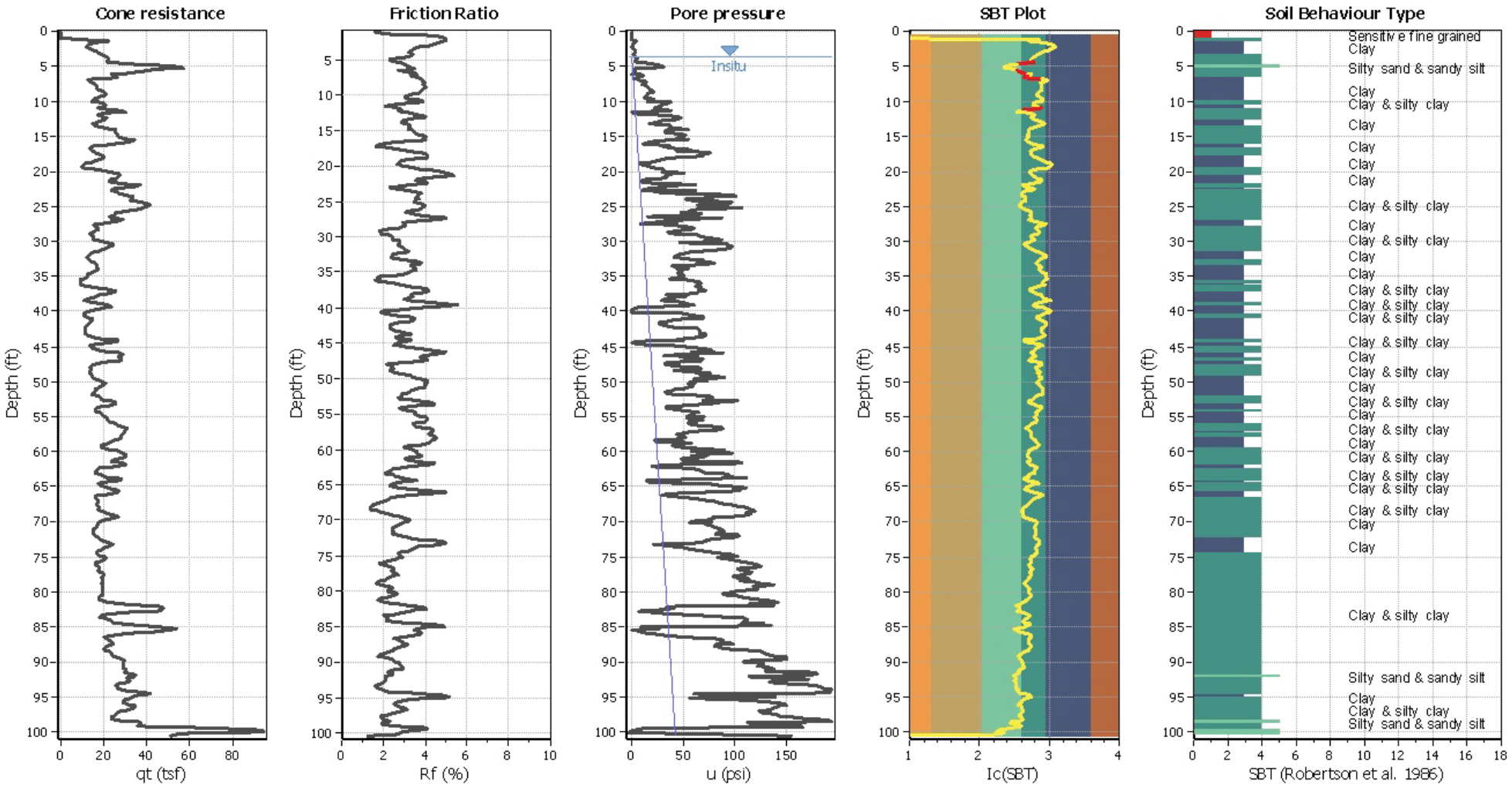
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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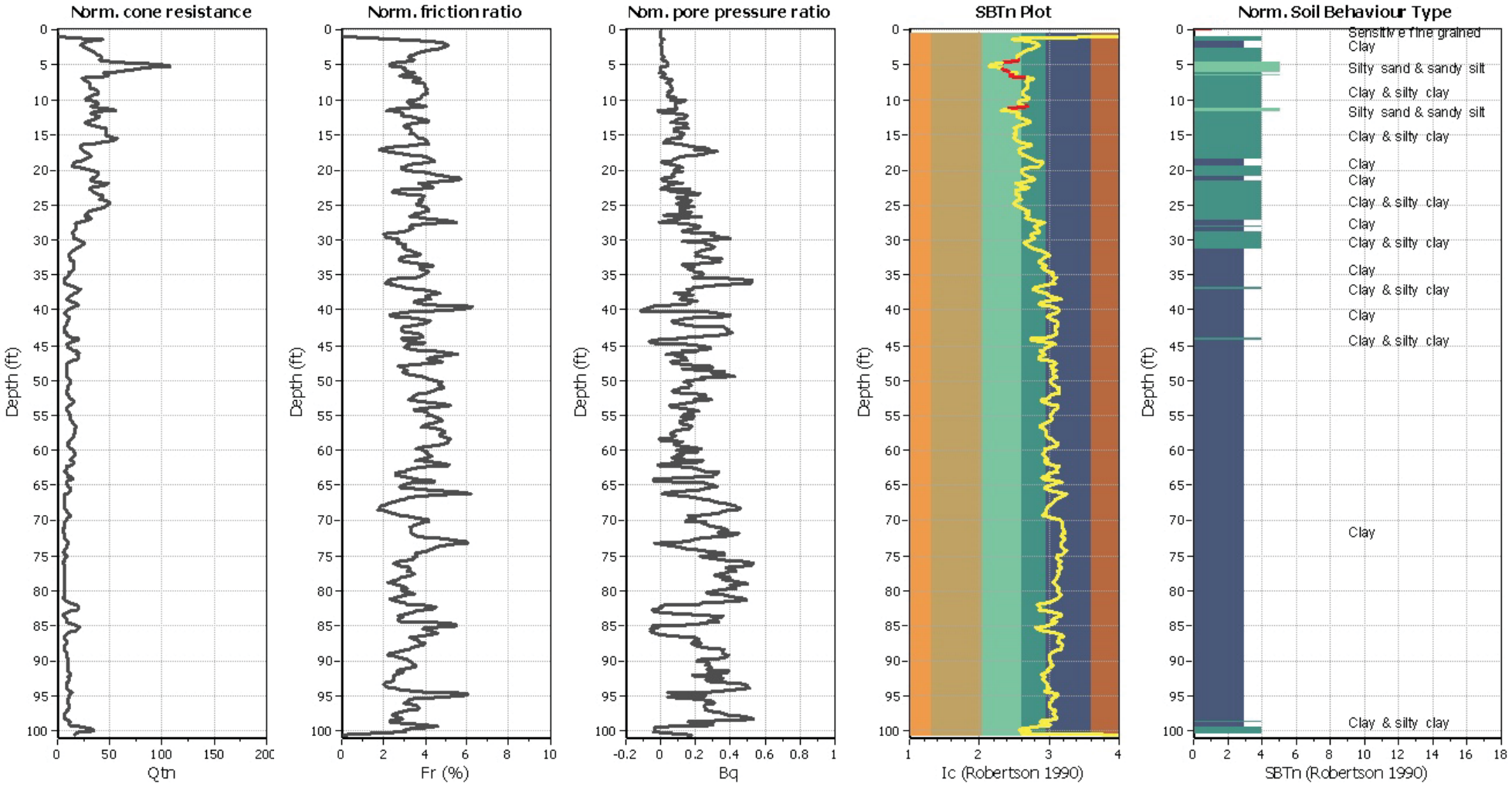
CPT name: 1-CPT10

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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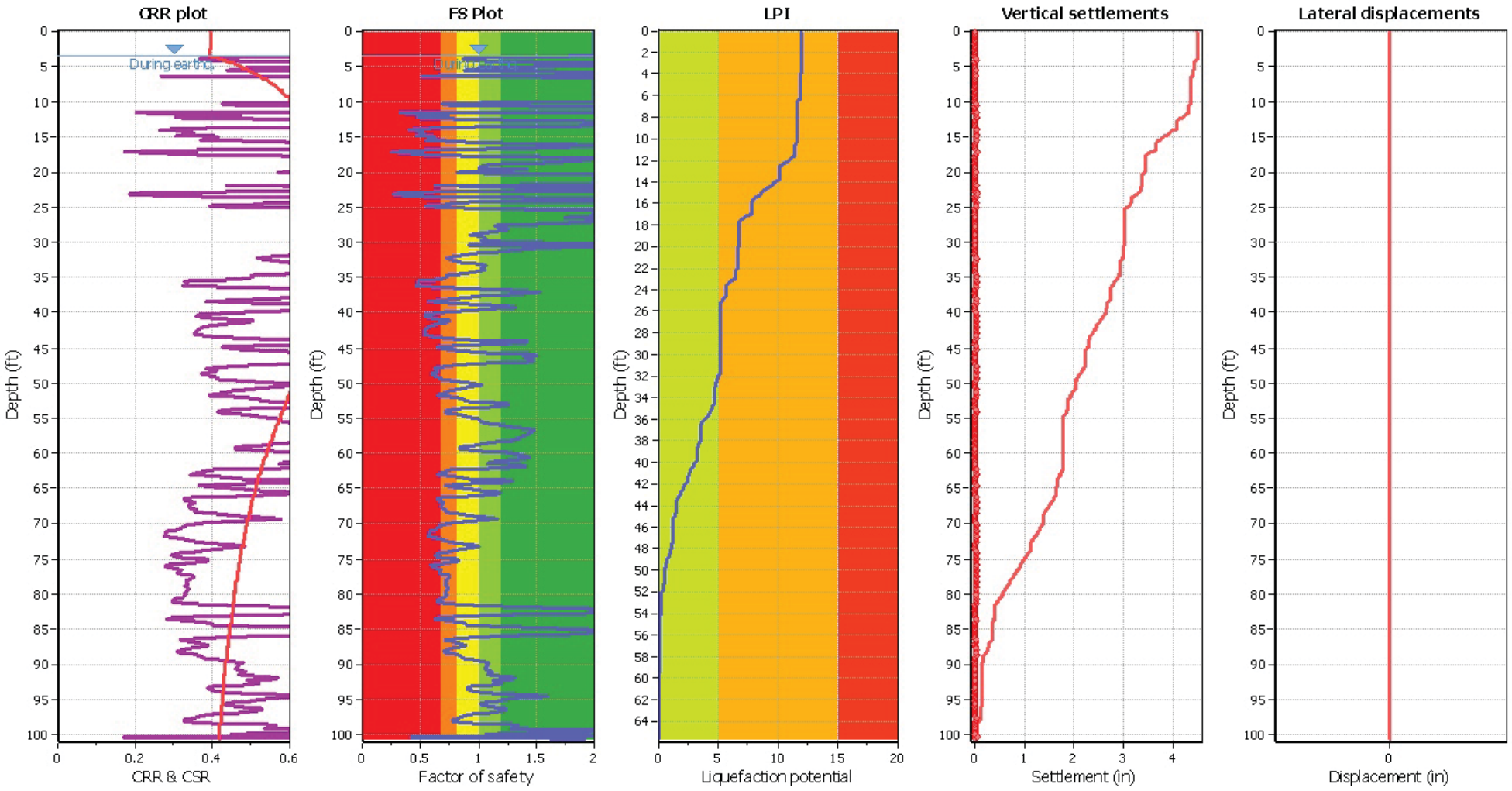
Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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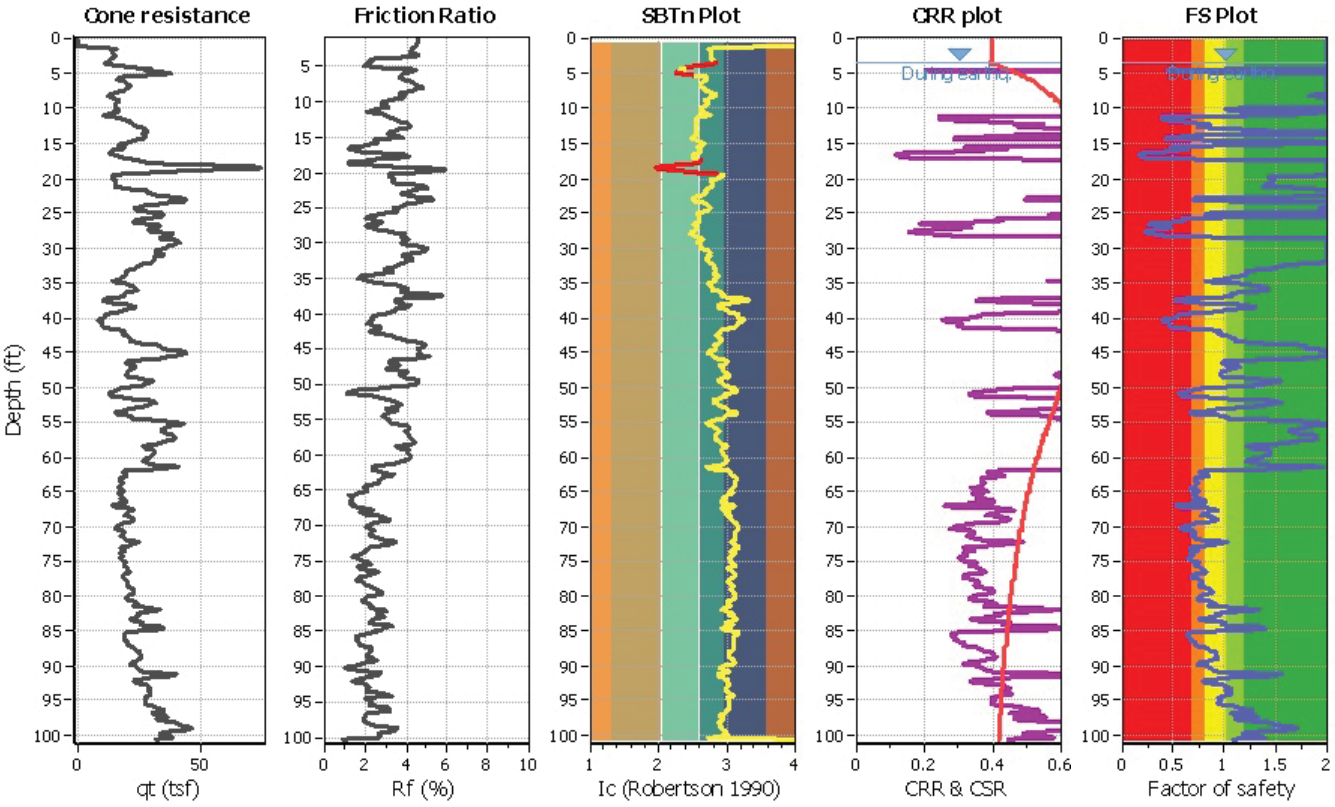
LIQUEFACTION ANALYSIS REPORT

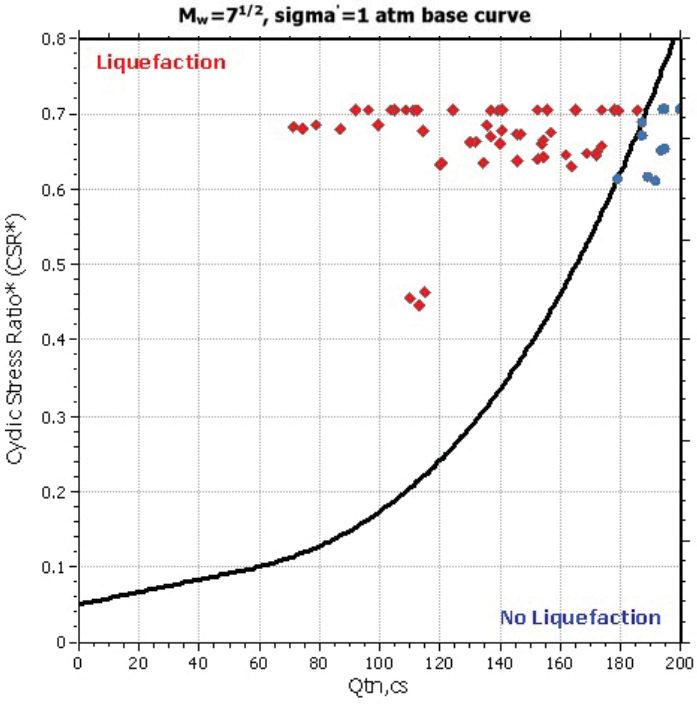
Project title : Caribbean 100 **Location : Sunnyvale, CA**

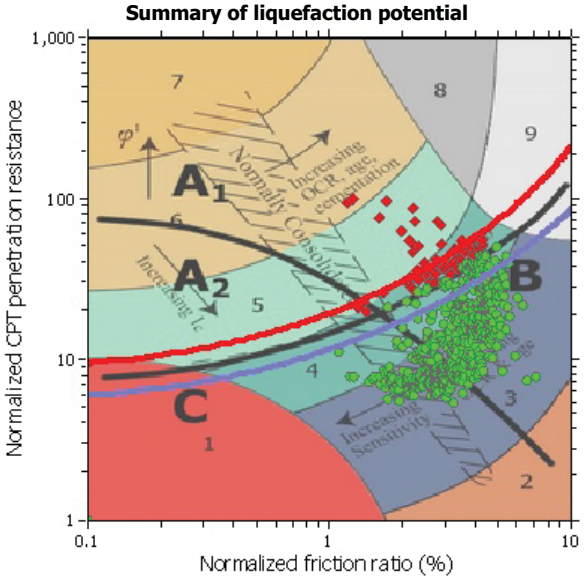
CPT file : 1-CPT11

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	4.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		

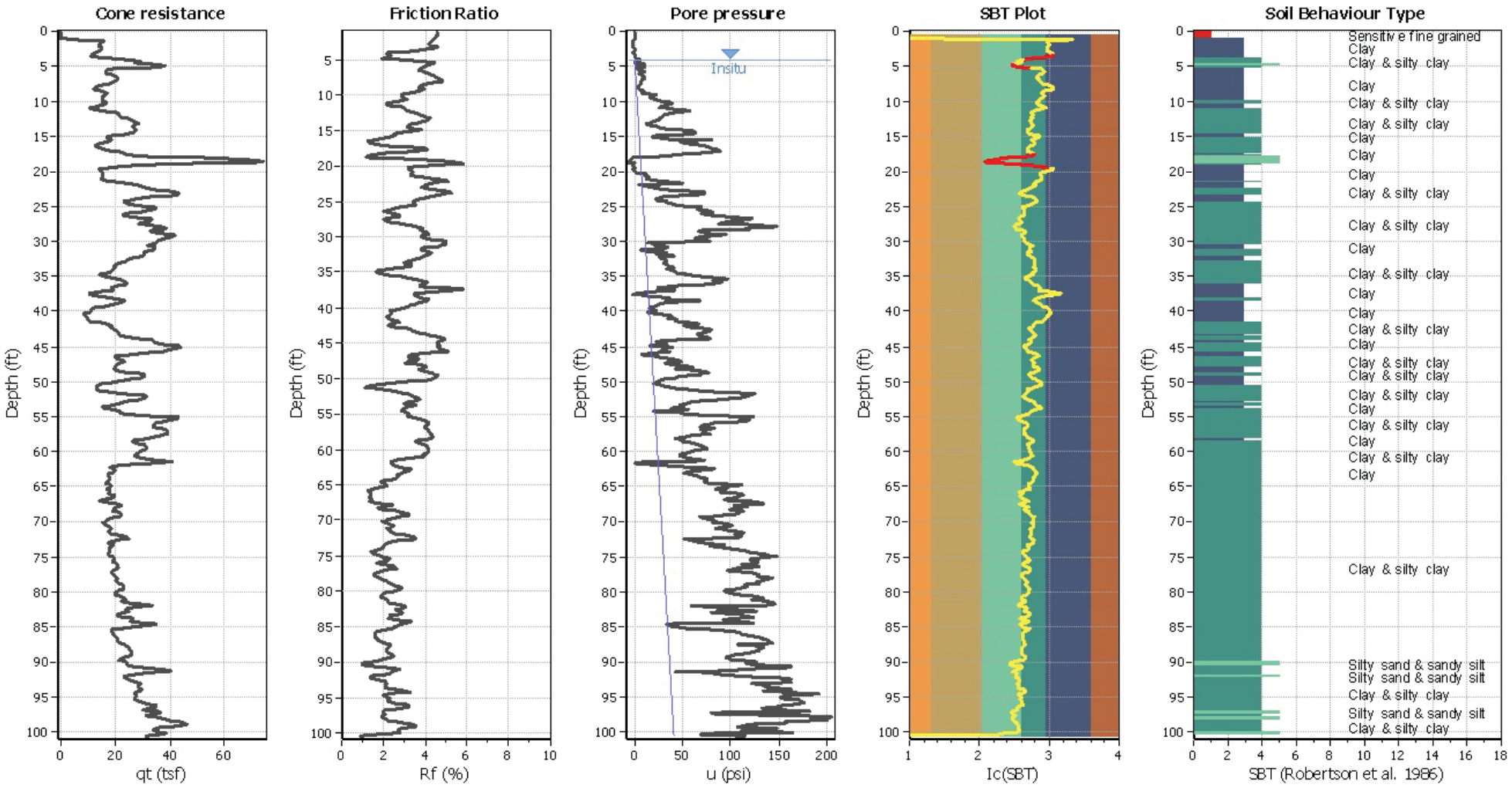






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plo



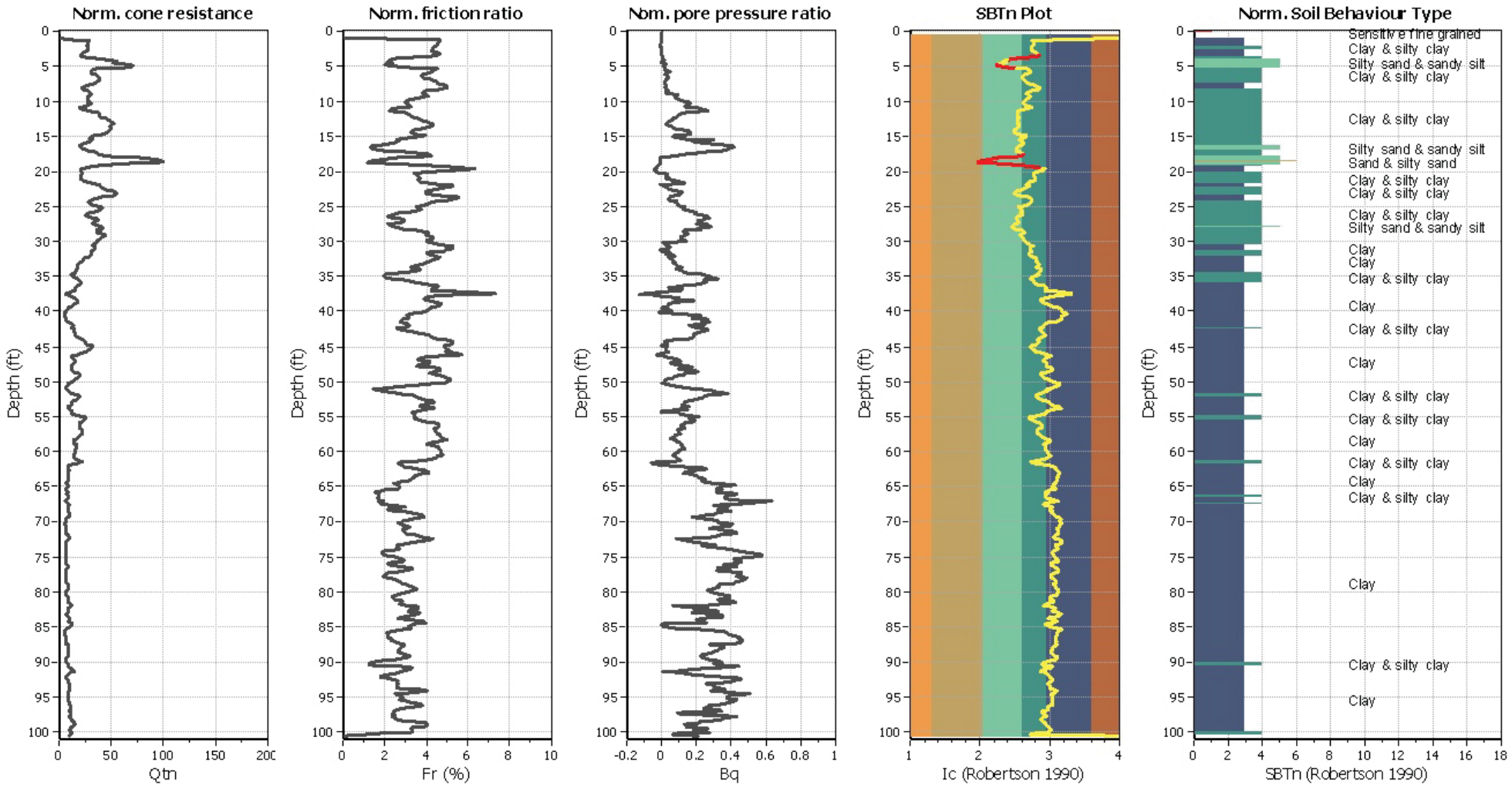
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



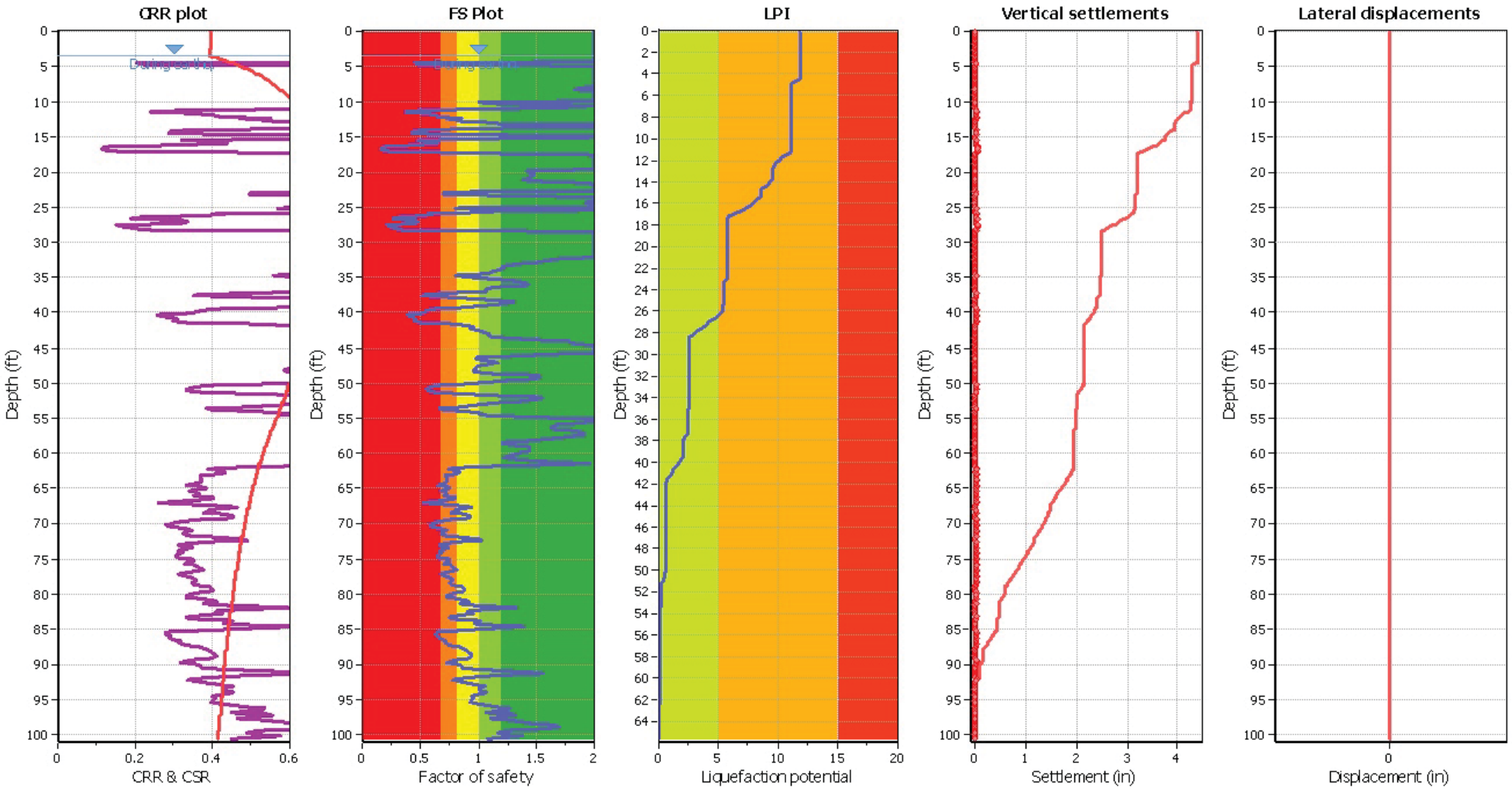
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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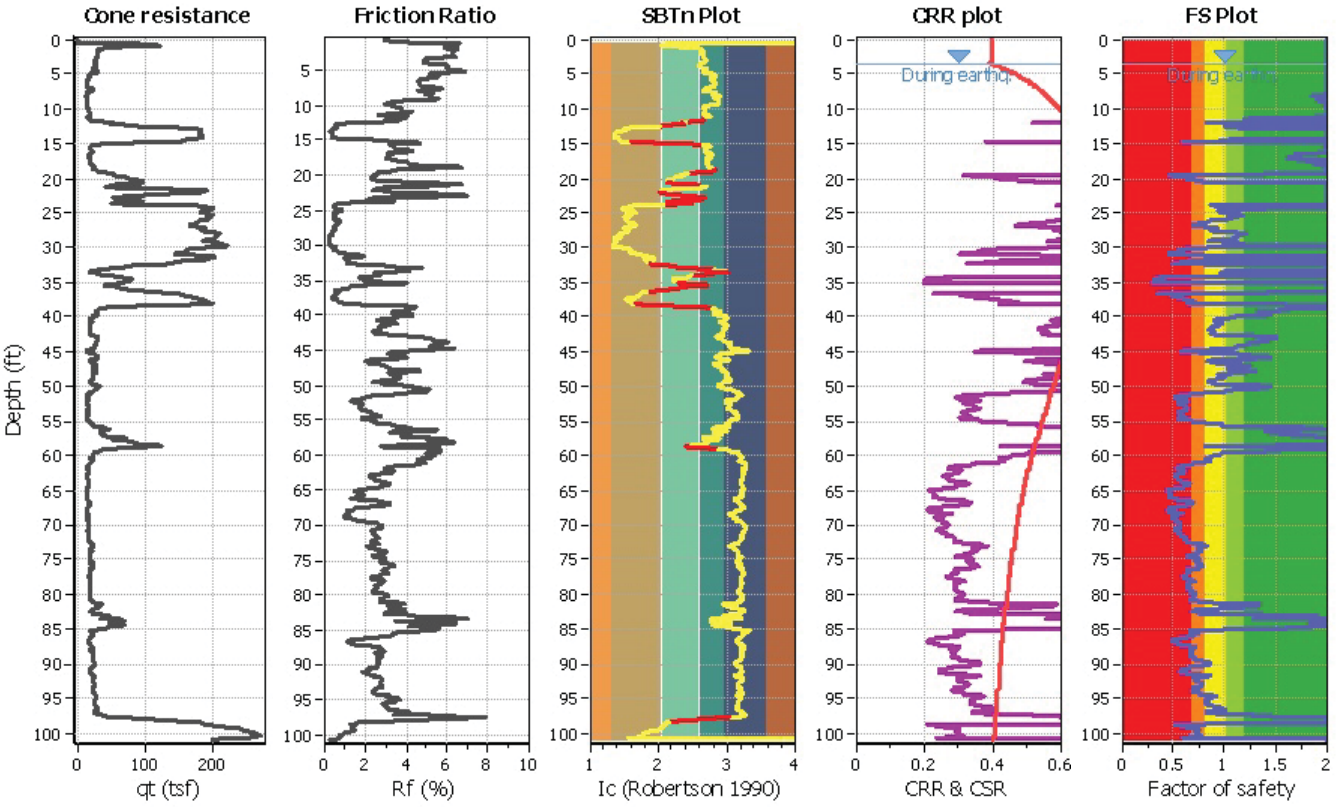
LIQUEFACTION ANALYSIS REPORT

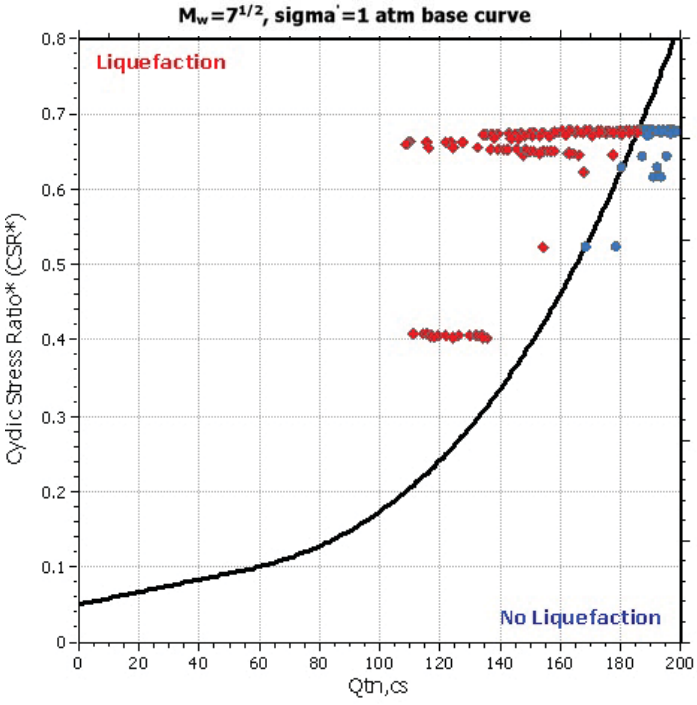
Project title : Caribbean 100 **Location : Sunnyvale, CA**

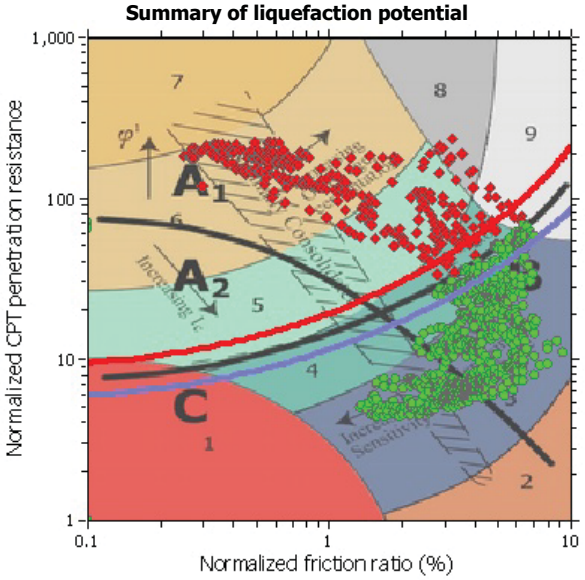
CPT file : 1-CPT12

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.30 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	No		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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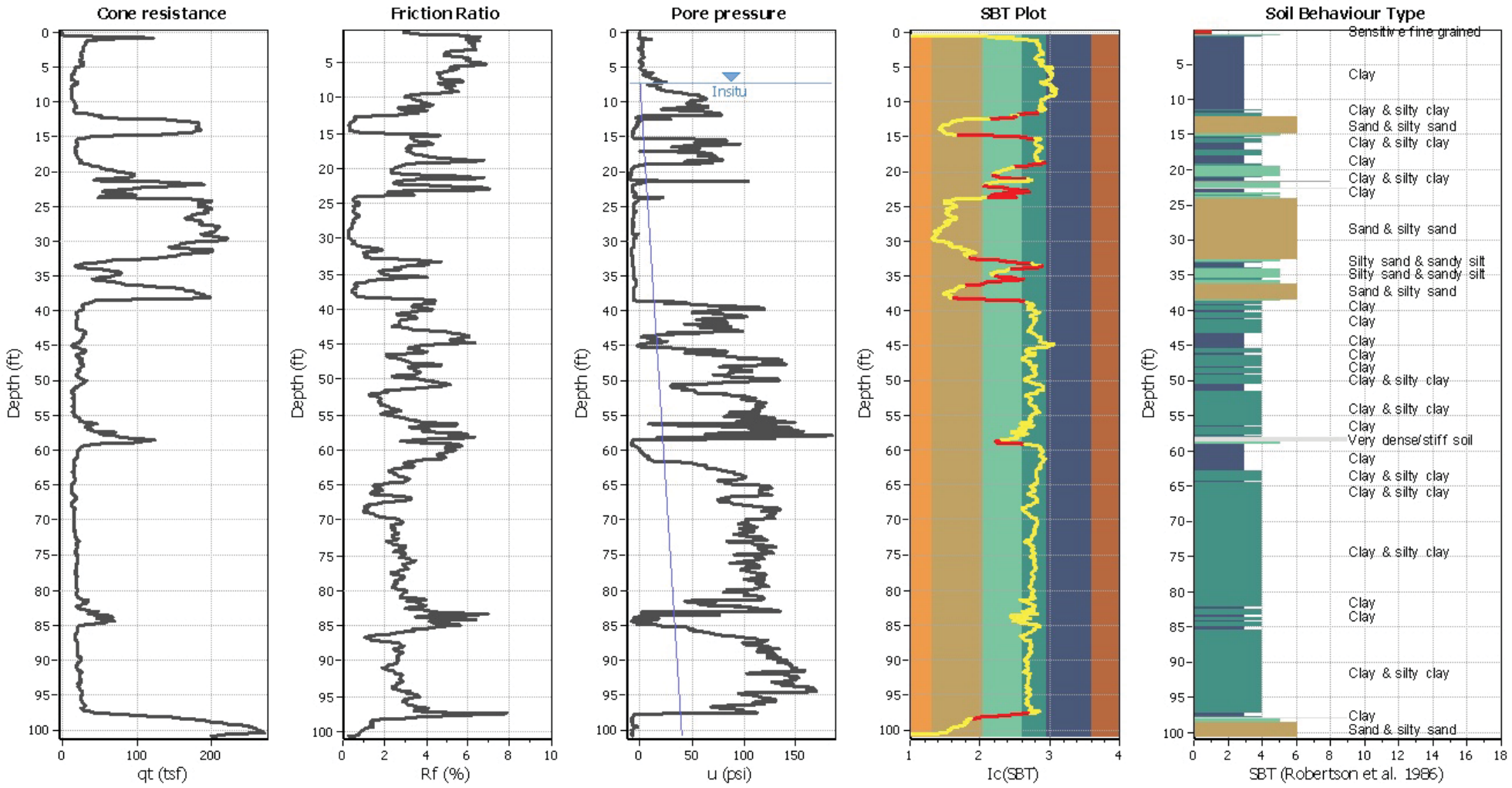
CPT basic interpretation plo



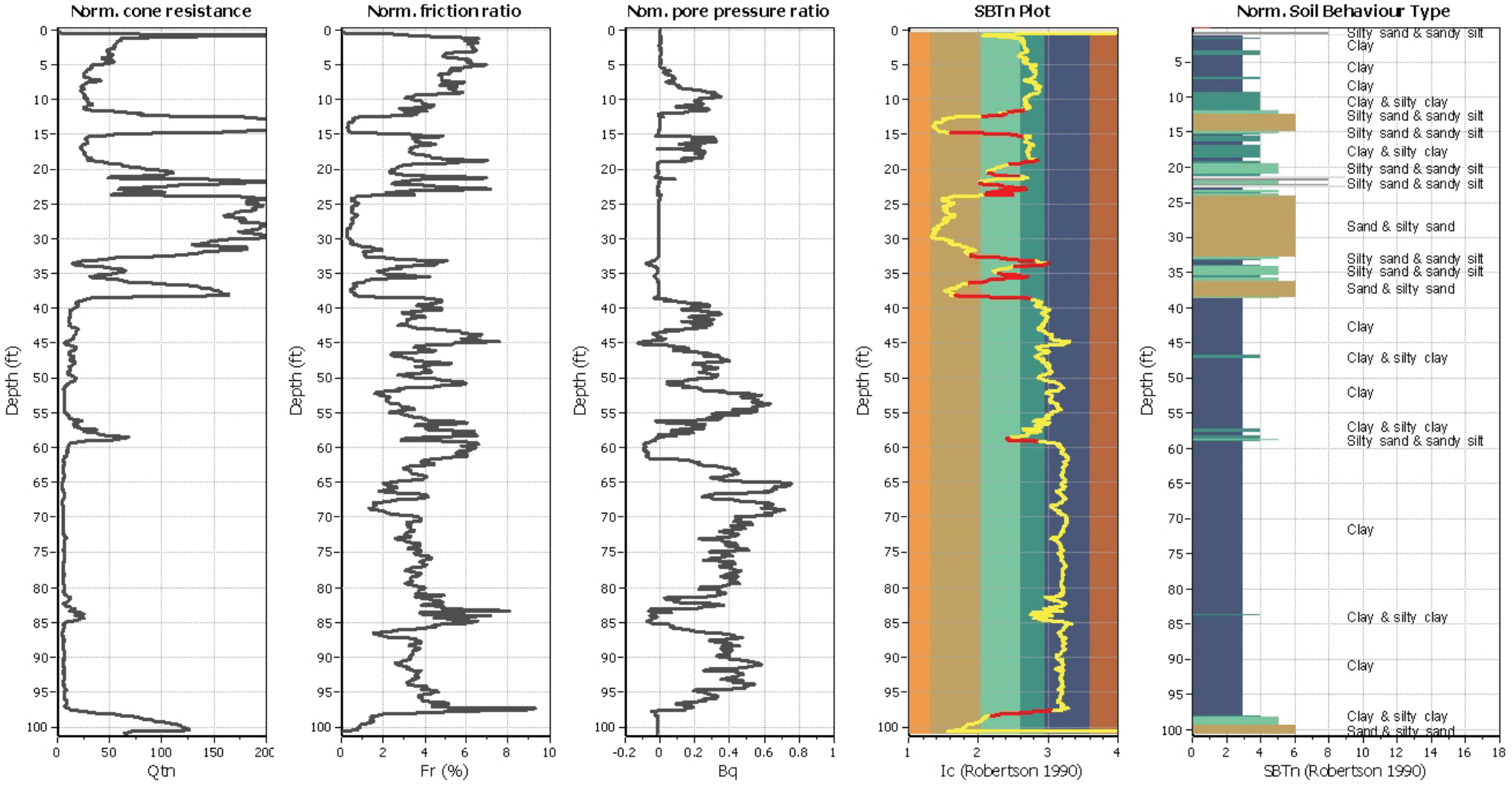
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



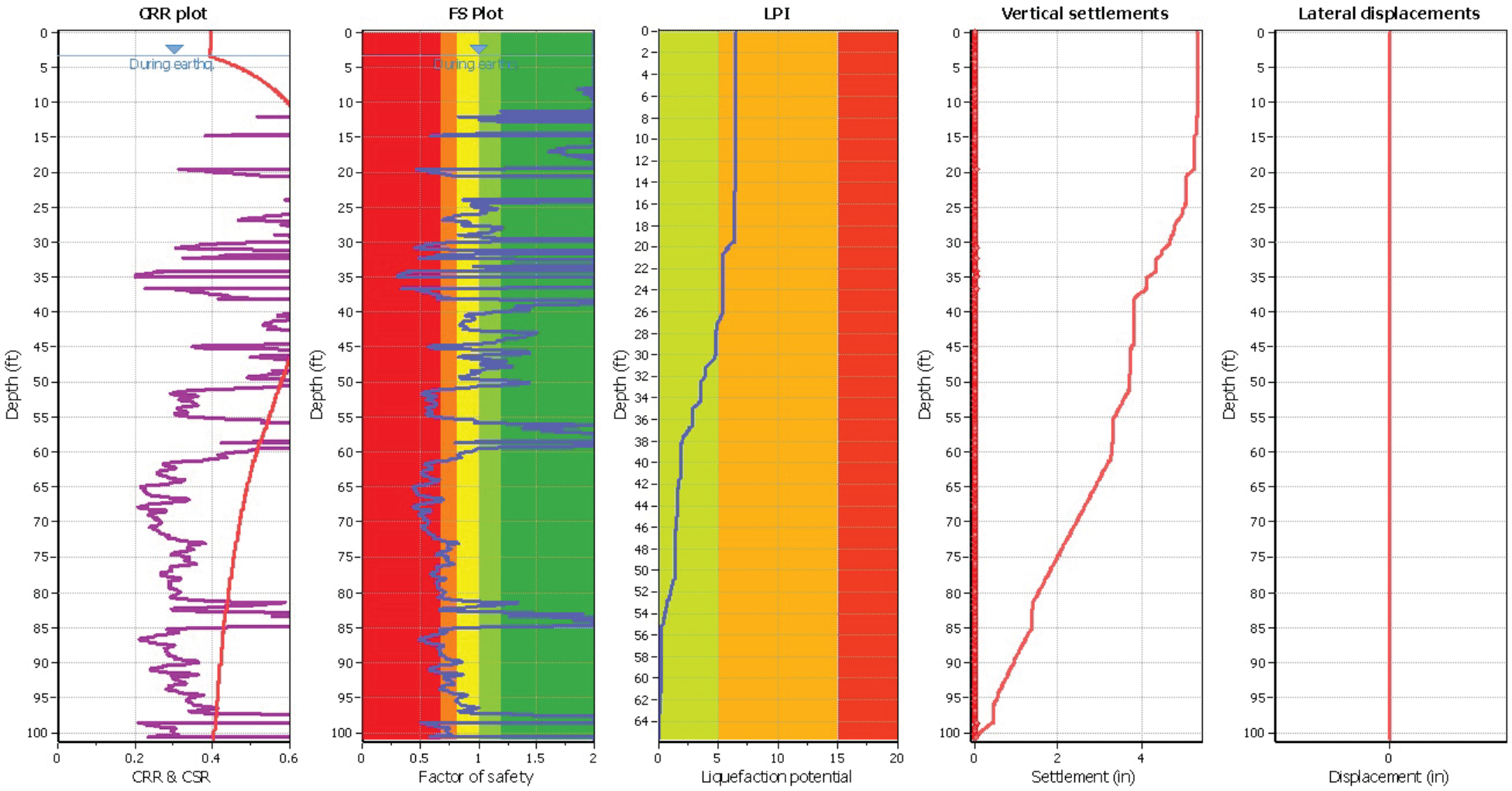
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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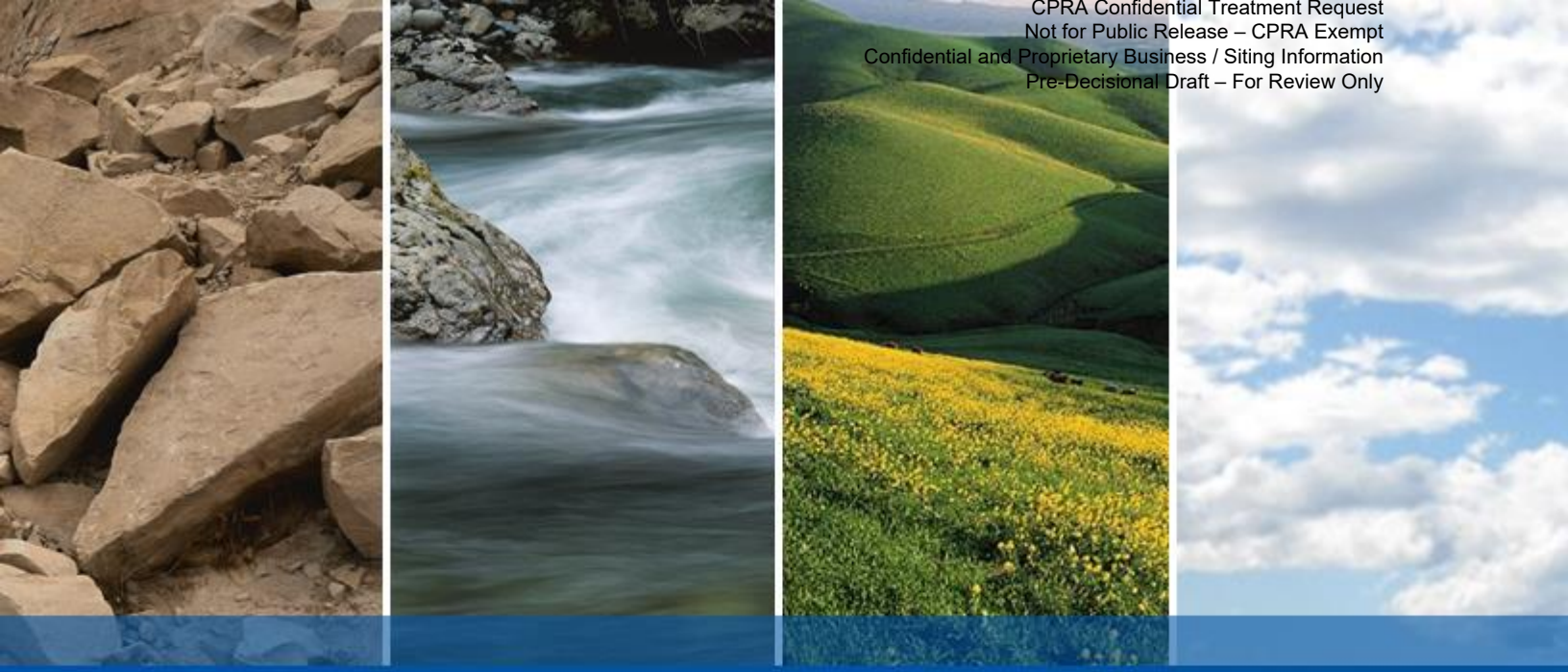

DRAFT

APPENDIX C

PRELIMINARY LIQUEFACTION ANALYSIS (BOULANGER & IDRISS, 2014)

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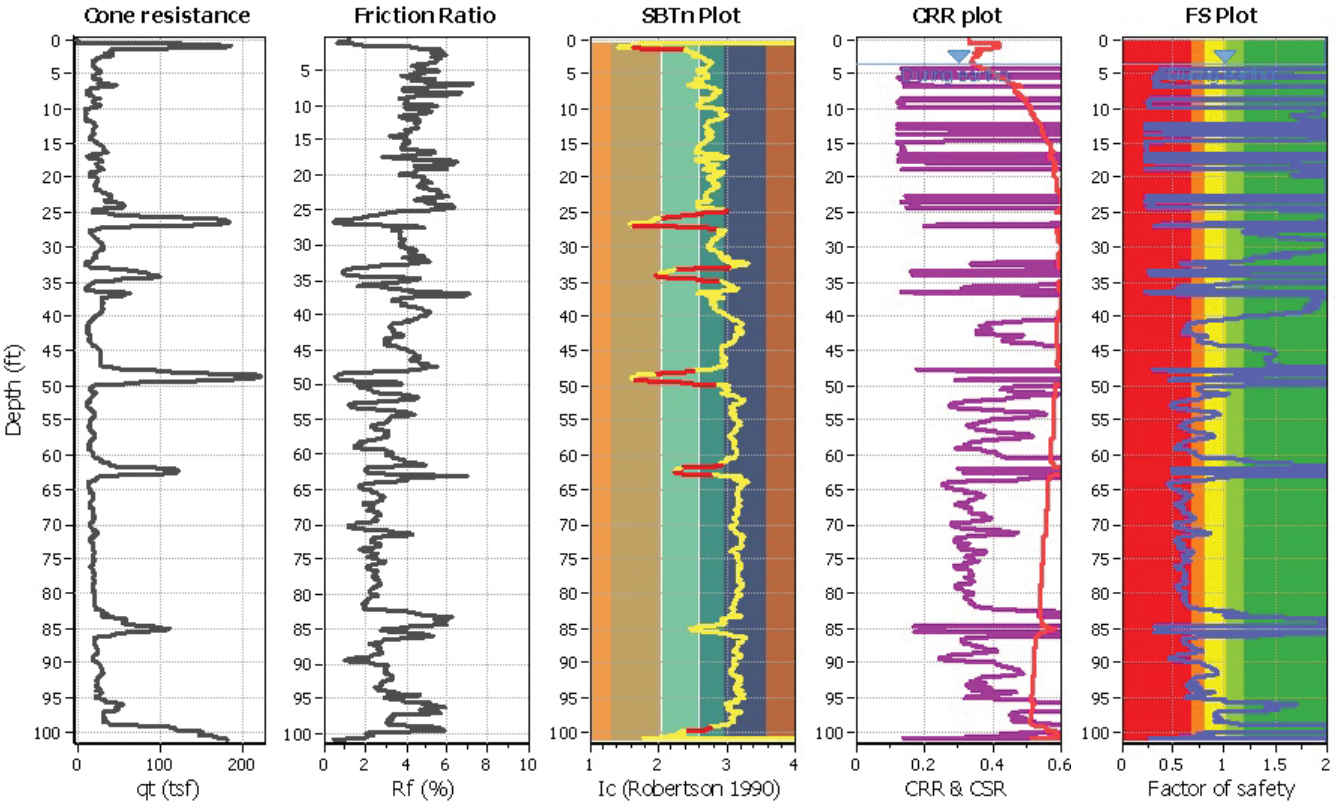
LIQUEFACTION ANALYSIS REPORT

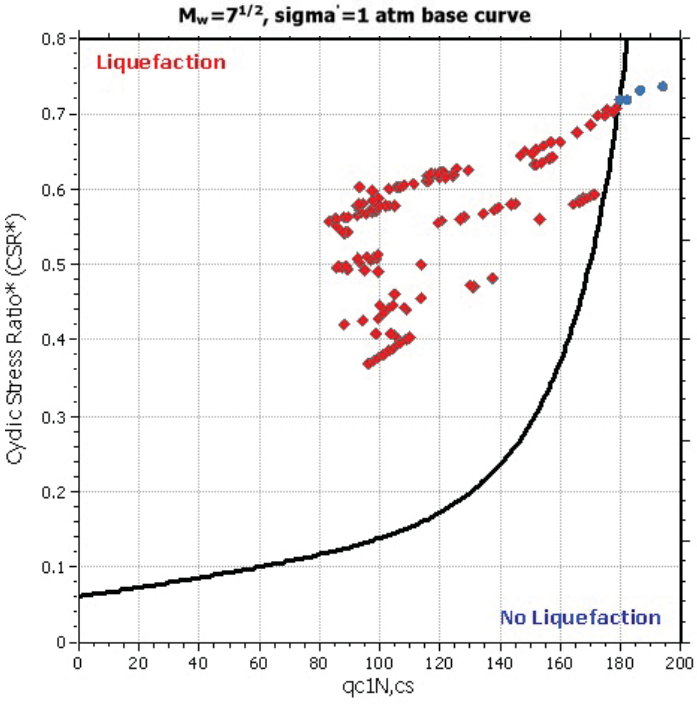
Project title : Caribbean 100 **Location : Sunnyvale, CA**

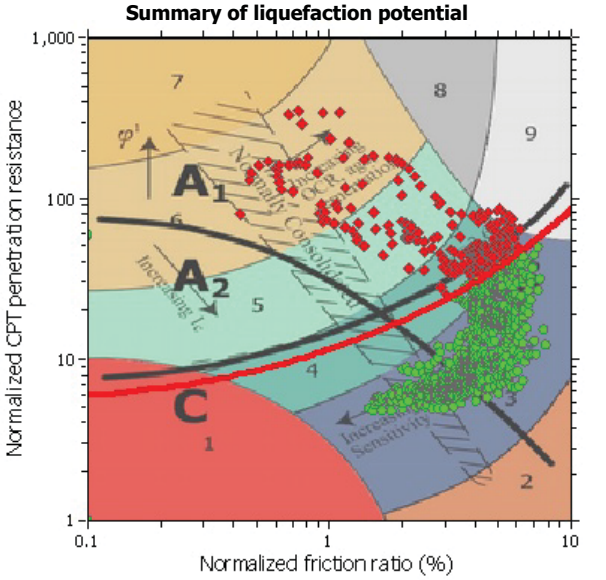
CPT file : 1-CPT07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.70 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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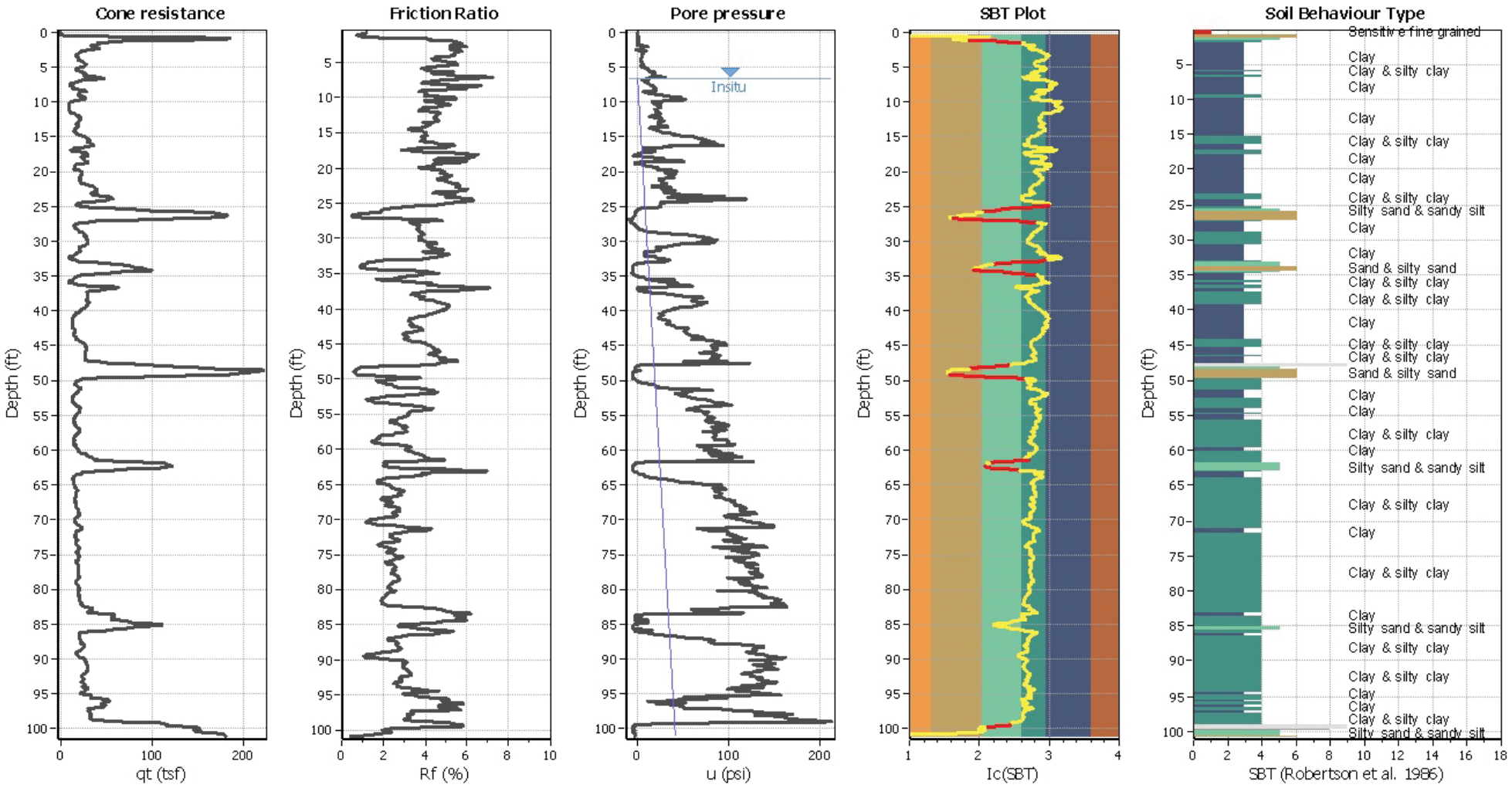
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

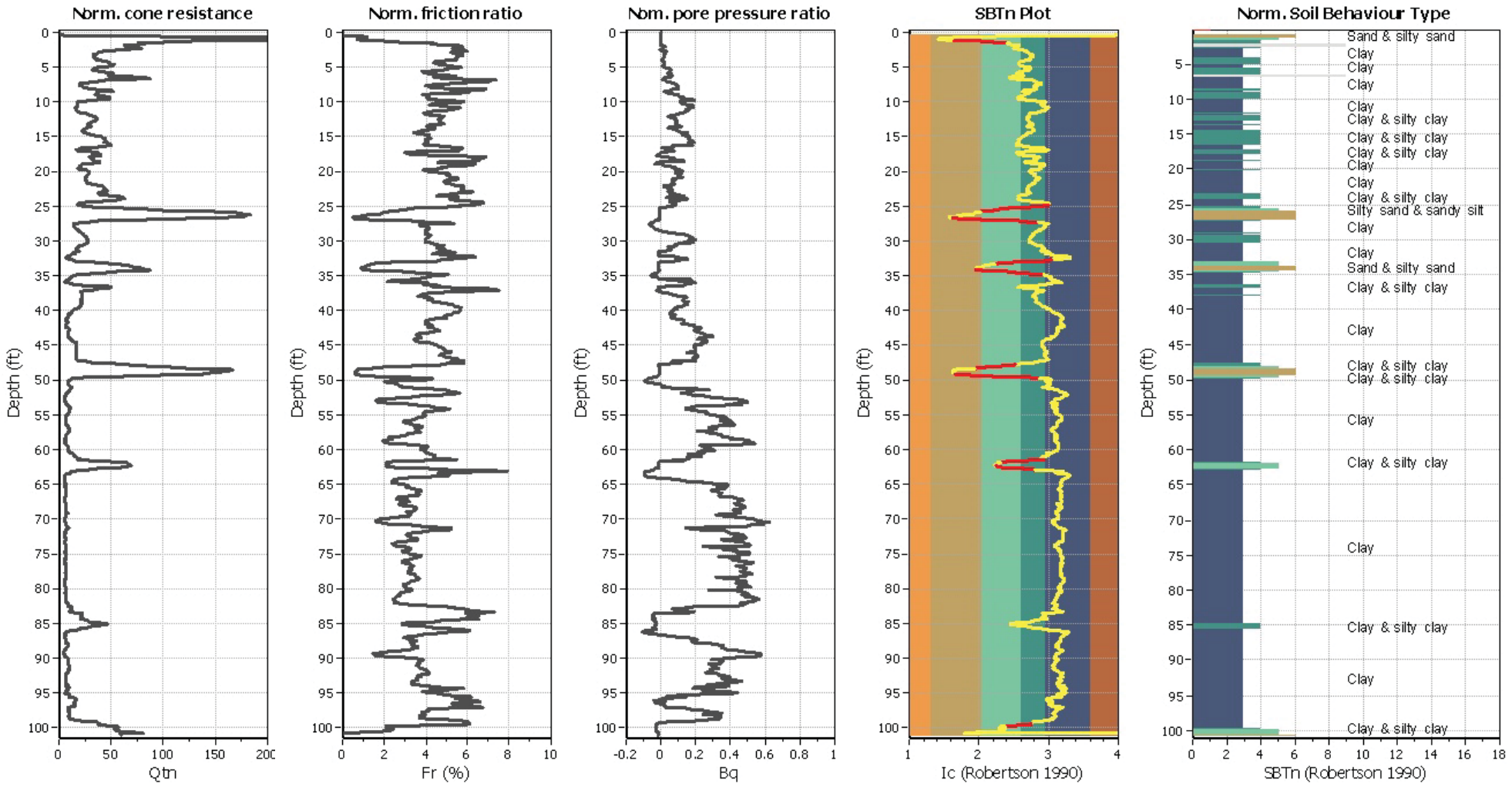
SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

This software is licensed to: ENGEO Incorporated

CPT name: 1-CPT07

CPT basic interpretation plots (normaliz



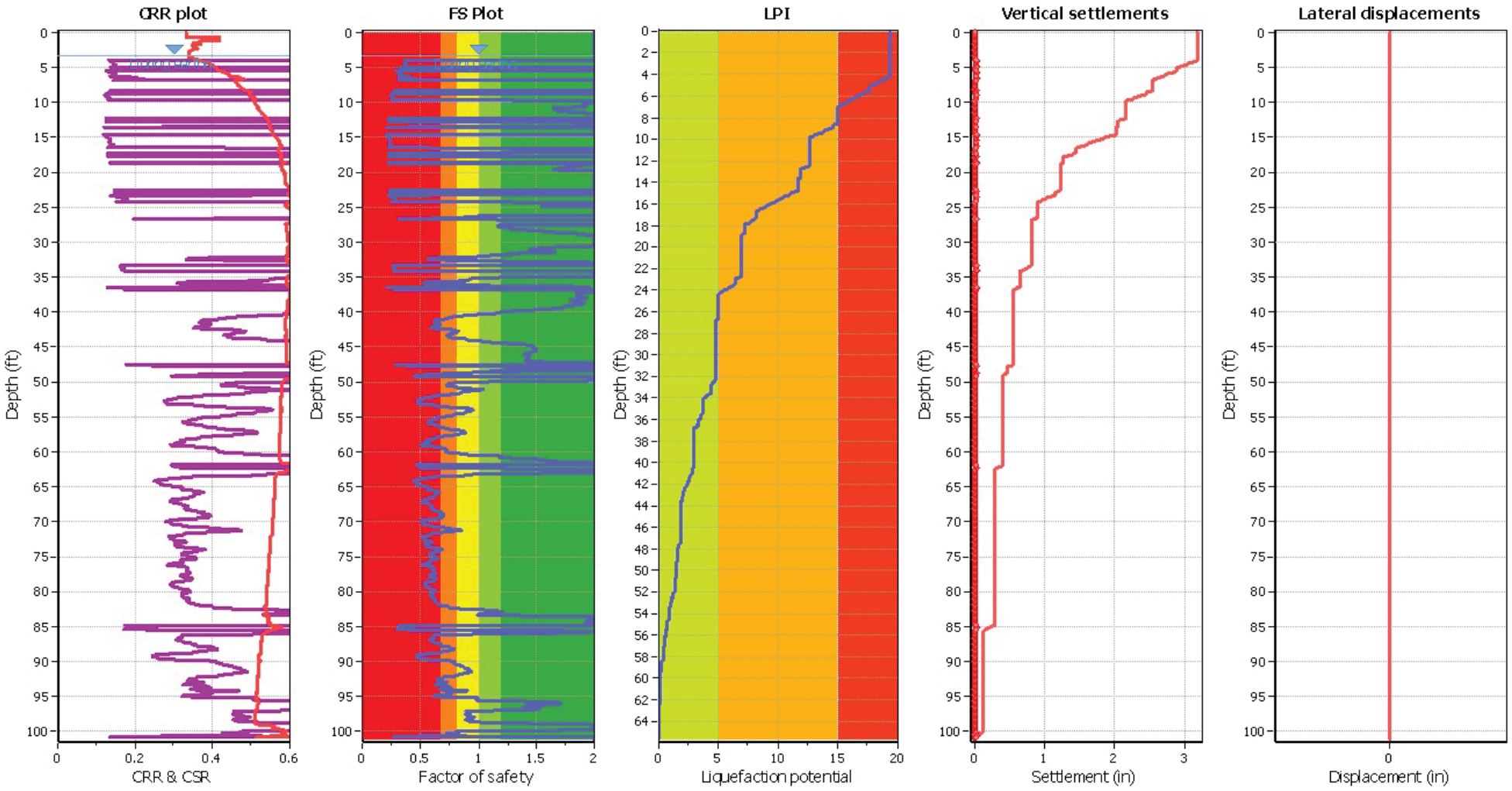
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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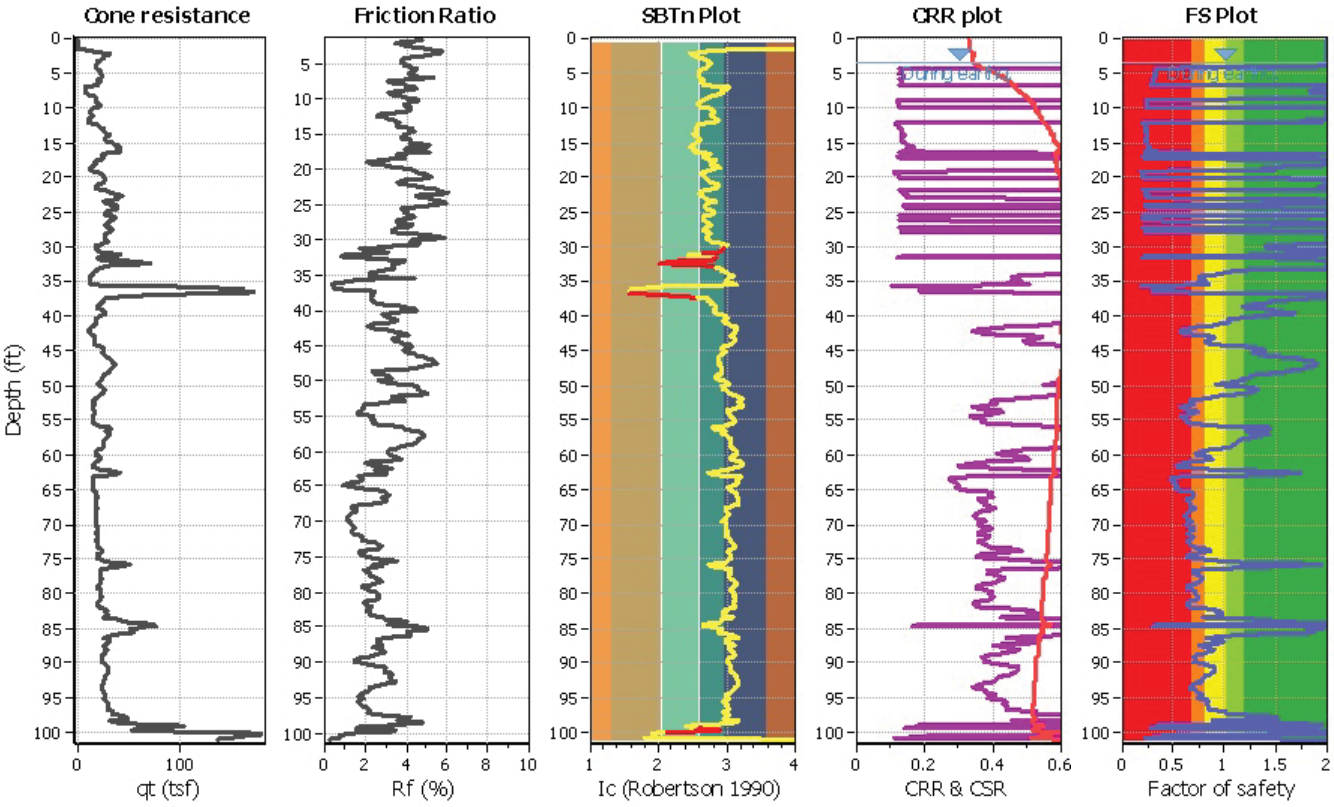
LIQUEFACTION ANALYSIS REPORT

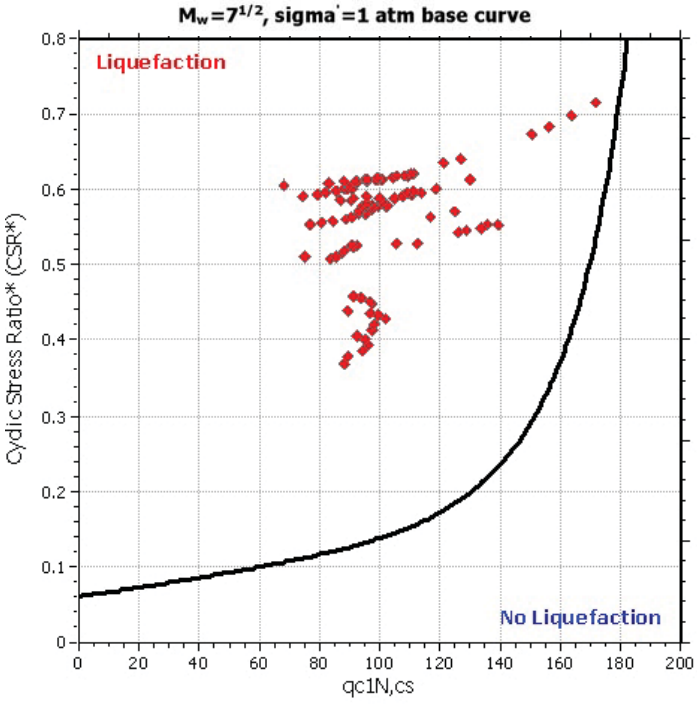
Project title : Caribbean 100 **Location : Sunnyvale, CA**

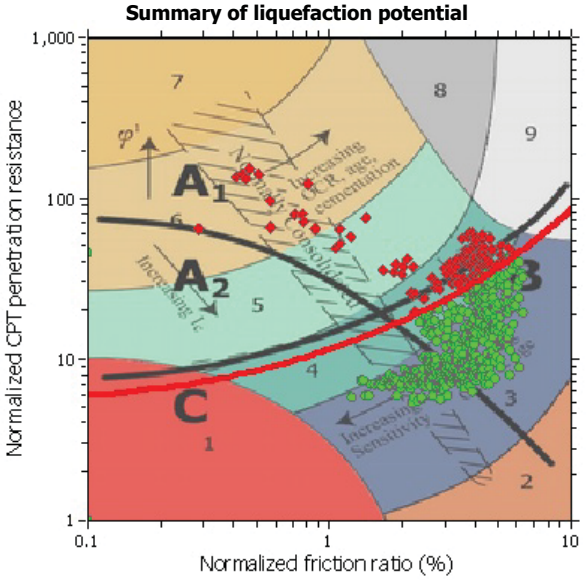
CPT file : 1-CPT08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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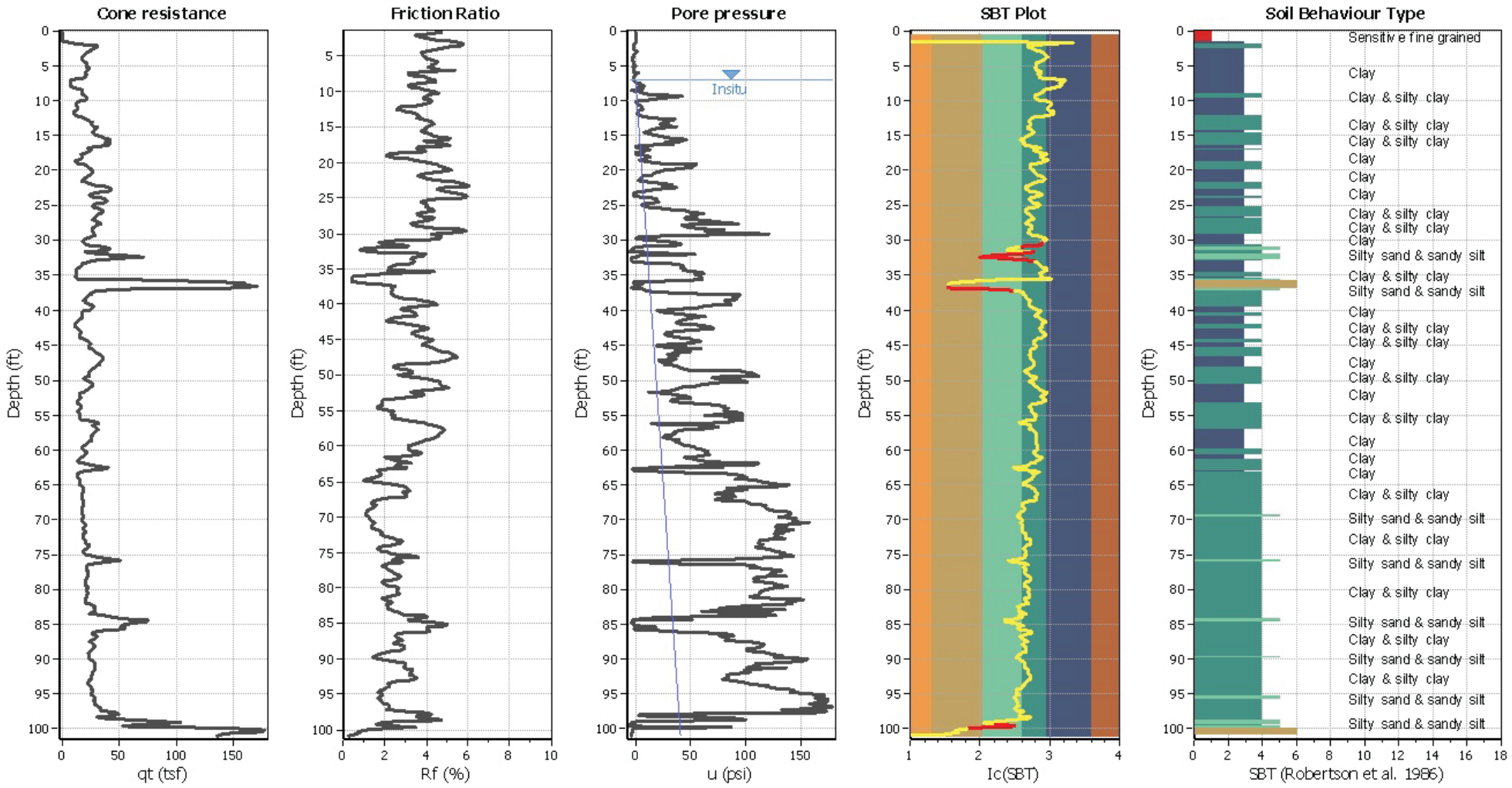
CPT basic interpretation plo



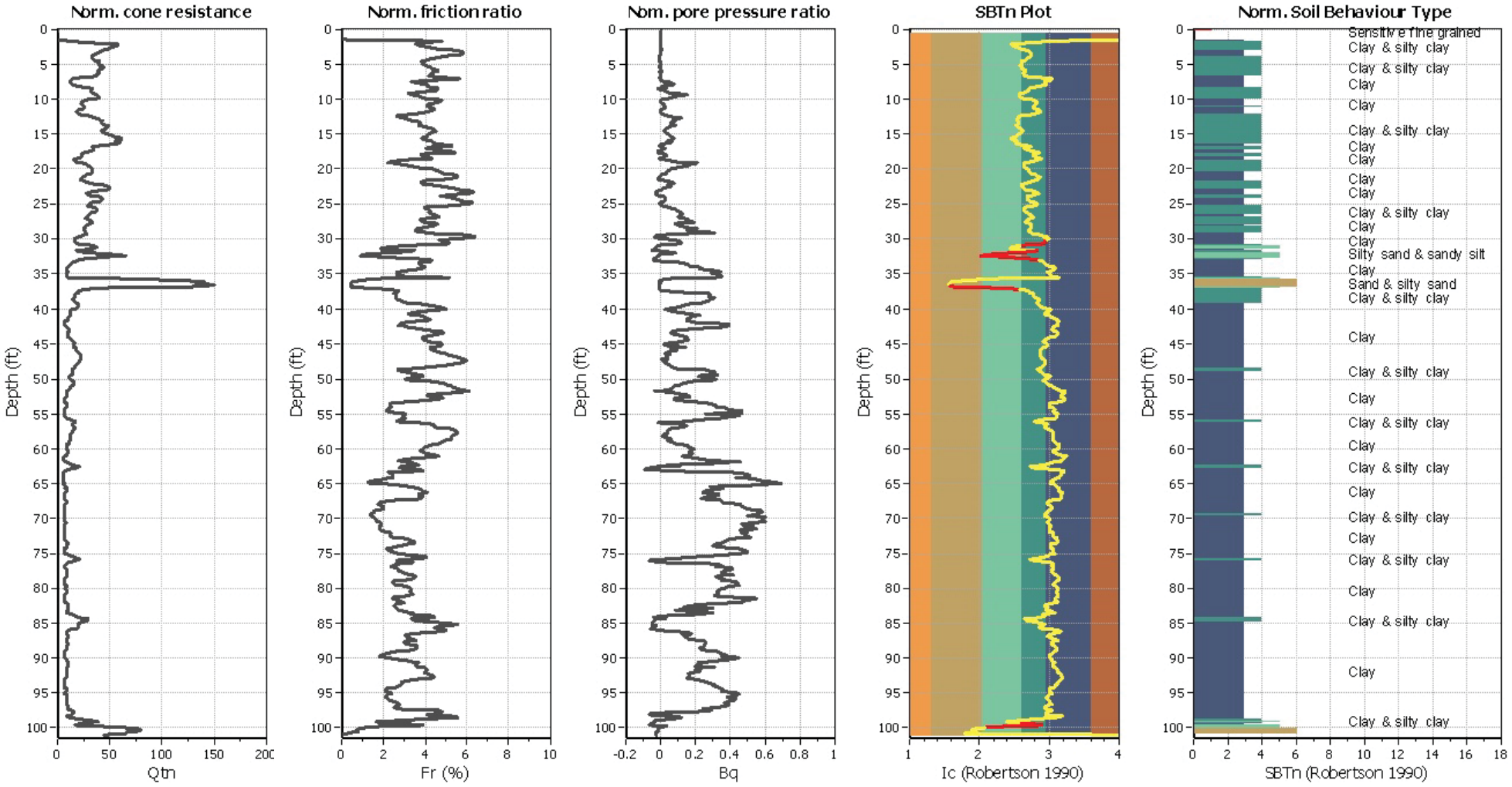
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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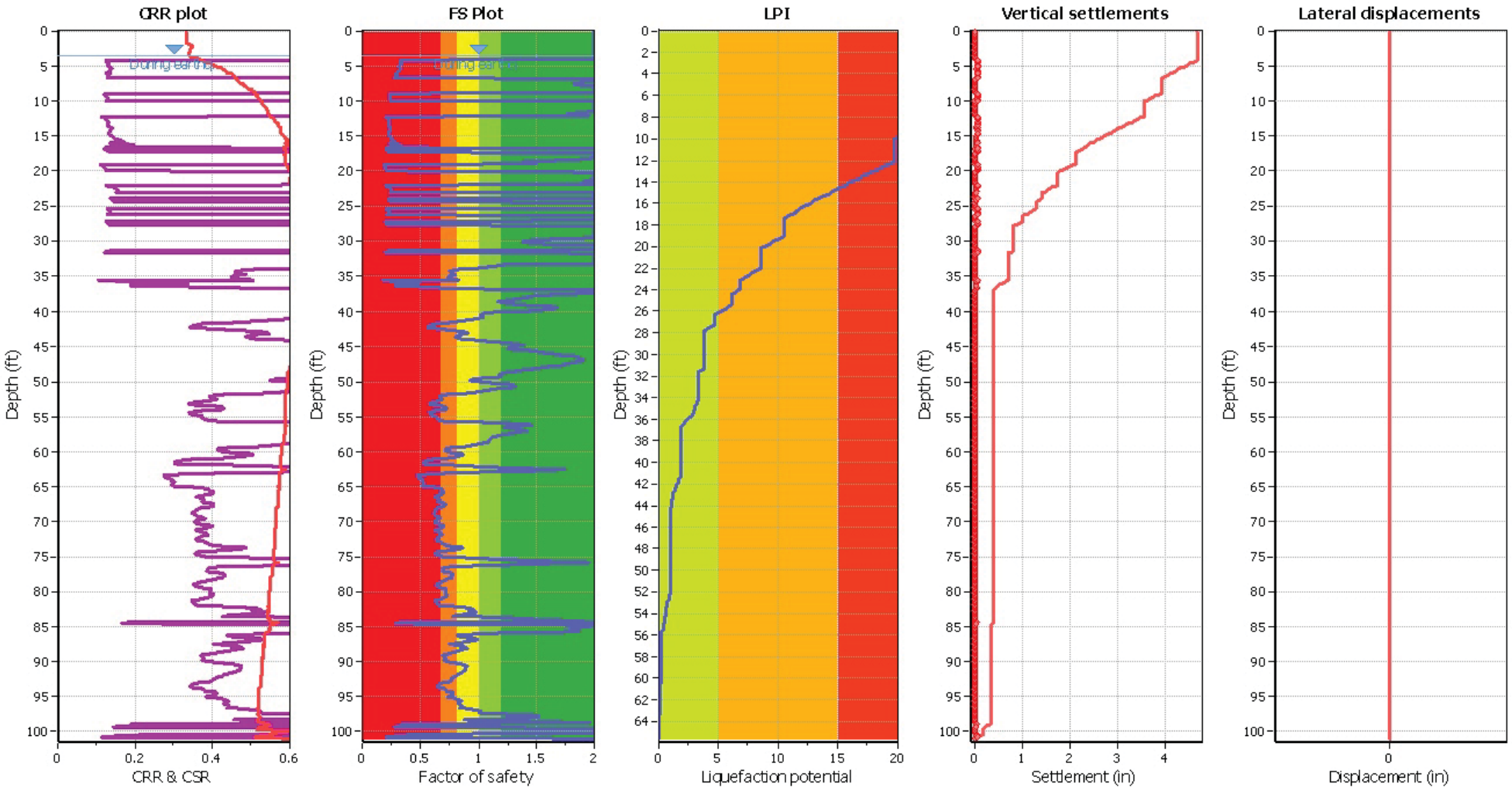
Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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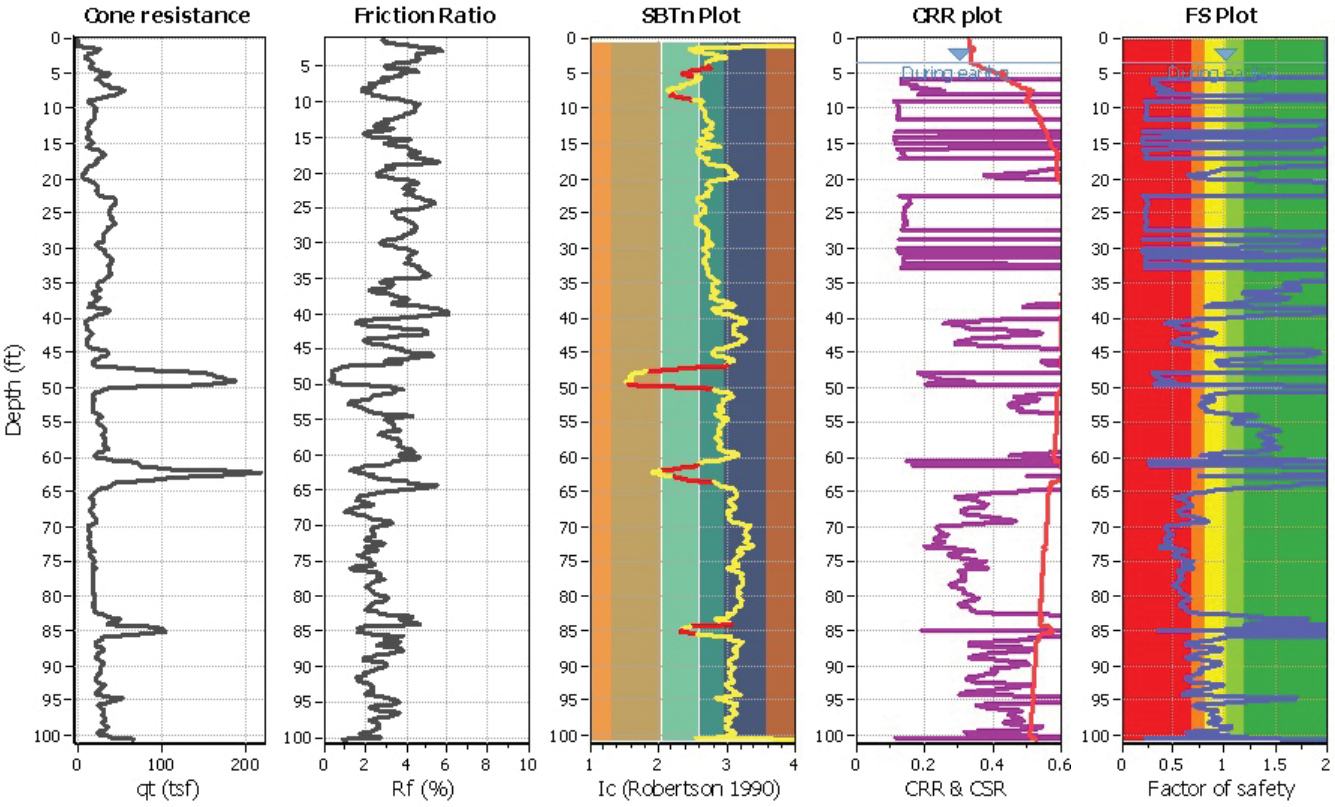
LIQUEFACTION ANALYSIS REPORT

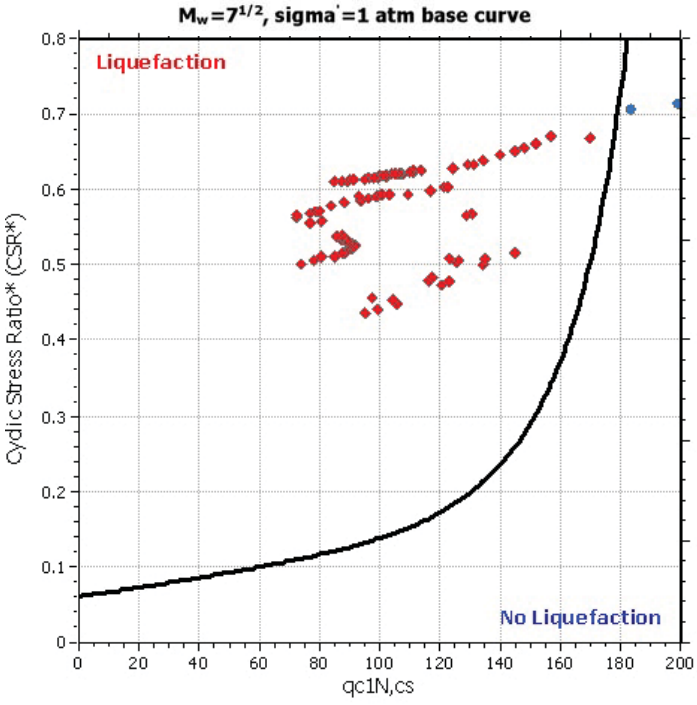
Project title : Caribbean 100 **Location : Sunnyvale, CA**

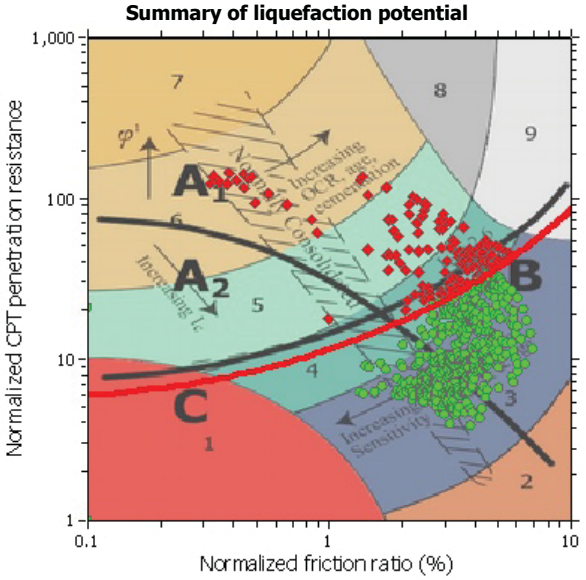
CPT file : 1-CPT09

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.20 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

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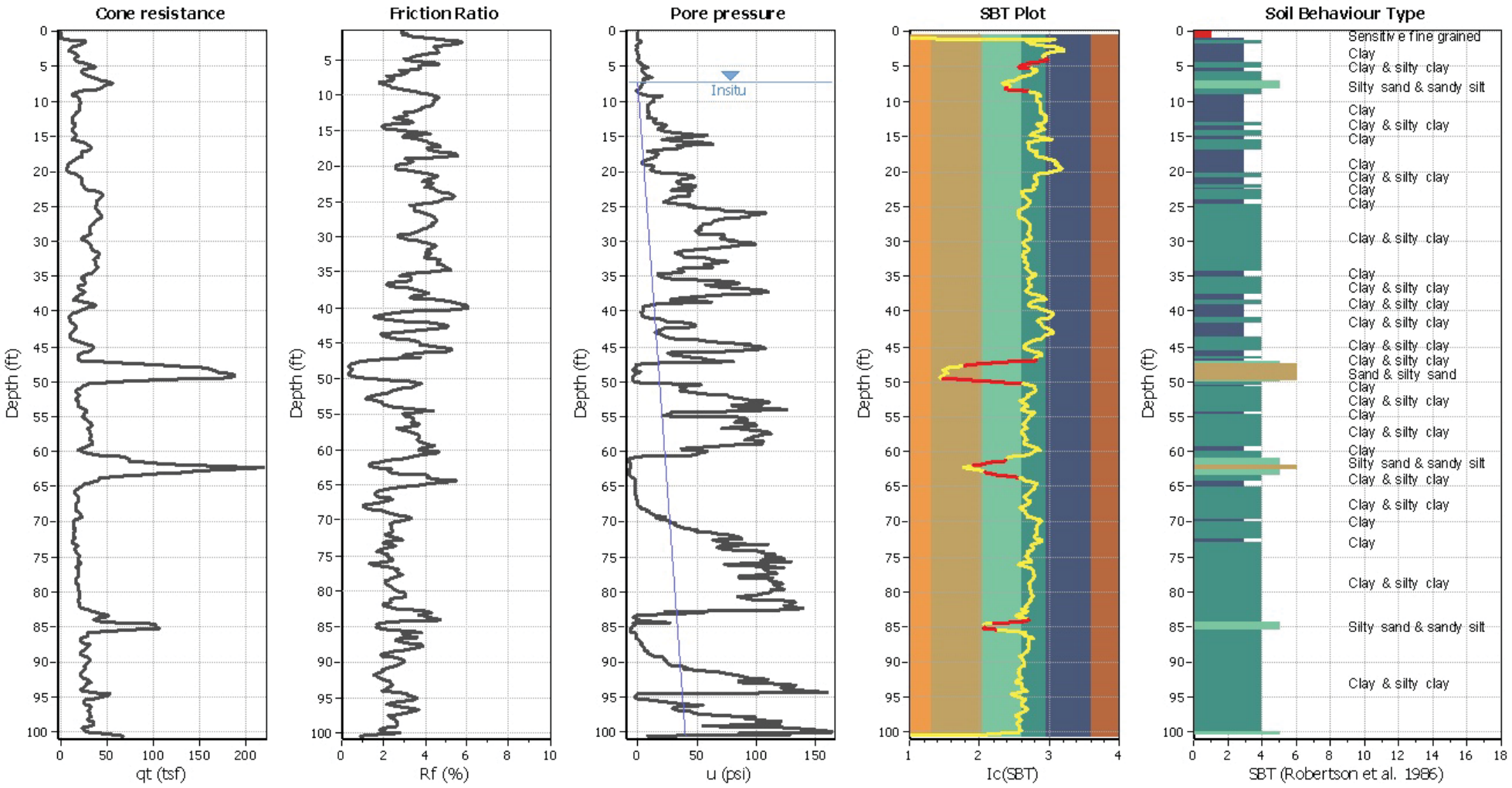
CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

