PCM3 CONSTRUCTION MANAGEMENT

Compton Community College District
Geotechnical and Soils Investigation Report
For
Instructional Building #1

1. **Original Report Prepared by Heider Inspection Group, Inc. dated December 21, 2015**
2. **CGS First review letter dated November 9, 2016**
3. **United-Heider Response to CGS first review letter dated January 20, 2017**
4. **CGS Second review letter dated March 10, 2017**
5. **United-Heider Response to CGS second review letter dated April 11, 2017**
6. **United Heider Addendum to the report dated April 28, 2017**
7. **CGS Third review letter and approval dated June 5, 2017**

PCM3, Inc. Site Office
Compton Community College District
1111 E. Artesia Ave., Bond Trailer, Compton, CA 90221

(1)

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November 30, 2015

David L.A. Shire, LEED AP, CDT
Project Manager II
Project Management & Construction
El Camino College Compton Center
800 West 6th Street, 16th Floor
Los Angeles, CA 90017

Subject: Geotechnical Engineering and Geologic Hazards Investigation
Proposed Instructional Building 1
El Camino College Compton Center
1111 E. Artesia Blvd
Compton, CA 90221
Heider Project # HE150249

Dear Mr. Shire:

In accordance with your authorization, **Heider Inspection Group** (Heider) has prepared this letter to provide preliminary geotechnical engineering recommendations for the subject project. These recommendations are based on our preliminary review of recent subsurface investigation of the site where we have performed four geotechnical borings along with three cone penetration tests (CPTs) as well as previous geotechnical report prepared for nearby project site provided by you. The purpose of this letter is to address the following:

- An assessment of liquefaction potential based on the field geotechnical information.
- Provide preliminary foundation recommendations.
- Provide seismic design parameters including a Site Classification.

Project Understanding

Based on the site plan review, we understand that El Camino Compton Center plans to build a new 2-Story Instruction Building and associated other improvements within the El Camino College Compton Center campus. The site is currently occupied by old existing classroom building. As the project is in the design phase, there are no detailed plans available at this time.

The project is located on El Camino Compton Center Campus, which is south of E Greenleaf Blvd, adjacent to the north parking area, as shown in Figure 1 Site Vicinity Map and Figure 3 Site Plan and Site Geology Map. The project site is located on the northern side of campus. The site is located along the north side of E Artesia Blvd, a few hundred yards south of E Greenleaf Blvd Compton, California. The site is surrounded by additional buildings and parking lot areas associated with the college complex. Residential properties are located to the west of the site, along the east side of S Tartar Lane. The site is relatively on a flat topography and an elevation is approximately 63 feet above mean sea level based on Google Earth elevation. The project site is located at approximately 33.8792° north latitude and 118.21° west longitude.

Existing Soil Conditions

Based on our review of the borings and C and our experience in the area, the subsurface condition of the planned site development area has predominantly stiff/medium dense silty sand and sandy silts in the upper fifteen to twenty feet. Below that is a layer of five to ten feet thick clay, silty sand, and sand layer to the maximum depth explored of 55 feet. Near Boring B-3, subsurface soils appear to be slightly less stiff or loose compare to Boring B-1 and B-2.

Boring B-4 hit a refusal while drilling in that area. More details of the subsurface soil condition and strengths are being evaluated as part of the final design level geotechnical investigation.

Groundwater Condition

Groundwater was encountered in two deep borings out of four borings. The groundwater was also detected during three cone penetration tests. The shallow ground water of 46 feet below existing ground level was observed in Boring B-3 and CPT-2. Based on a review of the Seismic Hazard Zone Report prepared for the South Gate Quadrangles, the depth to historic high groundwater is estimated to be approximately 7 feet above mean sea level or 56 feet below the existing ground elevation (Surface Elevation of the Project Site = 63 feet). In addition, based on some other previous geotechnical studies and the Los Angeles County Department of Public Works web site (http://dpw.lacounty.gov) well data, we very conservatively estimate the historical high groundwater as about 35 ft below existing ground elevation. As a result, groundwater is not expected to impact the planned improvements.

Liquefaction Assessment

The site appears to be underlain by predominately low plastic sandy silt or silty sand. The Seismic Hazard Zone Report for the South Gate 7.5-Minute Quadrangle, Los Angeles County, California prepared by California Geological Survey classifies the Site as in the Zone of Potential Liquefaction Area. Therefore we performed liquefaction analyses on all CPTs-1 thru 3 using CLiq v1.7.6.49 developed by Geologismiki Geotechnical Software. The analyses and calculations of CPT data are based on NCEER 1998. We considered historical groundwater table at the time of liquefaction as 35 feet (thirty-five) below ground surface, seismic Peak Ground Acceleration (PGA_M) coefficient of 0.623g, and maximum considered earthquake (MCE) of 6.6. Based on the CPT data measured from the project site we estimated post-earthquake settlements range from almost negligible to a maximum of 1.6 inches. Detailed analysis results will be provided in the Final Report. The summary results of the liquefaction analyses are presented below:

CPT #	Seismic Settlement (Inches)	Differential Settlement (Inches) within 30 ft Span
1	1.63	0.8
2	0.00	0
3	0.89	0.5

Preliminary Foundation Design

Based on our understanding of the planned project and our preliminary evaluation of the borings on the site, it is our opinion that the structures can be supported on a spread footing foundation. The depth of the footings should be preliminarily designed as 24-inch deep by 24-inch wide footings to be founded in well compacted native soil. For preliminary design we recommend an allowable bearing capacity of 2500 psf. Over excavation and re-compaction below the bottom of the footing is anticipated in some isolated areas depending upon the subsurface condition. For preliminary planning purposes we recommend that you anticipate that 3-feet of over excavation below the footing will be required. Lateral design capacity can be taken up in both friction and passive pressure using a coefficient of friction of 0.30 and a passive pressure of 300 psf/ft depth against the footings. The upper one-foot of the embedment depth should be ignored for the passive pressure.

Seismic Design Parameters

The site should be designed to account for potential earthquake ground motions in accordance with the seismic provisions of the 2013 California Building Code (CBC). Based on the 2013 CBC, we recommend the following seismic design parameters be used.

Seismic Design Parameters Based on 2013 CBC (per ASCE 7-10)

Item	Value	2013 CBC Source[R1]	ASCE 7-10 Table/Figure[R2]
Site Class	D	Table 1613A.3.2	Table 20.3-1
Mapped Spectral Response Accelerations Short Period, S_S 1-second Period, S_1	 1.674 g 0.611 g		 Figure 22-1 Figure 22-2
Site Coefficient, F_a	1.00	Table 1613A.3.3(1)	Table 11.4-1
Site Coefficient, F_v	1.50	Table 1613A.3.3(2)	Table 11.4-2
MCE (S_{MS})	1.674 g	Equation 16A-37	Equation 11.4-1
MCE (S_{M1})	0.916 g	Equation 16A-38	Equation 11.4-2
Design Spectral Response Acceleration Short Period, S_{DS} 1-second Period, S_{D1}	 1.116 g 0.611 g	 Equation 16A-39 Equation 16A-40	 Equation 11.4-3 Equation 11.4-4
Site Coefficient (F_{PGA})	1.0		Table 11.8-1
Peak Ground Acceleration (PGA_M)	0.623 g	-	Equation 11.8-1

R1: California Building Standards Commission (CBSC), "California Building Code," 2013 Edition.
R2: U.S. Seismic "Design Maps" Web Application, https://geohazards.usgs.gov/secure/designmaps/us/application.php
Note: the Seismic Design Category is **D** for buildings in all Risk Categories (I, II, III, and IV).

We hope this provides the necessary preliminary information you require. Should you or members of the design team have questions or need additional information, please contact either of the undersigned at (925) 314-7100, or by e-mail at rshrestha@geosphereinc.net or ejs@geosphereinc.net.

We appreciate the opportunity to be of service to you and to be involved in the design of this project.

Sincerely,
HEIDER INSPECTION GROUP
GEOSPHERE CONSULTANTS, INC.

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GEOTECHNICAL ENGINEERING AND GEOLOGIC HAZARDS STUDY

Proposed Instructional Building 1
El Camino College Compton Center
1111 E Artesia Boulevard, Compton, California 90221
Project #HE15281-2

Prepared for:

Project Management & Construction
El Camino College Compton Center
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HEIDER
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December 21, 2015

Project Management & Construction
El Camino College Compton Center
800 West 6th Street, 16th Floor
Los Angeles, California 90017

Attention: Mr. David L.A. Shire, LEED AP, CDT, Project Manager II

Subject: **Geotechnical Engineering and Geologic Hazards Study**
Proposed Instructional Building 1
El Camino College Compton Center
1111 E. Artesia Boulevard
Compton, California 90221
Heider Inspection Group Project # HE15281-2

Dear Mr. Shire:

In accordance with your authorization, Heider Inspection Group (Heider) has completed this Geotechnical Engineering and Geologic Hazards Study for the proposed Instructional Building 1 and associated improvements located on the El Camino College Compton Center campus located at 1111 E. Artesia Boulevard in Compton, California. Transmitted herewith are the results of our findings, conclusions, and recommendations for site preparation, foundation design, slab-on-grade construction, seismic design parameters, and utility trench backfilling. In general, the soils beneath the proposed building are considered to be geotechnically suitable for support of the new building provided the recommendations of this report are implemented in the design and construction of the project.

Should you or members of the design team have questions or need additional information, please contact the undersigned at (951) 697-4777. The opportunity to be of service to you and to be involved in the design of this project is appreciated.

Respectfully submitted,

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1.0 INTRODUCTION

1.1 Purpose and Scope

The purposes of this investigation were to evaluate the subsurface conditions at the site and to prepare geotechnical recommendations for the proposed Instructional Building 1, as well as to prepare a Geologic Hazards Evaluation per California Division of State Architect (DSA) requirements. This study provides recommendations for site preparation, foundations, slab-on-grade construction, seismic design parameters, and utility trench backfilling. No new paving areas or modification of existing paving areas are anticipated to be a part of the proposed project.

The scope of this study included the review of pertinent published and unpublished documents related to the site, including a preliminary site plan, a site reconnaissance, the excavation of four exploratory borings using hollow-stem drill type equipment, three cone penetration tests, laboratory testing of selected samples retrieved from the borings, engineering analysis of the accumulated data, and preparation of this report. The conclusions and recommendations presented in this report are based on the data acquired and analyzed during this study, and on prudent engineering judgment and experience.

1.2 Site Description

Based on the site plan review, we understand that El Camino College Compton Center plans to build a new two-story Instructional Building and associated other improvements within the El Camino College Compton Center campus. The site is currently occupied by two classroom buildings. As the project is in the design phase, there are no foundation plans available at this time.

The project is located on the El Camino College Compton Center Campus, which is directly north of East Artesia Boulevard in Compton, California, as shown in Figure 1, *Site Vicinity Map*. The proposed project site, at the location shown on Figure 2, *Development Site Plan*, is situated on the northern side of the campus. Topographically, the site is relatively level with less than about two feet of elevation differential based on elevations indicated on Google Earth.

The proposed building site is located about 700 feet south of East Greenleaf Boulevard and about 600 feet west of the eastern boundary of the campus. The site is surrounded by additional buildings and landscaped areas associated with the college complex. The average site elevation is approximately 62 feet above mean sea level based on Google Earth elevations. For analysis purposes, the project site was considered to be located at 33.8789° north latitude and 118.2100° west longitude.

1.3 Proposed Development

The proposed development will consist of a new two-story Instructional Building and associated other improvements within the El Camino College Compton Center campus. The site is currently occupied by two classroom buildings which will be demolished. The footprint area of the proposed instructional building will be approximately 26,830 square feet. As this project is in the design phase, there are no foundation plans available at this time. We understand that the proposed development will also be under jurisdiction of the City of Compton and/or Los Angeles County. The proposed schematic improvement area is shown on Figure 2.

2.0 PROCEDURES AND RESULTS

2.1 Literature Review

Geologic and geotechnical literature pertaining to the site area was reviewed. These included various publications and maps issued by the United States Geological Survey (USGS), California Division of Mines and Geology (CDMG), California Geological Survey (CGS), water agencies, and other government agencies, as listed in the References section.

2.2 Field Exploration

In order to characterize the subsurface conditions beneath the proposed improvement area, a field exploration program was conducted, which consisted of the drilling of four borings and three Cone Penetration Tests (CPTs) at the site. The test borings were drilled using a truck mounted drill rig equipped with an eight-inch diameter hollow stem auger to a maximum depth of 55 feet. The drilling was completed on Tuesday, November 3, 2015. Field exploration, testing, and soil sampling was performed under the supervision of a California Professional Engineer. The locations of the borings and CPTs relative to the proposed improvements and existing site are shown on Figure 2 as well as Figure 3, *Site Plan and Site Geology*.

A Heider representative visually classified the materials encountered in the borings according to the Unified Soil Classification System as the borings were advanced. Relatively undisturbed soil samples were recovered at selected intervals using a three-inch outside diameter Modified California split spoon sampler containing six-inch long brass liners, and a two-inch outside diameter Standard Penetration Test (SPT) sampler. The samplers were driven by means of a 140-pound safety hammer with an approximate 30-inch fall. Resistance to penetration was recorded as the number of hammer blows required to drive the sampler the final foot of an 18-inch drive. All of the field blow counts recorded using Modified California (MC) split spoon sampler were converted in the final logs to equivalent SPT blow counts using appropriate modification factors suggested by Burmister (1948), i.e., a factor of 0.65 with inner diameter of 2.5 inches. Therefore, all blow counts shown on the final boring logs are either directly measured (SPT sampler) or equivalent SPT (MC sampler) blow counts.

The boring logs with descriptions of the various materials encountered in each boring, a key to the boring symbols, and select laboratory test results are included in Appendix A. Ground surface elevations indicated on the soil boring logs were estimated to the nearest foot using Google Earth.

In addition, a total of three Cone Penetrometer Tests (CPTs), designated CPT-1 through CPT-3, were conducted to a maximum depth of about 55 feet. CPT data provide continuous soil profile parameters for geotechnical analysis, design, and project Site Class determination. Middle Earth Geo Testing, Inc., of Orange, California conducted the CPTs for this project, using a specially designed, truck-mounted, 25-ton cone apparatus. The instrumented cone assembly used for this project included a cone tip with a 60-degree apex, diameter of 35.6 millimeters (mm), and a projected cross sectional area of 10 square centimeters (cm^2), a sleeve segment with a surface area of 150 cm^2, and a pore pressure transducer near the base (shoulder) of the cone tip.

Prior to the start of the test, the truck was jacked up and leveled on four pads to provide a stable reaction for the cone thrust. During the test, the instrumented cone was hydraulically pushed into the ground at a rate of about 20 millimeters per second (about four-feet per minute), and continuous readings of cone tip resistance, sleeve friction, and pore pressure were digitally recorded. As the cone advanced, additional cone rods were added. PC-based data acquisition hardware in the CPT truck received electric signals from strain gauges mounted in the cone assembly, and generated graphical logs including cone resistance, friction resistance, friction ratio, and pore pressure ratio versus depth. CPT data was subsequently processed based on generally accepted soil behavior type correlations (Robertson et al., 1989) to interpret soil classification, and other properties such as SPT N-value and undrained shear strength were also estimated through correlations. CPT data plots and detailed tabulated logs are included in Appendix A.

Seismic shear wave velocities were also measured at CPT-3 using a conventional cone assembly that also included a three-component array of geophones. The seismic source consisted of a heavy wooden beam that was held firmly against the ground by stabilizing jacks at the side of the CPT truck. Seismic waves were generated at each test depth by striking one end of the beam with a sledge hammer attached to a rod string. An accelerometer mounted on the beam monitored "time zero", or the instant at which seismic waves were generated. The geophones mounted in the cone assembly monitored the waveform arrivals. Seismic data were acquired at five-foot intervals between depths of 5 and 55 feet. Test results are included in Appendix A.

2.3 Laboratory Testing

Laboratory tests were performed on selected samples to determine some of the physical and engineering properties of the subsurface soils. The results of the laboratory testing are either presented on the boring logs, and/or are included in Appendix B. The following soil tests were performed for this study:

Dry Density and Moisture Content (ASTM D2216 and ASTM 2937) – In-situ dry density and/or moisture tests were conducted on several samples to measure the in-place dry density and moisture content of the subsurface materials. These properties provide information for evaluating the physical characteristics of the subsurface soils. Test results are shown on the boring logs.

Atterberg Limits (ASTM D4318 and CT204) – An Atterberg Limits test was performed on a sample of cohesive soil encountered at the site. Liquid Limit, Plastic Limit, and Plasticity Index are useful in the classification and characterization of the engineering properties of soil, and help to evaluate the expansive characteristics of the soil and determine the USCS soil classification. Test results are presented in Appendix B, and on the applicable boring log.

Particle Size Analysis (Wet and Dry Sieve) and Hydrometer (ASTM D422, D1140, and CT202) - Sieve analysis testing was conducted on selected samples to measure the soil particle size distribution and the total percentage of fines (i.e., percent passing the USCS No. 200 sieve). This information is useful for characterizing the soil type according to USCS, and to assist in the evaluation of liquefaction susceptibility of granular soils. Test results are presented in Appendix B.

Direct Shear-Consolidated Undrained (Modified ASTM D3080M) - Direct shear tests were performed on three selected samples to determine the angle of internal friction and cohesion of the measured soil materials. This data can be utilized in determining allowable bearing capacity, retaining wall design parameters, and strength characteristics of the materials. Direct shear specimens were saturated under a 100-psf surcharge for a period of 24 hours prior to testing. Results are presented in Appendix B.

Corrosion (CT 532, CT 643, CT 422) – Corrosion testing was performed to assess the potential of site soils to corrode concrete and buried ferrous metal and includes determination of soil soluble sulfate, chloride, pH, and minimum resistivity. The results of these tests are presented in Appendix B and discussed in Section 4.3.

Collapse Potential of Soils – This test was performed to measure the magnitude of one-dimensional collapse that can occur when unsaturated soils are inundated with water. Collapse potential is used to estimate settlement that may occur in a soil layer at a particular site. One representative sample collected from Boring B-2 at a depth of 4.5 feet was tested for collapse potential. The test result is presented in Appendix B.

3.0 GEOLOGIC OVERVIEW

3.1 Regional/Local Geologic Setting

The Los Angeles metropolitan region is located at the convergence of two major physiographic/geomorphic provinces, the Transverse Ranges and the Peninsular Ranges, and includes rugged mountains, hills, valleys, and alluvial plains. The east-west–trending Transverse Ranges are irregular to the main northwest structural grain of California. The Transverse Ranges were uplifted along east to west–trending thrust faults and folds (Crowell, 1976; Wright, 1991; and Ingersoll and Rumelhart, 1999). The central Los Angeles basin is divided by a mountain range, the Santa Monica Mountains. The leading element in the area is the north-dipping Santa Monica–Hollywood–Raymond fault system, located at the southern boundary of the Transverse Ranges. The Los Angeles basin itself is part of the northern Peninsular Ranges, which extends southeastward into Baja California, Mexico. These ranges are formed by mildly metamorphosed sedimentary and volcanic rocks of Jurassic age that have been infringed by mid- Cretaceous plutonic rocks of the southern California batholith and rimmed by Cenozoic sedimentary rocks (Gastil et al., 1981; Schoellhamer et al., 1981). The Los Angeles greater basin is also part of the onshore portion of the California continental borderland, characterized by northwest-trending offshore ridges and basins, formed primarily during early and middle Miocene time (Legg, 1991; Wright, 1991; and Crouch and Suppe, 1993). Major northwest-trending strike-slip faults such as the Whittier, Verdugo, Northridge, Sierra Madre, Newport–Inglewood, and Palos Verdes faults dominate the great basin. The thickness of the predominantly Neogene-age sedimentary fill in the central depression of the Los Angeles basin, a structural low between the Whittier and Newport– Inglewood faults, is estimated to be about 30,000 feet (Yerkes et al., 1965).

