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SALEM engineering group, inc.

GEOTECHNICAL ENGINEERING INVESTIGATION

PRELIMINARY REPORT:
PROPOSED MULTI FAMILY HOUSING PROJECT
2020 NORTH PACIFIC AVENUE AND
115 KNIGHT STREET
SANTA CRUZ, CALIFORNIA

SALEM PROJECT NO. 5-224-0090
AUGUST 30, 2024

PREPARED FOR:
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August 30, 2024 Project No. 5-224-0090

Mr. Clay Tooms
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SUBJECT: GEOTECHNICAL ENGINEERING INVESTIGATION PRELIMINARY REPORT:
PROPOSED MULTI FAMILY HOUSING PROJECT
2020 NORTH PACIFIC AVENUE AND
115 KNIGHT STREET
SANTA CRUZ, CALIFORNIA

Dear Mr. Tooms:

As requested and authorized, SALEM Engineering Group, Inc. (SALEM) has prepared this Geotechnical Engineering Investigation, Preliminary Report for the proposed Multi-Family Housing Project to be located on the properties at 2020 Pacific Avenue and 115 Knight Street in Santa Cruz, California.

The accompanying report presents our findings and preliminary 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.

At the time this report was issued, it was our understanding that three (3) options for building type/height were being considered. Structural loads provided by the client for the mass timber option were considered for the purpose of this preliminary report. This report provides preliminary foundation design recommendations. As discussed in the foundation recommendations (Section 12.7), final geotechnical foundation design parameters will be impacted by the recommended design-build ground improvement, and final foundation design will need to be a collaborative effort between the building structural, geotechnical engineer, and ground improvement designer. A final report can be issued once the building type is determined and the final foundation recommendations have been developed.

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.

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**GEOTECHNICAL ENGINEERING INVESTIGATION
PRELIMINARY REPORT
PROPOSED MULTI FAMILY HOUSING PROJECT
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115 KNIGHT STREET
SANTA CRUZ, CALIFORNIA**

1. INTRODUCTION, PURPOSE, AND SCOPE

This report presents the results of our Geotechnical Engineering Investigation for a Multi-Family Housing Project to be located on the adjacent properties at 2020 Pacific Avenue and 115 Knight Street in Santa Cruz, California. The site location is depicted on Figure No. 1, Vicinity Map, provided at the end of this report.

At the time this report was issued, it was our understanding that three (3) options for building type/height were being considered. Structural loads provided by the client for the mass timber option were considered for the purpose of this preliminary report. This report provides preliminary foundation design recommendations. As discussed in the foundation recommendations (Section 12.7), final geotechnical foundation design parameters will be impacted by the recommended design-build ground improvement, and final foundation design will need to be a collaborative effort between the building structural, geotechnical engineer, and ground improvement designer. A final report can be issued once the building type is determined and the final foundation recommendations have been developed.

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 the geotechnical aspects of designing and constructing the project as presently proposed. Our investigation included drilling test borings, soil sampling, percolation testing, cone penetrometer tests (CPTs), testing of soil samples in our laboratory, evaluations, and preparation of this report.

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.

2. SITE LOCATION AND DESCRIPTION

The subject site is located in downtown Santa Cruz, in an area of commercial and residential properties. The site includes parcels 006-35-401 and 006-36-402 with addresses of 2020 North Pacific Avenue and 115 Knight Street, respectively. The two parcels combined (site) comprise an approximate 160 foot by 170 foot area (about 0.6 acre). The west side of the site is bounded by a sidewalk and Pacific Avenue beyond. The north and south sides of the site are bounded by sidewalks and Bulkhead Street and Knight Street beyond to the north and south, respectively. For reference, the north, west, and south property boundaries are located at or near back of existing sidewalk.

The east side of the site is bound by a property at 125 Water Street. This property includes a three (3) story building with subterranean parking below. The westernmost portion of the building, which houses Bizzack Wealth Advisory Group – Ameriprise, is located about 4 feet east of the subject site property boundary.

The 2020 Pacific Avenue property includes the approximate western two-thirds portion of the site and includes the old Lighthouse Bank building (not in use) and a parking lot with asphaltic concrete paving to the east of the building. The old bank building is one-story with exterior brick walls and a newer entrance addition located near the corner of Pacific Avenue and Knight Street, and an addition to the northwest corner of the building.

The approximate eastern one-third portion of the site is located at 115 Knight Street. The southern approximate one-third portion of the Knight Street property is occupied by a single-story building housing Anderson Christie Real Estate and Rush Inn (tavern). The approximate northern two-third of this property is parking lot with asphaltic concrete paving.

Two very large redwood trees are located on the 2020 Pacific Avenue property, near Knight Street, and several smaller/mature trees are located near the border shared by the Pacific Avenue property and Knight Street property. The existing site improvements, landscaped areas, etc., are shown on Figure No. 2, Site Plan.

According to the Boundary and Topographic Survey, prepared by GL Land Surveying and dated September 27, 2023, the ground surface at the site slopes very gently to the east, with elevations varying from about 22½ feet above mean sea level (AMSL) to 20½ feet AMSL.

The ground surface is relatively level in the vicinity of the site. However, it should be noted that an approximate 60-foot high, steep west ascending bedrock slope is located about 85 feet west of the site. The slope is behind (west of) the buildings located along the west side of North Pacific Avenue.

3. SITE HISTORY AND PREVIOUS INVESTIGATIONS

Based on review of numerous historic Google Earth images for the period of June 1993 to July 2023, the project site appears generally as it did at the time of our recent field investigation. A new entrance addition near the corner of Pacific Avenue and Knight Street, and an addition to the northwest corner of the building were added between March 2015 and April 2016.

A document entitled: *Operations and Maintenance Plan (OMP), Cap Remedy for Contaminated Soil*, dated April 8, 2016. …..," prepared by Trinity Source Group (TSG), was provided by Workbench and was reviewed for general information purposes. This document describes the areas where a soil cap was constructed. The soil cap was constructed by removing the upper two to four feet of contaminated soils, installing a filter fabric as a marker, followed by placement of tested-clean imported backfill material acting as a cap.

The OMP references a soils and soil vapor investigation conducted by TSG for Lighthouse Bank at the 2020 North Pacific Avenue property and a report entitled Soil and Soil Vapor Investigation Draft Remedial Action Plan, dated February 25, 2015. As part of the aforementioned report, TSG recommended mitigating the potential for construction worker exposure to lead and arsenic in shallow soils, proposing to remove shallow soils at select locations where site redevelopment could expose construction workers to contaminated soil and backfill these areas with clean imported soils to effectively cap these areas. Several areas received this soil cap prior to redevelopment of the Lighthouse Bank property. Several environmental investigations conducted by others at the site are also detailed in the OMP.

The OMP references a Phase I investigation by Weber, Hayes & Associates (2012) that indicates that a stove foundry machine shop was located on the site from between 1886 and 1928, that the property was used as a tire shop and gas station from 1928 to the late 1970's, and that the original bank structure was built in the early 1990’s, and that the building additions/site redevelopment was conducted by Lighthouse Bank in 2015 and 2016.

The Hazard Summary provided in the OMP states: *“The primary contaminants of concern onsite are lead and arsenic in shallow soil. Both are naturally occurring heavy metals residing in the local soil, which given high levels of exposure, pose serious threats to human health. Particles of lead and arsenic are relatively immobile in the subsurface, but can mobilize above the ground surface when attached to free-floating dust particles in the air. The most common modes of environmental exposure to humans for both metals are ingestion and inhalation.”*

A report entitled “Geotechnical Investigation for Proposed Additions Lighthouse Bank, 2020 North Pacific Avenue…..,” prepared by Pacific Crest Engineering Inc. (PCE) and dated February 2015, was provided by Workbench and was reviewed for general information purposes. The PCE report references previous investigations by others conducted at and near the project site. Pertinent information from the PCE report is referenced in various sections of this report.

4. PROJECT DESCRIPTION

Plans for the project had not been provided at the time this report was prepared. The following project description is based on correspondence with Workbench. It is our understanding that the project will include a multi-story housing project with a proposed building footprint of about 21,000 square feet covering nearly the entire site, with about 10 feet of building setback from property lines.

The building options being considered and the estimated structural loads were provided by Workbench and DCI Engineers and are summarized in the table below.

Building Options	Total Building Load	Interior Column	Edge Column
5 story wood frame over 3 story concrete podium	1,000 psf	900 kip	450 kip
6.5 story wood frame of over 3 story concrete podium	1,100 psf	990 kip	495 kip
11 story mass timber over 1 story concrete podium	1,750 psf	1,575 kip	788 kip

The first floor level is proposed to be about equal to the existing ground surface level at the site. A subterranean parking structure is NOT being considered at this time. As the existing project area is relatively flat, we anticipate that finished ground surface grade changes will be up to about plus or minus 2 feet.

It is also our understanding that appurtenant construction will include pavements, exterior flatwork/patios, and underground utilities, and on-site storm water disposal may be required.

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.

5. MAPPED GEOLOGIC CONDITIONS

The site is located within the historic floodplain of the San Lorenzo Rive. According to the Geologic Map of Santa Cruz County, California, (Compiled by Earl E. Brab, 1997, after USGS Open File 97-489), the site is mapped as Quaternary Alluvium (Qal). The steep slope to west of Pacific Avenue is mapped as Upper Miocene Santa Cruz Mudstone (siliceous organic mudstone).

6. SITE SOIL AND ROCK CONDITIONS REVEALED BY PREVIOUS INVESTIGATIONS

The PCE report (2015) prepared for additions on the north and south sides of the former bank building indicates two (2) CPT soundings were conducted and the soils encountered were predominantly interbedded sand, silty sand, clayey sand, sandy silt, and clayey silt. The PCE report indicates that the upper soils encountered in the Knight Street addition location differed from the Bulk Head Street addition location and states: "*The upper 11 to 12 feet in CPT-1 (Knight Street addition) generally consisted of dense sands and silty sand whereas in CPT-2 (Bulk Head Street addition), the upper 2½ to 11 feet was interpreted as clayey silt and silty clay. The clays and silts were very stiff to stiff. Below approximately 12 feet the soil encountered in both soundings generally consisted of interbedded, loose to medium dense, sand and silty sand…..Both CPT soundings were terminated due to refusal on very dense or hard earth materials. CPT-1 was terminated at approximately 27 feet. CPT was terminated at approximately 47 feet. It is not known if termination was due to encountering bedrock, or dense gravels, cobbles or boulders.*"

The PCE report also references four (4) geoprobe borings hydraulically driven at the site by Weber, Hayes and Associates on August 7, 2012, and states: "*The logs of the Weber, Hayes and Associates' Geo-Probe borings at both the Bulkhead Street and Knight Street addition sites depict the upper 10 feet of native soil as generally consisting of silty sand and sandy silt with approximately 40% to 50% fines and some gravels. Poorly graded and well graded sands were recorded below this depth. The upper 3½ feet of soil in the Knight Street addition boring (DP-2) was logged as fill. The logs of the Weber, Hayes and Associates' two Geo-Probe borings in the bank parking lot east of the existing building depict the upper 7 and 12 feet of native soil as generally consisting of silty sand and sandy silt with approximately 40% to 50% fines and some gravels. Poorly graded and well graded sands were recorded below this depth. The upper 4½ feet of soil in the parking lot borings was logged as fill….The exploratory borings advanced by Trinity Source Group indicate that there is up to 2½ feet of fill in the Knight Street Addition location, 2 feet, or more, of fill in the Knight Street Addition location and 1 to 3 feet, or more, of fill beneath the parking lot. The fill was underlain by sand, silty sand, gravels, and clayey sand.*"

The PCE report states: '*The site contains pods of non-engineered fill……Areas of man-made fill, if encountered on the project site will need to be completely excavated to undisturbed native materials or as designated by the geotechnical engineer in the field.*"

The OMP prepared by Trinity Source Group, Inc. states: "*The geology of the Site reflects that of its associated region, primarily consisting of well-graded sand and fill material, Quaternary alluvium, and mudstone bedrock (TPG, 2012). The fill material occupies the upper ~8 feet below ground surface (bgs), and is thought to represent re-worked alluvial deposits from the San Lorenzo River. Below the fill material lie units of medium to fine-grained sand that extends to depths upwards of 25 feet bgs, containing occasional discontinuous lenses of clay. These fine-grained materials are thought to represent floodplain alluvial deposits that settled from channel levee breaches during regular flooding events.*"

The OMP describes the nature and locations of a soil cap placed on portions of the site.

We consulted the Geotracker State Water Board portal (website) and conducted a limited review of the Remedial Action Five-Year Review report, prepared by Weber, Hayes & Associates for the "Geo Wilson" site at 125 River Street, dated May 29, 2013 (Updated March 10, 2014). The GEO Wilson site, located on the north side of Bulkhead Street and adjacent to the site, was recently developed with multi-story residential buildings. Section 2.3 of the report – Local Hydrologic Setting indicates approximately 2 to 10 feet of fill materials related to 1) deposition by flooding of the river, 2) onsite and nearby industrial operations, 3) dredged materials from the San Lorenzo River during River Street Extension and buildup for flood control (1907).

7. FIELD EXPLORATION

7.1 Site Reconnaissance, Drilling, and CPT Sounding

Our field exploration was conducted on April 1st through April 3rd, 2024, and consisted of site surface reconnaissance, drilling, percolation testing, and CPT soundings. The results of the site surface reconnaissance are provided in Section 2 of this report.

Prior to drilling test borings and conducting CPTs, permits were obtained from Santa Cruz County Environmental Health Department. In addition, a Health and Safety Plan for our field exploration program was submitted to Trinity Source Group for review. Also prior to drilling, a private utility locator was used to locate underground utilities in the areas of the proposed borings and CPTs.

Our field operations were observed by Ms. Anna Machulskaya, project geologist with Trinity Source Group. Test borings B-1 and B-2 were drilled to depths of 55 and 68 feet BSG using 6-5/8 inch diameter hollow-stem auger and mud rotary equipment rotated by a truck-mounted CME-55 drill rig. Test boring B-3 was drilled to 20 feet BSG using the same rig, with 6-5/8 inch diameter hollow-stem. Borings B-1 and B-2 were terminated at depths of 55 and 68 feet BSG, respectively, due to refusal caused by cobbles and low mud circulation. Boring B-3 was terminated at a depth of 20 feet BSG due to refusal caused by cobbles. The test borings were drilled at the approximate locations shown on Figure No. 2, Site Plan.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer at that time. Visual classification of the materials encountered in the test borings was generally made in accordance with the Unified Soil Classification System (ASTM D2487).

A soil classification chart and key to sampling is presented on the Unified Soil Classification Chart, in Appendix A. The test boring logs are presented in Appendix A. Subsurface soil samples were obtained by driving a Modified California sampler (MCS) or a Standard Penetration Test (SPT) sampler.

Penetration resistance blow counts were obtained in the hollow stem auger borings by dropping a 140-pound automated trip hammer through a 30-inch free fall to drive the sampler to a maximum penetration of 18 inches. The number of blows required to drive the last 12 inches, or less if very dense or hard, is recorded as Penetration Resistance (blows/foot) on the logs of borings.

Soil samples were obtained from the test borings at the depths shown on the boring logs included in Appendix A. The MCS samples were recovered and capped at both ends to preserve the samples at their natural moisture content; SPT samples were recovered and placed in a sealed bag to preserve their natural moisture content.

Soil cuttings were placed into 55 gallon drums. As requested by Workbench, the drums were left on the site for disposal by others.

At the completion of drilling and sampling, the test borings were backfilled with neat cement grout in accordance with the requirements of Santa Cruz County Environmental Health Department and the top portion of the hole was filled with asphaltic concrete pavement patch.

Cone Penetrometer Test sounding (CPTs) were conducted by Middle Earth Geotesting on April 3, 2024. CPT-1, CPT, 2, and CPT-3 were conducted to depths of about 45 to 50 feet BSG, within approximately 3 to 5 feet horizontally of borings B-1, B-2, and B-3, respectively. The CPTs were conducted to obtain refined soils data for liquefaction/seismic settlement analyses (see Section 7.4). The CPT soundings were performed using a 1.75 inch diameter electronic piezocone with a 60-degree apex angle and a surface area of 15 square centimeters and a friction sleeve area of 225 square centimeters. The CPT soundings were hydraulically advanced using a 25-ton CPT rig in accordance with ASTM Test Method D5778. Measurements of cone tip resistance and sleeve friction data were recorded at approximate 2-inch intervals during penetration to provide nearly continuous data for interpreting the engineering properties of the soils. The CPT logs are presented after the boring logs in Appendix A.

At the completion of each CPT, sounding holes were backfilled with neat cement grout in accordance with the requirements of Santa Cruz County Environmental Health Department.

7.2. Percolation Testing and Results

Percolation test holes (P-1 and P-2) were drilled at the approximate locations shown the attached Site Plan, Figure No. 2. The approximate test locations and depths were designated by Workbench. A perforated PVC pipe was installed in each test hole and pea gravel was placed in the annulus to prevent caving of the holes. The dimensions of the test holes are provided on the percolation test logs including in Appendix A of this report, after the test boring logs.

The percolation test holes were pre-saturated before percolation testing commenced. Percolation rates were measured by filling the test holes with clean water and measuring the water drops at a certain time interval. The percolation rate data are presented in tabular format at the end of this report. The difference in the percolation rates are reflected by the varied type of soil materials at the bottom of the test holes. The test results are shown in the table below.

TABLE 7.2
PERCOLATION TEST RESULTS

Test No.	Approx. Test Hole Depth (feet)	Gravel Corrected Percolation Rate (min/inch)*	Unfactored Infiltration Rate (inch/hour)**	Soil Type
P-1/B-1	5.2	26.6	0.17	Silty Sand
P-2/B-2	5.2	29.0	0.17	Silty Sand with Gravel

*** Gravel corrected to rate of water drop in open hole.**
**** Unfactored infiltration rate calculated as inches of water entering the total area of soil exposed in the sidewalls and bottom of test hole.**

Appropriate factors of safety should be incorporated into the storm water infiltration system design. It should be noted that the field percolation tests do not take into account the long term effects of subgrade saturation, silt accumulation, groundwater influence, nor vegetation. Soil bed consolidation, sediment, suspended soils, etc. in the discharge water can result in clogging of the pore spaces in the soil, thus reducing the soil infiltration rate over time. Percolation testing is a relatively small scale test. Variations in soil type and soil density across the infiltration area of the system can influence the infiltration rate.

8. 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 and density, gradation, expansion index, Atterberg Limits, shear strength, consolidation, and R-Value of the materials encountered.

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 boring logs in Appendix A of this report.

9. SOIL AND GROUNDWATER CONDITIONS

9.1 Soil Conditions

The upper soils encountered during our investigation predominantly comprised loose silty sands with varying percentages of gravel and cobble size fragments, and extended to depths of about 8½ to 10 feet BSG. Section 6 of this report describes undocumented fill soils encountered by other investigators at the site and an adjacent site. Based on our borings and data from other investigators, it is estimated that fill soils are present in some locations at the subject site, extending to depths of about 2 to 8 feet BSG.

Below depths of about 10 feet BSG, the predominant soils were medium dense poorly graded sand with silt and medium dense silty sands extending to the maximum depths explored in the borings (55, 68, and 20 feet BSG). Dense and very dense soils were logged at sporadic depth intervals, as a result of higher gravel and cobble content.

A medium stiff sandy silt and a medium stiff sandy silty clay were encountered in boring B-1 and B-2, at depths of about 8½ to 13½ feet BSG.

The results of consolidation tests are listed in the table below. Total consolidation is at 16 kips normal load and the samples were wetted at 2 kips normal load.

TABLE 9.1 - RESULTS OF CONSOLIDATION TESTING

Boring/Depth of Sample	Soil Type	Total Consolidation %	Collapse Upon Wetting %
B-1 / 8.5-10’	Medium Stiff Sandy Silt	18.8	7.0
B-2 / 3.5-5’	Loose Silty Sand	9.5	0.5
B-3 / 1-2.5’	Medium Dense Silty Sand	4.5	0.5
B-3 / 8.5-10’	Loose Silty Sand	10.8	0.3

An expansion index test performed on a near surface sample of silty sand resulted in an expansion index of 0 (very low expansion potential).

The results of an R-value test performed on a near surface sample of silty sand indicated an R-value of 65.

Soil conditions described in the previous paragraphs are generalized. Therefore, the reader should consult exploratory boring logs included in Appendix A for soil type, color, moisture, consistency, and USCS classification.

9.2 Groundwater

During our field exploration, the borings were checked for the presence of groundwater. Groundwater was encountered in the borings and depths of 14½ and 18½ feet BSG on April 1 and April 2, 2024.

The afore-referenced Remedial Action Five-Year Review report, prepared for the “Geo Wilson” site at 125 River Street, located on the north side of Bulkhead Street and adjacent to the site, states: *“Long term gauging of the Site’s eight (8) well monitoring network indicates depth to first encountered groundwater ranges from about 10 feet to 14 feet below street level. The groundwater flow direction has generally been to the south-southeast, with a relatively flat gradient of ranging from 0.001 to 0.03 foot per foot (see graphic, right). The groundwater velocity has been estimated to range from 10 to 20 feet per year (Terratech, 1997).”*

The test borings were checked for the presence of free groundwater. Groundwater was encountered in the test borings at depths ranging from about 14½ to 18½ feet BSG on April 1st and 2nd, 2024. The referenced geotechnical investigation report prepared by PCE indicated pore pressure dissipation tests conducted at the time of CPTs (January 14, 2015) indicated the groundwater table was situated at a depth of approximately 15½ feet below the existing ground surface. The PCE geotechnical investigation report also indicates that Weber, Hayes & Associates reported groundwater depths of 15½ and 16½ measured during Geo-Probe borings (August 2012).

The Geotechnical Evaluation report prepared by Ninyo & Moore for a proposed 3-story building with below ground parking garage, to be located at 2035 North Pacific Avenue states: *“Based on a review of available subsurface data, groundwater is generally about 10 to 16 feet below the ground surface and flows parallel to the contour of the relatively impermeable bedrock (Terra Pacific Group, 2016).”* The 2035 North Pacific Avenue site is located west of North Pacific Avenue and east of the mudstone slope, and extends from the Bulkhead Street alignment about 200 feet north.

It should also 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.

9.3 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. Soil samples were obtained 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 detected in the saturation extracts from the soil samples were <50 and 423 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 9.3 below.

TABLE 9.3
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
B- 1 at 1 to 4 feet	<0.005	S0	N/A	2,500 psi	No Restriction
B-2 at 1 to 4 feet	0.0423	S0	N/A	2,500 psi	No Restriction

The water-soluble chloride concentrations detected in the saturation extracts from the soil samples were 26 mg/kg for both samples tested. In addition, testing performed on the aforementioned soil samples resulted in minimum resistivity values of 8,381 and 2,622 ohm-centimeter. Based on the results, these soils would be considered to have a "mildly corrosive" 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. Additional corrosion testing for minimum resistivity may need to be performed if required by the pipe manufacturer.

10. GEOLOGIC SETTING

The subject site is located north of Monterey Bay in the Coast Ranges Geomorphic Province of California. The Coast Ranges province comprises a series of northwest-trending, low (2,000 to 4,000 feet above sea level) mountains and valleys that trend sub-parallel to the San Andreas Fault. The San Andreas Fault, located about 11 miles east of the site, is the most prominent geologic feature of the province and separates two distinct bedrock regions. To the west of the fault (in the area of the site) is the Salinian Block, composed of a granitic core overlain by Mesozoic and Cenozoic sedimentary strata. To the east of the fault lies the Franciscan Complex, which is a complexly folded mélange of Mesozoic marine sedimentary deposits. In several areas, the Franciscan rocks are overlain by Cenozoic volcanic cones and flows.

According to the Geologic Map of the Monterey 30' X 60' Quadrangle and Adjacent Areas, California (Compiled by Wagner et al., 2002), the subject site is located on Holocene marine terrace deposits. Santa Cruz mudstone is depicted exposed on the hillside west of the site.

11. GEOLOGIC HAZARDS

11.1 Faulting and Seismicity

Numerous active and potentially active faults are located in the site region and contribute to design seismic ground motion estimates. An "active fault" is defined, for the purpose of this evaluation, as a fault that has had surface displacement within the Holocene age (about the last 11,700 years). Based on the distance to active faults in the region, as well as the historic seismic record, the area of the subject site is considered to be subject to moderate to high seismicity.

According to the California Geological Survey EQ ZAP web application, Earthquake Zones of Required Investigation, the project area is not located in an area mapped by the State of California for earthquake fault rupture.

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) active faults/fault segments closest to the site are summarized below in Table 11.1.

TABLE 11.1
REGIONAL ACTIVE FAULT SUMMARY

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
Monterey Bay-Tularcitos	6.6	7.3
Zayante-Vergeles	7.8	7.0
San Gregorio Connected	10.0	7.5
N. San Andreas; SAP+SAS	10.9	7.5
N. San Andreas; SAP	13.7	7.2
Monte Vista-Shannon	18.0	6.5
Rinconada	25.6	7.5
Calaveras; CC	27.4	6.4
San Andreas; creeping segment	30.6	N/A
Calaveras; CS	30.9	5.8

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.

No active faults with the potential for surface fault rupture are known to pass directly beneath the site. The nearest active faults to the project site is the Monterey Bay-Tularcitos located about 6.6 miles west of the site. The potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered very low.

11.2 Ground Shaking

Seismic coefficients and spectral response acceleration values were developed based on the 2022 California Building Code (CBC). The CBC methodology for determining design ground motion values is based on the Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps, which incorporate both probabilistic and deterministic seismic ground motion. A site specific ground motion hazard analysis was not included in this investigation. Based on our understanding of the proposed project the project Structural Engineer will utilize code exceptions listed in ASCE 7-16 section 11.4.8 for design of planned foundations. Therefore, Site Specific Ground Motion Hazard Analysis is not required at this time. If required, SALEM should be contacted to provide an estimate for this service.

Based on the 2022 CBC, a Site Class D (stiff soil) represents the on-site soil conditions with a weighted average, standard penetration resistance, N-value, averaging between 15 and 50 blows per foot in the upper 100 feet below site grade. A table providing the recommended design acceleration parameters for the project site, based on a Site Class D (stiff soil) designation, is included in Section 12.6.1 of this report.

Based on Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps, the estimated design peak ground acceleration adjusted for site class effects (PGAm) was determined to be 0.762g. A site class D (stiff soil) was designated assuming the liquefaction is mitigated by preconstruction ground improvement (see Section 11.3).

11.3 Liquefaction

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. Primary factors that trigger liquefaction are: moderate to strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions (shallow groundwater). Due to the increasing overburden pressure with depth, liquefaction of granular soils is generally limited to the upper 50 feet of a soil profile. However, liquefaction has occurred in soils other than clean sand. A seismic hazard, which could potentially cause damage to the proposed development during seismic shaking, is the post-liquefaction settlement of the liquefied sands.

The area of the site has not been mapped for liquefaction hazard by the State of California Seismic Hazard Zonation Program. However, the City of Santa Cruz hazard maps indicate the site is located within an area considered to have a very high susceptibility for liquefaction during a major earthquake event.

Liquefaction and seismic settlement were evaluated using LiquefyPro computer program (version 5.9c) developed by Civiltech. A maximum earthquake magnitude of 7.88 M_w (based on deaggregation of the 2 percent probability in 50 year seismic event using the USGS Unified Hazard Tool, Dynamic Conterminous U.S. 2014), and a design peak horizontal ground surface acceleration of 0.762 g (PGA_M) were used in the analysis. CPT data files for CPT-1, CPT-2, and CPT-3 were imported into the program.

Based on the historic groundwater level data referenced in Section 9.2, an historic high groundwater depth of 10 feet BSG was used in the analysis.

Based on our analysis, liquefaction and seismic settlement are predicted to occur at over most of the depth interval between 10 and about 50 feet BSG, as a result of a large earthquake, such as the design level earthquake (defined above). The zones of liquefaction are shown on the Liquefy Pro graphic output figures included after the boring logs and CPT interpretation profiles, in Appendix A. Total seismic induced settlements calculated at CPT-1, CPT-2, and CPT-3 are estimated to be about 9.8, 12.5, and 9.0 inches, respectively. These results indicate differential seismic settlements will exceed tolerable limits for conventional shallow foundations. Also, considering the design groundwater depth of 10 feet BSG, and that liquefaction is predicted to occur at a depth of 10 feet BSG, a loss of soil bearing capacity and ground subsidence caused by sand boils would be anticipated as a result of a large earthquake. Sections 12.1.5 and 12.1.6 of this report provides discussion of the alternatives considered to mitigate liquefaction and seismic inducted settlements.

11.4 Lateral Spreading

Lateral spreading is a phenomenon in which soils move laterally during seismic shaking and is often associated with liquefaction. The amount of movement depends on the soil strength, duration and intensity of seismic shaking, distance to seismic source, ground slope topography, and free face geometry.

A screening level evaluation of the potential for lateral spreading to impact the site was conducted using the empirical equations of Youd and et al. 2002 (Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement). The ground surface slope in the area of the site relatively level. The San Lorenzo River channel flood levee is located about 450 feet east/northeast of the site. The ground surface elevation at the outboard base of flood levee is essentially equal to the project site elevation, and about 15 feet higher than the ground surface at the top of the west side river bank.

A source-to-site distance of 17.3 kilometers (San Andreas Fault) and the earthquake magnitude used (7.88 Mw) were derived based on deaggregation of the 2 percent probability in 50 year seismic event using the USGS Unified Hazard Tool, Dynamic Conterminous U.S. 2014. Based on equation 6a for free-face conditions, the results of the evaluation indicate less than one inch of lateral displacement occurring east of the Buchanan Street extension. Considering the results of screening level evaluation, the potential for lateral spreading to impact the proposed project site is considered very low.

11.5 Landslides

The California Geological Survey Landslide Inventory map (web application) does not indicate any landslides close enough to potentially impact the site

11.6 Flood Hazard

Based on FEMA Flood Insurance Rate Map No. 06087C0332E, effective May 16, 2012, the subject site area is labeled as Zone A99, Special Flood Hazard Area without base flood elevation, described as: Areas with a 1% annual chance flooding that will be protected by a Federal flood control system where construction has reached specific legal requirements. No depths or base flood elevations as shown within these zones

Based on review of the U.S. Army Corps of Engineers (USACE) website, National Inventory of Dams, the subject site would not be impacted by breach of a listed dam. Based on review of the Dam Breach Inundation Map Web Publisher (California Division of Safety of Dams), the subject site would be impacted by breach of listed dam Newell No. 23-2.

11.7 Tsunami Hazard

According to the California Geological Survey Warehouse: Tsunami Hazard Area Map, the subject site is located in a Tsunami Hazard Zone. The mapped hazard area represents the maximum considered tsunami runup from several extreme, infrequent, and realistic tsunami sources. These data are intended for local jurisdictional, coastal emergency planning uses only.

12. CONCLUSIONS AND RECOMMENDATIONS

12.1 General Conclusions and Recommendations

12.1.1 The 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. Based on the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site can accommodate the proposed construction, as planned, provided the recommendations contained in this report are incorporated into the project design and construction.

12.1.2 The subject site is located in an area prone to liquefaction resulting from a large earthquake, flood hazard zone, and a tsunami hazard zone (see Sections 11.4, 11.6, and 11.7). This report does not provide recommendations for mitigation of flood or tsunami hazards. It is recommended that a planning/civil consultant be consulted regarding these hazards.

12.1.3 The upper soils encountered during our investigation predominantly comprised loose silty sands with varying percentages of gravel and cobble size fragments, and extended to depths of about 8½ to 10 feet BSG. As noted in Section 9.1 of this report, it is estimated that fill soils are present in some locations at the subject site, extending to depths of about 2 to 8 feet BSG. (see Section 12.1.11 for discussion of removal of undocumented fill soils).

Below depths of about 10 feet BSG, the predominant soils were medium dense poorly graded sand with silt and medium dense silty sands extending to the maximum depths explored in the borings (55, 68, and 20 feet BSG). Dense and very dense soils were logged at sporadic depth intervals, as a result of higher gravel and cobble content. A medium stiff sandy silt and a medium stiff sandy silty clay were encountered in boring B-1 and B-2, at depths of about 8½ to 13½ feet BSG.

12.1.4 During our field exploration, the borings were checked for the presence of groundwater. Groundwater was encountered in the borings and depths of 14½ and 18½ feet BSG on April 1 and April 2, 2024. Considering the historic groundwater data in Section 7.2 of this report, a groundwater depth of 10 feet BSG is consider appropriate for design.

12.1.5 The primary geotechnical concerns are liquefaction and loss of shallow foundation bearing capacity. Liquefaction of the site soils between depths of 10 and 50 feet BSG is predicted as a result of a large earthquake, causing seismic settlement, loss of soil bearing capacity, and subsidence causes by sand boils. Project design will need to mitigate total seismic settlement of 12½ inches and differential seismic settlement on the order of 6 inches in 40 feet. Project design will also need to mitigate liquefaction loss of bearing capacity occurring at depths of about 8 to 10 feet below existing site grade and potential sand boil ground subsidence. Design for loss of bearing capacity and sand boils would need to account for structural spanning of large areas of soil subgrade that lose bearing support during an earthquake. In general, these concerns are typically mitigated by use of a reinforced mat foundation, deep pile foundation system, and or ground improvement, depending on the specific site conditions. These options are discussed below.

Support of the building could possibly be provided by a reinforced mat foundation and the owner should consult with the project structural engineer to evaluate that option. However, it is our opinion that a mat foundation would likely not be cost feasible for mitigating the afore-mentioned differential seismic settlement, and accounting for sand boil subsidence and soil loss of bearing capacity over large areas.

Support of the building and floor slab on a deep foundation system such as cast-in-drilled-hole (CIDH) piles or driven piles was considered. The project site presents significant challenges for installation of either type of pile (difficult drilling/driving conditions due to gravel and cobbles, casing required for CIDH piles, and vibration concerns for pile diving). However, in addition to these challenges, the most significant drawbacks to using a deep pile foundation system to support the building and floor slab are likely: 1) piles would need to be extremely long to account for the structural loads and the load imparted to the piles by downdrag (negative skin friction) occurring at depths of 10 to 50 feet BSG; 2) piles would not address potential sand boil subsidence; and 3) piles would need to also support the exterior improvements, walkways, parking areas, etc. to mitigate on the order of 12 inches of differential settlement occurring between the pile supported building and exterior non-pile supported improvements.

As alternatives to a mat foundation or pile foundation system, several potential ground improvement methods were considered and are discussed below in Section 12.1.6.

12.1.6 With the client's approval, we consulted with Keller North America (Keller) regarding possible foundation and ground improvement options for the project site. Keller North America (formerly Hayward-Baker) is a design-build contractor specializing in deep foundations and ground improvement methods. The purpose of our interaction with Keller was to obtain general feasibility level information about ground improvement options. Keller was provided with general information about the site, soil conditions revealed by borings, raw CPT data, liquefaction and seismic settlement estimates generated by SALEM, and the estimated building loads. Subsequent to Keller's evaluation of the CPT data, Keller recommended deep soil mixing (DSM): "*as the ground improvement solution for this project.* Deep soil mixing improves the characteristics of weak soils by mechanically mixing them with cementitious binder slurry. Kellers website states: "*A powerful drill advances a mixing tool as binder slurry is pumped through the connecting drill steel, mixing the soil to the target depth. Additional soil mixing is completed as the tool is withdrawn to the surface. This process constructs individual soilcrete columns, rows of overlapping columns, or 100% mass stabilization, all with designed strength and stiffness.*"

With regard to the subject project, Keller stated: *To mitigate liquefaction-related hazards, DSM columns should be overlapped to form a lattice grid pattern.* It is our understanding that a grid pattern of soil-cement walls act as a confined shear box, which can provide additional shear stiffness and strength for sites to withstand liquefaction. Keller also stated: *The ground improvement design would depend on the expected performance (e.g., maximum total and differential settlements) and the selected foundation system. For our evaluations, we assumed a mat foundation system and a maximum liquefaction-induced settlement of 1 inch. Based on our evaluation, the DSM design will be most likely controlled by the liquefaction mitigation rather than building loads support. That is, a DSM system designed to mitigate the liquefaction hazards at the site will also improve the bearing capacity to a level that should be sufficient for the three building options".* Keller also indicated: *Rough order of magnitude pricing for a DSM grid to treat the liquefiable material to a depth of 60 feet is approximately $1.8 to $1.95 million. This estimate assumes treating 140-ft x 150-ft building footprint and includes wet grab sampling and core sampling.*

Keller also stated: *We also evaluated vibro-replacement stone columns as a ground improvement alternative, which could be a more cost-effective option to mitigate the liquefaction hazards at the site. However, CPT-1 and CPT-3 suggest the presence of an approximately 4-ft thick layer of very soft clays, which may lead to concerns regarding static settlements if the site is improved with stone columns. Additional site investigation data, including consolidation testing, may help in evaluating the feasibility of stone columns as a ground improvement alternative.*

Rigid inclusions (also known as drilled displacement columns or controlled modulus columns) are not appropriate at this site, considering that large transient or permanent seismic ground deformations could occur in the liquefiable soils. Such deformations can cause significant bending in the rigid inclusions. Rigid inclusions that undergo significant bending due to seismic loading may develop plastic hinges, which could lead to bearing failure through the weakened hinge or dislocate the rigid inclusions in shear.

12.1.7 Workbench should work closely with the ground improvement design-build contractor (e.g. Keller) providing updated plans and foundation loads as project planning proceeds. Workbench should request and obtain formal bids for ground improvement from Keller and/or other ground improvement design-build contractors, as soon as possible. Considering the relatively high structural loads listed in Section 4 of this report, it is anticipated that a structural mat foundation will be needed to limit the foundation bearing pressures on the subgrade soils to roughly a maximum of 3 to 4 kips per square foot and transfer load across the building area treated by deep soil mixing. The actual allowable bearing capacity of the soils below the column foundations will be impacted by the ground improvement. Thus, the building architect and structural engineer will need to coordinate with the design-build contractor to obtain a mat foundation design soil bearing capacity.

12.1.8 Demolition and grading planning should be coordinated with the ground improvement contractor and geotechnical engineer.

12.1.9 Workbench should also provide updated plans and foundation loads to SALEM, prior final submittals and bidding. SALEM should be retained to review the project plans as they develop further, provide engineering consultation as-needed, and perform geotechnical observation and testing services during construction. A representative of our firm should be retained to observe and test site clearing and grading operations. This testing and observation is 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.

12.1.10 Based on the results of testing, the near surface on-site soils have a “very low” expansion potential and excellent pavement support characteristics.

12.1.11 As noted in Section 9.1 of this report, it is estimated that fill soils are present in some locations at the subject site, extending to depths of about 2 to 8 feet BSG. This report recommends that SALEM be present during all demolition and grading to identify unsuitable undocumented fill soils and recommend removal of those soils. This report also recommends a minimum over-excavation depth of 5 feet below preconstruction site grade for the building pad area.

12.1.12 The results of percolation testing conducted in the near surface silty sands with gravel are included in Section 7.2. Appropriate factors of safety should be incorporated into the storm water infiltration system design.

12.1.13 The soils tested exhibited sulfate concentrations corresponding to sulfate exposure class 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 "mildly corrosive" corrosion potential to buried metal objects (per National Association of Corrosion Engineers, Corrosion Severity Ratings).

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

12.1.15 Future investigations and construction should comply with most recent edition of the "*Operations and Maintenance Plan (OMP), Cap Remedy for Contaminated Soil*," prepared by Trinity Source Group (TSG).

12.2 Surface Drainage and Storm Water

12.2.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil 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.

12.2.2 Uncovered ground immediately adjacent to foundations should be sloped away from the buildings at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces (e.g. pavements) within 10 feet of any building or equipment slab should be sloped a minimum of 1 percent away from the building and drainage gradients maintained to carry 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 foundations/structures. Over-irrigation within landscaped areas adjacent to the structure should not be performed.

12.2.3 Roof drains should be installed with appropriate downspout extensions out-falling on splash blocks so as to direct water a minimum of 10 feet away from the structures, or be connected directly to the storm drain system for the development. Water should not be allowed to pond within 10 feet of any building or equipment slab.

12.2.4 Storm water infiltration systems, such as storm water basins, bioswales, etc. should not be located within 20 feet of proposed building/foundations, unless specifically approved by SALEM. Storm water infiltration plans should be provided to SALEM for review.

12.3 Site Demolition and Grading

12.3.1 Planning for site demolition and grading should be coordinated with geotechnical engineer and ground improvement contractor for input.

12.3.2 A representative of our firm should be present during all demolition, site clearing and grading operations to observe demolition excavations for undocumented fill, buried debris, etc. SALEM may recommend additional excavation within the proposed building and over-build zone to remove undocumented fill, debris, etc., beyond that required for removal of subsurface structures/utilities.

Removal of undocumented fill soils encountered from outside the building and over-build zone will reduce the potential for future settlement and damage to exterior improvements, and should be conducted at the discretion of the project owner. The bottom of excavations made during demolition should be approved by SALEM prior to backfilling with engineered fill. The suitability of on-site soils for reuse as engineered fill is described under Section 12.5 of this report. All engineered fill should be placed in lifts and compacted in accordance with Section 12.5 of this report. Testing and observation is 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.

12.3.3 A pre-construction conference should be held at the site <u>to discuss site clearing and grading operations</u>, with the owner, contractor, civil engineer and geotechnical engineer in attendance.

12.3.4 Future investigations and construction should comply with most recent edition of the "*Operations and Maintenance Plan (OMP), Cap Remedy for Contaminated Soil*," prepared by Trinity Source Group (TSG).

12.3.5 Site preparation activities shall include removal of all vegetation (and trees scheduled for removal) and demolition of surface obstructions not intended to be incorporated into final site design. In addition, underground buried structures and/or utility lines encountered during demolition and construction should be properly removed and the resulting excavations backfilled with Engineered Fill. <u>SALEM should be contacted and retained to document the removal of underground buried structures (utilities, foundations, etc.) and to conduct testing of backfill soils. Sections 12.3.9 through 12.3.11 should be reviewed for minimum over-excavation depths.</u> The over-excavation and backfilling with engineered fill should be conducted in accordance with California Building Code Section 3307, Protection of Adjoining Properties, and local codes and ordinances, whichever is most stringent.

12.3.6 Off haul of soil and demolition debris should be coordinated with the environmental consultant and conform to the most recent edition of the OMP.

12.3.7 Site preparation should begin with removal of existing surface/subsurface structures, pavements, underground utilities (as required), foundations, disturbed soil, and debris (if encountered). Any open graded fill materials encountered should be removed and stockpiled on-site separately from other soils. Open graded materials, such a crushed rock, would generally not be suitable for reuse on site. The suitability of on-site soils for reuse as engineered fill should be determined by the geotechnical engineer and environmental consultant. The general physical nature of the soils encountered during our field investigation suggest that these soils are suitable for use as engineered fill (from a geotechnical standpoint).

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.

Any areas or pockets of soft or loose soils, void spaces made by burrowing animals, or other disturbed soil (i.e. soil disturbed by structure 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 activities.

Portland cement concrete and asphaltic concrete surface cover materials (if any) shall be removed from areas of proposed improvements and stockpiled separately from the excavated stripped topsoil material. The stripped vegetation, will not be suitable for use as Engineered Fill or within structural fill areas (building, pavement areas, etc.). However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas, or exported from the site.

12.3.8 In addition to removal of trees (if scheduled to be removed), the roots and root systems of the trees to be removed should be excavated and removed, and the ground should be thoroughly cleared of root balls and isolated roots greater than 1/2-inch in diameter. The tree and 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.

12.3.9 **Over-Excavation in the Building Area:** All soils disturbed by site demolition and/or ground improvement should be removed. The minimum over-excavation depth should comply with the requirements of the environmental consultant and OMP. The minimum over-excavation depth should also achieve a depth of at least 5 feet below preconstruction site grade and 3 feet below the bottom of the mat foundation, whichever is greater. Any debris or concentrated organics encountered during demolition/grading will need to be removed from the site. All excavations should be backfilled with engineered fill (see Section 12.5 of this report). Upon SALEM's approval, the bottom of over-excavation should be scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to slightly above optimum moisture, and compacted to 92 percent of the maximum density. <u>Prior to placement of fill soil, the subgrade soils should be proof-rolled by a loaded water truck (or equivalent) to verify no deflections of greater than ½ inch occur. 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.</u> Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

<u>The horizontal limits of the over-excavation should extend throughout the entire building area, and laterally to a minimum of 5 feet beyond the edges of the building/perimeter foundations and any attached canopy foundations. All excavations should be backfilled with engineered fill (see Section 12.5 of this report). It is recommended that the project plans include an over-excavation plan delineating the depths and locations of required over-excavation. The building over-excavation plans should be coordinated with the ground improvement plans and ground improvement and over-excavation should extend sufficiently beyond the building perimeter to allow building egress and ingress after a large seismic event.</u>

It should be noted that Section 12.7 recommends that the mat slab is underlain by at least 4 inches of non-recycled aggregate base.

12.3.10 **Over-excavation of New Pavement and Walkway Areas** It is recommended that over-excavation of areas proposed for new parking, drive, and walkway areas comply with the requirements of the environmental consultant and OMP. The minimum over-excavation depth should also achieve a depth of at least 1 foot below the bottom of the recommended aggregate base and remove soils disturbed by site demolition and/or ground improvement. Any debris or concentrated organics encountered during demolition/grading will need to be removed from the site. All excavations should be backfilled with engineered fill (see Section 12.5 of this report). Upon SALEM's approval, the bottom of over-excavation should be scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to slightly above optimum moisture, and compacted to 92 percent of the maximum density. Prior to placement of fill soil, the subgrade soils should be proof-rolled by a loaded water truck (or equivalent) to verify no deflections of greater than ½ inch occur. 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. The horizontal limits of the over-excavation should extend throughout the entire improvement area, and laterally to a minimum of 2 feet beyond the edges of the surface improvements. All excavations should be backfilled with engineered fill (see Section 12.5 of this report).

12.3.11 **Over-Excavation for Lightly Loaded Shallow Conventional Foundations for Non-Habitable Structures:** The ground improvement proposed for the building will likely not achieve full liquefaction mitigation in the areas outside the perimeter of the proposed building. Thus, non-habitable structures outside the building area, supported on shallow conventional foundations, would be subject to damage as a result of a large earthquake. Lightly loaded foundations (such as short CMU site walls, site retaining walls), utilizing an allowable soil bearing capacity of 2,000 psf, should be prepared by over-excavation extending to a minimum depth of 2 feet below preconstruction site grade, to at least 1 foot below the bottom of foundations, whichever is greater. Upon approval of the bottom of over-excavation by SALEM, the bottom of over-excavation should be scarified to a depth of 8 inches, moisture conditioned and compacted to as engineered fill. The horizontal limits of the over-excavation should extend laterally to a minimum of 2 feet beyond the outer edges of the proposed footings.

12.3.12 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 should 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.

12.3.13 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.

12.3.14 Unstable soil conditions should be anticipated if construction is conducted during, or shortly after, the rainy season. 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 best alternative should be determined based on the field conditions at the time of earthwork construction, and consultation with a specialty chemical treatment contractor and SALEM.

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.

If relatively large areas require chemical stabilization, cement treatment could be considered. For preliminary planning purposes, subgrade stabilization may consist of an 18 inch thick section of soil treated with 5 percent high calcium quicklime. The best alternative should be determined based on the field conditions at the time of earthwork construction, and consultation with a specialty chemical treatment contractor and SALEM. Our firm should be consulted prior to implementing remedial measures to provide appropriate recommendations.

12.4 Soil and Excavation Characteristics

12.4.1 Based on the soils encountered, conventional earthwork equipment and low to moderate effort is expected to be necessary to achieve the required over-excavation depths described in this report.

12.4.2 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. Temporary excavations are further discussed in a later Section of this report.

12.4.3 The majority of the near surface soils identified in this report were, generally, damp and moist at the time of our field investigation, due to the absorption characteristics of the soil. Earthwork operations may encounter very moist unstable soils which may require removal to a stable bottom. If encountered, these soils will require additional drying/treatment prior to being used as engineered fill. Also, exposed native soils exposed as part of site grading operations should not be allowed to dry out and should be kept continuously moist prior to placement of subsequent fill.

12.5 Materials for Engineered Fill

12.5.1 From a geotechnical standpoint, on-site soils below existing improvements and below the stripping zone in landscaped areas will generally be suitable for use as general Engineered Fill, below the recommended aggregate base sections, provided they do not contain deleterious matter/organic material, they do not contain fragments/cobbles greater than 3 inches in greatest dimension, they do not contain high gravel contents, and that they can be processed to achieve a well graded soil mixture. Contractors should refer to the OMP and environmental consultant for possible other restriction of the use of onsite soils.

12.5.2 Imported engineered fill soil (if required) should be well-graded, very low-to-non-expansive slightly cohesive silty sand or sandy silt. This material should be approved by the Engineer prior to use and should typically possess the soil characteristics summarized below in Table 12.5.2.

TABLE 12.5.2
IMPORT FILL REQUIREMENTS

Percent Passing 3-inch Sieve	100
Percent Passing No.4 Sieve	75-100
Percent Passing No 200 Sieve	15-40
Maximum Plasticity Index	10
Maximum Organic Content	3% by Weight
Maximum Expansion Index (ASTM D4829)	5
Minimum Angel of Internal Friction (degrees)	32 (1)

(1) Pertains to retaining wall backfill only.

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

12.5.3 All Engineered Fill (including scarified ground surfaces and backfill) should be placed in lifts no thicker than will allow for adequate bonding and compaction (typically 6 to 8 inches in loose thickness). In the event that the Contractor is unable to achieve minimum required compaction, a lesser loose lift thickness should be considered.

12.5.4 On-site granular and imported soils used as engineered fill soils should moisture conditioned to slightly above optimum moisture content, and compacted to at least 92 percent relative compaction (ASTM D1557). A minimum of 95 percent relative compaction (ASTM D1557) is recommended for the upper 12 inches of soil below pavement aggregate base rock.

12.5.5 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.

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

12.5.7 Proposed import materials should be sampled, tested, and approved by SALEM prior to its transportation to the site.

12.5.8 Aggregate base material should meet the requirements of a Caltrans Class 2 Aggregate Base. Aggregate base within the building pad should be non-recycled base. 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. In addition, the Class 2 aggregate base recommended below interior slabs on grade should no contain recycled materials. 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

12.6 Seismic Design Criteria

12.6.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2022 CBC, our recommended parameters are shown below. These parameters were determined using California's Office of Statewide Health Planning and Development (OSHPD) (https://seismicmaps.org/) in accordance with the 2022 CBC. The Site Class was determined based on the soils encountered during our field exploration.

TABLE 12.6.1
2022 CBC SEISMIC DESIGN PARAMETERS

Seismic Item	Symbol	Value	2016 ASCE 7 or 2022 CBC Reference
Site Coordinates (Datum = NAD 83)		36.9776 Lat -122.0268 Lon	
Site Class (Liquefaction Mitigated by Ground Improvement)	--	D	ASCE 7 Table 20.3
Soil Profile Name	--	Stiff soil	ASCE 7 Table 20.3
Risk Category	--	II	CBC Table 1604.5
Site Coefficient for PGA	F_{PGA}	1.1	ASCE 7 Table 11.8-1
Peak Ground Acceleration (adjusted for Site Class effects)	PGA_M	0.762 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	1.651 g	CBC Figure 1613.2.1(1)
Mapped Spectral Acceleration (1.0 sec. period)	S_1	0.632 g	CBC Figure 1613.2.1(2)
Site Class Modified Site Coefficient	F_a	1.0	CBC Table 1613.2.3(1)

Seismic Item	Symbol	Value	2016 ASCE 7 or 2022 CBC Reference
Site Class Modified Site Coefficient	F_v	**1.7***	CBC Table 1613.2.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a S_S$	S_{MS}	1.651 g	CBC Equation 16-36
MCE Spectral Response Acceleration (1.0 sec. period) $1.5*S_{M1} = 1.5 (F_v S_1)$	$1.5 * S_{M1}$	**1.612g***	CBC Equation 16-37 / ASCE 7-16 Supplement 3
Design Spectral Response Acceleration S_{DS}=⅔S_{MS} (short period - 0.2 sec)	S_{DS}	1.1g	CBC Equation 16-38
Design Spectral Response Acceleration S_{D1}=⅔S_{M1} (1.0 sec. period)	S_{D1}	**1.074g***	CBC Equation 16-39
Short Period Transition Period (S_{D1}/S_{DS}), Seconds	T_S	**0.977***	ASCE 7-16, Section 11.4.6
Long Period Transition period (seconds)	T_L	12	ASCE 7-16, Figures 22-14 through 22-17

Note: * Values Fv, SM1, and SD1 determined per ASCE Table 11.4.2 for use in calculating TS only. These values should not be used in structural design. Site Specific Ground Motion Analysis was not included in the scope of this investigation. Per ASCE 11.4.8, Structures on Site Class D, with S1 greater than or equal to 0.2 may require Site Specific Ground Motion Analysis. The value reported for SM1 includes a 50% increase in accordance with exceptions listed in ASCE 7-16 - Supplement 3. In the event a site specific ground motion analysis is required, SALEM should be contacted for these services.

12.6.2 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.

12.7. Structural Mat Foundation – Preliminary Recommendations

Considering the relatively high structural loads listed in Section 4 of this report, it is anticipated that a structural mat foundation will be needed to limit the subgrade bearing pressures. The recommendations for mat foundation design provided in this section are preliminary. Structural/foundation plans should be provided to SALEM and the ground improvement design-build contractor for review, including mat slab pressure distribution diagrams. Design of mat foundations to accommodate the estimated building loads will be an iterative process involving collaboration between SALEM, the structural engineer, and the ground improvement contractor. It is expected that the grid locations for the deep soil mix columns will be tailored to the column foundation locations and loads. Preliminary recommendations are provided below for the mat foundation supported on soils improved by deep soil mixing and the depth of engineered fill recommended under Section 12.3 of this report.

12.7.1 Considering the mass timber option (heaviest building), the mat foundation would need to limit the average soil bearing pressure under the building to 2,000 pounds per square foot. Maximum foundation bearing pressures of 3,000 to 4,000 pounds per square foot (static) are anticipated to be feasible. These values may be increased by 1/3 for wind and seismic loading.

The actual allowable bearing capacity of the soils below the column foundations will need to be determined as part of the ground improvement design-build. Thus, the building architect and structural engineer will need to coordinate with the design-build contractor. Special attention to mat edge bearing pressures will need to consider potential for punching failure. A subgrade modulus of 15 psi/inch was estimated based on long term static column foundation settlement for the mass timber option, without the benefit of the soil mixing. The deep soil mixing will improve the modulus of subgrade reaction and the improved modulus of subgrade reaction should be determined by the design build contractor in collaboration with the building structural engineer and SALEM.

12.7.2 Structural mat foundations should be supported on a minimum 4 inches of non-recycled Class 2 aggregate base, over the depth of engineered fill specified below building foundations in this report.

12.7.3 The thickness and reinforcement of the structural slab should be determined by the Structural Engineer. The mat slab should have thickened edges extending to at least 6 inches below the bottom of mat foundation, and to a total depth of at least 18 inches below adjacent site grade, whichever is deeper.

12.7.4 Structural mat foundations should have a minimum concrete compressive strength of 4,500 pounds per square inch.

12.7.5 Resistance to lateral footing displacement can be computed using a coefficient of friction of 0.32 acting between the base of foundations and the supporting subgrade. 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 slab faces.

12.7.6 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.

12.7.7 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.

12.7.8 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 vapor retarder (a minimum of 15 mils thick, is recommended, polyethylene vapor retarder sheeting, Raven Industries “VaporBlock 15, Stego Industries 15 mil “StegoWrap” or W.R. Meadows Sealtight 15 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.

12.7.9 The concrete may be 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.

12.7.10 Avoid use of stakes driven through the vapor retarder.

12.7.11 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 or loose 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.

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

12.8 Shallow Conventional Foundations for Non-Habitable Ancillary Structures

The design seismic settlement values provided in this report exceed typical design tolerances for shallow conventional foundations. Thus, shallow foundation recommendations are provided in this report solely for use in design of foundations for not-habitable ancillary structures.

