Geotechnical Engineering Report

Proposed Residential Development
Moreno Valley, Riverside County, California
November 29, 2021
Terracon Project No. CB205038

Prepared for:
Perris at Pentecostal, LLC
Irvine, California

Prepared by:
Terracon Consultants, Inc.
Colton, California

November 29, 2021

Perris at Pentecostal, LLC
41 Corporate Park
Irvine, California 92606

Attn: Mr. David Patton
P: (949) 296 0450
E: dpatton545@gmail.com

Re: Geotechnical Engineering Report
Proposed Residential Development
Northeast Corner of Iris Avenue and Emma Lane
Moreno Valley, Riverside County, California
Terracon Project No. CB205038

Dear Mr. Patton:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with the Terracon Proposal No. PCB205038 dated March 17, 2020, and authorized September 24, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Jay J. Martin, E.G.
Principal Geologist

Keith P. Askew, P.E., G.E.
Department Manager

PROFESSIONAL GEOLOGIST
JAY J. MARTIN
No. EG1529
Exp. 8-31-2022
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
KEITH P. ASKEW
GE 2946
GEOTECHNICAL
STATE OF CALIFORNIA

REPORT TOPICS

Note: This report was originally delivered in a web-based format. Orange Bold text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

Proposed Residential Development
Northeast Corner of Iris Avenue and Emma Lane
Moreno Valley, Riverside County, California

Terracon Project No. CB205038
November 29, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Residential Development to be located at the Northeast Corner of Iris Avenue and Emma Lane in Moreno Valley, Riverside County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions and historic high groundwater
- 2019 California Building Code (CBC) seismic design parameters
- Seismic settlement
- Subgrade preparation/earthwork recommendations
- Foundation design and concrete slabs-on-grade
- Design for preliminary pavement sections

The geotechnical engineering Scope of Services for this project included the advancement of eighteen test borings to depths ranging from approximately 21½ to 51½ feet below existing site grades and laboratory testing. Our scope also included conducting seven Cone Penetrometer Test (CPT) soundings to depths of approximately 50 to 100 feet below existing ground surface (bgs), and preparation of this report.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and/or as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site is an approximately 20-acre tract of land located at the Northeast Corner of Iris Avenue and Emma Lane in Moreno Valley, Riverside County, California. The approximate coordinates of the site are: 33.8906°N/117.2288°W See **Site Location**
Existing Improvements	The project site is generally an undeveloped vacant parcel of land; however, there is an abandoned commercial complex that is partially demolished in the northwest corner, a residence located off of Emma Lane, and a residence with horse stables/arena along the southern boundary. The property overall is bounded by the following improvements: West side: March Middle and Rainbow Ridge Elementary Schools North side: Vacant undeveloped land East side: Home Depot and a utility easement South side: Residential development
Background	Terracon Consultants previously prepared a Geotechnical Report for Perris at Pentecostal for this project site providing on-site infiltration rates based on percolation testing. A report for that study was issued on November 26, 2019 (Terracon project number CB195149).
Current Ground Cover	With the exception of the improvements detailed above, the site is covered with native soils and grass.
Existing Topography	The project site is relatively level with elevations generally ranging from 1,510 feet to 1,505 feet based on Google Earth imagery.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Proposed Development	A site plan was provided for our use dated February 28, 2020, prepared by Humphreys & Partners Architects, L.P. The proposed construction includes eighteen 2-story Big House Buildings, three 3-story E-Urban Buildings and one Club/Leasing Building with a combined gross building area of approximately 592,037 SF (square feet). The project will also include appurtenant infrastructure, utilities, parking, and driveways. A total of approximately 830 parking spaces will be provided, of which approximately 340 will be covered with carports. The development will also include on-site stormwater infiltration basins. We understand that percolation tests conducted during the previous study for this project site will be utilized for infiltration rates.

Item	Description
Proposed Structures	Eighteen 2-storey Big House Buildings, three 3-storey E-Urban Buildings and one Club/Leasing building with a combined gross building area of approximately 592,037 SF (square feet).
Building Construction	The proposed buildings will consist of wood-frame structures supported on a conventional shallow foundation system with slabs on grade.
Finished Floor Elevation	Anticipated to be within 3 feet of existing grade.
Structural Loads (assumed)	Structural loads were not provided at the time of this report. We assume that the proposed structures will have the following loads: ■ Columns: up to 200 kips ■ Walls: 1 to 4 kips per linear foot (klf) ■ Slabs: 100 to 150 pounds per square foot (psf)
Grading Requirements	Grading plans were not provided; we assume cuts and fills for grading will be less than 3 feet excluding remedial grading requirements. Slopes are anticipated to have inclinations of 2:1 (horizontal:vertical) and maximum heights of 5 feet.
Below Grade Structures	Not anticipated
Infiltration Systems	An on-site stormwater retention/infiltration system is planned and may consist of either a basin or chamber.
Free-Standing Retaining Wall	Not anticipated
Pavements	Paved driveway and parking will be constructed on site. We assume both rigid (concrete) and flexible (asphalt) pavement sections will be considered with the following loadings. Anticipated traffic indices (TIs) are as follows for asphalt pavement: ■ Auto Parking Areas: TI=4.5 ■ Drive Lanes TI=5.5 ■ Truck Delivery Areas: TI=6.0 ■ The pavement design period is 20 years. Anticipated average daily truck traffic (ADTT) is as follows for concrete pavement: ■ Light Duty: ADTT=1 (Category A) ■ Medium Duty: ADTT=25 (Category B) ■ Dumpster Pad: ADTT=700 (Category C)

GEOTECHNICAL CHARACTERIZATION

Site Geology

The site is located in the northern portion of the Perris Block, part of the Peninsular Ranges Geomorphic Province. The northern Perris Block is bounded on the southwest by the Chino-Elsinore fault, on the north by the Cucamonga fault, and on the northeast by the San Jacinto fault. The Perris Block is largely underlain by granitic rocks of the Peninsular Ranges batholith. These rocks consist mostly of varied granitic types such as exist in the Lakeview Mountains, east of the site.

Morton and others (2002, https://ngmdb.usgs.gov/Prodesc/proddesc_464845.htm) mapped most of the site as young alluvial fan deposits of Holocene and Pleistocene age. The northeast portion of the site is mapped as very old alluvial fan deposits of early Pleistocene age (Morton and others, 2002). As part of a relatively stable structural block, these older materials have been subjected to a long period of subaerial exposure (at least 25,000 years). The in-situ weathering of the alluvium has resulted in a strong reddish-brown color and elevated clay content associated with argillic soil horizons.

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. In general, the site is underlain with interbedded layers of silty sand, sandy lean clay, lean clay, and poorly graded sand with varying amounts of silt. The soils encountered in the borings within the upper approximately 4 to 15 feet bgs were generally comprised of loose, silty sand and poorly graded sand with varying amount of silt. Layers of lean clay with varying amounts of sand were encountered at varying depths generally greater than 13 feet bgs with the exception of B-18 where it was encountered at 4 feet bgs.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options, and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section of this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The borings were advanced using continuous flight auger drilling techniques that allow short-term groundwater observations to be made while drilling. Groundwater was observed within borings B-1, B-3 and B-13 at depths of 46½, 36½, and 39½ feet bgs respectively, during the course of drilling. Our review of historical information regarding groundwater levels for the area indicates that high historical groundwater levels are about 20 feet bgs. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed.

Hydroconsolidation

To evaluate the potential deformation that may be caused by the addition of water to subsurface soils, hydroconsolidation testing was performed on four relatively undisturbed samples. The results are shown in Exploration Results section. The test results indicate collapse potentials of

1.9% (B-2 at 5 feet), 2.8% (B-6 at 5 feet), 1.7% (B-13 at 5 feet), and 0.4% (B-15 at 7.5 feet). The soil samples were saturated under a confining pressure of 2,000 psf. The risk of hydrocollapse can be reduced by the removal and recompaction of the upper zones of the existing soils within the building pads footprints as recommended in this report.

SEISMIC CONSIDERATIONS

Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our opinion that the Seismic Site Classification is D. The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that “In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites.” Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

Description	Value
Site Classification (CBC) [1]	D [2]
Site Latitude (°N)	33.8906
Site Longitude (°W)	117.2288
S_s Spectral Acceleration for a 0.2-Second Period	1.5
S_1 Spectral Acceleration for a 1-Second Period	0.6
F_a Site Coefficient for a 0.2-Second Period	1.0
F_v Site Coefficient for a 1-Second Period	1.7
Site Modified Peak Ground Acceleration	0.661g
De-aggregated Modal Magnitude [3]	8.1

Description	Value
1. Seismic site classification in general accordance with the *2019 California Building Code*. 2. The 2019 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile determination. Our borings were extended to a maximum depth of 51½ feet. This seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration. 3. These values were obtained using on-line Unified Hazard Tool by the USGS (https://earthquake.usgs.gov/hazards/interactive/) for return period of 2% in 50 years accessed	

A site-specific ground motion study may reduce design values and consequently construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in the seismically active southern California area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the San Jacinto (San Jacinto Valley segment) Fault, which is considered to have the most significant effect at the site from a design standpoint, has a maximum earthquake magnitude of 7.99 and is located approximately 10 kilometers from the site. Gridded point sources located a few kilometers north of the site comprise a seismic hazard nearly equal to that of the San Jacinto fault.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the peak ground acceleration (PGA_M) at the project site is expected to be 0.661g. Based on the USGS Unified Hazard Tool, the project site has a de-aggregated modal magnitude of 8.1. The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.

LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction Potential

Liquefaction is a mode of ground failure that results from the generation of high pore-water pressures during earthquake ground shaking, causing loss of shear strength, and is typically a hazard where loose sandy soils exist below groundwater. Riverside County has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

The subsurface materials generally consist of interbedded layers of silty sand, sandy and lean clays, and poorly graded sand with varying amounts of silt extending to the maximum depth of the borings. Groundwater was encountered at 39½ to 46½ feet bgs within three of the borings during drilling, and has historically ranged from 20 to greater than 100 feet bgs.

According to the County of Riverside geologic hazard GIS map, the site is located within an area having a moderate liquefaction potential. Based on the County of Riverside map, and the subsurface conditions encountered, we performed a liquefaction evaluation using the data from CPT tests CPT-1 to CPT-7.

Seismic Settlement

To determine the amount of seismic settlement, we utilized the software "LiquefyPro" by CivilTech Software, seismic settlement was estimated using the soil profile from exploratory CPT test results. A Peak Ground Acceleration (PGA) of 0.661g and the de-aggregated mean magnitude of 7.04 were utilized as input into the liquefaction analysis program. Settlement analysis used the Ishihara / Yoshimine method and CPT calculation performed using the Modified Robertson method. We used a historicial high ground water of 20 feet bgs for analysis.

Based on the calculation results, seismically induced settlement (dry sand and liquefaction settlement) is estimated to be on the order of 2 inches. The maximum differential seismic settlement could be on the order of half of total seismic settlement over a distance of 40 feet.

GEOTECHNICAL OVERVIEW

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and our current understanding of the proposed project.

The subsurface materials generally consist of interbedded layers of silty sand, sandy lean clay, lean clay, and poorly graded sand with varying amounts of silt extending to the maximum depth of the borings. The soils encountered in the borings within the upper approximately 4 to 15 feet bgs were generally comprised of loose, silty sand and poorly graded sand with varying amount of silt. Layers of lean clay with varying amounts of sand were encountered at varying depths generally greater than 13 feet bgs with the exception of B-18 where it was encountered at 4 feet

bgs. On-site subsurface soils are not expected to experience substantial volumetric changes (shrink/swell) with fluctuations in moisture content.

The identification of previously placed fill soils was not discernable from native soils during the investigation and fill soils are likely present, particularly within the areas of existing structures. All fill soils should be removed during grading operations.

Based on the conditions encountered and assumptions regarding finish grade, the proposed buildings can be supported on shallow foundations, such as conventional spread footings provided the remedial grading outlined in this report is followed.

Groundwater was encountered in borings B-1, B-3 and B-13 at depths of 46½, 36½, and 39½ feet bgs respectively, Groundwater is not expected to affect shallow foundation construction on this site.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

The identification of previously placed fill soils was not discernable from native soils during the investigation, and there is the possibility that support of pavements may be on or above existing fill materials not encountered during this study; however, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing vegetation, debris, pavements and other deleterious materials from proposed buildings and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create

a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

Demolition of the existing buildings should include complete removal of all foundation systems and remaining underground utilities within the proposed construction area. This should include removal of any loose backfill found adjacent to existing foundations. All materials derived from the demolition of existing structures and pavements should be removed from the site and not be allowed for use as on-site fill, unless processed in accordance with the fill requirements included in this report.

Although evidence of underground facilities such as septic tanks, cesspools, and basements was not obseverd during the reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

All previously placed fill associated with any previous development should be removed within the proposed development area. We recommend that the proposed buildings be supported on engineered fill extending to a minimum depth of 3 feet below the bottom of foundations, or 5 feet below existing grades, whichever is greater. Engineered fill placed beneath the entire footprint of the building should extend horizontally a minimum distance of 3 feet beyond the outside edge of perimeter footings.

Subgrade soils beneath exterior slabs and pavements should be removed to a depth of 2 feet below existing grade or bottom of proposed pavement section, whichever is greater, and replaced as engineered fill to the proposed grades. The bottom of excavations should then be scarified, moisture conditioned, and compacted to a minimum depth of 10 inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned as necessary, and compacted per the compaction requirements in this report. Compacted fill soils should then be placed to the design grades, and the moisture content and compaction of soils should be maintained until slab, pavement, or proposed improvements are constructed.

Based upon the subsurface conditions determined from the geotechnical exploration, the on site soils are suitable for the proposed fill soils provided they are free from any organics and debris. and the on site soils are anticipated to be relatively workable; however, the workability of the soils may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than three inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

■ general site grading	■ foundation backfill
■ foundation areas	■ pavement areas
■ interior floor slab areas	■ exterior slab areas

If imported soils are used as fill materials to raise grades, these soils should conform to low volume change materials and should conform to the following requirements:

Gradation	**Percent Finer by Weight (ASTM C 136)**
3”	100
No. 4 Sieve	50 - 100
No. 200 Sieve	20 - 50

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum Expansive Index* ..... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor

that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Compaction Requirements

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
On-site soils and/or low volume change imported fill:			
Beneath foundations:	90	0%	+3%
Beneath interior slabs:	90	0%	+3%
Miscellaneous backfill:	90	0%	+3%
Beneath pavements:	95	0%	+3%
Utility Trenches*:	90	0%	+3%
Bottom of excavation receiving fill:	90	0%	+3%
Aggregate base (beneath pavements):	95	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas.

Utility Trenches

We anticipate that the on-site soils will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 is recommended for bedding and shading of utilities, unless otherwise allowed by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the

gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

We recommend a minimum horizontal setback distance of 10 feet from the perimeter of any building and the high-water elevation of the nearest storm-water retention basin.

Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers.

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

Onsite soils contains zones of cohesionless sandy soils. Such soils have the tendency to cave and slough during excavations. Therefore, formwork may be needed for foundation excavations.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Construction Observation and Testing

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Item	Description
Foundation Support	Engineered fill extending 3 feet below the bottom of foundations, or 5 feet below existing grades, whichever is greater.
Net Allowable Bearing pressure [1, 2] (On-site soils or structural fill)	2,500 psf
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 18 inches
Minimum Footing Depth	24" below finished grade
Ultimate Passive Resistance [4]	350 pcf
Ultimate Coefficient of Sliding Friction [5]	0.36
Estimated Total Static Settlement from Structural Loads [2]	about 1 inch
Estimated Differential Settlement [2, 6]	About 1/2 of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied.
2. Values provided are for maximum loads noted in **Project Description**. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Use of passive earth pressures requires the footing forms be removed and compacted structural fill be placed against the vertical footing face. A factor of safety of 2.0 is recommended.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. A factor of safety of 1.5 is recommended.
6. Differential settlements are as measured over a span of 40 feet.

Shallow Foundations Designed for Uplift Conditions

Reinforced concrete footing foundations for canopy structures, cast against undisturbed native soils, are recommended for resistance to uplift. Footings may be designed using the cone method. The equation for determining the ultimate uplift capacity as a function of footing dimension, foundation depth, and soil weight based on the import low volume change soils is:

$$T_u = \gamma \times D^2 \times (B + L) + W$$

Where:

Variable	Description	Unit
T_u	Ultimate uplift capacity	lbs.
γ	Unit weight of soil[1]	pcf
D	Depth to base of footing/dead-man foundation below final grade	ft
B	Width of footing/dead-man foundation	ft
L	Length of footing/dead-man foundation	ft
W	Weight of footing/dead-man + weight of soil directly over the top of the footing/block	lbs.

[1]A unit weight (γ) of 120 pcf is recommended for soil (either undisturbed or compacted backfill) at this site.

The design uplift resistance should be calculated by dividing the ultimate resistance obtained from the equation above by an appropriate factor of safety. A factor of safety of at least 2 is recommended for live uplift loads in the analysis.

Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

To ensure foundations have adequate support, special care should be taken when footings are located adjacent to trenches. The bottom of such footings should be at least 1 foot below an imaginary plane with an inclination of 1.5 horizontal to 1.0 vertical extending upward from the nearest edge of adjacent trenches.

FLOOR SLABS

DESCRIPTION	RECOMMENDATION
Interior floor system	Slab-on-grade concrete
Floor slab support	Engineered fill extending 3 feett below the bottom of associated foundations, or 5 feet below existing grades, whichever is greater.
Subbase	Minimum 4-inches of Aggregate Base

DESCRIPTION	RECOMMENDATION
Modulus of subgrade reaction	150 pounds per square inch per inch (psi/in) (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Pavement Design Parameters

Design of asphalt concrete (AC) pavements is based on the procedures outlined in the Caltrans "Highway Design Manual for Safety Roadside Rest Areas" (Caltrans, 2016). Design of Portland cement concrete (PCC) pavements are based upon American Concrete Institute (ACI) 330R-08; "Guide for Design and Construction of Concrete Parking Lots."

