FINAL INITIAL STUDY ♦ MITIGATED NEGATIVE DECLARATION

575 Los Trancos Road Residential Project

PREPARED BY	City of Palo Alto 250 Hamilton Avenue Palo Alto, California 94301 Contact: Emily Foley, AICP, Associate Planner
PREPARED WITH THE ASSISTANCE OF	Rincon Consultants, Inc. 449 15th Street, Suite 303 Oakland, California 94612
REPORT DATE	January 2023

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

INITIAL STUDY

1. PROJECT TITLE

575 Los Trancos Road Residential Project

2. LEAD AGENCY NAME AND ADDRESS

City of Palo Alto
250 Hamilton Avenue
Palo Alto, California 94301

3. CONTACT PERSON AND PHONE NUMBER

Emily Foley, AICP, Associate Planner
(650) 617-3125

4. PROJECT SPONSOR'S NAME AND ADDRESS

Innovative Homes LLC
c/o John Suppes
412 Olive Avenue
Palo Alto, California 94306

5. PROJECT LOCATION

The project site is located at 575 Los Trancos Road in the City of Palo Alto and consists of a single 5.38-acre (234,352 square-foot) parcel. The assessor's parcel number is 182-46-012. The project site is located on the western side of Los Trancos Road approximately 0.8 miles south of its intersection with Alpine Road. Regional access to the site is available via Interstate 280 (I-280) and State Route (SR) 84. Figure 1 shows the site location in a regional context. Figure 2 shows the location of the site relative to the surrounding area.

6. GENERAL PLAN DESIGNATION

The site is designated as Open Space/Controlled Development. The City's Comprehensive Plan Land Use and Community Design Element (2017) defines this category as "land having all the characteristics of open space but where some development may be allowed on private properties. Open space amenities must be retained in these areas. Residential densities range from 0.1 to 1 dwelling unit per acre but may rise to a maximum of 2 units per acre where second units are allowed, and population densities range from 1 to 4 persons per acre."

Figure 1 Regional Location

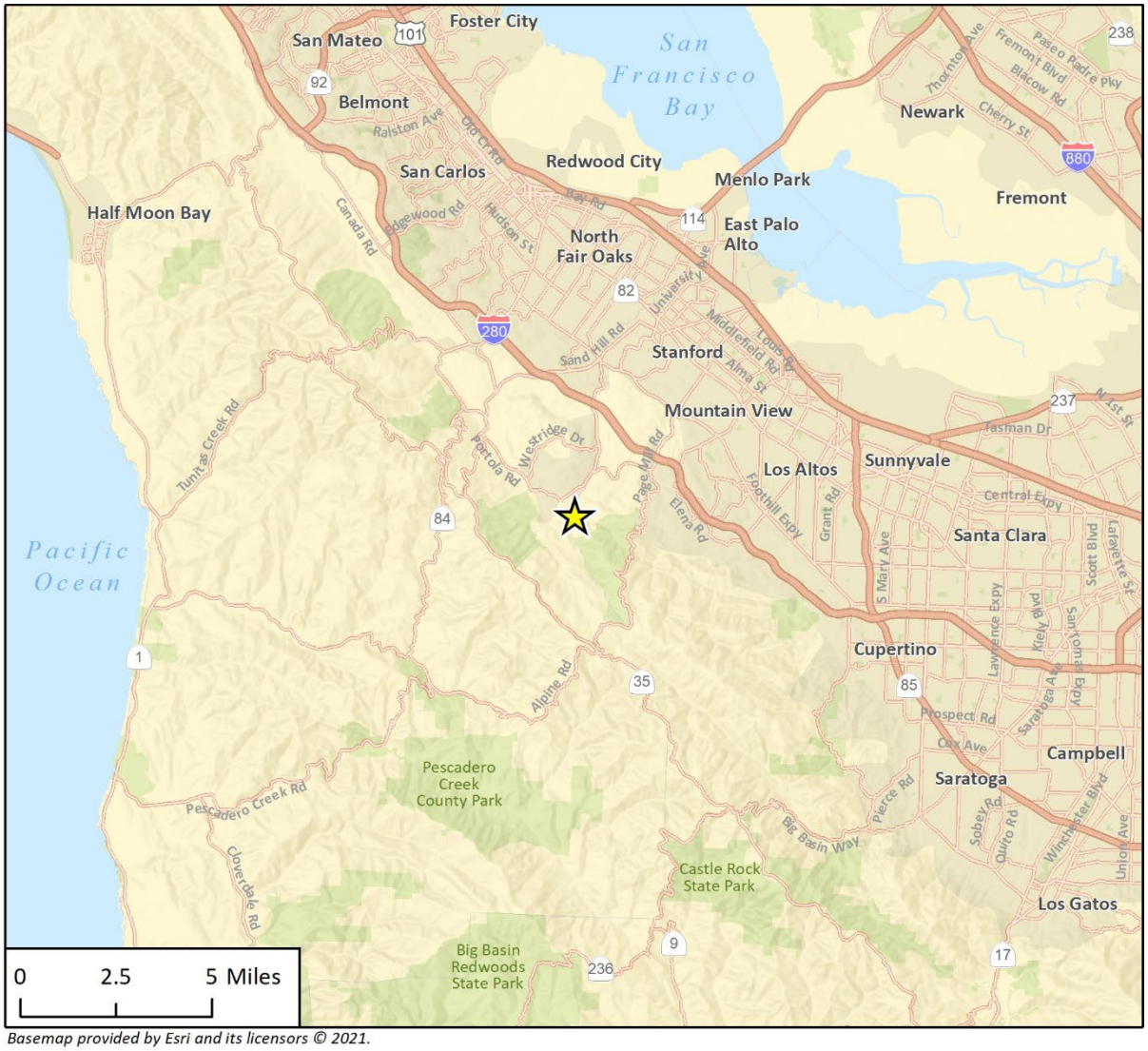
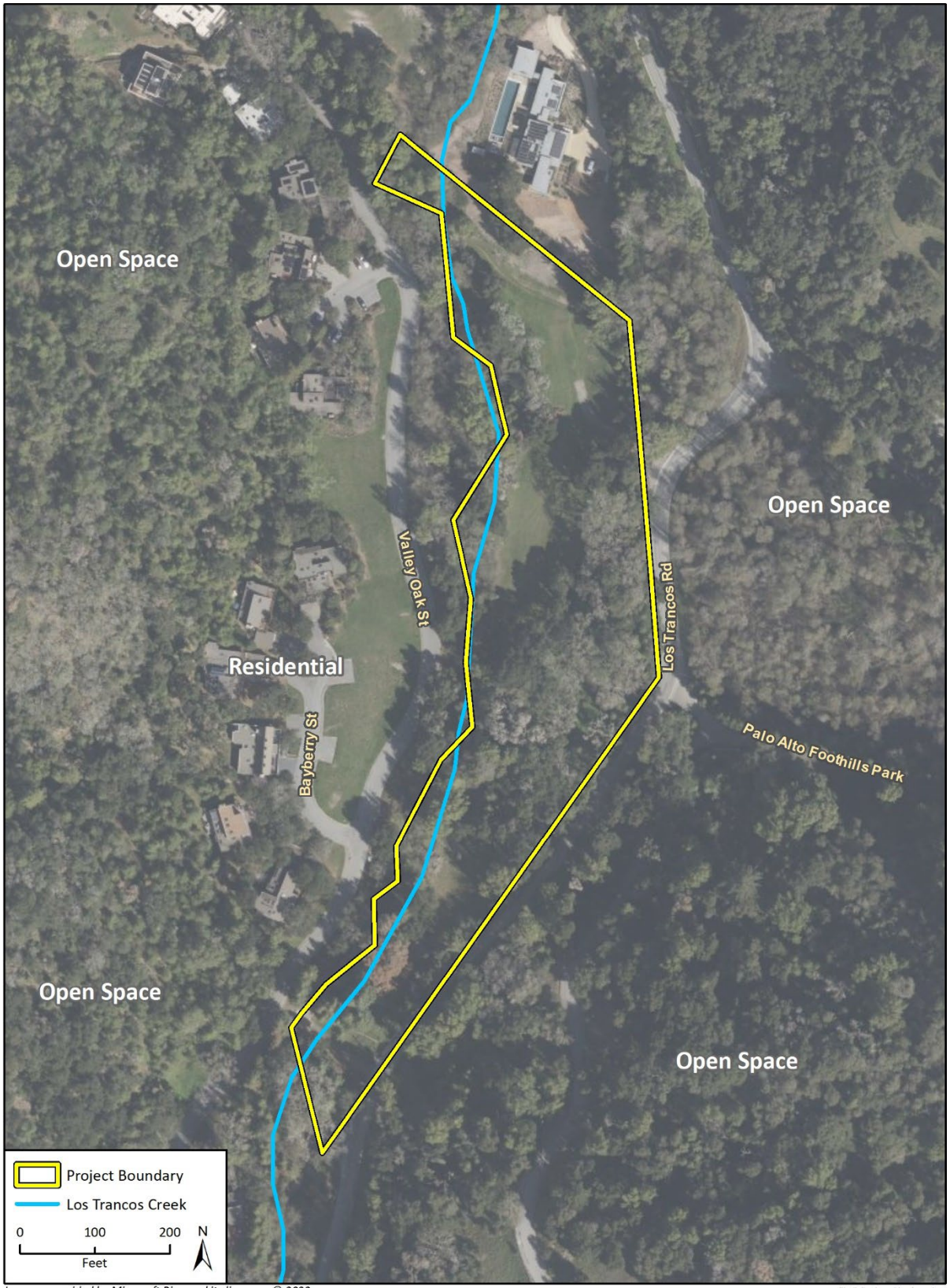


Figure 2 Project Location



7. ZONING

The site is zoned Open Space (OS). Palo Alto Municipal Code (PAMC) Section 18.28.010(b) defines the OS district as "intended to protect the public health, safety and welfare, protect and preserve open space land as a limited and valuable resource, and to permit the reasonable use of open space land, while at the same time preserving and protecting its inherent open space characteristics to assure its continued availability for the following: as agricultural land, scenic land, recreation land, conservation or natural resource land; for the containment of urban sprawl and the structuring of urban development; and for the retention of land in its natural or near-natural state, and to protect life and property in the community from the hazards of fire, flood, and seismic activity; and coordinate with and carry out federal, state, regional, county, and city open space plans."

8. LOCATION AND EXISTING SETTING

The project site is located in the southern extension of the City of Palo Alto where the predominant land use designations and land uses are Open Space/Controlled Development and Public Conservation Land. The site is surrounded by undeveloped areas and low-density residential. To the north of the site is a residence, Los Trancos Creek is located along the western boundary of the site, and undeveloped lands are located to the south and east of the site and further east beyond Los Trancos Road. Los Trancos Road abuts the project site to the east. The project site is an undeveloped and vacant lot, dominated by oak woodland, riparian woodland, and non-native grasses. Figure 3 and Figure 4 show photographs of the project site.

PROJECT DESCRIPTION

The proposed project would involve the construction of a 7,245 square-foot single-family residence and 734 square-foot attached garage, an 895 square-foot accessory dwelling unit (ADU), and associated amenities including a 4.5-foot-deep swimming pool in the flat, western portion of the site. The main residence would have a maximum height of 25 feet and would consist of two stories, a 6,030 square-foot first floor and 1,215 square foot second floor. The proposed lot coverage would be 9,374 square feet of the total lot area of 234,352 square feet (5.38 acres) which would result in a total lot coverage of four percent of the total site.

The project would include 30-foot setbacks on the front, sides, and rear of the property. Design materials would include natural dark-stained vertical grain wood/wood-clad sliding and slats, smooth-finish cement plaster in an earth-tone gray color, a smooth dark painted finish along trim, and large windows. Exterior lighting would be limited by shielding on exterior safety lighting and shades on windows facing the creek. Figure 5 shows the proposed site plan.

Figure 3 Project Site Photographs 1 and 2

Photograph 1. View from near the center of the project site looking north

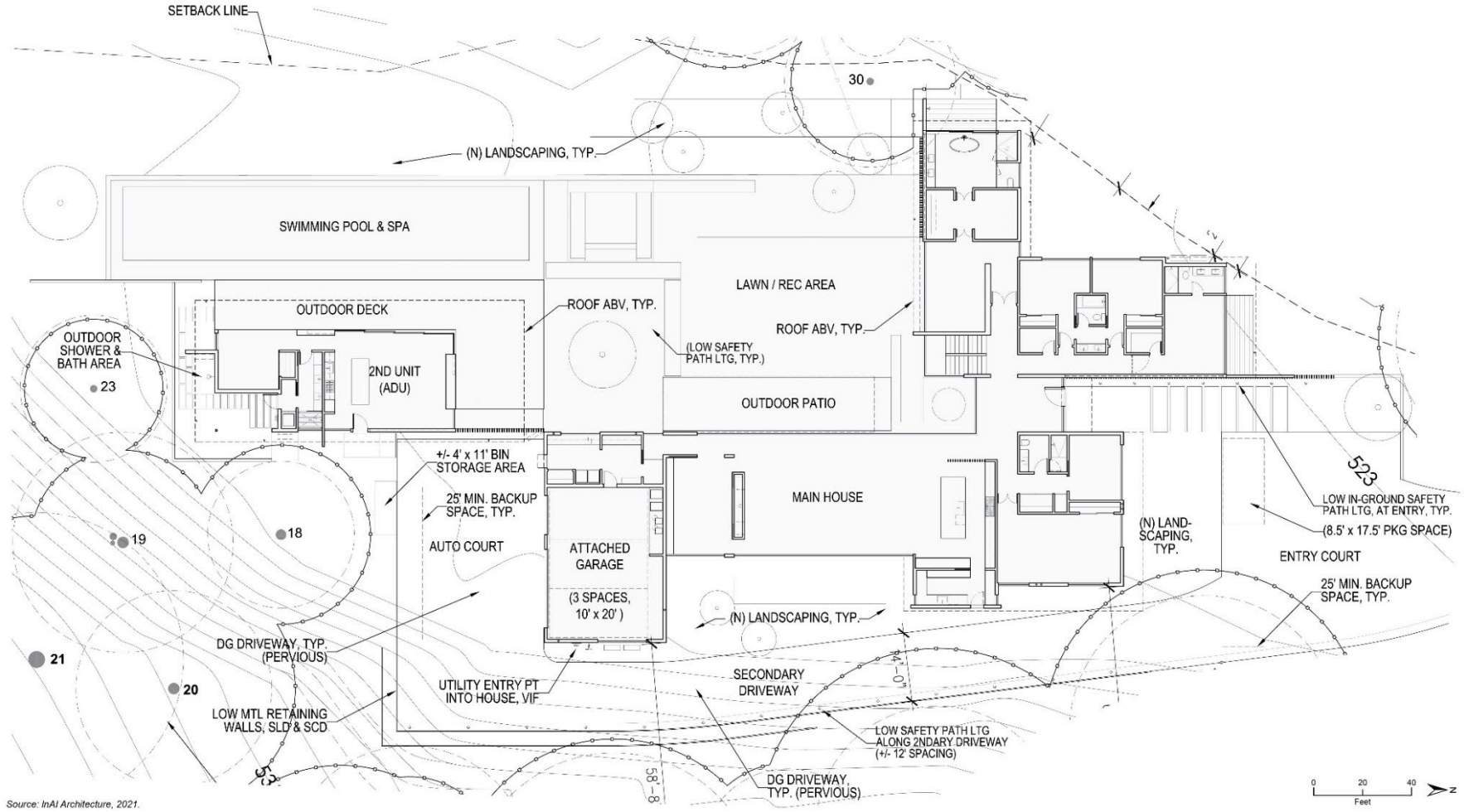
Photograph 2. View from near the center of the project site looking south

Figure 4 Project Site Photographs 3 and 4

Photograph 3. View of the project site from southeast Los Trancos Road

Photograph 4. View of the project site from eastern Los Trancos Road

Figure 5 Proposed Site Plan



Source: InAI Architecture, 2021.

Access to the project site would be via a new curved driveway that would extend from Los Trancos Road toward the northern portion of the site and curve back toward the residence and attached three-car garage. The driveway would have a 14-foot width to accommodate fire trucks and at its termination at the residence would allow for fire truck turnaround. The project would include a 20 feet creek setback pursuant to Palo Alto's Stream Corridor Ordinance (Section 18.40.140 of the PAMC).

LANDSCAPING AND OPEN SPACE

Landscaping on the project site would be limited to the immediate perimeter of the proposed development area. Along the perimeter of the residence, landscaping would consist of California native grasses and trees including but not limited to Bigleaf maple (*Acer macrophyllum*), Coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), Chokecherry (*Prunus virginiana*), Interior live oak(*Quercus wislizeni*), Blue elderberry (*Sambucus Mexicana*), Arroyo Willow (*Salix lasiolepis*), Concha California lilac (*Ceanothus Concha*), California Coffeeberry *(Frangula californica*), Toyon (*Heteromeles arbutifolia*), White pitcher sage *(Lepechinia calycina*), California honeysuckle (*Lonicera hispidula*), Pacific wax myrtle (*Myrica californica*), Golden currant (*Ribes aureum vas. Gracillimum*), California Wild Rose (*Rosa Californica*), Common Yarrow (*Achillea millefolium*), Mugwort (*Artenusua dougliasiana*), Crevice alumroot (*Heuchera micrantha*), Bee's bliss purple sage (*Salvia leucophylla 'Bee's Bliss'*), Yerba Buena (*Clinopodium douglassii*), Woodland strawberry (*Fragaria vesca*). Landscaping would be used primarily for screening and creek side planting.

CONSTRUCTION

Construction of the project would include site preparation, grading, building construction, paving, and architectural coating phases. Construction would occur over an estimated 14 months. The project would require approximately 280 cubic yards of excavation (80 cubic yards for the house and 200 cubic yards for the pool), which would be dispersed evenly throughout the site and would not be exported. Construction activities would occur Monday through Friday between the hours of 8:00 a.m. and 6:00 p.m. and Saturday between the hours of 9:00 a.m. and 6:00 p.m.

PALO ALTO GREEN BUILDING CHECKLIST

In addition to California Building Code (CBC) requirements, the City of Palo Alto has adopted more stringent green building regulations. The Palo Alto Green Building Ordinance (Ord. 5393, 2020) requires applicants to incorporate sustainable design, construction, and operational requirements into most single-family residential, multi-family residential, and non-residential projects. For residential development, the City has adopted California Green Building Standards Code (CALGreen) Tier 1 for additions and renovations over 1,000 square feet and CALGreen for Tier 2 for new construction pursuant to Palo Alto Municipal Code (PAMC) Section 16.14. To achieve Tier 2 status, a project must comply with the requirements identified in CALGreen Appendix A4, Division A4.601.5 and be 10 percent more energy efficient than the base CALGreen code

requirements. In accordance with the City's Green Building Ordinance, the proposed project would satisfy requirements for CALGreen Tier 2. The project would be all electric and would utilize a 10-kilowatt renewable energy system. Additionally, heat pump technology would be used for water heating, including for the proposed pool, and space heating.

9. OTHER PUBLIC AGENCIES WHOSE APPROVAL IS REQUIRED

The City of Palo Alto is the lead agency with jurisdiction over adoption of the proposed project and certification of the CEQA document. No other public agency's discretionary approval is required.

10. HAVE CALIFORNIA NATIVE AMERICAN TRIBES TRADITIONALLY AND CULTURALLY AFFILIATED WITH THE PROJECT AREA REQUESTED CONSULTATION PURSUANT TO PUBLIC RESOURCES CODE SECTION 21080.3.1? IF SO, IS THERE A PLAN FOR CONSULTATION THAT INCLUDES, FOR EXAMPLE, THE DETERMINATION OF SIGNIFICANCE OF IMPACTS TO TRIBAL CULTURAL RESOURCES, PROCEDURES REGARDING CONFIDENTIALITY, ETC?

No California Native American Tribes have requested consultation pursuant to Public Resources Code Section 21080.3.1.

This page intentionally left blank.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

This project would potentially affect the environmental factors checked below, involving at least one impact that is "Potentially Significant" or "Less than Significant with Mitigation Incorporated" as indicated by the checklist on the following pages.

☐	Aesthetics	☐	Agriculture and Forestry Resources	■	Air Quality
■	Biological Resources	■	Cultural Resources	☐	Energy
■	Geology/Soils	☐	Greenhouse Gas Emissions	☐	Hazards & Hazardous Materials
■	Hydrology/Water Quality	☐	Land Use/Planning	☐	Mineral Resources
☐	Noise	☐	Population/Housing	☐	Public Services
☐	Recreation	☐	Transportation	☐	Tribal Cultural Resources
☐	Utilities/Service Systems	☐	Wildfire	■	Mandatory Findings of Significance

DETERMINATION

Based on this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

■ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potential significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Emily Foley
Signature

1/10/2023
Date

Emily Foley
Printed Name

Planner
Title

This page left intentionally blank.

ENVIRONMENTAL CHECKLIST

1 Aesthetics

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Except as provided in Public Resources Code Section 21099, would the project:				
a. *Have a substantial adverse effect on a scenic vista?*	☐	☐	■	☐
b. *Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?*	☐	☐	☐	■
c. *Substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from a publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?*	☐	☐	■	☐
d. *Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?*	☐	☐	■	☐

SETTING

The project site is located within an area that consists primarily of open space, but limited development is allowed on private properties. North of the site is a single-family residence, to the west are single-family residences, to the east is open space, and to the northeast is a single-family residence. Residences are surrounded by dense tree cover and are set back from roadways. From the project site, there are views of nearby hillsides.

Skyline Boulevard, identified in the City's Comprehensive Plan as a scenic route, is located approximately 2.5 miles west of the project site.

IMPACT ANALYSIS

a. Would the project have a substantial adverse effect on a scenic vista?

Views from and through the project site from public viewpoints such as the surrounding streets of Los Trancos Road and Valley Oak and from the Sweet Springs Trail are of trees,

open space, and glimpses of surrounding single-family development through vegetation. There are no vistas classified as significant or scenic in the vicinity of the project site (City of Palo Alto 2017a). Views from public viewpoints through the site would not substantially change, as trees and topography would generally screen the proposed buildings from view. The proposed project would not have a substantial adverse effect on a scenic vista. This impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

State Scenic Highways designated by the California Department of Transportation (Caltrans) near the project site include State Route (SR) 35 to the west and SR 280 to the east (Caltrans 2019). The project site is not visible from either SR 35 or SR 280. The project site is not located near listed scenic routes in the City's comprehensive plan including Sand Hill Road, University Avenue between Middlefield Road and San Francisquito Creek, Embarcadero Road, Page Mill Road, Oregon Expressway, Interstate 280, Arastradero Road (west of Foothill Expressway), Junipero Serra Boulevard/Foothill Expressway and Skyline Boulevard (City of Palo Alto 2017a). Therefore, the proposed project would have no impact on scenic resources within a state scenic highway or within a scenic corridor identified in the comprehensive plan.

NO IMPACT

c. Would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from a publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

Although the City of Palo Alto as a whole is an urbanized area, for the purposes of this analysis, the site is considered to be in a non-urbanized area due to its semi-rural character and open-space surroundings. Construction activities would temporarily alter the visual quality of the site. Construction of the project would require hauling of building materials and construction of below-grade foundations, the building itself, and landscaping. Construction activities would include the storage of equipment and materials onsite for several months. Due to the temporary nature of construction, these activities would not permanently degrade or modify the existing aesthetic image of the neighborhood, nor generate substantial long-term contrast with the visual character of the surrounding area. Therefore, visual quality impacts associated with construction would be less than significant.

The project site is undeveloped, and the introduction of a single-family residence would change the visual character of the project site from existing conditions. However, the proposed project would introduce a structure that would be generally consistent with the height and massing of the other nearby single-family residences. Consistent with the City of Palo Alto Comprehensive Plan controlled development designation, the project would result in one dwelling unit and an attached accessory dwelling unit. Proposed external materials for the new buildings would adequately reflect and be compatible with the natural

environment surrounding the project site. The project would also be required to comply with the single-family individual review guidelines for which a checklist is provided (City of Palo Alto 2005; 2022a). The purpose of the checklist is to ensure a project's compliance with the City of Palo Alto's Single-Family Individual Review Guidelines. Although grading would be required to prepare the site, the new development would generally be on the flatter portions of the site and no major grading or recontouring that would substantially alter the topography is proposed.

The project would include the removal of five trees for which there would be three replacement trees introduced to the site, consistent with the City of Palo Alto's Tree Technical Manual pursuant to Palo Alto Municipal Code (PAMC) Section 8.10.30. The majority of trees on the project site would remain and would be required to be preserved pursuant to PAMC Chapter 8.10 which provides standards for removal, maintenance, and planting of trees to, ultimately, preserve trees on the site. Because the majority of existing trees would remain on the project site, the proposed residence would be screened from travelers on nearby roadways and views through the project site of the new residence would be brief.

The proposed project would not significantly degrade the existing visual character of quality of the site and its surroundings. The proposed project's height, massing, and design would be consistent with nearby single-family development. Therefore, impacts related to visual character and quality would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?

Implementation of the proposed project would introduce new sources of light and glare to a site where there are currently no existing sources of light and glare. Potential new sources of lighting from the proposed project would include light visible through windows, car headlights, outdoor lighting, and exterior security lighting. The surrounding area consists of generally low levels of existing lighting. Primary sources of light adjacent to the project site are lighting associated with existing residences nearby. Lighting on the project site would be generally similar to existing lighting at residences nearby. Compliance with Single-Family individual Review Guidelines and PAMC Section 18.28.070(n) require that exterior lighting should be low-intensity and shielded from view and require utilization of treatments such as translucent glass, shading systems, and interior light placement. Adherence to these requirements would reduce night glare potential impacts from lighting. Impacts related to lighting would be less than significant.

Potential sources of glare from the proposed project would consist of windows, parked cars, and the pool. However, these sources of glare would be similar to nearby residences and would not result in a substantial new source of glare. The proposed residence would also be screened from the roadway and nearby residences by existing tree cover. Compliance with PAMC Section 18.28.070(n) would reduce potential impacts from glare to the night sky and off-site. Therefore, the proposed project would not create a substantial source of glare that

would adversely affect day or nighttime views. Impacts related to glare would be less than significant.

LESS THAN SIGNIFICANT IMPACT

2 Agriculture and Forestry Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. Convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	■
b. Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	■
c. Conflict with existing zoning for or cause rezoning of forest land (as defined in Public Resources Code Section 12220(g)); timberland (as defined by Public Resources Code Section 4526); or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	☐	☐	☐	■
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	■
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	■

IMPACT ANALYSIS

a. Would the project convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

c. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?

d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

e. Would the project involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?

The project is located on Other Land, pursuant to the Department of Conservation's (DOC) Important Farmland Finder (DOC 2014). The project site is not identified as prime farmland, farmland of statewide importance, unique farmland, farmland of local importance, or grazing land. The project site is not enrolled in a Williamson Act contract, nor does it support forest land or resources; the site does not meet the definition of forest land, timberland, or timberland zoned Timberland Production in Public Resources Code (PRC) 12220(g), 4526, and 51104(g). The project site is not located on or adjacent to agricultural land or forest land and the proposed project would not involve development that could result in the conversion of farmland to non-agricultural uses. Therefore, the project would have no impact with respect to conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) to non-agricultural use; conflict with existing agricultural zoning or Williamson Act contracts; result in the loss of forest land or conversion of forest land to non-forest use; or other conversion of farmland to non-agricultural use.

NO IMPACT

3 Air Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. *Conflict with or obstruct implementation of the applicable air quality plan?*	☐	☐	■	☐
b. *Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?*	☐	■	☐	☐
c. *Expose sensitive receptors to substantial pollutant concentrations?*	☐	☐	■	☐
d. *Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?*	☐	☐	■	☐

AIR QUALITY STANDARDS AND ATTAINMENT

The project site is located within the San Francisco Bay Area Air Basin (the Basin), which is under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). As the local air quality management agency, the BAAQMD is required to monitor air pollutant levels to ensure that state and federal air quality standards are met and, if they are not met, to develop strategies to meet the standards.

Depending on whether the standards are met or exceeded, the Basin is classified as being in "attainment" or "nonattainment." Under state law, air districts are required to prepare a plan for air quality improvement for pollutants for which the district is in non-compliance. The BAAQMD is in non-attainment for the state and federal ozone standards, the state and federal PM2.5 (particulate matter up to 2.5 microns in size) standards and the state PM10 (particulate matter up to 10 microns in size) standards and is required to prepare a plan for improvement (BAAQMD2017a)

The health effects associated with criteria pollutants for which the Basin is in non-attainment are described in Table 1.

Table 1 Health Effects Associated with Non-Attainment Criteria Pollutants

Pollutant	Adverse Effects
Ozone	(1) Short-term exposures: (a) pulmonary function decrements and localized lung edema in humans and animals and (b) risk to public health implied by alterations in pulmonary morphology and host defense in animals; (2) long-term exposures: risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (3) vegetation damage; and (4) property damage.
Suspended particulate matter (PM_{10})	(1) Excess deaths from short-term and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease (including asthma).[a]
Suspended particulate matter ($PM_{2.5}$)	(1) Excess deaths from short- and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes, including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children, such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease, including asthma.[a]

[a] More detailed discussions on the health effects associated with exposure to suspended particulate matter can be found in the following documents: United States Environmental Protection Agency (USEPA), Air Quality Criteria for Particulate Matter, 2004.

Source: USEPA 2018

AIR QUALITY MANAGEMENT

The Bay Area 2017 Clean Air Plan provides a plan to improve Bay Area air quality and protect public health as well as the climate. The legal impetus for the Plan is to update the most recent ozone plan, the 2010 Clean Air Plan, to comply with state air quality planning requirements as codified in the California Health & Safety Code. Although steady progress has been made toward reducing ozone levels in the Bay Area, the region continues to be designated as non-attainment for both the one-hour and eight-hour state ozone standards as noted previously. In addition, emissions of ozone precursors in the Bay Area contribute to air quality problems in neighboring air basins. Under these circumstances, state law requires the Clean Air Plan to include all feasible measures to reduce emissions of ozone precursors and reduce transport of ozone precursors to neighboring air basins (BAAQMD 2017b).

In 2006, the United States Environmental Protection Agency (USEPA) tightened the national 24-hour PM2.5 standard regarding short-term exposure to fine particulate matter from 65 µg/m3 (micro-grams per cubic meter) to 35 µg/m3. Based on air quality monitoring data for years 2006-2008 showing that the region was slightly above the standard, the USEPA designated the Bay Area as non-attainment for the 24-hour national standard in December 2008. This triggered the requirement for the Bay Area to prepare a State Implementation Plan (SIP) submittal to demonstrate how the region would attain the standard. However, data for both the 2008-2010 and the 2009-2011 cycles showed that Bay Area PM2.5 levels currently meet the standard. On October 29, 2012, the USEPA issued a proposed rule to determine that the Bay Area has attained the 24-hour PM2.5 national standard. Based on this, the Bay Area is required to prepare an abbreviated SIP submittal that includes an emission inventory for primary (directly emitted) PM2.5, as well as precursor pollutants that

contribute to formation of secondary PM in the atmosphere and amendments to the BAAQMD New Source Review to address PM2.5 (adopted December 2012).[1] However, key SIP requirements to demonstrate how a region will achieve the standard (i.e., the requirement to develop a plan to attain the standard) will be suspended as long as monitoring data continues to show that the Bay Area attains the standard.

In addition to preparing the "abbreviated" SIP submittal, the BAAQMD has prepared a report entitled Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area (BAAQMD 2012). The report will help guide the BAAQMD's ongoing efforts to analyze and reduce PM in the Bay Area to protect public health better. The Bay Area will continue to be designated as "non-attainment" for the national 24-hour PM2.5 standard until the district elects to submit a "redesignation request" and a "maintenance plan" to the USEPA, and the agency approves the proposed redesignation.

AIR EMISSION THRESHOLDS

This analysis uses the BAAQMD's May 2017 CEQA Air Quality Guidelines to evaluate air quality. The May 2017 Guidelines include revisions made to the 2010 Guidelines, addressing the California Supreme Court's 2015 opinion in the *Cal. Bldg. Indus. Ass'n vs. Bay Area Air Quality Mgmt. Dist., 62 Cal. 4th 369* (BAAQMD 2017c). Therefore, the numeric thresholds in the May 2017 BAAQMD CEQA Air Quality Thresholds were used for this analysis to determine whether the impacts of the project exceed the thresholds identified in Appendix G of the CEQA Guidelines.

The BAAQMD has developed screening criteria to provide lead agencies and project applicants with a conservative indication of whether a project could result in potentially significant air quality impacts. If all the screening criteria are met by a project, the lead agency or applicant would not need to perform a detailed air quality assessment of their project's air pollutant emissions and air quality impacts would be considered less than significant. These screening levels are generally representative of new development on greenfield sites without any form of mitigation measures taken into consideration. For infill projects, such as this one, emissions would be less than the greenfield-type project on which the screening criteria are based (BAAQMD 2017c). The BAAQMD's screening level sizes for single-family land uses is 325 dwelling units for operational criteria pollutant emissions and 114 dwelling units for construction-related emissions (BAAQMD 2017c).

For construction-related emissions to be considered less than significant, projects must meet the following criteria in addition to being below the applicable screening level:

1. All *Basic Construction Mitigation Measures* would be included in the project design and implemented during construction; and

[1] PM is made up of particles emitted directly, such as soot and fugitive dust, as well as secondary particles formed in the atmosphere from chemical reactions involving precursor pollutants such as oxides of nitrogen (NO_x), sulfur oxides (SO_x), volatile organic compounds (VOC), and ammonia (NH_3).

2. Construction-related activities would not include any of the following:
    a. Demolition
    b. Simultaneous occurrence of more than two construction phases (e.g., paving and building construction would not occur simultaneously)
    c. Simultaneous construction of more than one land use type (e.g., project would develop residential and commercial uses on the same site) (not applicable to high density infill development)
    d. Extensive site preparation (i.e., greater than default assumptions used by the Urban Land Use Emissions Model [URBEMIS] for grading, cut/fill, or earth movement)
    e. Extensive material transport (e.g., greater than 10,000 cubic yards of soil import/export) requiring a considerable amount of haul truck activity

IMPACT ANALYSIS

a. Would the project conflict with or obstruct implementation of the applicable air quality plan?

The California Clean Air Act requires that air districts create a Clean Air Plan that describes how the jurisdiction will meet air quality standards. The most recently adopted air quality plan is the BAAQMD 2017 Plan. The 2017 Plan updates the most recent Bay Area plan, the 2010 Clean Air Plan, pursuant to air quality planning requirements defined in the California Health and Safety Code. To fulfill state ozone planning requirements, the 2017 control strategy includes all feasible measures to reduce emissions of ozone precursors—ROG and NO_X—and reduce transport of ozone and its precursors to neighboring air basins. The CAP builds upon and enhances the BAAQMD's efforts to reduce emissions of fine particulate matter and TACs. The 2017 Plan does not include control measures that apply directly to individual development projects. Instead, the control strategy includes control measures related to stationary sources, transportation, energy, buildings, agriculture, natural and working lands, waste management, water, and super-GHG pollutants.

The 2017 CAP focuses on two paramount goals:

- Protect air quality and health at the regional and local scale by attaining all national and state air quality standards and eliminating disparities among Bay Area communities in cancer health risk from TACs
- Protect the climate by reducing Bay Area GHG emissions to 40 percent below 1990 levels by 2030, and 80 percent below 1990 levels by 2050

Under BAAQMD's methodology, a determination of consistency with the 2017 Plan should demonstrate that a project:

- Supports the primary goals of the air quality plan
- Includes applicable control measures from the air quality plan
- Does not disrupt or hinder implementation of any air quality plan control measures

A project that would not support the 2017 Plan's goals would not be considered consistent with the 2017 Plan. On an individual project basis, consistency with BAAQMD quantitative

thresholds is interpreted as demonstrating support for the clean air plan's goals. As discussed under criterion (b) below, the project would not exceed BAAQMD significance thresholds related to air quality emissions), the project would not result in exceedances of BAAQMD thresholds for criteria air pollutants and thus would not conflict with the 2017 Plan's goal to attain air quality standards. The 2017 Clean Air Plan includes goals and measures to increase the use of electric vehicles, promote the use of on-site renewable energy, and encourage energy efficiency. The project would include features that are consistent with these goals and measures, including meeting California Green Building Standards for residences and inclusion of efficient household fixtures, as well as being an all-electric development. Therefore, the project would not conflict with or obstruct the implementation of an applicable air quality plan and the project would have a less than significant impact.

LESS THAN SIGNIFICANT IMPACT

b. Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

CONSTRUCTION

The proposed project would involve construction of one single-family residence and an associated accessory structure. The proposed project would not involve simultaneous construction phases, simultaneous construction of more than one land use type, extensive site preparation, or extensive material transport. Therefore, the project would meet all of the screening criteria for construction emissions.

FUGITIVE DUST

Site preparation and grading may cause wind-blown dust that could contribute particulate matter into the local atmosphere. The BAAQMD has not established a quantitative threshold for fugitive dust emissions but rather states that projects that incorporate BMPs for fugitive dust control during construction, such as watering exposed surfaces and limiting vehicle speeds to 15 miles per hour, would have a less than significant impact related to fugitive dust emissions. The project does not expressly include implementation of these BMPs; therefore, construction-related fugitive dust emissions would be potentially significant and Mitigation Measure AQ-1 would be required.

OPERATION

For single-family residential uses such as the proposed project, BAAQMD's operational screening size is 325 dwelling units. Therefore, the project would meet the screening criteria for operational emissions. Operational emissions impacts would be less than significant.

MITIGATION MEASURE

AQ-1 BAAQMD Basic Construction Mitigation. The property owner or their designee shall implement the following measures during project construction to reduce dust fall-out emissions:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, and graded areas) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered or maintain at least 2 feet of freeboard.
- 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.
- Enclose, cover, water daily or apply non-toxic soil binders to exposed stockpiles (dirt, sand, etc.)
- 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.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- 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 CCR Title 13, Section 2485). Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.
- Post a publicly visible sign with the telephone number and person to contact at the City of Palo Alto or construction contractor 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.

SIGNIFICANCE AFTER MITIGATION

Mitigation Measure AQ-1 would ensure that the project comply with all BAAQMD basic mitigation, reducing construction emission impacts to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

c. Would the project expose sensitive receptors to substantial pollutant concentrations?

Sensitive receivers nearest to the project site include single-family residences to the west and the single-family residence to the north. The California Air Resources Board (CARB) has identified diesel particulate matter ($PM_{2.5}$) as the primary airborne carcinogen in the state (CARB 2021). In addition, Toxic Air Contaminants (TAC) comprise a defined set of air pollutants that may pose a present or potential hazard to human health. Common sources of TACs and $PM_{2.5}$ include gasoline stations, dry cleaners, diesel backup generators, truck distribution centers, freeways, and other major roadways (BAAQMD 2017c). The proposed project does not include construction of new gas stations, dry cleaners, highways, roadways, or other sources that could be considered a new permitted or non-permitted source of TAC or $PM_{2.5}$ in proximity to receivers. In addition, the proposed project would not introduce a stationary source of emissions, nor would it result in particulate matter emissions greater than the BAAQMD threshold. Therefore, this impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

Table 3-3 in the BAAQMD's 2017 CEQA Guidelines provides odor screening distances for land uses that have the potential to generate substantial odor complaints. The odor-generating uses in the table include wastewater treatment plants, landfills or transfer stations, refineries, composting facilities, confined animal facilities, food manufacturing, smelting plants, and chemical plants (BAAQMD 2017c). The proposed project involves residential uses and does not include any of the uses identified by the BAAQMD as odor-generating uses. Therefore, the proposed project would not generate objectionable odors affecting a substantial number of people. This impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

This page left intentionally blank.

4 Biological Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
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 Wildlife 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, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	■	☐	☐
c. Have a substantial adverse effect on state or federally protected wetlands as defined by Section 404 of the Clean Water Act (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 as defined by the City of Palo Alto's Tree Preservation Ordinance (Municipal Code Section 8.10)?	☐	■	☐	☐
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?	☐	☐	■	☐

EXISTING SETTING

Rincon Consultants prepared a Biological Resources Constraints Analysis (BRCA) in November 2021 (Rincon Consultants 2021; Appendix A). The analysis in this Initial Study is based on the 2021 BRCA. As part of the report, Rincon conducted a field reconnaissance survey on October 5, 2021. During that field survey, three terrestrial vegetation communities or other land cover types were observed within the project site: Coast live oak woodland, non-native annual grassland, and riparian. Coast live oak woodland (*Quercus agrifolia* Forest and Woodland Alliance) is typically found on canyon bottoms, slopes, and flats with deep sandy or loamy soils throughout the inner and outer Coast Ranges, Transverse Ranges, and southern coast, usually below 1,200 meters. Coast live oak woodlands are widely distributed throughout the state from northern Mendocino County to San Diego County. This community is dominated by coast live oak (*Q. agrifolia*), often including California bay (*Umbellularia californica*) and Pacific madrone (*Arbutus menziesii*). Stands vary from open or continuous to savanna-like. Dense conditions support sparse understory vegetation including California blackberry (*Rubus ursinus*), poison oak, and snowberry (*Symphoricarpos spp.*), while more open stands have a grassy understory. Coast live oak woodland is found throughout the project site. Canopy cover is continuous to scattered, with a moderately dense understory of herbs and shrubs. Other observed tree species commonly associated with coast live oak woodland include California bay and California buckeye (*Aesculus californica*). The shrub layer of the coast live oak woodland is typically poorly developed and the herbaceous layer is mostly continuous with adjacent grasslands. Shrubs in the project site include poison oak, coyote brush, and California blackberry.

On the project site, non-native annual grassland primarily occurs in the interior of the site and is surrounded by coast live oak woodland. The majority of the non-native annual grassland within the project site has been previously mowed. Characteristic non-native annual grasses observed include wild oat (*Avena fatua*), Italian rye (*Festuca perennis*), and foxtail barley (*Hordeum murinum*). Many ruderal herbs were also present, including plantain (*Plantago* spp.).

Riparian habitat is found along Los Trancos Creek within the project site. This habitat type is similar to coast live oak woodland described above, with the distinction that it occurs along the banks of the creek and is considered riparian habitat.

IMPACT ANALYSIS

a. Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as candidate, sensitive, or special status in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?

Based on a review of agency databases and literature review, as well as the results of the reconnaissance survey of the project site, Rincon evaluated 85 special-status species (40 special-status plant species and 45 special-status animal species) documented within the *Mindego Hill*, *California* USGS 7.5-minute topographic quadrangle and the surrounding eight quadrangles (*Woodside*, *Palo Alto*, *Mountain View*, *La Honda*, *Cupertino*, *Franklin Point*, *Big*

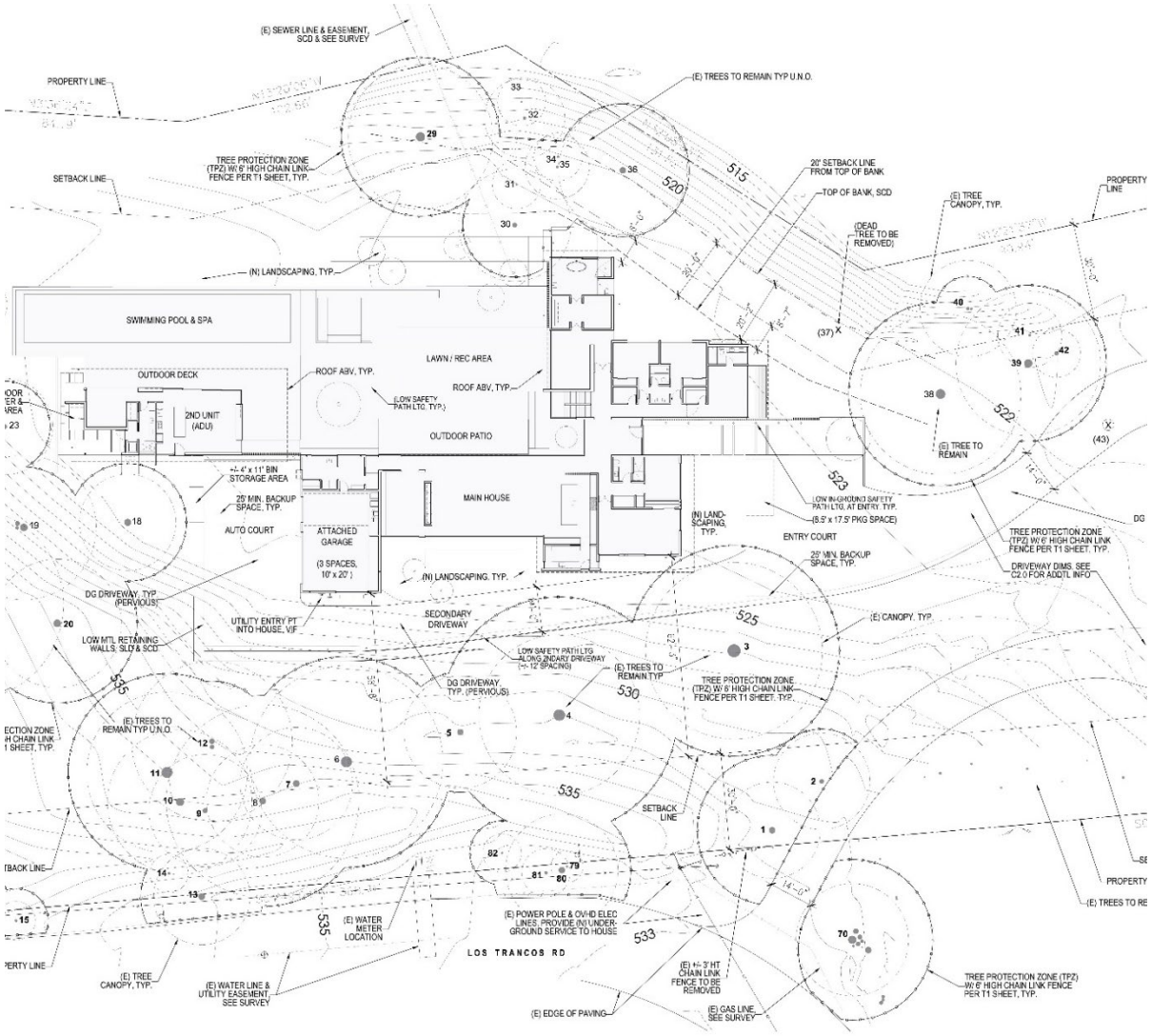
Basin, and *Castle Rock Ridge*). Each of these 85 species was evaluated for its potential to occur at the project site. The majority of special-status species are not expected to occur based on the absence of suitable habitat and/or the project site being outside of the geographic range of the species. However, Mitigation Measure BIO-1 would require implementation of a Worker Environmental Awareness Program (WEAP) in order to aid workers in recognizing special-status species, which would reduce impacts to a less than significant level.

Of the 40 special-status plant species, one has a moderate potential to occur on the project site. Woodland woollythreads (*Monolopia gracilens*), CRPR 1B.2, can be found in a variety of habitat types, including some that occur on the project site, such as woodlands and grassy sites in openings. Blooming period for this species is March through July. Multiple occurrences of woodland woollythreads have been recorded within five miles of the project area, including the most recent occurrence from 2018 approximately one mile southwest of the project site. Therefore, the project has the potential to impact woodland woollythreads through removal of habitat and this impact is potentially significant. Mitigation Measure BIO-2 would be required to reduce impacts on woodland woollythreads and other special-status plant species to a less than significant level.

Of the 45 special-status animal species, nine have moderate to high potential to occur in habitat on the site: steelhead - central California coast (CCC) distinct population segment (steelhead) (*Oncorhynchus mykiss irideus*), Santa Cruz black salamander (*Aneides niger*), California giant salamander (*Dicamptodon ensatus*), California red-legged frog (*Rana draytonii*), western pond turtle (*Emys marmorata),* San Francisco gartersnake (*Thamnophis sirtalis tetrataenia*) pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*). Additionally, there is suitable nesting habitat throughout the project site for nesting birds, which are protected under the Migratory Bird Treaty Act and CDFW Fish and Game Code. Mitigation measures BIO-3 through BIO-7 would be required to reduce impacts on the above-mentioned special-status animal species to a less than significant level.

The project would include a 20-foot creek setback (see Figure 6) pursuant to Palo Alto's Stream Corridor Ordinance (Section 18.40.140 of the PAMC) and no direct impacts to aquatic habitat would occur. However, construction of the project would result in removal of vegetation and loss of terrestrial habitat on limited portions of the site, and runoff and erosion from the project site could indirectly impact aquatic species habitat. Critical habitat for steelhead is present in Los Trancos Creek, both within and immediately adjacent to the project site. Designated critical habitat is also located in several of the rivers surrounding the project site within five miles for coho Salmon, though the project site does not overlap with these rivers and no drainages onsite are connected to the other rivers where critical habitat is designated. The project would include a 20-foot creek setback pursuant to Palo Alto's Stream Corridor Ordinance and no direct impacts to steelhead critical habitat would occur. However, indirect impacts from runoff or erosion could impact water quality; therefore, the project has the potential to impact steelhead designated critical habitat and the impact is potentially significant. Mitigation Measure BIO-3 would be required to address potential erosion and provided BMPs for protection of steelhead and aquatic habitats.

Figure 6 Site Plan (Partial) in Relation to Creek and Property Lines



Architecture, 2021.

New lighting introduced on the project site could have an adverse effect on animal species in the creek corridor if not properly limited and controlled. PAMC Section 18.40.140(B)(3) requires that "Nighttime lighting shall be directed away from the riparian corridor of a stream" and that "The distance between nighttime lighting and the riparian corridor of a stream should be maximized." A lighting plan submitted by the applicant shows shielding on exterior safety lighting and shades to limit interior lighting spillover toward the creek. The City would require adherence to PAMC Section 18.40.140(B)(3) during final review of project lighting prior to issuance of building permits. Implementation of these requirements would limit light intrusion into the creek corridor and associated impacts would be avoided.

Additionally, although designated critical habitat for California red-legged frog and Bay checkerspot butterfly is located within five miles of the project area, the project does not overlap with either of these designated critical habitats.

MITIGATION MEASURES

The following mitigation measures are required:

BIO-1 **Worker Environmental Awareness Program (WEAP)**. Prior to initiation of construction activities (including staging and mobilization) all personnel associated with project construction shall attend a Worker Environmental Awareness Program (WEAP) training, conducted by a qualified biologist, to aid workers in recognizing special-status resources that may occur in the construction area. The specifics of this program shall include identification of the sensitive species and habitats, a description of the regulatory status and general ecological characteristics of sensitive resources, and review of the limits of construction and measures required to reduce impacts to biological resources within the work area. A qualified biologist shall prepare a fact sheet conveying this information for distribution to all contractors, their employers, and other personnel involved with construction. All employees shall sign a form provided by the trainer indicating they have attended the WEAP and understand the information presented to them. The forms from all trainings shall be available to the City upon request to document compliance.

BIO-2 **Special-Status Plant Species Botanical Surveys.** A qualified biologist shall conduct a protocol level botanical survey, including a site visit during the blooming period of the target species in March through July. If the CRPR 1 rank plant is found, the plants shall be avoided by installing protective fencing and warning construction personnel of their presence through the WEAP training. If special-status plants species cannot be avoided, impacts shall be mitigated at a minimum ratio of 1:1 (number of acres or individuals restored to number of acres or individuals impacted). A restoration plan shall be prepared and submitted to the City for review and approval and to CDFW for review. The restoration plan shall include, at a minimum, the type and area of habitat to be established, restored, enhanced, and/or preserved; goals and objectives of the mitigation project; a monitoring plan including performance standards and success criteria; and maintenance activities to occur during

monitoring. The applicant shall implement the measures prior to commencement of ground disturbance, tree removal or construction.

BIO-3 Best Management Practices for Protection of Steelhead and Aquatic Habitat. No vegetation removal, ground disturbance or construction shall occur within the creek or the 20-foot creek setback zone, which shall be demarcated with high visibility orange construction fencing to ensure avoidance of impacts to the aquatic habitat. Best management practices (BMPs) shall be developed and implemented during all grading and construction activities to prevent erosion and sedimentation into the creek and to prevent the spill of contaminants in or around the creek. The following BMPs shall be included and implemented on-site during construction to prevent any indirect impacts to aquatic habitat, as well as jurisdictional waters and wetlands:

- Vehicles and equipment shall be checked at least daily for leaks and maintained in good working order. Spill kits shall be available on-site at all times and a spill response plan shall be developed and implemented.
- Sediment and erosion control measures (e.g., sand or gravel bags, hay bales, check dams) shall be implemented and maintained throughout the project site to prevent the entry of sediment and/or pollutants into any waterways or jurisdictional areas. No monofilament plastic may be used for erosion control materials.

BIO-4 Preconstruction Surveys for California Giant Salamander, Santa Cruz Black Salamander, Western Pond Turtle, California Red-Legged Frog, and San Francisco Garter Snake. A qualified biologist shall conduct a pre-construction survey within 24 hours of the initiation of project activities. If California Giant Salamander, Santa Cruz Black Salamander, and/or Western Pond Turtle are observed the animal shall be allowed to leave the site on its own. If California Red-Legged Frog, and/or San Francisco garter snake is found, USFWS shall be notified immediately to determine the correct course of action and the proposed project shall not begin until approved by USFWS.

