Appendix C

Geotechnical and Paleo Evaluation

AQUABELLA MASTER PLANNED COMMUNITY
MORENO VALLEY, CALIFORNIA

BASELINE GEOTECHNICAL REPORT

SUBMITTED TO
Mr. Mel Mercado
Vice President Community Development
Highland Fairview
14225 Corporate Way
Moreno Valley, CA 92553

PREPARED BY
ENGEO Incorporated

February 6, 2023

PROJECT NO.
19848.000.001

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19848.000.001

February 6, 2023

Mr. Mel Mercado
Vice President Community Development
Highland Fairview
14225 Corporate Way
Moreno Valley, CA 92553

Subject: Aquabella Master Planned Community
Moreno Valley, California

BASELINE GEOTECHNICAL REPORT

Dear Mr. Mercado:

ENGEO prepared this baseline geotechnical report for Highland Fairview as outlined in our agreement dated February 2, 2022. The purpose of this report was to characterize the subsurface conditions at the site and provide preliminary geotechnical recommendations to support the design team during planning and grading design.

From a geotechnical standpoint, the site is suitable for the planned development provided the conclusions and recommendations presented in this report are incorporated into design. The primary geotechnical constraints that could affect development on the site are ground shaking, existing fill, and expansive soil. We present mitigation recommendations to address these constraints in this report.

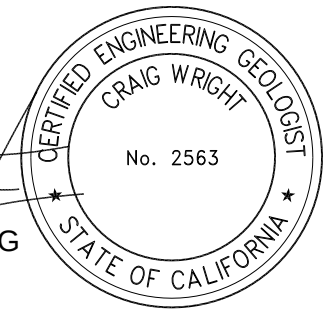
If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Jeff Braun, PE, PMP

Craig Wright, CEG



Josef J. Tootle, GE

jk/mv/jtb/csw/jtt/dt

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EXECUTIVE SUMMARY

ENGEO performed a geotechnical study to support mass grading plan preparation and provide preliminary findings, conclusions, and recommendations for building and infrastructure improvements for estimation purposes. Site-specific explorations and studies are recommended for each tract/community and other building types (retail and commercial).

In our opinion and from a geotechnical engineering viewpoint, the site is suitable for the proposed development provided the geotechnical recommendations in this report are properly incorporated into the design plans and specifications. The primary geotechnical constraints are ground shaking, existing fill, and expansive soil. Brief summaries of select conclusions and recommendations are below.

Our exploration observations and laboratory testing identified areas of soil that may be susceptible to potential soil collapse, throughout the site. Site soil in the upper 5 to 9 feet of the site has swell/collapse test results indicative of low to moderate collapse potential.

Based on our percolation test results, we believe select soil units at the reported depths are capable of supporting on-site infiltration best management practices (BMPs), such as water quality basins, swales, or dry wells. The location and depth of infiltration features should be coordinated with us to avoid wetting of collapsible soils near structural elements.

For structural areas that may be sensitive to potential differential settlement, we recommend overexcavation of existing soil to a minimum depth of 5 feet below existing grade, or 5 feet below bottom of foundations, whichever is deeper. For planned open space, parking areas, and other areas less sensitive to differential settlements, remedial grading should include overexcavation of existing soil to a minimum depth of 3 feet below finished grade. Our remedial grading recommendations will reduce, but not eliminate, the potential total and differential settlement caused by seismic densification and/or collapse.

Assuming remedial grading or ground improvement is completed in accordance with our recommendations provided in this report, buildings can be founded on conventional footings with slab-on-grade or conventional mat foundations. Provided our earthwork recommendations in Section 5.0 are followed, the proposed multi-family residential structures, and retail and commercial buildings, can be supported on a structural reinforced conventional mat foundation or post-tensioned mat foundation bearing in prepared native or compacted engineered fill.

Pavement sections depend on vehicle loading and subgrade conditions, both of which may vary widely for this project. We provide preliminary pavement sections in Section 9.1 for a range of traffic indices based on R values of 10 and 40 for estimation purposes.

The following sections of this report provide further details regarding the conclusions and recommendations provided in this Executive Summary, along with summaries of our understanding of the project, findings, and additional conclusions and recommendations to support ongoing design.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this geotechnical exploration report is to provide preliminary design recommendations for the planning and mass grading of the proposed Aquabella Master Planned Community project and associated improvements located in Moreno Valley, California. Highland Fairview authorized ENGEO to conduct the following scope of services.

- Review previous geotechnical studies
- Subsurface field exploration
- Geotechnical laboratory testing
- Data analysis and conclusions
- Preliminary recommendations
- Report preparation

For our use, we received the following documents from your team and PACE Water upon your authorization.

- Leighton and Associates, Supplemental Geotechnical Investigation, Proposed Aqua Bella Development, Tentative Parcel No. 33532, Moreno Valley Field Station; Moreno Valley, California; September 23, 2005.

- Highland Fairview, Aquabella Land Use Plan and Conceptual site Plan Maps, August 13, 2007.

- RBF Consulting, Removal Topo Sheets, Aquabella PA-10, 190 total sheets, June 15, 2007, through June 4, 2007.

- Papich Construction Co., Inc., Aquabella Development – Mass Earthwork Proposal, December 5, 2021.

- Psomas, Mass Grading and Erosion Control Plan, Parcel Map No. 33532, last revision November 21, 2007.

- RBF Consulting, Improvement Plans, Tract Map No. 34951, January 18, 2008.

- Stantec, Topographic Map and Aerial Imagery as of April 2021.

- PACE Water, Mass Grading Plan Comparison, Aquabella @ Rancho Belago, April 21, 2021.

- Psomas, Aquabella Water Quality Management Plan, March 2, 2006.

1.2 PROJECT LOCATION

The proposed Aquabella master planned community encompasses approximately 685 acres within the City of Moreno Valley, generally bounded by Brodiaea Avenue to the north, Lasselle Street to the west, Iris Avenue to the south, and Oliver Street to the east, as shown in Figures 1 and 2A.

1.3 PROJECT HISTORY

We understand that mass grading and infrastructure improvements were completed for portions of the site in 2007. Figure 2B provides phase area numbers for referencing the areas identified below.

Based on our discussions with PACE and review of the documents depicting the grading limits provided to us, we understand portions of the site were previously mass graded. These areas include the majority of Areas 6, 6A, 9, and 10; southern portions of Areas 7 and 8; the cut for a planned large lake within area 6 and extending along the boundaries between areas 4, 5, and 6A; and cuts for the relatively small lakes planned within Areas 6 and 7 at their boundaries with Nason Street.

Additional improvements performed by others include construction of a concrete-lined drainage channel at the southeast portion of the site, construction of a storm drain line paralleling Cactus Avenue and connecting to Nason Street, and installation of utilities and construction of street improvements for the north-to-south aligned Nason Street, bisecting the development. The Nason Street improvements included construction of a bridge over the newly-constructed drainage channel.

Aerial imagery is consistent with the graded areas and improvements identified in the provided documents and our discussions with you and PACE.

We understand the 2007 mass grading may have included other areas of the project, but we were unable to confirm the grading limits through our discussions and review of the documents provided.

1.4 PROPOSED PROJECT DESCRIPTION

We understand the concept plans for the Aquabella master-planned community are undergoing revisions, but the most recent project description, provided on January 30, 2023, identified the following project features.

- Multi-family residences – approximately 15,000 units
- Utilities and other infrastructure improvements
- Paved streets, parking, and drive lanes
- Man-made lake and drainage features
- Retaining walls
- Landscape and concrete flatwork
- Commercial and retail buildings, including a potential 300-room hotel
- School buildings (up to three elementary schools and one middle school)

2.0 FINDINGS

2.1 PREVIOUS GEOTECHNICAL EXPLORATIONS

Previous geotechnical explorations consisted of 39 borings and 5 test pits. The geotechnical investigations also included laboratory testing of select soil samples recovered from the borings and test pits. The logs of relevant CPTs, borings, and laboratory test data are included in Appendix C, and the approximate locations of the explorations are shown on Figure 2A.

2.2 REGIONAL GEOLOGY

The site is located within the northeastern portion of the Peninsular Ranges geomorphic province of California. The Peninsular Ranges geomorphic province is characterized by a series of northwest-trending, fault-bound mountain ranges separated by long, broad valleys. The Aquabella site is located on the Parris Block, which is the central block of three fault-bound blocks of the northern Peninsular Ranges. The Parris Block is a structurally stable block bound to the west by the Chino and Elsinore Fault Zones and Elsinore Trough, to the east and northeast by the San Jacinto Fault Zone, to the north by the Cucamonga fault, and to the south by the San Felipe Fault Zone.

Locally, the project is set on a valley floor, within alluvial soil of various ages. Regional mapping (Figure 3) identifies the site to be underlain by young alluvial fan and alluvial valley deposits (Holocene and late Pleistocene), and very old alluvial fan deposits (middle to early Pleistocene). The northeast portion of the site is underlain by Holocene to Late Pleistocene young alluvial fan deposits (Qyfa), which are characterized by gray sand, cobble, and gravel deposits (Morton et. al., 2002). The western, central, and southeast portions of the site is underlain by Middle to Early Pleistocene very old alluvial fan deposits (Qvofa). Morton et. al. (2002) describes these deposits as mostly well-dissected, well-indurated, reddish-brown sand deposits containing minor gravel. In the central southern portion of the site, mainly south of the concrete-lined drainage channel, the site is underlain by young alluvial valley deposits (Qyva), which are characterized by gray, unconsolidated, silty to sandy alluvium deposited on valley floors (Morton et. al., 2002).

2.3 FAULTING AND SEISMICITY

The San Jacinto Valley contains numerous active earthquake faults. Nearby active faults include the Claremont section of the San Jacinto fault, located approximately 6 miles northeast of the site, and the San Andreas fault located approximately 23 miles to the northeast. According to California Geologic Survey (CGS) Special Publication 42, an active fault is defined as one that has had surface displacement within Holocene time (the last 11,700 years – CGS SP42, Revised 2018).

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site. Fault rupture through the site, therefore, is not anticipated. The Moreno Valley 2040 General Plan indicates the site is located in an area of low to moderate liquefaction susceptibility (Figure 7).

Numerous small earthquakes occur every year in Southern California and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of faults and epicenters of significant historic earthquakes recorded within the San Jacinto Valley.

To determine nearby active faults capable of generating strong seismic ground shaking at the site, we utilized the USGS Unified Hazard Tool* and disaggregated the hazard at the peak ground acceleration (PGA) for a 2,475-year return period. The USGS Unified Hazard Tool utilizes the most updated rupture forecast model, the Uniform California Earthquake Rupture Forecast (UCERF3) (Field et al., 2015), which considers both Holocene-aged faults and Holocene-Latest Pleistocene faults (active within the last 15,000 years). The resulting faults are listed below in Table 2.3-1.

TABLE 2.3-1: Active Faults Capable of Producing Significant Ground Shaking at the Site
Latitude: 33.909865, **Longitude:** -117.197303

FAULT NAME	DISTANCE FROM SITE (miles)	MAXIMUM MOMENT MAGNITUDE
San Jacinto (San Jacinto Valley) rev [1]	6.4	7.98
San Andreas (San Bernardino S) [2]	23.5	7.86
San Gorgonio Pass [2]	15.6	7.65

*USGS Unified Hazard Tool - Edition: Dynamic Conterminous U.S. 2014 (update) (v4.2.0)

The Uniform California Earthquake Rupture Forecast (UCERF3) (Field et al., 2015) estimates the 30-year probability for a magnitude 6.7 or greater earthquake in Southern California at approximately 93 percent, considering the known active seismic sources in the region.

2.4 SURFACE CONDITIONS

The site was most recently used for agricultural purposes (farming and research by the University of California at Riverside). Historically, we understand the site consisted of operational facilities in the northwest corner of the site, with potential buried and open landfills in the southeast portion of the site, although there was no evidence of the landfills during our explorations. We show the reported approximate locations of the landfills on Figures 2A and 2B.

A northeast-southwest trending, approximately 190 feet wide, flood control and sanitary sewer easement transects the site in the southeast, with a concrete-lined storm water drainage channel occupying most of the easement. Four Eastern Municipal Water District (EMWD) observation and irrigation wells are located in the southern portion of the site.

Surface conditions during our field exploration were observed to mainly consist of bare soil with some occasional vegetation. The southern portion of the site, west of Nason Street was overgrown with vegetation. We observed the ground surface to be generally dry and medium dense to very stiff. There are also multiple previously graded man-made lakes throughout the site, which can be seen on Figures 1, 2A, and 2B.

Site topography was observed to be generally flat, gently sloping from an approximate elevation of Elevation 1,565 feet at the north to a lower elevation of Elevation 1,505 feet at the southern limits of the site.

2.5 SUPPLEMENTAL FIELD EXPLORATION

To supplement the previous geotechnical investigations, our field exploration included drilling three borings, advancing 20 cone penetrometer test (CPT) soundings, including two seismic CPTs (SCPT), and performing four deep-boring percolation tests at locations across the site. We performed our field exploration between March 8 and April 1, 2022. Figure 2A shows the approximate locations of previous field explorations and our recent field exploration locations.

The location and elevations of our explorations are approximate and were estimated by using GPS and GIS applications on hand-held devices; they should be considered accurate only to the degree implied by the method used.

2.5.1 Borings

We retained a truck-mounted CME 75 drill rig and crew to advance the borings using an 8-inch-diameter hollow-stem auger. The borings were advanced to depths ranging from 51½ to 53 feet below existing grade. An ENGEO geologist observed the drilling and logged the subsurface conditions at each location.

We obtained soil samples at various intervals using standard penetration test (SPT) and modified California (MC) driven samplers. The penetration resistance blow counts were obtained by dropping a 140-pound automatic hammer through a 30-inch free fall. The sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. Unless otherwise indicated, the blows per foot recorded on the boring log represent the number of blows to drive the last 1 foot of penetration; the blow counts presented on the boring logs have not been converted using any correction factors. When sampler driving was difficult, penetration was recorded only as inches penetrated for 50 hammer blows.

We used the field logs to develop the report logs in Appendix A, which depict subsurface conditions at the exploration locations for the date of exploration.

2.5.2 Cone Penetration Tests

We retained a CPT rig to push the cone penetrometer to a maximum depth of approximately 100 feet below existing grade. A 30-ton CPT rig was utilized to push a cone penetrometer with a 15-square-centimeter (cm^2) base area, an apex angle of 60 degrees, and a friction sleeve with a surface area of 225 cm^2. The cone, connected with a series of rods, is pushed into the ground at a constant rate. Cone readings are taken at approximately 2.5-centimeter (cm) intervals with a penetration rate of 2 cm per second in accordance with ASTM D-5778. Measurements include the tip resistance to penetration of the cone (Qc), the resistance of the surface sleeve (Fs), and pore pressure (U) (Robertson and Campanella, 1988). CPT logs are presented in Appendix A.

We advanced two SCPTs, 1-SCPT-01 and 1-SCPT-02, to an approximate depth of 100 feet below existing ground surface and utilized a seismic cone to develop a shear-wave velocity (Vs) profile as a function of depth (i.e., Vs profile). The time-averaged shear-wave velocities of the soil profiles (Vs30) were determined to characterize the Site Class. SCPT logs are presented in Appendix A.

2.5.3 Percolation Tests

Between March 31 and April 1, 2022, we drilled four geotechnical borings, installed four temporary wells, and performed four percolation tests at the locations shown on Figure 2A. The percolation testing was performed in accordance with the procedures of the Riverside County Design Handbook for Low Impact Development Best Management Practices. We targeted native sandy soil with low fines content for the percolation testing, extending the percolation test holes to a depth of between approximately 11.5 and 20 feet below existing ground surface, respectively. The percolation test results and conclusions regarding the potential for on-site infiltration are provided in Section 3.9.

2.6 SUBSURFACE CONDITIONS

The site generally consists of young alluvial fan deposits, young alluvial valley deposits, and very old alluvial fan deposits, capped by a thin layer, approximately 3 to 6 inches thick, of light reddish brown, silty sand with variable amounts of gravel. There were also intermittent deposits of undocumented fill related to agricultural activities.

The geotechnical investigation report (Leighton and Associates, 2005) indicated the presence of buried and open landfills in the southeast portion of the site; however, no additional information was available regarding the depth, precise lateral limits, or subsurface conditions. The report indicated the landfills were used as dumping site for refuse/household type waste. Our review of aerial images shows evidence of activity in the potential landfill locations identified on Figures 2A and 2B. The aerial imagery did not provide enough detail to confirm the activity was associated with landfills or if it included excavation/burying of material.

Based on our review of previous and current boring and CPT information, the site can be divided into two large areas from the subsurface condition standpoint, although both areas have varying depths of undocumented fill overlaying alluvial deposits. The site generally west of Nason Street consists of approximately 20 to 35 feet of medium dense to very dense silty sand, sand with silt, and stiff to very stiff silt and clay, underlain by interbedded medium dense to dense poorly graded sand and silty sand, and medium stiff to hard clay and silt to the maximum depth explored. The portion of the site east of Nason Street, generally north and south of the drainage channel, consists of up to 5 feet of medium dense to dense silty/clayey sand overlaying medium stiff to hard clay and silt to maximum depth explored. Select locations within this portion of the site, particularly southeast of Nason Street, consists of clayey/silty soil to the maximum depths explored with occasional intermittent layers of dense sand approximately between 40 and 50 feet below ground surface.

The Site Plan (Figure 2A) and exploration logs (Appendix A) provide further descriptions for specific subsurface conditions at each exploration location. The logs contain the soil type, color, consistency, and visual classification in general accordance with the Unified Soil Classification System (USCS). The logs graphically depict the subsurface conditions encountered at the time of the exploration.

2.7 UNDOCUMENTED ENGINEERED FILL

Based on our review of our subsurface explorations within the site and conversations with the design team, portions of the site were mass graded under the observation of the previous geotechnical engineer of record. A testing and observation report was not available at the time of writing this report, but based on the removal topo sheets provided by the civil engineer (RBF, 2007), the upper 5 feet of Areas 6, 9, and 10 of the Land-Use Plan (Figure 2B) consist of engineered fill. The relatively higher tip resistance and sleeve friction within the upper top 5 feet recorded by our CPT explorations in these areas indicate the soil is relatively more dense/stiff than the surrounding areas where grading has not occurred. Portions of Areas 6A, 7, and 8 of the Land-Use Plan may also contain engineered fill, but the vertical and lateral limits of the engineered fill within these areas are unknown. Additionally, the subsurface conditions at the landfill areas located in the southeastern portion of the site are unknown.

2.8 GROUNDWATER CONDITIONS

During our subsurface explorations, we encountered static groundwater at various exploration locations at depths ranging between approximately 30 and 50 below ground surface. Based on the groundwater readings obtained for four monitoring wells located within the project site, as shown on Figure 2A, the historic high groundwater elevation is approximately 30 feet below ground surface (California Department of Water Resources). Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made.

2.9 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed moisture content, dry density, plasticity index, grain size distribution, unconfined compression, strength, resistance value, swell/collapse, and soil corrosion potential testing. Moisture contents, dry densities, and plasticity index are recorded on the boring logs in Appendix A; other laboratory data is included in Appendix B. Laboratory test results from previous reports are documented in Appendix D.

3.0 CONCLUSIONS

From a geotechnical engineering viewpoint, in our opinion, the site is suitable for the proposed development, provided the geotechnical recommendations in this report and subsequent design-level reports are properly incorporated into the design plans and specifications. The primary geotechnical concerns that could affect development on the site are seismic shaking, existing undocumented fill, and expansive soil. We summarize our conclusions below.

3.1 EXISTING UNDOCUMENTED ENGINEERED FILL

Portions of the project site were mass graded in 2007, as mentioned in Section 1.2 and 1.3, but as-built plans, testing and observation data, and other construction documentation regarding vertical and horizontal limits of grading conducted were not available at the time of writing this report. We understand the soil was placed as engineered fill under the supervision of a geotechnical engineer, and our limited explorations performed as part of this preliminary study indicated the soil within the upper 5 feet was stiffer/more dense than the surrounding areas where grading had not yet occurred. Without documentation identifying the limits of the graded areas, portions of the site previously graded may require additional overexcavation.

In addition, we were not able to obtain documentation associated with the placement of fill for the improvements associated with agricultural land, construction of the concrete-lined drainage channel, Nason Street, the Nason Street bridge, or the associated utility improvements described earlier in Section 1.3.

3.2 PREVIOUS LANDFILL

As described earlier in Sections 2.4 and 2.6, potential previous landfills were located east of Nason Street and north of the concrete-lined drainage channel. We observed no indication of their presence during our exploration. Landfill waste can lead to substantial differential settlement and potentially hazardous material conditions if not removed or mitigated.

3.3 COLLAPSIBLE SOIL

Collapsible soil forms where alluvial soil is rapidly deposited in semi-arid to arid climates, creating a sensitive material with little to no natural cementation or strength. Collapse occurs when the subject soil is wetted or experiences increased loading, which causes rapid changes in void ratio and results in soil settlement. Indicators of potentially collapsible soil are low density and low moisture contents of in-situ soil. These properties suggest the soil contains an open structure with high void ratio and high porosity, and is characteristic of a geologically young deposit and low inter-particle bonding strength (Howayek et al., 2011).

The severity of the alluvial soil collapse hazard depends on the thickness of the collapse susceptible soil deposits, the extent of the wetting front, and loading from overburden and/or structures. The water sources of wetting generally consist of landscape irrigation and stormwater with poor drainage patterns, underground service line leakage, and ponding water from detention basins or water-quality ponds.

The Characteristics and Problems of Collapsible Soils (1992) document states that collapsible soil has liquid limits below 45 and plasticity indexes below 25. Based on our lab testing, site soil has liquid limits between 23 and 60 and plasticity indexes between 3 and 35. We performed swell/collapse tests on two soil samples; 1-B-1 at 9 feet deep yielded 2.1 percent swell, and 1-B-3 at 5 feet deep yielded 1.5 percent collapse, which indicates low to moderate collapse potential.

Based on our subsurface explorations, the observed blow counts are indicative of medium dense to very dense sand or stiff to hard fine-grained material. Given the density/consistency of the soil observed during our exploration, the laboratory data, and our experience with similar geologic conditions, it is our opinion that the potential for soil collapse within the site is low to moderate.

3.4 EXPANSIVE SOIL

Expansive soil changes in volume with changes in moisture. They can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Building damage due to volume changes associated with expansive soil can be reduced by properly blending, moisture conditioning and compacting fills, sub-excavating and rebuilding cut areas with homogeneous, properly moisture-conditioned fills, and supporting structures on properly designed foundations.

During our explorations, we observed potentially expansive, fine-grained soil within portions of the site. We submitted seven representative samples of soil material for plasticity index (PI) testing. Tested soil yielded PIs ranging between 3 and 35 at various locations and depths across the site, which indicates the shrink/swell potential varies from very low to high. We observed the majority of the expansive clay in the upper 10 feet of our explorations within portions of the site generally located southeast of Nason Street as described in Section 2.6. Refer to boring logs and Appendix B for specific laboratory results.

To reduce the potential for damage to the planned structures, we recommend site-specific testing be performed for the tracts/communities as the project progresses. Where testing indicates moderate or high shrink/swell potential, mitigation measures to limit potential impacts include supporting buildings on properly designed post-tensioned mat foundations bearing on competent native soil or compacted fill, and compacting clayey soil at a slightly lower relative compaction at a moisture content well over optimum. Design criteria for post-tension mat foundations are presented in Section 6.0.

Successful performance of structures on expansive soil requires special attention during construction. It is imperative that exposed soil be kept moist prior to placement of concrete for foundation construction. It can be difficult to remoisturize clayey soil without excavation, moisture conditioning, and recompaction.

3.5 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, soil liquefaction, and lateral spreading. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, landslides, tsunamis, or seiches is considered low to negligible at the site.

3.5.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Alquist-Priolo Earthquake Fault Zone (Figure 5), it is our opinion that primary fault ground rupture is unlikely at the property.

3.5.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Jacinto Valley could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2019 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead and live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.5.3 Liquefaction

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. The soil considered the most susceptible to liquefaction is clean, loose, saturated, uniformly graded fine sand below the groundwater table. Empirical evidence indicates that loose fine-grained soil, including low plasticity silt and clay, is also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop and liquefaction of susceptible soil to occur. If liquefaction occurs, and if the soil consolidates or vents to the surface during and following liquefaction, ground settlement and surface deformation may occur.

The Moreno Valley 2040 General Plan indicates the site is located in an area of very low to moderate liquefaction susceptibility (Figure 6). We encountered groundwater at depths as shallow as 30 feet below ground surface during our explorations, with relatively dense and stiff soil strata at the elevations below historic high groundwater level.

We evaluated liquefaction potential using CPT data and methods published by Robertson (2009). Our analysis is based on a Peak Ground Acceleration (PGA_M) value of 0.86g, which is the mapped Maximum Considered Earthquake (MCE) Geometric Mean Peak Ground Acceleration based on the 2019 ASCE 7 Standard for a Site Class C. We also used a moment magnitude (Mw) of 7.98 in our analysis, which corresponds to the maximum magnitude for the San Jacinto and San Andreas faults based on the United States Geological Survey (USGS) national seismic hazard maps. We assumed a groundwater depth of 30 feet for our analyses based on our observations and the historic high groundwater elevation described earlier in Section 2.8.

Based on our review of the subsurface explorations, our analyses, and our experience working with similar geologic conditions, we believe the liquefaction potential for the project site is low.

3.5.4 Lateral Spreading

Youd (1993) defined lateral spreading as “horizontal displacement of surficial soil layers as a consequence of liquefaction of a subsurface granular deposit.” This condition can occur on gently sloping ground or movement towards an incised channel or “free face.” Youd (1993, 2002, and 2009) concluded that liquefiable soil layers with corrected/normalized blow counts, $(N1)_{60}$, greater than 15 are too dense and too dilative for shallow lateral spreads to develop at shallow depths, at least for earthquakes with magnitude less than 8.

Based on our subsurface explorations, the groundwater table is approximately 30 feet below ground surface and the sandy soil above the ground water table is generally medium dense to dense. As mentioned in Section 3.5.3, liquefaction potential at the site is low.

3.6 FLOODING

Based on our review of FEMA issued Flood Insurance Rate Maps, portions of the project site are mapped in the 100- and 500-year floodplains. The Civil Engineer should review pertinent information relating to possible flood levels for the subject site based on final pad elevations and provide appropriate design measures for development of the project, if necessary.

3.7 2019 CBC SEISMIC DESIGN PARAMETERS

The 2019 CBC utilizes design criteria set forth in the 2016 ASCE 7 Standard. Based on the shear-wave velocity profiles measured at 1-SCPT-1 and 1-SCPT-2, we estimated Vs30 values of 1,039 feet per second (316 meters per second) and 1,341 feet per second (408 meters per second), respectively. Based on the 2019 CBC, these Vs30 values correlate to Site Class C at 1-SCPT-1 and Site Class D at a 1-SCPT-2.

Based on the geology within the site, for preliminary purposes, Site Class C may generally be assigned to the portions of the site underlain by Middle to Early Pleistocene very old alluvial fan deposits (Qvofa) and Holocene to Late Pleistocene young alluvial fan deposits (Qyfa), Similarly, Site Class D may be generally assigned to the portions of the site underlain by young alluvial valley deposits (Qyva).

Since the site is located on the border of two site classes, we recommend site-specific determination of Site Class for the various future builder areas, community center, and other structure types as the project progresses.

We provide the 2019 CBC seismic design parameters in Tables 3.7-1 and 3.7-2 below, which include design spectral response acceleration parameters based on the mapped Risk Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters for site Classes C and D.

TABLE 3.7-1: 2019 CBC Seismic Design Parameters – Site Class C,
Latitude: 33.904118 **Longitude:** -117.199119

PARAMETER	VALUE
Site Class	C
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.68
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.66
Site Coefficient, F_A	1.2
Site Coefficient, F_V	1.4
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	2.02
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	0.92
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.35
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	0.61
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.71
Site Coefficient, F_{PGA}	1.2
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.86
Long period transition-period, T_L	8 sec

TABLE 3.7-2: 2019 CBC Seismic Design Parameters – Site Class D,
Latitude: 33.904118 **Longitude:** -117.199119

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.68
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.66
Site Coefficient, F_A	1.0
Site Coefficient, F_V	Null – See section 11.4.8
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.68
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	Null – See section 11.4.8
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.12
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	Null – See section 11.4.8
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.71
Site Coefficient, F_{PGA}	1.1
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.78
Long period transition-period, T_L	8 sec

Assuming the fundamental periods of proposed structures are less than 1.5Ts, the structural engineer may consider exception(s) of Section 11.4.8 of ASCE 7-16 as follows.

> "A ground motion hazard analysis is not required for structures… where, structures on site Class D sites with S1 greater than or equal to 0.2, provided the value of the seismic response coefficient Cs is determined by Eq. (12.8-2) of ASCE 7-16 for values of $T \leq 1.5TS$ and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) of ASCE 7-16 for$1.5Ts < T \leq TL$."

We recommend that we collaborate with the structural engineer of record to further evaluate the effects of taking the exceptions on the structural design and identify the need for performing a site-specific seismic-hazard analysis. We can provide a scope for site-specific seismic-hazard analysis and ground motion study separately, if needed.

3.8 SOIL CORROSION POTENTIAL

As part of this study, we obtained two representative soil samples and submitted to a qualified analytical lab for determination of pH, resistivity, sulfate, and chloride. The results are included in Appendix B and summarized in the table below.

TABLE 3.8-1: Corrosivity Test Results

SAMPLE LOCATION	DEPTH	pH	RESISTIVITY (ohms-cm)	CHLORIDE (mg/kg)	SULFATE (mg/kg)
1-CPT-3	Near-surface	6.7	4,000	19	20
1-CPT-17	Near-surface	6.9	20,800	3.4	8.2

In accordance with 2014 American Concrete Institute Manual, ACI 318-14, Section 19.3.1, the soil on site is categorized within the "S0" sulfate exposure class. Considering a 'Not Applicable' sulfate exposure, the site soil does not pose a significant impact to reinforced concrete structures or cement mortar-coated steel. For "S0", there is no requirement for cement type or water-cement ratio; however, a minimum concrete compressive strength of 2,500 psi is specified by the building code. It should be noted, however, that the structural engineering design requirements for concrete may result in more stringent concrete specifications.

The samples tested indicate they are considered "essentially non-corrosive" to "corrosive" to buried metal per Chapter 5 of NACE Corrosion Basics; however, soil resistivity is not the only parameter that determines a soil's corrosivity potential. Note that the lab results represent the resistivity of the soil sample at a specific location and depth.

If desired to investigate this further, we recommend a corrosion consultant be retained to evaluate if specific corrosion recommendations are advised for the project.

3.9 ON-SITE INFILTRATION/PERCOLATION

We performed deep percolation tests targeting coarse-grained materials identified in boring and CPT locations to evaluate the feasibility of on-site infiltration for the project. Locations of the tests are shown on Figure 2A. The rates provided below in Table 3.9-1 are the direct-measured rates and have no reduction or safety factors applied.

TABLE 3.9-1: Percolation Test Results

LOCATION	DEPTH BELOW GROUND SURFACE (feet)	FIELD PERCOLATION RATE (in/hr)
1-P-1	16	568
1-P-2	15	108
1-P-3	20	36
1-P-4	11½	15

Based on our percolation test results, we believe select soil units are capable of supporting on-site infiltration best management practices (BMPs), such as water quality basins, swales, or dry wells. We recommend using an unfactored percolation rate no greater than 100 inches per hour, or the field-measured rate listed above, if lower, for preliminary design. The design engineer should consider appropriate conversion factors or factors of safety for the design of the BMPs. The purpose of this study was to determine the feasibility of on-site percolation and we recommend additional percolation testing to support final BMP design.

3.10 FUTURE SLOPE STABILITY ANALYSES

As mentioned in Section 2.4, one large man-made lake is planned within the site; however, select lakes were cut to grade during previous grading. Slope stability analyses for both static and pseudostatic conditions should be performed to support design of the lake. At the time of writing this report, the locations, depths, and configurations of the lake has not been finalized. Based on our review of the exploration logs, it is our opinion that construction of a man-made lake is feasible within the site. When more information is available, we will perform slope-stability analysis to further study the planned slope conditions and provide recommendations for slope design and construction under separate cover.

4.0 CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading and foundation plans and specifications prior to construction to evaluate whether our recommendations have been implemented, and to provide additional or modified recommendations, as needed. This also allows us to check if any changes have occurred in the nature, design, or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.

2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. Earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill materials are satisfactory, and that placement and compaction of the fills has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is important.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

5.0 EARTHWORK RECOMMENDATIONS

As used in this report, relative compaction refers to the in-place dry unit weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the ASTM D1557 laboratory compaction test procedure, latest edition. Compacted soil is not acceptable if it is unstable; it should exhibit only minimal flexing or pumping, as observed by an ENGEO representative. The term “moisture condition” refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry.

We define “structural areas” as any area sensitive to settlement of compacted soil. These areas include, but are not limited to building pads, sidewalks, pavement areas, and retaining walls.

5.1 GENERAL SITE CLEARING

Areas to be developed should be cleared of surface and subsurface deleterious materials, debris, shrubs, and associated roots. Following clearing, the site should be stripped to remove surface organic materials. Strip organics from the ground surface to a depth of at least 2 to 3 inches below the surface. Remove stripping’s from the site or, if considered suitable by the landscape architect and owner, place and compact in landscape only fill areas containing no hardscape or site walls.

We recommend you retain our services to observe and test backfilling. No loose or uncontrolled backfilling of depressions resulting from stripping is permitted.

5.2 EXISTING UNDOCUMENTED ENGINEERED FILL

There are areas of undocumented engineered fill as described earlier in Section 3.1. We understand that the material in these locations was placed as engineered fill under the observation of the previous geotechnical engineer of record, although no reports documenting the remedial grading limits or compaction test results were available for our review at the time of preparing this report. At a minimum, undocumented fill conditions at these locations should be further reviewed prior to, or during, future grading operations to determine removal and recompaction requirements, if remedial grading is deemed necessary.

5.3 PREVIOUS LANDFILL

At the time of writing this, the vertical and lateral extents of the potential landfill sites were not available. We recommend additional exploration at the potential landfill locations to determine the presence of any landfill material and estimate the landfill dimensions to support ongoing planning and budget estimation. If the presence of landfill material is confirmed, we will develop site-specific remedial grading recommendations based on the depth, lateral limits, and planned land use for the locations.

5.4 LAKE DESIGN

As mentioned in Section 3.10, the previously planned lakes have been cut to grade based on previous grading designs. We understand the locations and sizes of the lakes will likely change as grading design advances. Once the locations and geometries of the lakes are finalized, we will perform slope-stability analyses to assist with further design. We will also provide supplemental recommendations to backfill the existing cut lakes, or portions of, with engineered fill to reduce potential for differential settlement.

Our explorations encountered clayey soil in the upper 10 feet within portions of the site as mentioned in Section 2.5. If desired by the design team, as an option, consideration may be given to using the available clayey soil to use as impermeable liner.

5.5 REMEDIAL GRADING RECOMMENDATIONS

Within the portions of the site that have not been mass graded, we recommend the following remedial grading recommendations to mitigate the geotechnical and geologic hazards at the site.

- For structural areas not already underlain by engineered fill, like the building footprint and other features that may be sensitive to potential differential settlement, remedial grading should include overexcavation of existing soil to a minimum depth of 5 feet below existing grade, or 5 feet below bottom of foundations, whichever is deeper.

- For planned open space, parking areas, and other areas less sensitive to differential settlements, remedial grading should include overexcavation of existing soil to a minimum depth of 3 feet below finished grade.

Within the portions of the site that were previously mass graded, we recommend removing existing fill to competent native soil or engineered fill, as evaluated by ENGEO.

The recommendations above removes a portion, but not all, of the upper 5 feet of site soil that are susceptible to collapse. This layer of engineered fill will reduce the potential for wetting of deeper collapse-susceptible soil and limit the potential for differential settlement beneath the planned improvements.

ENGEO will prepare a geotechnical corrective grading plan that will designate the limits of subexcavation areas and the required depths of subexcavation when final grading plans are available for the site.

5.6 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Under-optimum (dry) soil moisture conditions may be encountered during summer and fall months.

Wet soil conditions can generally be mitigated by:

1. Frequent spreading and mixing during warm dry weather,
2. Mixing with drier materials,
3. Mixing with a lime, lime-flyash, or cement product, or
4. Stabilizing with aggregate or geotextile stabilization fabric, or both.

Options 3 and 4 should be evaluated by ENGEO prior to implementation.

Dry soil conditions can generally be mitigated by:

1. Ripping, adding water, mixing, and recompacting.
2. Mixing with wetter materials.
3. Sprinkling or wetting the exposed surface for several days.

5.7 ACCEPTABLE FILL

On-site soil material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 6 inches in maximum dimension. Imported fill materials should have a plasticity index equal to or less than the on-site soil, and at least 20 percent passing the No. 200 sieve. Allow ENGEO to sample and test proposed imported fill materials at least 5 days prior to delivery to the site.

5.8 FILL COMPACTION

5.8.1 General

Once a suitable firm base is achieved, the exposed non-yielding surface should be scarified to an approximate depth of 12 inches, moisture conditioned, and compacted to provide adequate bonding with the initial lift of fill. Engineered fill should be spread in loose lifts that do not exceed 12 inches in thickness, or the depth of penetration of the compaction equipment used, whichever is less. Engineered fill should be placed according to the following fill specifications, depending upon location and material.

5.8.2 Grading in Structural Areas

5.8.2.1 Low-Expansive Soil Conditions

Perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade as follows.

1. Scarify to a depth of at least 12 inches.
2. Moisture condition soil to at least 2 percentage points above the optimum moisture content.
3. Compact the subgrade to at least 92 percent relative compaction (ASTM D1557).

After the subgrade soil has been compacted, place and compact acceptable fill as follows.

1. Spread fill in loose lifts that do not exceed 12 inches.

2. Moisture condition lifts to at least 2 percentage point above the optimum moisture content.

3. Compact fill to a minimum of 92 percent relative compaction (ASTM D1557).

4. Compact the upper 3 feet of finished pavement subgrade to at least 95 percent relative compaction prior to aggregate base placement, per City of Moreno Valley Standard Precise Grading Notes – Standard Plan MVSI-166D-2.

5.8.2.2 Highly Expansive Soil Conditions (PI greater than 15)

Perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade as follows.

1. Scarify to a depth of at least 12 inches.
2. Moisture condition soil to at least 5 percentage point above the optimum moisture content.
3. Compact fill to 87 to 92 percent relative compaction (ASTM D1557).

After the subgrade soil has been compacted, place and compact acceptable fill as follows.

1. Spread fill in loose lifts that do not exceed 12 inches.
2. Moisture condition lifts to at least 5 percentage points above the optimum moisture content.
3. Compact fill to between 87 and 92 percent relative compaction (ASTM D1557).

5.8.3 Landscape Fill

Process, place, and compact fill in accordance with Sections 5.7.2, except compact to at least 85 percent relative compaction (ASTM D1557).

5.8.4 Aggregate Base

Compact aggregate base section to at least 95 percent relative compaction (ASTM D1557). Moisture condition aggregate base to or slightly above optimum moisture content prior to compaction. Aggregate base should meet the requirements for ¾-inch maximum Class 2 AB in accordance with Section 26-1.02B of the latest Caltrans Standard Specifications.

5.9 SLOPES

We anticipate that slope gradients of 2:1 (horizontal:vertical) or flatter will be suitable for slope heights less than 10 feet. For slope heights greater than 10 feet, we should evaluate the conditions at the slope location, potentially including a slope-stability analyses based on site-specific soil parameters. The contractor is responsible to construct temporary construction slopes in accordance with Cal/OSHA requirements. Slope inclinations can be further evaluated as the concept plan for the development progresses.

5.10 SITE DRAINAGE

The project civil engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finish grades be sloped away from buildings and pavements to the maximum extent practical. The latest California Building Code Section 1804.4 specifies minimum slopes of 5 percent away from foundations. Where lot lines or surface improvements restrict meeting this slope requirement, we recommend that specific drainage requirements be developed. As a minimum, we recommend the following.

1. Discharge roof downspouts into closed conduits and direct away from foundations to appropriate drainage devices.

2. Do not allow water to pond near foundations, pavements, or exterior flatwork.

3. For areas with expansive soil conditions, consider the use of rear lot surface drainage collection systems to reduce overland surface drainage from back to front of lot.

6.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

We developed structural improvement recommendations using data obtained from our field exploration, laboratory test results, and engineering analysis. Provided our earthwork recommendations in Section 5.0 are followed, the proposed multi-family residential structures and retail and commercial buildings can be supported on a structural reinforced conventional mat foundation or post-tensioned mat foundation bearing in prepared native or compacted engineered fill.

Once the land-use, structure type, and approximate structural loads are finalized, we will provide settlement estimates for the specific products.

6.1 CONVENTIONAL MAT FOUNDATION

Conventionally reinforced mat foundations may be designed with a maximum allowable dead-plus-live bearing pressure of 1,000 pounds per square foot (psf) for dead-plus-live loads with maximum localized bearing pressures of 1,500 psf at column or wall loads. The allowable bearing pressure can be increased by one-third for all loads including wind or seismic. The following additional design parameters should be incorporated in the foundation design.

- Cantilever edge distance of 5 feet or unsupported radius of 10 feet
- Maximum beam spacing of 15 feet for non-uniform thick slabs
- Subgrade modulus of 75 psi/in

For preliminary design and estimation purposes, the conventional mat foundation design recommendations provided above are for soil with low-to-moderate expansion potential (PI less than 15), but actual site conditions may require revision of the parameters, and further site-specific testing should be performed as the designs for particular areas progress.

Underlay conventional mat foundations with a moisture reduction system as recommended in Section 6.4 below.

6.2 POST-TENSIONED MAT FOUNDATIONS

As an alternative, we recommend that the proposed multi-family residential structures and retail and commercial buildings be supported on post-tensioned (PT) mat foundations bearing on prepared native soil or engineered fill.

PT mats may be designed for an average allowable bearing pressure of up to 1,000 pounds per square foot (psf) for dead-plus-live loads with maximum localized bearing pressures of 1,500 psf at column or wall loads. Allowable bearing pressures can be increased by one-third for wind or seismic loads. For estimation purposes, we present PT mat design criteria for non-expansive to moderately expansive material, and highly expansive material in Tables 6.2-1 and 6.1-2 below, respectively. The recommended values are based on the procedure presented by the Post-Tensioning Institute “Design of Post-Tensioned Slabs-on-Ground” Third Edition, including appropriate addenda (PTI, 2007). We developed the PT design criteria assuming foundation pads are constructed in accordance with our earthwork recommendations in Section 5.0. Further, soil sampling and testing should be performed once pads are graded to finished grade elevation for final site-specific design parameters.

The project structural engineer should determine the actual PT mat thickness using the geotechnical recommendations in this report; we defer to the professional judgment of the structural engineer on the necessary mat thickness. ENGEO should be retained to review the PT mat foundation design to verify the application of these geotechnical recommendations.

TABLE 6.2-1: Post-Tensioned Mat Design Recommendations – Non-expansive to Moderately Expansive Soil

CONDITION	CENTER LIFT	EDGE LIFT
Edge Moisture Variation Distance, e_m (feet)	9.0	5.1
Differential Soil Movement, y_m (inches)	0.5	0.7

For foundations constructed on non-expansive to moderately expansive subgrade soil, moisture conditioning of the building foundation subgrade should be to a moisture content at least three percentage points above optimum immediately prior to foundation construction.

TABLE 6.2-2: Post-Tensioned Mat Design Recommendations – Highly Expansive Soil (PI greater than 15)

CONDITION	CENTER LIFT	EDGE LIFT
Edge Moisture Variation Distance, e_m (feet)	6.7	3.7
Differential Soil Movement, y_m (inches)	1.6	2.5

For foundations constructed on highly expansive subgrade soil, moisture conditioning of the building foundation subgrade should be to a moisture content at least five percentage points above optimum immediately prior to foundation construction.

The subgrade should not be allowed to dry prior to concrete placement. We also recommend ENGEO be retained to observe the pre-pour moisture conditions to check that our report recommendations have been followed.

Underlay PT mats with a moisture reduction system as recommended in Section 6.4 below.

6.3 FOUNDATION LATERAL RESISTANCE

Lateral loads may be resisted by friction along the base and by passive pressure along the sides of foundations. The passive pressure is based on an equivalent fluid pressure in pounds per cubic foot (pcf). We recommend the following allowable values for design.

Low-Expansive Soil Condition:
- Passive Lateral Pressure: 300 pcf
- Coefficient of Friction: 0.35

High-Expansive Soil Condition (PI greater than 15):
- Passive Lateral Pressure: 200 pcf
- Coefficient of Friction: 0.30

The above allowable values include a factor of safety of 1.5. Increase the above values by one-third for the short-term effects of wind or seismic loading. Passive lateral pressure should not be used for footings on or above slopes.

6.4 SLAB MOISTURE VAPOR REDUCTION

When buildings are constructed with concrete mat foundations, including PT mats, water vapor from beneath the foundation will migrate through the slab and into the building. This water vapor can be reduced but not stopped. Vapor transmission can negatively affect floor coverings and lead to increased moisture within a building. When water vapor migrating through the slab would be undesirable, we recommend the following to reduce, but not stop, water vapor transmission upward through the slab-on-grade.

1. Install a vapor retarder membrane sealed at all seams and pipe penetrations and connected to all footings. Vapor retarders shall conform to Class A vapor retarder in accordance with ASTM E 1745, latest edition, “Standard Specification for Plastic Water Vapor Retarders used in Contact with Soil or Granular Fill under Concrete Slabs”.

2. Use a concrete water-cement ratio for slabs-on-grade of no more than 0.50.

3. Provide inspection and testing during concrete placement to check that the proper concrete and water-cement ratio are used.

4. Moist cure slabs for a minimum of 3 days or use other equivalent curing specified by the structural engineer.

7.0 EXTERIOR FLATWORK

Exterior flatwork includes items such as concrete sidewalks, steps, and outdoor courtyards exposed to foot traffic only. The expansion potential of the on-site soil material varies from very low to high across the project area, as documented earlier in Section 3.4. For preliminary design and estimation purposes, we provide recommendations below for exterior flatwork on soil with moderate expansion potential, but actual site conditions may allow for thinner or thicker total sections, and further site-specific testing should be performed as the designs for particular areas progress.

Assuming subgrade with moderate expansion potential, we recommend a minimum hardscape section of 4 inches of concrete over 4 inches of aggregate base. Compact the aggregate base to at least 90 percent relative compaction (ASTM D1557). Thicken flatwork edges to at least 8 inches to help control moisture variations in the subgrade and place rebar within the middle third of the slab, as needed, to help control the width and offset of cracks. Construct control and construction joints in accordance with current Portland Cement Association Guidelines.

8.0 PRELIMINARY RETAINING WALL RECOMMENDATIONS

8.1 LATERAL SOIL PRESSURES

Proposed retaining walls should be designed to resist lateral earth pressures from adjoining natural materials and/or backfill and from any surcharge loads. Design drained, unrestrained retaining walls up to 10 feet high for active lateral equivalent fluid pressure as follows. If site walls over 6 feet are planned, a seismic increment should be considered.

TABLE 8.1-1: Recommended Lateral Earth Pressures

BACKFILL SLOPE CONDITION (horizontal:vertical)	ACTIVE PRESSURE (pounds per cubic foot)
Level	**40**
3:1	**50**
2:1	**60**

The above lateral earth pressures assume low-to-moderately expansive compacted engineer fill with a friction angle of approximately 28 degrees as the backfill material. We recommend avoiding placing highly expansive soil with PI values greater than 15 as retaining wall backfill material, but if that is not feasible, we can provide recommendations on a case-by-case basis based on the site-specific backfill characteristics.

The recommended lateral pressures also assume sufficient drainage, as described in Section 8.2, behind the walls to prevent any build-up of hydrostatic pressures from surface water infiltration and/or a rise in the groundwater level. If adequate drainage is not provided, we recommend that an additional equivalent fluid pressure of 40 pcf be added to the values recommended above for both restrained and unrestrained walls. Damp-proofing of the walls should be included in areas where wall moisture would be problematic.

8.2 RETAINING WALL DRAINAGE

Construct either graded rock drains or geosynthetic drainage composites behind the retaining walls to reduce hydrostatic lateral forces. For rock drain construction, we recommend two types of rock drain alternatives.

1. A minimum 12-inch-thick layer of Class 2 Permeable Filter Material (Caltrans Specification 68-2.02F) placed directly behind the wall, or

2. A minimum 12-inch-thick layer of washed, crushed rock with 100 percent passing the ¾-inch sieve and less than 5 percent passing the No. 4 sieve. Envelop rock in a minimum 6-ounce, nonwoven geotextile filter fabric.

For both types of rock drains:

1. Place the rock drain directly behind the walls of the structure.

2. Extend rock drains from the wall base to within 12 inches of the top of the wall.

3. Place a minimum of 4-inch-diameter perforated pipe (glued joints and end caps) at the base of the wall, inside the rock drain and fabric, with perforations placed down.

4. Place pipe at a gradient at least 1 percent to direct water away from the wall by gravity to a drainage facility.

ENGEO should review and approve geosynthetic composite drainage systems prior to use.

8.3 BACKFILL

Backfill behind retaining walls should be placed and compacted in accordance with Section 5.0. Use light compaction equipment within 5 feet of the wall face. If heavy compaction equipment is used, the walls should be temporarily braced to avoid excessive wall movement.

8.4 FOUNDATIONS

Retaining walls may be supported on continuous footings with a minimum width of 12 inches and a minimum depth of 18 inches from the lowest adjacent pad grade. Design such footings for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf) for dead-plus-live loads. Increase this bearing capacity by one-third for the short-term effects of wind or seismic loading. The maximum allowable bearing pressure is a net value; the weight of the footing may be neglected for design purposes. Footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1:1 (horizontal:vertical) plane projected upward from the bottom edge of the trench to the footing. Lateral resistance may be determined as recommended in Section 6.4.

9.0 PRELIMINARY PAVEMENT DESIGN

9.1 FLEXIBLE PAVEMENTS

We obtained two representative bulk samples of the surface soil from locations within the site and performed R-value tests to provide data for preliminary pavement design and estimation purposes. The results of the tests are included in Appendix B and indicate R-values of 12 and 65. Because surface soil varies across the site, we provide preliminary pavement section recommendations for design R-values of 10 and 40. Using estimated traffic indexes for various pavement loading requirements, we developed recommended pavement sections using Topic 633 of the Caltrans Highway Design Manual (including the asphalt factor of safety), as presented in the tables below.

TABLE 9.1-1: Recommended Asphalt Concrete Pavement Sections for R-value of 10

TRAFFIC INDEX	SECTION	
	ASPHALT CONCRETE (inches)	CRUSHED AGGREGATE BASE (inches)
5	3.6*	8.0
6	3.6*	12.0
7	4.0	15.0
8	4.5	17.0

* City of Moreno Valley minimum HMA section is 3.6 inches (0.3 feet).

TABLE 9.1-2: Recommended Asphalt Concrete Pavement Sections for R-value of 40

TRAFFIC INDEX	SECTION	
	ASPHALT CONCRETE (inches)	CRUSHED AGGREGATE BASE (inches)
5	3.6*	6.0**
6	3.6*	6.0**
7	4.0	7.0
8	4.5	9.0

* City of Moreno Valley minimum HMA section is 3.6 inches (0.3 feet).
** City of Moreno Valley minimum Aggregate Base section is 6.0 inches (0.5 feet).

The civil engineer should determine the appropriate traffic indexes based on the estimated traffic loads and frequencies. We recommend collecting additional representative soil samples for R-value testing upon the completion of grading and construction of wet utilities within street alignments to support developing site-specific final pavement section recommendations.

9.2 RIGID PAVEMENTS

Use concrete pavement sections to resist heavy loads and turning forces in areas such as fire lanes or trash enclosures. Final design of rigid pavement sections, and accompanying reinforcement, should be performed based on estimated traffic loads and frequencies. We recommend the following preliminary minimum design sections for rigid pavements based on the soil conditions and an estimated traffic index of 10.

- Use a minimum section of 6 inches of Portland cement concrete over 6 inches of Caltrans Class 2 Aggregate Base. This section assumes an Average Daily Truck Traffic (ADTT) less than 25.
- Concrete pavement should have a minimum 28-day compressive strength of 3,500 psi.
- Provide minimum control joint spacing in accordance with Portland Cement Association Guidelines.

9.3 SUBGRADE AND AGGREGATE BASE COMPACTION

Compact finish subgrade and aggregate base in accordance with Section 5. Aggregate base should meet the requirements for ¾-inch maximum Class 2 aggregate base in accordance with Section 26 1.02B of the latest Caltrans Standard Specifications.

9.4 CUTOFF CURBS

Saturated pavement subgrade or aggregate base can cause premature failure or increased maintenance of asphalt concrete pavements. This condition often occurs where landscape areas directly abut and drain toward pavements. If desired to install pavement cutoff barriers, they should be considered where pavement areas lie downslope of any landscape areas that are to be sprinklered or irrigated, and should extend to a depth of at least 4 inches below the base rock layer. Cutoff barriers may consist of deepened concrete curbs or deep-root moisture barriers.

If reduced pavement life and greater than normal pavement maintenance are acceptable to the owner, then the cutoff barrier may be eliminated.

11.0 GROUND HEAT EXCHANGE

Based on our findings and review of the proposed development, we consider the site to be *highly* suitable for using a Ground Heat-Exchange (GHX) system to achieve energy savings and to potentially eliminate the need for outdoor air conditioner units, if desired.

For the thermal properties of the soil and groundwater conditions at the site, either a closed-loop or open-loop GHX system would likely be well suited and could be implemented on select buildings or integrated into a project-wide system.

As project planning progresses into architectural design, we can meet with you, your architect, and your MEP designer to further assess and develop GHX energy saving opportunities and efficiencies.

12.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.4 for the Aquabella Master Planned Community project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies, or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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FIGURES

FIGURE 1: Vicinity Map
FIGURE 2A: Site Plan
FIGURE 2B: Land-Use Plan
FIGURE 3: Regional Geologic Map
FIGURE 4: Regional Faulting and Seismicity Map
FIGURE 5: Seismic Hazards Zone Map
FIGURE 6: Liquefaction Hazards Map
FIGURE 7: Landslide Hazards Map
FIGURE 8: Flood Hazards Areas

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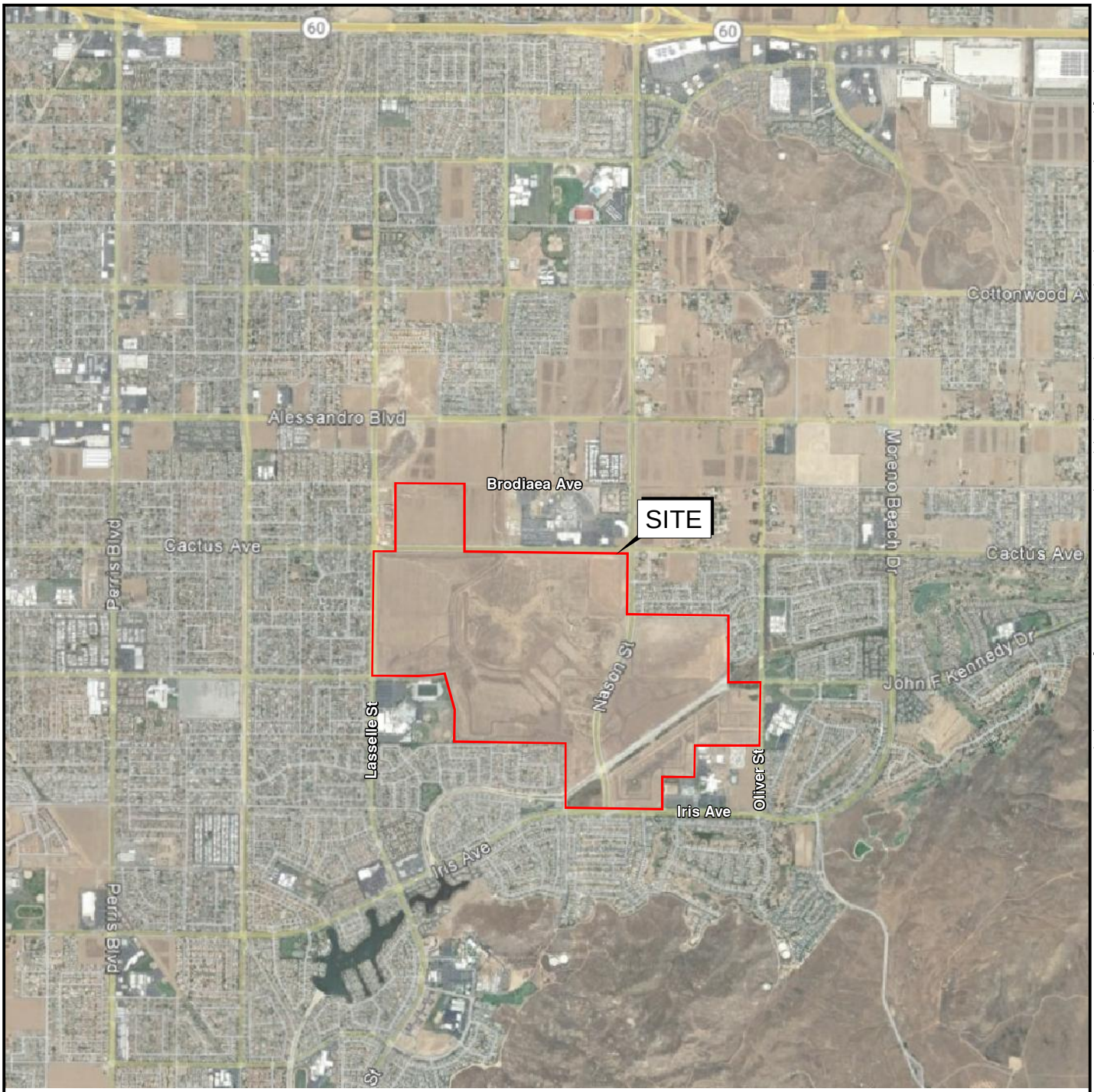

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE, 2021

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VICINITY MAP

AQUABELLA MASTER PLANNED COMMUNITY

MORENO VALLEY, CALIFORNIA

PROJECT NO.: 19848.000.001		FIGURE NO. 1
SCALE: AS SHOWN		
DRAWN BY: LL	CHECKED BY: JTT	

ORIGINAL FIGURE PRINTED IN COLOR

SITE

1-CPT-1, 1-P-4, TP-1, TP-2, TP-3, TP-4, TP-5, B-38, B-11, 1-CPT-2, 1-CPT-5, 1-CPT-8, B-37, B-12A, B-35, 1-B-2, 1-CPT-3, B-12B, B-13, B-15, B-14, 1-P-2, 1-CPT-13, B-36, 1-P-1, B-24, B-16, 1-SCPT-1, B-17, 1-CPT-9, 1-CPT-14, B-32, B-33, B-18, B-19, B-25, 1-B-1, 1-CPT-4, 1-CPT-6, 1-CPT-10, B-20, B-31, 1-CPT-18, 1-SCPT-2, B-34, 1-CPT-15, 1-B-3, B-21, 1-CPT-7, 1-CPT-16, B-29, B-22, 1-CPT-11, B-26, B-27, 1-P-3, B-28, 1-CPT-17, B-23, 1-CPT-12

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- BORING (ENGEO, 2022)
- BORING (LEIGHTON, 2005)
- CONE PENETRATION TEST (ENGEO, 2022)
- CONE PENETRATION TEST (ENGEO, 2022)
- PERCOLATION TEST (ENGEO, 2022)
- TEST PIT (LEIGHTON, 2005)
- MONITORING WELL (CA DWR)
- BOUNDARY OF LAKES CUT TO PREVIOUSLY PLANNED GRADE
- POTENTIAL LANDFILL AREA

N

0 800
FEET

BASE MAP SOURCE: UNKNOWN

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SITE PLAN
AQUABELLA MASTER PLANNED COMMUNITY
MORENO VALLEY, CALIFORNIA

PROJECT NO.: 19848.000.001
SCALE: AS SHOWN
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FIGURE NO. 2A

ORIGINAL FIGURE PRINTED IN COLOR

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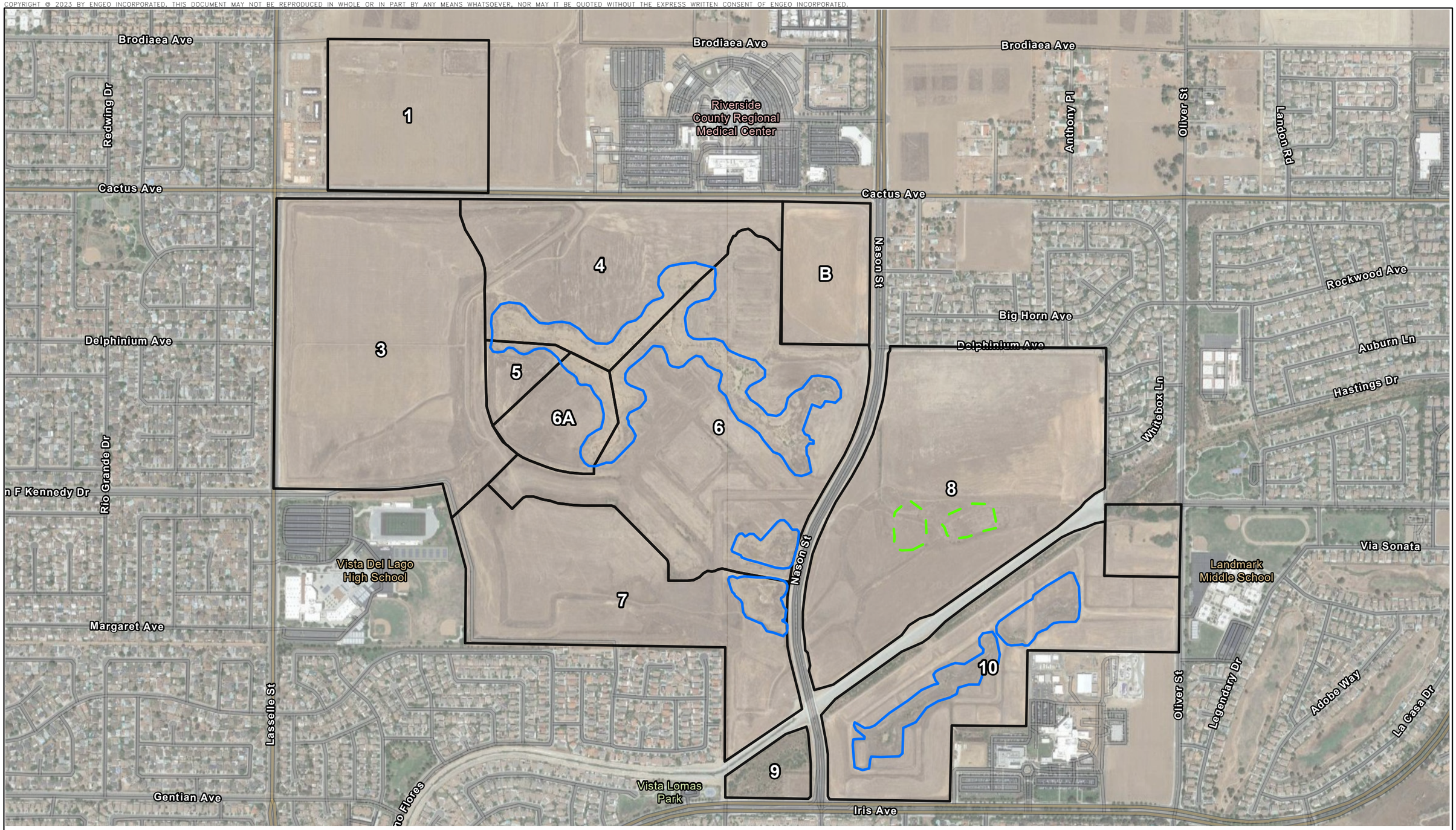

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

10 AREA IDENTIFIER

BOUNDARY OF LAKES CUT TO PREVIOUSLY PLANNED GRADE

POTENTIAL LANDFILL AREA

N

0 400 800

FEET

BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 2021 & HIGHLAND FAIRFIELD

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LAND-USE PLAN

AQUABELLA MASTER PLANNED COMMUNITY

MORENO VALLEY, CALIFORNIA

PROJECT NO. : 19848.000.001

SCALE: AS SHOWN

DRAWN BY: MAT CHECKED BY: JJT

FIGURE NO. 2B

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LAYOUT: B-SIZE LANDSCAPE USER: LLEE

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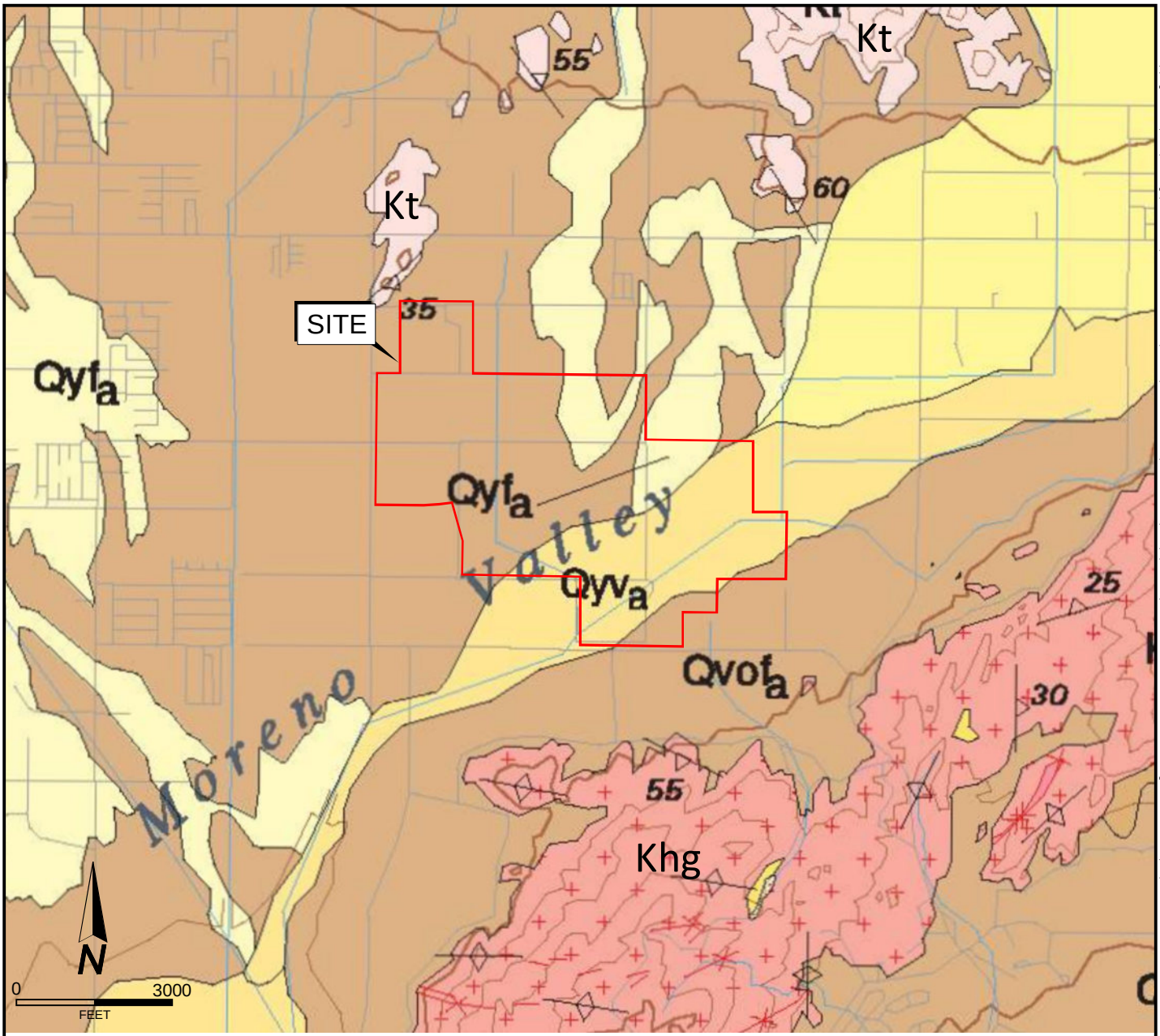

EXPLANATION

GEOLOGIC CONTACT-DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED

FAULT LINEAMENT
DOTTED WHERE CONCEALED, QUERIED WHERE EXISTENCE IS DOUBTFUL.

