SAN MATEO COUNTY NAVIGATION CENTER
REDWOOD CITY, CALIFORNIA

GEOTECHNICAL EXPLORATION

SUBMITTED TO
Ms. Jasmine Gao
County of San Mateo
Project Development
555 County Center, 2nd Floor
Redwood City, CA 94063

PREPARED BY
ENGEO Incorporated

July 30, 2021

PROJECT NO.
11780.003.004

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Expect Excellence

Project No.
11780.003.004

July 30, 2021

Ms. Jasmine Gao
County of San Mateo
Project Development
555 County Center, 2nd Floor
Redwood City, CA 94063

Subject: San Mateo County Navigation Center
1450 Maple Street
Redwood City, California

GEOTECHNICAL EXPLORATION

Dear Ms. Gao:

We prepared this geotechnical report for the County of San Mateo as outlined in our agreement dated May 12, 2021. We characterized the subsurface conditions at the site to provide the enclosed geotechnical recommendations for design.

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to review the project plans and specifications and provide geotechnical observation and testing services during construction. Please let us know when working drawings are nearing completion, and we will be glad to discuss these additional services with you.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Wyatt Iwanaga

Jeff Fippin, GE

REGISTERED PROFESSIONAL ENGINEER
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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

We prepared this geotechnical report for design of the proposed Navigation Center in Redwood City, California. We prepared this report as outlined in our agreement dated May 12, 2021. The County of San Mateo authorized us to conduct the following scope of services.

- Service plan development
- Subsurface field exploration
- Soil laboratory testing
- Data analysis and conclusions
- Report preparation

For our use, we received the following.

1. Site Plan Schemes, Exhibits B, C.1, and C.2; City of Redwood City, Community Development Department, February 22, 2021; received electronically via email.
2. San Mateo County Navigation Center, Concept Design; Office of Charles F. Bloszies, FAIA; May 4, 2021; received electronically via email.
3. Navigation Center at 1450 Maple Street, Redwood City, CA, Structural Concept; Office of Charles F. Bloszies, FAIA; June 28, 2021; received electronically via email.

This report was prepared for the exclusive use of our client and their consultants for design of this project. In the event that any changes are made in the character, design, or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 PROJECT LOCATION

Figure 1 displays a Site Vicinity Map. The approximately 4.6-acre site is associated with Assessor's Parcel Number (APN) 059-398-010 and is located northwest of the intersection of Blomquist Street and Maple Street in Redwood City, California. Access is provided by unpaved, gated driveways along Maple Street.

Figure 2 shows site boundaries, proposed building and pavement areas, and our exploratory locations. The site is bordered on the northwest, northeast, and southeast by Maple Street and to the southwest by the Redwood City Police Department. Across Maple Street to the northwest is an active construction site. An aquatic center lies across Maple Street to the northeast, abutting the San Francisco Bay. Across Maple Street to the southeast is an industrial-use lot.

1.3 PROJECT DESCRIPTION

Based on our discussion with the project team and review of the information provided, we understand that the following site improvements are proposed.

1. Earthwork fill up to 8 feet and minor excavation of less than 5 feet

2. Paved streets, parking, and drive lanes
3. Utilities and other infrastructure improvements
4. Retaining walls up to 8 feet in height with level backfill
5. Concrete flatwork
6. Temporary residential units consisting of repurposed, prefabricated shipping containers. In portions of the site, the shipping containers will be stacked three high and an elevated platform and stairs will be constructed to provide access.

1.4 SITE HISTORY

We reviewed historical aerial photography taken at the site from between 1946 and 2016. The site was previously occupied by a wastewater treatment plant. Construction of the plant began between 1946 and 1948 based on photographs from those years. The plant was expanded between 1958 and 1960. Between 1987 and 1991, the wastewater treatment plant was demolished, and a majority of the debris was mixed into the on-site fill. Between 1991 and 2002, the site was repurposed as fleet parking for car dealerships with the exception of the northeastern quadrant, which consists of wetland. The site is currently used for fleet parking.

1.5 REVIEW OF EXISTING DATA

As part of our scope for this design-level report, we reviewed the following geotechnical reports that we previously prepared in the vicinity of the site for relevant geotechnical and geologic information.

- ENGEO; Preliminary Geotechnical Exploration; Homeless Shelter Transitional Housing, 1402 Maple Street, Redwood City, California; June 3, 2020; Project No. 11780.001.005 (immediately southeast of the project site)
- ENGEO; Geotechnical Exploration; Offsite Sanitary Sewer, San Mateo County, Replacement Correctional Facility, Redwood City, California; June 14, 2013; Project No. 9515.000.001 (immediately southwest of the project site)
- ENGEO; Geotechnical Recommendations for 1548 Maple Street Off-site Improvements; 1548 Maple Street, Redwood City, California; January 30, 2020; Project No. 9599.001.000 (immediately northeast and southwest of the project site)
- ENGEO; Geotechnical Exploration; 1548 Maple Street, Redwood City, California; February 8, 2017; Project No. 9599.001.000 (immediately northwest of the project site)
- ENGEO; Geotechnical Exploration; San Mateo County Replacement Correctional Facility, Redwood City, California; November 30, 2012; Project No. 9515.000.000 (700 feet south of the project site)

2.0 FINDINGS

2.1 GEOLOGY AND SEISMICITY

2.1.1 Geology

The site is located in the Northern California Coast Ranges geomorphic province, which is dominated by northwest-trending faults and folds. The Coast Ranges are a complex series of linear mountain ranges that lie more-or-less parallel to the coast and to the San Andreas Fault System. The Coast Ranges are composed primarily of Jurassic and Cretaceous-aged rocks that accumulated on the sea floor and were later scraped off when the oceanic plate on which they originated was subducted beneath the North American plate. These older rocks include a tectonic mix of sandstone, chert, altered basalt referred to as greenstone, and serpentinite, collectively referred to as the Franciscan Complex. While Franciscan bedrock is exposed in the hills and cliffs of the San Francisco Bay Area, the flanks of the hills are blanketed with thin to thick layers of colluvium and alluvium (weathered material washed downslope from bedrock exposures). Valleys within this area of the San Francisco Bay Area are filled with water-laid stream deposits.

Historical development of the San Francisco Bay shoreline resulted in placement of artificial fill material over substantial portions of modern estuaries, marshlands, tributaries, and creek beds in an effort to reclaim land. Geologic mapping by Brabb (1998) indicates the site is underlain by artificial fill (af) and Bay Mud deposits (Qhb), as shown on Figure 3.

2.1.2 Seismicity

The San Francisco Bay Area contains numerous active earthquake faults. Nearby active faults include the San Andreas Fault, approximately 5 miles away, and the Monte Vista – Shannon Fault, approximately 4½ miles away. An active fault is defined by the California Geologic Survey as one that has had surface displacement within Holocene time (about the last 11,000 years) (Bryant and Hart, 2007).

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site. Fault rupture through the site, therefore, is not anticipated.

Numerous small earthquakes occur every year in the San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 5 shows the approximate locations of these faults and significant historic earthquakes recorded within the San Francisco Bay Region. The Uniform California Earthquake Rupture Forecast (UCERF 3) (Field et al., 2015) estimates the 30-year probability for a magnitude 6.7 or greater earthquake in the San Francisco Bay Region at approximately 72 percent, considering the known active seismic sources in the region.

To identify nearby active faults that are capable of generating strong seismic ground shaking at the site, we utilized the USGS Unified Hazard Tool* and disaggregated the hazard at the peak ground acceleration (PGA) with the resulting faults listed below in Table 2.1.2-1.

TABLE 2.1.2-1: Active Faults Capable of Producing Significant Ground Shaking at the Site (Latitude: 37.4944 Longitude: -122.2201)

SOURCE	R_{RUP}		MOMENT MAGNITUDE M_W
	(KM)	(MILES)	
San Andreas (Peninsula) [6]	8.06	5.01	7.84
Monte Vista – Shannon [0]	7.44	4.62	6.78
Hayward (So) [4]	22.88	14.22	7.27
San Gregorio (North) [11]	21.04	13.07	7.70
Pilarcitos [3]	10.80	6.71	7.54

*USGS Unified Hazard Tool - Edition: Dynamic Conterminous U.S. 2014 (update) (v4.2.0)

2.2 FIELD EXPLORATION

Our field exploration included drilling four borings at various locations on the site. We performed our field exploration on May 24, 2021.

The location of our explorations are approximate, and we estimated them using recreational-grade GPS; they should be considered accurate only to the degree implied by the method used. We estimated the elevations based on topographic information provided to us.

We observed drilling of four borings at the locations shown on the Site Plan, Figure 2. A representative of our firm observed the drilling and logged the subsurface conditions at each location. We retained the services of a subcontractor operating a track-mounted CME 75 drill rig to advance the borings using 8-inch-diameter hollow-stem auger and 6-inch-diameter mud-rotary methods. We advanced the borings to depths ranging from 12½ to 41½ feet below existing grade. We permitted and backfilled the borings in accordance with the requirements of San Mateo County.

We obtained bulk soil samples from drill cuttings and retrieved both disturbed and relatively undisturbed soil samples at various intervals in the borings using standard penetration tests, 2½-inch O.D. split-spoon sampler, and thin-walled Shelby tube samplers.

We obtained the standard penetration resistance blow counts by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. In addition, we obtained 2½-inch I.D. samples using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows to drive the last 1 foot of penetration; the blow counts have not been converted using any correction factors. When sampler driving was difficult, we recorded penetration only as inches penetrated for 50 hammer blows.

We used the field logs to develop the report logs in Appendix A. The logs depict subsurface conditions at the exploration locations for the date of exploration; however, subsurface conditions may vary with time.

2.3 SURFACE CONDITIONS

The site is currently divided into three portions at different grades. A wetland area occupies the northeastern portion of the site. This wetland area has a water level that generally rests at

Elevation 5 feet (WGS84). The southern lot slopes from approximately Elevation 14½ feet in the eastern portion to Elevation 10 feet in the northwestern portion. The northern lot is generally level at Elevation 8 feet, with the exception of a raised zone at Elevation 10 feet located southwest of the wetland. A seasonal drainage swale runs along the eastern boundary of the site. The bottom of this swale is at approximately Elevation 2 feet.

Please refer to the Site Plan, Figure 2, for more information on site features.

2.4 SUBSURFACE CONDITIONS

The exploratory borings encountered artificial fill in the upper 7 to 10 feet. This fill material was highly heterogeneous, comprising a range of soil types from very stiff to hard gravelly clay to loose poorly graded sand. We encountered debris from the demolition of the wastewater treatment plant that previously occupied the site, including concrete and glass fragments, in the fill material. Beneath the fill in our explorations, we encountered between 3 and 7 feet of interbedded Young Bay Mud, a soft, highly compressible fat clay, and medium dense clayey sand. Below the Young Bay Mud, the explorations, with the exception of 1-B3, encountered Old Bay Clay, a very stiff clay; 1-B3 encountered a layer of clayey gravel between the Young Bay Mud and Old Bay Clay. Below the Old Bay Clay, we encountered alluvial deposits primarily comprising very stiff lean clay with varying amounts of sand and gravel.

The Site Plan and exploration logs can be consulted for specific subsurface conditions at each location. We include our exploration logs in Appendix A. The logs contain the soil type, color, consistency, and visual classification in general accordance with the Unified Soil Classification System. The logs graphically depict the subsurface conditions encountered at the time of the exploration.

2.5 GROUNDWATER CONDITIONS

We did not observe static groundwater in any of our subsurface explorations. We observed perched groundwater in Boring 1-B2 at a depth of approximately 3 feet below existing grade. At this location, water has infiltrated the surface soil and ponded on less permeable layers. Because of the site's proximity to the San Francisco Bay, we anticipate a static groundwater level at or above the Young Bay Mud, corresponding to roughly Elevation 1 to 3 feet. The low permeability of the encountered subsurface materials likely prevented water from entering the borehole at a sufficient rate to observe the static groundwater level within our explorations.

Fluctuations in the level of groundwater may occur due to tidal fluctuations, variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made.

2.6 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed moisture content, dry density, unconfined compression, plasticity index, expansion index, sieve, and hydrometer testing. Moisture contents, dry densities, plasticity indices, fines contents, shear strengths, and unconfined compressive strengths are recorded on the boring logs in Appendix A; other laboratory data is included in Appendix B.

