Appendix D

Geotechnical Investigations

Appendix D-1

Preliminary Geotechnical Exploration

SCOTTS VALLEY DEVELOPMENT
VALLEJO, CALIFORNIA

PRELIMINARY GEOTECHNICAL EXPLORATION

SUBMITTED TO
Ms. Bibiana Sparks
Acorn Environmental
5170 Golden Foothill Parkway
El Dorado Hills, CA 95762

PREPARED BY
ENGEO Incorporated

June 19, 2024
Latest Revision June 27, 2024

PROJECT NO.
16484.000.001

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Expect Excellence

Project No.
16484.000.001

June 19, 2024
Latest Revision June 27, 2024

Ms. Bibiana Sparks
Acorn Environmental
5170 Golden Foothill Parkway
El Dorado Hills, CA 95762

Subject: Scotts Valley Development
Admiral Callaghan Lane and Columbus Parkway
Vallejo, California

PRELIMINARY GEOTECHNICAL EXPLORATION

Dear Ms. Sparks:

At your request, we have prepared this preliminary geotechnical report for the Scotts Valley Development in Vallejo, California. Our services were performed as outlined in our agreement dated March 7, 2024. We understand that the site is planned for mixed use development; current conceptual plans include a combination of residential lots, administrative buildings, and commercial buildings, along with associated site improvements. At this time, the details have not been finalized.

Based on our preliminary findings, it is our opinion from a geotechnical viewpoint that the site is suitable for the proposed development, provided that the recommendations contained in this report are incorporated into planning, and that a design-level, site-specific geotechnical exploration is performed to develop design recommendations.

The main geotechnical and geologic considerations at the site include landslides and the stability of natural slopes; expansive soil; excavation and rippability of strong in-place bedrock units where grading and development areas are planned; potentially compressible alluvium and colluvium; undocumented fill; the presence of natural springs and drainages; and other hydrogeologic conditions at the site. This report discusses our conclusions and preliminary findings regarding these considerations.

We trust that this document provides geotechnical guidance appropriate for the current planning process. 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

Anne Robertson, PE

Theodore P. Bayham, GE, CEG

J. Brooks Ramsdell, CEG

awr/jbr/tbp/ar

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

We prepared this preliminary geotechnical report to identify potential geologic hazards and provide preliminary geotechnical, geologic, and hydrogeologic characterization of the Scotts Valley Development in Vallejo, California.

As outlined in our agreement dated March 7, 2024, you authorized us to conduct the following scope of services.

- Review available geologic and hydrogeologic literature for the site and the provided site plans
- Review the previous geotechnical report prepared by KC Engineering for the neighboring parcel (Lee Property) located east of the site, north of Columbus Parkway (2021)
- Perform a subsurface field exploration consisting of infiltration testing, borings, and test pits
- Conduct laboratory testing of representative soil samples
- Assess hydrogeologic conditions at the site
- Develop preliminary recommendations and conclusions
- Prepare this preliminary geotechnical report

For our use, we received a conceptual site plan prepared by Steelman Partners, dated May 24, 2024, and schematic grading plans for Alternatives A, B, and C prepared by Kimley Horn, dated June 27, 2024 (see Section 1.3).

This report was prepared for the exclusive use of our client and their consultants for the design of this project. If 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

The project site is approximately 160 acres in size, and it is located at the northeastern corner of Interstate 80 (I-80) interchange with Columbus Parkway in Vallejo, California. The Assessor's Parcel Numbers (APNs) for the site include APNs 0812-010-010 and 0812-020-020, 0812-020-080, and 0812-020-010. The property is bordered to the south and west by the Solano Bike Pathway and I-80, to the north by the western ridge of Sulphur Springs Mountain, to the east by privately owned open space including a water tower, and to the south by Columbus Parkway. Access to the site is provided through a bicycle path located at the southwestern corner of the site and through a locked gate.

Figure 1 displays a site Vicinity Map. Figures 2A and 2C show site boundaries, proposed grading limits, exploratory locations, surface geology, and spring locations based on our geotechnical and geologic explorations. Figures 2B and 2D show proposed development locations and surface geology.

1.3 PROJECT DESCRIPTION

The conceptual site plans for the project depict three potential layout alternatives, as described below. Site improvements are also planned for each of the alternatives, including paved streets and parking areas, pedestrian pathways and sidewalks, landscaping, bioretention areas, and below-grade utilities. Planned developments at the site are primarily located on APN 0812-010-010, which in this report is referred to as "development area." This area is shown in black in Figures 2A through 2D.

Alternative A – Proposed Project

- Tribal housing and administrative buildings in the northern portion of the development area
- Eight-story casino structure with parking levels, restaurants, bars, and a ballroom/event space in the central portion of the development area
- A planned borrow area to accommodate approximately 165,000+/- cubic yards (cyds) of cut

Alternative B – Reduced Intensity Alternative

- Eight-story casino structure with parking levels, restaurants, bars, and a ballroom/event space in the central portion of the development area
- A planned borrow area to accommodate approximately 165,000+/- cyds of cut

Alternative C – Non-Gaming Alternative

- Tribal housing and administrative buildings in the central portion of the development area
- Hotel parcels and commercial buildings in the southern portion of the development area
- At-grade parking areas
- Planned borrow areas to accommodate approximately 295,400+/- cyds of cut

The proposed development areas for the gaming and non-gaming alternatives are shown in Figures 2B and 2D, and in Exhibits 1.3-1 through 1.3-3.

EXHIBIT 1.3-1: Alternative A – Proposed Project

EXHIBIT 1.3-2: Alternative B – Reduced Intensity Alternative

EXHIBIT 1.3-3: Alternative C – Non-Gaming Alternative

We understand that the proposed development alternatives may be subject to change during the project planning process. A structural plan was not provided to us for our review prior to preparation of this report. This report addresses the primary geologic and geotechnical concerns for the project as they relate to the referenced project planning documents.

2.0 FINDINGS

2.1 SITE BACKGROUND

The project site is located within a historical quarry and mining area. One prominent mercury mining site, St. John's Mine, is located approximately 1 mile northeast of the site, on the northern ridge of Sulphur Springs Mountain. We understand that St. John's Mine is no longer active. The project site itself has historically been used as a quarry, and existing tailings piles from quarry activities have been identified near the center of the site.

2.2 REGIONAL GEOLOGY

The project site lies on the eastern edge of the Coast Range Geomorphic Province. The region is characterized by numerous northwest-trending thrust faults, including the Lake Herman, Sky Valley, and Green Valley Faults (Graymer et al., 1999). The project site is primarily underlain by Cretaceous and Jurassic age Great Valley sedimentary rocks. Along the ridge to the northeast and along the eastern edge of the site, Great Valley rocks are overridden by a thrust-block of Jurassic Coast Range Ophiolite sequence silica-carbonate rock (Bezore et al., 1998, Graymer et al., 1999). The contact between the silica-carbonate rock and underlying Great Valley Rocks is mapped by Graymer et al. as a partially concealed thrust fault trace of the Lake Herman Fault, which transects the northeastern portion of the site (1999). It is not known to be active.

Published maps of the site by USGS and CGS also note that the area is characterized by expansive landslides through both silica-carbonate rock and Great Valley Sequence rock on the southern slope of Sulphur Springs Mountain (Bezore et al, 1998, Graymer et al., 1999).

We present a regional geologic map of the site in Figure 3.

2.3 REGIONAL SEISMICITY

The site is in a seismically active area that contains numerous faults. Small earthquakes occur every year in the Bay Area region and larger earthquakes have been recorded and can be expected to occur in the future. Faults have been cataloged and mapped by the United States Geological Survey (USGS) in the Quaternary Fault and Fold Database of the United States. An active fault is defined by the California Geologic Survey as one that experienced surface displacement within Holocene time (about the last 11,700 years) (CGS, 2018). Figure 4 shows the approximate locations of known active faults, along with other Quaternary faults, based on the USGS Quaternary Fault and Fold Database, as well as significant historical earthquakes recorded within the Bay Area region. We note that the Lake Herman Fault, which transects the site, is not characterized as an active fault.

To identify nearby faults that may generate strong seismic ground shaking at the site, we used the USGS Earthquake Hazard Toolbox and the 2018 National Seismic Hazard Model (NSHM) to perform a disaggregation of the seismic hazard at the peak ground acceleration (PGA) and at spectral periods up to 3 seconds for a return period of 2,475 years. The resulting faults are listed in Table 2.3-1.

TABLE 2.3-1: Faults Considered Capable of Producing Strong Ground Shaking at the Site*
Latitude: 38.144326 Longitude: -122.215092

SOURCE NAME	RUPTURE DISTANCE, R_{RUP} (km)	(mi)	MOMENT MAGNITUDE, M_W
Green Valley (3)	13.6	8.4	7.08
Contra Costa (Lake Chabot) [2] (1)	1.6	1.0	6.94
West Napa (6)	3.4	2.1	6.94
Contra Costa (Connected) [1] (0)	2.1	1.3	7.11
Contra Costa (Vallejo) [2] (1)	3.7	2.3	6.95
Franklin (5)	6.4	4.0	7.07
Hayward (North) (6)	19.5	12.1	8.05
Great Valley 4b (Gordon Valley)	20.9	13.0	7.20
Green Valley (6)	13.7	8.5	7.00
San Andreas (Peninsula) (15)	48.1	29.9	8.05

*Based on USGS Earthquake Hazard Toolbox: NSHM Conterminous U.S. 2018

These results represent known fault sources contributing at least 1 percent to the seismic hazard at the site considering spectral periods ranging from the PGA to 1 second for the given return period. The rupture distances (R_{RUP}) and mean moment magnitudes (M_W) listed are based on values assigned according to the 2018 NSHM, and the numbers in parentheses after the fault names correspond to fault subsections assigned by the NSHM. Note that the above fault table is not an exhaustive list and other faults in the region may generate seismic shaking at the project site.

In 2014, the Working Group on California Earthquake Probabilities estimated the 30-year likelihood of one or more M_W 6.7 or greater earthquake events in the San Francisco Bay Area region at approximately 72 percent, considering the known seismic sources in the region.

2.4 REVIEW OF HISTORICAL AERIAL PHOTOGRAPHS

We reviewed available historical stereographic aerial photographs covering the site from years between 1937 to 1987. We also reviewed available Google Earth imagery covering the site between the years of 1993 to 2024.

Based on our review, the site has remained relatively undeveloped since the earliest photographs covering the site. The existing springs and one of the existing transmission lines present at the site are visible in the 1937 photographs. A fill slope was constructed along a portion of the western boundary of the site associated with I-80 in the 1950's. This fill was later expanded towards the east with the widening of I-80 in the 1960's. The I-80 and Highway 37 interchange was upgraded sometime in the 1970's, and during this grading the knoll located at the southwest corner of the site was cut down to it current elevation by removing over 60 feet of material. Based on our review of the aerial photos, it appears the water tank located just east of the site was constructed sometime between 1987 and 1993.

Several of the large bedrock landslides mapped and discussed in more detail later in this report are visible in the stereographic aerial photographs covering the site.

2.5 2021 GEOTECHNICAL REPORT FOR NEIGHBORING PROPERTY

We reviewed an available geotechnical report prepared by KC Engineering (2021) for the neighboring Lee Property, located east of the project development area and immediately north of Columbus Parkway. The KC Engineering report included their findings, conclusions, slope stability analysis, and recommendations, which are summarized as follows.

- Clayey colluvium and alluvium deposits up to 24 feet thick were encountered in the central and southern portions of the site. These were found to be highly expansive and to have R-values of 5 or less.
- Groundwater was encountered at two exploration locations at depths of 20 feet and 8½ feet.
- The northern and eastern portions of the site are underlain by landslide deposits.
- KC Engineering performed slope stability analyses of the landslide to the north of the site. Their analysis concluded that the landslide area could potentially be stabilized by construction of an earthwork buttress at the toe. The buttress considered in the analysis was approximately 250 feet wide and 90 feet tall and included removal of some of the landslide deposits.

ENGEO scope for this report does not include a geotechnical review of the work performed by KC Engineering for the adjacent property. Thus, we cannot render our opinion on their analysis and design recommendations in this report. The KC Engineering study is not intended to be used for the Scott Valley development project.

2.6 FIELD EXPLORATION

We conducted a surface and subsurface exploration of the development area between April 9 and April 24, 2024, which included drilling 3 borings, excavating 24 test pits, and conducting 6 infiltration tests at various locations shown in the Site Plan, Figures 2A and 2C. We also performed geologic field mapping concurrently.

The locations of our explorations are approximate and were estimated using coordinates taken on site using Google Earth; they should be considered accurate only to the degree implied by the method used. The exploration elevations were estimated from the project LiDAR data and should be considered accurate only to the degree implied by the method used. All elevations in this report refer to the North American Vertical Datum of 1988 (NAVD 88) unless otherwise specified.

2.6.1 Borings

We observed drilling of three borings at the locations shown in the Site Plan, Figures 2A and 2C. An ENGEO representative observed the drilling and logged the subsurface conditions at each location. We retained a track-mounted CME-55 drill rig and crew to advance the borings. Boring 1-B1 was advanced using 5-inch mud-rotary drilling and HQ wireline coring methods. Boring 1-B2 was advanced using 8-inch hollow-stem auger drilling methods. Boring 1-B3 was advanced using solid-flight auger and dry-coring methods. The borings were advanced to depths ranging from 43 to 75½ feet below existing grade. Boring 1-B3 was terminated at a depth of 60 feet, the maximum depth of the drillers' equipment. We permitted and backfilled the borings in accordance with the requirements of Solano County Environmental Health Division.

We obtained bulk soil samples from drill cuttings and retrieved disturbed samples at various intervals in the borings using standard penetration tests and Modified California samplers.

The standard penetration resistance test (SPT) blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch outside diameter (O.D.) split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. In addition, 2½-inch inside diameter (I.D.) samples were obtained 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 foot of penetration; the blow counts have not been converted using any correction factors. When sampler driving was difficult, penetration was recorded only as inches penetrated for 50 hammer blows.

The boring and core logs depict subsurface conditions at the boring locations during the exploration; however, subsurface conditions may vary with time. The boring logs are included in Appendix A.

2.6.2 Test Pits

We observed excavation of 24 test pits at the locations shown in the Site Plan, Figures 2A and 2C. An ENGEO representative observed the test pit excavation and logged the subsurface conditions at each location. We retained a subcontractor using a track mounted Bobcat 325 excavator to dig the test pits using an 18-inch-wide bucket and logged the type, location, and uniformity of the underlying soil and rock. The maximum depth penetrated by the test pits was 8 feet.

We obtained bulk soil samples from test pits using hand-sampling techniques. The test pit logs present descriptions and photos of the subsurface conditions encountered.

The logs depict subsurface conditions at the test pit locations during the exploration; however, subsurface conditions may vary with time. The test pit logs are included in Appendix A.

2.6.3 Infiltration Tests

Photo 2.6.3-1: Infiltration Field Set-Up

We performed six field infiltration tests within the development area on April 9, 2024, using a Modified Philip Dunne (MPD) Infiltrometer. The MPD tests were performed in general conformance with ASTM D8152-18. Test methods included scarifying the ground surface soil, removing vegetation, and embedding a graduated cylinder to a depth of 2 inches. We covered the test apparatus with an umbrella to prevent it from overheating. The cylinder was filled with approximately 1 gallon of water, and a head drop (fall in the water level in centimeters) was recorded over time.

The raw infiltration data is included in Appendix B. Note that some of the tests show a NULL output due to insufficient elevation head loss over the duration of the test (head loss must be greater than 10 cm over the duration of the test to show a result). At these locations, we analyzed output results provided and assessed the soil type at each location to develop the range of preliminary design infiltration rate values provided below. The field-measured infiltration rates and preliminary recommended range of design infiltration rates are summarized in the table below. No factors of safety or correction factors have been applied.

TABLE 2.6.3-1: Preliminary Design Infiltration Rates

TEST LOCATION	TEST METHOD	USCS SOIL TYPE	FIELD MEASURED INFILTRATION RATE (inch/hour)	PRELIMINARY DESIGN INFILTRATION RATES (inch/hour)
1-MPD1	MPD	CL	0.0*	0.0*
1-MPD2	MPD	SC	1.05	0.8 - 1.0
1-MPD3	MPD	CL	0.0*	0.0*
1-MPD4	MPD	SC	3.10	2.5 - 3.0
1-MPD5	MPD	SC	0.54*	0.4 - 0.5*
1-MPD6	MPD	CL	0.03*	0.00 - 0.03*

** indicates NULL output in Upstream Technologies Infiltration Report*
CL – Lean Clay
SC – Clayey Sand

2.6.4 Geologic Field Mapping

During our field explorations, an ENGEO geologist observed and mapped the surface conditions and visible geologic features in the development area. We include our preliminary map of surface geology in the Site Plan, Figures 2A and 2C.

2.7 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate some of their engineering properties. For this project, we performed moisture content, dry density, grain size analysis, plasticity index, hydrometer testing, and limited strength testing. Moisture contents, dry densities, and unconfined compressive strengths are recorded on the boring logs in Appendix A; other laboratory data is included in Appendix C.

2.8 SURFACE CONDITIONS

The topography of the development area is generally hilly and hummocky. The northeastern portion is characterized by a relatively steep hillside at the base of Sulpher Springs Mountain, which slopes towards the southwest. The remainder of the development area consists of gentle hills and hummocks formed from eroded and/or cut bedrock ridges. Development area elevations range from approximately Elevation 800 feet (NAVD 88) in the northeastern corner near Sulpher Springs Mountain to Elevation 130 feet in the southeastern corner. We observed the following site features during our reconnaissance.

- Cattle are present in the development area and the property is currently used for grazing.
- Two spring-fed stream channels traverse the development area, flowing in parallel towards the southwest. Both channels culminate in the lowlands near the southeastern corner of the site in a wetland. Water was flowing through both channels at the time of our reconnaissance.
- Two Pacific Gas & Electric (PG&E) transmission lines and associated easements traverse the site north to south; one along the western boundary, and the other cutting through the northeastern corner of the site.

- The site is generally covered with seasonal grasses and low shrubs. More dense and green vegetation is located along the spring fed stream beds.
- An existing water tank borders the eastern boundary of the development area. The surrounding concrete basin and metal fence encroach on the project development area by approximately 50 feet.
- Several existing dirt roads and tire tracks are present traversing the site. These cross the existing stream beds and wetlands. Access from the entrance at the southern end of the site requires crossing at least one of the streams.
- The stream to the north has been channelized into a corrugated metal pipe culvert beneath one of the dirt access roads.

Please refer to the Site Plan, Figures 2A and 2C, for more information on site features.

2.9 SUBSURFACE CONDITIONS

Preliminary geologic mapping is included in Figures 2A and 2C, based on findings from our exploration, geologic reconnaissance, and examination of aerial photography. We also present two preliminary geologic cross-sections which extend below the proposed development areas in Figure 5. Our interpretation of the main geologic units identified within the development area is summarized below.

2.9.1 Artificial Fill (af)

Relatively thin artificial fill deposits, possibly associated with previous mining activities, was encountered in Test Pits 1-TP12 and 1-TP14 near the center of the development area, below the historical quarry area. The fill ranged from 1 to 4 feet deep in Test Pits 1-TP12 and 1-TP14, respectively. This fill consisted of silty gravel and very soft to medium stiff gravelly fat clay.

Thicker artificial fill is present to the west of the project site, along the I-80 corridor.

2.9.2 Colluvium - Qc (Holocene)

In our explorations, we identified colluvial deposits within swales on the lower flanks of hill slopes, and in topographic low-lying areas. Colluvium is generally considered of medium stiff to very stiff clay with variable amounts of gravel and sand. Some deposits were soft in the upper 3 feet. The thickness of colluvium encountered during our exploration ranged from 2½ to greater than 8 feet in our test pits, and up to 13 feet in our borings.

2.9.3 Alluvium – Qal (Holocene)

In our explorations, we identified alluvial deposits in the areas along and surrounding the drainages in the development area. Alluvium in the development area varies from sandy lean clay to fat clay with gravel. The alluvial deposits are typically moist and range from very soft to very stiff. We found colluvium and alluvium interlayered in the low-lying areas of the development area. We anticipate that depths of interlayered deposits of colluvium and alluvium may exceed 20 feet in the west-central portion of the development area. Saturated clay soil may be potentially compressible and may exhibit high settlements when subjected to building loads.

2.9.4 Landslides (Qls)

We reviewed historical stereoscopic aerial photographs from various years, published geologic maps by Bezore et al. (1998) and Graymer et al. (1999), landslide hazard maps by Manson (1988), documentation by Caltrans, site topographic maps, and our field exploration data to estimate the extents of existing landslides at the site.

We identified four landslides, which are numbered for discussion on the Site Plan, Figures 2A and 2C. Two of these, Hunter Hill Landslide and the Eastern Landslide Complex, are critical to project planning and development due to their location relative to the proposed structures and site improvements. These landslides are identified as Landslide 1 and Landslide 3, respectively. Landslide 2 (mapped as possible landslide feature) should be considered in project planning because of its relationship to proposed access roads. These three landslides are discussed in detail in the following sections.

2.9.4.1 Hunter Hill Landslide

Hunter Hill Landslide (Landslide 1) is a deep-seated landslide through Great Valley Sequence bedrock located on the northwestern portion of the development area. It crosses I-80, and is estimated to be approximately 1,300 feet long, 600 feet wide, and approximately 60 feet deep on average (Caltrans, 2005). Ongoing roadway distress and cracking in the Solano Bike Pathway indicate continued creeping movement of the landslide, with rates increasing during wet years. Inclinometers installed by Caltrans near the landslide showed movement below I-80, approximately 30 feet below the roadway surface between 2003 and 2005 (Caltrans, 2005). At Boring 1-B3, we encountered landslide deposits through the full depth of our exploration; we therefore interpret the landslide plane depth at this location to be greater than 60 feet.

According to documentation by Caltrans, a vertical drainage gallery was partially constructed in 1990 through the existing landslide near the bike path to reduce water pressures in the landslide, at the approximate location shown in Figures 2A and 2C. The drainage gallery was planned to consist of vertical sand drains 3 feet in diameter, approximately 53 feet deep, and spaced at 6 feet on-center, interconnected at the bottom by overlapping bells. It was intended to be drained to the southwest under I-80 by a horizontal perforated pipe (Caltrans, 1988). The bottom drain from the drainage gallery was never completed due to the presence of hard rock and difficult drilling conditions. The as-built depth and lateral extent of the gallery are not known, but these are expected to be less than the planned dimensions due to early termination of the project (Caltrans 1990a, 1990b). Therefore, an elevated water table may still be present in this area of the landslide. Groundwater depth fluctuates between approximately 10 and 14 feet below ground surface near the gallery (Caltrans, 2005). We did not observe the drainage gallery during our site reconnaissance.

2.9.4.2 Landslide 2 (mapped as possible landslide feature)

The area labeled as Landslide 2 (mapped as possible landslide feature) is along a ridgeline of outcropping silica-carbonate rock. The ridge is situated in the northeastern portion of the site, immediately to the east of the Lake Herman thrust fault. We consider this geomorphic feature a possible slide, which may have detached from upslope silica-carbonate bedrock, and moved towards the south-southwest; however whether this is an actual landslide hazard or not is unknown. Furthermore, based on our preliminary assessment of this feature and the proposed access roads, we believe there is a low risk of reducing stability in these areas, provided that minimal cuts and fills (less than 5 feet deep) are associated with access road grading. If necessary, further evaluation of this possible landslide could be conducted as part of design-level geotechnical study.

2.9.4.3 Eastern Landslide Complex

Published geologic maps indicate a large landslide partially underlying the eastern portion of the project development area, which we refer to in this report as the Eastern Landslide Complex (Landslide 3). The Eastern Landslide Complex is more than 350 acres in area and contains numerous nested landslide planes and source areas. Published geologic maps disagree on the exact extents of this landslide complex. The western boundary of the Eastern Landslide Complex shown in Figures 2A and 2C is based on our site-specific field investigation and may be used for project planning purposes. The southern boundary of the Eastern Landslide Complex is mapped as extending into the neighboring Lee Property (KC Engineering, 2021).

At its western boundary, the Eastern Landslide Complex abuts two ridges comprised of silica-carbonate rock. Based on the results of our preliminary field mapping, we consider these ridges to be in place. The depth and full extent of the landslide deposits between the ridges is not fully constrained. We encountered landslide deposits consisting of highly sheared and altered shale at Boring 1-B1 to the full exploration depth of 75½ feet.

2.9.5 Bedrock

Much of the project development area is underlain by relatively shallow bedrock with a thin (approximately 1 to 3 feet thick) residual soil cap over bedrock. The bedrock units encountered during our exploration are consistent with those mapped by Bezore et al. (1998) and Graymer et al. (1999) and include Early to Late Cretaceous Great Vally Sequence (Kgv), and Jurassic Coast Range Ophiolite Sequence silica-carbonate rock (sc).

Great Valley Sequence rock underlies the western portion of the development area, and consists of Cretaceous age sandstone, siltstone, shale, and minor conglomerates. Great Valley Sequence rocks encountered in our explorations included moderately to slightly weathered, moderately strong to strong siltstone, shale, and sandstone. Shale and siltstone bedding was generally very thin to thin. Local areas of weak to very weak rock, with localized areas of intense shearing and fractures and increased weathering, were observed within landslide areas and near the Lake Herman thrust fault.

Silica-carbonate (sc) rock makes up the hanging wall of the Lake Herman thrust fault on the eastern portion of the development area. Silica-carbonate rock is formed from altered ultramafic rock of the Jurassic-age Coast Range Ophiolite Sequence. Coast Range Ophiolite rocks also locally contain basalt, gabbro, serpentinite, and pyroxenite.

2.10 GROUNDWATER

During our field exploration, we encountered groundwater in Boring 1-B2 at a depth of 14 feet below the existing ground surface within Great Valley Sequence rock. Water was not encountered in Boring 1-B3 to final depth of the boring (60 feet). The depth to groundwater in Boring 1-B1 was obscured due to the drilling method used; however, the partially stabilized groundwater table was recorded at 11 feet below the ground surface at the beginning of the second day of drilling. Reports from Caltrans indicate that groundwater depths near the drainage gallery (shown in Figures 2A and 2C) fluctuate seasonally between depths of approximately 10 to 14 feet (Caltrans, 2005).

We also observed surface water flowing from springs and then down the existing drainages across the development area.

Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made. We include a draft assessment of the hydrogeologic conditions at the development area, which we published on May 2, 2024, in Appendix D.

3.0 PRELIMINARY GEOTECHNICAL CONCLUSIONS

From a geotechnical engineering viewpoint, in our opinion, the development area is conditionally feasible for the proposed development, provided the geotechnical recommendations in this report are properly incorporated into project planning and that a design-level, site-specific geotechnical exploration is performed to develop design recommendations.

The main geotechnical and geologic considerations at the development area include landslides and the stability of natural slopes, expansive soil, excavation and rippability of strong in-place bedrock units where grading and development areas are planned, potentially compressible alluvium and colluvium, undocumented fill, the presence of natural springs and drainages, and other hydrogeologic conditions at the site. The following sections of this report discuss our preliminary findings and conclusion.

