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SALEM
engineering group, inc.

GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED RESIDENTIAL DEVELOPMENT
SCENIC WONDERS EMPLOYEE HOUSING
YOSEMITE WEST
YOSEMITE NATIONAL PARK, CALIFORNIA

SALEM PROJECT NO. 1-222-1112
NOVEMBER 16, 2022

PREPARED FOR:

KL WATER & LAND LLC
7548 HENNESS CIRCLE
YOSEMITE NATIONAL PARK, CA 95389

PREPARED BY:

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November 16, 2022 Project No. 1-222-1112

Mr. Ken LeBlanc
KL Water & Land LLC
7548 Henness Circle
Yosemite National Park, CA 95389

SUBJECT: PROPOSED RESIDENTIAL DEVELOPMENT
SCENIC WONDERS EMPLOYEE HOUSING
YOSEMITE WEST
YOSEMITE NATIONAL PARK, CALIFORNIA

Dear Mr. LeBlanc:

At your request and authorization, SALEM Engineering Group, Inc. (SALEM) has prepared this geotechnical engineering investigation report for the proposed grading, residence buildings, roadway/driveways, and two (2) water storage tanks planned to be located within the subject site near Henness Circle, Yosemite West, Yosemite National Park, California. The coordinates for the approximate center of the proposed development are 37.646828, -119.714910.

The accompanying report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of designing and constructing the project as presently proposed. In our opinion, the proposed project is feasible from a geotechnical viewpoint provided our recommendations are incorporated into the design and construction of the project.

We appreciate the opportunity to assist you with this project. Should you have questions regarding this report or need additional information, please contact the undersigned at (559) 271-9700.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

Ken Clark, CEG
Senior Engineering Geologist
PG 5623 / CEG 1864

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Geotechnical Manager
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1. PURPOSE AND SCOPE

SALEM Engineering Group, Inc. (SALEM) has completed this geotechnical engineering investigation with the purpose to observe and sample the subsurface conditions encountered at the site, and provide conclusions and recommendations relative to site preparation and earthwork procedures/slope grading (stability of cut slopes), surface and subdrainage, foundation design parameters, and retaining wall design parameters. The recommendations presented herein are based on analysis of the data obtained during the investigation and our local experience with similar soil and geologic conditions.

If project details vary significantly from those described herein, SALEM should be contacted to determine the necessity for review and possible revision of this report.

2. SITE LOCATION AND DESCRIPTION

The proposed development is planned to be located on the south and east sides of Henness Circle, about 500 feet south of Henness Ridge Road, Yosemite West, California. The coordinates for the central portion of the site are approximately 37.646828, -119.714910. The site location is depicted on Figure No. 1, Vicinity Map, attached to the end of this report.

The development is proposed to be located in an approximate 2 acre area on a north facing slope with numerous trees and rock outcrops. The axis of a broad swale/drainage area extends from south to north through the central portion of the development area. Figure No. 2 (attached to the end of this report) shows the existing topography and proposed development. Based on our site observations and according to plan sheet Grading Design V3, dated October 10, 2022, provided by Jeff Hornecek with Yosemite Mountain Builders, Inc., the slope grades are relatively variable across the site and range from nearly flat to as steep as 2½ H to 1V in small areas. Most of the site area appears to be flatter than about 4H to 1V. Site elevations range from about 6,100 feet above mean sea level (AMSL) south of the proposed water tanks, to about 6,030 feet AMSL on Henness Circle at the northeast portion of the site.

3. PROJECT DESCRIPTION

Our understanding of the project is based on correspondence and discussions with Mr. Jeff Hornecek with Yosemite Mountain Builders, Inc., and review of site plans/grading plans provided by Mr. Hornecek on October 10, 2022, it is our understanding that seven (7) residential buildings and two (2) 25,000 gallon water storage tanks are proposed for the project. The proposed building and tank locations are shown on

Drawing No. 2. The buildings are designated Bldg 1 and Bldgs 3 through 8. Building 2 was constructed prior to our investigation.

The project will also include driveways connecting Henness Circle to the building areas, and an access road extending from near Building 3 to the water tank site. The project will also include several retaining walls retaining up to about 10 feet of soil/earth. Cuts and fills of up to about 10 feet are indicated on the plans provided. It is our understanding that the residence buildings will be supported by conventional shallow foundations with raised wood and/or slab-on-grade floors. Structural loads were not provided, however, based upon our past experience, we have assumed that the maximum column and line footing loads will be approximately 30 kips and about 3 kips per linear foot, respectively.

It is our understanding that the proposed water tanks will be fully above-ground, and likely of bolted steel type construction, supported on a mat or ring wall foundation.

4. FIELD EXPLORATION

Our field exploration consisted of surface reconnaissance and subsurface exploration. The results of the reconnaissance are noted in Sections 2 of this report.

Nine (9) test pits (TP-1 through TP-9) were excavated on October 18, 2022, at the approximate locations shown on Figure No. 2. The pits were excavated by Mr. Hornacek, to depths ranging from about 1½ to 7 feet BSG using a Cat 430 F2 backhoe equipped with a 36-inch wide bucket. It should be noted that excavation refusal was encountered in each of the pits, at the depths indicated on the test pit logs.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by the field geologist. Visual classification of the soil materials encountered were generally made in accordance with the Unified Soil Classification System (ASTM D2488).

The logs of the backhoe pits are presented in Appendix A. A soil classification chart and key to sampling is presented in Appendix A. The locations of the backhoe pits were determined by measuring from features shown on the Site Plans, provided to us. Hence, accuracy can be implied only to the degree that this method warrants.

Soil samples were obtained from the backhoe pits at the depths shown on the pit logs (see Appendix A of this report). Bulk samples were placed in sealed bags to preserve their natural moisture content. The field geologist departed the site prior to the pits being backfilled, at which time Mr. Hornacek indicated that he would backfill the pits with the soil cuttings excavated, on that day. It is our understanding that the backfill soils placed in the pits were not compacted as engineered fill and not tested for compaction as would be required to demonstrate suitable placement of engineered on the building pad. Thus, the backfilled pits will be subject to future settlement and the backfill will not be suitable to support any proposed improvements or fill soils. The pits should be re-excavated and backfilled with engineered fill as recommended under Sections 9.6 of this report.

5. LABORATORY TESTING

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory-testing program was formulated with emphasis on the evaluation of natural moisture, density, plasticity, gradation, shear strength, and maximum density-optimum moisture of the materials excavated.

In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal.

Details of the laboratory test program and the results of laboratory test are summarized in Appendix B of this report. This information, along with the field observations, was used to prepare the final test pit logs in Appendix A of this report.

6. GEOLOGIC CONDITIONS

The subject site is located in the Sierra Nevada Geomorphic Province, a tilted fault block nearly 400 miles long. The east face of the Sierra Nevada range is high and rugged with multiple scarps, contrasting with the gentle western slope (about 2 degrees) that disappears under sediments of the Great Valley. Deep river canyons are cut into the western slope of California. Multiple active faults are located along the east edge of the province and have, in recent geologic time, accommodated major uplift of the Sierra Nevada Range.

According to Geologic Map of California, Mariposa Sheet (Compiled in 1967), the site is located on Mesozoic granitic rock. Weathered granitic rock was encountered in the test pits excavated for this investigation.

7. SOIL, ROCK, AND GROUNDWATER CONDITIONS

7.1 Surface and Subsurface Soil and Rock Conditions

The backhoe pits encountered subsurface conditions typical of those found in the geologic region of the site. A layer of surface organic debris was generally noted at the site, ranging in thickness from three to twelve inches. In areas with soil (no exposed rock), the soils in the upper 12 to 18 inches were loose silty sands and contained abundant rootlets and organic matter. These soils with relatively high concentrations of root matter are not suitable to support fills or foundations, nor are they suitable for use as engineered fill (see Section 9.5.4 of this report). Tree roots, about 2 to 3 inches in diameter, were noted in several of the pits, extending to depths of 2 to 3 feet BSG. These roots would need to be removed by screening or hand picking prior to using the soil for engineered fill.

Based on our visual observations of rock outcrops and results of subsurface exploration, it appears that near surface, moderately weathered, hard, granitic rock is present at shallow depths of about 0 to 2 feet BSG in the southern and western portions of the site, including the proposed locations for the tanks, and Buildings 3, 4, and 5. Because the more shallow portions of the rock exhibit spheroidal exfoliation/weathering and fractures, the backhoe was typically able to excavate a few feet into the weathered rock before encountering practical refusal. The dimensions of the fragments of moderately weathered and fractured, hard, granitic rock ranged from a about 6 inches to several feet. Test pits 2 and 3 (Buildings 5 and 4) encountered decomposed rock resembling a dry, fine grained silty sand, below a “layer” of moderately weathered and fractured rock. This soil like material was virtually non-cohesive and caved readily into the backhoe excavation.

In contrast to the southern and western portions of the site, the larger fragments of moderately weathered, hard, granitic rock hard were not encountered in the pits excavated to depths of about 3 to 7 feet BSG in the central and eastern portions of the site, including the proposed locations for Buildings 1, 6, 7, and 8. The materials encountered in these pits included silty sands with abundant rootlets underlain by colluvial-grus soils with coarse angular grains and weathered in-place decomposed granitic rock. The weathered in-place decomposed granitic rock resembles granitic rock, but is friable and excavates more like a soil. The weathered in-place decomposed granitic rock materials formed the matrix around cobble sized fragments of harder moderately weathered rock. The colluvial-grus and weathered in-place decomposed granitic rock materials were typically several feet thick exposed in the test pits.

The colluvial-grus material encountered in test pit TP-7 had a significantly higher moisture content than soils encountered in the other pits.

Test Pit 9 (Building 8) encountered a silty sand fill soil extending from the ground surface to a depth of about 2 feet BSG.

The soil and rock conditions described in the previous paragraphs are generalized. Therefore, the reader should consult exploratory backhoe pit logs included in Appendix A for additional soil and rock descriptions.

7.2 Groundwater

Groundwater was not encountered in the backhoe pits at the time of the field investigation on October 18, 2022. However, test pit TP-7 encountered moist soils. This pit appeared to be located near the axis of the drainage swale and the soil moisture is likely indicative of shallow groundwater perched on the fractured, moderately weathered rock. Shallow perched groundwater is typically a common occurrence in the upper decomposed granite/soil zone. This report provides recommendations for constructing subdrains to maintain separation between the building walls and floor slabs and the subsurface water.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, localized pumping, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

7.3 Soil Corrosion Screening

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete and the soil. The 2019 Edition of ACI 318 (ACI 318) has established criteria for evaluation of sulfate and chloride levels and how they relate to cement reactivity with soil and/or water. A near surface soil sample was obtained from the project site and was tested for the evaluation of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts and soluble chloride. The water-soluble sulfate concentrations in the saturation extracts from the two (2) soil samples tested was detected to be less than 50 mg/kg.

ACI 318 Tables 19.3.1.1 and 19.3.2.1 outline exposure categories, classes, and concrete requirements by exposure class. ACI 318 requirements for site concrete based upon soluble sulfate are summarized in Table 7.3 below.

TABLE 7.3
WATER SOLUBLE SULFATE EXPOSURE REQUIREMENTS

Sample Location and Depth	Water Soluble Sulfate (SO_4) in Soil, Percentage by Weight	Exposure Class	Maximum w/cm Ratio	Minimum Concrete Compressive Strength	Cementations Materials Type
TP-4 at 1.5 feet	<0.0050	S0	N/A	2,500 psi	No Restriction
TP-7 at 5-6 feet	<0.0050	S0	N/A	2,500 psi	No Restriction

The water-soluble chloride concentrations detected in the saturation extracts from the soil samples were 78 mg/kg and 37 mg/kg. In addition, testing performed on the aforementioned soil samples resulted in minimum resistivity values of 59,551 ohm-centimeter and 51,143 ohm-centimeter. Based on the results, these soils would be considered to have a “negligible” corrosion potential to buried metal objects (per National Association of Corrosion Engineers, Corrosion Severity Ratings). It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, applicable manufacturer’s recommendations for corrosion protection of buried metal pipe be closely followed.

8. GEOLOGIC HAZARDS

8.1 Fault Rupture

The project area is not within a State or locally defined Earthquake Fault Hazard Zone. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. A fault rupture hazard study is not required for the project.

To determine the distance of known active faults within 100 miles of the site, we used the United States Geological Survey (USGS) web-based application *2008 National Seismic Hazard Maps - Fault Parameters*, supplemented with the Fault Activity Map of California-web application (California Geological Survey). The ten (10) closest active faults are summarized below in Table 8.1.

TABLE 8.1
REGIONAL ACTIVE FAULT SUMMARY

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
Hartley Springs	37.6	6.8
Mono Lake	38.8	6.8
Robinson Creek	44.2	6.7
Hilton Creek	45.6	6.9
Round Valley	53.6	7.1
Smith Valley	58.5	7.4
Antelope Valley	60.3	7.0
Huntoon Valley System	60.4	6.9
Unnamed Faults	63.5	6.9

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
Wassuk Range Zone	66.6	7.5

The faults tabulated above and numerous other faults in the region are sources of potential ground motion. However, earthquakes that might occur on other faults throughout California are also potential generators of significant ground motion and could subject the site to intense ground shaking.

8.2 Ground Shaking

Based on the proximity of numerous active faults, as well as the historic seismic record, the area of the subject site is considered subject to low to moderate seismicity.

Seismic coefficients and spectral response acceleration values, based on the 2019 California Building Code (CBC), were developed using the Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps website. A Site Class C (very dense soil-soft rock) was used based on the shallow rock conditions revealed in the backhoe pits. A table providing the recommended design acceleration parameters for the project site is included in Section 9.8.1 of this report. The design peak ground acceleration adjusted for site class effects (PGA_M) was determined to be 0.281g (based on both probabilistic and deterministic seismic ground motion).

8.3 Landslide Hazard

The ground surface slope gradients at the site are typically 4H to 1V or flatter and do not appear to exceed 2½H to 1V. Considering the results of our site reconnaissance and the predominant granular soils overlying shallow decomposed and moderately weathered granitic rock, it is our opinion that potential for future landslides to impact the project is very low.

8.4 Liquefaction and Seismic Settlement

The site is not located within a mapped liquefaction zone. Considering the very shallow depth of bedrock at the site, the project would not be subject to liquefaction or significant seismic settlement, or manifestations of liquefaction, such as lateral spreading, loss of bearing capacity, sand boils etc.

8.5 Tsunamis and Seiches

The site is not located within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site is suitable for the construction of the proposed improvements at the site as planned, provided the recommendations contained in this report are incorporated into the project design and construction. Conclusions and recommendations provided in this report are based on our review of available literature, analysis of data obtained from our field exploration and laboratory testing program, and our understanding of the proposed development at this time.

9.1.2 In areas with soil (no exposed rock), the soils in the upper 12 to 18 inches were loose silty sands and contained abundant rootlets and organic matter. These soils with relatively high concentrations of root matter are not suitable to support fills or foundations, nor are they suitable for use as engineered fill (see Section 9.7 of this report). Tree roots, about 2 to 3 inches in diameter, were noted in several of the pits, extending to depths of 2 to 3 feet BSG.

Based on our visual observations of rock outcrops and results of subsurface exploration, it appears that near surface, moderately weathered, hard, granitic rock is present at shallow depths of about 0 to 2 feet BSG in the southern and western portions of the site, including the proposed locations for the tanks, and Buildings 3, 4, and 5. Because of the more shallow portions of the rock exhibit spheroidal exfoliation/weathering and fractures, the backhoe was typically able to excavate a few feet into the weathered rock before encountering practical refusal. Test pits 2 and 3 (Buildings 5 and 4) encountered decomposed rock resembling a dry, fine grained silty sand, below a “layer” of moderately weathered and fractured rock. This soil like material was virtually non-cohesive and caved readily into the backhoe excavation.

