CE&G
Pragmatic Expertise™

CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Rd. | Walnut Creek | CA 94596
6455 Almaden Expwy., Suite 100| San José | CA 95120
23785 Cabot Blvd., Suite 321 | Hayward | CA 94545
www.caleng.com

PRELIMINARY GEOLOGIC AND GEOTECHNICAL ASSESSMENT REPORT

LA HONDA CREEK PARKING AREA AND TRAILHEAD FEASIBILITY STUDY

CE&G DOCUMENT: 210881.001

01 MARCH 2022

Prepared for:

Douglas Nelson
RHAA Landscape Architecture & Planning
2255 Miller Avenue
Mill Valley, California 94941

Rocio Briseno, P.G.
Project Geologist

Kevin Loeb, P.G., C.E.G.
Senior Geologist

Reviewed by:

David Burger, P.G., E.G.
Principal Geologist

TABLE OF CONTENTS

FIGURES

1.0 INTRODUCTION

1.1 GENERAL

This preliminary geologic and geotechnical assessment report has been prepared in support of RHAA Landscape Architecture & Planning, Inc. (RHAA) for the proposed La Honda Creek parking area and trailhead feasibility study within the La Honda Creek Open Space Preserve in San Mateo County, California (Figure 1).

1.2 PROJECT DESCRIPTION

We understand the project consists of a total of five project sites (sites B2, B3, D, D bridge, and E3), two of which are located along Sears Ranch Road and three of which are just east of U.S. Highway 84 (La Honda Road), just north of La Honda, California (Figure 1). The Project sites are located in the La Honda Creek Open Space Preserve, which is part of the larger Midpeninsula Regional Open Space District (MROSD). The proposed improvements at these sites are intended to provide new public access points for the central portion of the La Honda Creek Open Space Preserve and are anticipated to include gravel parking lots for trailers and other vehicles, new trail access points, a vault restroom facility, and replacement of and existing trail access bridge over La Honda Creek.

1.3 PURPOSE AND SCOPE OF WORK

The purpose of Cal Engineering & Geology's (CE&G) work has been to provide a preliminary review and interpretation of existing geologic and geotechnical data within the vicinity of the project areas. CE&G's review was used to determine if potential data gaps exist and if existing data can be used to reduce or refine the number of exploration locations (originally proposed in CE&G's previously submitted scope of work, dated 26 July 2021).

The scope of work completed for this preliminary geologic and geotechnical assessment report included:

- Review of available published and unpublished soil and geologic maps and historical aerial photographs within our files.
- Review of readily available maps, plans, and reports provided by RHAA, the La Honda Creek Open Space Preserve, and San Mateo County.
- Development of topographic base maps utilizing the most recent publicly available LiDAR and ortho-photographic information available from the County.

- Completion of reconnaissance level geologic mapping and preparation of maps identifying geologic and geotechnical hazards within the project areas.
- Preparation of this preliminary geologic and geotechnical assessment report.

2.0 SITE AND PROPOSED IMPROVEMENT DESCRIPTIONS

The five project sites are located within the La Honda Creek Open Space Preserve, situated in the central portion of the Santa Cruz mountains within unincorporated San Mateo County. Each of the site descriptions and their proposed improvements is described in the following sections.

The site plans for each location are included on Figures 2A through 2E.

2.1 SITE B2

Site B2 is located along Sears Ranch Road approximately 0.5 miles to the northwest of its intersection with La Honda Road and west to southwest of the existing Sears Ranch Road Parking Area. The site itself includes a portion of the west-facing grass-covered slope to the west of the Sears Ranch Road parking area, parts of the asphalt-paved Sears Ranch Road, part of a private driveway branching from Sears Ranch Road, and a small portion of the slope to the south of the private driveway. This area is mostly free of trees except along the private driveway and along Sears Ranch Road, south of the intersection with the private driveway.

We understand that the conceptual plan will be to develop a parking lot on the west-facing slope, west of the existing Sears Ranch Road Parking Area. This parking area will accommodate cars and equestrian trailers. The development of the site may include the construction of a ramp onto the private road to the south of the site to facilitate an exit point from that parking area. (Figure 2A)

2.2 SITE B3

Site B3 is located southeast of Site B2 and encompasses approximately 650 feet of Sears Ranch Road, a gently sloping open space to the east of Sears Ranch Road, and a small portion of the east-facing slope to the west of Sears Ranch Road and north of the La Honda Elementary School. The open space north of La Honda Elementary School is mostly free of trees and is grass-covered. Trees line both sides of Sears Ranch Road in the project site.

We understood that an overflow parking lot may be developed on the gently sloping open space area to the north of the La Honda Elementary School. The section of Sears Ranch Roach between residential properties to the south and the private driveway to the north may be widened. (Figure 2B)

2.3 SITE D

Site D is located along La Honda Road (Hwy 84) between post mile 10.8 and 11. The site includes approximately 770 feet of La Honda Road and its inboard shoulder as well as the heavily forested area along the outboard edge of the road.

We understood that a parking lot will be developed on the gently sloping area on the western side of La Honda Road. A restroom facility is also being considered for this location. (Figure 2C)

2.4 SITE D (BRIDGE)

The bridge site is located approximately 480 feet to the west and downslope of the westernmost edge of Site D. This location consists of an existing north-northeast trending bridge that crosses La Honda Creek. The bridge is currently decommissioned and is in a heavily forested area.

We understand the existing bridge will be replaced at this location and new abutments construction will be required. (Figure 2D)

2.5 SITE E3

Site E3 is located along La Honda Road between post mile 12 and 12.35. The site includes approximately 1,375 feet of La Honda Road, approximately 40 feet into the inboard edge of the road, consisting of southwest and northwest facing slopes, an open space area to the west of La Honda Road. The open space area includes a historic Red Barn and a Jeep Trail branching off from Highway 84.

Proposed improvements at this location consist of a gravel parking area, a safe vehicular right turn only into the site from La Honda Road, and a new trail access point to the historic Red Barn. We understood that a conceptual plan may also include the construction of a pedestrian crossing or tunnel across or under Highway 84 near the southeastern corner of the project area. (Figure 2E)

3.0 GEOLOGIC CONDITIONS

3.1 REGIONAL GEOLOGIC SETTING

The project sites are located in the Santa Cruz Mountains, within the Coast Ranges geomorphic province of California (Figure 1). This province is characterized by northwest-southeast trending mountain ranges such as the Santa Cruz Mountains and intervening valleys such as that occupied by the San Francisco Bay. The Santa Cruz Mountains mark a mountain-range scale regional uplift centered on the San Andreas fault. The portion of the Coast Ranges, proximal to the project sites is, comprised of a complex sequence of Mesozoic age sedimentary and volcanic rocks. These bedrock materials have been extensively folded and faulted as a result of regional tectonic forces. As a consequence, geological relationships are often complex, and individual bedrock units are locally tightly folded, faulted, sheared, and overturned.

The geologic setting for the five sites is shown on our Regional Geologic Map (Figure 3).

3.2 BEDROCK GEOLOGY

The generalized bedrock geology of the La Honda area has been mapped by various geologists (e.g., Brabb and others, 1998; Graymer and others, 2006). Maps by these geologists are in general agreement that the project sites are primarily underlain sedimentary rocks of tertiary age.

3.2.1 Sites B2 and B3

The sedimentary bedrock underlying Sites B2 and B3 has been identified by Brabb and others (1998) as belonging to the Tahana member of the Purisima formation (Pliocene and Upper Miocene). This unit is described as "greenish-gray to white or buff, medium to very fine-grained sandstone and siltstone, with some silty mudstone" (Brabb and others, 1998). Sedimentary beds in the project site vicinity are mapped as dipping to the southwest with dip angles ranging from 10° to 24° (Brabb and others, 1998).

3.2.2 Site D, Site D (Bridge), and Site E3

The sedimentary bedrock mapped in the areas of Sites D, Site D (Bridge), and Site E3 have been identified by Brabb and others (1998) as belonging to the Lambert shale and San Lorenzo formation (Oligocene, and middle and upper Eocene in age). These units are described as "brown and dark-gray to gray mudstone, siltstone, and shale, and some beds of fine to coarse-grained sandstone" (Brabb and others, 1998). The sedimentary beds in the area of the project sites are folded, which has resulted in alternating syncline and

anticline structures that trend northwest-southeast (Brabb and others, 1998). Sedimentary beds in the vicinity of Site D (bridge) are mapped as dipping to the northeast with dip angles ranging from 25° to 51° (Brabb and others, 1998).

3.3 SURFICIAL SOILS

The surficial soils on the project areas have been mapped by the USDA National Resource Conservation Service (NRCS, 2021). Several soils have been identified per area. The distribution of each soil is shown in Figure 4. These soils and some selective properties have been summarized in Tables 3-1 through 3-5 below.