The youngest surficial deposits are Holocene sediments of modern alluvial fans, stream channels (i.e., Los Angeles and San Gabriel Rivers), and their flood plains. These debris-flow, sheet flood, and fluvial deposits consist of boulder, cobble, and pebble gravel lenses and sheets, interbedded with sand, silt, and clay derived from the surrounding highlands. Although the thickness of these sediments is usually less than 100 feet (30 m), they are locally as thick as 200 feet (60 m), and the fluvial sediments are roughly graded, with the lower parts containing coarser material. A narrow zone of well-sorted, fine- to medium-grained, dune sand, as thick as 70 feet (21 m), is located near the coast between Santa Monica and the Palos Verdes Hills (California Department of Water Resources, 1961; Yerkes et al., 1965). Since about 6 ka ago, when postglacial sea level had risen to near its present level, coastal estuaries and tidal marshes formed and became filled with organic-rich, fine-grained sediment that extended as far as four miles (6.4 km) inland from the mouths of the streams (Yerkes et al., 1965).

Real estate development has now transformed most of these estuaries and marshes into marinas and residential areas (Geology of Los Angeles, California).

Based on a review of the *USGS Geologic Map of the Long Beach 30' x 60' Quadrangle* (CGS, 2009), the site area is mapped as being underlain by younger alluvial fan and valley deposits, as shown on Figure 4, *Site Vicinity Geologic Map.*

4.0 FINDINGS

4.1 Subsurface Conditions

During our subsurface exploration program, we investigated the subsurface soils and evaluated soil conditions to maximum depths of about 55 feet in the borings performed for this study. From our collected data, we believe that the area of the proposed new construction is underlain by damp to moist, loose to very dense silty sand (SM) layers and damp to moist, stiff to very stiff, sandy silt (MLS) and silt clay/clayey silt (ML-CL) layers to the maximum depth explored. At least the upper five feet of the soil profile consists of loose to medium dense silty sand. Below that layer, thick layers of stiff sandy silt and medium dense silty sand were encountered. The surficial soils within the upper 15 feet generally appeared to be of low plasticity and low expansion potential. Results of an Atterberg Limits laboratory test performed on a sample of representative soils from Boring B-2 at a depth of 19 feet indicated a Plasticity Index of 15 and a Liquid Limit of 48. Our interpretation of the subsurface soil conditions is presented on Figure 5, *Schematic Geologic Cross Section A-A'*. Additional details of materials encountered in the exploratory borings and CPT logs are included in Appendix A, and laboratory test summaries are presented in Appendix B.

4.2 Groundwater

Groundwater was encountered in Borings B-1 and B-3 during drilling. The depths of groundwater encountered in the borings as well as estimated from the CPTs ranged from 46 to 48.5 feet below existing ground surface. According to the Department of Water Resources (DWR), available groundwater level data for Well 338872N1182432W001, the nearest well located approximately two miles northwest of the project site, a single measurement made on September 14, 1995 indicated the groundwater on that date to be at 122.45 feet below the existing local ground surface, corresponding to El. -32.5 feet (mean sea level datum). The DWR groundwater level data are presented in Appendix C.

Based on a review of the Seismic Hazard Zone Report for the South Gate 7.5-Minute Quadrangles, Los Angeles County, California (1998), the depth to historic high groundwater is estimated to be on the order of eight feet below existing grade.

4.3 Corrosion Testing

A sample collected from the upper five of the soil profile at Boring B-2 was tested to measure sulfate content, chloride content, pH, and resistivity. Test results are included in Appendix B and are summarized on the following table.

Table 1: Summary of Corrosion Test Results

Soil Description	Sample Depth (feet)	Sulfate (mg/kg)	Chloride (mg/kg)	Resistivity (ohm-cm)	pH
Silty Sand	0 - 5	45	16	3,120	6.9

Water-soluble sulfate can affect the concrete mix design for concrete in contact with the ground, such as shallow foundations, piles, piers, and concrete slabs. Section 4.3 in American Concrete Institute (ACI) 318, as referenced by the CBC, provides the following evaluation criteria:

Table 2: Sulfate Evaluation Criteria

Sulfate Exposure	Water-Soluble Sulfate in Soil, Percentage by Weight or (mg/kg)	Sulfate in Water, ppm	Cement Type	Max. Water Cementitious Ratio by Weight	Min. Unconfined Compressive Strength, psi
Negligible	0.00-0.10 (0-1,000)	0-150	NA	NA	NA
Moderate	0.10-0.20 (1,000-2,000)	150-1,500	II, IP (MS), IS (MS)	0.50	4,000
Severe	0.20-2.00 (2,000-20,000)	1,500-10,000	V	0.45	4,500
Very Severe	Over 2.00 (20,000)	Over 10,000	V plus pozzolan	0.45	4,500

The water-soluble sulfate content was measured to be 45 mg/kg or 0.0045% by dry weight in the soil sample, suggesting the site soil should have negligible impact on buried concrete structures at the site. However, it should be pointed out that the water-soluble sulfate concentrations can vary due to the addition of fertilizer, irrigation, and other possible development activities.

Table 4.4.1 in ACI 318 suggests use of mitigation measures to protect reinforcing steel from corrosion where chloride ion contents are above 0.06% by dry weight. The chloride content was measured to be 16 mg/kg or 0.0016% by dry weight in the soil sample. Therefore, the test result for chloride content does not suggest a corrosion hazard for mortar-coated steel and reinforced concrete structures due to high concentration of chloride.

In addition to sulfate and chloride contents described above, pH and resistivity values were measured in the soil sample. They were measured to be 6.9 and 3,120 ohm-cm, respectively. The soil is considered to be corrosive if resistivity is less than 700 ohm-cm, or potentially corrosive if pH is less than 2 or greater than 8.5. Based on the measured values of pH and resistivity, the soil is considered to be of a low corrosion potential to cast and ductile iron pipes.

These results are preliminary, and provide information only on the specific soil sampled and tested. Other soil at the site may be more or less corrosive. Providing a complete assessment of the corrosion potential of the site soils are not within our scope of work. For specific long-term corrosion control design recommendations, we recommend that a California-registered professional corrosion engineer evaluate the corrosion potential of the soil environment on buried concrete structures, steel pipe coated with cement-mortar, and ferrous metals.

5.0 SEISMIC SETTING

5.1 Regional Faulting and Tectonics

The site is located in a seismically active region that has experienced periodic, large magnitude earthquakes during historic times. This seismic activity appears to be largely controlled by displacement between the Pacific and North American crustal plates, separated by the San Andreas Fault zone, and located approximately 44.4 miles (70.8 km) northeast of the site. This plate displacement produced regional strain that is concentrated along major faults of the San Andreas Fault System including the San Andreas and other faults in this region. A map showing the location of local and regional faults is presented in Figure 6, *Regional Fault Map*. The faults that may influence the project site are listed in the table below.

Table 3: Regional Fault Data

Fault Name	Approximate Fault Distance (Miles)	Maximum Credible Earthquake (MCE)
Newport-Inglewood	1.7	7.1
Puente Hills Blind Thrust	7.1	7.1
Palos Verdes	9.1	7.3
Whittier	13.3	6.8
Malibu Coast	21.2	6.9
Sierra Madre	22.2	7.2
Newport-Inglewood	26.2	7.1
Anacapa-Dume	28.9	7.5
San Gabriel	30.7	7.2
Simi Santa Rosa	40.4	7.0
Southern San Andreas	44.4	8.1

Source: USGS 2002.

5.2 Historic Seismicity

Los Angeles is earthquake country. Thousands of earthquakes are recorded every year in Southern California; luckily, very few of them are felt by people. As the recent earthquake history of Southern California shows, large earthquakes can cause severe damage and loss of life. In the last 100 years, only one earthquake, the 1971 M6.6 San Fernando Earthquake, caused significant damage in the Los Angeles area due to fault displacement of the ground surface. The most significant damage in all of the recent earthquakes, including the 1971 earthquake, as well as the 1933 M6.4 Long Beach earthquake that resulted in the passage of the 1933 Field Act mandating earthquake-resistant design of California public schools, was caused by intense ground motion (i.e., shaking).

This ground motion was amplified and focused by local geological conditions and deep geological structures and produced ground failures such as liquefaction and landslides. Dolan et al. (1995) sounded the wake-up call for Los Angeles by postulating a serious deficit in the number of ''Northridge-type'' earthquakes in the Los Angeles basin. Their conclusions are alarming: either the Los Angeles area could experience 15 additional M6.7 earthquakes over the next 30 years just to catch up to unreleased strain accumulation, or Los Angeles should expect significantly larger earthquakes (M7.2–7.6) in the future.

6.0 GEOLOGIC HAZARDS

6.1 Seismic Induced Hazards

Seismic hazards resulting from the effects of an earthquake generally include ground shaking, liquefaction, lateral spreading, dynamic settlement, fault ground rupture and fault creep, dam inundation, and tsunamis and seiches. The site is not necessarily impacted by all of these potential seismic hazards. Nonetheless, potential seismic hazards are briefly discussed in the following sections in relation to the planned construction.

6.1.1 Ground Shaking

Thousands of earthquakes are recorded every year in Southern California. The site, over the project lifetime, should be expected to experience severe ground shaking resulting from a major earthquake originating from sources such as the major Southern California Area faults/blind thrust, particularly the nearby Newport-Inglewood, Puente Hills Blind Thrust, Palos Verdes, Whittier, Raymond, Verdugo, Sierra Madre, Newport-Inglewood, San Gabriel, and the San Andreas Fault.

6.1.2 Liquefaction Induced Phenomena

Liquefaction is the process where the pore pressure increases in the soil in response to seismic shaking activity to the point where a zero effective stress condition develops within the soil profile so that the individual soil grains lose contact. Following pore-water pressure dissipation, excessive settlements can occur. Research and historical data indicate that soil liquefaction generally occurs in saturated, loose granular and low plastic silts and clays. Because of the higher inter-granular pressure of the soil at greater depths, the potential for liquefaction is generally limited to the upper 50 feet of the soil. Potential hazards associated with soil liquefaction below or near a structure include loss of foundation support, lateral spreading, sand boils, lurching, and areal and differential settlement.

The site is mapped as being located within a State of California liquefaction susceptibility hazard zone, as shown on Figure 7, *Liquefaction Susceptibility Map*. The site is generally underlain by loose to dense silty sand. Additionally, the depth to historic high groundwater at the site is reported to be approximately eight feet below grade. Therefore, we performed a liquefaction analysis using the computer software CLiq v .1.7.6.49 and the in-situ soil parameters measured in the CPT soundings. This software utilizes an analysis method slightly differing from the original 1998 National Center for Earthquake Engineering Research (NCEER) which was developed with the broad consensus of national geotechnical earthquake engineering experts. For this analysis we considered a historic high groundwater level at eight feet below ground surface as indicated on the CGS Seismic Hazards Report; a seismic peak ground acceleration (PGA_M adjusted for Site Class per ASCE 7-10) of 0.62g, and an earthquake magnitude of 6.6. Based on the information collected during the field investigation, laboratory test results, types of soils encountered in the borings within the project site and liquefaction analysis results, we calculated post-earthquake settlements at the site to occur within various loose to medium dense sandy silt/silty sand layers occurring primarily between depths of 10 and 45 feet below the existing ground surface. Post-earthquake settlements at the two 55-foot deep CPTs (CPT-1 and CPT-3) were calculated to be approximately 1.7 and 1.4 inches, respectively, with potential differential settlement across the structure estimated on the order of 1/3 to 2/3 of the vertical settlement, corresponding to 0.6 to 1.2 inches. Detailed results of our liquefaction analyses are presented in Appendix D.

The primary surface manifestations of liquefaction include ground settlement, lateral spreading and sand boiling. However, due to much of the calculated liquefaction occurring relatively deep, the major impact of potential liquefaction would be post-earthquake settlement which could potentially damage a structure due to excessive vertical and differential settlements. These settlements should be taken into account by the Structural Engineer during the design of the structure foundations. If the settlements are judged to be excessive, special remediation for ground improvement may be considered to reduce post liquefaction settlement.

6.1.3 Fault Ground Rupture and Fault Creep

The State of California adopted the Alquist-Priolo Earthquake Fault Zone Act of 1972 (Chapter 7.5, Division 2, Sections 2621 – 2630, California Public Resources Code), which regulates development near active faults for the purpose of preventing surface fault rupture hazards to structures for human occupancy. In accordance with the Alquist-Priolo Act, the California Geological Survey established boundary zones, or *Earthquake Fault Zones* surrounding faults or fault segments judged to be sufficiently active, well-defined, and mapped for some distance. Structures for human occupancy within designated Earthquake Fault Zone boundaries are not permitted unless surface fault rupture and fault creep hazards are adequately addressed in a site-specific evaluation of the development site.

The site is not currently located within a designated Earthquake Fault Zone as defined by the State of California, per the Seismic Hazard Zones, South Gate Quadrangle Official Map, released on March 25, 1999, as shown on

Figure 8, *Alquist-Priolo Earthquake Fault Map*. Since the site is not within an Earthquake Fault Zone, the potential fault ground rupture and fault creep hazard are judged to be low.

6.1.4 Dynamic Settlement

Seismically induced settlement occurs as the result of loose, medium to coarse sands located above the groundwater table densifying during strong shaking from a seismic event. Based on the liquefaction analyses results for dry densification, it is our opinion that dynamic settlement is not a significant design consideration for this project.

6.1.5 Secondary Seismic Effects

In addition to ground shaking, surface rupture settlement and liquefaction, effects of seismic activity on a project site may include landsliding, lateral spreading, tsunamis, and seiches. Results of our site-specific evaluation of each of the above secondary effects are explained below.

Seismically Induced Slope Instability - Seismically induced landslides and other slope failures are common occurrences during or after earthquakes in areas of significant relief. The site is relatively flat with no slopes. Accordingly, the potential for seismically induced landslides affecting the building is considered to be nil.

Lateral Spreading - Seismically induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The absence of free open slopes adjacent to the site suggests that lateral spreading potential of the site is nil.

Tsunamis and Seiches - Tsunamis and Seiches are seismically induced waves generated in oceans (tsunamis) or large enclosed bodies of water (seiches) by fault displacement or major ground movement. Based on a review of the Tsunami Inundation Maps for the Venice and Long Beach quadrangles, issued by the California Emergency Management Agency, the site is not located within or near a designated tsunami inundation area. Due to the significant distance of the site from the ocean and/or large bodies of water, the potential for tsunamis and seiches to impact the project site is considered minimal.

6.2 Other Geologic Hazards

Potential geologic hazards other than those caused by a seismic event generally include ground failure and subsidence, consolidation settlement, landslides under static loading conditions, expansive and collapsible soils, flooding, dam inundation, naturally occurring asbestos (NOA) and soil erosion. These are discussed and evaluated in the following sections.

6.2.1 Ground Cracking and Subsidence

Withdrawal of groundwater and other fluids (i.e. petroleum and the extraction of natural gas) from beneath the surface has been linked to large-scale land subsidence and associated cracking on the ground surface. Other causes for ground cracking and subsidence include the oxidation and resultant compaction of peat beds, the decline of groundwater levels and consequent compaction of aquifers, hydro-compaction and subsequent settlement of alluvial deposits above the water table from irrigation, or a combination of any of these causes. However, subsidence generally impacts a region, and should not produce excessive differential settlement in a single location, such as the subject site. Local and regional locations prone to subsidence generally subside equally over time.

6.2.2 Settlement Due to Consolidation

Consolidation is the densification of soil into a more dense arrangement from additional loading, such as new fills or foundations. Consolidation of clayey soils is usually a long-term process, whereby the water is squeezed out of the soil matrix with time. Sandy soils consolidate relatively rapidly with an introduction of a load. Consolidation of soft and loose soil layers and lenses can cause settlement of the ground surface or buildings. Based on visual observation in the field and laboratory testing, the subsurface soils are considered to have a relatively low potential to significantly consolidate, considering the relative lack of soft, compressible soils underlying the project site.

6.2.3 Landslides

Landslides can occur under a variety of loading conditions, including both static and seismic, but involve sloping ground. The site is not within an earthquake induced landslide area and the site is classified as "flatland." The site and immediate vicinity is relatively flat and does not exhibit landslide features as determined by our site reconnaissance and literature review. Therefore, the site is not susceptible to landslide.

6.2.4 Expansive and Collapsible Soils

Non-expansive soils and soils of relatively low expansion potential were encountered during our subsurface exploration. The boring logs and laboratory test results are contained in the appendices of the report. The results of the laboratory testing performed on a representative sample of the most expansive sub-surface soils indicate a measured Plasticity Index of 15, indicative of a low shrink/swell or expansion potential. Hence, no mitigation for expansive soils will be required for this site.

Collapsible soils are fine sandy and silty soils that have been laid down by the action of flowing water, usually in alluvial fan deposits. Terrace deposits and fluvial deposits can also contain collapsible soil deposits. The soil particles are usually bound together with a mineral precipitate. The loose structure is maintained in the soil until a load is imposed on the soil and water is introduced. The water breaks down the inter-particle bonds and the newly imposed loading densifies the soil. Based on a laboratory collapse test performed on a representative onsite soil sample collected from B-2 at a depth of 4.5 feet, a collapse potential index of about one percent was observed at an applied overburden pressure of 2,200 pounds per square foot (psf). We anticipate up to about an eight-foot thickness of the surficial onsite soils may be susceptible to collapse under saturation, corresponding to approximately one-inch of collapse settlement. This calculated settlement should also be considered in designing the proposed structure foundation.

6.2.5 Flooding

The site does not appear to be subject to significant flooding. As shown on Figure 9, *Flood Hazard Map*, FEMA (2008) has mapped the proposed building location as within Zone X (dot); i.e., a flood-hazard area which is within the area of 0.2% annual chance floodplain, areas of one percent annual chance flood with average depths of less than one foot or with drainage areas less than one square mile. Therefore, the site is considered to have a relatively low hazard of significant flooding. An in-depth engineering evaluation of the flooding potential of the site is beyond the scope of this study or our expertise, and a flood specialist should be contacted if a more in-depth flooding analysis is desired.

6.2.6 Inundation from Dam Failure

The site does not appear to be subject to inundation from a dam failure since the site does not appear to be situated in the downstream path of a nearby dam or reservoir. However, a review of the "Safety Element of the Los Angeles City General Plan" indicated that the site is within a Flood Control Basin area.

6.2.7 Soil Erosion

Present construction techniques and agency requirements have provisions to limit soil erosion and resultant siltation during construction. These measures will reduce the potential for soil erosion at the site during the various construction phases. Long-term erosion at the site will be reduced by landscaping and hardscape areas, such as parking lots and walkways, designed with appropriate surface drainage facilities.

6.2.8 Naturally Occurring Asbestos (NOA)

No sources of NOA have been mapped in the vicinity of the site and therefore the potential for NOA to impact the site is judged to be very low.

7.0 CONCLUSIONS AND ENGINEERING RECOMMENDATIONS

The following conclusions and recommendations are based upon the analysis of the information gathered during the course of this study and our understanding of the proposed improvements.

7.1 Conclusions

The site is considered geotechnically and geologically suitable for the proposed improvements provided the recommendations of this report are incorporated into the design and implemented during construction. The predominant geotechnical and geological issues that need to be addressed at this site are summarized below.

Seismic Ground Shaking – The site is located within a seismically active region. As a minimum, the building design should consider the effects of seismic activity in accordance with the latest edition of the California Building Code (CBC).

Ground Settlements – Potential settlements at the site may occur due to liquefaction, soil collapse, and static settlements due to imposed building loads. Compared to calculated liquefaction and collapse settlements, static settlements are not expected to be significant given the anticipated building loads. Potential settlements should be considered in the selection and/or design of the building foundations. Should the estimated potential settlements be judged to be excessive for the foundation type considered, mitigation alternatives to reduce the magnitude of potential settlements are presented in this report.