In contrast to the southern and western portions of the site, the larger fragments of moderately weathered, hard, granitic rock hard were not encountered in the pits excavated to depths of about 3 to 7 feet BSG in the central and eastern portions of the site, including the proposed locations for Buildings 1, 6, 7, and 8. The materials encountered in these pits included silty sands with abundant rootlets underlain by colluvial-grus soils with coarse angular grains and weathered in-place decomposed granitic rock. The weathered in-place decomposed granitic rock resembles granitic rock, but is friable and excavates more like a soil. The weathered in-place decomposed granitic rock materials formed the matrix around cobble sized fragments of harder moderately weathered rock. The colluvial-grus and weathered in-place decomposed granitic rock materials were typically several feet thick exposed in the test pits.

The colluvial-grus material encountered in test pit TP-7 had a significantly higher moisture content than soils encountered in the other pits.

Test Pit 9 (Building 8) encountered a silty sand fill soil extending from the ground surface to a depth of about 2 feet BSG.

Soil conditions described in the previous paragraphs are generalized. Therefore, the reader should consult exploratory backhoe pit logs included in Appendix A for additional soil and rock descriptions.

9.1.3 Groundwater was not encountered in the backhoe pits at the time of the field investigation on October 18, 2022. However, test pit TP-7 encountered moist soils. This pit appeared to be located near the axis of the drainage swale and the soil moisture is likely indicative of shallow groundwater perched on the fractured, moderately weathered rock. Shallow perched groundwater is typically a common occurrence in the upper decomposed granite/soil zone. This report provides recommendations for constructing subdrains to maintain separation between the building walls and floor slabs and the subsurface water.

9.1.4 Provided the recommendations included in this report are followed, the proposed residential development may be supported on conventional shallow spread foundations with conventional slabs on grade.

9.1.5 The soils tested exhibited sulfate concentrations corresponding to sulfate exposure classes S0. Concrete should be designed using exposure Class S0 (see Section 7.3 of this report). Also, based on the test results, the near surface soils should be considered to have a "negligible" corrosion potential to buried metal objects (per National Association of Corrosion Engineers, Corrosion Severity Ratings).

9.1.6 All references to relative compaction and optimum moisture content in this report are based on ASTM D 1557 (latest edition).

9.1.7 SALEM should be retained to review the project plans as they develop further. SALEM should also be retained to perform geotechnical observation and testing services during construction and provide engineering consultation as-needed.

9.2 Surface Drainage

9.2.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils and fractured rock can adversely affect the performance of the planned improvements. Saturation of subgrade supporting structures can cause it to lose internal shear strength and increase its compressibility, resulting in a change to important engineering properties. Proper drainage should be maintained at all times.

9.2.2 The ground immediately adjacent to the foundations shall be sloped away from buildings at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces within 10 feet of the building foundations shall be sloped a minimum of 2 percent away from the buildings and drainage gradients maintained to carry all surface water to collection facilities and off site. These grades should be maintained for the life of the project. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed.

9.2.3 Roof drains should be installed with appropriate downspout extensions out-falling on splash blocks so as to direct water a minimum of 15 feet away from the structures, and grading shall prevent ponding within 15 feet of foundations.

9.2.4 Lined (concrete or asphalt) gutters, "U-gutters," swales, etc. should be provided at the bottom of slopes, including immediately above retaining walls, where slope runoff trends toward the walls.

9.3 Slopes Gradients, Drainage Protection, and Slope Maintenance

9.3.1 A SALEM engineering geologist should be contacted prior to commencement of site grading to provide periodic site visits during grading to observe the grading and estimate the stability of cut slopes. The maximum cut slope grades provided in this section are estimates and the engineering geologist may revised the prescribed maximum gradients based on conditions observed during grading.

9.3.2 Temporary slopes should be graded in accordance with Section 9.14 of this report.

9.3.3 Permanent cut slopes exposing the fine to coarse grained silty sands or colluvial-grus soils should be graded at a maximum repose of 2H to 1V, or flatter, for stability and to reduce erosion potential. Cut slopes exposing the friable, decomposed and weathered in-place granitic rock or moderately weathered, moderately hard granitic rock should be graded at a maximum repose of 1H to 1V, or flatter, for stability, with the exception that slopes steeper than 1½H to 1V should not be greater than 10 feet in height. Slope grading should be conducted in accordance with Section 9.5.9 of this report.

9.3.4 Fill slopes should be graded at a maximum repose of 2H to 1V, or flatter, for stability and to reduce erosion potential.

9.3.5 To reduce the potential for sediment transport downslope, loose soils should not be left on finished slopes. Fill slopes should be constructed in a manner that includes compaction of the face of the slopes.

9.3.6 It is recommended to develop and maintain site grades which will rapidly drain surface runoff away from graded or natural slopes - both during and after construction. To accomplish this, use curbs, brow ditches, berms or other measures to intercept and safely redirect flow away from the tops of slopes. Runoff shall not be allowed to drain over top of graded slopes. Brow ditches and berms should be periodically inspected and maintenance of brow ditches and berms should be anticipated to maintain the functionality of the berms/ditches to intercept and safely redirect flow away from the tops of slopes. Maintenance may include removal of debris from flow paths and/or earthwork repair of rivulets/erosion.

9.3.7 Exposed graded slopes should be planted and maintained with strong rooting vegetation to reduce erosion potential. In addition, the existing vegetation should remain covering slopes, if possible. If the existing vegetation is disturbed, shallow rooted ground cover, as well as deeper rooted trees or bushes, should be planted on the disturbed or reconstructed portions of the slopes to reduce the potential for erosion and aid in surficial slope stability.

9.3.8 Irrigation in the areas of graded slopes should be of a drip type system without surface runoff. All irrigation lines and sprinklers should be monitored for leaks. All leaks and damage should be repaired promptly.

9.3.9 If future erosion or slope instability occur on native or graded slopes, SALEM should be contacted to provide recommendations for repair, and the distressed areas should be repaired as soon as possible under the direction of SALEM to reduce the potential for impact to improvements.

9.3.10 Foundation setback recommendations from slopes are provided under Section 9.9.2 of this report. Other, non-structural improvements such as flatwork, etc. placed within about 5 feet of the tops of descending fill slopes will have a higher potential for settlement and distress.

9.4 Rockeries

9.4.1 It is our understanding that Yosemite Mountain Builders, Inc. has experience building relatively short rockeries in the area of the site and that those walls have performed well over the years. Recommendations are provided in this section for use by Yosemite Mountain Builders, Inc. Rockeries or “dry-stack walls” may be used to retain soil for this project under the specified conditions/maximum heights indicated in this section. Rockeries should be constructed using hard, angular, granitic rock boulders utilizing the recommendations of this section.

9.4.2 The maximum height of the rockery should not exceed 4 feet as measured from the exposed ground surface at the toe of the rock faced slope to the top of the rock faced slope. SALEM should be contacted to provide additional recommendations (including subdrainage recommendations) in the event that higher rockeries are desired/planned.

9.4.3 The soils retained by the rock faced slope should be granular on site soils. In the event that clay soils are encountered during grading, these soils should not be used within a horizontal distance of twice the height of the rockery (see Section 9.4.2).

9.4.4 The maximum batter of the rock faced slope should not be steeper than 0.5 horizontal to 1 vertical.

9.4.5 The back-cut soil (rock-soil interface) should not be steeper than 1.5 horizontal to 1 vertical.

9.4.6 **Rockeries may be used only**: 1) where the top of the rock faced slope is at least 8 feet from the top of any foundation; and, 2) the average finished ground slope gradient within 8 feet behind the top of the rock faced slope does not exceed 20 percent; and, 3) the average finished ground slope gradient within 8 feet below the bottom of the rock faced slope does not exceed 20 percent.

9.4.7 Rockeries should not be used where lateral or vertical ground movements cannot be tolerated. Lateral and vertical ground movements of magnitudes expected to cause cracking of pavements should be anticipated within about 5 behind the top of the rock faced slope.

9.4.8 Surcharge loads, such and vehicle wheel loads, are not accounted for by the recommendations of this report. Loading of the ground surface (e.g vehicles) should not be allowed within 4 feet of the tops of rockeries.

9.4.9 The base of the bottom course of rock should be excavated to expose firm soils or rock below the organic rich soils, or at least 18 inches below original ground surface, whichever is deeper.

9.4.10 The face of the soil slope should be over-built as engineered fill and trimmed back or compacted prior to placement of rock.

9.4.11 The base of the bottom course of rock should be excavated to expose firm soils or rock, or at least 18 inches below original ground surface, whichever is deeper.

9.4.12 Bottom coarse rocks should have average dimensions on the order 1 foot (100 to 200 pounds) minimum. The rocks should be selected and stacked such that most of the rock in a given row are approximately the same size and gaps between rocks are minimized. If gaps between rocks of larger than 6 inches cannot be avoided, they should be chinked (filled) with smaller rocks. However, chinking should not provide primary bearing support for overlying rocks. At least 3 points of rock-on-rock contact should be achieved near the face of the rock slope.

9.4.13 Grading and fill placement should be in accordance with section 9.3, 9.5, 9.6, and 9.7 of this report.

9.4.14 Finished grading should drain surface runoff away from the tops of rockeries. To accomplish this brow ditches should be used to intercept and safely redirect flow away from the tops of rockeries. Runoff shall not be allowed to drain over top of rockeries. Brow ditches and berms should be periodically inspected and maintenance of brow ditches and berms should be anticipated to maintain the functionality of the berms/ditches to intercept and safely redirect flow away from the tops of slopes. Maintenance may include removal of debris from flow paths and/or earthwork repair of rivulets/erosion.

9.5 Site Preparation, Grading, and Subdrainage

9.5.1 A SALEM representative should be present during site clearing and over-excavation/grading operations to test and observe earthwork construction. In addition, a SALEM engineer or geologist should be scheduled to observe the bottoms of over-excavation in structural pad areas. The testing and observations are an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Geotechnical Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section, as well as other portions of this report.

9.5.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, designer, contractor, and geotechnical engineer in attendance.

9.5.3 Site demolition activities shall include removal of all surface obstructions not intended to be incorporated into final site design (if any). In addition, undocumented fill, underground buried structures, existing foundations, and/or utility lines, if encountered during demolition and/or construction, should be properly removed and the resulting excavations backfilled with Engineered Fill. After demolition activities, it is recommended that disturbed soils be removed and/or replaced with compacted engineered fill soils. Excavations or depressions resulting from site clearing operations, or other existing excavations or depressions, should be restored with Engineered Fill in accordance with the recommendations of this report.

9.5.4 Surface organic debris and surface vegetation consisting of grasses, brush and other similar vegetation should be removed by raking/cutting prior to stripping. Stripping should remove organic-rich soils with abundant roots/rootlets. Based on the soils exposed in the test pits, a stripping depth of 12 to 18 inches is recommended. Deeper removal may be required in localized areas. The stripped vegetation and organic rich soils will not be suitable for use as engineered fill below pavement or structural fill/building areas, or within 5 feet horizontally of building areas, or within a 1H to 1V envelope extending downward from the top edge of any foundation, whichever is further. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas or exported from the site.

9.5.5 The backfilled pits will be subject to future settlement and the backfill is not suitable to support any proposed improvements or fill soils. The pits should be re-excavated and backfilled with compacted engineered fill in accordance with the recommendations under Section 9.7 of this report.

9.5.6 Where not to remain, any existing trees to be removed should have their root systems removed, including root balls as well as isolated roots greater than ¼-inch in diameter. The root system removal may disturb a significant quantity of soil. Following tree removal, all loose and disturbed soil should be removed from the tree wells. Any areas or pockets of soft or loose soils, void spaces made by burrowing animals, undocumented fill, or other disturbed soil (i.e. soil disturbed by root removal) that are encountered, should be excavated to expose approved firm native material. Care should be taken during site grading to mitigate (e.g. excavate and compact as engineered fill) all soil disturbed by demolition and tree removal activities.

9.5.7 Undocumented fill soils, as encountered in test pit TP-9, are not suitable for support of structures or support of any engineered fill soils and should be completely removed for areas to be developed.

9.5.8 To provide uniform support for the proposed buildings and tanks, and reduce future differential settlement across the structural pads, it is recommended that over-excavation of the **building pad and tank pad** extend to at least 18 inches below preconstruction site grade, to 1 foot below the bottom of proposed foundations, to the depth required to remove any undocumented fills, or to the depth required to provide a horizontal setback of at least 5 feet from the top of any foundation to a finished sloped ground surface, whichever is greater. The resulting bottom of over excavation should be observed, documented, and approved by SALEM. Upon approval, the bottom of the excavation should be scarified to a minimum depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to at least 1 optimum moisture content, and compacted to a minimum of 92 percent of the maximum density. The 12 inch deep scarification is not required where hard rock is encountered. The bottom of excavation should be verified by the testing lab prior to backfill.

9.5.9 In areas where the ground surface slopes at a 5H:1V inclination or greater, fill slopes should be constructed by excavating a keyway and flat benches into native firm soils, at a minimum vertical interval of about 1½ feet. Keyways should extend at least 2 feet below adjacent round surface level at the toe of the slope and should be at least as wide as the height of the finished slope. The bottom of the keyway should slope down at about 2 percent in the upslope direction. The bottom of the keyway should be scarified to a depth of 12 inches and compacted prior to placement of fill. The 12 inch deep scarification is not required where hard rock is encountered.

9.5.10 To reduce the potential for sediment transport downslope, loose soils should not be left on finished slopes. The slopes should be constructed in a manner that includes compaction of the face of the slopes.

9.5.11 The building and tank pad structural areas and over-build zones should be considered as the entire building/tank area and extending a minimum of 5 feet horizontally beyond the outside of the proposed foundations.

9.5.12 Interior concrete slabs on grade should be supported on a minimum of 4 inches of Caltrans Class 2 aggregate base, over the depth of engineered fill recommended below foundations (see 9.5.8 of this report).

9.5.13 Areas of lightly loaded foundations such as for site retaining walls, screen walls, etc., should be prepared by over-excavation to a minimum of 12 inches below foundations, 18 inches below preconstruction site grade, or to the depth required to remove undocumented fills (if encountered), whichever is greater. The resulting bottom of over-excavation shall be scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to above optimum moisture, and compacted to a minimum of 92 percent of the maximum density. The horizontal limits of the over-excavation should extend, laterally to a minimum of 3 feet beyond the outer edges of these lightly loaded foundations.

9.5.14 After stripping, areas of proposed pavements, exterior slabs, or any areas to receive fill placement OUTSIDE the structural pad/foundation areas and associated over-build zones, should be prepared by over-excavation to a minimum of 18 inches below existing grade, 12 inches below the bottom of concrete slabs on grade, or the depth required to remove undocumented fills (if encountered), whichever is greater. In the event that the owner accepts additional risk of future settlement damage (cracking, birdbaths, etc.) to pavement or exterior slabs, the undocumented fill soils may be left in place. Upon approval, the bottom of excavation should be scarified a minimum of 8 inches, moisture conditioned to above optimum moisture and compacted as engineered fill. The zone of subgrade preparation should extend a minimum of 3 feet beyond these improvements.

Lightly loaded exterior concrete slabs on grade should be supported on a minimum of 4 inches of Class 2 aggregate base compacted to 95 percent relative compaction, over moisture conditioned compacted engineered fill prepared as recommended above.

9.5.15 Areas of rockeries should be prepared as recommended in Section 9.4.

9.5.16 An integral part of satisfactory fill placement is the stability of the placed lift of soil. If placed materials exhibit excessive instability as determined by a SALEM field representative, the lift will be considered unacceptable and shall be remedied prior to placement of additional fill material. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

9.5.17 The most effective site preparation alternatives will depend on site conditions prior to grading. We should evaluate site conditions and provide supplemental recommendations immediately prior to grading, if necessary.