2.7 LIQUEFACTION ANALYSES

As shown in Figure 4, the site is mapped in a Seismic Hazard Zone for liquefaction by the California Geological Survey (2008). Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction is clean, loose, saturated, uniformly graded fine sand below the groundwater table. Empirical evidence indicates that loose silty sand is also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop. If excess hydrostatic pressures exceed the effective confining stress from the overlying soil, the sand may undergo deformation. If the sand undergoes virtually unlimited deformation without developing significant resistance, it is said to have liquefied, and if the sand consolidates or vents to the surface during and following liquefaction, ground settlement and surface deformation may occur. In some cases, settlements of approximately 2 to 3 percent of the thickness of the liquefiable layer have been measured.

In our four borings, we encountered variable strata of loose to dense clayey sand approximately 2 to 5 feet thick at depths of approximately 10 to 30 feet below the ground surface at the locations explored. We observed the most significant layers of loose sand at a depth between approximately 10 to 15 feet.

We based our theoretical liquefaction assessment on the analysis framework published by Seed, et al. in 2003. This framework is an extension of the original simplified method first proposed by Seed and Idriss in 1971. Our assessment evaluated liquefaction potential to the maximum depth explored, with a groundwater depth of 7 feet below existing grade for the northern lot and a groundwater depth of 14 feet below existing grade for the southern lot. We converted penetration resistance to SPT N-values and included corrections to the recorded blow count resistance. We performed corrections for sampler and hammer type, overburden pressure, boring diameter, and fines content. The results indicate clayey sand layers up to approximately 5 feet thick may be potentially liquefiable.

Due to the relatively flat site topography, liquefaction-induced ground settlement is the primary concern. We estimated potential settlement estimates based on the methods first proposed by Tokimatsu and Seed in 1987 and Ishihara and Yoshimine in 1992. Based on this methodology, we estimate a potential ground settlement up to 1¼ inches due to liquefaction; we estimate differential settlement could be as large as ¾ inch over a lateral distance of 50 feet. We recommend that site improvements be designed to allow for this potential ground settlement resulting from an earthquake and continue to perform as intended. Our experience indicates that the containers planned for this site will perform appropriately should the estimated liquefaction-induced settlement occur.

3.0 CONCLUSIONS

From a geotechnical engineering viewpoint, the proposed project may be designed as planned, provided the geotechnical recommendations in this report are properly incorporated into the design plans and specifications.

The primary geotechnical concerns that could affect development on the site are existing fill, compressible soil, and potential liquefaction settlement. We summarize our conclusions below.

3.1 EXISTING FILL

Our borings indicate that the site is underlain by non-engineered fill. The fill is approximately 7 feet thick in the northern portion of the site and approximately 14 feet thick in the southern portion.

Non-engineered fill can undergo excessive settlement, especially under new fill or building loads. Because the observed penetration resistance of the existing fill is relatively high, we do not anticipate excessive settlement in the existing fill, and complete removal and replacement of the fill is not required. However, the existing fill was found to contain significant proportions of clay of varying plasticity, which could result in expansive or contractive behavior in response to changes in moisture content. To mitigate expansive behavior, we recommend removal, moisture conditioning, and replacement of the fill to a minimum depth of 2 feet below planned pad grade. More detailed mitigation recommendations are presented in Section 5.1.

3.2 COMPRESSIBLE SOIL

We encountered compressible soil layers with thicknesses of between 3 and 7 feet at our exploration locations. We anticipate that this soil will settle up to 3 inches as a result of raising grade within the northern lot. We anticipate that primary settlement of this soil will be complete approximately one to three months after fill placement. As such, we anticipate the majority of settlement resulting from raising grade will be completed prior to construction of the proposed structures. We recommend establishing surface points after site grading and measuring the points every other week until site settlement significantly slows before placing surface improvements. Settlement of the building foundations is further discussed in Section 6.0.

3.3 SOIL CORROSION POTENTIAL

As part of this study, we obtained representative soil samples and submitted to a qualified analytical laboratory for determination of pH, redox potential, resistivity, sulfate, and chloride. Additionally, we previously submitted a representative composite sample of soil from the nearby 1548 Maple Street project to a qualified analytical laboratory; results of these tests are included with the understanding that the stockpile soil from the nearby 1548 Maple Street site is proposed for use as imported fill for this project. The results are included in Appendix B and summarized in the table below.

TABLE 3.3-1: Corrosivity Test Results

SAMPLE LOCATION	DEPTH	PH	REDOX POTENTIAL (mV)	RESISTIVITY (OHMS-CM)	CHLORIDE (MG/KG)	SULFATE (MG/KG)
1-B3	3.5’	8.32	360	1,000	36	220
1548 Maple Street (composite)	Near-surface	7.42	107	200	2347.9	833.4

If desired to investigate the impacts of corrosive soil further, we recommend a corrosion consultant be retained to evaluate if specific corrosion recommendations are advised for the project.

3.4 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking and ground lurching.

The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, soil liquefaction, lateral spreading, landslides, tsunamis, flooding or seiches is considered low to negligible at the site.

3.4.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, it is our opinion that ground rupture is unlikely at the subject property.

3.4.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2019 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.4.3 Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion can cause ground cracks to form in weaker soil. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the site as in other locations in the Bay Area region, but based on the site location, the offset would be minor.

3.5 2019 CBC SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions encountered, we characterized the site as Site Class D in accordance with the 2019 CBC. We provide the 2019 CBC seismic design parameters in Table 3.5-1 below, which include design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCER) spectral response acceleration parameters.

TABLE 3.5-1: 2019 CBC Seismic Design Parameters, Latitude: 37.4944 **Longitude:** -122.2201

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.63
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.66

PARAMETER	VALUE
Site Coefficient, F_A	1.00
Site Coefficient, F_V	Null*
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.63
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	Null*
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.08
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	Null*
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.70
Site Coefficient, F_{PGA}	1.10
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.77
Long-period transition-period, T_L	12

*Requires site-specific ground motion hazard analysis per ASCE 7-16 Section 11.4.8

We estimate the fundamental period of the proposed structures to be less than 1.5 T_S. Therefore, the Structural Engineer may consider the exception of Section 11.4.8 of ASCE 7-16 as follows:

> "A ground motion hazard analysis is not required for structures… where, structures on Site Class D sites with S_1 greater than or equal to 0.2, provided the value of the seismic response coefficient C_S is determined by Eq. (12.8-2) of ASCE 7-16 for values of $T \leq 1.5T_S$ and taken as equal to 1.5 times the value computed in accordance with Eq. (12.8-3) of ASCE 7-16 for $1.5T_S < T \leq T_L$."

If the noted exception is not used, a ground motion hazard analysis can be provided upon request in a separate cover.

4.0 CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading and foundation plans and specifications prior to construction to evaluate whether our recommendations have been implemented, and to provide additional or modified recommendations, as needed. This also allows us to check if any changes have occurred in the nature, design, or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.

2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. Earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill materials are satisfactory, and that placement and compaction of the fills has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is important.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

5.0 EARTHWORK RECOMMENDATIONS

As used in this report, relative compaction refers to the in-place dry unit weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the ASTM D1557 laboratory compaction test procedure, latest edition. Compacted soil is not acceptable if it is unstable; it should exhibit only minimal flexing or pumping, as observed by a representative of our firm. The term “moisture condition” refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry.

We define “structural areas” as any area sensitive to settlement of compacted soil. These areas include, but are not limited to building pads, sidewalks, pavement areas, and retaining walls.

5.1 EXISTING FILL MITIGATION

Fill in structural areas should be removed to a minimum depth of 2 feet below final pad grade, moisture conditioned, and replaced, as defined in Section 5.4.

5.2 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. In addition, wet soil conditions may be found below the water table. Wet soil can make proper compaction difficult or impossible.

Wet soil conditions can be mitigated by:

1. Frequent spreading and mixing during warm dry weather,
2. Mixing with drier materials,
3. Mixing with a lime, lime-flyash, or cement product, or
4. Stabilizing with aggregate or geotextile stabilization fabric, or both.

We should evaluate options 3 and 4 prior to implementation.

5.3 ACCEPTABLE FILL

On-site soil material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension. Young Bay Mud or Fat Clay excavated during construction should not be reused as engineered fill due to the high expansion potential.

Fill within 2 feet of finished grade in structural areas should not contain significant concentrations of clay, as evaluated by our field representative.

Imported fill materials should meet the above requirements and have a plasticity index less than 25 and at least 20 percent passing the No. 200 sieve. We should be allowed to sample and test proposed imported fill materials at least 5 days prior to delivery to the site.

5.4 REUSE OF ON-SITE RECYCLED MATERIALS

If desired to reuse asphalt or Portland Cement concrete as engineered fill, we recommend that it be ground up to less than 4 inches in greatest dimension, with no more than 25 percent larger than 2½ inches. Recycled aggregate can be used as structural fill, trench backfill or aggregate subbase. If desired to use as recycled base, we recommend testing for conformance to Caltrans specifications.

5.5 FILL COMPACTION

5.5.1 Grading in Structural Areas

Imported and Existing Fill

Subgrade compaction should be performed prior to fill placement, following cutting operations, and in areas left at grade as follows.

1. Scarify to a depth of at least 8 inches.
2. Moisture condition soil to at least 3 percentage points over the optimum moisture content.
3. Compact the soil to a minimum of 90 percent relative compaction. Compact the upper 6 inches of finish pavement subgrade to at least 95 percent relative compaction prior to aggregate base placement.

After the subgrade has been compacted, place and compact acceptable fill as follows.

1. Spread fill in loose lifts that do not exceed 8 inches.
2. Moisture condition lifts to at least 3 percentage points over the optimum moisture content.
3. Compact fill to a minimum of 90 percent relative compaction; compact the upper 6 inches of fill in pavement areas to at least 95 percent relative compaction prior to aggregate base placement.

The pavement Caltrans Class 2 aggregate base section should be compacted to at least 95 percent relative compaction (ASTM D1557). The aggregate base should be moisture conditioned to or slightly above the optimum moisture content prior to compaction.

5.5.2 Underground Utility Backfill

5.5.2.1 General

The contractor is responsible for conducting trenching and shoring in accordance with CALOSHA requirements. Project consultants involved in utility design should specify pipe-bedding materials.

5.5.2.2 Structural Areas

Imported and Existing Fill

Trench backfill should be placed and compacted as follows.

1. Trench backfill should have a maximum particle size of 6 inches.

2. Moisture condition trench backfill to or slightly above the optimum moisture content. Moisture condition backfill outside the trench.
3. Place fill in loose lifts not exceeding 8 inches.
4. Compact fill to a minimum of 90 percent relative compaction (ASTM D1557).

Jetting of backfill without mechanical compaction is not an acceptable means of compaction. We may allow thicker loose lift thicknesses based on acceptable density test results where increased effort is applied to rocky fill or for the first lift of fill over pipe bedding.

5.6 SITE DRAINAGE

5.6.1 Surface Drainage

The project civil engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finished grades be sloped away from buildings and pavements to the maximum extent practical. The latest California Building Code Section 1804.4 specifies minimum slopes of pervious surfaces be at least 5 percent away from foundations. Where development conditions restrict meeting this slope requirement, we recommend that specific drainage requirements be developed. As a minimum, we recommend the following.

1. Roof and other structure downspouts should discharge into closed conduits and be directed away from foundations to appropriate drainage devices.
2. Water should not be allowed to pond near foundations, pavements, or exterior flatwork.

5.6.2 Subsurface Drainage

Based on our site exploration and current grading concepts for the site, we do not anticipate that subdrainage systems will be recommended. We recommend that we review the site grading plans to further evaluate the need for subdrainage systems as well as observe the earthwork operations during site grading.

6.0 FOUNDATION RECOMMENDATIONS

Typically prefabricated units such as the containers to be used for this project are placed on a leveling course of aggregate base. We recommend placing at least 12 inches of compacted Class 2 aggregate base in areas to receive the containers. Based on discussions with your design team, we understand the three-level structure will exert approximately 370 pounds per square foot. This load will result in approximately 2½ inches of total static settlement, corresponding to a differential settlement of ½ inch across a container footprint; this settlement assumes that settlement from fill placement is complete prior to placing the containers. Less settlement will occur in areas with single container units. Further, containers may experience up to 1¼ inches of settlement due to liquefaction and a corresponding differential settlement of up to ¼ inch across a single container unit. If this amount of settlement is not structurally acceptable by the container units, we recommend placing the units on structural mats designed for the anticipated settlement.