AXIS OF FOLD

ANTICLINE — SYNCLINE

STRIKE AND DIP OF STRATA

INCLINED

Qyf$_a$	YOUNG ALLUVIAL FAN DEPOSITS (HOLOCENE AND LATE PLEISTOCENE)
Qyv$_a$	YOUNG ALLUVIAL-VALLEY DEPOSITS (HOLOCENE AND LATE PLEISTOCENE)
Qvof$_a$	VERY OLD ALLUVIAL-FAN DEPOSITS (MIDDLE TO EARLY PLEISTOCENE); CAPPED BY "A" TYPE SOILS
Kt	TONALITE, UNDIFFERENTIATED (CRETACEOUS)
Khg	HETEROGENEOUS GRANITE ROCKS (CRETACEOUS)

BASE MAP SOURCE: USGS GEOLOGIC MAP, OFR 2006-1217, SHEET 1 OF 4

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REGIONAL GEOLOGIC MAP
AQUABELLA MASTER - PLANNED COMMUNITY
MORENO VALLEY, CALIFORNIA

PROJECT NO.: 19848.000.001
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FIGURE NO. 3

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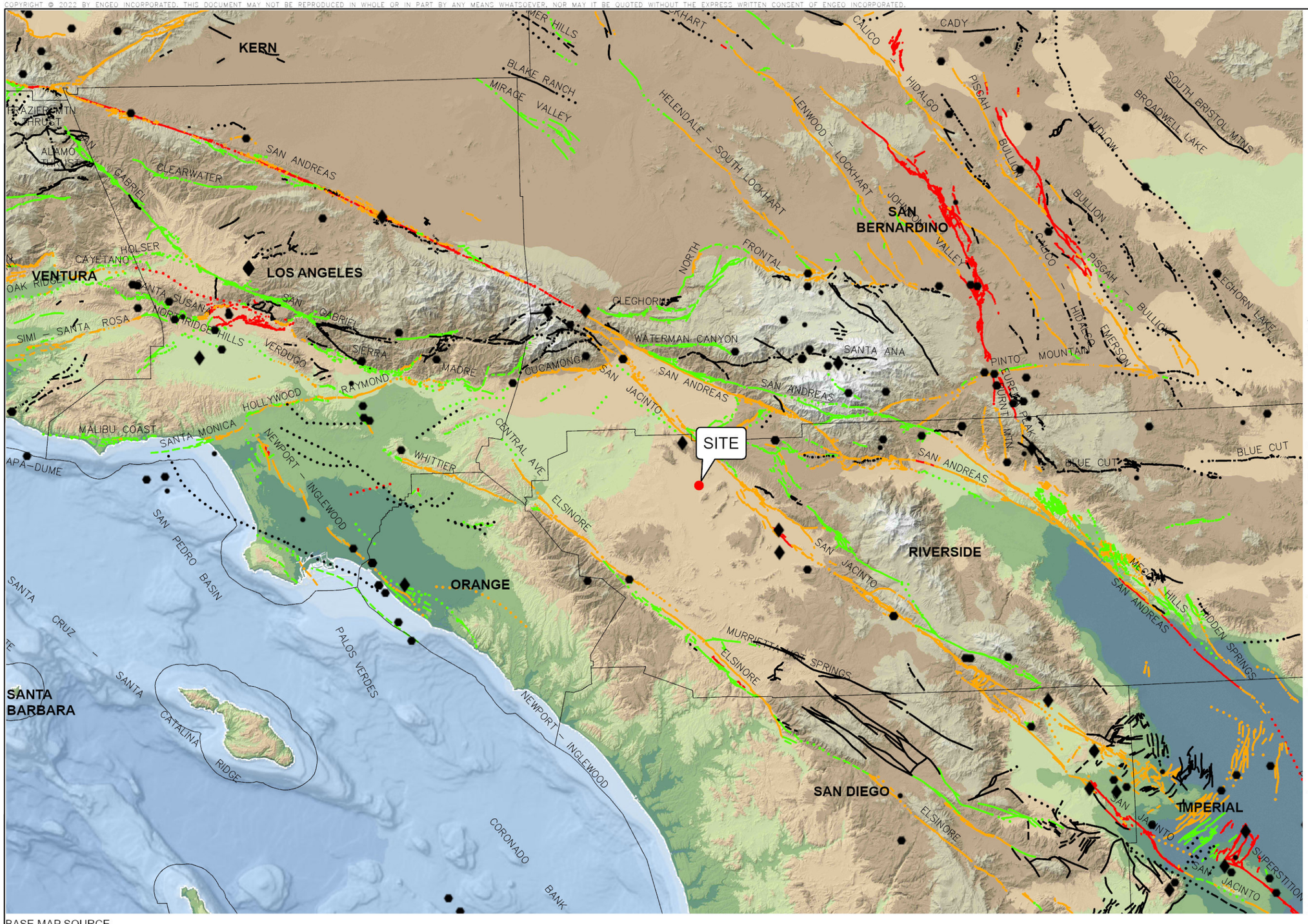

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

EARTHQUAKE

- MAGNITUDE 7+
- MAGNITUDE 6-7
- MAGNITUDE 5-6

QUATERNARY FAULTS

BASED ON TIME OF MOST RECENT SURFACE DEFORMATION

- HISTORICAL (<150 YEARS), WELL CONSTRAINED LOCATION
- HISTORICAL (<150 YEARS), MODERATELY CONSTRAINED LOCATION
- HISTORICAL (<150 YEARS), INFERRED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), WELL CONSTRAINED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), MODERATELY CONSTRAINED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), INFERRED LOCATION
- LATE QUATERNARY (<130,000 YEARS), WELL CONSTRAINED LOCATION
- LATE QUATERNARY (<130,000 YEARS), MODERATELY CONSTRAINED LOCATION
- LATE QUATERNARY (<130,000 YEARS), INFERRED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), WELL CONSTRAINED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), MODERATELY CONSTRAINED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), INFERRED LOCATION
- GREAT VALLEY FAULT ZONE

BASE MAP SOURCE
ESRI, GEBCO, DELORME, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2018
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)

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REGIONAL FAULTING AND SEISMICITY

AQUABELLA MASTER PLANNED COMMUNITY
MORENO VALLEY, CALIFORNIA

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FIGURE NO. 4

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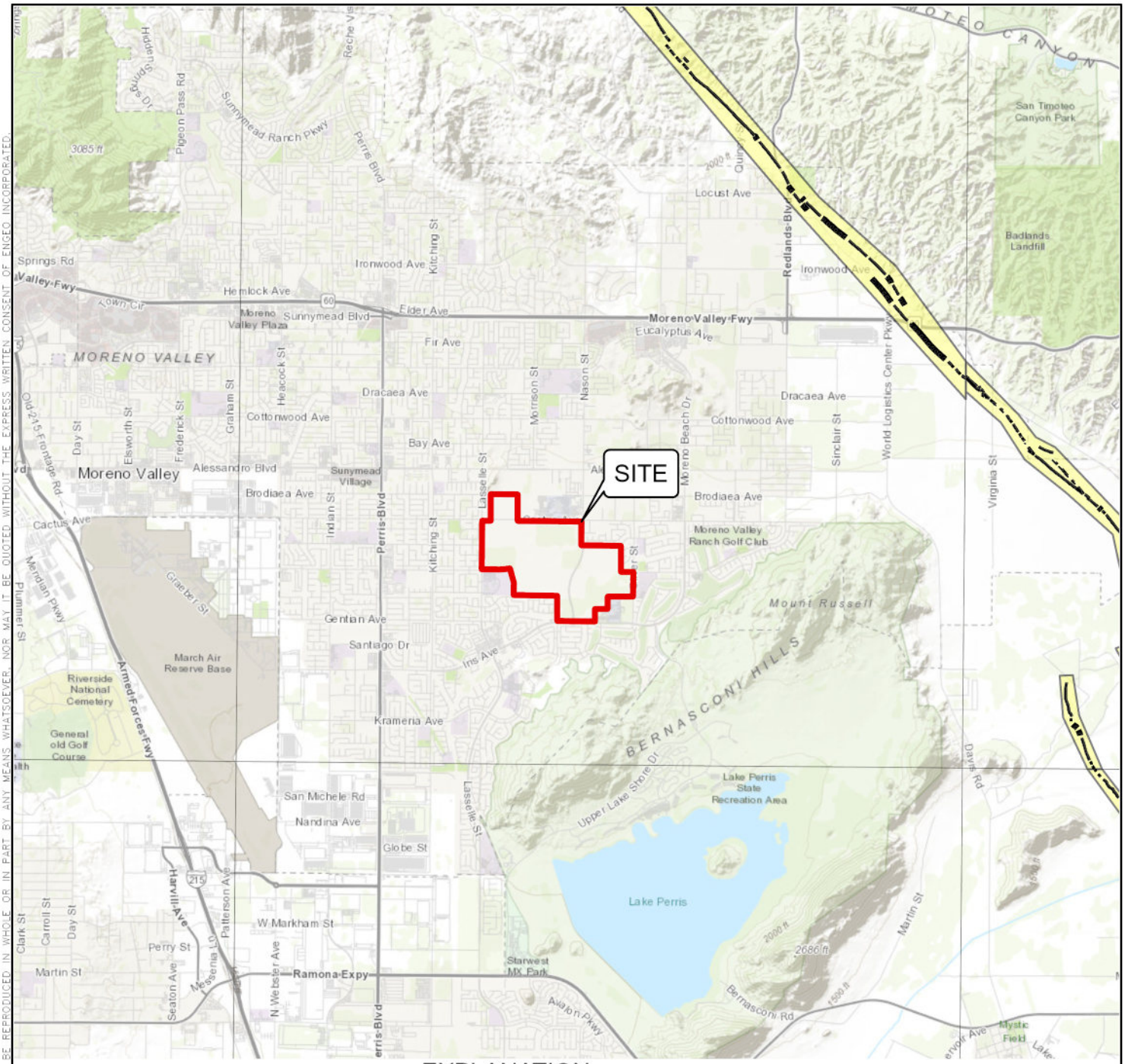

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- ACCURATELY LOCATED
- INFERRED
- APPROXIMATELY LOCATED
- CONCEALED

EARTHQUAKE FAULT ZONE
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 CREEP SUCH THAT AVOIDANCE AS DESCRIBED IN PUBLIC RESOURCES CODE SECTION 2621.5(A) WOULD BE REQUIRED

N

0 4,000 8,000

FEET

BASEMAP SOURCE: ESRI MAPPING SERVICE
CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY

ENGEO
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SEISMIC HAZARDS ZONE MAP

AQUABELLA MASTER PLANNED COMMUNITY

MORENO VALLEY, CALIFORNIA

PROJECT NO. :	19848.000.001
SCALE:	AS SHOWN
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FIGURE NO. 5

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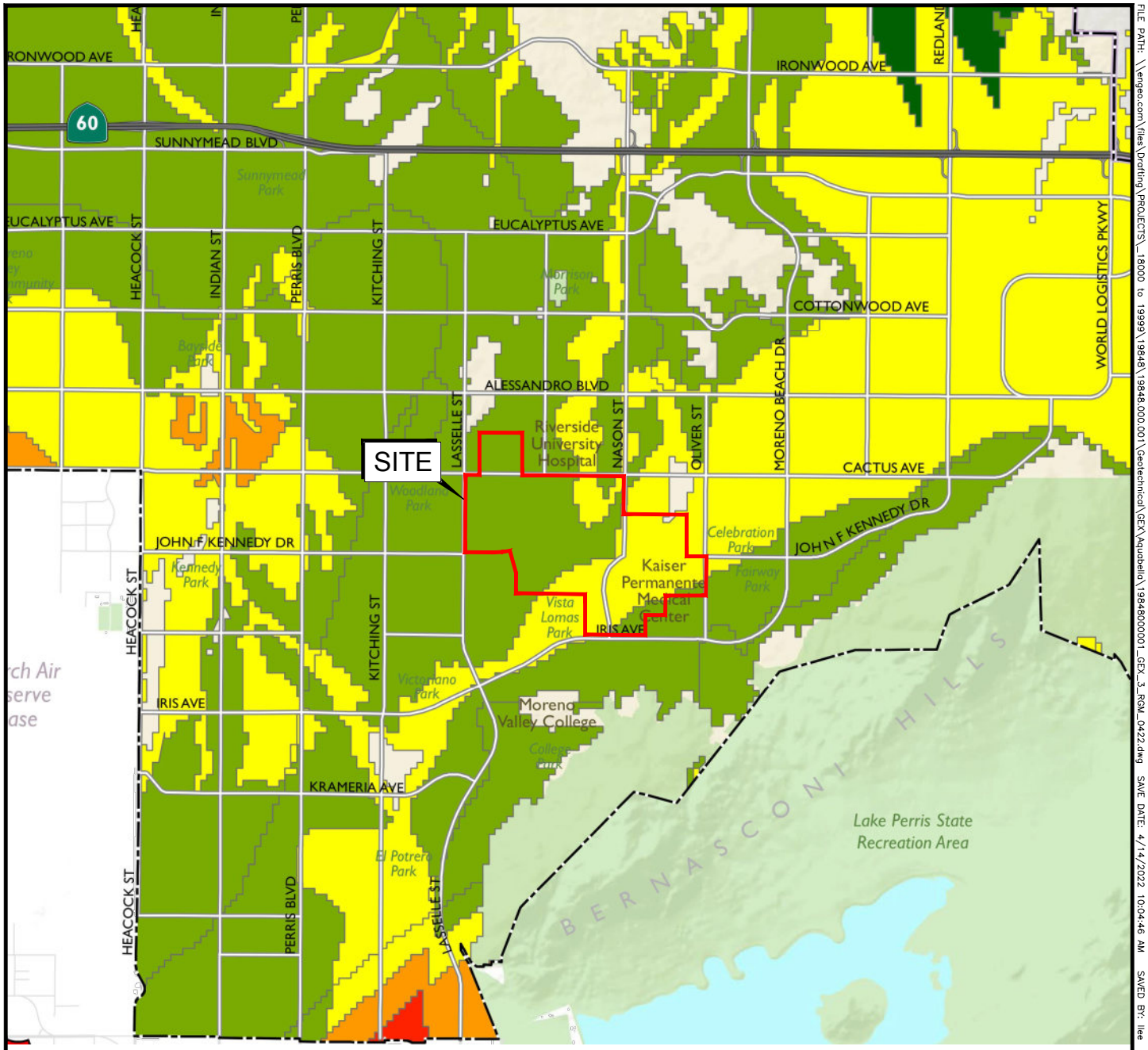
LAYOUT: SEISMIC HAZARD USER: MTORRES



EXPLANATION

Liquefaction Susceptibility

- Very low
- Low
- Moderate
- High
- Very High
- City of Moreno Valley
- Sphere of Influence

N

0 5000
FEET

BASE MAP SOURCE: CITY OF MORENO VALLEY 2040 GENERAL PLAN, RIVERSIDE COUNTY GIS, DYETT & BHATIA, 2019

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LIQUEFACTION HAZARDS

AQUABELLA MASTER PLANNED COMMUNITY

MORENO VALLEY, CALIFORNIA

PROJECT NO.: 19848.000.001	FIGURE NO. 6
SCALE: AS SHOWN	
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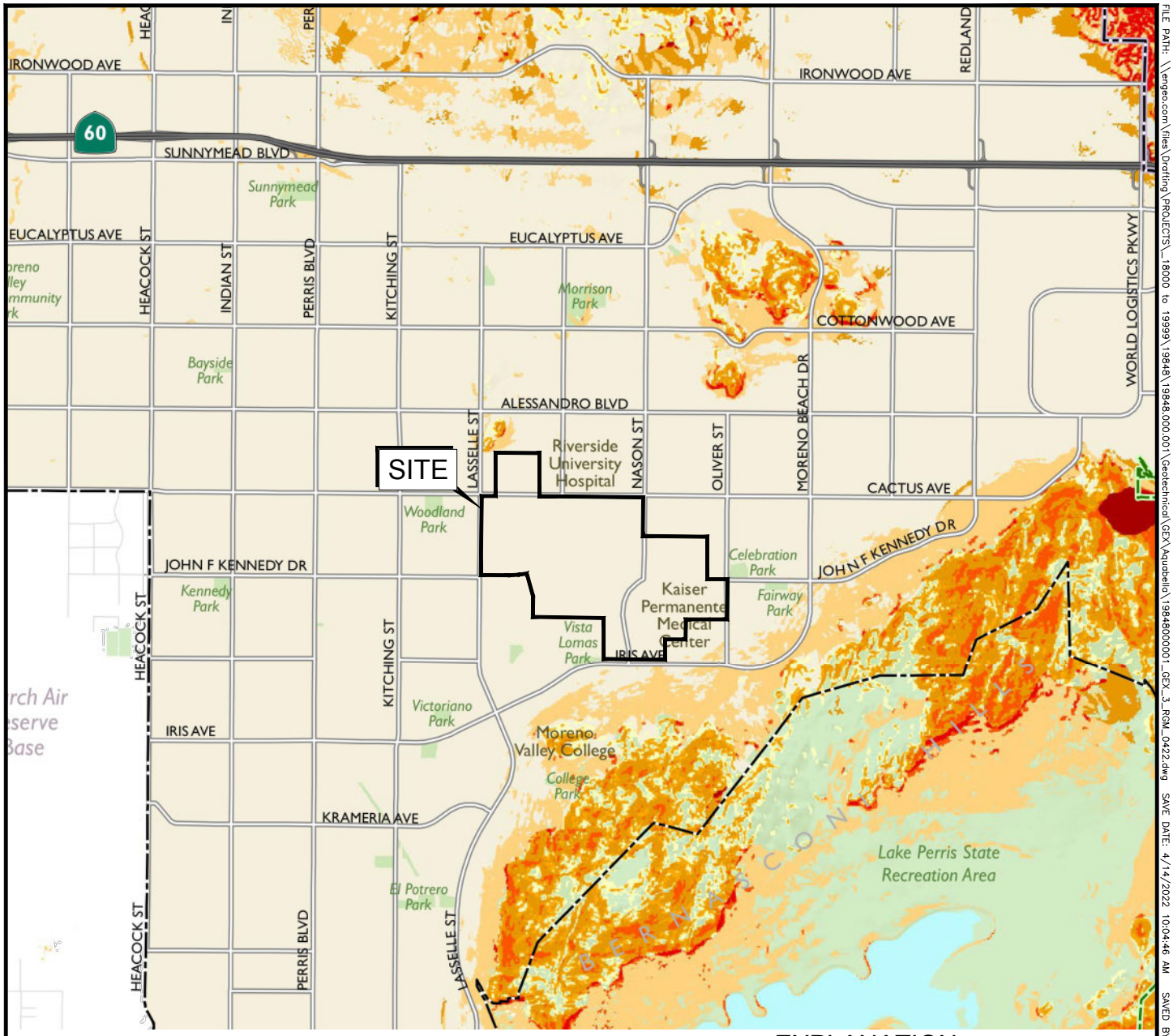

EXPLANATION

Landslide Susceptiblity Classes

- 0
- III
- V
- VI
- VII
- VIII
- IX
- X
- City of Moreno Valley
- Sphere of Influence

N

0 5000 FEET

BASE MAP SOURCE: CITY OF MORENO VALLEY 2040 GENERAL PLAN, RIVERSIDE COUNTY GIS, DYETT & BHATIA, 2019

ENGEO Expect Excellence

LANDSLIDE HAZARDS

AQUABELLA MASTER PLANNED COMMUNITY

MORENO VALLEY, CALIFORNIA

PROJECT NO.: 19848.000.001	FIGURE NO. 7
SCALE: AS SHOWN	
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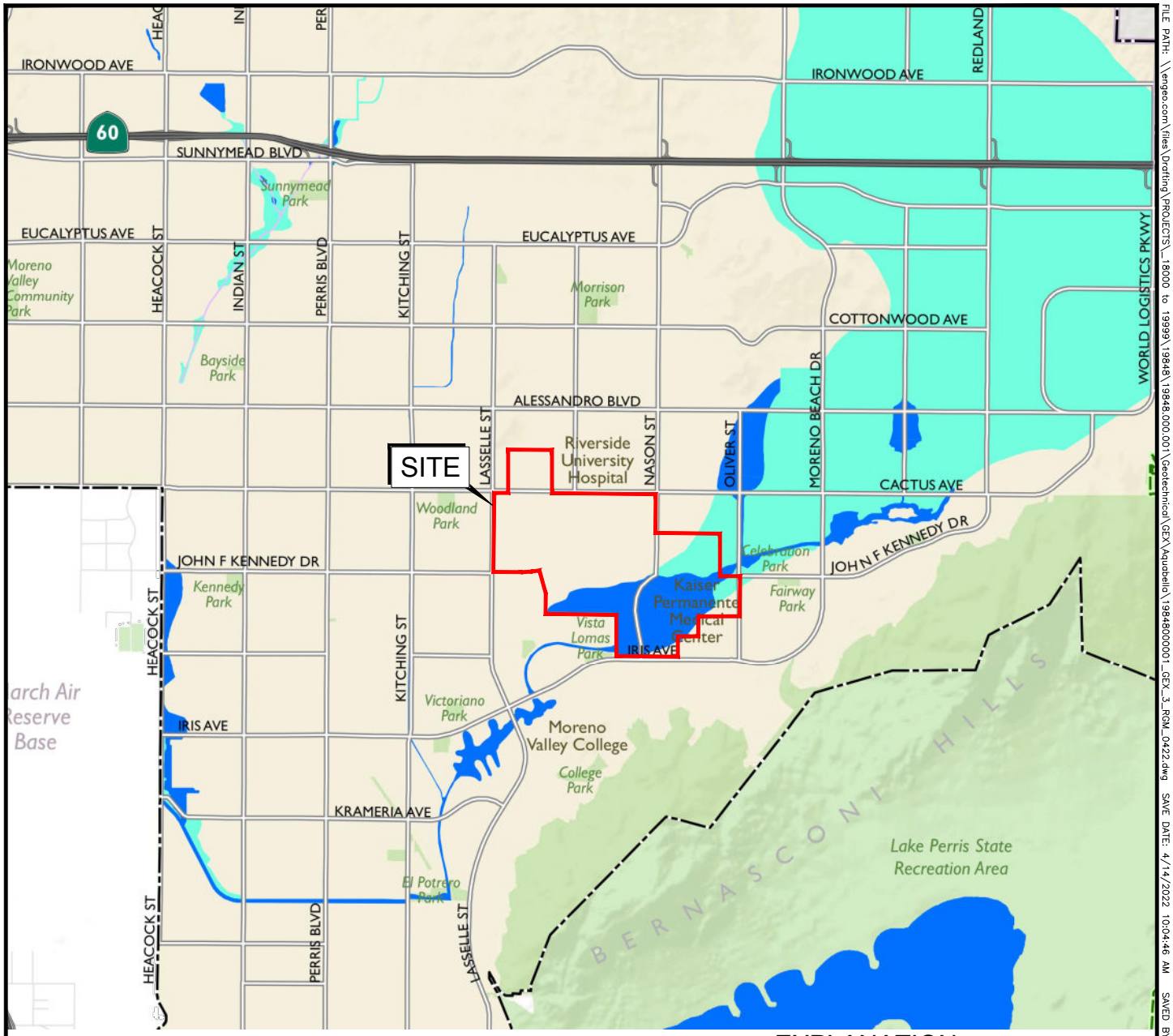

EXPLANATION

FEMA Floodplains and Floodways

- 500-year Floodplain
- 100-year Floodplain
- Floodway
- City of Moreno Valley
- Sphere of Influence

N

0 5000
FEET

BASE MAP SOURCE: CITY OF MORENO VALLEY 2040 GENERAL PLAN, RIVERSIDE COUNTY GIS, DYETT & BHATIA, 2019

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FLOOD HAZARD AREAS

AQUABELLA MASTER PLANNED COMMUNITY

MORENO VALLEY, CALIFORNIA

PROJECT NO.: 19848.000.001	FIGURE NO. 8
SCALE: AS SHOWN	
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APPENDIX A

KEY TO BORING LOGS
EXPLORATION LOGS (ENGEO, 2022)
CONE PENETRATION TESTS (ENGEO, 2022)

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

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

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE					CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"		
SILTS AND CLAYS	SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE			

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

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

MOISTURE CONDITION

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

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUNDWATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

ENGEO
Expect Excellence

LOG OF BORING 1-B-1

ENGEO Expect Excellence

LATITUDE: 33.90342084 LONGITUDE: -117.2034247

Geotechnical Exploration
Aquabella
Moreno Valley, California
19848.000.001

DATE DRILLED: 3/22/2022
HOLE DEPTH: Approx. 53 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 1514 ft.

LOGGED / REVIEWED BY: J. Knipper / CW
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SANDY LEAN CLAY (CL), light yellowish brown, hard, moist, <5% fine- to coarse-grained sand			44				51	5.6	97.2		>4.5*	PP
	1510		Medium plasticity			16	30	16	14						
5						49					4.9	114.8		>4.5*	PP
						20									
	1505					40					5.7 18.4	101.4 107.3			
10			SILTY SAND (SM), dark yellowish brown, medium dense, moist, fine- to coarse- grained			46					5.7	102.1			
						13				41					
	1500														
15						39									
			Becomes light yellowish brown			11									
	1495														
20			Fine- to medium- grained			36					8.2	113.5			
			Fine- to coarse- grained			22									
	1490														
25						42									
			Lean clay lens												
	1485														
30															

LOG - GEOTECHNICAL_SU+QU W/ ELEV GINT AQUABELLA.GPJ ENGEO INC.GDT 4/20/22

LOG OF BORING 1-B-1

ENGEO Expect Excellence

LATITUDE: 33.90342084 LONGITUDE: -117.2034247

Geotechnical Exploration
Aquabella
Moreno Valley, California
19848.000.001

DATE DRILLED: 3/22/2022
HOLE DEPTH: Approx. 53 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 1514 ft.

LOGGED / REVIEWED BY: J. Knipper / CW
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILT (ML), dark yellowish brown, hard, moist, high plasticity			46	23	20	3					>4.5*	PP
			LEAN CLAY WITH SAND (CL), reddish brown, hard, moist, low plasticity, fine-grained			32									
	1480														
35			SILT WITH SAND (ML), reddish brown, hard, moist, fine- to medium- grained			51								>4.5*	PP
	1475														
40			SILTY SAND (SM), dark yellowish brown, medium dense, moist, fine- to coarse- grained			42									
						21									
	1470														
45						50/5									
			Becomes light yellowish brown												
			POORLY GRADED SAND (SP), light yellowish brown, dense, moist, fine- to coarse- grained			36									
	1465				▽										
50			SILTY SAND (SM), light yellowish brown, medium dense, saturated, fine-grained			39					19.8	108.2			
			Becomes wet, fine- to coarse- grained			39									
			Bottom of boring at approximately 53 feet. Groundwater encountered at approximately 49 feet.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV GINT AQUABELLA.GPJ ENGEO INC.GDT 4/20/22

LOG OF BORING 1-B-2

ENGEO Expect Excellence

LATITUDE: 33.90756443 LONGITUDE: -117.1929412

Geotechnical Exploration
Aquabella
Moreno Valley, California
19848.000.001

DATE DRILLED: 3/22/2022
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 1530 ft.

LOGGED / REVIEWED BY: J. Knipper / CW
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	1530		SILTY SAND (SM), light yellowish brown, medium dense, moist, fine-grained			17					4.6	76.7			
			Becomes loose			6				30					
5	1525		<5% fine gravel, fine- to coarse-grained			15					3.2	110.6			
						15									
						17				18					
10	1520		Poorly graded sand lens Medium dense, fine-grained			12									
			<5% fine gravel			28					3.6	109.6			
			SANDY SILT (ML), light yellowish brown, very stiff, moist, low plasticity, fine-grained			16									
15	1515		SILT WITH SAND (ML), light yellowish brown, hard, moist, low plasticity, fine- to medium-grained			28					6.7 4.41	105.8 108.28		>4.5*	PP
20	1510		LEAN CLAY (CL), light yellowish brown, hard, moist, high plasticity, <5% fine- to medium-grained sand			36	27	19	8		10.8	120		>4.5*	PP
						33									
25	1505					40								>4.5*	PP
30	1500														

LOG - GEOTECHNICAL_SU+QU W/ ELEV GINT AQUABELLA.GPJ ENGEO INC.GDT 4/20/22

LOG OF BORING 1-B-2

Expect Excellence

LATITUDE: 33.90756443 LONGITUDE: -117.1929412

Geotechnical Exploration
Aquabella
Moreno Valley, California
19848.000.001

DATE DRILLED: 3/22/2022
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 1530 ft.

LOGGED / REVIEWED BY: J. Knipper / CW
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), light yellowish brown, hard, moist, high plasticity, <5% fine- to medium-grained sand			26								>4.5*	PP
35	1495		SILTY SAND (SM), light yellowish brown, medium dense, moist, fine- to coarse-grained			55				24					
			SILT WITH SAND (ML), dark yellowish brown, very stiff, moist, medium plasticity, 5 to 10% clay, fine- to coarse-grained			20									
40	1490		SILTY SAND (SM), reddish brown, dense, moist, 5 to 10% clay, fine-grained			56									
			SILT (ML), reddish brown, very stiff, moist, medium plasticity, 5 to 10% clay			24									
45	1485		Light grayish brown			39	50	24	26					4.0*	PP
			LEAN CLAY (CL), reddish brown, very stiff to hard, medium to high plasticity, becomes very stiff to hard												
50	1480		Increasing sand and silt			43								>4.5*	PP
			Bottom of boring at approximately 51 1/2 feet. Groundwater not encountered.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV GINT AQUABELLA.GPJ ENGEO INC.GDT 4/20/22

LOG OF BORING 1-B-3

ENGEO Expect Excellence

LATITUDE: 33.90016482 LONGITUDE: -117.1835636

Geotechnical Exploration
Aquabella
Moreno Valley, California
19848.000.001

DATE DRILLED: 3/23/2022
HOLE DEPTH: Approx. 53 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 1521 ft.

LOGGED / REVIEWED BY: J. Knipper / CW
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	1520		FAT CLAY (CH), light yellowish brown, hard, moist, low plasticity			50	60	25	35	94				>4.5*	PP
			Becomes hard												
5	1515		Trace calcite stringers			35					5.3	119.5		>4.5*	PP
			SILT WITH SAND (ML), light yellowish brown, hard, moist, medium plasticity, fine-grained			29	35	25	10		20.58	98		>4.5*	PP
			Becomes hard			15								>4.5*	PP
10	1510		SANDY SILT (ML), light yellowish brown, hard, moist, high plasticity, fine- to medium-grained			25					13.5	104.7			
						18									
15	1505		LEAN CLAY (CL), light reddish brown, hard, moist, high plasticity, <5% fine- to medium-grained sand			87/6	31	19	12		11	113.5		>4.5*	PP
						44				56					
20	1500		Trace calcite stringers			71					9.7	120.2		>4.5*	PP
						48									
25	1495		SILTY SAND (SM), light yellowish brown, medium dense, moist, fine- to coarse-grained			33									
						26									
30															

LOG - GEOTECHNICAL_SU+QU W/ ELEV GINT AQUABELLA.GPJ ENGEO INC.GDT 4/20/22

LOG OF BORING 1-B-3

ENGEO Expect Excellence

LATITUDE: 33.90016482 LONGITUDE: -117.1835636

Geotechnical Exploration
Aquabella
Moreno Valley, California
19848.000.001

DATE DRILLED: 3/23/2022
HOLE DEPTH: Approx. 53 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (WGS84): Approx. 1521 ft.

LOGGED / REVIEWED BY: J. Knipper / CW
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	1490		SILTY SAND (SM), light yellowish brown, medium dense, moist, fine- to coarse-grained, <5% fine gravel			52									
			Trace calcite stringers			24									
35			SANDY SILT (ML), dark yellowish brown, very stiff, moist, fine- to coarse-grained			37									
	1485		SILTY SAND (SM), dark yellowish brown, medium dense, moist, fine- to coarse-grained			25				35					
40															
	1480				▽	45					12.2	124			
						29									
45			POORLY GRADED SAND (SP), light yellowish brown, medium dense, moist, fine- to coarse-grained												
	1475		SILTY SAND (SM), dark yellowish brown, medium dense, moist, fine- to coarse-grained			21									
50			SANDY SILT (ML), dark yellowish brown, very stiff, moist, fine- to coarse-grained			41					12.7	125.9			
	1470		Becomes stiff			20									
			Bottom of boring at approximately 53 feet. Groundwater encountered at approximately 41 feet.												

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Geotechnical Engineers
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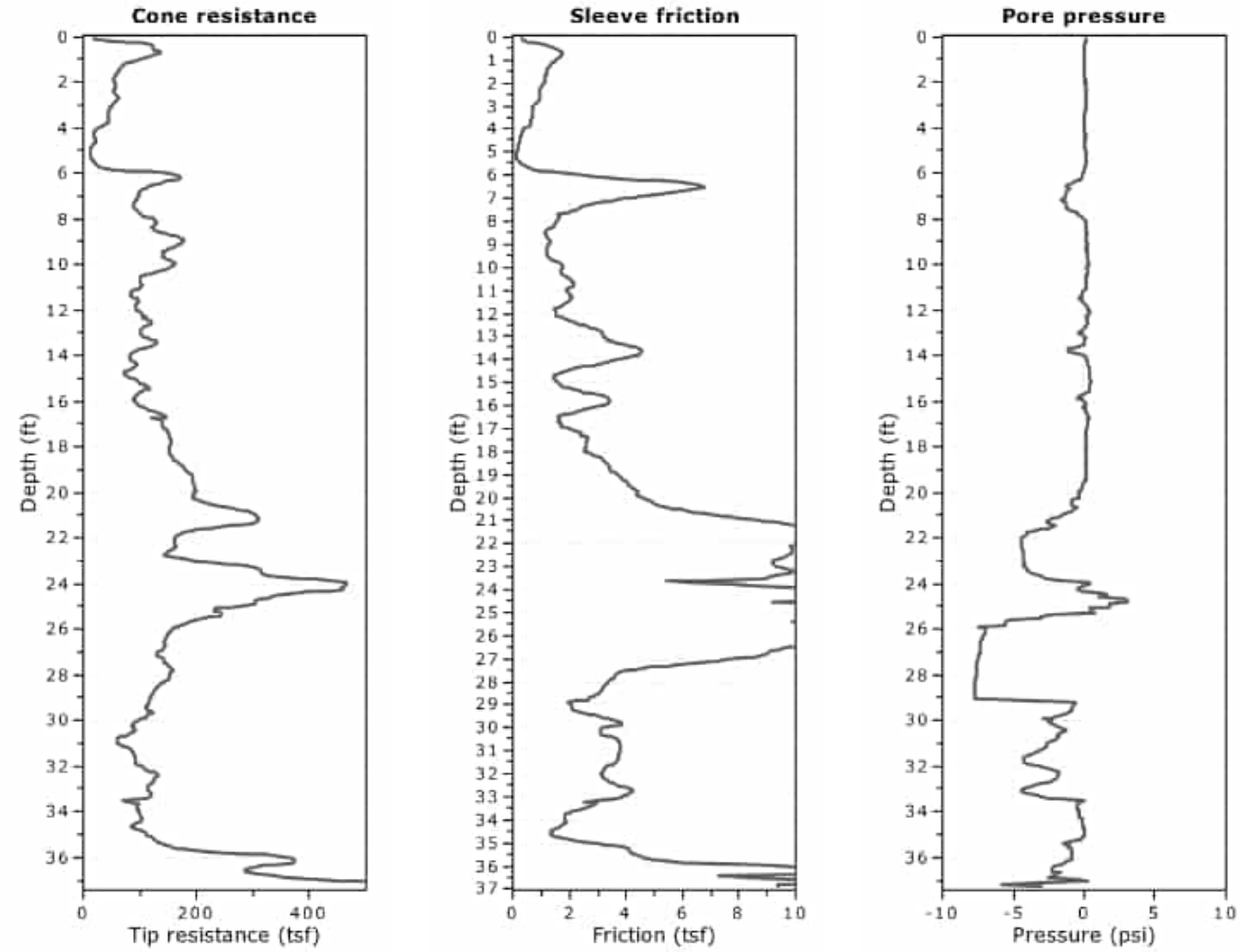
http://www.geologismiki.gr

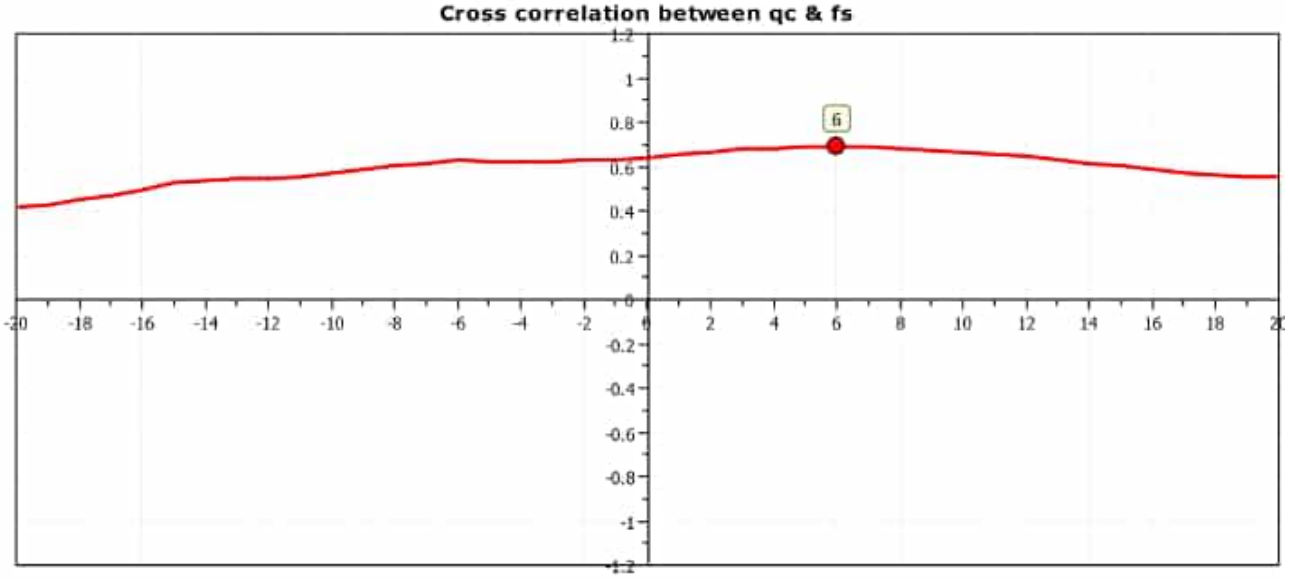
1-CPT-1

Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 37.28 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



GeoLogismiki
Geotechnical Engineers
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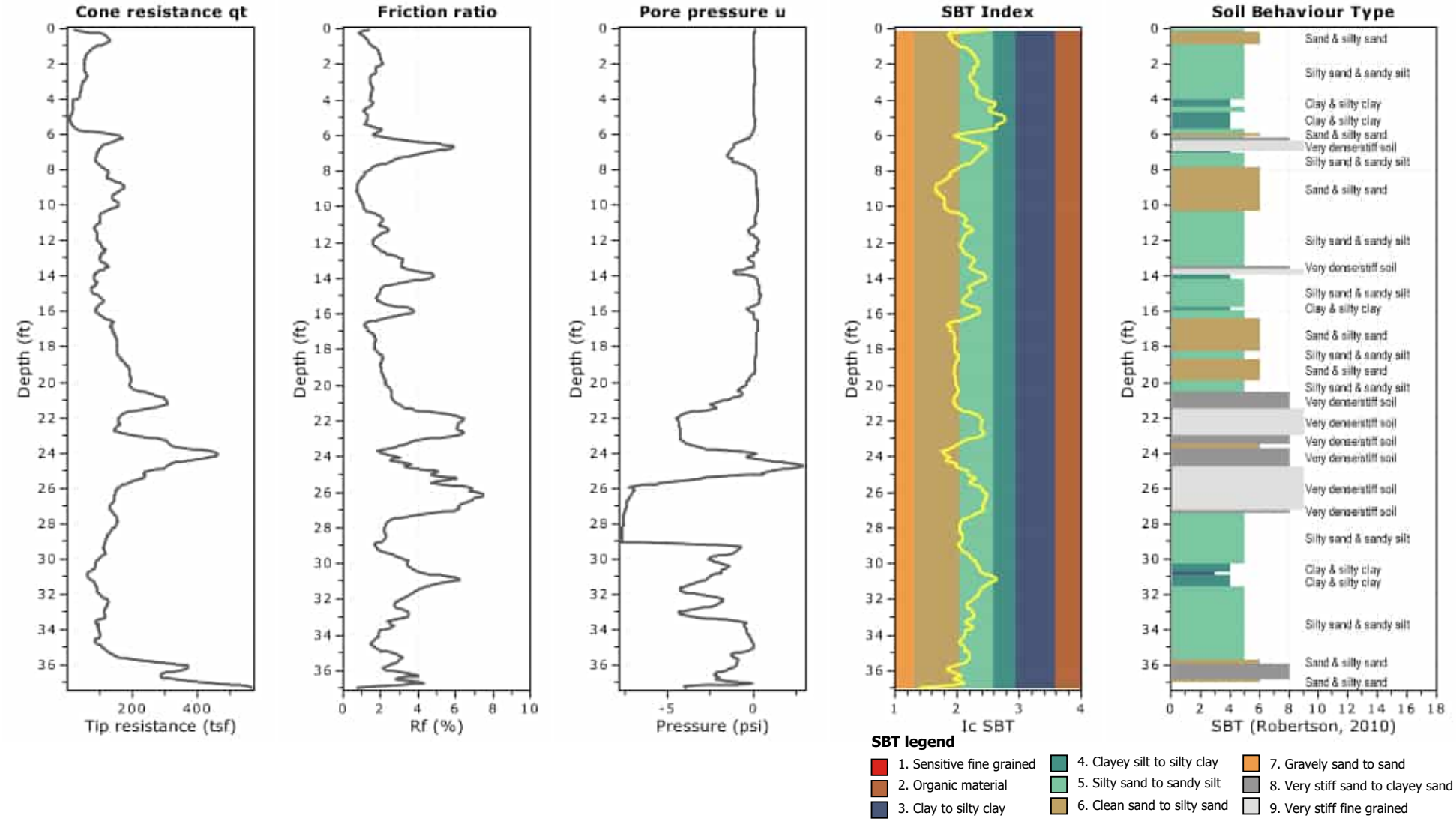
http://www.geologismiki.gr

1-CPT-1

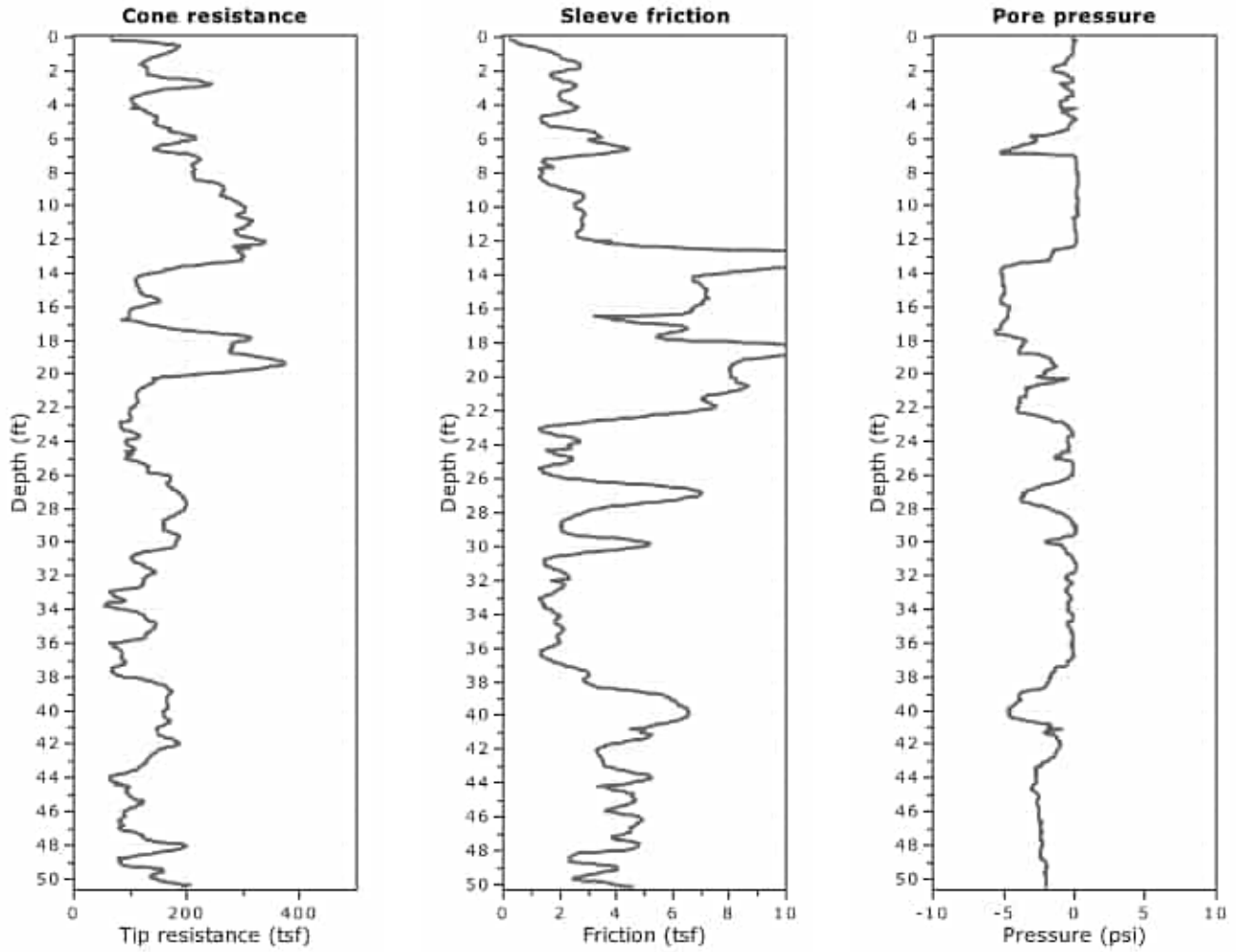
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 37.28 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

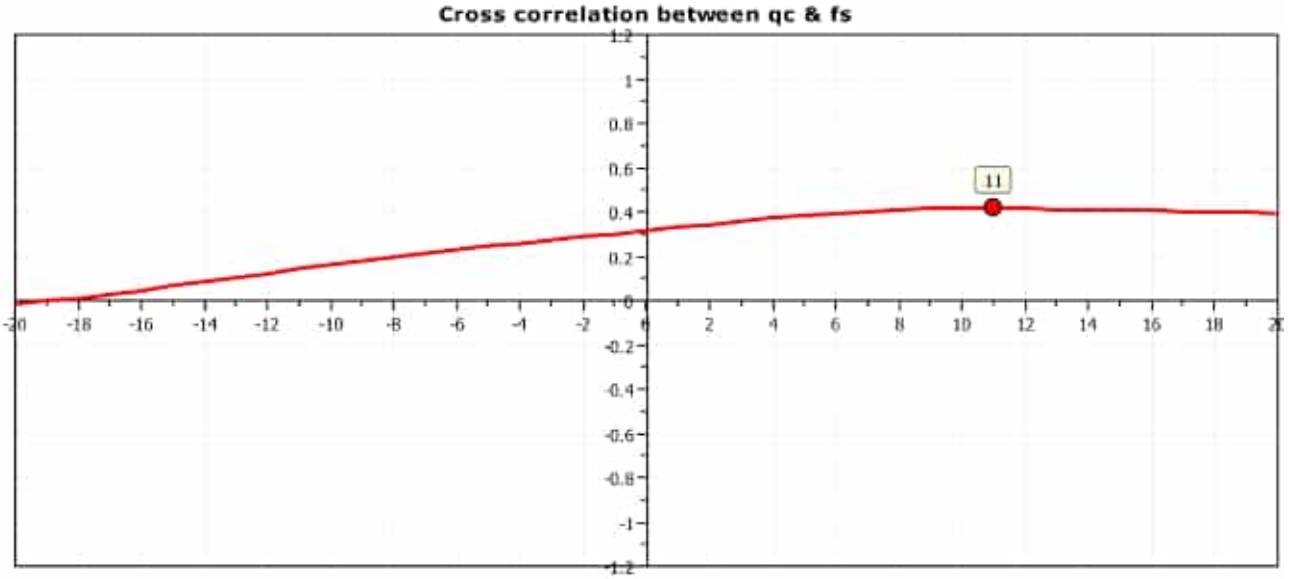


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.46 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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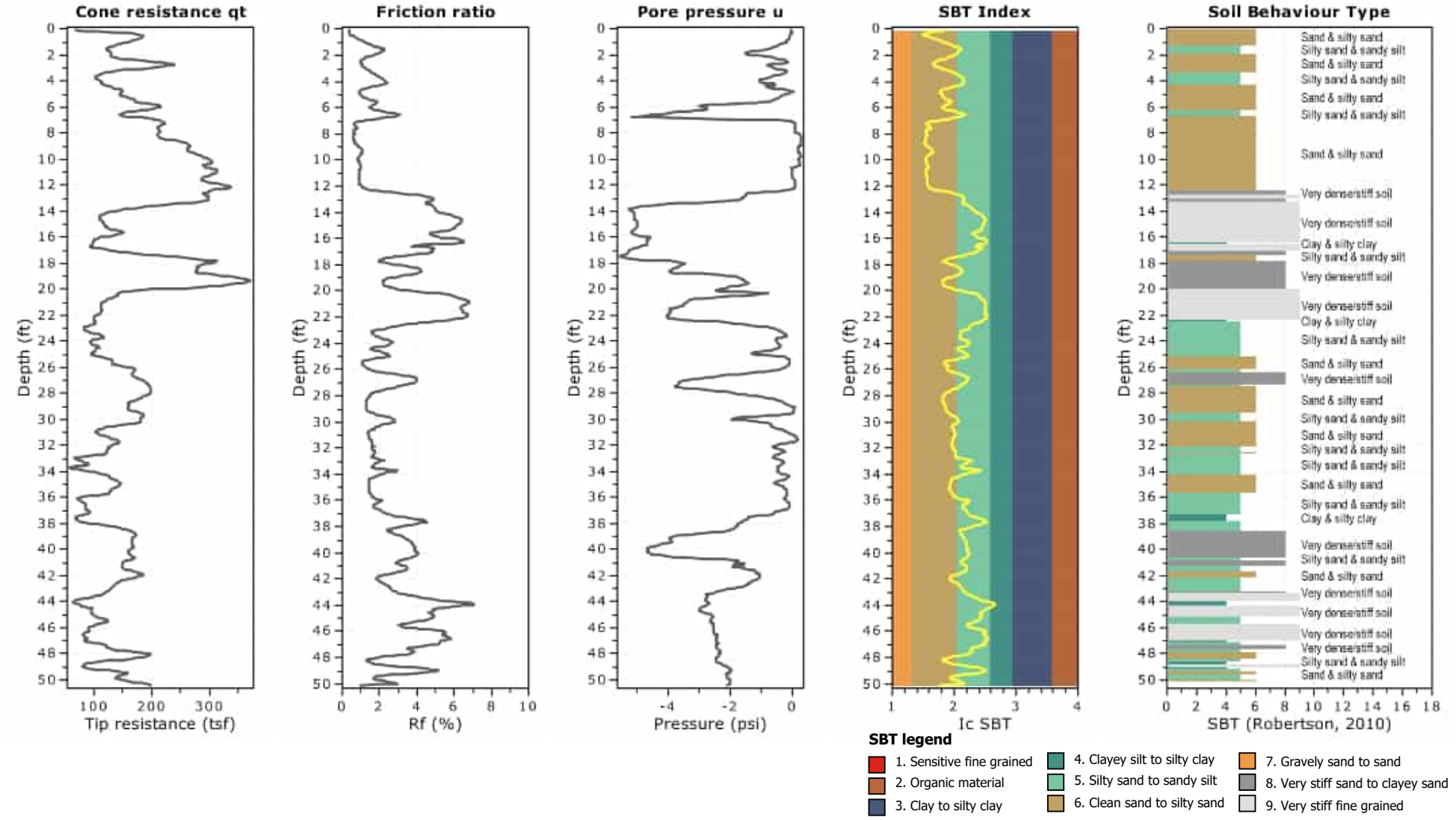
1-CPT-2

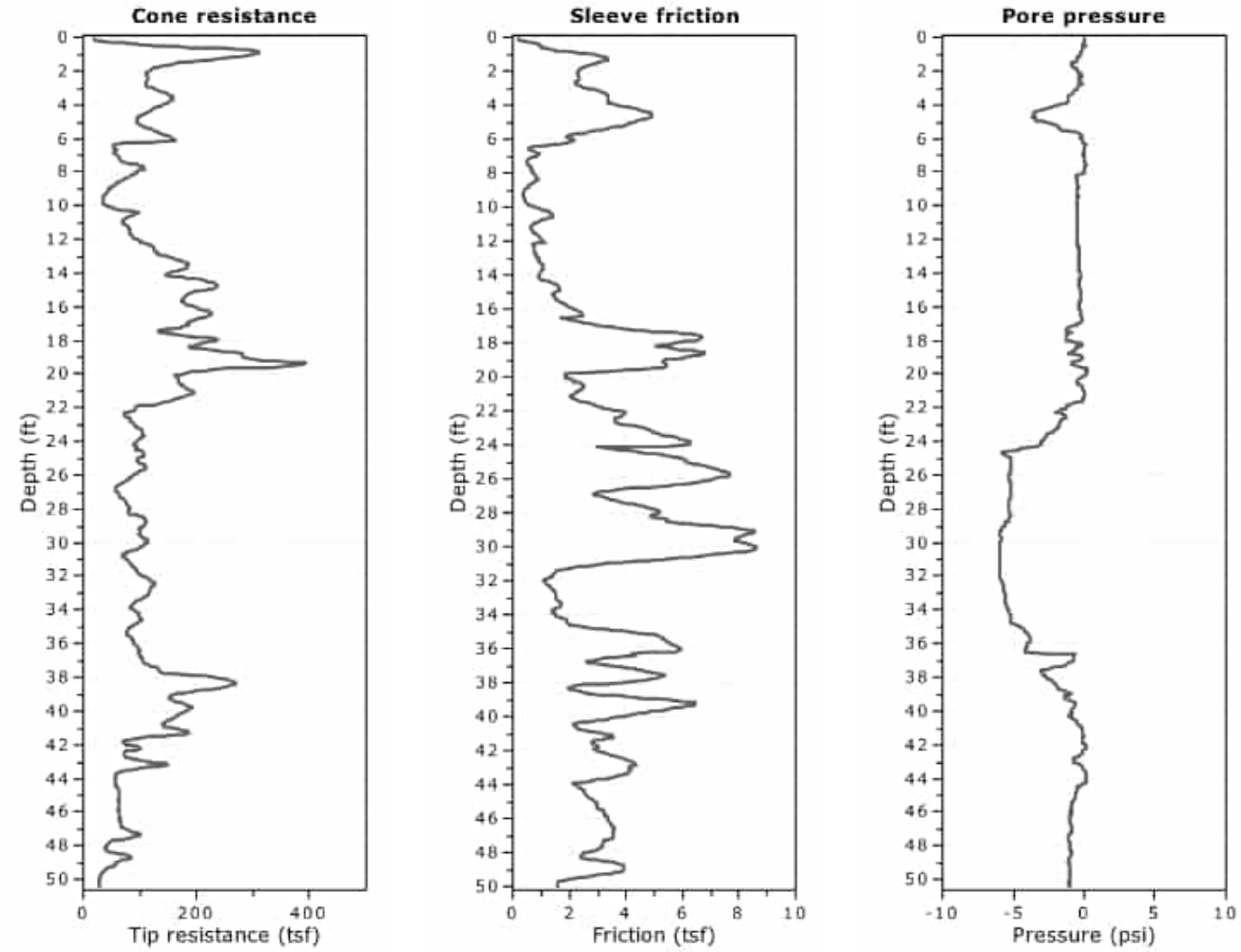
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.46 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

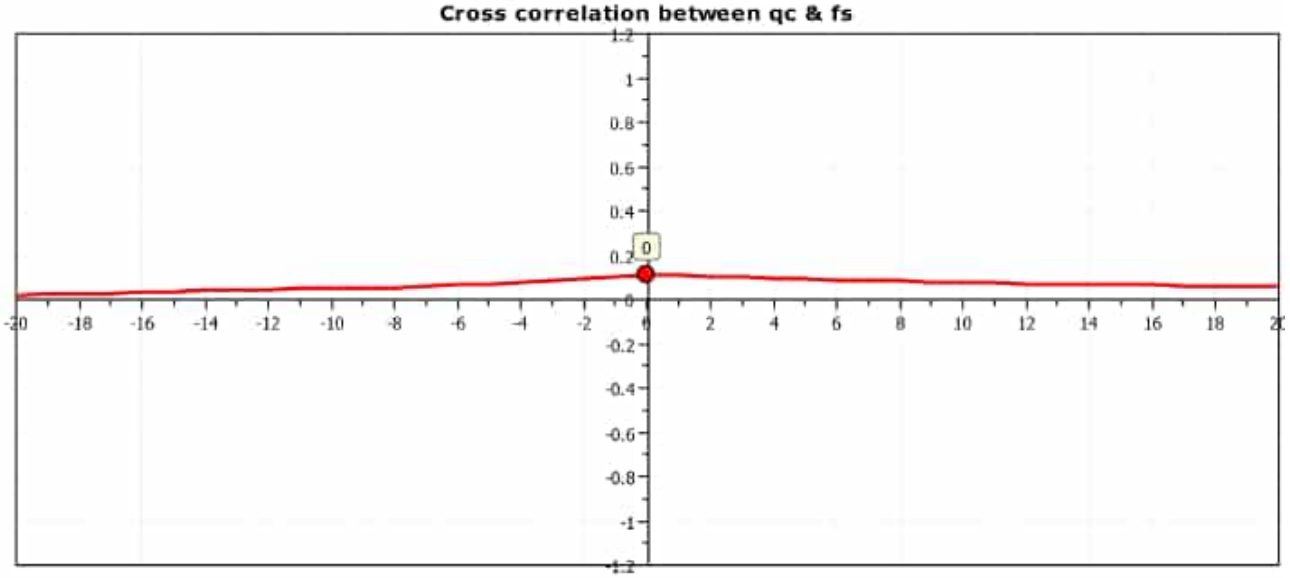


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.42 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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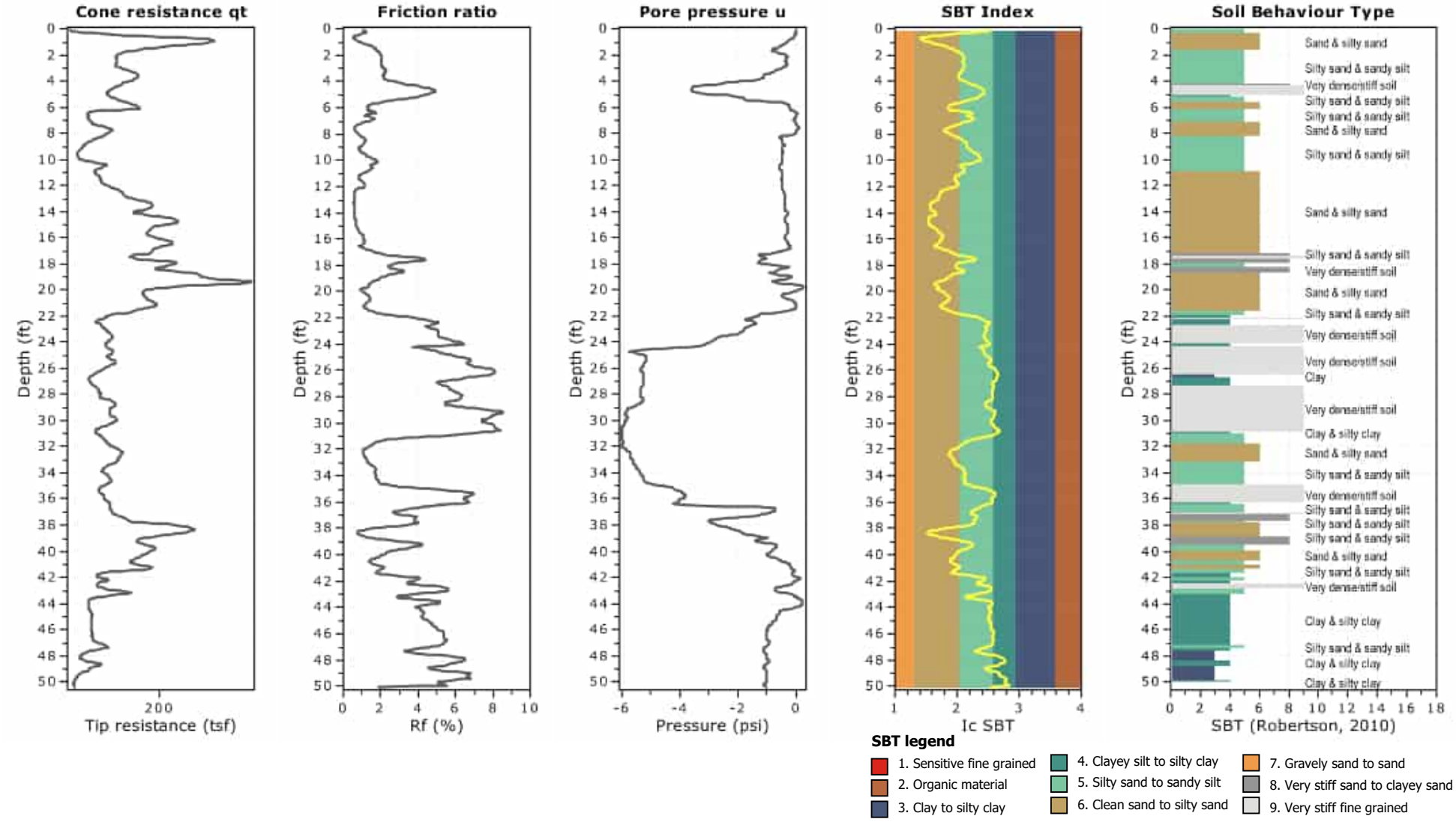
1-CPT-3

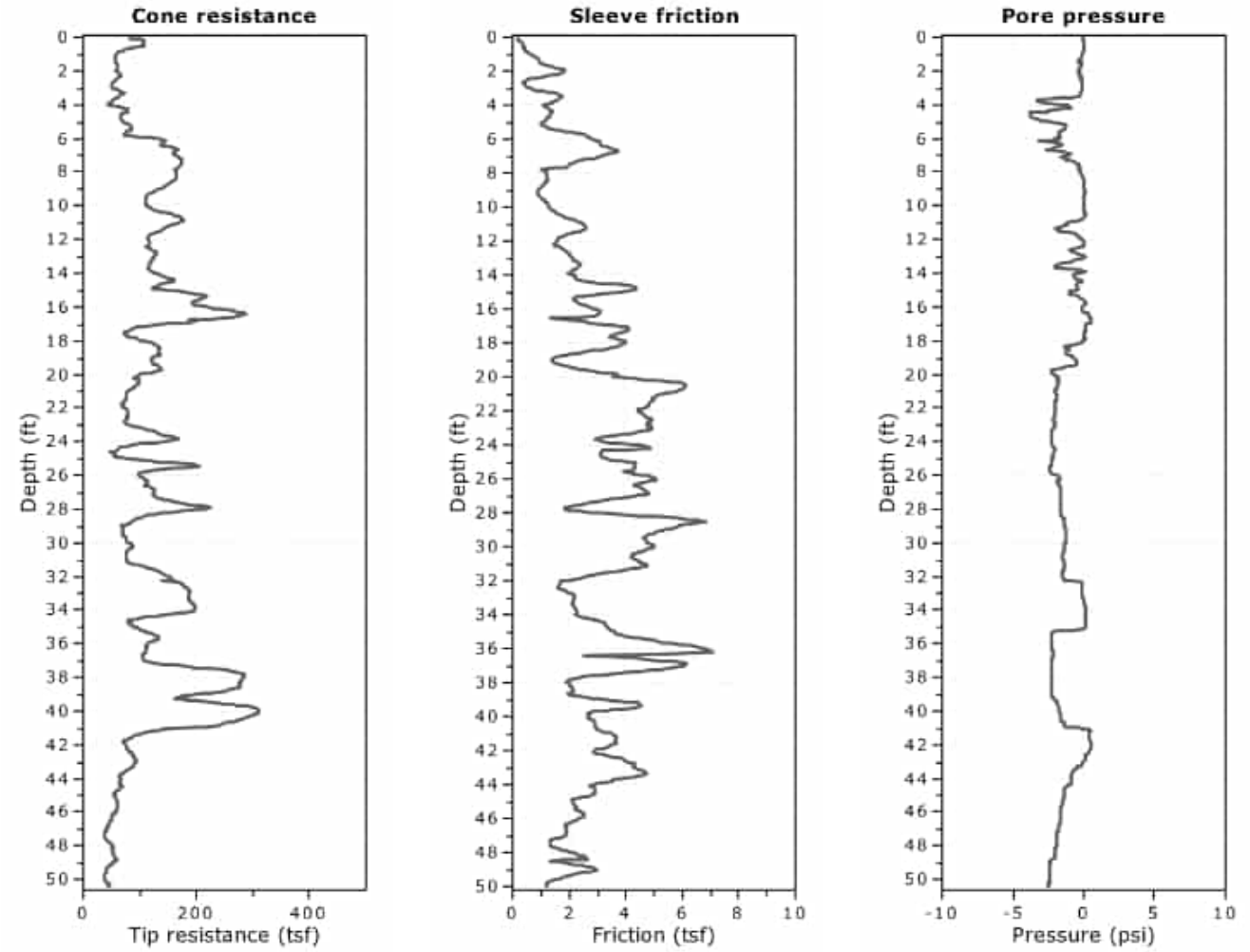
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.42 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

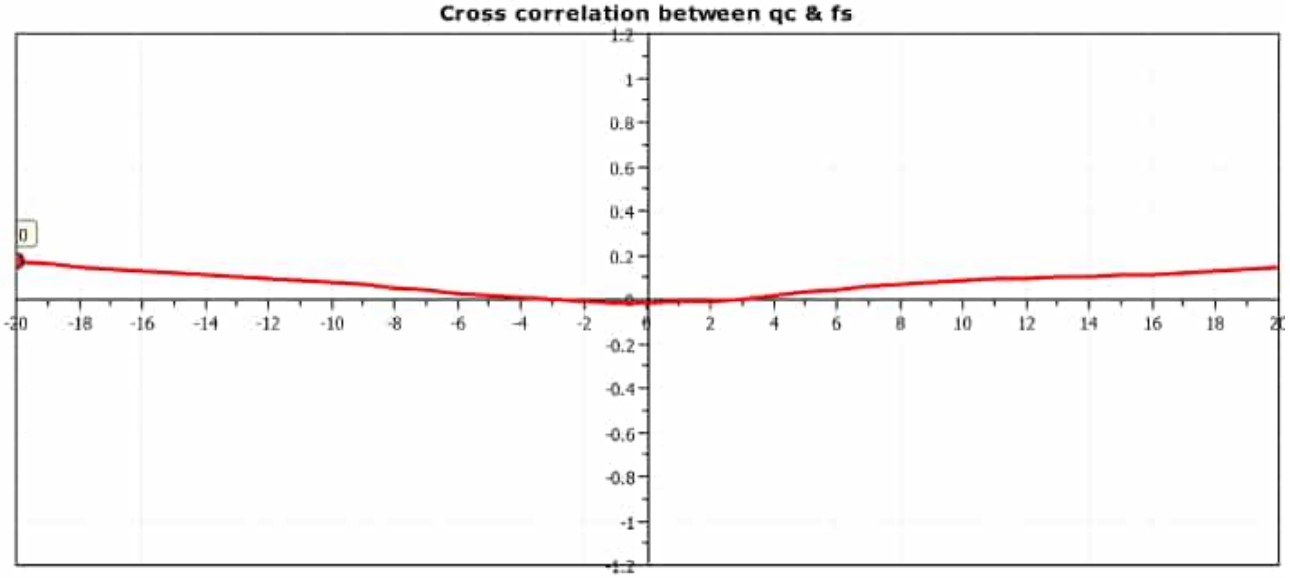


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.41 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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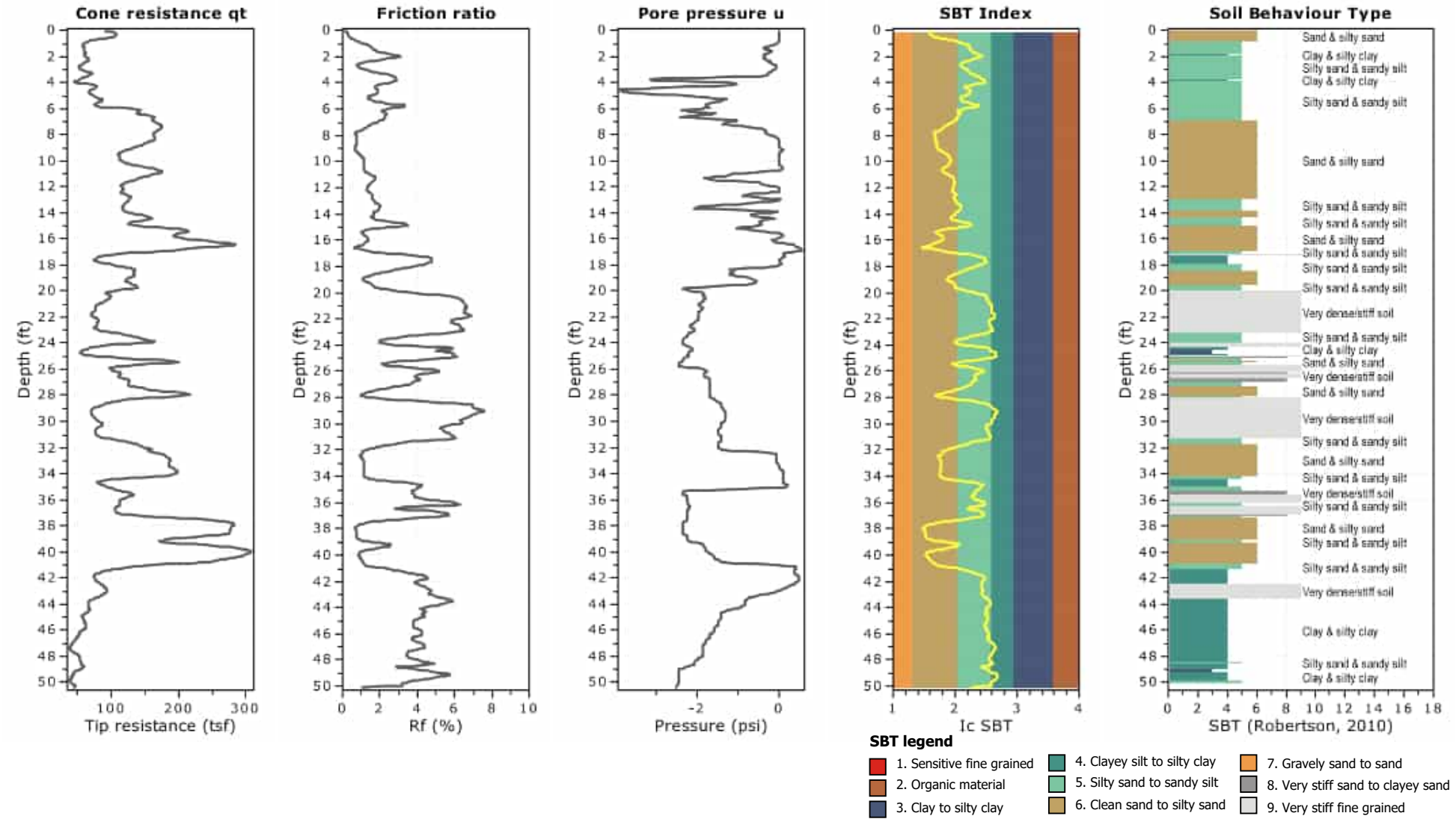
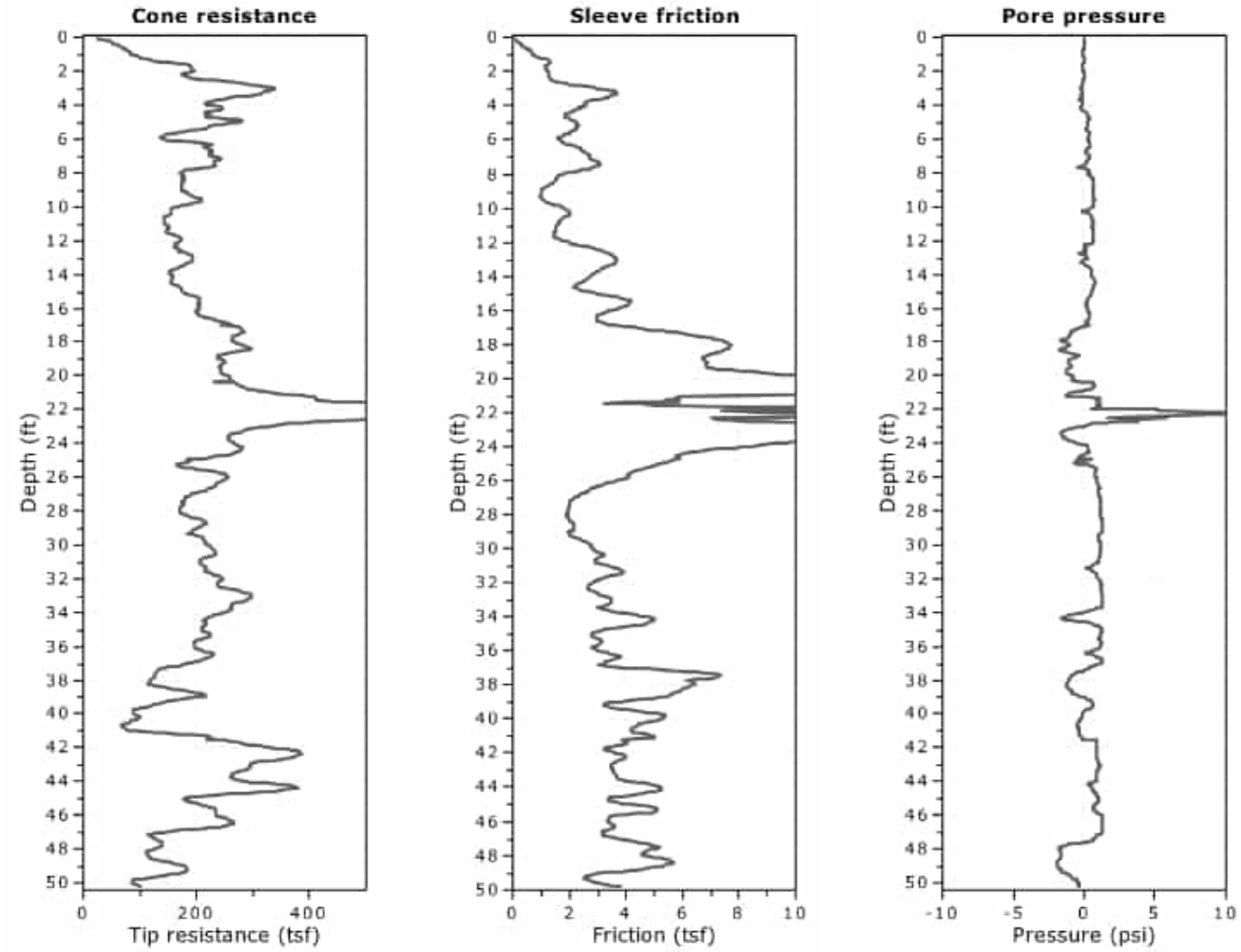
1-CPT-4

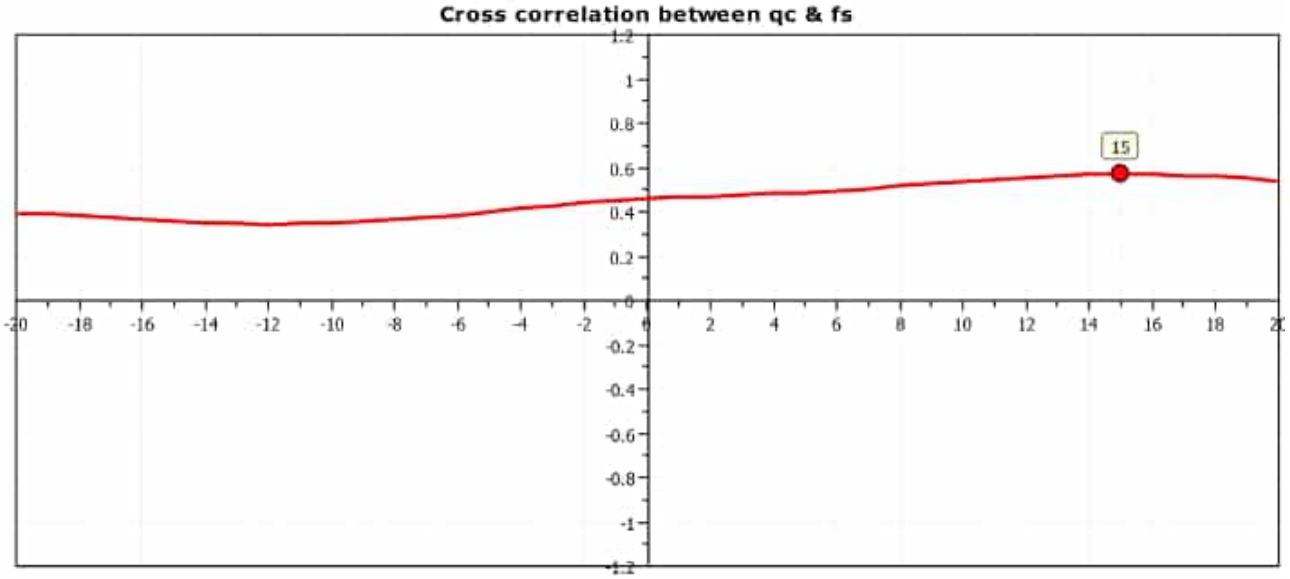
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.41 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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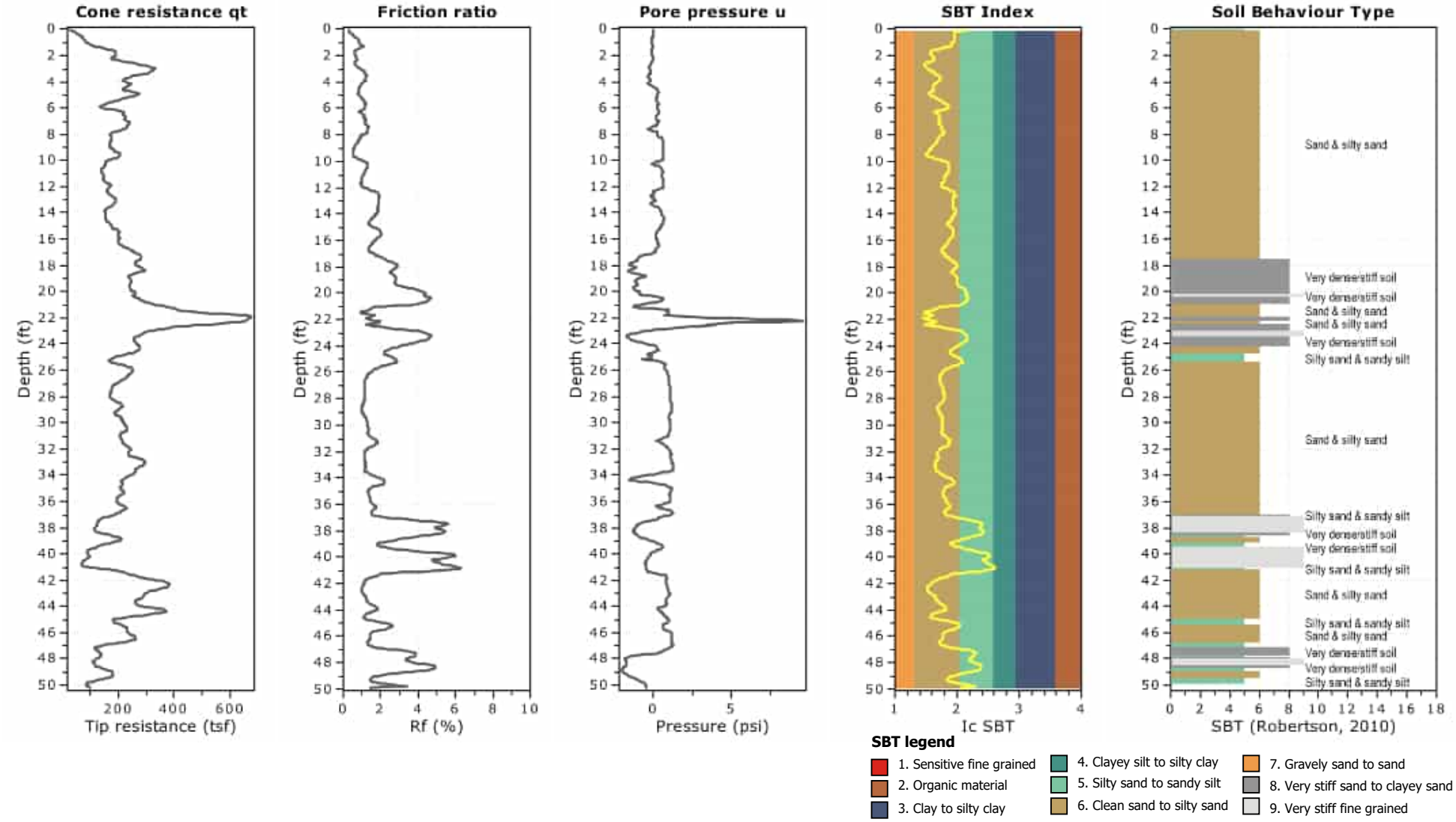
1-CPT-5

