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APPENDIX E

Preliminary Geotechnical Report

GEOTECHNICAL INVESTIGATION REPORT

for

Proposed Goodman Energy Park (GEP)
3049 and 3163 East Vernon Avenue
Vernon, California

Prepared For:

GIC Vernon LLC
3333 Michelson Drive
Suite 1050
Irvine, CA 92612

Prepared By:

Langan CA, Inc.
18575 Jamboree Road, Suite 150
Irvine, California 92612

December 18, 2024
Langan Project No.: 721040501

LANGAN

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Technical Excellence
Practical Experience
Client Responsiveness

December 18, 2024

Matthew Davidson, Development Manager
Matthew McGuire, Vice President Acquisition, Construction, Due Diligence
GIC Vernon LLC
3333 Michelson Drive
Suite 1050
Irvine, CA 92612

Geotechnical Investigation Report
Proposed Project
3049 and 3163 East Vernon Avenue
Vernon, CA
Langan Project No.: 721040501

Dear Matthew and Matthew:

Langan CA, Inc. is pleased to submit this report summarizing our geotechnical investigation for the proposed project to be constructed at 3049 and 3163 East Vernon Avenue, Vernon, California.

Our services were performed in general accordance with our proposal for geotechnical engineering services dated May 2, 2023, and Change Order 11 dated August 23, 2024.

Sincerely,
Langan CA, Inc.

Christopher J. Zadoorian, P.E, G.E., F. ASCE
Associate Principal / Vice President

Robert 'Rory' Johnston, P.E, G.E, F. ASCE
Managing Principal / Executive Vice President

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1.0 INTRODUCTION

1.1 General

In accordance with the request of GIC Vernon, LLC (GIC), Langan CA, Inc. (Langan) performed a geotechnical investigation at the site and is pleased to submit this report summarizing the geotechnical investigation for the proposed development to be constructed at 3049 and 3163 East Vernon Avenue in Vernon, CA. The site location is shown on Figure 1.

The site is approximately 12 acres and located at the northeast corner of the intersection of East Vernon Avenue and Soto Street. The site is bound on the north by a vacant lot and the Los Angeles River Channel and on the east by existing industrial developments.

The site is within the southern half of a property formerly developed with an industrial facility that was recently demolished. The prior development included approximately eight industrial buildings and an engine room associated with the most recent site usage as a meat processing and distribution facility. Approximately five of the prior industrial buildings and the engine room were located within the site. An access tunnel crossing beneath East Vernon Avenue and Soto Street was also present on the south side of the site. Subterranean building and tunnel components within the site were demolished, including subterranean building levels, foundations, and floor slabs and the areas were subsequently backfilled, typically with processed miscellaneous base.

The meat processing and distribution facility was developed in the 1920's; prior to that time the site was developed with single-family residences.

GIC furnished Langan with a preliminary site plan dated August 21, 2024, prepared by Corgan. Based on a review of the plans and subsequent discussions, it is understood that the proposed development will include two data center buildings designated as Data Center Building 1 and Data Center Building 2, each requiring 49.5 Mega Watts of electrical capacity.

The data center buildings each have an approximately 94,500-square-foot plan area and include three above-grade levels. Adjoining generator yards will be constructed adjacent to each data center building and a substation will be constructed between the data center buildings. The locations of the proposed structures are shown on Figures 2A and 2B.

Langan is also the civil engineer on this project and based on the Langan drawings dated November 22, 2024, Table 1 summarizes the lowest finish floor level (LFFE) for proposed data center building, generator yard and the substation.

Table 1 – Planned LFFE

Project Component	LFFE (ft, mean sea level)
Data Center Building 1	197
Data Center Building 2	200
Generator Yard 1	196
Generator Yard 2	199
Substation	197

Loading docks, drive lanes, and surface parking lots are also planned as part of the proposed development.

Chris Wong of PASE provided preliminary structural loading information for the proposed data center buildings. Typical dead-plus-live column loading is on the order of 800 to 1,200 kips for the proposed data center buildings.

Column loading for the proposed generators and/or substation were not available at the time this report was prepared. It is anticipated that axial loading on the screen walls will be relatively light; lateral loading on the screen wall foundation elements will likely include relatively large moments due to planned wall heights.

A large stockpile is located at the site due to processing (crushing) of the former Portland cement concrete (PCC) buildings and other site development features. The location of the existing stockpile is shown on Figure 2B.

The following sections of the report summarize the geotechnical investigation and the conclusions and recommendations for the proposed development.

1.2 Prior Geotechnical Investigations

Langan performed a geotechnical investigation at the site for a previously proposed development (industrial warehouse) and summarized the results in a report dated July 14, 2023. The prior investigation included six borings, seven cone penetration tests (CPTs), and four field percolation tests at the site.

The data from the prior field investigations, in conjunction with the data from our current investigation, was utilized to develop the conclusions and recommendations presented herein.

2.0 SUBSURFACE EXPLORATIONS AND SUBSURFACE CONDITIONS

2.1 Current Geotechnical Investigation

To supplement the data from our prior investigation, five exploration borings (B-17 through B-21) were drilled, and four CPT soundings (CPT-17 through CPT-20) were advanced to obtain additional data on the subsurface geotechnical conditions.

The borings were drilled to a depth of approximately 51½ feet bgs using truck-mounted hollow-stem auger drilling equipment and the CPTs were advanced to depths of approximately 9½ to 75½ feet bgs with the first two attempts at CPT-18 encountering refusal at approximately 9 and 11 feet. Seismic shear wave velocity measurements were performed during two of our CPT soundings (CPT-17 and CPT-20) as presented in Section 2.5.

During drilling, a Langan field representative maintained a log of the subsurface conditions encountered in each boring, collected relatively undisturbed samples, and performed standard penetration testing (SPT) at regular depth intervals. Bulk samples were also collected from the near surface in boring across the site.

Limited environmental field screening was also performed on samples collected during drilling using a photo-ionization detector (PID).

Upon completion of drilling, the borings were backfilled with bentonite cement grout and the ground surface was restored to the approximate pre-existing condition.

The locations of the borings and CPTs advanced during the recent investigation are shown on Figure 2B.

Logs of the exploration borings are presented in Appendix A and logs of the CPTs are presented in Appendix B.

2.2 Prior Geotechnical Investigation

As discussed above, Langan performed a geotechnical investigation for a previously proposed development at the site and summarized the results in a report dated July 14, 2023. Our prior investigation included six borings, seven cone penetration tests (CPTs), and four field percolation tests that are considered relevant to the subject development. The subsurface explorations were performed at the approximate locations shown on Figure 2B.

Our prior borings (B-1 through B-4, B-7, and B-8) were generally drilled to depths ranging from approximately 31½ to 36½ feet below the existing ground surface (bgs) and our CPTs (CPT-through CPT-6 and CPT-10) were advanced to approximately 48 to 64 feet bgs. Our field percolation wells (FP-1 and FP-3 through FP-5) were drilled to approximately 50 to 66 feet bgs.

Logs of the relevant prior exploration borings are presented in Appendix C and logs of the relevant prior CPTs are presented in Appendix D.

2.3 Subsurface Conditions

Asphaltic-concrete (AC) pavement ranging from ¼ inch to four inches in thickness was encountered in prior borings B-3, B-4, B-8, FP-1, and FP-5. Aggregate base materials were not encountered beneath the AC pavement, however, Portland cement concrete (PCC) three inches in thickness was encountered underling the AC pavement in the prior boring B-8.

PCC pavement ranging from five to seven inches in thickness was encountered in prior borings B-3 and B-4. Aggregate base materials 12 inches in thickness were encountered beneath the PCC in boring B-4; aggregate base materials were not encountered beneath the PCC in boring B-3.

Pavement encountered in the prior borings was demolished during demolition of the prior meat processing and distribution facility. Pavement was not encountered in the current borings.

Fill materials were encountered in the current and prior borings ranging in thickness from approximately one to 15 feet. The fill consists of engineered fill and artificial fill noting that for the purposes of this report, engineered fill is fill that was placed under our observation, documentation, and testing; and artificial fill is fill that we did not observe, document nor test during placement.

Engineered fill is present at the locations shown on Figure 2 and was encountered in boring B-18 and generally consists of dense to very dense sandy gravel noting that the fill materials are comprised of processed miscellaneous base (PMB) generated from demolition of the prior on-site structures.

Artificial fill generally consists of loose to medium dense sand, silty sand, and sand with silt with varying amounts of gravel.

The underlying native soils consist of alluvial deposits composed of loose to medium dense sand, silty sand to depths of approximately eight to ten feet bgs. The upper alluvial sand and silt were typically underlain by medium dense to dense sand, and silty sand, sand with silt, and clayey sand to depths of approximately 28 to 35 feet.

A fine-grained layer consisting primarily of stiff to hard clayey and silty soils was encountered in the borings and CPTs beneath the medium dense to dense sandy soils to depths of approximately 33 to 49 feet bgs.

Primarily dense to very dense sand, gravelly sand, clayey sand, and silty sand with varying amounts of gravel were encountered below the fine-grained layer to the maximum depth explored of approximately 75 feet bgs.

PID readings collected during drilling were typically non-detect and, in all cases, less than 2.5 parts per million.

Generalized depictions of subsurface conditions at the site are presented in Figures 3A through 3D.

2.4 Groundwater

Groundwater was not encountered in the current or prior borings to a maximum drilled depth of approximately 66 feet bgs.

Based on a review of the *Seismic Hazard Evaluation of the Los Angeles and South Gate 7.5-Minute Quadrangles, Los Angeles County, California, Seismic Hazard Zone Reports 029 & 34*, the historical high groundwater level (HHGWL) at the site is greater than approximately 60 feet bgs as shown on Figure 4.

2.5 Field Percolation Testing

Langan performed field percolation testing at three locations (FP-1, FP-4, and FP-5) in the prior investigation at or within close proximity to the site in general conformance with the guidelines presented in the County of Los Angeles Department of Public Works Geotechnical and Materials Engineering Division, Guidelines for Geotechnical Investigation and Reporting Low Impact Development Storm Water Infiltration, dated June 30, 2021 (Los Angeles County Guidelines; GS200.1).

The field percolation test borings were drilled to depths ranging from approximately 50 feet to approximately 66 feet bgs. Test wells were constructed in each boring by installing three-inch outside-diameter perforated PVC casing in the lower ten feet of the well and three-inch outside-diameter solid PVC casing within the remainder of the test well. Three inches of ¾-inch gravel were placed at the bottom of the well prior to installing the casing, and within the annular space between the boring side walls and the perforated casing was filled with sand.

Water was introduced to the subsurface soils through the PVC pipe and allowed to pre-soak for a period of approximately one hour. Based on the rate of infiltration during the presoak period, and guidance from the LACPWA manual, Langan performed falling head and constant head tests at the infiltration test locations.

Table 2 summarizes the prior field percolation test results. Please note that these values do not include reduction factors for the test procedure, site variability and long-term siltation plugging that are required for the design infiltration rate.

Table 2 – Field Percolation Test Results

Field Percolation Test	Test Depth (Feet)	USCS Soil Type	Measured Field Percolation Rate (in/hr)
FP-1	55 - 65	SP/SP-SM	1.39
FP-3	43 – 50	SP/SW	15.87
FP-4	43 - 50	CL/SP-SM/SM	4.80
FP-5	39 - 50	SM	4.20

The results of our field percolation testing are summarized in Appendix E, and recommendations for storm water infiltration including reduction factors and recommended design infiltration rates are presented in Section 6.3.

2.6 Seismic Shear Wave Velocity Measurements

Langan engaged Kehoe Testing and Engineering (Kehoe) to perform seismic shear wave velocity measurements during advancement of CPTs, CPT-17 and CPT-20. Shear wave velocity measurements were performed in both CPTs at approximately five-foot intervals to depths of approximately 55 and 53 feet bgs in CPT-17 and CPT-20 respectively.

The results of the measurements indicate an average shear wave velocity to the depths explored of 764 feet per second (ft/s) in CPT-17 and 867 ft/s in CPT-20.

The results of shear wave measurements are presented in Appendix B.

3.0 GEOTECHNICAL LABORATORY TESTING

3.1 Current Investigation

Langan performed the following laboratory tests on select samples taken during our site investigation:

- In-situ moisture content and dry density
- Maximum dry density and optimum moisture content
- Atterberg limits
- Consolidation
- Direct shear
- Corrosion
- Expansion index

The results of the current geotechnical laboratory tests are presented in Appendix A.

3.2 Prior Investigation

As part of the prior investigation, Langan performed the following geotechnical laboratory testing on select samples taken at or within close proximity to the proposed development:

- In-situ moisture content and dry density
- Maximum dry density and optimum moisture content
- Percent passing #200 sieve
- Consolidation
- Direct shear
- R-Value
- Corrosion
- Expansion index
- Particle size analysis

The results of the prior geotechnical laboratory testing are presented in Appendix C.

4.0 GEOLOGIC AND SEISMIC HAZARDS EVALUATION

4.1 Regional Tectonic and Local Geologic Setting

The site is located near the northwestern end of the Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges Geomorphic Province consists of a series of mountain ranges separated by northwest trending valleys that are subparallel to faults that branch from the San Andreas Fault.

More specifically, the site is within the Central Block of the Los Angeles Basin, an extensive sediment-filled depression bound by the San Gabriel Mountains and Santa Monica Mountains to the

north, and the Pacific Ocean on the west, the Palos Verdes Peninsula on the west, the Santa Ana Mountains on the southeast, and the Puente, San Jose, and Chino Hills on the northeast. The basin's structural history includes extension and strike-slip faulting, followed by oblique contraction via thrusting and strike-slip faulting (Yerkes et al, 1965).

Regional geologic maps of the area by Campbell et al. (2014) indicates the site is underlain by late Pleistocene-aged, alluvial fan deposits (map unit Qya_2). This soil is described as 'Unconsolidated, generally friable, stream-deposited silt, sand and gravel on flood plains, locally including related alluvial fans and streambeds.'

The data from the current exploration borings are generally consistent with the geologic conditions summarized by Campbell et al. (2014).

Figure 5 presents a regional geologic map depicting the surficial geologic deposits at the site.

4.2 Regional Faulting & Seismicity

The site is in an active seismic area that has historically been affected by generally moderate to occasionally high levels of ground motion. Therefore, the proposed development will probably experience moderate to potentially high levels of ground motion from nearby faults as well as ground motions from other area active seismic areas of the southern California region.

A search of the USGS ANSS Comprehensive Earthquake Catalog (ComCat) using a web-based Earthquake Archive Search and URL builder tool, confirmed that as of May 15, 2023, 40 earthquakes with magnitudes of 5.0 or greater have occurred within a 100-km radius of the site since 1800 as shown on Figure 6A and 6B.

4.3 Ground Surface Rupture Potential

Langan reviewed the *California Geological Survey (CGS) Earthquake Zones of Required Investigation map for the Los Angeles and South Gate Quadrangles, and the* City of Vernon General Plan - Safety Element. Based on the review, the site is not located within a State- or City-designated active fault zone.

Therefore, the potential for ground surface rupture is very low.

The site location relative to the mapped seismic hazard zones is presented on Figure 7.

4.4 Liquefaction Potential

Liquefaction generally occurs in saturated, loose to medium dense granular soil and soft to moderately firm non-plastic silts and clays because of strong ground shaking. As the density and/or particle size of the soil increases and as the confinement (overburden pressure) increases, the potential for liquefaction decreases.

The footprint of the proposed development is not located within a State- or City-designated liquefaction hazard zone as shown on Figure 7.

The historic high groundwater level for the site is sufficiently deep to preclude liquefaction potential during the design seismic event. Therefore, the potential for liquefaction at the site is very low.

4.5 Lateral Spreading and Ground Lurching Potential

Lateral spreading and ground lurching are seismically induced slope instability conditions that may occur where either liquefaction potential is present in conjunction with a nearby slope wherein a liquefiable layer daylights within an exposed slope face or cracks form on the slope surface during a seismic event due to relatively loose soil exposed on the slope.

The project site is generally flat, and the subsurface soils are not susceptible to liquefaction. Therefore, the potential for lateral spreading and ground lurching at the site is negligible.

4.6 Seismic (aka 'Dry') Settlement

Seismic (dry) settlement can occur in loose to medium dense, granular soil because of strong ground shaking.

Loose and/or undocumented sand and silty sand were encountered in the upper approximately eight to 10 feet bgs at the site. The upper loose soils are subject to seismically induced settlement and the results of the preliminary analysis indicates approximately ½ inches may occur in these soils due to strong ground shaking at the site.

4.7 Earthquake-Induced Landslides

The site is not located in a zone of required investigation for Earthquake-Induced Landslides per CGS's Earthquake Zones of Required Investigation, Los Angeles, and South Gate Quadrangles, as shown on Figure 7.

The site is relatively flat and there are no sloped boundary conditions. Thus, the potential for earthquake-induced landsliding is negligible at the site.

4.8 Hydrocollapse

Hydro-collapse is a phenomenon that occurs when loose, predominately sandy soils are subjected to saturated conditions. The loose nature of these soils undergoes a decrease in volume (i.e. densification) when the particle-to-particle contact is disturbed with the introduction of pore water, resulting in settlement that could manifested to the ground surface.

Based on data available from the current and prior laboratory testing, the upper loose granular soils are subject to hydro-collapse if saturated.

4.9 Flood Mapping

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 06037C1639F and 06037C1638G, the site is located outside the 0.2 percent annual chance floodplain.

4.10 Tsunamis, Seiche, and Dam Inundation

Based on information and maps available from the CGS, the site is not located within a Tsunami Inundation Area. Based on review of adjacent water bodies, the site is not subject to inundation from seiche. Based on Review of the City of Vernon General Plan, the site is located within inundation areas from the Sepulveda and Hansen Dams. Inundation scenarios from either of these dams are not available from the Dam Breach Inundation Map Web Publisher hosted by the California Division of Safety of Dams (DSOD).

4.11 Subsidence

Land subsidence may be induced from withdrawal of oil, gas, or water from wells. Based on a search of the CalGEM (formerly known as Division of Oil, Gas, and Geothermal Resources [DOGGR]) GIS Well Finder online tool, the site is not located within an Oil/Gas field; active and inactive oil or gas wells are not located onsite.

According to our review of the available information from CalGEM, the likelihood of land subsidence caused by oil or gas withdrawal from oil wells is very low.

4.12 Expansive Soils

Expansive soils swell and shrink when the moisture content in the soil changes due to cyclic wet/dry weather cycles, installation of irrigation systems, change in landscape plantings, or changes in grading. Swelling and shrinking soils can result in differential movement of structures including floor slabs and foundations, and site work including hardscape, utilities, and sidewalks.

Based on the results of testing performed on samples collected from our current borings and prior borings in or within proximity to the site, the upper on-site soils have a very low potential for expansion.

4.13 Methane Zone

Based on a review of the Solid Waste Information Management System – online viewer, by Los Angeles County, the site is not located within 300 feet of an oil or gas well, or within 1,000 feet of a methane producing site.

5.0 CONCLUSIONS

5.1 County 111 Statement

The proposed development is feasible from a geotechnical perspective and the planned work will not adversely impact adjacent properties nor developments. Additionally, adjacent properties and developments will not have an adverse impact on the proposed development.

The proposed development will require new construction and appropriate care should be taken to avoid disturbance to the surrounding properties.

5.2 General

The site is generally free from geologic or seismic hazards that would preclude the proposed development and the proposed development is considered feasible from a geotechnical perspective.

The site is subject to strong ground shaking that would result from an earthquake occurring on a nearby or distant fault source; however, this hazard is common in Southern California and can be mitigated by following the seismic design requirements of the 2022 California Building Code (CBC).

The planned industrial building development is not subject to landslide hazards, will not result in settlement or slippage and will not adversely affect the geotechnical stability of the area beyond the site limits.

5.3 Foundations

5.3.1 Data Center Buildings

Undocumented fill and loose native soils are generally present within the upper five to 10 feet at the site and these soils are not suitable for support for the proposed data center buildings.

One method to support the proposed data center buildings would be deep foundations that extend through the upper fill and/or loose native soils. A suitable deep foundation method for the given site conditions is auger-cast piles (ACPs).

ACPs are constructed by advancing a flight auger to the design ACP tip elevation and injecting grout through the auger tip beginning from the tip elevation. As the grout is injected, the auger is rotated in reverse of the installation direction so that the side walls of the ACP shaft are never unsupported (i.e. the stresses are not relaxed). Once the auger is fully withdrawn and the wet grout is in-place, reinforcing steel is placed within the wet grout.

Full-scale, pre-production load testing is required to verify design capacity recommendations for ACPs, in accordance with CBC Section 1810.3.3.

5.3.2 Generator Yards

Undocumented fill and loose native soils are generally present within the upper five to ten feet at the site and these soils are not suitable for support for the proposed generator yards.

Noting that the average applied bearing pressure over the generator yard imposed by the generator frames is relatively low, removal and re-compaction of the undocumented fill and loose native soils may be performed, and the proposed generator pads may be supported on a mat foundation established on properly compacted fill soils.

Alternatively, generator yards may be supported on ACPs.

5.3.3 Generator Yard Screen Wall

The proposed generator yard screen wall may be supported on ACPs noting that it is anticipated that lateral loading demands will govern the foundation design.

5.3.4 Substation

Foundation design of the proposed substation is beyond the scope of this investigation; however, it is anticipated that removal and re-compaction of the upper fill and native soils would allow the use of a mat foundation to support of the proposed substation.

5.4 Seismic Design Considerations

Based on the shear wave velocity measurements, the site may be designated as Site Class D in accordance with Table 20.3-1 of ASCE 7-16.

5.5 Floor Slab Support

The upper undocumented fill soils and loose sandy soils are not suitable for support of the industrial building floor slabs.

The proposed industrial building floor slabs may be supported on a minimum of five feet of properly compacted fill soils.

Where finish flooring is planned, a capillary break section should be installed beneath the floor slab to mitigate the potential for moisture transmission through the slab.

5.6 Temporary Excavations

Temporary excavations are feasible in the on-site soils provided the recommendations presented herein are followed.

Temporary vertical cuts are generally not feasible in the upper undocumented fill and/or loose native soils however may be performed within properly compacted fill provided the recommendations presented herein are followed.

5.7 Corrosion Potential

The results of the current and prior corrosion testing are summarized in Table 3.

Table 3 – Corrosion Test Results

Boring (Depth)	Firm	Soil Type	Resistivity (ohm-cm)	pH	Sulfate (Percent by Weight)	Chloride (Percent by Weight)
B-3 (0 to 5 feet)	Langan (2023)	Silty Sand	4,700	7.6	0.0168	0.0096
B-17 (0 to 5 feet)	Langan (2024)	Sand with Silt	1,400	7.8	0.0213	0.0168
B-18 (35 feet)	Langan (2024)	Sandy Clay	860	7.7	0.0082	0.0254

The results of the sulfate testing indicates that the on-site soils be classified as exposure category S_0 for sulfates and exposure category C_1 for chlorides in accordance with American Concrete Institute (ACI) Table 19.3.1.1.

It is recommended that an engineer specializing in corrosion be engaged to evaluate the need for provisions to protect buried metallic piping based on the results of the corrosion testing.

5.8 Expansive Soils

Expansive soils were not encountered during the current or prior investigations at the site and are not anticipated to impact the proposed development.

5.9 Materials for Fill

On-site soils undocumented fill and loose native sand are suitable for reuse in the required fills.

Recommendations for grading and site preparation are presented in Section 6.8.

5.10 Groundwater

Groundwater was not encountered in the current or prior explorations and is will not impact mass grading.

For the purposes of stormwater design, the current groundwater level at the site is estimated to be present at a depth of approximately 100 feet bgs.

5.11 Shrinkage and Subsidence

Typically, excavation of native materials and replacement of those materials as compacted fill results in a nominal loss of volume (shrinkage) because the materials are typically placed at a higher density than in their naturally deposited state.

Subsidence may occur when the weight of the properly compacted fill is greater than the weight of the pre-existing soil conditions, due to the increased density and/or locally grade changes above existing ground surface level.

The on-site soils will exhibit a degree of shrinkage and subsidence when excavated and re-used as properly compacted fill. It is estimated that a total combined shrinkage and subsidence of ten to 15 percent may be realized during the grading activities.

5.12 Stormwater Infiltration

Based on the City of Vernon General Plan, stormwater runoff is managed through local and Los Angeles County Flood Control District storm drainage systems. The discharges are regulated under an existing NPDES permit for municipal stormwater, which covers most of Los Angeles County, including Vernon. The permit sets guidelines for monitoring discharges, maintaining water quality, implementing best management practices, and submitting reports to the Regional Water Quality Control Board.

To address concerns about contamination from stormwater runoff in urban areas, the Los Angeles Regional Water Quality Control Board seeks cooperation from co-permittees to capture and treat runoff on individual properties during redevelopment. The board's policy emphasizes the infiltration of stormwater whenever possible. However, implementing this approach in Vernon is challenging due to the city's industrial nature and risk of groundwater impacts.

Concurrent with the prior geotechnical investigation, Langan also performed a Phase II environmental investigation for the prior development and the results the Phase II investigation were summarized in a report dated May 30, 2023. Based on information available from the Phase II investigation, limited petrochemical may be present within the soils near the top of fine-grained soil layer present throughout the site, typically between 25 and 33 feet bgs. Therefore, stormwater infiltration may not be feasible at the site above these depths.

Noting the fine-grained later typically extends to depths of approximately 33 to 49 feet bgs, stormwater infiltration is feasible below the fine-grained layer via deep dry wells that utilized solid piping to pass through the fine-grained layer and perforated casing below.

Recommendations for stormwater infiltration are presented in Section 6.3.

6.0 RECOMMENDATIONS

6.1 Foundations

6.1.1 Data Center Building Foundations – Auger-cast Piles (ACP)

The Goodman Energy Park may be supported on auger-cast piles (ACP) that extend through the upper fill and/or loose native soils.

Langan developed axial ACP capacities using the procedure outlined in Federal Highway Administration (FHWA) publication number FHWA NHI-18-024, Drilled Shafts: Construction Procedures and Design Methods dated September 11, 2018.

Allowable ASD and LRFD axial pile capacities for 18- and 24-inch diameter ACPs are presented in Figures 8 (downward) and 9 (upward) for shafts spaced at least three diameters on-center. The recommended allowable axial ACPs may be increased by one-third when considering short term wind and seismic loading conditions.

Allowable axial capacities for ACPs spaced closer than three diameters on-center should be reduced to account for potential group action. Reduction factors for group action once ACP spacing and configurations are available, can be provided, as required.

Static and dynamic settlement of ACPs is estimated to be on the order of ½ inch or less.

To confirm the capacities presented in Figure 8 and 9, load testing should be performed in general accordance with Section 1810.3.3 of the 2022 CBC as recommended below.

6.1.2 Lateral Capacities

Lateral loading may be resisted by ACPs and by passive resistance from the planned ACP caps.

Langan computed lateral capacities for 18- and 24-inch diameter ACPs using the software program LPile by Ensoft for fixed head conditions for ½-, and 1-inch deflection. The results of the analysis are presented in Table 4.

Table 4 – 18-inch and 24-Inch Diameter Auger-Cast Piles – Fixed Head

Parameter	18-inch Diameter		24-inch Diameter	
	½-inch Deflection	1-inch Deflection	½-inch Deflection	1-inch Deflection
Shear (kips)	44	54	68	81
Maximum Moment (inch-kips)	1,800	2,000	3,100	3,200
Depth to Maximum Moment (feet)	0	0	0	0
Depth to Zero Moment (feet)	18	18	20	20

The recommended lateral capacities presented in Table 4 may be used for lead ACPs in the direction of loading, and for ACPs spaced less than six diameters, reductions in the above recommended lateral capacities should be implemented due to group action. Table 5 presents reduction factors for center-to-center spacing of three to six diameters.

Table 5 – Reduction Factors for Lateral Group Action

Pile	Pile Center-to-Center Spacing			
	3D	4D	5D	6D
Lead Pile	1.0	1.0	1.0	1.0
Trailing Piles	0.30	0.50	0.75	0.90

In addition to the ACP capacities presented in Table 5, passive pressure may be relied on between the soil and both pile caps and grade beams.

As an additional means to resist lateral loading, an ultimate coefficient of friction equal to 0.6 may be used in conjunction with an ultimate passive pressure of 800 psf per foot of embedment of ACP caps provided the passive pressure is reduced by 0.5 to account for the deformation necessary to mobilize the full passive resistance.

An allowable coefficient of friction equal to 0.4 may be used in conjunction with an allowable passive pressure of 400 psf per foot of embedment without reduction.

The contribution of the top one foot of the triangular-shaped passive pressure distribution should be neglected when computing passive resistance so that the resulting passive pressure will be trapezoidal-shaped.

6.1.3 Pre-production Load Testing – ACPs

To verify or modify the design capacities presented in this report, compressive load testing as outlined in Section 1810.3.3 of the 2022 CBC, shall be performed in accordance with ASTM D 1143, Procedure B. Loading shall be applied in increments of ten percent of the maximum test load (200-percent of the design capacity) up to 200-percent of the design load.

Each load interval shall be maintained so that the rate or axial movement does not exceed 0.01 inch per hour for a maximum of 2 hours, and the minimum total loading time should be at least 12 hours. If after the minimal 12 hour loading time, the axial movement at 200-percent does not exceed 0.01 inch per hour, remove the load in decrements of 25 percent of the maximum test load with 10 minutes between decrements. In this case, the test will be considered passing.

If failure occurs during the loading, the failure load (or maximum possible load) shall be maintained until the axial movement equals 15-percent of the pile diameter. Once the 200-pecent loading is

applied and the overall test duration is at least 12 hours, unloading may be performed. Alternatively, loading may be incrementally increased to failure as presented in ASTM D 1143, Procedure B.

Pre-production load testing shall be performed after the concrete has cured sufficiently. Concrete cylinders should be collected and tested at 7- and 28-day compressive strengths, to provide confirmation of material strength. The piles tested in pre-production shall be sacrificial and not used as a part of the foundation system.

The allowable recommended axial capacities should be determined using one of the methods cited in Section 1810.3.3.1.3.

As requested, Langan can work with the general contractor and their foundation drilling subcontractor to develop a pre-production load testing program that replicates the planned production installation methods and utilizes the same equipment and materials. Upon completion of load testing program, a letter will be issued, either confirming or updating the recommended axial capacities presented herein.

6.1.4 Production Load Testing – ACPs

A minimum of five percent of production ACPs should be proof tested to a test load of 160 percent of the design value.

Proof testing should include predetermined load increments with a minimum of 10-minute holding period for each load. Readings should be taken at 0, 1, 3, 6, and 10 minutes. If the difference between the 1- and 10-minute reading is less than 0.1 inch during the loading, the test is deemed acceptable. If the difference is more than 0.1 inch, the holding period should be extended to an additional 60 minutes, and the movements should be recorded at 15, 20, 25, 30, 45, and 60 minutes. Under 60-minute hold time, the load test is considered acceptable if less than 0.1 inches of movement occurs.

In addition, all production ACPs should be integrity tested using a non-destructive method such as gamma-gamma logging or thermal integrity profiling.

Detailed proof testing procedures should be provided in a submittal prior to construction. We will work in collaboration with the subcontractor to provide additional testing requirements, as necessary.

Production load testing shall be performed after the concrete has cured sufficiently. Concrete cylinders should be collected and tested at 7- and 28-day compressive strengths, to provide confirmation of material strength.

Detailed proof testing procedures should be provided in a submittal prior to construction. Langan will work in collaboration with the subcontractor to provide additional testing requirements, as necessary.

6.1.5 Construction Considerations – ACPs

Drilling for ACPs may be performed with conventional equipment in good working condition. Care should be taken during installation to avoid contamination of the ACP with soil and rates of auger advancement and withdraw should be consistent among the ACPs, based on the results of the load testing.

The PMB fill materials includes gravel that may result in difficulty drilling. Special provisions should be made to advance augers through PMB fill where present.

Cold joints should not be constructed within the ACPs and reinforcing steel should be installed as soon as possible after placement of grout noting that the grout in the lower portion of the ACP shaft will begin to cure due to the pressure of the overlying grout column. If the grout begins to cure, it will be difficult to install the reinforcing steel to the planned depth and the allowable capacities of the ACP may be impacted.

6.1.6 Generator Yard

6.1.6.1 General

Two alternatives for foundation support for the proposed generator yard are: a mat foundation or auger-cast piles. Recommendations for each alternative are presented below.

6.1.6.2 Mat Foundation

Undocumented fill and loose native soils are generally present within the upper five to ten feet at the site and these soils are not suitable for support for the proposed data center building.

The proposed generator frame structures may be supported on a mat foundation established on properly compacted fill soils.

The existing undocumented fill soils should be removed and replaced with properly compacted fill that should extend a minimum of five feet below the bottom of the mat foundation and a minimum of five horizontal feet beyond the outside edges of the mat foundation. The lower 18 inches of the fill should consist of crushed miscellaneous base (CMB) or equivalent.

The mat foundation may be designed for an allowable bearing capacity equal to 1,500 psf and using a modulus of subgrade reaction of 90 pounds per cubic inch (pci). Langan can review the subgrade modulus with the structural engineer once foundation modeling results are available and provide an updated subgrade modulus in our final report.

It is anticipated that the static settlement of the mat foundation supported on properly compacted fill as recommended herein will be on the order of ½ inch or less and that differential static settlement will be on the order of ½ inch or less.

Seismic settlement on the order of ½ inch or less may occur in the upper loose native soils due to strong ground shaking so that the total static-plus-dynamic settlement will be on the order of 1 inch and total static-plus-dynamic differential settlement will be on the order of one inch or less.

6.1.6.3 Auger-Cast Piles

As an alternative to utilizing a mat foundation, the proposed generator yard may also be supported on auger-cast piles. Axial capacity recommendations presented section 6.1.1 are applicable for proposed generator yard foundations.

For preliminary design consideration, the lateral design recommendations presented in Table 3 may also be considered applicable. However, if ACPs are used, Langan should be provided with lateral loading demands to confirm if values presented in Table 3 are applicable or if updated values are needed.

The results of the load testing recommended in Section 6.1.3 will be applicable to ACPs for generator yard, if utilized.

Construction considerations presented in Section 6.1.4 are also applicable for ACPs for the generator yard, if utilized.

6.1.7 Generator Yard Screen Wall – ACPs

The proposed screen wall may be supported on auger-cast piles (ACP) that extend through the upper fill and/or loose native soils. Axial capacity recommendations presented section 6.1.1 are acceptable for generator yard screen wall.

Langan can provide lateral design recommendations for the proposed generator yard screen wall once lateral demands (shear and moment) are provided.

The results of the load testing recommended in Section 6.1.3 will be applicable to ACPs for generator yard screen walls, if utilized.

Construction considerations presented in Section 6.1.4 are also applicable for ACPs for the generator yard screen wall, if utilized.

6.2 Seismic Design

The site may be classified in accordance with Chapter 20 of ASCE-7-16 as Site Class D. We anticipate that the fundamental period of the proposed buildings will allow the Exemption 2 of Section 11.4.8 of ASCE-7-16, and therefore it is not anticipated that a site-specific ground motion study will be required. California Building Code-prescribed seismic design parameters are presented in Table 6.

Table 6 – CBC Prescriptive Seismic Design Parameters

Design Parameter	Value
MCE_R Ground Motion at Short Periods, S_s	1.841
MCE_R Ground Motion at 1 Second Period, S_1	0.655
Site Class	D
Site Amplification Factor at 0.2 second, F_a	1.0
Site Amplification Factor at 1.0 second, F_v	2.5
Site-Modified Spectral Acceleration Value at Short Periods, S_{MS}	1.841
Site-Modified Spectral Acceleration Value at 1 Second Period, S_{M1}	1.638
Design Spectral Response Acceleration at short periods, S_{DS}	1.227
Design Spectral Response Acceleration at 1 second period, S_{D1}	1.092
MCE_G Peak Ground Acceleration, PGA_M	0.866

The recommended mapped values of F_v, S_{M1}, and S_{D1} have been increased by 50 percent in accordance with the exception of Section 11.4.8.1 of Supplemental No. 3 to ASCE 7-16.

6.3 Storm Water Infiltration

Storm water infiltration may be performed using dry wells that introduce water to the primarily granular soils encountered 39 to 55 feet bgs in the field percolation wells. Recommended design infiltration rates are summarized in Table 7.

Table 7 – Field Percolation Test Results

Field Percolation Test #	Test Depth (Feet)	USCS Soil Type	Measured Field Percolation Rate (in/hr)	Reduction Factor	Design Infiltration Rate (in/hr)
FP-1	55 - 65	SP/SP-SM	1.39	3	0.46
FP-3	43 – 50	SP/SW	15.87	3	5.29
FP-4	43 - 50	CL/SP-SM/SM	4.80	3	1.60
FP-5	39 - 50	SM	4.20	3	1.40

6.4 Pavement Design

6.4.1 General

New pavement sections should be established on at least 12 inches of properly compacted non-expansive fill soils. Please note that most of the near-surface native soil present onsite is considered non-expansive. Langan's field representative can provide visual confirmation of this during grading and supplemental laboratory testing may be performed if deemed necessary.

The required pavement and base thicknesses will depend on the expected wheel loads, traffic index (TI), and the R-value of the subgrade soils. Based on laboratory test results, the R-value of the on-site subgrade soils is on the order of 72 to 77; however, based on the guidelines presented in the Caltrans Highway Design Manual, the R-value used in design should be limited to no more than 50. Therefore, an R-value of 50 was used for the design of pavement sections established near existing grade.

Given the high R-Value of the subgrade soils, asphalt concrete (AC) and Portland cement concrete (PCC) may be constructed directly on the properly compacted non-compacted fill soils noting that clayey soils should not be used as fill within two feet of pavement sections.

Recommendations for AC and PCC constructed on aggregate base (AB) materials and directly on the properly compacted non-compacted fill soils is presented below.

6.4.2 Asphalt-Concrete Pavement Design

AC pavement for surface parking shall be designed in accordance with the CALTRANS method. Tables 8A and 8B summarize our AC pavement recommendations for assumed TIs of 5, 6, 8 and 9.

Table 8A – AC Pavement Design Recommendations with AB

Traffic Use	TI	AC (inches)	AB (inches)
Parking Areas	5	3	4
Passenger Vehicle Drive Lanes	6	4	4
Entry / Exit Drive Lanes	8	6	4
Loading Docks	9	6	7

Table 8B – AC Pavement Design Recommendations without AB

Traffic Use	TI	AC (inches)
Parking Areas	5	5
Passenger Vehicle Drive Lanes	6	6
Entry / Exit Drive Lanes	8	8
Loading Docks	9	9

Recommended pavement and aggregate base thickness for other Tis can be provided upon request. Careful inspection is recommended to check that the recommended thickness or greater is achieved and that proper construction procedures are followed.

6.4.3 Portland Cement Concrete Pavement Design

Tables 9A and 9B summarize the PCC pavement recommendations for assumed TI of 5, 6, 8, and 9 based on minimum compressive strength of 3,000 psi for the PCC.

Table 9A – PCC Pavement Design Recommendations

Traffic Use	TI	PCC (inches)	AB (inches)
Parking Areas	5	4	4
Passenger Vehicle Drive Lanes	6	5	4
Entry / Exit Drive Lanes	8	5	6
Loading Docks	9	5	8

Table 9B – PCC Pavement Design Recommendations

Traffic Use	TI	PCC (inches)
Parking Areas	5	5
Passenger Vehicle Drive Lanes	6	6
Entry / Exit Drive Lanes	8	7
Loading Docks	9	8

Reinforcing steel is not considered necessary for the PCC from a geotechnical standpoint. Careful inspection is recommended to check that the recommended PCC thickness or greater is achieved and that proper construction procedures are followed.

Control joints should be installed at 15-foot intervals and cold joints should be spaced at approximately 45-foot intervals.

6.5 Freestanding Retaining Walls

6.5.1 Freestanding Wall Foundation Design

Freestanding walls may be supported on two feet of properly compacted select fill soils. If the exposed excavation bottom is not firm and unyielding, bottom stabilization will be required as recommended herein.

Continuous freestanding wall footings a minimum of two feet wide and established at least 18 inches below the lowest adjacent grade or top of floor slab within properly compacted select fill may be designed using an allowable bearing pressure equal to 2,500 pounds per square foot (psf).

The allowable bearing pressure may be considered a net bearing pressure that includes the considerations for the weight of the foundation and any soil above the footing.

The recommended allowable bearing pressure may be increased by one-third when considering short term loading.

It is estimated that the total settlement for freestanding retaining walls designed as recommended herein will be on the order of approximately 1 inch or less and the differential settlement between adjacent columns will be on the order of ¼ inch or less.

To resist lateral loading, an ultimate coefficient of friction equal to 0.4 may be used in conjunction with an ultimate passive pressure of 800 psf per foot of embedment of continuous footings provided the passive pressure is reduced by 0.5 to account for the deformation necessary to mobilize the full passive resistance.

An allowable coefficient of friction equal to 0.4 may be used in conjunction with an allowable passive pressure of 400 psf per foot of embedment without reduction.

The contribution of the top one foot of the triangular-shaped passive pressure distribution should be neglected when computing passive resistance so that the resulting passive pressure will be trapezoidal-shaped.

6.5.2 Freestanding Wall Design Lateral Earth Pressures

Drained, freestanding retaining walls should be designed to resist an equivalent fluid pressure equal to 35H psf. Free standing walls in excess of six feet (retained height) should also be designed to resist a triangular-shaped seismic lateral earth pressure distribution equal to 15H psf.

Additionally, if the surface at the top of the wall is sloped, the recommended lateral earth pressures should be increased as indicated in Table 10.