During the field investigation at the site, one sample of the near surface soil taken from our borings was tested in our laboratory to determine the Hveem Stabilometer Value (R-value). The test produced an R-value of 50 and was used to calculate the AC pavement thickness sections. A

modulus of subgrade reaction of 150 pci and a modulus of rupture of 600 psi were used for the PCC pavement designs.

The structural sections are predicated upon proper compaction of the utility trench backfills and the subgrade soils as prescribed by in **Earthwork**, with the upper 12 inches of subgrade soils and all aggregate base material brought to a minimum relative compaction of 95 percent in accordance with ASTM D 1557 prior to paving. The aggregate base should meet Caltrans requirements for Class 2 base.

The pavement designs were based upon the results of preliminary sampling and testing and should be verified by additional sampling and testing (specifically R-value testing) during construction when the actual subgrade soils are exposed. Additionally, the preliminary sections provided are minimums based on procedures previously referenced. The project civil engineer should confirm minimum Traffic Indices and sections required by local agencies or jurisdictions if applicable.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

Asphalt Concrete Design		
Usage	**Assumed Traffic Index**	**Recommended Structural Section**
Auto Parking Areas	4.5	3” HMA[1]/4” Class 2 AB[2]
Drive lanes	5.5	3” HMA[1]/4” Class 2 AB[2]
Truck Delivery Areas	6.0	3.5” HMA[1]/4” Class 2 AB[2]

1. HMA = hot mix asphalt
2. AB = aggregate base

Portland Cement Concrete Design			
Layer	**Thickness (inches)**		
	Light Duty[1]	**Medium Duty[2]**	**Dumpster Pad[3]**
PCC	4.0	5.0	6.5
Aggregate Base [4]	--	--	--

1. Car Parking and Access Lanes, Average Daily Truck Traffic (ADTT) = 1 (Category A).
2. Truck Parking Areas, Multiple Units, ADTT = 25 (Category B)

Portland Cement Concrete Design			
Layer	Thickness (inches)		
	Light Duty[1]	Medium Duty[2]	Dumpster Pad[3]

3. In areas of anticipated heavy traffic, fire trucks, delivery trucks, or concentrated loads (e.g., dumpster pads), and areas with repeated turning or maneuvering of heavy vehicles, ADTT = 700 (Category C).
4. Aggregate base is not required. Compacted on-site material is considered competent.

Recommended structural sections were calculated based on assumed TIs and our preliminary sampling and testing.

Terracon does not practice traffic engineering. We recommend that the project civil engineer or traffic engineer verify that the TIs and ADTT traffic indices used are appropriate for this project.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2 percent.
- Subgrade and pavement surfaces should have a minimum 2 percent slope to promote proper surface drainage.

- Install below pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

CORROSIVITY

The following table lists the laboratory electrical resistivity (standard and as-received), chlorides, soluble sulfates, and pH testing results. These values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Boring	Depth (feet)	Soluble Sulfate (mg/kg)	Soluble Chloride (mg/kg)	Total Salts (mg/kg)	pH	Resistivity (as-received) (Ohm-cm)	Resistivity (saturated) (Ohm-cm)
B-8	0 to 5	83	53	239	7.73	34,920	4,462

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 4.3.1 of the ACI Design Manual. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

For protection against corrosion to buried metals, Terracon recommends that an experienced corrosion engineer be retained to design a suitable corrosion protection system for underground metal structures or components.

If corrosion of buried metal is critical, it should be protected using a non-corrosive backfill, wrapping, coating, sacrificial anodes, or a combination of these methods, as designed by a qualified corrosion engineer.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction.

Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Terracon conducted six (6) soil-testing borings. These borings were drilled at the locations and to depths indicated in the table below.

Boring Number	Boring Depth (feet) [1]	Location
B-1	51½	EU-1
B-2	31 ½	EU-2
B-3	51½	EU-3
B-4	21 ½	BH-18
B-5	21 ½	Carport
B-6	21 ½	BH-11
B-7	21 ½	BH-10
B-8	31 ½	BH-17
B-9	31 ½	BH-9
B-10	21 ½	BH-13
B-11	21 ½	BH-8
B-12	21 ½	BH-15
B-13	51½	BH-14
B-14	21 ½	Carport
B-15	21 ½	Club/Leasing
B-16	21 ½	BH-7
B-17	31 ½	BH-1
B-18	21 ½	BH-4
CPT-1	50	EU-1
CPT-2	50	EU-2
CPT-3	50	EU-3
CPT-4	100	BH-12
CPT-5	50	BH-16
CPT-6	50	BH-6
CPT-7	50	BH-2 and BH-3

1. Below ground surface.

Cone Penetration Test: The Cone Penetration Test (CPT) soundings were performed in accordance with ASTM D 5778. CPT testing has proven to be a more reliable approach to characterize the subsurface conditions for seismic settlement analysis than SPT/ring sampling with conventional borings.

Boring/CPT Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from the Google Earth. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advance the borings with a truck-mounted drill rig using hollow-stem augers. Both a standard penetration test (SPT) sampler (2-inch outer diameter and 1-3/8-inch inner diameter) and a modified California ring-lined sampler (3-inch outer diameter and 2-3/8-inch inner diameter) are utilized in our investigation. The penetration resistance is recorded on the boring logs as the number of hammer blows used to advance the sampler in 6-inch increments (or less if noted). The samplers are driven with an automatic hammer that drops a 140-pound weight 30 inches for each blow. After the required seating, samplers are advanced up to 18 inches, providing up to three sets of blowcounts at each sampling interval. The sampling depths, penetration distances, and other sampling information are recorded on the field boring logs. The recorded blows are raw numbers without any corrections for hammer type (automatic vs. manual cathead) or sampler size (ring sampler vs. SPT sampler). Relatively undisturbed and bulk samples of the soils encountered are placed in sealed containers and returned to the laboratory for testing and evaluation.

We observe and record groundwater levels during drilling and sampling. For safety purposes, all borings are backfilled with auger cuttings after their completion.

Our exploration team prepares field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs are prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- Water (Moisture) Content of Soil by Mass

- Laboratory Determination of Density (Unit Weight) of Soil Specimens
- Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- Atterberg limits
- Modified Proctor test
- Hydro-consolidation
- R-value
- Corrosivity suite test

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

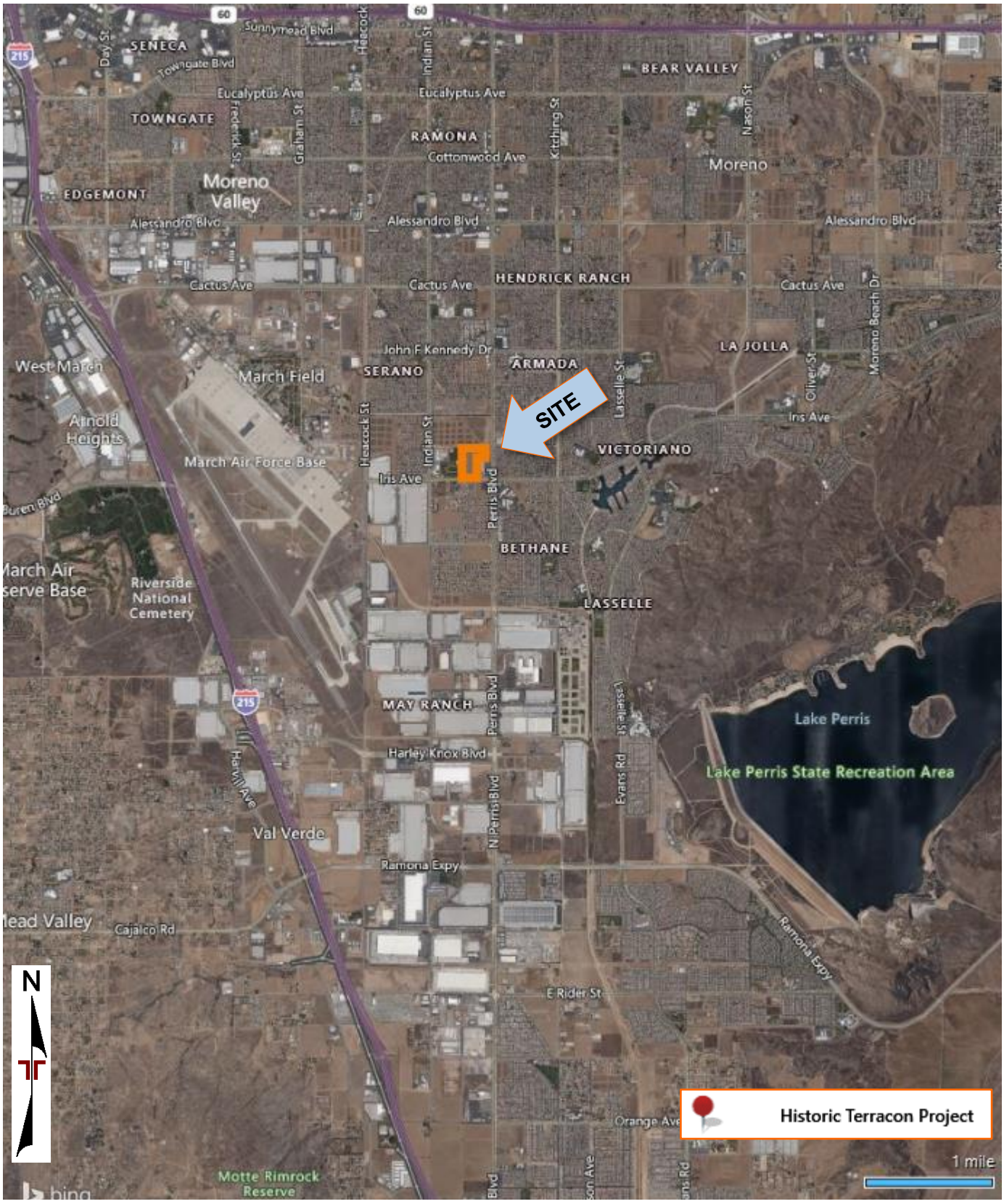


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

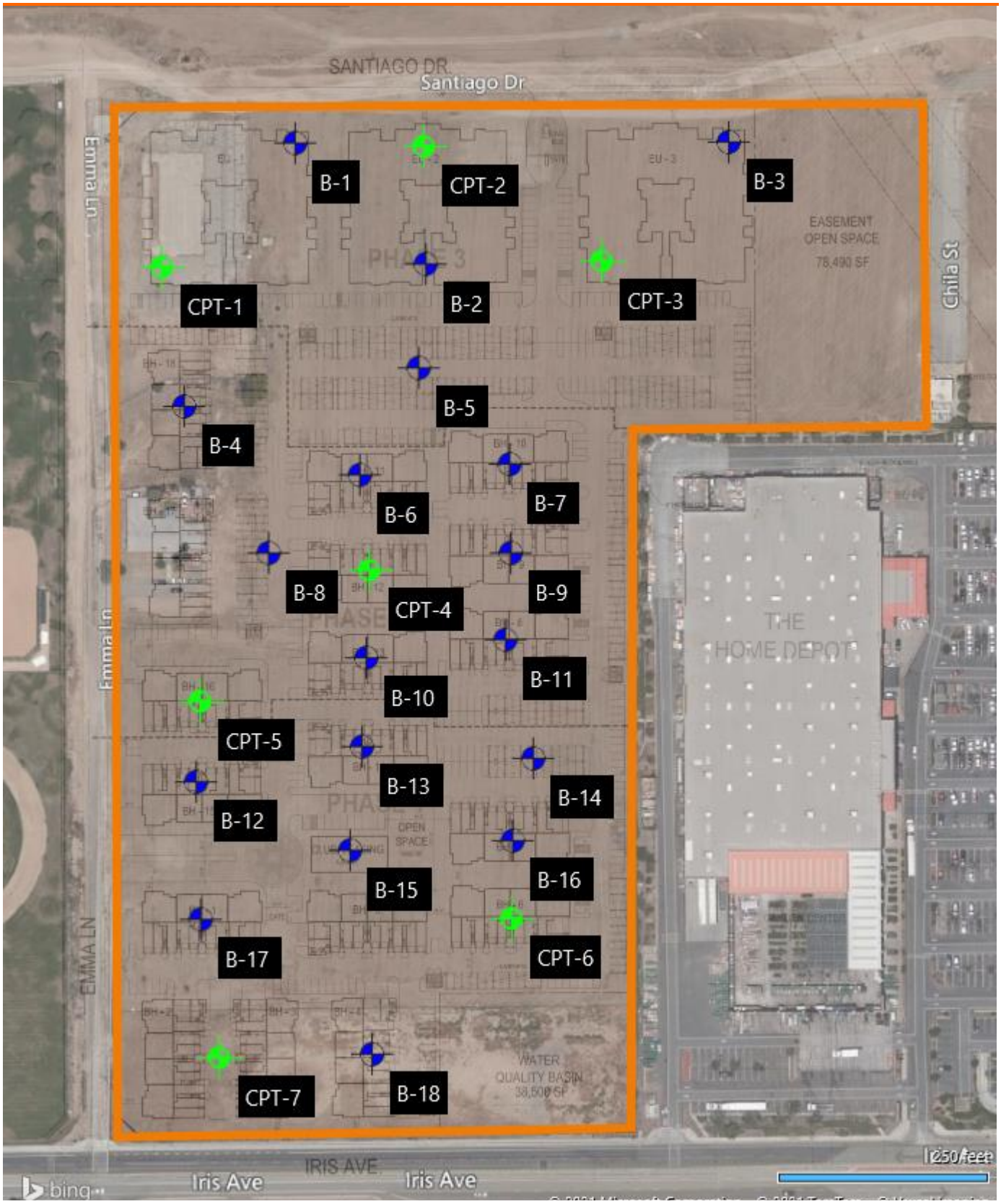


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8918° Longitude: -117.2298°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine grained, brown, loose				NP	38
5			7-8-6	2.7	103		34
			2-2-6	6.5	104		28
		fine to medium grained	3-5-6	4.3	108		21
10			3-6-6	4.4	104		21
15		15.0 **SANDY LEAN CLAY (CL)**, brown, very stiff 2" silty sand lens at 16'	4-9-7 N=16				61
20		20.0 **LEAN CLAY (CL)**, brown, very stiff	3-7-13 N=20				
25		23.0 **SILTY SAND (SM)**, fine to coarse grained, brown, medium dense 6" sandy clay lens at 26'	5-7-4 N=11				33

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While sampling

10 minutes after drilling

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-1

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8918° Longitude: -117.2298°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), fine to coarse grained, brown, medium dense *(continued)*								
		coarse sand and clay lenses	30			6-6-5 N=11				30
35.5			35			7-9-10 N=19				50
		SANDY LEAN CLAY (CL), brown, very stiff								
38.0										
		LEAN CLAY (CL), brown, medium stiff	40			2-2-2 N=4			27-16-11	87
43.0										
		SANDY LEAN CLAY (CL), brown, stiff	45	▽		2-3-6 N=9				56
48.0										
		SILTY SAND (SM), fine to coarse grained, brown, medium dense	50	▽		5-9-8 N=17				31
51.5		***Boring Terminated at 51.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While sampling*

▽ *10 minutes after drilling*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-2

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8914° Longitude: -117.2293°

DEPTH	GRAPHIC LOG		FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine grained, brown, loose					
5			3-3-5	3.0	104		
		medium dense	4-8-11	5.3	111		
8.0			6-7-8	0.4	104		
10.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, reddish brown, loose					
10			4-7-12	0.4	113		
13.0		**POORLY GRADED SAND (SP)**, medium to coarse grained, reddish brown, medium dense					
15			3-5-7 N=12			30-18-12	
20		**LEAN CLAY (CL)**, brown, stiff	3-5-11 N=16				
23.0							
25		**SANDY LEAN CLAY (CL)**, brown, stiff	4-5-7 N=12				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-2

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8914° Longitude: -117.2293° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.0 **SANDY LEAN CLAY (CL)**, brown, stiff *(continued)*								
	SILTY SAND (SM), fine to coarse grained, brown, medium dense	30			7-10-11 N=21				
	31.5 ***Boring Terminated at 31.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021	Boring Completed: 10-15-2021
Drill Rig: CME 75	Driller: Martini Drilling
Project No.: CB205038	

BORING LOG NO. B-3

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8918° Longitude: -117.2281°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine to coarse grained, reddish brown, loose					
			3-5-6	5.3	107	NP	22
							22
5.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, reddish brown, loose					
5			3-4-6	0.8			5
		medium to coarse grained					
			5-5-10	1.2	104		5
9.5		**SILTY SAND (SM)**, fine grained, brown, medium dense					
10			5-12-21	9.9	117		43
		loose					
15			2-3-5 N=8				45
18.0		**SANDY LEAN CLAY (CL)**, reddish brown, very stiff					
20			5-11-18 N=29				50
		stiff					
25			4-6-9 N=15				51
		3" silty sand lens at 26'					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- While sampling
- 10 minutes after sampling
- 10 minutes after drilling

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-3

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8918° Longitude: -117.2281°

DEPTH		FIELD TEST RESULTS	PERCENT FINES
28.0	**SANDY LEAN CLAY (CL)**, reddish brown, very stiff *(continued)*		
	SILTY SAND (SM), fine to medium grained, brown, medium dense, with occasional sandy clay lenses	4-6-8 N=14	40
33.0	**SANDY LEAN CLAY (CL)**, brown with olive, stiff	4-5-5 N=10	59
36.5	**SILTY SAND (SM)**, fine to medium grained, brown, medium dense, with occasional coarse sand lenses	6-10-11 N=21	20
41.5	**SANDY LEAN CLAY (CL)**, brown, stiff	3-6-8 N=14	55
48.0	**SILTY SAND (SM)**, fine to coarse grained, brown, medium dense	7-11-12 N=23	16
51.5	***Boring Terminated at 51.5 Feet***		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- While sampling
- 10 minutes after sampling
- 10 minutes after drilling