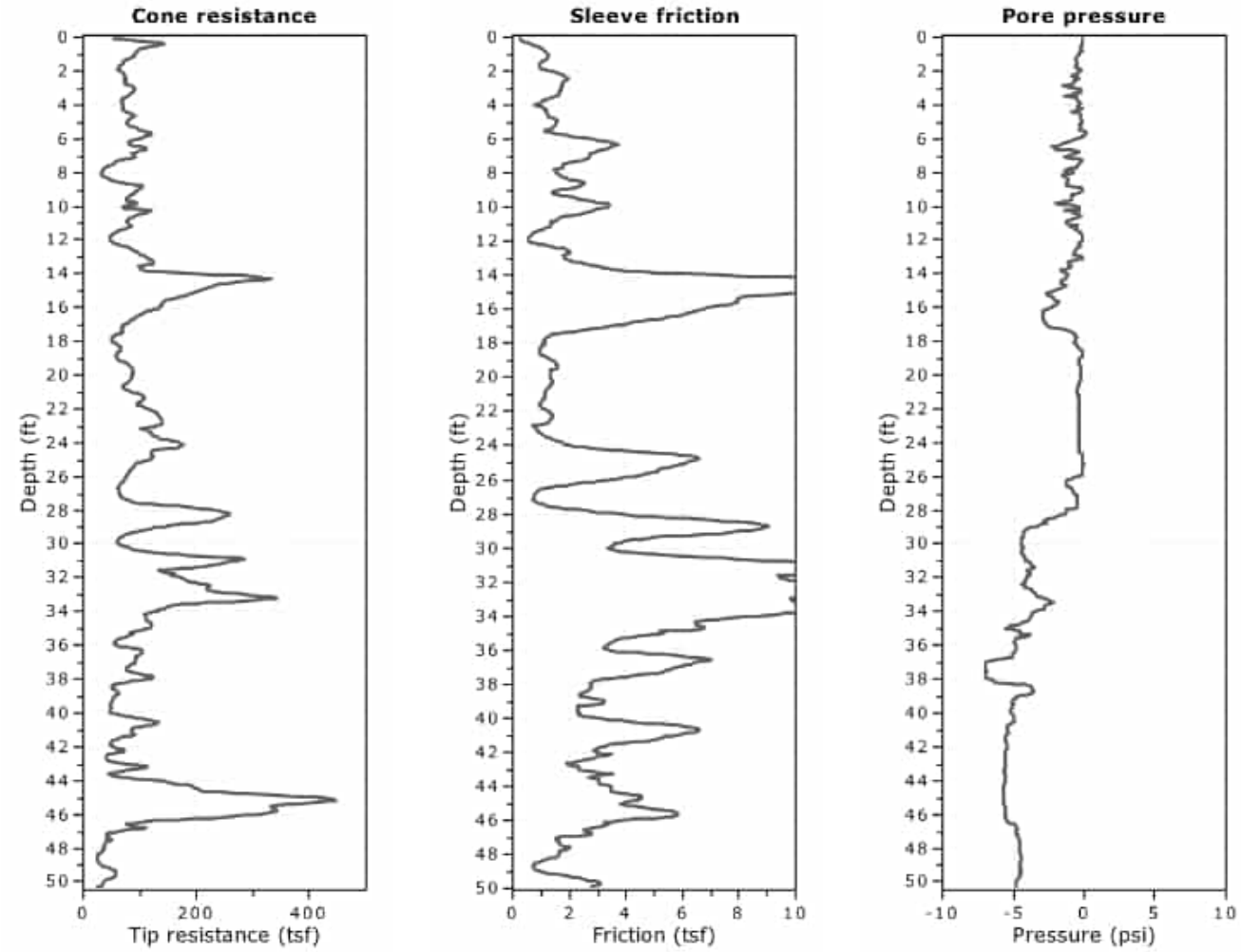
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.21 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

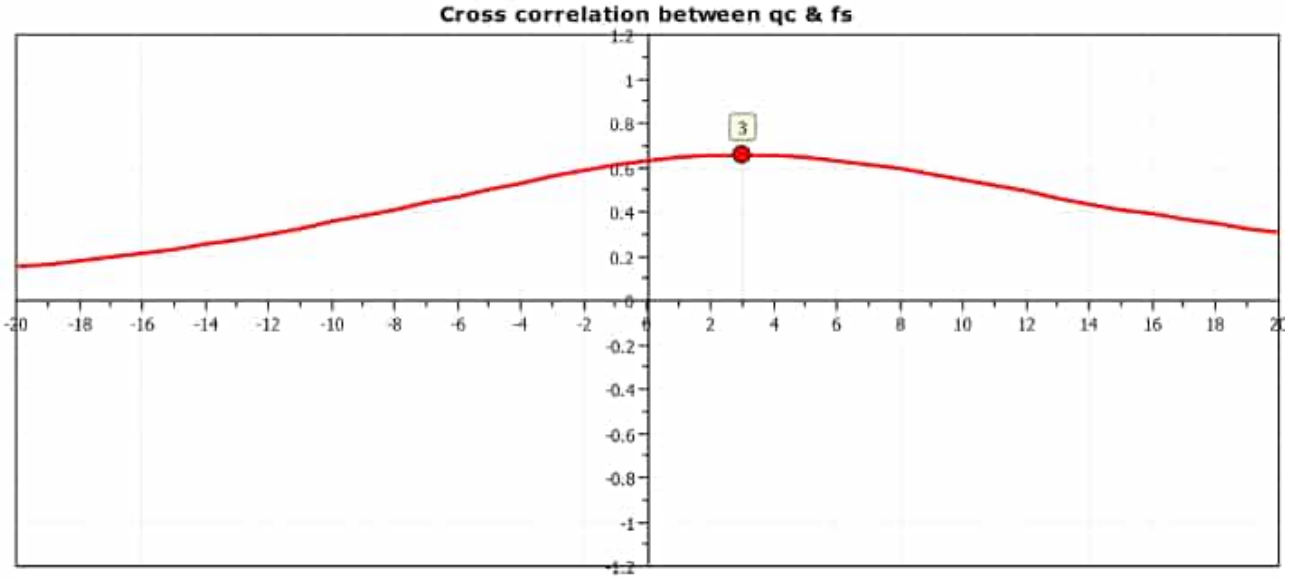


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.27 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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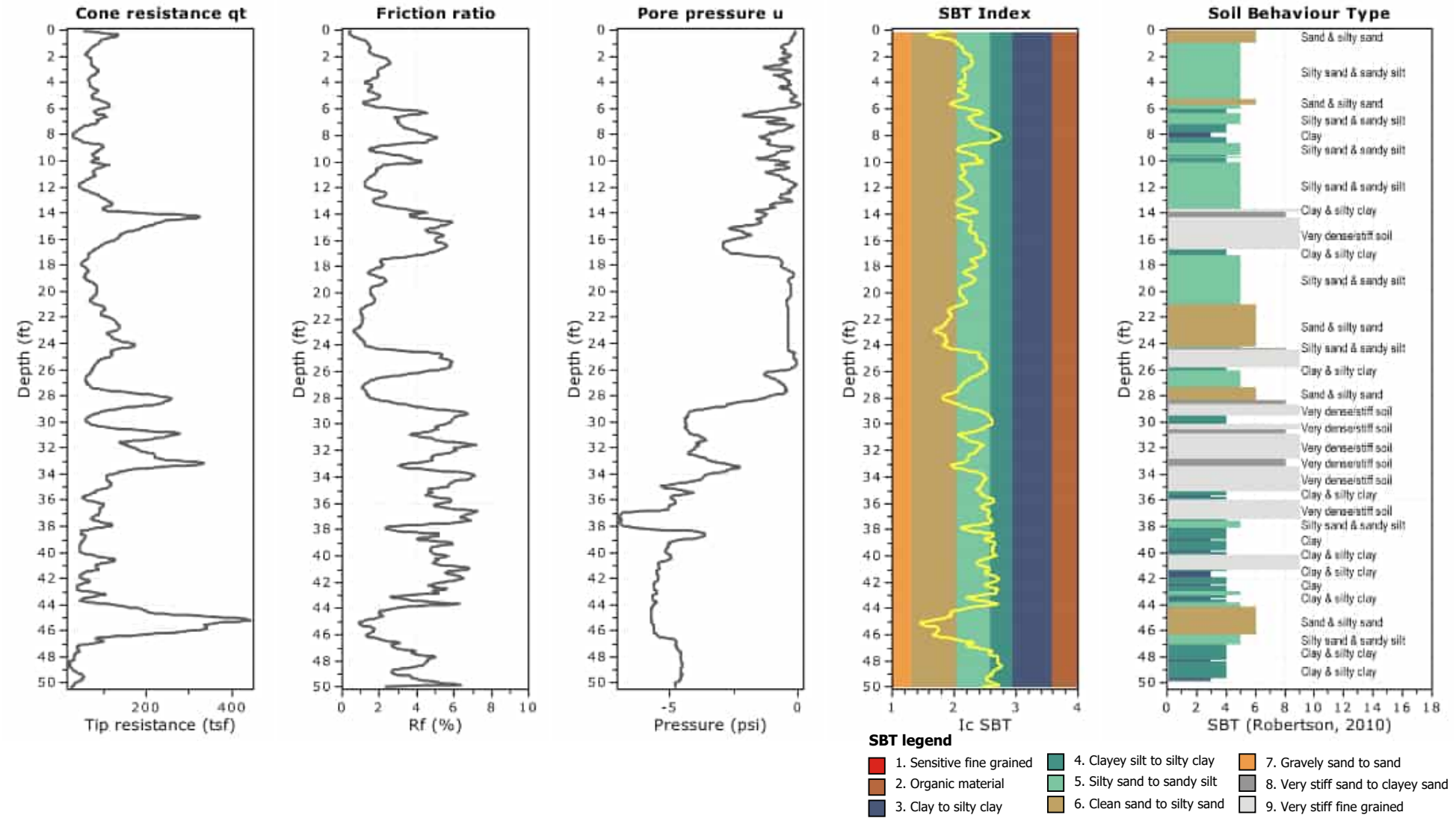
1-CPT-6

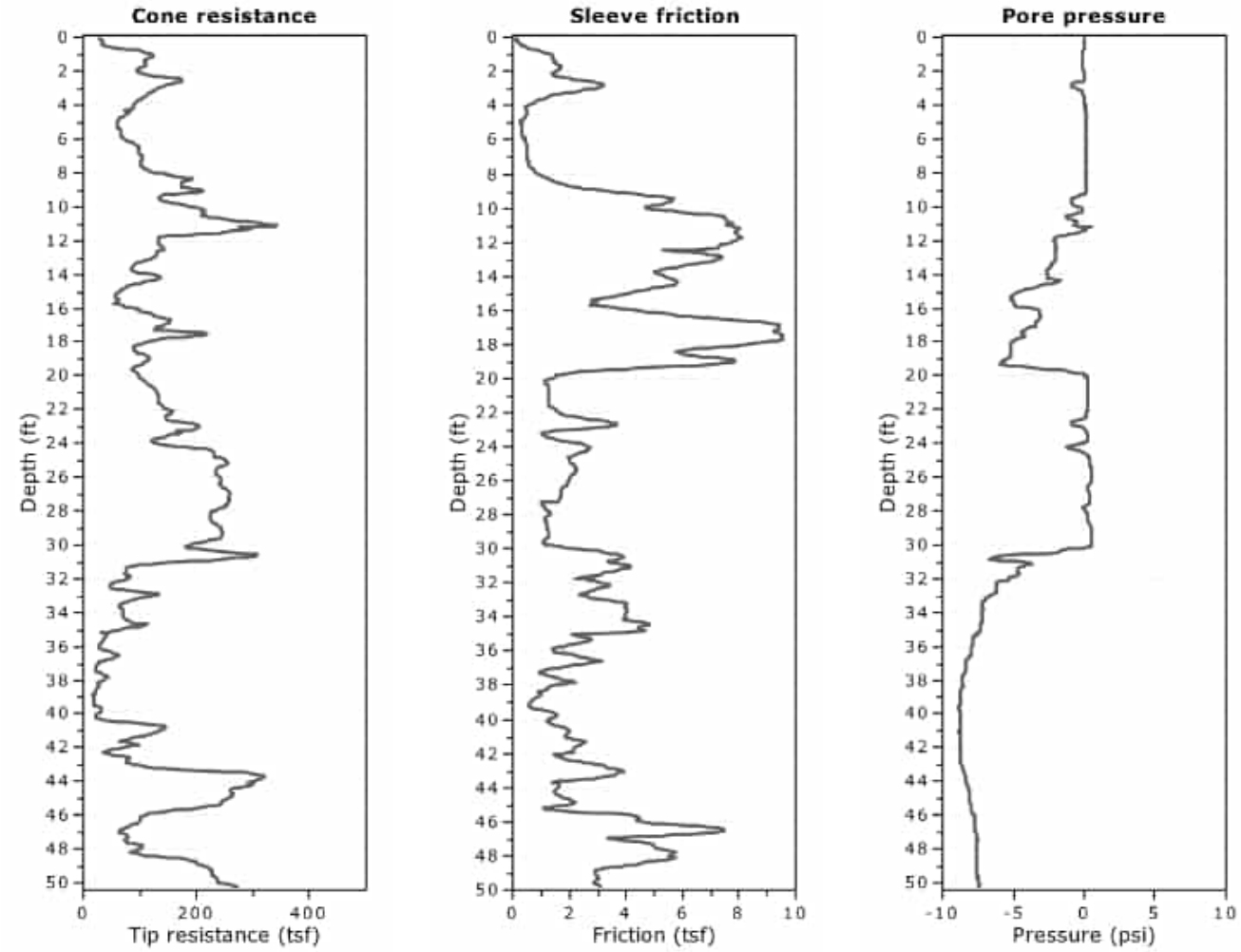
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.27 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

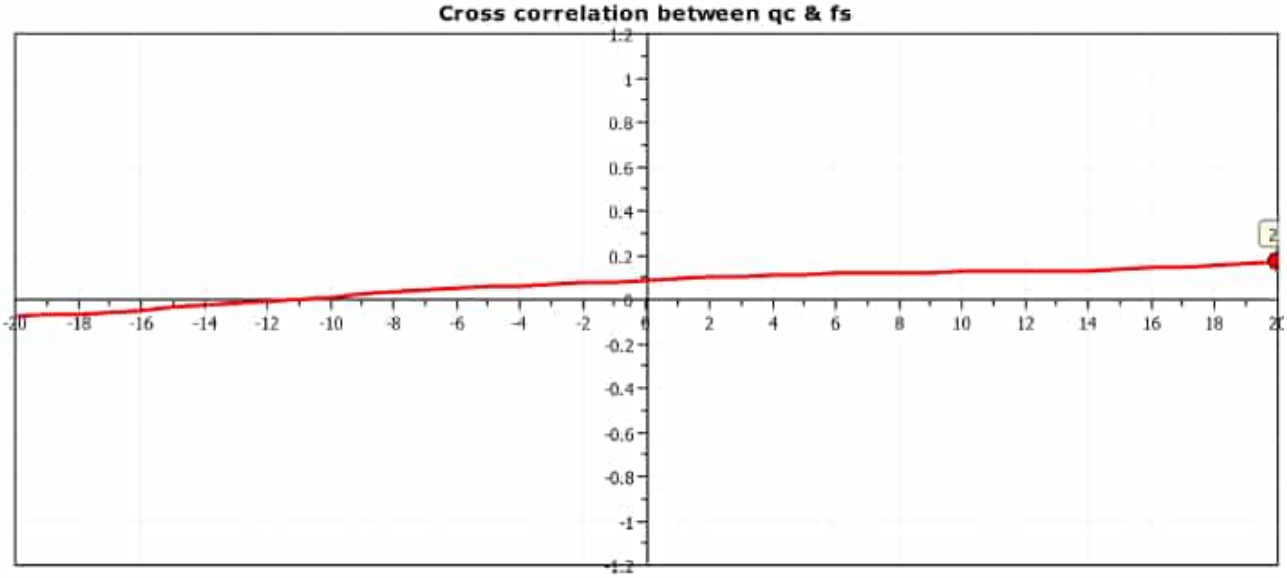


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.21 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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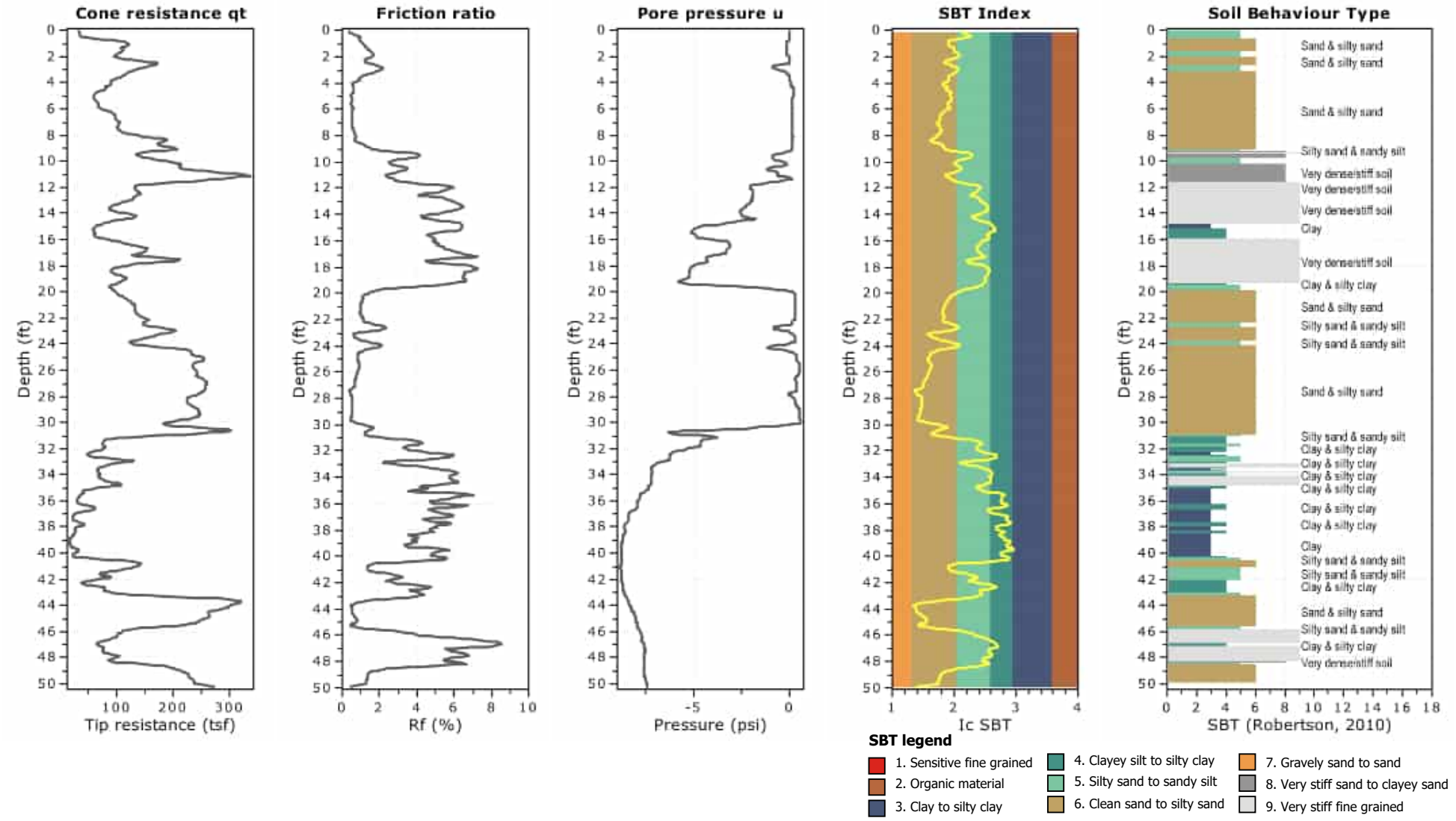
http://www.geologismiki.gr

1-CPT-7

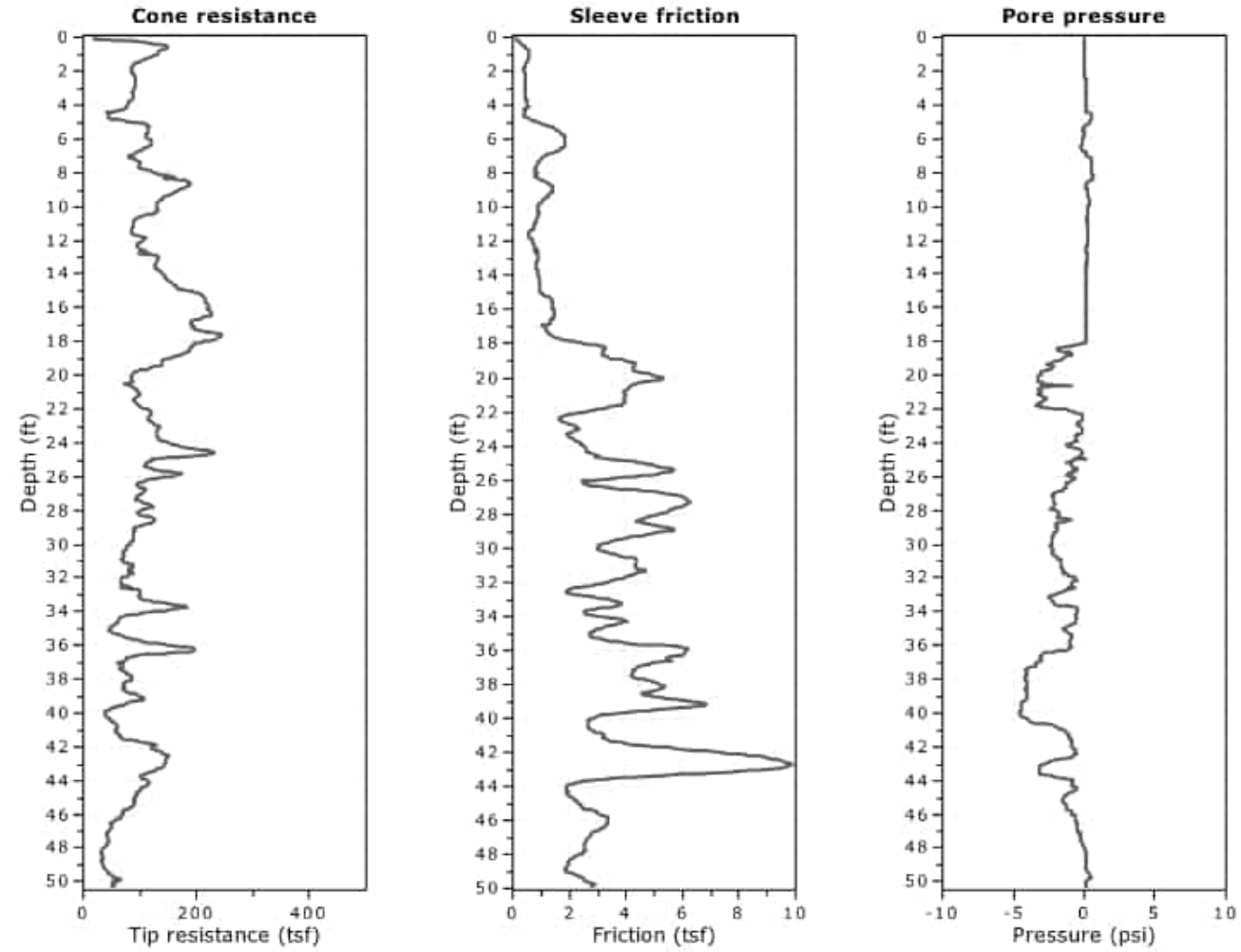
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.21 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

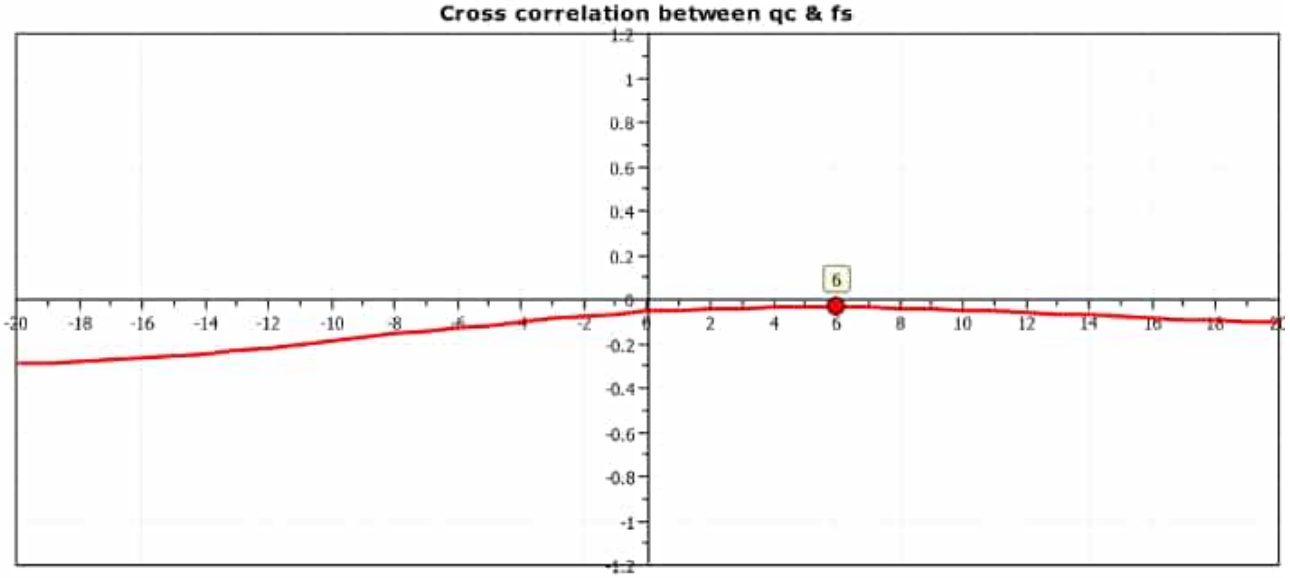


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.28 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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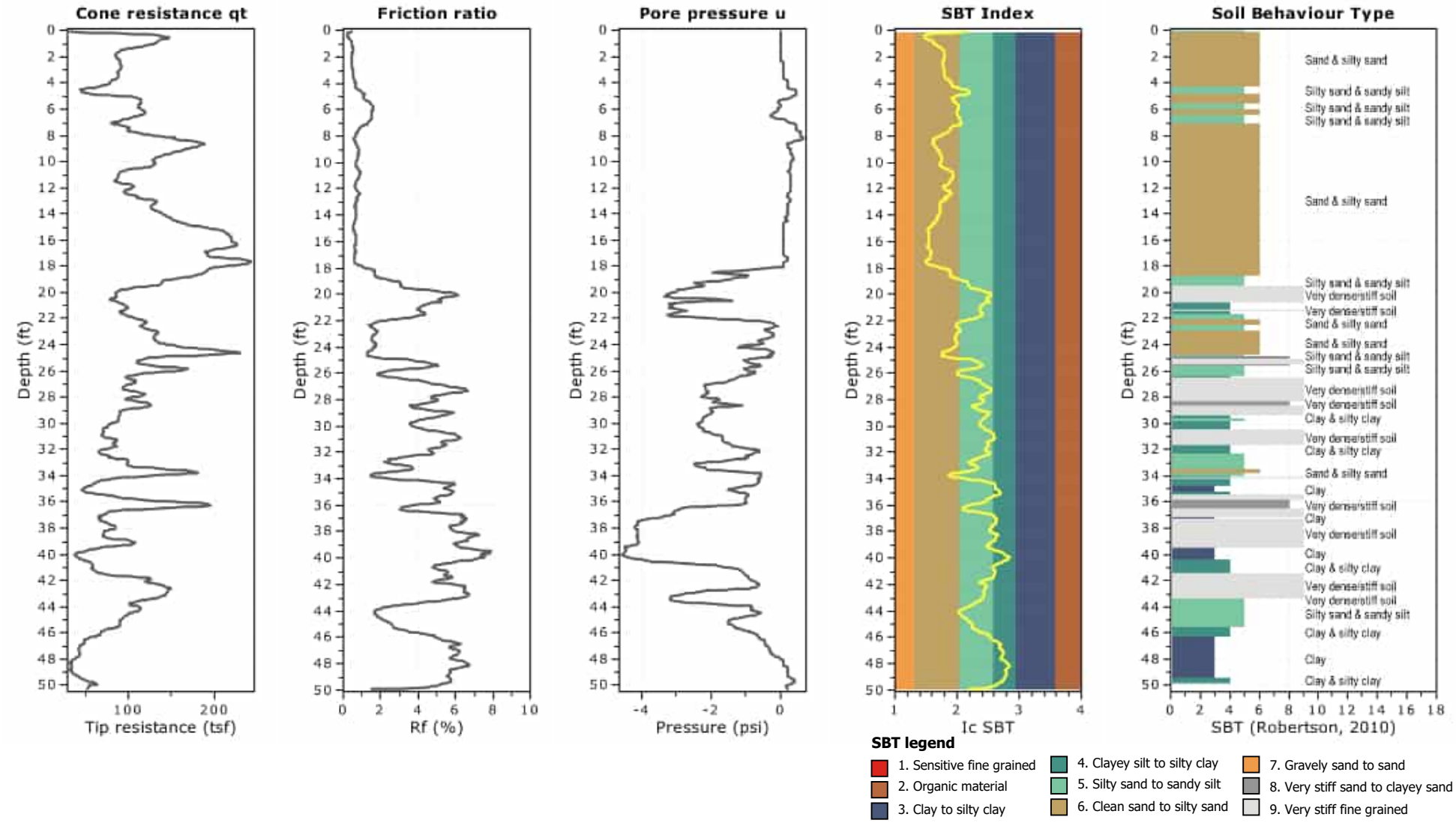
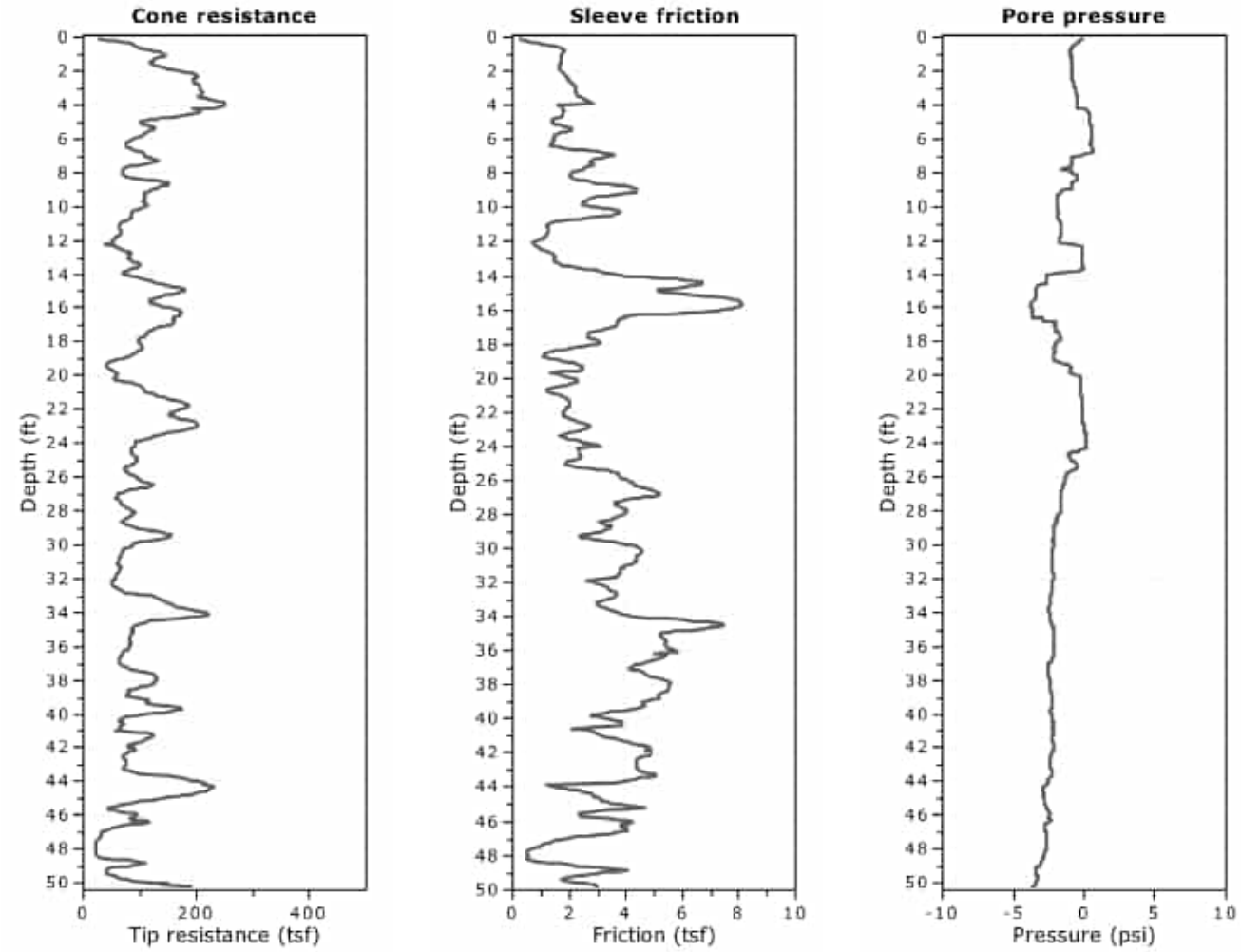
1-CPT-8

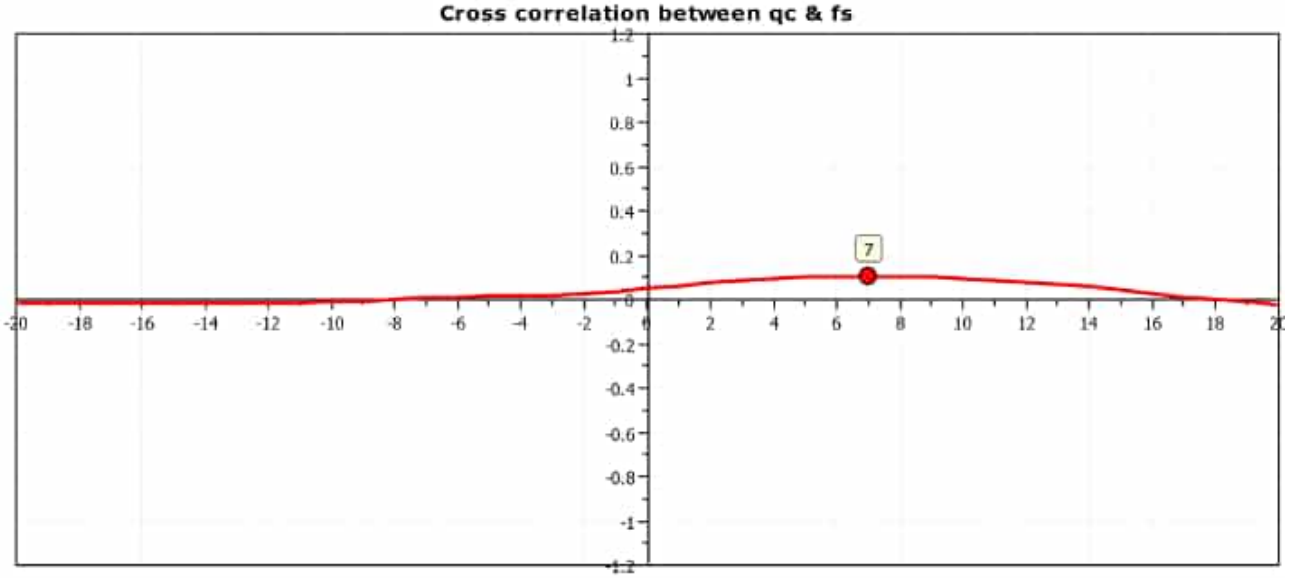
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.28 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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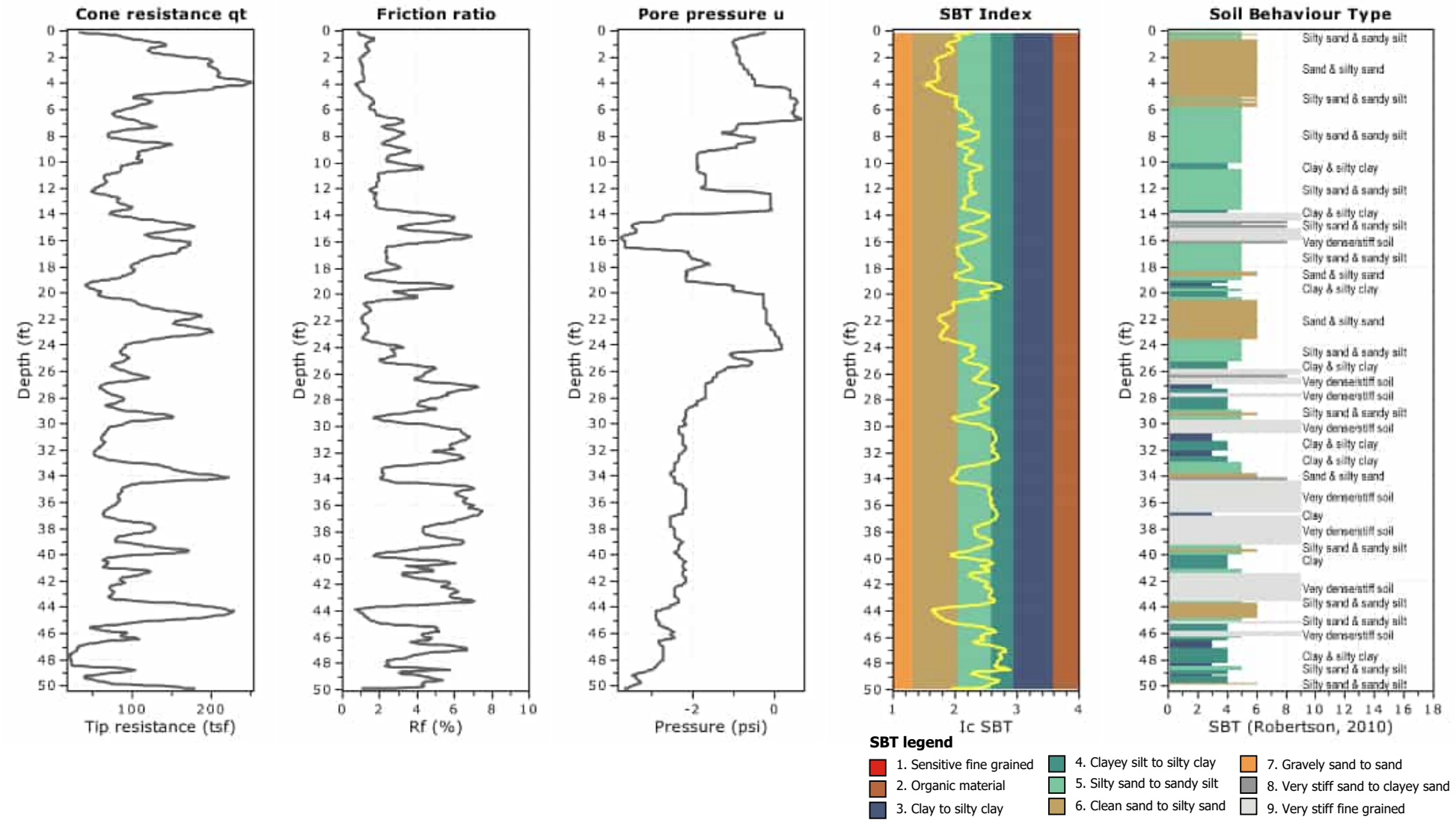
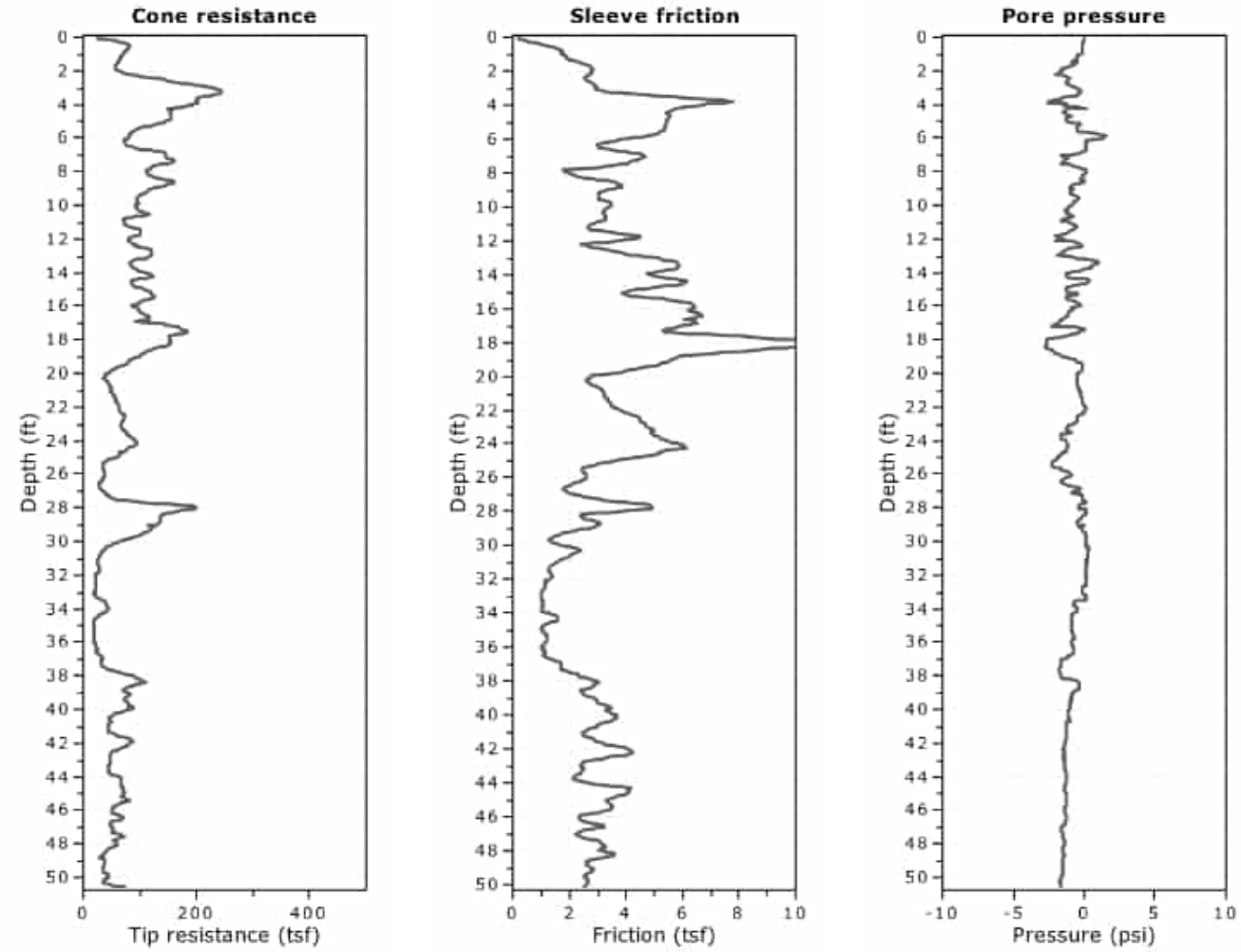
1-CPT-9

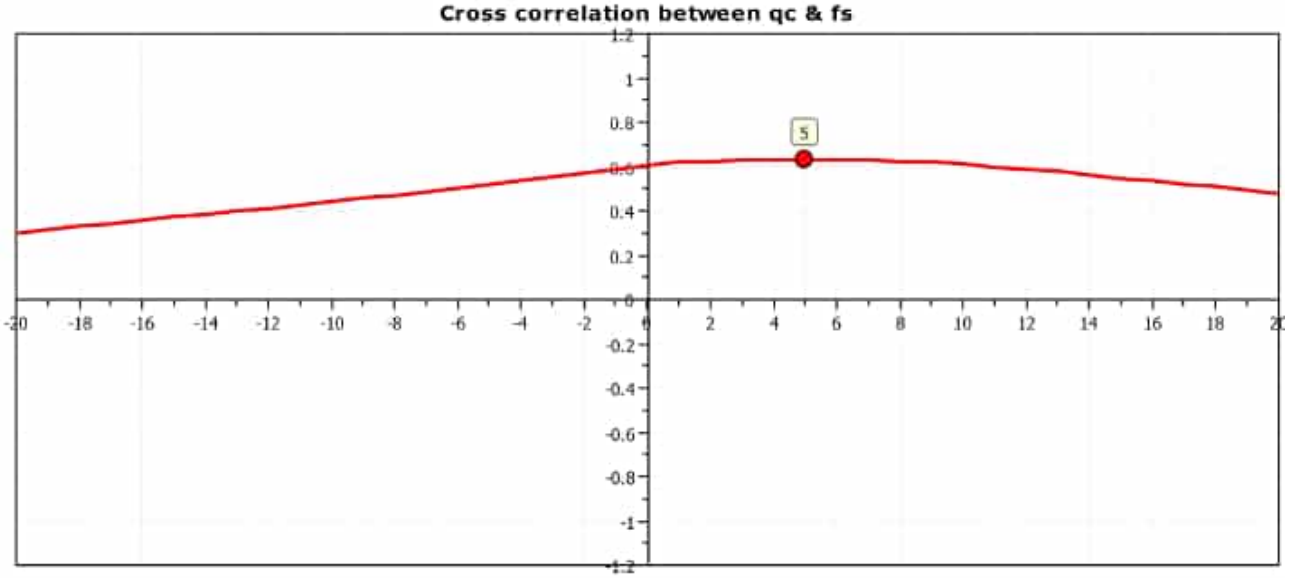
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.20 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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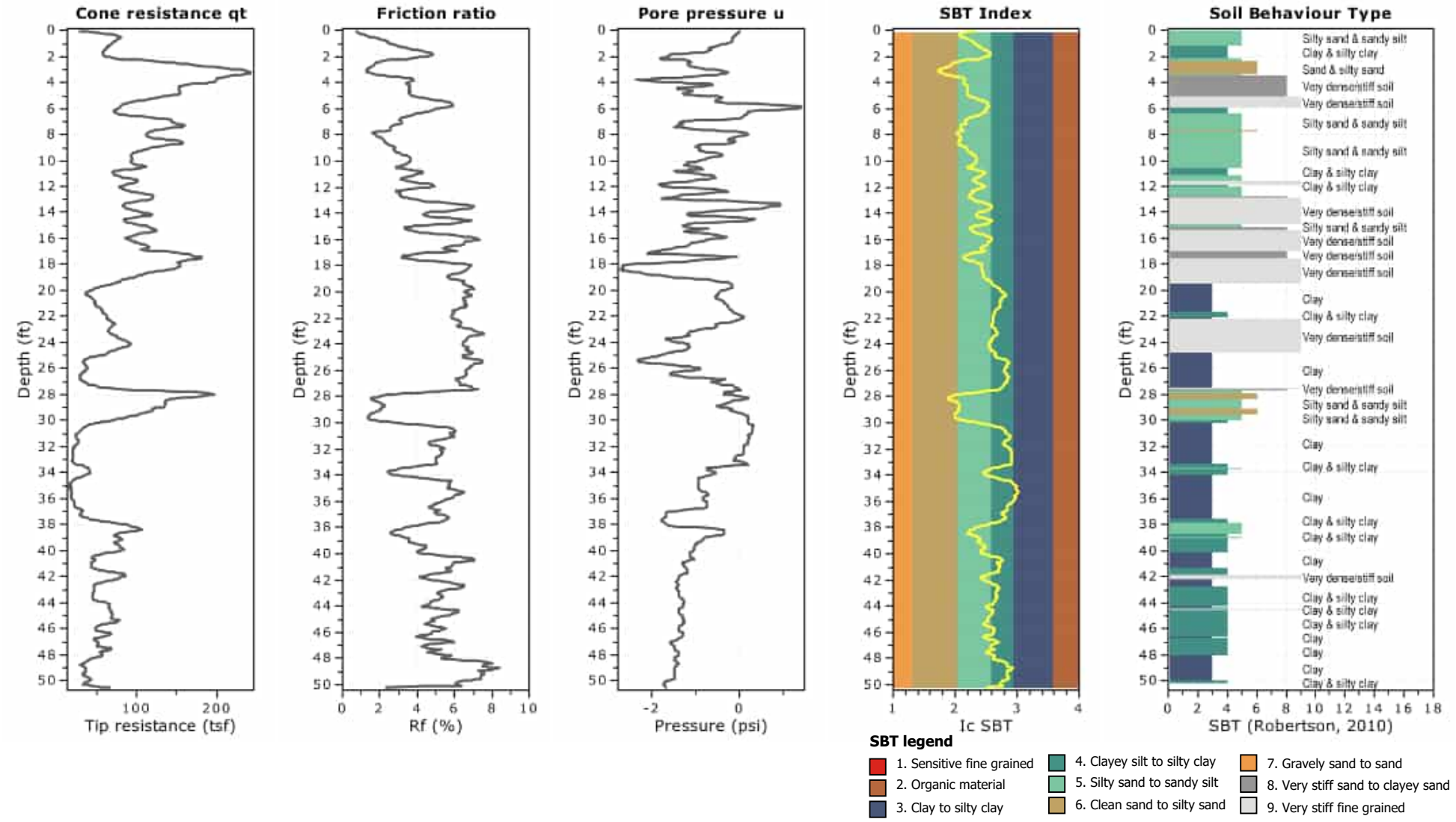
1-CPT-10

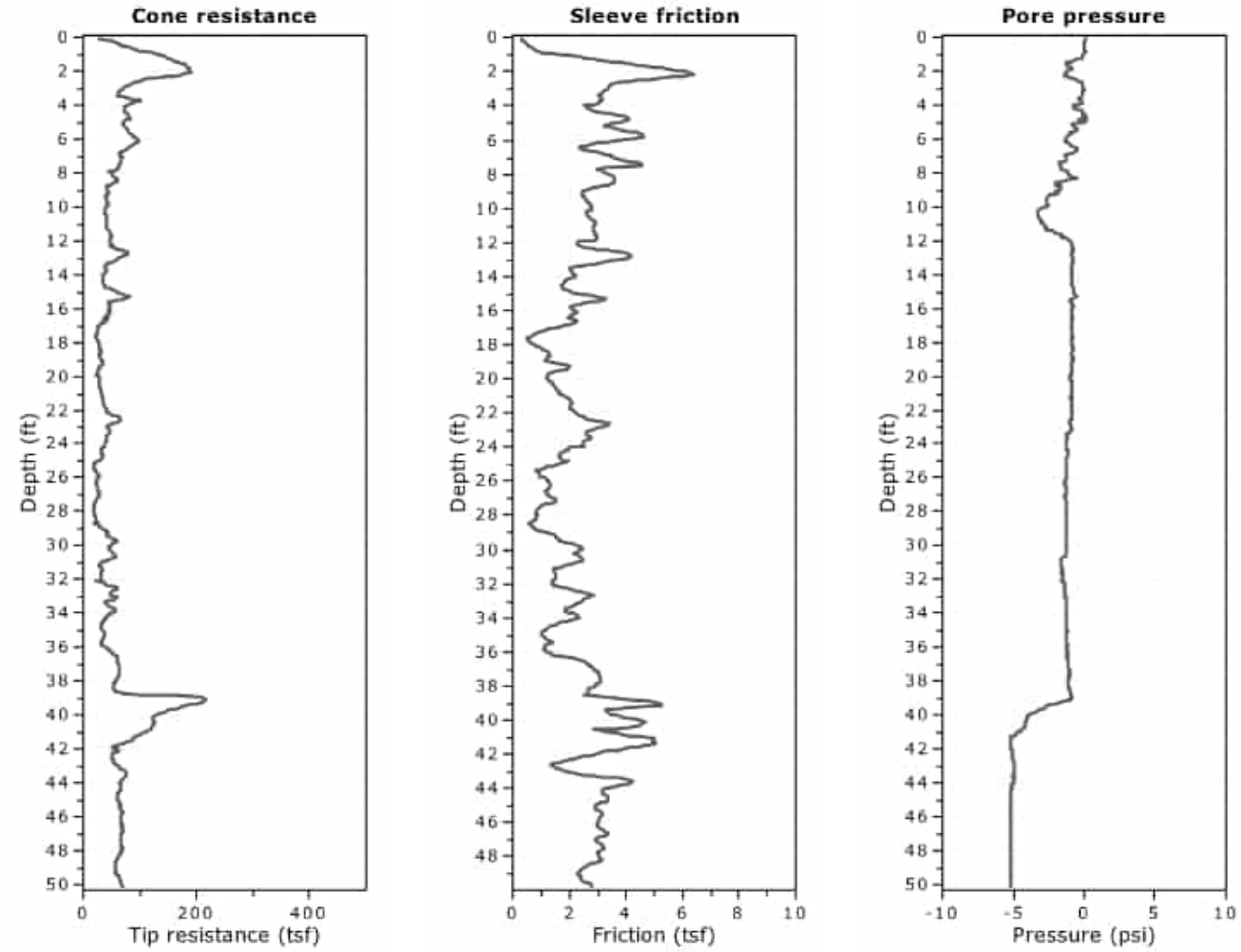
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.53 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

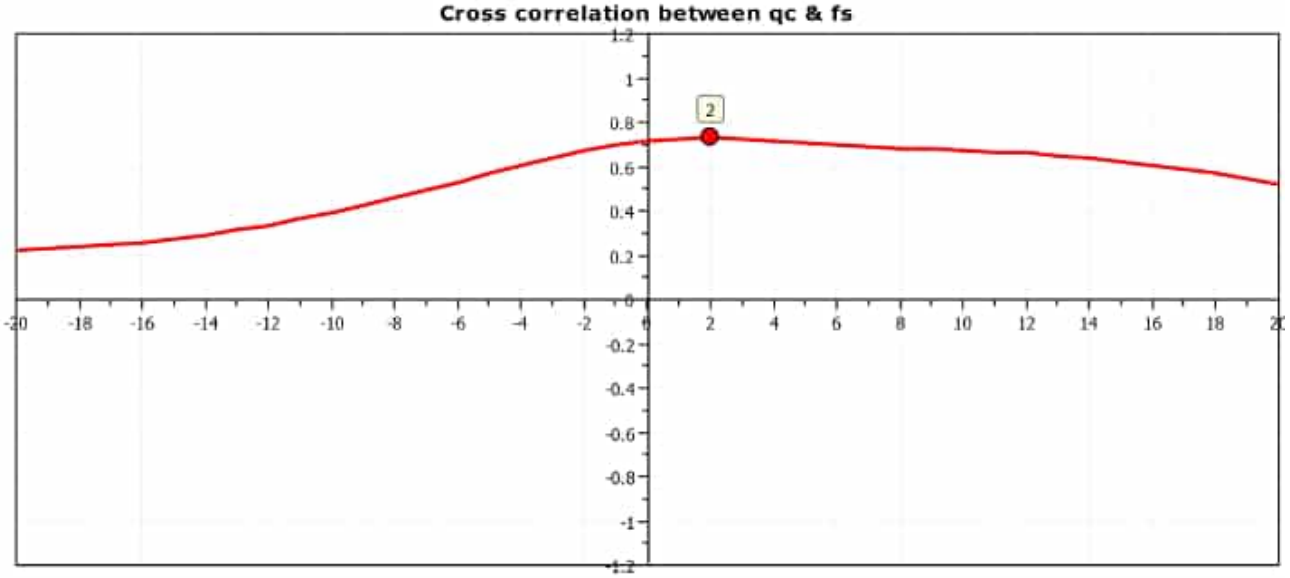


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.14 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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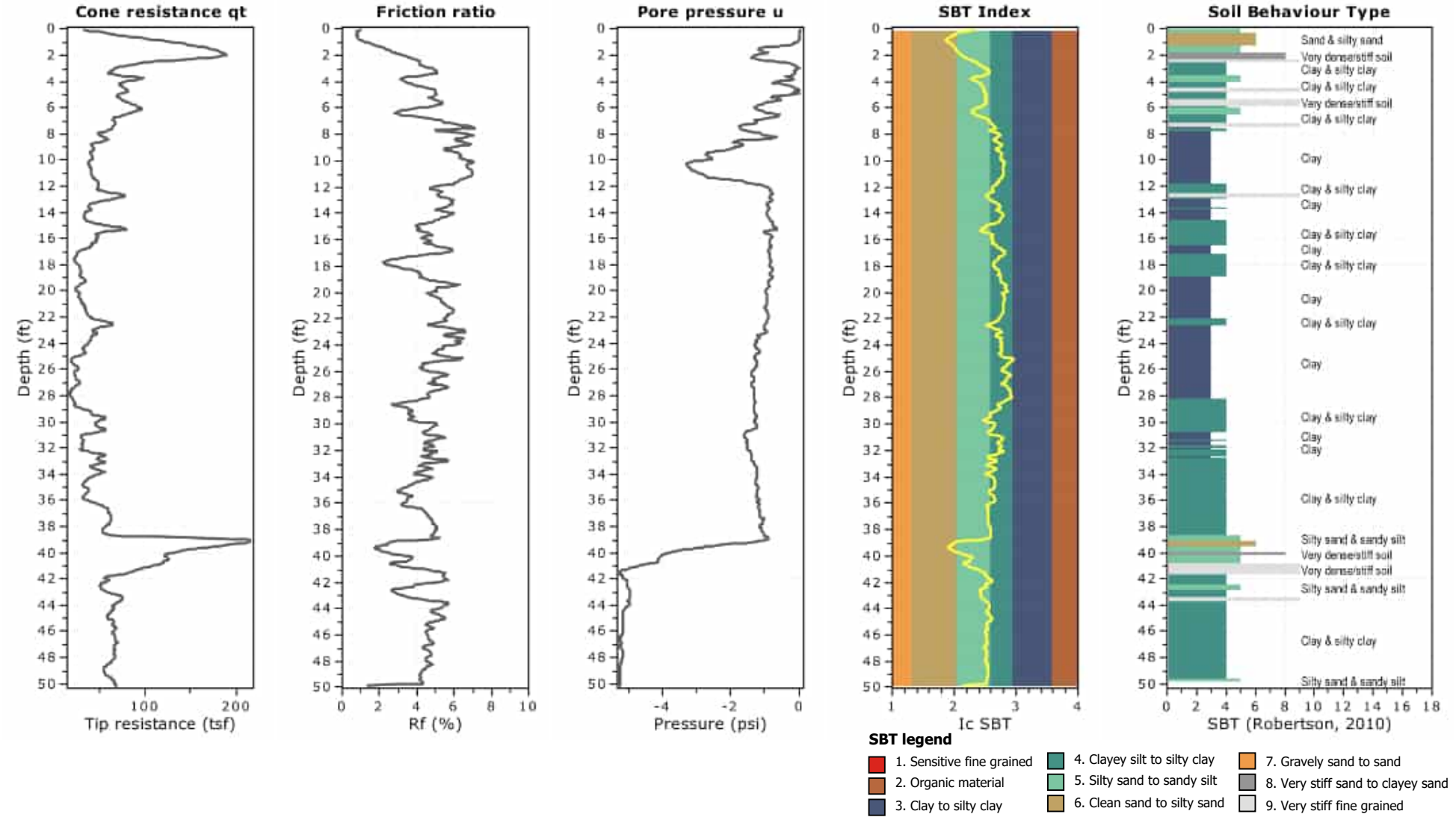
1-CPT-11

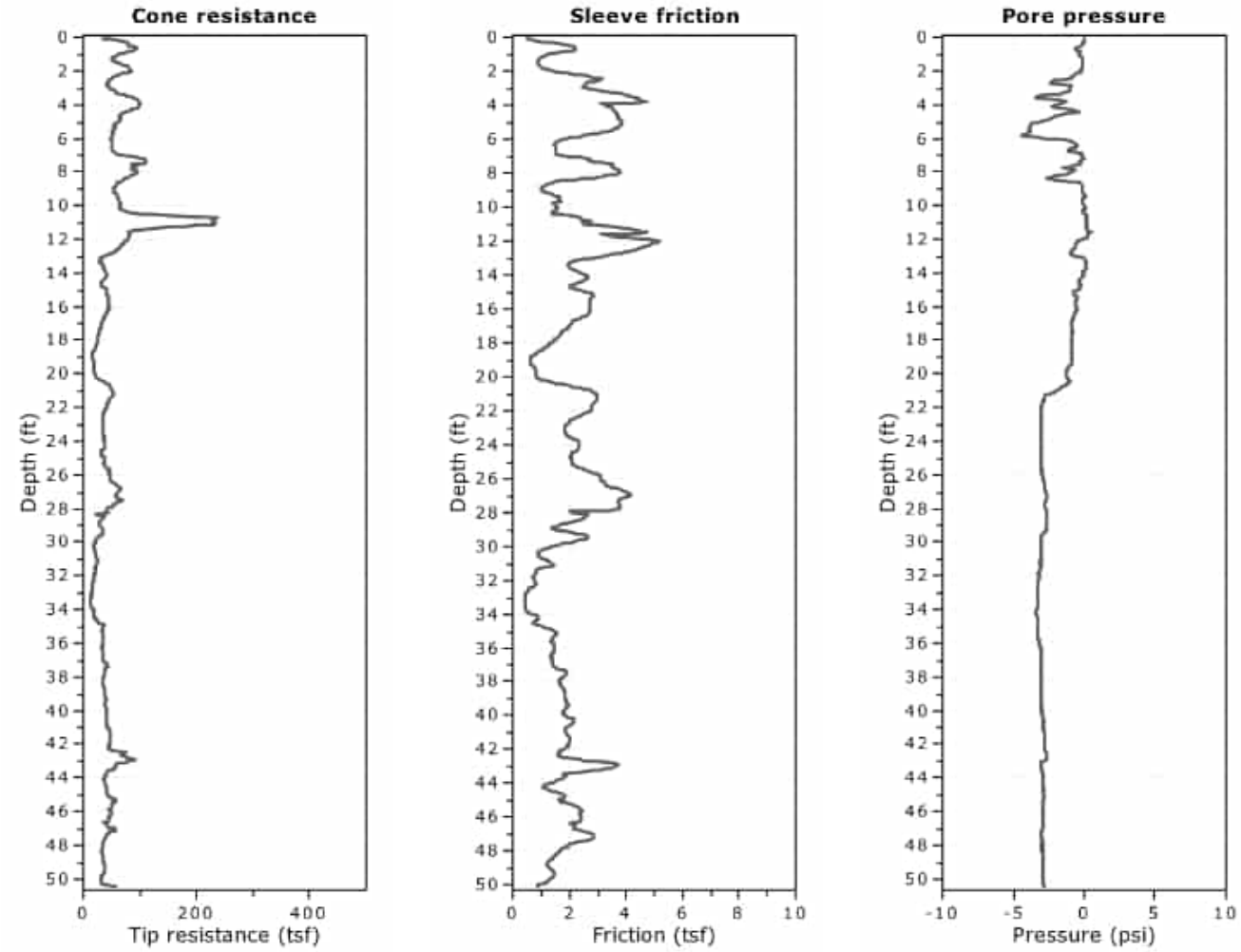
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.14 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

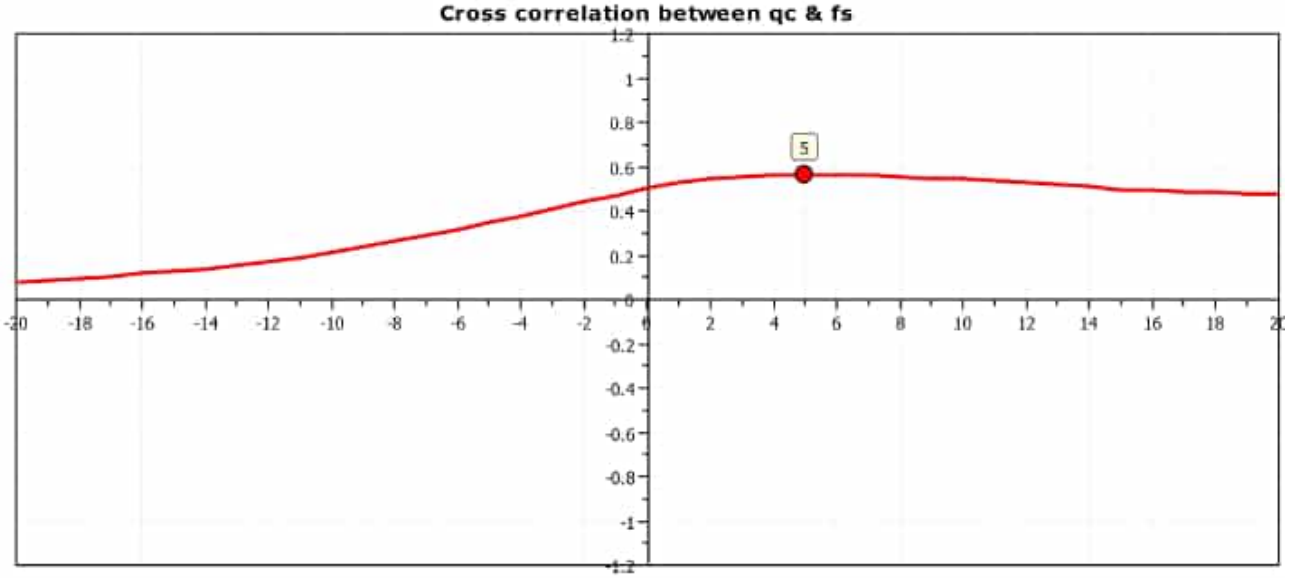


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.46 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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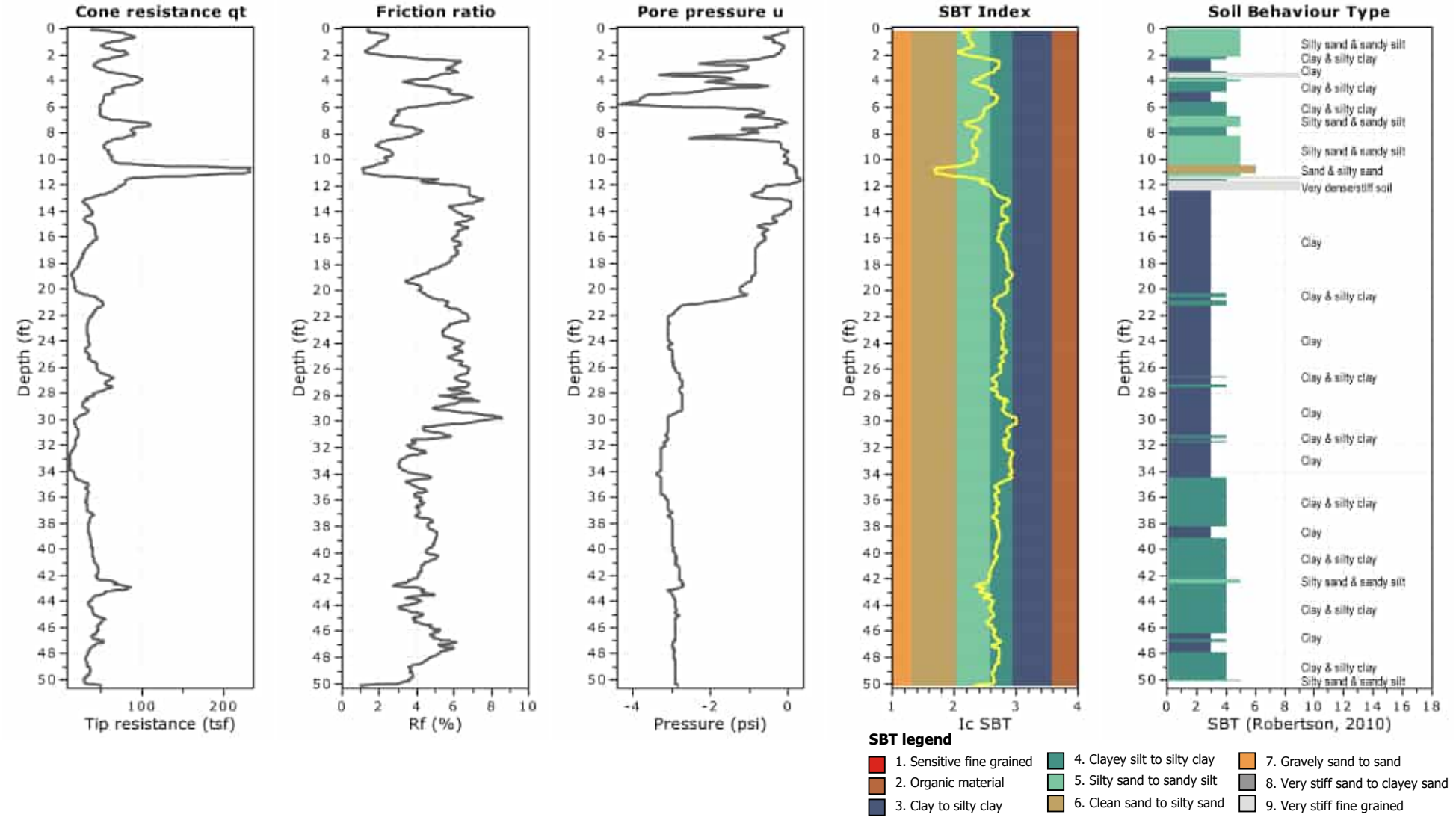
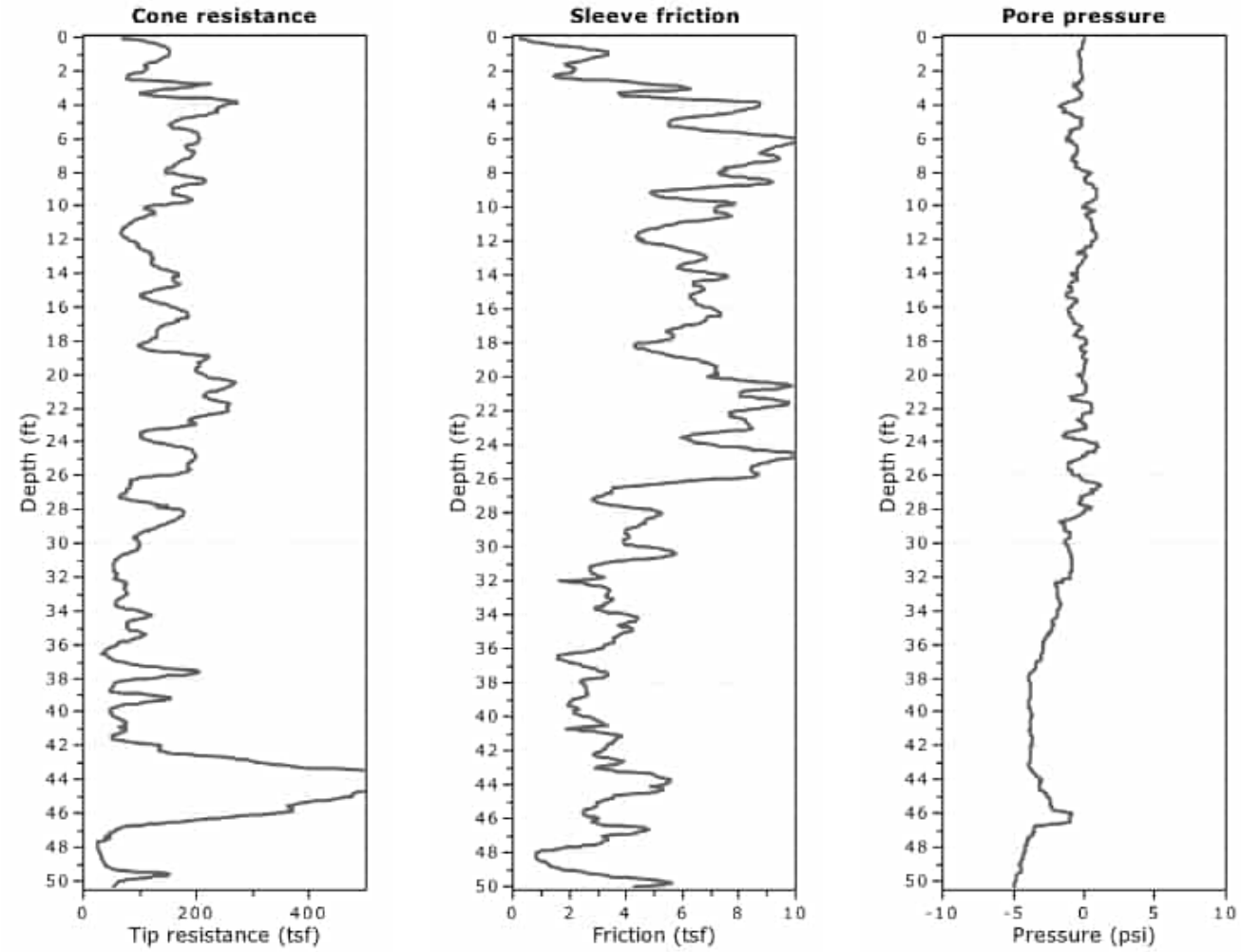
1-CPT-12