Table 10 – Lateral Earth Pressures Increases

Slope Inclination at Top of Wall (H:V)	Increase in Lateral Earth Pressure (percent)
1:1	200
1.5:1	165
2:1	150

6.5.3 Freestanding Retaining Wall Backdrainage

Permanent freestanding retaining walls should be constructed with adequate back-drainage to prevent the buildup of hydrostatic pressure behind the walls. It is recommended that the use of drainage boards on the back of the walls, in conjunction with conventional weep holes at the base of the walls, be utilized to provide adequate drainage.

6.6 Floor Slab Support

The proposed data center building floor slab may be established on a minimum of five feet of properly compacted select fill from bottom of floor slab. The select fill should include a minimum 18-inch-thick layer of crushed miscellaneous base (CMB) placed at the bottom of the required excavation and properly compacted fill soil should then be placed on the CMB. The 18-inch-thick

layer of base is included within the minimum five feet of properly compacted select fill and is not in addition to it.

The existing undocumented fill and loose native soils below the recommended CMB may remain in-place noting some mitigation of the excavation bottoms may be required to provide a firm working surface for placement engineered fill.

To reduce the potential of moisture transfer through the building floor slab that could damage finish flooring, a capillary break section should be installed beneath the building floor slab. The capillary break section should consist of six inches of gravel, or equivalent, underlying a 15-mil HDPE membrane. The membrane should be placed between the gravel layer and the building floor slab.

Please note that if finish flooring is not planned the capillary break may be omitted.

6.7 Temporary Vertical Cuts and Construction Slopes

Temporary vertical cuts are feasible in the on-site soils. In general, temporary vertical cuts should not exceed 4 feet in height. It's unlikely that temporary vertical cuts will stand within the existing granular fill soils.

Temporary, unsurcharged slopes may be excavated into the on-site fine-grained soils and properly compacted select fill; however, these slopes should not exceed a 1½ H:1V gradient and should not exceed 15 feet in height.

Temporary construction slopes should be protected from erosion by directing surface water away from the top of the slope, by placing sandbags at the top of the slopes and vertical cuts, and/or covering the slopes with plastic sheeting during rain events.

6.8 Earthwork Considerations

6.8.1 General

Earthwork will include removal and re-compaction of the existing undocumented fill and underlying loose native soils for floor slab support of the data center buildings, for foundation support of the generator yard, and for presumably the substation building.

A minimum of five feet of removal and re-compaction from bottom of foundations and floor slabs will be required for suitable foundation and floor slab support. Note removal of more than five feet for floor slab support may not be necessary provided CMB is used for fill materials as presented in Section 6.6.

Recommendations for mat foundation and floor slab support are presented in Sections 6.1.6 and 6.6 respectively.

Demolition of existing buildings, foundations and floor slabs, pits, ramps, and other existing subterranean features will result in disturbance to the existing underlying soils.

Exposed excavation bottoms should be evaluated by our field representative. Any zones of loose, soft, excessively moist, or otherwise unsuitable materials should be removed and replaced with suitable fill materials including compacted fill, crushed rock and/or sand-cement slurry. Langan will review such occurrences on a case-by-case basis.

All deleterious materials should be removed from excavation bottoms prior to placement of foundation concrete, floor slab sections, or fill.

6.8.2 Materials for Fill

On-site soils are suitable for re-use in the required fills. Additionally, crushed PCC and AC resulting from demolition of existing on-site buildings, foundations, floor slabs and other features may be re-used in required fills provided these materials are thoroughly blended with on-site soils at a maximum of a 3:1 (on-site soils-to-crushed PCC / AC) ratio.

In general, all fill soils should be free of organic and other deleterious materials and have a maximum particle size no greater than 3 inches.

Imported fill material should be primarily non-expansive and granular in nature and reviewed by our field technician prior to import to the site.

6.8.3 Fill Placement and Compaction

Fill soils shall be moisture conditioned as recommended herein, placed in loose lifts not exceeding 8-inches in thickness and mechanically compacted.

Fine-grained fill soils should be moisture conditioned to 2 to 4 percent above the optimum moisture content and compacted to at least 90 percent of the maximum dry density obtainable per ASTM D-1557. It is recommended that relatively light-weight compaction equipment be utilized when working in fine-grained soils.

Granular soils should be moisture conditioned to 0 to 2 percent above the optimum moisture content and compacted to at least 95 percent of the maximum dry density obtained per ASTM D-1557.

Crushed rock if used for bottom stabilization should be densified using vibratory methods.

6.8.4 Site Drainage

Proper drainage should be always maintained. Ponding or trapping of water in localized areas can cause differing moisture levels in the subsurface soil. Drainage should be directed away from the tops of slopes. Erosion protection and drainage control measures should be implemented during periods of inclement weather. While raining, backfill operations may need to be restricted to allow for proper moisture control during fill placement.

7.0 TESTING, INSPECTION AND OBSERVATION PROGRAM

Geotechnical testing and observation during construction is a continuing part of our geotechnical consultation. As required by the City of Vernon and in accordance with good practice, our representative should perform geotechnical observation and testing during the following primary activities:

- Installation and documentation of test and production ACPs
- Observation and documentation of recommended removal and recompaction
- Placement and compaction of backfill materials
- Observation and probing of excavation bottoms
- Installation of capillary break sections
- Installation and removal of temporary shoring
- Subgrade preparation and placement of aggregate base materials for pavement sections
- Observation and approval of foundation excavation bottoms
- Placement and compaction of utility trench backfill

In addition, development of a load test program in collaboration with the foundation contractor will be required and we will need to issue a supplemental letter summarizing the results of the load testing. Our letter will confirm or update our ACP axial capacity recommendations.

We will prepare daily field reports and summary reports at the end of the project that document that geotechnical related construction work was performed in general accordance with the approved geotechnical recommendations.

8.0 LIMITATIONS

The conclusions and recommendations provided in this report are based on subsurface conditions inferred from available boring data, as well as project information provided to date.

This report was prepared for GIC Vernon LLC and their design consultants and contractors for use in the proposed development.

If changes to the proposed development are made, we should be notified to review our conclusions and recommendations.

We should be retained during the construction phase to perform necessary geotechnical observations and testing in accordance with good geotechnical engineering practice.

Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of investigation.

9.0 CLOSING

We sincerely appreciate the opportunity to provide professional services for this project and look forward to working with you on this project.

Sincerely,

Langan CA, Inc.

Brandon Watkins
Senior Staff Engineer

Christopher J. Zadoorian
Associate Principal / Vice President

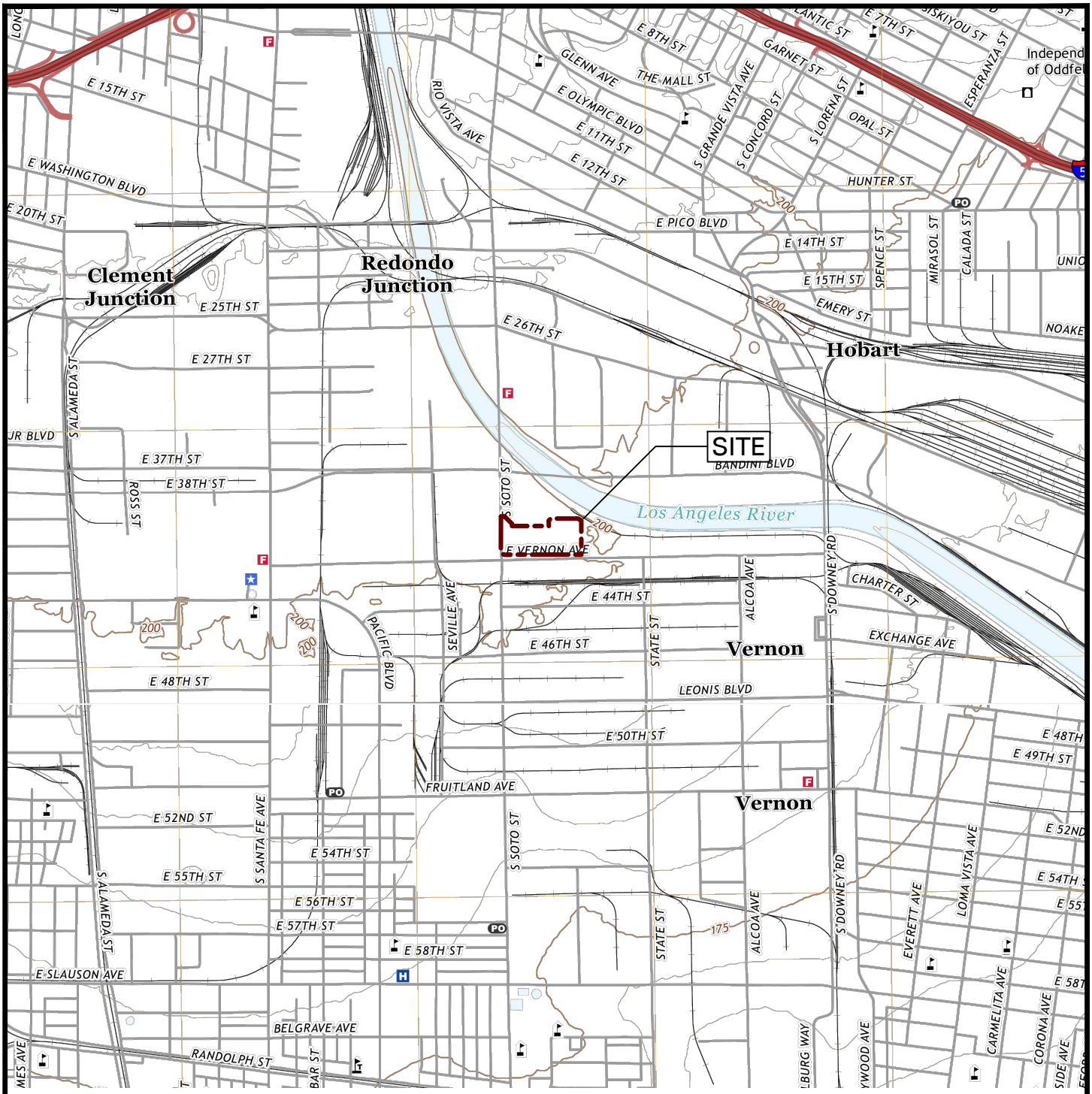
REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER JOHN ZADOORIAN
GE2493
GEOTECHNICAL
STATE OF CALIFORNIA
signed 12/18/24

Claudia Rangel
Senior Staff Engineer

Robert 'Rory' Johnston
Managing Principal / Executive Vice President

LICENSED PROFESSIONAL ENGINEER
ROBERT S. JOHNSTON
GE 2198
GEOTECHNICAL
STATE OF CALIFORNIA
signed 12/18/24

FIGURES



LEGEND:

SITE LIMITS

2000 1000 0 2000

SCALE IN FEET

REFERENCE: USGS 7.5-MINUTE TOPOGRAPHIC MAP OF THE LOS ANGELES AND SOUTH GATE, CA QUADRANGLES (2018).

LANGAN

Langan CA, Inc.

1960 East Grand Avenue, Suite 585
El Segundo, California 90245

T: 213.314.8100 F: 213.314.8101 www.langan.com

Project

GEP VERNON

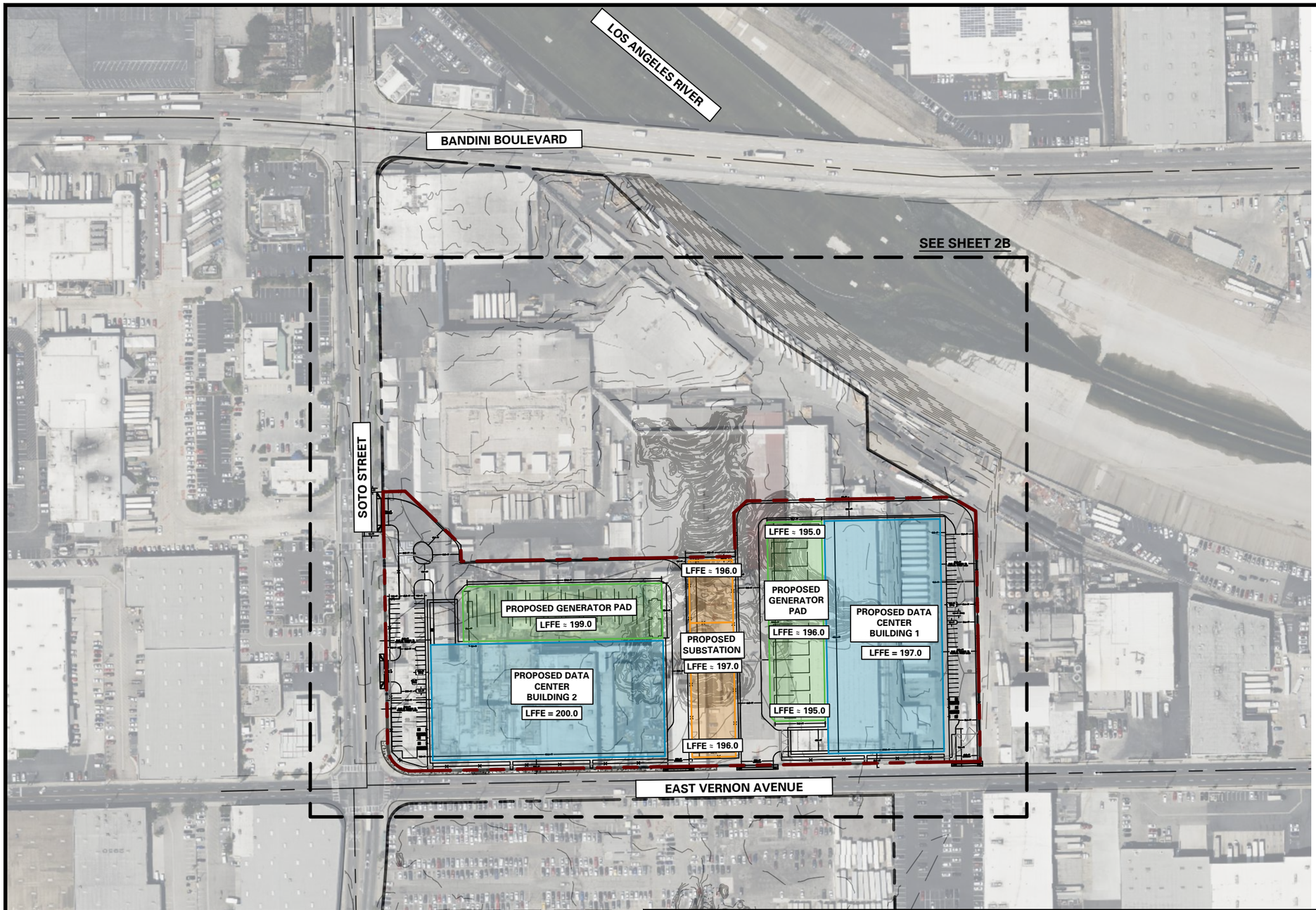
3049 EAST VERNON AVENUE
VERNON
LOS ANGELES COUNTY CALIFORNIA

Figure Title

SITE LOCATION MAP

Project No.	Figure No.
721040501	1
Date: DECEMBER 2024	
Scale: AS SHOWN	
Drawn By: CR	

Filename: \\langan.com\data\LAX\data5\721040501\Project Data_Discipline\Geotechnical\CAD\- GEOSEISMIC FIGURES\GEOSEISMIC FIGURES.dwg Date: 12/12/2024 Time: 13:30 User: vramirez Style Table: Langan.stb Layout: SLM



LEGEND:

- PROPOERTY LIMITS
- SITE LIMITS
- PROPOSED BUILDING
- PROPOSED SUBTATION
- PROPOSED GENERATOR PAD

NOTES:

1. BACKGROUND AERIAL IMAGE OBTAINED FROM BING MAPS ON NOVEMBER 26, 2024.
2. BACKGROUND GRADING PLAN REFERENCED FROM GEP VERNON GRADING PLAN SHT. C04-01, PREPARED BY LANGAN, DATED NOVEMBER 25, 2024.

200 100 0 200

SCALE IN FEET

LANGAN

LANGAN
Langan CA, Inc.
1960 East Grand Avenue, Suite 585
El Segundo, California 90245
T: 213.314.8100 F: 213.314.8101 www.langan.com

Project
GEP VERNON
3049 EAST VERNON AVENUE
VERNON
LOS ANGELES COUNTY CALIFORNIA

Figure Title
PROJECT LOCATION MAP

Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR
Figure No.	**2A**

Filename: \\langan.com\data\LAX\data5\721040501\Project Data_Discipline\Geotechnical\CAD\721040501- GEP VERNON Geotech Figures.dwg Date: 12/13/2024 Time: 12:28 User: crangel Style Table: Langan.stb Layout: SP Site Map 11x17

LANGAN

LEGEND:

- SITE LIMITS
- PROPOSED BUILDING
- PROPOSED SUBSTATION
- PROPOSED GENERATOR PAD
- B-17 — BORING LOCATION
- CPT-17 — CONE PENETRATION TEST LOCATION
- FP-1 — PRIOR FIELD PERCOLATION TEST LOCATION (LANGAN, 2023)
- CPT-1 — PRIOR CONE PENETRATION TEST LOCATION (LANGAN, 2023)
- B-1 — PRIOR BORING (LANGAN, 2023)
- 15.5 — APPROXIMATE LIMITS AND THICKNESS OF ENGINEERED FILL DOCUMENTED BY LANGAN (FEET)
- LFFE = 197.0 — LOWEST FINISHED FLOOR ELEVATION

NOTES:

1. BACKGROUND PLAN REFERENCED FROM GEP VERNON GRADING PLAN SHT. C04-01, PREPARED BY LANGAN, DATED NOVEMBER 25, 2024.

PROJECT LOCATION MAP

SCALE IN FEET
50 25 0 50

LANGAN
Langan CA, Inc.
1960 East Grand Avenue, Suite 585
El Segundo, California 90245
T: 213.314.8100 F: 213.314.8101 www.langan.com

Project	GEP VERNON
	3049 EAST VERNON AVENUE VERNON LOS ANGELES COUNTY CALIFORNIA
Figure Title	SITE PLAN
Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR
Figure No.	2B

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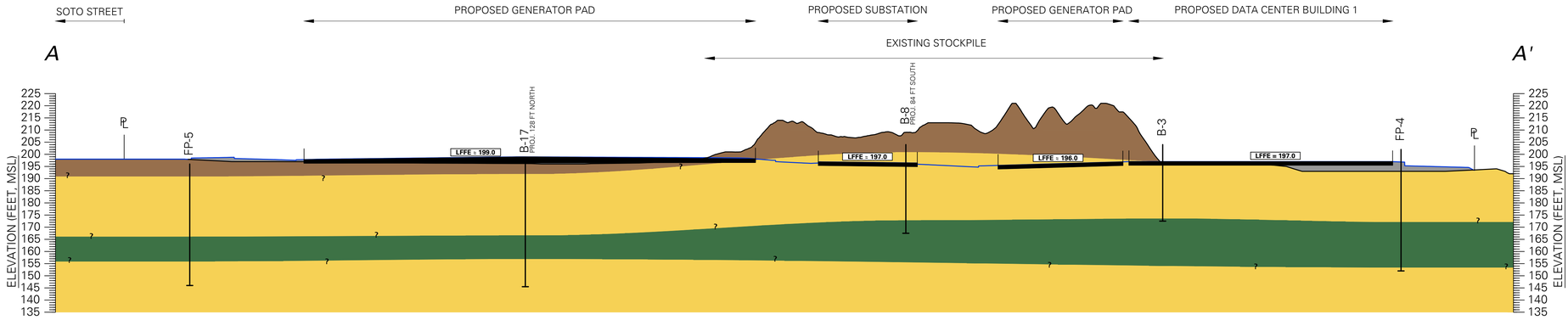
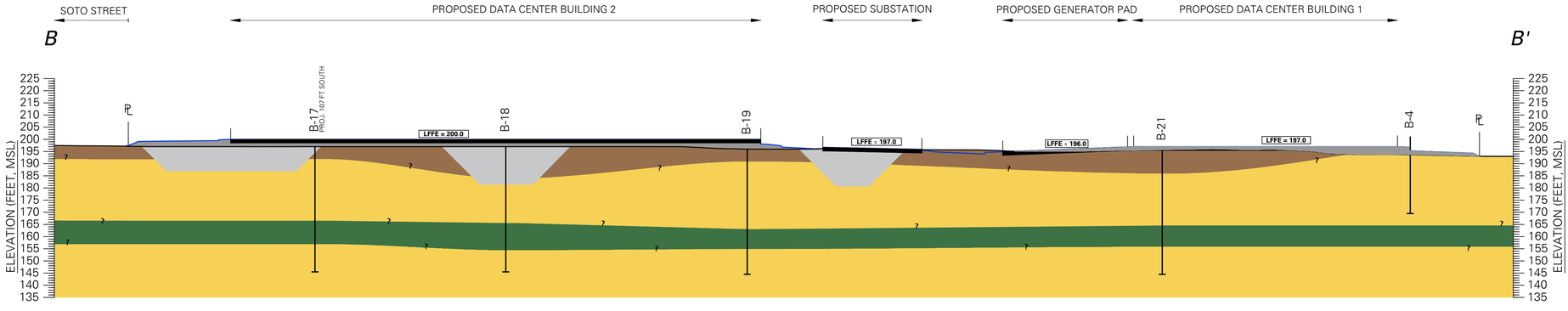
CROSS SECTION A-A'

WEST



CROSS SECTION B-B'

WEST



LEGEND:

- PROPOSED GROUND SURFACE
- EXISTING GROUND SURFACE
- PROPOSED FILL
- ENGINEERED FILL (OBSERVED BY LANGAN)
- ARTIFICIAL FILL (af)
- PREDOMINATELY FINE GRAINED SOIL
- PREDOMINATELY COARSE GRAINED SOIL
- LFFE = 200.0 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR DETAILED DESCRIPTIONS OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS AND CONE PENETRATION DATA.
2. REFER TO SITE PLAN FOR CROSS SECTION LOCATIONS.
3. EXISTING GROUND SURFACE PROFILE INFERRED FROM "GIS-NET PUBLIC, DEPARTMENT OF REGIONAL PLANNING - PLANNING & ZONING INFORMATION FOR UNINCORPORATED LA COUNTY" ON MAY 16, 2023.
4. PROPOSED GROUND SURFACE PROFILE REFERENCED FROM "3163 VERNON - CONCEPTUAL GRADING PLAN" SHEET CG101, PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED MAY 12, 2023.

50 25 0 50
SCALE IN FEET (HORIZONTAL)

25 0 25
SCALE IN FEET (VERTICAL)

LANGAN

Langan CA, Inc.

1960 East Grand Avenue, Suite 585
El Segundo, California 90245

T: 213.314.8100 F: 213.314.8101 www.langan.com

Project
GEP VERNON
3049 EAST VERNON AVENUE
VERNON
LOS ANGELES COUNTY CALIFORNIA

Figure Title
CROSS SECTION A-A' TO B-B'

Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR
Figure No.	3A

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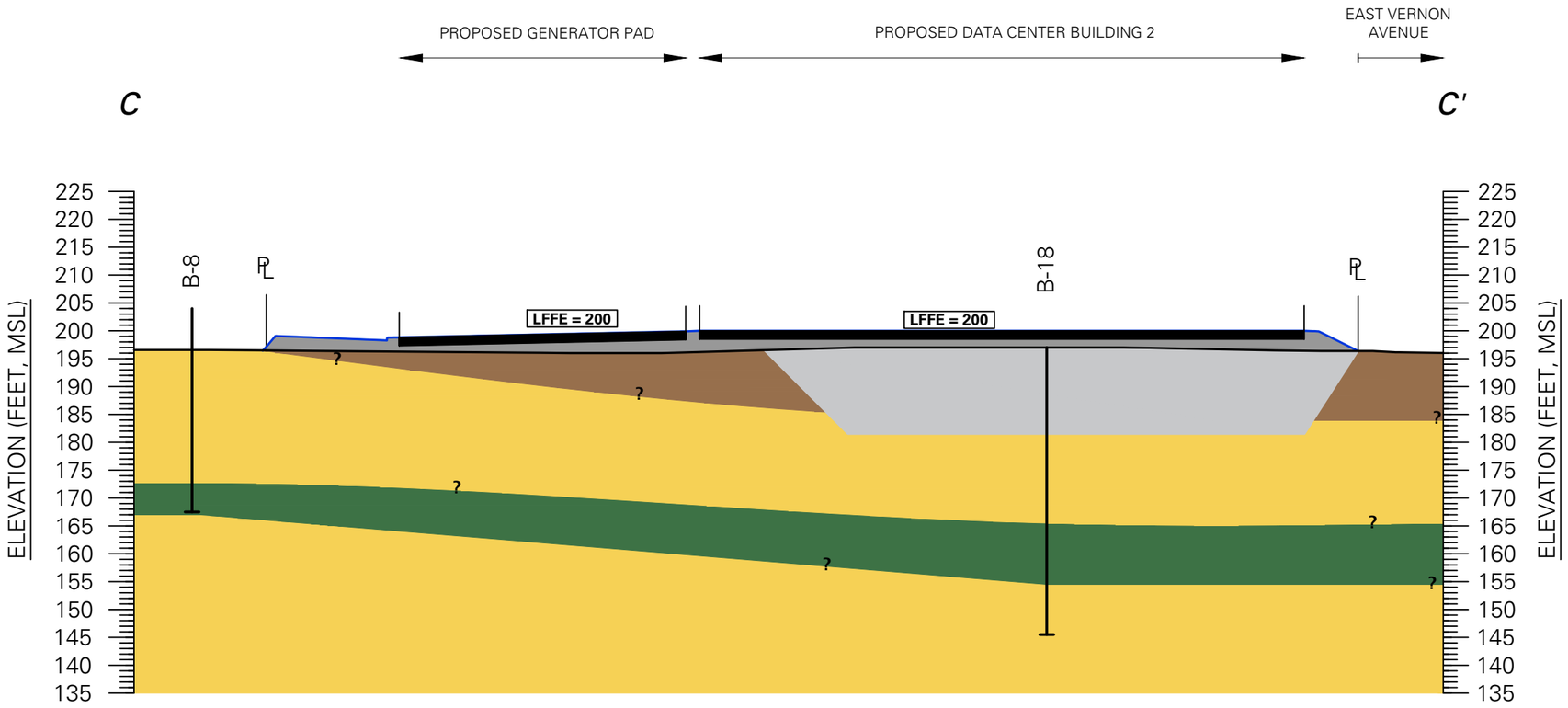
CROSS SECTION C-C'

NORTH



LEGEND:

- PROPOSED GROUND SURFACE
- EXISTING GROUND SURFACE
- PROPOSED FILL
- ENGINEERED FILL (OBSERVED BY LANGAN)
- ARTIFICIAL FILL (af)
- PREDOMINATELY FINE GRAINED SOIL
- PREDOMINATELY COARSE GRAINED SOIL
- LFFE = 200.0 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR DETAILED DESCRIPTIONS OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS AND CONE PENETRATION DATA.
2. REFER TO SITE PLAN FOR CROSS SECTION LOCATIONS.
3. EXISTING GROUND SURFACE PROFILE INFERRED FROM "GIS-NET PUBLIC, DEPARTMENT OF REGIONAL PLANNING - PLANNING & ZONING INFORMATION FOR UNINCORPORATED LA COUNTY" ON MAY 16, 2023.
4. PROPOSED GROUND SURFACE PROFILE REFERENCED FROM "3163 VERNON - CONCEPTUAL GRADING PLAN" SHEET CG101, PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED MAY 12, 2023.

50 25 0 50
SCALE IN FEET (HORIZONTAL)

25 0 25
SCALE IN FEET (VERTICAL)

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Project	GEP VERNON 3049 EAST VERNON AVENUE VERNON LOS ANGELES COUNTY CALIFORNIA
Figure Title	CROSS SECTION C-C'
Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR
Figure No.	3B

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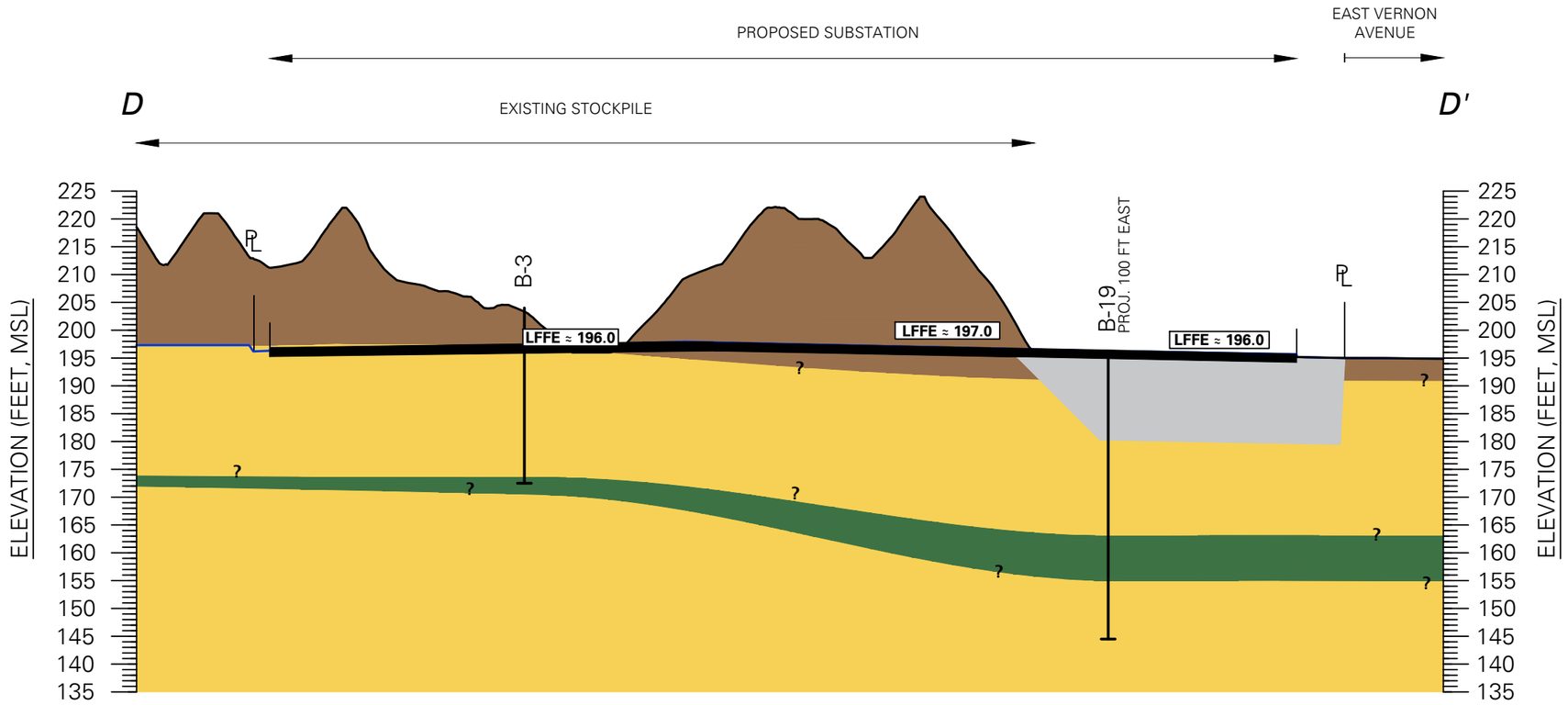
CROSS SECTION D-D'

NORTH



LEGEND:

- PROPOSED GROUND SURFACE
- EXISTING GROUND SURFACE
- PROPOSED FILL
- ENGINEERED FILL (OBSERVED BY LANGAN)
- ARTIFICIAL FILL (af)
- PREDOMINATELY FINE GRAINED SOIL
- PREDOMINATELY COARSE GRAINED SOIL
- LFFE = 200.0 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

1. CROSS SECTION DISPLAYS GENERALIZED SUBSURFACE CONDITIONS; FOR DETAILED DESCRIPTIONS OF CONDITIONS ENCOUNTERED REFER TO BORING LOGS AND CONE PENETRATION DATA.
2. REFER TO SITE PLAN FOR CROSS SECTION LOCATIONS.
3. EXISTING GROUND SURFACE PROFILE INFERRED FROM "GIS-NET PUBLIC, DEPARTMENT OF REGIONAL PLANNING - PLANNING & ZONING INFORMATION FOR UNINCORPORATED LA COUNTY" ON MAY 16, 2023.
4. PROPOSED GROUND SURFACE PROFILE REFERENCED FROM "3163 VERNON - CONCEPTUAL GRADING PLAN" SHEET CG101, PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED MAY 12, 2023.

50 25 0 50
SCALE IN FEET (HORIZONTAL)

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SCALE IN FEET (VERTICAL)

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Project	GEP VERNON 3049 EAST VERNON AVENUE VERNON LOS ANGELES COUNTY CALIFORNIA
Figure Title	CROSS SECTION D-D'
Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR
Figure No.	3C

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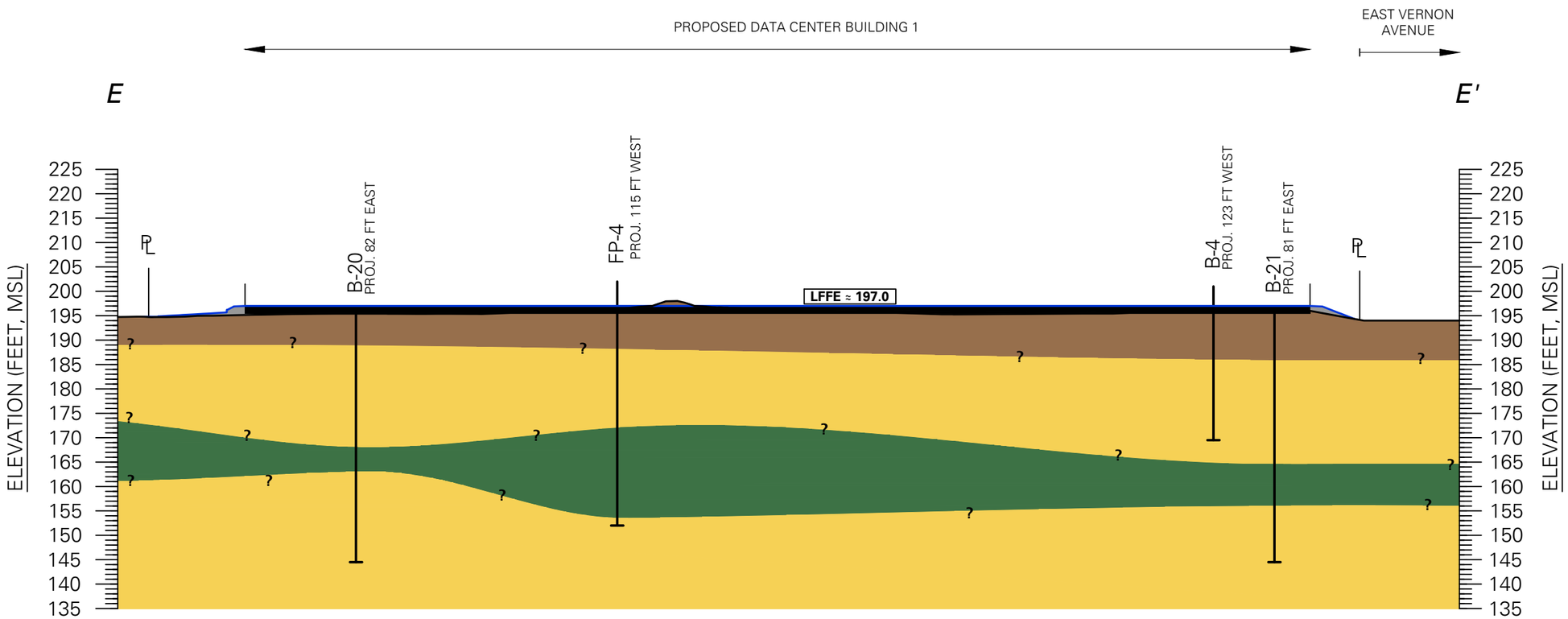
CROSS SECTION E-E'

NORTH



LEGEND:

- PROPOSED GROUND SURFACE
- EXISTING GROUND SURFACE
- PROPOSED FILL
- ENGINEERED FILL (OBSERVED BY LANGAN)
- ARTIFICIAL FILL (af)
- PREDOMINATELY FINE GRAINED SOIL
- PREDOMINATELY COARSE GRAINED SOIL
- LFFE = 200.0 — LOWEST FINISHED FLOOR ELEVATION (FEET)

NOTES:

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4. PROPOSED GROUND SURFACE PROFILE REFERENCED FROM "3163 VERNON - CONCEPTUAL GRADING PLAN" SHEET CG101, PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC., DATED MAY 12, 2023.

50 25 0 50
SCALE IN FEET (HORIZONTAL)

25 0 25
SCALE IN FEET (VERTICAL)

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Project	GEP VERNON 3049 EAST VERNON AVENUE VERNON LOS ANGELES COUNTY CALIFORNIA
Figure Title	CROSS SECTION E-E'
Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR
Figure No.	3D

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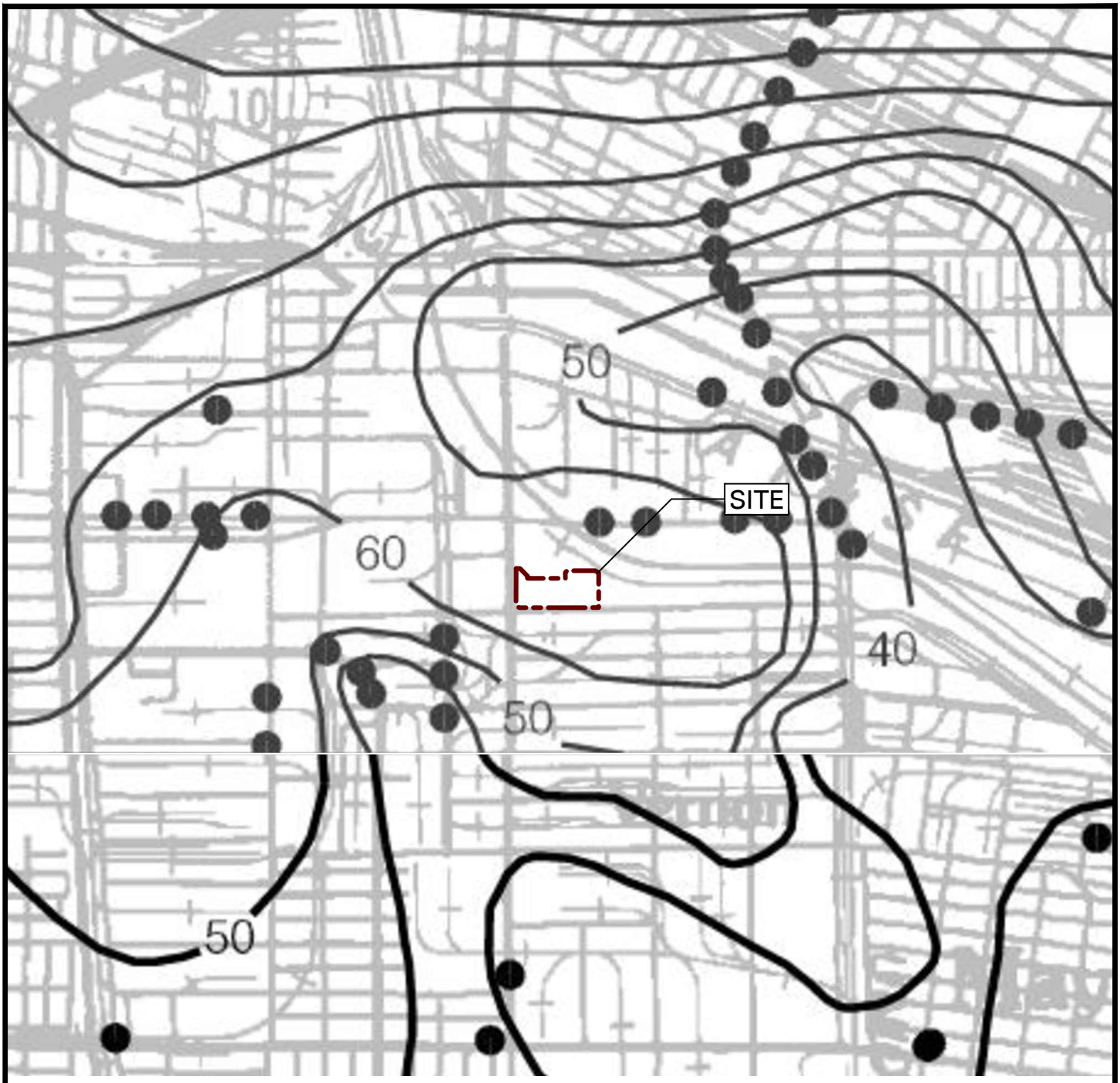

LEGEND:

SITE LIMITS

BOREHOLE SITE

30 DEPTH TO GROUNDWATER IN FEET

REFERENCE: CALIFORNIA DEPARTMENT OF CONSERVATION, DIVISION OF MINES AND GEOLOGY - SEISMIC HAZARD REPORT FOR THE LOS ANGELES AND SOUTH GATE 7.5-MINUTE QUADRANGLES, LOS ANGELES COUNTY, CALIFORNIA, PLATE 1.2 (SHZR 29 & 34), (1998).