Liquefaction – California Geologic Survey has mapped the area as being located within a hazard zone. Based on the subsurface soil encountered and its characteristics, the historical groundwater level at the site, and our liquefaction analysis results, the liquefaction potential at the site is considered to be significant at depths between 10 and 45 feet, occurring in discontinuous granular layers throughout this depth range. Based on our liquefaction analysis, we calculated potential post-seismic liquefaction settlements induced by a design earthquake to range between 1.4 and 1.7 inches. Seismic settlements potentially occurring due to liquefaction should be considered in the design of the foundation for the proposed structure.

Collapse Potential – The site is judged to have a low to moderate collapse potential upon saturation of the near-surface soils. A sample of soil tested for collapse potential resulted in a measured collapse index on the order of one percent at a depth of 4.5 feet. Assuming a surficial eight-foot thick layer susceptible to collapse settlement, we estimate a potential one inch of future settlement could occur due to soil collapse of these existing in-place surficial soils. Therefore, potential settlement due to collapse should also be considered in the design of foundations. Potential options for remediation of potential collapse settlements are discussed in this report.

Winter Construction – If grading occurs in the winter rainy season, appropriate erosion control measures will be required and weatherproofing of the building pads, foundation excavations, and/or pavement areas should be considered. Winter rains may also impact foundation excavations and underground utilities.

Other potential geotechnical considerations, including those that should not significantly impact the project are explained below.

Groundwater – Groundwater is currently not expected to be problematic with construction of shallow conventional foundations or most utility trenches. During our field exploration, groundwater was encountered at depths exceeding 40 feet below existing grade. However, general regional mapping by CGS showed a local historic high groundwater depth on the order of eight feet below existing grade.

Utility Connections – Consideration can be given for utility connections at building perimeters be designed for at least one inch of potential movement in any direction where any critical utility enters the building. This should help accommodate potential differential movement during a seismic event as well as minor settlements over the life of the structure.

7.2 Seismic Design Parameters

The proposed building should be designed in accordance with local design practice to resist the lateral forces generated by ground shaking associated with a major earthquake occurring within the Los Angeles basin. We performed one seismic cone penetration test (SCPT) at the site to measure shear wave velocities. Measurements were performed up to 55 feet below the existing surface. The average shear wave velocity was measured to be 779 feet per second (ft/sec; see Appendix A). Below a depth of 55 feet, the soil is anticipated to be denser; therefore, the average shear wave velocity is anticipated to be higher than 779 ft/sec. Although liquefiable soils and potential liquefaction settlement have been identified at the site, Site Class "F" was judged to not apply since, per ASCE 7-10, Section 20.3.1, the proposed building is anticipated to have a fundamental period of vibration less than 0.5 second. Therefore, based on the subsurface conditions and geology of the site, and measured shear wave velocities, we judge Site Class "D", representative of stiff soils averaged over the uppermost 100 feet of the subsurface profile to be appropriate for this site.

For design of the proposed site structures in accordance with the seismic provisions of the CBC 2013 and American Society of Civil Engineers (ASCE) 7-10, the following seismic ground motion parameters should be used as a minimum for design. Detailed USGS design maps summary reports are presented in Appendix D.

Table 4: Seismic Coefficients Based on 2013 CBC (per ASCE 7-10)

Item	Value	2013 CBC Source[R1]	ASCE 7-10 Table/Figure[R2]
Site Class	D	Table 1613A.3.2.	Table 20.3-1
Mapped Spectral Response Accelerations Short Period, S_s 1-second Period, S_1	 1.674 0.611		 Figure 22-1 Figure 22-2
Site Coefficient, F_a	1.0	Table 1613A.3.3(1)	Table 11.4-1
Site Coefficient, F_v	1.5	Table 1613A.3.3(2)	Table 11.4-2
MCE (S_{MS})	1.674	Equation 16A-37	Equation 11.4-1
MCE (S_{M1})	0.916	Equation 16A-38	Equation 11.4-2
Design Spectral Response Acceleration Short Period, S_{DS} 1-second Period, S_{D1}	 1.116 0.611	 Equation 16A-39 Equation 16A-40	 Equation 11.4-3 Equation 11.4-4
Site Coefficient (F_{PGA})	1.0		Table 11.8-1
Peak Ground Acceleration (PGA_M)	0.623g		Equation 11.8-1

R1 California Building Standards Commission (CBSC), "California Building Code," 2013 Edition.
R2 U.S. Seismic "Design Maps" Web Application, http://earthquake.usgs.gov/designmaps/us/application.php

Based on ASCE 7-10, Table 11.6-1 and 11.6-2 the Seismic Design Category is D for buildings in Risk Categories I, II, and III, and IV.

7.3 Site Grading

Based on the subsurface soils conditions encountered in the test borings and CPTs, it is our opinion that the site is geotechnically suitable for the planned building, provided the recommendations contained in this report are followed.

7.3.1 General Grading and Material Requirements

Site grading is generally anticipated to consist of site demolition and removal of unsuitable materials, mass and/or finish grading of building and flatwork areas, including preparation of supporting subgrades for at-grade exterior flatwork.

On-site soils having an organic content of less than three percent by weight and Plasticity Index of less than 15 can be reused as fill as approved by the Geotechnical Engineer. Imported soil should be non-expansive (select soil), having a Plasticity Index of 15 or less, an R-Value greater than 40, and contain sufficient fines so the soil can bind together. Imported materials should be free of environmental contaminants, organic materials and debris, and should not contain rocks or lumps greater than three inches in maximum size. Import fill materials should be approved by the Geotechnical Engineer prior to use on site.

7.3.2 Project Compaction Recommendations

The following table provides the recommended compaction requirements for this project. Not all soils, aggregates and scenarios listed below may be applicable for this project. Specific grading recommendations are discussed individually within applicable sections of this report.

Table 5: Project Compaction Requirements

Description	Min. Percent Relative Compaction (per ASTM D1557)	Min. Percent Above Optimum Moisture Content
General Fill Areas, Engineered Fill, Onsite Soil	90	±3
General Fill Areas, Engineered Fill, Select Fill	90	±3
Building Pads, Onsite Soil – scarified subgrade or used as fill	95	±3
Building Pads, Baserock or Select (non-expansive) Engineered Fill, Subexcavation Backfill	95	±3
Building Pads – Treated Soil	93	±3
Concrete Flatwork, Subgrade Soil	90	±3
Concrete Flatwork, Baserock	90	±3
Underground Utility Backfill	90	±3
Underground Utility Backfill, Upper 3 Feet in Building Pad or Paved Areas	95	±3
Pavement – Subgrades	95	±3
Pavement – Class 2 Aggregate Base Section	95	±3

7.3.3 Site Preparation

Site grading should be performed in accordance with the recommendations provided within this report. A pre-construction conference should be held at the jobsite with representatives from the owner, general contractor, grading contractor, and Heider prior to starting the stripping operations at the site.

Following demolition of the existing (remaining) buildings, the existing asphalt and concrete pavement within the new building area should be removed along with any existing conflicting utility lines that should be removed or re-routed as needed. Excavations resulting from the removal of existing utilities or other improvements should be backfilled with properly compacted engineered fill. These backfill operations can be eliminated if over-excavation is being done at the site as a ground improvement method.

7.3.4 Building Pad Preparation

The existing near surface soils that are disturbed during demolition of the existing improvements should be recompacted or removed as needed to make it firm stable subgrade soils. The need for and extent of removal of soils disturbed by site demolition should be determined by the Geotechnical Engineer at the time of grading. If a structural mat foundation as described in Section 7.6.2 is selected for building support, the soils underlying the building pad should be over-excavated to construct the recommended five-foot thick engineered fill layer, and backfilled with engineered fill. Over-excavation should be performed to a lateral extent of at least five feet beyond the perimeter of the new building footprint. The scarified and recompacted layer at the bottom of the over-excavation can be included in the thickness of the engineered fill layer.

Following demolition and removal of any disturbed soil, or after completion of over-excavation if performed, the soils within the building pad area should be proof rolled with a heavy rubber-tired piece of construction equipment in the presence of and approved by the Geotechnical Engineer. Proof rolling should consist of at least six passes, three in each perpendicular direction, to determine if any unstable soils are present. A loaded dump truck or similar equipment is recommended for proof rolling. If pumping or other signs of instability are noted, those unstable soils should be removed as recommended by the Geotechnical Engineer.

Following proof rolling and removal of any unsuitable soil, the exposed subgrade within the planned building area should be scarified to a depth of about eight inches, moisture conditioned to about zero to three percent above the soil's optimum content and compacted to at least 90 percent relative compaction based upon the maximum dry unit weight determined by ASTM Test Method D 1557. Approved fill material may then be placed in thin lifts (generally less than eight inches in pre-compacted thickness), moisture conditioned to at least optimum moisture content. Each fill lift should be compacted to at least 95% relative compaction based upon the maximum dry unit weight determined by ASTM Test Method D 1557 (latest edition).

7.3.5 Grading Flatwork Areas

Areas to receive exterior flatwork should be scarified to a depth of eight inches below existing grade or final subgrade, whichever is lower. Scarified areas should be moisture conditioned and compacted. Where required, engineered fill should be placed and compacted to reach design subgrade elevation.

Rubber-tired heavy equipment, such as a full water truck, should be used to proof-load exposed subgrade areas where pumping is suspected. Proof loading will determine if the subgrade soil is capable of supporting construction equipment without excessive pumping or rutting.

7.3.6 Site Winterization and Unstable Subgrade Conditions

If grading occurs in the winter rainy season, unstable and unworkable subgrade conditions may be present in very silty soils, and compaction of such soils may not be feasible. These conditions may be remedied using soil admixtures, such as cement. A five percent mixture of cement based on a soil unit weight of 125 pcf is recommended for planning purposes. Treatment could vary between 12 to 18 inches, depending on the anticipated construction equipment loads. More detailed and final recommendations can be provided during construction. Stabilizing subgrade in small, isolated areas can be accomplished either with the approval of the Geotechnical Engineer by over-excavating one foot, placing engineering fill/aggregate base or placing Tensar TriAx TX-140, BX-1100 or similar geogrid on the soil, and then placing 12-inches of Class 2 base-rock on the geogrid. The upper six inches of the baserock should be compacted to at least 95 percent relative compaction.

7.4 Utility Trench Construction

7.4.1 Trench Backfilling

Utility trenches may be backfilled with onsite soil above the utility bedding and shading materials. If rocks or concrete larger than three inches in maximum size are encountered, they should be removed from the fill material prior to placement in the utility trenches. Utility bedding and shading compaction requirements should be in conformance with the requirements of the local agencies having jurisdiction and as recommended by the pipe manufacturers. Jetting of trench backfill is not recommended.

Pipeline trenches should be backfilled with fill placed in lifts of approximately eight inches in pre-compacted thickness. However, thicker lifts can be used, provided the method of compaction is approved by the Geotechnical Engineer, and the required minimum degree of compaction is achieved.

If rain is expected and the trench will remain open, the bottom of the trench may be lined with one to two inches of gravel. This would provide a working surface in the trench bottom. The trench bottom may have to be sloped to a low point to pump the water out of the trench.

7.4.2 Utility Penetrations at Building Perimeter

Flexible connections at building perimeters should be considered for critical utility lines passing through perimeter foundations. This would provide flexibility during a seismic event as well as minor settlement over a period of time. This could be provided by special flexible connections, pipe sleeving with appropriate waterproofing, or other methods.

7.4.3 Pipe Bedding and Shading

Pipe bedding material is placed in the utility trench bottom to provide a uniform surface, a cushion, and protection for the utility pipe. Shading material is placed around the utility pipe after installation and testing to protect the pipe. Bedding and shading material and placement are typically specified by the pipe manufacturer, agency, or project designer. Agency and pipe manufacturer recommendations may supersede our suggestions. These suggestions are intended as guidelines and our opinions based on our experience to provide the most cost-effective method for protecting the utility pipe and surrounding structures. Other geotechnical engineers, agency personnel, contractors, and civil engineers may have different opinions regarding this matter.

<u>Bedding and Shading Material</u> - The bedding and shading material should be the same material to simplify construction. The material should be clean, uniformly graded, fine to medium grained sand. It is suggested that bedding and shading material contain less than three percent fines with 100 percent passing the No. 8 sieve. Coarse sand, angular gravel or baserock should be avoided since this type of shading material may bridge when backfilling around the pipe, possibly creating voids, and may be too stiff as bedding material. Open graded gravel should be avoided for shading since this material contains voids, and the surrounding soil could wash into the voids, potentially causing future ground settlement. However, open graded gravel may be required for bedding material when water is entering the trench. This would provide a stable working surface and a drainage path to a sump pit in the trench for water in the trench. The maximum size for bedding material should be limited to about ¾ -inch.

Bedding Material Placement - The thickness of the bedding material should be minimized to reduce the amount of trench excavation, soil export, and imported bedding material. Two to three inches for pipes less than eight-inches in diameter and about four to six inches for larger pipes are suggested. Bedding for very large diameter pipes are typically controlled by the pipe manufacturer. Compaction is not required for thin layers of bedding material. The pipe needs to be able to set into the bedding, and walking on a thin layer of bedding material should sufficiently compact the sand. Rounded gravel may be unstable during construction, but once the pipe and shading material is in place, the rounded gravel will be confined and stable.

Shading Material Placement – Jetting is not typically recommended since the type of shading material is unknown when preparing the geotechnical report and agencies typically do not permit jetting. If the sand contains fines or if the sand is well graded, jetting will not work. Additionally, if too much water is used during jetting, this could create a wet and unstable condition. However, clean, uniformly graded and fine to medium sand can be placed by jetting. The shading material should be able to flow around and under the utility pipe during placement. Some compactive effort along the sides of the pipe should be made by the contractor to consolidate the shading material around the pipe. A minimum thickness of about six-inches of shading material should be placed over the pipe to protect the pipe from compaction of the soil above the shading material. The contractor should provide some compactive effort to densify the shading material above the pipe. Relative compaction testing is not usually performed on the shading material. However, the contractor is ultimately responsible for the integrity of the utility pipe.

7.5 Temporary Excavation Slopes

The Contractor should incorporate all appropriate requirements of OSHA/ Cal OSHA into the design of any temporary construction slopes used during construction. Excavation safety regulations are provided in the OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, Subpart P, and apply to excavations greater than five feet in depth.

The Contractor, or his specialty subcontractor, should design temporary construction slopes to conform to the OSHA regulations and should determine actual temporary slope inclinations based on the subsurface conditions exposed at the time of construction. For pre-construction planning purposes, the subsurface materials in the areas of the site where excavation may take place may be assumed to consist of very stiff silt categorized as OSHA Type C with temporary slope inclination of no steeper than 1.5:1 (horizontal to vertical). This maximum slope ratio is assumed to be uniform from top to toe of the slope. The type of slope material and actual temporary construction slopes should be confirmed during construction by a competent civil/geotechnical engineer or engineering geologist responsible to the grading contractor.

If temporary slopes are left open for extended periods of time, exposure to weather and rain could have detrimental effects such as sloughing and erosion on surficial soils exposed in the excavations. We recommend that all vehicles and other surcharge loads be kept at least 10 feet away from the top of temporary slopes, and that such temporary slopes are protected from excessive drying or saturation during construction. In addition, adequate provisions should be made to prevent water from ponding on top of the slope and from flowing over the slope face. Desiccation or excessive moisture in the excavation could reduce stability and require shoring or laying back side slopes.

7.6 Foundation Design Recommendations

7.6.1 Discussion of Foundation Alternatives

The proposed building should be supported on foundations designed to accommodate the anticipated static and calculated seismic total and differential settlements without undue distress occurring to the building. As discussed in Sections 6.1.2, 6.2.4 and 7.0, the project site is susceptible to potential settlement due to collapse settlement of the surficial silty soils, as well as liquefaction settlement induced by the design earthquake. Based on our liquefaction analyses, we calculated post-seismic liquefaction settlement to potentially range from 1.4 to 1.7 inches. Potential settlement due to collapse within the surficial silty soils was estimated to be on the order of one inch. Static settlements due to imposed building loads would tend to be likely relatively smaller (i.e., on the order of ½ inch or less) and would occur rapidly after the building loads are applied. Potential differential settlements would be on the order of ½ to ⅔ the total settlement across the structure. As an alternative to designing the building to tolerate the estimated potential settlements as indicated, remedial measures may be chosen to either reduce the potential settlements through methods such as reworking the surficial, collapse-susceptible soils as engineered fill, or use of conventional shallow spread footing foundations in combination with a ground improvement method such as Geopiers or drilled displacement columns to transfer structural building loads to deeper, dense supporting strata below the bulk of the collapse and liquefaction-susceptible layers onsite. Based on discussions with the College, foundation options consisting of (1) a structural mat foundation supported on a layer of engineered fill, and (2) shallow spread footing foundations supported by drilled displacement columns are presented for foundation design.

7.6.2 Structural Mat Foundation

A structural mat foundation can be used to support the proposed building. However, due to potential excess settlements caused by liquefaction and collapse-susceptible soils, the mat foundation should be supported on a minimum five-foot thick layer of engineered fill. This engineered fill layer would effectively eliminate the potential for collapse settlements below the building as well as provide a cushion for the mat to better accommodate potential total and differential seismic liquefaction settlements. The building pad should be over-excavated and the engineered fill layer constructed in accordance with the recommendations presented in Section 7.3.4.

The mat foundation may be designed for any practical bearing pressure up to a maximum of 1,200 psf. Total settlement of mat foundations designed to the maximum bearing pressure are estimated to be on the order of 2½ inches or less (including seismic settlement) and differential settlement between adjacent columns should not exceed ¾ inch provided that the mat extends to a minimum two feet below lowest adjacent grade.

For structural design of mat foundations, an average modulus of subgrade reaction, K_s of 150 pci (pounds per cubic inch) may be used. The foundation can be designed to resist lateral loads using an allowable coefficient of friction of 0.35. Lateral sliding resistance is derived at the concrete/soil interface below the mat. A ⅓ increase to the allowable bearing capacity and frictional resistance is permitted for short-term seismic and wind loads.

Heider personnel should be retained to observe and confirm that foundation excavations prior to backfill or formwork and reinforcing steel placement bear in soils suitable for the recommended maximum design bearing pressure.

7.6.3 Shallow Foundations with Ground Improvement

Shallow spread footing foundations supported by a ground improvement method such as Drilled Displacement Columns (DDC), a ground improvement technique, can be used as an alternate for building foundation support. DDC is a method where a large diameter auger is advanced to the design depth, and as the auger is withdrawn, low strength concrete (CLSM) is injected under pressure as the auger is slowly withdrawn, providing soil compaction in loose and soft soil zones as well as providing a column. The method is similar to the installation of auger-cast piles except that minimal spoils are generated, and the columns serve to also transfer load of shallow foundations to deeper, more competent supporting strata rather than serving as a deep foundation with internal steel reinforcement.

The advantages of DDC include the following:

- Large soil displacement (ground improvement) during construction achieved with full-displacement auger barrels;
- The hydraulically-powered installation process imposes no noise or vibration concerns;
- Very low spoil generated during construction makes DDC a desirable foundation support solution;
- High-quality cemented columns constructed with heavy crowd pressure driving a displacement mandrel that feeds pressurized cemented backfill during withdrawal; and,
- Increased bearing capacity reduces spread footing sizes and resulting footing spoil off-haul costs, especially on sites with undocumented fill materials.

If used, drilled displacement columns should be extended to a bearing depth 30 feet below the existing ground surface. We estimate that columns extended to a depth 30 feet will reduce potential liquefaction settlement to less than approximately ½ inch. Multiple columns may be needed at footing locations based on footing loads and dimensions, and additional columns may be required and spaced at wider intervals below slab-on-grade floors in order to minimize the potential for differential settlement of floor slabs and adjacent building columns.