Prior to ground disturbance, a temporary wildlife exclusion barrier shall be installed along the limits of disturbance. A qualified biologist shall inspect the area prior to barrier installation. The barrier shall be designed to prevent the target species from entering the project area and will remain in place until all development activities have been completed. This barrier shall be inspected daily by a qualified biologist and maintained and repaired as necessary to ensure that it is functional and is not a hazard to the target species on the outer side of the barrier.

A qualified biologist shall be present during all grading and initial ground disturbing activities. Vegetation disturbance shall be the minimum necessary to achieve the goals of the project. Immediately prior to initial ground disturbance and vegetation removal, a qualified biologist shall conduct a visual clearance survey. Vegetation shall be cut to 6 inches in height using hand tools (including string trimmers or chainsaw for brush). Once the ground is visible, a second visual survey for target species shall be conducted by the biologist prior to additional ground disturbance.

Should California Giant Salamander, Santa Cruz Black Salamander, or Western Pond Turtle be observed within the project site, construction shall be halted in the vicinity until either the animal exits the site on its own or until a qualified biologist relocates the animal to suitable habitat in the immediate vicinity. Should California Red-Legged Frog, and/or San Francisco garter snake be observed within the project site, the USFWS shall be notified immediately and construction shall be halted until either the animal exits the site on its own or until a qualified biologist with the appropriate USFWS Recovery Permit relocates the animal.

No work shall occur during a rain event over 0.25." If a rain event occurs, a qualified biologist shall inspect the site again prior to resuming work. All holes and trenches shall be covered at the end of the day or ramped to avoid entrapment.

BIO-5 Focused Surveys for Special-Status Bat Species and Roosting Bat Protection Plan. Prior to tree removal, a qualified biologist shall conduct a focused survey of all trees to be removed or impacted by construction activities to determine whether active roosts of special-status bats are present on site. If tree removal is planned for the fall, it is recommended the survey be conducted in September to ensure tree removal would have adequate time to occur during seasonal periods of bat activity, as described below. If tree removal is planned for the spring, it is recommended the survey be conducted during the earliest possible time in March, to allow for suitable conditions for both the detection of bats and subsequent tree removal. Trees containing suitable potential bat roost habitat features shall be clearly marked or identified.

If day roosts are found to be potentially present, the biologist shall prepare a site-specific roosting bat protection plan to be implemented by the contractor following the City of Palo Alto's approval. The plan shall incorporate the following guidance as appropriate:

- To the extent possible, trees identified as suitable roosting habitat shall be removed during seasonal periods of bat activity, including the following, but not during maternity season:
  - Between September 1 and about October 15, or before evening temperatures fall below 45 degrees Fahrenheit and/or more than 0.5 inch of rainfall within 24 hours occurs.
  - Between March 1 and April 15, or after evening temperatures rise above 45 degrees Fahrenheit and/or no more than 0.5 inch of rainfall within 24 hours occurs.
- If a tree must be removed during the maternity/breeding season and is identified as potentially containing a colonial maternity roost, then a qualified biologist shall conduct acoustic emergence surveys or implement other appropriate methods to further evaluate if the roost is an active maternity roost. Under the biologist's guidance, the contractor shall implement measures similar to or better than the following:

- If it is determined that the roost is not an active maternity roost, then the roost may be removed in accordance with the other requirements of this recommendation.
- If it is found that an active maternity roost of a colonial roosting species is present, the roost shall not be disturbed during the breeding season (April 15 to August 31).

- Potential colonial hibernation roosts may only be removed during seasonal periods of bat activity. Potential non-colonial roosts that cannot be avoided shall be removed on warm days in late morning to afternoon when any bats present are likely to be warm and able to fly. Appropriate methods shall be used to minimize the potential harm to bats during tree removal. Such methods may include using a two-step tree removal process. This method is conducted over two consecutive days and works by creating noise and vibration by cutting non-habitat branches and limbs from habitat trees using chainsaws only (no excavators or other heavy machinery) on day one. The noise and vibration disturbance, together with the visible alteration of the tree, is very effective in causing bats that emerge nightly to feed to not return to the roost that night. The remainder of the tree is removed on day two.

BIO-6 Preconstruction Surveys for San Francisco Dusky-Footed Woodrat. A qualified biologist shall conduct a pre-construction survey for woodrats no more than 14 days prior to construction. Nests within 50 feet of project activity that would not be directly impacted by project activity shall be demarcated with a 10-foot avoidance buffer and left intact. If a nest(s) that cannot be avoided are found during the pre-construction survey, an approved biologist shall dismantle the nest and relocate it to suitable habitat outside the work area no more than 50 feet away with the goal of ensuring the individuals are allowed to leave the work area(s) unharmed before on site activities begin. Nest relocation shall occur within 48 hours of construction activities to ensure that nests are not reestablished.

BIO-7 Preconstruction Surveys for Nesting Birds. A general pre-construction nesting bird survey shall be conducted by a qualified biologist within 14 days prior to the initiation of construction activities. If construction is stopped for more than 14 days during the nesting season, a pre-construction survey shall be conducted prior to the re-start of construction activities. Surveys shall include the disturbance area plus a 50-foot buffer for passerine species, and a 500-foot buffer for raptors.

If active nests are located, an appropriate avoidance buffer shall be established within which no work activity would be allowed that would impact these nests. The avoidance buffer shall be established by the qualified biologist on a case-by-case basis based on the species and site conditions. Larger buffers may be required depending upon the status of the nest and the construction activities occurring in the vicinity of the nest. The buffer area(s) shall be closed to all construction personnel and equipment until juveniles have fledged and/or the nest is inactive. A qualified biologist shall confirm that breeding/nesting is complete, and the nest is no longer active prior to removal of the buffer. If work within a buffer area cannot be

avoided, then a qualified biologist shall be present to monitor all project activities that occur within the buffer. The biological monitor shall evaluate the nesting avian species for signs of disturbance and shall have the ability to stop work.

SIGNIFICANCE AFTER MITIGATION

Implementation of Mitigation Measure BIO-1 would require all personnel associated with project construction to attend a WEAP, which would aid them in recognizing special-status resources and reduce impacts to a less than significant level. Implementation of Mitigation BIO-2 would reduce impacts on special-status plant species to a less than significant level through conduction of botanical surveys and avoidance of CRPR 1 rank plant. Implementation of Mitigation BIO-3 would require implementation of BMPs for the protection of steelhead and aquatic habitats, as well as measures for sediment and erosion control which would reduce impacts on aquatic habitats and jurisdictional waters and wetlands to a less than significant level. Implementation of Mitigation Measures BIO-4 through BIO-7 would require surveys for and avoidance if possible for special-status animal species such as the California Giant Salamander, Santa Cruz Black Salamander, Western Pond Turtle, California Red-Legged Frog, San Francisco garter snake, special-status bat species, San Francisco Dusky-Footed Woodrat, and nesting birds, which would reduce impacts on those species to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Would 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?

c. Would the project have a substantial adverse effect on state or federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

d. Would the project 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?

Three sensitive natural communities (Northern Coastal Salt Marsh, Serpentine Bunch Grass, and Valley Oak Woodland) are known to occur within the nine-quadrangle search radius; however, none are present within the project site. Los Trancos Creek is an intermittent stream that crosses the western border of the site, as shown in Figure 2. It is a tributary to San Francisquito Creek, which flows into San Francisco Bay, a Traditional Navigable Water, and therefore is potentially under the jurisdiction of the U.S. Army Corps of Engineers (USACE), CDFW, and/or Regional Water Quality Control Board (RWQCB). The proposed project would not alter the course of this creek or other stream or river and would implement a 20 foot creek setback pursuant to Palo Alto's Stream Corridor Ordinance as noted in Section 18.40.140 of the PAMC. Riparian habitat (coast live oak woodland) occurs adjacent to the creek. Coast live oak woodland is not a CDFW sensitive natural community,

but riparian habitat is considered to be jurisdictional by CDFW. Project plans avoid direct impacts to Los Trancos Creek by precluding work or disturbance within 20 feet of the top of bank; however, the proposed project may result in indirect impacts to the creek and riparian habitat from erosion or runoff from the project site. Mitigation Measure BIO-3 requires development of BMPs to protect water quality and aquatic habitat and would also serve to protect wetlands and waters of the U.S. and State. Mitigation Measure BIO-3 would be required to reduce potential water quality impacts to a less than significant level.

Project activities within the dripline of the riparian canopy and removal of riparian canopy shall be avoided to the extent possible. Mitigation Measure BIO-3 requires high visibility orange construction fencing established for the creek setback zone. Where the riparian canopy extends beyond the 20-foot setback, the fencing must be extended to encompass the dripline of the riparian canopy. If project activities requiring pruning or soil disturbance, or that have the potential to impact soils within the dripline of the riparian canopy cannot be avoided, a CDFW Section 1600 Lake and Streambed Alteration Agreement is required. Mitigation at a minimum ratio of 1:1 shall be required. A compensatory mitigation plan for impacts to riparian habitat must be prepared and submitted to CDFW for approval. The mitigation plan must include, at a minimum, the type and area of habitat to be established, restored, enhanced, and/or preserved; goals and objectives of the mitigation project; a monitoring plan including performance standards and success criteria; and maintenance activities to occur during monitoring. The applicant must implement the measures prior to commencement of ground disturbance, tree removal or construction.

The project site is mapped within CDFW's California Essential Habitat Connectivity areas as somewhat permeable to wildlife passage. However, the project site is outside of mapped Landscape Blocks for the California Bay Area Linkage Network, indicating that it is not identified as highly permeable or high-quality habitat. Within the larger landscape, the project site is surrounded by highly permeable landscape providing terrestrial species more attractive alternatives for movement around the project site. Many large terrestrial wildlife species such as the candidate threatened mountain lion (*Puma concolor*) and most small species such as rodents and herpetofauna avoid openings and use the cover provided by the riparian corridor. The project is designed to avoid impacts to the riparian corridor, and Mitigation Measure BIO-3 requires fencing of the creek setback zone. The proposed placement of the structure is within an existing clearing on the property. The City would require adherence to PAMC Section 18.40.140(B)(3) requiring shielding of the creek from lighting. Implementation of these requirements would limit intrusion into the riparian corridor and impacts to the movement of both terrestrial and aquatic wildlife, established corridors, or nursery sites would be less than significant.

MITIGATION MEASURE AND SIGNIFICANCE AFTER MITIGATION

Mitigation Measure BIO-3 would require implementation of BMPs to reduce impacts on Los Trancos Creek and riparian habitat. With mitigation, impacts would be less than significant.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or as defined by the City of Palo Alto's Tree Preservation Ordinance (Municipal Code Section 8.10)?

The purpose of the City of Palo Alto Tree Preservation Ordinance is to promote the health, safety, welfare, and quality property within the city, and the establishment of standards for removal, maintenance, and planting of trees. In establishing these procedures and standards, it is the City's intent to encourage the preservation of trees. Chapter 8.10, Tree Preservation and Management Regulations, establishes regulations for the preservation of protected trees, defined as:

- Coast live oak, 11.5 inches in diameter or greater when measured 4.5 ft above natural grade
- Valley oak, 11.5 inches in diameter or greater when measured 4.5 ft above natural grade
- Coast redwood, 18 inches in diameter or greater when measured 4.5 ft above natural grade
- A heritage tree designated by the City Council

Under the tree protection ordinance, discretionary development approvals for property containing protected trees will include appropriate conditions providing for the protection of such trees during construction and for maintenance of the trees thereafter.

According to the arborist report prepared by Kielty Arborist Services on June 7, 2021 and revised on August 24, 2021 (Kielty Arborist Services 2021; Appendix B), there are currently 82 trees within or adjacent to the area of development. Four non-protected trees (one red willow tree, two olive trees, and one black walnut tree) would be removed as part of the project since they either pose a fire hazard or are located within the proposed driveway area. Coast live oak trees and valley oak trees with a diameter at breast height of greater than 11.5 inches occur within project site. Pursuant to PAMC Section 8.10, these on-site oak trees would qualify as protected trees. There are currently 55 protected trees on site. Except for one coast live oak tree, the rest of the protected trees are located away from the proposed work on site. However, Mitigation Measure BIO-8 would be required in order to reduce impacts on trees to be retained on site. The one Coast live oak tree that is located on the northwestern portion of the site and is dead would need to be removed. The City's tree protection ordinance requires compliance with the Tree Technical Manual, which outlines the requirements for removal and replacement of protected trees consistent with the tree canopy requirements. A written Tree Removal Permit is required prior to removal of any street tree and would further ensure that the requirements of the Ordinance are met. The project would be required to comply with the tree ordinance and apply for the required permit as needed; therefore, there is no conflict with local policies or ordinances.

MITIGATION MEASURE

BIO-8 **Protection of Retained Trees.** The project applicant shall adhere to recommendations as described in the arborist report prepared by Kielty Arborist Services (Kielty Arborist Services 2021) regarding protection of retained trees.

Recommendations include landscape buffers, tree pruning, root cutting, trenching and excavation, irrigation, grading, and inspections.

SIGNIFICANCE AFTER MITIGATION

Mitigation Measure BIO-8 would require protection measures for retained trees on site, which would reduce impacts to the trees to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

f. Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

The project site is not within an approved Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. No impact would occur.

LESS THAN SIGNIFICANT IMPACT

5 Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. *Cause a substantial adverse change in the significance of a historical resource as defined in§15064.5 or recognized by City Council resolution?*	☐	☐	☐	■
b. *Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?*	☐	■	☐	☐
c. *Disturb any human remains, including those interred out of formal cemeteries?*	☐	☐	■	☐

a. Would the project cause a substantial adverse change in the significance of a historical resource as defined in §15064.5 or recognized by City Council resolution?

Rincon Consultants prepared a Cultural Resources Assessment Report for the project in February 2022 (Foster and Blind 2022). This assessment included a cultural resources records search of the California Historical Resources Information System (CHRIS), a Sacred Lands File (SLF) search, historic-period aerial and topographic map review, a pedestrian survey of the project site on January 14, 2022. The CHRIS records search was conducted to identify previous cultural resources studies and previously recorded cultural resources within 0.5 mile of the project site. Rincon also reviewed the NRHP, the CRHR, the California Historical Landmarks list, and the Built Environment Resources Directory (BERD), as well as its predecessor the California State Historic Property Data (HPD) File. Additionally, Rincon reviewed the Archaeological Determination of Eligibility (ADOE) list. No structures or previously recorded historic structures were identified on the project site. The field survey and background research did not identify any built-environment historical resources on or adjacent to the project site. Therefore, no impacts would occur.

NO IMPACT

b. Would the project cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?

Rincon identified two archaeological resources within the vicinity of the project site. Rincon evaluated one historical archaeological resource within the project site for listing in the CRHR and recommended it ineligible as its data potential was exhausted at initial recording. One Native American resource is located outside of the project site and will not be affected by project activities. This resource was not evaluated for listing in the CRHR. While the SLF results were negative, the project site still maintains moderate sensitivity to containing

historic-period or Native American archaeological resources due to the proximity of the project to previously recorded archaeological resources. Therefore, impacts are potentially significant.

MITIGATION MEASURES

CR-1 **Worker's Environmental Awareness Program (WEAP).** Prior to project ground disturbance, all construction personnel and contractors responsible for overseeing and operating ground-disturbing activities shall be required to receive cultural awareness and sensitivity training. The purpose of this training is to educate construction personnel regarding the legal obligations of the project, the types of archaeological deposits that may be encountered during construction, and the appropriate procedures required in the event of a discovery of archaeological resources, paleontological resources, or human remains. The WEAP shall also provide cultural sensitivity training to ensure respectful and appropriate behaviors in the vicinity of archaeological deposits and human remains. The WEAP shall be implemented by a qualified archaeologist that meets or exceeds the Secretary of the Interior's Professional Qualifications Standards in archaeology.

CR-2 **Archaeological and Native American Monitoring.** A qualified archaeologist shall conduct archaeological monitoring for all project-related ground disturbing activities. Archaeological monitoring shall be performed under the direction of an archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for archaeology (National Park Service 1983). Locally affiliated Native American tribes shall be given the opportunity to conduct Native American monitoring. In the event that Native American monitoring occurs, a locally affiliated tribal member shall monitor all project-related ground disturbing activities. The monitor(s) will have the authority to halt and redirect work should any archaeological resources be identified during monitoring. If archaeological resources are encountered during ground-disturbing activities, work in the immediate area must halt and the find evaluated for listing in the CRHR. Archaeological monitoring may be reduced to spot-checking or eliminated at the discretion of the monitors, in consultation with the lead agency, as warranted by conditions such as encountering bedrock, sediments being excavated are fill, or negative findings during the first 60 percent of rough grading. If monitoring is reduced to spot-checking, spot-checking shall occur when ground-disturbance moves to a new location within the project area and when ground disturbance will extend to depths not previously reached (unless those depths are within bedrock).

CR-3 **Unanticipated Discovery of Cultural or Tribal Cultural Resources.** In the event that archaeological resources are unexpectedly encountered during ground-disturbing activities, work in the immediate area shall be halted and an archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards for archeology (National Park Service 1983) shall be contacted immediately to evaluate the find. If the find is Native American in origin, then a Native American representative shall also be contacted to participate in the evaluation of the find. The qualified archaeologist, and, if applicable, the Native American representative, shall examine

the find and make appropriate recommendations regarding additional work necessary to evaluate the significance of the find and the appropriate treatment of the resource. All cultural resources identified shall be evaluated for CRHR eligibility and local listing. Additional work may be necessary to evaluate the resource for inclusion in the CRHR or local listing. Recommendations could include, but are not limited to, invasive or non-invasive testing, sampling, laboratory analysis, preservation in place, or data recovery. A report of findings documenting any data recovered during monitoring shall be prepared by a qualified archaeologist and submitted to the Director of Planning. If the discovery is determined to be Native American in nature, the on-site Native American monitor, if applicable, shall be consulted to determine the appropriate treatment of the resource. In the event that no Native American monitor is contracted, locally affiliated Native American tribes shall be invited to consult regarding the appropriate treatment of any Native American resources identified during project construction.

SIGNIFICANCE AFTER MITIGATION

Implementation of Mitigation Measures CR-1, CR-2, and CR-3 would ensure that cultural resources are properly identified and preserved in the event they are uncovered during construction and would reduce impacts regarding disrupting intact archaeological resources to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

c. Would the project disturb any human remains, including those interred out of formal cemeteries?

No human remains are known to be present within the project site. However, the discovery of human remains is always a possibility during ground disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be of Native American origin, the Coroner will notify the Native American Heritage Commission, which will determine and notify the Most Likely Descendent (MLD). The MLD has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the MLD does not make recommendations within 48 hours, the landowner shall reinter the remains in an area of the property secure from subsequent disturbance. With adherence to existing regulations, impacts to human remains would be less than significant.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

6 Energy

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. *Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?*	☐	☐	■	☐
b. *Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?*	☐	☐	■	☐

a. *Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?*

b. *Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?*

The proposed project would involve the use of energy during construction and operation. Energy use during the construction phase would be primarily in the form of fuel consumption. Long-term operation of the proposed project would require permanent grid connections for electricity to power internal and exterior building lighting and heating and cooling systems. In addition, the increase in vehicle trips associated with the project would increase fuel consumption within Palo Alto. However, the proposed project would be subject to the energy conservation requirements of the California Energy Code (Title 24 of the California Code of Regulations, Part 6) and the California Green Building Standards Code (24 CCR part 11) as well as the City's green building ordinance (PAMC Section 16.14.). Additionally, the proposed project would be fully electric and would utilize renewable energy in the form of solar roof panels with a system of more than 10 kilowatts (kW). Heat pump technology would be used for water heating and space heating. The project would also utilize energy-efficient appliances and lighting, as well as water-efficient appliances and fixtures, which would be consistent with the following policies within the City of Palo Alto 2030 Comprehensive Plan:

- **Policy T-4.7** Require new residential development projects to implement best practices for street design, stormwater management and green infrastructure.
- **Policy N-7.4** Maximize the conservation and efficient use of energy in new and existing residences and other buildings in Palo Alto.

- **Policy N-7.5** Encourage energy efficient lighting that protects dark skies and promotes energy conservation by minimizing light and glare from development while ensuring public health and safety.

Moreover, since the proposed project would involve the construction of one single-family residence and associated accessory structure, the increase in vehicle trips would be minimal and would not substantially increase fuel consumption within the City. Therefore, impacts related to the wasteful, inefficient, or unnecessary consumption of energy resources would be less than significant.

LESS THAN SIGNIFICANT IMPACT

7 Geology and Soils

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. Directly or indirectly cause potential Expose substantial adverse effects, including the risk of loss, injury, or death involving:				
1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	■
2. Strong seismic ground shaking?	☐	■	☐	☐
3. Seismic-related ground failure, including liquefaction?	☐	■	☐	☐
4. Landslides?	☐	☐	☐	■
b. Result in substantial soil erosion or loss of topsoil?	☐	■	☐	☐
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	■	☐	☐
d. Be located on expansive soil, as defined in Table 1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?				
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	■
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	■	☐	☐

SETTING

FAULT ZONES

Similar to much of California, Palo Alto is located in a seismically active region. The USGS defines Holocene-active faults as those that are likely to have moved one or more times (surface displacement) in the last 10,000 years (USGS, n.d.), while inactive faults have not had surface displacement within that period. The major fault zones located near Palo Alto include the San Andreas Fault (5.5 miles southwest from the City), the Hayward Fault (13 miles northeast from the City), and the Calaveras Fault (23 miles northeast from the City).

In addition to primary hazards like surface fault ruptures, earthquakes also result in secondary hazards and impacts such as ground shaking, landslides, and liquefaction, which could cause widespread damage. The project site is not located within an identified earthquake fault zone as delineated on the Alquist-Priolo Earthquake Fault Zoning Map (DOC 2021a).

GROUND SHAKING

Seismically induced ground shaking covers a wide area and is greatly influenced by the distance of the site to the seismic source, soil conditions, and depth to groundwater. The most intense ground-shaking scenario mapped by the USGS and Associated Bay Area Governments (ABAG) in the vicinity assumes a 7.0 magnitude earthquake on the Hayward Fault system (northern and southern segments). The predicted ground-shaking level from such an earthquake would be “strong shaking” to “very strong shaking” throughout the City (ABAG 2019).

LIQUEFACTION AND SEISMICALLY INDUCED SETTLEMENT

Liquefaction is defined as the sudden loss of soil strength due to a rapid increase in soil pore water pressure resulting from seismic ground shaking. Liquefaction potential is dependent on such factors as soil type, depth to ground water, degree of seismic shaking, and the relative density of the soil. When liquefaction of the soil occurs, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the ground surface. Liquefied soil may be unable to support its own weight or that of structures, which could result in loss of foundation bearing or differential settlement. Liquefaction may also result in cracks in the ground surface followed by the emergence of a sand-water mixture. According to the DOC, the project site is located in a liquefaction zone (DOC 2021a).

Seismically induced settlement occurs in loose to medium dense unconsolidated soil above groundwater. These soils compress (settle) when subject to seismic shaking. The settlement can be exacerbated by increased loading, such as from the construction of buildings. Settlement can also result solely from human activities including improperly placed artificial fill, and structures built on soils or bedrock materials with differential settlement rates.

LANDSLIDES

Landslides result when the driving forces that act on a slope (i.e., the weight of the slope material, and the weight of objects placed on it) are greater than the slope's natural resisting forces (i.e., the shear strength of the slope material). Slope instability may result from natural processes, such as the erosion of the toe of a slope by a stream, or by ground shaking caused by an earthquake. Slopes can also be modified artificially by grading, or by the addition of water or structures to a slope. Development that occurs on a slope can substantially increase the frequency and extent of potential slope stability hazards. The project site is not located in a landslide hazard zone or an earthquake fault zone (DOC 2021a).

EXPANSIVE SOILS

Expansive soils can change dramatically in volume depending on moisture content. When wet, these soils can expand; conversely, when dry, they can contract or shrink. Sources of moistures that can trigger this shrink-swell phenomenon include seasonal rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soil can develop wide cracks in the dry season, and changes in soil volume have the potential to damage concrete slabs, foundations, and pavement. Special building/structure design or soil treatment are often needed in areas with expansive soils. Expansive soils are typically very fine-grained with a high to very high percentage of clay. The clay minerals present typically include montmorillonite, smectite, and/or bentonite. Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent.

EROSION

Erosion is the wearing away of the soil mantle by running water, wind or geologic forces. Excessive erosion can contribute to landslides, siltation of streams, undermining of foundations, and ultimately the loss of structures. Removal of vegetation tends to heighten erosion hazards. The City enforces grading and erosion control ordinances to reduce these hazards and the 2030 Comprehensive Plan also contains policies to prevent erosion-related issues.

PALEONTOLOGICAL SETTING

Paleontological sensitivity refers to the potential for a geologic unit to produce scientifically significant fossils. Direct impacts to paleontological resources occur when earthwork activities, such as grading or trenching, cut into the geologic deposits within which fossils are buried and physically destroy the fossils. Since fossils are the remains of prehistoric animal and plant life, they are considered to be nonrenewable. Such impacts have the potential to be significant and, under the *CEQA Guidelines*, may require mitigation. Sensitivity is determined by rock type, past 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.

The discovery of a vertebrate fossil locality is of greater significance than that of an invertebrate fossil locality, especially if it contains a microvertebrate assemblage. The recognition of new vertebrate fossil locations could provide important information on the geographical range of the taxa, their radiometric age, evolutionary characteristics, depositional environment, and other important scientific research questions. Vertebrate fossils are almost always significant because they occur more rarely than invertebrates or plants. Thus, geological units having the potential to contain vertebrate fossils are considered the most sensitive.

IMPACT ANALYSIS

a1. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?

The project site is not located within an identified earthquake fault zone as delineated on the Alquist-Priolo Earthquake Fault Zoning Map (DOC 2021a). No known fault lines are located on the site. The closest active fault is the San Andreas Fault which is located approximately 0.4 miles southwest of the site. According to the Geotechnical Engineering Study completed by Earth Systems on April 9, 2021 (Earth Systems 2021; Appendix C), the danger from rupture of a known earthquake fault on the site is low. Therefore, no impact would occur.

NO IMPACT

a2. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

As with any site in the Bay Area region, the project site is susceptible to strong seismic ground shaking in the event of a major earthquake. Nearby faults include the San Andreas Fault, the Hayward Fault and the Calaveras Fault. These faults are capable of producing strong seismic ground shaking at the site. According to the project's Geotechnical Engineering Study, strong shaking of the site is likely to occur, but the project would be feasible from a geotechnical standpoint if the recommendations in the report are implemented. This impact is potentially significant.

MITIGATION MEASURE

GEO-1 Geotechnical Design Considerations. The project plans submitted for building permit approval shall incorporate the design recommendations outlined in the Geotechnical Study prepared by Earth Systems on April 9, 2021, or any other design feature or measure shown to equivalently reduce impacts associated with geology and soils to the satisfaction of the Director of Public Works. These include recommendations under the categories of:

- General site preparation
- Compaction
- Fill
- Mat slab foundations
- Post-tensioned slab foundations
- Interior slab-on-grade construction
- Exterior flatwork
- Swimming pool
- Utility trench backfills
- Management of site drainage and finish improvements
- Geotechnical observation and testing

Refer to the Geotechnical Study for full detail recommendations for each of the abovementioned categories.

SIGNIFICANCE AFTER MITIGATION

With implementation of Mitigation Measure GEO-1, the potentially significant impact associated with ground shaking would be reduced to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

a3. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

c. Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

As mentioned above under *Liquefaction*, the project site is located in a liquefaction zone (DOC 2021a). The Geotechnical Engineering Study found that potentially liquefiable soils across the site are discontinuous, and therefore the potential for lateral displacement is considered low. However, there are concerns regarding loose soils in the upper 5 feet of the project site and the potential for settlement due to seismic shaking. Implementation of Mitigation Measure GEO-1 would reduce impacts on liquefaction to a less than significant level. Additionally, with modern construction and required adherence to the geology and soil provisions of the CBC, which sets forth seismic design standards (Chapters 16, 18) and geohazard study requirements (Chapter 18), impacts would be less than significant.

MITIGATION MEASURE AND SIGNIFICANCE AFTER MITIGATION

With implementation of Mitigation Measure GEO-1, the potentially significant impact associated with liquefaction would be reduced to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

a4. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

Earthquakes can trigger landslides that may cause injuries and damage to people and structures. Landslides are typically hazards on or near slopes or hillside areas, rather than generally level areas like the project site and vicinity. According to the DOC, the project site is not located in a landslide zone, and therefore there would be no impact.

NO IMPACT

b. Would the project result in substantial soil erosion or the loss of topsoil?

Ground disturbing activities that would occur during the grading and excavation phase of construction would have the highest potential for erosion, and as a result temporary erosion could occur. However, the project would be required to comply with PAMC Chapters 16.28.070 and 16.28.120, which require measures to minimize surface runoff, erosion, and sedimentation. In addition, the project would be required to comply with erosion control standards administered by the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) through the National Pollutant Discharge Elimination System (NPDES) permit process, which requires implementation of nonpoint source control of stormwater runoff. Furthermore, as mentioned under Section 3, *Air Quality*, the project would be required to comply with BAAQMD best management practices (BMPs) in Section 8.1.2 of the BAAQMD CEQA Guidelines, which address the minimization or avoidance of erosion and loss of topsoil. Additional information related to the prevention of stormwater-induced erosion is provided in Section 10, *Hydrology and Water Quality*. Compliance with these requirements as well as implementation of Mitigation Measure GEO-1 and Mitigation Measure BIO-3 would ensure that impacts of the proposed development associated with soil erosion and the loss of topsoil would be less than significant.

MITIGATION MEASURE AND SIGNIFICANCE AFTER MITIGATION

With implementation of Mitigation Measure GEO-1, which requires incorporation of design measures such as stabilization of surface soils while managing site drainage, and Mitigation Measure BIO-3, which requires implementation of sediment and erosion control measures (e.g., sand or gravel bags, hay bales, check dams) throughout the project site to prevent the entry of sediment and/or pollutants into any waterways or jurisdictional areas, the potentially significant impact associated with erosion or the loss of topsoil would be reduced to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

d. Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property;

Section 21.12.070 of the PAMC requires the preparation of a preliminary soil report in order to determine the presence of expansive soils and recommend corrective action to prevent structural damage. Building on unsuitable soils would have the potential to create future subsidence or collapse issues that could result in the settlement of infrastructure, and/or the disruption of utility lines and other services.

As analyzed in the Geotechnical Engineering Study, the near surface soils on the project site are sandy in nature and therefore are not expansive. Compliance with existing State and local laws and regulations would ensure that impacts associated with expansive soil are minimized by requiring the submittal and review of detailed soils and/or geologic reports prior to construction. Such evaluations must contain recommendations for ground preparation and earthwork specific to the site, which then become an integral part of the construction design. Palo Alto building codes and other City requirements would ensure that potential impacts are minimized or avoided. With implementation of Mitigation Measure GEO-1, impacts associated with expansive soils would be less than significant.

MITIGATION MEASURE AND SIGNIFICANCE AFTER MITIGATION

With implementation of Mitigation Measure GEO-1, the potentially significant impact associated with expansive soils would be reduced to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

e. Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

The proposed project would be connected to the local wastewater treatment system. Septic systems would not be used. There would be no impacts.

NO IMPACT

f. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

There are no unique geological features on the project site. Since the project would include a pool and spa area on the southern portion of the site, maximum depth of excavation could potentially reach no more than 8 feet on the southern portion of the site where the pool is proposed. The project has the potential to uncover unanticipated paleontological resources. This impact is potentially significant.

MITIGATION MEASURES

GEO-2 Discovery of Previously Unidentified Paleontological Resources. In the event a fossil is uncovered during Project construction, all work shall cease until a certified paleontologist can investigate the finds and make appropriate recommendations. Any artifacts uncovered shall be recorded and removed for storage at a location to be determined by the monitor.

SIGNIFICANCE AFTER MITIGATION

Mitigation Measure GEO-2 would provide for the recovery, identification, and curation of previously unrecovered fossils, and Mitigation Measure CR-1 would require implementation of a WEAP prior to ground-breaking activities, which would ensure that potential impacts to paleontological resources be reduced to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

8 Greenhouse Gas Emissions

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	■	☐
b. Conflict with any applicable plan, policy, or regulation adopted to reduce the emissions of greenhouse gases?	☐	☐	■	☐

CLIMATE CHANGE AND GREENHOUSE GAS (GHG) EMISSIONS

Climate change is the observed increase in the average temperature of the earth's atmosphere and oceans along with other substantial changes in climate (such as wind patterns, precipitation, and storms) over an extended period of time. Climate change is the result of numerous, cumulative sources of greenhouse gases (GHG), gases that trap heat in the atmosphere, analogous to the way in which a greenhouse retains heat. Common GHGs include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), fluorinated gases, and ozone (O_3). GHGs are emitted by both natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices and landfills. Man-made GHGs, many of which have greater heat-absorption potential than CO_2, include fluorinated gases, such as hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6) (California Environmental Protection Agency [Cal EPA] 2015).

The accumulation of GHGs in the atmosphere regulates the earth's temperature. Without the natural heat trapping effect of GHGs, Earth's surface would be about 34° C cooler (Cal EPA 2015). However, it is believed that emissions from human activities, particularly the consumption of fossil fuels for electricity production and transportation, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

IMPACT ANALYSIS

a. Would the project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?

b. Would the project conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The project's proposed construction activities, energy use, daily operational activities, and mobile sources (traffic) would generate GHG emissions. However, since the proposed project would involve construction of one single-family residence and an associated accessory structure, and would not involve demolition, simultaneous construction phases, simultaneous construction of more than one land use type, extensive site preparation, or extensive material transport, it would not generate substantial amounts of GHG emissions. For single-family residential uses such as the proposed project, BAAQMD's operational GHG screening size is 56 dwelling units. Therefore, the project would meet the screening criteria for operational GHG emissions.

The project would be consistent with the following goal policies within the 2030 Comprehensive Plan aimed at reducing greenhouse gases through the use of clean and efficient energy (City of Palo Alto 2017a):

- **Goal N-7** A clean, efficient energy supply that makes use of cost-effective renewable resources.
- **Policy N-7.4** Maximize the conservation and efficient use of energy in new and existing residences and other buildings in Palo Alto.
- **Policy N-7.6** Support the maximum economic use of solar electric (photovoltaic) and solar thermal energy, both as renewable supply resources for the Electric Utility Portfolio and as alternative forms of local power generation.
- **Policy N-7.7** Explore a variety of cost-effective ways to reduce natural gas usage in existing and new buildings in Palo Alto in order to reduce associated greenhouse gas emissions.

The proposed project would be fully electric and would utilize energy-efficient appliances and lighting as well as water-efficient appliances and fixtures. The project would also include renewable energy in the form of solar roof panels as well as fully insulated slab construction foundation and exterior insulation on the roof. Therefore, the project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions and this impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

9 Hazards and Hazardous Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	■	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	■	☐
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?	☐	☐	■	☐
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	■
e. For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	■
f. Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	■
g. Expose people or structures to a significant risk of loss, injury, or death involving wildland fires?	☐	☐	■	☐

IMPACT ANALYSIS

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

b. Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?

Residential uses, such as those proposed by the project, typically do not use or store large quantities of hazardous materials other than minor amounts needed for cleaning or landscaping maintenance. During grading and construction activities, limited quantities of miscellaneous hazardous substances, such as gasoline, diesel fuel, hydraulic fluid, solvents, oils, paints, may be transported to the site, used on site, and disposed over after use. However, the project would be required to comply with applicable Federal, State, and local regulations that address the handling, storage, use, and disposal of hazardous substances, including the Occupational Safety and Health Act and the Toxic Substances Control Act. This would eliminate potential significant hazards to the public or the environment through the routine transport, use, or disposal of hazardous materials. Construction contractors would be required to comply with applicable Federal and State environmental and workplace safety laws. The project site is not located within 0.25 mile of an existing or proposed school. Adherence to these regulatory requirements would ensure that impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project create a significant hazard to the public or the environment from existing hazardous materials contamination by exposing future occupants or users of the site or from location on listed hazardous material sites compiled pursuant to Government Code Section 65962.5?

A search of the following databases was conducted on April 27, 2022, for known hazardous materials contamination in the project area:

- EnviroStor Database (Department of Toxic Substances Control [DTSC] 2022a)
- Cortese list of Hazardous Waste and Substances Sites (DTSC 2022b)
- Geotracker search for leaking underground fuel tanks, Spills-Leaks-Investigations-Cleanups (SLIC) and Landfill sites (California State Water Resources Control Board 2022)

According to EnviroStor and GeoTracker, there are no hazardous wastes or cleanup sites located on the project site or within 1,000 feet of the site. The nearest hazardous site to the project is located on Portola Road, approximately 0.6 miles northwest of the project site. Therefore, the project would not create a significant hazard to the public or environment and no impact would occur.

NO IMPACT

e. For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

There are no private airstrips in the vicinity of the site. The Palo Alto Airport of Santa Clara County (PAO) is the closest airport to the project site and is located over 7 miles away. PAO is a 103-acre facility with a single runway, parallel taxiway, and a building area. The airport primarily serves small general aviation aircraft. The area is located entirely outside of the airport safety and traffic pattern zones (Santa Clara County Airport Land Use Commission 2016). Therefore, no impact would occur.

NO IMPACT

f. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The project would involve construction of a single-family residence on a vacant site. The residence would not obstruct existing roadways or require the construction of new roadways or access points. The proposed buildings would not block emergency response or evacuation routes or interfere with adopted emergency response and emergency evacuation plans. No impact would occur.

NO IMPACT

g. Would the project expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

This impact is further discussed under Section 20, *Wildfire*. The project would not expose people lor structures to a significant risk of loss, injury, or death involving wildfires. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

10 Hydrology and Water Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. Violate any water quality standards or waste discharge requirements or otherwise degrade surface or groundwater quality?	☐	■	☐	☐
b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	■	☐
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of a course of a stream or river or through the addition of impervious surfaces in a manner which would:				
1. Result in substantial erosion or siltation on- or off-site?				
2. Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?				
3. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff				
4. Impede or redirect flows	☐	☐	■	☐
d. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	■
e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	■	☐

IMPACT ANALYSIS

a. Would the project violate any water quality standards or waste discharge requirements or otherwise degrade surface or groundwater quality?

Development of the proposed project would introduce heavy equipment during construction and increase traffic to and from the site during operation. This increase in heavy construction equipment and operational traffic could result in an increase in fuel, oil, and lubricants in the stormwater runoff due to leaks or accidental releases.

Since the project would involve development of an individual detached single-family residence not part of a larger common plan of development, it would not constitute a development project under PAMC Section 16.11.020 and therefore would not be required to obtain a NPDES Construction General Permit or develop and implement a Stormwater Pollution Prevention Plan (SWPPP) for construction activities.

In terms of impacts related to operational activities, impervious surfaces can carry a variety of pollutants, including oil and grease, metals, and sediment and pesticide residues from roadways, parking lots, rooftops, and landscaped areas depositing them into adjacent waterways via the storm drain system. The project would be required to comply with the stormwater pollution prevention measures in PAMC Section 16.11.036 as well as the Santa Clara Valley Urban Runoff Pollution Prevention Program's C.3 requirements. Under Section 16.11.036 of the PAMC and C.3, since the project would create 2,500 square feet or more of impervious surfaces, it would be required to implement one of six site design measures but not treatment or hydromodification control measures (County of Santa Clara 2016).

The proposed project, in accordance with PAMC and C.3 requirements, would be designed to direct runoff from roofs and sidewalks into vegetated areas to treat surface runoff before entering the stormwater system, which would also ensure the protection of the Los Trancos Creek from harmful effluent. The project would also implement rainwater catchment systems as well as utilize recycled water for landscape irrigation. Compliance with the PAMC and C.3 requirements would not result in adverse effects on water quality or violate water quality standards or waste discharge requirements during construction or operation. Therefore, excessive stormwater runoff, substantial erosion or siltation on- or off-site would not occur and the potential for the project to violate water quality standards and substantially degrade water quality would be reduced.

As discussed in Section 7, *Geology and Soils,* the proposed project could involve excavation up to 8 feet for the pool and spa structure. According to the Geotechnical Study (Appendix C), groundwater was encountered at 17 to 18 feet below the site. Therefore, it is unlikely that groundwater would be encountered during excavation activities. However, if groundwater were to be encountered, the project would be required to comply with local regulations. According to the City's *Construction Dewatering System Policy and Plan Preparation Guidelines* (City of Palo Alto 2020a), excavation activities that would require excavation within two feet of known groundwater are required to submit a Construction Dewatering Plan to the City's Public Works Department. The Public Works Department would review and permit the dewatering plan prior to commencement of dewatering as part of the Grading and Excavation Permit process. The Construction Dewatering Plan must

comply with the City's Guidelines, which require that water is tested for contaminants prior to initial discharge and at intervals during dewatering. In the dewatering plan, the applicant must include provisions for keeping sediment and contaminated groundwater out of the storm drain system. With adherence to the City's policies regarding dewatering, contaminated groundwater would not enter the stormwater system.

Although Los Trancos Creek is located within the western border of the site, the proposed project would implement a 20 feet creek setback pursuant to Palo Alto's Stream Corridor Ordinance (PAMC Section 18.40.140), and implementation of Mitigation Measure BIO-3 would further minimize soil erosion and reduce potential runoff of pollutants into the creek. Overall, the proposed project would have a less than significant impact on water quality with implementation of Mitigation Measure BIO-3.

MITIGATION MEASURE AND SIGNIFICANCE AFTER MITIGATION

Mitigation Measure BIO-3 would require implementation of avoidance and minimization measures to reduce impacts on and pollutants entering Los Trancos Creek. With mitigation, impacts would be less than significant.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

As discussed in Section 19, *Utilities and Service Systems*, the proposed project would receive its water from the California Water Service (Cal Water) Bear Gulch District. Cal Water uses a combination of local surface water and surface water purchased from the City and County of San Francisco (SFPUC). Local surface water, approximately 11 percent of Cal Water's total supply, is derived from their 1,200-acre watershed in the Woodside hills, collected and treated at Cal Water's reservoir and treatment plant in Atherton. The remaining 89 percent of Cal Water's total supply is purchased from the SFPUC (Cal Water 2022). Therefore, water supply to the project site would not rely on groundwater supplies. Development under the proposed project would not include installation of new groundwater wells or use of groundwater from existing wells. Temporary dewatering during construction would not substantially affect groundwater levels, and because the maximum depth of excavation would not be near existing groundwater levels, the project would not result in a significant depletion of groundwater supply. Therefore, the proposed project would not result in a net deficit in aquifer volume or a lowering of the groundwater table. Impacts related to groundwater would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c1. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of a course of a stream or river or through the addition of impervious surfaces in a manner which would result in substantial erosion or siltation on- or off-site?

c2. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of a course of a stream or river or through the addition of impervious surfaces in a manner which would substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

c3. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of a course of a stream or river or through the addition of impervious surfaces in a manner which would create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

c4. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of a course of a stream or river or through the addition of impervious surfaces in a manner which would impede or redirect flows?

Los Trancos Creek runs along the western border of the project site. The proposed project would not alter the course of this creek or other stream or river (no other surface water features are identified in the project site) and would implement a 20 feet creek setback pursuant to Palo Alto's Stream Corridor Ordinance as noted in Section 18.40.140 of the PAMC. Although the proposed project would increase runoff on the site, it would be consistent with PAMC and C.3 stormwater treatment requirements and would include low sloping roofs with built-in perimeter gutters to direct runoff to vegetated areas, as well as pervious driveways throughout the site in order to reduce pollutants and runoff volume. Therefore, the project would not substantially increase runoff volumes, result in substantial erosion or siltation, result in flooding on- or off-site, or alter the existing drainage pattern of the site or area. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. In flood hazard, tsunami, or seiche zones, would the project risk release of pollutants due to project inundation?

The project site is in Flood Zone X, which is defined by the Federal Emergency Management Agency (FEMA) as area of Minimal Flood Hazard/ 0.2 Percent Annual Chance Flood Hazard (Flood Insurance Rate Map 06085C0180H). The site is not in a Special Flood Hazard Area. According to the State of California Tsunami Inundation Map (DOC 2021b), the site is not located within a tsunami inundation zone. According to the City of Palo Alto's Natural Environment Element and Safety Element of the 2030 Comprehensive Plan, mudflows and seiches are not identified as issues for the city. In addition, the nearest body of water that could experience a seiche event is the San Francisco Bay, and it is not anticipated that a seiche in the Bay would have potential to affect the project site. Therefore, the project site is located in a low hazard area for tsunami, seiche, and mudflow. No impact would occur.

NO IMPACT

e. Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

As discussed under Impact (a) above, the project would not violate water quality standards or degrade water quality during construction or operation.

The City of Palo Alto is under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB). The San Francisco Bay RWQCB provides permits for projects that may affect surface waters and groundwater locally and is responsible for preparing the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). The Basin Plan designates beneficial uses of water in the region and establishes narrative and numerical water quality objectives. The Basin Plan serves as the basis for the San Francisco Bay RWQCB's regulatory programs and incorporates an implementation plan for achieving water quality objectives (California Water Board 2017). The proposed project would not interfere with the objectives and goals in the Basin Plan. This impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

11 Land Use and Planning

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project have any of the following impacts:				
a. *Physically divide an established community?*	☐	☐	■	☐
b. *Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?*	☐	☐	■	☐

IMPACT ANALYSIS

a. Would the project physically divide an established community?

The proposed project would involve construction of a single-family residence on a vacant parcel and would not cut off connected neighborhoods or land uses from each other. No new roads, linear infrastructure or other development features are proposed that would divide an established community or limit movement, travel or social interaction between established land uses. No impact would occur.

NO IMPACT

b. Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental

The proposed project's consistency with the City of Palo Alto 2030 Comprehensive Plan and Zoning Ordinance are discussed below.

CITY OF PALO ALTO 2030 COMPREHENSIVE PLAN

The project site has a Comprehensive Plan land use designation of Open Space/Controlled Development. The Comprehensive Plan defines this category as "Land having all the characteristics of open space but where some development may be allowed on private properties… Residential densities range from 0.1 to 1 dwelling unit per acre but may rise to a maximum of 2 units per acre where second units are allowed, and population densities range from 1 to 4 persons per acre" (City of Palo Alto 2017a). The proposed project involves single-family residential use consistent with the land use designation for this site. Additionally, the project would have a residential density of approximately 0.2 dwelling units per acre, which would be consistent with the allowed density range for the Open Space/Controlled Development land use designation.

CITY OF PALO ALTO ZONING ORDINANCE

The project site is zoned Open Space (OS). The PAMC Section 18.28.010(b) defines the OS district as "intended to protect the public health, safety and welfare, protect and preserve open space land as a limited and valuable resource, and to permit the reasonable use of open space land, while at the same time preserving and protecting its inherent open space characteristics to assure its continued availability for the following: as agricultural land, scenic land, recreation land, conservation or natural resource land; for the containment of urban sprawl and the structuring of urban development; and for the retention of land in its natural or near-natural state, and to protect life and property in the community from the hazards of fire, flood, and seismic activity; and coordinate with and carry out federal, state, regional, county, and city open space plans."

Pursuant to Section 18.28.040 of the PAMC, single-family dwelling units as well as accessory facilities and uses are permitted in the Open Space district. The project proposes a Floor Area Ratio (FAR) of 4 percent, consistent with PAMC requirements under Section 18.28.050(b)(1). Additionally, the proposed project would incorporate 30 feet setbacks in the front, sides, and rear, as well as a maximum height of 25 feet with a maximum number of two stories, consistent with PAMC Section 18.28.050(a).

Therefore, the proposed project would not conflict with the 2030 Comprehensive Plan or the City of Palo Alto Zoning Ordinance and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

12 Mineral Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	■
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	■

SETTING

A small portion of Palo Alto is classified as Mineral Resource Zone-2 (MRZ-2), defined as "adequate information indicated that significant mineral deposits are present or a likelihood of their presence and development should be controlled". The MRZ-2 is located in the southern portion of the city, adjacent to the San Mateo County/Santa Clara County border north of Foothills Park (0.5 mile east of the project site) (City of Palo Alto 2017b). Pursuant to USGS records, there are no known mineral resources or mines present on the project site and work area (USGS 2022).

IMPACT ANALYSIS

a. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

b. Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

The project site and work area are not located in an area with known mineral resources or a mineral resource recovery site. Therefore, the project would not result in the loss of a known mineral resource or mineral resource recovery site. No mineral resource activities would be altered or displaced by the proposed project. There would be no impact.

NO IMPACT

This page intentionally left blank.

13 Noise

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in:				
a. *Generation of a substantial temporary or permanent increase in ambient noise levels in the project vicinity in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?*	☐	☐	■	☐
b. *Generation of excessive groundborne vibration or groundborne noise levels?*	☐	☐	■	☐
c. *For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*	☐	☐	■	☐

SETTING

Noise is unwanted sound that disturbs human activity. Environmental noise levels typically fluctuate over time, and different types of noise descriptors are used to account for this variability. Noise level measurements include intensity, frequency, and duration, as well as time of occurrence. Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound power levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz).

Because of the logarithmic scale of the decibel unit, sound levels cannot be added or subtracted arithmetically. If the physical intensity of a sound is doubled, the sound level increases by 3 dBA, regardless of the initial sound level. For example, 60 dBA plus 60 dBA equals 63 dBA. Where ambient noise levels are high in comparison to a new noise source, the change in noise level would be less than 3 dBA. For example, when 70 dBA ambient noise levels are combined with a 60 dBA noise source the resulting noise level equals 70.4 dBA.

Noise that is experienced at any receptor can be attenuated by distance or the presence of noise barriers or intervening terrain. Sound from a single source (i.e., a point source)

radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. For acoustically absorptive, or soft, sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), ground attenuation of about 1.5 dBA per doubling of distance normally occurs. A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object, proximity to the noise source and receiver, surface weight, solidity, and the frequency content of the noise source. Natural terrain features (such as hills and dense woods) and human-made features (such as buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dBA of noise reduction.

Vibration is a unique form of noise because its energy is carried through buildings, structures, and the ground, whereas noise is simply carried through the air. Thus, vibration is generally felt rather than heard. Some vibration effects can be caused by noise; e.g., the rattling of windows from passing trucks. This phenomenon is caused by the coupling of the acoustic energy at frequencies that are close to the resonant frequency of the material being vibrated. Typically, groundborne vibration generated by manmade activities attenuates rapidly as distance from the source of the vibration increases. The ground motion caused by vibration is measured as particle velocity in inches per second and is referenced as vibration decibels (VdB) in the U.S.

The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel wheeled trains, and traffic on rough roads.

CITY OF PALO ALTO NOISE STANDARDS

The City's Comprehensive Plan Natural Environment Element includes goals and policies related to noise. This element establishes land use compatibility categories for community noise exposure (see Table 2). For residential uses, noise levels up to 60 dBA Ldn are identified as normally acceptable and noise levels between 60 and 75 dBA Ldn are identified as conditionally acceptable.

Table 2 Palo Alto Land Use Compatibility for Community Noise Environments

Land Use Category	Exterior Noise Exposure Ldn or CNEL or dB		
	Normally Acceptable	Conditionally Acceptable	Unacceptable
Residential, Hotel and Motels	50-60	60-75	75+
Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds	50-65	65-80	80+
Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls, Churches	50-60	60-75	75+
Office Buildings, Business Commercial, and Professional	50-70	70-80	80+
Auditoriums, Concert Halls, and Amphitheaters	N/A	50-75	75+
Industrial, Manufacturing, Utilities, and Agriculture	50-70	75+	N/A

Source: City of Palo Alto 2017a

The PAMC regulates noise primarily through the Noise Ordinance, which comprises Chapter 9.10 of the Code, under Title 9, Public Peace, Morals and Safety. The Municipal Code contains additional specific and general provisions relating to noise.

The Noise Ordinance also regulates noise associated with construction activities. Section 9.10.060 of the PAMC restricts construction activities to the hours of 8 AM to 6 PM Monday through Friday and 9 AM to 6 PM on Saturday. Construction is prohibited on Sundays and holidays. Construction, demolition or repair activities during construction hours must meet the following standards:

- No individual piece of equipment shall produce a noise level exceeding 110 dBA at a distance of 25 feet. If the device is housed within a structure on the property, the measurement shall be made out-side the structure at a distance as close to 25 feet from the equipment as possible.
- The noise level at any point outside of the property plane of the project shall not exceed 110 dBA.
- The holder of a valid construction permit for a construction project in a non-residential zone shall post a sign at all entrances to the construction site upon commencement of construction, for the purpose of informing all contractors and subcontractors, their employees, agents, materialmen and all other persons at the construction site, of the basic requirements of this chapter.

PROJECT SITE NOISE ENVIRONMENT

Palo Alto's noise environment is dominated by transportation-related noise, including car and truck traffic and trains. The project site is located in a non-urbanized area and away from noise generating sources such as highways and major roadways. The closest highway to the site is Interstate 280 (I-280), approximately 2.3 miles northeast of the project site.

Residential, educational, and medical uses are more sensitive to noise than are commercial and industrial activities. Noise sensitive uses ("sensitive receptors") are defined as those

facilities including, but not limited to, areas containing residences, schools, hospitals, rest homes, long-term medical or mental care facilities, or any other land use areas deemed noise sensitive by the local jurisdiction. The nearest sensitive receptors to the geometrical center of the proposed structure are a single-family residence located immediately adjacent to the north (approximately 230 feet), as well as a single-family residence approximately 250 feet west of the site.