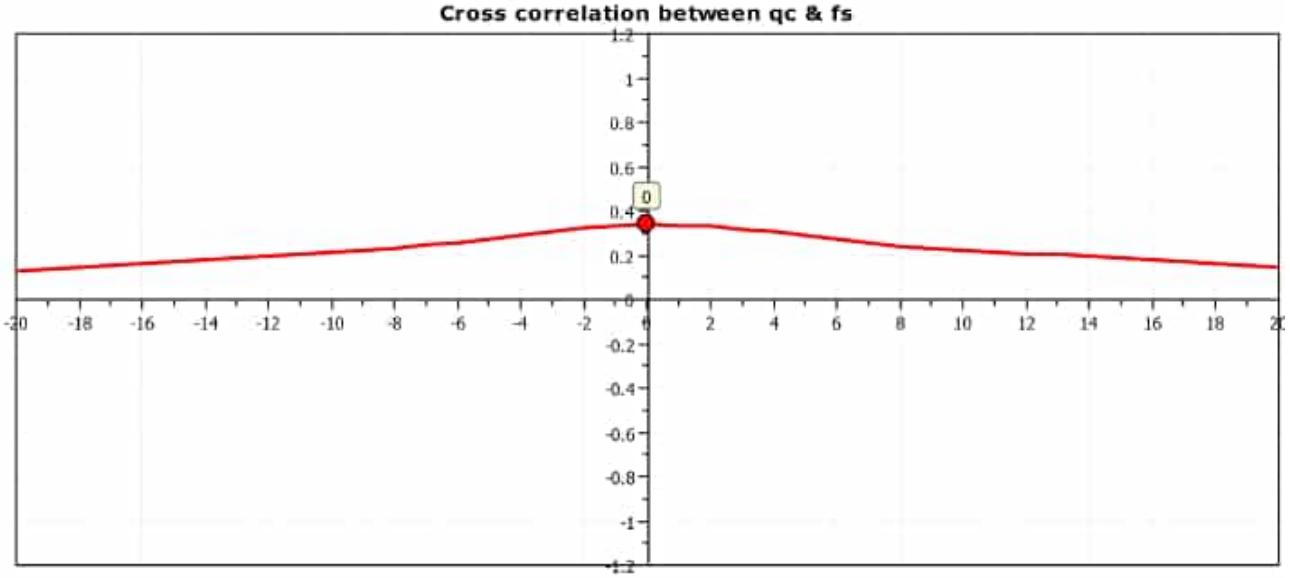
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.46 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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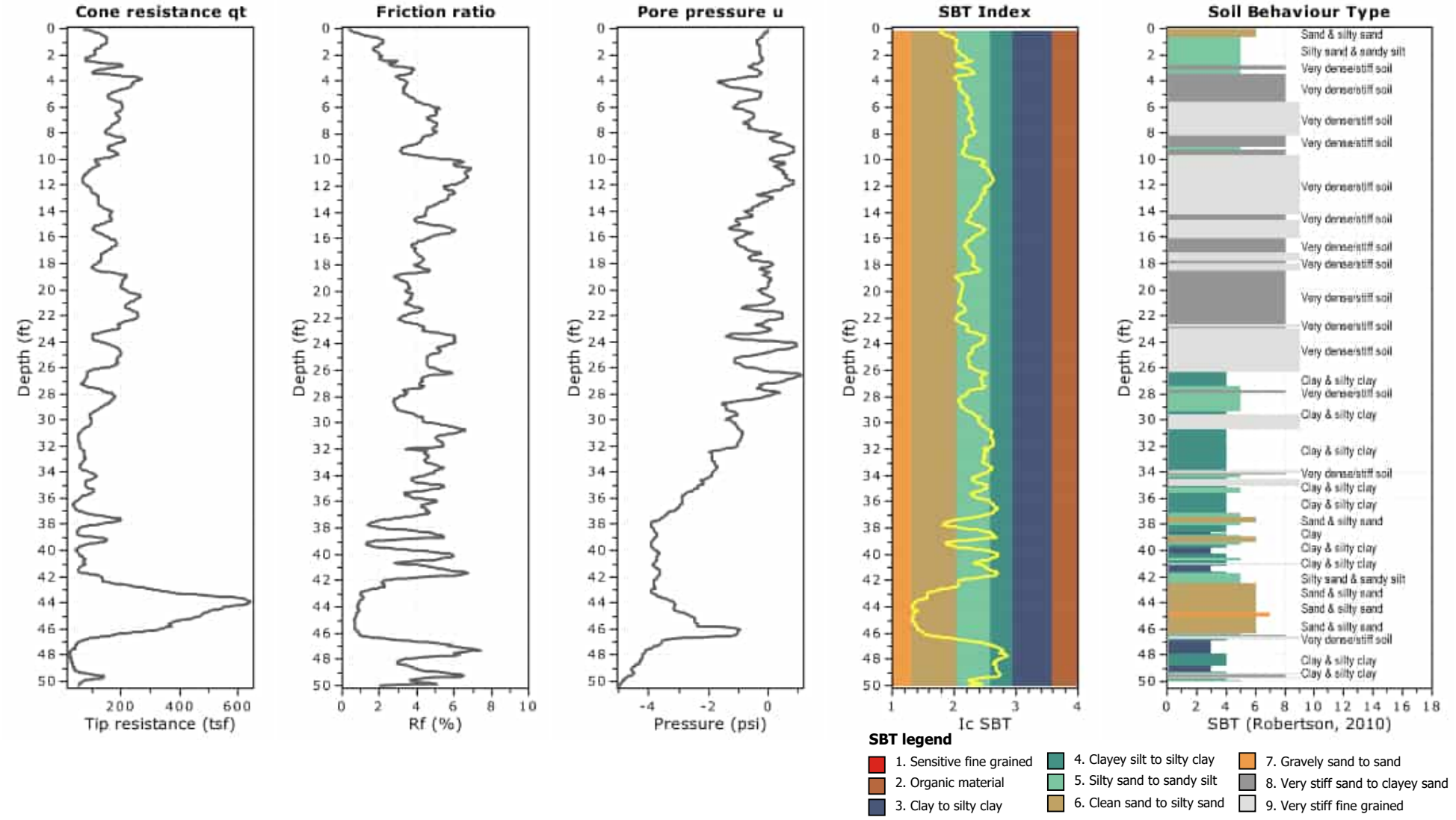
1-CPT-13

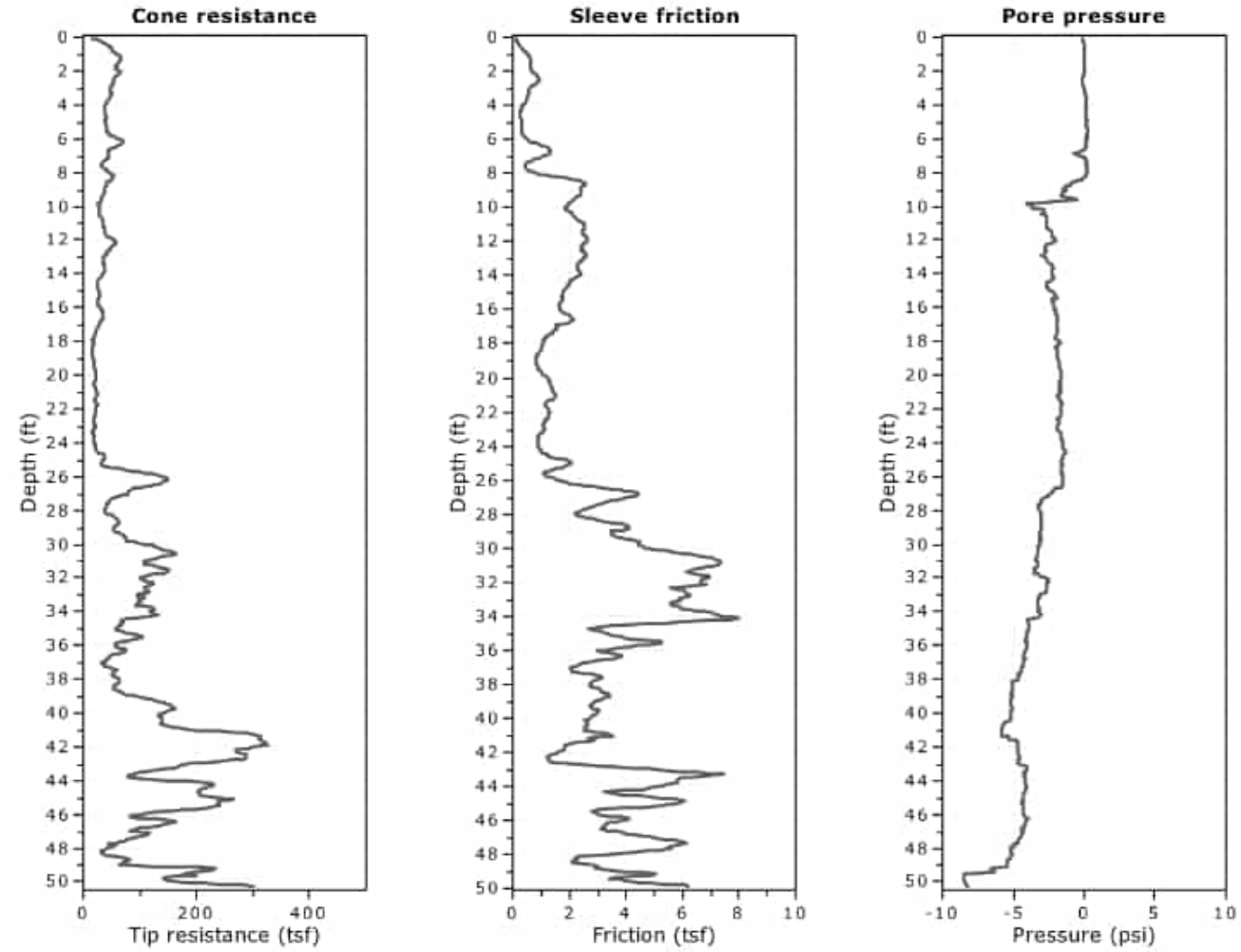
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.35 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

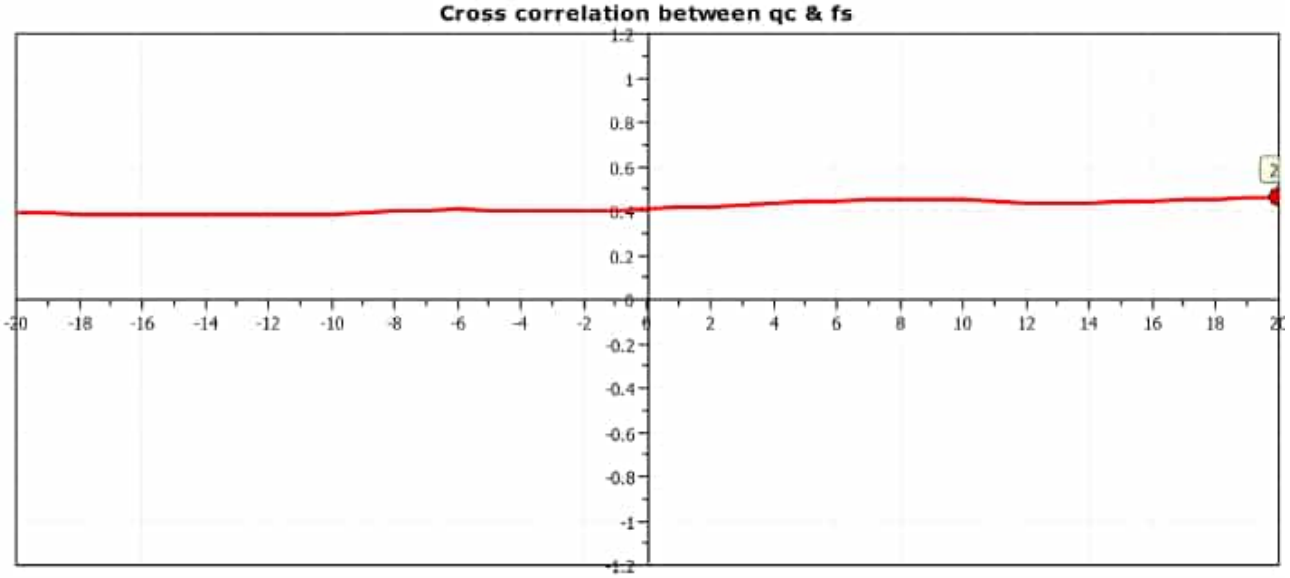


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.27 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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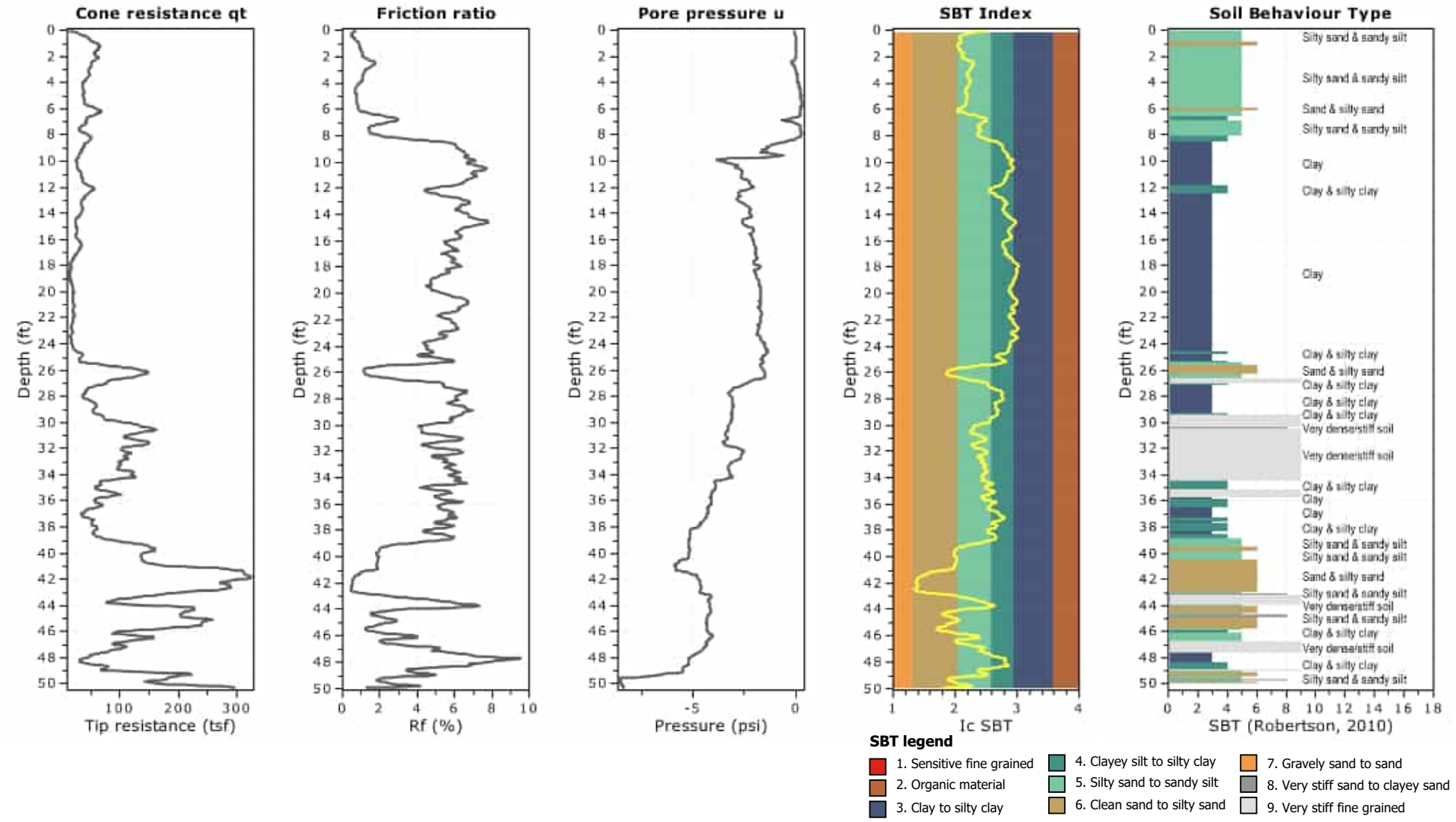
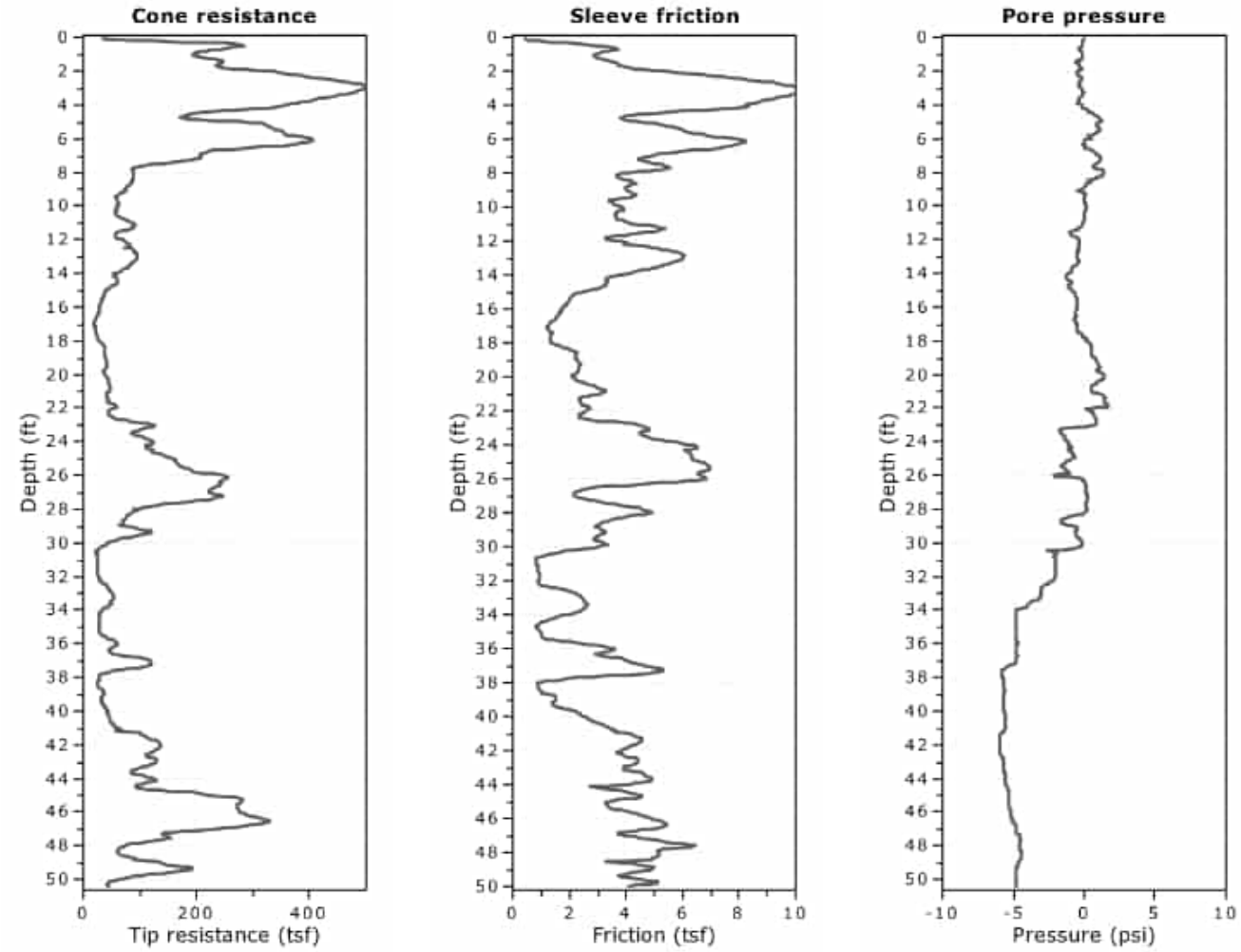
1-CPT-14

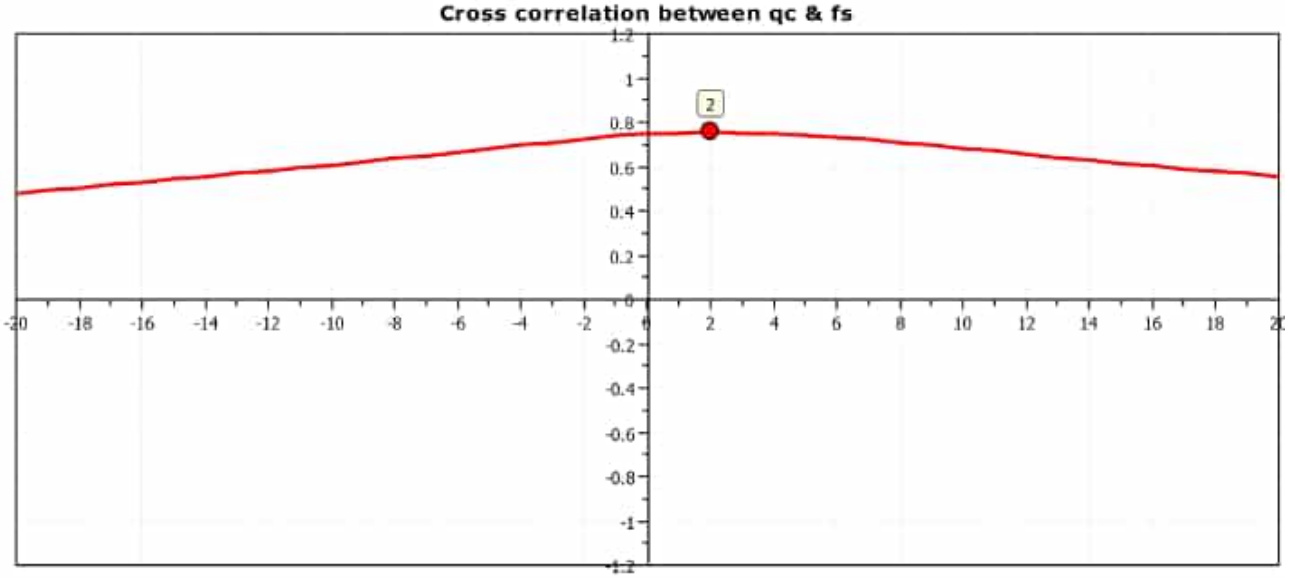
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.27 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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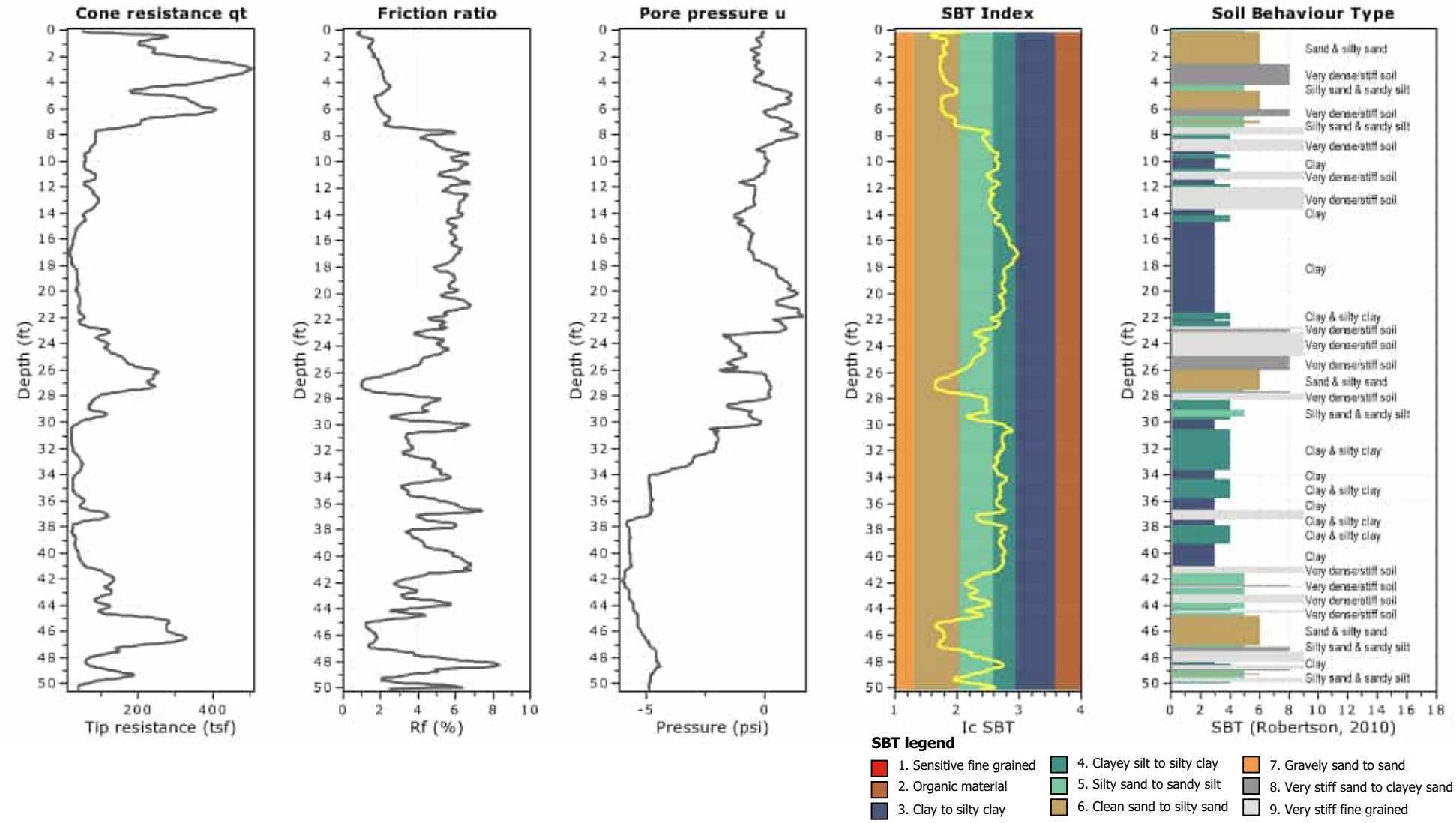
1-CPT-15

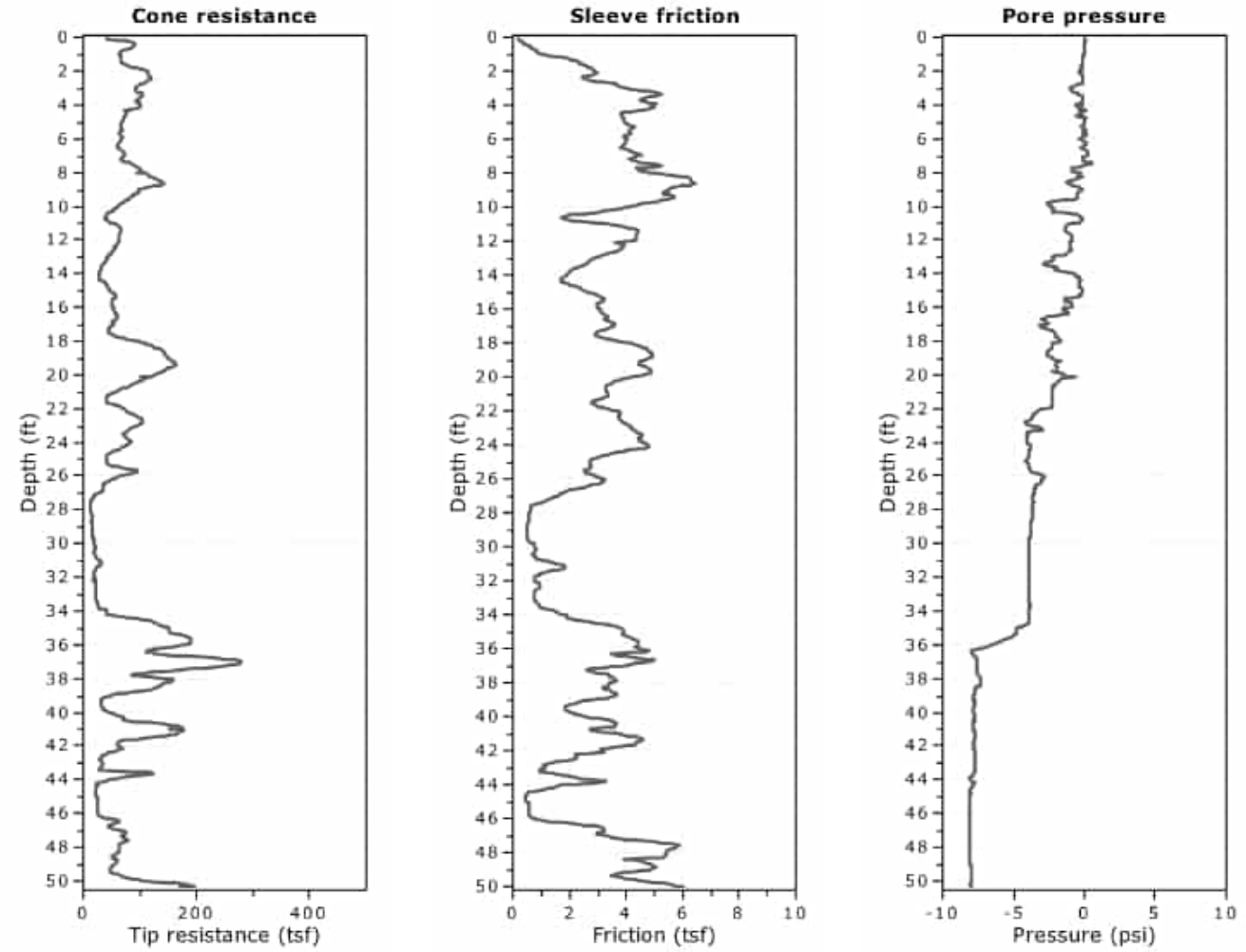
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.41 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

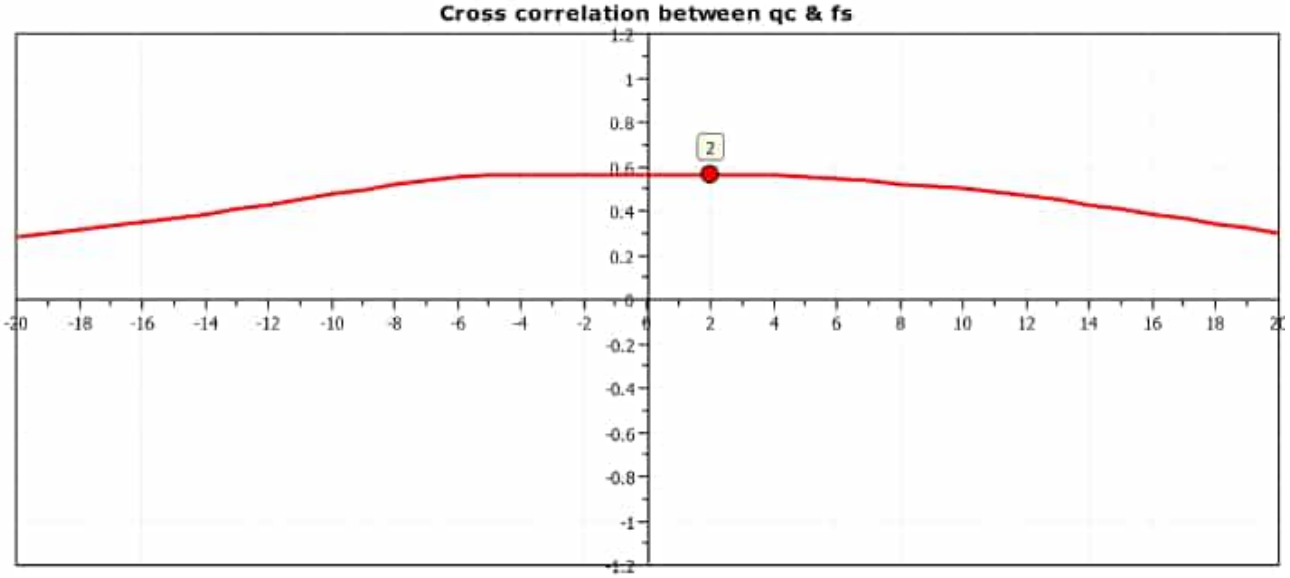


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.33 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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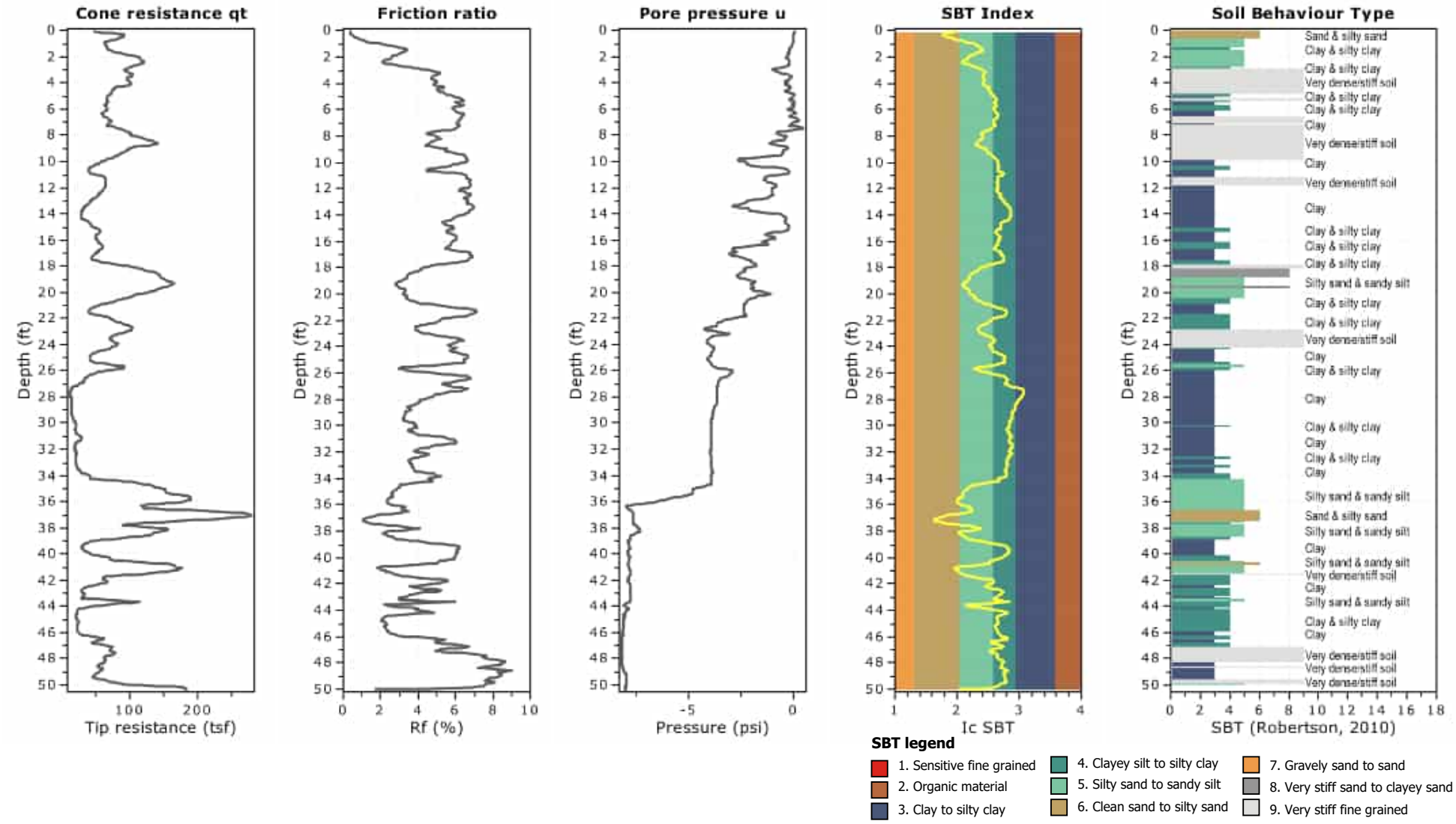
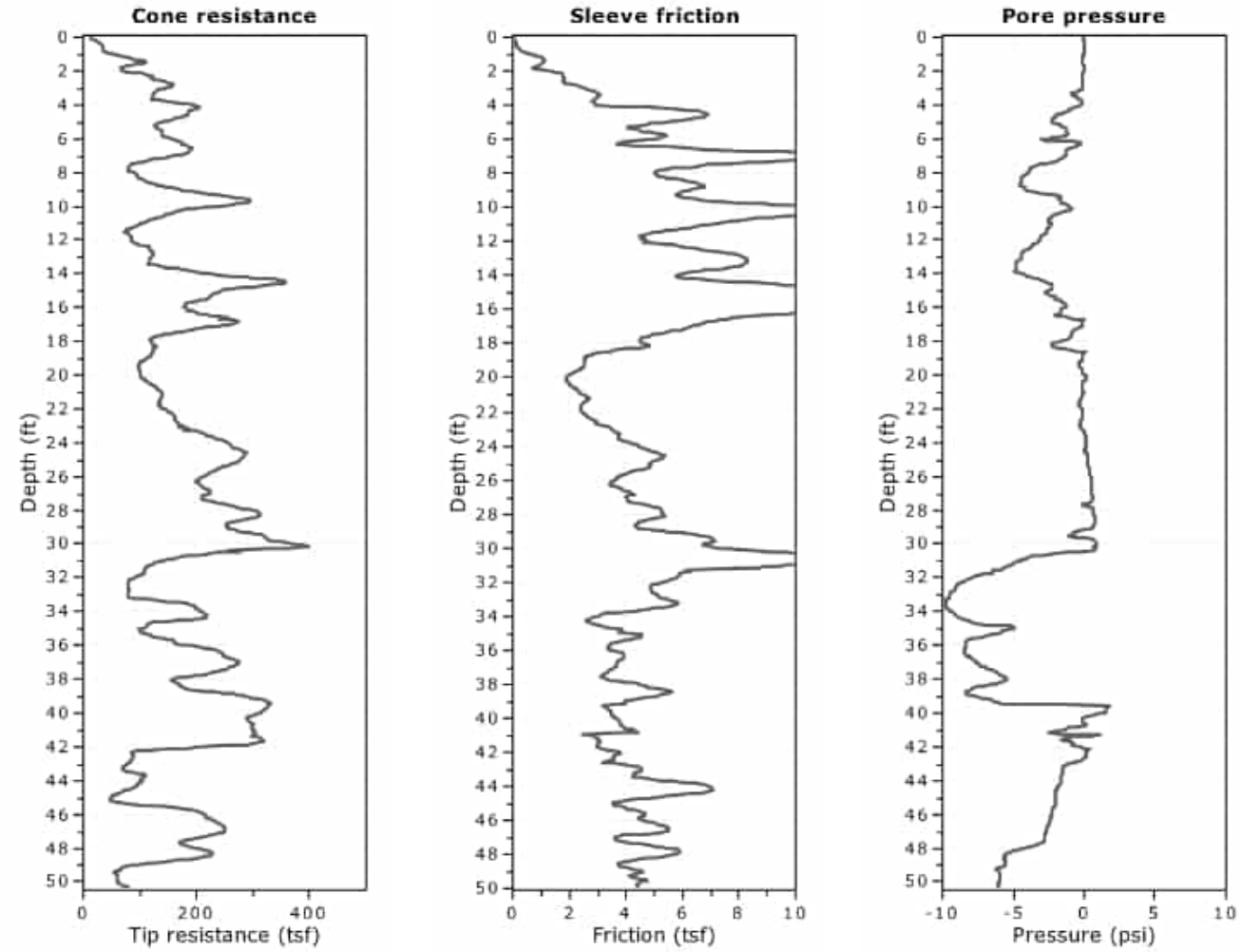
1-CPT-16

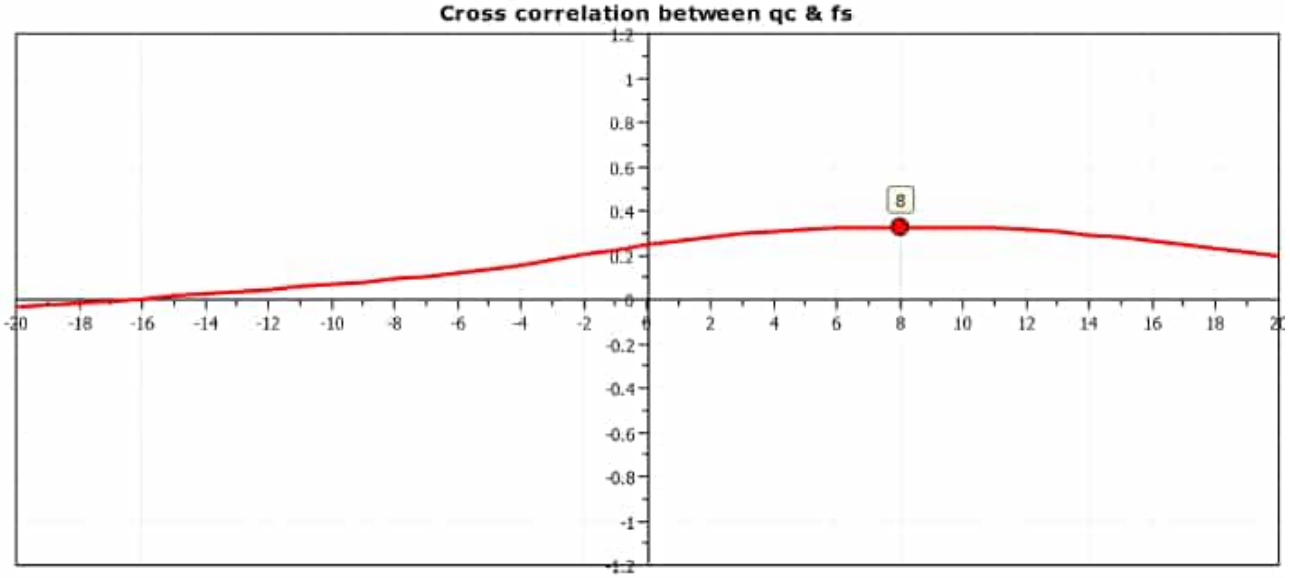
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.33 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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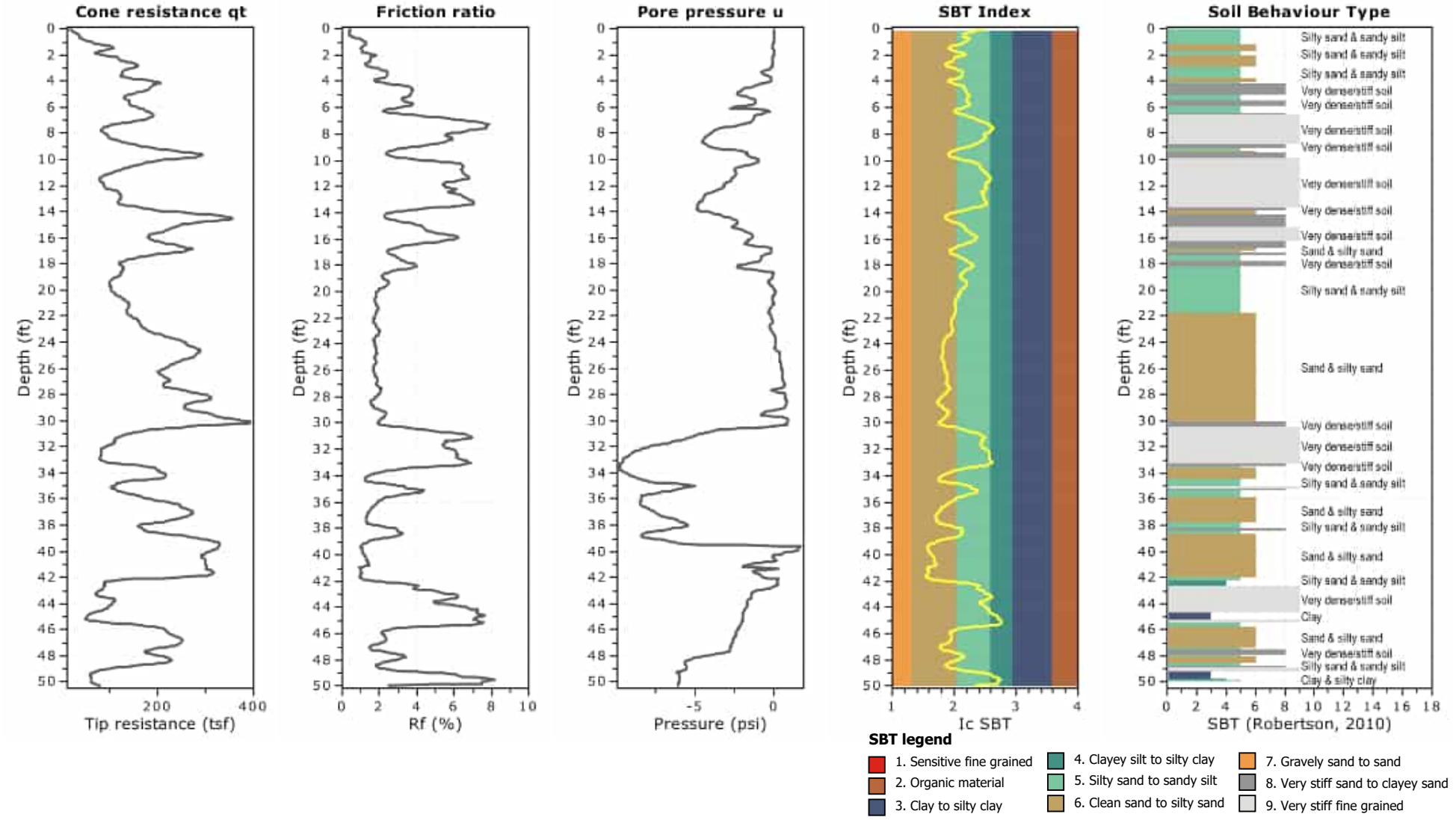
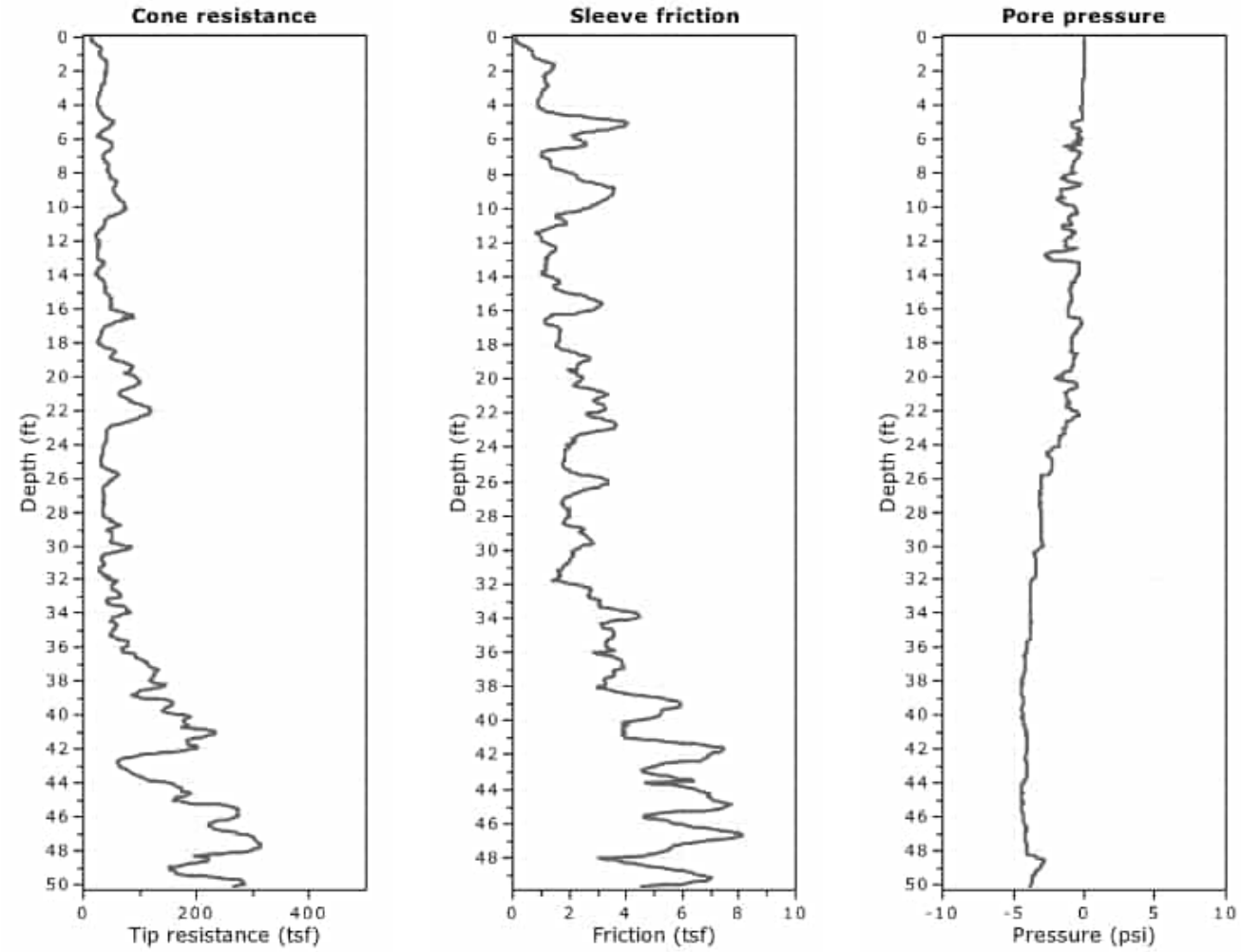
1-CPT-17

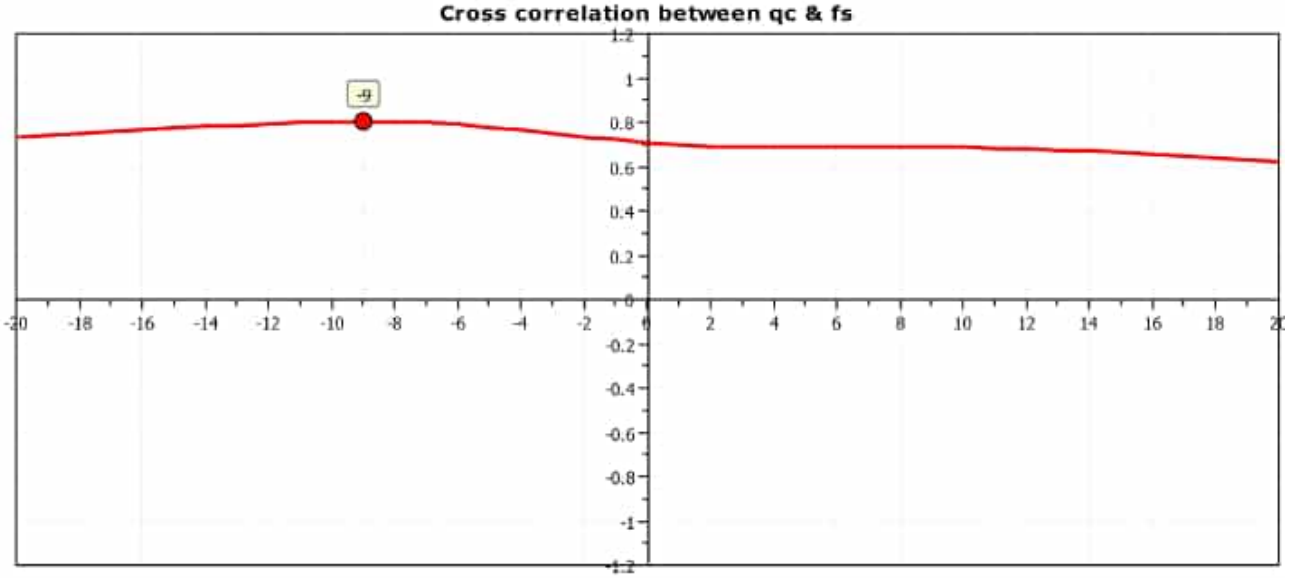
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.27 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering





The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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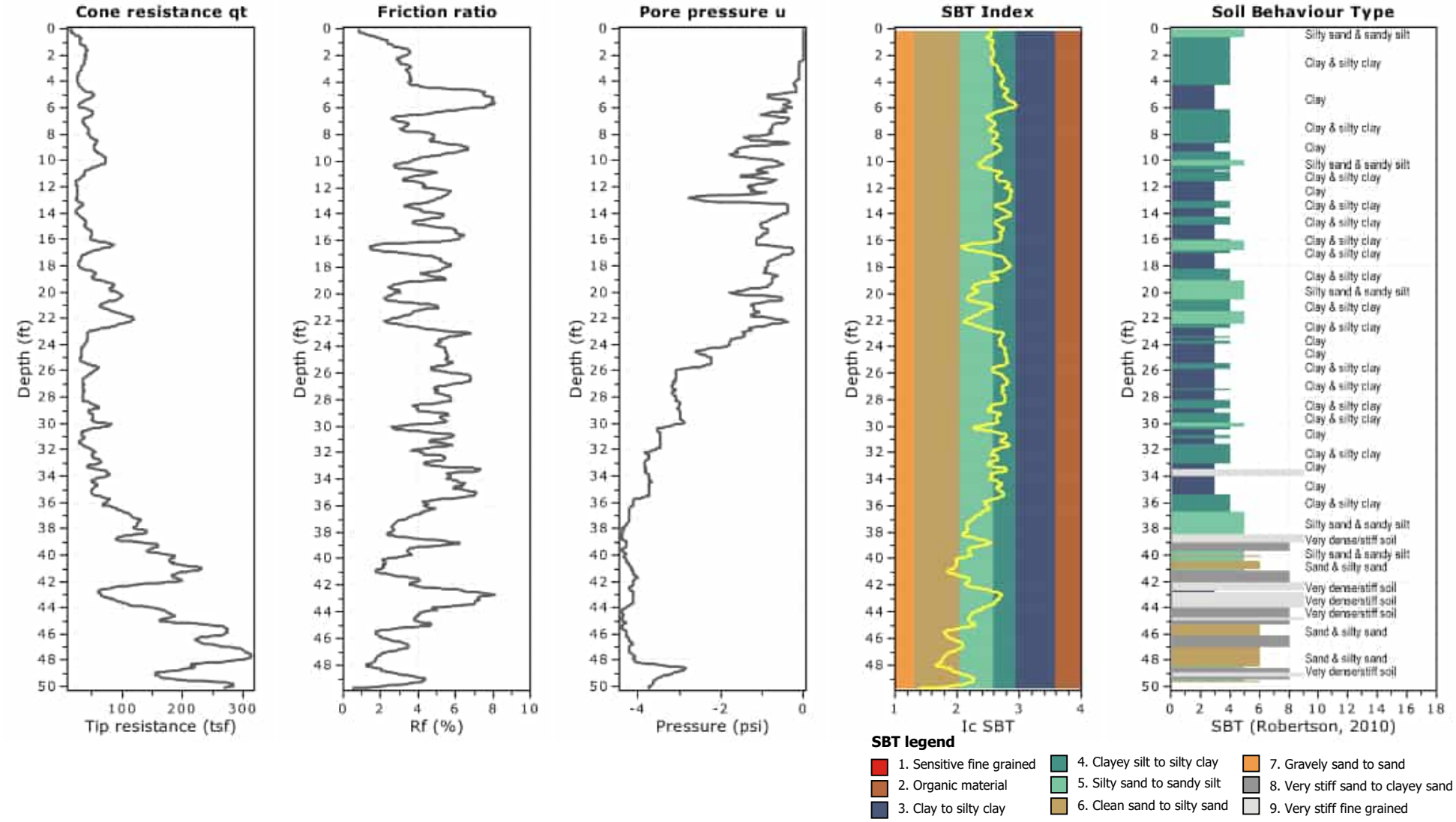
1-CPT-18

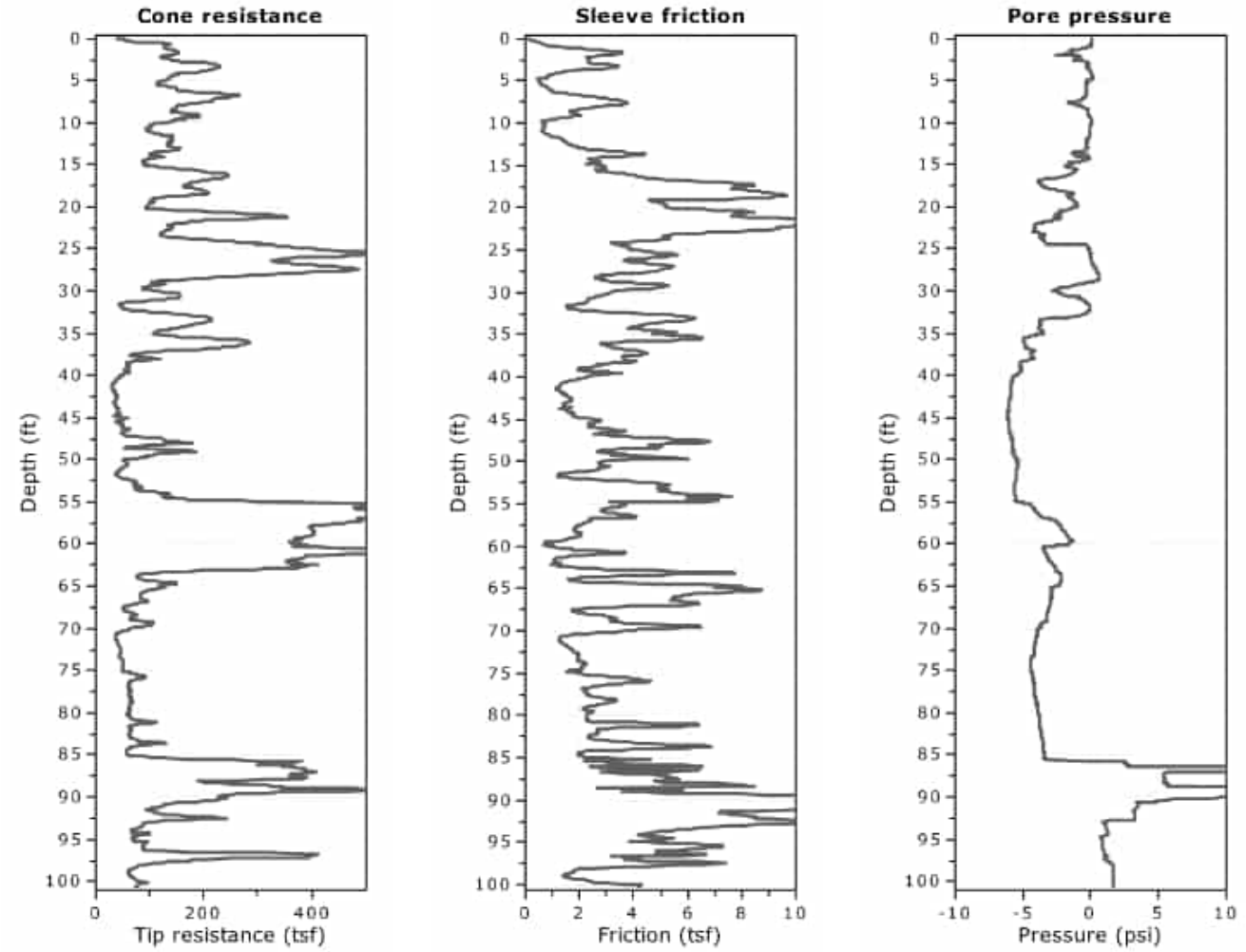
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 50.09 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

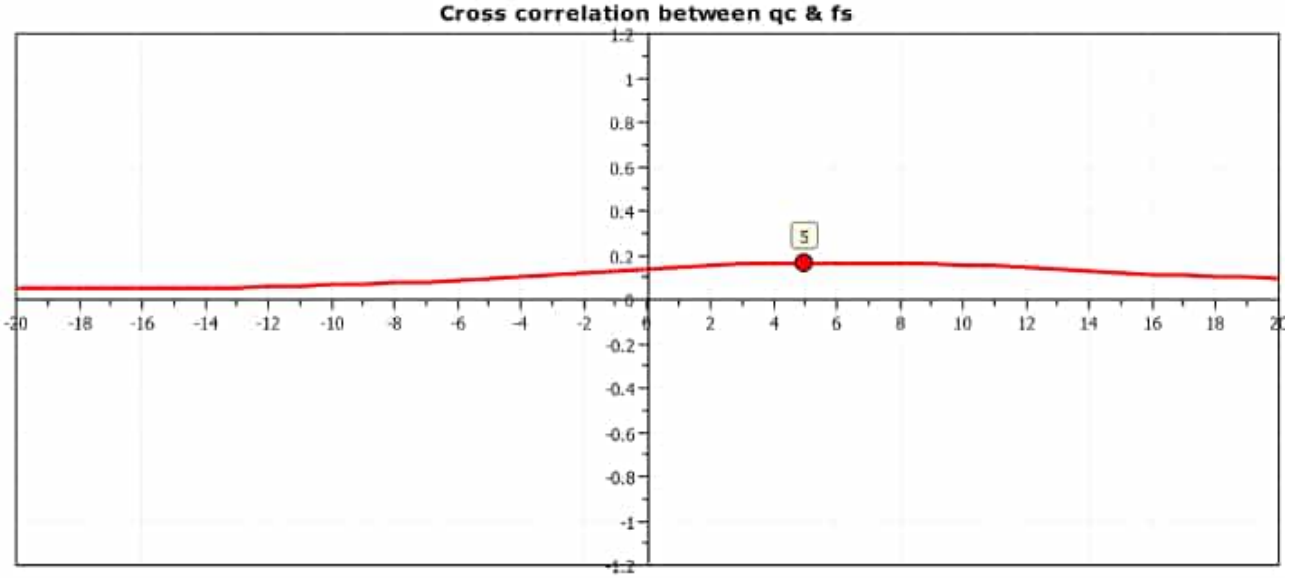


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 100.62 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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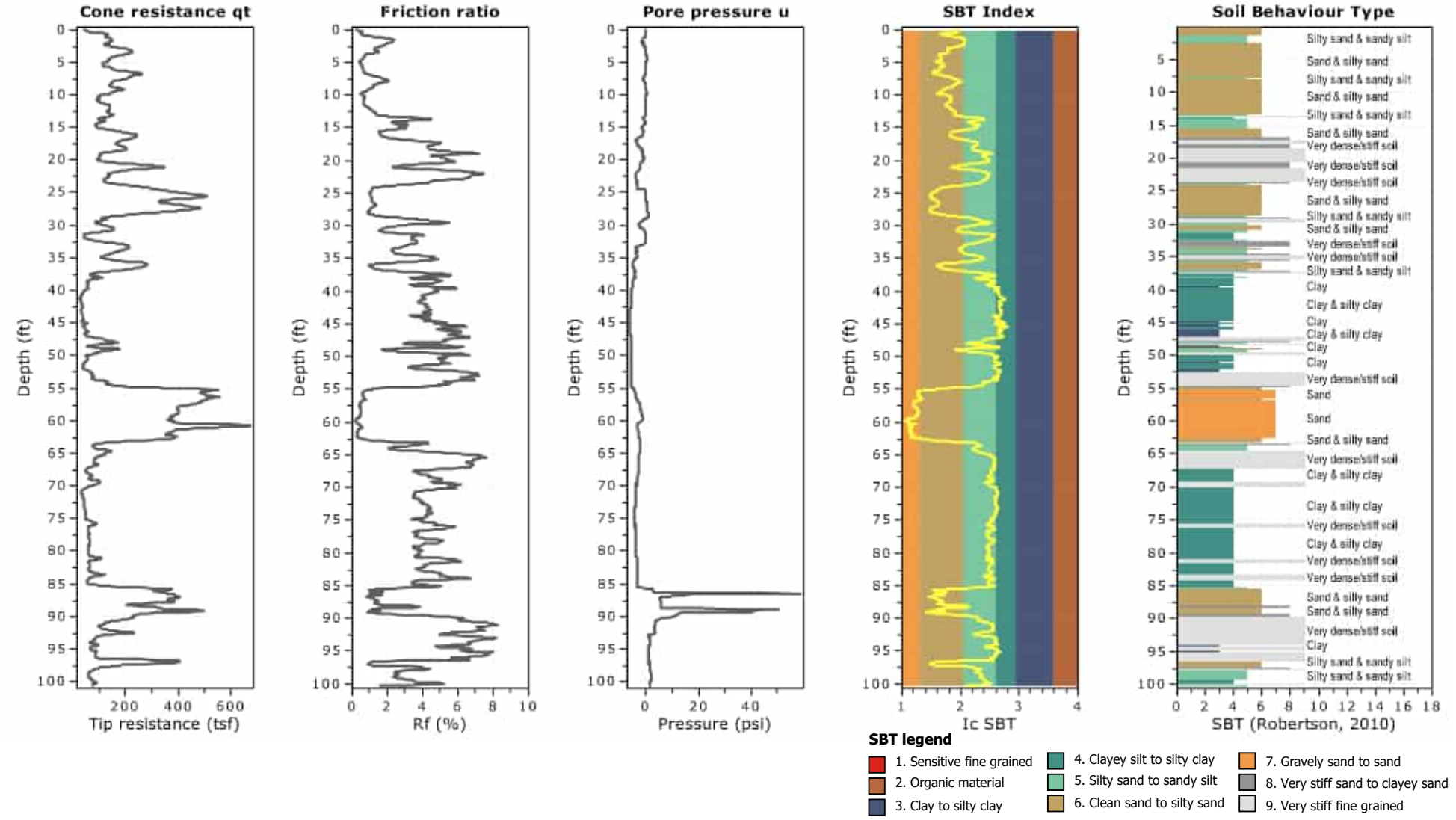
1-SCPT-1

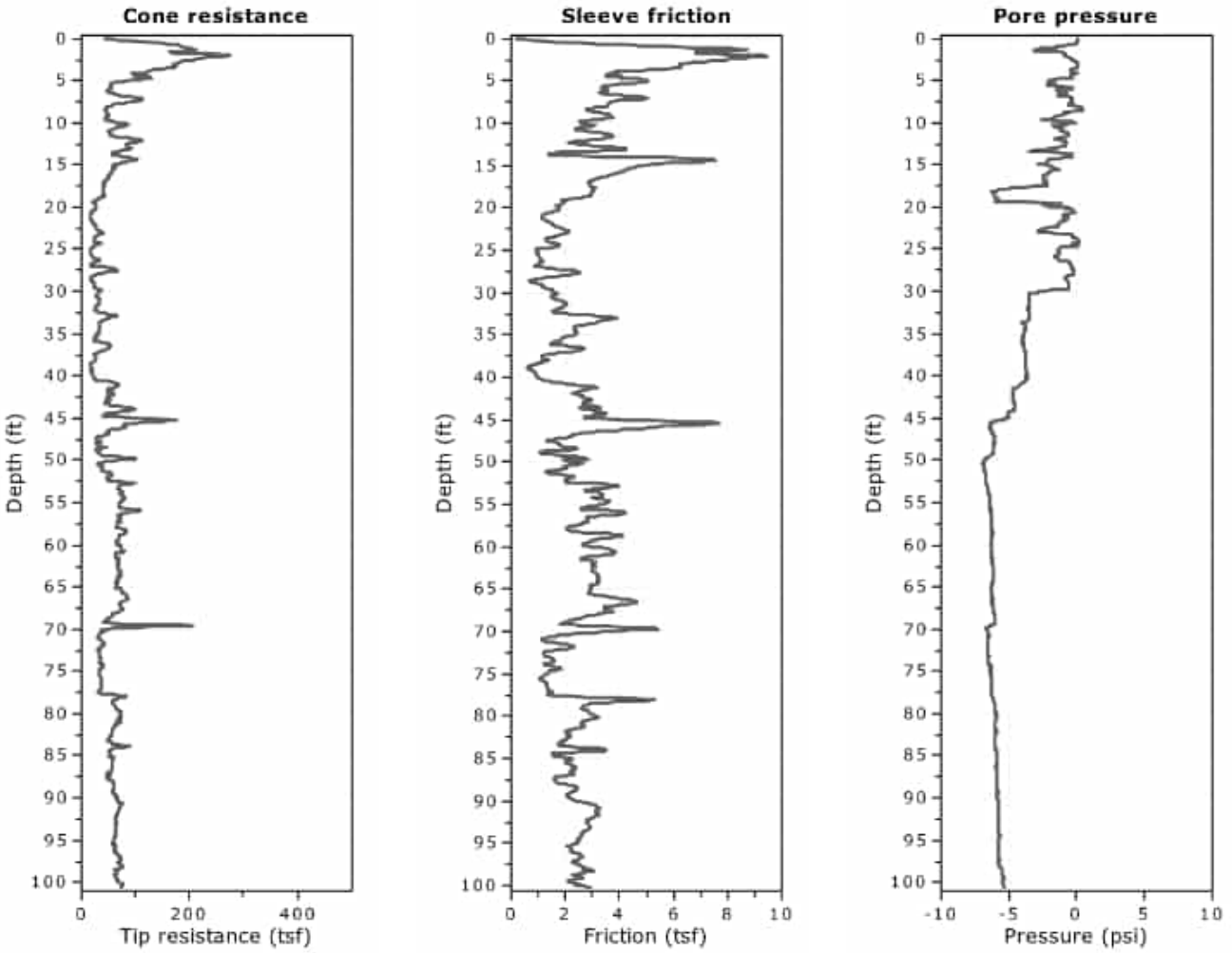
Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 100.62 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering

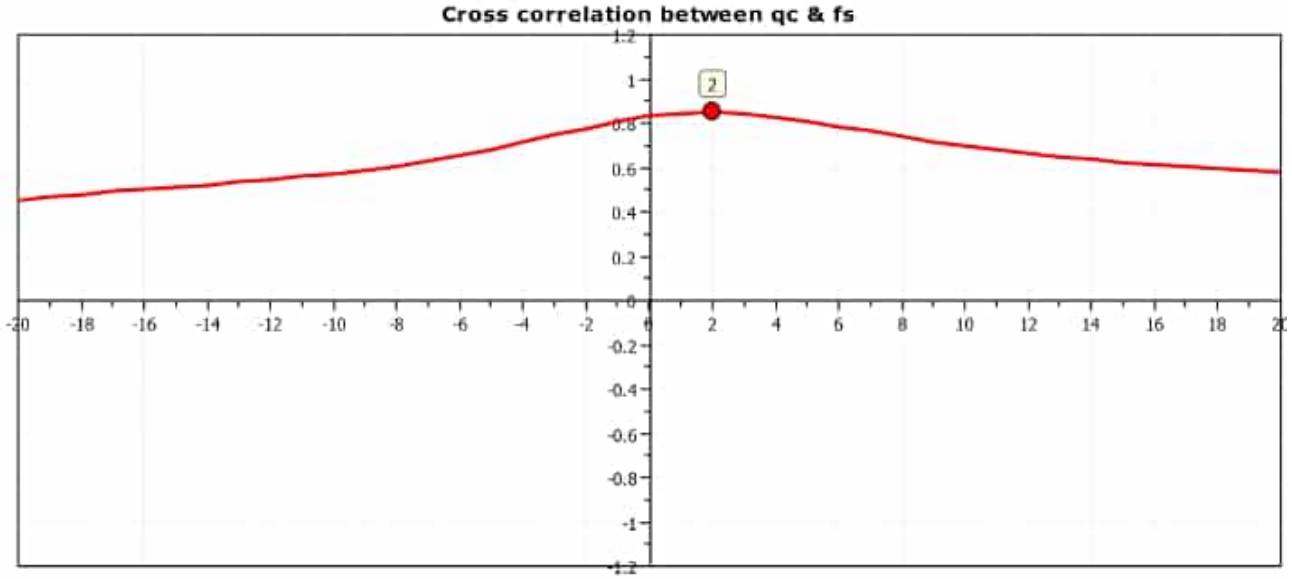


Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 100.60 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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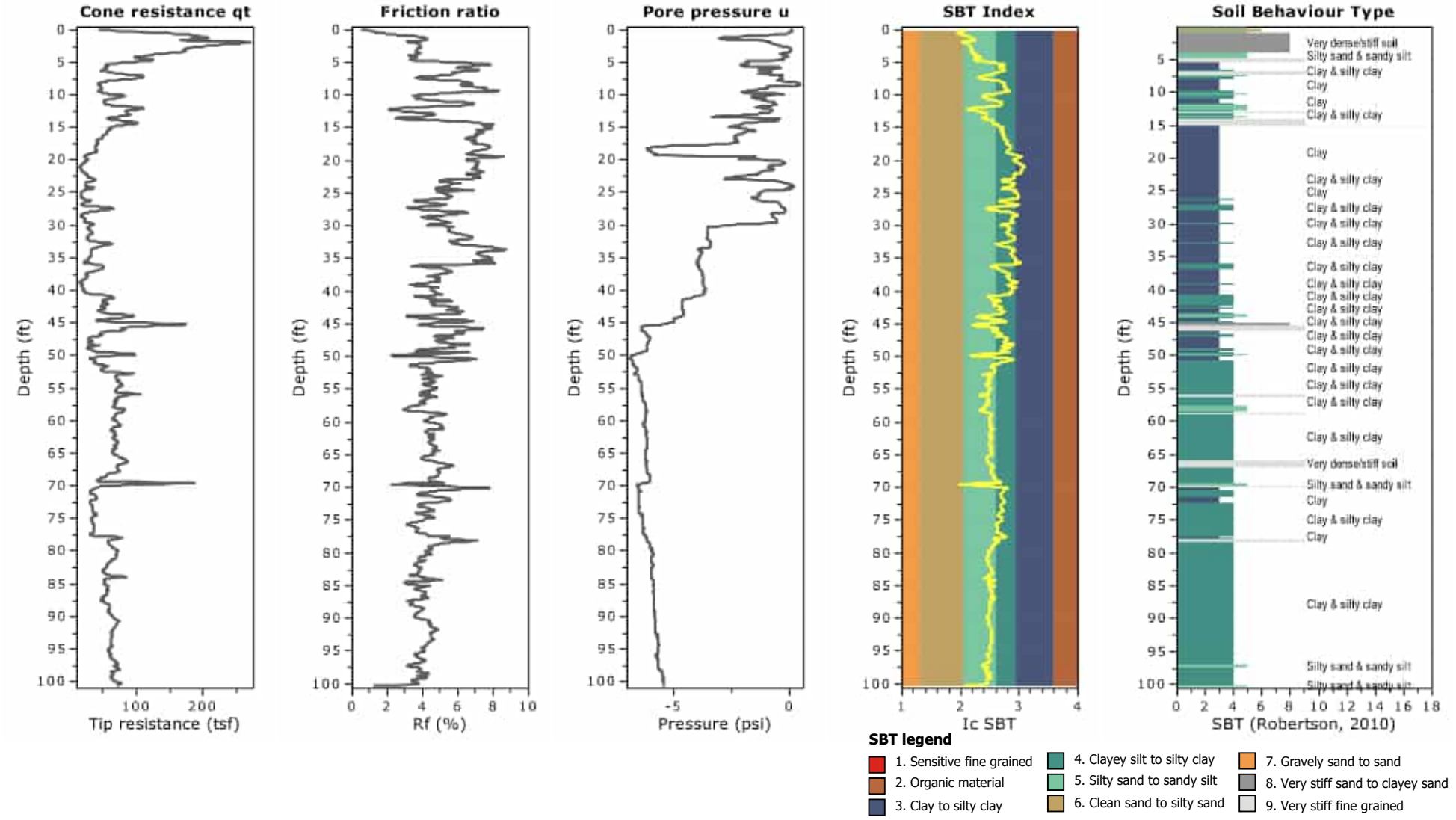
1-SCPT-02

Project: **Aquabella Master Planned Community**
Location: **Moreno Valley, CA**

Total depth: 100.60 ft, Date: 3/7/2022
Cone Operator: Kehoe Testing and Engineering



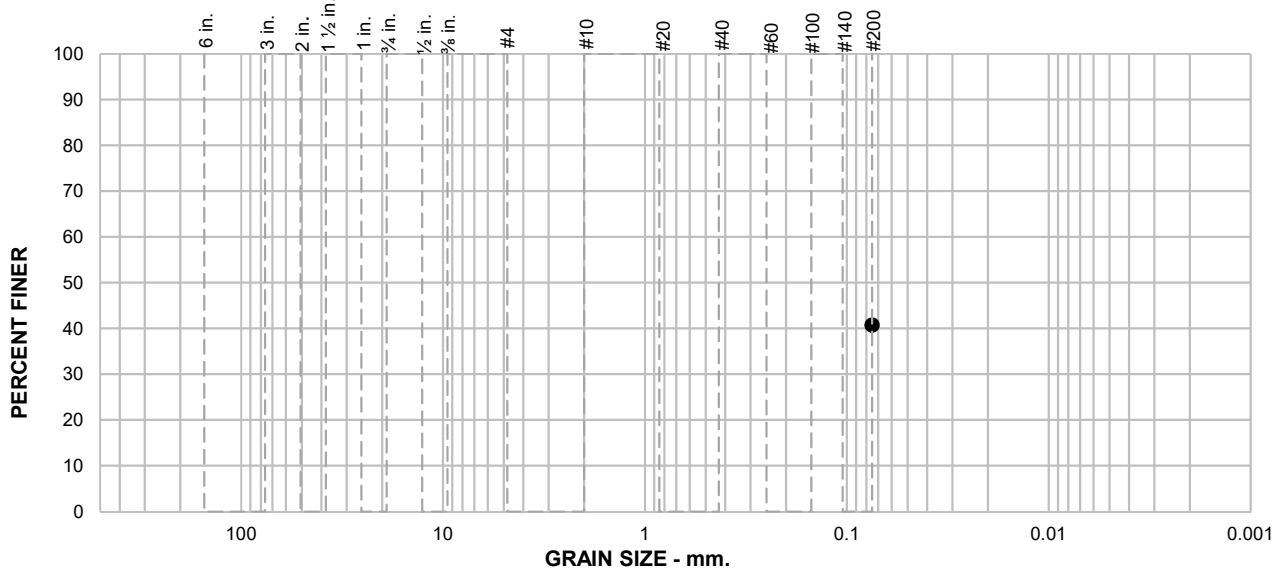
APPENDIX B

LABORATORY TEST DATA

Particle Size Distribution Report
Liquid and Plastic Limits Test Report
Moisture-Density Determination Report
R-Value Test Report
Unconfined Compression Test Report
Consolidation Drained Direct Shear Test Report
One-dimensional Swell/Collapse Test Report
Analytical Results of Soil Corrosion

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B-1@12-13

DEPTH (ft): 12-13

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						41	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	41		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 290.9 g
Largest particle size < No. 4 Sieve

* (no specification provided)

CLIENT: Highland Fairview

PROJECT NAME: Aquabella Master Planned Community

PROJECT NO: 19848.000.001 PH002

PROJECT LOCATION: Moreno Valley, CA

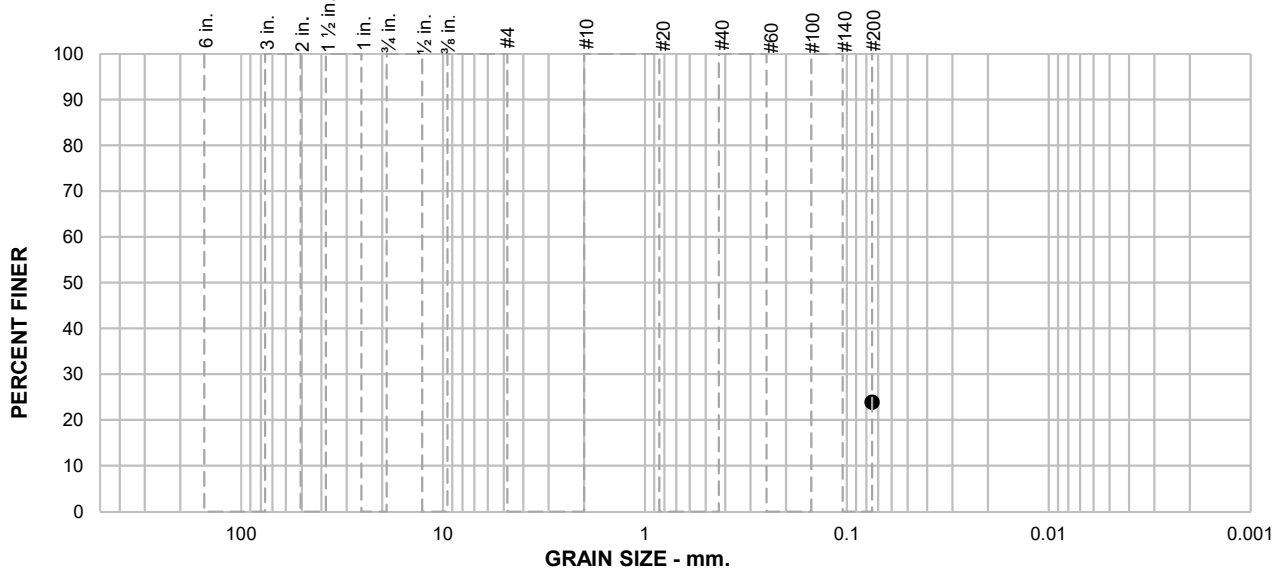
REPORT DATE: 4/13/2022

TESTED BY: L. Schmitz

REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B-2@35.5-36

DEPTH (ft): 35.5-36

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						24	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	24		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 859.4 g
Largest particle size ≥ No. 4 Sieve

* (no specification provided)

CLIENT: Highland Fairview

PROJECT NAME: Aquabella Master Planned Community

PROJECT NO: 19848.000.001 PH002

PROJECT LOCATION: Moreno Valley, CA

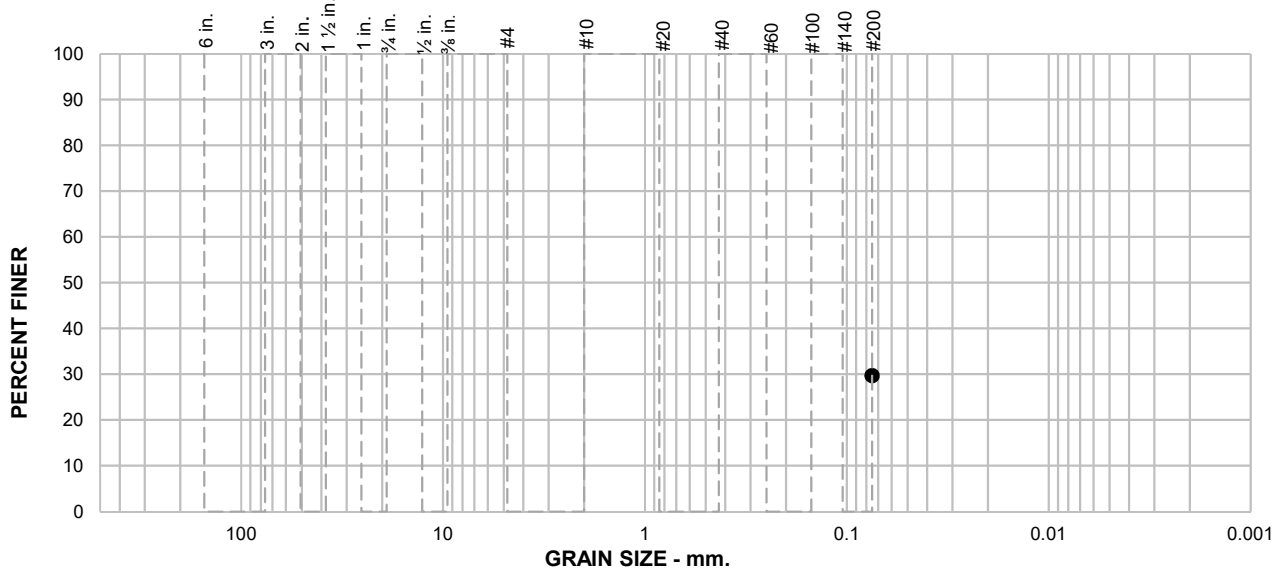
REPORT DATE: 4/13/2022

TESTED BY: L. Schmitz

REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B-2@4-5

DEPTH (ft): 4-5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						30	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	30		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = #DIV/0! D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 396.1 g
Largest particle size ≥ No. 4 Sieve

* (no specification provided)

ENGEO
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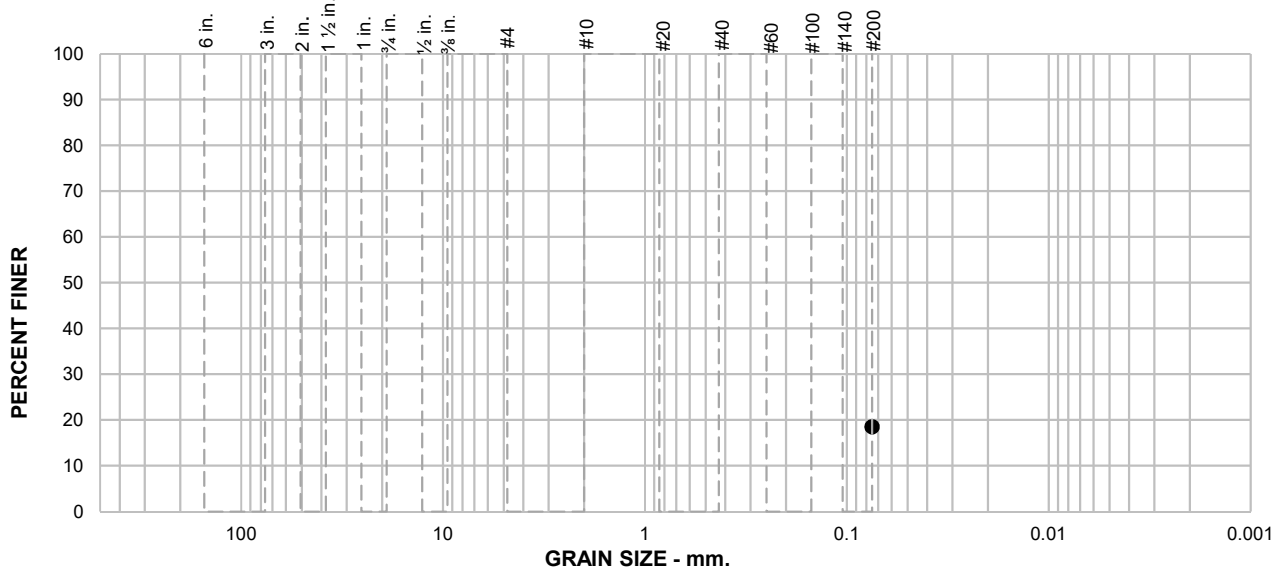
CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B-2@8.5-9

DEPTH (ft): 8.5-9

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	18		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 816.7 g
Largest particle size ≥ No. 4 Sieve

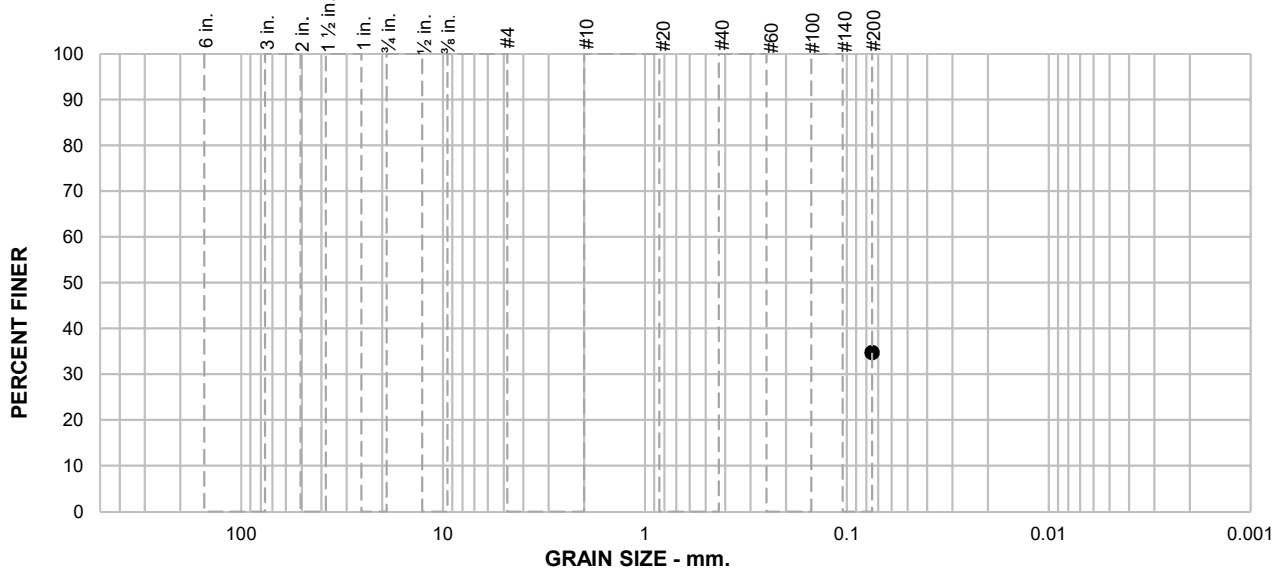
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B-3@36-36.5

DEPTH (ft): 36-36.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						35	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	35		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 870.4 g
Largest particle size ≥ No. 4 Sieve

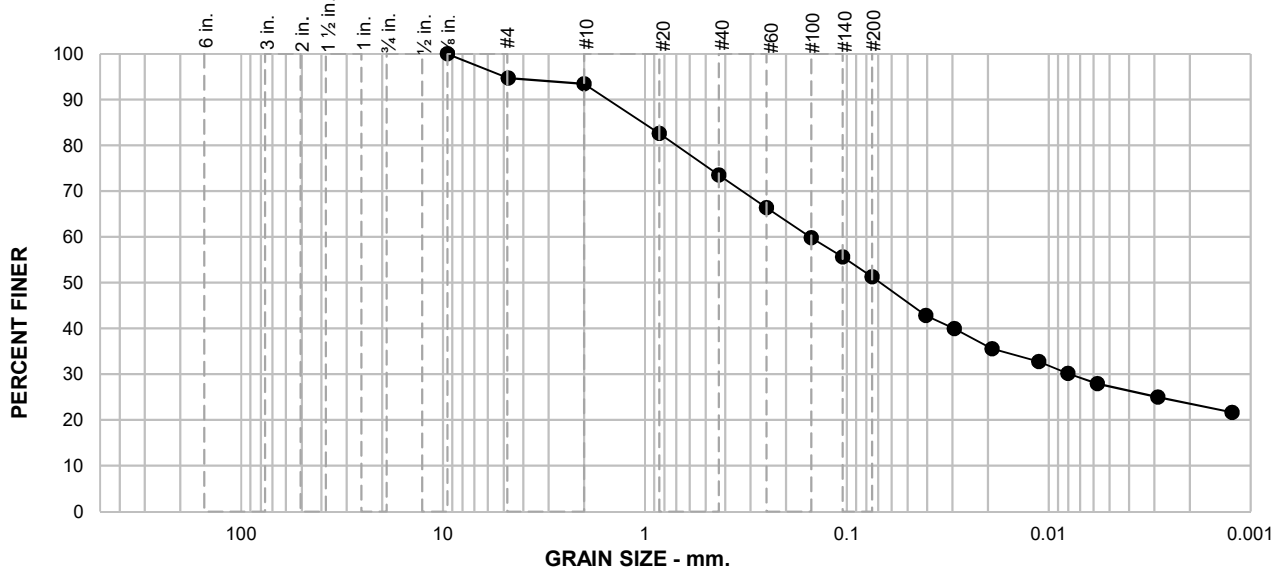
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D422



SAMPLE ID: 1-B-1@2.5-3

DEPTH (ft): 2.5-3

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		5	1	20	22	27.8	23.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
⅜ in.	100		
#4	95		
#10	93		
#20	83		
#40	74		
#60	66		
#100	60		
#140	56		
#200	51		
0.0407 mm.	42.8		
0.0293 mm.	40.0		
0.0191 mm.	35.6		
0.0112 mm.	32.7		
0.0080 mm.	30.2		
0.0058 mm.	28.0		
0.0029 mm.	25.0		
0.0012 mm.	21.7		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 1.5472 mm D_{85} = 1.0087 mm D_{60} = 0.1500 mm

D_{50} = 0.0696 mm D_{30} = 0.0078 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Silt/clay division of 0.002mm used

* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Highland Fairview

PROJECT NAME: Aquabella Master Planned Community

PROJECT NO: 19848.000.001 PH002

PROJECT LOCATION: Moreno Valley, CA

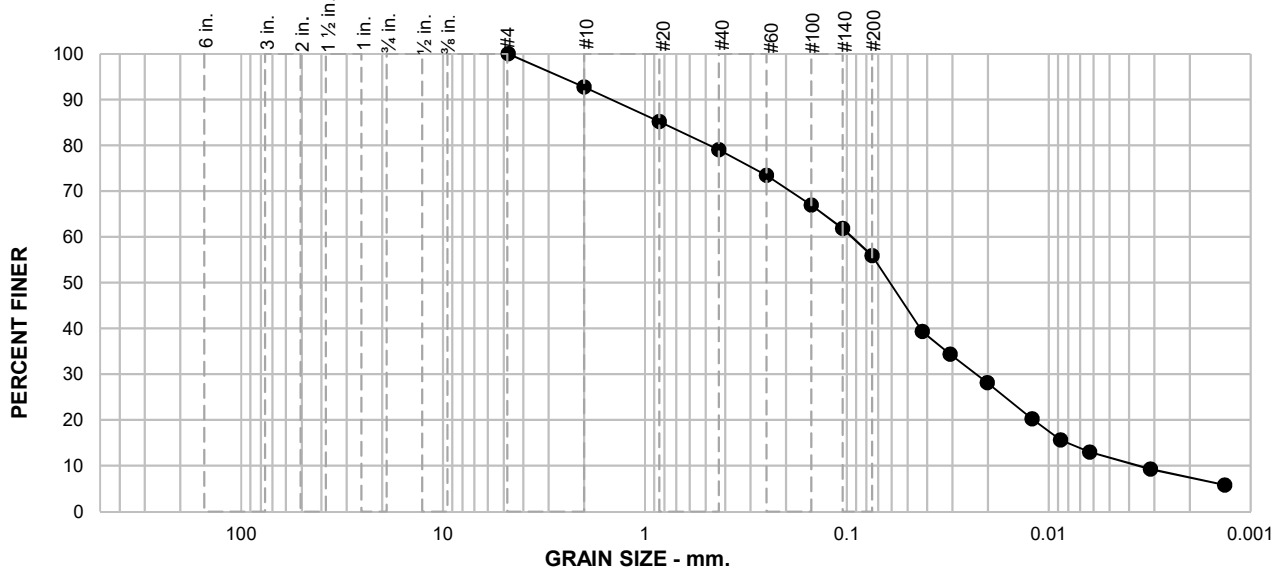
REPORT DATE: 4/13/2022

TESTED BY: L. Schmitz

REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D422



SAMPLE ID: 1-B-3@17-18

DEPTH (ft): 17-18

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
			7	14	23	48.5	7.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	93		
#20	85		
#40	79		
#60	73		
#100	67		
#140	62		
#200	56		
0.0423 mm.	39.3		
0.0308 mm.	34.4		
0.0201 mm.	28.1		
0.0121 mm.	20.3		
0.0087 mm.	15.6		
0.0063 mm.	13.0		
0.0031 mm.	9.3		
0.0013 mm.	5.8		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 1.4510 mm D_{85} = 0.8500 mm D_{60} = 0.0939 mm

D_{50} = 0.0610 mm D_{30} = 0.0229 mm D_{15} = 0.0081 mm

D_{10} = 0.0036 mm C_u = 26.31 C_c = 1.56

CLASSIFICATION

USCS =

REMARKS

Silt/clay division of 0.002mm used

* (no specification provided)

ENGEO Expect Excellence

CLIENT: Highland Fairview

PROJECT NAME: Aquabella Master Planned Community

PROJECT NO: 19848.000.001 PH002

PROJECT LOCATION: Moreno Valley, CA

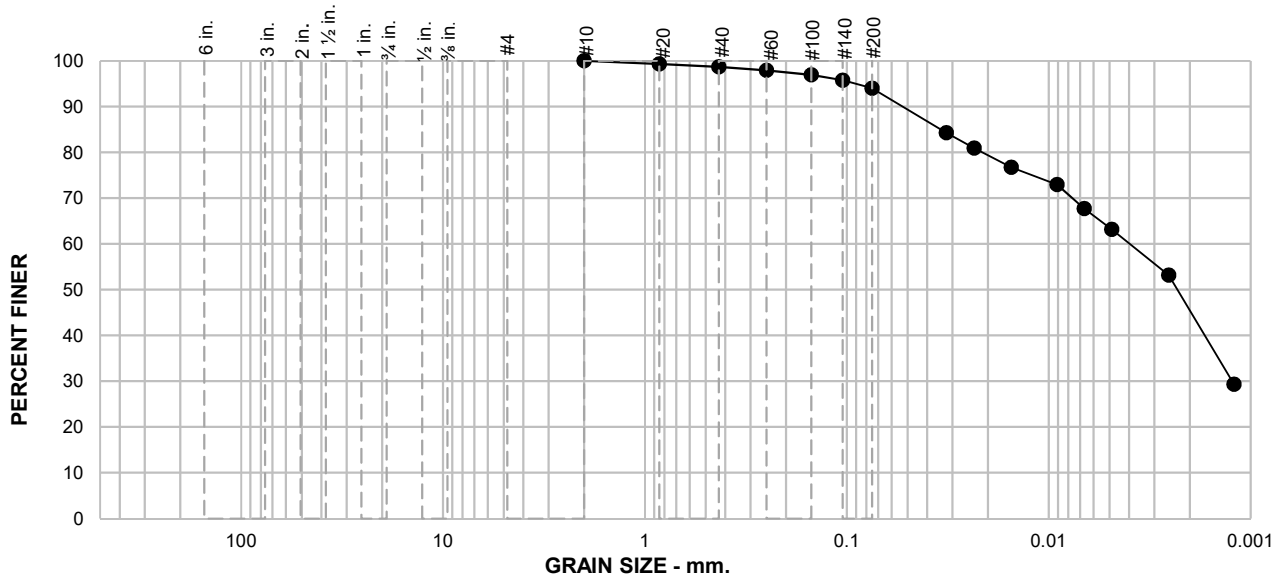
REPORT DATE: 4/13/2022

TESTED BY: L. Schmitz

REVIEWED BY: N. Broussard

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D422



SAMPLE ID: 1-B-3@3-3.5

DEPTH (ft): 3-3.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				1	5	48.5	45.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	99		
#40	99		
#60	98		
#100	97		
#140	96		
#200	94		
0.0322 mm.	84.3		
0.0234 mm.	80.9		
0.0153 mm.	76.8		
0.0091 mm.	73.0		
0.0067 mm.	67.7		
0.0049 mm.	63.1		
0.0025 mm.	53.2		
0.0012 mm.	29.3		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.0529 mm D_{85} = 0.0342 mm D_{60} = 0.0040 mm

D_{50} = 0.0023 mm D_{30} = 0.0012 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Silt/clay division of 0.002mm used

* (no specification provided)

ENGEO
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CLIENT: Highland Fairview

PROJECT NAME: Aquabella Master Planned Community

PROJECT NO: 19848.000.001 PH002

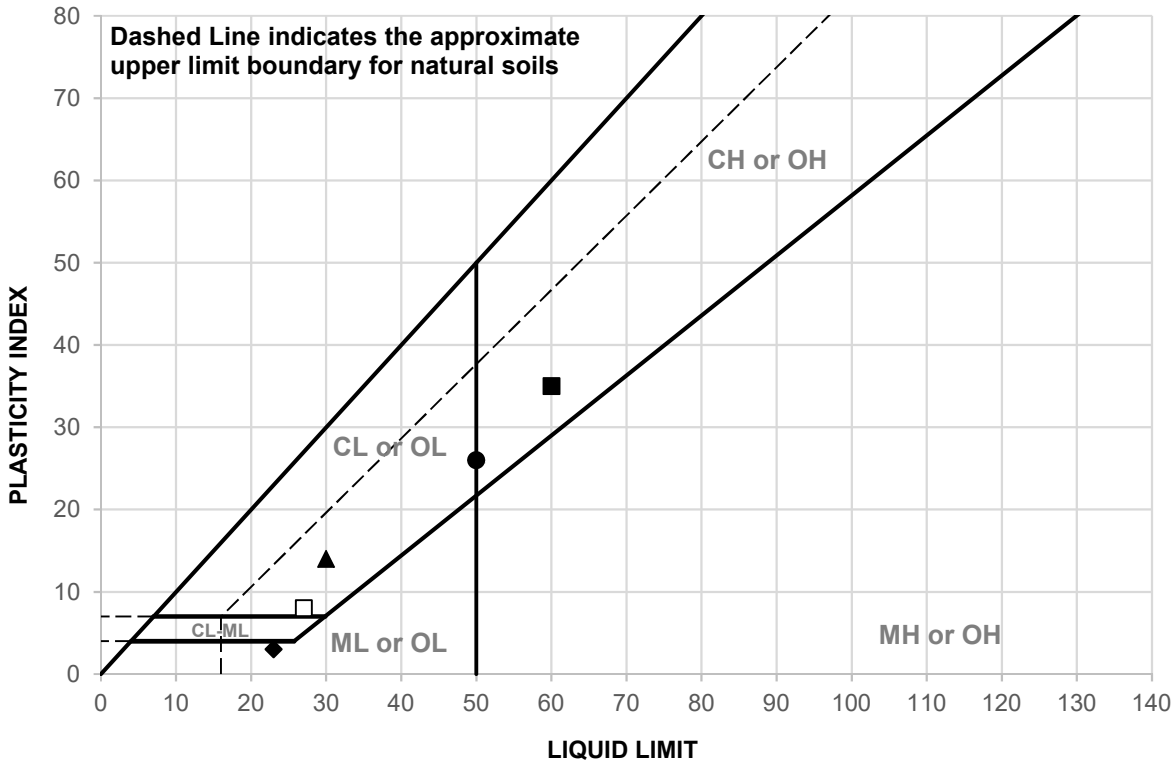
PROJECT LOCATION: Moreno Valley, CA

REPORT DATE: 4/13/2022

TESTED BY: L. Schmitz

REVIEWED BY: N. Broussard

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH (ft)	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B-1@4.5	4.5	See exploration logs	30	16	14
◆	1-B-1@31-32	31-32	See exploration logs	23	20	3
□	1-B-2@21-21.5	21-21.5	See exploration logs	27	19	8
●	1-B-2@46-46.5	46-46.5	See exploration logs	50	24	26
■	1-B-3@3-3.5	3-3.5	See exploration logs	60	25	35

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B-1@4.5	PI: ASTM D4318, Wet Method	
◆	1-B-1@31-32	PI: ASTM D4318, Wet Method	
□	1-B-2@21-21.5	PI: ASTM D4318, Wet Method	
●	1-B-2@46-46.5	PI: ASTM D4318, Wet Method	
■	1-B-3@3-3.5	PI: ASTM D4318, Wet Method	

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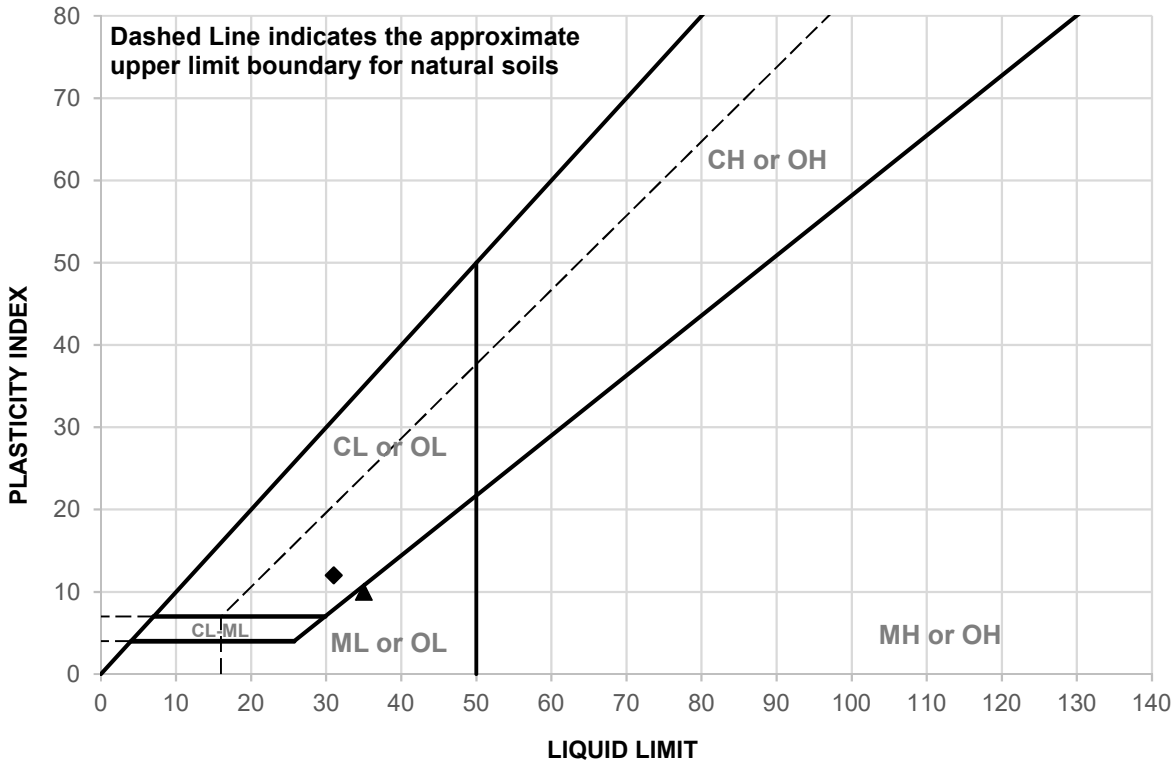
CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH (ft)	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B-3@7.5-8	7.5-8	See exploration logs	35	25	10
◆	1-B-3@15.5-16	15.5-16	See exploration logs	31	19	12

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B-3@7.5-8	PI: ASTM D4318, Wet Method	
◆	1-B-3@15.5-16	PI: ASTM D4318, Wet Method	

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CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

MOISTURE-DENSITY DETERMINATION REPORT
ASTM D7263

SAMPLE ID	1-B-1 @2.5-3	1-B-1 @6-6.5	1-B-1 @8-8.5	1-B-1 @10.5-11	1-B-1 @21-21.5	1-B-1 @50.5-51	1-B-2 @2.5-3	1-B-2 @6-6.5
DEPTH (ft.)	2.5-3	6-6.5	8-8.5	10.5-11	21-21.5	50.5-51	2.5-3	6-6.5
METHOD A OR B	B	B	B	B	B	B	B	B
MOISTURE CONTENT (%)	5.6	4.9	5.7	5.7	8.2	19.8	4.6	3.2
DRY DENSITY (pcf)	97.2	114.8	101.4	102.1	113.5	108.2	76.7	110.6

SAMPLE ID	1-B-2 @11.5-12	1-B-2 @15-16	1-B-2 @21-21.5	1-B-3 @11-11.5	1-B-3 @15.5-16	1-B-3 @21-21.5	1-B-3 @41-41.5	1-B-3 @51-51.5
DEPTH (ft.)	11.5-12	15-16	21-21.5	11-11.5	15.5-16	21-21.5	41-41.5	51-51.5
METHOD A OR B	B	B	B	B	B	B	B	B
MOISTURE CONTENT (%)	3.6	6.7	10.8	13.5	11.0	9.7	12.2	12.7
DRY DENSITY (pcf)	109.6	105.8	120.0	104.7	113.5	120.2	124.0	125.9

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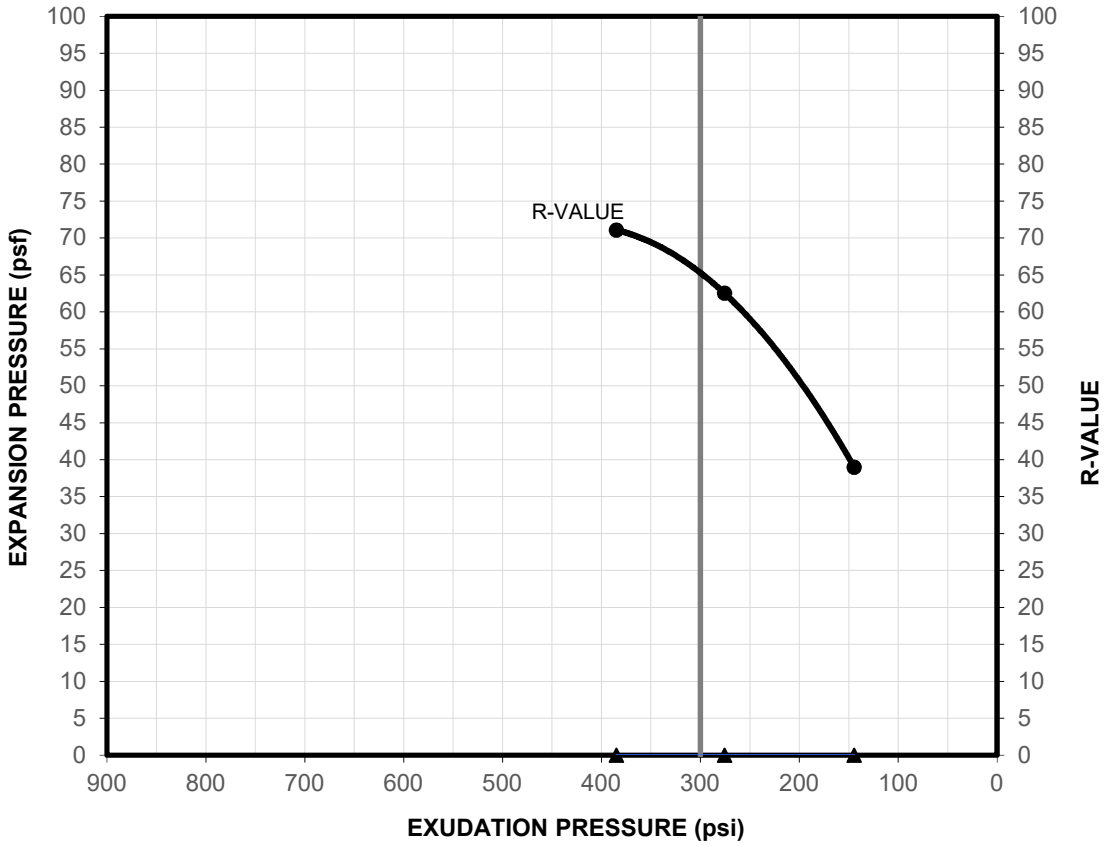
CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

R-VALUE TEST REPORT
CTM 301



SAMPLE ID	MATERIAL DESCRIPTION	SAMPLE LOCATION
1-CPT-17	See exploration logs	1-CPT-17

SPECIMENS	1	2	3
EXUDATION PRESSURE (psi)	385	275	144
EXPANSION PRESSURE (psf)	0	0	0
R-VALUE	71	63	39
MOISTURE CONTENT (%)	8.4	9.3	9.8
DRY DENSITY (pcf)	129.9	128.7	128.1
EXPANSION PRESSURE (psf) AT EXUDATION PRESSURE OF 300 psi		0	

R-VALUE AT EXUDATION PRESSURE OF 300 psi	TEST RESULT
	65

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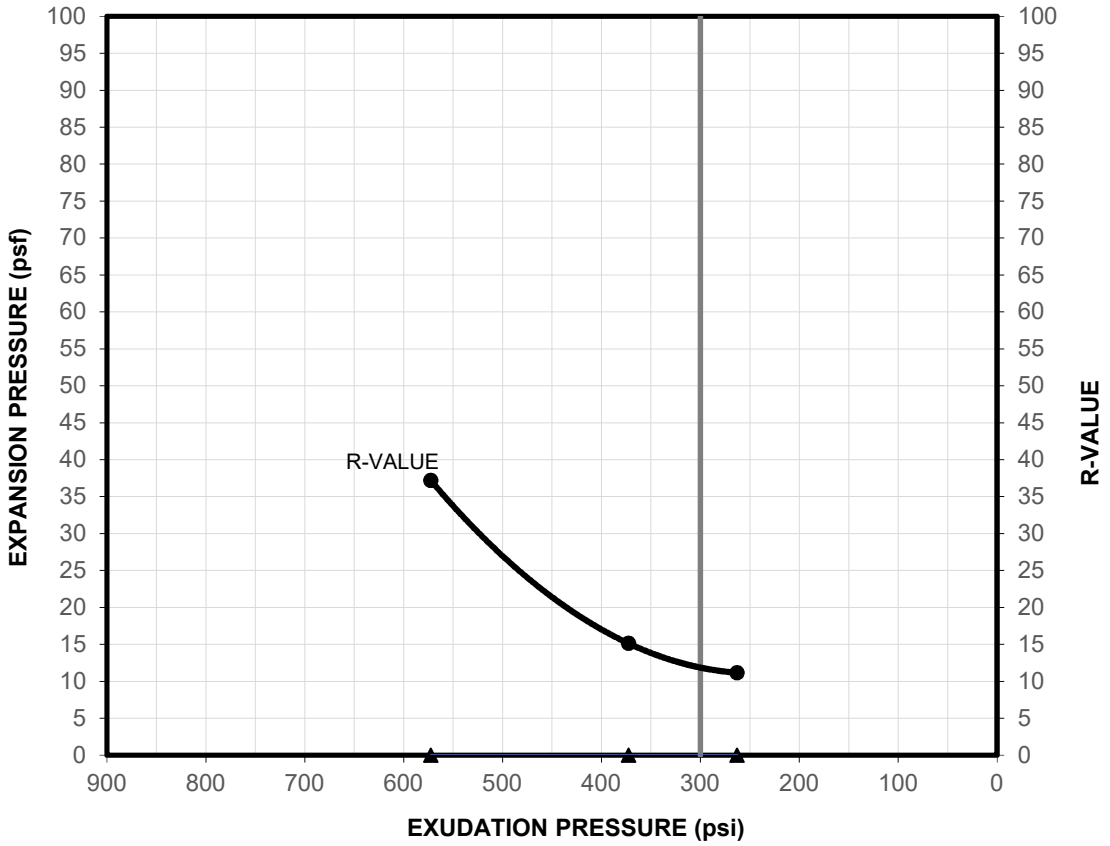
CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002 T002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/11/2022
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

R-VALUE TEST REPORT
CTM 301



SAMPLE ID	MATERIAL DESCRIPTION	SAMPLE LOCATION
1-CPT-3	See exploration logs	1-CPT-3

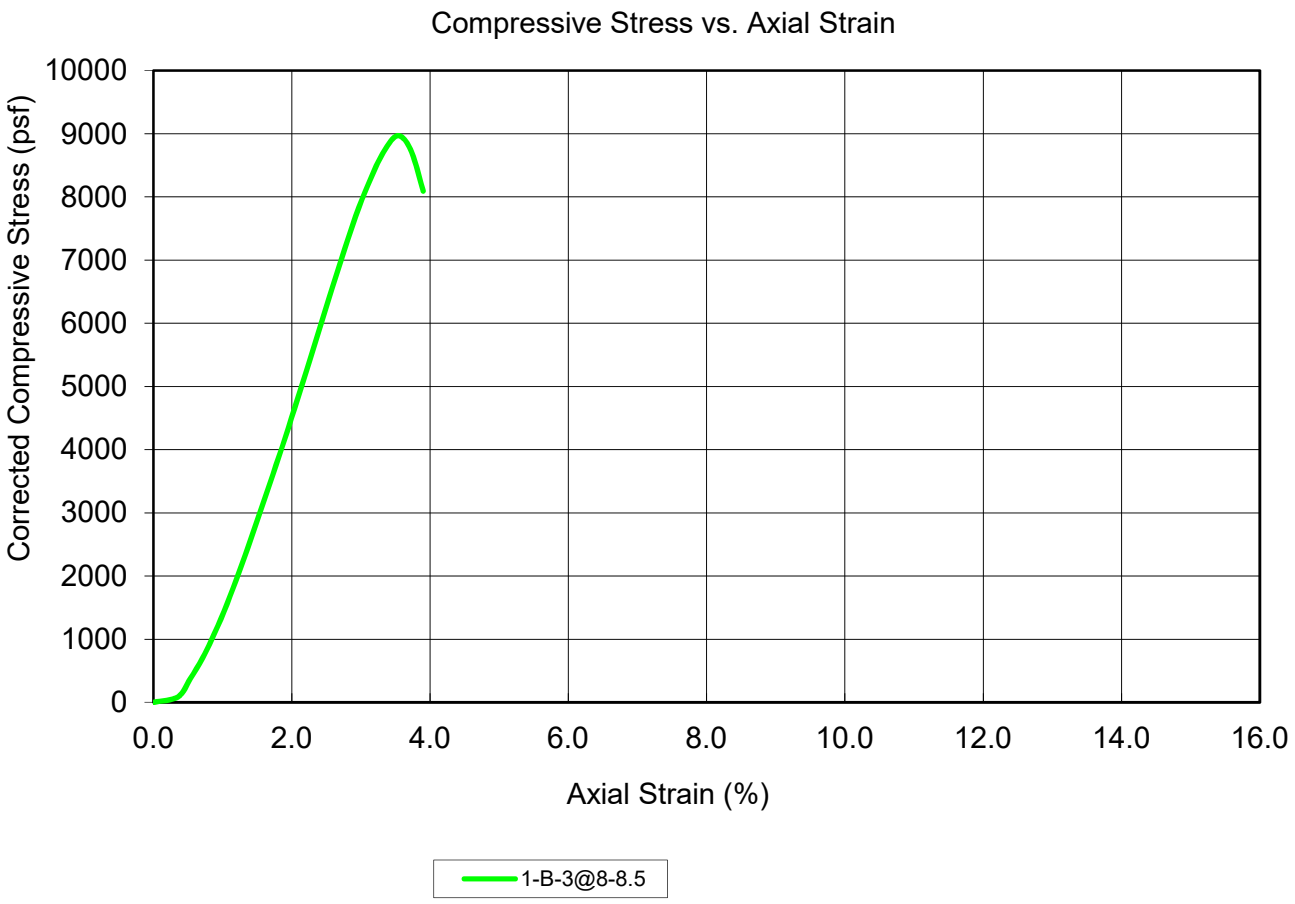
SPECIMENS	1	2	3
EXUDATION PRESSURE (psi)	572	373	263
EXPANSION PRESSURE (psf)	0	0	0
R-VALUE	37	15	11
MOISTURE CONTENT (%)	9.4	11.0	11.8
DRY DENSITY (pcf)	128.7	124.3	122.3
EXPANSION PRESSURE (psf) AT EXUDATION PRESSURE OF 300 psi		0	

R-VALUE AT EXUDATION PRESSURE OF 300 psi	TEST RESULT
	12

ENGEO
Expect Excellence

CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002 T002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/11/2022
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



BEFORE TEST	SPECIMEN 1-B3@8-8.5
Test Moisture Content (%)	20.58
Dry Density (pcf)	98.0
Saturation (%)	76.4
Void Ratio	0.73
Diameter (in)	2.363
Height (in)	5.640
Height-To-Diameter Ratio	2.39
TEST DATA	
Unconfined Compressive Strength (psf)	8970
Undrained Shear Strength (psf)	4485.2
Strain Rate (in/min)	0.050
Specific Gravity (ASSUMED)	2.720
Strain at Failure(%)	3.55
Test Remarks	

SPECIMEN	DESCRIPTION
1-B3@8-8.5	See exploration logs.

PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
CLIENT: Highland Fairview
LOCATION: Moreno Valley, CA

Report Date: 4/13/22
Tested By: L. Schmitz
Reviewed By: N. Broussard

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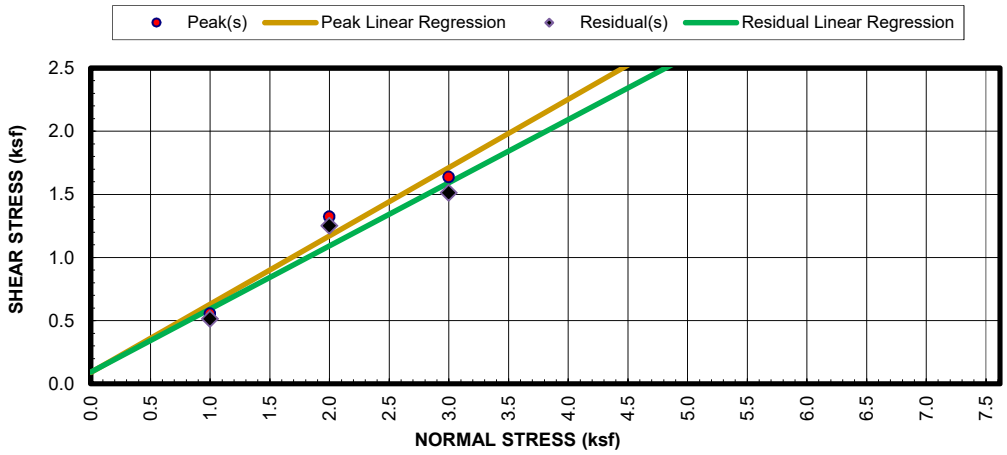
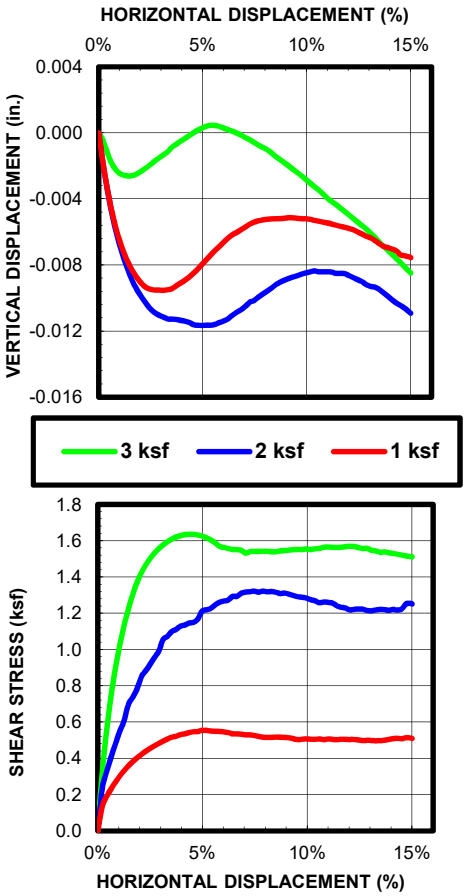
CONSOLIDATED DRAINED DIRECT SHEAR
ASTM D3080





	SPECIMEN			
INITIAL PARAMETERS	**3 ksf**	**2 ksf**	**1 ksf**	
MOISTURE (%)	4.41	4.97	4.34	
DRY DENSITY (PCF)	108.28	111.32	107.04	
VOID RATIO	0.562	0.520	0.580	
SATURATION (%)	21.27	25.93	20.27	
DIAMETER (IN.)	2.412	2.412	2.412	
HEIGHT (IN.)	1.000	1.000	1.000	
DIAMETER-TO-HEIGHT RATIO	2.412	2.412	2.412	
SPECIFIC GRAVITY (ASTM D854)	2.710	2.710	2.710	
FINAL PARAMETERS	**3 ksf**	**2 ksf**	**1 ksf**	
MOISTURE (%)	12.39	16.81	19.93	
DRY DENSITY (PCF)	124.25	116.22	109.84	
VOID RATIO	0.362	0.456	0.540	
SATURATION (%)	92.88	100.00	100.00	
DIAMETER (IN.)	2.412	2.412	2.412	
HEIGHT (IN.)	0.981	0.958	0.975	
NORMAL STRESS (ksf)	3.00	2.00	1.00	
PEAK STRESS (ksf)	1.64	1.32	0.55	
PEAK STRAIN (%)	4.35	7.46	4.98	
RESIDUAL STRESS (ksf)	1.51	1.25	0.51	
RESIDUAL STRAIN (%)	15.00	15.00	15.00	
RATE (IN/MIN)	0.00181	0.00181	0.00389	
DIAMETER-TO-HEIGHT RATIO	2.458	2.518	2.475	

SPECIMEN INFORMATION		STRENGTH PARAMETERS	ϕ°	C(psf)
SAMPLE ID:	1-B-2@16-16.5			
DEPTH (ft):	16-16.5 feet	PEAK:	28.4	89.9
SAMPLE TYPE:	In-situ	RESIDUAL:	26.6	92.3
DESCRIPTION:	See exploration logs	ASTM D4318		
		LIQUID LIMIT	n/a	
		PLASTIC LIMIT:	n/a	
REMARKS:	Consolidation data inconclusive. Default minimum shear rates used per ASTM D3080			

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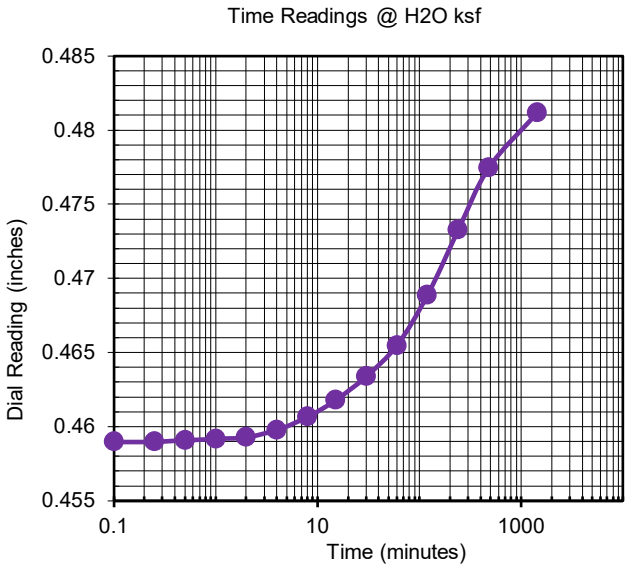
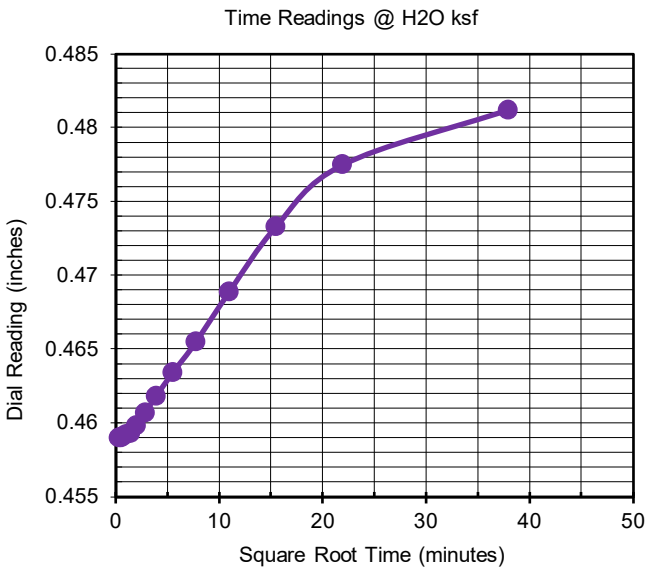
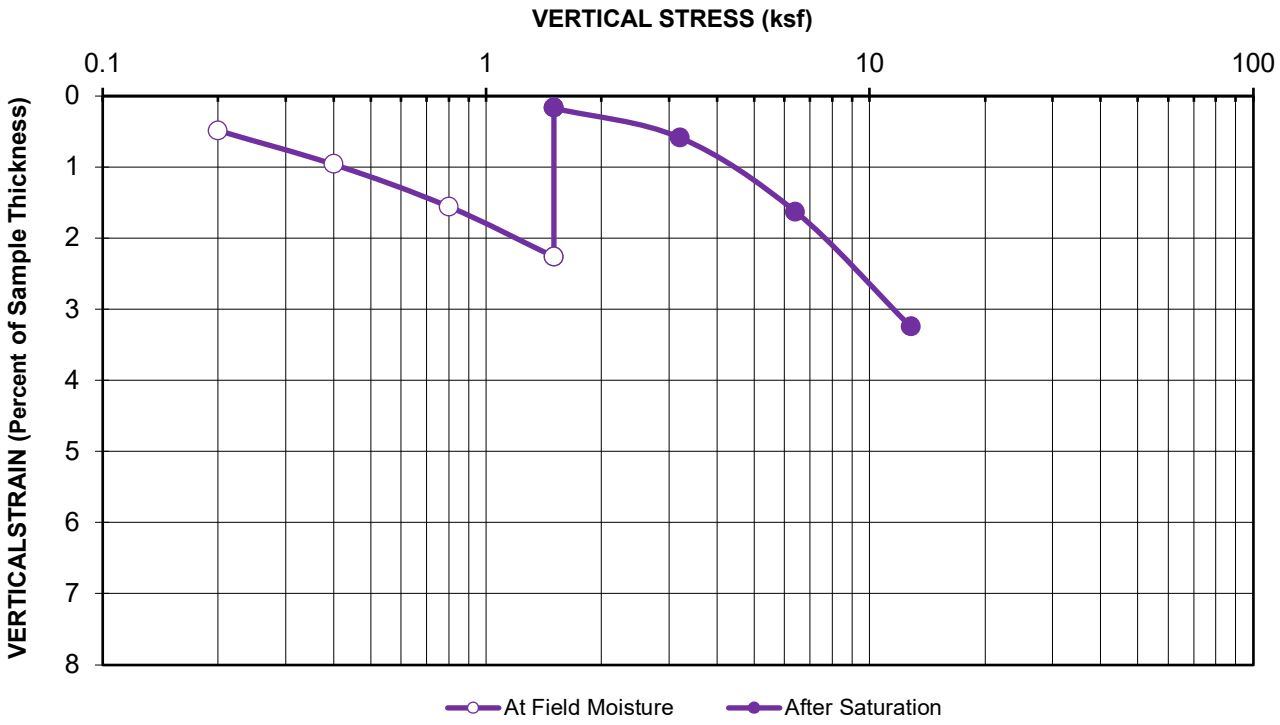
CLIENT: Highland Fairview
PROJECT NAME: Aquabella Master Planned Community
PROJECT NO: 19848.000.001 PH002
PROJECT LOCATION: Moreno Valley, CA
REPORT DATE: 4/13/2022
TESTED BY: L. Schmitz
REVIEWED BY: N. Broussard

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com





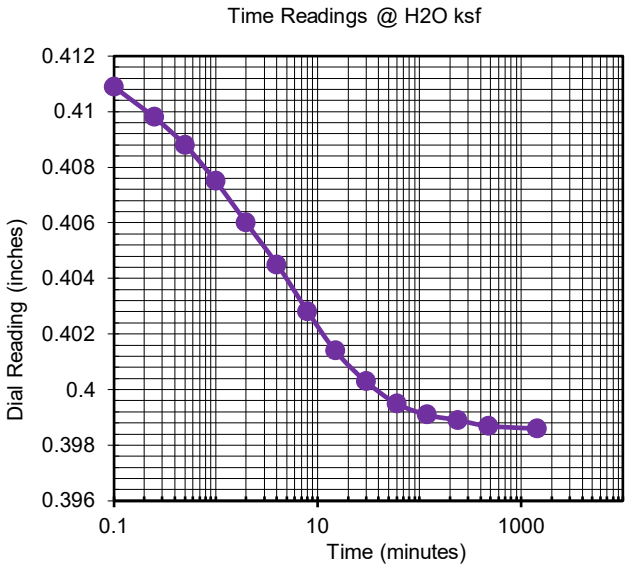


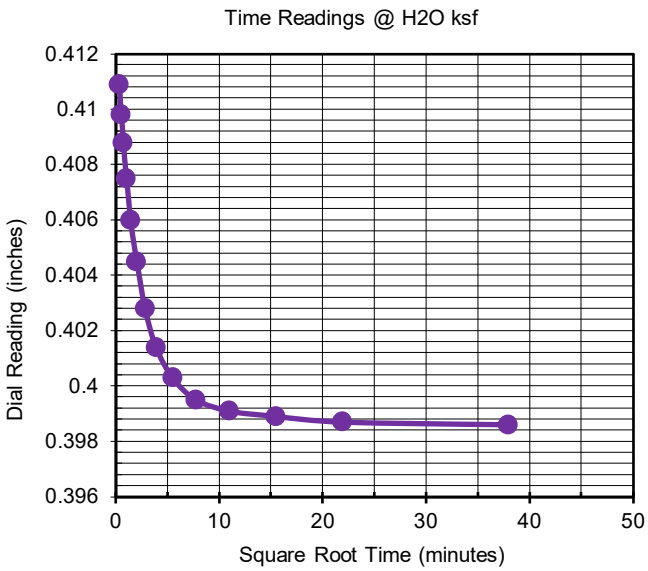
Boring No. :	1-B-1	Initial Dry Unit Weight (pcf):	107.3
Sample No.:	2	Initial Moisture Content (%):	18.4
Depth (feet):	9-9.5	Final Moisture Content (%):	20.7
Sample Type:	Mod Cal	Initial Void Ratio:	0.57
Soil Description:	Clay		
Remarks:	Swell = 2.09% upon inundation		

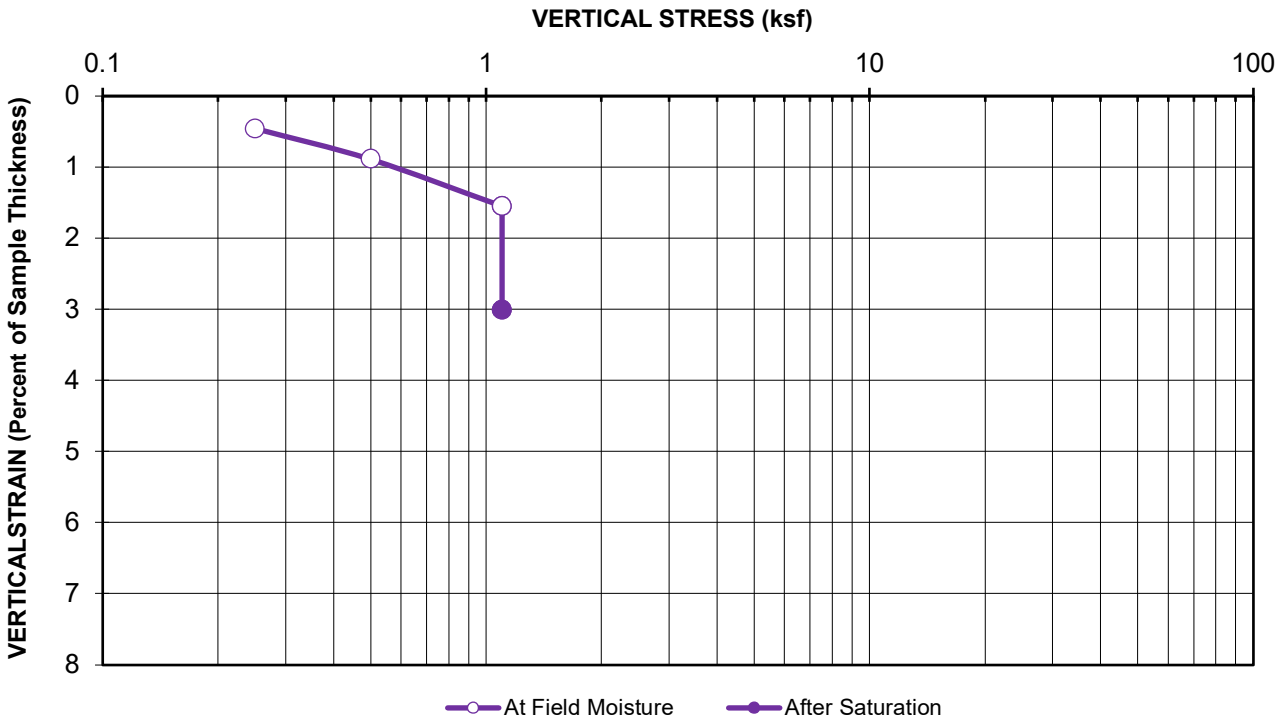
1-D SWELL/COLLAPSE
ASTM D 4546-14, Method B

Project Name:	AB
Project No.:	19848.000.001 P002 T002
Date:	4/11/22
AP No:	22-0407

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com







Boring No. :	1-B-3	Initial Dry Unit Weight (pcf):	119.5
Sample No.:	1	Initial Moisture Content (%):	5.3
Depth (feet):	5.5-6	Final Moisture Content (%):	13.7
Sample Type:	Mod Cal	Initial Void Ratio:	0.41
Soil Description:	Sandy Clay		
Remarks:	Collapse = 1.46% upon inundation		

1-D SWELL/COLLAPSE
ASTM D 4546-14, Method B

Project Name:	AB
Project No.:	19848.000.001 P002 T002
Date:	4/11/22
AP No:	22-0407

Table 1 - Laboratory Tests on Soil Samples

ENGEO Inc
AB
Your #14848.000.001 P002 T002, HDR Lab #22-0389LAB
13-Apr-22

Sample ID

			CPT-3	CPT-17
Resistivity		**Units**		
as-received		ohm-cm	34,000	38,800
saturated		ohm-cm	4,000	20,800
pH			6.7	6.9
Electrical Conductivity		mS/cm	0.07	0.05
Chemical Analyses				
Cations				
calcium	Ca^{2+}	mg/kg	na	na
magnesium	Mg^{2+}	mg/kg	na	na
sodium	Na^{1+}	mg/kg	na	na
potassium	K^{1+}	mg/kg	na	na
ammonium	NH_4^{1+}	mg/kg	na	na
Anions				
carbonate	CO_3^{2-}	mg/kg	na	na
bicarbonate	HCO_3^{1-}	mg/kg	na	na
fluoride	F^{1-}	mg/kg	na	na
chloride	Cl^{1-}	mg/kg	19	3.4
sulfate	SO_4^{2-}	mg/kg	20	8.2
nitrate	NO_3^{1-}	mg/kg	na	na
phosphate	PO_4^{3-}	mg/kg	na	na
Other Tests				
sulfide	S^{2-}	qual	na	na
Redox		mV	na	na

Resistivity per ASTM G187, pH per ASTM G51, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.

Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.

mg/kg = milligrams per kilogram (parts per million) of dry soil.