The DDC work should be performed by a qualified specialty contractor. The DDC work scope should include a DDC design-build submittal stamped by a California Registered Engineer, equipment and personnel mobilization, DDC load testing, and construction of DDCs. The design package should be submitted to Heider for review at least two weeks prior to mobilization for construction. Installation of DDC elements should be observed by Heider on a full-time basis.

We initially estimate an allowable vertical capacity of 80 to 100 kips for each 18-inch-diameter DDC element to be installed to a depth of approximately 15 to 30 feet below the existing grade. DDC elements to be installed in a grid pattern at a spacing of four to six feet on center under footings, and 10 to 12 on centers under slabs can be used to control static, seismically-induced settlements, as well as settlements due to collapse meeting the project design criteria. Final DDC sizing and spacing would be determined by the design-build contractor once structural loading and foundation plans become available.

Conventional continuous and/or isolated spread footings bearing on the improved onsite soils should be founded a minimum of 24 inches below lowest adjacent finished grade. Continuous footings should have a minimum width of at least 24 inches, and isolated column footings should have a minimum width of at least 30 inches. In addition, footings located adjacent to other footings or utility trenches should bear below an imaginary 1.5:1 (horizontal to vertical) plane projected upward from the bottom edge of the adjacent footings or utility trench. Footing reinforcement should be determined by the project Structural Engineer.

Footings supported on DDC-reinforced soils can be initially designed for an allowable bearing capacity of 5,000 pounds per square foot (psf). The bearing capacity should be verified by a full-scale load test. An aggregate "cushion" layer at least eight inches thick should be placed between the DDC elements and footing. The aggregate "cushion" is typically placed and constructed by the grading contractor and is not a part of the DDC work.

Footings can be designed to resist lateral loads using an allowable coefficient of friction of 0.40. Lateral sliding resistance is derived at the concrete/aggregate interface below the footing. In addition, an ultimate passive resistance equal to an equivalent fluid weighing 400 pounds per cubic foot (pcf) acting against the foundation may be used for lateral load resistance against the sides of footings perpendicular to the direction of loading where the footing is poured neat against undisturbed material (i.e., native soils or engineered fills). The top foot of passive resistance at foundations not adjacent to and confined by pavement, interior floor slab, or hardscape should be neglected. In order to fully mobilize this passive resistance, a lateral footing deflection on the order of one to two percent of the embedment of the footing is required. If it is desired to limit the amount of lateral deflection to mobilize the passive resistance, a proportional safety factor should be applied.

A one-third increase to the allowable bearing capacity and frictional resistance is permitted for short-term seismic and wind loads. The estimated long-term total and differential settlements of the DDC-supported footings should be less than one inch and ½ inch, respectively.

Heider personnel should be retained to observe and confirm that foundation excavations prior to backfill or formwork and reinforcing steel placement bear in the anticipated soils suitable for the recommended maximum design bearing pressure.

7.7 Concrete Slabs-on-Grade

7.7.1 Interior Floor Slabs

Non-structural concrete slab-on-grade floors, if used, should be a minimum of five-inches in thickness. The concrete floor slab should be constructed on properly prepared subgrade compacted to the requirements for engineered fill. Slab reinforcing should be provided in accordance with the anticipated use and loading of the slab, but as a minimum should consist of No. 4 bars spaced at 18-inch centers each way. Slab-on-grade subgrade surfaces should be proof-rolled to provide a smooth, unyielding surface for slab support.

If desired, slab-on-grade concrete floors with moisture sensitive floor coverings can be underlain by a moisture retarder system constructed between the slab and subgrade. Such a system could consist of four inches of free-draining gravel, such as ¾-inch, clean, crushed, uniformly graded gravel with less than three percent passing No. 200 sieve, or equivalent, overlain by a relatively impermeable vapor retarder placed between the subgrade soil and the slab. The vapor retarder should be at least 10-mil thick and should conform to the requirements for ASTM E 1745 Class C Underslab Vapor Retarders (e.g., Griffolyn Type 65, Griffolyn Vapor Guard, Moistop Ultra C, or equivalent). If additional protection is desired by the owner, a higher quality vapor barrier conforming to the requirements of ASTM E 1745 Class A, with a water vapor transmission rate less than or equal to 0.006 gr/ft2/hr (i.e., 0.012 perms) per ASTM E 96 (e.g., 15-mil thick "Stego Wrap Class A"), or to Class B (Griffolyn Type 85, Moistop Ultra B, or equivalent) may be used in place of a Class C retarder.

The vapor retarder or barrier should be placed directly under the slab. A capillary rock layer or rock cushion is not required if a Class A barrier is used beneath the floor slab, and a sand layer is not required over the vapor retarder from a geotechnical standpoint. If sand on top of the vapor retarder is required by the design structural engineer, we suggest the thickness be minimized to less than one inch. If construction occurs in the winter months, water may pond within the sand layer since the vapor retarder may prevent the vertical percolation of rainwater.

ASTM E1643 should be utilized as a guideline for the installation of the vapor retarder. During construction, all penetrations (e.g., pipes and conduits,) overlap seams, and punctures should be completely sealed using a waterproof tape or mastic applied in accordance with the vapor retarder manufacturer's specifications. The vapor retarder or barrier should extend to the perimeter cutoff beam or footing.

7.7.2 Exterior Concrete Flatwork

Exterior concrete flatwork with pedestrian traffic should be at least four inches thick. Underlying aggregate baserock is at the designer's option, or if required by the regulating agency. The subgrade beneath the flatwork should be moisture conditioned and compacted as specified in the grading section of this report.

Control joints should be constructed in accordance with ACI 224 "Control of Cracking in Concrete Structures". In general for typical flatwork, joints would be required every 24 to 36 times the concrete thickness.

7.8 Surface Drainage

Positive surface drainage should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building, if used, should preferably be sealed. In areas where sidewalks or paving do not immediately adjoin the building, we recommend that protective slopes be provided with a minimum grade of approximately five 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 potential moisture infiltration.

Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems should not be installed within five feet of foundation walls. Landscaped irrigation adjacent to the foundation system should be minimized.

7.9 Plan Review

We recommend that Heider be provided the opportunity to review the final project plans prior to construction. The purpose of this review is to assess the general compliance of the plans with the recommendations provided in this report and confirm the incorporation of these recommendations into the project plans and specifications.

7.10 Observation and Testing During Construction

We recommend that Heider be retained to provide observation and testing services during site preparation, mass grading, underground utility construction, foundation preparation or excavation, and to observe final site drainage. This is to observe compliance with the design concepts, specifications and recommendations, and to allow for possible changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

8.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report are based upon the soil and conditions encountered in the borings and CPTs. If variations or undesirable conditions are encountered during construction, Heider should be contacted so that supplemental recommendations may be provided.

This report is issued with the understanding that it is the responsibility of the owner or his representatives to see that the information and recommendations contained herein are called to the attention of the other members of the design team and incorporated into the plans and specifications, and that the necessary steps are taken to see that the recommendations are implemented during construction.

The findings and recommendations presented in this report are valid as of the present time for the development as currently proposed. However, changes in the conditions of the property or adjacent properties may occur with the passage of time, whether by natural processes or the acts of other persons. In addition, changes in applicable or appropriate standards may occur through legislation or the broadening of knowledge. Accordingly the findings and recommendations presented in this report may be invalidated, wholly or in part, by changes outside our control. Therefore, this report is subject to review by Heider after a period of three (3) years has elapsed from the date of issuance of this report. In addition, if the currently proposed design scheme as noted in this report is altered Heider should be provided the opportunity to review the changed design and provide supplemental recommendations as needed.

Recommendations are presented in this report which specifically request that Heider be provided the opportunity to review the project plans prior to construction and that we be retained to provide observation and testing services during construction. The validity of the recommendations of this report assumes that Heider will be retained to provide these services.

This report was prepared upon your request for our services, and in accordance with local and currently accepted geotechnical engineering practice. No warranty based on the contents of this report is intended, and none shall be inferred from the statements or opinions expressed herein. The scope of our services for this report did not include an environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on, below or around this site. Any statements within this report or on the attached figures, logs or records regarding odors noted or other items or conditions observed are for the information of our client only.

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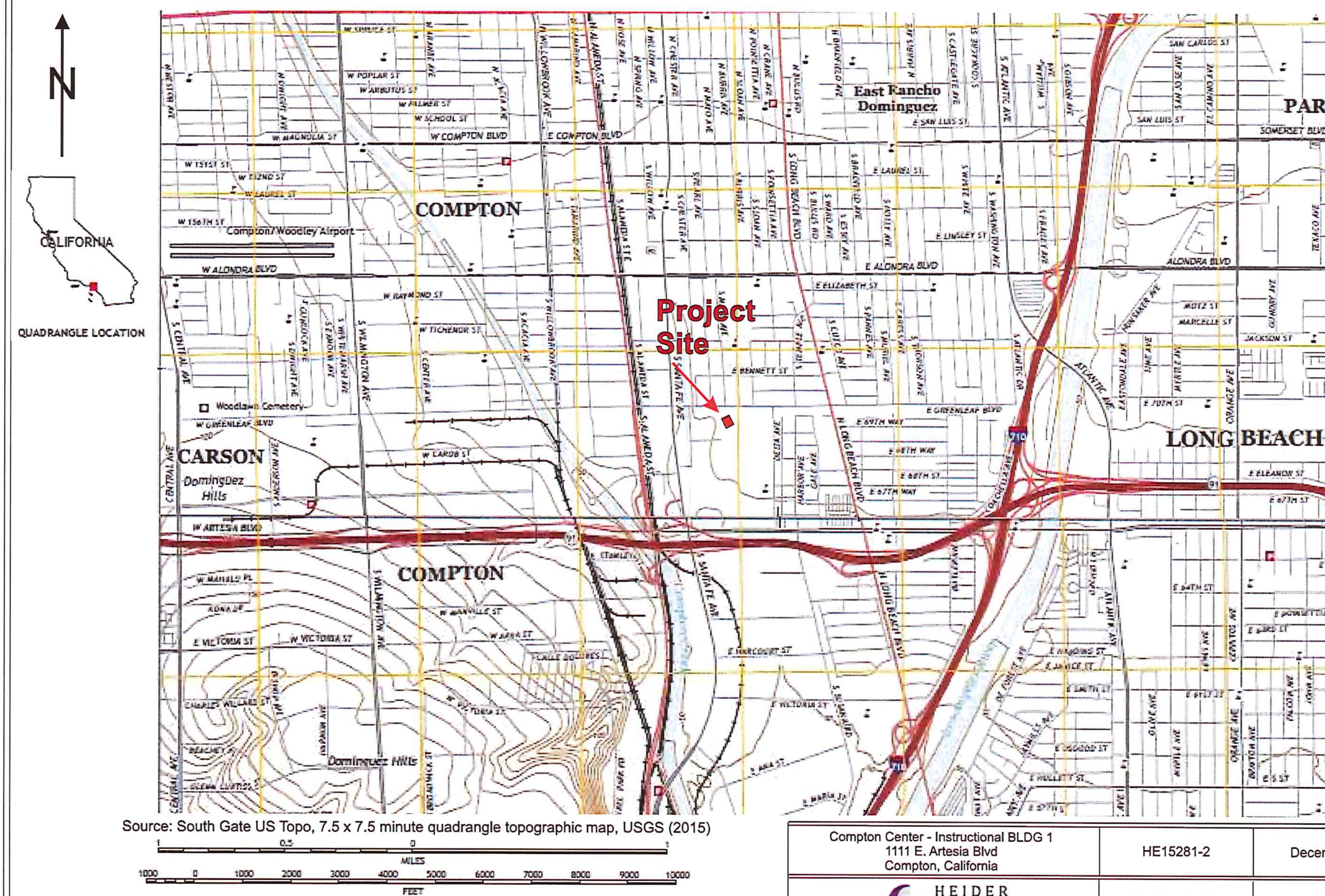
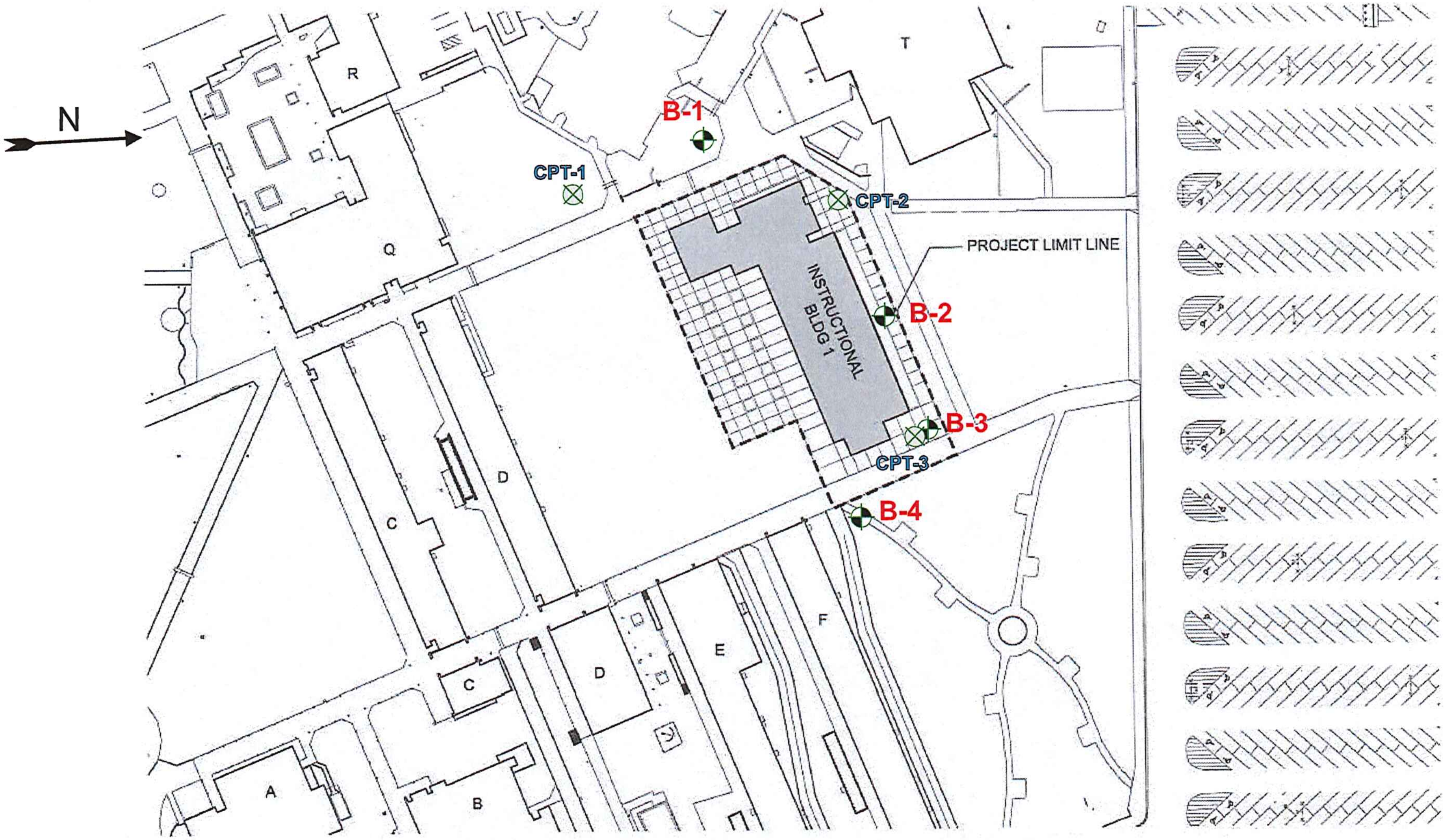
FIGURES



Source: South Gate US Topo, 7.5 x 7.5 minute quadrangle topographic map, USGS (2015)

Compton Center - Instructional BLDG 1 1111 E. Artesia Blvd Compton, California	HE15281-2	December 2015
HEIDER INSPECTION GROUP	Site Vicinity Map	Figure 1

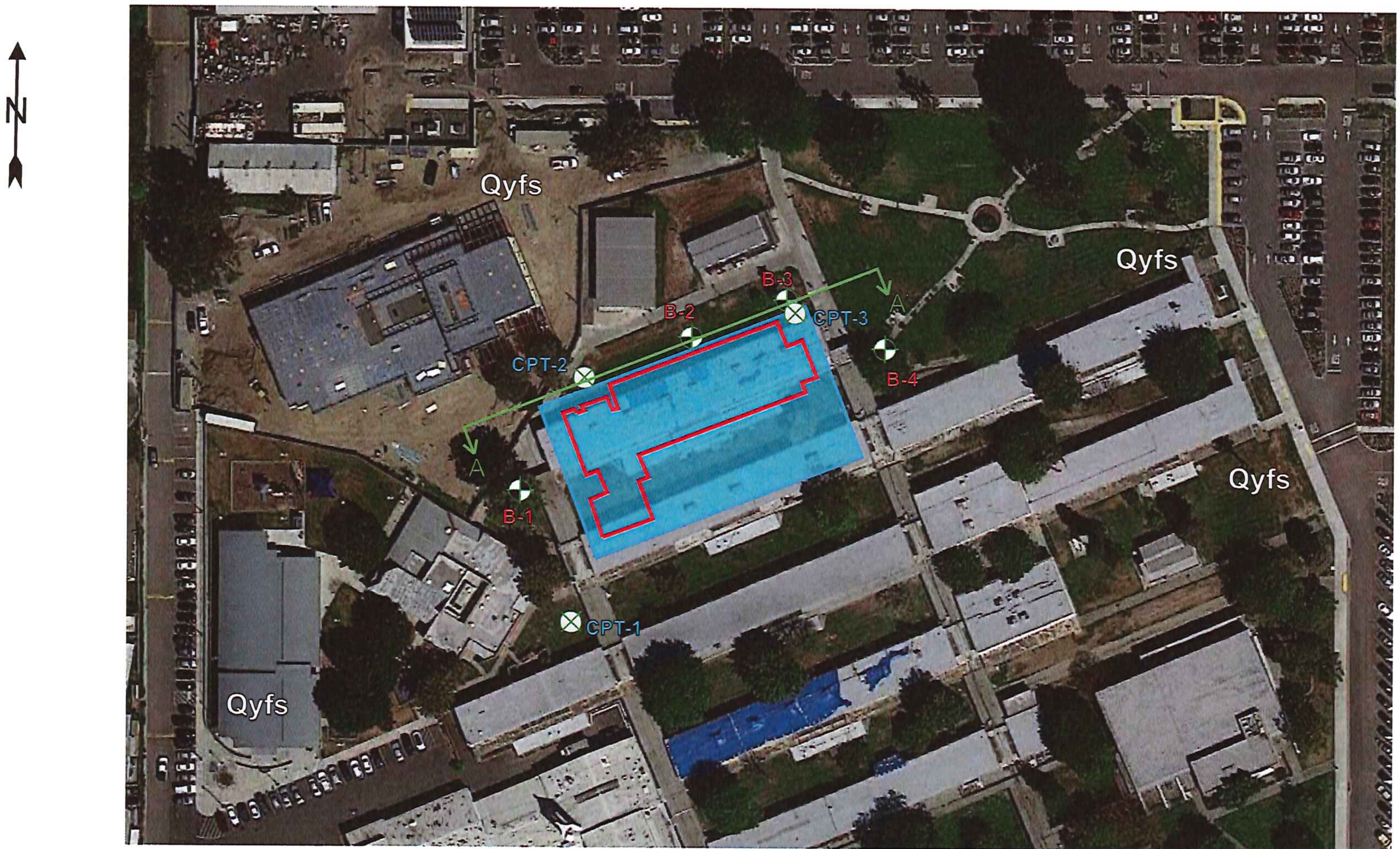


- Approximate CPT Location

- Approximate Boring Location

Base Map: El Camino College Compton Center - Instructional BLDG 1
Dated 8/20/15, prepared by DLR Group