Table 3-1: Site B2 Mapped Surficial Soils

Soils Name	Parental Material	Plasticity Index Range	Shrink-Swell Potential
Mindego clay loam	Basalt	10 - 35 percent in upper 4 ft	Low to medium
Pomponio clay loam	Shale	10 -35 percent in upper 3 ft	Low to medium
Sweeney clay loam	Diabase, Basalt	NP - 35 percent in upper 4 ft	Low to medium

Table 3-2: Site B3 Mapped Surficial Soils

Soils Name	Parental Material	Plasticity Index Range	Shrink-Swell Potential
Lobitos loam	Shale	NP - 20 percent in upper 3 ft	Low to medium
Sweeney clay loam	Diabase, Basalt	NP - 35 percent in upper 4 ft	Low to medium
Mindego clay loam	Basalt	10 - 35 percent in upper 4 ft	Low to medium
Pomponio loam	Shale	5 -35 percent in upper 3 ft	Low to medium

Table 3-3: Site D Mapped Surficial Soils

Soils Name	Parental Material	Plasticity Index Range	Shrink-Swell Potential
Butano loam	Siliceous Shale	NP - 20 percent in upper 3 ft	Low to medium
Laughlin-Sweeney loam	Sandstone, Shale	NP - 15 percent in upper 2 ft	Low
Sweeney clay loam	Diabase, Basalt	NP - 20 percent in upper 5 ft	Low to medium

Table 3-4: Site D (Bridge) Mapped Surficial Soils

Soils Name	Parental Material	Plasticity Index Range	Shrink-Swell Potential
Butano loam	Siliceous Shale	NP - 20 percent in upper 3 ft	Low to medium
Santa Lucia loam	Shale	5 - 10 percent in upper 2 ft	Low

Table 3-5: Site E3 Mapped Surficial Soils

Soils Name	Parental Material	Plasticity Index Range	Shrink-Swell Potential
Butano loam	Siliceous Shale	NP - 20 percent in upper 3 ft	Low to medium
Santa Lucia loam	Shale	5 - 10 percent in upper 2 ft	Low
Pomponio loam	Shale	5-35 percent in upper 2.5 ft	Low to high

3.4 SEISMICITY

The project sites are located within the greater San Francisco Bay Area which is recognized as one of the more seismically active regions of California. The seismic activity in this region results from the complex movements along the transform boundary between the Pacific Plate and the North American Plate. Along this transform boundary, the Pacific Plate is slowly moving to the northwest relative to the more stable North American Plate at approximately 40 mm/yr in the Bay Area (Page, 1992). The differential movements between the two crustal plates caused the formation of a series of active fault systems within the transform boundary. The transform boundary between the two plates extends across a broad zone of the North American Plate within which right-lateral strike-slip faulting predominates. In this broad transform boundary, the San Andreas fault

accommodates less than half of the average total relative plate motion. Much of the remainder of the motion in the South Bay Area is distributed across faults such as the San Gregorio, Monte Vista-Shannon, Butano, Sargent, Hayward, Calaveras, and Zayante-Vergeles fault zones.

Due to each of the project site locations in the seismically active San Francisco Bay Area, it will likely experience strong ground shaking from a large (Moment Magnitude [Mw] 6.7) or greater earthquake along one or more of the nearby active faults during the design lifetime of the project (WGCEP, 2003). It should be noted that the third Uniform California Earthquake Rupture Forecast (UCERF3) time-independent model supports a magnitude-dependent methodology that accounts for historic open intervals on faults without a date of last event constraint. The exact factors influencing differences between UCERF2 and UCERF3 vary throughout the region and depend on the evaluation of specific seismogenic sources. For example, with the 30 yr M≥6.7 probabilities, the most significant changes from UCERF2 are a threefold increase on the Calaveras fault and a threefold decrease on the San Jacinto fault. The model also suggests that the average time between 6.7 Mw or larger events has increased from every 4.8 years to every 6.3 years. The UCERF3 model indicates that M≥6.7 probabilities may not be representative for other hazard or loss measures and the applicability of UCERF3 should be evaluated on a case-by-case basis if required by during site-specific ground motion analyses or at the behest of the regulatory agencies (WGCEP, 2014).

Some contributors to seismic risk for the project include the Monte Vista/Shannon, San Andreas, Hayward, Calaveras, Sargent, and San Gregorio-Hosgri faults. A large magnitude earthquake on any of these fault systems has the potential to cause significant ground shaking in the vicinity of the sites. The intensity of ground shaking that is likely to occur in the area is generally dependent upon the magnitude of the earthquake and the distance to the epicenter.

The San Mateo County Hazard Mapping Tool identifies the sites as exposed to " Very Strong" to "Severe" groundshaking associated with modeled earthquake events on the Butano, San Gregorio, Monte Vista-Shannon, and San Andreas faults.

A table showing the approximate distances between each of the five sites and various major surface fault traces with their estimated max moment magnitude to be experienced by that fault will be provided in the proposed geotechnical report phase of the project.

3.5 GEOHAZARD MAPPING

3.5.1 Active Faulting

According to CGS (2018), a Holocene-active fault is defined as a fault that has had surface displacement within Holocene time (the last 11,700 years), and a pre-Holocene fault is defined as a fault whose recency of past movement is older than 11,700 years. The Alquist-Priolo Earthquake Fault Zoning Act only addresses the hazard of surface fault rupture for Holocene-active faults, although pre-Holocene-active faults may also have the potential for future surface fault rupture (CGS, 2018). The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults.

The La Honda quadrangle has not been evaluated for Holocene-active faults as designated by a State Geologist.

According to the United States Geological Survey's (USGS) Quaternary fault and fold database, there are no active faults mapped as crossing through the project sites (USGS, 2017).

3.6 LANDSLIDES

The U.S. Geological Survey has developed preliminary landslide and earth flow distribution maps for a significant portion of the greater San Francisco Bay Area (Wentworth et al., 1997). The landslide and earth flow distribution maps for the greater San Mateo County identify the project areas as ones of mostly landslides. Note that most mapped landslides identified in these maps show no evidence of recent movement or are currently non-active and are based on photo-interpretive definitions.

The San Mateo County Hazard Mapping Tool identifies the sites as having the following landslide susceptibilities:

Site Name	Landslide Susceptibility
Site B2	Moderate
Site B3	Moderate
Site D	Low to moderate
Site D (Bridge)	Not evaluated
Site E3	High to low

Note that the high landslide susceptibility identified for Site E was only for the eastern corner of the site, on the north side of Highway 84. Most of the site was identified as having low landslide susceptibility.

The U.S. Geological Survey has also developed maps showing principal debris-flow source areas for a significant portion of the greater San Francisco Bay Area (Ellen et al., 1997). The principal debris-flow source area map for the greater San Mateo County does not identify the project areas as ones of sources for debris flows.

3.7 REGIONAL GROUNDWATER

Groundwater within the hillslope areas encompassing the sites is likely variable, with the water table commonly sloping downhill toward the closest drainage axis.

4.0 RECORDS RESEARCH

RHAA and the La Honda Creek Open Space Preserve have provided CE&G with the following documents pertaining to the project site:

- AECOM, 2016, Memorandum-Sears Ranch Parking Area Biotic Study, dated 28 October 2016
- ALTA Owners Policy, 1991, Form No. 1402-87, Schedule A, dated 03 April 1991
- ASCENT Environmental, 2012, La Honda Creek Open Space Master Plan, Draft Initial Study/Mitigated Negative Declaration, dated 2 July 2012
- Birds Observed at the La Honda Creek Open Space Preserve, 2013, table
- BKF Engineers, 2017, Red Barn- Cut and Fill Exhibit Alternative 3-Phase 1, dated 01 December 2017
- BKF Engineers, 2016, La Honda Creek Open Space Preserve, Red Barn Public Access Area, Tree Survey, San Mateo County, dated 23 November 2016
- BKF Engineers, 2021, Topographic Survey of the Lands of the Mid-Peninsula Regional Open Space District, County of San Mateo, dated 23 November 2021
- BKF Engineers, 2021, Topographic Survey of the Lands of the Mid-Peninsula Regional Open Space District, County of San Mateo, dated 30 November 2021
- California Highway Patrol, 2019, #190913 2009 AV. 2017/2018 Collisions on SR 84 Between SR 35 and SR 1, San Mateo County, dated 31 July 2019
- California Highway Patrol, 2021, #211264AC 2019-AV.2020/2021 Crashes on RT 84 (La Honda RD/Woodside RD) Between RT 35 (Skyline BL) and RT 1 (Cabrillo HWY), San Mateo CO., dated 20 October 2021
- Conservation by Design, Inc., 2011, District-Wide Interpretive Plan, dated December 2011
- Conservation Metrics, 2020, Automated Acoustic Surveys for Marbled Murrelet, Steller's Jay, and Northern Spotted Owl in the Santa Cruz Mountains
- Fall Creek Engineering, Inc., 2017, Revised Stormwater Drainage Report, La Honda Creek Open Space Preserve, San Mateo County, California, dated 26 April 2017
- Fall Creek Engineering, Inc., 2017, Sears Ranch Road, Sears Ranch Improvements and Parking Lot Installation, La Honda Creek Open Space Preserve, San Mateo County, California, April 2017
- Hexagon Transportation Consultants, Inc., 2016, Memorandum, La Honda Creek Open Space Preserve-Red Barn Access Study, dated 10 August 2016
- H.T. Harvey & Associates-Ecological Consultants, 2017 LA Honda Space Preserve-Bat Surveys for the Red Barn Public Access Project (HTH 4009-01), dated 12 October 2017