2000 1000 0 2000

SCALE IN FEET

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Project

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VERNON
LOS ANGELES COUNTY CALIFORNIA

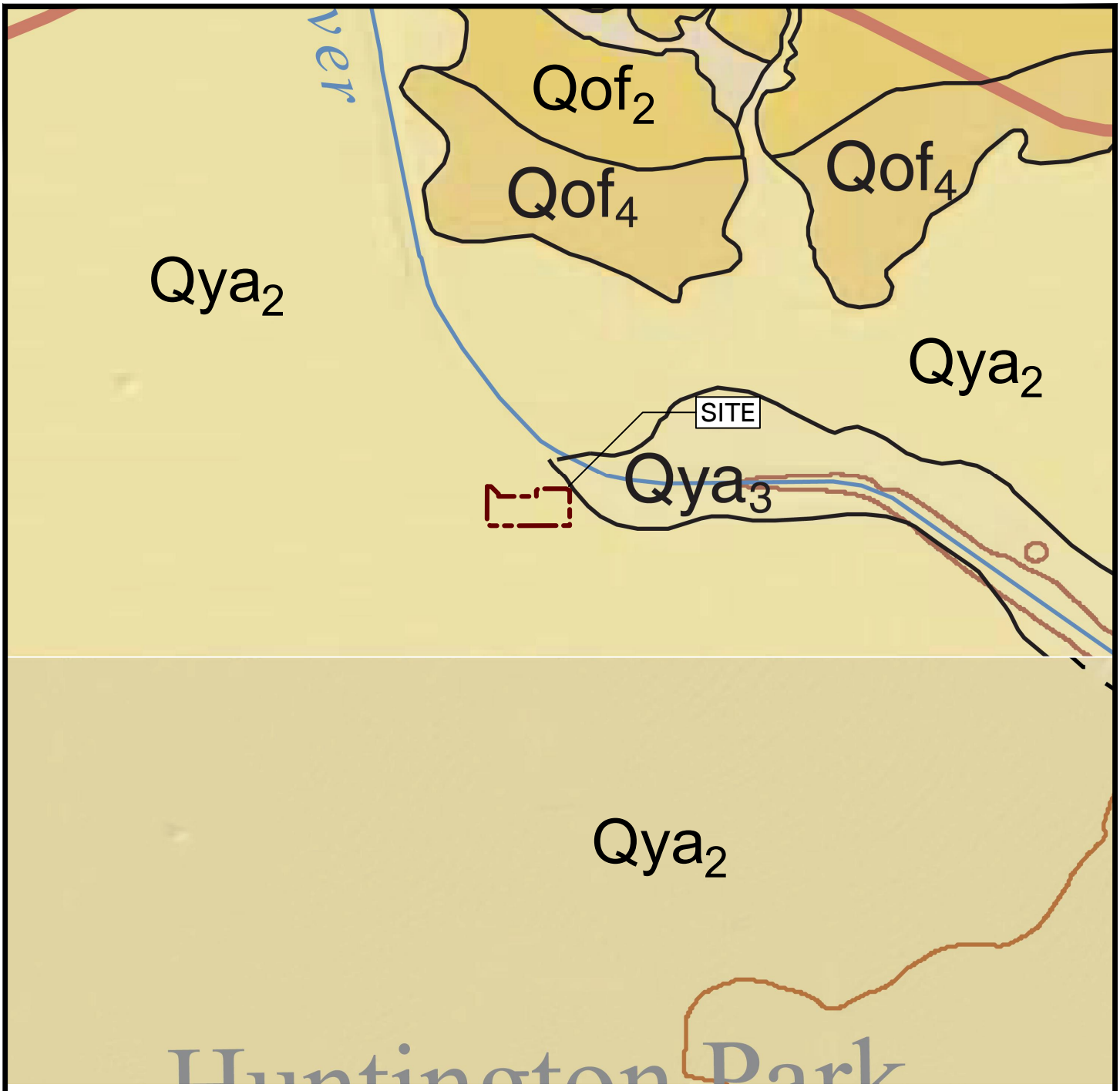
Figure Title

HISTORICAL HIGH GROUNDWATER MAP

Project No.	721040501
Date	DECEMBER 2024
Scale	AS SHOWN
Drawn By	CR

Figure No. **4**

Filename: \\langan.com\data\LAX\data5\721040501\Project Data_Discipline\Geotechnical\CAD\- GEOSEISMIC FIGURES\GEOSEISMIC FIGURES.dwg Date: 12/12/2024 Time: 15:23 User: vramirez Style Table: Langan.stb Layout: HHGW



LEGEND:

SITE LIMITS

Qya YOUNG ALLUVIUM

Qof OLD ALLUVIAL FAN DEPOSITS

REFERENCE: CGS PRELIMINARY GEOLOGIC MAP OF THE LOS ANGELES 30' x 60' QUADRANGLE, CALIFORNIA (CAMPBELL ET AL., 2014) AND CGS GEOLOGIC MAP OF THE LONG BEACH 30' x 60' QUDRANGLE, CALIFORNIA (SAUCEDO ET AL., 2016)

2000 1000 0 2000

SCALE IN FEET

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VERNON
LOS ANGELES COUNTY CALIFORNIA

Figure Title
REGIONAL GEOLOGIC MAP

Project No. 721040501

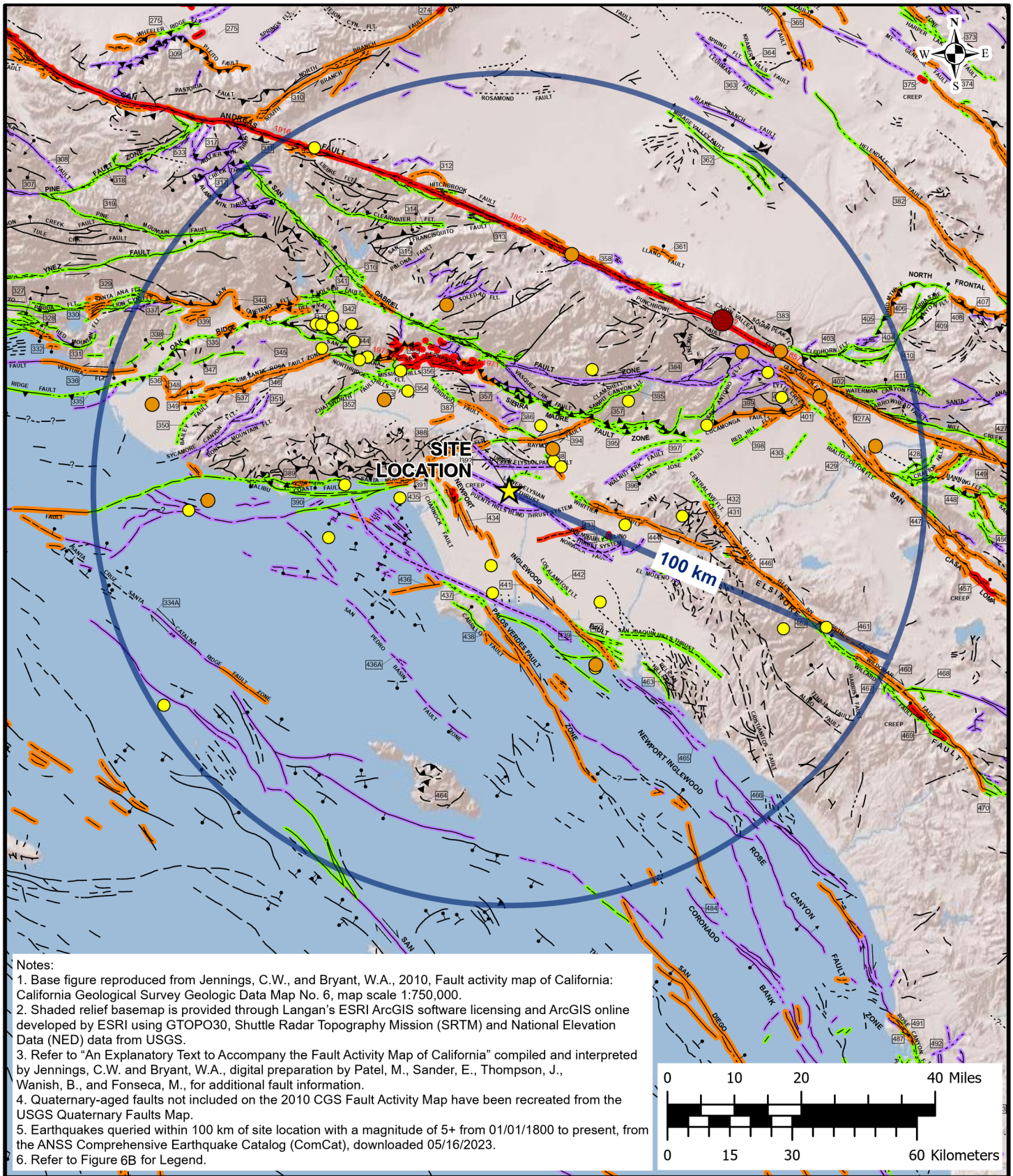
Date DECEMBER 2024

Scale AS SHOWN

Drawn By CR

Figure No. **5**

Filename: \\langan.com\data\LAX\data5\721040501\Project Data_Discipline\Geotechnical\CAD\- GEOLOGIC MAP\GEOLOGIC MAP.dwg Date: 12/12/2024 Time: 15:28 User: vramirez Style Table: Langan.stb Layout: 8.5x11 P



Notes:
1. Base figure reproduced from Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.
2. Shaded relief basemap is provided through Langan's ESRI ArcGIS software licensing and ArcGIS online developed by ESRI using GTOPO30, Shuttle Radar Topography Mission (SRTM) and National Elevation Data (NED) data from USGS.
3. Refer to "An Explanatory Text to Accompany the Fault Activity Map of California" compiled and interpreted by Jennings, C.W. and Bryant, W.A., digital preparation by Patel, M., Sander, E., Thompson, J., Wanish, B., and Fonseca, M., for additional fault information.
4. Quaternary-aged faults not included on the 2010 CGS Fault Activity Map have been recreated from the USGS Quaternary Faults Map.
5. Earthquakes queried within 100 km of site location with a magnitude of 5+ from 01/01/1800 to present, from the ANSS Comprehensive Earthquake Catalog (ComCat), downloaded 05/16/2023.
6. Refer to Figure 6B for Legend.

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Project
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Figure Title
MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS

Project No. 721040501
Date DECEMBER 2024
Scale 1 inch = 20 miles
Drawn By TO

Figure 6A

Path: \\langan.com\data\LAX\data5\721040501\Project Data\ArcGIS\APRX\Vernon Fault Figures - 721040501.aprx Date: 5/16/2023 User: Toulie Time: 5:10 PM

LEGEND:

Site Location

Fault Age

- Historic
- Holocene
- Late Quaternary
- Early Quaternary
- Pre-Quaternary Fault
- 100 km Search Radius

Earthquake Epicenter

- Magnitude 5.0 to 5.9
- Magnitude 6.0 to 6.9
- Magnitude 7.0 to 7.4
- Magnitude 7.5 to 8.0

Fault Symbols

- Bar and ball on downthrown side (relative or apparent).
- Relative or apparent direction of lateral movement.
- Direction of dip.
- Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened.
- 491 — Numbers refer to annotations listed in the appendices of the accompanying report.
- Structural discontinuity (offshore) separating differing Neogene structural domains.
- Brawley Seismic Zone.

Fault Classification

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:
(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.
(b) fault creep slippage - slow ground displacement usually without accompanying earthquakes.
(c) displaced survey lines.

1906 ▶ / 1906 ▷ — A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

▶1906◀ — Date bracketed by triangles indicates local fault break.

1906 — No triangle by date indicates an intermediate point along fault break.

CREEP — Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

1906 ■ / 1906 ■ — Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

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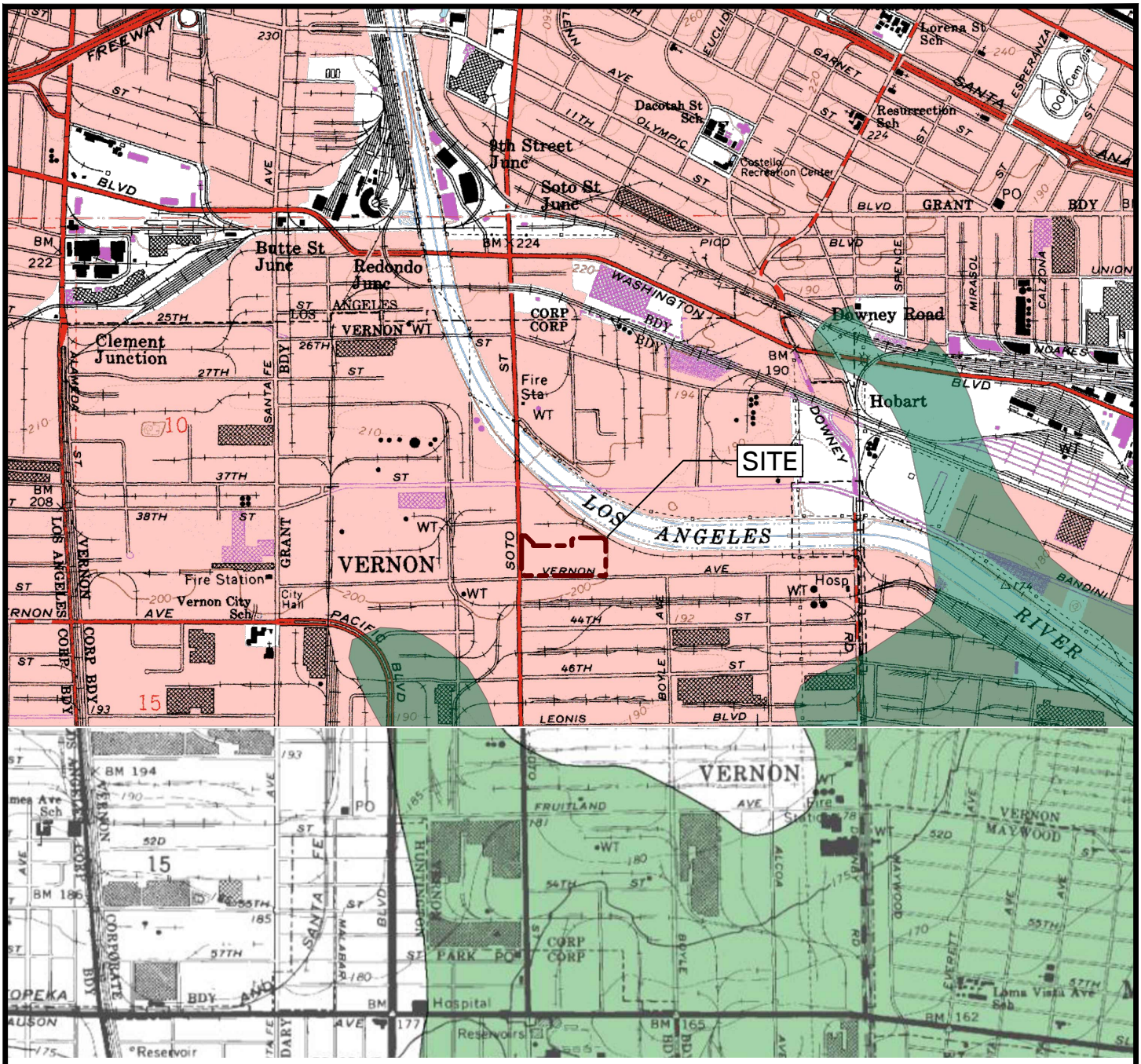
LOS ANGELES COUNTY CALIFORNIA

Figure Title: **MAJOR FAULTS AND EARTHQUAKE EPICENTERS MAP LEGEND**

Project No.	Figure
721040501	6B
Date: DECEMBER 2024	
Scale: NOT TO SCALE	
Drawn By: TO	



LEGEND:

SITE LIMITS

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONES

Earthquake Fault Zones
Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.

Active Fault Traces
Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) indicates additional uncertainty.

SEISMIC HAZARD ZONES

Liquefaction Zones
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslide Zones
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

2000 1000 0 2000

SCALE IN FEET

REFERENCE: CGS EARTHQUAKE ZONES OF REQUIRED INVESTIGATION FOR THE LOS ANGELES AND SOUTH GATE, CALIFORNIA 7.5-MINUTE QUADRANGLES (2017,1999).

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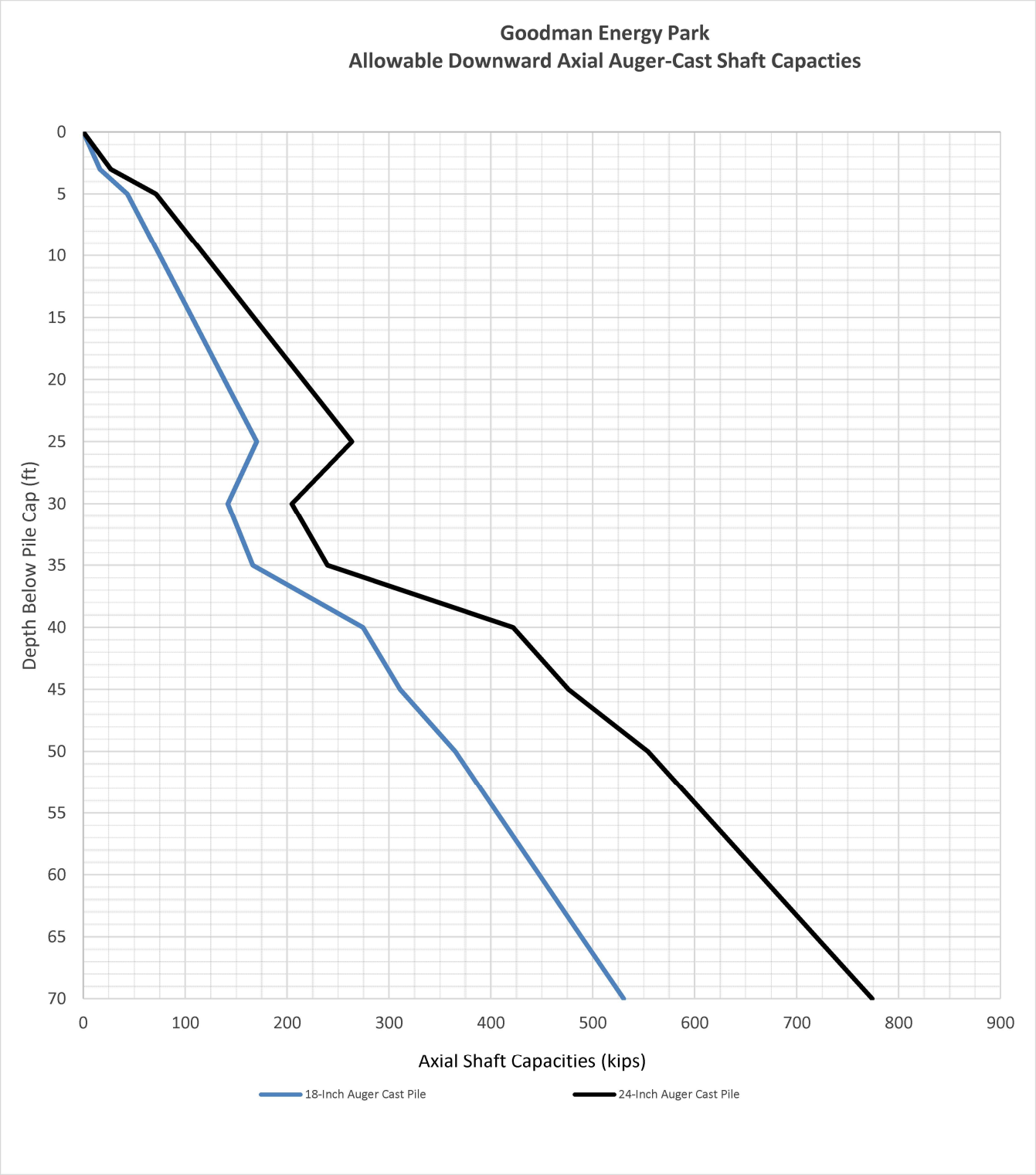
Figure Title
SEISMIC HAZARD ZONES MAP

Project No.	Figure No.
721040501	7
Date: DECEMBER 2024	
Scale: AS SHOWN	
Drawn By: CR	

Filename: \\langan.com\data\LAX\data5\721040501\Project Data_Discipline\Geotechnical\CAD\- GEOSEISMIC FIGURES\GEOSEISMIC FIGURES.dwg Date: 12/12/2024 Time: 15:13 User: vramirez Style Table: Langan.stb Layout: SHZM



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WASHINGTON DC VIRGINIA WEST VIRGINIA OHIO FLORIDA
TEXAS ARIZONA CALIFORNIA

ABU DHABI ATHENS DOHA
DUBAI ISTANBUL LONDON PANAMA

Langan CA, Inc.

Project

GEP VERNON

3049 and 3163 East Vernon Avenue,
Vernon, CA

LOS ANGELES COUNTY CALIFORNIA

Figure Title

DOWNWARD AXIAL SHAFT CAPACITIES FOR 18- & 24-INCH DIAMETER AUGER-CAST PILES

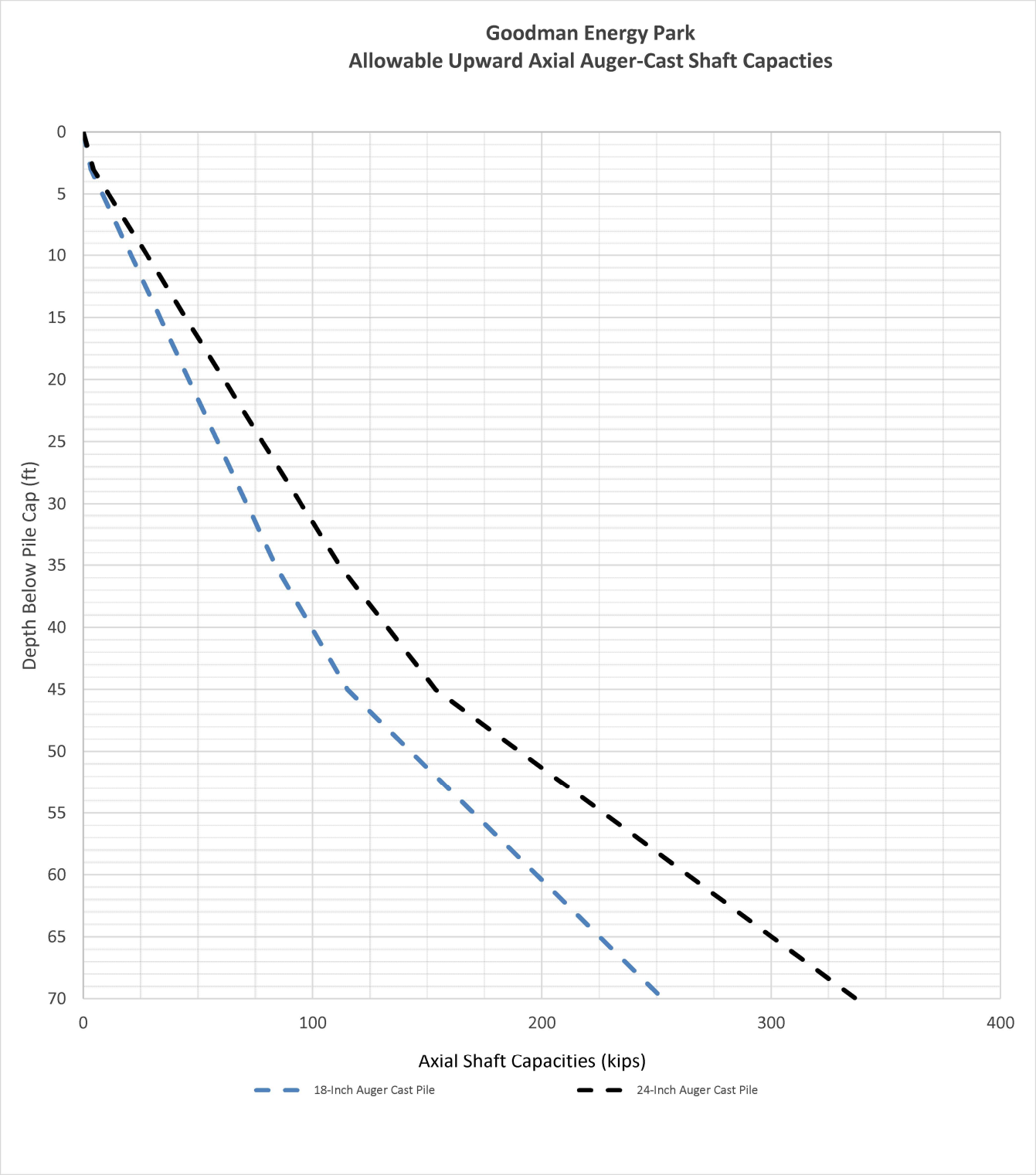
Project No.
721040501

Date
DECEMBER 2024

Scale
N.T.S.

Drawn By
BW

Figure No.
8



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TEXAS ARIZONA CALIFORNIA

ABU DHABI ATHENS DOHA
DUBAI ISTANBUL LONDON PANAMA

Langan CA, Inc.

Project

GEP VERNON

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Vernon, CA

LOS ANGELES COUNTY CALIFORNIA

Figure Title

UPWARD AXIAL SHAFT CAPACITIES FOR 18- & 24-INCH DIAMETER AUGER-CAST PILES

Project No.
721040501

Date
DECEMBER 2024

Scale
N.T.S.

Drawn By
BW

Figure No.
9

APPENDIX A
Current Field Explorations and Laboratory Testing

APPENDIX A

SUBSURFACE EXPLORATIONS

Our current investigation consisted of exploring the subsurface conditions at the site by drilling five borings (B-17 through B-21) to a depth of approximately 51½ feet bgs at the locations shown on Figure 2. The borings were drilled by 2R Drilling, Inc. using truck-mounted hollow-stem auger drilling equipment on September 3, 2024.

The locations of the exploration were determined in the field by observing nearby landmarks/structures, which were based on site maps prepared by us. This information should be considered accurate only to the degree implied by the methods used.

Our field engineer observed and logged the explorations. We obtained representative samples of the soils encountered in the explorations. Classifications and sampling intervals are presented on the exploration logs included in this appendix.

Upon completion of drilling, the samples collected from the borings were transported to our office for further evaluation. The boring was backfilled with bentonite cement grout mix per Vernon City guidelines and topped with cuttings.

We also explored the subsurface conditions at the site with four CPTs advanced to depths ranging between approximately 9.5 and 71.5 feet bgs at the locations shown on Figure 2. The CPTs were advanced on September 3, 2025, by Kehoe Testing and Engineering, Inc.

SOIL SAMPLING

Samples were collected from the borings using modified California split-spoon samplers in general accordance with ASTM D3550 and we performed Standard Penetration Tests (SPTs) in general accordance with ASTM D1586.

The modified California samplers and SPTs were driven using a 140-pound hammer free falling 30 inches. The samplers were driven a total distance of 18 inches or to refusal. The number of blow counts required to drive the sampler for each 6-inch segment was recorded (or less if refusal is met) on the exploration logs. Sampling methods and intervals are shown on the exploration logs.

The samples collected from the borings were transported to our office for further review and for assignment of geotechnical laboratory testing.

SOIL CLASSIFICATION

The soil samples were described in accordance with the classification legend that is included in this appendix prior to the exploration logs. The exploration logs indicate the depths at which the soils or their characteristics change, although the change may be gradual. If the change occurred between sample locations, the depth was interpreted. Changes between geologic units or soil types on the boring logs are represented with a solid line if observed directly in the samples, and with a dashed line if inferred between sample depths. Classifications are shown on the exploration logs.

LABORATORY TESTING

Moisture Content and In-place Dry Density

The natural moisture content of select soil samples were performed in general accordance with ASTM D2216. The natural moisture content is a ratio of the weight of the water to soil in a test sample and is expressed as a percentage.

Select soil samples were tested to determine the in situ dry density. The tests were performed in general accordance with ASTM D2937. The dry density is defined as the ratio of the dry weight of the soil sample to the volume of that sample. The dry density typically is expressed in units of pounds per cubic foot (pcf).

The test results are presented in this appendix and on the boring logs.

Maximum dry-density and Optimum Moisture Content

Maximum dry-density and Optimum Moisture Content testing was performed in general accordance with ASTM D 1557 on one bulk samples obtained from the explorations. The tests determine the optimal moisture content at which sample achieves its maximum dry density. The test results are presented in this appendix**.**

Strength Testing

Direct shear tests were completed on select samples obtained from the explorations. The tests were performed in general accordance with ASTM D3080. The test determines the effects upon shear resistance and displacement, and strength properties such as Mohr strength envelopes.

The test results are presented in this appendix.

Consolidation Testing

One-dimensional consolidation testing was performed in general accordance with ASTM D2435 on relatively undisturbed soil samples. The test measures the volume change of a soil sample under predetermined loads.

The test results are presented in this appendix.

Expansion Index

Expansion index tests were performed on selected bulk samples of the on-site soils in accordance with the latest version of Test Method ASTM D4829.

The test results are presented in this appendix.

Atterberg Limits

Atterberg Limit tests were completed on select samples obtained from the explorations. The tests were conducted in general accordance with ASTM D 4318. The test measures the amount of material finer than 75-μm (No. 200) sieve in soils. The test results are presented in this appendix.

Corrosion Testing

Corrosion testing was performed on one selected sample. The testing was completed in general accordance with California Test Methods 634, 417, and 422 for pH value, sulfate content, and chloride content, respectively.

The test results are presented in this appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soil (more than half of soil is larger than the no. 200 sieve size)	**Gravels** (more than half of coarse fraction is retained/> no. 4 sieve size)	**GW**	Well-graded GRAVELS with less than 5% fines or gravel-sand mixtures
		GP	Poorly-graded GRAVELS with less than 5% fines or gravel-sand mixtures
		GM	Silty gravels, gravel-sand-silt mixtures;GRAVELS with greater than 12% ML or MH fines
		GC	Clayey gravels, gravel-sand-clay mixtures; GRAVELS with greater than 12% CL or CH
	Sands (more than half of coarse fraction passes/< no. 4 sieve size)	**SW**	Well-graded sands with less than 5% fines or gravelly sands, little or no fines
		SP	Poorly-graded sands with less than 5% fines or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures; SANDS with greater than 12% ML or MH fines
		SC	Clayey sands, sand-clay mixtures; SANDS with greater than 12% CL or CH fines
Fine-Grained Soils (more than half of soil is smaller than the no. 200 sieve size)	**Silts and Clays** LL = < 50	**ML**	Inorganic silts and clayey silts of low plasticity, sandy non-plastic SILT, gravelly SILT
		CL	Inorganic clays of low to medium plasticity, silty CLAY, trace fines, sand
		OL	Organic silts and organic silt-clays of non-plastic to medium plasticity
	Silts and Clays LL = > 50	**MH**	Inorganic medium plastic silts, medium plastic to very plastic clayey silts.
		CH	Inorganic plastic to very plastic CLAYS, sandy plastic CLAY
		OH	Organic medium plastic to plastic silty CLAYS, and very plastic CLAYS
Highly Organic Soils		**PT**	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to ¾" ¾" to No.4	76.2 to 4.75 76.2 to 19.1 19.1 to 4.75
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.240 to 0.075
Silt and Clay	Below No. 200	Below 0.075

GROUNDWATER READING

- Groundwater encountered during drilling
- Groundwater at completion
- Groundwater at 24 hours

SOIL DESCRIPTIONS/SYMBOLS

- Well-graded GRAVEL (GW)
- Poorly-graded GRAVEL (GP)
- Silty GRAVEL (GM)
- Clayey GRAVEL (GC)
- Well-graded SAND (SW)
- Poorly-graded SAND (SP)
- Silty SAND (SM)
- Clayey SAND (SC)
- AGGREGATE BASE
- Low-Plasticity SILT (ML)
- High-Plasticity SILT (MH)
- Low-Plasticity CLAY (CL)
- High-Plasticity CLAY (CH)
- SANDSTONE
- CLAYSTONE
- SILTSTONE
- FILL
- ASPHALT

SAMPLER TYPE

- CR - Modified California (CR) split-barrel ring sampler with 3.0-inch outside diameter and a 2.5-inch inside diameter.
- SPT - Standard Penetration Test (SPT) split-barrel sampler with a 2.00-inch outside diameter with a 1.5-inch inside diameter
- ST - Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure
- BAG - Bulk Sample
- C - Core Barrel

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Langan CA, Inc.

515 South Flower Street, Suite 1060
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Figure Title

BORING LOG LEGEND

Figure No.

APPENDIX A

LANGAN

Log of Boring **B-17** Sheet 1 of 3

Project: GEP Vernon	Project No.: 721040501
Location: 3049 East Vernon Avenue	Elevation and Datum: Approx. 197
Drilling Company: 2R Drilling	Date Started: 09/03/2024 / Date Finished: 09/03/2024
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 5 / Undisturbed 5 / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Carlos
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+197.0		0						Hand auger from 0-5 feet. Bulk sample collected from 0-5 feet. Direct Shear Expansion Index Compaction Corrosion WC = 4.9% DD = 101.4 pcf
	+196.6	AB = 5-inches thick							
		Articial Fill (af) SAND with Silt and Gravel (SP-SM), brown, moist, fine sand, fine gravel [FILL].	1						
			2						
			3						
			4						
	+192.0		5						
		Quaternary Young Alluvium (Qya) SAND (SP), light brown, loose, moist, fine sand.	6	S-1	CR	18	3 4 7	0.0	
			7						
			8						
			9						
		Medium dense, fine to coarse sand, trace fine gravel.	10	S-2	SPT	18	10 11 13	0.0	
			11						
			12						
			13						
			14						
		Dense, fine to medium sand, trace fine to coarse gravel.	15	S-3	CR	18	7 19 21	0.0	WC = 3.3% DD = 104.4 pcf
			16						
			17						
			18						
			19						
	+177.0		20						

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Log of Boring **B-17** Sheet 2 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 197

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+177.0	SAND with Gravel (SP), light brown, medium dense, moist, fine to coarse sand, fine to coarse gravel.	20	S-4	SPT	18	11 11 13	0.0	
			21						
			22						
			23						
			24						
		Dense, trace fine to coarse gravel.	25	S-5	CR	18	19 25 28	0.3	Direct Shear
			26						
			27						
	+169.0	Silty SAND (SM), wet, fine sand.	28						
			29						
	+166.5	Sandy SILT to Clay (ML/CL), brown, stiff, moist.	30	S-6	SPT	18	7 7 6	0.1	LL = 27, PL = 15, PI = 12
			31						
			32						
	+164.0	Clay (CL), brown, hard, moist.	33						
			34						
			35	S-7	CR	18	20 37 50/6"	0.1	WC = 15.8% DD = 120.5 pcf
			36						
			37						
			38						
			39						
	+157.0	Silty SAND (SM), brown, medium dense, moist, fine sand, layer of sandy silt in sample, high fines content.	40	S-8	SPT	18	6 7 12	0.0	
			41						
			42						
	+154.0	SAND (SP), light brown, very dense, moist, fine sand.	43						
			44						
			45						

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Log of Boring **B-17** Sheet 3 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 197

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+152.0		45	S-9	CR	18	17 25 50	0.5	WC = 2.9% DD = 102.3
	+149.0	Silty SAND (SM), brown, dense, moist, fine sand.	46						
			47						
			48						
			49						
			50	S-10	SPT	18	9 16 25	0.0	
	+145.5		51						
		Total Depth = 51.5 feet Groundwater not encountered. Borehole backfilled with grout and topped with cuttings.	52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **B-18** Sheet 1 of 3

Project: GEP Vernon	Project No.: 721040501
Location: 3049 East Vernon Avenue	Elevation and Datum: Approx. 197
Drilling Company: 2R Drilling	Date Started: 09/03/2024 / Date Finished: 09/03/2024
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 5 / Undisturbed 5 / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Carlos
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+197.0	**Engineered Fill (afe)** Processed Miscellaneous Base, Sandy GRAVEL (GP), light gray, moist, dense, fine to coarse grained [FILL].	0						Unable to hand auger due to base/fill material.
	+195.0	Silty SAND with Gravel (SM), brown, medium dense, moist, fine sand, few fine gravel [FILL].	1–4						
			5	S-1	SPT	18	8 9 11	0.0	WC = 2.6% DD = 103.6 pcf
		Mottled brown and gray, very dense, moist, fine sand, some gravel.	6–9						
			10	S-2	CR	18	26 35 38	0.0	WC = 8.1% DD = 123.9 pcf
			11–14						
			15	S-3	SPT	18	9 7 7	0.0	
	+181.5	**Quaternary Young Alluvium (Qya)** SAND (SP), brown, medium dense, moist, fine to medium sand, trace fine gravel, trace silt.	16–20						

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Log of Boring **B-18** Sheet 2 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 197

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+177.0	Light brown, dense, fine to coarse sand.	20	S-4	CR	18	15 20 32	0.0	Consolidation
			21						
			22						
			23						
			24						
		Some fine gravel.	25	S-5	SPT	18	13 12 14	0.0	
			26						
			27						
	+169.0	Silty SAND (SM), brown, medium dense, very moist to wet, fine sand.	28						
			29						
			30	S-6	CR	18	7 8 14	0.0	Sandy clay at bottom of sample. Consolidation
	+165.5		31						
		Sandy CLAY (CL), brown, very stiff, moist, fine sand.	32						
			33						
			34						
			35	S-7	SPT	18	5 8 11	0.0	Corrosion
			36						
			37						
			38						
			39						
		Hard.	40	S-8	CR	18	20 25 34	0.0	WC = 14.8% DD = 119.6 pcf
			41						
			42						
	+154.5	SAND (SP), brown, dense, moist, fine to coarse sand, trace silt.	43						
			44						
			45						

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Log of Boring **B-18** Sheet 3 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 197

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+152.0		45					0.0	
			46	S-9	SPT	18	14 17 17		
			47						
			48						
			49						
		Light brown.	50	S-10	CR	12	27 50/6"	0.0	WC = 3.7% DD = 112.6 pcf
	+145.5		51						
		Total Depth = 51.5 feet Groundwater not encountered. Borehole backfilled with grout and topped with cuttings.	52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **B-19** Sheet 1 of 3

Project: GEP Vernon	Project No.: 721040501
Location: 3049 East Vernon Avenue	Elevation and Datum: Approx. 196
Drilling Company: 2R Drilling	Date Started: 09/03/2024 — Date Finished: 09/03/2024
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 5 — Undisturbed 5 — Core
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ - — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Carlos
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+196.0	**Artificial Fill (af)** SAND (SP), light brown to brown, moist, fine to medium sand, trace silt [FILL].	0						Hand auger from 0-5 feet.
	+191.0	**Quaternary Young Alluvium (Qya)** Sand (SP), light brown to brown, loose, moist, fine to medium sand, trace fine to coarse gravel.	5	S-1	CR	18	5 4 5	0.2	
			10						Drill rig chatter from approximately 8-10 feet.
		Dense, fine to coarse sand.	10	S-2	SPT	18	12 13 17	1.1	
		Medium dense, fine to medium sand, no gravel.	15	S-3	CR	18	11 14 21	1.7	WC = 5.2% DD = 101.6 pcf
			20						

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Log of Boring **B-19** Sheet 2 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 196

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+176.0	Fine to coarse sand, some fine gravel.	20	S-4	SPT	18	10 13 15	0.1	
			21						
			22						
			23						
			24						
		Dense.	25	S-5	CR	18	19 30 37	0.4	WC = 6.5% DD = 109.2 pcf
			26						
			27						
			28						
			29						
		Fine to coarse gravel.	30	S-6	SPT	18	11 19 23	0.0	
			31						
			32						
	+163.0		33						
		Sandy CLAY (CL), brown, very stiff, moist, fine sand.	34						
			35	S-7	CR	18	8 11 15	0.0	WC = 14.9% DD = 121.2 pcf
			36						
			37						
			38						
			39						
		Olive brown, some fine sand.	40	S-8A/S-8B	SPT	18	4 6 19	0.0	
	+155.0		41						
		SAND (SP), brown, medium dense, moist, fine sand, trace clay.	42						
			43						
			44						
			45						

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Log of Boring **B-19** Sheet 3 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 196

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+151.0	Light brown to brown, very dense, fine to medium sand.	45	S-9	C/R	17	26 36 50/5"	0.0	Direct Shear
			46						
			47						
			48						
			49						
		Light brown, fine to coarse sand, trace fine gravel.	50	S-10	SPT	18	10 26 29	0.0	
	+144.5		51						
		Total Depth = 51.5 feet Groundwater not encountered. Borehole backfilled with grout and topped with cuttings.	52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **B-20** Sheet 1 of 3

Project: GEP Vernon	Project No.: 721040501
Location: 3049 East Vernon Avenue	Elevation and Datum: Approx. 197
Drilling Company: 2R Drilling	Date Started: 09/03/2024 / Date Finished: 09/03/2024
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 5 / Undisturbed 5 / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Carlos
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+197.0	**Artificial Fill (af)** SAND (SP), brown, moist, fine sand, fine to coarse gravel, trace silt [FILL].	0						Bulk sample from 0-5 feet. Refusal on hand auger.
			1						
			2						
			3						
			4						
		Medium dense, increased silt, trace brick and glass fragments.	5	S-1	SPT	18	10 11 16	0.0	
			6						
	+190.0		7						
		Quaternary Young Alluvium SAND (SP), light brown to brown, medium dense, moist, fine sand, trace fine gravel.	8						
			9						
			10	S-2	CR	18	7 10 23	0.0	
			11						
			12						
			13						
			14						
		Fine to medium sand, trace fine to coarse gravel.	15	S-3	SPT	18	9 13 14	0.0	
			16						
			17						
			18						
			19						
			20						

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Log of Boring **B-20** Sheet 2 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 197

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+177.0	Light brown, fine gravel, fine to coarse sand.	20	S-4	CR	18	21 18 20	0.0	WC = 1.8% DD = 116.1 pcf
		No gravel, fine to medium sand.	25	S-5	SPT	18	12 12 15	0.1	
	+169.0	Sandy CLAY (CL), brown, hard, moist, fine sand.	28	S-6	CR	18	14 17 29	0.4	Direct Shear
	+164.0	SAND (SP), brown, dense, moist, fine to medium sand, trace fine gravel, trace clay.	33	S-7	SPT	18	12 14 16	0.1	
		Light brown, very dense, fine to coarse sand.	40	S-8	CR	18	21 36 39	1.1	WC = 4.2% DD = 102.9 pcf
			45						

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Log of Boring **B-20** Sheet 3 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 197