If structural mats are used, they can be designed for dead-plus-live load conditions using an allowable bearing capacity of 1,500 pounds per square foot (psf). This allowable bearing capacity can be increased by one-third for load conditions including wind and seismic.

If the proposed structures cannot be designed to tolerate the above static settlements, we recommend surcharging as a cost-effective mitigation measure. We anticipate that temporarily placing 3 feet of soil above the proposed final grade within the footprint of the three-level structure for a period of three months will reduce settlement to acceptable levels.

If surcharging is implemented, the total amount and rate of settlement should be monitored with settlement plates after surcharge fill is placed, and the actual time required for settlement will depend on the observed settlement rates. The settlement monitoring plates should be installed prior to surcharge placement to monitor consolidation. We can provide the number and location of settlement monitoring plates once the surcharge staging has been developed. To allow for redundancy, no fewer than two settlement-monitoring plates should be installed in any surcharge phase. The settlement-monitoring plates should be surveyed to measure elevations at least weekly for the first two months and then monthly until we identify that the desired degree of surcharge-driven preconsolidation has been achieved. All readings of settlement should be tied to benchmarks established well beyond the zone of surcharge influence.

Support for elevated platforms, stairs and other structures can be designed using spread footings. Footings can be designed with an allowable bearing capacity of 2,000 psf assuming they have a minimum width and embedment of 24 inches. To minimize loading on the Young Bay Mud and post-construction settlement, we recommend footings have a width no greater than 48 inches. Footings could experience up to ¾ inch of static settlement and the previously referenced liquefaction settlement.

The mat foundations should be designed using a subgrade modulus of 20 pounds per cubic inch (pci) in the upper lot and 10 pci in the lower lot.

Lateral loads may be resisted by friction along the base and by passive pressure along the sides of foundations. The passive pressure is based on an equivalent fluid pressure in pounds per cubic foot (pcf). We recommend the following ultimate values for design.

- Passive Lateral Pressure: 350 pcf
- Coefficient of Friction: 0.35

If both values are used, one value should be reduced by half to address strain incompatibility between these two methods of resistance. The above values are unfactored and an appropriate load or resistance factor should be applied based on the design methodology used.

7.0 SLOPE STABILITY

We understand that one concept for the site development comprises constructing a slope along the edge of the development. The slope will be approximately 7 feet high. We performed a limit equilibrium analysis of the slope where it will be constructed adjacent to the wetland above an existing slope. Our analyses indicate that seismic slope movement will be relatively minor during a Design Earthquake-level event. We recommend the fill slope be keyed into competent material at the toe and be constructed no steeper than 2:1 (horizontal:vertical). Based on the depth of the Young Bay Mud encountered during our exploration, we recommend placement of fill along the property boundaries adjacent to the wetland and Maple Street consist of a keyway that is 15 feet wide and 2 feet deep below existing grade prior to placement of fill.

8.0 RETAINING WALLS

8.1 LATERAL SOIL PRESSURES

Retaining walls should be designed to resist lateral earth pressures from adjoining natural materials and/or backfill and from any surcharge loads. Provided that adequate drainage is included as recommended below, walls restrained from movement at the top should be designed to resist an equivalent fluid pressure of 65 pounds per cubic foot (pcf). In addition, restrained walls should be designed to resist an additional uniform pressure equivalent to one-half of any surcharge loads applied at the surface.

Unrestrained retaining walls with adequate drainage should be designed to resist an equivalent fluid pressure of 45 pcf plus one-third of any surcharge loads.

The above lateral earth pressures assume level backfill conditions and sufficient drainage behind the walls to prevent any build-up of hydrostatic pressures from surface water infiltration and/or a rise in the groundwater level. If adequate drainage is not provided, we recommend that an additional equivalent fluid pressure of 40 pcf be added to the values recommended above for both restrained and unrestrained walls. Damp-proofing of the walls should be included in areas where wall moisture would be problematic.

Walls should include a drainage system, as recommended below, to reduce hydrostatic forces behind the retaining wall.

8.2 RETAINING WALL DRAINAGE

Either graded rock drains or geosynthetic drainage composites should be constructed behind the retaining walls to reduce hydrostatic lateral forces. For rock drain construction, we recommend two types of rock drain alternatives.

1. A minimum 12-inch-thick layer of Class 2 Permeable Filter Material (Caltrans Specification 68-2.02F) placed directly behind the wall, or
2. A minimum 12-inch-thick layer of washed, crushed rock with 100 percent passing the ¾-inch sieve and less than 5 percent passing the No. 4 sieve. Envelop rock in a minimum 6-ounce, nonwoven geotextile filter fabric.

For both types of rock drains:

1. The rock drain should be placed directly behind the walls of the structure.
2. The rock drains should extend from the wall base to within 12 inches of the top of the wall.
3. A minimum of 4-inch-diameter perforated pipe (glued joints and end caps) should be placed at the base of the wall, inside the rock drain and fabric, with perforations placed down.
4. The pipe should be placed at a gradient at least 1 percent to direct water away from the wall by gravity to a drainage facility.

We should review and approve geosynthetic composite drainage systems prior to use.

8.3 BACKFILL

Backfill behind retaining walls should be placed and compacted in accordance with Section 5.5.1. Light compaction equipment should be used within 5 feet of the wall face. If heavy compaction equipment is used, the walls should be temporarily braced to avoid excessive wall movement.

8.4 FOUNDATIONS

Retaining walls may be supported on continuous footings designed in accordance with recommendations presented in Section 6.0, except the minimum embedment depth should be increased to 36 inches below lowest adjacent soil grade.

9.0 PAVEMENT DESIGN

9.1 FLEXIBLE PAVEMENTS

Because surface soil varies across the site, an R-value of five is applicable for design. Using estimated traffic indexes for various pavement loading requirements, we developed the following recommended pavement sections using Topic 633 of the Caltrans Highway Design Manual (including the asphalt factor of safety), presented in the table below.

TABLE 9.1-1: Recommended Asphalt Concrete Pavement Sections

TRAFFIC INDEX	SECTION	
	ASPHALT CONCRETE (INCHES)	CLASS 2 AGGREGATE BASE (INCHES)
5	3.5	10
6	3.5	14
7	4	16

The civil engineer should determine the appropriate traffic indexes based on the estimated traffic loads and frequencies.

10.0 UNDERGROUND UTILITES

As discussed above, consolidation settlement is expected within the project site. If the new fill is placed and allowed to settle before utilities are constructed and surcharging is not employed, differential settlement across the site will be up to 1¼ inches over 15 feet. Differential settlement along the perimeter of the mat foundation supporting the containers could be up to 2½ inches. This settlement should be considered in utility design. Based on our experience, flexible utility connections will likely be required to accommodate this level of settlement.

11.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.3 for the San Mateo County Navigation Center project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; no warranty is express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, we must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, or flood potential. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without our written authorization. Such authorization is essential because it requires us to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to our documents. Therefore, we must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If our scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, we cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

We estimated the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

SELECTED REFERENCES

Brabb, E.E., Graymer, R.W., and Jones, D.L, Open-File Report 98-137, Geology of the onshore part of San Mateo County, California: A Digital Database, 1998, United States Geological Survey.

Bryant, W. and Hart, E., 2007, Special Publication 42, "Fault-Rupture Hazard Zones in California", Interim Revision 2007, California Department of Conservation.

California Building Code, 2019.

California Geologic Survey, 2008, Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California.

Division of Mines and Geology, 1997, Special Publication 117, Guidelines for Evaluation and Mitigating Seismic Hazards in California, Adopted March 13.

ENGEO; Preliminary Geotechnical Exploration; Homeless Shelter Transitional Housing, 1402 Maple Street, Redwood City, California; June 3, 2020; Project No. 11780.001.005.

ENGEO; Geotechnical Exploration; Offsite Sanitary Sewer, San Mateo County, Replacement Correctional Facility, Redwood City, California; June 14, 2013; Project No. 9515.000.001.

ENGEO; Geotechnical Recommendations for 1548 Maple Street Off-site Improvements; 1548 Maple Street, Redwood City, California; January 30, 2020; Project No. 9599.001.000.

ENGEO; Geotechnical Exploration; 1548 Maple Street, Redwood City, California; February 8, 2017; Project No. 9599.001.000.

ENGEO; Geotechnical Exploration; San Mateo County Replacement Correctional Facility, Redwood City, California; November 30, 2012; Project No. 9515.000.000.

Field, E.H., and 2014 Working Group on California Earthquake Probabilities, 2015, UCERF3: A new earthquake forecast for California's complex fault system: U.S. Geological Survey 2015–3009, 6 p., https://dx.doi.org/10.3133/fs20153009.

FIGURES

N

0 2000
FEET

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence	VICINITY MAP SMC NAVIGATION CENTER REDWOOD CITY, CALIFORNIA	PROJECT NO.: 11780.003.004 SCALE: AS SHOWN DRAWN BY: CC CHECKED BY: LC	FIGURE NO. 1

ORIGINAL FIGURE PRINTED IN COLOR

FILE PATH: G:\Drafting\PROJECTS_10000 to 12999\11780\117800003004\GEX0621\117800003004_VM_1_0621.dwg SAVE DATE: 6/15/2021 8:39:08 AM SAVED BY: CCulbertson

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

1-B3 BORING (ENGEO, 2021)

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence	SITE PLAN SMC NAVIGATION CENTER REDWOOD CITY, CALIFORNIA	PROJECT NO.: 11780.003.004 SCALE: AS SHOWN DRAWN BY: CC / CHECKED BY: LC	FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR

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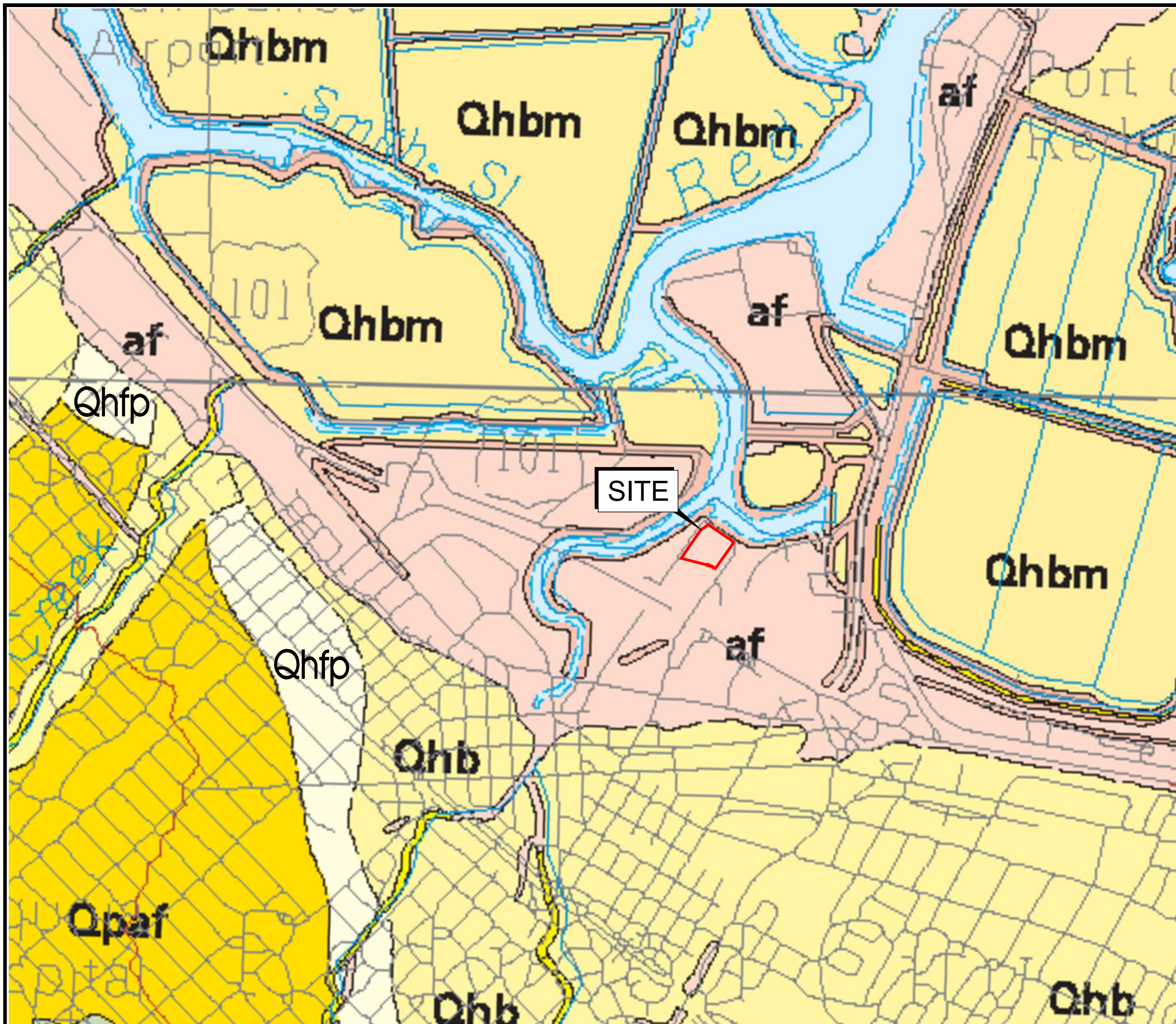