9.5.18 We do not anticipate groundwater or seepage to adversely affect construction if conducted during the drier months of the year (typically summer and fall). However, groundwater and soil moisture conditions could be significantly different during the wet season (typically winter and spring) as surface soil becomes wet; perched groundwater conditions may develop. Grading during this time period will likely encounter wet materials resulting in possible excavation and fill placement difficulties. Project site winterization consisting of placement of aggregate base and protecting exposed soils during construction should be performed. If the construction schedule requires grading operations during the wet season, we can provide additional recommendations as conditions warrant.

9.5.19 Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material or placement of crushed rocks or aggregate base material; or mixing the soil with an approved lime or cement product.

The most common remedial measure of stabilizing the bottom of the excavation due to wet soil condition is to reduce the moisture of the soil to near the optimum moisture content by having the subgrade soils scarified and aerated or mixed with drier soils prior to compacting. However, the drying process may require an extended period of time and delay the construction operation. To expedite the stabilizing process, crushed rock may be utilized for stabilization provided this method is approved by the owner for the cost purpose.

If the use of crushed rock is considered, it is recommended that the upper soft and wet soils be replaced by 6 to 24 inches of ¾-inch to 1-inch crushed rocks. The thickness of the rock layer depends on the severity of the soil instability. The recommended 6 to 24 inches of crushed rock material will provide a stable platform. It is further recommended that lighter compaction equipment be utilized for compacting the crushed rock. All open graded crushed rock/gravel should be fully encapsulated with a geotextile fabric (such as Mirafi 140N) to minimize migration of soil particles into the voids of the crushed rock. Although it is not required, the use of geogrid (e.g. Tensar BX 1100, BX 1200 or TX 160) below the crushed rock will enhance stability and reduce the required thickness of crushed rock necessary for stabilization.

Our firm should be consulted prior to implementing remedial measures to provide appropriate recommendations.

9.5.20 Shallow groundwater perched on rock is anticipated to occur seasonally throughout the site area. Also, high moisture content in the soils exposed at test pit TP-7 suggest that concentrated shallow subsurface water may occur in this area (located near the axis of the drainage swale). Vertical subdrains (French drains) should be constructed on the upgradient sides of the building pads. Recommendations for the depths and locations of the subdrains should be requested from a SALEM engineer or geologist subsequent to SALEM'S approval of the bottom of pad over-excavation (Section 9.5.8). For preliminary design, the subdrains should be trenched at least 12 inches wide and located no closer than 5 feet from the building foundations. The subdrain should be filled with Caltrans Class 2 permeable material and should include a perforated drain pipe (3 inch min. dia.) with perforations facing down at about 2 inches above the bottom of the trench. As an alternative to Class 2 permeable material, a ¾ inch gravel may be used, completely wrapped in filter fabric (Mirafi 140N, or equivalent). The perforated pipe should transition to a solid pipe and a cement slurry cut-off should be placed in the trench just downgradient from that transition. Erosion control, such as rip-rap, should be placed on the ground surface where the solid drain pipe daylights.

9.6 Soil/Rock Excavation Characteristics and Processing of On-site Materials for General Fill

9.6.1 Based on the soil conditions encountered in the test pits (excavation refusal encountered at the depths indicated on the test pit logs), it is anticipated that rock excavation will require blasting, a dozer with rippers, or a large excavator with hydro-hammer. The contractor should anticipate needing to hand pick or otherwise screen logs, roots and other deleterious materials from the undocumented fill soils prior to reuse as engineered fill.

9.7 Fill Materials

9.7.1 On-site soil at a depth of 12 to 18 inches BSG (below the organic rich zone) and rock materials that can be reduced in size are generally considered suitable for reuse as engineered fill on the project, below recommended aggregate base (where applicable). On-site soils/rock used as engineered fill should not contain deleterious matter, notable organic material, or rock fragments larger than 3 inches in maximum dimension. The contractor should anticipate needing to hand pick or otherwise screen logs, roots and other deleterious materials from the undocumented fill soils prior to reuse as engineered fill.

9.7.2 Import soils (if required) shall be well-graded, slightly cohesive silty fine sand or sandy silt, with relatively impervious characteristics when compacted. A clean sand or very sandy soil is not acceptable for this purpose. Proposed import soils should typically possess the soil characteristics summarized below in Table 9.7.2.

TABLE 9.7.2
IMPORT NON-EXPANSIVE FILL REQUIREMENTS

Percent Passing 3-inch Sieve	100
Percent Passing No.4 Sieve	75-100
Percent Passing No 200 Sieve	15-40
Maximum Organic Content	3% by Weight
Maximum Plasticity Index	10
Maximum Expansion Index (ASTM D4829)	10
Minimum Angle of Internal Friction (degrees)	32 (1)

(1) Applicable to retaining wall and rockery backfill only.

It is recommended proposed import materials be sampled, tested, and approved by SALEM prior to its transportation to the site. At a minimum, prior to importing the Contractor should demonstrate to the Owner that the proposed import meets the requirements for import fill specified in this report. In addition, the material should be verified by the Contractor that the soils do not contain any environmental contaminates as regulated by local, state, or federal agencies, as applicable

9.7.3 All engineered fill (including scarified ground surfaces and backfill) should be placed in lifts no thicker than 6 inches to allow for adequate bonding and compaction (typically 4-6 inches in loose thickness).

9.7.4 On-site soils and/or import engineered fill, if used, should be placed, moisture conditioned to slightly above optimum moisture content, and compacted to at least 92 percent relative compaction. A minimum of 95 percent relative compaction is recommended in the upper 1 foot below aggregate base for pavement sections.

9.7.5 The preferred materials specified for engineered fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since they have complete control of the project site.

9.7.6 Environmental characteristics and corrosion potential of import soil materials should also be considered.

9.7.7 Aggregate base material should meet the requirements of a Caltrans Class 2 Aggregate Base. Aggregate base placed within the limits of the building pad should be non-recycled. The aggregate base material should conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, ¾-inch or 1½-inches maximum size. The aggregate base material should be compacted to a minimum relative compaction of 95 percent based ASTM D1557. The aggregate base material should be spread in layers not exceeding 6 inches and each layer of aggregate material course should be tested and approved by the Soils Engineer prior to the placement of successive layers

9.7.8 Open graded gravel and rock material (i.e. ¾ inch or ½ inch crushed gravel) should not be used as backfill including utility trenches. If required by local agency or for use in subgrade stabilization, to prevent migration of fines, open graded materials should be fully encapsulated in a geotextile fabric such as Mirafi 140N or equivalent. Open graded rock should be placed in loose lifts no greater than about 6 to 8 inches, and vibrated in-place to a firm non-yielding condition.

9.8 Seismic Design Criteria

9.8.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2019 CBC, our recommended parameters are shown below. These parameters were determined using California's Office of Statewide Health Planning and Development (OSHPD) Seismic Design Map Tool Website (https://seismicmaps.org/) in accordance with the 2019 CBC. A Site Class C (very dense soil-soft rock) was used based on the shallow rock conditions revealed in the backhoe pits.

TABLE 9.8.1
SEISMIC DESIGN PARAMETERS

Seismic Item	**Symbol**	**Value**	**ASCE 7-16 or 2019 CBC Reference**
Site Coordinates		37.6468 Lat -119.7149 Lon	
Site Class	--	C	ASCE 7 Table 20.3
Soil Profile Name	--	Very Dense Soil-Soft Rock	ASCE 7 Table 20.3
Risk Category	--	II	CBC Table 1604.5
Site Coefficient for PGA	F_{PGA}	1.2	ASCE 7 Table 11.8-1
Peak Ground Acceleration (adjusted for Site Class effects)	PGA_M	0.281 g	ASCE 7 Equation 11.8-1
Seismic Design Category	SDC	D	ASCE 7 Table 11.6-1 & 2
Mapped Spectral Acceleration (Short period - 0.2 sec)	S_S	0.541 g	Figure 1613.2.1(1)
Mapped Spectral Acceleration (1.0 sec. period)	S_1	0.204 g	Figure 1613.2.1(2)
Site Class Modified Site Coefficient	F_a	1.283	Table 1613.2.3(1)
Site Class Modified Site Coefficient	F_v	1.5	Table 1613.2.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a\ S_S$	S_{MS}	0.695 g	Equation 16-36
MCE Spectral Response Acceleration (1.0 sec. period) $S_{M1} = F_v\ S_1$	S_{M1}	0.306 g	Equation 16-37
Design Spectral Response Acceleration $S_{DS}=⅔S_{MS}$ (short period - 0.2 sec)	S_{DS}	0.463g	Equation 16-38
Design Spectral Response Acceleration $S_{D1}=⅔S_{M1}$ (1.0 sec. period)	S_{D1}	0.204 g	Equation 16-39
Short Term Transition Period (S_{D1}/S_{DS}), Seconds	T_S	0.441	ASCE 7-16, Section 11.4.6
Long Period Transition Period (seconds)	T_L	6	ASCE 7-16, Figure 22-14

9.8.2 Conformance to the criteria in the above table for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

9.9 Conventional Shallow Foundations and Mat Foundations

9.9.1 The site is suitable for use of conventional shallow foundations consisting of continuous footings and isolated pad footings, or mat foundations, if supported on engineered fill soils prepared in accordance with recommendations under Section 9.5 of this report. Shallow foundations for the buildings, supported on engineered fill as recommended in this report, may be designed based on total and differential static settlement of 1 inch and ½ inch in 40 feet, respectively. Provided the tank pad is graded in accordance with the recommendations of this report and foundations are constructed as described herein, we estimate: 1) a total static settlement of 1 inch at the center of the tank; 2) a settlement of ½ inch at the edge of the tank; and 3) a differential settlement of ½ inch from the center to the edges of the tanks.

9.9.2 Bearing wall footings considered for the building structure should be continuous with a minimum width of 15 inches and extend to a minimum depth of 18 inches below the lowest adjacent grade, or to achieve the slope setback recommendations below, or to the minimum County frost depth requirement, whichever is deeper. Isolated column footings should have a minimum width of 18 inches and extend a minimum depth of 18 inches below the lowest adjacent grade, or to achieve the slope setback recommendations below, or to the minimum County frost depth requirement, whichever is deeper. Minimum footing depths should also consider that a horizontal setback from the top of any foundation to a sloped ground surface of at least 5 feet is required.

9.9.3 Lightly loaded foundations for screen walls, retaining walls, etc., should have a minimum width of 12 inches and minimum depth of 12 inches below adjacent grade.

9.9.4 Shallow spread foundations supported engineered fill prepared in accordance with the recommendations provided in this report may be designed based on an allowable bearing pressure of 2,500 pounds per square foot. This value may be increased by 1/3 for short term wind and seismic loading.

9.9.5 Mat foundations should be supported on a minimum of 4 inches of Caltrans Class 2 aggregate base, over the depth of engineered fill recommended below foundations (Section 9.5.8). Mat foundation may be designed using a modulus of subgrade reaction of 175 psi/inch.

9.9.6 Footing concrete should be placed into neat excavation. The footing bottoms shall be maintained free of loose and disturbed soil.

9.9.7 Resistance to lateral footing displacement can be computed using a coefficient of friction factor of 0.35 acting between the base of foundations and engineered fill soils.

9.9.8 Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 300 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 of the 2019 CBC that includes wind or earthquake loads.

9.9.9 Underground utilities running parallel to footings should not be constructed in the zone of influence of footings. The zone of influence may be taken to be the area beneath the footing and within a 1:1 plane extending out and down from the bottom edge of the footing.

9.9.10 The foundation subgrade should be sprinkled as necessary to maintain a moist condition without significant shrinkage cracks as would be expected in any concrete placement. Prior to placing rebar reinforcement, foundation excavations should be evaluated by a representative of SALEM for appropriate support characteristics and moisture content. Moisture conditioning may be required for the materials exposed at footing bottom, particularly if foundation excavations are left open for an extended period.

9.10 Interior Concrete Slabs-on-Grade

9.10.1 Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 5 inches thick and underlain by four (4) inches of non-recycled Class 2 aggregate base compacted to 95 percent relative compaction, over the depth of engineered fill extending below foundations (see under Section 9.5).

9.10.2 We recommend reinforcing slabs, at a minimum, with welded wire or fiber mesh reinforcement. The type of reinforcement should be selected by the structural engineer.

9.10.3 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs.

9.10.4 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement. The exterior floors should be poured separately in order to act independently of the walls and foundation system.

9.10.5 It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the structures is recommended.

9.10.6 Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with manufacturer's recommendations and/or ASTM guidelines, whichever is more stringent. In addition, ventilation of the structure is recommended to reduce the accumulation of interior moisture.

9.10.7 In areas where it is desired to reduce floor dampness where moisture-sensitive coverings, coatings, underlayments, adhesives, moisture sensitive goods, humidity controlled environments, or climate cooled environments are anticipated, construction should have a suitable waterproof vapor retarder (a minimum of 10 mils thick, is recommended, polyethylene vapor retarder sheeting, Raven Industries "VaporBlock 10, Stego Industries 10 mil "StegoWrap" or W.R. Meadows Sealtight 10 mil "Perminator") incorporated into the floor slab design. The water vapor retarder should be a decay resistant material complying with ASTM E96 or ASTM E1249 not exceeding 0.01 perms, ASTM E154 and ASTM E1745 Class A. The vapor retarder should, maintain the recommended permeance **after** conditioning tests per ASTM E1745. The vapor barrier should be placed between the concrete slab and the compacted granular aggregate subbase material. The water vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-18.

9.10.8 The concrete maybe placed directly on vapor retarder. The vapor retarder should be inspected prior to concrete placement. Cut or punctured retarder should be repaired using vapor retarder material lapped 6 inches beyond damaged areas and taped. Extend vapor retarder over footings and seal to foundation wall or slab at an elevation consistent with the top of the slab or terminate at impediments such as water stops or dowels. Seal around penetrations such as utilities or columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab as well as at the slab perimeter.

9.10.9 Avoid use of stakes driven through the vapor retarder.

9.10.10 The recommendations of this report are intended to reduce the potential for cracking of slabs due to soil movement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to soil movement. This is common for project areas that contain expansive soils since designing to eliminate potential soil movement is cost prohibitive. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.10.11 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

9.11 Exterior Concrete Slabs on Grade

9.11.1 The following recommendations are intended for lightly loaded exterior slabs on grade not subject to vehicular traffic. Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 4 inches thick and underlain by four (4) inches of Caltrans Class 2 aggregate base, over subgrade soils prepared in accordance with the recommendations under Section 9.5 of this report.

9.11.2 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs.

9.11.3 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement.

9.11.4 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

9.12 Retaining Wall Design Parameters

Retaining walls retaining greater than 5 feet of soil are not anticipated for the project. SALEM should be provided with retaining wall plans for review prior to finalizing the plans.

9.12.1 Lateral earth pressures and coefficient of friction for retaining wall design are provided below based on drained conditions and granular on-site or select imported backfill behind the wall (see under Section 9.7 for import fill recommendations). All retaining walls should be drained (see under Section 9.13). Separate tables are provided for level backfill and a slope condition behind the walls, for slopes up to as steep as 2H to 1V. Retaining walls should NOT be designed for active pressure unless the shell is expected to rotate at least 0.0005 radians at the top. The at-rest soil pressure is applicable to retaining structures that are fully fixed against both rotation and translation. Walls restrained from translation at the top and bottom, but able to deflect 0.0005 radian between restrained points should be designed for the braced lateral pressure. Retaining wall reinforcement should be designed by a structural engineer to accommodate any expected surcharge loads (such as adjacent foundations), if any.