IMPACT ANALYSIS

a. Would the project generate a substantial temporary or permanent increase in ambient noise levels in the project vicinity in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

CONSTRUCTION NOISE

As discussed above, PAMC Section 9.10.060 regulates temporary construction noise. Construction of the project would generate temporary noise that would be audible at the single-family residence adjacent to the north of project site. Noise associated with construction is a function of the type of construction equipment, the location and sensitivity of nearby land uses, and the timing and duration of the construction activities. Based on construction details provided by the applicant, it is estimated that the construction period would involve approximately 30 days for site preparation, 30 days for grading, 270 days for building construction, 30 days for paving, and 30 days for architectural coating. While all phases of construction would generate noise, the building construction phase would represent the longest period of noise-generating activity. According to applicant provided information, pile drivers would not be used in building construction.

Construction noise was estimated using the Federal Highway Administration's Roadway Construction Noise Model (RCNM) (Appendix D). Noise was modeled based on the list of anticipated equipment list for each phase of construction and the distances to nearby receptors. For a conservative approach, it was assumed that all construction equipment per phase would be operating simultaneously and would combine as a collective noise source. Table 3 shows the results of construction noise modeling from the center of activities for the project at distances of 230 feet and 250 feet from the closest property lines at the single-family residences north and west of the site.

Table 3 Calculated Construction Noise Levels for Each Phase of Construction

Construction Phase	Equipment	Estimated Noise at 230 feet (dBA L_{eq}/dBA L_{max})	Estimated Noise at 250 feet (dBA L_{eq}/dBA L_{max})
Site preparation	Backhoe, compactor, crawler tractor, dozer, dumper/tender, excavator, grader, front-end loader, skid steer loader, sweeper/scrubber	74.6/71.7	73.8/71.0
Grading	Backhoe, compactor, dozer, excavator, grader, front-end loader, skid steer loader, sweeper/scrubber	73.6/71.7	72.9/71.0
Building construction	Aerial lift, cement and mortar mixer, concrete/industrial saw, compactor, compressor, crane, dumper/tender, forklift, generator, pressure washer, pump, rough terrain forklift, skid steer loader, sweeper/scrubber, welder	74.5/76.3	73.8/75.6
Paving	Backhoe, concrete/industrial saw, compactor, crawler tractor, grader, front-end loader, paver, paving equipment, roller, sweeper/scrubber	75.6/76.3	74.5/75.6
Architectural coating	Air compressor	60.4/64.4	59.7/63.7

See Appendix D for calculations.

As shown in Table 3, at the center of the project buildings nearest the property line of the single-family residence north of the site, maximum noise levels generated by project construction equipment are calculated to range from 64.4 to 76.3 dBA L_{max} and 60.4 to 75.6 dBA L_{eq}, while the maximum noise levels from the center of project buildings nearest the property line of the single-family residence west of the site are calculated to range from 63.7 to 75.6 dBA L_{max} and 59.7 to 74.5 dBA L_{eq}. Construction noise levels would therefore be below the City's adopted standard of 110 dBA at any point outside the property line during allowable construction hours (PAMC Section 9.10.060). Impacts related to construction noise would be less than significant.

OPERATIONAL NOISE

Operation of the proposed residence would not substantially increase existing ambient noise levels. The primary sources of noise that would be associated with the project are vehicle trips to and from the residence, stationary noise sources, periodic landscaping (e.g., lawn mower), talking and music. Development of the proposed project would increase the number of vehicle trips to and from the site, which would incrementally increase traffic noise on area roadways. However, the proposed project would be a single-family residence and would not generate substantial trips. In addition, other operational noise sources such as ground level HVAC equipment, landscaping equipment, talking, and music would be comparable to noise from surrounding residences and consistent with existing ambient noise levels. The proposed project would include a vehicle turnaround area in between the

project site and the adjacent single-family residence north of the site. This would place vehicles adjacent to the existing residence. However, noise from vehicles using the turnaround area would be intermittent and would be anticipated to be below 60 dBA. Therefore, the project would not substantially increase ambient noise levels and noise generated during operation would be comparable to nearby single-family residential uses. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

Construction of the project over an anticipated 14-month period would intermittently generate vibration on and adjacent to the project site. Vibration-generating equipment would include excavators, front-end loaders, and dozers for site preparation and grading, and vibratory rollers for paving. It is assumed that pile drivers, which generate strong groundborne vibration, would not be used during construction. The closest noise sensitive receptors from property line to property line are a single-family residence adjacent to the north (35 feet) and single-family residence approximately 50 feet to the west. Table 4 identifies vibration velocity levels at distances of 35 and 50 feet from the source.

Table 4 Vibration Levels for Construction Equipment at Noise-Sensitive Receptors

	Estimated VdB at Nearest Sensitive Receptors	
Equipment	**35 feet**	**50 feet**
Vibratory roller	94	87
Large bulldozer	84	80
Loaded trucks	80	76
Small bulldozer	55	51

Source: Caltrans 2013; See calculations in Appendix D

Based on Table 4, noise-sensitive receptors would experience the strongest vibration of up to 94 VdB during paving with vibratory rollers and up to 84 VdB during the use of large bulldozers during site preparation and grading. Compliance with Section 9.10.060 of the PAMC would restrict vibration-generating construction activity to daytime hours that are outside of normal sleeping hours, i.e., 8 AM to 6 PM Monday through Friday and 9 AM to 6 PM on Saturday. While vibration from construction activity could be perceptible at adjacent residences during daytime hours, this timing restriction would ensure that vibration does not exceed the FTA's criterion of 72 VdB during normal sleeping hours at residential uses. Vibration levels also would not exceed 95 VdB at any fragile historic buildings and therefore would not damage such buildings. The project would have a less than significant impact from groundborne vibration.

LESS THAN SIGNIFICANT IMPACT

c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The Palo Alto Airport (PAO)'s land use plan does not include the project site and is located over 7 miles away. Furthermore, there is no private airstrip in the vicinity of the project site. Thus, future residents would not be exposed to excessive noise levels associated with air traffic.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

14 Population and Housing

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. *Induce substantial unplanned population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?*	☐	☐	■	☐
b. *Displace substantial amounts of existing housing, necessitating the construction of replacement housing elsewhere?*	☐	☐	☐	■

IMPACT ANALYSIS

a. Would the project induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

The current population of Palo Alto is estimated at 67,657 with a per-person household rate of 2.45 (Department of Finance [DOF] 2021). ABAG estimates that the population will increase to 86,510 by 2040 while the per-person household rate will increase to 2.48 (ABAG 2017). The City also currently has 29,406 housing units (DOF 2021). ABAG projections estimate that the number of housing units will increase to 32,940 by 2040.

The project would include development of one single-family residence and an associated accessory structure and would therefore directly generate population growth. The estimated average persons per household in Palo Alto is 2.45 (DOF 2021). Based on that rate, assuming an estimated 2 to 3 people in the main residence and 1 to 2 people in the ADU, the proposed project would add an estimated 3 to 5 new residents. This incremental increase would be within the population forecast for the City. The proposed project would therefore not substantially induce population growth through the provision of new housing units and would result in less than significant impacts.

LESS THAN SIGNIFICANT IMPACT

b. Would the project displace substantial amounts of existing housing, necessitating the construction of replacement housing elsewhere?

There are no existing housing units at the project site or people residing on the project site in a form of temporary housing. Therefore, the project would not displace existing housing units or people. No impacts would occur.

NO IMPACT

This page intentionally left blank.

15 Public Services

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in any of the following impacts:				
a. Result in an adverse physical impact from the construction of additional school facilities in order to maintain acceptable performance standards?	☐	☐	■	☐
b. Result in an adverse physical impact from the construction of additional fire protection facilities in order to maintain acceptable performance standards?	☐	☐	■	☐
c. Result in an adverse physical impact from the construction of additional police protection facilities in order to maintain acceptable performance standards?	☐	☐	■	☐
d. Result in an adverse physical impact from the construction of additional parks and recreation facilities in order to maintain acceptable performance standards?	☐	☐	■	☐
e. Result in an adverse physical impact from the construction of additional library facilities in order to maintain acceptable performance standards?	☐	☐	■	☐

IMPACT ANALYSIS

a. Would the project result in an adverse physical impact from the construction of additional school facilities in order to maintain acceptable performance standards?

Historically, the demand for school facilities has increased nearly proportionally to the amount of new housing that is built in the Palo Alto Unified School District (PAUSD) service area (City of Palo Alto 2017d). The proposed project would involve the construction one single family residence. Assuming the proposed residence would involve 1 or 2 school-aged children, this would not substantially increase enrollment at area schools. In addition, consistent with state law (Section 65995(h) of the California Government Code, Senate Bill 50, chaptered August 27, 1998), new development would be required to pay school impact fees. Payment of developer impact fees pursuant to state law would ensure that adequate school facilities are provided to accommodate future growth. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project result in an adverse physical impact from the construction of additional fire protection facilities in order to maintain acceptable performance standards?

The City of Palo Alto Fire Department (PAFD) provides fire protection, fire suppression, paramedic ambulance service, search and rescue, fire prevention inspections/permits, public fire education programs, emergency preparedness planning, and other services based on community needs. The closest fire department is Station 2 (Mayfield) at 2675 Hanover Street, located approximately 4.5 miles northeast of the project site. The site is within the existing service area of the PAFD and on-site construction would be required to comply with applicable Fire Code requirements. The project involves one single-family residence and would not create excessive demand for emergency services or introduce development to areas outside of normal service range that would necessitate new fire protection facilities. With the continued implementation of existing practices of the City, including compliance with the California Fire Code, the proposed project would not significantly affect community fire protection services and would not result in the need for construction of fire protection facilities.

LESS THAN SIGNIFICANT IMPACT

c. Would the project result in an adverse physical impact from the construction of additional police protection facilities in order to maintain acceptable performance standards?

The Palo Alto Police Department (PAPD) provides police protection for the project vicinity. The closest police station is located at 275 Forest Avenue, approximately 5.8 miles northeast of the project site. The project site is within the PAPD's service area and is currently serviced by the PAPD. The project involves one single-family residence which would not create excessive demand for police services or introduce development to areas outside of normal service range that would necessitate new police protection facilities. The proposed project would not create the need for new or expanded police protection facilities and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project result in an adverse physical impact from the construction of additional parks and recreation facilities in order to maintain acceptable performance standards?

Refer to Section 15, *Recreation.*

LESS THAN SIGNIFICANT IMPACT

e. Would the project result in an adverse physical impact from the construction of additional library facilities in order to maintain acceptable performance standards?

The Palo Alto City Library (PACL) provides library services. The proposed project involves one single-family residence which would incrementally increase population growth in the

City. Overall, the project would not substantially impact the capacity of existing library facilities such that the construction of new facilities would be required.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

16 Recreation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	■
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	■

IMPACT ANALYSIS

a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The City of Palo Alto maintains 174 acres of urban parks distributed throughout the City as well as 43.2 miles of trail and over 4,000 acres in natural open space preserves. The four natural open space preserves are: Baylands Nature Preserve (which includes Byxbee Park), Esther Clark Preserve, Foothills Park, and Pearson-Arastradero Preserve (City of Palo Alto 2017c). The project site is within a mile radius of the Pearson-Arastradero Preserve, and approximately 1.6 miles west of Foothills Park. The proposed project would not involve the construction or expansion of recreational or park facilities. Further, the proposed single-family residence would not generate substantial population growth such that the construction of new park or recreational facilities would be required. No impact would occur.

NO IMPACT

This page intentionally left blank.

17 Transportation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. *Conflict with an applicable plan, ordinance or policy addressing the circulation system, taking into account all modes of transportation, including transit, bicycle, and pedestrian facilities?*	☐	☐	☐	■
b. *Conflict with or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)?*	☐	☐	■	☐
c. *Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?*	☐	☐	■	☐
d. *Result in inadequate emergency access?*	☐	☐	■	☐

IMPACT ANALYSIS

a. Conflict with an applicable plan, ordinance or policy addressing the circulation system, taking into account all modes of transportation, including transit, bicycle, and pedestrian facilities?

The project involves construction of a single-family residence served by an existing road. The proposed project would not affect adopted policies, plans and programs in support of alternative transportation. The project would have no impact on adopted policies, plans, and ordinances addressing the circulation system.

NO IMPACT

b. Conflict with or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)?

Pursuant to the Office of Planning and Research's (OPR) vehicles miles traveled (VMT) Technical Advisory document, small projects that generate or attract fewer than 110 trips per day or residential projects of 20 units or less would be presumed to have a less than significant impact on VMT (City of Palo Alto 2020b). Since the proposed project would involve construction of one single-family residence with an associated accessory structure, the project would not significantly increase VMT.

LESS THAN SIGNIFICANT IMPACT

c. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Construction of the proposed project would occur in a low-density area in Palo Alto where it would take access via an appropriately-sized driveway from an existing road, and would not include hazardous design features or incompatible uses. The proposed project would not require temporary lane detours or closures that would affect traffic patterns or capacity. Therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Result in inadequate emergency access?

As discussed in Section 9, *Hazards and Hazardous Materials*, the proposed project would not involve the development of structures that could potentially impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. No streets would be closed, rerouted or substantially altered. The project would involve the construction of new entryways to the project site, which would be required to be reviewed and approved by the Palo Alto Fire Department to ensure safety emergency access is provided.

LESS THAN SIGNIFICANT IMPACT

18 Tribal Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in a Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	■	☐	☐
b. 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 Public Resources Code Section 2024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	■	☐	☐

SETTING

As of July 1, 2015, California Assembly Bill 52 of 2014 (AB 52) was enacted and expands CEQA by defining a new resource category, "tribal cultural resources." AB 52 establishes that "A project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment" (PRC Section 21084.2). It further states that the lead agency shall establish measures to avoid impacts that would alter the significant characteristics of a tribal cultural resource, when feasible (PRC Section 21084.3).

PRC Section 21074 (a)(1)(A) and (B) defines tribal cultural resources as "sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe" and is:

1. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or
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 Public Resources

Code Section 5024.1. In applying these criteria, the lead agency shall consider the significance of the resource to a California Native American tribe.

AB 52 also establishes a formal consultation process for California tribes regarding those resources. The consultation process must be completed before a CEQA document can be certified. Under AB 52, lead agencies are required to "begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project." Native American tribes to be included in the process are those that have requested notice of projects proposed within the jurisdiction of the lead agency.

In May 2016, the City of Palo received a single request from a tribe to be contacted in accordance AB 52. However, through subsequent correspondence with the tribe, it was concluded that the tribe had contacted the City of Palo Alto in error and did not wish to be contacted regarding future projects within the City's jurisdiction. The tribe, the Torres Martinez Desert Cahuilla Indians, is not traditionally or culturally affiliated with the geographic area within the City of Palo Alto. Because no other tribes have requested to be contacted, no notices in accordance with AB 52 were sent and no further action is required. As discussed in the Cultural Resources Section, a SLF search of the project area was also negative.

IMPACT ANALYSIS

a. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074 that is listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)?*

b. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074 that is 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 Public Resources Code Section 2024.1?*

Although no tribal cultural resources are expected to be present within the project site, there is the possibility of encountering undisturbed subsurface tribal cultural resources during construction activities which could potentially result in significant impacts on unanticipated tribal cultural resources. Therefore, Mitigation Measures CR-1 throughCR-3 would be required to reduce impacts on unidentified tribal cultural resources to a less than significant level.

MITIGATION MEASURES AND SIGNIFICANCE AFTER MITIGATION

Implementation of Mitigation Measure CR-1 would require a WEAP for all construction personnel to inform them of the appropriate procedures required in the event of a discovery. Implementation of Mitigation Measure CR-2 would ensure that locally affiliated Native American tribes be given the opportunity to conduct Native American Monitoring. Implementation of Mitigation Measure CR-3 would require that tribal cultural resources are identified properly and appropriately treated in the unanticipated event they are uncovered during construction. Implementation of these mitigation measures would reduce impacts related to disruption of tribal cultural resources to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

This page intentionally left blank.

19 Utilities and Service Systems

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. *Require or result in the relocation or construction of new or expanded water, wastewater treatment, stormwater drainage, electrical power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?*	☐	☐	■	☐
b. *Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?*	☐	☐	■	☐
c. *Result in a determination by the wastewater treatment provider that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?*	☐	☐	■	☐
d. *Generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?*	☐	☐	■	☐
e. *Comply with federal, state, and local statutes and regulations related to solid waste?*	☐	☐	■	☐

IMPACT ANALYSIS

a. *Require or result in the relocation or construction of new or expanded water, wastewater treatment, stormwater drainage, electrical power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?*

c. *Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?*

WATER

Water to the project site would be supplied by Cal Water's Bear Gulch District pursuant to Cal Water's will serve letter dated August 19, 2021 (Appendix E). This is discussed in further detail under Impact (b) below.

WASTEWATER

Wastewater services would be provided by the West Bay Sanitary District pursuant to the District's will serve letter dated August 17, 2021 (Appendix E). The West Bay Sanitary District conveys wastewater via the Menlo Park Pump Station and force main, to Silicon Valley Clean Water (SVCW) for treatment and eventually discharge to the San Francisco Bay (West Bay Sanitary District 2022). The SVCW regional wastewater treatment plant has an average dry weather flow permitted capacity of 29 million gallons per day (SVCW 2020).

Assuming the proposed project would generate approximately 280 gallons of wastewater per day (City of Los Angeles 2006), the proposed project would generate an estimated 280 gallons of wastewater per day. The increase in wastewater generation associated with the project would be less than 0.000001[2] percent of the permitted capacity of the SVCW regional wastewater treatment plant. Therefore, there would be sufficient wastewater capacity to serve the project site. The proposed project would not exceed wastewater treatment requirements or require or result in the construction of new wastewater treatment facilities or expansion of existing facilities. The proposed project would not result in a substantial physical deterioration of public wastewater facilities. Impacts would be less than significant.

STORMWATER

As discussed under Impact (a) in Section 10, *Hydrology and Water Quality*, pursuant to and in accordance with PAMC and C.3 requirements, the proposed project would be designed to direct runoff from roofs into vegetated areas to treat surface runoff before entering the stormwater system. In addition, the project would also implement rainwater catchment systems as well as utilize recycled water for landscape irrigation. The project would not require or result in the construction of new stormwater facilities or the expansion of existing facilities. Impacts would be less than significant.

ELECTRICITY

The City of Palo Alto Utilities (CPAU) receives electricity at a single connection point with Pacific Gas and Electric's (PG&E's) transmission system. From there the electricity is delivered to customers through nearly 470 miles of distribution lines, of which 223 miles (48 percent) are overhead lines and 245 miles (52 percent) are underground. The City also maintains six substations, roughly 2,000 overhead line transformers, 1,075 underground and substation transformers, and the associated electric services (which connect the distribution lines to the customers' homes and businesses) (City of Palo Alto 2017a). The proposed project would continue to be served by CPAU and would not require or result in

[2] 280 gallons per day divided by 29 million gallons per day (permitted capacity) = less than 0.000001 percent

the construction of new utilities or the expansion of existing facilities. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?

Development of the residential project would increase demand for potable water. Assuming that water use is approximately 120 percent of wastewater generation (280 gallons per day), the proposed project would demand approximately 336 gallons of water per day, or 0.001 acre-feet per day. According to the Cal Water Bear Gulch District 2020 Urban Water Management Plan (UWMP), sufficient water supplies would be available to serve the project from existing entitlements and resources. No new or expanded entitlements would be needed to serve the proposed project. The project would not result in a substantial physical deterioration of public water facilities or result in adverse physical impacts from new or expanded utility facilities due to increased use as a result of the project. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

e. Would the project comply with federal, state, and local statutes and regulations related to solid waste?

The City is currently contracted with GreenWaste of Palo Alto for collection of garbage, recycling and composting services and partners with the cities of Mountain View and Sunnyvale on the Sunnyvale Materials Recovery and Transfer Station (SMaRT Station). The SMaRT Station processes mixed garbage from Palo Alto and recovers recyclable and compostable materials that would have otherwise gone to landfill. The City is also contracted with Waste Management Inc. to use the Kirby Canyon Landfill for waste disposal (City of Palo Alto 2018). The Kirby Canyon Landfill has a remaining capacity of 16,191,600 tons (CalRecycle 2019) and the daily permitted capacity is 2,600 tons per day (Waste Management 2022).

Using the CalRecycle waste generation rate of 12.23 per pound per household per day (CalRecycle 2018), the project would generate approximately 12.23 pounds, or 0.006 tons, of solid waste per day. The incremental increase in solid waste associated with the project would be within the permitted capacities of Kirby Canyon Landfill. Therefore, the project would be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs. The proposed project would not result in a substantial physical deterioration of public solid waste facilities. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

20 Wildfire

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
If located in or near a state responsibility area or land classified as very high fire hazard severity zones, would the project result in any of the following impacts:				
a. *Substantially impact an adopted emergency response plan or emergency evacuation plan?*	☐	☐	■	☐
b. *Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?*	☐	☐	■	☐
c. *Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?*	☐	☐	■	☐
d. *Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result or runoff, post-fire slope instability, or drainage changes?*	☐	☐	■	☐

IMPACT ANALYSIS

a. Would the project substantially impact an adopted emergency response plan or emergency evacuation plan?

According to the Cal Fire Hazard Severity Zone map (Cal Fire 2022), the project site is not located in a Local Responsibility Area (LRA) or State Responsibility Area (SRA) Very High Fire Hazard Severity Zone (VHFHSZ). The project would not obstruct existing roadways or require the construction of new roadways or access points, and project plans include a detailed fire truck turning exhibit showing fire truck access to and within the site and reflecting radius requirements from the PAFD. Therefore, the proposed building would not block emergency response or evacuation routes or interfere with adopted emergency response and emergency evacuation plans. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Due to slope, prevailing winds, and other factors, would the project exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

As mentioned in Impact (a) above, the project site is not located in a LRA or SRA VHFHSZ. The nearest Very High Fire Hazard Severity Zone (VHFHSZ) is located approximately 1 mile northwest of the project site near Portola Valley (Cal Fire 2022). The project would be required to comply with the following 2030 Comprehensive Plan policy listed below which would require fire protection design in new development and ensure adequate emergency access for the PAFD (City of Palo Alto 2017a).

- **Policy S-2.14** Require that the planning and design of development in areas exposed to wildland fire hazards minimize the risks of wildfire and include adequate provisions for vegetation management, emergency access and firefighting.

The project would comply with Policy S-2.14 by requiring fire sprinkler protection in all structures and installing a National Fire Protection Association (NFPA) 13-D fire sprinkler system[3] throughout the house, including closets and bathrooms. The project would also comply with wildland urban interface (WUI) requirements pursuant to the 2019 California Residential Code and Chapter 15 of the PAMC which include requirements for vegetation management; roofing; vents; exterior walls; eaves; exterior porch ceilings, floor projections, underfloor protection, underside of appendages; windows, skylights and doors; garages; decking; and accessory structures (City of Palo Alto 2019). The project site is also in proximity to three fire hydrants, one approximately 750 feet north of the proposed driveway, one approximately 420 feet east of the driveway, and one approximately 990 feet south of the driveway. Therefore, the project would not exacerbate wildfire risks and expose project occupants to pollutant concentrations from a wildfire. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. Would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

The project site is not located in a LRA or SRA VHFHSZ. Although the project would involve the construction of a driveway that would extend from Los Trancos Road (entry) to the proposed single-family residence, the driveway would provide emergency access in the case of a fire, and would not exacerbate wildfire risk. Additionally, the project would not involve the construction of new utility infrastructure or power lines that would worsen wildfire risk. Roads, maintained landscaping, and fire-resistant building materials would help prevent the spread of uncontrolled wildfire. Therefore, wildfire impacts from associated project infrastructure would be less than significant.

LESS THAN SIGNIFICANT IMPACT

[3] The NFPA 13-D sprinkler system is a residential sprinkler design standard focused on low-rise residential occupancies to ensure life safety and property protection (NFPA 2022).

d. Would the project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result or runoff, post-fire slope instability, or drainage changes?

The project site is not located in a landslide hazard zone. Therefore, the project would not substantially expose people or structures to flooding or landslides as a result of runoff, post-fire slope instability, or drainage changes, and would not exacerbate existing hazards. Furthermore, as mentioned in Section 10, *Hydrology and Water Quality*, the project would include low sloping roofs with built-in perimeter gutters to direct runoff to vegetated areas, as well as pervious driveways throughout the site which would ensure that runoff does not exceed the existing capacity of stormwater drainage systems which would reduce the potential of flooding. Impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

This page intentionally left blank.

21 Mandatory Findings of Significance

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. *Have the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self- sustaining levels, eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?*	☐	■	☐	☐
b. *Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?*	☐	☐	■	☐
c. *Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?*	☐	■	☐	☐

IMPACT ANALYSIS

a. *Would the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self- sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?*

As noted under Section 4, *Biological Resources*, implementation of the proposed project may have potentially significant impacts on biological resources since special-status species have the potential to be present on the project site. Mitigation measures BIO-1 through BIO-7 would reduce impacts to special-status plant and animal species and riparian habitats to a less than significant level. Protected trees under PAMC Chapter 8.10 were also surveyed on or adjacent to the project site. However, only one dead coastal live oak tree would be removed as part of the project. Mitigation Measure BIO-8 would still be required

to reduce impacts on retained trees to a less than significant level. As discussed under Section 5, *Cultural Resources*, and Section 18, *Tribal Cultural Resources*, the project would not eliminate important examples of the major periods of California history or prehistory with adherence to Mitigation measures CR-1, CR-2, and CR-3, which would reduce potential impact to unknown resources to less than significant. Overall, impacts would be less than significant with mitigation.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Would the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

There are currently no pending and approved developmental projects in the immediate vicinity of the project that would contribute to the cumulative impact setting (City of Palo Alto 2022b).

Cumulative impacts are addressed in the individual topical sections above: Air Quality, Greenhouse Gas Emissions, Transportation, and Utilities and Service Systems (see CEQA Guidelines Section 15064(h)(3). Some of the other resource areas were determined to have no impact in comparison to existing conditions and therefore would not contribute to cumulative impacts, such as those related to mineral resources and agricultural resources. As such, cumulative impacts in these issue areas would also be less than significant (not cumulatively considerable). With mitigation, the proposed project would not result in a significant cumulative impact with respect to Air Quality, Biological Resources, Cultural Resources, Geology and Soils, and Tribal Cultural Resources. Therefore, overall cumulative impacts would be less than significant with required mitigation.

LESS THAN SIGNIFICANT IMPACT

c. *Would the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?*

In general, impacts to human beings are associated with air quality, geology and soils, hazards and hazardous materials, noise, and wildfire impacts. As detailed in the preceding responses, the project would not result, either directly or indirectly, in substantial adverse impacts related to these issue areas. The project's effects on air quality would be less than significant with implementation of Mitigation Measure AQ-1; and the project's effects on geology and soils would be less than significant with Mitigation Measures GEO-1 and GEO-2. Therefore, impacts would be less than significant with mitigation incorporated.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

REFERENCES

BIBLIOGRAPHY

Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC). 2019. MTC/ABAG Hazard Viewer Map. https://mtc.maps.arcgis.com/apps/webappviewer/index.html?id=4a6f3f1259df42eab29b35dfcd086fc8

California Department of Conservation (DOC). 2002. California Geomorphic Provinces. https://www.conservation.ca.gov/cgs/Documents/Publications/CGS-Notes/CGS-Note-36.pdf

_____. 2021a. Earthquake Zones of Required Investigation Map. https://maps.conservation.ca.gov/cgs/EQZApp/app/

_____. 2021b. Santa Clara County Tsunami Hazard Areas. https://www.conservation.ca.gov/cgs/tsunami/maps/santa-clara

California Department of Forestry and Fire Protection (CAL FIRE). 2022. Fire Hazard Severity Zone viewer. https://egis.fire.ca.gov/FHSZ/ (accessed April 2022)

CalRecycle. 2018. Waste Generation Rates. https://www2.calrecycle.ca.gov/WasteCharacterization/General/Rates

_____. 2019. SWIS Facility/Site Activity Details Kirby Canyon Recycling & Disposal Facility. https://www2.calrecycle.ca.gov/SolidWaste/SiteActivity/Details/1370?siteID=3393

California State Water Resources Control Board. 2022. GeoTracker. https://geotracker.waterboards.ca.gov/map/

Caltrans. 2019. California State Scenic Highway System Map. https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa

California Water Boards San Francisco Bay. 2017. Chapter 3: Water Quality Objectives. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/bp_ch3.html

California Water Service (Cal Water). 2022. Bear Gulch District Information. https://www.calwater.com/district-information/?dist=bg

Department of Toxic Substances Control (DTSC). 2022a. EnviroStor. https://www.envirostor.dtsc.ca.gov/public/map/

_____. 2022b. Cortese List. https://www.envirostor.dtsc.ca.gov/public/search?cmd=search&reporttype=CORTESE&site_type=CSITES,FUDS&status=ACT,BKLG,COM&reporttitle=HAZARDOUS+WASTE+AND+SUBSTANCES+SITE+LIST+%28CORTESE%29

Foster, Elaine, and Heather Blind. 2022. 575 Los Trancos Road Residential Project Cultural Resources Assessment, Palo Alto, Santa Clara County, California. Rincon Consultants Project No. 21-12195. Report on file at the Northwest Information Center, Sonoma State University, California

Los Angeles, City of. City of Los Angeles CEQA Threshold Guidelines. https://planning.lacity.org/eir/CrossroadsHwd/deir/files/references/A07.pdf

National Fire Protection Association (NFPA). 2022. Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies. https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=13R

Office of Emergency Services. 2017. Santa Clara County Operational Area Hazard Mitigation Plan. https://emergencymanagement.sccgov.org/sites/g/files/exjcpb261/files/For%20Partners/Local-Hazard-Mitigation-Plan-LHMP-Vol-1.pdf

Palo Alto, City of. 2005. Palo Alto Single-Family Individual Review Guidelines. https://www.cityofpaloalto.org/files/assets/public/planning-amp-development-services/file-migration/current-planning/forms-and-guidelines/individual-review-guidelines.pdf

_____. 2017a. 2030 Comprehensive Plan. https://www.cityofpaloalto.org/files/assets/public/planning-amp-development-services/3.-comprehensive-plan/comprehensive-plan/full-comp-plan-2030_with-june21-amendments.pdf

_____. 2017b. Comprehensive Plan Update Supplement to the Draft EIR SCH #2014052101. https://www.cityofpaloalto.org/files/assets/public/planning-amp-development-services/3.-comprehensive-plan/comprehensive-plan/paloalto_compplanupdate_suppeir_feb2017.pdf

_____. 2017c. Parks, Trails, Natural Open Space and Recreation Master Plan. https://www.cityofpaloalto.org/files/assets/public/community-services/parks-and-open-space/palo-alto-parks-master-plan.pdf

_____. 2019. Inspection Guidelines: Wildland Urban Interface. https://www.cityofpaloalto.org/files/assets/public/development-services/building-division/residential-guidelines/inspections/wildland-urban-interface_2019-01-09.pdf

_____. 2020a. Regulations for Groundwater Dewatering during Construction of Below Ground Structures. https://www.cityofpaloalto.org/files/assets/public/public-works/engineering-services/webpages/forms-and-permits/regulations-for-groundwater-dewatering-during-construction-of-below-ground-structures-2021.pdf

_____. 2020b. Update to the City's Transportation Analysis Methodology to Comply With Senate Bill 743, Including Use of Vehicle Miles Traveled (VMT) for CEQA Review and Level of Service (LOS) Standard for Local Transportation Analysis. https://www.cityofpaloalto.org/files/assets/public/agendas-minutes-reports/reports/city-manager-reports-cmrs/year-archive/2020/id-11333-senate-bill-743.pdf?t=52295.02

_____. 2022a. Single-Family Individual Review (IR) Guidelines' Key Points Checklist. https://www.cityofpaloalto.org/files/assets/public/development-services/planning-review/1.-single-family-and-duplexes/ir-guideline-checklist-for-applicants.pdf

_____. 2022b. Palo Alto Building Eye. https://paloalto.buildingeye.com/planning

Santa Clara County Airport Land Use Commission. 2016. Palo Alto Airport. https://plandev.sccgov.org/sites/g/files/exjcpb941/files/ALUC_PAO_CLUP.pdf

Santa Clara, County of. 2016. Santa Clara Valley Urban Runoff Pollution Prevention Program C.3 Stormwater Handbook. https://cleanwater.sccgov.org/sites/g/files/exjcpb461/files/SCVURPPP_C.pdf

Silicon Valley Clean Water (SVCW). 2020. 2020-21 Operating Budget. https://svcw.org/wp-content/uploads/2020/11/SVCW-FY2020-21-Budget-Adopted.pdf

United States Geological Survey. N.d. Earthquake Glossary. https://earthquake.usgs.gov/learn/glossary/?term=active%20fault

_____. 2022. Mineral Resources Online Spatial Data. https://mrdata.usgs.gov/general/map-us.html.

Waste Management. 2022. Kirby Canyon Landfill. https://kirbycanyon.wm.com/about-us/index.jsp#:~:text=Capacity%3A,operation%20until%202059%20and%20beyond

West Bay Sanitary District. 2022. West Bay Sanitary District. https://westbaysanitary.org/

LIST OF PREPARERS

Rincon Consultants, Inc. prepared this IS-MND under contract to the City of Palo Alto. Persons involved in data gathering analysis, project management, and quality control include:

RINCON CONSULTANTS, INC.

Abe Leider, AICP CEP, Principal
Leslie Trejo, Project Manager
Karly Kaufman, Senior Advisor
Nichole Yee, Associate Planner
Kristin Asmus, Biologist
Elaine Foster, Archaeologist
Debra Jane Seltzer, Publishing Specialist
Alvin Flores, Publishing Specialist
Allysen Valencia, GIS Analyst

This page intentionally left blank.

Appendix A

Biological Resources Technical Report

Rincon Consultants, Inc.
449 15th Street, Suite 303
Oakland, California 94612

510 834 4455 OFFICE

info@rinconconsultants.com
www.rinconconsultants.com

November 4, 2021
Project No: 21-11882

Emily Foley, AICP
Associate Planner, Planning & Development Services
City of Palo Alto
250 Hamilton Ave. 5th Floor
Palo Alto, California 94301
Via email: Emily.Foley@CityofPaloAlto.org

Subject: Biological Resources Constraints Analysis for the 575 Los Trancos Road Project, Palo Alto, California

Dear Ms. Foley:

Rincon Consultants, Inc. (Rincon) has prepared this Biological Resources Constraints Analysis (BRCA) for the City of Palo Alto (City) of potential biological resources constraints to development at the approximately 5-acre property located at 575 Los Trancos Road in Palo Alto. (APN 182-46-012; Figure 1; Attachment 1). This report documents the existing conditions of the proposed development area within this parcel (hereafter known as the "project site") and identifies sensitive biological resources that do or could occur on the site. Based on the evaluation of sensitive biological resources, the report presents an assessment of the potential significant impacts to biological resources under the California Environmental Quality Act (CEQA) and identifies potential impacts that may require permitting under the California Endangered Species Act (CESA) and/or federal Endangered Species Act (FESA) and/or the Clean Water Act (CWA) and state regulations regarding waters of the State. The report also provides recommendations to address any potential constraints associated with such resources.

Project Location and Description

The project site is an approximately five-acre property located at 575 Los Trancos Road in the City of Palo Alto, Santa Clara County, California. The site is approximately 2.5 miles southwest of U.S. Highway 280. The parcel lies within the *Mindego Hill, California* U.S. Geological Survey (USGS) quadrangle and within the San Francisquito Creek Watershed (Hydrologic Unit Code Number 180500030404). Los Trancos Creek, classified as a riverine habitat, runs west to east along the western border of the project site.

The proposed project would involve construction of a new 7,266 square foot (sf) single-family residence with a new 1,000 sf accessory dwelling unit and associated improvements including a swimming pool and landscaped trees and shrubs. The project site is within the Open Space zoning district. Land use surrounding the project site consists of low-density residential and undeveloped areas. The project site is bordered on the eastern side by Los Trancos Road. The project site consists of an undeveloped and vacant lot, dominated by oak woodland, riparian woodland, and non-native grasses (Figure 2; Attachment 1). The non-native annual grasses are regularly mowed. The project site is surrounded by a residence to the north, Los Trancos Creek to the west, and undeveloped lands to the south and east. See Attachment 2 for representative photographs of the project site.

Methodology

This BRCA includes a review of relevant literature followed by a reconnaissance-level field survey and aquatic resources delineation. The purpose of this BRCA is to document the biological conditions of the project site and to provide information on the potential constrains to development related to sensitive biological resources.

Literature Review

Information on biological resources was compiled from a variety of publicly available sources including:

- Aerial photographs of the project site and vicinity;
- California Department of Fish and Wildlife (CDFW) *California Natural Diversity Database* (CNDDB; CDFW 2021a);
- California Native Plant Society (CNPS) *Inventory of Rare and Endangered Plants* (CNPS 2021);
- CDFW *Biogeographic Information and Observation System* (BIOS; CDFW 2021b);
- CDFW *Special Animals List* (CDFW 2021c);
- CDFW *Special Vascular Plants, Bryophytes, and Lichens List* (CDFW 2021d);
- U.S. Fish and Wildlife Service (USFWS) *Information for Planning and Consultation System* (IPaC; USFWS 2021a);
- USFWS *Critical Habitat Portal* (USFWS 2021b);
- USFWS *National Wetlands Inventory* (NWI; USFWS 2021c);
- USGS *National Hydrography Dataset* (NHD; USGS 2021);
- NOAA Fisheries California Species Tool (National Oceanic and Atmospheric Administration [NOAA] 2021)
- Essential California Habitat Connectivity Project data (available as GIS layers in BIOS [CDFW 2021b]).

In addition, the *Technical Memorandum Biotic Study* (2014) prepared by Wildlife Research Associates (WRA) for an adjacent site was reviewed. The sources outlined above provide general information and coarse-grained data on biological resources to support a preliminary desktop assessment of the biological conditions of the project site. This level of evaluation allows for an assessment of potential constraints to development from sensitive biological resources and is sufficient to support CEQA environmental review. The potential presence of special-status species is based on the literature review which is intended to assess general habitat suitability within the project site only.

Field Reconnaissance Survey

Rincon Biologist Christian Knowlton conducted a field reconnaissance survey on October 5, 2021. Mr. Knowlton surveyed the entire project site on foot and recorded all biological resources encountered on site. Weather conditions at the time of the survey were clear (0% cloud cover) with winds at approximately zero to three miles per hour (mph) and an air temperature of 61 degrees Fahrenheit (F). The survey was conducted to document the existing site conditions, map vegetation communities, and to evaluate the potential for presence of sensitive biological resources, including sensitive plant and animal species, sensitive plant communities, and habitat for nesting birds protected by federal and state laws. During the survey, an inventory of all plant and animal species observed was compiled.

All plant species encountered were noted and identified to the lowest taxonomic level possible given the condition of the materials during the site visit. Plant species nomenclature and taxonomy followed Baldwin et al. (2012) as updated by The Jepson Online Interchange (University of California, Berkeley 2020). (Jepson Flora Project 2021). The vegetation classification system used for this analysis is based on *A Manual of California Vegetation, Second Edition* (MCV2; Sawyer et al. 2009), but has been modified as needed to accurately describe the existing habitats observed on site. Vegetation communities were mapped onto aerial imagery depicting the project site and then later digitized using ArcGIS® (ESRI 2021).

Wildlife identification and nomenclature followed standard reference texts, including Sibley Birds West: Field Guide to Birds of Western North America (Sibley 2016). The habitat requirements for each regionally occurring special-status species were assessed and compared to the type and quality of the habitats observed within the project site during the field survey. Several sensitive species were eliminated from consideration as having potential to occur on site due to lack of suitable habitat, lack of suitable soils/substrate, and/or knowledge of regional distribution.

Existing Conditions

Topography and Soils

Topography of the site is relatively flat, with elevation approximately 535 feet (163 meters) above mean sea level. A review of the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service's online Web Soil Survey (2019) revealed one soil type mapped within the site: Flaskan sandy clay loam, 5 to 9 percent slopes. The Flaskan series consists of very deep, well drained soils that formed in alluvium from mixed rock sources. (USDA 2021b)

Vegetation Communities and General Land Cover Types

Three terrestrial vegetation communities or other land cover types were observed within the project site. A map approximating the types and acreages of the various vegetation communities and land-cover types that occur within the study area is shown in Attachment 1 (Figure 2). Habitat characterizations were based on the classification systems presented in MCV2 (Sawyer et al. 2009); but have been modified slightly to reflect the existing site conditions most accurately. See Attachment 3 for a complete list of plant species observed within the project site.

Coast Live Oak Woodland

Coast live oak woodland (*Quercus agrifolia* Forest and Woodland Alliance) is typically found on canyon bottoms, slopes, and flats with deep sandy or loamy soils throughout the inner and outer Coast Ranges, Transverse Ranges, and southern coast, usually below 1,200 meters. Coast live oak woodlands are widely distributed throughout the state from northern Mendocino County to San Diego County. This community is dominated by coast live oak (*Q. agrifolia*), often including California bay (*Umbellularia californica*) and Pacific madrone (*Arbutus menziesii*). Stands vary from open or continuous to savanna-like. Dense conditions support sparse understory vegetation including California blackberry (*Rubus ursinus*), poison oak, and snowberry (*Symphoricarpos spp.*), while more open stands have a grassy understory (Sawyer et al. 2009; Holland 1986).

Coast live oak woodland is found throughout the project site. Canopy cover is continuous to scattered, with a moderately dense understory of herbs and shrubs. Other observed tree species commonly

associated with coast live oak woodland include California bay and California buckeye (*Aesculus californica*). The shrub layer of the coast live oak woodland is typically poorly developed and the herbaceous layer is mostly continuous with adjacent grasslands. Shrubs in the project site include poison oak, coyote brush, and California blackberry.

Non-native annual grassland

Non-native annual grassland is typically comprised of annual grasses and forbs introduced during and since the Spanish colonial period. This vegetation community most closely resembles the *Avena* spp. – *Bromus* spp. Herbaceous Semi-Natural Alliance described by Sawyer et al. (2009). Non-native annual grassland is generally found in open areas in valleys and foothills throughout coastal and interior California. It typically occurs on soils consisting of fine-textured loams or clays that are somewhat poorly drained. Non-native annual grasses and weedy annual and perennial forbs, primarily of Mediterranean origin, dominate this vegetation type, probably as a result of human disturbance. Scattered native grass and wildflower species, representing remnants of the original vegetation may also be common (Sawyer et al. 2009).

On the project site, this vegetation community primarily occurs in the interior of the site and is surrounded by coast live oak woodland. The majority of the non-native annual grassland within the project site had been previously mowed. Characteristic non-native annual grasses observed include wild oat (*Avena fatua*), Italian rye (*Festuca perennis*), and foxtail barley (*Hordeum murinum*). Many ruderal herbs were also present, including plantain (*Plantago* spp.).

Riparian

Riparian habitat is found along Los Trancos Creek within the project site. This habitat type is similar to coast live oak woodland described above, with the distinction that it occurs along the banks of the creek and is thus riparian habitat. The MCV has moved similar riparian woodlands into the California sycamore – coast live oak riparian woodlands (*Platanus racemosa – Quercus agrifolia* Woodland) alliance, but this vegetation community does not include California sycamore, and the vegetation community present best corresponds to the Central Coast live oak riparian forest as described in Holland (1986). This plant community would be classified as upland where trees are rooted outside of the top of banks at the drainages and as palustrine forested wetland where trees are rooted along the drainage banks, following Cowardin et al. (1979).

General Wildlife

Wildlife activity was low during the reconnaissance survey. Eastern gray squirrel (*Sciurus carolinensis*), Nuttall's woodpecker (*Dryobates nuttallii*), and Steller's jay (*Cyanocitta stelleri*) were observed at the project site during the site survey. See Attachment 4 for a complete list of wildlife species observed within the project site.

Biological Constraints

Special-Status Species

For the purpose of this report, special status species are defined as those plants and animals listed, proposed for listing, or candidates for listing as threatened or endangered by the USFWS or NMFS under

the FESA; those listed or candidates for listing as rare, threatened, or endangered by the CDFW under CESA; animals designated as "Species of Special Concern" (SSC) by the CDFW or "Fully Protected" under the CFGC; and plants with a California Rare Plant Rank (CRPR) of 1B, 2, 3, or 4.

The project site may contain suitable habitat for special-status species. Based on the agency databases and literature review, as well as the results of the reconnaissance survey of the project site, Rincon evaluated 85 special-status species (40 special-status plant species and 45 special-status animal species) documented within the *Mindego Hill*, *California* USGS 7.5-minute topographic quadrangle and the surrounding eight quadrangles (*Woodside*, *Palo Alto*, *Mountain View*, *La Honda*, *Cupertino*, *Franklin Point*, *Big Basin*, and *Castle Rock Ridge*). Each of these 85 species was evaluated for its potential to occur in the project site (see Attachment 5). The majority of special-status species are not expected to occur based on the absence of suitable habitat and/or the project site being outside of the geographic range of the species.

Special-Status Plants

As noted above, based on the database and literature review of records, 40 special-status plant species are known to or have the potential to occur within the regional vicinity of the project site (Attachment 4). Potential to occur within the project site was based primarily on the presence of suitable habitat, determined during the site reconnaissance survey, and the proximity to CNDDB/CNPS documented occurrences. No special-status plant species were detected within the project site during the reconnaissance survey; however, this survey was conducted outside of the seasonal bloom period for many special-status plant species and the project site had been recently mowed. As such, it is possible that these special-status plant species occur at the project site but were simply undetected due to the timing of the reconnaissance survey and problematic vegetation conditions due to regular vegetation maintenance.

Of the 40 special-status plant species, one has a moderate potential to occur on the project site. Woodland woollythreads (*Monolopia gracilens*), CRPR 1B.2, can be found in a variety of habitat types, including some that occur on the project site, such as woodlands and grassy sites in openings. Blooming period for this species is March through July. Multiple occurrences of woodland woollythreads have been recorded within five miles of the project area, including the most recent occurrence from 2018 approximately one mile southwest of the project site. Protections are afforded for this and other special-status plants through CEQA, regardless of their listing status under the FESA, CESA, or the Native Plant Protection Act (NPPA).

Special-Status Animals

Forty-five special-status animal species were reported to occur within the regional vicinity, based on the database and literature review. Habitats within the project site have moderate to high potential to support nine special-status wildlife species: steelhead - central California coast (CCC) distinct population segment (steelhead) (*Oncorhynchus mykiss irideus*), Santa Cruz black salamander (*Aneides niger*), California giant salamander (*Dicamptodon ensatus*), California red-legged frog (*Rana draytonii*), western pond turtle (*Emys marmorata),* San Francisco gartersnake (*Thamnophis sirtalis tetrataenia*) pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*). Each of these species is discussed in more detail below.

Steelhead

The project site is located within the known range of the federally listed as threatened steelhead. Steelhead that occur in this geographic area are considered part of the CCC DPS. This DPS was listed by NMFS in 2006 and includes steelhead populations in streams from the upper Russian River in Mendocino County to Aptos Creek in southern Santa Cruz County (NMFS 2016).

Steelhead are capable of surviving in a wide range of temperature conditions within freshwater and estuarine environments but prefer temperatures less than 57 degrees Fahrenheit. Eggs tend to experience mortality at temperatures greater than 55 degrees Fahrenheit, and steelhead appear to have difficulty obtaining sufficient oxygen from water temperatures greater than 70 degrees Fahrenheit. Elevated summer water temperatures have been identified as a problem (CDFW 1996). Steelhead do best where dissolved oxygen concentrations are at least seven parts per million. In streams, deep low-velocity pools are important wintering habitats. Spawning habitat consists of gravel substrates that are free of excessive silt.

Los Trancos Creek runs along the property boundary on the western side. It is immediately adjacent to the project site and is critical habitat for steelhead. A 20-foot creek setback is marked on the proposed project plan, indicating that the creek is outside the limits of disturbance. Implementation of the proposed project may result in direct or indirect impacts to steelhead at all life stages. The results and conclusions presented herein represent our best professional judgement but do not represent determinations of the NMFS and CDFW as these agencies have ultimate jurisdiction over the steelhead through administration and enforcement of the FESA and CESA, respectively.

Santa Cruz black salamander

Santa Cruz black salamander (*Aneides flavipunctatus niger*) is a state species of special concern. This species is typically found in mixed deciduous woodlands, coniferous forests, and coastal grasslands in Santa Cruz, Santa Clara, and San Mateo counties. They primarily reside in moist habitats with wet soils, rotten logs, and surface debris for cover adjacent to ravines and water courses below 3,500 feet in elevation (Zeiner 1990, CDFW 2021a, Nafis 2020).

Los Trancos Creek and the riparian corridor within the project site provides suitable breeding and foraging habitat for Santa Cruz black salamander. The grassland and oak woodland within the project site may also be utilized by dispersing salamanders. Implementation of the proposed project may result in direct or indirect impacts to individuals within the project site.

California giant salamander

California giant salamander (*Dicamptodon ensatus*) is a state species of special concern that occurs in damp coastal forests and riparian woodland habitats up to 6,500 feet in elevation. Terrestrial adults are commonly found in damp litter, in burrows, or under fallen logs, and aquatic adults typically occur near cold, clear, permanent or semi-permanent water sources with rocky substrates. Breeding occurs from March to May and eggs are laid in slow moving waters and springs and under streambanks (Zeiner 1990, CDFW 2021a, Nafis 2020).

Los Trancos Creek and the riparian corridor within the project site provides suitable breeding and foraging habitat for California giant salamander. The grassland and oak woodland within the project site may also provide habitat for burrowing animals which may provide refugia for California giant

salamander. Implementation of the proposed project may result in direct or indirect impacts to individuals within the project site.

California red-legged frog

The California red-legged frog is federally listed as threatened and a state species of special concern throughout its range. The historic range of California red-legged frog extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, and inland from the vicinity of Redding, Shasta County, southward to northwestern Baja California, Mexico. California red-legged frog inhabits quiet pools of streams, marshes, and ponds. All life history stages are most likely to be encountered in and around breeding sites, which include coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation (USFWS 2011).

Los Trancos Creek and the riparian corridor within the project site may provide suitable breeding habitat, in slow moving pools, and foraging habitat for California red-legged frog. The closest documented breeding habitat is approximately 2.6 miles north of the project site within San Francisquito Creek. The grassland and oak woodland within the project site may also provide habitat for burrowing animals which may provide refugia for California red-legged frog. Implementation of the proposed project may result in direct or indirect impacts to individuals within the project site.

Western pond turtle

Western pond turtle (*Actinemys marmorata* [=*Emys marmorata*]) is a state species of special concern. This species is a semi-aquatic turtle that occurs in ponds, marshes, rivers, streams and irrigation ditches that typically support aquatic vegetation. It requires downed logs, rocks, mats of vegetation, or exposed banks for basking. Western pond turtle lay their eggs in nests dug along the banks of streams or other uplands in sandy, friable soils. Western pond turtles, especially those that reside near creeks, are known to overwinter in upland habitats. Upland movements can be quite extensive, and individuals have been recorded nesting or overwintering hundreds of meters from aquatic habitats. The typical nesting season is usually from April through August; however, variation exists depending upon geographic location.

Los Trancos creek may provide suitable foraging habitat for the western pond turtle. The oak woodland and annual grassland may also provide suitable breeding and foraging habitat. Western pond turtles have been documented approximately 2.9 miles north of the project site within San Francisquito Creek. Implementation of the proposed project may result in direct or indirect impacts to individuals within the project site.

San Francisco garter snake

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) is federally and state listed as endangered. The historical distribution of the San Francisco garter snake included wetland areas on the San Francisco peninsula from the San Francisco County line south along the eastern and western foothills of the Santa Cruz Mountains to at least Upper Crystal Springs Reservoir and Año Nuevo Point in San Mateo County, and Waddell Creek in Santa Cruz County. The San Francisco garter snake occurs in a number of aquatic and terrestrial habitats throughout their range.

San Francisco garter snake has been documented within the San Francisquito Creek watershed, which Los Trancos Creek is a part of. Suitable aquatic and terrestrial habitats are found along Los Trancos

creek. Implementation of the proposed project may result in direct or indirect impacts to individuals within the project site.

Special-Status Bat Species

Pallid bat, and Townsend's big-eared bat are CDFW SSC. Pallid bats are found in grasslands, shrublands, woodlands, and forests, and may roost in trees or buildings. Townsend's big-eared bat are found in a wide variety of habitats and may roost in abandoned buildings or large trees. Bats prefer open areas or open areas under a tree canopy for foraging, and often roost near water. Several large and mature oak trees contain dense canopy cover within the project site may provide suitable roosting habitat for these special-status bat species. Implementation of the proposed project may result in direct or indirect effects to roosting special-status bat species, should they be present within the project site and/or immediate surrounding vicinity.

San Francisco dusky-footed woodrat

The San Francisco woodrat is one of eleven described subspecies of the dusky-footed woodrat (Hooper 1938) and is recognized by the CDFW as a species of special concern. Dusky-footed woodrats are well known for their large terrestrial stick houses/nests, some of which can last for twenty or more years (Linsdale and Tevis 1951). Middens/nests can be placed on the ground against or straddling a log or exposed roots of a standing tree and are often located in dense brush. Middens/nests are also placed in the crotches and cavities of trees and in hollow logs. Sometimes arboreal nests are constructed, this behavior seems to be more common in habitat with evergreen trees such as live oak. The body coloring is brown/grey with white/grey underside and white/dusky coloring on feet. The woodrats have a hairy brown tail, usually with a lighter underside, and large ears (Burt and Gossenheider 1980). The San Francisco dusky-footed woodrat can be found throughout the San Francisco Bay area in grasslands, scrub and wooded areas (Hall 1981).