EXPLANATION

——— - - - - DISPOSITIONAL OR INTRUSIVE CONTACT, SMALL DASHED WHERE INFERRED, DOTTED WHERE CONCEALED, QUERIED WHERE LOCATION IS UNCERTAIN

N

0 2000
FEET

af	ARTIFICIAL FILL
Qhbm	BAY MUD
Qhb	BASIN DEPOSITS
Qhfp	FLOODPLAIN DEPOSITS
Qpaf	ALLUVIAL FAN AND FLUVIAL DEPOSITS

BASE MAP SOURCE: OPEN FILE REPORT 98–137

ENGEO
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REGIONAL GEOLOGIC MAP
SMC NAVIGATION CENTER
REDWOOD CITY, CALIFORNIA

PROJECT NO.: 11780.003.004	FIGURE NO. 3
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: LC

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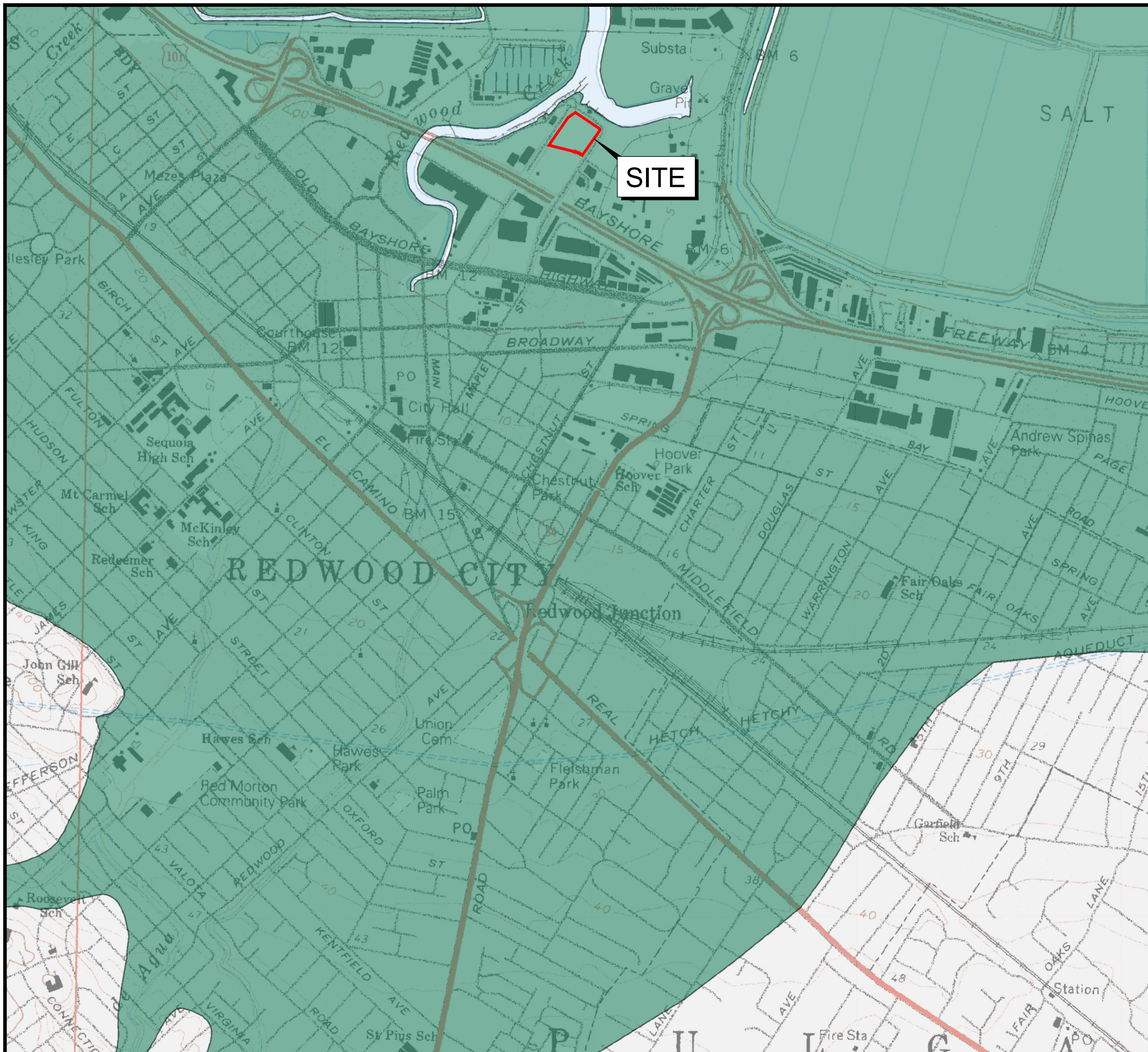
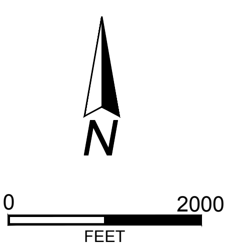
ORIGINAL FIGURE PRINTED IN COLOR





EXPLANATION

LIQUEFACTION

AREAS WHERE HISTORIC OCCURRENCE OF LIQUEFACTION, OR LOCAL GEOLOGICAL, GEOTECHNICAL AND GROUNDWATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(c) WOULD BE REQUIRED

BASE MAP SOURCE: CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY, 2006

ENGEO Expect Excellence	SEISMIC HAZARD ZONES MAP SMC NAVIGATION CENTER REDWOOD CITY, CALIFORNIA	PROJECT NO.: 11780.003.004 SCALE: AS SHOWN DRAWN BY: CC / CHECKED BY: LC	FIGURE NO. 4

ORIGINAL FIGURE PRINTED IN COLOR

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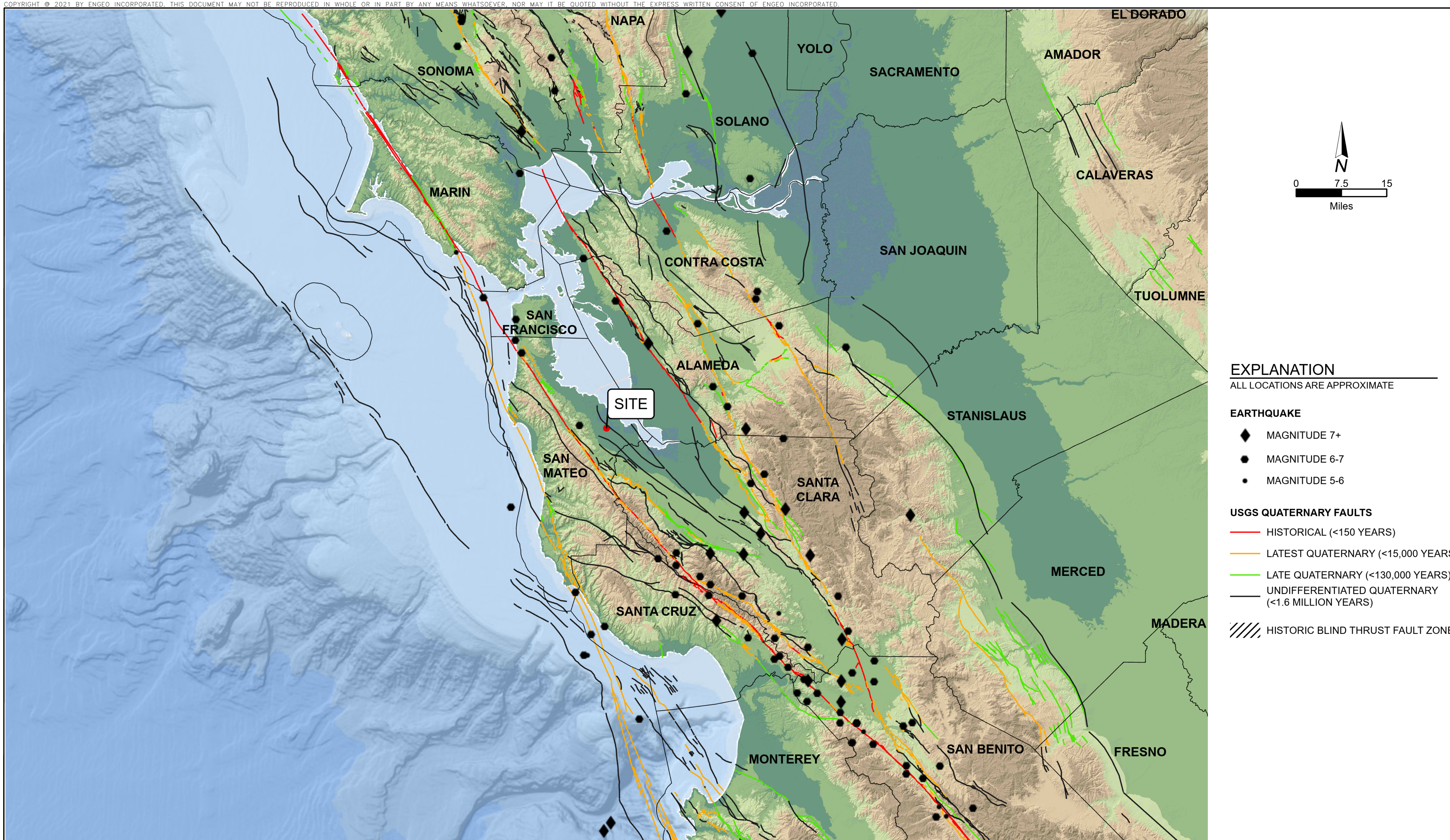

BASE MAP SOURCE
ESRI, GEBCO, DELORME, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2018
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)

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REGIONAL FAULTING AND SEISMICITY
SMC NAVIGATION CENTER
REDWOOD CITY, CALIFORNIA

PROJECT NO.: 11780.003.004	FIGURE NO. 5
SCALE: AS SHOWN	
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LAYOUT: FAULT&SEISMICITY USER: CCULBERTSON

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

BORING LOG KEY
EXPLORATION LOGS

KEY TO BORING LOGS

MAJOR TYPES				DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES		GW - Well graded gravels or gravel-sand mixtures
				GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES		GM - Silty gravels, gravel-sand and silt mixtures
				GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES		SW - Well graded sands, or gravelly sand mixtures
				SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES		SM - Silty sand, sand-silt mixtures
				SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS			ML - Inorganic silt with low to medium plasticity
				CL - Inorganic clay with low to medium plasticity
				OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %			MH - Elastic silt with high plasticity
				CH - Fat clay with high plasticity
				OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS			PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE: 200, 40, 10, 4 — CLEAR SQUARE SIEVE OPENINGS: 3/4 ", 3", 12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- Solid - Layer Break
- Dashed - Gradational or approximate layer break

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 1-B1A

ENGEO
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LATITUDE: 37.494702 LONGITUDE: -122.220238

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 21½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 9 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			CLAYEY GRAVEL (GC), dark gray to brown, loose to medium dense, moist, fine to coarse gravel, few fine- to coarse-grained sand, [FILL]												
						23					6.6	113.9			
	5														
5															
			FAT CLAY (CH), dark gray, moist based on soil cuttings [YOUNG BAY MUD]												
	0		No sample recovery due to large gravel lodged in sampler			4									
10															
			LEAN CLAY (CL), dark gray mottled with brown, very stiff, moist, few fine- to coarse-grained sand, [OLD BAY CLAY]												
						450 psi							2000*	2.75*	PP+TV
	-5														
15															
	-10														
20															

LOG OF BORING 1-B1A

ENGEO
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LATITUDE: 37.494702 LONGITUDE: -122.220238

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 21½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 9 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), dark gray mottled with brown, very stiff, moist, [OLD BAY CLAY]			12							2500*	2.25*	PP+TV
			Bottom of exploration at approximately 21½ feet below ground surface. Groundwater was not observed.												