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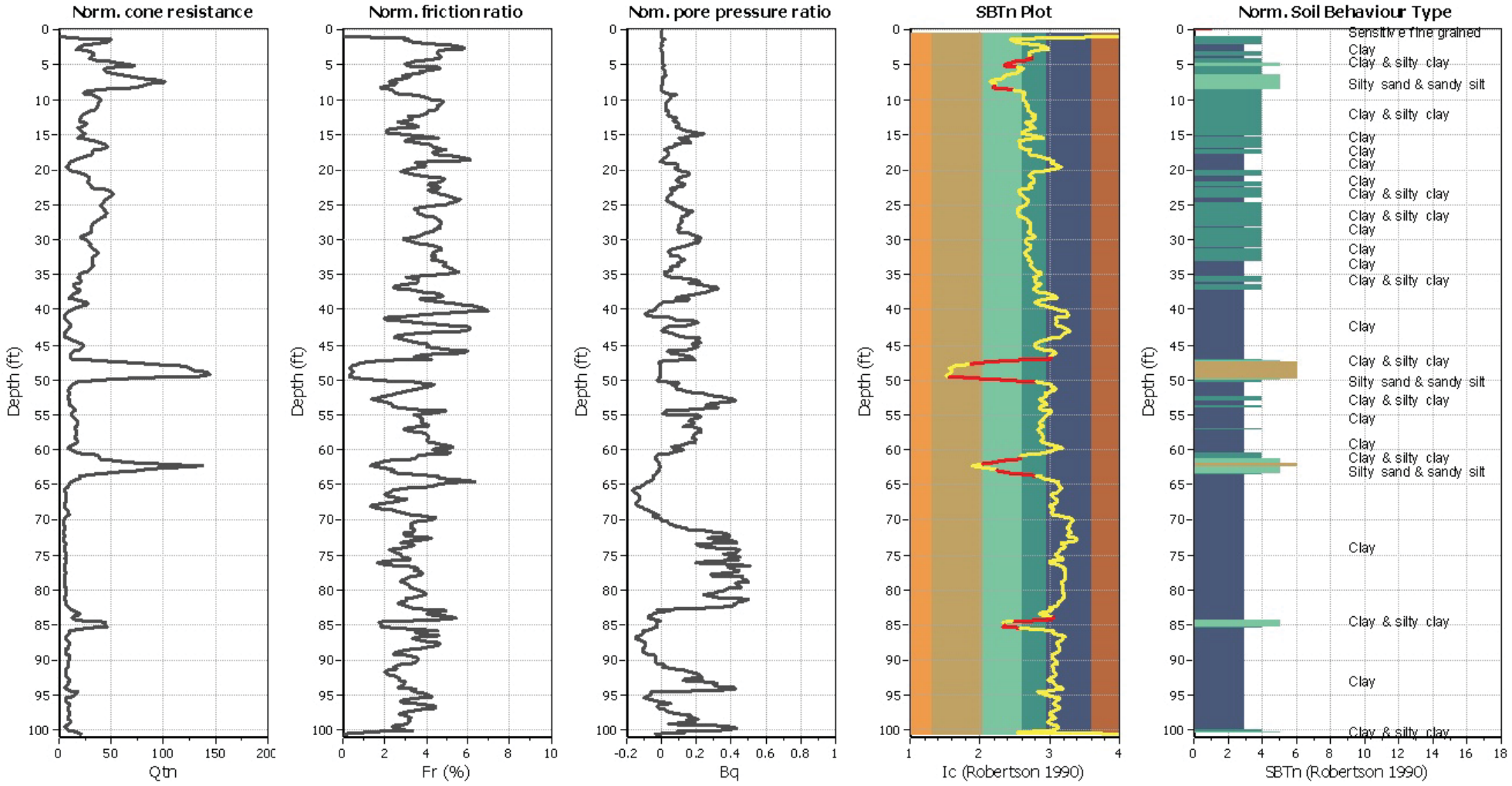
CPT name: 1-CPT09

CPT basic interpretation plots (normaliz



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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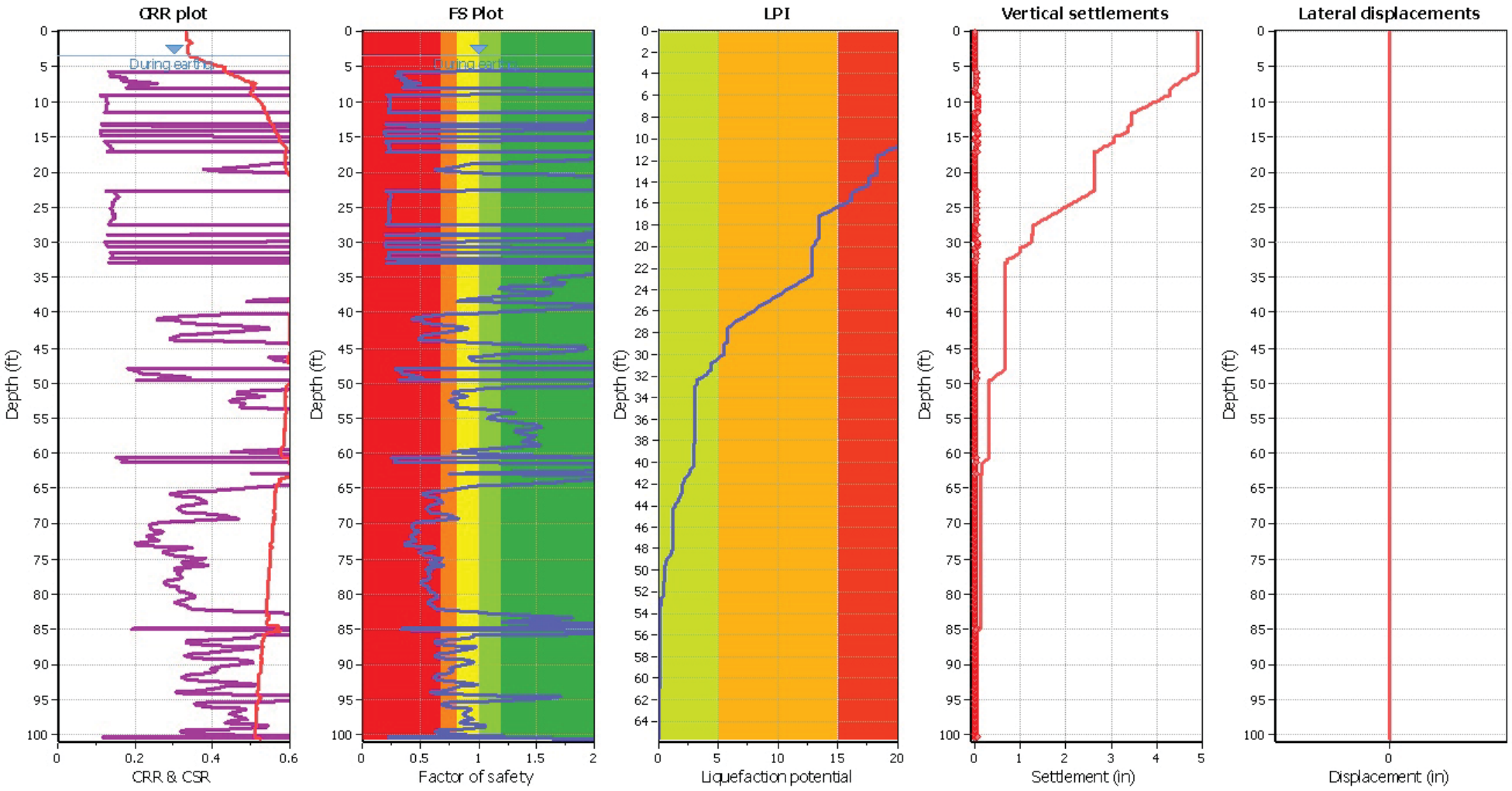
Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.20 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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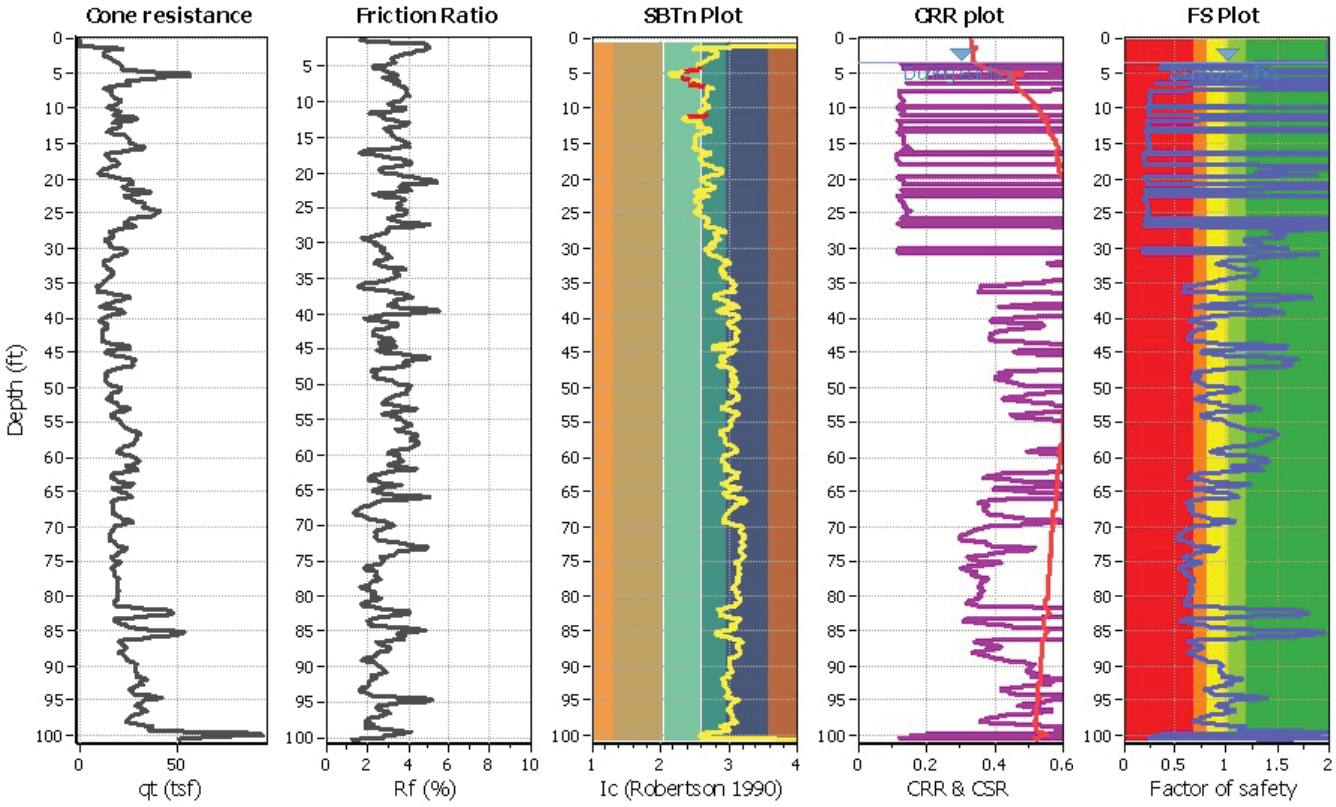
LIQUEFACTION ANALYSIS REPORT

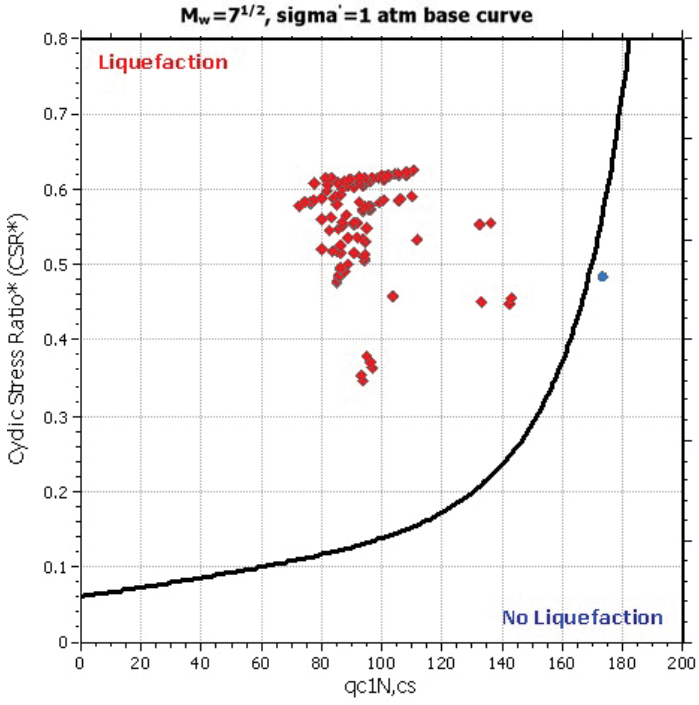
Project title : Caribbean 100 **Location : Sunnyvale, CA**

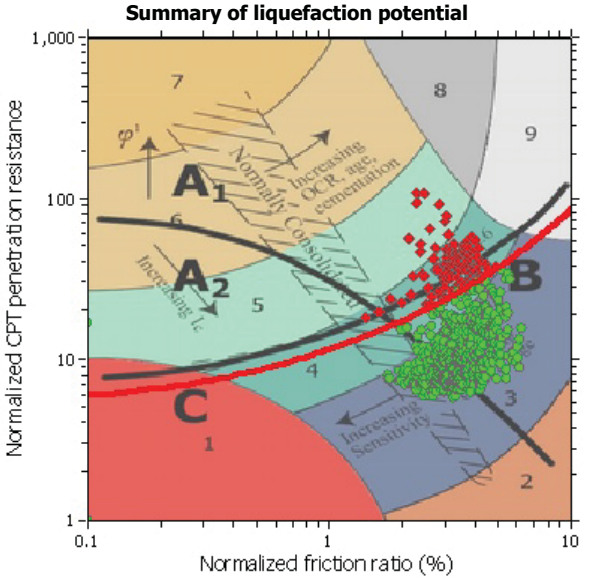
CPT file : 1-CPT10

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.70 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method

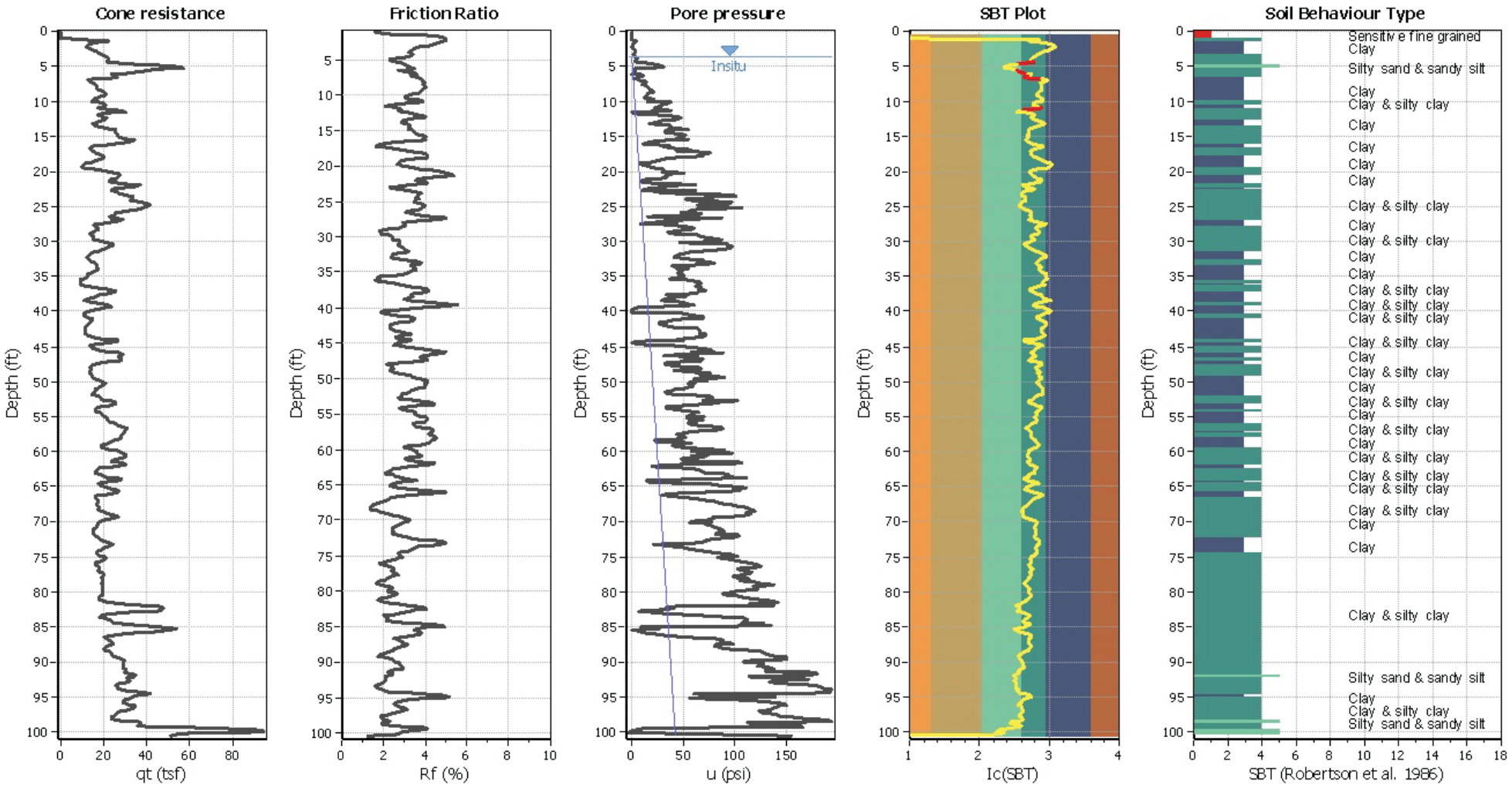






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

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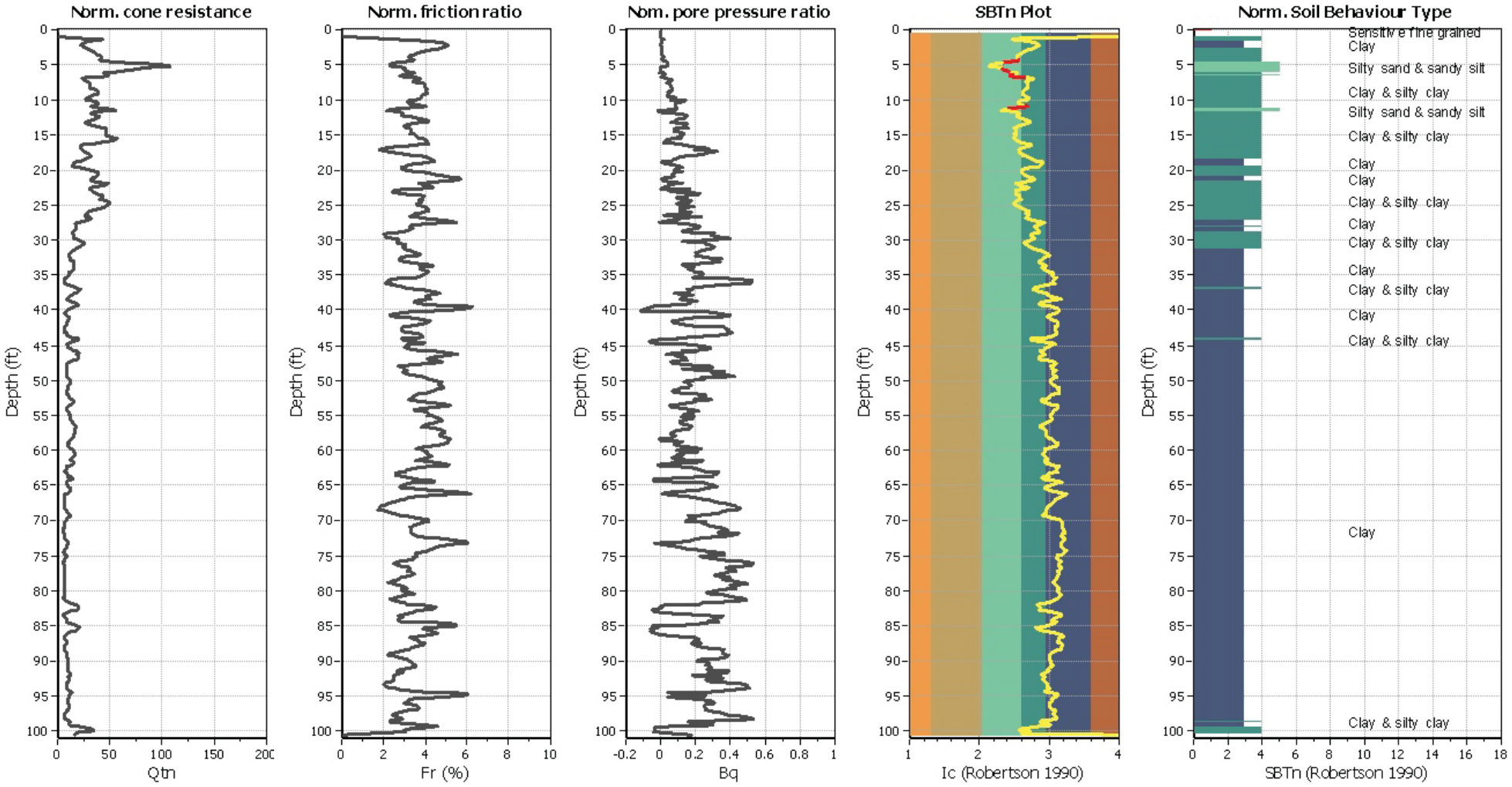
CPT name: 1-CPT10

CPT basic interpretation plots (normaliz



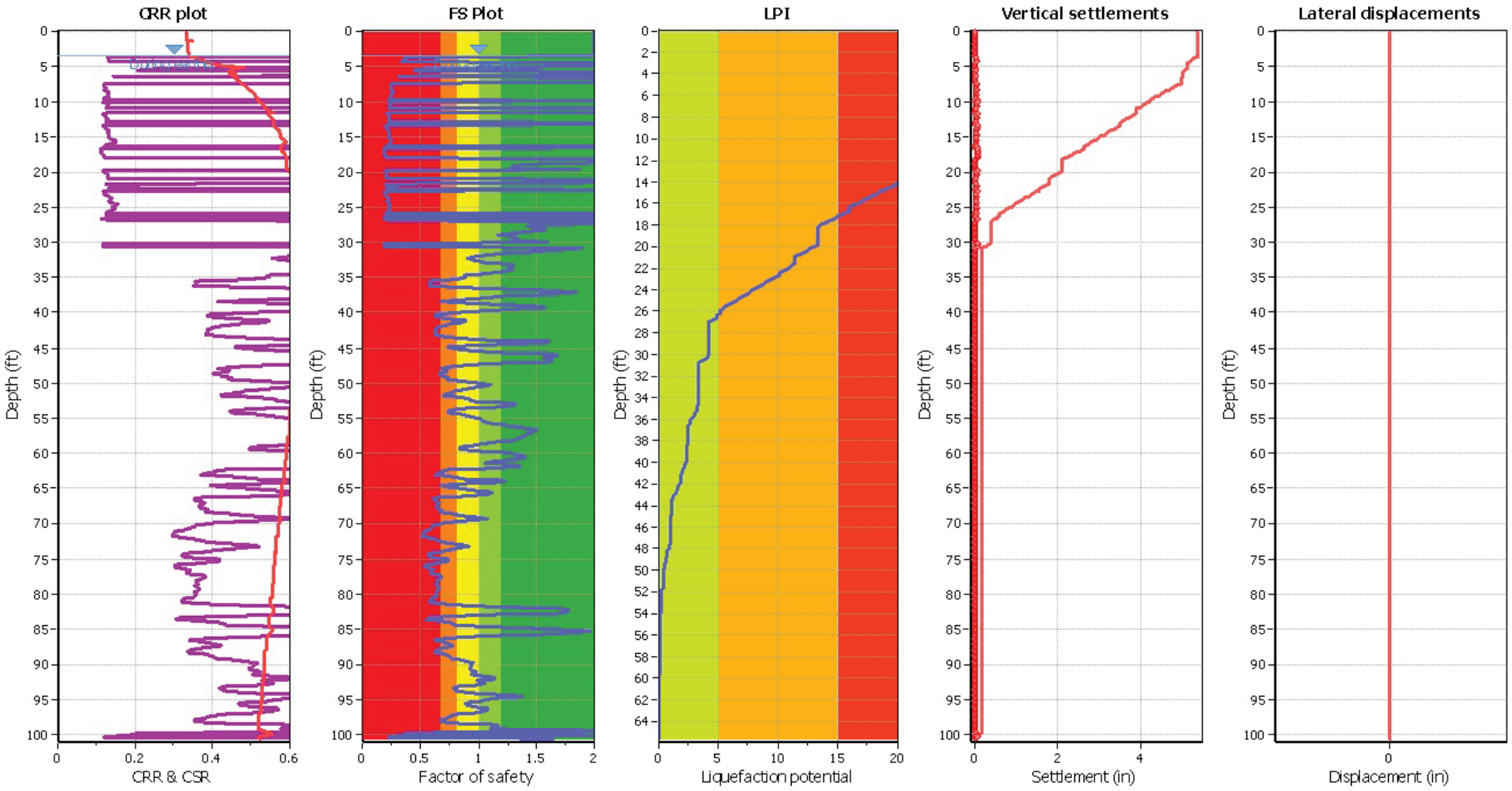
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.70 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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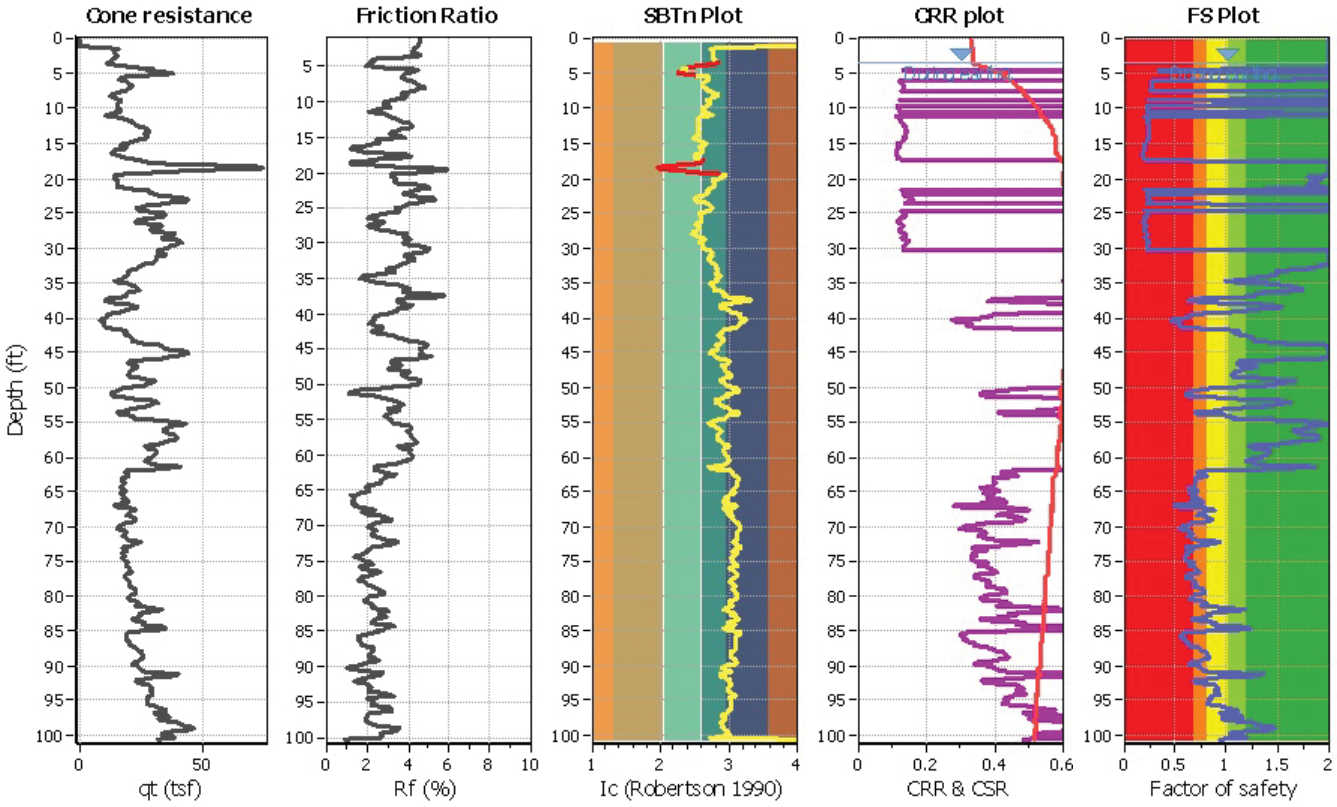
LIQUEFACTION ANALYSIS REPORT

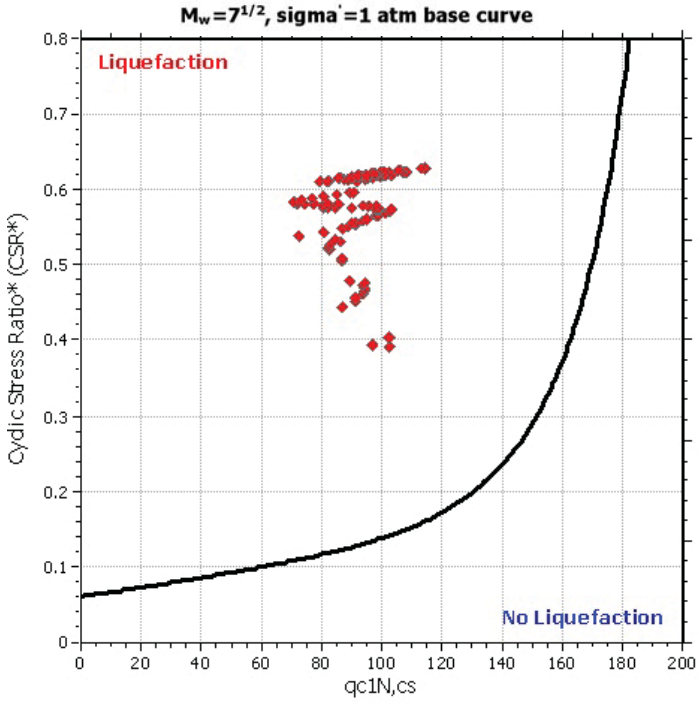
Project title : Caribbean 100 **Location : Sunnyvale, CA**

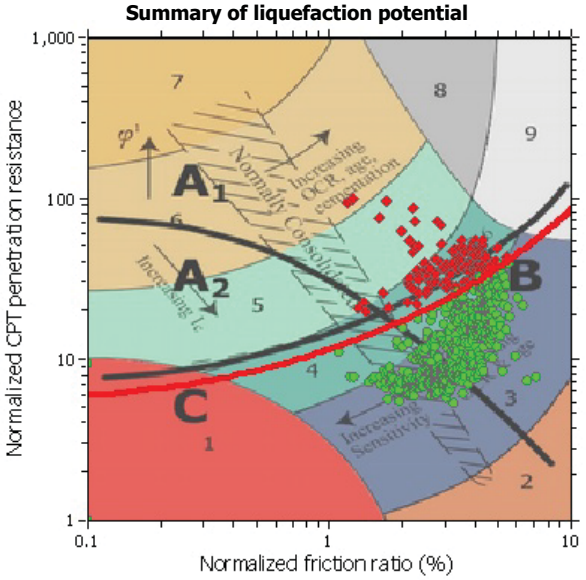
CPT file : 1-CPT11

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method

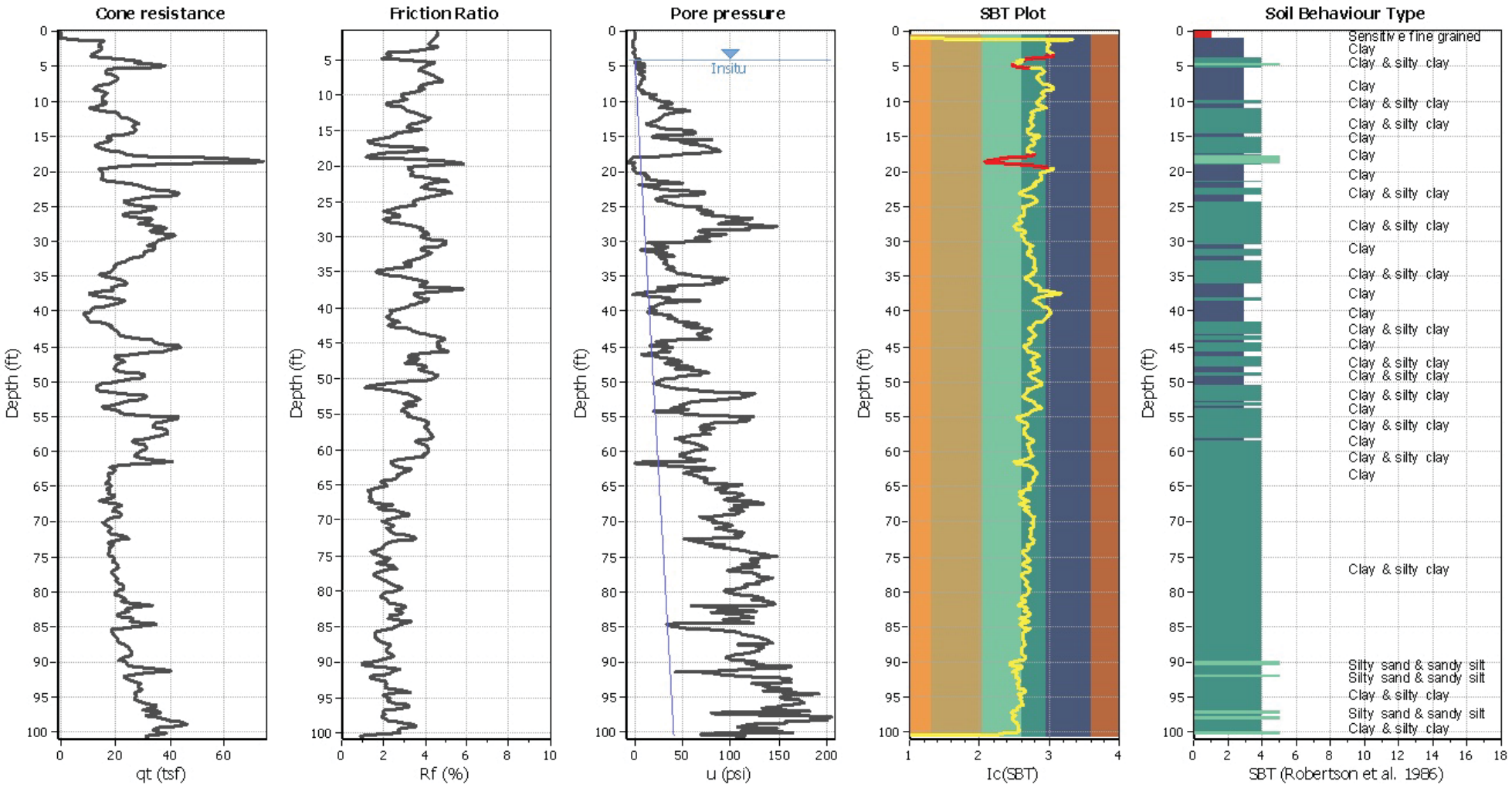






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plo



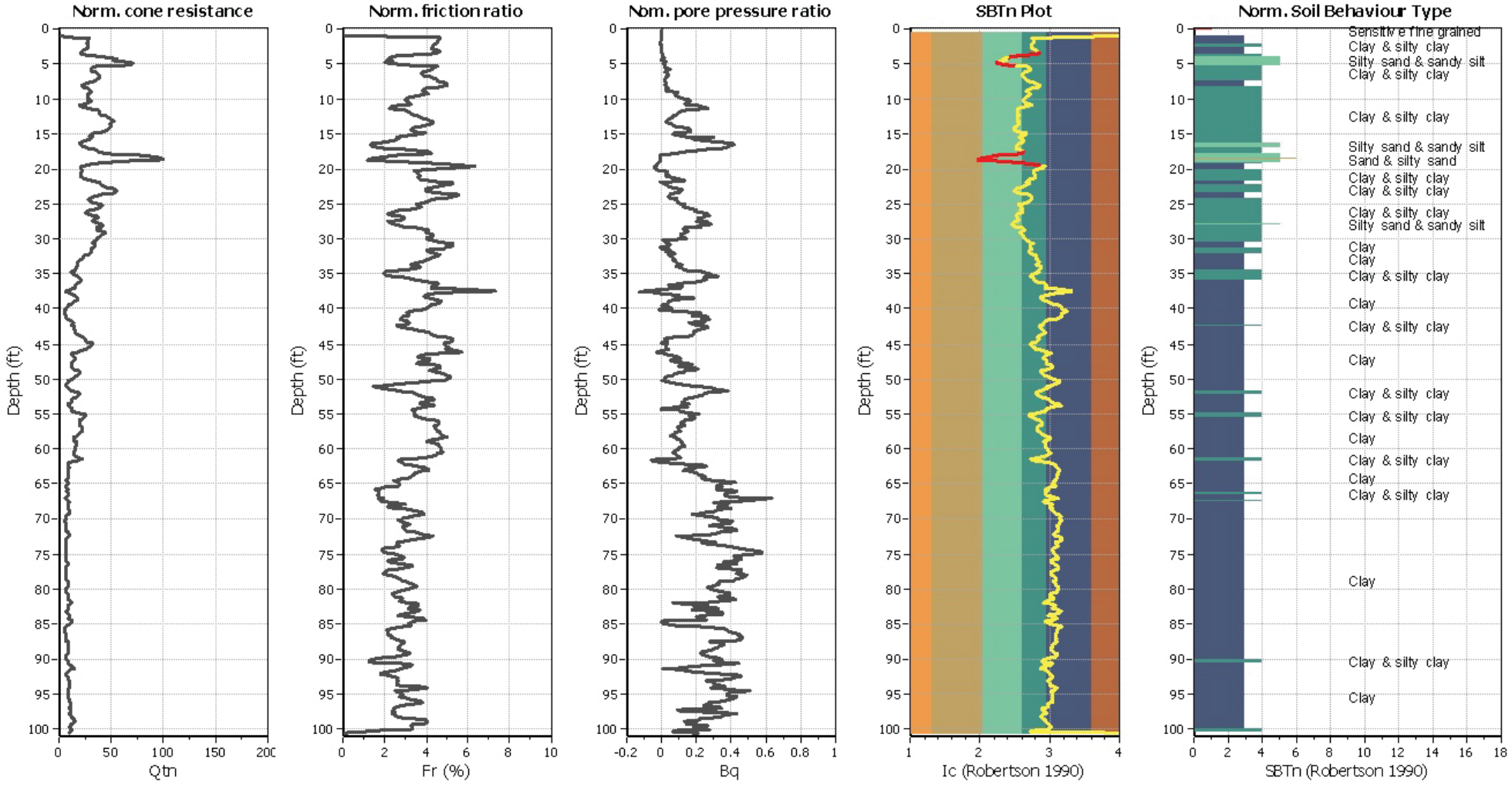
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



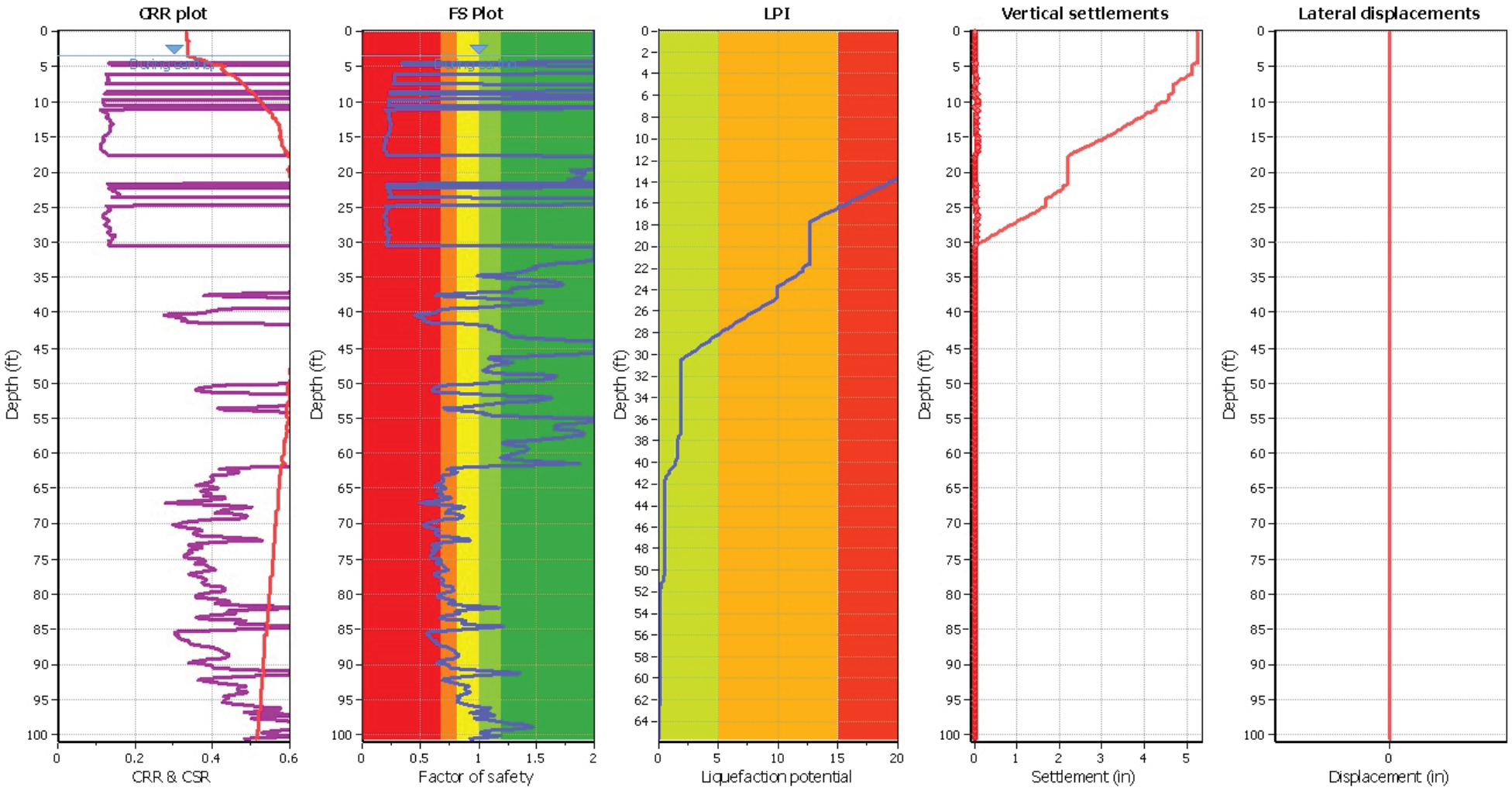
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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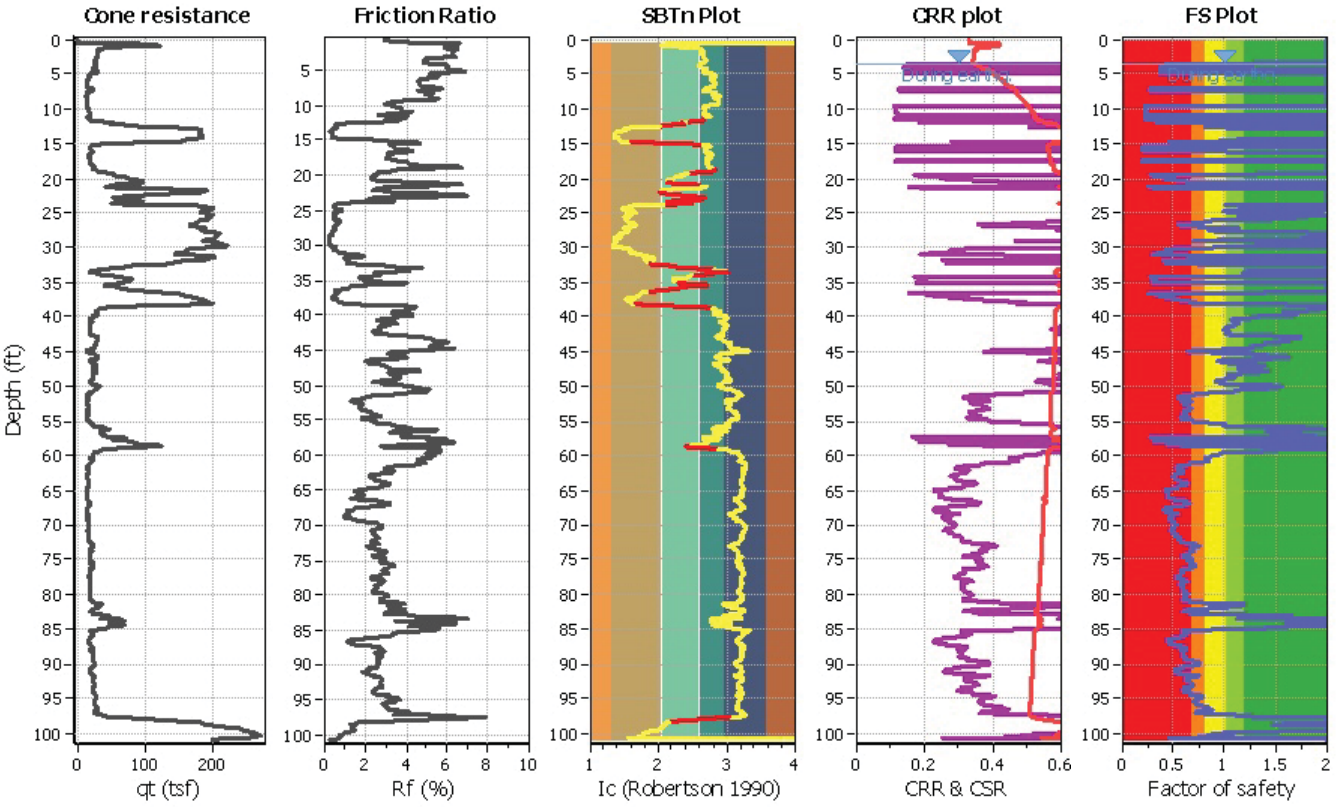
LIQUEFACTION ANALYSIS REPORT

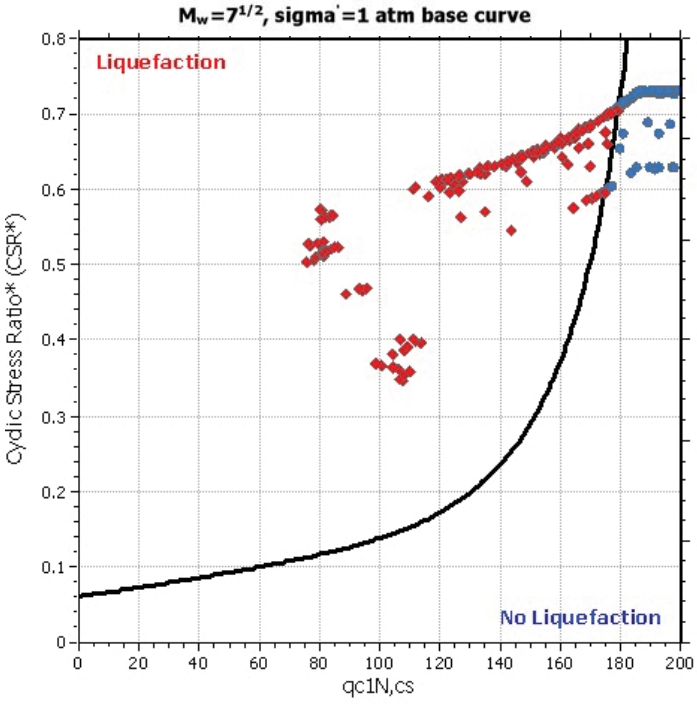
Project title : Caribbean 100 **Location : Sunnyvale, CA**

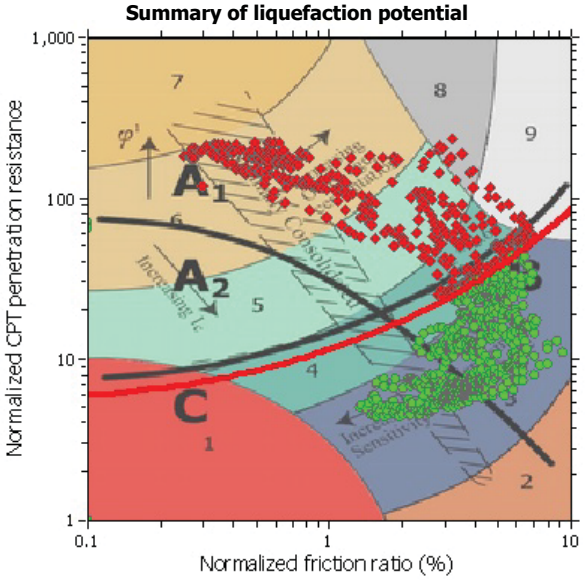
CPT file : 1-CPT12

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.30 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.70	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.50	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method

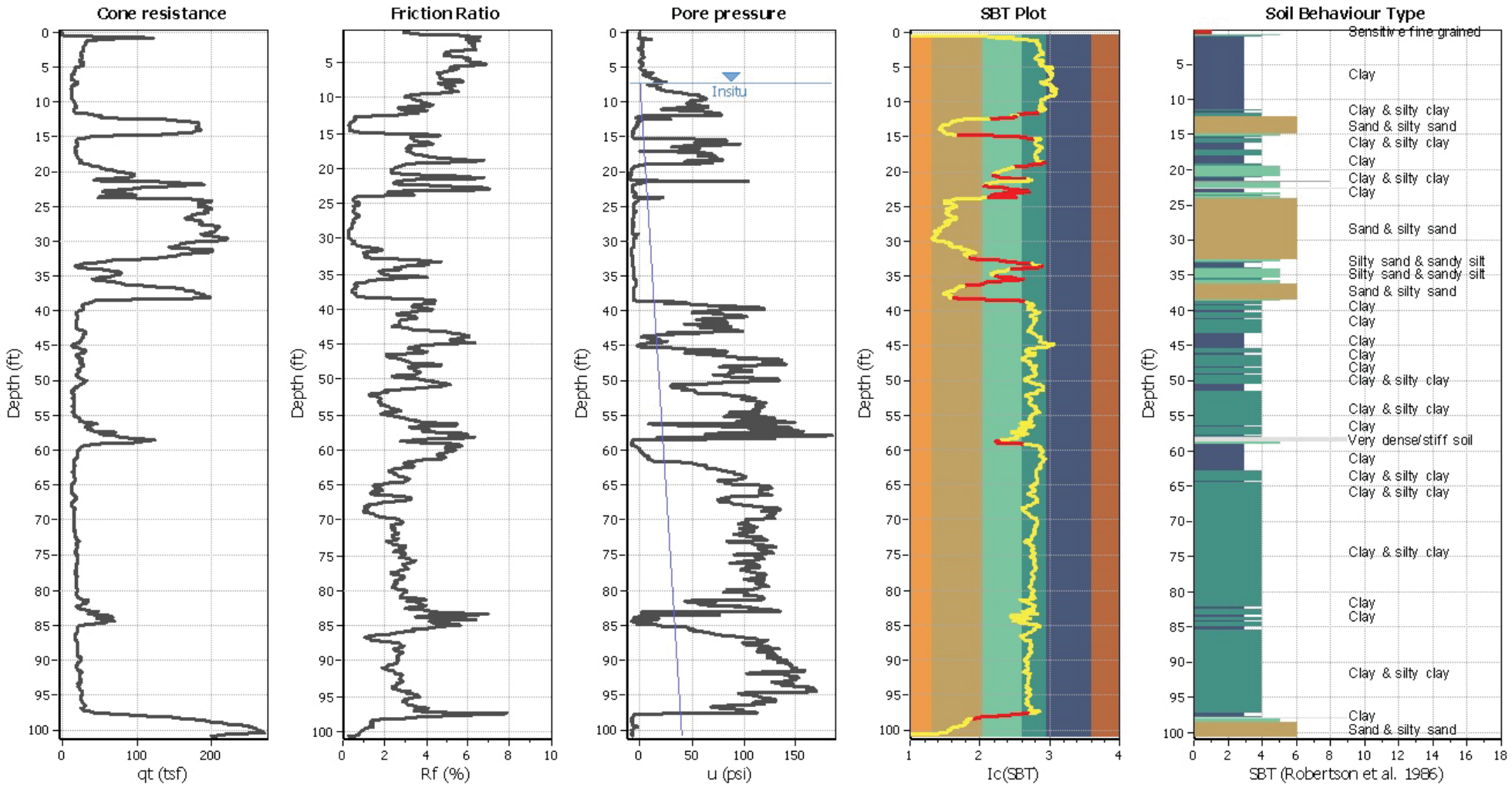






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plo



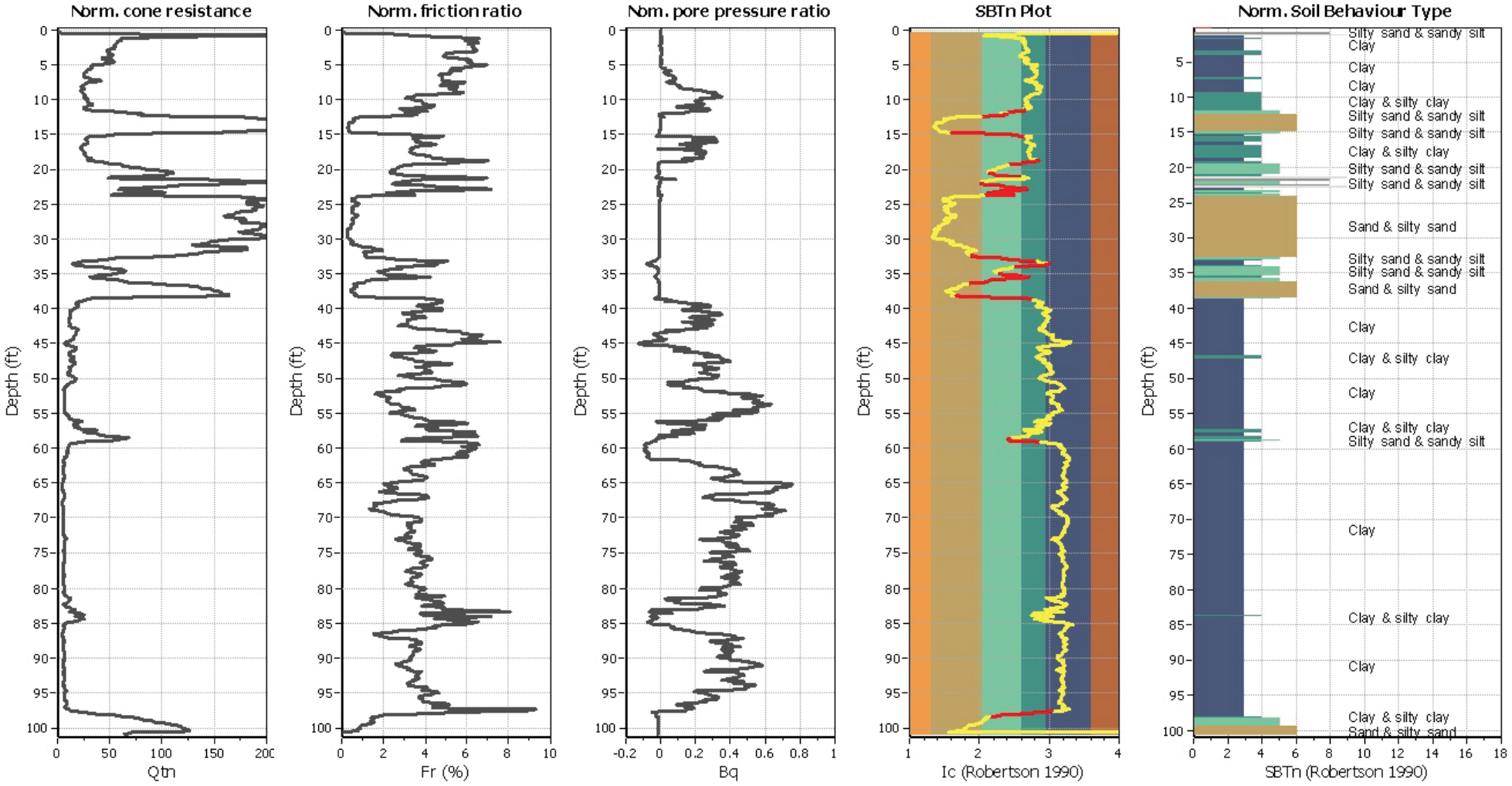
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.70	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



Input parameters and analysis data

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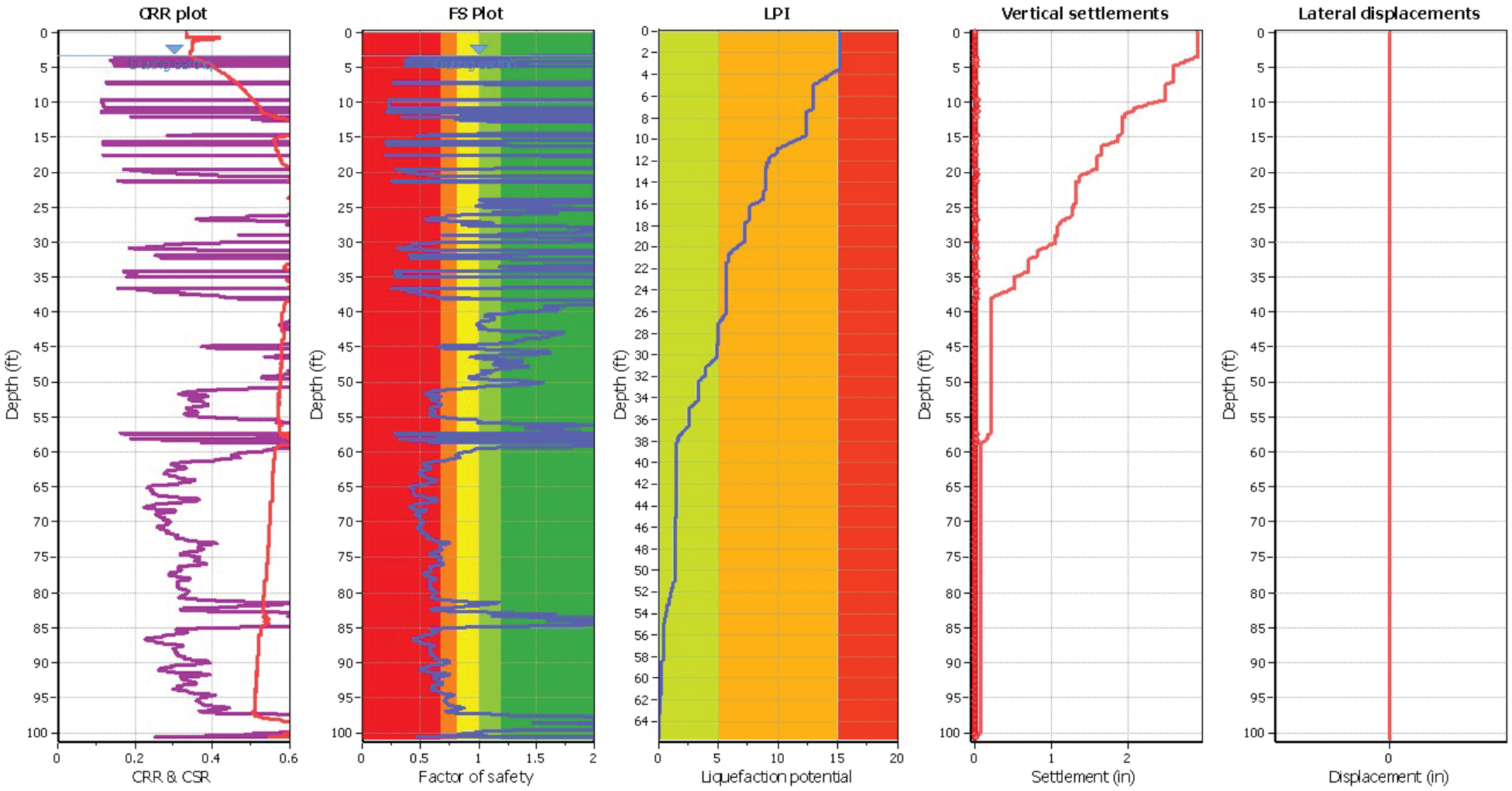
Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plot



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Peak ground acceleration:	0.50	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.30 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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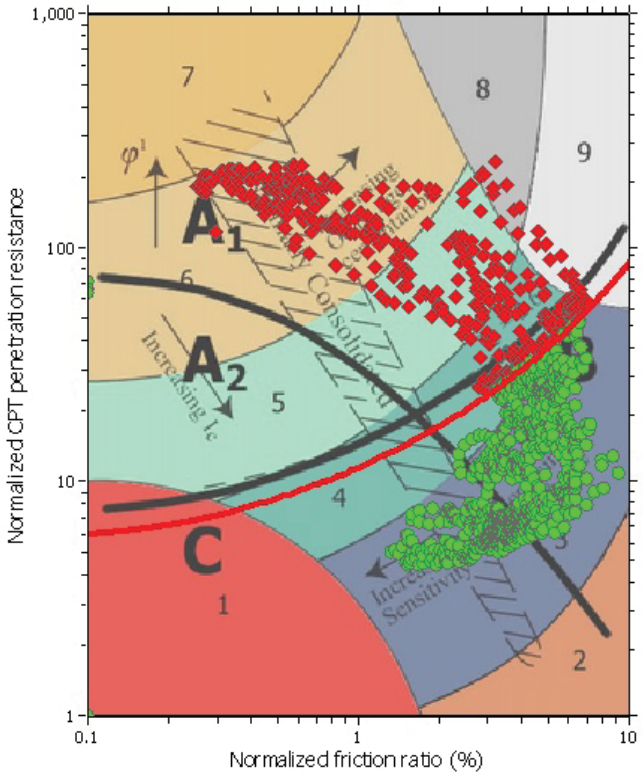
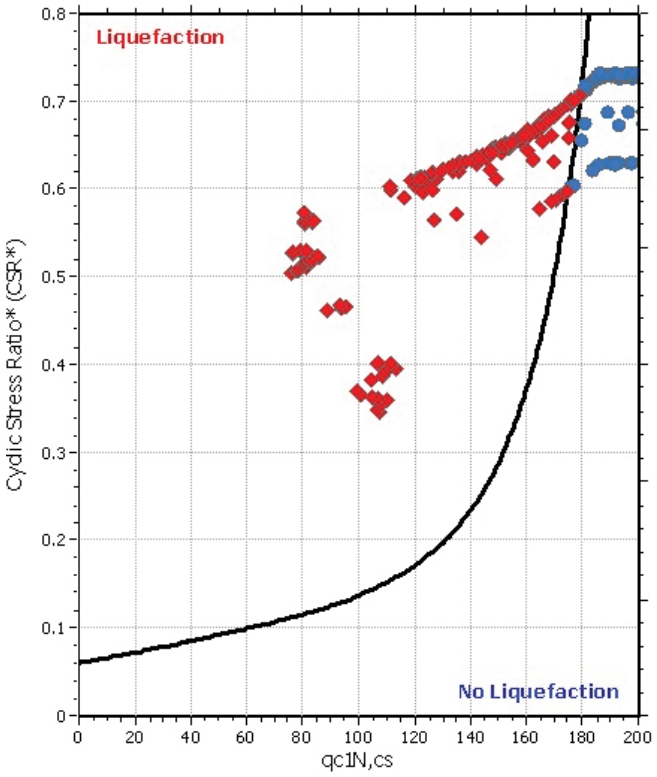
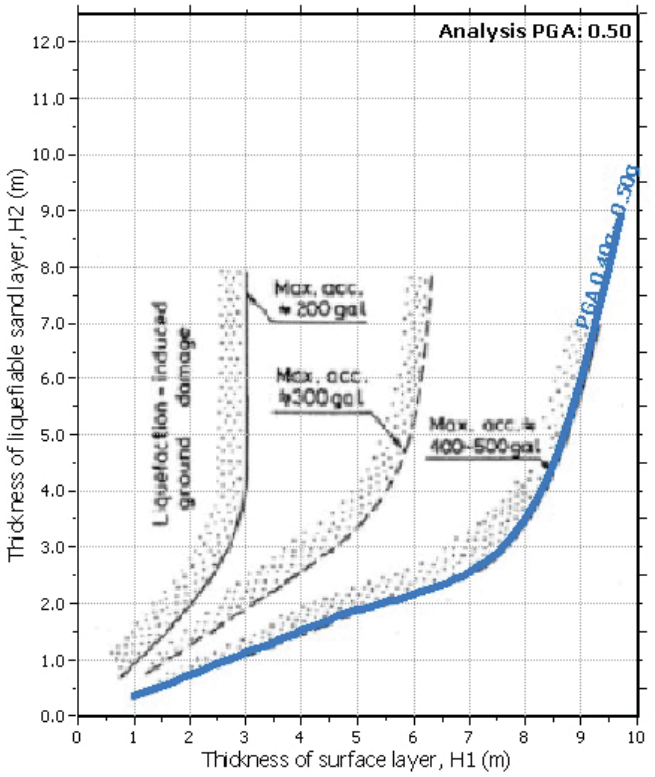
Not for Public Release – CPRA Exempt
Confidential and Proprietary Business / Siting Information
Pre-Decisional Draft – For Review Only

Liquefaction analysis summary plo







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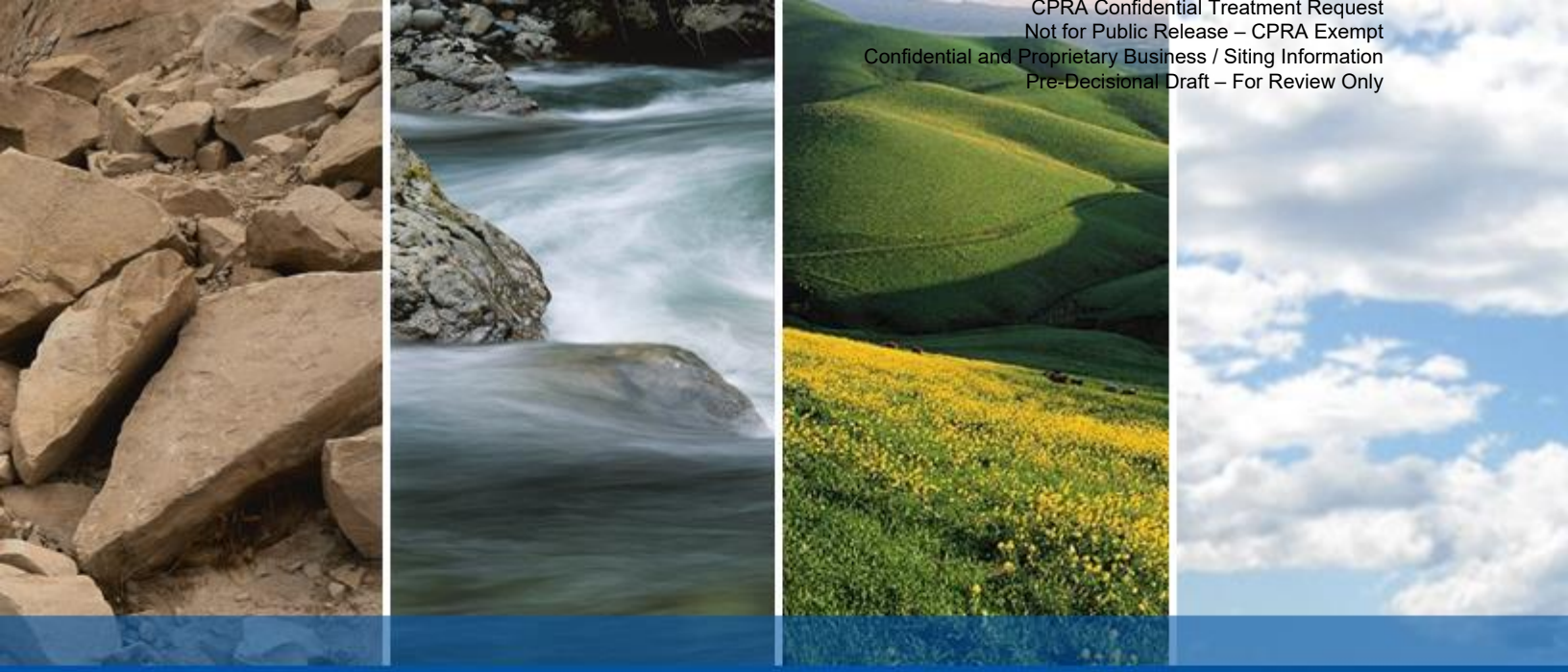

DRAFT

SAN RAMON

SAN FRANCISCO

SAN JOSE

OAKLAND

LATHROP

ROCKLIN

SANTA CLARITA

IRVINE

CHRISTCHURCH

WELLINGTON

AUCKLAND

ENGEO
Expect Excellence

Appendix G-2

Google Caribbean Campus Project Paleontological Resources Technical Report

Google Caribbean Campus Project Paleontological Resources Technical Report, Sunnyvale, Santa Clara County, California

MARCH 2019

PREPARED FOR

Kimley-Horn

PREPARED BY

SWCA Environmental Consultants

GOOGLE CARIBBEAN CAMPUS PROJECT PALEONTOLOGICAL RESOURCES TECHNICAL REPORT, SUNNYVALE, SANTA CLARA COUNTY, CALIFORNIA

Prepared for

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Prepared by

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Principal Investigator

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SWCA Project No. 51728

March 2019

ABSTRACT/EXECUTIVE SUMMARY

Purpose and Scope: Kimley-Horn retained SWCA Environmental Consultants (SWCA) to prepare a paleontological resources technical report in support of the proposed Google Caribbean Campus Project (project) located at 100 and 200 Caribbean Avenue, within the Moffett Park Specific Plan (MPSP) area in the city of Sunnyvale, Santa Clara County, California. Google proposes to redevelop the site to facilitate construction of the new Google campus on approximately 40.44 acres within 10 existing assessor's parcels (project area).

SWCA conducted the following study to determine the paleontological sensitivity of geologic units within the project area and make recommendations for avoiding impacts to those resources as a result of project implementation. The study included the following tasks: (1) paleontological resources records search from the Natural History Museum of Los Angeles County (LACM); (2) a review of the online collections database of the University of California Museum of Paleontology (UCMP); and (3) a review of geologic mapping and the scientific literature.

Regulatory Setting: This evaluation was completed under the provisions of CEQA and Public Resources Code (PRC) Chapter 1.7, Section 5097.5. Alyssa Bell, Ph.D., conducted the paleontological sensitivity assessment and authored this report. Mandi Martinez, M.A. provided oversight. Cultural Resources Principal Investigator Heather Gibson, Ph.D., RPA, provided technical review.

Dates of Investigation: SWCA requested a records search from the UCMP on January 29, 2019, with a follow-up request on February 7. When no reply was received the UCMP search was cancelled and the online collections database was reviewed on February 20, 2019. A records search was requested from the LACM on February 14, with the results returned on February 20, 2019.

Findings: Geologic mapping by Dibblee and Minch (2007) indicates that the project area is underlain by silty clay dating to the middle or early Holocene. Museum collections records maintained by the LACM and the UCMP online database indicate that fossil localities have been recorded from similar geologic units in the vicinity of the project area. The combined results of the museum records searches and literature review indicate that the geologic unit underlying the project area has high paleontological sensitivity.

Recommendations: Recommendations to avoid significant impacts to fossil resources are provided that include worker environmental awareness program (WEAP) training and the development of a paleontological monitoring and mitigation plan by a qualified paleontologist that will include monitoring of ground-disturbing activities. Should any significant fossils be encountered, they should be salvaged and curated at an approved repository.

Disposition of Data: The final paleontological resources assessment report and any subsequent related reports will be filed with (the city of Sunnyvale) and with SWCA's Pasadena, California, office.

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INTRODUCTION

Kimley-Horn retained SWCA Environmental Consultants (SWCA) to prepare a paleontological resources technical report in support of the proposed Google Caribbean Campus Project (project) located at 100 and 200 Caribbean Avenue (project area; Figure 1). The project area is within the Moffett Park Specific Plan (MPSP) area in the city of Sunnyvale on approximately 40.44 acres within 10 existing assessor's parcels (Figure 2 and Figure 3). Google proposes to redevelop the site to facilitate construction of the new Google campus. The study included the following tasks: (1) paleontological resources records search from the Natural History Museum of Los Angeles County (LACM); (2) a review of the online collections database of the University of California Museum of Paleontology (UCMP); and (3) a review of geologic mapping and the scientific literature.

This evaluation was completed under the provisions of CEQA and Public Resources Code (PRC) Chapter 1.7, Section 5097.5. Alyssa Bell, Ph.D., conducted the paleontological sensitivity assessment and authored this report. Mandi Martinez, M.A. provided oversight. Paleontological Resources Principal Investigator Russell Shapiro, Ph.D., provided technical review.

Project Description

Google proposes to redevelop the project area (located at 100 and 200 Caribbean Avenue), in the city of Sunnyvale, California, on 40.44 acres within 10 existing assessor's parcels. The project area currently contains 13 single-story structures, which are used as commercial business, research and development, and for industrial uses. The area also contains parking lots, access roads, sidewalks, and landscaped areas. Redevelopment of this area would include demolition of the existing structures, removal of materials, excavation, and grading to facilitate construction of the new Google campus.

Once the site is prepared, the construction phase would be implemented, and as proposed, the site would be developed with two new main buildings. The buildings would be readdressed and designated as 100 West Caribbean Drive and 200 West Caribbean Drive. The site is currently bisected roughly in half from south to north by the Santa Clara Valley Water District's (SCVWD) West Channel. The buildings would be on either side of the West Channel; the project applicant is working closely with SCVWD on enhancements. Improvements to the West Channel are proposed as part of the project, but its function would not be changed. The two sides of the campus would be connected by pedestrian bridges as part of the pedestrian circulation plan for the project site.

Figure 1. Project area and vicinity.

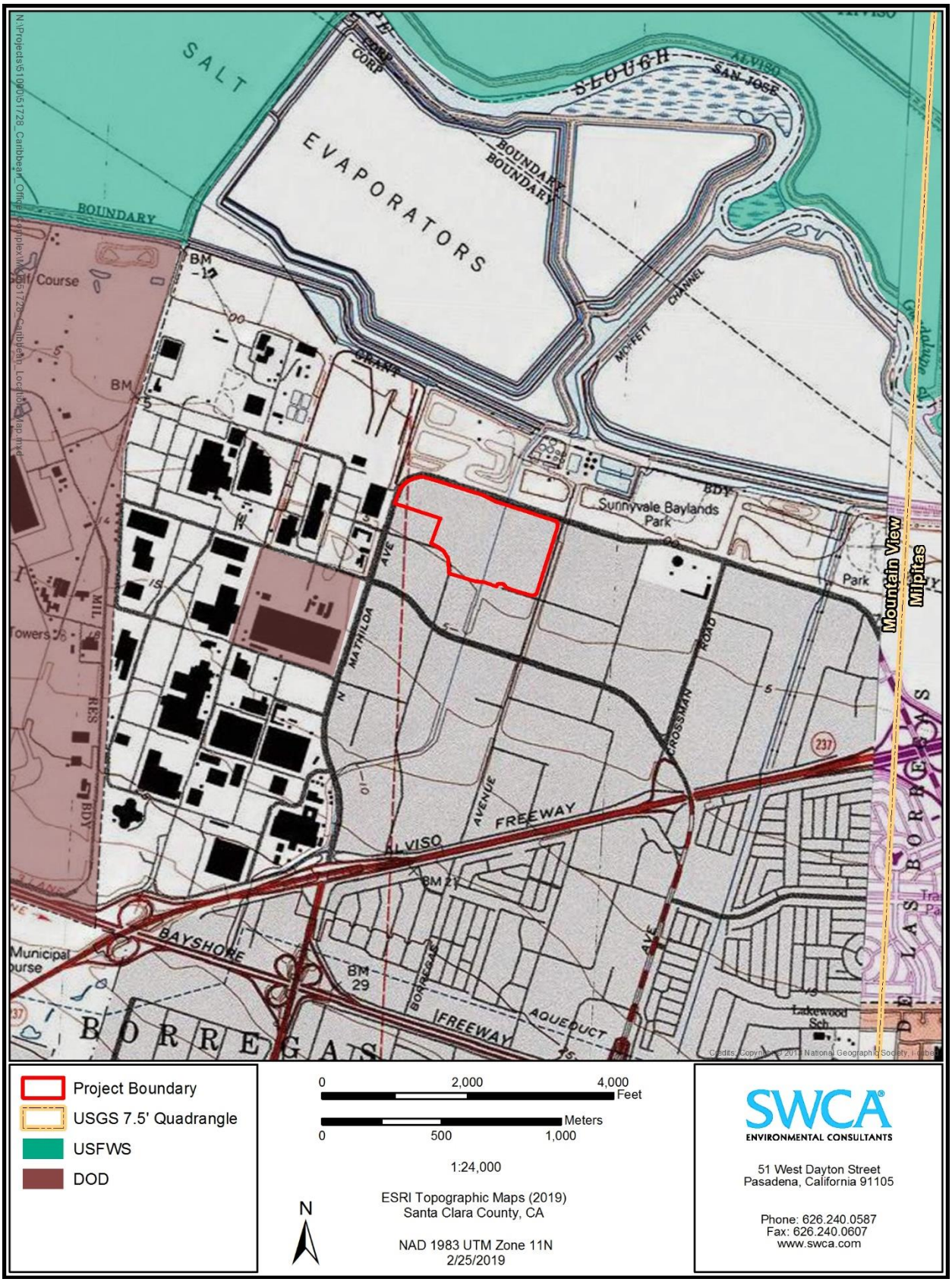

Figure 2. Project location on topographic map.

Figure 3. Project location on aerial photograph.

REGULATORY FRAMEWORK

This section includes a discussion of the applicable state and local laws, ordinances, regulations, and standards informing the identification of eligible historic resources.

State Regulations

California Environmental Quality Act

CEQA is the principal statute governing environmental review of projects occurring in the state and is codified at Public Resources Code (PRC) Section 21000 et seq. CEQA requires lead agencies to determine if a proposed project would have a significant effect on the environment, including significant effects on paleontological resources. Guidelines for the Implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations 15000 et seq.), define procedures, types of activities, persons, and public agencies required to comply with CEQA, and include as one of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section VII, Part a) the following: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

California Public Resources Code (PRC) Section 5097.5

Requirements for paleontological resource management are included in the PRC Division 5, Chapter 1.7, Section 5097.5, and Division 20, Chapter 3, Section 30244, which states:

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

These statutes prohibit the removal, without permission, of any paleontological site or feature from lands under the jurisdiction of the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, local agencies are required to comply with PRC 5097.5 for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others. PRC Section 5097.5 also establishes the removal of paleontological resources as a misdemeanor, and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) lands.

Local Regulations

Although the following regulations are applicable to the project area, none directly addresses paleontological resources requirements: city of Sunnyvale General Plan, city of Sunnyvale Municipal Code, and Moffett Park Specific Plan.

METHODS

Records Search

SWCA requested a museum records search for the current project area and vicinity from the University of California Museum of Paleontology (UCMP) on January 29, 2019, with a follow-up request on February 7. When no reply was received the UCMP search was cancelled and the online collections database was reviewed on February 20, 2019. A records search was requested from the LACM on February 14, with the results returned on February 20, 2019.

Archival Research

SWCA examined the most recent geological mapping as well as the relevant scientific literature in order to assess the potential for geologic units present in the project area to preserve paleontological resources.

Paleontological Sensitivity Assessment

Definition and Significance of Paleontological Resources

Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments (Murphey and Daitch, 2007). Therefore, a wide range of material is represented in the fossil record, including bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains, which may vary in their degree of mineralization. The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered nonrenewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced (Murphey and Daitch, 2007). Fossils are important scientific and educational resources and can be used to:

- study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- reconstruct ancient environments, climate change, and paleoecological relationships;
- provide a measure of relative geologic dating, which forms the basis for biochronology and biostratigraphy, and is an independent and corroborating line of evidence for isotopic dating;
- study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- study patterns and processes of evolution, extinction, and speciation; and
- identify past and potential future human-caused effects to global environments and climates (Murphey and Daitch, 2007).

Resource Assessment Guidelines

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be a significant environmental impact. Direct impacts on paleontological resources primarily concern the potential destruction of nonrenewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains. If potentially fossiliferous bedrock or surficial sediments are disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information (a significant impact). At the project-specific level, direct impacts can be mitigated to a less-than-significant level through the implementation of paleontological mitigation.

The CEQA threshold of significance for a significant impact to paleontological resources is reached when a project is determined to "directly or indirectly destroy a significant paleontological resource or unique geologic feature" (Appendix G, State CEQA Guidelines). In general, for project areas underlain by paleontologically sensitive geologic units, the greater the amount of ground disturbance, the higher the potential for significant impacts to paleontological resources. For project areas directly underlain by geologic units with no paleontological sensitivity, there is no potential for impacts on paleontological resources unless sensitive geologic units that underlie the non-sensitive unit are also affected.

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g., Eisentraut and Cooper, 2002; Murphey and Daitch, 2007; Scott and Springer, 2003). In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life; or
5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

Professional Standards

The Society of Vertebrate Paleontology (SVP) has established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation (1995, 2010). Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological laws, ordinances, regulations, and standards accept and use the professional standards set forth by the SVP.

As defined by the SVP (2010:11), significant paleontological resources are defined as:

> fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than

> recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).

A geologic unit known to contain significant fossils is considered sensitive to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains directly or indirectly. This definition of sensitivity differs fundamentally from the definition for archaeological resources as follows:

> It is extremely important to distinguish between archaeological and paleontological (fossil) resource sites when defining the sensitivity of rock units. The boundaries of archaeological sites define the areal extent of the resource. Paleontological sites, however, indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontological potential in each case (SVP, 1995).

Many archaeological sites contain features visually detectable on the surface. In contrast, fossils are often contained within surficial sediments or bedrock, and are therefore not observable or detectable unless exposed by erosion or human activity.

In summary, paleontologists cannot know either the quality or quantity of fossils prior to natural erosion or human-caused exposure. As a result, even in the absence of fossils on the surface, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if these remains are significant, successful mitigation and salvage efforts may be undertaken to prevent adverse impacts to these resources.

Paleontological Sensitivity

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its "Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources," the SVP (2010:1–2) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential:

High Potential. "Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ash or tephra), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstone, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstone, fine-grained marine sandstone, etc.). Paleontological potential consists of both a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated

with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential."

Low Potential. "Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e.g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils."

Undetermined Potential. "Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy."

No Potential. "Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection or impact mitigation measures relative to paleontological resources" (SVP, 2010:1–2).

SETTING

Geological Setting

The project area is located in the San Francisco Bay, which is in the Coastal Ranges Geomorphic Province. The Coast Ranges consist of relatively young (3.5 million years ago, Ma) northwest-trending mountain ranges and valleys that run along the Pacific coast from Santa Barbara to the Oregon border, coincident with the Pacific-North American plate boundary (Page et al., 1998). The Coast Ranges preserve a thick sequence of sedimentary strata dating back to the Mesozoic (~251 Ma) overlying granitic and metamorphic bedrock (Norris and Webb, 1990). Although elevations are moderate within the Coast Ranges, the relief of these mountains is often considerable, with peaks rising around 1,000 meters just a few kilometers from the coast (Norris and Webb, 1990). These sedimentary rocks have a rich fossil history in central California, recording the filling of offshore basins dating to the Mesozoic followed by the progressively shallowing sea and the emergence of terrestrial environments in the Pliocene and Pleistocene (Page et al., 1998). This sedimentary sequence is dominated by Miocene rocks that are primarily marine in origin, such as the well-known Monterey Formation (Norris and Webb, 1990). More recently, the Pleistocene history of the region (2.6 million – 10,000 years ago) is marked by glacially controlled sea level fluctuations and tectonic uplift during which the shoreline advanced and retreated as much as 30 miles across the continental shelf, carving a series of marine terraces along the coast (Norris and Webb, 1990).

Locally, the project is on the southern margin of the San Francisco Bay, where the Sacramento and San Juan Rivers empty and form the largest estuary on the west coast of North America (Foxgrover et al., 2004). The San Francisco Bay formed approximately 650,000 years ago as a result of motion along the San Andreas Fault, where the Pacific Plate is moving laterally past the North American Plate (Atwater et al., 1977). Water levels in the Bay have fluctuated since the broad structural depression formed, with

marine highstands occurring 100,000 and just under 10,000 years ago (Atwater et al., 1977). Fluctuations in sea level has left a record of alternating estuarian, salt marsh, freshwater marsh, and terrestrial sediments, with the most recent highstand resulting in thick deposits of Bay muds in the vicinity of the project area.

RESULTS

Paleontological Sensitivity

Geologic mapping by Dibblee and Minch (2007) indicates the surficial geology of the project area consists of silty clay (mapped as Qac in Figure 4). This unit and its paleontological sensitivity are discussed below.

Silty Clay (Qac). These sediments consist of silty and organic clay deposited in between alluvial fans during the early and middle Holocene, as determined by the presence of invertebrate fossils in this unit (Dibblee and Minch, 2007). The SVP defines fossils as being older than 5,000 years in age, which correlates roughly to the middle Holocene and older. The San Francisco Bay area has a rich history of early Holocene and Pleistocene fossils from sediments of this age (Jefferson, 1991a, 1991b). Most famously, the fossil beds used to define the Irvingtonian North American Land Mammal Age are from the Irvington District of Fremont, California (Stirton, 1939; Savage, 1951). Iconic Ice Age fossils such as mammoths, horses, saber-toothed cats, and wolves, as well as smaller animals such as rodents, reptiles, fish, and birds are known from Pleistocene alluvium in this area (Atwater et al., 1977; Atwater et al., 1981; Baskin, 2016; Bell and Bever, 2006; Bell et al., 2004; Cabanatuan, 2012; Casteel and Adam, 1977; Tomiya et al., 2011). The UCMP online collections search returned records of 32 vertebrate fossils from Pleistocene sediments collected from Santa Clara County (UCMP, 2019). The closest LACM fossil locality is northeast of the project area near Martinez, California, where a fossil horse specimen was recovered and identified as the holotype of a new species, *Equus pacificus* (McLeod, 2019). Given the record of fossil preservation in these sediments, silty clay (Qac) is determined to have high paleontological sensitivity.

RECOMMENDATIONS

To demonstrate CEQA compliance, a response is required to the following question in the Environmental Checklist, based on the results of the paleontological analysis: “Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” With the implementation of the following recommendations, construction associated with the project will be mitigated against directly or indirectly destroying unique paleontological resources or sites or unique geologic features. The intent of these recommendations is to ensure that potential adverse impacts to paleontological resources as a result of project implementation are reduced to a less-than-significant level.

The following mitigation measures have been developed in accordance with the SVP (2010) standards and meet the paleontological requirements of CEQA. Similar mitigation measures have been used

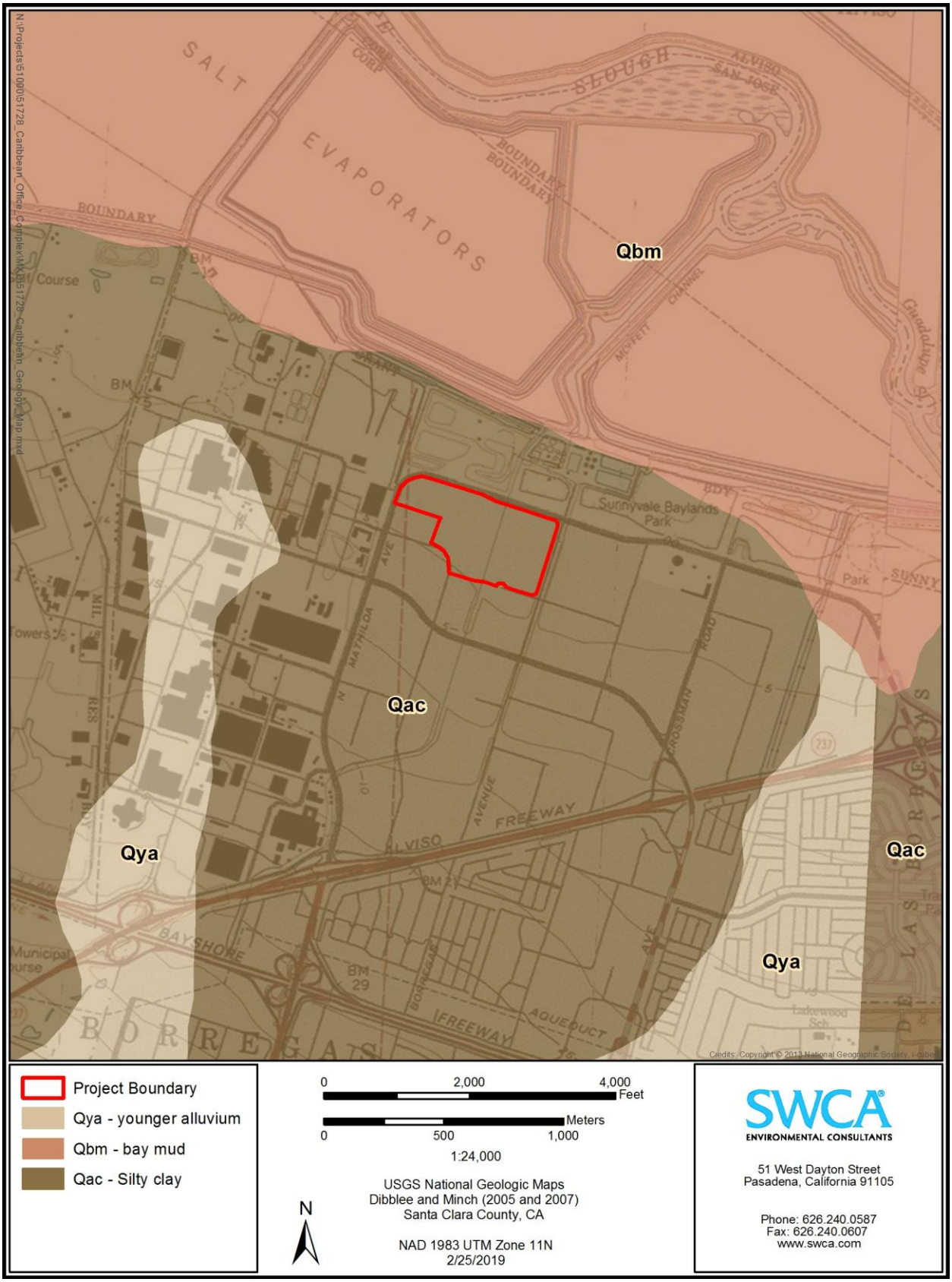

Figure 4. Geologic map of the project area.

throughout California and have been successful in protecting paleontological resources while allowing timely completion of construction.

PAL-1, Worker Training: A qualified paleontologist will develop a Worker's Environmental Awareness Program (WEAP) to train the construction crew on the legal requirements for preserving fossil resources as well as procedures to follow in the event of a fossil discovery. This training program will be given to the crew before ground-disturbing work commences and will include handouts to be given to new workers as needed.

PAL-2, Paleontological Monitor: A qualified paleontologist shall be retained to prepare a Paleontological Resources Monitoring and Mitigation Plan (PRMMP). This plan will address specifics of monitoring and mitigation and comply with the recommendations of the Society of Vertebrate Paleontology's 2010 Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources. All ground disturbances in the project area that occur in previously undisturbed sediment with high paleontological sensitivity will require monitoring. This includes all depths of ground disturbance in areas mapped as silty clay (Qac). The Project Paleontologist may periodically inspect construction activities to adjust the level of monitoring in response to subsurface conditions. In the event that any potentially significant paleontological resources are discovered, the paleontological monitor shall stop work inside a zone designated by him/her where additional paleontological resources could be found. A plan for the evaluation of the resource shall be submitted to the Community Development Director for approval.

PAL-3, Halt Construction and Evaluate Resource: In the event that a paleontological resource (fossilized invertebrate, vertebrate, plan or micro-fossil) is found during construction, excavation within 50 feet of the find shall be temporarily halted or diverted until the discovery is evaluated. Upon discovery, the Community Development Director shall be notified immediately and a qualified paleontologist shall be retained to document and assess the discovery in accordance with Society of Vertebrate Paleontology's 2010 Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources, and determine procedures to be followed before construction is allowed to resume at the location of the find. If determined to be significant, the paleontologist will prepare an excavation plan for mitigating the Project's impact on this resource, including preparation, identification, cataloging, and curation of any salvaged specimens.

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CONFIDENTIAL APPENDIX A:

LACM Results

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Appendix H-1

Site Management Plan

CORNERSTONE EARTH GROUP

Type of Services	**Site Management Plan**
Location	**100 and 200 Caribbean Campus Project** **West Caribbean Drive and Borregas Avenue** **Sunnyvale, California**
Client	**Google LLC**
Client Address	**1842 North Shoreline Boulevard** **Mountain View, California 94043**
Project Number	**678-3-2**
Date	**February 14, 2019**

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CORNERSTONE EARTH GROUP

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CORNERSTONE EARTH GROUP

Type of Services	**Site Management Plan**
Location	**100 and 200 Caribbean Campus Project** **Caribbean Drive** **Sunnyvale, California**

SECTION 1: INTRODUCTION

On behalf of Google LLC (Google), Cornerstone Earth Group, Inc. (Cornerstone) prepared this Site Management Plan (SMP) for the planned commercial development at the 100 and 200 Caribbean Campus in Sunnyvale, California (Site) as shown on Figures 1 and 2. This work was performed in accordance with our March 2, 2018 Agreement (Agreement).

The SMP meets the following corrective action standards:

- Be protective of human health and the environment;
- Describes contingency measures to control the impacted areas and other unanticipated contaminated areas to reduce or eliminate further releases of hazardous constituents that may pose a threat to human health and the environment;
- Comply with applicable federal, state and local standards for management of wastes; and
- Implement applicable risk management controls.

The SMP provides the technical and operational protocols for handling of known and unknown subsurface structures and impacted soil, soil vapor and ground water that may be encountered during the redevelopment of the Site. It contains the following:

- A description of the Site background;
- A general description of the planned development of the Site; and
- General soil, soil vapor and ground water management protocols to be implemented during construction of the planned development.

It is the General Contractor's responsibility to incorporate the provisions of this SMP into the redevelopment plans; applicable worker health and safety procedures are to be applied by the General Contractor and its subcontractors conducting the work.

Google has obtained regulatory oversight from the Santa Clara County Department of Environmental Health (DEH). This SMP will be submitted to the DEH for review and approval prior to starting construction.

SECTION 2: SITE DESCRIPTION

2.1 LOCATION

The approximately 40-acre Site consists of 10 parcels developed with 13 commercial buildings. The Sunnyvale West Channel bisects the Site, separating 100 and 200 Caribbean. Tables 1 and 2 describes the physical location of the property.

TABLE 1. SITE PROPERTIES – 100 CARIBBEAN

Reported Address/Location	Assessor's Parcel No. (APN)	Approximate Lot Size (acres)	Existing Building Footprint (approx. square feet)
140-146 West Caribbean Drive	110-26-027	4.50	90,000
141 Caspian Court	110-26-031	3.63	57,344
1325 Borregas Avenue	110-26-030	3.61	50,000
1383 Borregas Avenue	110-26-029	2.63	50,880
1393-1395 Borregas Avenue	110-26-028	2.88	50,880

TABLE 2. SITE PROPERTIES – 200 CARIBBEAN

Reported Address/Location	Assessor's Parcel No. (APN)	Approximate Lot Size (acres)	Existing Building Footprint (approx. square feet)
360-364 West Caribbean Drive	110-26-023	3.49	72,000
370-376 West Caribbean Drive	110-26-022	2.91	54,000
380-384 West Caribbean Drive	110-26-021	2.95	54,000
390-394 West Caribbean Drive	110-26-020	4.58	86,000
1330-1338 Bordeaux Drive	110-26-025	9.26	25,200
1340-1346 Bordeaux Drive			50,400
1350 Bordeaux Drive			34,500
1360-1368 Bordeaux Drive			25,200

2.2 PLANNED DEVELOPMENT

Google is planning to demolish the buildings and redevelop the Site with Class A office space. For 200 Caribbean, the planned 5-story approximately 505,140 square foot building will have a ground floor footprint of approximately 187,356 square feet. The planned five-story building at 100 Caribbean will consist of approximately 536,750 square feet of office space with a ground floor footprint of approximately 207,828 square feet. Site grades will be raised approximately 7 feet in the area of the planned building pads. A conceptual development plan is included in Figure 3.

Building demolition is tentatively scheduled to start in Spring 2019 with Site development activities anticipated to begin in Summer 2019.