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+152.0	Dense, fine to medium sand.	45	S-9	SPT	18	7 17 22	0.2	
			46						
			47						
			48						
			49						
		Very dense, fine to coarse sand, fine to coarse gravel.	50	S-10	CR	12	42 50/6"	0.0	WC = 2.9% DD = 108.7 pcf
	+145.5		51						
		Total Depth = 51.5 feet Groundwater not encountered. Borehole backfilled with grout and topped with cuttings.	52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **B-21** Sheet 1 of 3

Project: GEP Vernon	Project No.: 721040501
Location: 3049 East Vernon Avenue	Elevation and Datum: Approx. 196
Drilling Company: 2R Drilling	Date Started: 09/03/2024 — Date Finished: 09/03/2024
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 5 — Undisturbed 5 — Core
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ - — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Carlos
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+196.0	**Artificial Fill** SAND with Silt (SP-SM), brown, dense, moist, fine sand, trace fine to coarse gravel, brick fragments [FILL].	0						Hand auger from 0-5 feet.
			5	S-1	CR	18	19 27 30	0.3	WC = 6.2% DD = 121.4 pcf
	+186.0	**Quaternary Young Alluvium** SAND (SP), light brown, medium dense, moist, fine to medium sand, trace fine gravel.	10	S-2	SPT	18	6 8 11	0.0	
		Dense, fine to coarse sand, fine to coarse gravel.	15	S-3	CR	18	28 32 42	0.0	4-inch cobble in shoe. Sample disturbed. WC = 2.5% DD = 108.5 pcf
			20						

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Log of Boring **B-21** Sheet 2 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 196

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+176.0	Fine to medium sand.	20	S-4	SPT	18	13 17 19	0.0	
			21						
			22						
			23						
			24						
		Medium dense, fine to coarse sand.	25	S-5	CR	18	11 12 12	0.0	Brown silt at bottom of sample.
			26						
			27						
			28						
			29						
		Dense.	30	S-6	SPT	18	17 18 18	0.0	
	+164.5		31						
		CLAY with Sand (CL), brown, very stiff, moist, fine sand.	32						Clay in sample tip.
			33						
			34						
			35	S-7	CR	18	10 13 14	1.6	WC = 2.5% DD = 117.4 pcf
			36						
			37						
			38						
			39						
	+156.0		40	S-8	SPT	18	8 10 15	0.0	
		Clayey SAND (SC), brown, medium dense, moist, fine sand.	41						
			42						
	+153.0		43						
		SAND (SP), brown, dense, moist, fine to medium sand.	44						
			45						

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Log of Boring **B-21** Sheet 3 of 3

Project	Project No.
GEP Vernon	721040501
Location	**Elevation and Datum**
3049 East Vernon Avenue	Approx. 196

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+151.0		45	S-9	CR	18	16 20 26	0.0	Direct Shear WC = 13.4% DD = 122.5 pcf
	+146.0	Sandy SILT (ML), olive brown, very stiff, moist, fine sand.	50	S-10A/S-10B	SPT	18	7 17 21	0.0	
	+145.0		51						
	+144.5	SAND (SP), brown, dense, moist, fine to medium sand.							
		Total Depth = 51.5 feet Groundwater not encountered. Borehole backfilled with grout and topped with cuttings.	52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

MOISTURE DENSITY TESTS

PROJECT Langan # 721040501 **JOB NO.** 2012-0057 **BY** LD **DATE** 09/14/24

Sample No.	B-17/S-1	B-17/S-3	B-17/S-7	B-17/S-9	B-18/S-2	B-18/S-8	B-18/S-10	B-18/S-1
Depth (ft)	5.0	15.0	35.0	45.0	10.0	40.0	50.0	5.0
Testing								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Clay	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Clay	Brown, Silty Sand	Brown, Silty Sand
Wet+Tare	831.3	840.6	1030.2	989.6	996.0	1220.1	1072.1	831.0
Tare	5	5	5	6	5	6	6	5
Wet Weight	118.1	142.5	159.9	129.5	65.7	172.1	130.2	118.8
Dry Weight	112.6	137.9	138.1	125.9	60.8	149.9	125.6	115.8
Wet density	106.3	107.9	139.6	105.2	133.8	137.3	116.7	106.3
% Water	4.9	3.3	15.8	2.9	8.1	14.8	3.7	2.6
Dry Density	101.4	104.4	120.5	102.3	123.9	119.6	112.6	103.6
O.B.Press(psf)								

Sample No.	B-19/S-3	B-19/S-5	B-19/S-7	B-20/S-4	B-20/S-8	B-20/S-10		
Depth (ft)	15.0	25.0	35.0	20.0	40.0	50.0		
Testing								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Clay	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand		
Wet+Tare	1001.3	1069.6	1029.0	901.8	837.1	1036.8		
No. Ring	6	6	5	5	5	6		
Wet Weight	123.7	150.5	156.1	115.2	128.1	126.1		
Dry Weight	117.6	141.3	135.8	113.2	122.9	122.6		
Wet density	106.8	116.4	139.4	118.1	107.3	111.8		
% Water	5.2	6.5	14.9	1.8	4.2	2.9		
Dry Density	101.6	109.2	121.2	116.1	102.9	108.7		
O.B.Press(psf)								

Geo-Logic ASSOCIATES

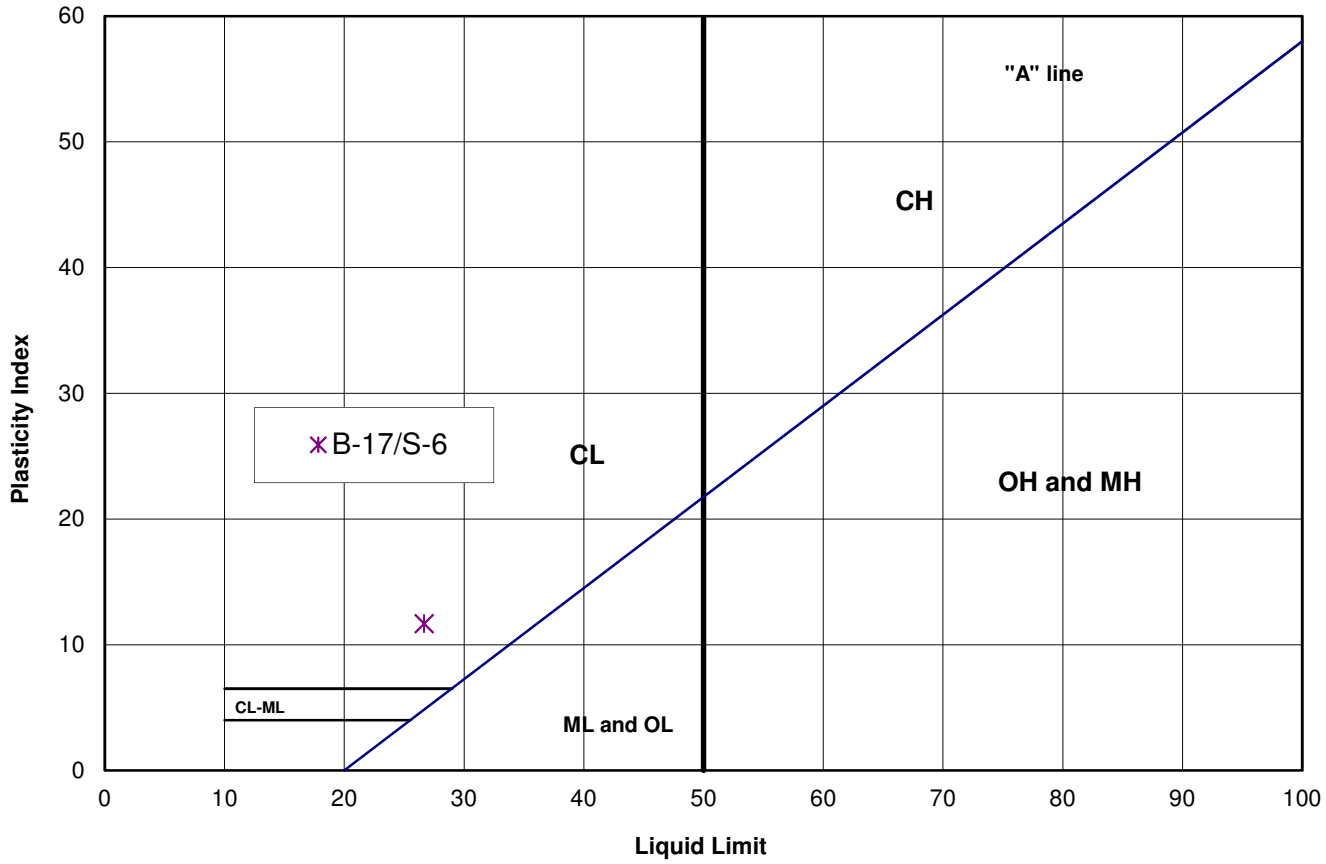
MOISTURE DENSITY TESTS

PROJECT Langan # 721040501 **JOB NO.** 2012-0057 **BY** LD **DATE** 09/14/24

Sample No.	B-21/S-1	B-21/S-3	B-21/S-5	B-21/S-7				
Depth (ft)	5.0	15.0	35.0	45.0				
Testing								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Sandy Clay				
Wet+Tare	966.3	860.5	549.4	1026.3				
Tare	5	5	3	5				
Wet Weight	125.5	78.4	166.0	155.9				
Dry Weight	118.2	76.5	161.9	137.5				
Wet density	128.9	111.2	120.4	138.9				
% Water	6.2	2.5	2.5	13.4				
Dry Density	121.4	108.5	117.4	122.5				
O.B.Press(psf)								
Sample No.								
Depth (ft)								
Testing								
Soil Type								
Wet+Tare								
No. Ring								
Wet Weight								
Dry Weight								
Wet density								
% Water								
Dry Density								
O.B.Press(psf)								

Geo-Logic ASSOCIATES

PLASTICITY INDEX _ ASTM D4318



Sample	Depth	LL	PL	PI	USCS	Material Description
B-17/S-6	30.0'	27	15	12	CL	

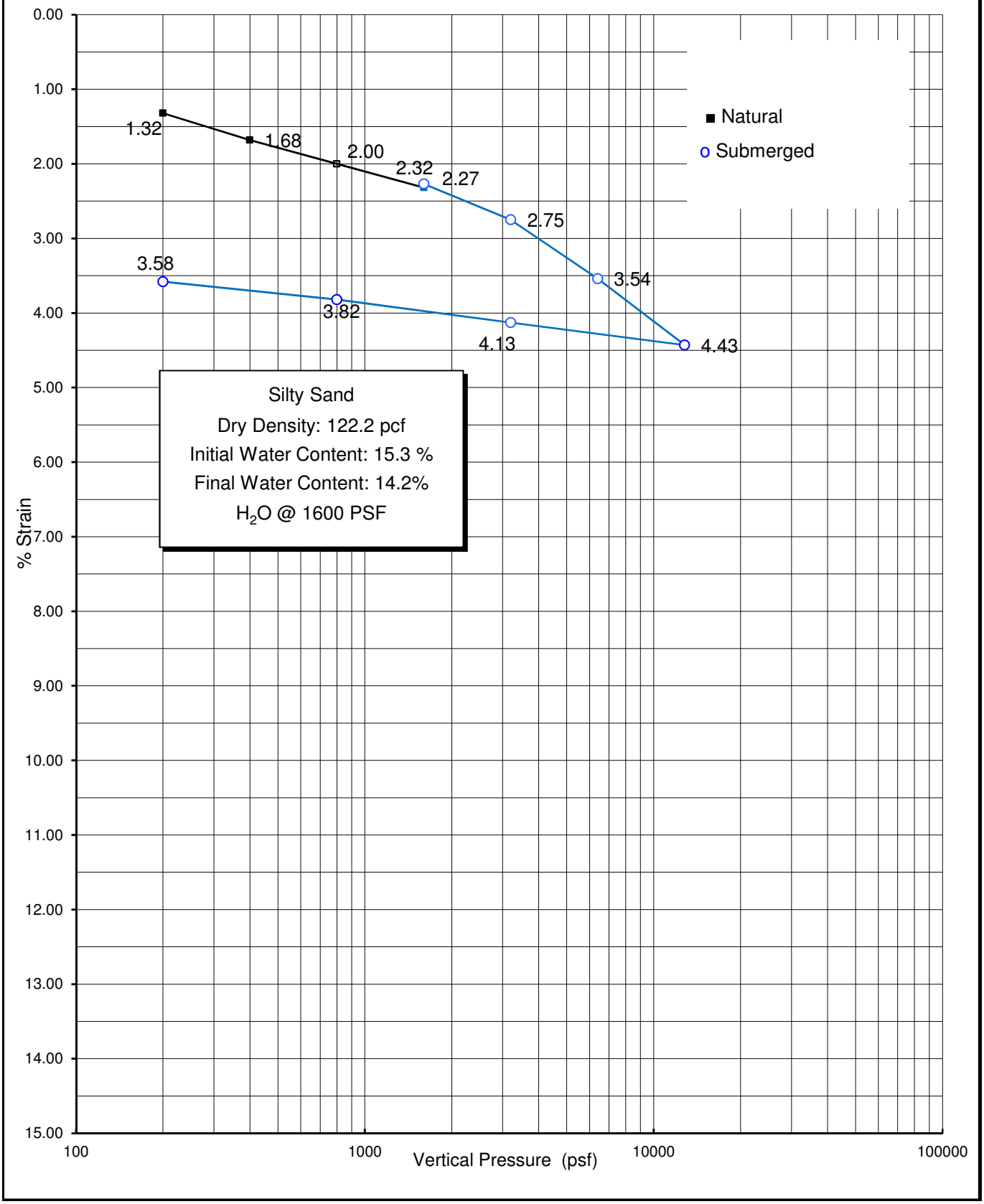
Job Name: Langan # 721040501 Date: 9/14/24

Job No.: 2012-0057

Geo-Logic ASSOCIATES

CONSOLIDATION TEST - ASTM D2435

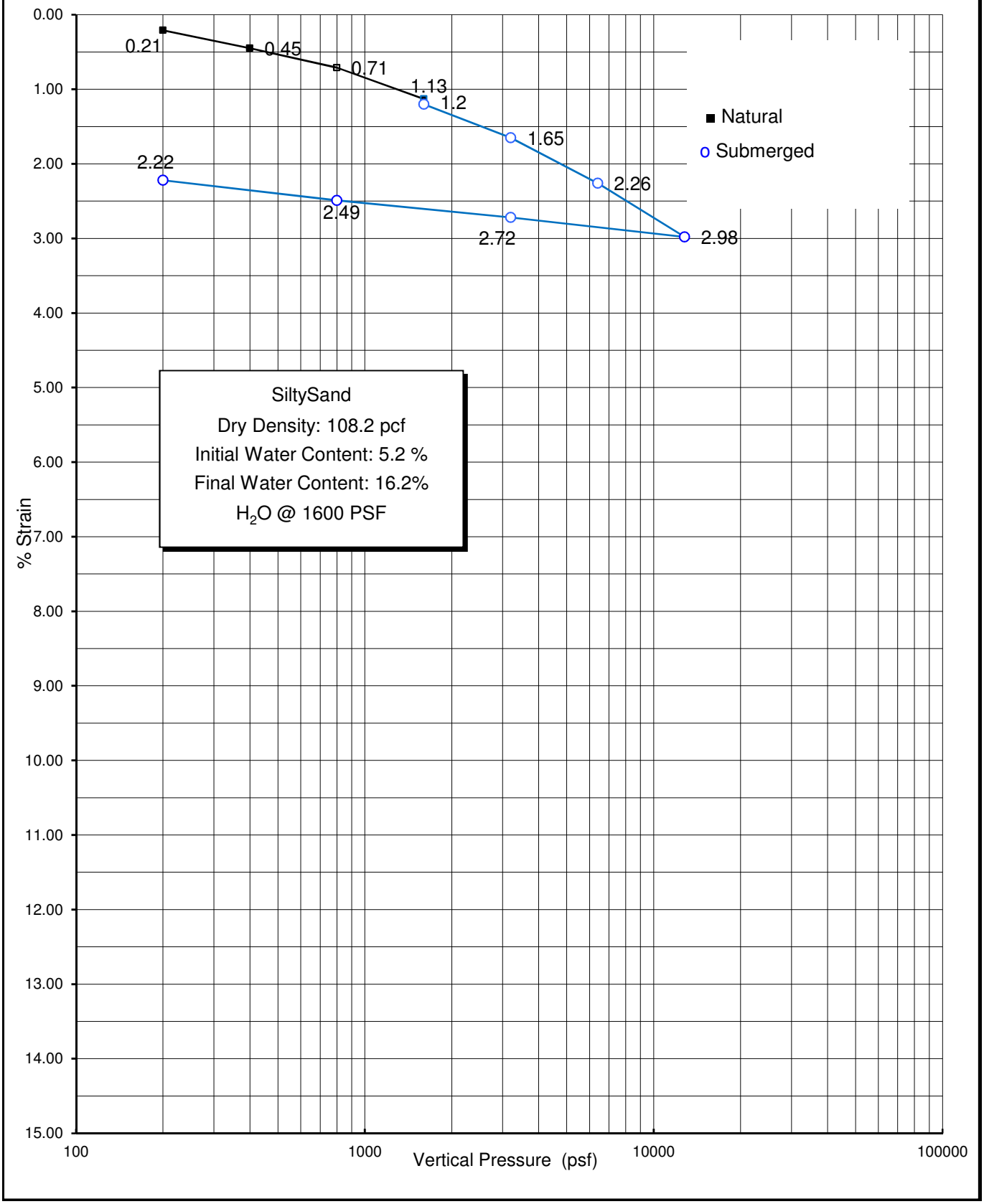
Boring / Sample No.	B-18/S-6	Depth:	30'	Date	09-06-24



Geo-Logic Associates

CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-18/S-4	Depth:	20'	Date	09-06-24



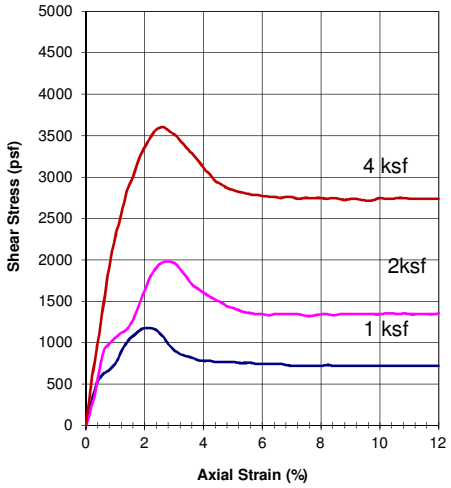
Geo-Logic ASSOCIATES

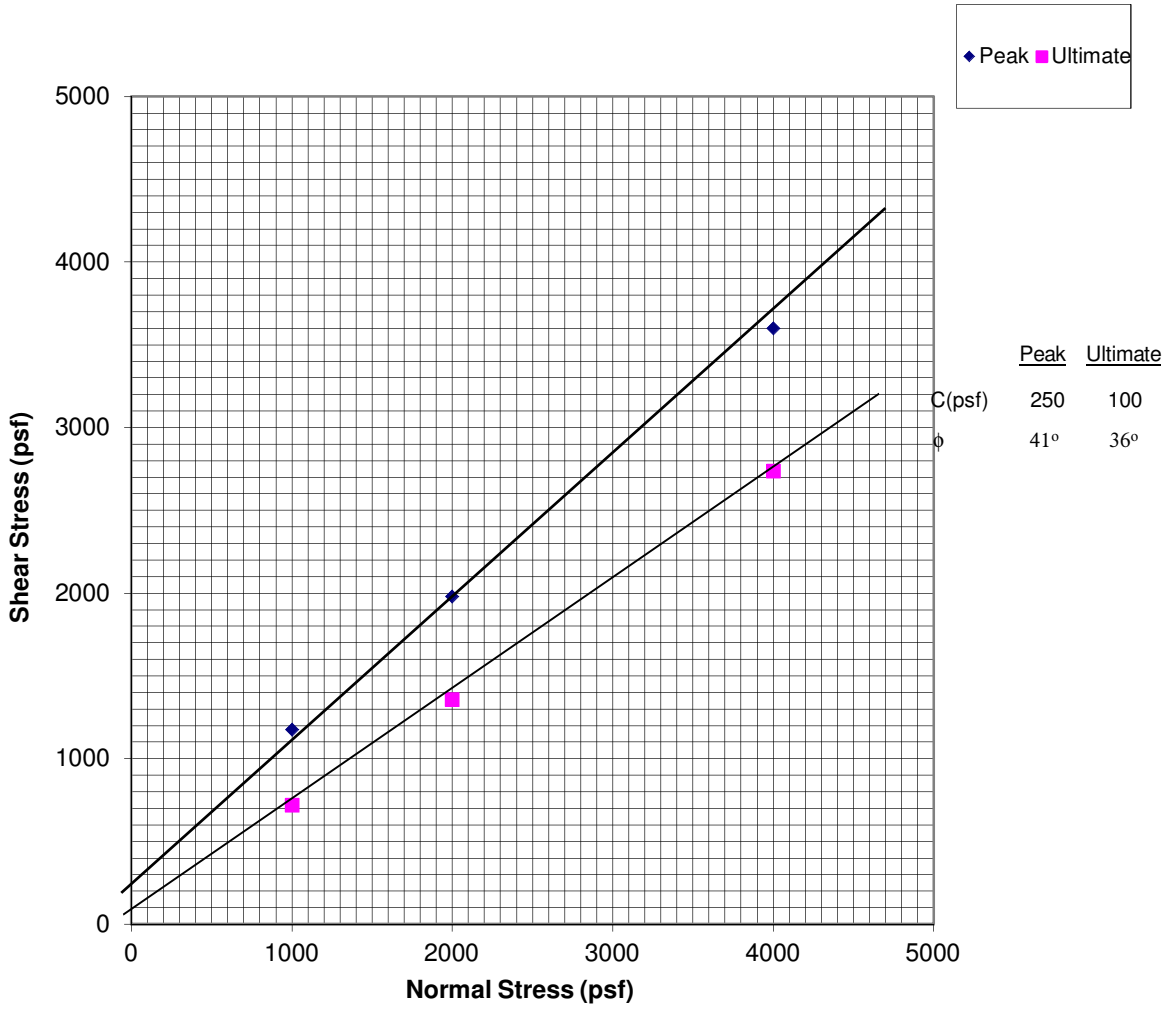
DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501
GLA JOB NO.:	2012-0057
SAMPLE :	B-17 @ 0 - 5'
SAMPLE TYPE:	Remolded & Saturated
DESCRIPTION:	Silty Sand

Date: 9/14/2024

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	1176	1980	3600
Displacement, % strain	2	2.8	2.64
Residual Stress, psf	720	1356	2736
Displacement, % strain	12	12	12
Initial Dry Density, pcf	117.3	117.3	117.3
Initial Water Content,%	9.5	9.5	9.5
Final Water Content,%	15.1	15.1	15.1
Strain Rate, in/min.	0.0084	0.0084	0.0084





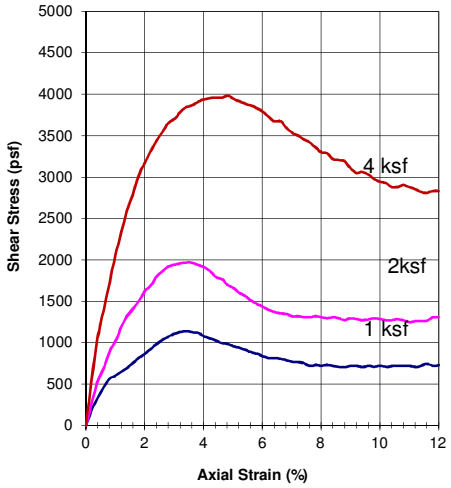
	Peak	Ultimate
C(psf)	250	100
ϕ	41°	36°

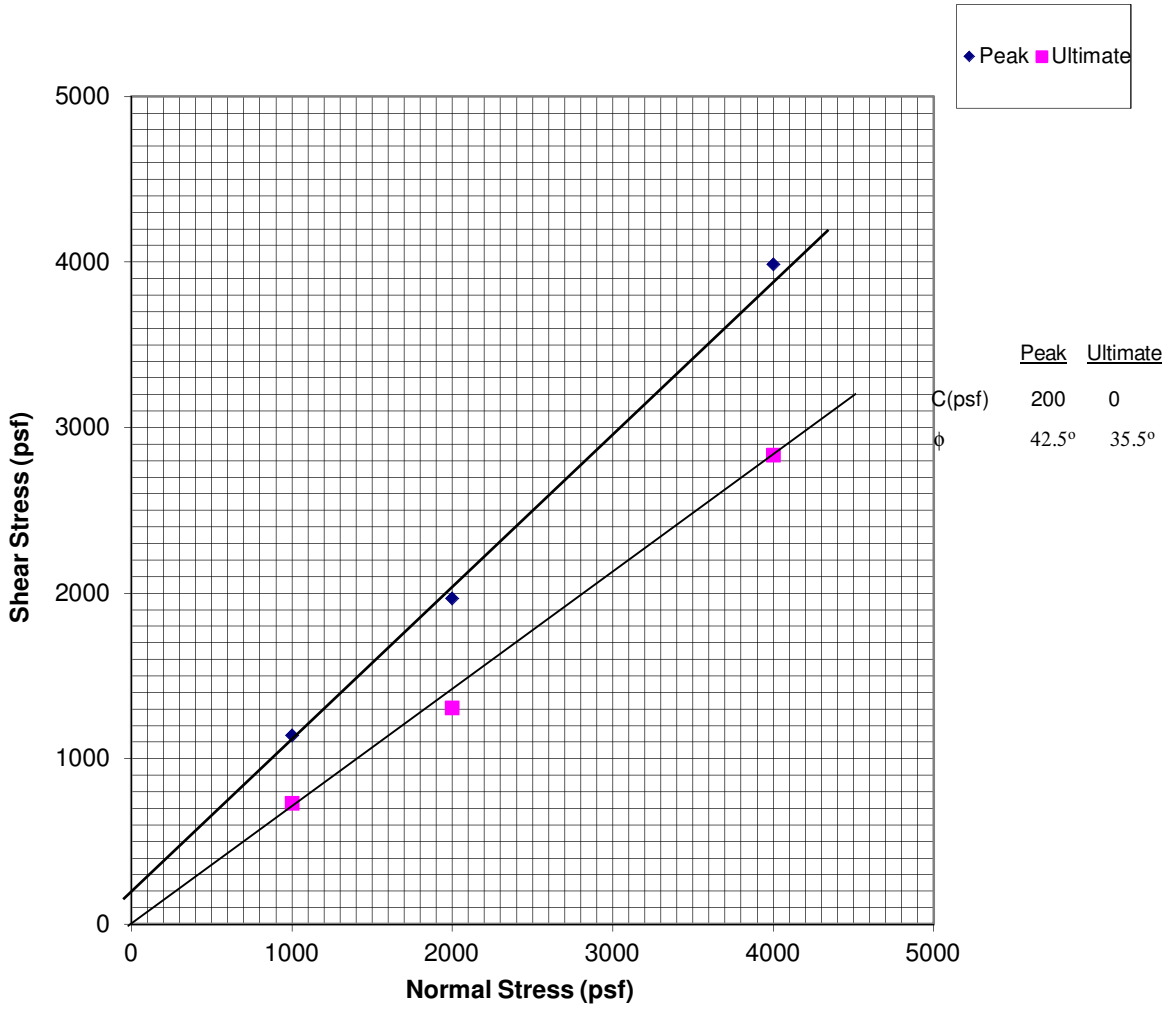
Geo-Logic ASSOCIATES

DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501	Date:	9/14/2024
GLA JOB NO.:	2012-0057		
SAMPLE :	B-17/S-5 @ 25'		
SAMPLE TYPE:	Undisturbed & Saturated		
DESCRIPTION:	Silty Sand		

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	1140	1968	3984
Displacement, % strain	3.44	3.4	4.84
Residual Stress, psf	732	1308	2832
Displacement, % strain	12	12	12
Initial Dry Density, pcf	111.3	111.3	111.3
Initial Water Content,%	2.4	2.4	2.4
Final Water Content,%	20.3	20.3	20.3
Strain Rate, in/min.	0.0084	0.0084	0.0084





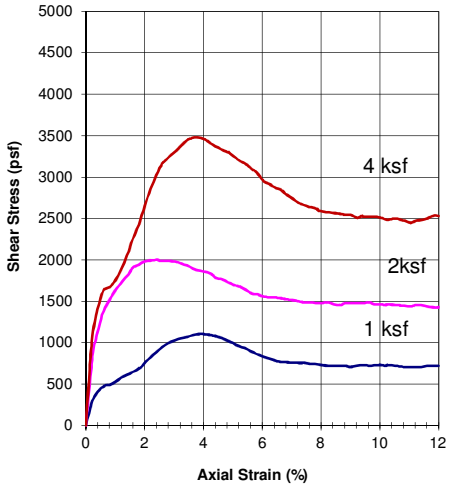
	Peak	Ultimate
C(psf)	200	0
ϕ	42.5°	35.5°

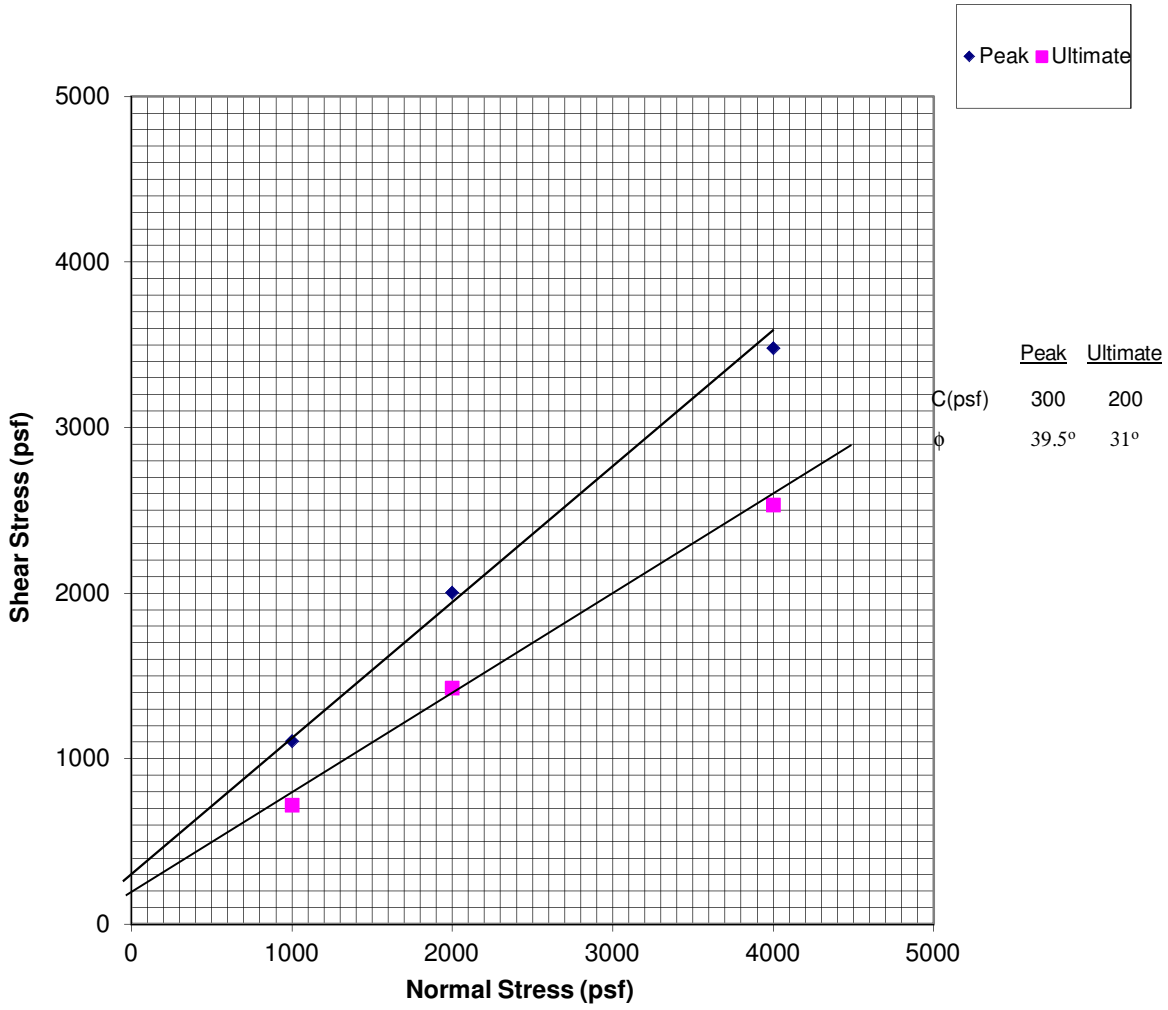
Geo-Logic ASSOCIATES

DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501	Date:	9/14/2024
GLA JOB NO.:	2012-0057		
SAMPLE :	B-19/S-9 @ 45'		
SAMPLE TYPE:	Undisturbed & Saturated		
DESCRIPTION:	Sandy Clay		

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	1104	2004	3480
Displacement, % strain	3.84	2.44	3.8
Residual Stress, psf	720	1428	2532
Displacement, % strain	12	12	12
Initial Dry Density, pcf	111.6	111.6	111.6
Initial Water Content,%	5.3	5.3	5.3
Final Water Content,%	18.3	18.3	18.3
Strain Rate, in/min.	0.0084	0.0084	0.0084





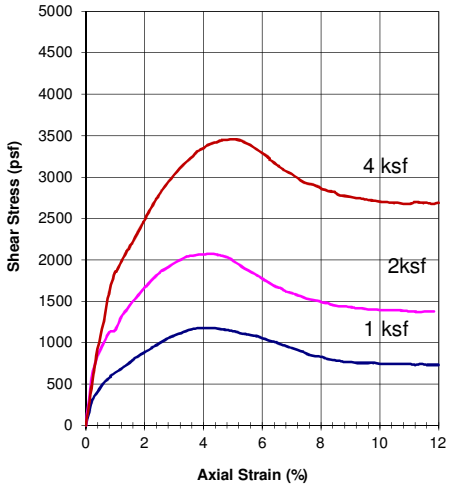
	Peak	Ultimate
C(psf)	300	200
ϕ	39.5°	31°

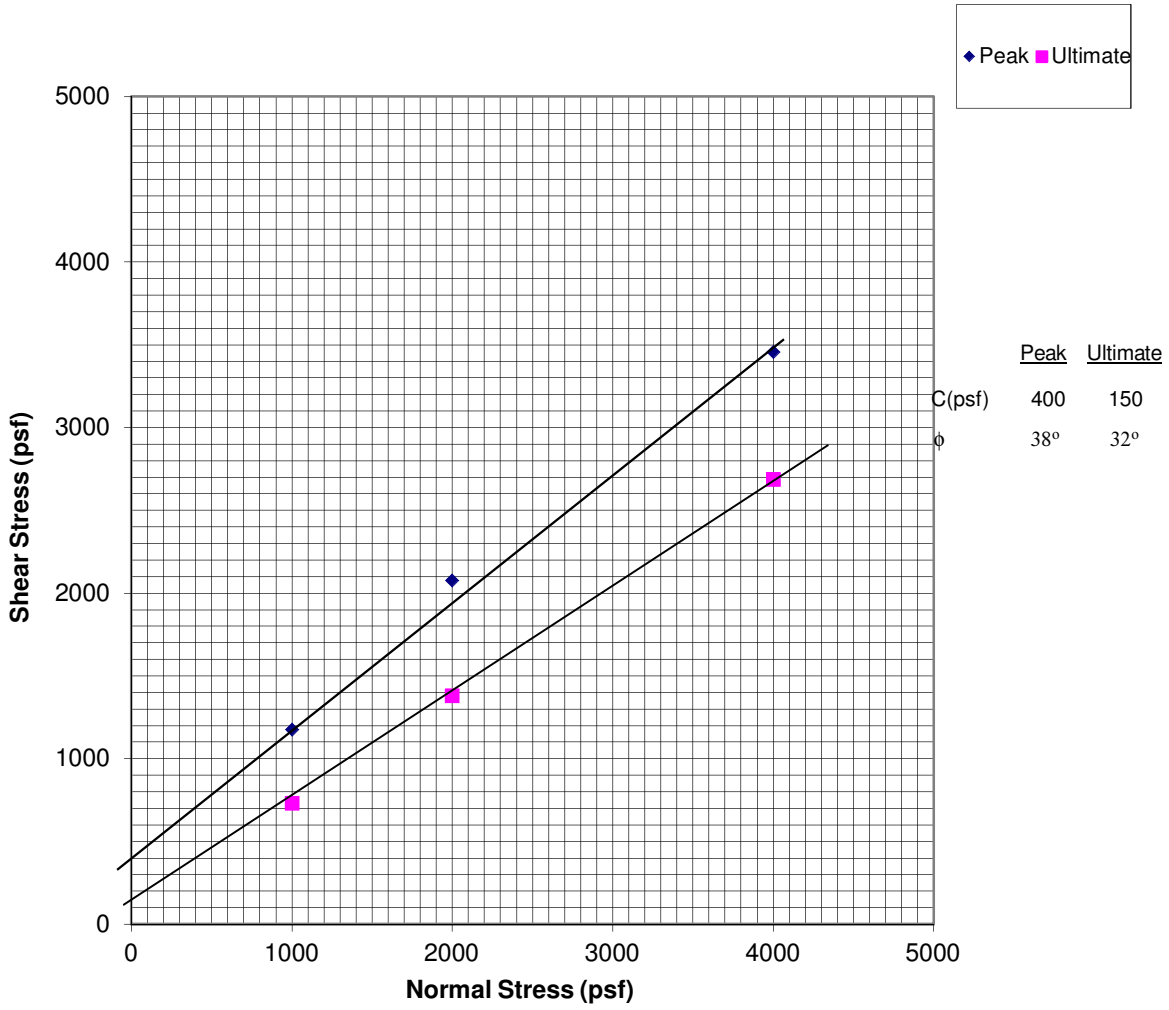
Geo-Logic ASSOCIATES

DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501	Date:	9/14/2024
GLA JOB NO.:	2012-0057		
SAMPLE :	B-20/S-6 @ 30'		
SAMPLE TYPE:	Undisturbed & Saturated		
DESCRIPTION:	Sandy Clay		

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	1176	2076	3456
Displacement, % strain	3.84	4.24	5
Residual Stress, psf	732	1380	2688
Displacement, % strain	12	11.84	12
Initial Dry Density, pcf	121.7	121.7	121.7
Initial Water Content,%	14.1	14.1	14.1
Final Water Content,%	16.2	16.2	16.2
Strain Rate, in/min.	0.0084	0.0084	0.0084





	Peak	Ultimate
C(psf)	400	150
ϕ	38°	32°

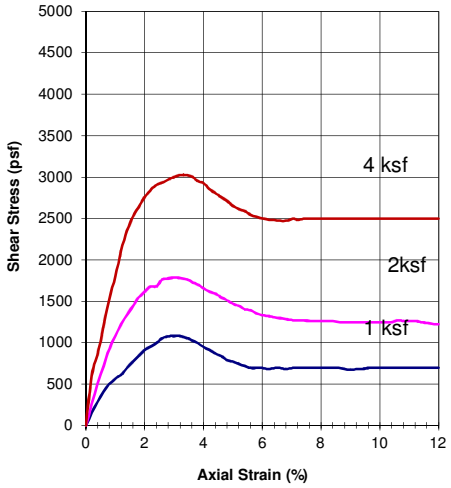
Geo-Logic ASSOCIATES

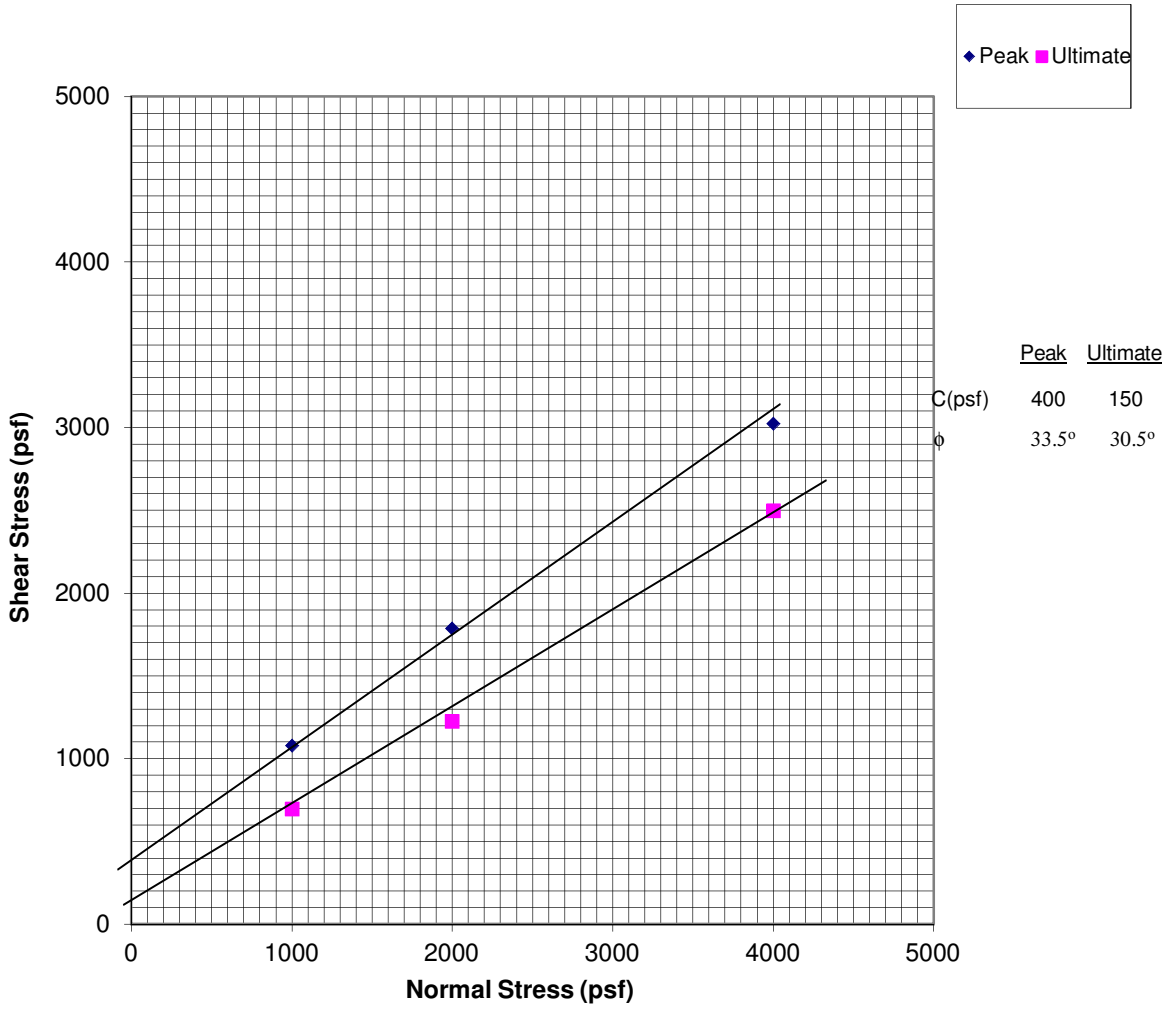
DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501
GLA JOB NO.:	2012-0057
SAMPLE :	B-21/S-9 @ 45'
SAMPLE TYPE:	Undisturbed & Saturated
DESCRIPTION:	Silty Sand