12.8.1 The site is suitable for use of shallow conventional foundations for non-habitable ancillary structures such as screen walls, retaining walls, etc. However, damage to these structures should be anticipated as a result of liquefaction occurring during a large earthquake. Shallow foundations consisting of continuous footings and isolated pad footings should be supported on engineered fill prepared in accordance with recommendations under Section 12.3 of this report. Shallow conventional foundations for non-habitable structures supported on soils prepared as recommended in this report may be designed based on total static settlement of 1 inch and a differential static settlement of ½ inch in 40 feet. Depending on the extent of the site area beyond the building perimeter that can be effectively treated by deep soil mixing, damage to these exterior structures may occur as result of a large seismic event.

12.8.2 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.

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

12.8.4 Foundations supported on the depth of engineered fill recommended in this report may be designed base on an allowable bearing capacity of 2,000 pounds per square foot. This value may be increased by one-third due to wind and seismic loading.

12.8.5 Resistance to lateral footing displacement can be computed using an allowable coefficient of friction factor of 0.32 acting between the base of foundations and the supporting native subgrade.

12.8.6 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 native 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 2022 CBC that includes wind or earthquake loads.

12.8.7 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.

12.8.8 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.

12.8.9 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.

12.9 Exterior Concrete Slabs on Grade

12.9.1 The following recommendations are intended for walk ways - 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. Exterior concrete slabs on grade should be supported on a minimum of 4 inches of Class 2 aggregate base compacted to 92 percent relative compaction over compacted subgrade soils prepared as recommended in Section 12.3.10.

Where slabs abut landscaped areas and areas where soil moisture fluctuations are expected, thickened slab edges are recommended to extend to the level of the bottom of the aggregate base.

12.9.2 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 6-inch thick slabs.

12.9.3 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.

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

12.10 Lateral Earth Pressures and Frictional Resistance for Site Retaining Walls

12.10.1 The earth pressures given in Table 12.10.1 may be used for design of site retaining walls where foundations are prepared in accordance with Section 12.3.11. Retaining walls retaining more than

5 feet of soil, or with sloped backfill, are not anticipated for this project. The appropriate earth pressure condition (active, at-rest) should be used for design based on drained conditions.

TABLE 12.10.1 - LATERAL EARTH PRESSURES FOR DRAINED CONDITION - LEVEL BACKFILL

Loading Condition	Earth Pressure for Drained Condition
Active Pressure (pcf)	43
At-Rest Pressure (pcf)	65
Allowable Passive Pressure (pcf)	300
Minimum Wet Unit Weight (pcf)	100
Maximum Wet Unit Weight (pcf)	130

Note: Earth pressures assume level backfill. PCF=pounds per cubic foot equivalent fluid pressure.

12.10.2 The lateral earth pressure against the retaining wall will be dependent upon the ability of the wall to deflect. The active pressure is applicable to walls able to rotate/translate 0.0005 radians at the top or bottom. 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.

12.10.3 The top one-foot of adjacent subgrade (below ground surface) should be deleted from the passive pressure computation.

12.10.4 The allowable parameters include a safety factor of 1.5 and can be used in design for direct comparison of resisting loads against lateral driving loads.

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

12.10.6 For dynamic seismic lateral loading the following equation shall be used:

Dynamic Seismic Lateral Loading Equation
Dynamic Seismic Lateral Load = $\frac{3}{8}\gamma K_h H^2$
Where: γ = Maximum In-Place Soil Density (135 pcf)
K_h = Horizontal Acceleration = $\frac{2}{3}PGA_M$ (Section 12.6.1 above)
H = Wall Height

12.11 Site Retaining Walls

12.11.1 Site retaining walls should be designed using the geotechnical parameters in Section 12.10 and appropriate lateral loads due to any applicable surcharges. In the event proposed retaining walls exceed 5 feet of retained height, SALEM should be notified by the wall designer to review the wall plans prior to submittal for permit and/or construction bidding.

12.11.2 Retaining and/or below grade 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 should consist of native soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage into the wall drain system. The gravel should conform to Class 2 permeable materials graded in accordance with the current Caltrans Standard Specifications.

12.11.3 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.

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

12.11.5 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.

12.11.6 For retaining walls less than 5 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 2-inch minimum diameter holes (concrete walls) or unmortared head joints (masonry walls) and placed no higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to the Caltrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

12.11.7 During grading and backfilling operations adjacent to any wall, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

12.12 Temporary Excavations

12.12.1 Deep, temporary excavations near the property line are not anticipated. In the event that pile and lagging type temporary shoring is needed, SALEM should be contacted to provide recommendations for pile and lagging type shoring.

12.12.2 Excavation and backfilling with engineered fill should be conducted in accordance with California Building Code Section 3307, Protection of Adjoining Properties, and local codes and ordinances, whichever is most stringent.

12.12.3 We anticipate that the vast majority of the site soils to be excavated will be classified as Cal-OSHA "Type C" soil when encountered in excavations during site development and construction. 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.

12.12.4 It is the contractor's responsibility to provide sufficient and safe excavation support as well as protecting nearby utilities, structures, and other improvements which may be damaged by earth movements. 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.

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

12.12.6 Temporary open, unbraced excavations in undisturbed soils should be made according to the slopes presented in the following table:

RECOMMENDED TEMPORARY EXCAVATION SLOPES

Depth of Excavation (ft)	Slope (Horizontal : Vertical)
0-5	1:1
5-10	1½:1

12.12.7 If, due to space limitation, excavations near existing structures are performed in a vertical position, 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.

12.12.8 Braced shorings should be designed for a maximum pressure distribution of 32H, (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.

12.12.9 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.

12.13 Underground Utilities

12.13.1 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 bedding and pipe zone – see Section 12.13.2) 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.

12.13.2 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 a 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.

12.13.3 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.

12.13.4 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.

12.14 Pavement Design and Construction

12.14.1 New pavement subgrade soils should be prepared as recommended in Section 10.3.7 of this report.

12.14.2 The pavement design recommendations provided herein are based on the State of California Department of Transportation (CALTRANS) design manual, the results of the R-value testing performed, a minimum aggregate base thickness of 4 inches, and a minimum AC thickness of 2.5 inches. An R-value of 50 was utilized for design of project pavement sections based on the results of R-value testing and consideration of the potential variation in soil conditions exhibited on the borings logs.

12.14.3 The pavement design recommendations provided herein are based on a 20-year pavement life for traffic indexes ranging from 4.0 to 8.0. Salem should be contacted if alternate traffic indices are required for design. Table 12.14.3 presents minimum sections recommended for flexible asphaltic concrete pavement design.

TABLE 12.14.3
ASPHALT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Asphaltic Concrete, (inches)	Class 2 Aggregate Base, (inches)*	Compacted Subgrade, (inches)*
4.0	2.5	4.0	12.0
5.0	2.5	4.0	12.0
6.0	3.0	4.0	12.0
7.0	4.0	4.5	12.0
8.0	4.5	6.0	12.0

**95% compaction based on ASTM D1557 Test Method*

12.14.4 The following recommendations are for Portland Cement Concrete pavement sections.

TABLE 12.14.4
PORTLAND CEMENT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Portland Cement Concrete, (inches)*	Class 2 Aggregate Base, (inches)**	Compacted Subgrade. (inches)**
4.0	5.0	4.0	12.0
5.0	5.5	4.0	12.0
6.0	6.0	4.0	12.0
7.0	6.0	4.0	12.0
8.0	6.5	4.0	12.0

** Minimum Compressive Strength of 4,000 psi*
*** 95% compaction based on ASTM D1557 Test Method*

12.14.5 Asphalt concrete should conform to Section 39 of Caltrans' latest Standard Specifications for ½ inch Hot Mix Asphalt (HMA) Type A or B. Asphaltic concrete pavements should be placed and compacted in accordance with Caltrans Standard Specifications.

12.14.6 Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. Any buried structures encountered during construction should be properly removed and backfilled.

12.14.7 Buried structures encountered during construction should be properly removed/rerouted and the resulting excavations backfilled. It is suspected that demolition activities of the existing pavement will disturb the upper soils. After demolition and ground improvement activities, it is recommended that disturbed soils within pavement areas be removed and/or compacted as engineered fill under the observation and testing of SALEM.

12.14.8 An integral part of satisfactory fill placement is the stability of the placed lift of soil. Prior to placement of aggregate base, the subgrade soils should be proof-rolled by a loaded water truck (or equivalent) to verify no deflections of greater than ½ inch occur. 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.

12.14.9 A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material.

12.15. PLAN REVIEW, CONSTRUCTION OBSERVATION AND TESTING

12.16 Plan and Specification Review

12.16.1 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.

12.17 Construction Observation and Testing Services

12.17.1 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.

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

12.17.3 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.

13. LIMITATIONS AND CHANGED CONDITIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the test boring and CPT soundings conducted at the approximate locations shown on the Site Plan, Figure No. 2. The report does not reflect variations which may occur between test boring locations explored. 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.

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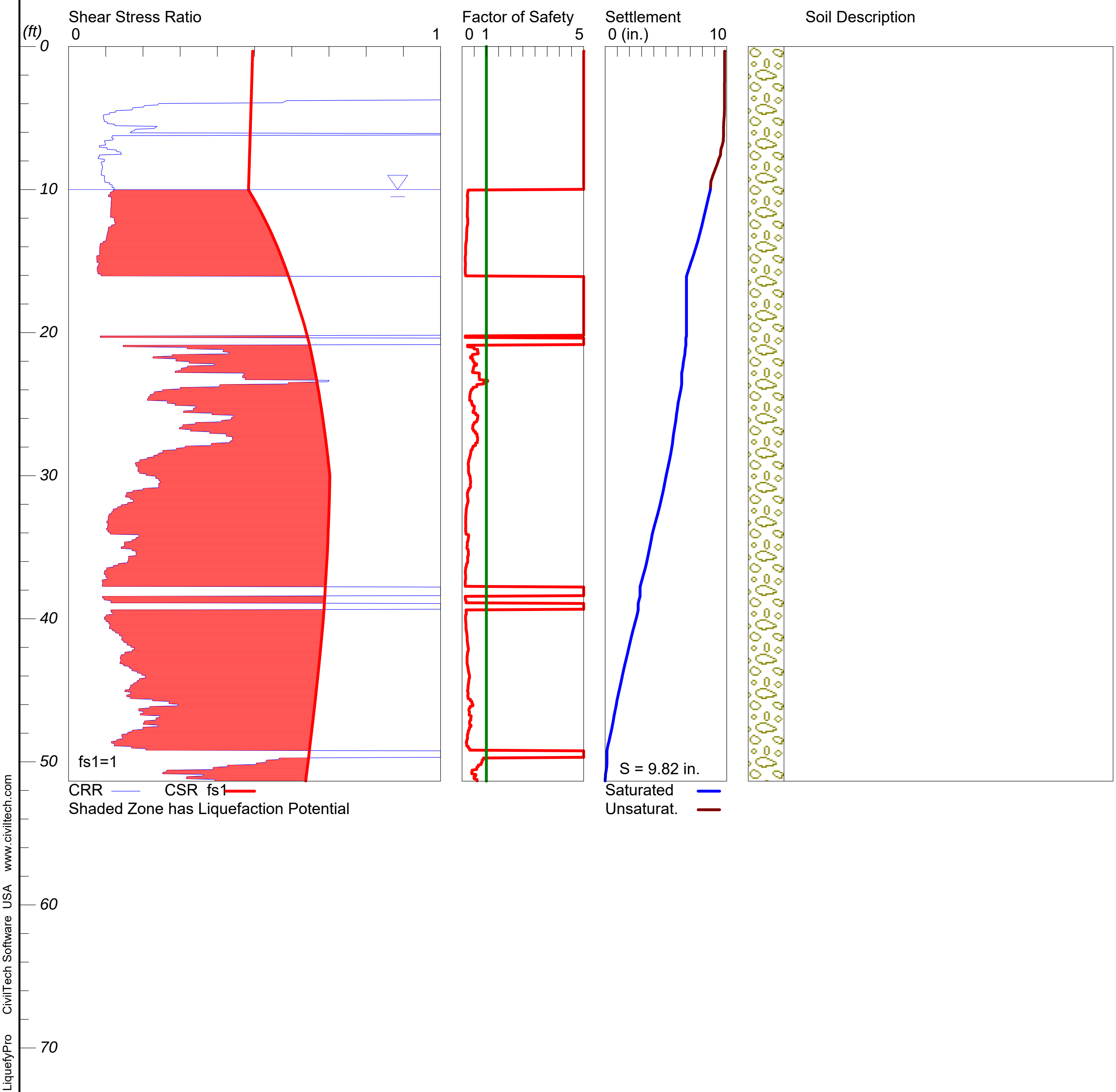
VICINITY MAP	SCALE: 1" = 2,500'	DATE: April 26, 2024	SALEM engineering group, inc.
GEOTECHNICAL ENGINEERING INVESTIGATION Proposed Multi Family Housing Project 2020 North Pacific Avenue Santa Cruz, California	DRAWN BY: KM	APPROVED BY: KC	
	PROJECT NO. 5-224-0090	FIGURE NO. 1	

SITE PLAN	SCALE: 1" =40'	DATE: April 26, 2024	SALEM engineering group, inc.
GEOTECHNICAL ENGINEERING INVESTIGATION Proposed Multi Family Housing Project 2020 North Pacifice Avenue Santa Cruz, California	DRAWN BY: KM	APPROVED BY: KC	
	PROJECT NO. 5-224-0090	FIGURE NO. 2	

LIQUEFACTION ANALYSIS

2020 N Pacific Ave, Santa Cruz

Hole No.=CPT-1 *Water Depth=10 ft* *Surface Elev.=22* *Magnitude=7.88*
Acceleration=0.762g

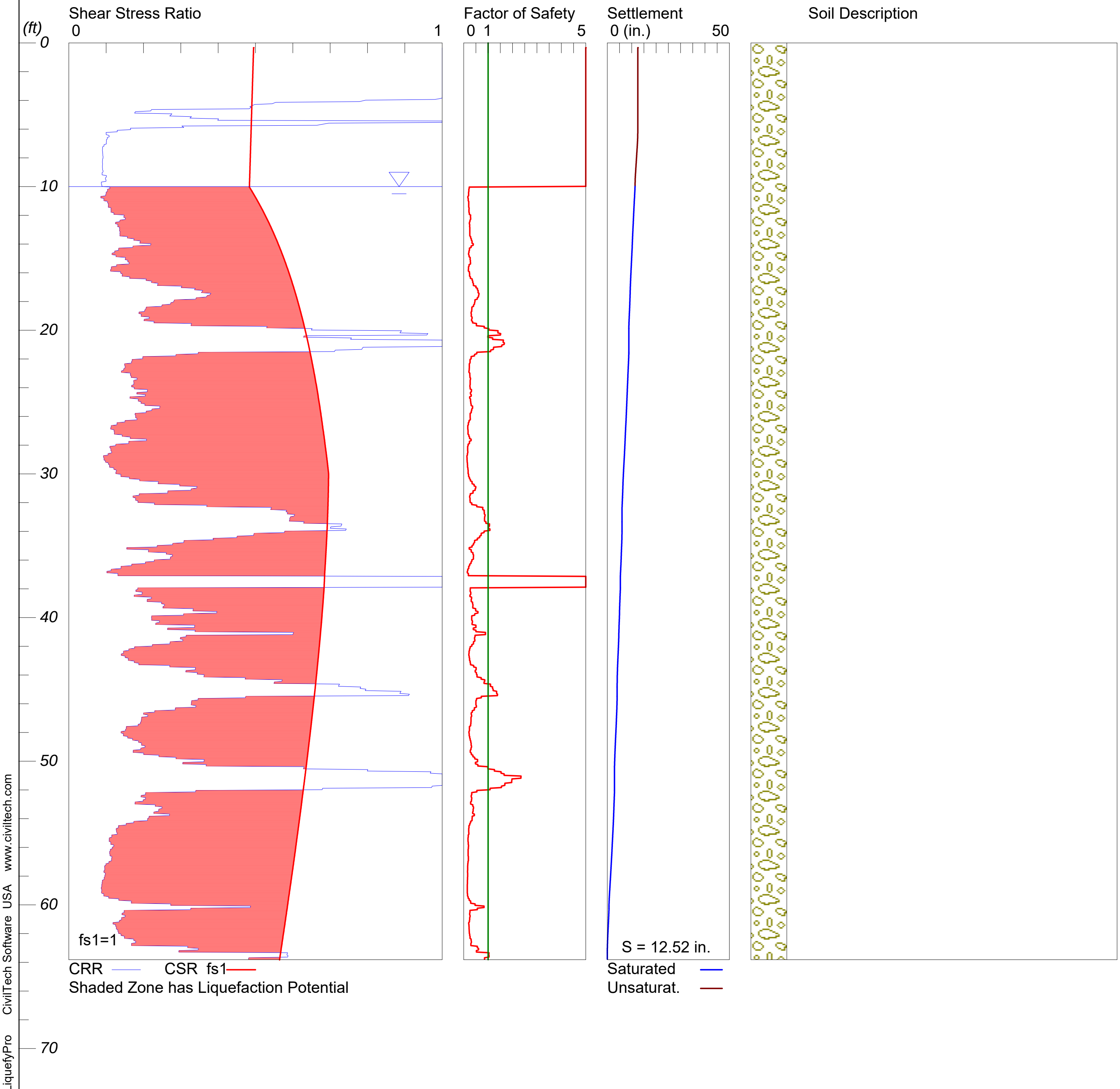


LIQUEFACTION ANALYSIS

2020 N Pacific Ave, Santa Cruz

Hole No.=CPT-2   Water Depth=10 ft   Surface Elev.=22

Magnitude=7.88
Acceleration=0.762g



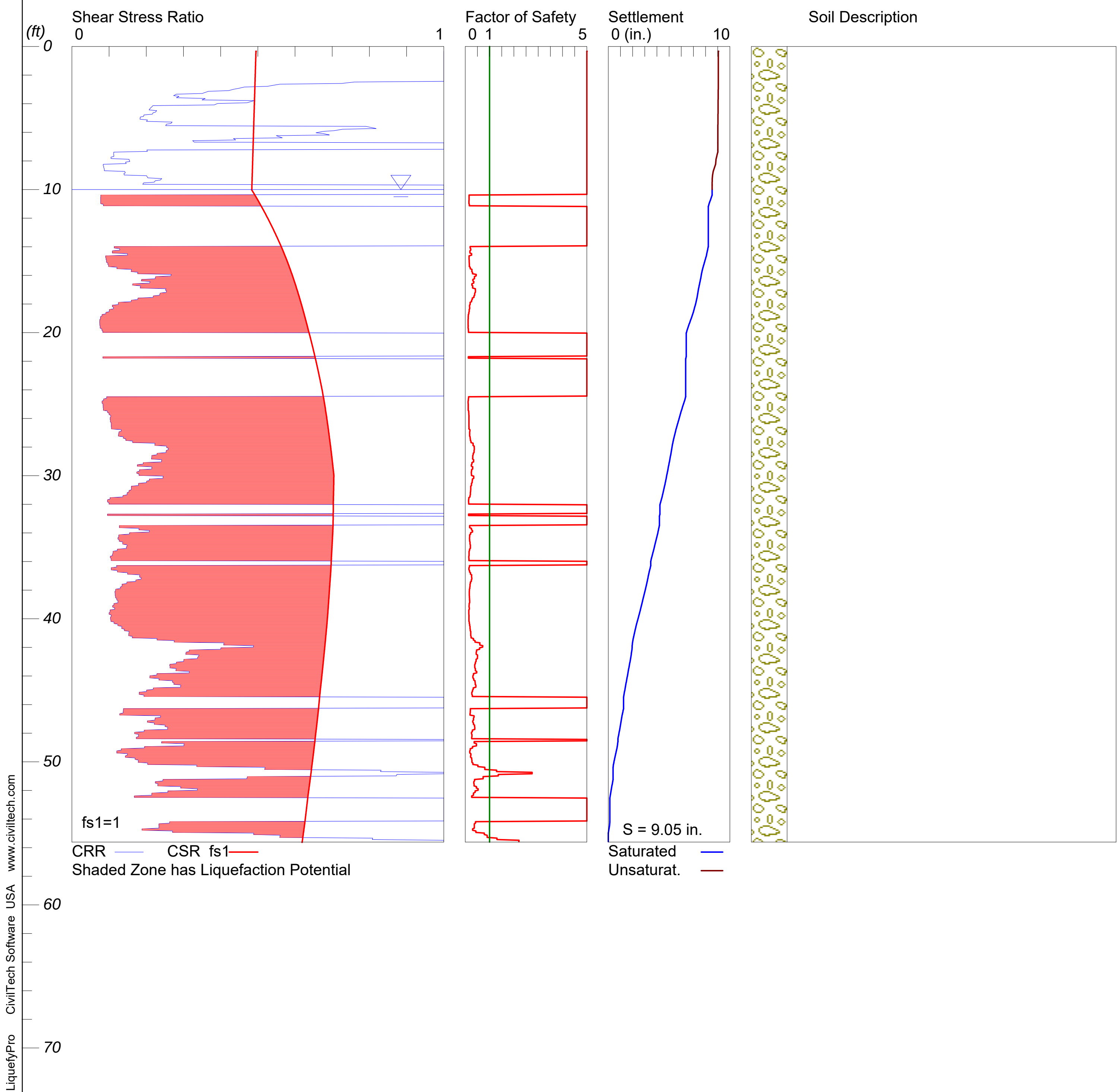
CivilTech Corporation

Plate A-1

LIQUEFACTION ANALYSIS

2020 N Pacific Ave, Santa Cruz

Hole No.=CPT-3 Water Depth=10 ft Surface Elev.=22 Magnitude=7.88
Acceleration=0.762g

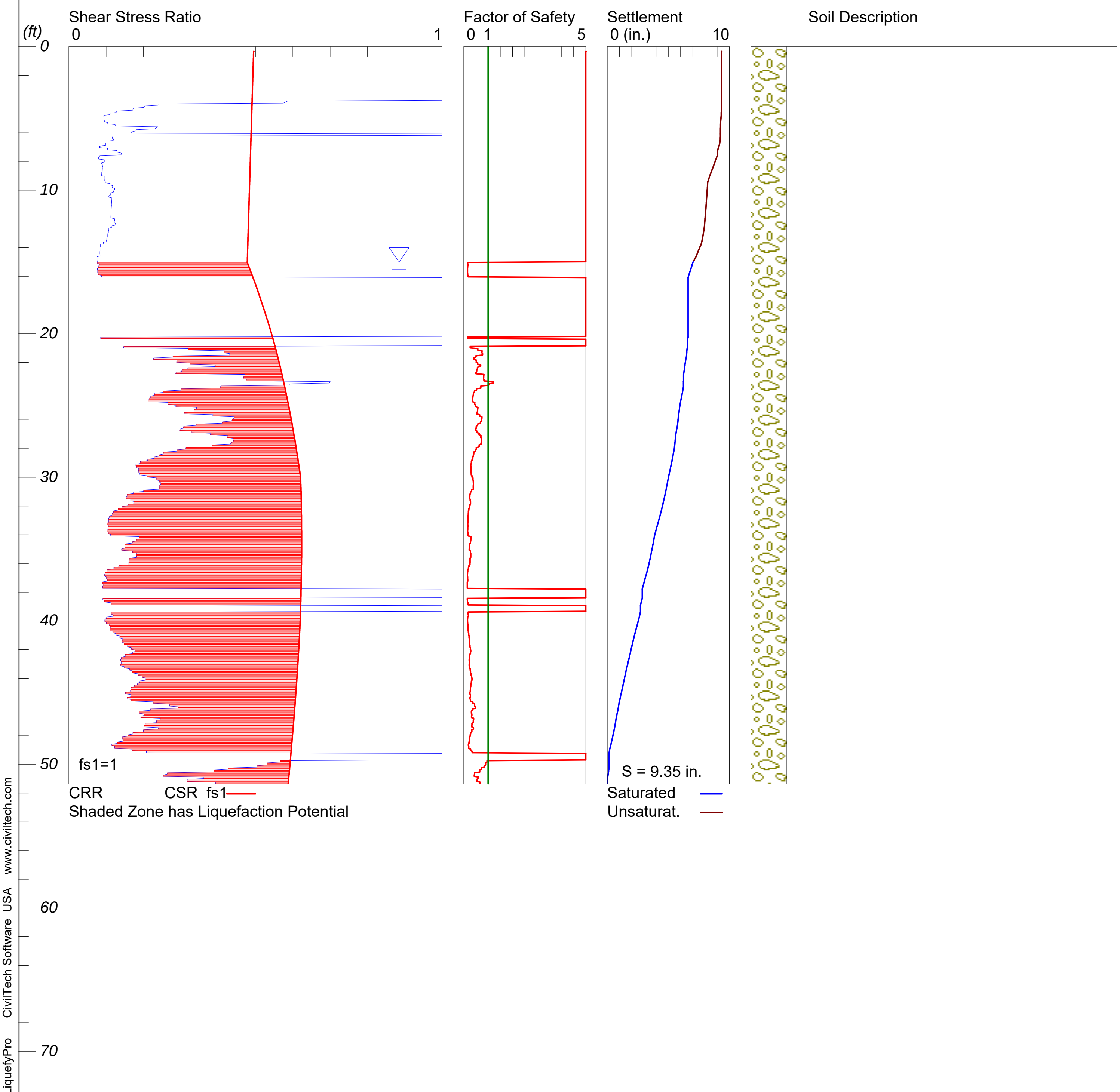


LIQUEFACTION ANALYSIS

2020 N Pacific Ave, Santa Cruz

Hole No.=CPT-1 Water Depth=15 ft Surface Elev.=22

Magnitude=7.88
Acceleration=0.762g



CivilTech Corporation

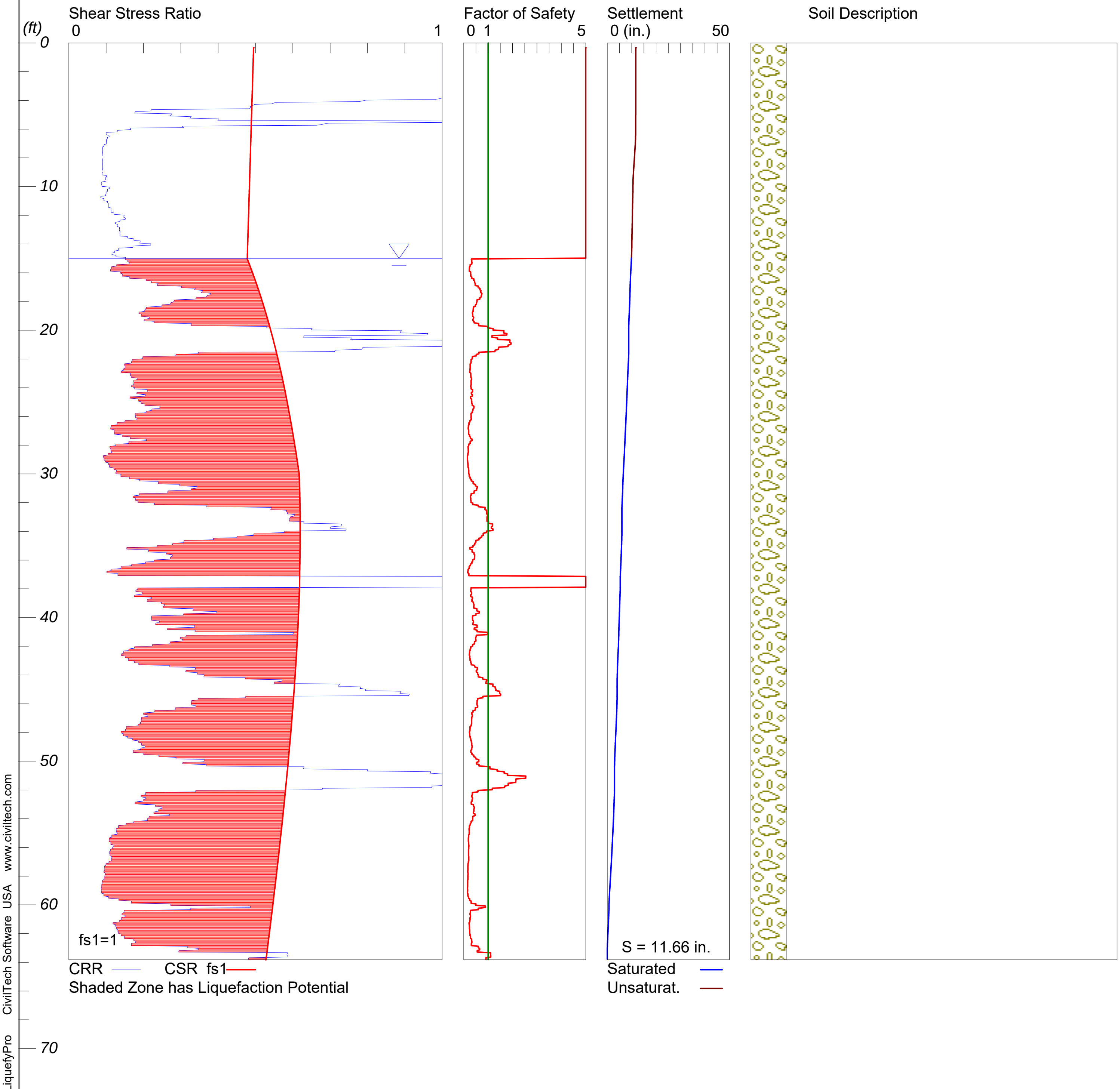
Plate A-1

LIQUEFACTION ANALYSIS

2020 N Pacific Ave, Santa Cruz

Hole No.=CPT-2   Water Depth=15 ft   Surface Elev.=22

Magnitude=7.88
Acceleration=0.762g



CivilTech Corporation

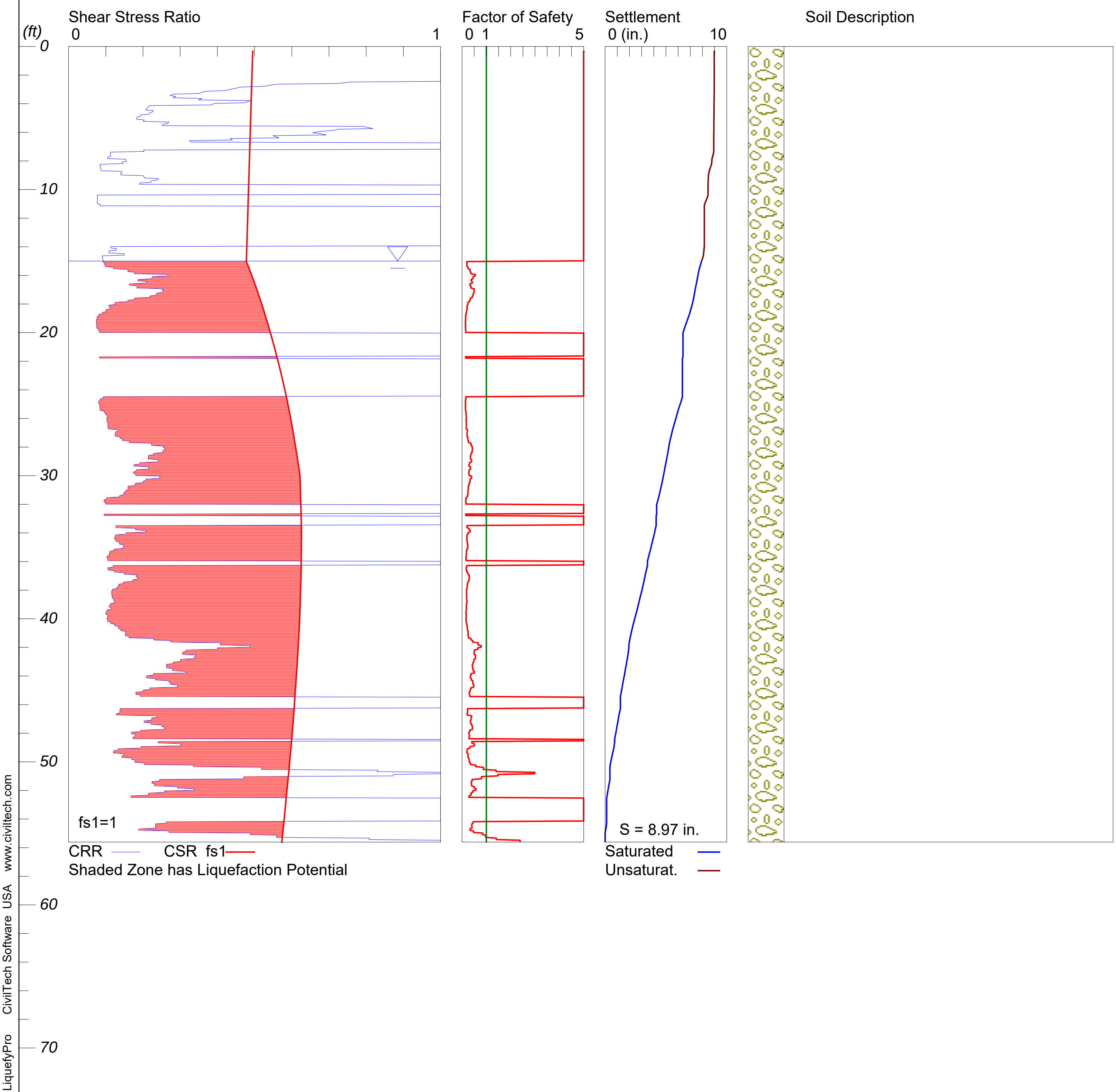
Plate A-1

LIQUEFACTION ANALYSIS

2020 N Pacific Ave, Santa Cruz

Hole No.=CPT-3 Water Depth=15 ft Surface Elev.=22

Magnitude=7.88
Acceleration=0.762g



APPENDIX

A

APPENDIX A

FIELD EXPLORATION

Our field exploration was conducted on April 1st through April 3rd, 2024, and consisted of site surface reconnaissance, drilling, percolation testing, and CPT soundings.

Prior to drilling test borings and conducting CPTs, permits were obtained from Santa Cruz County Environmental Health Department. In addition, a Health and Safety Plan for our field exploration program was submitted to Trinity Source Group for review. Also prior to drilling, a private utility locator was used to locate underground utilities in the areas of the proposed borings and CPTs.

Test borings B-1 and B-2 were drilled to depths of 55 and 68 feet BSG using 6-5/8 inch diameter hollow-stem auger and mud rotary equipment rotated by a truck-mounted CME-55 drill rig. Test boring B-3 was drilled to a depth of 20 feet BSG using the same rig, with 6-5/8 inch diameter hollow-stem. Borings B-1 and B-2 were terminated at depths of 55 and 68 feet BSG, respectively, due to refusal caused by cobbles and low mud circulation. Boring B-3 was terminated at a depth of 20 feet BSG due to refusal caused by cobbles. The test borings were drilled at the approximate locations shown on Figure No. 2, Site Plan.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer at that time. Visual classification of the materials encountered in the test borings was generally made in accordance with the Unified Soil Classification System (ASTM D2487). Subsurface soil samples were obtained by driving a Modified California sampler (MCS) or a Standard Penetration Test (SPT) sampler.

Penetration resistance blow counts were obtained in the hollow stem auger borings by dropping a 140-pound automated trip hammer through a 30-inch free fall to drive the sampler to a maximum penetration of 18 inches. The number of blows required to drive the last 12 inches, or less if very dense or hard, is recorded as Penetration Resistance (blows/foot) on the logs of borings.

Soil samples were obtained from the test borings at the depths shown on the boring logs included in Appendix A. The MCS samples were recovered and capped at both ends to preserve the samples at their natural moisture content; SPT samples were recovered and placed in a sealed bag to preserve their natural moisture content. Soil cuttings were placed into 55 gallon drums and the drums were left on the site for disposal by others, as requested by Workbench.

At the completion of drilling and sampling, the test borings were backfilled with neat cement grout in accordance with the requirements of Santa Cruz County Environmental Health Department and the top portion of the hole was filled with asphaltic concrete pavement patch.

Cone Penetrometer Test sounding (CPTs) were conducted by Middle Earth Geotesting on April 3, 2024. CPT-1, CPT, 2, and CPT-3 were conducted to depths of about 45 to 50 feet BSG, within approximately 3 to 5 feet of borings B-1, B-2, and B-3, respectively. The CPT soundings were performed using a 1.75 inch diameter electronic piezocone with a 60-degree apex angle and a surface area of 15 square centimeters and a friction sleeve area of 225 square centimeters. The CPT soundings were hydraulically advanced using a 25-ton CPT rig in accordance with ASTM Test Method D5778. Measurements of cone tip resistance and sleeve friction data were recorded at approximate 2-inch intervals during penetration to provide nearly continuous data for interpreting the engineering properties of the soils. The CPT logs are presented after the boring logs in this Appendix.

At the completion of each CPT, sounding holes were backfilled with neat cement grout in accordance with the requirements of Santa Cruz County Environmental Health Department.

Test Boring: B-1 **Page** 1 **Of:** 2

SALEM engineering group, inc.

Project Number: 5-224-0090

Date: April 1, 2024

Client: Clocktower Center, LLC.

Project: Proposed Multi-Familty Housing Project

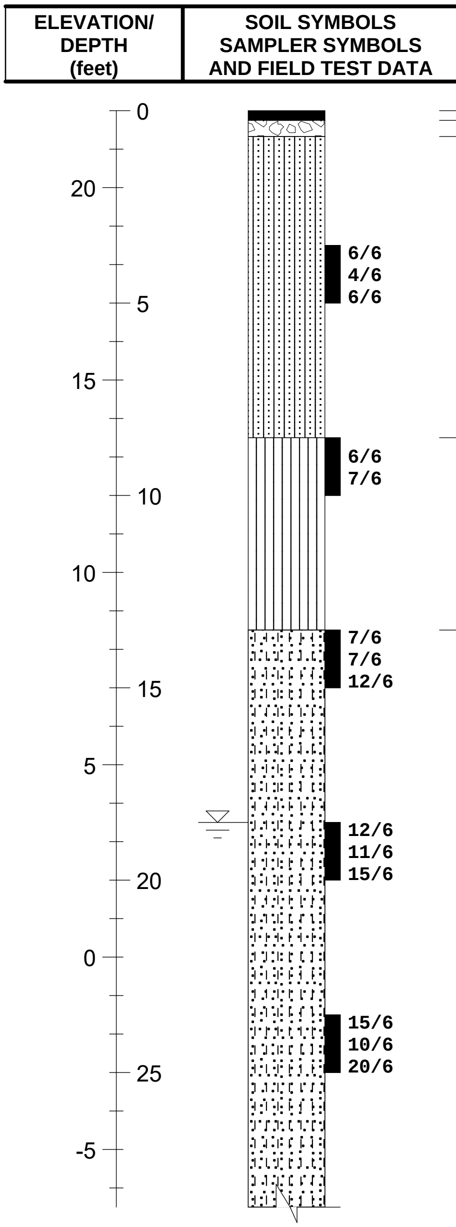
Location: 2020 North Pacific Avenue, Santa Cruz, California

Drilled By: Salem Engineering Group, Inc. **Logged By:** C.R.

Drill Type: CME-55 **Elevation:** 22 feet AMSL

Auger Type: 6-5/8" HSA & Mud Rotary **Initial Depth to Groundwater:** 18.5 feet BSG

Hammer Type: 140lbs/30in Automatic Trip **Final Depth to Groundwater:** N/E



SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
	AC	Asphaltic Concrete = 3 inches.				
	AB	Aggregate Base = 5 inches.				At 1-4': -#200= 21% SAND=68% +#4=11%
6/6 4/6 6/6	SM	Silty SAND; loose, brown, moist, fine to coarse grained, some gravel, trace of cobble.	10	26.4	85.1	No Recovery in rings
6/6 7/6	ML	Sandy SILT; medium stiff, brown, moist, non-plastic, trace of gravel.	13	7.3	84.7	Disturbed Rings
7/6 7/6 12/6	SP-SM	Poorly Graded SAND with Silt; medium dense, light to dark brown, moist, fine to coarse grained.	19	10.8	115.4	
12/6 11/6 15/6		Grades as above; wet, trace of cobbles and silt.	26	8.1	124.1	
15/6 10/6 20/6		Grades as above; blackish brown, no cobbles.	30	11.0	123.9	

Notes: *Asphaltic Concrete Surface*
Switched to Mud Rotary at 33.5 feet BSG

Figure Number A-1

SALEM engineering group, inc.

Project Number: 5-224-0090
Date: April 1, 2024
Test Boring: B-1

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
30 / -10	19/6 15/6 20/6		Grades as above;	35	17.5	107.3	
35 / -15	5/6 8/6 9/6	SM	Silty SAND; medium dense, gray to brown, wet, fine to medium grained.	17	24.8	100.4	
40 / -20	3/6 6/6 10/6		Grades as above;	16	26.4	95.6	-#200=18% SAND=82%
45 / -25	10/6 11/6 16/6	SP-SM	Poorly Graded SAND with Silt and Gravel; medium dense, grayish brown, wet, fine to coarse grained.	27	15.9	116.5	
50 / -30	8/6 9/6 5/6		Grades as above; loose.	14	21.4	97.0	
55	0/6 0/6 0/6		Grades as above with cobbles; very loose.		11.3	116.7	
60 / -35 / -40			End of boring at 55 feet BSG due to refusal caused by cobbles and low mud circulation.				

Notes: *Asphaltic Concrete Surface*
Switched to Mud Rotary at 33.5 feet BSG

Figure Number A-1

SALEM
engineering group, inc.

Test Boring: B-2 **Page** 1 **Of:** 3

Project Number: 5-224-0090

Date: April 2, 2024

Client: Clocktower Center, LLC.

Project: Proposed Multi-Familty Housing Project

Location: 2020 North Pacific Avenue, Santa Cruz, California

Drilled By: Salem Engineering Group, Inc. **Logged By:** C.R.

Drill Type: CME-55 **Elevation:** 21 feet AMSL (Approx)

Auger Type: 6-5/8" HSA & Mud Rotary **Initial Depth to Groundwater:** 18.5 feet BSG

Hammer Type: 140lbs/30in Automatic Trip **Final Depth to Groundwater:** N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0 (Elev. 21)		AC	Asphaltic Concrete = 3 inches.				
		AB	Aggregate Base = 5 inches.				Ar 1-4': -#200=20% SAND=64% +#4=16% EI=0
	4/6 4/6 5/6	SM	Silty SAND with Gravel; loose, brown to dark brown, moist, non-plastic.	9	46.6	63.4	
	5/6 4/6 7/6	CL-ML	Sandy Silty CLAY; medium stiff, dark brown to red, moist, low plasticity.	11	17.8	99.0	-#200=57% SAND=42% +#4=1% PI=6 LL=28
	8/6 10/6 14/6	SP-SM	Poorly Graded SAND with Silt; medium dense, brown, very moist, fine to coarse grained.	24	13.3	112.2	-#200=6% SAND=88% +#4=6%
	21/6 15/6 19/6		Grades as above with gravel and cobbles; wet.	34	8.8	123.2	
	13/6 8/6 13/6	SP-SM	Poorly Graded SAND with Silt and Gravel; medium dense, grayish brown, wet, medium to coarse grained.	21	13.9	106.3	-#200=9% SAND=73% +#4=18%

Notes: *Asphaltic Concrete Surface*

Figure Number A-2

SALEM engineering group, inc.

Project Number: 5-224-0090
Date: April 2, 2024
Test Boring: B-2

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
30 / -10	14/6 17/6 21/6		Grades as above; with cobbles; brown, wet, fine to coarse grained.	38	18.8	106.0	
35 / -15	48/6 38/6 21/6		Grades as above with no cobbles; dense.	59	12.0	122.9	-#200=9% SAND=58% +#4=33%
40 / -20	20/6 14/6 12/6		Grades as above; medium dense, .	26	14.1	111.9	
45 / -25	25/6 38/6 20/6		Grades as above; dense.	58	13.6	118.1	
50 / -30	78/6 48/6 33/6		Grades as above; very dense.	>65	13.7	116.9	
55 / -35	28/6 21/6 19/6	SM	Silty SAND; medium dense, brown, fine to coarse grained.	40	18.9		-#200=16% SAND=83% +#4=1%
60 / -40	8/6 15/6 17/6		Grades as above with gravel; dense.	32			

Notes: *Asphaltic Concrete Surface*

SALEM engineering group, inc.

Project Number: 5-224-0090
Date: April 2, 2024
Test Boring: B-2

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
65 -45	12/6 9/6 12/6		Grades as above; medium dense.	21			
70 -50 75 -55 80 -60 85 -65 90 -70 95 -75			End of boring at 68 feet BSG due to refusal caused by cobbles and low circulation.				

Notes: *Asphaltic Concrete Surface*

Figure Number A-2

SALEM engineering group, inc.

Test Boring: B-3 **Page** 1 **Of:** 1

Project Number: 5-224-0090

Date: April 2, 2024

Client: Clocktower Center, LLC.

Project: Proposed Multi-Famility Housing Project

Location: 2020 North Pacific Avenue, Santa Cruz, California

Drilled By: Salem Engineering Group, Inc. **Logged By:** C.R.

Drill Type: CME-55 **Elevation:** 20 feet AML (Approx)

Auger Type: 6-5/8" HSA & Mud Rotary **Initial Depth to Groundwater:** 14.5 feet BSG

Hammer Type: 140lbs/30in Automatic Trip **Final Depth to Groundwater:** N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
20 / 0		AC	Asphaltic Concrete = 3 inches.				
	8/6 7/6 11/6	AB	Aggregate Base = 5 inches.	18	12.3	111.3	
		SM	Silty SAND; medium dense, light to dark brown, moist, fine to medium grained.				
	5/6 4/6 7/6		Grades as above with gravel; loose, dark brown.	11	17.4	107.9	
15 / 5							
	5/6 4/6 6/6		Grades as above; moist.	10	16.5	105.3	-#200=41% SAND=59% PI=3 LL=25
10 / 10							
	5/6 7/6 13/6		Grades as above with gravel; medium dense, wet.	20	11.1	116.8	
5 / 15							
	6/6 5/6 5/6	SP	Poorly Graded SAND with gravel and cobbles; loose, brown, wet, fine to coarse grained.	10	13.9	110.2	-#200=4% SAND=75% +#4=21%
0 / 20			End of boring at 20 feet BSG due to refusal caused by gravel and cobbles.				
-5 / 25							

Notes: *Asphaltic Concrete Surface*

Figure Number A-3

SALEM engineering group, inc.

Test Boring: P-1 **Page** 1 **Of:** 1

Project Number: 5-224-0090

Date: April 1, 2024

Client: Clocktower Center, LLC.

Project: Proposed Multi-Familty Housing Project

Location: 2020 North Pacific Avenue, Santa Cruz, California

Drilled By: Salem Engineering Group, Inc. **Logged By:** C.R.

Drill Type: CME-55 **Elevation:** 22 feet AMSL (Approx)

Auger Type: 6-5/8" Hollow Stem Auger **Initial Depth to Groundwater:** N/E

Hammer Type: 140lbs/30in Automatic Trip **Final Depth to Groundwater:** N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		AC	Asphaltic Concrete = 3 inches.				
	5/6 6/6 9/6	AB	Aggregate Base = 5 inches.	15			
20		SP	Poorly Graded SAND; medium dense, brown to orangish brown, moist, fine to coarse grained, trace of gravel.				
	3/6 1/6 2/6	SM	Silty SAND; very loose, dark brown, moist, fine grained, trace of gravel.	3			-#200=35% SAND=63% +#4=2%
5			End of boring at 5 feet BSG.				
15							
10 / 10							
15 / 5							
20 / 0							
25 / -5							

Notes: *Asphaltic Concrete Surface*

Figure Number A-4

Test Boring: P-2 **Page** 1 **Of:** 1

Project Number: 5-224-0090

Date: April 2, 2024

Client: Clocktower Center, LLC.

SALEM engineering group, inc.

Project: Proposed Multi-Familty Housing Project

Location: 2020 North Pacific Avenue, Santa Cruz, California

Drilled By: Salem Engineering Group, Inc. **Logged By:** C.R.