- H.T. Harvey & Associates-Ecological Consultants, 2021, Memorandum: Analysis of E-bike Noise and Recommendations for Buffer Distances between Bike Trails and Bat Roosts/Nesting Birds, dated 17 September 2021
- H.T. Harvey & Associates-Ecological Consultants, 2017, Winter Bat Survey for the Red Barn Public Access Project (HTH 4009-01), dated 30 March 2017
- LANGAN, 2016, Geotechnical Investigation, Sears Ranch Road Interim Staging Area, La Honda, California, dated 22 April 2016
- LANGAN, 2016, Memorandum, Additional Geotechnical Recommendations – Sears Ranch Road Sears Ranch Road Interim Staging Area, dated 01 November 2016
- LSA, 2016, Historic Resource Evaluation, Red Barn Staging Area, La Honda Creek Open Space Preserve, Unincorporated San Mateo County, California, dated August 2016
- Midpeninsula Regional Open Space District, 2012, Meeting 12-29, Agenda Item 7, dated 22 August 2012
- Midpeninsula Regional Open Space District, 2020, Meeting R-20-81, Agenda Item 2, dated 28 July 2020
- Midpeninsula Regional Open Space District, 2012, La Honda Creek Open Space Master Plan, dated August 2012
- Midpeninsula Regional Open Space District, 2012, La Honda Creek Open Space Master Plan, Mitigation Monitoring Program, dated 22 August 2012
- Midpeninsula Regional Open Space District, 2014, McDonald Ranch Premise Map, dated October 2014
- Midpeninsula Regional Open Space District, 2021, CONFIDENTIAL: Special Status Species-Site B2 and B3, dated 02 December 2021
- Midpeninsula Regional Open Space District, 2021, CONFIDENTIAL: Special Status Species-Site D, dated 02 December 2021
- Midpeninsula Regional Open Space District, 2021, CONFIDENTIAL: Special Status Species-Site E3, dated 02 December 2021
- Midpeninsula Regional Open Space District, 2021, Memorandum: Update on the Electric Bicycle (e-bike) Noise Study, dated 10 November 201
- Midpeninsula Regional Open Space District, 2021, Project Limits-Site B2, dated 21 June 2021
- Midpeninsula Regional Open Space District, 2021, Project Limits-Site B3, dated 21 June 2021
- Midpeninsula Regional Open Space District, 2021, Project Limits-Site D and Hwy 84, dated 21 June 2021
- Midpeninsula Regional Open Space District, 2021, Project Limits-Site E3, dated 21 June 2021

- Pathways for Wildlife, date unknown, American Badger Habitat Suitability Assessment: Cost Surface Layer with Draft Linkage Design and Badger Records
- Paul A. Heady and Winifred F. Frick Central Coast Bat Research Group, 2000, Impact Assessment and Mitigation/ Action Recommendations for the Pallid Bat Colony in the La Honda Big Red Basin
- Paul A. Heady and Winifred F. Frick Central Coast Bat Research Group, 2002, Post-Construction Assessment for the Pallid Bat Colony in the La Honda Big Red Basin
- SAGE ASSOCIATES, Agricultural and Environmental Consultants, 2007, La Honda Creek Open Space Preserve, Grazing Management Plan for Former McDonald & Dyer Sites, dated November 2007
- Sean E. McAllister, 2019, La Honda Open Space Preserve, Marbled Murrelet Surveys, 2018 & 2019, dated 17 October 2017
- Timothy C. Best, CEG Engineering Geology and Hydrology, 2007, Driscoll Ranch Road Erosion Inventory, dated September 2007
- TRA Environmental Sciences, 2017, La Honda Creek Open Space Preserve, Red Barn Public Access Area, Jurisdictional Waters and Wetland Delineation, dated January 2017
- Tim Garrison, P.E. Consulting Engineer, 2013, Structural Investigation-LH07, La Honda Creek Bridge, dated 9 April 2013
- Vaughan Forestry, 2016, Draft- Red Barn Public Access Area Project, dated 12 December 2016
- Vollmar Natural Lands Consulting, 2021, LA Honda Creek, El Corte De Madera Creek, Thornewood, and Windy Hill Open Space Preserves, San Mateo County, California, dated November 2021
- W-Trans, 2017, Memorandum, Interim Transportation Circulation Technical Memorandum for the Red Barn Public Access Area in the La Honda Creek Open Space Preserve, dated 03 February 2017
- W-Trans, 2020, La Honda Creek Open Space Access Analysis, dated 17 January 2020

In addition, CE&G also completed a geotechnical study within the La Honda Preserve titled "LA Honda Creek Loop Trail", dated 01 August 2018.

The majority of these documents contained information regarding plant and animal species, historical/cultural significance, watershed studies, and traffic studies. The documents containing pertinent geotechnical information have been reviewed and are summarized below.

4.1 SUMMARY OF PERTINENT GEOTECHNICAL INFORMATION

CE&G identified three studies during our review, with geotechnical data proximal to the project sites. The location and general description of the data available are summarized below.

LANGAN completed a geotechnical investigation in April 2016 at what they referred to as the Sears Ranch Road site (located at the eastern limit of our current Site B2) in support of a parking lot and pre-fabricated restroom. Their investigation consisted of one R-value sample, two dynamic penetrometer tests ranging in depth from 11.2 and 14.4 feet below ground surface, and one hand augured boring to three feet below ground surface. They found that the site soils consist of moderately to highly expansive clay loam that is characterized by large fluctuations in volume due to varying moisture content. Grading recommendations and a pavement section were provided.

LANGAN also issued a memorandum in November 2016 providing supplemental pavement recommendations for a section of Sears Ranch Road to be widened to 16 feet to accommodate emergency vehicle access. No further exploration was completed for the memorandum.

Tim Garrison, a consulting engineer, conducted a structural investigation of the bridge in Site D (Bridge). His investigation was visual only and did not yield any geotechnical data. In his summary, he concludes that "while the bridge itself is in good condition, the abutments and log retaining wall banks are in dangerously bad condition. We recommend that this bridge not be used until the abutments and banks are repaired or replaced.".

5.0 FIELD RECONNAISSANCE MAPPING

5.1 BASEMAP

Topographic base maps for each site were developed utilizing the most recent publicly available LiDAR and ortho-photographic information from the County of San Mateo.

5.2 GEOLOGIC MAPPING AND RECONNAISSANCE

Geologic site reconnaissance was completed on 12 and 13 January 2022 to document surface features and potential geologic hazards at each of the five project sites. The mapped features were documented on a topographic base map. The site conditions were photographed at the time of the field reconnaissance. The identified geomorphic features include, but are not limited to, shallow slump features (head scarp ≤ 3 feet tall), other landslide features, significant and/or intense soil erosion, and saturated soil. The results of our geologic mapping and reconnaissance are shown on Figures 2A through 2E and are described in the following sections.

5.2.1 Site B2

We identified several features, including a wedge of undocumented fill, shallow slump failures, landslides, soil creep, and areas of standing water.

A wedge of undocumented fill is located across from the existing Sears Ranch Road Parking Area. Evidence of fill creep was identified along the west-facing slope along the downslope and outboard edge of Sears Ranch Road. Soil creep was also observed along the road cuts along the dirt trail north of the Sears Ranch Road Parking Area.

Documented shallow slump failures and landslides are shown on Figure 2A. Most of these features were identified in close proximity to saturated soils. Most of the landslides were identified along the private paved driveway branching from Search Ranch Road, mostly originating on the hillsides south of the driveway. The private driveway showed signs of distress in the form of deep tire ruts in the distressed pavement. Downslope of the private driveway, there are areas of standing water.

Two 12-inch diameter corrugated metal culverts were identified along the northern edge of the private driveway, draining into the standing-water area. What appeared to be the remnant of drop inlets were identified directly across the private driveway. The remnants consist of two brick-lined square holes. The pipe was observable at the bottom of these holes.

Several plastic 12-inch corrugate pipes were also identified along the dirt road branching from the Sears Ranch Road Parking Area and along the fill wedge. The drainage from the metal and plastic pipes is likely responsible for the saturated soil areas with increased vegetation.

The hillside areas along the southern edge of Site-B2 could not be evaluated due to limited access.

5.2.2 Site B3

We identified several site features, including drainage areas, shallow slump failures, landslides, wetland areas, and soil creep.

Drainage for this site is generally towards the south. Two major drainage swales were identified on the hillsides north of the La Honda Elementary School. The eastern drainage swale is an area with increased vegetation. The drainage from that swale appears to be accommodated by an east-draining v-ditch at the base of a fence along the elementary school's northern border. Standing water and a delineated wetland area were observed at the eastern end of the v-ditch.

The western drainage swale is accommodated by a south-draining culvert at the northwest corner of the school property. It's unclear whether the culvert extends underground once it reaches the school property. Slow, south-moving water was observed running parallel to Sears Ranch Road to the south of the school's parking lot. The slow-moving water is accommodated in a ditch approximately 7 feet east of the road's edge. A 4-inch PVC pipe and 18-inch corrugated pipe were observed draining into this ditch, south of the school property.

Energy dissipation features were also observed along the western edge of Search Ranch Road, from the intersection of the private driveway to about halfway through the elementary school property. At that point, the energy dissipation features give way to an asphalt-lined v-ditch.