Google is working in partnership with the Santa Clara Valley Water District (SCVWD) to enhance a portion of the Sunnyvale West Channel between West Caribbean Drive and Caspian Court in Sunnyvale as a part of the larger Sunnyvale East and West Channels Protection Flood

Project. As shown on Figure 3, the planned improvements on the SCVWD's parcel will include reconfiguring the channel geometry, widening the channel, creating wetland and riparian habitats, multi-use path and maintenance access, and transitional landscape areas along the channel. A separate SMP will be prepared for the planned channel improvements on SCVWD land.

2.3 SITE SETTING AND ADJOINING SITE USES

The Site is bound by West Caribbean Drive and the Sunnyvale Landfill to the north, Borregas Avenue and commercial development to the east, Caspian Court and commercial development to the south, Bordeaux Drive and undeveloped land to the southwest, and office buildings and commercial buildings occupied by Yahoo! Inc. to the west.

SECTION 3: BACKGROUND

In 2017, Cornerstone performed separate Phase II Soil, Soil Vapor, and Ground Water Quality Evaluations at the 200 Caribbean (Cornerstone, 2018a) and 100 Caribbean campus projects (Cornerstone, 2018b). Figure 4 presents Cornerstone's boring and sampling locations; prior and existing ground water monitoring wells are also shown on Figure 4. The analytical results of Cornerstone's Phase II studies are included in Appendix A.

Relevant Site information presented in the Phase II documents is summarized below, and referenced Site features are shown on Figures 5 to 8. Please refer directly to the Phase II reports for a more complete overview of the Site.

3.1 PRIOR SITE USES

The Site historically was used for agricultural purposes until the late 1970s when the existing commercial buildings were constructed, except for 1325 Borregas Avenue that was constructed in the early 1980s. Since at least the early 1980s several tenants have occupied the buildings involving various uses including commercial, light industrial, warehouse and storage, research and development, and office space. Limited information is known concerning past Site operations by historical tenants that occupied the buildings except for the A.C. Ball Company that formerly occupied 141 Caspian Court; Federal Express that formerly occupied 1393-1395 Borregas Avenue; and AG Associates (AGA) that formerly occupied 1325 Borregas Avenue. These former facilities are further discussed below in Sections 3.1.1, 3.1.2, and 3.1.3.

3.1.1 A.C. Ball Company

A.C. Ball Company, a Department of Defense specialty contractor, formerly occupied the 141 Caspian Court Site building from 1978 to 1982. During A.C. Ball Company's occupancy of Site building 141 Caspian Court, volatile organic compounds (VOCs) were released to soil and ground water as a result of leaking underground solvent storage tanks. Under the regulatory oversight of the San Francisco Bay Regional Water Quality Control Board (Water Board), the underground storage tanks (USTs) were removed in 1987 along with some impacted soil. A dual phase extraction system was installed that operated until November 1996. The system extracted approximately 11 million gallons of ground water, 40 million cubic feet of soil gas, and 130 pounds of VOCs. During the last ground water monitoring event in 2002, maximum VOC concentrations in ground water were 10 micrograms per liter (µg/L) for perchloroethene (PCE), 42 µg/L for trichloroethene (TCE), 69 µg/L for 1,1,1-trichloroethane (TCA), 190 µg/L for 1,1-dichloroethane (DCA), 17 µg/L for 1,2-dichloroethene (DCE), and 22 µg/L for 1,4-dioxane.

In their case closure documentation dated December 15, 2004, the Water Board references a deed restriction for the property that includes the following restrictions that run with the land: 1) no water production wells are to be installed within the property boundaries; 2) the Water Board is to be advised of all changes in ownership; and 3) a health and safety plan (HSP) must be prepared for any excavation work within the property boundaries with provisions for properly managing any VOC-impacted soils.

3.1.2 1393-1395 Borregas Avenue

In the mid/late 1980s, 1393-1395 Borregas Avenue was occupied by Federal Express who operated a 10,000-gallon diesel/gasoline UST located near the southeast corner of the building. The UST initially stored diesel fuel but was later used to store unleaded gasoline. The UST and associated piping was removed in April 1987; a small hole was observed near the suction pump in the piping elbow. Soil and ground water samples were collected from beneath the leaking piping elbow. Total petroleum hydrocarbons (TPH) as gasoline (TPHg) was detected in ground water but not in the selected soil sample. Following removal of the UST in 1987, a Leaking Underground Storage Tank (LUST) case was opened by the Water Board.

In 1989, three monitoring wells (MW-1A, MW-2A, MW-3A) were installed northwest, southwest, and northeast of the building, respectively. TPHg was detected in the ground water sample from MW-3A at a concentration of 8,100 µg/L. Additionally benzene was detected at a concentration of 20 µg/L, toluene at 2 µg/L, ethylbenzene at 98 µg/L, and total xylenes at 360 µg/L. Two additional monitoring wells (MW-4A and MW-5A) were installed and subsequently sampled in April 1991. TPHg was not detected in soil or ground water samples collected from these wells. Quarterly ground water monitoring was conducted between May 1991 and 1992. TPHg was consistently detected from ground water samples collected from MW-3A.

In March 1992, five additional borings (BH-1, BH-2, MW-6A, TW-1, and TW-2) were advanced to help evaluate the lateral extent of the petroleum hydrocarbons. TPHg was detected in soil and ground water samples from two of the borings located down-gradient of the former UST.

In November 1994, a supplemental investigation was performed and three additional monitoring wells (MW-7A, MW-8A, and MW-9A) were installed and sampled quarterly through 1995. During the last reported monitoring event in September 1995, TPHg was detected up to 220 µg/L, PCE up to 8.9 µg/L, and TCE up to 7.2 µg/L. In a letter dated August 8, 1996, the Water Board indicated that no further remedial action was required. The Water Board staff letter also indicated that the available data suggested that the source of the chlorinated VOC contamination was from off-property and up-gradient sources.

3.1.3 1325 Borregas Avenue

By 1983, 1325 Borregas Avenue (also addressed as 133 Caspian Court) was developed with the existing on-Site building. AGA occupied the subject property from at least 1985 through 1995. AGA reportedly manufactured rapid thermal processing equipment for the semiconductor industry and used industrial solvents and acids. Based on Cornerstone's cursory review of provided chemical inventory records, chemical use did not specifically list PCE or TCE. Hazardous materials storage areas were identified at the northern end of the building. Beginning in March 1990, the southern one-third of the building was occupied by Gamma Link (GL), a manufacturer of fax boards. These tenants occupied the property until 1995 when the building became vacant and the property was foreclosed. In 1997 Mercury Interactive

investigated the property prior to its purchase and occupation of the building. Mercury Interactive, a provider of information technology software and services, vacated the Site on May 1, 2004. Spirent Communications (Spirent) occupied the building from at least 1997 to 2014 for office use.

In 1991 three ground water monitoring wells were installed at the property presumably to assess potential impact from the adjacent A.C. Ball Company. The three former ground water monitoring wells were reportedly identified as MW-1, MW-2, and MW-3. Sampling of the wells located at the subject property reportedly occurred from 1991 through 1997, and by 1997, VOC concentrations remained detected in two of three wells but had reportedly declined below drinking water maximum contaminant levels (MCLs). In their letter dated August 12, 1997, the Water Board indicated "*the subject property is not under Board oversight and we are not aware of any VOC sources which need to be addressed at 1325 Borregas Avenue. Therefore, we have no objections to the abandonment of the three on-site ground water monitoring wells on the subject property, provided that neither the SCVWD nor local authorities object.*" A subsequent Water Board letter addressed to Mercury Interactive dated September 16, 1997 stated that *"VOC concentrations were not high enough to be of concern, and do not appear of sufficient significance for us to initiate a site investigation or require the submittal of detailed technical information or continued groundwater monitoring. No further action is required for addressing contamination at the subject property."*

3.2 OFF-SITE CONTAMINATION CASES

3.2.1 Lockheed Plant One

The Site is located adjacent to the approximately 560-acre Lockheed Martin Space Systems Company Plant One Facility (Lockheed). Since approximately 1988, several environmental investigations and remedial efforts have been completed at Lockheed. These investigations were performed under the regulatory oversight of the Water Board due to the reported releases of VOCs, hexavalent chromium, and nitrates that have impacted soil and ground water quality. Ground water monitoring and remediation is ongoing.

A ground water extraction system designed to contain and remove contaminants of concern in the first and second water-bearing zones has operated at Lockheed since 1992. Additionally, an in-situ bioremediation (ISBR) pilot system has been operating since 2009 in the deeper water-bearing zones near the Lockheed source area at Building 182, located approximately 0.3 miles southwest of 200 Caribbean.

Based on a review of the most recent semi-annual monitoring report dated September 2017, TCE is the the primary contaminant of concern that extends beyond the Lockheed property. The approximate reported boundary of TCE-impacted ground water that exceeds 5 µg/L is shown on Figure 4. Other contaminants of concern (*i.e.*, hexavalent chromium and nitrates) appear limited to impacted ground water on the Lockheed property.

3.2.2 Unidentified Sources of Ground Water Contamination

The Site is located in an area of regional VOC ground water contamination from unknown sources. Regulatory agencies have not yet identified a responsible party for the regional contamination. Prior studies have been performed at several properties to help demonstrate these properties are not a potential source of the VOC contamination and the VOCs detected in shallow ground water are reportedly associated with up-gradient sources of contamination.

3.3 PRIOR STUDIES

During Cornerstone's 2017 investigations, soil, soil vapor and ground water sampling were performed to help evaluate potential impacts from reported off- and on-Site VOC releases, and from unidentified regional VOC ground water contamination. At 200 Caribbean, laboratory analyses of the grab ground water samples detected VOCs above laboratory reporting limits in 7 of 19 samples. The occurrence of VOCs in these seven ground water samples is likely attributed to the VOC-impacted ground water that has migrated beneath the Site from the Lockheed ground water contaminant plume and/or releases associated with the on-Site former A.C. Ball Company located at 100 Caribbean. Laboratory analyses of the grab ground water samples collected at 100 Caribbean detected VOCs above laboratory reporting limits in 15 of 17 samples. PCE, TCE, and 1,1-DCE were detected with the greatest frequency and concentration magnitude. Other VOCs with a lower frequency of detection that also exceeded drinking water MCLs[1] included 1,2-DCA, 1,1-DCA, 1,4-dioxane, cis-1,2-DCE, and vinyl chloride.

Laboratory analyses of the soil vapor samples collected from 38 temporary vapor probes installed at the Site detected similar VOCs as were detected in the paired ground water data. The greatest concentrations and extent of impact appears associated with 100 Caribbean due to historical on-Site releases from the former A.C. Ball Company. PCE, TCE and their breakdown products including, but not limited to, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, and/or vinyl chloride were detected in vapor samples collected from 15 of 17 probes installed at 100 Caribbean. These VOCs were detected in the 15 soil vapor samples at concentrations that exceed commercial ESLs[2]. The lateral extent of soil vapor impacts exceeding commercial ESLs correlates with the ground water contaminant plume and ground water exceedances. This data indicates the source of these VOCs in soil vapor is likely due to off-gassing of VOC-impacted ground water from beneath this portion of the Site.

At 200 Caribbean, soil vapor samples with VOC concentrations exceeding commercial ESLs were limited to the vapor probes installed at the western edge of the Site. The source of these VOCs appears associated with the off-Site Lockheed VOC release. As shown on Figure 3, an aboveground parking structure is planned in this portion of project.

To reduce the risk of vapor intrusion, the planned building at 100 Caribbean will be designed with appropriate structural and engineering features. Vapor intrusion mitigation measures will also be incorporated into development plans for the planned building at 200 Caribbean to effectively eliminate actual and/or perceived risk of vapor intrusion into the building.

3.4 CHEMICALS OF CONCERN

Chemicals of Concern (COC) in the subsurface are defined as those detected at or above their respective ESLs established by the Water Board, or MCLs established by the State Water Resources Control Board. As shown in the Data Summary Tables included in Appendix A, COC in soil vapor and ground water at 200 Caribbean include PCE, TCE, cis-1,2-DCE, and vinyl chloride. At 100 Caribbean, COC in soil vapor and ground water include PCE, TCE, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, vinyl chloride, 1,2-DCA, 1,1-DCA, and 1,4-dioxane.

[1] Ground water results were compared to the drinking water Maximum Contaminant Levels (MCLs) established by the State Water Resources Control Board (SWRCB, October 2018).

[2] Due to the regulatory involvement of the Water Board at several nearby and on-Site properties, soil vapor results were compared to Environmental Screening Levels (ESLs) established by the San Francisco Bay Regional Water Quality Board (Water Board, 2019).

SECTION 4: PHYSICAL SETTING

4.1 RECENT USGS TOPOGRAPHIC MAP

A 1999 USGS 7.5 minute topographic map was reviewed to evaluate the physical setting of the Site. The Site's elevation is approximately 5 feet above mean sea level; topography in the vicinity of the Site slopes downward gently to the northeast towards the San Francisco Bay.

4.2 LITHOLOGY AND HYDROGEOLOGY

Based on Cornerstone's prior studies at the Site, the upper approximate ½ to 1 foot consisted of finished surface materials including landscape materials, Portland cement concrete, asphalt concrete or asphalt pavement over aggregate base. Beneath the surface materials, up to approximately 5 feet of possible fill and/or reworked native soils consisting of medium stiff brown lean sandy clays with gravel and clayey sands with gravel were observed. In general, the greater thicknesses of the fill and/or reworked native soil were observed in the borings located on the northern half of the Site. Below the fill and/or reworked native soil were stiff expansive clays with varying amounts of sand to approximately 5 to 7 feet, followed by stiff to medium stiff lean sandy clays with varying amounts of sands and gravels. In approximately half of the borings, lean clays with varying amounts of sand extended to the maximum depth explored of approximately 15 to 20 feet. In general, ground water was not readily observed in the soil column from these borings; however, after drilling, ground water was measured in the boreholes at approximate depths ranging from 7 to 10 feet.

In the other half of the borings, beneath the lean clay was sand layer with varying amounts of clay and gravel; it was observed to be approximately ½ to 4 feet thick. Ground water was observed in this layer at approximate depths ranging from 9 to 18 feet. After drilling, ground water was measured in the boreholes at approximate depths ranging from 6 to 12 feet, indicating possible semi-confined to confined ground water conditions.

SECTION 5: SITE MANAGEMENT APPROACH

5.1 APPLICABILITY OF THE CONSTRUCTION MANAGEMENT PLAN

Soil, soil vapor and ground water with concentrations of COC may be present at various on- and off-Site locations. This SMP presents protocol for the following construction activities that may encounter residual COC:

- Building demolition and utility removal;
- Trenching, excavating and grading;
- Subsurface utility installation;
- Building foundation construction;
- Hardscapes; and
- Landscapes.

5.2 GENERAL RISK MANAGEMENT CONSTRUCTION PROTOCOLS

During construction activities, measures will be taken by the General Contractor to minimize dust generation, storm water runoff and tracking of soil on- and off-Site. In addition, measures will be taken to reduce the potential for the creation of preferential pathways (vertical or horizontal) for COC detected in ground water beneath the Site. The general risk management construction protocols are described below.

5.2.1 Pre-Construction Notification

Prior to the start of any construction activity that involves below ground work (e.g. mass grading, foundation construction, excavating or utility trenching), information regarding Site risk management procedures (*e.g.*, a copy of this SMP) will be provided to the General Contractor and each of its subcontractors for incorporation into their HSPs.

5.2.2 Site-Specific Health and Safety Worker Requirements

A Site-specific HSP prepared by a Certified Industrial Hygienist (CIH) is included in Appendix B. The HSP establishes health and safety protocols for personnel working in impacted areas. This HSP meets federal and State of California OSHA standards for hazardous waste operations (29 CFR 1910.120 and 8 CCR 5192).

The General Contractor will be responsible for following the protocols presented in the HSP. The Contractor also will prepare their own HSP and Injury and Illness Prevention Plan (IIPP) and will maintain the responsibility for the health and safety of their workers. The General Contractor's HSP will follow the protocols in the Site-specific HSP and will establish health and safety protocols for their personnel and their subcontractors and their personnel in accordance with federal and State of California OSHA standards. The General Contractor's HSP will contain provisions for limiting chemical exposure to construction workers, chemical and non-chemical hazards, emergency procedures, and standard safety protocols. Contractors are required to implement their specific requirements for worker training, based on the level of expected contact to soil, soil vapor, and ground water associated with their workers' activities.

5.2.3 Personal Protection Equipment (PPE)

Work activities will be conducted with, at a minimum, Level D protection:

- Rubber boots when in contact with ground water;
- Work boots;
- Work gloves;
- Safety glasses when risk of splashing or contact with ground water;
- Hard hat at all times; and
- Hearing protection (if noise levels exceed 85 dBA).
- As noted below, earthwork conducted in exclusion zones also requires coveralls, nitrile gloves, and respiratory protection.

Workers conducting earthwork activities in exclusion zones as discussed in Section 5.2.5 shall complete 40-hour HAZWOPER training course (29 CFR 1910.120). In these areas, coveralls and nitrile gloves are needed only as required to help reduce soiling by contaminated materials. Respiratory protection is also required for workers entering excavations/trenches until air sampling results demonstrate that it is no longer needed.

5.2.4 Site Security and Access

The Site will be fenced and gated with lock. Access to the Site will be limited by the General Contractor to authorized personnel. Site control procedures will be implemented by the General Contractor to control the flow of personnel, vehicles and materials in and out of the Site. Signs will be posted by the General Contractor instructing visitors to sign in at the project support areas at all Site entrances.

5.2.5 Site Control in Contaminated Areas

To help prevent the migration of contamination by personnel or equipment, three zones will be established for work activities performed in known contaminated areas: an exclusion zone, a contamination reduction zone (CRZ) and a support zone. The General Contractor and its subcontractors are responsible for establishing these work zones.

5.2.5.1 Exclusion Zone

Exclusion zones consist of areas where inhalation, oral contact, or dermal contact with contaminants is considered to be possible. Currently, three exclusion zones have been established:

- The portion of the Site that overlies the Lockheed VOC ground water plume and is 5 feet or more below existing Site grades (Figure 5);
- The portion of the Site that overlies the on-Site former A.C. Ball Company VOC ground water plume and is 5 feet or more below existing Site grades (Figure 5); and
- Potentially impacted soil associated with the former solvent UST systems operated by A.C. Ball Company (Figure 6);

As shown on Figure 5, the geometry of the exclusion zones for the Lockheed and A.C. Ball Company VOC releases were established based on the portion of the ground water contaminant plumes that may exceed drinking water MCLs. The size and configuration of each exclusion zone may vary. The procedures described in this SMP will be followed when work is occurring within approximately 50 feet of these areas. Each exclusion zone boundary will be clearly and conspicuously marked prior to disturbing existing soil in that zone. A single entry and exit point will be established. Entry will be limited to essential personnel or pre-approved visitors. As construction progresses, demarcation of the exclusion zone work area will be adjusted depending if soil disturbance is completed and/or new areas are disturbed.

5.2.5.2 Support Zone

The support zone will consist of a clearly marked area where the administrative area, break areas, and changing facilities are located. Smoking, drinking, and eating will be allowed only in designated areas. Sanitation facilities (with hand wash) will be provided in the support zone.

5.2.5.3 Contamination Reduction Zone

The CRZ will be established between the exclusion zone and support zone. In this area, personnel will begin the sequential decontamination process required to exit the exclusion zone. To prevent on- and off-Site migration of contamination and to facilitate personnel accountability, all personnel will enter and exit the exclusion zone through the CRZ. All vehicles and equipment exiting the exclusion zone will traverse a track-out prevention area consisting of rumble strips or a 20-foot pad of 6-inch minus rock to dislodge materials from wheels and undercarriage. In no event will visible track-out to public roadways be permitted. Potentially contaminated material that is removed will be added to the stockpile area, and rinsate generated by decontamination activities can be used for dust control on the contaminated stockpiles which will be located in lined and bermed areas. Rinsate generated by decontamination activities cannot be used for other dust control purposes.

5.2.6 Access Controls

The General Contractor will establish the physical boundaries of each zone and will instruct all workers and visitors on the limits of the restricted areas. No one will be allowed to enter a restricted area without the required protective equipment for that area. The General Contractor's Site Safety Officer (SSO) will ensure compliance with all restricted area entry and exit procedures. The General Contractor's SSO also will designate a decontamination corridor through which personnel may exit from a contaminated area and enter into adjacent clean break areas. Additional responsibilities of the SSO are summarized in the HSP.

Visitors should check in with the General Contractor's SSO immediately upon arrival. Only authorized visitors will be allowed access to active work areas. Each visitor will be required to provide and wear the necessary protective equipment for use during Site visits and will be escorted by the General Contractor while on Site. All visitors, subcontractors and other personnel will be required to sign a safety plan acknowledgement sheet to certify that they have read and will comply with the Site HSP. Failure to comply with this Site entry procedure may result in expulsion from the Site.

5.2.7 Traffic Control

To reduce the potential impacts of construction traffic at the Site, the General Contractor will employ traffic management measures at the Site: 1) to provide for the safety of on-Site personnel; 2) to reduce the potential for spillage or tracking of soil on- or off-Site; 3) to help facilitate concurrent construction activities with remediation activities so that they do not adversely impact or compromise safe traffic flow within the Site; and 4) to limit the disruption of existing traffic flows on local roadways.

Traffic management protocols include:

- Visual monitoring of traffic movements on the Site will be performed by the General Contractor to ensure safe movement of traffic and protection of persons and property around the Site.
- Construction roads will be observed by the General Contractor to confirm road conditions support safe working and driving.

- Each subcontractor is responsible for compliance with this plan for vehicle and transport safety of personnel and vehicles under their control.
- Drivers of vehicles are responsible for driving safely and exercising care.
- Any track-out on a paved public road at any location where vehicles exit the work Site will be cleaned by using wet sweeping or a HEPA filter equipped vacuum device by the end of each work day. Dry sweeping of paved roadways will be prohibited.
- A maximum vehicle speed limit of approximately 15 miles per hour or less.
- Water applied sufficiently often to keep the area adequately wetted.
- Vehicles maintained by covering holes or other openings in cargo compartments such that no spillage can occur.
- Loads wetted and either:
    - Covered with tarps; or
    - Loaded such that the material does not contact the front, back, or sides of the cargo compartment at any point less than ½ foot from the top and that no point of the load extends above the top of the cargo compartment.
- Spills immediately cleared by engaging appropriate safety and response standards as relevant to the event.

5.2.8 Equipment Decontamination

Decontamination procedures shall be established and implemented by the General Contractor to reduce the potential for construction equipment and vehicles to release contaminated soil onto public roadways or other off-Site transfer. A separate decontamination pad will be established for the decontamination of all equipment leaving the exclusion zones. The following will apply:

- Gross soil deposits will be removed manually from tracks, tires, drives, etc. using digging bars, scrapers, etc. before moving to the decontamination pad.
- All surfaces that cannot be sufficiently decontaminated manually will be pressure washed to remove remaining adhering contamination.
- A final rinse will be performed to remove dissolved contaminant, water, and surfactant residues.
- Rinsates and dislodged soil and other contaminated material will be added to the impacted stockpiles or directly hauled by trucks for appropriate off-Site disposal.

5.2.9 Dust Control

The General Contractor will utilize effective means of dust and erosion control to minimize the generation of dust and erosion associated with excavation activities, truck and vehicle traffic onto and off the Site, and the effects of ambient wind traversing exposed soil.

Work activities, such as clearing, demolition, excavation and grading operations, construction vehicle traffic on unpaved ground, and wind blowing over disturbed soil surfaces may generate dust and particulate matter whenever exposed soil surfaces are dry. The General Contractor will minimize dust emissions to the maximum extent possible. To accomplish minimal dust emissions, the General Contractor will implement dust control measures in accordance with Air District rules and regulations.

An effective means of dust control will be utilized to minimize the generation of dust associated with the earthwork activities, truck traffic onto and off the Site, and the effects of ambient wind traversing exposed soil. Dust control measures (which will be recorded in a daily written log) utilized at the Site will include several or more of the following on an as needed basis:

- Providing equipment and staffing during normal working hours for watering of all exposed or disturbed soil surfaces sufficient to suppress dust plumes.
- Using dust suppressant additives in the water, which can be a small amount of ordinary liquid detergent.
- Covering or wetting of stockpiles of debris, soil, sand or other materials that can be blown by the wind.
- Misting or spraying water while excavating soil and loading transportation vehicles.
- Minimizing drop heights while loading/unloading excavated soil.
- Sweeping adjacent streets of all soil and debris generated from the Site work activities.
- Wetting inactive portions of the Site that have exposed soil surfaces or treating these areas with an approved dust suppressant.
- Suspending earth moving or other dust producing activities during periods of high winds whenever dust control measures are unable to prevent visible dust plumes.
- Watering to control dust will not result in ponded water or runoff. If runoff occurs, it will be contained on-Site.

5.2.9.1 Perimeter Air Monitoring

Perimeter air monitoring for dust during excavation and grading activities at the Site can be conducted at the Site by the Environmental Professional or General Contractor if requested by Google. The following procedures would be followed.

Prior to the beginning of excavation or grading activities, a windsock or anemometer will be used to monitor the wind direction at the Site and to help determine the location of monitors along the fence lines. Fence line dust monitoring will be conducted at three locations. Each monitor will be positioned within the breathing zone at approximately 5 feet above the ground level.

Perimeter dust monitoring will include the collection of air samples at one upwind location and two downwind locations. The monitoring will be performed using three DataRAM PDR-1000

particulate monitors. These meters log the detected airborne dust concentrations.

The particulate meters will be monitored to evaluate if excessive dust is migrating off-Site. Each time the meters are checked, the differences between the average upwind dust concentration and the average downwind concentration will be compared to the ambient air quality standard of 150 µg/m³ (8-hour average) for respirable dust. If this standard is exceeded, increased dust control measures will be implemented. The California Ambient Air Quality Standard for respirable particulate matter (PM10) is 50 µg/m^3 over an averaging time of 24 hours. Based on an 8-hour construction work day, 150 µg/m^3 over an averaging time of 8 hours will average 50 µg/m^3 over 24 hours (16 hours of non-activity). Significant concentrations are defined as exceeding 150 µg/m^3 over an averaging time of 8 hours.

5.2.10 Storm Water Pollution Prevention Plan (SWPPP)

The Clean Water Act and associated federal regulations (Title 40 of the Code of Federal Regulations [CFR] 123.25(a)(9), 122.26(a), 122.26(b)(14)(x) and 122.26(b)(15) require nearly all sites engaged in clearing, grading, and excavating activities that disturb one acre or more, to obtain coverage under a National Pollutant Discharge Elimination System (NPDES) permit for storm water discharges. A Site-specific Storm Water Pollution Prevention Plan (SWPPP) and Erosion Control Plan covering the activities of Site redevelopment will be prepared by the Civil Engineer (QSD). Contractors and their Subcontractors shall comply with the provisions and protocols of this plan. A copy of the SWPPP will remain on-Site throughout construction. Storm water pollution controls will be based on best management practices (BMPs), such as those described in “Information on Erosion and Sediment Control for Construction Projects: A Guidebook” (Water Board 1998) and “Erosion and Sediment Control Field Manual, Third Edition (Water Board 1999). The California Stormwater Best Management Practice Handbooks published by the California Stormwater Quality Association (CASQA) (http://www.casqa.org) also reflect current practices and storm water management standards. Sediment and erosion control procedures include, but are not limited to the following:

- Construct temporary berms or erecting silt fences around exposed soil;
- Place straw bale barriers or sediment traps around catch basins or other entrances to storm drains;
- Cover soil stockpiles with plastic sheeting or tarps during rainfall events;
- Thoroughly sweep paved areas exposed to soil excavation/grading activities;
- During storm events, prevent stockpiled soil from entering the storm drain system;
- Provide water for truck cleaning and dust control; and
- Implement other appropriate BMPs.

Maintenance, monitoring and inspection will be conducted according to the BMPs. Erosion control measures will be maintained until disturbed areas are stabilized. Changes to this erosion control plan will be made to meet field conditions only with the approval or at the direction of the Civil Engineer.

5.2.11 Stockpiling

Soil may require temporary stockpiling as needed by the General Contractor. The stockpile area including protection of nearby storm drains will be constructed in accordance with the approved SWPPP. The SWPPP will also include measures to protect stockpiles during rain events.

5.2.11.1 "Clean" Soil

In general, the stockpile area will be clean and free of debris. The stockpile will be covered with heavy duty plastic (minimum of 30 mil), or watered twice daily, or sprayed with a non-toxic soil binder. All stockpiles will include berms for containment of any water that drains from the soil. Stockpiles will be inspected at least daily. All stockpiles will be handled as to prevent and/or reduce potential dust generation. Additional water spray will be utilized for dust suppression and foam or surfactant will be utilized for stabilization of stockpiles, if necessary.

5.2.11.2 Soil Suspected as Contaminated

Excavated soil suspected to be impacted will require additional stockpiling measures. In general, the stockpile area will be clean and free of debris prior to the placement of the bottom liner. The liners will consist of heavy duty plastic (minimum of 30-mil) as the bottom and top liners. All stockpiles will include berms for containment of any water that drains from the soil. Stockpiles will be inspected at least twice daily and repaired as needed. At the end of each shift or when the stockpile is not in use for two hours or longer, the pile(s) will be securely covered with the heavy duty plastic liner. All stockpiles will be handled as to prevent and/or reduce potential dust generation. Additional water spray will be utilized for dust suppression and foam or surfactant will be utilized for stabilization of stockpiles, if necessary.

5.2.11.3 Sampling of Stockpiles Suspected as Contaminated

Stockpile samples will be collected in random areas and depths and analyzed for COC in accordance with the following protocols:

- Up to 1,000 cubic yards (cy): One sample per every 250 cy
- 1,000 to 5,000 cy: Four samples for the first 1,000 cy and one sample for each additional 500 cy
- Greater than 5,000 cy: 12 samples for the first 5,000 cy and one sample for each additional 1,000 cy

5.2.12 Corrosion

Because of the nature of the contaminants and their potential detrimental impacts on utility pipelines, a corrosion study shall be performed by a Corrosion Engineer to evaluate the need for protective measures for utilities, which could include wrapping piping with corrosion resistant tape, applying an epoxy coating, using corrosion resistant piping materials (including gaskets, flanges and couplings) and/or installing a cathodic protection system.

5.2.13 General Protective Measures

- All excavating, trenching and grading activities will be conducted according to Cal OSHA regulations.
- Trenches/excavations 5 feet or deeper will be sloped, shored or benched.
- Open trenches/excavations will be inspected daily for readily observable indications of possible cave-ins, hazardous atmosphere or other hazardous conditions.
- If readily observable conditions are noted that could result in cave-in, hazardous atmosphere or other hazardous condition, exposed workers will be removed from the area until the necessary precautions have been taken to address the concern.
- Trenches/excavations will be protected with adequate barriers or physical protection.
- Stockpiles of soil will not be stored within 2 feet of a trench/excavation.
- Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, the atmosphere will be tested before workers enter the work area.
- Adequate precautions will be taken to prevent exposures to atmospheres containing less than 19.5 percent oxygen and or hazardous atmospheres, including proper respiratory protection or ventilation.
- Workers will not work in excavations/trenches in which there is accumulated water or in trenches/excavations in which water is accumulating, unless adequate precautions have been taken against the hazards posed by the accumulation. These measures can include PPE, shoring or water removal.
- Workers will wash hands thoroughly after handling Site soil or ground water even if they were wearing protective gloves.

5.2.14 Field Documentation

The Environmental Professional will be present on-Site during earthwork operations performed within approximately 50 feet of an exclusion zone and will be responsible for observing soil conditions, air monitoring and sampling, monitoring health and safety measures, stockpile sampling, and confirming that General Contractor activities are being completed in conformance with this document. As part of this process, daily field reports documenting Site activities will be completed and made available for inspection by authorized oversight personnel for the duration of the project.

5.2.14.1 Daily Field Reports

Daily field reports will document where, when, how, and from whom project information was obtained. Entries will be complete and accurate enough to permit reconstruction of field activities. Each page will be dated and the time of entry noted.

5.2.14.2 Chain of Custody Records

Chain-of-custody records are used to document sample collection and shipment to the laboratory for analysis. All sample shipments for analyses will be accompanied by a chain-of-custody record. Form(s) will be completed and sent with the samples for each laboratory and each shipment. If multiple coolers are sent to a single laboratory on a single day, chain-of-custody form(s) will be completed and sent with the samples for each cooler. The chain-of-custody record will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until receipt by the laboratory, the custody of the samples will be the responsibility of the sample collector.

5.2.14.3 Photographs

Photographs will be taken by the Environmental Professional to help document information entered in the daily field report. When a photograph is taken, the following information will be written in the daily field report:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed
- Name of person taking the photograph

5.3 DEMOLITION OF BUILDINGS

5.3.1 Hazardous Materials

Some components encountered as part of the building demolition waste stream may contain hazardous materials. Identified asbestos containing materials, light bulbs, ballasts and remaining universal wastes, lubrication fluids and CFCs and HCFC's will be removed before structural demolition begins. With proper planning, a majority of the environmental risk associated with the management of waste from a demolition project can be eliminated. Materials that may result in possible risk to human health and the environment when improperly managed include lamps, thermostats, and light switches containing mercury; batteries from exit signs, emergency lights, and smoke alarms; lighting ballasts which contain PCBs; and lead pipes and roof vent flashings. A summary of these components and their potential risks are presented below.

5.3.2 Asbestos

NESHAP guidelines require the removal of potentially friable asbestos containing materials prior to building demolition. Friable asbestos containing materials greater than 1% asbestos shall be manifested, transported and disposed as a hazardous waste.

5.3.3 Lead-Based Paint

The Consumer Product Safety Commission banned the use of lead as an additive in paint in 1978. The removal of lead-based paint isn't required if it is bonded to the building materials. However, if the lead-based paint is flaking, peeling, or blistering, it should be removed prior to demolition. In either case, applicable OSHA regulations will be followed; these include requirements for worker training, air monitoring and dust control, among others. Building debris

or soil containing lead above regulatory levels will be disposed appropriately.

5.3.4 PCBs

Caulking containing concentrations of PCBs equal to or greater than 50 mg/kg shall be disposed as hazardous waste.

If any ballasts (PCB or non-PCB) are present, they will be collected and recycled in accordance with universal waste requirements. Drums will be labeled and closed during accumulation. Drums should not be filled more than half due to weight. PCB ballasts will be segregated from non-PCB ballast.

Light ballasts suspected to contain PCBs will be inspected for the printed statement, “No PCBs”. PCB ballasts missing the “No PCBs” label will be removed from the fixtures and disposed as PCB containing materials prior to the demolition of the buildings. Ballast marked as “No PCBs” could contain land-banned dielectric fluids and will be disposed in an appropriate manner.

In addition, PCBs were commonly used in transformers; several transformers were observed on-Site. Transformers will be appropriately removed and disposed prior to demolition activities.

5.3.5 Mercury

Mercury containing equipment may be present. Mercury containing devices will be handled with caution to prevent spillage. Devices will be handled intact, sealed and packaged to prevent breakage. All used mercury containing equipment must be labeled clearly as “Universal Waste – Mercury Containing Equipment”. Examples of mercury containing equipment include: thermostats, tilt switches, pressure gauges, flow meters, float switches and drain traps.

5.3.6 Batteries

Storage batteries and other batteries than contain hazardous metals, such as mercury, lead, silver and cadmium, must be clearly labeled with the following phrases: “Universal Waste – Battery(ies)”, “Waste Battery(ies)”, or “Used Battery(ies)” during accumulation.

5.3.7 CFC-Based Refrigerant

Accessible condenser-type air conditioning equipment may be present on rooftops. Mechanical equipment will be assumed to contain a CFC-based refrigerant. Refrigerant and lubricating fluids will be captured from the equipment and properly disposed prior to demolition of the structures.

5.3.8 Miscellaneous Chemicals

Any hazardous chemicals found during demolition will be handled as hazardous waste. Examples include: cylinders, bottles and cans with liquid.

5.3.9 Waste Disposal

Demolition waste such as fluorescent lamps, PCB ballasts, lead acid batteries, mercury thermostats, and lead flashings have special case-by-case requirements for generation, storage, transportation, and disposal. Before disposing of any demolition waste, the General

Contractor and/or their subcontractor will determine if the waste is hazardous and will ensure proper disposal of waste materials.

5.3.10 General Demolition Risk Management Protocols

- Hazardous materials spills will be immediately contained and remediated by trained personnel and reported to the key personnel listed in Table 3.
- Demolition activities will be performed in a manner to minimize airborne dust as described in Section 5.2.9. All demolition activities will be performed with the objective of preventing visible emissions of dust from the Site.
- Stripped topsoil will be stockpiled for on-Site use and protected as described in Section 5.2.11. Excess soil from footings and other subsurface materials will be removed and stockpiled per the protocols of Section 5.2.11. If this material is planned for off-Site disposal, it will be evaluated through analytical testing by the Environmental Professional so that appropriate handling and disposal alternatives can be determined.
- As per the traffic control protocols (Section 5.2.7), all vehicles leaving the work areas will be required to exit via the tire shaker and wheel wash at the guard shack at the Site entrance/exit.

5.3.11 Field Observation During Demolition

Figures 6, 7, and 8 present known areas of the Site where prior occupants stored and/or used hazardous materials. Except for the former solvent UST systems, these areas are not identified as exclusion zones. During removal of the hardscape in these known historical chemical use areas, including in the former solvent UST system exclusion zone, the Environmental Professional will observe the condition of the surface soil for evidence of staining, soil discoloration, odors, and/or other signs of potential contamination. Monitoring of soil vapors with an Organic Vapor Meter (OVM) will also be performed as outlined in Section 6.1.2. If unanticipated contamination is encountered, the area will be managed as described in Section 5.2.5 (Site Control in Contaminated Areas) and the protocols outlined in Section 6.3 (Management of Unanticipated Contamination) will be followed.

5.3.12 Recycled Building Materials

Significant quantities of asphalt concrete (AC) grindings, aggregate base (AB), and Portland Cement Concrete (PCC) will be generated during demolition activities. If the AC grindings are mixed with the underlying AB to meet Class 2 AB specifications, they may be reused (if acceptable to the Geotechnical Engineer of Record) within the new pavement and flatwork structural sections, including within parking garage slab-on-grade areas (provided crushed rock is not required due to the proximity to ground water). AC/AB grindings shall not be reused beneath ground floor/enclosed building areas unless approved by Google. Laboratory testing will be required to confirm the grindings meet project specifications.

If the Site area allows for on-Site pulverization of PCC and provided the PCC is pulverized to meet the “Material for Fill” requirements of the Geotechnical Engineer and Environmental Professional, it may be used as select fill within habitable building areas, excluding the capillary break layer; as typically pulverized PCC comes close to or meets Class 2 AB specifications, the

recycled PCC may likely be used within the pavement structural sections. PCC grindings also make good winter construction access roads, similar to a cement-treated base (CTB) section.

SECTION 6: SOIL MANAGEMENT PROTOCOLS

6.1 SOIL MANAGEMENT IN EXCLUSION ZONES

As discussed, exclusion zones consist of areas where inhalation, oral contact, or dermal contact with contaminants is considered to be possible. Currently, three exclusion zones have been established:

- Impacted soil and ground water associated with the Lockheed VOC ground water plume that has migrated beneath the Site;
- Impacted soil and ground water associated with the on-Site A.C. Ball Company VOC ground water plume; and
- Potentially impacted soil associated with the former solvent UST systems operated by A.C. Ball Company.

The exclusion zones established for the Lockheed and AC Ball Company VOC ground water plumes are presented on Figure 5 and generally coincide with the area of the ground water plume that could potentially exceed drinking water MCLs. Construction activities in these exclusion zones that involve excavation to an approximate depth greater than 5 feet below existing grades are subject to the soil, soil vapor, and ground water management protocols presented in Sections 6, 7 and 8 of this SMP.

Figure 6 presents the former solvent USTs operated by the A.C. Ball Company. All soil disturbing activities performed in this exclusion zone must be performed in accordance with the requirements outlined in Sections 6, 7 and 8 of this SMP.

6.1.1 Soil Excavation Procedures

The General Contractor should assume that soil excavated from the exclusion zones below an approximate depth of 5 feet may be contaminated. Additionally, shallower soil excavated from the solvent UST exclusion zone may also be contaminated. Screening of the excavated soil from these areas/depths as described in Section 6.1.2 will be performed by the Environmental Professional to help evaluate reuse and/or disposal options.

Soil in contact with ground water shall be assumed contaminated. If excavated, these materials will be handled as described in Section 6.1.2.4.

6.1.2 Screening of Excavated Soils

Excavated soil will be field-screened for the presence of VOCs. Field screening will occur using an OVM that measures to at least 10 parts per billion by vapor (ppb_v). Soil that is field-screened and “cleared” using the field head space method with the OVM (discussed below) can be considered “clean” and acceptable for reuse as on-Site fill (if also approved by the Geotechnical Engineer of Record).

6.1.2.1 Calibration

The direct-read monitor will be calibrated in accordance with the manufacturer's manual. If the instrument readings are irregular and the meter cannot be recalibrated, the meter will be removed from the field and replaced with a different unit that is capable of being calibrated and used with reliability.

6.1.2.2 Soil Screening Procedure

Soil screening will be performed as follows:

- A representative soil sample will be placed into an unused resealable Ziplock plastic bag with a minimum volume of one quart until the bag is approximately half full;
- The bag will be sealed and the soil crumbled by hand while inside the bag;
- After a minimum of 2 minutes, the bag slightly opened to allow the OVM probe into its headspace; and
- The sample will be considered as possibly contaminated if the OVM reading is 500 ppbv or higher for approximately 10 seconds or more.

6.1.2.3 Soil Screening Frequency

Soil screening will be performed by the Environmental Professional as follows:

- During soil grading activities with an excavation cut less than 2 feet, one soil sample will be collected and screened using an OVM for every approximately 100 square feet of disturbed soil surface. This criterion applies to the former solvent UST system exclusion zone since shallower impacted soil may be encountered.
- Utility trench screening will involve collecting one soil sample for every approximately 50 cubic yards of excavated soil, or every 10 lineal feet of trench.

6.1.2.4 Potentially Contaminated Soil

Potentially contaminated soil will be segregated and stockpiled separately from other soil. Soil samples will be collected by the Environmental Professional from the suspect impacted stockpile for laboratory analyses. Soil samples for laboratory analyses will be collected in new (unused) or pre-cleaned, stainless steel liners. Soil samples for VOC analysis will be collected in 5-gram Core N' One™ capsules following DTSC guidance. The ends of the liners will be covered in a Teflon film, fitted with plastic end caps, taped, and labeled with a sample identification number. Each sample will be assigned a unique sample number. The assigned number will provide a tracking procedure to allow ease of data retrieval, data reduction, and evaluation. The sample identification numbers will be maintained on the Daily Field Reports and on the chain-of-custody records. The sample label or tags will be affixed to each sample container. The samples will then be placed in an ice-chilled cooler and transported to a state-certified laboratory with chain of custody documentation.

Collected soil samples will be submitted to a state-certified laboratory and selectively analyzed for COC identified for the Site:

- Full list Volatile Organic Compounds (VOCs) and Total Petroleum Hydrocarbons (TPH) as gasoline (EPA Test Method 8260)
- TPH as diesel and motor oil (EPA Test Method 8015B).

Other analytical test methods may be recommended by the Environmental Professional and/or required by the Water Board or landfill (if off-Site disposal is required).

If the analytical results of the soil samples do not exceed residential ESLs, the soil will be suitable for reuse as backfill.

6.1.3 Excavation Perimeter Monitoring in Exclusion Zones

A ppbRAE 3000 OVM or other direct-read (real-time) monitors will be used to monitor trench/excavation perimeters in the exclusion zones to evaluate if areas outside the excavation areas are potentially impacted by excavation activities. Samples will be collected by the Environmental Professional over approximately 1 to 5 minute durations every hour around the perimeter of the excavation during trench/excavation air monitoring activities discussed in Section 8.2.2. Baseline OVM samples will be collected for comparison each day, prior to and during excavation activities and in the ambient air at least 100 feet from the excavation area.

Ambient air will be considered as possibly elevated if 1) the OVM reading is over 500 ppb_v above background for greater than one minute or more, and 2) in the opinion of the Environmental Professional, the source of the vapors is COC originating from the trench/excavation and not from unrelated sources (e.g. construction equipment and materials). Under this scenario, the soil vapor management protocols outlined in Section 8 must be followed.

6.1.4 "Clean" Import Fill Placement in Exclusion Zones

As discussed, "clean" fill will be imported to the Site to raise Site grades approximately 7 feet. Following placement of approximately 1 foot of "clean" import fill in an exclusion zone, the exclusion zone designation can be removed during continued placement of import fill. If future grading/trenching activities in an exclusion zone involve extending the excavation through the "clean" fill section and below existing Site grades[3] (i.e. foundation excavation/drilling, landscape excavation, the area of disturbance will be managed as described in Section 5.2.5 (Site Control in Contaminated Areas).

6.2 EXISTING UTILITIES

Due to the commercial use of the Site, utility lines are likely to be encountered during demolition and grading activities. The General Contractor will review drawings and conduct field investigations to verify the location, type and elevation of existing utilities, whether or not shown on the construction plans. Any removed utility line that is greater than 3 inches in diameter will be observed by the General Contractor for sediment. If sediment is present, it will be stockpiled

[3] In the case of the ground water exclusion zones, as discussed in Section 6.1 (Soil Management in Exclusion Zones), the area of excavation work will need to be managed as an exclusion zone if excavation activities through the "clean" import fill section extend at least 5 feet below existing Site grades.

as potentially contaminated material and sampled in accordance with the protocols outlined above in Section 6.1.2.4. If the utility appears to be former process piping or drain/sewer lines, the material should be assumed contaminated and the General Contractor will notify the Environmental Professional; note that regulatory agencies may need to be notified prior to the removal of such utilities.

6.3 MANAGEMENT OF UNANTICIPATED CONTAMINATION OR HAZARDOUS DEBRIS

Other known areas of the Site where prior occupants reportedly used or stored hazardous materials are shown on Figures 6, 7, and 8. Due to the Site's long history, other former chemical-use areas likely also were present. During construction activities, if unanticipated contamination (*e.g.*, if soil discoloration or odors are noted), buried structures (*e.g.*, sumps, tanks, or abandoned piping), or hazardous debris are encountered that may pose a risk to human health or the environment, earthwork in the suspect area will be immediately stopped and worker access to the suspect area will be restricted. The area will be cordoned off using delineators and caution tape, or similar materials by the General Contractor. Subsequently, the Environmental Professional must be notified within 24 hours of discovery and a site visit will be performed to observe current Site conditions. If buried structures (*e.g.*, sumps, tanks, or abandoned piping) or hazardous debris are encountered, DEH will be notified within 48-hours of discovery. Key Site contacts are provided in Section 10 of this SMP.

6.3.1 Suspect Impacted Soil

If unanticipated contamination is discovered, during the initial visit, excavated and in-place suspect soil will be observed by the Environmental Professional for discoloration or readily apparent chemical odors. OVM screening as discussed in Section 6.1.2 will also be performed. If suspect impacted materials are observed, these soils will be designated as potentially contaminated and will be evaluated through analytical testing by the Environmental Professional so that appropriate handling and disposal alternatives can be determined.

Soil samples will be collected from the stockpile and in-place soil and analyzed for full list VOCs (EPA Test Method 8260B). Other analytical test methods may be recommended by the Environmental Professional and/or required by the DEH or landfill (if off-Site disposal is required). If COC are detected below their respective screening levels presented in Section 6.5.2, then reuse of the soil would be appropriate and no further action is needed. If COC are detected above these levels, the DEH will be notified within approximately 48 hours of receiving the analytical results.

The probable remedial approach will be over-excavation of the impacted soil following the soil management protocols outlined in this SMP and laboratory analyses of confirmation soil samples collected from the sidewalls and base of the excavation. Sidewall soil samples will be collected every approximately 50 lineal feet of excavation face. At least one sample will be collected from each sidewall. Each sample will be collected from freshly exposed soil in the approximate middle of the sidewall depth. Bottom confirmation samples will be collected every approximately 2,500 square feet of excavation base.

No further action is required if the results of the confirmation soil samples indicate that all chemical compounds are below screening levels. If the results of the confirmation samples contain chemical compounds that exceed their screening levels, and the remaining in-place soil is within the planned construction excavation limits, additional over-excavation will be performed

following the protocols outlined in this SMP. Alternatively, if the remaining in-place impacted soil is at the planned construction excavation boundary, possible remedial options may include in-situ characterization, over-excavation, capping the impacted materials, and/or other remedial strategies. The preferred soil management and/or remedial approach will need to be approved by DEH.

6.3.2 Buried Structures and/or Hazardous Debris

If buried structures and/or hazardous debris are encountered, during the initial Site visit, the Environmental Professional will use professional judgment, including evaluating any observed odors or soil staining and past land use activities to assess whether the encountered structure and/or hazardous debris poses a significant risk to human health or the environment. Residual sludge, tank contents, and/or debris that may be present will be characterized by the Environmental Professional through laboratory testing. Laboratory analyses selected will be based on field observation and professional judgment.

The structure/debris and any contents will be removed from the excavation and properly disposed in accordance with applicable laws and regulations. Representative soil samples will be collected beneath the structure/debris by the Environmental Professional. Laboratory analyses of the soil samples will be based on characterization of the structure/debris contents. If a chemical is detected in the soil sample above its screening level, the soil management protocols described in this SMP will be followed.

Tanks or sumps and associated piping will be removed in accordance with in accordance with applicable laws and regulations including the guidance document titled *Underground Storage Tank System and Sump Closure Requirements* dated November 16, 2015 prepared for the Unidocs Member Agencies. Following removal of the tank or sump and any associated piping, soil samples will be collected from the excavation by the Environmental Professional and analyzed as required by the regulatory guidance and under the supervision of DEH and/or City of Sunnyvale Fire Department inspectors. If not all of the pipe is removed, the contents inside the pipe will be removed and the ends of the pipe that remain in place will be capped.

6.4 SOIL DISPOSAL

Soil that requires off-Site disposal shall be evaluated in accordance with Google's gSAFE guidance document dated July 2017 that is included in Appendix C.

6.5 IMPORT FILL

6.5.1 Geotechnical Engineering Parameters

Imported fill shall meet the requirements of the Geotechnical Engineer. Typically the fill must be non-expansive inorganic material with a Plasticity Index (PI) of 15 or less. For the backfilling of deeper excavations, a higher PI may be allowable if approved by the Geotechnical Engineer. To help prevent significant caving during excavation activities, imported material should have sufficient fines. Samples of potential import sources should be delivered to the Geotechnical Engineer's office at least 10 days prior to the desired import start date. Information regarding the import source should be provided, such as any site geotechnical reports. If the material will be derived from an excavation rather than a stockpile, potholes will likely be required to collect samples from throughout the depth of the planned cut that will be imported. At a minimum, laboratory testing will include PI tests. Material data sheets for select fill materials (Class 2

aggregate base, ¾- inch crushed rock, quarry fines, etc.) listing current laboratory testing data (not older than 6 months from the import date) may be provided for our review without providing a sample. If current data is not available, specification testing will need to be completed prior to approval.

Soil corrosion characterization must also be evaluated prior to acceptance. The potential import source should not be more corrosive than the on-Site soils, based on pH, saturated resistivity, and soluble sulfate and chloride testing.

6.5.2 Environmental Parameters

To limit the potential introduction of contaminated fill onto the Site, possible sources of import fill must be evaluated. Adequate documentation will be required so it can be verified that the fill source is appropriate for the Site by the Environmental Professional. The documentation will include detailed information on previous land use of the fill source, any environmental site assessments performed and the findings, and the results of any analytical testing performed. If no documentation is available or the documentation is inadequate, or if no analytical testing has been performed, samples of the potential fill material will be collected and analyzed per the protocols established by the Department of Toxic Substances Control (DTSC). The analyses performed will be based on the fill source and knowledge of the previous land use. The sample frequency for potential fill material will be in accordance with that outlined in the technical document titled, "*Information Advisory on Clean Imported Fill Material*" (DTSC, October 2001 or most current version).

The analytical results for potential import sources will be compared to Tier 1 Environmental Screening Levels (ESLs) established by the San Francisco Bay Regional Water Quality Control Board (Water Board, January 2019 or most current version) except as noted below:

- For organochlorine pesticides (with the exception of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, which are discussed below), results will be compared to direct exposure human health risk ESLs for residential shallow soil exposure (Water Board, January 2019 or most current version).

- The detected metal concentrations in soil samples collected from the Site are consistent with regional background concentrations published by Scott (1991)[4] and Duvergé (2011)[5]. Naturally occurring background concentrations of arsenic, chromium, lead, nickel, and thallium often exceed their respective Tier 1 ESL. CalEPA generally does not require cleanup of soil to below background concentrations. As such, the upper bound concentrations reported by Scott for chromium (170 mg/kg), lead (54 mg/kg), nickel (145 mg/kg) and thallium (3.8 mg/kg) will be substituted for the Tier 1 ESLs. Consistent with the ESL guidance document (January 2019), the 99th percentile upper estimate arsenic concentration published by Duvergé of 11 mg/kg will be substituted for the Tier 1 ESL. There is no established background concentration of vanadium published by Scott. The maximum detected concentration of vanadium (65 mg/kg) at the Site will be used as a Site-specific background concentration for comparison.

[4] To minimize inherent natural differences in soil composition, Scott's study was limited to properties located within an approximate 2-mile radius of the intersection of Highway 101 and 237 in Sunnyvale, California. The Site is located within Scott's study area.

[5] Duvergé (2011) conducted a study of regional background concentrations of arsenic in undifferentiated urbanized flatland soils in the San Francisco Bay Region.

- The Tier 1 ESLs for organochlorine pesticide compounds 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and/or the sum of these compounds will be replaced with the more conservative Total Threshold Limit Concentration (TTLC) of 1 mg/kg established in Title 22 California Code of Regulations. The TTLC is the level at which a solid waste is considered hazardous when evaluating waste disposal options.

Prior importing soil to the Site, a report will be prepared for the potential import source that will be provided to the DEH for review and approval. The report, at a minimum, will include the following components: summary of the Site's history, prior tenants and operations; chemical storage and use information; discussion of prior environmental studies; sampling and analyses plan for the characterization soil samples collected from the proposed excavation cut and/or soil stockpile; and data summary tables presenting the soil characterization data and comparison to the screening criteria presented in Section 6.5.2.

SECTION 7: GROUND WATER MANAGEMENT PROTOCOLS

7.1 DEEP FOUNDATIONS

The development plans include the construction of deep foundations. Auger cast pressure grouted displacement (APGD) piles will be used to help eliminate the potential for downward migration of contaminated ground water. This pile type has become more common in the Bay Area; they are a proven foundation element where a deep foundation is required. Benefits of APGD piles include the ability to penetrate dense layers, with low noise and vibration during installation as compared to driven pile types. In addition, APGD piles provide several advantages for sites with subsurface contamination, such as the minimal generation of soil spoils and mitigation of the potential for vertical migration of contamination.

The APGD piling method is a "*displacement*" method. The displacement pile is installed by drilling with a hollow stem auger, with special flighting near the tip, until the desired tip elevation is reached. During installation, the penetrated soils are displaced laterally away from the auger by means of mechanical compaction as the auger is advanced as opposed to being removed to the ground surface. The custom flight displacement auger provides a seal behind the auger tip. Due to the continuous slow rotation of the auger, the displacement tip, and the pressure grouting, a polished surface is not likely to occur[6]. After the auger tip reaches the desired depth, high strength grout is immediately injected under pressure through the hollow stem. Upon achieving sufficient grout pressure, withdrawal of the auger begins at a controlled rate. Upon retrieval of the auger, steel cages will then be wet-set in the grouted excavations under their own weight. The grout mixture is primarily composed of sand, cement, fly ash, water and admixtures. Plasticizers, water reducers and viscosity modifiers are typically used as admixtures.

The soil cuttings will be managed as described in Section 6. Ground water generated during the pile installation will be contained and shall be placed in holding tanks and disposed as described in Section 7.3 or used for dust control on the contaminated stockpiles.

To establish final design parameters of the deep foundation, Test Piles will be installed. Prior to Test Pile installation, the APGD Contractor may perform Cone Penetration Tests (CPTs) using CPT equipment under observation of the Geotechnical Engineer to further evaluate subsurface

[6] Confirmed by load testing; higher skin friction values compared to conventional augered piles, which correlates to more intimate and irregular surface than other (e.g. precast) displacement pile types.

conditions. Upon same day completion, the 1½ inch diameter CPT boring will be tremie grouted without delays from the bottom of the boring to the surface through the rod as the CPT is withdrawn to the surface; no CPT boring will be left open overnight.

7.2 UTILITY TRENCHES

If utility trenches that extend to an approximate depth of 5 feet or more, measures will be implemented to reduce the potential for vapor and ground water migration through trench backfill and utility conduits. Such measures shall include placement of low-permeability backfill "plugs" at selected intervals on-Site and at all locations where the utility trenches extend off-Site. In addition, utility conduits that are placed below ground water will be installed with water-tight fittings to reduce the potential for ground water to migrate into the conduits. The Civil Engineer will survey and record all '*plug'* placement locations.

7.3 EXCAVATION DEWATERING

If excavation dewatering is required, pumped water will be transferred from the excavations into holding tanks and then either pumped to the sanitary sewer under a POTW permit, treated and discharged to the storm drain system pursuant to a California Regional Water Quality Control Board – San Francisco Bay Region (Water Board) NPDES permit, and/or loaded into tanker trucks for off-Site disposal. If on-Site reuse for dust control is desired, water samples must be collected from the holding tank and analyzed for volatile organic compounds with gasoline-range total petroleum hydrocarbons (EPA Test Method 8260B) and diesel-range petroleum hydrocarbons (EPA Test Method 8015M). If the detected analytes do not exceed ground water ESLs, the water in the holding tanks can be reused on-Site for dust control.

If an extended period of ground water dewatering is anticipated, a Dewatering Plan will be submitted to the DEH for review and approval.

7.4 GROUND WATER MONITORING WELLS

Eight ground water monitoring wells associated with the Lockheed contamination case are located on-Site (Figure 4). Based on initial coordination meetings, Lockheed and Google desire to destroy the monitoring wells prior to Site demolition to avoid damaging the wells during construction and potentially creating preferential pathway for ground water contamination. Lockheed and Google are coordinating the preferred locations for the replacement ground water monitoring wells and Lockheed will obtain approval from Water Board. Following approval by the Water Board, the replacement wells will be installed after construction of the planned development and/or improvements in the public right-of-way. All decommission and reinstallation activities will be conducted by Lockheed in accordance with the requirements of the Santa Clara Valley Water District.

SECTION 8: SOIL VAPOR MANAGEMENT PROTOCOLS

This section provides air monitoring and soil vapor management protocols that must be followed during soil-disturbing activities in the exclusions zones identified in Section 6.1.

8.1 RESPIRATORY PROTECTION

Due to the elevated TCE vapors present in the exclusions zones and short-term exposure concerns to construction workers, NIOSH/MSHA-approved respirators equipped with

combination organic vapor and P-100 HEPA air purifying cartridges are required for workers entering excavations and trenches. In the case of the Lockheed and A.C. Ball Company VOC ground water plume exclusion zones, respiratory protection is required for any excavation that extends approximately 5 feet below existing grades. For the exclusion zone associated with the A.C. Ball Company former solvent UST systems, respiratory protection is needed during grading/trenching activities that extend below an approximate depth of 2 feet. If respirators are no longer desired to be worn by workers entering excavations, sampling or screening for TCE shall be conducted using the methods outlined in Section 8.2.

Please refer to the HSP included in Appendix B for additional details regarding respiratory protection measures.

8.2 AIR MONITORING IN TRENCHES/EXCAVATIONS

8.2.1 Screening Levels

TCE analytical data will be compared to EPA Region 9 indoor air screening levels presented in their July 9, 2014 memorandum titled "*EPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion."* The accelerated and urgent commercial response action levels based on a 8-hour work day are 8 µg/m^3 and 24 µg/m^3, respectively. Ambient air monitoring results will be considered elevated if analytical data exceeds 8 µg/m^3. For other chemicals, commercial ambient air ESLs will be used for comparison. If these action levels are exceeded, response action are required to determine if mitigation and worker protection measures are necessary.

8.2.2 Sampling Approach and Frequency

If air monitoring in trenches and/or excavations is performed, sampling must be completed using at least one of the methods presented below:

- Personal air monitoring using TCE sampling badges (e.g., Radiello 130 or Radiello 145 samplers or equivalent);
- Screening air in the excavation using direct-read (real-time) portable gas chromatography equipment; and/or
- Air sampling using Summa canisters.

Sampling or screening for TCE will be conducted by the Environmental Professional for a minimum period of one full work day during soil-disturbing activities in the exclusion zones. Personal and Summa canister air samples will be analyzed and reported on an approximate 24-hour turnaround time. Screening with portable gas chromatography equipment will be conducted, at a minimum, on an hourly basis. If sampling or screening data collected over a minimum period of one full work day demonstrates that TCE is either (1) not detected above a reporting limit of 5 µg/m^3 in the excavation or (2) is present in the excavation at concentrations less than the EPA's Accelerated Response Action Level (8 µg/m^3), the use of respiratory protection during excavation entry may be discontinued.

Personnel entering the excavation will resume using respiratory protection and the Environmental Professional will resume sampling or screening for TCE, or other COC if

relevant, if any of the following conditions occur:

- The excavation is deepened by more than 1 foot;
- Ground water begins to enter the excavation;
- The excavation is enlarged by 20 feet or greater; or
- Excavation activities commence in a new excavation area within the exclusion zone.

Additionally, if excavation/trenching work continues after discontinuing the use of respirators, the Environmental Professional will perform trench/excavation monitoring using an OVM at a frequency of once per day for one week. Breathing zone air in the trench/excavation will be screened over approximately 1 to 5 minute durations. Breathing zone air will be considered as possibly elevated if 1) the OVM reading is over 500 ppb_v above background for greater than one minute or more, and 2) in the opinion of the Environmental Professional, the source of the vapors is COC originating from the trench/excavation and not from unrelated sources (e.g. construction equipment and materials). Under this scenario, personnel entering the excavation will resume using respiratory protection and the Environmental Professional will resume sampling or screening for TCE.

8.3 RESPONSE ACTIONS

It is anticipated that workers will not be in an area subject to VOC vapors for the entire work day. The goal of the SMP is that no worker will be exposed to TCE vapor in excess of EPA's recommended guidance of 8 $\mu g/m^3$ in a 8-hour period.

If sampling or screening data, with a reporting limit of 5 $\mu g/m^3$ or lower, demonstrates that TCE is present at concentrations greater than 8 $\mu g/m^3$, the use of respiratory protection during all excavation entry will continue. Should the TCE concentrations exceed the urgent response action level (24 $\mu g/m^3$), engineering controls presented in Section 8.4 will be implemented by the General Contractor until at least levels fall below 21 $\mu g/m^3$. At the discretion of the Project CIH, engineering controls may need to remain in-place until concentrations decrease below 8 $\mu g/m^3$.

8.4 MITIGATION OF VAPOR EMISSIONS

There are several methods available, as listed below, by which the levels of vapor emissions can be eliminated or reduced. Some of these can be deployed routinely in advance to avoid events of vapor emissions and reduce potential construction down time.

- Natural Ventilation: Delay work or discontinue work in an area for a sufficient time to allow vapor levels to be reduced to acceptable levels. Bay Area Air Quality Management District regulations must be followed.
- Mechanical Ventilation: Fans can be placed in the area of concern to reduce vapor levels to acceptable levels.
- Application of Water: Application of water will often reduce vapor levels. Water trucks will be on the Site to provide water for dust control and soil conditioning for compaction and can also be used to mitigate vapor emissions.

- Application of Foam: Application of foams can often reduce vapor levels. For example, Rusmar Foam Technologies offers several foams products for different uses and associated application equipment.

- Higher Level PPE: Higher levels of worker protection per the Health and Safety Plan can be implemented, such as Level C or B personal protective equipment per 29CFR 1910.134.

- Soil Source: Assess if the elevated readings may be due to contaminated soil.

8.5 MITIGATION OF VAPOR INTRUSION INTO PLANNED OFFICE BUILDINGS

To effectively eliminate vapor intrusion concerns, the planned occupied spaces for the 100 and 200 Caribbean project will be designed with appropriate engineering features to reduce risk of vapor intrusion into buildings. At a minimum, this design will include passive sub-slab ventilation with a spray applied seamless vapor barrier (and with the ability to convert the system from passive to active ventilation). Vapor mitigation system engineering design drawings and specifications will be incorporated into the building engineering plans that will be provided to the City of Sunnyvale for their review and approval. Additionally, prior to installation, a vapor intrusion Mitigation Plan will be submitted to DEH for review and approval.

SECTION 9: SMP COMPLETION REPORT

The Environmental Professional shall prepare a SMP Completion Report for submittal to the regulatory agency for review and approval. The report will show sampling locations, a description of sampling protocols, and copies of the analytical reports; it will also describe variances to this SMP.

SECTION 10: SMP ROLES AND RESPONSIBILITIES

This section presents the key project team members and their roles and responsibilities as they relate to implementing this SMP. Site contacts are presented in Table 3.

Table 3. Key Site Contacts

Organization	Personnel	Responsibility	Email	Phone
Santa Clara County Department of Environmental Health	Aaron Costa	Project Manager	Aaron.costa@cep.sccgov.org	408-918-1954
Earth Safety Dynamics	Kevin R. Braun, C.I.H.	Project C.I.H.	krbraun1@aol.com	925-455-6601
Devcon Construction (General Contractor)	John Castagnoli	Project Manager	jcastagnoli@rewsprojects.com	408-942-8200
Cornerstone Earth Group	Kurt M. Soenen, P.E.	Environmental Professional	ksoenen@rewsprojects.com	408-245-4600
Engeo	Jeanine Ruffoni	Geotechnical Engineer	jruffoni@rewsprojects.com	408-574-4900

10.1 GENERAL CONTRACTOR

The General Contractor is retained by Google and is responsible for 1) confirming the SMP guidelines are integrated into the HSP, project specifications and construction plans 2) implementing the construction documents; 3) implementing the protocols in this SMP and communicating these requirements to their subcontractors; 4) maintaining a safe work area for the construction workers at the Site; and 4) prior to starting work, seeking clarification from

Google and/or the Environmental Professional should they have questions regarding this SMP or HSP.

10.2 ENVIRONMENTAL PROFESSIONAL

The Environmental Professional will provide guidance and support as needed during subsurface construction, perform real-time monitoring during subsurface construction, collect soil and ground water samples as needed for waste characterization, and observe activities performed by the General Contractor to evaluate conformance with this SMP. The Environmental Professional will be supported by the project certified industrial hygienist as needed during construction. The presence of the Environmental Professional's field personnel is for the purpose of providing observation and monitoring services. The Environmental Professional's work will not include supervision or direction of the work of the General Contractor. The General Contractor is responsible for the health and safety of their own employees. Neither the presence of the Environmental Professional's field representatives nor the observation by the Environmental Professional shall excuse the General Contractor in any way for defects in their work. The Environmental Professional is also not responsible for job or Site safety. Daily field reports documenting site activities will be prepared by the Environmental Professional and made available for review by authorized personnel for the duration of the project.

SECTION 11: LIMITATIONS

Contractors working on-Site are responsible for the health and safety of their employees and subcontractors. This document, an instrument of professional service, was prepared for the sole use of Google and their consultants and contractors, and may not be reproduced or distributed to others without written authorization from Cornerstone. Cornerstone makes no warranty, expressed or implied, except that our services have been performed in accordance with the environmental principles generally accepted at this time and location.

SECTION 12: REFERENCES

Cornerstone Earth Group, 2018a. *Phase II Soil, Soil Vapor, and Ground Water Quality Evaluation, Caribbean Office Campus, 1330-1338, 1340-1346, 1350, 1360-1368 Bordeaux Drive, and 360-364, 370-376, 380-382, and 390-394 West Caribbean Drive, Sunnyvale, California,* dated March 9, 2018.

Cornerstone Earth Group, 2018b. *Phase II Soil, Soil Vapor, and Ground Water Quality Evaluation, Borregas Office Campus, 140-146 West Caribbean Drive, 1325, 1383, and 1393-1395 Borregas Avenue, and 141 Caspian Court, Sunnyvale, California,* dated March 9, 2018.

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Duverge, Dylan Jacques. December 2011. *Establishing Background Arsenic in Soil of the Urbanized San Francisco Bay Region*.

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CORNERSTONE EARTH GROUP

FIGURES

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Vicinity Map

100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

Project Number	678-3-2
Figure Number	Figure 1
Date	February 2018
Drawn By	RRN

370-376 West Caribbean Drive
360-364 West Caribbean Drive
140-146 West Caribbean Drive
380-384 West Caribbean Drive
200 Caribbean
Caribbean Drive
100 Caribbean
390-394 West Caribbean Drive
1393-1395 Borregas Avenue
Sunnyvale West Channel
1383 Borregas Avenue
1330-1370 Bordeaux Drive
Caspian Court
Caspian Drive
141 Caspian Court (former AC Ball Facility)
1325 Borregas Avenue
Approximate Site Boundary
North Mathilda Avenue
Bordeaux Drive
Borregas Avenue
Java Drive
N
0 300 600
APPROXIMATE SCALE (FEET)

Base by Google Earth, dated 4/15/2017

Project Number 678-3-2
Figure Number Figure 2
Drawn By RRN
Date February 2018

Site Plan

100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

CORNERSTONE EARTH GROUP

200 Caribbean

Caribbean Drive

100 Caribbean

North Mathilda Avenue

Sunnyvale West Channel

Borregas Avenue

Bordeaux Drive

Caspian Court

Caspian Drive

Approximate
Site Boundary

N

0 200 400

APPROXIMATE SCALE (FEET)

Base by Google Earth, dated 4/15/2017
Overlay by OLIN, Site Plan - L100.1, dated 4/16/2018

Project Number 678-3-2

Figure Number Figure 3

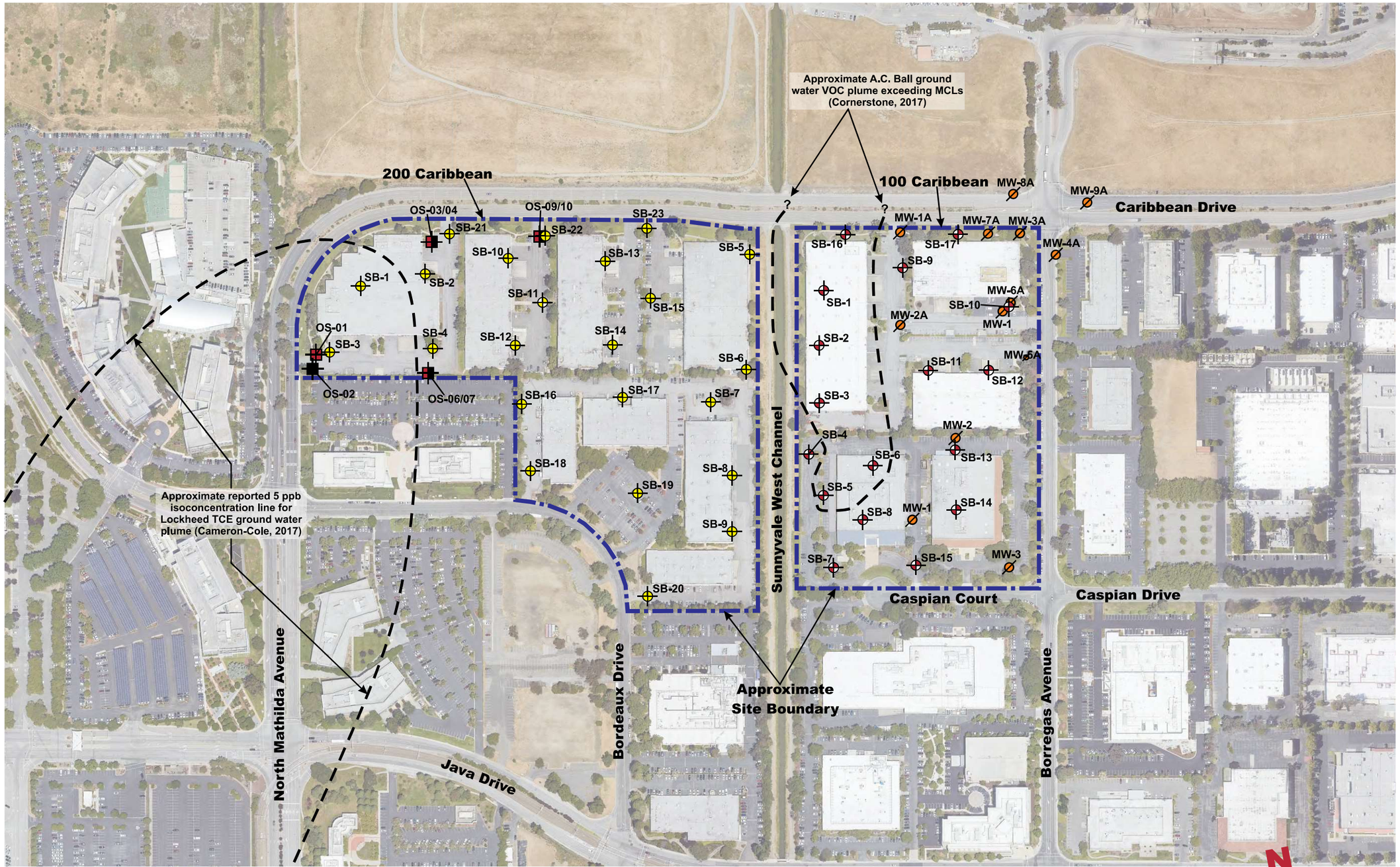
Date March 2018

Drawn By RRN

Conceptual Development Plan

100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

CORNERSTONE EARTH GROUP



Legend

- Approximate location of soil boring and vapor probe at 100 Caribbean (Cornerstone, September 2017)
- Approximate location of soil boring and vapor probe at 200 Caribbean (Cornerstone, June 2017)
- Destroyed monitoring well
- Approximate location of first transmissive zone well (Cameron-Cole, April 2016)
- Approximate location of second transmissive zone well (Cameron-Cole, April 2016)
- Approximate location of first and second transmissive zone wells are in the same approximate area

N

0 300 600

APPROXIMATE SCALE (FEET)

Base by Google Earth, dated 4/15/2017

Project Number 678-3-2

Figure Number Figure 4

Drawn By RRN

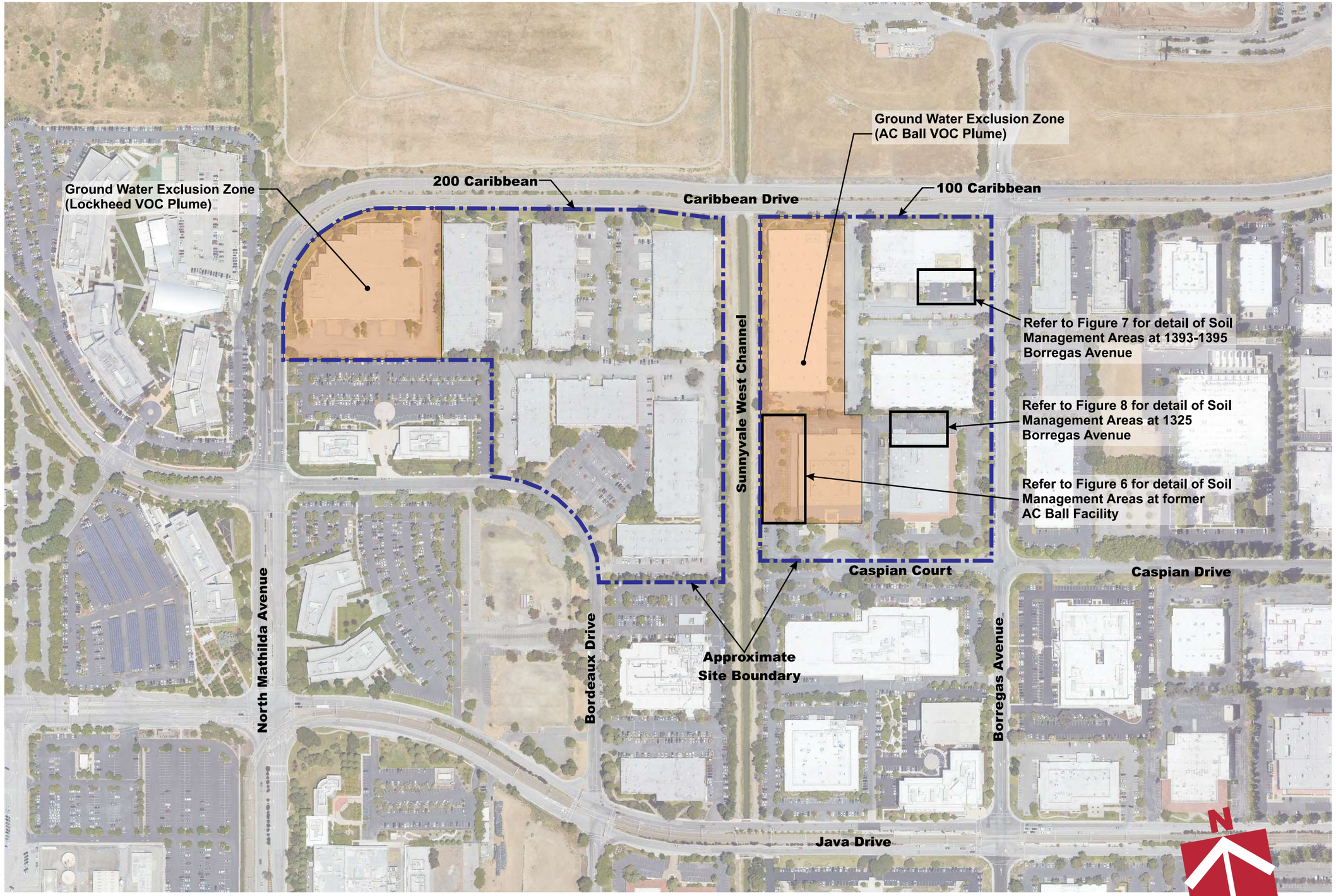
Date March 2018

Boring and Sampling Locations

200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

100 and 200

CORNERSTONE EARTH GROUP



Base by Google Earth, dated 4/15/2017

Project Number 678-3-2

Figure Number Figure 5

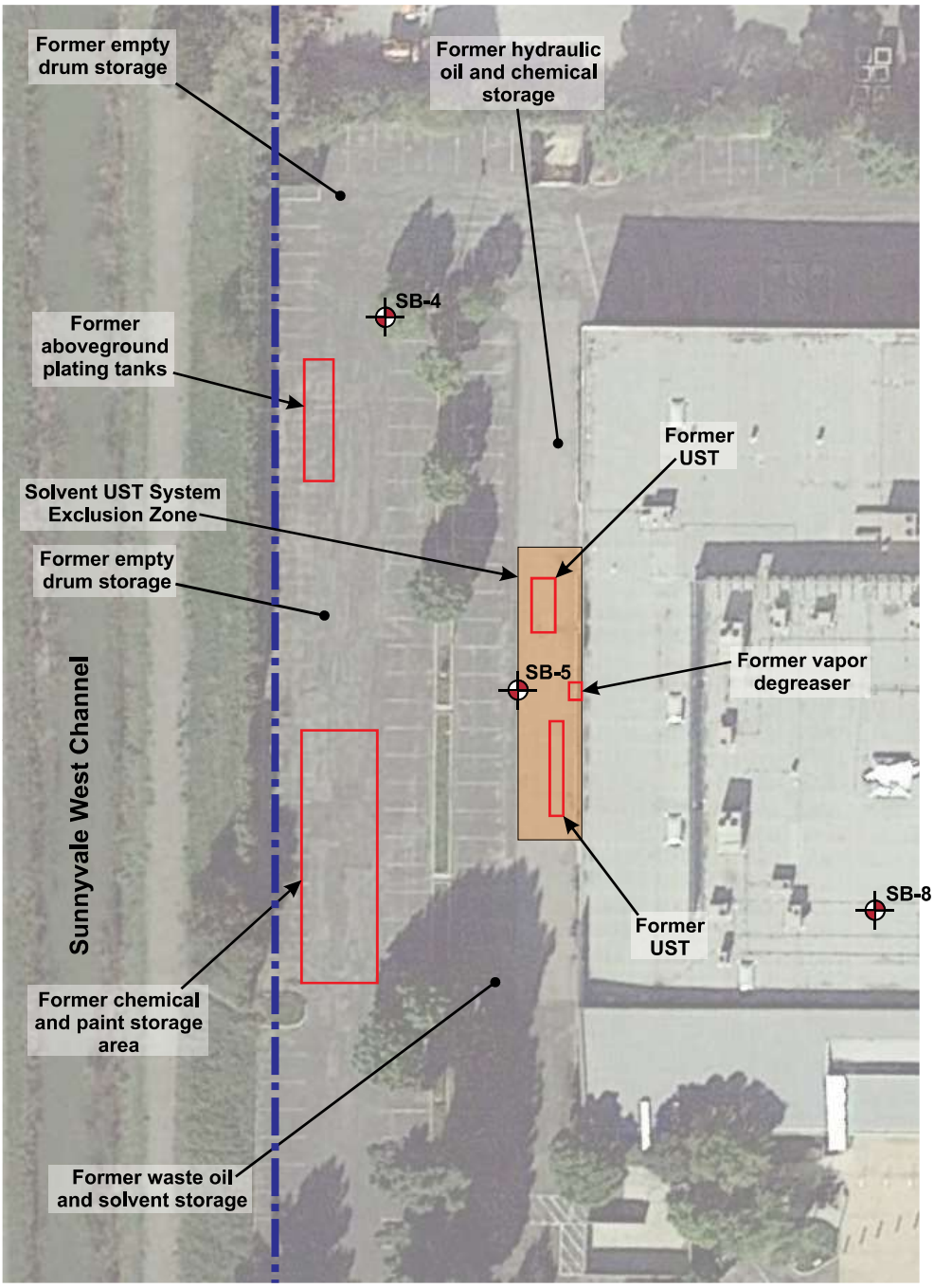
Drawn By RRN

Date March 2018

Site Management Areas

100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

CORNERSTONE EARTH GROUP



Legend

Approximate location of soil boring and vapor probe (Cornerstone, September 2017)

N

0 60 120

APPROXIMATE SCALE (FEET)

Base by Google Earth, dated 11/2/2016

CORNERSTONE EARTH GROUP

Soil Management Area - Former AC Ball Facility

100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

Project Number: 678-3-2

Figure Number: Figure 6

Date: March 2018

Drawn By: RRN

Legend

Approximate location of soil boring and vapor probe (Cornerstone, September 2017)

Destroyed monitoring well

N

0 30 60

APPROXIMATE SCALE (FEET)

Base by Google Earth, dated 11/2/2016

CORNERSTONE EARTH GROUP

Soil Management Area - 1393-1395 Borregas Avenue)

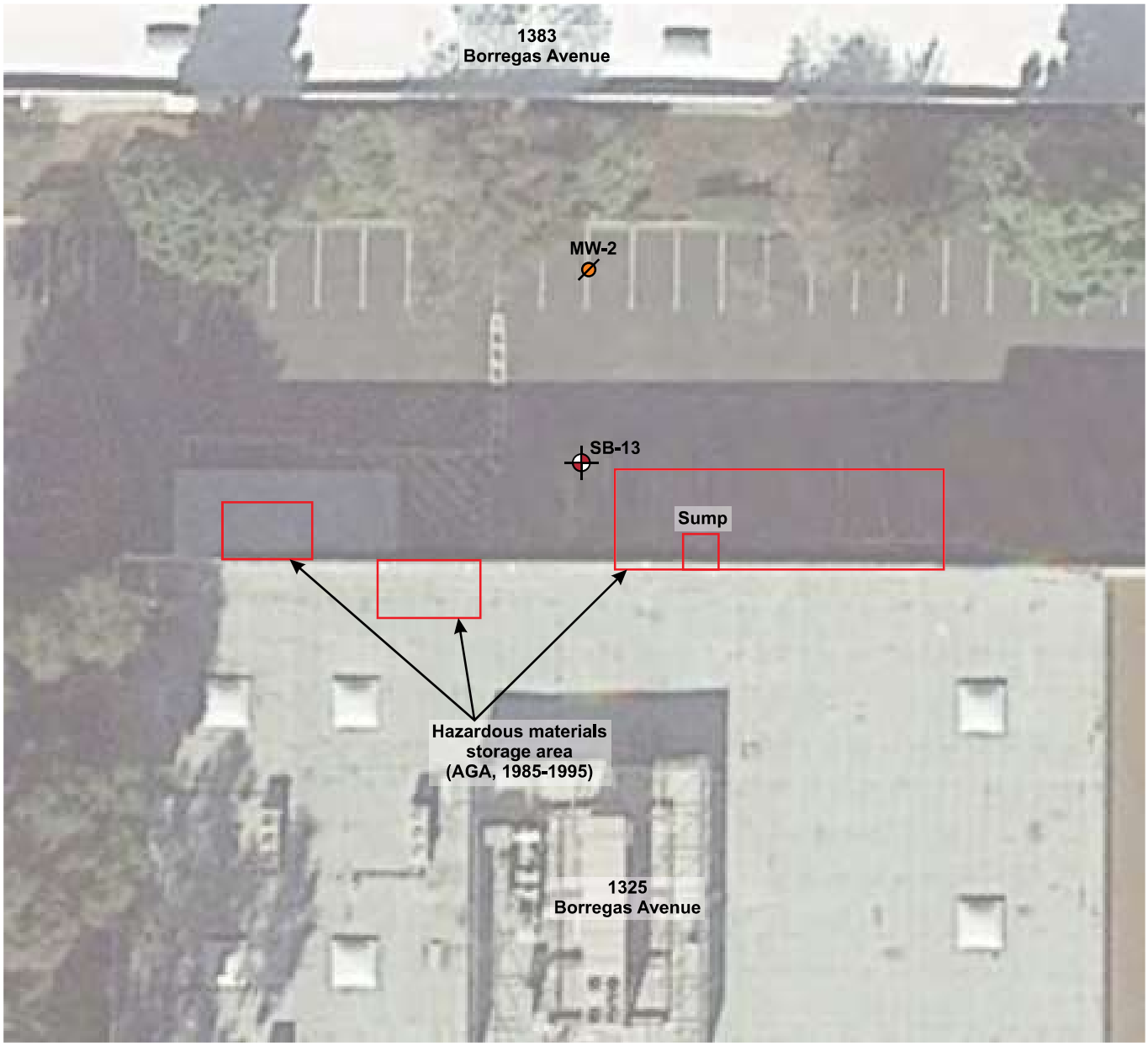
100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

Project Number 678-3-2

Figure Number Figure 7

Date March 2018

Drawn By RRN



Legend

Approximate location of soil boring and vapor probe (Cornerstone, September 2017)

Destroyed monitoring well

N

0 200 400

APPROXIMATE SCALE (FEET)

Base by Google Earth, dated 11/2/2016

CORNERSTONE EARTH GROUP

Soil Management Area - 1325 Borregas Avenue)

100 and 200 Caribbean Campus Project
Caribbean Drive
Sunnyvale, CA

Project Number: 678-3-2

Figure Number: Figure 8

Date: March 2018

Drawn By: RRN

CORNERSTONE EARTH GROUP

APPENDIX A – DATA SUMMARY TABLES FROM PRIOR STUDIES

CORNERSTONE EARTH GROUP

Table 1. Analytical Results of Selected Soil Samples - OCPs, Metals
(Concentrations in mg/kg)

Property	Boring ID	Sample ID	Soil Type	Date	Depth (feet)	4,4´-DDD	4,4´-DDE	4,4´-DDT	DDT Total	alpha-Chlordane	Dieldrin	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Vanadium	Zinc
140-146 West Caribbean Drive	SB-1	SB-1 (16.5-17)	Vadose Zone	9/19/2017	16.5-17	---	---	---	---	---	---	2.2	4	82	<0.28	<0.35	72	11	31	5.1	0.072	<1.4	91	49	50
	SB-2	SB-2 (4-4.5)	Native	9/19/2017	4-4.5	0.036	0.19	<0.002	0.226	<0.002	0.0066	---	3.8	---	---	---	---	---	---	7.7	0.04	---	---	---	---
		SB-2 (15-15.5)	Vadose Zone	9/19/2017	15-15.5	---	---	---	---	---	---	2.6	4	85	<0.38	<0.47	62	13	31	4.2	0.076	<1.9	72	61	55
	SB-3	SB-3 (3.5-4)	Native	9/19/2017	3.5-4	0.02	0.19	0.0024	0.2124	<0.002	0.0054	---	4.5	---	---	---	---	---	---	9.2	0.51	---	---	---	---
	SB-16A	SB-16A (3-3.5)	Fill and/or Reworked Native	9/22/2017	3-3.5	0.11	0.4	<0.0099	0.51	<0.0099	0.018	---	5.8	---	---	---	---	---	---	11	0.044	---	---	---	---
141 Caspian Court	SB-4	SB-4 (1-1.5)	Fill and/or Reworked Native	9/20/2017	1-1.5	---	---	---	---	---	---	2.4	3.7	170	0.39	<0.40	65	13	33	8	0.075	<1.6	82	44	53
		SB-4 (2.5-3)	Native	9/20/2017	2.5-3	0.0097	0.1	0.016	0.1257	<0.002	0.0063	---	6.4	---	---	---	---	---	---	10	0.041	---	---	---	---
	SB-5	SB-5 (2.5-3)	Fill and/or Reworked Native	9/20/2017	2.5-3	0.0052	0.15	0.04	0.1952	<0.0019	0.0057	---	5.3	---	---	---	---	---	---	9	0.044	---	---	---	---
	SB-6	SB-6 (1.5-2)	Fill and/or Reworked Native	9/20/2017	1.5-2	<0.002	0.0053	<0.002	0.0053	<0.002	<0.002	<1.6	7.5	110	0.55	1.8	15	5.4	17	6.6	0.029	3.7	30	19	72
	SB-7	SB-7 (3-3.5)	Fill and/or Reworked Native	9/19/2017	3-3.5	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<1.3	<2.7	240	<0.27	<0.34	44	8.9	25	8.5	0.1	<1.3	46	41	52
		SB-7 (5-5.5)	Native	9/19/2017	5-5.5	---	---	---	---	---	---	1.4	2.2	95	0.32	<0.26	43	8.3	22	4.3	0.053	<1.0	46	42	39
	SB-8	SB-8 (3-3.5)	Fill and/or Reworked Native	9/20/2017	3-3.5	0.0049	0.17	0.058	0.2329	<0.002	0.005	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1393-1395 Borregas Avenue	SB-9	SB-9 (2-2.5)	Fill and/or Reworked Native	9/18/2017	2-2.5	<0.002	0.01	<0.002	0.01	<0.002	<0.002	<1.4	5	170	0.37	<0.35	52	11	27	6.5	0.088	<1.4	67	42	47
		SB-9 (4-4.5)	Native	9/18/2017	4-4.5	0.011	0.1	0.005	0.116	0.0021	0.0026	---	5.1	---	---	---	---	---	---	8.5	0.044	---	---	---	---
	SB-10	SB-10 (4.5-5)	Native	9/18/2017	4.5-5	0.018	0.21	0.006	0.234	<0.002	<0.002	---	3.4	---	---	---	---	---	---	9.1	0.041	---	---	---	---
	SB-17	SB-17 (3.5-4)	Native	9/18/2017	3.5-4	0.076	0.045	0.0061	0.1271	<0.002	<0.002	---	3.6	---	---	---	---	---	---	13	0.032	---	---	---	---
1383 Borregas Avenue	SB-11	SB-11 (1-1.5)	Fill and/or Reworked Native	9/18/2017	1-1.5	<0.002	0.011	<0.002	0.011	<0.002	<0.002	<1.4	6.1	170	<0.29	<0.36	65	14	34	13	0.11	<1.4	89	52	52
	SB-12	SB-12 (1-1.5)	Fill and/or Reworked Native	9/18/2017	1-1.5	0.02	0.14	0.0042	0.1642	<0.002	<0.002	---	5.4	---	---	---	---	---	---	11	0.054	---	---	---	---
1325 Borregas Avenue	SB-13	SB-13 (1.5-2)	Fill and/or Reworked Native	9/19/2017	1.5-2	0.0023	0.035	<0.002	0.0373	<0.002	<0.002	---	<3.2	---	---	---	---	---	---	7.8	0.043	---	---	---	---
	SB-14	SB-14 (1-1.5)	Fill and/or Reworked Native	9/20/2017	1-1.5	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<1.4	8.3	140	0.5	**2.3**	31	4.8	17	6.9	0.024	5	38	22	80
	SB-15	SB-15 (1.5-2)	Fill and/or Reworked Native	9/19/2017	1.5-2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	---	5.2	---	---	---	---	---	---	6.9	0.053	---	---	---	---
Environmental Screening Criteria						2.7	1.8	1.9	1	0.48	0.037	11	11	390	5	1.9 (78)	170	23	180	54	13	6.9	145	390	340
Screening Level Basis						ESL[1]	ESL[2]	ESL[2]	TTLC[3]	ESL[4]	ESL[2]	ESL[1]	Duverge[5]	ESL[1]	ESL[1]	ESL[1,2]	Scott[6]	ESL[1]	ESL[1]	Scott[6]	ESL[1]	ESL[1]	Scott[6]	ESL[2]	ESL[1]

1 Tier 1 Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019. Value in parenthesis is the residential direct exposure human health risk ESL.
2 Residential direct exposure human health risk ESL - January 2019.
3 Total Threshold Limit Concentration - California Code of Regulations, Title 22.
4 ESLs for alpha-chlordane are not established; value is residential direct exposure human health risk ESL for chlordane.
5 Duverge, 2011. Establishing Backround Arsenic in Soil of the Urbanized San Francisco Bay Region.
6 Scott, Christina. December 1991. Background Metal Concentrations in Soils in Northern Santa Clara County. Value is maximum background detection by Scott.
< Not detected at or above laboratory reporting limit
--- Not Analyzed
BOLD Concentration exceeds selected environmental screening criteria

Table 2. Analytical Results of Selected Soil Samples - VOCs, TPHs
(Concentrations in mg/kg)

Property	Boring ID	Sample ID	Soil Type	Date	Depth (feet)	1,1 - DCE	Acetone	n-Butylbenzene	n-Propylbenzene	sec-Butylbenzene	Styrene	tert-Butylbenzene	TPHg	TPHd	TPHo
140-146 West Caribbean Drive	SB-1	SB-1 (16.5-17)	Native	9/19/2017	16.5-17	0.0049	<0.041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	---	---	---
	SB-2	SB-2 (15-15.5)	Native	9/19/2017	15-15.5	0.0086	<0.063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.31	---	---
	SB-16A	SB-16A (3-3.5)	Fill and/or Reworked Native	9/22/2017	3-3.5	<0.0054	<0.054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.27	---	---
	SB-16	SB-16 (2-2.5)	Fill and/or Reworked Native	9/18/2017	2-2.5	<0.0048	0.21	<0.0048	<0.0048	<0.0048	0.0062	<0.0048	<0.24	---	---
141 Caspian Court	SB-4	SB-4 (12.5-13)	Native	9/20/2017	12.5-13	<0.0044	<0.044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	---	---	---
	SB-5	SB-5 (13.5-14)	Native	9/20/2017	13.5-14	<0.0042	<0.042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	---	---	---
	SB-6	SB-6 (1.5-2)	Fill and/or Reworked Native	9/20/2017	1.5-2	---	---	---	---	---	---	---	---	55	130
	SB-7	SB-7 (3-3.5)	Fill and/or Reworked Native	9/19/2017	3-3.5	---	---	---	---	---	---	---	---	4.2	<50
		SB-7 (5-5.5)	Native	9/19/2017	5-5.5	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	---	---	---
	SB-8	SB-8 (6.5-7)	Native	9/20/2017	6.5-7	<0.0046	<0.046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	---	---	---
1393-1395 Borregas Avenue	SB-9	SB-9 (2-2.5)	Fill and/or Reworked Native	9/18/2017	2-2.5	---	---	---	---	---	---	---	---	14	79
		SB-9 (7-7.5)	Native	9/18/2017	7-7.5	<0.0042	0.28	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.21	---	---
	SB-10	SB-10 (9-9.5)	Native	9/18/2017	9-9.5	<0.0045	0.078	0.078	0.02	0.034	<0.0045	0.005	61	---	---
		SB-10 (12.5-13)	Native	9/18/2017	12.5-13	<0.0049	0.057	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.25	3.5	<50
1383 Borregas Avenue	SB-11	SB-11 (1-1.5)	Fill and/or Reworked Native	9/18/2017	1-1.5	---	---	---	---	---	---	---	---	24	<50
		SB-11 (12.5-13)	Native	9/18/2017	12.5-13	<0.0041	0.22	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	0.35	---	---
1325 Borregas Avenue	SB-14	SB-14 (1-1.5)	Fill and/or Reworked Native	9/20/2017	1-1.5	---	---	---	---	---	---	---	---	5.7	<50
Environmental Screening Criteria						0.54	0.92	3,900	3,800	2,200	0.92	2,200	100	260	1,600
Screening Level Basis						ESL[1]	ESL[1]	DTSC-SL[2]	RSL[3]	DTSC-SL[2]	ESL[1]	DTSC-SL[2]	ESL[1]	ESL[1]	ESL[1]

1 Tier 1 Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019.
2 Department of Toxic Substance Control Recommended Screening Level (DTSC-SL), HERO Note 3 - June 2018.
3 Regional Screening Level (RSL), USEPA Region 9 - November 2018.
< Not detected at or above laboratory reporting limit
--- Not Analyzed

Table 3. Analytical Results of Selected Ground Water Samples - VOCs, TPHg
(Concentrations in µg/L)

Property	Boring ID	Sample ID	Date	Screen Depth (feet)	Benzene	1,4-Dioxane	Acetone	Freon 113	PCE	TCE	cis-1,2-DCE	1,1 - DCE	1,1-DCA	1,2-DCA	Vinyl Chloride	1,1,1-TCA	TPHg
140-146 West Caribbean Drive	SB-1	SB-1 (15-20)	9/19/2017	15-20	<0.50	**6.2**	<50	2.4	1.4	**17**	**6.4**	**76**	**12**	<0.50	**0.65**	2.7	81
	SB-2	SB-2 (15-20)	9/19/2017	15-20	<0.50	**9**	<50	4.1	1.8	**17**	**7.1**	**150**	**13**	**0.91**	**0.66**	3	130
	SB-3	SB-3 (15-20)	9/19/2017	15-20	<0.50	**5.8**	<50	3.9	2.8	**20**	**7.7**	**140**	**26**	**0.63**	**0.59**	2.1	130
	SB-16	SB-16 (15-20)	9/18/2017	15-20	<0.50	---	54	0.87	<0.50	**9.4**	4.2	**31**	**15**	<0.50	<0.50	1.5	<50
141 Caspian Court	SB-4	SB-4 (15-20)	9/20/2017	15-20	<0.50	<2.0	<50	<0.50	2.8	2	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<50
	SB-5	SB-5 (15-20)	9/21/2017	15-20	<0.50	<2.0	<50	<0.50	2.7	3	1.2	1.5	<0.50	<0.50	**1.2**	<0.50	<50
	SB-6	SB-6 (15-20)	9/22/2017	15-20	<0.50	<2.0	<50	<0.50	**5.8**	3.2	<0.50	1.5	<0.50	<0.50	<0.50	<0.50	<50
	SB-7	SB-7 (15-20)	9/19/2017	15-20	<0.50	<2.0	<50	<0.50	3.1	0.82	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<50
	SB-8	SB-8 (15-20)	9/19/2017	15-20	<0.50	<2.0	<50	<0.50	4.8	2.1	<0.50	0.8	<0.50	<0.50	<0.50	<0.50	<50
1393-1395 Borregas Avenue	SB-9	SB-9 (15-20)	9/18/2017	15-20	<0.50	---	69	<0.50	1.5	1.3	<0.50	1	<0.50	<0.50	<0.50	<0.50	<50
	SB-10	SB-10 (15-20)	9/18/2017	15-20	0.74	---	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	66
	SB-17	SB-17 (15-20)	9/18/2017	15-20	<0.50	---	67	<0.50	1.5	<0.50	<0.50	1.2	<0.50	<0.50	<0.50	<0.50	<50
1383 Borregas Avenue	SB-11	SB-11 (15-20)	9/18/2017	15-20	0.53	---	<50	<0.50	1.2	0.59	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<50
	SB-12	SB-12 (15-20)	9/18/2017	15-20	<0.50	---	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<50
1325 Borregas Avenue	SB-13	SB-13 (15-20)	9/19/2017	15-20	<0.50	---	<50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	<0.50	<0.50	<50
	SB-14	SB-14 (15-20)	9/20/2017	15-20	<0.50	---	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<50
	SB-15	SB-15 (15-20)	9/19/2017	15-20	<0.50	---	<50	<0.50	3	3.8	<0.50	0.88	<0.50	<0.50	<0.50	<0.50	<50
Environmental Screening Criteria					1	0.38	1,500	1,200	5	5	6	6	5	0.5	0.5	200	760
Screening Level Basis					MCL[1]	ESL[2]	ESL[2]	MCL[1]	MCL[1]	MCL[1]	MCL[1]	MCL[1]	MCL[1]	MCL[1]	MCL[1]	MCL[1]	ESL[3]

1 Maximum Contaminant Level (MCL), State Water Resources Control Board - October 2018.
2 MCL not established. Value is Tier I Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019.
3 MCL not established. Value is residential direct exposure human health risk ESL, RWQCB, San Francisco Bay Region - January 2019.
< Not detected at or above laboratory reporting limit
--- Not Analyzed
Bold Concentration exceeds selected environmental screening criteria.