TABLE 9.12.1 A
DESIGN PARAMETERS FOR RETAINING WALLS-LEVEL BACKFILL CONDITIONS

Retaining Wall Design Parameters Level Backfill	Soil Equivalent Fluid Pressure
Active Pressure, Drained, (pcf EFP)	40
At-Rest Pressure, Drained, (pcf EFP)	61
Allowable Passive Pressure, (pcf EFP)	300
Allowable Coefficient of Friction	0.35
Maximum Unit Weight (pcf) [γ_{max}]	130
Minimum Unit Weight (pcf) [γ_{min}]	100

Note: EFP= equivalent fluid pressure

TABLE 9.12.1 B
DESIGN PARAMETERS FOR RETAINING WALLS-SLOPED (2H TO 1V MAX) BACKFILL CONDITIONS

Retaining Wall Design Parameters Maximum Slope 2H to 1V Retained Conditions	**Soil Equivalent Fluid Pressure**
Active Pressure, Drained, (pcf EFP)	59
At-Rest Pressure, Drained, (pcf EFP)	76
Allowable Passive Pressure, (pcf EFP)	300
Allowable Coefficient of Friction	0.35
Maximum Unit Weight (pcf) [γ_{max}]	130
Minimum Unit Weight (pcf) [γ_{min}]	100

Notes: EFP= equivalent fluid pressure.

9.12.2 The preceding lateral earth pressures assume sufficient drainage behind retaining walls to prevent the build-up of hydrostatic pressure. The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.

9.12.3 For dynamic seismic lateral loading on retaining walls the following equation shall be used:

TABLE 9.12.3
SEISMIC LATERAL LOADING FOR RETAINING WALLS

Dynamic Seismic Lateral Loading For Level and Drained Backfill Conditions
Dynamic Seismic Lateral Load = $\frac{3}{8}\gamma K_h H^2$
Where: γ = Maximum Wet Unit Weight (130 pcf)
K_h = Horizontal Acceleration = $\frac{2}{3}PGA_M$ (Section 9.8.1 above)
H = Wall Height

Note: If seismic loading is required for design of walls with sloped backfill or undrained backfill conditions, SALEM should be notified and wall plans should be provided to SALEM for review. Additional recommendations may be warranted.

9.12.4 For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

9.13 Retaining Wall Drainage

9.13.1 Retaining walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. **The upper 12 inches of backfill soils placed within 5 feet of the top of the wall should consist of native fine grained soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage directly into the wall drain system.** The gravel should conform to Class 2 permeable materials graded in accordance with the current Caltrans Standard Specifications.

9.13.2 Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

9.13.3 Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements.

9.13.4 The top of the perforated pipe should be placed at or below the bottom of the adjacent floor slab or pavements. The pipe should be placed in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Slots should be no wider than 1/8-inch in diameter, while perforations should be no more than ¼-inch in diameter.

9.13.5 Lined (concrete or asphalt) gutters, "U-gutters," swales, etc. should be provided at the bottom of slopes, including immediately above retaining walls, where slope runoff trends toward the walls.

9.13.6 All subsurface and surface drain collected behind and at the top of the retaining wall should be directed to outlet in a non-erosive manner at least 15 feet from the residence structure. Ponding should not be allowed within 10 feet of any foundation/structure.

9.14 Temporary Excavations

9.14.1 We anticipate that the site soils condition will be classified as Cal-OSHA "Type C" soil when encountered in excavations during site development and construction. Temporary excavation sloping, benching, the use of trench shields, and the placement of trench spoils should conform to the latest applicable Cal-OSHA standards. The contractor should have a Cal-OSHA-approved "competent person" onsite during excavation to evaluate trench conditions and make appropriate recommendations where necessary.

9.14.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable Occupational Safety and Health Administration (OSHA) rules and regulations to maintain safety and maintain the stability of adjacent existing improvements. All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load.

9.14.3 Temporary excavations and slope faces should be protected from rainfall and erosion. Surface runoff should be directed away from excavations and slopes.

9.14.4 Open, unbraced excavations in undisturbed soils should be made according to the slopes presented in the following table:

TABLE 9.14.4

RECOMMENDED MAXIMUM TEMPORARY EXCAVATION SLOPES

Depth of Excavation (ft)	Slope (Horizontal : Vertical)
0-5 feet - exposing soil	1:1
5-10 feet – exposing soil	1½:1
0-10 feet - exposing rock	1:1

9.14.5 If, due to space limitation, excavations near property lines or existing structures are performed in a vertical position, slot cuts, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavations and installation. A Specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction.

9.14.6 Braced shorings should be designed for a maximum pressure distribution of 25H, (where H is the depth of the excavation in feet). The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given herein. Equipment traffic should concurrently be limited to an area at least 3 feet from the shoring face or edge of the slope.

9.14.7 The excavation and shoring recommendations provided herein are based on soil characteristics derived from the borings within the area. Variations in soil conditions will likely be encountered during the excavations. SALEM Engineering Group, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation. Slope height, slope inclination, or excavation depth should in no case exceed those specified in local, state, or federal safety regulation, (e.g. OSHA) standards for excavations, 29 CFR part 1926, or Assessor's regulations.

9.15 Underground Utilities

9.15.1 Underground utility trenches should be backfilled with properly compacted material. The material excavated from the trenches should be adequate for use as final backfill (not for bedding and pipe zone – see Section 9.15.2) provided it does not contain deleterious matter, vegetation or rock larger than 3 inches in maximum dimension. Trench backfill should be placed in loose lifts not exceeding 8 inches and compacted to at least 92 percent relative compaction at or above optimum moisture content. The upper 12 inches of trench backfill within asphalt or concrete paved areas should be moisture conditioned to at or above optimum moisture content and compacted to at least 95 percent relative compaction.

9.15.2 Bedding and pipe zone backfill typically extends from the bottom of the trench excavations to approximately 12 inches above the crown of the pipe. Pipe bedding, haunches and initial fill extending to 1 foot above the pipe should consist of imported clean well graded sand with 100 percent passing the #4 sieve, a maximum of 15 percent passing the #200 sieve, and a minimum sand equivalent of 20.

9.15.3 Underground utilities crossing beneath new or existing structures should be plugged at entry and exit locations to the building or structure to prevent water migration. Trench plugs can consist of on-site clay soils, if available, or sand cement slurry. The trench plugs should extend 2 feet beyond each side of individual perimeter foundations.

9.15.4 The contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

10. PLAN REVIEW, CONSTRUCTION OBSERVATION AND TESTING

10.1 Plan and Specification Review

10.1.1 SALEM should review the project plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

10.2 Construction Observation and Testing Services

10.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.

10.2.2 SALEM should be present at the site during site preparation to observe site clearing, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

10.2.3 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

11. LIMITATIONS AND CHANGED CONDITIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the test borings drilled at the approximate locations shown on the Site Plan, Figure No. 2. The report does not reflect variations which may occur between borings. The nature and extent of such variations may not become evident until construction is initiated.

If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of such variations. The findings and recommendations presented in this report are valid as of the present and for the proposed construction. If site conditions change due to natural processes or human intervention on the property or adjacent to the site, or changes occur in the nature or design of the project, or if there is a substantial time lapse between the submission of this report and the start of the work at the site, the conclusions and recommendations contained in our report will not be considered valid unless the changes are reviewed by SALEM and the conclusions of our report are modified or verified in writing. The validity of the recommendations contained in this report is also dependent upon an adequate testing and observations program during the construction phase.

Our firm assumes no responsibility for construction compliance with the design concepts or recommendations unless we have been retained to perform the on-site testing and review during construction. SALEM has prepared this report for the exclusive use of the owner and project design consultants.

SALEM does not practice in the field of corrosion engineering. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, that manufacturer's recommendations for corrosion protection be closely followed. Further, a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of concrete slabs and foundations in direct contact with native soil.

The importation of soil and or aggregate materials to the site should be screened to determine the potential for corrosion to concrete and buried metal piping. The report has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 271-9700.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

KENNETH J. CLARK
No. 1864
Exp 5-31-23

Ken Clark, CEG
Senior Engineering Geologist
CEG 1864

DEAN B. LEDGERWOOD II
C 94395
EXP. 03/31/23
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Dean B. Ledgerwood II
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Dean B. Ledgerwood II, PE, PG, CEG
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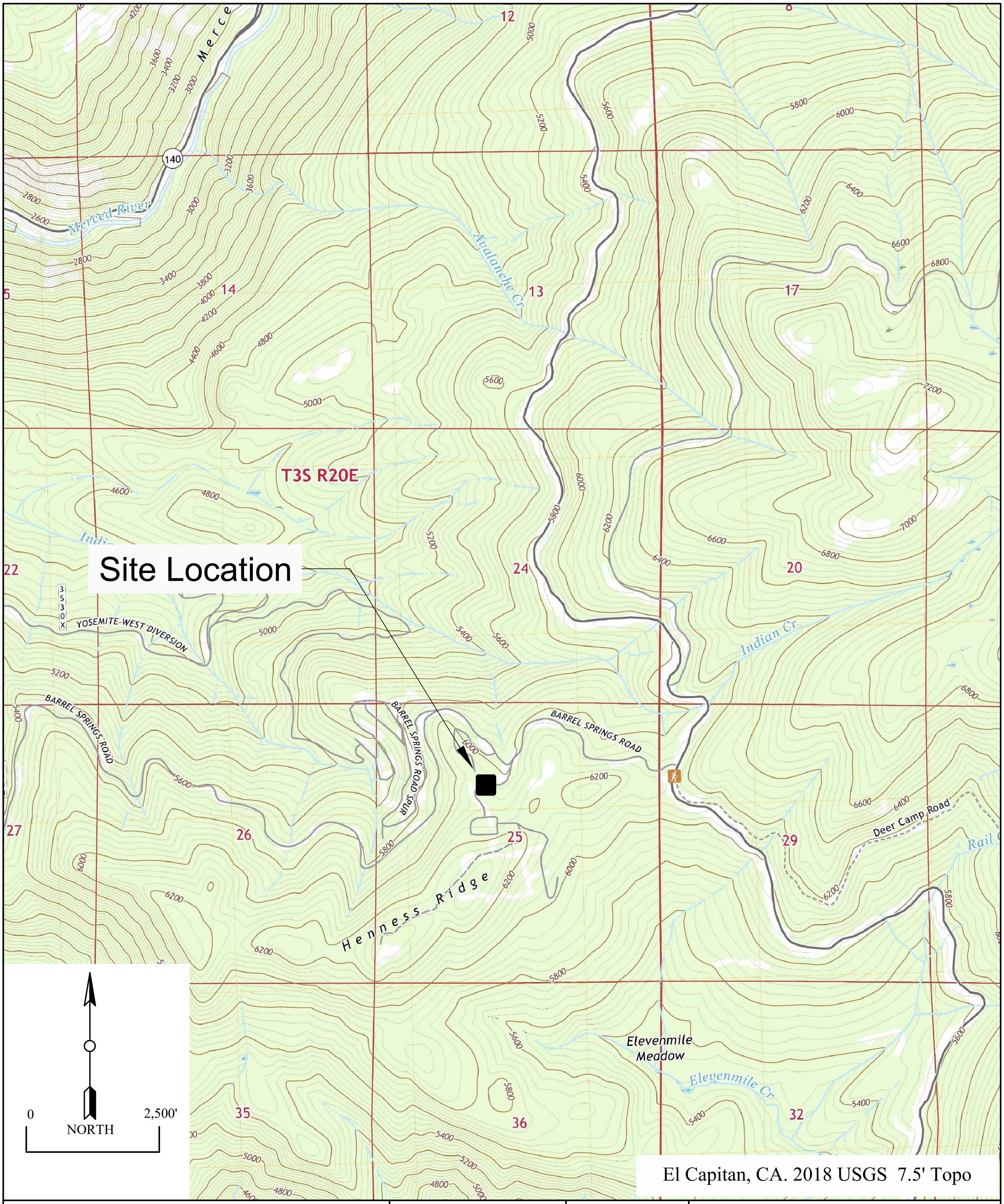
R. Sammy Salem, PE, GE
Principal Managing Engineer
RCE 52762 / RGE 2549

R. SAMMY SALEM
GE 2549
EXP. 12-31-2022
GEOTECHNICAL



El Capitan, CA. 2018 USGS 7.5' Topo

VICINITY MAP

PROPOSED SCENIC WONDERS EMPLOYEE HOUSING DEVELOPMENT
HENNESS CIRCLE (37.647014, -119.713959)
YOSEMIT NATIONAL PARK, CALIFORNIA

SCALE: 1 : 2500'

DATE: Oct. 2022

DRAWN BY: VT

APPROVED BY: DL

PROJECT NO. 1-222-112

FIGURE NO. 1

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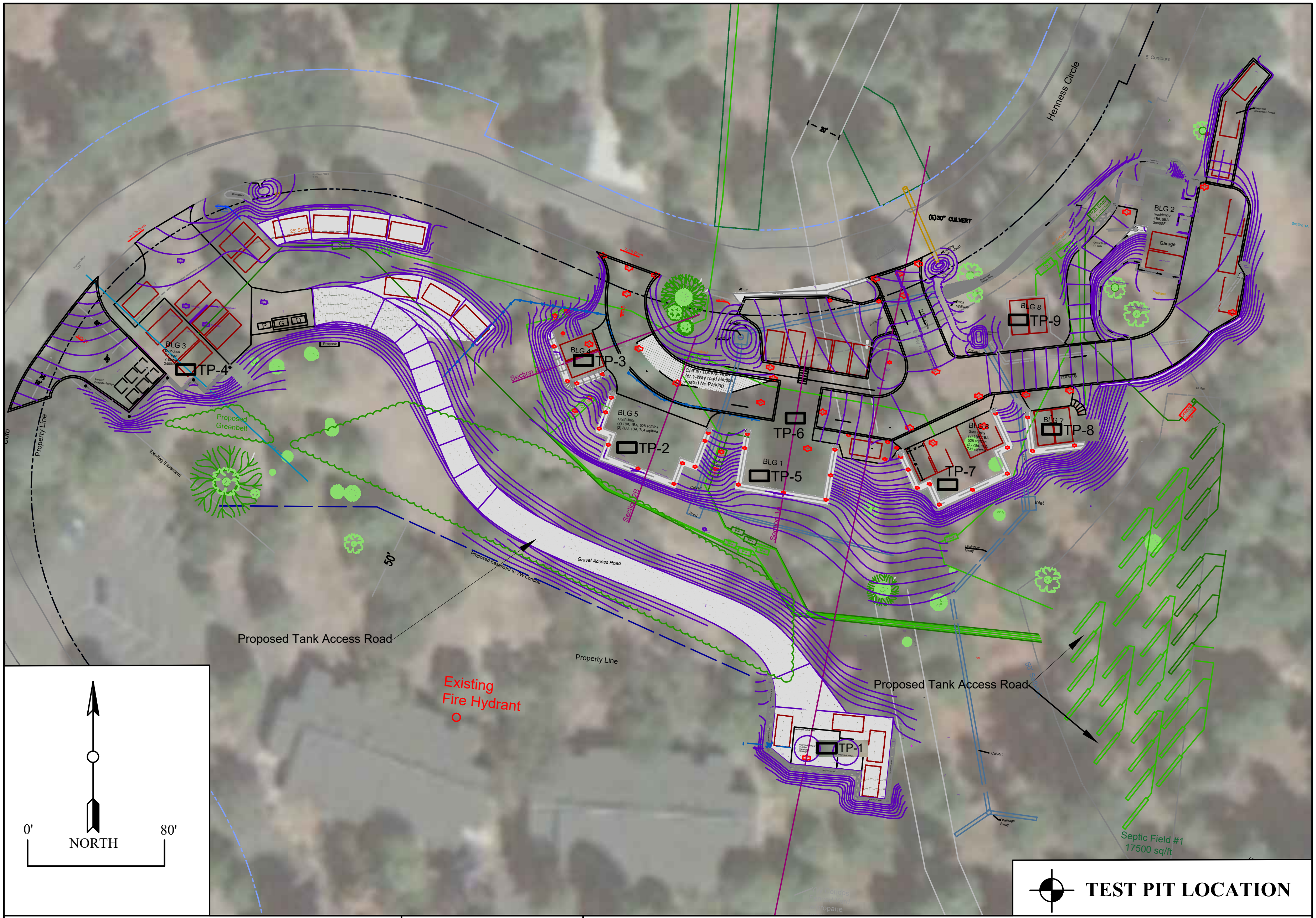


SITE PLAN

PROPOSED SCENIC WONDERS EMPLOYEE HOUSING DEVELOPMENT
HENNESS CIRCLE (37.647014, -119.713959)
YOSEMIT NATIONAL PARK, CALIFORNIA

SCALE: 1" = 80'	DATE: Oct. 2022
DRAWN BY: VT	APPROVED BY: DL
PROJECT NO. 1-222-1112	FIGURE NO. 2

SALEM
engineering group, inc.