Redox = oxidation-reduction potential in millivolts

ND = not detected

na = not analyzed

APPENDIX C

PREVIOUS BORINGS (LEIGHTON, 2005)
PREVIOUS TEST PIT LOGS (LEIGHTON, 2005)

GEOTECHNICAL BORING LOG B-11

Date 7-19-04 **Sheet** 1 **of** 1

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1538' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0	N S							QUATERNARY ALLUVIUM (Qal)	
			Bulk 1 @ 0-5'							
1535				R2	30			ML	@ 2.5': Red-brown, dry, very stiff, sandy SILT; slightly porous	
	5			R3	19			SM	@ 5': Brown, moist, medium dense, silty SAND	
1530				R4	24	115.8	3.0		@ 7.5': Brown, moist, medium dense, silty SAND	
	10			S5	9				@ 10': Brown, moist, loose, silty SAND	
1525				R6	22	110.8	6.5	ML	@ 12.5': Brown, moist, stiff, sandy SILT	
	15			S7	14			SM	@ 15': Brown, moist, medium dense, silty SAND	
1520										
	20			R8	52			SC	@ 20': Red-brown, moist, dense, clayey SAND	
1515										
	25								Total Depth 21.5' No Groundwater Encountered Backfilled with Spoils 7/19/04	
1510										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-12A

Date 7-19-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1528' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1525				S1	10			SM	@ 2.5': Brown, moist, loose, silty SAND	
	5			R2	36	128.0	4.7	ML	@ 5': Brown, moist, very stiff, sandy SILT with clay	
1520				S3	8				@ 7.5': Brown, moist, firm, sandy SILT	
	10			R4	24			SM	@ 10': Brown, moist, medium dense, silty SAND	
1515				S5	16				@ 12.5': Brown, moist, medium dense, silty SAND	
	15			R6	31				@ 15': Brown, moist, medium dense, silty SAND	
1510				S8	26				@ 17.5': Brown, moist, medium dense, silty SAND; trace clay	
	20			R8	75				@ 20': Red-brown, moist, dense, silty SAND	
1505										
	25			S9	38				@ 25': Brown, moist, dense, silty SAND	
1500										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-12A

Date 7-19-04 **Sheet** 2 **of** 2
Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001
Drilling Co. 2R Drilling **Type of Rig** CME-55
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1528' **Location** See Map

Logged By RM
Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R10	43			SP/SM	@ 30': Brown, moist, medium dense SAND with silt	
1495										
	35			S11	26			SM	@ 35': Brown, moist, medium dense, silty SAND	
1490										
	40								Total Depth 36.5' No Groundwater Encountered Backfilled with Spoils 7/19/04	
1485										
	45									
1480										
	50									
1475										
	55									
1470										
	60									

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-12B

Date 7-21-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1523' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1520				S1	6		8.4	SM	@ 2.5': Brown, moist, loose, silty SAND; trace clay	
	5			R2	19	122.9	7.4		@ 5': Red-brown, moist, medium dense, silty SAND; slightly porous	
1515				S3	10		9.4		@ 7.5': Brown, moist, loose to medium dense, silty SAND; trace clay	
	10			R4	40	114.2	6.2		@ 10': Brown, moist, medium dense, silty SAND; trace gravel	
1510				S5	13			SP/SM	@ 12.5': Brown, slightly moist, medium dense, coarse SAND with silt	
	15			R6	33				@ 15': Brown, dry, medium dense, coarse SAND with silt	
								SM/ML	@ 15.5': Brown, moist, medium dense to stiff, silty SAND to sandy SILT	
1505										
	20			R7	50			SP/SM	@ 20': Brown, dry to slightly moist, dense, coarse SAND with silt; trace gravel	
1500										
	25			R8	85			SC	@ 25': Red-brown, moist, dense, clayey SAND	
1495										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-12B

Date 7-21-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1523' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			S9	18			SM	@ 30': Brown, moist, medium dense, silty SAND	
1490										
	35			R10	74	127.8	7.7		@ 35': Brown, moist, dense, silty SAND	
1485										
	40								Total Depth 36.5' No Groundwater Encountered Backfilled with Spoils 7/21/04	
1480										
	45									
1475										
	50									
1470										
	55									
1465										
	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-13

Date 7-19-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1520' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
			Bulk 1 @ 0-5'							
				R2	30	132.3	5.9	SM	@ 2.5': Red-brown, moist, medium dense, silty SAND with clay; slightly porous	
1515	5			S3	16			ML	@ 5': Brown, moist, stiff, sandy SILT with clay	
				R4	26	119.1	9.4	SM	@ 7.5': Brown, moist, medium dense, silty SAND	
1510	10			S5	12				@ 10': Brown, moist, medium dense, silty SAND	
1505	15			R6	59				@ 15': Brown, moist, dense, silty SAND	
1500	20			S7	47			SC	@ 20': Brown, moist, dense, clayey SAND	
1495	25			R8	57			SM	@ 25': Brown, moist, dense, silty SAND	
1490	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-13

Date 7-19-04 **Sheet** 2 of 2
Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001
Drilling Co. 2R Drilling **Type of Rig** CME-55
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1520' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
	30			S9	23			SM	@ 30': Brown, moist, medium dense, silty SAND	
1485	35								Total Depth 31.5' No Groundwater Encountered Backfilled with Spoils 7/19/04	
1480	40									
1475	45									
1470	50									
1465	55									
1460	60									

SAMPLE TYPES:
S SPT
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-14

Date 7-20-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1522' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1520				S1	3			SM	@ 2.5': Brown, moist, loose, silty SAND	
	5			R2	24	117.2	4.9		@ 5': Brown, moist, medium dense, silty SAND; slightly porous	
1515				S3	25		3.2		@ 7.5': Brown, slightly moist, medium dense, silty SAND	
	10			R4	37	118.7	1.7		@ 10': Brown, moist, medium dense, silty SAND	
1510				S5	21			ML	@ 12.5': Olive, moist, very stiff, sandy SILT	
	15			R6	79			SM	@ 15': Brown, moist, dense, silty SAND	
1505										
	20			S7	18			CL	@ 20': Olive, moist, stiff, silty CLAY	
1500										
	25			R8	35	114.8	15.6	ML	@ 25': Olive, moist, very stiff SILT with clay	
1495										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-14

Date 7-20-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1522' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			S9	21			ML	@ 30': Olive-brown, moist, stiff, sandy SILT	
1490										
	35								Total Depth 31.5' No Groundwater Encountered Backfilled with Spoils 7/20/04	
1485										
	40									
1480										
	45									
1475										
	50									
1470										
	55									
1465										
	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-15

Date 7-20-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1522' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1520			Bulk 1 @ 0-5'							
				S2	4		0.7	SM	@ 2.5': Light brown, dry, loose, silty SAND	
	5			R3	7				@ 5': Brown, moist, loose, silty SAND; slightly porous and root hairs	
1515				S4	21		6.4		@ 7.5': Brown, moist, medium dense, silty SAND; traces of carbonate stringers	
	10			R5	84	131.1	6.5		@ 10': Brown, moist, dense, silty SAND	
1510										
	15			S6	14				@ 15': Brown, moist, medium dense, silty SAND	
1505										
	20			R7	47	125.1	10.4		@ 20': Brown, moist, medium dense, silty SAND; slightly porous	
1500										
	25			S8	23			SC	@ 25': Red-brown, moist, medium dense, clayey SAND	
1495										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-15

Date 7-20-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1522' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1490	30			R9	48	126.5	6.3	SM	@ 30': Brown, moist, medium dense, silty SAND	
1485	35								Total Depth 31.5' No Groundwater Encountered Backfilled with Spoils 7/20/04	
1480	40									
1475	45									
1470	50									
1465	55									
	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-16

Date 7-20-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1522' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1520			Bulk 1 @ 0-5'	R2	9			SM	@ 2.5': Brown, moist, loose, silty SAND; traces of porosity	
	5			R3	7				@ 5': Brown, moist, loose, silty, coarse SAND	
1515				R4	30	114.4	7.4		@ 7.5': Brown, moist, medium dense, silty SAND; root hairs	
	10			S5	14				@ 10': Brown, moist, medium dense, silty SAND	
1510				R6	35				@ 12.5': Brown, moist, medium dense, silty SAND; slightly porous with silt lenses	
	15			S7	15				@ 15': Brown, moist, medium dense, silty SAND	
1505										
	20			R8	54			ML	@ 20': Brown, moist, hard, sandy SILT	
1500										
	25			S9	8			CL	@ 25': Olive, moist, stiff CLAY; traces of caliche nodules	
1495										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-16

Date 7-20-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1522' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R10	35	116.5	16.5	ML	@ 30': Olive, moist, very stiff SILT with clay	
1490										
	35								Total Depth 31.5' No Groundwater Encountered Backfilled with Spoils 7/20/04	
1485										
	40									
1480										
	45									
1475										
	50									
1470										
	55									
1465										
	60									

Logged By RM

Sampled By RM

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-17

Date 7-21-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1515' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1515	0								QUATERNARY ALLUVIUM (Qal)	
				R1	18	125.3	9.3	SC	@ 2.5': Brown, moist, medium dense, clayey SAND	
1510	5			S2	32				@ 5': Brown, slightly moist, medium dense, clayey SAND	
				R3	80	126.4	3.7		@ 7.5': Brown, slightly moist, dense, clayey SAND	
1505	10			S4	27			SM	@ 10': Light brown, dry to slightly moist, medium dense, silty SAND	
				R5	77				@ 12.5': Light brown, dry to slightly moist, dense, silty SAND; trace gravel	
1500	15			S6	25				@ 15': Light brown, dry, medium dense, silty, coarse SAND	
1495	20			R7	76/10"				@ 20': Light brown, dry, dense, silty SAND; traces of porosity	
1490	25			S8	43			SC	@ 25': Brown, slightly moist, dense, clayey SAND	
1485	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-17

Date 7-21-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1515' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By RM **Sampled By** RM	
1485	30			R9	77	127.4	2.5	SM	@ 30': Brown, dry to slightly moist, dense, silty, coarse SAND	
1480	35								Total Depth 31' No Groundwater Encountered Backfilled with Spoils 7/21/04	
1475	40									
1470	45									
1465	50									
1460	55									
1455	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-18

Date 7-21-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1515' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1515	0								QUATERNARY ALLUVIUM (Qal)	
			Bulk 1 @ 0-5'							
				R2	50	127.0	5.9	SM	@ 2.5': Brown, slightly moist, dense, silty SAND with clay; slightly porous	
1510	5			S3	16			SC	@ 5': Brown, moist, medium dense, clayey SAND	
				R4	22			SM	@ 7.5': Brown, moist, medium dense, silty, fine SAND	
1505	10			S5	4				@ 10': Brown, moist, loose, silty SAND	
				R6	37	114.3	5.2		@ 12.5': Brown, moist, medium dense, silty SAND; slightly porous	
1500	15			S7	19				@ 15': Brown, dry, medium dense, coarse SAND with silt	
									@ 16': Brown, moist, medium dense, silty SAND	
1495	20			R9	55	124.7	8.9	SC	@ 20': Red-brown, moist, dense, clayey SAND	
1490	25			S10	23			SM	@ 25': Brown, moist, medium dense, silty SAND	
1485	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-18

Date 7-21-04 **Sheet** 2 **of** 2
Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001
Drilling Co. 2R Drilling **Type of Rig** CME-55
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1515' **Location** See Map

Logged By RM
Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1485	30			R11	69			SM	@ 30': Brown, moist, dense, silty SAND	
1480	35			S12	21				@ 35': Brown, moist, medium dense, silty SAND; trace clay	
1475	40			R13	60	122.0	14.4	CL	@ 40': Red-brown, moist, hard, sandy CLAY; slightly porous	
1470	45								Refusal @ 41.5' No Groundwater Encountered Backfilled with Spoils 7/21/04	
1465	50									
1460	55									
1455	60									

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-19

Date 7-21-04 **Sheet** 1 of 1

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1510	0		Bulk 1 @ 0-5'						QUATERNARY ALLUVIUM (Qal)	
				S2	5			ML	@ 2.5': Brown, moist to very moist, firm, sandy SILT	
1505	5			R3	92	125.1	11.9	SC	@ 5': Red-brown, moist, very dense, clayey SAND	
				S4	21			SM/ML	@ 7.5': Brown, moist, medium dense to stiff, silty SAND to sandy SILT	
1500	10			R5	23	106.2	21.9	ML	@ 10': Brown, moist to very moist, very stiff, sandy SILT	
				S6	19			SM	@ 12.5': Brown, moist, medium dense, silty, coarse SAND	
1495	15			R7	29				@ 15': Brown, moist, medium dense, silty, coarse SAND; trace gravel	
1490	20			S8	14			CL	@ 20': Red-brown, moist, stiff, sandy CLAY	
	25			R9	50/3"	131.0	10.3		@ 25': Red-brown, moist, very hard, sandy CLAY	
1485				S10	48			SC	@ 26': Brown, moist, dense, clayey SAND	
	30								Refusal @ 27.5' No Groundwater Encountered Backfilled with Spoils 7/21/04	

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-20

Date 7-21-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1510	0		Bulk 1 @ 0-5'						QUATERNARY ALLUVIUM (Qal)	
				S2	4			SM	@ 2.5': Brown, moist, loose, silty SAND	
1505	5			R3	7	112.4	4.7		@ 5': Brown, moist, loose, silty SAND	
				S4	12			CL-ML	@ 7.5': Olive, moist, stiff, silty CLAY	
	10			R5	54			ML	@ 10': Olive, moist, hard SILT; traces of porosity	
1500								CL	@ 11': Olive, moist, stiff CLAY	
				S6	17				@ 12.5': Olive, moist, stiff CLAY with carbonate streaks	
1495	15			R7	58	108.1	15.4		@ 15': Olive, moist, hard CLAY with carbonate streaks and traces of porosity	
	20			S8	5				@ 20': Olive-white, very moist, firm CLAY with caliche nodules	
1490				R9	19				@ 21': Olive-white, very moist, stiff CLAY; caliche nodules	
1485	25			R10	23	109.9	17.9		@ 25': Olive, moist, stiff, sandy CLAY; caliche nodules	
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-20

Date 7-21-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1480	30			S11	15			ML	@ 30': Olive, moist, stiff, sandy SILT	
	35			R12	61	119.3	12.4	SM	@ 34': Brown, moist, dense, silty SAND	
1475								CL	@ 35': Olive-brown, moist, hard CLAY	
1470	40								Total Depth 35.5' No Groundwater Encountered Backfilled with Spoils 7/21/04	
1465	45									
1460	50									
1455	55									
	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
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- EI EXPANSION INDEX
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- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-21

Date 7-21-04 **Sheet** 1 **of** 1

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1504' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1500				S1	13			ML	@ 2.5': Brown, dry to slightly moist, stiff, sandy SILT; trace porosity	
	5			R2	77	93.3	12.0		@ 5': Olive-brown, dry to slightly moist, hard, sandy SILT; traces of root hairs	
1495				S3	24				@ 7.5': Olive-brown, dry to slightly moist, stiff, sandy SILT	
	10			R4	50/3"	105.9	11.2		@ 10': Olive-brown, slightly moist to moist, hard, sandy SILT	
1490				S5	8				@ 12.5': Olive-brown, moist, stiff, sandy SILT	
	15			R6	37	116.8	7.0	SM	@ 15': Olive-brown, moist, medium dense, silty SAND	
1485										
	20			S7	10			SC/CL	@ 20': Olive, moist, stiff, clayey SAND to sandy CLAY	
1480										
	25			R8	50/5"			SM	@ 25': Orange-brown, moist, dense, silty SAND	
1475				R9	53	118.1	13.0	CL	@ 28': Olive, moist, hard, sandy CLAY	
	30								Refusal @ 29.5', No GW, BF w/ Spoils 7/21/04	

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
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- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-22

Date 7-20-04 **Sheet** 1 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1500' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1500	0								QUATERNARY ALLUVIUM (Qal)	
			Bulk 1 @ 0-5'							
				R2	37	110.3	10.4	ML	@ 2.5': Olive-brown, moist, very stiff, sandy SILT; white streaks	
1495	5			S3	10			MH	@ 5': Olive-brown, moist, stiff, elastic SILT	
				R4	84	85.3	26.2	ML	@ 7.5': Olive-brown, moist, hard SILT	
1490	10			S5	15				@ 10': Olive-brown, moist, stiff SILT	
				R6	27				@ 12.5': Olive-brown, very moist, very stiff SILT	
1485	15			S7	8			CL	@ 15': Olive, very moist, stiff, silty CLAY	
				R8	67			ML	@ 17.5': Olive, very moist, hard SILT	
1480	20			S9	20				@ 20': Olive, moist, very stiff SILT	
				R10	48	120.7	11.7	SM	@ 22.5': Olive, moist, medium dense, silty SAND with clay layers	
1475	25			S11	18			ML	@ 25': Olive, moist, very stiff SILT with clay	
1470	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-22

Date 7-20-04 **Sheet** 2 **of** 2

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1500' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By RM; Sampled By RM)	Type of Tests
1470	30			R12	35			ML	@ 30': Olive, moist, very stiff SILT with clay	
1465	35			S13	8			CL-ML	@ 35': Olive, moist, stiff, silty CLAY	
1460	40			R14	29	99.7	18.1	CL	@ 40': Olive, very moist, very stiff CLAY	
1455	45			S15	33			SP/SM	@ 45': Olive-brown, moist, dense SAND with silt	
1450	50								Refusal @ 46.5' No Groundwater Encountered Backfilled with Spoils 7/21/04	
1445	55									
1440	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-23

Date 7-20-04 **Sheet** 1 **of** 1

Project Highland Fairview Properties-Moreno Valley Field Station **Project No.** 111280-001

Drilling Co. 2R Drilling **Type of Rig** CME-55

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Logged By RM

Sampled By RM

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1510	0		Bulk 1 @ 0-5'						QUATERNARY ALLUVIUM (Qal)	
				S2	4		5.8	SM	@ 2.5': Brown, dry to slightly moist, loose, silty SAND; root hairs	
1505	5			R3	62	111.2	7.9	ML	@ 5': Light brown, dry, hard, sandy SILT; traces of porosity	
				S4	24				@ 7.5': Light brown with olive, dry to slightly moist, very stiff, sandy SILT	
1500	10			R5	50/5"	125.3	7.5		@ 10': Light brown-olive, slightly moist, hard, sandy SILT; traces of porosity and cementation	
				S6	44			SM	@ 12.5': Orange-brown, moist, dense, silty SAND	
1495	15			R7	50/5"				@ 15': Red-brown, moist, dense, silty, fine SAND	
1490	20			S8	25				@ 20': Red-brown, moist, medium dense, silty SAND	
1485	25			R9	78				@ 25': Red-brown, moist, dense, silty SAND	
	30								Total Depth 26.5' No Groundwater Encountered Backfilled with Spoils 7/20/04	

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-24

Date 7-6-05 **Sheet** 1 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
1510	0							ML	QUATERNARY ALLUVIUM (Qal)	
				R1	36	126.4	7.4		@ 2.5': Light gray, moist, very stiff SILT with sand	
	5			R2	36	128.1	5.7	SM	@ 5': Gray, moist, medium dense, silty SAND	MD, RDS
1505			Bulk 4 @ 0-10'							
				R3	14	114.5	6.9		@ 7.5': Gray, moist, loose, silty SAND	DS
	10			R5	15	106.2	4.9		@ 10': Brown, slighty moist, loose, silty SAND	CN
1500										
	15			S6	12			SP	@ 15': Light brown, moist, medium dense, poorly graded SAND	
1495										
	20			R7	40	130.9	1.0		@ 20': Light orange, dry, medium dense, poorly graded SAND	
1490										
	25			S8	27			CL	@ 25': Light brown, moist, very stiff, sandy CLAY	
1485	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-24

Date 7-6-05 **Sheet** 2 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By DB **Sampled By** DB	
1480	30		Bulk 10 @ 30-35'	R9	76	131.6	5.9	SM	@ 30': Brown, moist, dense, silty SAND	
1475	35			S11	24			SP-SM	@ 35': Gray, slightly moist, medium dense, poorly graded SAND with silt	
1470	40								Total Depth 36.5' No Groundwater Encountered Backfilled with Spoils 7/6/05	
1465	45									
1460	50									
1455	55									
	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-25

Date 7-6-05 **Sheet** 1 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1524' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	0							ML	QUATERNARY ALLUVIUM (Qal)	
				R1	31	125.4	8.2		@ 2.5': Brown, moist, very stiff SILT with gravel	
1520	5			R2	17	121.7	8.2		@ 5': Brown, moist, stiff, sandy SILT	-200/52
			Bulk 4 @ 0-10'							RV, CS
				R3	27	122.5	9.1	SM	@ 7.5': Brown, moist, medium dense, silty SAND	-200/44
1515	10			R5	30	115.5	14.0	ML	@ 10': Brown, moist, very stiff, clayey SILT	
1510										
	15			S6	10			SC	@ 15': Brown, moist, loose, clayey SAND	
1505										
	20			R7	50/5"	127.7	10.3		@ 20': Brown, moist, dense, clayey SAND	-200/48
1500										
	25			S8	18				@ 25': Brown, moist, medium dense, clayey SAND	
1495	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-25

Date 7-6-05 **Sheet** 2 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1524' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	30			R9	71	128.8	4.3	SP	@ 30': Gray, slightly moist, dense, poorly graded SAND	
1490										
	35			S10	17			SM	@ 35': Gray, slightly moist, medium dense, silty SAND	-200/40
1485										
	40			R11	74	120.0	4.0		@ 40': Gray, slightly moist, dense, silty SAND	
1480										
	45			S12	27				@ 45': Light gray, dry, dense, silty SAND	
1475										
	50			R13	50/5"	120.7	14.7		@ 50': Brown, moist, very dense, silty SAND	-200/33
1470									Total Depth 50. 9' No Groundwater Encountered Backfilled with Spoils 7/6/05	
	55									
1465										
	60									

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-26

Date 7-6-05 **Sheet** 1 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1514' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	0							SC	QUATERNARY ALLUVIUM (Qal)	
				R2	42	108.6	9.7		@ 2.5': Brown, moist, medium dense, clayey SAND	
1510	5			R3	24	97.5	23.9	CH	@ 5': Olive-gray, moist, stiff, fat CLAY	EI
			Bulk 1 @ 0-15'	R4	32	99.3	24.4		@ 7.5': Olive-gray, moist, very stiff, fat CLAY	
1505	10			R5	26	96.9	26.2		@ 10': Olive-gray, moist, stiff, fat CLAY	
1500	15			S6	14			ML	@ 15': Olive-gray, moist, stiff, lean SILT	AL
1495	20			R7	10	82.4	28.0	CH	@ 20': Brown, moist, medium stiff, fat CLAY	
1490	25			S8	19			ML	@ 25': Brown, moist, very stiff, clayey, sandy SILT	
1485	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-26

Date 7-6-05 **Sheet** 2 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1514' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R9	52/6"	118.1	15.5	CH	@ 30': Olive-gray, moist, hard, fat CLAY	
1480	35								Total Depth 31' No Groundwater Encountered Backfilled with Spoils 7/6/05	
1475	40									
1470	45									
1465	50									
1460	55									
1455	60									

Logged By DB

Sampled By DB

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-27

Date 7-6-05 **Sheet** 1 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1500' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
1500	0							CL	QUATERNARY ALLUVIUM (Qal)	
				R2	37	108.6	13.2		@ 2.5': Brown, moist, very stiff, sandy CLAY	
1495	5		Bulk 1 @ 0-10'	R3	42	112.1	17.2		@ 5': Brown, moist, very stiff, lean CLAY with sand	-200/96
				R4	18	89.8	32.5	CH	@ 7.5': Gray, very moist, stiff, fat CLAY	DS, AL
1490	10			R5	35	93.6	28.8	CL-CH	@ 10': Gray, moist, very stiff, lean CLAY to fat CLAY	
1485	15			S6	15			CL	@ 15': Olive-gray, moist, stiff, sandy CLAY	
1480	20			R7	10	80.5	36.4		@ 20': Brown, very moist, stiff, silty CLAY	-200/92
1475	25			S8	11			CH	@ 25': Brown, moist, stiff, fat CLAY	
1470	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-27

Date 7-6-05 **Sheet** 2 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1500' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
1470	30			R9	12	69.5	49.6	CH	@ 30': Brown, wet, medium stiff, fat CLAY	-200/88
1465	35			S10	24			ML	@ 35': Brown, moist, very stiff, sandy SILT	-200/70
1460	40			R11	23	108.8	20.6	SM	@ 40': Brown, very moist, medium dense, silty SAND	-200/39
1455	45			S12	21			CL	@ 45': Olive-gray, moist, very stiff, sandy CLAY	
1450	50			R13	43	94.4	30.9	CH	@ 50': Olive-gray, moist, very stiff, fat CLAY	
1445	55								Total Depth 51.5' No Groundwater Encountered Backfilled with Spoils 7/6/05	
1440	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-28

Date 7-6-05 **Sheet** 1 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1514' **Location** See Map

Logged By DB

Sampled By DB

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							ML	QUATERNARY ALLUVIUM (Qal)	
			Bulk 1 @ 0-5'							
				R2	22	111.1	8.4		@ 2.5': Brown, moist, stiff, sandy SILT	
1510										
	5			R3	14	119.6	14.7		@ 5': Brown, moist, stiff, sandy SILT	CN
				R4	21	108.5	18.2		@ 7.5': Brown, moist, stiff, sandy, clayey SILT	
1505										
	10			R5	28	103.6	22.1		@ 10'; Brown, moist, very stiff, sandy SILT	
1500										
	15			S6	10			CL	@ 15': Brown, moist, stiff, sandy, silty CLAY	
1495										
	20			R7	20	98.2	24.9	CH	@ 20': Brown, moist, stiff, fat CLAY	
1490										
	25			S8	15			ML	@ 25': Gray, moist, stiff, sandy SILT	
1485										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-28

Date 7-6-05 **Sheet** 2 **of** 2
Project Highland Fairview - Aquabella **Project No.** 111280-005
Drilling Co. Redman **Type of Rig** CME-75
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1514' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			R9	46	117.7	15.0	CL	@ 30': Brown, moist, very stiff, sandy CLAY	
1480	35								Total Depth 31.5' No Groundwater Encountered Backfilled with Spoils 7/6/05	
1475	40									
1470	45									
1465	50									
1460	55									
1455	60									

Logged By DB
Sampled By DB

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-29

Date 7-12-05 **Sheet** 1 **of** 1
Project Highland Fairview - Aquabella **Project No.** 111280-005
Drilling Co. Redman **Type of Rig** CME-75
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1542' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1540								CH		
				R2	42/2"				@ 2.5': No sample recovery	
	5			R3	50	103.4	21.6		@ 5': Olive-gray, moist, very stiff, fat clay	
1535										
				R4	44	95.3	25.2	CL	@ 7.5': Brown, moist, very stiff, sandy CLAY	
	10			R5	35	97.9	26.2		@ 10': Brown-olive gray, moist, very stiff, sandy CLAY	
1530			Bulk 1 @ 5-15'							EI
	15			S6	12				@ 15': Brown, moist, stiff, silty CLAY	
1525										
	20			R7	30	92.3	29.8	CH	@ 20': Brown, moist, very stiff, fat CLAY	
1520										
	25								Total Depth 21.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
1515										
	30									

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-30

Date 7-12-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1524' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
								ML		
				R2	39	114.0	13.6		@ 2.5': Brown, moist, very stiff, sandy SILT	
1520										
	5			R3	58	113.6	12.6		@ 5': Brown, moist, very stiff, sandy, clayey SILT	
			Bulk 1 @ 5-10'							SA
				R4	51	114.4	14.2		@ 7.5': Brown, moist, very stiff, lean SILT	
1515										
	10			R5	18	115.7	10.6		@ 10': Brown, moist, stiff, lean SILT	HCO
1510										
	15			S6	17			CL	@ 15': Brown, moist, very stiff, sandy, silty CLAY	
1505										
	20								Total Depth 16.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
1500										
	25									
1495										
	30									

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-31

Date 7-12-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1511' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
1510	0							SM	QUATERNARY ALLUVIUM (Qal)	
				R2	24	119.5	3.6		@ 2.5': Brown, dry, medium dense, silty SAND	
1505	5			R3	27	114.5	5.2		@ 5': Brown, slightly moist, medium dense, silty SAND	
				R4	25	103.6	21.8	CL	@ 7.5': Brown, moist, stiff, sandy, silty CLAY	
1500	10			R5	35				@ 10': Brown to olive gray, moist, very stiff, sandy, silty CLAY	
1495	15			S6	9				@ 15': Brown, moist, stiff CLAY	
1490	20								Total Depth 16.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
1485	25									
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-32

Date 7-12-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1519' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	0							SM	QUATERNARY ALLUVIUM (Qal)	
				R2	26	114.4	2.8		@ 2.5': Light brown, dry, medium dense, silty SAND	
1515	5			R3	16	105.0	1.7		@ 5': Brown, dry, loose, silty SAND	
			Bulk 1 @ 5-10'							SA
				R4	10	114.1	3.6		@ 7.5': Dark brown, dry, loose, silty SAND	
1510	10			R5	26	122.6	7.8	SC	@ 10': Brown, moist, medium dense, clayey SAND	
1505	15			S6	19			CL	@ 15': Brown, moist, very stiff, sandy CLAY	
1500	20								Total Depth 16.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
1495	25									
1490	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-33

Date 7-12-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1512' **Location** See Map

Logged By DB

Sampled By DB

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1510	0							ML	QUATERNARY ALLUVIUM (Qal)	
				R2	50	115.7	4.7		@ 2.5': Brown, slightly moist, very stiff, sandy SILT	
	5			R3	29	119.9	5.6	SM	@ 5': Brown, slightly moist, medium dense, silty SAND	
1505				R4	36	108.0	19.9	CL	@ 7.5': Olive-gray, moist, very stiff, sandy CLAY	
	10			R5	26	107.2	18.8	SC	@ 10': Brown, moist, medium dense, clayey SAND	
1500										
	15			S6	7			(CH)s	@ 15': Brown, moist, medium stiff, fat CLAY with sand	
1495										
	20								Total Depth 16.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
1490										
	25									
1485										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-34

Date 7-12-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1506' **Location** See Map

Logged By DB

Sampled By DB

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
1505								SM		
				R2	49	121.3	7.2		@ 2.5': Brown, moist, medium dense, silty SAND	
	5			R3	14	104.4	4.6	SP	@ 5': Brown, slightly moist, loose, poorly graded SAND	HCO
1500				R4	22	111.4	5.7	SM	@ 7.5': Brown, moist, medium dense, silty SAND	
	10			R5	32	106.3	8.5		@ 10': Brown, moist, medium dense, silty SAND	
1495										
	15			S6	24				@ 15': Brown, moist, medium dense, silty SAND with little clay	
1490										
	20			R7	44	124.9	12.6	ML	@ 20': Dark brown, moist, very stiff, sandy SILT	
1485										
	25			S8	28			CL	@ 25': Orange-brown, moist, very stiff, sandy CLAY	
1480										
									Total Depth 26.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-35

Date 7-12-05 **Sheet** 1 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1533' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
								SM		
1530				R2	11	120.9	11.0		@ 2.5': Brown, moist, loose, silty SAND	
	5			R3	10	111.6	8.7		@ 5': Brown, moist, loose, silty SAND	
1525				R4	20	115.7	5.9		@ 7.5': Brown, moist, medium dense, silty SAND	
	10			R5	30	116.3	6.7		@ 10': Brown, moist, medium dense, silty SAND	
1520										
	15			S6	12				@ 15': Brown, moist, medium dense, silty SAND	
1515										
	20			R7	49	125.1	5.2		@ 20': Brown, moist, medium dense, silty SAND	
1510										
	25			S8	20			(CL)s	@ 25': Gray, moist, very stiff, sandy CLAY	
1505										
	30									

SAMPLE TYPES:
- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-35

Date 7-12-05 **Sheet** 2 **of** 2

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1533' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
									Logged By DB **Sampled By** DB	
	30			R9	23	101.8	23.3	(CL)s	@ 30': Brown, moist, stiff, sandy CLAY	
1500										
	35			S10	32			SM	@ 35': Brown, moist, dense, silty SAND with clay	
1495										
	40								Total Depth 36.5' No Groundwater Encountered Backfilled with Spoils 7/12/05	
1490										
	45									
1485										
	50									
1480										
	55									
1475										
	60									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-36

Date 7-13-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1527' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB; Sampled By DB)	Type of Tests
1525	0							SM	QUATERNARY ALLUVIUM (Qal)	
				R2	32	113.7	4.5		@ 2.5': Light brown, slightly moist, medium dense, silty SAND	
	5			R3	33	108.2	3.2		@ 5': Light brown, dry, medium dense, silty SAND	
1520				R4	16	97.2	3.1	SP	@ 7.5': Brown, dry, loose, poorly graded SAND	
	10			R5	32	108.8	3.7		@ 10': Brown, slightly moist, medium dense, poorly graded SAND	
1515										
	15			S6	29				@ 15': Brown, moist, dense, poorly graded SAND	
1510										
	20								Total Depth 16.5' No Groundwater Encountered Backfilled with Spoils 7/13/05	
1505										
	25									
1500										
	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-37

Date 7-13-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1534' **Location** See Map

Logged By DB

Sampled By DB

Elevation Feet	Depth Feet	Graphic Log (N–S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							ML	QUATERNARY ALLUVIUM (Qal)	
1530				R2	36	119.3	6.4		@ 2.5': Light brown, moist, very stiff, sandy SILT	
	5			R3	16	114.5	4.6	SM	@ 5': Brown, slightly moist, loose, silty SAND	
				R4	13	110.7	3.7	SP-SM	@ 7.5': Brown, slightly moist, loose, silty SAND; poorly graded	
1525	10			R5	44	116.4	14.3	SM	@ 10': Brown, moist, medium dense, silty SAND with clay	
1520										
	15			S6	27			SP	@ 15': Brown, moist, dense, poorly graded SAND	
1515										
	20			R7	50/4"	124.3	8.2	SM	@ 20': Dark brown, moist, very dense, silty SAND	
1510										
	25								Total Depth 20.8' No Groundwater Encountered Backfilled with Spoils 7/13/05	
1505	30									

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-38

Date 7-13-05 **Sheet** 1 **of** 1
Project Highland Fairview - Aquabella **Project No.** 111280-005
Drilling Co. Redman **Type of Rig** CME-75
Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"
Elevation Top of Hole +/- 1544' **Location** See Map

Elevation Feet	Depth Feet	Graphic Log (N S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION (Logged By DB, Sampled By DB)	Type of Tests
	0								QUATERNARY ALLUVIUM (Qal)	
								ML		
				R2	64	122.2	6.7		@ 2.5': Brown, moist, very stiff, sandy SILT	
1540										
	5			R3	20	116.2	6.3	SM	@ 5': Dark brown, moist, medium dense, silty SAND	
				R4	12	112.5	4.8	SP	@ 7.5': Light brown, slightly moist, loose, poorly graded SAND	HCO
1535										
	10			R5	26	109.9	7.5	SM	@ 10': Brown, moist, medium dense, silty SAND	
1530										
	15			S6	31				@ 15': Light brown, moist, dense, silty SAND	
1525										
	20			R7	37	123.9	12.2	ML	@ 20': Dark brown, moist, very stiff, sandy SILT with clay	
1520										
	25			S8	20			SC	@ 25': Dark brown, moist, very stiff, clayey SAND	
1515	30								Total Depth 26.5' No Groundwater Encountered Backfilled with Spoils 7/13/05	

SAMPLE TYPES:
S SPT
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:
SU SULFATE
DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
HCO HYDROCOLLAPSE
HD HYDROMETER
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE
CS CORROSION SUITE
MC MOISTURE CONTENT
SE SAND EQUIVALENT
-200 200 WASH
RDS Remolded DS

LEIGHTON

GEOTECHNICAL BORING LOG B-39

Date 7-13-05 **Sheet** 1 **of** 1

Project Highland Fairview - Aquabella **Project No.** 111280-005

Drilling Co. Redman **Type of Rig** CME-75

Hole Diameter 8" **Drive Weight** 140 lbs **Drop** 30"

Elevation Top of Hole +/- 1551' **Location** See Map

Logged By DB

Sampled By DB

Elevation Feet	Depth Feet	Graphic Log (N / S)	Notes	Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
1550	0							SM	QUATERNARY ALLUVIUM (Qal)	
				R2	53	123.7	3.1		@ 2.5': Light brown, dry, dense, silty SAND	
1545	5			R3	20	113.9	2.3		@ 5': Brown, dry, medium dense, silty SAND	
				R4	19	114.7	3.1	SP	@ 7.5': Brown, dry, medium dense, poorly graded SAND	
1540	10			R5	20	100.1	4.2	SP-SM	@ 10': Brown, slightly moist, medium dense, poorly graded SAND with silt	HCO
1535	15			S6	20			SM	@ 15': Brown, moist, medium dense, silty SAND	
1530	20			R7	39	120.9	13.7	ML	@ 20': Brown, moist, very stiff, sandy SILT	
1525	25			S8	17			SM	@ 25': Brown, moist, medium dense, silty SAND with clay	
	30								Total Depth 26.5' No Groundwater Encountered Backfilled with Spoils 7/13/05	

SAMPLE TYPES:

- S SPT
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:

- SU SULFATE
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- HCO HYDROCOLLAPSE
- HD HYDROMETER
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE
- CS CORROSION SUITE
- MC MOISTURE CONTENT
- SE SAND EQUIVALENT
- -200 200 WASH
- RDS Remolded DS

LEIGHTON

LOG OF TRENCH: TP-1

Project Name: Aqua Bella Logged by: DB

Project Number: 111280 005 Elevation: 1556 feet

Equipment: Case 580 Backhoe Location/Grid: See map

GEOLOGIC ATTITUDES	DATE: July 19, 2005 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL					
	@ 0 – 1 feet, grey, dry, hard, Silty SAND.	Afu	SM			
	QUATERNARY ALLUVIUM	Qal				
	@ 1 – 3 feet, Alluvium, Grey, dry, medium stiff, Sandy SILT .		ML			
	@ 3 – 7 feet, Grey, moist, loose to medium dense, SAND with silt.		SM	B-1		
	@ 7 – 9 feet, Grey, wet, medium dense, Clayey SAND.		SC	B-2		
	@ 9 – 14 feet, Grey, wet, medium dense, Silty SAND with clay.		SM	B-3		

GRAPHICAL REPRESENTATION: SCALE: 1 in = 5 feet SURFACE SLOPE: 5^0 TREND: N135^{0}W

Total Depth: 14 Feet
No Ground Water Encountered
Backfilled: July 19, 2005

LOG OF TRENCH: TP-2

Project Name: Aqua Bella		Logged by: DB		ENGINEERING PROPERTIES			
Project Number: 111280 005		Elevation: 1548 feet					
Equipment: Case 580 Backhoe		Location/Grid: See map					
GEOLOGIC ATTITUDES	DATE: July 19, 2005 DESCRIPTION:		GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	QUATERNARY ALLUVIUM		Qal				
	@ 0 – 5 feet, Brown, dry, dense, Silty SAND.			SM			
	@ 5 – 8 feet, Brown, dry, medium dense, Silty SAND.			SM	B-1		
	@ 8 – 15 feet, Brown to Grey, moist, medium dense, Silty SAND.			SM	B-2		

GRAPHICAL REPRESENTATION: SCALE: 1 in = 5 feet SURFACE SLOPE: 0^0 TREND: $N95^0W$

Total Depth: 15 Feet
No Ground Water Encountered
Backfilled: July 19, 2005

LOG OF TRENCH: TP-3

Project Name: Aqua Bella | Logged by: DB

Project Number: 111280 005 | Elevation: 1550 feet

Equipment: Case 580 Backhoe | Location/Grid: See map

GEOLOGIC ATTITUDES	DATE: July 19, 2005 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moisture (%)	Density (pcf)
	QUATERNARY ALLUVIUM	Qal				
	@ 0 – 5 feet, Grey, dry, stiff, Sandy SILT.		ML	B-1		
	@ 5 – 7 feet, Grey, moist, dense, Silty SAND.		SM			
	@ 7 – 8 feet, Grey, moist, dense, poorly graded SAND with SILT.		SP-SM	B-2		
	@ 8 – 13 feet, Grey, moist, dense, Silty SAND.		SM			
	@ 13 – 16 feet, Grey, moist, medium dense, poorly graded SAND with SILT.		SP-SM	B-3		

GRAPHICAL REPRESENTATION: SCALE: 1 in = 5 feet SURFACE SLOPE: 5^0 TREND: $N30^0W$

Total Depth: 16 Feet
No Ground Water Encountered
Backfilled: July 19, 2005

LOG OF TRENCH: TP-4

Project Name: Aqua Bella | Logged by: DB

Project Number: 111280 005 | Elevation: 1550 feet

Equipment: Case 580 Backhoe | Location/Grid: See map

GEOLOGIC ATTITUDES	DATE: July 19, 2005 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moisture (%)	Density (pcf)
	QUATERNARY ALLUVIUM	Qal				
	@ 0 – 5 feet, Brown, dry, medium dense, Silty SAND.		SM	B-1		
	@ 5 – 13 feet, Brown, moist, dense, Silty SAND.		SM	B-2		
	@ 13 – 15 feet, Brown, moist, medium dense, Clayey SAND.		SC	B-3		

GRAPHICAL REPRESENTATION: SCALE: 1 in = 5 feet SURFACE SLOPE: 5^0 TREND: $N0^0W$

Total Depth: 15 Feet
No Ground Water Encountered
Backfilled: July 19, 2005

LOG OF TRENCH: TP-5

Project Name: Aqua Bella Logged by: DB

Project Number: 111280 005 Elevation: 1545 feet

Equipment: Case 580 Backhoe Location/Grid: See map

GEOLOGIC ATTITUDES	DATE: July 19, 2005 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES: USCS	Sample No.	Moisture (%)	Density (pcf)
	QUATERNARY ALLUVIUM	Qal				
	@ 0 – 3 feet, Grey, dry, stiff, Sandy SILT.		ML	B-1		
	@ 3 – 5 feet, Grey, dry, dense, Silty SAND.		SM			
	@ 5 – 8 feet, Grey, moist, medium dense, Silty SAND.		SM			
	@ 8 – 13 feet, Grey, slightly moist, dense, Silty SAND.		SM			
	@ 13 – 15 feet, Grey, moist, loose, SAND with SILT.		SP-SM	B-2		

GRAPHICAL REPRESENTATION: SCALE: 1 in = 5 feet SURFACE SLOPE: 5^0 TREND: $N90^0W$

Total Depth: 15 Feet
No Ground Water Encountered
Backfilled: July 19, 2005

APPENDIX D

PREVIOUS LABAROTORY TEST DATA (LEIGHTON, 2005)

APPENDIX E

Laboratory Testing Procedures and Test Results (This Study)

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed, in general accordance with ASTM test method D2937, on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs.

Classification or Grain Size Tests: Representative materials were subjected to mechanical grain-size analysis by sieving from U.S. Standard brass screens (ASTM Test Method D422). The data was evaluated in determining the classification of the materials. The grain-size distribution curves and soil classifications per the Unified Soil Classification System (USCS) are presented in this appendix.

Percent Passing No. 200 Sieve: Selected samples were tested in accordance with the ASTM Standard D1140 to determine the amounts of materials finer than the U.S. Standard Sieve No. 200. Test results are presented in this appendix.

Atterberg Limits: The Atterberg Limits were determined in accordance with ASTM Test Method D4318 for engineering classification of the representative fine-grained materials. Test results are presented in this appendix.

Maximum Density Tests: The maximum dry density and optimum moisture content of representative bulk samples of onsite soils were determined in accordance with ASTM Test Method D1557. Test results and dry density vs. moisture curves are presented in this appendix.

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Test, ASTM D4829. Specimens were molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimens were loaded to an equivalent 144 psf surcharge and inundated with tap water until volumetric equilibrium was reached. Test results are presented in this appendix.

Hydrocollapse Tests: Hydrocollapse tests were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent hydrocollapse for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The hydrocollapse vs. pressure curves are presented in this appendix. Test results are presented in this appendix.

Direct Shear Tests: Direct shear tests were performed on selected remolded and relatively undisturbed samples which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the

Laboratory Testing Procedures and Test Results (Cont'd)

sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.05 inches per minute. The test results and presented in this appendix.

Consolidation Tests: Consolidation tests were performed on selected, relatively undisturbed ring samples in general accordance with ASTM D 2435. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. Test results and the consolidation pressure curves are presented in this appendix.

R-Value Tests: Tests for resistance R-value were performed, in general accordance with California Standard Test Method No. 301, on representative bulk samples obtained from exploratory borings. Test results and the graphically determined R-value at exudation pressure of 300 psi are presented in this appendix.

Soluble Sulfates Content, Chloride Content, Minimum Resistivity and pH Tests: The soluble sulfate contents of selected samples were determined by standard geochemical methods, California Test Method 417. Chloride content, Minimum resistivity and pH tests were performed in general accordance with California Test Methods 422, 532 and 643, respectively. The results are presented in this appendix.

Boring No.	B-25	B-25	B-25	B-25	B-25	B-27	B-27	B-27
Sample No.	R-2	R-3	R-7	S-10	R-13	R-3	R-7	R-9
Depth (ft.)	5	7.5	20	35	50	5	20	30
Sample Type	RING	RING	RING	SPT	RING	RING	RING	RING
Visual Soil Classification	s(ML)	SM	SM	SM	SM	CL	ML	ML
Moisture Correction								
Wet Weight of Soil + Container (gm.)	219.6	220.3	240.7	291.7	254.9	227.2	231.7	231.1
Dry Weight of Soil + Container (gm.)	208.6	206.9	226.2	273.9	241.8	203.3	201.4	181.7
Weight of Container (gm)	113.3	83.9	86.6	87.5	84.8	85.3	117.9	81.4
Moisture Content (%)	11.5	10.9	10.4	9.5	8.3	20.3	36.3	49.3
Container No.:	R	T	P	B-25	D	E	S	C
Sample Dry Weight Determination								
Weight of Sample + Container (gm.)	219.6	220.3	240.7	291.7	254.9	227.2	231.7	231.1
Weight of Container (gm.)	113.3	83.9	86.6	87.5	84.8	85.3	117.9	81.4
Weight of Dry Sample (gm.)	95.3	123.0	139.6	186.4	157.0	118.0	83.5	100.3
Container No.:	R	T	P	B-25	D	E	S	C
After Wash								
Dry Weight of Sample + Container (gm)	159.1	152.8	159.0	198.5	189.9	89.6	124.8	93.7
Weight of Container (gm)	113.3	83.9	86.6	87.5	84.8	85.3	117.9	81.4
Dry Weight of Sample (gm)	45.8	68.9	72.4	111.0	105.1	4.3	6.9	12.3
% Passing No. 200 Sieve	**52**	**44**	**48**	**40**	**33**	**96**	**92**	**88**
% Retained No. 200 Sieve	48	56	52	60	67	4	8	12

PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Leighton and Associates, Inc.

Project Name: AQUA BELLA
Project No.: 111280-005
Client Name:
Tested By: JMD Date: 8/1/05

Rev. 08-04

x200 Wash 1

Boring No.	B-27	B-27						
Sample No.	S-10	R-11						
Depth (ft.)	35	40						
Sample Type	SPT	RING						
Visual Soil Classification	s(ML)	SM						
Moisture Correction								
Wet Weight of Soil + Container (gm.)	460.1	488.5						
Dry Weight of Soil + Container (gm.)	419.8	452.7						
Weight of Container (gm)	215.0	230.4						
Moisture Content (%)	19.7	16.1						
Container No.:	EF	AP						
Sample Dry Weight Determination								
Weight of Sample + Container (gm.)	460.1	488.5						
Weight of Container (gm.)	215.0	230.4						
Weight of Dry Sample (gm.)	204.8	222.3						
Container No.:	EF	AP						
After Wash								
Dry Weight of Sample + Container (gm)	277.2	366.8						
Weight of Container (gm)	215.0	230.4						
Dry Weight of Sample (gm)	62.2	136.4						
% Passing No. 200 Sieve	**70**	**39**						
% Retained No. 200 Sieve	30	61						

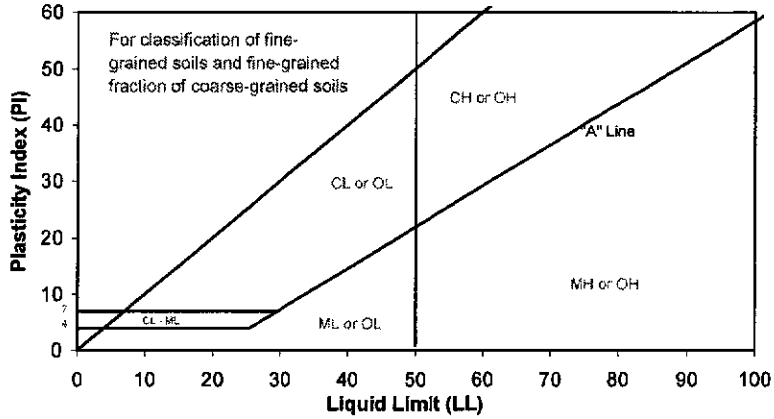
PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Leighton and Associates, Inc.

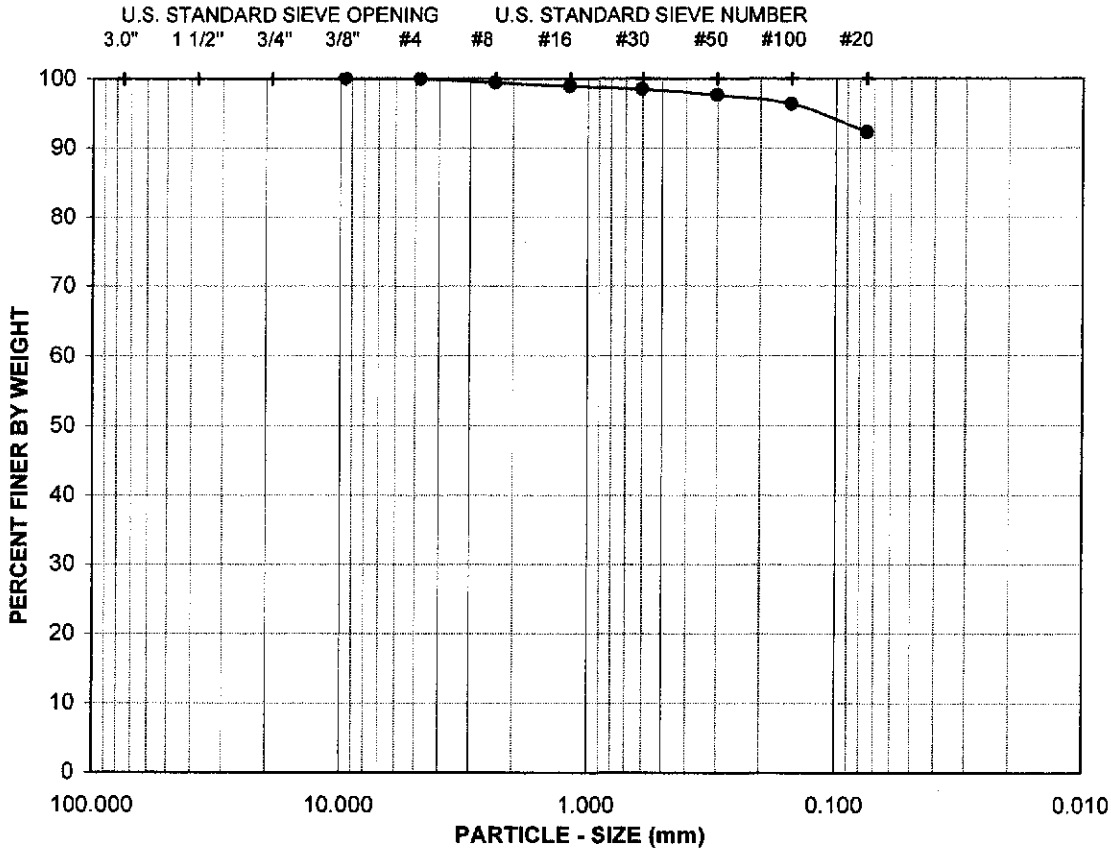
Project Name: AQUA BELLA
Project No.: 111280-005
Client Name:
Tested By: JMD Date: 8/1/05

Rev. 08-04

x200 Wash 2



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI	LL,PL,PI
B-30	B-1	5-10	ML	0 : 8 : 92	N/A

Visual Sample Description:
ML, BROWN LEAN SILT

Project No.: 111280-005

AQUA BELLA

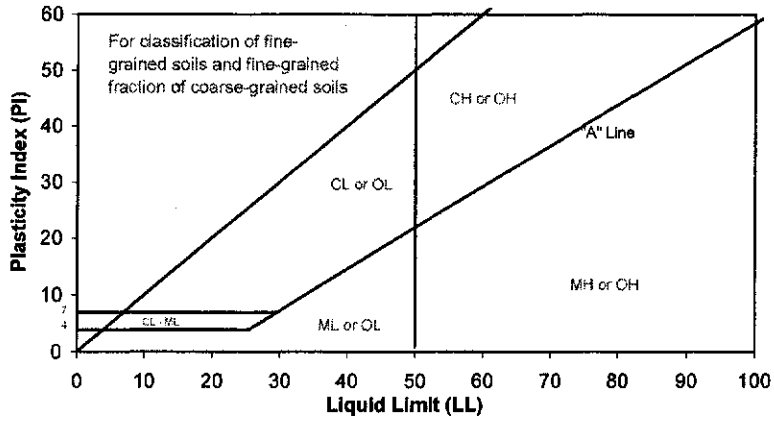
ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

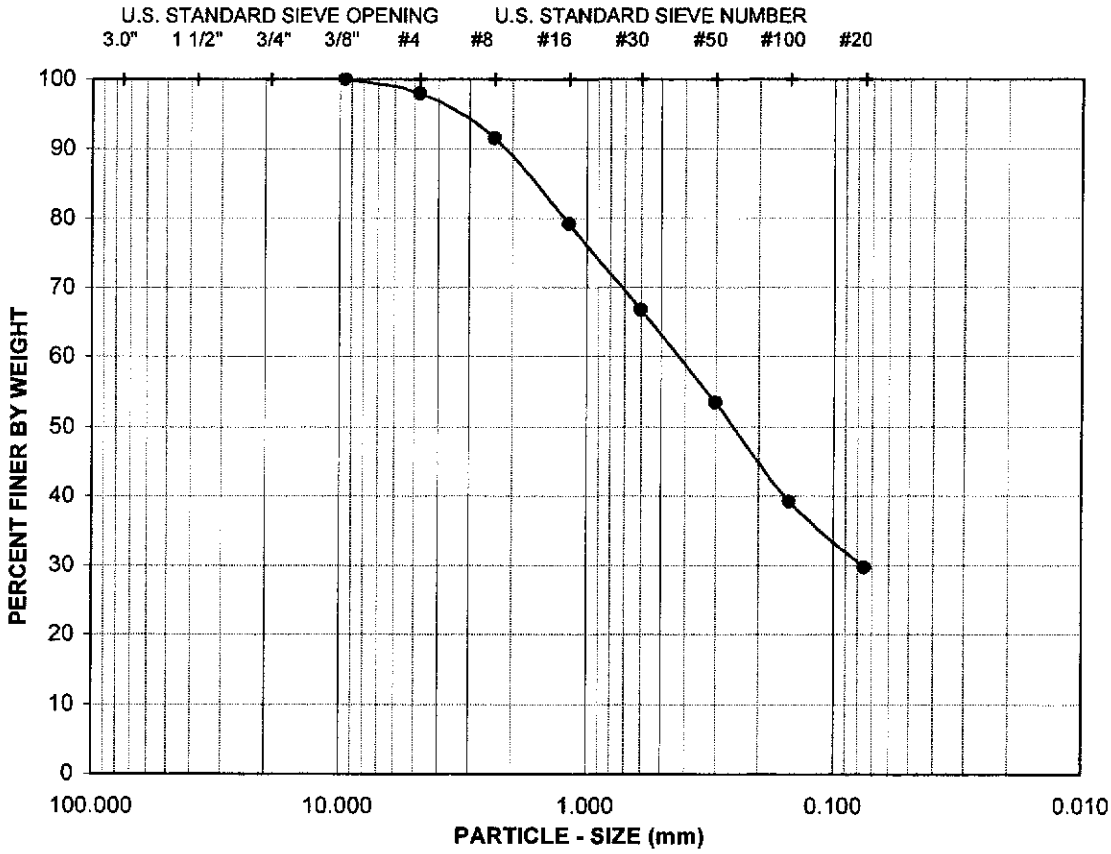
Leighton and Associates, Inc.

Rev. 08-04

Sieve B-30,B-1



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI	LL,PL,PI
B-32	B-1	5-10	SM	2 : 68 : 30	N/A

Visual Sample Description:
SM, BROWN SILTY SAND

Project No.: 111280-005

AQUA BELLA

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Leighton and Associates, Inc.

Rev. 08-04

Sieve B-32,B-1

Leighton and Associates, Inc.

ATTERBERG LIMITS

ASTM D 4318

Project Name:	AQUA BELLA	Tested By:	JMD	Date:	8/8/05
Project No. :	111280-005	Input By:	JMD	Date:	8/8/05
Boring No.:	B-26	Checked By:	PRC	Date:	8/10/05
Sample No.:	S-6	Depth (ft.)	15		
Sample Description:	ML, BROWN LEAN SILT				

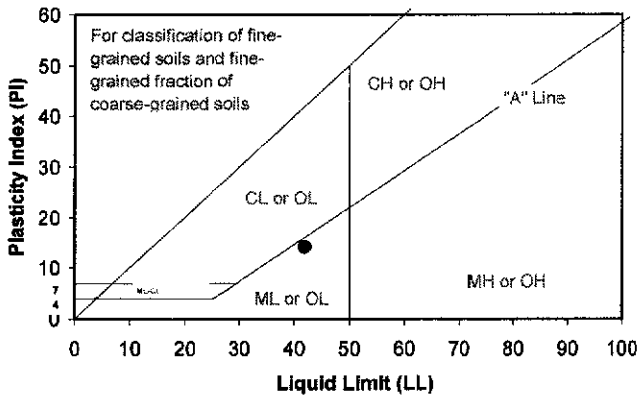
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			31	23	13	
Wet Wt. of Soil + Cont. (gm)	17.70	20.25	31.71	24.62	28.15	
Dry Wt. of Soil + Cont. (gm)	16.27	18.22	25.61	20.60	22.91	
Wt. of Container (gm)	11.16	10.91	11.00	11.11	11.16	
Moisture Content (%) [Wn]	28.0	27.8	41.8	42.4	44.6	

Liquid Limit	42
Plastic Limit	28
Plasticity Index	14
Classification	ML

PI at "A" - Line = 0.73(LL-20) =

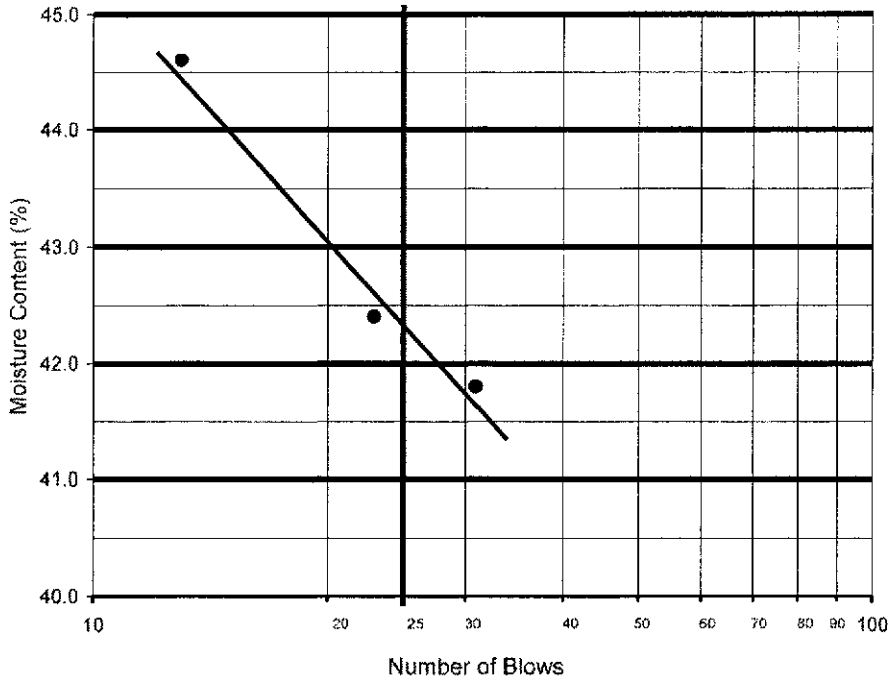
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- ☐ Wet Preparation
  Multipoint - Wet
- ☒ Dry Preparation
  Multipoint - Dry
- ☒ Procedure A
  Multipoint Test
- ☐ Procedure B
  One-point Test



Leighton Consulting, Inc.

ATTERBERG LIMITS

ASTM D 4318

Project Name:	AQUA BELLA	Tested By:	JMD	Date:	8/9/05
Project No. :	111280-005	Input By:	JMD	Date:	8/9/05
Boring No.:	B-27	Checked By:	PRC	Date:	8/10/05
Sample No.:	R-4	Depth (ft.)	7.5		
Sample Description:	CH, BROWN FAT CLAY				

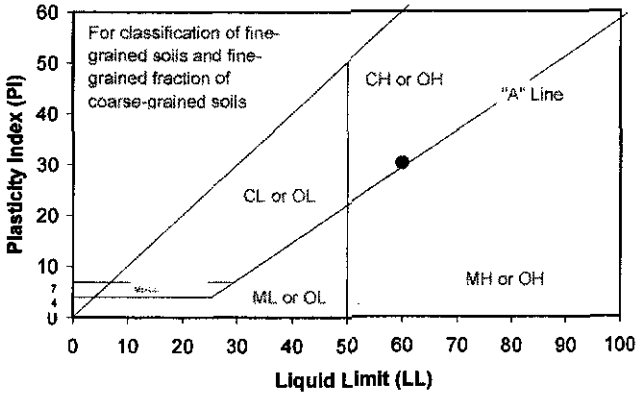
	PLASTIC LIMIT		LIQUID LIMIT		
TEST NO.	1	2	1	2	3
Number of Blows [N]			38	26	15
Wet Wt. of Soil + Cont. (gm)	17.87	18.89	25.69	22.08	25.49
Dry Wt. of Soil + Cont. (gm)	16.28	17.15	20.38	17.97	19.79
Wt. of Container (gm)	11.03	11.14	11.13	11.03	11.13
Moisture Content (%) [Wn]	30.3	29.0	57.4	59.2	65.8

Liquid Limit	60
Plastic Limit	30
Plasticity Index	30
Classification	CH

PI at "A" - Line = 0.73(LL-20) =

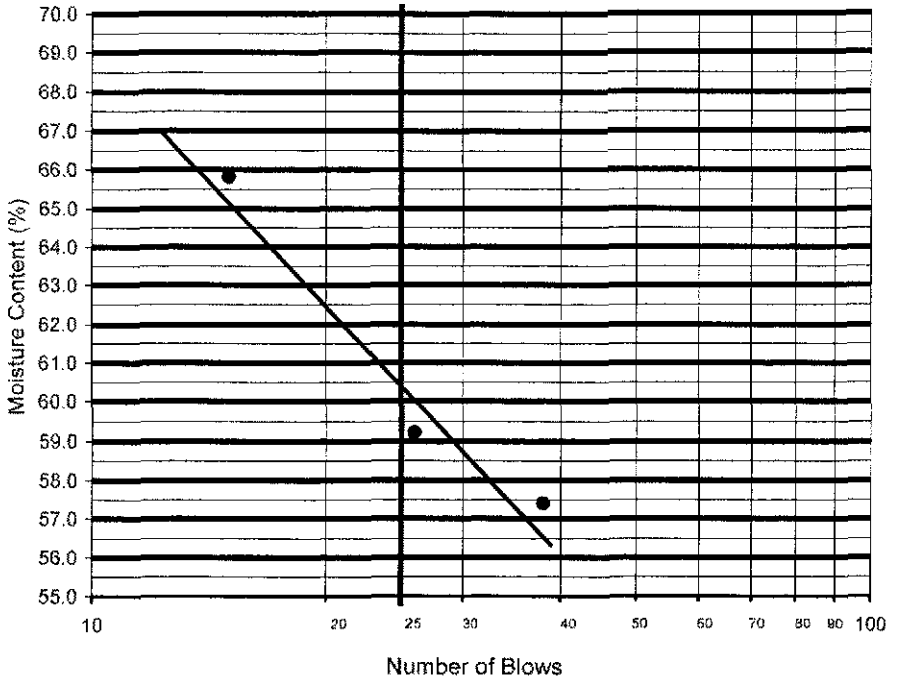
One - Point Liquid Limit Calculation

LL =Wn(N/25) $^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



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Leighton and Associates, Inc.

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	AQUA BELLA	Tested By :	AJP	Date:	8/2/05
Project No.:	111280-005	Input By :	PRC	Date:	8/3/05
Boring No.:	B-24	Depth (ft.)	0-10		
Sample No. :	B-4				
Soil Identification:	SM, BROWN SILTY SAND				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03344 *Ram Weight = 10 lb.; Drop = 18 in.*

Moisture Added (ml)	0	100	50	150		
TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5703	5814	5819	5734		
Weight of Mold (g)	3639	3639	3639	3639		
Net Weight of Soil (g)	2064	2175	2180	2095		
Wet Weight of Soil + Cont. (g)	128.6	132.7	125.3	125.4		
Dry Weight of Soil + Cont. (g)	123.0	122.6	117.8	114.0		
Weight of Container (g)	11.2	11.2	11.2	11.2		
Moisture Content (%)	5.0	9.1	7.0	11.1		
Wet Density (pcf)	136.1	143.4	143.7	138.1		
Dry Density (pcf)	129.6	131.5	134.3	124.3		

Maximum Dry Density (pcf) 135.0 **Optimum Moisture Content (%)** 7.5

PROCEDURE USED

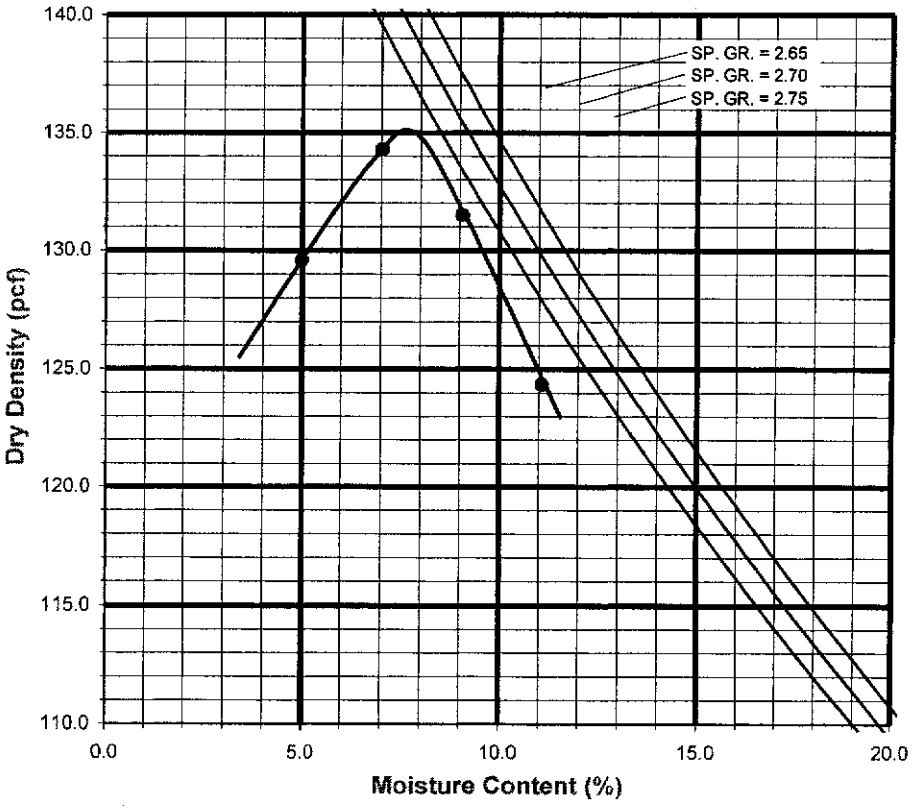
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



Leighton and Associates, Inc.

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	AQUA BELLA	Tested By :	AJP	Date:	8/1/05
Project No.:	111280-005	Input By :	PRC	Date:	8/4/05
Boring No.:	TP-2	Depth (ft.)	5-8		
Sample No. :	B-1				
Soil Identification:	SM, BROWN SILTY SAND				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03344 *Ram Weight = 10 lb.; Drop = 18 in.*

Moisture Added (ml)	200	100	150	50		
TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5738	5813	5807	5721		
Weight of Mold (g)	3639	3639	3639	3639		
Net Weight of Soil (g)	2099	2174	2168	2082		
Wet Weight of Soil + Cont. (g)	123.9	129.3	139.0	132.3		
Dry Weight of Soil + Cont. (g)	113.0	121.8	128.6	126.8		
Weight of Container (g)	12.0	12.0	12.0	12.0		
Moisture Content (%)	10.8	6.8	8.9	4.8		
Wet Density (pcf)	138.4	143.3	142.9	137.3		
Dry Density (pcf)	124.9	134.2	131.2	131.0		

Maximum Dry Density (pcf) 135.0 **Optimum Moisture Content (%)** 7.5

PROCEDURE USED

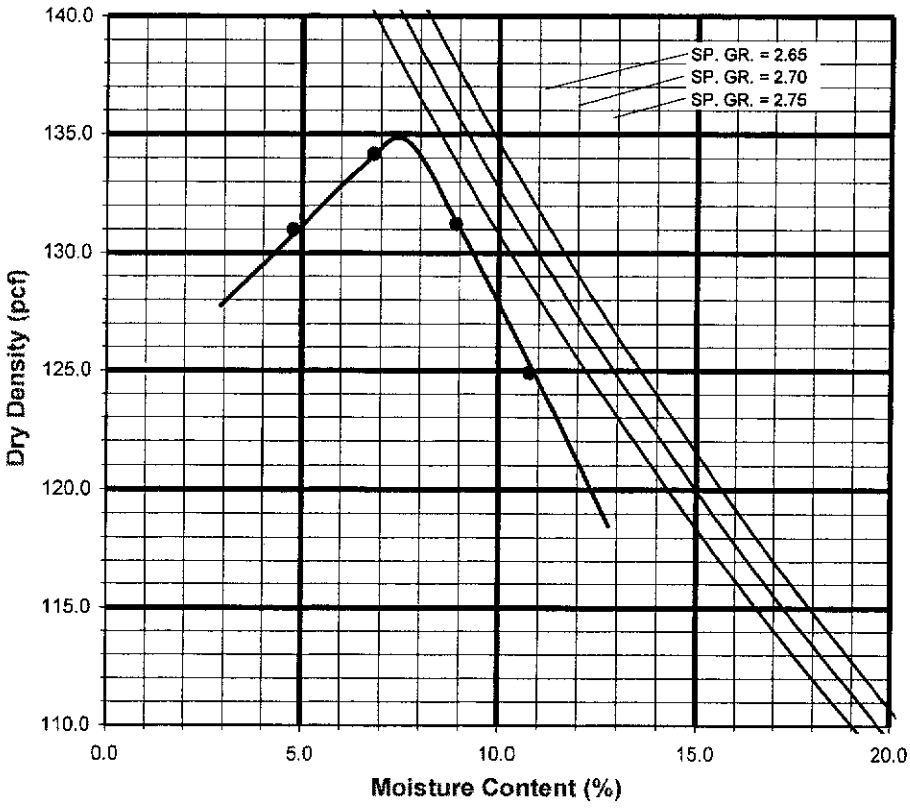
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



Leighton and Associates, Inc.

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	AQUA BELLA	Tested By: JCL / BRM	Date: 7/21/05
Project No. :	111280-005	Checked By: PRC	Date: 7/29/05
Boring No.:	B-26	Depth (ft.) 0-10	
Sample No. :	B-1	Location:	
Sample Description:	SC, BROWN CLAYEY SAND		

Dry Wt. of Soil + Cont. (gm.)	4347.0
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	4347.0
Weight Soil Retained on #4 Sieve	73.0
Percent Passing # 4	98.3

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0150
Wt. Comp. Soil + Mold (gm.)	619.0	633.5
Wt. of Mold (gm.)	188.3	188.3
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-5	E-5
Wet Wt. of Soil + Cont. (gm.)	313.0	633.5
Dry Wt. of Soil + Cont. (gm.)	289.5	397.0
Wt. of Container (gm.)	13.0	188.3
Moisture Content (%)	8.5	12.2
Wet Density (pcf)	129.9	134.1
Dry Density (pcf)	119.7	119.6
Void Ratio	0.408	0.429
Total Porosity	0.290	0.300
Pore Volume (cc)	60.0	63.1
Degree of Saturation (%) [S meas]	**56.3**	**76.5**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
7/21/05	13:30	1.0	0	1.0000
7/21/05	13:40	1.0	10	0.4961
	Add Distilled Water to the Specimen			
7/22/05	7:30	1.0	1070	0.5150
7/22/05	8:30	1.0	1130	0.5150

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	18.9
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**22**

Rev. 08-04

Leighton and Associates, Inc.

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	AQUA BELLA	Tested By:	JCL	Date:	7/26/05
Project No. :	111280-005	Checked By:	PRC	Date:	7/29/05
Boring No.:	B-29	Depth (ft.)	5-15		
Sample No. :	B-1	Location:			
Sample Description:	(CL)s, BROWN LEAN CLAY WITH SAND				

Dry Wt. of Soil + Cont. (gm.)	2000.0
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	2000.0
Weight Soil Retained on #4 Sieve	0.0
Percent Passing # 4	100.0

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0398
Wt. Comp. Soil + Mold (gm.)	508.8	567.7
Wt. of Mold (gm.)	180.5	180.5
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-4	E-4
Wet Wt. of Soil + Cont. (gm.)	312.9	567.7
Dry Wt. of Soil + Cont. (gm.)	273.8	285.5
Wt. of Container (gm.)	12.9	180.5
Moisture Content (%)	15.0	35.6
Wet Density (pcf)	99.0	116.6
Dry Density (pcf)	86.1	86.0
Void Ratio	0.958	1.036
Total Porosity	0.489	0.509
Pore Volume (cc)	101.3	109.5
Degree of Saturation (%) [S meas]	**42.3**	**92.9**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
7/26/05	13:05	1.0	0	1.0000
7/26/05	13:15	1.0	10	0.4974
	Add Distilled Water to the Specimen			
7/27/05	8:41	1.0	1166	0.5398
7/27/05	9:41	1.0	1226	0.5398

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	42.4
Expansion Index (EI)$_{50}$ = EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**38**

Rev. 08-04

Leighton and Associates, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	AQUA BELLA		Tested By:	JMD	Date: 8/5/05
Project No.:	111280-005		Checked By:	PRC	Date: 8/8/05
Boring No.:	B-30		Sample Type:	IN SITU	
Sample No.:	R-5		Depth (ft.)	10	
Sample Description:	ML, BROWN LEAN SILT				

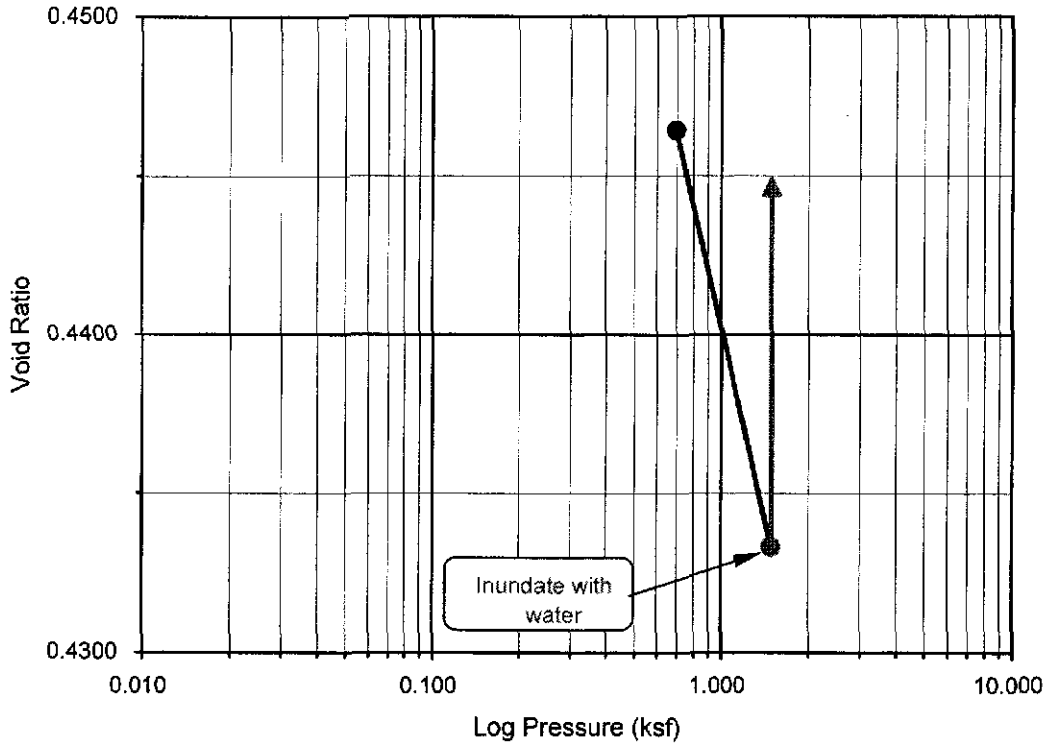
Initial Dry Density (pcf):	115.7
Initial Moisture (%):	10.6
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	116.7
Final Moisture (%) :	12.7
Initial Void ratio:	0.4572
Specific Gravity(assumed):	2.70
Initial Saturation (%)	62.4

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.700	0.0574	0.9926	0.00	-0.74	0.4464	-0.74
1.500	0.0664	0.9836	0.00	-1.64	0.4333	-1.64
H2O	0.0586	0.9914	0.00	-0.86	0.4447	-0.86

Percent Swell / Settlement After Inundation = 0.79

Void Ratio - Log Pressure Curve



Rev. 08-04

xCollapse B-30,R-5

Leighton and Associates, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name: AQUA BELLA
Project No.: 111280-005
Boring No.: B-34
Sample No.: R-3
Sample Description: SP, BROWN POORLY GRADED SAND

Tested By: JMD Date: 8/5/05
Checked By: PRC Date: 8/8/05
Sample Type: IN SITU
Depth (ft.) 5

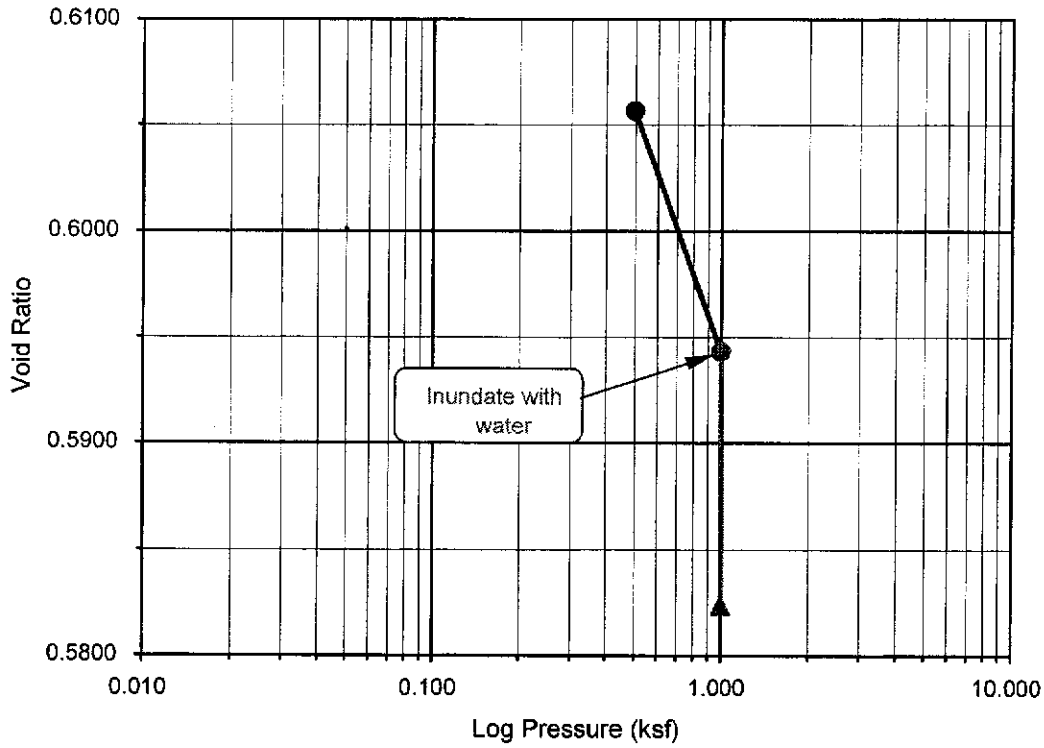
Initial Dry Density (pcf):	104.4
Initial Moisture (%):	4.6
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	106.5
Final Moisture (%) :	16.0
Initial Void ratio:	0.6150
Specific Gravity(assumed):	2.70
Initial Saturation (%)	20.3

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.500	0.0558	0.9942	0.00	-0.58	0.6056	-0.58
1.000	0.0628	0.9872	0.00	-1.28	0.5943	-1.28
H2O	0.0702	0.9798	0.00	-2.02	0.5824	-2.02

Percent Swell / Settlement After Inundation = -0.75

Void Ratio - Log Pressure Curve



Rev. 08-04

Collapse B-34,R-3

Leighton and Associates, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	AQUA BELLA		Tested By:	JMD	Date: 8/5/05
Project No.:	111280-005		Checked By:	PRC	Date: 8/8/05
Boring No.:	B-38		Sample Type:	IN SITU	
Sample No.:	R-4		Depth (ft.)	7.5	
Sample Description:	SP, BROWN POORLY GRADED SAND				

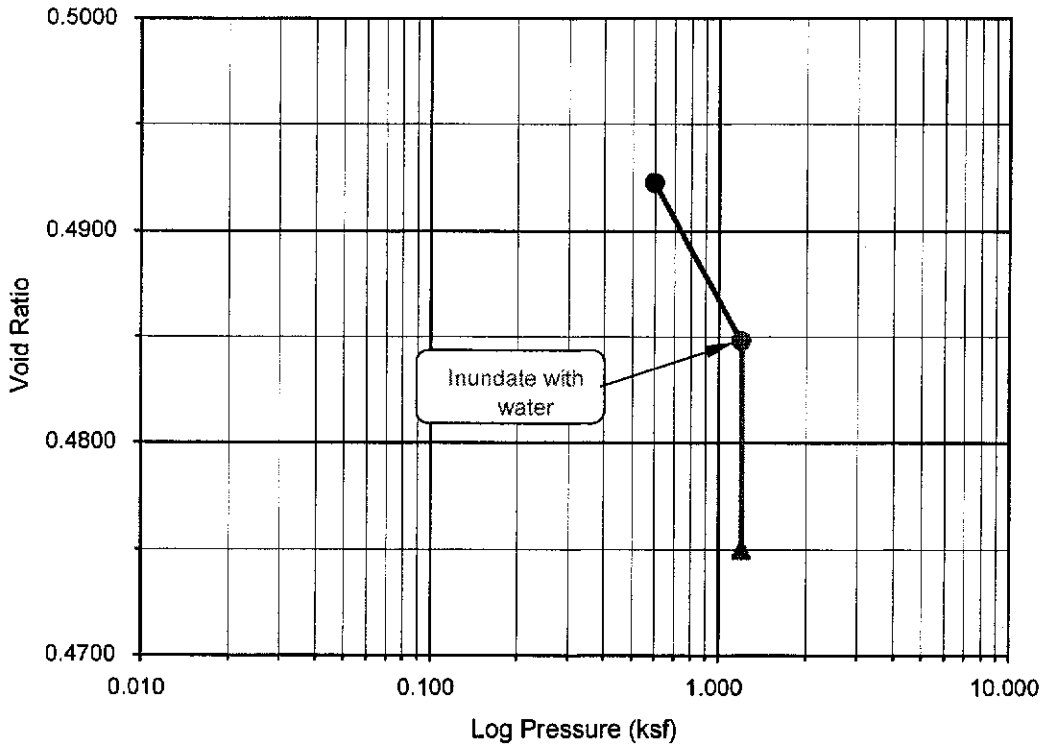
Initial Dry Density (pcf):	112.5
Initial Moisture (%):	4.8
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	114.3
Final Moisture (%) :	13.9
Initial Void ratio:	0.4981
Specific Gravity(assumed):	2.70
Initial Saturation (%)	26.0

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.600	0.0539	0.9961	0.00	-0.39	0.4922	-0.39
1.200	0.0589	0.9911	0.00	-0.89	0.4848	-0.89
H2O	0.0654	0.9846	0.00	-1.54	0.4750	-1.54

Percent Swell / Settlement After Inundation = -0.66

Void Ratio - Log Pressure Curve



Rev. 08-04

Leighton and Associates, Inc.