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-4

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8909° Longitude: -117.2302°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine to medium grained, brown, loose							
					5-8-10	0.4	115		
5					5-8-9	2.0	108		
7.0		**POORLY GRADED SAND (SP)**, medium to coarse grained, reddish brown, loose			4-8-10	0.2	106		
10					5-6-10	0.5	108		
15.0		**SILTY SAND (SM)**, fine to coarse grained, brown, medium dense			6-8-11 N=19				
15									
18.0		**LEAN CLAY (CL)**, brown, stiff							
20					2-4-10 N=14				
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-5

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8910° Longitude: -117.2293°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), fine grained, brown, loose								
						3-4-6	3.6	107		40
		very loose	5			1-2-1 N=3				46
		loose				3-6-8	5.5	104		47
		with occasional silt lenses	10			2-2-2 N=4				38
15.5		**LEAN CLAY WITH SAND (CL)**, brown, very stiff	15			6-9-8 N=17				75
18.0		**SANDY LEAN CLAY (CL)**, reddish brown, hard	20			8-14-28 N=42				55
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-6

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8907° Longitude: -117.2296°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), fine grained, brown, loose				2-2-2 N=4				
			5			2-3-9	1.9	111		
7.0		**POORLY GRADED SAND (SP)**, medium to coarse grained, reddish brown, loose				2-3-5 N=8				
		medium dense	10			7-12-12	1.0	110		
		fine to coarse grained	15			8-8-9 N=17				
18.0		**SILTY SAND (SM)**, fine to coarse grained, brown, medium dense								
			20			7-12-12 N=24				
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-7

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8907° Longitude: -117.2290°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine grained, brown, loose								
						2-3-4	2.4	105		
5						2-2-2 N=4				
		fine to medium grained				5-7-9	5.2	110		
10						2-2-2 N=4				
11.0		**POORLY GRADED SAND (SP)**, medium to coarse grained, reddish brown, loose								
13.0		**SILTY SAND (SM)**, fine to coarse grained, brown, medium dense, with interbedded clay lenses								
15						6-9-12 N=21				
20						4-6-10 N=16				
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-8

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8904° Longitude: -117.2303°

DEPTH	GRAPHIC LOG		FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine grained, brown, loose					
		medium dense	9-8-13	3.2	51	NP	34 / 31
5			2-5-10	4.0	108		29
7.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, medium to coarse grained, reddish brown, loose	4-7-10	1.0	108		7
9.0		**POORLY GRADED SAND (SP)**, medium to coarse grained, reddish brown, medium dense					
10			4-10-13	0.6	104		4
15.0		**SILTY SAND (SM)**, fine to medium grained, brown, medium dense					
15			5-5-5 N=10				29
20.0		**SANDY LEAN CLAY (CL)**, dark brown, stiff					
20			3-5-6 N=11				51
25		reddish brown	3-6-9 N=15				64

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-8

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8904° Longitude: -117.2303°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.0	**SANDY LEAN CLAY (CL)**, dark brown, stiff *(continued)*								
	31.5	**SILTY SAND (SM)**, fine grained, brown, medium dense	30			5-7-6 N=13				34
		Boring Terminated at 31.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-9

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8904° Longitude: -117.2290°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel up to 1/4", fine to coarse grained, yellowish brown, loose								
						4-6-6	2.4	109		
			5			3-4-5	3.0	110		
7.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel up to 1/4", fine to coarse grained, grayish brown, loose to medium dense				4-7-8	0.7			
			10			4-6-8	0.7	109		
15.0		**SILTY SAND (SM)**, trace gravel up to 1/4", fine grained, brown, medium dense	15			5-9-12 N=21				
20.0		**SANDY LEAN CLAY (CL)**, fine to coarse grained, brown, stiff	20			3-5-8 N=13				
25.0		**SILTY SAND (SM)**, trace clay, fine to coarse grained, brown, medium dense	25			8-13-14 N=27				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-9

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8904° Longitude: -117.2290°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace clay, fine to coarse grained, brown, medium dense *(continued)*								
30.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel up to 1/4", fine to coarse grained, light brown, medium dense	30			7-9-10 N=19				
31.5		***Boring Terminated at 31.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-10

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8901° Longitude: -117.2295°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel up to 1/4", fine to coarse grained, yellowish brown, loose							
					4-5-8	3.0	102	NP	33
5		medium dense			8-21-25	5.0	111		
		medium to coarse grained loose			3-5-9	3.9	103		
10		fine to coarse grained, medium dense			4-9-14	3.1	111		
15					5-10-12 N=22				
		20.0							
20		**SANDY LEAN CLAY (CL)**, brown, stiff			3-5-8 N=13				
		21.5							
		Boring Terminated at 21.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-11

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8901° Longitude: -117.2290°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace clay, fine to coarse grained, brown, loose							
					3-4-4	4.2	111		42
5					3-5-9	4.3	108		20
7.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel up to 1/4", fine to coarse grained, grayish brown, loose			4-7-11	0.7	108		5
		medium dense							
10					5-11-13	1.0			6
15.0		**SILTY SAND (SM)**, trace gravel up to 1/4", fine grained, brown, medium dense			7-12-13 N=25				16
15									
20.0									
20		**SANDY LEAN CLAY (CL)**, fine to coarse grained, brown, stiff			3-5-6 N=11				53
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-12

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8897° Longitude: -117.2302°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel up to 1", fine to coarse grained, yellowish brown, loose							
5					5-5-4	3.6	102		
					2-3-6	5.4	108		
		trace clay, fine to medium grained, medium dense			5-8-11	4.8	112		
10					5-8-10	4.1	113		
15					4-5-8 N=13				
20					5-5-7 N=12				
20.0		**SANDY LEAN CLAY (CL)**, fine to medium grained, brown, stiff							
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-13

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8898° Longitude: -117.2295°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel up to 1/4", fine to coarse grained, yellowish brown, very loose							
		fine to medium grained			3-2-2	3.1	91	NP	34 29
5		loose			2-3-5	2.9	102		19
		trace clay medium dense			5-10-14	4.9	112		35
10					6-9-11	4.4	106		30
15		no clay, fine to coarse grained, dark brown			6-9-8 N=17				29
20					5-9-10 N=19				34
25					6-9-8 N=17				40

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

After 15 minutes

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-13

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8898° Longitude: -117.2295°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel up to 1/4", fine to coarse grained, yellowish brown, very loose *(continued)*								
			30			6-9-10 N=19				33
			35			7-8-8 N=16				18
		trace clay	40	▽		8-8-11 N=19				17
45.0		**SANDY LEAN CLAY (CL)**, dark brown, stiff	45			3-4-6 N=10				70
48.0		**SILTY SAND (SM)**, dark brown, medium dense	50			5-8-12 N=20				43
51.5		***Boring Terminated at 51.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *After 15 minutes*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-14

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8897° Longitude: -117.2289°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, trace gravel up to 1/4", fine to coarse grained, yellowish brown, loose					
5		medium dense	3-3-4	2.3	99		
			12-18-15	5.4	109		
7.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel up to 1/4", fine to coarse grained, grayish brown, loose	4-7-9	0.5			
10		medium dense	6-7-12	3.6	102		
15.0		**SILTY SAND (SM)**, trace gravel up to 1/4", fine grained, brown, medium dense	7-8-10 N=18				
15							
20.0		**SANDY LEAN CLAY (CL)**, fine to coarse grained, brown, stiff	3-6-8 N=14				
20							
21.5		***Boring Terminated at 21.5 Feet***					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-15

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8894° Longitude: -117.2296°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace clay, trace gravel up to 1/4", fine to medium grained, yellowish brown, loose							
5					5-6-7	3.8	114		
					3-4-7	5.5	106		
					4-6-7	8.6	107		
10		6" lens of coarse sand with gravel			2-5-8	0.8	104		
15		medium dense			3-5-6 N=11				
20		20.0 **SANDY LEAN CLAY (CL)**, fine to coarse grained, dark brown, stiff			4-5-9 N=14				
		21.5 ***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-16

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8895° Longitude: -117.2290°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, trace gravel up to 1/4", fine grained, brown, loose					
			4-5-6	2.7	103		
5			4-6-6	4.3	99		
7.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel up to 1/4", fine to coarse grained, grayish brown, loose	3-6-10	2.5	111		
10.0		**SILTY SAND (SM)**, trace gravel up to 1/4", fine grained, brown, medium dense	7-14-16	5.9	109		
10							
15			6-9-9 N=18				
20.0		**SANDY LEAN CLAY (CL)**, fine to coarse grained, brown, stiff					
20			3-4-7 N=11				
21.5		***Boring Terminated at 21.5 Feet***					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-17

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8892° Longitude: -117.2302°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace clay, trace gravel 1/4", fine to medium grained, yellowish brown, very loose							
					5-5-4	6.5	102		43
5					3-3-2	7.4	99		48
		no clay loose			2-4-7	3.8	106		35
10					4-7-10	3.2	101		29
		medium dense			6-11-12 N=23				46
20		trace clay, fine to coarse grained			7-10-11 N=21				46
25		calcium carbonate			3-6-5 N=11				41

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-17

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8892° Longitude: -117.2302°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
SILTY SAND (SM), trace clay, trace gravel 1/4", fine to medium grained, yellowish brown, very loose *(continued)*									
		30							
fine grained					5-6-7 N=13				43
31.5									
Boring Terminated at 31.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 10-14-2021 | Boring Completed: 10-14-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

BORING LOG NO. B-18

PROJECT: Proposed Residential Development

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

LOCATION See Exploration Plan

Latitude: 33.8888° Longitude: -117.2295°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		**SILTY SAND (SM)**, fine grained, brown, loose				NP	38
			4-5-6	4.8	109		
4.0		**SANDY LEAN CLAY (CL)**, dark brown, stiff					
5			2-7-9	8.2	113		
			5-8-10	8.5	110		
9.5		**SILTY SAND (SM)**, fine to medium grained, brown, loose					
10			5-7-10	2.0	113		
		coarse sand lens at 11'					
15.5		**SANDY LEAN CLAY (CL)**, brown, stiff					
15			5-7-7 N=14				
		very stiff					
20			7-12-16 N=28				
21.5		***Boring Terminated at 21.5 Feet***					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic (79.3%)

Advancement Method:
6" Hollow-Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

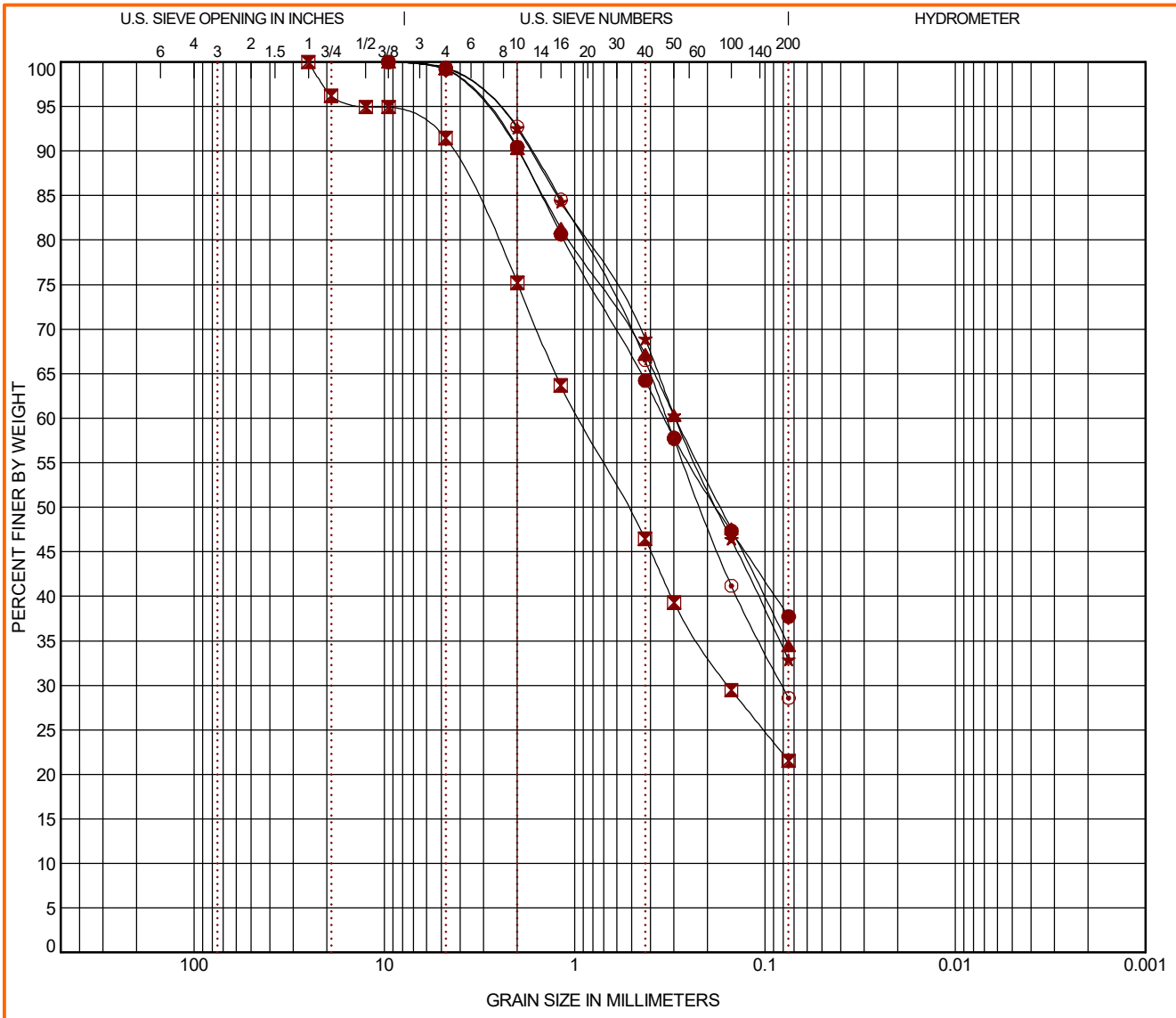
Boring Started: 10-15-2021 | Boring Completed: 10-15-2021

Drill Rig: CME 75 | Driller: Martini Drilling

Project No.: CB205038

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-1	0 - 5	SILTY SAND (SM)		NP	NP	NP		
⊠	B-3	0 - 5	SILTY SAND (SM)		NP	NP	NP		
▲	B-8	0 - 5	SILTY SAND (SM)		NP	NP	NP		
★	B-10	2 - 5	SILTY SAND (SM)		NP	NP	NP		
⊙	B-13	2 - 5	SILTY SAND (SM)		NP	NP	NP		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-1	0 - 5	9.5	0.338			0.0	0.8	61.5		37.7	
⊠	B-3	0 - 5	25	0.95	0.156		0.0	8.6	69.9		21.5	
▲	B-8	0 - 5	9.5	0.295			0.0	0.8	64.7		34.4	
★	B-10	2 - 5	9.5	0.296			0.0	0.7	66.4		32.9	
⊙	B-13	2 - 5	9.5	0.329	0.081		0.0	0.6	70.8		28.6	

PROJECT: Proposed Residential Development

PROJECT NUMBER: CB205038

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

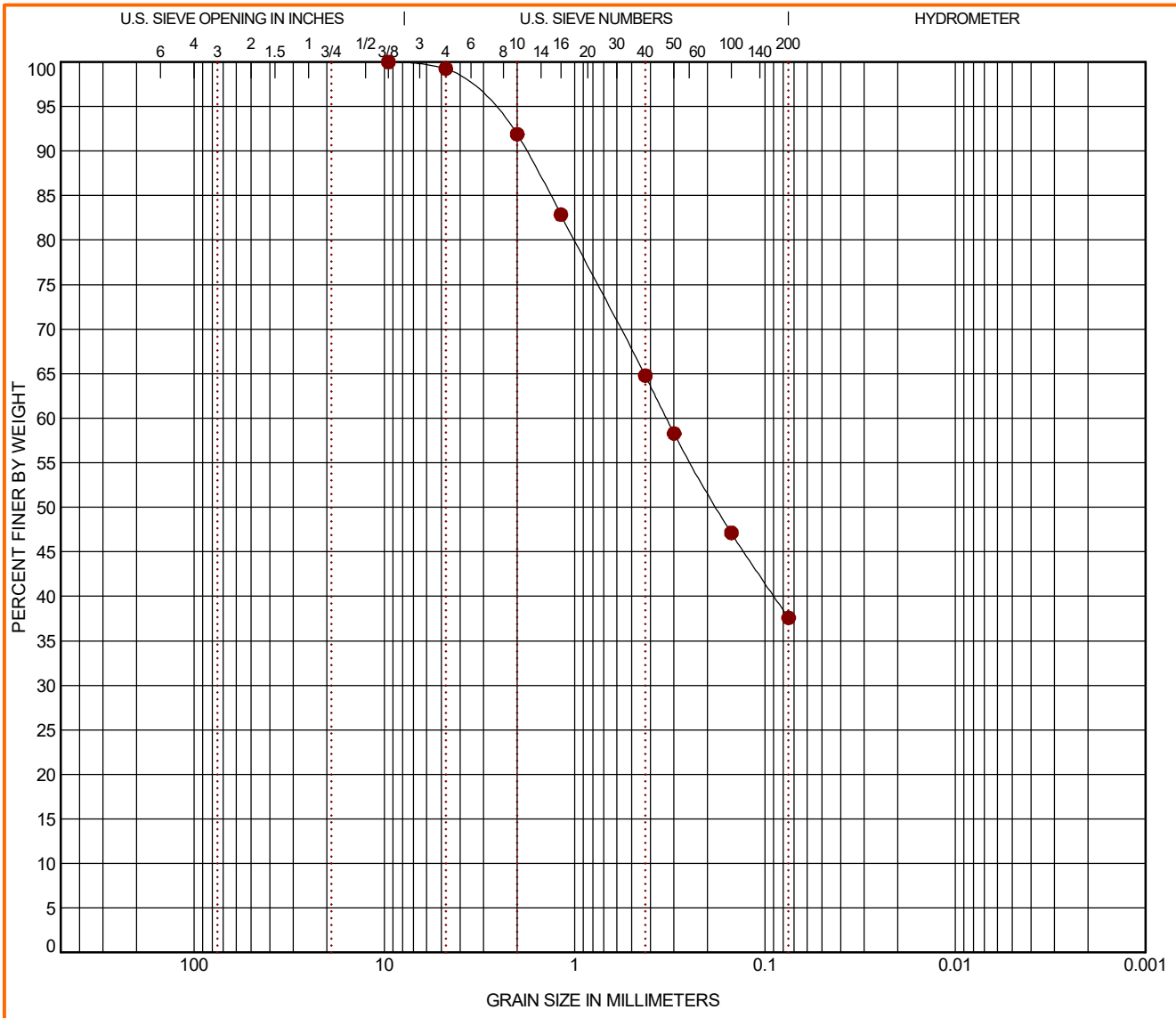
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