CORNERSTONE EARTH GROUP

Table 4. Analytical Results of Selected Soil Vapor Samples
(Concentrations in µg/m³)

Property	Boring ID	Date	Probe Depth (feet)	Benzene	Toluene	Ethylbenzene	1,1 - DCE	1,1,1-TCA	1,1-DCA	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	4-Ethyl Toluene	4-Methyl-2-Pentanone (MIBK)	Acetone	Carbon Disulfide	Chloroform	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Freon 113	Heptane	Hexane	Isopropanol	o-xylene	PCE	Styrene	TCE	Tetrahydrofuran	trans-1,2-DCE	Trichlorofluoromethane	Vinyl Chloride
140-146 West Caribbean Drive	SV-1	9/21/2017	6.5	<4.4	<5.9	<13	**22,000**	<12	**300**	<13	<14	<12	<7.2	<42	<17	<15	**1,900**	<8.2	<13	<16	<14	<11	<23	<12	<20	<3.0	**990**	<6.6	160	<12	**1,700**
	SV-2	9/21/2017	6	<3.2	<4.3	<9.3	**12,000**	330	170	100	<10	62	<5.3	<30	<13	<11	58	<6.0	<9.8	1,200	<10	<8.2	<17	<8.9	**530**	<2.2	**2,800**	<4.8	<15	<9.0	<9.0
	SV-16	9/21/2017	5.5	<0.33	14	<0.96	<1.2	<0.91	<0.73	7.5	<1.0	<0.90	<0.55	<3.2	<1.3	<1.1	<1.5	<0.62	<1.0	<1.2	<1.0	<0.85	<1.7	6.2	<1.5	16	<0.52	<0.50	<1.6	<0.94	<0.94
	SV-3	9/21/2017	5.5	<5.2	<5.3	<9.2	**34,000**	<7.1	150	<4.8	<4.2	<4.3	<5.5	<14	<18	<9.0	**3,300**	<7.8	<8.1	630	<6.3	<8.8	<13	<9.0	**570**	<3.9	**1,900**	<4.1	100	<6.4	**420**
141 Caspian Court	SV-4	9/25/2017	5.5	6.9	<0.47	<1.0	130	50	42	30	11	14	<0.57	<3.3	<1.4	<1.2	87	5.2	26	140	<1.1	<0.89	<1.8	<0.97	**810**	<0.24	**580**	<0.53	9.9	<0.98	**36**
	SV-5	9/25/2017	5.5	<0.36	<0.48	<1.0	<1.3	1,000	<0.79	35	15	10	<0.58	<3.4	<1.4	<1.2	<1.6	<0.67	7.7	130	<1.1	<0.91	<1.8	<0.99	**1,200**	<0.25	**150**	<0.54	<1.7	<1.0	<1.0
	SV-6	9/25/2017	6	<0.33	8.5	<0.96	23	93	<0.73	30	16	13	<0.54	<3.2	<1.3	<1.1	<1.5	<0.62	<1.0	300	<1.0	<0.85	<1.7	5.3	**2,900**	<0.23	**120**	<0.50	<1.6	20	<0.93
	SV-7	9/25/2017	5	<0.33	<0.44	<0.96	<1.2	21	<0.73	12	<1.0	<0.89	<0.54	<3.1	<1.3	<1.1	<1.5	<0.62	8.1	140	<1.0	<0.84	<1.7	<0.92	**1,300**	<0.23	**65**	<0.50	<1.6	<0.93	<0.93
	SV-8	9/25/2017	5	<0.33	<0.44	<0.96	13	930	<0.73	<0.98	<1.0	<0.90	<0.54	<3.2	<1.3	<1.1	<1.5	<0.62	<1.0	560	<1.0	<0.85	<1.7	<0.92	**2,000**	<0.23	**120**	<0.50	<1.6	31	<0.93
1393-1395 Brregas Avenue	SV-9	9/21/2017	5.5	<0.33	16	<0.96	<1.2	13	<0.73	6.1	<1.0	6.5	<0.54	<3.2	<1.3	<1.1	<1.5	<0.62	<1.0	57	<1.0	<0.85	<1.7	5.9	**480**	<0.23	**17**	<0.50	<1.6	<0.94	<0.93
	SV-10	9/21/2017	6.5	<0.33	<0.44	<0.96	<1.2	<0.90	<0.73	<0.98	<1.0	<0.89	5.1	<3.1	<1.3	29	<1.5	<0.62	<1.0	<1.2	<1.0	<0.84	<1.7	<0.92	<1.5	<0.23	<0.51	18	<1.6	<0.93	<0.93
	SV-17	9/21/2017	5.5	10	34	<0.96	33	<0.91	9.1	6.5	<1.0	5.9	<0.55	37	30	<1.1	24	25	<1.0	34	80	99	<1.7	6.1	9.8	<0.23	11	<0.50	<1.6	<0.94	**7.7**
1383 Borregas Avenue	SV-11	9/21/2017	4.5	5.5	38	11	28	48	<0.76	19	7.9	18	<0.57	32	<1.4	<1.2	<1.5	<0.65	<1.0	240	5.1	<0.88	<1.8	13	**1,000**	<0.24	**30**	<0.52	<1.7	20	<0.97
	SV-12	9/21/2017	5	<0.35	7.9	<1.0	5	39	<0.77	<1.0	<1.1	<0.95	<0.58	34	<1.4	<1.2	<1.6	<0.66	<1.1	63	<1.1	<0.90	<1.8	<0.97	**16**	<0.24	<0.54	<0.53	<1.7	22	<0.99
1325 Borregas Avenue	SV-13	9/25/2017	5	<0.34	<0.46	<0.98	<1.2	50	<0.75	41	18	12	<0.56	<3.2	<1.4	<1.1	<1.5	<0.64	<1.0	200	<1.1	<0.87	<1.8	<0.94	**380**	<0.24	<0.53	<0.51	<1.6	33	<0.96
	SV-14	9/25/2017	5.5	<0.33	<0.44	<0.95	<1.2	9.6	<0.72	<0.97	<1.0	<0.88	<0.54	<3.1	<1.3	<1.1	<1.5	<0.61	<1.0	11	<1.0	<0.84	<1.7	<0.91	**33**	<0.23	<0.51	<0.50	<1.6	<0.92	<0.92
	SV-15	9/25/2017	5	<0.34	<0.45	<0.98	<1.2	39	<0.75	20	14	9.6	<0.56	<3.2	<1.3	<1.1	<1.5	<0.63	<1.0	34	<1.1	<0.86	<1.8	<0.94	**1,300**	<0.24	**62**	<0.51	<1.6	7.1	<0.95
Commercial ESL[1]				14	44,000	160	10,000	150,000	260	NE	NE	NE	440,000	4,500,000	NE	18	1,200	NE	NE	NE	NE	NE	NE	15,000	67	130,000	100	NE	12,000	NE	5.2

1 Commercial Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019.
< Not detected at or above laboratory reporting limit
NE Not Established
BOLD Concentration exceeds selected environmental screening criteria

CORNERSTONE EARTH GROUP

Table 1. Analytical Results of Selected Soil Samples - OCPs, Petroleum Hydrocarbons, Metals
(Concentrations in mg/kg)

Property	Boring ID	Sample ID	Soil Type	Date	Depth (feet)	4,4´-DDD	4,4´-DDE	4,4´-DDT	DDT Total	Dieldrin	TPHd	TPHo	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Vanadium	Zinc
390-394 West Caribbean Drive	SB-4	SB-4 (1-1.5)	Fill and/or Reworked Native	4/26/2017	1-1½	0.018	0.28	<0.002	0.298	<0.002	22	53	5.4	250	0.53	<0.30	85	19	51	24	0.09	<1.2	100	65	74
360-364 West Caribbean Drive	SB-5	SB-5 (5-5.5)	Native	4/25/2017	5-5½	<0.002	<0.002	<0.002	<0.002	<0.002	---	---	5.5	---	---	---	---	---	---	7.5	0.079	---	---	---	---
	SB-23	SB-23 (2-2.5)	Fill and/or Reworked Native	4/25/2017	2-2½	0.0056	0.056	<0.0019	0.0616	<0.0019	74	240	8	**490**	0.83	1.7	63	13	37	12	0.097	4.2	73	64	94
		SB-23 (4-4.5)	Native	4/25/2017	4-4½	0.02	0.12	<0.002	0.14	<0.002	---	---	4.3	---	---	---	---	---	---	14	<0.0088	---	---	---	---
1330-1370 Bordeaux Drive	SB-7	SB-7 (1-1.5)	Native	4/24/2017	1-1½	0.031	0.25	<0.002	0.281	0.0041	---	---	3.8	---	---	---	---	---	---	10	0.15	---	---	---	---
	SB-8	SB-8 (1-1.5)	Fill and/or Reworked Native	4/24/2017	1-1½	0.012	0.11	<0.0019	0.122	<0.0019	4.7	<49	3.8	240	0.63	<0.32	72	14	39	11	0.084	<1.3	67	56	61
	SB-9	SB-9 (1-1.5)	Native	4/24/2017	1-1½	0.025	0.65	0.076	0.751	<0.0099	---	---	4	---	---	---	---	---	---	11	0.1	---	---	---	---
	SB-17	SB-17 (1-1.5)	Fill and/or Reworked Native	4/24/2017	1-1½	<0.002	<0.002	<0.002	<0.002	<0.002	2.7	<50	4.7	270	0.63	<0.38	71	14	38	10	0.12	<1.5	62	62	55
	SB-18	SB-18 (3-3.5)	Native	4/24/2017	3-3½	0.044	0.23	<0.002	0.274	0.0036	---	---	2.6	---	---	---	---	---	---	9	0.22	---	---	---	---
	SB-19	SB-19 (1-1.5)	Native	4/25/2017	1-1½	0.024	0.31	<0.002	0.334	0.0037	---	---	3.5	---	---	---	---	---	---	11	<0.010	---	---	---	---
	SB-20	SB-20 (1-1.5)	Fill and/or Reworked Native	4/25/2017	1-1½	0.013	0.13	<0.002	0.143	<0.002	4.9	<50	2.6	150	0.49	<0.28	52	9.9	28	6	0.074	<1.1	47	40	46
370-376 West Caribbean Drive	SB-13	SB-13 (4-4.5)	Native	4/25/2017	4-4½	<0.002	<0.002	<0.002	<0.002	<0.002	---	---	3	---	---	---	---	---	---	7.1	0.047	---	---	---	---
Environmental Screening Level						2.7	1.8	1.9	1	0.037	260	1,600	11	390 (15,000)	5	1.9	170	23	180	54	13	6.9	145	390	340
Screening Level Basis						ESL[1]	ESL[2]	ESL[2]	TTLC[3]	ESL[2]	ESL[1]	ESL[1]	Duverge[4]	ESL[1,2]	ESL[1]	ESL[1]	Scott[5]	ESL[1]	ESL[1]	Scott[5]	ESL[1]	ESL[1]	Scott[5]	ESL [2]	ESL [1]

1 Tier 1 Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019. Value in parenthesis is the residential direct exposure human health risk ESL.
2 Residential direct exposure human health risk ESL - January 2019.
3 Total Threshold Limit Concentration - California Code of Regulations, Title 22.
4 Duverge, 2011. Establishing Backround Arsenic in Soil of the Urbanized San Francisco Bay Region.
5 Scott, Christina. December 1991. Background Metal Concentrations in Soils in Northern Santa Clara County. Value is maximum background detection reported by Scott.
< Not detected at or above laboratory reporting limit
--- Not Analyzed
BOLD Concentration exceeds environmental screening criteria.

Table 2. Analytical Results of Selected Ground Water Samples - VOCs, TPHg
(Concentrations in µg/L)

Property	Boring ID	Sample ID	Date	Screen Depth (feet)	PCE	TCE	cis-1,2-DCE	1,1 - DCE	4-Isopropyltoluene	Freon 113	TPHg
390-394 West Caribbean Drive	SB-1	SB-1 (10-15)	4/26/2017	10-15	<0.50	**7.9**	0.63	<0.50	<1.0	<0.50	<50
	SB-2	SB-2 (10-15)	4/26/2017	10-15	<0.50	1.6	<0.50	<0.50	<1.0	<0.50	<50
360-364 West Caribbean Drive	SB-5	SB-5 (10-15)	4/26/2017	10-15	<0.50	1.9	<0.50	1.9	<1.0	<0.50	<50
	SB-6	SB-6 (10-15)	4/24/2017	10-15	<0.50	1.4	<0.50	1.1	4.3	<0.50	<50
	SB-15	SB-15 (10-15)	4/25/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-23	SB-23 (10-15)	4/25/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
1330-1370 Bordeaux Drive	SB-7	SB-7 (10-15)	4/24/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-8	SB-8 (10-15)	4/24/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	0.58	<50
	SB-9	SB-9 (10-15)	4/25/2017	10-15	0.7	<0.50	<0.50	<0.50	<1.0	0.52	<50
	SB-16	SB-16 (10-15)	4/24/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-17	SB-17 (10-15)	4/24/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-18	SB-18 (10-15)	4/24/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-19	SB-19 (10-15)	4/25/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-20	SB-20 (10-15)	4/25/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
380-384 West Caribbean Drive	SB-10	SB-10 (10-15)	4/26/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-11	SB-11 (10-15)	4/26/2017	10-15	<0.50	0.94	<0.50	<0.50	<1.0	<0.50	<50
	SB-12	SB-12 (10-15)	4/26/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
370-376 West Caribbean Drive	SB-13	SB-13 (10-15)	4/25/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
	SB-14	SB-14 (10-15)	4/25/2017	10-15	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<50
Environmental Screening Level					5	5	6	6	NE	1,200	760
Screening Level Basis					MCL[1]	MCL[1]	MCL[1]	MCL[1]	NE	MCL[1]	ESL[2]

1 Maximum Contaminant Level (MCL), State Water Resources Control Board - October 2018.
2 MCL not established. Value is residential direct exposure human health risk Environmental Screening Level (ESL). RWQCB, San Francisco Bay Region - January 2019.
< Not detected at or above laboratory reporting limit
BOLD Concentration exceeds MCL
NE Not Established

CORNERSTONE EARTH GROUP

Table 3. Analytical Results of Selected Soil Vapor Samples - VOCs, Fixed Gases
(Concentrations in µg/m³, unless stated otherwise)

Property	Boring ID	Date	Probe Depth (feet)	Benzene	Toluene	1,1 - DCE	1,1,1-TCA	2,2,4-Trimethylpentane	2-Butanone (MEK)	4-Methyl-2-Pentanone (MIBK)	Acetone	Carbon Disulfide	cis-1,2-DCE	Chloroform	Cyclohexane	Freon 12	Freon 113	Heptane	Hexane	Isopropanol	m,p-Xylene	PCE	TCE	Tetrahydrofuran	trans-1,2-DCE	Trichlorofluoromethane	Vinyl Chloride	Ethanol	Oxygen (%)	Carbon Dioxide (%)	Methane (%)
390-394 West Caribbean Drive	SV-1	5/1/2017	5.5	**15**	<1.0	100	<2.2	<0.98	<3.8	<2.5	<4.8	<1.7	490	<11	<1.4	<11	77	<1.8	12	<1.6	<10	**92**	**2,700**	<1.4	83	<2.4	**27**	<2.4	---	---	---
	SV-2	5/1/2017	4.5	10	6.9	<1.0	<1.1	14	<1.9	<1.3	53	<0.85	<1.4	<5.7	<0.71	<5.8	16	14	9.5	<0.83	<5.0	<1.1	**160**	<0.71	<1.7	<1.2	<0.27	14	---	---	---
	SV-3	5/1/2017	5	13	<0.55	120	<1.1	<0.51	<2.0	<1.3	<2.5	<0.88	**1,500**	<5.9	<0.73	<6.0	260	<0.95	<0.28	<0.86	6.1	**250**	**1,700**	<0.74	120	<1.2	**160**	<1.2	---	---	---
	SV-4	5/1/2017	5	7.6	<0.59	<1.1	<1.2	<0.54	<2.1	<1.4	<2.7	<0.93	110	<6.2	<0.78	<6.3	<2.1	<1.0	<0.30	<0.92	<5.6	<1.2	100	<0.78	<1.9	<1.3	5.1	24	---	---	---
	SV-21	5/1/2017	6	**19**	12	<1.1	<1.2	<0.53	38	6.6	99	18	160	<6.1	<0.76	<6.2	<2.0	39	16	<0.89	11	<1.2	36	13	5.9	<1.3	**17**	<1.3	1.1	16	0.4
360-364 West Caribbean Drive	SV-5	4/28/2017	5	7.1	<0.49	16	<0.99	<0.79	<3.3	<0.60	<3.5	<1.4	<1.6	<6.4	<0.68	<6.5	<1.4	<1.1	<0.93	<1.9	<5.7	<1.7	<0.56	<0.55	<1.8	<1.0	**9.6**	<3.2	---	---	---
	SV-6	5/1/2017	5	<0.35	<0.55	<1.0	<1.1	<0.51	<2.0	<1.3	<2.5	<0.88	<1.4	<5.8	<0.73	<5.9	<2.0	<0.94	<0.28	<0.86	<5.2	13	<1.5	<0.73	<1.8	<1.2	<0.28	<1.2	---	---	---
	SV-15	4/28/2017	5	6.2	8.9	<1.2	<0.90	<0.72	<3.0	<0.54	<3.1	19	<1.5	<5.8	<0.62	<5.9	12	18	<0.84	<1.7	<5.2	<1.5	<0.51	<0.50	<1.6	11	<0.93	<2.9	---	---	---
	SV-23	4/28/2017	5	7.9	8.8	<1.1	<1.2	12	29	<1.4	110	31	<1.5	<6.0	<0.75	<6.1	<2.0	100	8.7	<0.88	<5.4	<1.2	<1.5	4.7	<1.8	<1.3	<0.28	<1.3	1.2	13	0.12
1330-1370 Bordeaux Drive	SV-7	4/27/2017	5	4.5	9.8	<1.2	<0.88	9.7	23	<0.53	95	<1.3	<1.4	<5.7	6.4	<5.8	<1.2	91	12	<1.7	<5.1	<1.5	<0.50	<0.49	<1.6	<0.92	<0.91	<2.8	---	---	---
	SV-8	4/27/2017	5	7.8	12	<1.2	16	5.6	24	<0.54	95	<1.3	<1.5	<5.8	<0.62	<5.9	470	62	5.3	<1.7	8.4	24	<0.51	<0.50	<1.6	15	<0.92	<2.9	---	---	---
	SV-9	4/27/2017	5	8.4	17	<1.2	9.9	10	<3.0	<0.55	<3.2	46	<1.5	<5.9	9.3	<6.0	280	140	33	<1.7	9	**100**	<0.52	<0.50	<1.6	10	<0.94	<2.9	---	---	---
	SV-16	4/27/2017	5	4.8	12	<1.1	<0.86	10	<2.8	<0.52	31	65	<1.4	<5.6	8.2	<5.6	<1.2	100	27	<1.6	10	<1.4	<0.49	<0.48	<1.5	<0.89	<0.89	<2.8	---	---	---
	SV-18	4/28/2017	5	4.8	6.4	<1.1	<0.83	7.5	28	<0.50	100	38	<1.4	<5.4	<0.57	<5.4	<1.1	66	14	<1.6	5.5	<1.4	<0.47	<0.46	<1.5	<0.86	<0.86	<2.7	---	---	---
	SV-19	4/28/2017	5	6.6	<0.44	<1.2	<0.89	<0.71	<3.0	<0.54	40	<1.3	<1.5	<5.8	<0.61	<5.9	<1.2	<1.0	<0.84	<1.7	<5.1	<1.5	<0.51	<0.50	<1.6	<0.92	<0.92	<2.9	---	---	---
	SV-20	4/28/2017	5	<0.32	<0.43	<1.1	<0.88	<0.70	<2.9	<0.53	30	<1.3	<1.4	<5.7	<0.61	<5.8	<1.2	<1.0	<0.82	<1.7	<5.1	<1.5	<0.50	<0.49	<1.6	15	<0.91	<2.8	---	---	---
380-384 West Caribbean Drive	SV-11	5/1/2017	5	6.2	<0.57	<1.1	<1.2	<0.52	<2.1	<1.4	<2.6	<0.90	<1.5	<6.0	<0.75	<6.1	<2.0	6.8	<0.29	<0.89	<5.4	<1.2	<1.5	<0.76	<1.8	<1.3	<0.28	<1.3	---	---	---
	SV-12	5/1/2017	5	12	<1.1	<2.0	<2.2	<1.0	<3.9	<2.6	<5.0	<1.7	<2.9	<12	<1.4	<12	<3.9	14	<0.56	<1.7	<10	<2.2	<2.9	<1.4	<3.4	<2.4	<0.54	<2.5	---	---	---
	SV-22	5/1/2017	5	6.9	5.8	<1.1	<1.2	13	<2.2	<1.4	34	<0.95	<1.6	<6.4	<0.79	<6.4	<2.1	17	11	<0.94	<5.7	<1.2	11	<0.80	<1.9	<1.3	<0.30	16	1.6	15	<0.00012
370-376 West Caribbean Drive	SV-13	4/28/2017	5	9.7	13	<1.0	<1.1	8.6	<1.9	<1.3	39	51	<1.4	<5.7	5.5	<5.8	<1.9	110	17	<0.84	6.6	<1.1	<1.4	8	<1.7	8.8	<0.27	<1.2	---	---	---
	SV-14	4/28/2017	5	14	26	<1.2	<0.93	8.8	<3.1	<0.56	<3.2	84	<1.5	<6.0	14	<6.1	27	200	43	<1.8	13	<1.6	<0.53	<0.52	<1.6	47	<0.96	<3.0	---	---	---
Commercial ESL[1]				14	44,000	10,000	150,000	NE	730,000	440,000	4,500,000	NE	1,200	18	NE	NE	NE	NE	NE	NE	15,000	67	100	NE	12,000	NE	5.2	NE	NE	NE	NE

1 Commercial Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019.
< Not detected at or above laboratory reporting limit.
NE Not Established
--- Not Analyzed
BOLD Concentration exceeds Commercial ESL.

CORNERSTONE EARTH GROUP

APPENDIX B – HEALTH AND SAFETY PLAN

PROJECT HEALTH AND SAFETY PLAN

100 and 200 Caribbean Campus Project
West Caribbean Drive and Borregas Avenue
Sunnyvale, California

***Plan Prepared For*:**

Cornerstone Earth Group, Inc.
1259 Oakmead Parkway
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(408) 245-4600

***Prepared By*:**
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(Revision 1)

July 11th, 2018

Limitations

Services provided by Earth Safety Dynamics, Inc. and its subcontractors have been provided in accordance with generally accepted professional practices for the nature and conditions of similar work completed in the same or similar localities, at the time the work was performed. The scope of work for the project was conducted within the limitations prescribed by the client. This Health and Safety Plan reflects conditions as reported to Earth Safety Dynamics at the time of production, and is not meant to represent a legal opinion. This Plan is provided as a framework and may be adopted by tiered subcontractors, or they may develop their own equally protective Plan. No other warranty, expressed or implied, is made. This Plan was prepared for the sole use of Cornerstone Earth Group and their designees and may not be duplicated or used by any other party without the expressed consent of the client.

Kevin R. Braun, CIH
Certified Industrial Hygienist

ABIH Certification # 7029

July 11th, 2018

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List of Abbreviations and Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
A.L.	Action Level
A.P.R.	Air Purifying Respirator
ATCM	Airborne Toxic Control Measure
C	Ceiling Limit (8 CCR 5155)
COPC	Contaminant Of Potential Concern
c.y.	Cubic Yard
bgs	Below Ground Surface
Cal/OSHA	California Department of Labor; Division of Occupational Safety and Health
CHHSL	California Health Hazard Screening Level
C.I.H.	Certified Industrial Hygienist (American Board of Industrial Hygiene)
dBA	Decibels; A-Weighted Range
ESL	Environmental Screening Level
ESLI	End of Service Life Indicator
GFCI	Ground Fault Circuit Interrupter
IDLH	Immediately Dangerous to Life or Health
LEL	Lower Explosive Limit
MSHA	Mine Safety and Health Administration
M.U.C.	Maximum Use Concentration
NIOSH	National Institute for Occupational Safety and Health
NEA	Negative Exposure Assessment
NOA	Naturally Occurring Asbestos
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit (8 CCR 5155)
PID	Photoionization Detector
PNAs	Polynuclear (or Polycyclic) Aromatic Hydrocarbons
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation & Recovery Act
REL	Recommended Exposure Limit; NIOSH
SAR	Supplied Air Respirator
SSO	Site Safety Officer
STLC	Solubility Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value (American Conference of Governmental Hygienists)
TPH	Total Petroleum Hydrocarbons
TTLC	Total Threshold Limit Concentration
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WET	Waste Extraction Test

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SECTION 1
INTRODUCTION

On behalf of Cornerstone Earth Group, Inc. (Cornerstone), Earth Safety Dynamics, Inc. has developed this site Health And Safety Plan (HASP) to inform personnel of potential hazards associated with earthwork activities for the planned commercial development at the 100 and 200 Caribbean Campus in Sunnyvale, California (Site).

Individual contractors performing soil-intrusive activities will be required to prepare their own Plans that are equally or more protective than this HASP. Each contractor is responsible for designating a medical provider and own safety and emergency response personnel and is responsible for the health and safety of their own employees.

The development, referred to as the 100 and 200 Caribbean Campus project, consists of a 40-acre Site consisting of 10 parcels developed with 13 commercial buildings. The Sunnyvale West Outfall Canal bisects the Site, separating the 100 Caribbean and 200 Caribbean development projects. The Site is located within a relatively large geographical area underlain by multiple plumes of Volatile Organic Compound (VOC) - impacted ground water. This contamination appears both to have originated from previous site uses and to have been transported from a number of nearby off-site sources.

Contaminants found in soil, soil gas, and groundwater are outlined in the Site Management Plan prepared by Cornerstone Earth Group. This summarizes previous investigations and is the primary source document used to prepare this Health and Safety Plan:

March 15, 2018; Cornerstone Earth Group: Site Management Plan: 100 and 200 Caribbean Campus Project

(Site history, including previous property uses and sources of contamination and suspected contamination, is presented in the source document and is incorporated by reference and not repeated here.)

The main contaminants of concern (COCs) identified in this document as persisting in the soil, soil vapor, and groundwater include PCE, TCE, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, vinyl chloride, 1,2-DCA, 1,1-DCA, and 1,4-dioxane.

The parcel being redeveloped currently is occupied by a number of structures that will be demolished before earthwork begins.

The potential exists for encountering contaminated/hazardous soils, underground storage tanks (USTs), and possible hazardous building materials during various phases of the project. Work will not proceed in areas of VOC contamination until notification has been made to the Santa Clara County Department of Environmental Health and the Bay Area Air Quality Management District (BAAQMD) under Regulation 8, Rule 40, Section 402. (Notification must be made a minimum of five days before commencement of excavation.)

EH&S personnel will be contacted by the General Contractor before work in areas of identified contamination is performed, or if any indications of additional (unforeseen) contamination are encountered, including but not limited to:

- Stained or discolored soil
- Characteristic or unidentified odor
- Visible unidentified residues
- Underground Storage Tank(s)

This HASP establishes the policies and procedures that protect workers and the public from potential hazards posed by work with these materials at this site. All work performed by the General Contractor and subs will be executed in

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a manner that minimizes the probability of injury, accident, or incident.

This HASP is written and all Site activities will be conducted in accordance with all applicable Federal OSHA and California Division of Occupational Safety and Health requirements contained respectively in 29 CFR 1910.120 and 1926, and California Title 8, § 1529, and 1500 – 1938, and 5192.:

1) United States Department of Labor, OSHA Standards, specifically:

- Title 29 CFR Part 1910.120 - Hazardous Waste Site Operations and Emergency Response
- Title 29 CFR Part 1926 - Safety and Health Regulations for Construction

2) California Occupational Safety and Health Regulations, specifically:

- Title 8 CCR §1532.1 – Lead in Construction
- Title 8 CCR §5192 - Hazardous Waste Operations and Emergency Response
- Title 8 CCR §5194 - Hazard Communication
- Title 8 CCR §5095-5100 - Hearing Conservation
- Title 8 CCR Chapter 4, Subchapter 4 - Construction Safety Orders
- Title 8 CCR §3203 and §1509 - Injury and Illness Prevention Programs

3) USEPA Standard Operating Safety Guides, July 1988.

4) NIOSH/OSHA/USCG/USEPA: *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, October 1985

SECTION 2
PROJECT DESCRIPTION

The Site is bound by West Caribbean Drive and the Sunnyvale Landfill to the north, Borregas Avenue and commercial development to the east, Caspian Court and commercial development to the south, Bordeaux Drive and undeveloped land to the southwest, and office buildings and commercial buildings occupied by Yahoo! Inc. to the west.

The developer is planning to demolish the buildings and redevelop the Site with Class A office space. For 200 Caribbean, the planned 5-story approximately 505,140 square foot building will have a ground floor footprint of approximately 207,828 square feet.

The planned five-story building at 100 Caribbean will consist of approximately 536,750 square feet of office space with a ground floor footprint of approximately 187,356 square feet.

Building demolition is tentatively scheduled to start in December 2018 with Site development activities anticipated to begin in Summer 2019.

The new buildings will be supported by drilled, cast-in-place, displacement augercast piles. Augercast piles are concrete piles that are cast in place using a hollow-stem auger that drills to the design depth and then the sand-cement grout (4,000 to 6,000 psi grout) is pumped through the hollow-stem as the drill stem is extracted. We anticipate that drilling spoils will be minor. Various types of steel reinforcing, including rebar cages or H-piles may be installed into the still-wet grout after drilling to satisfy bending moment requirements.

Excavation and spoil generation and handling or disposal will be required utility trenching, pile caps, and grade beams. Dewatering and water management likely will be required for deeper excavations.

The potential for direct contact with hazardous soils and exposure to particulate bound contaminants and VOCs exists during demolition and disposal of existing subsurface encumbrances and excavation and stockpile or disposal of spoils. Normal dust control and decontamination and personal hygiene during Site activities are expected to help prevent exposure to these substances. Site personnel involved in operations covered by the Hazardous Waste Operations and Emergency Response standard (as defined in 29 CFR 1910.120 and 8 CCR 5192) are bound to satisfy Cal-OSHA requirements for work in those areas, and they will be trained in accordance with that standard. All others working on Site will be trained in accordance with the Hazard Communication (8 CCR 5144). Dust control and other engineering control measures will be strictly enforced by the General Contractor to maintain exposures as low as reasonably achievable on Site and at neighboring properties.

Contractor tasks affected by this HASP may include exploratory excavation and dewatering activities, demolition of existing foundations, pavement and cap materials, demolition and disposal of various subsurface obstructions, trenching and removal/replacement of existing sewer laterals, handling of some auger spoils, and excavation and stockpiling of soils from grade beams and pile caps, and loading and disposal of contaminated soils and rubble.

SECTION 3
ORGANIZATION AND RESPONSIBILITIES

The General Contractor shall maintain a policy of providing its employees, with information and procedures in accordance with the requirements of the California OSHA Hazard Communication Standard in order to protect them and the adjacent community from any adverse effects that might result from work at a job site involving potentially hazardous substances. All personnel working on this project will follow the health and safety procedures set forth in their HASP. Visitors will not be allowed entry unless they have read and agreed to comply with this plan. The HASP acknowledgment will be signed by all Cornerstone employees who actively participate at this project.

The Cornerstone Earth Group, Inc. Staff Organizational Chart is presented in Figure 1. The responsibilities and authorities for key personnel are discussed below.

3.1 SITE SAFETY OFFICER (SSO)

The General Contractor's Site Safety Officer shall have the following responsibilities:

- Health surveillance of all Site workers.
- Documenting that safety procedures in effect for project activities are in compliance with appropriate federal, state, and local regulations
- Maintaining personnel exposure air monitoring records (if performed) for Site workers
- Providing and ensuring proper use of appropriate personal protective equipment (PPE) by Site workers
- Consulting with project CIH regarding PPE assignment and adjustments based on exposure data

The SSO will maintain a safety log (in the Appendices), which will be kept for Site activities. This log will include safety meeting topics, training records, air monitoring information, and any incidents related to employee health and safety. The SSO has responsibility for implementing and enforcing all aspects of this HASP for site workers. He or she will oversee any personnel monitoring and in consultation with the project CIH will decide when action levels have been reached which require work stoppage. The SSO establishes and enforces the protective equipment to be used by site personnel for all site activities.

3.2 EMPLOYEE SAFETY RESPONSIBILITY

Although the General Contractor is responsible for providing a safe and healthful workplace, each employee is responsible for his/her own safety as well as the safety of those around him/her. All Site personnel are aware that they are responsible for isolation and correction of unsafe conditions, either by direct action (fix it themselves) or by alerting their respective supervisors after isolating the problem. All employees shall use provided equipment in a safe and responsible manner as directed by his supervisor.

3.2.1 Buddy System

No work will be performed in any designated exclusion zone without benefit of the "buddy system". Workers will be paired in buddy teams at the start of each shift for any and all hazardous waste operations or emergency response work to be undertaken during the day. Buddy teams will remain in communication for the duration of the shift.

3.3 LOGS, REPORTS, AND RECORD KEEPING

Recordkeeping is an important component of any effective health and safety program. Safety records for site activities shall be updated daily. The following logs, reports, and records shall be maintained in the appendices of this HASP:

- Safety meetings;
- Training logs - Site specific and visitors;
- Weekly safety inspection logs;
- Employee/visitor sign-in;
- Ambient and personal air monitoring results

SECTION 4
JOB HAZARD ANALYSIS

This section discusses chemical, physical, and environmental hazards to workers on the site.

4.1 CHEMICAL HAZARDS

The chemicals listed in Table 4.1 are believed or suspected to be present on this Site.

Contaminants of potential concern (COPCs) in soil, soil vapor, and ground water include trichloroethylene (TCE), dichloroethylene (DCE), vinyl chloride (VC). The target compound for monitoring will be TCE, as this is present in the highest concentrations compared to its PEL. Table 1 presents the summary of the COPC that may be encountered at the Site.

ORGANIC COMPOUNDS

Volatile Organic Compounds (VOCs):

Solvent residues are the primary organic contaminants identified as possibly existing on site that present potential exposure. Hazardous components and subcomponents of these wastes are expected to include:

- PCE
- DCE
- DCA
- TCE
- Vinyl Chloride
- 1,4 - dioxane

cis - 1,2 - Dichloroethylene (cDCE)

1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. Breathing high levels of 1,2-dichloroethene can cause nausea, drowsiness, and fatigue and can be fatal in high concentrations. Animal studies have shown liver and lung damage and anemia, and the effects were more severe with longer exposure times. High concentrations resulted in heart damage as well. One study indicated it as a possible fetotoxin. The EPA has determined that *cis*-1,2-dichloroethene is not classifiable as to its human carcinogenicity.

1.2 – dichloroethane (Ethylene dichloride, DCA)
Nervous system disorders, liver and kidney diseases, and lung effects have been reported in humans ingesting or inhaling large amounts of 1,2-dichloroethane. In laboratory animals, breathing or ingesting large amounts of 1,2-dichloroethane have also caused nervous system disorders and liver, kidney, and lung effects. Animal studies also suggest that 1,2-dichloroethane may damage the immune system. Kidney disease has also been seen in animals ingesting low doses of 1,2-dichloroethane for a long time. Studies in animals indicate that 1,2-dichloroethane does not affect reproduction. The EPA has determined that 1,2-dichloroethane is a probable human carcinogen and the International Agency for Cancer Research (IARC) considers it to be a possible human carcinogen.

Gasoline
Gasoline is a colorless, pale brown, or pink liquid, and is very flammable. Typically, gasoline contains more than 150 chemicals, including small amounts of benzene, toluene, ethylbenzene, xylene and sometimes lead or other additives such as methyl tert-butyl ether (MTBE). How the gasoline is made determines which chemicals are present in the gasoline mixture and how much of each is present. The actual composition varies with the source of the crude petroleum, the manufacturer, and the time of year.

Many of the harmful effects seen after exposure to gasoline are due to the individual chemicals in the gasoline mixture, such as benzene and lead. Inhaling high concentrations of gasoline is irritating to the lungs, and ingestion is irritating to the lining of the stomach when swallowed. Inhaling in high levels of gasoline for short periods or swallowing large amounts of gasoline may also cause harmful effects on the nervous system, including coma and the inability to breathe, while less serious effects include dizziness and headaches.

There is not enough information available to determine if gasoline causes birth defects or affects reproduction. Automotive gasoline is currently undergoing review by the EPA for cancer classification.

Trichloroethylene (TCE)
Most of the trichloroethylene used in the United States is released into the atmosphere from industrial degreasing operations. Acute (short-term) and chronic (long-term) inhalation exposure to trichloroethylene can affect the human central nervous system (CNS), with symptoms such as dizziness, headaches, confusion, euphoria, facial numbness, and weakness. Liver, kidney, immunological, endocrine, and developmental effects have also been reported in humans. A recent analysis of available epidemiological studies reports trichloroethylene exposure to be associated with several types of cancers in humans, especially kidney, liver, cervix, and lymphatic system. Animal studies have reported increases in lung, liver, kidney, and testicular tumors and lymphoma. EPA currently is reassessing the cancer classification of trichloroethylene. In Utero exposure to low levels of TCE has been linked to heart valve defects in the developing fetus.

Vinyl Chloride
Vinyl chloride is known also as chloroethene, chloroethylene, ethylene monochloride, or monochloroethylene. At room temperature, it is a colorless gas, it burns easily, and it is not stable at high temperatures. Vinyl chloride exists in liquid form if kept under high pressure or at low temperatures. Vinyl chloride has a mild, sweet odor, which may become noticeable at 3,000 parts vinyl chloride per million parts (ppm) of air. However, the odor is of little value in preventing excess exposure. The primary target of vinyl chloride acute exposure is the CNS. Signs and symptoms include dizziness, ataxia, inebriation, fatigue, numbness and tingling of the extremities, visual disturbances, coma, and death. Prolonged absorption of vinyl

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chloride can induce hepatotoxicity and hepatic cancers, including angiosarcoma. The U.S. Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have classified vinyl chloride as a known human carcinogen. Vinyl chloride has caused angiosarcoma of the liver in heavily exposed individuals.

Monitoring will be done for organics any time that odors are detected or stained soils are encountered. Sustained reading of ≥ 10 ppm total VOCs (measured with a PID or other organic vapor monitor) in a worker breathing zone will require work stoppage and/or use of respiratory protection as directed by the SSO in consultation as required with the project CIH.

Representative breathing zone and perimeter monitoring will be done for TCE compounds in accordance with Section 8 of this Plan.

Tetrachloroethylene (Perchloroethylene; PCE)

Tetrachloroethylene is widely used for dry-cleaning fabrics and metal degreasing operations. Effects resulting from acute (short term) high-level inhalation exposure of humans to tetrachloroethylene include irritation of the upper respiratory tract and eyes, kidney dysfunction, and neurological effects such as reversible mood and behavioral changes, impairment of coordination, dizziness, headache, sleepiness, and unconsciousness. The primary effects from chronic (long term) inhalation exposure are neurological, including impaired cognitive and motor neurobehavioral performance. Tetrachloroethylene exposure may also cause adverse effects in the kidney, liver, immune system and hematologic system, and on development and reproduction. Studies of people exposed in the workplace have found associations with several types of cancer including bladder cancer, non-Hodgkin lymphoma, multiple myeloma. EPA has classified tetrachloroethylene as likely to be carcinogenic to humans.

TABLE 4.1 MAJOR CONTAMINANTS OF POTENTIAL CONCERN ON-SITE				
Compound or Class	Description	Exposure Limits	Exposure Routes	Exposure Signs and Symptoms
Gasoline	Mixture of aliphatic and aromatic hydrocarbons. Colorless to light yellow liquid with characteristic odor	PEL = 300 ppm (AL = 25 ppm)	Inhalation Ingestion	Headache, narcosis, defatting dermatitis.
cis-dichloroethylene (cDCE)	Colorless liquid with a slightly acrid, chloroform-like odor	PEL = 200 ppm	Inhalation Ingestion	Irritation of eyes and respiratory system; CNS depression
Dichloroethane (ethylene dichloride; DCA)	Colorless liquid with a mild, chloroform-like odor	PEL = 1 ppm STEL = 4 ppm REL = CA **	Inhalation Ingestion Absorption	Irritation of eyes and respiratory system; skin redness, CNS depression, possible carcinogen
Tetrachloroethylene (PCE) $[\ ]_{max}$ = 0.43 ppm	Colorless liquid with a mild, chloroform-like odor	PEL = 25 ppm STEL = 100 ppm REL = CA **	Inhalation Ingestion Absorption	Irritation of eyes and respiratory system; skin redness, CNS depression, possible carcinogen
Trichloroethylene (TCE) $[\ ]_{max}$ = 0.50 ppm ††	Colorless liquid with a slightly acrid, chloroform-like odor	PEL = 25 ppm STEL = 100 ppm TLV = 10 ppm	Inhalation Ingestion	Irritation of eyes and respiratory system; CNS depression
Vinyl Chloride (VC) $[\ ]_{max}$ = 0.67 ppm ††	Colorless gas with a pleasant odor at high concentrations	PEL = 1 ppm REL = CA **	Inhalation	Lassitude, abdominal pain, GI bleeding, enlarged liver, cyanosis. Carcinogen

Notes

PEL Permissible Exposure Limit; 8 CCR 5155
STEL Short-Term Exposure Limit; 8 CCR 5155
TLV Threshold Limit Value (ACGIH)
AL Project Action Level for Respiratory Protection
ppm parts per million (by volume)
ppb parts per billion (by volume)
$\mu g/m^3$ micrograms per cubic meter
* California Action Level as defined in 8 CCR 1532.1 or Project Action Level
** Exposure to carcinogens maintained As Low As Reasonably Achievable
† Recommended Exposure Limit ; National Institute for Occupational Safety and Health (NIOSH)
†† Maximum detected concentration in soil gas

4.2 Exposure Prevention

Engineering controls (consisting primarily of an aggressive dust control program) are expected to be sufficient to control exposures to particulate - bound site contaminants.

The maximum detected VOC concentrations in soil gas are below their respective PELs.

$mg/m^3 = [(mg/m^3 \text{ dust}) \times (mg/kg \text{ TCE})]/10^6$

Using an assumed maximum TCE concentration of 1.0 mg/kg (see Cornerstone site characterizatio) in generated dust, the Action Level (AL) of 7 $\mu g/m^3$ (based on EPA's accelerated response action level) would be reached at total dust concentrations of approximately 700 mg/m^3, a value well in excess of the PEL for total nuisance dust and in fact impossible to achieve.

Dust becomes visible (depending on lighting, reflectivity, background, etc.) generally at or below a concentration of 2 mg/m^3. Specifications call for no visible fugitive dust evolution during earthwork, so the PEL for dust and particulate-bound contaminants is unlikely to be reached or exceeded. Required engineering controls (No earthwork will be performed without active dust suppression, achieved through application of water before and during soil-disturbing activities.) and personal protective equipment (PPE) requirements combined with general hygiene requirements (wash arms, face, and hands before eating or smoking) will prevent exposures due to inhalation or ingestion of contaminated dust.

Screening for organic vapors in soil vapor will be performed during initial disturbance of contaminated soils and during removal of selected subsurface utilities. A wash facility will be located on Site at all times. In addition, the SSO and Site Supervisor shall observe and warn the crew members to be aware of the initial symptoms of chemical exposure. The severity of exposure depends primarily on the specific activities undertaken and the care with which the activities are performed.

Any crew member will be removed from the work site and placed under watch immediately if these initial symptoms are noted:

- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Euphoria
- Chest pains and coughing
- Rashes or burns

Level C protection may be required only in the event that unexpected contaminant concentrations are encountered or dust control efforts prove ineffective. Action levels for respiratory protection are established for the site based on maximum known concentrations. Respiratory protection will be utilized in accordance with Section 6.4 – 6.10 if the following sustained (≥ 5 minutes) breathing zone concentrations are recorded:

Contaminant	Action Level
Nuisance Dust (total)	5.0 mg/m^3
Organic Vapor (total VOC)	10 ppm
TCE	1 ppb (7 $\mu g/m^3$)
COPCs (other)	0.5 x PEL

4.2.1 Hazard Communication Program

The General Contractor shall implement a Hazard Communication Program. The purpose of this program is to transmit information about the various chemical hazards in the workplace to the workers using various media. The transmittal of information will be accomplished by means of a comprehensive hazard communication program, which will include container labeling and other forms of warning, Material Safety Data Sheets, and employee training in accordance with Title 8 CCR §5194. The program will be available at the GC's office for review by all employees. The GC will fulfill the hazard communication requirements through formal safety training, departmental safety

meetings, and job site safety meetings. Material Safety Data Sheets for all chemicals likely to be encountered on this job will be maintained and available on site.

4.3 PHYSICAL HAZARDS

To minimize physical hazards, the General Contractor shall develop standard safety protocols that will be followed at all times. Hazard analyses are produced, updated frequently, and reviewed daily with all affected crew members for every jobsite operation. Failure to follow safety protocols or continued negligence of these policies will result in expulsion of a crew member from the Site as well as possible termination of employment.

Site personnel must be familiar with the field activities that will be conducted at the site. They will be trained to work safely under various field conditions. In addition, Site workers will be required to use work practices designed to minimize physical hazards.

Hard hats, safety vests, and leather work boots will be required in all areas of the site.

4.3.1 Tripping, Slipping, and Falling Hazards

Site workers will be reminded daily to maintain sure footing on all surfaces. Use of safety harnesses and fall arrest/restraint will be required for any personnel working 6 or more feet above any surface, including on manlifts, and whenever they are exposed to impalement hazards.

To minimize tripping hazards caused by construction debris, material will be removed daily from the work areas and stockpiled in appropriate designated storage areas. This "house cleaning" effort will be enforced by the SSO at the end of each day.

4.3.2 Head, Eye, and Back Injuries

As minimum requirements, hard hats and safety glasses will be donned prior to entering any active work area or performing any related job tasks. (This includes visitors, outside service contractors, etc.) Personnel will be trained in and required to use proper lifting techniques for all lifts.

4.3.3 Falling Objects

All project tasks can be accomplished without any object free-falling to the ground. No personnel shall work under equipment or elevated loads at any time. Areas beneath elevated work will be barricaded and posted with warning signs.

4.3.4 Heavy Equipment and Traffic

The use of heavy excavators, scrapers, and other equipment on Site presents the greatest potential for injury to personnel. In order to minimize these hazards, designated routes will be established for transport of material through the Site, and specific traffic patterns will be established. All trucks will be equipped with operable backup alarms and shall use spotters for backing procedures.

Personnel needing to approach heavy equipment during operation will observe the following protocols:

1. Make eye contact with the operator.
2. Signal the operator to cease heavy equipment activity.
3. Approach the equipment and inform the operator of intentions.

Only qualified personnel, as determined by the Site Superintendent, will operate heavy equipment. Those crew members directly involved with spotting for the operator will be the only personnel allowed within the operating radius of the heavy equipment. All other personnel will remain a safe distance away from these operations.

General Contractor personnel and subcontractors will follow all Site traffic rules and instructions, including use of reflective safety vests. Barricades will be erected around any work sites within an open right-of-way, and all personnel will remain within barricaded area. Road and lane closures will be permitted by the City of Mountain View. Only trained flaggers will be used to direct traffic around and through the work area.

4.3.5 Site Pre-inspection of Equipment

Only equipment that is in safe working order will be permitted on site. To maintain this policy, all equipment brought onto the project Site will be inspected for structural integrity, smooth operational performance, and proper functioning of all critical safety devices in accordance with the manufacturer's specifications. This inspection will be performed by a qualified equipment operator. Also, every operator will perform and document a Daily Equipment Inspection at the start of each work shift and turn the form in to the foreman by the end of shift.

Equipment found during this inspection not conforming to operational and safety requirements will not be put into service until all necessary repairs are made to the satisfaction of the inspection group.

4.3.6 Operator Qualifications

Only qualified operators familiar with the equipment to be used will be permitted to operate. Subcontractors will supply proof of operators' qualifications to operate in a safe manner, including certification for any equipment requiring it (lift trucks, etc.).

4.3.7 Electrical Hazards

The GC will implement an Assured Grounding Program for the project. To prevent accidents caused by electric shock, the SSO will inspect electrical connections on a daily basis. He will shut down and lock out any equipment that is found to have frayed wiring or loose connections until a qualified electrician can be contacted and repairs effected.

Electrical equipment will be de-energized and tested by qualified personnel before any electrical work is done. All equipment will be properly grounded before and during all work.

Due to expected wet conditions, ground fault circuit interrupters (GFCIs) will be used for all power cords between the power source and tool, unless the presence of a potentially explosive atmosphere precludes this procedure. Generators used to supply power will be grounded and equipped with GFCIs.

4.3.8 Welding Hazards

Personnel who will be performing or observing welding operations are required to use approved welding shields or glasses. Welding shields and glasses are to be inspected prior to each use for scratches and pits that would inhibit their ability to shield harmful ultraviolet light.

Workers will be required to wear protective clothing to shield the skin from slag and harmful ultraviolet light produced by welding operations. Persons working near welding operations that could ignite chemical protective clothing must wear flame retardant outer apparel (Nomex or equivalent).

4.3.9 Fire and Explosion

All flammable liquids will be stored in UL-Approved safety containers in designated areas. Oxygen and acetylene cylinders will be stored secured upright in separate areas except when on carts for immediate use. All high-pressure cylinders will be transported with caps in place, and all valves and gauges will be inspected before each use. Monitoring for explosive vapors will be performed before any hot work undertaken in exclusion zone(s), and no hot work will be permitted if combustible gas or vapor concentrations at the lowest point exceed 10 percent of the Lower Explosive Limit (LEL).

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4.4 ENVIRONMENTAL HAZARDS

4.4.1 Weather and Heat Stress

With the possible combination of ambient factors such as high air temperature, high relative humidity, low air movement, high radiant heat, and protective clothing use, the potential for heat stress is a concern. The potential exists for:

- Heat Rash is caused by continuous exposure to hot and humid air and aggravated by chafing clothes. Heat rash decreases ones ability to tolerate heat.

- Heat Cramps are caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs of heat cramps include muscle spasm and pain in the extremities and abdomen.

- Heat Exhaustion is caused by increased stress on various organs to meet increased demands to cool the body. Signs of heat exhaustion include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and listlessness.

- Heat Stroke is the most severe form of heat stress. The body must be cooled immediately to prevent severe injury or death. Signs and symptoms of heat stroke are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma.

Daytime temperatures at the Site may be expected to range from 2° C to 27° C (35° F to 80° F). Wearing an impermeable suit with rubber boots, gloves, hard hat, and full-face respirator imposes an additional 6° C to 11° C (10° F to 20° F) burden on the worker. For the purposes of this Environmental Health and Safety Plan, it is assumed that workers at the Site wearing Level C protective gear (if required) with impermeable suits will experience the same additional temperature burdens as described above. It is therefore possible that workers wearing Level C safety gear, with an impermeable suite, could be exposed to working temperatures inside their suits of approximately 8° C to 38° C (45° F to 100 °F). The project Action Level for heat stress observation is set at 70° F. Whenever the ambient temperature is greater than or equal to this action level, the SSO will alert his crew to be vigilant for symptoms of heat stress. The SSO will also advise the crew to increase the amount of water intake.

Heat stroke, heat cramps, and heat exhaustion are covered in detail during general and site-specific training program. In addition, this information is discussed during safety "tailgate" meetings. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade during warm weather. Water and electrolyte-containing beverages will be provided on-site and will be available for consumption during work breaks.

Protective Measures

Regular monitoring and other precautions relating to heat stress have been prescribed by NIOSH. The following protective measures will be taken by workers at the Site if ambient temperatures exceed 75° F**.**

1) Workers will take rest periods every two to four hours. Rest periods will be a minimum of fifteen minutes. Liquids (particularly electrolyte-replenishing fluids) will be available to all workers during rest periods.

2) Workers will wear lightweight clothing under impervious suits (i.e. short sleeve shirts are acceptable depending on anticipated chemical exposure levels).

3) NIOSH recommends that workers wearing impervious clothing receive physiological monitoring at regular

intervals when the ambient air temperature approaches or exceeds 70°F. Physiological monitoring will consist of the following measurements (taken during prescribed rest periods):

a) Measure heart rate (HR) as early as possible in the rest period and record.

b) Check for the physical reactions related to heat stress. Physical reactions include fatigue, irritability, anxiety, and decreased concentration, dexterity or movement.
If the measured heart rate exceeds 110 beats per minute, or any of the above physical symptoms are noted, the work period will be shortened by 30 percent (NIOSH 1985). Work may resume after the heart rate and physical condition of the worker has returned to normal.

Cold Stress
Cool and wet conditions are possible during the execution of this work. The Site Safety Officer (SSO) and workers will be alert for signs and symptoms of cold stress (hypothermia). This is commonly caused by prolonged exposure to cool / windy conditions while wearing clothing that has become wet, either from precipitation, dust control measures, or paradoxically by perspiration caused by heavy work in protective suits.

The SSO will monitor the ambient air temperature using a thermometer in the support zone. At temperatures below 40° F, actual temperature or corrected for wind chill, the most current published ACGIH cold stress standard will be followed.

Field personnel will be observed for the following signs and symptoms:

- Pain in the extremities
- Uncontrolled shivering
- Malaise or reduced responsiveness

Any team member who exhibits these signs will be monitored for cold stress. Any individual with an oral temperature of less than 97° F will be taken immediately to a warming shelter.

A warming shelter will be provided on any job site where the ambient temperature is less than 40° F. Breaks will be taken in the shelter as needed according to ACGIH TLV for cold stress.

4.4.2 Hearing Conservation Program

The General Contractor shall implement a comprehensive Hearing Conservation Program and requires use of hearing protection for all personnel working on or within 50 feet of heavy equipment or within any areas designated by management. This hearing conservation program shall comply with both the California and Federal Hearing Conservation Standards.

4.4.3 Confined Space Entry

All trenches deeper than five feet in Areas 1 and 6 and other areas with identified contamination will be treated as Non-Permit-Required Confined Spaces in accordance with the GC's Confined Space Entry Program. Initial and hourly monitoring will be performed throughout the work area for flammable gases or vapors, oxygen, carbon monoxide, and total VOCs. Continuous monitoring will be performed during all hot work and work involving use of internal combustion engines of any type in or around occupied spaces.

Work will cease and all spaces will be evacuated immediately in the event any meter goes into "alarm" mode, or any of the following parameters for acceptable entry is exceeded:

Parameter	Acceptable Range
Oxygen	19.5% - 23%
Combustible Gas	≤ 10% LEL
H_2S	≤ 2 ppm
CO	≤ 10 ppm
VOCs (total)	≤ 10 ppm

The space will not be re-entered for any reason until the condition has abated or the condition has been further evaluated and deemed safe by the Site Safety Officer in consultation with the project Industrial Hygienist.

4.5 HAZARD ANALYSIS SUMMARY

This work involves significant risk from several sources. Physical hazards and construction activity present a higher than normal risk due to the confined work areas, use of protective equipment, and proximity to traffic. These risks will be minimized by adequate traffic control, planning, and worker education.

Excavation work at the site presents two principal exposure routes: ingestion and inhalation of dust contaminated with metals and particulate-bound organics. These risks will be minimized by use of engineering controls as well as appropriate personal protective equipment and personal hygiene.
Aggressive dust control measures required by the management plan as well as this site safety plan are expected to prevent potential overexposures to particulate and particulate-bound contaminants. A requirement for Level C respiratory protection is therefore not anticipated unless unanticipated contaminant concentrations are encountered or vapors accumulate in the work area in excess of project action levels. Dust monitoring will be performed in the work area using a real-time aerosol monitor (MIE PDRAM or equivalent), and organic vapor screening and representative personal and ambient air sampling will be performed as detailed in Section 8 to confirm compliance with the Permissible Exposure Limits. Perimeter monitoring also may be performed in order to evaluate site engineering and administrative controls.

Potential for generation of airborne contamination is expected to occur during earthwork activities that disturb or aerate contaminated soils. Monitoring equipment may be used to identify downwind releases and upwind (background) concentrations. Respirators may be used to minimize exposure of workers in these areas only in the event that dusty conditions or air monitoring data indicate such a need. Otherwise, work will proceed without respiratory protection unless or until additional soil sampling or air monitoring results indicate protection is required or advisable. Protective clothing ensembles for each of the levels of protection are described in Section 6.

4.6 TASK SPECIFIC RISK ASSESSMENT

TASK: Dewatering, Drilling; Installation and Grouting of Auger Cast Pressure Grouted Displacement (APGD) Piles
SPECIFIC HAZARDS: Utilities, Noise, heavy equipment operation, vehicular traffic, falls/engulfment, TCE Exposure, caustic burns.
CONTROL MEASURES: A survey for underground utilities shall be conducted over the full lateral extent of horizontal bores prior to any drilling. Personnel shall wear hearing protection while inside the operating radius of the equipment, and shall otherwise maintain a minimum distance of 40 feet from the equipment. Only qualified and experienced operators will operate equipment. Hard hats, safety glasses, gloves and work boots are mandatory for all personnel. Spotters/flaggers will be used to direct traffic and spot trucks. All ground personnel will maintain a minimum clearance of six feet from the rotating auger system and bores unless fall restraint is used. Monitoring for VOCs will be performed using a ppbRAE™ (or other real-time monitor with equivalent sensitivity) during all dewatering and soil disturbance in areas of known or suspected VOC contamination. All workers with potential exposure to grout mixes will wear gloves and protective coveralls along with eye protection.

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TASK: Excavation, Grading and Loading / Disposal of Contaminated Soils
SPECIFIC HAZARDS: Utilities, noise, heavy equipment and truck/scraper operations, vehicular traffic, particulate contaminants and projectiles, hazardous vapor, contaminated ground water.
CONTROL MEASURES: A survey for underground utilities shall be conducted prior to any excavation. Personnel will use care when walking around excavation edges. Level "D" personal protection will be used unless otherwise specified by Client or Cornerstone Site Safety Officers. The work area will be clearly marked. Ground personnel shall maintain eye contact with the equipment operator and wear hearing protection while inside the operating radius of the equipment, and shall otherwise maintain a minimum distance of 40 feet from the equipment unless spotting for the operator. Only qualified and experienced operators will operate equipment. Hard hats, safety glasses, gloves and work boots are mandatory for all personnel, and rubber overboots and tyvek suits (or equivalent) will be worn by all personnel performing job tasks with potential for soiling by contaminated materials. An aggressive program of dust control will be utilized to help prevent visible dust generation and will thereby reduce the potential for airborne contaminants. Sufficient water will be applied to exposed soils to maintain surfaces above 70 percent of soil capacity, thereby preventing dust suspension. Spotters/flaggers will be used to direct traffic and spot trucks and flag other traffic across or through scraper spreads. Haul trucks will be securely tarped before transport of hazardous or contaminated material on any public road outside of project limits. Spilled material will be cleaned immediately from vehicles and (open) road surface and returned to excavation. Screening for organic vapor will be performed during dewatering operations and soil disturbance and in areas of known VOC contamination.

TASK: Demolition of subsurface encumbrances
SPECIFIC HAZARDS: Utilities, equipment, slips, trips, & falls, noise, contact with contaminated materials, atmospheric hazards, fire and explosion
CONTROL MEASURES: All utilities will be disconnected and disconnect verified by SSO or his designee before commencement of any demolition activity. The work area will be surrounded by a barricade to exclude ground personnel from projectile and impalement hazards. All potentially exposed personnel shall wear hearing protection. Only qualified and experienced operators (as detailed in Section 4.3.6 of this HASP) will operate equipment. Hard hats and safety glasses will be required at all times. All hazardous building materials (asbestos, etc.) will have been removed and removal verified in writing by "soft demolition" subcontractor before commencement of demolition. Dust control will be utilized to reduce the potential for airborne concrete dust. Disturbance of structures coated with lead-based paint will be performed in accordance with this HASP, 8 CCR 1532.1. Air monitoring and sampling will be conducted in accordance with Section 8 of this HASP.

Any USTs encountered will have contents evacuated and internal atmosphere completely inerted (0% LEL) before any permitted removal is performed.

TASK: Demolition of utilities and process piping/sewer laterals and/or Line Breaking
SPECIFIC HAZARDS: Utilities, equipment, slips, trips, & falls, noise, contact with contaminated residues, trench entry, atmospheric hazards, unanticipated chemical reactions.
CONTROL MEASURES: All utilities and process piping will be disconnected and disconnect verified by SSO before commencement of any demolition activity. The work area will be surrounded by a barricade to exclude unauthorized personnel. All exposed personnel shall wear hearing protection as dictated by noise levels. Only qualified and experienced operators (as detailed in Section 4.3.6 of this HASP) will operate equipment. Hard hats and safety glasses will be required at all times. All hazardous materials (asbestos insulation, etc.) will have been removed and removal verified in writing by "soft demolition" subcontractor. Lines will be drained and purged whenever possible. All trenches will be properly shored or sloped before entry, and will be treated as non-permit required confined spaces. Air monitoring and sampling will be conducted in accordance with Section 8 of this HASP.

TASK: Sampling of Stockpiles
SPECIFIC HAZARDS: Slips, trips, & falls, contact with contaminated materials
CONTROL MEASURES: Extreme care will be taken by workers climbing stockpiles, especially covered piles that may have voids below tarps. Rubber boots, coveralls, and nitrile gloves will be used by workers in direct contact with stockpile material. Respiratory protection will be required only if higher than expected levels of contaminants are encountered during excavation.

SECTION 5
WORK AND SUPPORT AREAS

To help prevent migration of contamination caused by personnel or equipment, work areas and personal protective equipment are clearly specified prior to beginning operations. The following designated work areas or zones are suggested by the NIOSH/ OSHA/USCG/EPA document, “Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities”. The work area will be divided into three zones: an exclusion (or "hot") zone (EZ), a contamination reduction zone (CRZ), and a support zone. The excavation and/or shoring contractor is responsible for establishing these work zones; the recommended zones are summarized below.

5.1 EXCLUSION ZONE

The exclusion zones will consist of areas where inhalation, oral contact, or dermal contact with contaminants is considered to be possible. Individual EZs are described in the SMP and incorporated by reference here.

It is anticipated that each EZ will encompass open excavations in contaminated (known or suspected) areas of the site prior to installation of clean base as well as areas in the vicinity of the sewer line and the immediate confines of any stockpiles. The size and configuration of each area may vary according to air monitoring results. Each exclusion zone boundary will be clearly and conspicuously marked. A single entry and exit point will be established at each zone. Entry shall be limited to essential personnel or pre-approved visitors.

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5.2 CONTAMINATION REDUCTION ZONE

The CRZ will be established between the exclusion zone and support zone. In this area, personnel will begin the sequential decontamination process required to exit the exclusion zone. To prevent off-site migration of contamination and to facilitate personnel accountability, all personnel will enter and exit the exclusion zone through the CRZ. All vehicles and equipment exiting areas where they may have contacted contaminated materials (Exclusion Zones) will traverse a trackout prevention area consisting of a minimum 50 foot paved area. Alternatively, rumble strips or a 20-foot pad of 6-inch minus rock may be used to dislodge materials from wheels and undercarriage. In no event will visible trackout to public roadways be permitted. Potentially contaminated material that is removed will be added to stockpile area, and rinsates generated by decontamination activities will be used for dust control on the contaminated stockpiles, which will be located in lined and bermed areas.

5.3 SUPPORT ZONE

The support zone will consist of a clearly marked area where the administrative area, break areas, and changing facilities are located. Smoking, drinking, and eating will be allowed only in designated areas. Sanitation facilities (with hand wash) are provided in the support zone.

5.4 ACCESS CONTROLS

The General Contractor shall establish the physical boundaries of each zone and shall instruct all workers and visitors on the limits of the restricted areas. No one shall be allowed to enter a restricted area without the required protective equipment for that area. The contractor's SSO shall ensure compliance with all restricted area entry and exit procedures.

The General Contractor's SSO shall also designate a decontamination corridor through which personnel may exit from a contaminated area and enter into adjacent clean break areas.

Visitors should check in immediately upon arrival. Only authorized visitors will be allowed access to active work areas. Each visitor will be required to provide and wear the necessary protective equipment for use during site visits and shall be escorted by the Supervisor while on site. All visitors, subcontractors and other personnel will be required to sign a safety plan acknowledgement sheet to certify that they have read and will comply with this site health and safety plan. Failure to comply with this site entry procedure will result in expulsion from the site.

SECTION 6
PROTECTIVE EQUIPMENT

The following lists define the required personal protective equipment for each work location and task within a specific zone.

6.1 EXCAVATION EXCLUSION ZONE(S)

Tasks: All Site Workers
EPA Level: D/C *
Respiratory Protection: None *
Head: Hard hat
Hand: Work Gloves
Suit: None †
Foot: Work Boots; Rubber boots or work boots with overboots only to prevent contact with ground water or as needed to facilitate decontamination
Eye: Safety Glasses; Face Shields**
Special Requirements: † Coveralls and gloves needed only as required to prevent soiling by contaminated ground water or other materials. Workers not in direct contact with soils or ground water may substitute work clothes and gloves for coveralls and Nitrile/Liner system.

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Comments: Hearing protection is required within 50 feet of operating heavy equipment and all other areas found to present noise levels in excess of 85 dBA.

* Respiratory protection will be necessary only in the event that sustained levels of contaminants in worker breathing zones exceed project action levels or sampling results indicate individual components or aggregate concentrations in excess of respective or derived Permissible Exposure Limits (PELs). Respirators will also be necessary if areas of higher than expected concentrations of soil contaminants are encountered or engineering controls are unable to maintain airborne dust concentrations below established action levels. Respiratory protection will be used in accordance with State and Federal respiratory protection standards as well as Cornerstone's Respiratory Protection Program.

** Face shields required only as needed for splash hazards from contaminated ground water and other free liquids.

6.2 CONTAMINATION REDUCTION ZONE

Tasks: All decontamination procedures
EPA Level: D
Respiratory Protection: None.
Head: Hard hat.
Hand: Work gloves.
Suit: None *
Feet: Work Boots
Eye: Safety Glasses / Face Shield
Special Requirements: Coveralls will be available on site for use in unusual tasks that would otherwise result in excess soiling of work clothing. Waterproof suit, rubber boots, and face shield required for pressure washing of tools and equipment.
Comments: See Section 4.6

6.3 SUPPORT ZONE

Personnel working in the support zone will use the following Level "D" protective gear:

- Work Boots
- Hard hat
- Safety glasses
- Safety Vest

6.4 RESPIRATOR CARTRIDGES

Should conditions require an upgrade to Level "C" protection for some tasks, crew members working in Level "C" will wear NIOSH/MSHA-approved respirators equipped with combination organic vapor and P-100 HEPA air purifying cartridges. These cartridges hold approval for:

- Dusts, fumes and mists with a TLV of 0.05 mg/m^3 or greater
- Asbestos containing dusts and mists
- Radon daughters and radionuclides
- Organic Vapors

6.5 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once daily or more frequently as indicated by increased breathing resistance or End of Service Life Indicator (ESLI). However, water saturation of the HEPA filter or extremely dusty conditions may necessitate more frequent changes. Changes will occur whenever personnel begin to experience increased breathing resistance, notice any unusual odor inside the respirator, or experience excessive heat generation in the cartridges.

6.6 INSPECTION AND CLEANING

Respirators will be inspected daily before use by the individual user(s) and will be checked periodically by the General Contractor's SSO. All respirators and associated equipment will be decontaminated, cleaned, and disinfected by the user after each shift using materials that will be provided on site.

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6.7 FIT TESTING

Annual respirator fit tests are required of all personnel wearing negative pressure respirators. Qualitative fit tests will utilize isoamyl acetate or irritant smoke. Fit tests must incorporate the style and size of respirator to be used. Additionally, a positive and negative pressure seal check shall be conducted each time any tight-fitting respirator is donned.

6.8 FACIAL HAIR

No personnel with facial hair that interferes with the respirator's sealing surface will be permitted to wear a respirator.

6.9 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses who also must don full-face respiratory protection, special spectacles designed for use with respirators will be provided. Eyeglasses rated as safety glasses (ANSI Approval Z87 displayed on frame) are acceptable provided they are fitted with rigid side shields.

6.10 MEDICAL CERTIFICATION

In accordance with the Respiratory Protection Standard and the General Contractor's Respiratory Protection Programs, only workers who have been certified by a physician as being physically capable of respirator use will be issued a respirator. Documentation of this approval will be maintained on site.

SECTION 7
DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

7.1 PERSONNEL DECONTAMINATION

Decontamination of personnel shall be accomplished to ensure that any material that they may have contacted in the exclusion zone is removed in the contamination reduction zone:

Step 1: Segregated equipment drop
Deposit equipment used on-site on plastic drop cloths or in containers with plastic liners.

Step 2: Overboot and glove wash
Scrub overboots and gloves with soap and water if visibly soiled.

Step 3: Overboot and glove rinse
Rinse boots and gloves with water.

Step 4: Outer glove removal
Remove outer gloves and deposit in container with plastic liner.

Step 5: Suit and boot removal
Remove Tyvek suit with assistance of helper or buddy as needed. Deposit in container with plastic liner. Pull off rubber boots.

Step 6: Respirator removal (Level C)
Remove respirator. Avoid touching face with gloves. Place respirator in wash basin.

Step 7: Inner glove removal (if used)
Remove inner gloves and dispose of in container with plastic liner.

Step 8: Wash
Wash hands, face, and neck before breaks and lunch.

All rinsates and dislodged soils and other potentially contaminated material will be added to stockpiles or directly to haul trucks for disposal.

7.2 EQUIPMENT DECONTAMINATION

Brushing and establishment of a track-out zone will suffice for decontamination of vehicles. No visible trackout will be permitted onto public roadways, and any visible tracked material must be removed at least twice daily through wet sweeping or use of a HEPA- filtered vacuum system. A separate decontamination pad will be established for the decontamination of all equipment leaving hazardous waste exclusion zones. The following steps will be performed sequentially:

Step 1: Gross Contamination Removal
Gross soil deposits will be removed manually from tracks, tires, drives, etc. using digging bars, scrapers, etc. before moving onto decontamination pad.

Step 2: Pressure Wash
All surfaces that cannot be sufficiently decontaminated manually and by track out buffer will be pressure washed with surfacted water to remove any remaining adhering contamination.

Step 3: Final water rinse
A final rinse is performed to remove dissolved contaminant, water, and surfactant residues.

7.3 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with hazardous materials will proceed to the contamination reduction zone and wash off the contamination. If chemical contact causes injury, the employee will remove clothing, shower, don clean clothing, and immediately be taken to the First Aid Station.

7.4 SANITATION / HYGIENE

Before any eating, smoking, or drinking, personnel will exit exclusion zones and wash hands, arms, neck, and face. Separate - sex sanitation facilities will be available in the support zone if ten or more employees are to be accommodated.

7.5 OTHER DECONTAMINATION PROCEDURES

All decontamination liquids and disposable clothing will be handled as contaminated waste and disposed of properly at the direction of the client.

SECTION 8
EXPOSURE MONITORING

Personal and ambient air monitoring will be conducted by Site Safety personnel as necessary in order to determine airborne contamination levels. Air sampling to ensure and document that exposure control measures in use are adequate to protect personnel against the contaminants present on site will be conducted in accordance with 8 CCR Sections 5155 and 5192.

Objective data (site characterization data and integrated aerosol measurements) may be used to document the lack of airborne hazard as long as dust control measures are implemented in accordance with Construction Safety Orders and this Plan and no odors or other indication of contaminant levels exceeding those anticipated are encountered.

Representative personal exposure (worker breathing zone) samples will be obtained for TCE for workers entering any excavations or other exclusion zones.

Perimeter air monitoring for dust during excavation and grading activities at the Site can be conducted at the Site by the Environmental Professional if requested by Google. The following procedures would be followed:

Prior to the beginning of excavation or grading activities, a windsock or anemometer will be used to monitor the wind direction at the Site

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and to help determine the location of monitors along the fence lines. Fence line dust monitoring will be conducted at three locations. Each monitor will be positioned within the breathing zone at approximately 5 feet above the ground level.

Perimeter dust monitoring will include the collection of air samples at one upwind location and two downwind locations. The monitoring will be performed using three DataRAM PDR-1000 particulate monitors. These meters log the detected airborne dust concentrations.

The particulate meters will be monitored to evaluate if excessive dust is migrating off-Site. Each time the meters are checked, the differences between the average upwind dust concentration and the average downwind concentration will be compared to the ambient air quality standard of 150 µg/m³ (8-hour average) for respirable dust. If this standard is exceeded, increased dust control measures will be implemented. The California Ambient Air Quality Standard for respirable particulate matter (PM10) is 50 $\mu g/m^3$ over an averaging time of 24 hours. Based on an 8-hour construction work day, 150 $\mu g/m^3$ over an averaging time of 8 hours will average 50 $\mu g/m^3$ over 24 hours (16 hours of non-activity). Significant concentrations are defined as exceeding 150 $\mu g/m^3$ over an averaging time of 8 hours

All personal and ambient sampling will be performed in accordance with either NIOSH/OSHA or EPA methods, and results will be shared with full crew at the next scheduled safety meeting.

Noise levels will be evaluated and safe (85 dBA or less) perimeters established for all operations and equipment. Dosimetry will be performed for non-routine job tasks and those requiring frequent transit of areas requiring hearing protection to determine requirements for these tasks.

All exposure monitoring records will be kept in the appendices of this Plan and made available to all employees and their designated representatives on request.

SECTION 9
EMERGENCY RESPONSE

Prior to start of field activities, the SSO shall plan emergency egress routes and discuss them with all personnel who will be conducting the field work. Initial planning includes establishing and posting of emergency warning signals and evacuation routes in case of an emergency.

9.1 EMERGENCY SERVICES

A tested system shall exist for rapid and clear distress communication. All personnel shall be provided concise and clear directions and accessible transportation to local emergency services. A map outlining directions to the nearest hospital will be posted on site.

The following emergency equipment shall be present on the site:

- Fire extinguishers
- Industrial first aid kit
- Portable eye washes, capable of supplying 15 minutes of water

9.2 EMERGENCY EVACUATION FROM EXCLUSION AND CONTAMINATION REDUCTION ZONES

Any personnel requiring emergency medical attention shall be evacuated immediately from exclusion and contamination reduction zones. Personnel shall not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an

essential part of life saving first aid. For others, decontamination may aggravate the injury or delay lifesaving treatment. If decontamination does not interfere with essential treatment, it should be performed.

If decontamination can be performed:
- Wash external clothing and cut it away.

If decontamination cannot be performed:
- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures.
- Send along site personnel familiar with the incident

9.3 FIRST AID

Only qualified personnel shall give first aid and stabilize an individual needing assistance. Life support techniques such as CPR and treatment of life threatening problems such as airway obstruction and shock will be given top priority. Professional medical assistance shall be obtained at the earliest possible opportunity.

At least two persons currently certified in first aid and CPR will be on Site at all times during Site activity. To provide first-line assistance to field personnel in the case of sickness or injury, the following items will be immediately available:

- First aid kit
- Portable emergency eye wash
- Supply of clean water

9.4 EMERGENCY ACTIONS

Only individuals with minor injuries requiring minor medical attention (beyond first aid provided at the job site) will be transported to the hospital in company vehicles. If actual or suspected serious injury occurs, these steps shall be followed:

- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Affected personnel will be decontaminated after critical first aid is give.
- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.
- Other personnel in the work area shall be evacuated to a safe distance until the site supervisor determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.
- Notify SSO and Project Manager of incident.
- Notify Cal/OSHA within 8 hours of serious injury or death.

9.5 GENERAL EVACUATION PLAN

In the general case of a large fire, explosion, or toxic vapor release, a site evacuation shall be ordered and shall follow these steps:

- Sound alarm (repeated long blast) and advise SSO and client representative.
- Evaluate the immediate situation and wind direction. All personnel will evacuate in the upwind or crosswind direction to the designated assembly area immediately outside the main gate. (Specific routes will depend on wind direction – check wind directions on site and choose route that will avoid areas downwind of any release.)
- All personnel will assemble in a designated upwind area when the situation permits, and a head count will be taken.
- Determine the extent of the problem.

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• Coordinate with emergency response personnel to dispatch or direct a response team in protective clothing and self-contained breathing apparatus on site to evacuate any missing personnel or to correct the problem. If no trained Emergency Response Team is available on site, the off site emergency response provider designated below will be summoned immediately and directed by SSO upon arrival.

9.6 EMERGENCY PHONE NUMBERS

Fire /Medical Emergency 911

Large Spill Response (800) 800-7472
Philip Services Corporation
60 22nd St # 688
Oakland, CA 94612

Cal/OSHA (Regional): (415) 703-5210

Environmental Representative:
Kurt Soenen, Cornerstone Earth Group, Inc.
Mobile: (408) 605-3037

Project CIH: Kevin Braun
Office (925) 455-6601
Mobile (925) 980-0568

The following personnel and contacts are to be determined:

Site Safety Officer/Project Manager

Superintendent

Client / Owner Representative

Medical Services (650) /940-7000
El Camino Hospital
2500 Grant Road
Mountain View, CA 94040

Note: Each contractor will have own designated Medical Service provider.

Spill Release: Office of Emergency Services
State O.E.S. (800) 852-7550
When calling for assistance from outside emergency responders, use the procedures for reporting emergencies as outlined in Section 9.7.

Directions to Hospital:
Leaving the Site, head East on Caribbean Drive. Merge onto Highway 237 West for 4.5 miles and continue onto Grant Road. Continue on Grant Rd for 1 mile, turn right onto North Drive. The hospital is on the left; follow signs for Emergency Department.

Note: Only those individuals with minor (non life-threatening) injuries are to be transported by project personnel. Emergency medical services will be summoned for all other injuries and illnesses.

9.7 STANDARD PROCEDURES FOR REPORTING EMERGENCIES

When calling for assistance in an emergency situation, the following information should be provided:

1. Call the appropriate emergency phone number (Posted on site; see above).

2. Provide the following information upon request:
• Name of person making the call.
• Telephone number at location of person making call.
• Name of person(s) exposed or injured.
• Nature of emergency.
• Actions already taken.

3. Remain on line until instructed by dispatch to hang up.

Note: When calling 911 from a cell phone, calls are routed through CHP central dispatch. Additional information regarding nature of emergency, appropriate response agency and measure, etc. may be required.

SECTION 10
TRAINING REQUIREMENTS

All workers using respiratory protection will be trained in accordance with 8 CCR 5144. All field employees engaged in Hazardous Waste Operations (as outlined in the Scope and Application of the HAZWOPER Standards; 29 CFR 1910.120 and 8 CCR 5192) take a training class and pass a written examination in compliance with Federal and State Hazardous Waste Operations and Emergency Response standards). (This is not anticipated for the listed activities absent EPA requirements.)

All personnel entering exclusion zones or other regulated areas will be trained in Hazard Awareness and Control and the provisions of this site Health and Safety Plan and will be required to sign the Health and Safety Plan Acknowledgement Page.

SECTION 11
MEDICAL SURVEILLANCE PROGRAM

All workers using respiratory protection will receive clearance by a Physician or Licensed Healthcare Practitioner (PLHCP) prior to such use.

All personnel working in areas where they may be exposed to any contaminant or combination of contaminants in concentrations at or above permissible exposure limits (without regard to use of respiratory protection) are required to participate in the Company's Medical Surveillance Program. This program is initiated when the employee starts work on the project with a complete physical and medical history and is continued as required. Other medical consultants will be retained if additional expertise is required.

Medical Surveillance Elements

Item	Initial	Annual
Medical History	X	X
Work History	X	X
Visual Acuity	X	X
Pulmonary Function *	X	X
Audiometry	X	X
Chest X-Ray	X	
Complete Blood Count	X	X
Blood Chemistry (SMAC)	X	X
Blood Lead / ZPP	X	X
Urinalysis	X	X
Dermatology Exam	X	X

* Pulmonary function test at discretion of physician after review of Pulmonary Fitness Questionnaire.

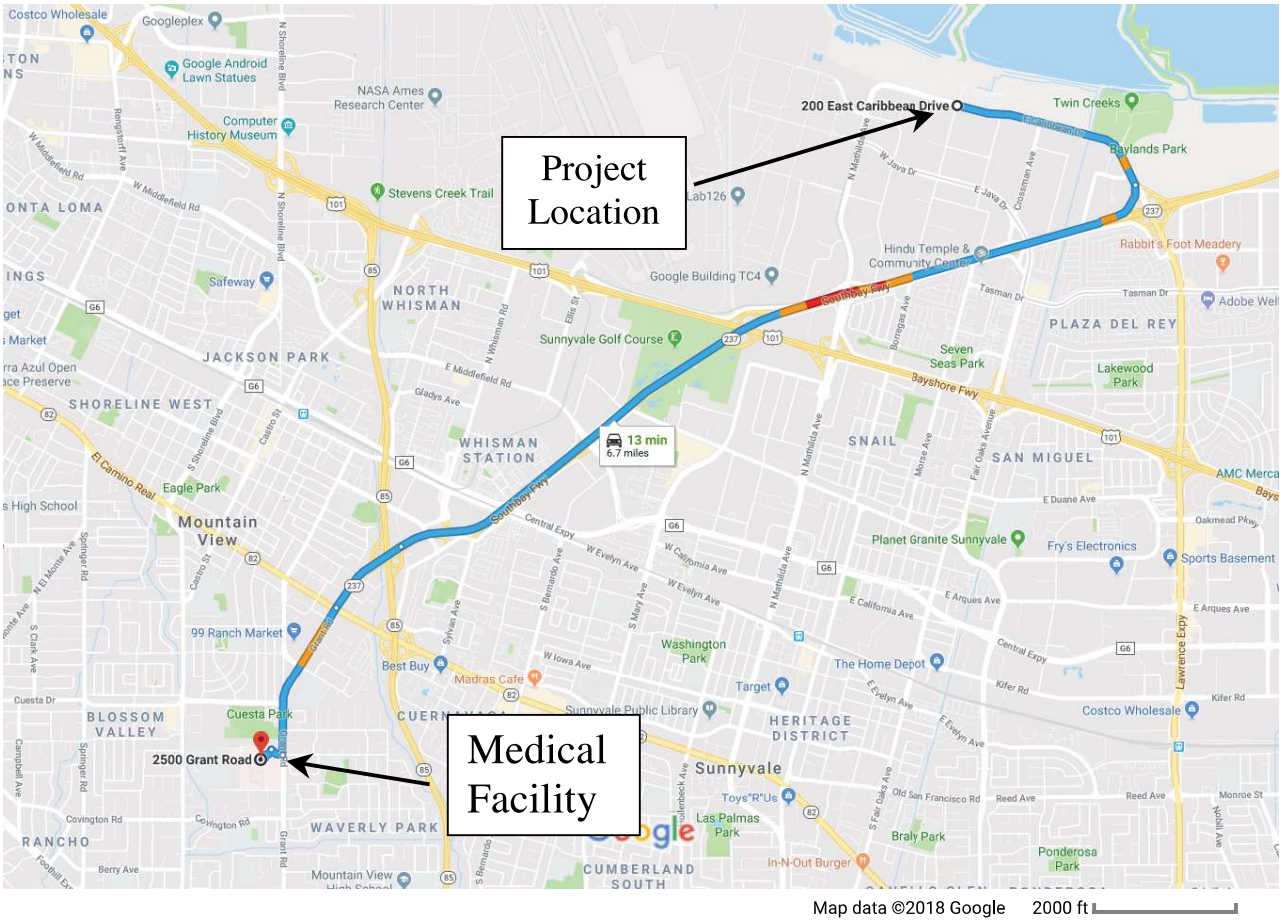
Figure 1:

Project Health and Safety Organization

To Be Determined

Figure 2: Hospital Directions

Google Maps 200 E Caribbean Dr, Sunnyvale, CA 94089 to 2500 Grant Rd, Mountain View, CA 94040 Drive 6.7 miles, 13 min



Health and Safety Plan Acknowledgement

I have read, understand, accept and will abide by all provisions of this Health and Safety Plan. I also agree to inform my supervisor and/or the Site Safety Officer of any conditions which are or appear to be unsafe.

Date	Time	Name (Print)	Signature

Rev. 1; July 2018. Information contained herein is proprietary and confidential and is to be used or released to others only with explicit permission of Cornerstone

APPENDIX A: CHANGES TO THIS HEALTH AND SAFETY PLAN

APPENDIX B: SAFETY INSPECTION REPORTS

APPENDIX C: EMPLOYEE EXPOSURE MONITORING RECORDS

APPENDIX D: OSHA LOG 300 SUMMARY

APPENDIX E: EMPLOYEE MEDICAL SURVEILLANCE AND IMMUNIZATION RECORDS

APPENDIX F: RESPIRATOR FIT TEST RECORDS

APPENDIX G: EMPLOYEE TRAINING RECORDS

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APPENDIX H: SAFETY MEETING FORMS

APPENDIX I: INCIDENT REPORTS

CORNERSTONE EARTH GROUP

APPENDIX C – SOIL DISPOSAL GUIDANCE

Rev. 7/2017
No. 99

gSAFE

Topic

EHS Process to Haul Soil Off Site (Americas)

Applicability

This guidance applies to soil that will leave the site.
This gSafe should only be used as a reference and not a definitive resource.
Contact EHS if you have any questions about the process.

All soil being shipped off site requires appropriate documentation and EHS approval.

Process for Project Executives, Project Managers and Designees

To ship potentially impacted soil off site to approved disposal facility, follow these steps:

1. Hire environmental consultant to sample soil (see soil sampling section below)
2. Have environmental consultant compare analytics to hazwaste criteria. Have them prepare a letter confirming the status - hazardous, state hazardous only, non-hazardous, clean fill
3. Seek a final disposal location and send the analytical results to the disposal location
4. Send the following to EHS for approval:
    a. Analytical results
    b. Letter from environmental consultant with status documenting the data and evaluation of the results
    c. Profile from landfill
    d. Scanned copy of manifest or non-haz manifest for soil off-haul (not required, but ensures the manifests will be signed when dropped off)
    e. Estimated volume (not required, but estimate speeds up the process)
5. Allow 3 days for review by EHS, once approved, drop off the manifest/non-haz manifest (BOL) and EHS will sign
6. Contractor ships soil off site with signed shipping documents
    a. Return shipping documents to EHS within 7 days
    b. Send weigh tickets to EHS, if applicable

To ship clean dirt off site to a residential, commercial, or reclamation site:

1. Conduct recommended sampling
2. A letter summarizing the analytical results, comparison to appropriate screening levels and an explanation as to why this soil is clean and appropriate for the proposed reuse should be prepared.
3. Submit this letter to EHS for approval.
4. Seek an appropriate site or sites for reuse and send this letter to them.
5. Destination needs to provide acceptance either with profile, letter or email. Provide this acceptance to EHS and summarize proposed documentation to document off haul.
6. After off haul approval from EHS, conduct off haul used approved documentation approach and submit these documents to EHS after off haul is completed. These documents should at a minimum include :
    a. Origination
    b. Destination
    c. Date
    d. Volume or truck loads

Soil sampling

Work with EHS and Environmental Consultant on required soil sampling. Representative samples from the stockpiled soil shall be collected. At minimum, soils must be screened for the following analytical criteria. Note that different laboratories can have very

different detection limits even using the same methods. Ensuring the detection limits are adequate for the purpose intended is an important step in selection of both method and laboratory. Based on the end-site requirements, additional testing may be required:

Analytical Parameter	Sampling Method
Metals	6020
Volatile Organic Compounds (VOCs)	8260B and 5035
Semi-volatile Organic Compounds (SVOCs)	8270
Petroleum Hydrocarbons (TPH-g/d/mo)	8015B
Polychlorinated Biphenyls (PCBs)	8082
Pesticides	8081
pH	9045C
Asbestos	Carb 435

EHS Needs to approve and sign all profiles and shipping docs

EHS will need to approve and sign:

- Hazardous Waste Manifest
- Non-hazardous waste shipping document / Bill of Lading (BOL)
- Profile with disposal site

EHS will use the analytical data to determine if the soils meet Federal and State (California) Hazardous Waste Criteria and disposal site criteria. EHS will help determine soil generator, if applicable. All soil shipping documents (BOL and manifests) must be sent to EHS for final records retention. EHS will handle the regulatory management of the manifests.

Contact EHS ehs-env@google.com with questions.