APPENDIX

A

APPENDIX A
FIELD EXPLORATION

Fieldwork for our investigation was conducted on October 18, 2022 and included a site visit, subsurface exploration, and soil sampling. The locations of the exploratory backhoe pits are shown on the Site Plan, Figure No. 2. Backhoe pit logs for our exploration are presented following the text in this appendix. Borings were located in the field using existing reference points. Therefore, actual boring locations may deviate slightly.

The backhoe pits were excavated using Cat 430 F2 backhoe equipped with a 36-inch wide bucket with rock teeth.

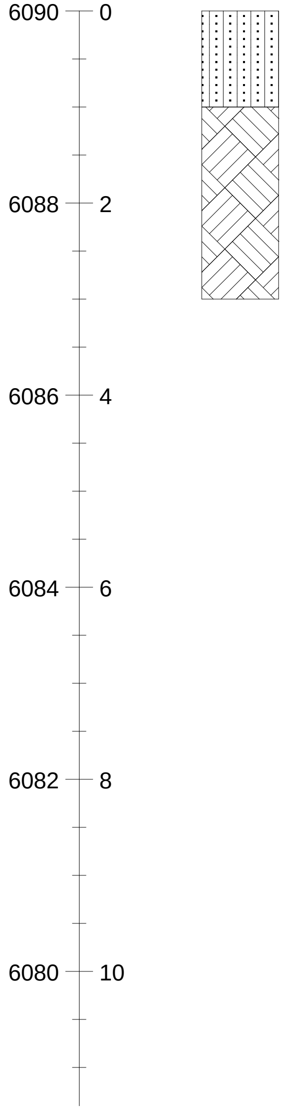
The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer. Visual classification of the soil materials encountered were generally made in accordance with the Unified Soil Classification System (ASTM D2488).

Soil samples were obtained from the backhoe pits at the depths shown on the pit logs (see Appendix A of this report). Bulk samples were placed in sealed bags to preserve their natural moisture content. Soil and rock samples were also obtained by driving a 2½ inch diameter ring sampler containing 6 inch long, thin walled rings. The ring samples were recovered and capped at both ends to preserve the samples at their natural moisture content. The field geologist departed the site prior to the pits being backfilled, at which time Mr. Hornacek indicated that he would backfill the pits with the soil cuttings excavated, within a few days. It is our understanding that the backfill soils placed in the pits were not compacted as engineered fill and not tested for compaction as would be required to demonstrate suitable placement of engineered on the building pad. Thus, the backfilled pits will be subject to future settlement and the backfill will not be suitable to support any proposed improvements or fill soils. The pits should be re-excavated and backfilled with engineered fill as recommended under Sections 9.7 of this report.

SALEM engineering group, inc.

Project Number: 1-222-1112
Date: October 18, 2022
Test Boring: TP-1
Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development
Location: Yosemite West, CA
Drilled By: JH
Drill Type: CAT 430 F2
Logged By: KC
Auger Type: 24 inch bucket
Elevation: 6,090 feet AMSL (Appox)
Hammer Type: N/A
Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
6090 0		SM	Silty SAND, loose, fine to medium grained, dry, yellow-tan, abundant rootlets to about 12 to 18 inches BSG, with ocassional roots 2 to 3 inch dia.				
		ROCK	Weathered granitic rock (hard fragments), coarse grained, moderately to slightly fractured, spheroidal exfoliation fractures producing platy fragments, with interstitial intensely weathered to decomposed granitic rock (friable).				
			Bottom of pit at 3 feet BSG. Backhoe excavation refusal on hard rock.				

Notes: *Proposed location of 2-25,000 gallon water tanks. Twelve inch thick layer of organic debris on ground surface.*

Figure Number

Project Number: 1-222-1112

Date: October 18, 2022

Test Boring: TP-2

Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development

Location: Yosemite West, CA

Drilled By: JH

Drill Type: CAT 430 F2

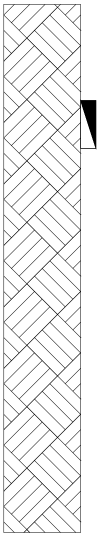
Logged By: KC

Auger Type: 24 inch bucket

Elevation: 6,070 feet AMSL (Appox)

Hammer Type: N/A

Depth to Groundwater: Not Encountered

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
6070 0 6068 2		ROCK	Weathered granitic rock (hard fragments), coarse grained, moderately to slightly fractured, spheroidal exfoliation fractures producing platy fragments, with interstitial intensely weathered to decomposed granitic rock (friable).				
6066 4			Decomposed Granitic Rock, appears as a fine grained silty sand, yellow-tan, dry. Soil like material caves into excavation, non-cohesive.				
6064 6 6062 8 6060 10			Bottom of pit at 5.5 feet BSG. Backhoe excavation refusal on hard rock.				

Notes: *Proposed location of Building 5. Three inch thick layer of organic debris on ground surface.*

Figure Number

SALEM engineering group, inc.

Project Number: 1-222-1112
Date: October 18, 2022
Test Boring: TP-3
Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development
Location: Yosemite West, CA
Drilled By: JH
Drill Type: CAT 430 F2 **Logged By:** KC
Auger Type: 24 inch bucket **Elevation:** 6,060 feet AMSL (Appox)
Hammer Type: N/A **Depth to Groundwater:** Not Encountered

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
6060 0	▨	ROCK	Weathered granitic rock (hard fragments), coarse grained, moderately to slightly fractured, spheroidal exfoliation fractures producing platy fragments, with interstitial intensely weathered to decomposed granitic rock (friable).				
6058 2	▨						
6056 4	▨		Decomposed Granitic Rock, appears as a fine grained silty sand, yellow-tan, dry. Soil like material caves into excavation, non-cohesive.				
6054 6			Bottom of pit at 5 feet BSG. Backhoe excavation refusal on hard rock.				
6052 8							
6050 10							

Notes: *Proposed location of Building 4. Three inch thick layer of organic debris on ground surface.*

Figure Number

Project Number: 1-222-1112

Date: October 18, 2022

Test Boring: TP-4

Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development

Location: Yosemite West, CA

Drilled By: JH

Drill Type: CAT 430 F2

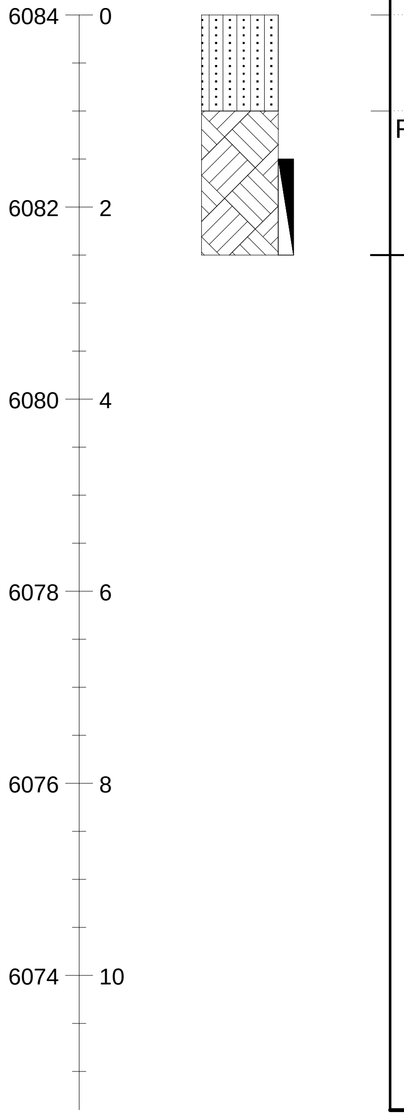
Logged By: KC

Auger Type: 24 inch bucket

Elevation: 6,084 feet AMSL (Appox)

Hammer Type: N/A

Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		SM	Silty SAND, loose, fine to medium grained, dry, yellow-tan, abundant rootlets to about 12 to 18 inches BSG, with ocassional roots 2 to 3 inch dia.				
		ROCK	Weathered granitic rock (hard fragments), coarse grained, moderately to slightly fractured, spheroidal exfoliation fractures producing platy fragments, with interstitial intensely weathered to decomposed granitic rock (friable).		4.3		-#200=10% SAND= 67% +#4=23%
			Bottom of pit at 2.5 fett BSG. Backhoe excavation refusal on hard rock.				

Notes: *Proposed location of Building 3. Three inch thick layer of organic debris on ground surface.*

Figure Number

Project Number: 1-222-1112

Date: October 18, 2022

Test Boring: TP-5

Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development

Location: Yosemite West, CA

Drilled By: JH

Drill Type: CAT 430 F2

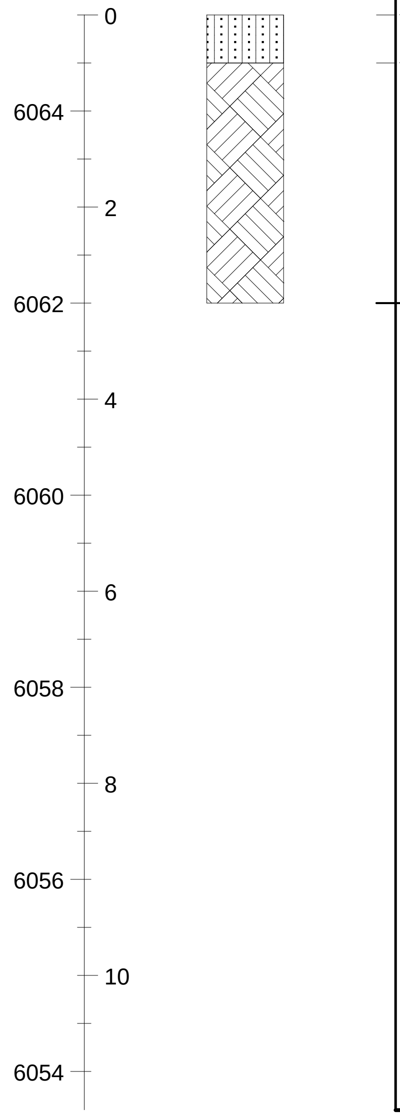
Logged By: KC

Auger Type: 24 inch bucket

Elevation: 6,065 feet AMSL (Appox)

Hammer Type: N/A

Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		SM	Silty SAND, loose, fine to medium grained, dry, yellow-tan, abundant rootlets to about 6 inches BSG, with ocassional roots 2 to 3 inch dia.				
		ROCK	Decomposed Granitic Rock, weathered in place with relic granitic texture, surrounding fragments of moderately weathered (harder) rock.				
			Bottom of pit at 3 feet BSG. Backhoe excavation refusal on hard rock.				

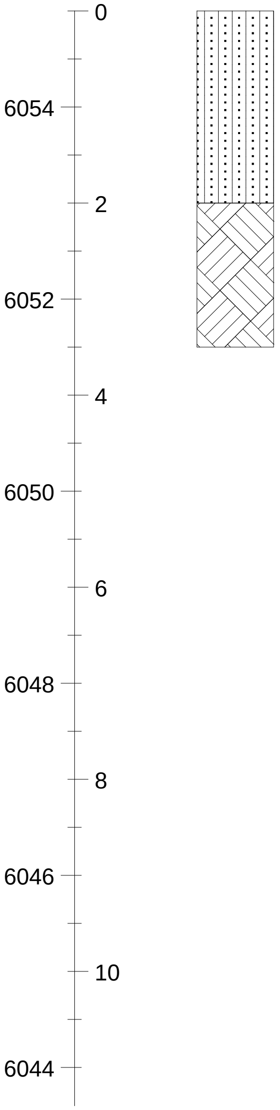
Notes: *Proposed location of Building 1. Three to 12 inch thick layer of organic debris on ground surface.*

Figure Number

SALEM
engineering group, inc.

Project Number: 1-222-1112
Date: October 18, 2022
Test Boring: TP-6
Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development
Location: Yosemite West, CA
Drilled By: JH
Drill Type: CAT 430 F2
Logged By: KC
Auger Type: 24 inch bucket
Elevation: 6,055 feet AMSL (Appox)
Hammer Type: N/A
Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		SM	Silty SAND, loose, fine to medium grained, dry, dark brown, abundant rootlets to about 12 to 18 inches BSG, with ocassional roots 2 to 3 inch dia.				
		ROCK	At 2 feet BSG: Weathered granitic rock (hard fragments), coarse grained, moderately to slightly fractured, spheroidal exfoliation fractures producing platy fragments, with interstitial intensely weathered to decomposed granitic rock (friable). Weathered granitic rock (hard fragments), coarse grained, moderately to slightly fractured, spheroidal exfoliation fractures producing platy fragments, with interstitial intensely weathered to decomposed granitic rock (friable). At 3 feet BSG: Decomposed Granitic Rock, appears as a fine grained silty sand, yellow-tan, dry. Soil like material caves into excavation, non-cohesive.				
			Bottom of pit at 3.5 feet. Backhoe excavation refusal on hard rock.				

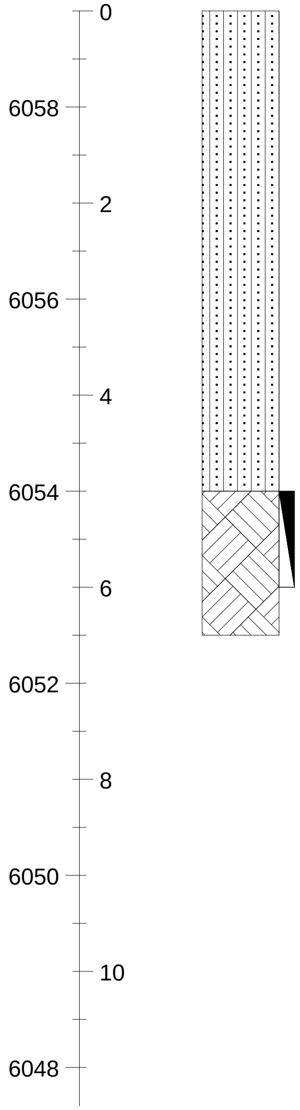
Notes: *Proposed location of Building 1. Three to 12 inch thick layer of organic debris on ground surface.*

Figure Number

SALEM engineering group, inc.

Project Number: 1-222-1112
Date: October 18, 2022
Test Boring: TP-7
Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development
Location: Yosemite West, CA
Drilled By: JH
Drill Type: CAT 430 F2
Logged By: KC
Auger Type: 24 inch bucket
Elevation: 6,059 feet AMSL (Appox)
Hammer Type: N/A
Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		SM	Silty SAND, loose, fine to coarse grained, moist, dark brown, ocassional roots (1/4 to 1 inch dia.) in upper 3 feet rootlets to about 12 to 18 inches BSG, with ocassional roots 2 to 3 inch dia.				
			At 4 feet BSG: Granitic colluvial soil-grus moist, friable, gray. Appears as fine to coarse grained (angular grains) silty sand.				
		ROCK	Decomposed Granitic Rock				-#200=23% SAND= 75% +#4=2% Non-plastic
			Bottom of pit at 6.5 feet. Backhoe excavation refusal on hard rock.				

Notes: *Proposed location of Building 6. Three inch thick layer of organic debris on ground surface.*

Figure Number

SALEM engineering group, inc.