3.1 LANDSLIDES

As previously described in Section 2.9, there are several deep-seated bedrock landslides that we observed and mapped within the development area. These landslides may impact and damage the proposed development and improvements if not properly addressed. The current conceptual site plan depicts some of the proposed development areas to be situated adjacent to existing deep-seated landslides.

It is our experience that there are numerous mitigation approaches to stabilizing landslide hazards, which each pose various risks to the planned development areas. To determine suitable and feasible stabilization methods for a given landslide, project constraints should be considered. These may include property boundaries, existing structures and site improvements, sensitive vegetation, and habitat areas, etc. Depending on the landslide location, depth, and activity level (ancient, dormant, or actively moving landslide) with respect to planned development areas, there may be increased risk during construction of repairs where destabilization could trigger movement of the landslide. This risk is especially present during repair efforts at the toe of a landslide, as excavation at the toe reduces the resisting force of the landslide.

Some feasible repair concepts for landslides may include:

- Partial or full landslide removal and reconstruction
- Filling along lower portions to create buttress and catchment areas
- Reducing the driving force of the landslide by removing mass along the landslide crest and rebuilding the upper portion to protect development areas
- Dewatering measures
- Structural solutions to retain or strengthen weak landslide materials

In general, it is possible to reduce construction risk by taking measures to stabilize the slope throughout construction, using methods such as dewatering the slope, buttressing the landslide toe, and unloading the landslide crest. In contrast, construction methods that decrease slope stability may increase construction risk, such as excavating cut near the landslide toe, adding mass to the landslide crest, or allowing additional water to enter the slope.

Where repairs are not feasible, then hazard avoidance, safe setbacks for development areas and protective measures may be considered. Based on the relationship of the various landslides to planned development areas, a variety of these repair concepts may be planned for the planned development areas as described in this report in Table 3.1-1.

TABLE 3.1-1: Landslides Adjacent to the Proposed Development

LANDSLIDE	TYPE	DESIGN RECOMMENDATIONS
1	Deep-Seated Translational Bedrock Landslide	Corrective grading, OR Setback from crest, OR Structural retention
2	Possible Deep-Seated Translational Bedrock Landslide *	Minimal Grading For Access Roads Crossing Lower Portion OR None if avoided
3	Deep-Seated Translational Bedrock Landslide	Setback from toe AND/OR Corrective grading AND/OR Structural retention
4	Earthflow	Corrective grading OR None if avoided

*May be further evaluated during design level study

Grading considerations and design recommendations are further discussed in Section 4.0.

3.2 EXPANSIVE SOIL

We observed expansive lean clay, fat clay, clayey sand, and claystone near the surface of the development area in our borings and test pits. Our laboratory testing indicates that this soil exhibits high to critically high shrink/swell potential with variations in moisture content.

Expansive soil changes in volume with changes in moisture. It can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Building damage due to volume changes associated with expansive soil can be reduced by: (1) using a rigid mat foundation that is designed to resist the settlement and heave of expansive soil, (2) deepening the foundations to below the zone of moisture fluctuation (i.e. by using deep footings or drilled piers), and/or (3) using footings at normal shallow depths but bottomed on a layer of select fill having a low-expansion potential.

If the third option is preferred, it may be practical to consider import of non-expansive soil to underly the building pads due to the limited amount of non-expansive material observed on the site during our exploration. For planning purposes, we consider that the upper 36 inches of soil below building pads and extending laterally 5 feet outside of building footprints be replaced with non-expansive soil. In lieu of importing non-expansive fill, it may be cost effective to lime treat the upper 18 inches of the building pad to reduce the expansion potential of the on-site soil.

3.3 EXISTING ARTIFICIAL FILL

Our test pits and review of historical aerial photos and topographic maps indicate that portions of the development area are underlain by existing undocumented "man-made" fill. Undocumented fill may undergo excessive settlement, especially under new fill or building loads. Additionally, existing undocumented fill may be subject to seismic slope instability.

3.4 POTENTIALLY COMPRESSIBLE SOIL

Our test pits and borings indicate that portions of the development area are underlain by colluvium and alluvium comprised of lean and fat clay with varying amounts of sand and gravel. Soft and medium stiff clay may be potentially compressible and may exhibit excessive settlement under building loads.

3.5 EXCAVATION AND RIPPABILITY OF STRONG IN-PLACE BEDROCK

Where silica-carbonate rock or ultramafic rock are encountered during grading, difficult ripping is expected even when using the largest available grading equipment. It is anticipated that these areas will produce oversize boulders that may require special treatment.

The siltstone, sandstone, and claystone of the Great Valley Sequence (Kgv) encountered in our field exploration was found to generally be moderately to slightly weathered in our test pits, except in landslide areas, where it was more highly weathered. Difficult drilling conditions in the Great Valley Sequence bedrock were encountered near the Hunter Hill Landslide during construction of the drainage gallery (Caltrans, 2008). Heavy duty grading and backhoe equipment are anticipated to be capable of excavating and trenching siltstone with moderate to high effort. Local areas of harder and less weathered rock should be expected.

Additional recommendations can be provided once the extent of proposed grading is planned, and additional exploration is performed.

3.6 SERPENTINITE BEDROCK

As previously described, silica-carbonate bedrock is part of an ultramafic rock sequence, which may also locally contain other ultramafic rocks and minerals, including serpentinite. While most site grading is expected to occur within Great Valley Sequence bedrock, some grading and cut may be expected in silica-carbonate rock as well, especially along the eastern portion of the development area. Grading activities and cut in areas mapped as silica-carbonate rock may locally encounter serpentinite.

Serpentinite sometimes contains the mineral chrysotile, a fibrous asbestos mineral. Asbestos is considered hazardous when it becomes airborne, which may occur during excavation and grading activities in dry conditions. We recommend that during future exploration on the site, that soil and/or bedrock samples be collected from potential cut areas in silica-carbonate rock, ideally from the depths of proposed cut. Laboratory testing of these samples should then be performed to determine if the soil/rock samples contain asbestos. Depending on the results of this testing, special measures may be needed during grading to manage the potential hazards. Measures of this type can be costly and include air/dust monitoring and intensive dust control measures.

3.7 GROUNDWATER AND SURFACE WATER

It does not appear that the static groundwater level beneath the development area is likely to affect the proposed development. However, water from the springs is known to flow as surface water through existing drainages, which overlap with or lie adjacent to some of the proposed development areas at the site. The locations of the springs are shown in the Site Plan, Figures 2A and 2C. Water flowing through the drainages may also lead to local areas of perched groundwater. Perched groundwater and surface water near the proposed developments or site improvements can:

1. Impede grading activities.
2. Cause moisture damage to sensitive floor coverings.
3. Transmit moisture vapor through slabs causing excessive mold/mildew build-up, fogging of windows, and damage to computers and other sensitive equipment.
4. Cause premature pavement or foundation failure by erosion of pavement subgrades.
5. Lead to slope instability by erosion of the toes of existing or planned slopes.

The civil engineer should review the existing spring locations and provide appropriate design recommendations to address spring water and drainages flowing from the springs.

3.8 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 development area. Based on topographic and lithologic data, the risk of regional subsidence or uplift, lateral spreading, tsunamis, flooding, or seiches is considered low to negligible at the site.

3.8.1 Ground Rupture

A concealed surface trace of the Lake Herman Fault crosses a portion of the site, as shown in the Site Plan, Figures 2A and 2C. However, the Lake Herman Fault is not known to be active, and is not included on the USGS list of Quaternary Faults anticipated to cause ground rupture. Additionally, the site is not located within the Earthquake Fault Special Study Zone (A-P Zone). Therefore, it is our opinion that ground rupture is unlikely at the project site.

3.8.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay region could cause considerable ground shaking at the site, like that which has occurred in the past. Structures should be designed using sound engineering judgment and the 2022 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 non-structural damage, and (3) resist major earthquakes without collapse but with some structural, as well as non-structural 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).

3.8.3 Liquefaction

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-grained sand. The soil encountered in our borings and test pits generally consisted of clay with variable amounts of sand and gravel.

Where we encountered minor sand and gravel in our borings, the deposits appeared to be discontinuous and comprised of angular rock fragments mixed with sand and clayey fines. In addition, groundwater was not encountered within coarse-grained soil layers in our borings. For these reasons and based upon engineering judgment, it is our opinion that the potential for liquefaction in the development area is low during seismic shaking.

3.8.4 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, it is our opinion that the offset is expected to be minor. We provide preliminary recommendations for remedial grading, foundation, and pavement design in this report that are intended to reduce the potential for adverse impacts from lurch cracking.

3.8.5 Earthquake-Induced Landslides

Numerous landslides have been mapped on the site, as discussed in Section 2.9. Ground shaking associated with earthquake events can trigger new landslides or remobilization of the existing landslides in weak geologic materials caused by a wide range of mechanisms. Due to the presence of existing landslides on and near the site, and the overall topography of the site, the potential for earthquake-induced landslides is considered high. Preliminary recommendations to address this geologic hazard are discussed in later sections of this report.

3.8.6 2022 CBC Seismic Design Parameters

The 2022 CBC utilizes seismic design criteria established in the ASCE/SEI “Standard Minimum Design Loads and Associated Criteria for Buildings and Other Structures,” (ASCE 7-16). Based on the subsurface conditions encountered and mapping by Willis 2015, we characterized the development area as both Site Class B and Site Class C. Areas mapped as silica-carbonate rock or Great Valley Sequence rock are classified as Site Class B, while areas underlain by colluvium may be classified as Site Class C. We recommend that further geotechnical testing be performed beneath proposed building locations during the design-level study to confirm and refine these classifications.

We anticipate that the proposed casino structure may be Risk Category III, while the proposed residential area will be Risk Category II. However, we note that the mapped seismic parameters do not change between a Risk Category II and III structure for either site class. In Table 3.8.6-1 below, we provide the CBC seismic parameters based on the ASCE Hazard Tool for your use.

TABLE 3.8.6-1: 2022 CBC Seismic Design Parameters, Latitude: 38.144326 Longitude: -122.215092

PARAMETER	VALUE			
Risk Category	II	II	III	III
Site Class	B	C	B	C
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.868	1.868	1.868	1.868
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.652	0.652	0.652	0.652
Site Coefficient, F_a	0.9	1.2	0.9	1.2
Site Coefficient, F_v	0.8	1.4	0.8	1.4
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.681	2.241	1.681	2.241
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	0.522	0.913	0.522	0.913
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.121	1.494	1.121	1.494
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	0.348	0.609	0.348	0.609
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.771	0.771	0.771	0.771
Site Coefficient, F_{PGA}	0.9	1.2	0.9	1.2
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.694	0.925	0.694	0.925
Long period transition-period, T_L (sec)	8	8	8	8

4.0 PRELIMINARY GRADING CONSIDERATIONS

Conceptual site layouts for Alternatives A, B, and C are shown in Exhibits 1.3-1 through 1.3-3.

4.1 ALTERNATIVE A – PROPOSED PROJECT

4.1.1 Northern Development Area – Residential

Alternative A of the conceptual development plans shows a residential development in the northern-central portion of the development area. Appropriate geotechnical design measures must be designed and implemented to allow residential structures, fill, pedestrian improvements, roads, and landscaping within 100 feet of the crest of the Hunter Hill Landslide as depicted in the Site Plan, Figures 2B and 2D. Remedial measures will be either minor or not required if the development is moved outside the 100-foot setback. We anticipate that a remedial grading solution may be appropriate for treatment of this area. This would include removal of the existing landslide deposits downslope of the proposed improvements, and construction of a keyway and benched fill.

Typical keyway designs consist of 30-foot-wide keyways constructed to a minimum depth of 5 feet, or extending below existing fill, colluvium, or landslide deposits and at least 3 feet into competent native bedrock, whichever is deeper. Subsurface drainage systems should be installed within the keyways and benched fill. We present a typical keyway section in Figure 6, and a typical subdrain detail in Figure 7. Engineered fill may need to be reinforced with geogrid to provide additional strength.

Structural solutions may also be considered.

4.1.2 Northern Development Area – Access Road

Alternative A of the conceptual development plans shows the grading limits for the access road approaching the extents of Landslide 2, as shown in the Site Plan, Figure 2B. We recommend that proposed roads, utilities, improvements, and cuts in this area be constructed outside of the mapped landslide extents. It is acceptable to place fill near or on the landslide toe.

4.1.3 Central Development Area – Casino

Alternative A of the conceptual plans shows a casino development in the central portion of the development area, at the toe of the Eastern Landslide Complex. We recommend that any proposed structures, roads, pedestrian improvements, utilities, or cut in this area be set back a distance of at least 150 feet from the toe of this landslide to reduce the potential for adverse impacts from landslide activity.

It is feasible to construct a portion of the development within the setback area if other appropriate measures are designed and implemented to reduce the hazard. Where drainage swales are planned, we recommend that they be made of concrete or be lined with an impervious liner within the landslide and setback areas to reduce water infiltration near the landslide area. The swales may be earthen where they are outside of the setback areas. We provide a conceptual summary of potential design options below for planning purposes. These options should be preliminarily incorporated into project planning and evaluated for slope stability during the design-level study.

TABLE 4.1.3-1: Central Casino Development Potential Design Measures

SETBACK	CONCEPTUAL DESIGN MEASURES
150 feet	• Avoid cut within the building pad • Place fill and raise grades across landslide toe • Construct buttress across landslide toe outside of building footprint
100 feet	• Place fill and raise grades across landslide toe • Minimum pad grade elevation of approximately 285 feet (NAVD 88) • Construct buttress across landslide toe outside of building footprint • Construct deflection berm or wall • Partial removal and replacement of landslide deposits with benched fill and subdrain system
< 100 feet	• Place fill and raise grades across landslide toe • Minimum pad grade elevation of approximately 305 feet (NAVD 88) • Construct deflection berm • Construct debris bench • Construct shear key into rock below landslide deposits, up to 70 feet deep • Fully remove and replace landslide deposits with benched fill and subdrain system • Potential additional structural solutions

Additional explorations should be conducted in this area during the design-level study to assess whether alluvial and colluvial soil in this area is compressible beneath the proposed building loads. Depending on the extent of compressible soil encountered, a remedial grading solution involving removal and replacement of compressible soil with engineered fill may be feasible. Alternatively, ground improvement may be considered for this area. Deep foundations may be appropriate for some portions of the development area; however, we consider a shallow foundation system to be preferred on sloped grades and near the Eastern Landslide Complex toe.

4.1.4 Southwestern Borrow Area and Utilities

A borrow pit is shown in the southwestern corner of the development area. We also understand that other utilities may be planned on top of the borrow area. The borrow pit extents do not overlap with Landslide 4. Additionally, due to the shallow nature of Landslide 4, a setback is not required for grading or borrowing activities. We consider the southwestern corner of the development area and borrow pit to be generally suitable for construction of additional improvements, so long as design-level grading considerations are taken into account.

4.2 ALTERNATIVE B – REDUCED INTENSITY ALTERNATIVE

4.2.1 Central Development Area – Casino

Refer to recommendations for Alternative A for this area.

4.3 ALTERNATIVE C – NON-GAMING ALTERNATIVE

4.3.1 Central Development Area – Residential

Alternative C of the conceptual plans shows a residential development in the central portion of the development area, at the toe of the Eastern Landslide Complex. We recommend that any proposed development in this area be set back a distance of at least 150 feet from the toe of this landslide to reduce the potential for adverse impacts from landslide activity.

We understand that some of the roads and residential structures are planned within the 150-foot setback. It is feasible to construct a portion of the development within the setback area if other appropriate measures are designed and implemented to reduce the hazard. We provide a conceptual summary of potential design options in Table 4.1.3-1 for planning purposes. These options should be preliminarily incorporated into project planning and evaluated for slope stability during the design-level study.

4.3.2 Southwestern Development Area – Hotel

Alternative C of the conceptual plans shows a hotel development in the southwestern portion of the development area. This area is primarily underlain by a bedrock cut and is adjacent to Landslide 4.

Remedial grading will be required in this area. This would include removal of the existing landslide deposits at Landslide 4 downslope of the proposed improvements, and potential construction of a keyway, subdrains, and benched fill depending on the depths of the landslide deposits. We present a typical keyway section in Figure 6, and a typical subdrain detail in Figure 7. Engineered fill may need to be reinforced with geogrid to provide additional strength.

4.3.3 Southern Development Area – Commercial

Alternative C of the conceptual plans shows a commercial development in the southern portion of the development area. This area is underlain by colluvium and alluvium.

Additional explorations should be conducted in this area during the design-level study to assess whether alluvial and colluvial soil in this area is compressible beneath the proposed building loads. Depending on the extent of compressible soil encountered, a remedial grading solution involving removal and replacement of compressible soil with engineered fill may be feasible. Alternatively, deep foundations or ground improvement may be considered for this area.

4.4 LEE PROPERTY – ACCESS ROADS

All of the alternatives show access roads to the project site entering through the Lee Property to the southeast of the project development area, north of Columbus Parkway. As discussed in Section 2.9.4, the toe of the Eastern Landslide Complex extends into the Lee Property. Access roads should be set back at least 200 feet from the toe of the landslide, unless appropriate geotechnical design measures are designed and implemented to further stabilize it. The setback is shown in Figures 2A through 2D. The access road locations are shown in Figures 2B and 2D.

We provide a conceptual summary of potential design options below for planning purposes. These options should be preliminarily incorporated into project planning and evaluated for slope stability during the design-level study.

TABLE 4.4-1: Access Road – Lee Property Potential Design Measures

SETBACK	CONCEPTUAL DESIGN MEASURES
200 feet	• Avoid cut within the setback area • Place fill and raise grades across landslide toe • Construct buttress upslope of roadway
< 200 feet	• Place fill and raise grades across landslide toe • Construct buttress and deflection berm upslope of roadway • Construct debris bench • Construct shear key into rock below landslide deposits • Partially or fully remove and replace landslide deposits with benched fill and subdrain system • Potential additional structural solutions

4.5 GUIDELINES FOR GRADED SLOPES

In general, the following slope gradient guidelines may be applied for preliminary grading design of both permanent cut and fill slopes. The contractor is responsible to construct temporary construction slopes in accordance with Cal/OSHA requirements. Slopes steeper than 3:1 (horizontal:vertical) should be constructed with drainage benches at widths and intervals as recommended in the current California Building Code.

TABLE 4.5-1: Slope Specifications

ALLOWABLE SLOPE GRADIENT (horizontal:vertical)	MAXIMUM ALLOWABLE SLOPE HEIGHT (feet)	
	GENERAL FILL	BEDROCK CUT
2:1	10	10
2½:1	15	20
3:1	>15	>20

Depending on materials used to construct fill slopes or rebuild cut slopes, it may be necessary to incorporate additional slope stabilization techniques such as the use of geogrid reinforcement within the slope to enhance long-term stability.

4.6 CUT/FILL TRANSITION LOTS AND CUT LOTS

Some structures in the proposed development may be entirely in cut or traversed by a cut-fill grading transition. We anticipate that significant variations in material properties may occur in areas of cut or cut-and-fill daylighting if not addressed during site grading. As such, we recommend cut portions of transition building pads be overexcavated and the excavated materials replaced with properly compacted engineered fill. This can be accomplished by subexcavating the natural soil cover and the native rock and replacing the subexcavated material with engineered fill. The subexcavation depth should be 3 feet for cut-fill transition building pads on residential lots. In addition, cut residential building areas should be overexcavated and reworked to at least 3 feet below rough pad grade. A typical cut lot pad detail is presented in Figure 8. A typical cut-fill transition section detail is presented in Figure 9. A typical fill lot pad detail is presented in Figure 10.

4.7 DIFFERENTIAL FILL THICKNESS

Differential building movements may result from conditions where building pads have significant differentials in fill thickness. For planning purposes, we recommend that differentials in fill thickness under buildings should not exceed 15 percent (i.e. less than 15 feet over a 100-foot length). Actual allowable differential fill thickness may vary depending on the foundation system selected for the proposed structures. The extent and depths of local subexcavation should be determined once design-level grading plans are available.

The purpose of this requirement is to limit differential fill settlement and/or swell under buildings. Local subexcavation of natural materials and replacement by engineered fill may be necessary to comply with the final differential fill thickness requirement.

4.8 ACCEPTABLE FILL

On-site soil and rock material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 6 inches in maximum dimension.

4.9 SUBSURFACE DRAINAGE

Subsurface drainage systems should be installed in keyways and swales or natural drainage areas. Typical keyway subdrains are shown in Figure 7. In addition, where cut or fill slopes over 5 feet high are positioned uphill of proposed residential or commercial lots, we recommend a lot subdrain be installed at the toe of the slope. The lot subdrains are designed to divert water from natural seepage along cut slopes and water migration due to irrigation and rainwater.

Subdrains should also be designed and implemented to redirect water from existing springs and seeps on the site around the proposed development and improvement areas.

4.10 STORMWATER INFILTRATION

Due to the high clay content of colluvium and alluvium, the near-surface site soil is expected to have a low to moderate permeability value for stormwater, unless subdrains are installed. Great Valley Sequence bedrock is also anticipated to have low to moderate infiltration potential, which may reduce over time as fractures in the rock fill up with water. Therefore, best management practices should assume that limited stormwater infiltration will occur at the site. Percolation testing at the proposed stormwater sites may help to further refine infiltration rate estimates.

If stormwater infiltration areas are still planned for the site, they should be located away from slopes and existing landslides, as increased groundwater levels may contribute to slope instability. They should also be located more than 10 feet away from proposed building footprints and more than 5 feet away from other proposed improvements to limit the impact of shrink and swell of surrounding soil on building foundations and pavements.

4.11 PAVEMENTS

For preliminary planning of residential streets and thruways, we provide the following recommended pavement sections (based on a preliminary R-value of 5) for traffic indices of 5.0 through 8.0 in accordance with methods prescribed in Topic 608 of Highway Design Manual by Caltrans.

TABLE 4.11-1: Recommended Pavement Sections

TRAFFIC INDEX	AC (inch)	AB (inch)
5.0	3	11
6.0	3 ½	14
7.0	4	16
8.0	5	18

Notes: AC is asphaltic concrete
AB is aggregate base Class 2 Material with minimum R = 78

The sections above should be considered for estimating purposes only. The traffic index should be determined by the civil engineer or appropriate public agency. Actual pavement sections for design should be based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading.

5.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

We anticipate that a shallow foundation system, such as a concrete mat foundation or a post-tensioned slab, will be suitable to support both the casino and the proposed residential structures, provided that appropriate remedial grading measures are performed at the site. There may be cases where deep foundations are more suitable for some areas of the development area.

As discussed in Section 3.2, shallow foundation system design should incorporate measures to address highly expansive soil.

6.0 PRELIMINARY RETAINING WALL RECOMMENDATIONS

Retaining walls are planned for each alternative site layout. Alternative A shows one wall retaining cut into soil and rock up to 20 feet high in the northern development area. For Alternatives A and B, walls up to approximately 25 feet tall may also be required to retain fill below the casino building pads, which would be integral to the casino structure. Alternative C shows eight walls retaining cut between 10 and 50 feet in height, which will likely retain native soil and bedrock.

Where retaining walls are planned below building pads and are not integral to the building structure, the building pad should be at least 15 feet away from the back of the wall.

In general, where retaining walls are planned for cut into native soil and bedrock, an anchored wall (such as a soil nail or tieback wall) is an appropriate wall type. Where walls are planned to retain fill or are integral to a structure, cast-in-place walls will likely be more feasible.

7.0 DESIGN-LEVEL GEOTECHNICAL STUDIES

Design-level geotechnical studies should be performed as a part of the design phase of the project. This is anticipated to include additional subsurface investigations beneath the proposed development areas and improvements, laboratory testing, engineering analysis, consultation with the design team, and reporting of conclusions and design-level recommendations for the development.

Due to the complex geology and hillside topography, we also recommend that a corrective grading plan be developed along with the design-level study. This will be important to clarify our geotechnical recommendations related to keyways, benches, cut/fill transition subexcavation, and subdrains. In preparing these plans, we intend to overlay the grading plans with graphic representations of our grading and subsurface drainage recommendations presented in this report. This allows the unique hillside geotechnical recommendations to be clearly displayed on the grading plans. This can assist in obtaining more accurate earthwork bids, as well as clarifying the geotechnical recommendations as they apply to the final grading plan.

We recommend that the design-level study include the following scope of services, at a minimum. Optional additional scope items are also included below, which may be beneficial to other aspects of design of the proposed development.

<u>Recommended Scope</u>:

- Additional mud-rotary borings with rock coring within the footprint of the proposed building locations to confirm depth of fill, colluvial/alluvial soil, and landslide deposits, and to collect samples for laboratory testing.
- Additional test pits and/or trenches to further constrain geometry of existing landslides and confirm depth of fill and colluvial/alluvial soil.
- Soil sample collection at depths relevant to foundation design.
- Laboratory testing, including, but not limited to, moisture content, unit weight, gradation, Atterberg Limits, R-value, strength including remolded and residual strength, and corrosivity testing.
- Design-level assessment of geologic and geotechnical hazards, including, but not limited to:
  - Characterization of subsurface conditions
  - Static and pseudo-static slope stability analysis of up to three critical cross sections
  - Recommendations for treatment of expansive soil
- Preparation of a remedial grading plan.
- Design recommendations for foundation system design.
- Design recommendations for retaining wall design.
- Foundation constructability recommendations.
- Design-level earthwork and improvement design and construction recommendations.

Alternate Future Studies (Optional):

- Site-specific ground-motion studies for the proposed casino structure.
- Site-specific infiltration testing at proposed locations if they are planned.
- Sampling and testing of silica-carbonate rock for asbestos.
- Geophysical testing to further characterize bedrock rippability.
- Construction of a groundwater test well and implementation of a groundwater pump test.

8.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.3 for the Scotts Valley Development 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 strive to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, 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, ENGEO 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 written authorization of ENGEO. Such authorization is essential because it requires ENGEO 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 ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies, or other changes necessary to reflect changed field or other conditions.

We determined 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

American Society of Civil Engineers (ASCE). 2024. ASCE Hazard Tool. Available at https://ascehazardtool.org/.

Bezore, S.P., Wagner, D.L., and Sowers, J.M. 1998. Geologic Map of the Cordelia 7.5' Quadrangle Solano and Napa Counties, California [map], California Geologic Survey.

California Building Code, 2022.

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

California Geological Survey. 2018. Earthquake Fault Zones – A Guide for Government Agencies, Property Owners / Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California: Special Publication 42 (SP42), available at https://www.conservation.ca.gov/cgs/Documents/Publications/Special-Publications/SP_042.pdf

Caltrans. 2005. Memorandum: Geotechnical Recommendation for Roadway Rehab Project, File No. 04-SOL-80, KP 6.3-13.0/PM 3.9-8.1.

Caltrans. 1990a. Memorandum: Results of Field Investigation and Decision regarding Future of Project, File No. 10-339203, 10-SOL-80, PM 6.3.

Caltrans. 1990b. Memorandum: Field Investigation for Redesign of Project, File No. 10-339203, 10-SOL-80, PM 6.4.

Caltrans. 1988. Memorandum: Seismic Investigation of the Hunter Hill Slide near Vallejo, File No. 10-5S6000, 10-SOL-80-6.0.