A few minor slump failures and landslides were observed along the western edge of Sears Ranch Road. The landslides were indicated by subparallel crack repairs along the road. Most of the head scarps were obscured by vegetation.

Soil creep was observed along the eastern edge of the project site (Figure 2B).

5.2.3 Site D

The moderately sloping area within site D (where a parking lot is planned) generally drains to the north to northwest. The drainage is gradual due to the gentle slopes in the western half. The eastern half has more sudden grade breaks. A shallow slump failure was identified along one of these sudden grade breaks. A few hummocky and inverted topographic zones were observed from the contours, suggesting a potential deep landslide, with the head scarp along the western edge of the proposed parking area. The landslide feature was obscured by vegetation and not directly observed during the site visit.

Depending on the limits for the proposed parking lot, there may be a need for a retaining wall to support the proposed improvements. There will also be a need for accommodating natural drainage and potential deep-seated landslide (Figure 2C).

5.2.4 Site D (Bridge)

The bridge, its abutments, and areas surrounding the bridge were observed. The bridge crosses a stream with a confluence on the western side of the bridge. The bridge appears to be supported by logs. The bottom-most log on the southern abutment was partly washed/pulled away from the rest of the logs. All the logs were rotted to some degree. The logs are up to approximately 26 feet long in combined length along the southern abutment and approximately 34 feet long in combined length along the northern abutment.

A push fill envelope at the southern abutment extends approximately 10 feet away from the bridge. There is also a dirt ramp that leads to the western bank of the southern abutment. This ramp is approximately 25 feet long and 6 feet wide. An approximately 10-foot-wide path, on the eastern side of the southern abutment leads to a well house. The bank at the north to northeastern edge of the well house appears to have been scoured away.

Observed push fill at the northern abutment extends approximately 8 feet to the west of the bridge and about 20 feet to the east of the bridge. The western edge has a steep drop to the northern fork of the confluence. The eastern side is a gentle ramp to the stream bank.

The stream banks are near vertical on both sides of the stream east of the bridge. The heavy vegetation made observation from the bank edge inaccessible in areas. Observable areas showed up to approximately 3 feet of scour. A large leaning tree was observed on the eastern bank, of the northern bridge abutment, and observable from the well house looking west. The tree roots were undermined by scour (Figure 2D).

5.2.5 Site E3

Site E3 will be discussed as Upper Site-E3 for the area north of Highway 84 and as Lower Site-E3 for the area south of Highway 84.

Upper Site E3 consists of hilly terrain with bedrock outcropping in the northernmost portion of the project area. Two drainage swales were also observed along the slope, as evidenced by the increase in vegetation and the presence of a 12-inch diameter culvert at the base of the slope along Highway 84. In addition, there appears to be a fire break trail along the middle portion of the slope. The easternmost portion seems to be covered with thick colluvial deposits, as evidenced by the difference in steepness of the terrain and the presence of observable fat clay in the most gently sloping areas.

Lower Site E3 appears to have been constructed by cutting into the adjacent slope, as evidenced by the rock outcrops observed throughout the site. It's probable that the building pad for the red barn and corral area was cut into rock with push fill extending along the western edge.

A shallow slump failure was observed near the historic Red Barn, indicated by hummocky terrain and an increase in vegetation, suggesting an increase in moisture in that area.

Standing water was observed along the southern edge of the corral. This area of standing water is below the drainage swale observed in Upper Site E3.

A shallow slump failure was also observed in the tree-lined slope above the trail leading up to the white barn (Figure 2E).

6.0 RECOMMENDED REVISIONS OF PROPOSED SUBSURFACE EXPLORATION PROGRAM

6.1 GENERAL

The purpose of this preliminary geologic and geotechnical assessment was to review and interpret existing geologic and geotechnical data within the vicinity of the project areas to determine if potential data gaps exist, or if existing data can be used to reduce or refine the number of exploration locations that were originally proposed in CE&G's scope of work, dated 26 July 2021.

When our original scope of work was prepared, conceptual plans of the improvements had not been provided and there had been conversations with the client regarding potential work to be done along the roadways. The original scope consisted of up to 20 geotechnical borings to be drilled over the course of up to 8 days.

6.2 RECOMMENDED EXPLORATION PROGRAM

Based on review of existing geological and geotechnical data, information gathered from our site reconnaissance mapping, and further conversations held with the client, CE&G recommends drilling up to a total of 16 borings instead of 20, resulting in approximately 6 to 7 days of exploration instead of 8 days, as initially proposed. The proposed boring details (e.g., locations, depths, purpose, etc.) are shown in Table 6-1 below. If this recommended exploration workplan is acceptable, a revised project scope and cost will be provided.

Table 6-2. Revised Exploration Plan

Site	Number of Borings	Estimated Boring Depths (feet)	Type of Permit	Drill Rig Type	Purpose of Boring(s)
B2	3	15 to 30	County	Track	Characterize subsurface materials for proposed parking lot areas
B3	3	15 to 30	County	Truck & Track	Characterize subsurface materials for proposed parking lot areas and Sears Ranch Road improvements
D	3	20 to 30	County & Caltrans (if in ROW)	Track	Characterize subsurface materials for proposed parking lot area, restroom foundation, and potential retaining wall
D (Bridge)	2	30 to 45	County	Track or portable	Characterize bridge abutment
E3	3	10 to 30	County and Caltrans	Truck	Characterize subsurface materials for proposed parking lot areas, access driveway, and Potential new median
	2	45	County & Caltrans (if in ROW)	Track or portable	Characterize area for pedestrian crossing

6.2.1 Assumptions

We have made the following assumptions to adjust our original scope of work:

1. RHAA and the District will assist in obtaining right-of-entry or access agreements for privately owned parcels.

2. We will undertake field activities between 7:00 AM and 5:00 PM on non-holiday weekdays and per encroachment permit conditions.

3. Field activities (drilling, traffic control, logging of borings) will be provided per Department of Industrial Relations guidelines and are subject to prevailing wage rates, which are reflected in our cost estimate.

4. Traffic control will be provided by a subcontractor under CE&G. It is assumed that 2 days of traffic control will be needed.

5. Cuttings generated during the subsurface investigations can be spread along the side of the road

6. Caltrans permits may be required for borings drilled within HWY 84 right of way. Caltrans permits will require a minimum of 90 days to process.

These assumptions are based upon the limited conversations had with the client regarding the project scope.

7.0 LIMITATIONS

The conclusions and recommendations of this report are based upon information provided to us regarding the site at the time of our work, our geologic reconnaissance, and professional judgment. Site conditions described in the text of this report are those existing at the time of our January 2022 field reconnaissance and are not necessarily representative of the site conditions at other times or locations.

CE&G's work has been specifically limited to evaluation of the geologic and soil conditions in the project areas. Evaluation of the conditions in other areas was beyond the authorized scope of work. Evaluation or identification of the potential presence of hazardous materials at the site was not requested and is beyond the authorized scope of work.

We have employed accepted geotechnical engineering and geologic procedures, and our professional opinions and conclusions are made in accordance with generally accepted geotechnical engineering and engineering geologic principles and practices. This standard is in lieu of all warranties, either expressed or implied.

8.0 REFERENCES

Brabb E.E., 1980, Preliminary Geologic Map of the La Honda and San Gregorio Quadrangles, San Mateo County, California, U.S. Geological Survey, Open File Report 80-245, map scale 1:24,000

California Department of Transportation, (2018), Caltrans fault database and Caltrans ARS online reports and data, http://dap3.dot.ca.gov/ARS_Online/technical.php

Ellen, S.D. and others, 1997, Map Showing Principal Debris-Flow Source Areas in San Mateo County, California. U.S. Geological Survey Open-File Report 97-745E.

Graymer et al., 2006, Geologic Map of the San Francisco Bay Region, U.S. Geological Survey, Scientific Investigation Map 2918

NRCS. (2021). *Web Soil Survey*. Retrieved December 21, 2021, from United States Department of Agriculture Natural Resources Conservation Service: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