Drill Type: CME-55 **Elevation:** 21 feet AMSL (Approx)

Auger Type: 6-5/8" Hollow Stem Auger **Initial Depth to Groundwater:** N/E

Hammer Type: 140lbs/30in Automatic Trip **Final Depth to Groundwater:** N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		AC	Asphaltic Concrete = 3 inches.				
20	12/6 8/6 14/6	AB	Aggregate Base = 5 inches.	22			
		SP	Poorly Graded SAND; medium dense, light to orangish brown, damp, fine to coarse grained.				
	3/6 7/6 5/6	SM	Silty SAND with Gravel; medium dense, light to orangish brown, damp, trace of clay.	12			-#200=31% SAND=42% +#4=27%
5 / 15			End of boring at 5 feet BSG.				
10 / 10							
15 / 5							
20 / 0							
25 / -5							

Notes: *Asphaltic Concrete Surface*

Figure Number A-5

KEY TO SYMBOLS

Symbol	Description
	Strata symbols
	Asphaltic Concrete
	Aggregate Base
	Silty Sand
	Silt
	Poorly graded sand with silt
	Silty low plasticity clay
	Poorly graded sand
	Misc. Symbols
	Water table during drilling
	Boring continues
	Drill rejection
	Soil Samplers
	California sampler
	Standard penetration test

Notes:

Granular Soils
Blows Per Foot (Uncorrected)

	MCS	SPT
Very loose	<5	<4
Loose	5-15	4-10
Medium dense	16-40	11-30
Dense	41-65	31-50
Very dense	>65	>50

Cohesive Soils
Blows Per Foot (Uncorrected)

	MCS	SPT
Very soft	<3	<2
Soft	3-5	2-4
Firm	6-10	5-8
Stiff	11-20	9-15
Very Stiff	21-40	16-30
Hard	>40	>30

MCS = Modified California Sampler
SPT = Standard Penetration Test Sampler

Project ID: Salem Engineering
Data File: SDF(813).cpt
CPT Date: 4/3/2024 11:10:45 AM
GW During Test: 15 ft

Sounding ID: CPT-01
Project No: 5-224-0090
Cone/Rig: DDG1627

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
0.33	377.0	604.6	604.6	377.3	1.2	13.4	0.3	7	grvly SAND to dense SAND	130	6.0	100	63	86	95	48	-	-	5	1.000	1.00	16
0.49	245.8	394.3	394.3	246.0	1.4	9.0	0.6	7	grvly SAND to dense SAND	130	6.0	66	41	61	95	48	-	-	5	1.000	1.32	16
0.66	204.9	328.6	328.6	205.0	1.6	5.7	0.8	6	clean SAND to silty SAND	125	5.0	66	41	54	95	48	-	-	5	0.350	1.47	16
0.82	175.9	282.1	282.1	175.9	1.7	3.5	1.0	6	clean SAND to silty SAND	125	5.0	56	35	48	95	48	-	-	5	0.350	1.58	16
0.98	171.9	275.7	275.7	172.0	1.6	2.3	0.9	6	clean SAND to silty SAND	125	5.0	55	34	46	95	48	-	-	5	0.350	1.56	16
1.15	191.3	306.8	306.8	191.4	1.6	2.9	0.9	6	clean SAND to silty SAND	125	5.0	61	38	51	95	48	-	-	5	0.350	1.51	16
1.31	199.3	319.6	319.6	199.3	1.5	3.5	0.8	6	clean SAND to silty SAND	125	5.0	64	40	52	95	48	-	-	5	0.350	1.47	16
1.48	203.9	327.0	327.0	204.0	1.3	4.4	0.7	6	clean SAND to silty SAND	125	5.0	65	41	52	95	48	-	-	5	0.350	1.41	16
1.64	193.3	310.0	310.0	193.3	0.6	3.7	0.3	7	grvly SAND to dense SAND	130	6.0	52	32	47	95	48	-	-	5	1.000	1.22	16
1.80	180.8	290.0	290.0	180.9	0.7	3.4	0.4	7	grvly SAND to dense SAND	130	6.0	48	30	45	95	48	-	-	5	1.000	1.30	16
1.97	154.6	247.9	247.9	154.6	0.7	3.0	0.5	6	clean SAND to silty SAND	125	5.0	50	31	39	95	48	-	-	5	0.350	1.39	16
2.13	128.6	206.3	206.3	128.7	0.8	1.3	0.6	6	clean SAND to silty SAND	125	5.0	41	26	34	91	48	-	-	5	0.350	1.53	16
2.30	132.9	213.1	213.1	132.9	0.9	1.4	0.7	6	clean SAND to silty SAND	125	5.0	43	27	36	92	48	-	-	5	0.350	1.56	16
2.46	152.2	244.1	244.1	152.2	1.1	2.0	0.7	6	clean SAND to silty SAND	125	5.0	49	30	40	95	48	-	-	5	0.350	1.52	16
2.62	168.4	270.1	270.1	168.4	1.1	2.3	0.7	6	clean SAND to silty SAND	125	5.0	54	34	44	95	48	-	-	5	0.350	1.48	16
2.79	170.5	273.5	275.0	170.6	2.0	2.7	1.2	6	clean SAND to silty SAND	125	5.0	55	34	47	95	48	-	-	5	0.350	1.65	16
2.95	165.1	264.8	264.8	165.2	1.5	2.6	0.9	6	clean SAND to silty SAND	125	5.0	53	33	45	95	48	-	-	5	0.350	1.59	16
3.12	155.5	249.3	249.3	155.5	1.3	2.6	0.9	6	clean SAND to silty SAND	125	5.0	50	31	42	95	48	-	-	5	0.350	1.58	16
3.28	145.4	233.3	283.1	145.5	3.3	3.6	2.3	6	clean SAND to silty SAND	125	5.0	47	29	45	95	48	-	-	11	0.350	1.93	16
3.45	123.7	198.4	234.6	123.7	2.3	0.4	1.8	6	clean SAND to silty SAND	125	5.0	40	25	37	90	48	-	-	10	0.350	1.89	16
3.61	111.3	178.6	215.2	111.3	2.0	-0.2	1.8	6	clean SAND to silty SAND	125	5.0	36	22	34	86	48	-	-	11	0.350	1.92	16
3.77	44.6	71.5	164.7	44.6	1.6	-0.4	3.5	4	clayy SILT to silty CLAY	115	2.0	36	22	17	-	-	3.1	9.9	26	0.070	2.40	15
3.94	41.6	66.7	115.8	41.6	0.8	0.0	1.9	5	silty SAND to sandy SILT	120	3.0	22	14	14	54	43	-	-	20	0.200	2.23	16
4.10	36.7	58.9	106.8	36.7	0.7	0.2	1.8	5	silty SAND to sandy SILT	120	3.0	20	12	13	50	42	-	-	21	0.200	2.26	16
4.27	31.9	51.1	98.2	31.9	0.6	0.3	1.7	5	silty SAND to sandy SILT	120	3.0	17	11	11	45	41	-	-	22	0.200	2.29	16
4.43	25.4	40.7	83.5	25.4	0.4	0.2	1.5	5	silty SAND to sandy SILT	120	3.0	14	8	9	37	40	-	-	24	0.200	2.33	16
4.59	21.1	33.8	77.5	21.1	0.3	0.0	1.5	5	silty SAND to sandy SILT	120	3.0	11	7	8	31	39	-	-	26	0.200	2.39	16
4.76	18.9	30.2	68.5	18.9	0.2	0.0	1.2	5	silty SAND to sandy SILT	120	3.0	10	6	7	28	38	-	-	26	0.200	2.39	16
4.92	17.6	28.2	66.4	17.6	0.2	-0.1	1.2	5	silty SAND to sandy SILT	120	3.0	9	6	7	25	37	-	-	27	0.200	2.41	16
5.09	16.4	26.4	69.4	16.4	0.2	-0.3	1.4	5	silty SAND to sandy SILT	120	3.0	9	5	6	23	37	-	-	29	0.200	2.47	16
5.25	14.5	23.2	69.4	14.5	0.2	-0.6	1.6	4	clayy SILT to silty CLAY	115	2.0	12	7	6	-	-	1.0	9.9	33	0.070	2.54	15
5.41	13.0	20.8	-	13.0	0.2	-0.7	1.8	4	clayy SILT to silty CLAY	115	2.0	10	6	5	-	-	0.9	9.9	36	0.070	2.61	15
5.58	11.6	18.5	-	11.5	0.3	-0.8	2.2	4	clayy SILT to silty CLAY	115	2.0	9	6	5	-	-	0.8	9.9	41	0.070	2.72	15
5.74	10.3	16.5	-	10.3	0.2	-0.8	2.3	4	clayy SILT to silty CLAY	115	2.0	8	5	5	-	-	0.7	9.3	44	0.070	2.77	15
5.91	10.1	16.2	-	10.1	0.2	-0.6	2.1	4	clayy SILT to silty CLAY	115	2.0	8	5	4	-	-	0.7	8.9	43	0.070	2.75	15
6.07	9.0	14.4	-	9.0	0.2	0.1	1.8	4	clayy SILT to silty CLAY	115	2.0	7	5	4	-	-	0.6	7.7	44	0.070	2.76	15
6.23	8.2	13.1	-	8.1	0.1	-0.2	1.4	4	clayy SILT to silty CLAY	115	2.0	7	4	4	-	-	0.5	6.7	42	0.070	2.74	15
6.40	8.5	13.6	-	8.5	0.1	-0.4	1.4	4	clayy SILT to silty CLAY	115	2.0	7	4	4	-	-	0.6	6.8	42	0.070	2.73	15
6.56	9.5	15.3	-	9.5	0.1	-0.5	1.4	4	clayy SILT to silty CLAY	115	2.0	8	5	4	-	-	0.6	7.5	39	0.070	2.68	15
6.73	10.3	16.5	-	10.3	0.1	-0.6	1.4	4	clayy SILT to silty CLAY	115	2.0	8	5	4	-	-	0.7	8.0	38	0.070	2.64	15
6.89	12.7	19.1	57.5	12.7	0.1	-0.6	1.1	5	silty SAND to sandy SILT	120	3.0	6	4	5	12	33	-	-	33	0.200	2.54	16
7.05	15.1	22.3	59.6	15.0	0.2	-0.5	1.1	5	silty SAND to sandy SILT	120	3.0	7	5	5	17	34	-	-	30	0.200	2.48	16
7.22	13.6	20.0	59.5	13.6	0.2	-0.6	1.2	5	silty SAND to sandy SILT	120	3.0	7	5	5	14	34	-	-	33	0.200	2.54	16
7.38	12.4	18.0	59.0	12.4	0.2	-0.7	1.3	4	clayy SILT to silty CLAY	115	2.0	9	6	5	-	-	0.8	8.8	35	0.070	2.59	15
7.55	12.7	18.2	56.4	12.7	0.1	-0.6	1.1	5	silty SAND to sandy SILT	120	3.0	6	4	5	11	33	-	-	33	0.200	2.56	16
7.71	15.3	21.7	56.0	15.3	0.1	-0.7	1.0	5	silty SAND to sandy SILT	120	3.0	7	5	5	17	34	-	-	29	0.200	2.46	16
7.87	16.6	23.3	60.1	16.6	0.2	-0.7	1.1	5	silty SAND to sandy SILT	120	3.0	8	6	6	19	34	-	-	29	0.200	2.46	16
8.04	22.3	30.9	62.5	22.2	0.2	-0.8	0.9	5	silty SAND to sandy SILT	120	3.0	10	7	7	28	36	-	-	23	0.200	2.32	16
8.20	30.1	41.4	65.6	30.1	0.2	-0.7	0.8	5	silty SAND to sandy SILT	120	3.0	14	10	9	38	38	-	-	18	0.200	2.16	16
8.37	32.6	44.4	65.6	32.6	0.2	-0.7	0.7	5	silty SAND to sandy SILT	120	3.0	15	11	9	40	38	-	-	16	0.200	2.11	16
8.53	30.8	41.6	63.3	30.8	0.2	-0.7	0.7	5	silty SAND to sandy SILT	120	3.0	14	10	9	38	38	-	-	17	0.200	2.14	16
8.69	28.0	37.5	62.4	28.0	0.2	-0.7	0.8	5	silty SAND to sandy SILT	120	3.0	12	9	8	35	37	-	-	19	0.200	2.20	16
8.86	27.9	36.9	65.2	27.9	0.2	-0.7	0.9	5	silty SAND to sandy SILT	120	3.0	12	9	8	34	37	-	-	20	0.200	2.24	16
9.02	28.2	37.0	67.2	28.1	0.3	-0.7	1.0	5	silty SAND to sandy SILT	120	3.0	12	9	8	34	37	-	-	21	0.200	2.26	16
9.19	29.6	38.6	69.4	29.6	0.3	-0.7	1.0	5	silty SAND to sandy SILT	120	3.0	13	10	8	36	37	-	-	21	0.200	2.25	16
9.35	34.0	43.9	73.3	34.0	0.3	-0.7	1.0	5	silty SAND to sandy SILT	120	3.0	15	11	9	40	38	-	-	19	0.200	2.20	16
9.51	41.0	52.4	77.0	41.0	0.4	-0.6	0.9	5	silty SAND to sandy SILT	120	3.0	17	14	11	46	39	-	-	16	0.200	2.11	16
9.68	47.9	60.8	82.6	47.9	0.4	-0.5	0.8	6	clean SAND to silty SAND	125	5.0	12	10	12	51	39	-	-	14	0.350	2.04	16
9.84	52.8	66.4	86.0	52.8	0.4	-0.5	0.8	6	clean SAND to silty SAND	125	5.0	13	11	13	54	40	-	-	13	0.350	2.00	16
10.01	51.3	63.9	84.2	51.2	0.4	-0.5	0.8	6	clean SAND to silty SAND	125	5.0	13	10	13	52	40	-	-	13	0.350	2.01	16
10.17	45.4	56.1	80.6	45.4	0.4	-0.6	0.9	5	silty SAND to sandy SILT	120	3.0	19	15	11	48	39	-	-	16	0.200	2.09	16
10.34	40.0	49.1	79.4	40.0	0.4	-0.6	1.1	5	silty SAND to sandy SILT	120	3.0	16	13	10	44	38	-	-	18	0.200	2.18	16
10.50	36.6	44.6	82.0	36.6	0.5	-0.7	1.3	5	silty SAND to sandy SILT	120	3.0	15	12	10	40	37	-	-	21	0.200	2.26	16
10.66	36.2	43.8	84.5	36.2	0.5	-0.6	1.4	5	silty SAND to sandy SILT	120	3.0	15	12	10	40	37	-	-	22	0.200	2.29	16
10.83	36.3	43.5	84.9	36.3	0.5	-0.6	1.5	5	silty SAND to sandy SILT	120	3.0	14	12	10	40	37	-	-	23	0.200	2.30	16
10.99	35.2	41.9	83.9	35.2	0.5	-0.7	1.5	5	silty SAND to sandy SILT	120	3.0	14	12	9	38	37	-	-	23	0.200	2.32	16
11.16	35.4	41.8	85.7	35.4	0.5	-0.6	1.5	5	silty SAND to sandy SILT	120	3.0	14	12	9	38	37	-	-	24	0.200	2.33	16
11.32	38.6	45.3	82.2	38.6	0.5	-0.5	1.3	5	silty SAND to sandy SILT	120	3.0	15	13	10	41	37	-	-	21	0.200	2.26	16
11.48	40.4	47.1	82.1	40.4	0.5	-0.5	1.2	5	silty SAND to sandy SILT	120	3.0	16	13	10	42	37	-	-	20	0.200	2.23	16
11.65	40.0	46.3	80.0	40.0	0.5	-0.6	1.2	5	silty SAND to sandy SILT	120	3.0	15	13	10	42	37	-	-	20	0.200	2.22	16
11.81	40.6	46.6	83.5	40.6	0.5	-0.4	1.3	5	silty SAND to sandy SILT	120	3.0	16	14	10	42	37	-	-	21	0.200	2.25	16
11.98	42.2	48.1	87.0	42.2	0.6	-0.4	1.4	5	silty SAND to sandy SILT	120	3.0	16	14	10	43	37	-	-	21	0.200	2.25	16
12.14	46.2	52.3	89.0	46.2	0.6	-0.4	1.3	5	silty SAND to sandy SILT	120	3.0	17	15	11	46	38	-	-	19	0.200	2.21	16
12.30	49.9	56.1	87.0	49.9	0.6	-0.4	1.1	5	silty SAND to sandy SILT	120	3.0	19	17	12	48	38	-	-	17	0.200	2.15	16
12.47	48.7	54.4	80.6	48.7	0.5	-0.4	1.0	5	silty SAND to sandy SILT	120	3.0	18	16	11	47	38	-	-	16	0.200	2.11	16
12.63	48.2	53.6	78.5	48.2	0.4	-0.4	0.9	5	silty SAND to sandy SILT	120	3.0	18	16	11	46	38	-	-	16	0.200	2.11	16
12.80	47.7	52.7	77.8	47.7	0.4	-0.4	0.9	5	silty SAND to sandy SILT	120	3.0	18	16	11	46	38	-	-	16	0.200	2.11	16
12.96	45.9	50.4	77.5	45.9	0.4	-0.4	1.0	5	silty SAND to sandy SILT	120	3.0	17	15	10	44	38	-	-	17	0.200	2.14	16
13.12	44.5	48.4	76.4	44.4	0.4	-0.4	1.0	5	silty SAND to sandy SILT	120	3.0	16	15	10	43	37	-	-	18	0.200	2.16	16
13.29	42.3	45.8	73.7	42.3	0.4	-0.4	0.9	5	silty SAND to sandy SILT	120	3.0	15	14	10	41	37	-	-	18	0.200	2.18	16
13.45	40.2	43.3	70.7	40.2	0.4	-0.4	0.9	5	silty SAND to sandy SILT	120	3.0	14	13	9	39	37	-	-	19	0.200	2.19	16
13.62	38.1	40.8	65.4	38.1	0.3	-0.5	0.8	5	silty SAND to sandy SILT	120	3.0	14	13	9	37	36	-	-	18	0.200	2.17	16
13.78	34.0	36.2	59.6	34.0	0.2	-0.5	0.7	5	silty SAND to sandy SILT	120	3.0	12	11	8	33	35	-	-	19	0.200	2.19	16
13.94	28.7	30.3	56.0	28.7	0.2	-0.6	0.7	5	silty SAND to sandy SILT	120	3.0	10	10	7	28	34	-	-	21	0.200	2.27	16
14.11	26.1	27.4	57.3	26.1	0.2	-0.6	0.8	5	silty SAND to sandy SILT	120	3.0	9	9	6	24	34	-	-	24	0.200	2.34	16
14.27	26.7	27.9	56.8	26.7	0.2	-0.6	0.8	5	silty SAND to sandy SILT	120	3.0	9	9	6	25	34	-	-	24	0.200	2.33	16
14.44	25.1	26.1	54.5	25.1	0.2	-0.6	0.8	5	silty SAND to sandy SILT	120	3.0	9	8	6	23	33	-	-	24	0.200	2.34	16
14.60	22.5	23.3	48.7	22.5	0.1	-0.6	0.6	5	silty SAND to sandy SILT	120	3.0	8	8	5	19	32	-	-	24	0.200	2.34	16
14.76	20.8	21.4	48.0	20.8	0.1	-0.6	0.6	5	silty SAND to sandy SILT	120	3.0	7	7	5	16	32	-	-	26	0.200	2.38	16
14.93	19.0	19.4	49.5	19.0	0.1	-0.7	0.7	5	silty SAND to sandy SILT	120	3.0	6	6	5	13	31	-	-	29	0.200	2.45	16
15.09	15.0	15.3	45.5	15.0	0.1	-0.8	0.7	5	silty SAND to sandy SILT	120	3.0	5	5	4	5	29	-	-	32	0.200	2.54	16
15.26	16.2	16.4	44.1	16.1	0.1	-0.8	0.6	5	silty SAND to sandy SILT	120	3.0	5	5	4	7	30	-	-	30	0.200	2.48	16
15.42	18.4	18.7	47.3	18.4	0.1	-0.7	0.7	5	silty SAND to sandy SILT	120	3.0	6	6	4	12	31	-	-	29	0.200	2.45	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Santa Cruz Multi-Family Housing

Project ID: Salem Engineering
Data File: SDF(813).cpt
CPT Date: 4/3/2024 11:10:45 AM
GW During Test: 15 ft

Sounding ID: CPT-01
Project No: 5-224-0090
Cone/Rig: DDG1627

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rato %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	* SPT R-N1 60%	SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
15.58	17.7	17.9	43.7	17.7	0.1	-0.9	0.5	5	silty SAND to sandy SILT	120	3.0	6	6	4	10	30	-	-	28	0.200	2.43	16
15.75	16.5	16.6	42.7	16.4	0.1	-0.9	0.5	5	silty SAND to sandy SILT	120	3.0	6	5	4	8	30	-	-	29	0.200	2.46	16
15.91	14.0	14.1	42.7	14.0	0.1	-1.0	0.6	5	silty SAND to sandy SILT	120	3.0	5	5	4	5	29	-	-	33	0.200	2.55	16
16.08	11.3	12.1	-	11.3	0.1	-1.0	1.1	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.7	3.6	42	0.070	2.73	15
16.24	9.7	10.3	-	9.7	0.1	-0.9	0.8	4	clayy SILT to silty CLAY	115	2.0	5	5	3	-	-	0.6	3.1	43	0.070	2.74	15
16.40	7.8	8.3	-	7.8	0.1	-0.9	1.1	4	clayy SILT to silty CLAY	115	2.0	4	4	2	-	-	0.5	2.4	52	0.070	2.89	15
16.57	6.1	6.4	-	6.1	0.0	-0.9	0.8	4	clayy SILT to silty CLAY	115	2.0	3	3	2	-	-	0.4	1.8	55	0.070	2.95	15
16.73	5.8	6.0	-	5.7	0.0	-1.0	0.9	3	silty CLAY to CLAY	115	1.5	4	4	2	-	-	0.3	1.6	59	0.005	3.00	15
16.90	4.2	4.4	-	4.2	0.0	-0.9	0.8	1	sensitive fine SOIL	115	2.0	2	2	2	-	-	0.2	1.1	69	0.005	3.15	15
17.06	3.3	3.4	-	3.3	0.0	-0.9	1.6	3	silty CLAY to CLAY	115	1.5	2	2	1	-	-	0.2	0.8	91	0.005	3.41	15
17.23	2.7	2.8	-	2.6	0.0	-0.8	1.6	3	silty CLAY to CLAY	115	1.5	2	2	1	-	-	0.1	0.6	95	0.005	3.54	15
17.39	2.5	2.6	-	2.5	0.0	-0.7	1.7	3	silty CLAY to CLAY	115	1.5	2	2	1	-	-	0.1	0.5	95	0.005	3.59	15
17.55	2.3	2.4	-	2.3	0.0	-0.5	2.3	3	silty CLAY to CLAY	115	1.5	2	2	1	-	-	0.1	0.4	95	0.005	3.70	15
17.72	2.8	2.8	-	2.8	0.1	-0.5	3.2	3	silty CLAY to CLAY	115	1.5	2	2	2	-	-	0.1	0.6	95	0.005	3.66	15
17.88	2.8	2.8	-	2.8	0.1	-0.4	4.3	2	Organic SOILS - Peats	100	1.0	3	3	2	-	-	0.2	0.6	95	0.100	3.73	10
18.05	3.1	3.1	-	3.1	0.1	-0.2	3.5	3	silty CLAY to CLAY	115	1.5	2	2	2	-	-	0.1	0.7	95	0.005	3.62	15
18.21	6.3	6.3	-	6.3	0.1	0.3	1.2	3	silty CLAY to CLAY	115	1.5	4	4	2	-	-	0.4	1.7	61	0.005	3.04	15
18.37	1.2	1.2	-	1.2	0.0	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	1	-	-	0.0	0.1	95	0.100	5.15	10
18.54	1.4	1.4	-	1.4	0.0	0.0	8.3	2	Organic SOILS - Peats	100	1.0	1	1	12	-	-	0.0	0.1	95	0.100	4.54	10
18.70	1.3	1.3	-	1.3	0.0	0.1	9.9	2	Organic SOILS - Peats	100	1.0	1	1	1	-	-	0.0	0.1	95	0.100	4.76	10
18.87	1.2	1.2	-	1.2	0.0	0.3	9.9	2	Organic SOILS - Peats	100	1.0	1	1	1	-	-	0.0	0.1	95	0.100	5.03	10
19.03	2.3	2.3	-	2.3	0.0	0.4	3.6	2	Organic SOILS - Peats	100	1.0	2	2	2	-	-	0.1	0.4	95	0.100	3.84	10
19.19	4.9	4.8	-	4.9	0.1	0.6	1.6	3	silty CLAY to CLAY	115	1.5	3	3	2	-	-	0.3	1.2	75	0.005	3.23	15
19.36	7.8	7.7	-	7.8	0.1	0.8	1.5	3	silty CLAY to CLAY	115	1.5	5	5	2	-	-	0.5	2.2	58	0.005	3.00	15
19.52	10.7	10.5	-	10.7	0.1	0.9	1.5	4	clayy SILT to silty CLAY	115	2.0	5	5	3	-	-	0.7	3.1	49	0.070	2.86	15
19.69	11.9	11.7	-	12.0	0.2	1.0	1.5	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.8	3.5	47	0.070	2.82	15
19.85	10.0	9.7	-	10.0	0.2	1.2	2.1	3	silty CLAY to CLAY	115	1.5	6	7	3	-	-	0.6	2.8	56	0.005	2.97	15
20.01	13.8	13.3	-	13.8	0.2	1.8	1.3	4	clayy SILT to silty CLAY	115	2.0	7	7	4	-	-	0.9	4.0	42	0.070	2.73	15
20.18	15.1	14.5	-	15.1	0.1	1.6	0.9	4	clayy SILT to silty CLAY	115	2.0	7	8	4	-	-	1.0	4.4	36	0.070	2.61	15
20.34	11.6	11.2	-	11.7	0.2	2.1	1.8	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.7	3.3	51	0.070	2.88	15
20.51	13.4	12.8	-	13.5	0.3	2.2	2.5	3	silty CLAY to CLAY	115	1.5	9	9	4	-	-	0.9	3.9	52	0.005	2.89	15
20.67	26.5	25.2	-	26.5	1.3	2.2	5.0	3	silty CLAY to CLAY	115	1.5	17	18	7	-	-	1.8	7.9	48	0.005	2.84	15
20.83	56.9	53.8	103.3	56.9	1.0	2.5	1.8	5	silty SAND to sandy SILT	120	3.0	18	19	12	47	37	-	-	22	0.200	2.29	16
21.00	122.8	115.9	147.7	122.8	1.8	2.4	1.5	6	clean SAND to silty SAND	125	5.0	23	25	23	72	41	-	-	12	0.350	1.98	16
21.16	151.8	143.0	163.3	151.9	1.8	2.2	1.2	6	clean SAND to silty SAND	125	5.0	29	30	27	79	42	-	-	9	0.350	1.85	16
21.33	172.6	162.2	163.2	172.6	1.2	1.1	0.7	6	clean SAND to silty SAND	125	5.0	32	35	28	83	43	-	-	5	0.350	1.65	16
21.49	144.7	135.6	135.6	144.7	0.7	1.5	0.5	6	clean SAND to silty SAND	125	5.0	27	29	23	77	42	-	-	5	0.350	1.63	16
21.65	131.8	123.3	123.3	131.9	0.6	2.8	0.5	6	clean SAND to silty SAND	125	5.0	25	26	21	74	42	-	-	5	0.350	1.64	16
21.82	132.1	123.2	141.2	132.2	1.3	2.6	1.0	6	clean SAND to silty SAND	125	5.0	25	26	23	74	42	-	-	9	0.350	1.85	16
21.98	144.0	134.1	147.1	144.1	1.3	2.6	0.9	6	clean SAND to silty SAND	125	5.0	27	29	24	77	42	-	-	8	0.350	1.79	16
22.15	157.1	145.8	158.4	157.1	1.5	2.1	0.9	6	clean SAND to silty SAND	125	5.0	29	31	26	79	42	-	-	8	0.350	1.77	16
22.31	143.0	132.5	145.6	143.0	1.3	2.2	0.9	6	clean SAND to silty SAND	125	5.0	26	29	24	76	42	-	-	8	0.350	1.79	16
22.47	152.0	140.5	140.5	152.1	0.6	1.8	0.4	6	clean SAND to silty SAND	125	5.0	28	30	24	78	42	-	-	5	0.350	1.55	16
22.64	148.7	137.1	137.1	148.7	0.6	2.8	0.4	6	clean SAND to silty SAND	125	5.0	27	30	23	77	42	-	-	5	0.350	1.56	16
22.80	151.6	139.4	173.4	151.6	2.4	2.6	1.6	6	clean SAND to silty SAND	125	5.0	28	30	27	78	42	-	-	12	0.350	1.95	16
22.97	157.5	144.6	170.9	157.6	2.2	3.2	1.4	6	clean SAND to silty SAND	125	5.0	29	32	27	79	42	-	-	10	0.350	1.89	16
23.13	165.7	151.8	171.5	165.8	2.0	3.4	1.2	6	clean SAND to silty SAND	125	5.0	30	33	28	81	43	-	-	9	0.350	1.83	16
23.30	214.0	195.5	195.5	214.0	1.3	3.4	0.6	6	clean SAND to silty SAND	125	5.0	39	43	33	89	44	-	-	5	0.350	1.56	16
23.46	201.3	183.5	183.5	201.4	1.2	2.3	0.6	6	clean SAND to silty SAND	125	5.0	37	40	31	87	43	-	-	5	0.350	1.58	16
23.62	174.3	158.6	158.6	174.4	0.8	2.5	0.5	6	clean SAND to silty SAND	125	5.0	32	35	27	82	43	-	-	5	0.350	1.56	16
23.79	153.9	139.7	139.7	153.9	0.3	1.9	0.2	6	clean SAND to silty SAND	125	5.0	28	31	23	78	42	-	-	5	0.350	1.43	16
23.95	142.8	129.3	129.3	142.8	0.4	-2.9	0.3	6	clean SAND to silty SAND	125	5.0	26	29	21	75	42	-	-	5	0.350	1.53	16
24.12	136.9	123.7	123.7	136.8	0.5	-2.4	0.3	6	clean SAND to silty SAND	125	5.0	25	27	21	74	41	-	-	5	0.350	1.57	16
24.28	134.0	120.8	120.8	133.9	0.6	-2.0	0.5	6	clean SAND to silty SAND	125	5.0	24	27	21	73	41	-	-	5	0.350	1.65	16
24.44	132.5	119.2	119.6	132.5	0.6	-1.6	0.5	6	clean SAND to silty SAND	125	5.0	24	26	21	73	41	-	-	5	0.350	1.65	16
24.61	131.6	118.1	118.9	131.6	0.6	-1.3	0.5	6	clean SAND to silty SAND	125	5.0	24	26	20	73	41	-	-	5	0.350	1.65	16
24.77	133.6	119.6	134.8	133.6	1.2	-0.4	0.9	6	clean SAND to silty SAND	125	5.0	24	27	22	73	41	-	-	9	0.350	1.83	16
24.94	131.6	117.6	140.9	131.6	1.5	-1.7	1.2	6	clean SAND to silty SAND	125	5.0	24	26	22	72	41	-	-	11	0.350	1.91	16
25.10	137.3	122.4	152.1	137.2	1.9	-2.7	1.4	6	clean SAND to silty SAND	125	5.0	24	27	24	74	41	-	-	12	0.350	1.95	16
25.26	142.4	126.7	150.4	142.3	1.7	-5.8	1.2	6	clean SAND to silty SAND	125	5.0	25	28	24	75	41	-	-	10	0.350	1.90	16
25.43	150.1	133.3	144.0	150.0	1.2	-4.9	0.8	6	clean SAND to silty SAND	125	5.0	27	30	24	76	42	-	-	7	0.350	1.76	16
25.59	174.9	154.9	154.9	174.8	0.8	-3.7	0.5	6	clean SAND to silty SAND	125	5.0	31	35	26	81	42	-	-	5	0.350	1.56	16
25.76	185.2	163.7	163.7	185.1	0.9	-3.2	0.5	6	clean SAND to silty SAND	125	5.0	33	37	27	83	43	-	-	5	0.350	1.54	16
25.92	184.6	162.8	162.8	184.5	0.8	-2.6	0.5	6	clean SAND to silty SAND	125	5.0	33	37	27	83	43	-	-	5	0.350	1.54	16
26.08	180.5	158.9	158.9	180.4	0.7	-2.8	0.4	6	clean SAND to silty SAND	125	5.0	32	36	26	82	43	-	-	5	0.350	1.51	16
26.25	167.5	147.1	147.1	167.5	0.7	-2.3	0.4	6	clean SAND to silty SAND	125	5.0	29	34	25	80	42	-	-	5	0.350	1.56	16
26.41	160.5	140.7	140.7	160.4	0.8	-2.3	0.5	6	clean SAND to silty SAND	125	5.0	28	32	24	78	42	-	-	5	0.350	1.61	16
26.58	158.7	138.9	138.9	158.7	0.5	-1.8	0.3	6	clean SAND to silty SAND	125	5.0	28	32	23	78	42	-	-	5	0.350	1.53	16
26.74	165.7	144.6	144.6	165.6	0.6	-1.7	0.4	6	clean SAND to silty SAND	125	5.0	29	33	24	79	42	-	-	5	0.350	1.53	16
26.90	176.4	153.6	153.6	176.3	0.7	-1.3	0.4	6	clean SAND to silty SAND	125	5.0	31	35	25	81	42	-	-	5	0.350	1.52	16
27.07	184.9	160.8	160.8	184.9	0.7	-1.1	0.4	6	clean SAND to silty SAND	125	5.0	32	37	26	83	43	-	-	5	0.350	1.49	16
27.23	188.0	163.1	163.1	187.9	0.8	-1.4	0.4	6	clean SAND to silty SAND	125	5.0	33	38	27	83	43	-	-	5	0.350	1.53	16
27.40	188.4	163.2	163.2	188.4	1.0	-1.2	0.5	6	clean SAND to silty SAND	125	5.0	33	38	28	83	43	-	-	5	0.350	1.57	16
27.56	187.5	162.0	162.0	187.5	1.1	-0.8	0.6	6	clean SAND to silty SAND	125	5.0	32	38	28	83	43	-	-	5	0.350	1.61	16
27.72	178.9	154.3	153.7	178.9	1.1	0.4	0.6	6	clean SAND to silty SAND	125	5.0	31	36	27	81	42	-	-	5	0.350	1.64	16
27.89	162.8	140.1	142.7	162.8	1.0	1.2	0.6	6	clean SAND to silty SAND	125	5.0	28	33	24	78	42	-	-	6	0.350	1.67	16
28.05	155.4	133.5	138.1	155.4	1.0	1.2	0.6	6	clean SAND to silty SAND	125	5.0	27	31	23	77	42	-	-	6	0.350	1.69	16
28.22	145.5	124.7	131.2	145.5	0.9	1.3	0.6	6	clean SAND to silty SAND	125	5.0	25	29	22	74	41	-	-	7	0.350	1.72	16
28.38	141.0	120.6	127.4	141.0	0.9	1.4	0.6	6	clean SAND to silty SAND	125	5.0	24	28	21	73	41	-	-	7	0.350	1.73	16
28.54	139.4	119.0	125.5	139.4	0.8	1.5	0.6	6	clean SAND to silty SAND	125	5.0	24	28	21	73	41	-	-	7	0.350	1.72	16
28.71	131.8	112.3	119.3	131.8	0.8	1.4	0.6	6	clean SAND to silty SAND	125	5.0	22	26	20	71	41	-	-	7	0.350	1.74	16
28.87	125.9	107.0	113.6	125.9	0.7	1.4	0.5	6	clean SAND to silty SAND	125	5.0	21	25	19	69	40	-	-	7	0.350	1.73	16
29.04	123.4	104.7	109.2	123.4	0.6	1.4	0.5	6	clean SAND to silty SAND	125	5.0	21	25	18	69	40	-	-	6	0.350	1.71	16
29.20	124.7	105.6	109.3	124.7	0.6	1.6	0.5	6	clean SAND to silty SAND	125	5.0	21	25	19	69	40	-	-	6	0.350	1.70	16
29.36	127.9	108.1	112.4	127.9	0.6	2.0	0.5	6	clean SAND to silty SAND	125	5.0	22	26	19	70	40	-	-	6	0.350	1.70	16
29.53	127.8	107.8	112.4	127.9	0.6	2.3	0.5	6	clean SAND to silty SAND	125	5.0	22	26	19	69	40	-	-	6	0.350	1.71	16
29.69	130.3	109.7	113.1	130.4	0.6	2.5	0.5	6	clean SAND to silty SAND	125	5.0	22	26	19	70	40	-	-	6	0.350	1.69	16
29.86	139.5	117.2	118.1	139.6	0.6	2.7	0.4	6	clean SAND to silty SAND	125	5.0	23	28	20	72	41	-	-	5	0.350	1.66	16
30.02	147.8	124.0	124.0	147.8	0.6	3.0	0.4	6	clean SAND to silty SAND	125	5.0	25	30	21	74	41	-	-	5	0.350	1.63	16
30.19	150.5	126.0	125.9	150.5	0.7	3.1	0.5	6	clean SAND to silty SAND	125	5.0	25	30	22	75	41	-	-	5	0.350	1.65	16
30.35	150.1	125.4	127.2	150.1	0.8	3.5	0.5	6	clean SAND to silty SAND	125	5.0	25	30	22	74	41	-	-	5	0.350	1.67	16
30.51	148.7	124.0	128.3	148.8	0.8	3.9	0.6	6	clean SAND to silty SAND	125	5.0	25	30	22	74	41	-	-	6	0.350	1.69	16
30.68	145.8	121.4	127.2	145.9	0.9	3.6	0.6	6	clean SAND to silty SAND	125	5.0	24	29	21	73	41	-	-	6	0.350	1.71	16
30.84	133.7	111.1	117.5	133.8	0.7	3.6	0.6	6	clean SAND to silty SAND	125	5.0	22	27	20	70	40	-	-	7	0.350	1.73	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Salem Engineering
Data File: SDF(813).cpt
CPT Date: 4/3/2024 11:10:45 AM
GW During Test: 15 ft

Sounding ID: CPT-01
Project No: 5-224-0090
Cone/Rig: DDG1627

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. Depth ft	qc PS tsf	qc1n PS -	q1ncs PS -	qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rato %	Mat Typ Zon	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N1 60%	SPT R-N 60%	SPT IcN1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR - -	Fin Ic %	D50 - mm	Ic SBT Indx	Nk - -
31.01	119.0	98.7	107.1	119.1	0.7	3.3	0.6	6	clean SAND to silty SAND	125	5.0	20	24	18	67	40	-	-	7	0.350	1.77	16
31.17	112.2	92.9	101.6	112.2	0.6	3.1	0.5	6	clean SAND to silty SAND	125	5.0	19	22	17	65	39	-	-	8	0.350	1.78	16
31.33	114.5	94.6	101.0	114.5	0.5	2.8	0.5	6	clean SAND to silty SAND	125	5.0	19	23	17	65	39	-	-	7	0.350	1.74	16
31.50	122.8	101.2	103.6	122.8	0.5	1.0	0.4	6	clean SAND to silty SAND	125	5.0	20	25	18	67	40	-	-	6	0.350	1.68	16
31.66	128.2	105.6	106.6	128.2	0.5	-1.1	0.4	6	clean SAND to silty SAND	125	5.0	21	26	18	69	40	-	-	5	0.350	1.66	16
31.83	118.9	97.7	102.4	118.8	0.5	-2.1	0.4	6	clean SAND to silty SAND	125	5.0	20	24	17	66	40	-	-	6	0.350	1.72	16
31.99	107.4	88.1	95.7	107.4	0.5	-1.8	0.5	6	clean SAND to silty SAND	125	5.0	18	21	16	63	39	-	-	8	0.350	1.77	16
32.15	99.4	81.4	90.4	99.4	0.5	-1.5	0.5	6	clean SAND to silty SAND	125	5.0	16	20	15	60	39	-	-	8	0.350	1.81	16
32.32	92.9	75.9	85.9	92.9	0.4	-1.4	0.5	6	clean SAND to silty SAND	125	5.0	15	19	14	58	38	-	-	9	0.350	1.83	16
32.48	89.0	72.6	82.3	89.0	0.4	-1.1	0.4	6	clean SAND to silty SAND	125	5.0	15	18	13	56	38	-	-	9	0.350	1.83	16
32.65	86.7	70.6	79.6	86.7	0.3	-1.1	0.4	6	clean SAND to silty SAND	125	5.0	14	17	13	56	38	-	-	9	0.350	1.83	16
32.81	84.0	68.3	77.9	84.0	0.3	-1.6	0.4	6	clean SAND to silty SAND	125	5.0	14	17	13	54	38	-	-	9	0.350	1.84	16
32.97	78.2	63.4	76.8	78.1	0.4	-1.9	0.5	6	clean SAND to silty SAND	125	5.0	13	16	12	52	37	-	-	11	0.350	1.92	16
33.14	72.9	59.0	74.4	72.8	0.4	-1.9	0.6	6	clean SAND to silty SAND	125	5.0	12	15	11	50	37	-	-	12	0.350	1.97	16
33.30	71.7	58.0	76.0	71.7	0.5	-1.9	0.7	6	clean SAND to silty SAND	125	5.0	12	14	11	49	37	-	-	13	0.350	2.01	16
33.47	70.6	57.0	77.0	70.6	0.5	-1.8	0.7	6	clean SAND to silty SAND	125	5.0	11	14	11	48	36	-	-	14	0.350	2.04	16
33.63	65.8	53.0	76.2	65.8	0.5	-2.1	0.8	5	silty SAND to sandy SILT	120	3.0	18	22	11	46	36	-	-	16	0.200	2.09	16
33.79	63.4	51.0	80.2	63.3	0.6	-1.8	1.0	5	silty SAND to sandy SILT	120	3.0	17	21	11	45	36	-	-	18	0.200	2.16	16
33.96	64.5	51.8	85.8	64.4	0.7	-1.9	1.2	5	silty SAND to sandy SILT	120	3.0	17	21	11	45	36	-	-	19	0.200	2.20	16
34.12	66.6	53.4	117.6	66.6	1.5	-0.3	2.4	5	silty SAND to sandy SILT	120	3.0	18	22	12	46	36	-	-	25	0.200	2.37	16
34.29	73.2	58.6	114.7	73.2	1.5	-0.9	2.1	5	silty SAND to sandy SILT	120	3.0	20	24	13	49	37	-	-	23	0.200	2.30	16
34.45	81.4	65.0	112.2	81.3	1.4	-2.3	1.8	5	silty SAND to sandy SILT	120	3.0	22	27	14	53	37	-	-	20	0.200	2.22	16
34.61	71.4	57.0	105.0	71.4	1.2	-2.8	1.8	5	silty SAND to sandy SILT	120	3.0	19	24	12	48	36	-	-	21	0.200	2.27	16
34.78	73.5	58.6	106.0	73.5	1.2	-3.2	1.7	5	silty SAND to sandy SILT	120	3.0	20	25	13	49	37	-	-	21	0.200	2.25	16
34.94	84.5	67.2	98.1	84.4	1.0	-3.9	1.2	5	silty SAND to sandy SILT	120	3.0	22	28	14	54	37	-	-	16	0.200	2.10	16
35.11	101.0	80.2	110.4	100.9	1.2	-5.1	1.3	5	silty SAND to sandy SILT	120	3.0	27	34	16	60	38	-	-	14	0.200	2.05	16
35.27	114.2	90.5	110.8	114.1	1.1	-6.0	0.9	6	clean SAND to silty SAND	125	5.0	18	23	17	64	39	-	-	11	0.350	1.94	16
35.43	114.7	90.8	111.5	114.6	1.1	-5.8	1.0	6	clean SAND to silty SAND	125	5.0	18	23	17	64	39	-	-	11	0.350	1.94	16
35.60	109.3	86.4	104.8	109.2	0.9	-5.3	0.9	6	clean SAND to silty SAND	125	5.0	17	22	16	62	39	-	-	11	0.350	1.93	16
35.76	113.1	89.2	104.7	113.0	0.8	-4.8	0.8	6	clean SAND to silty SAND	125	5.0	18	23	17	63	39	-	-	10	0.350	1.88	16
35.93	111.5	87.8	103.2	111.4	0.8	-4.7	0.7	6	clean SAND to silty SAND	125	5.0	18	22	17	63	39	-	-	10	0.350	1.89	16
36.09	96.0	75.4	93.1	95.9	0.7	-4.6	0.8	6	clean SAND to silty SAND	125	5.0	15	19	15	58	38	-	-	11	0.350	1.94	16
36.26	81.0	63.5	85.8	80.9	0.7	-4.7	0.9	6	clean SAND to silty SAND	125	5.0	13	16	13	52	37	-	-	14	0.350	2.04	16
36.42	68.4	53.6	76.3	68.3	0.5	-4.7	0.8	5	silty SAND to sandy SILT	120	3.0	18	23	11	46	36	-	-	15	0.200	2.08	16
36.58	65.6	51.3	70.9	65.5	0.4	-4.7	0.7	6	clean SAND to silty SAND	125	5.0	10	13	10	45	36	-	-	15	0.350	2.06	16
36.75	63.5	49.6	68.8	63.5	0.4	-4.9	0.6	6	clean SAND to silty SAND	125	5.0	10	13	10	44	35	-	-	15	0.350	2.06	16
36.91	64.3	50.1	74.7	64.2	0.5	-5.0	0.8	5	silty SAND to sandy SILT	120	3.0	17	21	10	44	35	-	-	16	0.200	2.12	16
37.08	59.8	46.6	76.7	59.8	0.6	-3.0	1.0	5	silty SAND to sandy SILT	120	3.0	16	20	10	42	35	-	-	19	0.200	2.19	16
37.24	45.6	35.4	67.7	45.5	0.4	-3.0	1.0	5	silty SAND to sandy SILT	120	3.0	12	15	8	33	33	-	-	22	0.200	2.29	16
37.40	38.3	29.8	64.0	38.3	0.4	-2.9	1.0	5	silty SAND to sandy SILT	120	3.0	10	13	7	27	32	-	-	25	0.200	2.36	16
37.57	29.6	22.9	61.7	29.5	0.3	-3.1	1.1	5	silty SAND to sandy SILT	120	3.0	8	10	6	18	30	-	-	30	0.200	2.49	16
37.73	22.6	14.3	-	22.5	0.2	-2.7	1.1	4	clayy SILT to silty CLAY	115	2.0	7	11	4	-	-	1.5	4.3	39	0.070	2.67	15
37.90	17.4	11.0	-	17.4	0.4	-2.2	2.7	3	silty CLAY to CLAY	115	1.5	7	12	3	-	-	1.1	3.2	57	0.005	2.98	15
38.06	11.5	7.3	-	11.5	0.5	-1.0	5.1	3	silty CLAY to CLAY	115	1.5	5	8	3	-	-	0.7	1.9	83	0.005	3.32	15
38.22	17.9	11.3	-	17.9	0.4	1.0	2.8	3	silty CLAY to CLAY	115	1.5	8	12	4	-	-	1.2	3.2	57	0.005	2.98	15
38.39	39.3	30.3	64.3	39.3	0.4	-0.1	1.0	5	silty SAND to sandy SILT	120	3.0	10	13	7	28	32	-	-	24	0.200	2.35	16
38.55	48.1	37.0	71.8	48.1	0.5	-1.9	1.1	5	silty SAND to sandy SILT	120	3.0	12	16	8	34	33	-	-	22	0.200	2.30	16
38.72	46.0	35.3	84.4	45.9	0.7	-2.4	1.7	5	silty SAND to sandy SILT	120	3.0	12	15	8	33	33	-	-	27	0.200	2.42	16
38.88	37.7	23.5	-	37.6	0.7	-2.3	2.0	4	clayy SILT to silty CLAY	115	2.0	12	19	6	-	-	2.5	7.3	36	0.070	2.61	15
39.04	33.6	20.8	-	33.5	0.6	-2.0	2.0	4	clayy SILT to silty CLAY	115	2.0	10	17	5	-	-	2.3	6.4	38	0.070	2.66	15
39.21	35.5	22.0	-	35.5	0.6	-1.9	1.9	4	clayy SILT to silty CLAY	115	2.0	11	18	6	-	-	2.4	6.8	37	0.070	2.63	15
39.37	45.9	35.0	81.7	45.8	0.7	-2.4	1.5	5	silty SAND to sandy SILT	120	3.0	12	15	8	32	33	-	-	27	0.200	2.41	16
39.54	50.2	38.3	88.5	50.2	0.8	-2.8	1.7	5	silty SAND to sandy SILT	120	3.0	13	17	9	35	34	-	-	26	0.200	2.40	16
39.70	51.4	39.1	79.3	51.4	0.6	-3.2	1.3	5	silty SAND to sandy SILT	120	3.0	13	17	9	36	34	-	-	23	0.200	2.32	16
39.86	58.8	44.6	71.1	58.7	0.5	-3.4	0.9	5	silty SAND to sandy SILT	120	3.0	15	20	9	40	35	-	-	18	0.200	2.17	16
40.03	69.7	52.9	72.8	69.6	0.5	-3.6	0.7	6	clean SAND to silty SAND	125	5.0	11	14	11	46	36	-	-	14	0.350	2.05	16
40.19	75.6	57.3	78.3	75.6	0.6	-1.9	0.8	6	clean SAND to silty SAND	125	5.0	11	15	11	49	36	-	-	14	0.350	2.05	16
40.36	80.7	61.0	82.3	80.6	0.6	-2.7	0.8	6	clean SAND to silty SAND	125	5.0	12	16	12	51	36	-	-	14	0.350	2.04	16
40.52	91.2	68.9	81.0	91.1	0.4	-2.7	0.5	6	clean SAND to silty SAND	125	5.0	14	18	13	55	37	-	-	10	0.350	1.89	16
40.68	100.9	76.1	83.6	100.9	0.4	-3.8	0.4	6	clean SAND to silty SAND	125	5.0	15	20	14	58	38	-	-	8	0.350	1.79	16
40.85	109.0	82.1	89.0	108.9	0.4	-4.5	0.4	6	clean SAND to silty SAND	125	5.0	16	22	15	60	38	-	-	7	0.350	1.77	16
41.01	114.6	86.1	93.2	114.5	0.5	-4.2	0.4	6	clean SAND to silty SAND	125	5.0	17	23	16	62	38	-	-	7	0.350	1.77	16
41.18	117.1	87.9	96.1	117.0	0.6	-4.0	0.5	6	clean SAND to silty SAND	125	5.0	18	23	16	63	39	-	-	8	0.350	1.78	16
41.34	116.1	87.0	95.7	116.0	0.6	-3.7	0.5	6	clean SAND to silty SAND	125	5.0	17	23	16	62	38	-	-	8	0.350	1.79	16
41.50	120.6	90.2	98.1	120.5	0.6	-3.4	0.5	6	clean SAND to silty SAND	125	5.0	18	24	16	64	39	-	-	8	0.350	1.77	16
41.67	131.9	98.5	102.8	131.8	0.5	-3.0	0.4	6	clean SAND to silty SAND	125	5.0	20	26	17	67	39	-	-	6	0.350	1.71	16
41.83	139.1	103.8	104.6	139.1	0.5	-2.7	0.4	6	clean SAND to silty SAND	125	5.0	21	28	18	68	39	-	-	5	0.350	1.66	16
42.00	144.1	107.3	107.8	144.1	0.5	-2.4	0.4	6	clean SAND to silty SAND	125	5.0	21	29	19	69	40	-	-	5	0.350	1.65	16
42.16	138.1	102.7	106.0	138.1	0.6	-2.0	0.4	6	clean SAND to silty SAND	125	5.0	21	28	18	68	39	-	-	6	0.350	1.69	16
42.32	128.5	95.5	100.8	128.5	0.5	-1.7	0.4	6	clean SAND to silty SAND	125	5.0	19	26	17	65	39	-	-	7	0.350	1.73	16
42.49	120.6	89.5	95.8	120.6	0.5	-1.5	0.4	6	clean SAND to silty SAND	125	5.0	18	24	16	63	39	-	-	7	0.350	1.75	16
42.65	119.0	88.1	94.3	118.9	0.5	-1.2	0.4	6	clean SAND to silty SAND	125	5.0	18	24	16	63	38	-	-	7	0.350	1.75	16
42.82	120.7	89.2	94.3	120.7	0.5	-0.9	0.4	6	clean SAND to silty SAND	125	5.0	18	24	16	63	39	-	-	7	0.350	1.73	16
42.98	123.2	90.9	94.8	123.2	0.4	-0.6	0.4	6	clean SAND to silty SAND	125	5.0	18	25	16	64	39	-	-	6	0.350	1.71	16
43.15	127.5	94.0	97.4	127.5	0.5	-0.1	0.4	6	clean SAND to silty SAND	125	5.0	19	26	17	65	39	-	-	6	0.350	1.70	16
43.31	134.6	99.1	105.3	134.6	0.6	0.3	0.5	6	clean SAND to silty SAND	125	5.0	20	27	18	67	39	-	-	7	0.350	1.74	16
43.47	140.0	102.9	107.9	140.0	0.6	0.6	0.5	6	clean SAND to silty SAND	125	5.0	21	28	18	68	39	-	-	6	0.350	1.72	16
43.64	149.6	109.8	111.4	149.6	0.6	2.3	0.4	6	clean SAND to silty SAND	125	5.0	22	30	19	70	40	-	-	5	0.350	1.67	16
43.80	155.0	113.6	114.4	155.0	0.6	1.8	0.4	6	clean SAND to silty SAND	125	5.0	23	31	20	71	40	-	-	5	0.350	1.66	16
43.97	155.4	113.7	117.5	155.5	0.8	2.3	0.5	6	clean SAND to silty SAND	125	5.0	23	31	20	71	40	-	-	6	0.350	1.69	16
44.13	153.0	111.8	112.4	153.0	0.6	2.5	0.4	6	clean SAND to silty SAND	125	5.0	22	31	19	71	40	-	-	5	0.350	1.65	16
44.29	150.0	109.5	111.8	150.1	0.6	2.1	0.4	6	clean SAND to silty SAND	125	5.0	22	30	19	70	40	-	-	6	0.350	1.68	16
44.46	144.9	105.6	107.9	144.9	0.6	0.2	0.4	6	clean SAND to silty SAND	125	5.0	21	29	18	69	39	-	-	6	0.350	1.68	16
44.62	139.5	101.5	104.9	139.5	0.6	-0.1	0.4	6	clean SAND to silty SAND	125	5.0	20	28	18	67	39	-	-	6	0.350	1.69	16
44.79	130.3	94.6	105.1	130.3	0.8	0.2	0.6	6	clean SAND to silty SAND	125	5.0	19	26	17	65	39	-	-	8	0.350	1.81	16
44.95	128.8	93.4	101.1	128.8	0.6	-0.7	0.5	6	clean SAND to silty SAND	125	5.0	19	26	17	65	39	-	-	7	0.350	1.76	16
45.11	132.6	96.1	105.7	132.6	0.8	-0.5	0.6	6	clean SAND to silty SAND	125	5.0	19	27	17	66	39	-	-	8	0.350	1.79	16
45.28	129.1	93.4	102.9	129.1	0.7	0.0	0.6	6	clean SAND to silty SAND	125	5.0	19	26	17	65	39	-	-	8	0.350	1.79	16
45.44	137.2	99.1	107.2	137.2	0.7	-0.6	0.5	6	clean SAND to silty SAND	125	5.0	20	27	18	67	39	-	-	7	0.350	1.76	16
45.61	148.0	106.7	126.0	148.0	1.4	-2.0	1.0	6	clean SAND to silty SAND	125	5.0	21	30	20	69	39	-	-	10	0.350	1.89	16
45.77	173.5	125.0	135.5	173.5	1.3	-2.9	0.8	6	clean SAND to silty SAND	125	5.0	25	35	23	74	40	-	-	7	0.350	1.77	16
45.93	189.9	136.6	139.6	189.8	1.1	-5.0	0.6	6	clean SAND to silty SAND	125	5.0	27	38	24	77	41	-	-	6	0.350	1.68	16
46.10	162.3	116.6	122.8	162.3	0.9	-4.7	0.6	6	clean SAND to silty SAND	125	5.0	23	32	21	72	40	-	-	7	0.350	1.72	16
46.26	152.8	109.6	112.1	152.8	0.7	-4.2	0.4	6	clean SAND to silty SAND	125	5.0	22	31	19	70	40	-	-	6	0.350	1.68	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Santa Cruz Multi-Family Housing

Project ID: Salem Engineering
Data File: SDF(813).cpt
CPT Date: 4/3/2024 11:10:45 AM
GW During Test: 15 ft

Sounding ID: CPT-01
Project No: 5-224-0090
Cone/Rig: DDG1627

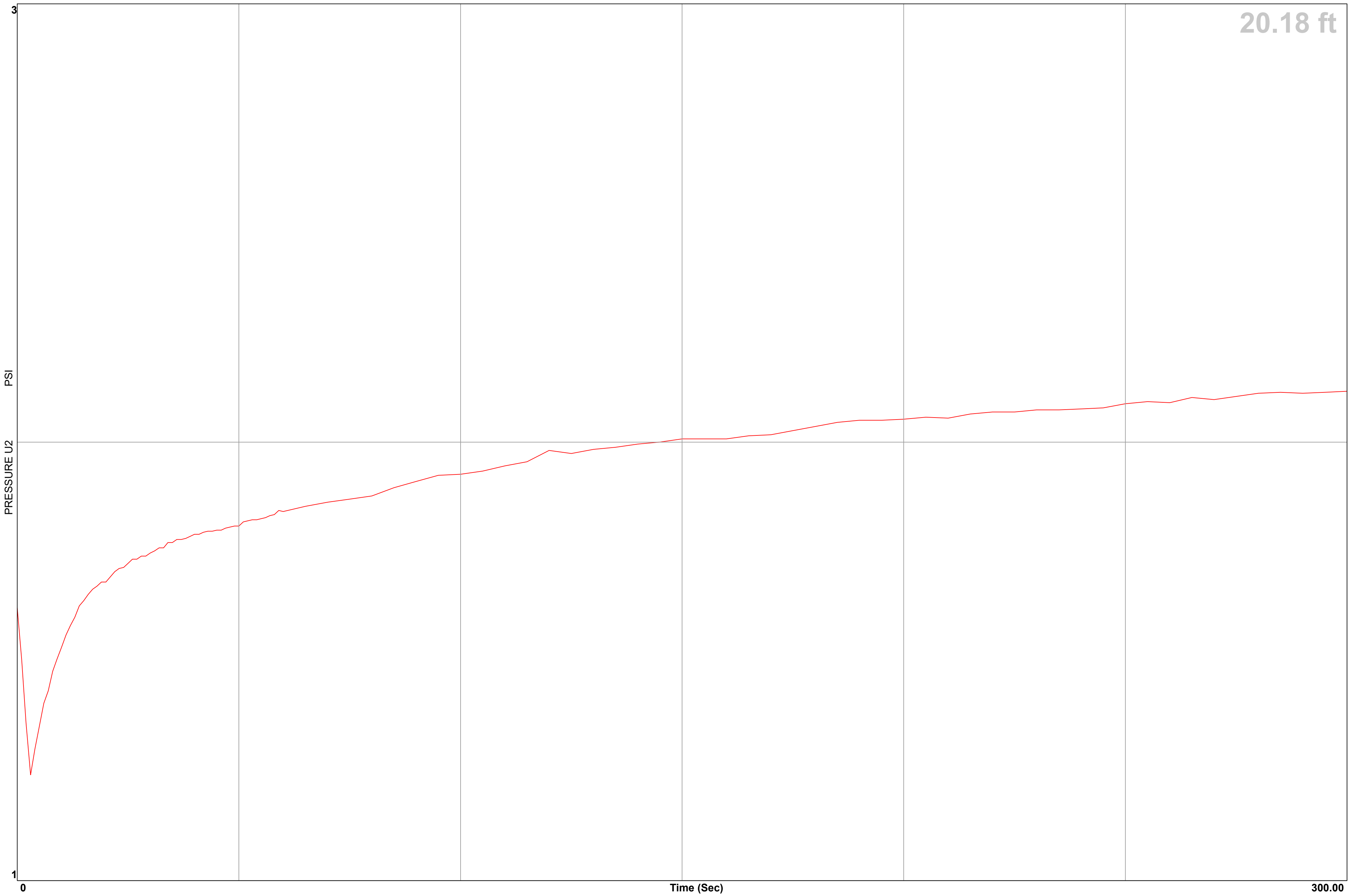
Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rato %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	* SPT R-N1 60%	SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* D50 mm	* Ic SBT Indx	* Nk -
46.43	146.6	105.0	119.0	146.5	1.1	-3.6	0.8	6	clean SAND to silty SAND	125	5.0	21	29	19	69	39	-	-	9	0.350	1.84	16
46.59	145.1	103.8	116.2	145.1	1.0	-3.9	0.7	6	clean SAND to silty SAND	125	5.0	21	29	19	68	39	-	-	8	0.350	1.82	16
46.75	145.4	103.8	131.6	145.3	1.8	-4.3	1.3	6	clean SAND to silty SAND	125	5.0	21	29	20	68	39	-	-	12	0.350	1.97	16
46.92	139.8	99.7	128.9	139.7	1.8	-4.2	1.3	6	clean SAND to silty SAND	125	5.0	20	28	20	67	39	-	-	13	0.350	2.00	16
47.08	137.9	98.2	119.6	137.9	1.4	-1.5	1.0	6	clean SAND to silty SAND	125	5.0	20	28	19	66	39	-	-	11	0.350	1.93	16
47.25	131.6	93.6	119.0	131.5	1.5	-4.6	1.1	6	clean SAND to silty SAND	125	5.0	19	26	18	65	39	-	-	12	0.350	1.98	16
47.41	159.1	113.0	129.0	159.0	1.4	-4.8	0.9	6	clean SAND to silty SAND	125	5.0	23	32	21	71	40	-	-	9	0.350	1.85	16
47.57	158.2	112.2	116.3	158.1	0.8	-4.6	0.5	6	clean SAND to silty SAND	125	5.0	22	32	20	71	40	-	-	6	0.350	1.70	16
47.74	147.9	104.8	107.2	147.8	0.6	-5.4	0.4	6	clean SAND to silty SAND	125	5.0	21	30	18	69	39	-	-	6	0.350	1.68	16
47.90	139.4	98.6	102.6	139.3	0.6	-4.7	0.4	6	clean SAND to silty SAND	125	5.0	20	28	17	67	39	-	-	6	0.350	1.70	16
48.07	118.4	83.7	97.6	118.3	0.8	-4.2	0.7	6	clean SAND to silty SAND	125	5.0	17	24	16	61	38	-	-	10	0.350	1.88	16
48.23	105.8	74.7	100.2	105.7	1.1	-3.8	1.0	6	clean SAND to silty SAND	125	5.0	15	21	15	57	37	-	-	14	0.350	2.03	16
48.39	99.9	70.4	93.7	99.9	0.9	-3.5	0.9	6	clean SAND to silty SAND	125	5.0	14	20	14	55	37	-	-	14	0.350	2.02	16
48.56	103.6	72.9	83.1	103.6	0.5	-3.6	0.5	6	clean SAND to silty SAND	125	5.0	15	21	14	57	37	-	-	9	0.350	1.84	16
48.72	103.0	72.4	90.2	103.0	0.7	-4.0	0.7	6	clean SAND to silty SAND	125	5.0	14	21	14	56	37	-	-	12	0.350	1.96	16
48.89	96.9	68.0	113.3	96.8	1.6	-4.1	1.7	5	silty SAND to sandy SILT	120	3.0	23	32	14	54	37	-	-	19	0.200	2.20	16
49.05	72.0	50.5	119.6	71.9	1.8	-3.4	2.5	5	silty SAND to sandy SILT	120	3.0	17	24	12	44	35	-	-	27	0.200	2.41	16
49.22	46.8	24.3	-	46.7	2.1	-3.2	4.9	3	silty CLAY to CLAY	115	1.5	16	31	7	-	-	3.2	7.5	49	0.005	2.85	15
49.38	33.9	17.5	-	33.8	1.7	-1.8	5.6	3	silty CLAY to CLAY	115	1.5	12	23	6	-	-	2.3	5.3	59	0.005	3.00	15
49.54	56.6	29.2	-	56.6	1.9	1.7	3.5	4	clayy SILT to silty CLAY	115	2.0	15	28	8	-	-	3.9	9.1	40	0.070	2.69	15
49.71	257.1	179.4	179.4	257.1	1.9	0.0	0.7	6	clean SAND to silty SAND	125	5.0	36	51	31	86	42	-	-	5	0.350	1.64	16
49.87	245.9	171.4	178.3	245.9	2.1	-2.4	0.9	6	clean SAND to silty SAND	125	5.0	34	49	30	85	42	-	-	6	0.350	1.70	16
50.04	244.5	170.1	173.6	244.5	1.9	-3.9	0.8	6	clean SAND to silty SAND	125	5.0	34	49	30	85	42	-	-	6	0.350	1.67	16
50.20	230.9	160.4	162.1	230.8	1.6	-4.4	0.7	6	clean SAND to silty SAND	125	5.0	32	46	28	83	41	-	-	5	0.350	1.66	16
50.36	223.3	154.9	154.6	223.2	1.4	-4.6	0.6	6	clean SAND to silty SAND	125	5.0	31	45	27	81	41	-	-	5	0.350	1.64	16
50.53	186.4	129.2	134.2	186.4	1.1	-3.1	0.6	6	clean SAND to silty SAND	125	5.0	26	37	23	75	40	-	-	6	0.350	1.70	16
50.69	181.8	125.8	131.2	181.7	1.1	-2.7	0.6	6	clean SAND to silty SAND	125	5.0	25	36	22	75	40	-	-	6	0.350	1.71	16
50.86	159.3	110.1	158.5	159.3	3.1	-2.6	2.0	5	silty SAND to sandy SILT	120	3.0	37	53	22	70	39	-	-	16	0.200	2.09	16
51.02	155.5	107.4	149.6	155.4	2.7	-3.1	1.8	5	silty SAND to sandy SILT	120	3.0	36	52	22	69	39	-	-	15	0.200	2.06	16
51.18	179.3	123.7	161.5	179.3	3.0	-2.7	1.7	6	clean SAND to silty SAND	125	5.0	25	36	24	74	40	-	-	13	0.350	2.00	16
51.35	282.6	194.7	208.5	282.8	3.3	7.6	1.2	6	clean SAND to silty SAND	125	5.0	39	57	35	89	42	-	-	7	0.350	1.75	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Salem Engineering

Location	Santa Cruz Multi-Family Housing	Operator	JM-FA		
Job Number	5-224-0090	Cone Number	DDG1627	GPS	
Hole Number	CPT-01	Date and Time	4/3/2024 11:10:45 AM		
Equilized Pressure	2.1	EST GW Depth During Test	15.3		



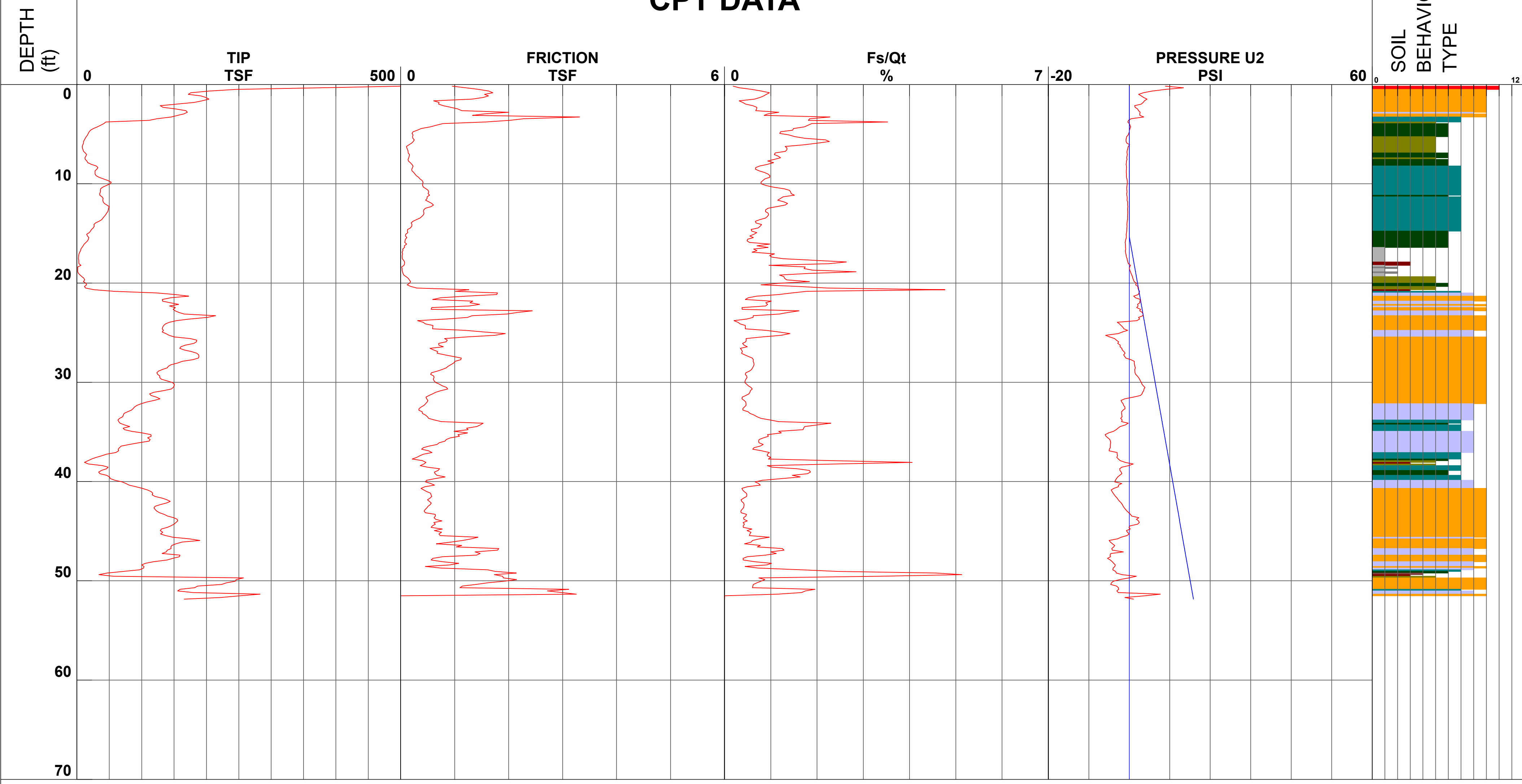
Salem Engineering

Middle Earth GEO TESTING INC.