Standard soil ownership (lease may confirm otherwise):

- Google owned = Google waste
- Google operated (full service = owner 100% responsible) = LL waste
- Google operated (triple net = vendor 100% responsible) = Google waste
- Superfund site = contact EHS

Questions

Learn more @ go/safety

Questions? ehs-env@

Appendix H-2

Geotracker Search

GEOTRACKER

Sites and Facilities - INFO

Cleanup Sites

- [x] LUST Cleanup Sites
- [x] Cleanup Program Sites
- [x] Military Cleanup Sites
- [x] DTSC Cleanup Sites

Permitted Facilities

- [x] Waste Discharge Requirements (WDR) Sites
- [ ] Permitted USTs - INFO
- [ ] DTSC Hazardous Waste Sites
- [ ] Land Disposal Sites
- [x] Irrigated Lands Regulatory Program Sites
- [ ] Oil / Gas Sites
- [x] Confined Animal Sites

Other Sites

- [ ] Project Sites
- [ ] Non-Case Information Sites
- [ ] Sampling Points - Public
- [ ] Field Points

☒ SIGNIFIES A CLOSED SITE

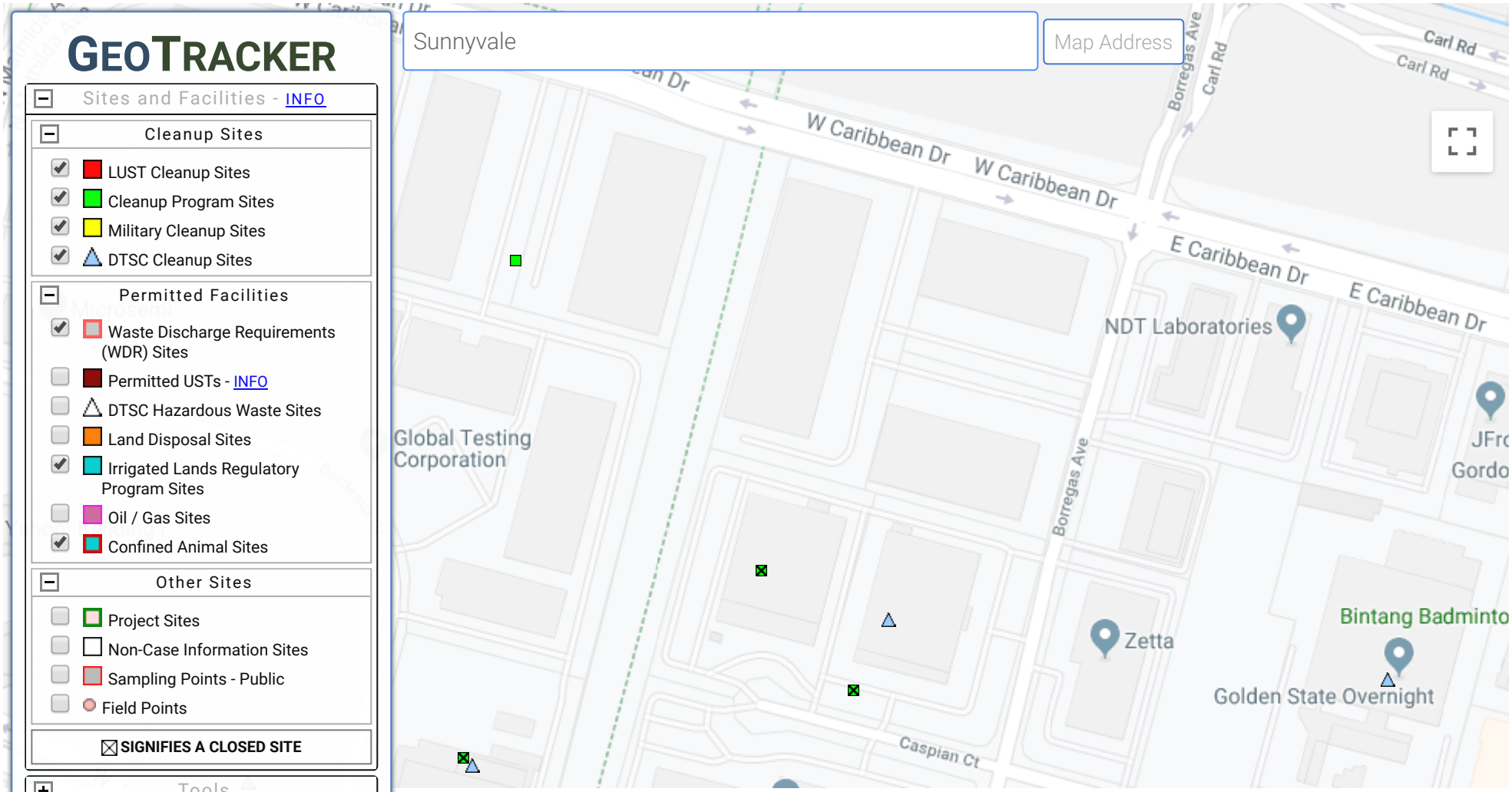
Tools

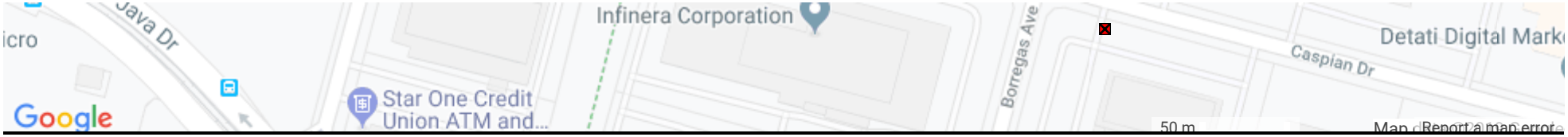
Map Coverages

TAKE A TOUR VIEW ON GAMA

Sunnyvale

Map Address





SITES CURRENTLY VISIBLE ON MAP

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
ENVIROSTOR

A C BALL COMPANY (80001626)

SIGN UP FOR EMAIL ALERTS

141 CASPIAN COURT
SUNNYVALE, CA 940860000
SANTA CLARA COUNTY
SITE TYPE: CORRECTIVE ACTION

OFFICE: CLEANUP BERKELEY
CENSUS TRACT: 6085504602
CALENVIROSCREEN PERCENTILE SCORE: 81-85%

Summary | Activities | Site/Facility Docs | Sub-Areas | Map | Related Sites | CalEnviroScreen | Permitting

Site Information

CLEANUP STATUS
REFER: RWQCB AS OF 5/16/1991

SITE TYPE: CORRECTIVE ACTION
NATIONAL PRIORITIES LIST: NO
ACRES: 0 ACRES
APN: 110-26-031
CLEANUP OVERSIGHT AGENCIES:
RWQCB 2 - SAN FRANCISCO BAY - LEAD AGENCY

ENVIROSTOR ID: 80001626
SITE CODE:
SPECIAL PROGRAM:
FUNDING:
ASSEMBLY DISTRICT: 24
SENATE DISTRICT: 13

Regulatory Profile

PAST USE(S) THAT CAUSED CONTAMINATION
NONE SPECIFIED

POTENTIAL CONTAMINANTS OF CONCERN
NONE SPECIFIED

POTENTIAL MEDIA AFFECTED
NONE SPECIFIED

Site History

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1.011719 seconds

STATE WATER RESOURCES CONTROL BOARD
GEOTRACKER

AC BALL MENLO CASPIAN (T0608591628) - (MAP)

SIGN UP FOR EMAIL ALERTS

141 CASPIAN CT
SUNNYVALE, CA 94089
SANTA CLARA COUNTY
CLEANUP PROGRAM SITE (INFO)
ASSOCIATED ENVIROSTOR PROJECTS
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
SAN FRANCISCO BAY RWQCB (REGION 2) *(LEAD)* - *CASE #: 43S0265*
CASEWORKER: ***Regional Water Board***
SANTA CLARA VALLEY WATER DISTRICT

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | Site Maps / Documents | Community Involvement | *Related Cases*

Regulatory Profile

PRINTABLE CASE SUMMARY

CLEANUP STATUS - DEFINITIONS
COMPLETED - CASE CLOSED AS OF 2/18/2004 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
1300216

POTENTIAL MEDIA OF CONCERN
OTHER GROUNDWATER (USES OTHER THAN DRINKING WATER)

FILE LOCATION

DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC

DWR GROUNDWATER SUB-BASIN NAME
Santa Clara Valley - Santa Clara (2-009.02)

CALWATER WATERSHED NAME
Santa Clara - Palo Alto (205.50)

Site History

No site history available

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STATE WATER RESOURCES CONTROL BOARD
GEOTRACKER

ESL/AC BALL/COURSON CO. (T0608501788) - (MAP)

SIGN UP FOR EMAIL ALERTS

141 CASPIAN COURT
SUNNYVALE, CA 94089
SANTA CLARA COUNTY
CLEANUP PROGRAM SITE (INFO)
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
SAN FRANCISCO BAY RWQCB (REGION 2) *(LEAD)* - *CASE #: 14-375*
CASEWORKER: *Regional Water Board*
SANTA CLARA COUNTY LOP - *CASE #: 06S1W18F01f*

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | Site Maps / Documents | Community Involvement | *Related Cases*

Regulatory Profile

PRINTABLE CASE SUMMARY

CLEANUP STATUS - DEFINITIONS
COMPLETED - CASE CLOSED AS OF 12/15/2004 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
WASTE OIL / MOTOR / HYDRAULIC / LUBRICATING

POTENTIAL MEDIA OF CONCERN
OTHER GROUNDWATER (USES OTHER THAN DRINKING WATER)

FILE LOCATION
ALL FILES ARE ON GEOTRACKER OR IN THE LOCAL AGENCY DATABASE

DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC

DWR GROUNDWATER SUB-BASIN NAME
Santa Clara Valley - Santa Clara (2-009.02)

CALWATER WATERSHED NAME
Santa Clara - Palo Alto (205.50)

Site History

No site history available

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STATE WATER RESOURCES CONTROL BOARD
GEOTRACKER

GOOGLE CARIBBEAN CAMPUS (T10000011817) - (MAP)

SIGN UP FOR EMAIL ALERTS

100/200 CARIBBEAN DR.
SUNNYVALE, CA 94089
SANTA CLARA COUNTY
CLEANUP PROGRAM SITE (INFO)
PRINTABLE CASE SUMMARY / CSM REPORT

CLEANUP OVERSIGHT AGENCIES
SANTA CLARA COUNTY LOP *(LEAD)* - *CASE #: 2018-20s*
CASEWORKER: ***AARON COSTA***

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | Site Maps / Documents | Community Involvement | *Related Cases*

Regulatory Profile

PRINTABLE CASE SUMMARY

CLEANUP STATUS - DEFINITIONS
OPEN - VERIFICATION MONITORING AS OF 3/11/2019 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN
1,4-DIOXANE, DICHLOROETHANE (DCA), DICHLOROETHENE (DCE), TETRACHLOROETHYLENE (PCE), TRICHLOROETHYLENE (TCE), VINYL CHLORIDE

POTENTIAL MEDIA OF CONCERN
OTHER GROUNDWATER (USES OTHER THAN DRINKING WATER), SOIL, SOIL VAPOR

FILE LOCATION
ALL FILES ARE ON GEOTRACKER OR IN THE LOCAL AGENCY DATABASE

DESIGNATED GROUNDWATER BENEFICIAL USE(S) - DEFINITIONS
MUN, AGR, IND, PROC

DWR GROUNDWATER SUB-BASIN NAME
Santa Clara Valley - Santa Clara (2-009.02)

CALWATER WATERSHED NAME
Santa Clara - Palo Alto (205.50)

Deed Restrictions / Land Use Restrictions / Covenants

DATE RECORDED	SITE MANAGEMENT REQUIREMENTS
3/13/2019	ACTIVITIES PROHIBITED WHICH DISTURB THE REMEDY AND MONITORING SYSTEMS WITHOUT APPROVAL, LAND USE COVENANT, RESIDENCE USE PROHIBITED

Post Closure Site Management Requirements

ACTIVITIES PROHIBITED WHICH DISTURB THE REMEDY AND MONITORING SYSTEMS WITHOUT APPROVAL
LAND USE COVENANT
RESIDENCE USE PROHIBITED

Site History

The site is bound by West Caribbean Dr. and the Sunnyvale landfill to the north, Borregas Ave. and commercial developments to the east, Caspain Ct. and commercial development to the south and Bordeaux Dr. and undeveloped land to the southwest, and office buildings to the west. The site was historically used for agricultural purposes until the late 1970s when the existing commercial buildings were constructed. Several tenants have occupied the properties with various uses including research and development, warehouse and storage, and light

industrial. One tenant, A.C. Ball Company used VOCs in their operations. A Site Cleanup Case was overseen by the Regional Water Quality Control Board and closed in 2004 with residual contamination remaining beneath the site.

A commercial development is planned for these properties which includes a 5-story building with approximately 536,750 square feet of office space at 100 Caribbean and a 5-story building with approximately 505,140 square feet of office space at 200 Caribbean. A Site Management Plan will be implemented to protect human health and the environment during the development project.

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Appendix H-3

Imported Soil Reuse Approval Letter

County of Santa Clara
Department of Environmental Health

Hazardous Materials Compliance Division
Site Mitigation Program
1555 Berger Drive, Suite 300
San Jose, CA 95112-2716
(408) 918-3400 FAX (408) 280-6479

Jun 4, 2019

SENT VIA ELECTRONIC MAIL ONLY

Google LLC
c/o Mr. Jeff Holzman
jholzman@google.com

Re: **Site Cleanup Program: Google Caribbean Campus, 100/200 Caribbean Dr., Sunnyvale, CA**
APNs: 110-26-020, -021, -022, -023, -025, -027, -028, -029, -030, -031
Case No. 2018-20s

Dear Mr. Holzman:

The Department of Environmental Health (DEH) has reviewed the two Soil Import Request letters from Cornerstone Earth Group (Cornerstone) and dated May 14, 2019. The Soil Import Request letters provide an evaluation of the suitability of soil originating from two different construction sites in Santa Clara County.

Soil Source 1 – 2200 Lawson Lane, Santa Clara

- A soil excavation to an approximate depth of 30 feet below current grade is required as part of the construction of a subsurface parking garage at this site.
- Soils between current grade and 10 feet below current grade (0-10 feet) are not suitable for import material at the Google Caribbean Campus.
- Soils from depths below 10 feet of current grade (10-30 feet) are proposed for import material at the Google Caribbean Campus. Cornerstone estimates approximately 15,500 cubic feet of soil will be used as import soil for the Google Caribbean Campus project.

SOIL SOURCE 1 APPROVAL CONDITIONS

1. The DEH approves soils from depths below 10 feet of current grade (10-30 feet) at Soil Source 1 as import material at the Google Caribbean Campus.
2. It is the responsibility of the party receiving the imported soil (Google) to verify that the soil received from Soil Source 1 meets the criteria described in the Soil Import Request letter and is suitable for reuse.
3. You are required to submit an Imported Fill Verification Letter to the DEH once the soil from Soil Source 1 has been received.

Board of Supervisors: Cindy Chavez, Mike Wasserman, Dave Cortese, Susan Ellenberg, S. Joseph Simitian
County Executive: Jeffrey V. Smith

4. This approval does not replace any of the Site Management Plan approval conditions for the 2200 Lawson Lane project (DEH Case No. 2018-34s).

Soil Source 2 – 333 West San Fernando Street, San Jose

- A soil excavation to an approximate depth of 28 feet below current grade is required as part of the construction of a subsurface parking garage at this site.

- Fill soils are currently present on the site between depths ranging from 2 and 7.5 feet below current grade (0-7.5 feet). These fill soils (non-native) are not suitable for import material at the Google Caribbean Campus.

- Native soils below the fill soils are proposed for import material at the Google Caribbean Campus.

SOIL SOURCE 2 APPROVAL CONDITIONS

1. The DEH approves soils from a depth of at least 1 foot below native soils at Soil Source 2 as import material at the Google Caribbean Campus.

2. It is the responsibility of the party receiving the imported soil (Google) to verify that the soil received from Soil Source 2 meets the criteria described in the Soil Import Request letter and is suitable for reuse.

3. You are required to submit an Imported Fill Verification Letter to the DEH once the soil from Soil Source 2 has been received.

4. This approval does not replace any of the Site Management Plan approval conditions for the 333 West San Fernando Street project (DEH Case No. 2018-27s).

TECHNICAL REPORT REQUIREMENT

Please submit the following documents and/or technical reports to DEH via GeoTracker according to the following schedule:

Imported Fill Verification Letters **No Later Than December 27, 2019**

Reports are required pursuant to our authority under Section 101480 of the California Health and Safety Code. Each report shall include conclusions and recommendations for the next phases of work required to protect water resources, human health and safety, and the environment at the site. We require that all work be performed in a prompt and timely manner. Revisions to the schedule shall be requested at least two (2) weeks prior to the due date in writing with appropriate justification for the anticipated delays and a proposed revised schedule.

The California Business and Professions Code (Sections 6735, 7835, and 7835.1) require that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments must be performed under the direction of an appropriately registered or certified professional.

ELECTRONICAL SUBMITTAL OF INFORMATION (ESI) REQUIREMENT

As indicated in the Remedial Action Agreement you are required to submit to the State Water Resources Control Board GeoTracker database over the internet, laboratory data (EDF), reports, surveyed elevations of permanent monitoring wells, in addition to other data. Your case will not be closed prior to completion of this requirement.

Please refer to the following regulation for a listing of all required submittals:
https://www.waterboards.ca.gov/ust/electronic_submittal/docs/text_regs.pdf

If you have any questions, please contact me at (408) 918-1954 or via email.

Sincerely,

Aaron Costa
Senior Hazardous Materials Specialist
Site Mitigation Program
aaron.costa@cep.sccgov.org

cc: Travis Flora, DEH, travis.flora@cep.sccgov.org
Peter McDonnell, pmcdonnell@google.com
Ron Helm, Cornerstone, rhelm@cornerstoneearth.com
Kurt Soenen, Cornerstone, ksoenen@cornerstoneearth.com
James Dunn, PES Environmental, jdunn@pesenv.com
Justina Hyland, Adobe, jhyland@adobe.com
Peter Tsai, Sobrato, ptsai@sobrato.com
Ryan Kuchenig, City of Sunnyvale Planning, rkuchenig@sunnyvale.ca.gov

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Appendix H-4

Vapor Management Plan and SCDEH Approval Letter

County of Santa Clara
Department of Environmental Health

Hazardous Materials Compliance Division
Site Mitigation Program
1555 Berger Drive, Suite 300
San Jose, CA 95112-2716
(408) 918-3400 FAX (408) 280-6479

October 25, 2019

SENT VIA ELECTRONIC MAIL ONLY

Google LLC
c/o Mr. Jeff Holzman
jholzman@google.com

Re: Site Cleanup Program Case No. 2018-20s – Google Caribbean Campus
100/200 Caribbean Dr., Sunnyvale, CA

Dear Mr. Holzman:

The Department of Environmental Health (DEH) has reviewed the *Vapor Mitigation Plan* (VMP) prepared by Cornerstone Earth Group (Cornerstone) and dated July 20, 2019. The VMP includes details and design of two Vapor Intrusion Mitigation Systems (VIMS), Construction Quality Assurance (CQA) protocols for the VIMS installation, and Operation Maintenance and Monitoring (OM&M) protocols for the management and performance of the VIMS.

BACKGROUND

The proposed development is comprised of ten properties across approximately 40 acres. The DEH understands the proposed development plan includes demolition of all existing buildings and structures for construction of two five-story Class A office buildings (100 Caribbean and 200 Caribbean) and a four-story open-air parking garage. The ten properties will be consolidated into two properties subsequent to construction.

Due to the groundwater and soil vapor contamination beneath the "100 Caribbean" properties, the DEH requires a VIMS to be installed during development to reduce the potential for vapor intrusion.

The DEH does not require a VIMS to be installed beneath the "200 Caribbean" building since the location of the proposed building is not in an area of elevated groundwater and soil vapor contamination. Although the DEH does not require a VIMS at 200 Caribbean, Google will be installing a VIMS voluntarily as a greater level of protection to future occupants. Since the VIMS at 200 Caribbean will be installed voluntarily, the DEH will not comment on the VIMS design, CQA, and OM&M at that location.

100 CARIBBEAN VMP

The DEH conditionally approves the VMP and accepts the VIMS design for the 100 Caribbean building provided all of the following comments and conditions are met.

Board of Supervisors: Cindy Chavez, Mike Wasserman, Dave Cortese, Susan Ellenberg, S. Joseph Simitian
County Executive: Jeffrey V. Smith

The proposed VIMS design for 100 Caribbean as described in the VMP shall be included with the final building design plans submitted to the City of Sunnyvale. The City of Sunnyvale is the lead agency responsible for approving the final building design plans, including the proposed VIMS design. Please submit documentation of City approval of the final VIMS design plans for 100 Caribbean to the DEH prior to installation of the VIMS.

POST CONSTRUCTION MONITORING

Post construction monitoring is required at the 100 Caribbean building only. A minimum of five post-construction soil vapor and indoor air monitoring events shall be performed to confirm the operational effectiveness of the VIMS. After Sampling Event 5, the DEH will determine if additional sampling shall be required. The five sampling events are described below.

1. Sampling Events 1 and 2 – Sampling to take place after the building at 100 Caribbean is complete, but before occupancy in accordance with Sections 6.1.3 and 6.1.4 of the VMP. Soil gas, indoor air, and ambient air samples shall be collected at the same time. Indoor air samples shall be collected over two 24-hour sampling periods: one with the HVAC system on and one with the HVAC system off. The results shall be included in a Pre-Occupancy Verification Monitoring Report, which must be approved in writing by the DEH before the buildings are occupied.

2. Sampling Events 3 and 4 – Sampling to take place 6 and 12 months after the buildings are occupied. The results shall be included in the Post-Occupancy Verification Monitoring Report (1-Year Event). Soil gas, indoor air, and ambient air samples shall be collected at the same time.

3. Sampling Event 5 – Sampling to take place 1 year after Sampling Event 4. The results shall be included in the Post-Occupancy Verification Monitoring Report (2-Year Event). Soil gas, indoor air, and ambient air samples shall be collected at the same time.

100 CARIBBEAN PRE-OCCUPANCY SUBMITTALS

After construction is complete (including VIMS installation), but before the building is occupied, the following documents shall be submitted to the DEH.

1. **VIMS Installation Report** - The VIMS Installation Report shall include the items listed below, at minimum.

    - Final as-built drawings, specifications, and photo documentation of the VIMS installation.
    - Construction observation, integrity and thickness testing and certification records.
    - Documentation of trench dam installations and dry-conduit sealants.
    - Summary of deviations from the VMP.

2. **Pre-Occupancy Verification Monitoring Report**. This report shall include the results of Sampling Events 1 and 2.

The VIMS Completion Report and Pre-Occupancy Verification Monitoring Report may be submitted separately or together as one report. Both reports must be approved by the DEH in writing before the 100 Caribbean building is occupied.

100 CARIBBEAN POST-OCCUPANCY SUBMITTALS

After the buildings are occupied, Post-Occupancy Verification Monitoring Reports shall be submitted to the DEH after the 1-year and 2-year monitoring events as described above. Results of the monitoring events shall be compared to Environmental Screening Levels (ESLs) applicable at the time of the evaluation. If indoor air concentrations exceed screening criteria, the DEH shall be notified as soon as possible and no later than 14 days after the analytical work is complete.

A Deed Restriction/Environmental Covenant shall be filed for the 100 Caribbean property with the County of Santa Clara Clerk Recorder within 3 months of building occupancy. A copy of the filing receipt and the fully executed deed restriction shall be provided to the DEH. The deed restriction shall include the items listed below.

- State that actions which damage the VIMS are prohibited.
- State that if the VIMS is damaged, the DEH must be notified and the VIMS shall be repaired.
- Include a fact sheet describing the environmental site conditions and the technical purpose of the VIMS.
- Include a copy of the OM&M Plan.

TECHNICAL REPORT REQUIREMENT

Please submit the following documents and/or technical reports to DEH via GeoTracker according to the following schedule:

VIMS Installation Report	**Prior to building occupancy, and no later than October 25, 2020**
Pre-Occupancy Verification Monitoring Report	**Prior to building occupancy, and no later than October 25, 2020**
Deed Restriction/Environmental Covenant	**Within 3 months of building occupancy**

Reports are required pursuant to our authority under Section 101480 of the California Health and Safety Code. Each report shall include conclusions and recommendations for the next phases of work required to protect water resources, human health and safety, and the environment at the site. We require that all work be performed in a prompt and timely manner. Revisions to the schedule shall be requested at least two (2) weeks prior to the due date in writing with appropriate justification for the anticipated delays and a proposed revised schedule.

The California Business and Professions Code (Sections 6735, 7835, and 7835.1) require that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments must be performed under the direction of an appropriately registered or certified professional.

ELECTRONIC SUBMITTAL OF INFORMATION (ESI) REQUIREMENT

As indicated in the Remedial Action Agreement you are required to submit to the State Water Resources Control Board GeoTracker database over the internet, laboratory data (EDF), reports, surveyed elevations of permanent monitoring wells, in addition to other data. Your case will not be closed prior to completion of this requirement.

Please refer to the following regulation for a listing of all required submittals:
https://www.waterboards.ca.gov/ust/electronic_submittal/docs/text_regs.pdf

If you have any questions, please contact me at (408) 918-1954 or via email.

Sincerely,

Digitally signed by Aaron Costa
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CORNERSTONE EARTH GROUP

Type of Services	**Vapor Mitigation Plan**
Location	**Caribbean Campus Development** **West Caribbean Drive and Borregas Avenue** **Sunnyvale, California**
Client	**Google LLC**
Client Address	**1600 Amphitheatre Parkway** **Mountain View, California 94043**
Project Number	**678-3-2**
Date	**July 30, 2019**

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CORNERSTONE EARTH GROUP

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CORNERSTONE EARTH GROUP

Type of Services	**Vapor Mitigation Plan**
Location	**Caribbean Office Campus Development** **West Caribbean Drive and Borregas Avenue** **Sunnyvale, California**

SECTION 1: INTRODUCTION

On behalf of Google LLC (Google), Cornerstone Earth Group, Inc. (Cornerstone) has prepared this Vapor Mitigation Plan (VMP) for the planned commercial development at the Caribbean Campus in Sunnyvale, California (Site) as shown on Figures 1 and 2. This VMP presents the measures that will be implemented at the Site to effectively eliminate vapor intrusion concerns into the planned 5-story office buildings. It contains the following:

- Description of the vapor intrusion mitigation system (VIMS) design components and operation;
- Construction quality control measures to help confirm the VIMS is installed in accordance with the design documents;
- Performance monitoring and measurements to help demonstrate that the VIMS is functioning properly and is effective in helping to prevent vapor intrusion concerns;
- Criteria for conversion to an alternate active sub-slab ventilation (SSV) or depressurization (SSD) system;
- Description of VIMS design components and operation for an active SSV/SSD system, if needed.

1.1 SITE DESCRIPTION

The combined area of the Caribbean Campus is approximately 40-acres and consists of 10 parcels developed with 13 commercial buildings. The Sunnyvale West Channel bisects the Site separating the 100 Caribbean Campus (referred to as 100 Caribbean) from the 200 Caribbean Campus (referred to as 200 Caribbean). Tables 1 and 2 describes the physical location of the parcels.

TABLE 1. SITE PROPERTIES – 100 CARIBBEAN

Reported Address/Location	Assessor's Parcel No. (APN)	Approximate Lot Size (acres)	Existing Building Footprint (approx. square feet)
140-146 West Caribbean Drive	110-26-027	4.50	90,000
141 Caspian Court	110-26-031	3.63	57,344
1325 Borregas Avenue	110-26-030	3.61	50,000
1383 Borregas Avenue	110-26-029	2.63	50,880
1393-1395 Borregas Avenue	110-26-028	2.88	50,880

TABLE 2. SITE PROPERTIES – 200 CARIBBEAN

Reported Address/Location	Assessor's Parcel No. (APN)	Approximate Lot Size (acres)	Existing Building Footprint (approx. square feet)
360-364 West Caribbean Drive	110-26-023	3.49	72,000
370-376 West Caribbean Drive	110-26-022	2.91	54,000
380-384 West Caribbean Drive	110-26-021	2.95	54,000
390-394 West Caribbean Drive	110-26-020	4.58	86,000
1330-1338 Bordeaux Drive	110-26-025	9.26	25,200
1340-1346 Bordeaux Drive			50,400
1350 Bordeaux Drive			34,500
1360-1368 Bordeaux Drive			25,200

1.2 REDEVELOPMENT PLAN

Google plans to demolish the buildings and redevelop the Site with Class A office space. The planned five-story building at 100 Caribbean will consist of approximately 536,750 square feet of office space with a ground floor footprint of approximately 207,828 square feet. For 200 Caribbean, the planned 5-story, approximately 505,140 square foot building will have a ground floor footprint of approximately 187,356 square feet. The Caribbean campus office buildings have a unique design with the stepped, sloped green roofs and facades with fixed geometrically intricate shading devices. A four level, 371,034 square foot parking garage (referred to as 400 Caribbean) and attached 79,200 square foot structure (referred to as 300 Caribbean) will also be constructed on the Caribbean Campus to support the completed development. The ground floor of the parking garage and attached structure will be at street grade and will consist of vehicle parking except for the main electrical room in the southwest corner of the building. Conceptual development plans are included in Figures 2A, 2B, and 2C.

The planned development for the office buildings includes the construction of deep foundations. Auger cast pressure grouted displacement (APGD) piles will be used to help eliminate the potential for downward migration of contaminated groundwater. This pile type has become more common in the Bay Area; they are a proven foundation element where a deep foundation is required. Benefits of APGD piles include the ability to penetrate dense layers, with low noise and vibration during installation as compared to driven pile types. In addition, APGD piles provide several advantages for sites with subsurface contamination, such as the minimal generation of soil spoils and mitigation of the potential for vertical migration of contamination.

APGD piles will be installed on a maximum approximately 35-foot centers, capped with concrete (referred to as a “pile cap”) and interconnected by a series of grade beams. The elevation of the top of the pile cap generally will coincide with the top of the grade beams. Gravel will be placed between the grade beams and an approximately 6-inch thick slab will be poured that will be tied into the grade beams. The thickened slab sections at the grade beams will create a waffle-like foundation system that will create dead zones for air flow communication from one gravel zone to another.

The finished floor slab elevation will be at 12 feet mean sea level (msl) with the structural slab in the northern approximate one-third of each building depressed by approximately 32 inches. Based on average existing Site grades of elevation 4 to 5 feet msl, the surface elevation beneath the planned buildings will be raised by approximately 4½ to 7 feet. Approximately 200,000 cubic yards of “clean” soil will be imported to raise Site grades.

Google is working in partnership with the Santa Clara Valley Water District (SCVWD) to enhance a portion of the Sunnyvale West Channel between West Caribbean Drive and Caspian Court in Sunnyvale as a part of the larger Sunnyvale East and West Channels Protection Flood Project. The planned improvements on the SCVWD’s parcel will include reconfiguring the channel geometry, widening the channel, creating wetland and riparian habitats, multi-use path and maintenance access, and transitional landscape areas along the channel. There will also be two bridges over the channel to meet emergency vehicle access requirements.

1.3 REGULATORY STATUS

Google has obtained regulatory oversight from the Santa Clara County Department of Environmental Health (DEH) under a Remedial Action Agreement (July 17, 2018). Cornerstone prepared a Site Management Plan (SMP, February 14, 2019) for the development that was reviewed and approved by DEH (March 13, 2019).

This VMP will be submitted to the DEH to obtain their written approval prior to initiating construction activities.

SECTION 2: BACKGROUND

In 2017, Cornerstone performed separate Phase II Soil, Soil Vapor, and Groundwater Quality Evaluations at 200 Caribbean (Cornerstone, 2018a) and 100 Caribbean (Cornerstone, 2018b). A discussion of these reports was included the DEH-approved SMP and is summarized below.

2.1 PRIOR STUDIES – CORNERSTONE PHASE II INVESTIGATION

During Cornerstone's 2017 investigations, soil, soil vapor and groundwater sampling were performed to help evaluate potential impacts from reported off-Site[1] and on-Site[2] volatile organic compound (VOC) releases, and from unidentified regional VOC groundwater contamination[3].

2.1.1 Groundwater

The approximate lateral extent of VOC-impacted groundwater exceeding Maximum Contaminant Levels (MCLs) is shown on Figure 3.

At 200 Caribbean, laboratory analyses of the grab groundwater samples detected VOCs above laboratory reporting limits in 7 of 19 samples. The occurrence of VOCs in these seven groundwater samples is likely attributed to the VOC-impacted groundwater that has migrated beneath the Site from the Lockheed groundwater contaminant plume and/or releases associated with the on-Site former A.C. Ball Company (located at 100 Caribbean).

At 100 Caribbean, laboratory analyses of the grab groundwater samples detected VOCs above laboratory reporting limits in 15 of 17 samples. Perchloroethene (PCE), TCE, and 1,1-dichloroethene (DCE) were detected with the greatest frequency and concentration. Other VOCs with a lower frequency of detection that also exceeded MCLs included 1,2-dichlorothane (DCA), 1,1-DCA, 1,4-dioxane, cis-1,2-DCE, and vinyl chloride.

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[1] The Site is located adjacent to the approximately 560-acre Lockheed Martin Space Systems Company Plant One Facility (Lockheed). Since approximately 1988, several environmental investigations and remedial efforts have been completed at Lockheed. These investigations were performed under the regulatory oversight of the San Francisco Bay Regional Water Quality Control Board (Water Board) due to the reported releases of VOCs, hexavalent chromium, and nitrates that have impacted soil and groundwater quality. Groundwater monitoring and remediation is ongoing. A groundwater extraction system designed to contain and remove contaminants of concern in the first and second water-bearing zones has operated at Lockheed since 1992. Additionally, an in-situ bioremediation (ISBR) pilot system has been operating since 2009 in the deeper water-bearing zones near the Lockheed source area at Building 182, located approximately 0.3 miles southwest of 200 Caribbean. Trichloroethene (TCE) is the tprimary contaminant of concern that extends beyond the Lockheed property and onto the northwest portion of 200 Caribbean.

[2] A.C. Ball Company, a Department of Defense specialty contractor, formerly occupied the 141 Caspian Court Site building from 1978 to 1982. During A.C. Ball Company's occupancy of Site building 141 Caspian Court, volatile organic compounds (VOCs) were released to soil and groundwater as a result of leaking underground solvent storage tanks. Under the regulatory oversight of the San Francisco Bay Regional Water Quality Control Board (Water Board), the underground storage tanks (USTs) were removed in 1987 along with some impacted soil. A dual phase extraction system was installed that operated until November 1996. The system extracted approximately 11 million gallons of groundwater, 40 million cubic feet of soil gas, and 130 pounds of VOCs. During the last groundwater monitoring event in 2002, maximum VOC concentrations in groundwater were 10 micrograms per liter (µg/L) for perchloroethene (PCE), 42 µg/L for trichloroethene (TCE), 69 µg/L for 1,1,1-trichloroethane (TCA), 190 µg/L for 1,1-dichloroethane (DCA), 17 µg/L for 1,2-dichloroethene (DCE), and 22 µg/L for 1,4-dioxane. The case was closed by the Water Board in their letter dated December 15, 2004.

[3] The Site is located in an area of regional VOC groundwater contamination from unknown sources. Regulatory agencies have not yet identified a responsible party for the regional contamination. Prior studies have been performed at several properties to help demonstrate these properties are not a potential source of the VOC contamination and the VOCs detected in shallow groundwater are reportedly associated with up-gradient sources of contamination.

2.1.2 Soil Vapor

The approximate lateral extent of VOC-impacted soil vapor exceeding commercial ESLs is shown on Figure 4.

Laboratory analyses of the soil vapor samples collected from 38 temporary vapor probes installed at the Site detected similar VOCs as were detected in the paired groundwater data. The greatest concentrations and extent of impact appears associated with 100 Caribbean due to historical on-Site releases from the former A.C. Ball Company. PCE, TCE and their breakdown products including, but not limited to, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, and/or vinyl chloride were detected in vapor samples collected from 15 of 17 probes installed at 100 Caribbean. These VOCs were detected in the 15 soil vapor samples at concentrations that exceed commercial Environmental Screening Levels (ESLs) established by the Water Board using attenuation factors of 1/1000 (February 2016 ESLs) and 1/30 (February 2019 ESLs). The lateral extent of soil vapor impacts exceeding commercial ESLs published in 2016 correlates with the groundwater contaminant plume and groundwater exceedances. This data indicates the source of these VOCs in soil vapor is likely due to off-gassing of VOC-impacted groundwater from beneath this portion of the Site.

At 200 Caribbean, soil vapor samples with VOC concentrations exceeding commercial ESLs were mostly limited to the vapor probes installed at the western boundary of the Site. The source of these VOCs appears associated with the off-Site Lockheed VOC release.

2.2 CHEMICALS OF CONCERN

Chemicals of Concern (COC) in the subsurface are defined as those detected at or above their respective ESLs established by the Water Board or MCLs established by the State Water Board. COC in soil vapor and groundwater at 200 Caribbean are PCE, TCE, cis-1,2-DCE, and vinyl chloride. At 100 Caribbean, COC in soil vapor and groundwater are PCE, TCE, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, vinyl chloride, 1,2-DCA, 1,1-DCA, and 1,4-dioxane.

SECTION 3: LITHOLOGY AND HYDROGEOLOGY

Based on Cornerstone's prior studies at the Site, the upper approximate ½ to 1 foot consisted of finished surface materials including landscape materials, Portland cement concrete, asphalt concrete or asphalt pavement over aggregate base. Beneath the surface materials, up to approximately 5 feet of possible fill and/or reworked native soils consisting of medium stiff brown lean sandy clays with gravel and clayey sands with gravel were observed. In general, the greater thicknesses of the fill and/or reworked native soil were observed in the borings located on the northern half of the Site. Below the fill and/or reworked native soil were stiff expansive clays with varying amounts of sand to approximately 5 to 7 feet, followed by stiff to medium stiff lean sandy clays with varying amounts of sands and gravels. In approximately half of the borings, lean clay with varying amounts of sand extended to the maximum depth explored of approximately 15 to 20 feet. In general, groundwater was not readily observed in the soil column from these borings; however, after drilling, groundwater was measured in the boreholes at approximate depths ranging from 7 to 10 feet.

In the other half of the borings, beneath the lean clay was a sand layer with varying amounts of clay and gravel; it was observed to be approximately ½ to 4 feet thick. Groundwater was observed in this layer at approximate depths ranging from 9 to 18 feet. After drilling,

groundwater was measured in the boreholes at approximate depths ranging from 6 to 12 feet, indicating possible semi-confined to confined groundwater conditions.

The design level groundwater elevation recommended by the Geotechnical Engineer of Record is approximately 2½ to 3½ feet below existing Site grade, corresponding to an approximate elevation of 1.5 feet msl[4].

SECTION 4: VAPOR INTRUSION CONTROL SYSTEM DESIGN

4.1 VAPOR INTRUSION PROCESS

Vapor intrusion is the movement of chemical vapors from contaminated groundwater or soil into a nearby building. As vapor accumulates underneath a building slab, the vapor concentration and pressure in the soil pores increases. Pressure gradient is the primary driving force for vapor migration (e.g., vapor flows from high to low pressure). Accumulated soil vapor will potentially migrate through cracks in the foundation, drain tiles, utility pipes, sumps, and conduit penetrations if the pressure underneath the slab is greater than the pressure inside the building. Once inside the workplace, vapors may be inhaled posing potential health risks.

4.2 DESCRIPTION OF SELECTED VAPOR MITIGATION SYSTEM

4.2.1 100 Caribbean

To help eliminate vapor intrusion concerns into the planned office building, a passive SSV system will be installed. The passive SSV system contains no active mechanical equipment, but it was designed to be installed with the ability to easily convert to an active system if necessary. The passive SSV system is designed to allow for the unimpeded movement of soil gas vapors to the atmosphere. In addition to a permeable venting layer, perforated collection pipes are installed laterally in the venting layer to assist the collection of the soil gas and route it to an exhaust point outside the building. With a passive SSV system, vapor intrusion is effectively prevented by the natural movement of air through the venting layer, diluting the contaminants in the sub-slab, and allowing for a natural exhaust point before the contaminants have an opportunity to enter the building. Vent caps installed on the riser pipes will promote natural air flow from the subsurface. Additionally, natural diurnal oscillations in barometric pressure (typically 4 to 5 millibars or 1 to 2 inches of water column) will create a pressure gradient that will result in venting of gases in the permeable gravel layer during periods decreasing barometric pressure. As the barometric pressure rises, a gradient is imposed that will allow fresh ambient air to enter the permeable gravel layer. This natural process is referred to as “barometric pumping” and is further discussed in Section 4.3.1.

A planned spray-applied membrane (i.e., Liquid Boot® Plus) or waterproofing membrane (COREFLEX® 60) will provide an additional level of protection. This membrane will be placed between the concrete slab and permeable gravel layer discussed in Section 4.3.2, effectively sealing penetrations and the sub-slab to create an additional barrier to vapors from permeating through the slab and into the building.

If the performance criteria for the passive SSV system as discussed in Section 6.2 are not met, the system will be converted into an active SSV or SSD system with mechanical blower

[4] The average existing Site grade elevation is approximately 4 to 5 feet msl; the surface elevation beneath the planned buildings will be raised by approximately 4½ to 7 feet.

equipment. The active SSV/SSD system will be designed to move larger volumes of air through the gravel blanket continuously creating a lower pressure directly underneath the building slab relative to the pressure within the building. The resulting sub-slab negative pressure will inhibit soil gases from flowing into the building. If present, volatile chemicals caught in this negative pressure field will be collected and piped to ambient air discharge points.

4.2.2 200 Caribbean

As shown on Figures 3 and 4, the 200 Caribbean office building is in the central area of the Site where vapor intrusion does not appear to be a significant concern. Impacted soil vapor and groundwater are greater than 100 feet from the perimeter of the 200 Caribbean building. The overall footprint of these plume boundaries is expected to continue to decrease over time. To help reduce potential vapor migration pathways towards the building from areas of impacted soil vapor or groundwater, utility trench plugs and dry conduit sealants will be installed.

Based on the analytical data and the planned vapor mitigation measures to address preferential pathways, installation of a VIMS beneath the planned building does not appear needed. However, for a greater level of protection to future occupants, Google has voluntarily elected to install a passive SSV vapor mitigation system beneath the planned building. Design details are provided in Section 4.3.

4.2.3 300/400 Caribbean

The first level of the 300/400 Caribbean parking structure will consist almost entirely of vehicle parking stalls and drive aisles and will have primarily open walls for natural ventilation. No closed rooms will be installed on the first floor except for the main electrical room that is located on the southwest corner of the structure. The electrical room will not be occupied except for infrequent maintenance visits over short durations; however, for added protection, the Liquid Boot® Plus vapor membrane system discussed in Section 4.3.4 will be installed on the underside of the slab below this room.

4.3 KEY COMPONENTS FOR PASSIVE SYSTEM

4.3.1 Raising Site Grades

Grades beneath the planned 100 and 200 Caribbean buildings will be raised up to approximately 4½ to 7 feet using “clean” imported fill. The upper approximate 28 inches below the structural slab will consist of approximately 10 inches of highly permeable gravel over 18 inches of non-expansive fill. The remaining section will be imported soil from other sources. Imported fill sources must meet unrestricted use screening levels and require pre-approval from DEH prior to importing to the Site.

Increasing the separation between the building slab and contaminant source (i.e. VOC-impacted groundwater and/or soil vapor) likely will help to decrease vapor intrusion concerns due to the influence of natural barometric pressure forces. “Barometric pumping” (the movement of ambient air into and out of the vadose zone in response to changes in atmospheric pressure) and atmospheric mixing are anticipated to affect the rate of contaminant transport from the subsurface up to the building slab. Barometric pressure fluctuations consist of diurnal fluctuations due to thermal and gravitational effects, and longer-term fluctuations that result from regional scale weather patterns.

The low permeability native clay below existing Site grades also will help to act as a geologic barrier to gas migration and will reduce the soil vapor flow rate into the overlying fill section. Additionally, the advective flux rate into and out of the imported fill section due to barometric pumping is anticipated to be greater than the diffusive flux of VOC vapors from the low permeability native clays. The barometric pumping processes also will be enhanced by: 1) the uncapped landscape areas surrounding the buildings, allowing ambient air to more easily enter the subsurface; and 2) the presence of what is anticipated to be fill material with higher permeabilities compared to native soils, which will permit pressure variations to propagate deeper into the fill.

4.3.2 Permeable Gravel Layer – 100 and 200 Caribbean

The SSV system includes a vapor permeable gravel layer that will be placed across the entire footprint of the 100 and 200 Caribbean buildings. The gravel will provide a path of least resistance for the soil vapor to migrate, and a system of perforated pipes (soil vapor vent pipes) will collect the vapor and vent it to the atmosphere (via vent risers). A minimum 10-inch thick permeable gravel blanket will be installed over the compacted sub-grade of the entire building footprint. A minimum 2-inch thick aggregate bedding and cover will be installed at all perforated pipe locations to facilitate adequate vapor migration. The aggregate will be free of organic or deleterious matter and conform to the specifications provided in Table 3.

Table 3. AASHTO #5 Gravel Gradation

Percent Passing	Screen Size
90-100%	1-inch
20-55%	¾-inch
0-10%	½-inch
0-5%	⅜-inch
0%	#4 Sieve

4.3.3 Sub-Slab Vent System – 100 and 200 Caribbean

The sub-slab vent system piping layout will extend across the entire building footprint to be occupied by office space. For design purposes, perforated vent piping will be installed in most sub-slab areas that are isolated due the presence of sub-slab walls or foundation elements. Pipe sleeves will be installed in smaller isolated sub-slab areas allowing for an air flow pathway to an adjacent sub-slab area where perforated vent piping is present. A maximum perforated pipe run of approximately 400 feet and maximum pipe spacing of approximately 50 foot on center and 25 feet from the building perimeter were used as general design parameters.

The perforated vent piping below the slab will consist of 6-inch diameter Schedule 40 PVC pipe positioned in the middle of the minimum 10-inch thick gravel blanket. The perforation pattern for the PVC pipe will consist of three rows of perforations consistent with ASTM D2729. Circumferential hole spacing will be 60 degrees with a hole diameter of ½ inch across the upper one-third of the pipe. Longitudinal hole spacing is three inches. For water drainage purposes, if any, an additional ½ inch hole will be added to the underside of the pipe with longitudinal spacing of approximately every 1 foot. This hole pattern exceeds the minimum required equivalent openings per length of perforated pipe of 1.0 $inch^2$ per lineal foot of pipe. The perforated piping will be fitted with a polyester filter sock with a minimum air permeability of 700 $ft^3/ft^3/min$.

The piping networks will be embedded in the permeable gravel layer and connected to 6-inch solid vent riser pipes. Approximately 2 feet above the slab penetration the 6-inch PVC pipe will transition to 6-inch cast iron piping with gas-tight no-hub fittings. The solid vent riser pipes will extend from below the slab to the mechanical rooftop or to exterior lamp posts.

4.3.3.1 Design Details for 100 Caribbean

The occupied building footprint, approximately 186,300 square feet, was divided into four quadrants with the two northern quadrants located in the depressed slab area. The interconnected grade beams and pile caps serve as boundary conditions for each quadrant and effectively prevent the air-filled pores in the gravel blankets from communicating with the gravel pore spaces in other quadrants. Each quadrant contains dedicated perforated piping that does not extend into adjacent quadrants. The perforated piping is connected to riser pipes routed to lamp posts or to the mechanical rooftop. The piping networks are designed to allow cross-flow ventilation through the gravel layer in the event active SSV is needed. The perforated piping connected to the lamp post riser pipes serve as air intakes allowing ambient air to enter the gravel blanket. The ambient air will be drawn through gravel blanket by perforated exhaust piping connected to the mechanical rooftop riser pipes. Approximately 3 to 5 riser pipes will be installed in each quadrant (a total of 19 risers) based on an approximate frequency of one riser pipe for every approximately 10,000 to 15,000 square feet of floor space. This frequency is consistent with guidelines outlined in published guidance. The sub-slab vent piping layout is shown on Figure 5A. Additional design details are provided below in Table 4.

Table 4. Design Details – 100 Caribbean

Quadrant Service Area	Approximate Size (square feet)	Maximum Pipe Runs
NW Quadrant	34,300	615 feet: 144 feet perforated 471 feet blank
SW Quadrant	56,000	374 feet: 297 feet perforated 77 feet blank
NE Quadrant	30,000	714 feet: 351 feet perforated 363 feet blank
SE Quadrant	66,000	438 feet: 205 feet perforated 233 feet blank

Butterfly valves will be installed in-line with the solid piping routed to each lamp post riser. The valves will remain open during passive ventilation. In the event active ventilation is needed, the butterfly valves can be partially closed as needed to assist in balancing air intake flows. Alternatively, if conversion from an active SSV to SSD system is needed, the butterfly valves can be completely or partially closed to assist in creating a negative pressure field beneath the slab.

4.3.3.2 Design Details for 200 Caribbean

Similar to 100 Caribbean, the occupied building footprint of approximately 170,000 square feet was divided into four quadrants. The interconnected grade beams and pile caps serve as boundary conditions for each quadrant and prevent the air-filled pores in the gravel blanket from communicating with the gravel pore spaces in adjacent quadrants. Each quadrant contains dedicated perforated piping that is connected to riser pipes routed to lamp posts or to the mechanical rooftop. Seventeen lamp post risers and four rooftop risers will be installed. In general, each lamp post riser services one row of foundation grid zones with a maximum overall service area of approximately 10,000 square feet. To enhance air flow at the end of the service area, the perforated piping is connected to blank piping that is dedicated to each quadrant and is routed to the mechanical rooftop. The quadrants range in size from approximately 25,000 to 60,000 square feet. In the unlikely event active ventilation is needed, mechanical blower equipment can be installed on the mechanical rooftop and connected to the riser pipes. The sub-slab vent piping layout is shown on Figure 5B.

4.3.4 Gas Vapor Barrier System – 100 and 200 Caribbean

The gas vapor barrier system beneath the 100 and 200 Caribbean building slabs will consist of vapor barrier products manufactured by CETCO. Two vapor barrier assemblies will be installed: Liquid Boot® Plus System and COREFLEX® 60 System. The Liquid Boot® Plus System will be installed on the southern approximate two-thirds of the 100 and 200 Caribbean building footprints where the structural floor slab is present at elevation 12 feet msl. The COREFLEX® 60 System will be installed in all slab depressions that are below the flood plain elevation (11 feet msl); these areas include the large building depressions in the northern approximate one-third of the 100 and 200 Caribbean buildings and elevator pits.

The Liquid Boot® Plus System will be installed on top of the gravel layer and adhered to the underside of the structural slab and will consist of three products: a protection base course, middle course vapor barrier, and a protection top course. The VI-20™ base course will be placed directly on top of the gravel layer and consists of a 20-mil, high performance polyethylene-EVOH copolymer geomembrane. VI-20™ also meets the Class A requirement for water vapor barriers; Class A is the highest rating for puncture resistance. Liquid Boot® is a seamless spray-applied water-based membrane that will be installed over the base course at a minimum 60 mil cured thickness. The membrane will terminate at least 3 inches onto grade beams and pile caps at each foundation grid zone. Ultrashield™ G-1000 is a polypropylene, staple fiber non-woven geotextile fabric that will be placed over the spray-applied membrane.

The COREFLEX® 60 System is a thermoplastic waterproofing membrane with active polymer core that is also protective against chemical vapor intrusion. COREFLEX® 60 is a 1.5 mm (60 mil) nominal thermoplastic membrane reinforced with a 5.0 ounce weft inserted knit polyester fabric integrally bonded to an Active Polymer Core (APC). The barrier performance starts with a thermoplastic membrane with welded seams providing a monolithic watertight barrier layer. The thermoplastic membrane is reinforced with a weft inserted knit polyester reinforcement fabric and is produced with DuPont's Elvaloy-KEE® (Keytone Ethylene Ester), a solid phase high molecular weight ethylene interpolymer. The COREFLEX® 60 System will be installed without terminations (i.e., grade beams and pile caps will be wrapped) and will tie into the Liquid Boot® Plus System at the underside of the structural slab.

4.3.5 Sub-Slab Monitoring Probes – 100 and 200 Caribbean

To help evaluate soil vapor quality in the gravel venting layer and measure pressure differential if needed for active ventilation, monitoring probes will be installed at various locations beneath the 100 and 200 Caribbean building slabs where the SSV system is present. Based on the building size and configuration, 8 to 10 probes will be installed beneath each office structure (approximately 1 probe per 20,000 square feet of ground floor office space). The probes will consist of a porous polypropylene tip embedded in the permeable gravel layer and connected to ¼-inch diameter polyethylene tubing. Additional installation instructions are provided below.

4.3.5.1 100 Caribbean

The monitoring tubing will be routed in 1.5-inch SCH 80 PVC conduit that will penetrate the floor slab at an interior wall location selected by the architect. The conduit will be routed to an approximate 12 inch by 12 inch by 8 inch deep dead front panel enclosure that will be installed flush mounted in the interior wall. Expandable foam will be sprayed inside the conduit below the slab and within approximately 12 inches of where the conduit penetrates the panel enclosure. The gap between the dead front panel face to inside of enclosure cover will be approximately 1¼ inches. The monitoring tubing will be connected to a quick connect fitting that will be mounted in the dead panel. Mounting channels will be installed in the back of the enclosure panel for future equipment, if needed. Additionally, ethernet network cable and 120-volt power will be routed to the panel. Installation details are shown on Figure 6A.

4.3.5.2 200 Caribbean

The monitoring probe tubing will be routed into nearby perforated piping then will extend in the direction of the lamp post riser pipe. Outside the building envelope at a location selected by the architect, the tubing will be routed up to a monitoring station Christy box in 1½-inch SCH 80 PVC conduit. Expandable foam will be sprayed inside the conduit to prevent migration of vapors into the Christy box. A quick connect fitting will be installed on the end of the tubing. Installation details are shown on Figure 6B.

4.3.6 Utility Trench Dams

Trench dams will be installed in new utility trenches throughout the Caribbean Campus to help prevent the migration of contaminated soil vapor and/or groundwater. The trench dams will be installed both along the utility alignment at evenly spaced intervals and at the edge of building slab where the utility line extends beneath the building. Preliminary trench dam locations are shown on the utility plan sheets included in Appendix A.

The trench dams will be at least 3 feet in length and will consist of sand-cement slurry with 4 percent Type II cement and 2 percent powdered bentonite with a compressive strength range of 75 to 200 pounds per square inch (psi). If sand-cement slurry is not allowed (e.g. trenches conveying Pacific Gas & Electric gas lines), the trench dam will consist of fly ash and sand slurry with a mixture of 10 percent fly ash (ASTM C618, Class F), 90 percent fine aggregate sand, and water. The sidewalls and bottom of the trench must be undisturbed native soil and/or engineered fill with equal or lower permeability than the surrounding soil. The trench dam must extend from the bottom of the trench up to the top of permeable backfill section or up to the

design groundwater elevation (1.5 feet msl), whichever is higher. Trench dam construction details are shown on Figure 7.

As shown in Appendix A, trench dams will not be installed for the electrical and telecommunication utilities since permeable backfill will not be used and the duct work will be fully encased in sand-cement slurry. The project team intends to use concrete slurry with a minimum compressive strength of 150 pounds psi. The slurry will be placed along the entire trench alignment, including the trench sections that extend below the buildings.

4.3.7 Dry-Conduit Sealants

Subsurface dry conduit typically is not pressure tested to confirm its air tightness. Additionally, the conduit can become damaged during construction. To help prevent the migration of vapors, sealant will be added to the interior piping of all dry conduits throughout the Caribbean Campus that penetrate the floor slab. The sealant will be added to the conduit within approximately 18 inches of the conduit penetrating the floor slab. For conduits two inches or larger, the Polywater® FST™ duct sealant will be installed. FST™ closed-cell duct sealant is chemically resistant and designed to protect electrical and telecommunication equipment from chemical gases. The FST-MINI product will be used for smaller conduits, including at both ends of the branch conduits that penetrate the slab and extend from electrical or communications rooms to the targeted destination. Installation instructions are included on the electrical details sheet included in Appendix B.

4.3.8 Utility Vaults and Manholes

Several underground utility vaults will be installed throughout the Caribbean Campus. These vaults will be for the Pacific Gas & Electric (PG&E) service entrance (approximately 4'-6" x 8'-6" x 4'-6" deep with spring assist hinge covers), 12 kilovolt (KV) power distribution vaults (4'-6" x 8'-6" x 4'-6" deep with spring assist hinge covers), emergency power distribution vaults (3' x 5' x 3' deep with lift off covers), pull box vaults for site power and lighting distribution (2' x 3' x 2' with lift off covers), typical N40 and N48 concrete Christy boxes for wiring and/or telecommunications equipment. Additionally, two utility manholes will be installed at 100 Caribbean and two at 200 Caribbean. These vault/manhole locations are shown on the electrical plan sheets included in Appendix A.

The concrete vaults will be monolithically poured by a local manufacturer without any concrete cold joints. Prior to pouring, pipe penetration locations will be identified by the electrical engineer and pipe fittings will be installed for welded dry conduit connections. Each vault will have a closed sump that will collect nuisance water, if any, and will require physical removal using mechanical equipment.

To help limit potential migration of vapors into vaults, open conduits inside the vaults will be sealed with closed-cell expandable foam duct sealant. Additionally, vaults located in areas of TCE-impacted soil vapor and/or groundwater will contain ventilated lids with the ability to test the internal atmosphere before removing the cover.

4.4 CONTINGENCIES FOR CONVERSION TO ACTIVE SYSTEM – 100 CARIBBEAN

4.4.1 Design Criteria/Assumptions for Blower Selection

If the passive SSV system is not effective in mitigating potential vapor intrusion concerns, conversion to an active system will be performed. To assist in estimating an appropriately-sized blower for an active system, the largest quadrant was selected (southeast quadrant, 66,000 square feet) and pressure losses in the gravel blanket and collection pipes were estimated. Darcy's Law was used to calculate pressure losses in the gravel layer and standard fluid mechanics head loss equations were used to estimate pipe losses.

For design calculation purposes, pressure losses were estimated for an approximate 35-foot by 35-foot grade beam grid zone (approximately 1,225 square feet). Approximately 54 grid zones were assumed for the 66,000 square foot quadrant. Assuming an approximate 10-inch gravel section with a porosity of 0.3 and approximately one air exchange per hour, the estimated design flow rate per 1,225 square foot grid zone is assumed to be approximately 5 cubic feet per minute (CFM) or approximately 280 CFM for the entire 66,000 square foot quadrant. Assuming an intrinsic permeability of 1,000 Darcys for the AASHTO #5 gravel gradation, an average distance of 35 feet between the air intake piping and exhaust piping, pressure losses through the gravel layer are estimated to be 0.69 inches of water column (inches WC) per grid zone, or approximately 37 inches WC for the entire quadrant. Pressure losses through the pipe sleeves and along the grade beams are negligible.

Pressure losses in the solid and perforated piping are minimized because of the diameter and pipe type selected (6-inch SCH 40 PVC pipe). For pipe loss calculations, air flow was assumed to be evenly disturbed across the air intake/exhaust pipes, i.e. with a total flow of 280 CFM and four intake pipes, the assumed flow in each intake pipe was estimated to be 70 CFM. For the solid exhaust piping, the maximum air flow was conservatively assumed. The calculated pressure losses in the piping are estimated to be approximately 4 inches WC.

Based on the above calculations, the design criteria for the mechanical blower that may be needed for the largest quadrant is 280 CFM at a static pressure of 41 inches WC. For conservative planning purposes, these design criteria will also be used for the other three quadrants which vary in size from approximately 30,000 square feet to 56,000 square feet. Additionally, as shown on Figure 5A, the collection piping network is designed such that a second blower can be added to the larger southwest and southeast quadrants, if needed.

4.4.2 Key Components for Active System

If performance criteria are not met and contingency measures are needed to convert to an active SSV or SSD system, the building portion of concern will be identified, and its associated quadrant will be selected to install and operate mechanical blower equipment. As shown on Figure 5B, up to six blowers may be needed for active mode ventilation beneath the entire building; however, final blower sizing and selection will be determined at time of construction and installation. Each blower will be equipped with its own variable frequency drive (VFD) to assist in controlling the motor speed. A steel rack system (approximately 27 inches by 30 inches by 91 inches tall) designed to accommodate up to three blowers will be installed on the mechanical rooftop; a second rack system would be needed if additional blowers were added. The rack systems will be installed in the central portion of the rooftop within the mechanical equipment screen. For preliminary planning purposes, 230/460 voltage, three phase, 60-hertz AC power will be routed to an electrical disconnect for the blower equipment.

A single control panel, approximately 2 feet by 2 feet, will be installed in a central location that will include magnehelic pressure gauges that will measure the static pressure for the blower equipment. Both power and ethernet network conduit and cabling will need to be routed to the control panel. The magnehelic gauges will be connected to a human machine interface (HMI) touch screen that will provide a textual or graphical view of the system conditions. In addition to blower static pressure, the HMI touch display screen will also display the measured pressure differential across the concrete slab at the remote monitoring stations that will be performed by installing a magnehelic differential pressure gauge and remote I/O chassis and module in each remote panel. The remote and rooftop monitoring system will provide the ability to monitor real-time pressure differential data with alarm notifications if there is a loss of power and/or the pressure differential drops below the targeted criteria.

Figure 8 presents a process and instrumentation diagram for conversion to an active system, if needed.

SECTION 5: CONSTRUCTION QUALITY CONTROL

5.1 SUBMITTALS

Before any of the materials identified relating to the VIMS are delivered to the Site, the installation contractor will be required to submit complete certified Shop Drawings for review and approval by the owner's representative. The Shop Drawings will include all details of fabrication, assembly, installation, descriptive literature, bulletins, catalog cut sheets of the components, complete manufacturer's specifications and materials of construction, and manufacturer's current recommended method of installation for materials provided.

5.2 FIELD DOCUMENTATION

Cornerstone will perform periodic observations to document installation activities are performed in accordance with this VMP. As part of this process, field reports documenting activities will be completed and made available for inspection by authorized oversight personnel for the duration of the project. At a minimum, field observation will be performed by Cornerstone during the following stages of installation:

- Installation of the sub-slab vent piping;
- Installation of the monitoring probes and associated equipment and wiring;
- Placement and backfilling of the permeable gravel layer;
- Installation of the vapor barrier system; and
- Installation and integrity testing of the vapor barrier and riser pipes.

Photographs will be taken to help document information entered in the daily field report. When a photograph is taken, the following information will be written in the daily field report: time, date, location, and, if appropriate, weather conditions; description of the subject photographed; and name of person taking the photograph.

5.3 VAPOR BARRIER INSTALLATION – 100 AND 200 CARIBBEAN

This section presents the construction quality control measures that will be implemented during vapor barrier installation activities.

5.3.1 Contractor Certification

The selected vapor barrier contractor/applicator must be trained and approved by CETCO. The contractor/applicator will be required to provide a letter from CETCO confirming the contractor/applicator is certified by the manufacturer for installation of the product and warranting its product to be free of defects when that product is installed by the certified contractor/applicator.

5.3.2 Vapor Membrane Coupon Sampling

Coupon samples of the Liquid Boot® vapor membrane will be collected to confirm the membrane thickness meets or exceeds 60 mils. A minimum of one coupon sample with a maximum area of 2 square inches will be collected from the membrane per 500 to 1,500 square feet of application. The location of the coupon sample will be recorded on a Site map and included with the daily field report. Calipers will be used to measure the thickness of the coupon sample. Coupon samples will be retained by Cornerstone for review by authorized representatives. Prior to performance of the integrity testing described in Section 5.3.4, the coupon sample location will be patched in accordance with the manufacturers approved methods. Spray or trowel applied Liquid Boot® will be applied to an approximate 120 mil minimum dry thickness, extending at least two inches beyond the base course.

5.3.3 Membrane Termination Field Quality Control

On concrete footings, pile caps, and/or grade beams, the vapor membrane will be checked by Cornerstone for coverage with a depth gauge. Four readings will be recorded over a one square inch area for every 500 lineal feet of membrane application along the structural element. The minimum readings will be recorded, and the test area will be marked for repair. Test areas will be patched with a minimum 60-mil dry thickness extending approximately one inch beyond the test perimeter.

5.3.4 Vapor-Tight Integrity Testing

Following installation of the vapor barrier, but before placement of the protection top course, smoke/pressure testing will be performed by the applicator under the observation of Cornerstone to document the integrity of the membrane system. A second smoke/pressure test will be performed after installation of the structural rebar and other materials required for installation prior to the concrete pour. The smoke/pressure testing procedure typically involves using the following equipment: portable and reversible blower or ventilator capable of producing an airflow rate of 200 cubic feet per minute (cfm) at 2 inches water column equivalency; a fireproof smoke chamber with a 2-inch hose for connection to the geomembrane ventilation hole; and industrial smoke bombs or canisters sufficient to produce a quantity of smoke equal to two pore volumes of the gravel blanket. The smoke/pressure testing will be completed by the contractor/applicator and observed by Cornerstone. The smoke testing procedure generally will consist of the following steps:

1) The designated smoke testing control areas will consist of each underslab section bound by grade beams. The smoke testing assembly (blower and smoke chamber) will be connected to ventilation hole using a gas-tight boot to inject smoke beneath the membrane.

2) To facilitate airflow through the testing area, a penetration of the vapor membrane is made to allow the smoke to displace the existing air volume. The initial ventilation hole should be located on the opposite side of the testing area from the smoke injection point. A sufficient volume of smoke will be applied to purge the pore volume of the gravel blanket.

3) The vapor membrane, seams, penetration boots, and perimeter batten seals will be observed to document no leakage of smoke (or air) occurs at any location other than the ventilation hole. The vent hole should also be monitored to observe if air and/or smoke are dispersed through the soil vapor venting system and vented out through the penetration.

4) Following completion of the additional individual penetrations and smoke/pressure tests, all penetrations will be permanently sealed.

5) Any leaks in the vapor barrier, perimeter batten seals, and/or piping boots other than the induced ventilation holes will need to be marked and appropriately repaired, followed by the completion of an additional smoke/pressure test to verify the vapor-tight integrity of the membrane.

SECTION 6: OPERATION, MAINTENANCE, AND MONITORING

System monitoring will generally entail two phases: (i) an initial post-construction phase; and (ii) a subsequent phase comprised of fewer diagnostic tests/inspections conducted periodically as part of the long-term vapor intrusion Operations, Maintenance, and Monitoring (OM&M) Plan. Adjustments to the mitigation system and/or additional diagnostic testing may be warranted if the results of such testing do not clearly demonstrate that the system is achieving its intended performance and effectiveness.

6.1 INITIAL POST-CONSTRUCTION OBSERVATION AND MONITORING

Initial post-construction monitoring activities will be performed at 100 Caribbean prior to building occupancy and will include: 1) visual observations; 2) collecting system measurements such as vacuum and pressure differential readings from the monitoring probes; and 3) collecting and analyzing air samples from indoor air, outdoor ambient air, and sub-slab monitoring probes. These activities will be performed during both HVAC-on and HVAC-off modes.

Initial post-construction monitoring activities described in Sections 6.1.3 and 6.1.4 will not be performed at the 200 Caribbean building since vapor intrusion does not appear to pose a significant human health risk and installation of a VIMS technically is not needed.

6.1.1 System Observation

Observation of visible components of the VIMS including piping, seals, membranes and collection points will be performed to evaluate any readily observable defects, damage, or

degradation. In addition, the foundation walls and slabs will be visually evaluated for cracks, damage and/or disturbance. If needed, corrective measures will be addressed and documented in the VIMS Implementation Report, as outlined in Section 6.1.5.

6.1.2 System Measurements

Diagnostic testing of a passive vapor mitigation system can be difficult due to the low and variable flow rates and vacuum pressures generated with this type of mitigation system. Nonetheless, prior to and/or during each air sampling event, system measurements will be recorded. Vacuum measurements will be taken using an appropriately-scaled micromanometer from the sub-slab monitoring probes. Air velocity / flow measurements will also be taken from the vent risers using a velocity meter. Air velocity is measured in feet per minute and then multiplied by the cross-sectional surface area of the pipe to obtain flow in cubic feet per minute (CFM). Pressure differential readings between the indoor air and sub slab air will also be recorded.

6.1.3 Air Sample Collection and Analyses – Indoor/Outdoor Air

HVAC-on and HVAC-off indoor air sampling will be performed d prior to building occupancy. One sample will be collected for every approximately 20,000 square feet of building footprint on the ground level. The intake sampling port of the Summa Canister will be placed approximately 3 to 4 feet above the ground surface. To the extent practical, doors, windows, intake vents, and other openings will remain closed during sampling activities.

Outdoor air sampling will also be simultaneously performed at four locations: two samples will be collected at ground level at an up-wind location relative to each building; the other two samples will be collected from each building's rooftop.

The indoor and outdoor air samples will be collected in 6-liter Summa canisters using a 24-hour flow controller. The canister and sampling trains will be individually certified by the laboratory for low level SIM analyses. Canister pressures will be measured before and after the monitoring period and will be verified on receipt at the laboratory. The samples will be submitted under standard chain of custody for analysis of PCE, TCE, 1,1-DCE, cis-1,2 DCE, trans-1,2 DCE, vinyl chloride, 1,2-DCA, 1,1-DCA, and 1,4-dioxane using EPA Method TO-15 GC/MS analysis by SIM mode for the highest sensitivity analysis.

6.1.4 Air Sample Collection and Analyses – Sub-Slab Probes

Sub-slab sampling will be performed concurrently with the indoor air sampling event performed during HVAC-on or HVAC-off mode. The sampling will consist of connecting Teflon tubing (¼-inch diameter) to a dedicated sampling port and the other end of the tubing to a "T" fitting. A 6-liter Summa canister will be connected to the "T" fitting. The other end of the "T" fitting will be affixed to a digital vacuum gauge and a 1-liter Summa canister utilized for purging.

A minimum 10-minute vacuum tightness test will be performed on the manifold and connections by opening and closing the 1-liter purge canister valve and applying and monitoring a vacuum on the vacuum gauge. The sample shut-off valve on the downhole side of the sampling manifold will remain in the "off" position. When gauge vacuum is maintained for at least 10 minutes without any noticeable decrease (less than approximately 0.1 inches of mercury (Hg) for properly connected fittings), purging will begin. The shut off valve will be opened and approximately three tubing volumes of vapor will be removed using the purging 1-liter Summa.

The volume of air removed will be estimated by the calculated pressure drop in the purging Summa canister. The purge volume will be calculated based on the length and inner diameter of the Teflon sampling tube and the connected sampling tubing and equipment.

The soil gas samples will be collected in 6-liter Summa canisters using a 24-hour flow controller. The canister and sampling trains will be individually certified by the laboratory for low level SIM analyses. Canister pressures will be measured before and after the monitoring period and will be verified on receipt at the laboratory. The samples will be submitted under standard chain of custody for analysis of PCE, TCE, 1,1-DCE, cis-1,2 DCE, trans-1,2 DCE, vinyl chloride, 1,2-DCA, 1,1-DCA, and 1,4-dioxane using EPA Method TO-15 GC/MS analysis by SIM mode for the highest sensitivity analysis.

6.1.5 Reporting

6.1.5.1 100 Caribbean

A VIMS Implementation Report will be provided to DEH within 60 days of completing the initial post-construction monitoring activities. The report will include:

- Description of the work performed;
- Documentation of installation of trench dams and dry-conduit sealants;
- Contractor certification indicating that the vapor barrier was installed and tested in accordance with manufacturer's specifications and is free of leaks;
- As-built plans of the vapor mitigation system including approved construction submittals and shop drawings provided by the installation contractor;
- Results of the vapor membrane coupon sampling and vapor-tight integrity testing;
- Documentation of initial post-construction monitoring activities including visits and monitoring results to document effectiveness of the mitigation system;
- Results of the indoor air, outdoor air, and sub-slab sampling performed during post-construction monitoring;
- Corrective measures (if any) completed as result of initial post-construction operation inspection and monitoring activities;
- Summary of deviations to the construction, installation, operation, and/or maintenance of the vapor mitigation system; and
- Task list and schedule for implementation of future activities and documents, including the OM&M Plan (refer to Section 6.3).

6.1.5.2 200 Caribbean

Since building construction and completion will occur during different time periods, a separate VIMS Implementation Report will be prepared for 200 Caribbean. The report will include the

same elements as for 100 Caribbean. Documentation of initial post-construction indoor air and sub-slab monitoring activities will not be included in the report since these tasks will not be performed.

6.2 CRITERIA FOR CONVERSION TO ACTIVE SYSTEM

If contaminants of concern are detected in the post-construction indoor air samples at concentrations that exceed Environmental Screening Criteria, and follow-up indoor air and/or pathway sampling confirms the source of the indoor air contaminants is due to vapor intrusion, the contingency actions presented in the Section 4.4 will be implemented. DEH will be notified and a construction schedule will be provided for conversion to an active VIMS. These measures will be documented in the VIMS Implementation Report prepared for 100 Caribbean.

6.3 LONG-TERM OPERATION, MAINTENANCE, AND MONITORING PLAN

Once an adequate demonstration of effectiveness has been made for the vapor intrusion mitigation system, periodic monitoring will be performed to verify that this performance is sustained. A long-term Operation, Maintenance, and Monitoring (OM&M) Plan for the vapor intrusion control system will be provided to DEH within 60 days after DEH approval of the VIMS Implementation Report prepared for 100 Caribbean. The OM&M Plan will be prepared for both 100 and 200 Caribbean and will include:

- Description of the installed vapor mitigation measures;
- Description and schedule of normal operation and maintenance tasks, including equipment and material requirements, anticipated equipment replacement for significant components, provisions for remote monitoring and control, operator training and certification requirements, staffing needs, and related requirements;
- Description of record keeping and reporting requirements, including operation and inspection logs, maintenance records and checklists;
- Description and analysis of potential operating problems and contingency plan (e.g., equipment failure, higher than expected contaminant concentrations), including emergency operating and response activities and relevant health and safety information;
- Description of the types of monitoring data to be collected, including sampling and data gathering methods, if applicable;
- Recommended frequency and methodologies of sampling, types of samples, and performance monitoring;
- Description of how the performance data will be analyzed, interpreted, and reported to evaluate system performance, if applicable;
- Description of air emission monitoring to verify that air emissions from treatment operations do not exceed requirements established by the Bay Area Air Quality Management District, if applicable;
- Quality Assurance/Quality Control activities;

- Project organization and responsibility;
- Overall operations, maintenance, and monitoring schedule;
- Description of the building-specific institutional controls monitoring, management, and implementation plan;
- Proposed decision-making process and criteria for determining the VIMS is no longer necessary as a vapor intrusion remedy; and
- Description of the contents, format, and frequency of progress reporting.

SECTION 7: LIMITATIONS

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SECTION 8: REFERENCES

Cornerstone Earth Group, 2018a. *Phase II Soil, Soil Vapor, and Ground Water Quality Evaluation, Caribbean Office Campus, 1330-1338, 1340-1346, 1350, 1360-1368 Bordeaux Drive, and 360-364, 370-376, 380-382, and 390-394 West Caribbean Drive, Sunnyvale, California,* dated March 9, 2018.

Cornerstone Earth Group, 2018b. *Phase II Soil, Soil Vapor, and Ground Water Quality Evaluation, Borregas Office Campus, 140-146 West Caribbean Drive, 1325, 1383, and 1393-1395 Borregas Avenue, and 141 Caspian Court, Sunnyvale, California,* dated March 9, 2018.

CORNERSTONE EARTH GROUP

FIGURES

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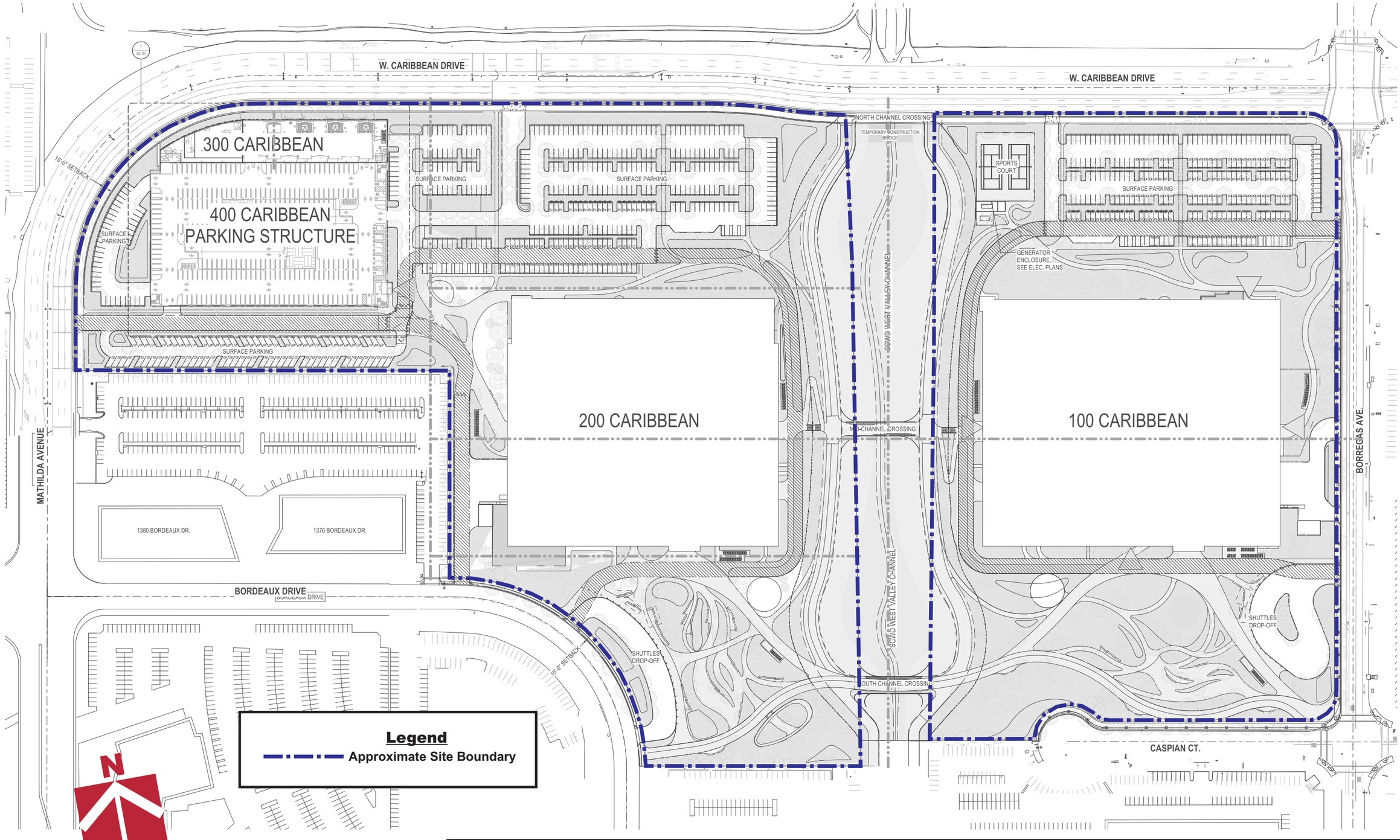
Vicinity Map

Caribbean Campus Development
Sunnyvale, CA

Project Number	678-3-2
Figure Number	Figure 1
Date	June 2019
Drawn By	RRN



Base by DEVCON, Overall Campus Site Plan - A3-100, dated 12/21/2018

CORNERSTONE EARTH GROUP

Overall Site Plan

Caribbean Campus Development
Sunnyvale, CA

Project Number	678-3-2
Figure Number	Figure 2A
Date	June 2019
Drawn By	RRN

Base by DEVCON, Cover Sheet, 100 Caribbean - A1 - VOL1, dated 12/21/2018

CORNERSTONE EARTH GROUP

Planned Development - 100 Caribbean

Caribbean Campus Development
Sunnyvale, CA

Project Number	678-3-2
Figure Number	Figure 2B
Date	June 2019
Drawn By	RRN

Base by DEVCON, Cover Sheet, 200 Caribbean - A2 - VOL1, dated 12/21/2018

CORNERSTONE EARTH GROUP

Planned Development - 200 Caribbean

Caribbean Campus Development
Sunnyvale, CA

Project Number	678-3-2
Figure Number	Figure 2C
Date	June 2019
Drawn By	RRN

W. CARIBBEAN DRIVE

300 CARIBBEAN

400 CARIBBEAN
PARKING STRUCTURE

200 CARIBBEAN

100 CARIBBEAN

SURFACE PARKING

SURFACE PARKING

SURFACE PARKING

SURFACE PARKING

15'-0" SETBACK

MATHILDA AVENUE

BORREGAS AVE.

1380 BORDEAUX DR.

1376 BORDEAUX DR.

BORDEAUX DRIVE

NORTH CHANNEL CROSSING

TEMPORARY CONSTRUCTION BRIDGE

SCVWD WEST VALLEY CHANNEL

MID-CHANNEL CROSSING

SOUTH CHANNEL CROSSING

SPORTS COURT

GENERATOR ENCLOSURE SEE ELEC. PLAN

SHUTTLES DROP-OFF

SHUTTLES DROP-OFF

CASPIAN CT.

Legend

Approximate extent of soil vapor exceeding soil vapor screening criteria based on an attenuation factor of 1/30 and commercial indoor air ESL (February, 2019)

Approximate extent of soil vapor exceeding soil vapor screening criteria based on an attenuation factor of 1/1000 and commercial indoor air ESL (February, 2019)

N

0 160 320

APPROXIMATE SCALE (FEET)

Base by DEVCON, Overall Campus Site Plan - A3-100, dated 12/21/2018

CORNERSTONE EARTH GROUP

Soil Vapor Plume Map

Caribbean Campus Development
Sunnyvale, CA

Project Number: 678-3-2

Figure Number: Figure 4

Date: June 2019

Drawn By: RRN

W. CARIBBEAN DRIVE

300 CARIBBEAN (CUP)

400 CARIBBEAN PARKING STRUCTURE

SURFACE PARKING

SURFACE PARKING

SURFACE PARKING

SURFACE PARKING

15'-0" SETBACK

200 CARIBBEAN

MATHILDA AVENUE

1380 BORDEAUX DR.

1376 BORDEAUX DR.

BORDEAUX DRIVE

BORDEAUX DRIVE

15'-0" SETBACK

SHUTTLES DROP-OFF

W. CARIBBEAN DRIVE

NORTH CHANNEL CROSSING

TEMPORARY CONSTRUCTION BRIDGE

SCVWD WEST VALLEY CHANNEL

MID-CHANNEL CROSSING

SPORTS COURT

SURFACE PARKING

GENERATOR ENCLOSURE SEE ELEC. PLAN

150 CARIBBEAN

BORREGAS AVE.

SCVWD WEST VALLEY CHANNEL

SOUTH CHANNEL CROSSING

SHUTTLES DROP-OFF

CASPIAN CT.

Legend

Approximate extent of soil vapor exceeding soil vapor screening criteria based on an attenuation factor of 1/30 and commercial indoor air ESL (February, 2019)

Approximate extent of soil vapor exceeding soil vapor screening criteria based on an attenuation factor of 1/1000 and commercial indoor air ESL (February, 2019)

N

0 160 320

APPROXIMATE SCALE (FEET)

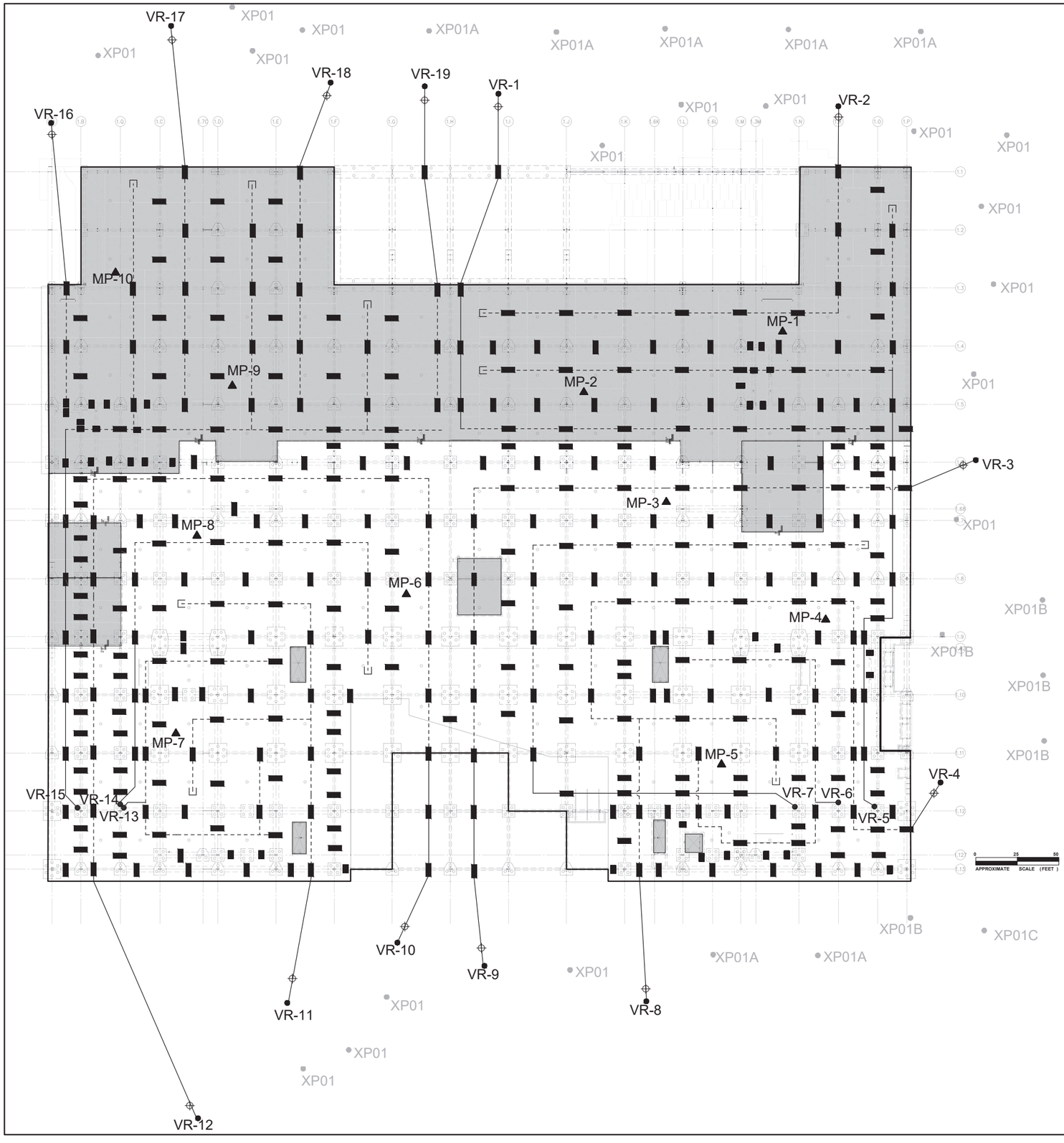
Base by DEVCON, Overall Campus Site Plan - A3-100, dated 12/21/2018

CORNERSTONE EARTH GROUP

Soil Vapor Plume Map

Caribbean Campus Development
Sunnyvale, CA

Project Number	678-3-2
Figure Number	Figure 4
Date	June 2019
Drawn By	RRN



LEGEND

- HORIZONTAL EXTENT OF SUB-SLAB VENTING (SSV) SYSTEM WITH MINIMUM 10-INCH THICK GAS PERMEABLE AGGREGATE
- 6-INCH DIAMETER PERFORATED SSV COLLECTION PIPE WITH FILTER SOCK BENEATH FLOOR SLAB TO RISER PIPES AT ROOF TOP
- 6-INCH DIAMETER PERFORATED SSV COLLECTION PIPE WITH FILTER SOCK BENEATH FLOOR SLAB TO RISER PIPES AT LIGHT POSTS
- 6-INCH DIAMETER SCHEDULE 40 SOLID PVC SSV COLLECTION PIPE
- VR- 5, 6, 7, 13, 14, 15: 6-INCH DIAMETER VERTICAL RISER AT IDENTIFICATION NUMBER. EXTEND THROUGH ROOF
- VR-1: 6" DIAMETER VERTICAL RISER AND LAMP POST WITH IDENTIFICATION NUMBER
- MP-1: APPROXIMATE LOCATION OF MONITORING PROBES. EXTEND 1/4" DIA. TUBING TO MONITORING STATION LOCATION SELECTED BY ARCHITECT .
- 6-INCH DIAMETER SCHEDULE 40 PERFORATED SSV COLLECTION PIPE CONNECTING TO 6-INCH DIAMETER SCHEDULE 40 SOLID PVC PIPE TO TRANSITION THROUGH GRADE BEAM
- 6-INCH DIAMETER SCHEDULE 40 SOLID PVC PIPE SLEEVE
- ELEVATOR PITS, SLAB DEPRESSIONS , AND SLAB ELEVATION CHANGES. !
- CHANGE IN SLAB-AT-GRADE ELEVATION.
- XP01: LAMP POST AVAILABLE FOR VERTICAL RISER PLACEMENT
- CAST IRON 6" DIAMETER BUTTERFLY VALVE

Project Number 678-3-2

Figure Number 5A

Date JUNE 2019

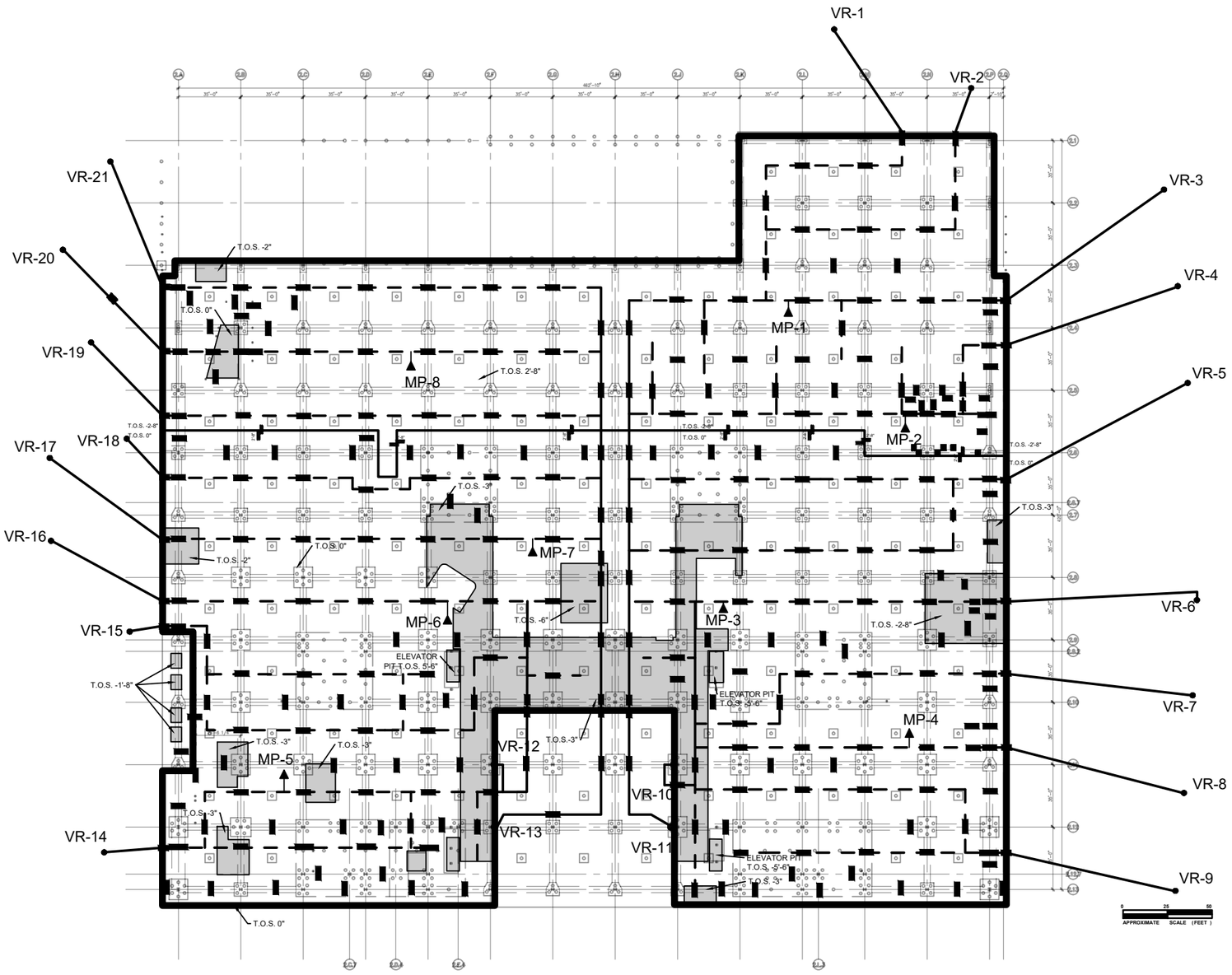
Drawn By MFC/JMA/ELH

Venting Plan - 100 Caribbean

100 Caribbean
Sunnyvale, California

CORNERSTONE EARTH GROUP

PRELIMINARY: NOT FOR CONSTRUCTION



LEGEND

- HORIZONTAL EXTENT OF SUB-SLAB VENTING (SSV) SYSTEM WITH GAS VAPOR BARRIER AND MINIMUM 10-INCH THICK GAS PERMEABLE AGGREGATE
- 6-INCH DIAMETER PERFORATED SSV COLLECTION PIPE WITH FILTER SOCK BENEATH FLOOR SLAB
- 6-INCH DIAMETER SCHEDULE 40 SOLID PVC SSV COLLECTION PIPE
- VR-10,11,12,13 — 6-INCH DIAMETER VERTICAL RISER AND IDENTIFICATION NUMBER. EXTEND THROUGH ROOF TO EXHAUST STACK
- VR-1 — 6" DIAMETER VERTICAL RISER ATTACHED TO LAMP POST WITH IDENTIFICATION NUMBER
- MP-1 — APPROXIMATE LOCATION OF MONITORING PROBES. EXTEND 1/4" DIA. TUBING TO MONITORING STATION LOCATION SELECTED BY ARCHITECT
- 6-INCH DIAMETER SCHEDULE 40 PERFORATED SSV COLLECTION PIPE CONNECTING TO 6-INCH DIAMETER SCHEDULE 40 SOLID PVC PIPE TO TRANSITION THROUGH GRADE BEAM
- 6-INCH DIAMETER SCHEDULE 40 SOLID PVC PIPE SLEEVE
- ELEVATOR PITS, SLAB DEPRESSIONS , AND SLAB ELEVATION CHANGES.
- CHANGE IN SLAB-AT-GRADE ELEVATION.