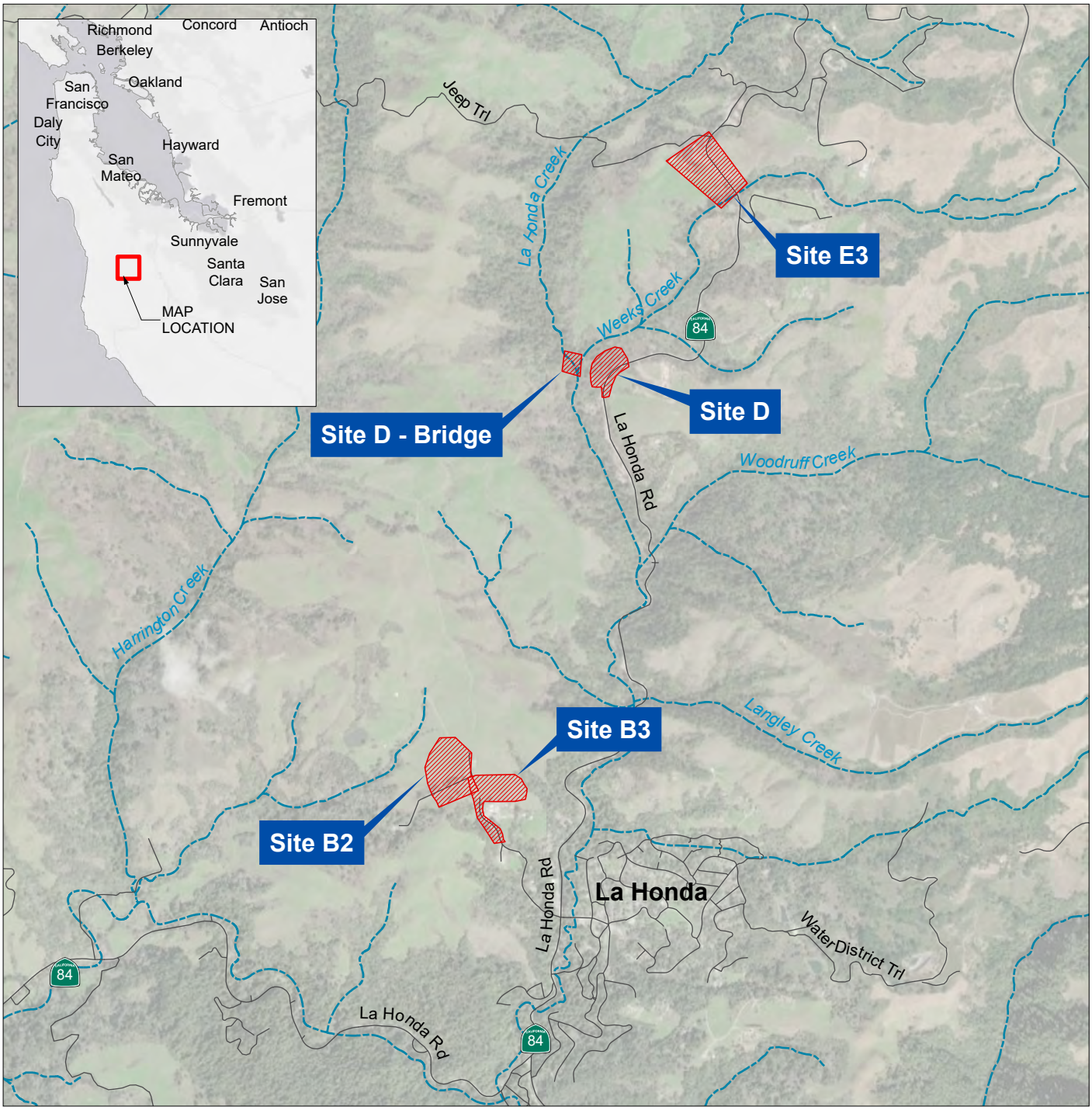
Page, B. (1992). Tectonic Tetting of the San Francisco Bay Region. *Proceedings of the Second Conference on Earthquake Hazards in the Eastern San Francisco Bay Area* (pp. 1-7). Sacramento: California Department of Conservation, Division of Mines and Geolog

U.S. Geological Survey and California Geological Survey, Quaternary fault and fold database for the United States, accessed December 2021, at: https://www.usgs.gov/natural-hazards/earthquake-hazards/faults

Wentworth, C.M. and others, 1997, Summary Distribution of Slides and Earth Flows in San Mateo County, California. U.S. Geological Survey Open-File Report 97-745C.

Working Group on California Earthquake Probabilities (WGCEP), 2003, Earthquake Probabilities in the San Francisco Bay Region: 2002-2031: U.S. Geological Survey Open File Report 2003-214.

Figures



BASEMAP REFERENCE

1. STREET CENTERLINES FROM CALTRANS CALIFORNIA ROAD SYSTEM, DOWNLOADED ON 18 FEB 2020.
2. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

N

0 0.25 0.5 1
MILES

CE&G
CAL ENGINEERING & GEOLOGY

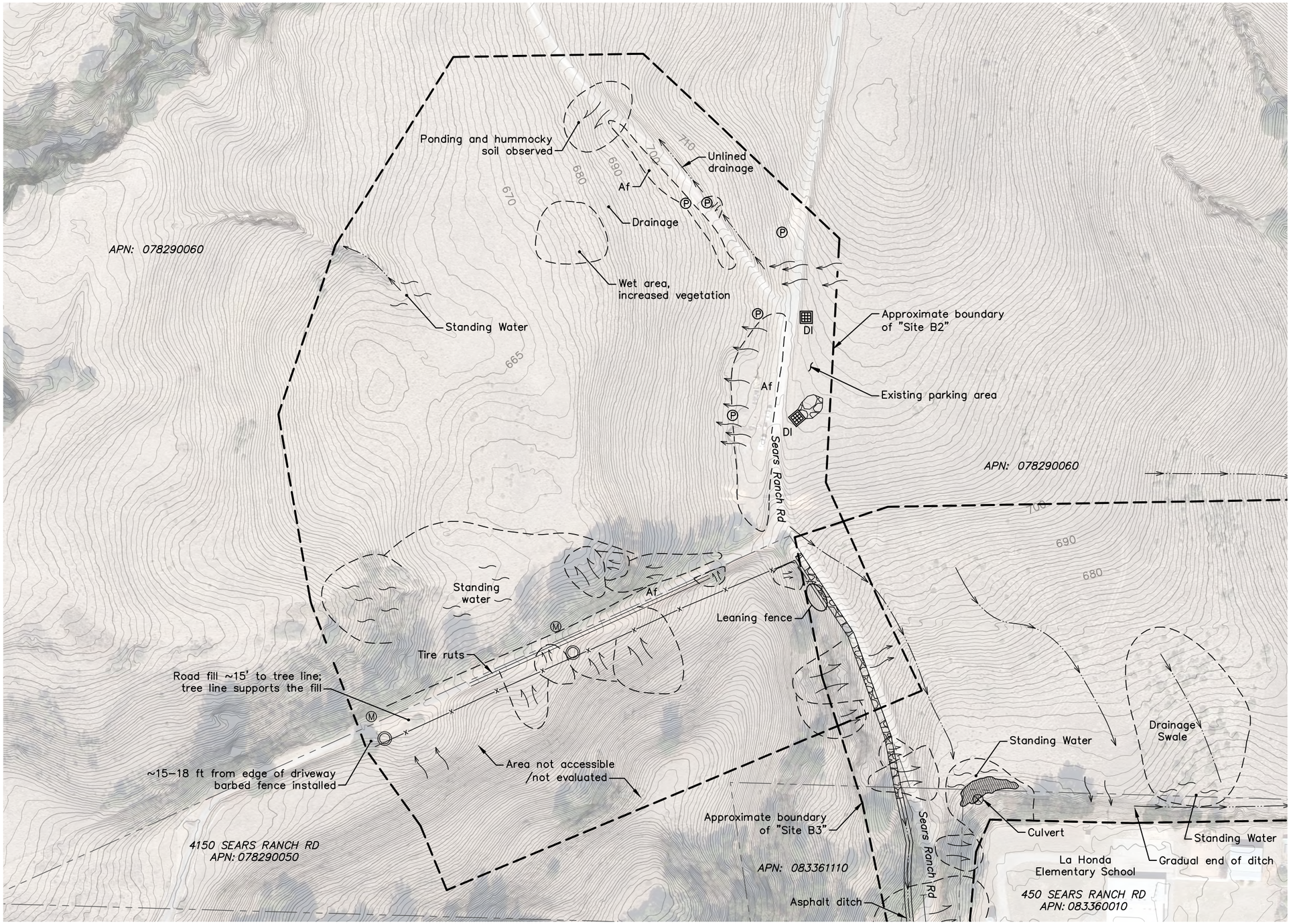
785 Ygnacio Valley Rd.
Walnut Creek, CA, 94596
www.caleng.com
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

SITE LOCATION MAP

210881	FEBRUARY 2022	FIGURE 1

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\GIS\ArcGIS\ArcGIS-210881-LaHonda.aprx; 2/24/2022; kdrozynska



MAP UNIT DESCRIPTION

Af	ARTIFICIAL FILL
Ⓜ	CORRUGATED 12" METAL PIPE
Ⓟ	12" BLACK CORRUGATED PLASTIC PIPE, ENDS IN A "T" WITH ENERGY DISSCIPATOR
◎	2X2.5X3' DEEP BRICK–LINED HOLE CONNECTS TO PIPE
	SOIL CREEP
	NATURAL DRAINAGE DIRECTION
	STANDING WATER
—x—	FENCE
	ENERGY DISSIPATION (ROCKS)
	SHALLOW SLUMP
	WETLAND AREA FROM RHAA, CAD FILE RECEIVED ON 02/07/2022

REFERENCES

1. GEOLOGIC MAPPING BY R. BRISENO BETWEEN 1/12 AND 1/13 2022.
2. 1–ft CONTOURS FROM SAN MATEO COUNTY, 2019.
3. ORTHOIMAGERY FROM SAN MATEO COUNTY, 2017.
4. PARCEL DATA FROM SAN MATEO COUNTY GIS DATABASE; ACCESSED ONLINE ON 2/25/2019.

