County Review Draft

ROCKRIDGE GEOTECHNICAL

Prepared for **MP Moss Beach Associates, L.P.**

GEOTECHNICAL INVESTIGATION
PROPOSED AFFORDABLE HOUSING DEVELOPMENT
16TH AND CARLOS STREET
MOSS BEACH, CALIFORNIA

July 10, 2018
Project No. 17-1285

ROCKRIDGE
GEOTECHNICAL

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MP Moss Beach Associates, L.P.
c/o MidPen Housing Corporation
303 Vintage Park Drive, Suite 250
Foster City, California 94404

Attention: Mr. Andrew Bielak

Subject: Geotechnical Investigation Report
Proposed Affordable Housing Development
16th and Carlos Streets
Moss Beach, California

Dear Mr. Bielak,

We are pleased to present our geotechnical investigation report for the proposed Carlos Street affordable housing development in Moss Beach, California. Our geotechnical investigation was performed in accordance with our General Consultant Services Agreement with MP Moss Beach Associates L.P., dated March 21, 2017.

The project site is located on the eastern side of Carlos Street between Sierra Street to the south and 16th Street to the north. The subject property encompasses an area of approximately 10.4 acres of vacant land and is bordered by a combination of single-family homes and vacant land to the north and east, single-family homes to the south, and Carlos Street to the west. The site slopes up gently to moderately to the east/northeast with the exception of a north-facing slope along the northern side of the site, which slopes moderately down to the north, and some localized flat areas near the center and eastern portions of the site. There are numerous concrete slabs along with low concrete retaining walls that are remnants from previous military buildings that were part of a World War II training facility that occupied the site around 1945. Heavy vegetation, including numerous mature trees and shrubs, occupies much of the site outside the limits of the concrete slabs.

Plans are to construct two story-buildings containing 71 residential units and one community building. Proposed improvements on the remainder of the site will include surface parking, drive aisles, landscaping, and storm water retention areas.

On the basis of our investigation, we conclude the site can be developed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical concern at the site is the presence of undocumented fill and unknown buried foundations and utility lines from the previous site development, as well as the likely presence of large tree roots beneath some of the proposed improvements. We conclude the proposed buildings may be supported on conventional spread footings.

The recommendations contained in our report are based on a limited subsurface exploration. Consequently, variations between expected and actual subsurface conditions may be found in localized areas during construction. Therefore, we should be engaged to observe site preparation and grading and footing subgrade preparation, during which time we may make changes in our recommendations, if deemed necessary.

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely yours,
ROCKRIDGE GEOTECHNICAL, INC.

Linda H. J. Liang, P.E., G.E.
Associate Engineer

Craig S. Shields, P.E., G.E.
Principal Geotechnical Engineer

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GEOTECHNICAL INVESTIGATION
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16TH AND CARLOS STREETS
Moss Beach, California

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Rockridge Geotechnical, Inc. for the proposed Carlos Street affordable housing development in Moss Beach, California. The project site is located on the eastern side of Carlos Street between Sierra Street to the south and 16th Street to the north, as shown on the Site Location Map, Figure 1.

The subject property encompasses an area of approximately 10.4 acres of vacant land, as shown on the Site Plan and Existing Geology, Figure 2A. It is bordered by a combination of single-family homes and vacant land to the north and east, single-family homes to the south, and Carlos Street to the west. The site slopes up gently to moderately to the east/northeast with the exception of a north-facing slope along the northern side of the site, which slopes moderately down to the north, and some localized flat areas near the center and eastern portions of the site. There are numerous concrete slabs along with low concrete retaining walls that are remnants from previous military buildings that were part of a World War II training facility that occupied the site around 1945. Heavy vegetation, including numerous mature trees and shrubs, occupies much of the site outside the limits of the concrete slabs.

Easements for the Montara Water and Sanitary District (MWSD) and Pacific Gas & Electric (PG&E) utilities extend along the unpaved roadways within the property. MWSD infrastructure on the site consists includes water storage tanks in the southeastern portion of the site, a booster pump system, and distribution facilities with a fenced-in parcel of land adjacent to and west of the intersection of Lincoln Street and Buena Vista Street near the eastern boundary of the property.

Plans are to construct two story-buildings containing 71 residential units and one community building as shown on the attached Site Plan - Proposed Building Layout, Figure 2B. Proposed improvements on the remainder of the site will include surface parking, drive aisles, landscaping, and storm water retention areas.

Structural design loads were not available at the time this report was prepared. Based on our experience with similar buildings we estimate exterior and interior column loads will be approximately 130 and 260 kips, respectively.

2.0 SCOPE OF SERVICES

Our investigation was performed in accordance with our General Consultant Services Agreement with MP Moss Beach Associates L.P., dated March 21, 2017. Our scope of services consisted of exploring subsurface conditions at the site by drilling nine test borings, performing a geologic site reconnaissance, performing laboratory testing on selected soil samples, and performing engineering analyses to develop conclusions and recommendations regarding:

- subsurface conditions
- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced ground failure
- geological hazard evaluation, including slope stability
- the most appropriate foundation type(s) for the proposed building and carports
- design criteria for the recommended foundation type(s), including vertical and lateral capacities
- estimates of foundation settlement
- subgrade preparation for slab-on-grade floors and concrete flatwork
- site grading and excavation, including criteria for the fill quality and compaction
- pavement section for asphalt concrete and Portland cement concrete
- 2016 California Building Code (CBC) site class and design spectral response acceleration parameters
- construction considerations.

3.0 GEOLOGIC RECONNAISSANCE AND FIELD INVESTIGATION

Our geologist performed a geologic reconnaissance of the site on June 12, 2108 to visually identify any geologic hazards, including landslide hazards. Our field investigation consisted of drilling nine test borings and performing laboratory testing on selected soil samples. Details of the field investigation and laboratory testing are described below.

3.1 Test Borings

We planned to drill 10 borings; however, one of the proposed boring locations (Boring B-1) could not be accessed with the track-mounted drill rig. Prior to mobilizing to the site, we prepared a Drilling Notification Form (attached in Appendix A) in accordance with our Annual Geotechnical Drilling Permit with the San Mateo County Environmental Health Services Division (SMCEHSD), contacted Underground Service Alert (USA) to notify them of our work, as required by law, and retained a private utility locator, Precision Locating LLC, to check that the borehole locations were clear of existing utilities.

The test borings, designated B-2 through B-10, were drilled on May 11 and 12, 2017 at the approximate locations shown on the Figures 2A and 2B. The borings were drilled by Britton Exploration of Los Gatos, California to depths ranging from 11.5 to 25 feet below the existing ground surface (bgs) using a track-mounted CME-55 drill rig equipped with eight-inch-outside-diameter hollow-stem flight augers. During drilling, our field engineer logged the soil encountered and obtained representative samples for visual classification and laboratory testing. The logs of the borings are presented on Figures A-1 through A-9 in Appendix A. The soil encountered in the borings was classified in accordance with the classification chart shown on Figure A-10.

Soil samples were obtained using the following samplers:

- Sprague and Henwood (S&H) split-barrel sampler with a 3.0-inch outside diameter and 2.5-inch inside diameter, lined with 2.43-inch inside diameter brass/stainless steel tubes.
- Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside and 1.5-inch inside diameter, without liners.

The S&H and SPT samplers were driven with a 140-pound automatic hammer falling 30 inches per drop. The samplers were driven up to 18 inches and the hammer blows required to drive the samplers were recorded every six inches and are presented on the boring logs. A "blow count" is defined as the number of hammer blows per six inches of penetration or 50 blows for six inches or less of penetration. The blow counts used for this conversion were: (1) the last two blow counts if the sampler was driven more than 12 inches, (2) the last one blow count if the sampler was driven more than six inches but less than 12 inches, and (3) the only blow count if the sampler was driven six inches or less. The blow counts required to drive the S&H and SPT samplers were converted to approximate SPT N-values using factors of 0.84 and 1.44, respectively, to account for sampler type and approximate hammer energy. The converted SPT N-values are presented on the boring logs.

Upon completion, the boreholes were backfilled with neat cement grout in accordance with SMCEHSD grouting guidelines. The soil cuttings generated by the borings were placed on the ground next to each boring location. Straw wattles were placed and staked around the soil cuttings at each boring location to reduce silt content in surface water runoff that comes in contact with the cuttings.

3.2 Laboratory Testing

We re-examined each soil sample obtained from our borings to confirm the field classifications and select representative samples for laboratory testing. Soil samples were tested to measure moisture content, dry density, Atterberg limits, grain-size distribution, resistance value (R-value), and corrosivity. The results of the laboratory tests are presented on the boring logs and in Appendix B.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Site Conditions

The subject property encompasses an area of approximately 10.4 acres of vacant land. It is bordered by a combination of single-family homes and vacant land to the north and east, single-family homes to the south, and Carlos Street to the west. The site slopes up gently to moderately to the east/northeast with the exception of a north-facing slope along the northern side of the site, which slopes moderately down to the north, and some localized flat areas near the center and eastern portions of the site. Ground surface elevations across the site range from about 95 feet (datum unknown) along the northern edge of the site to about 205 feet along the eastern edge of the site. The inclinations of on-site slopes are generally 5:1 (horizontal:vertical) or flatter, except in localized areas and along the northern and southern property lines where the slope inclinations are as steep approximately 3:1.

There are numerous concrete slabs along with low concrete retaining walls that are remnants from previous military buildings that were part of a World War II training facility that occupied the site around 1945. The site was also previously used as a school and a fire training facility for firefighters. Heavy vegetation, including numerous mature trees and shrubs, occupies much of the site outside the limits of the concrete slabs. Notable hydrophilic plants (pampas grass) are abundant on the eastern part of the lower terrace; these pampas grass likely grows where surface run off from the relatively steeper and impermeable upper terrace accumulates within the relatively thicker soil and low-angle down-slope terrace deposits.

Easements for the Montara Water and Sanitary District (MWSD) and Pacific Gas & Electric (PG&E) utilities extend along the unpaved roadways within the property. MWSD infrastructure on the site consists includes water storage tanks in the southeastern portion of the site, a booster pump system, and distribution facilities with a fenced-in parcel of land adjacent to and west of the intersection of Lincoln Street and Buena Vista Street near the eastern boundary of the property.

According to a Limited Phase II Subsurface Investigation report prepared by AEI Consultants, dated February 15, 2017, there are records of two water wells on the site. One well, referred to as the "upper well", was found along the northern edge of the site; however, the second well could not be located. It is not known whether either of these wells was properly abandoned in accordance with local regulations.

4.2 Site Geology and Subsurface Conditions

The geologic units in the site vicinity are mapped as Quaternary (1.6 million years [Ma] to recent) alluvial fan (Qf) and marine terrace deposits (Qmt) and Cretaceous (145 to 65 Ma) Montara Mountain granitic rocks (Kgr) of the Salinian Complex (Brabb *et al*., 1983; Wagner *et al*.,1990 and Brabb *et al*.,1998). The site locality is shown lying in part, on marine terrace deposits (Qmt) in the eastern half and granitic rocks (Kgr) in the western half (Brabb *et al*.,1998), as shown on Figure 2A.

Our borings indicate there is up to 3-1/2 feet of undocumented fill consisting of medium stiff sandy clay or medium dense clayey sand with varying amounts of gravel in localized areas of the site. Beneath the fill is stiff to hard clay and sandy clay interbedded with medium dense to very dense clayey sand and sand with clay that extend to top of bedrock, where encountered, or to the maximum depths explored. Atterberg limits tests indicate the soil underlying the site has low plasticity and, therefore has low expansion potential.

During our subsurface exploration and reconnaissance we encountered granitic bedrock in the western part of the site (Borings B-2, B-5, B-6, B-7, B-9, and B-10) at depths of greater than 17.5 feet bgs and at the eastern part of the site (Borings B-3, B-4, and B-8) as shallow as 4.5 feet bgs. More specifically, the depth to granitic bedrock increased from east to west between Borings B-8 and B-7 from 8.5 feet bgs to greater than 25 feet bgs, respectively, and within B-3 and B-2 from 4.5 feet bgs to greater than 21 feet bgs, respectively; this suggests a relatively steeply westward dipping bedrock surface that bisects the site from north to south that is overlain by shallow (4.5 to 8.5 feet) terrace deposits in the eastern part and thicker (>17 feet) terrace deposits in the western part of the property. We interpret that the relatively steeply dipping bedrock surface is perhaps a buried and eroded paleoseacliff that is separating two different age marine terrace surfaces. Borings B-3, B-4 and B-8 are located on the outer (western) edge of a older and eroded marine terrace surface and the western borings (Borings B-2, B-5, B-6, B-7, B-9, and B-10) lie on the eastern part of the younger terrace in an area where more accumulation of colluvium and alluvium has occurred.