Date: 9/14/2024

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	1080	1788	3024
Displacement, % strain	2.84	3.04	3.24
Residual Stress, psf	696	1224	2496
Displacement, % strain	12	12	12
Initial Dry Density, pcf	102.3	102.3	102.3
Initial Water Content,%	4.8	4.8	4.8
Final Water Content,%	23.8	23.8	23.8
Strain Rate, in/min.	0.0084	0.0084	0.0084





	Peak	Ultimate
C(psf)	400	150
ϕ	33.5°	30.5°

Geo-Logic ASSOCIATES

EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

PROJECT Langan # 721040501 JOB NO. 2012-0057

Sample	B-17/ Bulk		By	LD	Sample			By	
Sta. No.					Sta. No.				
Soil Type	Brown, Silty Sand				Soil Type				
Date	Time	Dial Reading	Wet+Tare	614.2	Date		Dial Reading	Wet+Tare	
9/9/2024	16:20	0.3986	Tare	207.8				Tare	
		H2O	Net Weight	406.4				Net Weight	
9/10/2024	10:00	0.3988	% Water	9				% Water	
			Dry Dens.	113.0				Dry Dens.	
			% Max					% Max	
			Wet+Tare	639.4				Wet+Tare	
			Tare	207.8				Tare	
			Net Weight	431.6				Net Weight	
INDEX	0	0.0%	% Water	15.8	**INDEX**			% Water	

Sample			By		Sample			By	
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date		Dial Reading	Wet+Tare		Date		Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
INDEX			% Water		**INDEX**			% Water	

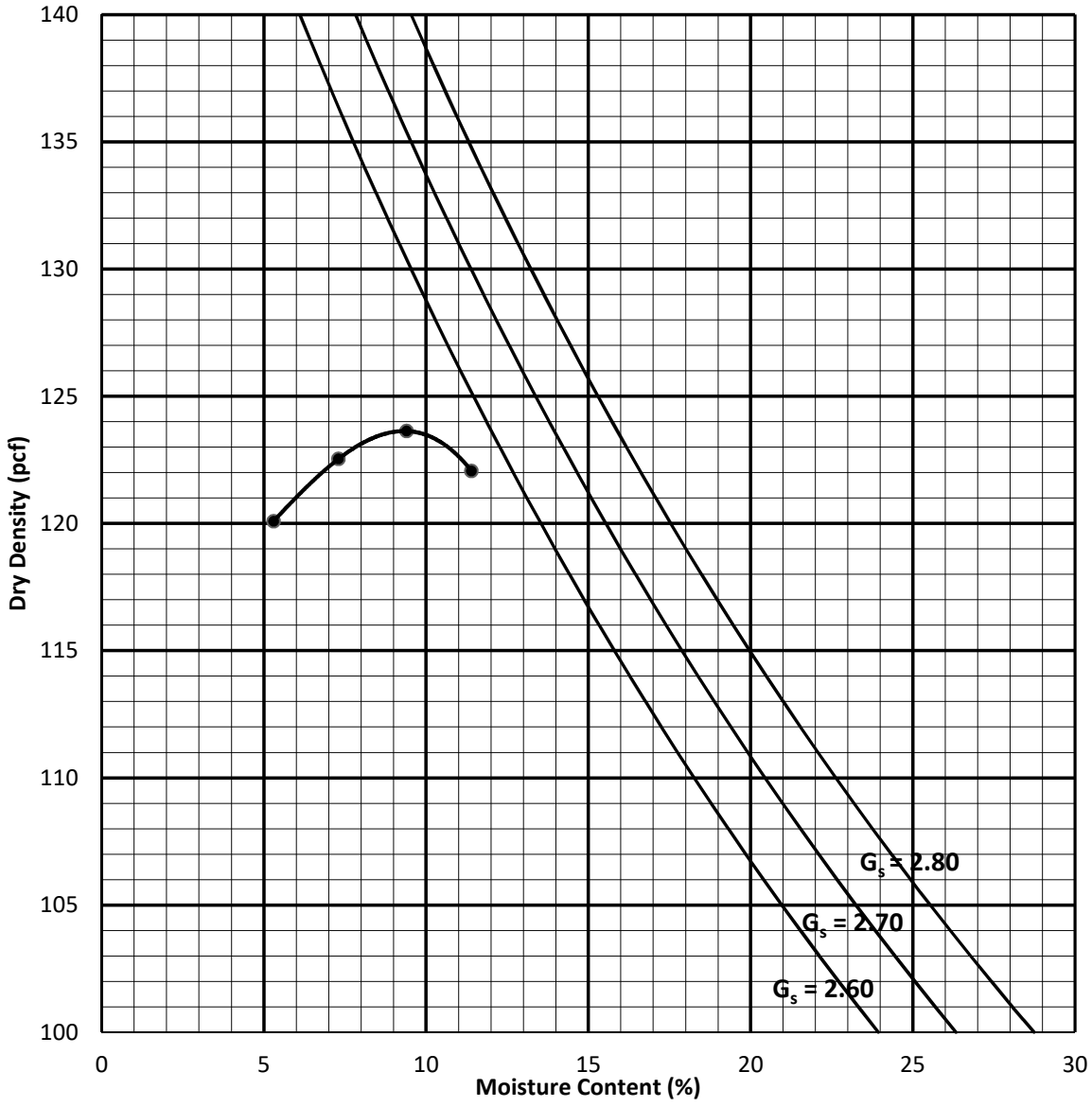
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan #721040501 **Job No.** 2012-0057
Sample: Max #1 **Date:** 5/23/2024
Description: Brown, Silty Sand w. F. Gravel **By:** LD

ASTM D1557	Method B	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		**A**	**B**	**C**	**D**
Wet Weight (grs)		2045	2056	1988	1912
Wet Density (pcf)		135.3	136.0	131.5	126.5
Moisture Content (%)		9.4	11.4	7.3	5.3
Dry Density (pcf)		123.6	122.1	122.5	120.1

Max. Dry Density : 123.5 pcf
Opt. Water Content: 9.5 %



Langan Engineering # 721040501 SOIL TEST RESULTS *Job No. 2012-0057*

SAMPLE NO.:	B-17 / Bulk	B-18 @ 35'			
DESCRIPTION	Silty Sand	Silty Clay			
DIRECT SHEAR TEST (type)					
Initial Moisture Content %					
Dry Density (pcf)					
Normal Stress (psf)					
Peak Shear Stress (psf)					
Ultimate Shear Stress (psf)					
Cohesion (psf)					
Internal Friction Angle (degrees)					
EXPANSION TEST UBC STD 18-2					
Initial Dry Density (pcf)					
Initial Moisture Content %					
Final Moisture Content %					
Pressure (psf)					
Expansion Index / Swell %					
CORROSIVITY TEST					
Resistivity (CTM643) (ohm-cm)	1400	860			
pH (CTM643)	7.8	7.7			
CHEMICAL TESTS					
Soluble Sulfate (CTM 417) (ppm)	213	82			
Chloride Content (CTM 422) (ppm)	168	254			
Wash #200 Sieve (ASTM-1140) %					
Sand Equivalent (ASTM D2419)					

Geo-Logic ASSOCIATES

APPENDIX B

Current Cone Penetrometer Test (CPT) Soundings

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Goodman Energy Park
3163 E. Vernon Avenue
Vernon, CA
September 3, 2024

Prepared for:

Mr. Shaun Wilkins
Langan Eng. & Environmental Services
18575 Jamboree Road, Ste 150
Irvine, CA 92612
Office (949) 561-9200 / Fax (949) 561-9201

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289
www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Goodman Energy Park project located at 3163 E. Vernon Avenue in Vernon, California. The work was performed by Kehoe Testing & Engineering (KTE) on September 3, 2024. The scope of work was performed as directed by Langan Eng. & Environmental Services personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at six locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-17	56	Refusal
CPT-18	11	Refusal
CPT-18A	9	Refusal
CPT-18B	75	
CPT-19	75	
CPT-20	52	Refusal

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone with a cone net area ratio of 0.83. The following parameters were recorded at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

At locations CPT-17 & CPT-20, shear wave measurements were obtained at various depths. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil behavior type on the CPT plots is derived from the attached CPT SBT plot (Robertson, "Interpretation of Cone Penetration Test…", 2009) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

The CPT data files have also been provided. These files can be imported in CPeT-IT (software by GeoLogismiki) and other programs to calculate various geotechnical parameters.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

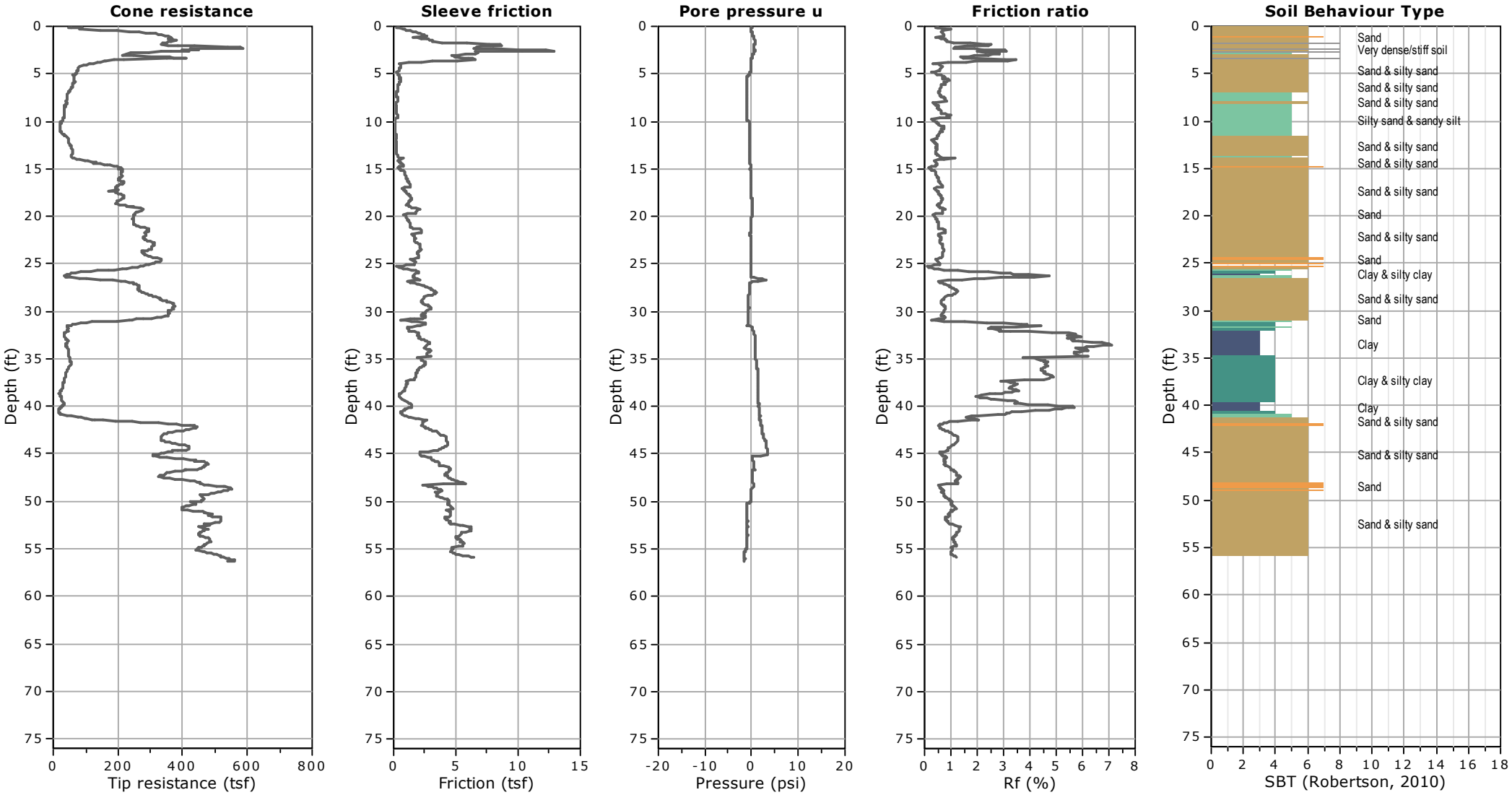
09/05/24-eb-6767

APPENDIX

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services / Goodman Energy Park**
Location: **3163 E. Vernon Ave, Vernon, CA**

CPT-17
Total depth: 56.30 ft, Date: 9/3/2024



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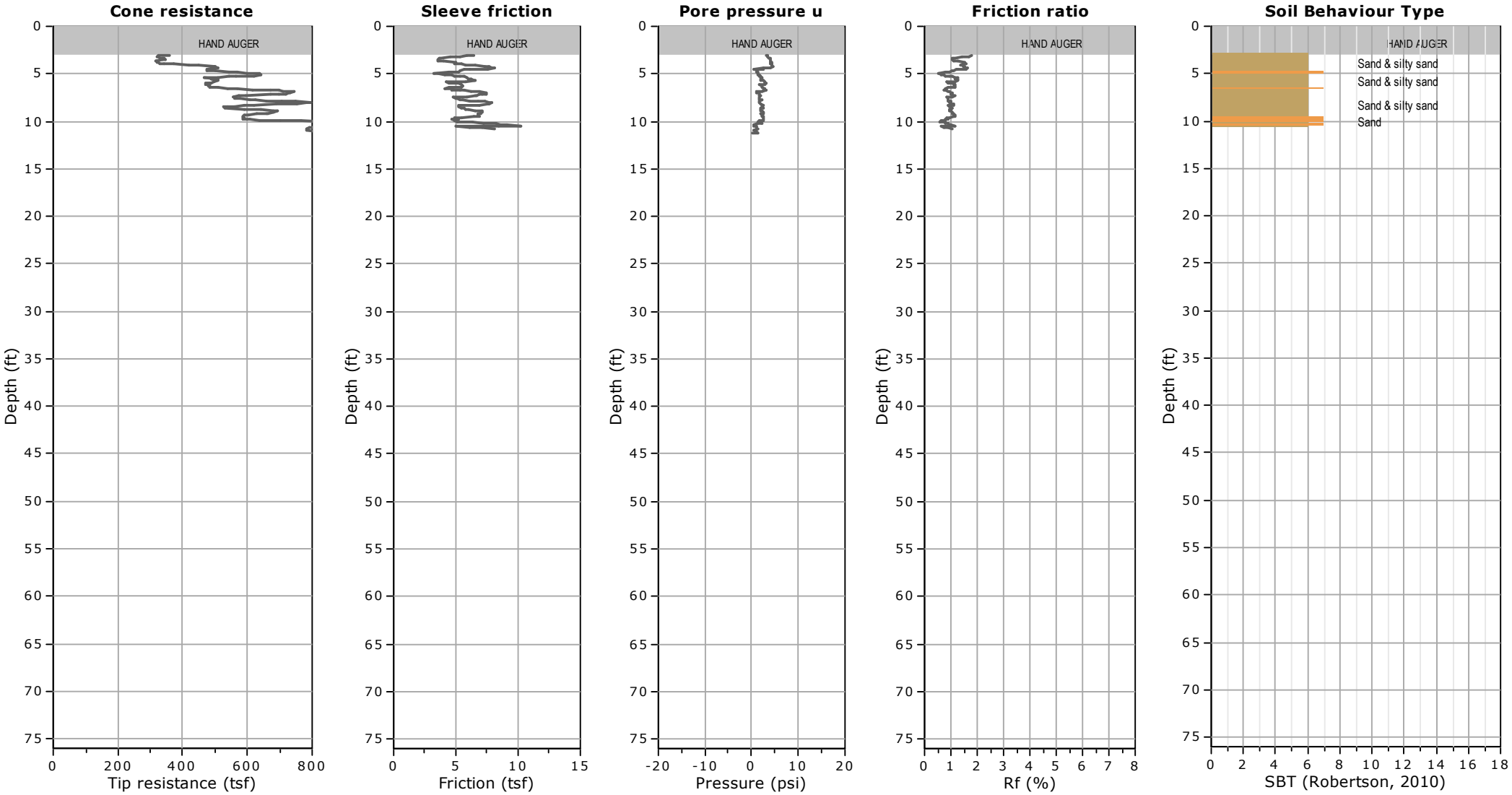
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services / Goodman Energy Park**
Location: **3163 E. Vernon Ave, Vernon, CA**

CPT-18
Total depth: 11.22 ft, Date: 9/3/2024



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steve@kehoetesting.com
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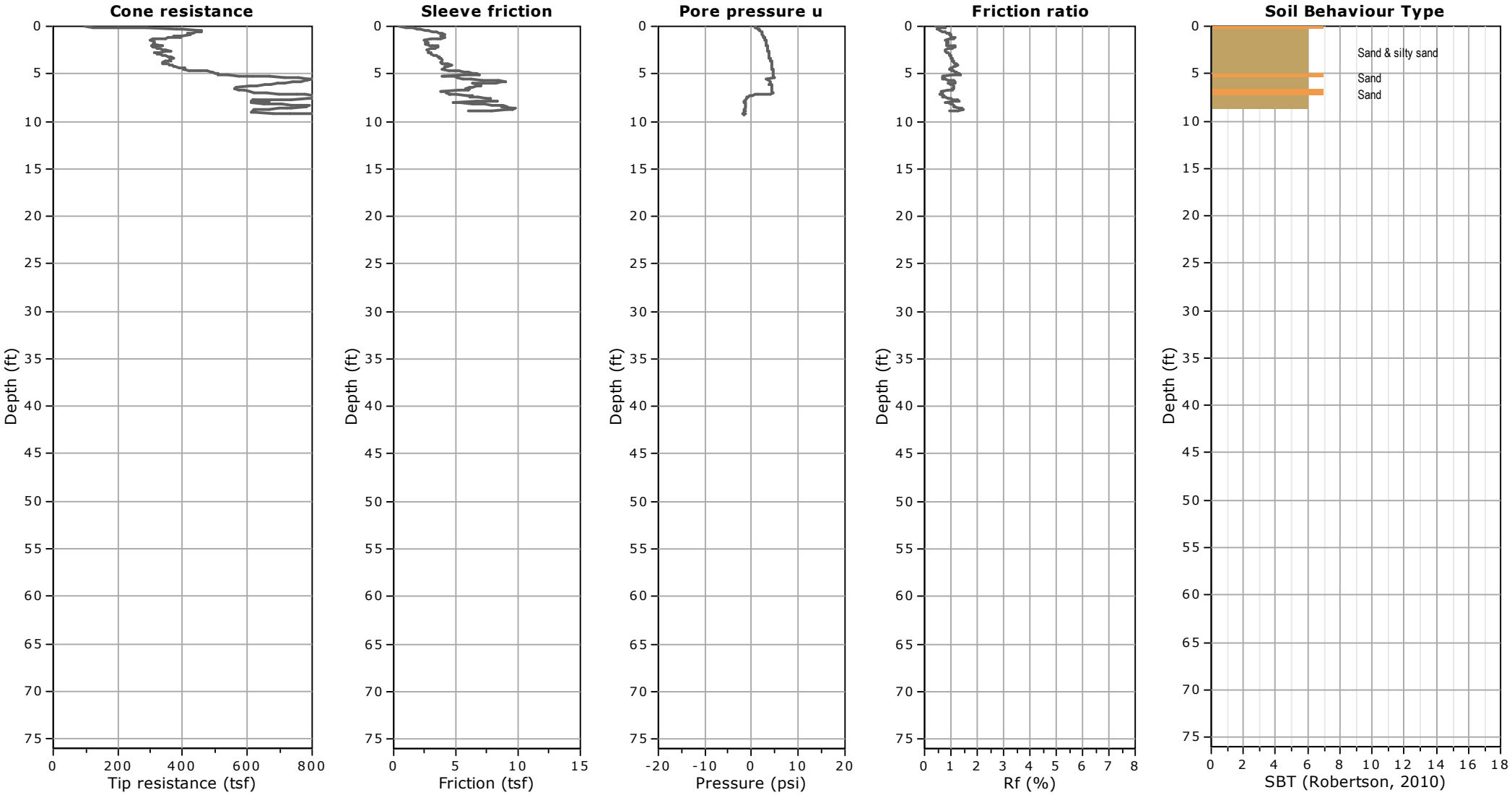
Project: **Langan Eng. & Environmental Services / Goodman Energy Park**
Location: **3163 E. Vernon Ave, Vernon, CA**

CPT-18A
Total depth: 9.32 ft, Date: 9/3/2024



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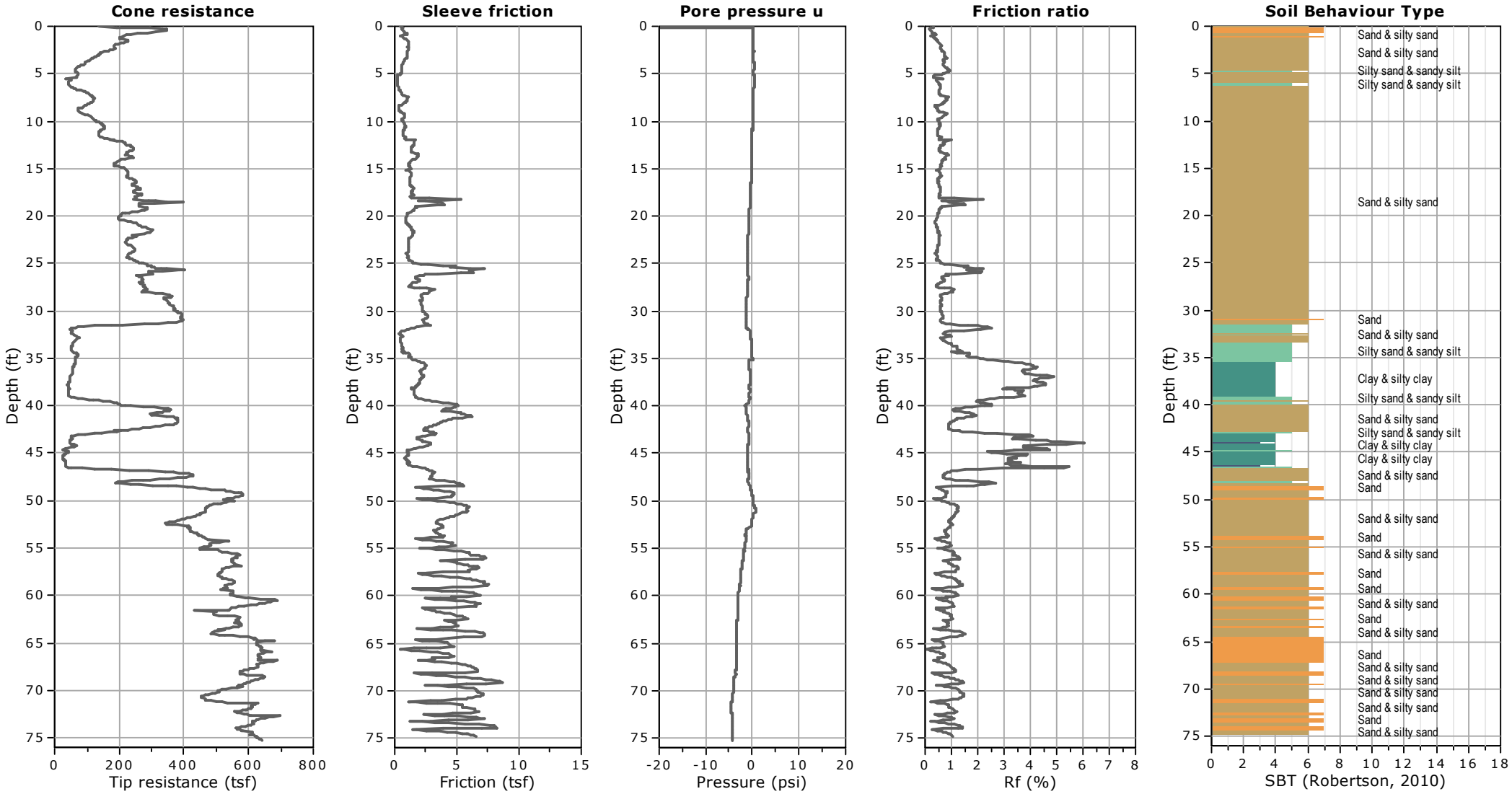
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services / Goodman Energy Park**
Location: **3163 E. Vernon Ave, Vernon, CA**

CPT-18B
Total depth: 75.20 ft, Date: 9/3/2024



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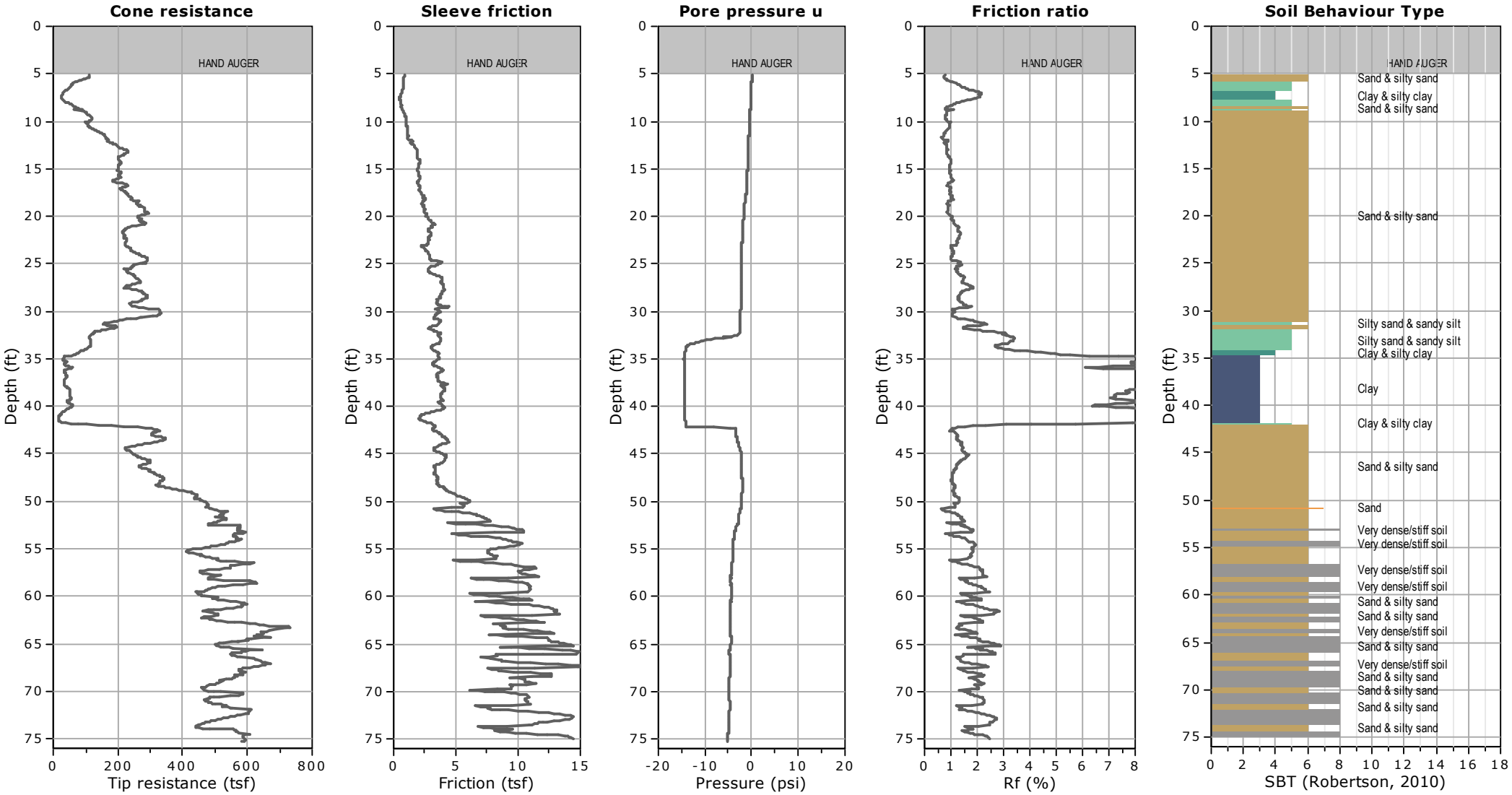
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services / Goodman Energy Park**
Location: **3163 E. Vernon Ave, Vernon, CA**

CPT-19
Total depth: 75.34 ft, Date: 9/3/2024



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steve@kehoetesting.com
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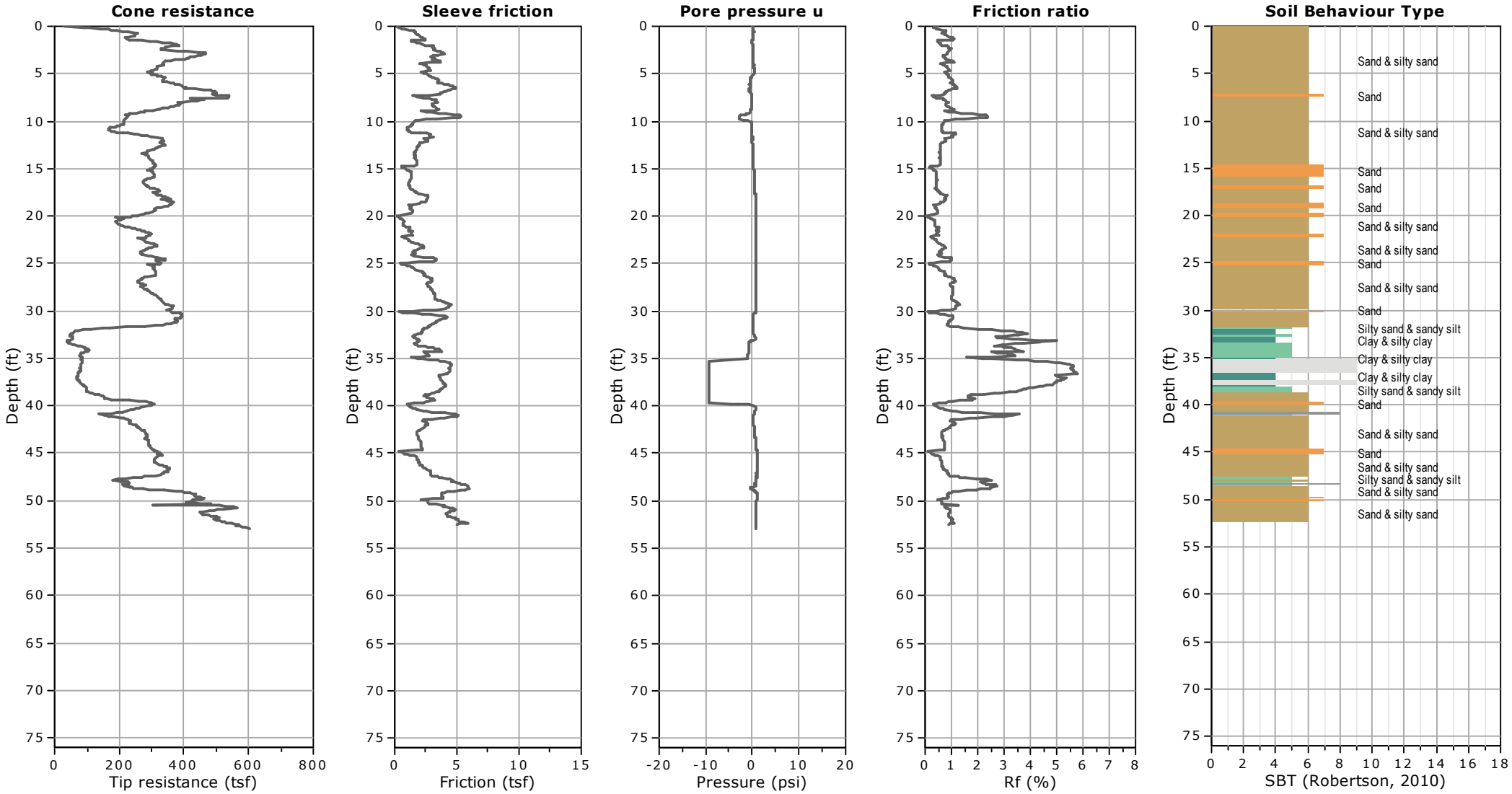
Project: **Langan Eng. & Environmental Services / Goodman Energy Park**
Location: **3163 E. Vernon Ave, Vernon, CA**

CPT-20
Total depth: 52.90 ft, Date: 9/3/2024



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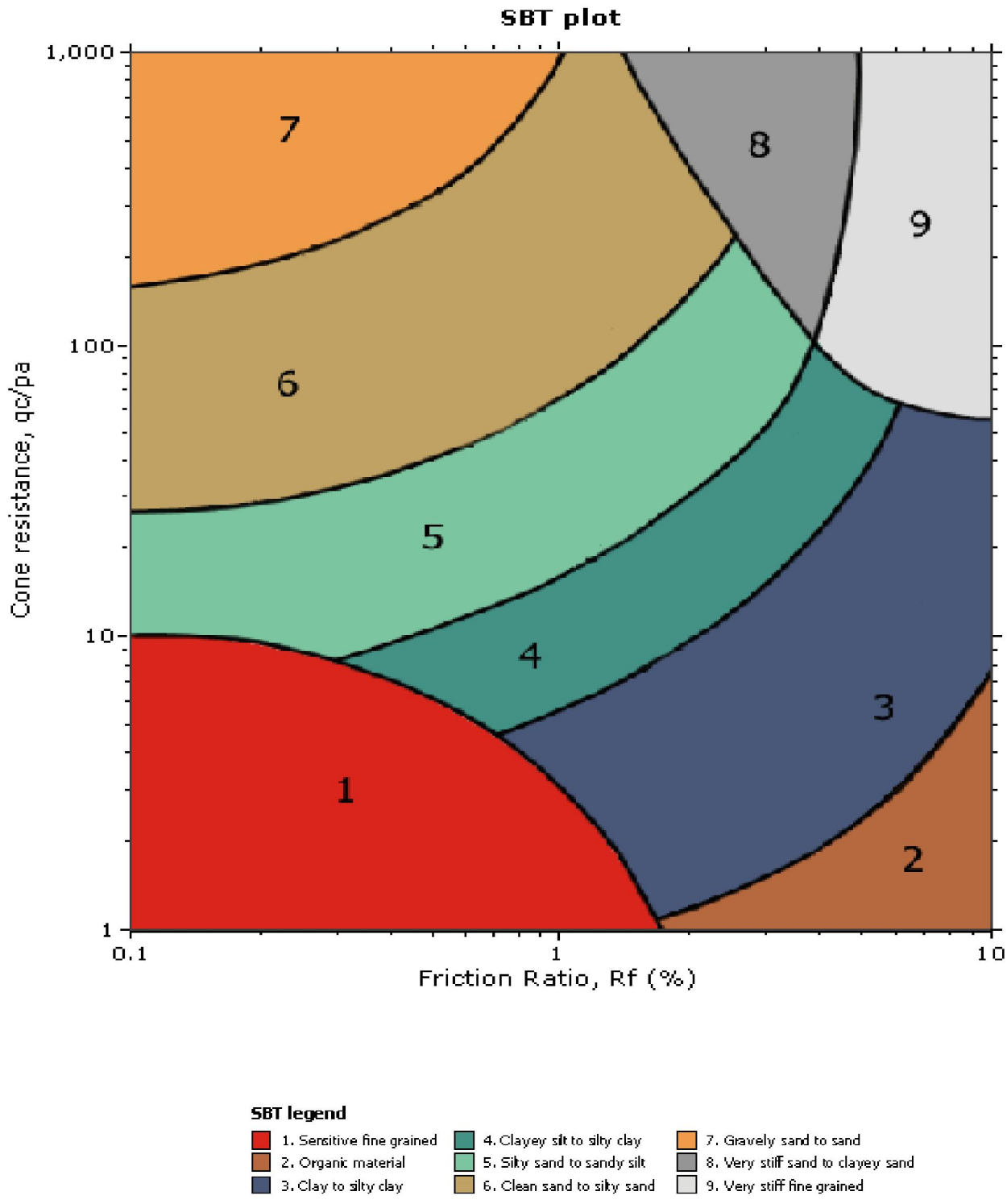
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com



Langan Eng. & Envrionmental Services
Goodman Energy Park
Vernon, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT-17	5.02	4.02	4.49	4.48	1002	
	10.01	9.01	9.23	12.48	740	592
	15.03	14.03	14.17	22.24	637	506
	20.01	19.01	19.11	28.24	677	824
	25.03	24.03	24.11	33.70	716	915
	30.05	29.05	29.12	39.40	739	878
	35.04	34.04	34.10	45.38	751	833
	40.03	39.03	39.08	50.40	775	993
	45.05	44.05	44.10	55.36	797	1011
	50.00	49.00	49.04	58.54	838	1555
	54.99	53.99	54.03	62.18	869	1370
CPT-20	5.02	4.02	4.49	4.16	1079	
	10.01	9.01	9.23	10.90	847	703
	15.03	14.03	14.17	17.00	834	810
	20.05	19.05	19.15	24.40	785	673
	25.03	24.03	24.11	30.28	796	843
	29.99	28.99	29.06	35.42	820	962
	35.04	34.04	34.10	40.22	848	1050
	40.03	39.03	39.08	44.76	873	1097
	45.01	44.01	44.06	48.80	903	1231
	50.00	49.00	49.04	52.90	927	1216
	52.89	51.89	51.93	54.68	950	1622

Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

APPENDIX C

Prior Field Investigation Borings and Geotechnical Laboratory Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soil (more than half of soil is larger than the no. 200 sieve size)	**Gravels** (more than half of coarse fraction is retained/> no. 4 sieve size)	**GW**	Well-graded GRAVELS with less than 5% fines or gravel-sand mixtures
		GP	Poorly-graded GRAVELS with less than 5% fines or gravel-sand mixtures
		GM	Silty gravels, gravel-sand-silt mixtures;GRAVELS with greater than 12% ML or MH fines
		GC	Clayey gravels, gravel-sand-clay mixtures; GRAVELS with greater than 12% CL or CH
	Sands (more than half of coarse fraction passes/< no. 4 sieve size)	**SW**	Well-graded sands with less than 5% fines or gravelly sands, little or no fines
		SP	Poorly-graded sands with less than 5% fines or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures; SANDS with greater than 12% ML or MH fines
		SC	Clayey sands, sand-clay mixtures; SANDS with greater than 12% CL or CH fines
Fine-Grained Soils (more than half of soil is smaller than the no. 200 sieve size)	**Silts and Clays** LL = < 50	**ML**	Inorganic silts and clayey silts of low plasticity, sandy non-plastic SILT, gravelly SILT
		CL	Inorganic clays of low to medium plasticity, silty CLAY, trace fines, sand
		OL	Organic silts and organic silt-clays of non-plastic to medium plasticity
	Silts and Clays LL = > 50	**MH**	Inorganic medium plastic silts, medium plastic to very plastic clayey silts.
		CH	Inorganic plastic to very plastic CLAYS, sandy plastic CLAY
		OH	Organic medium plastic to plastic silty CLAYS, and very plastic CLAYS
Highly Organic Soils		**PT**	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to ¾" ¾" to No.4	76.2 to 4.75 76.2 to 19.1 19.1 to 4.75
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.240 to 0.075
Silt and Clay	Below No. 200	Below 0.075

GROUNDWATER READING

- Groundwater encountered during drilling
- Groundwater at completion
- Groundwater at 24 hours

SOIL DESCRIPTIONS/SYMBOLS

- Well-graded GRAVEL (GW)
- Poorly-graded GRAVEL (GP)
- Silty GRAVEL (GM)
- Clayey GRAVEL (GC)
- Well-graded SAND (SW)
- Poorly-graded SAND (SP)
- Silty SAND (SM)
- Clayey SAND (SC)
- AGGREGATE BASE
- Low-Plasticity SILT (ML)
- High-Plasticity SILT (MH)
- Low-Plasticity CLAY (CL)
- High-Plasticity CLAY (CH)
- SANDSTONE
- CLAYSTONE
- SILTSTONE
- FILL
- ASPHALT

SAMPLER TYPE

- CR - Modified California (CR) split-barrel ring sampler with 3.0-inch outside diameter and a 2.5-inch inside diameter.
- SPT - Standard Penetration Test (SPT) split-barrel sampler with a 2.00-inch outside diameter with a 1.5-inch inside diameter
- ST - Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure
- BAG - Bulk Sample
- C - Core Barrel

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Langan CA, Inc.