Project	Santa Cruz Multi-Family Housing	Operator	JM-FA	Filename	SDF(813).cpt
Job Number	5-224-0090	Cone Number	DDG1627	GPS	
Hole Number	CPT-01	Date and Time	4/3/2024 11:10:45 AM	Maximum Depth	51.84 ft
EST GW Depth During Test		15.30 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 15cm²

S*Soil behavior type and SPT based on data from UBC-1983

Santa Cruz Multi-Family Housing

Project ID: Salem Engineering
Data File: SDF(812).cpt
CPT Date: 4/3/2024 10:01:28 AM
GW During Test: 18 ft

Page: 1
Sounding ID: CPT-02
Project No: 5-224-0090
Cone/Rig: DDG1627

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
0.33	592.4	950.0	950.0	592.5	2.8	8.1	0.5	7	grvly SAND to dense SAND	130	6.0	100	99	100	95	48	-	-	5	1.000	1.03	16
0.49	396.8	636.4	636.4	397.0	4.0	10.1	1.0	6	clean SAND to silty SAND	125	5.0	100	79	100	95	48	-	-	5	0.350	1.39	16
0.66	277.4	444.9	445.6	277.6	4.5	7.5	1.6	6	clean SAND to silty SAND	125	5.0	89	55	77	95	48	-	-	5	0.350	1.65	16
0.82	183.9	295.0	338.3	184.0	4.0	1.4	2.2	6	clean SAND to silty SAND	125	5.0	59	37	55	95	48	-	-	9	0.350	1.85	16
0.98	98.8	158.4	258.0	98.8	3.6	2.6	3.6	8	stiff SAND to clayy SAND	115	5.0	32	20	33	82	48	-	-	18	0.250	2.18	16
1.15	124.3	199.3	258.0	124.7	3.1	21.0	2.5	5	silty SAND to sandy SILT	120	3.0	66	41	39	90	48	-	-	13	0.200	2.00	16
1.31	225.7	361.9	361.9	226.2	2.4	29.8	1.1	6	clean SAND to silty SAND	125	5.0	72	45	61	95	48	-	-	5	0.350	1.55	16
1.48	235.4	377.5	377.5	235.5	2.0	7.2	0.9	6	clean SAND to silty SAND	125	5.0	76	47	61	95	48	-	-	5	0.350	1.46	16
1.64	233.2	373.9	373.9	233.2	1.9	4.0	0.8	6	clean SAND to silty SAND	125	5.0	75	47	60	95	48	-	-	5	0.350	1.44	16
1.80	233.6	374.7	374.7	233.7	1.6	2.7	0.7	6	clean SAND to silty SAND	125	5.0	75	47	59	95	48	-	-	5	0.350	1.38	16
1.97	223.1	357.7	357.7	223.1	1.6	1.8	0.7	6	clean SAND to silty SAND	125	5.0	72	45	57	95	48	-	-	5	0.350	1.41	16
2.13	206.3	330.9	330.9	206.3	1.7	0.6	0.8	6	clean SAND to silty SAND	125	5.0	66	41	54	95	48	-	-	5	0.350	1.48	16
2.30	202.5	324.7	324.7	202.5	1.8	-0.1	0.9	6	clean SAND to silty SAND	125	5.0	65	40	54	95	48	-	-	5	0.350	1.52	16
2.46	212.8	341.2	341.2	212.8	2.2	0.7	1.0	6	clean SAND to silty SAND	125	5.0	68	43	57	95	48	-	-	5	0.350	1.54	16
2.62	180.9	290.1	302.7	180.9	2.6	0.7	1.4	6	clean SAND to silty SAND	125	5.0	58	36	51	95	48	-	-	6	0.350	1.71	16
2.79	121.2	194.4	268.4	121.2	3.5	-0.1	2.9	5	silty SAND to sandy SILT	120	3.0	65	40	39	89	48	-	-	15	0.200	2.06	16
2.95	91.4	146.6	274.8	91.4	4.0	0.7	4.4	9	very stiff fine SOIL	120	1.0	100	91	32	-	-	3.2	9.9	22	0.250	2.28	30
3.12	119.9	192.2	294.4	119.9	4.3	2.4	3.6	8	stiff SAND to clayy SAND	115	5.0	38	24	40	89	48	-	-	17	0.250	2.14	16
3.28	68.4	109.7	230.8	68.5	3.0	3.8	4.3	9	very stiff fine SOIL	120	1.0	100	68	25	-	-	2.4	9.9	24	0.250	2.35	30
3.45	86.5	138.8	220.2	86.6	2.7	5.1	3.1	5	silty SAND to sandy SILT	120	3.0	46	29	29	78	47	-	-	18	0.200	2.17	16
3.61	84.1	134.8	202.7	84.2	2.3	6.6	2.7	5	silty SAND to sandy SILT	120	3.0	45	28	28	77	47	-	-	17	0.200	2.13	16
3.77	78.0	125.0	193.9	78.0	2.1	1.8	2.7	5	silty SAND to sandy SILT	120	3.0	42	26	26	74	46	-	-	17	0.200	2.15	16
3.94	64.0	102.6	184.0	64.0	2.0	0.9	3.1	5	silty SAND to sandy SILT	120	3.0	34	21	22	68	45	-	-	21	0.200	2.25	16
4.10	56.5	90.7	163.8	56.6	1.6	2.1	2.8	5	silty SAND to sandy SILT	120	3.0	30	19	20	64	45	-	-	21	0.200	2.25	16
4.27	55.9	89.7	157.8	55.9	1.5	0.4	2.6	5	silty SAND to sandy SILT	120	3.0	30	19	19	63	44	-	-	20	0.200	2.24	16
4.43	44.1	70.7	162.9	44.1	1.5	2.0	3.5	4	clayy SILT to silty CLAY	115	2.0	35	22	16	-	-	3.1	9.9	26	0.070	2.40	15
4.59	40.0	64.1	115.1	40.0	0.8	1.7	2.0	5	silty SAND to sandy SILT	120	3.0	21	13	14	52	42	-	-	21	0.200	2.25	16
4.76	40.8	65.4	106.2	40.8	0.6	0.8	1.6	5	silty SAND to sandy SILT	120	3.0	22	14	14	53	42	-	-	18	0.200	2.18	16
4.92	54.3	87.1	128.0	54.3	0.9	-0.6	1.7	5	silty SAND to sandy SILT	120	3.0	29	18	18	62	44	-	-	16	0.200	2.11	16
5.09	50.0	80.2	143.8	50.0	1.2	-0.6	2.5	5	silty SAND to sandy SILT	120	3.0	27	17	17	60	43	-	-	21	0.200	2.25	16
5.25	38.4	61.5	152.0	38.3	1.3	-0.3	3.5	4	clayy SILT to silty CLAY	115	2.0	31	19	15	-	-	2.7	9.9	28	0.070	2.44	15
5.41	22.4	35.9	-	22.4	1.1	-0.3	5.2	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	42	0.005	2.73	15
5.58	17.8	28.6	-	17.9	0.7	0.1	4.2	3	silty CLAY to CLAY	115	1.5	19	12	8	-	-	1.2	9.9	42	0.005	2.74	15
5.74	18.5	29.6	-	18.5	0.5	0.5	3.0	4	clayy SILT to silty CLAY	115	2.0	15	9	8	-	-	1.3	9.9	37	0.070	2.63	15
5.91	18.7	29.9	83.5	18.7	0.4	0.1	1.9	4	clayy SILT to silty CLAY	115	2.0	15	9	7	-	-	1.3	9.9	31	0.070	2.50	15
6.07	17.0	27.2	76.0	17.0	0.3	0.1	1.7	5	silty SAND to sandy SILT	120	3.0	9	6	7	24	36	-	-	31	0.200	2.51	16
6.23	15.4	24.3	72.5	15.4	0.2	0.0	1.6	4	clayy SILT to silty CLAY	115	2.0	12	8	6	-	-	1.1	9.9	33	0.070	2.54	15
6.40	14.4	22.6	70.4	14.4	0.2	-0.2	1.6	4	clayy SILT to silty CLAY	115	2.0	11	7	6	-	-	1.0	9.9	34	0.070	2.56	15
6.56	15.0	23.2	67.6	15.0	0.2	-0.3	1.5	5	silty SAND to sandy SILT	120	3.0	8	5	6	19	35	-	-	32	0.200	2.53	16
6.73	15.4	23.6	65.6	15.4	0.2	-0.6	1.3	5	silty SAND to sandy SILT	120	3.0	8	5	6	19	35	-	-	31	0.200	2.50	16
6.89	15.5	23.4	66.6	15.5	0.2	-0.7	1.4	5	silty SAND to sandy SILT	120	3.0	8	5	6	19	35	-	-	31	0.200	2.52	16
7.05	17.0	25.4	65.6	17.0	0.2	-0.8	1.3	5	silty SAND to sandy SILT	120	3.0	8	6	6	22	35	-	-	29	0.200	2.46	16
7.22	19.2	28.3	65.8	19.2	0.2	-0.9	1.2	5	silty SAND to sandy SILT	120	3.0	9	6	7	25	36	-	-	27	0.200	2.40	16
7.38	19.2	28.0	66.0	19.2	0.2	-0.9	1.2	5	silty SAND to sandy SILT	120	3.0	9	6	7	25	36	-	-	27	0.200	2.41	16
7.55	18.8	27.1	66.1	18.8	0.2	-1.2	1.2	5	silty SAND to sandy SILT	120	3.0	9	6	6	24	35	-	-	28	0.200	2.43	16
7.71	18.4	26.3	66.2	18.4	0.2	-1.2	1.3	5	silty SAND to sandy SILT	120	3.0	9	6	6	23	35	-	-	28	0.200	2.45	16
7.87	18.1	25.6	66.5	18.1	0.2	-1.3	1.3	5	silty SAND to sandy SILT	120	3.0	9	6	6	22	35	-	-	29	0.200	2.46	16
8.04	18.9	26.3	66.6	18.8	0.2	-1.3	1.3	5	silty SAND to sandy SILT	120	3.0	9	6	6	23	35	-	-	29	0.200	2.45	16
8.20	18.9	26.1	67.1	18.9	0.2	-1.3	1.3	5	silty SAND to sandy SILT	120	3.0	9	6	6	23	35	-	-	29	0.200	2.46	16
8.37	18.7	25.6	67.0	18.7	0.2	-1.3	1.3	5	silty SAND to sandy SILT	120	3.0	9	6	6	22	35	-	-	29	0.200	2.47	16
8.53	18.9	25.5	64.6	18.8	0.2	-1.3	1.2	5	silty SAND to sandy SILT	120	3.0	9	6	6	22	35	-	-	29	0.200	2.45	16
8.69	18.7	25.0	63.7	18.6	0.2	-1.3	1.2	5	silty SAND to sandy SILT	120	3.0	8	6	6	21	34	-	-	29	0.200	2.45	16
8.86	18.1	24.1	64.5	18.1	0.2	-1.2	1.3	5	silty SAND to sandy SILT	120	3.0	8	6	6	20	34	-	-	30	0.200	2.48	16
9.02	19.5	25.7	65.4	19.4	0.2	-1.3	1.2	5	silty SAND to sandy SILT	120	3.0	9	6	6	22	35	-	-	29	0.200	2.45	16
9.19	22.7	29.7	66.7	22.7	0.3	-1.3	1.2	5	silty SAND to sandy SILT	120	3.0	10	8	7	27	35	-	-	26	0.200	2.38	16
9.35	24.2	31.3	68.7	24.2	0.3	-1.3	1.2	5	silty SAND to sandy SILT	120	3.0	10	8	7	29	36	-	-	25	0.200	2.37	16
9.51	23.1	29.6	69.3	23.0	0.3	-1.3	1.3	5	silty SAND to sandy SILT	120	3.0	10	8	7	27	35	-	-	27	0.200	2.41	16
9.68	21.3	27.0	62.2	21.2	0.2	-1.4	1.1	5	silty SAND to sandy SILT	120	3.0	9	7	6	24	35	-	-	26	0.200	2.40	16
9.84	19.9	25.1	62.0	19.9	0.2	-1.4	1.1	5	silty SAND to sandy SILT	120	3.0	8	7	6	21	34	-	-	28	0.200	2.44	16
10.01	20.3	25.4	66.8	20.3	0.3	-1.4	1.3	5	silty SAND to sandy SILT	120	3.0	8	7	6	22	34	-	-	29	0.200	2.47	16
10.17	21.7	26.9	67.8	21.6	0.3	-1.5	1.3	5	silty SAND to sandy SILT	120	3.0	9	7	6	24	34	-	-	28	0.200	2.45	16
10.34	22.9	28.2	67.5	22.9	0.3	-1.4	1.2	5	silty SAND to sandy SILT	120	3.0	9	8	7	25	35	-	-	27	0.200	2.42	16
10.50	23.4	28.6	66.3	23.4	0.3	-1.4	1.2	5	silty SAND to sandy SILT	120	3.0	10	8	7	26	35	-	-	26	0.200	2.40	16
10.66	26.1	31.6	63.0	26.1	0.2	-1.4	0.9	5	silty SAND to sandy SILT	120	3.0	11	9	7	29	35	-	-	23	0.200	2.31	16
10.83	30.2	36.4	64.2	30.2	0.3	-1.3	0.9	5	silty SAND to sandy SILT	120	3.0	12	10	8	34	36	-	-	20	0.200	2.24	16
10.99	36.2	43.2	79.3	36.2	0.4	-1.2	1.2	5	silty SAND to sandy SILT	120	3.0	14	12	9	39	37	-	-	21	0.200	2.26	16
11.16	41.2	48.9	76.5	41.2	0.4	-1.2	1.0	5	silty SAND to sandy SILT	120	3.0	16	14	10	43	38	-	-	18	0.200	2.16	16
11.32	41.5	48.8	77.7	41.4	0.4	-1.3	1.0	5	silty SAND to sandy SILT	120	3.0	16	14	10	43	38	-	-	18	0.200	2.17	16
11.48	37.8	44.2	79.5	37.8	0.5	-0.9	1.2	5	silty SAND to sandy SILT	120	3.0	15	13	10	40	37	-	-	21	0.200	2.25	16
11.65	40.7	47.2	80.9	40.7	0.5	-1.0	1.2	5	silty SAND to sandy SILT	120	3.0	16	14	10	42	37	-	-	20	0.200	2.22	16
11.81	51.7	59.6	85.7	51.7	0.5	-0.9	1.0	5	silty SAND to sandy SILT	120	3.0	20	17	12	50	39	-	-	16	0.200	2.09	16
11.98	66.1	75.6	95.3	66.1	0.6	-0.7	0.9	6	clean SAND to silty SAND	125	5.0	15	13	15	58	40	-	-	12	0.350	1.97	16
12.14	73.5	83.5	99.3	73.5	0.5	-0.6	0.8	6	clean SAND to silty SAND	125	5.0	17	15	16	61	41	-	-	10	0.350	1.90	16
12.30	65.7	74.1	91.0	65.7	0.5	-0.6	0.7	6	clean SAND to silty SAND	125	5.0	15	13	14	57	40	-	-	11	0.350	1.94	16
12.47	63.4	71.0	87.4	63.3	0.4	-0.8	0.7	6	clean SAND to silty SAND	125	5.0	14	13	14	56	40	-	-	11	0.350	1.94	16
12.63	68.1	75.8	89.8	68.1	0.4	-0.8	0.6	6	clean SAND to silty SAND	125	5.0	15	14	14	58	40	-	-	10	0.350	1.90	16
12.80	67.0	74.1	89.6	67.0	0.5	-0.7	0.7	6	clean SAND to silty SAND	125	5.0	15	13	14	57	40	-	-	11	0.350	1.92	16
12.96	67.6	74.3	90.2	67.6	0.5	-0.7	0.7	6	clean SAND to silty SAND	125	5.0	15	14	14	57	40	-	-	11	0.350	1.93	16
13.12	68.9	75.2	91.7	68.9	0.5	-0.7	0.7	6	clean SAND to silty SAND	125	5.0	15	14	14	58	40	-	-	11	0.350	1.93	16
13.29	69.5	75.4	93.0	69.5	0.5	-0.7	0.8	6	clean SAND to silty SAND	125	5.0	15	14	14	58	40	-	-	11	0.350	1.94	16
13.45	77.3	83.3	99.3	77.3	0.6	-0.6	0.8	6	clean SAND to silty SAND	125	5.0	17	15	16	61	40	-	-	10	0.350	1.90	16
13.62	82.5	88.3	107.8	82.5	0.7	-0.5	0.9	6	clean SAND to silty SAND	125	5.0	18	17	17	63	41	-	-	11	0.350	1.93	16
13.78	86.7	92.2	112.7	86.7	0.8	-0.5	1.0	6	clean SAND to silty SAND	125	5.0	18	17	18	64	41	-	-	11	0.350	1.93	16
13.94	87.1	92.1	120.5	87.1	1.1	-0.5	1.3	6	clean SAND to silty SAND	125	5.0	18	17	18	64	41	-	-	13	0.350	2.01	16
14.11	78.7	82.7	105.3	78.7	0.8	-0.5	1.0	6	clean SAND to silty SAND	125	5.0	17	16	16	61	40	-	-	12	0.350	1.98	16
14.27	70.5	73.7	91.7	70.5	0.5	-0.6	0.8	6	clean SAND to silty SAND	125	5.0	15	14	14	57	39	-	-	12	0.350	1.95	16
14.44	62.9	65.4	84.7	62.9	0.5	-0.4	0.8	6	clean SAND to silty SAND	125	5.0	13	13	13	53	39	-	-	13	0.350	2.00	16
14.60	62.9	65.0	81.4	62.9	0.4	-0.5	0.7	6	clean SAND to silty SAND	125	5.0	13	13	13	53	39	-	-	12	0.350	1.96	16
14.76	72.0	73.9	87.3	72.0	0.4	-0.4	0.6	6	clean SAND to silty SAND	125	5.0	15	14	14	57	39	-	-	10	0.350	1.89	16
14.93	84.0	85.7	98.0	84.0	0.5	-0.2	0.6	6	clean SAND to silty SAND	125	5.0	17	17	16	62	40	-	-	9	0.350	1.85	16
15.09	88.2	89.5	98.5	88.2	0.5	-0.3	0.5	6	clean SAND to silty SAND	125	5.0	18	18	16	63	40	-	-	8	0.350	1.79	16
15.26	86.6	87.4	100.0	86.6	0.6	-0.3	0.7	6	clean SAND to silty SAND	125	5.0	17	17	16	63	40	-	-	9	0.350	1.85	16
15.42	75.2	75.6	86.5	75.2	0.4	-0.2	0.5	6	clean SAND to silty SAND	125	5.0	15	15	14	58	39	-	-	9	0.350	1.85	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

. . Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
15.58	69.3	69.2	77.6	69.3	0.3	-0.3	0.4	6	clean SAND to silty SAND	125	5.0	14	14	13	55	39	-	-	9	0.350	1.82	16
15.75	67.9	67.4	76.5	67.9	0.3	0.0	0.4	6	clean SAND to silty SAND	125	5.0	13	14	12	54	39	-	-	9	0.350	1.84	16
15.91	69.4	68.6	94.2	69.4	0.7	-0.2	1.0	6	clean SAND to silty SAND	125	5.0	14	14	14	55	39	-	-	14	0.350	2.05	16
16.08	83.0	81.5	95.1	83.0	0.5	-0.2	0.7	6	clean SAND to silty SAND	125	5.0	16	17	15	60	40	-	-	10	0.350	1.88	16
16.24	95.1	93.0	101.9	95.1	0.5	-0.1	0.5	6	clean SAND to silty SAND	125	5.0	19	19	17	65	40	-	-	8	0.350	1.79	16
16.40	115.4	112.3	114.0	115.4	0.5	0.8	0.4	6	clean SAND to silty SAND	125	5.0	22	23	20	71	41	-	-	6	0.350	1.67	16
16.57	118.2	114.3	116.6	118.2	0.6	0.8	0.5	6	clean SAND to silty SAND	125	5.0	23	24	20	71	41	-	-	6	0.350	1.67	16
16.73	124.8	120.1	120.3	124.8	0.6	0.6	0.5	6	clean SAND to silty SAND	125	5.0	24	25	21	73	42	-	-	5	0.350	1.65	16
16.90	139.8	133.9	133.9	139.8	0.6	0.9	0.4	6	clean SAND to silty SAND	125	5.0	27	28	23	77	42	-	-	5	0.350	1.59	16
17.06	147.3	140.4	140.4	147.3	0.6	1.1	0.4	6	clean SAND to silty SAND	125	5.0	28	29	23	78	42	-	-	5	0.350	1.55	16
17.23	151.6	143.8	143.8	151.7	0.5	1.2	0.4	6	clean SAND to silty SAND	125	5.0	29	30	24	79	42	-	-	5	0.350	1.53	16
17.39	156.2	147.4	147.4	156.2	0.8	1.6	0.5	6	clean SAND to silty SAND	125	5.0	29	31	25	80	43	-	-	5	0.350	1.62	16
17.55	155.2	145.8	145.8	155.2	0.7	1.6	0.4	6	clean SAND to silty SAND	125	5.0	29	31	25	79	42	-	-	5	0.350	1.57	16
17.72	150.7	140.9	140.9	150.7	0.6	1.3	0.4	6	clean SAND to silty SAND	125	5.0	28	30	24	78	42	-	-	5	0.350	1.56	16
17.88	139.5	129.8	129.8	139.5	0.5	1.2	0.3	6	clean SAND to silty SAND	125	5.0	26	28	22	76	42	-	-	5	0.350	1.55	16
18.05	138.2	128.3	128.3	138.3	0.4	1.3	0.3	6	clean SAND to silty SAND	125	5.0	26	28	21	75	42	-	-	5	0.350	1.53	16
18.21	133.2	123.4	123.4	133.3	0.3	1.2	0.2	6	clean SAND to silty SAND	125	5.0	25	27	20	74	42	-	-	5	0.350	1.50	16
18.37	122.3	113.0	113.0	122.3	0.3	0.7	0.3	6	clean SAND to silty SAND	125	5.0	23	24	19	71	41	-	-	5	0.350	1.57	16
18.54	121.6	112.1	112.1	121.6	0.4	0.7	0.3	6	clean SAND to silty SAND	125	5.0	22	24	19	71	41	-	-	5	0.350	1.59	16
18.70	117.0	107.6	107.6	117.0	0.4	0.6	0.3	6	clean SAND to silty SAND	125	5.0	22	23	18	69	41	-	-	5	0.350	1.63	16
18.87	119.3	109.5	109.5	119.3	0.4	0.4	0.4	6	clean SAND to silty SAND	125	5.0	22	24	19	70	41	-	-	5	0.350	1.64	16
19.03	124.7	114.2	116.7	124.7	0.6	0.5	0.5	6	clean SAND to silty SAND	125	5.0	23	25	20	71	41	-	-	6	0.350	1.68	16
19.19	122.2	111.6	113.2	122.2	0.5	0.8	0.4	6	clean SAND to silty SAND	125	5.0	22	24	19	71	41	-	-	5	0.350	1.66	16
19.36	127.1	115.8	119.8	127.1	0.7	0.5	0.5	6	clean SAND to silty SAND	125	5.0	23	25	20	72	41	-	-	6	0.350	1.69	16
19.52	144.9	131.7	143.7	144.9	1.2	0.8	0.9	6	clean SAND to silty SAND	125	5.0	26	29	24	76	42	-	-	8	0.350	1.78	16
19.69	184.1	167.0	172.8	184.1	1.5	0.9	0.8	6	clean SAND to silty SAND	125	5.0	33	37	29	84	43	-	-	6	0.350	1.69	16
19.85	202.4	183.3	183.5	202.4	1.6	0.3	0.8	6	clean SAND to silty SAND	125	5.0	37	40	32	87	43	-	-	5	0.350	1.65	16
20.01	224.4	202.7	207.2	224.4	2.2	-1.3	1.0	6	clean SAND to silty SAND	125	5.0	41	45	35	90	44	-	-	6	0.350	1.68	16
20.18	234.1	211.0	213.7	234.1	2.2	0.7	1.0	6	clean SAND to silty SAND	125	5.0	42	47	37	92	44	-	-	5	0.350	1.66	16
20.34	196.4	176.6	184.2	196.4	1.8	0.8	0.9	6	clean SAND to silty SAND	125	5.0	35	39	31	86	43	-	-	6	0.350	1.71	16
20.51	214.5	192.5	195.9	214.5	1.9	-1.6	0.9	6	clean SAND to silty SAND	125	5.0	38	43	34	89	44	-	-	6	0.350	1.67	16
20.67	242.5	217.1	217.1	242.5	2.2	0.0	0.9	6	clean SAND to silty SAND	125	5.0	43	48	37	93	44	-	-	5	0.350	1.63	16
20.83	245.5	219.3	219.3	245.5	2.0	-1.5	0.8	6	clean SAND to silty SAND	125	5.0	44	49	37	93	44	-	-	5	0.350	1.61	16
21.00	235.6	210.0	216.8	235.6	2.5	0.3	1.1	6	clean SAND to silty SAND	125	5.0	42	47	37	91	44	-	-	6	0.350	1.69	16
21.16	218.9	194.7	198.8	218.9	2.0	-2.2	0.9	6	clean SAND to silty SAND	125	5.0	39	44	34	89	44	-	-	6	0.350	1.67	16
21.33	213.5	189.5	189.5	213.5	1.7	-1.4	0.8	6	clean SAND to silty SAND	125	5.0	38	43	33	88	43	-	-	5	0.350	1.63	16
21.49	155.0	137.3	146.0	155.0	1.2	-1.2	0.8	6	clean SAND to silty SAND	125	5.0	27	31	24	77	42	-	-	7	0.350	1.74	16
21.65	140.2	123.9	136.0	140.2	1.1	-0.2	0.8	6	clean SAND to silty SAND	125	5.0	25	28	22	74	41	-	-	8	0.350	1.79	16
21.82	115.4	101.7	113.6	115.4	0.8	-0.6	0.7	6	clean SAND to silty SAND	125	5.0	20	23	19	68	40	-	-	8	0.350	1.81	16
21.98	104.5	92.0	104.6	104.5	0.7	-0.4	0.7	6	clean SAND to silty SAND	125	5.0	18	21	17	64	40	-	-	9	0.350	1.84	16
22.15	111.5	98.0	103.2	111.5	0.5	-2.8	0.5	6	clean SAND to silty SAND	125	5.0	20	22	17	66	40	-	-	7	0.350	1.72	16
22.31	100.6	88.2	97.3	100.6	0.5	-2.9	0.5	6	clean SAND to silty SAND	125	5.0	18	20	16	63	39	-	-	8	0.350	1.80	16
22.47	93.2	81.5	98.1	93.2	0.7	-2.2	0.8	6	clean SAND to silty SAND	125	5.0	16	19	16	60	39	-	-	11	0.350	1.92	16
22.64	90.8	79.2	96.2	90.7	0.7	-2.5	0.8	6	clean SAND to silty SAND	125	5.0	16	18	15	59	39	-	-	11	0.350	1.93	16
22.80	86.2	75.0	92.9	86.1	0.7	-2.1	0.8	6	clean SAND to silty SAND	125	5.0	15	17	14	58	38	-	-	12	0.350	1.95	16
22.97	83.3	72.4	105.2	83.2	1.1	-1.9	1.3	5	silty SAND to sandy SILT	120	3.0	24	28	15	56	38	-	-	16	0.200	2.10	16
23.13	91.3	79.2	105.6	91.2	1.0	-3.5	1.1	6	clean SAND to silty SAND	125	5.0	16	18	16	59	39	-	-	14	0.350	2.02	16
23.30	97.3	84.2	111.9	97.2	1.1	-3.2	1.2	6	clean SAND to silty SAND	125	5.0	17	19	17	61	39	-	-	14	0.350	2.02	16
23.46	105.3	91.0	105.1	105.3	0.8	0.6	0.7	6	clean SAND to silty SAND	125	5.0	18	21	17	64	40	-	-	9	0.350	1.86	16
23.62	113.6	98.0	104.7	113.6	0.6	-2.7	0.5	6	clean SAND to silty SAND	125	5.0	20	23	18	66	40	-	-	7	0.350	1.75	16
23.79	110.5	95.1	104.7	110.5	0.6	-2.6	0.6	6	clean SAND to silty SAND	125	5.0	19	22	17	65	40	-	-	8	0.350	1.79	16
23.95	111.0	95.3	105.6	110.9	0.7	-2.7	0.6	6	clean SAND to silty SAND	125	5.0	19	22	17	65	40	-	-	8	0.350	1.80	16
24.12	105.8	90.7	119.3	105.8	1.3	-2.0	1.3	6	clean SAND to silty SAND	125	5.0	18	21	18	64	39	-	-	13	0.350	2.01	16
24.28	98.7	84.5	109.5	98.7	1.1	-1.6	1.1	6	clean SAND to silty SAND	125	5.0	17	20	17	61	39	-	-	13	0.350	2.00	16
24.44	107.9	92.1	117.0	107.9	1.2	-2.3	1.1	6	clean SAND to silty SAND	125	5.0	18	22	18	64	40	-	-	12	0.350	1.98	16
24.61	105.1	89.5	101.6	105.1	0.7	-1.4	0.6	6	clean SAND to silty SAND	125	5.0	18	21	17	63	39	-	-	9	0.350	1.84	16
24.77	121.8	103.6	109.6	121.8	0.6	-1.8	0.5	6	clean SAND to silty SAND	125	5.0	21	24	18	68	40	-	-	7	0.350	1.73	16
24.94	128.6	109.1	110.2	128.5	0.5	-1.7	0.4	6	clean SAND to silty SAND	125	5.0	22	26	19	70	40	-	-	5	0.350	1.66	16
25.10	132.3	112.1	112.1	132.4	0.4	0.7	0.3	6	clean SAND to silty SAND	125	5.0	22	26	19	71	41	-	-	5	0.350	1.61	16
25.26	144.7	122.3	122.3	144.6	0.4	-3.9	0.2	6	clean SAND to silty SAND	125	5.0	24	29	20	74	41	-	-	5	0.350	1.52	16
25.43	138.8	117.1	117.1	138.7	0.3	-4.4	0.2	6	clean SAND to silty SAND	125	5.0	23	28	19	72	41	-	-	5	0.350	1.51	16
25.59	134.2	113.0	113.0	134.1	0.5	-4.0	0.4	6	clean SAND to silty SAND	125	5.0	23	27	19	71	41	-	-	5	0.350	1.62	16
25.76	123.9	104.1	104.1	123.8	0.4	-3.5	0.3	6	clean SAND to silty SAND	125	5.0	21	25	18	68	40	-	-	5	0.350	1.64	16
25.92	123.5	103.6	105.6	123.5	0.5	-3.4	0.4	6	clean SAND to silty SAND	125	5.0	21	25	18	68	40	-	-	6	0.350	1.67	16
26.08	114.8	96.1	108.3	114.8	0.8	-2.7	0.7	6	clean SAND to silty SAND	125	5.0	19	23	18	66	40	-	-	9	0.350	1.83	16
26.25	107.1	89.5	96.1	107.0	0.5	-2.9	0.4	6	clean SAND to silty SAND	125	5.0	18	21	16	63	39	-	-	7	0.350	1.75	16
26.41	95.6	79.7	87.6	95.5	0.4	-2.6	0.4	6	clean SAND to silty SAND	125	5.0	16	19	14	60	39	-	-	8	0.350	1.79	16
26.58	81.1	67.5	80.1	81.1	0.4	-2.1	0.5	6	clean SAND to silty SAND	125	5.0	14	16	13	54	38	-	-	10	0.350	1.90	16
26.74	67.1	55.8	79.8	67.1	0.6	-2.7	0.9	5	silty SAND to sandy SILT	120	3.0	19	22	11	48	36	-	-	15	0.200	2.09	16
26.90	56.4	46.8	88.6	56.3	0.8	-3.2	1.5	5	silty SAND to sandy SILT	120	3.0	16	19	10	42	35	-	-	22	0.200	2.28	16
27.07	62.5	51.8	88.8	62.5	0.8	-2.1	1.3	5	silty SAND to sandy SILT	120	3.0	17	21	11	45	36	-	-	20	0.200	2.22	16
27.23	75.5	62.4	98.0	75.4	1.0	-3.4	1.3	5	silty SAND to sandy SILT	120	3.0	21	25	13	51	37	-	-	18	0.200	2.16	16
27.40	105.8	87.3	102.8	105.8	0.8	0.6	0.8	6	clean SAND to silty SAND	125	5.0	17	21	16	63	39	-	-	10	0.350	1.89	16
27.56	126.8	104.5	115.7	126.8	0.9	-0.8	0.7	6	clean SAND to silty SAND	125	5.0	21	25	19	68	40	-	-	8	0.350	1.80	16
27.72	107.8	88.7	102.0	107.8	0.7	0.0	0.7	6	clean SAND to silty SAND	125	5.0	18	22	16	63	39	-	-	9	0.350	1.86	16
27.89	84.9	69.7	86.9	84.9	0.6	-0.7	0.7	6	clean SAND to silty SAND	125	5.0	14	17	13	55	38	-	-	12	0.350	1.96	16
28.05	64.9	53.2	81.1	64.9	0.6	-0.2	1.0	5	silty SAND to sandy SILT	120	3.0	18	22	11	46	36	-	-	17	0.200	2.14	16
28.22	55.0	45.0	82.7	55.0	0.7	0.0	1.3	5	silty SAND to sandy SILT	120	3.0	15	18	10	41	35	-	-	21	0.200	2.26	16
28.38	46.9	38.3	81.7	46.9	0.7	1.4	1.5	5	silty SAND to sandy SILT	120	3.0	13	16	9	35	34	-	-	25	0.200	2.35	16
28.54	48.8	39.8	76.9	48.8	0.6	0.1	1.2	5	silty SAND to sandy SILT	120	3.0	13	16	9	37	34	-	-	22	0.200	2.30	16
28.71	49.6	40.4	66.5	49.5	0.4	-4.8	0.8	5	silty SAND to sandy SILT	120	3.0	13	17	9	37	34	-	-	19	0.200	2.19	16
28.87	54.1	44.0	66.2	54.0	0.4	-6.1	0.7	5	silty SAND to sandy SILT	120	3.0	15	18	9	40	35	-	-	17	0.200	2.13	16
29.04	62.6	50.8	71.5	62.5	0.4	-6.1	0.7	6	clean SAND to silty SAND	125	5.0	10	13	10	45	36	-	-	15	0.350	2.07	16
29.20	68.6	55.5	75.1	68.4	0.5	-5.9	0.7	6	clean SAND to silty SAND	125	5.0	11	14	11	48	36	-	-	14	0.350	2.04	16
29.36	73.1	59.1	79.0	73.0	0.5	-5.5	0.7	6	clean SAND to silty SAND	125	5.0	12	15	12	50	37	-	-	14	0.350	2.03	16
29.53	74.6	60.2	84.7	74.5	0.7	-5.2	0.9	5	silty SAND to sandy SILT	120	3.0	20	25	12	50	37	-	-	15	0.200	2.07	16
29.69	76.2	61.4	88.4	76.1	0.8	-4.8	1.0	5	silty SAND to sandy SILT	120	3.0	20	25	12	51	37	-	-	16	0.200	2.09	16
29.86	87.3	70.2	88.2	87.2	0.6	-4.4	0.7	6	clean SAND to silty SAND	125	5.0	14	17	14	55	38	-	-	12	0.350	1.96	16
30.02	104.2	83.6	93.9	104.1	0.5	-4.8	0.5	6	clean SAND to silty SAND	125	5.0	17	21	15	61	39	-	-	9	0.350	1.82	16
30.19	116.5	93.3	101.9	116.4	0.6	-1.3	0.5	6	clean SAND to silty SAND	125	5.0	19	23	17	65	39	-	-	8	0.350	1.78	16
30.35	134.9	107.9	108.2	134.8	0.5	-1.7	0.4	6	clean SAND to silty SAND	125	5.0	22	27	19	69	40	-	-	5	0.350	1.65	16
30.51	151.8	121.2	121.2	151.7	0.6	-1.7	0.4	6	clean SAND to silty SAND	125	5.0	24	30	21	73	41	-	-	5	0.350	1.63	16
30.68	167.7	133.6	133.2	167.6	0.9	-1.1	0.5	6	clean SAND to silty SAND	125	5.0	27	34	23	77	41	-	-	5	0.350	1.64	16
30.84	178.6	142.1	142.8	178.6	1.0	-0.9	0.6	6	clean SAND to silty SAND	125	5.0	28	36	25	79	41	-	-	5	0.350	1.65	16

Project ID: Salem Engineering
Data File: SDF(812).cpt
CPT Date: 4/3/2024 10:01:28 AM
GW During Test: 18 ft

Sounding ID: CPT-02
Project No: 5-224-0090
Cone/Rig: DDG1627

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
31.01	175.4	139.4	140.5	175.4	1.0	-0.5	0.6	6	clean SAND to silty SAND	125	5.0	28	35	24	78	41	-	-	5	0.350	1.66	16
31.17	154.6	122.6	129.1	154.5	1.0	-0.4	0.6	6	clean SAND to silty SAND	125	5.0	25	31	22	74	41	-	-	7	0.350	1.72	16
31.33	130.0	102.9	110.2	130.0	0.7	-0.2	0.5	6	clean SAND to silty SAND	125	5.0	21	26	18	68	40	-	-	7	0.350	1.75	16
31.50	120.5	95.2	106.0	120.5	0.7	0.5	0.6	6	clean SAND to silty SAND	125	5.0	19	24	17	65	39	-	-	8	0.350	1.81	16
31.66	121.2	95.6	106.6	121.2	0.8	1.2	0.6	6	clean SAND to silty SAND	125	5.0	19	24	18	66	39	-	-	8	0.350	1.81	16
31.83	128.9	101.5	109.0	128.9	0.7	0.3	0.5	6	clean SAND to silty SAND	125	5.0	20	26	18	67	40	-	-	7	0.350	1.75	16
31.99	151.0	118.7	119.5	151.0	0.7	0.1	0.5	6	clean SAND to silty SAND	125	5.0	24	30	21	73	40	-	-	5	0.350	1.65	16
32.15	186.7	146.5	146.5	186.7	0.6	0.2	0.4	6	clean SAND to silty SAND	125	5.0	29	37	24	80	42	-	-	5	0.350	1.52	16
32.32	217.6	170.5	170.5	217.6	1.0	-1.4	0.5	6	clean SAND to silty SAND	125	5.0	34	44	28	85	42	-	-	5	0.350	1.52	16
32.48	224.1	175.4	175.4	224.1	1.0	-0.2	0.4	6	clean SAND to silty SAND	125	5.0	35	45	29	86	42	-	-	5	0.350	1.50	16
32.65	224.9	175.7	175.7	224.9	1.1	-0.7	0.5	6	clean SAND to silty SAND	125	5.0	35	45	29	86	42	-	-	5	0.350	1.53	16
32.81	227.9	177.7	177.7	227.9	1.1	-1.2	0.5	6	clean SAND to silty SAND	125	5.0	36	46	30	86	43	-	-	5	0.350	1.53	16
32.97	226.6	176.4	176.4	226.5	1.6	-1.4	0.7	6	clean SAND to silty SAND	125	5.0	35	45	30	86	42	-	-	5	0.350	1.63	16
33.14	226.8	176.3	176.3	226.8	1.6	-1.4	0.7	6	clean SAND to silty SAND	125	5.0	35	45	30	86	42	-	-	5	0.350	1.62	16
33.30	232.6	180.4	180.4	232.5	1.7	-0.9	0.7	6	clean SAND to silty SAND	125	5.0	36	47	31	86	43	-	-	5	0.350	1.63	16
33.47	233.7	181.0	194.4	233.7	2.6	-0.4	1.1	6	clean SAND to silty SAND	125	5.0	36	47	32	87	43	-	-	7	0.350	1.75	16
33.63	238.5	184.5	190.9	238.5	2.2	-2.5	0.9	6	clean SAND to silty SAND	125	5.0	37	48	32	87	43	-	-	6	0.350	1.70	16
33.79	248.5	191.9	191.9	248.5	1.6	-2.3	0.7	6	clean SAND to silty SAND	125	5.0	38	50	32	89	43	-	-	5	0.350	1.58	16
33.96	226.6	174.7	174.7	226.6	1.1	-3.7	0.5	6	clean SAND to silty SAND	125	5.0	35	45	29	85	42	-	-	5	0.350	1.52	16
34.12	214.0	164.7	164.7	213.9	0.8	-3.9	0.4	6	clean SAND to silty SAND	125	5.0	33	43	27	83	42	-	-	5	0.350	1.48	16
34.29	206.5	158.7	158.7	206.4	1.2	-3.8	0.6	6	clean SAND to silty SAND	125	5.0	32	41	27	82	42	-	-	5	0.350	1.62	16
34.45	194.4	149.2	149.2	194.4	1.0	-3.5	0.5	6	clean SAND to silty SAND	125	5.0	30	39	25	80	42	-	-	5	0.350	1.61	16
34.61	173.5	132.9	137.3	173.5	1.1	-2.8	0.6	6	clean SAND to silty SAND	125	5.0	27	35	23	76	41	-	-	6	0.350	1.69	16
34.78	166.0	127.0	132.6	166.0	1.0	-3.4	0.6	6	clean SAND to silty SAND	125	5.0	25	33	22	75	41	-	-	6	0.350	1.71	16
34.94	155.5	118.7	121.4	155.5	0.8	-3.0	0.5	6	clean SAND to silty SAND	125	5.0	24	31	21	73	40	-	-	6	0.350	1.68	16
35.11	105.0	80.0	100.3	105.1	0.9	5.3	0.9	6	clean SAND to silty SAND	125	5.0	16	21	15	60	38	-	-	12	0.350	1.96	16
35.27	145.3	110.6	117.3	145.3	0.8	-3.0	0.6	6	clean SAND to silty SAND	125	5.0	22	29	20	70	40	-	-	7	0.350	1.73	16
35.43	160.6	122.0	127.8	160.5	1.0	-5.0	0.6	6	clean SAND to silty SAND	125	5.0	24	32	22	74	40	-	-	6	0.350	1.71	16
35.60	161.2	122.3	133.4	161.0	1.2	-8.1	0.8	6	clean SAND to silty SAND	125	5.0	24	32	22	74	40	-	-	8	0.350	1.78	16
35.76	162.5	123.1	131.3	162.4	1.1	-8.3	0.7	6	clean SAND to silty SAND	125	5.0	25	33	22	74	40	-	-	7	0.350	1.74	16
35.93	154.0	116.5	119.5	153.9	0.8	-7.0	0.5	6	clean SAND to silty SAND	125	5.0	23	31	20	72	40	-	-	6	0.350	1.68	16
36.09	142.6	107.7	115.2	142.5	0.8	-7.0	0.6	6	clean SAND to silty SAND	125	5.0	22	29	19	69	40	-	-	7	0.350	1.75	16
36.26	132.7	100.1	102.8	132.6	0.5	-5.7	0.4	6	clean SAND to silty SAND	125	5.0	20	27	18	67	39	-	-	6	0.350	1.68	16
36.42	112.5	84.7	92.2	112.4	0.5	-5.4	0.4	6	clean SAND to silty SAND	125	5.0	17	23	15	62	38	-	-	8	0.350	1.77	16
36.58	80.3	60.4	81.6	80.2	0.6	-5.3	0.8	6	clean SAND to silty SAND	125	5.0	12	16	12	50	36	-	-	14	0.350	2.04	16
36.75	55.0	41.3	76.4	54.9	0.6	-5.1	1.1	5	silty SAND to sandy SILT	120	3.0	14	18	9	38	34	-	-	21	0.200	2.27	16
36.91	39.7	29.7	84.4	39.6	0.7	-4.8	1.9	4	clayy SILT to silty CLAY	115	2.0	15	20	7	-	-	2.7	7.3	31	0.070	2.51	15
37.08	29.0	17.2	-	28.9	0.7	-3.8	2.7	4	clayy SILT to silty CLAY	115	2.0	9	15	5	-	-	1.9	5.2	47	0.070	2.81	15
37.24	20.6	12.2	-	20.5	0.7	-4.5	3.6	3	silty CLAY to CLAY	115	1.5	8	14	4	-	-	1.3	3.6	59	0.005	3.01	15
37.40	14.7	8.7	-	14.6	0.7	-4.4	6.0	3	silty CLAY to CLAY	115	1.5	6	10	3	-	-	0.9	2.4	80	0.005	3.29	15
37.57	39.5	23.3	-	39.4	1.2	-5.2	3.3	4	clayy SILT to silty CLAY	115	2.0	12	20	6	-	-	2.7	7.2	43	0.070	2.75	15
37.73	45.2	26.6	-	45.2	1.2	-0.4	2.8	4	clayy SILT to silty CLAY	115	2.0	13	23	7	-	-	3.1	8.3	38	0.070	2.65	15
37.90	60.5	45.0	108.8	60.4	1.4	-1.1	2.3	5	silty SAND to sandy SILT	120	3.0	15	20	11	41	34	-	-	27	0.200	2.43	16
38.06	119.2	88.5	109.9	119.1	1.1	-7.3	1.0	6	clean SAND to silty SAND	125	5.0	18	24	17	63	39	-	-	12	0.350	1.95	16
38.22	122.1	90.5	114.3	122.0	1.3	-1.7	1.1	6	clean SAND to silty SAND	125	5.0	18	24	18	64	39	-	-	12	0.350	1.97	16
38.39	116.7	86.4	108.7	116.7	1.1	0.2	1.0	6	clean SAND to silty SAND	125	5.0	17	23	17	62	38	-	-	12	0.350	1.97	16
38.55	120.2	88.9	122.2	120.2	1.7	-1.2	1.4	5	silty SAND to sandy SILT	120	3.0	30	40	18	63	39	-	-	14	0.200	2.05	16
38.72	131.5	97.1	117.7	131.5	1.3	-0.1	1.0	6	clean SAND to silty SAND	125	5.0	19	26	19	66	39	-	-	11	0.350	1.92	16
38.88	148.5	109.5	127.2	148.5	1.4	2.0	0.9	6	clean SAND to silty SAND	125	5.0	22	30	20	70	40	-	-	10	0.350	1.87	16
39.04	141.6	104.3	131.3	141.6	1.7	-2.0	1.3	6	clean SAND to silty SAND	125	5.0	21	28	20	68	39	-	-	12	0.350	1.97	16
39.21	143.7	105.7	128.1	143.7	1.6	-3.1	1.1	6	clean SAND to silty SAND	125	5.0	21	29	20	69	39	-	-	11	0.350	1.92	16
39.37	168.4	123.6	145.3	168.3	1.9	-4.1	1.1	6	clean SAND to silty SAND	125	5.0	25	34	23	74	40	-	-	10	0.350	1.89	16
39.54	175.1	128.3	156.3	175.1	2.4	-0.7	1.4	6	clean SAND to silty SAND	125	5.0	26	35	25	75	40	-	-	11	0.350	1.93	16
39.70	138.6	101.5	143.9	138.6	2.4	-0.8	1.8	5	silty SAND to sandy SILT	120	3.0	34	46	21	67	39	-	-	15	0.200	2.08	16
39.86	157.9	115.4	120.2	157.9	0.8	4.0	0.5	6	clean SAND to silty SAND	125	5.0	23	32	20	72	40	-	-	6	0.350	1.71	16
40.03	158.3	115.6	119.5	158.4	0.8	1.6	0.5	6	clean SAND to silty SAND	125	5.0	23	32	20	72	40	-	-	6	0.350	1.69	16
40.19	165.3	120.5	124.4	165.4	0.9	2.0	0.5	6	clean SAND to silty SAND	125	5.0	24	33	21	73	40	-	-	6	0.350	1.69	16
40.36	164.9	120.0	120.6	165.0	0.7	1.5	0.5	6	clean SAND to silty SAND	125	5.0	24	33	21	73	40	-	-	5	0.350	1.65	16
40.52	166.0	120.6	146.7	166.1	2.1	5.7	1.3	6	clean SAND to silty SAND	125	5.0	24	33	23	73	40	-	-	11	0.350	1.93	16
40.68	175.6	127.4	127.4	175.7	0.6	6.7	0.3	6	clean SAND to silty SAND	125	5.0	25	35	21	75	40	-	-	5	0.350	1.57	16
40.85	195.7	141.8	141.8	195.8	1.0	3.6	0.5	6	clean SAND to silty SAND	125	5.0	28	39	24	79	41	-	-	5	0.350	1.62	16
41.01	246.1	178.1	178.1	246.2	0.9	6.6	0.4	6	clean SAND to silty SAND	125	5.0	36	49	29	86	42	-	-	5	0.350	1.47	16
41.18	178.1	128.7	140.4	178.2	1.5	2.8	0.8	6	clean SAND to silty SAND	125	5.0	26	36	23	75	40	-	-	8	0.350	1.78	16
41.34	178.6	128.9	137.8	178.6	1.3	1.5	0.7	6	clean SAND to silty SAND	125	5.0	26	36	23	75	40	-	-	7	0.350	1.75	16
41.50	184.5	132.9	138.1	184.5	1.2	-1.6	0.6	6	clean SAND to silty SAND	125	5.0	27	37	23	76	41	-	-	6	0.350	1.70	16
41.67	179.2	129.0	128.5	179.2	0.9	-1.3	0.5	6	clean SAND to silty SAND	125	5.0	26	36	22	75	40	-	-	5	0.350	1.64	16
41.83	162.7	116.9	120.3	162.6	0.8	-4.2	0.5	6	clean SAND to silty SAND	125	5.0	23	33	20	72	40	-	-	6	0.350	1.69	16
42.00	145.4	104.3	105.9	145.4	0.5	-3.5	0.4	6	clean SAND to silty SAND	125	5.0	21	29	18	68	39	-	-	5	0.350	1.67	16
42.16	137.1	98.3	101.7	137.1	0.5	-2.3	0.4	6	clean SAND to silty SAND	125	5.0	20	27	17	66	39	-	-	6	0.350	1.70	16
42.32	126.8	90.7	95.7	126.8	0.5	-0.3	0.4	6	clean SAND to silty SAND	125	5.0	18	25	16	64	38	-	-	7	0.350	1.73	16
42.49	122.2	87.3	93.0	122.2	0.5	-0.2	0.4	6	clean SAND to silty SAND	125	5.0	17	24	16	63	38	-	-	7	0.350	1.74	16
42.65	118.5	84.5	100.0	118.5	0.8	0.2	0.7	6	clean SAND to silty SAND	125	5.0	17	24	16	61	38	-	-	10	0.350	1.89	16
42.82	121.4	86.5	103.1	121.5	0.9	1.4	0.8	6	clean SAND to silty SAND	125	5.0	17	24	16	62	38	-	-	10	0.350	1.90	16
42.98	129.5	92.2	108.2	129.5	1.0	0.9	0.8	6	clean SAND to silty SAND	125	5.0	18	26	17	64	39	-	-	10	0.350	1.88	16
43.15	137.8	97.9	111.9	137.9	1.0	7.7	0.7	6	clean SAND to silty SAND	125	5.0	20	28	18	66	39	-	-	9	0.350	1.85	16
43.31	171.2	121.5	133.3	171.3	1.3	3.3	0.8	6	clean SAND to silty SAND	125	5.0	24	34	22	73	40	-	-	8	0.350	1.79	16
43.47	177.1	125.5	147.2	177.2	2.0	4.6	1.2	6	clean SAND to silty SAND	125	5.0	25	35	24	75	40	-	-	10	0.350	1.88	16
43.64	177.2	125.4	141.3	177.3	1.7	4.4	1.0	6	clean SAND to silty SAND	125	5.0	25	35	23	74	40	-	-	9	0.350	1.83	16
43.80	202.8	143.3	143.3	203.0	1.1	7.4	0.6	6	clean SAND to silty SAND	125	5.0	29	41	25	79	41	-	-	5	0.350	1.64	16
43.97	207.5	146.5	147.1	207.6	1.2	5.8	0.6	6	clean SAND to silty SAND	125	5.0	29	42	25	80	41	-	-	5	0.350	1.65	16
44.13	231.2	163.0	163.0	231.3	1.1	2.4	0.5	6	clean SAND to silty SAND	125	5.0	33	46	27	83	42	-	-	5	0.350	1.56	16
44.29	249.0	175.2	175.2	249.0	1.3	4.0	0.5	6	clean SAND to silty SAND	125	5.0	35	50	29	86	42	-	-	5	0.350	1.56	16
44.46	245.8	172.7	172.7	245.8	1.5	2.9	0.6	6	clean SAND to silty SAND	125	5.0	35	49	29	85	42	-	-	5	0.350	1.59	16
44.62	272.8	191.5	191.5	272.8	0.9	2.7	0.3	6	clean SAND to silty SAND	125	5.0	38	55	31	88	42	-	-	5	0.350	1.40	16
44.79	281.0	197.0	197.0	281.1	1.9	2.6	0.7	6	clean SAND to silty SAND	125	5.0	39	56	33	89	42	-	-	5	0.350	1.59	16
44.95	283.2	198.3	198.3	283.3	2.3	3.2	0.8	6	clean SAND to silty SAND	125	5.0	40	57	34	90	43	-	-	5	0.350	1.64	16
45.11	295.3	206.5	206.5	295.5	2.1	9.8	0.7	6	clean SAND to silty SAND	125	5.0	41	59	35	91	43	-	-	5	0.350	1.59	16
45.28	298.5	208.4	208.4	298.6	2.0	6.4	0.7	6	clean SAND to silty SAND	125	5.0	42	60	35	91	43	-	-	5	0.350	1.55	16
45.44	234.1	163.3	163.3	234.3	1.5	8.7	0.6	6	clean SAND to silty SAND	125	5.0	33	47	28	83	42	-	-	5	0.350	1.63	16
45.61	205.5	143.1	146.6	205.7	1.3	9.5	0.7	6	clean SAND to silty SAND	125	5.0	29	41	25	79	41	-	-	6	0.350	1.68	16
45.77	181.7	126.3	145.9	181.8	1.9	5.6	1.1	6	clean SAND to silty SAND	125	5.0	25	36	24	75	40	-	-	9	0.350	1.86	16
45.93	181.8	126.3	145.6	181.8	1.9	1.3	1.1	6	clean SAND to silty SAND	125	5.0	25	36	24	75	40	-	-	9	0.350	1.86	16
46.10	193.0	133.8	146.3	192.9	1.7	-3.1	0.9	6	clean SAND to silty SAND	125	5.0	27	39	24	77	40	-	-	8	0.350	1.78	16
46.26	186.8	129.4	136.0	186.7	1.2	-6.0	0.7	6	clean SAND to silty SAND	125	5.0	26	37	23	76	40	-	-	6	0.350	1.72	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Salem Engineering
Data File: SDF(812).cpt
CPT Date: 4/3/2024 10:01:28 AM
GW During Test: 18 ft