LOG OF BORING 1-B1B

ENGEO
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LATITUDE: 37.494717   LONGITUDE: -122.220261

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 12½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 9 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			POORLY GRADED SAND WITH CLAY (SP-SC), brownish gray to dark gray, loose, moist, fine- to medium-grained sand, trace silt, [FILL]												
	5														
5						14				12	26.2				
			CLAYEY SAND (SC), dark gray, loose, wet, fine- to medium-grained sand, [BAY DEPOSITS]												
			No recovery												
	0														
10															
			FAT CLAY (CH), dark gray, stiff, moist, [YOUNG BAY MUD]								34.9	90.6	1300*	1.5*	PP+TV
			Bottom of exploration at approximately 12½ feet below ground surface. Groundwater was not observed.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV 11780003004_GINT.GPJ ENGEO INC.GDT 7/1/21

LOG OF BORING 1-B2

LATITUDE: 37.494536 LONGITUDE: -122.21959

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 26½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 8 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	DESCRIPTION	Blow Count/Foot	Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
		SANDY LEAN CLAY (CL), dark brownish gray, hard, moist to wet, fine- to coarse-grained sand, trace fine gravel, glass fragment [FILL]										
	5		24					14.8	116.9		4.5+*	PP
5												
			5					81		300*	0.5*	PP+TV
		FAT CLAY (CH), dark gray, soft, moist, high plasticity, slight sulfur odor, [YOUNG BAY MUD]										
	0											
10			200 psi					86.9	49.8	400*	0.5*	PP+TV
	-5											
		LEAN CLAY (CL), dark gray mottled with brown, very stiff, moist, [OLD BAY CLAY]										
15			19							3000*	3.5*	PP+TV
	-10											
20												

LOG OF BORING 1-B2

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LATITUDE: 37.494536 LONGITUDE: -122.21959

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 26½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 8 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), dark gray mottled with brown, very stiff, moist, [OLD BAY CLAY]			16								4.5+*	PP+TV
	-15		LEAN CLAY (CL), light yellowish brown, very stiff, moist, trace fine- to coarse-grained sand, trace fine gravel, [ALLUVIUM]												
25						15							2500*	2.75*	PP+TV
			Bottom of exploration at approximately 26½ feet below ground surface (bgs). Perched water was observed at approximately 3 feet bgs.												

ENGEO
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LOG OF BORING 1-B3

LATITUDE: 37.494214 LONGITUDE: -122.22015

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 41½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 14 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			GRAVELLY LEAN CLAY (CL), brown to grayish brown, hard, moist, fine to coarse gravel, few fine- to coarse-grained sand, [FILL]												
						14					15.7			4.5+*	PP
	10														
5															
			Becomes stiff			12							1182		UU
	5														
10			SILTY SAND (SM), grayish green, medium dense, moist, fine- to medium-grained sand, trace fine to coarse gravel, [BAY DEPOSITS]												
						31									
	0		CLAYEY GRAVEL (GC), dark gray to greenish black, medium dense, wet, fine to coarse gravel, little fine- to coarse-grained sand												
15															
						12									
	-5		LEAN CLAY (CL), brown mottled with gray, very stiff, moist, trace fine-grained sand												
20															

LOG OF BORING 1-B3

LATITUDE: 37.494214 LONGITUDE: -122.22015

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 41½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 14 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), brown mottled with gray, very stiff, moist, trace fine-grained sand			17								3.75*	PP
	-10														
25			Grades to lean clay with sand, becomes stiff, fine- to coarse-grained sand, trace fine gravel			11							1750*	2.0*	PP+TV
	-15		CLAYEY SAND WITH GRAVEL (SC), dark gray, loose, wet, fine to coarse gravel, fine- to coarse-grained sand, trace clay												
30						15				20	15.4			2.0*	PP
			LEAN CLAY (CL), brown mottled with gray, very stiff, moist to wet, trace fine-grained sand												
	-20														
35			Grades to lean clay with sand, becomes medium stiff, wet, fine- to medium-grained sand			9							800*	1.0*	PP+TV
	-25														
40															

LOG OF BORING 1-B3

LATITUDE: 37.494214 LONGITUDE: -122.22015

Geotechnical Exploration
SMC Navigation Center
Redwood City, California
11780.003.004

DATE DRILLED: 5/24/2021
HOLE DEPTH: Approx. 41½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 14 ft.

LOGGED / REVIEWED BY: W. Iwanaga / JAF
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), brown mottled with gray, very stiff, moist to wet, trace fine-grained sand Grades to sandy lean clay			8	26	15	11	60	15.6		800*	1.0*	PP+TV
			Bottom of exploration at approximately 41½ feet below ground surface. Groundwater was not observed.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV 11780003004_GINT.GPJ ENGEO INC.GDT 7/1/21

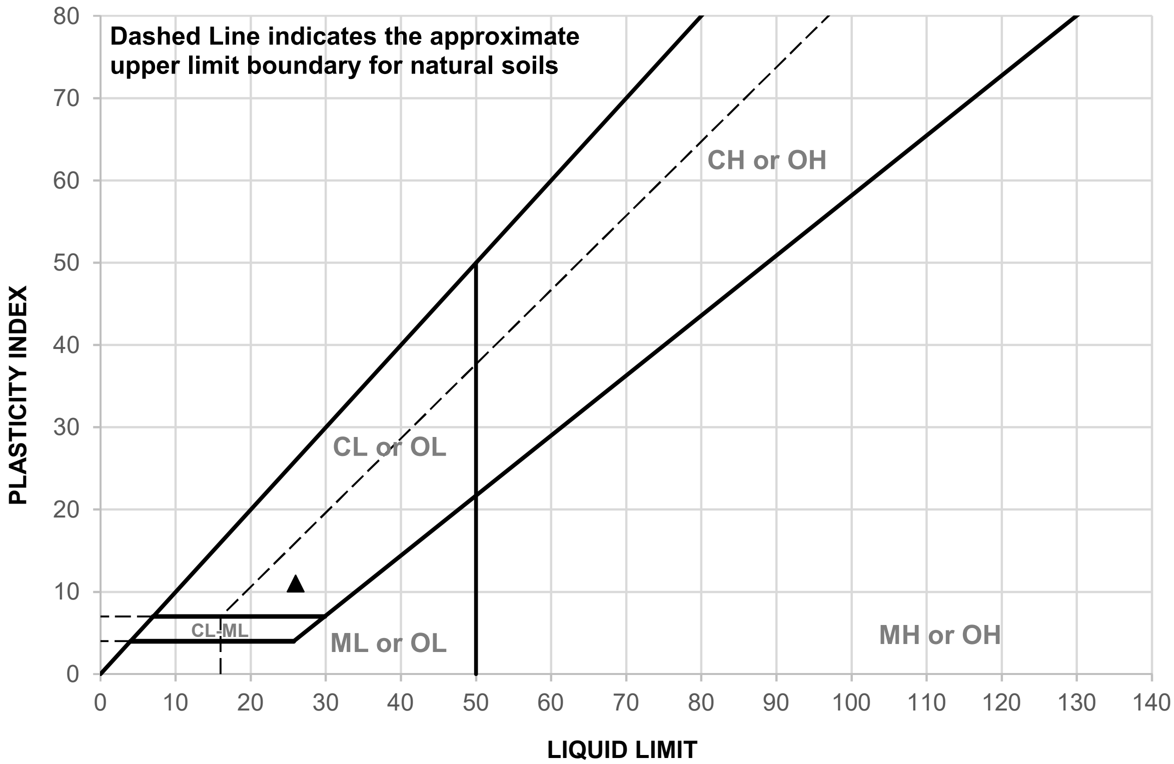
APPENDIX B

LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Unconsolidated Undrained Triaxial Test
Particle Size Distribution Report
Constant Rate of Strain Consolidation Test
CERCO Analytical Corrosion Test

LIQUID AND PLASTIC LIMITS TEST REPORT

ASTM D4318



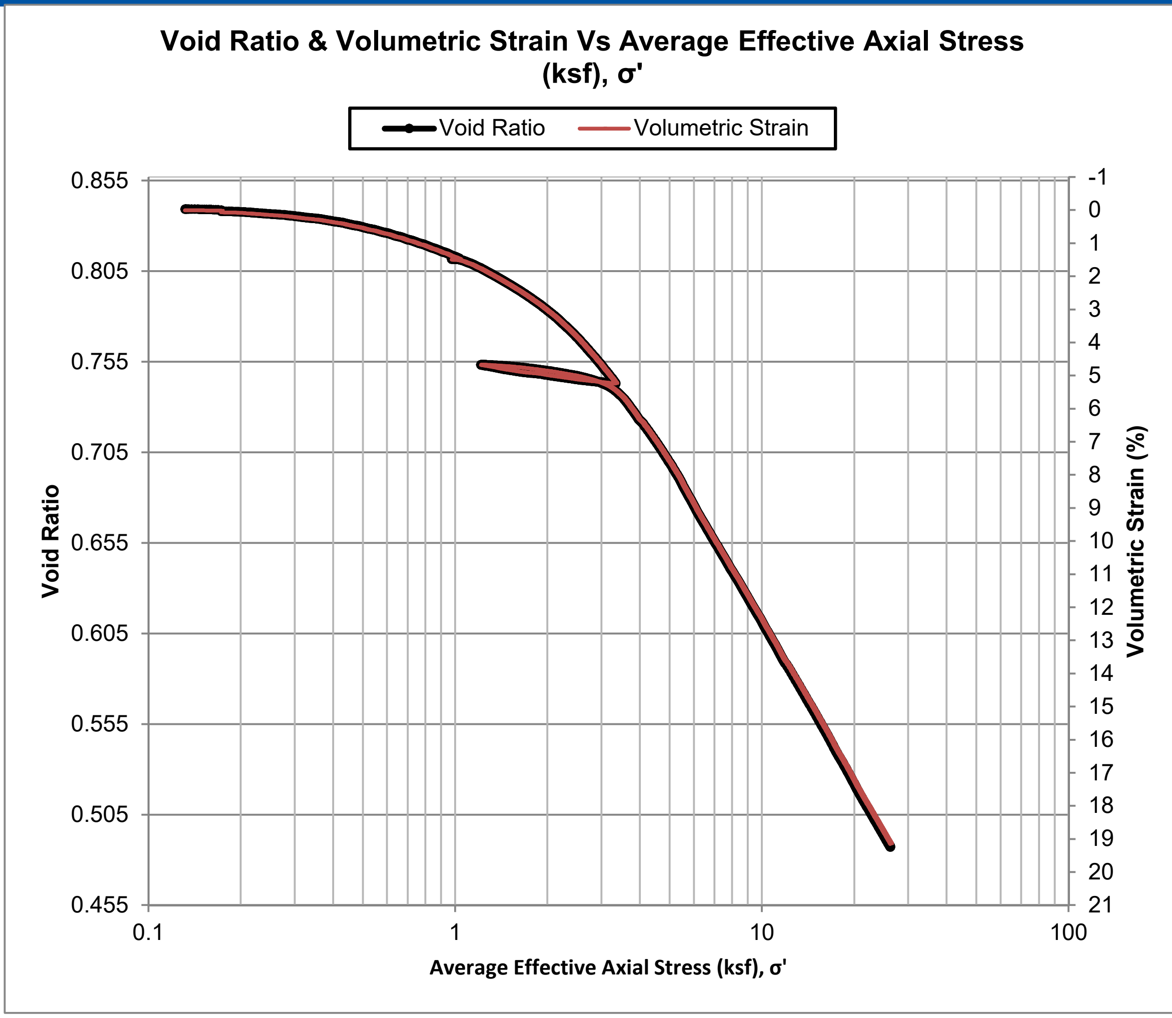
	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B3@40.5	40.5 feet	See exploration logs	26	15	11

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B3@40.5	PI: ASTM D4318, Wet Method	

ENGEO
Expect Excellence

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004 PHGEX
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/2/2021
TESTED BY: G. Criste
REVIEWED BY: K. Lecce

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B1B @ 10	**DEPTH:**	12.25-12.5 ft
SOIL DESCRIPTION:	See exploration logs		