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

Graymer, R.W., Brabb, E.E., and Jones, D.L. 1999. Geology of the Cordelia and the northern part of the Benicia 7.5 minute Quadrangles [map], USGS, Open File Report 99-162.

KC Engineering Company. 2021. Geotechnical Exploration Report for Proposed Solano Ranch Mixed-Use Development, APN 0182-020-010, -020, & -080 at Columbus Parkway, Vallejo, California, for GTL Properties LLC. Project No. VV2619A.

Manson, M.W. 1988. Landslide Hazards in the Cordelia-Vallejo Area, Solano and Napa Counties, California [map], California Division of Mines and Geology, Landslide Hazard Identification Map No. 13.

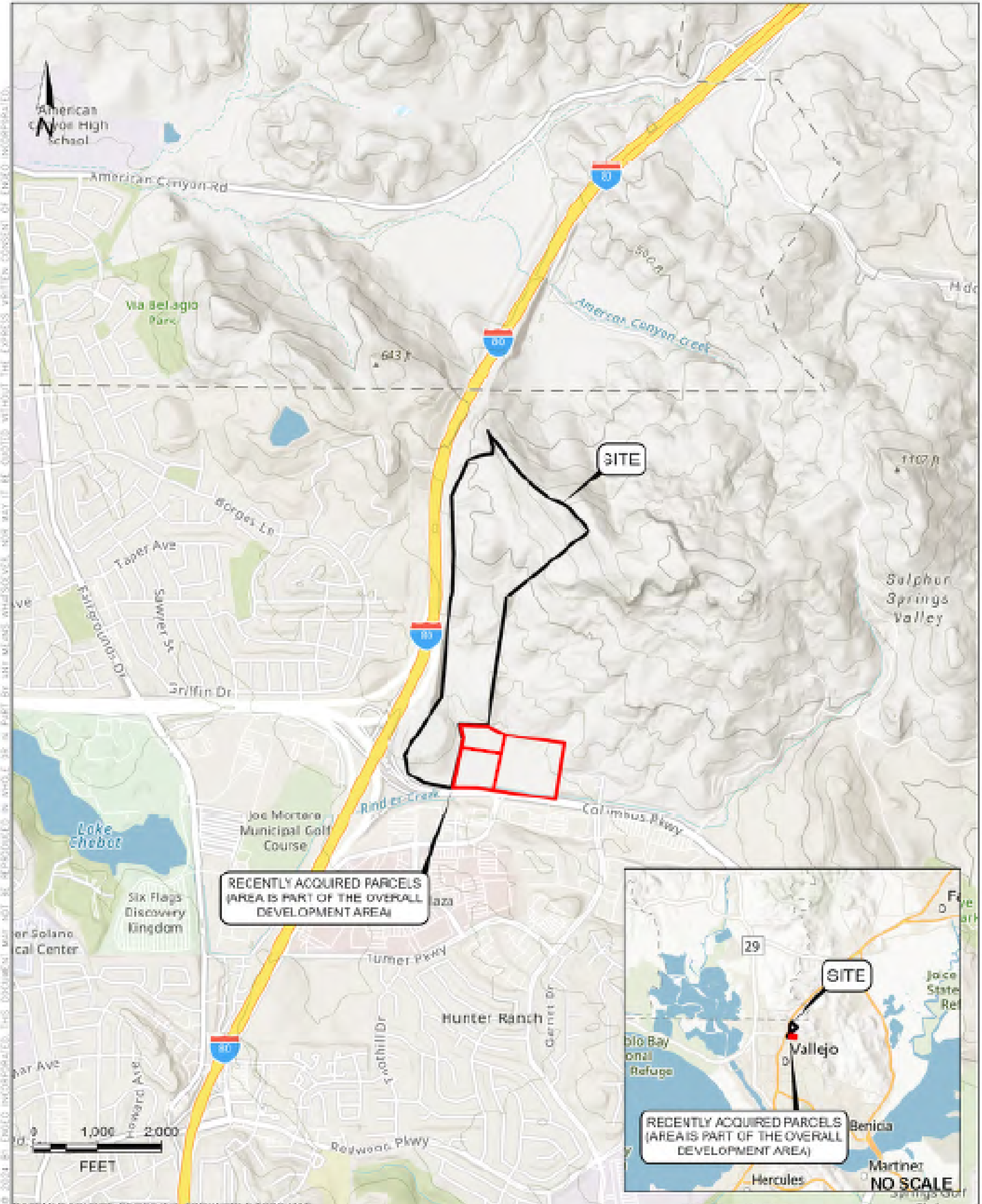
Jennings, C.W. and Bryant, W.A. 2010. 2010 Fault Activity Map of California [map]. California Geological Survey. https://maps.conservation.ca.gov/cgs/fam/.

SEAOC. 1996. Recommended Lateral Force Requirements and Tentative Commentary.

SELECTED REFERENCES (Continued)

Willis, C.J, Gutierrez, C.I., Perez, F.G., and Branum, D.B. 2015. A next-generation Vs30 map for California based on geology and topography: Bulletin of the Seismological Society of America [map]. Seismological Society of America. https://gis.data.ca.gov/datasets/cadoc::cgs-map-sheet-48-shear-wave-velocity-in-upper-30m-of-surficial-geology-vs30/explore

FIGURES



ENGEO Expect Excellence	VICINITY MAP VALLEJO SCOTTS VALLEY VALLEJO, CALIFORNIA	PROJECT NO.: 16484.000.001 SCALE: AS SHOWN DRAWN BY: NVG CHECKED BY: JBR	FIGURE NO. 1

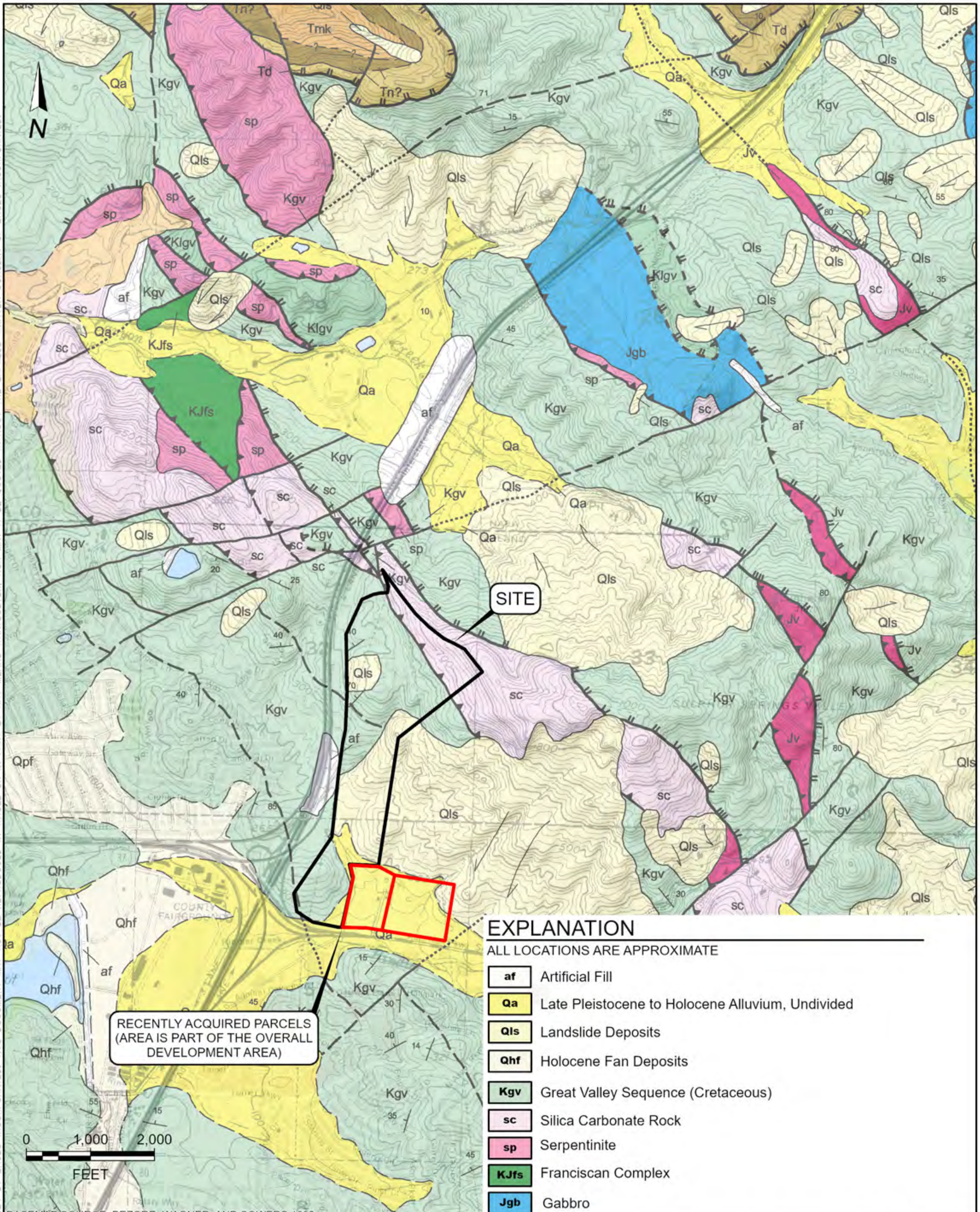
ORIGINAL FIGURE PRINTED IN COLOR


A
A'
B
B'
Holder Hill Landslide
Eastern Slide Complex
EXPLANATION
ENGEO
2A


EXPLANATION
ENGEO
2B


A
A'
B
B'
EXPLANATION
ENGEO
2C

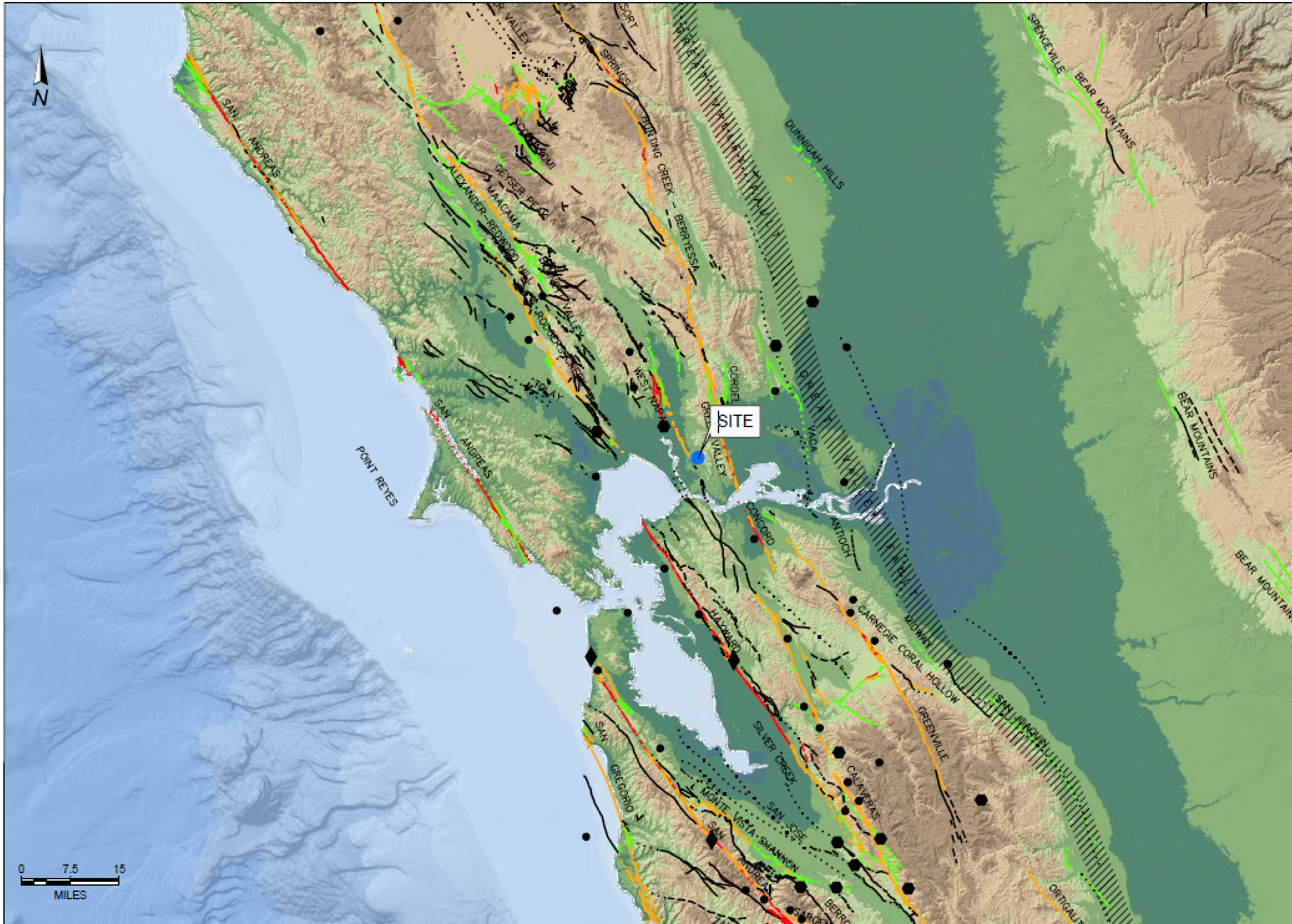

EXPLANATION
ENGEO
2D



ENGEO Expect Excellence	REGIONAL GEOLOGIC MAP VALLEJO SCOTTS VALLEY VALLEJO, CALIFORNIA	PROJECT NO.: 16484.000.001 SCALE: AS SHOWN DRAWN BY: NWC CHECKED BY: JBR	FIGURE NO. 3

PATH: G:\DRAFTING\PROJECTS_16000 TO 17999\16484\16484000001\GEOTECH\GEX\16484000001_VALLEJOSCOTTSVALLEY - GEX.APRX
LAYOUT: 03. GEOLOGIC 8.5 X 11 PORTRAIT USER: NCLOUGH

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

- Project Site

HISTORIC EARTHQUAKE EPICENTERS

- Magnitude 5-6
- Magnitude 6-7
- Magnitude 7+
- Historic Blind Thrust Fault Zone

QUATERNARY FAULTS 2020

Based on time of most recent surface deformation

- Historical (<150 Years), Well Constrained Location
- Historical (<150 Years), Moderately Constrained Location
- Historical (<150 Years), Inferred Location
- Latest Quaternary (<15,000 Years), Well Constrained Location
- Latest Quaternary (<15,000 Years), Moderately Constrained Location
- Latest Quaternary (<15,000 Years), Inferred Location
- Latest Quaternary (<15,000 Years), Inferred Location
- Late Quaternary (<130,000 Years), Moderately Constrained Location
- Late Quaternary (<130,000 Years), Inferred Location
- Middle And Late Quaternary (<750,000 Years), Well Constrained Location
- Middle And Late Quaternary (<750,000 Years), Moderately Constrained Location
- Middle And Late Quaternary (<750,000 Years), Inferred Location
- Undifferentiated Quaternary(<1.6 Million Years), Well Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Moderately Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Inferred Location
- Class B (Various Age), Well Constrained Location
- Class B (Various Age), Moderately Constrained Location
- Class B (Various Age), Inferred Location

BASE MAP SOURCE:
CSUMB, ESRI, GARMIN, NATURALVUE, ESRI, GEBCO, GARMIN, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2020
C.G.S. HISTORIC EARTHQUAKE DATABASE

ENGEO
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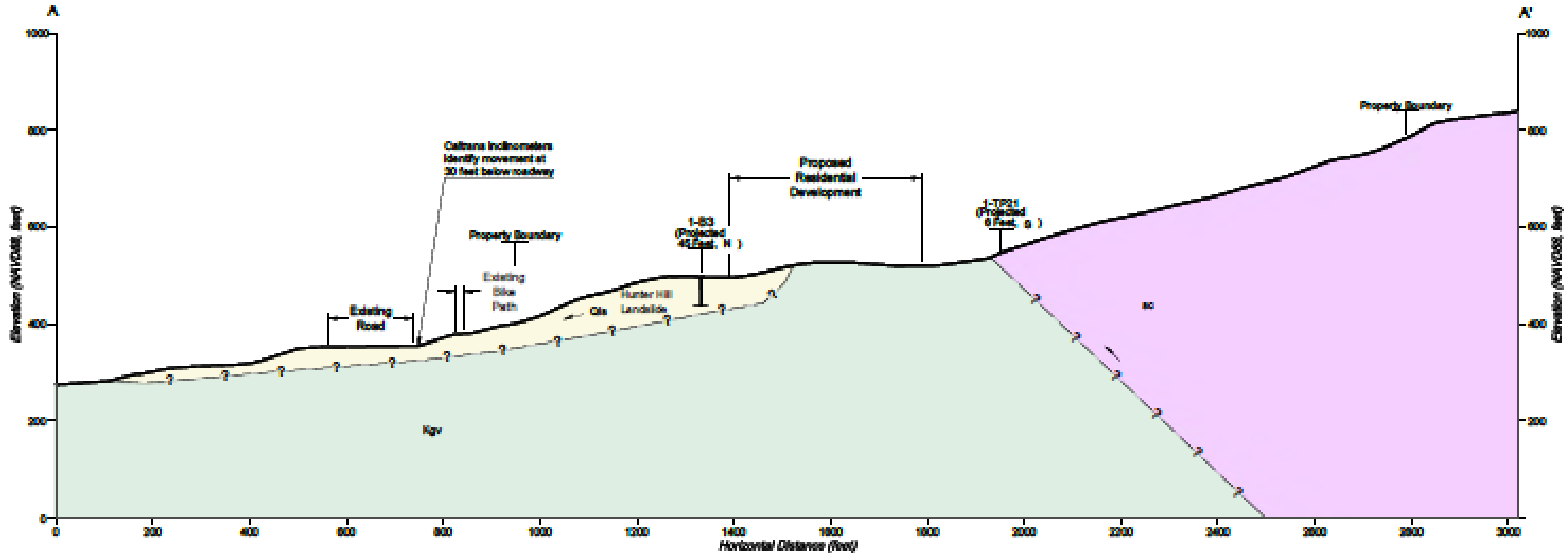
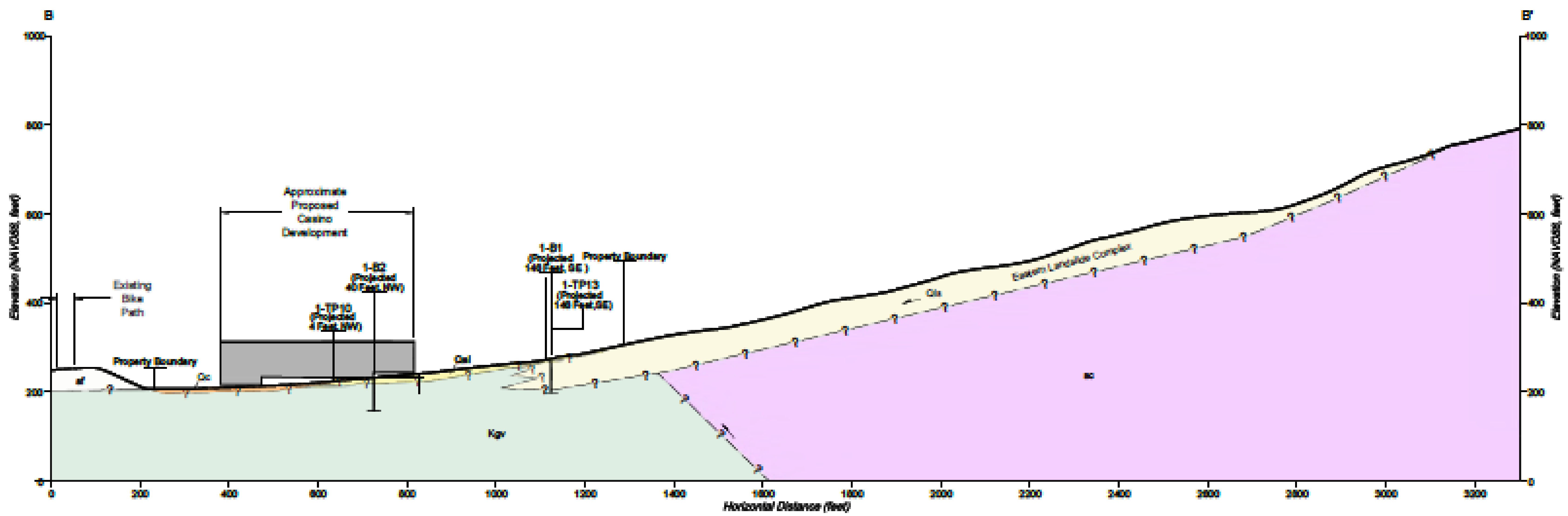
REGIONAL FAULTING AND SEISMICITY MAP
VALLEJO SCOTTS VALLEY
VALLEJO, CALIFORNIA

18484.000.001	4
AS SHOWN	
LL	JBR

Cross Section A-A'



Cross Section B-B'



Legend

af	Artificial Fill	1-B3	Boring (ENGEO, 2024)
Qal	Alluvium	1-TP21	Boring (ENGEO, 2024)
Qc	Colluvium		Existing Ground Surface
Qls	Landslide deposits		Geologic Contact, dashed where approximate queried where inferred
Kgv	Great Valley Sequence		
sc	Silica Carbonate Rock		

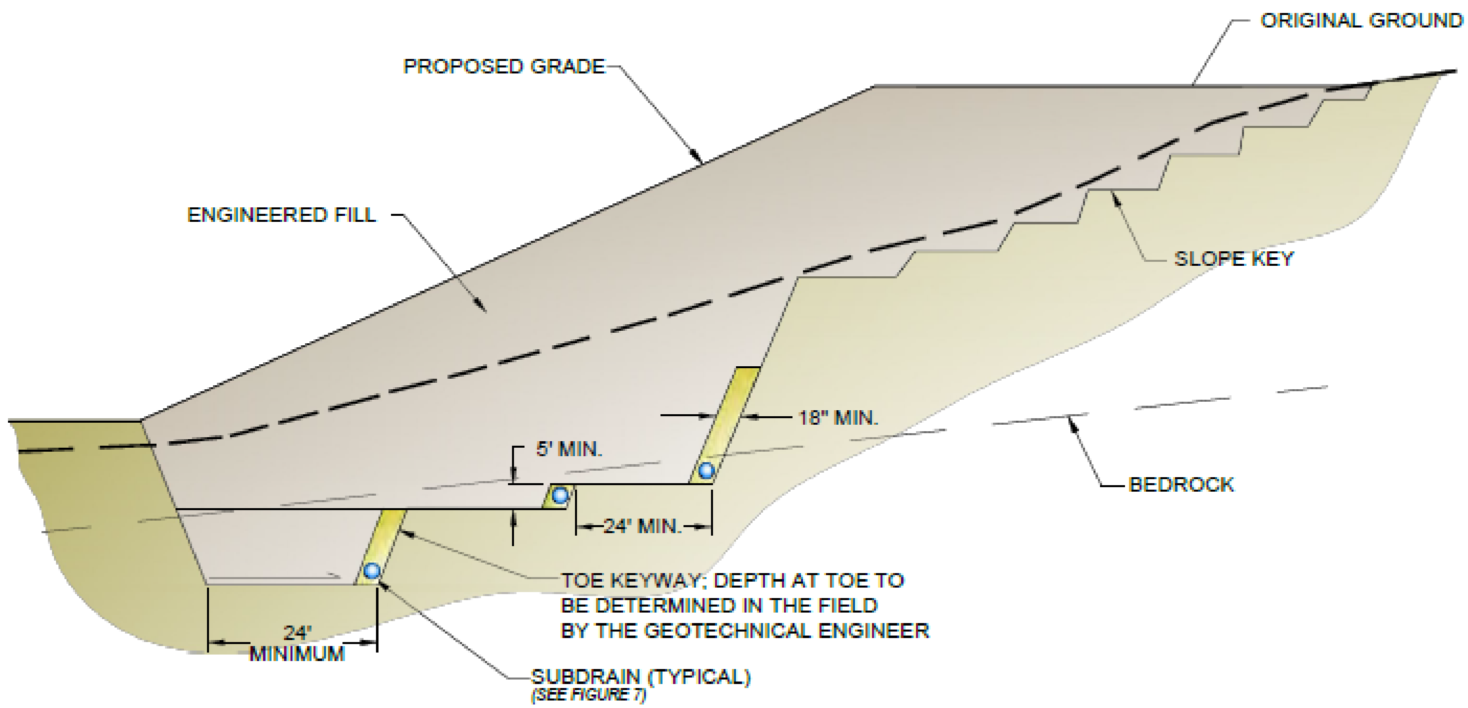
Disclaimer: Cross Section Is For Illustration Purposes Only. The Transition Between Materials May Be Abrupt Or Gradual. Variations Should Be Expected.