Sounding ID: CPT-02
Project No: 5-224-0090
Cone/Rig: DDG1627

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
46.43	173.9	120.3	120.3	173.8	0.7	-6.0	0.4	6	clean SAND to silty SAND	125	5.0	24	35	21	73	40	-	-	5	0.350	1.63	16
46.59	162.7	112.4	112.4	162.6	0.6	-7.3	0.4	6	clean SAND to silty SAND	125	5.0	22	33	19	71	39	-	-	5	0.350	1.62	16
46.75	155.3	107.2	118.4	155.2	1.1	-6.8	0.7	6	clean SAND to silty SAND	125	5.0	21	31	20	69	39	-	-	8	0.350	1.80	16
46.92	141.8	97.7	115.4	141.7	1.2	-6.1	0.9	6	clean SAND to silty SAND	125	5.0	20	28	18	66	39	-	-	10	0.350	1.89	16
47.08	128.8	88.6	116.6	128.7	1.5	-5.8	1.2	6	clean SAND to silty SAND	125	5.0	18	26	17	63	38	-	-	13	0.350	2.01	16
47.25	136.4	93.8	113.7	136.3	1.3	-5.7	0.9	6	clean SAND to silty SAND	125	5.0	19	27	18	65	38	-	-	11	0.350	1.92	16
47.41	151.5	104.0	110.4	151.4	0.8	-6.2	0.5	6	clean SAND to silty SAND	125	5.0	21	30	19	68	39	-	-	7	0.350	1.73	16
47.57	140.9	96.6	98.3	140.8	0.5	-6.1	0.3	6	clean SAND to silty SAND	125	5.0	19	28	17	66	39	-	-	6	0.350	1.67	16
47.74	141.2	96.6	96.6	141.0	0.4	-5.7	0.3	6	clean SAND to silty SAND	125	5.0	19	28	17	66	39	-	-	5	0.350	1.64	16
47.90	134.0	91.6	92.7	134.0	0.4	0.7	0.3	6	clean SAND to silty SAND	125	5.0	18	27	16	64	38	-	-	5	0.350	1.66	16
48.07	138.4	94.5	94.5	138.4	0.4	2.4	0.3	6	clean SAND to silty SAND	125	5.0	19	28	16	65	38	-	-	5	0.350	1.63	16
48.23	144.7	98.7	99.3	144.8	0.5	2.7	0.3	6	clean SAND to silty SAND	125	5.0	20	29	17	67	39	-	-	5	0.350	1.65	16
48.39	152.2	103.7	103.7	152.3	0.5	3.2	0.3	6	clean SAND to silty SAND	125	5.0	21	30	18	68	39	-	-	5	0.350	1.62	16
48.56	157.8	107.4	110.9	157.9	0.7	3.6	0.5	6	clean SAND to silty SAND	125	5.0	21	32	19	69	39	-	-	6	0.350	1.69	16
48.72	163.0	110.7	112.1	163.0	0.7	3.6	0.4	6	clean SAND to silty SAND	125	5.0	22	33	19	70	39	-	-	5	0.350	1.66	16
48.89	167.8	113.9	113.9	167.9	0.6	2.9	0.3	6	clean SAND to silty SAND	125	5.0	23	34	19	71	39	-	-	5	0.350	1.61	16
49.05	163.2	110.6	110.7	163.2	0.6	2.4	0.4	6	clean SAND to silty SAND	125	5.0	22	33	19	70	39	-	-	5	0.350	1.65	16
49.22	153.1	103.6	106.3	153.1	0.6	3.2	0.4	6	clean SAND to silty SAND	125	5.0	21	31	18	68	39	-	-	6	0.350	1.68	16
49.38	150.0	101.4	116.1	150.1	1.2	3.8	0.8	6	clean SAND to silty SAND	125	5.0	20	30	19	67	39	-	-	9	0.350	1.85	16
49.54	170.0	114.8	127.7	170.0	1.3	1.6	0.8	6	clean SAND to silty SAND	125	5.0	23	34	21	72	39	-	-	8	0.350	1.81	16
49.71	188.7	127.3	137.6	188.7	1.4	0.5	0.8	6	clean SAND to silty SAND	125	5.0	25	38	23	75	40	-	-	7	0.350	1.76	16
49.87	206.7	139.3	151.7	206.8	1.8	0.9	0.9	6	clean SAND to silty SAND	125	5.0	28	41	25	78	40	-	-	8	0.350	1.78	16
50.04	197.0	132.5	140.1	196.9	1.4	-1.2	0.7	6	clean SAND to silty SAND	125	5.0	27	39	24	76	40	-	-	7	0.350	1.73	16
50.20	217.9	146.4	150.4	217.9	1.5	-2.9	0.7	6	clean SAND to silty SAND	125	5.0	29	44	26	80	41	-	-	6	0.350	1.68	16
50.36	252.6	169.5	188.3	252.6	3.0	-1.4	1.2	6	clean SAND to silty SAND	125	5.0	34	51	31	84	42	-	-	8	0.350	1.81	16
50.53	296.5	198.8	202.1	296.4	2.7	-4.2	0.9	6	clean SAND to silty SAND	125	5.0	40	59	35	90	42	-	-	6	0.350	1.67	16
50.69	318.0	212.9	216.0	317.9	3.1	-5.1	1.0	6	clean SAND to silty SAND	125	5.0	43	64	37	92	43	-	-	5	0.350	1.67	16
50.86	329.5	220.3	220.3	329.5	2.7	-2.9	0.8	6	clean SAND to silty SAND	125	5.0	44	66	38	93	43	-	-	5	0.350	1.61	16
51.02	372.8	249.0	249.0	372.8	2.7	-2.8	0.7	6	clean SAND to silty SAND	125	5.0	50	75	41	95	43	-	-	5	0.350	1.53	16
51.18	351.3	234.3	234.3	351.3	2.3	-1.3	0.6	6	clean SAND to silty SAND	125	5.0	47	70	39	95	43	-	-	5	0.350	1.51	16
51.35	351.1	233.9	233.9	351.1	2.6	0.5	0.7	6	clean SAND to silty SAND	125	5.0	47	70	39	95	43	-	-	5	0.350	1.55	16
51.51	332.7	221.4	221.4	332.6	2.9	-4.0	0.9	6	clean SAND to silty SAND	125	5.0	44	67	38	93	43	-	-	5	0.350	1.62	16
51.68	315.3	209.5	218.6	315.3	3.4	2.6	1.1	6	clean SAND to silty SAND	125	5.0	42	63	37	91	43	-	-	6	0.350	1.71	16
51.84	278.0	184.6	191.4	278.0	2.6	-0.9	0.9	6	clean SAND to silty SAND	125	5.0	37	56	32	87	42	-	-	6	0.350	1.70	16
52.00	206.0	136.6	147.6	205.9	1.7	-5.4	0.8	6	clean SAND to silty SAND	125	5.0	27	41	25	77	40	-	-	7	0.350	1.76	16
52.17	158.1	104.7	118.7	158.0	1.2	-7.2	0.8	6	clean SAND to silty SAND	125	5.0	21	32	19	69	39	-	-	9	0.350	1.83	16
52.33	142.7	94.4	115.7	142.5	1.4	-7.9	1.0	6	clean SAND to silty SAND	125	5.0	19	29	18	65	38	-	-	11	0.350	1.94	16
52.50	133.7	88.3	121.1	133.5	1.8	-7.9	1.4	5	silty SAND to sandy SILT	120	3.0	29	45	18	63	38	-	-	14	0.200	2.05	16
52.66	133.9	88.4	119.8	133.7	1.7	-7.8	1.3	5	silty SAND to sandy SILT	120	3.0	29	45	18	63	38	-	-	14	0.200	2.04	16
52.82	120.3	79.3	112.8	120.2	1.6	-6.8	1.4	5	silty SAND to sandy SILT	120	3.0	26	40	16	59	37	-	-	15	0.200	2.08	16
52.99	153.0	100.8	126.7	152.9	1.8	-7.2	1.2	6	clean SAND to silty SAND	125	5.0	20	31	20	67	39	-	-	12	0.350	1.97	16
53.15	181.1	119.1	130.2	181.0	1.3	-6.6	0.8	6	clean SAND to silty SAND	125	5.0	24	36	22	73	40	-	-	8	0.350	1.78	16
53.32	176.8	116.2	128.2	176.7	1.3	-4.8	0.8	6	clean SAND to silty SAND	125	5.0	23	35	21	72	39	-	-	8	0.350	1.80	16
53.48	176.8	116.0	124.4	176.7	1.1	-4.7	0.7	6	clean SAND to silty SAND	125	5.0	23	35	21	72	39	-	-	7	0.350	1.75	16
53.64	188.8	123.7	133.4	188.7	1.4	-5.7	0.7	6	clean SAND to silty SAND	125	5.0	25	38	22	74	40	-	-	7	0.350	1.76	16
53.81	173.5	113.6	120.4	173.5	1.0	1.5	0.6	6	clean SAND to silty SAND	125	5.0	23	35	20	71	39	-	-	7	0.350	1.73	16
53.97	178.2	116.5	116.5	178.1	0.7	-3.0	0.4	6	clean SAND to silty SAND	125	5.0	23	36	20	72	39	-	-	5	0.350	1.63	16
54.14	158.7	103.7	107.1	158.7	0.7	-2.4	0.4	6	clean SAND to silty SAND	125	5.0	21	32	18	68	39	-	-	6	0.350	1.69	16
54.30	143.3	93.5	100.3	143.2	0.7	-1.4	0.5	6	clean SAND to silty SAND	125	5.0	19	29	17	65	38	-	-	7	0.350	1.75	16
54.46	128.9	84.0	93.8	128.9	0.6	-1.1	0.5	6	clean SAND to silty SAND	125	5.0	17	26	15	61	37	-	-	8	0.350	1.81	16
54.63	122.7	79.8	90.4	122.6	0.6	-0.9	0.5	6	clean SAND to silty SAND	125	5.0	16	25	15	60	37	-	-	9	0.350	1.83	16
54.79	128.2	83.4	90.4	128.2	0.5	-0.6	0.4	6	clean SAND to silty SAND	125	5.0	17	26	15	61	37	-	-	7	0.350	1.77	16
54.96	130.3	84.6	89.8	130.3	0.5	-0.3	0.4	6	clean SAND to silty SAND	125	5.0	17	26	15	61	37	-	-	7	0.350	1.74	16
55.12	119.0	77.2	84.3	119.1	0.4	3.4	0.4	6	clean SAND to silty SAND	125	5.0	15	24	14	58	37	-	-	8	0.350	1.78	16
55.28	110.4	71.5	80.9	110.5	0.4	3.9	0.4	6	clean SAND to silty SAND	125	5.0	14	22	13	56	36	-	-	9	0.350	1.83	16
55.45	100.0	64.7	80.6	100.1	0.6	3.8	0.6	6	clean SAND to silty SAND	125	5.0	13	20	12	53	36	-	-	12	0.350	1.96	16
55.61	86.0	55.6	84.8	86.1	0.9	3.6	1.0	5	silty SAND to sandy SILT	120	3.0	19	29	12	48	35	-	-	17	0.200	2.14	16
55.78	77.8	50.3	91.2	77.9	1.1	3.6	1.4	5	silty SAND to sandy SILT	120	3.0	17	26	11	44	34	-	-	21	0.200	2.26	16
55.94	84.5	54.5	88.5	84.6	1.0	5.1	1.2	5	silty SAND to sandy SILT	120	3.0	18	28	12	47	35	-	-	18	0.200	2.18	16
56.11	93.1	60.0	84.8	93.0	0.8	-5.4	0.9	5	silty SAND to sandy SILT	120	3.0	20	31	12	50	35	-	-	15	0.200	2.08	16
56.27	102.7	66.1	81.4	102.6	0.6	-6.8	0.6	6	clean SAND to silty SAND	125	5.0	13	21	13	53	36	-	-	11	0.350	1.94	16
56.43	109.8	70.6	81.3	109.6	0.5	-7.9	0.5	6	clean SAND to silty SAND	125	5.0	14	22	13	56	36	-	-	9	0.350	1.86	16
56.60	121.1	77.8	83.9	121.0	0.4	-8.2	0.3	6	clean SAND to silty SAND	125	5.0	16	24	14	59	37	-	-	7	0.350	1.76	16
56.76	124.7	80.0	82.7	124.5	0.3	-7.7	0.2	6	clean SAND to silty SAND	125	5.0	16	25	14	60	37	-	-	6	0.350	1.69	16
56.93	116.2	74.5	80.1	116.0	0.3	-7.8	0.3	6	clean SAND to silty SAND	125	5.0	15	23	13	57	37	-	-	7	0.350	1.76	16
57.09	104.7	67.0	74.9	104.5	0.3	-7.3	0.3	6	clean SAND to silty SAND	125	5.0	13	21	12	54	36	-	-	8	0.350	1.82	16
57.25	99.2	63.4	72.2	99.1	0.3	-6.9	0.3	6	clean SAND to silty SAND	125	5.0	13	20	12	52	36	-	-	9	0.350	1.84	16
57.42	99.8	63.7	72.1	99.7	0.3	-6.6	0.3	6	clean SAND to silty SAND	125	5.0	13	20	12	52	36	-	-	9	0.350	1.83	16
57.58	96.1	61.3	70.8	96.0	0.3	-4.8	0.3	6	clean SAND to silty SAND	125	5.0	12	19	11	51	35	-	-	9	0.350	1.86	16
57.75	97.6	62.2	73.0	97.5	0.4	-4.4	0.4	6	clean SAND to silty SAND	125	5.0	12	20	12	51	36	-	-	10	0.350	1.88	16
57.91	95.1	60.6	73.7	95.1	0.4	-3.9	0.5	6	clean SAND to silty SAND	125	5.0	12	19	12	50	35	-	-	11	0.350	1.93	16
58.07	91.7	58.3	72.0	91.6	0.4	-3.6	0.5	6	clean SAND to silty SAND	125	5.0	12	18	11	49	35	-	-	12	0.350	1.94	16
58.24	88.7	56.3	66.9	88.6	0.3	-3.3	0.4	6	clean SAND to silty SAND	125	5.0	11	18	11	48	35	-	-	10	0.350	1.90	16
58.40	87.3	55.4	65.6	87.2	0.3	-3.1	0.3	6	clean SAND to silty SAND	125	5.0	11	17	10	48	35	-	-	10	0.350	1.89	16
58.57	78.5	49.8	65.6	78.5	0.4	-2.9	0.5	6	clean SAND to silty SAND	125	5.0	10	16	10	44	34	-	-	13	0.350	2.01	16
58.73	74.9	47.4	64.4	74.9	0.4	-2.6	0.5	6	clean SAND to silty SAND	125	5.0	9	15	9	42	34	-	-	14	0.350	2.04	16
58.89	79.1	50.0	65.9	79.0	0.4	-2.1	0.5	6	clean SAND to silty SAND	125	5.0	10	16	10	44	34	-	-	13	0.350	2.01	16
59.06	84.6	53.4	66.7	84.6	0.3	-0.2	0.4	6	clean SAND to silty SAND	125	5.0	11	17	10	46	35	-	-	12	0.350	1.96	16
59.22	91.7	57.9	69.6	91.7	0.4	-2.6	0.4	6	clean SAND to silty SAND	125	5.0	12	18	11	49	35	-	-	11	0.350	1.91	16
59.39	97.1	61.2	81.0	97.0	0.7	-2.4	0.7	6	clean SAND to silty SAND	125	5.0	12	19	12	51	35	-	-	13	0.350	2.02	16
59.55	97.4	61.4	99.1	97.4	1.3	-2.0	1.4	5	silty SAND to sandy SILT	120	3.0	20	32	13	51	35	-	-	18	0.200	2.18	16
59.71	104.4	65.7	114.4	104.4	1.8	-1.3	1.8	5	silty SAND to sandy SILT	120	3.0	22	35	14	53	36	-	-	20	0.200	2.23	16
59.88	146.8	92.3	140.6	146.8	2.8	-0.8	1.9	5	silty SAND to sandy SILT	120	3.0	31	49	19	64	38	-	-	17	0.200	2.14	16
60.04	241.6	151.7	172.8	241.5	2.9	-6.2	1.2	6	clean SAND to silty SAND	125	5.0	30	48	28	81	41	-	-	9	0.350	1.84	16
60.21	185.8	116.5	149.0	185.9	2.7	5.8	1.5	6	clean SAND to silty SAND	125	5.0	23	37	23	72	39	-	-	13	0.350	1.98	16
60.37	135.3	84.7	102.0	135.3	1.0	3.6	0.8	6	clean SAND to silty SAND	125	5.0	17	27	16	62	37	-	-	11	0.350	1.92	16
60.53	124.9	78.2	98.8	125.0	1.1	8.0	0.9	6	clean SAND to silty SAND	125	5.0	16	25	15	59	37	-	-	12	0.350	1.97	16
60.70	124.0	77.5	103.9	123.9	1.3	-2.7	1.1	6	clean SAND to silty SAND	125	5.0	16	25	15	59	37	-	-	14	0.350	2.03	16
60.86	112.5	70.2	101.7	112.3	1.3	-9.7	1.2	5	silty SAND to sandy SILT	120	3.0	23	37	14	55	36	-	-	16	0.200	2.10	16
61.03	103.6	64.7	99.3	103.4	1.3	-10.0	1.3	5	silty SAND to sandy SILT	120	3.0	22	35	13	53	36	-	-	17	0.200	2.14	16
61.19	111.7	69.6	87.9	111.5	0.8	-10.5	0.7	6	clean SAND to silty SAND	125	5.0	14	22	14	55	36	-	-	12	0.350	1.97	16
61.35	125.7	78.3	90.5	125.5	0.7	-10.3	0.6	6	clean SAND to silty SAND	125	5.0	16	25	15	59	37	-	-	10	0.350	1.86	16
61.52	123.6	76.9	91.6	123.4	0.8	-9.9	0.6	6	clean SAND to silty SAND	125	5.0	15	25	15	58	37	-	-	10	0.350	1.90	16
61.68	123.8	76.9	94.9	123.6	0.9	-8.1	0.8	6	clean SAND to silty SAND	125	5.0	15	25	15	58	37	-	-	11	0.350	1.94	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Project ID: Salem Engineering
Data File: SDF(812).cpt
CPT Date: 4/3/2024 10:01:28 AM
GW During Test: 18 ft

Sounding ID: CPT-02
Project No: 5-224-0090
Cone/Rig: DDG1627

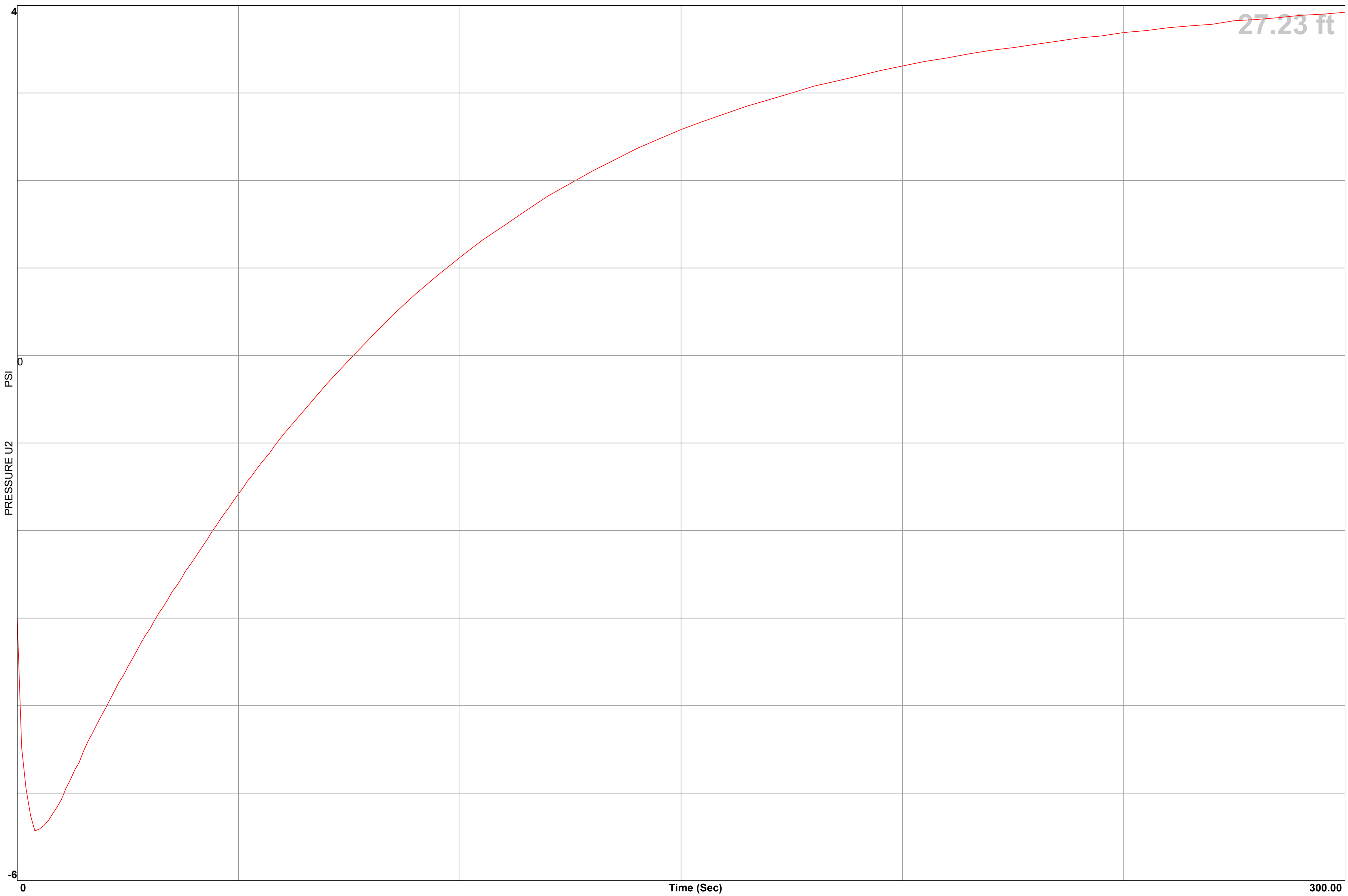
. . Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
61.85	135.0	83.8	94.9	134.9	0.7	-7.8	0.6	6	clean SAND to silty SAND	125	5.0	17	27	15	61	37	-	-	9	0.350	1.83	16
62.01	142.4	88.3	97.1	142.3	0.7	-7.6	0.5	6	clean SAND to silty SAND	125	5.0	18	28	16	63	37	-	-	8	0.350	1.79	16
62.17	134.4	83.3	102.3	134.3	1.1	-7.7	0.8	6	clean SAND to silty SAND	125	5.0	17	27	16	61	37	-	-	11	0.350	1.94	16
62.34	122.6	75.9	114.9	122.5	1.8	-7.6	1.5	5	silty SAND to sandy SILT	120	3.0	25	41	16	58	37	-	-	17	0.200	2.13	16
62.50	129.2	79.9	114.9	129.1	1.8	-7.4	1.4	5	silty SAND to sandy SILT	120	3.0	27	43	16	60	37	-	-	16	0.200	2.09	16
62.67	134.7	83.2	110.9	134.6	1.5	-7.2	1.2	6	clean SAND to silty SAND	125	5.0	17	27	16	61	37	-	-	14	0.350	2.02	16
62.83	149.8	92.4	152.7	149.7	3.4	-6.4	2.3	5	silty SAND to sandy SILT	120	3.0	31	50	20	64	38	-	-	19	0.200	2.19	16
63.00	159.6	98.4	158.0	159.5	3.6	-6.6	2.3	5	silty SAND to sandy SILT	120	3.0	33	53	21	66	38	-	-	18	0.200	2.17	16
63.16	186.8	115.0	141.9	186.7	2.4	-6.3	1.3	6	clean SAND to silty SAND	125	5.0	23	37	22	72	39	-	-	11	0.350	1.94	16
63.32	292.9	180.2	179.8	292.8	2.2	-4.8	0.8	6	clean SAND to silty SAND	125	5.0	36	59	31	86	41	-	-	5	0.350	1.64	16
63.49	279.5	171.8	184.7	279.5	2.9	-4.4	1.1	6	clean SAND to silty SAND	125	5.0	34	56	31	85	41	-	-	7	0.350	1.76	16
63.65	240.2	147.4	173.1	240.1	3.2	-5.2	1.4	6	clean SAND to silty SAND	125	5.0	29	48	28	80	40	-	-	10	0.350	1.88	16
63.82	250.1	153.4	183.7	250.0	3.8	-6.5	1.5	6	clean SAND to silty SAND	125	5.0	31	50	29	81	40	-	-	11	0.350	1.91	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Salem Engineering

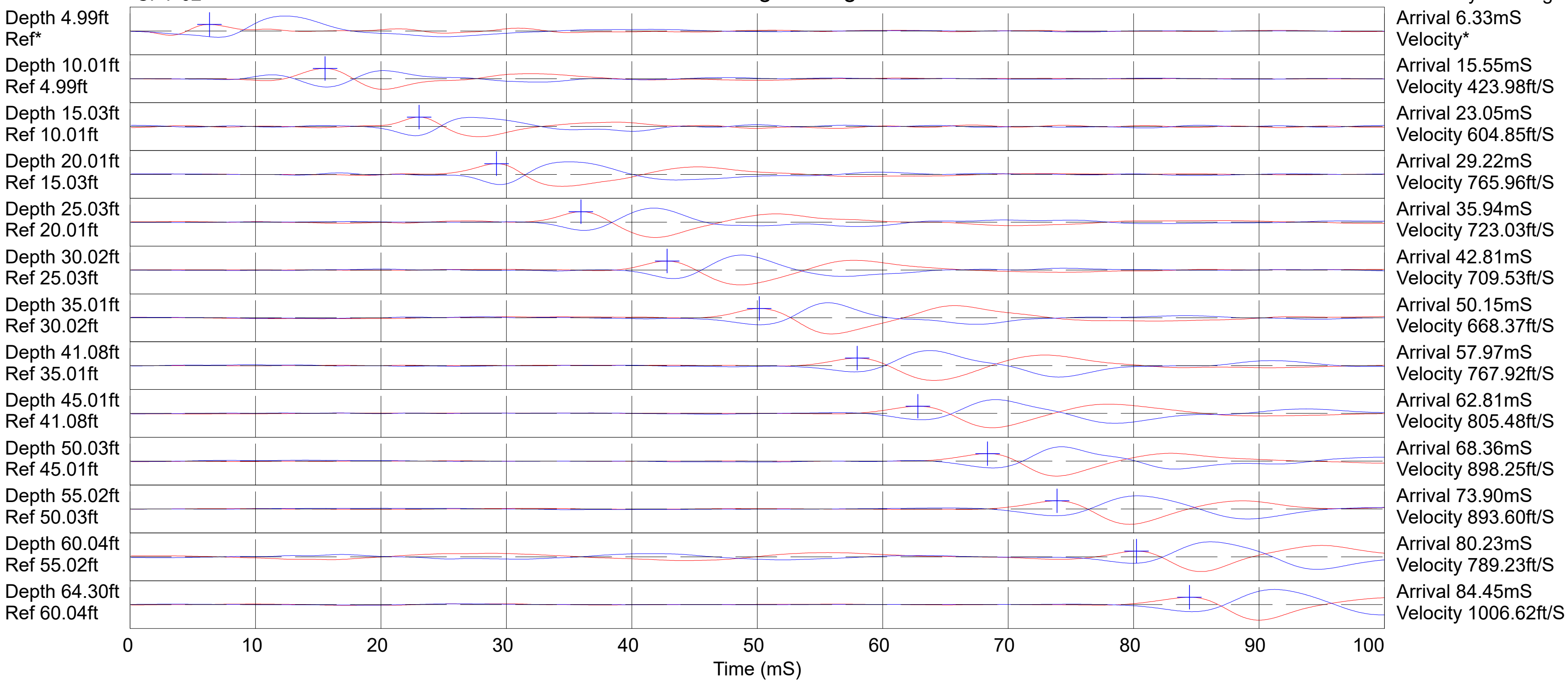
Location	Santa Cruz Multi-Family Housing	Operator	JM-FA		
Job Number	5-224-0090	Cone Number	DDG1627	GPS	
Hole Number	CPT-02	Date and Time	4/3/2024 10:01:28 AM		
Equilized Pressure	3.9	EST GW Depth During Test	18.1		



CPT-02

Salem Engineering

Santa Cruz Multi-Family Housing



Hammer to Rod String Distance (ft): 5.83

* = Not Determined

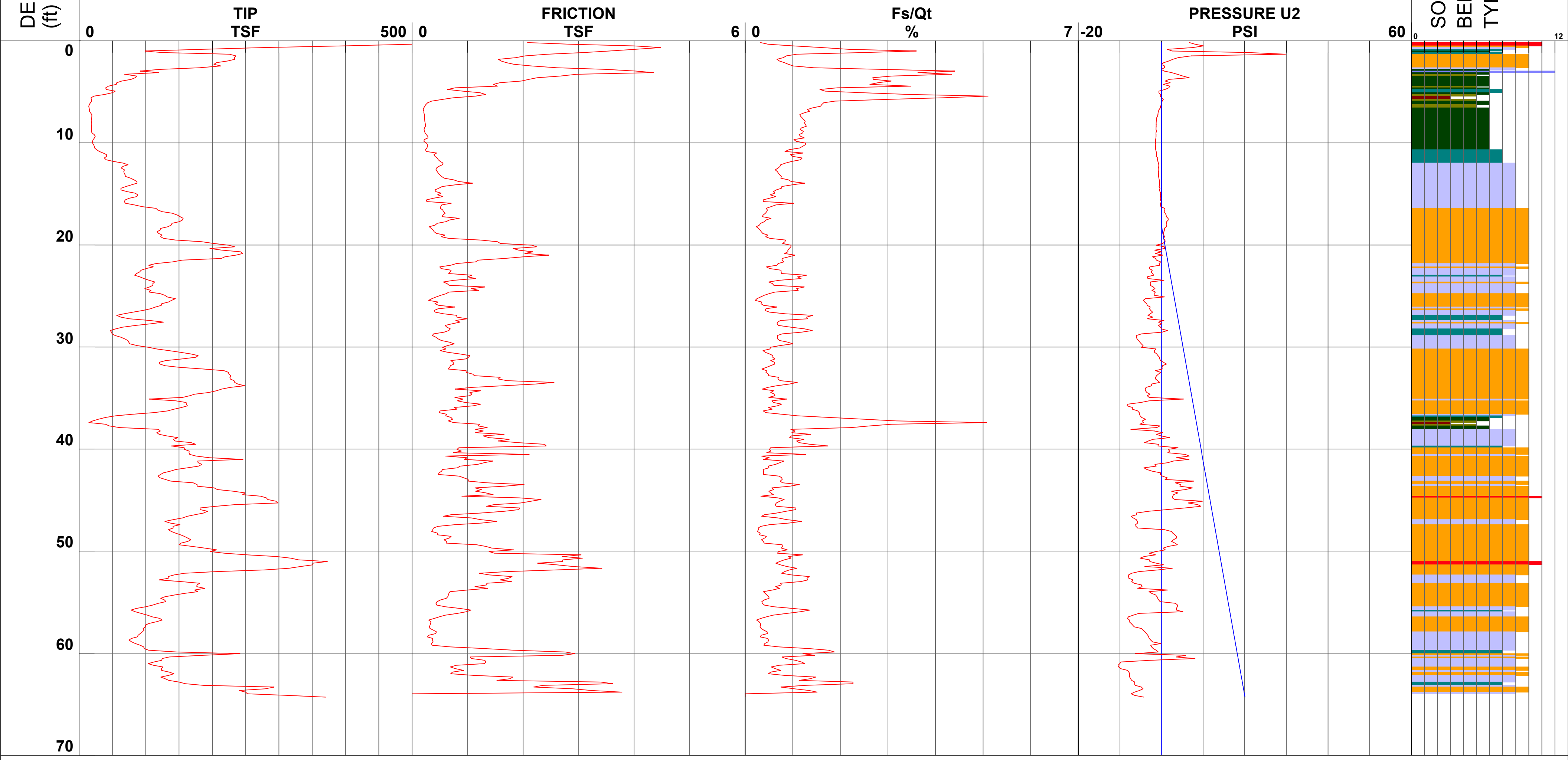
COMMENT:

Salem Engineering

Project	Santa Cruz Multi-Family Housing	Operator	JM-FA	Filename	SDF(812).cpt
Job Number	5-224-0090	Cone Number	DDG1627	GPS	
Hole Number	CPT-02	Date and Time	4/3/2024 10:01:28 AM	Maximum Depth	64.30 ft
EST GW Depth During Test		18.10 ft			

Net Area Ratio .8

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 15cm² Housing S*Soil behavior type and SPT based on data from UBC-1983

Santa Cruz Multi-Family Housing

Project ID: Salem Engineering
Data File: SDF(811).cpt
CPT Date: 4/3/2024 8:15:42 AM
GW During Test: 15 ft

Sounding ID: CPT-03
Project No: 5-224-0090
Cone/Rig: DDG1627

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
0.33	120.7	193.6	193.6	120.7	0.5	0.6	0.4	6	clean SAND to silty SAND	125	5.0	39	24	31	89	48	-	-	5	0.350	1.42	16
0.49	93.2	149.4	149.4	93.2	0.5	0.4	0.5	6	clean SAND to silty SAND	125	5.0	30	19	25	80	48	-	-	5	0.350	1.59	16
0.66	94.2	151.1	151.1	94.2	0.5	0.2	0.6	6	clean SAND to silty SAND	125	5.0	30	19	26	81	48	-	-	5	0.350	1.62	16
0.82	101.0	161.9	163.7	101.0	0.7	0.3	0.7	6	clean SAND to silty SAND	125	5.0	32	20	28	83	48	-	-	5	0.350	1.66	16
0.98	126.7	203.2	203.2	126.7	1.1	0.5	0.8	6	clean SAND to silty SAND	125	5.0	41	25	35	90	48	-	-	5	0.350	1.63	16
1.15	153.8	246.6	246.6	153.8	1.3	0.7	0.9	6	clean SAND to silty SAND	125	5.0	49	31	42	95	48	-	-	5	0.350	1.58	16
1.31	159.4	255.6	255.6	159.4	1.4	0.1	0.9	6	clean SAND to silty SAND	125	5.0	51	32	43	95	48	-	-	5	0.350	1.58	16
1.48	145.2	232.9	232.0	145.2	1.4	0.1	1.0	6	clean SAND to silty SAND	125	5.0	47	29	40	95	48	-	-	5	0.350	1.64	16
1.64	131.4	210.8	215.8	131.4	1.3	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	42	26	37	92	48	-	-	6	0.350	1.68	16
1.80	126.0	202.0	206.4	126.0	1.2	-0.1	1.0	6	clean SAND to silty SAND	125	5.0	40	25	35	90	48	-	-	6	0.350	1.68	16
1.97	115.7	185.6	185.2	115.7	0.9	-0.1	0.8	6	clean SAND to silty SAND	125	5.0	37	23	32	87	48	-	-	5	0.350	1.64	16
2.13	98.3	157.7	167.6	98.3	0.9	-0.1	0.9	6	clean SAND to silty SAND	125	5.0	32	20	28	82	48	-	-	7	0.350	1.74	16
2.30	86.0	138.0	151.7	86.0	0.8	0.2	0.9	6	clean SAND to silty SAND	125	5.0	28	17	25	78	48	-	-	8	0.350	1.79	16
2.46	77.1	123.6	139.6	77.1	0.7	0.3	1.0	6	clean SAND to silty SAND	125	5.0	25	15	23	74	48	-	-	9	0.350	1.83	16
2.62	70.1	112.4	128.5	70.1	0.6	0.0	0.9	6	clean SAND to silty SAND	125	5.0	22	14	21	71	47	-	-	9	0.350	1.85	16
2.79	65.9	105.6	122.3	65.9	0.6	0.0	0.9	6	clean SAND to silty SAND	125	5.0	21	13	20	69	47	-	-	10	0.350	1.87	16
2.95	65.6	105.2	120.9	65.6	0.6	0.2	0.9	6	clean SAND to silty SAND	125	5.0	21	13	20	69	47	-	-	9	0.350	1.86	16
3.12	63.6	102.0	115.6	63.6	0.5	0.1	0.8	6	clean SAND to silty SAND	125	5.0	20	13	19	68	46	-	-	9	0.350	1.84	16
3.28	58.5	93.7	108.4	58.5	0.4	0.0	0.8	6	clean SAND to silty SAND	125	5.0	19	12	17	65	46	-	-	10	0.350	1.86	16
3.45	54.7	87.7	111.5	54.7	0.6	-0.1	1.1	6	clean SAND to silty SAND	125	5.0	18	11	17	63	45	-	-	12	0.350	1.98	16
3.61	59.5	95.4	124.9	59.5	0.8	0.1	1.3	6	clean SAND to silty SAND	125	5.0	19	12	19	65	45	-	-	13	0.350	2.01	16
3.77	73.1	117.3	140.1	73.1	0.9	0.4	1.2	6	clean SAND to silty SAND	125	5.0	23	15	22	72	46	-	-	11	0.350	1.91	16
3.94	67.8	108.7	130.8	67.8	0.8	0.3	1.1	6	clean SAND to silty SAND	125	5.0	22	14	21	70	46	-	-	11	0.350	1.91	16
4.10	48.0	77.0	106.2	48.0	0.6	-0.2	1.2	5	silty SAND to sandy SILT	120	3.0	26	16	15	58	44	-	-	14	0.200	2.05	16
4.27	42.1	67.6	107.7	42.1	0.7	-0.2	1.6	5	silty SAND to sandy SILT	120	3.0	23	14	14	54	43	-	-	18	0.200	2.17	16
4.43	42.0	67.4	115.3	42.0	0.8	-0.1	1.9	5	silty SAND to sandy SILT	120	3.0	22	14	14	54	43	-	-	20	0.200	2.22	16
4.59	38.4	61.6	115.3	38.4	0.8	-0.2	2.0	5	silty SAND to sandy SILT	120	3.0	21	13	14	51	42	-	-	22	0.200	2.28	16
4.76	30.8	49.4	107.5	30.8	0.7	0.6	2.2	5	silty SAND to sandy SILT	120	3.0	16	10	11	44	41	-	-	25	0.200	2.36	16
4.92	25.4	40.8	101.5	25.4	0.6	-0.3	2.3	5	silty SAND to sandy SILT	120	3.0	14	8	10	37	40	-	-	28	0.200	2.44	16
5.09	47.1	75.5	112.4	47.2	0.7	3.5	1.5	5	silty SAND to sandy SILT	120	3.0	25	16	16	58	43	-	-	16	0.200	2.12	16
5.25	56.7	90.9	127.5	56.7	0.9	1.5	1.6	5	silty SAND to sandy SILT	120	3.0	30	19	18	64	43	-	-	15	0.200	2.07	16
5.41	41.0	65.7	130.1	41.0	1.0	-0.1	2.5	5	silty SAND to sandy SILT	120	3.0	22	14	15	53	42	-	-	23	0.200	2.31	16
5.58	21.9	35.1	-	21.9	0.9	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	18	11	9	-	-	1.5	9.9	39	0.070	2.68	15
5.74	18.7	30.1	-	18.7	0.9	-0.2	5.0	3	silty CLAY to CLAY	115	1.5	20	12	8	-	-	1.3	9.9	44	0.005	2.77	15
5.91	18.5	29.7	-	18.5	0.8	-0.5	4.5	3	silty CLAY to CLAY	115	1.5	20	12	8	-	-	1.3	9.9	43	0.005	2.75	15
6.07	21.0	33.6	-	20.9	0.8	-0.9	4.1	4	clayy SILT to silty CLAY	115	2.0	17	10	9	-	-	1.5	9.9	39	0.070	2.68	15
6.23	23.2	37.3	-	23.2	0.8	-0.6	3.7	4	clayy SILT to silty CLAY	115	2.0	19	12	10	-	-	1.6	9.9	36	0.070	2.61	15
6.40	24.2	37.6	124.1	24.2	0.8	0.2	3.5	4	clayy SILT to silty CLAY	115	2.0	19	12	10	-	-	1.7	9.9	35	0.070	2.60	15
6.56	19.9	31.9	-	19.9	0.6	-0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	16	10	8	-	-	1.4	9.9	36	0.070	2.61	15
6.73	14.2	22.8	-	14.2	0.5	-0.8	3.5	4	clayy SILT to silty CLAY	115	2.0	11	7	6	-	-	1.0	9.9	44	0.070	2.76	15
6.89	13.3	21.3	-	13.3	0.5	-0.8	3.8	3	silty CLAY to CLAY	115	1.5	14	9	6	-	-	0.9	9.9	46	0.005	2.80	15
7.05	13.9	22.3	-	13.9	0.5	-0.2	3.7	3	silty CLAY to CLAY	115	1.5	15	9	6	-	-	1.0	9.9	45	0.005	2.79	15
7.22	21.1	31.0	89.9	21.1	0.5	-0.2	2.2	4	clayy SILT to silty CLAY	115	2.0	15	11	8	-	-	1.5	9.9	32	0.070	2.53	15
7.38	30.4	44.1	80.7	30.4	0.4	0.1	1.3	5	silty SAND to sandy SILT	120	3.0	15	10	10	40	38	-	-	21	0.200	2.26	16
7.55	27.6	39.6	80.1	27.5	0.4	-0.5	1.4	5	silty SAND to sandy SILT	120	3.0	13	9	9	36	38	-	-	23	0.200	2.32	16
7.71	21.1	29.9	77.9	21.1	0.3	-0.9	1.6	5	silty SAND to sandy SILT	120	3.0	10	7	7	27	36	-	-	29	0.200	2.47	16
7.87	16.6	23.3	74.4	16.6	0.3	-0.7	1.8	4	clayy SILT to silty CLAY	115	2.0	12	8	6	-	-	1.1	9.9	34	0.070	2.58	15
8.04	13.5	21.6	71.6	13.5	0.2	-0.7	1.7	4	clayy SILT to silty CLAY	115	2.0	11	7	6	-	-	0.9	8.8	35	0.070	2.60	15
8.20	12.5	17.3	56.3	12.5	0.1	-0.8	1.1	4	clayy SILT to silty CLAY	115	2.0	9	6	4	-	-	0.9	8.0	35	0.070	2.59	15
8.37	12.2	16.7	54.5	12.2	0.1	-0.9	1.1	4	clayy SILT to silty CLAY	115	2.0	8	6	4	-	-	0.8	7.6	35	0.070	2.59	15
8.53	12.0	18.8	60.8	12.0	0.1	-0.8	1.3	4	clayy SILT to silty CLAY	115	2.0	9	6	5	-	-	0.8	7.4	35	0.070	2.59	15
8.69	13.8	18.5	61.6	13.8	0.2	-0.6	1.4	4	clayy SILT to silty CLAY	115	2.0	9	7	5	-	-	0.9	8.4	35	0.070	2.60	15
8.86	17.5	23.2	70.3	17.5	0.3	-0.6	1.6	4	clayy SILT to silty CLAY	115	2.0	12	9	6	-	-	1.2	9.9	33	0.070	2.55	15
9.02	18.1	27.2	88.7	18.1	0.4	-0.8	2.3	4	clayy SILT to silty CLAY	115	2.0	14	9	7	-	-	1.2	9.9	35	0.070	2.59	15
9.19	16.3	26.1	-	16.3	0.4	-0.8	2.7	4	clayy SILT to silty CLAY	115	2.0	13	8	7	-	-	1.1	9.4	38	0.070	2.65	15
9.35	15.9	25.4	-	15.9	0.4	0.0	2.6	4	clayy SILT to silty CLAY	115	2.0	13	8	7	-	-	1.1	9.0	38	0.070	2.65	15
9.51	14.9	23.9	-	14.9	0.3	-0.2	2.2	4	clayy SILT to silty CLAY	115	2.0	12	7	6	-	-	1.0	8.3	36	0.070	2.62	15
9.68	9.5	15.2	-	9.5	0.3	-1.0	3.2	3	silty CLAY to CLAY	115	1.5	10	6	5	-	-	0.6	5.0	51	0.005	2.89	15
9.84	8.6	13.9	-	8.6	0.3	-0.8	4.0	3	silty CLAY to CLAY	115	1.5	9	6	4	-	-	0.6	4.5	57	0.005	2.98	15
10.01	10.3	16.5	-	10.3	0.3	-0.6	2.8	4	clayy SILT to silty CLAY	115	2.0	8	5	5	-	-	0.7	5.3	48	0.070	2.83	15
10.17	11.8	18.9	-	11.8	0.2	-0.3	1.9	4	clayy SILT to silty CLAY	115	2.0	9	6	5	-	-	0.8	6.1	39	0.070	2.67	15
10.34	17.4	21.4	53.3	17.4	0.1	0.3	0.8	5	silty SAND to sandy SILT	120	3.0	7	6	5	16	33	-	-	28	0.200	2.44	16
10.50	19.5	23.9	48.0	19.5	0.1	-0.9	0.6	5	silty SAND to sandy SILT	120	3.0	8	7	5	20	34	-	-	23	0.200	2.32	16
10.66	21.2	25.8	46.2	21.2	0.1	-0.7	0.4	5	silty SAND to sandy SILT	120	3.0	9	7	6	22	34	-	-	21	0.200	2.25	16
10.83	17.9	21.5	43.2	17.8	0.1	-0.8	0.4	5	silty SAND to sandy SILT	120	3.0	7	6	5	16	33	-	-	23	0.200	2.32	16
10.99	13.2	15.8	42.9	13.2	0.1	-0.8	0.6	5	silty SAND to sandy SILT	120	3.0	5	4	4	6	31	-	-	30	0.200	2.49	16
11.16	10.0	13.1	-	10.0	0.1	-0.8	0.7	4	clayy SILT to silty CLAY	115	2.0	7	5	3	-	-	0.7	4.6	36	0.070	2.62	15
11.32	7.8	11.5	-	7.8	0.1	-0.8	1.2	4	clayy SILT to silty CLAY	115	2.0	6	4	3	-	-	0.5	3.5	45	0.070	2.77	15
11.48	6.4	9.3	-	6.4	0.1	-0.7	1.9	3	silty CLAY to CLAY	115	1.5	6	4	3	-	-	0.4	2.8	56	0.005	2.96	15
11.65	5.2	7.5	-	5.2	0.1	-0.7	2.6	3	silty CLAY to CLAY	115	1.5	5	3	3	-	-	0.3	2.1	67	0.005	3.12	15
11.81	4.2	6.0	-	4.2	0.1	-0.7	2.8	3	silty CLAY to CLAY	115	1.5	4	3	2	-	-	0.2	1.6	76	0.005	3.23	15
11.98	3.5	4.9	-	3.5	0.1	-0.6	3.3	3	silty CLAY to CLAY	115	1.5	3	2	2	-	-	0.2	1.3	86	0.005	3.36	15
12.14	3.1	4.3	-	3.1	0.1	-0.3	3.4	3	silty CLAY to CLAY	115	1.5	3	2	2	-	-	0.2	1.1	92	0.005	3.43	15
12.30	2.5	3.4	-	2.5	0.1	-1.2	4.1	3	silty CLAY to CLAY	115	1.5	2	2	2	-	-	0.1	0.8	95	0.005	3.60	15
12.47	2.3	3.1	-	2.3	0.1	-1.9	4.4	2	Organic SOILS - Peats	100	1.0	3	2	2	-	-	0.2	0.7	95	0.100	3.66	10
12.63	4.4	5.9	-	4.4	0.1	-1.2	1.5	3	silty CLAY to CLAY	115	1.5	4	3	2	-	-	0.3	1.6	66	0.005	3.11	15
12.80	6.7	8.8	-	6.7	0.0	-0.9	0.8	4	clayy SILT to silty CLAY	115	2.0	4	3	2	-	-	0.4	2.6	46	0.070	2.80	15
12.96	6.4	8.3	-	6.4	0.0	-0.7	0.6	4	clayy SILT to silty CLAY	115	2.0	4	3	2	-	-	0.4	2.4	45	0.070	2.78	15
13.12	3.9	5.0	-	3.9	0.0	-0.7	1.3	3	silty CLAY to CLAY	115	1.5	3	3	2	-	-	0.2	1.3	70	0.005	3.17	15
13.29	3.3	4.2	-	3.3	0.0	-0.5	1.7	3	silty CLAY to CLAY	115	1.5	3	2	2	-	-	0.2	1.0	81	0.005	3.30	15
13.45	2.5	3.1	-	2.5	0.1	-0.7	4.1	3	silty CLAY to CLAY	115	1.5	2	2	2	-	-	0.1	0.7	95	0.005	3.64	15
13.62	1.8	2.2	-	1.8	0.1	-0.7	7.5	2	Organic SOILS - Peats	100	1.0	2	2	2	-	-	0.1	0.4	95	0.100	3.97	10
13.78	3.3	4.0	-	3.3	0.1	0.6	4.0	3	silty CLAY to CLAY	115	1.5	3	2	2	-	-	0.2	1.0	95	0.005	3.50	15
13.94	32.3	34.5	81.8	32.3	0.5	-0.1	1.6	5	silty SAND to sandy SILT	120	3.0	12	11	8	32	35	-	-	27	0.200	2.41	16
14.11	28.1	29.8	78.9	28.0	0.5	-1.7	1.7	5	silty SAND to sandy SILT	120	3.0	10	9	7	27	34	-	-	30	0.200	2.48	16
14.27	36.7	38.7	83.0	36.7	0.5	0.7	1.5	5	silty SAND to sandy SILT	120	3.0	13	12	9	36	36	-	-	25	0.200	2.36	16
14.44	29.8	31.3	88.5	29.8	0.6	0.3	2.1	4	clayy SILT to silty CLAY	115	2.0	16	15	8	-	-	2.0	9.9	31	0.070	2.51	15
14.60	32.3	33.8	68.2	32.3	0.3	-0.3	1.1	5	silty SAND to sandy SILT	120	3.0	11	11	8	31	35	-	-	23	0.200	2.32	16
14.76	38.3	39.7	65.5	38.3	0.3	0.4	0.8	5	silty SAND to sandy SILT	120	3.0	13	13	8	37	36	-	-	19	0.200	2.19	16
14.93	42.0	43.4	64.4	42.0	0.3	0.2	0.7	5	silty SAND to sandy SILT	120	3.0	14	14	9	39	36	-	-	16	0.200	2.12	16
15.09	48.6	50.1	66.3	48.6	0.3	-0.5	0.5	6	clean SAND to silty SAND	125	5.0	10	10	10	44	37	-	-	13	0.350	2.02	16
15.26	58.1	59.7	70.8	58.1	0.2	0.8	0.4	6	clean SAND to silty SAND	125	5.0	12	12	11	50	38	-	-	10	0.350	1.90	16
15.42	73.7	75.4	84.5	73.7	0.3	0.0	0.4	6	clean SAND to silty SAND	125	5.0	15	15	14	58	39	-	-	9	0.350	1.82	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Santa Cruz Multi-Family Housing

Project ID: Salem Engineering
Data File: SDF(811).cpt
CPT Date: 4/3/2024 8:15:42 AM
GW During Test: 15 ft