75 0 75 150
SCALE FEET

N

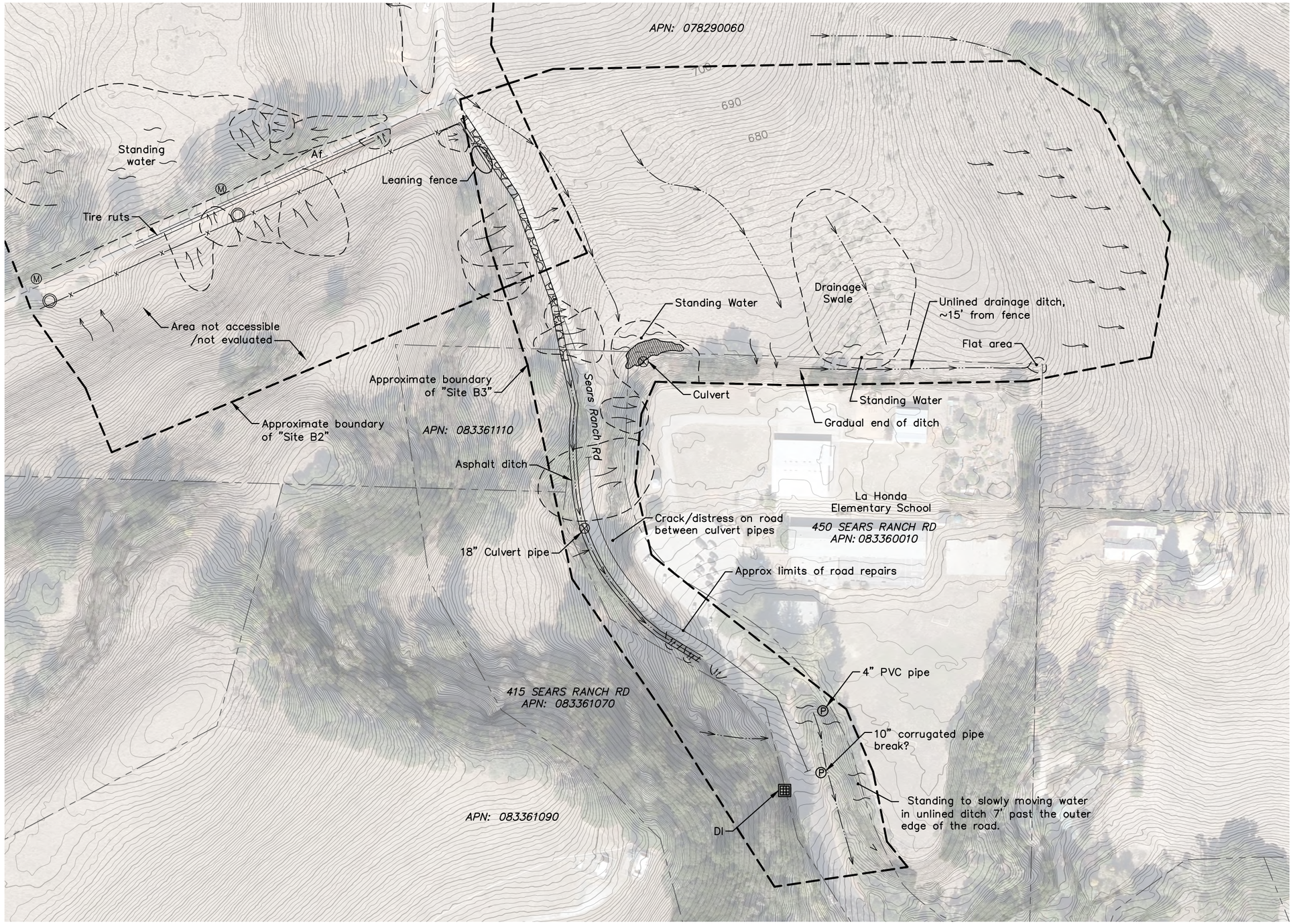
CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Road
Walnut Creek, CA 94596
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

SITE PLAN FOR "SITE B2"

210881	FEBRUARY 2022	FIGURE 2A

M:\2021\210881–RHAA–LaHondaCreekDataReview–Reconnaissance\AutoCAD\Figures\Fig2–SitePlan.dwg 3–01–22 01:40:11 AM kdrozynska



MAP UNIT DESCRIPTION

- CULVERT
- Ⓜ CORRUGATED 12" METAL PIPE
- Ⓟ 12" BLACK CORRUGATED PLASTIC PIPE, ENDS IN A "T" WITH ENERGY DISSCIPATOR
- STANDING WATER
- SOIL CREEP
- NATURAL DRAINAGE DIRECTION
- LEANING FENCE
- ENERGY DISSIPATION (ROCKS)
- SHALLOW SLUMP
- WETLAND AREA FROM RHAA, CAD FILE RECEIVED ON 02/07/2022

REFERENCES

1. GEOLOGIC MAPPING BY R. BRISENO BETWEEN 1/12 AND 1/13 2022.
2. 1-ft CONTOURS FROM SAN MATEO COUNTY, 2019.
3. ORTHOIMAGERY FROM SAN MATEO COUNTY, 2017.
4. PARCEL DATA FROM SAN MATEO COUNTY GIS DATABASE; ACCESSED ONLINE ON 2/25/2019.

75 0 75 150
SCALE FEET

N

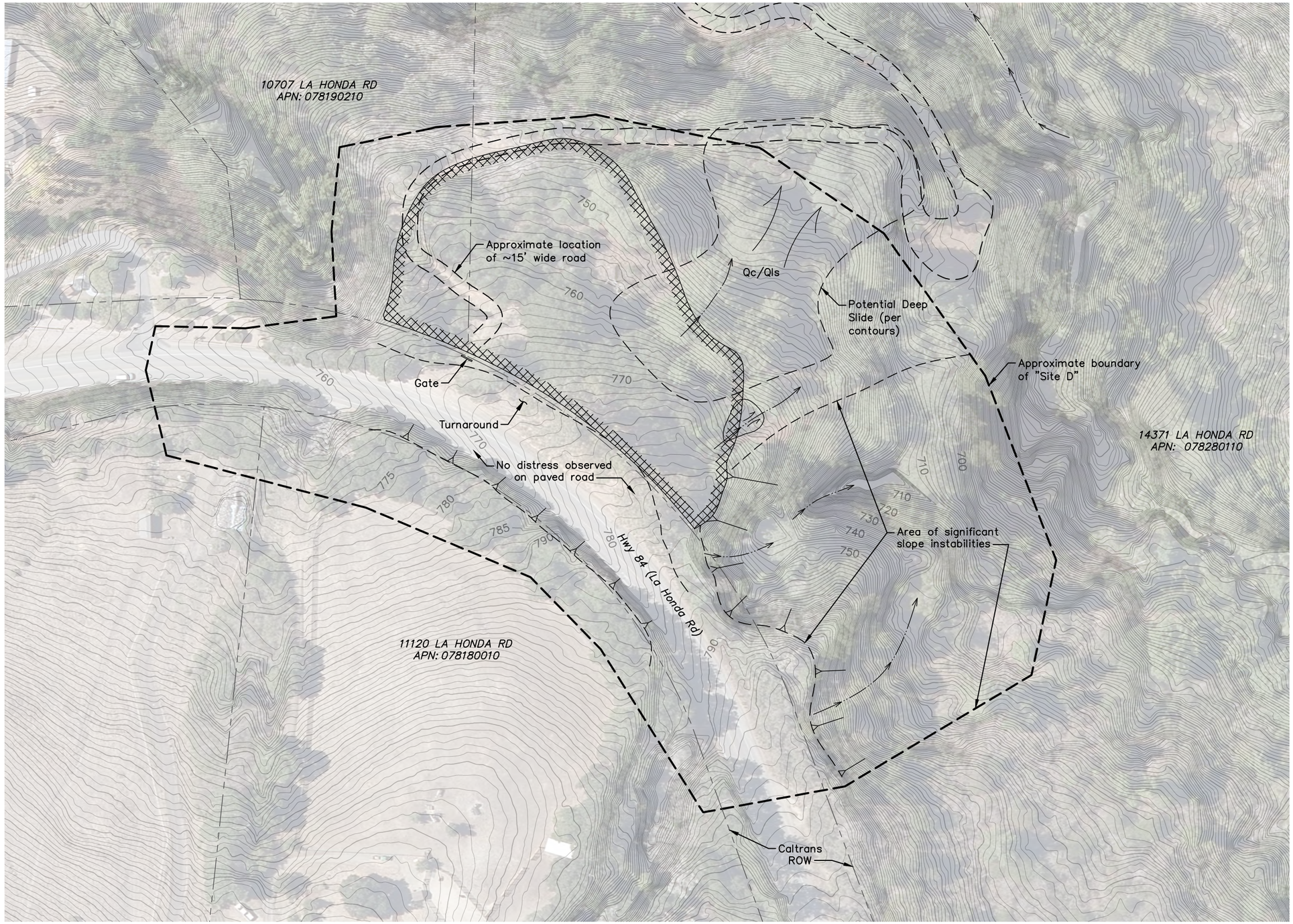
CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Road
Walnut Creek, CA 94596
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

SITE PLAN FOR "SITE B3"

210881	FEBRUARY 2022	FIGURE 2B

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\AutoCAD\Figures\Fig2-SitePlan.dwg 3-01-22 01:46:58 AM kdrozynski



MAP UNIT DESCRIPTION

- NATURAL DRAINAGE DIRECTION
- PROPOSED AREA OF DEVELOPMENT
- SHALLOW SLUMP
- GRADE BREAK / STEEP DROP OFF
- Qc/Qls — COLLUVIUM/LANDSLIDE DEPOSIT; ARROWS SHOW DIRECTION OF MOVEMENT

REFERENCES

1. GEOLOGIC MAPPING BY R. BRISENO BETWEEN 1/12 AND 1/13 2022.
2. 1-ft CONTOURS FROM SAN MATEO COUNTY, 2019.
3. ORTHOIMAGERY FROM SAN MATEO COUNTY, 2017.
4. PARCEL DATA FROM SAN MATEO COUNTY GIS DATABASE; ACCESSED ONLINE ON 2/25/2019.