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:	AQUA BELLA		Tested By:	JMD	Date: 8/5/05
Project No.:	111280-005		Checked By:	PRC	Date: 8/8/05
Boring No.:	B-39		Sample Type:	IN SITU	
Sample No.:	R-5		Depth (ft.)	10	
Sample Description:	SP-SM, BROWN POORLY GRADED SAND WITH SILT				

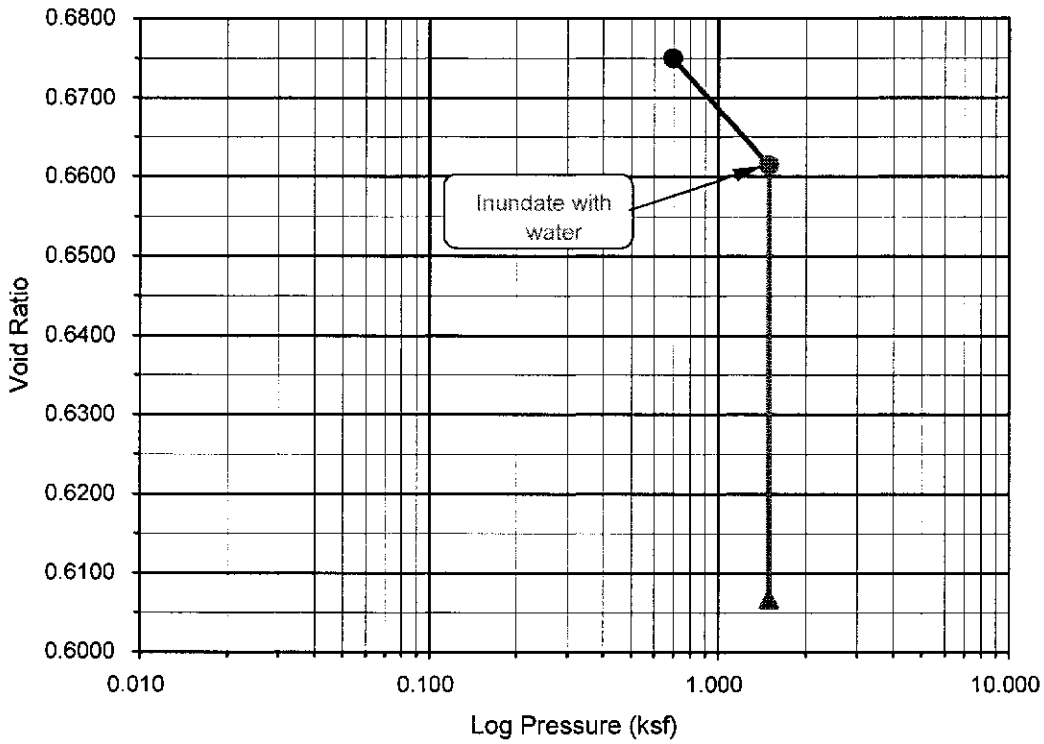
Initial Dry Density (pcf):	100.1
Initial Moisture (%):	4.2
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0500
Diameter(in):	2.416

Final Dry Density (pcf):	104.9
Final Moisture (%) :	18.1
Initial Void ratio:	0.6847
Specific Gravity(assumed):	2.70
Initial Saturation (%)	16.4

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.700	0.0558	0.9942	0.00	-0.58	0.6750	-0.58
1.500	0.0639	0.9861	0.00	-1.39	0.6613	-1.39
H2O	0.0963	0.9537	0.00	-4.63	0.6067	-4.63

Percent Swell / Settlement After Inundation = -3.29

Void Ratio - Log Pressure Curve



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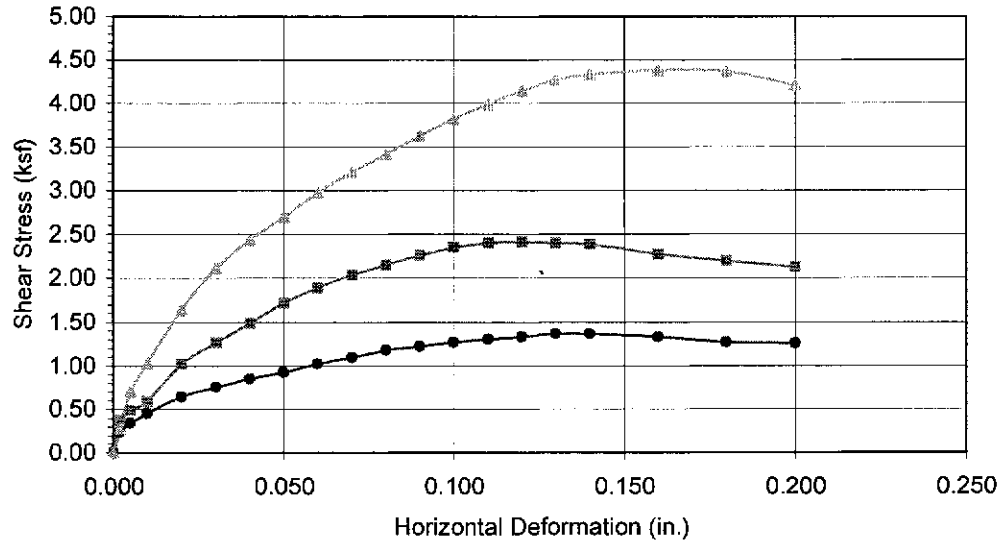
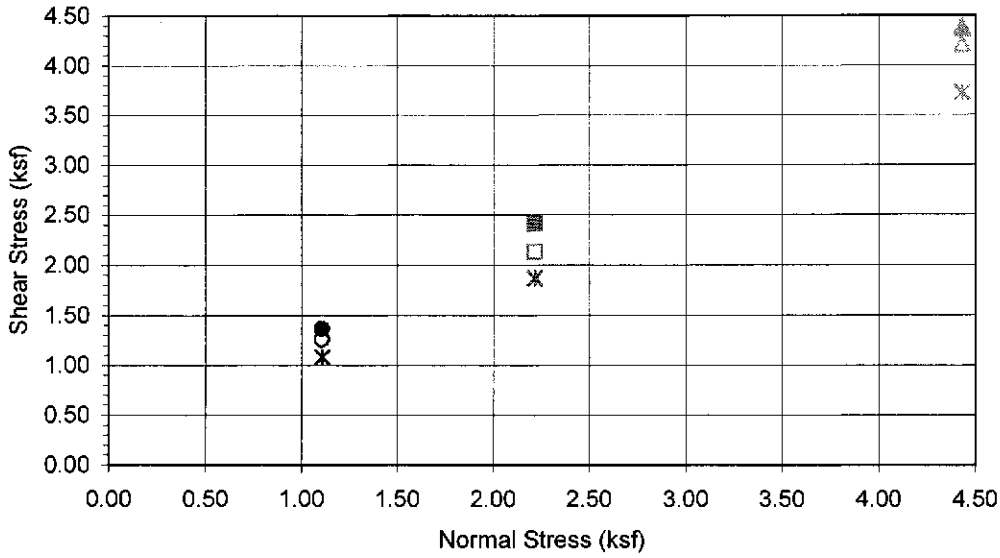
xCollapse B-39,R-5





Normal Stress (kip/ft²)	1.108	2.216	4.432
Peak Shear Stress (kip/ft²)	● 1.362	■ 2.410	▲ 4.382
Shear Stress @ End of Test (ksf)	○ 1.252	□ 2.128	△ 4.210
Relaxed Value (ksf)	X 1.080	X 1.862	X 3.725
Deformation Rate (in./min.)	0.050	0.050	0.050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.416	2.416	2.416
Initial Moisture Content (%)	7.1	7.8	6.8
Dry Density (pcf)	108.2	117.7	111.9
Saturation (%)	34.2	48.5	36.1
Soil Height Before Shearing (in.)	N/A	N/A	N/A
Final Moisture Content (%)	25.7	20.9	22.1

DIRECT SHEAR TEST RESULTS

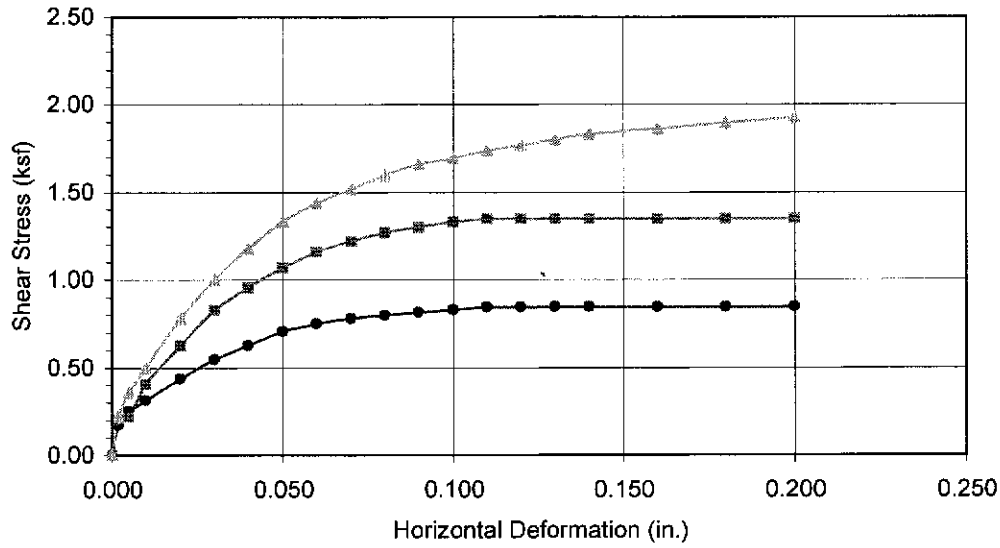
Consolidated Drained

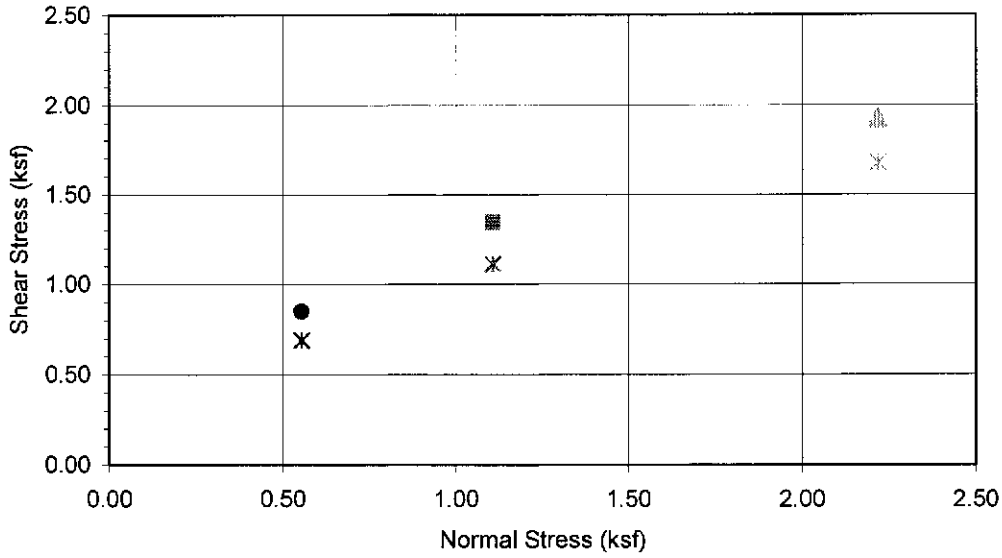
Leighton and Associates, Inc.

Boring No.: B-24
Sample No.: R-3
Depth (ft) 7.5
Soil Description: SM, BROWN SILTY SAND

Project No.: 111280-005

AQUA BELLA





Normal Stress (kip/ft²)	0.554	1.108	2.216
Peak Shear Stress (kip/ft²)	● 0.845	■ 1.346	▲ 1.925
Shear Stress @ End of Test (ksf)	○ 0.845	□ 1.346	△ 1.925
Relaxed Value (ksf)	X 0.689	X 1.111	X 1.675
Deformation Rate (in./min.)	0.050	0.050	0.050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.416	2.416	2.416
Initial Moisture Content (%)	7.5	7.5	7.5
Dry Density (pcf)	121.5	121.5	121.5
Saturation (%)	52.2	52.2	52.2
Soil Height Before Shearing (in.)	N/A	N/A	N/A
Final Moisture Content (%)	14.0	13.0	12.6

DIRECT SHEAR TEST RESULTS

Consolidated Drained, Remolded to 90% relative compaction

Leighton and Associates, Inc.

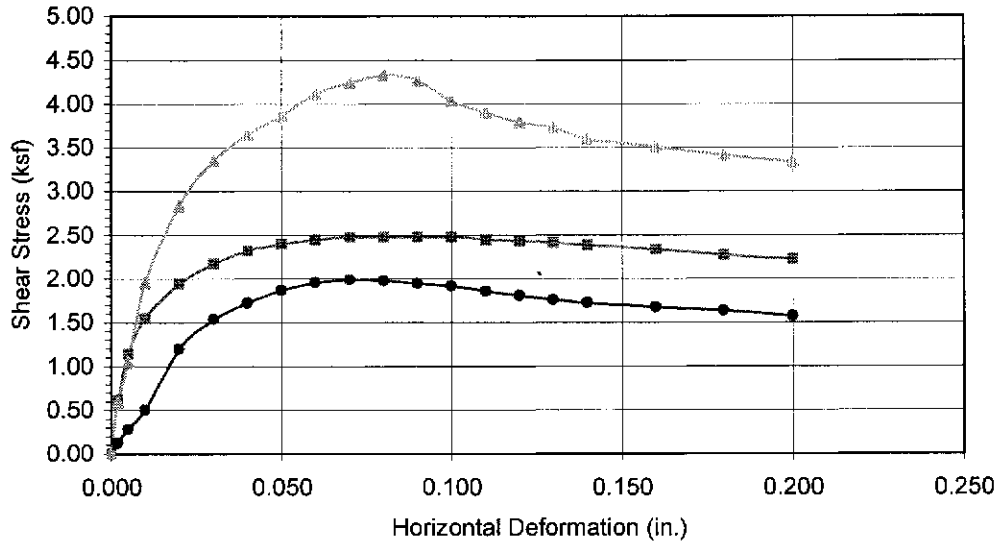
Boring No.:	B-24
Sample No.:	B-4
Depth (ft)	0-10
Soil Description:	SM, BROWN SILTY SAND

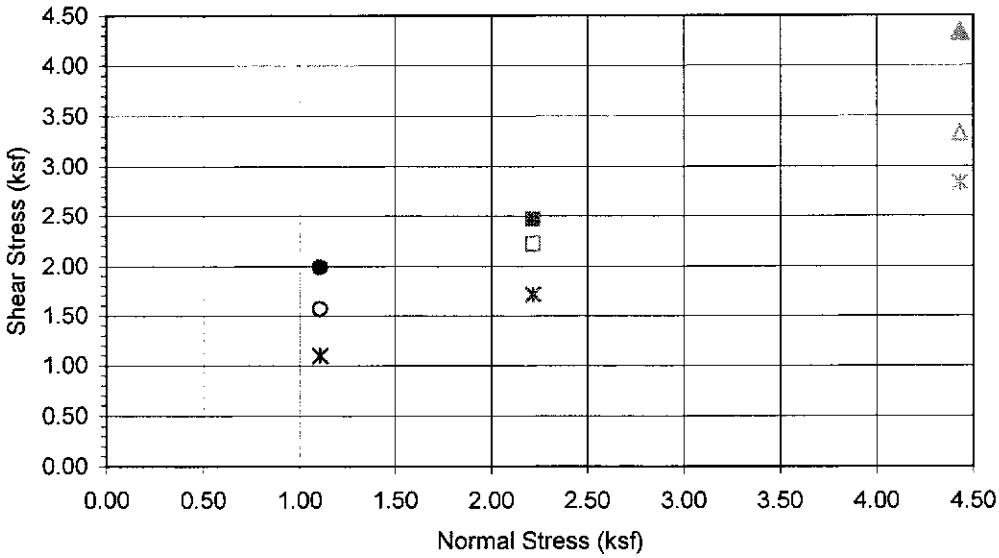
Project No.: 111280-005

AQUA BELLA

Rev. 08-04

xDirect Shear B-24,B-4





Normal Stress (kip/ft²)	1.108	2.216	4.432
Peak Shear Stress (kip/ft²)	● 1.988	■ 2.473	▲ 4.335
Shear Stress @ End of Test (ksf)	○ 1.565	□ 2.222	△ 3.333
Relaxed Value (ksf)	X 1.096	X 1.706	X 2.833
Deformation Rate (in./min.)	0.050	0.050	0.050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.416	2.416	2.416
Initial Moisture Content (%)	31.6	33.0	32.9
Dry Density (pcf)	86.5	82.7	86.5
Saturation (%)	90.0	85.7	93.8
Soil Height Before Shearing (in.)	N/A	N/A	N/A
Final Moisture Content (%)	68.0	71.0	67.2

DIRECT SHEAR TEST RESULTS

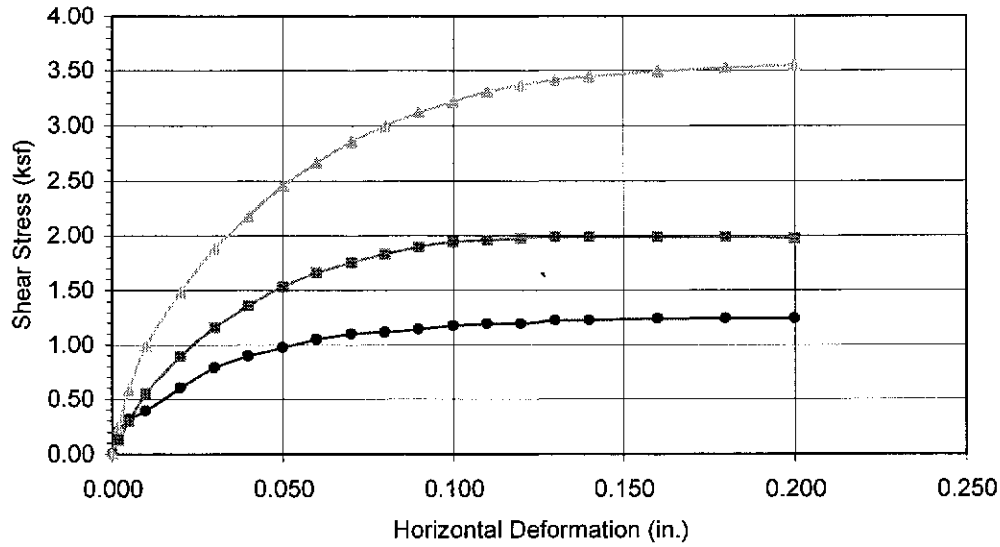
Consolidated Drained

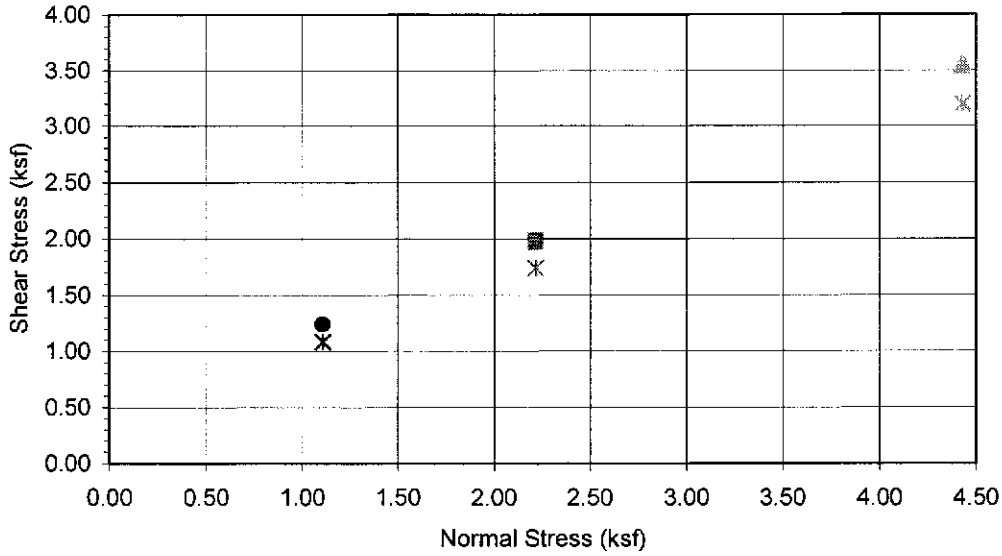
Leighton and Associates, Inc.

Boring No.: B-27
Sample No.: R-4
Depth (ft) 7.5
Soil Description: CH, BROWN FAT CLAY

Project No.: 111280-005

AQUA BELLA





Normal Stress (kip/ft²)	1.108	2.216	4.432
Peak Shear Stress (kip/ft²)	● 1.236	■ 1.988	▲ 3.553
Shear Stress @ End of Test (ksf)	○ 1.236	□ 1.972	△ 3.553
Relaxed Value (ksf)	X 1.080	X 1.737	X 3.193
Deformation Rate (in./min.)	0.050	0.050	0.050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.416	2.416	2.416
Initial Moisture Content (%)	7.5	7.5	7.5
Dry Density (pcf)	121.5	121.5	121.5
Saturation (%)	52.2	52.2	52.2
Soil Height Before Shearing (in.)	N/A	N/A	N/A
Final Moisture Content (%)	13.2	13.2	15.1

DIRECT SHEAR TEST RESULTS

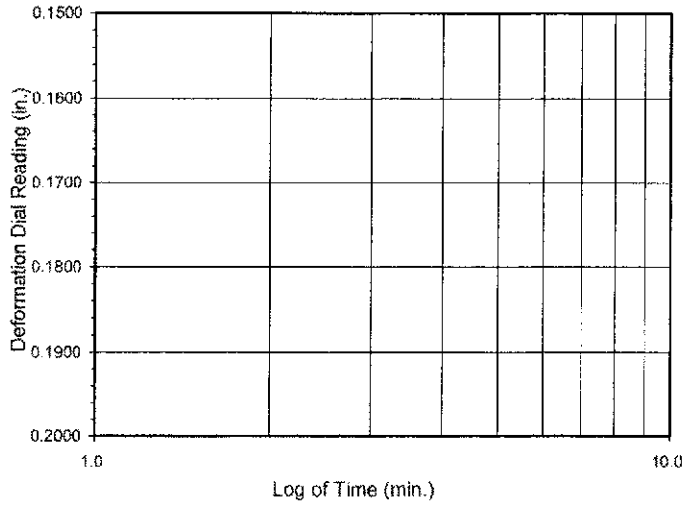
Consolidated Drained, Remolded to 90 % relative compaction

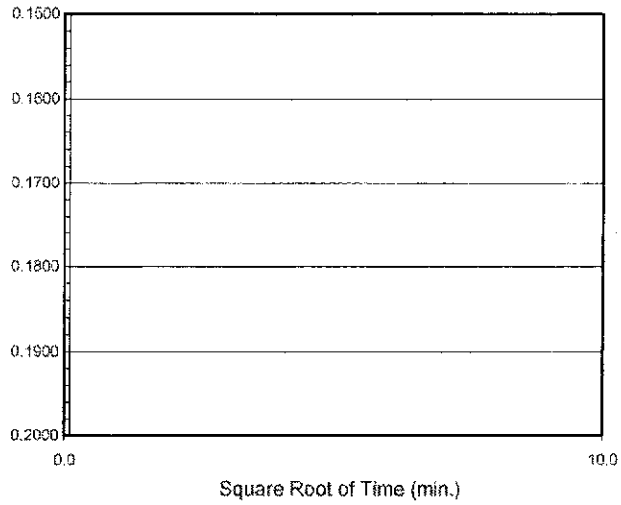
Leighton and Associates, Inc.

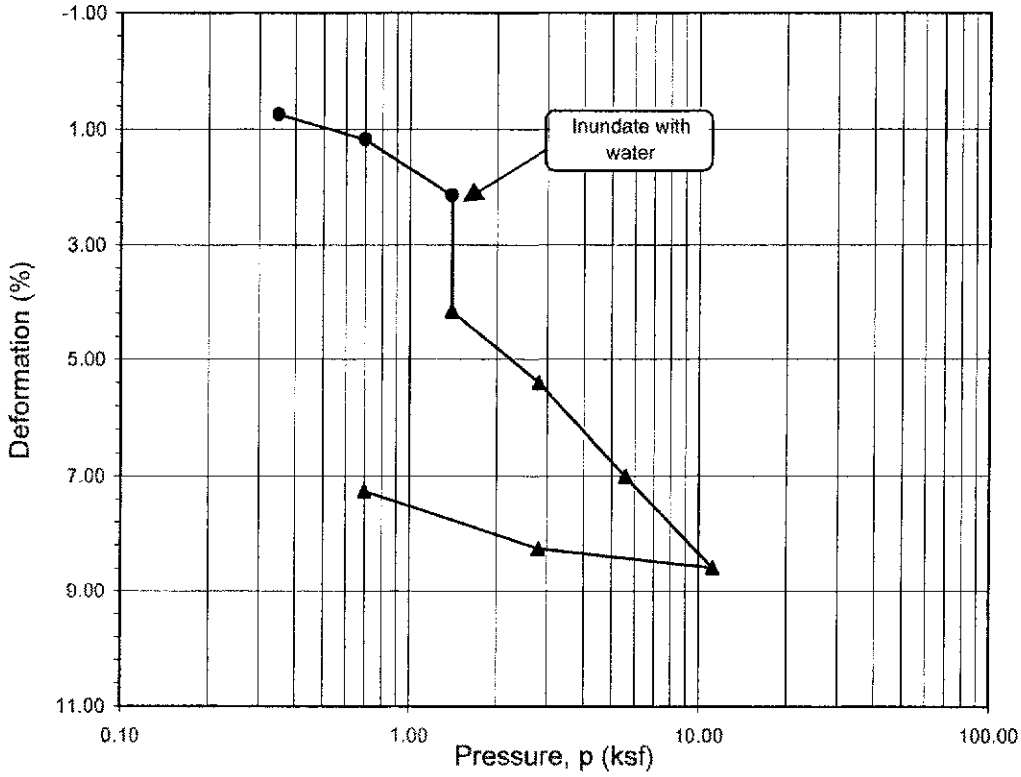
Boring No.:	TP-2
Sample No.:	B-1
Depth (ft)	5-8
Soil Description:	SM, BROWN SILTY SAND

Project No.: 111280-005

AQUA BELLA







Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-24	**R-5**	**10**	**4.9**	**15.0**	**106.2**	**114.5**	**0.587**	**0.472**	**23**	**86**

Sample Description:

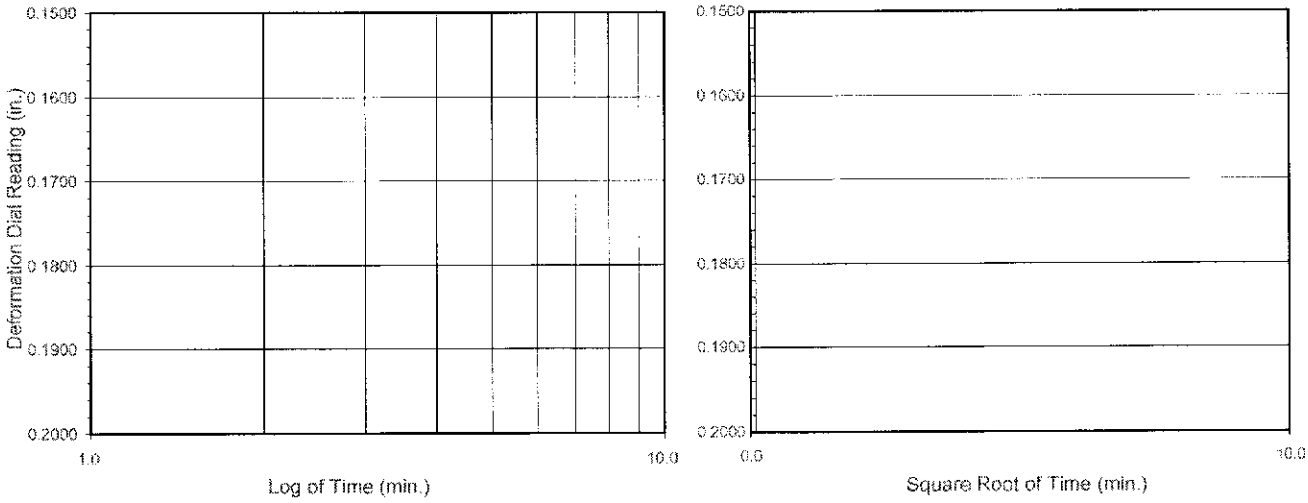
SM, BROWN SILTY SAND

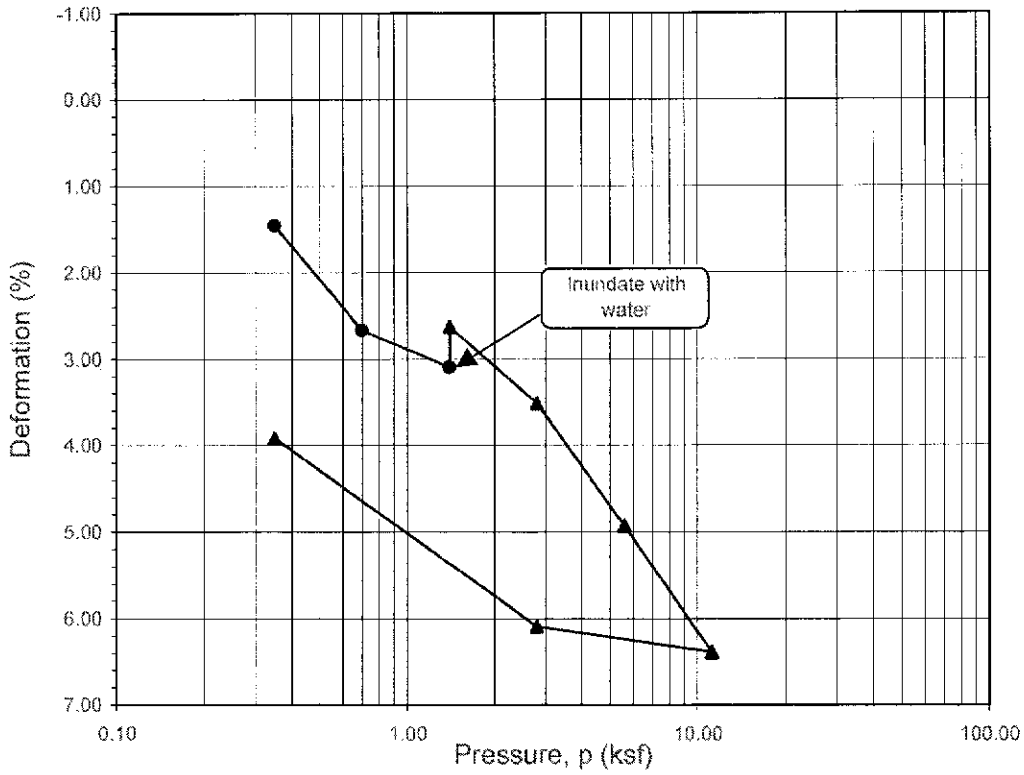
Leighton and Associates, Inc.

Project No.:	111280-005
Project Name:	AQUA BELLA

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Rev. 08-04





Boring No.	Sample No.:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-28	**R-3**	**5**	**14.7**	**18.3**	**109.6**	**114.1**	**0.538**	**0.478**	**74**	**100**

Sample Description:

s(ML), BROWN LEAN SILT WITH SAND

Leighton and Associates, Inc.

Project No.:	111280-005
Project Name:	AQUA BELLA

ONE - DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Rev. 08-04

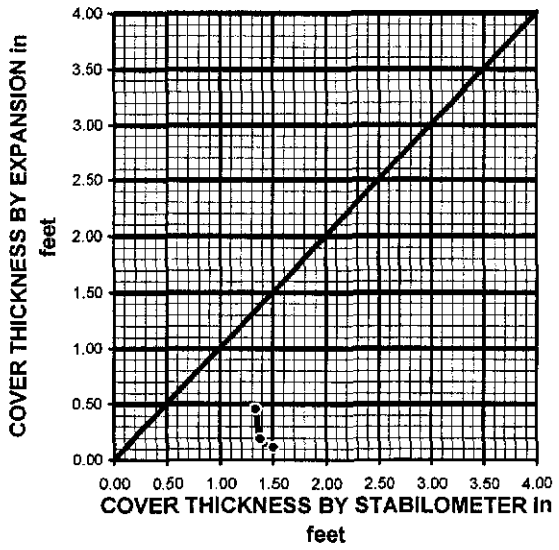
Leighton and Associates, Inc.

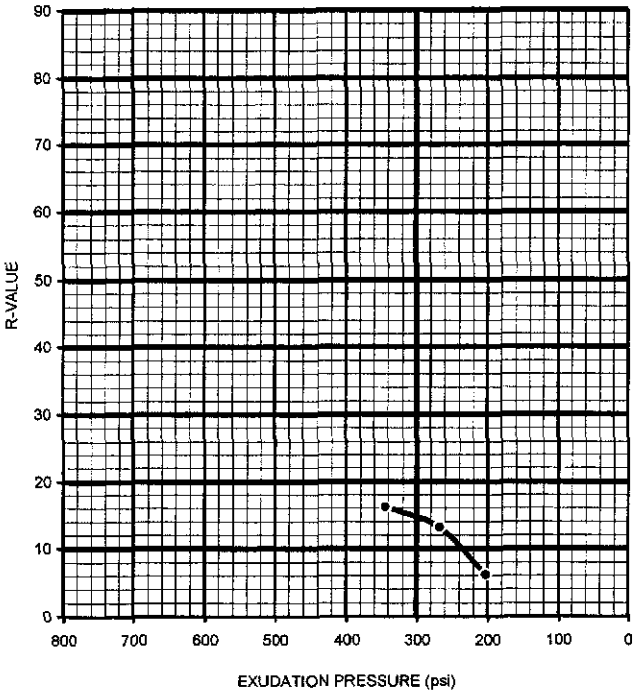
R-VALUE TEST RESULTS

Project Name:	AQUA BELLA	Date:	7/21/05
Project Number:	111280-005	Technician:	RGO
Boring Number:	B-25	Depth:	0-10
Sample Number:	B-4	Sample Location:	
Sample Description:	~~(CL)c. BROWN LEAN CLAY WITH SAND~~ ML SANDY SILT		

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	10.0	10.5	11.1
HEIGHT OF SAMPLE, Inches	2.51	2.49	2.54
DRY DENSITY, pcf	127.9	126.8	125.3
COMPACTOR AIR PRESSURE, psi	150	130	100
EXUDATION PRESSURE, psi	344	267	202
EXPANSION, Inches x 10exp-4	12	5	3
STABILITY Ph 2,000 lbs (160 psi)	119	125	141
TURNS DISPLACEMENT	4.49	4.66	5.20
R-VALUE UNCORRECTED	16	13	6
R-VALUE CORRECTED	16	13	6

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.34	1.39	1.50
EXPANSION PRESSURE THICKNESS, ft.	0.45	0.19	0.11





R-VALUE BY EXPANSION:	N / A
R-VALUE BY EXUDATION:	15
EQUILIBRIUM R-VALUE:	15

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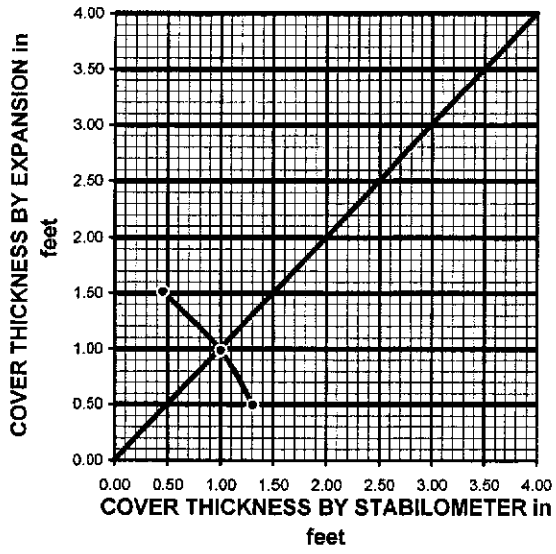
Leighton and Associates, Inc.

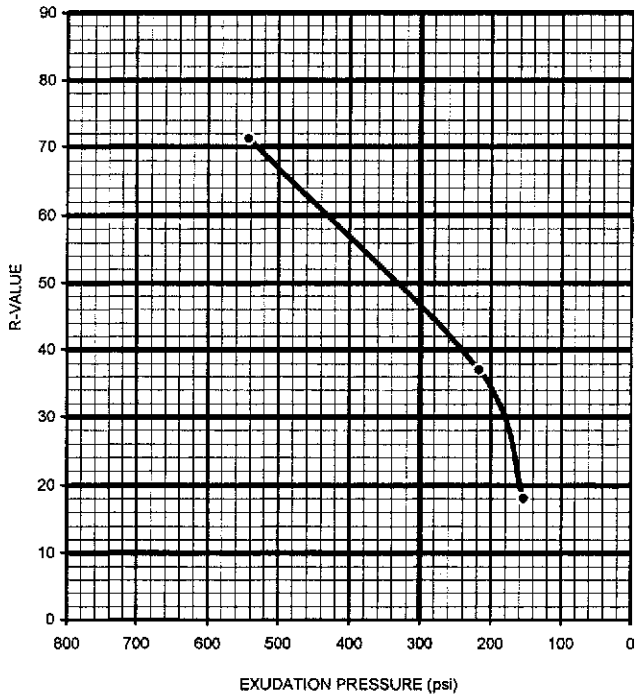
R-VALUE TEST RESULTS

Project Name:	AQUA BELLA	Date:	7/29/05
Project Number:	111280-005	Technician:	RGO
Boring Number:	TP-4	Depth:	0-5
Sample Number:	B-1	Sample Location:	
Sample Description:	SM, BROWN SILTY SAND		

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	8.4	10.5	11.5
HEIGHT OF SAMPLE, Inches	2.45	2.56	2.58
DRY DENSITY, pcf	127.7	123.6	121.1
COMPACTOR AIR PRESSURE, psi	260	160	100
EXUDATION PRESSURE, psi	543	216	153
EXPANSION, Inches x 10exp-4	40	26	13
STABILITY Ph 2,000 lbs (160 psi)	29	64	96
TURNS DISPLACEMENT	4.57	6.70	8.26
R-VALUE UNCORRECTED	71	36	17
R-VALUE CORRECTED	71	37	18

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.46	1.01	1.31
EXPANSION PRESSURE THICKNESS, ft.	1.51	0.98	0.49





R-VALUE BY EXPANSION:	38
R-VALUE BY EXUDATION:	47
EQUILIBRIUM R-VALUE:	38

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Leighton and Associates, Inc.

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: AQUA BELLA
Project No. : 111280-005
Boring No.: B-25
Sample No. : B-4
Visual Soil Identification: ML

Tested By : AJP Date: 7/29/05
Data Input By: AJP Date: 7/29/05
Checked By: PRC Date: 7/29/05
Depth (ft.) : 0-10

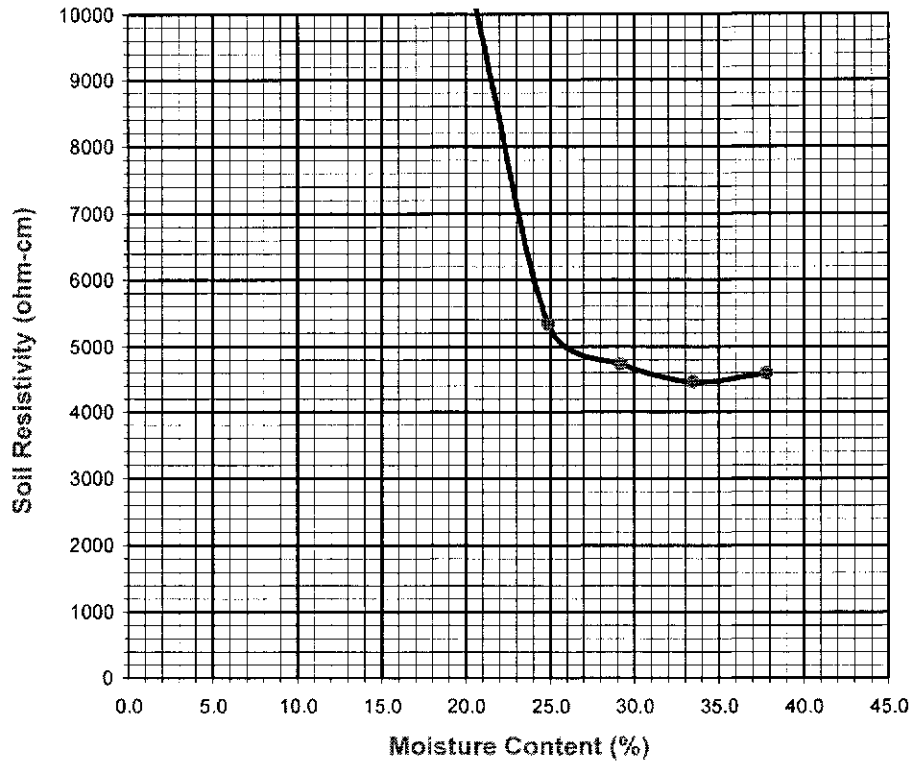
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (g)	200.00
Dry Wt. of Soil + Cont. (g)	180.00
Wt. of Container (g)	12.90
Moisture Content (%) (MCi)	11.97

Initial Soil Weight (gm)(Wt)	1300.0
Box Constant:	6.75

MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100

Remolded Specimen	Moisture Adjustments				
Water Added (ml) (Wa)	100	150	200	250	300
Adj. Moisture Content (%) (MC)	20.58	24.89	29.19	33.50	37.81
Resistance Rdg. (ohm)	1500	790	700	660	680
Soil Resistivity (ohm-cm)	10119	5329	4722	4452	4587



Minimum Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532/643
4452	33.5	<150	386	7.88

Rev. 11-04

Leighton and Associates, Inc.

TESTS for SULFATE CONTENT CHLORIDE CONTENT and pH of SOILS

Project Name: AQUA BELLA | Tested By : AJP | Date: 7/29/05

Project No. : 111280-005 | Data Input By: AJP | Date: 7/29/05

Boring No.	B-25				
Sample No.	B-4				
Sample Depth (ft)	0-10				
Visual Soil Classification	ML				
Wet Weight of Soil + Container (g)	200.0				
Dry Weight of Soil + Container (g)	180.0				
Weight of Container (g)	12.9				
Moisture Content (%)	12.0				
Weight of Soaked Soil (g)	100.0				

SULFATE CONTENT, DOT California Test 417, Hach Kit Method

Dillution : 1	3				
Water Fraction (ml)	25				
Tube Reading	<50				
PPM Sulfate	<150				
% Sulfate	<0.0150				

CHLORIDE CONTENT, DOT California Test 422

ml of Chloride Soln. For Titration (B	30				
ml of AgNO3 Soln. Used in Titration (C	3.6				
PPM of Chloride (C -0.2) * 100 * 30 / E	340				
PPM of Chloride, Dry Wt. Basis	**386**				

pH TEST, DOT California Test 532/643

Container No.	A				
pH Value	**7.88**				

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APPENDIX F

Laboratory Testing Procedures and Test Results (Leighton, 2004)

Atterberg Limits: The Atterberg Limits were determined in accordance with ASTM Test Method D4318 for engineering classification of the fine-grained materials.

Classification or Grain Size Tests: Typical materials were subjected to mechanical grain-size analysis by sieving from U.S. Standard brass screens (ASTM Test Method D422). Hydrometer analyses were performed where appreciable quantities of fines were encountered. The data was evaluated in determining the classification of the materials. The grain-size distribution curves are presented in the test data and the Unified Soil Classification (USCS) is presented in both the test data and the boring logs.

Consolidation Tests: Consolidation tests were performed in accordance with ASTM Test Method D2435 on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data herein.

Direct Shear Tests: Direct shear tests were performed, in general accordance with ASTM Test Method D3080, on selected remolded and/or undisturbed samples which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test results are presented in the test data.

Expansion Index Tests: The expansion potential of selected materials was evaluated in accordance with ASTM Test Method D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached.

Hydrocollapse Tests: Hydrocollapse test was performed in accordance with ASTM Test Method D4546 on selected, relatively undisturbed ring sample. A sample was placed in a consolidometer and loads were applied in geometric progression. The percent hydrocollapse for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The hydrocollapse pressure curve is presented in the test data.

Laboratory Testing (continued)

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed in accordance with ASTM Test Method D2216 and on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data

"R"-Value: The resistance "R"-value was determined by the California Materials Method No. 301 for subgrade soils. Three samples were prepared and exudation pressure and "R"-value determined on each one. The graphically determined "R"-value at exudation pressure of 300 psi is summarized in the test data.

Chloride Content, Sulfate Content, Minimum Resistivity and pH Tests: Chloride content, Sulfate Content, Minimum resistivity and pH tests were performed in general accordance with California Test Method 422, 417, and 532. The results are presented in the test data.

Leighton Consulting, Inc.

ATTERBERG LIMITS

ASTM D 4318

Project Name:	UCR FIELD STATION	Tested By :	JMD	Date:	8/2/2004
Project No. :	111280-001	Input By:	JMD	Date:	8/2/2004
Boring No.:	B-22	Checked By:	PRC	Date:	8/4/2004
Sample No.:	3	Depth (ft.):	5		
Sample Description:	MH, BROWN ELASTIC SILT				

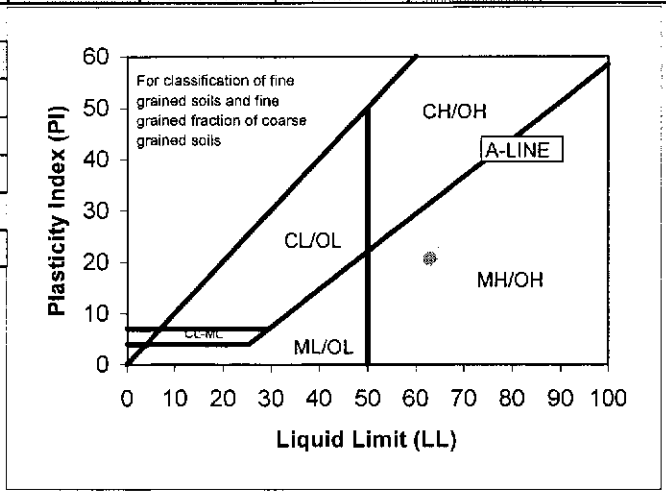
	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	
Number of Blows [N]			38	27	15	
Container No.	A	B	C	D	E	
Wet Wt. of Soil + Cont. (g)	25.18	26.42	15.45	17.89	17.01	
Dry Wt. of Soil + Cont. (g)	18.06	18.94	10.20	11.52	10.86	
Weight of Container (g)	1.29	1.30	1.35	1.35	1.38	
Moisture Content (%) [Wn]	42.5	42.4	59.3	62.6	64.9	

Liquid Limit	**63**
Plastic Limit	**42**
Plasticity Index	**21**
USCS Classification	**MH**

PI at "A" - Line = 0.73(LL-20) = 31

One-Point Liquid Limit Calculatio

LL =Wn(N/25)$^{0.121}$



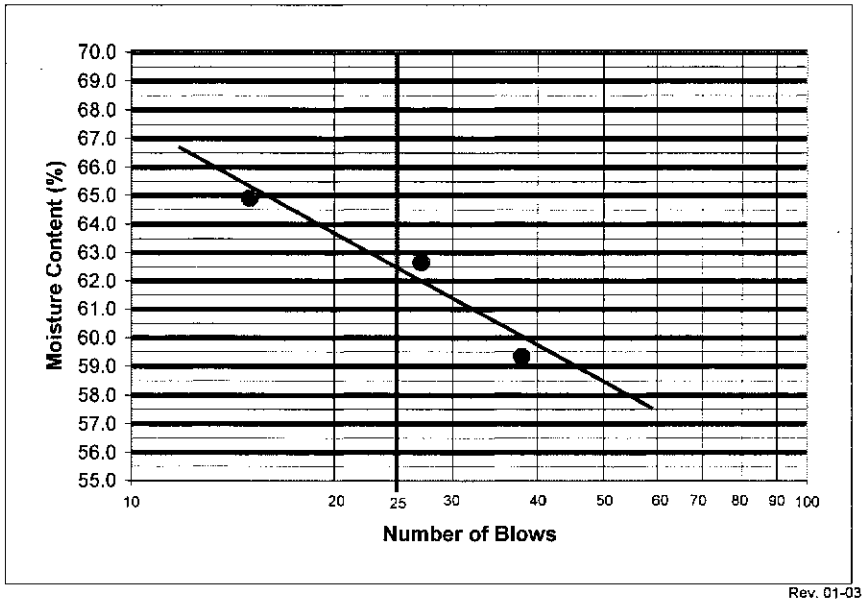
PROCEDURES USED

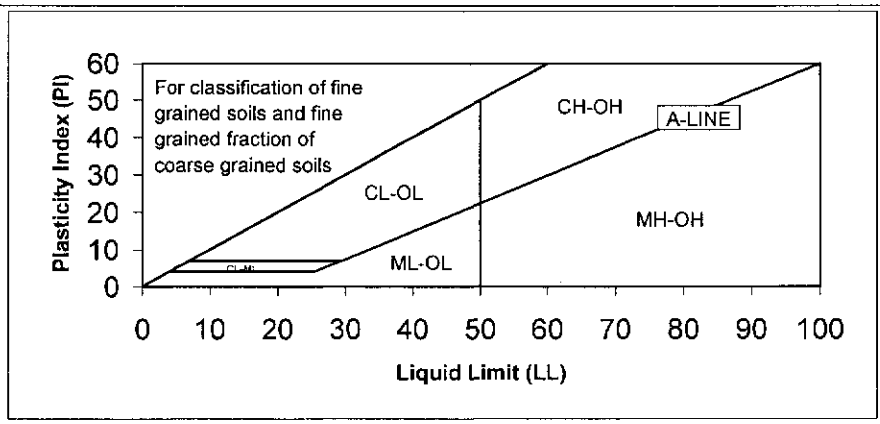
☐ Wet Preparation

☒ Dry Preparation

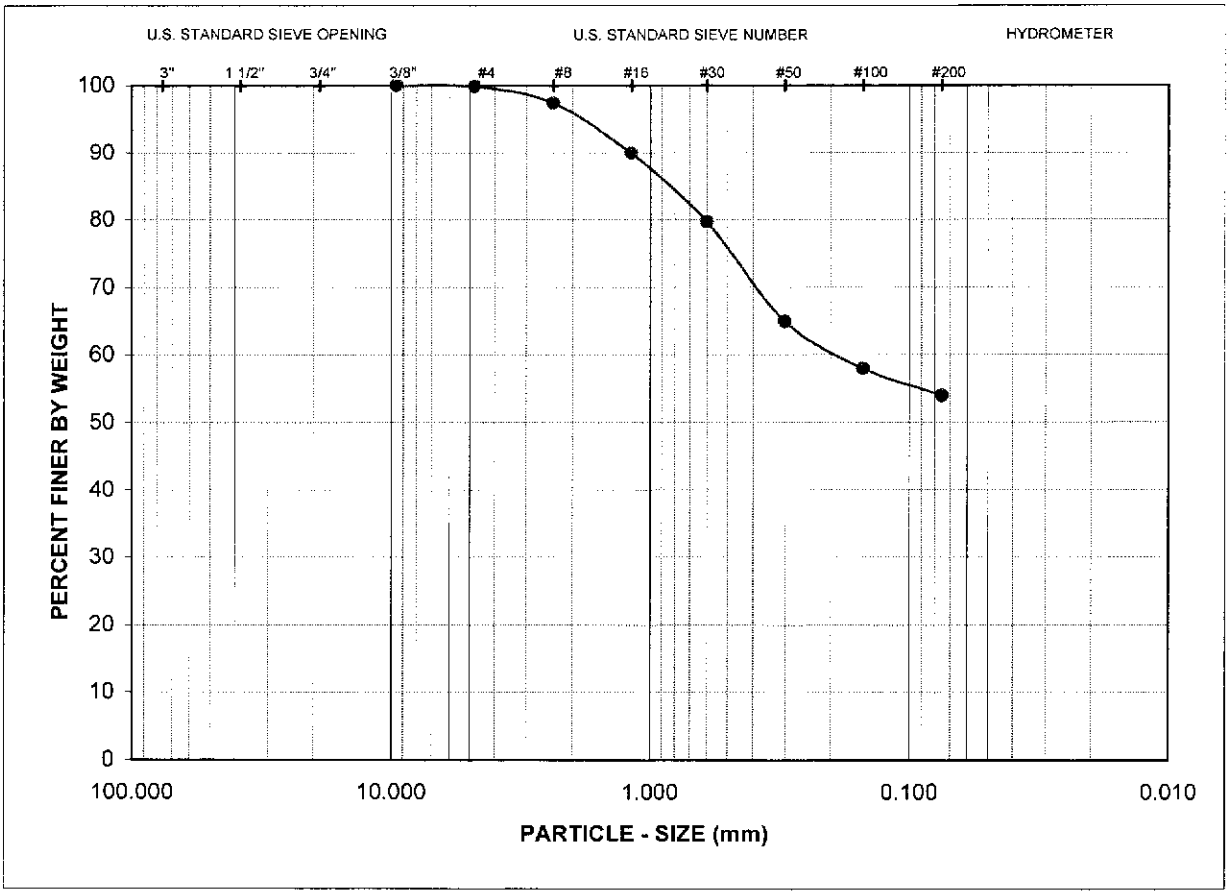
☒ Method A
Multipoint LL

☐ Method B
One-point LL





GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.	Sample No.	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL, PL, PI
B-12	2	5	s(ML)	**0 46 54**	**N/A**

Sample Description:
s(ML), BROWN SANDY LEAN SILT

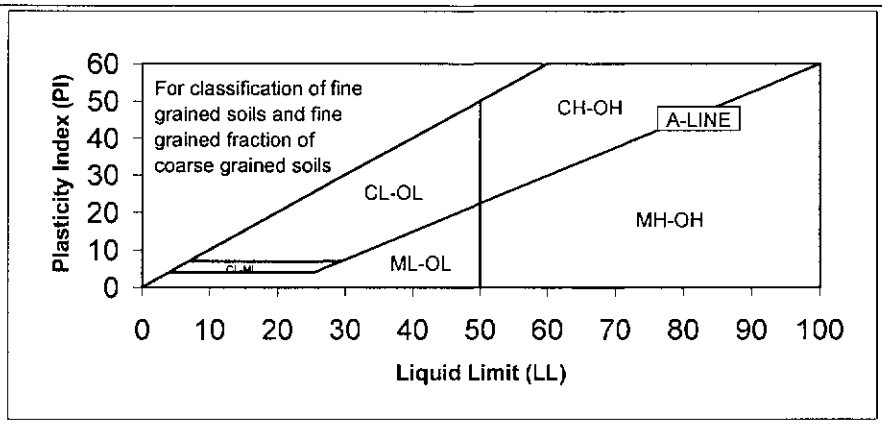
Leighton Consulting, Inc.

Project Name: UCR FIELD STATION

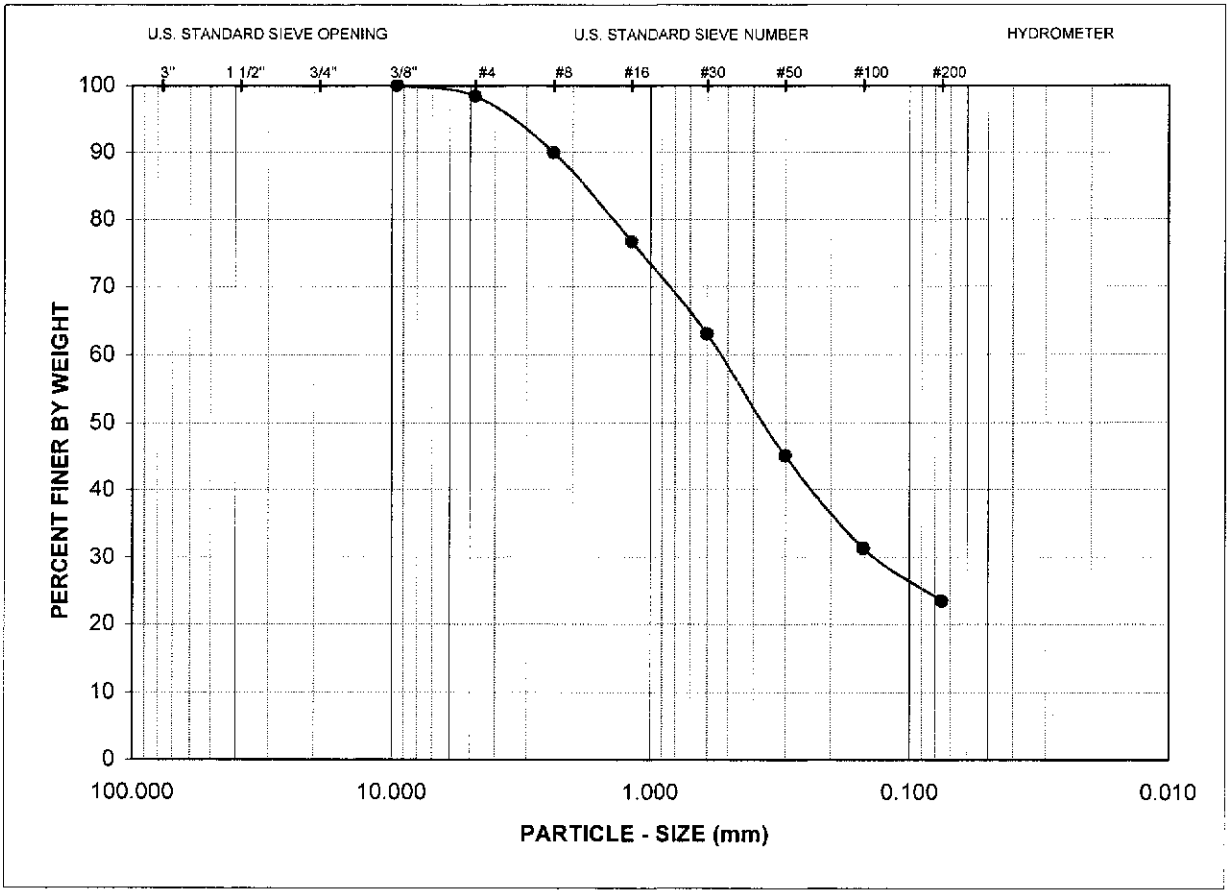
Project Number: 111280-001

Atterberg Limits, Particle Size Curve
ASTM D 4318, D 422

Rev. 01-03



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.	Sample No.	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL, PL, PI
B-18	5	10	SM	2 75 23	N/A

Sample Description:
SM, BROWN SILTY SAND

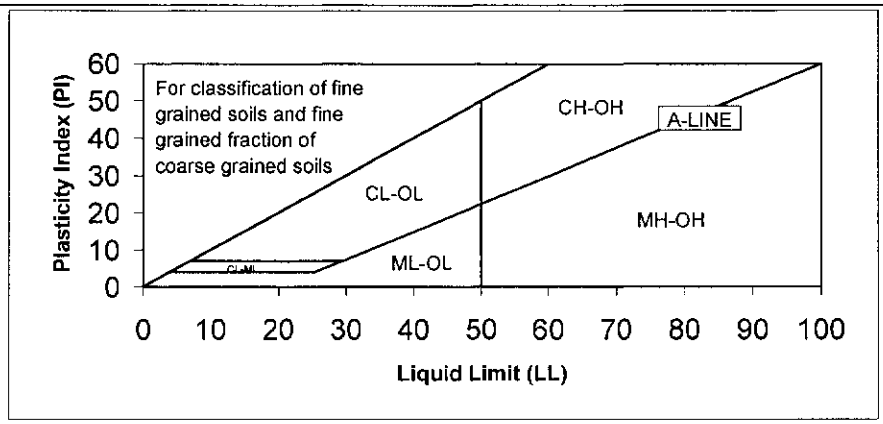
Leighton Consulting, Inc.

Project Name: UCR FIELD STATION

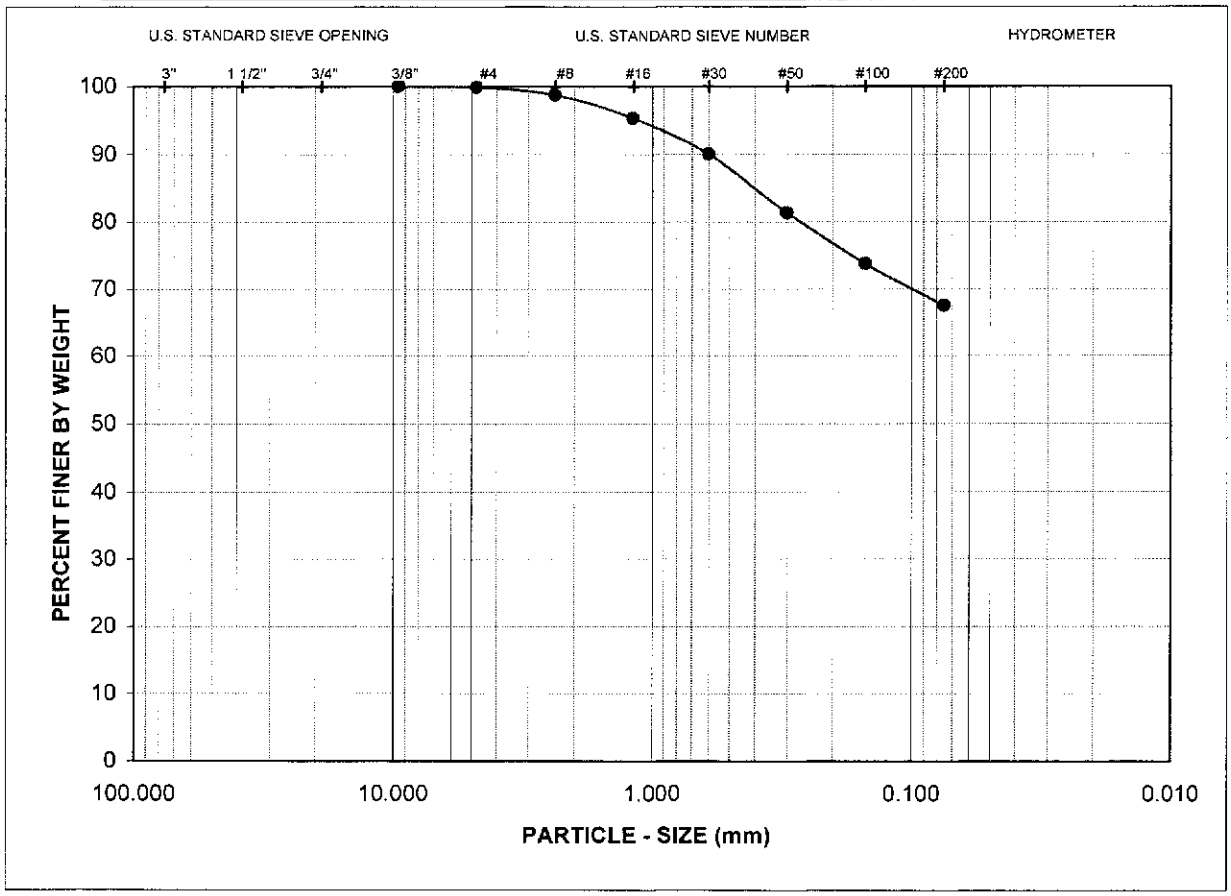
Project Number: 111280-001

Atterberg Limits, Particle Size Curve
ASTM D 4318, D 422

Rev. 01-03



GRAVEL		SAND			FINES
COARSE	FINE	CRSE	MEDIUM	FINE	SILT / CLAY



Boring No.	Sample No.	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL, PL, PI
B-23	3	5	s(CL)	**0 32 68**	**N/A**

Sample Description:
s(CL), BROWN SANDY LEAN CLAY

Leighton Consulting, Inc.

Project Name: UCR FIELD STATION

Project Number: 111280-001

Atterberg Limits, Particle Size Curve
ASTM D 4318, D 422

Rev. 01-03

Leighton Consulting, Inc.

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name:	UCR FIELD STATION		Tested By:	JMD	Date: 7/27/2004
Project Number:	111280-001		Checked By:	PRC	Date: 8/4/2004
Boring Number:	B-15		Sample Type:	RING	
Sample Number:	3		Depth (ft.):	5	
Sample Description:	SM, BROWN SILTY SAND				

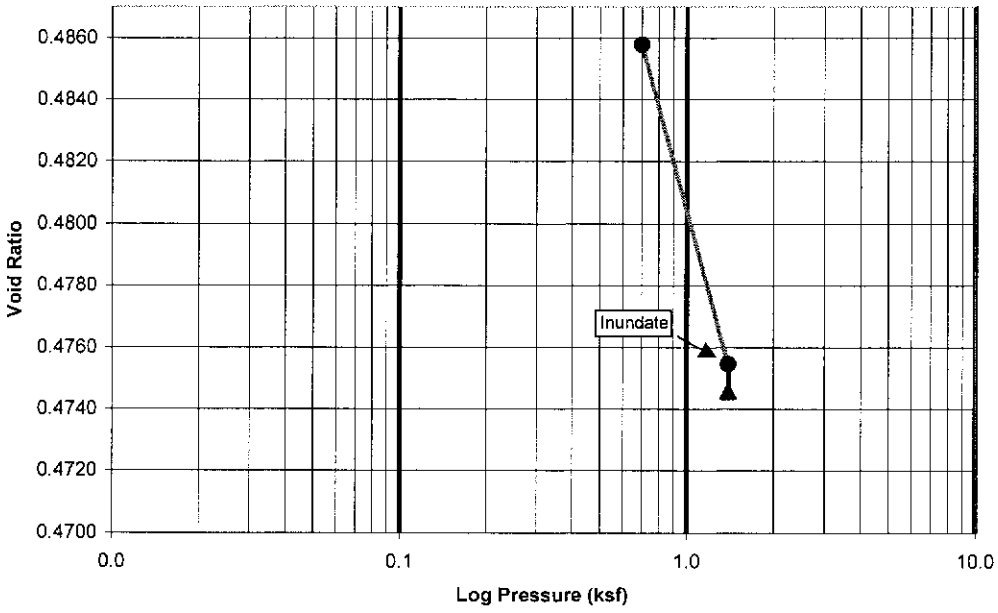
Initial Dry Density (pcf)	112.8
Initial Moisture (%)	13.3
Initial Height (in.)	1.0000
Initial Dial Reading	0.0500
Diameter (in.)	2.416

Final Dry Density (pcf)	114.3
Final Moisture (%)	18.0
Initial Void Ratio	0.4937
Specific Gravity (assumed)	2.70
Initial Saturation (%)	73

Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Swell (+) Settlement (-) Sample Thickness (%)	Void Ratio	Corrected Deformation (%)
0.700	0.0553	0.9947	0.00	-0.53	0.4858	-0.53
1.400	0.0622	0.9878	0.00	-1.22	0.4755	-1.22
H_2O	0.0628	0.9872	0.00	-1.28	0.4746	-1.28

Percent Swell (+) / Settlement (-) After Inundation = -0.06

Void Ratio - Log Pressure Curve



Leighton Consulting, Inc.

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name: UCR FIELD STATION
Project Number: 111280-001
Boring Number: B-16
Sample Number: 2
Sample Description: SM, BROWN SILTY SAND

Tested By: JMD Date: 7/27/2004
Checked By: PRC Date: 8/4/2004
Sample Type: RING
Depth (ft.): 2.5

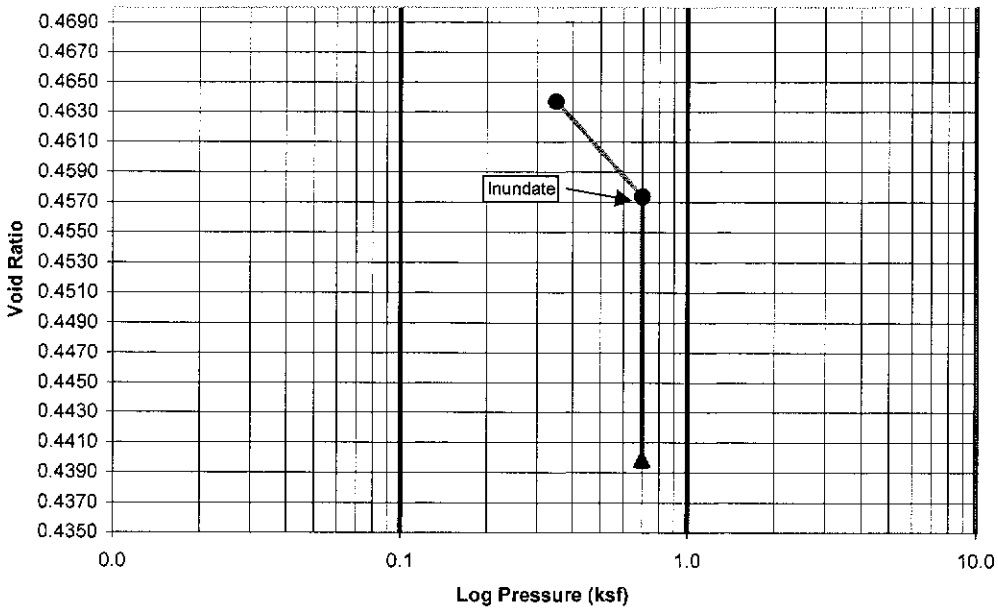
Initial Dry Density (pcf)	114.8
Initial Moisture (%)	4.5
Initial Height (in.)	1.0000
Initial Dial Reading	0.0500
Diameter (in.)	2.416

Final Dry Density (pcf)	117.1
Final Moisture (%)	15.2
Initial Void Ratio	0.4688
Specific Gravity (assumed)	2.70
Initial Saturation (%)	26

Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Swell (+) Settlement (-) Sample Thickness (%)	Void Ratio	Corrected Deformation (%)
0.350	0.0535	0.9965	0.00	-0.35	0.4637	-0.35
0.700	0.0578	0.9922	0.00	-0.78	0.4574	-0.78
H_2O	0.0697	0.9803	0.00	-1.97	0.4399	-1.97

Percent Swell (+) / Settlement (-) After Inundation = -1.20

Void Ratio - Log Pressure Curve



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ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name: UCR FIELD STATION
Project Number: 111280-001
Boring Number: B-18
Sample Number: 4
Sample Description: SM, BROWN SILTY SAND

Tested By: JMD Date: 7/27/2004
Checked By: PRC Date: 8/4/2004
Sample Type: RING
Depth (ft.): 7.5

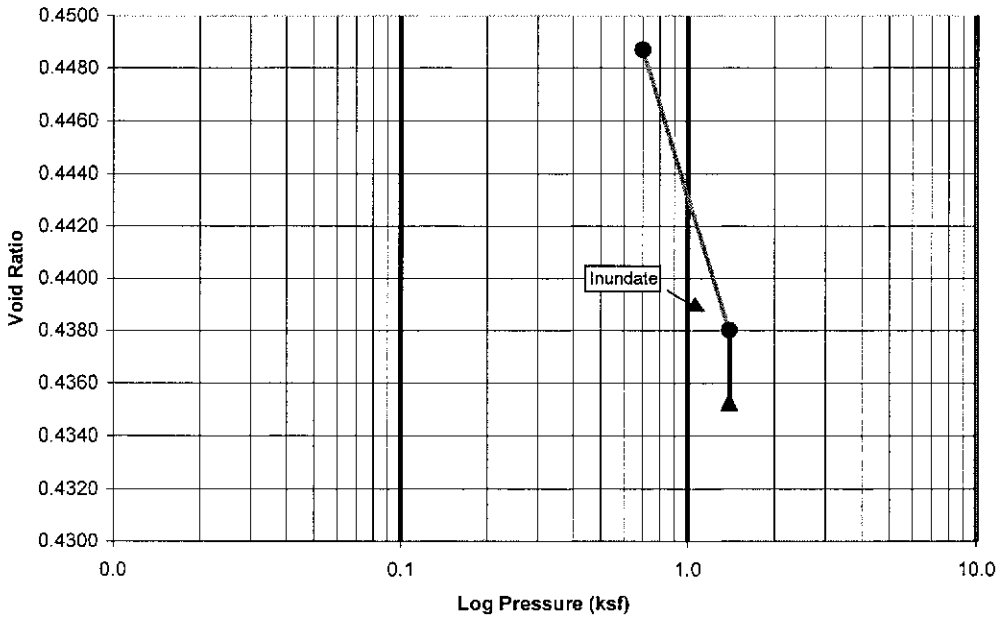
Initial Dry Density (pcf)	115.4
Initial Moisture (%)	11.2
Initial Height (in.)	1.0000
Initial Dial Reading	0.0500
Diameter (in.)	2.416

Final Dry Density (pcf)	117.4
Final Moisture (%)	17.3
Initial Void Ratio	0.4604
Specific Gravity (assumed)	2.70
Initial Saturation (%)	65

Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Swell (+) Settlement (-) Sample Thickness (%)	Void Ratio	Corrected Deformation (%)
0.700	0.0580	0.9920	0.00	-0.80	0.4487	-0.80
1.400	0.0653	0.9847	0.00	-1.53	0.4380	-1.53
H_2O	0.0672	0.9828	0.00	-1.72	0.4352	-1.72

Percent Swell (+) / Settlement (-) After Inundation = -0.19

Void Ratio - Log Pressure Curve



Rev. 01-03

Leighton Consulting, Inc.