Sounding ID: CPT-03
Project No: 5-224-0090
Cone/Rig: DDG1627

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rato %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	* SPT R-N1 60%	SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
15.58	89.7	91.6	101.8	89.7	0.5	0.8	0.6	6	clean SAND to silty SAND	125	5.0	18	18	17	64	40	-	-	8	0.350	1.81	16
15.75	102.4	104.2	107.4	102.4	0.4	0.2	0.4	6	clean SAND to silty SAND	125	5.0	21	20	18	68	41	-	-	6	0.350	1.69	16
15.91	109.1	110.8	131.9	109.2	1.2	2.0	1.1	6	clean SAND to silty SAND	125	5.0	22	22	21	70	41	-	-	10	0.350	1.90	16
16.08	101.7	103.0	122.5	101.7	1.0	1.4	1.0	6	clean SAND to silty SAND	125	5.0	21	20	19	68	41	-	-	10	0.350	1.90	16
16.24	97.9	98.8	112.7	97.9	0.7	0.1	0.8	6	clean SAND to silty SAND	125	5.0	20	20	18	67	41	-	-	9	0.350	1.84	16
16.40	111.6	112.3	116.7	111.6	0.6	0.7	0.5	6	clean SAND to silty SAND	125	5.0	22	22	20	71	41	-	-	6	0.350	1.70	16
16.57	95.2	95.6	104.9	95.3	0.5	1.5	0.6	6	clean SAND to silty SAND	125	5.0	19	19	17	66	41	-	-	8	0.350	1.79	16
16.73	98.4	98.6	111.9	98.4	0.7	0.4	0.7	6	clean SAND to silty SAND	125	5.0	20	20	18	67	41	-	-	9	0.350	1.84	16
16.90	100.7	100.6	131.5	100.8	1.4	1.4	1.4	6	clean SAND to silty SAND	125	5.0	20	20	20	67	41	-	-	13	0.350	2.01	16
17.06	110.2	109.7	131.8	110.2	1.2	2.0	1.1	6	clean SAND to silty SAND	125	5.0	22	22	21	70	41	-	-	11	0.350	1.91	16
17.23	108.0	107.3	128.6	108.0	1.1	3.6	1.1	6	clean SAND to silty SAND	125	5.0	21	22	20	69	41	-	-	11	0.350	1.91	16
17.39	105.2	104.2	121.5	105.2	1.0	1.5	0.9	6	clean SAND to silty SAND	125	5.0	21	21	20	68	41	-	-	10	0.350	1.87	16
17.55	98.2	97.0	110.6	98.2	0.7	1.4	0.7	6	clean SAND to silty SAND	125	5.0	19	20	18	66	41	-	-	9	0.350	1.84	16
17.72	93.1	91.7	104.3	93.1	0.6	1.8	0.7	6	clean SAND to silty SAND	125	5.0	18	19	17	64	40	-	-	9	0.350	1.84	16
17.88	83.7	82.2	87.6	83.7	0.3	2.0	0.4	6	clean SAND to silty SAND	125	5.0	16	17	15	61	40	-	-	7	0.350	1.74	16
18.05	75.1	73.7	78.0	75.2	0.2	1.1	0.3	6	clean SAND to silty SAND	125	5.0	15	15	13	57	39	-	-	7	0.350	1.73	16
18.21	68.3	66.8	80.5	68.3	0.4	1.4	0.6	6	clean SAND to silty SAND	125	5.0	13	14	13	54	38	-	-	11	0.350	1.92	16
18.37	61.5	59.9	72.0	61.5	0.3	1.1	0.5	6	clean SAND to silty SAND	125	5.0	12	12	11	50	38	-	-	11	0.350	1.91	16
18.54	47.0	45.7	66.0	47.0	0.3	1.0	0.7	5	silty SAND to sandy SILT	120	3.0	15	16	9	41	36	-	-	16	0.200	2.09	16
18.70	42.9	41.6	54.2	42.9	0.1	1.3	0.3	6	clean SAND to silty SAND	125	5.0	8	9	8	38	36	-	-	13	0.350	2.00	16
18.87	33.6	32.6	45.5	33.7	0.1	1.2	0.2	6	clean SAND to silty SAND	125	5.0	7	7	7	30	34	-	-	15	0.350	2.07	16
19.03	26.7	25.8	42.1	26.8	0.1	1.4	0.3	5	silty SAND to sandy SILT	120	3.0	9	9	5	22	33	-	-	19	0.200	2.19	16
19.19	22.9	22.0	42.4	22.9	0.1	1.4	0.4	5	silty SAND to sandy SILT	120	3.0	7	8	5	17	31	-	-	22	0.200	2.29	16
19.36	21.1	20.3	41.4	21.1	0.1	1.6	0.4	5	silty SAND to sandy SILT	120	3.0	7	7	5	14	31	-	-	24	0.200	2.33	16
19.52	19.2	18.4	45.2	19.2	0.1	1.4	0.6	5	silty SAND to sandy SILT	120	3.0	6	6	4	11	30	-	-	28	0.200	2.43	16
19.69	16.4	15.7	48.3	16.4	0.1	1.5	0.8	5	silty SAND to sandy SILT	120	3.0	5	5	4	6	29	-	-	33	0.200	2.56	16
19.85	15.6	15.1	-	15.7	0.1	1.8	0.9	4	clayy SILT to silty CLAY	115	2.0	8	8	4	-	-	1.0	4.6	36	0.070	2.60	15
20.01	15.9	15.2	-	15.9	0.2	1.8	1.0	4	clayy SILT to silty CLAY	115	2.0	8	8	4	-	-	1.0	4.7	37	0.070	2.63	15
20.18	16.5	15.8	-	16.6	0.2	1.9	1.0	4	clayy SILT to silty CLAY	115	2.0	8	8	4	-	-	1.1	4.8	36	0.070	2.61	15
20.34	16.7	15.9	-	16.7	0.2	1.7	1.1	4	clayy SILT to silty CLAY	115	2.0	8	8	4	-	-	1.1	4.9	37	0.070	2.63	15
20.51	15.5	14.7	-	15.5	0.2	1.8	1.2	4	clayy SILT to silty CLAY	115	2.0	7	8	4	-	-	1.0	4.5	39	0.070	2.67	15
20.67	14.5	13.7	-	14.5	0.2	1.7	1.2	4	clayy SILT to silty CLAY	115	2.0	7	7	4	-	-	1.0	4.1	40	0.070	2.70	15
20.83	13.8	13.0	-	13.9	0.2	2.0	1.4	4	clayy SILT to silty CLAY	115	2.0	7	7	4	-	-	0.9	3.9	44	0.070	2.76	15
21.00	13.1	12.3	-	13.2	0.2	1.9	1.3	4	clayy SILT to silty CLAY	115	2.0	6	7	3	-	-	0.9	3.7	44	0.070	2.76	15
21.16	12.9	12.0	-	12.9	0.2	2.1	1.5	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.8	3.6	46	0.070	2.81	15
21.33	13.4	12.5	-	13.4	0.2	2.1	1.3	4	clayy SILT to silty CLAY	115	2.0	6	7	3	-	-	0.9	3.7	44	0.070	2.76	15
21.49	13.9	12.9	-	13.9	0.1	1.8	1.1	4	clayy SILT to silty CLAY	115	2.0	6	7	3	-	-	0.9	3.8	41	0.070	2.72	15
21.65	15.7	14.5	-	15.7	0.1	2.0	1.0	4	clayy SILT to silty CLAY	115	2.0	7	8	4	-	-	1.0	4.4	37	0.070	2.64	15
21.82	13.9	12.7	-	13.9	0.1	0.2	1.0	4	clayy SILT to silty CLAY	115	2.0	6	7	3	-	-	0.9	3.8	40	0.070	2.70	15
21.98	12.4	11.4	-	12.4	0.1	1.1	1.0	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.8	3.4	43	0.070	2.76	15
22.15	12.3	11.2	-	12.3	0.1	1.9	1.2	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.8	3.3	45	0.070	2.78	15
22.31	12.6	11.5	-	12.7	0.2	1.6	1.4	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.8	3.4	47	0.070	2.81	15
22.47	12.2	11.0	-	12.2	0.1	1.3	1.4	4	clayy SILT to silty CLAY	115	2.0	6	6	3	-	-	0.8	3.2	47	0.070	2.82	15
22.64	13.2	11.9	-	13.2	0.1	1.6	1.2	4	clayy SILT to silty CLAY	115	2.0	6	7	3	-	-	0.9	3.5	44	0.070	2.77	15
22.80	14.3	12.9	-	14.4	0.2	1.1	1.4	4	clayy SILT to silty CLAY	115	2.0	6	7	4	-	-	0.9	3.8	44	0.070	2.77	15
22.97	14.4	12.9	-	14.4	0.2	0.1	1.3	4	clayy SILT to silty CLAY	115	2.0	6	7	4	-	-	0.9	3.9	43	0.070	2.76	15
23.13	14.5	12.9	-	14.5	0.2	0.1	1.2	4	clayy SILT to silty CLAY	115	2.0	6	7	4	-	-	0.9	3.9	42	0.070	2.73	15
23.30	16.7	14.8	-	16.7	0.2	1.2	1.1	4	clayy SILT to silty CLAY	115	2.0	7	8	4	-	-	1.1	4.5	38	0.070	2.66	15
23.46	16.4	14.5	-	16.4	0.2	0.0	1.1	4	clayy SILT to silty CLAY	115	2.0	7	8	4	-	-	1.1	4.4	39	0.070	2.67	15
23.62	16.1	14.2	-	16.1	0.2	0.7	1.2	4	clayy SILT to silty CLAY	115	2.0	7	8	4	-	-	1.1	4.3	40	0.070	2.70	15
23.79	17.2	15.1	-	17.3	0.2	1.6	1.1	4	clayy SILT to silty CLAY	115	2.0	8	9	4	-	-	1.1	4.6	37	0.070	2.64	15
23.95	19.2	17.4	54.5	19.2	0.2	1.6	1.0	5	silty SAND to sandy SILT	120	3.0	6	6	4	9	29	-	-	34	0.200	2.57	16
24.12	19.4	17.6	54.1	19.4	0.2	0.9	1.0	5	silty SAND to sandy SILT	120	3.0	6	6	4	10	30	-	-	33	0.200	2.56	16
24.28	19.1	17.3	55.1	19.1	0.2	0.7	1.0	4	clayy SILT to silty CLAY	115	2.0	9	10	4	-	-	1.3	5.1	34	0.070	2.58	15
24.44	20.5	18.5	54.3	20.5	0.2	1.4	0.9	5	silty SAND to sandy SILT	120	3.0	6	7	5	11	30	-	-	32	0.200	2.53	16
24.61	23.2	20.9	51.1	23.3	0.2	1.9	0.7	5	silty SAND to sandy SILT	120	3.0	7	8	5	15	31	-	-	28	0.200	2.43	16
24.77	31.1	28.0	52.0	31.1	0.2	1.8	0.6	5	silty SAND to sandy SILT	120	3.0	9	10	6	25	33	-	-	21	0.200	2.27	16
24.94	44.3	39.8	54.9	44.3	0.2	0.5	0.4	6	clean SAND to silty SAND	125	5.0	8	9	8	37	35	-	-	15	0.350	2.06	16
25.10	45.3	40.6	55.5	45.3	0.2	0.5	0.4	6	clean SAND to silty SAND	125	5.0	8	9	8	37	35	-	-	14	0.350	2.05	16
25.26	47.2	42.2	57.9	47.2	0.2	1.6	0.4	6	clean SAND to silty SAND	125	5.0	8	9	8	38	35	-	-	14	0.350	2.05	16
25.43	53.2	47.4	69.8	53.3	0.4	3.3	0.7	5	silty SAND to sandy SILT	120	3.0	16	18	10	42	36	-	-	16	0.200	2.11	16
25.59	61.2	54.4	72.2	61.3	0.4	4.5	0.6	6	clean SAND to silty SAND	125	5.0	11	12	11	47	37	-	-	13	0.350	2.02	16
25.76	67.8	60.2	74.7	67.9	0.4	3.9	0.5	6	clean SAND to silty SAND	125	5.0	12	14	12	50	37	-	-	12	0.350	1.95	16
25.92	71.9	63.7	75.0	72.0	0.3	4.4	0.4	6	clean SAND to silty SAND	125	5.0	13	14	12	52	38	-	-	10	0.350	1.89	16
26.08	78.1	69.1	74.9	78.2	0.2	4.1	0.3	6	clean SAND to silty SAND	125	5.0	14	16	12	55	38	-	-	7	0.350	1.77	16
26.25	80.7	71.2	75.4	80.8	0.2	4.3	0.2	6	clean SAND to silty SAND	125	5.0	14	16	13	56	38	-	-	7	0.350	1.73	16
26.41	81.1	71.4	77.0	81.2	0.2	4.5	0.3	6	clean SAND to silty SAND	125	5.0	14	16	13	56	38	-	-	7	0.350	1.76	16
26.58	82.0	72.0	77.4	82.1	0.2	4.6	0.3	6	clean SAND to silty SAND	125	5.0	14	16	13	56	38	-	-	7	0.350	1.75	16
26.74	82.6	72.4	92.5	82.7	0.7	4.4	0.8	6	clean SAND to silty SAND	125	5.0	14	17	14	56	38	-	-	12	0.350	1.98	16
26.90	82.3	72.0	89.2	82.4	0.6	4.4	0.7	6	clean SAND to silty SAND	125	5.0	14	16	14	56	38	-	-	12	0.350	1.95	16
27.07	86.5	75.5	88.6	86.6	0.5	5.3	0.6	6	clean SAND to silty SAND	125	5.0	15	17	14	58	39	-	-	10	0.350	1.88	16
27.23	97.8	85.2	95.4	97.9	0.5	5.1	0.5	6	clean SAND to silty SAND	125	5.0	17	20	16	62	39	-	-	8	0.350	1.82	16
27.40	89.1	77.4	97.6	89.2	0.8	4.4	0.9	6	clean SAND to silty SAND	125	5.0	15	18	15	59	39	-	-	12	0.350	1.97	16
27.56	103.0	89.4	105.2	103.1	0.8	5.1	0.8	6	clean SAND to silty SAND	125	5.0	18	21	17	63	39	-	-	10	0.350	1.89	16
27.72	107.6	93.2	127.3	107.7	1.5	5.1	1.5	5	silty SAND to sandy SILT	120	3.0	31	36	19	65	40	-	-	14	0.200	2.05	16
27.89	127.8	110.4	131.9	127.9	1.4	5.9	1.1	6	clean SAND to silty SAND	125	5.0	22	26	21	70	41	-	-	11	0.350	1.91	16
28.05	137.1	118.3	133.9	137.2	1.2	5.0	0.9	6	clean SAND to silty SAND	125	5.0	24	27	22	73	41	-	-	9	0.350	1.83	16
28.22	138.4	119.1	130.5	138.5	1.1	3.4	0.8	6	clean SAND to silty SAND	125	5.0	24	28	22	73	41	-	-	8	0.350	1.78	16
28.38	128.3	110.2	126.1	128.4	1.1	4.7	0.9	6	clean SAND to silty SAND	125	5.0	22	26	20	70	41	-	-	9	0.350	1.85	16
28.54	121.9	104.5	121.4	122.0	1.1	5.3	0.9	6	clean SAND to silty SAND	125	5.0	21	24	20	68	40	-	-	10	0.350	1.87	16
28.71	125.5	107.4	122.1	125.6	1.0	3.9	0.8	6	clean SAND to silty SAND	125	5.0	21	25	20	69	40	-	-	9	0.350	1.84	16
28.87	131.1	111.9	129.0	131.2	1.2	4.1	0.9	6	clean SAND to silty SAND	125	5.0	22	26	21	71	41	-	-	9	0.350	1.86	16
29.04	118.4	100.9	115.1	118.5	0.9	4.8	0.8	6	clean SAND to silty SAND	125	5.0	20	24	19	67	40	-	-	9	0.350	1.84	16
29.20	117.3	99.8	108.8	117.4	0.7	5.2	0.6	6	clean SAND to silty SAND	125	5.0	20	23	18	67	40	-	-	8	0.350	1.78	16
29.36	99.7	84.6	123.6	99.8	1.6	6.9	1.6	5	silty SAND to sandy SILT	120	3.0	28	33	17	61	39	-	-	16	0.200	2.10	16
29.53	104.8	88.8	111.6	104.9	1.1	4.2	1.0	6	clean SAND to silty SAND	125	5.0	18	21	17	63	39	-	-	12	0.350	1.96	16
29.69	100.1	84.6	109.8	100.2	1.1	5.7	1.1	6	clean SAND to silty SAND	125	5.0	17	20	17	61	39	-	-	13	0.350	2.00	16
29.86	109.0	92.0	111.5	109.0	1.0	1.6	0.9	6	clean SAND to silty SAND	125	5.0	18	22	18	64	39	-	-	11	0.350	1.92	16
30.02	141.8	119.5	128.3	141.9	1.0	4.7	0.7	6	clean SAND to silty SAND	125	5.0	24	28	21	73	41	-	-	7	0.350	1.75	16
30.19	135.8	114.2	118.2	135.9	0.7	5.2	0.5	6	clean SAND to silty SAND	125	5.0	23	27	20	71	41	-	-	6	0.350	1.70	16
30.35	135.9	114.0	114.3	136.0	0.6	4.6	0.4	6	clean SAND to silty SAND	125	5.0	23	27	20	71	41	-	-	5	0.350	1.65	16
30.51	128.5	107.6	107.7	128.5	0.5	3.3	0.4	6	clean SAND to silty SAND	125	5.0	22	26	19	69	40	-	-	5	0.350	1.65	16
30.68	121.2	101.3	102.8	121.2	0.4	4.1	0.4	6	clean SAND to silty SAND	125	5.0	20	24	18	67	40	-	-	6	0.350	1.67	16
30.84	113.8	94.9	104.2	113.9	0.6	4.9	0.6	6	clean SAND to silty SAND	125	5.0	19	23	17	65	40	-	-	8	0.350	1.79	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
31.01	109.8	91.4	101.6	109.9	0.6	5.6	0.6	6	clean SAND to silty SAND	125	5.0	18	22	17	64	39	-	-	8	0.350	1.81	16
31.17	106.4	88.4	99.2	106.5	0.6	7.8	0.6	6	clean SAND to silty SAND	125	5.0	18	21	16	63	39	-	-	9	0.350	1.82	16
31.33	97.9	81.3	93.7	98.1	0.6	5.8	0.6	6	clean SAND to silty SAND	125	5.0	16	20	15	60	39	-	-	9	0.350	1.86	16
31.50	71.1	58.9	75.2	71.2	0.4	4.0	0.6	6	clean SAND to silty SAND	125	5.0	12	14	11	50	37	-	-	12	0.350	1.98	16
31.66	58.8	48.6	69.8	58.9	0.4	5.8	0.7	5	silty SAND to sandy SILT	120	3.0	16	20	10	43	36	-	-	16	0.200	2.09	16
31.83	40.4	33.4	75.0	40.6	0.5	6.4	1.3	5	silty SAND to sandy SILT	120	3.0	11	13	8	31	33	-	-	26	0.200	2.38	16
31.99	26.9	19.3	-	27.0	0.5	7.0	2.2	4	clayy SILT to silty CLAY	115	2.0	10	13	5	-	-	1.8	5.9	41	0.070	2.71	15
32.15	21.3	15.3	-	21.5	0.6	9.2	2.9	3	silty CLAY to CLAY	115	1.5	10	14	5	-	-	1.4	4.6	50	0.005	2.87	15
32.32	19.2	13.7	-	19.4	0.4	11.5	2.2	4	clayy SILT to silty CLAY	115	2.0	7	10	4	-	-	1.3	4.1	48	0.070	2.84	15
32.48	22.0	15.7	-	22.1	0.2	2.9	1.0	4	clayy SILT to silty CLAY	115	2.0	8	11	4	-	-	1.5	4.7	36	0.070	2.62	15
32.65	27.0	22.1	64.7	27.0	0.3	0.5	1.3	5	silty SAND to sandy SILT	120	3.0	7	9	5	17	30	-	-	32	0.200	2.53	16
32.81	26.4	18.7	-	26.4	0.4	-0.8	1.7	4	clayy SILT to silty CLAY	115	2.0	9	13	5	-	-	1.8	5.7	38	0.070	2.66	15
32.97	22.1	15.6	-	22.1	0.5	0.1	2.7	4	clayy SILT to silty CLAY	115	2.0	8	11	5	-	-	1.5	4.7	49	0.070	2.84	15
33.14	19.5	13.7	-	19.5	0.4	2.1	2.5	3	silty CLAY to CLAY	115	1.5	9	13	4	-	-	1.3	4.1	51	0.005	2.88	15
33.30	22.2	15.6	-	22.4	0.9	10.5	4.7	3	silty CLAY to CLAY	115	1.5	10	15	5	-	-	1.5	4.7	58	0.005	2.99	15
33.47	69.1	56.1	92.2	69.2	0.9	4.6	1.3	5	silty SAND to sandy SILT	120	3.0	19	23	12	48	36	-	-	19	0.200	2.19	16
33.63	122.6	99.4	111.0	122.7	0.8	2.9	0.7	6	clean SAND to silty SAND	125	5.0	20	25	18	67	40	-	-	8	0.350	1.81	16
33.79	131.0	106.0	118.5	131.0	1.0	1.7	0.7	6	clean SAND to silty SAND	125	5.0	21	26	19	69	40	-	-	8	0.350	1.81	16
33.96	114.5	92.5	102.2	114.6	0.6	3.9	0.6	6	clean SAND to silty SAND	125	5.0	19	23	17	64	39	-	-	8	0.350	1.80	16
34.12	100.3	80.9	89.3	100.4	0.4	3.0	0.4	6	clean SAND to silty SAND	125	5.0	16	20	15	60	38	-	-	8	0.350	1.80	16
34.29	93.5	75.3	86.1	93.6	0.5	4.9	0.5	6	clean SAND to silty SAND	125	5.0	15	19	14	58	38	-	-	9	0.350	1.85	16
34.45	97.2	78.1	88.2	97.3	0.5	6.9	0.5	6	clean SAND to silty SAND	125	5.0	16	19	14	59	38	-	-	9	0.350	1.83	16
34.61	105.6	84.8	94.1	105.8	0.5	7.1	0.5	6	clean SAND to silty SAND	125	5.0	17	21	15	62	39	-	-	8	0.350	1.81	16
34.78	110.8	88.8	98.6	110.9	0.6	5.7	0.5	6	clean SAND to silty SAND	125	5.0	18	22	16	63	39	-	-	8	0.350	1.80	16
34.94	109.7	87.7	96.9	109.9	0.6	6.4	0.5	6	clean SAND to silty SAND	125	5.0	18	22	16	63	39	-	-	8	0.350	1.80	16
35.11	97.8	78.1	87.4	98.0	0.4	6.3	0.5	6	clean SAND to silty SAND	125	5.0	16	20	14	59	38	-	-	8	0.350	1.82	16
35.27	85.2	67.9	80.2	85.3	0.4	6.2	0.5	6	clean SAND to silty SAND	125	5.0	14	17	13	54	37	-	-	10	0.350	1.89	16
35.43	70.6	56.2	79.1	70.7	0.6	6.0	0.8	5	silty SAND to sandy SILT	120	3.0	19	24	11	48	36	-	-	15	0.200	2.07	16
35.60	56.3	44.7	76.7	56.4	0.6	6.8	1.1	5	silty SAND to sandy SILT	120	3.0	15	19	10	40	35	-	-	20	0.200	2.22	16
35.76	44.7	35.4	80.8	44.8	0.6	7.0	1.5	5	silty SAND to sandy SILT	120	3.0	12	15	8	33	33	-	-	26	0.200	2.39	16
35.93	33.9	22.5	-	34.0	0.8	2.6	2.4	4	clayy SILT to silty CLAY	115	2.0	11	17	6	-	-	2.3	7.0	39	0.070	2.67	15
36.09	36.8	29.1	85.0	36.9	0.7	5.3	1.9	4	clayy SILT to silty CLAY	115	2.0	15	18	7	-	-	2.5	7.6	32	0.070	2.53	15
36.26	51.2	40.4	85.7	51.2	0.8	0.9	1.5	5	silty SAND to sandy SILT	120	3.0	13	17	9	37	34	-	-	24	0.200	2.35	16
36.42	63.8	50.3	78.9	63.9	0.6	1.5	1.0	5	silty SAND to sandy SILT	120	3.0	17	21	11	44	36	-	-	18	0.200	2.16	16
36.58	82.9	65.3	86.0	82.9	0.7	-0.6	0.8	6	clean SAND to silty SAND	125	5.0	13	17	13	53	37	-	-	13	0.350	2.01	16
36.75	100.1	78.6	99.1	100.1	0.9	-0.1	0.9	6	clean SAND to silty SAND	125	5.0	16	20	15	59	38	-	-	12	0.350	1.97	16
36.91	115.9	90.9	111.6	115.9	1.1	0.0	1.0	6	clean SAND to silty SAND	125	5.0	18	23	17	64	39	-	-	11	0.350	1.94	16
37.08	119.0	93.2	114.1	119.0	1.1	-0.1	1.0	6	clean SAND to silty SAND	125	5.0	19	24	18	65	39	-	-	11	0.350	1.94	16
37.24	109.3	85.5	109.0	109.4	1.1	0.3	1.0	6	clean SAND to silty SAND	125	5.0	17	22	17	62	39	-	-	12	0.350	1.98	16
37.40	99.6	77.7	98.7	99.6	0.9	1.0	0.9	6	clean SAND to silty SAND	125	5.0	16	20	15	59	38	-	-	12	0.350	1.98	16
37.57	92.8	72.3	95.0	92.9	0.8	1.8	0.9	6	clean SAND to silty SAND	125	5.0	14	19	14	56	38	-	-	13	0.350	2.01	16
37.73	87.9	68.4	90.9	87.9	0.8	2.8	0.9	6	clean SAND to silty SAND	125	5.0	14	18	14	54	37	-	-	14	0.350	2.02	16
37.90	78.6	61.0	86.2	78.7	0.7	5.6	0.9	5	silty SAND to sandy SILT	120	3.0	20	26	12	51	37	-	-	15	0.200	2.08	16
38.06	75.9	58.9	85.2	76.1	0.7	7.1	1.0	5	silty SAND to sandy SILT	120	3.0	20	25	12	50	36	-	-	16	0.200	2.10	16
38.22	77.1	59.7	83.8	77.2	0.7	6.4	0.9	5	silty SAND to sandy SILT	120	3.0	20	26	12	50	36	-	-	15	0.200	2.07	16
38.39	78.9	61.0	85.1	79.0	0.7	7.3	0.9	5	silty SAND to sandy SILT	120	3.0	20	26	12	51	37	-	-	15	0.200	2.07	16
38.55	83.7	64.6	88.1	83.8	0.7	7.2	0.9	6	clean SAND to silty SAND	125	5.0	13	17	13	53	37	-	-	14	0.350	2.05	16
38.72	81.3	62.7	88.7	81.5	0.8	7.2	1.0	5	silty SAND to sandy SILT	120	3.0	21	27	13	52	37	-	-	15	0.200	2.08	16
38.88	73.1	56.3	83.3	73.3	0.7	7.1	1.0	5	silty SAND to sandy SILT	120	3.0	19	24	12	48	36	-	-	16	0.200	2.11	16
39.04	64.4	49.5	82.6	64.6	0.7	7.0	1.1	5	silty SAND to sandy SILT	120	3.0	16	21	11	44	35	-	-	19	0.200	2.20	16
39.21	58.6	45.0	87.1	58.8	0.8	7.0	1.4	5	silty SAND to sandy SILT	120	3.0	15	20	10	41	35	-	-	22	0.200	2.30	16
39.37	60.6	46.4	78.0	60.7	0.6	6.2	1.1	5	silty SAND to sandy SILT	120	3.0	15	20	10	42	35	-	-	19	0.200	2.21	16
39.54	67.1	51.4	75.5	67.2	0.5	1.1	0.8	5	silty SAND to sandy SILT	120	3.0	17	22	11	45	35	-	-	16	0.200	2.11	16
39.70	69.5	53.1	78.7	69.5	0.6	-2.6	0.9	5	silty SAND to sandy SILT	120	3.0	18	23	11	46	36	-	-	16	0.200	2.11	16
39.86	74.4	56.7	75.9	74.3	0.5	-2.8	0.7	6	clean SAND to silty SAND	125	5.0	11	15	11	48	36	-	-	14	0.350	2.03	16
40.03	82.9	63.1	76.6	82.8	0.4	-3.2	0.5	6	clean SAND to silty SAND	125	5.0	13	17	12	52	37	-	-	11	0.350	1.93	16
40.19	88.9	67.6	81.9	88.8	0.5	-3.6	0.6	6	clean SAND to silty SAND	125	5.0	14	18	13	54	37	-	-	11	0.350	1.92	16
40.36	95.8	72.8	88.1	95.8	0.6	-3.7	0.7	6	clean SAND to silty SAND	125	5.0	15	19	14	57	38	-	-	11	0.350	1.92	16
40.52	101.9	77.2	92.4	101.8	0.7	-3.4	0.7	6	clean SAND to silty SAND	125	5.0	15	20	15	58	38	-	-	11	0.350	1.91	16
40.68	108.7	82.3	96.3	108.7	0.7	-2.9	0.7	6	clean SAND to silty SAND	125	5.0	16	22	15	61	38	-	-	10	0.350	1.88	16
40.85	115.0	86.9	102.3	115.0	0.8	-2.4	0.7	6	clean SAND to silty SAND	125	5.0	17	23	16	62	39	-	-	10	0.350	1.89	16
41.01	114.5	86.4	102.3	114.4	0.8	-1.7	0.8	6	clean SAND to silty SAND	125	5.0	17	23	16	62	38	-	-	10	0.350	1.89	16
41.18	118.0	88.9	104.6	118.0	0.9	1.5	0.8	6	clean SAND to silty SAND	125	5.0	18	24	17	63	39	-	-	10	0.350	1.89	16
41.34	132.1	99.4	126.2	132.2	1.6	2.3	1.2	6	clean SAND to silty SAND	125	5.0	20	26	19	67	39	-	-	12	0.350	1.98	16
41.50	162.6	122.1	135.9	162.6	1.4	3.2	0.9	6	clean SAND to silty SAND	125	5.0	24	33	22	74	40	-	-	8	0.350	1.81	16
41.67	209.1	156.8	158.8	209.1	1.4	0.8	0.7	6	clean SAND to silty SAND	125	5.0	31	42	27	82	42	-	-	5	0.350	1.66	16
41.83	212.6	159.1	171.6	212.6	2.1	3.1	1.0	6	clean SAND to silty SAND	125	5.0	32	43	29	82	42	-	-	7	0.350	1.76	16
42.00	196.4	146.8	158.7	196.4	1.8	1.1	0.9	6	clean SAND to silty SAND	125	5.0	29	39	26	80	41	-	-	7	0.350	1.76	16
42.16	164.1	122.5	145.8	164.1	1.9	0.0	1.2	6	clean SAND to silty SAND	125	5.0	25	33	23	74	40	-	-	10	0.350	1.90	16
42.32	167.6	124.9	142.9	167.6	1.7	-3.0	1.0	6	clean SAND to silty SAND	125	5.0	25	34	23	74	40	-	-	9	0.350	1.85	16
42.49	195.7	145.6	146.6	195.7	1.2	-1.5	0.6	6	clean SAND to silty SAND	125	5.0	29	39	25	79	41	-	-	5	0.350	1.65	16
42.65	195.8	145.5	145.5	195.8	1.0	-1.5	0.5	6	clean SAND to silty SAND	125	5.0	29	39	25	79	41	-	-	5	0.350	1.60	16
42.82	186.7	138.5	138.5	186.7	0.7	0.6	0.4	6	clean SAND to silty SAND	125	5.0	28	37	23	78	41	-	-	5	0.350	1.54	16
42.98	181.4	134.4	134.4	181.3	0.5	-2.7	0.3	6	clean SAND to silty SAND	125	5.0	27	36	22	77	41	-	-	5	0.350	1.52	16
43.15	176.5	130.6	130.6	176.5	0.6	-2.4	0.3	6	clean SAND to silty SAND	125	5.0	26	35	22	76	41	-	-	5	0.350	1.56	16
43.31	177.0	130.7	130.7	177.0	0.8	-2.3	0.5	6	clean SAND to silty SAND	125	5.0	26	35	22	76	41	-	-	5	0.350	1.62	16
43.47	178.2	131.5	135.2	178.2	1.1	-0.4	0.6	6	clean SAND to silty SAND	125	5.0	26	36	23	76	41	-	-	6	0.350	1.69	16
43.64	186.4	137.2	142.9	186.4	1.3	1.0	0.7	6	clean SAND to silty SAND	125	5.0	27	37	24	77	41	-	-	6	0.350	1.70	16
43.80	155.6	114.4	124.6	155.6	1.1	-1.0	0.7	6	clean SAND to silty SAND	125	5.0	23	31	21	71	40	-	-	8	0.350	1.77	16
43.97	159.7	117.3	117.7	159.6	0.7	-4.5	0.4	6	clean SAND to silty SAND	125	5.0	23	32	20	72	40	-	-	5	0.350	1.65	16
44.13	165.8	121.6	125.8	165.7	0.9	-6.0	0.6	6	clean SAND to silty SAND	125	5.0	24	33	21	73	40	-	-	6	0.350	1.70	16
44.29	166.5	121.9	134.9	166.3	1.4	-7.3	0.8	6	clean SAND to silty SAND	125	5.0	24	33	22	74	40	-	-	8	0.350	1.80	16
44.46	171.7	125.5	135.9	171.7	1.3	2.1	0.8	6	clean SAND to silty SAND	125	5.0	25	34	23	75	40	-	-	7	0.350	1.77	16
44.62	182.7	133.4	138.5	182.8	1.2	5.7	0.6	6	clean SAND to silty SAND	125	5.0	27	37	23	77	41	-	-	6	0.350	1.70	16
44.79	162.7	118.6	122.1	162.8	0.8	6.0	0.5	6	clean SAND to silty SAND	125	5.0	24	33	21	73	40	-	-	6	0.350	1.69	16
44.95	138.7	101.0	118.4	138.8	1.2	6.2	0.9	6	clean SAND to silty SAND	125	5.0	20	28	19	67	39	-	-	10	0.350	1.88	16
45.11	110.4	80.2	115.1	110.3	1.5	-3.2	1.4	5	silty SAND to sandy SILT	120	3.0	27	37	16	60	38	-	-	15	0.200	2.09	16
45.28	83.1	60.3	120.4	83.1	1.8	-2.0	2.2	5	silty SAND to sandy SILT	120	3.0	20	28	13	50	36	-	-	23	0.200	2.31	16
45.44	47.5	26.5	-	47.6	1.1	2.6	2.6	4	clayy SILT to silty CLAY	115	2.0	13	24	7	-	-	3.2	8.2	37	0.070	2.64	15
45.61	23.4	13.0	-	23.5	0.8	4.6	4.1	3	silty CLAY to CLAY	115	1.5	9	16	4	-	-	1.5	3.8	60	0.005	3.03	15
45.77	12.7	7.0	-	13.0	0.7	14.8	7.3	3	silty CLAY to CLAY	115	1.5	5	8	3	-	-	0.8	1.8	93	0.005	3.43	15
45.93	12.8	7.1	-	13.4	0.7	30.5	6.9	3	silty CLAY to CLAY	115	1.5	5	9	3	-	-	0.8	1.8	91	0.005	3.41	15
46.10	22.3	12.3	-	22.9	1.4	33.4	7.4	3	silty CLAY to CLAY	115	1.5	8	15	5	-	-	1.4	3.6	74	0.005	3.21	15
46.26	78.9	56.9	99.2	79.1	1.2	8.7	1.5	5	silty SAND to sandy SILT	120	3.0	19	26	12	48	36	-	-	20	0.200	2.23	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Santa Cruz Multi-Family Housing

Project ID: Salem Engineering
Data File: SDF(811).cpt
CPT Date: 4/3/2024 8:15:42 AM
GW During Test: 15 ft

Sounding ID: CPT-03
Project No: 5-224-0090
Cone/Rig: DDG1627

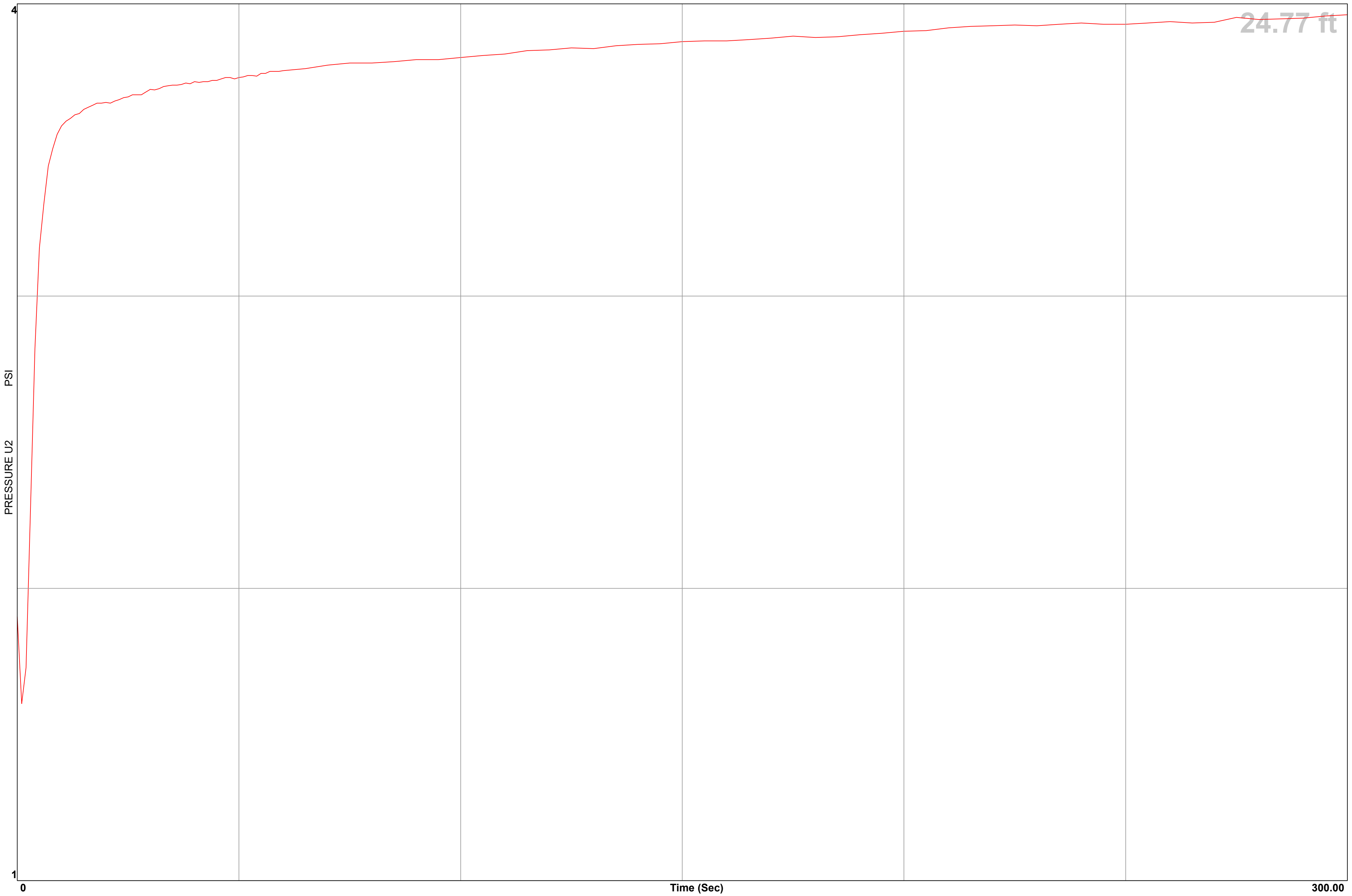
. . Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
46.43	76.6	55.1	101.4	76.6	1.2	3.3	1.7	5	silty SAND to sandy SILT	120	3.0	18	26	12	47	36	-	-	21	0.200	2.26	16
46.59	94.0	67.6	91.4	94.1	0.9	4.8	0.9	6	clean SAND to silty SAND	125	5.0	14	19	13	54	37	-	-	14	0.350	2.04	16
46.75	140.4	100.8	129.8	140.5	1.8	4.0	1.3	6	clean SAND to silty SAND	125	5.0	20	28	20	67	39	-	-	13	0.350	1.99	16
46.92	125.8	90.2	127.6	126.0	1.9	6.6	1.6	5	silty SAND to sandy SILT	120	3.0	30	42	18	64	38	-	-	15	0.200	2.08	16
47.08	115.2	82.5	122.1	115.3	1.8	6.9	1.6	5	silty SAND to sandy SILT	120	3.0	27	38	17	61	38	-	-	16	0.200	2.11	16
47.25	130.5	93.3	125.8	130.7	1.8	10.5	1.4	5	silty SAND to sandy SILT	120	3.0	31	43	19	65	39	-	-	14	0.200	2.04	16
47.41	152.5	108.9	132.2	152.6	1.7	1.5	1.1	6	clean SAND to silty SAND	125	5.0	22	31	21	70	39	-	-	11	0.350	1.93	16
47.57	163.5	116.6	133.1	163.5	1.5	3.0	0.9	6	clean SAND to silty SAND	125	5.0	23	33	22	72	40	-	-	9	0.350	1.85	16
47.74	131.1	93.4	118.2	131.2	1.4	5.1	1.1	6	clean SAND to silty SAND	125	5.0	19	26	18	65	39	-	-	12	0.350	1.97	16
47.90	115.8	82.3	109.3	116.0	1.3	10.3	1.1	6	clean SAND to silty SAND	125	5.0	16	23	16	61	38	-	-	14	0.350	2.02	16
48.07	95.9	68.1	116.5	96.1	1.7	9.4	1.8	5	silty SAND to sandy SILT	120	3.0	23	32	15	54	37	-	-	20	0.200	2.22	16
48.23	62.2	44.1	107.3	62.4	1.4	11.5	2.3	5	silty SAND to sandy SILT	120	3.0	15	21	10	40	34	-	-	28	0.200	2.43	16
48.39	45.0	23.9	-	45.4	2.2	23.0	5.2	3	silty CLAY to CLAY	115	1.5	16	30	7	-	-	3.0	7.4	50	0.005	2.87	15
48.56	92.6	65.5	134.4	93.7	2.3	55.2	2.6	5	silty SAND to sandy SILT	120	3.0	22	31	15	53	36	-	-	24	0.200	2.33	16
48.72	157.9	111.5	144.0	157.9	2.3	2.3	1.5	6	clean SAND to silty SAND	125	5.0	22	32	22	71	40	-	-	13	0.350	1.99	16
48.89	129.2	91.2	117.7	129.4	1.5	6.9	1.2	6	clean SAND to silty SAND	125	5.0	18	26	18	64	38	-	-	13	0.350	1.99	16
49.05	89.4	63.0	97.2	89.6	1.1	11.1	1.3	5	silty SAND to sandy SILT	120	3.0	21	30	13	52	36	-	-	17	0.200	2.15	16
49.22	86.6	61.0	88.8	86.8	0.9	10.3	1.0	5	silty SAND to sandy SILT	120	3.0	20	29	12	51	36	-	-	16	0.200	2.10	16
49.38	120.4	84.7	101.0	120.3	0.9	-4.3	0.8	6	clean SAND to silty SAND	125	5.0	17	24	16	61	38	-	-	10	0.350	1.90	16
49.54	115.4	81.0	98.0	115.4	0.9	-0.8	0.8	6	clean SAND to silty SAND	125	5.0	16	23	15	60	38	-	-	11	0.350	1.92	16
49.71	125.0	87.6	109.6	125.0	1.2	-0.1	1.0	6	clean SAND to silty SAND	125	5.0	18	25	17	63	38	-	-	12	0.350	1.96	16
49.87	127.6	89.4	111.7	127.7	1.3	1.5	1.0	6	clean SAND to silty SAND	125	5.0	18	26	17	63	38	-	-	12	0.350	1.96	16
50.04	149.4	104.4	119.5	149.3	1.2	-3.8	0.8	6	clean SAND to silty SAND	125	5.0	21	30	19	68	39	-	-	9	0.350	1.85	16
50.20	177.0	123.6	150.5	176.9	2.3	-7.4	1.3	6	clean SAND to silty SAND	125	5.0	25	35	24	74	40	-	-	11	0.350	1.93	16
50.36	192.0	133.9	180.6	191.9	3.8	-5.5	2.0	5	silty SAND to sandy SILT	120	3.0	45	64	27	77	40	-	-	14	0.200	2.04	16
50.53	234.4	163.3	214.5	234.3	5.1	-5.6	2.2	5	silty SAND to sandy SILT	120	3.0	54	78	32	83	41	-	-	13	0.200	2.01	16
50.69	389.0	270.6	283.9	389.3	5.4	13.9	1.4	6	clean SAND to silty SAND	125	5.0	54	78	48	95	44	-	-	6	0.350	1.72	16
50.86	256.4	178.2	217.2	256.6	4.7	7.7	1.9	6	clean SAND to silty SAND	125	5.0	36	51	34	86	42	-	-	11	0.350	1.93	16
51.02	205.5	142.5	171.4	205.7	3.0	11.9	1.5	6	clean SAND to silty SAND	125	5.0	29	41	27	79	41	-	-	11	0.350	1.91	16
51.18	164.1	113.7	129.8	164.4	1.5	14.4	0.9	6	clean SAND to silty SAND	125	5.0	23	33	21	71	40	-	-	9	0.350	1.85	16
51.35	163.8	113.3	125.3	164.1	1.2	15.9	0.8	6	clean SAND to silty SAND	125	5.0	23	33	21	71	40	-	-	8	0.350	1.80	16
51.51	177.7	122.8	125.2	177.7	0.9	-2.1	0.5	6	clean SAND to silty SAND	125	5.0	25	36	21	74	40	-	-	6	0.350	1.67	16
51.68	199.6	137.8	137.8	199.5	1.0	-1.4	0.5	6	clean SAND to silty SAND	125	5.0	28	40	24	78	41	-	-	5	0.350	1.62	16
51.84	197.3	136.0	149.3	197.5	1.8	8.8	0.9	6	clean SAND to silty SAND	125	5.0	27	39	25	77	40	-	-	8	0.350	1.79	16
52.00	179.0	123.2	132.7	179.2	1.3	9.0	0.7	6	clean SAND to silty SAND	125	5.0	25	36	22	74	40	-	-	7	0.350	1.76	16
52.17	148.8	102.3	123.9	148.9	1.5	7.9	1.0	6	clean SAND to silty SAND	125	5.0	20	30	20	68	39	-	-	11	0.350	1.92	16
52.33	76.8	52.7	113.1	76.8	1.6	1.2	2.2	5	silty SAND to sandy SILT	120	3.0	18	26	12	46	35	-	-	25	0.200	2.36	16
52.50	48.1	24.0	-	48.3	1.3	9.0	2.8	4	clayy SILT to silty CLAY	115	2.0	12	24	6	-	-	3.3	7.4	40	0.070	2.70	15
52.66	23.8	11.9	-	24.1	1.1	15.8	5.3	3	silty CLAY to CLAY	115	1.5	8	16	4	-	-	1.5	3.4	68	0.005	3.14	15
52.82	18.3	9.1	-	18.9	0.7	30.9	4.7	3	silty CLAY to CLAY	115	1.5	6	12	3	-	-	1.1	2.5	74	0.005	3.21	15
52.99	27.2	13.5	-	27.5	0.6	15.6	2.7	3	silty CLAY to CLAY	115	1.5	9	18	4	-	-	1.8	3.9	52	0.005	2.90	15
53.15	31.9	15.8	-	32.0	0.8	3.7	2.8	3	silty CLAY to CLAY	115	1.5	11	21	5	-	-	2.1	4.7	49	0.005	2.86	15
53.32	26.7	13.2	-	26.8	0.6	4.4	2.8	3	silty CLAY to CLAY	115	1.5	9	18	4	-	-	1.7	3.8	53	0.005	2.92	15
53.48	24.6	12.1	-	24.6	0.6	3.9	2.7	3	silty CLAY to CLAY	115	1.5	8	16	4	-	-	1.6	3.5	55	0.005	2.95	15
53.64	21.5	10.6	-	21.6	0.7	3.5	3.7	3	silty CLAY to CLAY	115	1.5	7	14	4	-	-	1.4	3.0	65	0.005	3.09	15
53.81	20.1	9.9	-	20.2	0.5	2.7	3.2	3	silty CLAY to CLAY	115	1.5	7	13	3	-	-	1.3	2.7	64	0.005	3.08	15
53.97	20.4	10.0	-	20.4	1.4	2.0	7.9	3	silty CLAY to CLAY	115	1.5	7	14	4	-	-	1.3	2.8	82	0.005	3.31	15
54.14	85.5	58.0	135.5	85.5	2.4	-2.3	2.9	5	silty SAND to sandy SILT	120	3.0	19	29	14	49	35	-	-	27	0.200	2.41	16
54.30	104.2	70.6	134.4	104.4	2.4	9.8	2.4	5	silty SAND to sandy SILT	120	3.0	24	35	16	56	37	-	-	22	0.200	2.29	16
54.46	126.0	85.3	132.7	126.3	2.3	14.2	1.9	5	silty SAND to sandy SILT	120	3.0	28	42	18	62	38	-	-	17	0.200	2.15	16
54.63	129.5	87.6	116.7	129.8	1.6	15.5	1.2	6	clean SAND to silty SAND	125	5.0	18	26	17	63	38	-	-	14	0.350	2.02	16
54.79	166.5	112.4	137.0	166.7	2.0	11.0	1.2	6	clean SAND to silty SAND	125	5.0	22	33	21	71	39	-	-	11	0.350	1.93	16
54.96	189.7	127.9	177.7	189.9	3.9	11.6	2.1	5	silty SAND to sandy SILT	120	3.0	43	63	26	75	40	-	-	15	0.200	2.06	16
55.12	224.5	151.3	184.2	224.8	3.6	16.8	1.6	6	clean SAND to silty SAND	125	5.0	30	45	29	81	41	-	-	11	0.350	1.93	16
55.28	286.9	193.1	209.5	287.2	3.5	13.5	1.2	6	clean SAND to silty SAND	125	5.0	39	57	35	89	42	-	-	7	0.350	1.77	16
55.45	368.6	247.8	247.8	368.7	3.4	6.9	0.9	6	clean SAND to silty SAND	125	5.0	50	74	42	95	43	-	-	5	0.350	1.61	16
55.61	431.6	289.8	289.8	431.9	4.4	12.9	1.0	6	clean SAND to silty SAND	125	5.0	58	86	49	95	44	-	-	5	0.350	1.59	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Salem Engineering

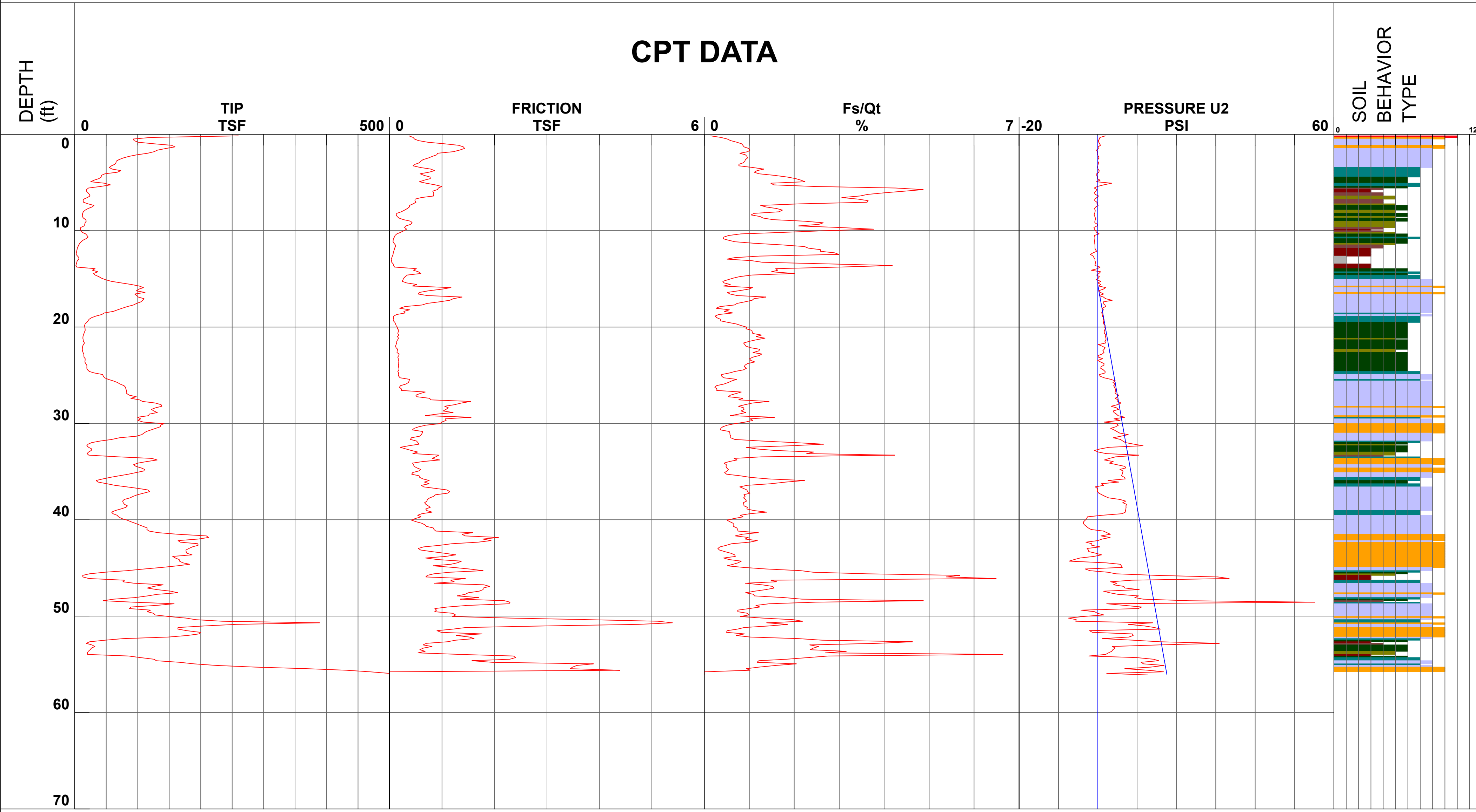
Location	Santa Cruz Multi-Family Housing	Operator	JM-FA		
Job Number	5-224-0090	Cone Number	DDG1627	GPS	
Hole Number	CPT-03	Date and Time	4/3/2024 8:15:42 AM		
Equilized Pressure	3.9	EST GW Depth During Test	15.6		



Salem Engineering

Project	Santa Cruz Multi-Family Housing	Operator	JM-FA	Filename	SDF(811).cpt
Job Number	5-224-0090	Cone Number	DDG1627	GPS	
Hole Number	CPT-03	Date and Time	4/3/2024 8:15:42 AM	Maximum Depth	56.10 ft
EST GW Depth During Test		15.60 ft			

Net Area Ratio .8



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 15cm²

S*Soil behavior type and SPT based on data from UBC-1983

Percolation Test Worksheet

				Length of Pipe	81.5 in.
Project:	2020 N Pacific Avenue	Job No.:	5-224-0090	Pipe stickup:	2.00 ft ##
	Santa Cruz, CA	Date Drilled:	4/2/2024	Hole Dia.:	6.625 in.
		Soil Classification:	SM	Pipe Dia.:	3 in.
Test Hole No.:	P-1			Gravel Below Pipe:	2 in.
Tested By:	RS	Presoaking Date:	4/2/2024	Gravel pack porosity:	0.4
Drilled Hole Depth:	5.17 Feet	Test Date:	4/2/2024	Gravel Correc Factor:	0.5

Trial	Time Start	Time Finish	Refill- Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Uncorrected Percolation Rate (min/in)	Gravel Pack Corrected Unfactored Percolation Rate (min/in)	Estimated Unfactored Infiltration Rate (inches/hr)
1	12:30	12:47	N	0:17	5.60	5.69	1.08	17	15.7	30.1	0.1655
2	12:48	13:00	N	0:12	5.69	5.76	0.84	12	14.3	27.3	0.1915
3	13:00	13:16	N	0:16	5.76	5.89	1.56	16	10.3	19.6	0.2848
4	13:20	13:35	Y	0:15	5.48	5.57	1.08	15	13.9	26.6	0.1749
5	13:35	13:50	N	0:15	5.57	5.66	1.08	15	13.9	26.6	0.1842
6	13:52	14:16	Y	0:24	4.98	5.30	3.84	24	6.3	11.9	0.3197
7	14:17	14:33	N	0:16	5.30	5.46	1.92	16	8.3	15.9	0.2696
8	14:34	14:52	N	0:18	5.46	5.58	1.44	18	12.5	23.9	0.1938
9	14:53	15:10	N	0:17	5.58	5.710	1.56	17	10.9	20.8	0.2390
10	15:45	16:30	N	0:45	5.43	5.70	3.24	45	13.9	26.6	0.1789
									Estimated Unfactored Infiltration Rate (in/hr)		0.17

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Percolation Test Worksheet

Project:	**2020 N Pacific Avenue Santa Cruz, CA**	**Job No.:**	**5-224-0090**	Length of Pipe	61.5 in.
		Date Drilled:	**4/2/2024**	Pipe stickup:	0.00 ft ##
		Soil Classification:	**SM**	Hole Dia.:	6.625 in.
Test Hole No.:	**P-2**			Pipe Dia.:	3 in.
Tested By:	**RS**	**Presoaking Date:**	**4/2/2024**	Gravel Below Pipe:	4 in.
Drilled Hole Depth:	**5.25** Feet	**Test Date:**	**4/2/2024**	Gravel pack porosity:	0.4
				Gravel Correc Factor:	0.5

Trial	Time Start	Time Finish	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Uncorrected Percolation Rate (min/in)	Gravel Pack Corrected Unfactored Percolation Rate (min/in)	Estimated Unfactored Infiltration Rate (inches/hr)
1	12:31	12:50	N	0:19	4.19	4.20	0.12	19	158.3	302.7	0.023
2	12:50	13:02	N	0:12	4.20	4.22	0.24	12	50.0	95.6	0.074
3	13:05	13:18	N	0:13	4.22	4.26	0.48	13	27.1	51.8	0.139
4	13:18	13:33	N	0:15	4.26	4.29	0.36	15	41.7	79.7	0.093
5	13:34	13:53	N	0:19	4.29	4.37	0.96	19	19.8	37.8	0.207
6	13:59	14:14	Y	0:15	3.66	3.74	0.96	15	15.6	29.9	0.164
7	14:15	14:31	N	0:16	3.74	3.81	0.84	16	19.0	36.4	0.141
8	14:33	14:50	N	0:17	3.81	3.85	0.48	17	35.4	67.7	0.078
9	14:50	15:15	N	0:25	3.85	3.92	0.84	25	29.8	56.9	0.097
10	15:15	15:41	N	0:26	3.92	4.00	0.96	26	27.1	51.8	0.112
11	15:41	16:33	N	0:52	4.00	4.11	1.32	52	39.4	75.3	0.082
12	16:35	17:00	N	0:25	4.11	4.21	1.20	25	20.8	29.8	0.169

Estimated Unfactored Infiltration Rate (in/hr) 0.170

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APPENDIX

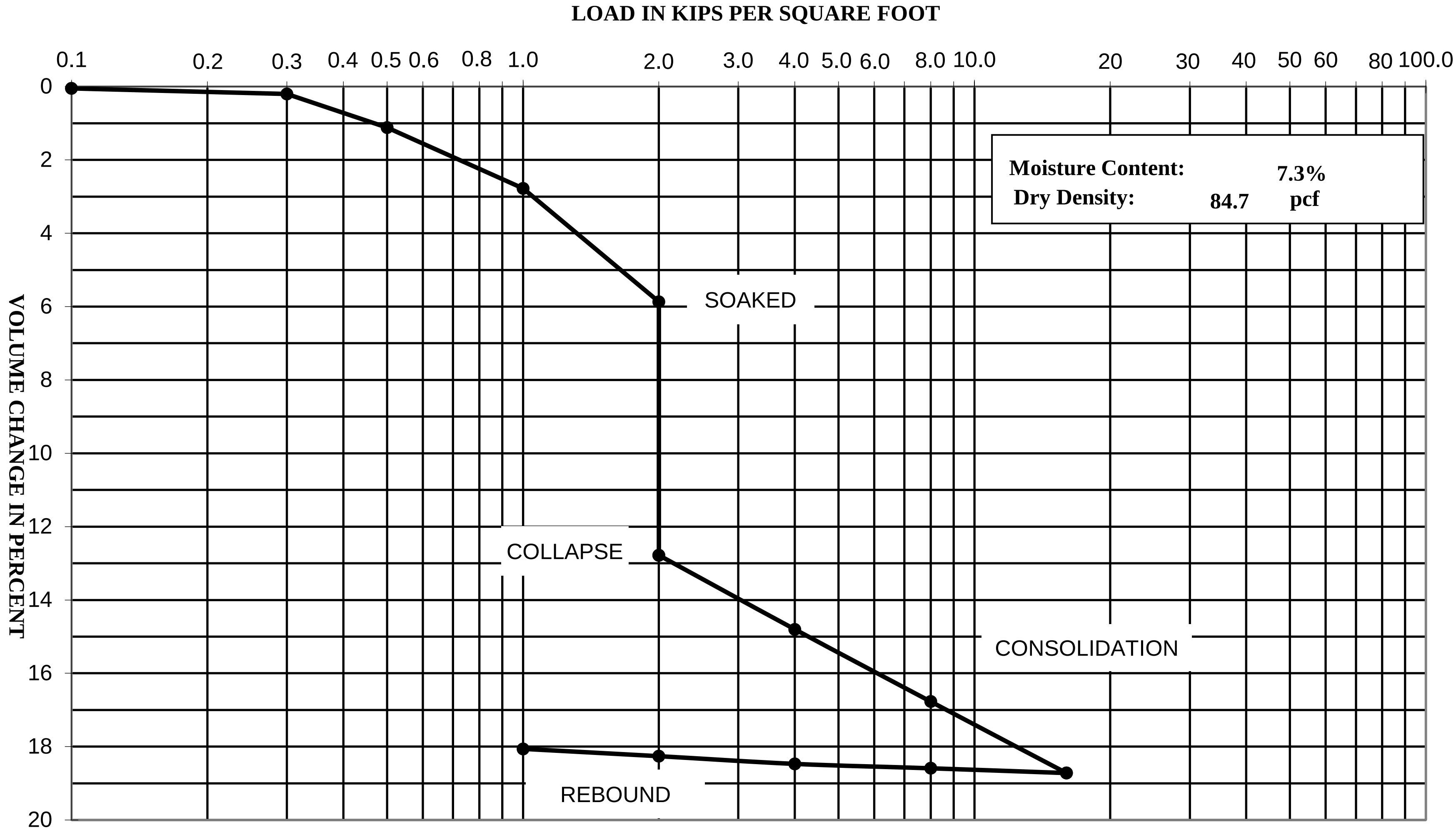
B

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 of the materials encountered were tested for natural moisture and density, gradation, expansion index, Atterberg Limits, shear strength, consolidation, R-Value and corrosivity. The results of the laboratory tests are summarized in the following figures.