4.3 Groundwater Conditions

Groundwater was not encountered in our borings which were drilled to depths up to 26.5 feet bgs. The AEI report referenced above indicates "standing and static water levels" were measured in an on-site water well depths of 168 and 35 feet, respectively, in June 1986. The depth to groundwater is expected to fluctuate several feet seasonally, depending on the amount of rainfall.

5.0 SEISMIC CONSIDERATIONS

5.1 Regional Seismicity

The site is located in the Coast Ranges geomorphic province of California that is characterized by northwest-trending valleys and ridges. These topographic features are controlled by folds and faults that resulted from the collision of the Farallon plate and North American plate and subsequent strike-slip faulting along the San Andreas Fault system. The San Andreas Fault is more than 600 miles long from Point Arena in the north to the Gulf of California in the south. The Coast Ranges province is bounded on the east by the Great Valley and on the west by the Pacific Ocean.

The geologic structure in the site vicinity is dominated by the Seal Cove Fault which is believed to be the onshore-strand of the greater Holocene-active San Gregorio Fault. The San Gregorio Fault extends for about 143 miles from the Big Sur region south of Monterey Bay and northward to where it merges with the San Andreas Fault System near Bolinas Bay north of San Francisco. Continuing activity along the Seal Cove Fault is revealed by a northwestward striking fault scarp that offsets the young Half Moon Bay Terrace near the Half Moon Bay Airport approximately three quarters of mile to the south of the site.

The major active faults in the area are the San Gregorio, San Andreas, and Hayward faults. These and other faults in the region are shown on Figure 3. For these and other active faults within a 100-kilometer radius of the site, the distance from the site and estimated mean characteristic Moment magnitude[1] [2007 Working Group on California Earthquake Probabilities (WGCEP) (USGS 2008) and Cao et al. (2003)] are summarized in Table 1.

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[1] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

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TABLE 1
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Mean Characteristic Moment Magnitude
San Gregorio Connected	1.0	East	7.5
N. San Andreas - Peninsula	11	East	7.2
N. San Andreas (1906 event)	11	East	8.0
Monte Vista-Shannon	26	East	6.5
N. San Andreas - North Coast	28	North	7.5
Total Hayward	41	Northeast	7.0
Total Hayward-Rodgers Creek	41	Northeast	7.3
Point Reyes	53	Northwest	6.9
Total Calaveras	54	East	7.0
Mount Diablo Thrust	57	Northeast	6.7
N. San Andreas - Santa Cruz	60	Southeast	7.1
Green Valley Connected	62	Northeast	6.8
Rodgers Creek	62	North	7.1
Zayante-Vergeles	69	Southeast	7.0
Greenville Connected	72	East	7.0
West Napa	74	Northeast	6.7
Monterey Bay-Tularcitos	77	Southeast	7.3
Great Valley 5, Pittsburg Kirby Hills	80	Northeast	6.7
Great Valley 7	90	East	6.9
Great Valley 4b, Gordon Valley	98	Northeast	6.8

Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989 with an M_w of 6.9. This earthquake occurred in the Santa Cruz Mountains about 58 kilometers southwest of the site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake ($M_w = 6.2$).

The U.S. Geological Survey's 2014 Working Group on California Earthquake Probabilities has compiled the earthquake fault research for the San Francisco Bay Area in order to estimate the probability of fault segment rupture. They have determined that the overall probability of moment magnitude 6.7 or greater earthquake occurring in the San Francisco region during the next 30 years (starting from 2014) is 72 percent. The highest probabilities are assigned to the Hayward Fault, Calaveras Fault, and the northern segment of the San Andreas Fault. These probabilities are 14.3, 7.4, and 6.4 percent, respectively.

5.2 Geologic Hazards

Because the project site is in a seismically active region, we evaluated the potential for earthquake-induced geologic hazards including ground shaking, ground surface rupture, liquefaction,[2] lateral spreading,[3] and cyclic densification[4]. We used the results of our field investigation to evaluate the potential of these phenomena occurring at the project site.

5.2.1 Ground Shaking

The seismicity of the site is governed by the activity of the nearby San Gregorio Fault, although ground shaking from future earthquakes on other faults, including the San Andreas and Hayward faults, will also be felt at the site. The intensity of earthquake ground motion at the site will depend upon the characteristics of the generating fault, distance to the earthquake epicenter, and magnitude and duration of the earthquake. We judge that strong to very strong ground shaking could occur at the site during a large earthquake on one of the nearby faults.

5.2.2 Ground Surface Rupture

The active Seal Cove part of San Gregorio Fault system lies approximately one mile to the southwest of the site. Several subsidiary splays of the Seal Cove Fault have been mapped sub-parallel and to the northeast of Seal Cove Fault that project toward the site from the southeast. However, the California Geological Survey (CGS) has concluded that these subsidiary splays are not Holocene active and extensive trench studies to the southeast of the site suggest that these fault traces do not strike through the site (CGS, 2003).

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake

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2 Liquefaction is a phenomenon where loose, saturated, cohesionless soil experiences temporary reduction in strength during cyclic loading such as that produced by earthquakes.

3 Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

4 Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing ground-surface settlement.

Fault Zoning Act, and no known active or potentially active faults exist on the site. We therefore conclude the risk of fault offset at the site from a known active fault is very low. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure from previously unknown faults is also very low.

5.2.3 Liquefaction and Associated Hazards

When a saturated, cohesionless soil liquefies, it experiences a temporary loss of shear strength created by a transient rise in excess pore pressure generated by strong ground motion. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits. Flow failure, lateral spreading, differential settlement, loss of bearing strength, ground fissures and sand boils are evidence of excess pore pressure generation and liquefaction.

The site is underlain by stiff to very stiff cohesive soil and medium dense to dense clayey sand and sand with clay that is not susceptible to liquefaction because of its cohesion and/or its high relative density. Further, it appears the depth to groundwater is in excess of 30 feet bgs. Therefore, we conclude the potential for liquefaction and liquefaction-related hazards, such as lateral spreading, is nil.

5.2.4 Cyclic Densification

Cyclic densification (also referred to as differential compaction) of non-saturated sand (sand above groundwater table) can occur during an earthquake, resulting in settlement of the ground surface and overlying improvements. We used the data from our borings to evaluate the potential for settlement due to cyclic densification within the soil above the water table. The results of our investigation indicate the soil encountered above the groundwater table has sufficient cohesion and/or sufficiently high relative density, such that the potential for cyclic densification to occur at the site is nil.

5.2.5 Landslide Hazards

To evaluate the potential for landslides to occur on the site, we performed a geologic reconnaissance and reviewed available published maps showing mapped existing landslides in San Mateo County. A portion of a landslide map prepared by Brabb and Pampeyan (1972) is attached (Figure 4). No evidence of landslides, slope instability, or erosional issues was observed during the geologic reconnaissance.

On the basis of our geologic reconnaissance and the findings from our subsurface investigation, we conclude the potential for landsliding at the site under both static and seismic conditions is low because of the lack of evidence of historic slope instability on the site, the high shear strength of the soil and weathered bedrock underlying the site and the apparent absence of any significant seepage on the slope faces. Further, we conclude construction of the proposed improvements will not impact slope stability at the site or in the surrounding area provided the grading and construction of improvements are performed in accordance with the recommendations presented in this report. Therefore, in our opinion, no slope instability mitigation measures are required for this project.

6.0 DISCUSSION AND CONCLUSIONS

From a geotechnical standpoint, we conclude the site can be developed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical concern at the site is the presence of undocumented fill and unknown buried foundations and utility lines from the previous site development, as well as the likely presence of large tree roots beneath some of the proposed improvements. Our conclusions and recommendations for this and other geotechnical aspects of the project are presented in this section.

6.1 Foundation Support and Settlement

The results of our investigation indicate the native soil underlying the site has moderate to high strength and low compressibility and, therefore, is capable of supporting the proposed structures on conventional spread footings. For conventional spread footings to be feasible, however, it will be necessary to overexcavate and recompact any existing undocumented fill beneath and within five horizontal feet from proposed buildings. We estimate settlement of buildings supported on spread footings bearing on stiff native soil and/or properly compacted fill will be less than 1/2 inch and differential settlement will be less than 1/4 inch over a horizontal distance of 30 feet.

6.2 Construction Considerations

The soil to be excavated consists primarily of clay and clayey sand, which can be excavated with conventional earth-moving equipment such as loaders and backhoes. If site grading is performed during the rainy season, repeated loads by heavy equipment will reduce the strength of the surficial soil and decrease its ability to resist deformation; this phenomenon could result in severe rutting and pumping of the exposed subgrade. To reduce the potential for this behavior, heavy rubber-tired equipment as well as vibratory rollers, should be avoided during the rainy season.

6.3 Soil Corrosivity

Corrosivity testing was performed by Project X Corrosion Engineering of Murrieta, California on samples of soil obtained during our field investigation from Boring B-2 at a depth of four feet bgs and from Boring B-6 at a depth of two feet bgs. The results of the tests are presented in Appendix B of this report. Based on the resistivity test results, the sample would be classified as mildly corrosive to buried steel. Accordingly, buried iron, steel, cast iron, galvanized steel, and dielectric-coated steel or iron should be properly protected against corrosion. If specific corrosion protection measures are needed, a corrosion mitigation report can be prepared by Project X Corrosion Engineering upon request. The chloride, and sulfate ion concentrations and pH of the soil do not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

7.0 RECOMMENDATIONS

Our recommendations for site preparation and grading, design of foundations and retaining walls, pavement design, seismic design, and other geotechnical aspects of the project are presented in this section.

7.1 Site Preparation and Grading

Site clearing should include removal of existing foundations, slabs, pavements, and underground utilities, if present. In general, abandoned underground utilities should be removed to the property line or service connections and properly capped or plugged with concrete. Where existing utility lines are outside of the footprint of the proposed improvements and will not interfere with the proposed construction, they may be abandoned in-place provided the lines are filled with lean concrete or cement grout to the property line. Voids resulting from demolition activities should be properly backfilled with engineered fill following the recommendations provided later in this section. Any vegetation and the upper 2 to 3 inches of organic topsoil should be stripped in areas to receive improvements (i.e., building, pavement, or flatwork). Stripped organic soil, if any, can be placed in future landscaped areas. Tree roots larger than 1/2 inch in diameter within three feet of the existing ground surface beneath the proposed buildings should also be removed.

After site clearing is completed, the proposed building pads should be excavated to a depth of at least three feet below existing site grades. In proposed pavement and flatwork areas, the overexcavation depth should be at least 18 inches below existing site grades. The excavations should extend at least five feet beyond the perimeters of the proposed buildings, except where constrained by property lines or existing utilities. The excavations should extend at least one foot beyond the edges of proposed pavements and flatwork. The exposed subgrade at the base of the excavations should be scarified to a depth of at least eight inches, moisture-conditioned to above optimum moisture content, and compacted to at least 92 percent relative compaction[5]. The excavated material and imported select fill, if needed, should then be placed in lifts not exceeding eight inches in loose thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 92 percent relative compaction beneath buildings and at least 90 percent below pavements and flatwork.

Subgrade soil or general fill consisting of clean sand or gravel (defined as soil with less than 10 percent fines by weight) should be compacted to at least 95 percent relative compaction. Soil subgrade for vehicular pavements should be compacted to at least 95 percent relative compaction and be non-yielding. The soil subgrade should be kept moist until it is covered by fill for improvements.

Excavations should be backfilled with properly compacted fill. Fill should consist of on-site soil or imported soil (select fill) that is free of organic matter (including roots larger than 1/2 inch in diameter), contains no rocks or lumps larger than three inches in greatest dimension, has a liquid limit of less than 40 and a plasticity index lower than 15, and is approved by the Geotechnical Engineer. Samples of proposed imported fill material should be submitted to the Geotechnical Engineer at least three business days prior to use at the site. The grading contractor should provide analytical test results or other suitable environmental documentation indicating the imported fill is free of hazardous materials at least three days before use at the site. If this data is not available, up to two weeks should be allowed to perform analytical testing on the proposed imported material.