ENGEO Expect Excellence

CROSS SECTION A-A' AND B-B'
SCOTTS VALLEY DEVELOPMENT
VALLEJO, CALIFORNIA

PROJECT NO.: 18484.000.001
SCALE: AS SHOWN
DRAWN BY: LL CHECKED BY: JH

FIGURE NO. 5



ENGEO
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TYPICAL KEYWAY DETAIL

SCOTTS VALLEY DEVELOPMENT

VALLEJO, CALIFORNIA

PROJECT NO.: 16484.000.001

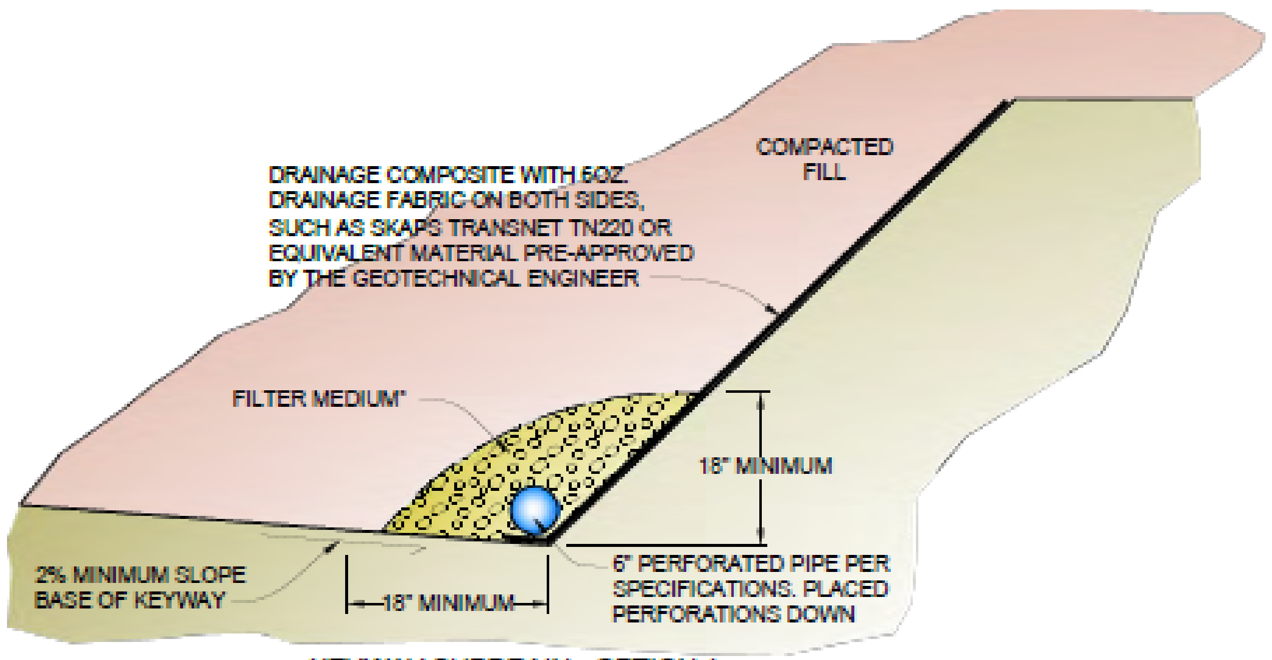
SCALE: AS SHOWN

DRAWN BY: LL

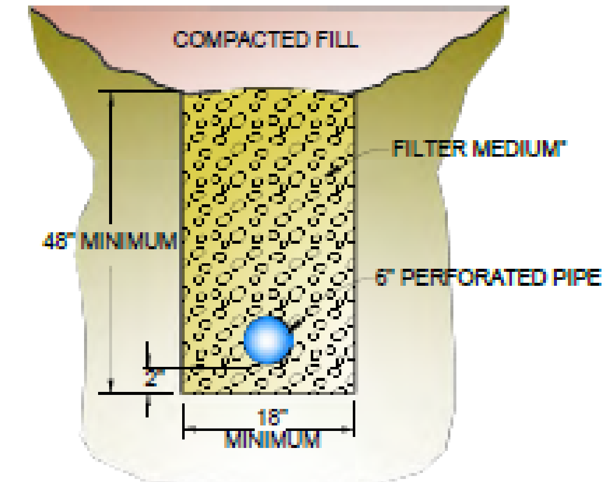
CHECKED BY: JBR

FIGURE NO. 6

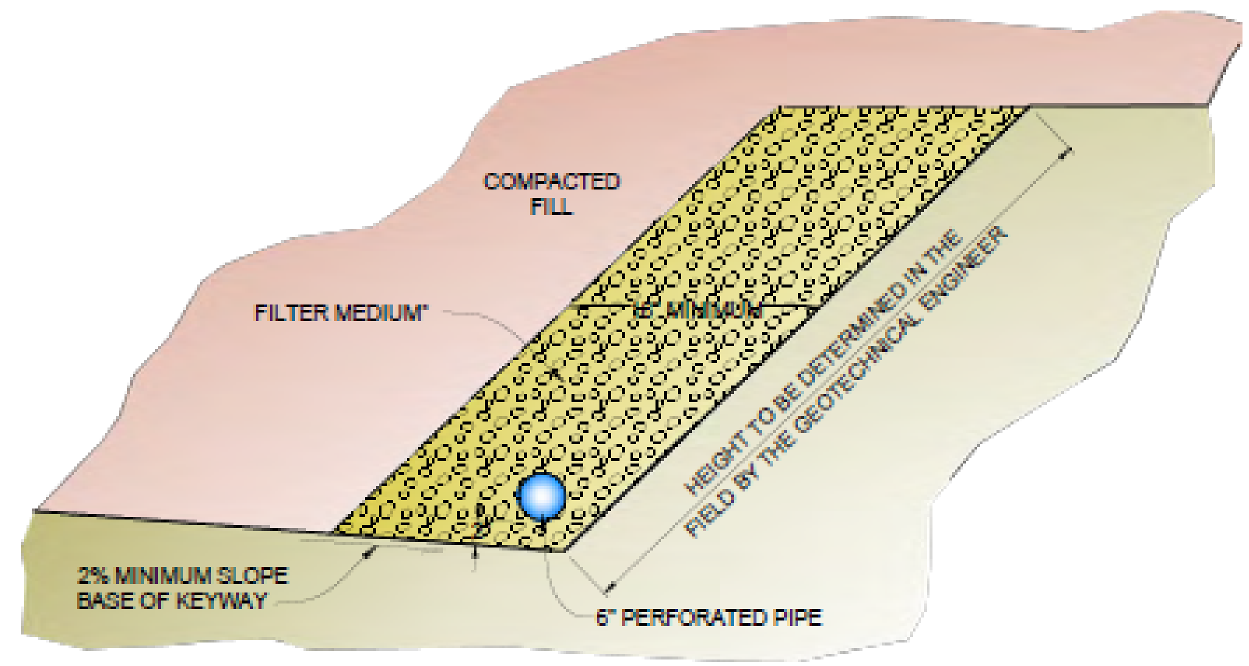
ORIGINAL FIGURE PRINTED IN COLOR



KEYWAY SUBDRAIN - OPTION 1



SWALE SUBDRAIN



KEYWAY SUBDRAIN - OPTION 2

*FILTER MEDIUM

ALTERNATIVE A

CLASS 2 PERMEABLE MATERIAL

MATERIAL SHALL CONSIST OF CLEAN, COARSE SAND AND GRAVEL OR CRUSHED STONE, CONFORMING TO THE FOLLOWING GRADING REQUIREMENTS:

SIEVE SIZE	% PASSING SIEVE
1"	100
3/4"	90-100
3/8"	40-100
#4	25-40
#8	18-33
#30	5-15
#50	0-7
#200	0-3

ALTERNATIVE B

CLEAN CRUSHED ROCK OR GRAVEL WRAPPED IN FILTER FABRIC

ALL FILTER FABRIC SHALL MEET THE FOLLOWING MINIMUM AVERAGE ROLL VALUES UNLESS OTHERWISE SPECIFIED BY ENGEO:

GRAB STRENGTH (ASTM D-4632)	180 lbs
MASS PER UNIT AREA (ASTM D-4751)	6 oz/yd ^{2}
APPARENT OPENING SIZE (ASTM D-4751)	70-100 U.S. STD. SIEVE
FLOW RATE (ASTM D-4491)	80 gal/min/ft
PUNCTURE STRENGTH (ASTM D-4833)	80 lbs

NOTES:

1. ALL PIPE JOINTS SHALL BE GLUED
2. ALL PERFORATED PIPE PLACED PERFORATIONS DOWN
3. 1% FALL (MINIMUM) ON ALL TRENCHES AND DRAIN LINES

ENGEO
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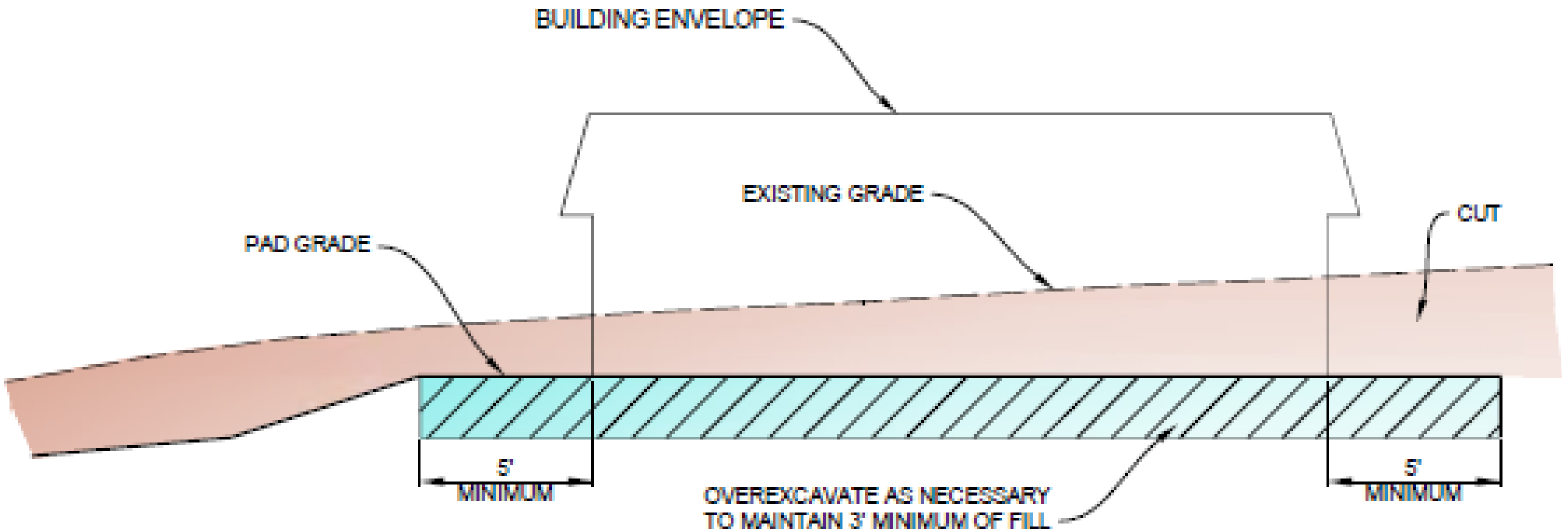
TYPICAL SUBDRAIN DETAILS
SCOTTS VALLEY DEVELOPMENT
VALLEJO, CALIFORNIA

PROJECT NO.: 16484.000.001
SCALE: AS SHOWN
DRAWN BY: LL
CHECKED BY: JBR
FIGURE NO. 7

ORIGINAL FIGURE PRINTED IN COLOR



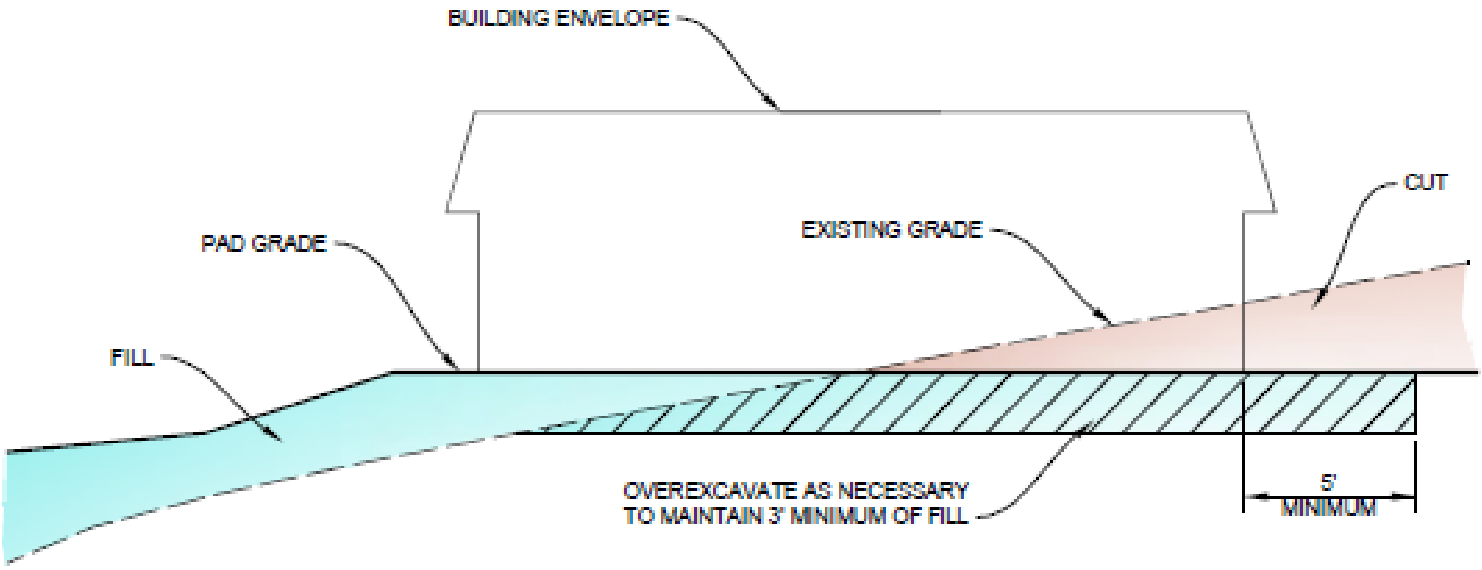
WHERE LOTS ARE COMPLETELY IN CUT, THE UPPER 3' SHOULD BE EXCAVATED AND RECOMPACTED AS SHOWN

ENGEO Expect Excellence

TYPICAL CUT LOT DETAIL
SCOTTS VALLEY DEVELOPMENT
VALLEJO, CALIFORNIA

PROJECT NO.: 16484.000.001
SCALE: NO SCALE
DRAWN BY: LL
CHECKED BY: JBR
FIGURE NO. 8

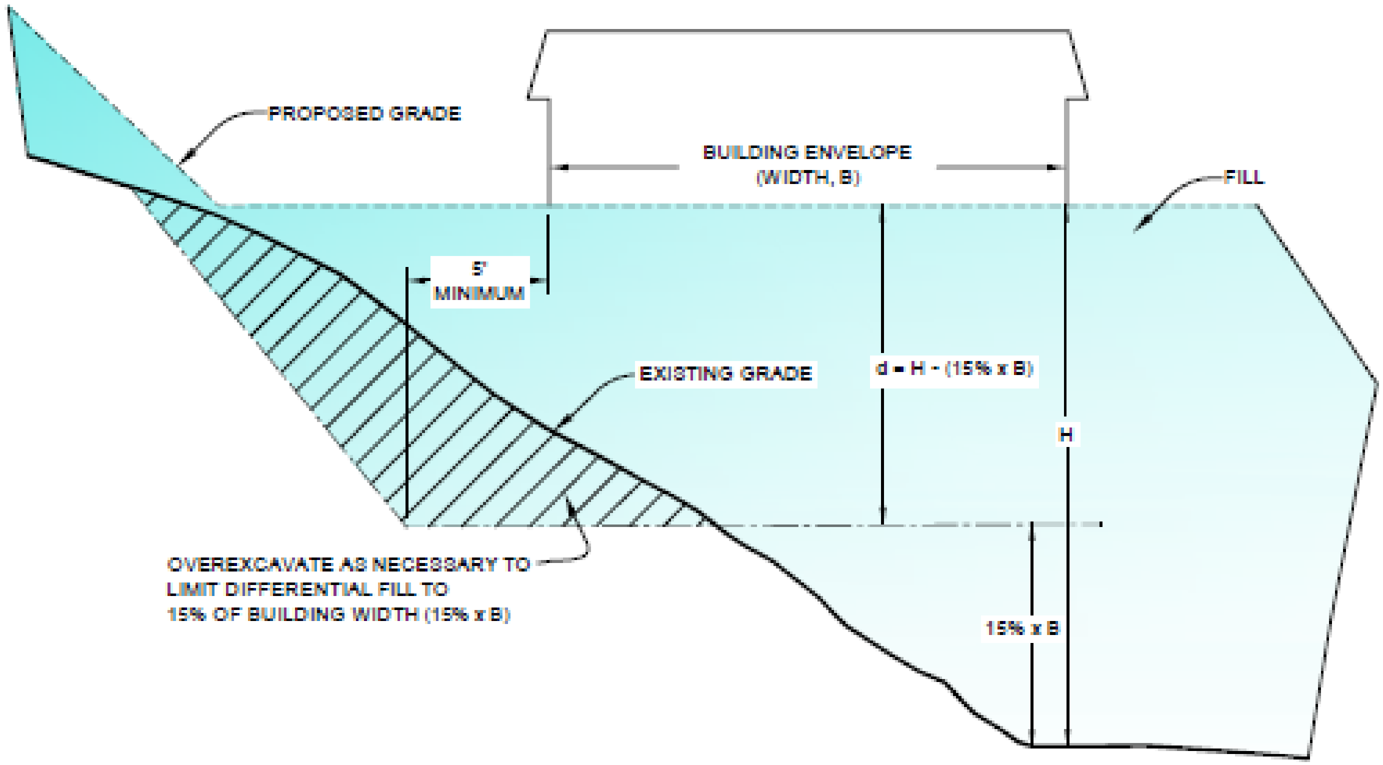
ORIGINAL FIGURE PRINTED IN COLOR



WHERE LOTS ARE PARTIALLY IN FILL, AND PARTIALLY IN CUT, OR LESS THAN 3' OF FILL IS PLANNED TO ACHIEVE PAD GRADE, OVEREXCAVATE AS SHOWN

ENGEO Expect Excellence	TYPICAL CUT/FILL TRANSITION LOT DETAIL SCOTTS VALLEY DEVELOPMENT VALLEJO, CALIFORNIA	PROJECT NO.: 16484.000.001 SCALE: AS SHOWN DRAWN BY: LL / CHECKED BY: JBR	FIGURE NO. 9

ORIGINAL FIGURE PRINTED IN COLOR



ENGEO
Expect Excellence

TYPICAL FILL LOT DETAIL
SCOTTS VALLEY DEVELOPMENT
VALLEJO, CALIFORNIA

PROJECT NO.: 16484.000.001		FIGURE NO. 10
SCALE: AS SHOWN		
DRAWN BY: LL	CHECKED BY: JBR	

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

TEST PIT LOGS
KEY TO BORING LOGS
KEY TO ROCK CHARACTERISTICS
EXPLORATION LOGS

TEST PIT LOG 1-TP1

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.138281 Logged Date: 4/19/24 Long: -122.215997 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	FAT CLAY with GRAVEL (CH), black to very dark brown, moist, stiff to very stiff, medium plasticity, fine to coarse angular to sub-angular gravel PP: 2.0 – 3.5 [Qc] Test pit terminated at approximately 3 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP2

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.138281 Logged Date: 4/19/24 Long: -122.216414 Equipment: Track-Mounted Excavator - Bobcat 325
Depth (Feet)	**Description**
0 – 1	SANDY LEAN CLAY (CL), brown, moist, soft, contains extensive roots PP: 2.0 – 3.5 [Qc]
1 – 3	GRAVELLY FAT CLAY (CH), yellowish brown to brown, moist, stiff to very stiff, medium to high plasticity, fine sub-rounded gravel PP: 2.0 – 2.5 [Qc] Test pit terminated at approximately 3 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP3

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.139316 Logged Date: 4/19/24 Long: -122.217188 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	GRAVELLY FAT CLAY (CH), yellowish brown to brown, moist, stiff to very stiff, medium to high plasticity, fine sub-rounded gravel PP: 2.0 – 2.5 [Qc] Test pit terminated at approximately 3 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP4

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Logged Date: 4/19/24 Equipment: Track-Mounted Excavator - Bobcat 325	Lat: 38.139866 Long: -122.217523

Depth (Feet)	Description
0 – 3	SHALE, black to very dark gray, very weak to weak, moderately weathered, thinly bedded, closely spaced joints. Bedding: S50°E at 60° Joint: S05°E at 79° [Kgv] Test pit terminated at approximately 3 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP5

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.140202 Logged Date: 4/19/24 Long: -122.216478 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	SHALE, black to very dark gray, very weak to weak, moderately weathered, thinly bedded, closely spaced joints. [Kgv] Test pit terminated at approximately 3 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP6

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.140760 Logged Date: 4/19/24 Long: -122.215953 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 2 ½	FAT CLAY (CH), brown, moist, medium stiff, high plasticity, contains roots PP: 0.75 – 1.0 [Qc]
2 ½ - 4 ½	GRAVELLY FAT CLAY (CH), yellowish brown to brown, moist, stiff to very stiff, medium to high plasticity, fine sub-rounded gravel [Qc]
4 ½ - 5	SILTSTONE, black to very dark gray, very weak to weak, moderately weathered, thinly bedded [Kgv]
	Test pit terminated at approximately 5 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP7

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Logged Date: 4/19/24 Equipment: Track-Mounted Excavator - Bobcat 325	Lat: 38.140995 Long: -122.215234

Depth (Feet)	Description
0 – 6	GRAVELLY FAT CLAY (CH), black with brown, moist, medium stiff, high plasticity, slickened surfaces, fine to coarse angular gravel PP: 2.0 [Qal]
6 – 8	GRAVELLY LEAN CLAY (CL), dark grayish brown, moist, low to medium plasticity, slickened surfaces, blocky, fine rounded gravel [Qc]
	Test pit terminated at approximately 8 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP8

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.141004 Logged Date: 4/19/24 Long: -122.214486 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	SANDY LEAN CLAY (CL), brown to reddish brown, moist, very stiff, low to medium plasticity, fine-grained sand PP: 3.5 [Qal]
6 – 8	SILTSTONE, olive gray, medium strong, slightly weathered, thinly bedded, FeO staining on discontinuities. Bedding: N24°W at 32° [Kgv]
	Test pit terminated at approximately 8 feet below ground surface. Groundwater not encountered.

ENGEO — Expect Excellence	TEST PIT LOG 1-TP9
Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.141792 Logged Date: 4/19/24 Long: -122.215428 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 6	GRAVELLY LEAN CLAY (CL), dark grayish brown, moist, medium stiff to stiff, low plasticity, slickened surfaces, blocky, fine rounded gravel PP: 1.0 – 1.5 [Qc]
5 – 6	Very stiff to hard
	Test pit terminated at approximately 6 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP10

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.143073 Logged Date: 4/19/24 Long: -122.215201 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	FAT CLAY (CH), black, moist, very soft to soft, blocky, trace gravel PP: 0.0 – 0.5 [Qal]
3 – 5	GRAVELLY LEAN CLAY with SAND (CL), light gray mottled with orange, saturated, low to medium plasticity, somewhat cemented, coarse angular gravel, gravel is mostly silicious carbonate, contains boulder size gravel [Qc - Debris fan]
	Test pit terminated at approximately 5 feet below ground surface. Groundwater encountered at 5 feet bgs.

ENGEO — Expect Excellence	TEST PIT LOG 1-TP11
Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.143270 Logged Date: 4/19/24 Long: -122.215688 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	GRAVELLY FAT CLAY (CH), black, moist, medium stiff to stiff, medium to high plasticity, contains sub-angular pebbles and cobbles, gravel is Kgv PP: 1.0 – 1.5 [Qc]
4 – 5	GRAVELLY LEAN CLAY with SAND (CL), light gray mottled with orange, moist, low to medium plasticity, somewhat cemented, coarse angular gravel, gravel is mostly silicious carbonate, contains boulder size gravel [Qc – Debris fan] Test pit terminated at approximately 5 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP12

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.143774 Logged Date: 4/19/24 Long: -122.214834 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 1	SILTY GRAVEL with SAND (GM), dark brownish red, loose, coarse angular gravel [Fill]
1 – 3	GRAVELLY LEAN CLAY (CL), brown, moist, hard, fine rounded gravel [Qc]
	Test pit terminated at approximately 3 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP13

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.143677 Logged Date: 4/19/24 Long: -122.213667 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 2½	SANDY LEAN CLAY (CL), brown, moist, stiff to very stiff, low plasticity, contains silt, fine-grained sand, trace fine gravel PP: 2.0 – 3.0 [Qc]
2½ – 5½	CLAYEY GRAVEL, olive gray and yellowish brown, dense, moist, fine to coarse angular gravel to cobbles, crushed siltstone with clay infill, FeO staining on clasts [Qls - Bedrock Landslide]
	Test pit terminated at approximately 5½ feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP14

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.145068 Logged Date: 4/19/24 Long: -122.214822 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – ½	GRAVELLY FAT CLAY (CH), dark brown, moist, high plasticity, fine to coarse angular to sub-rounded gravel, organics [Fill]
½ – 3	Dark yellowish brown to olive gray, very soft to soft, reduced organics PP: 0.25
3 – 4	Medium stiff PP: 1.0
4 – 6	GRAVELLY LEAN CLAY (CL), light gray to olive gray, moist, very stiff, low to medium plasticity, angular gravel PP: 2.5 [Qc]
6 – 7	Abundant calcium carbonate cementation, very stiff to hard Test pit terminated at approximately 7 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP15

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.145528 Logged Date: 4/19/24 Long: -122.214206 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	FAT CLAY (CH), black to very dark gray, moist, soft to medium stiff, medium plasticity, blocky PP: 0.5 [Qc]
3 – 5	Stiff, trace fine calcium carbonate nodules PP: 2.0
5 – 6	Very dark brown, very stiff to hard, coarse calcium carbonate nodules Test pit terminated at approximately 6 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP16

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by Logged Date: 4/19/24 Equipment: Track-Mounted Excavator - Bobcat 325	Lat: 38.14446 Long: -122.214513

Depth (Feet)	Description
0 – 1	GRAVELLY LEAN CLAY with SAND (CL), reddish brown, dry, soft to medium stiff [Fill]
1 – 2 ½	LEAN CLAY with GRAVEL (CL), dark yellowish brown, moist, very stiff, low to medium plasticity, fine rounded gravel, fine calcium carbonate nodules PP: 4.0 [Qc]
2 ½ - 4	SILICA-CARBONATE ROCK [SOAPSTONE], greenish gray with yellowish red weathering, very weak, moderately weathered, massive [SC]
3 ½ - 4	Strong to very strong Test pit terminated at approximately 4 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP17

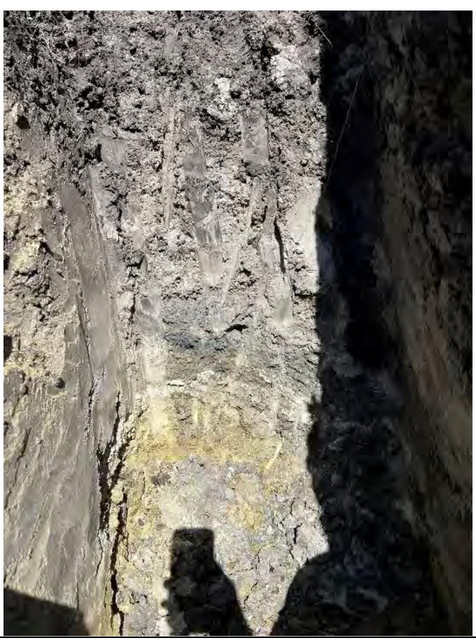
Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.145737 Logged Date: 4/19/24 Long: -122.214910 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 4	SANDY LEAN CLAY (CL), very dark brown, moist, very stiff, low plasticity, abundant calcium carbonate nodules, fine-grained sand, trace coarse angular gravel PP: 3.0 [Qal]
4 – 5	SILTSTONE, dark yellowish brown and olive gray with bluish gray oxidation on weathered surfaces, strong, slightly weathered, thinly bedded with sandstone Bedding: S58°E at 41° [Kgv]
	Test pit terminated at approximately 5 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP18

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.146285 Logged Date: 4/19/24 Long: -122.214224 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 2	FAT CLAY with GRAVEL (CH), black, moist, stiff, medium to high plasticity, coarse angular gravel, some pebble size clasts PP: 1.5 [Qal]
2 – 3 ½	FAT CLAY (CH), light gray, moist, medium stiff, high plasticity, abundant calcium carbonate PP: 0.75 [Qal]
3 ½ - 5	SHALE, very dark gray to black, very weak to weak, differentially weathered, thinly to very thinly bedded, very thin calcium carbonate layer within bedding Bedding: N°19E at 06° [Altered Kgv]
	Test pit terminated at approximately 5 feet below ground surface. Groundwater not encountered.