Compton Center - Instructional BLDG 1 1111 E. Artesia Blvd Compton, California	HE15281-2	December 2015
HEIDER INSPECTION GROUP	Development Site Plan	Figure 2



- Approximate CPT Location
- Approximate Boring Location
- Approximate Proposed Building Footprint
- Approximate Scale (0 – 150 ft)
- Geologic Cross-Section
- Proposed Building Location Concept Plan "I"

Qyfs - Young Alluvium fan and valley deposits, undivided (silt)

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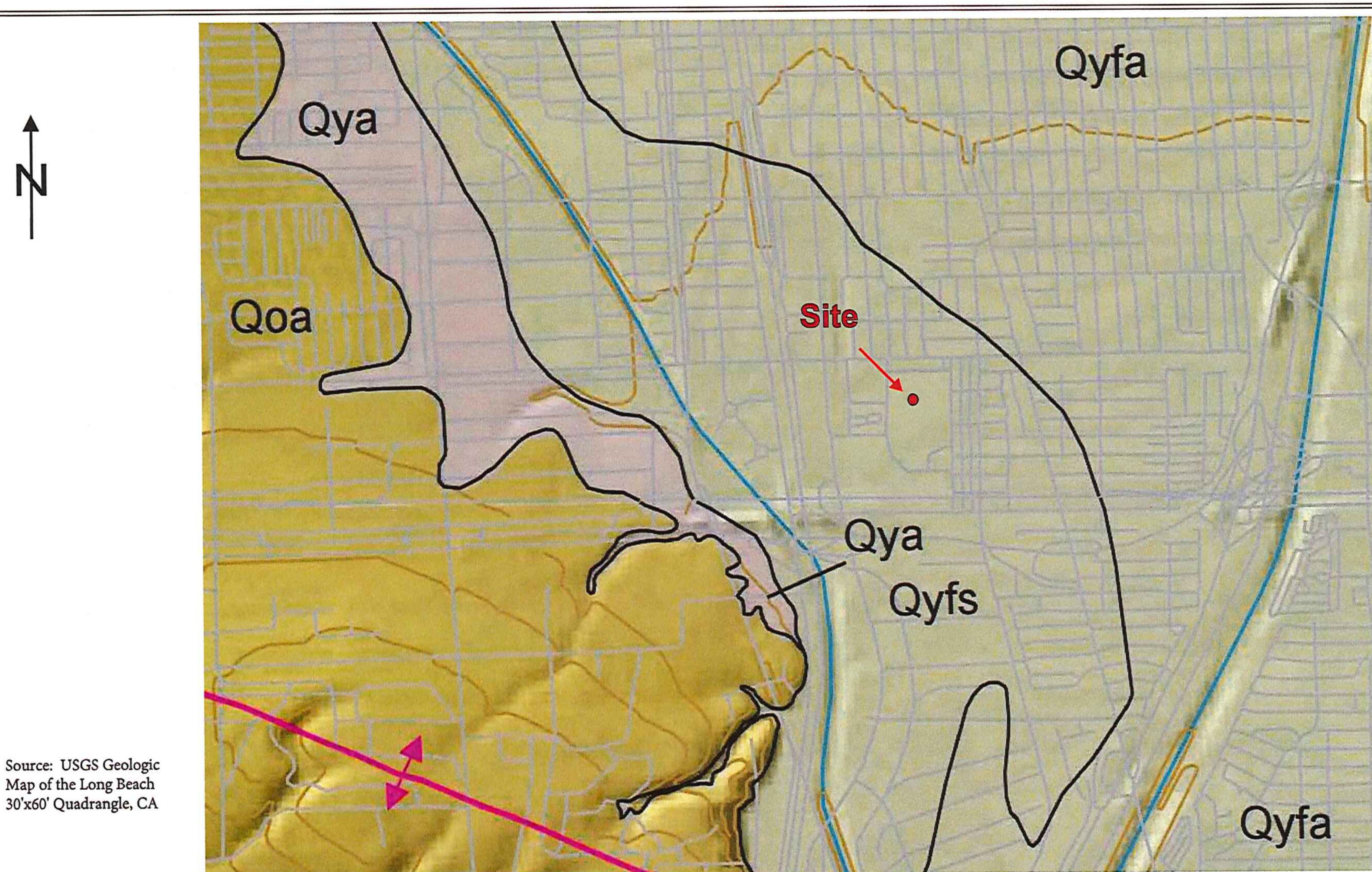
HEIDER INSPECTION GROUP	Site Plan and Site Geology	Figure 3



Source: USGS Geologic Map of the Long Beach 30'x60' Quadrangle, CA

Geologic contacts

Qya - Young Alluvium flood plain deposits

Qoa - Old Alluvium flood plain deposits

Qyfs - Young Alluvium fan and valley deposits (silt)

Qyfa - Young Alluvium fan and valley deposits (sand)

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HEIDER INSPECTION GROUP	Site Vicinity Geologic Map	Figure 4

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain.

FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred.

Holocene fault displacement (during past 11,700 years) without historic record.

Late Quaternary fault displacement (during past 700,000 years).

Quaternary fault (age undifferentiated).

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement.

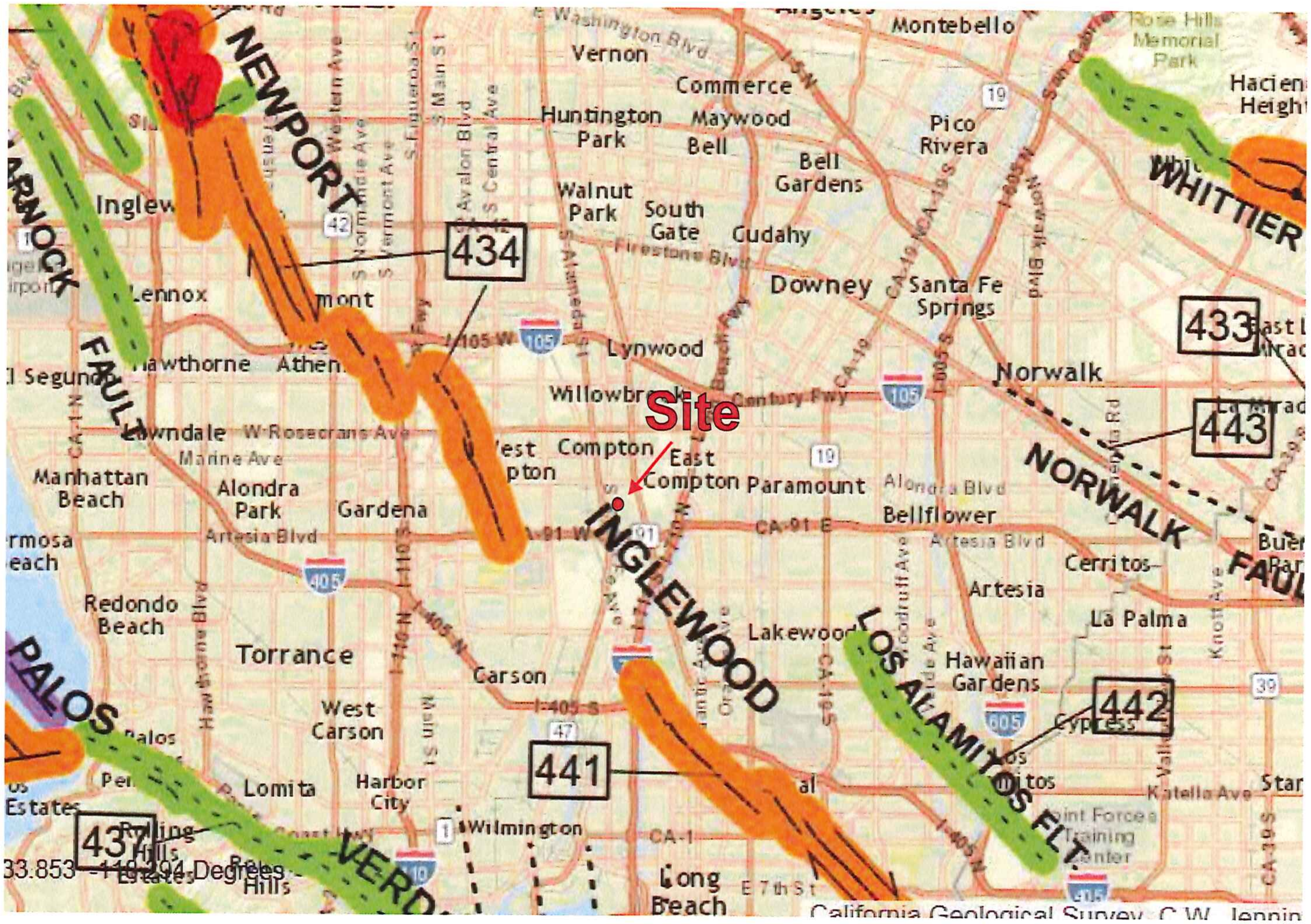
ADDITIONAL FAULT SYMBOLS

Bar and ball on downthrown side (relative or apparent).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate).



Base Map Reference: California Geological Survey - 2010 Fault Activity Map of California

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HEIDER INSPECTION GROUP	Regional Fault Map	Figure 5

Heider Inspection Group - An ETS Company
800 S Rochester Ave, Ste A
Ontario, CA 91761
Office: 909-673-0292; Fax: 909-673-0272

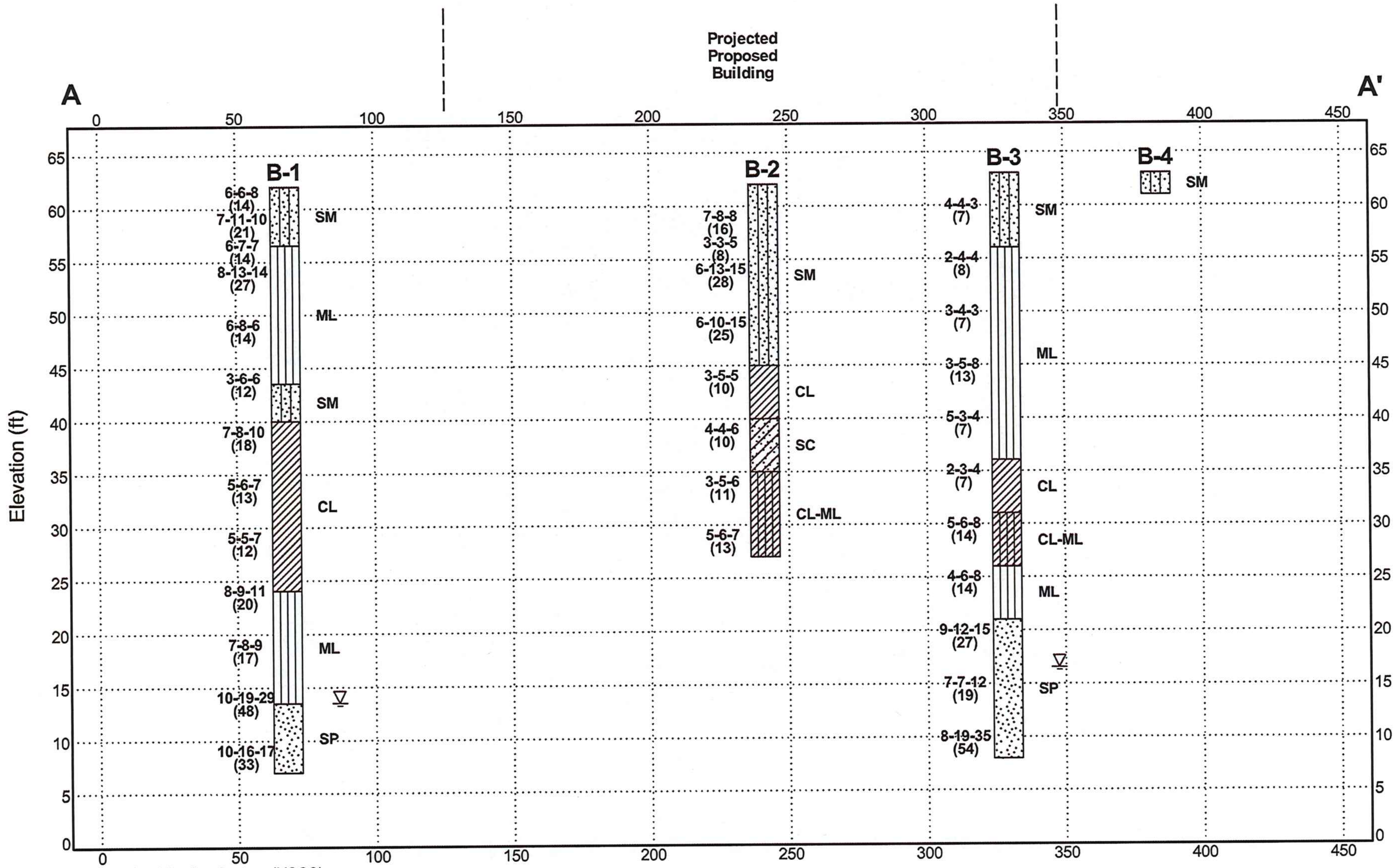
SUBSURFACE DIAGRAM

CLIENT El Camino College Compton Center

PROJECT NUMBER HE15281-2

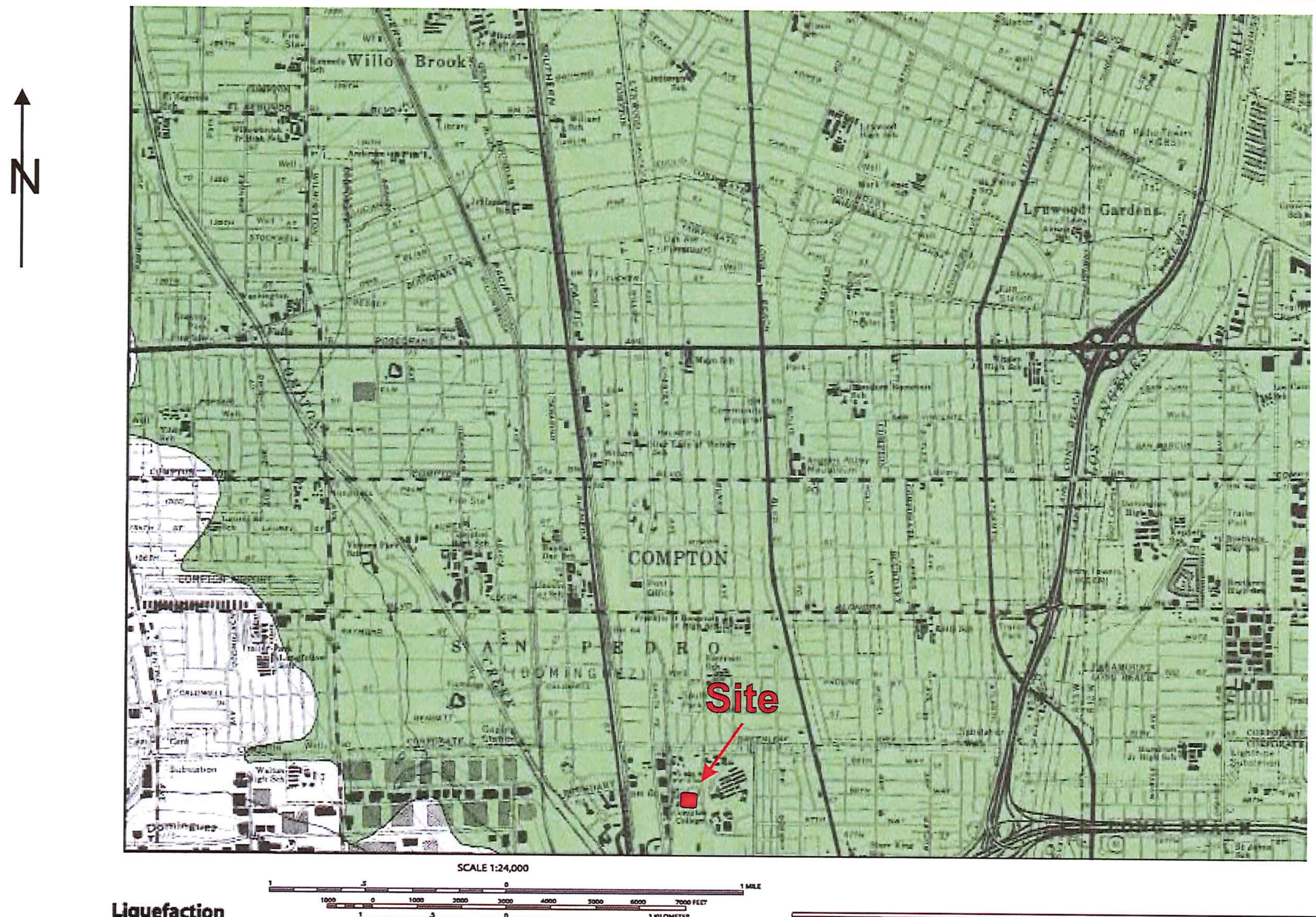
PROJECT NAME Proposed Instructional Building I

PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221



CL - Unified Soil Classification System (USCS)
14 - Blows Per Six Inches, Standard Penetration Test
(21) - N Value

Schematic Geologic Cross-Section A-A' | Figure 6



Liquefaction

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

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HEIDER INSPECTION GROUP	Liquefaction Susceptibility Map	Figure 7

Map Explanation

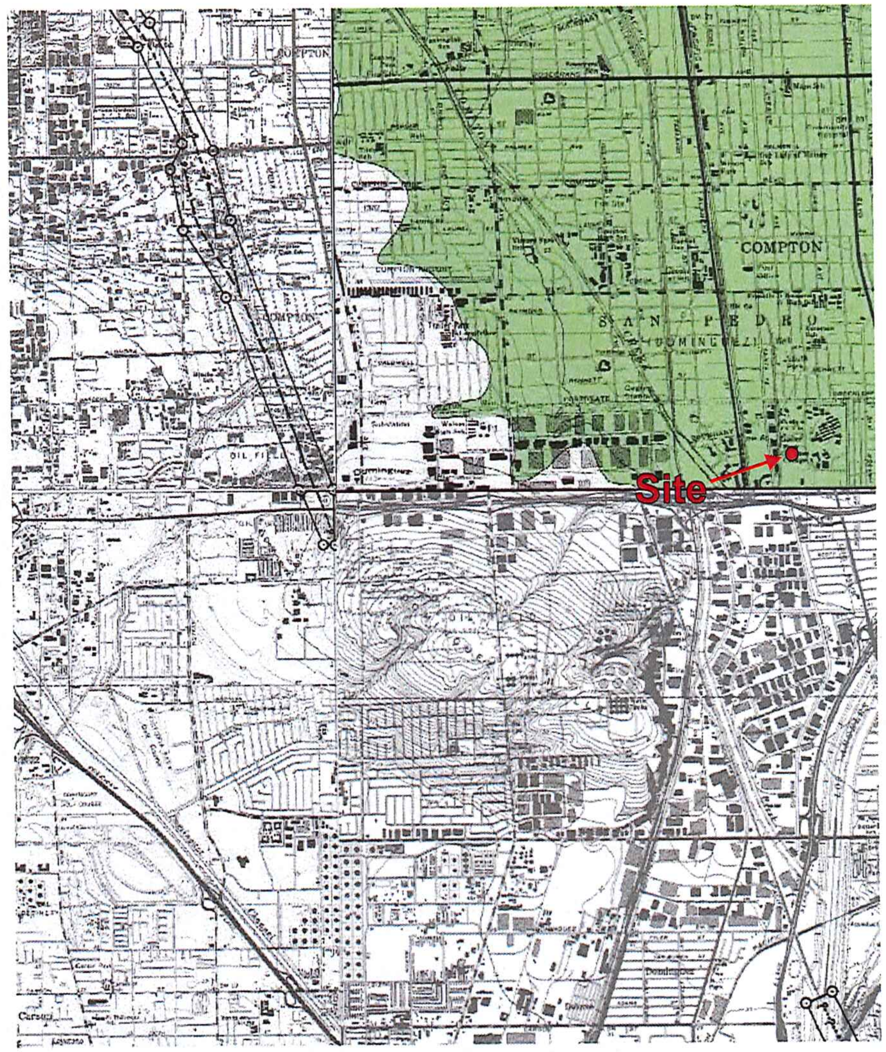
Potentially Active Faults

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query(?) Indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated or C for displacement caused by creep or possible creep.