Several San Francisco dusky-footed woodrat nests were observed during the reconnaissance survey. The oak woodland provides suitable breeding and foraging habitat throughout the project site. Implementation of the proposed project may result in direct or indirect impacts to individuals within the project site.

Nesting Birds

The California Fish and Game Code (CFGC) Section 3503 and the federal Migratory Bird Treaty Act (MBTA) protect native bird species and their nests. The blue oak woodland habitat within and adjacent to the project site provides suitable nesting habitat for a variety of bird species. No active or inactive bird nests were observed within the project site during the reconnaissance-level field surveys. However, species of birds that typically occur in the region, such as red-shoulder hawk (*Buteo lineatus*), Steller's jay, and Anna's hummingbird (*Calypte anna*), may nest in the project site or surrounding area. Implementation of the proposed project may result in direct or indirect effects to nesting bird species, should they be present within the project site and/or immediate surrounding vicinity.

Special-Status Vegetation Communities and Critical Habitat

Sensitive Natural Communities

Plant communities are also considered sensitive biological resources if they have limited distributions, have high wildlife value, include sensitive species, or are particularly susceptible to disturbance. The CDFW ranks sensitive communities as "threatened" or "very threatened" and keeps records of their occurrences in CNDDB. CNDDB vegetation alliances are ranked 1 through 5 based on NatureServe's (2010) methodology, with those alliances ranked globally (G) or statewide (S) as 1 through 3 considered sensitive. Some alliances with the rank of 4 and 5 have also been included in the 2020 sensitive natural communities list under CDFW's revised ranking methodology (CDFW 2020). Three sensitive natural communities are known to occur within the nine-quadrangle search radius, none of which are present within the project site:

- Northern Coastal Salt Marsh
- Serpentine Bunch Grass
- Valley Oak Woodland

Critical Habitat

Critical habitat for steelhead is present in Los Trancos Creek, shown in Appendix A (Figure 2), both within and immediately adjacent to the project site. (NOAA 2021). Designated critical habitat is also located in several of the rivers surrounding the project site within five miles for coho Salmon (Central California Coast ESU; *Oncorhynchus kisutch* pop. 4). However, the project site does not overlap with these rivers and no drainages onsite are connected to the rivers where critical habitat is designated. Designated critical habitat for California red-legged frog and Bay checkerspot butterfly (*Euphydryas editha bayensis*) is located within five miles of the project area (USFWS 2021b); however, the project does not overlap with either of these designated critical habitats.

Oak Trees

Coast live oak trees and valley oak trees with a diameter at breast height of greater than 11.5 inches occur within project site. Pursuant to Section 8.10, *Tree Preservation and Management Regulations*, of the Palo Alto Municipal Code, these on-site oak trees would qualify as protected trees. Under Section 8.10.020, all protected trees that are planned for removal must be approved by the director of planning and development services, on the basis of a tree report prepared by a certified arborist. The proposed project may result in trimming and or disturbance close in proximity to several of the trees and may include work within oak tree driplines. As such, implementation of the proposed project may result in direct or indirect impacts to protected oak trees within the project site.

Jurisdictional Waters and Wetlands

Los Trancos Creek is an intermittent stream within and immediately adjacent to the project site and is potentially under the jurisdiction of the U.S. Army Corps of Engineers (USACE), CDFW, and/or Regional Water Quality Control Board (RWQCB). Riparian habitat (coast live oak woodland) occurs adjacent to the creek. Coast live oak woodland is not a CDFW sensitive natural community, but riparian habitat is considered to be a jurisdictional wetland by CDFW. Project plans appear to avoid impacts to Los Trancos

Creek, however the proposed project may result in indirect impacts to the creek and direct or indirect impacts to riparian habitat if project activities occur within the dripline of the riparian canopy.

Discussion and Recommendations

The project site contains: potentially suitable habitat for one special-status plant species, nine special-status wildlife species and nesting bird species; native oak trees; and potentially jurisdictional areas. If the project will be subject to environmental review under CEQA and there will be impacts to special-status species that are not listed as threatened or endangered under CESA and/or FESA, it may be considered significant and compensatory mitigation and/or specific avoidance and minimization measures may be required before and during construction of the project.

Special-Status Plant Species

The project site contains suitable habitat for one special-status plant species, as described above. It was not observed within the project site during the reconnaissance survey; however, the reconnaissance survey was conducted outside the bloom period for the species. Following are recommendations to address constraints due to the potential presence of special-status plants within the project site:

- A qualified biologist should conduct a protocol level botanical survey, including a site visit during the blooming period in March through July, and to ensure impacts to special-status plant species are avoided, minimized, and/or mitigated.
- If the CRPR 1 rank plant is found, a qualified biologist shall determine if the project will result in a significant impact and if so, prepare compensatory mitigation measures.

Special-Status Wildlife Species

The project site contains suitable habitat for nine special-status wildlife species. Los Trancos Creek is designated critical habitat for steelhead, and the non-native annual grassland in the woodland openings may provide suitable habitat for several other species. The large and mature oak trees on the project site provide potentially suitable habitat for nesting birds as well as special-status bat species. None of these species were observed onsite during the reconnaissance-level field surveys and no focused or protocol-level species surveys were conducted. Following are recommendations to address constraints due to the potential for occurrence of special-status wildlife and the presence of their habitats within the project site:

Steelhead:

Best management practices (BMPs) should be implemented during all construction activities that take place in or adjacent to Los Trancos Creek to prevent erosion and sedimentation into the creek and to prevent the spill of contaminants in or around the creek. Construction should occur between June and December, outside of steelhead migration season in the region.

The following BMPs should be implemented on-site during construction to prevent any indirect impacts to waters and wetlands:

- Vehicles and equipment should be checked at least daily for leaks and maintained in good working order. Spill kits should be available on-site at all times and a spill response plan should be developed and implemented.

- Sediment and erosion control measures (e.g., sand or gravel bags, hay bales, check dams) should be implemented and maintained throughout the project site to prevent the entry of sediment and/or pollutants into any waterways or jurisdictional areas. No monofilament plastic will be used for erosion control.

California Giant Salamander and Santa Cruz Black Salamander

Immediately prior to initial ground disturbance and vegetation removal, a qualified biologist shall conduct a preconstruction clearance survey of the site for special status amphibians. If California giant salamander and/or Santa Cruz black salamander are observed on site, they shall be relocated to suitable habitat in the immediate vicinity by the qualified biologist. The following additional measures shall be implemented to reduce potential impacts:

- Vegetation disturbance shall be the minimum necessary to achieve the goals of the project.
- All trash shall be removed from the site daily and disposed of properly to avoid attracting potential predators to the site.
- No pets shall be permitted on site during project activities.
- All vehicles shall be in good working condition and free of leaks. All leaks shall be contained and cleaned up immediately to reduce the potential of soil/vegetation contamination.
- All hole and trenches shall be covered at the end of the day or ramped to avoid entrapment.

California red-legged frog:

A qualified biologist shall conduct a pre-construction survey within 14 days prior to initiation of construction activities. The USFWS will be notified should California red-legged frog be observed within the project site. The following avoidance and mitigation measures should be implemented to avoid impacts to California red-legged frog:

- Construction crew shall be taught during the WEAP training to check beneath the staging equipment each morning prior to commencement of daily construction activities. Should California red-legged frog occur within the staging areas, construction activities shall be halted until the California red-legged frog vacates the project site on its own or until a biologist with a USFWS Recovery Permit for California red-legged frog relocates the California red-legged frog.

- Prior to ground disturbance a temporary wildlife exclusion barrier shall be installed along the limits of disturbance. A qualified biologist will inspect the area prior to barrier installation. The barrier will be designed to prevent California red-legged frog from entering the project area, and will remain in place until all development activities have been completed. This barrier will be inspected daily by a qualified biologist and maintained and repaired as necessary to ensure that it is functional and is not a hazard to California red-legged frogs or San Francisco garter snakes on the outer side of the barrier.

- A qualified biologist shall be present during all grading and initial ground disturbing activities. Should California red-legged frog be observed within the project site, the USFWS shall be notified and construction shall be halted until either the California red-legged frog exits the site on its own or until a biologist with a USFWS Recovery Permit for California red-legged frog relocates the California red-legged frog.

- No work should occur during a rain event (over 0.25”). If a rain event occurs, a qualified biologist should inspect the site again prior to resuming work.

Western pond turtle

A qualified biologist shall conduct pre-construction clearance surveys for western pond turtle within 48 hours prior to the start of construction (including staging and mobilization) in areas of suitable habitat. The biologist shall flag limits of disturbance for each construction phase. Areas of special biological concern within or adjacent to the limits of disturbance should have highly visible orange construction fencing installed by a contractor between said area and the limits of disturbance. If western pond turtles are observed they shall be allowed to leave the site on their own.

San Francisco garter snake

A qualified biologist shall conduct a focused pre-construction survey within 24 hours of the initiation of project activities. If San Francisco garter snake is found, the USFWS shall be notified immediately to determine the correct course of action and the proposed project shall not begin until approved by the USFWS.

- Construction personnel will participate in a worker environmental awareness program training. The training will cover the need to check beneath and around equipment each morning prior to commencement of daily construction activities. Should San Francisco garter snake occur within the project areas, construction activities shall be halted until the San Francisco garter snake vacates the project site on its own or until a biologist with a USFWS Recovery Permit for San Francisco garter snake relocates the snake.
- Vegetation will be cut to 6 inches in height or when the ground is visible, using hand tools (including string trimmers or chainsaw for brush). Once the ground is visible, a visual survey for San Francisco garter snake will be conducted by the biologist prior to additional ground disturbance. If San Francisco garter snake is found, USFWS will be notified immediate to determine the correct course of action.
- Prior to ground disturbance a temporary wildlife exclusion barrier shall be installed along the limits of disturbance. A qualified biologist will inspect the area prior to barrier installation. The barrier will be designed to prevent San Francisco garter snake from entering the project area and will remain in place until all development activities have been completed. This barrier will be inspected daily and maintained and repaired as necessary to ensure that it is functional and is not a hazard to California red-legged frogs or San Francisco garter snakes on the outer side of the barrier.
- Prior to conducting non-native plant removal or treatments (e.g., spraying with herbicide, cutting, pulling, digging out), the permittee shall make every reasonable attempt to ensure that SFGS are not hidden within the plant or residual plant matter to be treated.

Special-Status Bat Species:

There is suitable roosting habitat for special-status bats present in the large oak trees throughout the project site. Disturbance of maternity roosts from construction activities, resulting in roost destruction or abandonment, would be a potentially significant impact to special-status bat species and would be violations of CFGC. The following are recommendations and possible constraints due to special-status bat species within the project site:

- Prior to tree removal, a qualified biologist should conduct a focused survey of all trees to be removed or impacted by construction activities to determine whether active roosts of special-status bats are present on site. If tree removal is planned for the fall, the survey should be conducted in September to ensure tree removal would have adequate time to occur during seasonal periods of bat activity, as described below. If tree removal is planned for the spring, then the survey should be conducted during the earliest possible time in March, to allow for suitable conditions for both the detection of bats and subsequent tree removal. Trees containing suitable potential bat roost habitat features should be clearly marked or identified.
- If day roosts are found to be potentially present, the biologist should prepare a site-specific roosting bat protection plan to be implemented by the contractor following the City of Palo Alto's approval. The plan should incorporate the following guidance as appropriate:
  - When possible, removal of trees identified as suitable roosting habitat should be conducted during seasonal periods of bat activity, including the following:
    1. Between September 1 and about October 15, or before evening temperatures fall below 45 degrees Fahrenheit and/or more than 0.5 inch of rainfall within 24 hours occurs.
    2. Between March 1 and April 15, or after evening temperatures rise above 45 degrees Fahrenheit and/or no more than 0.5 inch of rainfall within 24 hours occurs.
  - If a tree must be removed during the breeding season and is identified as potentially containing a colonial maternity roost, then a qualified biologist should conduct acoustic emergence surveys or implement other appropriate methods to further evaluate if the roost is an active maternity roost. Under the biologist's guidance, the contractor should implement measures similar to or better than the following:
    1. If it is determined that the roost is not an active maternity roost, then the roost may be removed in accordance with the other requirements of this recommendation.
    2. If it is found that an active maternity roost of a colonial roosting species is present, the roost should not be disturbed during the breeding season (April 15 to August 31).
  - Potential colonial hibernation roosts should only be removed during seasonal periods of bat activity. Potential non-colonial roosts that cannot be avoided should be removed on warm days in late morning to afternoon when any bats present are likely to be warm and able to fly. Appropriate methods should be used to minimize the potential harm to bats during tree removal. Such methods may include using a two-step tree removal process. This method is conducted over two consecutive days and works by creating noise and vibration by cutting non-habitat branches and limbs from habitat trees using chainsaws only (no excavators or other heavy machinery) on day one. The noise and vibration disturbance, together with the visible alteration of the tree, is very effective in causing bats that emerge nightly to feed to not return to the roost that night. The remainder of the tree is removed on day two.

San Francisco dusky-footed woodrat

A qualified biologist should conduct a pre-construction survey for woodrats no more than 14 days prior to construction. Nests within 50 feet of project activity that would not be directly impacted by project activity should be demarcated with a 10-foot avoidance buffer and left intact. If a nest(s) that cannot be avoided are found during the pre-construction survey, an approved biologist should dismantle the nest and relocate it to suitable habitat outside the work area no more than 50 feet away with the goal of ensuring the individuals are allowed to leave the work area(s) unharmed before on site activities begin. Nest relocation should occur within 48 hours of construction activities to ensure that nests are not

reestablished. With the implementation of mitigation (worker training program and relocation of active nests), impacts to San Francisco dusky-footed woodrat would be reduced to less than significant.

Nesting Birds:

There is suitable nesting habitat for nesting birds throughout the project site. If construction activities are scheduled to occur during the avian nesting season (typically February 1 to September 15), then typical avoidance and minimization measures to prevent take of bird nests, eggs or nestlings under CFGC and the MBTA could pose constraints on the project. The following are recommendations and possible constraints due to special-status birds and nesting birds within the project site:

- A general pre-construction nesting bird survey should be conducted by a qualified biologist, within 14 days prior to the initiation of construction activities. If construction is stopped for more than 14 days during the nesting season, a pre-construction survey should be conducted prior to the re-start of construction activities. Surveys should include the disturbance area plus a 200-foot buffer for passerine species, and a 500-foot buffer for raptors.
- If active nests are located, an appropriate avoidance buffer should be established within which no work activity would be allowed which would impact these nests. The avoidance buffer would be established by the qualified biologist on a case-by-case basis based on the species and site conditions. Larger buffers may be required depending upon the status of the nest and the construction activities occurring in the vicinity of the nest. The buffer area(s) should be closed to all construction personnel and equipment until juveniles have fledged and/or the nest is inactive. A qualified biologist should confirm that breeding/nesting is complete, and the nest is no longer active prior to removal of the buffer. If work within a buffer area cannot be avoided, then a qualified biologist should be present to monitor all project activities that occur within the buffer. The biological monitor should evaluate the nesting avian species for signs of disturbance and should have the ability to stop work.

Protected Trees

Pursuant to Chapter 8.10 of the Palo Alto Municipal Code the on-site coast live oak and valley oak trees would qualify as protected trees. Depending on the extent of disturbance, the proposed project may result in trimming and or disturbance close in proximity to several of the trees within the project site. Therefore, Section 8.10.050, *Tree Preservation and Management Regulations* would require an arborist report, conducted by a qualified arborist, tree mitigation may be required in accordance with the City of Palo Alto Tree Technical Manual. Additionally, should one or more protected trees be planned for removal, a tree protection and replacement plan may be required. This plan would include but is not limited to the following protective measures for trees:

- Prior to initiating any construction activity on a construction project, including demolition or grading, temporary protective fencing should be installed at each site tree.
    1. Fencing should be located at the Tree Protection Zone (TPZ) illustrated on the Improvement Plans.
    2. Fencing should serve as a barrier to prevent encroachment of any type by construction activities, equipment, materials storage, or personnel.
- The Tree Protection Zone (TPZ) is illustrated on the Improvement Plans and represents the area around each tree, or group of trees, which must be protected at all times with tree protection fencing.

1. No encroachment into the TPZ is allowed at any time without approval from the project arborist.
2. Any unauthorized entry into the TPZ is a violation of the Tree Protection Ordinance and shall be subject to enforcement through civil, criminal or administrative remedies, including applicable penalties.

- Contractors and subcontractors should direct all equipment and personnel to remain outside the fenced area at all times until project is complete and should instruct personnel and sub-contractors as to the purpose and importance of fencing and preservation.
- No grade changes should be made within the protective barriers without prior approval by the Planning Director.
- No attachments or wires other than those of a protective or non-damaging nature should be attached to a protected tree.
- Excavation or landscape preparation within the protective barriers should be limited to the use of hand tools and small handheld power tools and should not be of a depth that could cause root damage.
- When the existing grade around a protected tree is to be raised the project and/or City arborist should provide written directions on which method(s) may be used to drain liquids away from the trunk.
- When the existing grade around a protected tree is to be lowered the project and/or City arborist should provide written directions on which method(s) may be used (terracing, retaining wall, etc.) to allow the dripline to be left at the original grade.
- No equipment, solvents, paint, asphalt, or debris of any kind should be placed, stored, or allowed within the protective barrier.

Potentially Jurisdictional Areas

Los Trancos Creek is within and adjacent to the project area. It is a tributary to San Francisquito Creek, which flows into San Francisco Bay, a Traditional Navigable Water, thus it is potentially under the jurisdiction of USACE, CDFW, and the Regional Water Quality Control Board (RWQCB). In addition, riparian habitat on the project site would be considered jurisdictional by CDFW and RWQCB. Therefore, the following avoidance and minimization measures are recommended:

- If the project will avoid impacts to the riparian area (shown on Figure 2), we recommend installing high visibility orange construction fence between the jurisdictional areas and the construction activities, including a 20-foot buffer setback, to avoid all potential impacts to jurisdictional areas.
- If the project will impact the riparian areas, a formal delineation report and map should be prepared. If wetland areas cannot be avoided, regulatory permits from USACE, CDFW, and RWQCB would be required prior to construction.
- Vehicles and equipment should be checked at least daily for leaks and maintained in good working order. Spill kits should be available on-site at all times and a spill response plan should be developed and implemented.
- Sediment and erosion control measures (e.g., straw wattles, silt fence, check dams) should be implemented and maintained throughout the project site to prevent the entry of sediment and/or pollutants into any waterways or jurisdictional areas. No monofilament plastic will be used for erosion control.

Conclusion

As noted above, this report is intended to identify sensitive biological resources and potential occurrence of special-status species that represent potential constraints to development of the 575 Los Trancos Road project. This report provides analysis sufficient to support CEQA, though further analysis may be required for compliance with FESA, or CESA, and/or the CFGC. Thank you for the opportunity to support your environmental analysis needs for this important project. Please contact us if you have any questions.

Sincerely,
Rincon Consultants, Inc.

Christian Knowlton
Biologist

Sherri Miller
Principal

Attachments

Attachment 1 Figures
Attachment 2 Representative Site Photographs
Attachment 3 Plant Species List Observed
Attachment 4 Wildlife Species List Observed
Attachment 5 Special-Status Species Evaluation Tables

References

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, editors. 2012. The Jepson Manual: Vascular Plants of California, second edition. University of California Press, Berkeley.

Burt, W.H., and R.P. Grossenheider. 1980. A Field Guide to the Mammals of North America North of Mexico. The Peterson Field Guide Series.

California Department of Fish and Wildlife (CDFW). 2020. California Sensitive Natural Communities Arranged Alphabetically by Life Form (PDF). Available from https://www.wildlife.ca.gov/Data/VegCAMP/Natural-Communities#sensitive%20natural%20communities (accessed October 2021).

____. 2021a. California Natural Diversity Database (CNDDB), Rarefind 5 (online). Commercial Version. (accessed October 2021).

____. 2021b. Biogeographic Information and Observation System (BIOS). http://bios.dfg.ca.gov (accessed October 2021).

____. 2021c. Special Animals List. July. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline (accessed October 2021).

____. 2021d. Special Vascular Plants, Bryophytes, and Lichens List. July. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109383&inline (accessed October 2021).

____. 1996. Steelhead Restoration and Management Plan. Department of Fish and Game, Sacramento, California. February. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=3490&inline.

California Native Plant Society (CNPS). 2021. Inventory of Rare and Endangered Plants of California (online edition, v9-01 0.0). https://www.rareplants.cnps.org (accessed October 2021).

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. https://www.fws.gov/wetlands/documents/classwet/index.html#contents (accessed October 2021).

Hall, E. R. 1981. *The Mammals of North America*, Vol I, 2nd edition. John Wiley & Sons, New York. 690+92 pp.

Holland, Robert F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Wildlife, Nongame Heritage Program. 156 pgs.

Hooper, E. T. 1938. Geographical variation in woodrats of the species *Neotoma fuscipes*. University of California Publications in Zoology 42:213-245.

Jepson Flora Project (eds.). 2021. Jepson eFlora, https://ucjeps.berkeley.edu/eflora/

Leidy, R.A., G.S. Becker, B.N. Harvey (2005). "Historical distribution and current status of steelhead/rainbow trout (*Oncorhynchus mykiss*) in streams of the San Francisco Estuary, California." Center for Ecosystem Management and Restoration, Oakland, California. Retrieved October 2021.

Linsdale, J.M and L. P. Tevis. 1951. *The Dusky-footed Wood Rat: A Record of Observations Made on the Hastings Natural History Reservation*. University of California Press. Berkeley and Los Angeles. 664 pp.

Nafis, G. 2000-2020 California Herps - A Guide to the Amphibians and Reptiles of California. Available at: http://www.californiaherps.com/ (accessed October 2021).

National Oceanic and Atmospheric Administration (NOAA). 2021. California Species List Tools. https://www.westcoast.fisheries.noaa.gov/maps_data/california_species_list_tools.html

National Marine Fisheries Service (NMFS). 2016. Final Coastal Multispecies Recovery Plan for California Coastal Chinook Salmon, Northern California Steelhead and Central California Coast Steelhead. NMFS, Southwest Region, Santa Rosa, California.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society, Sacramento, CA. 1300 pp.

Sibley. 2016. Sibley Birds West: Field Guide to Birds of Western North America. Knopf; second edition.

United States Department of Agricultural (USDA), Natural Resources Conservation Service (NRCS). 2019. *Web Soil Survey*. July 31, 2019. Available at: http://websoilsurvey.nrcs.usda.gov/app/ (accessed October 2021).

U.S. Fish and Wildlife Service (USFWS). 2021a. Information, Planning, and Conservation Online Tool [online]. http://ecos.fws.gov/ipac/ (accessed October 2021).

____. 2021b. Designated Critical Habitat Portal [online]. http://criticalhabitat.fws.gov/crithab/ (accessed October 2021).

____. 2021c. National Wetlands Inventory Online Application. http://www.fws.gov/wetlands/Data/Mapper.html (accessed October 2021).

____. 2011. California Red-legged Frog (Rana draytonii) species account. Arcata Fish and Wildlife Office, Arcata, California. https://www.fws.gov/arcata/es/amphibians/crlf/crlf.html (accessed October 2021).

United States Geological Service (USGS). 2021. National Hydrography Dataset. https://nhd.usgs.gov/index.html (accessed October 2021).

University of California, Berkeley. 2020. University and Jepson Herberia. https://ucjeps.berkeley.edu/interchange/ [Accessed October 2021].

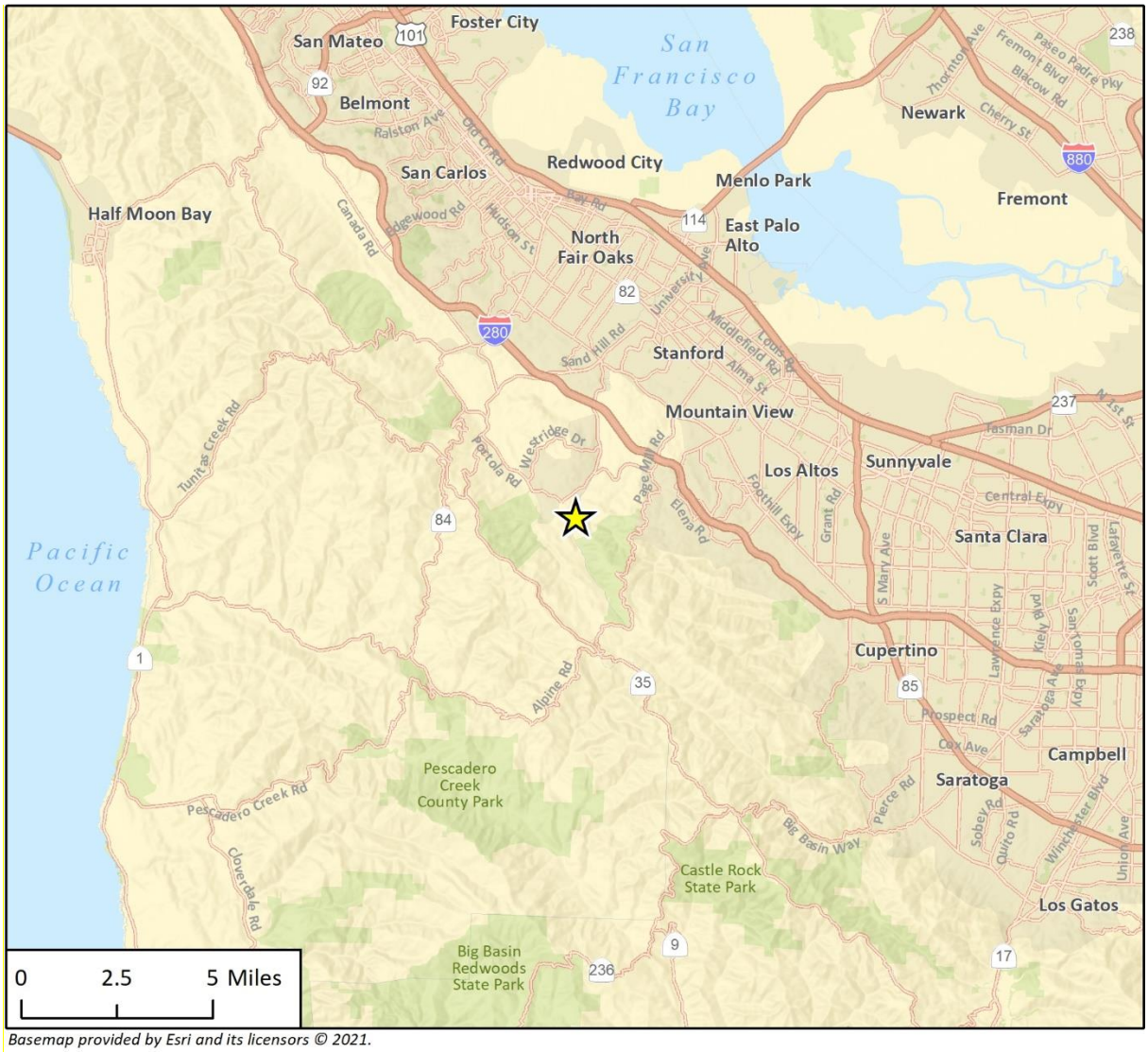
WRA (Wildlife Research Associates). 2014. Technical Memorandum Biotic Study: 805 Los Trancos Road, Palo Alto, California. May 27, 2008. Updated October 16, 2014.

Zeiner, D., W.F. Laudenslayer, Jr., and K.E. Mayer. 1988-1990. California's Wildlife. California Statewide Wildlife Habitat Relationship System, Volumes I, II, & III. California Department of Fish and Wildlife.

Attachment 1

Figures

Figure 1 Regional Location



Basemap provided by Esri and its licensors © 2021.

Project Location

N

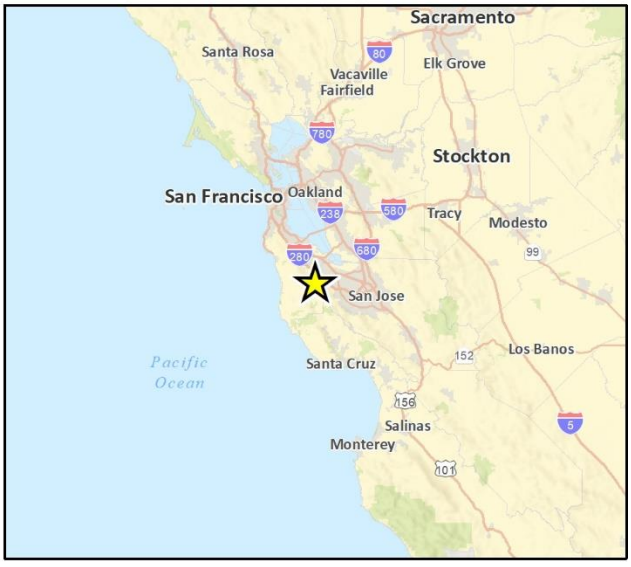
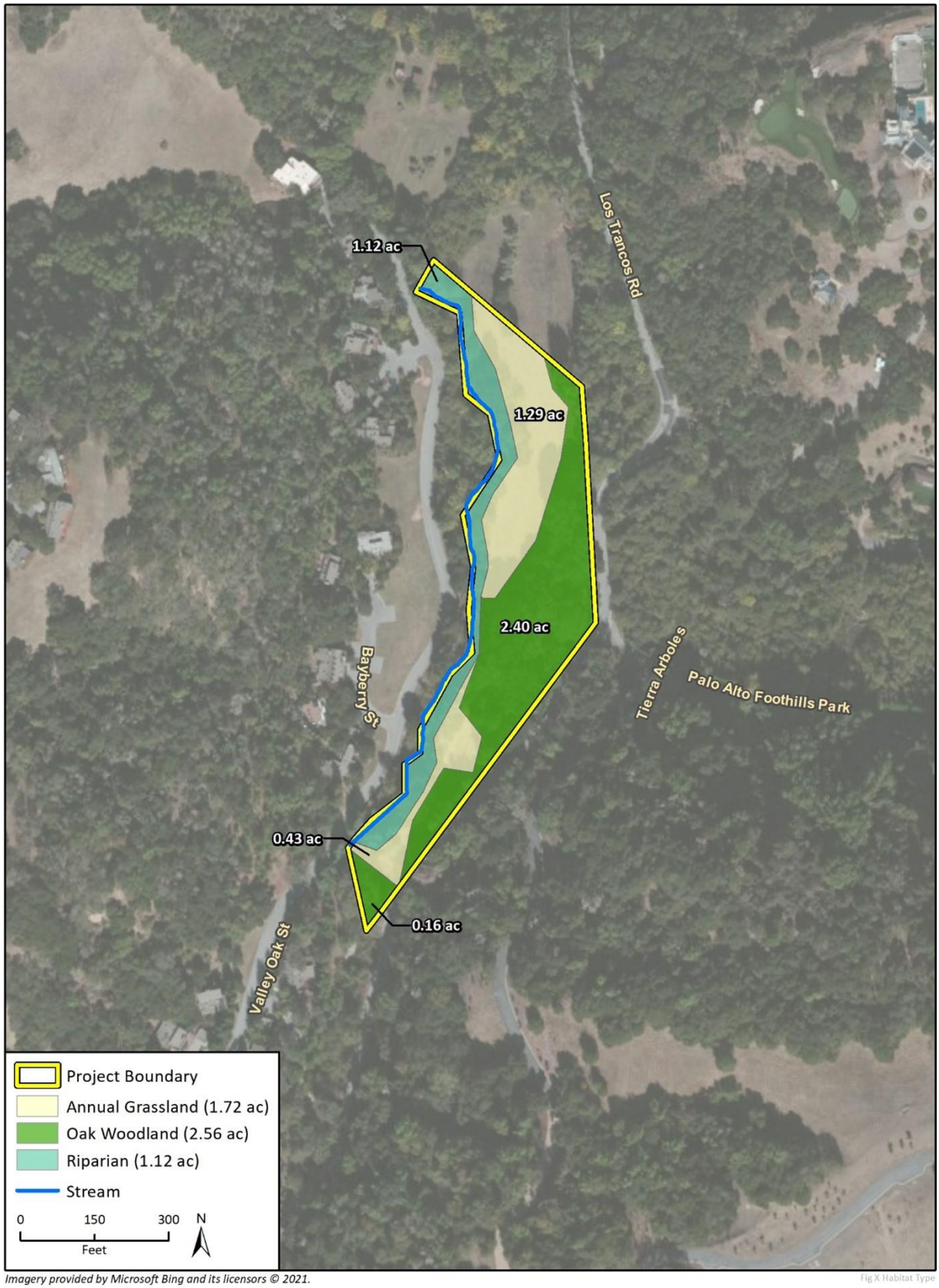


Figure 2 Land Cover Types



Attachment 2

Representative Site Photographs

Photograph 1. Overview of the coast live oak woodland within the project site. Photograph taken from the northern end of the project site, facing south.

Photograph 2. View of mowed non-native annual grassland surrounded by the oak woodland within the project area facing the northern boundary of the project area.

Photograph 3. Photograph of Los Trancos creek immediately adjacent to the west of the project area.

Photograph 4. San Francisco dusky footed woodrat nest within the project area.

Photograph 5. View of the oak woodland at the southern extent of the project area.

Photograph 6. View of the riparian woodland along the southern extent of the project area.

Photograph 7. Representative photo of the oak woodland within the project area.

Attachment 3

Plant Species List Observed

Scientific Name	Common Name	Origin & Cal-IPC Status[1]
Aesculus californica	California buckeye	Native
Artemesia douglasiana	mugwort	Native
Avena spp.	wild oats	Introduced; Cal-IPC Moderate
Bromus diandrus	ripgut grass	Introduced; Cal-IPC Moderate
Cynodon dactylon	Bermuda grass	Introduced; Cal-IPC Moderate
Genista monspessulana	French broom	Introduced; Cal-IPC High
Plantago lanceolata	English plantain	Introduced; Cal-IPC Limited
Quercus agrifolia	Coast live oak	Native
Quercus lobata	valley oak	Native
Rubus armeniacus	Himalayan blackberry	Introduced; Cal-IPC High
Salix lasiolepis	arroyo willow	Native
Toxicodendron diversilobum	poison oak	Native
Umbellularia californica	California bay	Native

[1] Cal-IPC: California Invasive Plant Council ratings

Attachment 4

Wildlife Species List Observed

Scientific Name	Common Name
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat
Dryobates nuttallii	Nuttall's woodpecker
Melanerpes formicivorus	Acorn woodpecker
Sciurus niger	Fox squirrel
Cyanocitta stelleri	Steller's jay
Certhia americana	Brown creeper
Sciurus carolinensis	Eastern gray squirrel
Melozone crissalis	California towhee
Junco hyemalis	Dark eyed junco

Attachment 5

Special-Status Species Evaluation Tables

Special-Status Plant Species in the Regional Vicinity (Nine Quad) of the Project Site

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Acanthomintha duttonii San Mateo thorn-mint	FE/SE G1/S1 1B.1	Chaparral, Valley and foothill grassland. Uncommon serpentinite vertisol clays; in relatively open areas. 50-300m. Blooms Apr-Jun.	Not Expected	Suitable serpentine soils not present. One historic occurrence from 1977 has been recorded within 5 miles, approximately 5 miles to the north of the site, and is considered extirpated (CDFW 2021a).
Allium peninsulare var. franciscanum Franciscan onion	None/None G5T2/S2 1B.2	Cismontane woodland, Valley and foothill grassland. Clay soils; often on serpentine; sometimes on volcanics. Dry hillsides. 52-305m. Blooms (Apr)May-Jun.	Not Expected	Suitable woodland habitat and grasslands are present. No native grassland communities are present within the site. Clay soils are present; however, no serpentine formations occur within the project site. One recent occurrence from 2013 is recorded within 5 miles of the project site, approximately 3.25 miles to the northeast (CDFW 2021a).
Amsinckia lunaris bent-flowered fiddleneck	None/None G3/S3 1B.2	Cismontane woodland, Coastal bluff scrub, Valley and foothill grassland. 3-500m. Blooms Mar-Jun.	Not Expected	Grasslands and coast live oak woodland are present. The non-native grasslands present are not a natural vegetation community and are frequently disturbed by mowing. No occurrences have been reported within 5 miles (CDFW 2021a).
Arctostaphylos andersonii Anderson's manzanita	None/None G2/S2 1B.2	Broadleafed upland forest, Chaparral, North Coast coniferous forest. Open sites, redwood forest. 60-760m. Blooms Nov-May.	Not Expected	Suitable vegetation communities absent. This species would have been observed if present.
Arctostaphylos regismontana Kings Mountain manzanita	None/None G2/S2 1B.2	Broadleafed upland forest, Chaparral, North Coast coniferous forest. Granitic or sandstone outcrops. 305-730m. Blooms Dec-Apr.	Not Expected	Suitable vegetation communities, elevations, and rock outcrops absent. Would have been observed if present.
Astragalus pycnostachyus var. *pycnostachyus* coastal marsh milk-vetch	None/None G2T2/S2 1B.2	Coastal dunes, Coastal scrub, Marshes and swamps. Mesic sites in dunes or along streams or coastal salt marshes. 0-30m. Blooms (Apr)Jun-Oct.	Not Expected	No suitable habitat or elevations occurs in the project site.

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Astragalus tener var. *tener* alkali milk-vetch	None/None G2T1/S1 1B.2	Playas, Valley and foothill grassland, Vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools. 1-60m. Blooms Mar-Jun.	Not Expected	No suitable habitat occurs in the project site. Outside of suitable elevation.
Centromadia parryi ssp. *congdonii* Congdon's tarplant	None/None G3T1T2/S1S2 1B.1	Valley and foothill grassland. Alkaline soils, sometimes described as heavy white clay. 0-230m. Blooms May-Oct(Nov).	Not Expected	Suitable soils absent.
Chloropyron maritimum ssp. *palustre* Point Reyes salty bird's-beak	None/None G4?T2/S2 1B.2	Marshes and swamps. Usually in coastal salt marsh with Salicornia, Distichlis, Jaumea, Spartina, etc. 0-10m. Blooms Jun-Oct.	Not Expected	No suitable habitat occurs in the project site.
Chorizanthe pungens var. hartwegiana Ben Lomond spineflower	FE/None G2T1/S1 1B.1	Lower montane coniferous forest. Zayante coarse sands in maritime ponderosa pine sandhills. 90-610m. Blooms Apr-Jul.	Not Expected	No suitable habitat occurs in the project and it does not contain maritime ponderosa forests.
Cirsium fontinale var. fontinale fountain thistle	FE/SE G2T1/S1 1B.1	Chaparral, Cismontane woodland, Meadows and seeps, Valley and foothill grassland. Serpentine seeps and grassland. 45-175m. Blooms (Apr)May-Oct.	Not Expected	No suitable habitat occurs in the project site and serpentine soils are not present.
Collinsia corymbosa round-headed Chinese-houses	None/None G1/S1 1B.2	Coastal dunes. 0-20m. Blooms Apr-Jun.	Not Expected	No suitable habitat or elevations occur in the project site.
Collinsia multicolor San Francisco collinsia	None/None G2/S2 1B.2	Annual herb. Blooms March-May. Closed-cone coniferous forest, coastal scrub. On decomposed shale (mudstone) mixed with humus. 30-250m (100-820ft).	Not Expected	Closed cone coniferous forests and suitable soils are absent.
Dirca occidentalis western leatherwood	None/None G2/S2 1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Closed-cone coniferous forest, North Coast coniferous forest, Riparian forest, Riparian woodland. On brushy slopes, mesic sites; mostly in mixed evergreen & foothill woodland communities. 25-425m. Blooms Jan-Mar(Apr).	Not Expected	Suitable habitat, including riparian woodland is present on the project site; however, this species would have been observed if present.

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Eriophyllum latilobum San Mateo woolly sunflower	FE/SE G1/S1 1B.1	Cismontane woodland, Coastal scrub, Lower montane coniferous forest. Often on roadcuts; found on and off of serpentine. 45-330m. Blooms May-Jun.	Low Potential	Coast live oak woodland is present. One historic occurrence from 1962 is recorded within 5 miles of the project site, approximately 1.8 miles to the southwest (CDFW 2021a).
Eryngium aristulatum var. *hooveri* Hoover's button-celery	None/None G5T1/S1 1B.1	Vernal pools. Alkaline depressions, vernal pools, roadside ditches and other wet places near the coast. 3-45m. Blooms (Jun)Jul(Aug).	Not Expected	No suitable habitat occurs in the project site, which outside of known elevation for this species.
Eryngium jepsonii Jepson's coyote-thistle	None/None G2/S2 1B.2	Valley and foothill grassland, Vernal pools. Clay. 3-300m. Blooms Apr-Aug.	Not Expected	No vernal pools within the project site. Suitable soils not present
Fissidens pauperculus minute pocket moss	None/None G3?/S2 1B.2	North Coast coniferous forest. Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 10-1024m.	Not Expected	No suitable habitat occurs in the project site, and no occurrences have been recorded within 5 miles (CDFW 2021a).
Fritillaria liliacea fragrant fritillary	None/None G2/S2 1B.2	Cismontane woodland, Coastal prairie, Coastal scrub, Valley and foothill grassland. Often on serpentine; various soils reported though usually on clay, in grassland. 3-410m. Blooms Feb-Apr.	Low Potential	Suitable habitat present although no serpentine soils were observed on the project site. One historical occurrence from 1932 has been recorded within 5 miles of the project site, approximately 2.5 miles to the north (CDFW 2021a).
Hesperocyparis abramsiana var. *abramsiana* Santa Cruz cypress	FT/SE G1T1/S1 1B.2	Chaparral, Closed-cone coniferous forest, Lower montane coniferous forest. Restricted to the Santa Cruz Mountains, on sandstone & granitic-derived soils; often w/*Pinus attenuata*, redwoods. 280-800m. Blooms .	Not Expected	No suitable habitat or elevation occurs in the project site. Would have been observed if present.
Hesperocyparis abramsiana var. *butanoensis* Butano Ridge cypress	FT/SE G1T1/S1 1B.2	Chaparral, Closed-cone coniferous forest, Lower montane coniferous forest. Sandstone. 400-490m. Blooms Oct.	Not Expected	No suitable habitat or elevation occurs in the project site. Would have been observed if present.
Hesperolinon congestum Marin western flax	FT/ST G1/S1 1B.1	Chaparral, Valley and foothill grassland. In serpentine barrens and in serpentine grassland and chaparral. 5-370m. Blooms Apr-Jul.	Not Expected	Suitable soils are absent.

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Hoita strobilina Loma Prieta hoita	None/None G2?/S2? 1B.1	Chaparral, Cismontane woodland, Riparian woodland. Serpentine; mesic sites. 30-860m. Blooms May-Jul (Aug-Oct).	Not Expected	Although suitable woodlands, including riparian woodlands occur on the project site, suitable serpentine soils are absent and no occurrences have been recorded within 5 miles.
Legenere limosa legenere	None/None G2/S2 1B.1	Vernal pools. In beds of vernal pools. 1-880m. Blooms Apr-Jun.	Not Expected	No suitable vernal pool habitat occurs in the project site.
Limnanthes douglasii ssp. *sulphurea* Point Reyes meadowfoam	None/SE G4T1/S1 1B.2	Coastal prairie, Marshes and swamps, Meadows and seeps, Vernal pools. Vernally wet depressions in open rolling, coastal prairies and meadows; typically in dark clay soil. 0-140m. Blooms Mar-May.	Not Expected	No suitable habitat occurs in the project site.
Malacothamnus arcuatus arcuate bush-mallow	None/None G2Q/S2 1B.2	Chaparral, Cismontane woodland. Gravelly alluvium. 15-355m. Blooms Apr-Sep.	Low Potential	Suitable woodland habitat is present; however, regular vegetation maintenance decreases the likelihood of their occurrence. No individuals were observed during the site visit.Two recent occurrences (2013 and 2015) have been recorded within 5 miles of the project site (CDFW 2021a).
Monolopia gracilens woodland woollythreads	None/None G3/S3 1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, North Coast coniferous forest, Valley and foothill grassland. Grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns, but may have only weak affinity to serpentine. 100-1200m. Blooms (Feb)Mar-Jul.	Moderate Potential	Suitable habitat is present within the project site and three recent occurrences (2015-2018) have been recorded within 5 miles of the project site (CDFW 2021a).
Pedicularis dudleyi Dudley's lousewort	None/SR G2/S2 1B.2	Chaparral, Cismontane woodland, North Coast coniferous forest, Valley and foothill grassland. Deep shady woods of older coast redwood forests; also in maritime chaparral. 60-900m. Blooms Apr-Jun.	Low Potential	Woodland habitat occurs on the project site however, deep shady forests and maritime chapparal are absent. No occurrences have been recorded within 5 miles (CDFW 2021a).

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Pentachaeta bellidiflora white-rayed pentachaeta	FE/SE G1/S1 1B.1	Cismontane woodland, Valley and foothill grassland. Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. 35-620m. Blooms Mar-May.	Not Expected	The annual grassland present on the project site is not a natural grassland community and is regularly maintained, thus would not provide suitable habitat. No occurrences have been recorded within 5 miles (CDFW 2021a).
Piperia candida white-flowered rein orchid	None/None G3/S3 1B.2	Broadleafed upland forest, Lower montane coniferous forest, North Coast coniferous forest. Sometimes on serpentine. Forest duff, mossy banks, rock outcrops, and muskeg. 30-1310m. Blooms (Mar)May-Sep.	Not Expected	No suitable habitat occurs in the project site. Only one occurrence from 1992 has been recorded within 5 miles of the project site (CDFW 2021a).
Plagiobothrys chorisianus var. chorisianus Choris' popcornflower	None/None G3T1Q/S1 1B.2	Chaparral, Coastal prairie, Coastal scrub. Mesic sites. 3-160m. Blooms Mar-Jun.	Not Expected	No suitable habitat occurs in the project site.
Plagiobothrys diffusus San Francisco popcornflower	None/SE G1Q/S1 1B.1	Coastal prairie, Valley and foothill grassland. Historically from grassy slopes with marine influence. 60-360m. Blooms Mar-Jun.	Not Expected	Grasslands present in the project site are not natural grassland communities and no occurrences have been recorded within 5 miles (CDFW 2021a).
Senecio aphanactis chaparral ragwort	None/None G3/S2 2B.2	Chaparral, Cismontane woodland, Coastal scrub. Drying alkaline flats. 15-800m. Blooms Jan-Apr(May).	Not Expected	No suitable soils occur in the project site.
Stuckenia filiformis ssp. *alpina* slender-leaved pondweed	None/None G5T5/S2S3 2B.2	Marshes and swamps. Shallow, clear water of lakes and drainage channels. 300-2150m. Blooms May-Jul.	Not Expected	No suitable habitat nor elevation occurs in the project site
Suaeda californica California seablite	FE/None G1/S1 1B.1	Marshes and swamps. Margins of coastal salt marshes. 0-15m. Blooms Jul-Oct.	Not Expected	No suitable habitat occurs in the project site.
Trifolium amoenum two-fork clover	FE/None G1/S1 1B.1	Coastal bluff scrub, Valley and foothill grassland. Sometimes on serpentine soil, open sunny sites, swales. Most recently cited on roadside and eroding cliff face. 5-415m. Blooms Apr-Jun.	Low Potential	Grassland habitat is present; however, it is non-native, and not a natural community. One historical occurrence has been recorded in 1950, approximately 3 miles north of the project site (CDFW 2021a).

Scientific Name Common Name	Status Fed/State ESA CRPR	Habitat Requirements	Potential to Occur	Rationale
Trifolium buckwestiorum Santa Cruz clover	None/None G2/S2 1B.1	Broadleafed upland forest, Cismontane woodland, Coastal prairie. Moist grassland. Gravelly margins. 105-610m. Blooms Apr-Oct.	Low Potential	Suitable woodland habitat is present; however, no occurrences have been recorded within five miles of the project site (CDFW 2021a).
Trifolium hydrophilum saline clover	None/None G2/S2 1B.2	Marshes and swamps, Valley and foothill grassland, Vernal pools. Mesic, alkaline sites. 0-300m. Blooms Apr-Jun.	Not Expected	No alkaline soils or suitable natural vegetation communities occur within the project site. No occurrences have been recorded within five (CDFW 2021a).

Regional Vicinity refers to within a 9-quad search radius of site.

FE = Federally Endangered FT = Federally Threatened FC = Federal Candidate Species

SE = State Endangered ST = State Threatened SC = State Candidate SR = State Rare

CRPR (CNPS California Rare Plant Rank):

1A=Presumed Extinct in California

1B=Rare, Threatened, or Endangered in California and elsewhere

2A=Plants presumed extirpated in California, but more common elsewhere

2B=Plants Rare, Threatened, or Endangered in California, but more common elsewhere

CRPR Threat Code Extension:

.1=Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)

.2=Fairly endangered in California (20-80% occurrences threatened)

.3=Not very endangered in California (<20% of occurrences threatened)

Special-Status Animal Species in the Regional Vicinity (Nine Quad) of the Project Site

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Invertebrates				
Euphydryas editha bayensis Bay checkerspot butterfly	FT/None G5T1/S1	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* & *O. purpurscens* are the secondary host plants.	Not Expected	No suitable habitat present within the project site
Speyeria zerene myrtleae Myrtle's silverspot butterfly	FE/None G5T1/S1	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	Not Expected	No suitable habitat present within the project site, species has been extirpated from its range in the vicinity of the project site.
Fish				
Oncorhynchus mykiss irideus pop. 8 steelhead - central California coast DPS	FT/None G5T2T3Q/S2S3	DPS includes all naturally spawned populations of steelhead (and their progeny) in streams from the Russian River to Aptos Creek, Santa Cruz County, California (inclusive). Also includes the drainages of San Francisco and San Pablo Bays.	High Potential	Steelhead are known in the San Francisquito Creek watershed and have been observed in Los Trancos Creek (Leidy et al. 2005).
Spirinchus thaleichthys longfin smelt	FC/ST G5/S1	Euryhaline, nektonic & anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.	Not Expected	No suitable habitat present within the project site
Amphibians				
Aneides niger Santa Cruz black salamander	None/None G3/S3 SSC	Mixed deciduous and coniferous woodlands and coastal grasslands in San Mateo, Santa Cruz, and Santa Clara counties. Adults found under rocks, talus, and damp woody debris.	Moderate Potential	Suitable habitat is present, there are five records within five miles of the project site
Dicamptodon ensatus California giant salamander	None/None G3/S2S3 SSC	Known from wet coastal forests near streams and seeps from Mendocino County south to Monterey County, and east to Napa County. Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.	Moderate Potential	Suitable habitat is present, there are five records within five miles of the project site
Rana boylii foothill yellow-legged frog	None/SE G3/S3 SSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	Not Expected	Suitable habitat is present however, the species is presumed to be extirpated from the region.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Rana draytonii California red-legged frog	FT/None G2G3/S2S3 SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	Moderate Potential	Suitable foraging habitat is present with in the project site. There are 10 recorded occurrences within five miles of the project site (CDFW 2021a). The nearest breeding habitat is approximately 2.6 miles north in San Francisquito Creek.
Reptiles				
Emys marmorata western pond turtle	None/None G3G4/S3 SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	Moderate Potential	Suitable habitat for breeding and foraging is present within the project site. There are three records within five miles of the project site, closest record is approximately 2.9 miles north in San Francisquito Creek.
Thamnophis sirtalis tetrataenia San Francisco gartersnake	FE/SE G5T2Q/S2 FP	Vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important.	Moderate Potential	Suitable habitat is present and there are 13 recorded occurrences within five miles of the project site (CDFW 2021a).
Birds				
Asio flammeus short-eared owl	None/None G5/S3 SSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields. Tule patches/tall grass needed for nesting/daytime seclusion. Nests on dry ground in depression concealed in vegetation.	Not Expected	Suitable habitat is not present and there are no recorded occurrences within five miles of the project site (CDFW 2021a).
Asio otus long-eared owl	None/None G5/S3? SSC	Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land, productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	Low Potential	Suitable habitat is present. One historic occurrence from 1987 has been recorded within 5 miles of the project site, approximately 4 miles to the southeast (CDFW 2021a).