515 South Flower Street, Suite 1060
Los Angeles, CA 90071
T: 213.314.8100 F: 213.314.8199 www.langan.com

Figure Title

BORING LOG LEGEND

Figure No.

APPENDIX A

LANGAN

Log of Boring **B-1** Sheet 1 of 2

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 206
Drilling Company: ABC Liovin	Date Started: 05/04/2023 / Date Finished: 05/04/2023
Drilling Equipment: CME-85 Truck Mounted Drill Rig	Completion Depth: 31.5 ft / Rock Depth: -
Size and Type of Bit: 6-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 3 / Undisturbed 3 / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Juan
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+206.0		0						Hand auger from 0-5 feet. Bulk sample collected from 0-5 feet.
	+205.7	AC = 4-inch thick; No base.							
		Artificial Fill (af) Silty SAND (SM), brown, moist, fine sand, trace concrete and glass fragments. [FILL]	1						
	+203.5		2						
		Quaternary Young Alluvium (Qya) Silty SAND (SM) to Sandy SILT (ML), brown, loose to medium stiff, moist, fine sand.	3						
			4						
			5	S-1	SPT	18	2 2 3	0	
			6						
			7						
	+198.0		8						
		SAND (SW), light brown, medium dense, moist, fine to coarse sand, trace fine gravel.	9						
			10	S-2	CR	14	5 10 17	0	WC = 2.6% DD = 109.7 pcf
			11						
			12						
	+193.0		13						
		SAND (SP), light brown, medium dense, moist, fine to medium sand.	14						
			15	S-3	SPT	18	5 11 13	1.2	
			16						
			17						
	+188.0		18						
		SAND with Silt (SP-SM), light brown, medium dense, moist, fine sand, trace fine gravel.	19						
			20						

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Log of Boring **B-1** Sheet 2 of 2

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 206

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+186.0		20	S-4	CR	18	7 13 24	0.2	WC = 8.7% DD = 110.5 pcf
		Fine to medium sand, no gravel.	21						
			22						
			23						
			24						
		Interbeds, brown, silty fine sand (SM) , 1 to 2 inches thick.	25	S-5	SPT	18	9 11 12	0	
			26						
			27						
	+178.0		28						
		CLAY with Sand (CL), brown, very stiff, moist, fine sand.	29						
			30	S-6	CR	18	5 6 23	0	LL = 25, PL = 15, PI = 10
	+174.5		31						
		Total Depth = 31.5 feet Groundwater not encountered. Vapor probes installed at 10 and 27 feet.	32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-2** Sheet 1 of 1

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 206
Drilling Company: ABC Liovin	Date Started: 05/03/2023 — Date Finished: 05/03/2023
Drilling Equipment: CME-85 Truck Mounted Drill Rig	Completion Depth: 3 ft — Rock Depth: -
Size and Type of Bit: 6-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed - / Undisturbed - / Core
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman:
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in		Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+206.0	AC = 4-inch thick; No base.	0						
	+205.5	**Artificial Fill (af)** Silty SAND (SM) and Sandy SILT (ML), dark brown, moist, scattered gravel and pieces of broken clay pipe. [FILL]	1						
			2						
	+203.0		3						
		Total Depth = 3 feet Groundwater not encountered. Backfilled with soil cuttings. **Boring abandoned due to potentially buried utility.**	4						
			5						
			6						
			7						
			8						
			9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

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Log of Boring **B-3** Sheet 1 of 2

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 204
Drilling Company: ABC Liovin	Date Started: 05/05/2023 — Date Finished: 05/05/2023
Drilling Equipment: CME-85 Truck Mounted Drill Rig	Completion Depth: 31.5 ft — Rock Depth: -
Size and Type of Bit: 6-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 3 — Undisturbed 3 — Core
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Juan
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	204.0		0						
	203.6	PCC = 5-inch thick, No base.							
		Artificial Fill (af) SAND (SP), light brown, moist, fine to medium sand, trace fine to coarse gravel, trace silt. [FILL]	1						Bulk sample collected from 0-5 feet. Corrosion and chemical test. Expansion Index.
			2						
			3						
	200.0		4						
		Silty SAND (SM), brown, loose, moist, fine sand, some fine gravel, trace clay. [FILL]	5	S-1	CR	18	2 3 7	0	WC = 10.7% DD = 106.0 pcf
	197.5		6						
		Quaternary Young Alluvium (Qya) SAND (SP), light brown, medium dense, moist, fine to coarse sand, trace fine gravel.	7						
			8						
			9						
			10	S-2	SPT	18	3 7 9	0	
			11						
			12						
	191.0		13						
		SAND with Silt (SP-SM), light brown, medium dense, moist, fine to medium sand.	14						
			15	S-3	CR	18	8 9 13	0	WC = 8.6% DD = 112.2 pcf
			16						
			17						
	186.0		18						
		SAND (SP), light brown, medium dense, moist, fine to medium sand.	19						
			20						

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Log of Boring **B-3** Sheet 2 of 2

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 204

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+184.0		20					0.1	
			21	S-4	SPT	15	7 11 16		
			22						
	+181.0	SAND (SW), light brown, dense, moist, fine to coarse sand and gravel.	23						
			24						
			25					0	WC = 2.6% DD = 103.7 pcf
			26	S-5	CR	18	13 21 28		
			27						
			28						
			29						
		Fine to medium sand, no gravel.	30					0.3	
	+173.5			S-6A/6B	SPT	18	10 7 10		
		Sandy CLAY (CL), brown, very stiff, moist, very fine to fine sand.	31						
	+172.5								
		Total Depth = 31.5 feet Groundwater not encountered. Vapor probes installed at 10 and 30 feet.	32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-4** Sheet 1 of 2

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 201
Drilling Company: ABC Liovin	Date Started: 05/03/2023 — Date Finished: 05/03/2023
Drilling Equipment: CME-85 Truck Mounted Drill Rig	Completion Depth: 31.5 ft — Rock Depth: -
Size and Type of Bit: 6-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 3 — Undisturbed 3 — Core
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman:
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+201.0	PCC = 7-inch thick, Base = 12-inch thick.	0						Hand auger from 0-6 feet.
	+199.4	**Artificial Fill (af)** Silty SAND (SM), light brown, slightly moist. [FILL]	1						
	+198.5	**Quaternary Young Alluvium (Qya)** Silty SAND (SM), light brown, slightly moist.	2						
			3						
			4						
		Grayish brown, loose, fine sand, micaceous.	5	S-1	SPT	18	2 3 4	0.3	
			6						
			7						
	+193.0	SAND with Silt (SW-SM), light brown, dense, slightly moist, fine to coarse sand.	8						
			9						
			10	S-2	CR	18	7 18 27	0.1	WC = 5.1% DD = 110.5 pcf
			11						
			12						
	+188.0	SAND with Some Silt (SP-SM), light brown, medium dense, slightly moist, medium to coarse sand.	13						
			14						
			15	S-3	SPT	18	7 12 13	0.1	
			16						
			17						
			18						
			19						
			20						

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Log of Boring **B-4** Sheet 2 of 2

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 201

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+181.0	Dense, medium sand.	20	S-4	CR	18	6 18 31	0	WC = 4.6% DD = 110.1 pcf
	+178.0	SAND with Silt (SP-SM), light brown, dense, slightly moist, medium sand, some fine and coarse sand.	25	S-5	SPT	18	10 20 24	0.4	
		Very moist, fine to coarse sand.	30	S-6	CR	18	21 38 22	0	WC = 4.5% DD = 124.4 pcf
	+169.5	Total Depth = 31.5 feet Groundwater not encountered. Vapor probes installed at 10 and 30 feet.	45						

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Log of Boring **B-7** Sheet 1 of 2

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 206
Drilling Company: ABC Liovin	Date Started: 05/04/2023 / Date Finished: 05/04/2023
Drilling Equipment: CME-85 Truck Mounted Drill Rig	Completion Depth: 36.5 ft / Rock Depth: -
Size and Type of Bit: 6-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 3 / Undisturbed 4 / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Juan
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+206.0	AC = 6-inch thick, No base.	0						Hand auger from 0-6 feet.
	+205.5	**Artificial Fill (af)** Silty SAND (SM), light brown, moist, fine sand. [FILL]	1						
	+203.5	**Quaternary Young Alluvium (Qya)** Silty SAND (SM), light brown, loose, moist, fine sand.	2						
			3						
			4						
			5						WC = 15.1% DD = 101.3 pcf
			6	S-1	CR	18	2 3 8	0	
			7						
	+197.5	SAND (SP), light brown, medium dense, moist, fine sand.	8						
			9						
			10	S-2	SPT	18	3 6 11	0	
			11						
			12						
	+193.0	SAND (SW), light brown, dense, moist, fine to coarse sand, trace fine gravel.	13						
			14						
			15	S-3	CR	16	12 25 36	0	Poor sample recovery; Bag sample taken.
			16						
			17						
			18						
			19						
			20						

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Log of Boring **B-7** Sheet 2 of 2

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 206

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+186.0		20	S-4	SPT	16	9 19 25	0.5	
			21						
			22						
			23						
			24						
			25	S-5	CR	18	21 33 40	0.3	WC = 7.9% DD = 99.0 pcf
			26						
			27						
	+178.0	Clayey SAND (SC), brown, dense, moist, fine sand.	28						
			29						
			30	S-6	SPT	18	8 20 20	0	High fines content.
			31						
			32						
	+173.0		33						
		Silty SAND (SM) to Sandy SILT (ML), brown, dense to very stiff, moist, very fine to fine sand, trace iron oxide staining.	34						
			35	S-7	CR	18	13 19 26	0	WC = 22.8% DD = 92.7 pcf
			36						
	+169.5		37						
		Total Depth = 36.5 feet Groundwater not encountered. Vapor probes installed at 10 and 28.5 feet.	38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-8** Sheet 1 of 2

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 204
Drilling Company: ABC Liovin	Date Started: 05/05/2023 — Date Finished: 05/05/2023
Drilling Equipment: CME-85 Truck Mounted Drill Rig	Completion Depth: 36.5 ft — Rock Depth: -
Size and Type of Bit: 6-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 4 — Undisturbed 3 — Core
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Juan
Sampler: 2-inch O.D. Split-Barrel SPT, 2.5-inch I.D. Cal Mod	Field Engineer: B. Watkins
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+204.0	AC = 4-inch thick, PCC = 3-inch thick.	0						Hand auger from 0-5 feet. Bulk sample collected from 0-5 feet. R-Value Test.
	+203.4	**Artificial Fill (af)** SAND with Silt (SP-SM), brown, moist, fine to medium sand, trace fine gravel. [FILL]	1						
			2						
	+201.0	**Quaternary Young Alluvium (Qya)** SAND (SP), light brown, medium dense, moist, fine sand, trace silt.	3						
			4						
			5	S-1	SPT	18	5 5 8	0.7	
			6						
			7						
			8						
			9						
		Fine to medium sand, no silt.	10	S-2	CR	18	4 8 9	0	
			11						
			12						
			13						
			14						
		Trace fine gravel.	15	S-3	SPT	18	7 12 12	1.9	
			16						
			17						
			18						
			19						
			20						

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Log of Boring **B-8** Sheet 2 of 2

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 204

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+184.0	Dense.	20	S-4	CR	18	10 19 33	0	WC = 3.4% DD = 105.8 pcf
			21						
			22						
			23						
			24						
		Medium dense, fine to coarse sand, no gravel.	25	S-5	SPT	18	9 12 17	2.4	
			26						
			27						
			28						
			29						
		Fine to medium sand.	30	S-6	CR	15	4 11 11	0.1	S-6A : WC = 3.4% DD = 103.3 pcf S-6B: WC = 13.6% DD = 122.1 pcf
	+172.8		31						
		Sandy CLAY (CL), brown, very stiff, moist, very fine to fine sand.	32						
			33						
			34						
		Very fine to medium sand, trace fine gravel.	35	S-7	SPT	18	3 5 10	1.1	
	+167.5		36						
		Total Depth = 36.5 feet Groundwater not encountered. Vapor probes installed at 10 and 30 feet.	37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **FP-1** Sheet 1 of 3

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 202
Drilling Company: 2R Drilling	Date Started: 05/05/2023 / Date Finished: 05/05/2023
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 65.8 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed / Undisturbed: 13 / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman:
Sampler: 2.5-inch I.D. Cal Mod	Field Engineer: S. Wilkins
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+202.0		0						
	+201.8	AC = 0.25-inch thick.							
		Artificial Fill (af) Silty SAND (SM), grayish brown, slightly moist, fine to medium sand. [FILL]	1						
		Brown, moist, some fine to coarse gravel, few mortar fragments.	2						
			3						
	+198.0		4						
		Quaternary Young Alluvium (Qya) SAND with Silt (SP-SM), grayish brown, medium dense, moist, fine to medium sand.	5						Perforated PVC
	+196.5	SAND (SP), light yellowish to grayish brown, medium dense, slightly moist, fine to medium sand, some fine gravel.	6	S-1	CR	18	6 8 10		
			7						
			8						
			9						
	+192.0	SAND with Silt (SP-SM), light yellowish to grayish brown, medium dense, slightly moist, fine sand, some fine gravel, increased fines content.	10	S-2	CR	18	5 14 9		
			11						
			12						
			13						
			14						
	+187.0		15						
		SAND (SP), light yellowish to grayish brown, medium dense, slightly moist, fine to medium sand, fine gravel.	16	S-3	CR	18	7 21 23		
			17						
			18						
			19						
			20						

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Log of Boring **FP-1** Sheet 2 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 202

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	182.0		20						
	181.0	SAND with Silt (SP-SM), light gray, dense, fine sand.	21	S-4	CR	18	9 25 26		
			22						
			23						
			24						
	177.0	SAND (SP), light yellowish to grayish brown, dense, slightly moist, fine to coarse sand, some fine to coarse gravel.	25	S-5	CR	18	18 25 40		
			26						
	174.0	CLAY (CL), dark yellowish brown and black mottled, very stiff, moist to very moist, few fine sand, some silt.	27						
			28						
			29						
			30	S-6	CR	18	7 13 22		
			31						
			32						
			33						
	168.0	Sandy CLAY (CL), yellowish brown, stiff, moist, fine sand.	34						
			35						
			36	S-7	CR	18	7 19 18		
			37						Solid PVC
			38						
			39						
		Increased sand content.	40						
	161.0		41	S-8	CR	18	9 25 43		
	160.5	Clayey SAND (SC), olive gray, dense, moist, fine to medium sand.	42						
		SAND with Silt (SP-SM), yellow, dense, moist, fine sand.	43						
			44						
			45						

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Log of Boring **FP-1** Sheet 3 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 202

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+157.0	Very dense, fine to medium sand.	45	S-9	CR	12	22 50		
			46						
			47						
			48						
			49						
	+152.0	Gravelly SAND (SP-GP), light yellow, very dense, slightly moist, fine to coarse sand and gravel.	50	S-10	CR	12	25 50/5"		
			51						
			52						
			53						
			54						
		Fine to medium sand, decreased gravel content.	55	S-11	CR	10	40 50/4"		
			56						
			57						
			58						
			59						
			60	S-12	CR	10	20 50/4"		
	+140.0		61						
		SAND with Silt (SP-SM), off-white, very dense, slightly moist, fine to medium sand, few coarse sand, fine gravel.	62						
			63						
			64						
			65	S-13	CR	10	27 50/4"		
	+136.2		66						
		Total Depth = 65.8 feet Groundwater not encountered. Boring converted to a percolation test well. Boring backfilled with bentonite cement grout and topped with soil cuttings and asphalt patched after percolation test.	67						
			68						
			69						
			70						

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Log of Boring **FP-3** Sheet 1 of 3

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 203
Drilling Company: 2R Drilling	Date Started: 05/25/2023 / Date Finished: 05/25/2023
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 50 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed / Undisturbed / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Ish
Sampler: 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+203.0	**Artificial Fill (af)** Sandy SILT (ML), brow, moist.	0						
	+201.0	**Native Young Alluvial Fan Deposits (Qyf)** Silty SAND (SM), brown, slightly moist.	1						
	+198.0	Silty SAND (SM) and Sandy SILT (ML), brown, loose to medium stiff, very moist to moist, clay in sampler shoe.	2						
	+195.5	Silty Sand (SM), light brown, medium dense, dry to slighlyt moist.	3						
	+193.0	Silty SAND with Gravel (SM-SW), light brown with some orangish brown, medium dense, dry to slightly moist, fine to coarse sand, fine to medium gravel, well-graded.	4						
			5	S-1	SPT	18	1 2 3		
			6						
			7						Solid PVC
			8	S-2	CR	18	6 16 20		
			9						
			10						
			11	S-3	SPT	18	3 9 9		
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
	+183.0		20						

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Log of Boring **FP-3** Sheet 2 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 203

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+183.0	Silty SAND (SM) and Sandy SILT (ML), brown, medium dense to very stiff, moist, fine to coarse sand, occasional gravel.	20	S-4	CR	18	9 12 12		
	+173.0	CLAY with Sand (CL), reddish brown with light reddish brown and gray brown mottle, very stiff, moist, fine to medium sand, maganese-oxide staining.	30	S-5	SPT	18	4 10 16		
	+163.0	SAND (SW), light brown, very dense, slighlty moist, fine to coarse sand, occasional fine gravel.	40	S-6	CR	18	22 40 47		
			45						

Annular Material

Solid PVC

Perforated PVC

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Log of Boring **FP-3** Sheet 3 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 203

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+158.0		45						
			46						
			47						Perforated PVC
			48						
	+154.5	SAND with Silt (SM), light brown, very dense, slightly moist.	49	S-7	SPT	18	20 25 25		
	+153.0	Total Depth = 50 feet. No Groundwater encountered. Boring converted to a percolation test well. Boring backfilled with bentonite cement grout and topped with soil cuttings and asphalt patched after percolation test.	50						
			51						
			52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **FP-4** Sheet 1 of 3

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 202
Drilling Company: 2R Drilling	Date Started: 05/25/2023 / Date Finished: 05/25/2023
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 50 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed / Undisturbed / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First ▽ - / Completion ▼ - / 24 HR. ▼ -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Ish
Sampler: 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+202.0	**Artificial Fill (af)** Silty SAND (SM), brown, slightly moist.	0						
	+197.0	Silty SAND with Gravel (SM), brown, medium dense, moist, fine to coarse sand, medium to coarse gravel, concrete in sampler shoe.	5	S-1	CR	18	8 18 22		
	+194.5	**Native Young Alluvial Fan Deposits (Qyf)** Silty SAND (SM), brown, loose, slightly moist, medium sand.	8	S-2	SPT	18	2 3 4		Solid PVC
	+192.0	Sandy CLAY (CL) and Clayey SAND (SC), brown, medium dense to very stiff, moist.	10	S-3	CR	18	7 11 11		
	+182.0		20						

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Log of Boring **FP-4** Sheet 2 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 202

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+182.0	Silty SAND (SM), to SAND with Silt (SP-SM), brown, medium dense, slighlty moist, occasional fine gravel.	20	S-4	SPT	18	5 7 8		
	+172.0	CLAY with Sand (CL), dark reddish brown, very stiff, moist to very moist.	30	S-5	CR	18	6 9 18		
	+162.0	Sandy CLAY (CL), brown with orange brown mottle, stiff, moist to very moist, medium to fine sand.	40	S-6	SPT	18	2 4 6		
			45						

Annular Material

Solid PVC

Perforated PVC

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Log of Boring **FP-4** Sheet 3 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 202

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+157.0		45						
			46						
			47						Perforated PVC
			48						
	+153.5	SAND with Silt (SP-SM) to Silty SAND (SM), light brown, very desne, dry to slighlty moist, fine to very coarse sand, occasional gravel.	49	S-7	CR	18	38 50 55		
	+152.0	Total Depth = 50 feet. No Groundwater encountered. Boring converted to a percolation test well. Boring backfilled with bentonite cement grout and topped with soil cuttings and asphalt patched after percolation test.	50						
			51						
			52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

LANGAN

Log of Boring **FP-5** Sheet 1 of 3

Project: 3163 East Vernon Avenue	Project No.: 721040501
Location: 3163 East Vernon Avenue	Elevation and Datum: Approx. 196
Drilling Company: 2R Drilling	Date Started: 05/25/2023 / Date Finished: 05/25/2023
Drilling Equipment: CME-75 Truck Mounted Drill Rig	Completion Depth: 50 ft / Rock Depth: -
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed / Undisturbed / Core
Casing Diameter (in): - / Casing Depth (ft): -	Water Level (ft.): First - / Completion - / 24 HR. -
Casing Hammer: - / Weight (lbs): - / Drop (in): -	Drilling Foreman: Ish
Sampler: 2.5-inch I.D. Cal Mod	Field Engineer: A. Nieblas
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+196.0		0						
	+195.7	AC = 4-inches thick.							
		Silty SAND (SM), brown, slightly moist to moist.	1						
	+194.0		2						
		Silty SAND (SM), brown.	3						
			4						
	+191.0		5						
		SAND with Silt (SP-SM), light grayish brown, medium dense, dry, fine to medium sand, occasional coarse sand.	6	S-1	CR	18	3 6 11		
	+188.5		7						
		Silty SAND (SM), light brown, medium dense, slightly moist.	8	S-2	SPT	18	3 5 6		Solid PVC
			9						
		Brown, occasional fine to coarse gravel, well-graded.	10	S-3	CR	18	5 9 18		
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

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Log of Boring **FP-5** Sheet 2 of 3

Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 196

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+176.0	Light brown.	20	S-4	SPT	18	7 9 13		
	+166.0	SILT with Sand (ML), reddish brown with light reddish brown mottle, stiff, moist to very moist, medium sand.	30	S-5	CR	18	6 9 12		
		Reddish brown, occasional gravel.	40						
	+156.0	Silty SAND (SM), reddish brown, medium dense, dry to slighlty moist, fine to coarse sand, occasiona fine gravel.	40	S-6	SPT	18	7 13 15		
			45						

Annular Material

Solid PVC

Perforated PVC

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Log of Boring **FP-5** Sheet 3 of 3

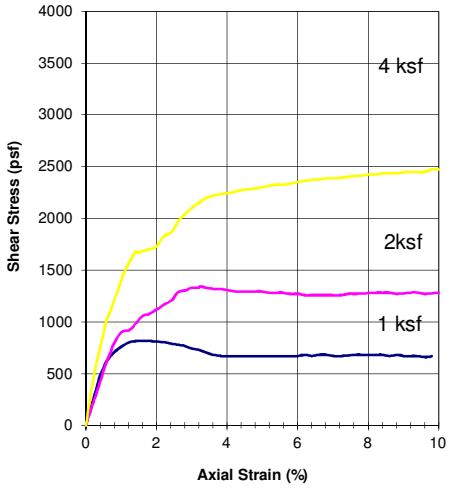
Project	Project No.
3163 East Vernon Avenue	721040501
Location	**Elevation and Datum**
3163 East Vernon Avenue	Approx. 196

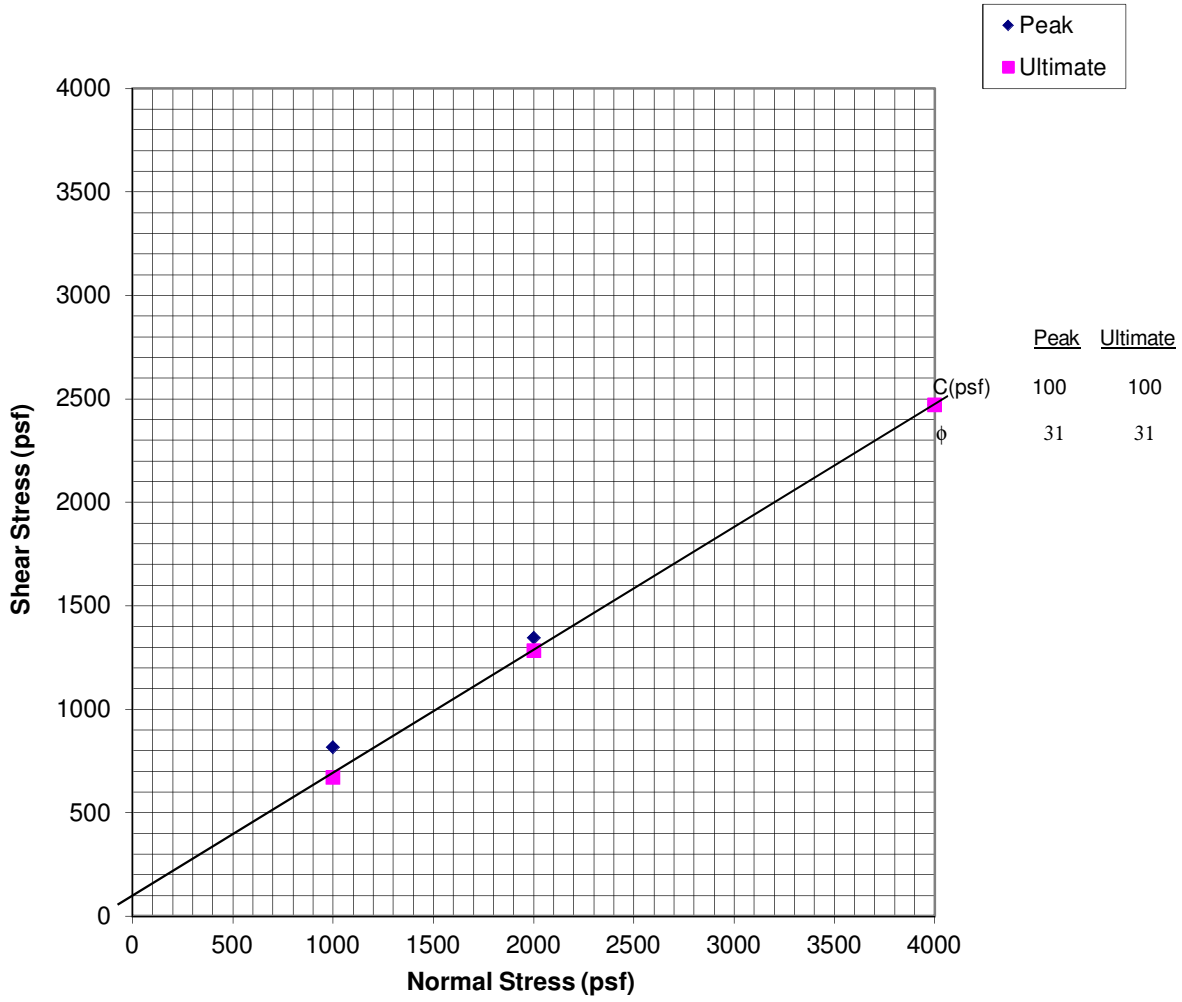
Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	PID (ppm)	Well Diagram
	+151.0		45						
			46						
			47						Perforated PVC
			48						
	+147.5	Silty SAND (SM) to Sandy SILT (ML), brown and reddish brown, hard to very dense, moist, maganese-oxide staining.	49	S-7	CR	18	15 32 42		
	+146.0	Total Depth = 50 feet. No Groundwater encountered. Boring converted to a percolation test well. Boring backfilled with bentonite cement grout and topped with soil cuttings and asphalt patched after percolation test.	50						
			51						
			52						
			53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501	Date:	5/19/2023
GLA JOB NO.:	2012-0057		
SAMPLE :	B-1 / Bulk		
SAMPLE TYPE:	Remolded @ 90% Max Density		
DESCRIPTION:	Silty Sand		

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	816	1344	2472
Displacement, % strain	1.44	3.24	9.8
Ultimate Stress, psf	672	1284	2472
Displacement, % strain	10	10	10
Initial Dry Density, pcf	101.3	101.3	101.3
Initial Water Content,%	15.0	15	15
Final Water Content,%	22.9	22.9	22.9
Strain Rate, in/min.	0.0084	0.0084	0.0084





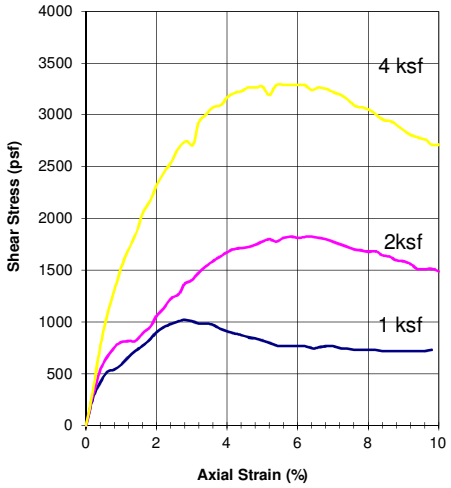
	Peak	Ultimate
C(psf)	100	100
ϕ	31	31

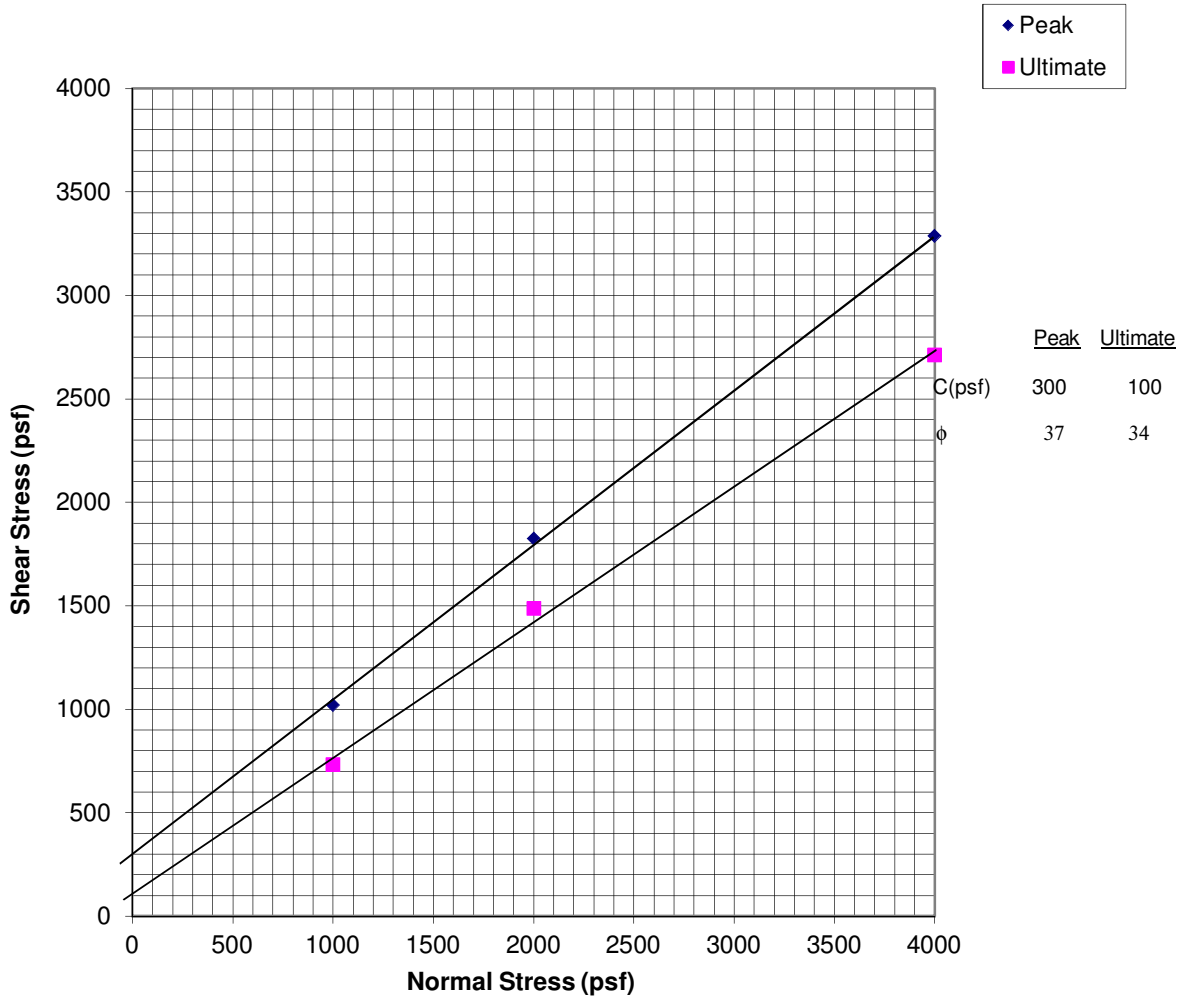
GeoLogic Associates

DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 721040501	Date:	5/19/2023
GLA JOB NO.:	2012-0057		
SAMPLE :	B-8 / S-2		
SAMPLE TYPE:	Undisturbed		
DESCRIPTION:	Silty Sand		

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	1020	1824	3288
Displacement, % strain	2.8	5.8	5.4
Ultimate Stress, psf	732	1488	2712
Displacement, % strain	10	10	10
Initial Dry Density, pcf	102.5	102.5	102.5
Initial Water Content,%	3.5	3.5	3.5
Final Water Content,%	21.2	21.2	21.2
Strain Rate, in/min.	0.0084	0.0084	0.0084



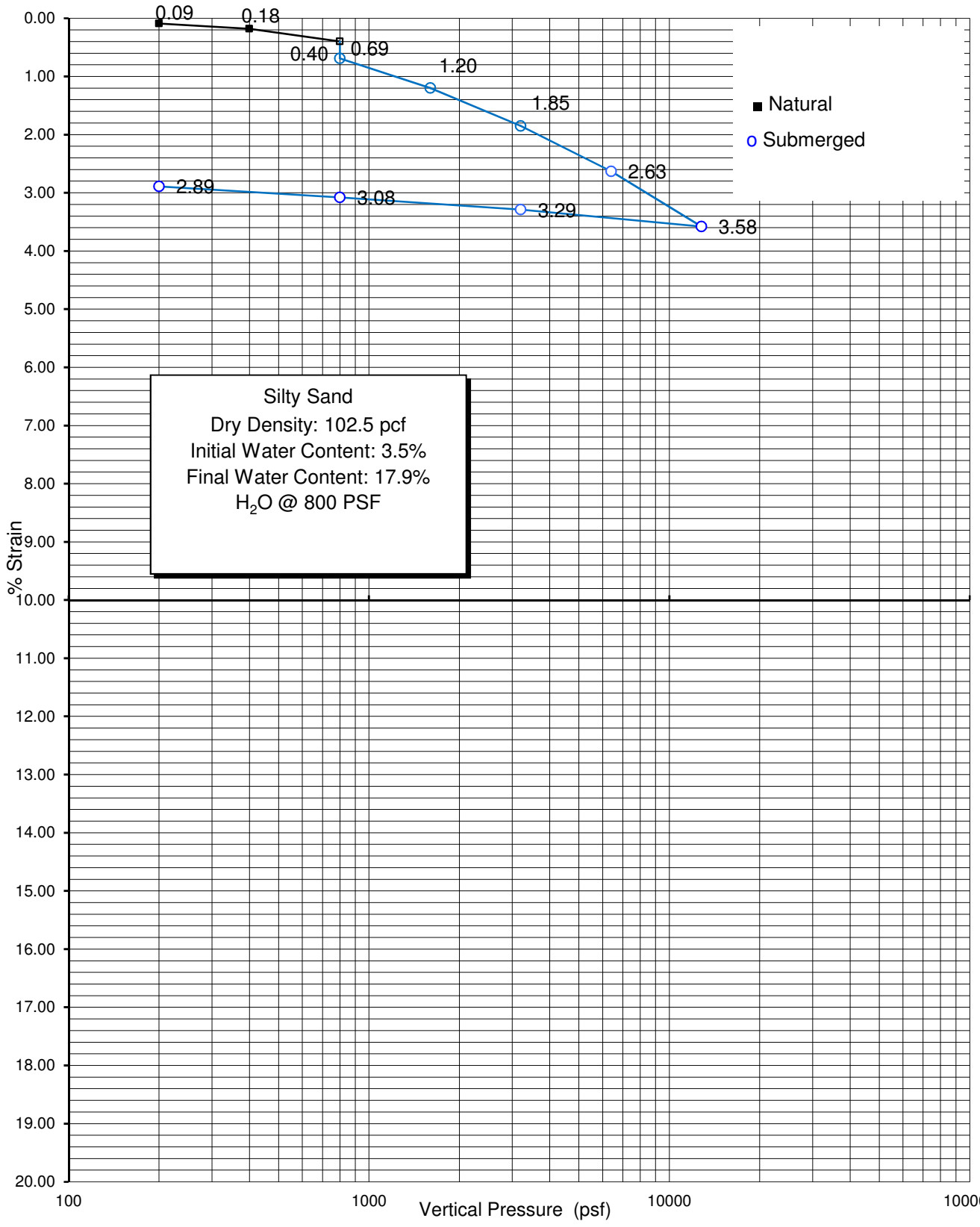


	Peak	Ultimate
C(psf)	300	100
ϕ	37	34

GeoLogic Associates

CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-8 / S-2	Depth:	10'	Date	05-15-23



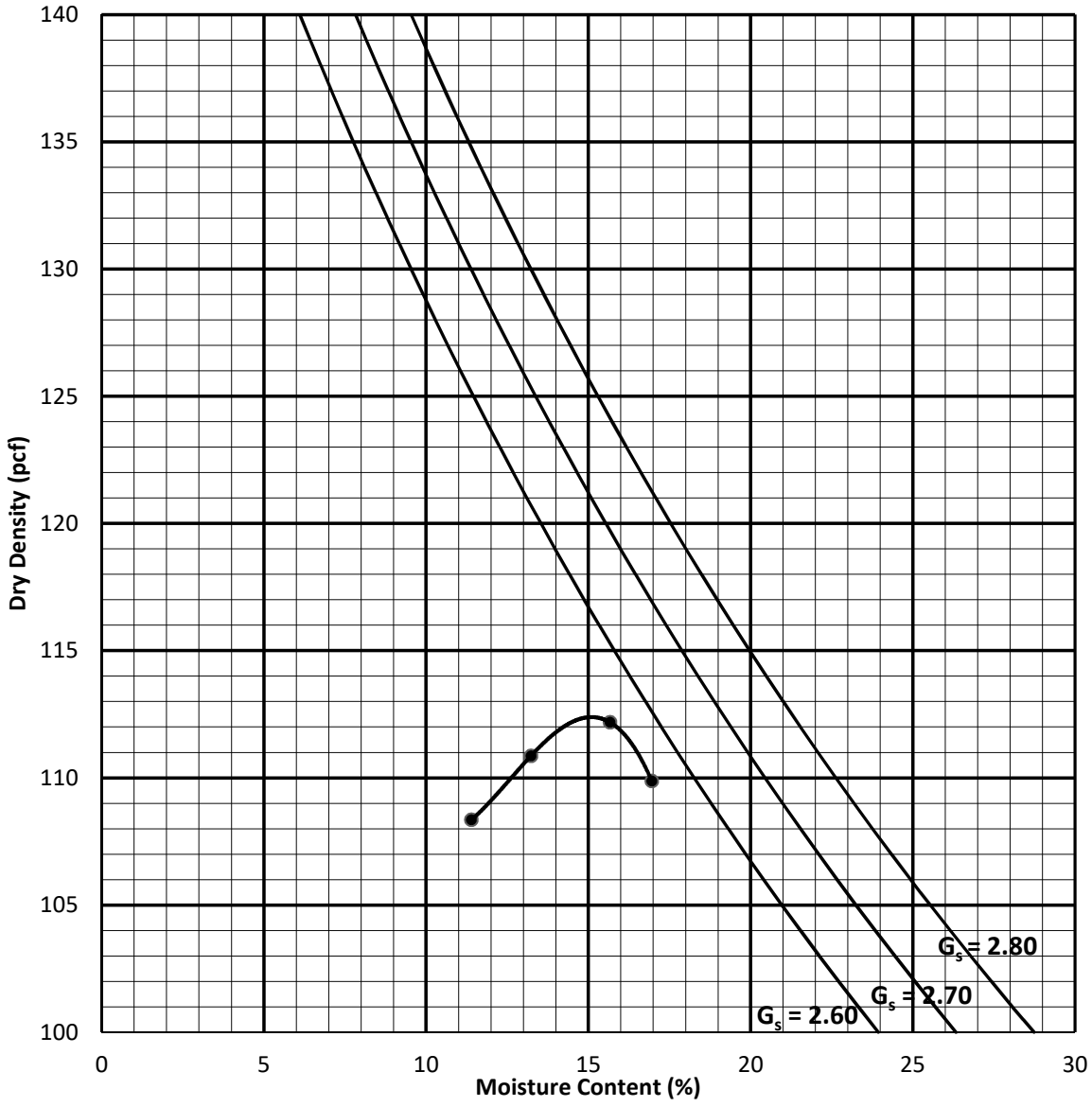
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 721040501 **GLA No.** 2012-0057
Sample: B-1 / Bulk **Date:** 5/19/2023
Description: Brown, Silty Sand **By:** LD

ASTM D1557	Method B	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		1943	1962	1898	1825
Wet Density (pcf)		128.5	129.8	125.5	120.7
Moisture Content (%)		17.0	15.7	13.2	11.4
Dry Density (pcf)		109.9	112.2	110.9	108.3