Special Study Zone Boundaries

These are delineated straight line segments that connect encircled turning points so as to define special studies zone segments.

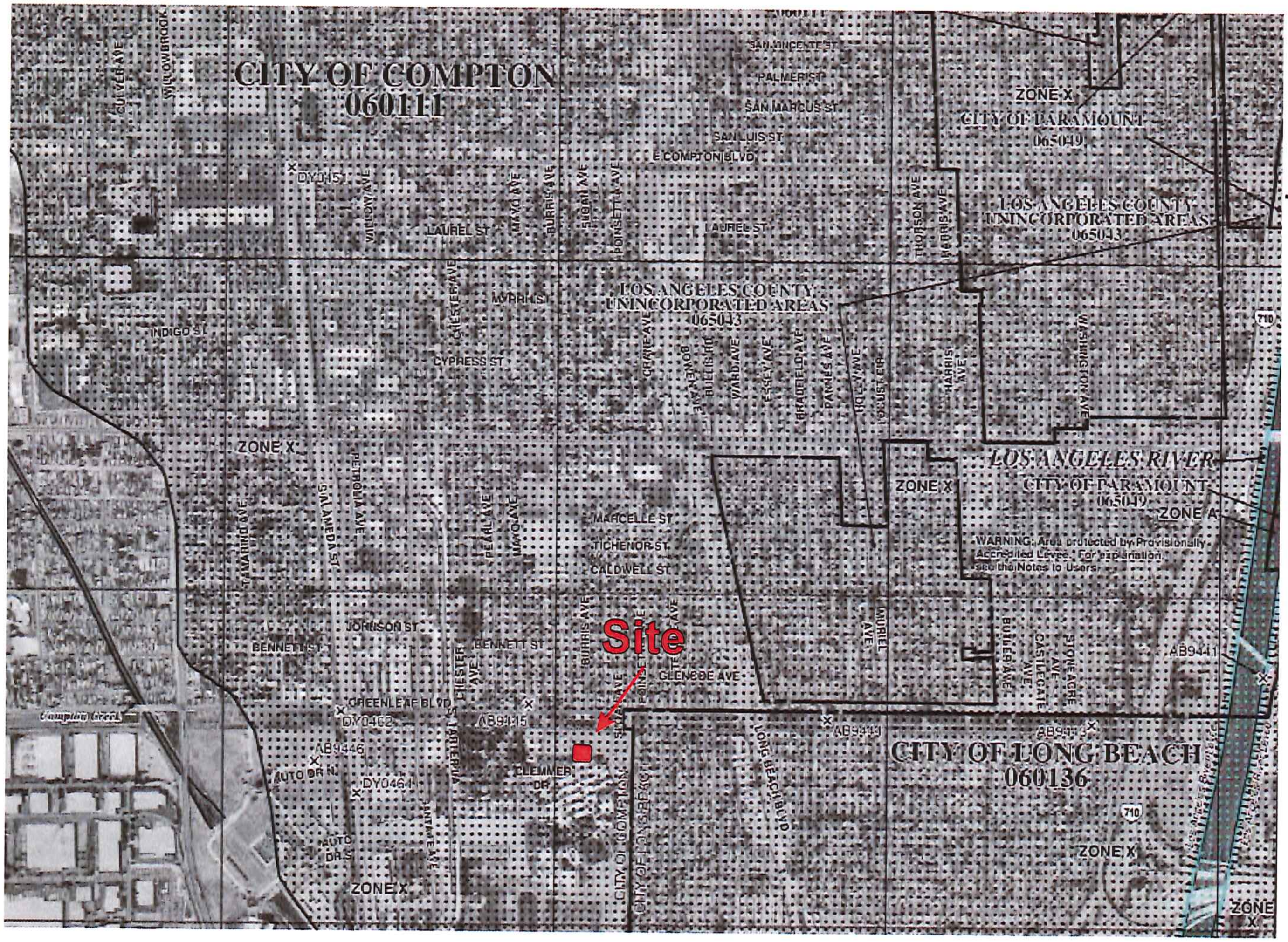
Seaward projection of zone boundary.



SCALE 1:24,000

CONTOUR INTERVAL 5 FEET

Compton Center - Instructional BLDG 1 1111 E. Artesia Blvd Compton, California	HE15281-2	December 2015
HEIDER INSPECTION GROUP	Alquist-Priolo Earthquake Fault Map	Figure 8



For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

PANEL 1815F

FIRM

FLOOD INSURANCE RATE MAP

LOS ANGELES COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1815 OF 2350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES COUNTY	065043	1815	F
CARSON, CITY OF	060107	1815	F
COMPTON, CITY OF	060111	1815	F
LONG BEACH, CITY OF	060136	1815	F
LOS ANGELES, CITY OF	060137	1815	F
LYNWOOD, CITY OF	060635	1815	F
PARAMOUNT, CITY OF	065049	1815	F
SOUTH GATE, CITY OF	060163	1815	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06037C1815F

EFFECTIVE DATE SEPTEMBER 26, 2008

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

Zone X (dot) - Other Flood Areas: Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

Zone X (blank) - Other Areas: Areas determined to be outside the 0.2% annual chance floodplain.

Zone A - No base flood elevation determined.

Compton Center - Instructional BLDG 1 1111 E. Artesia Blvd Compton, California	HE15281-2	December 2015
HEIDER INSPECTION GROUP	Flood Hazard Map	Figure 9

APPENDIX A

Key to Boring Log Symbols
Boring Logs and CPTs

UNIFIED SOIL CLASSIFICATION (ASTM D-2487)

Material Types	Criteria for Assigning Soil Group Names			Group Symbol	Soil Group Names	Legend
Coarse Grained Soils >50% Retained on No. 200 Sieve	Gravels >50% of Coarse Fraction Retained on No 4 Sieve	Clean Gravels <5% Fines	Cu≥4 and 1≤Cc≤3	GW	Well-Graded Gravel	
			Cu<4 and/or [Cc<1 or Cc>3]	GP	Poorly-Graded Gravel	
		Gravels with Fines >12% Fines	Fines Classify as ML or MH	GM	Silty Gravel	
			Fines Classify as CL or CH	GC	Clayey Gravel	
	Sands ≥50% of Coarse Fraction Passes on No. 4 Sieve	Clean Sands <5% Fines	Cu≥6 and 1≤Cc≤3	SW	Well-Graded Sand	
			Cu<6 and/or [Cc<1 or Cc>3]	SP	Poorly-Graded Sand	
		Sands and Fines >12% Fines	Fines Classify as ML or MH	SM	Silty Sand	
			Fines Classify as CL or CH	SC	Clayey Sand	
Fine Grained Soils ≥50% Passes No. 200 Sieve	Silts and Clays Liquid Limits<50	Inorganic	PI>7 and Plots≥"A" Line	CL	Lean Clay	
			PI<4 and Plots<"A" Line	ML	Silt	
		Organic	LL (Oven Dried)/LL(Not Dried <0.75)	OL	Organic Silt	
	Silts and Clays Liquid Limits≥50	Inorganic	PI Plots≥"A" Line	CH	Fat Clay	
			PI Plots<"A" Line	MH	Elastic Silt	
		Organic	LL (Oven Dried)/LL(Not Dried <0.75)	OH	Organic Clay	
Highly Organic Soils	Primarily Organic Matter, Dark in Color and Organic Odor			PT	Peat	

PENETRATION RESISTANCE (RECORDED AS BLOWS/0.5 FEET)

SAND AND GRAVEL		SILT AND CLAY		
RELATIVE DENSITY	N-VALUE (BLOWS/FOOT)*	CONSISTENCY	N-VALUE (BLOWS/FOOT)*	COMPRESSIVE STRENGTH
Very Loose	0 - 3	Very Soft	0 - 1	0 - 0.25
Loose	4 - 10	Soft	2 - 4	0.25 - 0.50
Medium Dense	11 - 29	Medium Stiff	5 - 7	0.50 - 1.0
Dense	30 - 49	Stiff	8 - 14	1.0 - 2.0
Very Dense	50 +	Very Stiff	15 - 29	2.0 - 4.0
		Hard	30 +	Over 4.0

SOIL MOISTURE

DESCRIPTOR	DESCRIPTION
Dry	Dry of Standard Proctor Optimum
Damp	Sand Dry
Moist	Near Standard Proctor Optimum
Wet	Wet of Satandard Proctor Optimum
Saturated	Free Water in Sample

Grab Bulk Sample

Standard Penetration Test

2.5 Inch Modified California

Shelby Tube

No Recovery

Initial Water Level Reading

Final Water Level Reading

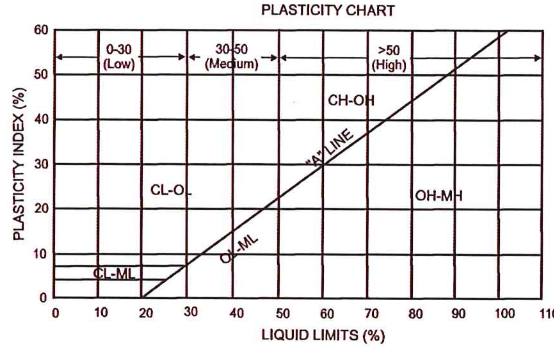
Blow Count
The number of blows of the sampling hammer required to drive the sampler through each of three 6-inch increments. Less than three increments may be reported if more than 50 blows are counted for any increment. The notation 50/5" indicates 50 blows recorded for 5 inches of penetration.

N-Value
Number of blows 140 LB hammer falling 30 inches to drive a 2 inch outside diameter (1-3/8 inch I.D) split barrel sampler the last 12 inches of an 18 inch drive (ASTM-1586 Standard Penetration Test)

PARTICLES SIZES

COMPONENTS		SIZE OR SIEVE NUMBER
Boulders		Over 12 Inches
Cobbles		3 to 12 Inches
Gravels	-Coarse	3/4 to 3 Inches
	-Fine	Number 4 to 3/4 Inch
Sand	-Coarse	Number 10 to Number 4
	-Medium	Number 40 to Number 10
	-Fine	Number 200 to Number 40
Fines (Silt and Clay)		Below Number 200

PLASTICITY CHART



CU -Consolidated Undrained triaxial test completed. Refer to laboratory results
DS - Results of Direct Shear test in terms of total cohesion (C, KSF) or effective cohesion and friction angles (C', KSF and degrees)
LL - Liquid Limit
PI - Plasticity Index
PP - Pocket Penetrometer test
TV - Torvane Shear Test results in terms of undrained shear strength (KSF)
UC - Unconfined Compression test results in terms of undrained shear strength (KSF)
#200 - Percent passing number 200 sieve
Cu - Coefficient of Uniformity
Cc - Coefficient of Concavity

General Notes

1. The boring locations were determined by pacing, sighting and/or measuring from site features. Locations are approximate. Elevations of borings (if included) were determined by interpolation between plan contours or from another source that will be identified in the report or on the project site plan. The location and elevation of borings should be considered accurate only to the degree implied by the method used.

2. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.

3. Water level readings in the drill holes were recorded at time and under conditions stated on the boring logs. This data has been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, tides, temperature and other factors at the time measurements were made.

4. The boring logs and attached data should only be used in accordance with the report.

HEIDER INSPECTION GROUP
An ETS Company

KEY TO EXPLORATORY BORING LOGS

Heider Inspection Group - An ETS Company
800 S Rochester Ave, Ste A
Ontario, CA 91761
Office: 909-673-0292; Fax: 909-673-0272

BORING NUMBER B-1

CLIENT El Camino College Compton Center
PROJECT NAME Proposed Instructional Building I
PROJECT NUMBER HE15281-2
PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221
DATE STARTED 11/3/15 **COMPLETED** 11/3/15
GROUND ELEVATION 62 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD HSA
∇ **AT TIME OF DRILLING** 48.50 ft / Elev 13.50 ft
LOGGED BY Steve Runyan **CHECKED BY** RS
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SM) **SILTY SAND:** Light brown, med. dense.										
			SPT 1-1		6-6-8 (14)			7				
		becomes white brown, fine grained.										
5			MC 1-2		7-11-10 (21)		96	5				
		(ML) **SILT:** Light brown, stiff w/ clay and fine sand.										
			SPT 1-3		6-7-7 (14)			6				
		increased sand content.										
10		becomes dark brown, very stiff w/ clay.	MC 1-4		8-13-14 (27)		112	7				
15		becomes stiff.	SPT 1-5		6-8-6 (14)							
		(SM) **SILTY SAND:** Light brown, med. dense, fine grained.										
20			SPT 1-6		3-6-6 (12)			29				
		(CL) **CLAY:** Green brown, stiff, w/ silt.										
25			SPT 1-7		7-8-10 (18)			8				
30		w/ silt and sand.	SPT 1-8		5-6-7 (13)			29				

(Continued Next Page)

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BORING NUMBER B-1

CLIENT El Camino College Compton Center
PROJECT NAME Proposed Instructional Building I
PROJECT NUMBER HE15281-2
PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
30		(CL) **CLAY:** Green brown, stiff, w/ silt. *(continued)*										
35		w/ silt.	SPT 1-9		5-5-7 (12)			30				
		(ML) **SANDY SILT:** Dark brown, very stiff, w/ trace amount of clay										
40			SPT 1-10		8-9-11 (20)			25				
45		becomes green brown.	SPT 1-11		7-8-9 (17)			39				
	∇	(SP) **SAND:** Tan, very dense, wet, med-coarse.										
50			SPT 1-12		10-19-29 (48)			18				
55		becomes gray.	SPT 1-13		10-16-17 (33)							

Bottom of borehole at 55.0 feet.

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BORING NUMBER B-2

CLIENT El Camino College Compton Center
PROJECT NAME Proposed Instructional Building I
PROJECT NUMBER HE15281-2
PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221
DATE STARTED 11/3/15 **COMPLETED** 11/3/15
GROUND ELEVATION 62 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING --- NGWE
LOGGED BY Steve Runyan **CHECKED BY** RS
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	(SM) **SILTY SAND:** Brown.										
		GB Bulk					8				
5	becomes grey and medium dense.	MC 1-1		7-8-8 (16)		95	3				44
	becomes dark brown and loose.	SPT 1-2		3-3-5 (8)			22				
10		MC 1-3		6-8-10 (18)		103	14				
15	becomes grey brown, med.dense and fine-grained.	SPT 1-4		6-10-14 (24)			5				
	(CL) **CLAY:** Green brown, stiff.										
20		SPT 1-5		3-5-5 (10)		69	52	48	33	15	94
	(SC) **CLAYEY SAND:** Black, stiff.										
25		SPT 1-6		4-4-6 (10)			25				

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BORING NUMBER B-2

CLIENT El Camino College Compton Center
PROJECT NAME Proposed Instructional Building I
PROJECT NUMBER HE15281-2
PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
25		(SC) **CLAYEY SAND:** Black, stiff. *(continued)*										
		(CL-ML) **CLAYEY SILT:** Green brown, stiff.										
30			SPT 1-7		3-5-6 (11)			30				
35		becomes very stiff.	SPT 1-8		5-6-7 (13)			27				

Bottom of borehole at 35.0 feet.

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BORING NUMBER B-3

CLIENT El Camino College Compton Center

PROJECT NAME Proposed Instructional Building I

PROJECT NUMBER HE15281-2

PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221

DATE STARTED 11/3/15 COMPLETED 11/3/15

GROUND ELEVATION 63 ft HOLE SIZE 8"

DRILLING CONTRACTOR

GROUND WATER LEVELS:

DRILLING METHOD HSA

AT TIME OF DRILLING 46.50 ft / Elev 16.50 ft

LOGGED BY Steve Runyan CHECKED BY RS

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SM) **SILTY SAND:** Light brown, loose.										
5			SPT 1-1		4-4-3 (7)			11				32
		(ML) **SANDY SILT:** Dark brown, stiff.										
10			SPT 1-2		2-4-4 (8)			22				
15		becomes green brown, w/ clay and trace sand.	SPT 1-3		3-4-3 (7)			41				92
20		becomes brown, w/ sand.	SPT 1-4		3-5-8 (13)			11				
25		becomes green brown, w/ trace clay.	SPT 1-5		5-3-4 (7)			30				
		(CL) **CLAY:** Green brown, stiff w/ silt.										
30			SPT 1-6		2-3-4 (7)			38				

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BORING NUMBER B-3

CLIENT El Camino College Compton Center
PROJECT NAME Proposed Instructional Building I
PROJECT NUMBER HE15281-2
PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
30		(CL) **CLAY:** Green brown, stiff w/ silt. *(continued)*										
		(CL-ML) **SILTY CLAY:** Green brown, stiff.										
35			SPT 1-7		5-6-8 (14)			29				
		(ML) **SILT:** Green brown, stiff, w/ fine grained sand.										
40			SPT 1-8		4-6-8 (14)			27				80
		(SP) **POORLY GRADED SAND:** Grey brown, med. dense, medium to fine grained.										
45			SPT 1-9		9-12-15 (27)			20				
	∇											
50		becomes brown, wet.	SPT 1-10		7-7-12 (19)			22				
55		becomes grey brown.	SPT 1-11		8-19-35 (54)			20				

Bottom of borehole at 55.0 feet.

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BORING NUMBER B-4

CLIENT El Camino College Compton Center
PROJECT NAME Proposed Instructional Building I
PROJECT NUMBER HE15281-2
PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221
DATE STARTED 11/3/15 **COMPLETED** 11/3/15
GROUND ELEVATION 63 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Steve Runyan **CHECKED BY** RS
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	SPT BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SM) **SILTY SAND:** Light brown, med. dense.										