TEST PIT LOG 1-TP19

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.147471 Logged Date: 4/19/24 Long: -122.212938 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 5	LEAN CLAY (CL), dark yellowish brown, moist, stiff, low to medium plasticity, trace fine rounded to sub-angular gravel PP: 1.5 [Qc]
5 – 6 ½	Blocky structure Test pit terminated at approximately 6 ½ feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP20

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.148596 Logged Date: 4/19/24 Long: -122.212783 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 3	SANDY LEAN CLAY (CL), very dark brown, moist, soft to medium stiff, low plasticity, fine-grained sand, trace fine sub-angular gravel PP: 0.5 [Qc]
3 – 5	LEAN CLAY WITH GRAVEL (CL), dark yellowish brown to dark brown, moist, very stiff, low plasticity, fine to coarse rounded to subrounded gravel PP: 2.25 [Qc]
5 - 6	Blocky structure Test pit terminated at approximately 6 feet below ground surface. Groundwater not encountered.

ENGEO Expect Excellence	TEST PIT LOG 1-TP21
Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.148746 Logged Date: 4/19/24 Long: -122.213873 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 6	LEAN CLAY (CL), brown to dark yellowish brown, moist, stiff, medium plasticity, somewhat blocky, trace fine sub-angular gravel PP: 1.5 [Qc]
6 – 8	Very stiff to hard, blocky Test pit terminated at approximately 8 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP22

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.148363 Logged Date: 4/19/24 Long: -122.214831 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 1 ½	LEAN CLAY (CL), dark brown, moist, medium stiff to stiff, low plasticity, trace sand and gravel, contains roots PP: 1.0 – 1.5 [Qls]
1 ½ – 4	GRAVELLY LEAN CLAY (CL), dark yellowish brown, moist, medium stiff, medium plasticity, fine to coarse angular siltstone gravel PP: 0.75 [Qls]
4 – 6	SHALE, olive gray, medium strong, moderately weathered, thinly bedded, shattered/crushed, heavily jointed Jointing: N41°E at 78° [Kgv-Qls] Test pit terminated at approximately 6 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP23

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.149246 Logged Date: 4/19/24 Long: -122.214299 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 2	SANDY LEAN CLAY (CL), brown, moist, medium stiff, low plasticity, fine-grained sand, trace fine sub-angular gravel PP: 1.0 [Qls]
2 – 3 ½	GRAVELLY LEAN CLAY (CL), dark yellowish brown, moist, stiff, low to medium plasticity, coarse angular gravel [Qls]
3 ½ - 5	SILSTONE, brown with dark orange, extremely weak/residual soil, heavily weathered, abundant slickensides Slickenside Plane: S23°E at 30-40° [Kgv - Qls] Test pit terminated at approximately 5 feet below ground surface. Groundwater not encountered.

TEST PIT LOG 1-TP24

Scott's Valley Development Vallejo, CA 16484.000.001	Logged By: NI, Checked by JBR Lat: 38.149714 Logged Date: 4/19/24 Long: -122.213483 Equipment: Track-Mounted Excavator - Bobcat 325

Depth (Feet)	Description
0 – 2	SANDY LEAN CLAY (CL), brown, moist, medium stiff, low to medium plasticity, fine-grained sand, trace fine sub-angular gravel PP: 1.0 [Qc]
2 – 3 ½	GRAVELLY FAT CLAY (CH), light grayish brown, moist, stiff, medium to high plasticity, fine to coarse angular gravel, some pebble size clasts PP: 1.5 [Qc]
3 ½ - 5	GRAVELLY LEAN CLAY (CL), dark yellowish brown, moist, hard, fine rounded gravel [Qc]
	Test pit terminated at approximately 5 feet below ground surface. Groundwater not encountered.

KEY TO BORING LO S

JOR 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 grav ls or grav el-sand mixt s GP - Poorly g aded grav ls or grav el-sand mixt s
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt ixt s GC - Clay y grav ls, grav el-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 mixt s SP - Poorly graded sands or gravelly sand mixt s
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay ixt s
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 th group name .

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

R IN SIZES

U.S. STANDARD SERIES SIEVE SIZE	200	40	10	4	CLEAR SQUARE SIEVE OPENIN S 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-
VERY STIFF	-4
HARD	OVER 4

MOISTURE CONDITION

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

SAMPLER SYMBOLS

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

LINE TYPES

- Solid - Lay Break
- Dashed - Gradational or approximate lay break

GROUNDWATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

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(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 pen trometer

KEY TO ROCK CHARACTERISTICS

ROCK COMPETENCY

Strength	Grade	Hand Sample Characteristic	Approximate Uniaxial Compressive Strength	
			MPa	ksi
Extremely Weak	R0	Can be indented by thumb nail	0.25-1.0	< 0.2
Very Weak	R1	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	1 - 5	0.2 - 0.7
Weak	R2	Can be peeled by pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	5 - 25	0.7 - 4
Medium Strong	R3	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	25 - 50	4 - 7
Strong	R4	Specimen requires more than one blow of a geological hammer to fracture	50 - 100	7 - 15
Very Strong	R5	Specimen requires many blows with a geologic hammer to fracture it	100-250	15 - 36
Extremely Strong	R6	Specimen can only be chipped with geological hammer	>250	>36

International Society for Rock Mechanics

ROCK STRUCTURAL FEATURES

Bedding or Foliation		Joints, Fractures, Faults	
Description	Thickness of beds	Description	Spacing
Massive	No apparent bedding	Very widely	> 4 feet
Very thick bedding	Greater than 4 feet	Widely	1 to 4 feet
Thick bedding	2 feet to 4 feet	Moderately	6 to 12 inches
Thin bedding	2 inches to 2 feet	Closely	1 to 6 inches
Very thin bedding	½ inch to 2 inches	Very closely	½ inch to 1 inch
Laminated	Less than ½ inch	Crushed	Less than ½ inch

DISCONTINUITY SHORTHAND

Discontinuity Data	Abbreviation
Type	
Bedding	Be
Joint	Jo
Shear	Sh
Mechanical Break	Me
Vein	Ve
Fault	Flt
Void	Vd
Fracture Zone	FZ
Aperture	
Tight	Ti
Open	Op
Healed	He
Filled	Fi
Surface Shape	
Irregular	Ir
Planar	Pl
Undulating, Curved	U
Stepped	S
Roughness	
Stepped	St
Rough	Ro
Moderately Rough	MR
Smooth	Sm
Slickensided	K
Polished	P
Infill Type	
Clean	N
Surface Film	F
Cemented	C
Infilling Material	
Carbonate	Ca
Iron Oxide	Fe
Magnesium Oxide	Mn
Quartz	Q
Clay	Cl

ROCK WEATHERING

Weathering	Grade	Description
Fresh	F	No visible sign of decomposition or discoloration. Rings under hammer impact.
Slightly	WS	Slight discoloration inwards from open fractures, otherwise similar to Fresh.
Moderately	WM	Discolored throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly	WH	Most minerals to some extent decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.
Completely Weathered	WC	Minerals decomposed to a soil but the fabric and structure preserved. Specimens easily crumbled or penetrated.
Residual Soil	RS	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

International Society for Rock Mechanics

ROCK QUALITY DESIGNATION (RQD)

*RQD %	Rock Quality
90-100	Excellent
75-90	Good
50-75	Fair
25-50	Poor
0-25	Very Poor

*RQD = The total length of pieces of rock core with length greater than 4 inches, divided by the full length of the core run

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LOG OF BORING 1-B1

ENGEO — Expect Excellence

LATITUDE: 38.14354 LONGITUDE: -122.21349

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/23/2024
HOLE DEPTH: Approx. 75½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 279 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: SFA, Switch to Mud
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 brown, medium stiff to stiff, moist, rootlets [Qc, COLLUVIUM]												
						13								1*	PP
			Brown mottled with dark brown			16	65	16	49						
	275										22	106	1422	1.4	UC
5			MUDSTONE, yellowish brown, very weak (R1), completely weathered (WC) [Qls, LANDSLIDE DEBRIS]			45									
			Switched to coring at approximately 6½ feet below ground surface. See next page for coring log.												
	270														
10															
	265														
15															
	260														
20															

CORELOG 1-B1

LATITUDE: 38.14354 LONGITUDE: -122.21349

ENGEO
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Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/23/2024
HOLE DEPTH: Approx. 75½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 279 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
CORING CONTRACTOR: Britton Exploration
CORING METHOD, BIT SIZE/TYPE: Wireline Core
NO. OF CORE BOXES: 7

Relative Hardness: R0 R1 R2 R3 R4 R5 R6
Weathering Grade: RS WC WH WM WS F

Depth in Feet	Elevation in Feet	Sample Type	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD	Graphic Log	Discontinuities Remarks	DESCRIPTION	NOTES
	278									
	277									
	276									
	275									
5	274									
	273								Begin wireline coring at 6.5 feet below ground surface. See soil borelog for previous data.	
	272		1	1.2	0/1.5	0	NR		SHEARED MUDSTONE, yellowish brown, extremely weak (R0), moderately fractured, completely weathered (WC), mudstone clasts within sheared clay matrix [Qls, LANDSLIDE DEBRIS]	
	271									
	270									
10	269		2	1.2	4.2/5	0		- Sh: 30° Ti, Ir, MR, F, Cl	Clay matrix washed out	
	268									
	267						NR	- Me	11'-12': matrix partially washed out, calcite veins	
	266									
	265									
15	264		3	2.6	5/5	0		- Vd: washed out matrix	Matrix washed out	
	263									
	262							- Sh: 25° Ti, Ir, MR, F, Cl - Me - Me	Closely fractured	
	261							- Me	Very weak (R1), moderately fractured	
	260							- Jo: 10° He, St		
20	259								19.5'-19.7': 2" band of gray rock at 60-70°	

R0 R1 R2 R3 R4 R5 R6
RS WC WH WM WS F

CORELOG 1-B1

ENGEO
Expect Excellence

LATITUDE: 38.14354 LONGITUDE: -122.21349

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/23/2024
HOLE DEPTH: Approx. 75½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 279 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
CORING CONTRACTOR: Britton Exploration
CORING METHOD, BIT SIZE/TYPE: Wireline Core
NO. OF CORE BOXES: 7

Depth in Feet	Elevation in Feet	Sample Type	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD	Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F)	Graphic Log	Discontinuities Remarks	DESCRIPTION	NOTES
	258–256		4	3	3.8/5	0		NR	- Jo: 70-80° He - Vd: washed out matrix zone 21.25' - 21.75'	SHEARED MUDSTONE, yellowish brown, very weak (R1), moderately fractured [Qls, LANDSLIDE DEBRIS] Crushed, grades to strong gray, highly to moderately weathered	
25	256–251		5	1.2	3.8/5	0		NR	- Clay gouge zone 23'-23.5' - Me - Me - Me - Me	SHEARED SHALE, strong gray, very weak (R1), moderately fractured to closely fractured, highly weathered (WH) to completely weathered (WC), angular shale clasts in clay matrix [Qls, LANDSLIDE DEBRIS]	25': DD=131.8 pcf, MC=10.35%, UCS=5.167 tsf
30	251–246		6	1.2	3/5	0		NR	- Me - Ve: 35° Sh, He, Ca - Ve: 35° Sh, He, Ca	Calcite veins	
35	246–241		7	3	5/5	0			- Vd: washed out matrix - Matrix partially washed out - Me	Mottled with dark gray	
40	241–239								- Sh: 30° Ti, St		

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CORELOG 1-B1

LATITUDE: 38.14354 LONGITUDE: -122.21349

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/23/2024
HOLE DEPTH: Approx. 75½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 279 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
CORING CONTRACTOR: Britton Exploration
CORING METHOD, BIT SIZE/TYPE: Wireline Core
NO. OF CORE BOXES: 7

Depth in Feet	Elevation in Feet	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD	Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F)	Discontinuities Remarks	DESCRIPTION	NOTES
	238	8	3	4.3/5	0	R1 / WH	- Jo: 10° Ti, Ir, MR, F, Cl - Jo: 25° Ti, Ir, MR, F, Cl	SHEARED SHALE, strong gray, very weak (R1), very closely fractured to crushed, highly weathered (WH) to completely weathered (WC), angular shale clasts in clay matrix [Qls, LANDSLIDE DEBRIS]	
	237						- Me		
	236						- Me - Vd: washed out matrix - Me	Matrix washed out	
45	234	9	5.2	5/5	0	R1 / WH	- Vd: washed out matrix		
	233						- Sh: 15° Ti, Ir, MR, F, Cl		
	232						- Me - Jo: 10° Ti, Ir, Ro, F, Cl		
	231						- Sh: 15° Ti, Ir, MR, F, Cl		
	230							Becomes clast-supported, reduced clay matrix	
50	229	10	4.8	5/5	0	R1 / WH	- Me		
	228						- Sh: 15° Ti, Ir, MR, F, Cl - Me		
	227						- Jo: 20° He, Ir, Ro,		
	226						- Me		
55	224	11	2.8	4.8/5	0	R1 / WH	- Me		
	223						- Me		
	222								
	221						- FZ: 58'-59.5'		
	220						- Sh: 15° Ti, Ir, P, N		
60	219								

Graphic Log:

CORELOG 1-B1

LATITUDE: 38.14354 LONGITUDE: -122.21349

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED:	4/23/2024
HOLE DEPTH:	Approx. 75½ ft.
HOLE DIAMETER:	8.0 in.
SURF ELEV (NAVD88):	Approx. 279 ft.
LOGGED / REVIEWED BY:	K. Wang / JBR
CORING CONTRACTOR:	Britton Exploration
CORING METHOD, BIT SIZE/TYPE:	Wireline Core
NO. OF CORE BOXES:	7

Depth in Feet	Elevation in Feet	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD
	218–216	12	2.6	5/5	0
65	216–211	13	7.6	4.4/5	6.7
70	211–206	14	5.6	5/5	0
75	206–203.5	15	8.4	2.5/2.5	0

Relative Hardness: R0 R1 R2 R3 R4 R5 R6
Weathering Grade: RS WC WH WM WS F

Discontinuities Remarks

- FZ: 60'-61.5' Material degraded to clay
- Ve: 15° Sh, He, Ca
- FZ: 63'-63.5', Be: 30-35°
- Sh: 25° Ti, Pl, P, N
- Sh: 25° Ti, Pl, P, F, Cl
- FZ: 65'-66', Be: 25-35°
- Sh: 30° Ti, Pl, P, F, Cl
- Sh: 30° Ti, Pl, P, F, Cl
- Jo: 20° Op, St
- Jo: 20° Ti, St
- Jo: 20° Ti, St
- Jo/Sh: 30° Ti, Pl, P, F, Cl
- FZ: 69.5'-71.3', He, F, Cl, randomly oriented
- FZ: 72'-73'
- FZ: 73'-74.25', Op
- Sh/Shear Zone: 45° Op, Pl

DESCRIPTION

SHEARED SHALE, strong gray mottled with dark gray, very weak (R1), very closely fractured to crushed, highly weathered (WH), angular shale clasts in minor clay matrix [Qls, LANDSLIDE DEBRIS]

63.8'-64.6': intensely sheared and fractured, joints and shears are healed, shears along bedding

Very closely fractured to crushed, moderately weathered (WM), very thinly bedded, reduced shearing

Closely fractured, freshly weathered (F)

66.3'-66.9': clay gouge

66.9'-67.4': SANDSTONE, gray, moderately strong, moderately to slightly weathered, thinly bedded

Very closely fractured to crushed, moderately weathered (WM) to highly weathered (WH), 68.5'-69.5': clay gouge

SHALE, strong gray, very weak (R1), very closely fractured, highly weathered (WH), joints and shears throughout, healed to open, randomly oriented [Qls, LANDSLIDE DEBRIS]

Crushed, Angular shale fragments with no matrix

Closely fractured, 74.3'-75': Healed joints and shears

Bottom of boring at approximately 75½ feet below ground surface. Groundwater encountered during drilling at approximately 14 feet below ground surface.

NOTES

69':
PL=17
LL=43
fines=97.2%
clay=54.9%

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LOG OF BORING 1-B2

LATITUDE: 38.14328 LONGITUDE: -122.21502

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/22/2024
HOLE DEPTH: Approx. 43¼ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 231 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
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	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
			FAT CLAY (CH), black, soft to medium stiff, moist, trace angular coarse gravel [Qal, ALLUVIUM]												
	230														
						9	92	21	71		36	79	592.8	0.6	UC
						12							100*	0.75*	PP+TV
5			SANDY LEAN CLAY (CL), yellowish brown mottled with very light brown, medium stiff to very stiff, moist, fine-grained sand, angular coarse gravel [Qc, COLLUVIUM]			17									
	225										30	92.5	837	0.85	UC
			CLAYEY SAND (SC), dark brown, loose, moist, angular, coarse gravel [Qc, COLLUVIUM]			21				19					
10			Very dense			50									
	220														
			Dark yellowish brown			50									
			SHALE, dark gray to very dark gray, very weak (R1), highly weathered (WH) [Kgv, GREAT VALLEY SEQUENCE]		▽	50/6"									
15															
	215					47									
20															

LOG OF BORING 1-B2

ENGEO
Expect Excellence

LATITUDE: 38.14328 LONGITUDE: -122.21502

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/22/2024
HOLE DEPTH: Approx. 43¼ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 231 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
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
	210		SHALE, dark gray to very dark gray, very weak (R1), highly weathered (WH) [Kgv, GREAT VALLEY SEQUENCE]			50/4"									
25	205					41									
30	200					50/4"									
35	195					55									
40															

LOG - GEOTECHNICAL_SU+QU W/ ELEV SOIL LOGS.GPJ ENGEO INC.GDT 5/21/24

LOG OF BORING 1-B2

ENGEO
Expect Excellence

LATITUDE: 38.14328 LONGITUDE: -122.21502

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/22/2024
HOLE DEPTH: Approx. 43¼ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): Approx. 231 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
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
	190		SHALE, dark gray to very dark gray, very weak (R1), completely weathered (WC), clay matrix with rock fragments [Kgv, GREAT VALLEY SEQUENCE]			50/3"									
						50/2"									
			Bottom of boring at approximately 43 feet below ground surface. Groundwater encountered during drilling at approximately 14 feet below ground surface.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV SOIL LOGS.GPJ ENGEO INC.GDT 5/21/24

LOG OF BORING 1-B3

LATITUDE: 38.14889 LONGITUDE: -122.21444

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/25/2024
HOLE DEPTH: Approx. 60 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NAVD88): Approx. 497 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
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
0	497		POORLY GRADED SAND WITH CLAY (SP-SC), dark brown, loose, dry to moist, rootlets [Qc, COLLUVIUM]												
	495														
2.5			CLAYEY SAND (SC), yellowish brown, medium dense, moist [Qc, COLLUVIUM]							25					
5		Sample (5–6.5)				47					14	105.9			
7	490		SANDSTONE, yellowish brown, extremely weak (R0), completely weathered (WC), decomposed [Qls, LANDSLIDE DEBRIS]												
10		Sample (10–11.5)				43									
11.5	485		Switched to dry coring at approximately 11½ feet below ground surface. See next page for dry coring log.												
15															
	480														
20															

CORELOG 1-B3

LATITUDE: 38.14889 LONGITUDE: -122.21444

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED:	4/25/2024	LOGGED / REVIEWED BY:	K. Wang / JBR
HOLE DEPTH:	Approx. 60 ft.	CORING CONTRACTOR:	Britton Exploration
HOLE DIAMETER:	6.0 in.	CORING METHOD, BIT SIZE/TYPE:	Dry Core
SURF ELEV (NAVD88):	Approx. 497 ft.	NO. OF CORE BOXES:	4

Depth in Feet	Elevation in Feet	Sample Type	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD	Relative Hardness (R0 R1 R2 R3 R4 R5 R6) / Weathering Grade (RS WC WH WM WS F)	Graphic Log	Discontinuties Remarks	DESCRIPTION	NOTES
	496										
	495										
	494										
	493										
5	492										
	491										
	490										
	489										
	488									Begin dry coring at 10 feet below ground surface. See soil borelog for previous data.	
10	487								- Jo: 5° Op, Ir, St - Jo: 10° Op, Ir, St	SANDSTONE, reddish yellow, extremely weak (R0), closely fractured to very closely fractured, completely weathered (WC) to residual soil (RS), landslide debris comprising angular clasts of sheared sandstone within a fine-grained matrix [Qls, LANDSLIDE DEBRIS]	
	486										
	485		1	2	4.25/5	0					
	484									13'-13.25': clay gouge, black oxidation	
	483										
15	482								- Me - Jo: 10° Op, Ir, Ro		
	481										
	480		2	2	5/5	0			- FZ/Shear zone: 16.75'-17.25' - Me		
	479								- Me - Jo: 5° Op, Ir, Ro		
	478								- Jo: 0° Op, Ir, Ro - FZ: 19.5'-20'		
20	477										

R0 R1 R2 R3 R4 R5 R6
RS WC WH WM WS F

ENGEO
Expect Excellence

CORELOG 1-B3

LATITUDE: 38.14889 LONGITUDE: -122.21444

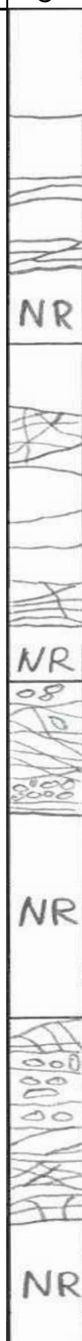
Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/25/2024
HOLE DEPTH: Approx. 60 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NAVD88): Approx. 497 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
CORING CONTRACTOR: Britton Exploration
CORING METHOD, BIT SIZE/TYPE: Dry Core
NO. OF CORE BOXES: 4

Relative Hardness: R0 R1 R2 R3 R4 R5 R6
Weathering Grade: RS WC WH WM WS F

Depth in Feet	Elevation in Feet	Sample Type	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD	Relative Hardness / Weathering Grade	Graphic Log	Discontinuities Remarks	DESCRIPTION	NOTES
	476–472		3	2.2	3.9/5	0	R0 / WC		- Jo: 5° Op, Ir, Ro - Sh: 45° Op, Pl, MR, F, Sand - FZ: 23.5'-24, 60°&0°	SANDSTONE, reddish yellow, extremely weak (R0), crushed, completely weathered (WC) to residual soil (RS), decomposed sandstone clasts without matrix [Qls, LANDSLIDE DEBRIS] 20.8'-21': dark brown, residual soil Intensely fractured throughout Completely weathered (WC)	
25	472–467		4	1	4.2/5	0	R0 / WC		- FZ: 26'-26.5' - Sh: 30° Op, Ir, MR, F, Cl - FZ: 27'-30'	25'-26': zone of reduced fractures and shears	
30	467–462		5	4.4	2/5	0	R0 / WC			Crushed; decomposed rock fragments up to 2 inches in diameter, no matrix	
35	462–457		6	1.8	3/5	0	R0 / WC				
40	457										



CORELOG 1-B3

ENGEO Expect Excellence

LATITUDE: 38.14889 LONGITUDE: -122.21444

Landslide Exploration
Scott's Valley PGEX
Vallejo, CA
16484.000.001

DATE DRILLED: 4/25/2024
HOLE DEPTH: Approx. 60 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NAVD88): Approx. 497 ft.

LOGGED / REVIEWED BY: K. Wang / JBR
CORING CONTRACTOR: Britton Exploration
CORING METHOD, BIT SIZE/TYPE: Dry Core
NO. OF CORE BOXES: 4

Depth in Feet	Elevation in Feet	Sample Type	Run Number	Drill Rate (s/ft)	Run Length (ft) / Recovery (ft)	RQD	Relative Hardness (R0–R6) / Weathering Grade (RS, WC, WH, WM, WS, F)	Graphic Log	Discontinuties Remarks	DESCRIPTION	NOTES
	456–453		7	4	1.5/5	0	R0 / WC	NR		SANDSTONE, reddish yellow, extremely weak (R0), crushed, completely weathered (WC), angular sandstone clasts without matrix [Qls, LANDSLIDE DEBRIS]	
45	452–448		8	1.2	2.75/5	0	R0 / WC	NR		Grades to yellowish brown	
50	447–443		9	1.6	2.5/5	0	R0 / WC	NR		SHALE, yellowish brown, extremely weak (R0), crushed, completely weathered (WC), angular shale clasts without matrix [Qls, LANDSLIDE DEBRIS]	
55	442–438		10	1.4	0/5	0	R0 / WC	NR			
60	437									Bottom of boring at approximately 60 feet below ground surface. Groundwater not encountered during drilling.	

APPENDIX B

MPD INFILTROMETER DATA

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Infiltration Report

Engeo San Ramon

651.237.5123

Scott's Valley - 16484.000.001 - Vallejo, CA

This report summarizes the results of a set of Modified Philip Dunne (MPD) Infiltrometer tests performed at the above referenced site. Engeo San Ramon personnel performed the field tests. The software used to compute saturated hydraulic conductivity (K_{sat}) and generate this report assumes that the field personnel used infiltrometers manufactured by Upstream Technologies Inc. and followed the procedures outlined in “Manual – Modified Philip - Dunne Infiltrometer” by Ahmed, Gulliver, and Nieber.

The following paragraphs describe the individual tests, input values used in the analysis, and methods used to compute the K_{sat} value.

After individual K_{sat} values were calculated, the method used to determine the overall site K_{sat}value ($K_{best\text{-}fit}$) is described in "Effective Saturated Hydraulic Conductivity of an Infiltration-Based Stormwater Control Measure" by Weiss and Gulliver 2015, "A relationship to more consistently and accurately predict the best-fit value of saturated hydraulic conductivity used a weighted sum of 0.32 times the arithmetic mean and 0.68 times the geometric mean."

METHOD USED TO COMPUTE K_{sat}

The MPD Infiltrometer software uses the following procedure described in "The Comparison of Infiltration Devices and Modification of the Philip-Dunne Permeameter for the Assessment of Rain Gardens" by Rebecca Nestigen, University of Minnesota, November 2007.