CONSOLIDATION - PRESSURE TEST DATA
ASTM D2435



Project Name: Multi Family Housing Project - Santa Cruz, CA

Project Number: 5-224-0090

Boring: B-1 @ 8.5'

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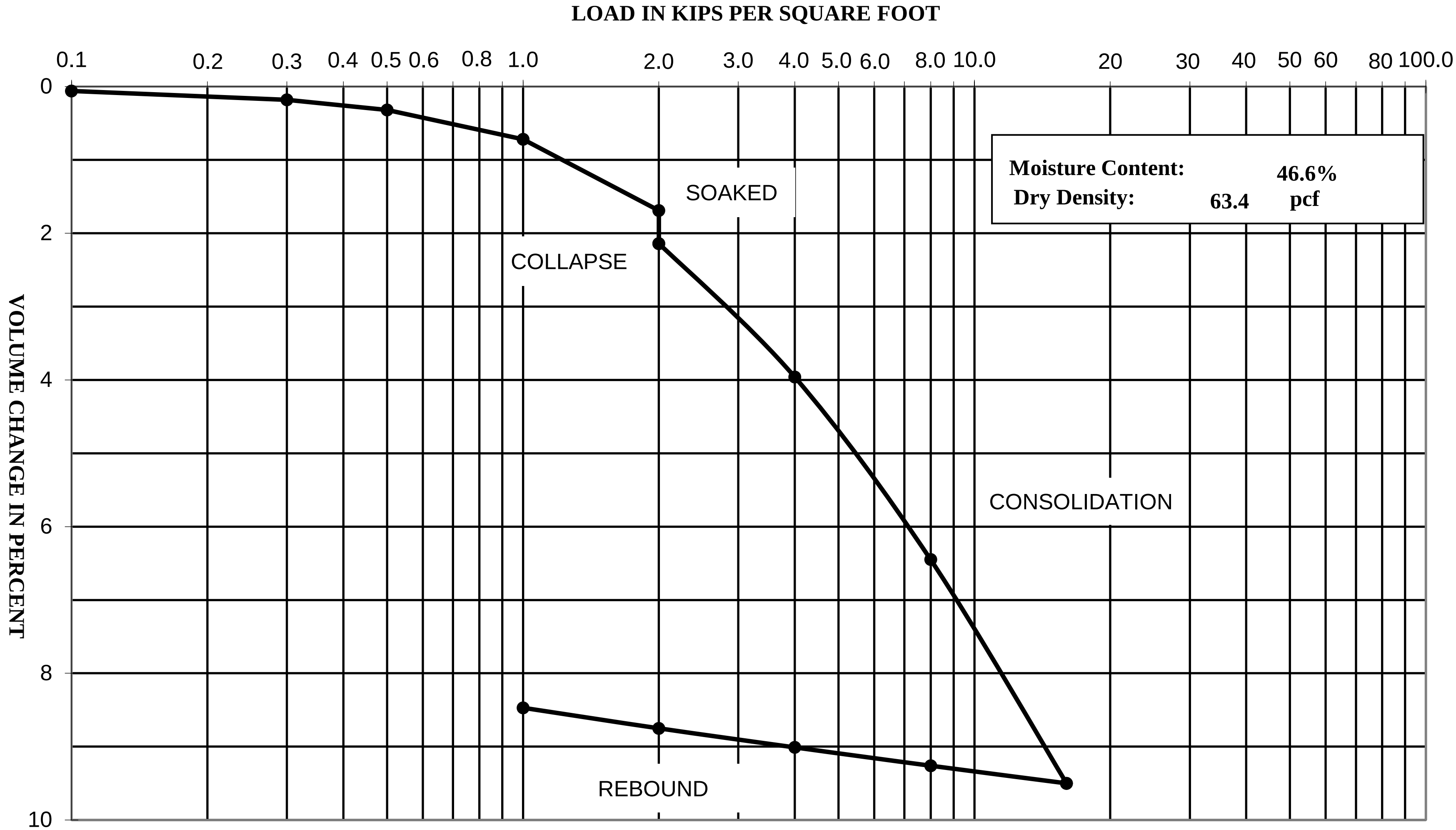
CONSOLIDATION - PRESSURE TEST DATA

ASTM D2435



Project Name: Multi Family Housing Project - Santa Cruz, CA

Project Number: 5-224-0090

Boring: B-2 @ 3.5'

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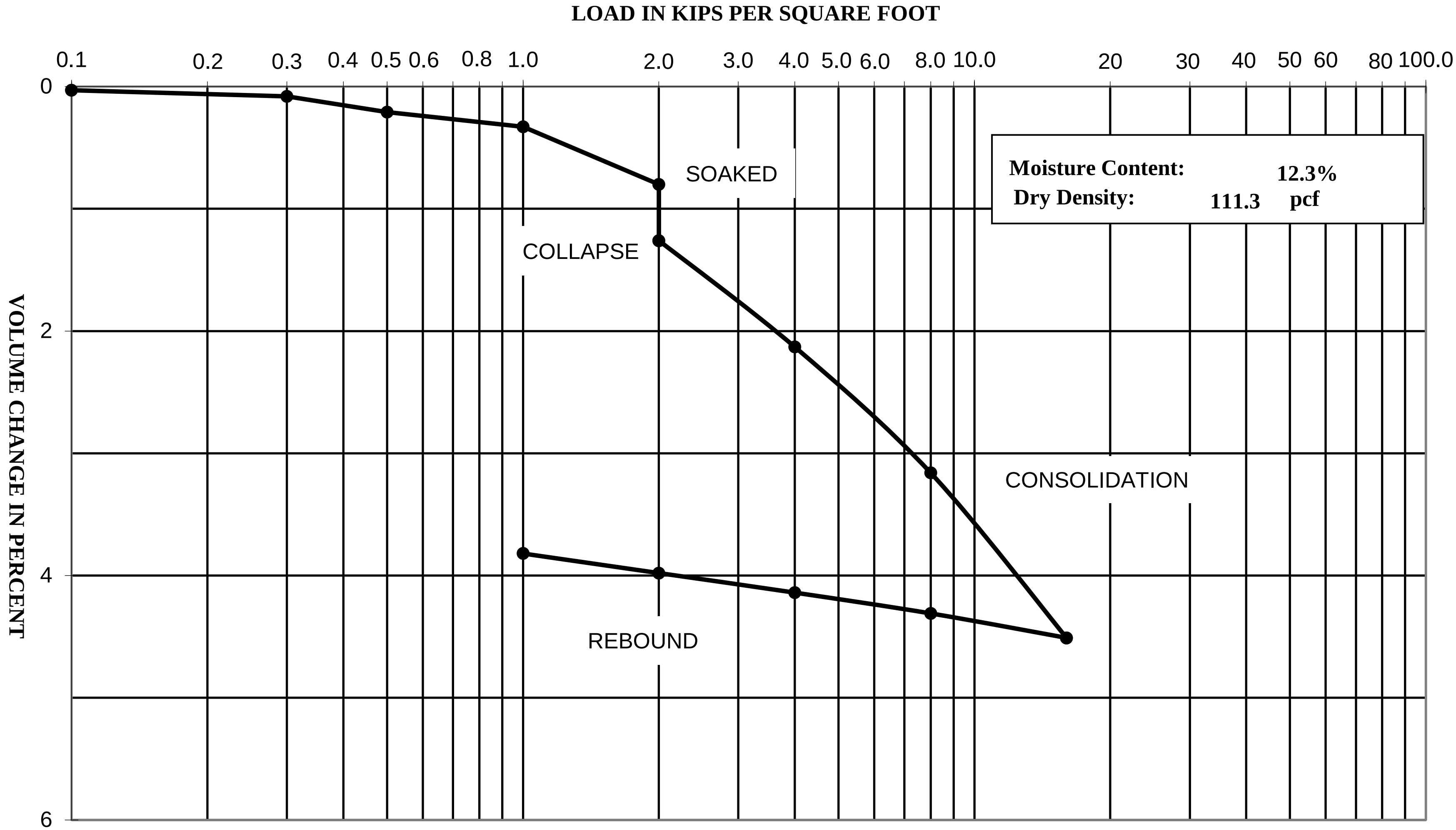
CONSOLIDATION - PRESSURE TEST DATA
ASTM D2435



Project Name: Multi Family Housing Project - Santa Cruz, CA

Project Number: 5-224-0090

Boring: B-3 @ 1'

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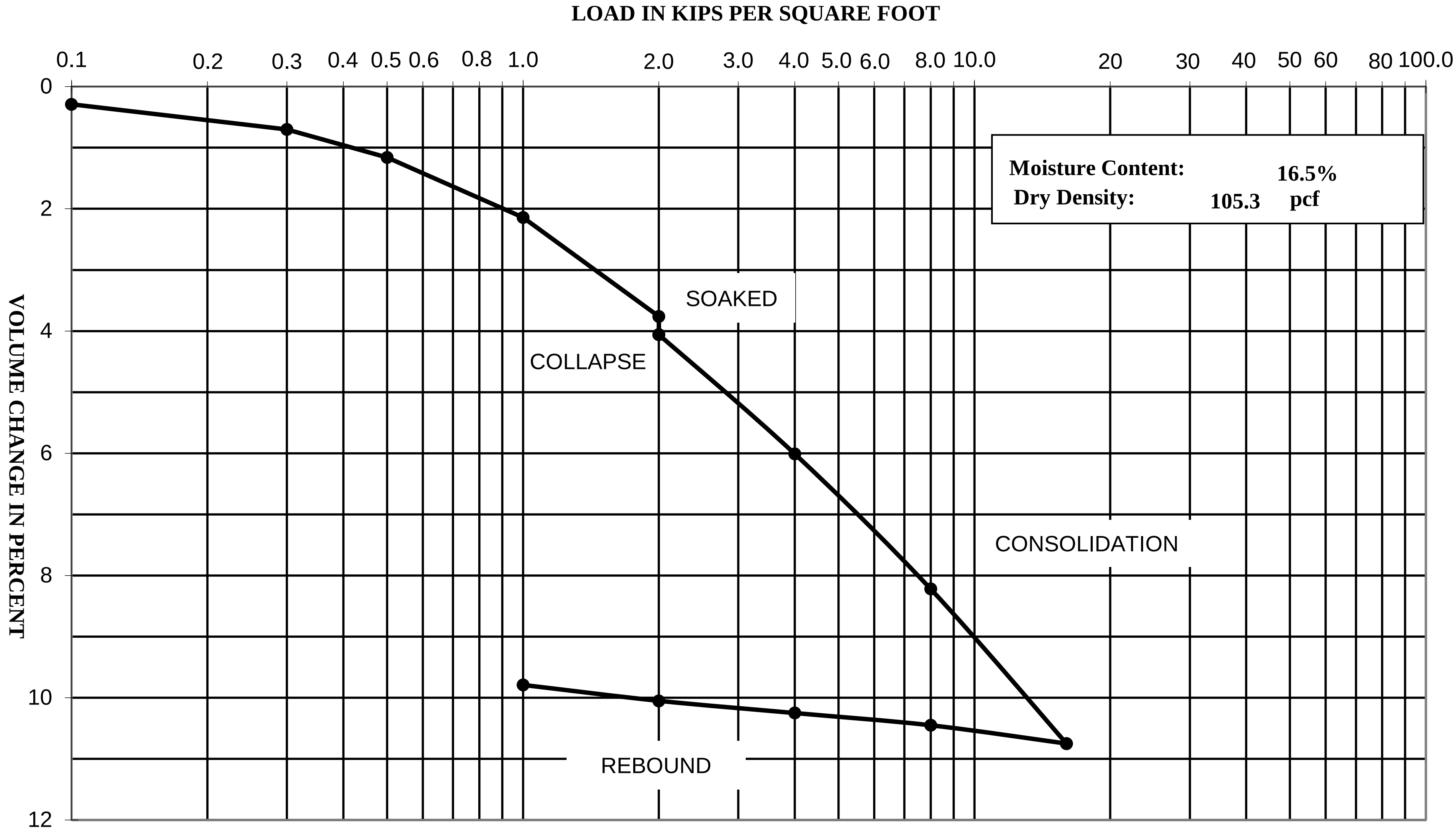
CONSOLIDATION - PRESSURE TEST DATA
ASTM D2435



Project Name: Multi Family Housing Project - Santa Cruz, CA

Project Number: 5-224-0090

Boring: B-3 @ 8.5'

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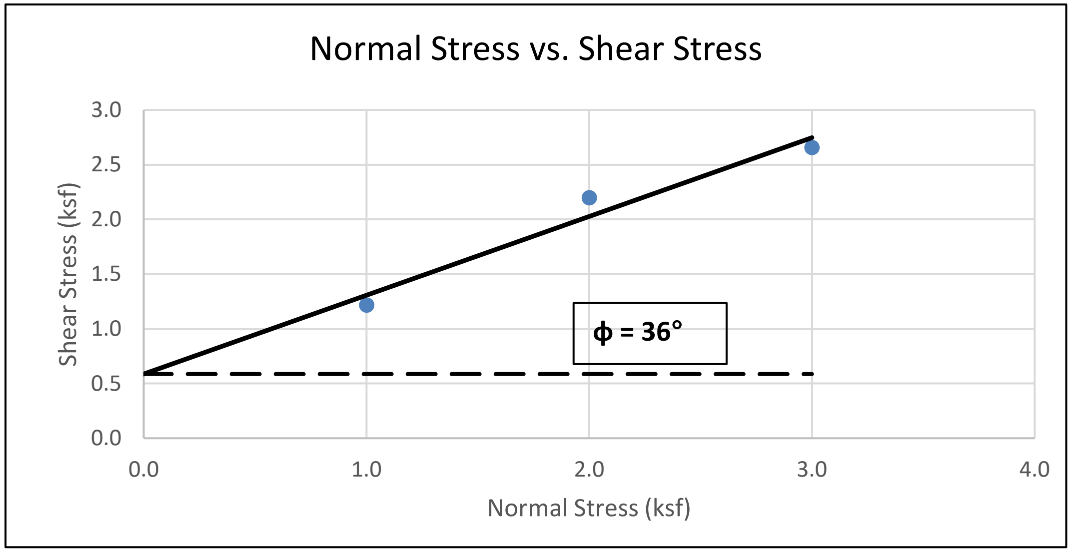
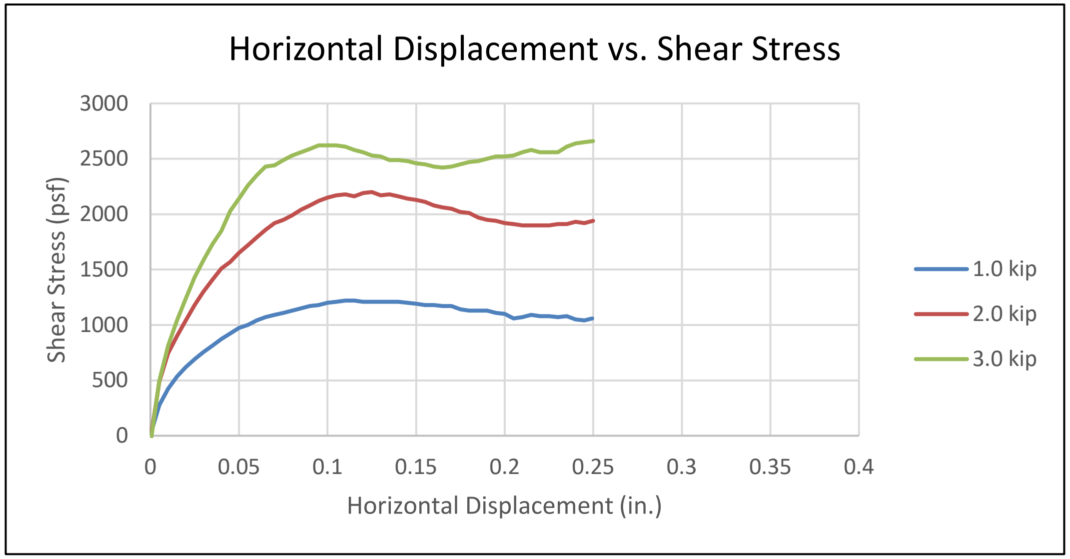
Direct Shear Test (ASTM D3080)

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Client:
Boring: B-1 @ 13.5'
Soil Type: Poorly Graded SAND wit
Sample Type: Undisturbed Ring
Tested By: NL
Reviewed By:
Date of Test: 4/17/24
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)	1.22	2.20	2.66

Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.980	0.983	0.966
Post-Shear Sample Height (in.)	0.989	0.987	0.960
Diameter of Sample (in)	2.4	2.4	2.4
Initial (pre-shear) Values			
Moisture Content (%)	10.8		
Dry Density (pcf)	101.9	109.9	114.2
Saturation %	45.2	55.7	62.7
Void Ratio	0.64	0.52	0.46
Consolidated Void Ratio	0.60	0.49	0.41
Final (post-shear) Values			
Final Moisture Content (%)	21.4	21.4	20.9
Dry Density (pcf)	100.3	104.3	108.5
Saturation %	73.8	89.2	105.6
Void Ratio	0.77	0.64	0.53





Peak Shear Strength Values	
Slope	0.72
Friction Angle	36
Cohesion (psf)	587

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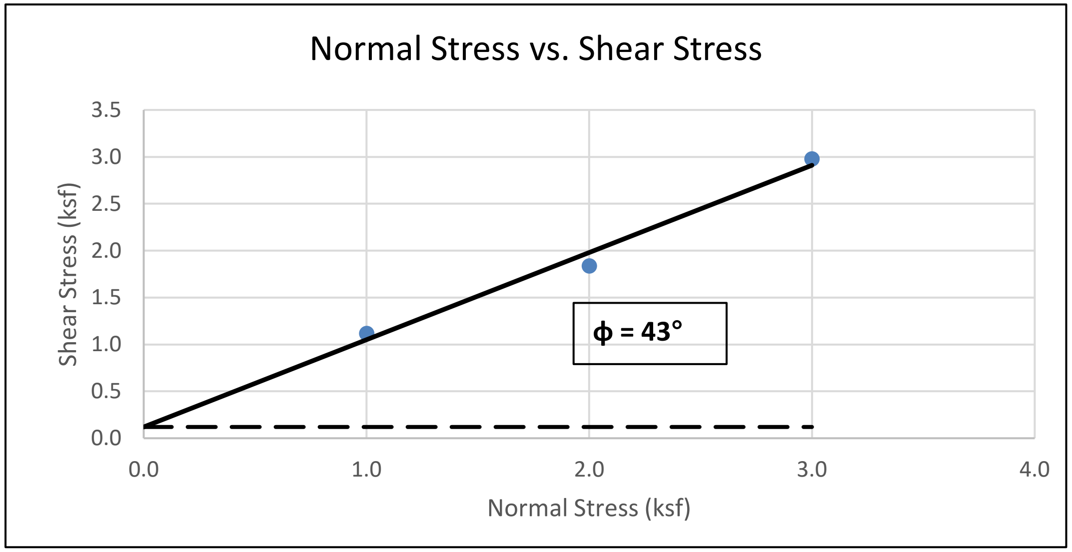
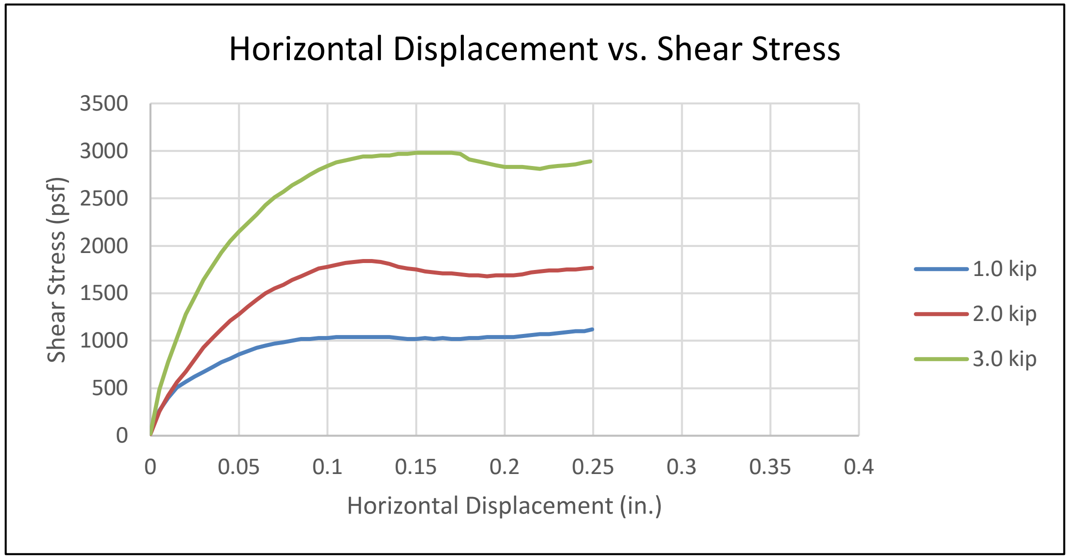
Direct Shear Test (ASTM D3080)

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Client:
Boring: B-1 @ 33.5'
Soil Type: Silty SAND (SM)
Sample Type: Undisturbed Ring
Tested By: NL / MC
Reviewed By:
Date of Test: 4/17/24 & 4/18/24
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)	1.12	1.84	2.98

Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.980	0.974	0.952
Post-Shear Sample Height (in.)	0.978	0.969	0.941
Diameter of Sample (in)	2.4	2.4	2.4
Initial (pre-shear) Values			
Moisture Content (%)	24.8		
Dry Density (pcf)	101.0	98.2	99.3
Saturation %	100.7	93.9	96.6
Void Ratio	0.66	0.71	0.69
Consolidated Void Ratio	0.63	0.67	0.61
Final (post-shear) Values			
Final Moisture Content (%)	27.7	27.5	28.8
Dry Density (pcf)	98.8	97.6	98.9
Saturation %	112.4	106.7	120.6
Void Ratio	0.66	0.69	0.64





Peak Shear Strength Values	
Slope	0.93
Friction Angle	43
Cohesion (psf)	120

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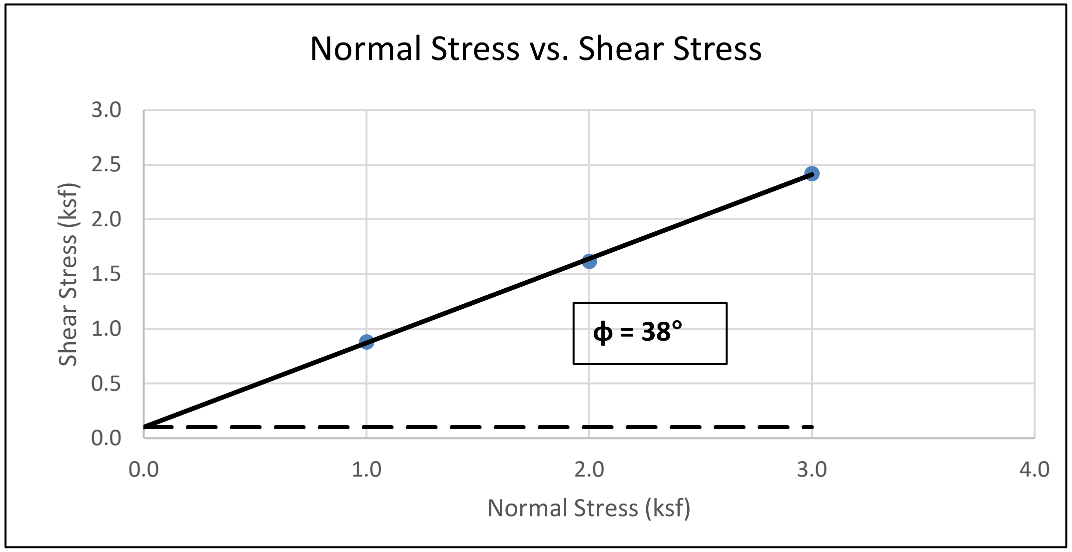
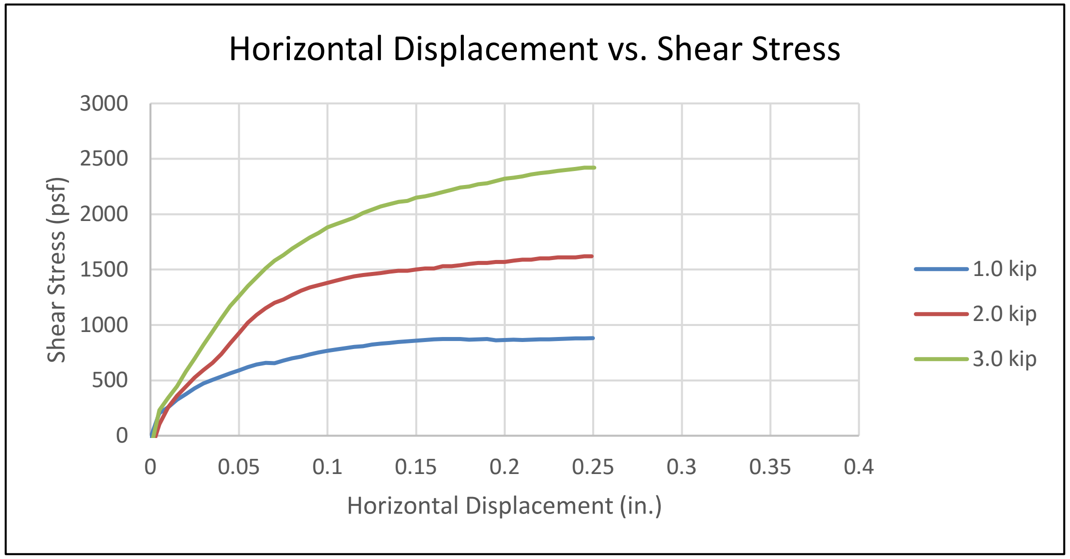
Direct Shear Test (ASTM D3080)

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Client:
Boring: B-2 @ 8.5'
Soil Type: Sandy Silty CLAY (CL-ML
Sample Type: Undisturbed Ring
Tested By: NL
Reviewed By:
Date of Test: 4/18/24
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)	0.88	1.62	2.42

Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.968	0.952	0.934
Post-Shear Sample Height (in.)	0.952	0.941	0.916
Diameter of Sample (in)	2.4	2.4	2.4
Initial (pre-shear) Values			
Moisture Content (%)	17.8		
Dry Density (pcf)	97.5	98.6	96.2
Saturation %	66.3	68.0	64.1
Void Ratio	0.72	0.70	0.75
Consolidated Void Ratio	0.67	0.62	0.63
Final (post-shear) Values			
Final Moisture Content (%)	24.9	22.7	23.6
Dry Density (pcf)	98.3	104.0	99.7
Saturation %	90.8	91.3	93.5
Void Ratio	0.74	0.67	0.68





Peak Shear Strength Values	
Slope	0.77
Friction Angle	38
Cohesion (psf)	101

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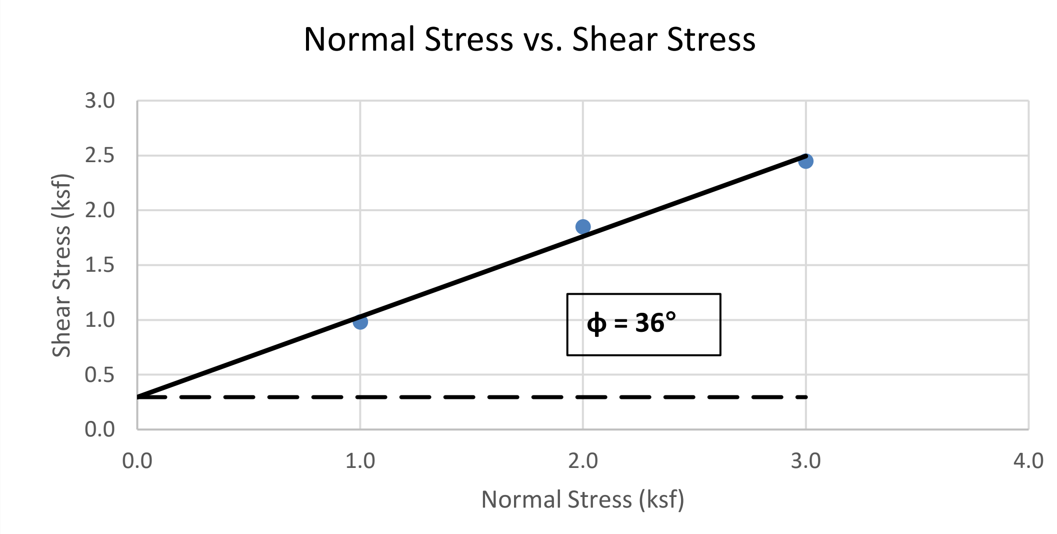
Fresno, CA 93722

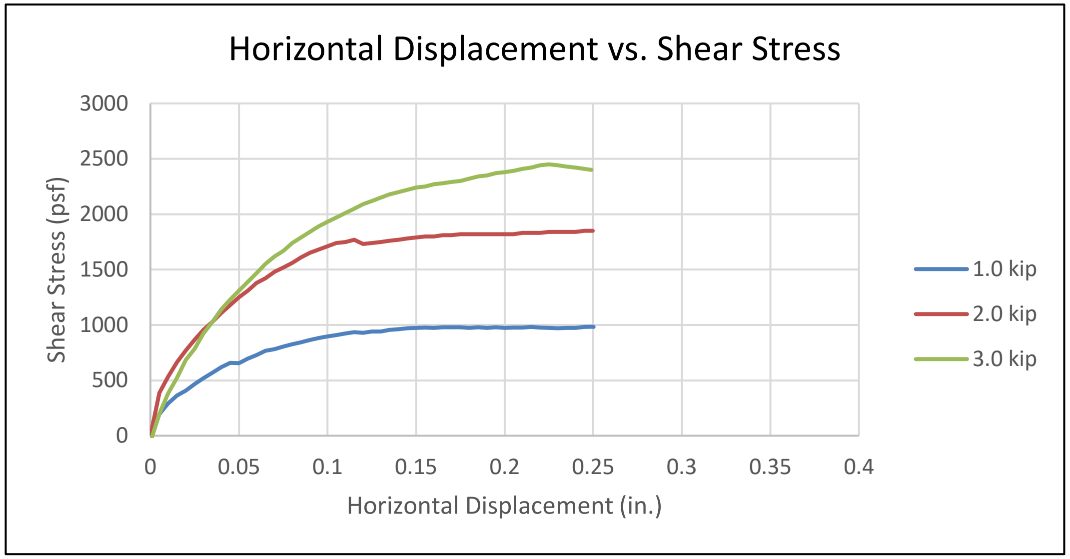
Direct Shear Test (ASTM D3080)

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Client:
Boring: B-3 @ 8.5'
Soil Type: Sandy Silty CLAY (CL-ML
Sample Type: Undisturbed Ring
Tested By: NL / MC
Reviewed By:
Date of Test: 4/18/24 & 4/19/24
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)	0.98	1.85	2.45

Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.972	0.899	0.865
Post-Shear Sample Height (in.)	0.960	0.880	0.839
Diameter of Sample (in)	2.4	2.4	2.4
Initial (pre-shear) Values			
Moisture Content (%)	16.5		
Dry Density (pcf)	95.6	105.2	99.2
Saturation %	58.6	74.5	64.1
Void Ratio	0.76	0.60	0.69
Consolidated Void Ratio	0.71	0.43	0.46
Final (post-shear) Values			
Final Moisture Content (%)	22.0	25.3	25.3
Dry Density (pcf)	100.9	102.7	99.2
Saturation %	77.1	133.5	129.0
Void Ratio	0.77	0.51	0.53





Peak Shear Strength Values	
Slope	0.73
Friction Angle	36
Cohesion (psf)	295

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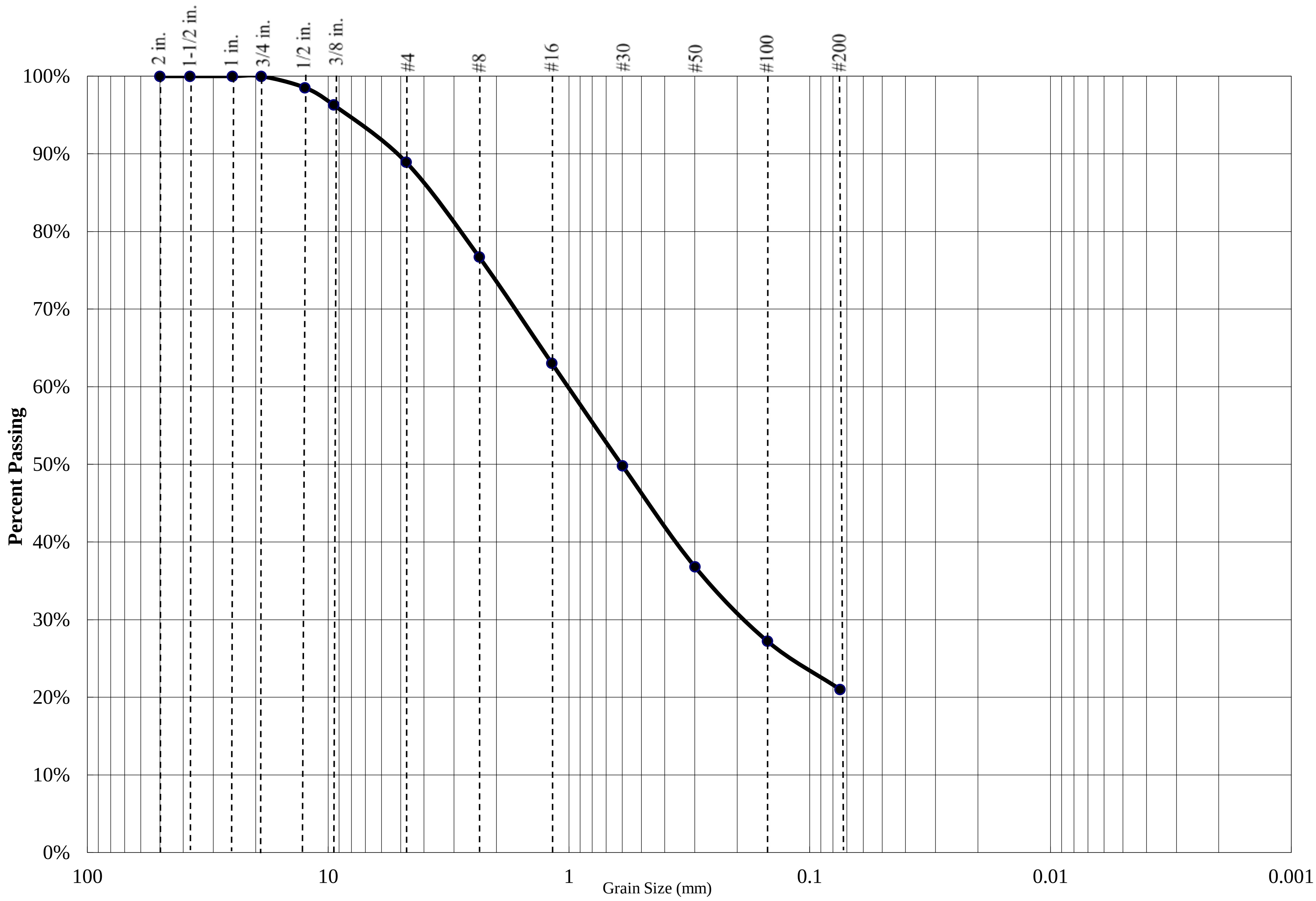
Fresno, CA 93722

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
11%	68%	21%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	98.5%
3/8 inch	96.3%
#4	88.9%
#8	76.7%
#16	63.1%
#30	49.8%
#50	36.8%
#100	27.2%
#200	21.0%

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
Silty SAND (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

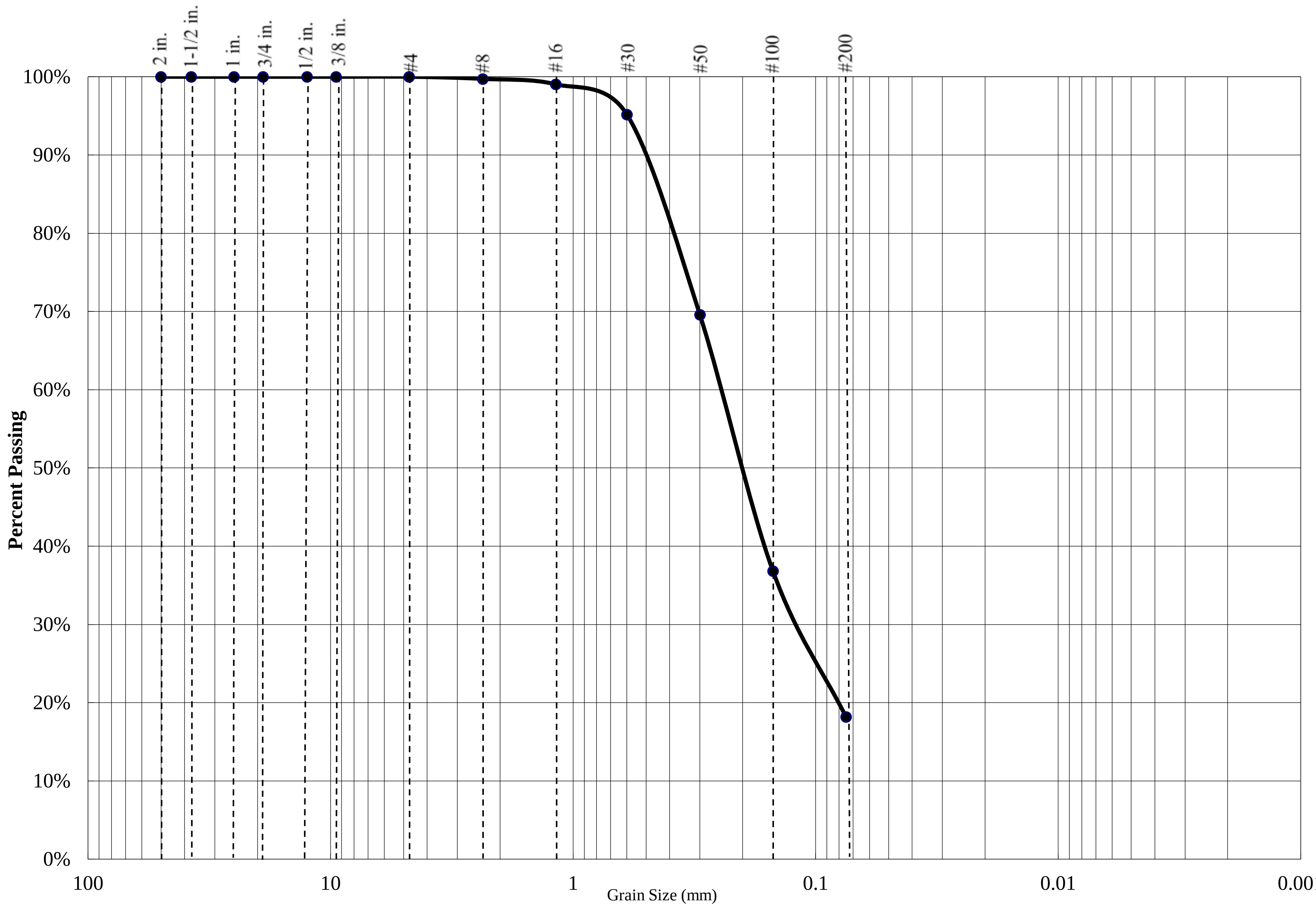
Project Number: 5-224-0090

Boring: B-1 @ 1' - 4'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
0%	82%	18%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	99.7%
#16	99.0%
#30	95.2%
#50	69.6%
#100	36.8%
#200	18.2%

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
Silty SAND (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

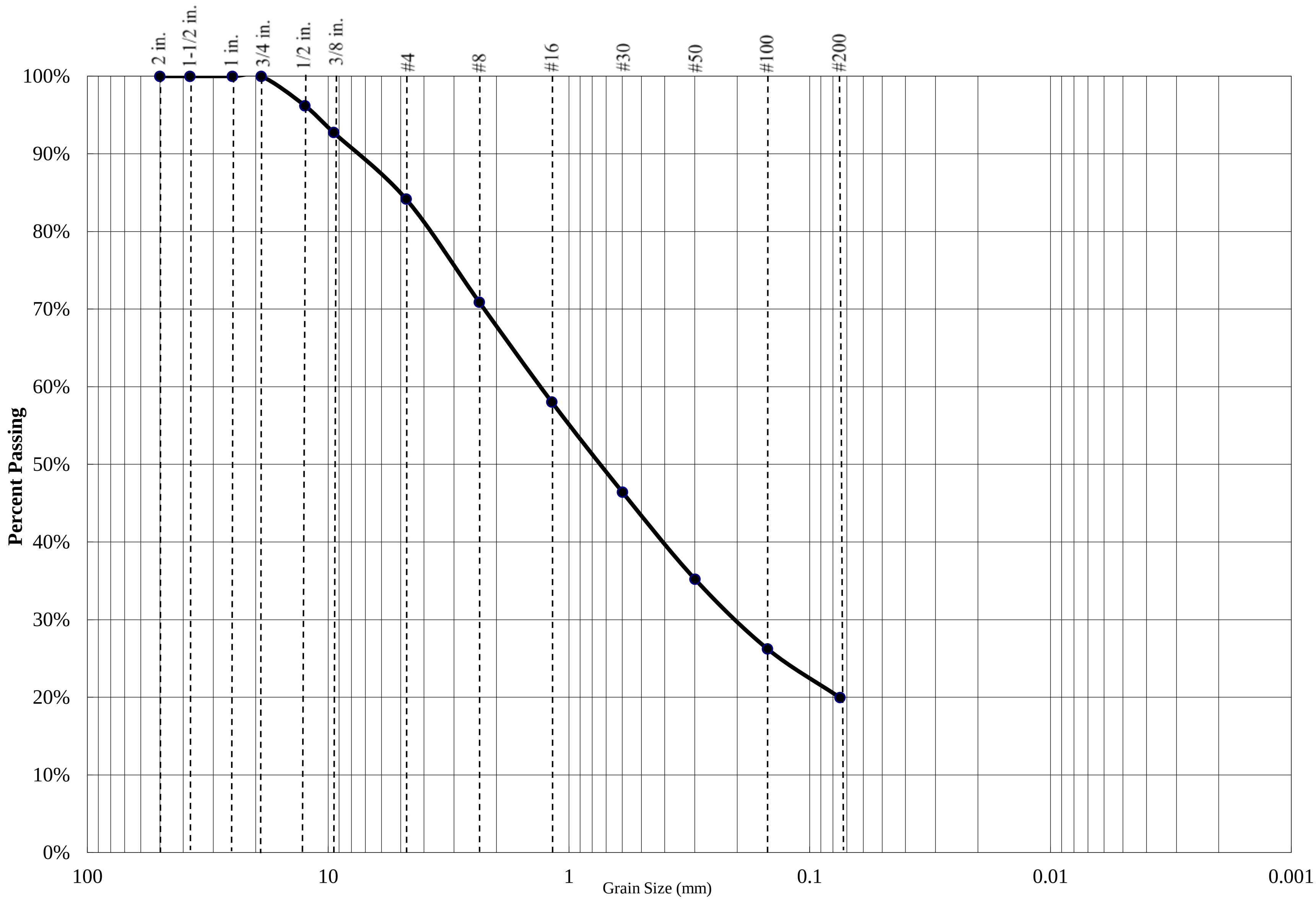
Project Number: 5-224-0090

Boring: B-1 @ 38.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
16%	64%	20%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	96.2%
3/8 inch	92.8%
#4	84.2%
#8	70.9%
#16	58.1%
#30	46.4%
#50	35.2%
#100	26.3%
#200	20.0%

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
Silty SAND with Gravel (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

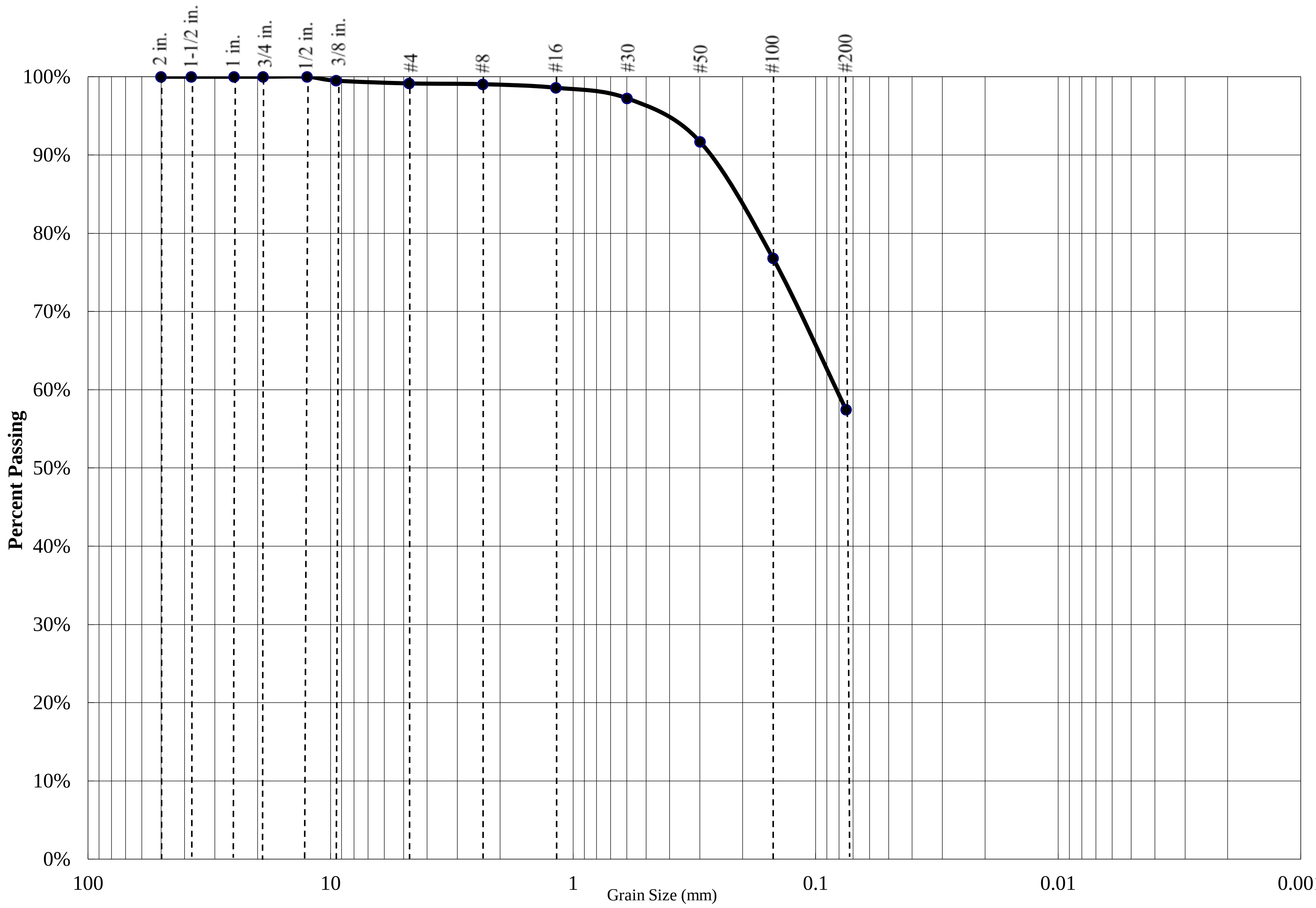
Project Number: 5-224-0090

Boring: B-2 @ 1' - 4'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
1%	42%	57%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	99.5%
#4	99.2%
#8	99.1%
#16	98.6%
#30	97.3%
#50	91.7%
#100	76.8%
#200	57.5%

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
Sandy Silty CLAY (CL-ML)