Max. Dry Density : 112.5 pcf
Opt. Water Content: 15.0 %



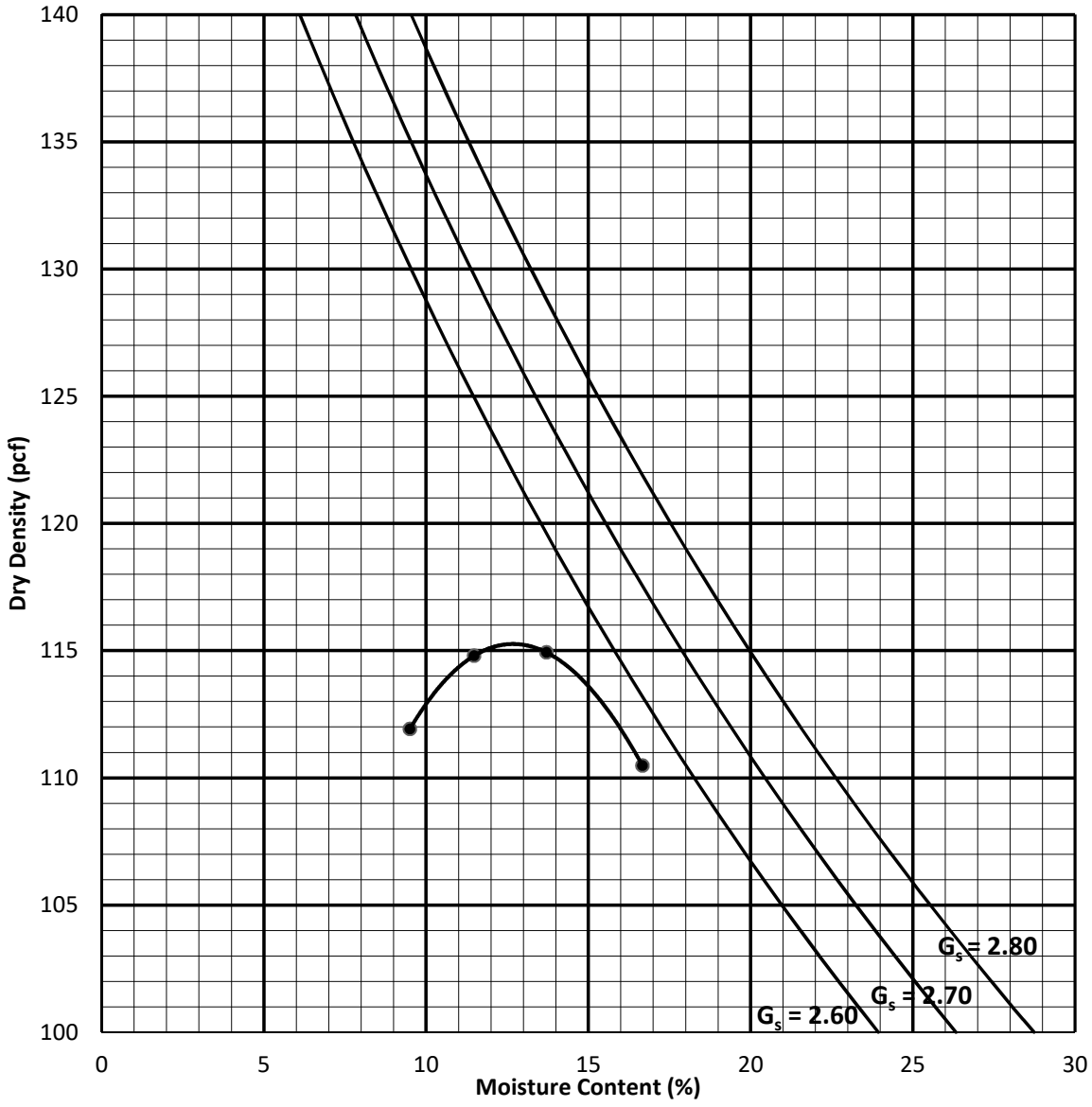
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 721040501 **GLA No.** 2012-0057
Sample: B-3 / Bulk **Date:** 5/19/2023
Description: Brown, Silty Sand **By:** LD

ASTM D1557	Method B	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		1949	1976	1935	1853
Wet Density (pcf)		128.9	130.7	128.0	122.6
Moisture Content (%)		16.7	13.7	11.5	9.5
Dry Density (pcf)		110.5	114.9	114.8	111.9

Max. Dry Density : 115.0 pcf
Opt. Water Content: 12.5 %



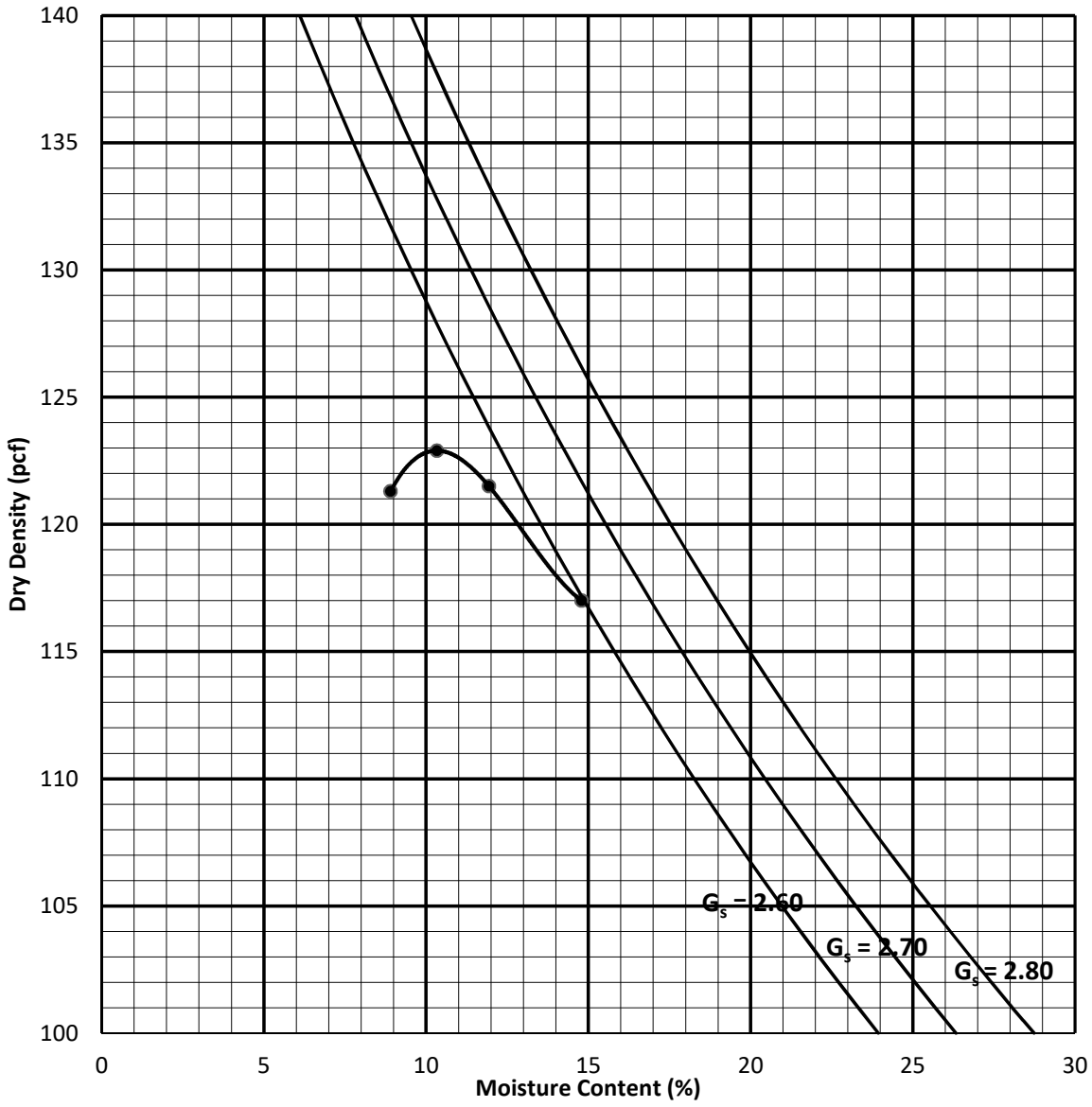
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 721040501 **GLA No.** 2012-0057
Sample: FP-1 / Bukj **Date:** 05/28/23
Description: Brown, Silty Sand w. Gravel **By:** LD

ASTM D1557	Method C	Volume (cf): 0.075		# Blows: 56	# Layers: 5
Specimen		A	B	C	D
Wet Weight (lbs)		10.07	10.20	10.17	9.91
Wet Density (pcf)		134.3	136.0	135.6	132.1
Moisture Content (%)		14.8	11.9	10.3	8.9
Dry Density (pcf)		117.0	121.5	122.9	121.3

Max. Dry Density : 123.0 pcf
Opt. Water Content: 10.5%



Geo-Logic ASSOCIATES

WASH #200 SIEVE - ASTM D 1140-92

Job Name Langan #721040501 Date 5-28-23

Job No. 2012-0057 By LD

Sample	FP-1 / S-1	**Sample**	FP-2 / S-2	**Sample**	B-1 / S-2
Soil Type		Soil Type		Soil Type	
% water	1.6	% water	5.7	% water	4.1
Wet weight	213.7	Wet weight	236.9	Wet weight	280.5
Dry weight	210.3	Dry weight	224.1	Dry weight	269.5
+ 200 sieve	202.9	+ 200 sieve	212	+ 200 sieve	254.8
% Retained	96.5	% Retained	94.6	% Retained	94.6
%Pass. #200	**4**	**%Pass. #200**	**5**	**%Pass. #200**	**5**

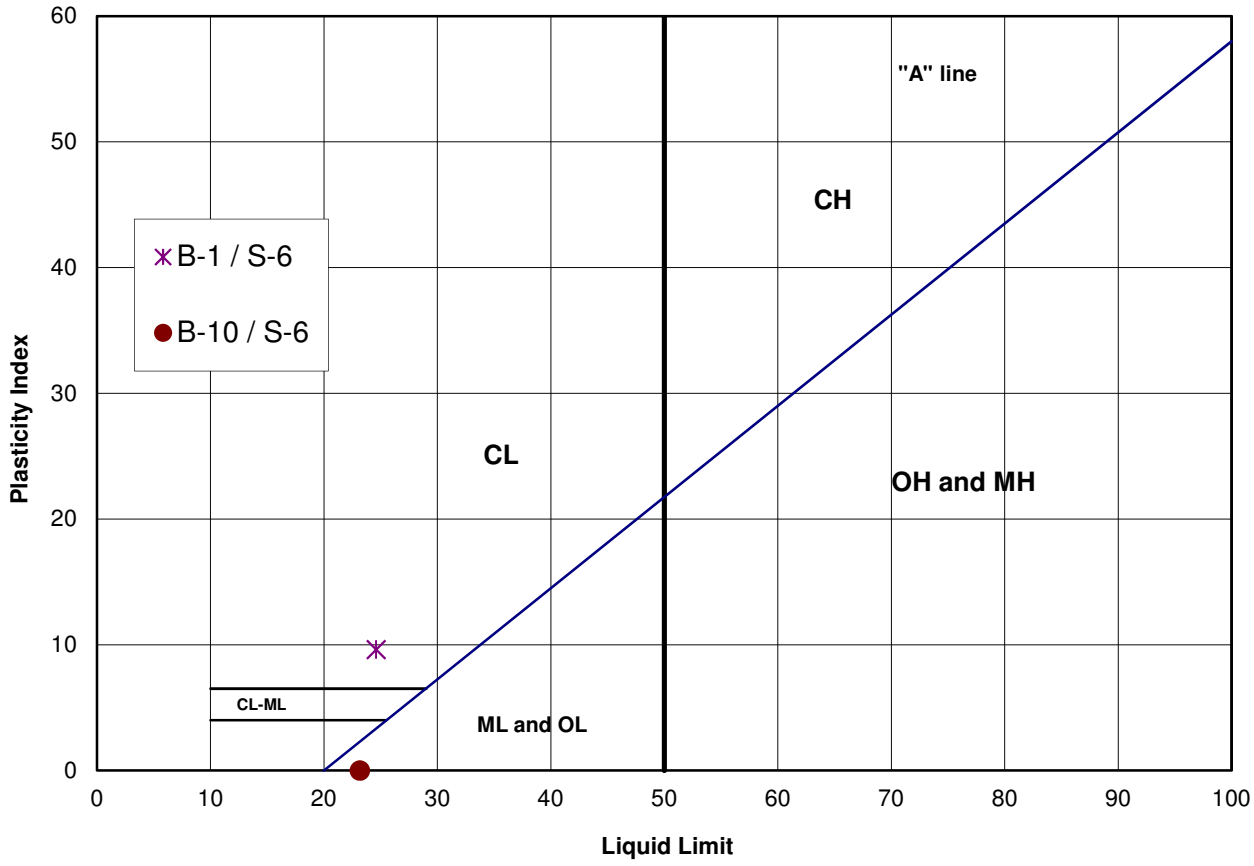
Sample	B-4 / S-2	**Sample**	B-5 / S-2	**Sample**	B-9 / S-1
Soil Type		Soil Type		Soil Type	
% water	5.3	% water	3.7	% water	6.7
Wet weight	303.4	Wet weight	222	Wet weight	236.8
Dry weight	288.1	Dry weight	214.1	Dry weight	221.9
+ 200 sieve	272.8	+ 200 sieve	204.1	+ 200 sieve	162.3
% Retained	94.7	% Retained	95.3	% Retained	73.1
%Pass. #200	**5**	**%Pass. #200**	**5**	**%Pass. #200**	**27**

Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. #200**		**%Pass. #200**	

Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. #200**		**%Pass. #200**	

Geo-Logic ASSOCIATES

PLASTICITY INDEX _ ASTM D4318



Sample	Depth	LL	PL	PI	USCS	Material Description
B-1 / S-6	30'	25	15	10	CL	
B-10 / S-6	30'	23	NP	-	SM	

Job Name: Langan # 721040501 Date: 5/18/23

Job No.: 2012-0057

EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

PROJECT Langan # 721040501 JOB NO. 2012-0057

Sample	B-3 / Bulk		By LD		Sample			By	
Sta. No.					Sta. No.				
Soil Type	Brown, Silty Sand				Soil Type				
Date	Time	Dial Reading	Wet+Tare	588.9	Date	Time	Dial Reading	Wet+Tare	
5/16/2023	16:20	0.3249	Tare	207.7				Tare	
		H2O	Net Weight	381.2				Net Weight	
5/17/2023	10:00	0.3253	% Water	11.5				% Water	
			Dry Dens.	103.6				Dry Dens.	
			% Max					% Max	
			Wet+Tare	616.1				Wet+Tare	
			Tare	207.7				Tare	
			Net Weight	408.4				Net Weight	
INDEX	0	0.0%	% Water	19.5				% Water	

Sample			By		Sample			By	
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date	Time	Dial Reading	Wet+Tare		Date	Time	Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	

EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

PROJECT Langan # 721040501 JOB NO. 2012-0057

Sample	FP-1 / Bulk		By LD		Sample			By	
Sta. No.					Sta. No.				
Soil Type	Brown, Silty Sand				Soil Type				
Date	Time	Dial Reading	Wet+Tare	619.6	Date	Time	Dial Reading	Wet+Tare	
5/26/2023	16:20	0.328	Tare	219.7				Tare	
		H2O	Net Weight	399.9				Net Weight	
5/27/2023	10:00	0.3275	% Water	9.5				% Water	
			Dry Dens.	110.7				Dry Dens.	
			% Max					% Max	
			Wet+Tare	647.2				Wet+Tare	
			Tare	219.7				Tare	
			Net Weight	427.5				Net Weight	
INDEX	1	0.1%	% Water	17.1				% Water	

Sample			By		Sample			By	
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date	Time	Dial Reading	Wet+Tare		Date	Time	Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	

SAMPLE NO.:	B-3 / Bulk
Depth:	0 - 5'
DIRECT SHEAR TEST (type)	
Initial Moisture Content %	
Dry Density (pcf)	
Normal Stress (psf)	
Peak Shear Stress (psf)	
Ultimate Shear Stress (psf)	
Cohesion (psf)	
Internal Friction Angle (degrees)	
EXPANSION TEST UBC STD 18-2	
Initial Dry Density (pcf)	
Initial Moisture Content %	
Final Moisture Content %	
Pressure (psf)	
Expansion Index / Swell %	
CORROSIVITY TEST	
Resistivity (CTM643) (ohm-cm)	4700
pH (CTM643)	7.6
CHEMICAL TESTS	
Soluble Sulfate (CTM 417) (ppm)	168
Chloride Content (CTM 422) (ppm)	96
Wash #200 Sieve (ASTM-1140) %	
Sand Equivalent (ASTM D2419)	

Geo-Logic ASSOCIATES

SAMPLE NO.:	FP-1 / Bulk
Depth:	0 - 5'
DIRECT SHEAR TEST (type)	
Initial Moisture Content %	
Dry Density (pcf)	
Normal Stress (psf)	
Peak Shear Stress (psf)	
Ultimate Shear Stress (psf)	
Cohesion (psf)	
Internal Friction Angle (degrees)	
EXPANSION TEST UBC STD 18-2	
Initial Dry Density (pcf)	
Initial Moisture Content %	
Final Moisture Content %	
Pressure (psf)	
Expansion Index / Swell %	
CORROSIVITY TEST	
Resistivity (CTM643) (ohm-cm)	3240
pH (CTM643)	7.4
CHEMICAL TESTS	
Soluble Sulfate (CTM 417) (ppm)	156
Chloride Content (CTM 422) (ppm)	128
Wash #200 Sieve (ASTM-1140) %	
Sand Equivalent (ASTM D2419)	

Geo-Logic ASSOCIATES

'R' VALUE CA 301

Client: Langan | Date: 5/24/23 | By: LD

Client's Job No.: **721040501** | Sample No.: B-8 @ 0 - 5'

GLA Reference: 2012-0057 | Soil Type: Brown, Silty Sand

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**350**	**350**	**350**	
Initial Moisture Content	%	**10.0**	**10.0**	**10.0**	
Water Added	ml	**10**	**4**	**7**	
Moisture at Compaction	%	10.9	10.4	10.6	
Sample & Mold Weight	gms	**3195**	**3181**	**3196**	
Mold Weight	gms	**2105**	**2094**	**2096**	
Net Sample Weight	gms	1090	1087	1100	
Sample Height	in.	**2.467**	**2.449**	**2.482**	
Dry Density	pcf	120.7	121.9	121.4	
Pressure	lbs	**3525**	**7930**	**4990**	
Exudation Pressure	psi	281	631	397	
Expansion Dial	x 0.0001	**4**	**13**	**9**	
Expansion Pressure	psf	17	56	39	
Ph at 1000lbs	psi	**18**	**15**	**16**	
Ph at 2000lbs	psi	**32**	**27**	**30**	
Displacement	turns	**3.99**	**3.65**	**3.89**	
R' Value		71	77	74	
Corrected 'R' Value		**71**	**77**	**74**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**72**
By Epansion Pressure :	**N/A**
TI = 5	

Geo-Logic ASSOCIATES

'R' VALUE CA 301

Client: Langan Date: 5/28/23 By: LD

Client's Job No.: **721040501** Sample No.: FP-1/Bulk

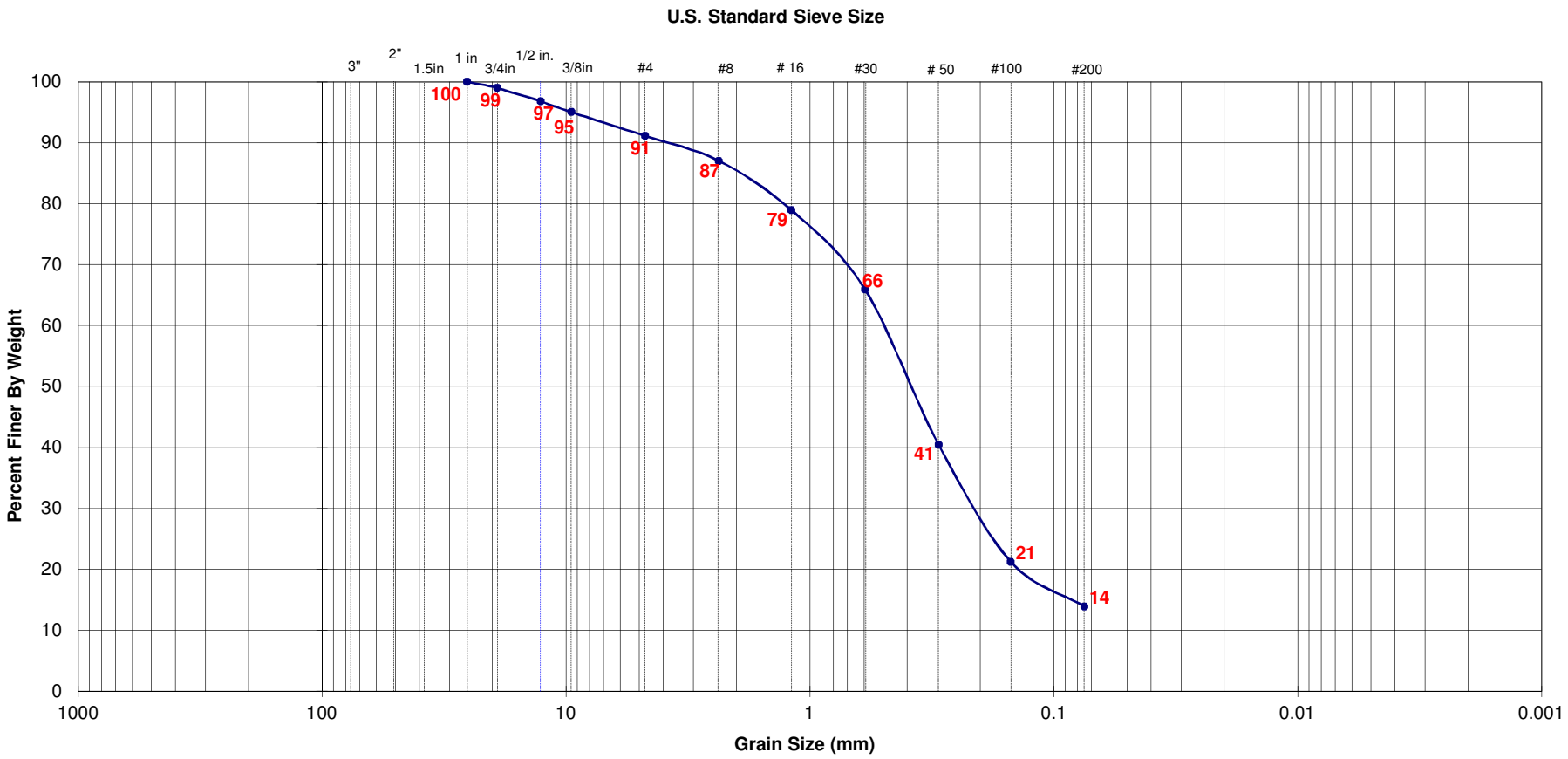
GLA Reference: 2012-0057 Soil Type: Brown, Silty Sand w. Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**350**	**350**	**350**	
Initial Moisture Content	%	**4.4**	**4.4**	**4.4**	
Water Added	ml	**65**	**72**	**68**	
Moisture at Compaction	%	10.1	10.7	10.4	
Sample & Mold Weight	gms	**3204**	**3209**	**3200**	
Mold Weight	gms	**2103**	**2103**	**2102**	
Net Sample Weight	gms	1101	1106	1098	
Sample Height	in.	**2.51**	**2.534**	**2.508**	
Dry Density	pcf	120.7	119.5	120.2	
Pressure	lbs	**8510**	**2960**	**4005**	
Exudation Pressure	psi	678	236	319	
Expansion Dial	x 0.0001	**0**	**0**	**0**	
Expansion Pressure	psf	0	0	0	
Ph at 1000lbs	psi	**11**	**15**	**13**	
Ph at 2000lbs	psi	**19**	**26**	**23**	
Displacement	turns	**4.12**	**4.46**	**4.22**	
R' Value		82	74	78	
Corrected 'R' Value		**82**	**74**	**78**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**77**
By Epansion Pressure :	**N/A**
TI = 5	

Geo-Logic ASSOCIATES

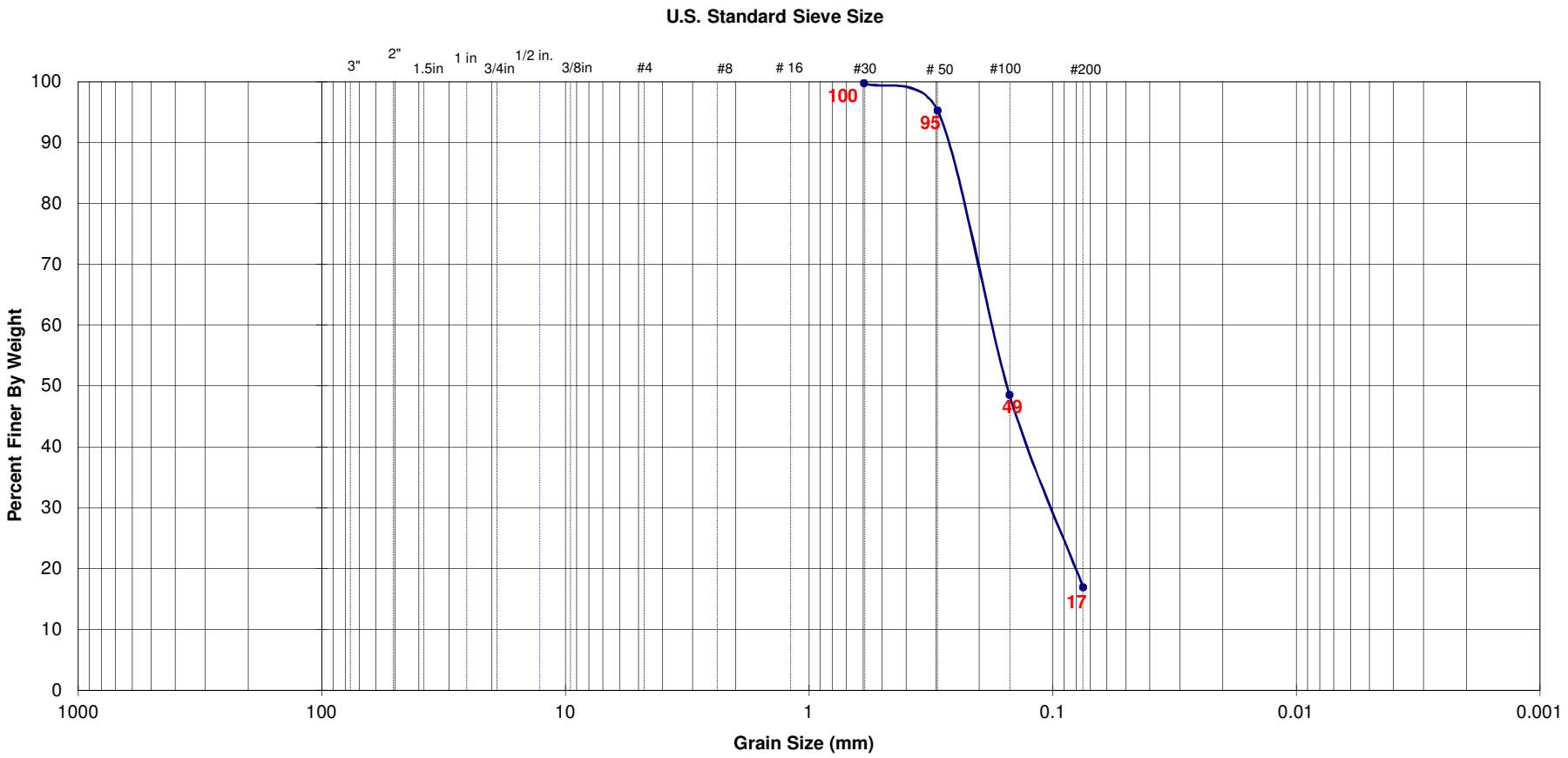
Date: 5/28/23



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
FP-1 / Bulk									**SW-SM**	

Geo-Logic ASSOCIATES

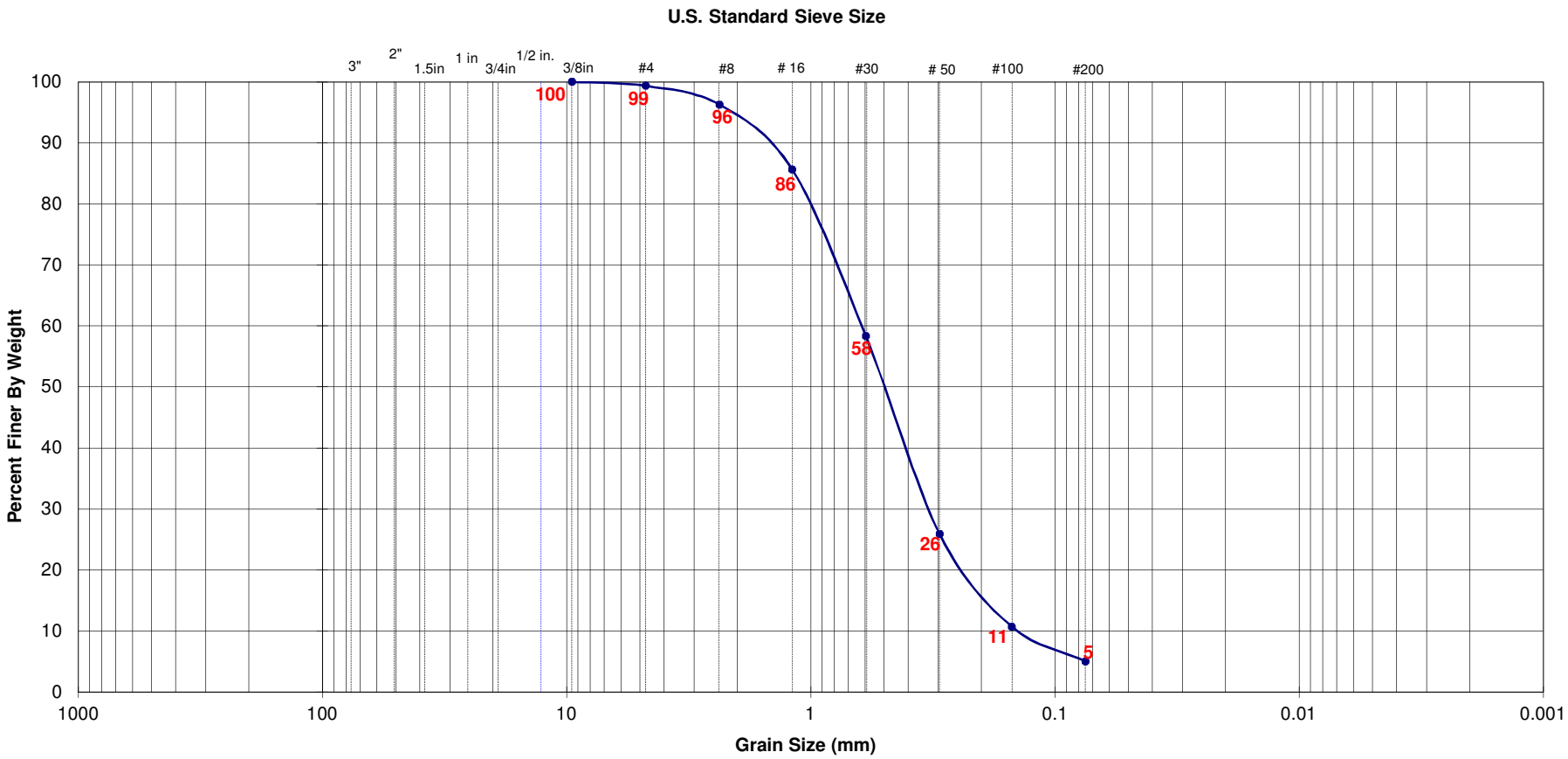
Date: 5/28/23



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
FP-2 / S-1									**SM**	

Geo-Logic ASSOCIATES

Date: 5/28/23



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
FP-1 / S-2									**SP-SM**	

Geo-Logic ASSOCIATES

MOISTURE DENSITY TESTS

PROJECT Langan # 721040501 **JOB NO.** 2012-0057 **BY** LD **DATE** 05/17/23

Sample No.	B-1 / S-2	B-1 / S-4	B-3 / S-1	B-3 / S-3	B-3 / S-5	B-4 / S-2	B-4 / S-4	B-4 / S-6
Depth (ft)	10.0	20.0	5.0	15.0	25.0	10.0	20.0	30.0
Type								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Clayey Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand
Wet+Tare	901.2	1135.5	929.9	1147.8	1037.2	1062.1	1055.1	1162.1
No. Ring	5	6	5	6	6	6	6	6
Wet Weight	127.4	151.8	175.3	150.3	112.9	122.3	135.4	126.7
Dry Weight	124.2	139.6	158.3	138.4	110.0	116.4	129.4	121.2
Wet density	112.6	120.1	117.4	121.8	106.4	116.1	115.2	130.1
% Water	2.6	8.7	10.7	8.6	2.6	5.1	4.6	4.5
Dry Density	109.7	110.5	106.0	112.2	103.7	110.5	110.1	124.4
O.B.Press(psf)								

Sample No.	B-5 / S-4	B-6 / S-3	B-6 / S-5	B-7 / S-1	B-7 / S-3	B-7 / S-5	B-7 / S-7	
Depth (ft)	20.0	15.0	25.0	5.0	15.0	25.0	35.0	
Type								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Clayey Sand	NSR	Brown, Silty Sand	Brown, Silty Clay	
Wet+Tare	660.3	1024.0	1129.4	888.0		1040.1	871.4	
No. Ring	4	6	6	5		6	5	
Wet Weight	142.9	271.9	109.0	219.3		135.4	107.6	
Dry Weight	116.7	217.1	87.2	190.5		125.5	87.6	
Wet density	106.2	104.6	119.3	116.6		106.8	113.9	
% Water	22.5	25.2	25.0	15.1		7.9	22.8	
Dry Density	86.7	83.5	95.4	101.3		99.0	92.7	
O.B.Press(psf)								

Geo-Logic ASSOCIATES

MOISTURE DENSITY TESTS

PROJECT Langan # 721040501 **JOB NO.** 2012-0057 **BY** LD **DATE** 05/17/23

Sample No.	B-8 / S-4	B-8 / S-6A	B-8 / S-6B					
Depth (ft)	20.0	30.0	30.0					
Type								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Clay					
Wet+Tare	1058.6	346.8	634.4					
No. Ring	6	2	3					
Wet Weight	131.9	84.9	68.7					
Dry Weight	127.6	82.1	60.5					
Wet density	109.4	106.9	138.7					
% Water	3.4	3.4	13.6					
Dry Density	105.8	103.3	122.1					
O.B.Press(psf)								
Sample No.								
Depth (ft)								
Type								
Soil Type								
Wet+Tare								
No. Ring								
Wet Weight								
Dry Weight								
Wet density								
% Water								
Dry Density								
O.B.Press(psf)								

Geo-Logic ASSOCIATES

MOISTURE DENSITY TESTS

PROJECT Langan # 721040501 **JOB NO.** 2012-0057 **BY** LD **DATE** 05/28/23

Sample No.	FP-1/S-1	FP-1/S-2	FP-1/S-3	FP-1/S-4	FP-1/S-5	FP-1/S-6	FP-1/S-7	FP-1/S-8
Depth (ft)	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0
Type								
Soil Type	Brown, Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Sand	Brown, Silty Clay	Brown, Sandy Clay	Brown, Silty Sand
Wet+Tare	659.1	1031.3	1006.0	1063.6	349.7	1229.0	1220.9	1093.6
No. Ring	4	6	6	6	2	6	6	6
Wet Weight	125.0	100.6	131.1	124.5	159.7	151.3	151.6	134.0
Dry Weight	123.0	98.2	125.5	115.9	156.3	132.0	134.0	128.2
Wet density	105.9	111.9	108.3	116.4	114.3	139.4	138.3	120.5
% Water	1.6	2.4	4.5	7.4	2.2	14.6	13.1	4.5
Dry Density	104.2	109.2	103.7	108.3	111.9	121.6	122.2	115.3
O.B.Press(psf)								

Sample No.	FP-1/S-9	FP-1/S-10	FP-2/S-1	FP-2/S-2	FP-2/S-3	FP-2/S-4	FP-2/S-5	FP-2/S-6
Depth (ft)	45.0	50.0	5.0	10.0	15.0	20.0	25.0	30.0
Type								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand	Brown, Sand	Brown, Sand	Brown, Silty Clay w. Gravel	Brown, Silty Sand
Wet+Tare	860.3	1014.6	995.0	957.1	777.8	1029.3	1105.9	1017.1
No. Ring	5	6	6	6	5	6	6	6
Wet Weight	109.2	140.0	124.9	116.2	95.0	132.9	125.9	121.5
Dry Weight	103.2	134.3	116.8	109.9	92.6	130.4	120.1	118.0
Wet density	112.0	109.5	106.8	101.5	98.2	111.6	122.2	109.9
% Water	5.8	4.2	6.9	5.7	2.6	1.9	4.8	3.0
Dry Density	105.9	105.1	99.9	96.0	95.7	109.5	116.6	106.7
O.B.Press(psf)								

Geo-Logic ASSOCIATES

MOISTURE DENSITY TESTS

PROJECT Langan # 721040501 **JOB NO.** 2012-0057 **BY** LD **DATE** 05/28/23

Sample No.	FP-2/S-7	FP-2/S-8	FP-2/S-9	FP-2/S-10				
Depth (ft)	35.0	40.0	45.0	50.0				
Type								
Soil Type	Brown, Silty Sand	Brown, Sandy Clay	Brown, Sandy Clay	Brown, Silty Sand				
Wet+Tare	1118.2	1224.2	908.5	1084.4				
No. Ring	6	6	5	6				
Wet Weight	143.2	151.0	140.5	125.5				
Dry Weight	111.4	129.9	125.5	121.5				
Wet density	124.0	138.7	120.1	119.3				
% Water	28.5	16.2	12.0	3.3				
Dry Density	96.4	119.3	107.2	115.5				
O.B.Press(psf)								
Sample No.								
Depth (ft)								
Type								
Soil Type								
Wet+Tare								
No. Ring								
Wet Weight								
Dry Weight								
Wet density								
% Water								
Dry Density								
O.B.Press(psf)								

Geo-Logic ASSOCIATES

APPENDIX D
Prior Cone Penetrometer Test (CPT) Soundings

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

3163 E. Vernon Avenue
Vernon, CA
May 4-5, 2023

Prepared for:

Mr. Shaun Wilkins
Langan Eng. & Environmental Services
18575 Jamboree Road, Ste 150
Irvine, CA 92612
Office (949) 561-9200 / Fax (949) 561-9201

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289
www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the project located at 3163 E. Vernon Avenue in Vernon, California. The work was performed by Kehoe Testing & Engineering (KTE) on May 4-5, 2023. The scope of work was performed as directed by Langan Eng. & Environmental Services personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at ten locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	48	Refusal
CPT-2	50	
CPT-3	50	
CPT-4	64	Refusal
CPT-5	50	
CPT-6	50	
CPT-7	50	
CPT-8	70	Refusal
CPT-9	50	
CPT-10	50	

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone with a cone net area ratio of 0.83. The following parameters were recorded at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil behavior type on the CPT plots is derived from the attached CPT SBT plot (Robertson, "Interpretation of Cone Penetration Test…", 2009) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

The CPT data files have also been provided. These files can be imported in CPeT-IT (software by GeoLogismiki) and other programs to calculate various geotechnical parameters.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