Project Number 678-3-2

Figure Number 5B

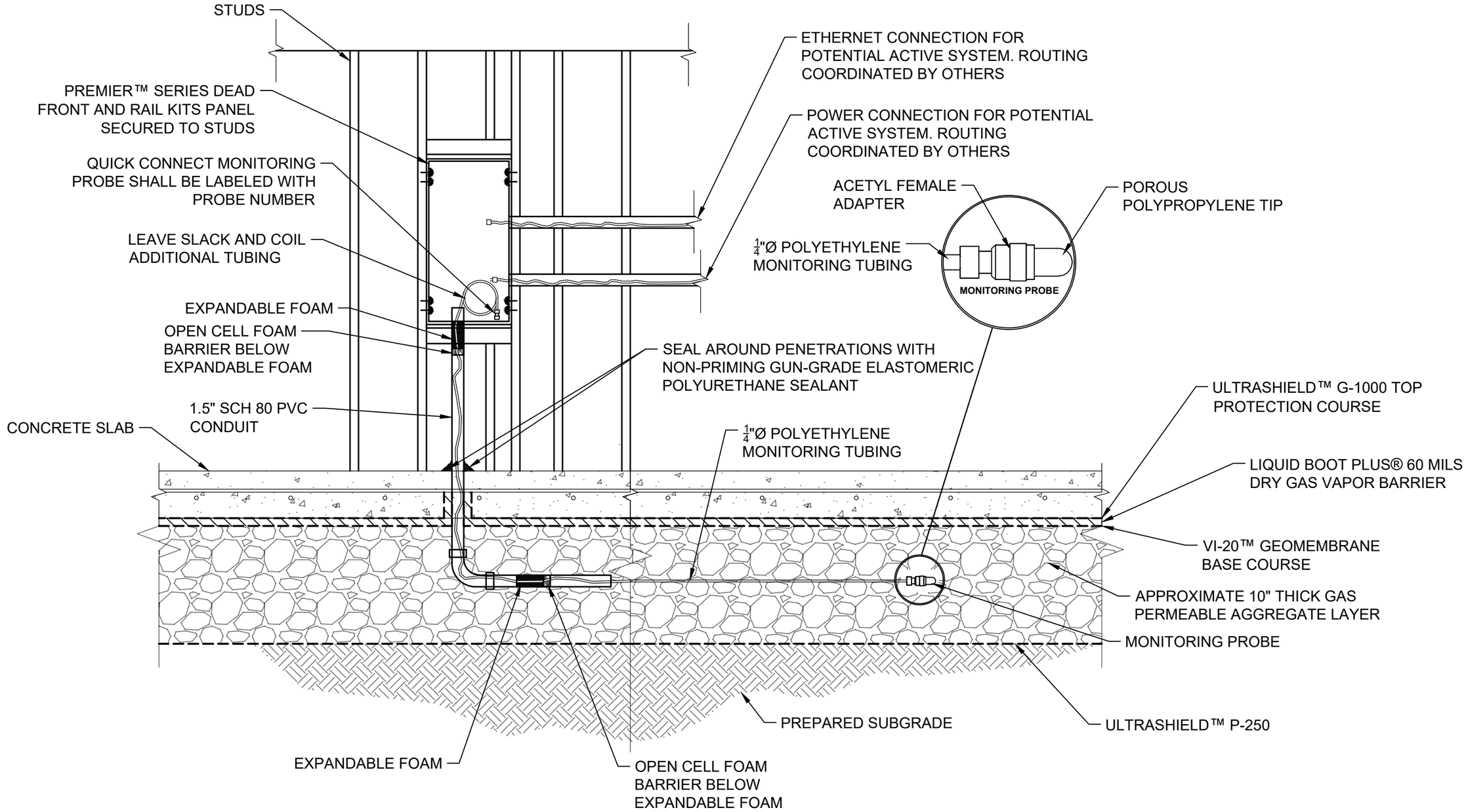
Date JUNE 2019

Drawn By ELH

Venting Plan - 200 Caribbean

Caribbean Campus Development
Sunnyvale, California

CORNERSTONE EARTH GROUP



1 TYPICAL MONITORING PROBE CONFIGURATION AND STATION

NOT TO SCALE

Project Number 678-3-2

Figure Number 6A

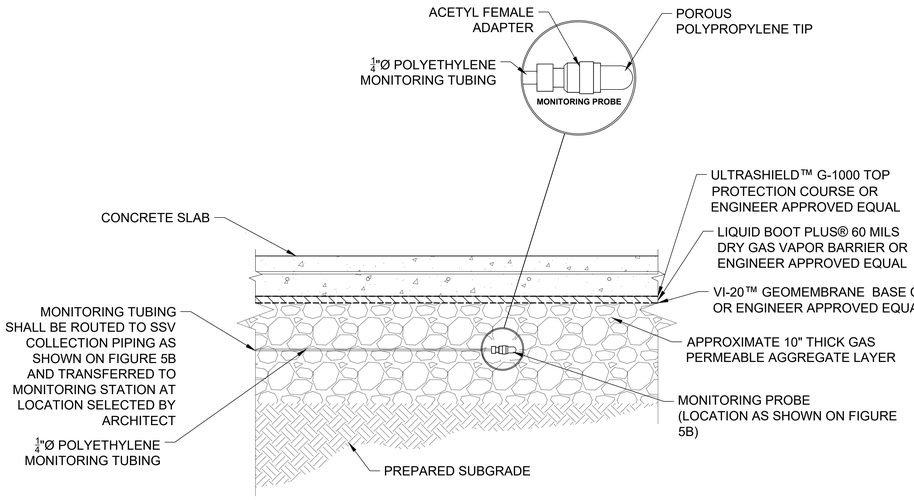
Date JUNE 2019

Drawn By ELH

Subslab Monitoring Probe/Stations - 100 Caribbean

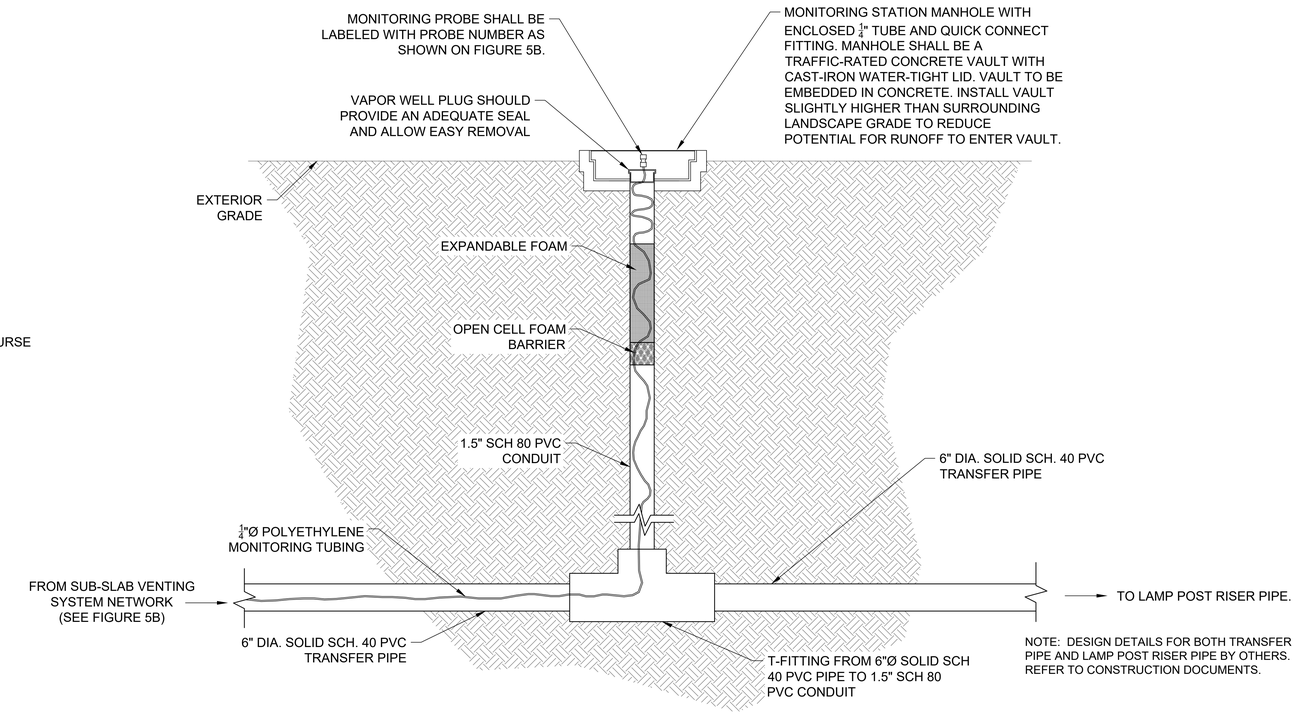
Caribbean Campus Development
Sunnyvale, California

CORNERSTONE EARTH GROUP



NOTE: REFER TO FIGURE 5B FOR MONITORING PROBE LOCATION. MONITORING STATION MANHOLE SHALL BE LOCATED IN AN EASILY ACCESSIBLE AREA WITHIN LANDSCAPING. PRIOR TO INSTALLATION COORDINATE LOCATIONS WITH ARCHITECT, STRUCTURAL ENGINEER, AND OTHER TRADES.

1 **TYPICAL MONITORING PROBE CONFIGURATION**
NOT TO SCALE



NOTE: DESIGN DETAILS FOR BOTH TRANSFER PIPE AND LAMP POST RISER PIPE BY OTHERS. REFER TO CONSTRUCTION DOCUMENTS.

2 **TYPICAL SUB-SLAB MONITORING PROBE STATION**
NOT TO SCALE

678-3-2

Figure Number 6B

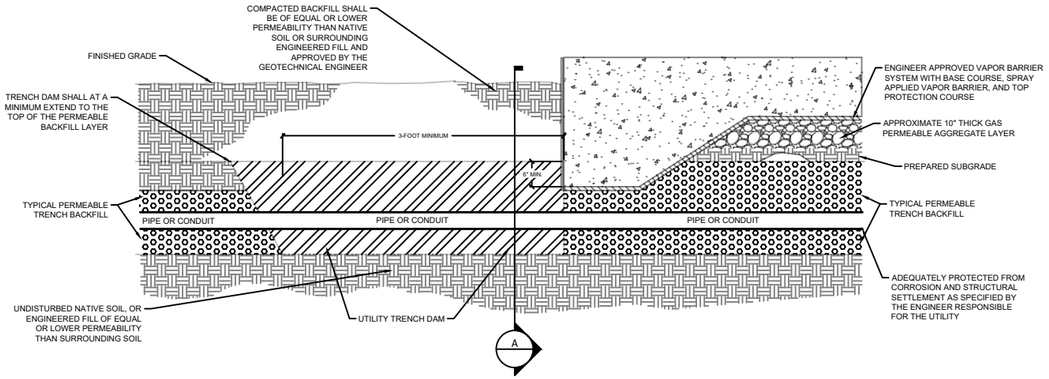
Date JUNE 2019

Drawn By JMA/ELH

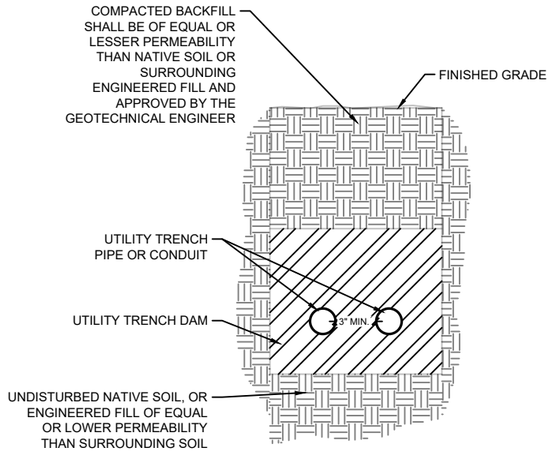
Subslab Monitoring Probe/Stations - 200 Caribbean

Caribbean Campus Development
Sunnyvale, California

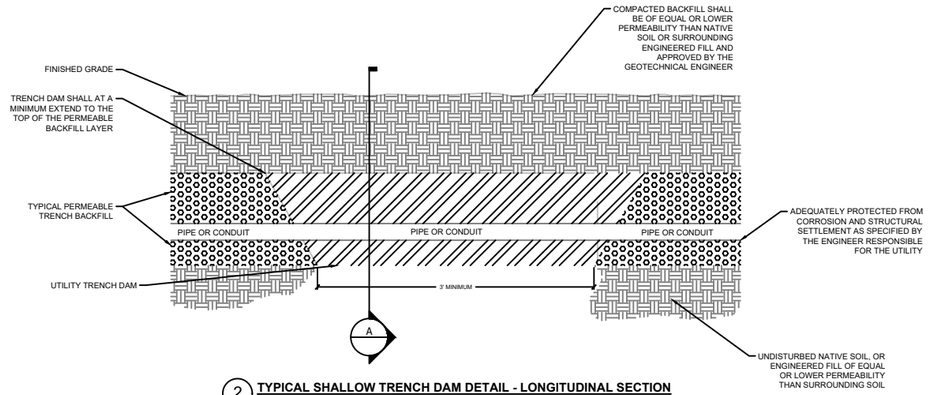
CORNERSTONE EARTH GROUP



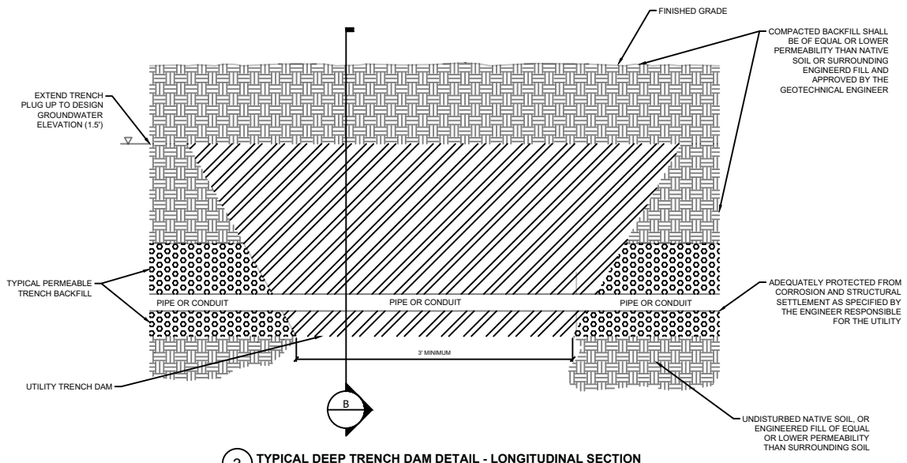
1 **TYPICAL TRENCH DAM DETAIL AT EDGE OF BUILDING SLAB**
NOT TO SCALE



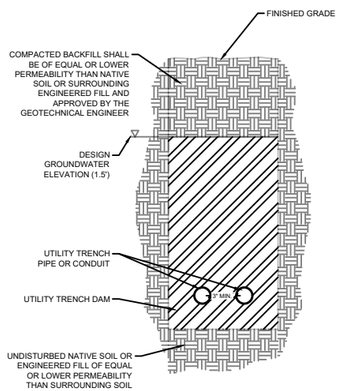
A **TRENCH DAM SECTION**
NOT TO SCALE



2 **TYPICAL SHALLOW TRENCH DAM DETAIL - LONGITUDINAL SECTION (UTILITIES ABOVE GROUNDWATER DESIGN ELEVATION)**
NOT TO SCALE



3 **TYPICAL DEEP TRENCH DAM DETAIL - LONGITUDINAL SECTION (UTILITIES BELOW GROUNDWATER DESIGN ELEVATION)**
NOT TO SCALE



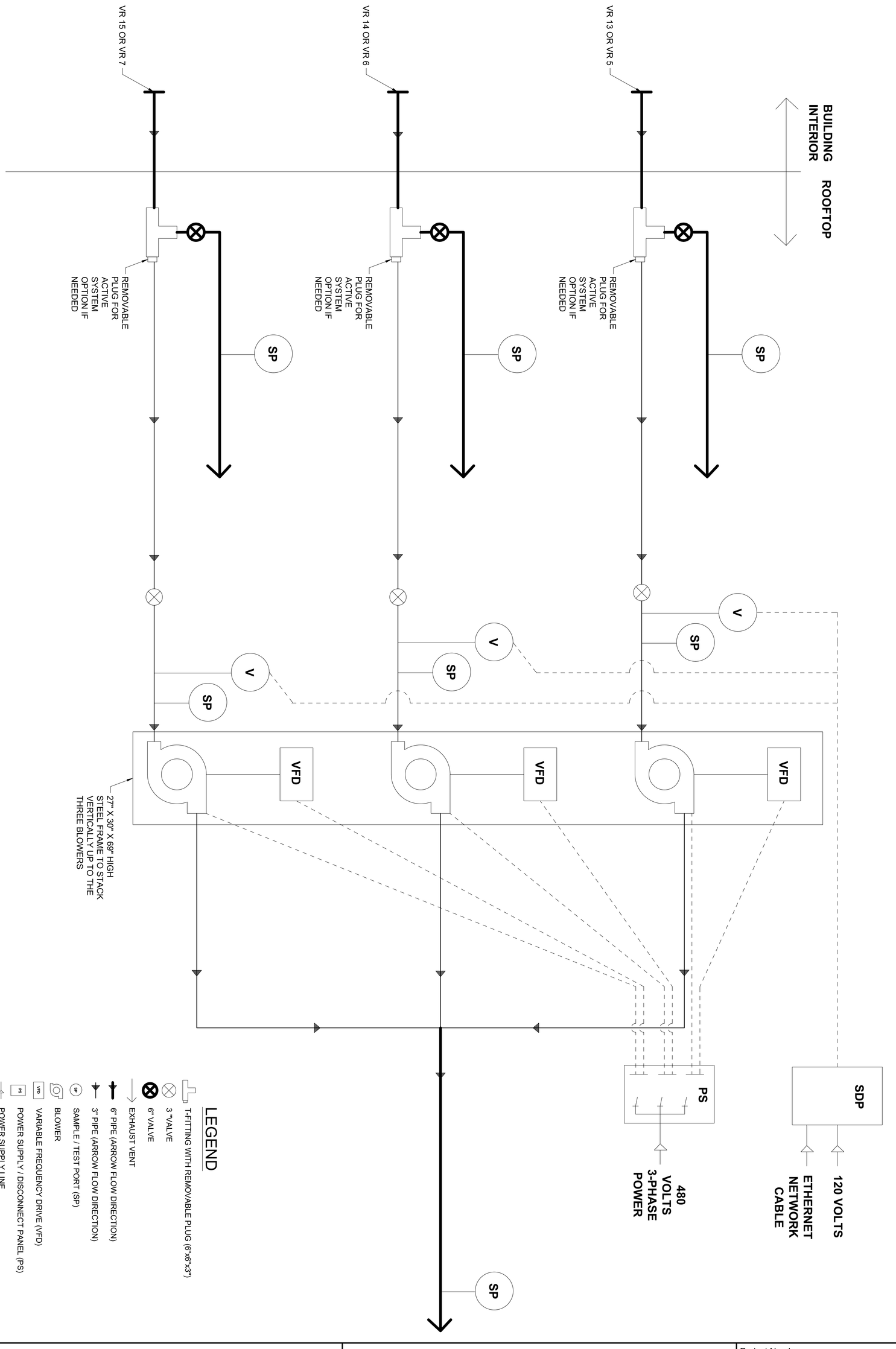
B **DEEP TRENCH DAM SECTION**
NOT TO SCALE

Project Number	678-3-2
Figure Number	7
Date	JUNE 2019
Drawn By	MFC/JMA/ELH

Trench Plug Details

100/200 Caribbean
Sunnyvale, California

CORNERSTONE EARTH GROUP



CORNERSTONE EARTH GROUP

Active System Process and Instrumentation Diagram - 100 Caribbean

Caribbean Campus Development
Sunnyvale, California

Project Number	678-3-2
Figure Number	8
Date	JUNE 2019
Drawn By	ELH

CORNERSTONE EARTH GROUP

APPENDIX A – PRELIMINARY TRENCH DAM LOCATIONS

CARIBBEAN DRIVE

APPROXIMATE FLOOD BOUNDARY

ZONE "X"

ZONE "AE" (EL 11)

100 CARIBBEAN
FF=12.0

BORREGAS AVENUE

PROPOSED 14' P.A.E.

PROPOSED 26' E.V.A.E.

PROPOSED 15" P.U.E. BY OTHERS

REFER TO LANDSCAPE DRAWINGS FOR ANY WORK WITHIN THIS AREA

REFER TO LANDSCAPE DRAWINGS FOR ANY WORK WITHIN THIS AREA

REFER TO 10"SS RELOCATION PLANS PREPARED BY KIER & WRIGHT CIVIL ENGINEERS

REFER TO 10"SS RELOCATION PLANS PREPARED BY KIER & WRIGHT CIVIL ENGINEERS

MATCHLINE - SEE SHEET C0-800.2

Shallow (above design GW elevation)

Deep (at or below design GW elevation)

Unknown depth

Design GW elevation is 1.5'

NORTH

0 10 20 40 60

Scale 1" = 20'

KEY NOTES

1. STORM DRAIN CONNECTION TO EXISTING STRUCTURE
2. SDMH STRUCTURE ON EXISTING STORM DRAIN SYSTEM PER CITY OF SUNNYVALE STANDARDS.
3. RECLAIMED WATER CONNECTION TO EXISTING RECLAIMED WATERLINE PER CITY OF SUNNYVALE STANDARDS.
4. FIRE SERVICE CONNECTION TO EXISTING WATERLINE PER CITY OF SUNNYVALE STANDARDS.
5. EXISTING FIBER OPTIC LINE TO REMAIN AND BE PROTECTED IN PLACE DURING CONSTRUCTION.
6. REFER TO LANDSCAPE DRAWINGS FOR AREA DRAINS AND PIPING CONNECTIONS TO CIVIL STORM AND DRAINAGE SYSTEM
7. INSTALL 4" MIDE SLOPED S300 K POWERDRAIN BY ACO, REFER TO LANDSCAPE PLANS FOR GRATE TYPE.

LEGEND

XJT	EXISTING JOINT TRENCH
XTELE–UG	EXISTING UNDERGROUND TELEPHONE SERVICE
XGAS	EXISTING GAS SERVICE
EX FO	EXISTING FIBER OPTIC SERVICE

NOTE:

1. ALL ONSITE EXISTING UTILITIES IF NOT SHOWN PROTECTED THEN ASSUME REMOVED OR ABANDONED.
2. ALL FIBER OPTICS, JT LOCATIONS WILL BE POTHOLED & VERIFIED IN THE FIELD PRIOR TO COMPLETION OF THE UTILITY DESIGN.
3. JT FOR REFERENCE ONLY.
4. UTILITIES TO BE POTHOLED PRIOR TO FINAL DESIGN.
5. THE UNDERGROUND PRIVATE SITE FIRE PROTECTION SYSTEMS ARE "LOOPED" SYSTEMS WITH TWO 10"FIRE SERVICE CONNECTIONS TO THE 12" PUBLIC MAIN (W. CARIBBEAN AND BOREGEAUX DRIVE.) THERE IS A 10"DIAMETER ABOVE GRADE REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA) AT EACH FIRE SERVICE CONNECTION. AS SUCH, NOTE THE FOLLOWING: THE 10"RPDA HAS A LISTED FLOW RATE OF 2,300 GPM. BEING THAT BUILDING 200 CARIBBEAN HAS THE LARGEST FIRE FLOW REQUIREMENT, 4500 GPM AT 20 PSI, NO ADDITIONAL RPDA'S ARE NEEDED.

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(801) 280-6424

D	03.22.2019	PERMIT SUBMITTAL
C	02.22.2019	ADDENDUM C
	12.21.2018	50% CD
	10.26.2018	100% DD
	06.29.2018	50% DD
	03.29.2018	50%DD SKIN BID
	03.09.2018	50% DD BID
	03.02.2018	50% DD

SEAL

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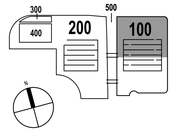
NOT FOR CONSTRUCTION

KEY PLAN



BAR SCALE

SHEET NAME

UTILITY PLAN

PROJECT NO: A17048-2
CDB NO:
SCALE: AS SHOWN
ISSUE: PERMIT SUBMITTAL
DATE: 03/22/19

SHEET NO: C0-800.1

CPRA CONFIDENTIAL TREATMENT REQUEST
NOT FOR PUBLIC RELEASE – CPRA EXEMPT
CONFIDENTIAL & PROPRIETARY BUSINESS/FINANCIAL INFO
PRE-DECISIONAL DRAFT FOR REVIEW ONLY

Z:\2017\A17048-2\DWG\CIVIL\BUILDING PERMIT\A17048-2-C0S-100-UP.dwg 3-21-19 02:21:24 PM ctrabdy

MATCHLINE - SEE SHEET C0-800.1

100 CARIBBEAN
FF=12.0

CASPIAN COURT

BORREGAS AVENUE

REFER TO LANDSCAPE DRAWINGS FOR ANY WORK WITHIN THIS AREA

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PROPOSED 26' E.V.A.E.

PROPOSED 15' P.U.E. BY OTHERS

PROPOSED 15' P.U.E. BY OTHERS

PROPOSED 14' P.U.E.

PIV SECTIONAL CONTROL VALVE

GREASE INTERCEPTOR

(CCNANI,ONFIBER,WORLDCOM)

(1-1/4"PL GAS,TELE,ELECT,SL)

EX.SDMH #113
RE 4.16
IE -3.18 54"S
IE -3.18 54"N
IE -3.18 24"NE
IE -1.00 12"W
IE -1.00 12"NW

0 10 20 40 60
Scale 1" = 20'

KEY NOTES

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- XJT — EXISTING JOINT TRENCH
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D	03.22.2019	PERMIT SUBMITTAL
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	10.26.2018	100% DD
	06.29.2018	50% DD
	03.29.2018	50%DD SKIN BID
	03.09.2018	50% DD BID
	03.02.2018	50% DD

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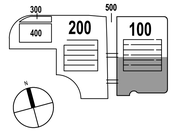
KEY PLAN



BAR SCALE

SHEET NAME

UTILITY PLAN

PROJECT NO
A11548-2

CSE NO

SCALE
AS SHOWN

ISSUE
PERMIT SUBMITTAL

DATE
03/22/19

SHEET NO
C0-800.2

CPRA CONFIDENTIAL TREATMENT REQUEST
NOT FOR PUBLIC RELEASE - CPRA EXEMPT
CONFIDENTIAL & PROPRIETARY BUSINESS/TRADE INFO
PRE-DECISIONAL DRAFT FOR REVIEW ONLY

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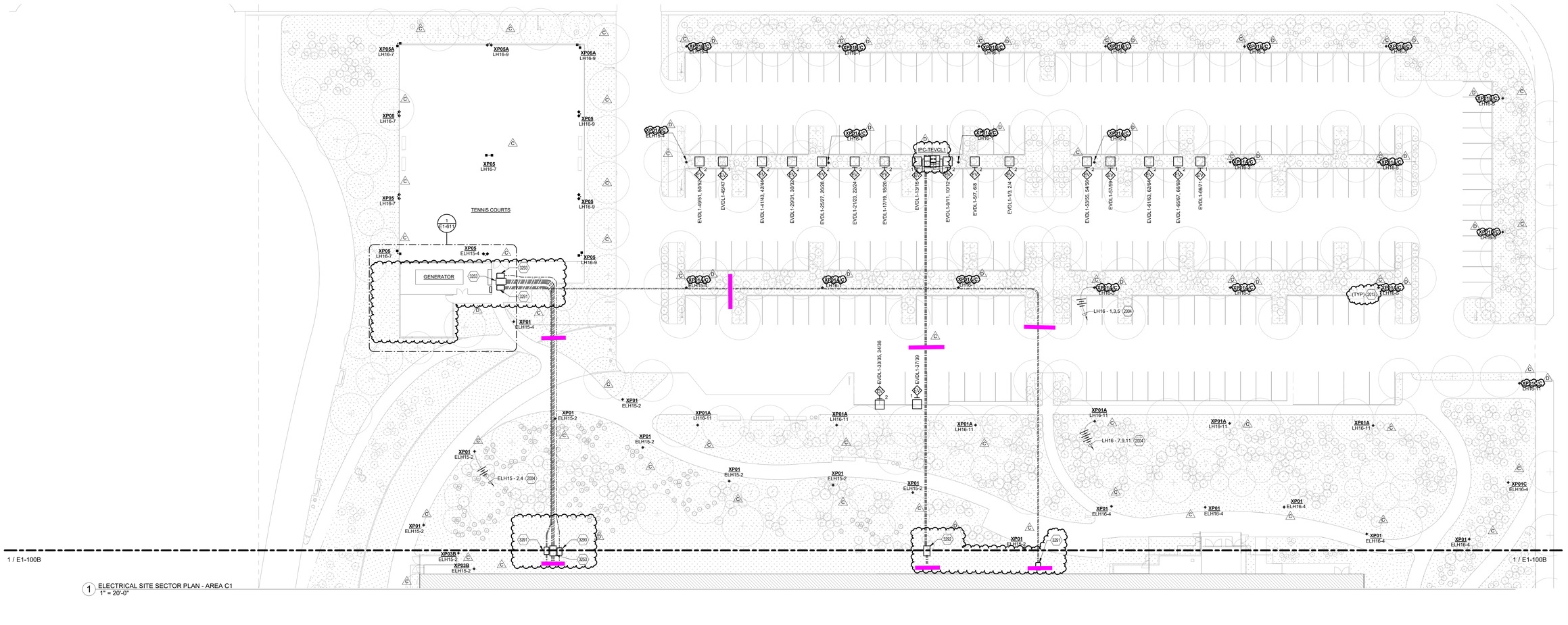
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XP05 LH16-9
XP05 LH16-7
TENNIS COURTS
XP05 LH16-7
XP05 LH16-9
1 E1-611
XP05 LH16-7
XP05 ELH15-4
XP05 LH16-9
GENERATOR
3253
3291
XP01 ELH15-4
XP01 ELH15-2
XP01A LH16-11
XP01 ELH15-2
XP01 ELH15-2
ELH15 - 2,4 2004
XP01 ELH15-2
XP03B ELH15-2
XP03B ELH15-2
3291
3253
3253
XP01A LH16-11
XP01 ELH15-2
XP01 ELH15-2
XP01 ELH15-2
XP01 ELH15-2
XP01A LH16-11
XP01A LH16-11
XP01A LH16-11
XP01 ELH15-2
XP01 ELH15-2
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3291
XP01A LH16-11
LH16 - 7,9,11 2004
XP01 ELH16-4
XP01 ELH16-4
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XP01A LH16-11
XP01C ELH16-4
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XP01A LH16-11
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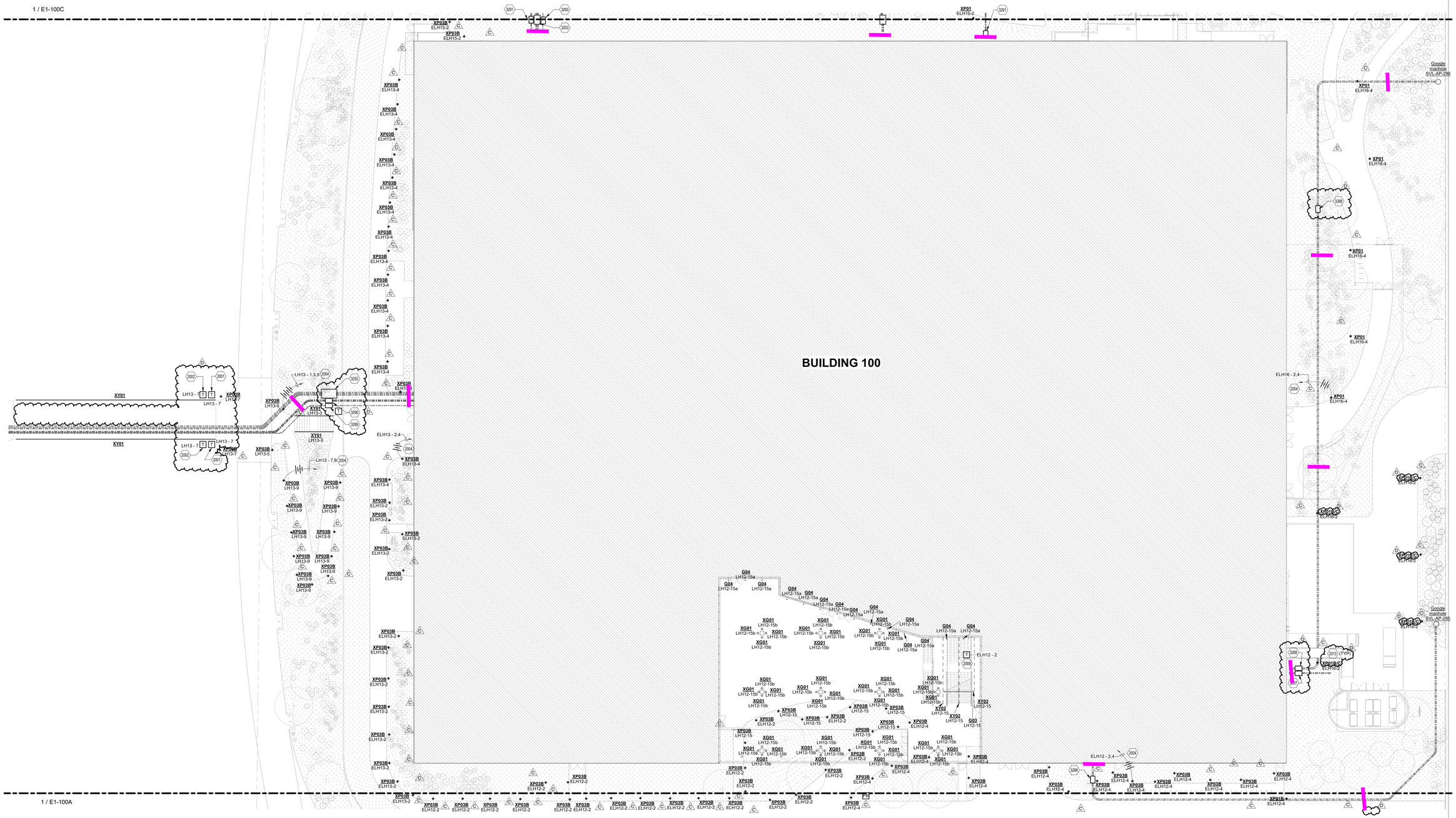


1 ELECTRICAL SITE SECTOR PLAN - AREA B1
1" = 20'-0"

GENERAL NOTES

1. ALL SITE LIGHTING CONDUCTORS SHALL BE #10 AWG.

NUMBERED NOTES

2001 AT THIS LOCATION, PROVIDE ONE (1) WATERTIGHT NEMA 4 ENCLOSURE, KLIK USA #LPNEMA4ENCL. EACH ENCLOSURE SHALL HOUSE TWO (2) 100 WATT DIMMABLE DRIVERS, KLIK USA #LP100WPRITRNDM TO CONTROL TYPE XY01 LED HANDRAIL. COORDINATE LOCATION AND MOUNTING WITH ARCHITECT.

2002 AT THIS LOCATION, PROVIDE ONE (1) WATERTIGHT NEMA 4 ENCLOSURE, KLIK USA #LPNEMA4ENCL. EACH ENCLOSURE SHALL HOUSE ONE (1) 100 WATT DIMMABLE DRIVER, KLIK USA #LP100WPRITRNDM TO CONTROL TYPE XY01 LED HANDRAIL. COORDINATE LOCATION AND MOUNTING WITH ARCHITECT.

2004 ROUTE CIRCUITS CONTROLLING EXTERIOR LIGHTING VIA ENLIGHTED DIGITAL LIGHTING CONTROL SYSTEM FOR TIMECLOCK CONTROL OF EXTERIOR LIGHTING.

2009 PROVIDE TWO (2) WATERTIGHT NEMA 4 ENCLOSURES, OLS #011300. ONE ENCLOSURE SHALL HOUSE TWO (2) 100 WATT DRIVERS, OLS #011384, AND THE OTHER ENCLOSURE SHALL HOUSE ONE (1) DRIVER FOR LIGHTED HANDRAIL FIXTURE TYPE XY02. COORDINATE ENCLOSURE LOCATIONS AND MOUNTING WITH ARCHITECT. NOTE: EACH SYMBOL IDENTIFIED BY THIS NOTE ON THE DRAWING REPRESENTS A TOTAL OF TWO (2) ENCLOSURES AND FOUR(4) DRIVERS.

2013 FOR ALL SITE POLE FIXTURES WITH '/C' AFTER THE FIXTURE TAG, PROVIDE WITH ABOVE GRADE CONCRETE BASE. SEE BASE DETAIL ON DETAIL SHEET. FOR THESE FIXTURES ORDER WITH SHORTER POLE SO THAT OVERALL FIXTURE HEIGHT OF ANY GIVEN TYPE REMAINS THE SAME, WHETHER IT HAS THE ABOVE GRADE BASE OR NOT.

3252 (N) UNDERGROUND VAULT FOR NORMAL 12KV POWER DISTRIBUTION. 4'-6" X 8'-6" X 4'-6" WITH SPRING ASSIST HINGED COVERS.

3253 (N) UNDERGROUND VAULT FOR EMERGENCY POWER DISTRIBUTION. 3'-0" X 5'-0" X 3'-0" WITH LIFT OFF COVERS.

3287 (N) AT&T VAULT. AT&T TO CONFIRM SIZE.

3288 (N) UNDERGROUND VAULT FOR TELECOM, N48 CHRISTY BOX.

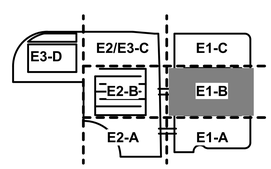
3289 (N) UNDERGROUND VAULT FOR ERRCS, N40 CHRISTY BOX.

3290 (N) UNDERGROUND VAULT FOR TELECOM/DAS, N40 CHRISTY BOX.

3291 (N) UNDERGROUND VAULT FOR CONTROLLER WIRING, N40 CHRISTY BOX.

3293 (N) UNDERGROUND VAULT FOR TELECOM, N40 CHRISTY BOX.

KEY PLAN - SITE



PROJECT NAME
Enter address here

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SARES - REGIS
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Making Buildings Perform Better
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TEECOM
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STRUCTURAL BRACING ENGINEER
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COREBRACE
5789 WEST WELLS PARK ROAD
WEST JORDAN, UT 84081
(801) 280-4504

NO	DATE	REVISION
D	03.22.2019	PERMIT SUBMITTAL
C	02.08.2019	ADDENDUM C
	12.21.2018	50% CD
	10.26.2018	100% DD
	06.29.2018	50% DD
	03.29.2018	50%DD SKIN BID
	03.09.2018	50% DD BID
	03.02.2018	50% DD

SEAL

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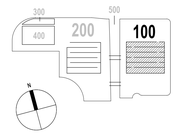
NOT FOR CONSTRUCTION

KEY



BAR

SHEET NAME
ELECTRICAL SITE PLAN - AREA B

PROJECT NO
PROJECT NUMBER
DGB NO
SCALE
1" = 20'-0"
ISSUE
PERMIT SUBMITTAL
DATE
03/22/19

SHEET NO
E1-100B

CPRA CONFIDENTIAL TREATMENT REQUEST
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CONFIDENTIAL & PROPRIETARY: BUSINESSSTING INFO
PRE-OCCSIONAL DRAFT FOR REVIEW ONLY

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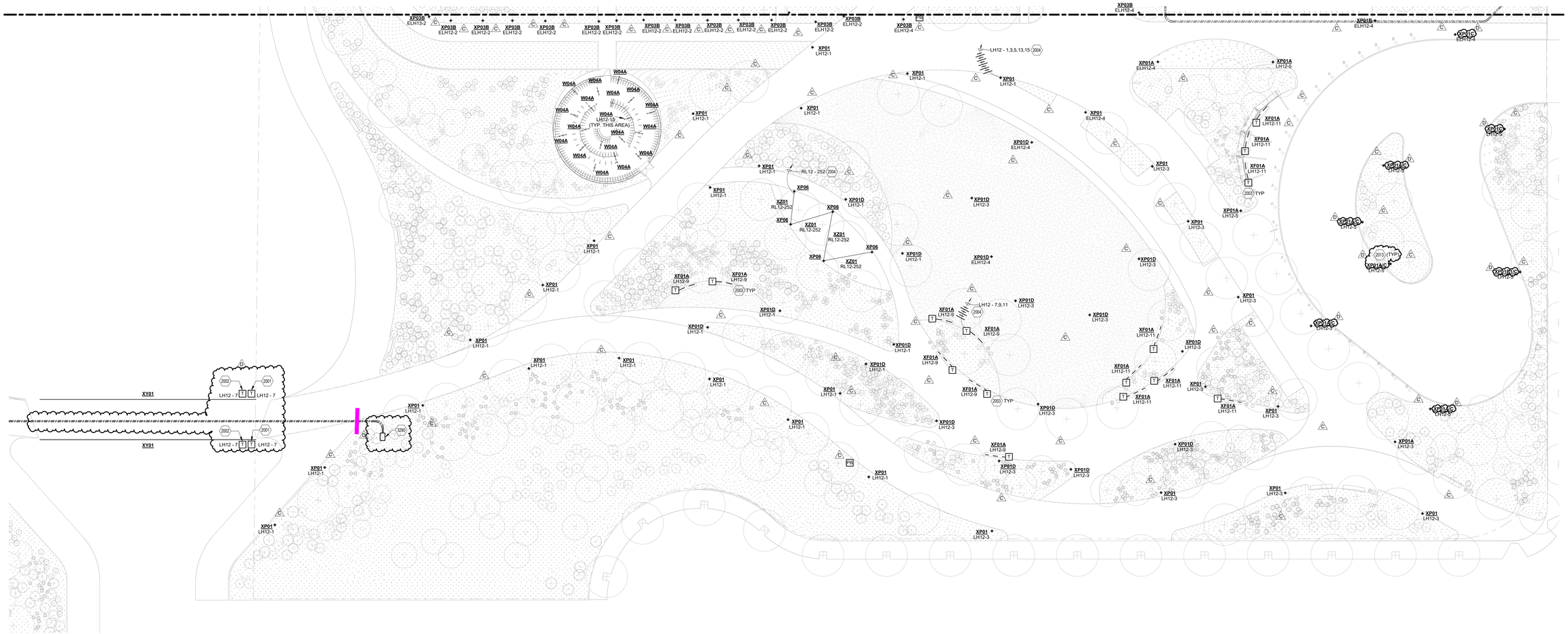


1 ELECTRICAL SITE SECTOR PLAN - AREA A1
1" = 20'-0"

GENERAL NOTES

1. ALL SITE LIGHTING CONDUCTORS SHALL BE #10 AWG.

NUMBERED NOTES

2001 AT THIS LOCATION, PROVIDE ONE (1) WATERTIGHT NEMA 4 ENCLOSURE, KLIK USA #LPNEMA4ENCL, EACH ENCLOSURE SHALL HOUSE TWO (2) 100 WATT DIMMABLE DRIVERS, KLIK USA #LP100WPRITRNDM TO CONTROL TYPE XY01 LED HANDRAIL. COORDINATE LOCATION AND MOUNTING WITH ARCHITECT.

2002 AT THIS LOCATION, PROVIDE ONE (1) WATERTIGHT NEMA 4 ENCLOSURE, KLIK USA #LPNEMA4ENCL, EACH ENCLOSURE SHALL HOUSE ONE (1) 100 WATT DIMMABLE DRIVER, KLIK USA #LP100WPRITRNDM TO CONTROL TYPE XY01 LED HANDRAIL. COORDINATE LOCATION AND MOUNTING WITH ARCHITECT.

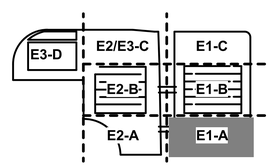
2003 LED DRIVER FOR TYPE XF01 BENCH LIGHTS SHALL BE UNIVERAL PRIMARY VOLTAGE, 100 WATT, LOW PROFILE, QTRAN SLV100-124V-FC. DRIVER SHALL MOUNT TO UNDERSIDE OF BENCH. COORDINATE LOCATION AND MOUNTING WITH LANDSCAPE ARCHITECT.

2004 ROUTE CIRCUITS CONTROLLING EXTERIOR LIGHTING VIA ENLIGHTED DIGITAL LIGHTING CONTROL SYSTEM FOR TIMECLOCK CONTROL OF EXTERIOR LIGHTING.

2013 FOR ALL SITE POLE FIXTURES WITH 'C' AFTER THE FIXTURE TAG, PROVIDE WITH ABOVE GRADE CONCRETE BASE. SEE BASE DETAIL ON DETAIL SHEET. FOR THESE FIXTURES ORDER WITH SHORTER POLE SO THAT OVERALL FIXTURE HEIGHT OF ANY GIVEN TYPE REMAINS THE SAME, WHETHER IT HAS THE ABOVE GRADE BASE OR NOT.

3290 (N) UNDERGROUND VAULT FOR TELECOM/DAS, N40 CHRISTY BOX.

KEY PLAN - SITE



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PROJECT NAME
Enter address here

CLIENT
Google — Owner — 1600 AMPHITHEATRE PARKWAY, MOUNTAINVIEW, CA, T +1 650 253 0000

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BRAND DESIGN
EGG office — EGG OFFICE — 2670 S. LA CIENEGA BLVD, LOS ANGELES, CA 90034, T +1 310 425 8942

CURTAIN WALL CONSULTANT
CDC — CURTAIN WAL DESIGN CONSULTING — 12 GEARY BLVD, #503, SAN FRANCISCO, CA 94108, T +1 925 906 9255

CURTAIN WALL DESIGN/BUILD CONTRACTOR
enclos — ENCLOS — 14670 CENTRAL AVENUE, CHINO, CA 91710, T +1 909 597 2537

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ALLANA BUICK & BERS — ALLANA BUICK & BERS, LLC. — 990 COMMERCIAL STREET, PALO ALTO, CA 94303, T +1 415 543 5400

FACADE MAINTENANCE
HIGH LINE CONSULTING — HIGHLINE CONSULTING, INC. — 4381 TECHNOLOGY DR, UNIT D, LIVERMORE, CA 94551, T +1 925.344.941

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ACCO engineered systems — ACCO ENGINEERED SYSTEMS — 1100 ALADDIN AVE, SAN LEANDRO, CA 94577, T +1 510 346 4200

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ROSENDIN ELECTRIC — ROSENDEN ELECTRIC — 880 MABURY RD, SAN JOSE, CA 95133, T +1 408 286 2800
SILVERMAN & LIGHT — 1301 Park Ave # 100, Emeryville, CA 94608, T +1 510 658 1200

PLUMBING DESIGN/BUILD ENGINEER
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TELECOM DESIGN ENGINEER
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STRUCTURAL BRACING ENGINEER
CoreBrace — COREBRACE — 5789 WEST WELLS PARK ROAD, WEST JORDAN, UT 84081, (801) 280-4004

NO	DATE	REVISION
D	03.22.2019	PERMIT SUBMITTAL
C	02.08.2019	ADDENDUM C
	12.21.2018	50% CD
	10.26.2018	100% DD
	06.29.2018	50% DD
	03.29.2018	50%DD SKIN BID
	03.09.2018	50% DD BID
	03.02.2018	50% DD

SEAL

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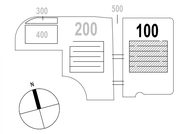
NOT FOR CONSTRUCTION

KEY



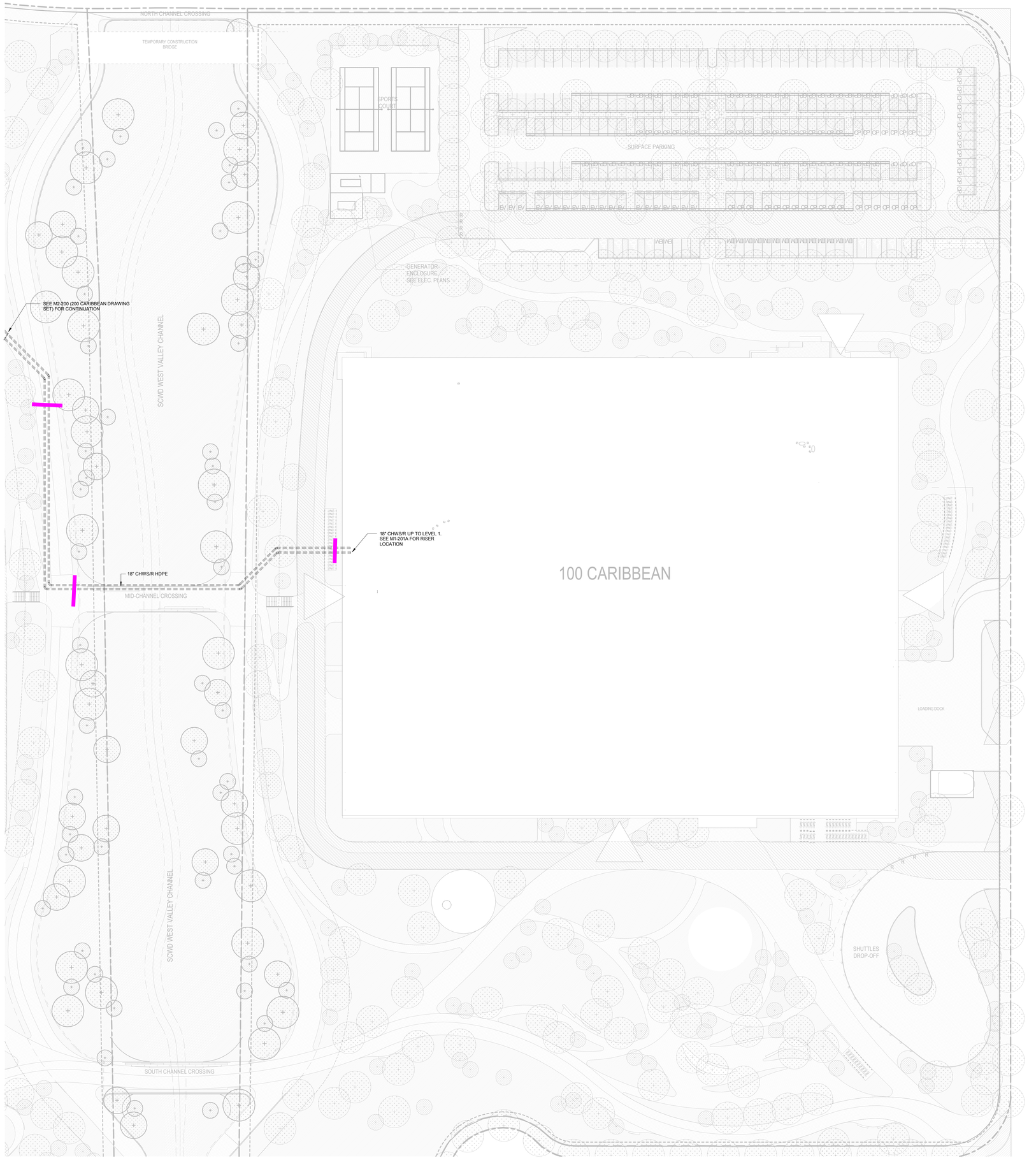
BAR:

SHEET NAME
ELECTRICAL SITE PLAN - AREA A

PROJECT NO: PROJECT NUMBER
DGB NO:
SCALE: 1" = 20'-0"
ISSUE: PERMIT SUBMITTAL
DATE: 03/22/19

SHEET NO: **E1-100A**

CPRA CONFIDENTIAL TREATMENT REQUEST NOT FOR PUBLIC RELEASE - CPRA EXEMPT CONFIDENTIAL & PROPRIETARY: BUSINESSSTING INFO PRE-OCCSIONAL DRAFT FOR REVIEW ONLY



1 UNDERGROUND PIPING PLAN
SCALE: 1/32" = 1'-0"

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CARIBBEAN CAMPUS

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NO	DATE	REVISION
D	03.22.2019	PERMIT SUBMITTAL
C	02.08.2019	ADDENDUM C
	12.21.2018	50% CD
	10.26.2018	100% DD
	07.13.2018	50% DD

SEAL

REGISTERED PROFESSIONAL ENGINEER — CRAIG A. SLOAN — No. M031857 — EXP. 09/30/19 — MECHANICAL — STATE OF CALIFORNIA

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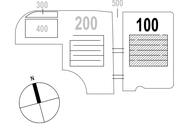
NOT FOR CONSTRUCTION

KEY



BAR

SHEET NAME

UNDERGROUND PIPING PLAN

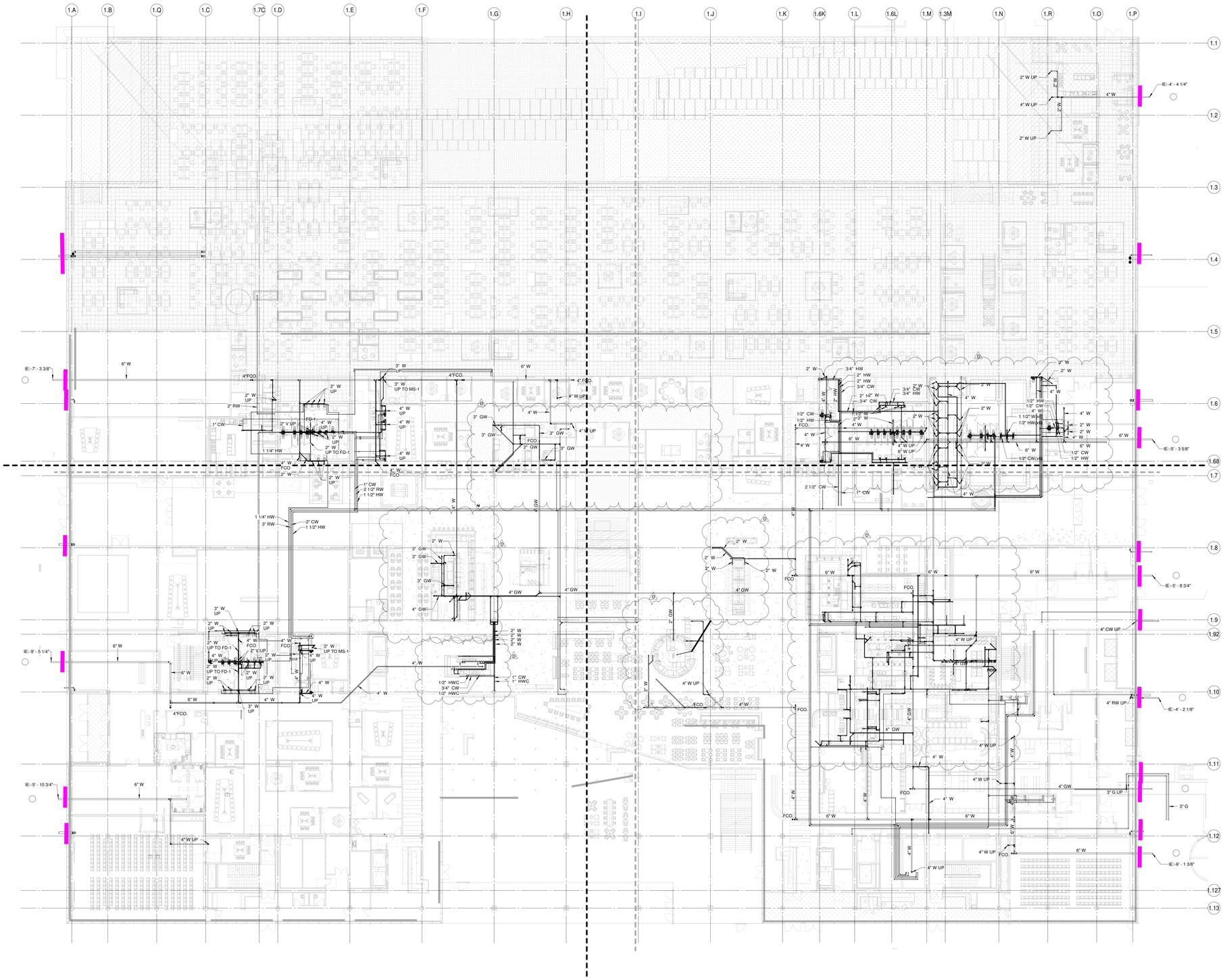
PROJECT NO: 622965
DOB NO:
SCALE: 1/32" = 1'-0"
ISSUE: PERMIT SUBMITTAL
DATE: 03/22/2019

SHEET NO: **M1-200**

CPRA CONFIDENTIAL TREATMENT REQUEST
NOT FOR PUBLIC RELEASE - CPRA EXEMPT
CONFIDENTIAL & PROPRIETARY BUSINESS/TRADE INFO
PRE DECISIONAL DRAFT FOR REVIEW ONLY

SHEET NOTES:

1 SEE CIVIL DRAWINGS FOR CONTINUATION.


1.A
1.B
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1.92
1.10
1.11
1.12
1.127
1.13
IE:-7' - 3 3/8"
IE:-4' - 4 1/4"
IE:-5' - 3 5/8"
IE:-5' - 8 3/4"
IE:-4' - 2 1/8"
IE:-6' - 1 3/8"
IE:-9' - 5 1/4"
IE:-5' - 10 3/4"
2" W UP
4" W UP
4" W
6" W
4"FCO
3" W UP
3" W UP TO MS-1
2" W UP TO FD-1
2" W UP TO FD-1
1" CW
1 1/4" HW
3" RW
2" CW
1 1/2" HW
3" GW
4" GW
2" W
FCO
1/2" HWC
3/4" CW
1/2" HWC
1" CW
1" HWC
4" W UP
4" RW UP
4" CW UP
3" G UP
3" G
2 1/2" CW
1/2" CW
1/2" HW
1 1/2" HW
4" W UP
6" W UP
1/2" CW
1/2" HW
1/2" CW
1/2" HW
3/4" HW
2" HW
3/4" CW
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4" W
2" W
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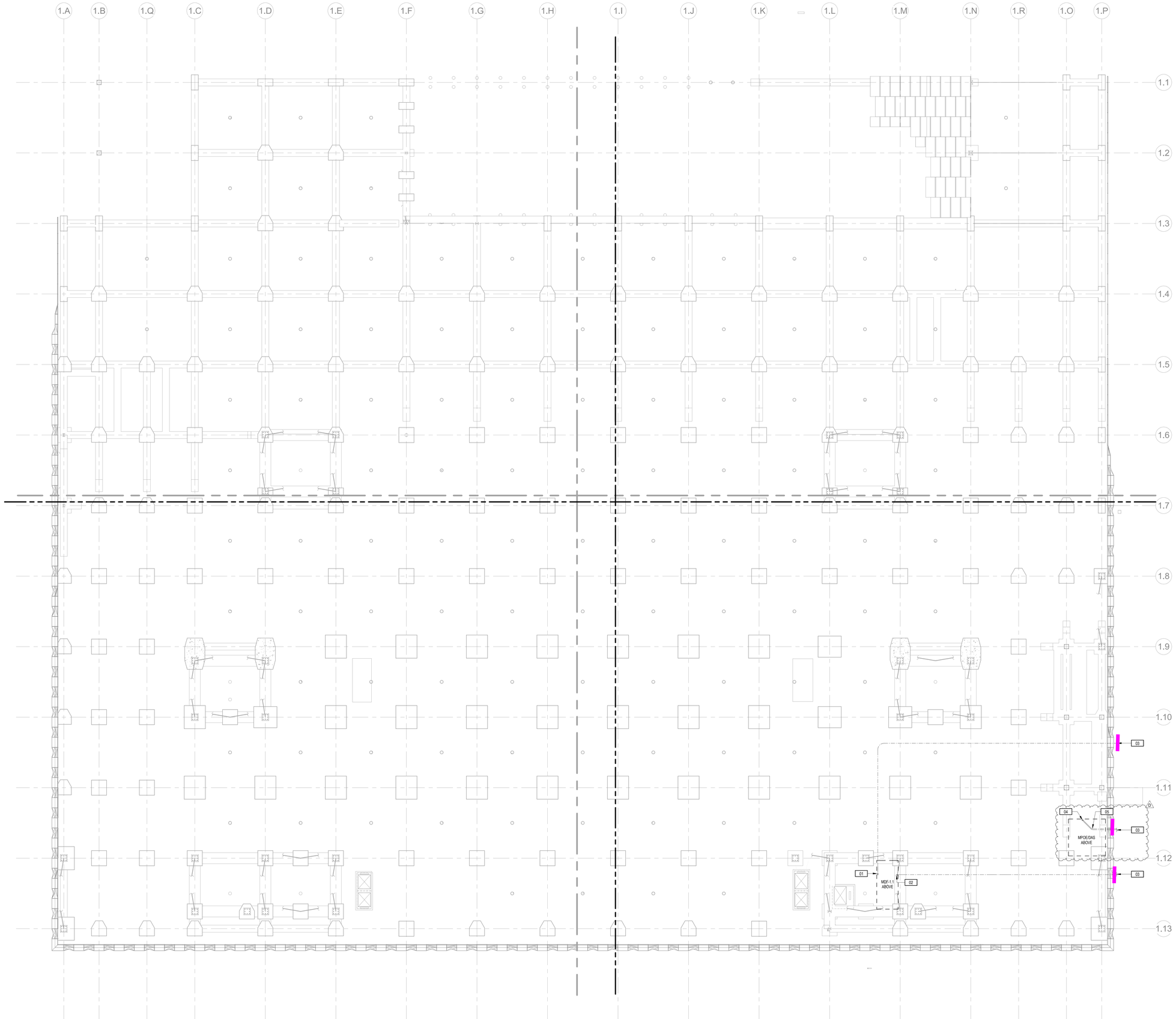
6" W
4" W UP
6" W UP
4" GW
3" GW
4" W UP
4" W
4" W UP
4" W UP
4" W UP



GENERAL NOTES

1. REFER TO SHEET T1 - 001 FOR ABBREVIATIONS, GENERAL NOTES, AND SYMBOL DEFINITIONS.
2. REFER TO SHEET T1 - 002 FOR PRIMARY PATHWAY REQUIREMENTS AND DEFINITIONS.

NUMBERED NOTES

01 OSP CONDUITS ROUTING FROM THE EAST SIDE OF THE BUILDING. REFER TO THE MDF-1.1 ENLARGED PLANS FOR STUB-UP LOCATION. REFER TO THE PATHWAYS RISER FOR CONDUIT SIZE AND QUANTITY. PROVIDE A MINIMUM OF 36" BEND RADIUS FOR THE 90-DEGREE TRANSITION INTO THE MDF ROOM. FIELD COORDINATE ROUTE WITH BUILDING'S FOOTINGS AND OTHER UNDERGROUND UTILITIES.

02 OSP CONDUITS ROUTING FROM THE SOUTHEAST SIDE OF THE BUILDING. REFER TO THE MDF-1.1 ENLARGED PLANS FOR STUB-UP LOCATION. REFER TO THE PATHWAYS RISER DIAGRAM FOR CONDUIT SIZE AND QUANTITY. PROVIDE A MINIMUM OF 36" BEND RADIUS FOR THE 90-DEGREE TRANSITION INTO THE MDF ROOM. FIELD COORDINATE ROUTE WITH BUILDING'S FOOTINGS AND OTHER UNDERGROUND UTILITIES.

03 REFER TO THE ELECTRICAL SITE PLAN FOR ROUTE CONTINUATION AND CONNECTION TO THE TELECOMMUNICATIONS SITE PATHWAYS INFRASTRUCTURE.

04 OSP CONDUITS ROUTING FROM EAST SIDE OF THE BUILDING. STUB CONDUITS ALONG THE EAST WALL OF THE MPOE/DAS ROOM. REFER TO THE PATHWAYS RISER DIAGRAM FOR CONDUIT SIZE AND QUANTITY. PROVIDE A MINIMUM OF 36" BEND RADIUS FOR THE 90-DEGREE TRANSITION INTO THE ROOM. FIELD COORDINATE ROUTE WITH BUILDING'S FOOTINGS AND OTHER UNDERGROUND UTILITIES.

05 DO NOT EXCEED 45° BEND FOR THE OSP CONDUITS.

Caribbean Campus

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SUNNYVALE, CA

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NO	DATE	REVISION
D	03.22.2019	PERMIT SUBMITTAL
C	02.08.2019	ADDENDUM C
	12.21.2018	50% CD
	10.26.2018	100% DD

SEAL

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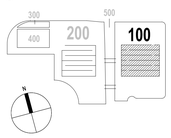
KEY



BAR

SHEET NAME

OVERALL UNDERSLAB PLAN

PROJECT NO: 15367
DOB NO:
SCALE: 1/16" = 1'-0"
ISSUE: PERMIT SUBMITTAL
DATE: 03/22/19

SHEET NO: T1 - 200

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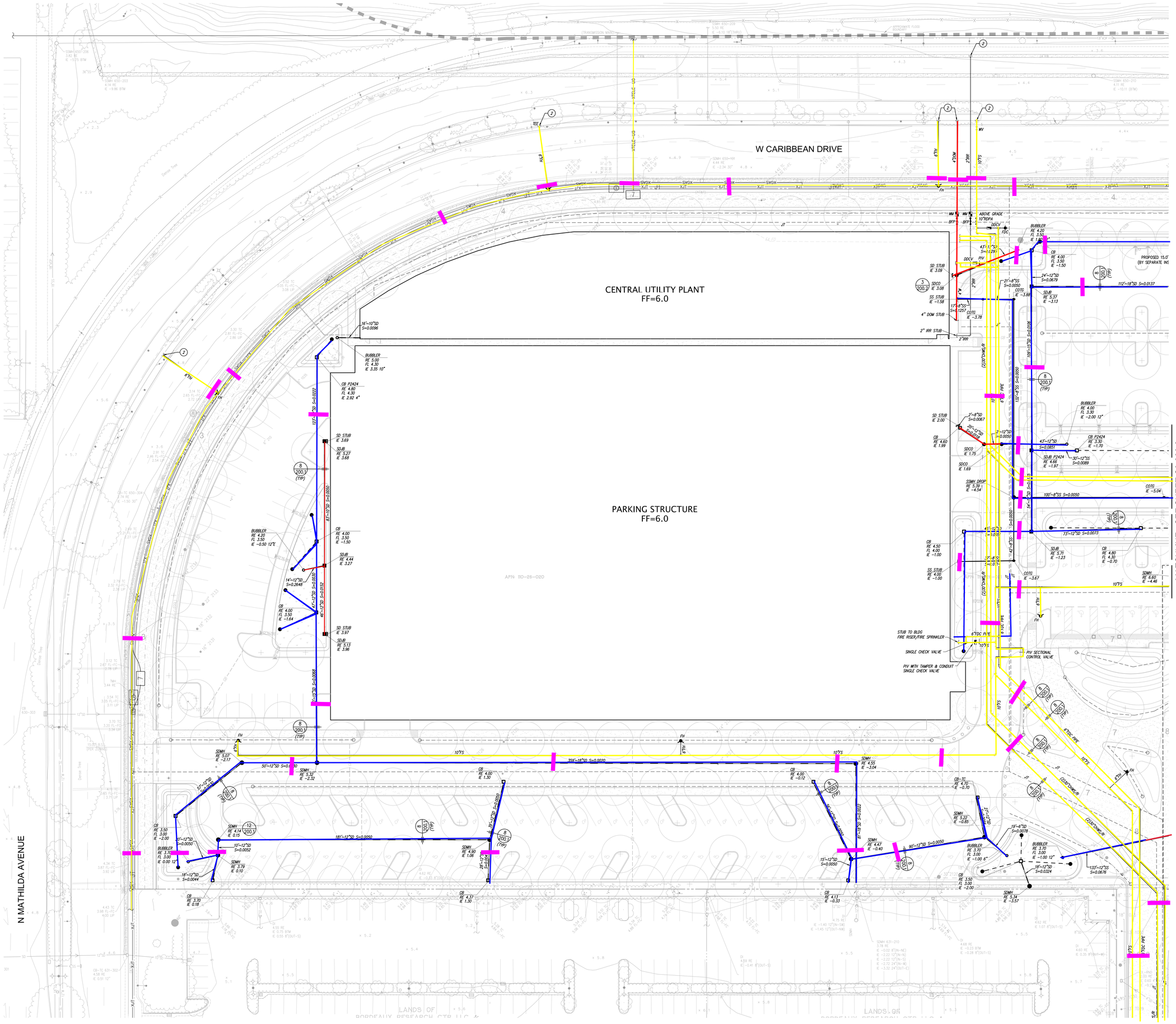
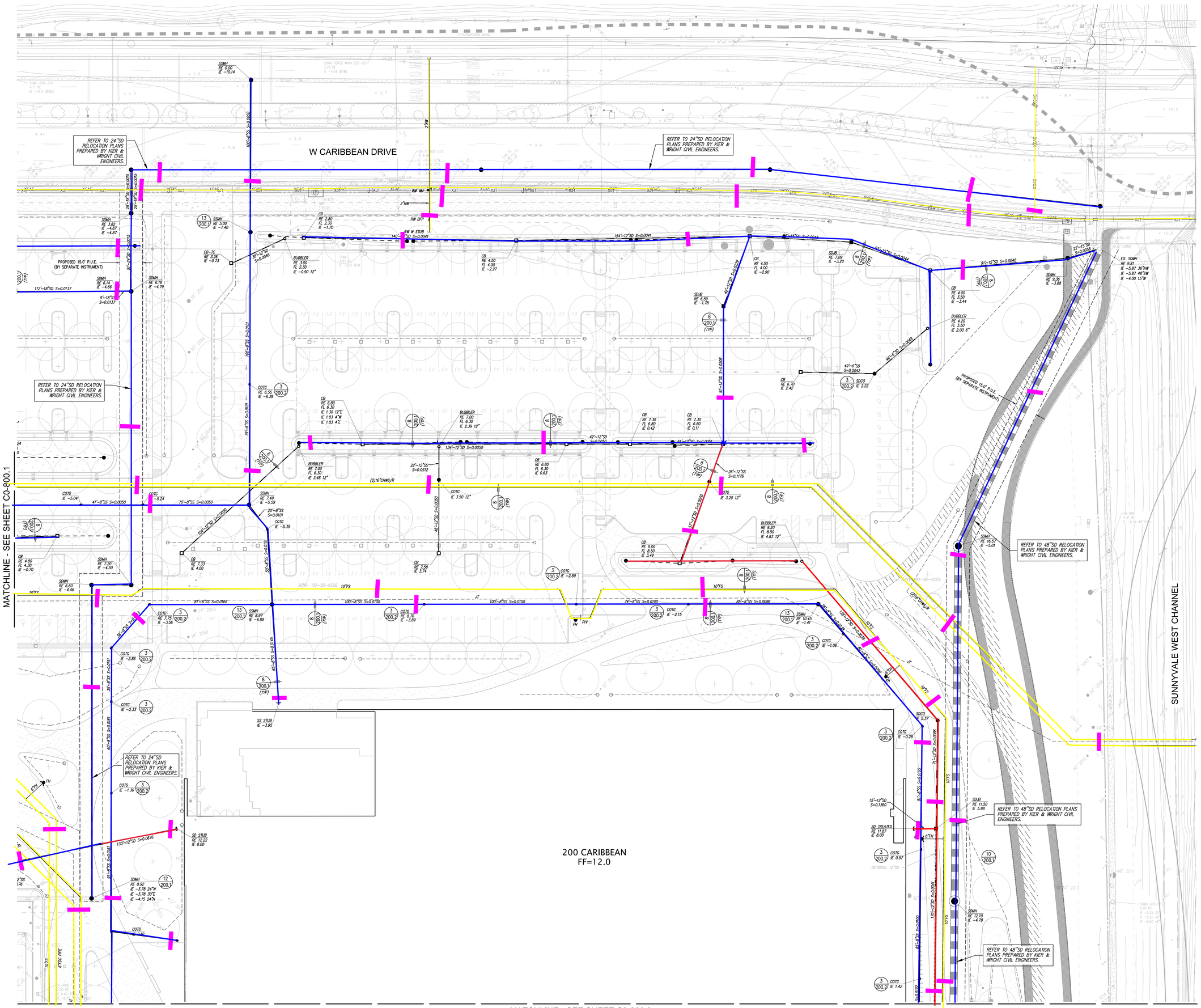

W CARIBBEAN DRIVE
CENTRAL UTILITY PLANT
FF=6.0
PARKING STRUCTURE
FF=6.0
N MATHILDA AVENUE
MATCHLINE - SEE SHEET C0-800.2
APN: 110-26-020
LANDS OF BORDEAUX RESEARCH CTR LLC
LANDS OF BORDEAUX RESEARCH CTR LLC
PROPOSED 15.0' (BY SEPARATE INS
ABOVE GRADE 10"RDPA
BUBBLER RE 4.20 FL 3.50 IE 1.50
CB RE 4.00 FL 3.50 IE -1.50
SDCO IE 3.08
SS STUB IE -1.58
4" DOM STUB
2" IRR STUB
SD STUB IE 3.09
SDJB RE 5.37 IE -3.13
COTG IE -3.88
COTG IE -3.78
112'-18"SD S=0.0137
24"-12"SD S=0.0679
21"-8"SS S=0.0050
127'-6"SS S=0.1257
109'-15"SD S=0.0016
132'-8"SS S=0.0050
10" PIPE
6" PIPE
2'-8"SD S=0.0067
20'-12"SD S=0.0050
2'-12"SD S=0.0050
SD STUB IE 2.00
CB RE 4.60 IE 1.99
SDCO IE 1.75
SDCO IE 1.69
SDMH DROP RE 5.39 IE -4.54
43'-12"SD S=0.0851
CB P2424 RE 3.30 IE -1.70
SDJB P2424 RE 4.68 IE -1.97
30'-12"SS S=0.0089
54'-12"SD S=0.0050
100'-8"SS S=0.0050
COTG IE -3.04
4'-12"SD L=1.0
73'-12"SD S=0.0073
CB RE 4.50 FL 4.00 IE -1.00
SS STUB RE 4.00 IE -1.00
7'-8"SS S=0.07
COTG IE -3.67
SDJB RE 5.71 IE -1.23
CB RE 4.80 FL 4.30 IE -0.70
SDMH RE 6.60 IE -4.46
10"SS
STUB TO BLDG FIRE RISER/FIRE SPRINKLER
SINGLE CHECK VALVE
PIV WITH TAMPER & CONDUIT SINGLE CHECK VALVE
PIV SECTIONAL CONTROL VALVE
6"DC PIPE
6"DC FIRE
(2)12"DOMESTIC
BUBBLER RE 4.20 FL 3.50 IE -0.50 12"E
CB RE 4.00 FL 3.50 IE -1.50
SDJB RE 4.44 IE 3.27
SD STUB IE 3.69
SDJB RE 5.27 IE 3.68
SD STUB IE 3.97
SDJB RE 5.13 IE 3.96
14'-12"SD S=0.2648
17'-12"SD S=0.0059
48'-12"SD S=0.0059
81'-10"SD S=0.0050
121'-10"SD S=0.0222
16'-10"SD S=0.0098
CB P2424 RE 4.80 FL 4.30 IE 2.92 4"
BUBBLER RE 5.00 FL 4.30 IE 3.35 10"
CB RE 4.00 FL 3.50 IE -1.64
50'-12"SD S=0.0050
SDMH RE 5.07 IE -2.17
SDMH RE 5.32 IE -2.32
159'-18"SD S=0.0020
SDMH RE 4.55 IE -3.04
CB RE 4.00 IE 1.50
CB RE 4.00 IE -0.12
CB-TC RE 4.70 IE -0.70
57'-12"SD S=0.0050
BUBBLER RE 3.70 FL 3.00 IE 0.00 12"
CB RE 3.50 FL 3.00 IE -2.00
SDMH RE 4.14 IE 0.15
SDMH RE 3.79 IE 0.10
10'-12"SD S=0.0050
18'-12"SD S=0.0044
CB RE 3.70 IE 0.18
181'-12"SD S=0.0050
30'-12"SD S=0.0050
SDMH RE 4.90 IE 1.06
CB RE 4.37 IE 1.30
295'-12"SD S=0.0044
CB RE 4.13 IE -0.33
8"-18"SD S=0.0022
SDMH RE 4.47 IE -0.40
90'-12"SD S=0.0050
15'-12"SD S=0.0050
SDMH RE 5.22 IE -0.85
27'-12"SD S=0.0050
19'-6"SD S=0.0078
BUBBLER RE 3.70 FL 3.00 IE -1.00 6"
BUBBLER RE 4.00 FL 3.30 IE -2.00 12"
16'-12"SD S=0.0324
133'-12"SD S=0.0676
CB RE 3.50 FL 3.00 IE -2.00
SDMH RE 5.14 IE -3.57
(2)12"DOMESTIC
6"DC PIPE
10"SS
SDMH 631-210 RE IE -0.02 8"(N-NE) IE -2.22 12"(N-N) IE -2.22 12"(N-S) IE -2.72 24"(N-W) IE -3.32 24"(OUT-S)
SDMH 631-209 RE IE -0.10 18"(IN) IE -2.34 30"(OUT-S)
SDMH 650-209 RE IE -9.10 18"(IN)
SDMH 650-206 RE IE -9.75 BTM
SDMH 650-203 RE IE -9.86 BTM
SDMH 650-210 RE IE -10.11 (BTM)
SDMH 650-101 RE IE -2.34 30"
TEE
HLG
XTELE-UG
SVDX
JT
WV
BFP
FH
6"FH
6"DC
DDCV
FDC
PIV
2"WR
4"DOM
2"IRR
6"FDC
6"FH
(2)6"DOMESTIC
(2)6"FIRE
(2)8"DOMESTIC
(2)8"FIRE
(2)10"DOMESTIC
(2)10"FIRE
(2)12"DOMESTIC
(2)12"FIRE



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2	02/22/2019	ADDENDUM C
1	12/07/2018	95% CDS SITE CIVIL

SEAL

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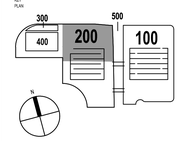
KEY PLAN



BAR SCALE

SHEET NAME

UTILITY PLAN

PROJECT NO A17048-2
CDS NO
SCALE AS SHOWN
ISSUE ADDENDUM C
DATE 02.22.2019

SHEET NO. C0-800.2

OPEN CONFIDENTIAL TREATMENT REQUEST NOT FOR PUBLIC RELEASE - OPEN EXHIBIT CONFIDENTIAL & PROPRIETARY BUSINESS/TECHNICAL INFO PRE-DECISIONAL; DRAFT FOR REVIEW ONLY

Z:\2017\A17048-2\CIVIL\CIVIL\BUILDING PERMIT\A17048-2-C05-200-UP.dwg 2-22-19 02:41:14 PM aarchen

MATCHLINE - SEE SHEET C0-800.2

# 200 CARIBBEAN
FF=12.0

APN: 110-26-025

BORDEAUX DRIVE

SUNNYVALE WEST CHANNEL

LANDS OF
GOOGLE INC.
APN: 110-26-024

REFER TO 48"SD RELOCATION PLANS PREPARED BY KIER & WRIGHT CIVIL ENGINEERS.

REFER TO LANDSCAPE PLANS FOR UNDERGROUND DRAINS (TYP)

PROPOSED 15.0' P.U.E. (BY SEPARATE INSTRUMENT)

XGAS

NORTH

0 10 20 40 60
Scale 1" = 20'

KEY NOTES

1. BACKFLOW PREVENTORS ARE TO BE LOCATED ON PRIVATE PROPERTY OUTSIDE OF ANY PUBLIC EASEMENTS
2. CONNECT TO EXISTING WATERLINE PER CITY OF SUNNYVALE STANDARDS AND SPECIFICATIONS.
3. INSTALL 4" WIDE SLOPED S300 K POWERDRAIN BY ACO, REFER TO LANDSCAPE PLANS FOR GRATE TYPE.

LEGEND

XJT	EXISTING JOINT TRENCH
XTELE-UG	EXISTING UNDERGROUND TELEPHONE SERVICE
XGAS	EXISTING GAS SERVICE
EX FO	EXISTING FIBER OPTIC SERVICE

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2	02/22/2019	ADDENDUM C
1	12/07/2018	95% CDS SITE CIVIL

SEAL

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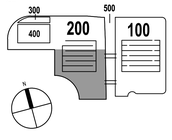
KEY PLAN



BAR SCALE

SHEET NAME

UTILITY PLAN

PROJECT NO	A17048-2
DRAWN	
SCALE	AS SHOWN
ISSUE	ADDENDUM C
DATE	02.22.2019
SHEET NO	C0-800.3

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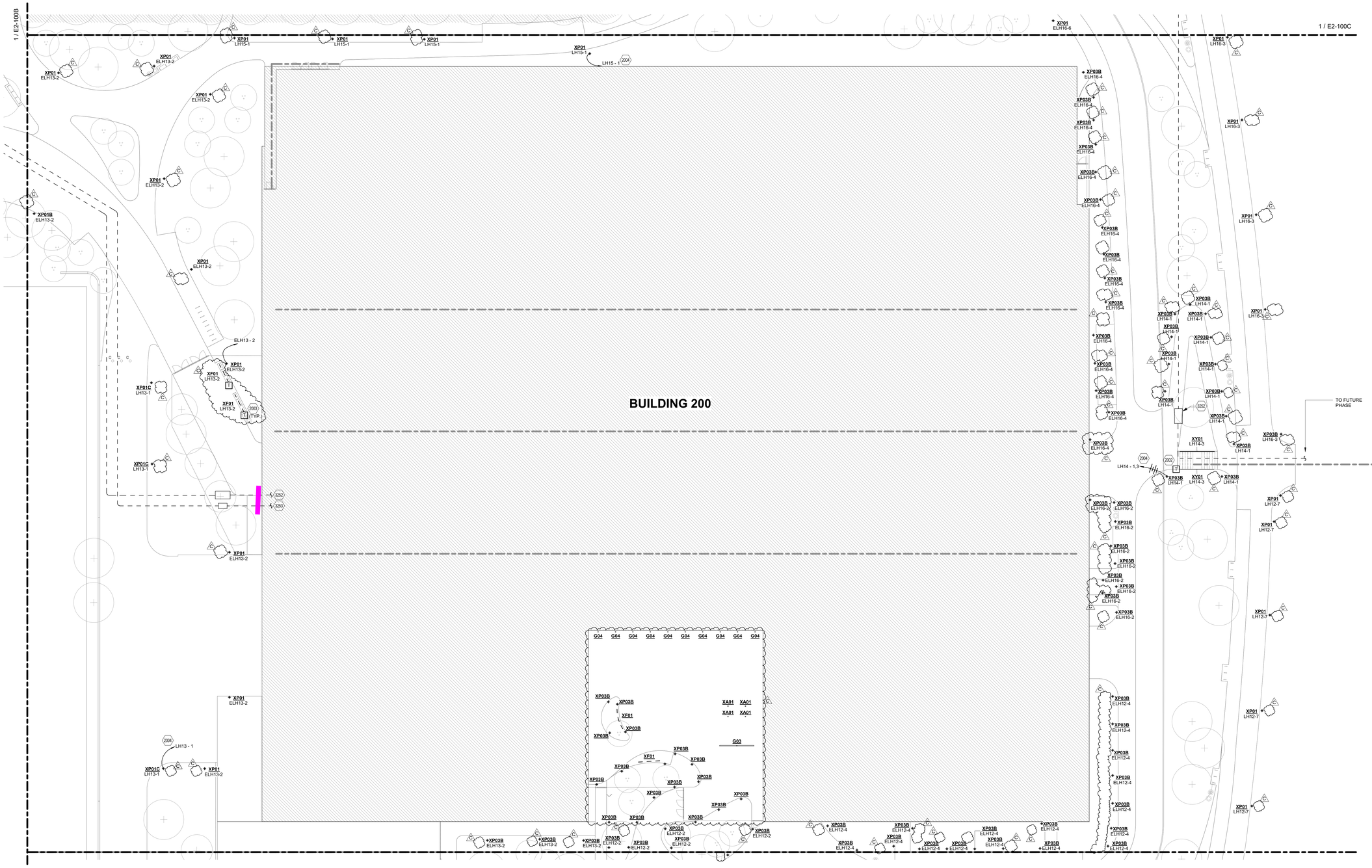
Z:\2017\A17048-2\DWG\CIVIL\BUILDING PERMIT\A17048-2-CDS-200-UP.dwg 2-22-19 02:56:13 PM aschermann



1 ELECTRICAL SITE SECTOR PLAN - AREA B2
1" = 20'-0"

GENERAL NOTES

1. ALL SITE LIGHTING CONDUCTORS SHALL BE #10 AWG.

NUMBERED NOTES

2002 AT THIS LOCATION, PROVIDE ONE (1) WATERTIGHT NEMA 4 ENCLOSURE, KLIK USA #LPNEMA4ENCL. EACH ENCLOSURE SHALL HOUSE ONE (1) 100 WATT DIMMABLE DRIVER, KLIK USA #LP100WPRITRNDM TO CONTROL TYPE XY01 LED HANDRAIL. COORDINATE LOCATION AND MOUNTING WITH ARCHITECT.

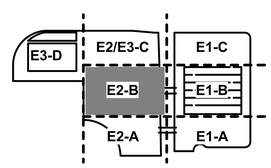
2003 LED DRIVER FOR TYPE XF01 BENCH LIGHTS SHALL BE UNIVERAL PRIMARY VOLTAGE, 100 WATT, LOW PROFILE, QTRAN SLV100-124V-FC. DRIVER SHALL MOUNT TO UNDERSIDE OF BENCH. COORDINATE LOCATION AND MOUNTING WITH LANDSCAPE ARCHITECT.

2004 ROUTE CIRCUITS VIA ENLIGHTED DIGITAL LIGHTING CONTROL SYSTEM FOR TIMECLOCK CONTROL OF EXTERIOR LIGHTING.

3252 (N) UNDERGROUND VAULT FOR NORMAL 12KV POWER DISTRIBUTION. 4'-6" X 8'-6" X 4'-6" WITH SPRING ASSIST HINGED COVERS.

3253 (N) UNDERGROUND VAULT FOR EMERGENCY POWER DISTRIBUTION. 3'-0" X 5'-0" X 3'-0" WITH LIFT OFF COVERS.

KEY PLAN - SITE



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CARIBBEAN 200

100 / 200 W CARIBBEAN DRIVE

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C	03.08.19	ADDENDUM C

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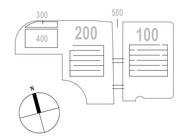

BAR

SHEET NAME

ELECTRICAL SITE PLAN - AREA B

PROJECT NO
2018-051
DOB NO
SCALE
1" = 20'-0"
ISSUE
BLDG PERMIT SUBMITTAL
DATE
12.21.2018

SHEET NO
E2-100B

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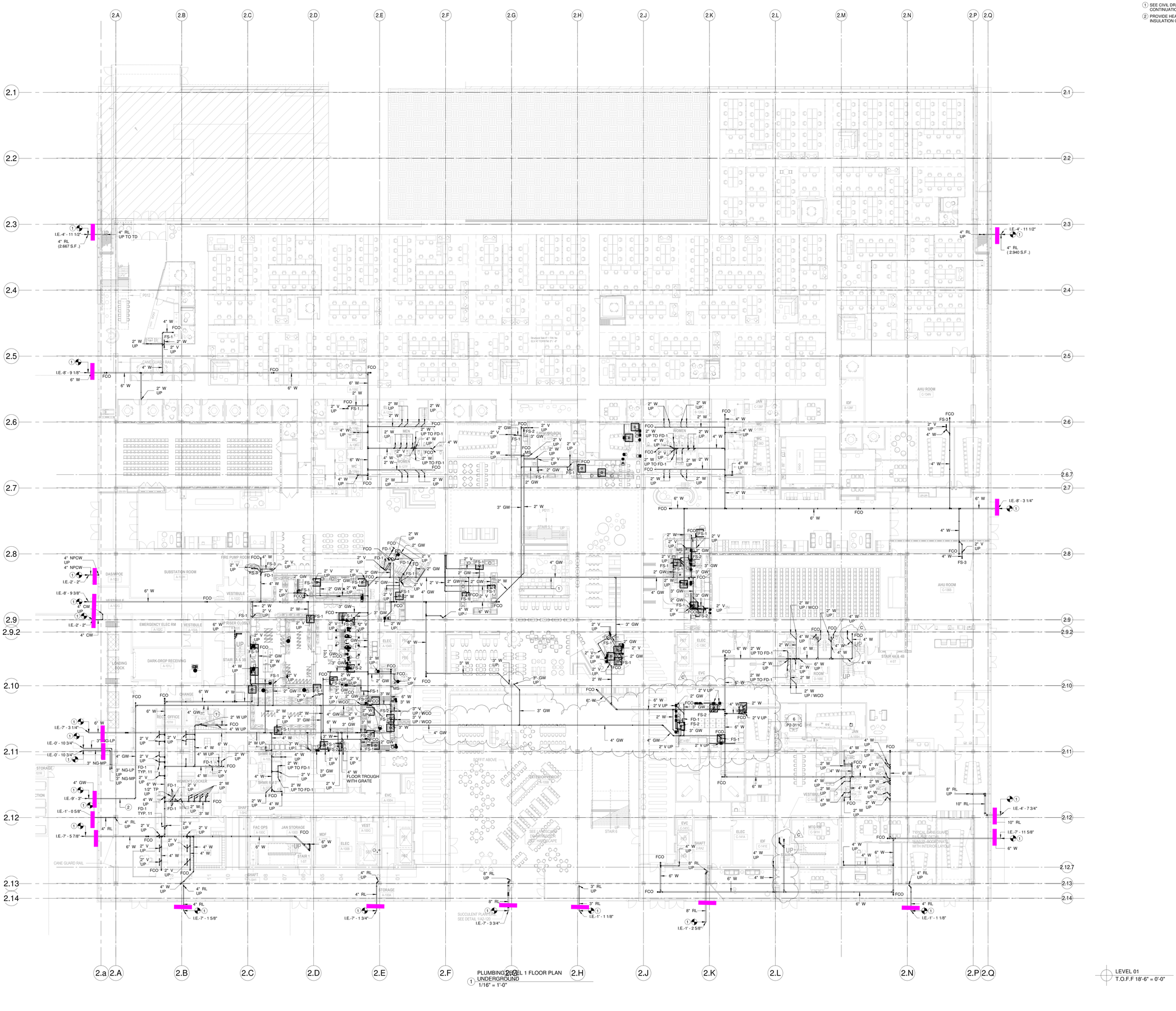
SHEET NOTES:

1. SEE CIVIL DRAWINGS FOR CONTINUATION.
2. PROVIDE HEAT TRACE AND INSULATION ON GREASE WASTE MAIN.



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NO	DATE	REVISION
C	02.08.2019	Addendum C

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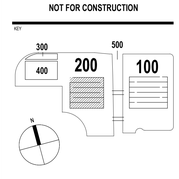

BAR

SHEET NAME

PLUMBING LEVEL 1 FLOOR PLAN UNDERGROUND

PROJECT NO
17-185

DOB NO

SCALE
1/16" = 1'-0"

ISSUE
BLDG PERMIT SUBMITTAL

DATE
12.21.2018

SHEET NO
P2-210

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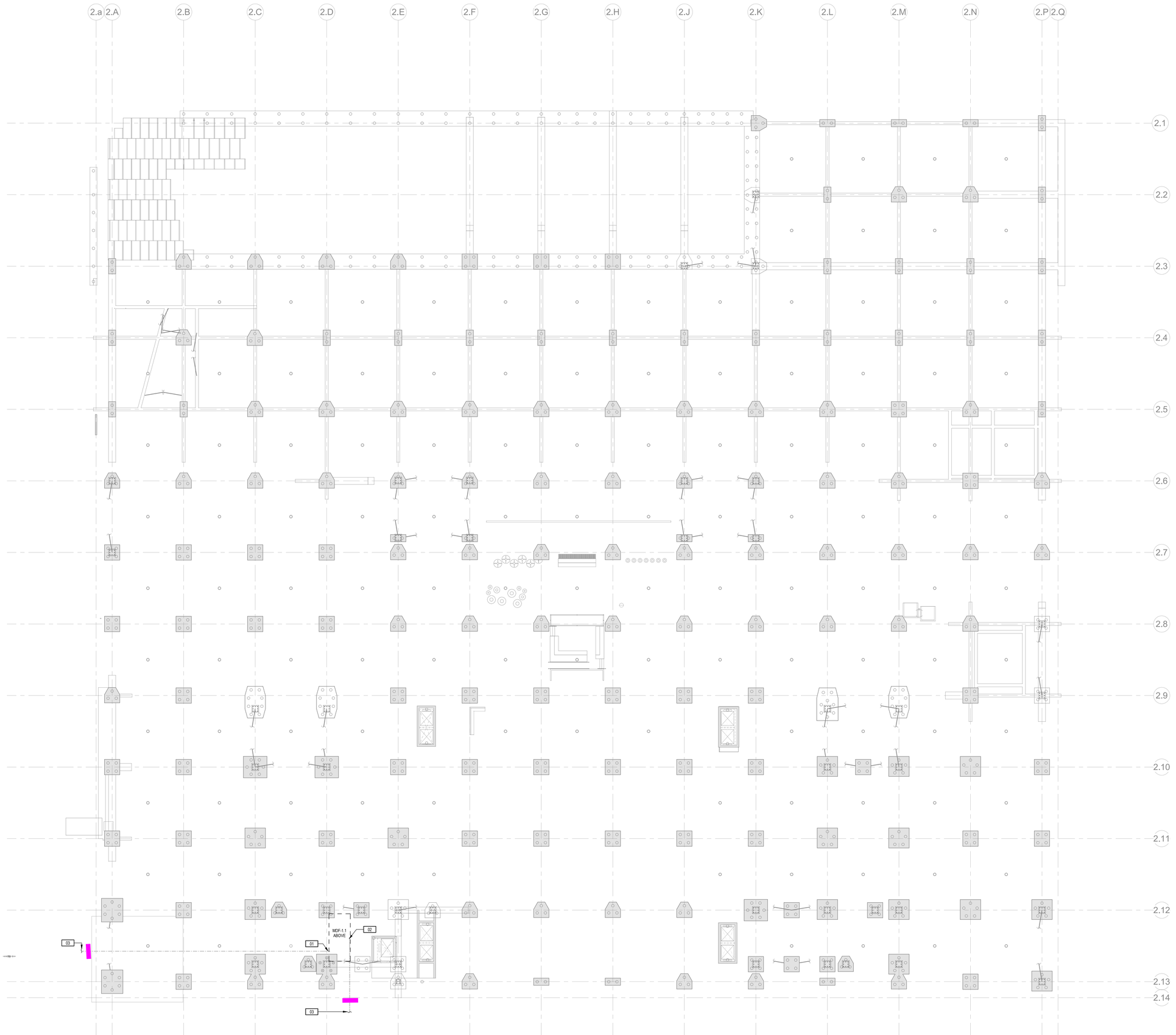

GENERAL NOTES

1. REFER TO SHEET T2 - 001 FOR ABBREVIATIONS, GENERAL NOTES, AND SYMBOL DEFINITIONS.
2. REFER TO SHEET T2 - 002 FOR PRIMARY PATHWAY REQUIREMENTS AND DEFINITIONS.

NUMBERED NOTES

01 OSP CONDUITS ROUTING FROM WEST SIDE OF THE BUILDING. REFER TO THE MDF-1.1 ENLARGED ROOM PLANS FOR STUB-UP LOCATION. REFER TO THE PATHWAYS RISER DIAGRAM FOR CONDUIT SIZE AND QUANTITY. PROVIDE A MINIMUM OF 36" BEND RADIUS FOR THE 90-DEGREE TRANSITION INTO THE MDF ROOM. FIELD COORDINATE ROUTE WITH BUILDING'S FOOTINGS AND OTHER UNDERGROUND UTILITIES.

02 OSP CONDUITS ROUTING FROM SOUTH SIDE OF THE BUILDING. REFER TO THE MDF-1.1 ENLARGED ROOM PLANS FOR STUB-UP LOCATION. REFER TO THE PATHWAYS RISER DIAGRAM FOR CONDUIT SIZE AND QUANTITY. PROVIDE A MINIMUM OF 36" BEND RADIUS FOR THE 90-DEGREE TRANSITION INTO THE MDF ROOM. FIELD COORDINATE ROUTE WITH BUILDING'S FOOTINGS AND OTHER UNDERGROUND UTILITIES.

03 REFER TO THE ELECTRICAL SITE PLAN FOR ROUTE CONTINUATION AND CONNECTION TO THE TELECOMMUNICATIONS SITE PATHWAYS INFRASTRUCTURE.

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NO	DATE	REVISION
C	02.08.2019	ADDENDUM C

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BAR

SHEET NAME

OVERALL UNDERSLAB PLAN

PROJECT NO: 18307
DOB NO:
SCALE: 1/16" = 1'-0"
ISSUE: BLDG PERMIT SUBMITTAL
DATE: 12.21.2018

SHEET NO: **T2 - 200**

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CORNERSTONE EARTH GROUP

APPENDIX B – DRY CONDUIT SEALANT DETAILS

DUCT SEAL INSTRUCTIONS

Polywater® Duct Sealant (FST-250)

Instructions for Use

FST-kit contents:

- Foam Base Cartridge (in protective pouch)
- Mixing Nozzles (in protective pouch/kit bag)
- Positioning Rod
- Foam Strips
- Pair Protective Gloves
- HP Cleaning Wipe

UL Recognized Sealant

See alternate Saturated Dam Method for specialty applications such as running water, vertical conduit, or other complex/unusual geometries.

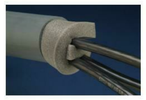
Installation Tips

- *Conduit cleaning and preparation is key to a good seal.*
- *Rapid injection will produce better mixing.*
- *For large ducts, use multiple injections. See Quantity Recommendation. (Page 3)*
- *Mixing nozzle is reusable 7-10 minutes after injection.*

Clean duct with wire brush, solvent wipe.

1.) If conduit has loose debris or rust, use a wire brush to remove all loose material. Abrade the surfaces with sand paper or steel wool to increase the effectiveness of the FST Sealant.

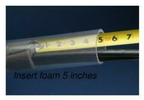
Clean cable(s) and duct with Type HP cleaning wipe (cat. # HP-P158ID) as provided in the kit. This will remove contaminants and any organic residue.



Separate cable(s) then wrap with foam strip.

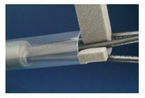
2.) Create a foam dam by loosely wrapping foam strip around cable(s) so that it fills the space between the cable(s) and duct. It should be slightly wider than duct and compress slightly when inserted. (If more than one cable, separate cables with foam strip.)

Tail end of foam strip should be at top of wrap. Foam strip will slow any existing water flow and contain the FST Sealant. Cut foam to size as necessary.



Insert foam 5 inches

3.) Using the positioning rod, push foam 5 inches (125 mm) into duct. Make sure there are no voids in the foam dam for FST Sealant to flow through.



Separate cable(s) with foam

Prepare cartridge

TOOL-250 contains FST-250

Dispense Foam Sealant

Rising Foam

4.) Wrap the second foam strip around cable. (If more than one cable, separate cables with foam strip.) Tail end of foam strip should be at top of wrap. Push second foam strip into the duct until the edge is flush with the duct entrance.

5.) Remove Foam Cartridge from pouch. NOTE: Do not remove cartridge from protective foil until ready to use. Wear impermeable gloves and eye protection. **Holding cartridge upright**, remove nut and plug. (Plug can be saved for re-use of cartridge.) Attach mixing nozzle and tighten nut back into place. **Nut must be replaced or mixing nozzle will detach from cartridge and material may spill.**

6.) Use a **heavy-duty**, high-ratio caulking tool for best performance, (Cat. # TOOL-250). Dispense and discard the first liquid to run through the nozzle (about 1 squirt with the application tool). This initial material will not be well mixed or have the proper ratio of material.