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Athene cunicularia burrowing owl	None/None G4/S3 SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	Not Expected	No suitable habitat is present within the project site. Grassland present on the site is routinely mowed and disturbed. The only recorded occurrence within 5 miles is from 2017, approximately 2.8 miles south of the project site (CDFW 2021a).
Brachyramphus marmoratus marbled murrelet	FT/SE G3/S2	Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.	Not Expected	No suitable habitat present and the project site is 11 miles inland, outside of the known species range.
Charadrius nivosus nivosus western snowy plover	FT/None G3T3/S2 SSC	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	Not Expected	No suitable habitat present within the project site.
Circus hudsonius northern harrier	None/None G5/S3 SSC	Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	Not Expected	Although suitable foraging habitat is present within the project site, no nearby marshes are known and no occurrences have been recorded within five miles of the project site (CDFW 2021a).
Coturnicops noveboracensis yellow rail	None/None G4/S1S2 SSC	Summer resident in eastern Sierra Nevada in Mono County. Small numbers winter regularly in the San Francisco Bay estuary.	Not Expected	Outside of usual species range and no suitable habitat present within the project site.
Elanus leucurus white-tailed kite	None/None G5/S3S4 FP	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	Not Expected	No suitable habitat present within the project site.
Falco peregrinus anatum American peregrine falcon	FD/SD G4T4/S3S4 FP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	Not Expected	No suitable nesting habitat present within the project site.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	None/None G5T3/S3 SSC	Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	Not Expected	No suitable habitat present within the project site.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Haliaeetus leucocephalus bald eagle	FD/SE G5/S3 FP	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	Not Expected	No suitable nesting or foraging habitat present within the project site.
Laterallus jamaicensis coturniculus California black rail	None/ST G3G4T1/S1 FP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	Not Expected	No suitable habitat present within the project site
Melospiza melodia pusillula Alameda song sparrow	None/None G5T2?/S2S3 SSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits Salicornia marshes; nests low in Grindelia bushes (high enough to escape high tides) and in Salicornia.	Not Expected	No suitable habitat present within the project site.
Rallus obsoletus obsoletus California Ridgway's rail	FE/SE G3T1/S1 FP	Salt water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	Not Expected	No suitable habitat present within the project site.
Rynchops niger black skimmer	None/None G5/S2 SSC	Nests on gravel bars, low islets, and sandy beaches, in unvegetated sites. Nesting colonies usually less than 200 pairs. .	Not Expected	No suitable nesting or foraging habitat present within the project site.
Sternula antillarum browni California least tern	FE/SE G4T2T3Q/S2 FP	Nests along the coast from San Francisco Bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, land fills, or paved areas.	Not Expected	No suitable habitat present within the project site.
Mammals				
Antrozous pallidus pallid bat	None/None G4/S3 SSC	Found in a variety of habitats including deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts in crevices of rock outcrops, caves, mine tunnels, buildings, bridges, and hollows of live and dead trees which must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	Moderate Potential	Suitable habitat is present and there are three recorded occurrences within five miles of the project site (CDFW 2021a).
Corynorhinus townsendii Townsend's big-eared bat	None/None G4/S2 SSC	Occurs throughout California in a wide variety of habitats. Most common in mesic sites, typically coniferous or deciduous forests. Roosts in the open, hanging from walls & ceilings in caves, lava tubes, bridges, and buildings. This species is extremely sensitive to human disturbance.	Moderate Potential	Suitable habitat is present and there are 13 recorded occurrences within five miles of the project site (CDFW 2021a).
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	None/None G5T2T3/S2S3 SSC	Typically found in forest habitats with moderate to dense understory. Can occur in chaparral, riparian woodlands, and coniferous forests, particularly redwood. Builds middens out of grasses, leaves, and woody debris. This subspecies is found only in the San Francisco Bay region.	Present	Nests were observed during reconnaissance surveys.

Scientific Name Common Name	Status Fed/State ESA CDFW	Habitat Requirements	Potential to Occur	Rationale
Reithrodontomys raviventris salt-marsh harvest mouse	FE/SE G1G2/S1S2 FP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat but may occur in other marsh vegetation types and in adjacent upland areas. Does not burrow; builds loosely organized nests. Requires higher areas for flood escape.	Not Expected	No suitable habitat present within the project site.
Sorex vagrans halicoetes salt-marsh wandering shrew	None/None G5T1/S1 SSC	Salt marshes of the south arm of San Francisco Bay. Medium high marsh 6-8 ft above sea level where abundant driftwood is scattered among Salicornia.	Not Expected	No suitable habitat present within the project site.
Taxidea taxus American badger	None/None G5/S3 SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	Not Expected	No suitable habitat present within the project site.

Regional Vicinity refers to within a 5-mile search radius of site.

FE = Federally Endangered FT = Federally Threatened FC = Federal Candidate Species FS=Federally Sensitive

SE = State Endangered ST = State Threatened SC = State Candidate SS=State Sensitive

SSC = CDFW Species of Special Concern SFP = State Fully Protected

Appendix B

Arborist Report

Kielty Arborist Services LLC

Certified Arborist WE#0476A
P.O. Box 6187
San Mateo, CA 94403
650-515-9783

June 7th, 2021, Revised August 24th, 2021

Innovative Homes, LLC
c/o: John Suppes
412 Olive Avenue
Palo Alto, CA 94306

Site: 575 Los Trancos Road, Palo Alto CA

Dear Innovative Homes, LLC,

As requested on Friday May 28th, 2021, Kielty Arborist Services visited the above site to inspect and comment on the trees. Your concerns as to the future health and safety of the trees has prompted this letter. A review of the trees and a tree protection plan will be found within this report. Preliminary site plan A1.1 dated 4/8/21 has been reviewed as a part of this report.

Method:
All inspections were made from the ground; the trees were not climbed for this inspection. The trees in question were located on an existing topography map provided by you. The trees were then measured for diameter at 54 inches above ground level (DBH or diameter at breast height). The trees were given a condition rating for form and vitality. The trees condition ratings are based on 50 percent vitality and 50 percent form, using the following scale.

1	-	29	Very Poor
30	-	49	Poor
50	-	69	Fair
70	-	89	Good
90	-	100	Excellent

The height of the trees was measured using a Nikon Forestry 550 Hypsometer. The spread was paced off. Comments and recommendations for future maintenance are provided.

Survey Key:
DBH-Diameter at breast height (54" above grade)
CON- Condition rating (1-100)
HT/SP- Tree height/ canopy spread
*indicates neighbor's trees
P-*Indicates protected tree by city ordinance*
R-*Indicates proposed tree removal*

575 Los Trancos (2)
Survey:

Tree#	Species	DBH	CON	HT/SP	Comments
1**P**	Coast live oak *(Quercus agrifolia)*	28.0	65	50/30	Good vigor, good form, near utilities and existing driveway.
2**P**	Coast live oak *(Quercus agrifolia)*	19.5	60	45/30	Fair vigor, fair form, codominant at 8 feet with fair union, suppressed.
3**P**	Coast live oak *(Quercus agrifolia)*	39.3	70	45/55	Good vigor, fair form, heavy laterals, aesthetically pleasing, **recommended to cable and prune heavy leaders.**
4**P**	Valley oak *(Quercus lobata)*	44.1	60	65/50	Fair vigor, fair form, minor dead wood, 10" and 6" dead limbs observed, codominant at 20 feet, heavy lateral limbs, history of limb loss, **recommended to removed dead wood.**
5**P**	Valley oak *(Quercus lobata)*	22.4	60	55/35	Fair vigor, fair form, suppressed, tall for diameter.
6**P**	Valley oak *(Quercus lobata)*	39.4	55	60/60	Fair vigor, poor form, codominant at 6 feet, heavy into site, one side of canopy pruned for utilities, bleeding canker on trunk, **recommended to treat canker, prune where heavy and cable where possible.**
7**P**	Coast live oak *(Quercus agrifolia)*	25.5	60	55/35	Fair vigor, fair form, suppressed, history of limb loss.
8**P**	Valley oak *(Quercus lobata)*	25.7	65	60/35	Fair vigor, fair form, suppressed.
9**P**	Coast live oak *(Quercus agrifolia)*	20.4	50	35/35	Fair vigor, poor form, heavily suppressed, grows towards street.
10**P**	Coast live oak *(Quercus agrifolia)*	35.0	70	60/45	Good vigor, fair form, large 10" dead limb. **recommended to remove dead limb.**
11**P**	Coast live oak *(Quercus agrifolia)*	36.9	45	35/50	Good vigor, poor form, grows horizontally. **recommended to prop and prune if retained.**
12**P**	Valley oak *(Quercus lobata)*	22.5-17.9	65	50/50	Good vigor, fair form, codominant at 2 feet, heavy into site.

575 Los Trancos (3)
Survey:

Tree#	Species	DBH	CON	HT/SP	Comments
13**P**	Coast live oak *(Quercus agrifolia)*	22.8	45	35/30	Good vigor, poor form, topped for utilities.
14	Bay *(Umbellularia californica)*	12.2-12	30	20/12	Poor vigor, poor form, dead leader, decay at root crown, topped.
15	Coast live oak *(Quercus agrifolia)*	10.1	50	30/12	Fair vigor, poor form, topped for line clearance.
16**P**	Coast live oak *(Quercus agrifolia)*	13.8	50	30/15	Fair vigor, poor form, topped for line clearance.
17**P**	Valley oak *(Quercus lobata)*	48.8	70	65/65	Good vigor, good form, mature. **recommended to prune where heavy and to cable codominant leaders.**
18**P**	Coast live oak *(Quercus agrifolia)*	22.0	70	45/30	Good vigor, fair form.
19**P**	Coast live oak *(Quercus agrifolia)*	22.6-16.8 13.6	65	45/45	Fair vigor, fair form, multi leader at grade, minor dead wood.
20**P**	Valley oak *(Quercus lobata)*	29.8	40	50/40	Fair to poor vigor, poor form, codominant at 10 feet, codominant leader is dead, decay at root crown, **recommended to expose root crown and inspect, remove dead codominant leader.**
21**P**	Valley oak *(Quercus lobata)*	35.2	70	60/60	Fair vigor, fair form, heavy lateral limbs.
22**P**	Valley oak *(Quercus lobata)*	26.3	60	60/60	Fair vigor, fair form, suppressed, signs of decay at root crown, **recommended to expose root crown and inspect.**
23**P**	Coast live oak *(Quercus agrifolia)*	17.0	65	50/30	Fair vigor, fair form, slight lean into site.
24**P**	Coast live oak *(Quercus agrifolia)*	17.2	50	25/35	Fair vigor, poor form, suppressed, heavy lean well pruned.
25**P**	Coast live oak *(Quercus agrifolia)*	37.5	65	60/60	Fair vigor, fair form, codominant at 12 feet. **recommended to prune and cable.**

575 Los Trancos (4)

Survey:

Tree#	Species	DBH	CON	HT/SP	Comments
26**P**	Coast live oak *(Quercus agrifolia)*	24-10	40	10/40	Good vigor, poor form, grows horizontally, suppressed, **recommended to prop and prune.**
27**P**	Coast live oak *(Quercus agrifolia)*	32.1-22	60	60/60	Fair vigor, fair form, codominant at grade. **recommended to cable and prune codominant leaders.**
28	Bay *(Umbellularia californica)*	14.9	50	45/30	Fair vigor, fair form, suppressed.
29	Black walnut *(Juglans nigra)*	29.6	30	50/45	Poor vigor, poor form, in decline.
30**P**	Coast live oak *(Quercus agrifolia)*	19.4	60	50/35	Good vigor, fair form, codominant at 20 feet with poor union, **recommended to prune and cable.**
31	Coast live oak *(Quercus agrifolia)*	7.5	50	30/15	Fair vigor, fair form, suppressed.
32	Black walnut *(Juglans nigra)*	12.0	60	45/25	Fair vigor, fair form.
33	Bay *(Umbellularia californica)*	8.0	50	30/15	Fair vigor, fair form, suppressed.
34	Bay *(Umbellularia californica)*	9.0	50	30/15	Fair vigor, fair form, suppressed.
35	Bay *(Umbellularia californica)*	10.0	50	45/20	Fair vigor, fair form, suppressed.
36**P**	Coast live oak *(Quercus agrifolia)*	24.8	60	55/40	Fair vigor, fair form, heavy lean, on creek bank, **crown reduction pruning recommended.**
37**R**	Red willow *(Salix laevigata)*	6-3	0	20/12	DEAD.
38**P**	Coast live oak *(Quercus agrifolia)*	34.3	70	55/50	Good vigor, fair form.

575 Los Trancos (5)

Survey:

Tree#	Species	DBH	CON	HT/SP	Comments
39	Big leaf maple *(Acer macrophyllum)*	29.2	30	50/45	Poor vigor, poor form, large leader failure in past, in decline.
40	Bay *(Umbellularia californica)*	10-12	55	40/30	Fair vigor, fair form, on creek bank, codominant at grade.
41	Bay *(Umbellularia californica)*	8-10	55	40/20	Fair vigor, fair form, suppressed, on creek bank.
42	Red willow *(Salix laevigata)*	16.3	30	30/15	Poor vigor, poor form, heavy decay on trunk, in decline.
43**R**	Olive *(Olea europaea)*	42.1	20	30/25	Poor vigor, poor form, in decline, nearly dead.
44**R**	Olive *(Olea europaea)*	30.2	20	30/25	Poor vigor, poor form, in decline, nearly dead.
45**R**	Black walnut *(Juglans nigra)*	12.6	65	30/25	Good vigor, good form.
46**P**	Coast live oak *(Quercus agrifolia)*	33.5	50	60/50	Fair vigor, fair form, decay at root crown, **recommended to expose root crown and inspect.**
47**P/R**	Coast live oak *(Quercus agrifolia)*	36.0	0	50/60	DEAD
48**P**	Coast live oak *(Quercus agrifolia)*	36.0	10	15/15	Fair vigor, poor form, failed tree, stump re sprout.
49**P**	Coast live oak *(Quercus agrifolia)*	29.8	70	50/40	Good vigor, good form, dense canopy.
50***P**	Coast live oak *(Quercus agrifolia)*	30est	80	45/40	Good vigor, good form.
51**P**	Coast live oak *(Quercus agrifolia)*	16.2	65	30/20	Good vigor, fair form, suppressed.
52**P**	Coast live oak *(Quercus agrifolia)*	10-8	65	30/20	Good vigor, fai form, suppressed.

575 Los Trancos (6)
Survey:

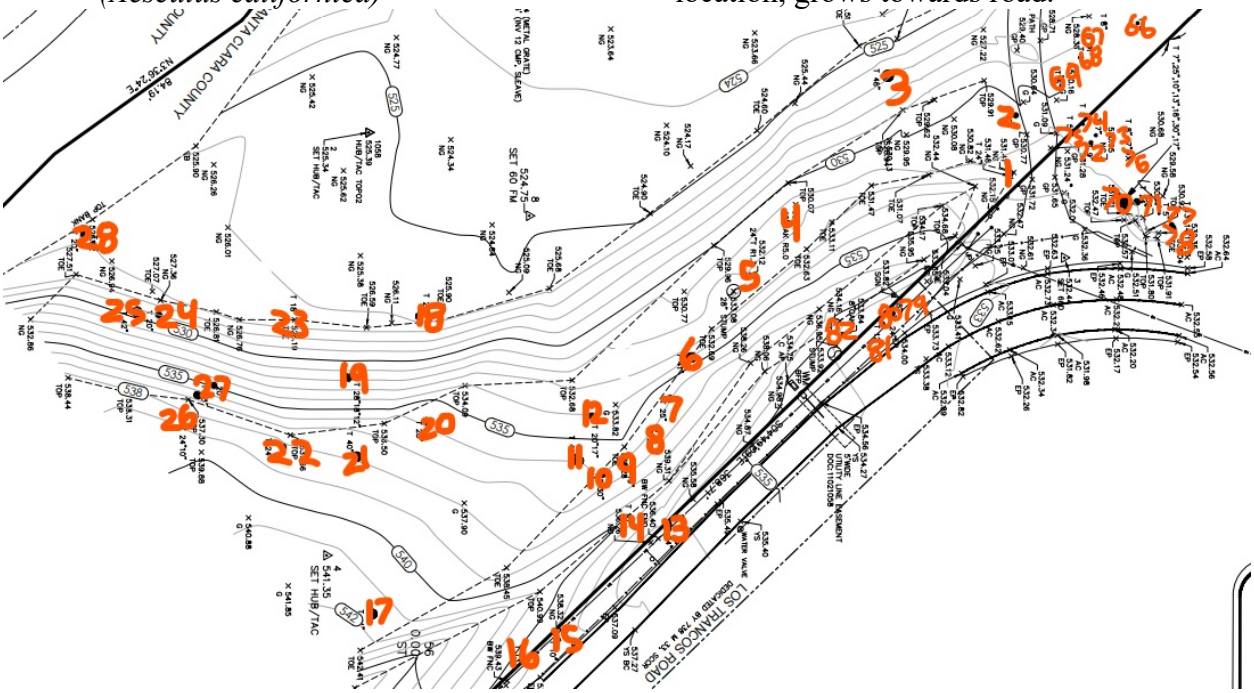
Tree#	Species	DBH	CON	HT/SP	Comments
53	Coast live oak *(Quercus agrifolia)*	11.1	50	20/30	Good vigor, poor form, suppressed, leans.
54**P**	Coast live oak *(Quercus agrifolia)*	16.2	60	35/30	Good vigor, poor form, suppressed, leans.
55	Bay *(Umbellularia californica)*	66.0	40	70/40	Fair to poor vigor, poor form, multi leader at 5 feet, ganoderma fungus at base, **recommended to prune out dead wood, and test for extent of decay.**
56	Bay *(Umbellularia californica)*	10-6-9-7-10-4-4-11	50	50/30	Fair vigor, poor form, multi at base.
57	Bay *(Umbellularia californica)*	13-12-6	50	45/30	Fair vigor, poor form, multi at base.
58	Bay *(Umbellularia californica)*	6.0	40	30/15	Fair vigor, poor form, suppressed.
59	Bay *(Umbellularia californica)*	28.6	50	60/30	Fair vigor, fair form, codominant at 8 feet.
60	Redwood *(Sequoia sempervirens)*	8.1	80	25/10	Good vigor, good form, recently planted.
61	Redwood *(Sequoia sempervirens)*	6.4	80	18/10	Good vigor, good form, recently planted.
62	Redwood *(Sequoia sempervirens)*	10.3	80	18/10	Good vigor, good form, recently planted.
63	Redwood *(Sequoia sempervirens)*	5.1	80	18/10	Good vigor, good form, recently planted.
64	Redwood *(Sequoia sempervirens)*	5.5	80	18/10	Good vigor, good form, recently planted.
65	Redwood *(Sequoia sempervirens)*	9.2	80	18/10	Good vigor, good form, recently planted.
66	Redwood *(Sequoia sempervirens)*	8.3	80	18/10	Good vigor, good form, recently planted.

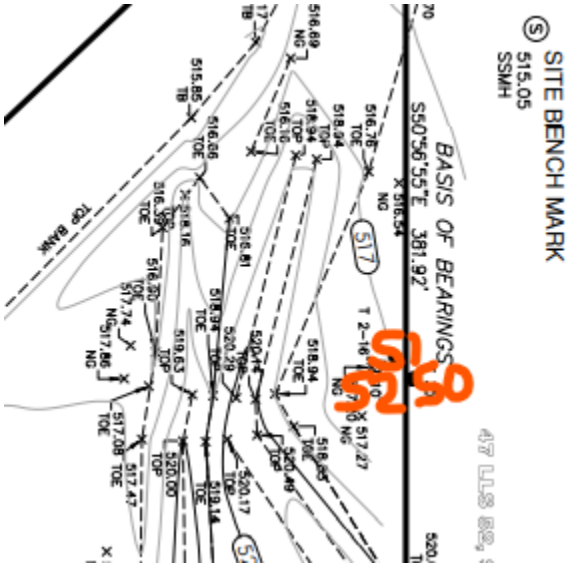
575 Los Trancos (7)
Survey:

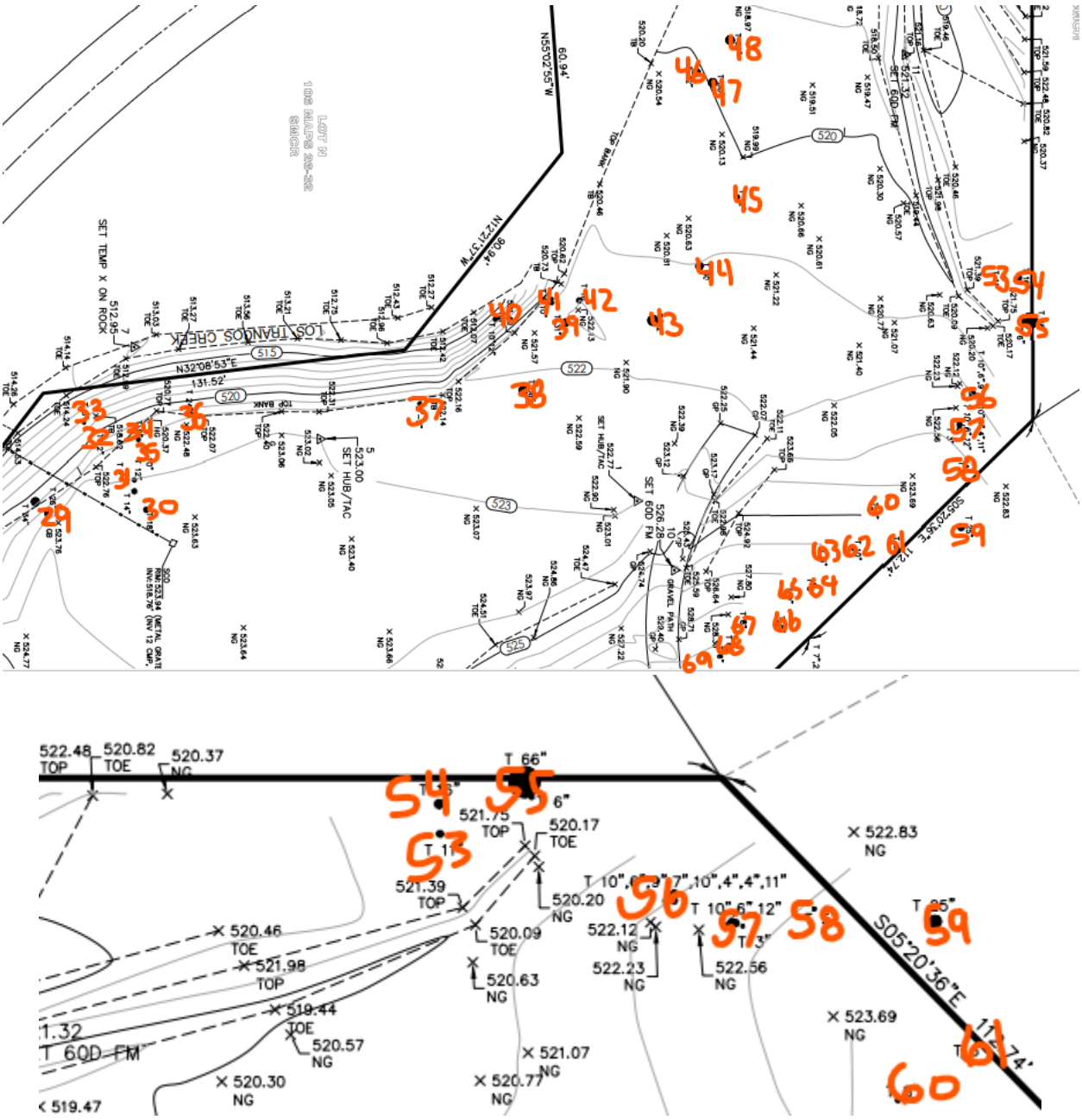
Tree#	Species	DBH	CON	HT/SP	Comments
67	Redwood *(Sequoia sempervirens)*	6.7	80	18/10	Good vigor, good form, recently planted.
68	Redwood *(Sequoia sempervirens)*	9.9	80	18/10	Good vigor, good form, recently planted.
69	Redwood *(Sequoia sempervirens)*	5.5	80	18/10	Good vigor, good form, recently planted.
70	Bay 7-25-10-13-18-30-17 *(Umbellularia californica)*	50		20/35	Fair to poor vigor, poor form, multi leader at grade.
71	White alder *(Alnus rhombifolia)*	24.2	45	60/25	Fair vigor, poor form, suppressed, leans against bay tree.
72	Coast live oak *(Quercus agrifolia)*	10.1	60	45/25	Fair vigor, fair form, suppressed.
73	Coast live oak *(Quercus agrifolia)*	8.6	60	45/25	Fair vigor, fair form, suppressed.
74	Coast live oak *(Quercus agrifolia)*	5.1	50	18/12	Fair vigor, poor form, suppressed.
75	Coast live oak *(Quercus agrifolia)*	5.3	50	15/12	Fair vigor, poor form, suppressed.
76	Elderberry *(Sambucus nigra)*	8-7	20	25/20	Poor vigor, poor form.
77	Black walnut *(Juglans nigra)*	5.0	60	40/15	Good vigor, fair form.
78	Bay 13-14-11 *(Umbellularia californica)*		50	45/35	Fair vigor, poor form, multi leader at grade.
79	Bay *(Umbellularia californica)*	8.0	30	20/10	Fair vigor, poor form, topped for utilities, next to driveway.
80**P**	Coast live oak *(Quercus agrifolia)*	25.8	45	25/35	Good vigor, poor form, topped for utilities, next to driveway.

575 Los Trancos (8)
Survey:

Tree#	Species	DBH	CON	HT/SP	Comments
81**P**	Coast live oak *(Quercus agrifolia)*	13.3	45	20/15	Fair vigor, poor form, topped for utilities.
82	Buckeye *(Aesculus californica)*	8.0	45	18/12	Fair vigor, poor form, under utilities, poor location, grows towards road.







Showing tree locations

Non-protected trees to be removed:
Red willow tree #37 is dead and should be removed as soon as possible as it is hazardous and a fire hazard for the site.

Olive trees #43 and #44 are in very poor condition. These trees are expected to be dead within the next few months. The trees are within the proposed driveway area. Tree removal and replacement is recommended. Black walnut tree #45 is in fair condition. This tree is also proposed for removal to facilitate the proposed construction of the driveway.

Showing nearly dead olive trees #43 and #44

Protected trees proposed for removal:
Coast live oak tree #47 is dead. The tree should be removed as soon as possible as it is a fire hazard for the site.

Showing oak tree #47

Tree replacement measures:
The tree canopy replacement standard as seen in Palo Alto's Tree Technical Manual was used to establish the number of replacement trees required on site. Below is a list of the canopy distance for each tree to be removed followed by the number of replacement trees required to fulfill city requirements.

Red Willow #37=12' wide canopy
Replacement trees= The tree is dead. No replacement trees are recommended.

Olive tree #43= 25' wide canopy
Replacement trees= Three 24" box size trees or two 36" box trees

Olive tree #44= 25' wide canopy
Replacement trees= Three 24" box size trees or two 36" box trees

Black walnut tree #45= 25' wide canopy
Replacement trees= Three 24" box size trees or two 36" box trees

Coast live oak tree #47= 60' wide canopy
Replacement trees= The tree is dead. No replacement trees are recommended.

Tree Canopy - Replacement Standard

COLUMN 1	COLUMN 2	COLUMN 3
Canopy of the Removed Tree (Avg. dist. across the canopy*)	Replacement Trees	Alternative Tree
4'-9'	Two 24" Box Size (minimum)	One 36" Box Size
10'-27'	Three 24" Box Size	Two 36" Box Size
28'-40'	Four 24" Box Size	Two 48" Box Size
40'-56'	Six 24" Box Size	Two 48" Box & Two 36" Box Size
56'-60'	Two 24" Box & Two 36" Box + Two 48" Box Size	**
60'+	**	**

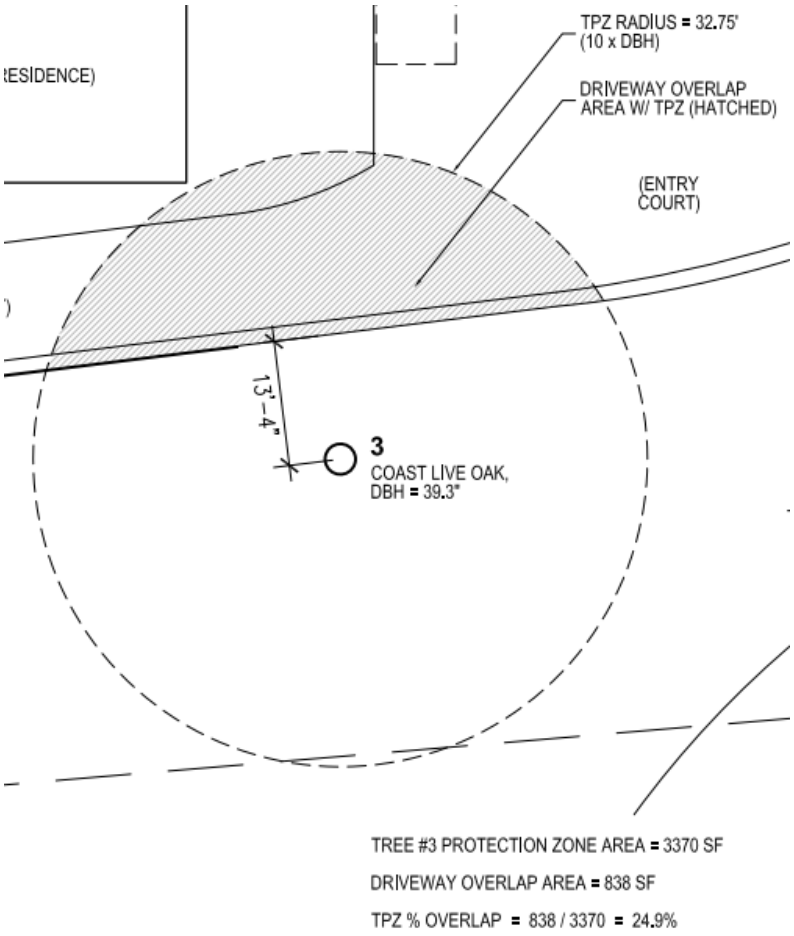
Showing tree canopy replacement standard used

Showing large oaks on site

Summary of retained trees:
Many large mature native oak trees were observed on site. Between the home and the proposed building pad are where the larger oak trees exist. These trees have grown in a grove like fashion with trees developing leans and heavy lateral limbs. Crown reduction pruning and cabling of codominant leaders is recommended for many of the larger oak trees on site. These recommendations can be seen in bold within the survey portion of the report. Oak trees #20, 22, and 46 are recommended to have their root crowns exposed and inspected as signs of possible root rot disease were observed. A large ganoderma fungus and dead wood was observed on the root crown of bay tree #55. A drill test and root crown is exposure is recommended to explore the extent of decay at the root crown. A general crown cleaning to remove dead wood is recommended for the oak trees to be retained as little to no tree maintenance has taken place on the site. The retained oak trees are recommended to be annually inspected by a Certified Arborist for any needed work. The area underneath the dripline of the retained oak trees is recommended to maintain a dry landscape.

Impacts/Recommendations:
Preliminary site plan A1.1 was reviewed for writing this section of the report. The retained trees are all a fair distance away from the proposed work on site. Oak tree #3 is shown at 13 feet from the proposed driveway. Oak tree #4 is shown at 21 feet from the secondary driveway. The driveway is shown on a sloped area. It is recommended to use a retaining wall to reduce any grading needed on the tree side of the secondary driveway and main driveway when near oak trees #3 and #4. This will help to reduce impacts as much as possible due to the grading that would be needed if the driveway was to be built without a retaining wall. Excavation for the retaining wall is recommended to be done by hand while under the Project Arborist supervision when working within 10 times the diameter of the protected trees on site. Roots encountered will need to be cleanly cut. Cut root ends will need to be kept moist by covering the cut root ends with layers of wetted down burlap. A soaker hose is recommended to be installed at the retaining wall cut once the retaining wall has been built. The soaker hose is recommended to be turned on every week during the first dry season following the retaining wall build. After one year the soaker hose shall be permanently suspended. The two oak trees will need to be inspected monthly during the required monthly inspections during the proposed construction. Once construction has been completed, the trees are recommended to be inspected annually in the spring. Impacts are expected to be minor.

Coast Live Oak tree #3 is the closest tree to the proposed driveway. At 10 times the tree's diameter the tree protection zone radius is 32.75 feet or a 3370 square foot area. The proposed driveway and retaining wall overlaps this area by 838 square feet. The tree's root zone will be encroached by 24.9% as shown in the provided diagram below. This is within Best Management Practices acceptable threshold for a species with a good tolerance to construction impacts and in good condition (or 25%). The recommendations stated in the last paragraph will help to keep impacts at a minor level. This tree is also recommended to be deep water fertilized anytime between fall and early spring.



Showing percentage of root zone impacted for Oak tree #3

The proposed driveway follows the same direction of the existing driveway near oak trees #1 and #2. Excavation for the new driveway when within the dripline of oak trees #1 and #2 shall not exceed more than 8" under existing grade. The finished grade of the driveway near these two trees is recommended to be at the existing grade or higher up. This will help to reduce impacts to the trees. Roots encountered measuring 2" in diameter or larger will need to be retained within the base rock section by packing base rock around roots. The existing driveway near these trees my have helped to reduce root growth in the area of proposed work through compaction. All excavation underneath the dripline of a protected tree will need to be carried out by hand while under the direct supervision of the Project Arborist.

A building wall is located at 11 feet from oak tree #30. Hand excavation under the Project Arborist supervision is recommended when working within 10 times the tree's diameter. Encountered roots must be cleanly cut using a hand saw or loppers. Once the wall has been built a soaker hose is recommended to be installed at the wall cut. The soaker hose is recommended to be turned on every week during the first dry season following the wall build. After one year the soaker hose shall be permanently suspended. The oak tree will need to be inspected monthly during the required monthly inspections during the proposed construction. Once construction has been completed, the tree is recommended to be inspected annually in the spring.

Tree Protection Plan:

Tree protection zones should be established and maintained throughout the entire length of the project. Fencing for the protection zones should be 6-foot-tall metal chain link type supported by 2-inch diameter metal poles pounded into the ground to a depth of no less than 2 feet. The support poles should be spaced no more than 10 feet apart on center. The location for the protection fencing for the protected trees on site should be placed at the tree driplines where possible (type 1 tree protection fencing). All other non-protected trees are recommended to be protected by fencing placed at the dripline as well. No equipment or materials should be stored or cleaned inside protection zones. Signs should be placed on fencing signifying "Tree Protection Zone - Keep Out". If fencing needs to be reduced for access or any other reasons, the non-protected areas must be protected by a landscape buffer. All tree protection and inspection schedule measures, design recommendations, watering and construction scheduling shall be implemented in full by the owner and contractor.

IMAGE 2.15-1
Tree Protection Fence at the Dripline

IMAGE 2.15-2
Tree Protection Fence at the Dripline

• Type I Tree Protection
The fences shall enclose the entire area under the **canopy dripline or TPZ** of the tree(s) to be saved throughout the life of the project, or until final improvement work within the area is required, typically near the end of the project (*see Images 2.15-1 and 2.15-2*). Parking Areas: If the fencing must be located on paving or sidewalk that will not be demolished, the posts may be supported by an appropriate grade level concrete base.

Showing type 1 tree protection fencing

Landscape Buffer
Where tree protection does not cover the entire root zone of the trees at the dripline or when a smaller tree protection zone is needed for access, a landscape buffer consisting of wood chips spread to a depth of six inches with plywood or steel plates placed on top will be placed where foot traffic is expected to be heavy. The landscape buffer will help to reduce compaction to the unprotected root zone. If plywood is used the pieces of plywood shall be attached in a way that minimizes movement.

Tree Pruning
During construction any Pruning will be supervised by the site arborist and must stay underneath 25% of the tree total foliage.

Root Cutting
Any roots to be cut should be monitored and documented. Large roots or large masses of roots to be cut should be inspected by the site arborist. The site arborist may recommend irrigation or fertilizing at that time. Cut all roots clean with a saw or loppers. Roots to be left exposed for a period of time should be covered with layers of burlap and kept moist. Roots to be cut measuring larger than 1.5" in diameter shall be shown to the Project Arborist before being cut.

Trenching and Excavation
Trenching for irrigation, electrical, drainage or any other reason, should be located outside of the trees calculated root zone of 10 times the tree diameters when possible. If not possible, trenching shall be hand dug when beneath the dripline of desired trees. Any excavation underneath the dripline of a protected tree will need to be supervised by the Project Arborist. Hand digging and careful placement of pipes below or beside protected roots will dramatically reduce root loss, thus reducing trauma to desired trees. Trenches should be back filled as soon as possible using native materials and compacted to near original levels. Trenches to be left open with exposed roots shall be covered with burlap and kept moist. Plywood laid over the trench will help to protect roots below. Roots retained within trenches are recommended to be wrapped in layers of wetted down burlap to avoid root desiccation.

Irrigation
Normal irrigation should be maintained throughout the entire length of the project for the imported trees. Irrigation should consist of surface flooding, with enough water to wet the entire root zone every other week during the dry season. The native trees on site (oaks, bays, and buckeyes) shall only be irrigated during the months of May and September to combat a prolonged drought period, or if their root zones are traumatized.

Grading
All existing grades underneath the dripline of a protected tree shall remain as is where possible.

Inspections
The site will be inspected after the tree protection measures are installed and before the start of construction. Monthly inspections are mandatory for a site such as this. Inspections will be carried out during the first week of each month. The inspections will be documented with inspection letters being provided to the owner, contractor, and City Arborist. Other inspections will be carried out on an as needed basis. The monthly inspections are required by the city of Palo Alto as a condition of approval. It is the contractor's responsibility to notify the site arborist when construction is to start, and whenever there is to be work performed within the dripline of a protected tree on site at least 48 hours in advance. During the site visits the site arborist will offer mitigation measures specific to the work completed. Kielty Arborist Services can be reached at 650-515-9783 or 650-532-4418, or by email at kkarbor0476@yahoo.com. A final inspection letter will also be required by the city before final occupancy.

Further information about tree protection can be found in the Tree Technical Manual provided by the city of Palo Alto. This information should be kept on site at all times. The information included in this report is believed to be true and based on sound arboricultural principles and practices.
Sincerely,
Kevin R. Kielty Certified Arborist WE#0476A Kevin Kielty

Kielty Arborist Services

P.O. Box 6187
San Mateo, CA 94403
650-515-9783

ARBORIST DISCLOSURE STATEMENT

Arborists are tree specialists who use their education, knowledge, training and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of the arborist, or seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like a medicine, cannot be guaranteed.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services such as property boundaries, property ownership, site lines, disputes between neighbors, landlord-tenant matters, etc. Arborists cannot take such issues into account unless complete and accurate information is given to the arborist. The person hiring the arborist accepts full responsibility for authorizing the recommended treatment or remedial measures.

Trees can be managed, but they cannot be controlled. To live near a tree is to accept some degree of risk. The only way to eliminate all risks is to eliminate all trees.

Arborist: Kevin Kielty
Kevin R. Kielty
Date: August 24th, 2021

Appendix C

Geotechnical Engineering Study

Earth Systems
48511 Warm Springs Boulevard, Suite 210 | Fremont, CA 94539 | Ph: 510.353.3833 | www.earthsystems.com

April 9, 2021 File No.: 304309-001

Mr. John Suppes
Clarum Homes
P.O. Box 60970
Palo Alto, CA 94306

PROJECT: PROPOSED SINGLE FAMILY RESIDENCE and ADU
575 LOS TRANCOS ROAD
PALO ALTO, CALIFORNIA

SUBJECT: Geotechnical Engineering Study

REF.: Revised Proposal to Perform a Geotechnical Engineering Study and Liquefaction Analysis, Proposed Single Family Residence and ADU, 575 Los Trancos Road, Palo Alto, California, by Earth Systems Pacific, dated November 20, 2020, revised December 4, 2020.

Soil Investigation, Proposed Single-Family Residence, Los Trancos Property (APN 182-46-003), Palo Alto, California, by Harding Lawson Associates, dated January 26, 1990.

Dear Mr. Suppes:

In accordance with your authorization of the above referenced proposal, this geotechnical engineering study has been prepared by Earth Systems Pacific (Earth Systems) for use in the development of plans and specifications for the proposed single family residence and accessory dwelling unit (ADU) in Palo Alto, California. Preliminary geotechnical recommendations for site preparation and grading; foundations; slabs-on-grade; exterior flatwork; swimming pool; utility trench backfill; site drainage and finish improvements; and observation and testing are presented herein.

We appreciate the opportunity to have provided services for this project and look forward to working with you again in the future. Please do not hesitate to contact this office if there are any questions concerning this report.

Sincerely,
Earth Systems Pacific

Phillip Penrose
Staff Engineer

Bill Zehrbach, GE 926
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
BILL E. ZEHRBACH
GE 926
EXP. 9/30/21
GEOTECHNICAL
STATE OF CALIFORNIA

Doc. No.: 2104-004.SER/kt

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

1.0 INTRODUCTION

Site Setting

The subject property is an irregular shaped, 5.47-acre parcel located at 575 Los Trancos Road in Palo Alto, California (APN 182-46-012). The site has a latitude of 37.3666°N and a longitude of 122.2012°W. The general location of the site is shown on the Site Location Map (Figure 1).

Site Description

The subject property is located on the west side of Los Trancos Road, about a half mile south of the intersection of Los Trancos Road and Alpine Road. The property is bounded by Los Trancos Road to the east, Los Trancos Creek and Valley Oak Street to the west, an existing residence to the north and undeveloped land to the south.

The property is currently undeveloped. The center of the parcel is covered with grasses and the property borders are covered by trees and dense brush. Los Trancos Creek runs along the western edge of the property. An existing gravel road starts at the northeastern corner of the property off Los Trancos Road and grants access to the property and the neighboring property to the north. The center of the lot, where the proposed developments lie, is mostly flat. The lot slopes towards the creek on the west side and slopes upwards towards Los Trancos Road on the east side.

Planned Development

We understand that you plan to construct a new residence in approximately the center of the parcel. The proposed ADU is expected to be constructed on the southern portion of the parcel and the swimming pool is proposed on the southwestern portion of the parcel. See Figure 2, Site Plan. Based on the preliminary plans by *LNAI Architecture* (dated February 10, 2021), it is our understanding that the new residence will be a two-story building with a partial second story.

Scope of Services

The scope of work for the geotechnical engineering study included a general site reconnaissance, evaluation of the subsurface soil and groundwater conditions from a geotechnical engineering standpoint by drilling borings and laboratory testing of selected samples, engineering analysis of the collected data, and preparation of this report. The analysis and subsequent recommendations were based on our understanding of the proposed development at the subject site.

The report and recommendations are intended to comply with the considerations of Section 1803 of the California Building Code (CBC), 2019 Edition, and common geotechnical engineering practice in this area at this time under similar conditions. The tests were performed in general conformance with the standards noted, as modified by common geotechnical practice in this area at this time under similar conditions.

Preliminary geotechnical recommendations for site preparation and grading, foundations, slabs-on-grade, exterior flatwork, swimming pool, utility trench backfill, site drainage and finish improvements, and geotechnical observation and testing are presented to guide the development of project plans and specifications. It is our intent that this report be used by the client to form the geotechnical basis of the design of the project as described herein, and in the preparation of plans and specifications.

Detailed evaluation of the site geology and potential geologic hazards, and analyses of the soil for mold or other microbial content, asbestos, percolation rates, corrosion potential, radioisotopes, hydrocarbons, or other chemical properties are beyond the scope of this report. This report also does not address issues in the domain of contractors such as, but not limited to, site safety, loss of volume due to stripping of the site, shrinkage of soils during compaction, excavatability, shoring, temporary slope angles, and construction means and methods. Ancillary features such as swimming pools, temporary access roads, fences, light poles, and non-structural fills are not within our scope and are also not addressed.

To verify that pertinent issues have been addressed and to aid in conformance with the intent of this report, it is requested that final grading and foundation plans be submitted to this office for review. In the event that there are any changes in the nature, design, or locations of improvements, or if any assumptions used in the preparation of this report prove to be incorrect, the conclusions and recommendations contained herein should not be considered valid unless the changes are reviewed, and the conclusions of this report are verified or modified in writing by the Geotechnical Engineer. The criteria presented in this report are considered preliminary until such time as they are verified or modified in writing by the Geotechnical Engineer in the field during construction.

2.0 GEOLOGIC SETTING

According to the Geologic Map of the Palo Alto 30’ x 60’ Quadrangle, California (Brabb et. al, 2000), the site is mapped as being underlain by Pleistocene older alluvial fan deposits (Qpoaf). The site is located in a liquefaction hazards zone as delineated by the State of California and the County of Santa Clara.

The entire San Francisco Bay Area is considered to be an active seismic region due to the presence of several active faults. Three northwest-trending major earthquake faults that are responsible for the majority of the movement on the San Andreas fault system extend through the Bay Area. They include the San Andreas fault, the Hayward fault and the Calaveras fault, which are respectively located approximately 0.4 miles to the southwest, 19.3 miles to the northeast and 22.4 miles to the northeast. The Monte Vista-Shannon fault is located approximately 1.4 miles northeast of the site. Using information from recent earthquakes, improved mapping of active faults, and a new model for estimating earthquake probabilities, the 2014 Working Group on California Earthquake Probabilities updated the 30 year earthquake forecast for California. They concluded that there is a 72 percent probability (or likelihood) of at least one earthquake of magnitude 6.7 greater striking somewhere in the San Francisco Bay region before 2043. A summary of the significant faults in the near vicinity of the site are listed below.

Major Active Faults

Fault	Distance from Site (miles)	Probability of $M_w \geq 6.7$ within 30 Years[1]
San Andreas	0.4 (SW)	6%
Monte-Vista Shannon	1.9 (NE)	1%
Hayward	19.3 (NE)	21%
Calaveras	22.4 (NE)	7%

[1] Working Group on California Earthquake Probabilities, 2015

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

Previous Geotechnical Studies

Harding Lawson Associates prepared a Soil Investigation for the subject lot dated January 26, 1990. Their investigation included the drilling of 5 exploratory borings on the lot at the approximate locations indicated on Figure 2, Site Plan. The logs of these borings are presented in Appendix A.

Subsurface Exploration (Current)

The subsurface exploration for this study consisted of drilling two exploratory borings at the site on February 23, 2021. The approximate locations of the test borings are shown on (Figure 2).

The borings were advanced to depths of 34 feet below ground surface (bgs). The drilling process consisted of using a truck-mounted drilling rig equipped with 8-inch diameter hollow stem augers. Once reaching the desired depth, a standard Mod-Cal or SPT sampler, connected to steel

rods was lowered into the hole. The samplers were driven into undisturbed ground with a 140-pound, safety hammer falling about 30 inches per drop. The samplers were driven up to 18 inches and the hammer blows required to drive every six inches of the samplers were recorded and are presented on the boring logs. The number of blows required to drive the final 12 inches of the sampler into the undisturbed ground were used as Penetration Resistance and this was used to interpret soil consistency/density. The borings were then backfilled with lean cement grout. The boring logs show soil description including: color, major and minor components, USCS classification, changes in soil conditions with depth, moisture content, consistency/density, plasticity, sampler type, and sampling depths and laboratory test results. Copies of the logs of boring drilled for this investigation are presented in Appendix B.

Soils encountered in the borings were logged in general accordance with the Unified Soil Classification System. An Earth Systems engineer prepared the logs and retained samples for laboratory testing.

Subsurface Profile

The borings drilled at the site revealed the presence of loose to very dense sand with variable percentages of clay and gravel. This is consistent with the geological mapping by Brabb et al.(2000). In Boring B-1, the upper 5 feet consisted of medium dense well graded sand with gravel. Below the well-graded sand, a clayey sand layer with variable percentages of gravel was encountered and extended to the bottom of the boring at 34 feet bgs. Some cobbles were encountered in the boring at 7 feet bgs. In Boring B-2, loose clayey sand with gravel was encountered at the surface and extended to 17 feet bgs. The sand became denser at approximately 7 feet bgs. At 17 feet bgs, a medium dense, well graded sand with clay and gravel layer was encountered. The clay content increased at 23 feet and decreased again at 28 feet bgs to well graded sand with clay and gravel, which extended to the bottom of the boring at 34 feet bgs.

Groundwater was encountered at 17 to 18 feet bgs in the borings drilled at the site to the maximum depth of exploration of 34 feet bgs.

Laboratory Testing

Five liner samples were tested to measure moisture content and dry density (ASTM D 2216-17 and D 2937-17), and four samples were tested to determine the percentage of material passing the minus #200 sieve (ASTM D 1140-17). Copies of the laboratory test results are included in Appendix C.

4.0 DATA ANALYSIS

Subsurface Soil Classification

Based on the subsurface data collected as a part of our subsurface exploration and our review of the published geologic literature, the site is assigned to Site Class C (very dense soil and soft rock) as defined by Table 20.3-1 of the ASCE 7-16.

Seismic Design Parameters

The following seismic design parameters represent the general procedure as outlined in Section 1613 of the CBC and in ASCE 7. The values determined below are based on the 2009 National Earthquake Hazard Reduction Program (NEHRP) maps and were obtained using the United States Geological Survey's Design Maps Web Application.

Summary of Seismic Parameters - CBC 2019
(Site Coordinates 37.3859°N, 122.1399°W)

Parameter	Design Value
Site Class	C
Mapped Short Term Spectral Response Parameter, (S_s)	2.549
Mapped 1-second Spectral Response Parameter, (S_1)	1.008
Site Coefficient, (F_a)	1.2
Site Coefficient, (F_v)	1.4
Site Modified Short Term Response Parameter, (S_{Ms})	3.059
Site Modified 1-second Response Parameter, (S_{M1})	1.411
Design Short Term Response Parameter, (S_{Ds})	2.04
Design 1-second Response Parameter, (S_{D1})	0.94
Seismic Design Category	E

Static Settlement

Based on our understanding of the proposed development and because the building loads are anticipated to be fairly light, anticipated static settlements are on the order of 1 inch with a differential settlement of ½ inch.

Liquefaction

Soil liquefaction is a phenomenon where saturated granular soils undergo a substantial loss of strength due to increased pore water pressure resulting from cyclic stress applications induced by earthquakes or other vibrations. In this process, the soil acquires mobility sufficient to permit both vertical and horizontal movements, which may result in significant deformations. Soils most

susceptible to liquefaction are loose, uniformly graded, fine-grained sands. In addition, recent literature indicates that fine grained soils may also be susceptible to liquefaction or cyclic strain softening. Examples of highly susceptible fine-grained soil include "non-plastic silts and clayey silts of low plasticity (PI<12) at high water content to liquid limit ratios (w_c/LL>0.85)." Examples of soils moderately susceptible to liquefaction include "clayey silts and silty clays of moderate plasticity (12<PI<18) at natural water content and Liquid Limits ratios (w_c/LL) greater than 0.80." (Bray and Sancio, 2006). It is generally acknowledged that liquefaction will not affect surface improvements if these deposits are located at a depth greater than 50 feet below the ground surface. In the deeper deposits, the greater overburden pressure is sufficient to prevent liquefaction effects from occurring.

Analysis Parameters

The referenced 1990 report by Harding Lawson Associates, gave a historic groundwater level of 8 feet bgs from an unknown reference, thus we used this value in our analysis. It should be noted that this value is likely conservative. According to United States Geological Survey's (USGS) Unified Hazard Tool, the predominant earthquake contributor is the San Andreas fault with mean magnitude using deaggregation of 7.8. The liquefaction analysis was performed utilizing the peak ground acceleration of 1.16g (PGAm) based on the Office of Statewide Health Planning and Development Seismic Design Maps Web Application. Any sand-like deposit (Soil Behavior Type Index, I_c < 2.6) below the groundwater table was assumed to be potentially liquefiable. The liquefaction analysis was based on the methodologies suggested by Idriss and Boulanger (2008 and 2014). The loose sand layers above the water table are subject to dry sand settlement. A two-thirds reduction in the PGA was used for the dry sand settlement, thus a separate analysis is presented in Appendix D.

Analysis Results

The calculated seismically induced settlement (liquefaction and dry sand settlement) was calculated to be approximately 1 to 1.7 inches. The liquefaction and dry sand analysis results are included in Appendix D.

Discussion

In general, there is a high potential of granular deposits to liquefy during a seismic event. Seismically induced settlements are expected to be on the order of 1.7 inches total or less and approximately 1 inch of differential settlement during a design level seismic event.

The creek at the rear of the property is approximately 80 feet from the building and is approximately 10 feet high. Estimates of lateral displacement are approximately 10 inches at the site. The zone of soil susceptible to liquefaction and lateral displacement are present at depths

from 19 to 23 feet at Boring B-1and appear to be at an elevation below the channel. The zone of soil susceptible to liquefaction at Boring B-2 is 8.5 to 13.5 feet bgs, indicating that the potentially liquefiable soils across the site are discontinuous. This is consistent with the analysis results of Harding Lawson Associates. As such, the potential for lateral displacement is considered low.

5.0 CONCLUSIONS

Site Suitability

The subject site is suitable for the proposed residential improvements from a geotechnical engineering standpoint, provided the recommendations included in this report are followed. The primary geotechnical concerns at the site are loose soils in the upper 5 feet and the settlement due to sesmic shaking.

Soil Expansion Potential

The near surface soils were sandy in nature and thus not deemed expansive. Thus, no measures other than moisture conditioning the pad are deemed yesterday.

Foundations

Due to the settlement from sesmic shaking, the proposed loads of the residence and ADU may be supported on a either a mat slab foundation or a post-tensioned slab foundation. Details of the foundation recommendations are included in the following sections of the report.

Site Preparation and Grading

Due to the loose soil in the upper 5 feet, a program of over-excavation is deemed necessary. The upper 2½ feet of existing ground in the building areas should be over-excavated and recompacted. Cuts and fills to create the pad for the residence are expected to be minimal. Additional grading work is anticipated to include backfill work related to placement of new utility lines and construction of the driveway, patios, and pool decking. Grading operations are discussed in detail in the *Recommendations* section of this report.

Groundwater

Groundwater was encountered at approximately 17 to 18 feet bgs during our subsurface exploration. Harding Lawson Associates reported an historic high groundwater level of 8 feet bgs. Variations in rainfall, temperature, and other factors may affect water levels, and therefore groundwater levels should not be considered constant. Groundwater is not expected to have an adverse effect on the construction or performance of the proposed residence and related structures.