50 0 50 100
SCALE FEET

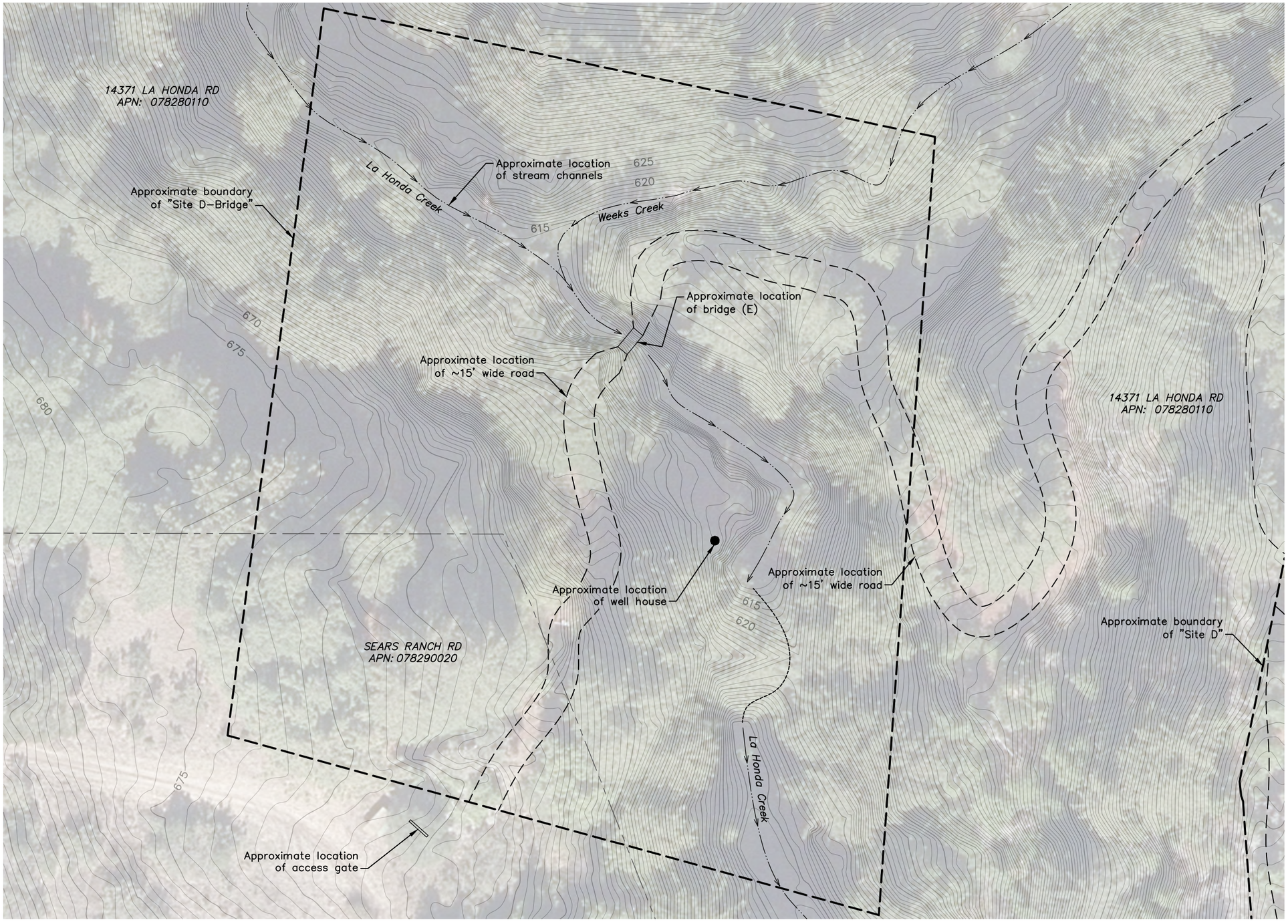
CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Road
Walnut Creek, CA 94596
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

SITE PLAN FOR "SITE D"

210881	FEBRUARY 2022	FIGURE 2C

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\AutoCAD\Figures\Fig2-SitePlan.dwg 3-01-22 12:04:17 PM kdrozynska



MAP UNIT DESCRIPTION

NATURAL DRAINAGE DIRECTION

REFERENCES

1. GEOLOGIC MAPPING BY R. BRISENO BETWEEN 1/12 AND 1/13 2022.
2. 1–ft CONTOURS FROM SAN MATEO COUNTY, 2019.
3. ORTHOIMAGERY FROM SAN MATEO COUNTY, 2017.
4. PARCEL DATA FROM SAN MATEO COUNTY GIS DATABASE; ACCESSED ONLINE ON 2/25/2019.

25 0 25 50
SCALE FEET

N

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\AutoCAD\Figures\Fig2-SitePlan.dwg 3-01-22 02:07:11 AM kdrozynska

CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Road
Walnut Creek, CA 94596
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

SITE PLAN FOR "SITE D-BRIDGE"

210881	FEBRUARY 2022	FIGURE 2D

APN: 078140090

Rx
73°, 31°N

Fire trail

Qc
(CH)

Drainage swale

Qc

(E) Gate

1090
1150
1120
1110
1100

12" Culvert

Hwy 84

1070

1060

(E) Gate

Area of Conceptual
Hwy Crossing

1050

1040

1030
1020

Caltrans
ROW

Disstress/cracks
on gravel road

Dirt Rd

311°, 24°S

Contaminated
Corral Area

1040

Graded flat/
pushed fill

Red
Barn
1045

257°, 20°S

Hummocky terrain

Standing water

Access Rd

4" Dia Stump

Graded flat/
pushed fill

White Barn

Approximate boundary
of "Site E"

11895 LA HONDA RD
APN: 078280090

14371 LA HONDA RD
APN: 078280110

MAP UNIT DESCRIPTION

Qc	THICK COLLUVIUM
×	OUTCROP
	STRIKE AND DIP OF BEDDING
	STANDING WATER
	SOIL CREEP
	NATURAL DRAINAGE DIRECTION
	CONTAMINATED CORAL AREA
	SHALLOW SLUMP

REFERENCES

1. GEOLOGIC MAPPING BY R. BRISENO BETWEEN 1/12 AND 1/13 2022.
2. 1-ft CONTOURS FROM SAN MATEO COUNTY, 2019.
3. ORTHOIMAGERY FROM SAN MATEO COUNTY, 2017.
4. PARCEL DATA FROM SAN MATEO COUNTY GIS DATABASE; ACCESSED ONLINE ON 2/25/2019.