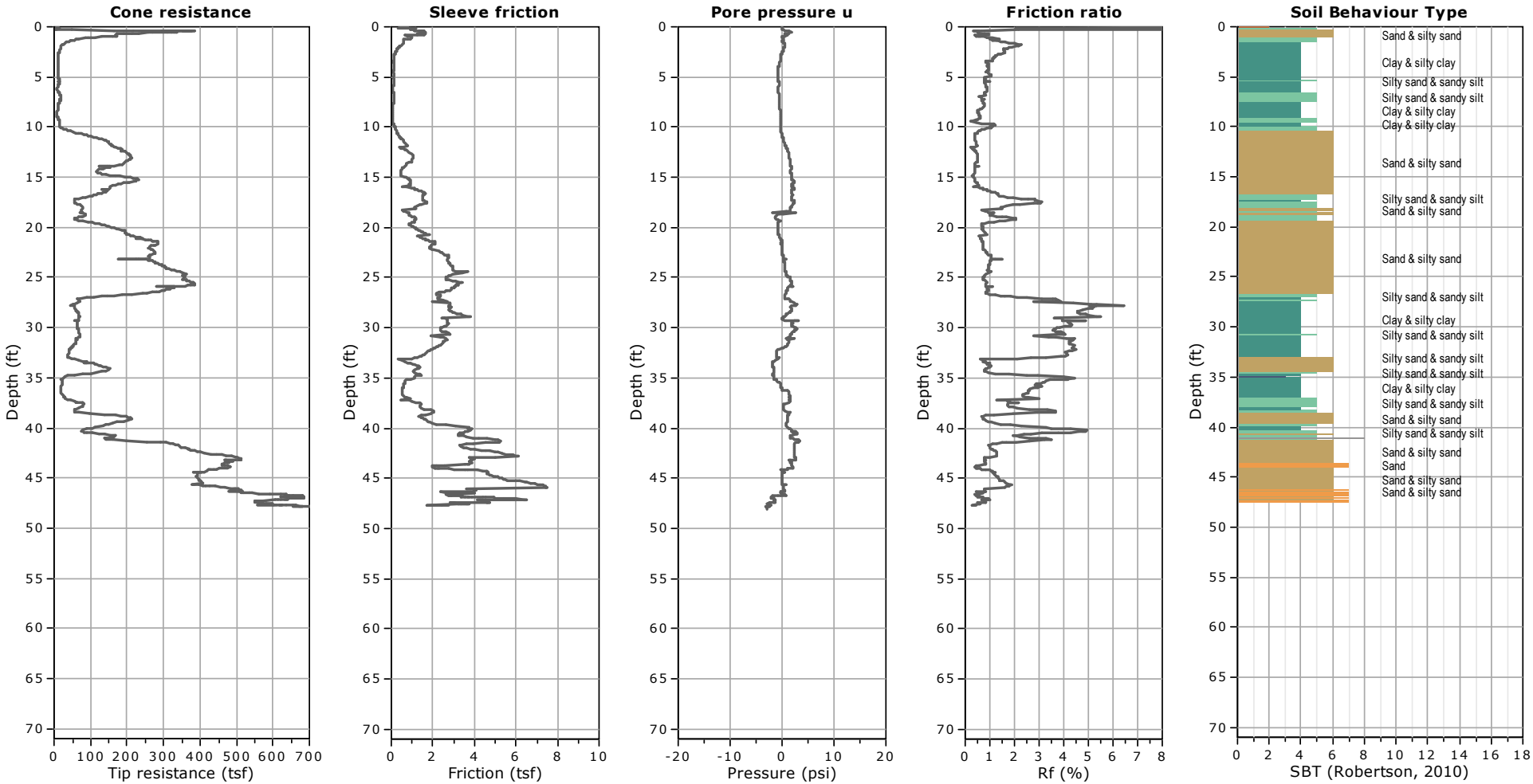
05/12/23-aa-5216

APPENDIX

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

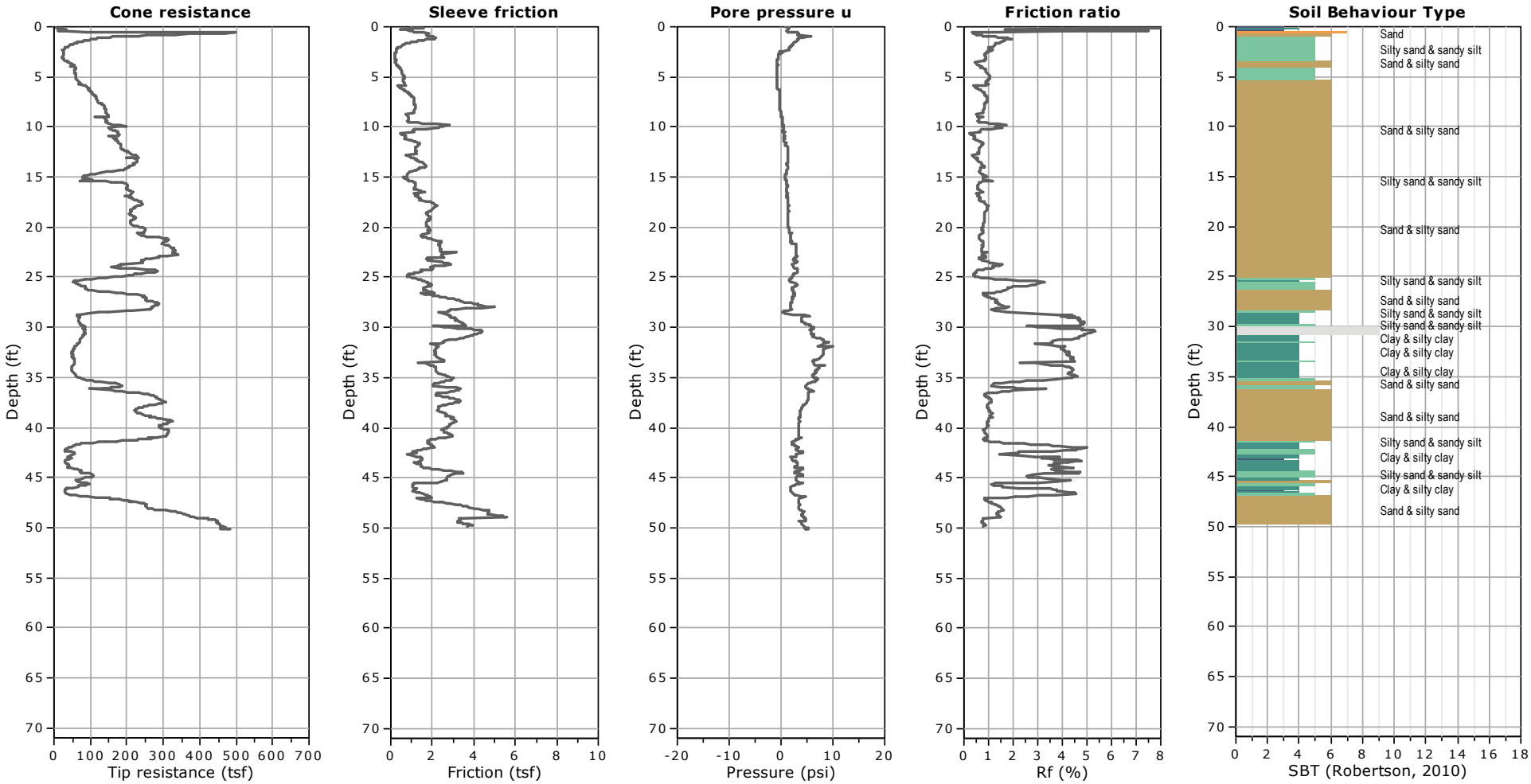
CPT-1
Total depth: 48.06 ft, Date: 5/5/2023



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

CPT-2
Total depth: 50.19 ft, Date: 5/5/2023



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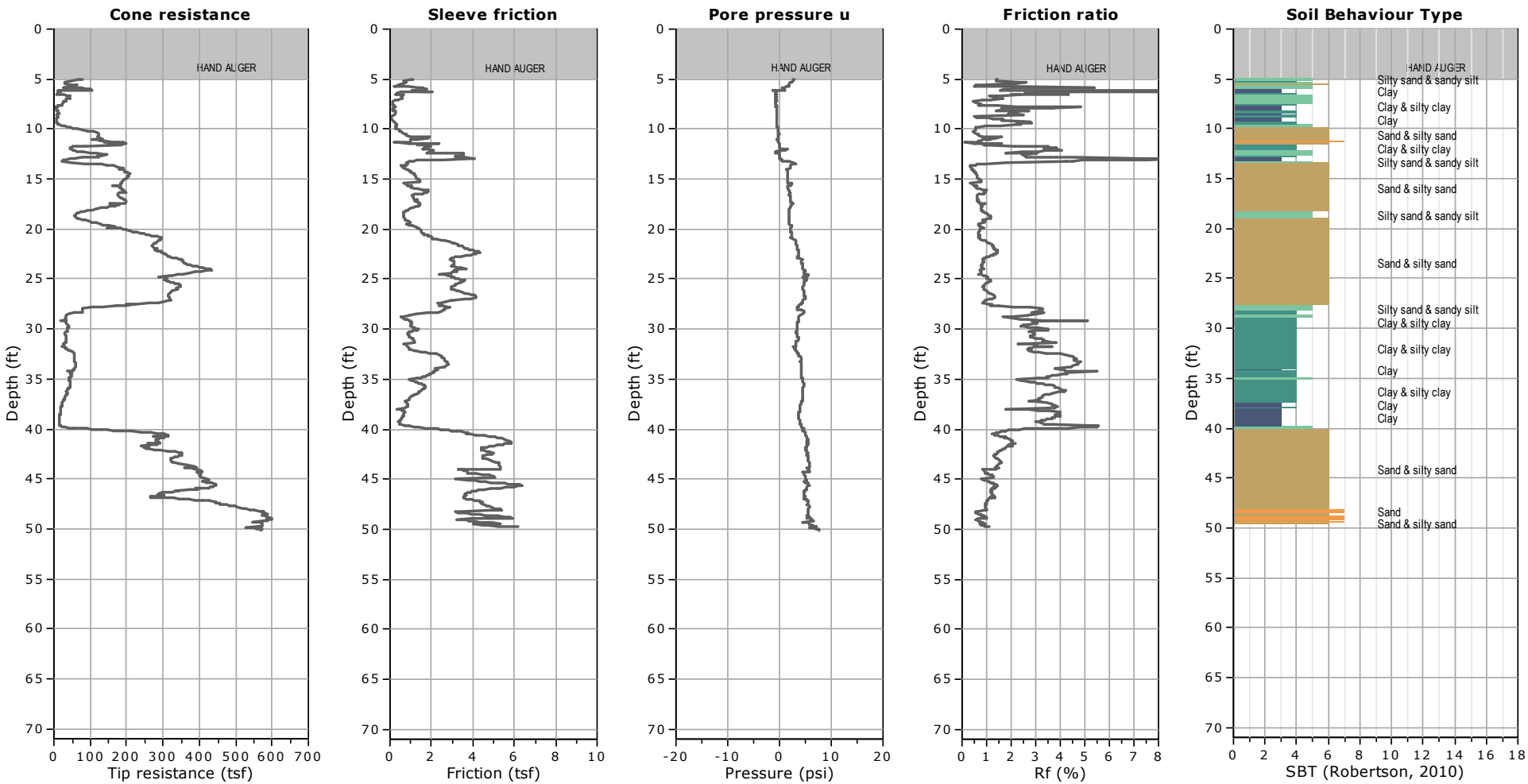
Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

CPT-3
Total depth: 50.13 ft, Date: 5/4/2023



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steve@kehoetesting.com
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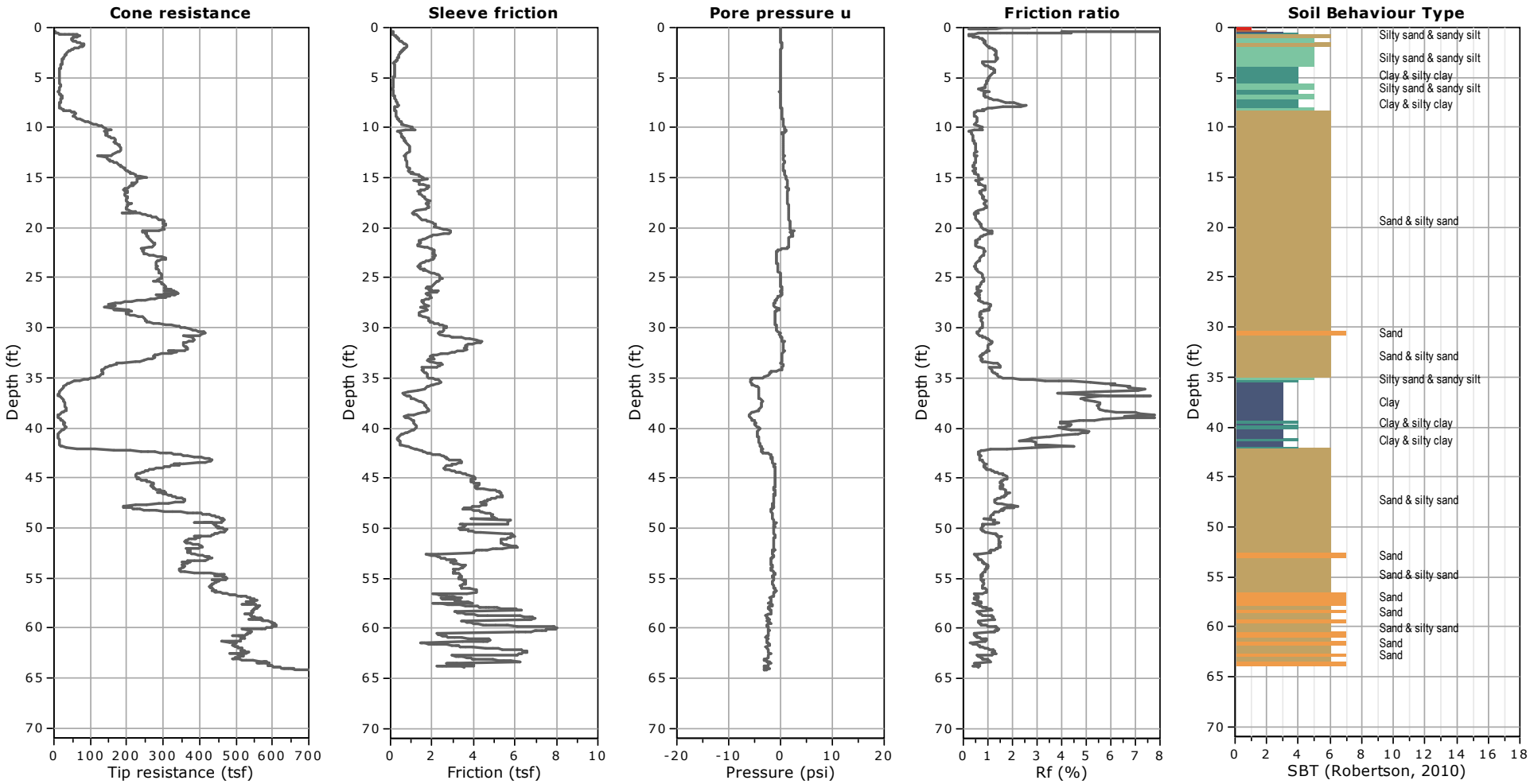
Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

CPT-4
Total depth: 64.22 ft, Date: 5/5/2023



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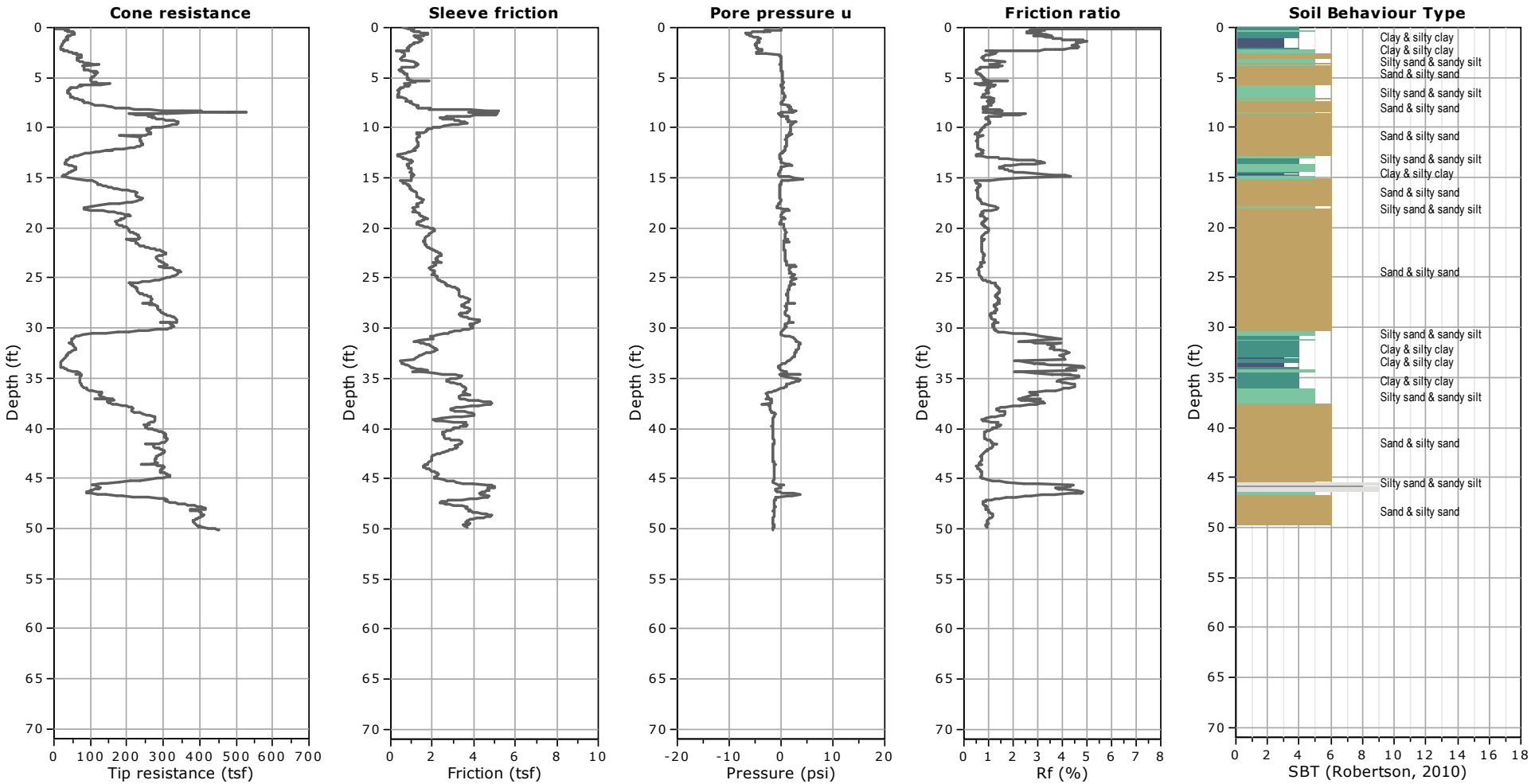
Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

CPT-5
Total depth: 50.19 ft, Date: 5/5/2023



Kehoe Testing and Engineering
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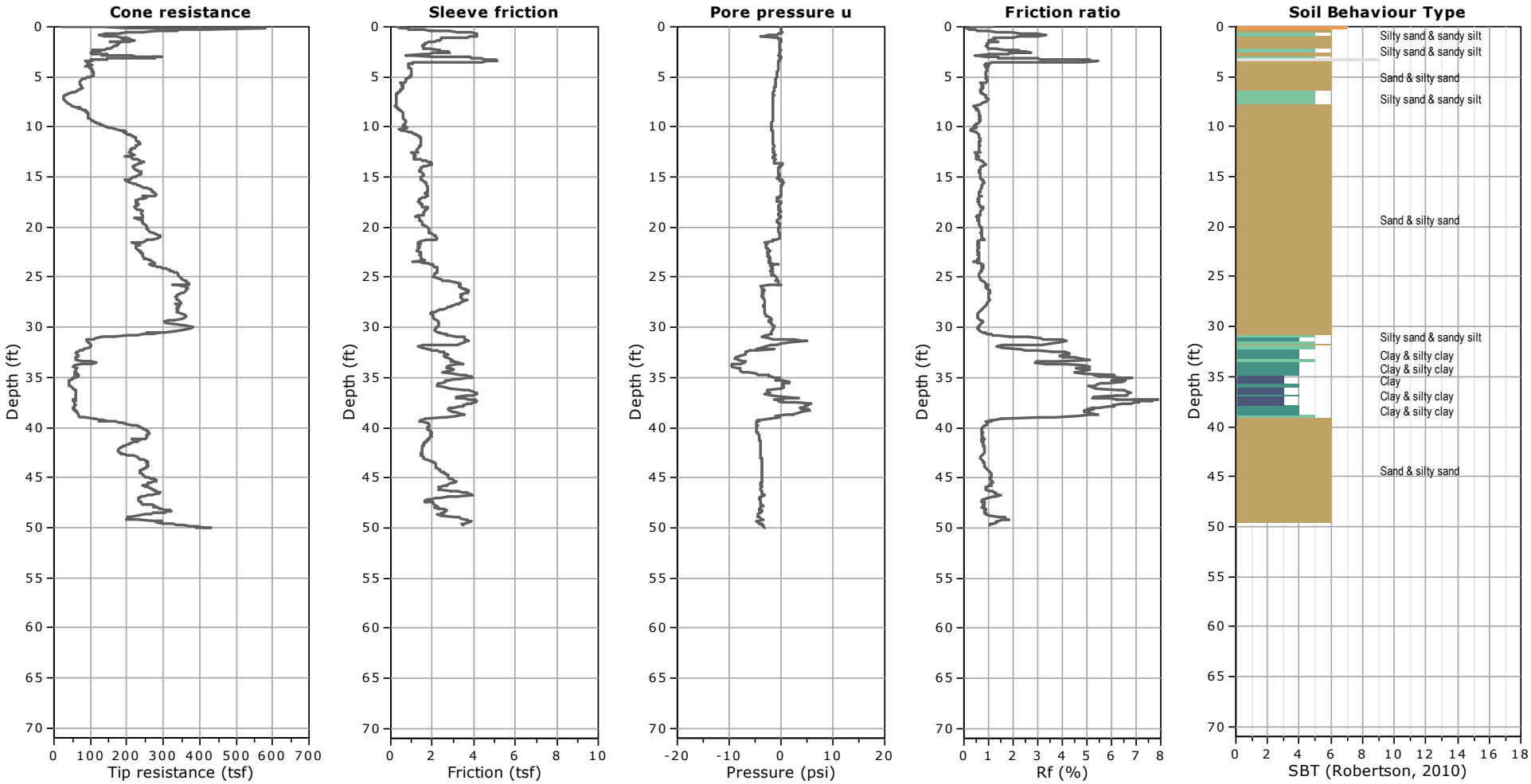
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

CPT-6
Total depth: 50.06 ft, Date: 5/5/2023



Kehoe Testing and Engineering
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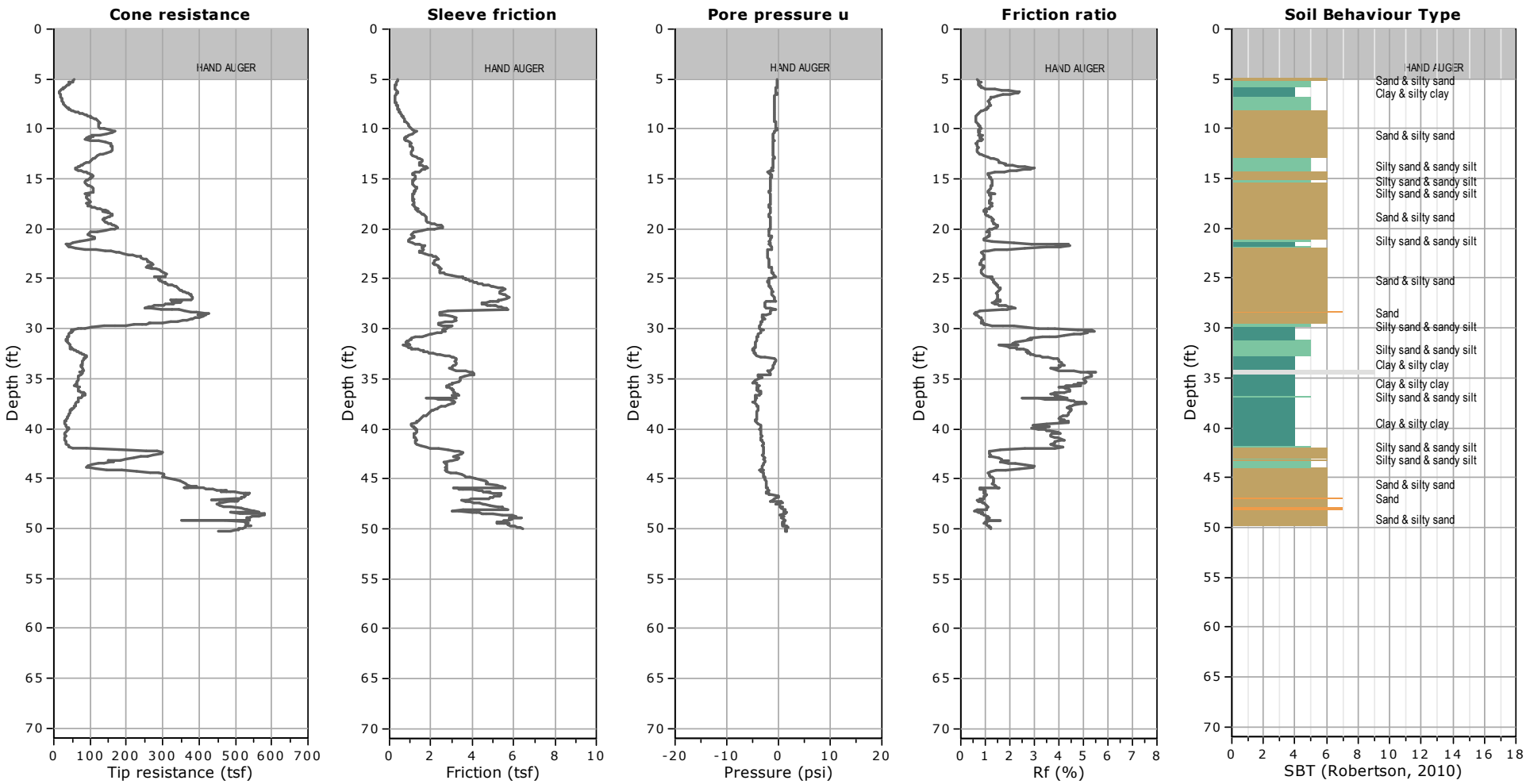
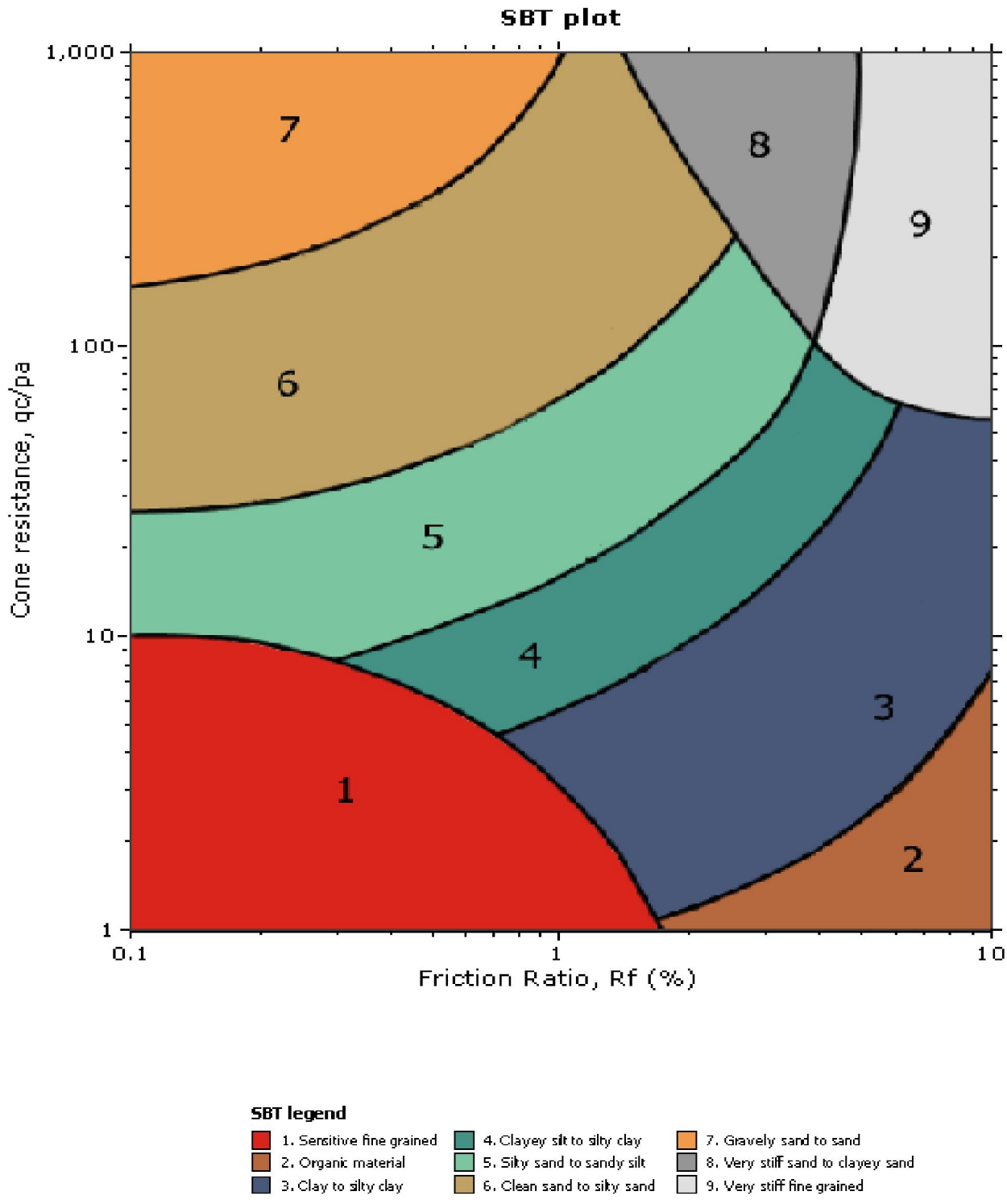
steve@kehoetesting.com
www.kehoetesting.com

Project: **Langan Eng. & Environmental Services**
Location: **3163 East Vernon Ave, Vernon, CA**

CPT-10
Total depth: 50.32 ft, Date: 5/4/2023



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com



APPENDIX E
Results of Prior Field Percolation Testing

PERCOLATION TEST DATA SHEET

FALLING HEAD INFILTRATION TEST

Project:	3163 E Vernon					Project No.:	721040501	Date:	5/5/2023
Test Hole No.:	FP-1					Tested By:	S. Wilkins		
Depth of Test Hole (ft):	65					USCS Soil Classification:		SP-SM	
PVC Pipe Dimension:	3-in I.D. Perforated by 10 Feet					Test Hole Diameter (in):		10	
Trial No.	Date	Time of Measurement	Initial Depth to Water (ft)	Time of Measurement	Final Depth to Water (ft)	Volume of Water Infiltrated (cu.in.)	Surface Area (sq.in.)	Time Interval (min)	Inflitration Rate (in/hr)
Time Interval	Presoak, 1 hour								
1	5/5/2023	10:20 AM	55.00	10:30 AM	56.74	1640	3848	10	2.56
2	5/5/2023	10:30 AM	55.00	10:40 AM	56.48	1395	3848	10	2.17
3	5/5/2023	10:40 AM	55.00	10:50 AM	56.24	1169	3848	10	1.82
4	5/5/2023	10:50 AM	55.00	11:00 AM	56.20	1131	3848	10	1.76
5	5/5/2023	11:00 AM	55.00	11:10 AM	55.98	924	3848	10	1.44
6	5/5/2023	11:10 AM	55.00	11:20 AM	56.02	961	3848	10	1.50
7	5/5/2023	11:20 AM	55.00	11:30 AM	56.12	1056	3848	10	1.65
8	5/5/2023	11:30 AM	55.00	11:40 AM	56.15	1084	3848	10	1.69
9	5/5/2023	11:40 AM	55.00	11:50 AM	56.10	1037	3848	10	1.62
10	5/5/2023	11:50 AM	55.00	12:00 PM	56.05	990	3848	10	1.54
11	5/5/2023	12:00 PM	55.00	12:10 PM	56.02	961	3848	10	1.50
12	5/5/2023	12:10 PM	55.00	12:20 PM	55.96	905	3848	10	1.41
13	5/5/2023	12:20 PM	55.00	12:30 PM	55.94	886	3848	10	1.38
14	5/5/2023	12:30 PM	55.00	12:40 PM	55.96	905	3848	10	1.41
15	5/5/2023	12:40 PM	55.00	12:50 PM	55.97	914	3848	10	1.43
16	5/5/2023	12:50 PM	55.00	1:00 PM	55.95	895	3848	10	1.40
17	5/5/2023	1:00 PM	55.00	1:10 PM	55.94	886	3848	10	1.38
18	5/5/2023	1:10 PM	55.00	1:20 PM	55.95	895	3848	10	1.40

Comments:	1. Percolation test was performed in accordance with the Boring Percolation Test Procedure provided in the "Guidelines for Design, Investigation, and Reporting - Low Impact Development Stormwater Infiltration," prepared by County of Los Angeles Department of Public Works, dated 30 June 2021. 2. Weather: Sunny and warm.	Average Stabilized Rate	1.39
		Reduction Factors RF_t=1, RF_v=1, RF_s=1	3
		Design Infiltration Rate (in/hr)	0.46

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CONSTANT HEAD INFILTRATION TEST DATA SHEET

Project:	3163 Vernon				Project No.:	721040501					Date:			5/25/2023	
Test Hole No.:	FP-3				Tested By:	CR									
Maximum Depth of Test Infiltraton (ft):	50				USCS Soil Classification:						SP/SW				
length of slotted pipe (ft):	50				Test Hole Diameter (in):						10				
Presoak Durration:	1 hour				Depth of Presoak (ft):						1.5				

Trial No.	Date	Time of Measurement	Initial Depth to Water (ft)	Time of Measurement	Final Depth to Water (ft)	Elapsed Time (min)	Time Interval (min)	Average Water Head (ft)	Volume of Water per Time Interval (gal/Δt)	Flow Rate (gal/min)	Flow Rate (ft^3/min)	Surface Area (ft^2)	Infiltration Rate, $K_{sat,\ measured}$ (ft/min)	Infiltration Rate, $K_{sat,\ measured}$ (in/hr)
Time Interval														--
						0	0	0.00		0	0	0	0	--
1	5/25/2023	7:10 AM	43.08	7:20 AM	43.40	10	10	6.76	30.30	3.03	0.41	17.70	0.02	16.48
2	5/25/2023	7:20 AM	43.11	7:30 AM	43.19	20	10	6.85	30.40	3.04	0.41	17.93	0.02	16.32
3	5/25/2023	7:30 AM	43.09	7:40 AM	43.34	30	10	6.79	31.20	3.12	0.42	17.76	0.02	16.91
4	5/25/2023	7:40 AM	43.10	7:50 AM	43.29	40	10	6.81	30.70	3.07	0.41	17.82	0.02	16.59
5	5/25/2023	7:50 AM	43.19	8:00 AM	43.40	50	10	6.71	32.00	3.20	0.43	17.55	0.02	17.55
6	5/25/2023	8:00 AM	43.15	8:10 AM	43.16	60	10	6.85	31.50	3.15	0.42	17.92	0.02	16.92
7	5/25/2023	8:10 AM	43.30	8:20 AM	43.40	70	10	6.65	30.60	3.06	0.41	17.41	0.02	16.92
8	5/25/2023	8:20 AM	43.35	8:30 AM	43.39	80	10	6.63	30.10	3.01	0.40	17.36	0.02	16.69
9	5/25/2023	8:30 AM	43.44	8:40 AM	43.48	90	10	6.54	30.00	3.00	0.40	17.12	0.02	16.86
10	5/25/2023	8:40 AM	43.50	8:50 AM	43.61	100	10	6.45	29.40	2.94	0.39	16.87	0.02	16.77
11	5/25/2023	8:50 AM	43.55	9:00 AM	43.66	110	10	6.40	28.30	2.83	0.38	16.74	0.02	16.27
12	5/25/2023	9:00 AM	43.28	9:10 AM	44.10	120	10	6.31	27.40	2.74	0.37	16.52	0.02	15.96
13	5/25/2023	9:10 AM	43.33	9:20 AM	43.72	130	10	6.48	27.30	2.73	0.36	16.95	0.02	15.50
14	5/25/2023	9:20 AM	43.28	9:30 AM	43.61	140	10	6.56	27.00	2.70	0.36	17.16	0.02	15.14
15	5/25/2023	9:30 AM	43.61	9:40 AM	43.86	150	10	6.27	28.20	2.82	0.38	16.40	0.02	16.55
16	5/25/2023	9:40 AM	43.96	9:50 AM	44.01	160	10	6.02	25.30	2.53	0.34	15.75	0.02	15.46
17	5/25/2023	9:50 AM	44.01	10:00 AM	44.17	170	10	5.91	25.80	2.58	0.34	15.47	0.02	16.05
18	5/25/2023	10:00 AM	44.17	10:10 AM	44.22	180	10	5.81	25.50	2.55	0.34	15.20	0.02	16.15
													Raw infiltration rate (in/hr)	15.87
													Reduction Factor	3.00
													Design Rate	**5.29**

Comments:

1. Infiltration test was performed in general accordance with the "Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration - GS200.1" prepared by County of Los Angeles Department of Public Works, dated 30 June 2021.

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TABLE A-1
INFILTRATION TEST DATA SHEET

Project:	3163 Vernon	Project No.:	721040501	Date:	5/25/2022
Test Hole No.:	FP-4	Tested By:	CR		
Maximum Depth of Test Infiltraton (ft):	50	USCS Soil Classification:		SM	
length of slotted pipe (ft):	50	Test Hole Diameter (in):		10	
Presoak Durration:	1 hour	Depth of Presoak (ft):		1.5	

Trial No.	Date	Time of Measurement	Initial Depth to Water (ft)	Time of Measurement	Final Depth to Water (ft)	Elapsed Time (min)	Time Interval (min)	Average Water Head (ft)	Volume of Water per Time Interval (gal/Δt)	Flow Rate (gal/min)	Flow Rate (ft^3/min)	Surface Area (ft^2)	Infiltration Rate, $K_{sat, measured}$ (ft/min)	Infiltration Rate, $K_{sat, measured}$ (in/hr)
Time Interval														--
						0	0	0.00	0.00	0	0	0	0	--
1	5/25/2022	10:30 AM	42.84	10:40 AM	43.29	10	10	6.94	9.80	0.98	0.13	18.16	0.01	5.20
2	5/25/2022	10:40 AM	43.29	10:50 AM	43.51	20	10	6.60	9.60	0.96	0.13	17.28	0.01	5.35
3	5/25/2022	10:50 AM	43.51	11:00 AM	43.16	30	10	6.67	9.40	0.94	0.13	17.45	0.01	5.19
4	5/25/2022	11:00 AM	43.16	11:10 AM	43.58	40	10	6.63	8.90	0.89	0.12	17.36	0.01	4.94
5	5/25/2022	11:10 AM	43.58	11:20 AM	43.84	50	10	6.29	8.80	0.88	0.12	16.47	0.01	5.14
6	5/25/2022	11:20 AM	43.84	11:30 AM	43.79	60	10	6.19	8.75	0.87	0.12	16.19	0.01	5.20
7	5/25/2022	11:30 AM	43.79	11:40 AM	43.88	70	10	6.17	8.40	0.84	0.11	16.14	0.01	5.01
8	5/25/2022	11:40 AM	43.88	11:50 AM	43.80	80	10	6.16	8.30	0.83	0.11	16.13	0.01	4.95
9	5/25/2022	11:50 AM	43.80	12:00 PM	44.07	90	10	6.07	8.40	0.84	0.11	15.88	0.01	5.09
10	5/25/2022	12:00 PM	44.07	12:10 PM	44.09	100	10	5.92	8.10	0.81	0.11	15.50	0.01	5.03
11	5/25/2022	12:10 PM	44.09	12:20 PM	44.15	110	10	5.88	7.90	0.79	0.11	15.39	0.01	4.94
12	5/25/2022	12:20 PM	44.15	12:30 PM	43.55	120	10	6.15	7.80	0.78	0.10	16.10	0.01	4.66
13	5/25/2022	12:30 PM	43.55	12:40 PM	43.23	130	10	6.61	8.10	0.81	0.11	17.30	0.01	4.51
14	5/25/2022	12:40 PM	43.23	12:50 PM	44.03	140	10	6.37	8.40	0.84	0.11	16.68	0.01	4.85
15	5/25/2022	12:50 PM	44.03	1:00 PM	44.07	150	10	5.95	7.50	0.75	0.10	15.58	0.01	4.63
16	5/25/2022	1:00 PM	44.07	1:10 PM	44.13	160	10	5.90	7.60	0.76	0.10	15.45	0.01	4.74
17	5/25/2022	1:10 PM	44.13	1:20 PM	44.29	170	10	5.79	7.60	0.76	0.10	15.16	0.01	4.83
18	5/25/2022	1:20 PM	44.29	1:30 PM	44.42	180	10	5.65	7.60	0.76	0.10	14.78	0.01	4.95
													Raw infiltration rate (in/hr)	4.80
													Factor of Safety	3.00
													Design Rate	**1.60**

Comments:

1. Infiltration test was performed in general accordance with the "Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration - GS200.1" prepared by County of Los Angeles Department of Public Works, dated 30 June 2021.
2. Infiltration rates provided do not include reduction factors.

PERCOLATION TEST DATA SHEET

FALLING HEAD INFILTRATION TEST

Project:	3163 E Vernon					Project No.:	721040501	Date:	5/25/2023
Test Hole No.:	FP-5					Tested By:	CR		
Depth of Test Hole (ft):	50					USCS Soil Classification:			
PVC Pipe Dimension:	3-in I.D. Perforated by 10 Feet					Test Hole Diameter (in):		8	
Trial No.	Date	Time of Measurement	Initial Depth to Water (ft)	Time of Measurement	Final Depth to Water (ft)	Volume of Water Infiltrated (cu.in.)	Surface Area (sq.in.)	Time Interval (min)	Inflitration Rate (in/hr)
Time Interval	Presoak, 1 hour								
1	5/25/2023	2:00 PM	39.88	2:10 PM	44.28	2654	3102	10	5.13
2	5/25/2023	2:10 PM	39.90	2:20 PM	44.26	2630	3096	10	5.10
3	5/25/2023	2:20 PM	39.95	2:30 PM	44.34	2648	3081	10	5.16
4	5/25/2023	2:30 PM	39.91	2:40 PM	44.19	2582	3093	10	5.01
5	5/25/2023	2:40 PM	40.02	2:50 PM	43.90	2340	3060	10	4.59
6	5/25/2023	2:50 PM	39.94	3:00 PM	44.10	2509	3084	10	4.88
7	5/25/2023	3:00 PM	39.98	3:10 PM	44.30	2606	3072	10	5.09
8	5/25/2023	3:10 PM	40.01	3:20 PM	44.50	2708	3063	10	5.30
9	5/25/2023	3:20 PM	40.00	3:30 PM	44.40	2654	3066	10	5.19
10	5/25/2023	3:30 PM	40.00	3:40 PM	45.50	3318	3066	10	6.49
11	5/25/2023	3:40 PM	40.00	3:50 PM	44.80	2895	3066	10	5.67
12	5/25/2023	3:50 PM	40.11	4:00 PM	43.47	2027	3033	10	4.01
13	5/25/2023	4:00 PM	40.09	4:10 PM	43.65	2147	3039	10	4.24
14	5/25/2023	4:10 PM	39.71	4:20 PM	43.59	2340	3154	10	4.45
15	5/25/2023	4:20 PM	39.94	4:30 PM	43.64	2232	3084	10	4.34
16	5/25/2023	4:30 PM	39.98	4:40 PM	43.65	2214	3072	10	4.32
17	5/25/2023	4:40 PM	39.94	4:50 PM	43.50	2147	3084	10	4.18
18	5/25/2023	4:50 PM	40.01	5:00 PM	43.49	2099	3063	10	4.11

Comments:	1. Percolation test was performed in accordance with the Boring Percolation Test Procedure provided in the "Guidelines for Design, Investigation, and Reporting - Low Impact Development Stormwater Infiltration," prepared by County of Los Angeles Department of Public Works, dated 30 June 2021. 2. Weather: Sunny and warm.	Average Stabilized Rate	4.20
		Reduction Factors RF_t=1, RF_v=1, RF_s=1	3
		Design Infiltration Rate (in/hr)	1.40

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