Seismicity

The San Francisco Bay area is recognized by geologists and seismologists as one of the most seismically active regions in the United States. The significant earthquakes in this area are generally associated with crustal movement along well-defined, active fault zones which regionally trend in a northwesterly direction. Although research on earthquake prediction has greatly increased in recent years, seismologists cannot predict when and where an earthquake will occur. Nevertheless, on the basis of current technology, it is reasonable to assume that the proposed development will be subjected to at least one moderate to severe earthquake during its lifetime. During such an earthquake, the danger from fault offset on the site is low, but strong shaking of the site is likely to occur and, therefore, the project should be designed in accordance with the seismic design provisions of the latest California Building Code. It should be understood that the California Building Code seismic design parameters are not intended to prevent structural damage during an earthquake, but to reduce damage and minimize loss of life.

6.0 RECOMMENDATIONS

Site Preparation and Grading

General Site Preparation

1. The site should be prepared for grading by removing existing trees to be removed and their root systems, vegetation, debris, and other potentially deleterious materials from areas to receive improvements. Existing utility lines that will not be serving the proposed residence should be either removed or abandoned. The appropriate method of utility abandonment will depend upon the type and depth of the utility. Recommendations for abandonment can be made as necessary.

2. Due to the loose surficial soil, a program of over-excavation and backfilling is deemed necessary. The upper loose soil within the area of the proposed improvements should be (over-excavated to 2½ feet bgs. The lateral extent of the over-excavation should extend at least 5 feet beyond the perimeter of the proposed residence, ADU, driveway and pool decking as determined in the field by the Geotechnical Engineer during grading operations. The exposed ground should be reviewed by the Geotechnical Engineer to determine the need for additional excavation work.

3. Ruts or depressions resulting from the removal of tree root systems should be properly cleaned out down to undisturbed native soil. The bottoms of the resulting depressions should be scarified and cross-scarified at least 8 inches in depth, moisture conditioned

and recompacted. The depressions should then be backfilled with approved, compacted, moisture conditioned structural fill, as recommended in other sections of this report.

4. Site clearing, and backfilling operations, should be conducted under the field observation of the Geotechnical Engineer. The Geotechnical Engineer should be notified at least 48 hours prior to commencement of grading operations.

Compaction Recommendations

1. In general, the underlying native soil in the areas proposed to receive additional fill, exterior flatwork or new structures should be scarified at least 8 inches, moisture conditioned and recompacted to the recommended relative compaction presented below, unless noted otherwise.

2. Recompacted native soils and fill soils should be compacted to a minimum relative compaction of 90 percent of maximum dry density at a moisture content at least 2 percentage points above optimum.

3. In areas to be paved, the upper 8 inches of subgrade soil should be compacted to a minimum 92 percent of maximum dry density at a moisture content at least 2 percentage points above optimum. The aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content that is slightly over optimum. The subgrade and base should be firm and unyielding when proof-rolled with heavy, rubber-tired equipment prior to paving. The pavement subgrade soils should be frequently moistened as necessary prior to placement of the aggregate base to maintain the soil moisture content near optimum.

Fill Recommendations

1. Structural fill is defined herein as a native or import fill material which, when properly compacted, will support foundations, pavements, and other fills. The on-site native soils that are free of debris, organics and other deleterious material, may be used as structural fill.

2. Import fill is not anticipated at the site. Should import fill be required, the soil should meet the following criteria:

   a. Be coarse grained and have a plasticity index of less than 12 and/or an expansion index less than 20;

b. Be free of organics, debris or other deleterious material;
c. Have a maximum rock size of 3 inches; and
d. Contain sufficient clay binder to allow for stable foundation and utility trench excavations.

3. A sample of the of the soil proposed to be imported to the site should be submitted at least three days before being transported to the site for evaluation by the geotechnical engineer. During importation to the site the material should be further reviewed on an intermittent basis.

Foundations

Mat Slab Foundation

1. The proposed residence and ADU may be supported by a concrete mat foundation bearing on the native soil. The mat slab should be designed using a maximum localized allowable bearing pressure of 2,000 psf for dead plus live load. This value may be increased by one-third when transient loads such as wind or seismicity are included. The mat slab should be sufficiently thick to uniformly spread the concentrated loads imposed by any building columns. The mat should be designed using a modulus of subgrade reaction value of 125 psi per inch. The slab should be designed for an edge cantilever distance of 6 feet and an interior span condition of 10 feet.

2. The mat slab should be thickened at the edges to penetrate a minimum of 6 inches into the prepared subgrade for a minimum width of 2 feet. The mat slab should be placed on top of a vapor retarder and capillary break layer extending to the thickened edge along the perimeter.

3. Resistance to lateral loads should be calculated based on a passive equivalent fluid pressure of 300 pcf and a friction factor of 0.3.

Post-Tensioned Slab Foundation

1. The post-tensioned slabs should be designed in accordance with the provisions of the current edition of the California Building Code and the recommendations of the Post-Tensioning Institute. Values for Edge Moisture Variation Distance and Estimated Differential Swell were calculated in accordance with the third edition of *Design of Post-Tensioned Slabs-on-Ground* by the Post-Tensioning Institute (2008).

Edge Moisture Variation Distance (e_m)	
Center Lift Condition	9.0 feet
Edge Lift Condition	5.0 feet
Estimated Differential Swell (y_m)	
Center Lift Condition	0.5 inches
Edge Lift Condition	0.8 inches
Allowable Bearing Capacity (dead load)	1,500 psf
Allowable Bearing Capacity (dead + live loads)	2,000 psf
Allowable Bearing Capacity (DL+LL+ wind or seismic)	2,500 psf
Subgrade Friction Factor (slab against subgrade)	0.3
Total settlement (static)	< 1 inch
Differential settlement (static)	< 0.5 inches

2. To further protect moisture-sensitive floor coverings, the perimeters of the post-tensioned slabs should be deepened to penetrate a minimum of 6 inches into the subgrade soil. Also, the concrete could be proportioned to reduce its porosity (and its corresponding potential for transmitting moisture) by limiting the w/c ratio to 0.48 or less.

3. Post-tensioned slabs should be constructed and maintained in accordance with the publication *Construction and Maintenance Manual for Post-Tensioned Slab-on-Ground Foundations* by the Post-Tensioning Institute. Particular attention should be paid to the "Property Owner Maintenance" and "Landscaping" sections of the Manual.

Interior Slab-on-Grade Construction

4. The building pad should be periodically moisture conditioned as necessary to maintain the soil moisture content at a minimum of 2 percent above optimum until the placement of concrete or vapor retarding membranes. The moisture content of the soil should be verified by the Geotechnical Engineer prior to placement of the concrete or vapor retarding membranes.

5. In areas where moisture transmitted from the subgrade would be undesirable, a vapor retarder underlain by a capillary break consisting of 4 inches of crushed rock should be utilized beneath the floor slab. The vapor retarder should comply with ASTM Standard Specification E 1745-17 and the latest recommendations of ACI Committee 302. The vapor retarder should be installed in accordance with ASTM Standard Practice E 1643-18a. Care should be taken to properly lap and seal the vapor retarder, particularly around utilities, and to protect it from damage during construction. A sand layer above the vapor retarder is optional.

6. If sand, gravel or other permeable material is to be placed over the vapor retarder, the material over the vapor retarder should be only lightly moistened and not saturated prior to casting the slab. Excess water above the vapor retarder would increase the potential for moisture damage to floor coverings. Recent studies, including those by ACI Committee 302, have concluded that excess water above the vapor retarder would increase the potential for moisture damage to floor coverings and could increase the potential for mold growth or other microbial contamination. These studies also concluded that it is preferable to eliminate the sand layer and place the slab in direct contact with the vapor retarder, particularly during wet weather construction. However, placing the concrete directly on the vapor retarder would require special attention to using the proper vapor retarder, concrete mix design, and finishing and curing techniques.

7. When concrete slabs are in direct contact with vapor retarders, the concrete water to cement (w/c) ratio must be correctly specified to control bleed water and plastic shrinkage and cracking. The concrete w/c ratio for this type of application is typically in the range of 0.45 to 0.50. The concrete should be properly cured to reduce slab curling and plastic shrinkage cracking. Concrete materials, placement, and curing methods should be specified by the architect/engineer.

Exterior Flatwork

1. Exterior flatwork should have a minimum thickness of 4 full inches and should be reinforced as directed by the architect/engineer. Patio slabs and walkways should be underlain by a minimum 4 inches of compacted aggregate base over properly compacted subgrade soil.

2. Assuming that movement (i.e., 1/4-inch or more) of exterior flatwork beyond the structure is acceptable, the flatwork should be designed to be independent of the building foundations. The flatwork should not be doweled to foundations, and a separator should be placed between the two.

3. To reduce shrinkage cracks in concrete, the concrete aggregates should be of appropriate size and proportion, the water/cement ratio should be low, the concrete should be properly placed and finished, contraction joints should be installed, and the concrete should be properly cured. Concrete materials, placement and curing specifications should be at the direction of the designer; ACI 302.1R-04 and ACI 302.2R-04 are suggested as resources for the designer in preparing such specifications.

Swimming Pool

1. The swimming pool design should be based on a minimum soil equivalent fluid pressure of 45 pcf. To reduce the potential for future expansion, the soil exposed in the pool excavation should be kept in a moist condition prior to placement of the gunite.

2. The pool may be designed with a pressure relief valve. The necessity of the valve should be under the discretion of the pool designer.

3. The pool excavation should be observed by a representative from Earth Systems. If soft soils or other unanticipated conditions are observed in the excavation, compaction of the soil or other remedial measures may be recommended. Recommendations for remedial grading or other measures (if deemed necessary) should be provided by the Geotechnical Engineer based on the conditions observed at the time of construction.

4. Any portions of the pool shell that will be above ground should be designed to support the water in the pool without soil support in accordance with Section 1808.7.3 of the California Building Code.

5. If portions of the pool walls will be within a horizontal distance of 7 feet from the top of an adjacent slope, those portions of the wall should be capable of supporting the water in the pool without soil support per section 1808.7.3 of the California Building Code.

Utility Trench Backfills

1. A select, noncorrosive, granular, easily compacted material should be used as bedding and shading immediately around utility pipes. The site soils may be used for trench backfill above the select material.

2. Trench backfill in the upper 8 inches of subgrade beneath pavement areas should be compacted to a minimum of 92 percent of maximum dry density at a moisture content at least 2 percentage points above optimum moisture content and the aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content at least 2 percentage points over optimum. Trench backfill in other areas should be compacted to a minimum of 90 percent of maximum dry density at a moisture content at least 2 percentage points above optimum moisture content. Jetting of utility trench backfill should not be allowed.

3. Where utility trenches extend under perimeter foundations, the trenches should be backfilled entirely with approved fill soil compacted to a minimum of 90 percent of maximum dry density at a moisture content at least 2 percentage points above optimum moisture content. The zone of approved fill soil should extend a minimum distance of 2 feet on both sides of the foundation. If utility pipes pass through sleeves cast into the perimeter foundations, the annulus between the pipes and sleeves should be completely sealed.

4. Parallel trenches excavated in the area under foundations defined by a plane radiating at a 45-degree angle downward from the bottom edge of the footing should be avoided, if possible. Trench backfill within this zone, if necessary, should consist of Controlled Density Fill (Flowable Fill).

Management of Site Drainage and Finish Improvements

1. Unpaved ground surfaces should be finish graded to direct surface runoff away from site improvements at a minimum 5 percent grade for a minimum distance of 10 feet. If this is not practical due to the terrain or other site features, swales with improved surfaces should be provided to divert drainage away from improvements. The landscaping should be planned and installed to maintain proper surface drainage conditions.

2. Runoff from driveways, roof gutters, downspouts, planter drains and other improvements should discharge in a non-erosive manner away from foundations, pavements, and other improvements. The downspouts may discharge onto splash blocks that direct the flow away from the foundation.

3. Stabilization of surface soils, particularly those disturbed during construction, by vegetation or other means during and following construction is essential to protect the site from erosion damage. Care should be taken to establish and maintain vegetation.

4. Open areas adjacent to exterior flatwork should be irrigated or otherwise maintained so that constant moisture conditions are created throughout the year. Irrigation systems should be controlled to the minimum levels that will sustain the vegetation without saturating the soil.

5. Bio-retention swales constructed within 10 feet or less from the building foundation should be lined with a 20-mil pond liner.

Geotechnical Observation and Testing

1. It must be recognized that the recommendations contained in this report are based on a limited number of borings and rely on continuity of the subsurface conditions encountered.

2. It is assumed that the Geotechnical Engineer will be retained to provide consultation during the design phase, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

3. Unless otherwise stated, the terms "compacted" and "recompacted" refer to soils placed in level lifts not exceeding 8 inches in loose thickness and compacted to a minimum of 90 percent of maximum dry density. The standard tests used to define maximum dry density and field density should be ASTM D 1557-12 and ASTM D 6938-17, respectively, or other methods acceptable to the geotechnical engineer and jurisdiction.

4. “Moisture conditioning” refers to adjusting the soil moisture to at least 3 percentage points above optimum moisture content prior to application of compactive effort. If the soils are overly moist so that they become unstable, or if the recommended compaction cannot be readily achieved, drying the soil to optimum moisture content or just above may be necessary. Placement of gravel layers or geotextiles may also be necessary to help stabilize unstable soils. The Geotechnical Engineer should be contacted for recommendations for mitigating unstable soils.

5. At a minimum, the following should be provided by the Geotechnical Engineer:

    - Review of final grading and foundation plans,
    - Professional observation during site preparation, grading, and foundation excavation,
    - Oversight of soil compaction testing during grading,
    - Oversight of soil special inspection during grading.

6. Special inspection of grading should be provided as per Section 1705.6 and Table 1705.6 of the CBC; the soils special inspector should be under the direction of the Geotechnical Engineer. In our opinion, the following operations should be subject to *continuous* soils special inspection:

    - Scarification and recompaction,
    - Fill placement and compaction,
    - Over-excavation to the recommended depth.

7. In our opinion, the following operations may be subject to *periodic* soils special inspection, subject to approval by the Building Official:

   - Site preparation,
   - Compaction of utility trench backfill,
   - Retaining wall backfill,
   - Pool excavation,
   - Removal of existing development features,
   - Compaction of subgrade and aggregate base,
   - Observation of foundation and basement excavations,
   - Building pad moisture conditioning.

8. It will be necessary to develop a program of quality control prior to beginning grading. It is the responsibility of the owner, contractor, or project manager to determine any additional inspection items required by the architect/engineer or the governing jurisdiction.

9. The locations and frequencies of compaction tests should be as per the recommendations of the Geotechnical Engineer at the time of construction. The recommended test locations and frequencies may be subject to modification by the geotechnical engineer based upon soil and moisture conditions encountered, the size and type of equipment used by the contractor, the general trend of the compaction test results, and other factors.

10. A preconstruction conference among a representative of the owner, the Geotechnical Engineer, soils special inspector, the architect/engineer, and contractors is recommended to discuss planned construction procedures and quality control requirements. Earth Systems should be notified at least 48 hours prior to beginning grading operations.

7.0 CLOSURE

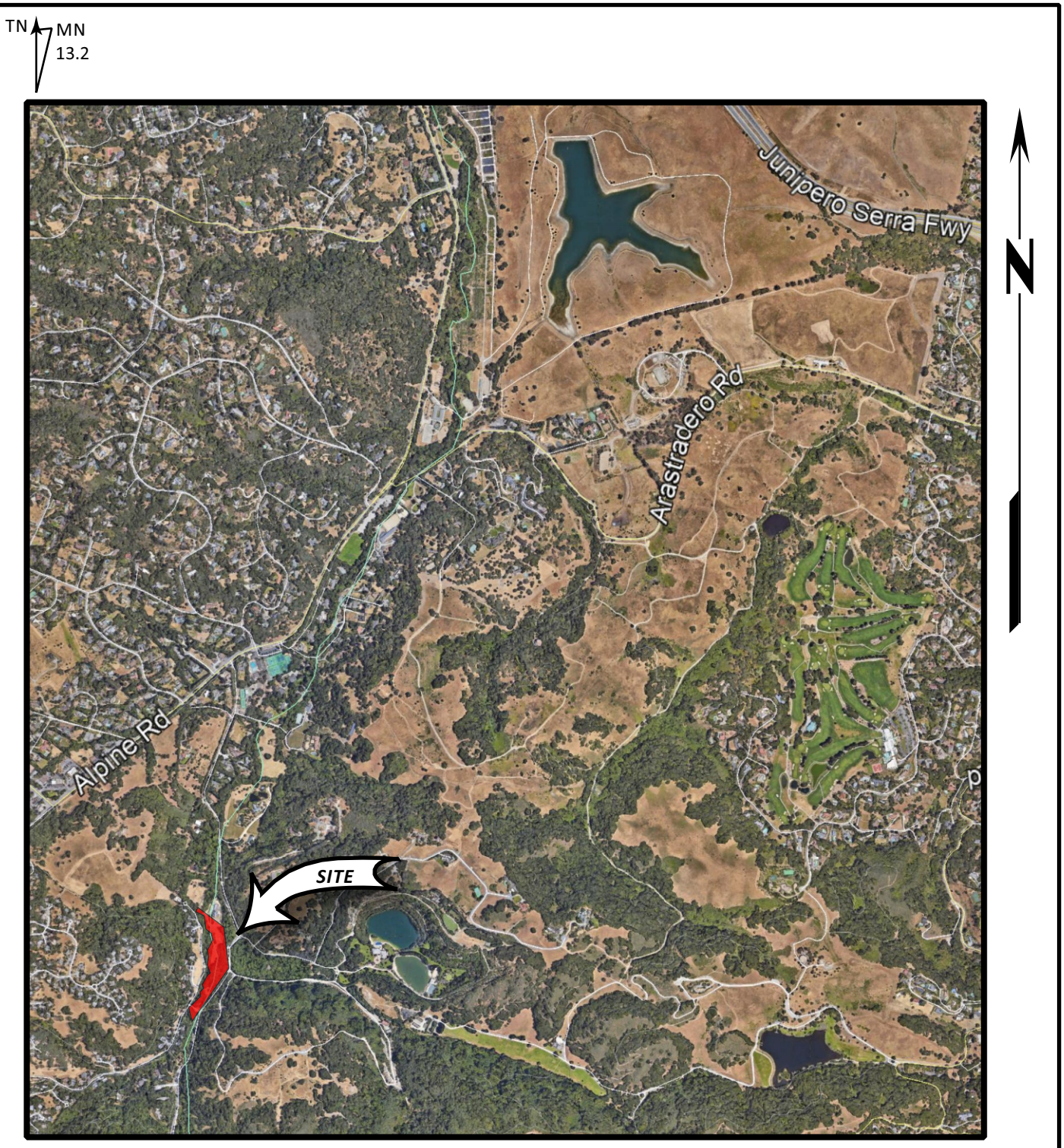
This report is valid for conditions as they exist at this time for the type of project described herein. Our intent was to perform the investigation in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project at this time under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the Scope of Services section. Application beyond the stated intent is strictly at the user's risk.

If changes with respect to the project type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions stated in this report are not correct, Earth Systems should be notified for modifications to this report. Any items not specifically addressed in this report should comply with the CBC and the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon the geotechnical conditions encountered during the investigation and may be augmented by additional requirements of the architect/engineer, or by additional recommendations provided by Earth Systems based on conditions exposed at the time of construction.

FIGURES

Figure 1

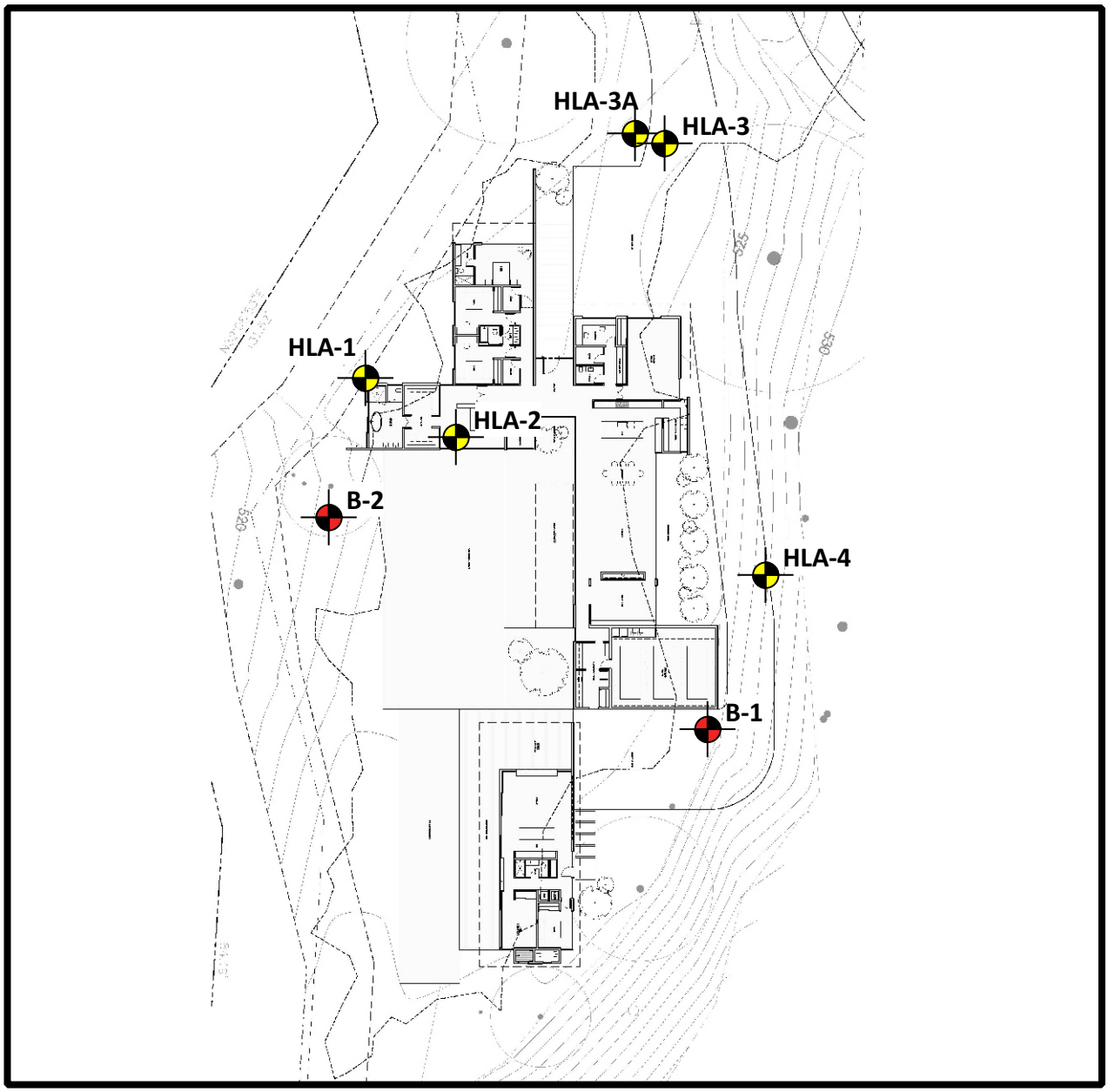


Base: Google Earth (2021)

Earth Systems Pacific	Proposed Single Family Residence and ADU 575 Los Trancos Road Palo Alto, California	Site Location Map 304309-001

Figure 2

TN MN 13.2



B-2 Approximate Boring Location (ESP, 2021)

HLA-4 Approximate Boring Location (Harding Lawson Associates, 1989)

Base: Google Earth (2021)

Earth Systems Pacific	**Proposed Single Family Residence and ADU** **575 Los Trancos Road** **Palo Alto, California**	**Site Plan** **304309-001**

APPENDIX A

Boring Logs
Harding Lawson Associates
1990

DIETERICH-POST 130713

Equipment 8" Hollow Stem Auger

Elevation 520.0 ft Date 10/30/89

Laboratory Tests	Blows/ft	Moisture Cont. (%)	Dry Density (pcf)	Depth ft Sample
	15*			0
19.5 percent passing No. 200 sieve	10*			5
	16			
PI=12 LL=34	8*	12.8	93	10
	16			
	56			15
	27*	8.0	117	20
	16			
26.1 percent passing No. 200 sieve (see Plate 7)				
	30/3"*			25
	50/5"			
				30
				35
				40

DARK BROWN SANDY SILT WITH GRAVEL (ML)
medium stiff, moist, with roots

DARK BROWN SILTY SAND WITH GRAVEL (SM)
medium dense, dry, with roots, fine-grained sand
becoming brown in color and decreasing fine content

increasing fines content

DARK BROWN SANDY CLAY WITH GRAVEL (CL/ML)
stiff to very stiff, moist

RED AND BROWN POORLY GRADED GRAVEL WITH SAND (GP)
dense to very dense, dry, gravel in tip of sampler

ORANGE, RED, AND BROWN CLAYEY GRAVEL WITH SAND (GC)
medium dense, moist to wet, gravels rounded and subangular, approximately 15 percent fines

LIGHT BROWN SILTY SAND WITH GRAVEL (SM)
medium dense, wet, approximately 30 percent fines and 20 percent gravel

MOTTLED ORANGE AND GRAY-BROWN CLAYEY SAND WITH GRAVEL (SC/SM)
medium dense, wet

BROWN CLAYEY SAND WITH GRAVEL (SC/GC)
very dense, saturated, rounded and subrounded gravels
approxiamtely 15 percent fines

*Marked blow counts represent S&H blow counts converted to "pseudo, SPT N-values" by multiplying field values by 0.6; all other values are SPT N-values as defined in ASTM D1586-84 Test Method; see text for more detail.

**Elevations are approximate and referenced to Mean Sea Level.

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring B-1
Conroe Residence
Palo Alto, California

(sheet 1 of 1)

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
B4740-G5	19640,001.04	WAA	1/90	

DIETERICH-POST 130713

Equipment 8" Hollow Stem Auger

Elevation 520.0 ft Date 10/30/89

Laboratory Tests	Blows/ft	Moisture Cont. (%)	Dry Density (pcf)	Depth ft	Sample
17.5 percent passing No. 200 sieve				0	
2.2 percent passing No. 200 sieve (see Plate 8)	8*				
	12*			5	
				10	
37.6 percent passing No. 200 sieve (see Plate 9)	20*				
	30				
	46			15	
	45/1"			20	
				25	
				30	
				35	
				40	

DARK BROWN SILTY SAND WITH GRAVEL (SM)
loose, moist, with roots

BROWN GRAVEL WITH SAND (GP)
loose to medium dense, dry, with roots

DARK BROWN CLAYEY SAND (SC/SM)
medium dense, moist,
14 percent gravel, with roots

GRAY AND BROWN POORLY GRADED GRAVEL WITH SAND (GP-GC)
dense, moist,
approximtely 10 percent fines and 30 percent sand

ORANGE-BROWN CLAYEY SAND WITH GRAVEL (SC)
dense, moist,
approximately 15 percent fines and 20 percent rounded gravel

No ground water was encountered.

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring B-2
Conroe Residence
Palo Alto, California

(sheet 1 of 1)

PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
B4740-G5	19640,001.04	WAA	1/90	

DIETERICH-POST 130713

Boring No. B-3

Equipment 8" Hollow Stem Auger

Elevation 520.0 ft Date 10/30/89

Laboratory Tests	Blows/ft	Moisture Content (%)	Dry Density (pcf)	Depth ft	Sample	
				0		DARK BROWN SILT (ML) soft to medium stiff, moist, with roots DARK BROWN SILTY SAND WITH GRAVEL (SM) loose to medium dense, moist
	8*					
30.5 percent passing No. 200 sieve (see Plate 10)				5		increasing gravel and cobbles
	15*					
						Refusal on cobbles at 7.0 feet. No ground water was encountered.
				10		
				15		

Boring No. B-3A

Equipment 8" Hollow Stem Auger

Elevation 520.0 ft Date 10/30/89

Laboratory Tests	Blows/ft	Moisture Content (%)	Dry Density (pcf)	Depth ft	Sample	
				0		BROWN SILT (ML) soft to medium stiff, moist, with roots DARK BROWN SILTY SAND WITH GRAVEL (SM) loose to medium dense, moist increasing gravel and cobbles at 4 feet
	17/0"			5		Refusal on cobbles at 5.0 feet. No ground water was encountered.
				10		
				15		

Harding Lawson Associates
Engineering and Environmental Services

Logs of Borings B-3 and B-3A
Conroe Residence
Palo Alto, California

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
B4740-G5	19640,001.04		1/90	

DIETERICH-POST 130713

Equipment 8" Hollow Stem Auger

Elevation 529.0 ft Date 10/30/89

Laboratory Tests	Blows/ft	Moisture Cont. (%)	Dry Density (pcf)	Depth ft	Sample
	30/5"*			0	

BLACK SILT (ML)
soft to medium stiff, moist,
with roots

BROWN CLAYEY SAND WITH GRAVEL (SC/GC)
dry, with cobbles

Refusal on cobbles at 3.0 feet.
No ground water was encountered.

5
10
15
20
25
30
35
40

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring B-4
Conroe Residence
Palo Alto, California

(sheet 1 of 1)

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
B4740-G5	19640,001.04	WKA	11/89	

APPENDIX B

Logs of Test Borings
Earth Systems Pacific
2021

Earth Systems Pacific

Boring No. 1
PAGE 1 OF 2
JOB NO.: 304309-001
DATE: February 23, 2021

LOGGED BY: P. Penrose
DRILL RIG: Mobile B-53
AUGER TYPE: 8" Hollow Stem

Proposed Residence
575 Los Trancos Road
Palo Alto, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	SW		Well graded SAND with GRAVEL; medium dense, dark gray brown, very moist, fine to coarse sand, fine to coarse gravel							
1									8	
2									9	
3				1.0-2.5	1-1	■	110.6	4.9	16	
4									6	
5									9	
				3.5-5.0	1-2	■	113.4	7.3	9	
6	SC		CLAYEY SAND with GRAVEL; medium dense, gray brown, very moist, fine to coarse sand, fine to coarse gravel							
7			- cobbles, dense							
8									24	
9									21	
				7.5-9.0	1-3	●			22	
10										
11										
12										
13										
14									16	
15									40	
				13.5-15.0	1-4	●			17	
16										
17										
18			▼							
19	SC		CLAYEY SAND; loose, brown, wet, mostly fine to medium sand, trace gravel						9	
20			[% passing #200 = 18%]						6	
				18.5-20.0	1-5	●			8	
21										
22										
23			- very dense, less clay, more gravel							
24										
				23.5-24.0	1-6	●			50/5"	
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ▭ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 1
PAGE 2 OF 2

LOGGED BY: P. Penrose
DRILL RIG: Mobile B-53
AUGER TYPE: 8" Hollow Stem

JOB NO.: 304309-001
DATE: February 23, 2021

Proposed Residence
575 Los Trancos Road
Palo Alto, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
26	SC		CLAYEY SAND with GRAVEL (same as above)							
27										
28			- blue gray	28.5-29.0	1-7	●			50/4"	
29										
30										
31										
32										
33										
34				33.5-34.0	1-8	●			50/5"	
35			Bottom of boring at 34' bgs No Groundwater encountered							
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										
51										
52										

LEGEND: ■ 2.5" Mod Cal Sample ▭ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 2
PAGE 1 OF 2

LOGGED BY: P. Penrose
DRILL RIG: Mobile B-53
AUGER TYPE: 8" Hollow Stem

JOB NO.: 304309-001
DATE: February 23, 2021

Proposed Residence
575 Los Trancos Road
Palo Alto, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	SC		CLAYEY SAND with GRAVEL; loose, gray brown, moist, fine to coarse sand, fine to coarse gravel							
1									5	
2									5	
3				1.0-2.5	2-1	■	103.4	12.9	6	
4									5	
5									6	
6				3.5-5.0	2-2	■	102.1	11.1	6	
7										
8										
9			- medium dense						6	
10									9	
11			[% passing #200 = 21%]	8.5-10.0	2-3	●			12	
12										
13			- very dense, gray, very moist							
14									5	
15									10	
16				13.5-15.0	2-4	■	115.7	18.4	41	
17			▼							
18	SW-SC		Well graded SAND with CLAY and GRAVEL; medium dense, gray brown, wet, fine to coarse sand, fine to coarse gravel							
19									10	
20			[% passing #200 = 9%]	18.5-20.0	2-5	●			15	
21									20	
22										
23										
24	SC		CLAYEY SAND with GRAVEL; medium dense, gray brown, wet, fine to coarse sand, fine gravel						25	
25			[% passing #200 = 31%]	23.5-25.0	2-6	●			12	
26									16	

LEGEND: ■ 2.5" Mod Cal Sample ▭ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 2
PAGE 2 OF 2

LOGGED BY: P. Penrose
DRILL RIG: Mobile B-53
AUGER TYPE: 8" Hollow Stem

JOB NO.: 304309-001
DATE: February 23, 2021

Proposed Residence
575 Los Trancos Road
Palo Alto, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
26	SC		CLAYEY SAND with GRAVEL (same as above)							
27										
28	SW-SC		Well graded SAND with CLAY and GRAVEL; dense, gray brown, wet, fine to coarse sand, fine to coarse gravel						9	
29									11	
30				28.5-29.0	2-7	●			30	
31										
32										
33										
34				33.5-34.0	2-8	●			50/6"	
35			Bottom of boring at 34' bgs Groundwater encountered at 17' bgs							
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										
51										
52										

LEGEND: ■ 2.5" Mod Cal Sample ▭ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

APPENDIX C

Summary of Laboratory Test Results

575 Los Trancos Road 304309-001

BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

March 4, 2021

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1-1	2.0 - 2.5	4.9	116.0	110.6
1-2	4.5 - 5.0	7.3	121.7	113.4
2-1	2.0 - 2.5	12.9	116.7	103.4
2-2	4.5 - 5.0	11.1	113.4	102.1
2-4	14.5 - 15.0	18.4	137.0	115.7

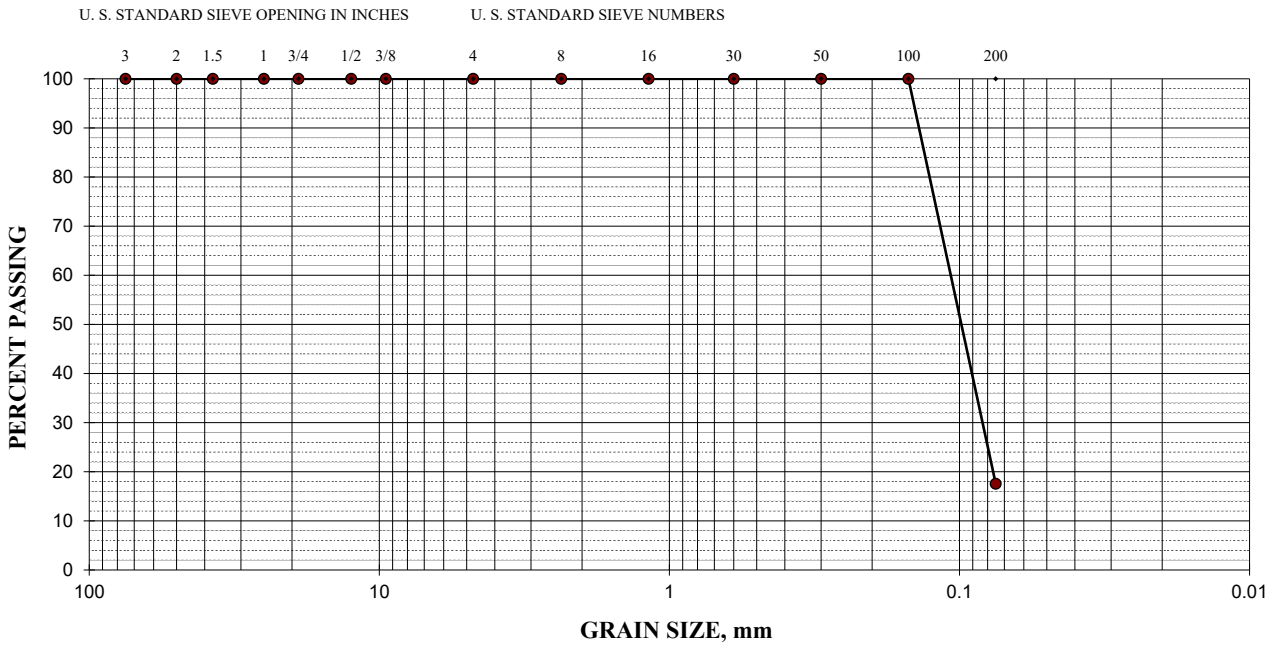
575 Los Trancos Road 304309-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07; D 1140-17

Boring #1 @ 18.5 - 20.0' March 4, 2021

Sieve size	% Retained	% Passing
3" (75-mm)	0	100
2" (50-mm)	0	100
1.5" (37.5-mm)	0	100
1" (25-mm)	0	100
3/4" (19-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	0	100
#30 (600-µm)	0	100
#50 (300-µm)	0	100
#100 (150-µm)	0	100
#200 (75-µm)	82	18



575 Los Trancos Road 304309-001

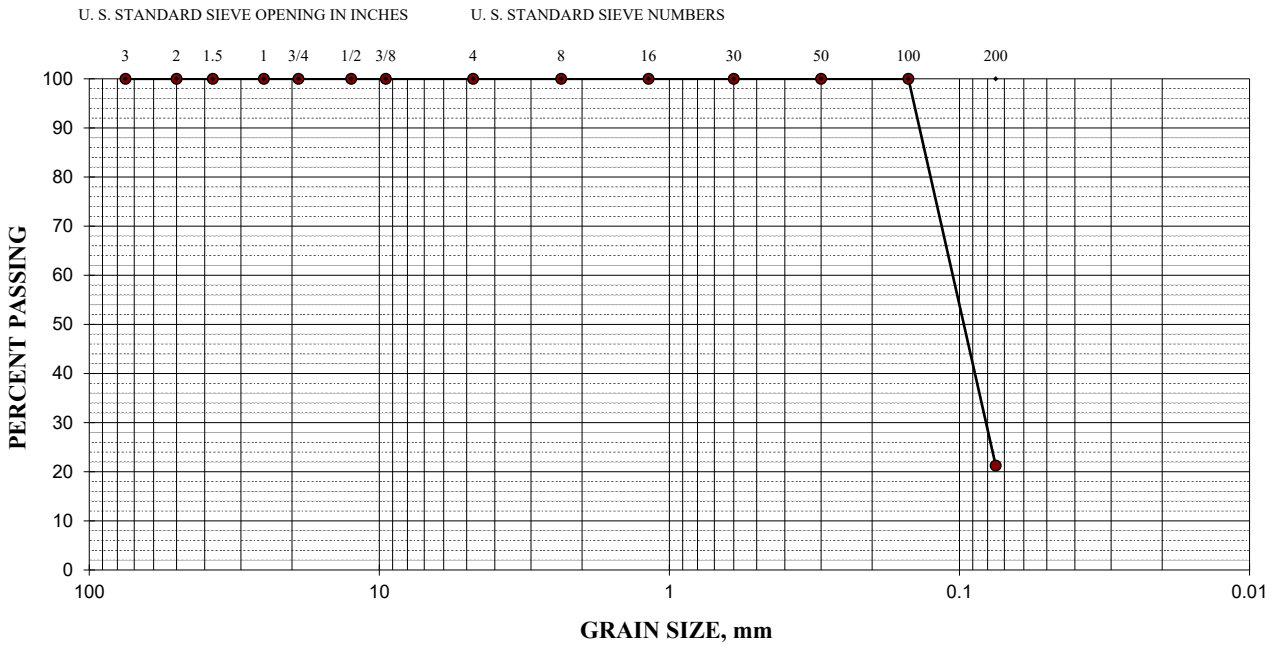
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07; D 1140-14

Boring #2 @ 8.5 - 10.0' March 4, 2021

Dark Brown Well Graded Sand with Clay and Gravel (SW-SC)

Sieve size	% Retained	% Passing
3" (75-mm)	0	100
2" (50-mm)	0	100
1.5" (37.5-mm)	0	100
1" (25-mm)	0	100
3/4" (19-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	0	100
#30 (600-µm)	0	100
#50 (300-µm)	0	100
#100 (150-µm)	0	100
#200 (75-µm)	79	21



575 Los Trancos Road 304309-001

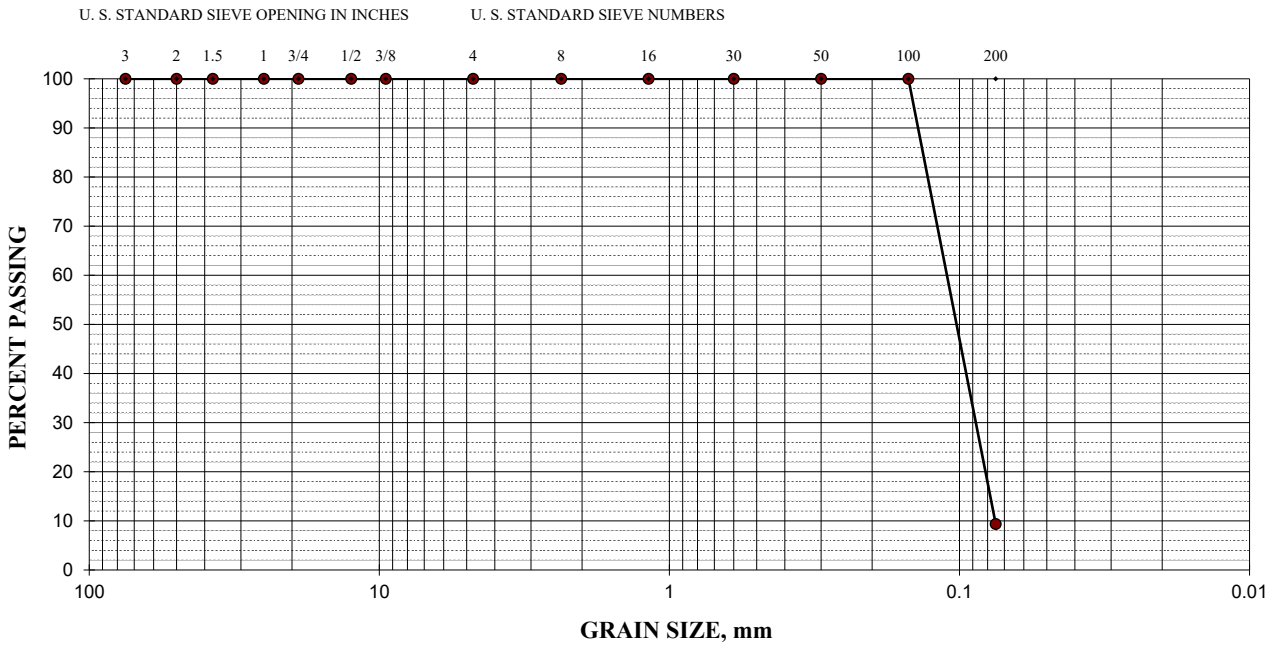
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07; D 1140-17

Boring #2 @ 18.5 - 20.0' March 4, 2021

Dark Yellowish Brown Clayey Sand with Gravel (SC)

Sieve size	% Retained	% Passing
3" (75-mm)	0	100
2" (50-mm)	0	100
1.5" (37.5-mm)	0	100
1" (25-mm)	0	100
3/4" (19-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	0	100
#30 (600-µm)	0	100
#50 (300-µm)	0	100
#100 (150-µm)	0	100
#200 (75-µm)	91	9



575 Los Trancos Road 304309-001

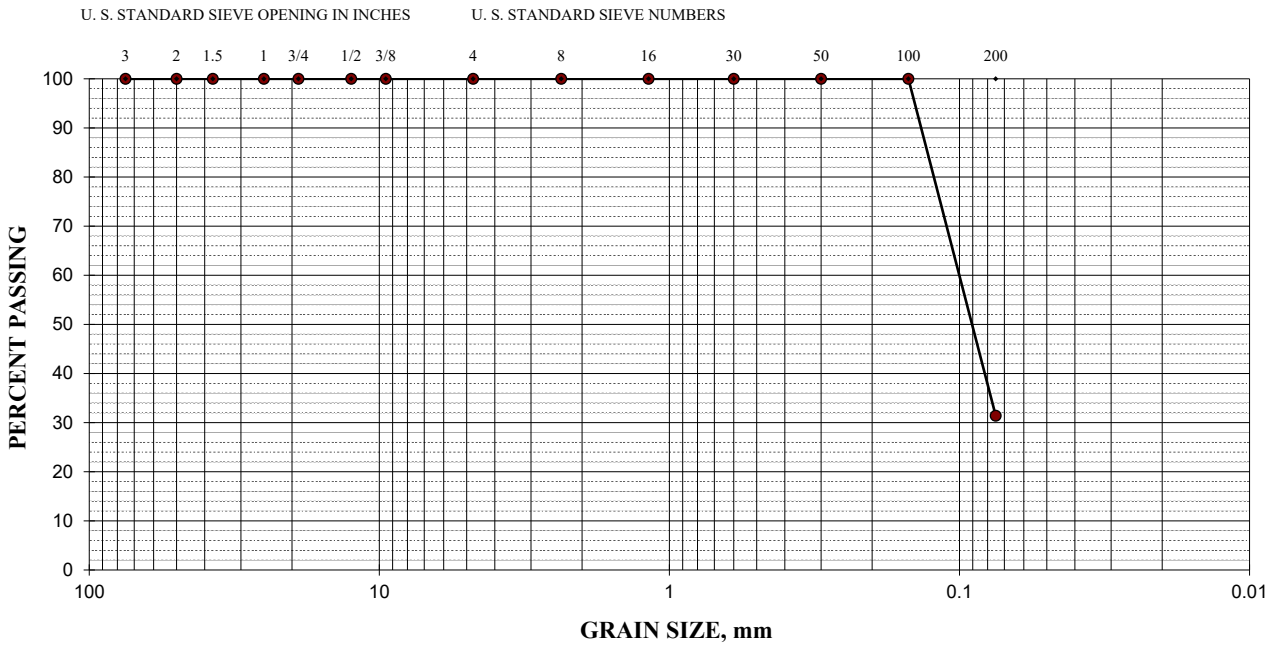
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07; D 1140-17

Boring #2 @ 23.5 - 25.0' March 4, 2021

Dark Yellowish Brown Clayey Sand with Gravel (SC)

Sieve size	% Retained	% Passing
3" (75-mm)	0	100
2" (50-mm)	0	100
1.5" (37.5-mm)	0	100
1" (25-mm)	0	100
3/4" (19-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	0	100
#30 (600-µm)	0	100
#50 (300-µm)	0	100
#100 (150-µm)	0	100
#200 (75-µm)	69	31



APPENDIX D

Liquefaction Analysis
Dry Sand Settlement

GEOLOGISMIKI
Geotechnical Software

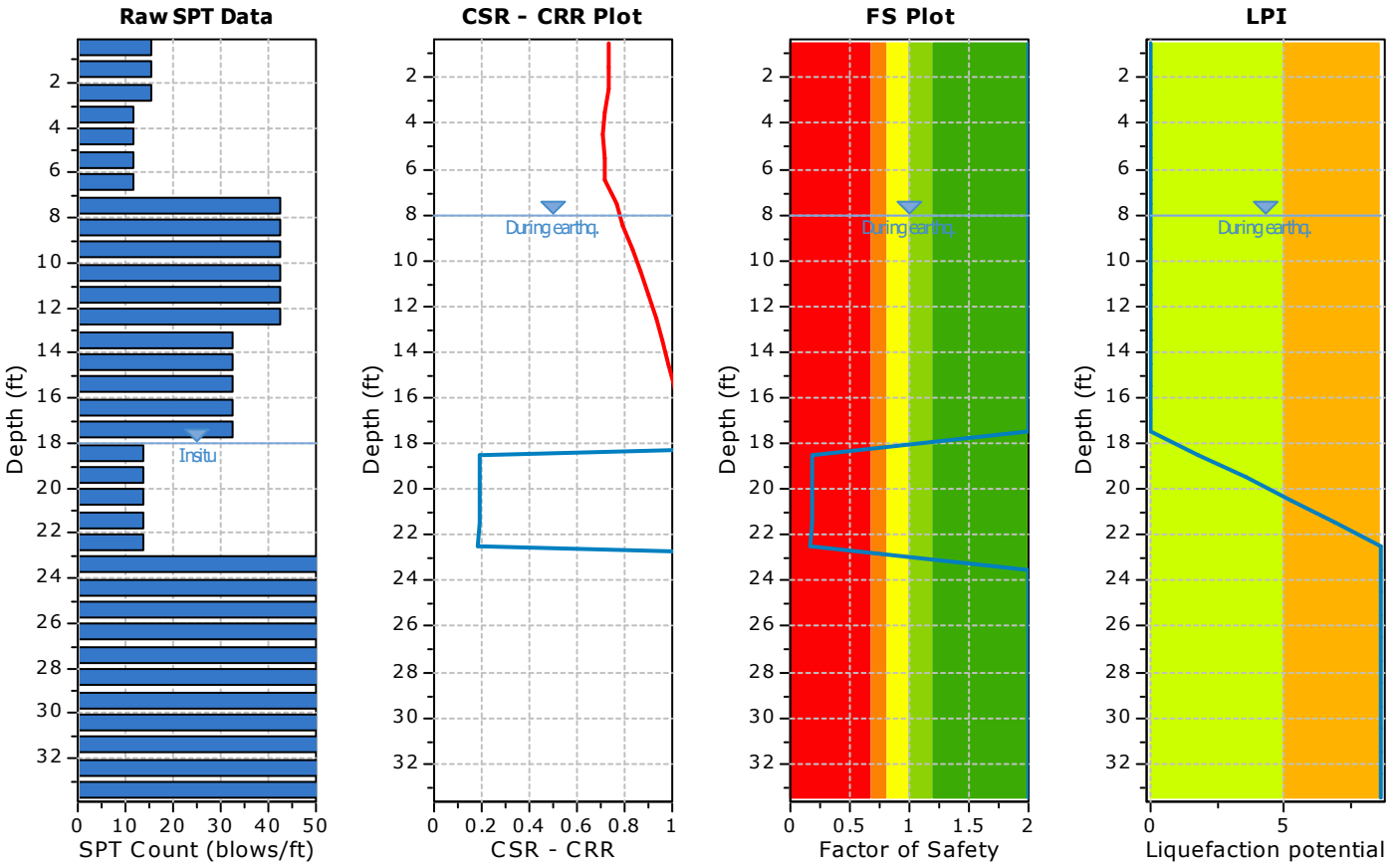
SPT BASED LIQUEFACTION ANALYSIS REPORT

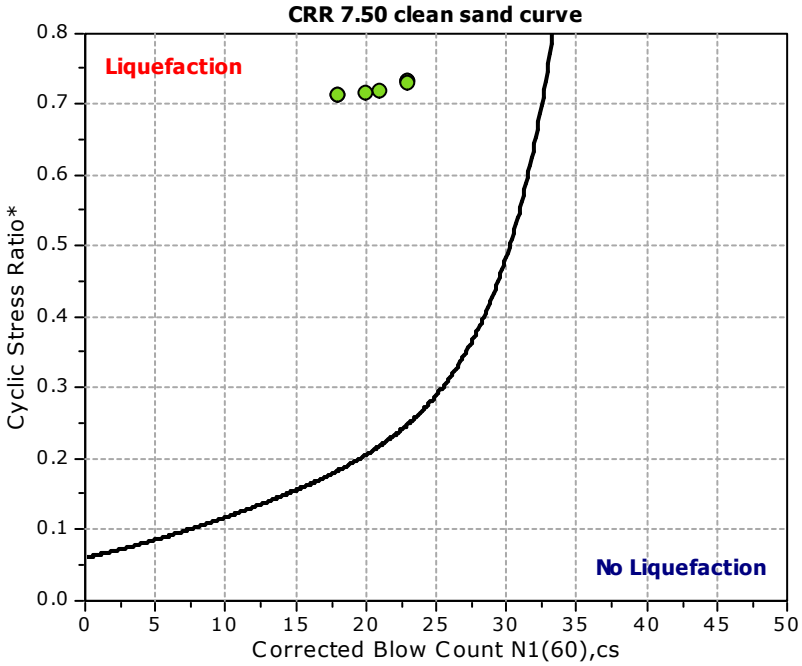
Project title : 575 Los Trancos Road Residence **SPT Name: B-1**

Location : Palo Alto, California

:: Input parameters and analysis properties ::

Analysis method:	Boulanger & Idriss, 2014	G.W.T. (in-situ):	18.00 ft
Fines correction method:	Boulanger & Idriss, 2014	G.W.T. (earthq.):	8.00 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	7.80
Borehole diameter:	200mm	Peak ground acceleration:	1.16 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.00		