7.1.1 Utility Trench Backfill

Excavations for utility trenches can be readily made with a backhoe. All trenches should conform to the current CAL-OSHA requirements. To provide uniform support, pipes or conduits should be bedded on a minimum of four inches of clean sand or fine gravel. After the pipes and

5 Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557 laboratory compaction procedure.

conduits are tested, inspected (if required) and approved, they should be covered to a depth of six inches with sand or fine gravel, which should be mechanically tamped. Backfill for utility trenches and other excavations is also considered fill, and should be placed and compacted according to the recommendations previously presented. If imported clean sand or gravel (defined as soil with less than 10 percent fines) is used as backfill, it should be compacted to at least 95 percent relative compaction. Jetting of trench backfill should not be permitted. Special care should be taken when backfilling utility trenches in pavement areas. Poor compaction may cause excessive settlements, resulting in damage to the pavement section.

7.1.2 Temporary and Permanent Slopes

Excavations that will be deeper than five feet and will be entered by workers should be sloped or shored in accordance with CAL-OSHA standards (29 CFR Part 1926). The contractor should be responsible for the construction and safety of temporary slopes. We judge temporary slopes excavated in the near-surface clay and clayey sand with a maximum inclination of 1:1 (horizontal to vertical) should be stable, provided the slope is not surcharged by adjacent structures, construction equipment, or stockpiled soil. If granular soil is encountered, however, flatter slopes will be required.

Permanent cut and fill slopes should be constructed at gradients no steeper than 2:1 (horizontal:vertical). If fills will be placed on existing slopes within an inclination steeper than 5:1, the slopes should be constructed with a keyway at least 10 feet wide and founded at least four feet into competent soil on the downslope side. The need for installing a subdrain in keyways will be assessed once grading plans are available. Fill slopes should be overbuilt two feet and cut back to exposed a firm compacted surface.

7.1.3 Erosion Control

Areas disturbed by grading should be protected against erosion during rainfall events. The bare portions of cut and fill slopes should be planted with deep-rooted, fast growing vegetation prior to winter. The surface slopes should be rolled to create a firm slope surface. The finished surface should be covered with appropriate erosion matting or hydro-seeded. Best Management

Practices (BMP's) should be implemented to prevent silt from entering the storm drains during and after construction.

7.1.4 Drainage and Landscaping

Positive surface drainage should be provided around the building to direct surface water away from the foundations. To reduce the potential for water ponding adjacent to the buildings, we recommend the ground surface within a horizontal distance of five feet from the building slope down away from the building with a surface gradient of at least two percent in unpaved areas and one percent in paved areas. In addition, roof downspouts should be discharged into controlled drainage facilities to keep the water away from the foundations. The use of water-intensive landscaping around the perimeter of the buildings should be avoided to reduce the amount of water introduced to the near-surface clay.

Care should be taken to minimize the potential for subsurface water to collect beneath non-permeable pavements and pedestrian walkways. Where landscape beds and tree wells are immediately adjacent to pavements and flatwork which are not designed as permeable systems, we recommend vertical cutoff barriers be incorporated into the design to prevent irrigation water from saturating the subgrade and aggregate base. These barriers may consist of either flexible impermeable membranes or deepened concrete curbs.

7.1.5 Bio-Retention Areas

The primary concerns with the proposed bio-retention areas are: 1) providing suitable support for foundations and curbs constructed near the bio-retention areas, and 2) potential for subsurface water from the bio-retention areas to migrate (and possibly build up) beneath pavements and proposed buildings. Consequently, we recommended that bio-retention features constructed at the site be provided with underdrains and/or drain inlets. In addition, we recommend bio-retention features, such as bioswales, be constructed no closer than five feet from buildings or pavements. If it is necessary to construct bio-retention features within five horizontal feet of buildings or pavements, the features should constructed with an impermeable membrane at least 15 mils thick. Unlined bio-retention features should not be constructed on slopes steeper than

5:1. Bio-retention features may be constructed on slopes steeper than 5:1 provided they are lined with an impermeable membrane.

Due to the low permeability of the on-site near-surface soil, these systems should be designed for *no exfiltration* into the subgrade soil. The drainage layer beneath the "treatment" soil should consist of a minimum 12-inch-thick layer of Caltrans Class 2 Permeable drainage material and include a minimum 4-inch-diameter perforated drain pipe placed with the perforations facing downward. An impermeable liner consisting of a high-density polyethylene liner (or equivalent) that is at least 15 mils thick should line the entire bottom and sides of the system, where required. The sides of bioswales should be sloped at a maximum gradient of 2:1 above the gravel layer. The sides of the bioswales may be cut vertical where they are adjacent to the gravel layer.

Where a vertical curb or foundation is constructed near a bio-retention area, the curb and the edge of the foundations should be founded below an imaginary line extending up at an inclination of 1.5:1 (horizontal: vertical) from the base of the bio-retention area.

7.2 Spread Footings

The proposed structures, including site retaining walls, may be supported on conventional spread footings bottomed in stiff, undisturbed native soil and/or properly compacted fill. Continuous footings should be at least 16 inches wide. Footings should bottom at least 18 inches below the lowest adjacent exterior grade or 12 inches below the bottom of the capillary break, whichever is deeper. If footings will be constructed on sloping ground or on level ground near slopes, the footings should be bottomed at a depth such that the face of the footing, measured at the footing bottom, is at least seven feet from the face of the slope. Footings for buildings, retaining walls, and other improvements may be designed using allowable bearing pressures of 3,000 pounds per square foot (psf) for dead-plus-live loads and 4,000 psf for total design loads, which include wind or seismic forces.

Lateral loads may be resisted by a combination of passive pressure on the vertical faces of the footings and friction between the bottoms of the footings and the supporting soil. To compute lateral resistance for transient and sustained loads, we recommend using a uniform pressure of 1,500 psf and an equivalent fluid weight (triangular distribution) of 270 pcf, respectively. The upper foot of soil should be ignored unless confined by a slab or pavement. Frictional resistance should be computed using a base friction coefficient of 0.30. The passive pressure and frictional resistance values include a factor of safety of at least 1.5.

In general, we recommend all footings be founded below an imaginary plane extending up at an inclination of 1.5:1 (horizontal:vertical) from the base of any vault, utility trench, bioswale/ storm water treatment area, etc. If the design footing depth is above this plane, the footing can either be deepened, or over-excavated below the line and replaced with lean concrete (200 psi minimum) to make up the difference.

Footing excavations should be free of standing water, debris, and disturbed materials prior to placing concrete. The bottoms and sides of the excavations should be moistened following excavation and maintained in a moist condition until concrete is placed. We should check footing excavations prior to placement of reinforcing steel to check for proper bearing and cleanout.

7.3 Concrete Slab-on-Grade Floor

If water vapor moving through the building floor slabs is considered detrimental, we recommend installing a capillary moisture break and water vapor retarder beneath the floor slabs. A capillary moisture break consists of at least four inches of clean, free-draining gravel or crushed rock. The particle size of the capillary break material should meet the gradation requirements presented in Table 2.

TABLE 2
Gradation Requirements for Capillary Moisture Break

Sieve Size	Percentage Passing Sieve
1 inch	90 – 100
¾ inch	30 – 100
½ inch	5 – 25
3/8 inch	0 – 6

The vapor retarder should meet the requirements for Class B vapor retarders stated in ASTM E1745. The vapor retarder should be placed in accordance with the requirements of ASTM E1643. These requirements include overlapping seams by six inches, taping seams, and sealing penetrations in the vapor retarder.

Concrete mixes with high water/cement (w/c) ratios result in excess water in the concrete, which increases the cure time and can result in excessive vapor transmission through the slab. Where the concrete is poured directly over the vapor retarder, we recommend the w/c ratio of the concrete not exceed 0.45. Water should not be added to the concrete mix in the field. If necessary, workability should be increased by adding plasticizers. In addition, the slab should be properly cured. Before the floor covering is placed, the contractor should check that the concrete surface and the moisture emission levels (if emission testing is required) meet the manufacturer's requirements.

7.4 Exterior Concrete Flatwork

Exterior concrete flatwork that will not receive vehicular traffic (i.e. sidewalk) should be underlain by at least four inches of Class 2 aggregate base compacted to at least 90 percent relative compaction. Prior to placement of the aggregate base, the upper eight inches of the subgrade soil should be scarified, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction.

7.5 Retaining Walls

Retaining walls should be designed to resist static lateral earth pressures, lateral pressures caused by earthquakes, and traffic loads (if vehicular traffic is expected within a horizontal distance equal to 1.5 times the wall height). All on-site walls, including low retaining walls in landscaped areas, should be designed in accordance with the recommendations presented in this section, although checking the walls for seismic loading is not required for walls less than six feet high. Retaining walls that are restrained from movement at the top or sides (e.g., a wall with a 90-degree turn) should be designed using the at-rest pressure presented in Table 3. Walls that are not restrained from rotation may be designed using the active pressure presented in Table 3.

TABLE 3
Lateral Earth Pressures for Retaining Wall Design

Soil Backfill Type	Active Static Condition (Unrestrained)	At-Rest Static Condition (Restrained)	Seismic Condition
On-site Soil - Drained	35 pcf[1]	55 pcf	35 pcf + 14 pcf
On-site Soil - Undrained	80 pcf	90 pcf	80 pcf + 7 pcf

1. Equivalent fluid weight (triangular distribution); pcf = pounds per cubic foot

The recommended lateral earth pressures above are based on a level backfill condition with no additional surcharge loads. If the retained soil will be sloped, we can provide additional recommendations after the degree to which the soil will be sloped has been determined. Where the below-grade walls are subject to traffic loading within a horizontal distance equal to 1.5 times the wall height, an additional uniform lateral pressure of 100 psf, applied to the entire height of the wall.

The "drained" design pressures presented Table 3 are based on fully drained walls. Although a majority of the retaining walls will be above the groundwater level, water can accumulate behind the walls from other sources, such as rainfall, irrigation, and broken water lines, etc. One acceptable method for backdraining a basement wall is to place a prefabricated drainage panel against the back of the wall. The drainage panel should extend down to a perforated PVC collector pipe at the base of the retaining wall. The pipe should be surrounded on all sides by at least four inches of Caltrans Class 2 permeable material or 3/4-inch drain rock wrapped in filter fabric (Mirafi NC or equivalent). The pipe should be connected to a suitable discharge point; a sump and pump system may be required to drain the collector pipes.

Wall backfill material and compaction should conform to the recommendations presented previously in Section 7.1 of this report. Lightweight compaction equipment should be used to reduce stresses induced on the retaining walls during fill placement unless the walls are appropriately braced.

Site retaining walls may be supported on spread footings bottomed on stiff native soil and/or properly compacted fill. The footings should be bottomed at least 18 inches below the lowest adjacent finished grade. The allowable bearing pressure, friction factor, and passive pressure presented for footings design in Section 7.2 may be used for design of site retaining walls.

7.6 Pavement Design

7.6.1 Flexible (Asphalt Concrete) Pavement Design

The State of California flexible pavement design method was used to develop the recommended asphalt concrete pavement sections. The resistance value (R-value) test results indicate the upper native soil has an R-value of approximately 29.

If the proposed pavement will experience little or no truck traffic, including garbage trucks, we recommend a traffic index (TI) of 4.5 be used for asphalt concrete pavement design. Pavement areas that will be subject to garbage truck traffic should be designed for a TI of 5.5. The project civil engineer should check that the TI’s presented in this report are appropriate for the intended use. Recommended pavement sections for these traffic indices are presented in Table 4.

TABLE 4
Recommended Asphalt Concrete Pavement Sections

TI	Asphaltic Concrete (inches)	Class 2 Aggregate Base R = 78 (inches)
4.5	2.5	6.0
5.0	3.0	6.0
5.5	3.0	7.5
6.0	3.5	8.0
6.5	4.0	8.0
7.0	4.0	10.0

The upper six inches of the subgrade and the Class 2 aggregate base beneath pavements should be moisture-conditioned to above optimum moisture content and compacted to at least 95 percent relative compaction.

To prevent irrigation water from entering the pavement section, curbs adjacent to landscaped areas should extend through the base rock and at least three inches into the underlying subgrade soil. Where pavement is constructed near bio-swales or other storm water treatment areas, curbs should be deepened so that the base is founded below an imaginary line extending up at an inclination of 1.5:1 (horizontal:vertical) from the base of the bio-swale/treatment area.