60 0 60 120
SCALE FEET

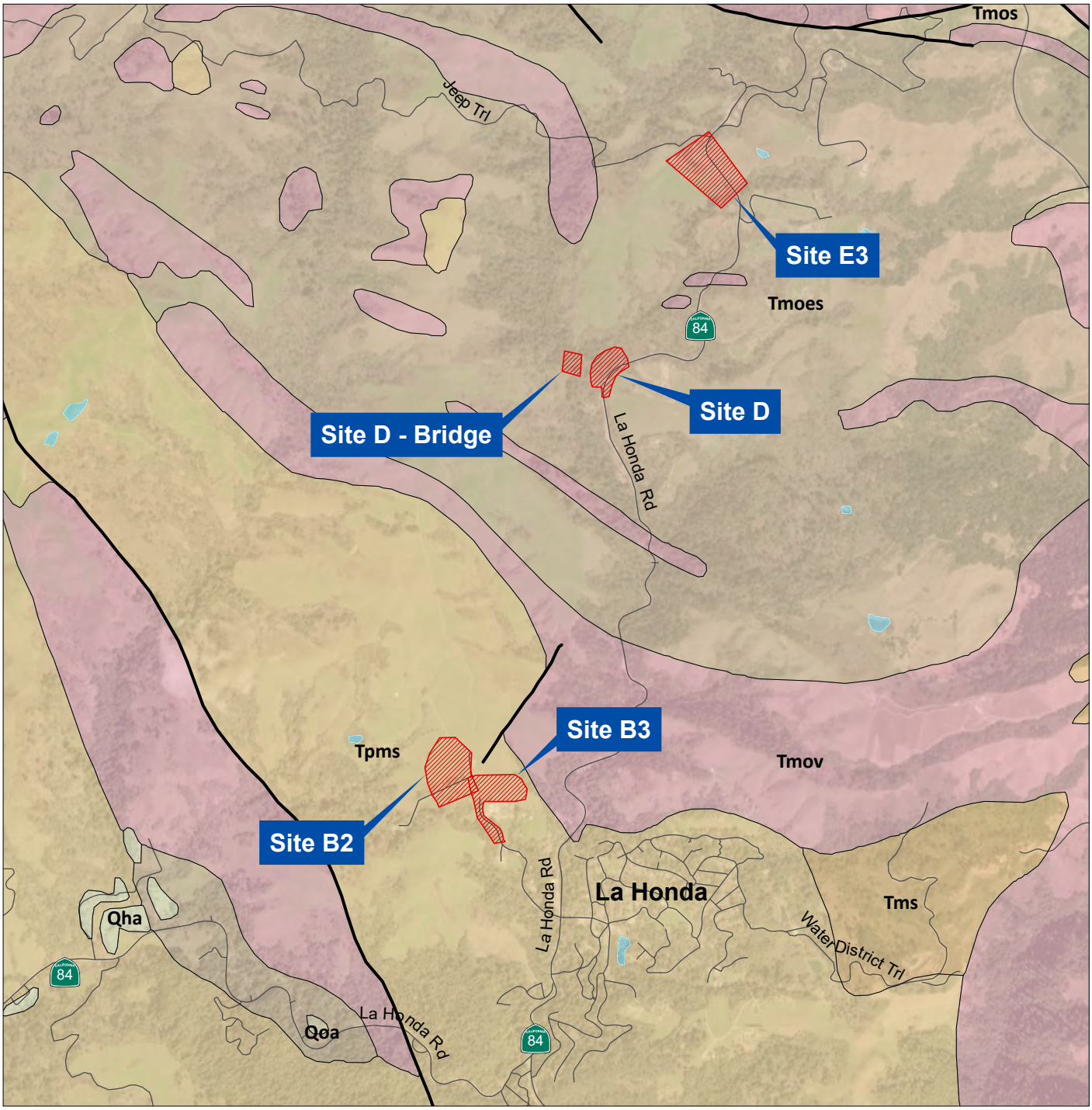
CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Road
Walnut Creek, CA 94596
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

SITE PLAN FOR "SITE E3"

210881	FEBRUARY 2022	FIGURE 2E

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\AutoCAD\Figures\Fig2-SitePlan.dwg 3-01-22 01:49:47 AM kdrozynska



BASEMAP REFERENCE

1. REGIONAL GEOLOGY FROM GRAYMER, 2006.

MAP UNIT DESCRIPTION

Qha	Alluvium (Holocene)
Qoa	Alluvium (early Pleistocene)
Tpms	Sedimentary rocks (Pliocene and early Miocene)
Tms	Sedimentary rocks (Miocene)
Tmos	Sedimentary rocks (Miocene and (or) Oligocene)
Tmov	Volcanic rocks (Miocene and (or) Oligocene)
Tmoes	Sedimentary rocks (Miocene, Oligocene, and (or) Eocene)

N

0 0.25 0.5 1
MILES

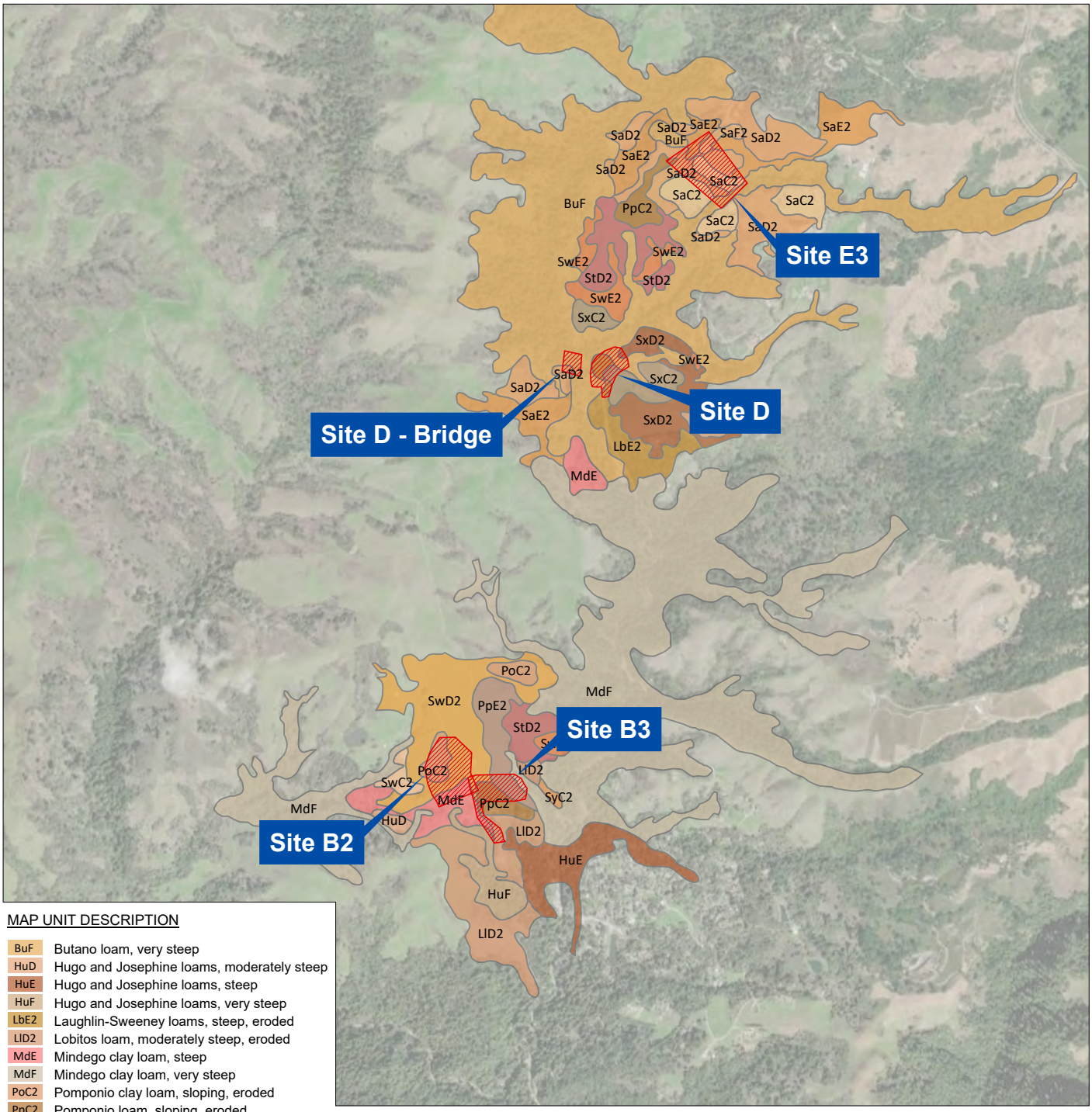
CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Rd.
Walnut Creek, CA, 94596
www.caleng.com
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

REGIONAL GEOLOGY MAP

210881	FEBRUARY 2022	FIGURE 3

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\GIS\ArcGIS\ArcGIS-210881-LaHonda.aprx; 2/24/2022; kdrozynska



MAP UNIT DESCRIPTION

BuF	Butano loam, very steep
HuD	Hugo and Josephine loams, moderately steep
HuE	Hugo and Josephine loams, steep
HuF	Hugo and Josephine loams, very steep
LbE2	Laughlin-Sweeney loams, steep, eroded
LlD2	Lobitos loam, moderately steep, eroded
MdE	Mindego clay loam, steep
MdF	Mindego clay loam, very steep
PoC2	Pomponio clay loam, sloping, eroded
PpC2	Pomponio loam, sloping, eroded
PpE2	Pomponio loam, steep, eroded
SaC2	Santa Lucia loam, sloping, eroded
SaD2	Santa Lucia loam, moderately steep, eroded
SaE2	Santa Lucia loam, steep, eroded
SaF2	Santa Lucia loam, very steep, eroded
StC	Sweeney clay, sloping
StD2	Sweeney clay, moderately steep, eroded
SwC2	Sweeney clay loam, sloping, eroded
SwD2	Sweeney clay loam, moderately steep, eroded
SwE2	Sweeney clay loam, steep, eroded
SxC2	Sweeney clay loam, deep, sloping, eroded
SxD2	Sweeney clay loam, deep, moderately steep, eroded
SyC2	Sweeney clay loam, deep, sloping, eroded

N

0 0.25 0.5 1
MILES

BASEMAP REFERENCE

1. SOIL DATA FROM NATURAL RESOURCES CONSERVATION SERVICE, US DEPARTMENT OF AGRICULTURE; WEB SOIL SURVEY, ACCESSED ONLINE ON 6/29/2020.

CE&G
CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Rd.
Walnut Creek, CA, 94596
www.caleng.com
Phone: (925) 935-9771

PRELIMINARY FEASIBILITY STUDY
LA HONDA
SAN MATEO COUNTY, CALIFORNIA

NRCS SOIL MAP

210881	FEBRUARY 2022	FIGURE 4

M:\2021\210881-RHAA-LaHondaCreekDataReview-Reconnaissance\GIS\ArcGIS\ArcGIS-210881-LaHonda.aprx; 2/24/2022; kdrozynska