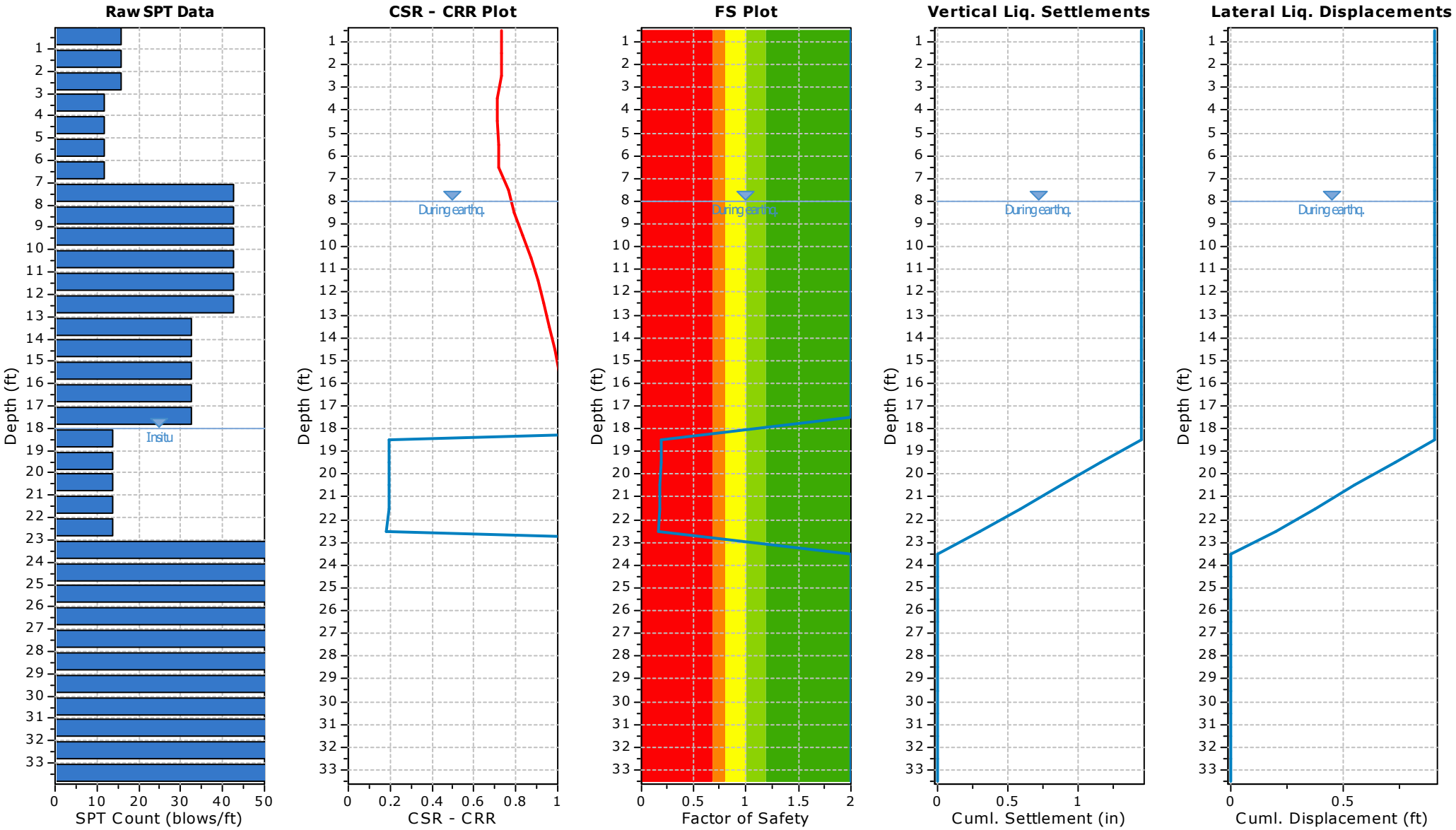
F.S. color scheme

- 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

:: Overall Liquefaction Assessment Analysis Plots ::



:: Field input data ::

Test Depth (ft)	SPT Field Value (blows)	Fines Content (%)	Unit Weight (pcf)	Infl. Thickness (ft)	Can Liquefy
0.50	16	5.00	116.00	1.00	Yes
1.50	16	5.00	116.00	1.00	Yes
2.50	16	5.00	116.00	1.00	Yes
3.50	12	5.00	122.00	1.00	Yes
4.50	12	5.00	122.00	1.00	Yes
5.50	12	18.00	122.00	1.00	Yes
6.50	12	18.00	122.00	1.00	Yes
7.50	43	18.00	120.00	1.00	Yes
8.50	43	18.00	120.00	1.00	Yes
9.50	43	18.00	120.00	1.00	Yes
10.50	43	18.00	120.00	1.00	Yes
11.50	43	18.00	120.00	1.00	Yes
12.50	43	18.00	120.00	1.00	Yes
13.50	33	18.00	120.00	1.00	Yes
14.50	33	18.00	120.00	1.00	Yes
15.50	33	18.00	120.00	1.00	Yes
16.50	33	18.00	120.00	1.00	Yes
17.50	33	18.00	120.00	1.00	Yes
18.50	14	18.00	120.00	1.00	Yes
19.50	14	18.00	120.00	1.00	Yes
20.50	14	18.00	120.00	1.00	Yes
21.50	14	18.00	120.00	1.00	Yes
22.50	14	18.00	120.00	1.00	Yes
23.50	100	18.00	120.00	1.00	Yes
24.50	100	18.00	120.00	1.00	Yes
25.50	100	18.00	120.00	1.00	Yes
26.50	100	18.00	120.00	1.00	Yes
27.50	100	18.00	120.00	1.00	Yes
28.50	100	18.00	120.00	1.00	Yes
29.50	100	18.00	120.00	1.00	Yes
30.50	100	18.00	120.00	1.00	Yes
31.50	100	18.00	120.00	1.00	Yes
32.50	100	18.00	120.00	1.00	Yes
33.50	100	18.00	120.00	1.00	Yes

Abbreviations

Depth: Depth at which test was performed (ft)
SPT Field Value: Number of blows per foot
Fines Content: Fines content at test depth (%)
Unit Weight: Unit weight at test depth (pcf)
Infl. Thickness: Thickness of the soil layer to be considered in settlements analysis (ft)
Can Liquefy: User defined switch for excluding/including test depth from the analysis procedure

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	FC (%)	$\Delta(N_1)_{60}$	$(N_1)_{60cs}$	$CRR_{7.5}$
0.50	16	116.00	0.03	0.00	0.03	0.41	1.70	1.00	1.15	0.75	1.00	23	5.00	0.00	23	4.000
1.50	16	116.00	0.09	0.00	0.09	0.41	1.70	1.00	1.15	0.75	1.00	23	5.00	0.00	23	4.000
2.50	16	116.00	0.15	0.00	0.15	0.41	1.70	1.00	1.15	0.75	1.00	23	5.00	0.00	23	4.000

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	FC (%)	$\Delta(N_1)_{60}$	$(N_1)_{60cs}$	$CRR_{7.5}$
3.50	12	122.00	0.21	0.00	0.21	0.46	1.70	1.00	1.15	0.75	1.00	18	5.00	0.00	18	4.000
4.50	12	122.00	0.27	0.00	0.27	0.46	1.70	1.00	1.15	0.75	1.00	18	5.00	0.00	18	4.000
5.50	12	122.00	0.33	0.00	0.33	0.41	1.62	1.00	1.15	0.75	1.00	17	18.00	4.09	21	4.000
6.50	12	122.00	0.39	0.00	0.39	0.42	1.53	1.00	1.15	0.75	1.00	16	18.00	4.09	20	4.000
7.50	43	120.00	0.45	0.00	0.45	0.26	1.25	1.00	1.15	0.80	1.00	50	18.00	4.09	54	4.000
8.50	43	120.00	0.51	0.00	0.51	0.26	1.21	1.00	1.15	0.80	1.00	48	18.00	4.09	52	4.000
9.50	43	120.00	0.57	0.00	0.57	0.26	1.18	1.00	1.15	0.80	1.00	47	18.00	4.09	51	4.000
10.50	43	120.00	0.63	0.00	0.63	0.26	1.15	1.00	1.15	0.85	1.00	48	18.00	4.09	52	4.000
11.50	43	120.00	0.69	0.00	0.69	0.26	1.12	1.00	1.15	0.85	1.00	47	18.00	4.09	51	4.000
12.50	43	120.00	0.75	0.00	0.75	0.26	1.10	1.00	1.15	0.85	1.00	46	18.00	4.09	50	4.000
13.50	33	120.00	0.81	0.00	0.81	0.30	1.08	1.00	1.15	0.85	1.00	35	18.00	4.09	39	4.000
14.50	33	120.00	0.87	0.00	0.87	0.31	1.06	1.00	1.15	0.85	1.00	34	18.00	4.09	38	4.000
15.50	33	120.00	0.93	0.00	0.93	0.31	1.04	1.00	1.15	0.85	1.00	34	18.00	4.09	38	4.000
16.50	33	120.00	0.99	0.00	0.99	0.29	1.02	1.00	1.15	0.95	1.00	37	18.00	4.09	41	4.000
17.50	33	120.00	1.05	0.00	1.05	0.30	1.00	1.00	1.15	0.95	1.00	36	18.00	4.09	40	4.000
18.50	14	120.00	1.11	0.02	1.09	0.45	0.99	1.00	1.15	0.95	1.00	15	18.00	4.09	19	0.194
19.50	14	120.00	1.17	0.05	1.12	0.45	0.97	1.00	1.15	0.95	1.00	15	18.00	4.09	19	0.194
20.50	14	120.00	1.23	0.08	1.15	0.45	0.96	1.00	1.15	0.95	1.00	15	18.00	4.09	19	0.194
21.50	14	120.00	1.29	0.11	1.18	0.45	0.95	1.00	1.15	0.95	1.00	15	18.00	4.09	19	0.194
22.50	14	120.00	1.35	0.14	1.21	0.46	0.94	1.00	1.15	0.95	1.00	14	18.00	4.09	18	0.184
23.50	100	120.00	1.41	0.17	1.24	0.26	0.96	1.00	1.15	0.95	1.00	105	18.00	4.09	109	4.000
24.50	100	120.00	1.47	0.20	1.27	0.26	0.95	1.00	1.15	0.95	1.00	104	18.00	4.09	108	4.000
25.50	100	120.00	1.53	0.23	1.30	0.26	0.95	1.00	1.15	0.95	1.00	104	18.00	4.09	108	4.000
26.50	100	120.00	1.59	0.27	1.32	0.26	0.94	1.00	1.15	0.95	1.00	103	18.00	4.09	107	4.000
27.50	100	120.00	1.65	0.30	1.35	0.26	0.94	1.00	1.15	0.95	1.00	102	18.00	4.09	106	4.000
28.50	100	120.00	1.71	0.33	1.38	0.26	0.93	1.00	1.15	0.95	1.00	102	18.00	4.09	106	4.000
29.50	100	120.00	1.77	0.36	1.41	0.26	0.93	1.00	1.15	0.95	1.00	101	18.00	4.09	105	4.000
30.50	100	120.00	1.83	0.39	1.44	0.26	0.92	1.00	1.15	1.00	1.00	106	18.00	4.09	110	4.000
31.50	100	120.00	1.89	0.42	1.47	0.26	0.92	1.00	1.15	1.00	1.00	106	18.00	4.09	110	4.000
32.50	100	120.00	1.95	0.45	1.50	0.26	0.91	1.00	1.15	1.00	1.00	105	18.00	4.09	109	4.000
33.50	100	120.00	2.01	0.48	1.53	0.26	0.91	1.00	1.15	1.00	1.00	104	18.00	4.09	108	4.000

Abbreviations

σ_v: Total stress during SPT test (tsf)
u_o: Water pore pressure during SPT test (tsf)
σ'_{vo}: Effective overburden pressure during SPT test (tsf)
m: Stress exponent normalization factor
C_N: Overburden corretion factor
C_E: Energy correction factor
C_B: Borehole diameter correction factor
C_R: Rod length correction factor
C_S: Liner correction factor
$N_{1(60)}$: Corrected N_{SPT} to a 60% energy ratio
$\Delta(N_1)_{60}$ Equivalent clean sand adjustment
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines content
$CRR_{7.5}$: Cyclic resistance ratio for M=7.5

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS
0.50	116.00	0.03	0.00	0.03	1.01	1.00	0.758	1.62	23	0.94	0.806	1.10	0.733	2.000

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS	
1.50	116.00	0.09	0.00	0.09	1.00	1.00	0.757	1.62	23	0.94	0.805	1.10	0.731	2.000	●
2.50	116.00	0.15	0.00	0.15	1.00	1.00	0.755	1.62	23	0.94	0.803	1.10	0.730	2.000	●
3.50	122.00	0.21	0.00	0.21	1.00	1.00	0.754	1.42	18	0.96	0.785	1.10	0.714	2.000	●
4.50	122.00	0.27	0.00	0.27	1.00	1.00	0.752	1.42	18	0.96	0.784	1.10	0.712	2.000	●
5.50	122.00	0.33	0.00	0.33	1.00	1.00	0.751	1.53	21	0.95	0.791	1.10	0.719	2.000	●
6.50	122.00	0.39	0.00	0.39	0.99	1.00	0.749	1.49	20	0.95	0.787	1.10	0.715	2.000	●
7.50	120.00	0.45	0.00	0.45	0.99	1.00	0.748	2.20	54	0.89	0.845	1.10	0.768	2.000	●
8.50	120.00	0.51	0.02	0.49	0.99	1.00	0.770	2.20	52	0.89	0.870	1.10	0.791	2.000	●
9.50	120.00	0.57	0.05	0.52	0.99	1.00	0.811	2.20	51	0.89	0.916	1.10	0.833	2.000	●
10.50	120.00	0.63	0.08	0.55	0.98	1.00	0.848	2.20	52	0.89	0.958	1.10	0.871	2.000	●
11.50	120.00	0.69	0.11	0.58	0.98	1.00	0.880	2.20	51	0.89	0.995	1.10	0.904	2.000	●
12.50	120.00	0.75	0.14	0.61	0.98	1.00	0.909	2.20	50	0.89	1.027	1.10	0.934	2.000	●
13.50	120.00	0.81	0.17	0.64	0.98	1.00	0.935	2.20	39	0.89	1.057	1.10	0.961	2.000	●
14.50	120.00	0.87	0.20	0.67	0.97	1.00	0.959	2.20	38	0.89	1.083	1.10	0.985	2.000	●
15.50	120.00	0.93	0.23	0.70	0.97	1.00	0.980	2.20	38	0.89	1.107	1.10	1.006	2.000	●
16.50	120.00	0.99	0.27	0.72	0.97	1.00	0.999	2.20	41	0.89	1.128	1.10	1.026	2.000	●
17.50	120.00	1.05	0.30	0.75	0.97	1.00	1.016	2.20	40	0.89	1.148	1.10	1.043	2.000	●
18.50	120.00	1.11	0.33	0.78	0.96	1.00	1.031	1.45	19	0.96	1.078	1.04	1.038	0.187	●
19.50	120.00	1.17	0.36	0.81	0.96	1.00	1.045	1.45	19	0.96	1.093	1.03	1.056	0.184	●
20.50	120.00	1.23	0.39	0.84	0.96	1.00	1.058	1.45	19	0.96	1.106	1.03	1.074	0.181	●
21.50	120.00	1.29	0.42	0.87	0.95	1.00	1.069	1.45	19	0.96	1.118	1.03	1.090	0.178	●
22.50	120.00	1.35	0.45	0.90	0.95	1.00	1.079	1.42	18	0.96	1.124	1.02	1.102	0.167	●
23.50	120.00	1.41	0.48	0.93	0.95	1.00	1.089	2.20	109	0.89	1.230	1.04	1.183	2.000	●
24.50	120.00	1.47	0.51	0.95	0.95	1.00	1.097	2.20	108	0.89	1.240	1.03	1.203	2.000	●
25.50	120.00	1.53	0.55	0.98	0.94	1.00	1.105	2.20	108	0.89	1.248	1.02	1.222	2.000	●
26.50	120.00	1.59	0.58	1.01	0.94	1.00	1.111	2.20	107	0.89	1.256	1.01	1.239	2.000	●
27.50	120.00	1.65	0.61	1.04	0.94	1.00	1.118	2.20	106	0.89	1.263	1.00	1.256	2.000	●
28.50	120.00	1.71	0.64	1.07	0.93	1.00	1.123	2.20	106	0.89	1.269	1.00	1.273	2.000	●
29.50	120.00	1.77	0.67	1.10	0.93	1.00	1.128	2.20	105	0.89	1.274	0.99	1.288	2.000	●
30.50	120.00	1.83	0.70	1.13	0.93	1.00	1.132	2.20	110	0.89	1.279	0.98	1.303	2.000	●
31.50	120.00	1.89	0.73	1.16	0.92	1.00	1.136	2.20	110	0.89	1.283	0.97	1.317	2.000	●
32.50	120.00	1.95	0.76	1.18	0.92	1.00	1.139	2.20	109	0.89	1.287	0.97	1.331	2.000	●
33.50	120.00	2.01	0.80	1.21	0.91	1.00	1.141	2.20	108	0.89	1.290	0.96	1.344	2.000	●

Abbreviations

$\sigma_{v,eq}$: Total overburden pressure at test point, during earthquake (tsf)
$u_{o,eq}$: Water pressure at test point, during earthquake (tsf)
$\sigma'_{vo,eq}$: Effective overburden pressure, during earthquake (tsf)
r_d: Nonlinear shear mass factor
α: Improvement factor due to stone columns
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$: CSR adjusted for M=7.5
K_{sigma}: Effective overburden stress factor
CSR^*: CSR fully adjusted (user FS applied)***
FS: Calculated factor of safety against soil liquefaction

*** User FS: 1.00

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L
0.50	2.000	0.00	9.92	1.00	0.00
1.50	2.000	0.00	9.77	1.00	0.00
2.50	2.000	0.00	9.62	1.00	0.00
3.50	2.000	0.00	9.47	1.00	0.00
4.50	2.000	0.00	9.31	1.00	0.00
5.50	2.000	0.00	9.16	1.00	0.00
6.50	2.000	0.00	9.01	1.00	0.00
7.50	2.000	0.00	8.86	1.00	0.00
8.50	2.000	0.00	8.70	1.00	0.00
9.50	2.000	0.00	8.55	1.00	0.00
10.50	2.000	0.00	8.40	1.00	0.00
11.50	2.000	0.00	8.25	1.00	0.00
12.50	2.000	0.00	8.10	1.00	0.00
13.50	2.000	0.00	7.94	1.00	0.00
14.50	2.000	0.00	7.79	1.00	0.00
15.50	2.000	0.00	7.64	1.00	0.00
16.50	2.000	0.00	7.49	1.00	0.00
17.50	2.000	0.00	7.33	1.00	0.00
18.50	0.187	0.81	7.18	1.00	1.78
19.50	0.184	0.82	7.03	1.00	1.75
20.50	0.181	0.82	6.88	1.00	1.72
21.50	0.178	0.82	6.72	1.00	1.68
22.50	0.167	0.83	6.57	1.00	1.67
23.50	2.000	0.00	6.42	1.00	0.00
24.50	2.000	0.00	6.27	1.00	0.00
25.50	2.000	0.00	6.11	1.00	0.00
26.50	2.000	0.00	5.96	1.00	0.00
27.50	2.000	0.00	5.81	1.00	0.00
28.50	2.000	0.00	5.66	1.00	0.00
29.50	2.000	0.00	5.50	1.00	0.00
30.50	2.000	0.00	5.35	1.00	0.00
31.50	2.000	0.00	5.20	1.00	0.00
32.50	2.000	0.00	5.05	1.00	0.00
33.50	2.000	0.00	4.89	1.00	0.00

Overall potential I_L : 8.60

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
0.50	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
1.50	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
2.50	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
3.50	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
4.50	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
5.50	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
6.50	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
7.50	50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000

Cumulative settlemetns: 0.000

Abbreviations

τ_{av}: Average cyclic shear stress
p: Average stress
G_{max}: Maximum shear modulus (tsf)
α, b: Shear strain formula variables
γ: Average shear strain
ε_{15}: Volumetric strain after 15 cycles
N_c: Number of cycles
ε_{Nc}: Volumetric strain for number of cycles N_c (%)
Δh: Thickness of soil layer (in)
ΔS: Settlement of soil layer (in)

:: Vertical & Lateral displ.acements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60cs}$	γ_{lim} (%)	F_α	FS_{liq}	γ_{max} (%)	e_v (%)	dz (ft)	$S_{v\text{-}1D}$ (in)	LDI (ft)
8.50	52	0.01	-1.75	2.000	0.00	0.00	1.00	0.000	0.00
9.50	51	0.02	-1.67	2.000	0.00	0.00	1.00	0.000	0.00
10.50	52	0.01	-1.75	2.000	0.00	0.00	1.00	0.000	0.00
11.50	51	0.02	-1.67	2.000	0.00	0.00	1.00	0.000	0.00
12.50	50	0.04	-1.59	2.000	0.00	0.00	1.00	0.000	0.00
13.50	39	1.07	-0.73	2.000	0.00	0.00	1.00	0.000	0.00
14.50	38	1.30	-0.65	2.000	0.00	0.00	1.00	0.000	0.00
15.50	38	1.30	-0.65	2.000	0.00	0.00	1.00	0.000	0.00
16.50	41	0.70	-0.88	2.000	0.00	0.00	1.00	0.000	0.00
17.50	40	0.87	-0.80	2.000	0.00	0.00	1.00	0.000	0.00
18.50	19	17.78	0.57	0.187	17.78	2.40	1.00	0.288	0.18
19.50	19	17.78	0.57	0.184	17.78	2.40	1.00	0.288	0.18
20.50	19	17.78	0.57	0.181	17.78	2.40	1.00	0.288	0.18
21.50	19	17.78	0.57	0.178	17.78	2.40	1.00	0.288	0.18
22.50	18	19.85	0.62	0.167	19.85	2.51	1.00	0.301	0.20
23.50	109	0.00	-6.93	2.000	0.00	0.00	1.00	0.000	0.00
24.50	108	0.00	-6.84	2.000	0.00	0.00	1.00	0.000	0.00
25.50	108	0.00	-6.84	2.000	0.00	0.00	1.00	0.000	0.00
26.50	107	0.00	-6.74	2.000	0.00	0.00	1.00	0.000	0.00
27.50	106	0.00	-6.64	2.000	0.00	0.00	1.00	0.000	0.00
28.50	106	0.00	-6.64	2.000	0.00	0.00	1.00	0.000	0.00
29.50	105	0.00	-6.55	2.000	0.00	0.00	1.00	0.000	0.00
30.50	110	0.00	-7.03	2.000	0.00	0.00	1.00	0.000	0.00
31.50	110	0.00	-7.03	2.000	0.00	0.00	1.00	0.000	0.00
32.50	109	0.00	-6.93	2.000	0.00	0.00	1.00	0.000	0.00
33.50	108	0.00	-6.84	2.000	0.00	0.00	1.00	0.000	0.00

:: Vertical & Lateral displ.acements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60cs}$	γ_{lim} (%)	F_α	FS_{liq}	γ_{max} (%)	e_v (%)	dz (ft)	S_{v-1D} (in)	LDI (ft)
Cumulative settlements:								**1.454**	**0.91**

Abbreviations

γ_{lim}: Limiting shear strain (%)
F_α/N: Maximun shear strain factor
γ_{max}: Maximum shear strain (%)
e_v:: Post liquefaction volumetric strain (%)
S_{v-1D}: Estimated vertical settlement (in)
LDI: Estimated lateral displacement (ft)

GEOLOGISMIKI Geotechnical Software

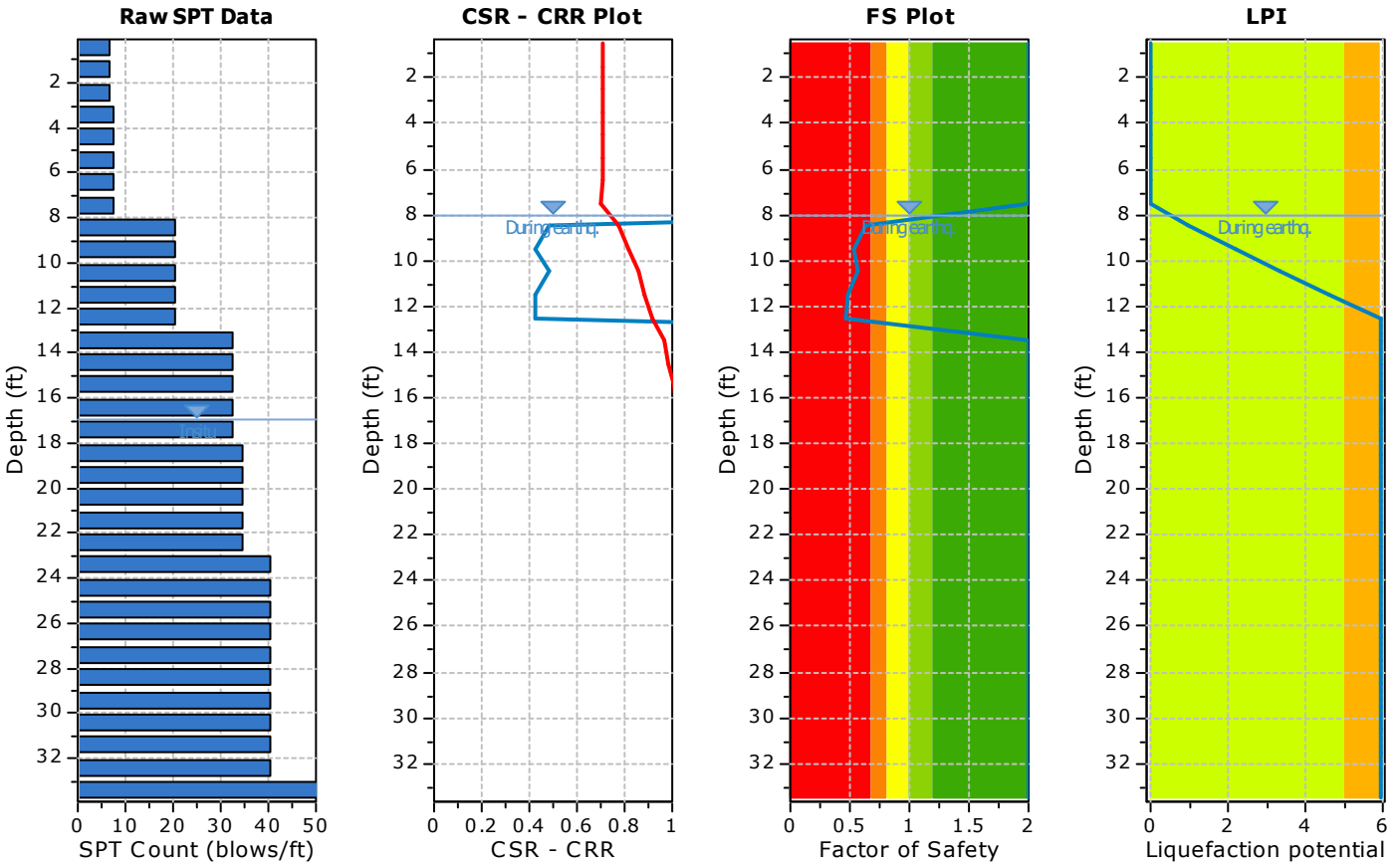
SPT BASED LIQUEFACTION ANALYSIS REPORT

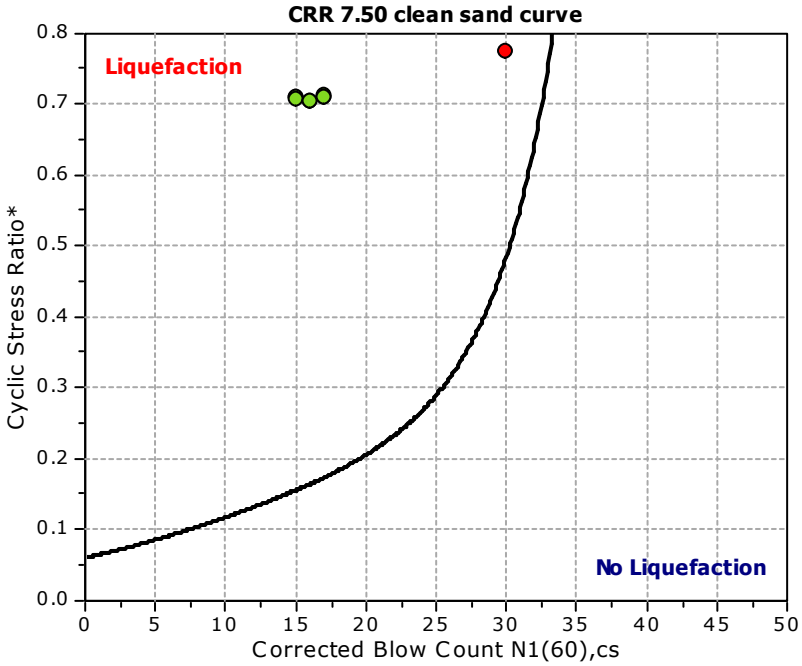
Project title : 575 Los Trancos Road Residence **SPT Name: B-2**

Location : Palo Alto, California

:: Input parameters and analysis properties ::

Analysis method:	Boulanger & Idriss, 2014	G.W.T. (in-situ):	17.00 ft
Fines correction method:	Boulanger & Idriss, 2014	G.W.T. (earthq.):	8.00 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	7.80
Borehole diameter:	200mm	Peak ground acceleration:	1.16 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.00		





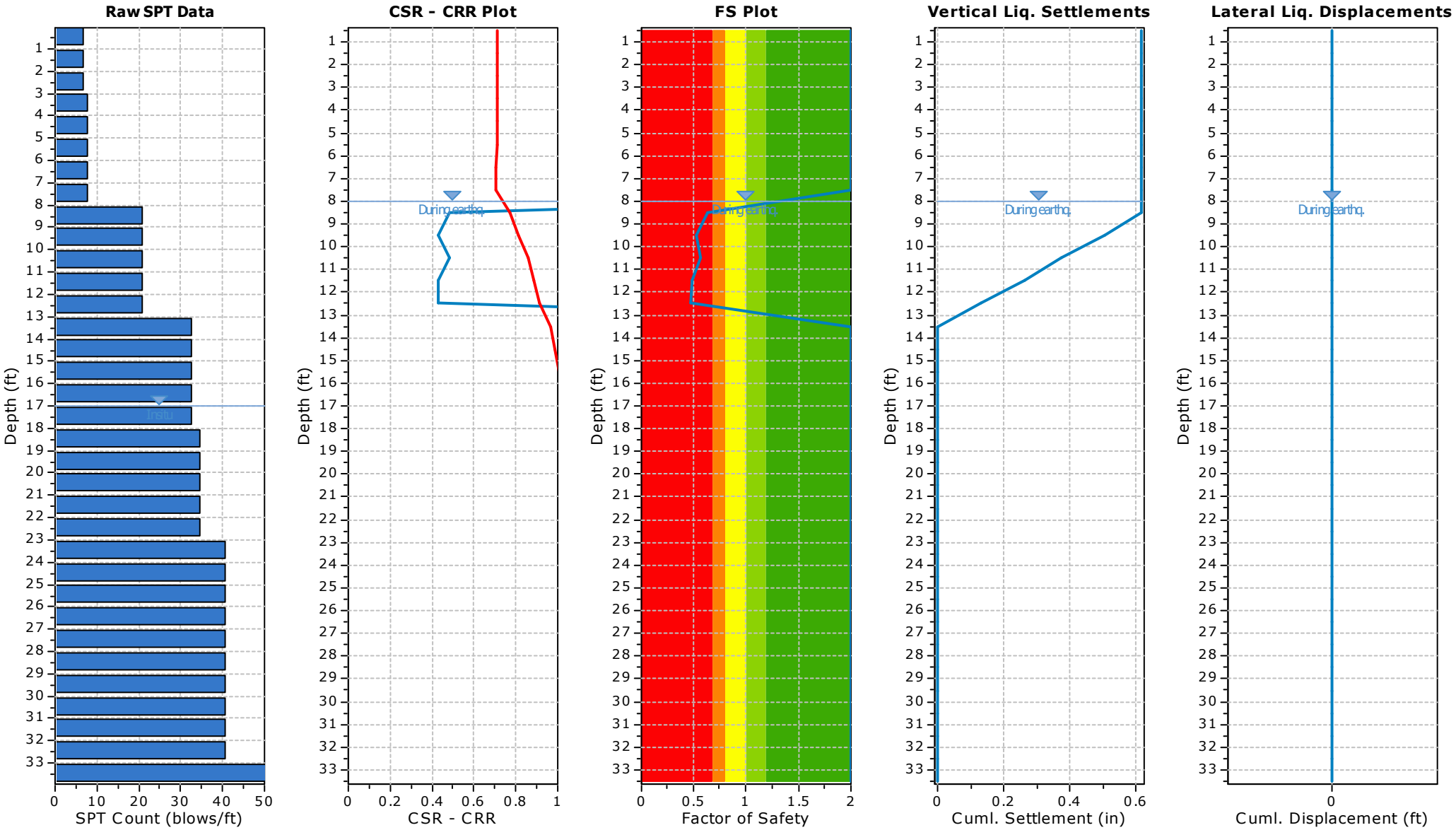
F.S. color scheme

- 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

:: Overall Liquefaction Assessment Analysis Plots ::



:: Field input data ::

Test Depth (ft)	SPT Field Value (blows)	Fines Content (%)	Unit Weight (pcf)	Infl. Thickness (ft)	Can Liquefy
0.50	7	21.00	117.00	1.00	Yes
1.50	7	21.00	117.00	1.00	Yes
2.50	7	21.00	117.00	1.00	Yes
3.50	8	21.00	113.00	1.00	Yes
4.50	8	21.00	113.00	1.00	Yes
5.50	8	21.00	113.00	1.00	Yes
6.50	8	21.00	113.00	1.00	Yes
7.50	8	21.00	113.00	1.00	Yes
8.50	21	21.00	120.00	1.00	Yes
9.50	21	21.00	120.00	1.00	Yes
10.50	21	21.00	120.00	1.00	Yes
11.50	21	21.00	120.00	1.00	Yes
12.50	21	21.00	120.00	1.00	Yes
13.50	33	21.00	137.00	1.00	Yes
14.50	33	21.00	137.00	1.00	Yes
15.50	33	21.00	137.00	1.00	Yes
16.50	33	21.00	137.00	1.00	Yes
17.50	33	9.00	120.00	1.00	Yes
18.50	35	9.00	120.00	1.00	Yes
19.50	35	9.00	120.00	1.00	Yes
20.50	35	9.00	120.00	1.00	Yes
21.50	35	9.00	120.00	1.00	Yes
22.50	35	9.00	120.00	1.00	Yes
23.50	41	31.00	120.00	1.00	Yes
24.50	41	31.00	120.00	1.00	Yes
25.50	41	31.00	120.00	1.00	Yes
26.50	41	31.00	120.00	1.00	Yes
27.50	41	31.00	120.00	1.00	Yes
28.50	41	9.00	120.00	1.00	Yes
29.50	41	9.00	120.00	1.00	Yes
30.50	41	9.00	120.00	1.00	Yes
31.50	41	9.00	120.00	1.00	Yes
32.50	41	9.00	120.00	1.00	Yes
33.50	100	9.00	120.00	1.00	Yes

Abbreviations

Depth: Depth at which test was performed (ft)
SPT Field Value: Number of blows per foot
Fines Content: Fines content at test depth (%)
Unit Weight: Unit weight at test depth (pcf)
Infl. Thickness: Thickness of the soil layer to be considered in settlements analysis (ft)
Can Liquefy: User defined switch for excluding/including test depth from the analysis procedure

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	FC (%)	$\Delta(N_1)_{60}$	$(N_1)_{60cs}$	$CRR_{7.5}$
0.50	7	117.00	0.03	0.00	0.03	0.46	1.70	1.00	1.15	0.75	1.00	10	21.00	4.63	15	4.000
1.50	7	117.00	0.09	0.00	0.09	0.46	1.70	1.00	1.15	0.75	1.00	10	21.00	4.63	15	4.000
2.50	7	117.00	0.15	0.00	0.15	0.46	1.70	1.00	1.15	0.75	1.00	10	21.00	4.63	15	4.000

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	FC (%)	$\Delta(N_1)_{60}$	$(N_1)_{60cs}$	$CRR_{7.5}$
3.50	8	113.00	0.20	0.00	0.20	0.44	1.70	1.00	1.15	0.75	1.00	12	21.00	4.63	17	4.000
4.50	8	113.00	0.26	0.00	0.26	0.44	1.70	1.00	1.15	0.75	1.00	12	21.00	4.63	17	4.000
5.50	8	113.00	0.32	0.00	0.32	0.44	1.70	1.00	1.15	0.75	1.00	12	21.00	4.63	17	4.000
6.50	8	113.00	0.37	0.00	0.37	0.45	1.61	1.00	1.15	0.75	1.00	11	21.00	4.63	16	4.000
7.50	8	113.00	0.43	0.00	0.43	0.46	1.51	1.00	1.15	0.80	1.00	11	21.00	4.63	16	4.000
8.50	21	120.00	0.49	0.00	0.49	0.35	1.31	1.00	1.15	0.80	1.00	25	21.00	4.63	30	0.485
9.50	21	120.00	0.55	0.00	0.55	0.36	1.27	1.00	1.15	0.80	1.00	24	21.00	4.63	29	0.429
10.50	21	120.00	0.61	0.00	0.61	0.36	1.22	1.00	1.15	0.85	1.00	25	21.00	4.63	30	0.485
11.50	21	120.00	0.67	0.00	0.67	0.36	1.18	1.00	1.15	0.85	1.00	24	21.00	4.63	29	0.429
12.50	21	120.00	0.73	0.00	0.73	0.37	1.15	1.00	1.15	0.85	1.00	24	21.00	4.63	29	0.429
13.50	33	137.00	0.80	0.00	0.80	0.30	1.09	1.00	1.15	0.85	1.00	35	21.00	4.63	40	4.000
14.50	33	137.00	0.87	0.00	0.87	0.30	1.06	1.00	1.15	0.85	1.00	34	21.00	4.63	39	4.000
15.50	33	137.00	0.93	0.00	0.93	0.31	1.04	1.00	1.15	0.85	1.00	34	21.00	4.63	39	4.000
16.50	33	137.00	1.00	0.00	1.00	0.29	1.02	1.00	1.15	0.95	1.00	37	21.00	4.63	42	4.000
17.50	33	120.00	1.06	0.02	1.05	0.32	1.00	1.00	1.15	0.95	1.00	36	9.00	0.72	37	4.000
18.50	35	120.00	1.12	0.05	1.08	0.31	0.99	1.00	1.15	0.95	1.00	38	9.00	0.72	39	4.000
19.50	35	120.00	1.18	0.08	1.10	0.31	0.99	1.00	1.15	0.95	1.00	38	9.00	0.72	39	4.000
20.50	35	120.00	1.24	0.11	1.13	0.31	0.98	1.00	1.15	0.95	1.00	37	9.00	0.72	38	4.000
21.50	35	120.00	1.30	0.14	1.16	0.31	0.97	1.00	1.15	0.95	1.00	37	9.00	0.72	38	4.000
22.50	35	120.00	1.36	0.17	1.19	0.31	0.96	1.00	1.15	0.95	1.00	37	9.00	0.72	38	4.000
23.50	41	120.00	1.42	0.20	1.22	0.26	0.96	1.00	1.15	0.95	1.00	43	31.00	5.40	48	4.000
24.50	41	120.00	1.48	0.23	1.25	0.26	0.96	1.00	1.15	0.95	1.00	43	31.00	5.40	48	4.000
25.50	41	120.00	1.54	0.27	1.28	0.26	0.95	1.00	1.15	0.95	1.00	43	31.00	5.40	48	4.000
26.50	41	120.00	1.60	0.30	1.31	0.26	0.95	1.00	1.15	0.95	1.00	42	31.00	5.40	47	4.000
27.50	41	120.00	1.66	0.33	1.34	0.26	0.94	1.00	1.15	0.95	1.00	42	31.00	5.40	47	4.000
28.50	41	120.00	1.72	0.36	1.36	0.28	0.93	1.00	1.15	0.95	1.00	42	9.00	0.72	43	4.000
29.50	41	120.00	1.78	0.39	1.39	0.29	0.92	1.00	1.15	0.95	1.00	41	9.00	0.72	42	4.000
30.50	41	120.00	1.84	0.42	1.42	0.27	0.92	1.00	1.15	1.00	1.00	43	9.00	0.72	44	4.000
31.50	41	120.00	1.90	0.45	1.45	0.28	0.92	1.00	1.15	1.00	1.00	43	9.00	0.72	44	4.000
32.50	41	120.00	1.96	0.48	1.48	0.28	0.91	1.00	1.15	1.00	1.00	43	9.00	0.72	44	4.000
33.50	100	120.00	2.02	0.51	1.51	0.26	0.91	1.00	1.15	1.00	1.00	105	9.00	0.72	106	4.000

Abbreviations

σ_v: Total stress during SPT test (tsf)
u_o: Water pore pressure during SPT test (tsf)
σ'_{vo}: Effective overburden pressure during SPT test (tsf)
m: Stress exponent normalization factor
C_N: Overburden corretion factor
C_E: Energy correction factor
C_B: Borehole diameter correction factor
C_R: Rod length correction factor
C_S: Liner correction factor
$N_{1(60)}$: Corrected N_{SPT} to a 60% energy ratio
$\Delta(N_1)_{60}$ Equivalent clean sand adjustment
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines content
$CRR_{7.5}$: Cyclic resistance ratio for M=7.5

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS
0.50	117.00	0.03	0.00	0.03	1.01	1.00	0.758	1.32	15	0.97	0.782	1.10	0.711	2.000

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS	
1.50	117.00	0.09	0.00	0.09	1.00	1.00	0.757	1.32	15	0.97	0.780	1.10	0.709	2.000	●
2.50	117.00	0.15	0.00	0.15	1.00	1.00	0.755	1.32	15	0.97	0.779	1.10	0.708	2.000	●
3.50	113.00	0.20	0.00	0.20	1.00	1.00	0.754	1.38	17	0.96	0.782	1.10	0.711	2.000	●
4.50	113.00	0.26	0.00	0.26	1.00	1.00	0.752	1.38	17	0.96	0.781	1.10	0.710	2.000	●
5.50	113.00	0.32	0.00	0.32	1.00	1.00	0.751	1.38	17	0.96	0.779	1.10	0.709	2.000	●
6.50	113.00	0.37	0.00	0.37	0.99	1.00	0.749	1.35	16	0.97	0.775	1.10	0.705	2.000	●
7.50	113.00	0.43	0.00	0.43	0.99	1.00	0.748	1.35	16	0.97	0.774	1.10	0.703	2.000	●
8.50	120.00	0.49	0.02	0.47	0.99	1.00	0.771	2.00	30	0.90	0.852	1.10	0.775	0.626	●
9.50	120.00	0.55	0.05	0.50	0.99	1.00	0.814	1.94	29	0.91	0.894	1.10	0.813	0.528	●
10.50	120.00	0.61	0.08	0.53	0.98	1.00	0.852	2.00	30	0.90	0.942	1.10	0.856	0.566	●
11.50	120.00	0.67	0.11	0.56	0.98	1.00	0.885	1.94	29	0.91	0.973	1.10	0.884	0.485	●
12.50	120.00	0.73	0.14	0.59	0.98	1.00	0.915	1.94	29	0.91	1.005	1.10	0.914	0.469	●
13.50	137.00	0.80	0.17	0.63	0.98	1.00	0.939	2.20	40	0.89	1.061	1.10	0.965	2.000	●
14.50	137.00	0.87	0.20	0.66	0.97	1.00	0.960	2.20	39	0.89	1.084	1.10	0.986	2.000	●
15.50	137.00	0.93	0.23	0.70	0.97	1.00	0.978	2.20	39	0.89	1.105	1.10	1.004	2.000	●
16.50	137.00	1.00	0.27	0.74	0.97	1.00	0.994	2.20	42	0.89	1.123	1.10	1.021	2.000	●
17.50	120.00	1.06	0.30	0.77	0.97	1.00	1.011	2.20	37	0.89	1.142	1.10	1.043	2.000	●
18.50	120.00	1.12	0.33	0.80	0.96	1.00	1.026	2.20	39	0.89	1.159	1.08	1.069	2.000	●
19.50	120.00	1.18	0.36	0.82	0.96	1.00	1.040	2.20	39	0.89	1.175	1.07	1.094	2.000	●
20.50	120.00	1.24	0.39	0.85	0.96	1.00	1.052	2.20	38	0.89	1.189	1.06	1.118	2.000	●
21.50	120.00	1.30	0.42	0.88	0.95	1.00	1.064	2.20	38	0.89	1.202	1.05	1.140	2.000	●
22.50	120.00	1.36	0.45	0.91	0.95	1.00	1.074	2.20	38	0.89	1.213	1.04	1.162	2.000	●
23.50	120.00	1.42	0.48	0.94	0.95	1.00	1.083	2.20	48	0.89	1.224	1.04	1.182	2.000	●
24.50	120.00	1.48	0.51	0.97	0.95	1.00	1.092	2.20	48	0.89	1.233	1.03	1.202	2.000	●
25.50	120.00	1.54	0.55	1.00	0.94	1.00	1.099	2.20	48	0.89	1.242	1.02	1.220	2.000	●
26.50	120.00	1.60	0.58	1.03	0.94	1.00	1.106	2.20	47	0.89	1.250	1.01	1.238	2.000	●
27.50	120.00	1.66	0.61	1.05	0.94	1.00	1.112	2.20	47	0.89	1.257	1.00	1.255	2.000	●
28.50	120.00	1.72	0.64	1.08	0.93	1.00	1.118	2.20	43	0.89	1.263	0.99	1.271	2.000	●
29.50	120.00	1.78	0.67	1.11	0.93	1.00	1.122	2.20	42	0.89	1.268	0.99	1.287	2.000	●
30.50	120.00	1.84	0.70	1.14	0.93	1.00	1.127	2.20	44	0.89	1.273	0.98	1.302	2.000	●
31.50	120.00	1.90	0.73	1.17	0.92	1.00	1.130	2.20	44	0.89	1.277	0.97	1.316	2.000	●
32.50	120.00	1.96	0.76	1.20	0.92	1.00	1.134	2.20	44	0.89	1.281	0.96	1.330	2.000	●
33.50	120.00	2.02	0.80	1.23	0.91	1.00	1.136	2.20	106	0.89	1.284	0.96	1.343	2.000	●

Abbreviations

$\sigma_{v,eq}$: Total overburden pressure at test point, during earthquake (tsf)
$u_{o,eq}$: Water pressure at test point, during earthquake (tsf)
$\sigma'_{vo,eq}$: Effective overburden pressure, during earthquake (tsf)
r_d: Nonlinear shear mass factor
α: Improvement factor due to stone columns
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$: CSR adjusted for M=7.5
K_{sigma}: Effective overburden stress factor
CSR^*: CSR fully adjusted (user FS applied)***
FS: Calculated factor of safety against soil liquefaction

*** User FS: 1.00

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L
0.50	2.000	0.00	9.92	1.00	0.00
1.50	2.000	0.00	9.77	1.00	0.00
2.50	2.000	0.00	9.62	1.00	0.00
3.50	2.000	0.00	9.47	1.00	0.00
4.50	2.000	0.00	9.31	1.00	0.00
5.50	2.000	0.00	9.16	1.00	0.00
6.50	2.000	0.00	9.01	1.00	0.00
7.50	2.000	0.00	8.86	1.00	0.00
8.50	0.626	0.37	8.70	1.00	0.99
9.50	0.528	0.47	8.55	1.00	1.23
10.50	0.566	0.43	8.40	1.00	1.11
11.50	0.485	0.51	8.25	1.00	1.29
12.50	0.469	0.53	8.10	1.00	1.31
13.50	2.000	0.00	7.94	1.00	0.00
14.50	2.000	0.00	7.79	1.00	0.00
15.50	2.000	0.00	7.64	1.00	0.00
16.50	2.000	0.00	7.49	1.00	0.00
17.50	2.000	0.00	7.33	1.00	0.00
18.50	2.000	0.00	7.18	1.00	0.00
19.50	2.000	0.00	7.03	1.00	0.00
20.50	2.000	0.00	6.88	1.00	0.00
21.50	2.000	0.00	6.72	1.00	0.00
22.50	2.000	0.00	6.57	1.00	0.00
23.50	2.000	0.00	6.42	1.00	0.00
24.50	2.000	0.00	6.27	1.00	0.00
25.50	2.000	0.00	6.11	1.00	0.00
26.50	2.000	0.00	5.96	1.00	0.00
27.50	2.000	0.00	5.81	1.00	0.00
28.50	2.000	0.00	5.66	1.00	0.00
29.50	2.000	0.00	5.50	1.00	0.00
30.50	2.000	0.00	5.35	1.00	0.00
31.50	2.000	0.00	5.20	1.00	0.00
32.50	2.000	0.00	5.05	1.00	0.00
33.50	2.000	0.00	4.89	1.00	0.00

Overall potential I_L : 5.94

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
0.50	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
1.50	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
2.50	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
3.50	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
4.50	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
5.50	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
6.50	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000
7.50	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.000

Cumulative settlemetns: 0.000

Abbreviations

τ_{av}: Average cyclic shear stress
p: Average stress
G_{max}: Maximum shear modulus (tsf)
α, b: Shear strain formula variables
γ: Average shear strain
ε_{15}: Volumetric strain after 15 cycles
N_c: Number of cycles
ε_{Nc}: Volumetric strain for number of cycles N_c (%)
Δh: Thickness of soil layer (in)
ΔS: Settlement of soil layer (in)

:: Vertical & Lateral displ.acements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60cs}$	γ_{lim} (%)	F_α	FS_{liq}	γ_{max} (%)	e_v (%)	dz (ft)	$S_{v\text{-}1D}$ (in)	LDI (ft)
8.50	30	4.65	-0.09	0.626	4.65	0.92	1.00	0.111	0.00
9.50	29	5.33	-0.02	0.528	5.33	1.10	1.00	0.131	0.00
10.50	30	4.65	-0.09	0.566	4.65	0.92	1.00	0.111	0.00
11.50	29	5.33	-0.02	0.485	5.33	1.10	1.00	0.131	0.00
12.50	29	5.33	-0.02	0.469	5.33	1.10	1.00	0.131	0.00
13.50	40	0.87	-0.80	2.000	0.00	0.00	1.00	0.000	0.00
14.50	39	1.07	-0.73	2.000	0.00	0.00	1.00	0.000	0.00
15.50	39	1.07	-0.73	2.000	0.00	0.00	1.00	0.000	0.00
16.50	42	0.56	-0.96	2.000	0.00	0.00	1.00	0.000	0.00
17.50	37	1.56	-0.58	2.000	0.00	0.00	1.00	0.000	0.00
18.50	39	1.07	-0.73	2.000	0.00	0.00	1.00	0.000	0.00
19.50	39	1.07	-0.73	2.000	0.00	0.00	1.00	0.000	0.00
20.50	38	1.30	-0.65	2.000	0.00	0.00	1.00	0.000	0.00
21.50	38	1.30	-0.65	2.000	0.00	0.00	1.00	0.000	0.00
22.50	38	1.30	-0.65	2.000	0.00	0.00	1.00	0.000	0.00
23.50	48	0.09	-1.43	2.000	0.00	0.00	1.00	0.000	0.00
24.50	48	0.09	-1.43	2.000	0.00	0.00	1.00	0.000	0.00
25.50	48	0.09	-1.43	2.000	0.00	0.00	1.00	0.000	0.00
26.50	47	0.13	-1.35	2.000	0.00	0.00	1.00	0.000	0.00
27.50	47	0.13	-1.35	2.000	0.00	0.00	1.00	0.000	0.00
28.50	43	0.44	-1.03	2.000	0.00	0.00	1.00	0.000	0.00
29.50	42	0.56	-0.96	2.000	0.00	0.00	1.00	0.000	0.00
30.50	44	0.34	-1.11	2.000	0.00	0.00	1.00	0.000	0.00
31.50	44	0.34	-1.11	2.000	0.00	0.00	1.00	0.000	0.00
32.50	44	0.34	-1.11	2.000	0.00	0.00	1.00	0.000	0.00
33.50	106	0.00	-6.64	2.000	0.00	0.00	1.00	0.000	0.00

:: Vertical & Lateral displ.acements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60cs}$	γ_{lim} (%)	F_α	FS_{liq}	γ_{max} (%)	e_v (%)	dz (ft)	S_{v-1D} (in)	LDI (ft)
Cumulative settlements:								**0.616**	**0.00**

Abbreviations

γ_{lim}: Limiting shear strain (%)
F_α/N: Maximun shear strain factor
γ_{max}: Maximum shear strain (%)
e_v:: Post liquefaction volumetric strain (%)
S_{v-1D}: Estimated vertical settlement (in)
LDI: Estimated lateral displacement (ft)

References

- Ronald D. Andrus, Hossein Hayati, Nisha P. Mohanan, 2009. Correcting Liquefaction Resistance for Aged Sands Using Measured to Estimated Velocity Ratio, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 135, No. 6, June 1

- Boulanger, R.W. and Idriss, I. M., 2014. CPT AND SPT BASED LIQUEFACTION TRIGGERING PROCEDURES. DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA AT DAVIS

- Dipl.-Ing. Heinz J. Priebe, Vibro Replacement to Prevent Earthquake Induced Liquefaction, Proceedings of the Geotechnique-Colloquium at Darmstadt, Germany, on March 19th, 1998 (also published in Ground Engineering, September 1998), Technical paper 12-57E

- Robertson, P.K. and Cabal, K.L., 2007, Guide to Cone Penetration Testing for Geotechnical Engineering. Available at no cost at http://www.geologismiki.gr/

- Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J.T., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J., Liao, S., Marcuson III, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R., and Stokoe, K.H., Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 127, October, pp 817-833

- Zhang, G., Robertson. P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180

- Zhang, G., Robertson. P.K., Brachman, R., 2004, Estimating Liquefaction Induced Lateral Displacements using the SPT and CPT, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 130, No. 8, 861-871

- Pradel, D., 1998, Procedure to Evaluate Earthquake-Induced Settlements in Dry Sandy Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 124, No. 4, 364-368