The steps are as follows:

1. For each measurement of head, use the following equation to find the corresponding distance to the sharp wetting front.

$$[H_0 - H(t)]r_1^2 = \frac{\theta_1 - \theta_2}{3}[2[R(t)]^3 + 3[R(t)]^2 L_{max} - L_{max}^3 - 4r_0^3]$$

2. Estimate the change in head with respect to time and the change in wetting front distance with respect to time by using the backward difference for all values of R(t) equal to or greater than the distance

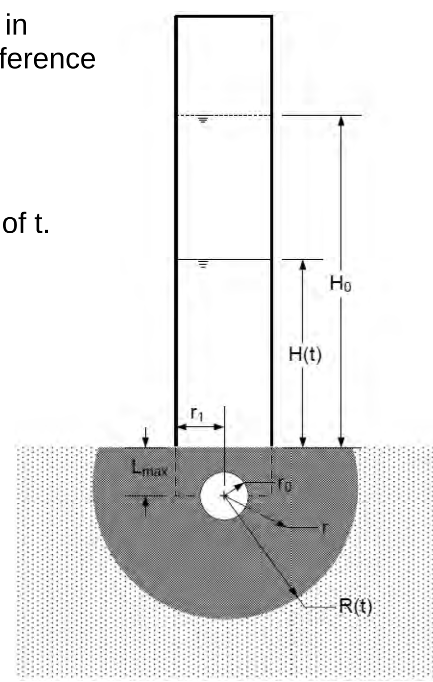
$$\sqrt{r_1^2 + L_{max}^2}$$

3. Make initial guesses for K and C.
4. Solve the following equations for ΔP(t) at each incremental value of t.

$$\Delta P(t) = \frac{\pi^2}{8}\left\{\theta_1 - \theta_0 \frac{[R(t)^2] + [R(t)]L_{max}}{K}\frac{dr}{dt} - 2r_0^2\right\} \frac{ln[\frac{R(t)[r_0 + L_{max}]}{r_0[R(t) + L_{max}]}]}{L_{max}}$$

$$\Delta P(t) = C - H(t) - L_{max} + \frac{L_{max}}{K}\frac{dh}{dt}$$

5. Minimize the absolute difference between the two solutions found in Step 4 by adjusting the values of K and C.



Parameters for Equations

Θ_0 = volumetric water content of soil before MPD test

Θ_1 = volumetric water content of soil after MPD test

Infiltration Report

MPD INFILTROMETER
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Upstream Technologies
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Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

1mpd4

Date	4/9/2024
Time	8:24 AM
Latitude	38.137993
Longitude	-122.216017
Initial Volumetric Moisture	10.00 %
Final Volumetric Moisture	50.00 %
Cylinder Size	3 Liter

1mpd4 Results

Map Pin #	1
Test Number	27665
Ksat - mm/hr	79
Ksat - in/hr	3.12
Capillary Pressure C mm	-64.6
RMS Error of Regression	8.9
Normalized RMS	0.3%

Readings

#	Time	Head	#	Time	Head	#	Time	Head	#	Time	Head
1	0 s	34.54 cm	26	749 s	24.33 cm	51	1500 s	17.38 cm	76	2250 s	12.11 cm
2	30 s	34.04 cm	27	780 s	24.0 cm	52	1530 s	17.14 cm	77	2279 s	11.91 cm
3	59 s	33.53 cm	28	810 s	23.69 cm	53	1560 s	16.91 cm	78	2310 s	11.73 cm
4	90 s	33.05 cm	29	840 s	23.37 cm	54	1590 s	16.67 cm	79	2339 s	11.54 cm
5	120 s	32.56 cm	30	870 s	23.06 cm	55	1620 s	16.45 cm	80	2370 s	11.36 cm
6	150 s	32.11 cm	31	899 s	22.76 cm	56	1650 s	16.22 cm	81	2400 s	11.18 cm
7	180 s	31.64 cm	32	930 s	22.45 cm	57	1679 s	15.99 cm	82	2429 s	11.0 cm
8	210 s	31.19 cm	33	959 s	22.15 cm	58	1710 s	15.77 cm	83	2460 s	10.82 cm
9	239 s	30.74 cm	34	990 s	21.86 cm	59	1739 s	15.55 cm	84	2489 s	10.65 cm
10	270 s	30.31 cm	35	1019 s	21.57 cm	60	1770 s	15.33 cm	85	2520 s	10.47 cm
11	299 s	29.89 cm	36	1050 s	21.29 cm	61	1799 s	15.12 cm	86	2550 s	10.28 cm
12	330 s	29.48 cm	37	1079 s	21.0 cm	62	1830 s	14.91 cm	87	2579 s	10.11 cm
13	359 s	29.06 cm	38	1110 s	20.72 cm	63	1859 s	14.69 cm	88	2610 s	9.94 cm
14	390 s	28.67 cm	39	1139 s	20.43 cm	64	1890 s	14.48 cm	89	2640 s	9.77 cm
15	419 s	28.27 cm	40	1170 s	20.17 cm	65	1919 s	14.27 cm	90	2669 s	9.6 cm
16	450 s	27.89 cm	41	1200 s	19.89 cm	66	1950 s	14.06 cm	91	2700 s	9.42 cm
17	479 s	27.49 cm	42	1230 s	19.62 cm	67	1979 s	13.86 cm	92	2729 s	9.25 cm
18	510 s	27.12 cm	43	1260 s	19.36 cm	68	2010 s	13.66 cm	93	2759 s	9.09 cm
19	539 s	26.75 cm	44	1290 s	19.11 cm	69	2039 s	13.45 cm	94	2790 s	8.92 cm
20	570 s	26.39 cm	45	1320 s	18.85 cm	70	2070 s	13.26 cm	95	2819 s	8.76 cm
21	600 s	26.02 cm	46	1350 s	18.59 cm	71	2100 s	13.05 cm	96	2849 s	8.59 cm
22	629 s	25.68 cm	47	1380 s	18.35 cm	72	2129 s	12.86 cm	97	2880 s	8.43 cm
23	660 s	25.33 cm	48	1410 s	18.1 cm	73	2160 s	12.67 cm	98	2909 s	8.27 cm
24	689 s	24.99 cm	49	1440 s	17.86 cm	74	2189 s	12.48 cm	99	2939 s	8.11 cm
25	720 s	24.66 cm	50	1470 s	17.61 cm	75	2220 s	12.29 cm	100	2970 s	7.96 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

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651.237.5123

1mpd4 Readings continued

#	Time	Head
101	2999 s	7.8 cm
102	3029 s	7.65 cm
103	3060 s	7.49 cm
104	3089 s	7.33 cm
105	3120 s	7.2 cm
106	3150 s	7.05 cm
107	3179 s	6.89 cm
108	3210 s	6.75 cm
109	3239 s	6.6 cm
110	3270 s	6.46 cm
111	3300 s	6.31 cm
112	3329 s	6.17 cm
113	3360 s	6.03 cm
114	3389 s	5.9 cm
115	3420 s	5.76 cm
116	3450 s	5.61 cm
117	3479 s	5.47 cm
118	3510 s	5.33 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

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651.237.5123

1mpd3

Date	4/9/2024
Time	9:42 AM
Latitude	38.138578
Longitude	-122.215725
Initial Volumetric Moisture	30.00 %
Final Volumetric Moisture	70.00 %
Cylinder Size	3 Liter

1mpd3 Results

Map Pin #	2
Test Number	27669
Ksat - mm/hr	NULL
Ksat - in/hr	NULL
Capillary Pressure C mm	NULL
RMS Error of Regression	NULL
Normalized RMS	NULL

Readings

#	Time	Head	#	Time	Head	#	Time	Head	#	Time	Head
1	0 s	36.39 cm	26	748 s	36.53 cm	51	1498 s	36.58 cm	76	2248 s	36.63 cm
2	28 s	36.39 cm	27	778 s	36.53 cm	52	1528 s	36.58 cm	77	2278 s	36.64 cm
3	58 s	36.39 cm	28	808 s	36.54 cm	53	1558 s	36.59 cm	78	2308 s	36.64 cm
4	88 s	36.39 cm	29	838 s	36.54 cm	54	1588 s	36.59 cm	79	2338 s	36.65 cm
5	118 s	36.4 cm	30	868 s	36.55 cm	55	1618 s	36.59 cm	80	2368 s	36.65 cm
6	148 s	36.41 cm	31	898 s	36.55 cm	56	1648 s	36.59 cm	81	2398 s	36.65 cm
7	178 s	36.41 cm	32	928 s	36.55 cm	57	1678 s	36.59 cm	82	2428 s	36.65 cm
8	208 s	36.42 cm	33	958 s	36.55 cm	58	1708 s	36.59 cm	83	2458 s	36.65 cm
9	238 s	36.43 cm	34	988 s	36.55 cm	59	1738 s	36.6 cm	84	2488 s	36.65 cm
10	268 s	36.44 cm	35	1018 s	36.56 cm	60	1768 s	36.6 cm	85	2518 s	36.66 cm
11	298 s	36.44 cm	36	1048 s	36.56 cm	61	1798 s	36.6 cm	86	2548 s	36.66 cm
12	328 s	36.46 cm	37	1078 s	36.56 cm	62	1828 s	36.6 cm	87	2578 s	36.66 cm
13	358 s	36.46 cm	38	1108 s	36.56 cm	63	1858 s	36.61 cm	88	2608 s	36.66 cm
14	388 s	36.47 cm	39	1138 s	36.56 cm	64	1888 s	36.61 cm	89	2638 s	36.66 cm
15	418 s	36.48 cm	40	1168 s	36.56 cm	65	1918 s	36.6 cm	90	2668 s	36.67 cm
16	448 s	36.48 cm	41	1198 s	36.56 cm	66	1948 s	36.61 cm	91	2698 s	36.67 cm
17	478 s	36.49 cm	42	1228 s	36.56 cm	67	1978 s	36.59 cm	92	2728 s	36.67 cm
18	508 s	36.5 cm	43	1258 s	36.56 cm	68	2008 s	36.6 cm	93	2758 s	36.69 cm
19	538 s	36.52 cm	44	1288 s	36.57 cm	69	2038 s	36.61 cm	94	2788 s	36.67 cm
20	568 s	36.52 cm	45	1318 s	36.57 cm	70	2068 s	36.61 cm	95	2818 s	36.69 cm
21	598 s	36.53 cm	46	1348 s	36.57 cm	71	2098 s	36.62 cm	96	2848 s	36.69 cm
22	628 s	36.49 cm	47	1378 s	36.58 cm	72	2128 s	36.62 cm	97	2878 s	36.69 cm
23	658 s	36.5 cm	48	1408 s	36.58 cm	73	2158 s	36.62 cm	98	2908 s	36.69 cm
24	688 s	36.52 cm	49	1438 s	36.58 cm	74	2188 s	36.63 cm	99	2938 s	36.69 cm
25	718 s	36.52 cm	50	1468 s	36.58 cm	75	2218 s	36.63 cm	100	2968 s	36.69 cm

1mpd3 Readings continued

#	Time	Head
101	2998 s	36.7 cm
102	3028 s	36.7 cm
103	3058 s	36.7 cm
104	3088 s	36.69 cm
105	3118 s	36.66 cm
106	3148 s	36.67 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

1mpd1

Date	4/9/2024
Time	10:56 AM
Latitude	38.140518
Longitude	-122.215576
Initial Volumetric Moisture	60.00 %
Final Volumetric Moisture	80.00 %
Cylinder Size	3 Liter

1mpd1 Results

Map Pin #	3
Test Number	27670
Ksat - mm/hr	NULL
Ksat - in/hr	NULL
Capillary Pressure C mm	NULL
RMS Error of Regression	NULL
Normalized RMS	NULL

Readings

#	Time	Head	#	Time	Head	#	Time	Head	#	Time	Head
1	29 s	31.47 cm	26	778 s	31.54 cm	51	1529 s	31.64 cm	76	2279 s	31.73 cm
2	58 s	31.47 cm	27	809 s	31.55 cm	52	1559 s	31.64 cm	77	2309 s	31.73 cm
3	89 s	31.49 cm	28	839 s	31.55 cm	53	1588 s	31.64 cm	78	2338 s	31.74 cm
4	118 s	31.48 cm	29	868 s	31.56 cm	54	1619 s	31.64 cm	79	2369 s	31.74 cm
5	149 s	31.49 cm	30	899 s	31.56 cm	55	1648 s	31.65 cm	80	2399 s	31.74 cm
6	178 s	31.5 cm	31	928 s	31.56 cm	56	1679 s	31.65 cm	81	2428 s	31.75 cm
7	209 s	31.5 cm	32	959 s	31.57 cm	57	1709 s	31.66 cm	82	2459 s	31.7 cm
8	238 s	31.51 cm	33	988 s	31.57 cm	58	1738 s	31.66 cm	83	2488 s	31.71 cm
9	269 s	31.46 cm	34	1019 s	31.57 cm	59	1769 s	31.66 cm	84	2519 s	31.71 cm
10	298 s	31.47 cm	35	1049 s	31.58 cm	60	1798 s	31.67 cm	85	2549 s	31.72 cm
11	329 s	31.47 cm	36	1078 s	31.58 cm	61	1829 s	31.67 cm	86	2578 s	31.73 cm
12	358 s	31.48 cm	37	1109 s	31.58 cm	62	1859 s	31.68 cm	87	2609 s	31.74 cm
13	389 s	31.49 cm	38	1138 s	31.59 cm	63	1888 s	31.68 cm	88	2638 s	31.75 cm
14	418 s	31.5 cm	39	1169 s	31.59 cm	64	1919 s	31.69 cm	89	2669 s	31.75 cm
15	449 s	31.51 cm	40	1198 s	31.59 cm	65	1948 s	31.69 cm	90	2699 s	31.77 cm
16	479 s	31.51 cm	41	1229 s	31.59 cm	66	1979 s	31.69 cm	91	2728 s	31.75 cm
17	509 s	31.52 cm	42	1258 s	31.61 cm	67	2009 s	31.7 cm	92	2759 s	31.77 cm
18	539 s	31.52 cm	43	1289 s	31.61 cm	68	2038 s	31.7 cm	93	2788 s	31.77 cm
19	568 s	31.53 cm	44	1319 s	31.61 cm	69	2069 s	31.71 cm	94	2819 s	31.77 cm
20	599 s	31.53 cm	45	1348 s	31.62 cm	70	2098 s	31.71 cm	95	2849 s	31.78 cm
21	628 s	31.53 cm	46	1379 s	31.62 cm	71	2129 s	31.71 cm	96	2878 s	31.78 cm
22	659 s	31.53 cm	47	1408 s	31.62 cm	72	2159 s	31.72 cm	97	2909 s	31.78 cm
23	688 s	31.54 cm	48	1439 s	31.63 cm	73	2188 s	31.72 cm	98	2939 s	31.78 cm
24	719 s	31.54 cm	49	1469 s	31.63 cm	74	2219 s	31.72 cm	99	2968 s	31.78 cm
25	749 s	31.54 cm	50	1498 s	31.63 cm	75	2248 s	31.73 cm	100	2999 s	31.78 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

1mpd1 Readings continued

#	Time	Head
101	3028 s	31.79 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

MPD INFILTROMETER www.upstreamtechnologies.us

Upstream Technologies 651.237.5123

1mpd5

Date	4/9/2024
Time	12:26 PM
Latitude	38.140563
Longitude	-122.217133
Initial Volumetric Moisture	10.00 %
Final Volumetric Moisture	70.00 %
Cylinder Size	3 Liter

1mpd5 Results

Map Pin #	4
Test Number	27671
Ksat - mm/hr	NULL
Ksat - in/hr	NULL
Capillary Pressure C mm	NULL
RMS Error of Regression	NULL
Normalized RMS	NULL

Readings

#	Time	Head	#	Time	Head	#	Time	Head	#	Time	Head
1	0 s	32.37 cm	26	749 s	30.15 cm	51	1499 s	28.31 cm	76	2249 s	26.71 cm
2	29 s	32.15 cm	27	779 s	30.07 cm	52	1529 s	28.24 cm	77	2279 s	26.64 cm
3	59 s	32.03 cm	28	809 s	29.99 cm	53	1559 s	28.18 cm	78	2309 s	26.58 cm
4	89 s	31.91 cm	29	839 s	29.91 cm	54	1589 s	28.11 cm	79	2339 s	26.51 cm
5	119 s	31.82 cm	30	869 s	29.84 cm	55	1619 s	28.05 cm	80	2369 s	26.46 cm
6	149 s	31.72 cm	31	899 s	29.76 cm	56	1649 s	27.97 cm	81	2399 s	26.39 cm
7	179 s	31.63 cm	32	929 s	29.69 cm	57	1679 s	27.91 cm	82	2429 s	26.33 cm
8	209 s	31.54 cm	33	959 s	29.61 cm	58	1709 s	27.85 cm	83	2459 s	26.27 cm
9	239 s	31.46 cm	34	989 s	29.54 cm	59	1739 s	27.78 cm	84	2489 s	26.21 cm
10	269 s	31.38 cm	35	1019 s	29.46 cm	60	1769 s	27.72 cm	85	2519 s	26.14 cm
11	299 s	31.3 cm	36	1049 s	29.39 cm	61	1799 s	27.65 cm	86	2549 s	26.08 cm
12	329 s	31.22 cm	37	1079 s	29.33 cm	62	1829 s	27.6 cm	87	2579 s	26.02 cm
13	359 s	31.14 cm	38	1109 s	29.25 cm	63	1859 s	27.54 cm	88	2609 s	25.96 cm
14	389 s	31.07 cm	39	1139 s	29.18 cm	64	1889 s	27.47 cm	89	2639 s	25.9 cm
15	419 s	31.0 cm	40	1169 s	29.1 cm	65	1919 s	27.42 cm	90	2669 s	25.84 cm
16	449 s	30.92 cm	41	1199 s	29.03 cm	66	1949 s	27.35 cm	91	2699 s	25.79 cm
17	479 s	30.85 cm	42	1229 s	28.96 cm	67	1979 s	27.28 cm	92	2729 s	25.73 cm
18	509 s	30.77 cm	43	1259 s	28.89 cm	68	2009 s	27.22 cm	93	2759 s	25.67 cm
19	539 s	30.69 cm	44	1289 s	28.8 cm	69	2039 s	27.16 cm	94	2789 s	25.61 cm
20	569 s	30.6 cm	45	1319 s	28.74 cm	70	2069 s	27.07 cm	95	2819 s	25.55 cm
21	599 s	30.53 cm	46	1349 s	28.67 cm	71	2099 s	27.02 cm	96	2849 s	25.49 cm
22	629 s	30.46 cm	47	1379 s	28.59 cm	72	2129 s	26.95 cm	97	2879 s	25.43 cm
23	659 s	30.38 cm	48	1409 s	28.52 cm	73	2159 s	26.89 cm	98	2909 s	25.38 cm
24	689 s	30.3 cm	49	1439 s	28.45 cm	74	2189 s	26.82 cm	99	2939 s	25.31 cm
25	719 s	30.22 cm	50	1469 s	28.38 cm	75	2219 s	26.76 cm	100	2969 s	25.25 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

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651.237.5123

1mpd5 Readings continued

#	Time	Head	#	Time	Head
101	2999 s	25.19 cm	133	3959 s	23.4 cm
102	3029 s	25.14 cm	134	3989 s	23.35 cm
103	3059 s	25.08 cm	135	4019 s	23.3 cm
104	3089 s	25.02 cm	136	4049 s	23.25 cm
105	3119 s	24.97 cm	137	4079 s	23.19 cm
106	3149 s	24.91 cm	138	4109 s	23.14 cm
107	3179 s	24.85 cm			
108	3209 s	24.79 cm			
109	3239 s	24.74 cm			
110	3269 s	24.67 cm			
111	3299 s	24.62 cm			
112	3329 s	24.57 cm			
113	3359 s	24.5 cm			
114	3389 s	24.45 cm			
115	3419 s	24.4 cm			
116	3449 s	24.34 cm			
117	3479 s	24.29 cm			
118	3509 s	24.22 cm			
119	3539 s	24.17 cm			
120	3569 s	24.12 cm			
121	3599 s	24.07 cm			
122	3629 s	24.01 cm			
123	3659 s	23.96 cm			
124	3689 s	23.89 cm			
125	3719 s	23.84 cm			
126	3749 s	23.79 cm			
127	3779 s	23.74 cm			
128	3809 s	23.67 cm			
129	3839 s	23.62 cm			
130	3869 s	23.56 cm			
131	3899 s	23.51 cm			
132	3929 s	23.46 cm			

Infiltration Report

Engeo San Ramon

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1mpd2

Date	4/9/2024
Time	1:46 PM
Latitude	38.139652
Longitude	-122.216595
Initial Volumetric Moisture	10.00 %
Final Volumetric Moisture	90.00 %
Cylinder Size	3 Liter

1mpd2 Results

Map Pin #	5
Test Number	27672
Ksat - mm/hr	27
Ksat - in/hr	1.05
Capillary Pressure C mm	-84.2
RMS Error of Regression	1.8
Normalized RMS	0.3%

Readings

#	Time	Head	#	Time	Head	#	Time	Head	#	Time	Head
1	0 s	29.75 cm	26	748 s	25.77 cm	51	1498 s	22.67 cm	76	2248 s	19.95 cm
2	28 s	29.52 cm	27	778 s	25.64 cm	52	1528 s	22.55 cm	77	2278 s	19.85 cm
3	58 s	29.3 cm	28	808 s	25.5 cm	53	1558 s	22.45 cm	78	2308 s	19.75 cm
4	88 s	29.11 cm	29	838 s	25.38 cm	54	1588 s	22.33 cm	79	2338 s	19.65 cm
5	118 s	28.92 cm	30	868 s	25.25 cm	55	1618 s	22.22 cm	80	2368 s	19.55 cm
6	148 s	28.74 cm	31	898 s	25.12 cm	56	1648 s	22.11 cm	81	2398 s	19.44 cm
7	178 s	28.56 cm	32	928 s	24.98 cm	57	1678 s	21.99 cm	82	2428 s	19.35 cm
8	208 s	28.39 cm	33	958 s	24.85 cm	58	1708 s	21.88 cm	83	2458 s	19.23 cm
9	238 s	28.24 cm	34	988 s	24.73 cm	59	1738 s	21.76 cm	84	2488 s	19.13 cm
10	268 s	28.09 cm	35	1018 s	24.6 cm	60	1768 s	21.66 cm	85	2518 s	19.03 cm
11	298 s	27.94 cm	36	1048 s	24.47 cm	61	1798 s	21.55 cm	86	2548 s	18.93 cm
12	328 s	27.79 cm	37	1078 s	24.34 cm	62	1828 s	21.43 cm	87	2578 s	18.84 cm
13	358 s	27.65 cm	38	1108 s	24.22 cm	63	1858 s	21.33 cm	88	2608 s	18.73 cm
14	388 s	27.51 cm	39	1138 s	24.11 cm	64	1888 s	21.22 cm	89	2638 s	18.63 cm
15	418 s	27.36 cm	40	1168 s	23.98 cm	65	1918 s	21.12 cm	90	2668 s	18.54 cm
16	448 s	27.22 cm	41	1198 s	23.85 cm	66	1948 s	21.01 cm	91	2698 s	18.44 cm
17	478 s	27.07 cm	42	1228 s	23.74 cm	67	1978 s	20.9 cm	92	2728 s	18.34 cm
18	508 s	26.93 cm	43	1258 s	23.62 cm	68	2008 s	20.8 cm	93	2758 s	18.25 cm
19	538 s	26.78 cm	44	1288 s	23.49 cm	69	2038 s	20.69 cm	94	2788 s	18.14 cm
20	568 s	26.64 cm	45	1318 s	23.37 cm	70	2068 s	20.58 cm	95	2818 s	18.05 cm
21	598 s	26.49 cm	46	1348 s	23.26 cm	71	2098 s	20.48 cm	96	2848 s	17.95 cm
22	628 s	26.34 cm	47	1378 s	23.14 cm	72	2128 s	20.37 cm	97	2878 s	17.85 cm
23	658 s	26.2 cm	48	1408 s	23.02 cm	73	2158 s	20.26 cm	98	2908 s	17.76 cm
24	688 s	26.06 cm	49	1438 s	22.9 cm	74	2188 s	20.16 cm	99	2938 s	17.66 cm
25	718 s	25.92 cm	50	1468 s	22.79 cm	75	2218 s	20.05 cm	100	2968 s	17.57 cm

MPD INFILTROMETER
www.upstreamtechnologies.us

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

Upstream Technologies
651.237.5123

1mpd2 Readings continued

#	Time	Head
101	2998 s	17.47 cm
102	3028 s	17.37 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

MPD INFILTROMETER www.upstreamtechnologies.us

Upstream Technologies 651.237.5123

1mpd6

Date	4/9/2024
Time	3:19 PM
Latitude	38.146098
Longitude	-122.214913
Initial Volumetric Moisture	30.00 %
Final Volumetric Moisture	80.00 %
Cylinder Size	3 Liter

1mpd6 Results

Map Pin #	6
Test Number	27673
Ksat - mm/hr	NULL
Ksat - in/hr	NULL
Capillary Pressure C mm	NULL
RMS Error of Regression	NULL
Normalized RMS	NULL

Readings

#	Time	Head	#	Time	Head	#	Time	Head	#	Time	Head
1	0 s	26.89 cm	26	748 s	25.56 cm	51	1498 s	24.98 cm	76	2248 s	24.38 cm
2	28 s	26.79 cm	27	778 s	25.52 cm	52	1528 s	24.96 cm	77	2278 s	24.36 cm
3	58 s	26.72 cm	28	808 s	25.49 cm	53	1558 s	24.94 cm	78	2308 s	24.34 cm
4	88 s	26.62 cm	29	838 s	25.47 cm	54	1588 s	24.92 cm	79	2338 s	24.31 cm
5	118 s	26.54 cm	30	868 s	25.44 cm	55	1618 s	24.9 cm	80	2368 s	24.29 cm
6	148 s	26.45 cm	31	898 s	25.42 cm	56	1648 s	24.89 cm	81	2398 s	24.26 cm
7	178 s	26.37 cm	32	928 s	25.39 cm	57	1678 s	24.86 cm	82	2428 s	24.24 cm
8	208 s	26.29 cm	33	958 s	25.36 cm	58	1708 s	24.84 cm	83	2458 s	24.21 cm
9	238 s	26.24 cm	34	988 s	25.33 cm	59	1738 s	24.82 cm	84	2488 s	24.19 cm
10	268 s	26.17 cm	35	1018 s	25.31 cm	60	1768 s	24.81 cm	85	2518 s	24.18 cm
11	298 s	26.13 cm	36	1048 s	25.29 cm	61	1798 s	24.79 cm	86	2548 s	24.14 cm
12	328 s	26.06 cm	37	1078 s	25.27 cm	62	1828 s	24.76 cm	87	2578 s	24.11 cm
13	358 s	26.02 cm	38	1108 s	25.25 cm	63	1858 s	24.75 cm	88	2608 s	24.09 cm
14	388 s	25.99 cm	39	1138 s	25.22 cm	64	1888 s	24.73 cm	89	2638 s	24.07 cm
15	418 s	25.95 cm	40	1168 s	25.2 cm	65	1918 s	24.71 cm	90	2668 s	24.04 cm
16	448 s	25.91 cm	41	1198 s	25.18 cm	66	1948 s	24.69 cm	91	2698 s	24.02 cm
17	478 s	25.88 cm	42	1228 s	25.16 cm	67	1978 s	24.67 cm	92	2728 s	24.0 cm
18	508 s	25.83 cm	43	1258 s	25.14 cm	68	2008 s	24.65 cm	93	2758 s	23.98 cm
19	538 s	25.8 cm	44	1288 s	25.12 cm	69	2038 s	24.63 cm	94	2788 s	23.95 cm
20	568 s	25.76 cm	45	1318 s	25.1 cm	70	2068 s	24.58 cm	95	2818 s	23.93 cm
21	598 s	25.73 cm	46	1348 s	25.08 cm	71	2098 s	24.53 cm	96	2848 s	23.91 cm
22	628 s	25.68 cm	47	1378 s	25.06 cm	72	2128 s	24.5 cm	97	2878 s	23.88 cm
23	658 s	25.65 cm	48	1408 s	25.03 cm	73	2158 s	24.47 cm	98	2908 s	23.86 cm
24	688 s	25.62 cm	49	1438 s	25.01 cm	74	2188 s	24.44 cm	99	2938 s	23.83 cm
25	718 s	25.59 cm	50	1468 s	25.0 cm	75	2218 s	24.42 cm	100	2968 s	23.82 cm