Project Number: 1-222-1112

Date: October 18, 2022

Test Boring: TP-8

Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development

Location: Yosemite West, CA

Drilled By: JH

Drill Type: CAT 430 F2

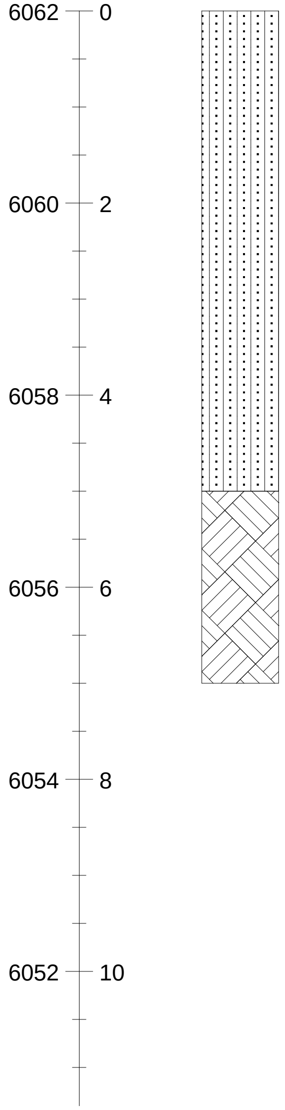
Logged By: KC

Auger Type: 24 inch bucket

Elevation: 6,062 feet AMSL (Appox)

Hammer Type: N/A

Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
6062 / 0		SM	Silty SAND, loose, fine to coarse grained, dry, brown to dark brown, ocassional roots (2 to 3 inch dia.) in upper 2 to 3 feet BSG				
			Granitic colluvial soil-grus, damp, friable, gray, with some hard rock fragments 3 to 8 inch dia.				
		ROCK	Decomposed Granitic Rock, weathered in place with relic granitic texture, surrounding fragments of moderately weathered (harder) rock.				
			Bottom of pit at 7 feet. Backhoe excavation refusal on hard rock.				

Notes: *Proposed location of Building 7. Organic rich top soils prviousy stripped off surface.*

Figure Number

Project Number: 1-222-1112

Date: October 18, 2022

Test Boring: TP-9

Client: Ken LeBlanc

Project: Scenic Wonders Employee Housing Development

Location: Yosemite West, CA

Drilled By: JH

Drill Type: CAT 430 F2

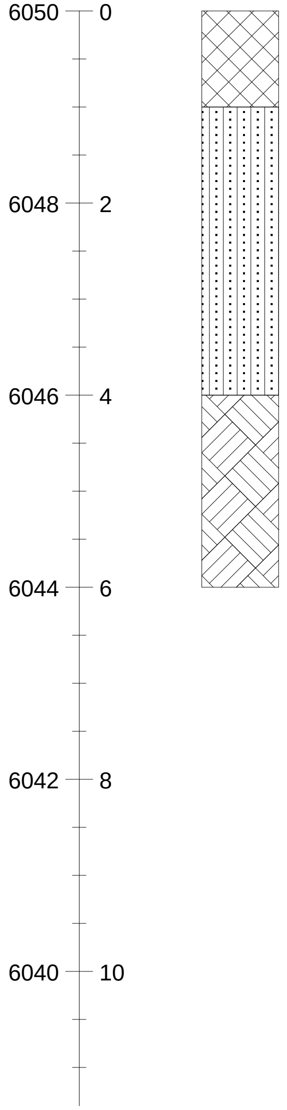
Logged By: KC

Auger Type: 24 inch bucket

Elevation: 6,050 feet AMSL (Appox)

Hammer Type: N/A

Depth to Groundwater: Not Encountered



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		FILL	Silty SAND, loose, fine to coarse grained, dry, brown to dark brown, ocassional root pieces				
		SM	Silty SAND, loose, fine to medium grained, dry, dark brown, abundant rootlets to about 12 to 18 inches BSG, with ocassional roots 2 to 3 inch dia. Granitic colluvial soil-grus, damp, friable, gray, with some hard rock fragments 3 to 8 inch dia. and scattered small roots.				
		ROCK	Moderately fractured granitic rock, with areas of moderate and intense weathering.				
			Bottom of pit at 6 feet. Backhoe excavation refusal on hard rock.				

Notes: *Proposed location of Building 8.*

Figure Number

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
▥	Silty sand
▨	Granitic Rock
▩	Fill
Soil Samplers	
◪	Bulk/Grab sample

APPENDIX

B

APPENDIX B
LABORATORY TESTING

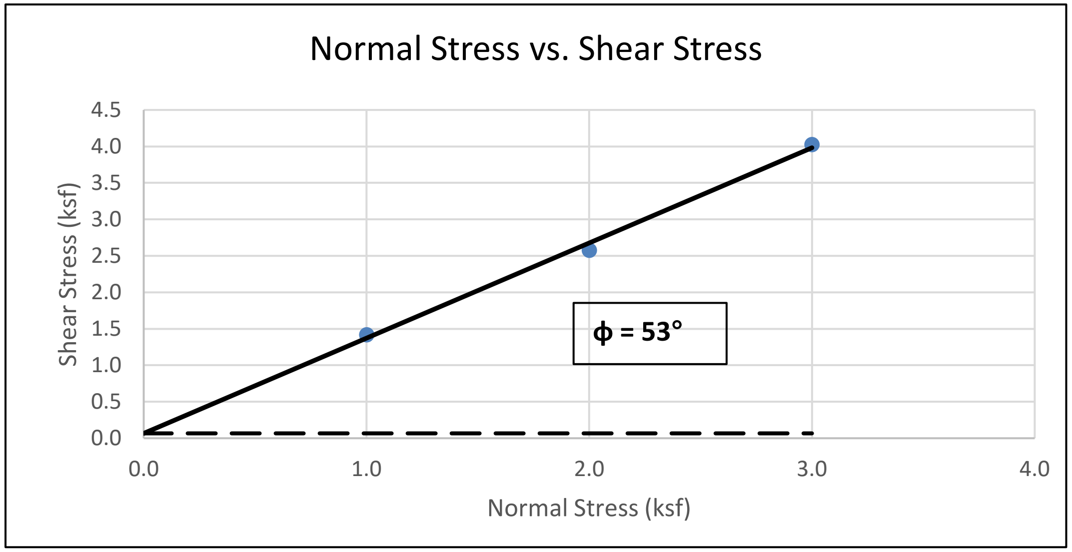
Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM), Caltrans, or other suggested procedures. Selected samples were tested for in-situ moisture content and density, grain size distribution, Atterberg Limits, shear strength, maximum density-optimum moisture content, and corrosivity. The results of the laboratory tests are summarized in the following figures.

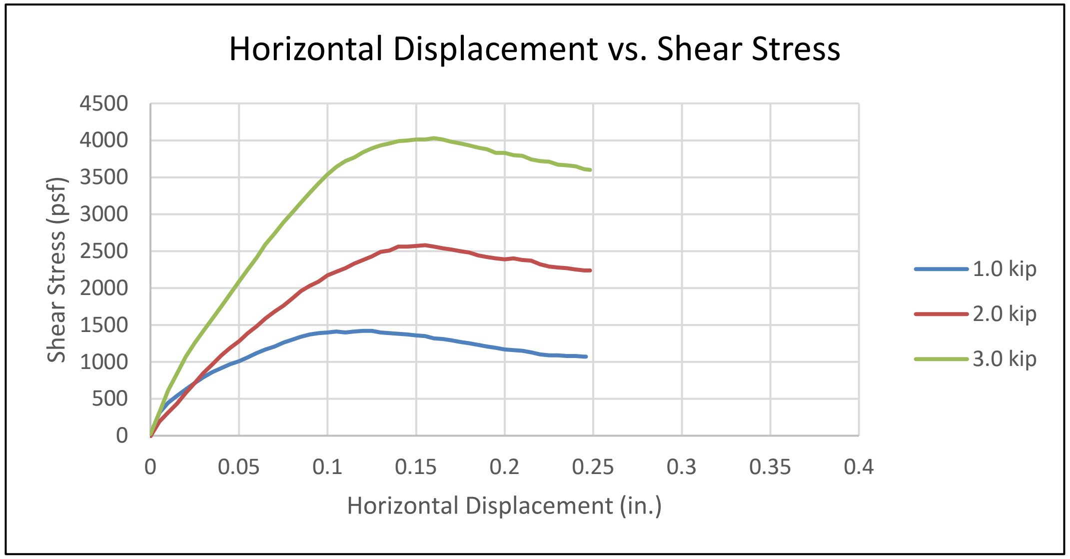
Direct Shear Test (ASTM D3080)

Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Project Number: 1-222-1112
Client:
Boring: TP-4 @ 1.5'
Soil Type: Silty Sand (SM)
Sample Type: Undisturbed Ring
Tested By: MC / NL
Reviewed By:
Date of Test: 10/27/22
Test Equipment: GeoComp ShearTrac II

	Loading		
	1.0 kip	**2.0 kip**	**3.0 kip**
Normal Stress (ksf)	1.00	2.00	3.00
Shear Rate (in/min)	0.0040	0.0040	0.0040
Peak Shear Stress (ksf)	1.42	2.58	4.03

Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.962	0.965	0.950
Post-Shear Sample Height (in.)	0.979	0.984	0.959
Diameter of Sample (in)	2.4	2.4	2.4
Initial (pre-shear) Values			
Moisture Content (%)	10.8		
Dry Density (pcf)	99.6	101.3	100.6
Saturation %	42.7	44.6	43.8
Void Ratio	0.67	0.64	0.66
Consolidated Void Ratio	0.61	0.59	0.58
Final (post-shear) Values			
Final Moisture Content (%)	24.8	24.2	24.4
Dry Density (pcf)	96.2	97.8	102.1
Saturation %	78.3	79.3	83.0
Void Ratio	0.85	0.82	0.79





Peak Shear Strength Values	
Slope	1.31
Friction Angle	53
Cohesion (psf)	67

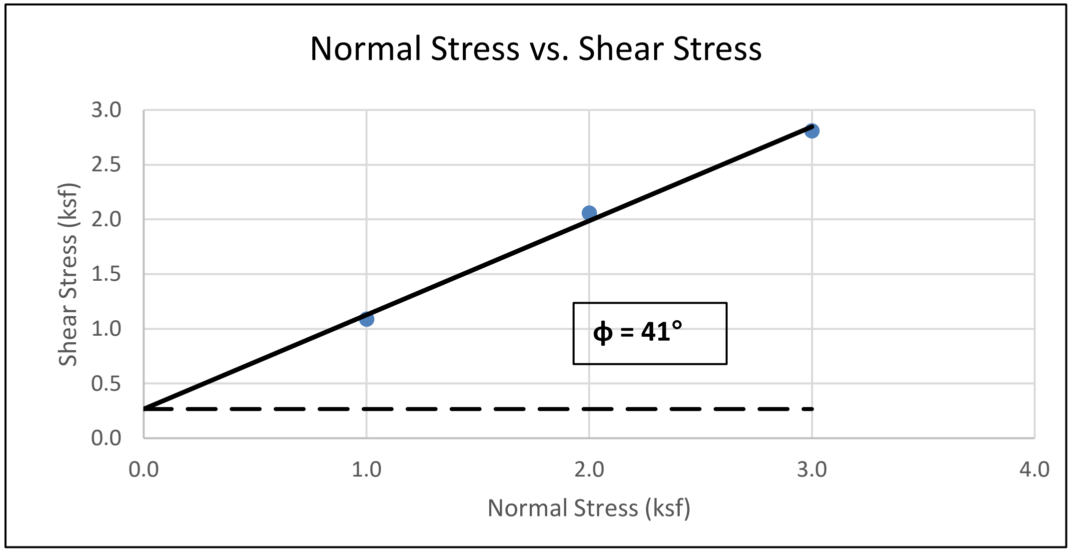
SALEM engineering group, inc.
4729 W. Jacquelyn Ave.
Fresno, CA 93722

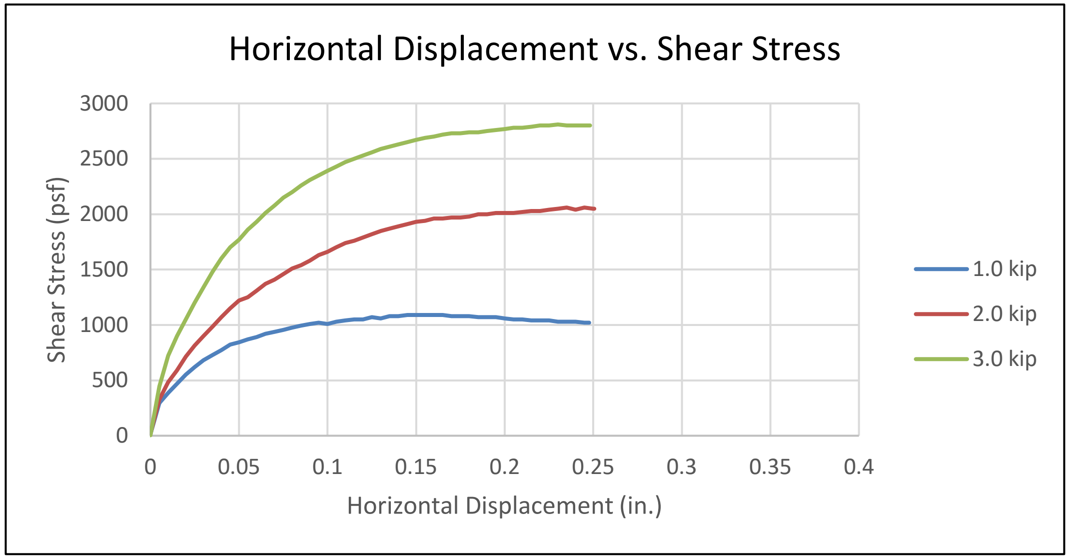
Direct Shear Test (ASTM D3080)

Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Project Number: 1-222-1112
Client:
Boring: TP-7 @ 5' - 6'
Soil Type: Silty Sand (SM)
Sample Type: Undisturbed Ring
Tested By: MC
Reviewed By:
Date of Test: 10/27/22
Test Equipment: GeoComp ShearTrac II

	Loading		
	1.0 kip	**2.0 kip**	**3.0 kip**
Normal Stress (ksf)	1.00	2.00	3.00
Shear Rate (in/min)	0.0040	0.0040	0.0040
Peak Shear Stress (ksf)	1.09	2.06	2.81

Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.950	0.922	0.903
Post-Shear Sample Height (in.)	0.937	0.904	0.886
Diameter of Sample (in)	2.4	2.4	2.4
Initial (pre-shear) Values			
Moisture Content (%)	10.9		
Dry Density (pcf)	99.0	100.4	99.8
Saturation %	42.7	44.3	43.6
Void Ratio	0.68	0.66	0.67
Consolidated Void Ratio	0.60	0.53	0.51
Final (post-shear) Values			
Final Moisture Content (%)	23.9	22.3	22.2
Dry Density (pcf)	102.5	107.7	108.6
Saturation %	83.9	91.1	94.1
Void Ratio	0.76	0.65	0.63