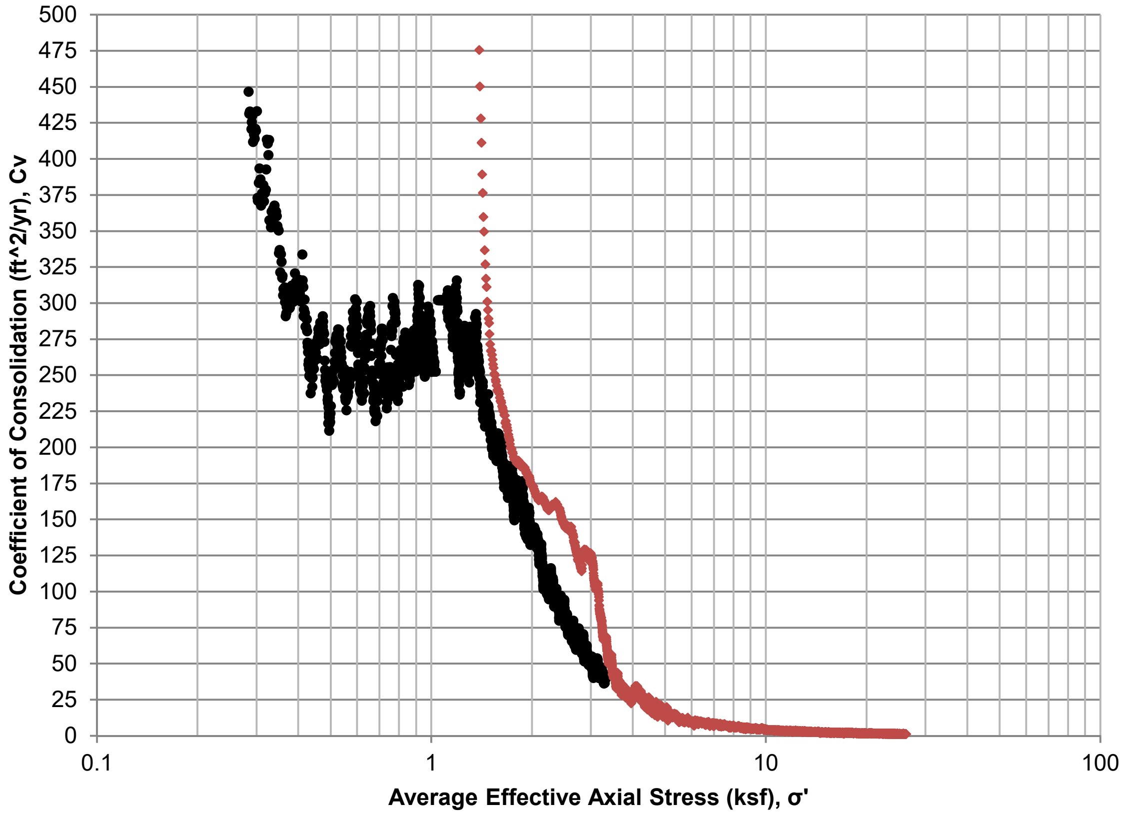
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	34.9	23.4	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	90.6	112.1	**PLASTIC LIMIT:**	
SATURATION (%):	100.0	100.0	**ASTM D854 - Measured**	
VOID RATIO:	0.839	0.487	**SPECIFIC GRAVITY**	2.675
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/14/2021
TESTED BY: D. Seibold
REVIEWED BY: W. Iwanaga

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B1B @ 10 **DEPTH:** 12.25-12.5 ft

SOIL DESCRIPTION: See exploration logs

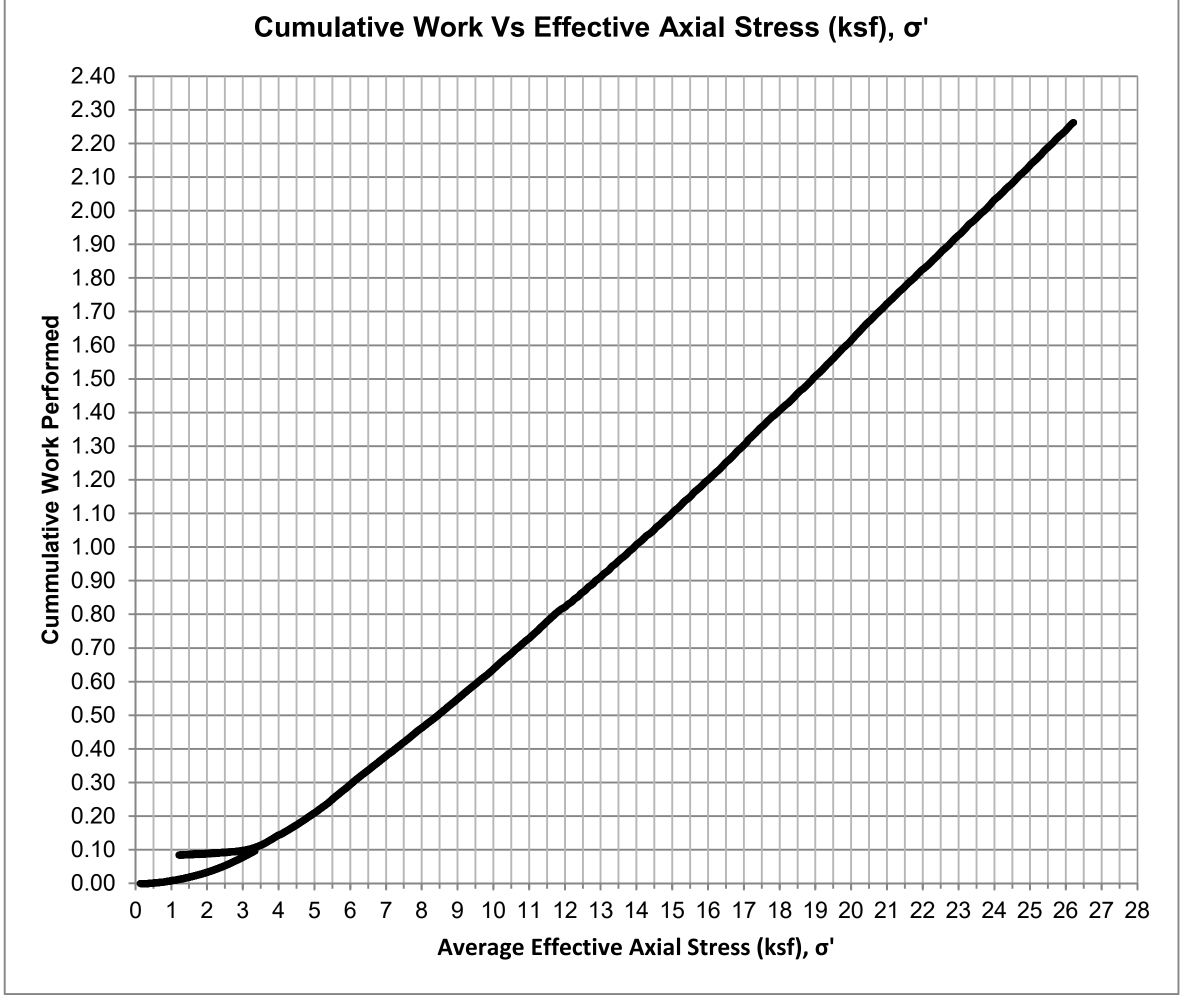
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	34.9	23.4	LIQUID LIMIT:	
DRY DENSITY (pcf):	90.6	112.1	PLASTIC LIMIT:	
SATURATION (%):	100.0	100.0	ASTM D854 - Measured	
VOID RATIO:	0.839	0.487	SPECIFIC GRAVITY	2.675
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/14/2021
TESTED BY: D. Seibold
REVIEWED BY: W. Iwanaga

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B1B @ 10 **DEPTH:** 12.25-12.5 ft

SOIL DESCRIPTION: See exploration logs

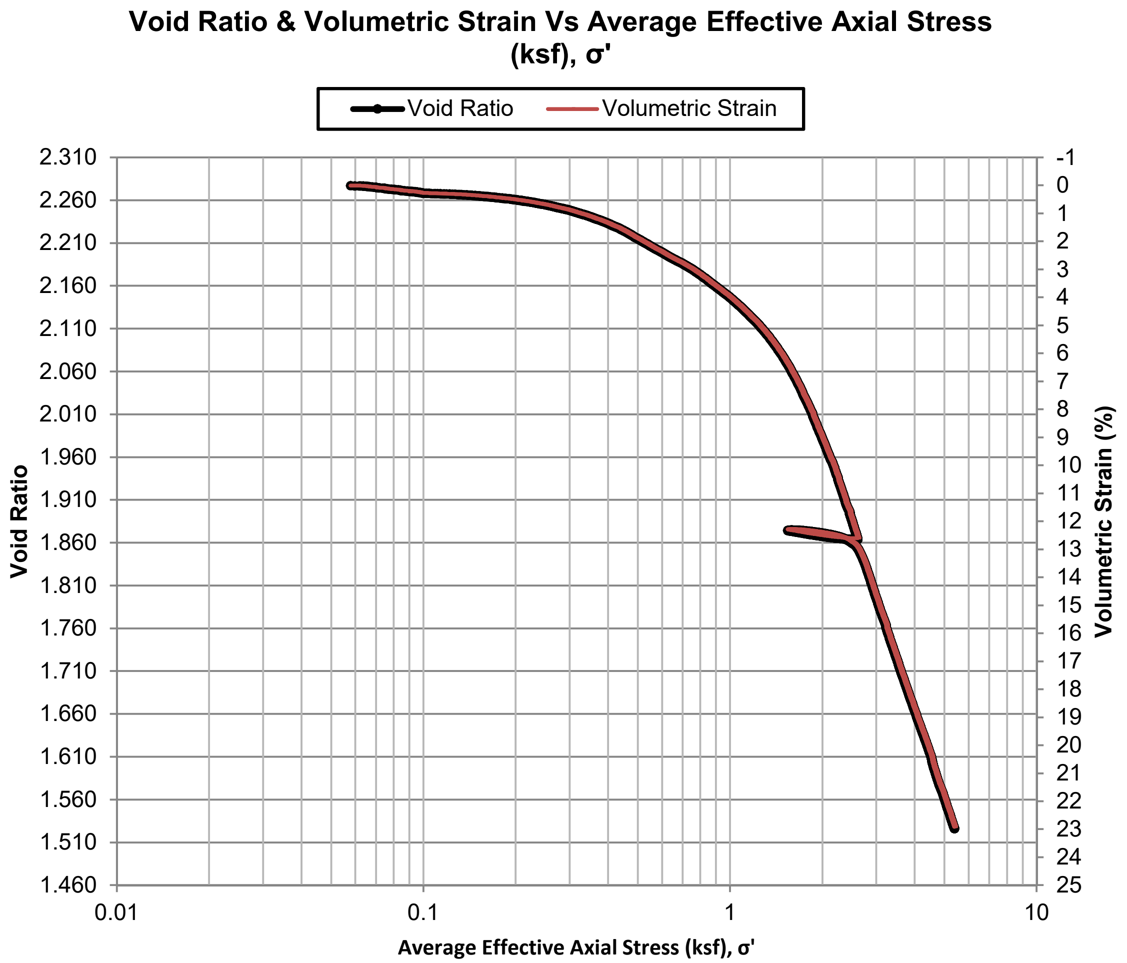
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	34.9	23.4	LIQUID LIMIT:	
DRY DENSITY (pcf):	90.6	112.1	PLASTIC LIMIT:	
SATURATION (%):	100.0	100.0	ASTM D854 - Measured	
VOID RATIO:	0.839	0.487	SPECIFIC GRAVITY	2.675
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/14/2021
TESTED BY: D. Seibold
REVIEWED BY: W. Iwanaga

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B2 @ 9 **DEPTH:** 11.25-11.5 ft