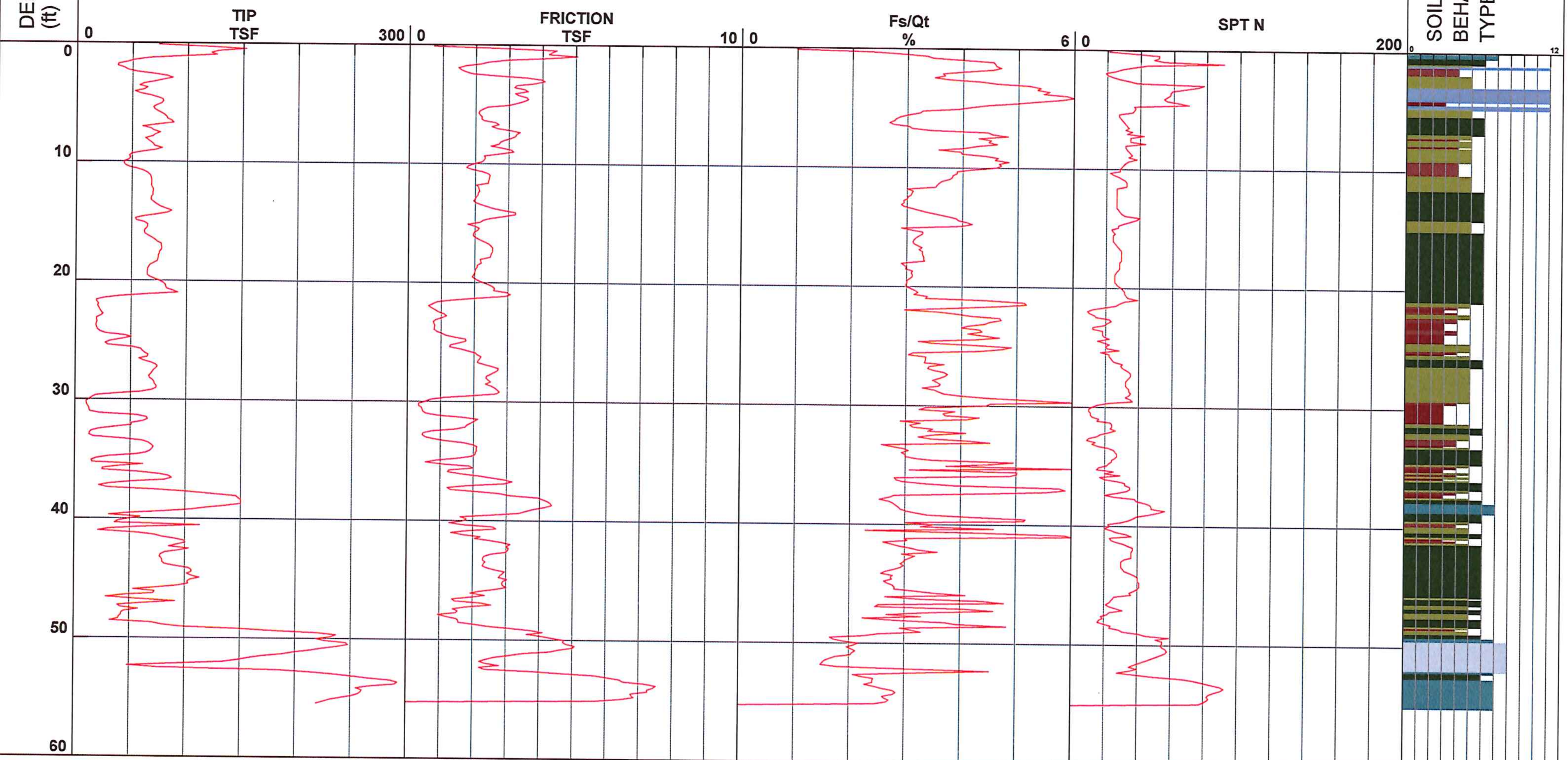
Refusal at 2' due to concrete. Attempted to redrill in another location 10' away and encountered concrete again.
Bottom of borehole at 2.0 feet.

Heider Inspections

ProjeInstructional Bldg I El Camino College Compton		Operator	RC-DG	Filename	SDF(349).cpt
Job Number	150249	Cone Number	DDG1333	GPS	
Hole Number	CPT-01	Date and Time	11/2/2015 11:45:02 AM	Maximum Depth	55.45 ft
EST GW Depth During Test		47.30 ft			

Net Area Ratio .8

CPT DATA



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

Cone size 10cm squared

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

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(349).cpt
CPT Date: 11/2/2015 11:45:02 AM
GW During Test: 47 ft

Sounding ID: CPT-01
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
0.33	120.8	247.5	120.8	2.8	-0.8	2.3	5	silty SAND to sandy SILT	120	4.0	30	48	89	48	-	-	12	1.98	16	N/A	N/A
0.49	152.4	317.8	152.4	4.4	-0.9	2.9	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	10.1	9.9	13	2.00	16	N/A	N/A
0.66	128.1	296.3	128.1	4.3	-1.0	3.3	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	8.5	9.9	16	2.09	16	N/A	N/A
0.82	121.0	289.3	121.0	4.2	-0.8	3.5	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	8.0	9.9	16	2.12	16	N/A	N/A
0.98	125.9	319.2	125.9	5.0	-1.0	4.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	8.3	9.9	18	2.16	16	N/A	N/A
1.15	91.3	279.1	91.3	4.1	-0.8	4.5	9	very stiff fine SOIL	120	2.0	46	73	80	48	-	-	22	2.29	30	N/A	N/A
1.31	65.2	231.5	65.1	3.0	-0.7	4.6	9	very stiff fine SOIL	120	2.0	33	52	68	48	-	-	25	2.38	30	N/A	N/A
1.48	51.3	205.3	51.3	2.4	-1.0	4.6	4	clayy SILT to silty CLAY	115	2.0	26	41	-	-	3.6	9.9	28	2.44	15	N/A	N/A
1.64	46.1	196.9	46.1	2.2	-1.0	4.7	4	clayy SILT to silty CLAY	115	2.0	23	37	-	-	3.3	9.9	30	2.48	15	N/A	N/A
1.80	37.1	174.2	37.1	1.7	-1.0	4.5	4	clayy SILT to silty CLAY	115	2.0	19	30	-	-	2.6	9.9	32	2.53	15	N/A	N/A
1.97	36.5	161.3	36.5	1.5	-1.0	4.0	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.6	9.9	31	2.50	15	N/A	N/A
2.13	42.5	163.2	42.5	1.5	-1.1	3.6	4	clayy SILT to silty CLAY	115	2.0	21	34	-	-	3.0	9.9	27	2.42	15	N/A	N/A
2.30	45.7	170.0	45.6	1.7	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	23	37	-	-	3.2	9.9	27	2.40	15	N/A	N/A
2.46	53.8	179.1	53.8	1.9	-1.2	3.5	5	silty SAND to sandy SILT	120	4.0	13	22	62	47	-	-	24	2.34	16	N/A	N/A
2.62	68.8	213.2	68.8	2.6	-1.3	3.8	5	silty SAND to sandy SILT	120	4.0	17	28	70	48	-	-	22	2.29	16	N/A	N/A
2.79	81.3	254.0	81.3	3.5	-1.4	4.3	9	very stiff fine SOIL	120	2.0	41	65	76	48	-	-	23	2.30	30	N/A	N/A
2.95	86.1	272.6	86.0	4.0	-1.4	4.6	9	very stiff fine SOIL	120	2.0	43	69	78	48	-	-	23	2.31	30	N/A	N/A
3.12	78.3	276.9	78.2	4.1	-1.4	5.2	9	very stiff fine SOIL	120	2.0	39	63	74	47	-	-	25	2.37	30	N/A	N/A
3.28	69.2	265.0	69.1	3.7	-1.4	5.4	9	very stiff fine SOIL	120	2.0	35	55	70	47	-	-	27	2.42	30	N/A	N/A
3.45	60.4	245.0	60.4	3.2	-1.4	5.4	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	28	2.45	30	N/A	N/A
3.61	56.6	243.0	56.6	3.1	-1.4	5.6	9	very stiff fine SOIL	120	2.0	28	45	64	45	-	-	30	2.48	30	N/A	N/A
3.77	63.5	254.8	63.4	3.5	-1.5	5.5	9	very stiff fine SOIL	120	2.0	32	51	68	46	-	-	28	2.44	30	N/A	N/A
3.94	60.7	260.8	60.7	3.6	-1.5	5.9	9	very stiff fine SOIL	120	2.0	30	49	66	45	-	-	30	2.48	30	N/A	N/A
4.10	52.3	247.0	52.3	3.2	-1.5	6.1	9	very stiff fine SOIL	120	2.0	26	42	61	44	-	-	32	2.53	30	N/A	N/A
4.27	57.1	249.6	57.1	3.3	-1.5	5.8	9	very stiff fine SOIL	120	2.0	29	46	64	45	-	-	30	2.49	30	N/A	N/A
4.43	66.3	257.2	66.3	3.5	-1.6	5.3	9	very stiff fine SOIL	120	2.0	33	53	69	45	-	-	27	2.43	30	N/A	N/A
4.59	72.5	257.5	72.5	3.6	-1.7	4.9	9	very stiff fine SOIL	120	2.0	36	58	72	45	-	-	25	2.38	30	N/A	N/A
4.76	77.2	251.5	77.2	3.5	-1.7	4.5	9	very stiff fine SOIL	120	2.0	39	62	74	46	-	-	23	2.32	30	N/A	N/A
4.92	77.8	243.0	77.7	3.3	-1.8	4.2	9	very stiff fine SOIL	120	2.0	39	62	74	45	-	-	23	2.30	30	N/A	N/A
5.09	76.3	231.1	76.2	3.0	-1.8	3.9	8	stiff SAND to clayy SAND	115	1.0	76	100	-	-	5.0	9.9	22	2.28	16	N/A	N/A
5.25	72.1	203.5	72.0	2.4	-1.8	3.3	5	silty SAND to sandy SILT	120	4.0	18	29	72	45	-	-	20	2.24	16	N/A	N/A
5.41	68.9	196.8	68.9	2.2	-1.9	3.2	5	silty SAND to sandy SILT	120	4.0	17	28	70	44	-	-	20	2.24	16	N/A	N/A
5.58	69.8	191.9	69.7	2.1	-1.9	3.0	5	silty SAND to sandy SILT	120	4.0	17	28	71	44	-	-	20	2.22	16	N/A	N/A
5.74	72.5	191.3	72.5	2.1	-1.9	2.9	5	silty SAND to sandy SILT	120	4.0	18	29	72	44	-	-	19	2.19	16	N/A	N/A
5.91	76.0	194.4	76.0	2.1	-2.0	2.8	5	silty SAND to sandy SILT	120	4.0	19	30	74	44	-	-	18	2.17	16	N/A	N/A
6.07	79.3	198.1	79.3	2.2	-2.0	2.8	5	silty SAND to sandy SILT	120	4.0	20	32	75	44	-	-	17	2.15	16	N/A	N/A
6.23	81.1	197.7	81.0	2.2	-2.1	2.7	5	silty SAND to sandy SILT	120	4.0	20	32	76	44	-	-	17	2.14	16	N/A	N/A
6.40	81.8	199.5	81.8	2.2	-2.1	2.8	5	silty SAND to sandy SILT	120	4.0	20	32	75	44	-	-	17	2.15	16	N/A	N/A
6.56	85.6	213.0	85.5	2.6	-2.1	3.0	5	silty SAND to sandy SILT	120	4.0	21	33	76	44	-	-	18	2.17	16	N/A	N/A
6.73	87.2	215.9	87.2	2.7	-2.2	3.1	5	silty SAND to sandy SILT	120	4.0	22	34	77	44	-	-	18	2.18	16	N/A	N/A
6.89	72.7	202.9	72.7	2.5	-2.1	3.4	5	silty SAND to sandy SILT	120	4.0	18	28	70	43	-	-	21	2.26	16	N/A	N/A
7.05	59.4	210.9	59.4	2.6	-2.1	4.5	4	clayy SILT to silty CLAY	115	2.0	30	45	-	-	4.2	9.9	27	2.41	15	N/A	N/A
7.22	66.8	225.4	66.7	3.0	-2.2	4.6	9	very stiff fine SOIL	120	2.0	33	50	67	43	-	-	26	2.39	30	N/A	N/A
7.38	69.1	236.2	69.1	3.3	-2.3	4.8	9	very stiff fine SOIL	120	2.0	35	51	67	43	-	-	27	2.40	30	N/A	N/A
7.55	75.1	229.2	75.1	3.2	-2.3	4.3	9	very stiff fine SOIL	120	2.0	38	55	70	43	-	-	24	2.34	30	N/A	N/A
7.71	70.9	227.6	70.8	3.2	-2.3	4.5	9	very stiff fine SOIL	120	2.0	35	51	68	43	-	-	26	2.38	30	N/A	N/A
7.87	68.6	221.3	68.5	3.1	-2.6	4.5	9	very stiff fine SOIL	120	2.0	34	49	66	43	-	-	26	2.39	30	N/A	N/A
8.04	62.0	213.2	61.9	2.9	-2.4	4.6	4	clayy SILT to silty CLAY	115	2.0	31	44	-	-	4.3	9.9	28	2.43	15	N/A	N/A
8.20	64.2	206.1	64.1	2.7	-2.3	4.3	4	clayy SILT to silty CLAY	115	2.0	32	45	-	-	4.5	9.9	26	2.40	15	N/A	N/A
8.37	66.9	202.4	66.9	2.7	-2.4	4.1	4	clayy SILT to silty CLAY	115	2.0	33	46	-	-	4.7	9.9	25	2.37	15	N/A	N/A
8.53	68.9	190.9	68.9	2.5	-2.4	3.6	5	silty SAND to sandy SILT	120	4.0	17	24	65	42	-	-	23	2.32	16	N/A	N/A
8.69	70.1	203.3	70.0	2.8	-2.4	4.0	4	clayy SILT to silty CLAY	115	2.0	35	47	-	-	4.9	9.9	25	2.36	15	N/A	N/A
8.86	77.0	213.4	77.0	3.1	-2.5	4.0	9	very stiff fine SOIL	120	2.0	39	52	68	43	-	-	24	2.33	30	N/A	N/A
9.02	71.3	216.4	71.2	3.1	-2.4	4.4	9	very stiff fine SOIL	120	2.0	36	47	65	42	-	-	26	2.39	30	N/A	N/A
9.19	58.7	201.5	58.6	2.7	-2.4	4.7	4	clayy SILT to silty CLAY	115	2.0	29	39	-	-	4.1	9.9	29	2.47	15	N/A	N/A
9.35	49.3	183.6	49.3	2.3	-2.4	4.6	4	clayy SILT to silty CLAY	115	2.0	25	32	-	-	3.4	9.9	31	2.52	15	N/A	N/A
9.51	47.4	185.2	47.3	2.3	-2.5	4.9	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.3	9.9	33	2.55	15	N/A	N/A
9.68	48.5	182.7	48.5	2.3	-2.4	4.7	4	clayy SILT to silty CLAY	115	2.0	24	31	-	-	3.4	9.9	32	2.53	15	N/A	N/A
9.84	47.1	180.4	47.0	2.2	-2.4	4.8	4	clayy SILT to silty CLAY	115	2.0	24	30	-	-	3.3	9.9	33	2.55	15	N/A	N/A
10.01	42.8	170.2	42.8	2.0	-2.4	4.7	4	clayy SILT to silty CLAY	115	2.0	21	27	-	-	3.0	9.9	34	2.57	15	N/A	N/A
10.17	42.8	159.6	42.7	1.8	-2.8	4.2	4	clayy SILT to silty CLAY	115	2.0	21	27	-	-	3.0	9.9	33	2.54	15	N/A	N/A
10.34	44.4	156.0	44.3	1.7	-2.8	4.0	4	clayy SILT to silty CLAY	115	2.0	22	28	-	-	3.1	9.9	31	2.51	15	N/A	N/A
10.50	48.9	162.2	48.9	1.9	-2.7	3.9	4	clayy SILT to silty CLAY	115	2.0	24	30	-	-	3.4	9.9	30	2.48	15	N/A	N/A
10.66	57.2	171.9	57.2	2.2	-2.5	3.9	4	clayy SILT to silty CLAY	115	2.0	29	35	-	-	4.0	9.9	28	2.43	15	N/A	N/A
10.83	62.2	177.7	62.1	2.4	-2.5	3.8	4	clayy SILT to silty CLAY	115	2.0	31	38	-	-	4.3	9.9	27	2.41	15	N/A	N/A
10.99	64.5	179.2	64.5	2.4	-2.5	3.8	4	clayy SILT to silty CLAY	115	2.0	32	39	-	-	4.5	9.9	26	2.40	15	N/A	N/A
11.16	66.7	177.3	66.6	2.4	-2.5	3.7	4	clayy SILT to silty CLAY	115	2.0	33	40	-	-	4.7	9.9	25	2.38	15	N/A	N/A
11.32	67.3	176.1	67.2	2.4	-2.5	3.6	4	clayy SILT to silty CLAY	115	2.0	34	40	-	-	4.7	9.9	25	2.37	15	N/A	N/A
11.48	67.6	174.9	67.5	2.4	-2.5	3.6	4	clayy SILT to silty CLAY	115	2.0	34	40	-	-	4.7	9.9	25	2.37	15	N/A	N/A
11.65	67.8	174.1	67.8	2.4	-2.5	3.6	4	clayy SILT to silty CLAY	115	2.0	34	40	-	-	4.7	9.9	25	2.37	15	N/A	N/A
11.81	67.7	158.9	67.6	2.0	-2.4	3.0	5	silty SAND to sandy SILT	120	4.0	17	20	59	40	-	-	23	2.32	16	N/A	N/A
11.98	67.3	161.0	67.2	2.1	-2.4	3.1	5	silty SAND to sandy SILT	120	4.0	17	19	59	40	-	-	24	2.34	16	N/A	N/A
12.14	68.3	160.8	68.2	2.1	-2.3	3.1	5	silty SAND to sandy SILT	120	4.0	17	20	59	40	-	-	24	2.33	16	N/A	N/A
12.30	69.3	161.1	69.2	2.1	-2.3	3.1	5	silty SAND to sandy SILT	120	4.0	17	20	59	40	-	-	24	2.33	16	N/A	N/A
12.47	69.2	158.9	69.1	2.1	-2.3	3.0	5	silty SAND to sandy SILT	120	4.0	17	20	59	40	-	-	23	2.32	16	N/A	N/A
12.63	68.9	157.8	68.8	2.1	-2.2	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	59	40	-	-	23	2.33	16	N/A	N/A
12.80	69.1	155.6	69.0	2.0	-2.2	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	58	40	-	-	23	2.32	16	N/A	N/A
12.96	67.6	153.7	67.5	2.0	-2.2	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	58	40	-	-	24	2.33	16	N/A	N/A
13.12	67.2	151.5	67.2	1.9	-2.2	2.9	5	silty SAND to sandy SILT	120	4.0	17	19	57	40	-	-	24	2.33	16	N/A	N/A
13.29	68.0	153.3	67.9	2.0	-2.2	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	57	40	-	-	24	2.33	16	N/A	N/A
13.45	70.4	158.8	70.4	2.2	-2.2	3.1	5	silty SAND to sandy SILT	120	4.0	18	19	58	40	-	-	24	2.34	16	N/A	N/A
13.62	72.8	165.8	72.8	2.4	-2.2	3.3	5	silty SAND to sandy SILT	120	4.0	18	20	59	40	-	-	24	2.34	16	N/A	N/A
13.78	75.8	172.0	75.7	2.5	-2.2	3.4	5	silty SAND to sandy SILT	120	4.0	19	20	60	40	-	-	24	2.35	16	N/A	N/A
13.94	80.7	182.2	80.6	2.9	-2.2	3.6	4	clayy SILT to silty CLAY	115	2.0	40	43	-	-	5.6	9.9	24	2.35	15	N/A	N/A
14.11	86.0	193.2	85.9	3.2	-2.2	3.8	4	clayy SILT to silty CLAY	115	2.0	43	46	-	-	6.0	9.9	24	2.35	15	N/A	N/A
14.27	82.5	193.2	82.4	3.2	-2.2	3.9	4	clayy SILT to silty CLAY	115	2.0	41	44	-	-	5.8	9.9	25	2.38	15	N/A	N/A
14.44	72.4	181.9	72.3	2.8	-2.2	4.0	4	clayy SILT to silty CLAY	115	2.0	36	38	-	-	5.1	9.9	27	2.42	15	N/A	N/A
14.60	60.0	170.3	59.9	2.5	-2.2	4.1	4	clayy SILT to silty CLAY	115	2.0	30	31	-	-	4.2	9.9	30	2.49	15	N/A	N/A
14.76	53.4	163.4	53.4	2.2	-2.6	4.2	4	clayy SILT to silty CLAY	115	2.0	27	28	-	-	3.7	9.9	32	2.53	15	N/A	N/A
14.93	54.0	159.3	54.0	2.1	-2.9	4.0	4	clayy SILT to silty CLAY	115	2.0	27	28	-	-	3.8	9.9	31	2.52	15	N/A	N/A
15.09	61.1	140.7	61.1	1.8	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	15	16	52	38	-	-	26	2.38	16	N/A	N/A
15.26	64.5	149.2	64.5	2.0	-2.3	3.1	4	clayy SILT to silty CLAY	115	2.0	32	33	-	-	4.5	9.9	26	2.39	15	N/A	N/A
15.42	64.3	153.3	64.2	2.1	-2.3	3.3	4	clayy SILT to silty CLAY	115	2.0	32	33	-	-	4.5	9.9	27	2.41	15	N/A	N/A

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(349).cpt
CPT Date: 11/2/2015 11:45:02 AM
GW During Test: 47 ft