Peak Shear Strength Values	
Slope	0.86
Friction Angle	41
Cohesion (psf)	267

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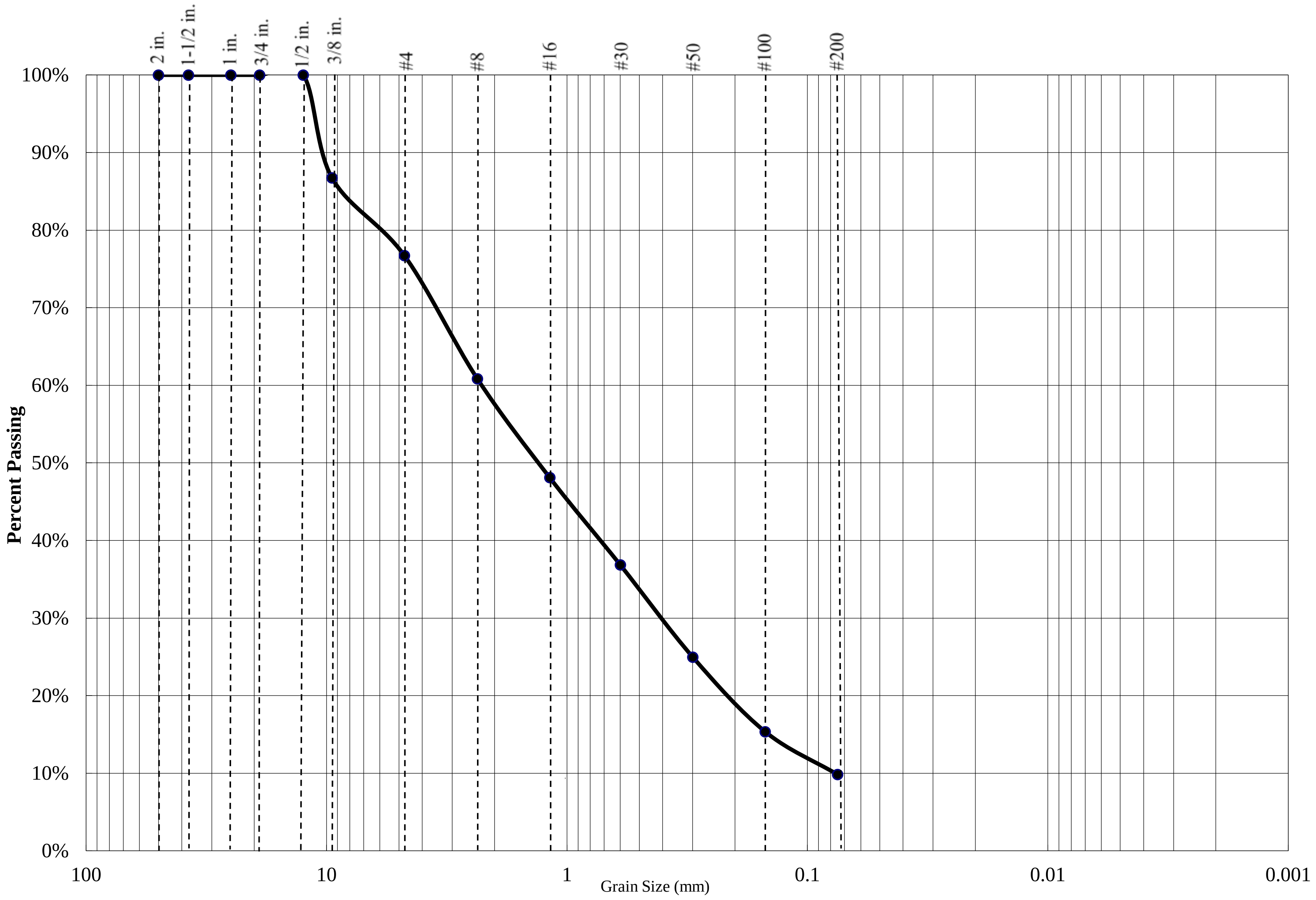
PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
23%	67%	10%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	86.8%
#4	76.7%
#8	60.9%
#16	48.1%
#30	36.8%
#50	25.0%
#100	15.4%
#200	9.8%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D85=		D60=		D50=	
D30=		D15=		D10=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
0

Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Project Number: 1-222-1112
Boring: TP-4 @ 1.5'

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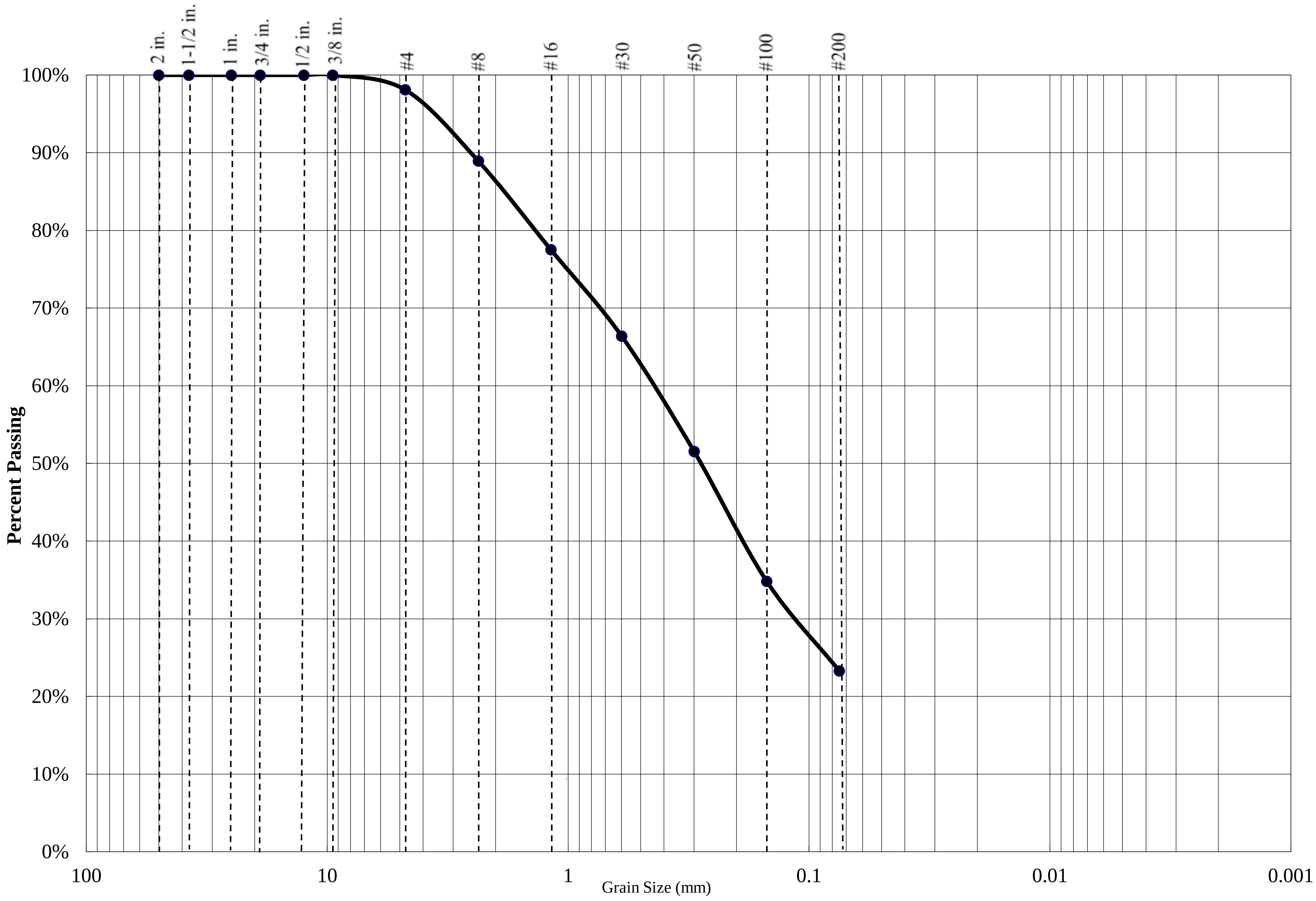
PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
2%	75%	23%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	98.1%
#8	88.9%
#16	77.5%
#30	66.4%
#50	51.6%
#100	34.8%
#200	23.3%

Atterberg Limits		
PL=	**LL=**	**PI=**

Coefficients

D_{85}=		**D_{60}=**		**D_{50}=**	
D_{30}=		**D_{15}=**		**D_{10}=**	
C_u=	N/A	**C_c=**	N/A		

USCS CLASSIFICATION
0

Project Name: Scenic Wonders Dev Yosemite Ntl. Park

Project Number: 1-222-1112

Boring: TP-7 @ 5' - 6'

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Atterberg Limits Determination

ASTM D4318

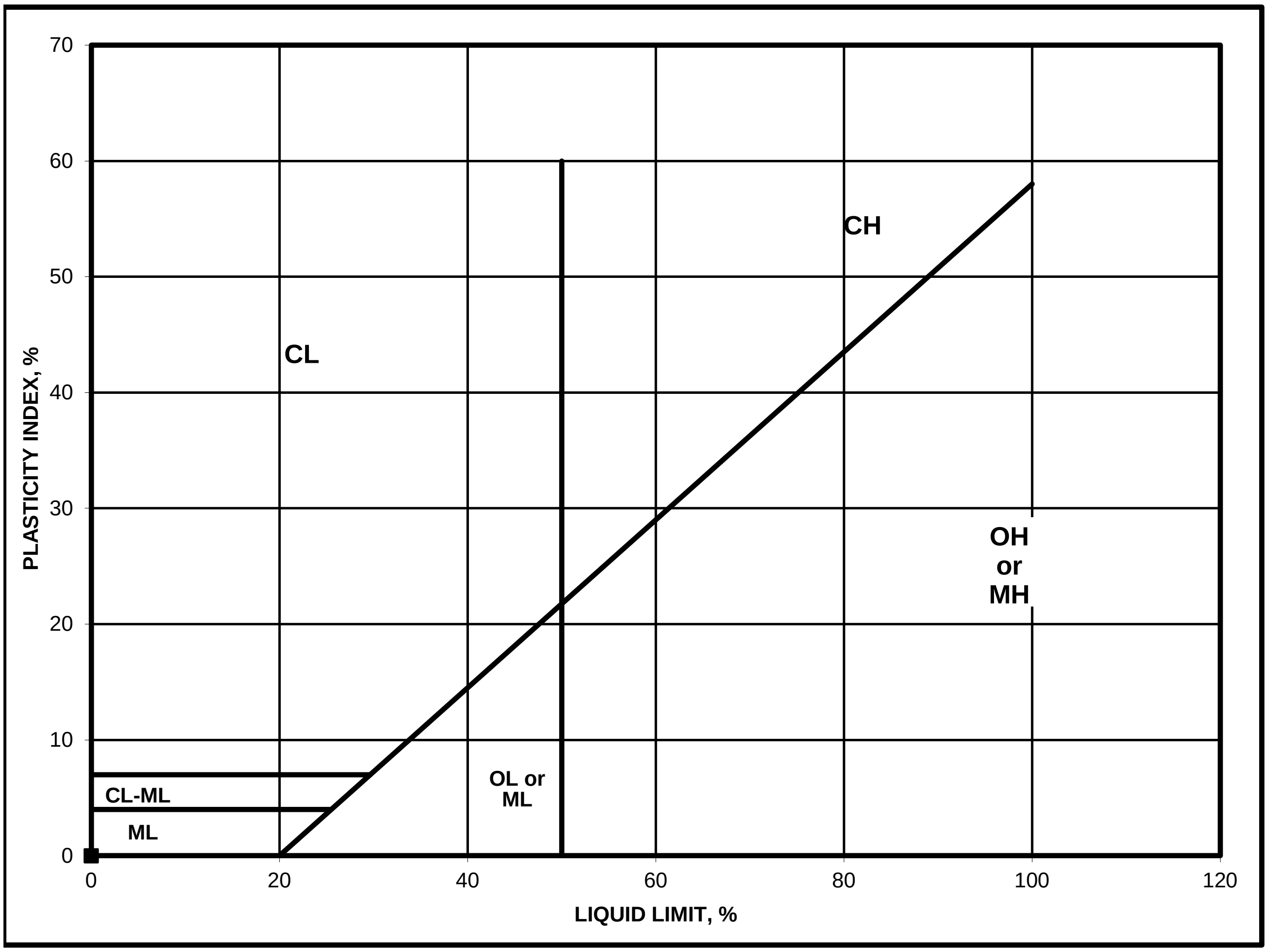
Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Project Number: 1-222-1112
Date Sampled: 10/18/22 Date Tested: 10/24/22
Sampled By: SEG Tested By: MC
Sample Location: TP-7 @ 5' - 6'

	Plastic Limit			Liquid Limit		
Run Number	1	2	3	1	2	3
Weight of Wet Soil & Tare						
Weight of Dry Soil & Tare						
Weight of Water	Does Not Roll			Slides On Cup		
Weight of Tare						
Weight of Dry Soil						
Water Content						
Number of Blows						

Plastic Limit : **Liquid Limit :**

Plasticity Index **: Non - Plastic**

Unified Soil Classification **:**



CHEMICAL ANALYSIS

SO_4 - Modified CTM 417 & Cl - Modified CTM 417/422

Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Project Number: 1-222-1112
Date Sampled: 10/18/22 Date Tested: 10/24/22
Sampled By: SEG Tested By: NS
Soil Description: Silty Sand (SM)

Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	TP-4 @ 1.5'	< 50 mg/kg	76 mg/kg	6.8
1b.	TP-4 @ 1.5'	< 50 mg/kg	78 mg/kg	6.8
1c.	TP-4 @ 1.5'	< 50 mg/kg	79 mg/kg	6.8
Average:		**< 50 mg/kg**	**78 mg/kg**	**6.8**

CHEMICAL ANALYSIS

SO_4 - Modified CTM 417 & Cl - Modified CTM 417/422

Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Project Number: 1-222-1112
Date Sampled: 10/18/22 Date Tested: 10/24/22
Sampled By: SEG Tested By: MC
Soil Description: Silty Sand (SM)

Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	TP-7 @ 5' - 6'	< 50 mg/kg	37 mg/kg	6.9
1b.	TP-7 @ 5' - 6'	< 50 mg/kg	36 mg/kg	6.9
1c.	TP-7 @ 5' - 6'	< 50 mg/kg	37 mg/kg	6.9
Average:		**< 50 mg/kg**	**37 mg/kg**	**6.9**

SOIL RESISTIVITY
CTM 643

Project Name: Scenic Wonders Dev Yosemite Ntl. F
Project Number: 1-222-1112
Sample Location: TP-4 @ 1.5'
Soil Description: Silty Sand (SM)

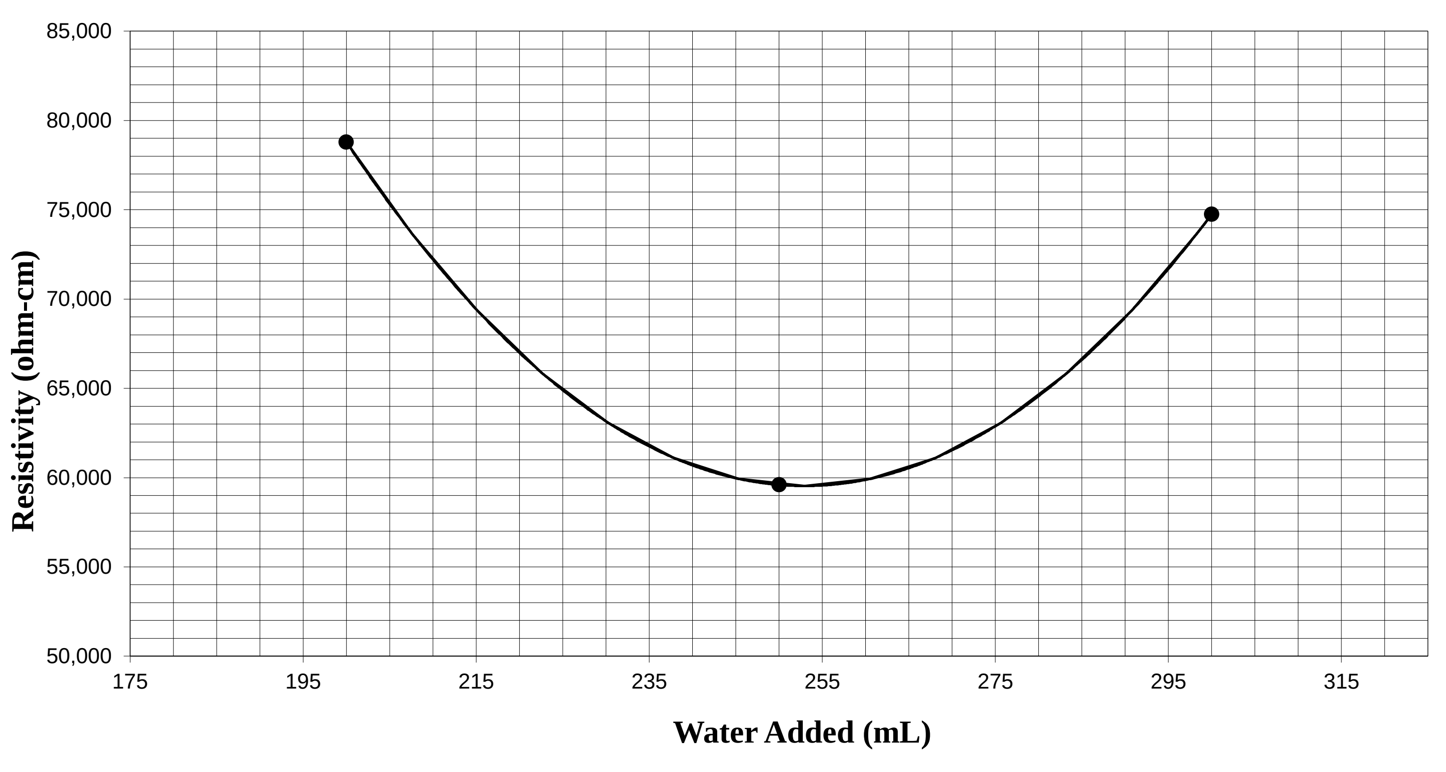
Date Sampled: 10/18/22
Sampled By: SEG
Date Tested: 10/21/22
Tested By: PR