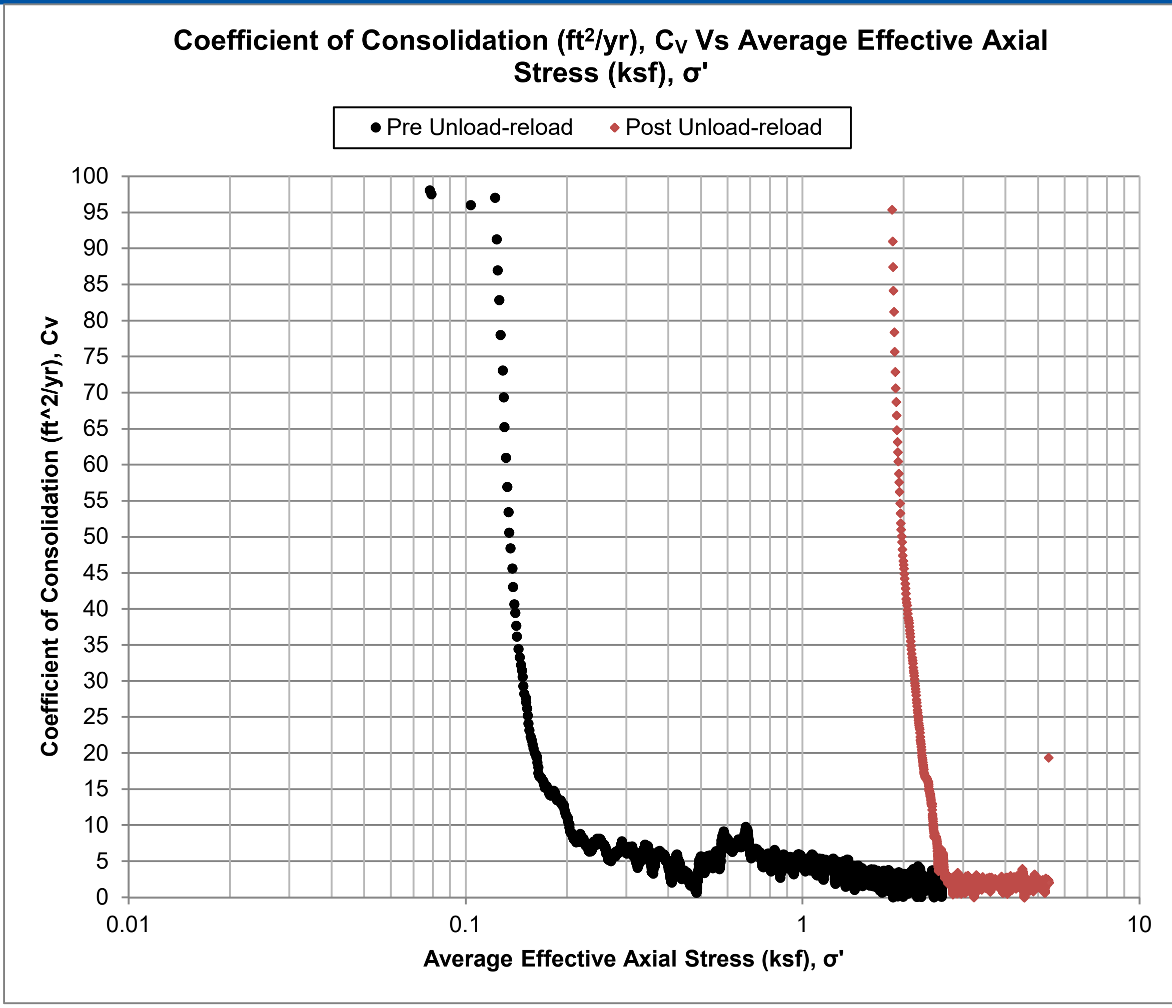
SOIL DESCRIPTION: See exploration logs

TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	86.9	60.8	LIQUID LIMIT:	
DRY DENSITY (pcf):	49.8	64.7	PLASTIC LIMIT:	
SATURATION (%):	100.0	100.0	ASTM D854 - Measured	
VOID RATIO:	2.277	1.526	SPECIFIC GRAVITY	2.621
STRAIN RATE (in/min):	0.00006			

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/10/2021
TESTED BY: W. Miller/D. Seibold
REVIEWED BY: W. Iwanaga

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B2 @ 9 **DEPTH:** 11.25-11.5 ft

SOIL DESCRIPTION: See exploration logs

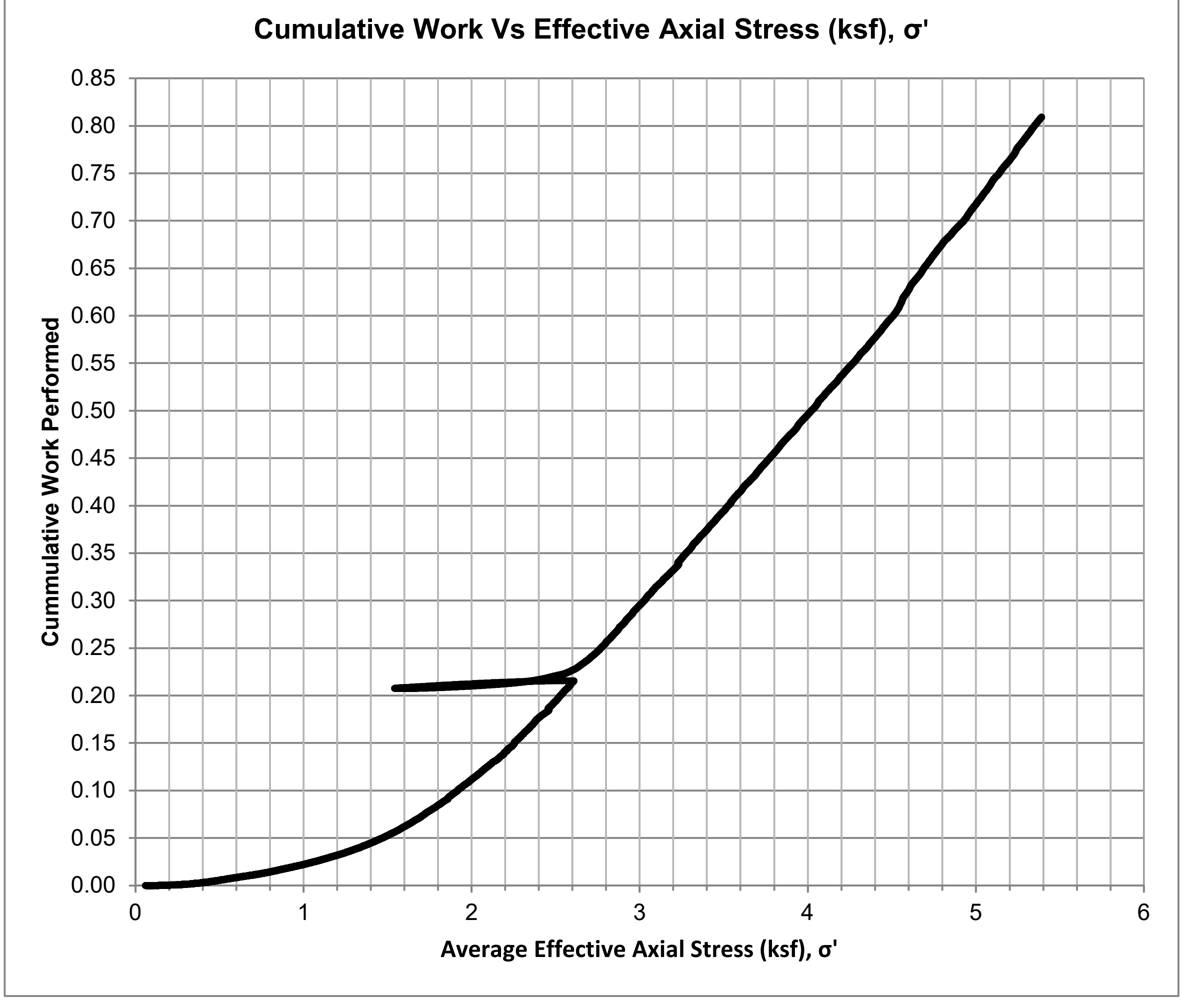
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	86.9	60.8	LIQUID LIMIT:	
DRY DENSITY (pcf):	49.8	64.7	PLASTIC LIMIT:	
SATURATION (%):	100.0	100.0	ASTM D854 - Measured	
VOID RATIO:	2.277	1.526	SPECIFIC GRAVITY	2.621
STRAIN RATE (in/min):	0.00006			

ENGEO
Expect Excellence

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/10/2021
TESTED BY: W. Miller/D. Seibold
REVIEWED BY: W. Iwanaga

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B2 @ 9 **DEPTH:** 11.25-11.5 ft

SOIL DESCRIPTION: See exploration logs

TEST DATA

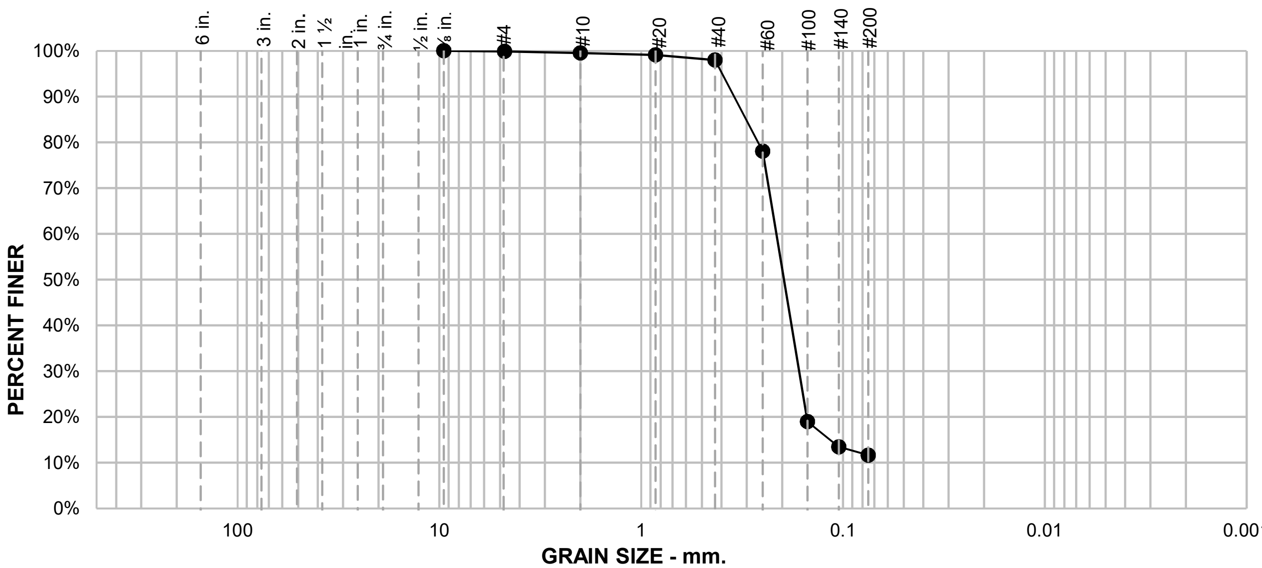
	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	86.9	60.8	LIQUID LIMIT:	
DRY DENSITY (pcf):	49.8	64.7	PLASTIC LIMIT:	
SATURATION (%):	100.0	100.0	ASTM D854 - Measured	
VOID RATIO:	2.277	1.526	SPECIFIC GRAVITY	2.621
STRAIN RATE (in/min):	0.00006			

ENGEO Expect Excellence

CLIENT: County of San Mateo
PROJECT NAME: 1450 Maple Street Navigation Center
PROJECT NO: 11780.003.004
PROJECT LOCATION: Redwood City, California
REPORT DATE: 6/10/2021
TESTED BY: W. Miller/D. Seibold
REVIEWED BY: W. Iwanaga

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B1B@5.5

DEPTH (ft): 5.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		0.1	0.4	1.5	86.3	11.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
⅜ in.	100.0		
#4	99.9		
#10	99.5		
#20	99.1		
#40	98.0		
#60	78.1		
#100	19.0		
#140	13.5		
#200	11.7		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.3458 mm D_{85} = 0.3017 mm D_{60} = 0.2138 mm