Infiltration Report

Engeo San Ramon

Scott's Valley - 16484.000.001 - Vallejo, CA

MPD INFILTROMETER
www.upstreamtechnologies.us

Upstream Technologies
651.237.5123

1mpd6 Readings continued

#	Time	Head	#	Time	Head
101	2998 s	23.8 cm	133	3958 s	23.46 cm
102	3028 s	23.78 cm	134	3988 s	23.43 cm
103	3058 s	23.76 cm	135	4018 s	23.42 cm
104	3088 s	23.74 cm	136	4048 s	23.4 cm
105	3118 s	23.71 cm	137	4078 s	23.38 cm
106	3148 s	23.69 cm	138	4108 s	23.35 cm
107	3178 s	23.67 cm	139	4138 s	23.34 cm
108	3208 s	23.66 cm	140	4168 s	23.33 cm
109	3238 s	23.63 cm	141	4198 s	23.31 cm
110	3268 s	23.62 cm	142	4228 s	23.29 cm
111	3298 s	23.6 cm	143	4258 s	23.28 cm
112	3328 s	23.58 cm	144	4288 s	23.26 cm
113	3358 s	23.65 cm	145	4318 s	23.25 cm
114	3388 s	23.65 cm	146	4348 s	23.22 cm
115	3418 s	23.66 cm	147	4378 s	23.2 cm
116	3448 s	23.66 cm	148	4408 s	23.17 cm
117	3478 s	23.66 cm	149	4438 s	23.14 cm
118	3508 s	23.65 cm	150	4468 s	23.11 cm
119	3538 s	23.64 cm	151	4498 s	23.07 cm
120	3568 s	23.63 cm	152	4528 s	23.03 cm
121	3598 s	23.61 cm	153	4558 s	23.0 cm
122	3628 s	23.6 cm	154	4588 s	22.98 cm
123	3658 s	23.61 cm	155	4618 s	22.95 cm
124	3688 s	23.61 cm	156	4648 s	22.91 cm
125	3718 s	23.59 cm	157	4678 s	22.89 cm
126	3748 s	23.58 cm	158	4708 s	22.84 cm
127	3778 s	23.55 cm	159	4738 s	22.8 cm
128	3808 s	23.54 cm			
129	3838 s	23.53 cm			
130	3868 s	23.51 cm			
131	3898 s	23.49 cm			
132	3928 s	23.47 cm			

APPENDIX C

LABORATORY TEST DATA

MOISTURE-DENSITY DETERMINATION REPORT
ASTM D7263

SAMPLE ID	1-B3@6							
DEPTH (ft.)	6							
METHOD A OR B	B							
MOISTURE CONTENT (%)	14.1							
DRY DENSITY (pcf)	105.9							

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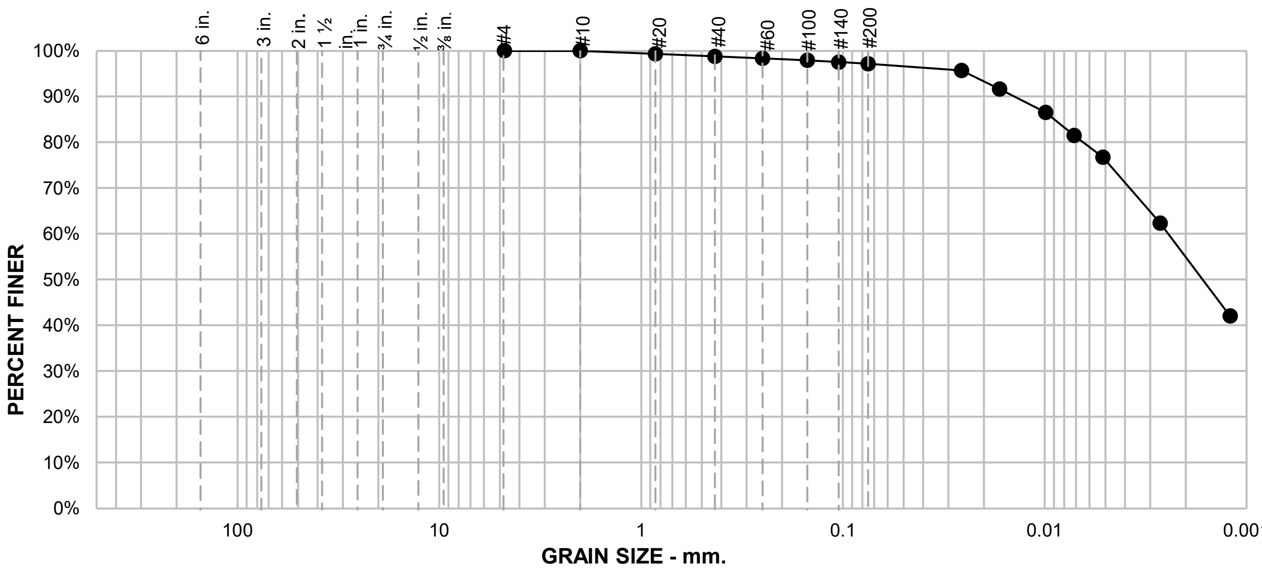
CLIENT: Acorn Environmental
PROJECT NAME: Scotts Valley Development
PROJECT NO: 16484.000.001 PH001 T003
PROJECT LOCATION: Vallejo, CA
REPORT DATE: 5/10/2024
TESTED BY: L. Schmitz
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D422



SAMPLE ID: 1-B1@69-69.5

DEPTH (ft): 69-69.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				1.2	1.6	42.3	54.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.3		
#40	98.8		
#60	98.3		
#100	97.9		
#140	97.5		
#200	97.2		
0.0259 mm.	95.7		
0.0167 mm.	91.6		
0.0099 mm.	86.6		
0.0072 mm.	81.5		
0.0051 mm.	76.7		
0.0027 mm.	62.4		
0.0012 mm.	42.0		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 17 LL = 43 PI = 26

COEFFICIENTS

D_{90} = 0.0141 mm D_{85} = 0.0089 mm D_{60} = 0.0024 mm

D_{50} = 0.0016 mm D_{30} = D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS = CL

REMARKS

Silt/clay division of 0.002mm used
PI: ASTM D4318, Wet Method
USCS: ASTM D2487

* (no specification provided)

CLIENT: Acorn Environmental

PROJECT NAME: Scotts Valley Development

PROJECT NO: 16484.000.001 PH001

PROJECT LOCATION: Vallejo, CA

REPORT DATE: 5/9/2024

TESTED BY: G. Criste

REVIEWED BY: D. Seibold

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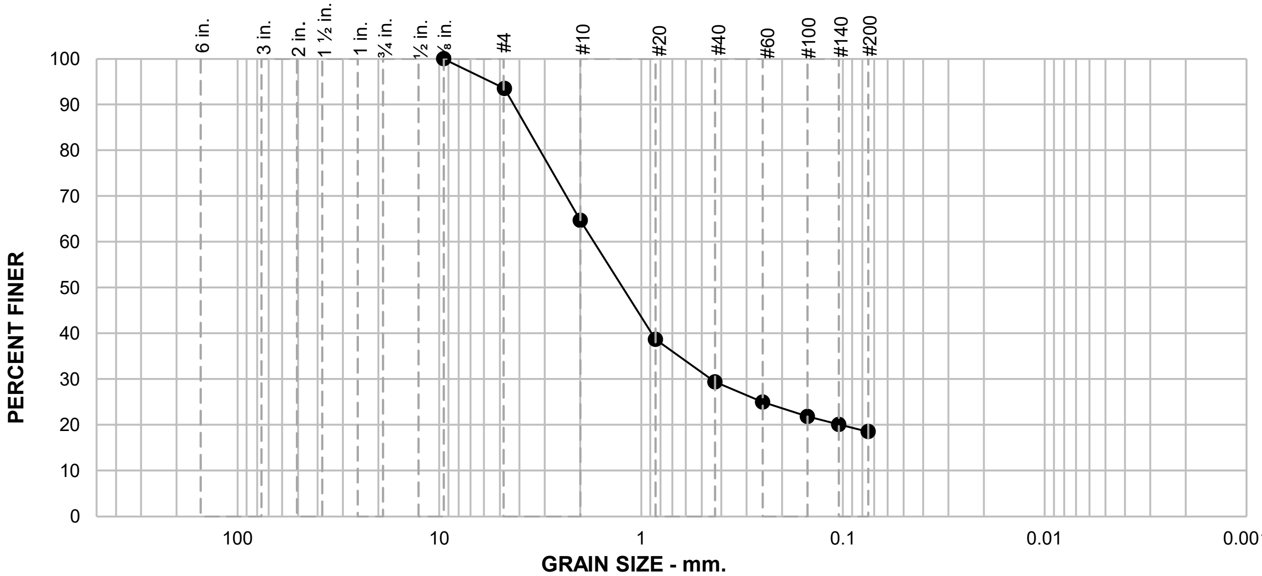
PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method A



SAMPLE ID: 1-B2@8.5

DEPTH (ft): 8.5

LOCATION: 1-B2 at 8.5 feet

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		6	29	36	10	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
⅜ in.	100		
#4	94		
#10	65		
#20	39		
#40	29		
#60	25		
#100	22		
#140	20		
#200	19		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 4.2158 mm D_{85} = 3.6317 mm D_{60} = 1.6965 mm

D_{50} = 1.2208 mm D_{30} = 0.4603 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

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CLIENT: Acorn Environmental

PROJECT NAME: Scotts Valley Development

PROJECT NO: 16484.000.001 PH001 T003

PROJECT LOCATION: Vallejo, CA

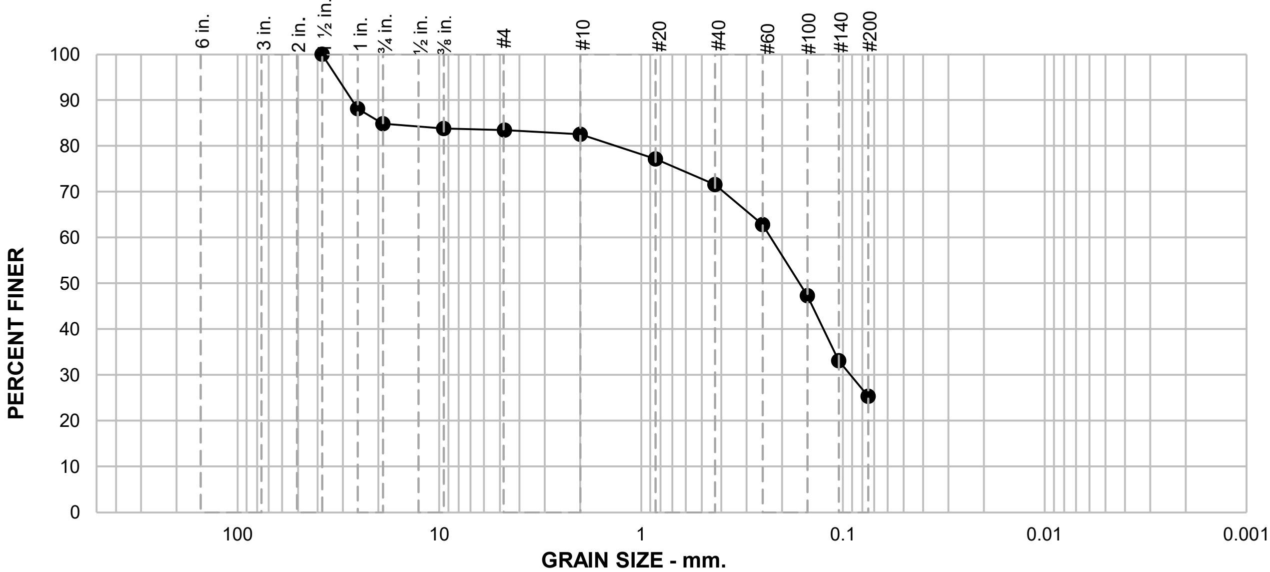
REPORT DATE: 5/15/2024

TESTED BY: M. Ryan

REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method A



SAMPLE ID: 1-B3@2.5

DEPTH (ft): 2.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
	15	2		11	47	25	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-½ in.	100		
1 in.	88		
¾ in.	85		
⅜ in.	84		
#4	83		
#10	83		
#20	77		
#40	72		
#60	63		
#100	47		
#140	33		
#200	25		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 27.1758 mm	D_{85} = 19.0500 mm	D_{60} = 0.2272 mm
D_{50} = 0.1651 mm	D_{30} = 0.0926 mm	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS =

REMARKS

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CLIENT: Acorn Environmental

PROJECT NAME: Scotts Valley Development

PROJECT NO: 16484.000.001 PH001 T003

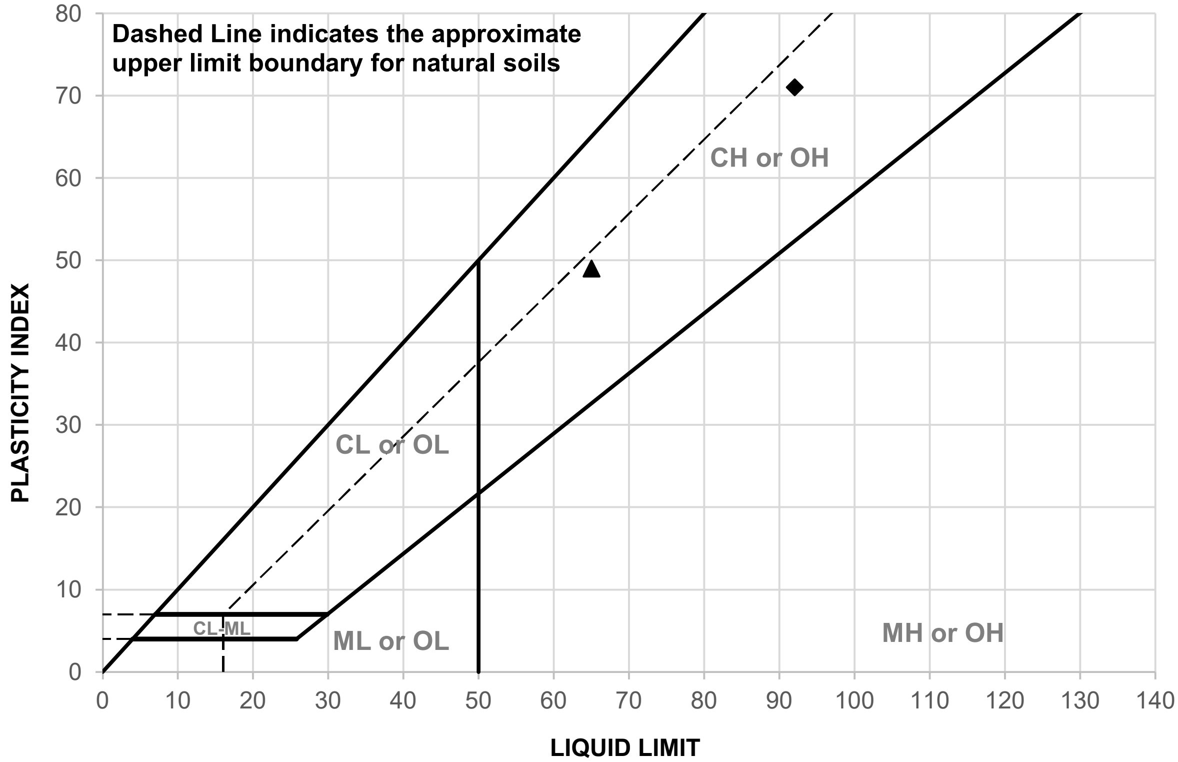
PROJECT LOCATION: Vallejo, CA

REPORT DATE: 5/15/2024

TESTED BY: M. Ryan

REVIEWED BY: M. Gilbert

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH (ft)	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B1@3.5	3.5	See exploration logs	65	16	49
◆	1-B2@1.5	1.5	See exploration logs	92	21	71

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B1@3.5	PI: ASTM D4318, Wet Method	
◆	1-B2@1.5	PI: ASTM D4318, Wet Method	

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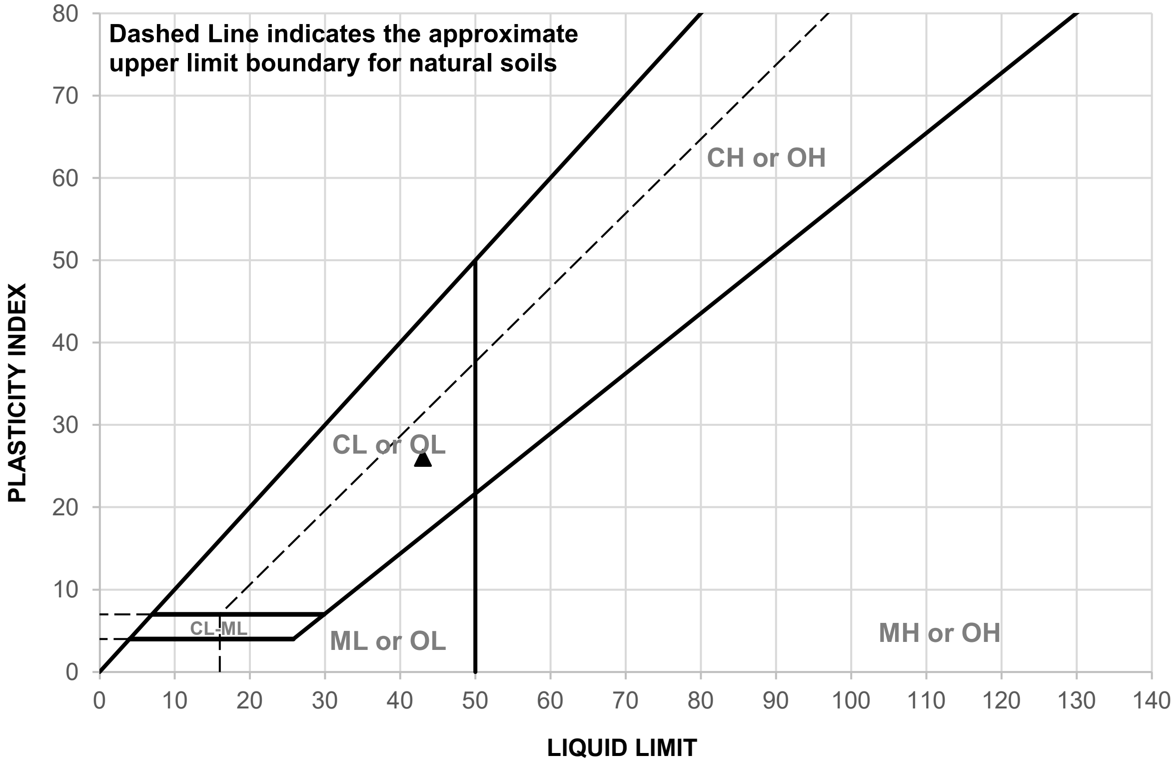
CLIENT: Acorn Environmental
PROJECT NAME: Scotts Valley Development
PROJECT NO: 16484.000.001 PH001 T003
PROJECT LOCATION: Vallejo, CA
REPORT DATE: 5/15/2024
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH (ft)	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B1@69-69.5	69-69.5	See exploration logs	43	17	26

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B1@69-69.5	PI: ASTM D4318, Wet Method	

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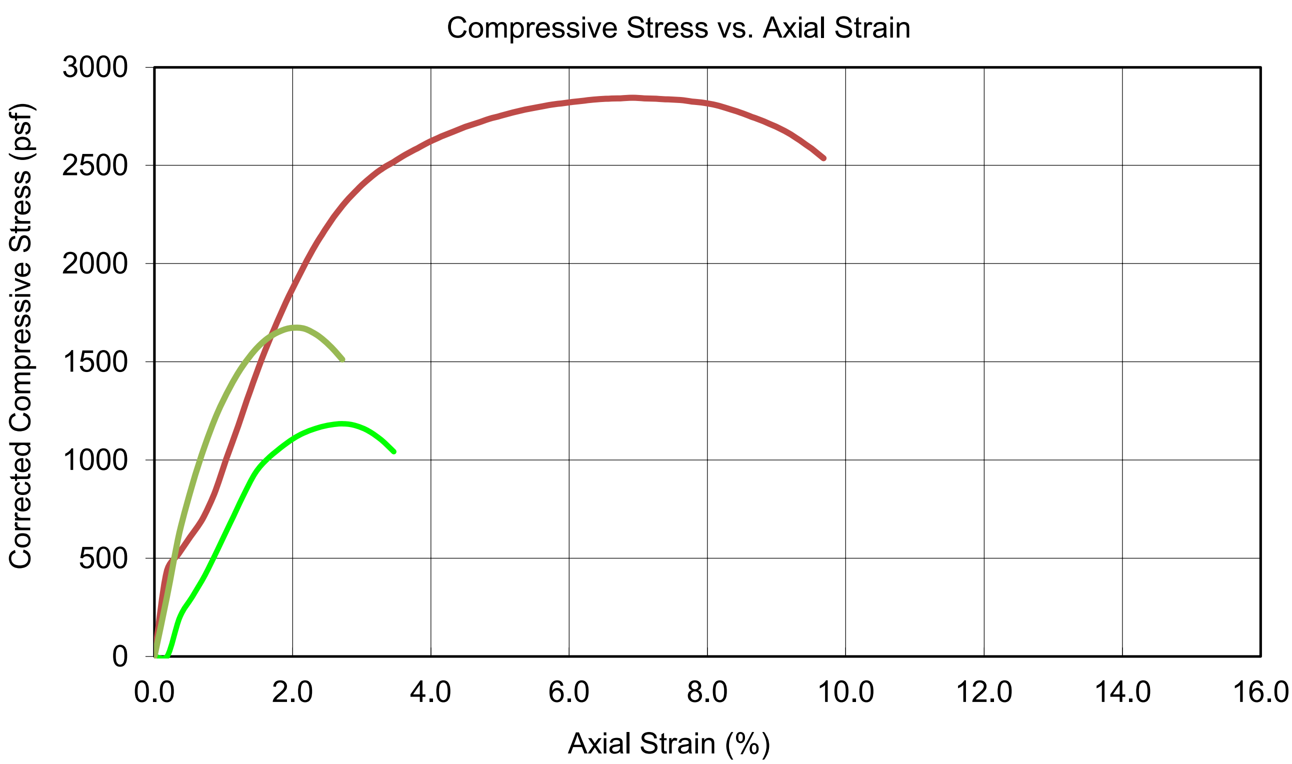
Expect Excellence

CLIENT: Acorn Environmental
PROJECT NAME: Scotts Valley Development
PROJECT NO: 16484.000.001 PH001
PROJECT LOCATION: Vallejo, CA
REPORT DATE: 5/8/2024
TESTED BY: O. Espinoza
REVIEWED BY: G. Criste

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



BEFORE TEST	SPECIMEN 1-B1@4	SPECIMEN 1-B2@2	SPECIMEN 1-B2@6
Test Moisture Content (%)	21.71	36.34	29.99
Dry Density (pcf)	106.3	79.0	92.5
Saturation (%)	98.8	86.0	97.6
Void Ratio	0.60	1.15	0.84
Diameter (in)	2.403	2.385	2.402
Height (in)	5.787	5.487	5.520
Height-To-Diameter Ratio	2.41	2.30	2.30
TEST DATA			
Unconfined Compressive Strength (psf)	2845	1186	1673
Undrained Shear Strength (psf)	1422.3	592.8	836.7
Strain Rate (in/min)	0.050	0.050	0.050
Specific Gravity (ASSUMED)	2.720	2.720	2.720
Strain at Failure(%)	6.91	2.73	1.99
Test Remarks			

SPECIMEN	DESCRIPTION
1-B1@4	See exploration logs
1-B2@2	See exploration logs
1-B2@6	See exploration logs

PROJECT NAME: Scotts Valley Development
PROJECT NO: 16484.000.001 PH001 T003
CLIENT: Acorn Environmental
LOCATION: Vallejo, CA

Test Date: 5/14/24
Tested By: L. Schmitz
Reviewed By: M. Gilbert

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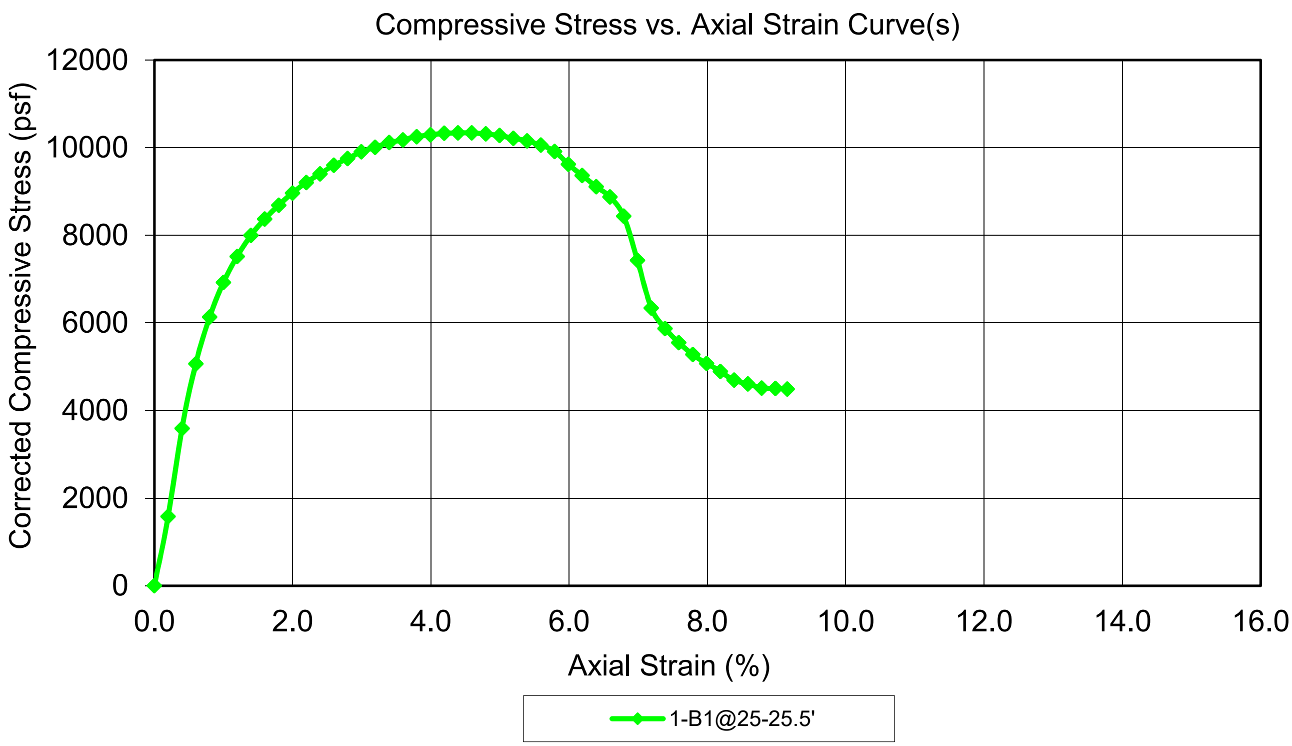
Expect Excellence

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



BEFORE TEST	SPECIMEN 1-B1@25-25.5'
Test Moisture Content (%)	10.35
Dry Density (pcf)	131.8
Saturation (%)	97.7
Void Ratio	0.29
Diameter (in)	2.413
Height (in)	5.009
Height-To-Diameter Ratio	2.08
TEST DATA	
Unconfined Compressive Strength (psf)	10335.20
Undrained Shear Strength (psf)	5167.60
Strain Rate (in/min)	0.050
Specific Gravity (ASSUMED)	2.720
Strain at Failure(%)	4.59
Test Remarks	

SPECIMEN	DESCRIPTION
1-B1@25-25.5'	See exploration logs

PROJECT NAME: Scotts Valley Development
PROJECT NO: 16484.000.001 PH001 T003
CLIENT: Acorn Environmental
LOCATION: Vallejo, CA

Test Date: 5/6/2024
Tested By: O. Espinoza
Reviewed By: G. Criste

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APPENDIX D

HYDROGEOLOGIC ASSESSMENT

Project No.
16484.000.001

May 2, 2024

Ms. Bibiana Sparks
Acorn Environmental
5170 Golden Foothill Parkway
El Dorado Hills, CA 95762

Subject: Scotts Valley Development
Admiral Callaghan Lane and Columbus Parkway
Vallejo, California

HYDROGEOLOGIC ASSESSMENT

Dear Ms. Sparks:

At your request, we have prepared this hydrogeologic assessment for the Scotts Valley Development in Vallejo, California. The purpose of this report is to assess the existing sources of groundwater at the site for potential use within the project.