7.6.2 Rigid (Portland Cement Concrete) Pavement

Concrete pavement design is based on a maximum single-axle load of 20,000 pounds and a maximum tandem axle load of 32,000 pounds and light truck traffic (i.e., a few trucks per week). The recommended rigid pavement section for these axle loads is 6-1/2 inches of Portland cement concrete (PCC) over six inches of Class 2 aggregate base. If the concrete pavement will be subject to fire truck traffic, the PCC should be at least seven inches thick. For residential driveways, the recommended pavement section is five inches of PCC over six inches of Class 2 aggregate base.

The modulus of rupture of the concrete should be at least 500 psi at 28 days. Contraction joints should be constructed at 15-foot spacing. Where the outer edge of a concrete pavement meets asphalt concrete pavement, the concrete slab should be thickened by 50 percent at a taper not to exceed a slope of 1 in 10. For areas that will receive weekly garbage truck traffic, we recommend the slab be reinforced with a minimum of No. 4 bars at 16-inch spacing in both directions. Recommendations for subgrade preparation and aggregate base compaction for concrete pavement are the same as those we have described above for asphalt concrete pavement.

7.7 Seismic Design

We understand the proposed building will be designed using the seismic provisions in the 2016 CBC. The latitude and longitude of the site are 37.5343° and -122.5168°, respectively. Based on our borings, we recommend Site Class C (Very Dense Soil and Soft Rock) be used. Hence, in accordance with the 2016 CBC, we recommend the following:

- S_S = 2.282g, S_1 = 0.966g
- S_{MS} = 2.282g, S_{M1} = 1.256g
- S_{DS} = 1.521g, S_{D1} = 0.837g
- PGA_M = 0.89g
- Seismic Design Category E for Risk Categories I, II, and III.

8.0 ADDITIONAL GEOTECHNICAL SERVICES

Prior to construction, Rockridge Geotechnical should review the project plans and specifications to verify that they conform to the intent of our recommendations. During construction, our field engineer should provide on-site observation and testing during site preparation, placement and compaction of fill, and installation of foundations. These observations will allow us to compare actual with anticipated subsurface conditions and to verify that the contractor's work conforms to the geotechnical aspects of the plans and specifications.

9.0 LIMITATIONS

This geotechnical investigation has been conducted in accordance with the standard of care commonly used as state-of-practice in the profession. No other warranties are either expressed or implied. The recommendations made in this report are based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed in the exploratory borings. If any variations or undesirable conditions are encountered during construction, we should be notified so that additional recommendations can be made. The foundation recommendations presented in this report are developed exclusively for the proposed development described in this report and are not valid for other locations and construction in the project vicinity.

REFERENCES

Brabb, E.E., Graymer, R.W. and Jones, D.L. (1998). Geology of the Onshore Part of San Mateo County, California: Derived from the Digital Database: U.S. Geological Survey Open-File Report 98-137. Available on-line at: http://geopubs.wr.usgs.gov/openfile/of98-137/.

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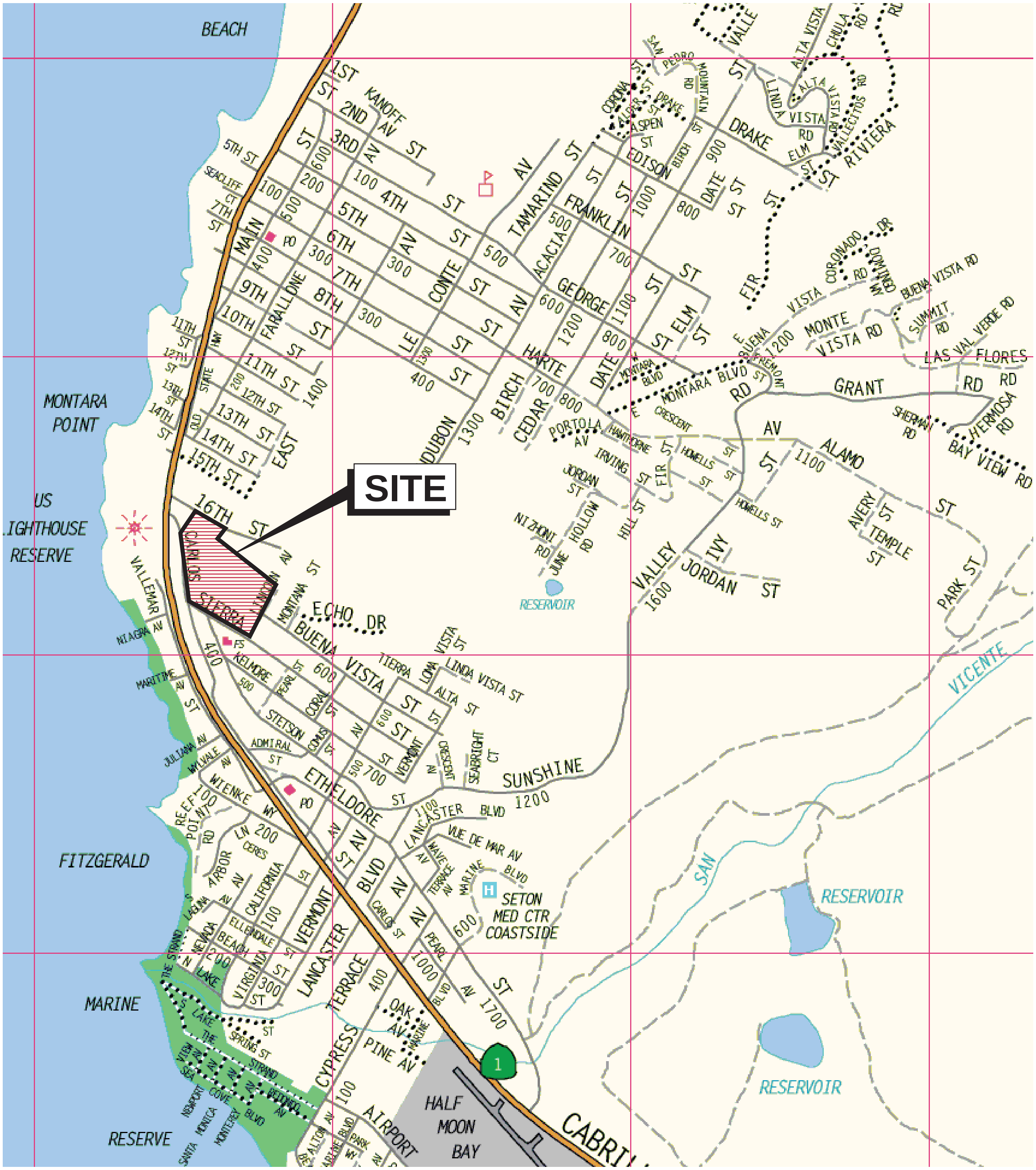
FIGURES

County Review Draft



Base map: The Thomas Guide San Mateo County 2002

0 1/4 1/2 Mile
Approximate scale

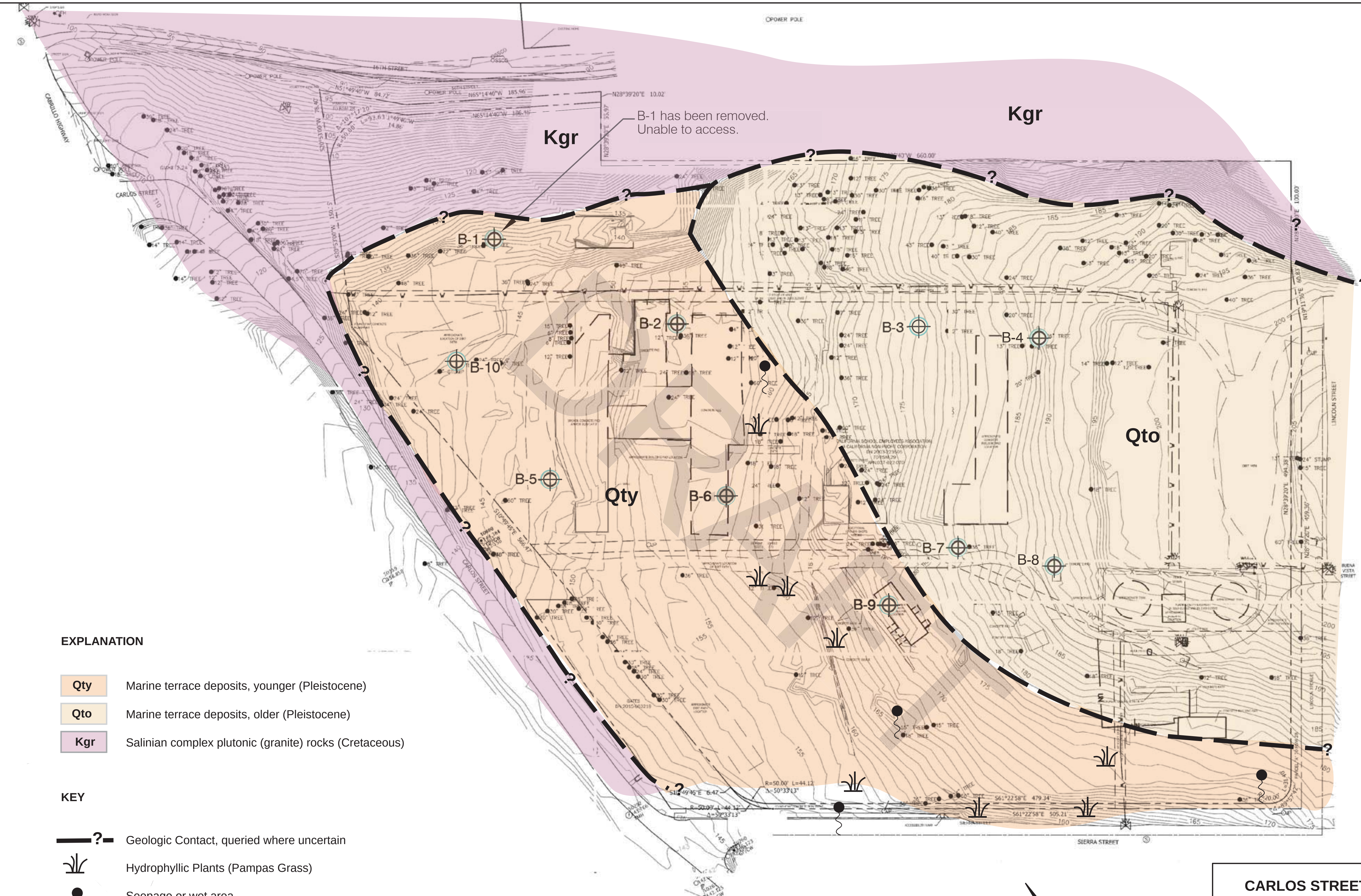
CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

SITE LOCATION MAP

Date 07/10/18	Project No. 17-1286	Figure 1

County Review Draft



EXPLANATION

Qty	Marine terrace deposits, younger (Pleistocene)
Qto	Marine terrace deposits, older (Pleistocene)
Kgr	Salinian complex plutonic (granite) rocks (Cretaceous)

KEY

- ?— Geologic Contact, queried where uncertain
- Hydrophyllic Plants (Pampas Grass)
- Seepage or wet area
- B-2 Approximate location of geotechnical boring by Rockridge Geotechnical Inc., May 11 & 12, 2017

0 100 Feet

Approximate scale

Reference: Base map from a drawing titled "Topographic Survey", by BKF, dated June 6, 2017.

CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

SITE PLAN AND GEOLOGY MAP
EXISTING BUILDING LAYOUT

Date 07/10/18	Project No. 17-1286	Figure 2A

ROCKRIDGE GEOTECHNICAL

County Review Draft

EXPLANATION

B-2 ⊕ Approximate location of geotechnical boring by Rockridge Geotechnical Inc., May 11 & 12, 2017

Reference: Base map from a drawing titled "Carlos Street Affordable Housing", by MidPen Housing, dated August 18, 2016.

CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

SITE PLAN
PROPOSED BUILDING LAYOUT

Date 07/09/18	Project No. 17-1286	Figure 2B

ROCKRIDGE GEOTECHNICAL

County Review Draft

Base Map: U.S. Geological Survey (USGS), National Seismic Hazards Maps - Fault Sources, 2008.