7.) Insert mixing nozzle into top wrap of foam dam so that tip extends into space between foam strips. Inject sealant above cables for better coverage. Use desired amount of foam sealant (see Table 1).

Rapid injection will produce better mixing.

For large ducts, use multiple injections.

8.) Remove cartridge with the static mixer attached. Sealant may seep between the crevices of the foam dam as it expands. After cure, excess foam may be trimmed and removed.

Sealant will expand fully in 2 to 5 minutes.

Sealant will harden (set) in 10-15 minutes.

Mixing nozzle is reusable 7-10 minutes after injection.

Duct Size, O.D. Inches/mm	Quantity Liquid Foam Sealant	
	0% Cable Fill	20% Cable Fill
2/50	1.5 cm *(1 injection)*	1 cm *(1 injection)*
3/75	3 cm *(1 injection)*	2.5 cm *(1 injection)*
4/100	2 + 2.5 cm *(2 injections)*	2 + 2 cm *(2 injections)*
5/125	3 + 4 cm *(2 injections)*	3 + 3 cm *(2 injections)*
6/150	3 + 3 + 4 cm *(3 injections)*	4 + 4 cm *(2 injections)*
8/200	4 + 4.5 + 4 + 4.5 cm *(4 injections)*	3 + 4 + 3 + 4 cm *(4 injections)*

Table 1

There are approximately 8.5 cm per FST-250 Cartridge. Use side markings to measure quantity by difference.

Use as a starting point only, actual required quantity will vary.

To seal large ducts (4 inch diameter or larger), inject the FST in parts. After each injection, ***wait 5 minutes*** for sealant to rise. Inject each portion as recommended. Excess material may squirt from the foam dam after adding the final portion.

For small ducts (1-1/2 inch diameter or smaller) the FST-MINI is recommended.

Use screwdriver to check for voids

9.) After sealant has fully set and cured, use the positioning rod or a screwdriver to check for voids in the FST Seal. Foam seal should be solid throughout the duct. If any holes or voids are discovered in the inspection, use a screwdriver to cut into top of foam and enlarge a path for new material. Attach a new mixing nozzle and inject sealant directly into the void area.

Dispose of any excess material in accordance with local and national regulations.

Storage: FST Foam is sensitive to sun, water and heat. To keep the FST Foam up to a month after initial use, place the partial used cartridge into the foil bag and tape it shut. Place the foil bag in a dry cool dark place until ready to use.

FST Foam Seal Application and Use

Polywater® Foam Sealant FST cures to a strong, rigid closed-cell structure. It has excellent wetting and adhesion to metal, concrete and plastic surfaces. It holds 20 feet (6 meters) water-head, and acts as a barrier to smoke and air. It provides superior resistance to water, acids, greases and bases and most organic compounds. Performance and test results can be found in the FST Tech Data Sheet and Lab Reports.

Large voids

Seal should be inspected after installation. If voids or holes are discovered, additional FST Sealant may be added at any time. It will bond very well to existing, cured material. Use a screwdriver to cut into top of foam and enlarge a path for new material. Attach a new mixing nozzle and inject sealant directly into the void area. Dam the fill area if larger than 2 inches (50 mm).

Urethane safety

Irritating and toxic smoke and vapors may form during combustion of cured FST Foam Sealant. Hazardous or irritating decomposition products include oxides of carbon, oxides of nitrogen and hydrogen cyanide. If possible, remove cured sealant prior to any torch cutting operations. The Sealant can usually be removed from the conduit using chisel style tool or pick. If burning the sealant material cannot be avoided, provide appropriate ventilation/respiratory protection against decomposition products during flame cutting operations.

Cable Compatibility

FST Foam is compatible with cable jacket materials. The foam is an inert solid that will not attack the jacket material.

Web Support

Standard Installation Video

Saturated Foam Method Installation Video

Quantity Calculator

Clogged/leaking cartridge

The small orifices in the cartridge tip may become clogged. Poke through and loosen hard material or crust with a wire. Material may be used as directed once the clog is cleared. If the back plugs are leaking, do not use cartridge.

Re-use and Clean-up

Cartridge can be reused for several weeks after initial use. Remove mixing nozzle and visually ensure that orifices are not blocked. Seal with replaceable plug and nut. When ready to use, remove end cap assembly and check to make sure orifices are clear of any hardened sealant. Attach a new, unused mixing nozzle, tighten nut and insert used cartridge into ratchet application tool.

Unreacted material may be cleaned from surfaces with a solvent wipe such as Polywater's Type HP Cleaner/Degreaser. Part A, amber resin will react with water if surfaces are washed with soap and water solution. Once reacted, material has strong adhesion, and may be scraped or cut from surface. For skin contamination, wash thoroughly with soap and water. See MSDS for further information.

Water in duct

FST Sealant will cure if the duct contains less than 10% water. If water is relatively clean and not flowing, the foam dam will work as a good block. FST Sealant will incorporate any excess water into the body of the cured foam seal. Too much water and/or contamination will weaken the seal.

For flowing water, use the saturated foam method. See alternative instructions or watch video.

Removal

FST Sealant produces a good, water-tight seal intended for permanent use. It can be mechanically removed with some effort. Use best practices and comply with the NEC by de-energizing equipment before any seal removal is attempted. Use a long screwdriver (7 inches/15 cms) to puncture holes ¼ to ¾ inch (0.5 to 2 cm) throughout the seal. With a hammer, push the screwdriver through the foam, twist it to enlarge cavity, and pull out. Go around the inside duct diameter to remove plug. Once the foam is weakened, material can be chipped away, and the cable should break free. At this time the cable can be removed or the remaining FST Foam can be detached from the cable.

Cold Weather Use

FST Sealant can be used in temperatures down to 35°F (2°C). Reaction is slower, but the sealant will completely foam and cure with time. At cold temperatures, the Foam Sealant (FST) becomes slightly viscous and flows through the mixing nozzle at a slower rate. Cure times are as follows:

	40° F (4° C)	70° F (21° C)
Foaming, Expansion Complete	8 - 9 Minutes	4 – 5 Minutes
Hard, Non-sticky Skin Formation	12 – 15 Minutes	7 – 9 Minutes

To decrease cure time in cold temperatures, keep FST Sealant cartridges warm prior to use.

APC R.M. #: 87001-010 (2/13)

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The statements contained herein are made in lieu of all warranties, express or implied, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, which warranties are hereby expressly disclaimed. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury or damage, direct or indirect, arising from the use or the failure to properly use these products, regardless of the legal theory asserted. The foregoing may not be altered except by a written agreement by the officers of American Polywater Corporation.

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C	02.08.2019	ADDENDUM C
	12.21.2018	50% CD
	10.26.2018	100% DD
	06.29.2018	50% DD
	03.29.2018	50%DD SKIN BID
	03.09.2018	50% DD BID
	03.02.2018	50% DD

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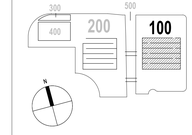

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ELECTRICAL DETAILS

PROJECT NO.
PROJECT NUMBER

DGB NO.

SCALE

ISSUE
PERMIT SUBMITTAL
DATE
03/22/19

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E1-703

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Appendix I-1

West Channel Enhancement for Google Hydraulic Basis of Design Memorandum

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Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS

MEMORANDUM

TO:	Scott Smithwick, DEVCON Construction Virginia Calkins, SRGNC	DATE:	August 15, 2019
FROM:	Caitlin Gilmore, PE Charles Anderson, PE	JOB#:	GOOG.03.18
SUBJECT:	West Channel Enhancement for Google Hydraulic Basis of Design		

Introduction

Project Background

The Santa Clara Valley Water District (District, SCVWD) is the in the process of permitting the construction of a channel improvement project for flood control and erosion protection on Sunnyvale West Channel within the City of Sunnyvale. The Project involves the construction of floodwalls atop earthen levees along the entire channel alignment as well as bridge improvements. Google is currently developing two parcels between Caspian Drive and Caribbean Drive and the West Channel bisects these properties (District Reach W2). Google's project goals are to provide flood protection through this reach while providing enhanced environment. In lieu of conventional flood protection improvements planned by the District, which includes levees and floodwalls within limited channel rights-of-way, an enhanced channel corridor will become part of the development landscape; providing flood protection while enhancing campus aesthetics, recreational opportunities and environmental resources for wildlife habitat. The channel will need to work effectively with regional flood control and drainage planning, and be adaptable to future climate conditions.

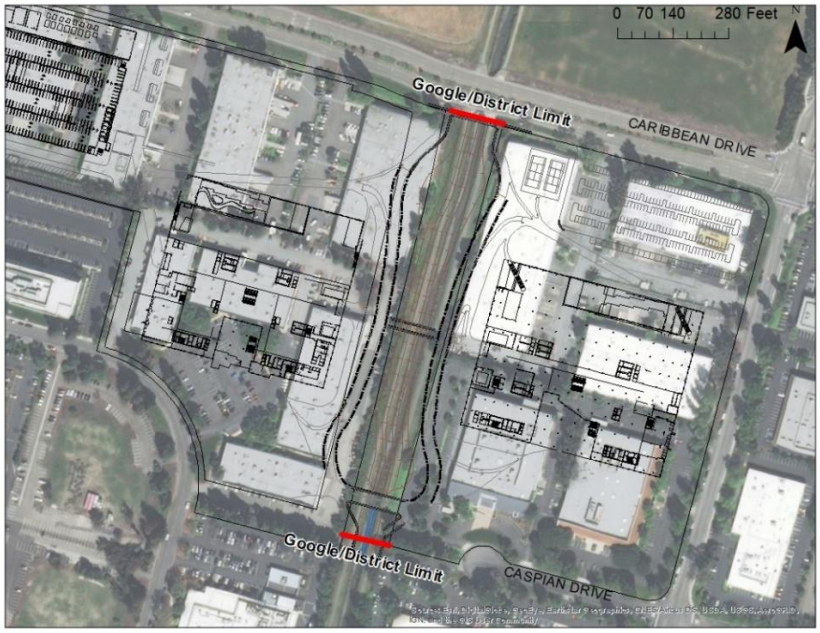

Figure 1: Project Reach

Purpose

The purpose of this Basis of Design Report is to provide the documentation of the engineering analyses, calculations and interpretations that are required to support the design of the enhancement project along Sunnyvale West Channel from Caspian Drive to Caribbean Drive. The project would provide capacity to convey the 1-percent design flow while meeting District performance standards and includes levees, floodwall transitions and bridge improvements.

Previous Reports

Reports previous issued by the District are as follows:

1. Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report, June 2010.

Guidance Documents from FEMA and the U.S. Army Corps of Engineers (USACE) are as follows:

1. FEMA "Analysis and Mapping Procedures for Non-Accredited Levee Systems", 2013.
2. FEMA "Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix H: Guidance for Mapping of Areas Protected by Levee Systems", 2003.
3. ETL 1110-2-583, "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams and Appurtenant Structures", USACE April 2014.
4. ETL 1110-2-1913, "Design and Construction of Levees", USACE April 2000.

Scope of Studies

The Basis of Design Report provides documentation of the engineering analysis, calculations, and interpretations that are required to support the design of the recommended plan for the West Channel Enhancement Project. Several additional studies support this report as described below.

Survey

A topographic survey and base map was created by Kier & Wright Civil Engineers & Surveyors, Inc. The horizontal control is based on the North American Datum (NAD) of 1983, California State Plane Zone 3. Vertical control is based on the North American Vertical Datum (NAVD) of 1988.

Agency Coordination

A number of agencies have jurisdiction over elements of the project design, and several regulatory permits are required to complete the proposed work. The following agencies will be consulted for guidance during design development:

- Santa Clara Valley Water District
- US Army Corps of Engineers (USACE)
- US Fish and Wildlife Service (USFWS)
- California Department of Fish and Wildlife (CDFW)
- San Francisco Bay Regional Water Quality Control Board (RWQCB)
- National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS)
- City of Sunnyvale

Utility Relocations

The project will require the relocation of a 48-inch diameter City of Sunnyvale storm drain line which runs within an easement parallel to the SCVWD right of way on the west side of the channel. Due to the lines lateral location and relative depth, it has to be relocated to be placed outside of the proposed channel and levee.

Maintenance Access

Per coordination with the District, the preferable width for access roads is 18 feet wide, with 12 feet as a minimum. The road should be constructed of an appropriate aggregate base material, or of asphalt pavement which is to be maintained by others after construction. Maintenance access into the channel itself is not currently proposed in the District's design, but providing for emergency access to the channel bottom is subsequently discussed in this Basis of Design.

Project Description

District Design

The existing flood control channel through the Google campus is an earthen levee system with a top of levee elevation of approximately 11 feet NAVD88 and adjacent grade of approximately 6 feet NAVD88. The channel is trapezoidal and straight through the reach. The District plans to increase the carrying capacity of the channel by increasing the top of levee elevation to 12 feet NAVD88 with floodwalls on both banks to elevation 18 feet NAVD88. The east side of the channel will have an 11- to 12-foot wide aggregate maintenance road on the inside of the new floodwall while a 12-foot wide asphalt maintenance road and public trail will be constructed on the outboard side of the west bank floodwall. The District designed channel has a varying bank width of 52 to 65 feet through the Google property reach. The District project is contained within the existing SCVWD right-of-way. Figure 2 shows the typical District design channel cross section through the Google reach.

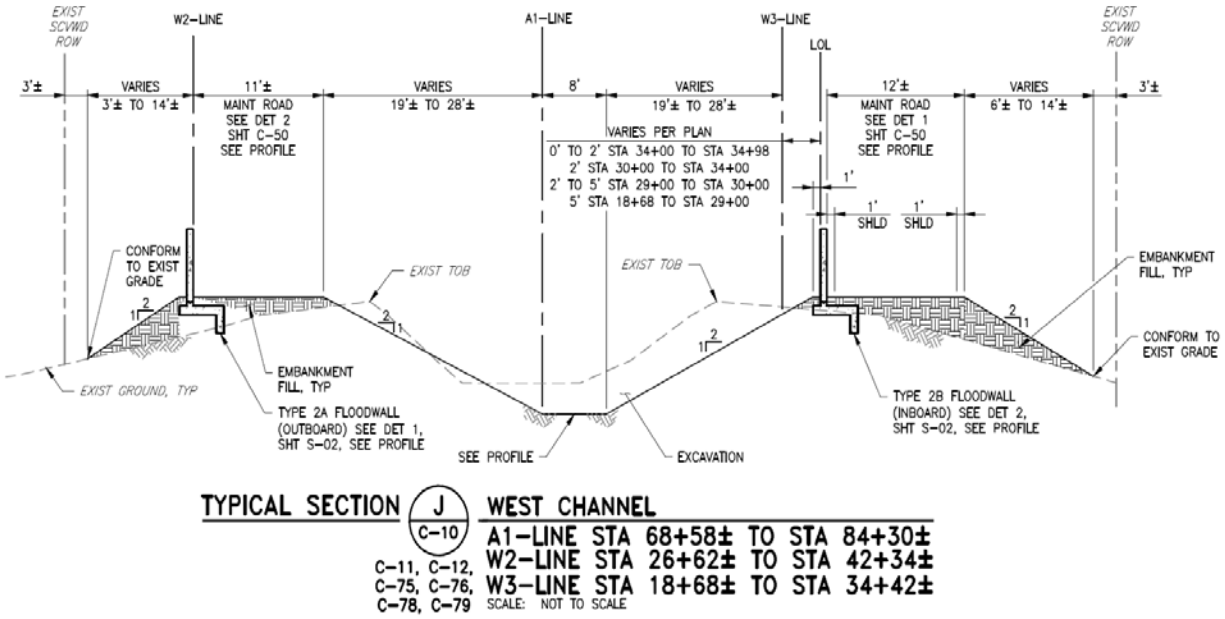

Figure 2: Typical District Channel Design Cross Section

Google's Conceptual Design

The revision proposed to the District project is to widen the channel between Caspian Drive and Caribbean Drive to a bank width varying between 127 and 187 feet. The levees will be widened and raised to an elevation of 18 feet NAVD88. The new widened channel and larger levees will extend past SCVWD right of way onto privately owned Google property. There will be a pedestrian and emergency vehicle bridge just to the north of Caspian Court to allow connectivity within the Google Campus on both sides of the channel. A pedestrian bridge will also be constructed approximately mid-property and the culvert under Caribbean Drive will be extended south to accommodate a new public sidewalk. Figure 3 shows the conceptual channel cross section that Google proposes to construct in lieu of the typical section shown in Figure 2. Figure 4 provides a perspective of the proposed channel geometry.

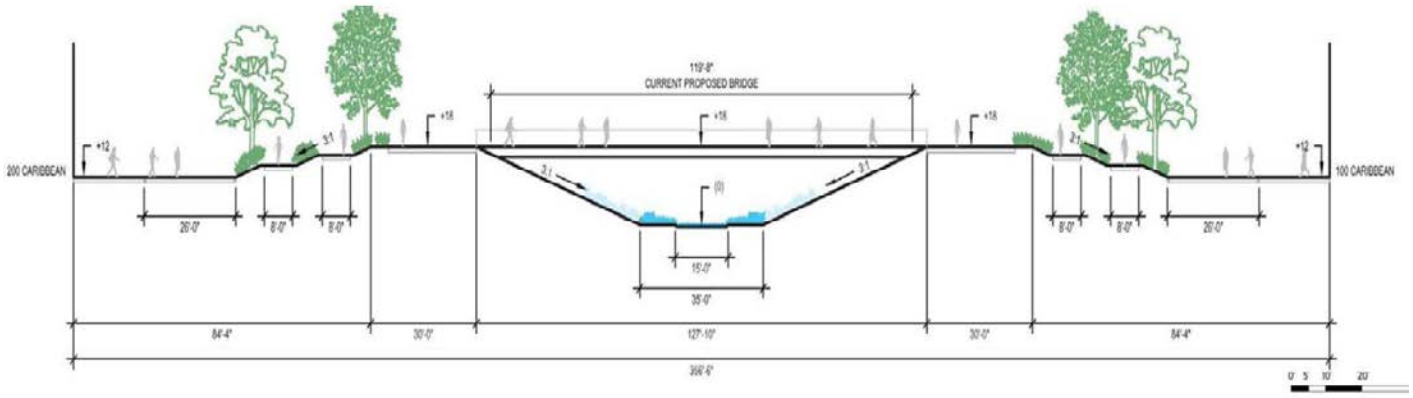

Figure 3: Conceptual Google Reach Design

Figure 4: Three-dimensional Perspective Looking North

Design Criteria

Hydraulic Criteria

In order to verify the channel reach capacity and the target water surface elevations established by the District are reached, the HEC-RAS model originally prepared by the District is used as refined herein. Relevant hydraulics modeling parameters include: flow, boundary conditions, channel geometry, channel roughness, bridge modeling and transition losses.

Design Flow

According to the Planning Study Report (PSR) for Sunnyvale East Channel and Sunnyvale West Channel the design one-percent (100-year) discharge rate for Sunnyvale West Channel is 380 cfs downstream from California Highway 237, which encompasses the entire subject project reach.[1]

Boundary Condition Criteria

The Google channel enhancement encompasses the reach between Caspian Drive and Caribbean Drive. In order to provide the same level of service the project must utilize the downstream boundary condition based on the PSR 1-percent flow and the 10-percent tide with 2.0 feet of future sea level rise equal to 13.49 feet NAVD88 just upstream of Caribbean Drive (HEC-RAS cross section 6704.145). The 2 feet of sea level rise is associated with a project design life of 50 years and represents the high range of estimated sea level rise; an estimate associated with a 99.5 percent confidence of non-exceedance.[2]

National Flood Insurance Program (NFIP) and FEMA regulations, however, require that only existing conditions are reflected on the Flood Insurance Rate Map (FIRM), and future sea level rise is not an existing condition. When processing changes to the FIRM reflecting project completion, FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners* require that when the downstream boundary of a modeled stream (in this case Guadalupe Slough) is within a coastal tidal reach, the tidal boundary of the model should be taken as equal to the Mean Higher High Water (MHHW) level of the nearby tide station.

However, evidence shows that mean tide elevations are not necessarily an appropriate boundary condition during storm events and tide elevations in San Francisco Bay are elevated (relative to predicted tides) during periods of heavy rainfall. Furthermore, the relationship between coincident tides and maximum annual runoff can be quantified and used in the model, providing for a more statistically correct solution than an arbitrarily selected tide condition.

A coincident one-percent tide analysis has been performed to establish the downstream boundary for Guadalupe Slough at San Francisco Bay, to provide a hydraulic backwater condition appropriate for an ultimate submittal to FEMA by the SCVWD. (The procedures described herein have been approved by FEMA for similar streams and rivers discharging directly to San Francisco Bay.)

The 19-year mean tide cycle for San Francisco Bay represents average tide heights over a specific period known as the tidal epoch, which spans the 19 years it takes for every possible combination of relative

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[1] *Santa Clara Valley Water District, Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report, June 2010.*

[2] *Griggs, G, Arvai, J, Cayan, D, DeConto, R, Fox, J, Fricker, HA, Kopp, RE, Tebaldi, C, Whiteman, EA (California Ocean Protection Council Science Advisory Team Working Group). Rising Seas in California: An Update on Sea-Level Rise Science. California Ocean Science Trust, April 2017.*

positions for the sun, moon and earth to occur. This cycle consists of two high tides (one higher than the other) and two low tides (one lower than the other) each lunar day. Based on calculations for relative celestial positions, it is possible to predict tides for any day of the year at any time of the day. Astronomic tides, created by the gravitational forces of the moon and sun acting on earth's oceans, are provided in tide prediction calendars. The mean tide cycle is simply the long-term average of astronomic tides. Observed tides, on the other hand, are actual tidal elevations recorded by National Oceanic and Atmospheric Administration (NOAA) gaging stations located throughout coastal areas.

The El Niño storm of February 2-3, 1998 provided an ideal event for examining potential correlations between runoff events and tide action. While stream runoff as measured by local gages often approached historic recorded levels, observed tides in San Francisco Bay were substantially higher than predicted. Figure 5 shows predicted and recorded tides in early February 1998 at Redwood City, which has the closest NOAA tide gage to Permanente Creek. Recorded tides during the week of this runoff event were consistently higher (on the order of up to 4 feet) than the astronomic (predicted) tide heights due to storm surge.

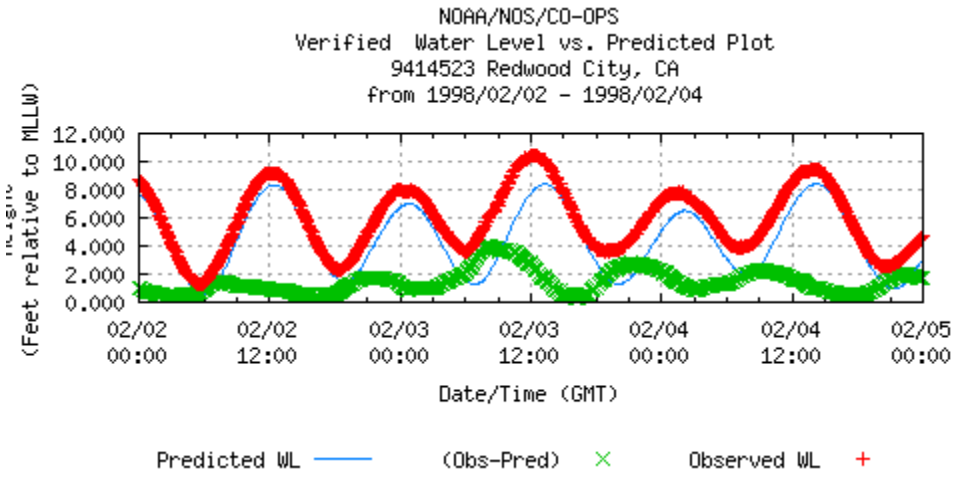

Figure 5: San Francisco Bay Tide During Feb. 2-3, 1998 Storm Event

As a control, observed tide heights are compared to predicted tides six months later at the same station, using the same sets of data. Figure 6 shows tide elevations during early August 1998, when there is very close agreement between the predicted and the actual tides and no rainfall. Both figures present tides on the local Mean Lower Low Water (MLLW) datum.

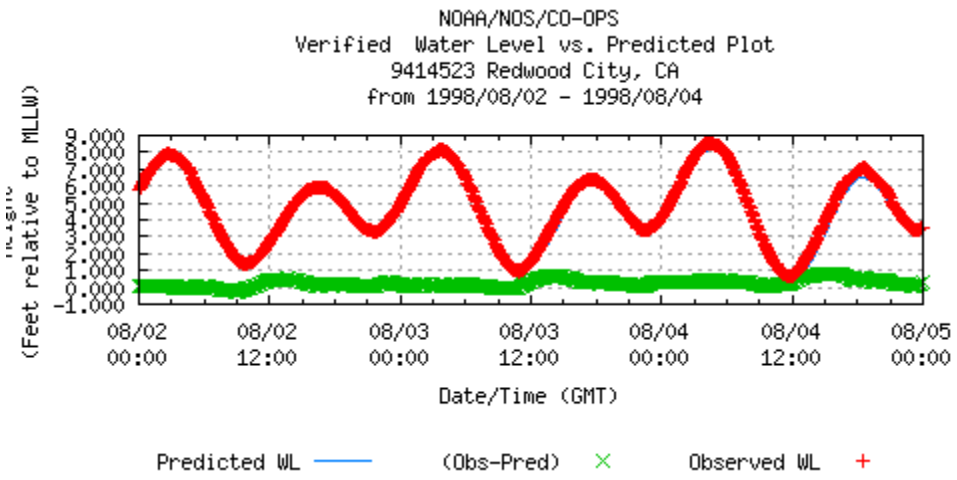

Figure 6: San Francisco Bay Tide During Early August 1998

The observed phenomenon presented in Figure 5 is not strongly dependent upon tide gage location, particularly within San Francisco Bay, and is exhibited during many historic storm events. Data indicate that higher tides as observed during the February 1998 event are not an isolated incident; rather, higher than predicted tides can be expected during storm events that generate significant runoff. Increases in the data set between observed tides over predicted tides range from 0.3 foot to 2 feet for the highest tide, and from 0.9 foot to 3 feet for the lowest tide. From observed historical data, it appears that storm-related forces induce higher tides during rainfall events, and by extension, runoff events. This phenomenon may be due to a number of meteorological or hydrologic factors. NOAA refers to the term “inverse barometer effect”, and defines it as higher tides that are caused by lower barometric pressures associated with winter storm systems. References to “storm surges”, the meteorological effects of low barometric pressures and/or strong southerly winds, are also found in the literature.

The exact nature and cause of this phenomenon, however, are not as important as potential impacts to backwater conditions for Guadalupe Slough. To model an appropriate San Francisco Bay high tide condition for the one percent storm event, the high tide elevation is set based on the one-percent conditional probability of coincident occurrence with the annual maximum discharge of San Francisquito Creek at Stanford, which represents the closest USGS stream flow gauging location with sufficient length of record for analysis.

This procedure is as described by Dixon (1986), whose hypothesis was that high tide events tend to occur the same day as flood flow events using conditional probability:

$$P(x,y) = P(x|y)\ P(y)$$

where P(x,y) is the probability of occurrence of x and y; P(x|y) is the probability of occurrence of x given y; P(y) is the probability of occurrence of y; x is tide elevation; and y is maximum annual peak discharge. Since we are interested only in annual maximum discharges, P(y) is one and the probability of joint occurrence, P(x,y), is equal to the probability of x given y.

Coincident higher high tides are fitted to a probability curve using the median plotting position for every recorded tide extreme at San Francisco (Presidio/Golden Gate) that occurred within 24 hours of the recorded maximum annual discharge. Figure 7 shows the probability distribution on the MLLW datum.

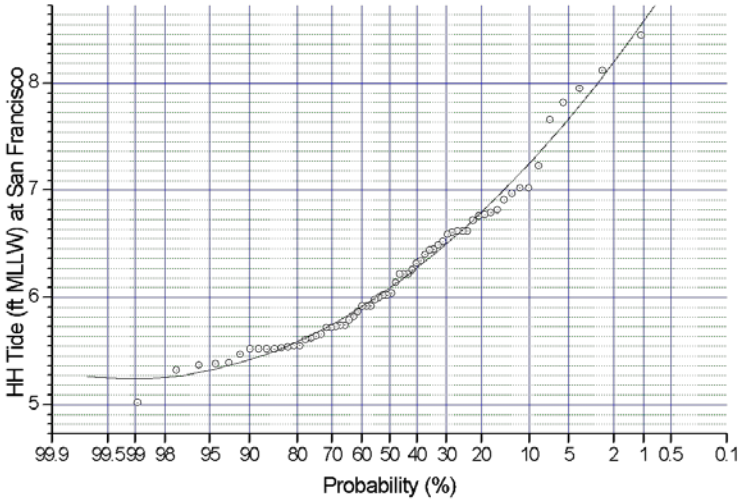

Figure 7: Coincident 1% Tide at San Francisco

The coincident one-percent high tide elevation at San Francisco is 8.63 feet MLLW. A tide elevation at the Golden Gate can be corrected for a different location within San Francisco Bay. The correction at the mouth of Guadalupe Slough is to add 2.7 feet to high tides. On the MLLW datum, the coincident one-percent tide for Guadalupe Slough is 11.33 feet. The MLLW datum can be converted the NAVD88 datum at this location by subtracting 1.33 feet (AECOM, 2016). This sets the coincident one-percent high tide at 10.0 feet NAVD88. This compares favorably to the District's starting water surface elevation of 10.05 feet NAVD88, without future sea level rise.

The entire project reach is within tidal influence ranging from elevation -1.3 feet NAVD88 at mean lower low water (MLLW) and 7.4 feet NAVD88 at mean higher high water (MHHW); the latter equating to a maximum depth of approximately 8.6 feet above the design invert and 5.1 feet above the invert of the Caribbean Drive culvert, which is assumed to be the estimated long-term sedimentation level. Figure 8 shows the mean tide cycle at the mouth of Guadalupe Slough.

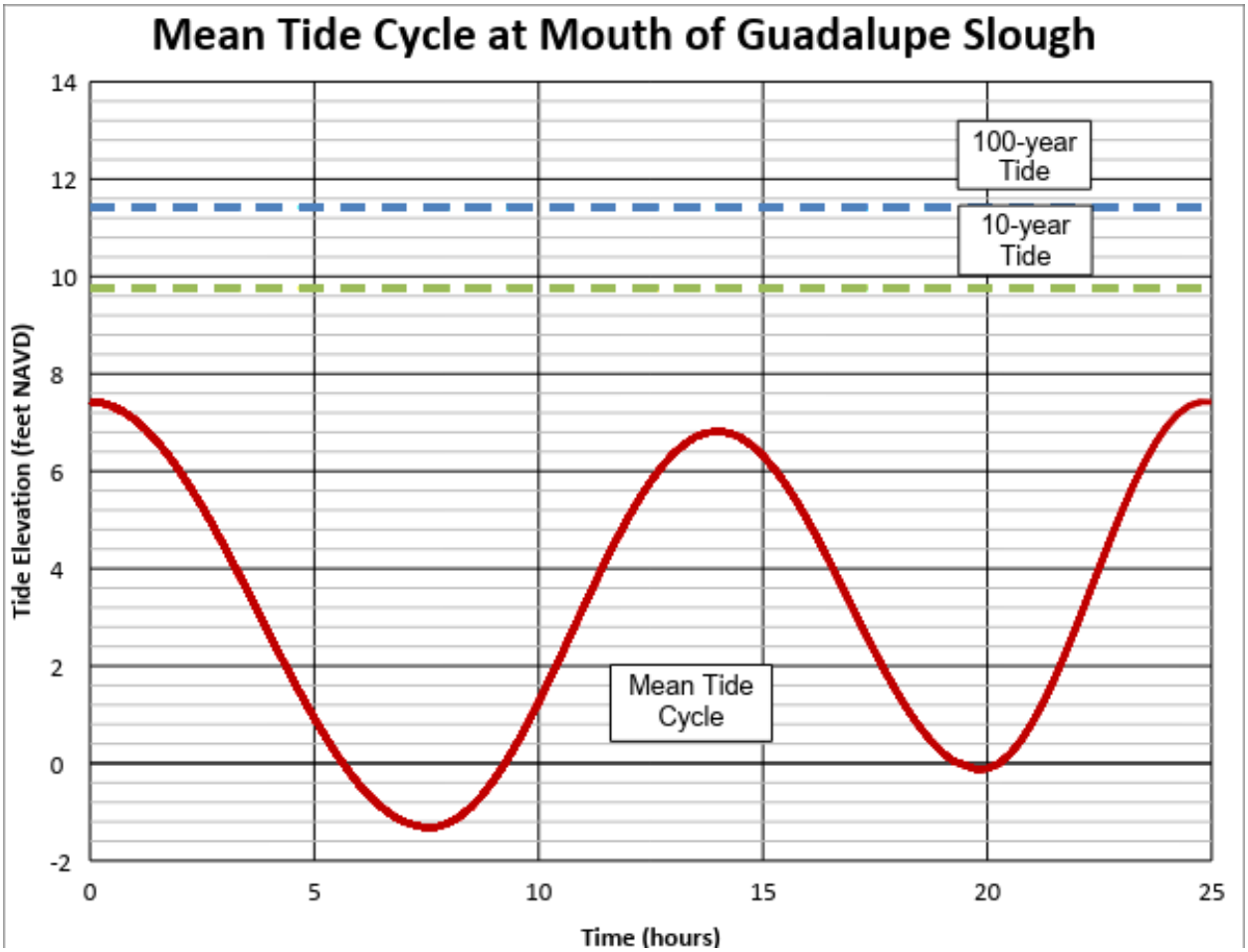

Figure 8: Mean Tide Cycle

The upstream 1-percent water surface elevation based on the District design is 13.69 feet NAVD88 at the Google property limits (HEC-RAS cross section 7800).

Channel Geometry

Modified channel geometry within the design reach is taken from the project preliminary design prepared by The Olin Studio. The channel will expand from a District design width of 52 to 65 feet to a varying bank-to-bank width of 127 to 187 feet. The design incorporates a low flow channel and terraced vegetation benches at varying elevations. The proposed channel is generally straight through the reach, with the variance coming from width, not necessarily meander.

Channel Roughness

Based on a sensitivity analysis performed using the hydraulic model, the composite channel roughness (Manning's "n" value) within the project reach can increase to 0.06 without causing an increase in hydraulic grade line based on roughness alone. Therefore it is conservatively assumed that the channel vegetation is allowed to develop to an n-value equal to 0.05 representing sluggish reaches, weedy, with deep pools; light brush and full summer trees. Actual vegetation will probably be less dense in the final

project design, and the composite roughness can iteratively be established during design development of the channel grading and vegetation plans.

While HEC-RAS has a built-in composite roughness routine wherein roughness estimates for each channel section may be input from station to station, according to the HEC-RAS Hydraulic Reference Manual (USACE 2002), a composite Manning's "n" is calculated using Chow's Equation 6-17:

$$n_c = \left[\frac{\sum_{1}^{N} \left(P_N \, n_N^{1.5} \right)}{P} \right]^{2/3}$$

This equation assumes that each part of the cross sectional area has the same mean velocity, which at the same time is equal to the mean velocity of the whole section. This may not be an appropriate working assumption for a multi-stage channel with different types and densities of vegetation across the cross section, as anticipated for the West Channel Enhancement Project.

Methods for computing the composite roughness coefficient based on a weighted distribution of roughness elements are available in the literature. Soong and Hoffman present ten methods for determining a weighted roughness coefficient, which are summarized by Table 1. The composite design roughness estimate will be an average of nine of the ten methods shown in Table 1. Composite roughness estimates achieved using the Lotter Equation (Equation 1) appear to be low outliers and have in the past been discarded from the overall average based on engineering judgment.

Table 1: Equations for Computing Design Composite Channel Roughness

Equation	Literature Reference	Basic Assumption	Reference Equation No.
$n_c = \frac{PR^{5/3}}{\sum \frac{P_i R_i^{5/3}}{n_i}}$	Lotter (1933)	Total discharge is sum of subarea discharge.	1
$n_c = \frac{\sum \left(n_i P_i R_i^{1/3}\right)}{PR^{1/3}}$		Total shear force is sum of subarea shear forces. $V_i/V = (R_i/R)^{1/2}$	2
$n_c = \frac{\sum \left(n_i P_i / R_i^{1/6}\right)}{P/R^{1/6}}$		Same as (2) but $V_i/V = 1$	3
$n_c = \left[\frac{1}{P}\sum \left(n_i^2 P_i\right)\right]^{1/2}$	Pavlovskii (1931) Einstein and Banks (1950)	Total resistance force is sum of resistance forces.	4
$n_c = \left[\frac{1}{P}\sum \left(n_i^{3/2} P_i\right)\right]^{2/3}$	Horton (1933) Einstein (1934)	$V = V_i$; $S = S_i$; $A = \Sigma A_i$	5
$n_c = \frac{P}{\sum \left(P_i/n_i\right)}$	Felkel (1960)	Manning's Eq. with $R_i/R = 1$	6
$n_c = \frac{\sum \left(n_i P_i\right)}{P}$		Component roughness linearly proportional to wetted perimeter.	7
$n_c = \exp\left[\frac{\sum P_i h_i^{3/2} \ln n_i}{\sum P_i h_i^{3/2}}\right]$	Krishnamurthy and Christiansen (1972)	Logarithmic velocity distribution over depth h for wide channel.	8
$n_c = \frac{\sum n_i A_i}{A}$	USACE (1968) Cox (1973)		9
$n_c = \left[\frac{\sum \left(n_i^{3/2} A_i\right)}{A}\right]^{3/2}$	Colebatch (1941)	Same as Eq. 1	10

Key to Parameters

x_i = parameter in the i^{th} subarea
X = parameter for entire cross section
n = Manning's roughness coefficient
P = wetted perimeter
A = cross sectional area
R = hydraulic radius
V = flow velocity
S = energy gradient

Erosion and Sedimentation

The District's Planning Study Report identified the project reach as containing erosion at the toe of the trapezoidal channel. Additional erosion control will not be necessary. The Google channel enhancement project will increase the carrying capacity of the channel and thereby reduce channel velocities throughout the reach. Average channel velocities will be reduced from 0.92 to 0.78 foot per second. This change in velocity, coupled by a reconstruction of the channel bed eliminates the need to provide erosion protection.

The District's design has channel bed invert that slopes from elevation 0.95 foot NAVD at the upstream Google property limit to elevation -1.2 feet NAVD at Caribbean Drive, while the downstream boundary invert is elevation 2.3 feet NAVD at the hard-surface Caribbean Drive culvert. The proposed conceptual design mimics this invert condition, which leaves a sink for sediment deposition just upstream from Caribbean Drive. It is understood that due to the tidal influence, sediment may generally deposit and settle to elevation 2.3 feet NAVD, which is the hard downstream control at Caribbean Drive. The District does not currently perform regular sediment removal in this reach of channel and anticipates an operating sediment level of approximately elevation 2.3 NAVD.

Transition Loss

Transition between the upstream walled channel section and the downstream project reach will be gradual so as to reduce hydraulic losses associated with a rapid widening of the channel. This channel widening will occur over a 100-foot distance, increasing from 52 feet from bank to bank to 120 feet in the enhanced channel. This transition is modeled with ineffective flow area at an expansion ratio of 2:1 per the figure below. The area of ineffective flow caused by the widening of the channel is defined as expanding 1 foot laterally for every 2 feet in channel length.

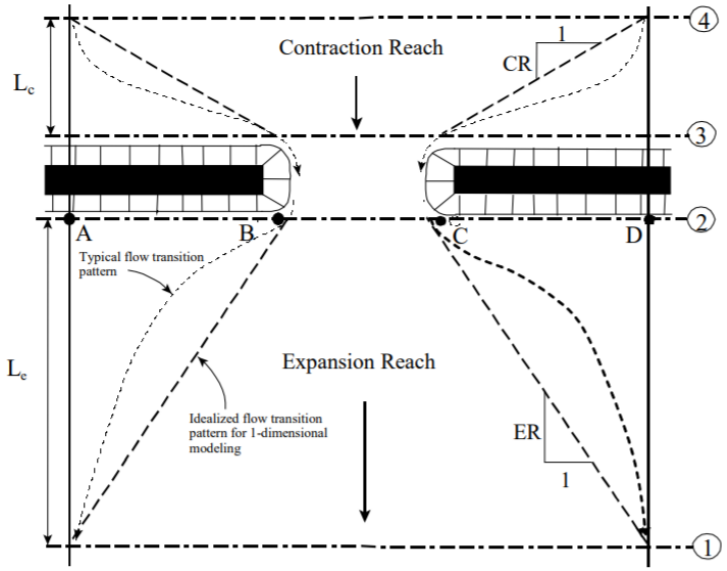

Figure 9: Expansion and Contraction Ratios[3]

[3] USACE HEC-RAS User's Manual, CPD-68, February 2016

Similarly, a downstream channel width taper will be provided upstream of the existing Caribbean Drive to transition from an approximate 180 foot channel to the 10 foot wide culvert over a 165-foot distance. This transition is accomplished within the model as ineffective flow area at a contraction ratio of 1:1.

Note that the District design model did not apply expansion and contraction coefficients at the bridge structures for Java or Caribbean. In keeping with similar methodology, ineffective flow areas are used to represent the transition losses in the enhanced channel, while maintaining the expansion and contraction coefficients for gradually varied flow

Bridges

There are two proposed bridges as part of the project: a pedestrian bridge mid-campus and an emergency vehicle bridge north of Caspian Court. The 1–percent water surface elevation needs to be contained by bridge headwalls with 4 feet of freeboard, but that freeboard does not necessarily need to be provided by the soffit elevation, provided that the bridges are designed for pressurized flow to the headwall and adjacent floodwall elevation. Due to the urbanized source of the flow to Sunnyvale West Channel, it is unlikely that large debris (trees and so forth) would be carried in the channel and cause an obstruction of flow at the bridges. The bridges will be designed to be free span over the 1-percent water surface elevation; or, be designed for pressure flow with the soffit and any conveyed utilities below the 1-percent water elevation. The free span alternative will have no impact to the channel hydraulics or the target design water surface criteria. A pressurized flow alternative will have no impact to the target design water surface elevation provided the bridge soffits are at or above elevation 12. Any intermediate piers necessary for structural support of the bridge should be evaluated hydraulically, in terms of size and placement within the channel.

The existing 95-foot long culvert under Caribbean Drive will be extended approximately 10 feet to the south to accommodate a new public sidewalk. The existing culvert is undersized for the 1-percent event and pressurized. The extension results in an approximate 0.1 foot increase in hydraulic grade due to culvert losses, making the water surface elevation upstream of the Google property elevation 13.74 at cross section 7800 (District design elevation 13.69). The entire project reach for Sunnyvale West Channel has been modelled to include this 0.05 foot increase in hydraulic grade at the upstream edge of the Google project. The required freeboard is met and exceeded for the full length of the District project.

Stability Criterion

Flood flows can be carried within channels either as subcritical flow or supercritical flow, often referred to as “tranquil” and “rapid” flow, respectively. It is not the velocity of flow, however, that distinguishes the flow regime; rather, the flow regime is defined by how fast the water is moving relative to the velocity of the wave that results from a small disturbance in the water surface. Disturbances in subcritical flow move upstream; disturbances in supercritical flow cannot move upstream because such waves must be swept downstream. The Froude number (F_r), which is analogous to the Mach number for gas flow, is defined as the ratio of stream velocity to wave velocity:

$$F_r = \frac{v}{\sqrt{g\,y}}$$

where v = stream velocity (feet per second)
g = gravitational acceleration (feet per second squared)
y = water depth (feet)

A Froude number greater than unity signifies supercritical flow (stream velocity greater than wave velocity), while a Froude number less than one indicates subcritical flow. When the Froude Number is between 0.8 and 1.2, however, the flow can be unstable, characterized by standing waves and other disturbances that may tend to propagate upstream or downstream depending upon the state of flow. Due to the high tailwater and low velocities, the conceptual channel design maintains subcritical flow with Froude numbers less than 0.2 at all modeled cross sections.

Freeboard Criteria

Freeboard, expressed in terms of feet above the design base flood elevation, is necessary whenever a levee system is used to provide flood protection.

Note that for channels without the water surface elevation (WSEL) above natural grade, FEMA has no freeboard requirements. Throughout the project reach the proposed adjacent grade is approximately elevation 12 feet NAVD88 while the 1-percent water surface elevation without adding sea level rise is approximately elevation 11.7 feet NAVD88. Therefore, according to FEMA criterion, there is no regulatory levee system within the Google project reach, and the proposed project levee is not required to meet Title 44 of the Code of Federal Regulations (44 CFR §65.10).

The freeboard requirements for the project are based on the District's design criteria. The top of levee elevation throughout the reach is designed to meet the District project height of elevation 18 feet NAVD88. A minimum of 4.3 feet of freeboard is provided throughout the enhanced project reach, which exceeds the District freeboard criteria listed in Table 2 below.

Table 2: Freeboard Criteria

Situation	FEMA*	District
WSEL above natural grade	3.0 feet	3.5 feet
Within 100 feet of a structure	4.0 feet	4.0 feet
Upstream end of a levee	3.5 feet	3.5 feet
Minimum Freeboard	n/a	1.0 foot or 0.2E

**Note that this criteria is relative to the 1-percent water surface elevation without sea level rise*

Project Design Criteria

Levees

Levees will be designed with a maximum slope of 2:1, with most slopes not exceeding 3:1 (H:V) for enhanced vegetation establishment. Top of levee elevations will be 18 feet NAVD88 to match the protection provided by the District project. Despite not being regulatory levees without sea level rise, as described previously, project levees will be designed in full compliance with National Flood Insurance Program (NFIP) and USACE freeboard criteria, to provide an equivalent level of flood protection as the District's design reaches. Top of levee width will vary between 12 feet and 40 feet. Additional width has been included to allow for future sea level rise adaptation.

Levee Vegetation

Vegetation will be located within the channel, the levee top and the outboard side of the levee. Vegetation will consist of native shrubs, grasses and trees. Care will be given to selecting planting palettes and spacing to allow for channel maintenance from the top of levee access roads.

The USACE vegetation policy[4] for levees forbids the planting of levees or within 15 feet on each side with any planting except perennial grasses as shown by Figure 9. However, the Corps policy applies only to projects with USACE partnership which is not a consideration at this site. As previously explained the proposed project levee is not considered to be a levee subject to Federal regulations as the 1-percent water surface elevation without sea level rise is below natural grade. Additionally, The Corps provides a variance to the vegetation guidelines in Section 1-2(b) in order to enhance environmental values and natural resources. The establishment of a riparian corridor would "enhance local environmental and aesthetic values". For these reasons the Corps levee vegetation policy does not apply to this project.

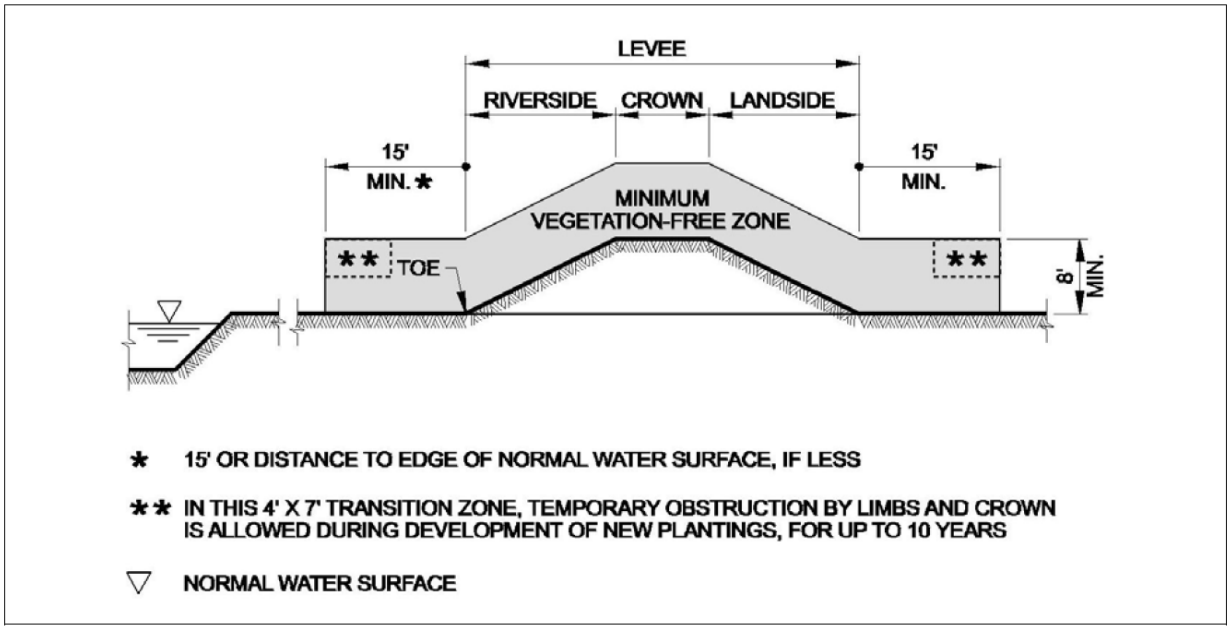

Figure 9: Army Corps Vegetation Free Zone

Vegetated Benches

The project proposes vegetated benches within the expanded channel to allow for habitat development and vegetation establishment.

Floodwalls

Floodwalls within the project reach are limited to the transitions from the District floodwalls to the enhanced project levee tops. Floodwalls will be constructed as part of the headwall replacement upstream of Caribbean Drive. This extended wing wall will taper between the bridge and the levees at elevation 18 feet. The second set of floodwalls south of Caspian will be tapered to meet the abutments of

[4] *USACE, ETL 1110-2-583, 30 April 2014*

the Caspian Bridge extension with a top of wall and bridge elevation of 18 feet. Floodwalls will be designed to meet District design criteria and provide at least 4 feet of freeboard above the design water surface elevation.

Appendix I-2

Dewatering Plan for the Google West Channel Enhancement

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Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS

MEMORANDUM

TO:	Scott Smithwick, DEVCON Construction Virginia Calkins, SRGNC	DATE:	August 15, 2019
FROM:	Caitlin Gilmore, PE Chuck Anderson, PE	JOB#:	GOOG.03.18
SUBJECT:	Dewatering Plan for the Google West Channel Enhancement		

The following conceptual dewatering plan was developed based on the draft 50% Design Development (DD) plan set dated June 29, 2018 and is intended to be used as an internal document to support environmental permit applications. This draft plan does not consider construction scheduling with the adjacent Santa Clara Valley Water District (District) West Channel Flood Control Project nor does it consider the development of the Google properties 100 and 200 Caribbean adjacent to the channel enhancement project reach.

Objectives

- Temporarily divert water from the project reach of Sunnyvale West Channel from upstream of the project to downstream of Caribbean Drive, a total length of approximately 1,300 feet.
- Create a dewatered work area and facilitate construction by dewatering the entire length of the channel within the project site.
- Prevent erosion, sedimentation and siltation from occurring in the upstream or downstream channel reach under active construction.

Design Event

The anticipated channel flow during construction is 1.4 cubic feet per second (cfs) which is the likely average flow in West Channel during the construction period from April 15th to October 15th with a maximum flow of 12 cfs. This is based on an upstream drainage area of 2.87 square miles and a flow of 0.5 cfs per square mile in urban areas drained by gravity based on the approximate pumping needed from the urbanized City of Milpitas storm drainage systems. There is no natural upstream watershed to the Sunnyvale West urbanized channel system.

There are no storm drainage outfalls within the project reach.

Schedule

The dewatering system will be in place and functioning prior to the start of in-channel construction work and will be removed only after all construction work at a dewatered reach is complete with a maximum duration of 6 months. The contractor may dewater the project areas in phases or all at once. The construction period will be during the dry season from April 15th to October 15th 2019.

Installation of the dewatering system will take approximately one week, and will commence at an allowed start date per the regulatory approvals. After construction activities at a reach are completed, the AquaDam and earthen coffer dams and diversion system will be removed within 48 hours. Flows will be

restored to the new construction reach in a manner that minimizes erosion. Ponded water will be re-directed into the established low-flow channel in a gradual manner to avoid an erosive surge of water.

The dewatering and system removal schedule will be coordinated with the upstream and downstream District project as well as the onsite construction.

Description of Dewatering System

System Overview

The dewatering system will be composed of an AquaDam spanning the full width of the channel located at the downstream boundary of the construction reach (i.e. just downstream of Caribbean Drive bridge — see Location A in *Appendix A*) and an earthen coffer dam spanning the full width of the channel located at the upstream limits of the construction reach (i.e. upstream of the Caspian Drive Bridge — see Location B in *Appendix A*); 28-inch diameter fused high-density polyethylene (HDPE) pipes (or multiple pipes of the same carrying capacity) to convey the diverted water around the construction reach; and riprap or equivalent erosion protection for the system discharge point (i.e. energy flow dissipater—see Table 1 BMPs below).

AquaDam Coffer Dam

A plastic water filled AquaDam will be inflated to a height of 9 feet from the existing downstream invert of the Caribbean bridge culvert and set at a minimum of elevation 7.4 feet NAVD88 (see Tidal Influences below) to prevent the intrusion of tidal water upstream from the coffer dam. The coffer dam must not exhibit UV corrosion for the duration of their installation. The cofferdam must be installed per manufacturer's instruction. Contractor will provide shoring behind the AquaDam as needed (see Detail 2 in *Appendix B*).

Earthen Coffer Dam

Earthen coffer dam will constructed using a combination of gravel-filled sandbags and sheet plastic with a minimum thickness of 6 mil. The gravel fill for the sandbags will contain no more than 15% fines. The gravel-filled sandbags will be placed on top of the plastic material, which will be laid above the invert for the 28-inch HDPE pipe. The width of the invert must be enough to wrap the installed sandbags in a "burrito-wrap" configuration. The sandbags will stack in a staggered pyramid-like fashion (see Detail 1 in *Appendix B*). After the design height has been reached, the original sheet plastic shall be placed on top of the sandbags and secured with additional sand bags. Sandbags on top of the sheet plastic will be spaced no more than 3 feet apart. To maximize flow inflow through the 28-inch HDPE pipe, the upstream configuration of the coffer dam will have a funnel shape with the portions closest to the channel banks wider than the mid-channel portion of the coffer dam. The top of the dam will be lowest in height at the center of the dam and increase in height towards the banks, thereby directing overtopping water into the centerline of the channel. See *Appendix E (to be included in final version)* for coffer dam height calculations.

Pipe System

The pipe system will be composed of a 28-inch diameter fused HDPE pipe trunk line, or two smaller pipes with equivalent capacity. The system will use gravity to convey water impounded by the upstream coffer dam and water collected from storm drain outlets to the low flow channel below the lower coffer dam. The bypass system can be located either to the east or west of the channel. If gravity flow is not effective in conveying water due to tidal influence, pumps will be used as necessary. Riprap (1/4 to 1/2 ton) will be placed at the downstream discharge point of the HDPE pipe to prevent erosion of the channel

bed. If necessary, one or more check dams, composed of straw/hale bales secured by wooden stakes (straw/hale bales) would be installed to slowly reduce water velocities and prevent bed erosion.

Energy Flow Dissipater

Diversion pipe flow energy (velocity) dissipater will be installed downstream of the AquaDam coffer dam on existing channel invert and banks. Pipe discharges will occur from low to high tide, and outlets shall be located above Mean Higher High Water. Dissipater may be under tide water and shall be designed to resist degradation by tidal movement. Dissipater shall be installed from pipe outlet to channel invert. Design shall be in accordance with CASQA Construction BMP EC-10 (see *Appendix C*).

Groundwater

All construction work will be implemented under dewatered channel conditions. If groundwater seepage occurs within the dewatered reach, pumps will be used to discharge the seepage flows to intakes of the 28-inch HDPE trunk line. When discharging into the intakes of the 28-inch pipe, the top opening of the intake will be sealed.

Tidal Influences

The maximum water surface elevation (WSEL) for the mean higher high water (MHHW) is approximately 7.4 feet NAVD88 (Schaaf & Wheeler, Draft West Channel Enhancement for Google Hydraulic Basis of Design). This tidal influence WSEL is at the mouth of Guadalupe Slough. The downstream AquaDam coffer dam would be set at elevation 7.4 feet NAVD88 to prevent the intrusion of tidal water upstream from the coffer dam. Since tidal waters can potentially reduce the flows downstream or even back up the flows upstream, pumps will be on standby to transfer excess flows downstream of the coffer dam.

System Removal

Once the construction work is completed at a dewatered reach, the diversion system and coffer dams will be removed within 48 hours of completion. Removal of the diversion pipe will start at the downstream terminus of the system and proceed upstream. Flows will be restored within the new construction area in a manner that minimizes erosion. Ponded flows will be re-directed into the established low-flow channel. Flows will be gradually restored to the channel to avoid a potentially erosive surge of water. All equipment and materials used in the dewatering system will be removed from the channel for re-use or proper disposal.

Water Quality Monitoring

The dewatering contractor will be responsible for visual observations, collection of water samples, and transportation of samples in a timely manner to an accredited laboratory testing. Water samples will be collected from the channel 100’ above and below the dewatered zone and from the HDPE pipe system within the dewatered zone. The HDPE pipe system will include air vents at maximum intervals of 500 feet in to allow collection of water samples from the pipes. During normal operation, the air vents will remain closed; the vents will be opened to obtain water sample. A section of clear pipe shall be installed on groundwater pump discharges to monitor turbidity.

Water quality testing will commence two days prior to installation of the dewatering system and will continue until one day after the dewatering system is completely removed. Observations, testing and sampling will be performed for the parameters listed in Table 1. Water quality readings will be submitted as part of daily QA/QC reports.

Table 1 – Water Quality Testing Parameters

Parameter	Frequency of Sampling/Testing	Exceedance Limit
Turbidity	Twice Daily	Incremental increase by 5 NTUs if background <50 NTUs and 10 percent if background >=50 NTUs
pH	Twice Daily	>0.5 units deviation above or below ambient levels
Dissolved Oxygen	Twice Daily	Minimum of 5.0 mg/l or no change if background <5.0mg/l
Temperature	Twice Daily	Increase by more than 5 degrees Fahrenheit above natural temperatures
Floating matter, foam, alteration of color, visible oil or other petroleum products	Daily	Visual observations only

Daily is defined as each day is which construction work occurs in the channel reach. Typically, this will be Monday through Friday except for holidays. If any construction occurs on a Saturday, Sunday or holiday, water quality monitoring will occur on that day also.

If water quality testing parameters are exceeded, the contractor will immediately investigate the potential source of the problem. The contractor shall at a minimum pump effluent from dewatered areas to baker tanks for settling prior to discharge to the 28-in HDPE pipe if turbidity is exceeded. If the contractor's operations are causing the problem, then the issue will be corrected immediately.

If the source is outside of/beyond the project limits, the contractor will notify the Water District, who will then notify the regulatory agencies of the situation, so that the regulatory agencies can determine the proper response to the water quality issue.

Best Management Practices

Applicable BMPs

The design and operation of the West Channel dewatering system will conform to the applicable SCVWD BMPs to prevent adverse impacts to water quality. Table 2 lists the applicable BMPs as detailed in *Appendix D (to be included in final version)*.

Table 2 – Water Quality BMPs Applicable to West Channel Enhancement Dewatering System

BMP No.	Title
WQ-1	Limit Impact of Pump and Generator Operation and Maintenance
WQ-2	Limit Impacts of Sediments on Water Quality
WQ-3	Limit Impacts from Staging and Stockpiling Materials
WQ-4	Stabilize Construction Entrances and Exits
WQ-5	Limit Impact of Concrete Near Waterways
WQ-6	Isolate Work in Tidal Areas with Use of Coffer Dam
WQ-7	Use Seeding for Erosion Control, Weed Suppression and Site Improvement
WQ-8	Manage Exposed Groundwater at Work Sites
WQ-9	Maintain Clean Conditions at Work Sites

BMP No.	Title
WQ-10	Control Sediment/Turbidity from Discharges
WQ-11	Prevent Water Pollution
WQ-12	Prevent Stormwater Pollution

Contingency Plans

Storm Event

It is unlikely, but possible, that a dry season precipitation event or high tide event could be of sufficient magnitude to exceed the design capacity of the dewatering system. To prevent damage to the system and adverse environmental impacts, the contractor will adhere to the requirements in Table 3.

If the volume of water impounded at the upstream coffer dam or tide levels at the downstream coffer dam exceeds the capacity of the dewatering system, the excess water will be pumped into baker tanks for temporary storage and proper disposal.

Table 3 – Dry Season Contingency Plan

Event	Response
>30% likelihood of significant precipitation	Inspect all BMPs and remedy identified deficiencies
>50% likelihood of significant precipitation or tides above MHHW	Maintain baker tanks and pumps at dewatering site and collect excess water as required
Precipitation causes violation of water quality standard	All construction operations cease until applicable water quality parameter is met

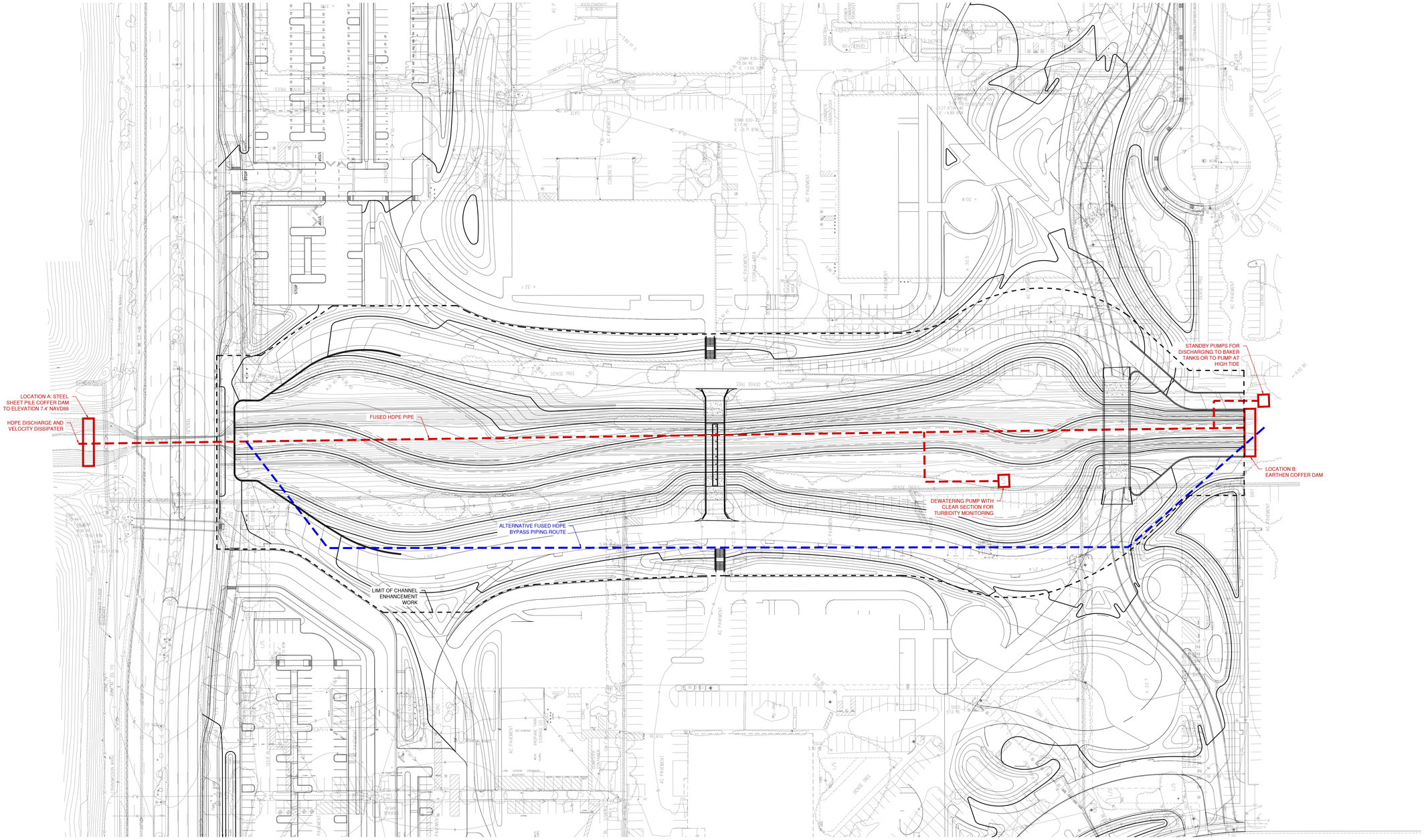
System Failure

The dewatering system could fail due to mechanical problems or unusually heavy flows exceeding the design flow. As a contingency, spare pipe materials, fittings, and pumps will be stored on site to facilitate timely repairs of damaged parts, thereby ensuring that the systems have a high degree of reliability and operability. In addition, additional pumps and baker tanks will be maintained on site. Excess flows will be filtered through the baker tanks and appropriately discharged downstream of the active reach.

In the case of actual or incipient system failure, the contractor will immediately perform all practical actions to remove sources of pollutants associated with the construction effort from the channel or prevent their entrainment by water flowing in the channel. This includes removing equipment and vehicles from the channel and protecting material stockpiles from in-channel flows.

Appendices

- Appendix A – Site Plans
- Appendix B – Coffer Dam Details
- Appendix C – Velocity Dissipation Detail
- Appendix D – BMPs (to be included in final)
- Appendix E – Coffer Dam Calculations (to be included in final)



DEWATERING PLAN

SCALE: 1" = 40'

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LOS ANGELES, CA 90036
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ELECTRICAL DESIGN/BUILD ENGINEER
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NO	DATE	REVISION
H	08.26.19	ADDENDUM H

SEAL

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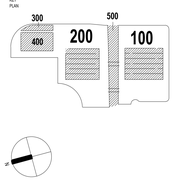
NOT FOR CONSTRUCTION

KEY PLAN



SHEET NAME

DEWATERING PLAN

PROJECT NO
11-185
CSW ID

SCALE
1" = 40'

ISSUE
ADDENDUM H

DATE
08.26.2019

SHEET NO

APPENDIX A

CPRA CONFIDENTIAL TREATMENT REQUEST
NOT FOR PUBLIC RELEASE - CPRA EXEMPT
CONFIDENTIAL & PROPRIETARY BUSINESSSTING INFO
PRE-OCCSIONAL DRAFT FOR REVIEW ONLY

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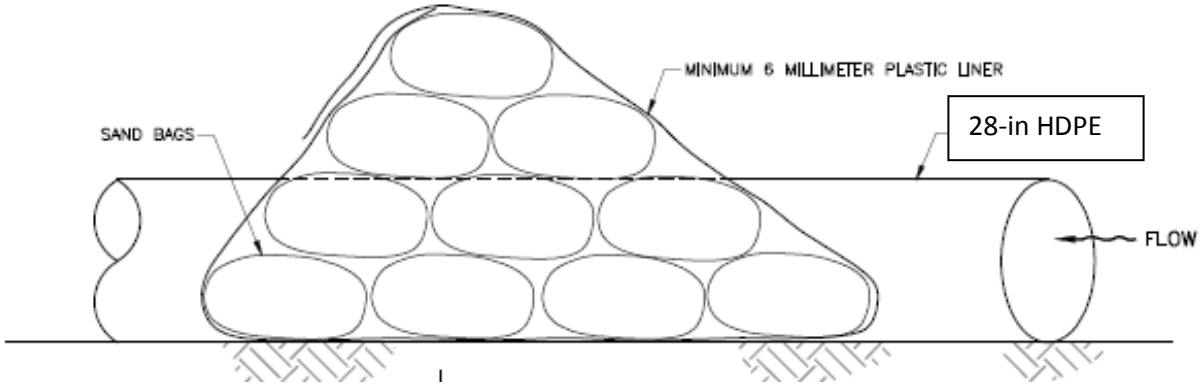
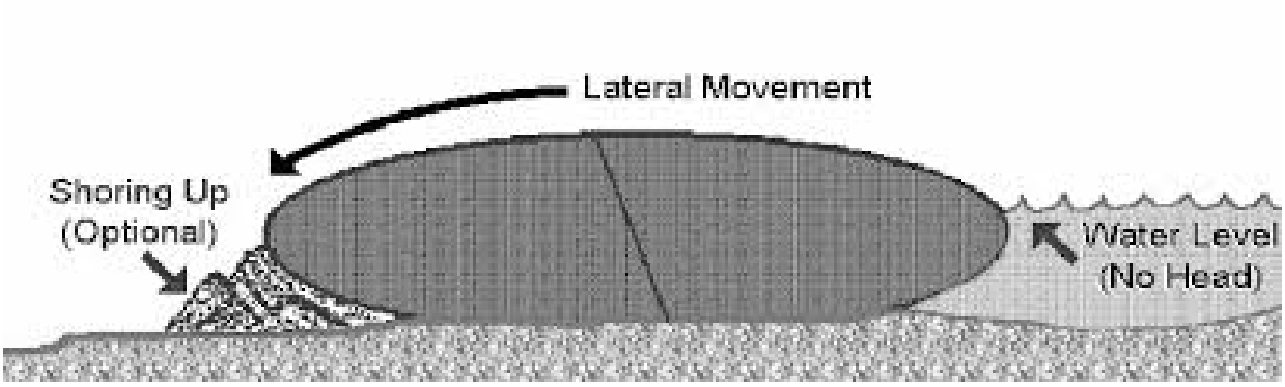


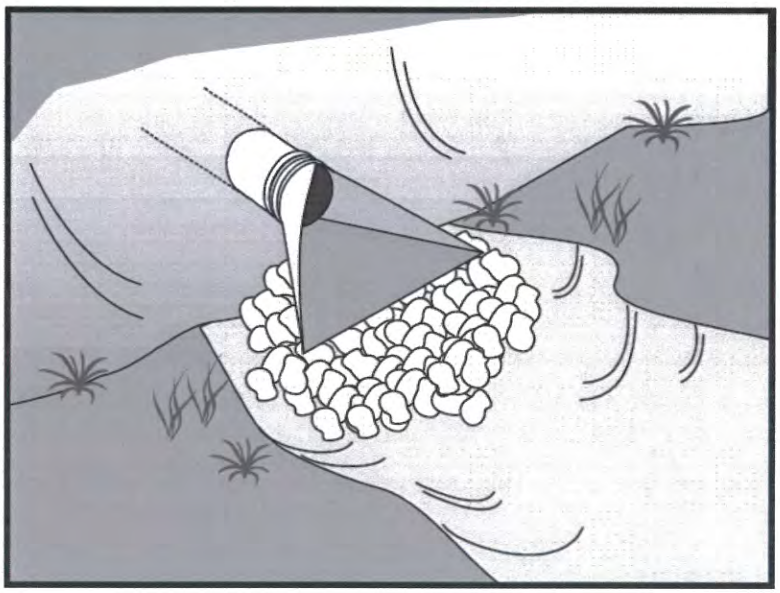
Detail 1 – Typical Earthen Coffer Dam (N.T.S)



Detail 2 – Typical AquaDam Coffer Dam (N.T.S)

Appendix C

Velocity Dissipation Devices EC-10



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.
    - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
    - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

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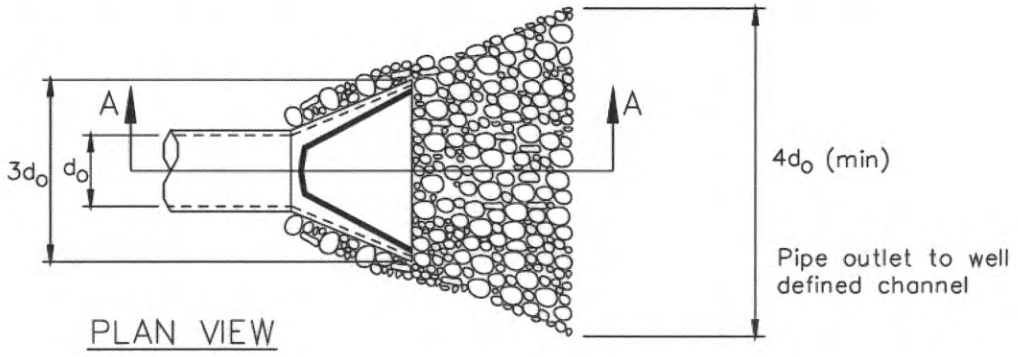
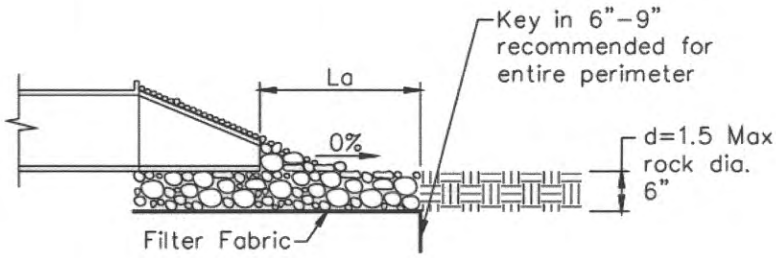


PLAN VIEW

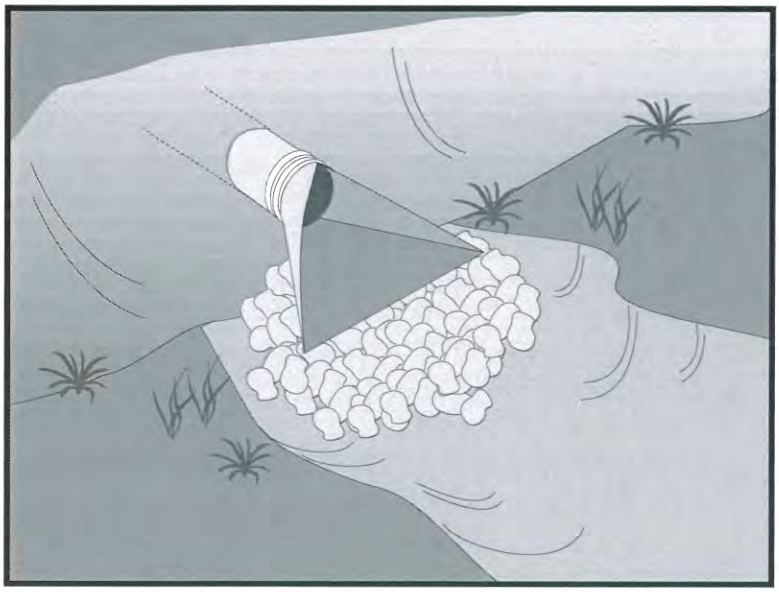


SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
SE	Sediment Control	
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

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- These devices may be used at the following locations:
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  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

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- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

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Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, state of California Department of Transportation (Caltrans), November 2000.

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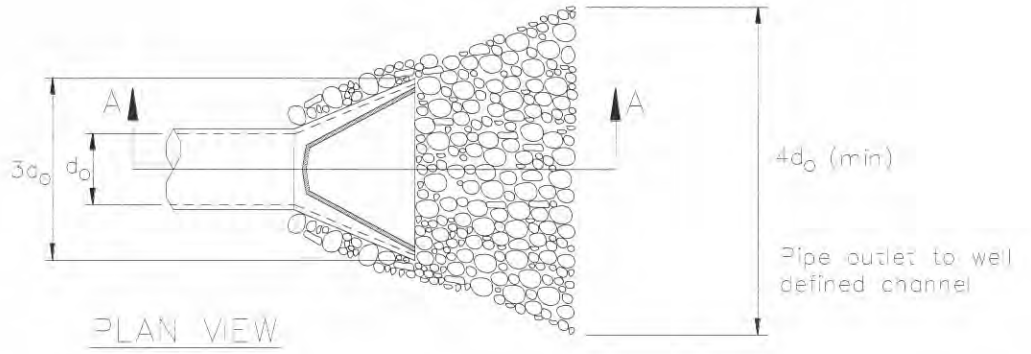
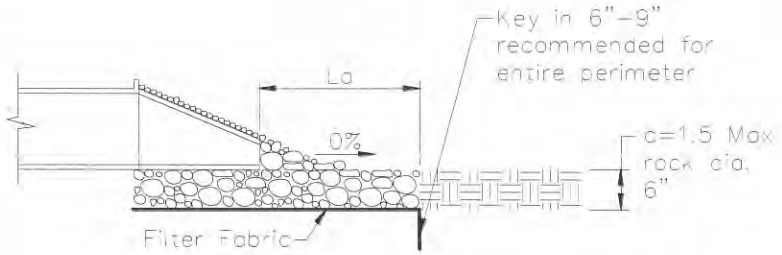


PLAN VIEW



SECTION A–A

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	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Appendix I-3

Site Management Plan Addendum for Sunnyvale West Channel

CORNERSTONE EARTH GROUP

Date:	September 11, 2019
Project No.:	678-8-3
Prepared For:	Mr. Andy Springer **GOOGLE LLC** 1600 Amphitheatre Parkway Mountain View, California 94043
Re:	**Addendum to 100/200 Caribbean SMP for Sunnyvale West Channel** Between West Caribbean Drive and Caspian Court Sunnyvale, California

Dear Mr. Springer:

On behalf of Google LLC (Google), Cornerstone Earth Group, Inc. (Cornerstone) prepared this Addendum to the Site Management Plan (SMP) dated February 14, 2019 prepared for Google's 100 and 200 Caribbean Campus development in Sunnyvale, California (100/200 Caribbean). The 100/200 Caribbean SMP was approved by the Santa Clara County Department of Environmental Health (DEH) in their letter dated March 13, 2019.

The purpose of this Addendum is to expand the project area subject to the requirements of the SMP to include Google's planned enhancement of the Sunnyvale West Channel located between West Caribbean Drive and Caspian Court in Sunnyvale, California (Site) and provide additional management protocols that are specific to the Site. The approximate location of the Site and 100/200 Caribbean is shown on Figures 1 and 2.

SECTION 1: INTRODUCTION

1.1 SITE DESCRIPTION

The Site is owned by the Santa Clara Valley Water District (SCVWD) and consists of approximately 1,100 linear feet of channel alignment and adjoining levee banks totaling approximately 3.2 acres in area. Bentonite slurry walls were constructed at the northern end of the east and west levees that extend laterally to the south approximately 440 feet and 310 feet, respectively. The Site is bound by West Caribbean Drive and the Sunnyvale Landfill to the north and the continuation of Sunnyvale West Channel to the south. Commercial buildings bound the Site to the east and west which consists of the planned 100/200 Caribbean campus development areas. An existing 48-inch storm drain is currently installed parallel to the west levee.

1.2 PLANNED DEVELOPMENT

Google is working in partnership with the SCVWD to enhance the Site as a part of the larger Sunnyvale East and West Channels Flood Protection Project. The planned channel

enhancements at the Site will include reconfiguring the channel geometry, widening the channel, creating wetland and riparian habitats, multi-use path and maintenance access, and transitional landscape areas along the channel. These improvements will involve regrading the existing levees and along the channel banks. Excavation cuts may be on the order of 10 feet and up to 4 feet of creek sediment may be removed. The existing 48" storm drain line will be abandoned in-place where it does not conflict with new improvements and a new storm drain will be constructed west of the Site. As shown on Figure 3, the planned improvements for the channel enhancement project (Project) will extend onto 100/200 Caribbean.

SECTION 2: SITE BACKGROUND

In June and October 2018, Cornerstone performed characterization soil sampling at the Site (Cornerstone, 2018). The analytical results were presented in a letter that was provided to the SCVWD. Relevant information presented in the letter is summarized below. Please refer directly to the letter for a complete overview. Data summary tables from the prior studies are attached.

2.1 PRIOR SITE USE

The Site historically was used for agricultural purposes until the late 1950s when the Sunnyvale West Channel was constructed. The Site is located in an area that has historically been occupied by properties used for research and development, high-tech, commercial, office, and industrial uses.

2.2 PRIOR SOIL/SEDIMENT SAMPLING

During Cornerstone's 2018 investigation, soil samples were collected from 22 exploratory borings located at accessible locations on the levees. Additionally, six sediment samples from randomly selected locations were collected from the channel. The samples were collected to evaluate the quality of the levee fill and sediment and were analyzed for a variety of organic and inorganic compounds including organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and asbestos. Exploratory borings and sediment sample locations are shown on Figure 4.

In May 2019, Cornerstone collected six sediment samples from the Phase 2 and 3 segments of the Sunnyvale West Channel Protection Flood Project. The Phase 2 segment is located immediately upstream of the Site between Caspian Court and West Java Drive. The Phase 3 segment is further upstream between 1212 Bordeaux Drive and 160 Gibraltar Court. The sediment samples were analyzed for the same analytical compounds selected for the Site. A combined discussion of the sediment data for the Site and Phase 2/3 segments is presented below.

2.2.1 Environmental Screening Criteria

Cornerstone compared detected contaminants in the soil and sediment samples to Tier 1 Environmental Screening Levels (ESLs) developed by the San Francisco Bay Regional Water Quality Control Board (Water Board, January 2019) except as summarized below:

- OCPs (with the exception of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, which are discussed below) and vanadium results were compared to direct exposure human health risk ESLs for residential shallow soil exposure (Water Board, January 2019).

- Naturally occurring background concentrations of arsenic, chromium, lead, nickel, and thallium often exceed their respective Tier 1 ESL. CalEPA generally does not require cleanup of soil to below background concentrations. As such, the upper bound concentrations reported by Scott (1991)[1] for chromium (170 mg/kg), lead (54 mg/kg), nickel (145 mg/kg) and thallium (3.8 mg/kg) were substituted for the Tier 1 ESLs. Consistent with the ESL guidance document (January 2019), the 99th percentile upper estimate arsenic concentration published by Duvergé (2011)[2] of 11 mg/kg was substituted for the Tier 1 ESL.

- The Tier 1 ESLs for organochlorine pesticide compounds 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and/or the sum of these compounds was replaced with the more conservative Total Threshold Limit Concentration (TTLC) of 1 mg/kg established in Title 22 California Code of Regulations. The TTLC is the level at which a solid waste is considered hazardous when evaluating waste disposal options.

- Asbestos analytical results were compared to the Asbestos Toxic Control Measure (ATCM) regulatory threshold screening level established by the California Air Resources Board (CARB).

Groundwater results were compared to the drinking water Maximum Contaminant Levels (MCLs) established by the State Water Resources Control Board (SWRCB, October 2018).

2.2.2 Levee Fill

As shown in the attached data summary tables, OCPs (4,4'-DDE, dieldrin, chlordane, toxaphene) were detected in the levee fill samples at concentrations that exceeded their respective Environmental Screening Criteria. Additionally, total DDT and/or toxaphene were detected above its TTLC in several fill samples. Soil exceeding its TTLC that is excavated and off-hauled will require disposal at a Class I hazardous landfill. Naphthalene and PCBs also were detected in three levee fill samples above their respective Environmental Screening Criteria. Chromium, cobalt, and nickel also were detected in one levee fill sample above their

[1] To minimize inherent natural differences in soil composition, Scott's study was limited to properties located within an approximate 2-mile radius of the intersection of Highway 101 and 237 in Sunnyvale, California. The Site is located within Scott's study area.

[2] Duvergé (2011) conducted a study of regional background concentrations of arsenic in undifferentiated urbanized flatland soils in the San Francisco Bay Region.

respective Environmental Screening Criteria; however, the reported metal concentrations are likely natural background and not from an anthropogenic source.

In general, the impacted fill appears limited to the upper approximate 5 feet of soil at portions of the west levee and 4 feet of soil at portions of the east levee. The distribution of OCP-impacted levee fill material is shown on Figure 4.

2.2.3 Sediment

Laboratory analyses of 12 sediment samples (six samples from the Site and six samples from the Phase 2/3 Sunnyvale West Channel segments) did not detect OCPs, PCBs, PAHs, metals, VOCs, petroleum hydrocarbons, or asbestos above their respective Environmental Screening Criteria except for chlordane and benzo(a)pyrene. Chlordane was detected above its laboratory reporting limit in 1 of 12 sediment samples at a concentration of 1.1 mg/kg, exceeding its Tier 1 ESL of 0.48 mg/kg. The commercial and construction worker ESLs for chlordane are 2.2 mg/kg and 14 mg/kg. Benzo[a]pyrene was detected above its laboratory reporting limit in 5 of 12 sediment samples with 2 of 5 detections exceeding their respective Tier 1 ESL. The calculated 95 percent UCL[3] for benzo[a]pyrene is 0.101 mg/kg, below its Tier 1 ESL of 0.11 mg/kg.

2.3 VOC Groundwater Plume from off-Site Releases

From approximately 1978 to 1982, A.C. Ball Company, a Department of Defense specialty contractor, occupied 141 Caspian Court located east of the Site at 100 Caribbean. During their occupancy, VOCs were released to soil and groundwater as a result of leaking underground solvent storage tanks. Under the regulatory oversight of the Water Board, the underground storage tanks (USTs) were removed in 1987 along with some impacted soil. A dual phase extraction system was installed that operated until November 1996. The case was closed by the Water Board in their case closure documentation dated December 15, 2004.

During Cornerstone's 2017 investigations at 100/200 Caribbean, groundwater sampling was performed to help evaluate the extent of groundwater impacts from VOC releases at the former A.C. Ball Company. Laboratory analyses of the grab groundwater samples collected at 100 Caribbean detected VOCs above laboratory reporting limits in 15 of 17 samples. Tetrachloroethene (PCE), trichloroethene (TCE), and 1,1-dichloroethene (DCE) were detected with the greatest frequency and concentration magnitude. Other VOCs with a lower frequency of detection that also exceeded drinking water MCLs included 1,2-dichloroethane (DCA), 1,1-DCA, 1,4-dioxane, cis-1,2-DCE, and vinyl chloride. Grab groundwater samples collected during the 200 Caribbean investigation near the western Site boundary did not detect VOCs above drinking water MCLs. The approximate boundary of the A.C. Ball Company VOC

[3] To evaluate the potential risk posed by a contaminant, EPA recommends using the average concentration to represent "a reasonable estimate of the concentration likely to be contacted over time" (USEPA 1989). Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean can be used for this variable. The 95 UCL was calculated for selected contaminants using USEPA's ProUCL software Version 5.1 (USEPA, 2016). The 95 percent UCL provides reasonable confidence that the true site average concentration will not be underestimated and accounts for uncertainties due to limited sampling data. The 95 percent UCL of a mean is defined as a value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95 percent of the time. The 95 percent UCL of the mean provides a conservative estimate of the average (or mean) concentration. A chemical contaminant is not considered to be present at a level of concern if the calculated 95 percent UCL is less than its respective regulatory threshold concentration (USEPA, 2007).

groundwater plume exceeding MCLs is shown on Figure 5. Note that Figure 5 also shows the VOC-impacted groundwater that extends onto the western portion of 200 Caribbean from VOC releases at the off-Site Lockheed Plant One facility.

2.4 Chemicals of Concern

Chemicals of Concern (COC) in the subsurface are defined as those detected at or above their respective Environmental Screening Criteria established in Section 2.2.1. As shown in the attached Data Summary Tables, COC in levee fill material at the Site include 4,4'-DDE, dieldrin, chlordane, toxaphene, chromium, cobalt, nickel, naphthalene, and PCBs. Contaminants associated with the A.C. Ball Company VOC groundwater plume include PCE, TCE, cis-1,2 DCE, trans-1,2 DCE, 1,1-DCE, vinyl chloride, 1,1-DCA, and 1,4-dioxane. Since VOC-impacted groundwater exceeding MCLs could extend beneath portions of the Site, these contaminants are also identified as COC.

SECTION 3: Applicability of Caribbean 100/200 SMP

As discussed, DEH is the environmental oversight agency for 100/200 Caribbean and has approved the SMP prepared for the development. The purpose of this Addendum is to expand the development area subject to the requirements of the SMP to include the Site and provide additional soil management protocols that are specific to the Project. If requested by the SCVWD and/or the Water Board's 401 Water Quality Certification and Wetlands Program, the SMP Addendum will be provided to the DEH for review and approval.

Construction activities at the Site must be performed in accordance with the SMP prepared for 100/200 Caribbean except as noted in Table A. It is the General Contractor's responsibility to incorporate the provisions of the SMP and this Addendum into the Construction Documents for the Project. Additionally, applicable worker health and safety procedures are to be applied by the General Contractor and its subcontractors conducting the work.

TABLE A. SMP MODIFICATIONS/DEVIATIONS FOR WEST CHANNEL PROJECT

CARIBBEAN 100/200 SMP		WEST CHANNEL SMP ADDENDUM	
SMP Report Section	**SMP Report Sub-Section(s)**	**Reason for Modification/Deviation**	**Description of Modification/Deviation**
Section 5. Site Management Approach	*5.2.2 Site-Specific Health and Safety Worker Requirements*	Health and Safety Plan (HASP) included in the Caribbean 100/200 SMP does not address the contaminants of concern identified at the Site.	The HASP will be updated prior to starting excavation work at the Site.
	5.2.5 Site Control in Contaminated Areas	Caribbean 100/200 SMP does not address contamination identified at the Site.	Refer to Section 4 of this SMP Addendum.

	5.3 Demolition of Buildings	Buildings are not present at the Site.	Not applicable to Site.
Section 6. Soil Management Protocols	*6.1 Soil Management in Exclusion Zones*	Caribbean 100/200 SMP does not address soil management protocols for Exclusion Zones identified at the Site.	Refer to Section 4 of this SMP Addendum.
Section 7. Groundwater Management Protocols	*7.4 Groundwater Monitoring Wells*	Monitoring wells are not present.	Not applicable to Site.
Section 9. SMP Completion Report	----	----	A separate SMP Completion Report will be prepared for the Project. If required, the Completion Report can be provided to DEH for review and approval.
Section 10. SMP Roles and Responsibilities	*Table 3. Key Site Contacts*	Table 3 must be modified to include key personnel for the Project.	Refer to Section 5 of this SMP Addendum.

SECTION 4: PROJECT-SPECIFIC MANAGEMENT PROTOCOLS

4.1 EXCLUSION ZONES

Exclusion zones consist of areas where inhalation, oral contact, or dermal contact with COC is considered to be possible. Currently, two exclusion zones have been established specifically for the Site, as described below:

- Portions of the existing channel levees are impacted with COC. The impacted levee fill is assumed to be present above Elevation 6 feet[4] and within the Levee Soil Management Area shown on Figure 6. Construction activities in this exclusion zone are subject to the soil excavation procedures presented in Section 4 of this SMP Addendum.

- Groundwater and potentially capillary zone soil beneath portions of the Site are impacted with VOCs associated releases originating from the off-Site former A.C. Ball Company. At 100 Caribbean, the limits of the exclusion zone are defined by the VOC groundwater plume that exceeds drinking water MCLs. As shown on Figure 5, the groundwater plume also extends onto the Site. Due to on-Site groundwater dewatering that likely will be needed during removal of the existing storm drain, and the proximity of the Site to the adjacent VOC groundwater plume, the exclusion zone established at 100 Caribbean was extended to the west to include the Site. This boundary is depicted on Figure 6. Construction activities in this exclusion zone that involve excavation to an approximate depth deeper than Elevation 0 feet are subject to the soil, soil vapor, and groundwater management protocols presented in the 100/200 Caribbean SMP.

The size and configuration of each exclusion zone may vary. The procedures described in this SMP Addendum will be followed when work is occurring within approximately 50 feet of these areas. Each exclusion zone boundary will be clearly and conspicuously marked prior to

[4] Elevation is referenced to the project datum (NAVD88).

disturbing existing soil in that zone. A single entry and exit point will be established. Entry will be limited to essential personnel or pre-approved visitors. As construction progresses, demarcation of the exclusion zone work area will be adjusted depending if soil disturbance is completed and/or new areas are disturbed.

4.2 Soil Management in Levee Fill Exclusion Zone

4.2.1 Soil Excavation Procedures for Cut Areas

Construction of the new channel alignment will involve excavating into portions of the existing levees to reach finished grades. Levee soil that is excavated above Elevation 6 feet is assumed contaminated and is not suitable for reuse at the Project. This soil will need to be profiled for disposal as discussed in Section 4.2.3. A conceptual cross section of the channel enhancement is shown on Figure 7. Cross sections along other portions of the channel alignment prepared by the Project Civil Engineer are attached.

In general, the planned excavation cut to achieve finished grades will extend below Elevation 6 feet. Prior to excavating soil below Elevation 6 feet, confirmation soil sampling will be performed as described in Section 4.2.2 before deeper excavation is performed. Upon completion of the sampling and receipt of the analytical results, excavation work can continue to planned finished grades, and the remaining in-place soil can be reused as general levee fill provided it meets the criteria in the specifications for levee core fill or landscape fill.

4.2.2 Confirmation Soil Sampling

If continued excavation is needed below Elevation 6 feet, confirmation soil samples will be collected from the bottom of excavated areas in the levee fill exclusion zone to document soil quality. One confirmation sample will be collected for every approximate 100 linear feet of excavation base. The soil samples will be collected using hand tools from the upper approximate ½ foot of in-place soil where additional excavation is planned to achieve finished grades. The soil samples will be collected in new (unused) or pre-cleaned, stainless steel liners. The ends of the liners will be covered in a Teflon film, fitted with plastic end caps, and labeled with a sample identification number. Each sample will be assigned a unique sample number. The assigned number will provide a tracking procedure to allow ease of data retrieval, data reduction, and evaluation. The sample identification numbers will be maintained by Cornerstone's field staff in a field notes and on the chain-of-custody records. The sample label or tags will be affixed to each sample container. The samples will then be placed in an ice-chilled cooler and transported to a state-certified laboratory with chain of custody documentation.

The confirmation soil samples will be submitted to a state-certified laboratory and analyzed for OCPs (EPA Test Method 8081) and PCBs (EPA Test Method 8082).

The analytical results for the confirmation soil samples will be compared to the Environmental Screening Criteria described in Section 2.2.1. If concentrations of COC in the confirmation soil samples exceed the applicable Environmental Screening Criteria, additional soil excavation will be performed followed by another round of confirmation soil sampling. The amount of additional

soil to be excavated will be dependent on visual observations, results of the initial confirmation soil samples and pre-characterization samples, the depth to finished construction grades, excavation shoring constraints, and/or safety concerns. For construction planning purposes, the Contractor should assume that some additional impacted soil removal will be needed.

Instead of collecting confirmation soil samples after initial excavation work has been completed, pre-excavation confirmation soil sampling could be performed following the steps outlined below:

1) Pre-excavation confirmation soil sampling locations will be determined with the project team and staked in the field by the General Contractor's Licensed Land Surveyor (Surveyor). The surface elevation of the sampling location will be noted on the construction stake.

2) The Contractor will excavate a pothole at each location to at least Elevation 6 feet. Pothole spoils will be placed near the pothole in an area that also will be excavated.

3) Soil samples will be collected from the upper approximate ½ foot of soil at Elevation 6 feet.

4) The soil samples will be submitted to a state-certified laboratory and analyzed for the OCPs and PCBs.

5) Deeper soil samples may be collected and analyzed based on the results of the samples collected from Elevation 6 feet.

6) The pothole spoils will be loosely backfilled and compacted in the excavation from where they originated.

7) Based on the soil data, Cornerstone will prepare a map showing the final elevations that must be achieved for removal of the impacted soil.

8) During construction grading in the levee fill exclusion zone, the Contractor will excavate the levee fill to finished construction grade or the final elevation determined by Cornerstone, whichever is higher in elevation. In areas where additional excavation is needed to achieve finished grades below the impacted soil, the Surveyor will survey the base of the excavations at 50-foot intervals including each confirmation sampling location to document the desired excavation depth was achieved. A signed and stamped letter will be provided by the Surveyor documenting that the elevations are consistent with map provided by Cornerstone.

9) Following written confirmation by the Surveyor, the remaining in-place soil that requires excavation can be removed and reused as general levee fill provided it meets the specifications for levee fill.

4.2.3 Soil Profiling and Disposal

Due to Site access constraints, impacted levee fill that is excavated will need to be direct-loaded for transport and disposal. This will require pre-approval from the landfill prior to starting excavation work. An estimated approximately 7,360 cubic yards of impacted levee fill excavated from above Elevation 6 feet will require off-haul. Pre-excavation soil profiling will be performed as described below:

1) Steps 1 and 2 in Section 4.2.2 will be followed.