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name:	UCR FIELD STATION		Tested By:	JMD	Date: 7/27/2004
Project Number:	111280-001		Checked By:	PRC	Date: 8/4/2004
Boring Number:	B-19		Sample Type:	RING	
Sample Number:	7		Depth (ft.):	15	
Sample Description:	SM, BROWN SILTY SAND				

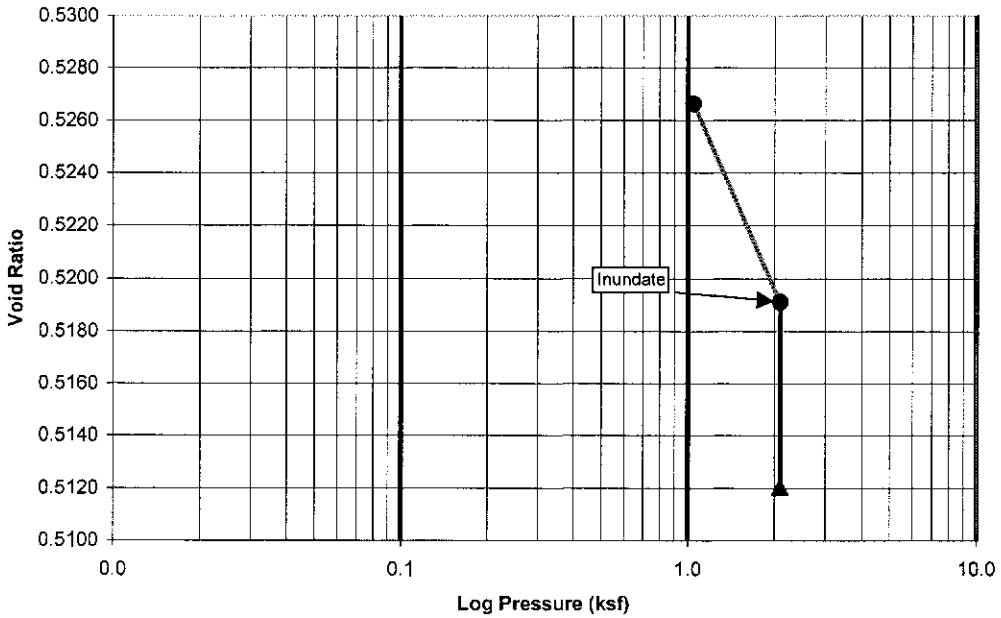
Initial Dry Density (pcf)	109.8
Initial Moisture (%)	3.9
Initial Height (in.)	1.0000
Initial Dial Reading	0.0500
Diameter (in.)	2.416

Final Dry Density (pcf)	111.5
Final Moisture (%)	16.0
Initial Void Ratio	0.5355
Specific Gravity (assumed)	2.70
Initial Saturation (%)	20

Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Swell (+) Settlement (-) Sample Thickness (%)	Void Ratio	Corrected Deformation (%)
1.050	0.0558	0.9942	0.00	-0.58	0.5266	-0.58
2.100	0.0607	0.9893	0.00	-1.07	0.5191	-1.07
H_2O	0.0653	0.9847	0.00	-1.53	0.5120	-1.53

Percent Swell (+) / Settlement (-) After Inundation = -0.46

Void Ratio - Log Pressure Curve



Leighton Consulting, Inc.

COMPACTION TEST

ASTM D 1557

Project Name: UCR FIELD STATION — Tested By: AJP — Date: 7/28/04
Project Number: 111280-001 — Checked By: PRC — Date: 8/4/04
Boring Number: B-19
Sample Number: 1 — Depth (ft.): 0-5 — Scalp Fraction (%): +#4: 0.9 — +3/8": — +3/4":
Sample Description: SM, BROWN SILTY SAND

Preparation Method: [ ] Moist [X] Dry — **Compaction Method:** [X] Mechanical Rammer [ ] Manual Rammer

Mold Volume (ft.^{3}): 0.03344 — **Rammer Weight:** 10 lbs. — **Drop:** 18 inches

Water added (ml):	100	50	0	150		
TEST NUMBER:	1	2	3	4	5	
Weight of Soil and Mold (g)	5724	5710	5580	5676		
Weight of Mold (g)	3586	3586	3586	3586		AS REC'D MOISTURE
Weight of Soil (g)	2138	2124	1994	2090		
Wet Soil and Tare (g)	166.9	153.8	153.0	166.3		153.0
Dry Soil and Tare (g)	152.3	142.8	144.5	149.3		144.5
Weight of Tare (g)	12.0	12.0	12.0	12.0		12.0
Wet Density (pcf)	141.0	140.0	131.5	137.8		
Moisture Content (%)	10.4	8.4	6.4	12.4		6.4
Dry Density (pcf)	127.7	129.2	123.5	122.6		

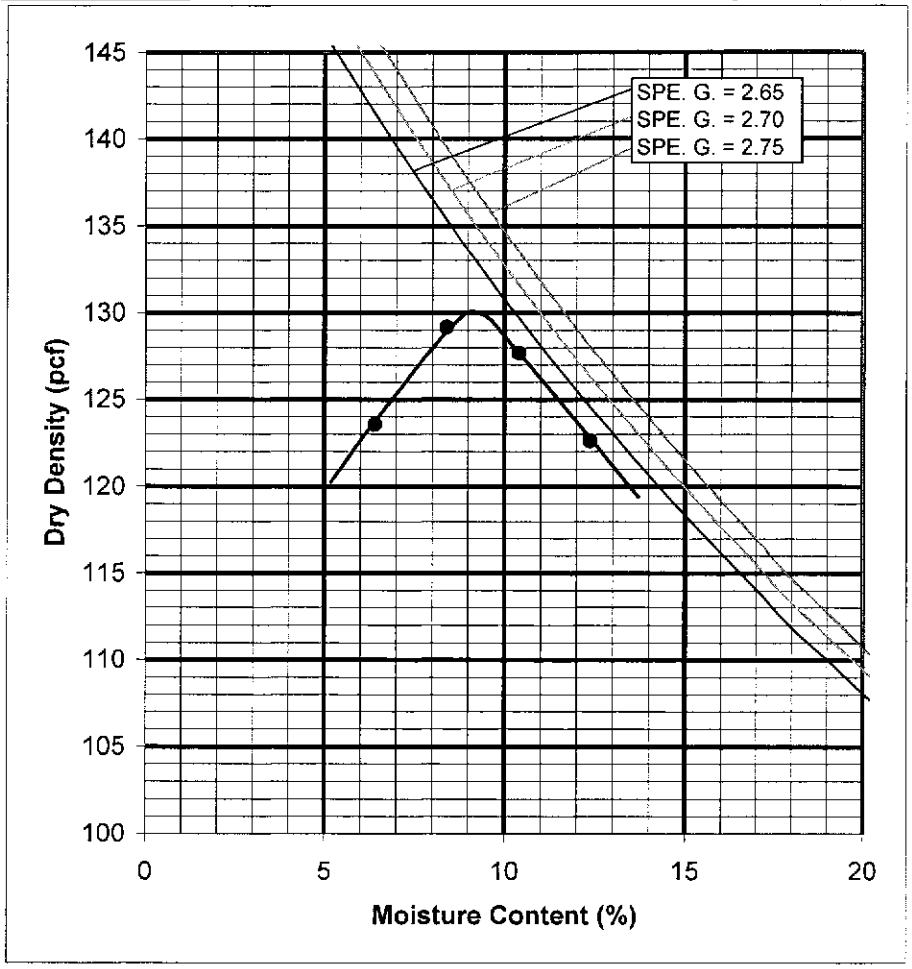
Maximum Dry Density (pcf) 130.0 — **Optimum Moisture Content (%)** 9.0

PROCEDURE

[X] **Procedure A**
Soil: Passing No. 4 (4.75mm) Sieve
Mold: 4 in. (101.6 mm) Diameter
Layers: 5 (five)
Blows per Layer: 25 (twenty-five)
May be used if 20% or less by weight of the material is retained on the No. 4 sieve.

[ ] **Procedure B**
Soil: Passing 3/8 in. (9.5 mm) Sieve
Mold: 4 in. (101.6 mm) Diameter
Layers: 5 (five)
Blows per Layer: 25 (twenty-five)
Shall be used if more than 20% by weight of the material is retained on the No. 4 sieve and 20% or less by weight is retained on the 3/8 in. sieve.

[ ] **Procedure C**
Soil: Passing 3/4 in. (19.0 mm) Sieve
Mold: 6 in. (152.4 mm) Diameter
Layers: 5 (five)
Blows per Layer: 56 (fifty-six)
Shall be used if more than 20% by weight of the material is retained on the 3/8 in. sieve and less than 30% by weight is retained on the 3/4 in. sieve.



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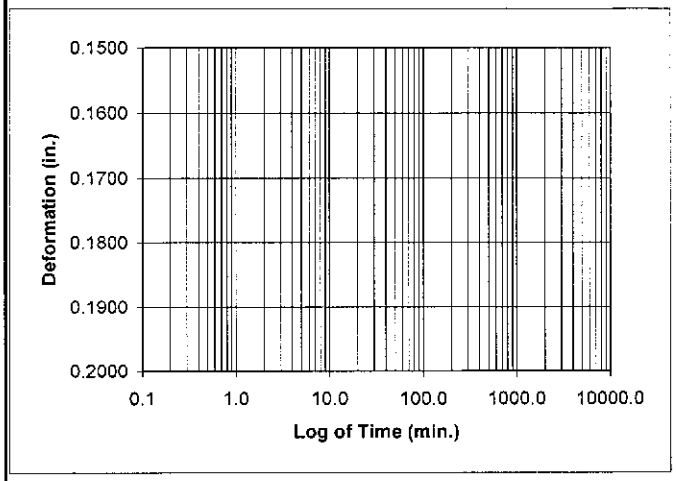
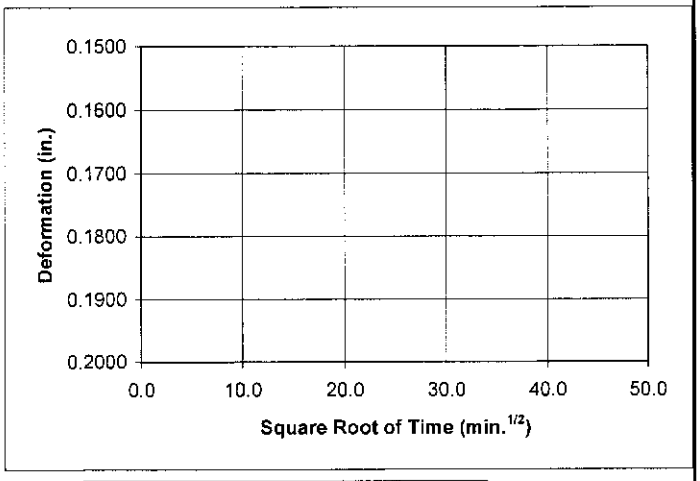
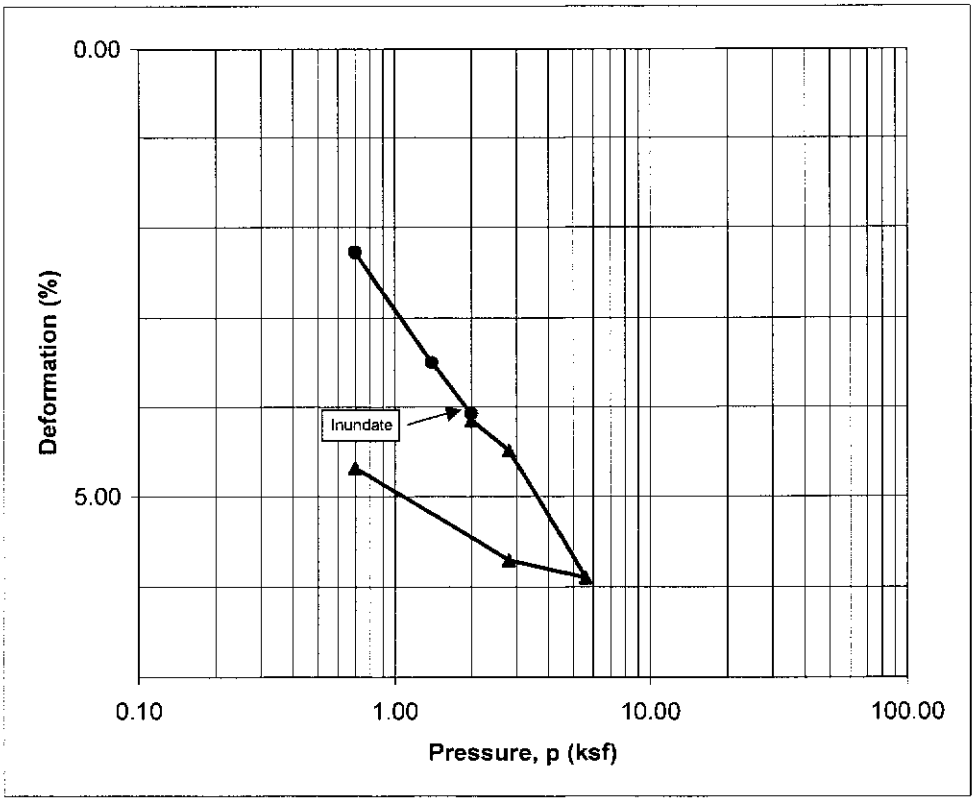
Time Readings @ 0 ksf







Boring Number	Sample Number:	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
B-22	**6**	**12.5**	**40.7**	**41.0**	**78.7**	**78.9**	**1.093**	**1.042**	**96**	**97**

Sample Description:
ML, BROWN LEAN SILT

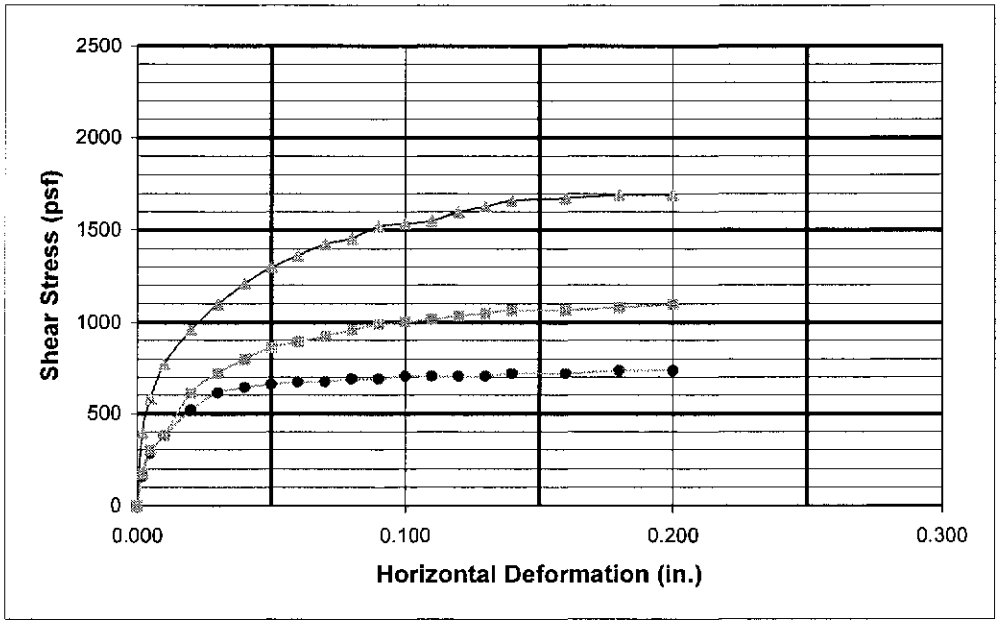
Leighton Consulting, Inc.

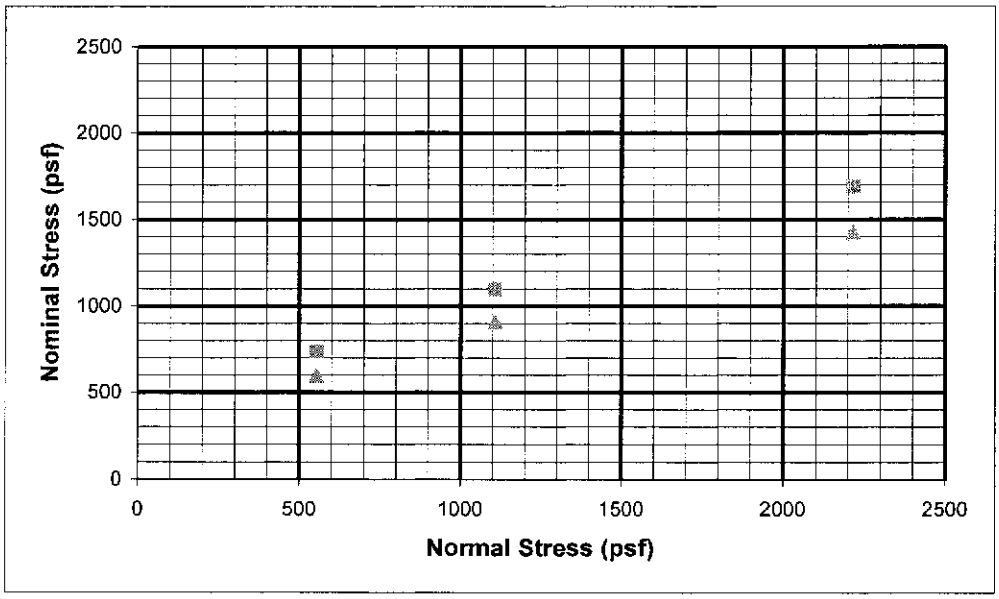
Project Name: UCR FIELD STATION

Project Number: 111280-001

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOIL
ASTM D 2435

Rev. 01-03





Normal Stress (psf)	554	1108	2216
Peak Shear Stress (psf)	736	1096	1690
Ultimate Shear Stress (psf)	736	1096	1690
Relaxed Shear Stress (psf)	595	908	1424
Rate of Shear (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Sample Height Before Shear (in.)	N/A	N/A	N/A
Sample Diameter (in.)	2.416	2.416	2.416
Initial Moisture Content (%)	9.0	9.0	9.0
Initial Dry Density (pcf)	117.0	117.0	117.0
Initial Degree of Saturation (%)	55	55	55
Final Moisture Content(%)	16.7	15.7	15.1

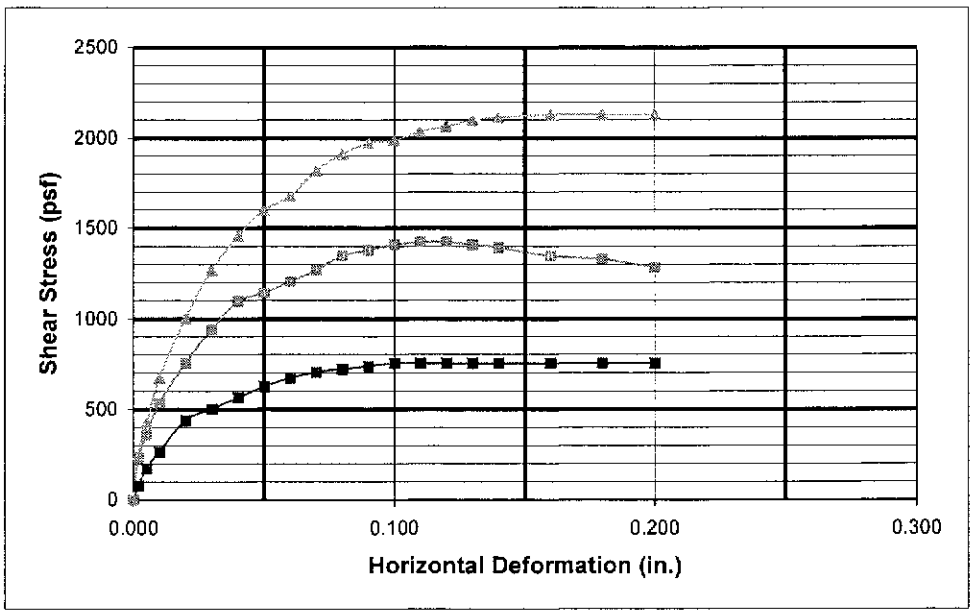
Leighton Consulting, Inc.

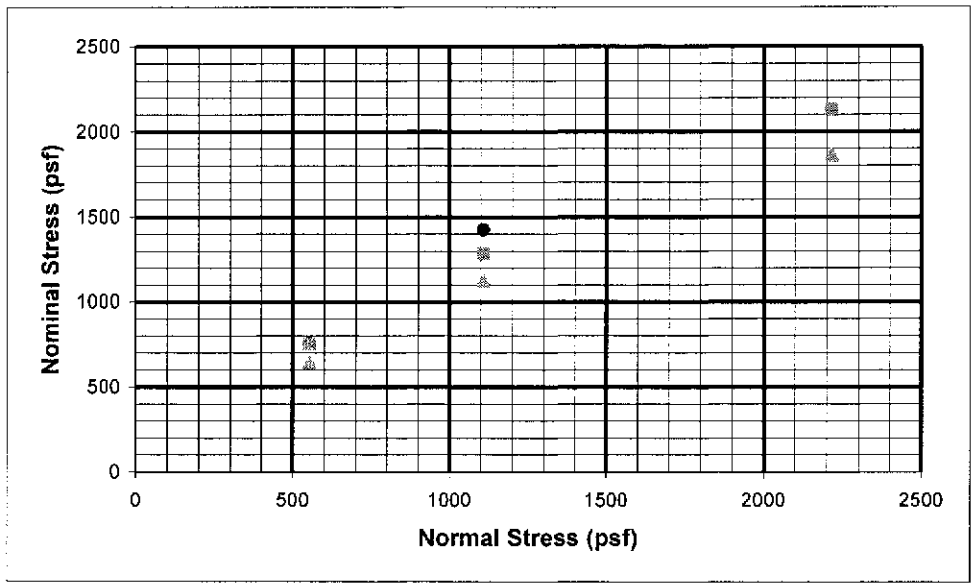
DIRECT SHEAR TEST RESULTS

ASTM D 3080

Project Name:	UCR FIELD STATION		
Project Number:	111280-001		
Boring Number:	B-19		
Sample Number:	1	Depth (ft.):	0-5
Sample Description:	SM, BROWN SILTY SAND		

Rev. 01-03





Normal Stress (psf)	554	1108	2216
Peak Shear Stress (psf)	751	1424	2128
Ultimate Shear Stress (psf)	751	1283	2128
Relaxed Shear Stress (psf)	642	1127	1862
Rate of Shear (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Sample Height Before Shear (in.)	N/A	N/A	N/A
Sample Diameter (in.)	2.416	2.416	2.416
Initial Moisture Content (%)	7.2	6.1	7.9
Initial Dry Density (pcf)	110.3	113.9	111.9
Initial Degree of Saturation (%)	37	34	42
Final Moisture Content(%)	18.8	16.8	16.5

Leighton Consulting, Inc.

DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name:	UCR FIELD STATION
Project Number:	111280-001
Boring Number:	B-14
Sample Number:	2
Depth (ft.):	5.0
Sample Description:	SM, BROWN SILTY SAND

Rev. 01-03

Leighton Consulting, Inc.

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	UCR FIELD STATION	Tested By: AJP	Date: 7/26/04
Project No. :	111280-001	Checked By: PRC	Date: 8/4/04
Boring No.:	B-18	Depth (ft.): 0-5	
Sample No. :	1	Location:	
Sample Description:	SM, BROWN SILTY SAND		

Dry Weight of Soil + Cont. (g)	1880.0
Weight of Container (g)	0.0
Dry Wt. of Soil (g)	1880.0
Weight Soil Retained on #4 Sieve (g)	13.0
Percent Retained on # 4 Sieve	0.7

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	0.4993
Weight of Soil & Ring (g)	605.6	638.6
Weight of Ring (g)	200.1	200.1
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-11	E-11
Wet Weight of Soil + Cont. (g)	311.9	638.6
Dry Weight of Soil + Cont. (g)	288.4	373.7
Weight of Container (g)	11.9	200.1
Moisture Content (%)	8.5	17.3
Wet Density (pcf)	122.3	132.4
Dry Density (pcf)	112.7	112.9
Void Ratio	0.495	0.494
Total Porosity	0.331	0.331
Pore Volume (cc)	68.6	34.2
Degree of Saturation (%) [S meas]	**46.3**	**94.6**

SPECIMEN INUNDATION: Inundate with distilled water for a period of 24 hours or until the expansion rate is less than 0.0002 in./hr. in no less than three hours.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
7/26/04	3:00	1.0	0	0.5000
7/26/04	3:10	1.0	10	0.4993
Add Distilled Water to the Specimen				
7/27/04	7:20	1.0	1690	0.4993
7/27/04	8:20	1.0	1750	0.4993

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**0.0**
Expansion Index (EI)$_{50}$ =	EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**0**

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EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	UCR FIELD STATION	Tested By: AJP	Date: 7/26/04
Project No. :	111280-001	Checked By: PRC	Date: 8/4/04
Boring No.:	B-22	Depth (ft.): 0-5	
Sample No. :	1	Location:	
Sample Description:	CL, BROWN LEAN CLAY		

Dry Weight of Soil + Cont. (g)	2000.0
Weight of Container (g)	0.0
Dry Wt. of Soil (g)	2000.0
Weight Soil Retained on #4 Sieve (g)	0.0
Percent Retained on # 4 Sieve	0.0

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	0.5485
Weight of Soil & Ring (g)	548.0	604.2
Weight of Ring (g)	199.1	199.1
Specific Gravity (Assumed)	2.70	2.70
Container No.	E-10	E-10
Wet Weight of Soil + Cont. (g)	311.9	604.2
Dry Weight of Soil + Cont. (g)	275.1	306.1
Weight of Container (g)	11.9	199.1
Moisture Content (%)	14.0	32.4
Wet Density (pcf)	105.2	113.8
Dry Density (pcf)	92.3	86.0
Void Ratio	0.826	0.915
Total Porosity	0.452	0.478
Pore Volume (cc)	93.6	54.2
Degree of Saturation (%) [S meas]	**45.8**	**95.5**

SPECIMEN INUNDATION: Inundate with distilled water for a period of 24 hours or until the expansion rate is less than 0.0002 in./hr. in no less than three hours.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
7/26/04	3:00	1.0	0	0.5000
7/26/04	3:10	1.0	10	0.5000
Add Distilled Water to the Specimen				
7/27/04	7:20	1.0	1690	0.5485
7/27/04	8:20	1.0	1750	0.5485

Expansion Index (EI meas) =	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**48.5**
Expansion Index (EI)$_{50}$ =	EI meas - (50 -S meas)x((65+EI meas) / (220-S meas))	**46**

Rev. 11-02

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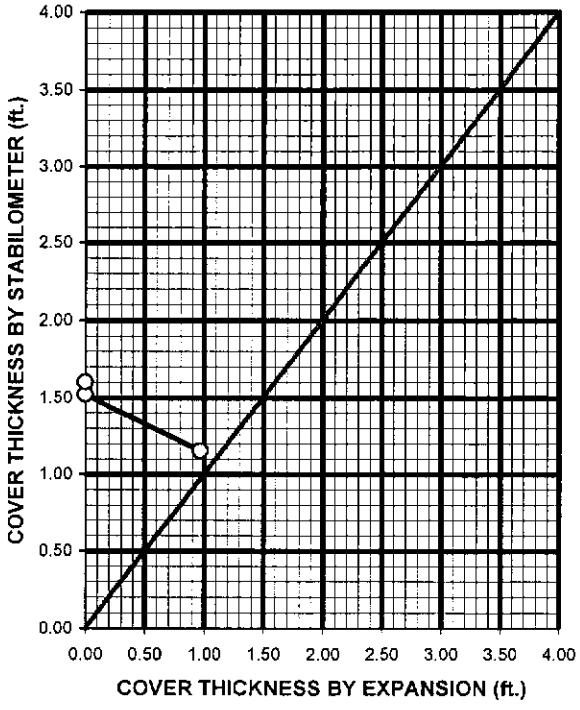
R-VALUE

CT 301

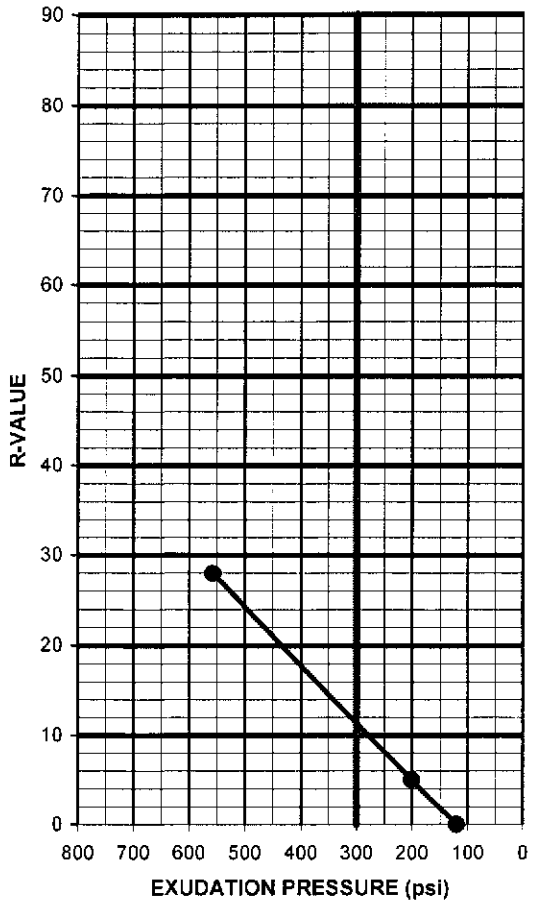
Project Name:	UCR FIELD STATION	Date Tested:	8/3/2004
Project Number:	111280-001	Tested By:	RGO
Boring Number:	B-13 Sample Number: 1	Depth (ft.):	0-5
Sample Location:	N/A		
Soil Description:	(CL)s, DARK BROWN LEAN CLAY WITH SAND		

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION (%)	9.1	11.2	13.4
HEIGHT OF COMPACTED SAMPLE (in.)	2.53	2.42	2.57
DRY DENSITY (pcf)	126.8	125.7	119.5
COMPACTION PRESSURE (psi)	240	105	55
EXUDATION PRESSURE (lbf)	7000	2520	1500
EXUDATION PRESSURE (psi)	557	200	119
EXPANSION (in. x 10,000)	29	0	0
STABILITY, Ph at 2000 lbf	100	145	168
TURNS DISPLACEMENT (in. x 10)	3.87	4.74	5.76
R-VALUE UNCORRECTED	28	5	0
R-VALUE CORRECTED	28	5	0
DESIGN CALCULATION DATA			
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS (ft.)	1.15	1.52	1.60
EXPANSION PRESSURE THICKNESS (ft.)	0.97	0.00	0.00

EXPANSION PRESSURE



EXUDATION PRESSURE



R-VALUE BY EXPANSION:	**N/A**
R-VALUE BY EXUDATION:	**12**
EQUILIBRIUM R-VALUE:	**12**

Rev. 01-03

Leighton Consulting, Inc.

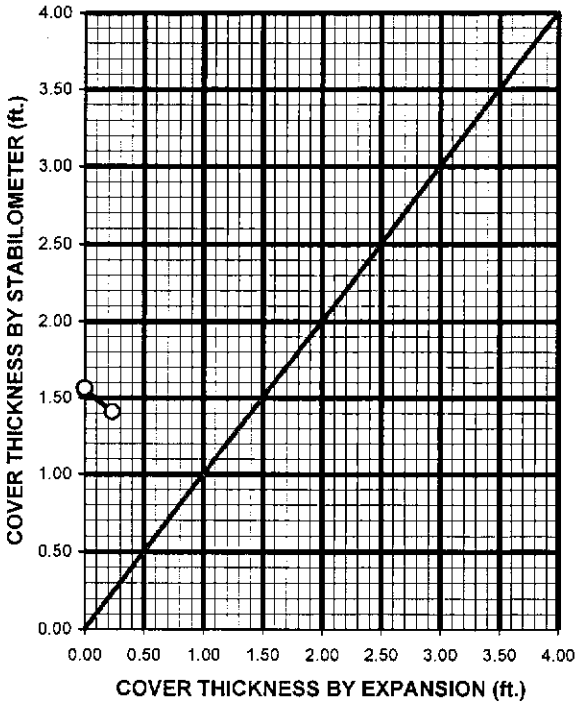
R-VALUE

CT 301

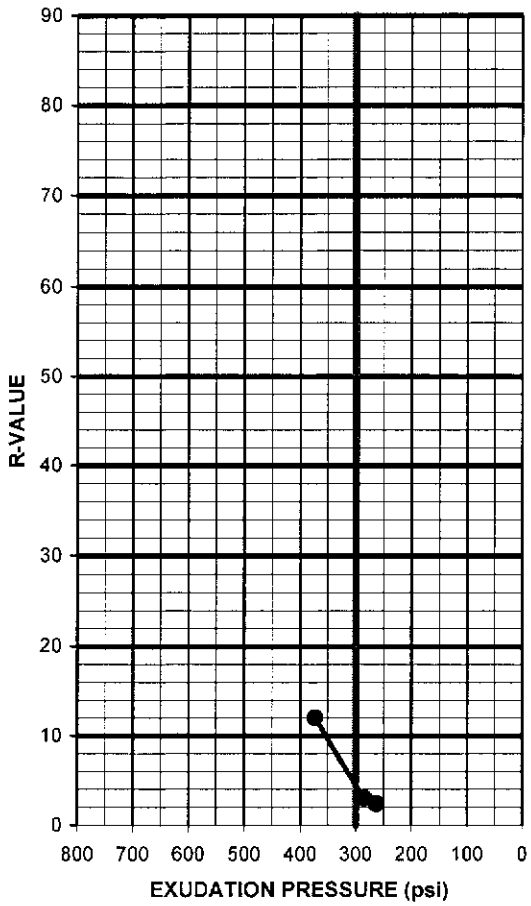
Project Name:	UCR FIELD STATION			Date Tested:	8/3/2004
Project Number:	111280-001			Tested By:	RGO
Boring Number:	B-22	Sample Number:	1	Depth (ft.):	0-5
Sample Location:	N/A				
Soil Description:	CL, BROWN LEAN CLAY				

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION (%)	20.4	21.6	22.7
HEIGHT OF COMPACTED SAMPLE (in.)	2.61	2.62	2.51
DRY DENSITY (pcf)	105.0	102.2	101.7
COMPACTION PRESSURE (psi)	110	95	75
EXUDATION PRESSURE (lbf)	4680	3580	3300
EXUDATION PRESSURE (psi)	372	285	263
EXPANSION (in. x 10,000)	7	0	0
STABILITY, Ph at 2000 lbf	132	148	153
TURNS DISPLACEMENT (in. x 10)	4.12	4.93	4.67
R-VALUE UNCORRECTED	11	4	2
R-VALUE CORRECTED	12	3	2
DESIGN CALCULATION DATA			
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS (ft.)	1.41	1.55	1.56
EXPANSION PRESSURE THICKNESS (ft.)	0.23	0.00	0.00

EXPANSION PRESSURE



EXUDATION PRESSURE



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	<5
EQUILIBRIUM R-VALUE:	<5

Rev. 01-03

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pH and Resistivity
Sulfate Content
Chloride Content

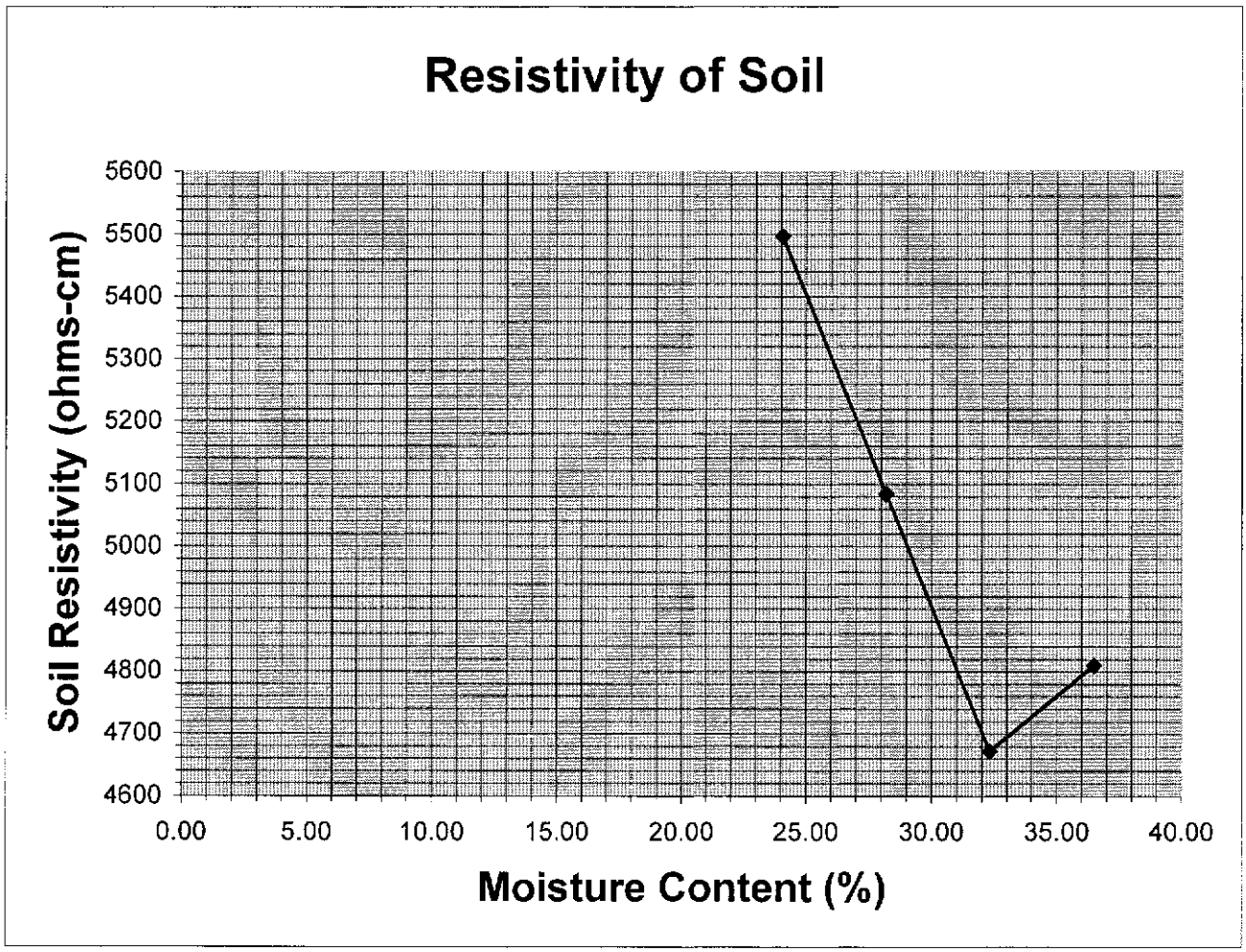
CT 532, CT 417, CT 422

Project Name:	UCR FIELD STATION	Date:	7/29/2004
Project Number:	111280-001	Tested By:	BCC
Boring Number:	B-22	Checked By:	
Sample Number:	1	Depth (ft.):	0.0-5.0
Sample Description:	SM: BROWN SILTY SAND		

Initial Moisture Content	
Wet Weight of Soil+Container (g)	100.0
Dry Weight of Soil+Container (g)	93.0
Weight of Container (g)	0.0
Moisture Content (%)	7.5

Initial Sample Weight (g)	1300
Box Constant	6.87
Soil pH	8.09
Sulfate Content (ppm)	<150
Chloride Content (ppm)	30

Water Added (ml)	200	250	300	350		
Moisture Content (%)	24.07	28.21	32.34	36.48		
Spec. Cond.(uhm/cm)	800	740	680	700		
Resistivity (ohms-cm)	5496	5084	4672	4809		



Leighton Consulting, Inc.

pH and Resistivity
Sulfate Content
Chloride Content

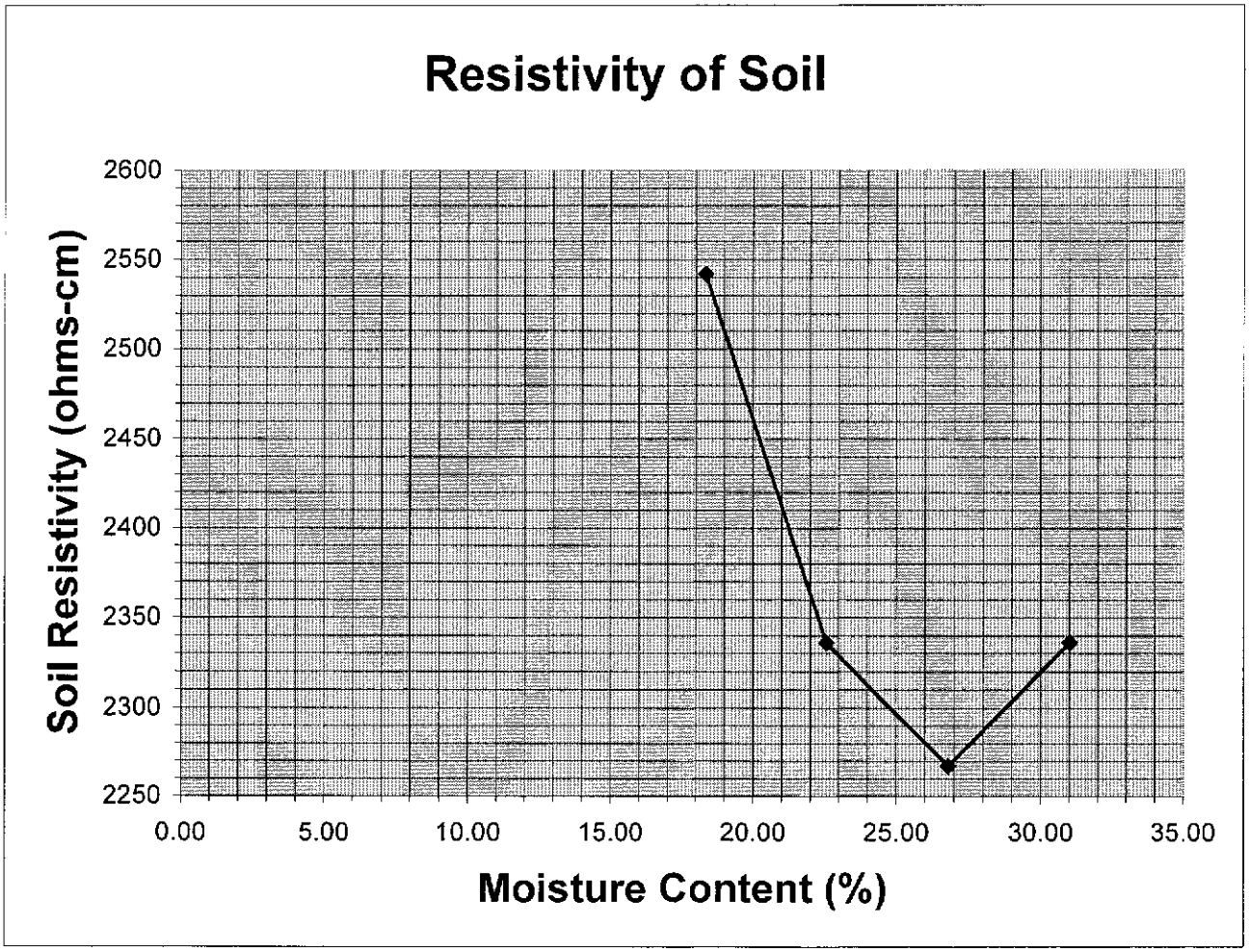
CT 532, CT 417, CT 422

Project Name:	UCR FIELD STATION	Date:	7/29/2004
Project Number:	111280-001	Tested By:	BCC
Boring Number:	B-19	Checked By:	
Sample Number:	1	Depth (ft.):	0.0-5.0
Sample Description:	SM: DARK BROWN SILTY SAND		

Initial Moisture Content	
Wet Weight of Soil+Container (g)	100.0
Dry Weight of Soil+Container (g)	91.0
Weight of Container (g)	0.0
Moisture Content (%)	9.9

Initial Sample Weight (g)	1300
Box Constant	6.87
Soil pH	8.01
Sulfate Content (ppm)	<150
Chloride Content (ppm)	270

Water Added (ml)	100	150	200	250		
Moisture Content (%)	18.34	22.57	26.80	31.02		
Spec. Cond.(uhm/cm)	370	340	330	340		
Resistivity (ohms-cm)	2542	2336	2267	2336		



ENGEO

Expect Excellence

Paleontological Resources Inventory Letter Report

Aquabella Specific Plan Amendment Project

MARCH 2023

Prepared for:

HIGHLAND FAIRVIEW
14177 Frederick Street
Moreno Valley, CA 92553
Contact: Andrew Daymude

Prepared by

Mike Williams, Ph.D. and Sarah Siren, M.Sc.
DUDEK

605 Third Street
Encinitas, California 92024

May 9, 2023

Subject: **Paleontological Resources Inventory Letter Report for Aquabella Specific Plan Amendment Plan Project, City of Moreno Valley, Riverside County, California**

Dudek conducted a paleontological resources inventory for the Aquabella Specific Plan Amendment (SPA) Project (Project) in the City of Moreno Valley in Riverside County, California. This letter report provides the paleontological resources inventory for the Project. The SPA Project plans to provide development to accommodate 15,000 multi-family housing, 300,000 square feet (sf) mixed use commercial and retail town center with a 300-room hotel, 80 acres of parks, 45 acres of schools, public services and facilities, infrastructure improvements, and other amenities. The overall Project site is located on 683 acres in the southeastern portion of the City of Moreno Valley, south of State Route 60 (Moreno Valley Freeway), east of Lasselle Street Road, north of Iris Avenue, and west of Oliver Street. The Project site is bisected by Nason Street and is located at Sections 15, 16, 21, 22, and Range 3 West and Township 3 South in the U.S. Geological Survey 7.5-minute Series Sunnymead California Quadrangle (Appendix A: Figure 1). Specifically, the Project site is located on Assessor's Parcel Numbers (APN) 486-300-013, 486-310-036, 486-310-014, 486-320-012, 486-320-009, 486-300-012, 486-320-010, 486-320-013, 486-320-011, 486-310-035, and rights of way.

In accordance with the California Environmental Quality Act (CEQA) and the Society of Vertebrate Paleontology (SVP) (2010) guidelines, Dudek performed a paleontological resources inventory for the Project. The inventory included a paleontological records search through the Natural History of Los Angeles County (LACM) and the Western Science Center (WSC), a review of geological mapping, and pertinent geological and paleontological literature, and an intensive pedestrian survey. No paleontological resources were observed during the pedestrian survey of the Project site. The results of the paleontological records searches indicated that there are no previously recorded fossil localities that appear directly within the Project site. However, the Project site is underlain by geological units that have low to high paleontological sensitivity. The potential to impact paleontological resources within the Project site during construction-related ground disturbance is possible on the surface or at depth and a mitigation plan or avoidance is recommended. Additionally, the LACM and WSC reported fossil localities nearby from the similar geological units that underlie the Project site at depth.

As the majority of the Project site have never been developed and is underlain by a geological unit with high paleontological sensitivity, there is a potential to encounter intact subsurface paleontological resources in areas underlain by geological units with high paleontological sensitivity. As such, a paleontological monitoring program, which includes the preparation and implementation of a Paleontological Resources Impact Mitigation Plan (PRIMP), is necessary to reduce impacts to any potential paleontological resources onsite in those areas underlain by sediments with high potential to yield significant paleontological resources. This memorandum was prepared by Michael Williams, Ph.D. and Sarah Siren, M.Sc., qualified Principal Investigators (PIs) for Paleontology, with assistance from Jason Collins, B.A., in accordance with federal and state CEQA guidelines and SVP (2010) standards..

Paleontological Resources

Paleontological resources are the remains or traces of plants and animals that are preserved in earth's crust, and per the SVP (2010) guidelines, are older than written history or older than approximately 5,000 years. They are limited, nonrenewable resources of scientific and educational value and are afforded protection under state laws and regulations. This study satisfies requirements in accordance with state guidelines (13 PRC, 21000 et seq.) and Public Resources Code Section 5097.5 (Stats 1965, c 1136, p. 2792). This analysis also complies with guidelines

and significance criteria specified by SVP (2010). Table 1 provides definitions for high, low, undetermined, and no paleontological resource potential, or sensitivity, as set forth in and by the SVP (2010) Guidelines for Determining Significance: Paleontological Resources.

Table 1. Paleontological Resource Sensitivity Criteria

Resource Sensitivity / Potential	Definition
High	Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rock units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ashes or tephras), and some low-grade metamorphic rocks that contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones). Paleontological potential consists of both (1) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units that contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units that may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.
Low Potential	Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections or, based on general scientific consensus, only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule; e.g., basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.
Undetermined Potential	Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine whether these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.
No Potential	Some rock units have no potential to contain significant paleontological resources; for instance, high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no paleontological resource potential require neither protection nor impact mitigation measures relative to paleontological resources.

Source: SVP (2010)

Regulatory Framework

California Environmental Quality Act

Paleontological resources are explicitly afforded protection under CEQA, which requires that all private and public activities not specifically exempted be evaluated against the potential for environmental damage, including effects to paleontological resources. Specifically, section VII(f) of CEQA Guidelines Appendix G, the "Environmental Checklist Form," addresses the potential for adverse impacts to "unique paleontological resource[s] or site[s] or … unique geological feature[s]." This provision covers fossils of signal importance – remains of species or genera new to science, for example, or fossils exhibiting features not previously recognized for a given animal group – as well as localities that yield fossils significant in their abundance, diversity, preservation, and so forth.

Public Resources Code Section 5097.5

California's Public Resources Code (PRC) Section 5097.5 states that:

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on [lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof], except with the express permission of the public agency having the jurisdiction over the lands. Violation of this section is a misdemeanor.

County of Riverside General Plan

The Multipurpose Open Space Element of the Riverside County General Plan (County of Riverside 2015) identifies a number of policies intended to minimize impacts to paleontological resources. It also includes a Paleontological Sensitivity Resources map (Figure OS-8 of the Multipurpose Open Space Element) indicating lands with low, undetermined, or high potential for finding paleontological resources (Table 1). The following policies apply to paleontological resources in the County:

> ***OS 19.6***: Whenever existing information indicates that a site proposed for development has high paleontological sensitivity as shown on Figure OS-8, a paleontological resource impact mitigation program (PRIMP) shall be filed with the County Geologist. The PRIMP shall specify the steps to be taken to mitigate impacts to paleontological resources.
>
> ***OS 19.7***: Whenever existing information indicates that a site proposed for development has low paleontological sensitivity as shown on Figure OS-8, no direct mitigation is required unless a fossil is encountered during site development. Should a fossil be encountered, the County Geologist shall be notified and a paleontologist retained by the project proponent. The paleontologist shall document the extent and potential significance of the paleontological resources on the site and establish appropriate mitigation measures for further site development.
>
> ***OS 19.8***: Whenever existing information indicates that a site proposed for development has undetermined paleontological sensitivity as shown on Figure OS-8, a report shall be filed with the County Geologist documenting the extent and potential significance of the paleontological resources on site and identifying mitigation measures for the fossil and for impacts to significant paleontological resources.

***OS 19.9*:** Whenever paleontological resources are found, the County Geologist shall direct them to a facility within Riverside County for their curation, including the Western Science Center in the City of Hemet.

Methods

Geological Map and Literature Review

Published geological mapping (Morton and Matti 2002) and published and unpublished geological paleontological reports and the geotechnical report were reviewed to identify geological units located within the Project site and determine their paleontological sensitivity.

Geotechnical Report Review

The Baseline Geotechnical Report prepared for the Project by ENGEO Incorporated (2023) was reviewed to identify and confirm geological units located within the Project site at depth and determine their paleontological sensitivity.

Paleontological Records Searches

A paleontological records search request was sent to the LACM and WSC. The purpose of the museum records search is to determine whether there are any known fossil localities in or near the Project site, assist in identifying the sensitivity of the geological units present within the Project site, and aide in determining whether a paleontological mitigation program is warranted to avoid or minimize potential adverse effects of construction on paleontological resources.

Field Survey

Dudek paleontological field lead, David Alexander, conducted a pedestrian survey of the Project site on March 30, 2023. The survey was conducted to determine if any surficial paleontological resources are present within the Project site and confirm geological mapping. The survey utilized standard paleontological survey procedures and consisted of systematic surface inspection of exposed geological units with high paleontological sensitivity. The ground surface was examined for the presence of exposed surficial fossils. Ground disturbances such as graded roads, drainages and eroded hillsides were also visually inspected for exposed fossils and sediments.

Results

Geological Map Review, Literature Review, Geotechnical Report, and Paleontological Records Search

The Project site is located within the northernmost Peninsular Ranges Geomorphic Province (Norris and Webb 1990; California Geological Survey [CGS] 2002). This geomorphic province is characterized by northwest trending mountain ranges and valleys that extend over 900 miles from the tip of the Baja California Peninsula to the Transverse Ranges (i.e., the San Bernardino and San Gabriel Mountains in southern California). Regionally, the Peninsular Ranges are bounded to the east by the Colorado Desert and the west by the continental shelf and offshore islands (Santa Catalina, Santa Barbara, San Nicholas, and San Clemente) (Norris and Webb 1990; CGS 2002). Regional mountain ranges in the Peninsular Ranges Geomorphic Province include the Santa Ana, San Jacinto, and Santa Rosa Mountains. Geologically, these mountains are dominated by Mesozoic, plutonic igneous and metamorphic rocks that are part of the Peninsular Ranges batholith (southern California batholith) (Jahns 1954).

According to published geological mapping by Morton and Matti (2002) at a 1:24,000 scale, the geotechnical report prepared for the project, and the WSC records search (Confidential Appendix A), the Project site is almost entirely mapped as early Pleistocene (approximately 2.58 million years ago [mya] to 778,000 years ago; Cohen et al [2022]) very old alluvial fan deposits (map unit Qvof), which are composed of very coarse to very fine sands, often containing paleosols (fossil soil horizons) and silcretes (silica cemented rocks). The southeastern and eastern portions of the Project site are comprised of Holocene (<11,700 years ago; Cohen et al. [2022]) sand and gravel deposits (map units Qya and Qyf). Cretaceous (approximately 145 million years ago mya to 66 mya) intrusive igneous rocks (map unit gr) are mapped to the north and south of the Project site (Figure 2). The early Pleistocene very old alluvial fan deposits are mostly well-dissected, well-indurated, reddish-brown sand deposits containing minor amounts of gravel (Morton and Matti 2002).

Numerous Pleistocene fossil localities are known from Riverside County. In his compilation of Quaternary (less than 2.58 million years ago) vertebrate fossil localities, Jefferson (1991) reported bison *(Bison antiquus*) from Beaumont; deer (*Odocoileus*), fish (Osteichthyes), reptile (Sauria), and large and small mammals (including mastodon [*Mammut* sp.] and camel [cf. *Camelops* sp.]} from Corona; horse (*Equus* sp.) from San Jacinto Valley; amphibian (Anura [frog]), turtle (*Clemmys* sp.), snake (*Crotalus* sp.), bird (Aves), rodents (e.g., Sciuridae and *Thomomys bottae*) and large mammals (e.g., *Smilodon* sp. and *Mammuthus* sp.); and mammoth (*Mammuthus* sp.) from the Winchester and Riverside. Due to the age of these deposits and their record of producing significant paleontological resources, Pleistocene very old alluvial fan deposits have high paleontological sensitivity or potential and any identifiable vertebrate fossil remains discovered in these deposits would be considered a significant paleontological resource. The Holocene sand and gravel deposits have low paleontological sensitivity; however, the sensitivity increases with depth, where they likely become old enough to preserve fossils.

The paleontological records search letters were sent to the LACM and WSC on February 15, 2023. The LACM results were received on February 26, 2023, and the WSC results were received on March 17, 2023. No records of fossil localities were found within the boundaries of the Project site; however, nine fossil localities are located nearby within similar sedimentary deposits as the Project site (Confidential Appendix A). The paleontological records search results are summarized in Table 2 below.

Table 2. LACM and WSC Fossil Localities Near the Project Site

Locality Number	Location	Formation	Taxa	Depth
WSC Unknown	3 miles north of Project area	Pleistocene aged alluvial deposits	Unknown	Unknown
LACM VP 4540	Gilman Springs Road; San Jacinto Valley	Unnamed Formation (Pleistocene, gravel pit)	Horse Family (Equidae)	Unknown
LACM VP 5168	East bay Section of Canyon Lake	Unknown formation (Pleistocene; clay)	Horse (*Equus*)	Unknown
LACM VP CIT570-CIT572	South of Lake Elsinore	Unknown Formation (Pleistocene)	Horse (*Equus*); peccary (*Platygonus*); camel (*Camelops*)	Unknown
LACM VP 1207	1 mile north-northwest of Corona	Unknown formation (Pleistocene)	Bovidae	Unknown
LACM VP 7811	West of Orchard Park, Chino Valley	Unknown formation (eolian, tan, silt; Pleistocene)	Whip snake (*Masticophis*)	9-11 bgs
LACM VP 4619	Wineville Ave, Eastvale, CA	Unknown formation (Pleistocene)	Mammoth (*Mammuthus*)	100 feet

*VP, Vertebrate Paleontology; CIT, California Institute of Technology; bgs, below ground surface

Paleontological Survey

The approximately 683-acre Project site is located in the southeastern portion of the City of Moreno Valley, south of State Route 60 (Moreno Valley Freeway), east of Lasselle Street Road, north of Iris Avenue, and west of Oliver Street. The paleontological survey focused predominately on the larger area west of Nason Street and south of Cactus Avenue, where Pleistocene very old alluvial fan deposits are mapped. Drainage improvements for stormwater and retention basins are situated in the south side of the larger Project site. Ground surface visibility was limited due to the scrubs and low-lying grasses (Figure 3, Photos 1 & 2). Surface exposures for directional channels, eroded hill sides, and retention basins were observed with reddish brown, unconsolidated, poorly sorted, silty to clayey, fine- to medium- and coarse-grained sands, with minor amounts of gravel. These deposits are mapped as very old alluvial fan deposits (Figure 3, Photo 4). No paleontological resources were observed during the pedestrian survey.

Summary and Management Recommendations

No paleontological resources were identified within the Project site as a result of the institutional records search, desktop geological review, and paleontological survey. The paleontological records search conducted by the WSC and the LACM revealed nine fossil localities are located nearby within Pleistocene geological units similar to the unit that underlies the majority of the Project site. These early Pleistocene very old alluvial fan deposits have high paleontological resources sensitivity throughout their stratigraphic and geographic range; the Holocene sand and gravel deposits have low paleontological resources sensitivity on the surface, increasing with depth; the plutonic igneous rocks, mapped near the northern and southern Project boundaries, are considered to have no paleontological sensitivity. Based on the records search results, survey, and map and literature review, the Project site has high potential to produce paleontological resources at the surface in areas underlain by early Pleistocene very old alluvial fan deposits and at depth where underlain by Holocene sand and gravel deposits during planned construction activities. In the event that intact paleontological resources are discovered on the Project site, ground-disturbing activities associated with construction of the Project, such as grading and large diameter (> 2 feet) drilling during site preparation and trenching for utilities, have the potential to destroy a unique paleontological resource or site. Without mitigation, the potential damage to paleontological resources during construction would be a potentially significant impact. However, with implementation of the following recommended mitigation measure (MM), impacts would be reduced to below a level of significance. Impacts of the Project are considered less than significant with mitigation incorporated during construction.

MM GEO-1: **Paleontological Resources Impact Mitigation Program and Paleontological Monitoring.** Prior to commencement of any grading activity on site, the applicant shall retain a qualified paleontologist per the Society of Vertebrate Paleontology (2010) guidelines. The Society of Vertebrate Paleontology (SVP, 2010) guidelines defines a qualified paleontologist as having:

"1. A graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; and demonstrated competence in field techniques, preparation, identification, curation, and reporting in the state or geologic province in which the project occurs. An advanced degree is less important than demonstrated competence and regional experience.

2. At least two full years professional experience as assistant to a Project Paleontologist with administration and project management experience; supported by a list of projects and referral contacts.

3. Proficiency in recognizing fossils in the field and determining significance.

4. Expertise in local geology, stratigraphy, and biostratigraphy.

5. Experience collecting vertebrate fossils in the field."

The qualified paleontologist shall prepare a Paleontological Resources Impact Mitigation Program (PRIMP) for the Project that shall be consistent with the SVP (2010) guidelines and outline requirements for preconstruction meeting attendance and worker environmental awareness training, where paleontological monitoring is required within the Project site based on construction plans and/or geotechnical reports, procedures for adequate paleontological monitoring and

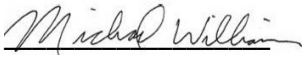
discoveries treatment, and paleontological methods (including sediment sampling for microinvertebrate and microvertebrate fossils), reporting, and collections management. The PRIMP shall also include a statement that any fossil lab or curation costs (if necessary due to fossil recovery) are the responsibility of the project proponent. A qualified paleontological monitor shall be on site during initial rough grading and other significant ground-disturbing activities (including drilling greater than two-feet in diameter) in areas underlain by early Pleistocene very old alluvial fan deposits and below a depth of five feet beneath the ground surface in areas underlain by Holocene sand and gravel deposits to determine if they are old enough to preserve scientifically significant paleontological resources. The SVP (2010) guidelines defines a qualified paleontological monitor as having:

> "1. BS or BA degree in geology or paleontology and one year experience monitoring in the state or geologic province of the specific project. An associate degree and/or demonstrated experience showing ability to recognize fossils in a biostratigraphic context and recover vertebrate fossils in the field may be substituted for a degree. An undergraduate degree in geology or paleontology is preferable, but is less important than documented experience performing paleontological monitoring, or
>
> 2. AS or AA in geology, paleontology, or biology and demonstrated two years experience collecting and salvaging fossil materials in the state or geologic province of the specific project, or
>
> 3. Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in the state or geologic province of the specific project.
>
> 4. Monitors must demonstrate proficiency in recognizing various types of fossils, in collection methods, and in other paleontological field techniques."

In the event that paleontological resources (e.g., fossils) are unearthed during grading, the paleontological monitor will temporarily halt and/or divert grading activity to allow recovery of paleontological resources. The area of discovery will be roped off with a 50-foot radius buffer. Once documentation and collection of the find is completed, the monitor will allow grading to recommence in the area of the find.

Should you have any questions relating to this report and its findings please contact Michael Williams (mwilliams@dudek.com) or Sarah Siren (ssiren@dudek.com).

Respectfully Submitted,



Michael Williams, Ph.D.
Paleontologist
Mobile: 225.892.7622
Email: mwilliams@dudek.com

Att.: *Figure 1, Project Location Map*
Figure 2, Geological Map

Figure 3, Survey Photos
Confidential Appendix A, Confidential LACM and WSC Paleontological Records Search Results

cc: *Sarah Siren, Dudek*
Jason Collins, Dudek

References

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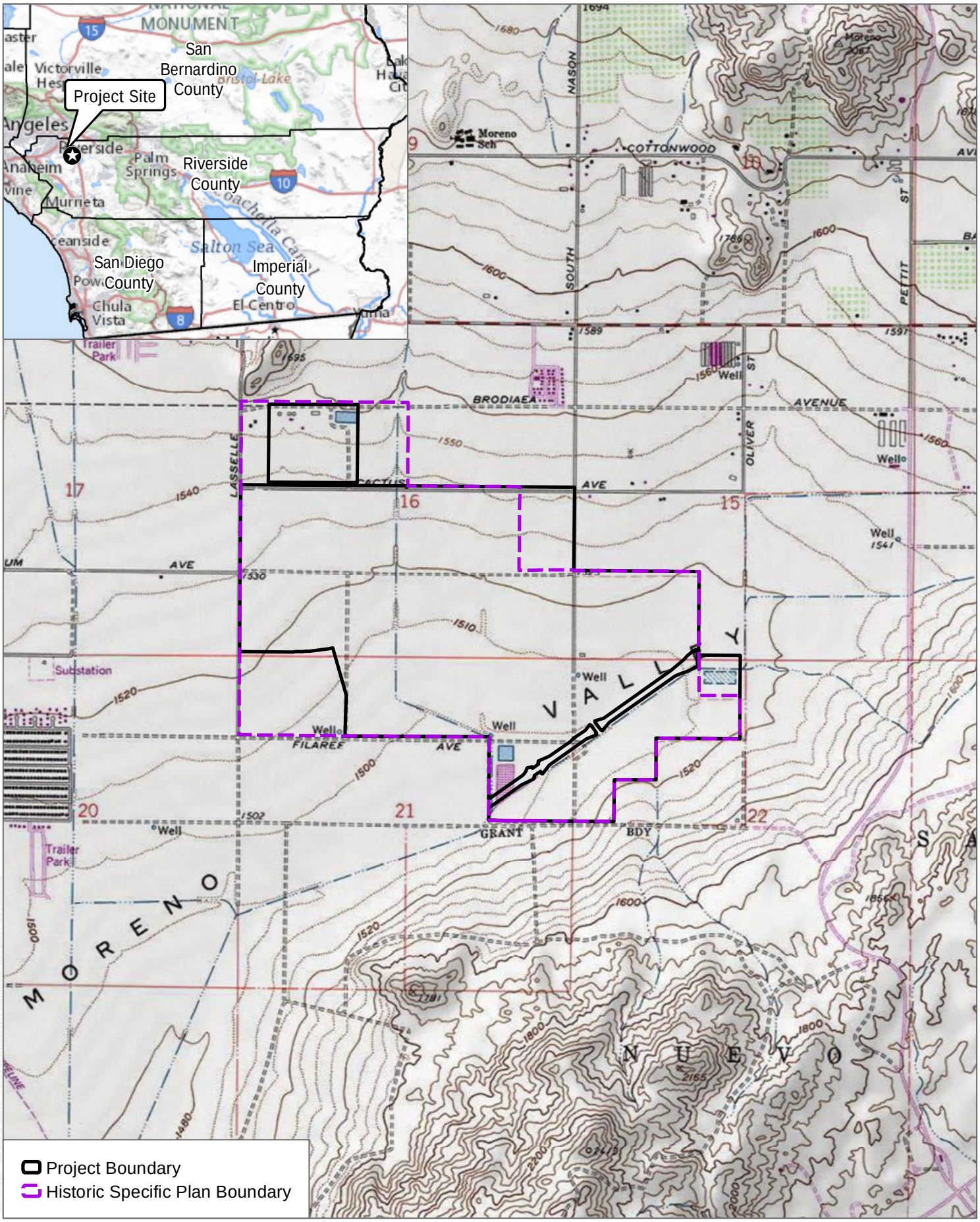

SOURCE: USA Topo Maps 7.5 Minute Series Sunnymead Quadrangle
Township 3S; Range 3W; Sections 15, 16, 21, 22

DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Location

Aquabella Project

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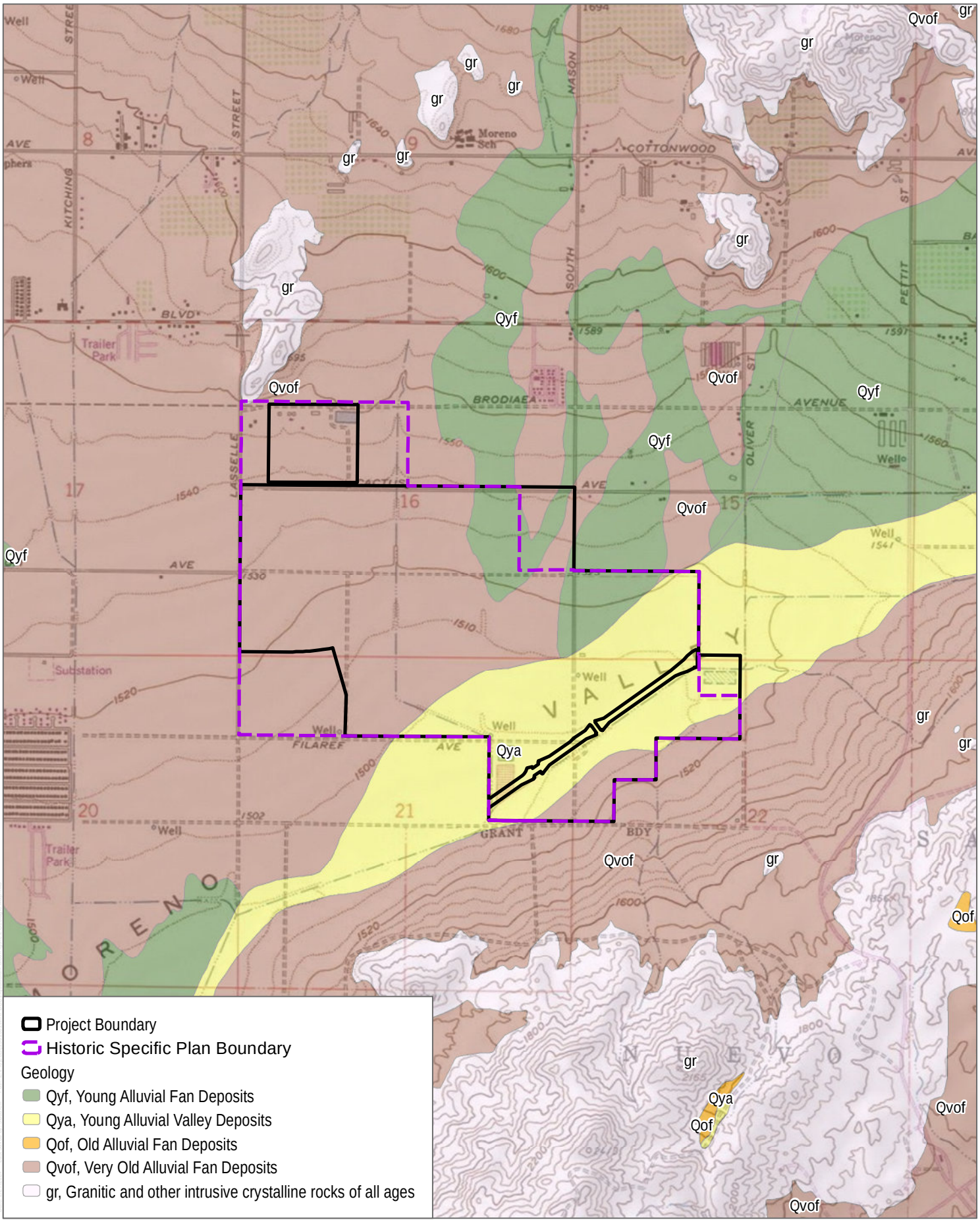

SOURCE: CA Geologic Society 2023

DUDEK

FIGURE 2

Geologic Map

Aquabella Project

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Figure 3 Survey Photos

Photo 1: Facing east, overview of basin cuts.

Photo 2: Facing north, overview of basin cut.

Photo 3: Facing east, eroded hillside and basin cut.

Photo 4: Facing north, close up of eroded area and exposure.

Confidential Appendix A

LACM and WSC Records Search Results (Confidential)