EXPLANATION

Strike slip

Thrust (Reverse)

Normal

0 5 10 Miles

Approximate scale

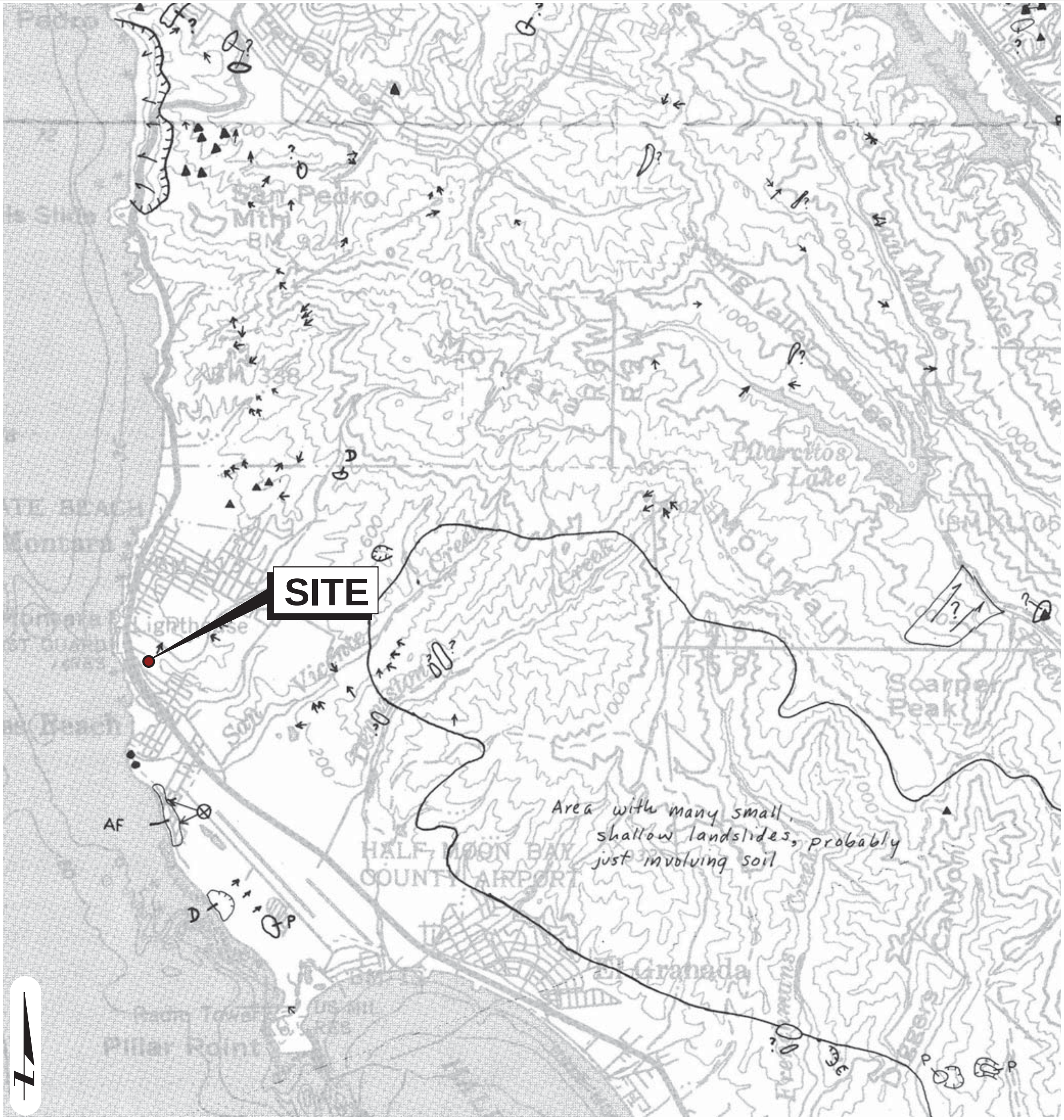
CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

REGIONAL FAULT MAP

Date 07/10/18	Project No. 17-1286	Figure 3

County Review Draft



LANDSLIDE DEPOSITS MAPPED IN THE FIELD

▲ Small landslide deposit, 50 to 500 feet in maximum dimension

FA Large landslide deposit, more than 500 feet in maximum dimension
F, mapped in field; A, active

LANDSLIDE INFORMATION FROM PUBLIC SOURCES

⊗ Subsidence of road or ground

△ Active landslide, Area greater than 100 square feet

LANDSLIDE INFORMATION FROM PRIVATE CONSULTING FIRMS

● Landslide

Reference:
Preliminary Map of landslide Deposits in San Mateo County, California by Earl E. Brabb and Earl H. Pampeyan, 1972.

0 1 2 Mile

Approximate scale

CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

REGIONAL PRELIMINARY MAP OF LANDSLIDE DEPOSITS

Date 07/10/18	Project No. 17-1286	Figure 4

ROCKRIDGE GEOTECHNICAL

APPENDIX A

Logs of Test Borings

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-2

Boring location: See Site Plan, Figure 2
Date started: 5/11/17 Date finished: 5/11/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)
Logged by: S. Magallon

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–2.25				SC	CLAYEY SAND (SC) brown, medium dense, moist, fine-grained, trace rootlets (FILL)						
2	S&H	5, 7, 10	14								
2.25–3				CL	SANDY CLAY (CL) orange-brown to brown						
3–10				CL	SANDY CLAY (CL) dark brown to black, stiff to very stiff, moist Corrosivity Test; see Appendix B						
4	S&H	5, 8, 9	14								
6	S&H	4, 8, 10	15		LL = 28, PI = 11; see Appendix B-1					18.9	108
9	SPT	3, 3, 2	7		medium stiff						
10					color change observed in cuttings						
10.5–21				CL	SANDY CLAY (CL) yellow-brown to brown with white grains, very stiff, moist						
14	S&H	4, 8, 11	16								
19	SPT	8, 13, 17	43		hard, with olive pockets of clayey sand						
20	SPT	16, 21, 24	65								

Boring terminated at a depth of 21 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 Figure: A-1

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-3

Boring location: See Site Plan, Figure 2
Date started: 5/11/17 Date finished: 5/11/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

Logged by: S. Magallon

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–4.5				SC	CLAYEY SAND (SC) yellow to yellow-brown, with white grains, medium dense, moist, fine- to medium-grained						
2	S&H	9 10 19	24								
4	S&H	10 18 30	40		dense						
4.5–11.5				Kgr	GRANITE (Kgr) mottled brown and red-brown with white grains, low hardness, friable, deeply weathered, manganese and iron oxidation						
6	SPT	6 23 29	75								
11	SPT	17 22 35	82								

Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286
Figure: A-2

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-4

Boring location: See Site Plan, Figure 2

Logged by: S. Magallon

Date started: 5/11/17 | Date finished: 5/11/17

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Automatic Hammer

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–2.25	S&H	4, 4, 6	8	SC	CLAYEY SAND (SC) dark brown to black, loose, moist, with some gravel and trace rootlets; LL = 29, PI = 10; see Figure B-1 (FILL/ TOPSOIL)					10.1	111
2.25–3.75	S&H	10, 11, 18	24	CL	SANDY CLAY (CL) yellow to yellow-brown with white gaines, medium stiff to stiff, moist				42	24.9	98
3.75–5.5	SPT	7, 10, 12	32	SC	CLAYEY SAND (SC) dark brown to yellow-brown with white grains, medium dense, moist, fine- to medium-grained; Corrosivity Test; see Appendix B; Particle Size Distribution; see Figure B-2						
5.5–11.5	SPT	8, 13, 20	48	Kgr	GRANITE (Kgr) yellow and olive with white grains, low hardness, friable, deeply weathered, with iron and manganese oxidation						

Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 | Figure: A-3

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-5

Boring location: See Site Plan, Figure 2
Logged by: S. Magallon
Date started: 5/11/17 | Date finished: 5/11/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches | Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–1				SP	SAND and GRAVEL (SP) olive-brown — FILL						
1–2	S&H	11, 11, 12	19	CL	SANDY CLAY (CL) brown to red-brown, very stiff, moist, fine-grained sand; R-Value Test; see Figure B-4						
3–4	S&H	4, 5, 8	11	CL	stiff, with oxidation staining; LL = 29, PI = 14; see Figure B-1					17.9	114
5–6	S&H	5, 8, 12	17	CL	very stiff						
7.5–9	SPT	6, 9, 11	29	SC	CLAYEY SAND (SC) brown to red-brown, medium dense, moist, fine-grained; Particle Size Distribution; see Figure B-2				13	15.4	
10–11	SPT	4, 4, 6	14	CL	SANDY CLAY (CL) red-brown with mottling olive-brown, stiff, moist						
11–13				SC	CLAYEY SAND (SC) olive-brown to olive with white grains, medium dense, moist, fine- to medium-grained						
13–14.5	SPT	5, 10, 12	32	CL	SANDY CLAY (CL) brown to red-brown with red oxidation staining, hard, moist, fine- to medium-grained sand						
14.5–18.5				SM	SILTY SAND (SM) olive, dense, moist, with clay; increase clay content						
18.5–24.5	SPT	6, 8, 9	24	SP-SC	SAND with CLAY (SP-SC) yellow to yellow-brown with white grains, medium dense, moist, fine- to medium-grained						
23–24.5	SPT	7, 9, 12	30	SP-SC	medium dense to dense						

Boring terminated at a depth of 24.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 | Figure: A-4

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-6

Boring location: See Site Plan, Figure 2
Date started: 5/11/17 | Date finished: 5/11/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches | Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)
Logged by: S. Magallon

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–2.75	S&H	10, 15, 22	31	CL	SANDY CLAY (CL) dark brown, hard, moist, with coarse, subangular gravel. Corrosivity Test; see Appendix B (FILL/TOPSOIL)						
2.75–8	SPT	3, 4, 5	13	SC	CLAYEY SAND (SC) yellow-brown and brown, medium dense, moist, trace fine, subrounded gravel. Particle Size Distribution; see Figure B-2				46	15.5	
	S&H	6, 11, 12	19	SC	yellow-brown to red-brown, increase sand content						
8–14.5	SPT	10, 13, 14	39	SC	CLAYEY SAND (SC) yellow-brown, dense, moist						
14.5–18	SPT	11, 13, 15	40	CL	SANDY CLAY (CL) yellow-brown and olive with red-brown, and white grains, hard, moist, fine- to medium-grained sand						
18–26.5	SPT	11, 18, 22	58	Kgr	GRANITE (Kgr) yellow and olive with white grains, low hardness, friable, deeply weathered, poorly cemented						
	SPT	16, 18, 25	62	Kgr							

Boring terminated at a depth of 26.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 | Figure: A-5

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-7

Boring location: See Site Plan, Figure 2

Logged by: K. Samlik

Date started: 5/12/17 | Date finished: 5/12/17

Drilling method: Hollow Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Automatic Hammer

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–0.3					3.5 inches of concrete slab						
0.3–2.5	S&H (1.5–2.5)	10, 9, 9	15	SC	CLAYEY SAND with GRAVEL (SC) dark brown with brown mottling, medium dense, moist, fine to medium sand						
2.5–4.5	S&H (4)	8, 13, 18	26	SC	CLAYEY SAND (SC) brown, medium dense, moist, trace gravel, medium grained sand; Particle Size Distribution; see Figure B-3				40	18.1	117
4.5–7	S&H (5.5)	12, 22, 26	40	CL	SANDY CLAY (CL) brown with dark brown, hard, moist, fine to medium sand						
7–11.5	SPT (9.5)	4, 15, 16	45	SP-SC	SAND with CLAY (SP-SC) red-brown, dense, moist, fine to medium sand						
11.5–16.5	SPT (14.5)	6, 8, 10	26	SP-SC	SAND with CLAY (SP-SC) dark red-brown, medium dense, moist; Particle Size Distribution; see Figure B-3				9	16.1	
16.5–21	SPT (19.5)	3, 4, 5	13	CL	CLAY with SAND (CL) brown with light mottling of red-brown and white, stiff, moist						
21–25	SPT (24.5)	8, 11, 13	35	CL	SANDY CLAY (CL) red-brown, hard, fine to medium sand						

Boring terminated at a depth of 25 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 | Figure: A-6

ROCKRIDGE 17-1286.GPJ TR.GDT 7/10/18

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-8

Boring location: See Site Plan, Figure 2
Date started: 5/12/17 Date finished: 5/12/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

Logged by: K. Samlik

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–2.5	S&H	17, 16, 19	29	SC	CLAYEY SAND with GRAVEL (SC) dark brown, medium dense, moist, fine to medium sand						
2.5–8.5	S&H	5, 9, 11	17	CL	SANDY CLAY (CL) red-brown with brown mottling, very stiff, moist						
	S&H	10, 14, 19	28		yellow brown						
8.5–20	SPT	12, 16, 20	52	Kgr	GRANITE (Kgr) yellow with brown, dark brown, orange mottling and white crystals, highly to completely weathered (deeply weathered), low hardness, intensely fractured to crushed, poorly cemented, friable						
	SPT	16, 25, 29	78								
	SPT	20, 25, 43	98								