Our scope of services included the following items.

- Research and review of relevant and available data for the site, including:
  - published geologic maps,
  - groundwater reports prepared by California Department of Water Resources (DWR),
  - available well records and reports from DWR and local agencies, and
  - published Caltrans records of Hunter Hill Landslide and associated drainage gallery.
- Characterization of surface and subsurface geology based on site exploration and published geologic maps
- Field reconnaissance of springs
- Preparation of this report

DOCUMENT REVIEW

Hunter Hill Landslide

An existing landslide, called the Hunter Hill landslide, is located on the northwestern portion of the site. The landslide crosses Interstate 80 (I-80), and is estimated to be approximately 1,300 feet long, 600 feet wide, and approximately 60 feet deep. Ongoing roadway distress has been documented due to continued movement of the landslide. Inclinometers installed by Caltrans near the slide showed movement below I-80 at approximately 30 feet below the roadway surface between 2003 and 2005 (Caltrans, 2005).

According to documentation by Caltrans, a vertical drainage gallery was partially constructed in 1990 through the existing landslide above I-80 in order to reduce water pressures in the landslide, at the approximate location shown in Exhibit 1. The drainage gallery was to consist of vertical sand drains 3 feet in diameter, approximately 53 feet deep, and spaced at 6 feet on-center, interconnected at the bottom by overlapping bells. The gallery was intended to be drained to the southwest under I-80 by a horizontal perforated pipe (Caltrans, 1988).

We did not observe the drainage gallery during our site reconnaissance. According to Caltrans documentation, the bottom drain from the drainage gallery was never completed due to the presence of hard rock and difficult drilling conditions. Additionally, the final constructed depth and extents of the vertical wells is not known since construction was terminated before project completion (Caltrans 1990a, 1990b). Therefore, an elevated water table may still be present in this area of the slide. Groundwater depth fluctuates between approximately 10 and 14 feet below ground surface near the gallery (Caltrans, 2005).

Existing Wells

Based on our review of the available DWR Well Completion Report (WCR) database, no groundwater wells were identified on the site or within a ½ mile radius of the site.

Napa-Sonoma Lowlands Subbasin

The site is located in upland bedrock terrain and outside of a designated groundwater basin. The site lies about $^{1}/_{3}$ mile east of the eastern boundary of the Napa-Sonoma Lowlands Groundwater Subbasin. The typical "water bearing formations" in the basin include Holocene and Pleistocene Alluvium, and Pleistocene Huichica Formation. We encountered Pleistocene alluvium and colluvium during our explorations to depths of up to 13 feet. The local groundwater conditions at the site would be characterized as fractured bedrock with an unknown water-bearing capacity within the Great Valley Sequence and silica-carbonate rock.

GEOLOGY

Our hydrogeologic characterization is based on our preliminary geotechnical exploration at the site. Geologic units encountered during our exploration include:

- **Artificial fill (af)** – In our explorations, artificial fill consists of bedrock-derived sand and gravel mixed with clay.
- **Alluvium and colluvium, undivided (Qa, Qc)** – Holocene and late Pleistocene deposits. In our explorations, this material generally consists of sandy and gravelly stiff to very stiff clay, with local lenses of increased sand and gravel fractions underlying surficial clay deposits.
- **Landslide Deposits (Qls)** – Holocene and Pleistocene deposits. Deposits near the north landslide (Hunter Hill Landslide) consisted primarily of gravelly lean clay and highly sheared shale and sandstone. Deposits near the south landslide consisted of sheared shale and mudstone in a clay matrix.
- **Great Valley Sequence (Kgv)** – Cretaceous age sandstone, siltstone, shale, and minor conglomerates. On the project site, this unit predominantly consists of siltstone and shale with minor sandstone.
- **Silica-Carbonate Rock (sc)** – Part of the Jurassic-age Coast Range Ophiolite sequence, which contains basalt, gabbro, and serpentinite. Serpentinite locally contains pyroxenite and silica-carbonate rock.

GROUNDWATER

During our field exploration, we encountered groundwater in one of our borings (1-B2) at a depth of 14 feet below the existing ground surface within Great Valley Sequence rock. Water was not encountered in Boring 1-B3 to final depth of the boring (60 feet). The depth to groundwater was not identified in Boring 1-B1 due to the drilling methods used. We also observed surface water flowing in small streams at the locations shown in blue in Exhibit 1. Reports from Caltrans indicate that groundwater depths near the drainage gallery (shown in Exhibit 1) fluctuate seasonally between approximately 10 to 14 feet (Caltrans, 2005).

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

FIELD RECONNAISSANCE OF SPRINGS

Four springs are present on or near the project site, as shown in Exhibit 1 – Site Plan. During our field exploration between April 22 and April 25, 2024, we performed a reconnaissance of the springs to assess their current condition. In a channel flowing from the easternmost spring, we estimated flow rates at three locations that ranged from ¼ gallon per minute (gpm) to 2½ gpm. Additionally, we observed water flowing from a culvert out of the southernmost spring at a rate of approximately 3 gpm. We consider these field estimates to be preliminary, and not representative of the total flow from the springs.

We also reviewed aerial imagery available on Google Earth from 1993 to 2023 to understand and estimate the seasonal fluctuation in flow from the springs. The streams are generally more active during winter and spring months and have a reduced vegetated area during summer and fall months, especially during drought years. Dry or drought conditions are evident in aerial imagery from May 2022, September 2010, and July 1993, as shown in Appendix A.

EXHIBIT 1: Site Plan

CONCLUSIONS

Water sources present on the site include surface water, four springs located along the boundaries of existing landslides and at geologic contacts, groundwater within alluvium and colluvium soil layers, and groundwater within fractured bedrock.

We note the following considerations regarding using water from these sources.

- Groundwater supply wells are not located on the project site or nearby. Our research did not identify previous well pump tests conducted in either soil or rock units on or near the site. It is also not known whether fractures throughout the Great Valley rock and silica-carbonate rock will provide sufficient flow to develop groundwater supply wells. Therefore, the potential yield of these materials is uncertain.
- The output from the springs is not known, although seasonal fluctuation and drought periods will result in reduced spring flow.
- The depth of colluvium and alluvium at the site is variable. In our explorations, we identified colluvium/alluvium thicknesses ranging from 3 to 13 feet, with alluvium and colluvium deposits covering approximately one quarter of the site. The lateral continuity or presence of groundwater in these deposits is unknown.
- Colluvium contains high concentrations of clay which may result in low yield conditions. We did not encounter continuous layers of sand or gravel in our explorations.
- Historical mercury mining operations were present at multiple locations near the site, including St. John's Mine located less than 1 mile northeast of the site. We consider it feasible that groundwater from both upper soil units and deeper bedrock in this area may be contaminated with heavy metals due to the historical mining operations and possible flow of water through rocks containing heavy metals.

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

Sincerely,

ENGEO Incorporated

Anne Robertson, PE James Thurber, CEG

awr/jet/ca

Attachments: Selected References
Appendix A

SELECTED REFERENCES

1. California Department of Water Resources (DWR). 2024. Online System for Well Completion Reports.

2. Caltrans. 2005. Memorandum: Geotechnical Recommendation for Roadway Rehab Project, File No. 04-SOL-80, KP 6.3-13.0/PM 3.9-8.1.

3. Caltrans. 1990a. Memorandum: Results of Field Investigation and Decision regarding Future of Project, File No. 10-339203, 10-SOL-80, PM 6.3.

4. Caltrans. 1990b. Memorandum: Field Investigation for Redesign of Project, File No. 10-339203, 10-SOL-80, PM 6.4.

5. Caltrans. 1988. Memorandum: Seismic Investigation of the Hunter Hill Slide near Vallejo, File No. 10-5S6000, 10-SOL-80-6.0.

6. California Department of Water Resources (DWR). 2014. Bulletin 118, Napa-Sonoma Valley groundwater Basin, Napa-Sonoma Lowlands Subbasin.

APPENDIX A

16484.000.001
May 2, 2024

APPENDIX A

AERIAL PHOTO REVIEW

PHOTO A-1: Google Earth Imagery, August 2023, Summer Conditions Following Historical Winter and Spring Rainfall

PHOTO A-2: Google Earth Imagery, May 2023, Spring Conditions Following Historical Rainfall

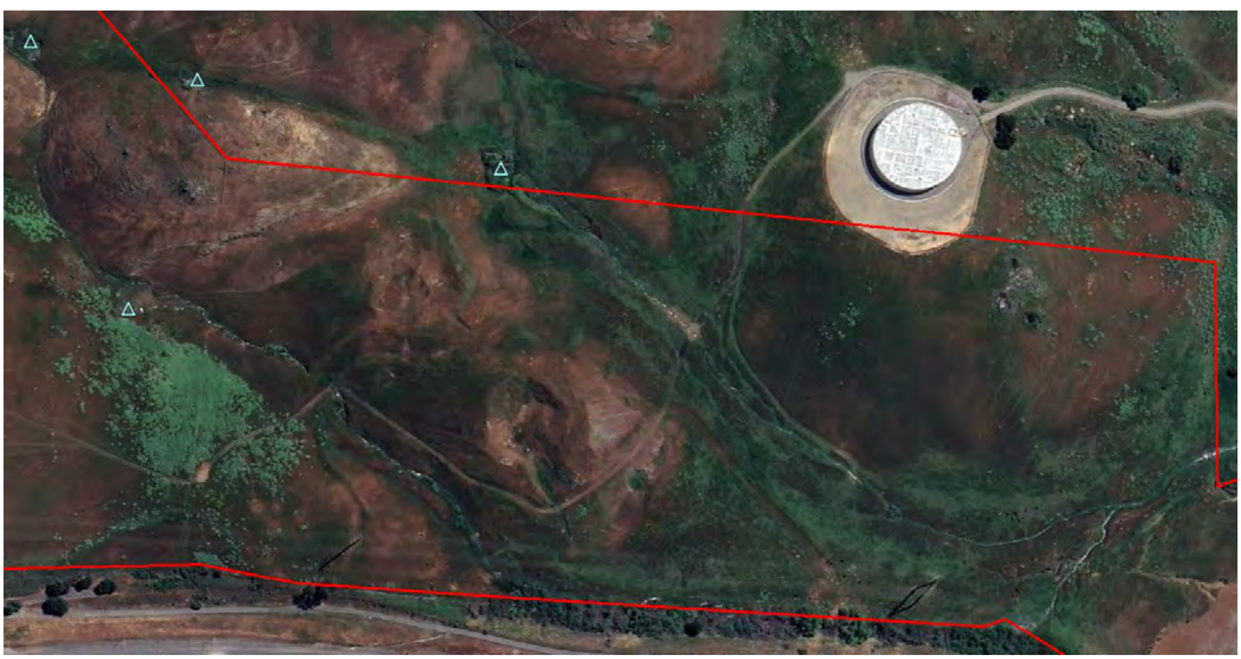


PHOTO A-3: Google Earth Imagery, May 2022, Spring Conditions Following 10+ Year Drought

PHOTO A-4: Google Earth Imagery, October 2020, Fall Conditions Following Second Driest October on Record in California and 8+ Year Drought

PHOTO A-5: Google Earth Imagery, September 2018, Fall Conditions Following Sixth Driest September on Record in California

PHOTO A-6: Google Earth Imagery, August 2014, Summer Conditions after a Severely Dry Month, and at Beginning of Exceptional Drought Levels

PHOTO A-7: Google Earth Imagery, September 2010, Fall Conditions Following 3+ Year Drought

PHOTO A-8: Google Earth Imagery, May 2008, Summer Conditions Following One Year of Extreme Drought

PHOTO A-9: Google Earth Imagery, August 2004, Summer Conditions Following 3+ Year Drought

PHOTO A-10: Google Earth Imagery, July 2003, Summer Conditions Amid Extreme Drought

PHOTO A-11: Google Earth Imagery, July 2002, Summer Conditions Amid Extreme Drought

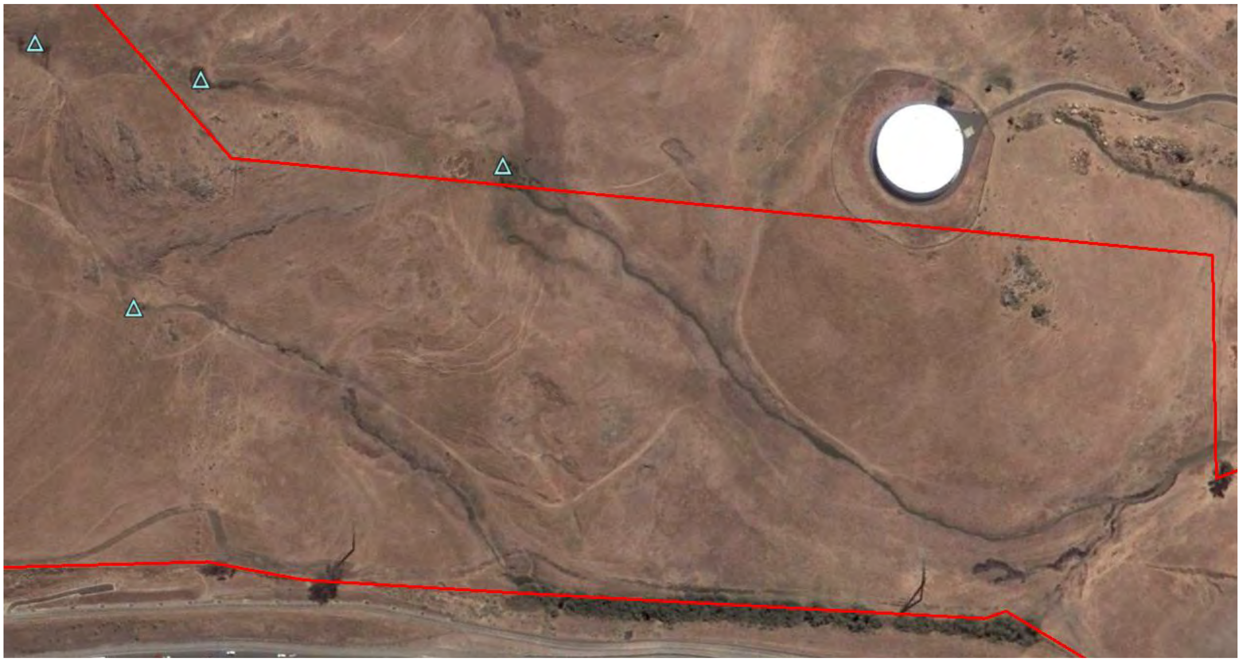
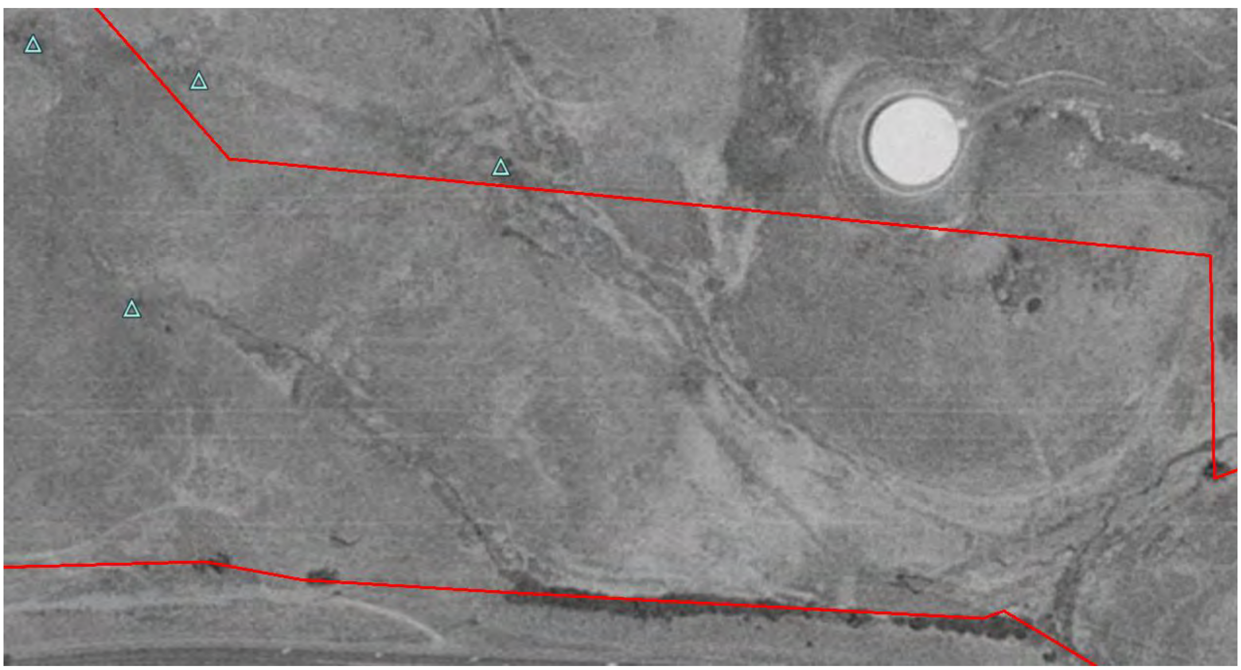


PHOTO A-12: Google Earth Imagery, July 1993, Summer Conditions Following 6+ Year Drought from 1986 to 1992



ENGEO

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Appendix D-2

Utility Area Geotechnical Feasibility

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES
COASTAL/MARINE GEOTECHNICS

Expect Excellence

Project No.
16484.000.001

November 14, 2024

Ms. Bibiana Sparks
Acorn Environmental
5170 Golden Foothill Parkway
El Dorado Hills, CA 95762

Subject: Scotts Valley Development
Admiral Callaghan Lane and Columbus Parkway
Vallejo, California

SUPPLEMENTAL GEOTECHNICAL RECOMMENDATIONS FOR PLANNED UTILITY AREA AND RETAINING WALL SYSTEMS

References:

1. ENGEO. 2024. Preliminary Geotechnical Exploration, Scotts Valley Development, Vallejo, California. June 19, 2024, Revised June 27, 2024. Project No. 16484.000.001.

2. Kimley Horn. 2024. Preliminary Grading and Stormwater Plan, Scotts Valley Casino and Tribal Community Project. November 6, 2024.

Dear Ms. Sparks:

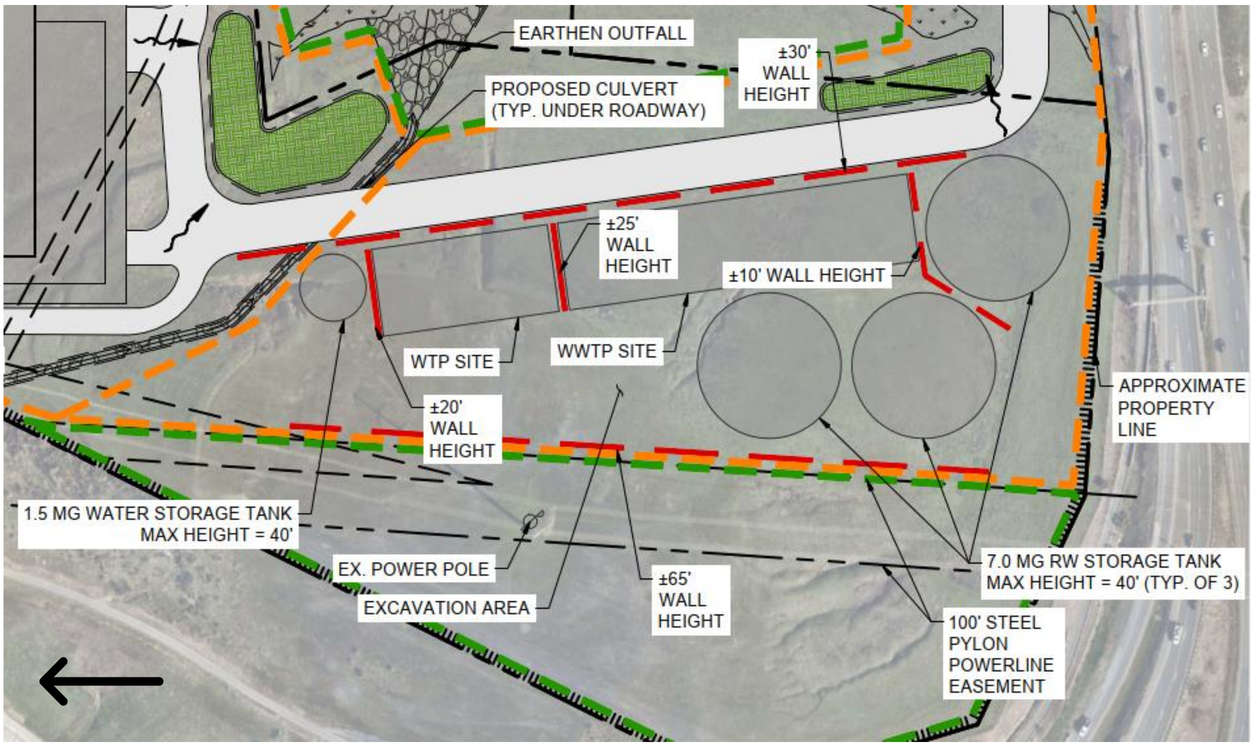
As requested, we prepared preliminary supplemental geotechnical recommendations for the planned utility area and associated retaining wall systems at the proposed Scotts Valley Development project in Vallejo, California.

In preparation of these recommendations, we reviewed geologic data collected during our geologic and geotechnical exploration of the site (Reference 1), as well as the updated schematic grading plans prepared by Kimley Horn and dated November 6, 2024 (Reference 2). The utility area will be in the southwestern corner of the site within the planned borrow area. During our geotechnical and geologic investigation, our geologists mapped this area as a bedrock knob comprising Great Valley Sequence (Kgv) bedrock, overlain by variable thicknesses of colluvium on the slopes of the knob. Improvements within the utility area will include construction of the following.

- A retaining wall structure on the western edge up to 65 feet in exposed height to support planned bedrock cut
- A retaining wall structure on the eastern edge up to 30 feet in exposed height to support planned bedrock cut overlain by up to approximately 10 feet of colluvial soil
- Three interior retaining wall systems between 10 and 25 feet in retained height to support cuts into bedrock and colluvial soil, as well as minor engineered fill

- Four terraced utility pads having pad grades ranging between approximate Elevations 135 to 190 feet (NAVD88)
- Three 7-million-gallon (MG) raw water storage tanks
- 1.5 MG water storage tank
- Water treatment plant
- Wastewater treatment plant
- Associated utility trenches

EXHIBIT 1: Proposed Utility Area Layout



PLANNED RETAINING WALL SYSTEMS

The above-described retaining wall systems are planned to accommodate grade changes between the existing terrain and the proposed excavations and improvements in the utility area. As noted, retaining wall systems are planned along the eastern and western edges and in the interior of the utility area, and will vary from approximately 10 to 65 feet in exposed height. As the retaining walls are situated predominantly in cut areas, we anticipate that they will be designed and constructed using a top-down construction approach, such that the retained earth materials at higher elevations will be supported while the excavation activities progress for lower areas of the walls. It is our experience that retaining wall systems suitable for planned walls of this type of construction may include soil nail walls or structural tie-back walls.

The retaining wall on the western edge of the utility area will be located adjacent to an existing PG&E easement as shown in Exhibit 1. Anchors from the wall may extend into the easement. Based on our discussions with you, we understand that this is acceptable per the terms of the easement agreement with PG&E.

The planned retaining wall systems should be designed to accommodate the following lateral loads.

- Active, or at-rest lateral, earth pressure of the retained soil and rock (depending on the type of retention system selected)
- Surcharge loads from structures, pedestrian or vehicle traffic, or equipment, as appropriate
- Seismic earth pressure increment
- Hydrostatic pressure, unless an appropriate drainage system is designed and implemented

Design-level analysis should consider local and global stability of the retaining walls and proposed slopes.

UTILITY INFRASTRUCTURE FOUNDATIONS

The main consideration for foundation design of the proposed utility infrastructure is limiting settlement and lateral displacement of the foundations. The schematic grading plans for the utility yard indicate that some of the water tanks and treatment facilities will be located on cut pads supported by the interior retaining walls. Depending on the type of retaining wall system selected, some deflection of the walls can be expected after construction is complete. For example, soil nail walls typically experience deflection because the strength of a soil nail is mobilized by relative movement along the soil-grout interface. Wall deflection may lead to settlement or displacement of retained soil and any structures that are supported by this soil.

Therefore, we recommend that proposed utility infrastructure sensitive to settlement and deflection, such as tanks and treatment plants, be supported on deep foundations embedded in rock below the bottom of adjacent retaining walls. Deep foundations will serve to isolate the utility infrastructure from potential deflection or settlement of the surrounding soil and will also reduce surcharge loading on the retaining walls. Examples of feasible deep foundation systems may include cast-in-drilled-hole (CIDH) piers or auger-cast piles (ACPs).

Where utility infrastructure is less sensitive to potential settlement or deflection, shallow foundation systems may be feasible in combination with an active retaining wall system, such as tiebacks, which may limit wall movement.

For planning purposes, we recommend that deep foundation elements be set back from the back of the retaining walls a minimum of 5 feet. In addition, the design of the foundation systems and retaining walls should be coordinated to avoid potential conflicts between deep foundation elements and retaining wall anchors. Optimization of the utility infrastructure foundation design should be performed during the design-level study.

GRADING CONSIDERATIONS

The proposed utility infrastructure pads are primarily planned to be cuts into bedrock. However, in some areas, portions of the pad grades may be underlain by colluvium. In addition, some of the pads are also traversed by a cut-fill transition. Areas where structures or site improvements are proposed that are underlain by colluvium will require corrective grading to remove these deposits and restore grades with engineered fill. We provide recommendations for grading in cut-fill transition areas in Section 4.6 of our Preliminary Geotechnical Report (Reference 1).

CONCLUSIONS

It is our opinion that the proposed improvements within the utility area are feasible from a geotechnical perspective. Design-level recommendations for utility infrastructure foundations, retaining walls, and grading within the utility area will be addressed in the design-level geotechnical report.

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

Sincerely,

ENGEO Incorporated

Anne Robertson, PE

J. Brooks Ramsdell, PG, CEG

awr/jbr/pe/tpb/cb