D_{50} = 0.1961 mm D_{30} = 0.1650 mm D_{15} = 0.1157 mm

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

ENGEO
Expect Excellence

CLIENT: County of San Mateo

PROJECT NAME: 1450 Maple Street Navigation Center

PROJECT NO: 11780.003.004 PHGEX

PROJECT LOCATION: Redwood City, California

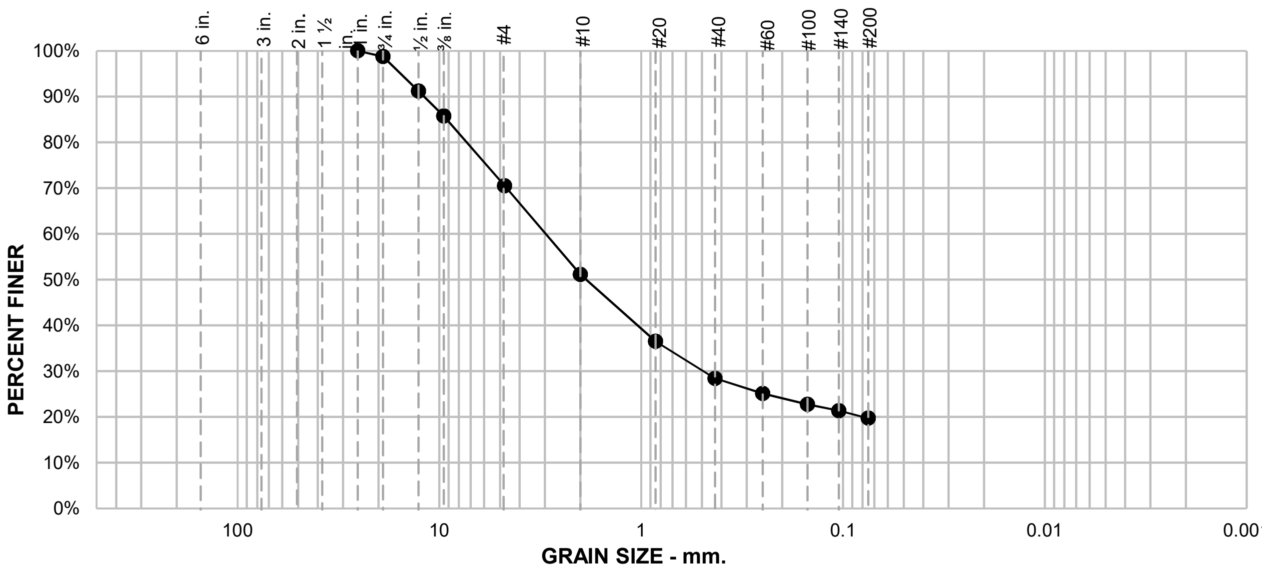
REPORT DATE: 6/1/2021

TESTED BY: C. Bruns

REVIEWED BY: G. Criste

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B3@30.5

DEPTH (ft): 30.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
	1.2	28.3	19.4	22.7	8.7	19.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
¾ in.	98.8		
½ in.	91.2		
⅜ in.	85.7		
#4	70.5		
#10	51.1		
#20	36.5		
#40	28.4		
#60	25.1		
#100	22.7		
#140	21.3		
#200	19.7		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 11.9274 mm	D_{85} = 9.2246 mm	D_{60} = 2.9742 mm
D_{50} = 1.8751 mm	D_{30} = 0.4920 mm	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

CLIENT: County of San Mateo

PROJECT NAME: 1450 Maple Street Navigation Center

PROJECT NO: 11780.003.004 PHGEX

PROJECT LOCATION: Redwood City, California

REPORT DATE: 6/1/2021

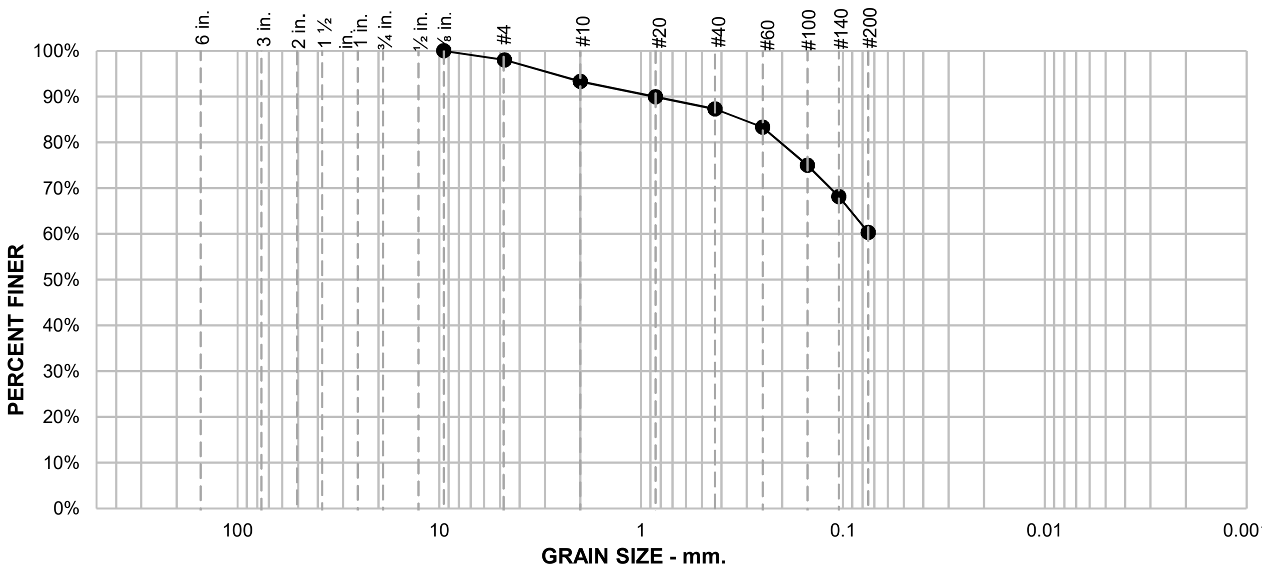
TESTED BY: C. Bruns

REVIEWED BY: G. Criste

ENGEO Expect Excellence

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B3@40.5

DEPTH (ft): 40.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		2.0	4.7	6.0	27.0	60.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
⅜ in.	100.0		
#4	98.0		
#10	93.3		
#20	90.0		
#40	87.3		
#60	83.3		
#100	75.0		
#140	68.1		
#200	60.3		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 15   LL = 26   PI = 11

COEFFICIENTS

D_{90} = 0.8500 mm D_{85} = 0.3148 mm D_{60} =

D_{50} = D_{30} = D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS = CL

REMARKS

PI: ASTM D4318, Wet Method

USCS: ASTM D2487

ENGEO

Expect Excellence

CLIENT: County of San Mateo

PROJECT NAME: 1450 Maple Street Navigation Center

PROJECT NO: 11780.003.004 PHGEX

PROJECT LOCATION: Redwood City, California

REPORT DATE: 6/1/2021

TESTED BY: C. Bruns

REVIEWED BY: G. Criste

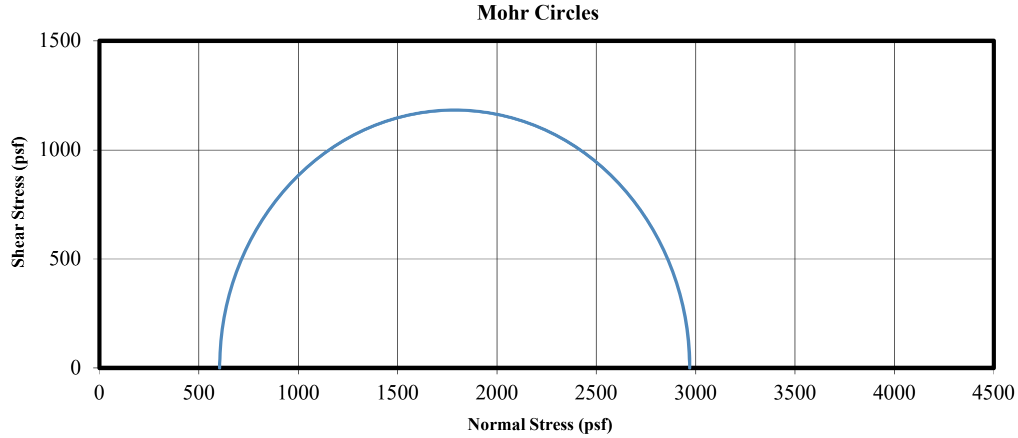
Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

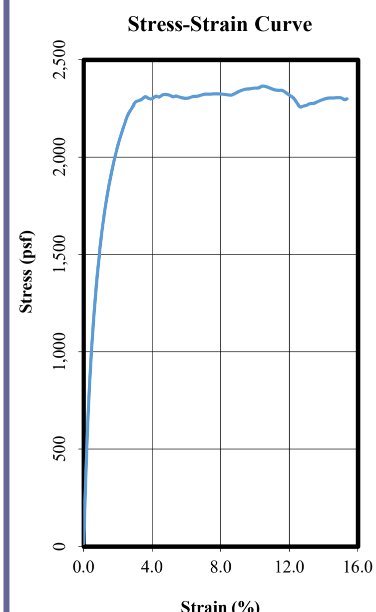
Date: 06/07/21

Checked By: K. Lecce

Date: 6/4/2021

Tested By: G. Criste





	Specimen			
Before Test	**1-B3@5.5**			
Water Content (%)	20.13			
Dry Density (pcf)	97.40			
Saturation (%)	73.67			
Void Ratio	0.74			
Diameter (in)	2.418			
Height (in)	4.997			
Height-to-Diameter Ratio	2.067			
ASTM D4318 - Wet Method				
Liquid Limit	n/a			
Plastic Limit	n/a			
ASTM D854 - Assumed				
Specific Gravity	2.720			
After Test	**1-B3@5.5**			
Water Content (%)	20.13			
Saturation (%)	73.67			
Strain Rate (%/min)	0.05			
Peak Deviator Stress (psf)	2364.9			
Axial Strain @ Failure (%)	10.406			
	Cell Pressure			
Cell (psf)	604.8			
Back (psf)	n/a			
	Principle Stresses at Failure			
σ1 (psf)	2969.7			
σ3 (psf)	604.8			
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			**Cohesion at Failure with a Zero Friction Angle (Ø=0)**			
Cohesion, c (psf)	n/a		1182.4			
Friction Angle Ø	n/a		n/a			

Project Information	
Project Name:	1450 Maple Street Navigation Center
Project Number:	11780.003.004 PHGEX
Project Location:	Redwood City, California
Client:	County of San Mateo
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

Date: 06/07/21

Checked By: K. Lecce

Date: 6/4/2021

Tested By: G. Criste

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B3@5.5

Project Information	
Project Name:	1450 Maple Street Navigation Center
Project Number:	11780.003.004 PHGEX
Project Location:	Redwood City, California
Client:	County of San Mateo
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: ENGEO, Incorporated
Client's Project No.: 11780.003.004
Client's Project Name: 1450 Maple St. Redwood City, CA 94063
Date Sampled: 24-May-21
Date Received: 21-Jul-21
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 26-Jul-2021

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
21207023-001	1-B3 @ 3.5'	360	8.32	-	1,000	-	36	220

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	26-Jul-2021	26-Jul-2021	-	23-Jul-2021	-	25-Jul-2021	25-Jul-2021

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**

Chain of Custody

Concord, CA 94520-1006
925 462 2771
Fax: 925 462 2775
CERCO analytical

Job No.	CU#	Client Project I.D.
2107023	1069	11780.003.004

Schedule		Date Sampled	Date Due
Analyte		5/24/21	

Full Name Wyatt Iwanaga, ENGEO

Phone 408-472-8115 x

Fax

Company and/or Mailing Address 2010 Crow Canyon Pl., San Ramon CA 94583

Cell ☒

Sample Source 1450 Maple St., Redwood City, CA 94063

Lab No.	Sample I.D.	Date	Time	Matrix	Contain.	Size	Preserv.	Qty.	Redox Potential	pH	Sulfate	Chloride	Resistivity-100% Saturated			Brief Evaluation						
-001	1-B3 @ 3.5'	5/24/21		S					x	x	x	x	x									

ANALYSIS — ASTM

MATRIX
- DW - Drinking Water
- GW - Ground Water
- SW - Surface Water
- WW - Waste Water
- Water
- SL - Sludge
- S - Soil
- Product

ABBREVIATIONS
- HB - Hosebib
- PV - Petcock Valve
- PT - Pressure Tank
- PH - Pump House
- RR - Restroom
- GL - Glass
- PL - Plastic
- ST - Sterile

SAMPLE RECEIPT

Total No. of Containers	1
Rec'd Good Cond/Cold	
Conforms to Record	
Temp. a t Lab -°C	
Sampler	

		Date	Time
Relinquished By:	Wyatt Iwanaga (signature)	7/20/21	
Received By:	Shew Moore (signature)	7/21/21	1030
Relinquished By:			
Received By:			
Relinquished By:			
Received By:			

Comments:

HERE IS AN ADDITIONAL CHARGE FOR EXTRUDING SOIL FROM METAL TUBES

Email Address: wiwanaga@engeo.com