CLIENT: Perris at Pentecostal LLC
Irvine, CA

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 CB205038 PROPOSED RESIDENT.GPJ TERRACON_DATATEMPLATE.GDT 11/24/21

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
B-18	0 - 5	SILTY SAND (SM)		NP	NP	NP		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
B-18	0 - 5	9.5	0.329			0.0	0.8	61.7		37.6	

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

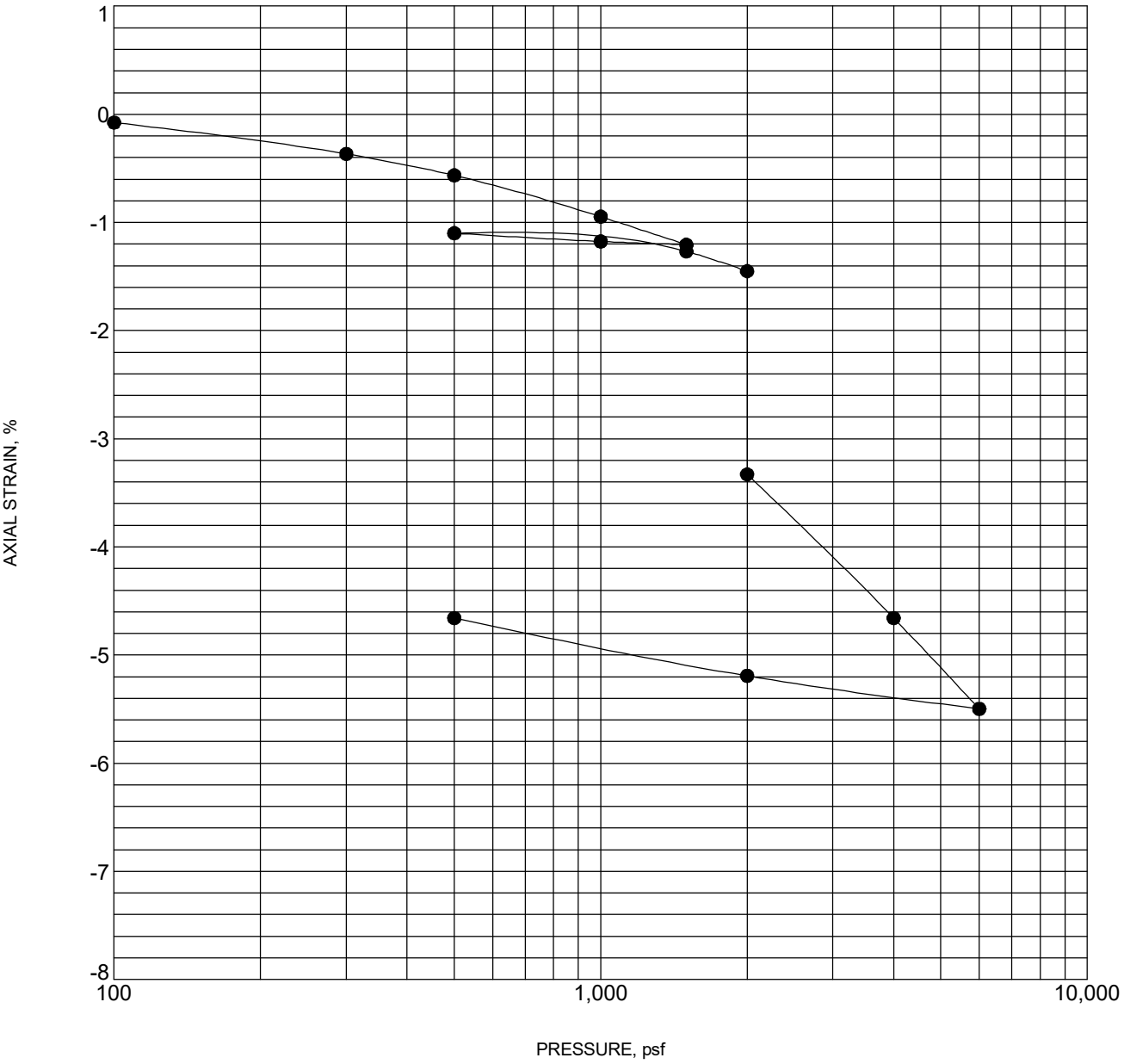
PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 CB205038 PROPOSED RESIDENT.GPJ TERRACON_DATATEMPLATE.GDT 11/24/21

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
O	B-2	5 - 6.5 ft	Silty Sand (SM)	109	5.1

NOTES:

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

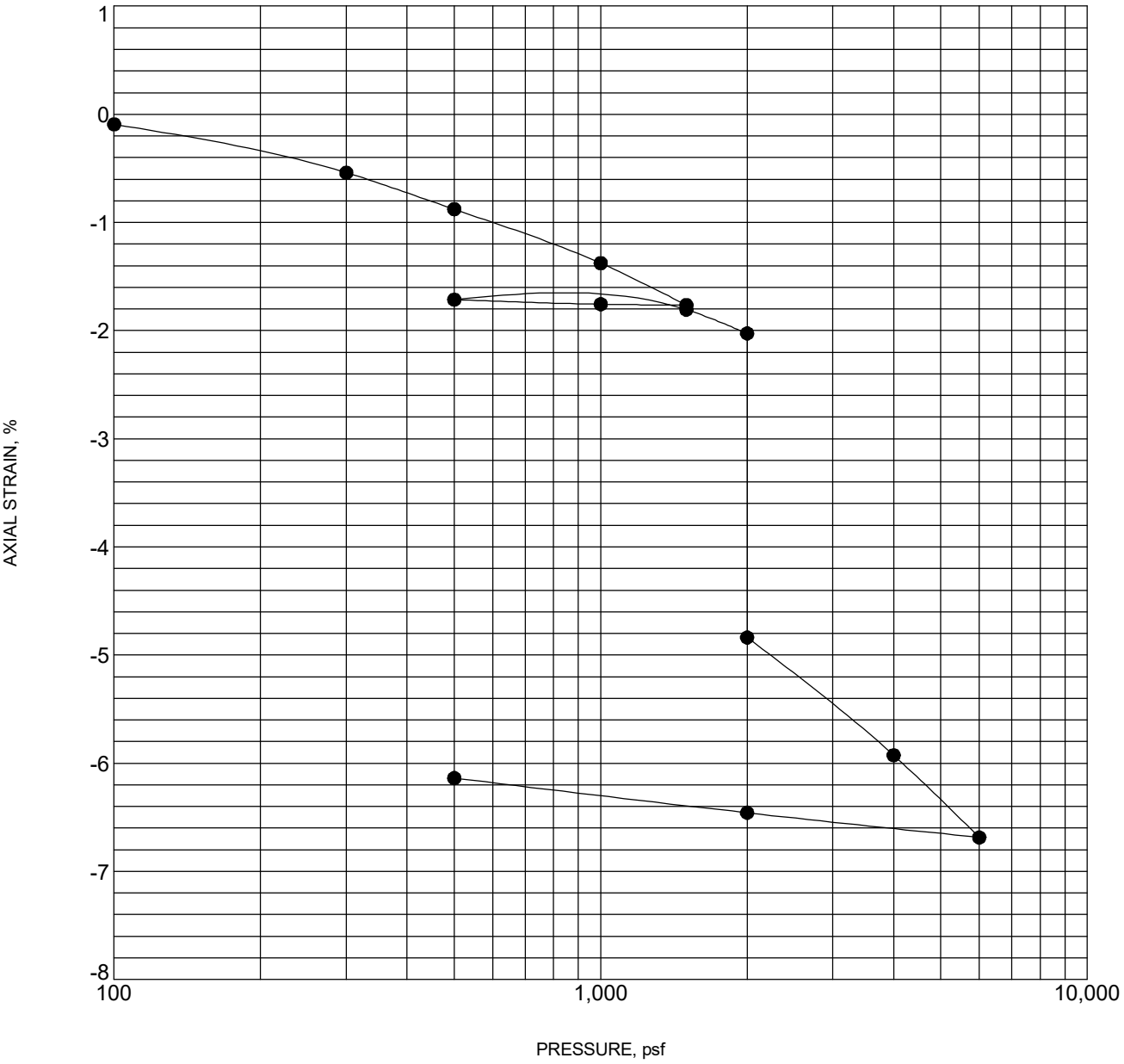
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
O	B-6	5 - 6.5 ft	Silty Sand (SM)	105	2.3

NOTES:

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

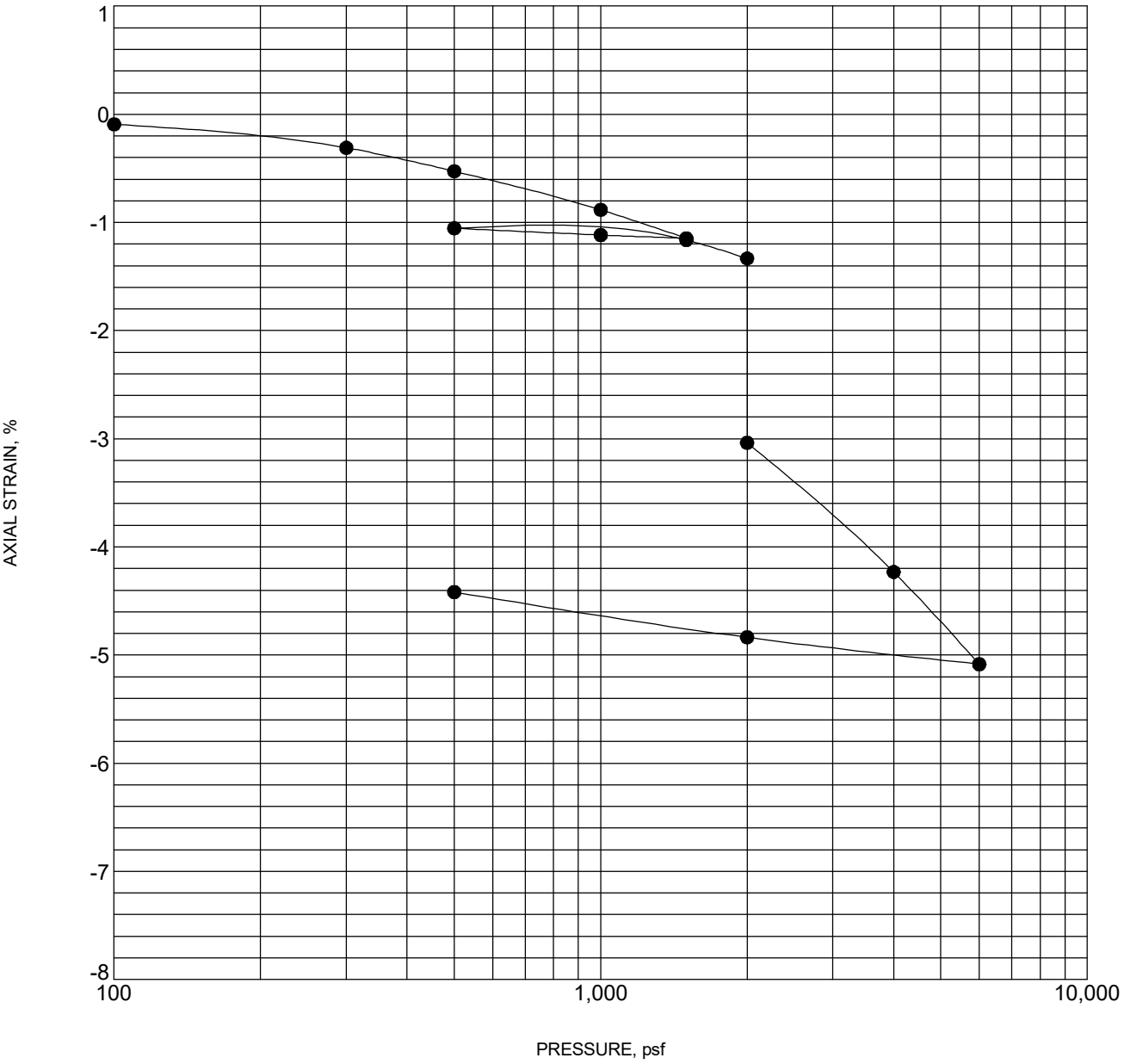
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
O	B-13	5 - 6.5 ft	Silty Sand (SM)	100	3.2

NOTES:

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

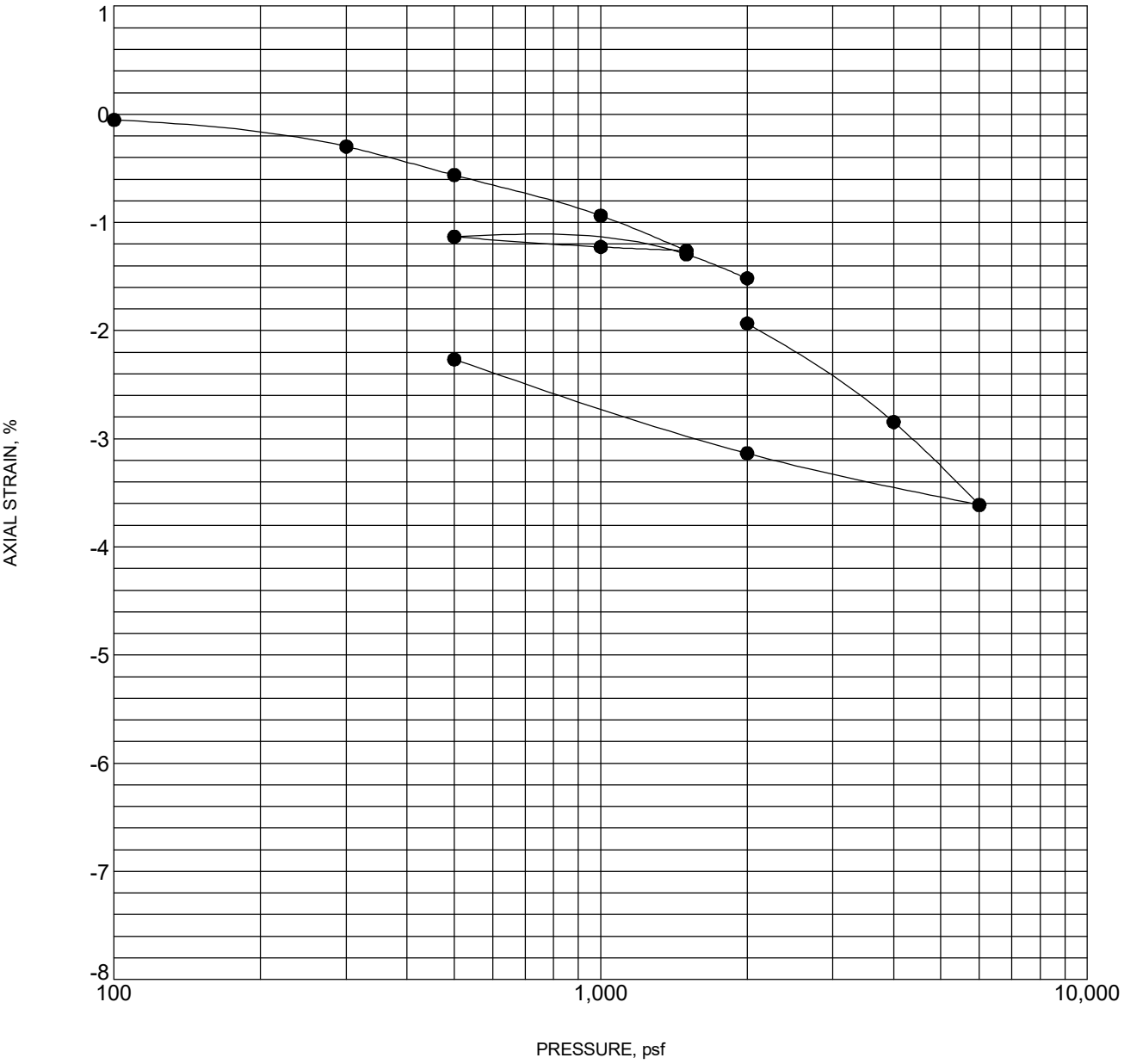
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
O	B-15	7.5 - 9 ft	Silty Sand (SM)	105	8.9

NOTES:

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

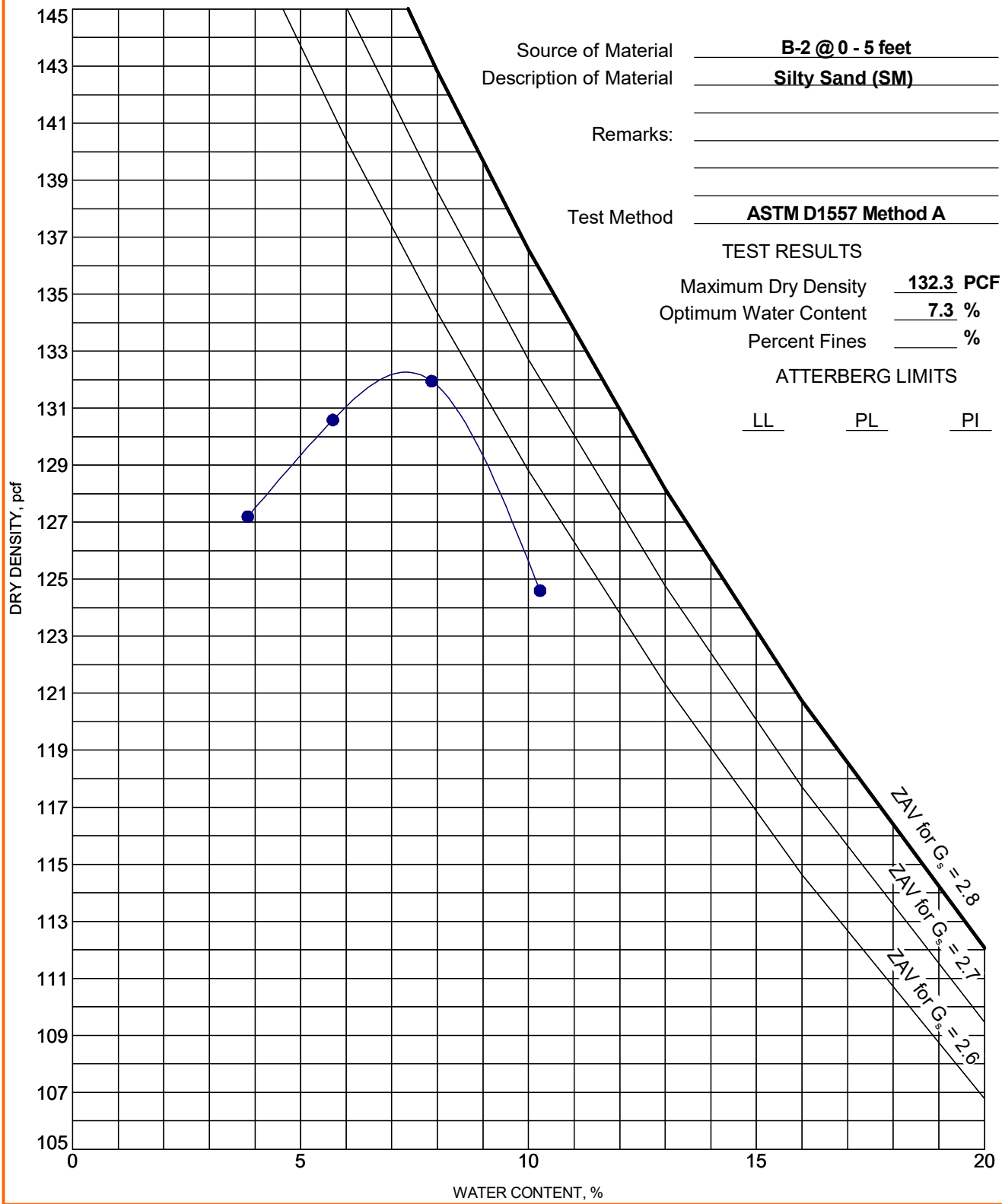
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-2 @ 0 - 5 feet**

Description of Material: **Silty Sand (SM)**

Remarks:

Test Method: **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density	**132.3**	**PCF**
Optimum Water Content	**7.3**	**%**
Percent Fines		**%**

ATTERBERG LIMITS

LL	PL	PI

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

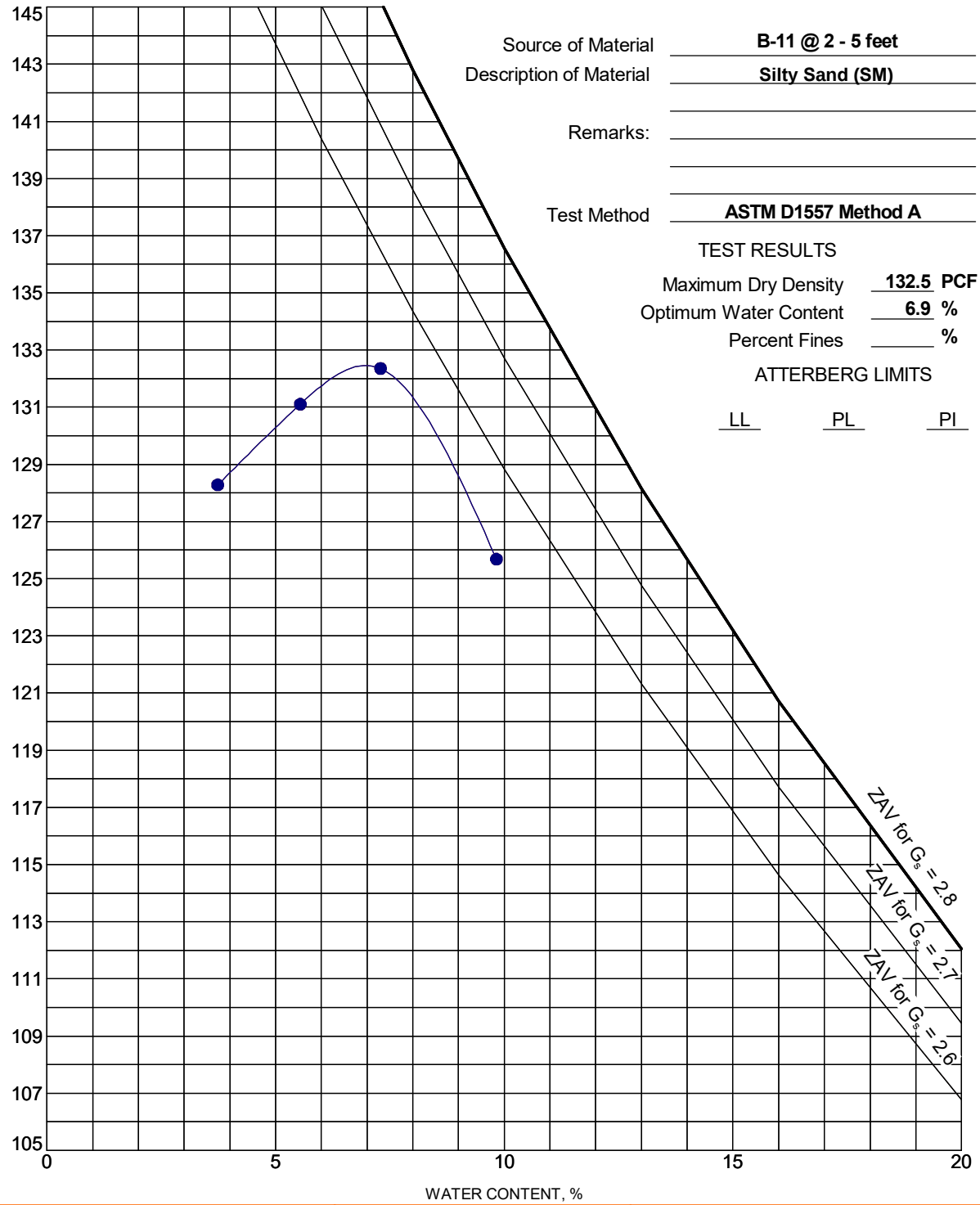
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-11 @ 2 - 5 feet**

Description of Material: **Silty Sand (SM)**

Remarks:

Test Method: **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density	**132.5**	**PCF**
Optimum Water Content	**6.9**	**%**
Percent Fines		**%**

ATTERBERG LIMITS

LL	PL	PI

PROJECT: Proposed Residential Development

SITE: Perris Boulevard & Santiago Drive
Moreno Valley

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB205038

CLIENT: Perris at Pentecostal LLC
Irvine, CA

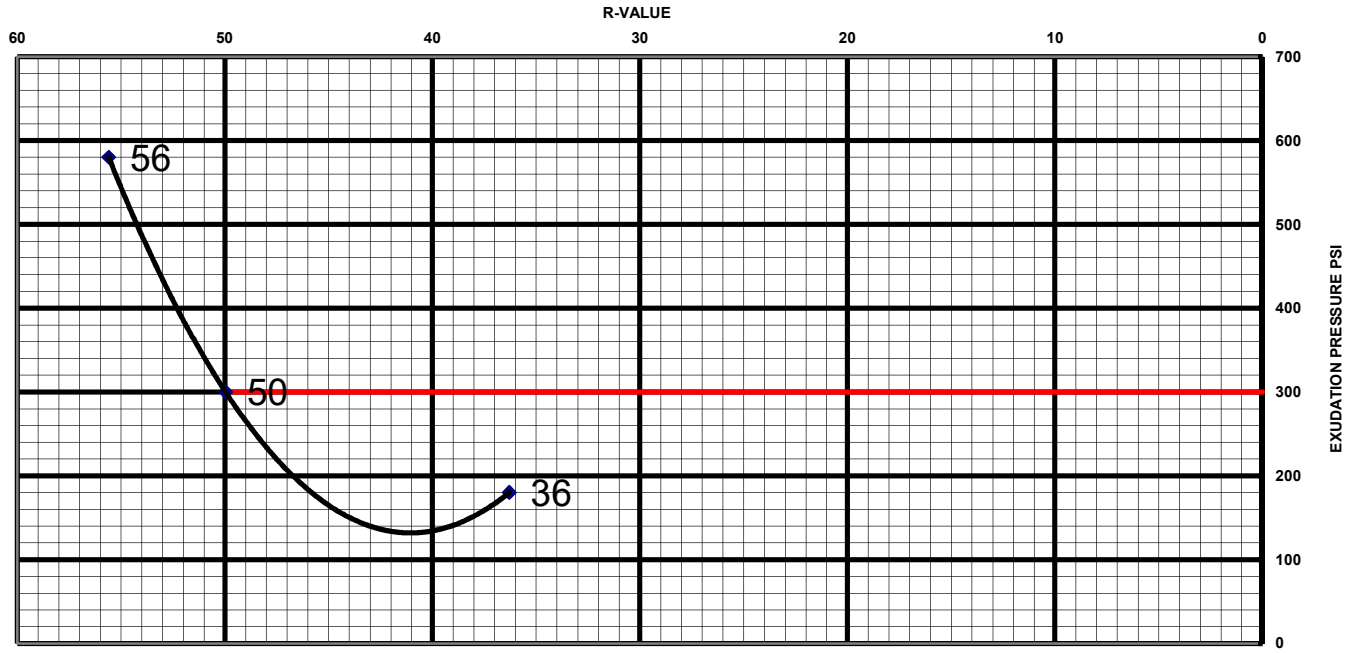
Job No. CB205038
Date. 11/18/2021

LABORATORY RECORD OF TESTS MADE ON BASE, SUBBASE, AND BASEMENT SOILS

CLIENT: **Perris at Pentecostal**
PROJECT **CCU**
LOCATION: **Moreno Valley, CA**
R-VALUE # : **10A**
T.I. :

	A	B	C	D
COMPACTOR AIR PRESSURE P.S.I.	350	350	350	
INITIAL MOISTURE %	3.1	3.1	3.1	
WATER ADDED, ML	90	80	70	
WATER ADDED %	8.2	7.3	6.3	
MOISTURE AT COMPACTION %	11.3	10.4	9.4	
HEIGHT OF BRIQUETTE	2.47	2.49	2.51	
WET WEIGHT OF BRIQUETTE	1129	1136	1138	
DENSITY LB. PER CU.FT.	124.4	125.3	125.5	
STABILOMETER PH AT 1000 LBS.	37	29	22	
2000 LBS.	71	52	47	
DISPLACEMENT	5.50	5.20	4.80	
R-VALUE	36	50	56	
EXUDATION PRESSURE	180	300	580	
THICK. INDICATED BY STAB.	0.00	0.00	0.00	
EXPANSION PRESSURE	0	0	0	
THICK. INDICATED BY E.P.	0.00	0.00	0.00	

EXUDATION CHART



R-Value: **50**

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client
Perris at Pentecostal LLC

Project
Proposed Residential Development
Moreno Valley

Sample Submitted By: Terracon (CB) **Date Received:** 11/1/2021 **Lab No.: 21-0810**

Results of Corrosion Analysis

Sample Number	8-A
Sample Location	B-8
Sample Depth (ft.)	0.0-5.0
pH Analysis, ASTM G 51	7.73
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	83
Chlorides, ASTM D 512, (mg/kg)	53
Total Salts, AWWA 2540, (mg/kg)	239
As-Received Resistivity, ASTM G 57, (ohm-cm)	34920
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	4462

Analyzed By:
Nathan Campo
Engineering Technician II

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Residential Development
Emma Lane & Iris Avenue
Moreno Valley, CA
October 20, 2021

Prepared for:

Mr. Sean Paroski
Terracon Consultants, Inc.
1355 E. Cooley Drive, Ste C
Colton, CA 92324
Office (909) 824-7311 / Fax (909) 301-6016

Prepared by:

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

TABLE OF CONTENTS

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Residential Development project located at Emma Lane & Iris Avenue in Moreno Valley, California. The work was performed by Kehoe Testing & Engineering (KTE) on October 20, 2021. The scope of work was performed as directed by Terracon Consultants, Inc. personnel.

2. SUMMARY OF FIELD WORK

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

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	50	
CPT-2	50	
CPT-3	50	
CPT-4	100	
CPT-5	50	
CPT-6	50	
CPT-7	50	