- R. Kayen, R. E. S. Moss, E. M. Thompson, R. B. Seed, K. O. Cetin, A. Der Kiureghian, Y. Tanaka, K. Tokimatsu, 2013. Shear-Wave Velocity–Based Probabilistic and Deterministic Assessment of Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 139, No. 3, March 1

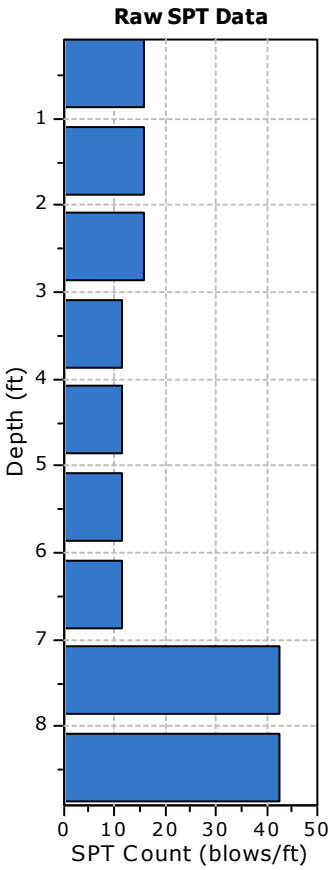
SPT BASED LIQUEFACTION ANALYSIS REPORT

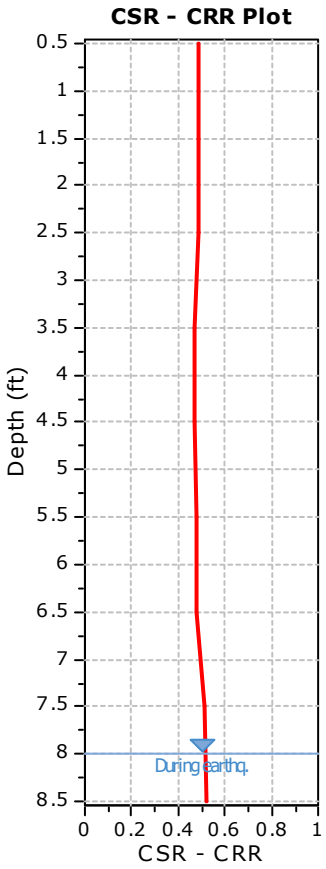
Project title : 575 Los Trancos Road Residence, Dry Sand **SPT Name: B-1**

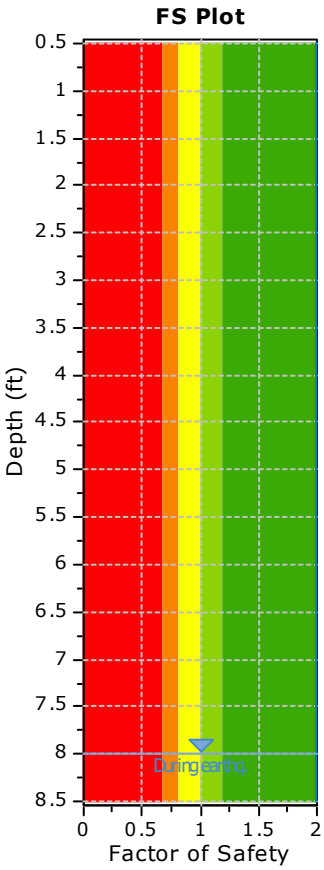
Location : Palo Alto, California

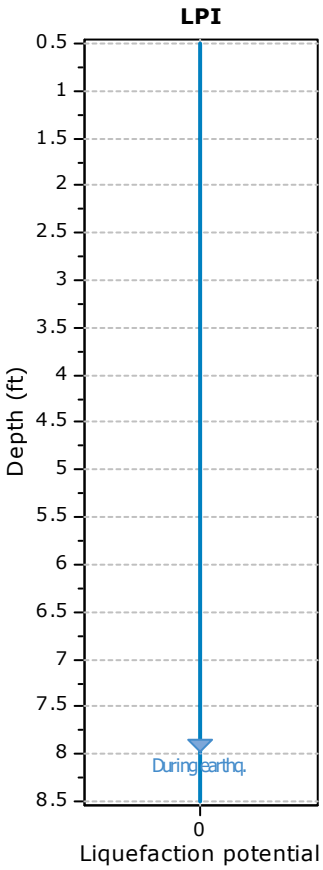
:: Input parameters and analysis properties ::

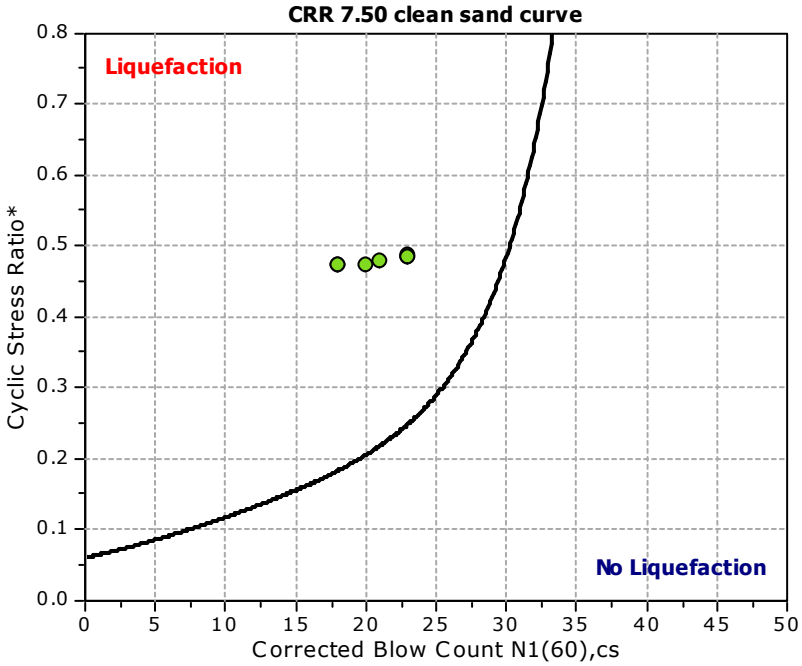
Analysis method:	Boulanger & Idriss, 2014	G.W.T. (in-situ):	18.00 ft
Fines correction method:	Boulanger & Idriss, 2014	G.W.T. (earthq.):	8.00 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	7.80
Borehole diameter:	200mm	Peak ground acceleration:	0.77 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.00		











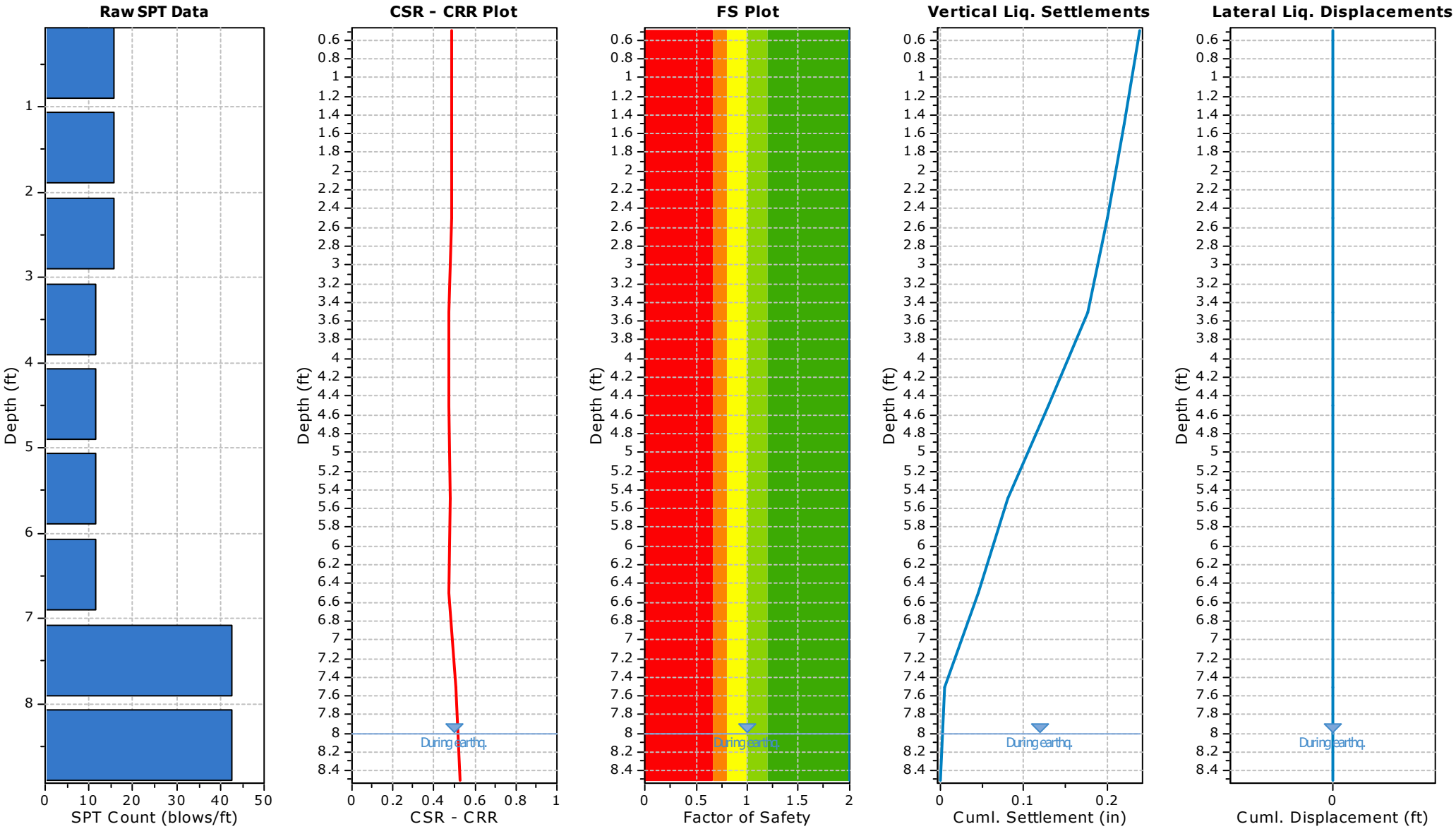
F.S. color scheme

- 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

:: Overall Liquefaction Assessment Analysis Plots ::



:: Field input data ::

Test Depth (ft)	SPT Field Value (blows)	Fines Content (%)	Unit Weight (pcf)	Infl. Thickness (ft)	Can Liquefy
0.50	16	5.00	116.00	1.00	Yes
1.50	16	5.00	116.00	1.00	Yes
2.50	16	5.00	116.00	1.00	Yes
3.50	12	5.00	122.00	1.00	Yes
4.50	12	5.00	122.00	1.00	Yes
5.50	12	18.00	122.00	1.00	Yes
6.50	12	18.00	122.00	1.00	Yes
7.50	43	18.00	120.00	1.00	No
8.50	43	18.00	120.00	1.00	No

Abbreviations

Depth: Depth at which test was performed (ft)
SPT Field Value: Number of blows per foot
Fines Content: Fines content at test depth (%)
Unit Weight: Unit weight at test depth (pcf)
Infl. Thickness: Thickness of the soil layer to be considered in settlements analysis (ft)
Can Liquefy: User defined switch for excluding/including test depth from the analysis procedure

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	FC (%)	$\Delta(N_1)_{60}$	$(N_1)_{60cs}$	$CRR_{7.5}$
0.50	16	116.00	0.03	0.00	0.03	0.41	1.70	1.00	1.15	0.75	1.00	23	5.00	0.00	23	4.000
1.50	16	116.00	0.09	0.00	0.09	0.41	1.70	1.00	1.15	0.75	1.00	23	5.00	0.00	23	4.000
2.50	16	116.00	0.15	0.00	0.15	0.41	1.70	1.00	1.15	0.75	1.00	23	5.00	0.00	23	4.000
3.50	12	122.00	0.21	0.00	0.21	0.46	1.70	1.00	1.15	0.75	1.00	18	5.00	0.00	18	4.000
4.50	12	122.00	0.27	0.00	0.27	0.46	1.70	1.00	1.15	0.75	1.00	18	5.00	0.00	18	4.000
5.50	12	122.00	0.33	0.00	0.33	0.41	1.62	1.00	1.15	0.75	1.00	17	18.00	4.09	21	4.000
6.50	12	122.00	0.39	0.00	0.39	0.42	1.53	1.00	1.15	0.75	1.00	16	18.00	4.09	20	4.000
7.50	43	120.00	0.45	0.00	0.45	0.26	1.25	1.00	1.15	0.80	1.00	50	18.00	4.09	54	4.000
8.50	43	120.00	0.51	0.00	0.51	0.26	1.21	1.00	1.15	0.80	1.00	48	18.00	4.09	52	4.000

Abbreviations

σ_v: Total stress during SPT test (tsf)
u_o: Water pore pressure during SPT test (tsf)
σ'_{vo}: Effective overburden pressure during SPT test (tsf)
m: Stress exponent normalization factor
C_N: Overburden corretion factor
C_E: Energy correction factor
C_B: Borehole diameter correction factor
C_R: Rod length correction factor
C_S: Liner correction factor
$N_{1(60)}$: Corrected N_{SPT} to a 60% energy ratio
$\Delta(N_1)_{60}$ Equivalent clean sand adjustment
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines content
$CRR_{7.5}$: Cyclic resistance ratio for M=7.5

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS	
0.50	116.00	0.03	0.00	0.03	1.01	1.00	0.503	1.62	23	0.94	0.535	1.10	0.486	2.000	●
1.50	116.00	0.09	0.00	0.09	1.00	1.00	0.502	1.62	23	0.94	0.534	1.10	0.486	2.000	●
2.50	116.00	0.15	0.00	0.15	1.00	1.00	0.501	1.62	23	0.94	0.533	1.10	0.485	2.000	●

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS	
3.50	122.00	0.21	0.00	0.21	1.00	1.00	0.500	1.42	18	0.96	0.521	1.10	0.474	2.000	●
4.50	122.00	0.27	0.00	0.27	1.00	1.00	0.499	1.42	18	0.96	0.520	1.10	0.473	2.000	●
5.50	122.00	0.33	0.00	0.33	1.00	1.00	0.498	1.53	21	0.95	0.525	1.10	0.478	2.000	●
6.50	122.00	0.39	0.00	0.39	0.99	1.00	0.497	1.49	20	0.95	0.522	1.10	0.475	2.000	●
7.50	120.00	0.45	0.00	0.45	0.99	1.00	0.496	2.20	54	0.89	0.561	1.10	0.510	2.000	●
8.50	120.00	0.51	0.02	0.49	0.99	1.00	0.511	2.20	52	0.89	0.577	1.10	0.525	2.000	●

Abbreviations

$\sigma_{v,eq}$: Total overburden pressure at test point, during earthquake (tsf)
$u_{o,eq}$: Water pressure at test point, during earthquake (tsf)
$\sigma'_{vo,eq}$: Effective overburden pressure, during earthquake (tsf)
r_d: Nonlinear shear mass factor
α: Improvement factor due to stone columns
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$: CSR adjusted for M=7.5
K_{sigma}: Effective overburden stress factor
CSR^*: CSR fully adjusted (user FS applied)***
FS: Calculated factor of safety against soil liquefaction

*** User FS: 1.00

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L
0.50	2.000	0.00	9.92	1.00	0.00
1.50	2.000	0.00	9.77	1.00	0.00
2.50	2.000	0.00	9.62	1.00	0.00
3.50	2.000	0.00	9.47	1.00	0.00
4.50	2.000	0.00	9.31	1.00	0.00
5.50	2.000	0.00	9.16	1.00	0.00
6.50	2.000	0.00	9.01	1.00	0.00
7.50	2.000	0.00	8.86	1.00	0.00
8.50	2.000	0.00	8.70	1.00	0.00

Overall potential I_L : 0.00

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
0.50	23	0.01	0.02	0.18	0.13	53547.74	0.00	0.00	18.12	0.08	1.00	0.018
1.50	23	0.04	0.06	0.31	0.13	27699.28	0.00	0.00	18.12	0.09	1.00	0.021
2.50	23	0.07	0.10	0.40	0.13	20387.27	0.00	0.00	18.12	0.10	1.00	0.023
3.50	18	0.10	0.14	0.44	0.13	16514.28	0.00	0.00	18.12	0.20	1.00	0.047
4.50	18	0.13	0.18	0.50	0.13	14134.26	0.00	0.00	18.12	0.21	1.00	0.049
5.50	17	0.16	0.22	0.58	0.14	12492.68	0.00	0.00	18.12	0.15	1.00	0.035
6.50	16	0.19	0.26	0.62	0.14	11277.43	0.00	0.00	18.12	0.17	1.00	0.041
7.50	50	0.22	0.30	0.93	0.14	10347.42	0.00	0.00	18.12	0.02	1.00	0.005

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)

Cumulative settlemetns: 0.239

Abbreviations

τ_{av}: Average cyclic shear stress
p: Average stress
G_{max}: Maximum shear modulus (tsf)
α, b: Shear strain formula variables
γ: Average shear strain
ε_{15}: Volumetric strain after 15 cycles
N_c: Number of cycles
ε_{Nc}: Volumetric strain for number of cycles N_c (%)
Δh: Thickness of soil layer (in)
ΔS: Settlement of soil layer (in)

:: Vertical & Lateral displ.acements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60cs}$	γ_{lim} (%)	F_α	FS_{liq}	γ_{max} (%)	e_v (%)	dz (ft)	S_{v-1D} (in)	LDI (ft)
8.50	52	0.00	0.00	2.000	0.00	0.00	1.00	0.000	0.00

Cumulative settlements: 0.000 0.00

Abbreviations

γ_{lim}: Limiting shear strain (%)
F_α/N: Maximun shear strain factor
γ_{max}: Maximum shear strain (%)
e_v:: Post liquefaction volumetric strain (%)
S_{v-1D}: Estimated vertical settlement (in)
LDI: Estimated lateral displacement (ft)

GEOLOGISMIKI Geotechnical Software

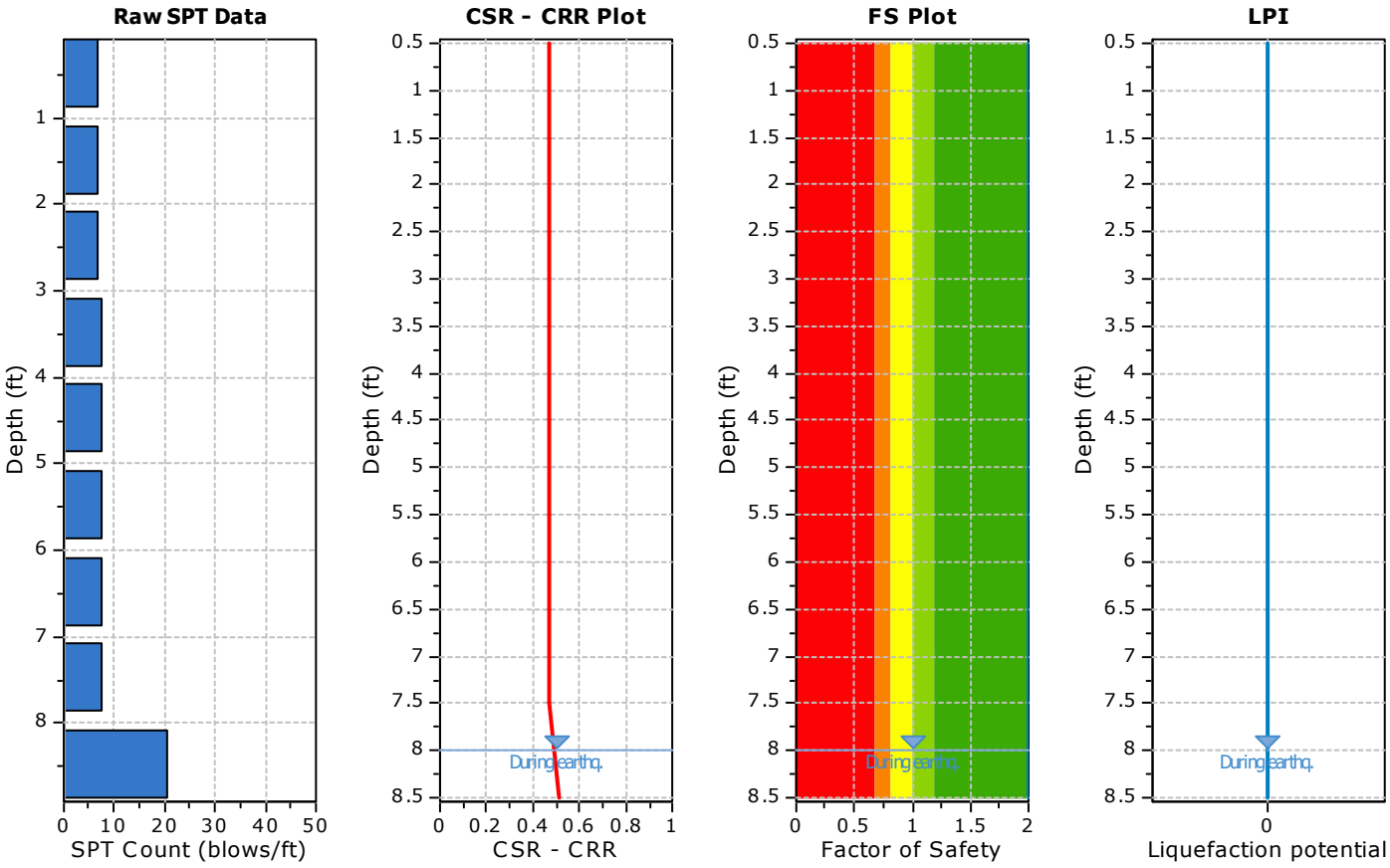
SPT BASED LIQUEFACTION ANALYSIS REPORT

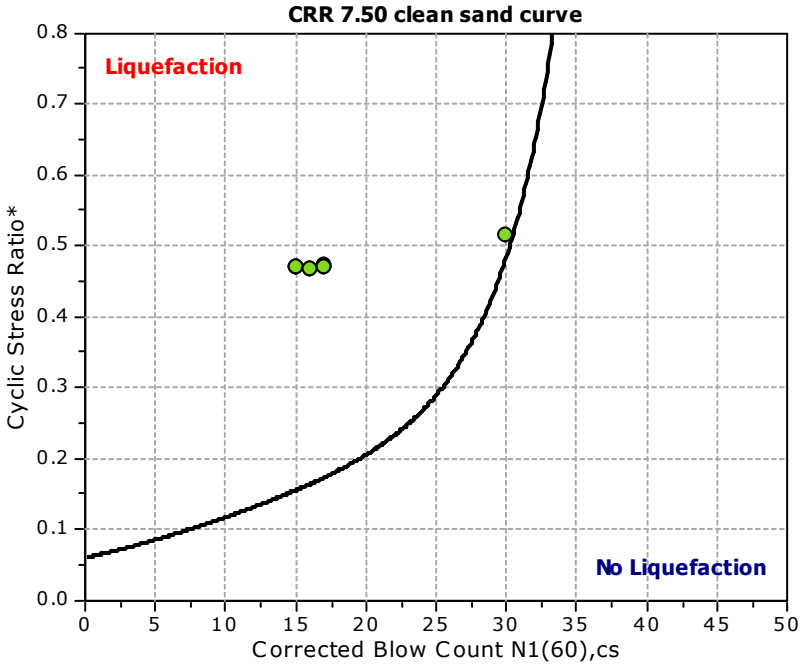
Project title : 575 Los Trancos Road Residence, Dry Sand **SPT Name: B-2**

Location : Palo Alto, California

:: Input parameters and analysis properties ::

Analysis method:	Boulanger & Idriss, 2014	G.W.T. (in-situ):	17.00 ft
Fines correction method:	Boulanger & Idriss, 2014	G.W.T. (earthq.):	8.00 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	7.80
Borehole diameter:	200mm	Peak ground acceleration:	0.77 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.00		





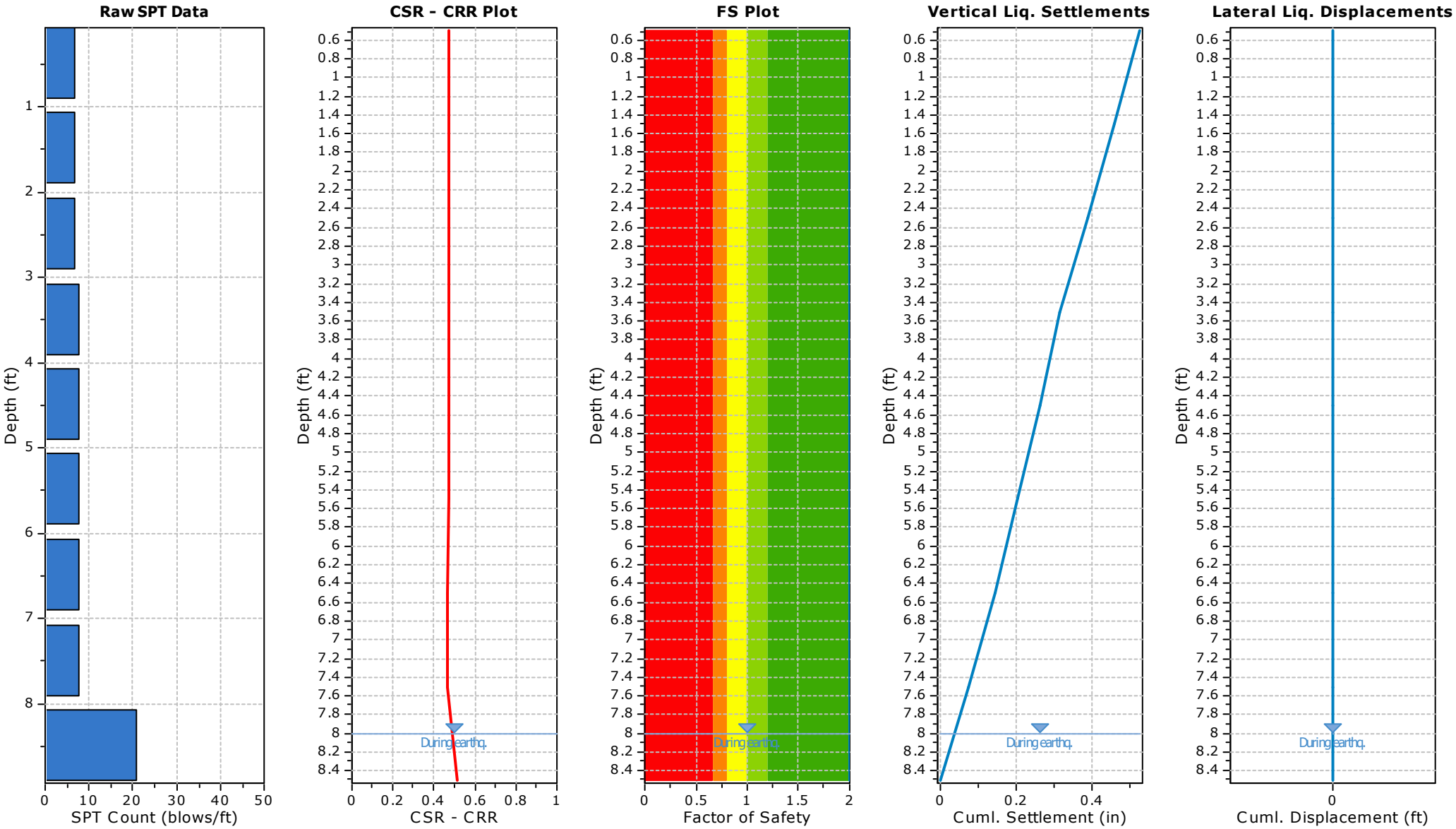
F.S. color scheme

- 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

:: Overall Liquefaction Assessment Analysis Plots ::



:: Field input data ::

Test Depth (ft)	SPT Field Value (blows)	Fines Content (%)	Unit Weight (pcf)	Infl. Thickness (ft)	Can Liquefy
0.50	7	21.00	117.00	1.00	Yes
1.50	7	21.00	117.00	1.00	Yes
2.50	7	21.00	117.00	1.00	Yes
3.50	8	21.00	113.00	1.00	Yes
4.50	8	21.00	113.00	1.00	Yes
5.50	8	21.00	113.00	1.00	Yes
6.50	8	21.00	113.00	1.00	Yes
7.50	8	21.00	113.00	1.00	No
8.50	21	21.00	120.00	1.00	No

Abbreviations

Depth: Depth at which test was performed (ft)
SPT Field Value: Number of blows per foot
Fines Content: Fines content at test depth (%)
Unit Weight: Unit weight at test depth (pcf)
Infl. Thickness: Thickness of the soil layer to be considered in settlements analysis (ft)
Can Liquefy: User defined switch for excluding/including test depth from the analysis procedure

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	m	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	FC (%)	$\Delta(N_1)_{60}$	$(N_1)_{60cs}$	$CRR_{7.5}$
0.50	7	117.00	0.03	0.00	0.03	0.46	1.70	1.00	1.15	0.75	1.00	10	21.00	4.63	15	4.000
1.50	7	117.00	0.09	0.00	0.09	0.46	1.70	1.00	1.15	0.75	1.00	10	21.00	4.63	15	4.000
2.50	7	117.00	0.15	0.00	0.15	0.46	1.70	1.00	1.15	0.75	1.00	10	21.00	4.63	15	4.000
3.50	8	113.00	0.20	0.00	0.20	0.44	1.70	1.00	1.15	0.75	1.00	12	21.00	4.63	17	4.000
4.50	8	113.00	0.26	0.00	0.26	0.44	1.70	1.00	1.15	0.75	1.00	12	21.00	4.63	17	4.000
5.50	8	113.00	0.32	0.00	0.32	0.44	1.70	1.00	1.15	0.75	1.00	12	21.00	4.63	17	4.000
6.50	8	113.00	0.37	0.00	0.37	0.45	1.61	1.00	1.15	0.75	1.00	11	21.00	4.63	16	4.000
7.50	8	113.00	0.43	0.00	0.43	0.46	1.51	1.00	1.15	0.80	1.00	11	21.00	4.63	16	4.000
8.50	21	120.00	0.49	0.00	0.49	0.35	1.31	1.00	1.15	0.80	1.00	25	21.00	4.63	30	4.000

Abbreviations

σ_v: Total stress during SPT test (tsf)
u_o: Water pore pressure during SPT test (tsf)
σ'_{vo}: Effective overburden pressure during SPT test (tsf)
m: Stress exponent normalization factor
C_N: Overburden corretion factor
C_E: Energy correction factor
C_B: Borehole diameter correction factor
C_R: Rod length correction factor
C_S: Liner correction factor
$N_{1(60)}$: Corrected N_{SPT} to a 60% energy ratio
$\Delta(N_1)_{60}$ Equivalent clean sand adjustment
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines content
$CRR_{7.5}$: Cyclic resistance ratio for M=7.5

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS	
0.50	117.00	0.03	0.00	0.03	1.01	1.00	0.503	1.32	15	0.97	0.519	1.10	0.472	2.000	●
1.50	117.00	0.09	0.00	0.09	1.00	1.00	0.502	1.32	15	0.97	0.518	1.10	0.471	2.000	●
2.50	117.00	0.15	0.00	0.15	1.00	1.00	0.501	1.32	15	0.97	0.517	1.10	0.470	2.000	●

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF_{max}	$(N_1)_{60cs}$	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS	
3.50	113.00	0.20	0.00	0.20	1.00	1.00	0.500	1.38	17	0.96	0.519	1.10	0.472	2.000	●
4.50	113.00	0.26	0.00	0.26	1.00	1.00	0.499	1.38	17	0.96	0.518	1.10	0.471	2.000	●
5.50	113.00	0.32	0.00	0.32	1.00	1.00	0.498	1.38	17	0.96	0.517	1.10	0.470	2.000	●
6.50	113.00	0.37	0.00	0.37	0.99	1.00	0.497	1.35	16	0.97	0.515	1.10	0.468	2.000	●
7.50	113.00	0.43	0.00	0.43	0.99	1.00	0.496	1.35	16	0.97	0.513	1.10	0.467	2.000	●
8.50	120.00	0.49	0.02	0.47	0.99	1.00	0.512	2.00	30	0.90	0.566	1.10	0.514	2.000	●

Abbreviations

$\sigma_{v,eq}$: Total overburden pressure at test point, during earthquake (tsf)
$u_{o,eq}$: Water pressure at test point, during earthquake (tsf)
$\sigma'_{vo,eq}$: Effective overburden pressure, during earthquake (tsf)
r_d: Nonlinear shear mass factor
α: Improvement factor due to stone columns
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$: CSR adjusted for M=7.5
K_{sigma}: Effective overburden stress factor
CSR^*: CSR fully adjusted (user FS applied)***
FS: Calculated factor of safety against soil liquefaction

*** User FS: 1.00

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L
0.50	2.000	0.00	9.92	1.00	0.00
1.50	2.000	0.00	9.77	1.00	0.00
2.50	2.000	0.00	9.62	1.00	0.00
3.50	2.000	0.00	9.47	1.00	0.00
4.50	2.000	0.00	9.31	1.00	0.00
5.50	2.000	0.00	9.16	1.00	0.00
6.50	2.000	0.00	9.01	1.00	0.00
7.50	2.000	0.00	8.86	1.00	0.00
8.50	2.000	0.00	8.70	1.00	0.00

Overall potential I_L : 0.00

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
0.50	10	0.01	0.02	0.15	0.13	53272.67	0.00	0.00	18.12	0.28	1.00	0.066
1.50	10	0.04	0.06	0.27	0.13	27556.98	0.00	0.00	18.12	0.29	1.00	0.070
2.50	10	0.07	0.10	0.35	0.13	20282.55	0.00	0.00	18.12	0.31	1.00	0.074
3.50	12	0.10	0.14	0.42	0.13	16672.60	0.00	0.00	18.12	0.23	1.00	0.055
4.50	12	0.13	0.17	0.48	0.13	14386.29	0.00	0.00	18.12	0.24	1.00	0.057
5.50	12	0.16	0.21	0.53	0.14	12781.27	0.00	0.00	18.12	0.25	1.00	0.059
6.50	11	0.19	0.25	0.56	0.14	11579.22	0.00	0.00	18.12	0.30	1.00	0.072
7.50	11	0.21	0.29	0.60	0.14	10637.94	0.00	0.00	18.12	0.31	1.00	0.074

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)

Cumulative settlemetns: 0.527

Abbreviations

τ_{av}: Average cyclic shear stress
p: Average stress
G_{max}: Maximum shear modulus (tsf)
α, b: Shear strain formula variables
γ: Average shear strain
ε_{15}: Volumetric strain after 15 cycles
N_c: Number of cycles
ε_{Nc}: Volumetric strain for number of cycles N_c (%)
Δh: Thickness of soil layer (in)
ΔS: Settlement of soil layer (in)

:: Vertical & Lateral displ.acements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60cs}$	γ_{lim} (%)	F_α	FS_{liq}	γ_{max} (%)	e_v (%)	dz (ft)	S_{v-1D} (in)	LDI (ft)
8.50	30	0.00	0.00	2.000	0.00	0.00	1.00	0.000	0.00

Cumulative settlements: 0.000 0.00

Abbreviations

γ_{lim}: Limiting shear strain (%)
F_α/N: Maximun shear strain factor
γ_{max}: Maximum shear strain (%)
e_v:: Post liquefaction volumetric strain (%)
S_{v-1D}: Estimated vertical settlement (in)
LDI: Estimated lateral displacement (ft)

References

- Ronald D. Andrus, Hossein Hayati, Nisha P. Mohanan, 2009. Correcting Liquefaction Resistance for Aged Sands Using Measured to Estimated Velocity Ratio, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 135, No. 6, June 1

- Boulanger, R.W. and Idriss, I. M., 2014. CPT AND SPT BASED LIQUEFACTION TRIGGERING PROCEDURES. DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA AT DAVIS

- Dipl.-Ing. Heinz J. Priebe, Vibro Replacement to Prevent Earthquake Induced Liquefaction, Proceedings of the Geotechnique-Colloquium at Darmstadt, Germany, on March 19th, 1998 (also published in Ground Engineering, September 1998), Technical paper 12-57E

- Robertson, P.K. and Cabal, K.L., 2007, Guide to Cone Penetration Testing for Geotechnical Engineering. Available at no cost at http://www.geologismiki.gr/

- Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J.T., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J., Liao, S., Marcuson III, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R., and Stokoe, K.H., Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 127, October, pp 817-833

- Zhang, G., Robertson. P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180

- Zhang, G., Robertson. P.K., Brachman, R., 2004, Estimating Liquefaction Induced Lateral Displacements using the SPT and CPT, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 130, No. 8, 861-871

- Pradel, D., 1998, Procedure to Evaluate Earthquake-Induced Settlements in Dry Sandy Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 124, No. 4, 364-368

- R. Kayen, R. E. S. Moss, E. M. Thompson, R. B. Seed, K. O. Cetin, A. Der Kiureghian, Y. Tanaka, K. Tokimatsu, 2013. Shear-Wave Velocity–Based Probabilistic and Deterministic Assessment of Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 139, No. 3, March 1

Appendix D

Roadway Construction Noise Model and Vibration Noise Calculations

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat ########
Case Descri 575 Los Trancos Road

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	230	0
Compactor (ground)	No	20		83.2	230	0
Tractor	No	40	84		230	0
Dozer	No	40		81.7	230	0
Dump Truck	No	40		76.5	230	0
Excavator	No	40		80.7	230	0
Grader	No	40	85		230	0
Front End Loader	No	40		79.1	230	0
All Other Equipment >	No	50	85		230	0

Results

	Calculated (dBA)		Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Backhoe	64.3	60.3	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	70	63	N/A	N/A	N/A	N/A	N/A
Tractor	70.7	66.8	N/A	N/A	N/A	N/A	N/A
Dozer	68.4	64.4	N/A	N/A	N/A	N/A	N/A
Dump Truck	63.2	59.2	N/A	N/A	N/A	N/A	N/A
Excavator	67.5	63.5	N/A	N/A	N/A	N/A	N/A
Grader	71.7	67.8	N/A	N/A	N/A	N/A	N/A
Front End Loader	65.9	61.9	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71.7	68.7	N/A	N/A	N/A	N/A	N/A
Total	71.7	74.6	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

	Equipment Spec	Actual	Receptor	Estimated

Description	Impact Device	Usage(%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)
Backhoe	No	40		77.6	250	0
Compactor (ground)	No	20		83.2	250	0
Tractor	No	40	84		250	0
Dozer	No	40		81.7	250	0
Dump Truck	No	40		76.5	250	0
Excavator	No	40		80.7	250	0
Grader	No	40	85		250	0
Front End Loader	No	40		79.1	250	0
All Other Equipment >	No	50	85		250	0

Results

	Calculated (dBA)		Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Backhoe	63.6	59.6	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	69.3	62.3	N/A	N/A	N/A	N/A	N/A
Tractor	70	66	N/A	N/A	N/A	N/A	N/A
Dozer	67.7	63.7	N/A	N/A	N/A	N/A	N/A
Dump Truck	62.5	58.5	N/A	N/A	N/A	N/A	N/A
Excavator	66.7	62.8	N/A	N/A	N/A	N/A	N/A
Grader	71	67	N/A	N/A	N/A	N/A	N/A
Front End Loader	65.1	61.2	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71	68	N/A	N/A	N/A	N/A	N/A
Total	71	73.8	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Noise Limit Exceedance (dBA)						
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date ########
Case Descri 575 Los Trancos Road - Grading

---- Receptor #1 ----

	Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	230	0
Compactor (ground)	No	20		83.2	230	0
Dozer	No	40		81.7	230	0
Excavator	No	40		80.7	230	0
Grader	No	40	85		230	0
Front End Loader	No	40		79.1	230	0
All Other Equipment >	No	50	85		230	0

	Calculated (dBA)		Results	Noise Limits (dBA)			
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Backhoe	64.3	60.3	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	70	63	N/A	N/A	N/A	N/A	N/A
Dozer	68.4	64.4	N/A	N/A	N/A	N/A	N/A
Excavator	67.5	63.5	N/A	N/A	N/A	N/A	N/A
Grader	71.7	67.8	N/A	N/A	N/A	N/A	N/A
Front End Loader	65.9	61.9	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71.7	68.7	N/A	N/A	N/A	N/A	N/A
Total	71.7	73.6	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

	Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	250	0
Compactor (ground)	No	20		83.2	250	0

Dozer	No	40		81.7	250	0
Excavator	No	40		80.7	250	0
Grader	No	40	85		250	0
Front End Loader	No	40		79.1	250	0
All Other Equipment >	No	50	85		250	0

			Results				
	Calculated (dBA)		Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Backhoe	63.6	59.6	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	69.3	62.3	N/A	N/A	N/A	N/A	N/A
Dozer	67.7	63.7	N/A	N/A	N/A	N/A	N/A
Excavator	66.7	62.8	N/A	N/A	N/A	N/A	N/A
Grader	71	67	N/A	N/A	N/A	N/A	N/A
Front End Loader	65.1	61.2	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71	68	N/A	N/A	N/A	N/A	N/A
Total	71	72.9	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Noise Limit Exceedance (dBA)						
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Noise Limit Exceedance (dBA)						
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date ########
Case Descri 575 Los Trancos Road - Building Construction

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Man Lift	No	20		74.7	230	0
Concrete Mixer Truck	No	40		78.8	230	0
Concrete Saw	No	20		89.6	230	0
Compactor (ground)	No	20		83.2	230	0
Compressor (air)	No	40		77.7	230	0
Crane	No	16		80.6	230	0
Dump Truck	No	40		76.5	230	0
Generator	No	50		80.6	230	0
Pumps	No	50		80.9	230	0
All Other Equipment >	No	50	85		230	0

	Calculated (dBA)		Results	Noise Limits (dBA)			
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Man Lift	61.4	54.5	N/A	N/A	N/A	N/A	N/A
Concrete Mixer Truck	65.5	61.6	N/A	N/A	N/A	N/A	N/A
Concrete Saw	76.3	69.3	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	70	63	N/A	N/A	N/A	N/A	N/A
Compressor (air)	64.4	60.4	N/A	N/A	N/A	N/A	N/A
Crane	67.3	59.3	N/A	N/A	N/A	N/A	N/A
Dump Truck	63.2	59.2	N/A	N/A	N/A	N/A	N/A
Generator	67.4	64.4	N/A	N/A	N/A	N/A	N/A
Pumps	67.7	64.7	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71.7	68.7	N/A	N/A	N/A	N/A	N/A
Total	76.3	74.5	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Man Lift	No	20		74.7	250	0
Concrete Mixer Truck	No	40		78.8	250	0
Concrete Saw	No	20		89.6	250	0
Compactor (ground)	No	20		83.2	250	0
Compressor (air)	No	40		77.7	250	0
Crane	No	16		80.6	250	0
Dump Truck	No	40		76.5	250	0
Generator	No	50		80.6	250	0
Pumps	No	50		80.9	250	0
All Other Equipment >	No	50	85		250	0

	Calculated (dBA)		Results Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Man Lift	60.7	53.7	N/A	N/A	N/A	N/A	N/A
Concrete Mixer Truck	64.8	60.8	N/A	N/A	N/A	N/A	N/A
Concrete Saw	75.6	68.6	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	69.3	62.3	N/A	N/A	N/A	N/A	N/A
Compressor (air)	63.7	59.7	N/A	N/A	N/A	N/A	N/A
Crane	66.6	58.6	N/A	N/A	N/A	N/A	N/A
Dump Truck	62.5	58.5	N/A	N/A	N/A	N/A	N/A
Generator	66.7	63.6	N/A	N/A	N/A	N/A	N/A
Pumps	67	64	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71	68	N/A	N/A	N/A	N/A	N/A
Total	75.6	73.8	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat ########
Case Descri 575 Los Trancos Road - Paving

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Backhoe	No	40		77.6	230	0
Concrete Saw	No	20		89.6	230	0
Compactor (ground)	No	20		83.2	230	0
Tractor	No	40	84		230	0
Grader	No	40	85		230	0
Front End Loader	No	40		79.1	230	0
Paver	No	50		77.2	230	0
Roller	No	20		80	230	0
All Other Equipment >	No	50	85		230	0

Results

	Calculated (dBA)		Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Backhoe	64.3	60.3	N/A	N/A	N/A	N/A	N/A
Concrete Saw	76.3	69.3	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	70	63	N/A	N/A	N/A	N/A	N/A
Tractor	70.7	66.8	N/A	N/A	N/A	N/A	N/A
Grader	71.7	67.8	N/A	N/A	N/A	N/A	N/A
Front End Loader	65.9	61.9	N/A	N/A	N/A	N/A	N/A
Paver	64	61	N/A	N/A	N/A	N/A	N/A
Roller	66.7	59.8	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71.7	68.7	N/A	N/A	N/A	N/A	N/A
Total	76.3	75.3	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

			Equipment			
			Spec	Actual	Receptor	Estimated

Description	Impact Device	Usage(%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)
Backhoe	No	40		77.6	250	0
Concrete Saw	No	20		89.6	250	0
Compactor (ground)	No	20		83.2	250	0
Tractor	No	40	84		250	0
Grader	No	40	85		250	0
Front End Loader	No	40		79.1	250	0
Paver	No	50		77.2	250	0
Roller	No	20		80	250	0
All Other Equipment >	No	50	85		250	0

Results

	Calculated (dBA)		Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Backhoe	63.6	59.6	N/A	N/A	N/A	N/A	N/A
Concrete Saw	75.6	68.6	N/A	N/A	N/A	N/A	N/A
Compactor (ground)	69.3	62.3	N/A	N/A	N/A	N/A	N/A
Tractor	70	66	N/A	N/A	N/A	N/A	N/A
Grader	71	67	N/A	N/A	N/A	N/A	N/A
Front End Loader	65.1	61.2	N/A	N/A	N/A	N/A	N/A
Paver	63.2	60.2	N/A	N/A	N/A	N/A	N/A
Roller	66	59	N/A	N/A	N/A	N/A	N/A
All Other Equipment >	71	68	N/A	N/A	N/A	N/A	N/A
Total	75.6	74.5	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date ########
Case Descri 575 Los Trancos Road - Architectural Coating

---- Receptor #1 ----

	Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	230	0

	Calculated (dBA)		Results Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Compressor (air)	64.4	60.4	N/A	N/A	N/A	N/A	N/A
Total	64.4	60.4	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

	Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Single Fami	Residential	65	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	250	0

	Calculated (dBA)		Results Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Compressor (air)	63.7	59.7	N/A	N/A	N/A	N/A	N/A
Total	63.7	59.7	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Groundborne Noise and Vibration Modeling

Notes
The reference distance is measured from the nearest anticipated point of construction equipment to the nearest structure.

	Reference Level Inputs			
Equipment	PPV_{ref} (in/sec)	Lv_{ref} (VdB)	RMS_{ref} (in/sec)	Reference Distance
Vibratory Roller	0.21	94	0.050	25
Hoe Ram	0.089	87	0.022	25
Large bulldozer	0.089	87	0.022	25
Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	Distance (feet)	PPV_x (in/sec)	Lv_x (VdB)	RMS_x (in/sec)
Vibratory Roller	35	0.1450	91	0.035
Hoe Ram	35	0.0615	84	0.015
Large bulldozer	35	0.0615	84	0.015
Caisson drilling	35	0.0615	84	0.015
Loaded trucks	35	0.0525	80	0.010
Jack hammer	35	0.0242	76	0.006
Small bulldozer	35	0.0021	55	0.001

	Vibration Contours		
	Distance to (feet)		
Equipment	0.200 PPV	72.0 VdB	0.0080 RMS
Vibratory Roller	26	250	133
Hoe Ram	12	120	64
Large bulldozer	12	120	64
Caisson drilling	12	120	64
Loaded trucks	10	79	42
Jack hammer	5	52	28
Small bulldozer	1	6	3

Source
California Department of Transportation (Caltrans). 2013. Transportation and Construction Last Updated: 4/11/2019

Groundborne Noise and Vibration Modeling

Notes
The reference distance is measured from the nearest anticipated point of construction equipment to the nearest structure.

	Reference Level Inputs			
Equipment	PPV_{ref} (in/sec)	Lv_{ref} (VdB)	RMS_{ref} (in/sec)	Reference Distance
Vibratory Roller	0.21	94	0.050	25
Hoe Ram	0.089	87	0.022	25
Large bulldozer	0.089	87	0.022	25
Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	Distance (feet)	PPV_x (in/sec)	Lv_x (VdB)	RMS_x (in/sec)
Vibratory Roller	50	0.0980	87	0.023
Hoe Ram	50	0.0415	80	0.010
Large bulldozer	50	0.0415	80	0.010
Caisson drilling	50	0.0415	80	0.010
Loaded trucks	50	0.0355	76	0.007
Jack hammer	50	0.0163	72	0.004
Small bulldozer	50	0.0014	51	0.000

	Vibration Contours		
	Distance to (feet)		
Equipment	0.200 PPV	72.0 VdB	0.0080 RMS
Vibratory Roller	26	250	133
Hoe Ram	12	120	64
Large bulldozer	12	120	64
Caisson drilling	12	120	64
Loaded trucks	10	79	42
Jack hammer	5	52	28
Small bulldozer	1	6	3

Source
California Department of Transportation (Caltrans). 2013. Transportation and Construction Last Updated: 4/11/2019

Appendix E

California Water Service and West Bay Sanitary District Will Serve Letter

CALIFORNIA WATER SERVICE

Bear Gulch District 3525 Alameda De Las Pulgas, Suite A
Menlo Park, CA 94025 *Tel:* (650) 561-9709

August 19, 2021

Will Serve Letter
Address: 575 Los Trancos Road, Palo Alto CA 94034

To Whom It May Concern:

As a regulated utility, California Water Service Company Bear Gulch District ("Cal Water") has an obligation to provide water service in accordance with the rules and regulations of the California Public Utility Commission (CPUC). Assuming you receive all required permits from City of Palo Alto, Cal Water will provide water service to the above referenced project. Cal Water agrees to operate the water system and provide service in accordance with the rules and regulations of the California Public Utilities Commission (CPUC) and the company's approved tariffs on file with the CPUC. This will serve letter shall remain valid for **two years** from the date of this letter. If construction of the project has not commenced within this **two year** time frame, Cal Water will be under no further obligation to serve the project unless the developer receives an updated letter from Cal Water reconfirming our commitment to serve the above mentioned project. Additionally, Cal Water reserves the right to rescind this letter at any time in the event its water supply is severely reduced by legislative, regulatory or environmental actions.

Cal Water will provide such potable[1] water at such pressure as may be available from time to time as a result of its normal operations per the company's tariffs on file with the CPUC. Installation of facilities through developer funding shall be made in accordance with the current rules and regulations of the CPUC including, among others, Tariff Rules 15 and 16 and General Order 103-A. In order for us to provide adequate water for domestic use as well as fire service protection, it may be necessary for the developer to fund the cost of special facilities, such as, but not limited to, booster pumps, storage tanks and/or water wells,[2] in addition to the cost of mains and services. Cal Water will provide more specific information regarding special facilities and fees after you provide us with your improvement plans, fire department requirements, and engineering fees for this project.

This letter shall at all times be subject to such changes or modifications by the CPUC as said Commission may, from time to time, require in the exercise of its jurisdiction.

If you have any questions regarding the above, please call me at *(650) 543-3412*.

Sincerely,

Celina Nance

Celina Nance
Customer Service Representative II

---

[1] This portion of the letter to be modified accordingly in the event the development for which this letter is being generated is to be served with potable and non-potable water.

[2] For the districts that collect facility fees on a per lot basis, delete the reference to wells as a special facility here and add in the following sentence, "Developer will also be required to contribute towards Cal Water's water supply by paying facilities fees on a per lot basis as described in Rule 15"

WEST BAY SANITARY DISTRICT

500 Laurel Street, Menlo Park, CA 94025
Telephone: (650) 321-0384 Fax (650) 321-4265

WILL SERVE LETTER

APN : 182-46-012

August 17, 2021

City of Palo Alto Building Department
285 Hamilton Ave # 1
Palo Alto, CA 94301

RE: 575 LOS TRANCOS RD
SANTA CLARA COUNTY
PROPERTY OWNER :
APN : 182-46-012

Dear City of Palo Alto Building Department:

This letter will serve as notice that the above-referenced address is within the West Bay Sanitary District's jurisdiction, and is entitled to receive all available services from the District, pursuant to compliance with the District's Code of General Regulations.

Should you have any questions please feel free to call the administration office at the District at (650) 321-0384. The property owners or their contractor may also feel free to contact our administration office with any questions.

Very truly yours,

WEST BAY SANITARY DISTRICT

Todd Reese
Office Manager

N–10

O–9

M–9

20

SAND STONE

VALLEY OAK

LONGSPUR

COALMINE VIEW

COYOTE HILL

HORSESHOE BEND

FRANCISCAN RIDGE

HAWK VIEW

OHLONE

WINTERCREEK

ACORN

WOODS PROPERTY

BAYBERRY

OAK FOREST

LOS TRANCOS WOODS ROAD

VALLEY OAK

CREEK XING
6" ACP ENCASED
IN 10" S.P.

CREEK XING
80° DIP TO
MH #63

FILLED & CIPP THROUGH

WEST BAY SANITARY DISTRICT BOUNDARY

SAN MATEO COUNTY
SANTA CLARA COUNTY

T=1+80
575 LOS TRANCOS WOODS ROAD
(PALO ALTO)
(ANNEXED)

north

N–9

FEBRUARY 2020