LABORATORY TEST DATA

Boring terminated at a depth of 20 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 Figure: A-7

County Review Draft

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-9

Boring location: See Site Plan, Figure 2
Date started: 5/12/17 Date finished: 5/12/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)
Logged by: K. Samlik

LABORATORY TEST DATA

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1				SP-SC	SAND with GRAVEL and CLAY (SP-SC) yellow, medium dense, moist, medium to coarse sand				
2	S&H	9 16 11	23		SANDY CLAY with GRAVEL (CL) dark brown, very stiff, moist, fine to medium sand				
3					no gravel, stiff			14.4	118
4	S&H	3 5 8	11		LL = 28, PI = 15; see Figure B-1 LL = 20, PI = 5; see Figure B-1			15.3	110
5				CL					
6	S&H	6 11 13	20		very stiff				
7									
8									
9					SAND with CLAY (SP-SC) red-brown, dense, moist, medium sand				
10				SP-SC					
11	SPT	9 11 16	39						
12									
13					SAND with CLAY (SP-SC) red-brown, dense, moist, fine to medium sand				
14	SPT	11 12 13	36						
15									
16				SP-SC					
17									
18									
19	SPT	8 11 12	33		Particle Size Distribution; see Figure B-3		8	15.4	
20									
21					CLAY with SAND (CL) red-brown, hard, moist				
22									
23				CL					
24	SPT	8 10 13	33						
25									
26									
27									

Boring terminated at a depth of 25 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286 Figure: A-8

PROJECT: **CARLOS STREET AFFORDABLE HOUSING**
Moss Beach, California

Log of Boring B-10

Boring location: See Site Plan, Figure 2
Logged by: S. Magallon
Date started: 5/11/17
Date finished: 5/11/17
Drilling method: Hollow Stem Auger
Hammer weight/drop: 140 lbs./30 inches
Hammer type: Automatic Hammer
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	Blows/ 6"	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–3.75				CL	SANDY CLAY (CL) brown, medium stiff to stiff, moist, trace coarse, subgular gravel (FILL)						
2	S&H	4, 4, 5	8								
4	S&H	5, 11, 13	20								
3.75–8.5				CL	SANDY CLAY (CL) orange-brown, very stiff, moist						
6	S&H	6, 8, 10	15								
8.5–11.5				SP-SC	SAND with CLAY (SP-SC) red-brown to yellow-brown, medium dense, moist						
11	SPT	7, 4, 5	13		Particle Size Distribution; see Figure B-3				11	19.2	
11.5–14				CL	CLAY (CL) olive with yellow-brown, stiff, moist, trace fine-grained sand						
14–20				SP-SC	SAND with CLAY (SP-SC) yellow to yellow-brown with white grains, medium dense, moist, fine to medium gravel						
16	SPT	5, 9, 11	29								
20–20.5				SC	CLAYEY SAND (SC) yellow-brown with red-brown mottling, very dense, moist						
20.5–21.5				SP-SC	SAND with CLAY (SP-SC) yellow-brown and olive with white gaines, very dense, moist, fine- to medium-grained, trace silt						
21	SPT	12, 18, 19	53								

Boring terminated at a depth of 21.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.84 and 1.44, respectively, to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1286
Figure: A-9

County Review Draft

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	**GW**	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	**SW**	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	**ML**	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	**MH**	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		**PT**	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample

Sampling attempted with no recovery

Core sample

Analytical laboratory sample

Sample taken with Direct Push sampler

Sonic

SAMPLER TYPE

C Core barrel

CA California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter

D&M Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube

O Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

S&H Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter

SPT Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

ST Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

CLASSIFICATION CHART

Date 07/10/18 | Project No. 17-1286 | Figure A-10

County Review Draft

DRILLING NOTIFICATION FORM FOR ANNUAL GEOTECHNICAL DRILLING PERMIT

SAN MATEO COUNTY ENVIRONMENTAL HEALTH SERVICES DIVISION
2000 ALAMEDA DE LAS PULGAS, SUITE 100, SAN MATEO, CA. 94403
VOICE (650) 372-6200 FAX (650) 627-8244 WWW.SMCHEALTH.ORG

An accurate & correct map of proposed boring locations must be included with notification.

Notification is hereby given under Annual Geotechnical Drilling Permit No. AGDP-16-2247 with expiration date December 12, 2017 that Rockridge Geotechnical Inc will be drilling for soil boring geotechnical investigation only, not permanent structures or for environmental investigations, as described below.

ALL DRILLING MUST BE SCHEDULED WITH COUNTY STAFF (drilling@smcgov.org) AT LEAST TWO (2) WORKING DAYS (48 HOURS) IN ADVANCE

DRILLING WILL BEGIN ON: May 11 AT: 8 AM (AM/PM) NO. OF BORINGS ~~10~~ 9

BORING DESIGNATIONS# ~~B-1~~ B-2 through B-10

DRILLING INFORMATION (MUST BE FILLED OUT COMPLETELY)

SITE NAME Carlos Street Affordable Housing ASSESSOR'S PARCEL # (REQUIRED) 037-022-070 (one per permit)

DRILLING LOCATION ADDRESS Southeast of Intersection of Carlo and 16th Streets CITY Moss Beach ZIP 94038

Borings To Be Constructed In: ☐ Public Property ☒ Private Property ☐ Refuse ☐ Other

Maximum Proposed Depth Wells/Borings 25 (feet) Drilling Method 8-inch-outside-diameter hollow-stem augers

Boring Diameter 8 inches Grout Material: use 6 gallons water max per 94 lb cement, can add up to 5% bentonite

BORING OWNER (BORING OWNER NAME OR CONTACT NAME SHOULD MATCH SIGNATURE)

NAME California School Employees Association CONTACT PERSON Steve Brashear

ADDRESS 2045 Lundy Avenue CITY, STATE, ZIP San Jose, CA 95131-1825

TELEPHONE 408-433-1227 EMAIL sbrashear@csea.com

(Letter signed by boring owner attesting to knowledge of all permit requirements and conditions, may be substituted for signature on permit application.)

Boring Owner's Signature X Steve Brashear Date 5/3/2017

PROPERTY OWNER (NAME AS APPEARS ON ASSESSOR'S ROLES SHOULD MATCH SIGNATURE)

NAME California School Employees Association (same as above) CONTACT PERSON Same as above

ADDRESS CITY, STATE, ZIP

TELEPHONE EMAIL

I understand that a boring(s) is being installed on my property. *(Letter signed by property owner, containing previous language, or encroachment permit may be substituted for signature on permit application.)*

Property Owner's Signature Date

DRILLING COMPANY

DRILLING COMPANY Britton Exploration CONTACT PERSON Paul Britton

ADDRESS 23051 Evergreen Lane CITY, STATE, ZIP Los Gatos, CA 95031

TELEPHONE 408-355-5781 C 57 LICENSE # C57 849905 E-MAIL brittonexploration@gmail.com

I certify that borings under this notification will be constructed/destroyed in compliance with the conditions of the Annual Geotechnical Drilling Permit listed above, the San Mateo County Ordinance, and the State Water Well Standards, and that the license listed above is considered current and active by the Contractor's State License Board.

Driller's Signature Date

CONSULTANT COMPANY

CONSULTANT COMPANY Rockridge Geotechnical, Inc. PROJECT MANAGER Craig Shields

ADDRESS 270 Grand Avenue TELEPHONE # 510-420-4738

CITY,STATE, ZIP Oakland, CA 94610 E-MAIL csshields@rockridgegeo.com

I certify that this notification is correct to the best of my knowledge. I certify that the geotechnical borings under this notification will be constructed/destroyed in compliance with the conditions of the Annual Geotechnical Drilling Permit listed above, the San Mateo County Ordinance, and the State Water Well Standards. I certify if I indicated the purpose of drilling is geotechnical, then no one will use the boring to collect any samples for environmental analyses. *(Responsible Professional must be a California Professional Geologist or Civil Engineer.)*

Responsible Professional's Name (Please print legibly) Craig Shields

Responsible Professional's Signature C Shields Date 5/3/17

California Professional Geologist (PG) No. or Civil Engineer (PE) No. CE38755

Revised every January 1

DRILLING NOTIFICATION FORM FOR County Review Draft
ANNUAL GEOTECHNICAL DRILLING PERMIT

SAN MATEO COUNTY ENVIRONMENTAL HEALTH SERVICES DIVISION
2000 ALAMEDA DE LAS PULGAS, SUITE 100, SAN MATEO, CA. 94403
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BORING DESIGNATIONS# ~~B-1~~ B-2 through B-10

DRILLING INFORMATION **(MUST BE FILLED OUT COMPLETELY)**

SITE NAME Carlos Street Affordable Housing ASSESSOR'S PARCEL # (REQUIRED) 037-022-070 (one per permit)

DRILLING LOCATION ADDRESS Southeast of Intersection of Carlo and 16th Streets CITY Moss Beach ZIP 94038

Borings To Be Constructed In: ☐ Public Property ☐ Private Property ☐ Refuse ☐ Other

Maximum Proposed Depth Wells/Borings 25 (feet) Drilling Method 8-inch-outside-diameter hollow-stem augers

Boring Diameter 8 inches Grout Material: use 6 gallons water max per 94 lb cement, can add up to 5% bentonite

BORING OWNER **(BORING OWNER NAME OR CONTACT NAME SHOULD MATCH SIGNATURE)**

NAME CONTACT PERSON

ADDRESS CITY, STATE, ZIP

TELEPHONE EMAIL

(Letter signed by boring owner attesting to knowledge of all permit requirements and conditions, may be substituted for signature on permit application.)

Boring Owner's Signature **Date**

PROPERTY OWNER **(NAME AS APPEARS ON ASSESSOR'S ROLES SHOULD MATCH SIGNATURE)**

NAME Same as boring owner CONTACT PERSON

ADDRESS CITY, STATE, ZIP

TELEPHONE EMAIL

I understand that a boring(s) is being installed on my property. *(Letter signed by property owner, containing previous language, or encroachment permit may be substituted for signature on permit application.)*

Property Owner's Signature **Date**

DRILLING COMPANY

DRILLING COMPANY Britton Exploration CONTACT PERSON Paul Britton

ADDRESS 23051 Evergreen Lane CITY, STATE, ZIP Los Gatos, CA 95031

TELEPHONE 408-355-5781 C 57 LICENSE # C57 849905 E-MAIL brittonexploration@gmail.com

I certify that borings under this notification will be constructed/destroyed in compliance with the conditions of the Annual Geotechnical Drilling Permit listed above, the San Mateo County Ordinance, and the State Water Well Standards, and that the license listed above is considered current and active by the Contractor's State License Board.