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

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

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

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

4. CONE PENETRATION TEST DATA & INTERPRETATION

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

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

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

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

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

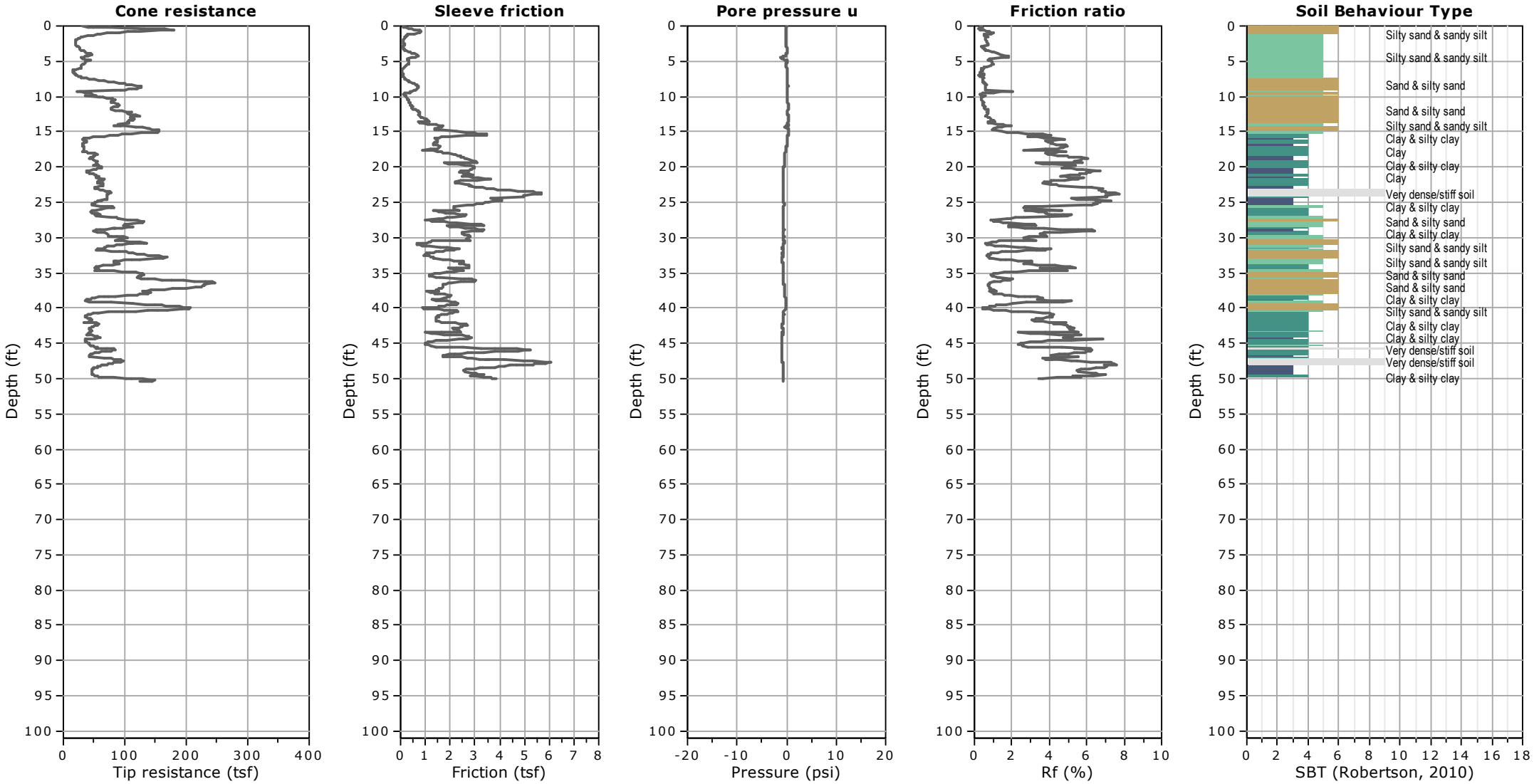
10/26/21-wt-3410

APPENDIX

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

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

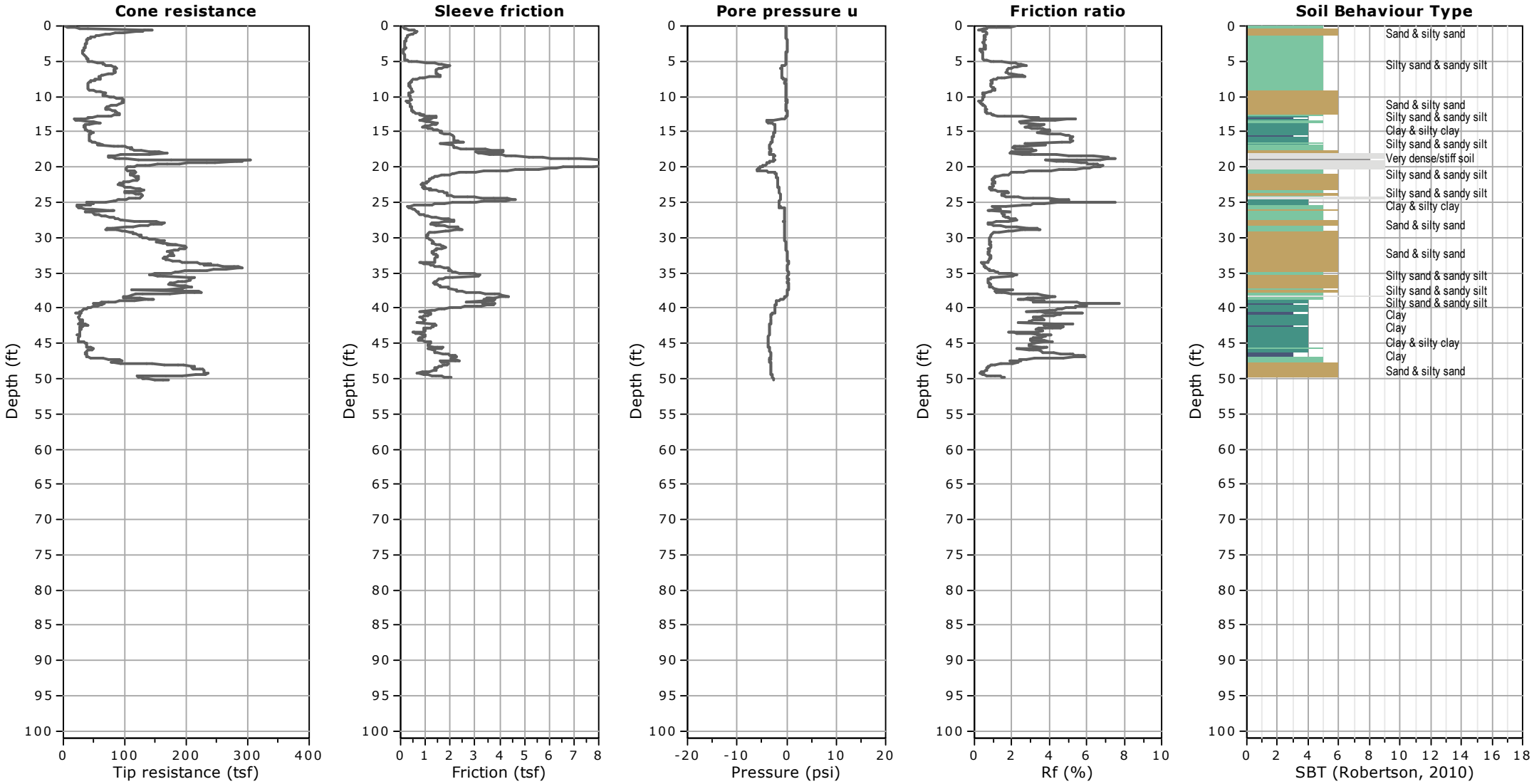
CPT-1
Total depth: 50.40 ft, Date: 10/20/2021



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

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

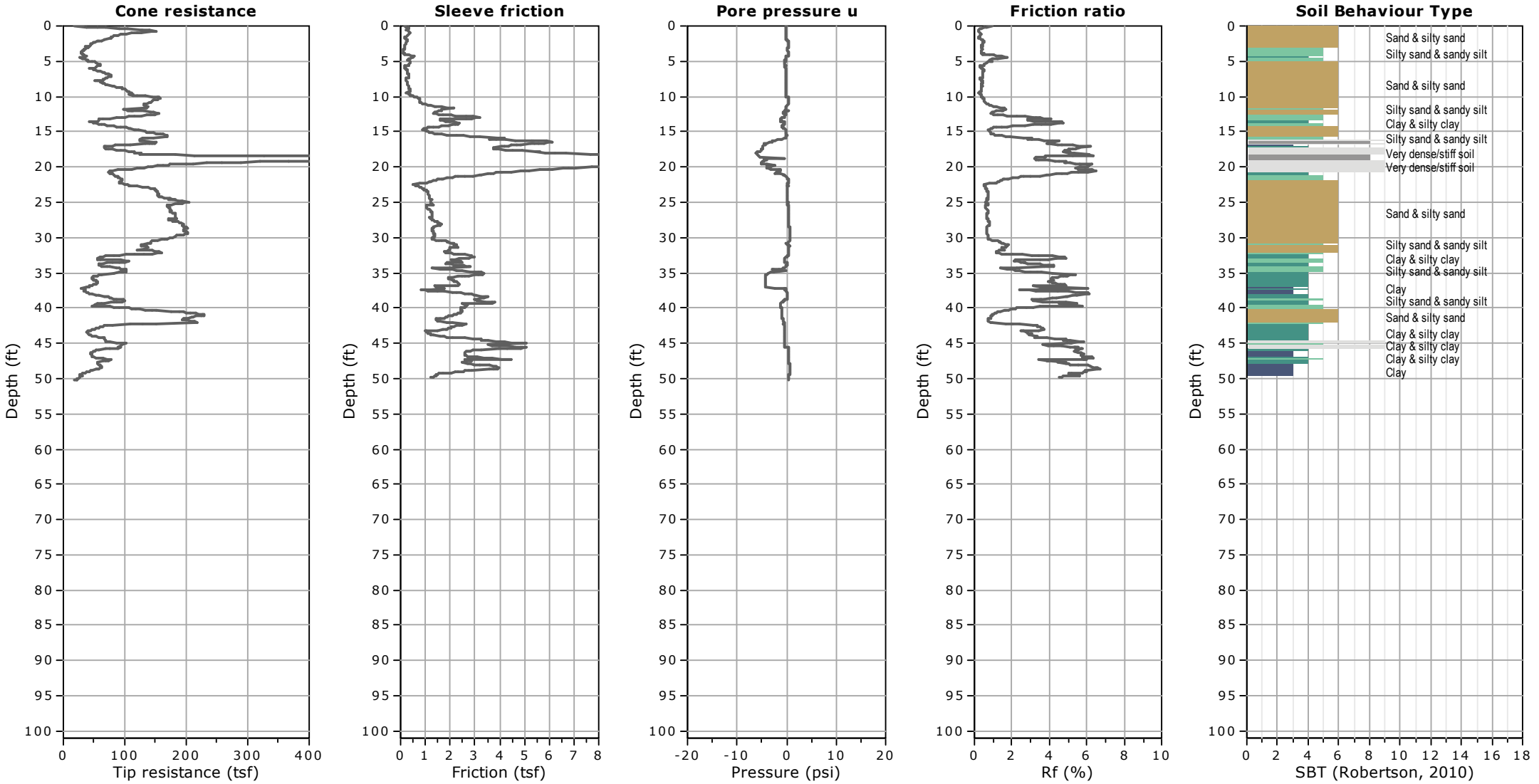
CPT-2
Total depth: 50.28 ft, Date: 10/20/2021



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

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

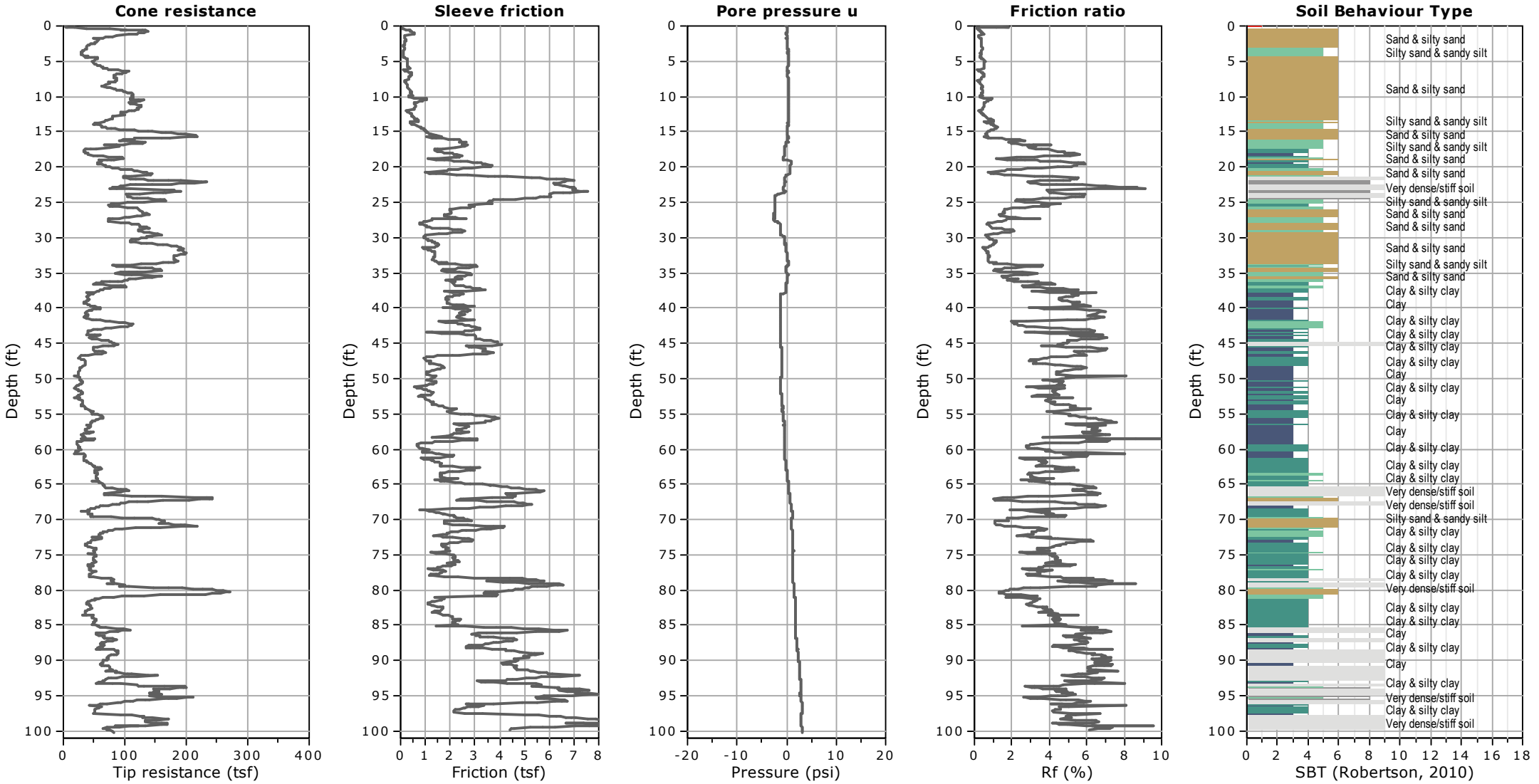
CPT-3
Total depth: 50.20 ft, Date: 10/20/2021



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

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

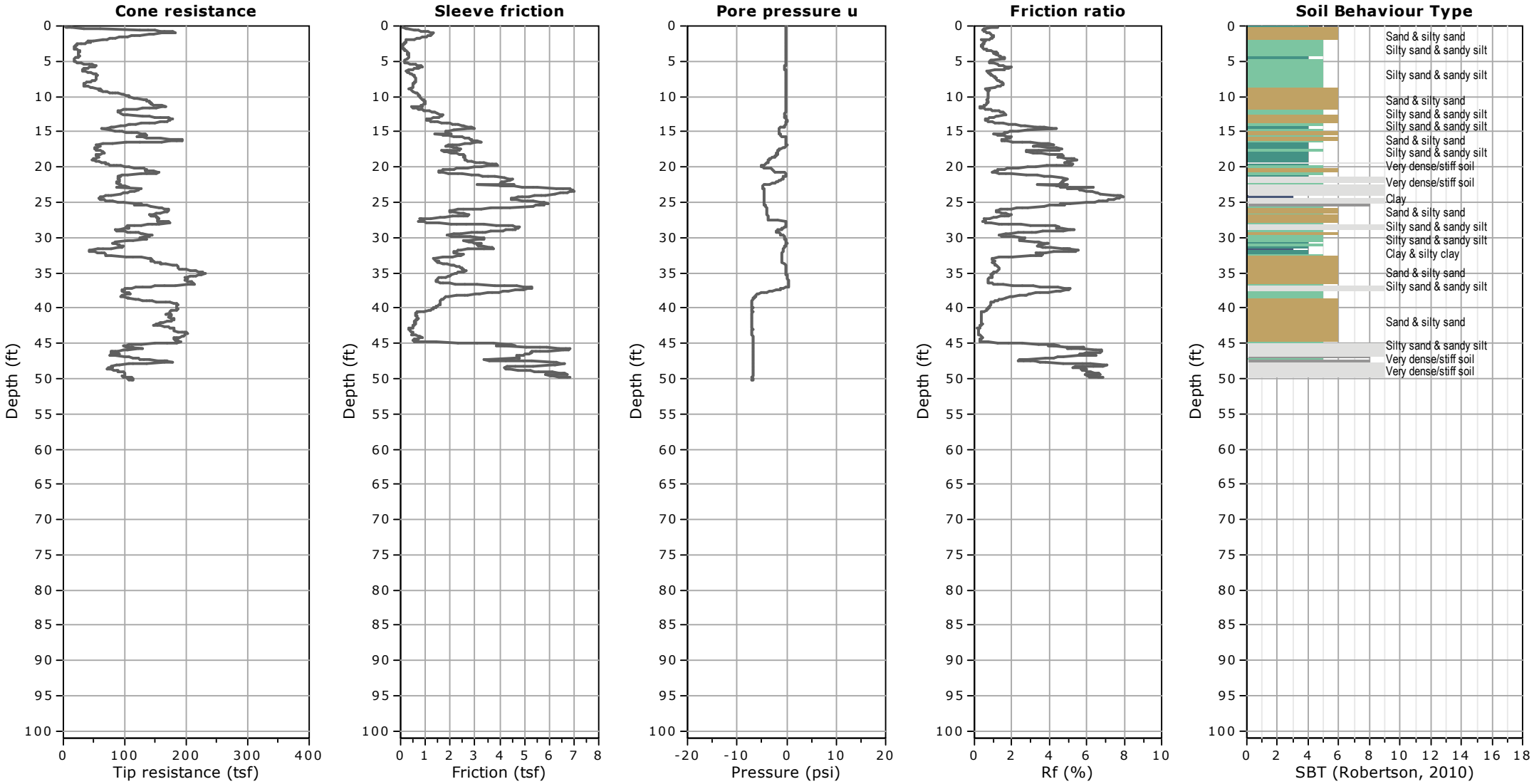
CPT-4
Total depth: 100.19 ft, Date: 10/20/2021



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

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

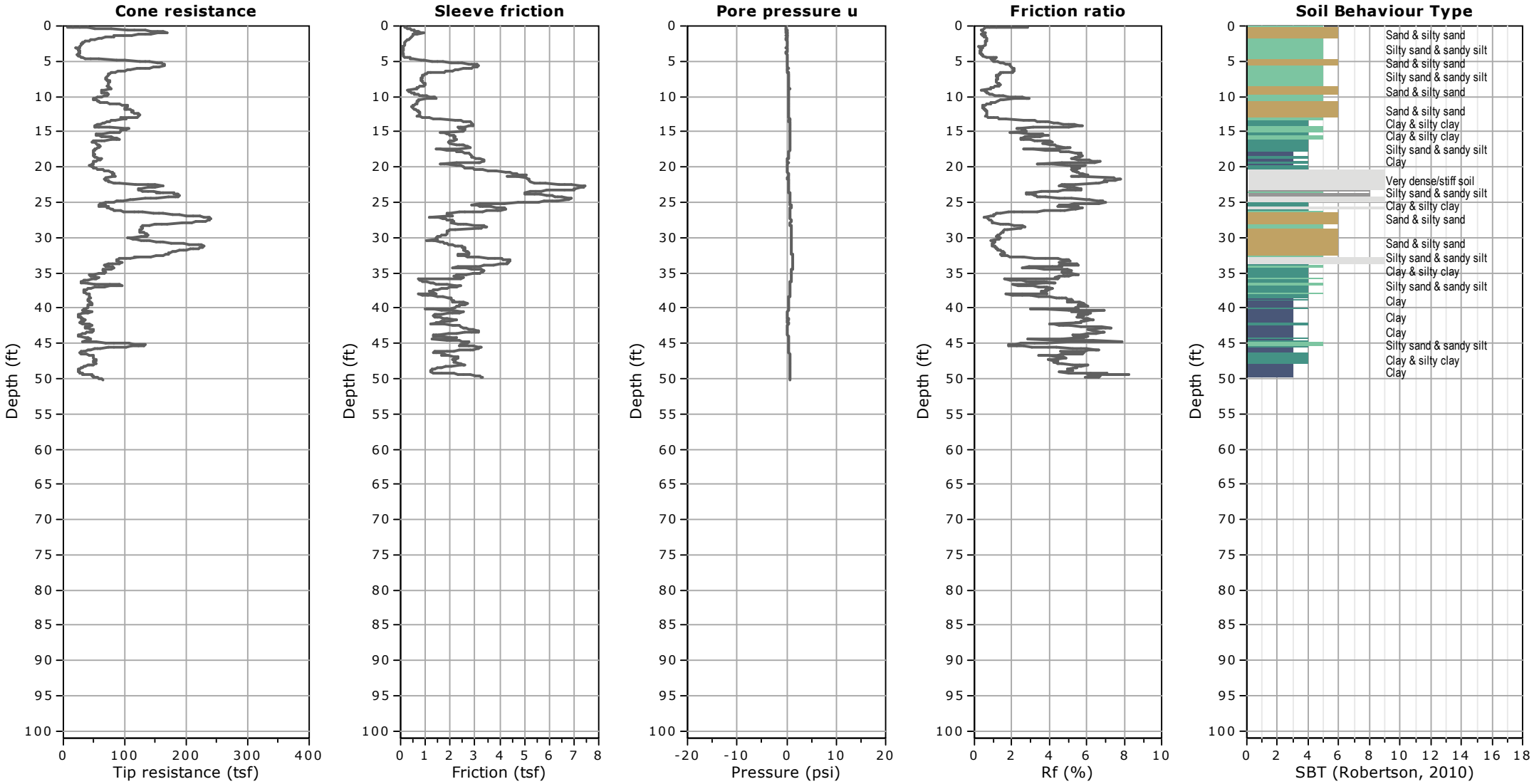
CPT-5
Total depth: 50.25 ft, Date: 10/20/2021