2) Cornerstone will coordinate with the General Contractor and their landfill representative to select pothole locations for soil sampling. Soil samples will be collected from each pothole from the upper approximate ½ foot of soil and approximate depths 1, 2, 3, and 4 feet. Sampling will be performed following the methods described in Section 4.2.2.

3) Three or four nearby pothole locations will be grouped and soil samples collected from similar depth intervals from each pothole will be composited at the laboratory for analyses. The number of pothole excavations and sampling and analyses plan will be determined by the Environmental Professional in coordination with the General Contractor and their selected disposal facility.

4) The 3 or 4-point composite soil samples will be analyzed for OCPs (EPA Test Method 8081), soluble OCPs using TCLP extraction techniques, and PCBs (EPA Test Method 8082). Other analyses may be required including total and soluble California Assessment Manual (CAM) 17 metals (EPA Test Method 6010/7471); diesel-range petroleum hydrocarbons (TPHd) and oil-range petroleum hydrocarbons (TPHo) (EPA Test Method 8015B); PAHs (EPA Test Method 8270SIM); and pH (EPA Test Method 9045C).

5) Up to 15 soil samples (one per pothole location) for VOCs analysis will be collected from the Site in three 5-gram Core-N-One™ capsules in general accordance with EPA Method 5035. The soil samples will be collected from various depths and analyzed at a state-certified laboratory for TPHg and VOCs (EPA Test Method 8260B).

6) The analytical results will be presented in a summary letter prepared by Cornerstone. The letter will be provided to the General Contractor who will be responsible for coordinating with their selected landfill. Landfill profile forms and waste manifests will need to be reviewed and signed by SCVWD.

4.2.4 Soil Management Procedures for Structural Levee Core

The subgrade surface beneath the planned structural levee cores will be prepared by excavating shallow benches that will be “keyed” into the compacted subgrade. Ripping, scarifying, and amending the subgrade surface will be performed to meet the levee core fill specification. Once completed, the soil will be recompacted in-place as engineered fill and additional levee core fill will be placed over the reworked surface up to finished grades.

In several locations along the planned channel alignment, levee core subgrade preparation will be performed in existing levee fill above Elevation 6 feet (Figure 7), estimated at approximately 440 cubic yards. This soil is assumed contaminated and must be managed as follows:

- To the extent practical, the General Contractor should limit disturbance of soil above Elevation 6 feet except where levee core subgrade preparation is needed;
- Where benching, ripping, scarifying, and/or amending is needed, the General Contractor should make efforts to perform this work without significant excavation, stockpiling, or soil relocation;
- In no case should soil originating from the Site boundary be moved off-Site to other areas of the Project; and
- Prior to additional fill placement over the prepared subgrade surface, construction equipment shall be decontaminated in accordance with protocols presented in the 100/200 Caribbean SMP.

4.3 Slurry Wall Removal

Slurry walls are located on the northern end of the existing levees and reportedly extend below planned finished grades. During construction grading, the portion of the slurry walls within the planned excavation cut will be removed and segregated from other materials. To the extent practical, soil should be removed from the excavated slurry and the materials disposed at an appropriate facility.

4.4 Estuarine Marsh Vegetation Soil Section

The upper approximate 18-inches of soil at the base of the new channel must meet the project horticultural specifications established by the Project Ecologist. The conceptual cross section on Figure 7 shows the approximate lateral location of the estuarine marsh vegetation soil section. The horticultural specification includes chemistry criteria, organic matter amendment, and soil physical properties that must be achieved. The chemistry criteria selected by the Project Ecologist is based on the Wetland Surface Material screening levels published in the Water Board's Draft Staff Report titled *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* dated May 2000 (Table 4 of the guidance document).

Adequate documentation will be required so it can be verified that the fill source is appropriate for the Site by the Project Ecologist. To help confirm the fill source meets the chemistry criteria, the documentation should include detailed information on previous land use of the fill source, any environmental site assessments performed and the findings, and the results of any analytical testing performed.

4.5 Reuse of Existing Channel Sediment

As shown on Figure 7, sediment in the existing channel is assumed to extend to the original invert elevation of approximately -1 feet. The existing sediment will remain in-place except

along portions of the new channel alignment where sediment over-excavation is needed to meet the horticultural specifications for estuarine marsh vegetation soil, or where the new channel bottom overlaps with the existing channel bottom. Approximately 420 cubic yards of sediment may require excavation.

Based on the sediment data collected from the Site and at the nearby and upstream Phase 2/3 Sunnyvale West Channel segments, sediment in the existing channel does not appear to pose significant human health risk under the planned channel enhancement development scenario. From an environmental standpoint, sediment that is excavated from the existing channel bottom is suitable for reuse as general levee fill within the Project boundary provided it meets the levee fill specification. If unforeseen contamination is discovered in the sediment during construction, the protocols outlined in the 100/200 Caribbean SMP must be followed.

SECTION 5: KEY PROJECT TEAM PERSONNEL

The key personnel for the Project are presented in Table B.

Table B. Key Site Contacts

Organization	Personnel	Responsibility	Email	Phone
Santa Clara County Department of Environmental Health*	Aaron Costa, Senior Hazardous Materials Specialist	Project Manager	Aaron.costa@cep.sccgov.org	408-918-1954
Santa Clara Valley Water District	Usha Chatwani	Property Owner Contact	uchatwani@valleywater.org	408-630-2731
Devcon Construction (General Contractor)	John Castagnoli	ProjectManager	jcastagnoli@rewsprojects.com	408-942-8200
Cornerstone Earth Group	Kurt M. Soenen, P.E.	Environmental Professional	ksoenen@rewsprojects.com	408-245-4600
Schaaf and Wheeler	Caitlin Gilmore, P.E.	Project Civil Engineer	cgilmore@rewsprojects.com	415-433-4848
H.T. Harvey & Associates	Matthew Quinn	Project Ecologist	mquinn@rewsprojects.com	408-458-3225
Engeo	Jeanine Ruffoni	Geotechnical Engineer	jruffoni@rewsprojects.com	408-574-4900

* Regulatory oversight agency for 100/200 Caribbean Development

SECTION 6: LIMITATIONS AND CLOSING

Contractors working on-Site are responsible for the health and safety of their employees and subcontractors. This document, an instrument of professional service, was prepared for the sole use of Google and their consultants and contractors and may not be reproduced or distributed to others without written authorization from Cornerstone. Cornerstone makes no warranty, expressed or implied, except that our services have been performed in accordance with the environmental principles generally accepted at this time and location.

We thank you for this opportunity and look forward to working with you on this important project. Should you have any questions regarding this Addendum, or if we may be of further service, please contact us at your convenience.

Sincerely,

Cornerstone Earth Group, Inc.

DRAFT

Melanie Seydel
Senior Staff Engineer

DRAFT

Kurt M. Soenen, P.E.
Principal Engineer

Copies: Addressee (1 by email)
Attachments: Figures
Attachment A: Data Summary Tables
Attachment B: Channel Enhancement Cross Sections

REFERENCES

Cornerstone Earth Group, 2018. *Phase II Soil, Soil Vapor, and Groundwater Quality Evaluation, Construction Parking/Office Project, 1362-1366, 1376-1380, and 1390-1398 Borregas Avenue, and 245 Caspian Drive, Sunnyvale, California,* dated May 16, 2018.

Cornerstone Earth Group, 2019. *Site Management Plan, 100 and 200 Caribbean Campus Project, West Caribbean Drive and Borregas Avenue, Sunnyvale, California,* dated February 14, 2019.

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Duverge, Dylan Jacques. December 2011. *Establishing Background Arsenic in Soil of the Urbanized San Francisco Bay Region*.

San Francisco Bay, Regional Water Quality Control Board. Revised January 2019. Environmental Screening Levels. http://www.waterboards.ca.gov/sanfranciscobay/water/chemicalcontaminants.shtml/

Scott, 1991. *Background Metal Concentrations in Soils in Northern Santa Clara County, California.*

State Water Resources Control Board. October 2018. *Maximum Contaminant Levels (MCLs).*

CORNERSTONE
EARTH GROUP

FIGURES

ATTACHMENT A – DATA SUMMARY TABLES

CORNERSTONE EARTH GROUP

ATTACHMENT B – CHANNEL ENHANCEMENT CROSS SECTIONS

Appendix J-1

Construction Noise Evaluation

Devcon Construction
Google Caribbean Campus
Construction Noise Evaluation

Rev 1 | March 29, 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 258499

Arup North America Ltd
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Suite 700
San Francisco 94105
United States of America
www.arup.com

ARUP

1 Introduction

This report addresses construction noise sources of the Google Caribbean Campus construction project, and their potential impacts on the surrounding community. The report defines and characterizes noise sources, identifies nearby receivers that could be affected by the noise, and where needed, proposes measures for reducing the noise from these sources.

The project consists of demolition of all existing buildings on the site and construction of two new buildings totaling more than 1,000,000 square feet of office and support space.

2 Code Criteria

City of Sunnyvale Municipal Code Section 16.08.030 covers allowable hours of construction and construction noise limits. The code specifies that:

> *Construction activity shall be permitted between the hours of seven a.m. and six p.m. daily Monday through Friday. Saturday hours of operation shall be between eight a.m. and five p.m. There shall be no construction activity on Sunday or federal holidays when city offices are closed.*
>
> *No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical instruments, radios, etc., will be allowed where such noises may be a nuisance to adjacent residential neighborhoods.*

Further, the code states that:

> *(b) As determined by the chief building official:*
>
> *(1) No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical instruments, radios, etc., will be allowed where such noises may be a nuisance to adjacent properties.*
>
> *…*
>
> *(3) Where additional construction activity will not be a nuisance to surrounding properties, based on location and type of construction, a waiver may be granted to allow hours of construction other than as stated in this section.*

Based on Code Section 16.08.030, we have analyzed the potential construction noise sources for impacts on nearby residential properties.

3 Sensitive receivers

Figure 1 below provides a zoning map of the nearby areas, from the City of Sunnyvale website. The nearest residential properties are approximately 3,000 ft from the site.

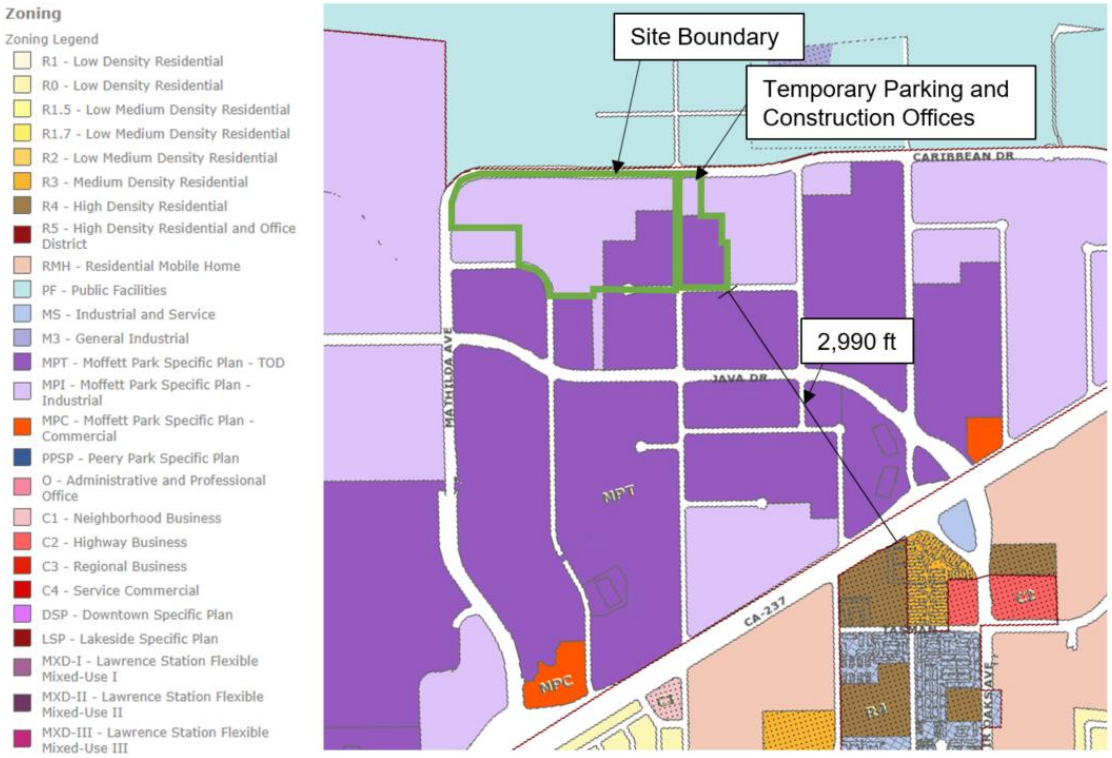

Figure 1: Map showing distance to nearest residential receivers

4 Existing noise environment

Ambient background noise levels near the site were measured as part of our site noise study. We expect these levels to be similar to levels at the nearest residential areas.

Measurement Results:

- **50 dBA** average daytime background noise level at site (5-min Leq)

  Note that this level is derived from the same data as the levels reported in the *Code evaluation: Site & CUP Noise report*, but uses a different metric to derive typical daytime background noise levels.

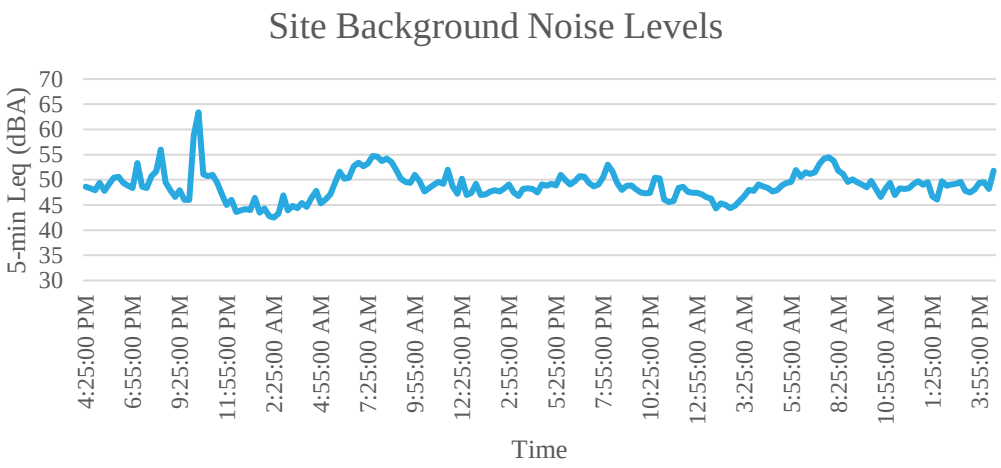

Figure 2: Chart of measured background noise levels

5 Noise Sources

The following table provides expected construction noise actives on site, and corresponding estimated noise levels. The expected equipment types have been provided by Devcon, and the expected noise levels are based on the Federal Highway Administration Construction Noise Handbook.

Equipment	**Source Noise Level (dBA @ 50 ft)***	**Source Noise Level (dBA @ 3,200 ft)***
All Other Equipment > 5 HP	85	49
Auger Drill Rig	84	48
Backhoe	78	42
Chain Saw	84	48
Compactor (ground)	83	47
Compressor (air)	78	42
Concrete Batch Plant	83	47
Concrete Mixer Truck	85	49
Concrete Pump Truck	82	46
Concrete Saw	90	54
Crane	81	45
Dozer	82	46
Drill Rig Truck	79	43
Dump Truck	76	40
Excavator	81	45
Flat Bed Truck	74	38
Front End Loader	79	43

Generator	81	45
Generator (<25KVA, VMS Signs)	73	37
Gradall	83	47
Grader	85	49
Grapple (on backhoe)	87	51
Hydra Break Ram	90	54
Jackhammer	89	53
Man Lift	75	39
Mounted Impact Hammer (hoe ram)	90	54
Pavement Scarifier	90	54
Asphalt Grinder	90	54
Concrete/Asphalt Crusher	90	54
Paver	77	41
Pickup Truck	75	39
Pneumatic Tools	85	49
Pumps	81	45
Rivit Buster/Chipping Gun	79	43
Roller	80	44
Scraper	84	48
Sheers (on backhoe)	96	60
Tamper	90	54
Tractor	84	48
Vacuum Excavator (Vac-Truck)	85	49
Vacuum Street Sweeper	82	46
Ventilation Fan	79	43
Welder/Torch	74	38
Loudest Equipment	96	60

* L_{max}

6 Analysis

Based on the measured background noise levels and estimated peak equipment noise levels, we do not expect any noise disturbance at the nearest residential receivers.

Occasional peak noise events may be just audible above the ambient background noise outdoors, but we do not expect any construction activities to be audible indoors.

7 Hours of operation

In accordance with the City of Sunnyvale code, the expected construction hours will be:

7AM to 6PM daily Monday through Friday.

8AM to 5PM Saturday.

No construction activity on Sunday or federal holidays when city offices are closed.

8 Mitigations

The following noise control measures should be implemented during construction in order to minimize noise disturbances at the nearby areas. These noise control measures are conceptual in nature; alternative measures may also be equally effective. The primary goal of any noise mitigation plan is to provide the most effective and practical techniques for controlling the construction site noise emission.

- Ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational.
- Use electric-powered instead of diesel-powered equipment and hydraulic tools instead of pneumatic impact tools whenever possible.
- Turn off idling equipment, whenever possible.
- Construction activities shall be limited to daytime hours, 7 a.m. to 6 p.m. on Monday through Friday and 8 a.m. to 6 p.m. on Saturday. No noise generating construction activities shall take place on Sundays and holidays.

9 Conclusions

- The noise created by the proposed CUP meets the guidelines outlined by the city of Sunnyvale's Municipal code. This calculation can be updated if equipment is reselected or added.
- Noise transmission from the CUP to outdoor program spaces will be below ambient noise.
- The noise at the sites is normally acceptable for commercial uses.
- No special-purpose acoustic measures are required of the building envelope for Caribbean and Borregas based on our measurements and CALGreen. Even

so the façade will reduce existing ambient exterior noise sufficiently to meet 50 dBA Leq1hr as per CALGreen 5.507.4.2.

- Construction noise will be addressed operationally as described.

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Appendix J-2

Noise Measurement Field Data

Noise Measurement Field Data

Project:	Google Caribbean	**Job Number:**	
Site No.:	#1	**Date:**	10/17/2018
Analyst:	Noemi Wyss	**Time:**	2:43 PM
Location:	380-384 W. Caribbean		
Noise Sources:	Cars on Caribbean drive		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
67.2	38.5	81.1	95.6

Equipment	
Sound Level Meter:	SoundPro DL
Calibrator:	QC-10
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	72
Wind (mph):	10
Sky:	Clear
Bar. Pressure:	30
Humidity:	41%

Photo:

Kimley»Horn

Noise Measurement Field Data

Project:	Google Caribbean	**Job Number:**	
Site No.:	#2	**Date:**	10/17/2018
Analyst:	Noemi Wyss	**Time:**	3:02 PM
Location:	Borregas Avenue and East Caribbean Drive		
Noise Sources:	parking lot, trucks and cars on Caribbean and Borregas		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
57.5	43.5	72.2	87.9

Equipment	
Sound Level Meter:	SoundPro DL
Calibrator:	QC-10
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	72
Wind (mph):	10
Sky:	Clear
Bar. Pressure:	30
Humidity:	41%

Photo:

Kimley»Horn

Noise Measurement Field Data

Project:	Google Caribbean	**Job Number:**	
Site No.:	#3	**Date:**	10/17/2018
Analyst:	Noemi Wyss	**Time:**	3:22 PM
Location:	Caspain Court		
Noise Sources:	parking lot, cars, people talking on phones, planes		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
52.1	47.7	62.9	98.2

Equipment	
Sound Level Meter:	SoundPro DL
Calibrator:	QC-10
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	72
Wind (mph):	10
Sky:	Clear
Bar. Pressure:	30
Humidity:	41%

Photo:

Kimley»Horn

Noise Measurement Field Data

Project:	Google Caribbean	**Job Number:**	
Site No.:	#4	**Date:**	10/17/2018
Analyst:	Noemi Wyss	**Time:**	3:39 PM
Location:	Bordeaux and Mathilda		
Noise Sources:	cars on streets, parking lot, crosswalk beeps		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
63.4	49.7	82.6	97.9

Equipment	
Sound Level Meter:	SoundPro DL
Calibrator:	QC-10
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	72
Wind (mph):	10
Sky:	Clear
Bar. Pressure:	30
Humidity:	41%

Photo:

Kimley»Horn

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Google Caribbean
Project Number:
Scenario: Existing
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Caribbean Drive	Mathilda Ave / Parking Garage Dwy and Borregas Ave / Caribbean Dr	4	18	10,205	45	0	2.0%	1.0%	62.8	-	-	-	-
2	Caribbean Drive	Borregas Ave / Caribbean Dr and Geneva Dr / Caribbean Dr	4	18	14,480	45	0	2.0%	1.0%	64.3	-	-	-	-
3	Caribbean Drive	Geneva Dr / Caribbean Dr and Caribbean Dr / Twin Creeks-Commercial Dwy	4	18	17,530	45	0	2.0%	1.0%	65.1	-	-	-	-
4	Caribbean Drive	Caribbean Dr / Twin Creeks-Commercial Dwy and Caribbean Dr / Moffett Park Dr-Baylands Park	4	18	19,250	45	0	2.0%	1.0%	65.5	-	-	-	-
5	Caribbean Drive	s/o Intersection 24: Caribbean Dr / Moffett Park Dr-Baylands Park	6	18	28,730	45	0	2.0%	1.0%	67.4	-	-	-	-
6	Bordeaux Drive	Mathilda Ave / 1st Ave-Bordeaux Dr and Bordeaux Dr / Java Dr	2	1	1,670	30	0	2.0%	1.0%	51.6	-	-	-	-
7	Bordeaux Drive	s/o Intersection 14: Bordeaux Dr / Java Dr	2	14	3,390	30	0	2.0%	1.0%	54.7	-	-	-	-
8	Borregas Avenue	Borregas Ave / Caribbean Dr and Borregas Ave / Caspian Ct-Caspian Dr	2	1	3,696	35	0	2.0%	1.0%	55.8	-	-	-	-
9	Borregas Avenue	Borregas Ave / Caspian Ct-Caspian Dr and Borregas Ave / Java Dr	2	1	3,950	35	0	2.0%	1.0%	56.1	-	-	-	-
10	Borregas Avenue	s/o Intersection 15: Borregas Ave / Java Dr	2	1	2,920	35	0	2.0%	1.0%	54.8	-	-	-	-
11	Java Drive	w/o and Bordeaux Dr / Java Dr	4	45	3,850	45	0	2.0%	1.0%	58.7	-	-	-	-
12	Java Drive	Bordeaux Dr / Java Dr and Borregas Ave / Java Dr	4	45	7,360	45	0	2.0%	1.0%	61.6	-	-	-	-
13	Java Drive	Borregas Ave / Java Dr and Geneva Dr / Java	4	45	7,710	45	0	2.0%	1.0%	61.8	-	-	-	-
14	Java Drive	e/o and Geneva Dr / Java	4	45	8,380	45	0	2.0%	1.0%	62.1	-	-	-	-
15	Geneva Drive	Geneva Dr / Java and Geneva Dr / Caribbean Dr	2	1	1,110	30	0	2.0%	1.0%	49.8	-	-	-	-
16	Crossman Avenue	n/o and Crossman Ave-SR 237 WB On-Ramp / Moffett Park Dr	4	14	4,700	45	0	2.0%	1.0%	59.4	-	-	-	-
17	Fair Oaks Avenue	n/o and Java Dr-Fair Oaks Ave / Fair Oaks Wy-Kensington Pl	4	45	15,340	45	0	2.0%	1.0%	64.8	-	-	-	-
18	Fair Oaks Avenue	b/w Intersection 18: and Intersection 19: Fair Oaks Ave / Ahwanee Ave	4	14	37,250	45	0	2.0%	1.0%	68.4	-	-	-	-
19	Fair Oaks Avenue	Fair Oaks Ave / Ahwanee Ave and Fair Oaks Ave / Caliente Dr	5	13	34,750	30	0	2.0%	1.0%	65.0	-	-	-	-
20	Fair Oaks Avenue	Fair Oaks Ave / Caliente Dr and Fair Oaks Ave / Wolfe Road	5	13	27,610	30	0	2.0%	1.0%	64.0	-	-	-	-
21	Fair Oaks Avenue	s/o and Fair Oaks Ave / Wolfe Road	6	22	16,110	35	0	2.0%	1.0%	62.6	-	-	-	-
22	Lawrence Expressway	n/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	36,810	50	0	2.0%	1.0%	69.9	-	-	-	-
23	Lawrence Expressway	s/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	32,340	50	0	2.0%	1.0%	69.3	-	-	-	-
24	Tasman Drive	Tasman Dr e/o Intersection 26: Great America Pkwy / Tasman Dr	4	35	23,050	40	0	2.0%	1.0%	65.3	-	-	-	-
25	Tasman Drive	Tasman Dr w/o Intersection 26: Great America Pkwy / Tasman Dr	4	35	11,750	40	0	2.0%	1.0%	62.4	-	-	-	-
26	Great America Parkway	n/o Intersection 26: Great America Pkwy / Tasman Dr	6	20	20,840	40	0	2.0%	1.0%	64.9	-	-	-	-
27	Great America Parkway	s/o Intersection 26: Great America Pkwy / Tasman Dr	6	25	25,740	40	0	2.0%	1.0%	65.9	-	-	-	-
28	Mathilda Avenue	n/o Intersection 27: Mathilda Ave / Sunnyvale-Saratoga Rd-Talisman Dr	6	20	27,720	40	0	2.0%	1.0%	66.2	-	-	-	-
29	Sunnyvale-Saratoga Road	S/o Intersection 27: Mathilda Ave / Sunnyvale-Saratoga Rd-Talisman Dr	6	25	34,290	40	0	2.0%	1.0%	67.1	-	-	-	-

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Google Caribbean
Project Number:
Scenario: Existing Plus Project
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Caribbean Drive	Mathilda Ave / Parking Garage Dwy and Borregas Ave / Caribbean Dr	4	18	12185	45	0	2.0%	1.0%	63.5	-	71	225	712
2	Caribbean Drive	Borregas Ave / Caribbean Dr and Geneva Dr / Caribbean Dr	4	18	16870	45	0	2.0%	1.0%	64.9	-	99	312	986
3	Caribbean Drive	Geneva Dr / Caribbean Dr and Caribbean Dr / Twin Creeks-Commercial Dwy	4	18	21720	45	0	2.0%	1.0%	66.0	-	127	402	1,270
4	Caribbean Drive	Caribbean Dr / Twin Creeks-Commercial Dwy and Caribbean Dr / Moffett Park Dr-Baylands Park	4	18	23440	45	0	2.0%	1.0%	66.4	-	137	433	1,370
5	Caribbean Drive	s/o Intersection 24: Caribbean Dr / Moffett Park Dr-Baylands Park	6	18	32950	45	0	2.0%	1.0%	68.0	-	201	637	2,014
6	Bordeaux Drive	Mathilda Ave / 1st Ave-Bordeaux Dr and Bordeaux Dr / Java Dr	2	1	2140	30	0	2.0%	1.0%	52.7	-	-	-	58
7	Bordeaux Drive	s/o Intersection 14: Bordeaux Dr / Java Dr	2	14	5900	30	0	2.0%	1.0%	57.1	-	-	51	162
8	Borregas Avenue	Borregas Ave / Caribbean Dr and Borregas Ave / Caspian Ct-Caspian Dr	2	1	4106	35	0	2.0%	1.0%	56.3	-	-	42	134
9	Borregas Avenue	Borregas Ave / Caspian Ct-Caspian Dr and Borregas Ave / Java Dr	2	1	4470	35	0	2.0%	1.0%	56.6	-	-	46	146
10	Borregas Avenue	s/o Intersection 15: Borregas Ave / Java Dr	2	1	3550	35	0	2.0%	1.0%	55.6	-	-	37	116
11	Java Drive	w/o and Bordeaux Dr / Java Dr	4	45	5660	45	0	2.0%	1.0%	60.4	-	-	110	348
12	Java Drive	Bordeaux Dr / Java Dr and Borregas Ave / Java Dr	4	45	10270	45	0	2.0%	1.0%	63.0	-	-	200	632
13	Java Drive	Borregas Ave / Java Dr and Geneva Dr / Java	4	45	10180	45	0	2.0%	1.0%	63.0	-	-	198	627
14	Java Drive	e/o and Geneva Dr / Java	4	45	12160	45	0	2.0%	1.0%	63.7	-	75	237	749
15	Geneva Drive	Geneva Dr / Java and Geneva Dr / Caribbean Dr	2	1	2820	30	0	2.0%	1.0%	53.8	-	-	-	77
16	Crossman Avenue	n/o and Crossman Ave-SR 237 WB On-Ramp / Moffett Park Dr	4	14	7720	45	0	2.0%	1.0%	61.5	-	-	142	449
17	Fair Oaks Avenue	n/o and Java Dr-Fair Oaks Ave / Fair Oaks Wy-Kensington Pl	4	45	20120	45	0	2.0%	1.0%	65.9	-	124	392	1,239
18	Fair Oaks Avenue	b/w Intersection 18: and Intersection 19: Fair Oaks Ave / Ahwanee Ave	4	14	41940	45	0	2.0%	1.0%	68.9	77	244	771	2,438
19	Fair Oaks Avenue	Fair Oaks Ave / Ahwanee Ave and Fair Oaks Ave / Caliente Dr	5	13	39190	30	0	2.0%	1.0%	65.5	-	112	353	1,117
20	Fair Oaks Avenue	Fair Oaks Ave / Caliente Dr and Fair Oaks Ave / Wolfe Road	5	13	31660	30	0	2.0%	1.0%	64.6	-	90	285	903
21	Fair Oaks Avenue	s/o and Fair Oaks Ave / Wolfe Road	6	22	19130	35	0	2.0%	1.0%	63.3	-	68	216	682
22	Lawrence Expressway	n/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	43910	50	0	2.0%	1.0%	70.6	116	367	1,160	3,667
23	Lawrence Expressway	s/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	39410	50	0	2.0%	1.0%	70.2	104	329	1,041	3,291
24	Tasman Drive	Tasman Dr e/o Intersection 26: Great America Pkwy / Tasman Dr	4	35	56070	40	0	2.0%	1.0%	69.1	82	259	821	2,595
25	Tasman Drive	Tasman Dr w/o Intersection 26: Great America Pkwy / Tasman Dr	4	35	28730	40	0	2.0%	1.0%	66.2	-	133	420	1,330
26	Great America Parkway	n/o Intersection 26: Great America Pkwy / Tasman Dr	6	20	27170	40	0	2.0%	1.0%	66.1	-	128	406	1,283
27	Great America Parkway	s/o Intersection 26: Great America Pkwy / Tasman Dr	6	25	47310	40	0	2.0%	1.0%	68.5	72	226	715	2,261
28	Mathilda Avenue	n/o Intersection 27: Mathilda Ave / Sunnyvale-Saratoga Rd-Talisman Dr	6	20	34720	40	0	2.0%	1.0%	67.1	-	164	518	1,639
29	Sunnyvale-Saratoga Road	S/o Intersection 27: Mathilda Ave / Sunnyvale-Saratoga Rd-Talisman Dr	6	25	42840	40	0	2.0%	1.0%	68.1	-	205	648	2,048

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Google Caribbean
Project Number:
Scenario: Opening Year Background
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

									Vehicle Mix		Distance from Centerline of Roadway			
#	Roadway	Segment	Lanes	Median Width	ADT Volume	Speed (mph)	Alpha Factor	Medium Trucks	Heavy Trucks	Ldn at 100 Feet	Distance to Contour 70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Caribbean Drive	Mathilda Ave / Parking Garage Dwy and Borre	4	18	12185	45	0	2.0%	1.0%	63.5	-	71	225	712
2	Caribbean Drive	Borregas Ave / Caribbean Dr and Geneva Dr /	4	18	16870	45	0	2.0%	1.0%	64.9	-	99	312	986
3	Caribbean Drive	Geneva Dr / Caribbean Dr and Caribbean Dr /	4	18	21720	45	0	2.0%	1.0%	66.0	-	127	402	1,270
4	Caribbean Drive	Caribbean Dr / Twin Creeks-Commercial Dwy	4	18	23440	45	0	2.0%	1.0%	66.4	-	137	433	1,370
5	Caribbean Drive	s/o Intersection 24: Caribbean Dr / Moffett Parl	6	18	32950	45	0	2.0%	1.0%	68.0	-	201	637	2,014
6	Bordeaux Drive	Mathilda Ave / 1st Ave-Bordeaux Dr and Borde	2	1	2140	30	0	2.0%	1.0%	52.7	-	-	-	58
7	Bordeaux Drive	s/o Intersection 14: Bordeaux Dr / Java Dr	2	14	5900	30	0	2.0%	1.0%	57.1	-	-	51	162
8	Borregas Avenue	Borregas Ave / Caribbean Dr and Borregas Av	2	1	4106	35	0	2.0%	1.0%	56.3	-	-	42	134
9	Borregas Avenue	Borregas Ave / Caspian Ct-Caspian Dr and Bo	2	1	4470	35	0	2.0%	1.0%	56.6	-	-	46	146
10	Borregas Avenue	s/o Intersection 15: Borregas Ave / Java Dr	2	1	3550	35	0	2.0%	1.0%	55.6	-	-	37	116
11	Java Drive	w/o and Bordeaux Dr / Java Dr	4	45	5660	45	0	2.0%	1.0%	60.4	-	-	110	348
12	Java Drive	Bordeaux Dr / Java Dr and Borregas Ave / Jav	4	45	10270	45	0	2.0%	1.0%	63.0	-	-	200	632
13	Java Drive	Borregas Ave / Java Dr and Geneva Dr / Java	4	45	10180	45	0	2.0%	1.0%	63.0	-	-	198	627
14	Java Drive	e/o and Geneva Dr / Java	4	45	12160	45	0	2.0%	1.0%	63.7	-	75	237	749
15	Geneva Drive	Geneva Dr / Java and Geneva Dr / Caribbean	2	1	2820	30	0	2.0%	1.0%	53.8	-	-	-	77
16	Crossman Avenue	n/o and Crossman Ave-SR 237 WB On-Ramp	4	14	7720	45	0	2.0%	1.0%	61.5	-	-	142	449
17	Fair Oaks Avenue	n/o and Java Dr-Fair Oaks Ave / Fair Oaks Wy	4	45	20120	45	0	2.0%	1.0%	65.9	-	124	392	1,239
18	Fair Oaks Avenue	b/w Intersection 18: and Intersection 19: Fair (	4	14	41940	45	0	2.0%	1.0%	68.9	77	244	771	2,438
19	Fair Oaks Avenue	Fair Oaks Ave / Ahwanee Ave and Fair Oaks A	5	13	39190	30	0	2.0%	1.0%	65.5	-	112	353	1,117
20	Fair Oaks Avenue	Fair Oaks Ave / Caliente Dr and Fair Oaks Ave	5	13	31660	30	0	2.0%	1.0%	64.6	-	90	285	903
21	Fair Oaks Avenue	s/o and Fair Oaks Ave / Wolfe Road	6	22	19130	35	0	2.0%	1.0%	63.3	-	68	216	682
22	Lawrence Expressway	n/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	43910	50	0	2.0%	1.0%	70.6	116	367	1,160	3,667
23	Lawrence Expressway	s/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	39410	50	0	2.0%	1.0%	70.2	104	329	1,041	3,291
24	Tasman Drive	Tasman Dr e/o Intersection 26: Great America	4	35	56070	40	0	2.0%	1.0%	69.1	82	259	821	2,595
25	Tasman Drive	Tasman Dr w/o Intersection 26: Great America	4	35	28730	40	0	2.0%	1.0%	66.2	-	133	420	1,330
26	Great America Parkway	n/o Intersection 26: Great America Pkwy / Tasi	6	20	27170	40	0	2.0%	1.0%	66.1	-	128	406	1,283
27	Great America Parkway	s/o Intersection 26: Great America Pkwy / Tasi	6	25	47310	40	0	2.0%	1.0%	68.5	72	226	715	2,261
28	Mathilda Avenue	n/o Intersection 27: Mathilda Ave / Sunnyvale-	6	20	34720	40	0	2.0%	1.0%	67.1	-	164	518	1,639
29	Sunnyvale-Saratoga Road	S/o Intersection 27: Mathilda Ave / Sunnyvale-	6	25	42840	40	0	2.0%	1.0%	68.1	-	205	648	2,048

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Google Caribbean
Project Number:
Scenario: Opening Year Plus Project
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Caribbean Drive	Mathilda Ave / Parking Garage Dwy and Borregas Ave / Caribbean Dr	4	18	17189	45	0	2.0%	1.0%	65.0	-	100	318	1,005
2	Caribbean Drive	Borregas Ave / Caribbean Dr and Geneva Dr / Caribbean Dr	4	18	20748	45	0	2.0%	1.0%	65.8	-	121	384	1,213
3	Caribbean Drive	Geneva Dr / Caribbean Dr and Caribbean Dr / Twin Creeks-Commercial Dwy	4	18	25186	45	0	2.0%	1.0%	66.7	-	147	466	1,472
4	Caribbean Drive	Caribbean Dr / Twin Creeks-Commercial Dwy and Caribbean Dr / Moffett Park D	4	18	26906	45	0	2.0%	1.0%	67.0	-	157	497	1,573
5	Caribbean Drive	s/o Intersection 24: Caribbean Dr / Moffett Park Dr-Baylands Park	6	18	36416	45	0	2.0%	1.0%	68.5	70	223	704	2,226
6	Bordeaux Drive	Mathilda Ave / 1st Ave-Bordeaux Dr and Bordeaux Dr / Java Dr	2	1	2266	30	0	2.0%	1.0%	52.9	-	-	-	62
7	Bordeaux Drive	s/o Intersection 14: Bordeaux Dr / Java Dr	2	14	5910	30	0	2.0%	1.0%	57.1	-	-	51	162
8	Borregas Avenue	Borregas Ave / Caribbean Dr and Borregas Ave / Caspian Ct-Caspian Dr	2	1	6501	35	0	2.0%	1.0%	58.3	-	-	67	212
9	Borregas Avenue	Borregas Ave / Caspian Ct-Caspian Dr and Borregas Ave / Java Dr	2	1	6911	35	0	2.0%	1.0%	58.5	-	-	71	225
10	Borregas Avenue	s/o Intersection 15: Borregas Ave / Java Dr	2	1	4766	35	0	2.0%	1.0%	56.9	-	-	49	155
11	Java Drive	w/o and Bordeaux Dr / Java Dr	4	45	6594	45	0	2.0%	1.0%	61.1	-	-	128	406
12	Java Drive	Bordeaux Dr / Java Dr and Borregas Ave / Java Dr	4	45	11245	45	0	2.0%	1.0%	63.4	-	69	219	692
13	Java Drive	Borregas Ave / Java Dr and Geneva Dr / Java	4	45	10743	45	0	2.0%	1.0%	63.2	-	-	209	661
14	Java Drive	e/o and Geneva Dr / Java	4	45	12793	45	0	2.0%	1.0%	64.0	-	79	249	788
15	Geneva Drive	Geneva Dr / Java and Geneva Dr / Caribbean Dr	2	1	2910	30	0	2.0%	1.0%	54.0	-	-	-	79
16	Crossman Avenue	n/o and Crossman Ave-SR 237 WB On-Ramp / Moffett Park Dr	4	14	7911	45	0	2.0%	1.0%	61.6	-	-	145	460
17	Fair Oaks Avenue	n/o and Java Dr-Fair Oaks Ave / Fair Oaks Wy-Kensington Pl	4	45	20894	45	0	2.0%	1.0%	66.1	-	129	407	1,286
18	Fair Oaks Avenue	b/w Intersection 18: and Intersection 19: Fair Oaks Ave / Ahwanee Ave	4	14	42352	45	0	2.0%	1.0%	68.9	78	246	779	2,462
19	Fair Oaks Avenue	Fair Oaks Ave / Ahwanee Ave and Fair Oaks Ave / Caliente Dr	5	13	39602	30	0	2.0%	1.0%	65.5	-	113	357	1,129
20	Fair Oaks Avenue	Fair Oaks Ave / Caliente Dr and Fair Oaks Ave / Wolfe Road	5	13	31971	30	0	2.0%	1.0%	64.6	-	91	288	912
21	Fair Oaks Avenue	s/o and Fair Oaks Ave / Wolfe Road	6	22	19381	35	0	2.0%	1.0%	63.4	-	69	218	691
22	Lawrence Expressway	n/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	46120	50	0	2.0%	1.0%	70.9	122	385	1,218	3,851
23	Lawrence Expressway	s/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	41620	50	0	2.0%	1.0%	70.4	110	348	1,099	3,476
24	Tasman Drive	Tasman Dr e/o Intersection 26: Great America Pkwy / Tasman Dr	4	35	56231	40	0	2.0%	1.0%	69.2	82	260	823	2,602
25	Tasman Drive	Tasman Dr w/o Intersection 26: Great America Pkwy / Tasman Dr	4	35	29122	40	0	2.0%	1.0%	66.3	-	135	426	1,348
26	Great America Parkway	n/o Intersection 26: Great America Pkwy / Tasman Dr	6	20	27170	40	0	2.0%	1.0%	66.1	-	128	406	1,283
27	Great America Parkway	s/o Intersection 26: Great America Pkwy / Tasman Dr	6	25	47541	40	0	2.0%	1.0%	68.6	72	227	719	2,273
28	Mathilda Avenue	n/o Intersection 27: Mathilda Ave / Sunnyvale-Saratoga Rd-Talisman Dr	6	20	35373	40	0	2.0%	1.0%	67.2	-	167	528	1,670
29	Sunnyvale-Saratoga Roa	S/o Intersection 27: Mathilda Ave / Sunnyvale-Saratoga Rd-Talisman Dr	6	25	43493	40	0	2.0%	1.0%	68.2	-	208	657	2,079

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Google Caribbean
Project Number:
Scenario: Horizon Year
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Caribbean Drive	Mathilda Ave / Parking Garage Dwy and Borre	4	18	14015	45	0	2.0%	1.0%	64.1	-	82	259	819
2	Caribbean Drive	Borregas Ave / Caribbean Dr and Geneva Dr /	4	18	19490	45	0	2.0%	1.0%	65.6	-	114	360	1,139
3	Caribbean Drive	Geneva Dr / Caribbean Dr and Caribbean Dr /	4	18	24920	45	0	2.0%	1.0%	66.6	-	146	461	1,457
4	Caribbean Drive	Caribbean Dr / Twin Creeks-Commercial Dwy	4	18	26940	45	0	2.0%	1.0%	67.0	-	157	498	1,575
5	Caribbean Drive	s/o Intersection 24: Caribbean Dr / Moffett Parl	6	18	38450	45	0	2.0%	1.0%	68.7	74	235	743	2,351
6	Bordeaux Drive	Mathilda Ave / 1st Ave-Bordeaux Dr and Borde	2	1	2440	30	0	2.0%	1.0%	53.2	-	-	-	66
7	Bordeaux Drive	s/o Intersection 14: Bordeaux Dr / Java Dr	2	14	6580	30	0	2.0%	1.0%	57.6	-	-	57	180
8	Borregas Avenue	Borregas Ave / Caribbean Dr and Borregas Av	2	1	4792	35	0	2.0%	1.0%	56.9	-	-	49	156
9	Borregas Avenue	Borregas Ave / Caspian Ct-Caspian Dr and Bo	2	1	5220	35	0	2.0%	1.0%	57.3	-	-	54	170
10	Borregas Avenue	s/o Intersection 15: Borregas Ave / Java Dr	2	1	4110	35	0	2.0%	1.0%	56.3	-	-	42	134
11	Java Drive	w/o and Bordeaux Dr / Java Dr	4	45	6420	45	0	2.0%	1.0%	61.0	-	-	125	395
12	Java Drive	Bordeaux Dr / Java Dr and Borregas Ave / Jav	4	45	11680	45	0	2.0%	1.0%	63.6	-	72	227	719
13	Java Drive	Borregas Ave / Java Dr and Geneva Dr / Java	4	45	11620	45	0	2.0%	1.0%	63.5	-	72	226	715
14	Java Drive	e/o and Geneva Dr / Java	4	45	13790	45	0	2.0%	1.0%	64.3	-	85	268	849
15	Geneva Drive	Geneva Dr / Java and Geneva Dr / Caribbean	2	1	3050	30	0	2.0%	1.0%	54.2	-	-	-	83
16	Crossman Avenue	n/o and Crossman Ave-SR 237 WB On-Ramp	4	14	8620	45	0	2.0%	1.0%	62.0	-	-	158	501
17	Fair Oaks Avenue	n/o and Java Dr-Fair Oaks Ave / Fair Oaks Wy	4	45	23080	45	0	2.0%	1.0%	66.5	-	142	449	1,421
18	Fair Oaks Avenue	b/w Intersection 18: and Intersection 19: Fair (	4	14	49190	45	0	2.0%	1.0%	69.6	90	286	904	2,860
19	Fair Oaks Avenue	Fair Oaks Ave / Ahwanee Ave and Fair Oaks A	5	13	45990	30	0	2.0%	1.0%	66.2	-	131	415	1,311
20	Fair Oaks Avenue	Fair Oaks Ave / Caliente Dr and Fair Oaks Ave	5	13	37190	30	0	2.0%	1.0%	65.3	-	106	335	1,060
21	Fair Oaks Avenue	s/o and Fair Oaks Ave / Wolfe Road	6	22	22580	35	0	2.0%	1.0%	64.1	-	80	255	805
22	Lawrence Expressway	n/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	51630	50	0	2.0%	1.0%	71.3	136	431	1,363	4,311
23	Lawrence Expressway	s/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	46220	50	0	2.0%	1.0%	70.9	122	386	1,221	3,860
24	Tasman Drive	Tasman Dr e/o Intersection 26: Great America	4	35	60640	40	0	2.0%	1.0%	69.5	89	281	887	2,806
25	Tasman Drive	Tasman Dr w/o Intersection 26: Great America	4	35	31210	40	0	2.0%	1.0%	66.6	-	144	457	1,444
26	Great America Parkway	n/o Intersection 26: Great America Pkwy / Tasi	6	20	31310	40	0	2.0%	1.0%	66.7	-	148	467	1,478
27	Great America Parkway	s/o Intersection 26: Great America Pkwy / Tasi	6	25	52540	40	0	2.0%	1.0%	69.0	79	251	794	2,511
28	Mathilda Avenue	n/o Intersection 27: Mathilda Ave / Sunnyvale-	6	20	40010	40	0	2.0%	1.0%	67.8	-	189	597	1,889
29	Sunnyvale-Saratoga Road	S/o Intersection 27: Mathilda Ave / Sunnyvale-	6	25	49380	40	0	2.0%	1.0%	68.7	75	236	746	2,360

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Google Caribbean
Project Number:
Scenario: Horizon Year Plus Project
Ldn/CNEL: Ldn

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	Ldn at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 Ldn	65 Ldn	60 Ldn	55 Ldn
1	Caribbean Drive	Mathilda Ave / Parking Garage Dwy and Borre	4	18	19019	45	0	2.0%	1.0%	65.5	-	111	352	1,112
2	Caribbean Drive	Borregas Ave / Caribbean Dr and Geneva Dr /	4	18	23368	45	0	2.0%	1.0%	66.4	-	137	432	1,366
3	Caribbean Drive	Geneva Dr / Caribbean Dr and Caribbean Dr /	4	18	28386	45	0	2.0%	1.0%	67.2	-	166	525	1,660
4	Caribbean Drive	Caribbean Dr / Twin Creeks-Commercial Dwy	4	18	30406	45	0	2.0%	1.0%	67.5	56	178	562	1,778
5	Caribbean Drive	s/o Intersection 24: Caribbean Dr / Moffett Parl	6	18	41916	45	0	2.0%	1.0%	69.1	81	256	810	2,563
6	Bordeaux Drive	Mathilda Ave / 1st Ave-Bordeaux Dr and Borde	2	1	2568	30	0	2.0%	1.0%	53.4	-	-	-	70
7	Bordeaux Drive	s/o Intersection 14: Bordeaux Dr / Java Dr	2	14	6590	30	0	2.0%	1.0%	57.6	-	-	57	180
8	Borregas Avenue	Borregas Ave / Caribbean Dr and Borregas Av	2	1	7187	35	0	2.0%	1.0%	58.7	-	-	74	234
9	Borregas Avenue	Borregas Ave / Caspian Ct-Caspian Dr and Bo	2	1	7661	35	0	2.0%	1.0%	59.0	-	-	79	250
10	Borregas Avenue	s/o Intersection 15: Borregas Ave / Java Dr	2	1	5326	35	0	2.0%	1.0%	57.4	-	-	55	174
11	Java Drive	w/o and Bordeaux Dr / Java Dr	4	45	7354	45	0	2.0%	1.0%	61.6	-	-	143	453
12	Java Drive	Bordeaux Dr / Java Dr and Borregas Ave / Jav	4	45	12655	45	0	2.0%	1.0%	63.9	-	78	246	779
13	Java Drive	Borregas Ave / Java Dr and Geneva Dr / Java	4	45	12183	45	0	2.0%	1.0%	63.8	-	75	237	750
14	Java Drive	e/o and Geneva Dr / Java	4	45	14423	45	0	2.0%	1.0%	64.5	-	89	281	888
15	Geneva Drive	Geneva Dr / Java and Geneva Dr / Caribbean	2	1	3140	30	0	2.0%	1.0%	54.3	-	-	-	85
16	Crossman Avenue	n/o and Crossman Ave-SR 237 WB On-Ramp	4	14	8811	45	0	2.0%	1.0%	62.1	-	51	162	512
17	Fair Oaks Avenue	n/o and Java Dr-Fair Oaks Ave / Fair Oaks Wy	4	45	23854	45	0	2.0%	1.0%	66.7	-	147	464	1,469
18	Fair Oaks Avenue	b/w Intersection 18: and Intersection 19: Fair (	4	14	49602	45	0	2.0%	1.0%	69.6	91	288	912	2,884
19	Fair Oaks Avenue	Fair Oaks Ave / Ahwanee Ave and Fair Oaks A	5	13	46402	30	0	2.0%	1.0%	66.2	-	132	418	1,323
20	Fair Oaks Avenue	Fair Oaks Ave / Caliente Dr and Fair Oaks Ave	5	13	37501	30	0	2.0%	1.0%	65.3	-	107	338	1,069
21	Fair Oaks Avenue	s/o and Fair Oaks Ave / Wolfe Road	6	22	22831	35	0	2.0%	1.0%	64.1	-	81	257	814
22	Lawrence Expressway	n/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	53840	50	0	2.0%	1.0%	71.5	142	450	1,422	4,496
23	Lawrence Expressway	s/o and Lawrence Expy / Persian Dr-Elko Dr	8	18	48430	50	0	2.0%	1.0%	71.1	128	404	1,279	4,044
24	Tasman Drive	Tasman Dr e/o Intersection 26: Great America	4	35	60801	40	0	2.0%	1.0%	69.5	89	281	890	2,814
25	Tasman Drive	Tasman Dr w/o Intersection 26: Great America	4	35	31602	40	0	2.0%	1.0%	66.7	-	146	463	1,463
26	Great America Parkway	n/o Intersection 26: Great America Pkwy / Tasi	6	20	31310	40	0	2.0%	1.0%	66.7	-	148	467	1,478
27	Great America Parkway	s/o Intersection 26: Great America Pkwy / Tasi	6	25	52771	40	0	2.0%	1.0%	69.0	80	252	798	2,523
28	Mathilda Avenue	n/o Intersection 27: Mathilda Ave / Sunnyvale-	6	20	40663	40	0	2.0%	1.0%	67.8	-	192	607	1,920
29	Sunnyvale-Saratoga Road	S/o Intersection 27: Mathilda Ave / Sunnyvale-	6	25	50033	40	0	2.0%	1.0%	68.8	76	239	756	2,392

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

Appendix K

Water Supply Assessment

Caribbean Drive Development Project

SB 610 Water Supply Assessment

Sunnyvale

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Caribbean Drive Development Project
SB 610 Water Supply Assessment

Prepared for

Sunnyvale

August 2019

Prepared by:

Tully & Young
Comprehensive Water Planning

Prepared for:
The City of Sunnyvale

Approved on

[place Engineers Stamp here]

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SUMMARY OF FINDINGS

The water demands of the proposed commercial development project located at 100 and 200 West Caribbean Drive (Proposed Project) are incorporated within the City of Sunnyvale's (City) anticipated future customer demands of approximately 26,896 acre-feet per year, which is satisfied by the City's water supply portfolio (see **Section 3**). Therefore, this Water Supply Assessment's sufficiency analysis relies upon the City's 2015 UWMP representation of water supply reliability (as summarized in **Section 3**), and concludes that sufficient water is available to meet the needs of the Proposed Project. The conclusion that sufficient water is available rests on the following:

- The Proposed Project is constructed in similar manner to the representations provided in **Section 1**, resulting in a water demand similar to the estimate.
- The City's representation of water supply reliability from Santa Clara Valley Water District and San Francisco Public Utility Commission remains as characterized in the 2015 UWMP.
- The City maintains its Water Shortage Contingency Plan (WSCP), an element detailed in the 2015 UWMP, to assure City water needs are met according to the WSCP during times of unforeseen shortage. Once complete, the Proposed Project will be subject to the requirements of the WSCP as a water customer of the City.

SECTION 1 – PROJECT INTRODUCTION

1.1 INTRODUCTION

As the lead agency under the California Environmental Quality Act (CEQA), the City of Sunnyvale (hereafter referred to as the "City") is assessing the potential environmental impacts associated with a proposed commercial development project located at 100 and 200 West Caribbean Drive. To support the CEQA analysis, a Water Supply Assessment (WSA) for the proposed development is necessary (hereafter referred to as the "Proposed Project").

Statutory Background

Enacted in 2001, Senate Bill 610 added section 21151.9 to the Public Resources Code requiring that any proposed "project," as defined in section 10912 of the Water Code, comply with Water Code section 10910, et seq. Commonly referred to as a "SB 610 Water Supply Assessment," Water Code section 10910, et seq. outlines the necessary information and analysis that must be included in an environmental analysis of a project to ensure that proposed land developments have a sufficient water supply to meet existing and planned water demands over a 20-year projection.

Proposed projects requiring the preparation of a SB 610 water supply assessment include, among others, residential developments of more than 500 dwelling units, shopping centers or business establishments employing more than 1,000 persons or having more than 500,000 square feet of floor space, commercial office buildings employing more than 1,000 persons or having more than 250,000 square feet of floor space and projects that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.[1]

The Proposed Project requires a WSA because it exceeds 250,000 square feet of floor space and will employ more than 1,000 people, as discussed below.

The WSA will be incorporated into the CEQA document that is being prepared for the Proposed Project.[2]

Document Preparation and Approval

The WSA law requires that the lead CEQA agency – in this case, the City of Sunnyvale – identify a "public water system"[3] that will serve the project, and further requires the lead CEQA agency to request that each identified public water system prepare a WSA for the project. If the lead agency is not able to identify a public water system that may supply water for the project, the lead agency must prepare the WSA itself after consulting with "any entity serving domestic

[1] Water Code § 10912, subdivision (a).
[2] Water Code § 10911(b).
[3] A "public water system" is a water system that provides water for human consumption that is permitted and regulated by the California Environmental Protection Agency, Division of Drinking Water.

water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site."[4]

In this case, the City has prepared the WSA because the City is the primary local water supplier and would serve the Proposed Project. The Proposed Project currently lies within the City's water service area. This document provides the necessary information for the City to make its determinations and to comply with the assessment of water supply sufficiency as required by statute.

Document Organization

This WSA supports the Proposed Project's environmental review process and analyzes the sufficiency of water supplies to meet projected water demands of the Proposed Project through the required 20-year planning horizon. The WSA is organized as follows:

Section 1: Project Introduction. This section provides an overview of WSA requirements, and a detailed description of the Proposed Project, especially the land-use elements that will require water service.

Section 2: Proposed Project Estimated Water Demands. This section describes the methodology used to estimate water demands of the Proposed Project and details the estimated water demands at build-out of the Proposed Project.

Section 3: Water Supply Characterization. This section characterizes the City's water supply portfolio that will serve the Proposed Project along with other current and future water demands, and provides necessary information for normal, single dry, and multiple dry year conditions.

Section 4: Sufficiency Analysis. This section assesses whether sufficient water will be available to meet the Proposed Project water demands, while recognizing existing and other potential planned water demands within the City service area. To provide the necessary conclusions required by statute, the analysis integrates the demand detailed in Section 2 with the characterization of City's water supply portfolio detailed in Section 3.

1.2 PROPOSED PROJECT DESCRIPTION

The Proposed Project is a redevelopment project on approximately 40 acres located at 100 and 200 West Caribbean Way, within the City's Moffett Park Specific Plan area. The project site is located on the south side of W. Caribbean Way between Mathilda Avenue and Borregas Avenue and is bisected by the Santa Clara Valley Water District's West Channel outfall. The 100 W. Caribbean site is bounded by W. Caribbean Drive on the north, Borregas Avenue on the east,

[4] Water Code § 10910(b).

Caspian Court on the south and the SCVWD[5] West Channel on the west. The 200 W. Caribbean site is bounded by W. Caribbean Drive on the north, the SCVWD west channel on the east, Bordeaux Drive on the south and Mathilda Avenue on the west. The project proposes to demolish 10 existing single story commercial buildings and build two five story buildings totaling 1,041,890 square feet, a four level, 371,034 square foot parking garage and a 79,200-square foot Central Utility Plant to support the completed project (see **Figure 1-1**). The Proposed Project is located within the Moffett Park Specific Plan District,[6] and includes many unique features, including rooftop and vertical landscape elements and native plantings (see **Figure 1-2**). The Proposed Project will be LEED certified and will use recycled water to irrigate the Proposed Project's planned landscaping.

Water demands associated with the Proposed Project (as detailed in Section 2) were generally addressed in the City's 2015 Urban Water Management Plan (UWMP) and in the City's 2010 Water Utility Master Plan (WUMP) as part of the City's anticipated overall commercial and industrial growth and redevelopment. This WSA relies on the analysis completed in the UWMP and the WUMP, which was foundational to the demand assumptions in the UWMP, as well as regional planning documents of the City's wholesaler water supplier and the local groundwater sustainability agency.

[5] Santa Clara Valley Water District
[6] The Moffett Park Specific Plan District was established by the City in 2004 as defined in the City Municipal Code, Chapter 19.29.

Figure 1-1 – Proposed Project Location and Layout

Figure 1-2: Rooftop and Vertical Landscape elements
(Source: July 11, 2018 Planning Submission Packet)

1 PARKING GARAGE SOUTHEAST CORNER

2 PARKING GARAGE WEST FACADE

Overall, the Proposed Project includes over one million square feet of office space to employ nearly 5,000 people[7], with over 2,000 parking spaces, a "living roof" and various other project attributes.

1.3 PROPOSED PROJECT PHASING

The proposed project is anticipated to build out completely within a couple of years following the start of construction. As such, there is no phasing associated with the demand calculations for this project. This demand is included in the projected annual water demands presented in **Section 2**.

[7] Personal communication: email on 2/15/19from Ryan Kuchenig, City Senior Planner.

SECTION 2 – PROPOSED PROJECT ESTIMATED WATER DEMANDS

This section describes the methodology, and provides the supporting evidence used to derive the Proposed Project's estimated annual water demand. This section includes a discussion of:

- Unique unit demand factors for Proposed Project's domestic and irrigation demand projections
- Estimate of total Proposed Project water demand at build-out

For the purposes of calculating water demand, build-out is expected to occur within 5 of starting construction.

2.1 DEMAND FACTOR DEVELOPMENT

As detailed in **Section 1**, the Proposed Project is planned as a technology campus, with a focus on standard office space for the applicant's technical-focused employees. The specific planned uses are described as an office space with associated facilities including food service and gym features. To understand the water needs of the entire Proposed Project, unique demand factors that correspond with each unique project element are necessary. This subsection presents the methodology for determining the unit water demand factors that become the basis of the Proposed Project water demand estimates.

Values developed for each distinct water use element are based on several sources of information as detailed in the following subsections.

2.1.1 Current and Future Mandates

There are several considerations that affect the development of unit water demand factors, ranging from state landscape mandates to changes in the plumbing and building codes. The most important factors for this analysis are described below.

2.1.1.1 Water Conservation Objectives

In 2009 Senate Bill No. 7 (SBX7-7) became law, which established a statewide goal of achieving a 20 percent reduction in urban per capita water use by 2020 for urban retail water suppliers.[8] Since the Proposed Project will be completed beyond 2020, the City's conservation actions to achieve the statutory requirements will already be in effect.[9]

The efforts undertaken by the City's wholesale water suppliers, the City, and throughout the State by other urban retail suppliers to comply with this statute, though not directly, will affect

[8] California Water Code § 10608.20

[9] The Proposed Project is commercial, so does not contribute to the City's population. Yet, its demand will be factored into the future per-capita values for the City. Given the City's already sizeable annual demand in comparison to the Proposed Project, it is unlikely this project noticeably effects the reduction target either in a negative manner.

the proposed project's use of appliances, fixtures, landscapes and other water using features, through changes or additions to City ordinances as well as State law and/or through an emerging "conservation ethic" developing throughout the State.[10]

2.1.1.2 Indoor Infrastructure Requirements

In January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (hereafter the "CAL Green Code") that requires the installation of water-efficient indoor infrastructure for all new projects beginning after January 1, 2011. CAL Green Code was incorporated as Part 11 into Title 24 of the California Code of Regulations. The Cal Green Code was revised in 2013 and again in 2016, and will be again in 2019, as part of a 3-year update cycle, however these later additions have focused on energy efficiency and have not had the substantial implications to the water use already contemplated by the 2010 Cal Green Code.[11] The CAL Green Code applies to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure. The Proposed Project must satisfy the indoor water use infrastructure standards necessary to meet the CAL Green Code.

The CAL Green Code requires nonresidential water efficiency and conservation measures for new buildings and structures that will reduce the overall potable water use inside the building by 20 percent. The Proposed Project will satisfy one of these two requirements through the use of appliances and fixtures such as high-efficiency toilets, faucet aerators, on-demand water heaters, or other fixtures as well as Energy Star and California Energy Commission-approved appliances.

Furthermore, the Proposed Project intends to achieve LEED certification, which will entail water efficiency measures commensurate with the CAL Green Code.

2.1.1.3 California Model Water Efficient Landscape Ordinance and County Ordinances

The Water Conservation in Landscaping Act was enacted in 2006, and has since been revised and expanded multiple times by Department of Water Resources (DWR) to result in today's Model Water Efficient Landscape Ordinance (MWELO).[12] In response to the Governor's executive order dated April 1, 2015, (EO B-29-15), DWR updated the MWELO and the California Water Commission approved the adoption and incorporation of the updated State standards for MWELO on July 15, 2015.[13] The changes included a reduction to 45% for the maximum amount of water that may be applied to a landscape for non-residential projects, which

[10] In May 2016, Governor Brown issued Executive Order B-37-16 entitled "*Making Water Conservation a California Way of Life*." This further illustrates the growing water conservation ethic in the state. In May 2018, Governor Brown signed into law SB 606 and AB 1668 that effectively implement the direction in the May 2016 Executive Order.

[11] "The CAL Green Code is evaluated for updates during the Triennial Code Adoption Cycle. HCD evaluated stakeholder input, changes in technology, implementation of sustainable building goals in California, and changes in statutory requirements. As such, the scope of CAL Green has continually increased and built on previsions cycles revisions. https://www.energy.ca.gov/title24/2019standards/

[12] Gov. Code §§ 65591-65599

[13] These updated changes have been incorporated into California Code of Regulations (CCR), Tit. 23, Div. 2, Ch. 2.7, Sec. 490-495.

effectively reduces the landscape area that can be planted with high water use plants. The MWELO applies to all types of new construction with a landscape area greater than 500 square feet (the prior MWELO applied to landscapes greater than 2,500 sf).[14] For the purposes of this WSA it is assumed that the City will require landscaping plans to comply with MWELO as required by law.[15]

As the proposed project intends to irrigate with Recycled water from the City's Waste Water Reclamation Facility, the water efficiency restrictions are significantly relaxed under the state MWELO guidelines.

2.1.1.4 Metering, Volumetric Pricing, and Water Budgets

California Water Code §525 requires water purveyors to install meters on all new service connections after January 1, 1992. California Water Code §527 requires water purveyors to charge for water based upon the actual volume of water delivered if a meter has been installed. The City currently bills customers on a volumetric basis, though this action alone does not necessarily reduce water use.

2.1.1.5 Project Specific Restrictions that Impact Potable Water Use

The Proposed Project plans for a number of specific design features that result in limits to future water use and encourage rainwater percolation. These include the following:

- *Limited Hardscape Area:* The limitation of the size of impermeable area will result in water percolating into the water table.
- *Recycled Water for Landscape Irrigation:* The outdoor water demands will be met with recycled water reducing the impact on the potable water system.
- *Indoor Water Use Efficient Fixtures:* The indoor water fixtures will include low flow toilets, low flow show heads in the gym area, and waterless urinals to comply with CAL Green and to meet LEED requirements.

Collectively these minor restrictions add up to an effective potable water use reduction strategy.

2.2 PROPOSED PROJECT ESTIMATED WATER DEMAND

This subsection describes the methods used and the values estimated for unit water demand factors for the Project. Indoor demand factors are represented as the quantity of water in gallons per year per square foot (gpy/sf). Outdoor demand factors are represented as the quantity of water in acre-feet per acre (af/ac) per year.

[14] CCR Tit. 23, Div. 2, Ch. 27, Sec. 490.1.
[15] The City's Landscaping Ordinance is found in Chapter 19.37.050 of the Sunnyvale Municipal Code and has been updated to conform with the State's MWELO.

The indoor and outdoor components are ultimately combined into a total project demand detailing each of the land-use categories.

2.2.1 Indoor Potable Demand Factors

This subsection discusses the indoor elements of the Proposed Project. The Proposed Project includes a number of demands characteristic of a modern technology campus. These are addressed below.

- *Technology Related Office Space*: The Proposed Project anticipates the majority of the floor space to be traditional office space. Water use data for office space is readily available and well defined, though varies widely with building age and function. The Proposed Project will incorporate the most efficient fixtures and appliances, as required by the CAL Green Code and to achieve desired LEED certification. As such, this WSA uses a national average water use factor of 15 gpy/sf (gallons per year per square-foot), reflecting similar new and efficient office buildings.[16] For the planned 1,041,890 square feet of office space, the water demand is estimated to be approximately 15.6 million gallons per year – or about 48 acre-feet annually.

- *Onsite Food Service*: The Proposed Project includes onsite food service which will provide sit down dining for employees. Based on national averages 10.1 gallons per meal per day multiplied by 0.33 meals per employee per day.[17] When taken with the average number of days worked per year, an estimate for total water potable demand for food service can be calculated. For the Proposed Project, the onsite food service is expected to use as much as 18 acre-feet annually.

- *Onsite Fitness Facilities*: The Proposed Project is similar to other modern technology campuses with the inclusion of an onsite gym facility. The gym facility being located onsite means that the incremental increase in water use is tied to shower use and laundering, if towel service is offered. Based on modern showerhead efficiency of 1.75 gpm, typical institutional shower length of 5 minutes, and estimated gym usage by employees of 10% per day, a typical gym water demand can be determined.[18] In total gym water use adds approximately 5 acre-feet annually.[19]

[16] US Energy Information Administration Commercial Buildings Energy Consumption Survey www.eia.gov/consumption/commercial/data
[17] Pacific Institute Urban Water Use Efficiency - https://pacinst.org/reports/urban_usage/appendix_e.pdf
[18] Data derived from multiple sources including: http://www.hcd.ca.gov/building-standards/calgreen/docs/HCDSHL605_2016.pdf https://pacinst.org/reports/urban_usage/appendix_d.pdf and internal estimates.
[19] Water demand associated with laundering is low due to the efficiencies of modern extractor type commercial washers with internal recycling. 1 lbs./towel and 1.5 gallon per lbs. of fabric results in approximately 0.05 AFY of demands. http://www.allianceforwaterefficiency.org/Health_Clubs_Introduction.aspx

2.2.2 Outdoor Landscape Area

The Proposed Project's landscaping will be irrigated with recycled water provided by the City and already available at the project location. Per a preliminary water budget calculation provided by the applicant, the Proposed Project anticipates 811,951 square-feet of landscape area. The following landscape elements are planned, accompanied by estimated percentages of the total landscape area based upon visual assessment of applicant submitted documents:[20]

- *High Water Use Turf Areas:* This landscape area is located in key landscape areas for the purpose of establishing specific visuals and to provide outdoor seating and recreation. This turf area totals approximately 10% of the total landscape area.

- *Rooftop Landscape Areas:* This landscape area is located on the roofs of the 3 main office buildings. The landscaping will include trellis with climbing landscape to put greenscape on vertical building surfaces. This area totals approximately 30% of the total landscape area.

- *Low to Medium Water Use Landscape Areas:* This landscape area is located south of surrounding the buildings as well as in the larger parking areas. This area totals approximately 30% of the total landscape area.

- *Low Water Use Landscape Areas:* This landscape is located around in the outlying parking areas, interspersed in the low-medium landscape area, and located in the drainage channel setbacks the bisect the Proposed Project. This area totals approximately 30% of the total landscape area.

Due to the use of recycled water, landscape irrigation limits under MWELO are essentially not applicable, allowing the entire area to be treated as "Special Landscape Areas" as defined by MWELO and the City's Municipal Code and using an equivalent ETo of 1.0 instead of a fraction.[21] According to the City's water budget calculator, the ETo is 45.30 inches per year.[22] Using the City's stated equation for the Maximum Applied Water Allowance (MAWA) for non-residential landscapes, the following is estimated as the landscape water demand:

MAWA = (ETo) (0.62) [(0.45 x LA) + (0.55 x SLA)]
MAWA = (45.3) (0.62) [(0.45 x 811,951) + (0.55 x 811,951)]
MAWA = 22,804,456 gallons per year
MAWA = ~ 70 acre-feet per year

[20] Landscape information was provided by the City and applicant, and includes information from review of the applicant's 9/19/2018 submission to the City and provided to Tully & Young via the City's sharepoint service on 2/15/19 from Ryan Kuchenig, and the applicant's landscape water budget calculations per the City's Municipal Code Chapter 19.37, and available here: https://sunnyvale.ca.gov/civicax/filebank/blobdload.aspx?BlobID=23597
[21] City Municipal Code 19.37.030
[22] The City's water budget calculator uses an ETo value referenced as "San Jose (Sunnyvale)" and listed as 45.30 inches per year. However, in the City's 2015 UWMP, CIMIS station 171 of Union City is used with a value of 44.8 inches per year. For this WSA, the higher value is assumed.

2.3 OTHER PROPOSED PROJECT WATER DEMANDS

This section describes the other incidental water demands which accompany a project such as the one described in this WSE

2.3.1 Construction Water Demands

Initiation of the Proposed Project will include site grading and infrastructure installation. These and other construction elements will require dust suppression and other incidental water uses. These are estimated to be nominal, and do not continue beyond the construction phases of the Project. For purposes of identifying incremental water demands, construction water is assumed to be 1 acre-feet per year. The Proposed Project is anticipated to be operating at full capacity and fully built within 5 years of breaking ground.

2.3.2 Non-Revenue Water Demands

The Proposed Project demand presented previously represents the demand for water at the project location. To fully represent the demand, distribution system losses must also be included. Often, distribution system losses represent water that is lost due to system leaks, fire protection, construction water, unauthorized connections, and inaccurate meters. Essentially, this is the water that is produced by the City that does not make its customers – either as a real loss or an apparent loss (e.g. such as may result when a customer meter underreports actual use). In most instances, the predominant source of distribution system losses is from leaks that inevitably exist throughout the many miles of pipes and fitting that bring water to the City's customers.

The City reported a typical loss factor of between 4 and 8 percent to be representative of non-revenue water based on its historical data in the Sunnyvale 2015 UWMP.[23] For the purposes of this WSA, a loss factor of 6% is used. This value represents the additional water the City will need to treat, convey and deliver to meet the Proposed Project's estimated demand.

As summarized in **Table 2-1**, the Proposed Project's estimated water demand is 141 acre-feet per year, prior to the inclusion of water to meet non-revenue needs. Using the 6% value, the non-revenue demand is estimated to be 8.9 acre-feet per year, rounded to 9 acre-feet for purposes of this WSA.[24] The resulting total project demand is 150 acre-feet annually.

[23] City of Sunnyvale 2015 Urban Water Management Plan, p. 4-2.

[24] The application of the 6% factor is to the total demand that must be provided by the City, which, after being subtracted, results in the 139 acre-feet of water available at the Proposed Project location. Therefore, to estimate the non-revenue value, the estimated demand at the site of 139 acre-feet is multiplied by 6.4%. The result is 8.9 acre-feet, which is added to the 139 acre-feet to obtain the total Proposed Project estimated demand of 148 acre-feet.

Table 2-1 Estimated Proposed Project Water Demand

Project Water Use Element	Demand (af/yr) at Buildout
Traditional Office Space	48
Onsite Food Service	18
Onsite Fitness Facilities	5
Landscaping (all)	70
Subtotal potable water demand	71
Subtotal recycled water demand	70
Total	**141**
Non-revenue potable water @ 6%	4.5
Non-revenue recycled water @ 6%	4.5
Total potable water demand	76
Total recycled water demand	74
Total Proposed Project Demand	**150**

2.4 Relationship to City of Sunnyvale Forecast Water Demand

The 2015 UWMP included projections of future demand for both residential and non-residential land uses through 2035. **Table 2-2** shows growth trends depicted in the 2015 UWMP by customer type.

Table 2-2 – City Demand Forecast
(source: 2015 UWMP Table 4-1, p. 4-1)

Customer Type	2010	2015	2020	2025	2030	2035
Single family residential	7,023	5,449	7,619	7,796	7,563	7,351
Multi-family residential	8,309	4,452	5,575	5,705	5,534	5,379
CII	4,261	3,806	6,722	7,952	8,986	10,268
Irrigation (potable)	970	1,374	2,288	2,341	2,271	2,208
Other (Firelines)	911	9	10	10	10	10
Total Potable	**21,474**	**15,090**	**22,214**	**23,804**	**24,364**	**25,216**

The projected demands include growth in CII (Commercial, Industrial, and Institutional) demands from 3,806 acre-feet in 2015 to 10,268 acre-feet in 2035 – an increase of over 6,400 acre-feet. The foundational document used in the CII analysis appears to be the 2010 Water Utility Master Plan (WUMP).[25] The WUMP predicted non-residential growth for a 2033 buildout condition, and specifically included a "development reserve" for the Moffett Park Specific Plan area that anticipated future demands beyond what the WUMP was otherwise projecting based upon available plans at that time. Specifically, the WUMP noted:

[25] [add basis for this assertion]

> "*The City provided a list of specific plans which are estimated to be complete within the 2013 time increment. These developments are illustrated in Figure 4-3. A large part of this development will occur within the Moffett Park and Downtown areas … It should be noted that the 5.44 M sqft "reserve" within Moffett Park is not expected to be developed until the ultimate (2033) time increment*." (WUMP, p. 88)

and;

> "*Table 4-13 shows that the non-residential area in Sunnyvale is currently 86% built out. After the completion of the specific plan development in the 2013 time increment projected non- residential build-out is approximately 88% of total non-residential build-out. With the exception of the "reserve" in Moffett Park, the remaining non-residential development is expected to be complete in 20 years. By this time non-residential build-out will be at 90%, which is consistent with the City's most recent projections. The 5.44 M sqft "reserve" in Moffett Park is not expected to be developed until the ultimate time increment, which corresponds to the remaining 10% of non-residential build-out.*" (WUMP, p. 108)

These excerpts help demonstrate that CII growth was explicitly expected to occur in the Moffett Park area through 2033. According to the WUMP, the "development reserve" was provided a water duty factor of 270 gallons per day per 1,000 square-feet (gdp/1,000sf). This translates to approximately 77 gpy/sf. As presented in Section 2, the Proposed Project water demand is estimated using a value of 15 gpy/sf for office space, plus water for other 'non-office' functions, including the food service, fitness, and landscaping. Combined, the estimated Proposed Project demand represents a water duty of about 26 gpy/sf.[26]

The expected increase in CII demands reflected in the 2015 UWMP, and the indication that the forecast growth originated with the WUMP indicates that planned growth in the Moffett Park area is specifically recognized as part of the City's CII growth.

Given the Proposed Project's location within the Moffett Park area, the Proposed Project's demand is therefore accommodated as part of the expected CII growth contemplated by the City. Therefore, the 2015 UWMP's representation of supply and demand conditions can be used to evaluate the sufficiency of water supplies to meet the Proposed Project's demand. The following sections present the City's water supplies and characterization of sufficiency to meet its overall projected water demands.

[26] 1,041,890 sf of floor area plus 811,951 sf of landscaping, with a combined demand of 150 acre-feet/year.

SECTION 3 – WATER SUPPLY CHARACTERIZATION

The Proposed Project's forecast water demands presented in the prior section are expected to be fully met by water supplies provided by the City. The City has potable water provided under its existing wholesale water contracts with both the San Francisco Public Utility Agency (SFPUC) and Santa Clara Valley Water District (SCVWD), along with groundwater provided through City-owned production wells. The City also has recycled water provided by the Sunnyvale Water Pollution Control Plant that will be used to meet the Proposed Project's landscape irrigation demands.

The long-term reliability and characteristics of all of these water supplies have been detailed by the City and documented in its 2015 UWMP, and are summarized in this section. Furthermore, upon the preparation of this WSA in the spring of 2019, the supply characterizations presented in the 2015 UWMP (adopted by the City in 2016) remain unchanged.[27]

3.1 CURRENT AND PROJECTED POTABLE WATER SUPPLIES

The City's forecast availability of potable supplies is summarized in Table 3-1. Historic use of these supplies has been split about 55% from SFPUC, 40% from SCVWD and 4% from wells, with the remainder comprised of recycled water.

Table 3-1 – City Potable Water Supplies
(source: 2015 UWMP Table 6-2, p. 6-2)

Water Supply	Total Right or Safe Yield	2020	2025	2030	2035	2040
SFPUC Purchased Water	14,100	11,124	12,266	12,266	12,266	12,266
SCVWD Purchased Water	10,200	10,642	11,202	11,762	12,614	12,726
Local Groundwater Wells	8,000	448	336	336	336	336
Recycled Water	-	1,456	1,567	1,680	1,680	1,680
Total		**23,670**	**25,373**	**26,045**	**26,898**	**27,009**

Notes:
1. The City has the ability to purchase additional available water from SCVWD during non-dry years when water is available.

Each of these water supplies are subject to a unique set of conditions based upon the terms of the underlying water rights, the regulatory environment, the contractual limitations, and wholesaler's ability to access and deliver the supplies. Within this framework, the City manages its water assets to meet all of its customers' demands.

[27] Personal communications: telephone call on March 5, 2019 with Mr. Mansour Nasser, Water & Sewer Manager, City of Sunnyvale.

3.1.1 SFPUC Supplies

SFPUC's primary supply is its Hetch Hetchy system on the Tuolumne River, but it also holds several water rights in local watersheds. About 85% of SFPUC's supply is from the Hetch Hetchy system, with all water supplies jointly considered the Regional Water Supplies (RWS). SFPUC has other local supplies including recycled water, raw water, and desalinated water, but these supplies are only made available to its retail customers. Only the RWS supplies are used for wholesale water service to customers such as the City. The portion of total RWS supplies available to the wholesale customers is presented in **Table 3-3** based on projected availability under average water supply conditions. Further discussion regarding availability under varying hydrologic conditions is provided later.

Table 3-2 - SFPUC Wholesale Supply Projections[28]

Wholesale Purchase Request	Individual Supply Guarantee	Individual Supply Allocation	2020	2025	2030	2035	2040
City of Sunnyvale	14,091	11,862	11,123	12,266	12,266	12,266	12,266

3.1.2 SCVWD Contract

In 1976, the City and SCVWD entered into a 75-year contract. SCVWD manages local groundwater and surface water supplies as well as maintaining SFPUC, CVP, and SWP contracts. Groundwater banking activity, both locally and with Semitropic, transfers, and exchanges provide SCVWD with additional operational flexibility. SCVWD is the local groundwater management authority and supplies imported water as a wholesaler for the purposes of maintaining groundwater conditions. The SWP and CVP contracts make up approximately 40% of SCVWD's supply portfolio. By importing and banking water, SCVWD can prevent local groundwater pumping and facilitate recharge activity so as to maintain groundwater as a dry year supply for the region.

SCVWD's diverse range of supplies and management activities mean that despite variability in supply capacity due to hydrologic impacts on the water projects, the region is considered to have reliable long term supplies. **Table 3-3** presents the SCVWD supply considered to be available to the City of Sunnyvale.

Table 3-3 – SCVWD water supply projections

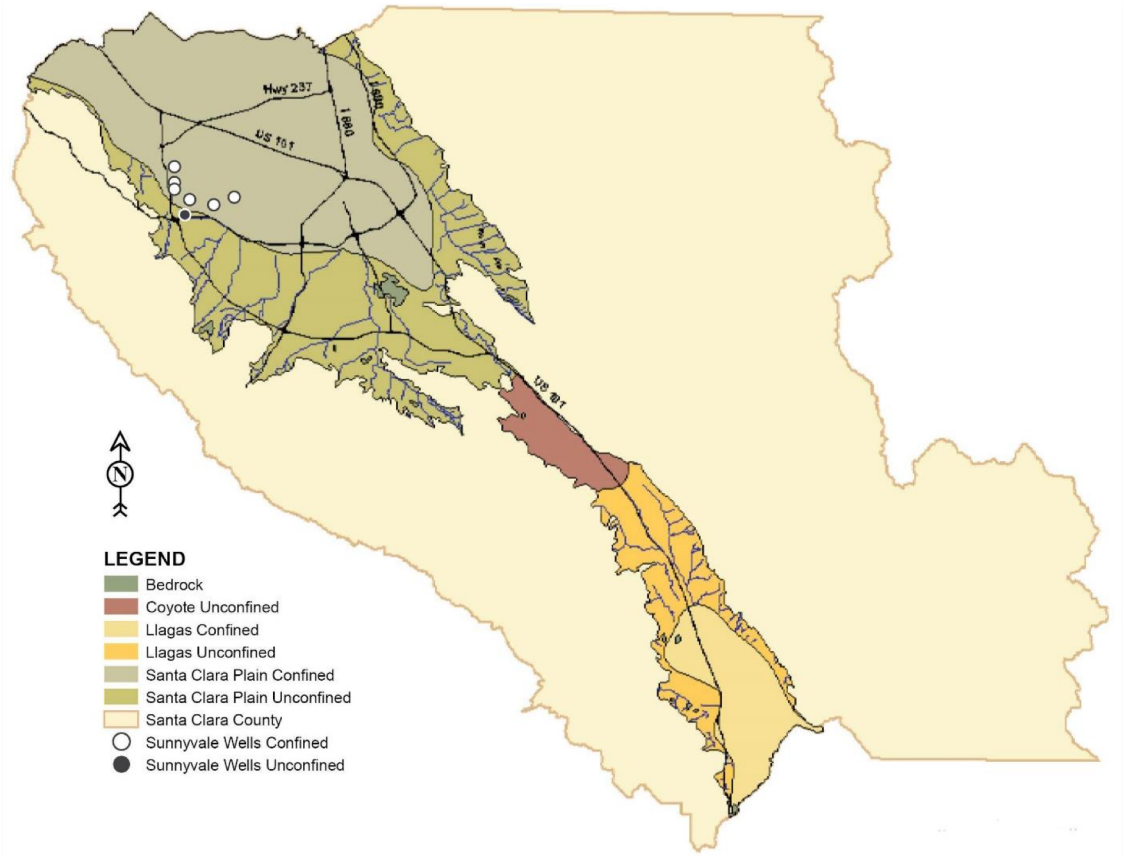
Wholesale Supply	2020	2025	2030	2035
City of Sunnyvale	10,642	11,202	11,762	12,614

[28] Values in Acre-feet, derived from SFPUC UWMP, Table 4-2, p. 4-12

3.1.3 Groundwater Supplies and Management

As noted in previously, regional groundwater management is generally a function of SCVWD, with the City operating its own wells within the regional context. This City maintains six operating wells and an additional emergency well which is left on stand-by. These wells are used for supplemental supplies to augment the SFPUC and SCVWD imported water. This City overlies the Santa Clara Subbasin, DWR Subbasin 2-9.02. The basin has long been a source for local water and as a result was at one time over pumped as use exceeded natural recharge. As imported water began to enter the area, groundwater pumping was reduced and the basin has since recovered. SCVWD now leads a number of recharge efforts and actively manages regional groundwater levels. **Figure 3-1** shows the groundwater basin from which the City pumps.

Figure 3-1 – Area Groundwater Basins[29]



The location of several large cities, history of subsidence and over pumping, and risk of salt water intrusion resulted in DWR classifying the basin as high priority. SCVWD's activities maintain groundwater levels sufficiently for the basin to be considered secure and managed within the safe yield. **Figure 3-2** shows the historic groundwater levels as the recovered through

[29] 2015 UWMP Figure 6-2

an increase in imported supplies. **Figure 3-3** shows the land subsidence that resulted due to over pumping of the basin before water imports began.

Figure 3-2 – Area Groundwater Basins[30]

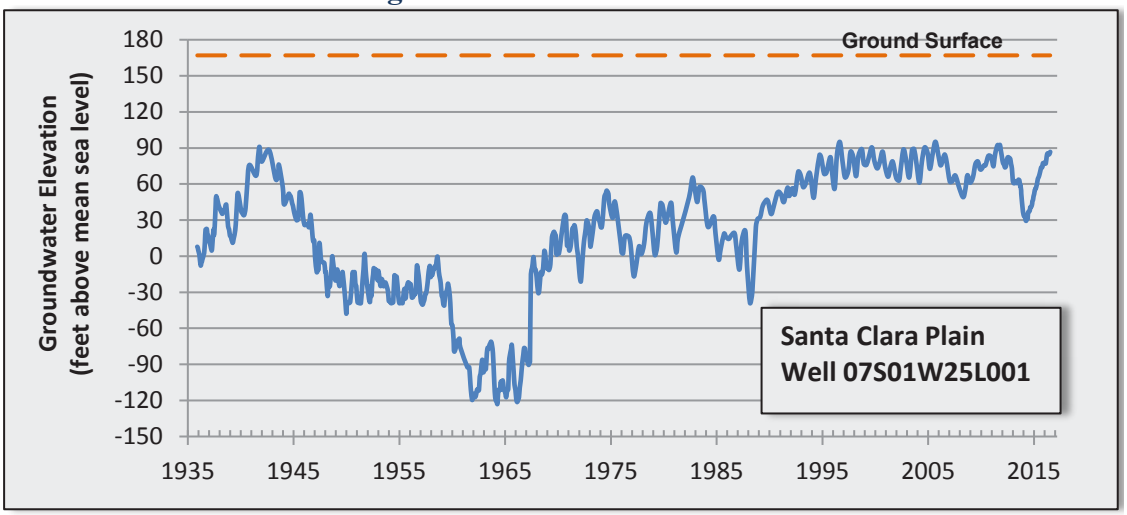
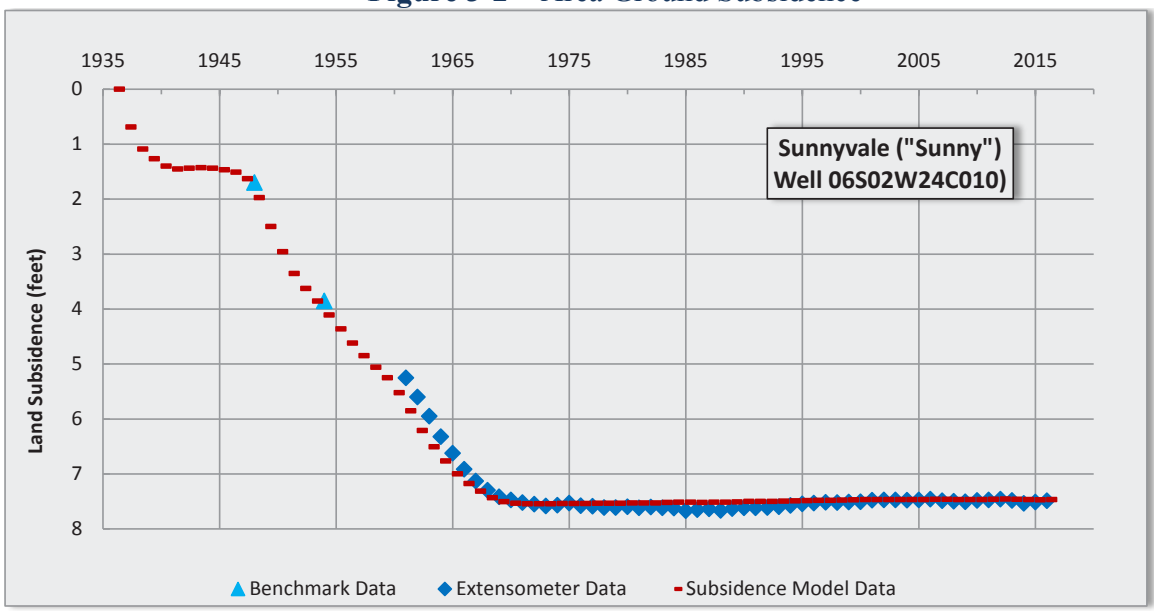


Figure 3-2 – Area Ground Subsidence[31]



The City's groundwater use has been typically low, increasing in drought years as part of the City's conjunctive use plans for its varied sources. Recent use has been in the range of a few hundred acre-feet per year with dry years seeing as high as a few thousand acre-feet. The City of Sunnyvale does not anticipate changing from this method of operation as it is an effective use of conjunctive water management and allows for the City to minimize the use of expensive water imports in dry years. **Table 3-4** shows the projected groundwater pumping in normal and driest

[30] 2016 SCVWD Groundwater Report figure 14
[31] 2016 SCVWD Groundwater Report figure 18

years as shown in the City's 2015 UWMP. The City's existing groundwater infrastructure can supply these volumes already, with no required additions.

Table 3-4 – Projected Groundwater Use (values in acre-feet)[32]

Groundwater Supply	2020	2025	2030	2035
Normal Year	448	336	336	336
Multi-Dry	2,838	4,016	4,693	5,249

3.1.4 Recycled Water

A significant aspect of the Proposed Project is the efficient landscape design and the use of recycled water for irrigation. The City of Sunnyvale has an established recycled water program and the purple pipe supply network already reaches the Proposed Project's location. **Table 3-6** shows the projected recycled water production that will be available to meet the Proposed Project's landscape demands, which are estimated at 70 acre-feet annually. Recycled water is produced at the Sunnyvale Water Pollution Control Plant, located near the Proposed Project.

Table 3-6 – Projected Recycled Water Supply[33]

Recyeled Supply	2020	2025	2030	2035
All Year Types	1,456	1,568	1,680	1,680

3.2 WATER SUPPLY SUMMARY

Tables 3-7 and **3-8** summarize the City of Sunnyvale's reasonably available water supplies in normal and dry conditions as presented by the 2015 UWMP. These supplies may be manipulated as the water assets are needed to meet demands. In other words, as shown in **Section 4**, the City only utilizes water supplies from its water asset portfolio that it needs to meet its then-existing demands. Sunnyvale defines a dry year as the conditions of 1977 and the multi dry years as 2013-2015.[34]

[32] Derived from 2015 City of Sunnyvale UWMP Tables 7-4 to 7-9
[33] Derived from 2015 City of Sunnyvale UWMP Table 7-4
[34] 2015 UWMP Table 7-3

Table 3-4 – Normal Year Water Supply Availability[35]

Source	2020	2025	2030	2035
SFPUC	11,124	12,266	12,266	12,266
SCVWD	10,642	11,202	11,762	12,614
Groundwater	448	336	336	336
Recycled Water	1,456	1,568	1,680	1,680
Supply Totals	**23,670**	**25,372**	**26,044**	**26,896**
Demand Totals	**23,670**	**25,372**	**26,044**	**26,896**
Difference	0	0	0	0
Difference as % Supply	0%	0%	0%	0%
Difference as % Demand	0%	0%	0%	0%

Table 3-5 – Dry Year Water Supply Availability[36]

Source	Year 1 2035	Year 2 2036	Year 3 2037
SFPUC	12,266	9,812	9,812
SCVWD	12,614	10,200	10,200
Groundwater	336	5,227	5,249
Recycled Water	1,680	1,680	1,680
Supply Totals	**26,896**	**26,919**	**26,941**
Demand Totals	**26,896**	**26,919**	**26,941**
Difference	0	0	0
Difference as % Supply	0%	0%	0%
Difference as % Demand	0%	0%	0%

3.3 CITY OF SUNNYVALE WSA STATUTE COMPLIANCE

The purpose of this section is to outline the necessary information needed to be presented to serve water to the Proposed Project and to describe the other important issues required for this WSA under the Water Code.

3.3.1 Area Annexation

The Proposed Project is a redevelopment project located within the existing City water service area. No annexation is required for the City to serve the Proposed Project.

[35] 2015 UWMP Table 7-4
[36] 2015 UWMP Table 7-9

3.3.2 Financing Requirements

California Water Code requires a proposed project to identify the funding sources necessary to build the water system that will be used by the Proposed Project. Water Code Section 10910(d)(2)(b) states that: "*Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system*." The water supply infrastructure to be used by the City to serve the Proposed Project has already been constructed.

3.3.3 Infrastructure Capacity

The Proposed Project is not anticipated to require any additional infrastructure capacity. Any constraints would be local in nature and negotiated as part of the development agreement between the City and the Proposed Project

3.3.4 SB 1263 Requirements and Water Permit Modifications

In 2016, the California Legislature adopted Senate Bill 1263, which imposed stringent requirements for construction of new public water systems, in order to ensure that those systems meet certain technical, managerial and financial criteria for the protection of public health and safety. The Proposed Project will to be exempt from the SB 1263 requirements as the Proposed Project will not require the establishment of a new or separately permitted public water system.

SECTION 4 – SUFFICIENCY ANALYSIS

The analysis detailed in this section provides a basis for determining whether sufficient water supplies exist to meet the estimated water demand of the Proposed Project.[37] The WSA must provide a reasoned analysis of the likely availability of the identified supplies to serve the Proposed Project, while considering the demands of existing and other future planned-for demands on those supplies.[38] As detailed in **Section 2**, this WSA estimates the Proposed Project's water demand to be approximately 150 acre-feet per year at build-out during normal conditions (including non-revenue water demands), essentially split between potable and recycled water demands.

4.1 SUFFICIENCY ANALYSIS AND CONCLUSION

As presented in **Table 3-4**, the Proposed Project's demands are incorporated within the City's anticipated future customer demands of approximately 26,896 acre-feet, which is satisfied by the City's water supply portfolio (see **Table 3-4** and **Table 3-5**). Therefore, this WSA's sufficiency analysis relies upon the City's 2015 UWMP representation of water supply reliability (as summarized in **Section 3**), and concludes that sufficient water is available to meet the needs of the Proposed Project. The conclusion that sufficient water is available rests on the following:

- The Proposed Project is constructed in similar manner to the representations provided in Section 1, resulting in a water demand similar to the estimate.
- The City's representation of water supply reliability from SCVWD and SFPUC remains as characterized in the 2015 UWMP.
- The City maintains its Water Shortage Contingency Plan (WSCP), an element detailed in the 2015 UWMP, to assure City water needs are met according to the WSCP during times of unforeseen shortage. Once complete, the Proposed Project will be subject to the requirements of the WSCP as a water customer of the City.

[37] CWC § 10910 (c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."
[38] *Vineyard Area Citizens for Responsible Growth, Inc*. v. *City of Rancho Cordova* (2007) 40 Cal.4th 412, 430-32.

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