Driller's Signature P. Britton **Date** 4-28-17

CONSULTANT COMPANY

CONSULTANT COMPANY Rockridge Geotechnical, Inc. PROJECT MANAGER Craig Shields

ADDRESS 270 Grand Avenue TELEPHONE # 510-420-4738

CITY,STATE, ZIP Oakland, CA 94610 E-MAIL csshields@rockridgegeo.com

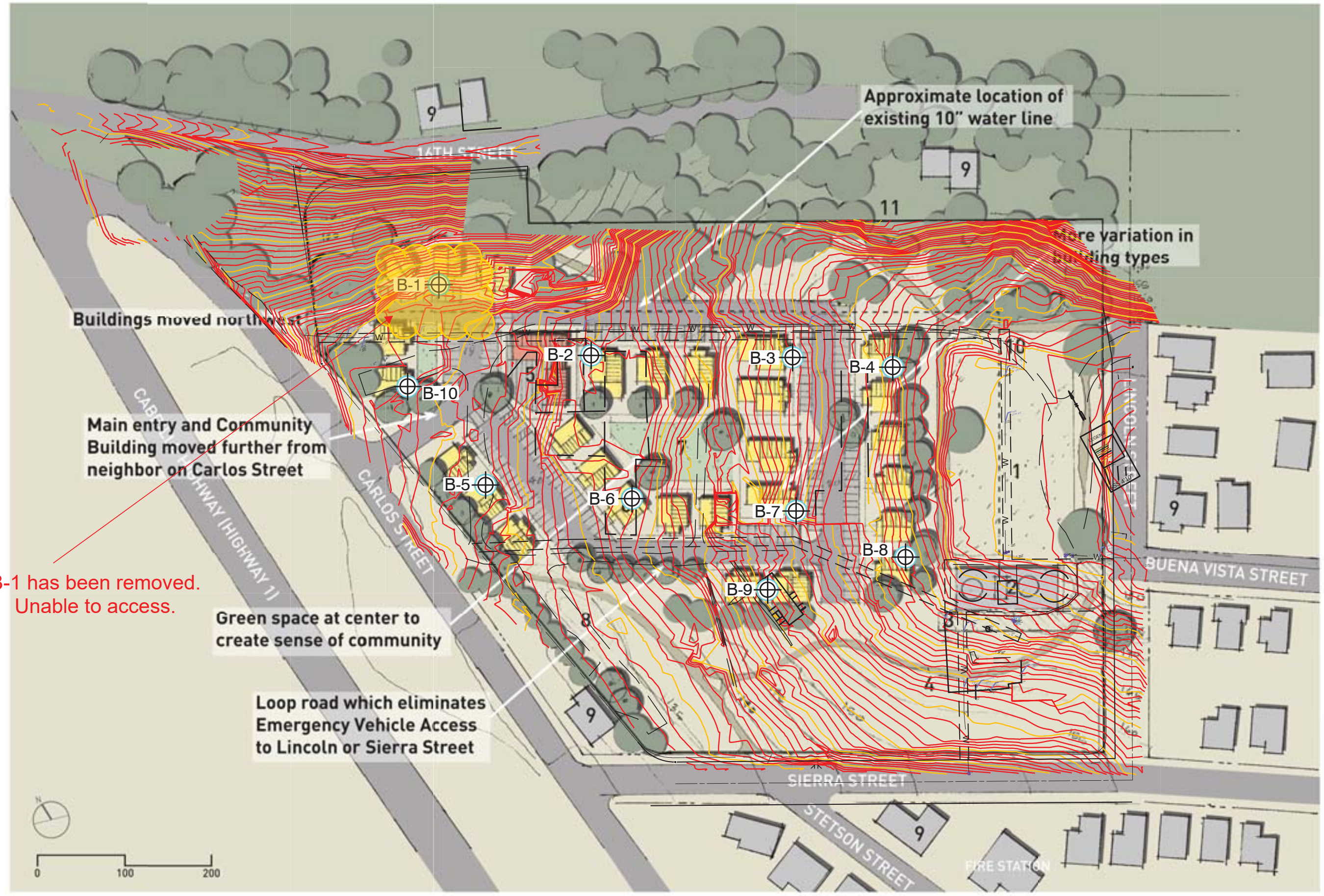
I certify that this notification is correct to the best of my knowledge. I certify that the geotechnical borings under this notification will be constructed/destroyed in compliance with the conditions of the Annual Geotechnical Drilling Permit listed above, the San Mateo County Ordinance, and the State Water Well Standards. I certify if I indicated the purpose of drilling is geotechnical, then no one will use the boring to collect any samples for environmental analyses. *(Responsible Professional must be a California Professional Geologist or Civil Engineer.)*

Responsible Professional's Name (Please print legibly) Craig Shields

Responsible Professional's Signature C. Shields **Date** 5/3/17

California Professional Geologist (PG) No. **or Civil Engineer (PE) No.** CE38755

County Review Draft



DEVELOPMENT SUMMARY

1 Bedroom: 16 21%
2 Bedroom: 37 54%
3 Bedroom: 18 25%
Total Units: 71

142 Parking Spaces
2:1 Parking

KEYED NOTES:

1. Existing field with new paths
2. Existing water tanks
3. Access to water tanks
4. New trails
5. New community building
6. New 2-story housing
7. Open space for residents
8. Storm water retention area
9. Existing homes
10. Parking reserve
11. New fence at property line

0 140 Feet
Approximate scale

EXPLANATION

B-1 Approximate location of proposed geotechnical boring by Rockridge Geotechnical Inc.

Reference: Base map from a drawing titled "Carlos Street Affordable Housing", by MidPen Housing, dated August 18, 2016.

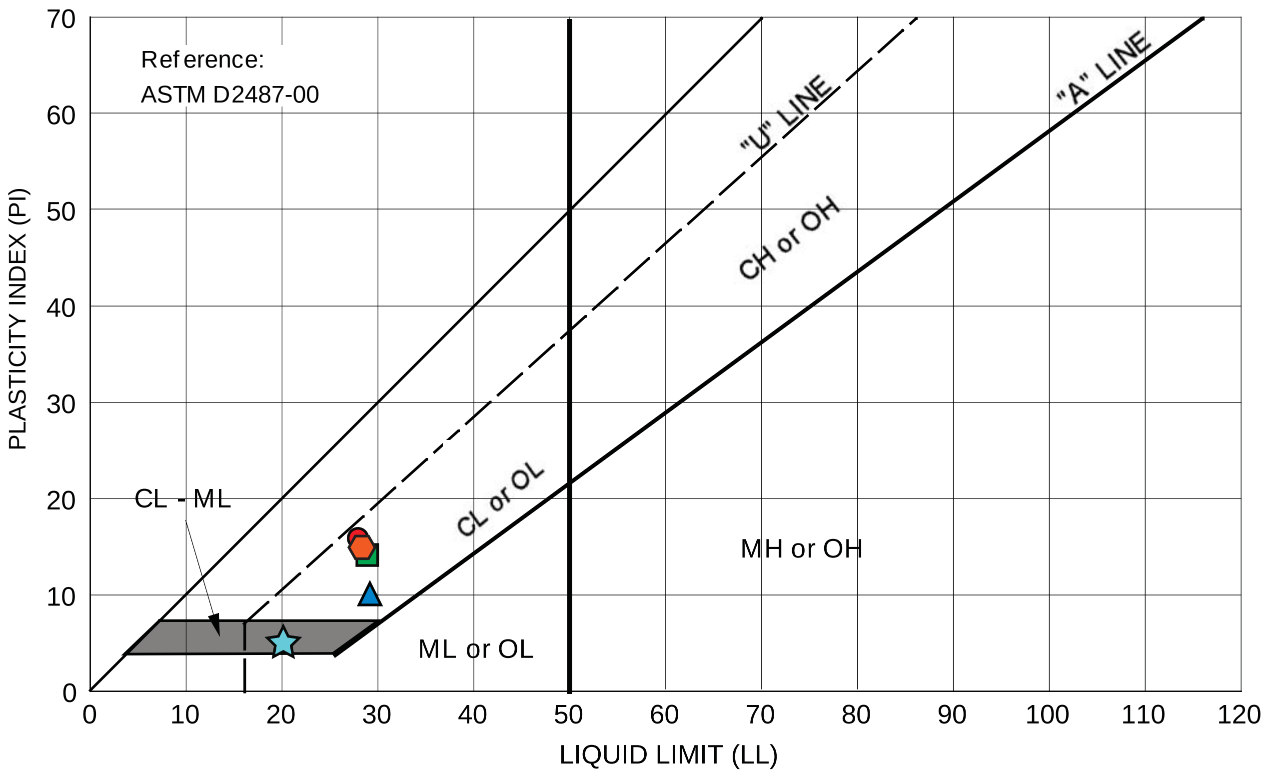
CARLOS STREET AFFORDABLE HOUSING Moss Beach, California		
SITE PLAN		
Date 04/27/17	Project No. 17-1286	Figure 1
ROCKRIDGE GEOTECHNICAL		

ROCKRIDGE GEOTECHNICAL

APPENDIX B

Laboratory Test Data

County Review Draft



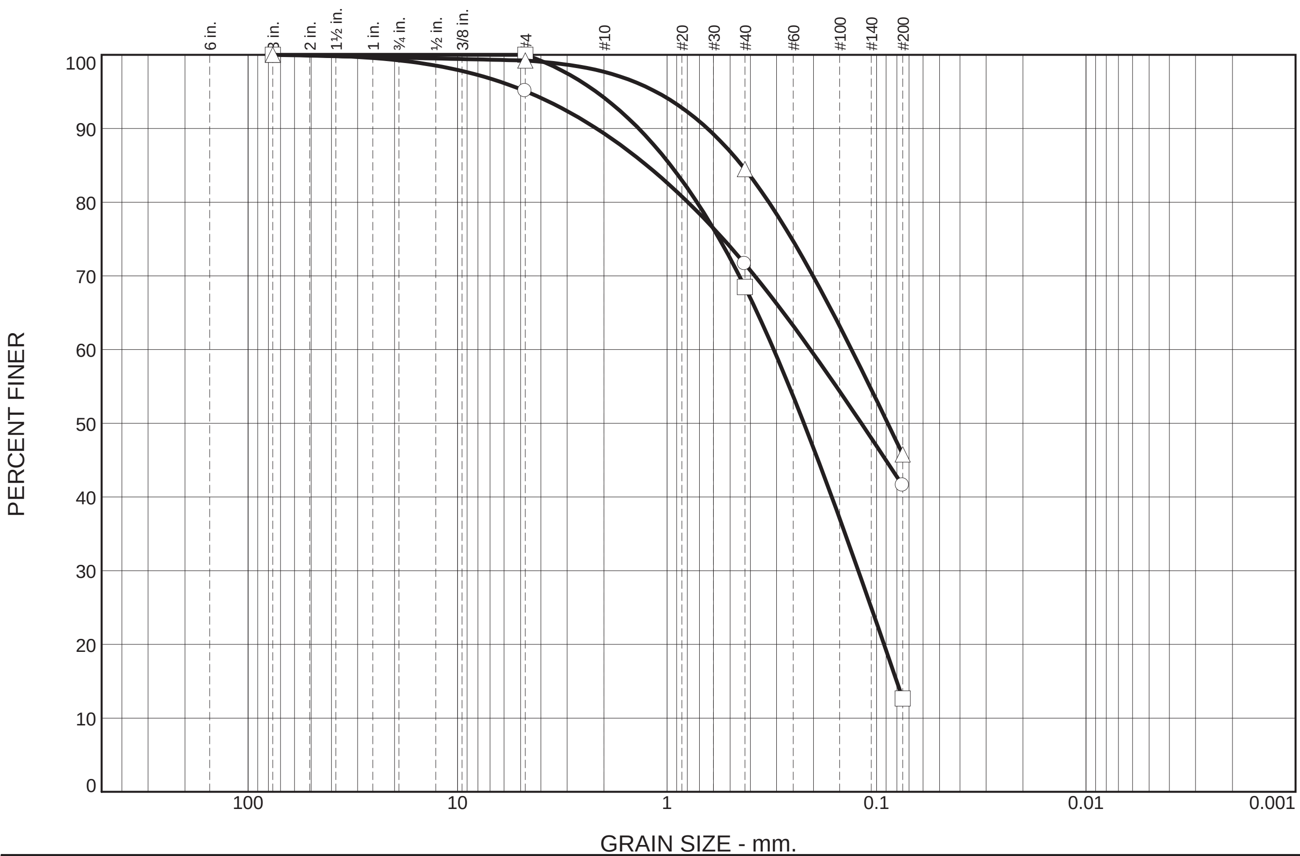
Symbol	Source	Description and Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B-2 at 6.0 feet	SANDY CLAY (CL), dark brown to black	18.9	28	11	--
▲	B-4 at 1.5 feet	CLAYEY SAND (SC), dark brown to black	10.1	29	10	--
■	B-5 at 4.0 feet	SANDY CLAY (CL), brown to red-brown	17.9	29	14	--
⬢	B-9 at 3.5 feet	SANDY CLAY with GRAVEL (CL), dark brown	14.4	28	15	--
☆	B-9 at 4.0 feet	SANDY CLAY with GRAVEL (CL), dark brown	15.3	20	5	--

CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

PLASTICITY CHART

Date 07/10/18 | Project No. 17-1286 | Figure B-1



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	DEPTH (ft.)	Material Description	USCS
○	B-4	4.0'	CLAYEY SAND, dark brown to yellow-brown with white grains	SC
□	B-5	8.0'	CLAYEY SAND, brown to red-brown	SC
△	B-6	3.0'	CLAYEY SAND, yellow-brown to brown	SC