Chloride Content: 78 mg/Kg
Sulfate Content: < 50 mg/Kg
Soil pH: 6.8

Initial Sample Weight: 700 gms
Test Box Constant: 1.010 cm

Test Data:

Trial #	Water Added (mL)	Meter Dial Reading	Multiplier Setting	Resistance (ohms)	Resistivity (ohm-cm)
1	200	7.8	10,000	78,000	78,783
2	250	5.9	10,000	59,000	59,592
3	300	7.4	10,000	74,000	74,743



Minimum Resistivity:	**59,551** ohm-cm

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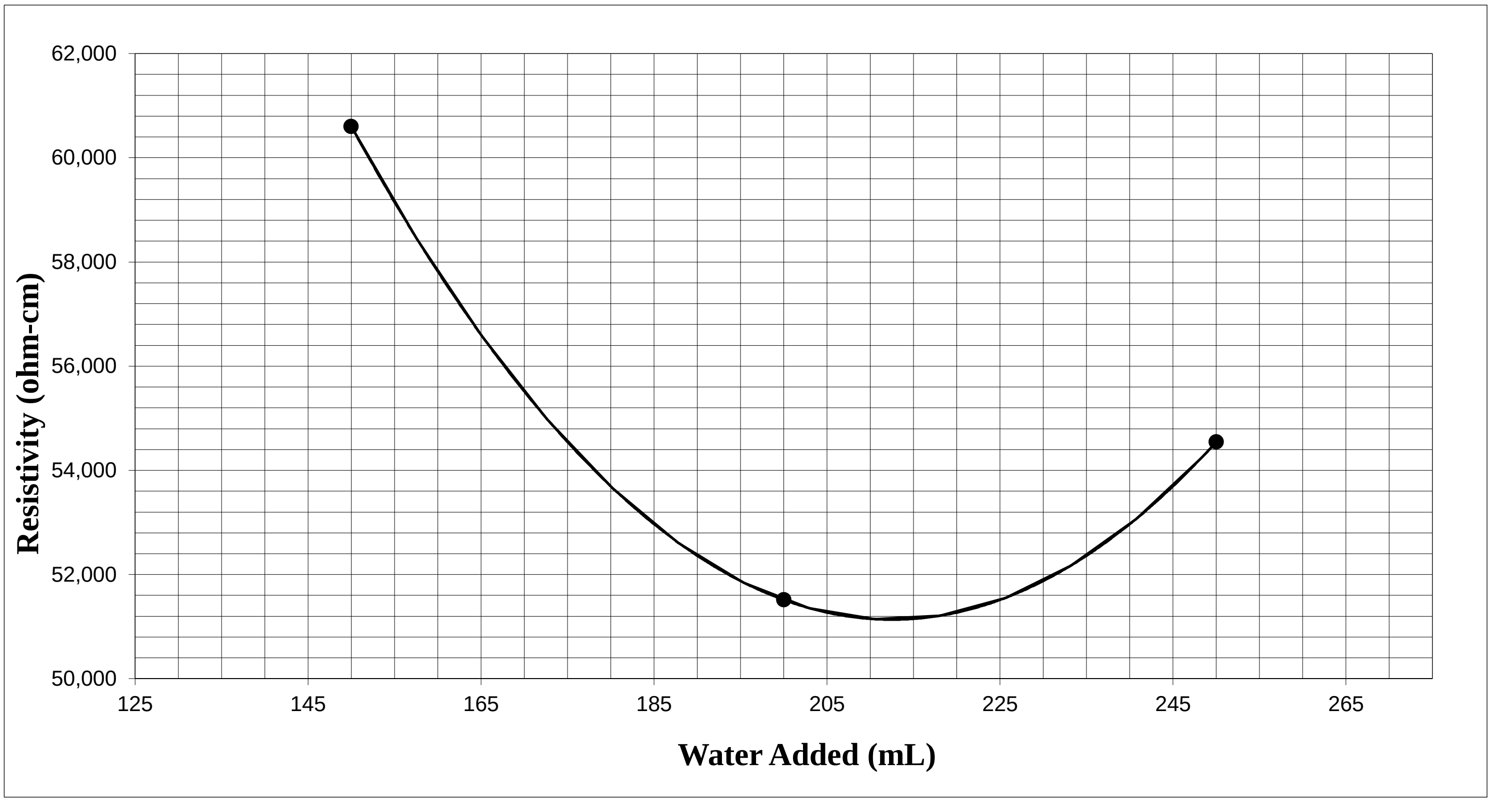
SOIL RESISTIVITY
CTM 643

Project Name: Scenic Wonders Dev Yosemite Ntl. F	Date Sampled: 10/18/22
Project Number: 1-222-1112	Sampled By: SEG
Sample Location: TP-7 @ 5'- 6'	Date Tested: 10/24/22
Soil Description: Silty Sand (SM)	Tested By: NS

Chloride Content:	37	mg/Kg	Initial Sample Weight:	700	gms
Sulfate Content:	< 50	mg/Kg	Test Box Constant:	1.010	cm
Soil pH:	6.9				

Test Data:

Trial #	Water Added (mL)	Meter Dial Reading	Multiplier Setting	Resistance (ohms)	Resistivity (ohm-cm)
1	150	6.0	10,000	60,000	60,602
2	200	5.1	10,000	51,000	51,512
3	250	5.4	10,000	54,000	54,542



Minimum Resistivity:	**51,143** ohm-cm

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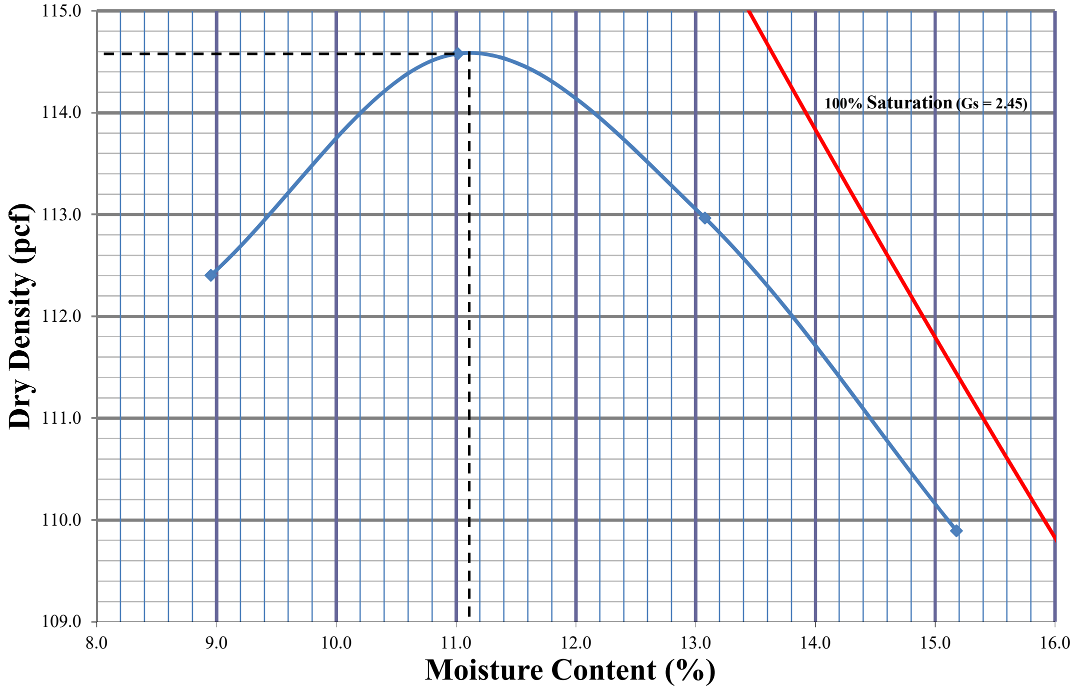
Laboratory Compaction Curve

(ASTM D1557, Method A)

Report to: KL Water & Land LLC
Project Name: Scenic Wonders Dev Yosemite Ntl. Park
Sample Location: S-2: Native - T-4
Soil Description: 0
Soil Described By: ASTM D2488
Percent Retained on 3/4": 0.0%
Percent Retained on 3/8": 0.0%
Percent Retained on No. 4: 0.0%
Percent Coarse Aggregate: 0.0%
As-Received Moisture: 3.0%

Date Sampled: 10/18/2022
Date Tested: 10/25/2022
Project No.: 1-222-1112
Depth: 1.5'
Specific Gravity: 2.45
Sampled By: SEG
Tested By: P. Crispin
Sample I.D. 1554-22
Preparation Method: ☑ Moist ☐ Dry
Type of Rammer Used: ☐ Manual ☑ Mechanical

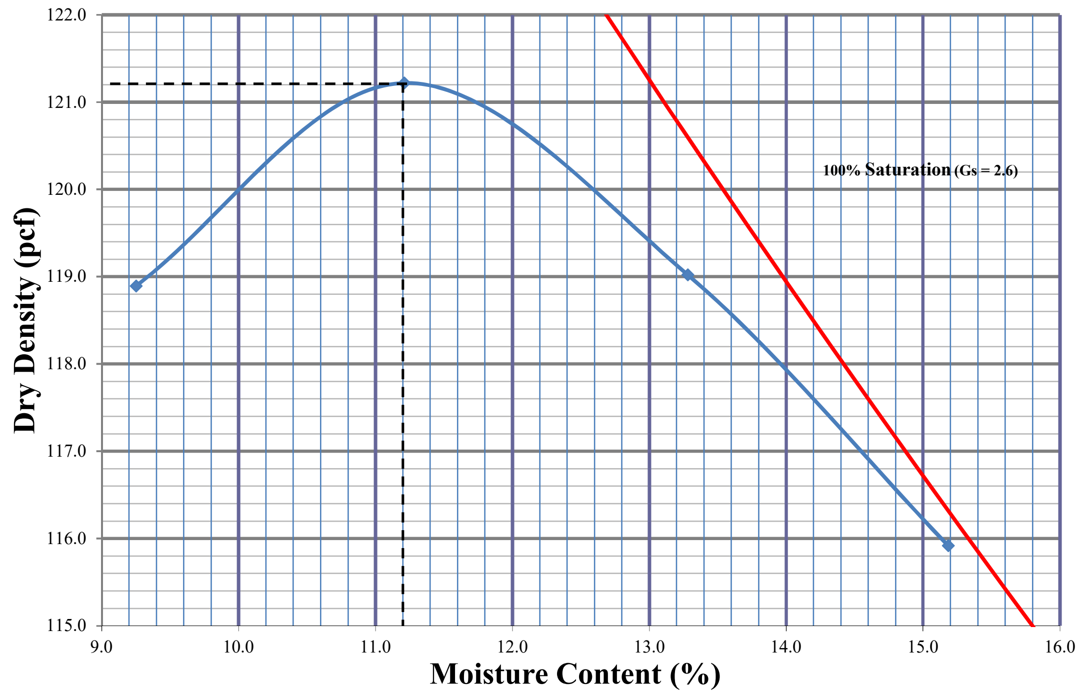


Test Results	
Maximum Dry Density (pcf):	**114.6**
Optimum Moisture Content (%):	**11.1**

Laboratory Compaction Curve

(ASTM D1557, Method A)

Report to:	KL Water & Land LLC	Date Sampled:	10/18/2022
Project Name:	Scenic Wonders Dev Yosemite Ntl. Park	Date Tested:	10/25/2022
Sample Location:	S-1: Native - TP-7	Project No.:	1-222-1112
Soil Description:	0	Depth:	5' - 6'
Soil Described By:	ASTM D2488	Specific Gravity:	2.6
Percent Retained on 3/4":	0.0%	Sampled By:	SEG
Percent Retained on 3/8":	0.0%	Tested By:	J. Santos
Percent Retained on No. 4:	0.0%	Sample I.D.	1552-22
Percent Coarse Aggregate:	0.0%	Preparation Method:	☑ Moist ☐ Dry
As-Received Moisture:	9.3%	Type of Rammer Used:	☐ Manual ☑ Mechanical



Test Results	
Maximum Dry Density (pcf):	**121.2**
Optimum Moisture Content (%):	**11.2**

APPENDIX

C

APPENDIX C
GENERAL EARTHWORK AND PAVEMENT SPECIFICATIONS

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

1.0 SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including, but not limited to, the furnishing of all labor, tools and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans and disposal of excess materials.

2.0 PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of SALEM Engineering Group, Incorporated, hereinafter referred to as the Soils Engineer and/or Testing Agency. Attainment of design grades, when achieved, shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary adjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

3.0 TECHNICAL REQUIREMENTS: All compacted materials shall be densified to no less than 90 percent of relative compaction (95 percent for granular non-expansive soil) based on ASTM D1557 Test Method (latest edition), UBC or CAL-216, or as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

4.0 SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Report. The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Report and the Contractor shall not be relieved of liability for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

5.0 DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work. Site preparation shall consist of site clearing and grubbing and preparation of foundation materials for receiving fill.

6.0 CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Soils Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed improvement areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations is not permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

7.0 SUBGRADE PREPARATION: Surfaces to receive Engineered Fill and/or building or slab loads shall be prepared as outlined above, scarified to a minimum of 12 inches, moisture-conditioned as necessary, and recompacted to 90 percent relative compaction (95 percent for granular non-expansive soil).

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and recompacted to 90 percent relative compaction (95 percent for granular non-expansive soil). All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any fill material.

8.0 EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

9.0 FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence or approval of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills, provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

10.0 PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. Compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer. Both cut and fill shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

11.0 SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing, or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill is as specified.

12.0 DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term “Standard Specifications”: hereinafter referred to, is the most recent edition of the Standard Specifications of the State of California, Department of Transportation. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as determined by ASTM D1557 Test Method (latest edition) or California Test Method 216 (CAL-216), as applicable.

13.0 PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 90 percent (95 percent for granular non-expansive soil) based upon ASTM D1557. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

14.0 AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, ¾-inch or 1½-inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

15.0 ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10, unless otherwise stipulated or local conditions warrant more stringent grade. The mineral aggregate shall be Type A or B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39. The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a combination steel-wheel and pneumatic rollers, as described in the Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.