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

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

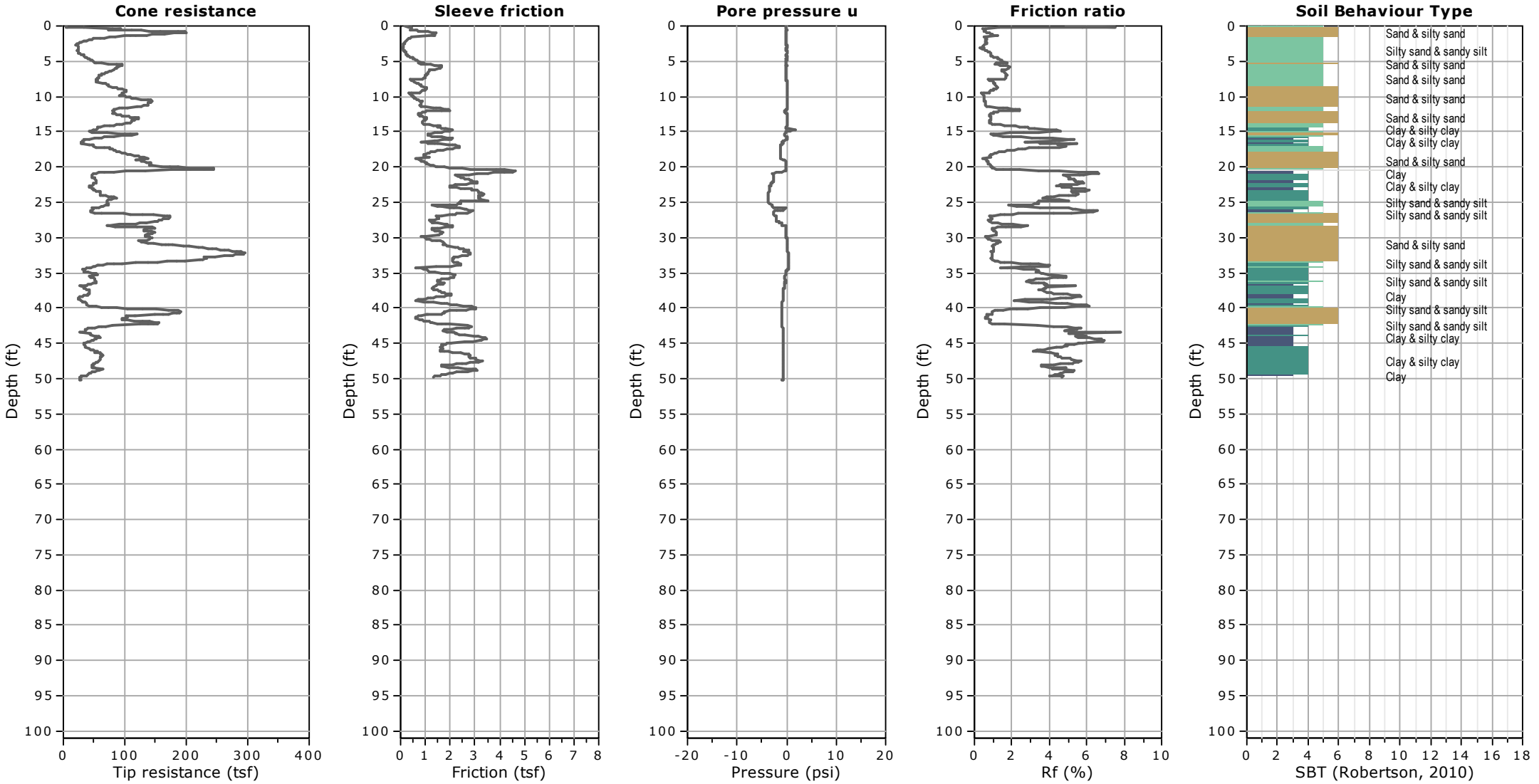
CPT-6
Total depth: 50.30 ft, Date: 10/20/2021



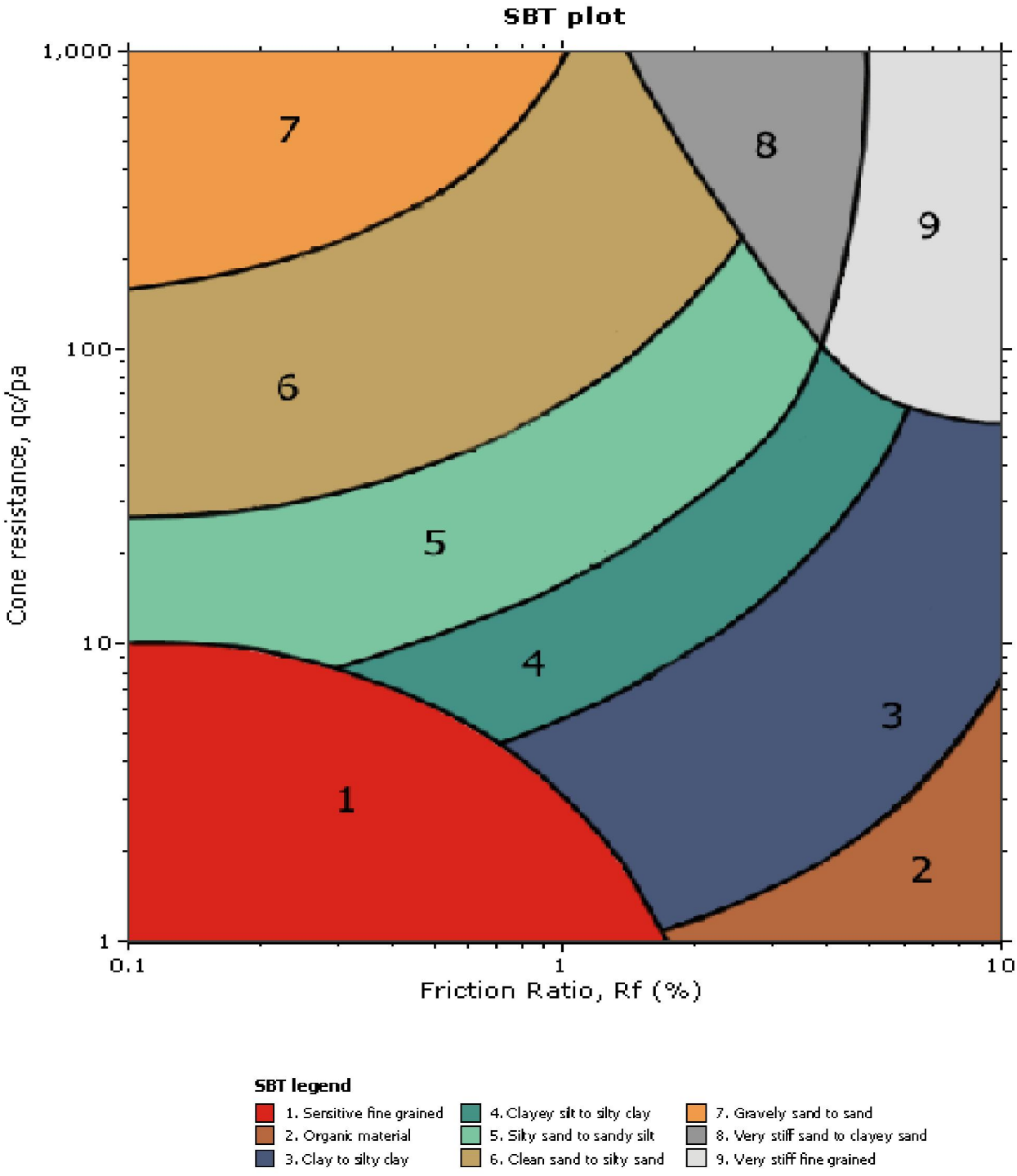
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Terracon Consultants / Residential Development**
Location: **Emma Lane & Iris Ave, Moreno Valley, CA**

CPT-7
Total depth: 50.20 ft, Date: 10/20/2021



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

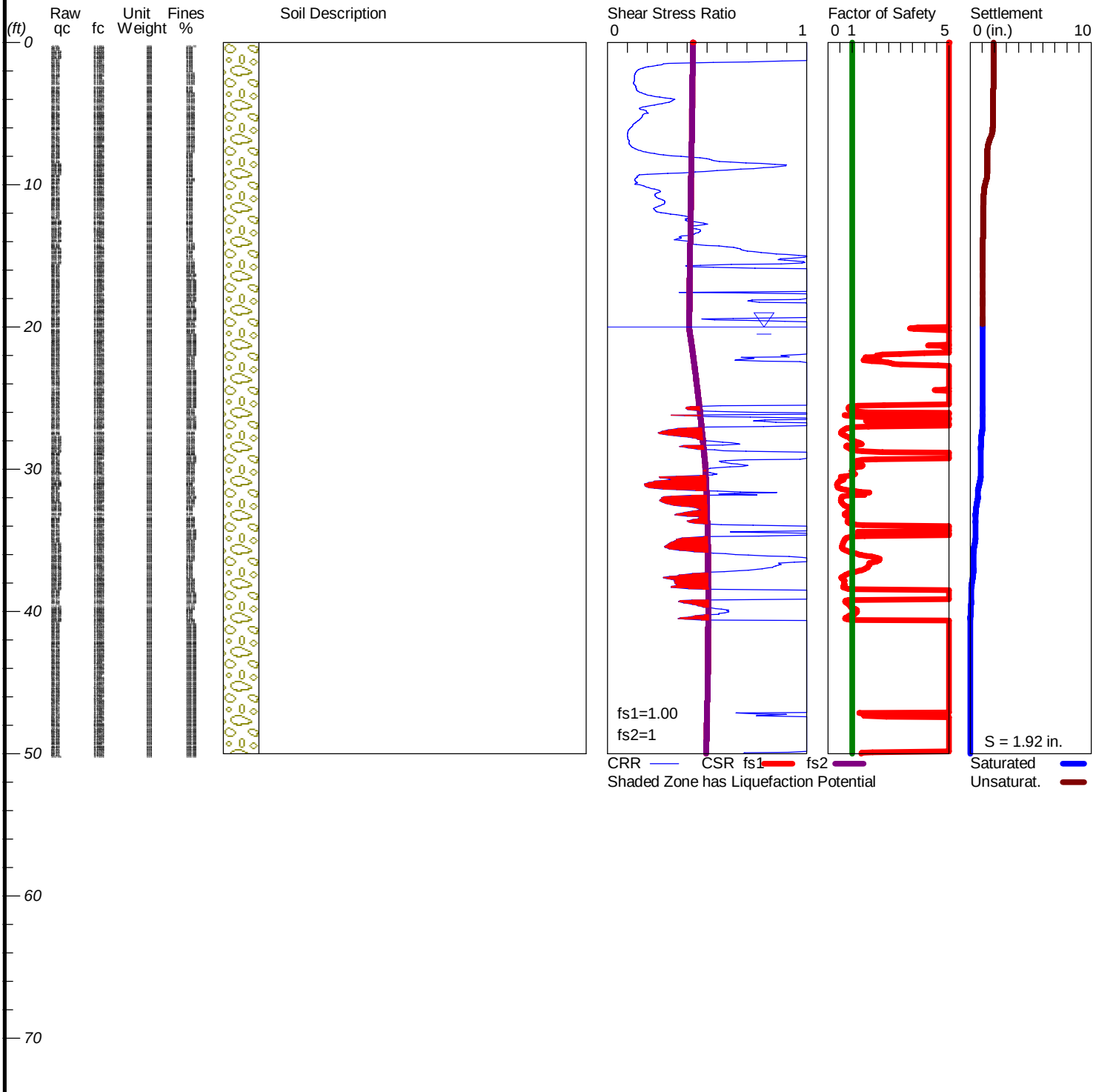


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=CPT-1 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g

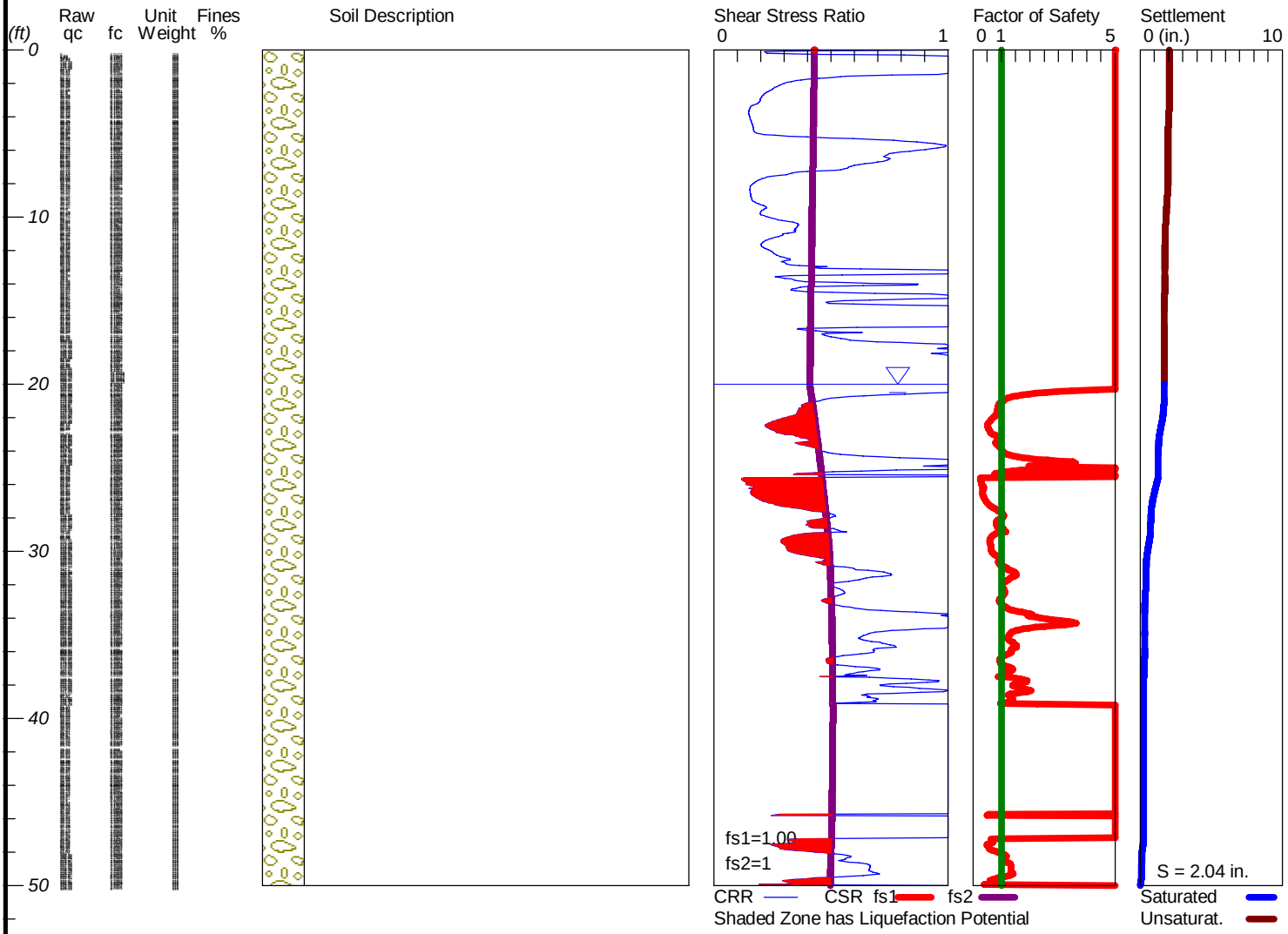


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=CPT-2 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g