Project Name: Multi Family Housing Project - Santa Cruz, CA

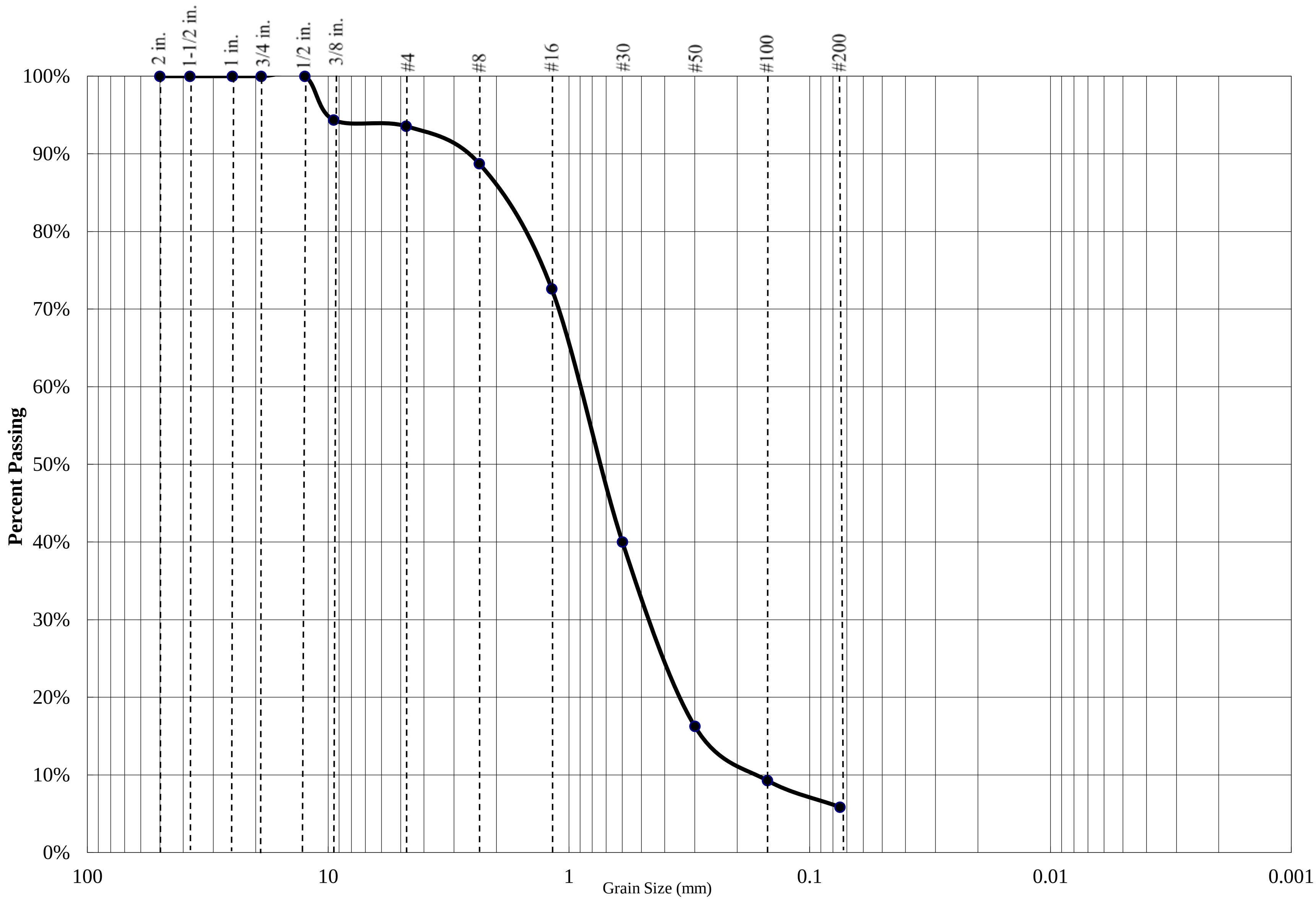
Project Number: 5-224-0090

Boring: B-2 @ 8.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
6%	88%	6%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	94.4%
#4	93.6%
#8	88.7%
#16	72.6%
#30	40.0%
#50	16.3%
#100	9.3%
#200	5.9%

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
Poorly Graded SAND with Silt (SP-SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

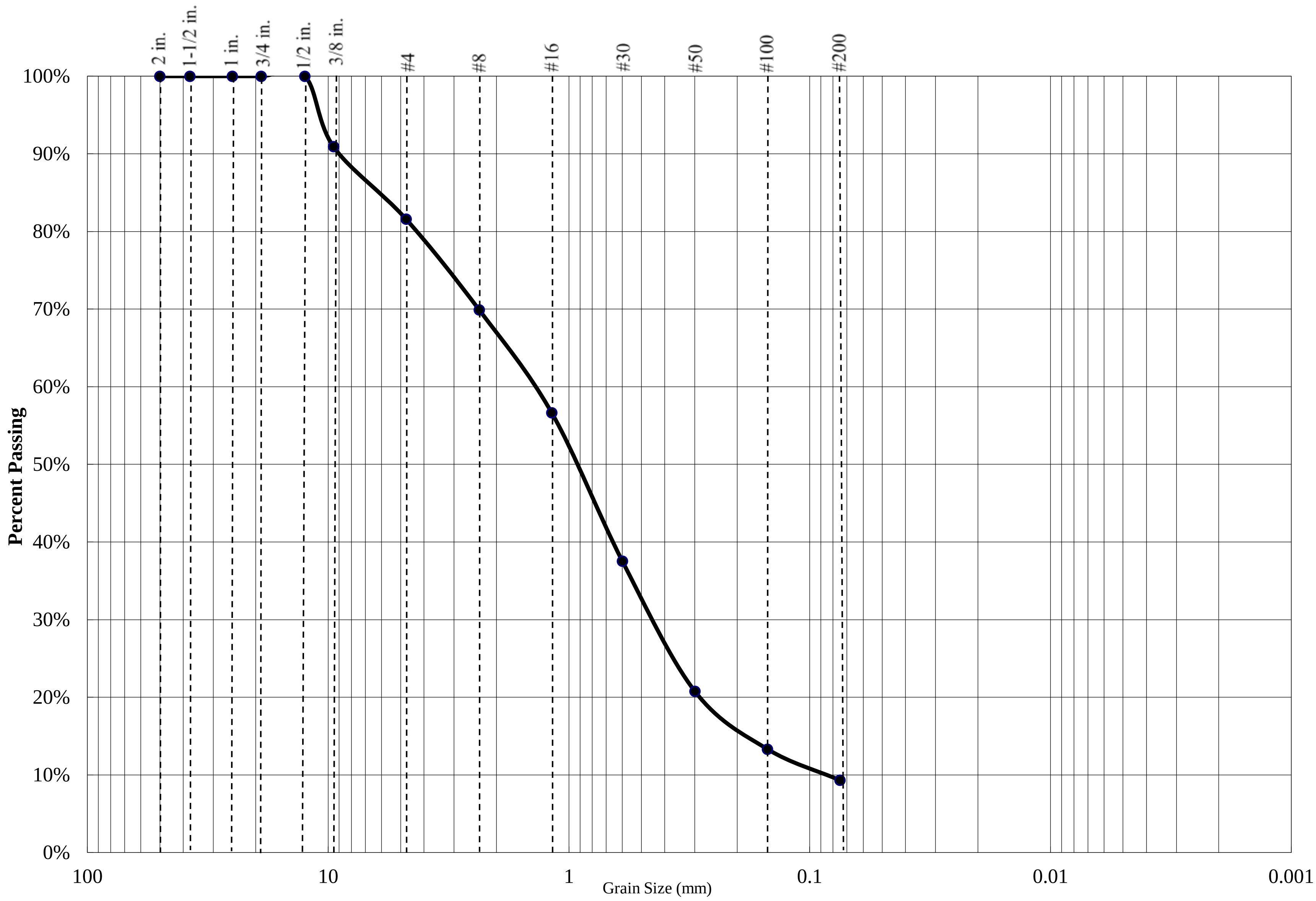
Project Number: 5-224-0090

Boring: B-2 @ 13.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
18%	73%	9%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	90.9%
#4	81.6%
#8	69.9%
#16	56.7%
#30	37.5%
#50	20.8%
#100	13.3%
#200	9.3%

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
Poorly Graded SAND with Silt (SP-SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

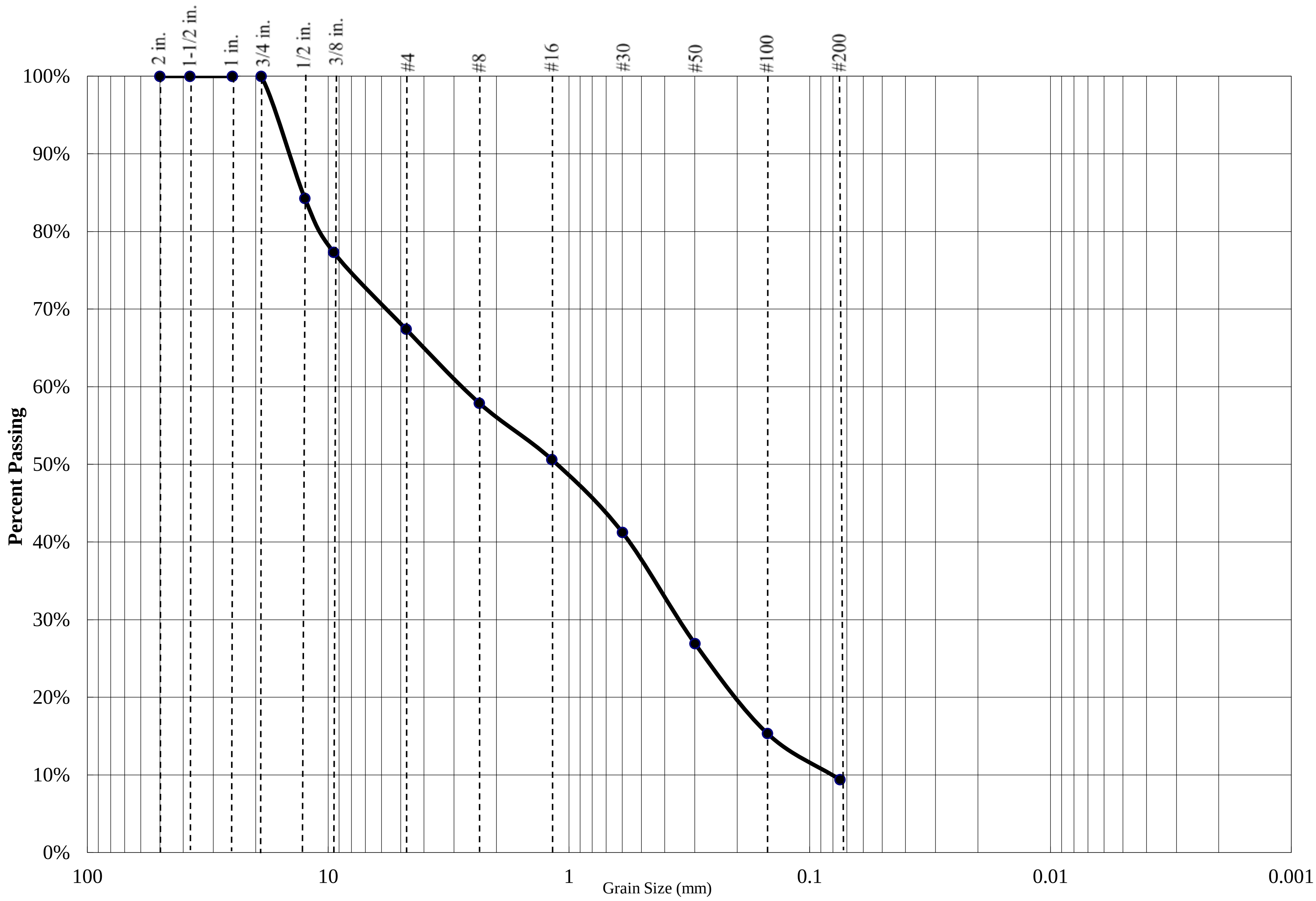
Project Number: 5-224-0090

Boring: B-2 @ 23.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
33%	58%	9%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	84.3%
3/8 inch	77.3%
#4	67.4%
#8	57.9%
#16	50.6%
#30	41.2%
#50	26.9%
#100	15.3%
#200	9.4%

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
Poorly Graded SAND with Silt (SP-SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

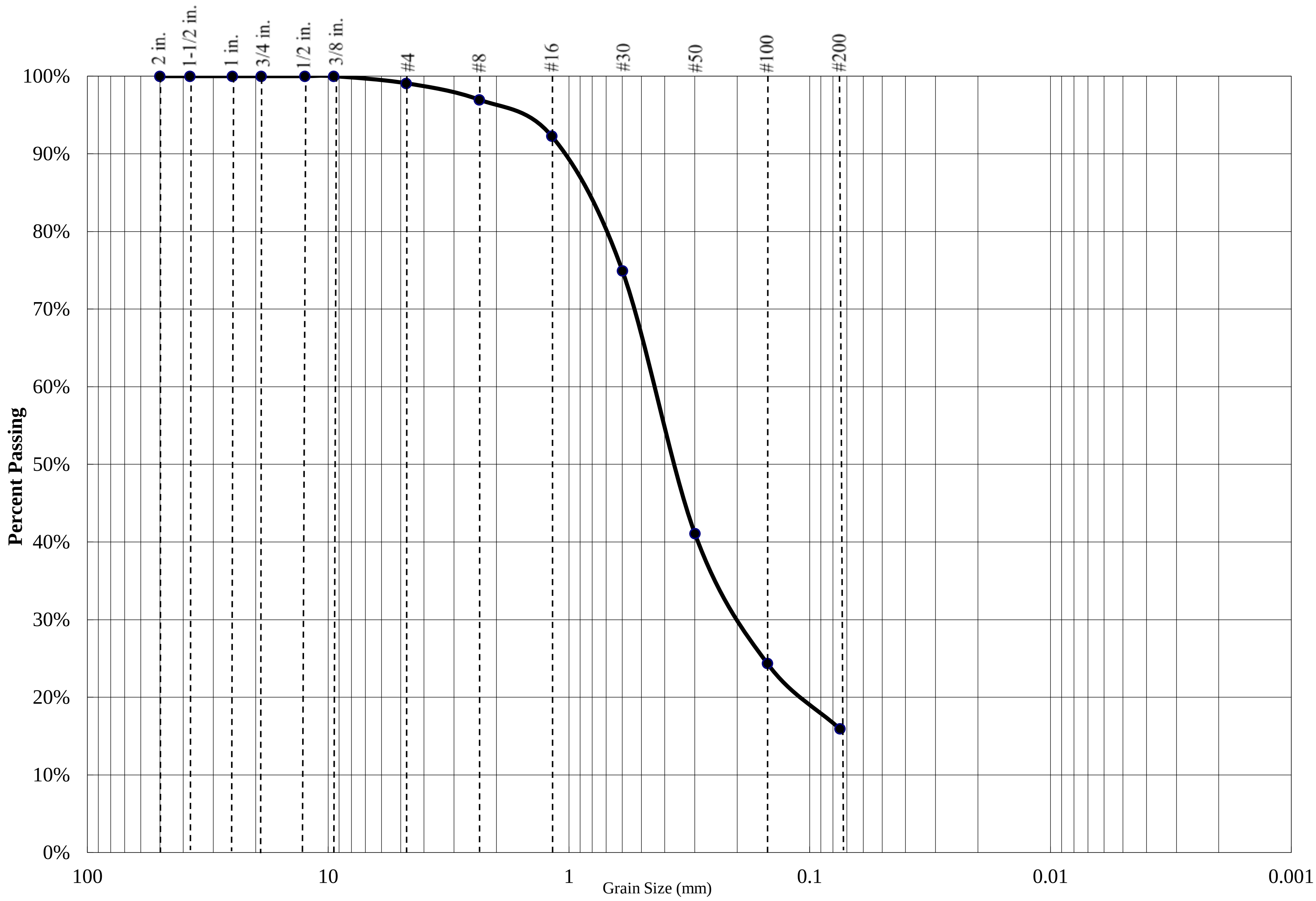
Project Number: 5-224-0090

Boring: B-2 @ 33.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
1%	83%	16%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	99.1%
#8	97.0%
#16	92.3%
#30	74.9%
#50	41.1%
#100	24.4%
#200	15.9%

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
Silty SAND (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

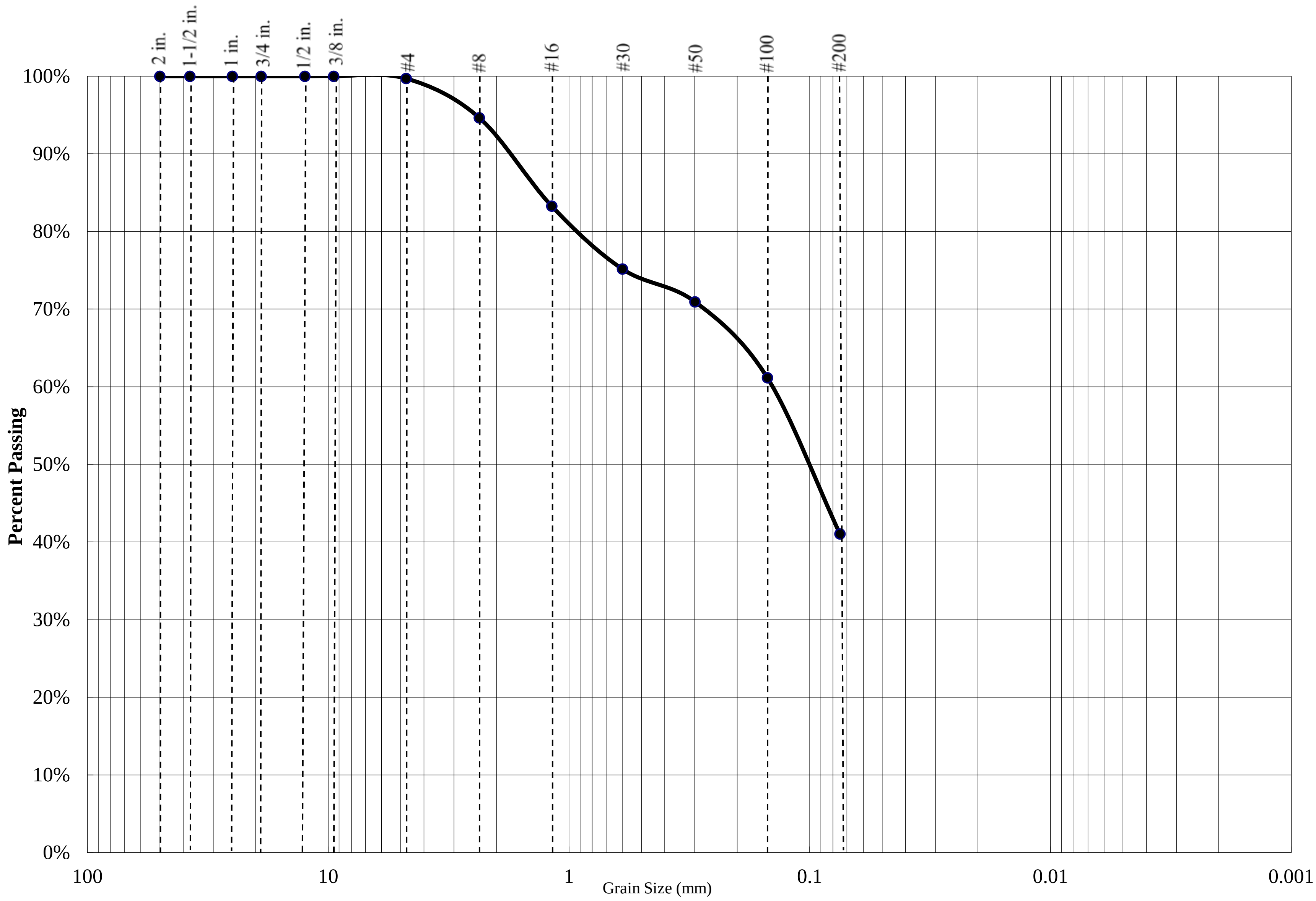
Project Number: 5-224-0090

Boring: B-2 @ 53.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
0%	59%	41%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	99.7%
#8	94.7%
#16	83.3%
#30	75.2%
#50	71.0%
#100	61.2%
#200	41.1%

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
Silty SAND (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

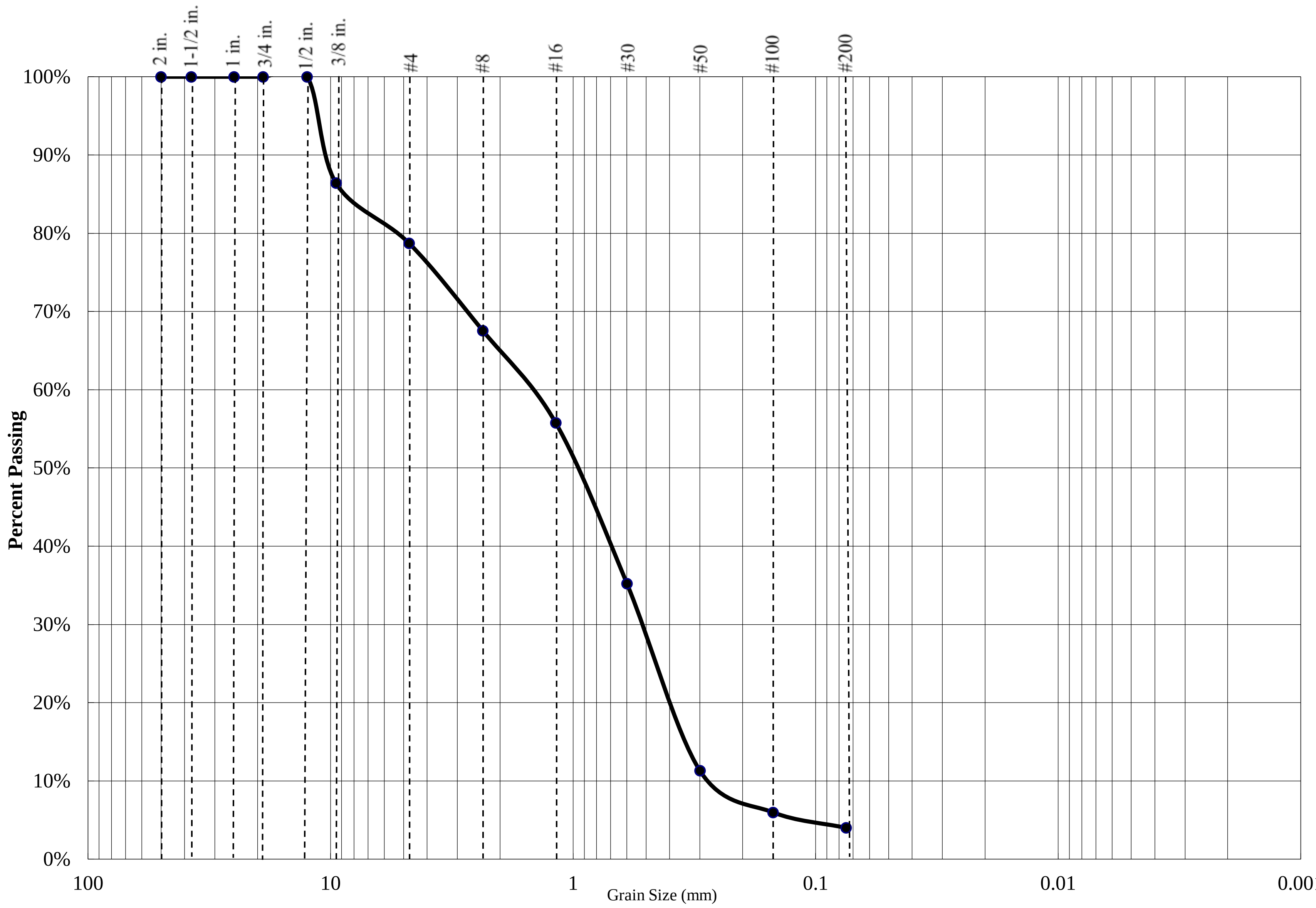
Project Number: 5-224-0090

Boring: B-3 @ 8.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
21%	75%	4%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	86.4%
#4	78.7%
#8	67.6%
#16	55.8%
#30	35.2%
#50	11.3%
#100	6.0%
#200	4.0%

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: Multi Family Housing Project - Santa Cruz, CA

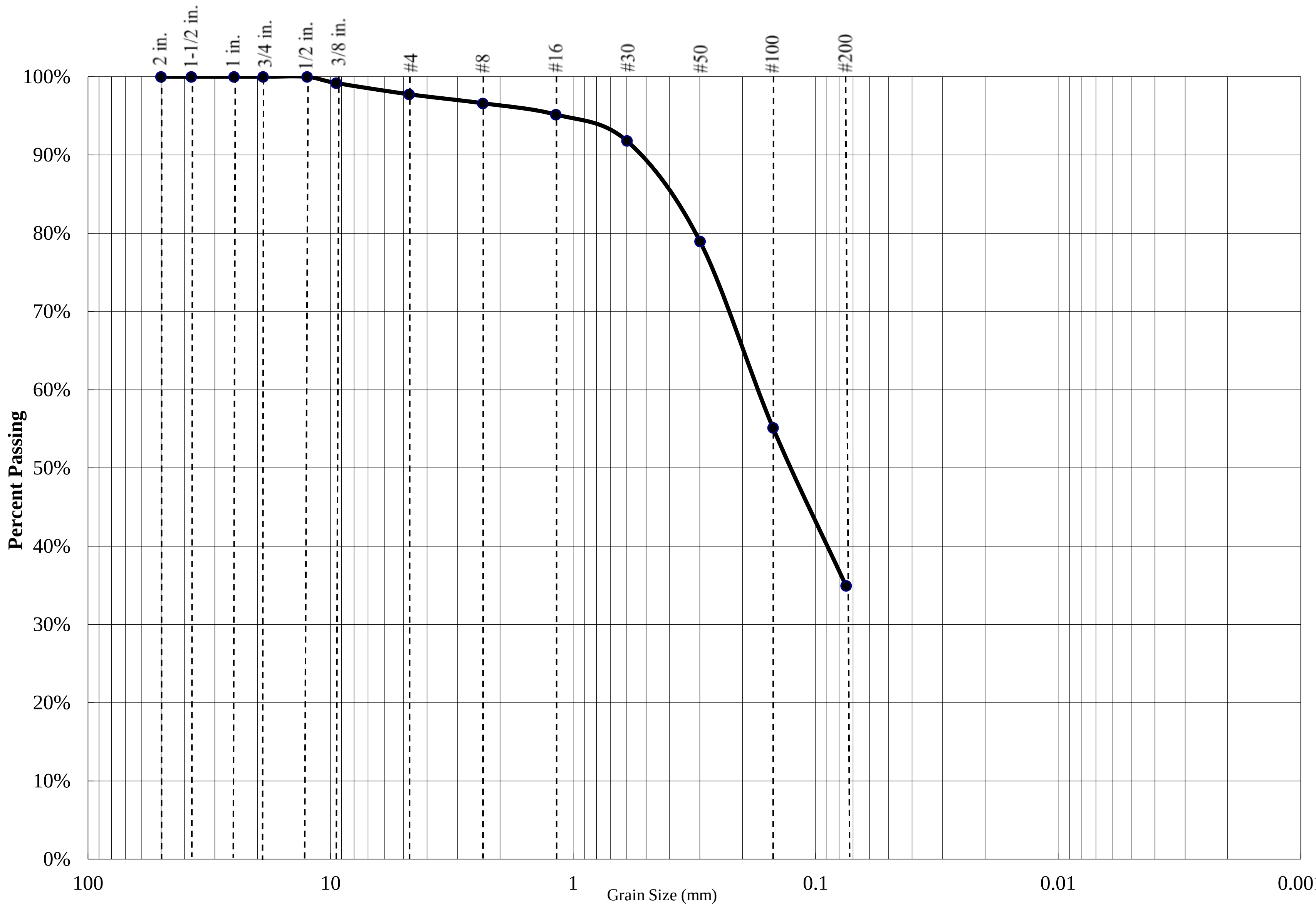
Project Number: 5-224-0090

Boring: B-3 @ 18.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
2%	63%	35%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	99.2%
#4	97.8%
#8	96.6%
#16	95.2%
#30	91.8%
#50	79.0%
#100	55.1%
#200	35.0%

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
Silty SAND (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

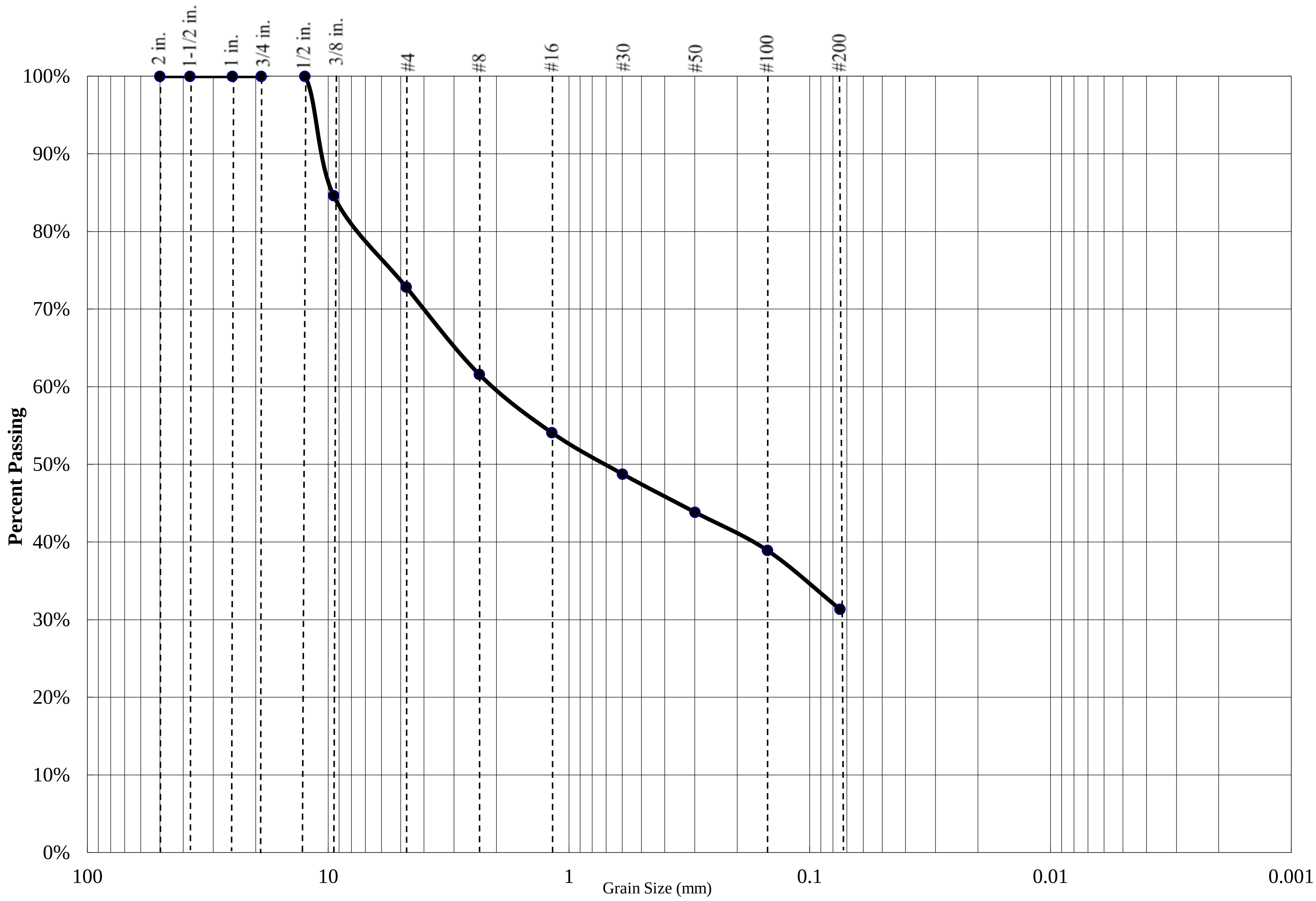
Project Number: 5-224-0090

Boring: P-1 @ 3.5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
27%	42%	31%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	84.6%
#4	72.9%
#8	61.6%
#16	54.1%
#30	48.8%
#50	43.8%
#100	38.9%
#200	31.4%

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
Soil Description:Silty SAND with Gravel (SM)

Project Name: Multi Family Housing Project - Santa Cruz, CA

Project Number: 5-224-0090

Boring: P-2 @ 3.5'

SALEM engineering group, inc.

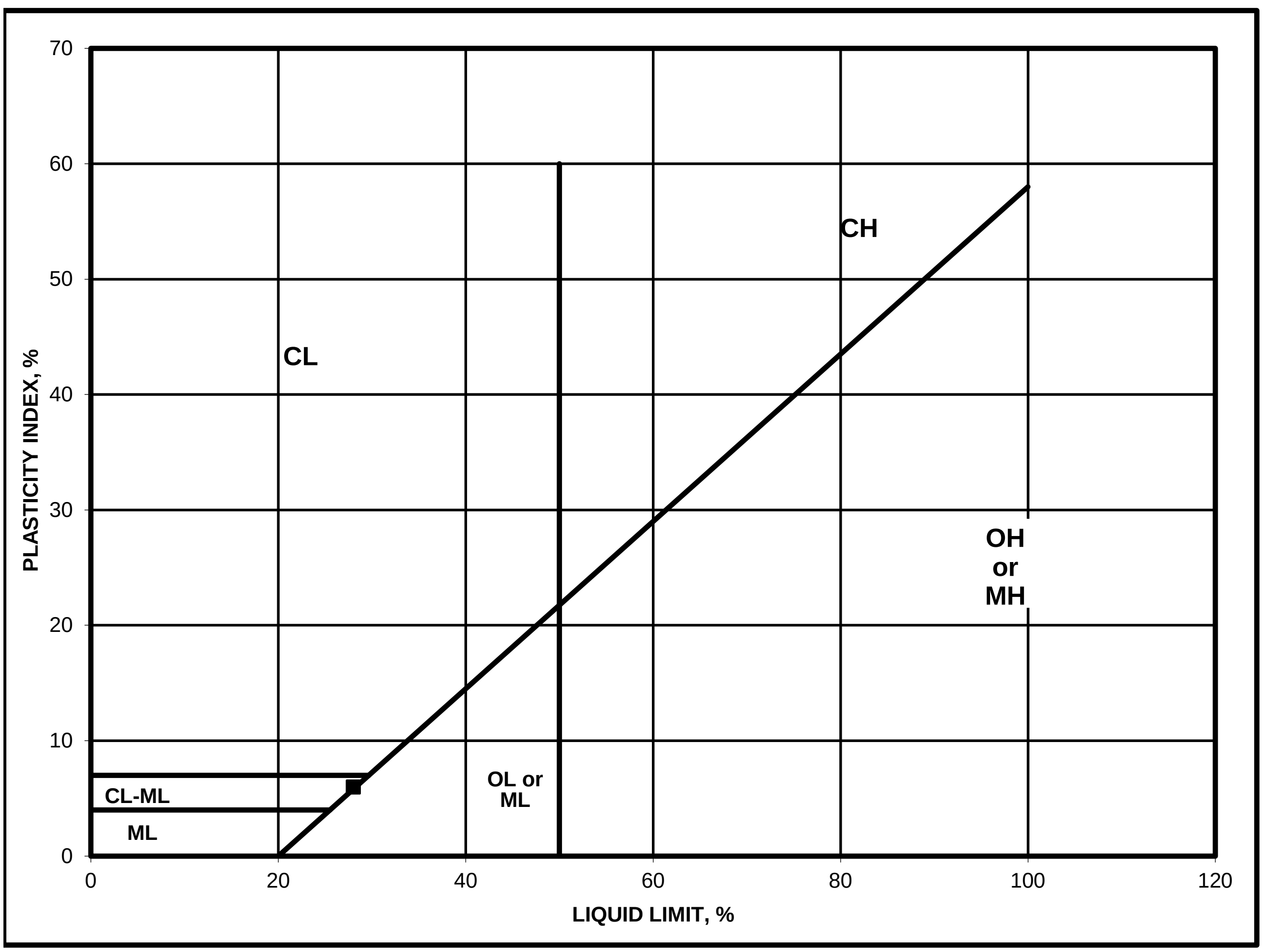
Atterberg Limits Determination
ASTM D4318

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24 Date Tested: 4/18/24
Sampled By: SEG Tested By: MC
Sample Location: B-2 @ 8.5'

	Plastic Limit			Liquid Limit		
Run Number	1	2	3	1	2	3
Weight of Wet Soil & Tare	28.17	27.78	27.70	32.55	30.83	31.30
Weight of Dry Soil & Tare	26.91	26.58	26.53	30.21	28.61	28.93
Weight of Water	1.26	1.20	1.17	2.34	2.22	2.37
Weight of Tare	21.09	21.10	21.14	21.87	20.75	20.66
Weight of Dry Soil	5.82	5.48	5.39	8.34	7.86	8.27
Water Content	21.6	21.9	21.7	28.1	28.2	28.7
Number of Blows				30	26	23

Plastic Limit : 22 **Liquid Limit : 28**

Plasticity Index **: 6**
Unified Soil Classification **: CL/ML**



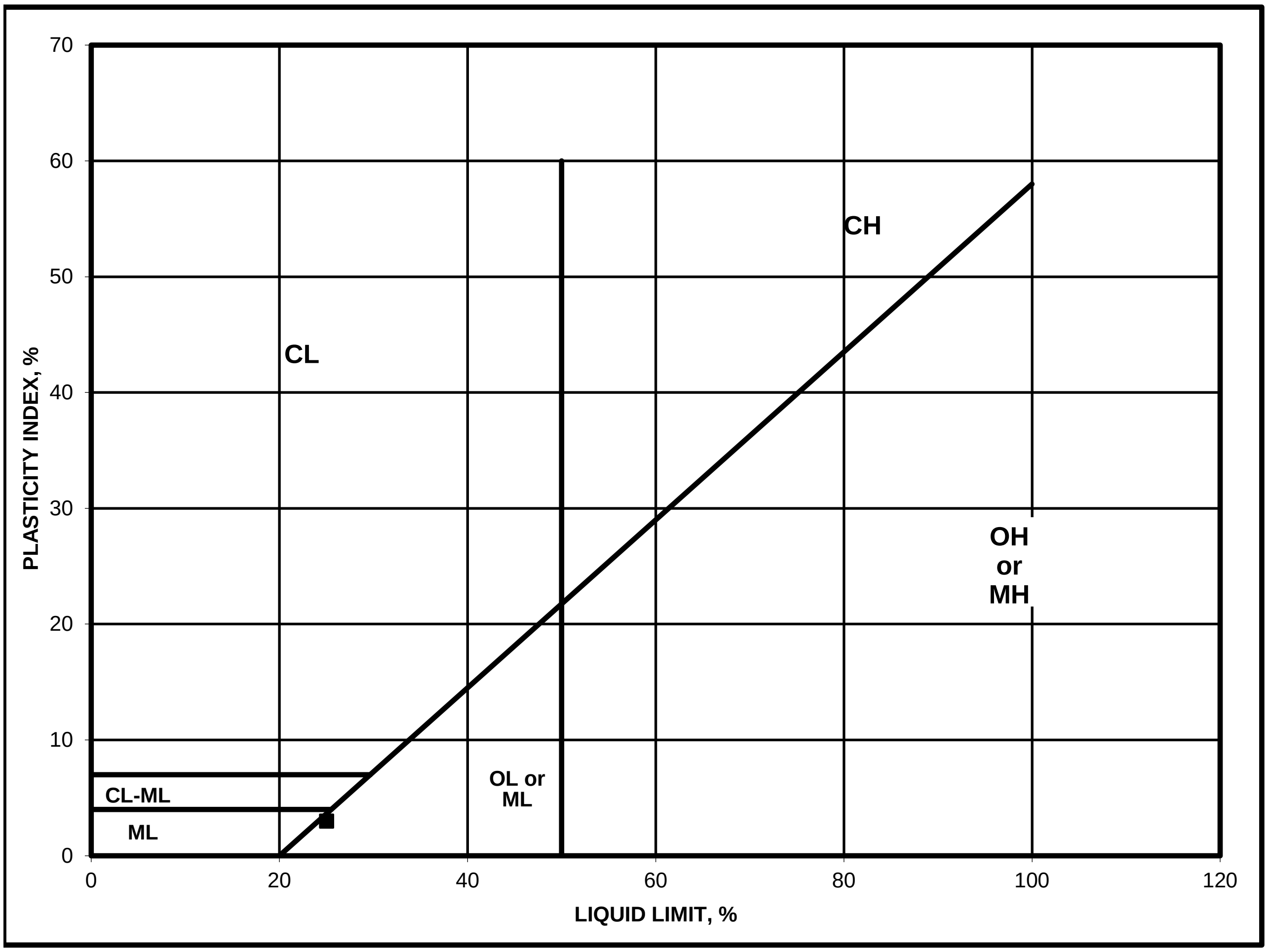
<u>Atterberg Limits Determination</u>
ASTM D4318

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24 Date Tested: 4/18/24
Sampled By: SEG Tested By: MC
Sample Location: B-3 @ 8.5'

	Plastic Limit			Liquid Limit		
Run Number	1	2	3	1	2	3
Weight of Wet Soil & Tare	29.52	23.36	23.12	31.48	33.14	33.39
Weight of Dry Soil & Tare	28.16	21.93	21.74	29.52	30.80	31.11
Weight of Water	1.36	1.43	1.38	1.96	2.34	2.28
Weight of Tare	22.08	15.54	15.63	21.61	21.47	22.09
Weight of Dry Soil	6.08	6.39	6.11	7.91	9.33	9.02
Water Content	22.4	22.4	22.6	24.8	25.1	25.3
Number of Blows				28	24	19

Plastic Limit : 22 **Liquid Limit : 25**

Plasticity Index : 3
Unified Soil Classification : OL/ML



SALEM engineering group, inc.

EXPANSION INDEX TEST
ASTM D4829

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24 Date Tested: 4/18/24
Sampled By: SEG Tested By: MC
Sample Location: B-2 @ 1' - 4'
Soil Description:Silty SAND with Gravel (SM)

Trial #	1	2	3
Weight of Soil & Mold, g.	594.2		
Weight of Mold, g.	187.8		
Weight of Soil, g.	406.4		
Wet Density, pcf	122.6		
Weight of Moisture Sample (Wet), g.	813.0		
Weight of Moisture Sample (Dry), g.	740.9		
Moisture Content, %	9.7		
Dry Density, pcf	111.7		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	51.7		

Time	Inital	30 min	1 hr	6 hrs	12 hrs	24 hrs
Dial Reading	0	-0.0021	-0.0023	--	--	-0.0027

Expansion Index $_{measured}$ = 0
Expansion Index $_{50}$ = 0.0

Expansion Index = 0

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

SALEM engineering group, inc.

CHEMICAL ANALYSIS

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

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24 Date Tested: 4/19/24
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.	B-1 @ 1' - 4'	< 50 mg/kg	26 mg/kg	7.5
1b.	B-1 @ 1' - 4'	< 50 mg/kg	25 mg/kg	7.5
1c.	B-1 @ 1' - 4'	< 50 mg/kg	28 mg/kg	7.5
Average:		**< 50 mg/kg**	**26 mg/kg**	**7.5**

SALEM
engineering group, inc.

CHEMICAL ANALYSIS

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

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24 Date Tested: 4/19/24
Sampled By: SEG Tested By: MC
Soil Description: Silty SAND with Gravel (SM)

Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	B-2 @ 1' - 4'	430 mg/kg	27 mg/kg	7.4
1b.	B-2 @ 1' - 4'	420 mg/kg	24 mg/kg	7.4
1c.	B-2 @ 1' - 4'	420 mg/kg	26 mg/kg	7.4
Average:		**423 mg/kg**	**26 mg/kg**	**7.4**

SALEM engineering group, inc.

SOIL RESISTIVITY
CTM 643

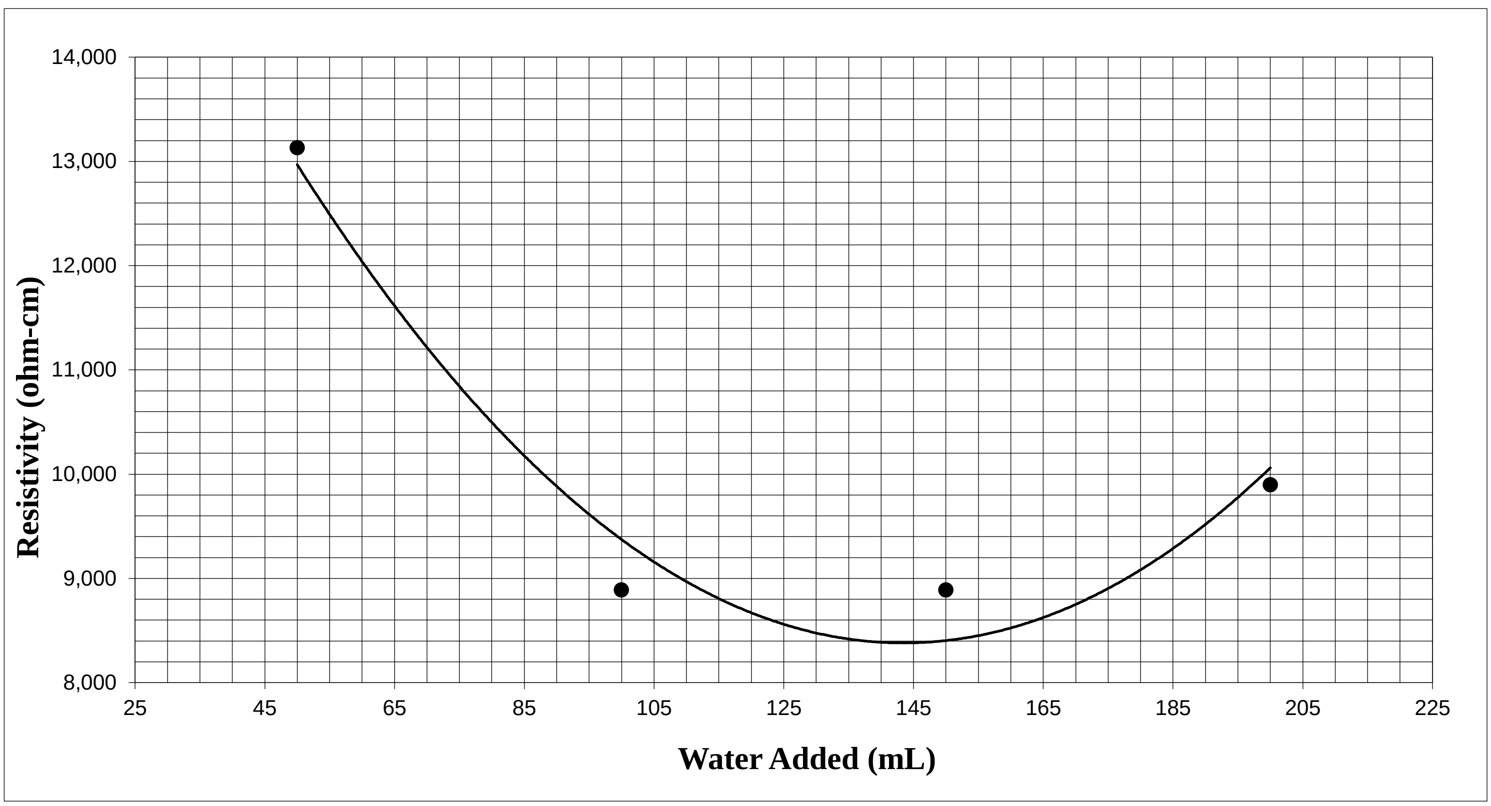
Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24
Sample Location: B-1 @ 1' - 4'
Sampled By: SEG
Soil Description: Silty SAND (SM)
Date Tested: 4/19/24 Tested By: MC

Chloride Content: 26 mg/Kg
Sulfate Content: < 50 mg/Kg
Soil pH: 7.5

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	50	1.3	10,000	13,000	13,131
2	100	8.8	1,000	8,800	8,888
3	150	8.8	1,000	8,800	8,888
4	200	9.8	1,000	9,800	9,898



Minimum Resistivity:	**8,381** ohm-cm

SALEM engineering group, inc.

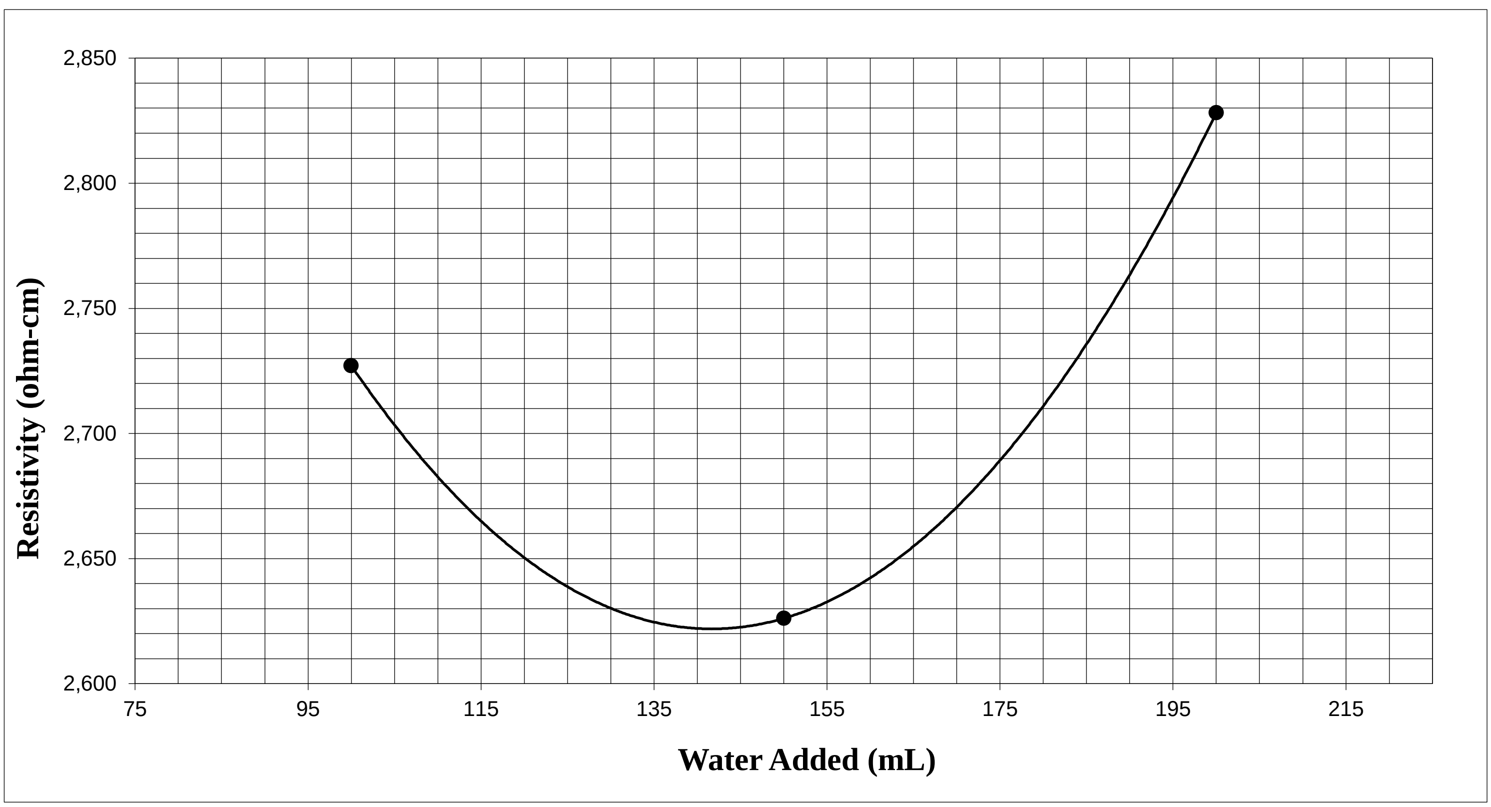
SOIL RESISTIVITY
CTM 643

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090 Date Sampled: 4/1/24 & 4/2/24
Sample Location: B-2 @ 1' - 4' Sampled By: SEG
Soil Description: Silty SAND with Gravel (SM) Date Tested: 4/19/24 Tested By: MC

Chloride Content: 26 mg/Kg Initial Sample Weight: 700 gms
Sulfate Content: 423 mg/Kg Test Box Constant: 1.010 cm
Soil pH: 7.4

Test Data:

Trial #	Water Added (mL)	Meter Dial Reading	Multiplier Setting	Resistance (ohms)	Resistivity (ohm-cm)
1	100	2.7	1,000	2,700	2,727
2	150	2.6	1,000	2,600	2,626
3	200	2.8	1,000	2,800	2,828

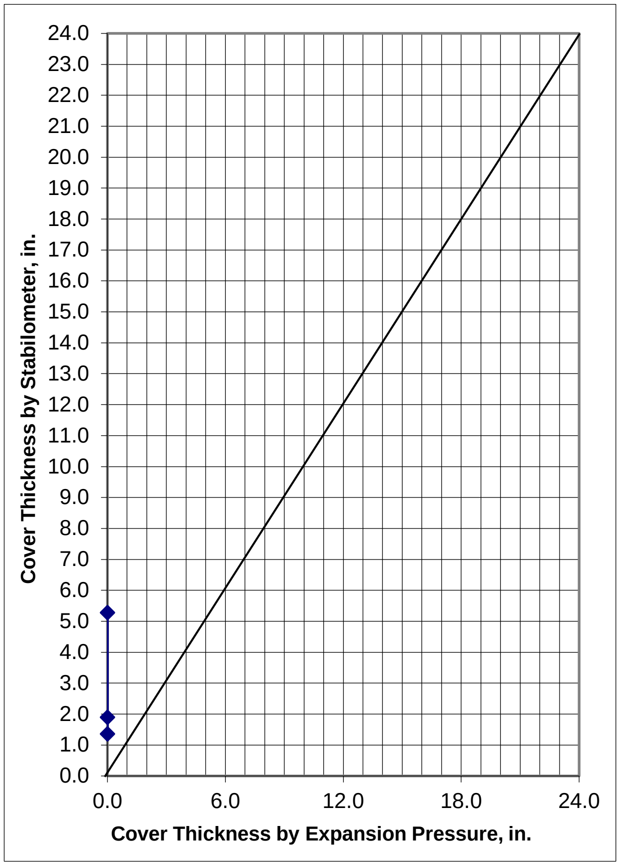


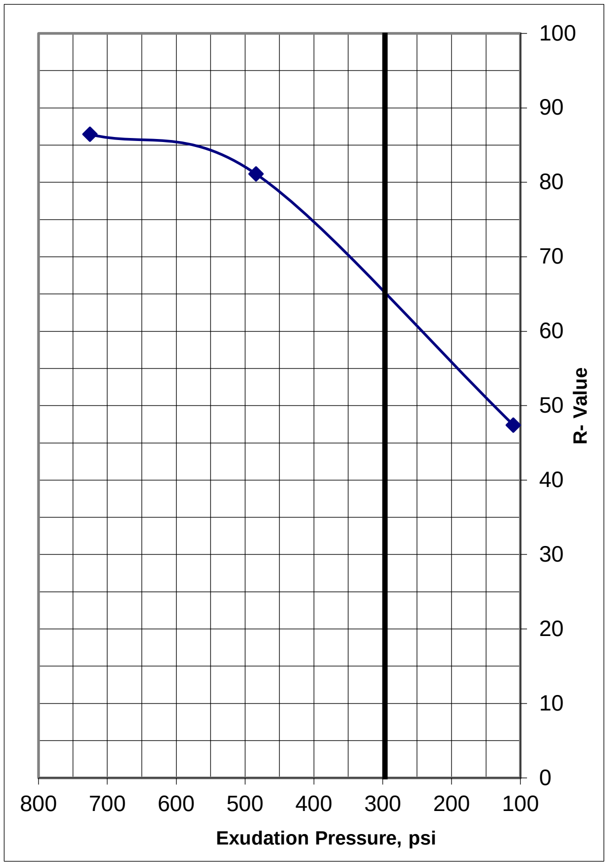
Minimum Resistivity:	**2,622** ohm-cm

SALEM engineering group, inc.

Resistance R-Value
and Expansion Pressure of Compacted Soils
ASTM D2844

Project Name: Multi Family Housing Project - Santa Cruz, CA
Project Number: 5-224-0090
Date Sampled: 4/1/24 & 4/2/24 Date Tested: 5/3/24
Sampled By: SEG Tested By: JTA
Sample Location: B-2 @ 1' - 4'
Soil Description: Silty SAND with Gravel (SM)





Specimen	1	2	3
Exudation Pressure, psi	725.3	484.1	110.2
Moisture at Test, %	8.6	9.4	10.1
Dry Density, pcf	126.7	126.9	126.8
Expansion Pressure, psf	0	0	0
Thickness by Stabilometer, in.	1.4	1.9	5.3
Thickness by Expansion Pressure, in.	0.0	0.0	0.0
R-Value by Stabilometer	86	81	47
R-Value by Expansion Pressure	N/A		
R-Value at 300 psi Exudation Pressure	65		

Controlling R-Value	**65**

SALEM
engineering group, inc.

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 that 90 percent of relative compaction (based on ASTM D1557 Test Method (latest edition), 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 compacted to 92 percent relative compaction.

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and compacted to 92 percent relative compaction. 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).

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 95 percent 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 2 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 ASTM D1557. 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 AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class 2 Subbase material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent based on ASTM D1557, and it shall be spread and compacted in accordance with the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

16.0 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.