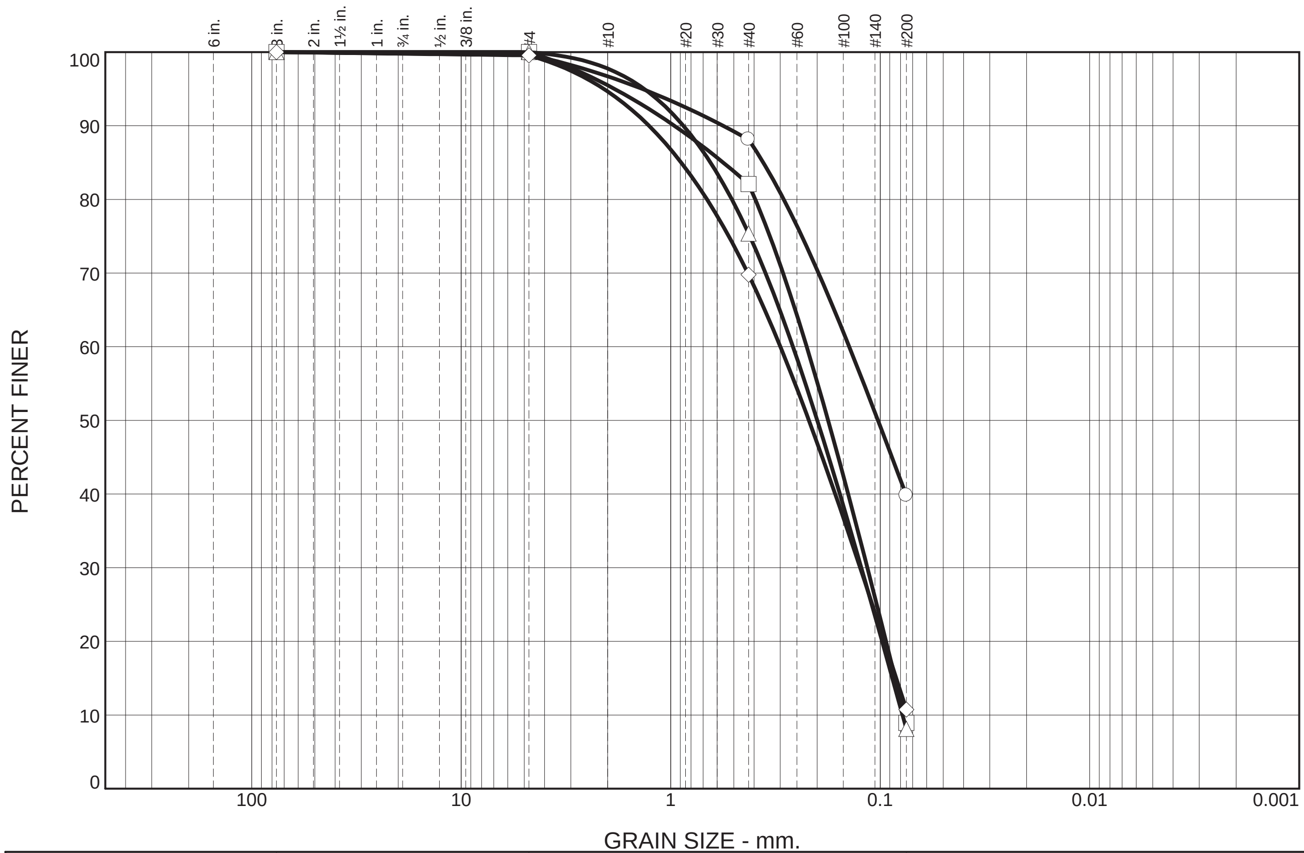
CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

PARTICLE SIZE DISTRIBUTION REPORT

Date 07/10/18 | Project No. 17-1286 | Figure B-2

County Review Draft



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay

MATERIAL DATA

SYMBOL	SOURCE	DEPTH (ft.)	Material Description	USCS
○	B-7	4.0'	CLAYEY SAND, brown	SC
□	B-7	13.5'	SAND with CLAY, dark red-brown	SP-SC
△	B-9	18.5'	SAND with CLAY, red-brown	SP-SC
◇	B-10	10.0'	SAND with CLAY, red-brown to yellow-brown	SP-SC

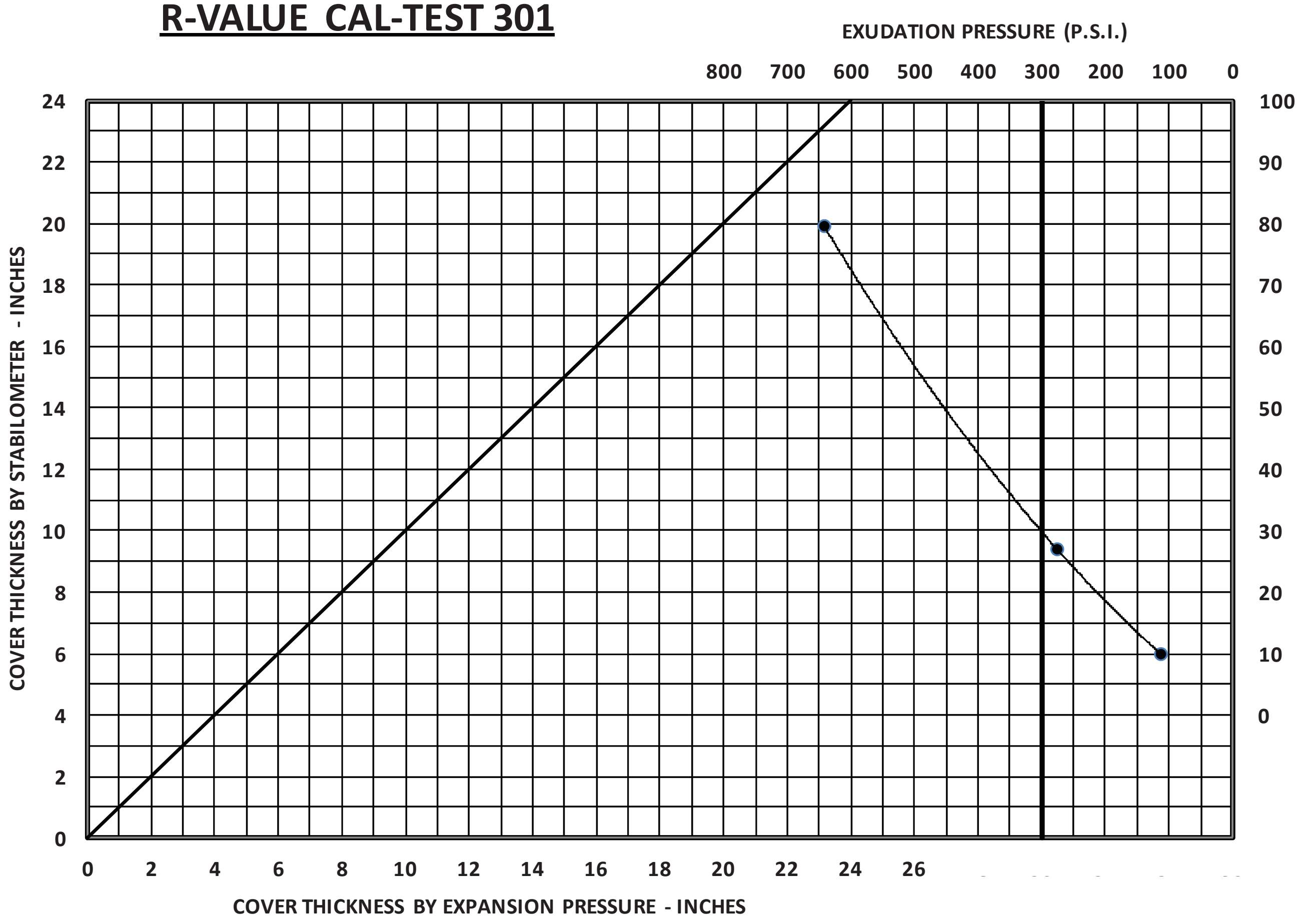
CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

PARTICLE SIZE DISTRIBUTION REPORT

Date 07/10/18 | Project No. 17-1286 | Figure B-3

R-VALUE CAL-TEST 301



Exudation psi	Compaction (psi)	Expansion (0.0001")	Expansion (psf)	Moisture %	Dry Density	Resistance Value
643	350	37	160	10.6	128.9	80
277	162	0	0	12.7	124.2	27
114	83	0	0	15.5	116.9	10

Test Results	Material Description
R-Value at 300 psi exudation pressure = 29	SANDY CLAY (CL), brown to red-brown
	Sample Source: B-5 Depth: 1-5' - 3'

CARLOS STREET AFFORDABLE HOUSING
Moss Beach, California

ROCKRIDGE GEOTECHNICAL

R-VALUE TEST REPORT

Date 07/10/18 | Project No. 17-1286 | Figure B-4

Results Only Soil Testing for Carlos Street, Moss Beach

May 22, 2017

Prepared for:
Katie Dickinson
Rockridge Geotechnical
270 Grand Ave,
Oakland, CA 94610
ksdickinson@rockridgegeo.com

Project X Job #: S170517A
Client Job or PO #: 17-1286

SOIL ANALYSIS LAB RESULTS

Client: Rockridge Geotechnical
Job Name: Carlos Street, Moss Beach
Client Job Number: 17-1286
Project X Job Number: S170517A
May 22, 2017

	Method	ASTM G187	ASTM G187	ASTM D516		ASTM D512B		SM 4500-E	SM 4500-C	SM 4500-D	ASTM G200	ASTM G51
Bore# / Description	**Depth**	**As-Rec'd Resistivity**	**Min-Resistivity**	**Sulfates**		**Chlorides**		**Nitrate**	**Ammonia**	**Sulfide**	**Redox**	**pH**
	(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(mg/kg)	(mg/kg)	(mg/kg)	(mV)	
B - 6	2	27,470	7,370	30	0.0030	84	0.0084	ND	15	2.82	152	8.36
B - 2	4	7,370	5,963	210	0.0210	156	0.0156	21	27	2.85	159	7.47

Unk = Unknown
NT = Not Tested
ND = 0 = Not Detected
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
mg/L - milligrams per liter of liquid volume
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Ernesto Padilla, BSME
Field Engineer

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
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5170517A-Rockridge-17-1286 • Carlos - 2 Full

County Review Draft

Project X
Corrosion Engineering
Corrosion Control - Soil, Water, and Metallurgy Lab

Lab Request Sheet Chain of Custody

Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com
Ship Samples To: 29970 Technology Dr, Suite 105F, Murrieta, CA 92563

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Project X Job #:	
Date:	5/16/17

Company Name:	Rockridge Geotechnical	**Contact Name:**	Katie Dickinson
		Phone No.:	5105044183
Mailing Address:	270 Grand Avenue, Oakland California	**Contact Email:**	ksdickinson@rockridgegeo.com
Accounting Contact:	Kate Schenk	**Invoice Email:**	kaschenk@rockridgegeo.com
Project Name:	Carlos street, Moss Beach		
Client Project No:	17-1286	**P.O. #:**	

	5 Day Normal	3 Day RUSH 75% mark-up	2 Day RUSH 100% mark-up
Turn Around Time:	X		

Results By: ☐ Phone ☐ Fax ☒ Email ~~☒ Mail~~ ☐ Overnight Mail (charges apply)

Received by: | **Default Method**

SPECIAL INSTRUCTIONS:

ANALYSIS REQUESTED (Please circle) | **NOTES**

#	SAMPLE ID - BORE #	DESCRIPTION	DEPTH (ft)	DATE COLLECTED	CORROSION SERIES (Min. Resistivity, Sulfate, Chloride, Sulfide, Redox, pH, Ammonia, Nitrate, Bicarbonate)	Soil Resistivity (Caltrans CTM643 / ASTM G57 / ASTM G187)	pH (Caltrans CTM643 / AASHTO T 289 / ASTM G 51)	Sulfate (Caltrans CTM417 / AASHTO T 290 / ASTM D516)	Chloride (Caltrans CTM422 / AASHTO T 291 / ASTM D512B)	Redox Potential (SM 2580B)	BiCarbonate (SM 2320B)	Alkalinity (SM 2520B)	Acidity (SM 2510B)	Nitrate (SM 4500-NO3 / Hach 835)	Ammonia (SM 4500-NH3 / Hach 830)	Sulfide (SM 4500-S2 / SM 4500-S2)	Moisture Content (ASTM D2216)	Soil Corrosivity Evaluation Report	Metallurgical Analysis	NOTES
1	B-6	Dark brown clay	2	5/11/17	X															
2	B-2	Orange brown sandy clay	4	5/11/17	X															
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				