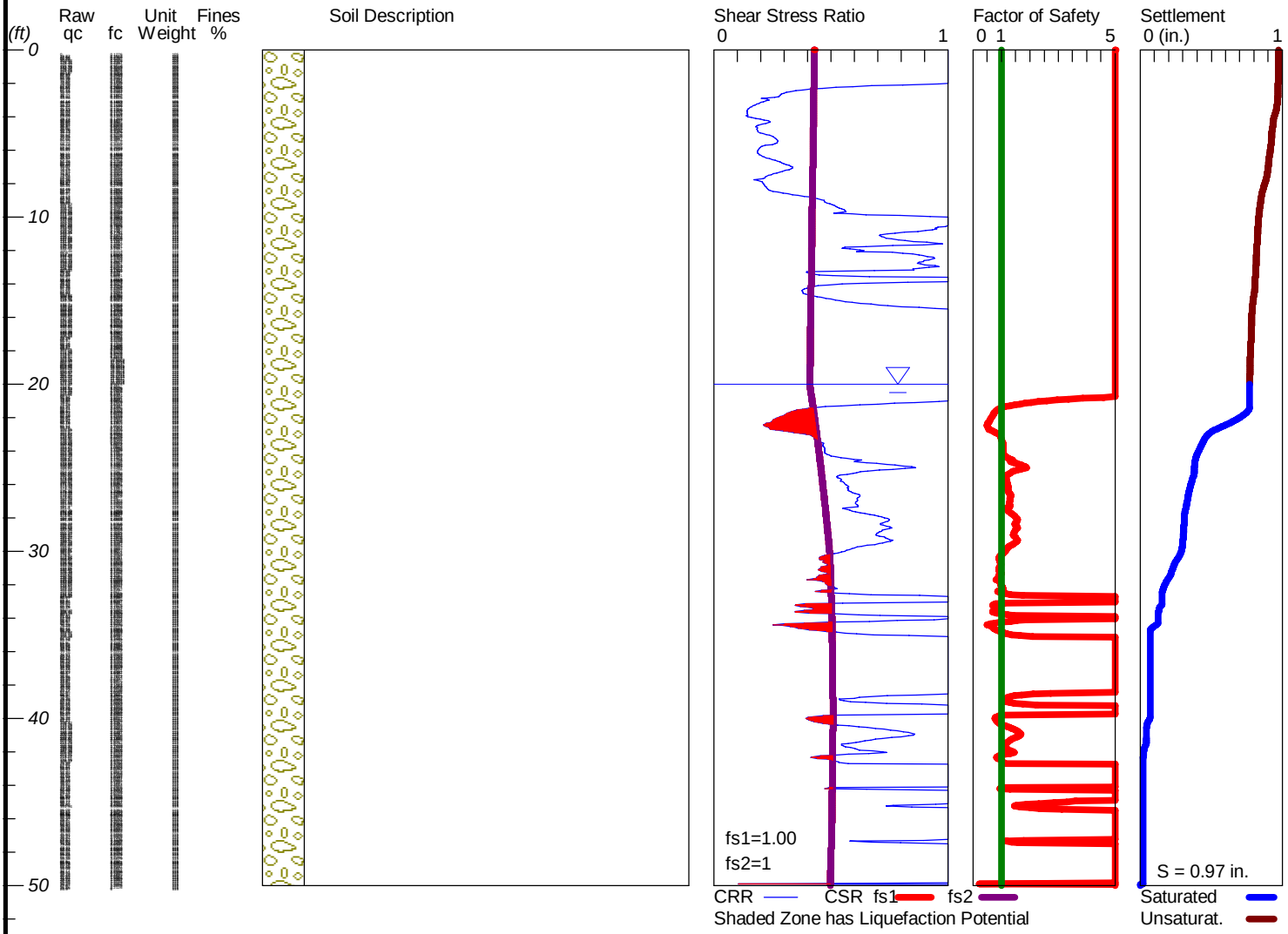


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=CPT-3 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g

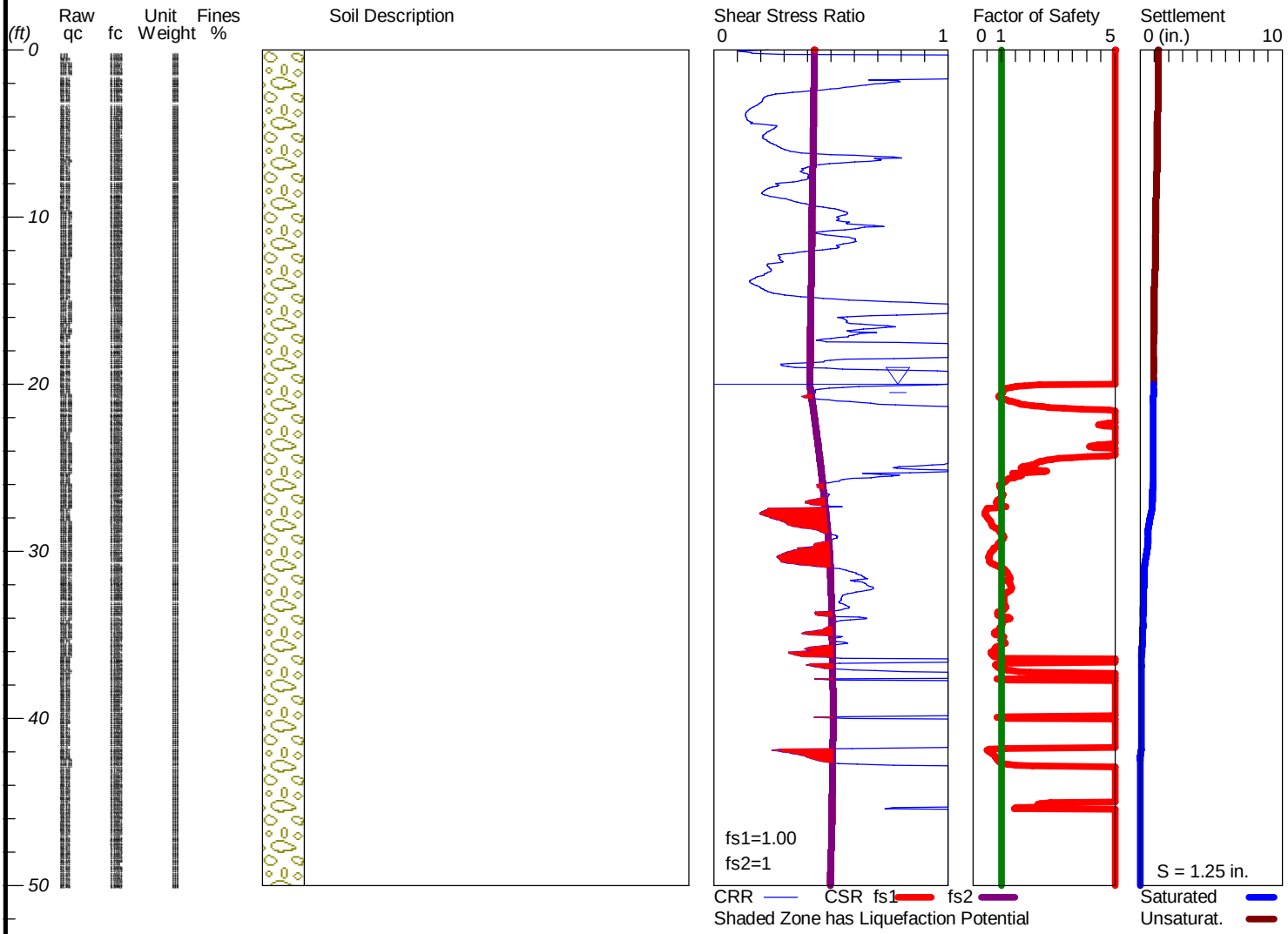


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=CPT-4 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g

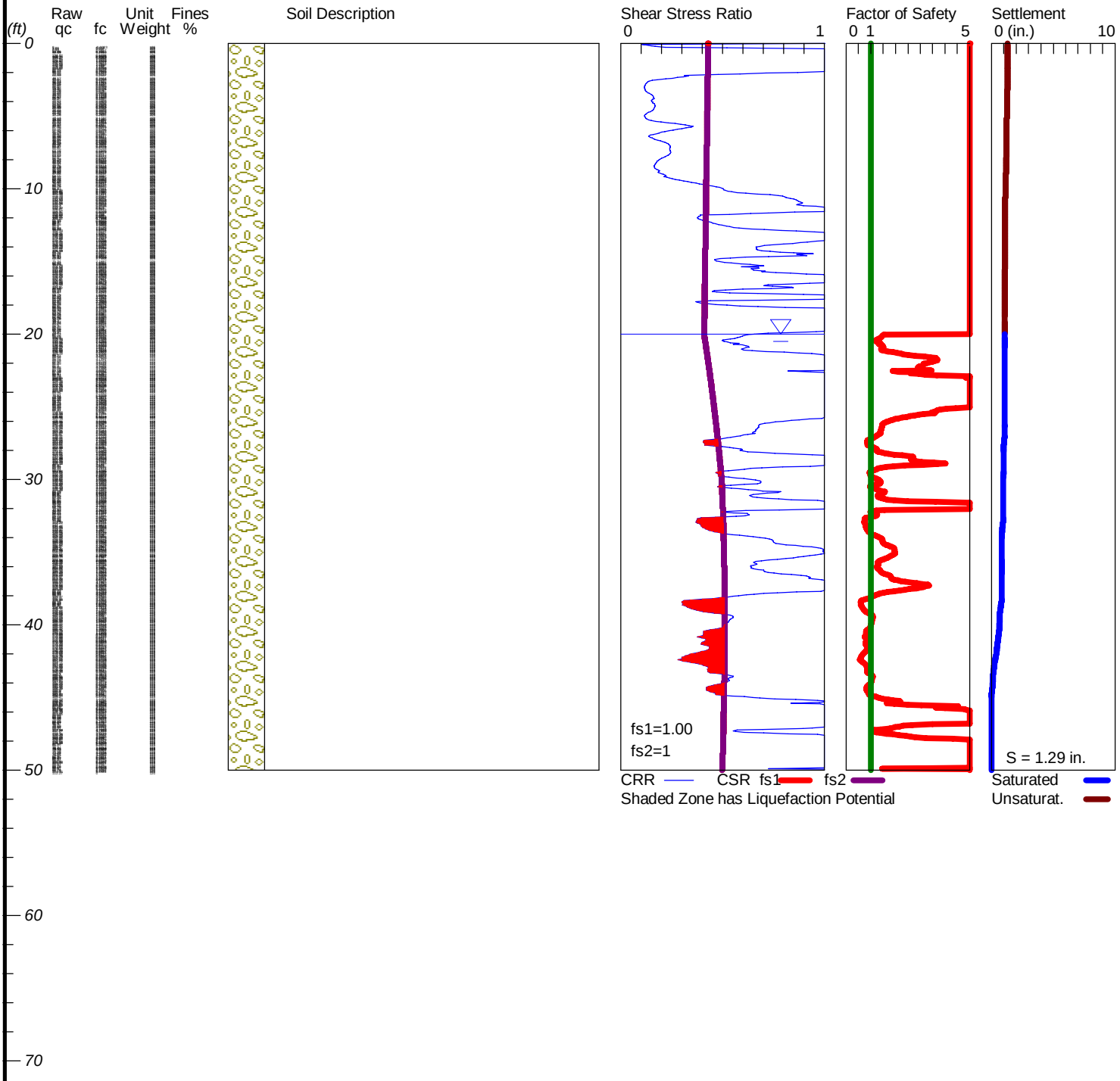


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=C-5 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g

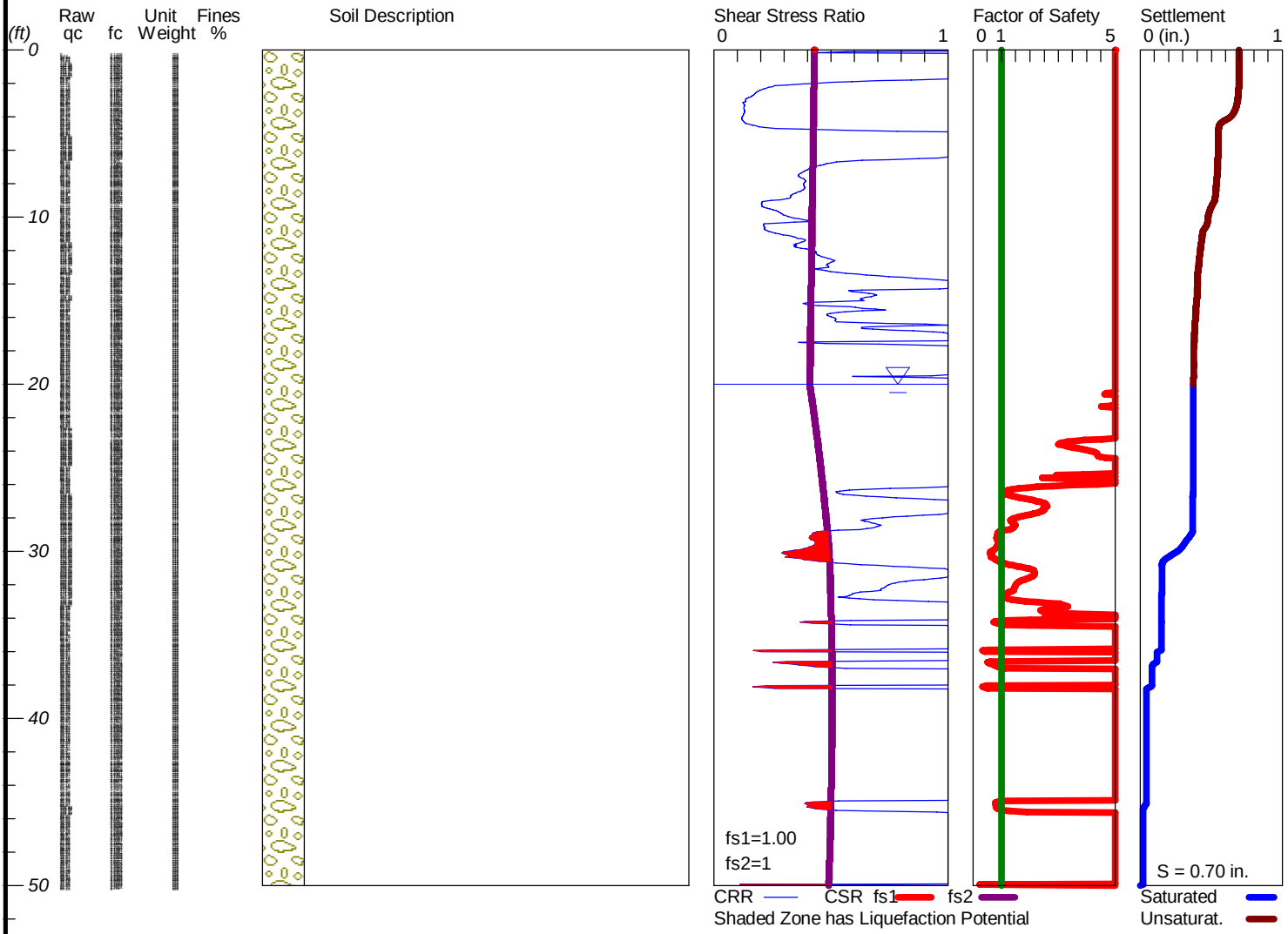


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=CPT-6 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g

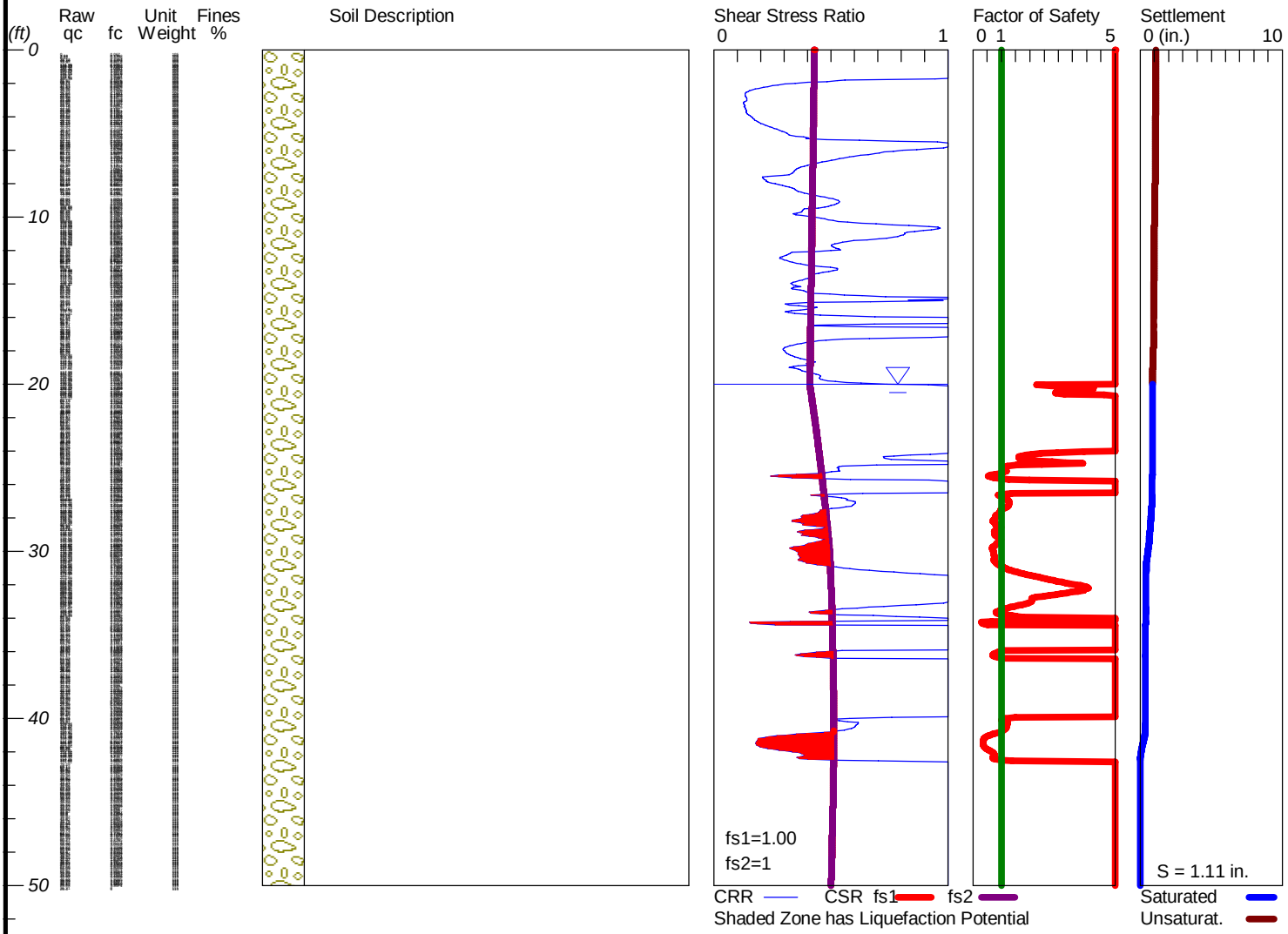


LIQUEFACTION ANALYSIS

Proposed Residential Development

Hole No.=CPT-7 Water Depth=20 ft

Magnitude=7.04
Acceleration=0.661g



SUPPORTING INFORMATION

Contents:

GENERAL NOTES

Terracon GeoReport

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING


Auger


Shelby Tube


Split Spoon


Rock Core


Macro Core


Modified California Ring Sampler


Grab Sample


No Recovery


Modified Dames & Moore Ring Sampler

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
N	N value
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer
(WOH)	Weight of Hammer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N] / Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P] / Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.