Page: 2
Sounding ID: CPT-01
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	63.3	151.8	63.3	2.1	-2.3	3.3	4	clayy SILT to silty CLAY	115	2.0	32	32	-	-	4.4	9.9	27	2.41	15	N/A	N/A
15.75	61.7	147.9	61.6	2.0	-2.3	3.3	4	clayy SILT to silty CLAY	115	2.0	31	31	-	-	4.3	9.9	27	2.42	15	N/A	N/A
15.91	61.5	146.1	61.4	1.9	-2.4	3.2	4	clayy SILT to silty CLAY	115	2.0	31	31	-	-	4.3	9.9	27	2.41	15	N/A	N/A
16.08	62.1	145.5	62.0	1.9	-2.2	3.2	4	clayy SILT to silty CLAY	115	2.0	31	31	-	-	4.3	9.9	27	2.41	15	N/A	N/A
16.24	65.4	148.2	65.4	2.0	-2.2	3.2	4	clayy SILT to silty CLAY	115	2.0	33	33	-	-	4.6	9.9	26	2.39	15	N/A	N/A
16.40	68.7	151.8	68.6	2.2	-2.2	3.2	4	clayy SILT to silty CLAY	115	2.0	34	34	-	-	4.8	9.9	26	2.38	15	N/A	N/A
16.57	71.1	155.6	71.0	2.3	-2.1	3.2	4	clayy SILT to silty CLAY	115	2.0	36	35	-	-	5.0	9.9	26	2.38	15	N/A	N/A
16.73	73.2	159.5	73.2	2.4	-2.1	3.3	4	clayy SILT to silty CLAY	115	2.0	37	36	-	-	5.1	9.9	26	2.38	15	N/A	N/A
16.90	76.7	161.2	76.7	2.5	-2.1	3.3	5	silty SAND to sandy SILT	120	4.0	19	19	57	39	-	-	25	2.36	16	N/A	N/A
17.06	76.9	162.9	76.9	2.5	-2.1	3.3	4	clayy SILT to silty CLAY	115	2.0	38	37	-	-	5.4	9.9	25	2.37	15	N/A	N/A
17.23	77.2	162.7	77.2	2.5	-2.0	3.3	4	clayy SILT to silty CLAY	115	2.0	39	37	-	-	5.4	9.9	25	2.37	15	N/A	N/A
17.39	76.9	162.4	76.9	2.5	-2.0	3.3	4	clayy SILT to silty CLAY	115	2.0	38	37	-	-	5.4	9.9	25	2.37	15	N/A	N/A
17.55	75.2	160.7	75.1	2.5	-1.9	3.3	4	clayy SILT to silty CLAY	115	2.0	38	36	-	-	5.2	9.9	26	2.38	15	N/A	N/A
17.72	75.0	160.0	74.9	2.5	-1.9	3.3	4	clayy SILT to silty CLAY	115	2.0	37	36	-	-	5.2	9.9	26	2.38	15	N/A	N/A
17.88	74.0	159.2	74.0	2.5	-1.9	3.4	4	clayy SILT to silty CLAY	115	2.0	37	35	-	-	5.2	9.9	26	2.39	15	N/A	N/A
18.05	74.2	147.8	74.2	2.2	-1.9	2.9	5	silty SAND to sandy SILT	120	4.0	19	18	55	39	-	-	24	2.35	16	N/A	N/A
18.37	73.3	148.8	73.3	2.2	-1.9	3.0	5	silty SAND to sandy SILT	120	4.0	18	17	55	38	-	-	25	2.36	16	N/A	N/A
18.54	69.7	144.8	69.6	2.1	-1.8	3.0	5	silty SAND to sandy SILT	120	4.0	17	16	53	38	-	-	26	2.38	16	N/A	N/A
18.70	66.6	144.7	66.5	2.1	-1.8	3.2	4	clayy SILT to silty CLAY	115	2.0	33	31	-	-	4.6	9.9	27	2.41	15	N/A	N/A
18.87	65.5	142.9	65.5	2.0	-1.7	3.1	4	clayy SILT to silty CLAY	115	2.0	33	30	-	-	4.5	9.9	27	2.41	15	N/A	N/A
19.03	64.6	142.5	64.6	2.0	-1.7	3.2	4	clayy SILT to silty CLAY	115	2.0	32	30	-	-	4.5	9.9	27	2.42	15	N/A	N/A
19.19	64.4	141.8	64.4	2.0	-1.7	3.2	4	clayy SILT to silty CLAY	115	2.0	32	29	-	-	4.5	9.9	27	2.42	15	N/A	N/A
19.36	64.2	140.1	64.2	2.0	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	29	-	-	4.5	9.9	27	2.42	15	N/A	N/A
19.52	64.3	138.7	64.3	1.9	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	32	29	-	-	4.5	9.9	27	2.42	15	N/A	N/A
19.69	66.2	140.5	66.1	2.0	-1.6	3.1	4	clayy SILT to silty CLAY	115	2.0	33	30	-	-	4.6	9.9	27	2.41	15	N/A	N/A
19.85	70.2	143.4	70.2	2.1	-1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	35	32	-	-	4.9	9.9	26	2.39	15	N/A	N/A
20.01	74.9	147.6	74.8	2.2	-1.6	3.0	5	silty SAND to sandy SILT	120	4.0	19	17	54	38	-	-	25	2.37	16	N/A	N/A
20.18	78.6	152.8	78.6	2.4	-1.6	3.1	5	silty SAND to sandy SILT	120	4.0	20	18	55	38	-	-	25	2.37	16	N/A	N/A
20.34	80.6	156.3	80.6	2.5	-1.7	3.2	5	silty SAND to sandy SILT	120	4.0	20	18	56	38	-	-	25	2.37	16	N/A	N/A
20.51	80.9	157.8	80.9	2.6	-1.6	3.2	4	clayy SILT to silty CLAY	115	2.0	40	36	-	-	5.6	9.9	25	2.37	15	N/A	N/A
20.67	81.9	156.5	81.9	2.6	-1.6	3.2	5	silty SAND to sandy SILT	120	4.0	20	18	56	38	-	-	25	2.36	16	N/A	N/A
20.83	87.7	168.2	87.6	3.0	-1.6	3.4	4	clayy SILT to silty CLAY	115	2.0	44	38	-	-	6.1	9.9	25	2.37	15	N/A	N/A
21.00	91.8	170.8	91.8	3.1	-1.6	3.4	5	silty SAND to sandy SILT	120	4.0	23	20	60	39	-	-	24	2.35	16	N/A	N/A
21.16	66.1	172.6	66.1	2.9	-1.6	4.5	4	clayy SILT to silty CLAY	115	2.0	33	29	-	-	4.6	9.9	33	2.54	15	N/A	N/A
21.33	39.0	-	39.0	2.0	-1.4	5.3	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.7	9.9	45	2.78	15	N/A	N/A
21.49	25.1	-	25.1	1.3	-1.5	5.4	3	silty CLAY to CLAY	115	1.5	17	13	-	-	1.7	6.2	54	2.94	15	N/A	N/A
21.65	18.6	-	18.6	0.9	-0.8	5.0	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.2	4.5	60	3.02	15	N/A	N/A
21.82	19.1	-	19.1	0.7	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	4.6	56	2.97	15	N/A	N/A
21.98	20.7	-	20.7	0.6	-0.3	3.2	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.4	5.0	50	2.87	15	N/A	N/A
22.15	19.8	-	19.8	0.7	-0.1	3.8	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	4.7	54	2.94	15	N/A	N/A
22.31	20.8	-	20.8	0.8	0.2	4.2	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.4	4.9	55	2.94	15	N/A	N/A
22.47	21.7	-	21.8	0.9	0.4	4.4	3	silty CLAY to CLAY	115	1.5	14	11	-	-	1.4	5.1	55	2.95	15	N/A	N/A
22.64	23.0	-	23.0	1.1	0.6	5.0	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.5	5.4	56	2.96	15	N/A	N/A
22.80	24.7	-	24.7	1.2	0.3	5.0	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	5.8	54	2.94	15	N/A	N/A
22.97	23.0	-	23.0	1.0	0.5	4.8	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.5	5.3	56	2.96	15	N/A	N/A
23.13	18.9	-	18.9	0.8	0.6	4.7	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.2	4.3	60	3.03	15	N/A	N/A
23.30	18.6	-	18.6	0.8	0.8	4.4	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.2	60	3.02	15	N/A	N/A
23.46	19.4	-	19.5	0.8	0.9	4.3	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.3	58	2.99	15	N/A	N/A
23.62	18.7	-	18.7	0.8	1.1	4.7	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.1	61	3.03	15	N/A	N/A
23.79	18.3	-	18.3	0.8	1.1	4.7	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.0	62	3.05	15	N/A	N/A
23.95	19.1	-	19.1	0.8	1.2	4.4	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.2	60	3.02	15	N/A	N/A
24.12	19.8	-	19.8	0.9	1.3	4.7	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.3	60	3.02	15	N/A	N/A
24.28	21.9	-	21.9	1.0	1.4	5.0	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.4	4.8	59	3.00	15	N/A	N/A
24.44	27.1	-	27.2	1.1	1.4	4.5	3	silty CLAY to CLAY	115	1.5	18	13	-	-	1.8	5.9	52	2.90	15	N/A	N/A
24.61	44.6	-	44.6	1.4	0.6	3.3	4	clayy SILT to silty CLAY	115	2.0	22	15	-	-	3.1	9.9	38	2.65	15	N/A	N/A
24.77	50.1	-	50.1	1.7	-1.7	3.6	4	clayy SILT to silty CLAY	115	2.0	25	17	-	-	3.4	9.9	37	2.63	15	N/A	N/A
24.94	41.2	-	41.2	1.7	-2.0	4.4	3	silty CLAY to CLAY	115	1.5	27	19	-	-	2.8	9.0	44	2.76	15	N/A	N/A
25.10	31.2	-	31.2	1.5	-1.9	5.1	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	6.7	52	2.90	15	N/A	N/A
25.26	27.0	-	27.0	1.3	-2.0	5.0	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.8	5.7	55	2.94	15	N/A	N/A
25.43	29.1	-	29.1	1.3	-1.9	4.6	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	6.1	52	2.89	15	N/A	N/A
25.59	50.7	-	50.7	1.6	-2.3	3.2	4	clayy SILT to silty CLAY	115	2.0	25	17	-	-	3.5	9.9	36	2.61	15	N/A	N/A
25.76	59.0	128.0	59.0	1.8	-1.3	3.1	4	clayy SILT to silty CLAY	115	2.0	29	23	-	-	4.1	9.9	30	2.49	15	N/A	N/A
25.92	60.4	136.1	60.4	2.0	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	30	24	-	-	4.2	9.9	31	2.52	15	N/A	N/A
26.08	62.5	137.8	62.5	2.1	-1.7	3.4	4	clayy SILT to silty CLAY	115	2.0	31	25	-	-	4.3	9.9	31	2.51	15	N/A	N/A
26.25	65.7	140.3	65.6	2.2	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	33	26	-	-	4.5	9.9	30	2.49	15	N/A	N/A
26.41	65.0	139.1	65.0	2.2	-1.0	3.4	4	clayy SILT to silty CLAY	115	2.0	32	25	-	-	4.5	9.9	30	2.49	15	N/A	N/A
26.58	57.4	-	57.3	2.1	-1.4	3.8	4	clayy SILT to silty CLAY	115	2.0	29	18	-	-	3.9	9.9	37	2.63	15	N/A	N/A
26.74	61.3	137.6	61.3	2.1	-1.6	3.5	4	clayy SILT to silty CLAY	115	2.0	31	24	-	-	4.2	9.9	32	2.52	15	N/A	N/A
26.90	67.6	142.5	67.6	2.3	-0.9	3.5	4	clayy SILT to silty CLAY	115	2.0	34	26	-	-	4.7	9.9	30	2.49	15	N/A	N/A
27.07	72.3	148.8	72.2	2.5	-0.9	3.6	4	clayy SILT to silty CLAY	115	2.0	36	28	-	-	5.0	9.9	30	2.48	15	N/A	N/A
27.23	73.9	154.6	73.9	2.7	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	37	28	-	-	5.1	9.9	30	2.49	15	N/A	N/A
27.40	72.4	154.5	72.4	2.7	-0.9	3.8	4	clayy SILT to silty CLAY	115	2.0	36	28	-	-	5.0	9.9	31	2.50	15	N/A	N/A
27.56	70.5	151.4	70.5	2.6	-0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	35	27	-	-	4.9	9.9	31	2.51	15	N/A	N/A
27.72	69.1	147.8	69.1	2.5	-0.8	3.7	4	clayy SILT to silty CLAY	115	2.0	35	26	-	-	4.8	9.9	31	2.51	15	N/A	N/A
27.89	68.0	143.8	68.0	2.4	-0.9	3.6	4	clayy SILT to silty CLAY	115	2.0	34	26	-	-	4.7	9.9	31	2.50	15	N/A	N/A
28.05	66.3	143.9	66.3	2.4	-0.9	3.6	4	clayy SILT to silty CLAY	115	2.0	33	25	-	-	4.6	9.9	31	2.52	15	N/A	N/A
28.22	67.1	145.9	67.1	2.4	-1.0	3.7	4	clayy SILT to silty CLAY	115	2.0	34	25	-	-	4.6	9.9	32	2.52	15	N/A	N/A
28.38	69.5	147.3	69.5	2.5	-0.8	3.7	4	clayy SILT to silty CLAY	115	2.0	35	26	-	-	4.8	9.9	31	2.51	15	N/A	N/A
28.54	71.0	141.4	71.0	2.3	-0.9	3.4	4	clayy SILT to silty CLAY	115	2.0	36	27	-	-	4.9	9.9	30	2.48	15	N/A	N/A
28.71	71.3	146.7	71.3	2.5	-0.9	3.6	4	clayy SILT to silty CLAY	115	2.0	36	27	-	-	4.9	9.9	30	2.49	15	N/A	N/A
28.87	73.0	149.8	73.0	2.6	-1.1	3.7	4	clayy SILT to silty CLAY	115	2.0	37	27	-	-	5.0	9.9	30	2.49	15	N/A	N/A
29.04	73.1	151.9	73.1	2.7	-1.1	3.8	4	clayy SILT to silty CLAY	115	2.0	37	27	-	-	5.0	9.9	31	2.50	15	N/A	N/A
29.20	69.3	-	69.3	2.8	-1.0	4.1	4	clayy SILT to silty CLAY	115	2.0	35	20	-	-	4.8	9.9	36	2.62	15	N/A	N/A
29.36	59.5	-	59.5	2.7	-0.9	4.6	3	silty CLAY to CLAY	115	1.5	40	23	-	-	4.1	9.9	41	2.71	15	N/A	N/A
29.53	36.1	-	36.1	1.9	-0.9	5.6	3	silty CLAY to CLAY	115	1.5	24	14	-	-	2.4	6.6	54	2.93	15	N/A	N/A
29.69	18.6	-	18.6	1.1	-0.8	6.7	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	3.2	74	3.22	15	N/A	N/A
29.86	15.2	-	15.2	0.7	-0.1	5.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	2.6	75	3.22	15	N/A	N/A
30.02	12.4	-	12.4	0.6	0.5	5.2	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	2.0	82	3.31	15	N/A	N/A
30.19	9.9	-	9.9	0.3	0.6	4.1	3	silty CLAY to CLAY	115	1.5	7	4	-	-	0.6	1.5	85	3.35	15	N/A	N/A
30.35	10.1	-	10.1	0.3	0.7	3.9	3	silty CLAY to CLAY	115	1.5	7	4	-	-	0.6	1.6	84	3.33	15	N/A	N/A
30.51	10.9	-	10.9	0.4	0.8	4.6	3	silty CLAY to CLAY	115	1.5	7	4	-	-	0.6	1.7	85	3.34	15	N/A	N/A
30.68	12.2	-	12.3	0.4	0.9	4.3	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.7	1.9	79	3.28	15	N/A	N/A
30.84	12.7	-	12.7	0.5	1.0	4.3	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	2.0	78	3.27	15	N/A	N/A
31.01	13.1	-	13.2	0.6	1.1	5.0	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.1	80	3.29	15	N/A	N/A

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(349).cpt
CPT Date: 11/2/2015 11:45:02 AM
GW During Test: 47 ft

Sounding ID: CPT-01
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR - -	* Fin Ic %	* Ic SBT Indx	* Nk - -	* Vol Strn %	* Cycl SStn %
31.17	22.9	-	22.9	0.9	1.2	4.4	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	3.8	62	3.05	15	N/A	N/A
31.33	55.6	-	55.6	1.6	-1.2	3.0	4	clayy SILT to silty CLAY	115	2.0	28	15	-	-	3.8	9.7	37	2.62	15	N/A	N/A
31.50	64.7	-	64.6	2.1	-1.2	3.4	4	clayy SILT to silty CLAY	115	2.0	32	18	-	-	4.4	9.9	36	2.61	15	N/A	N/A
31.66	65.4	129.2	65.3	2.0	-1.1	3.2	4	clayy SILT to silty CLAY	115	2.0	33	23	-	-	4.5	9.9	31	2.50	15	N/A	N/A
31.83	61.1	-	61.1	1.9	-1.1	3.2	4	clayy SILT to silty CLAY	115	2.0	31	16	-	-	4.2	9.9	36	2.62	15	N/A	N/A
31.99	51.3	-	51.3	1.8	-1.7	3.6	4	clayy SILT to silty CLAY	115	2.0	26	14	-	-	3.5	8.7	41	2.71	15	N/A	N/A
32.15	51.1	-	51.1	1.7	-2.3	3.5	4	clayy SILT to silty CLAY	115	2.0	26	14	-	-	3.5	8.7	41	2.71	15	N/A	N/A
32.32	35.6	-	35.6	1.5	-2.0	4.3	3	silty CLAY to CLAY	115	1.5	24	13	-	-	2.4	5.9	51	2.89	15	N/A	N/A
32.48	21.6	-	21.6	0.8	-1.0	3.8	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	3.4	61	3.04	15	N/A	N/A
32.65	14.6	-	14.6	0.5	-0.8	3.7	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.2	72	3.19	15	N/A	N/A
32.81	13.0	-	13.0	0.5	-0.6	4.1	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	1.9	78	3.27	15	N/A	N/A
32.97	12.9	-	12.9	0.5	-0.4	4.9	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.8	1.9	83	3.32	15	N/A	N/A
33.14	16.4	-	16.4	0.7	-0.3	5.1	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	2.5	76	3.23	15	N/A	N/A
33.30	44.9	-	44.9	1.2	-0.6	2.7	4	clayy SILT to silty CLAY	115	2.0	22	12	-	-	3.0	7.3	40	2.69	15	N/A	N/A
33.47	60.7	-	60.7	1.7	-1.2	2.8	4	clayy SILT to silty CLAY	115	2.0	30	16	-	-	4.2	9.9	35	2.60	15	N/A	N/A
33.63	66.3	125.9	66.3	2.0	-1.2	3.0	4	clayy SILT to silty CLAY	115	2.0	33	23	-	-	4.5	9.9	30	2.49	15	N/A	N/A
33.79	68.7	129.7	68.7	2.1	-0.9	3.1	4	clayy SILT to silty CLAY	115	2.0	34	24	-	-	4.7	9.9	30	2.49	15	N/A	N/A
33.96	70.8	128.1	70.8	2.1	-0.7	3.0	4	clayy SILT to silty CLAY	115	2.0	35	24	-	-	4.9	9.9	29	2.47	15	N/A	N/A
34.12	69.7	128.9	69.6	2.1	-0.9	3.1	4	clayy SILT to silty CLAY	115	2.0	35	24	-	-	4.8	9.9	30	2.48	15	N/A	N/A
34.29	68.3	127.7	68.2	2.0	-0.9	3.1	4	clayy SILT to silty CLAY	115	2.0	34	23	-	-	4.7	9.9	30	2.49	15	N/A	N/A
34.45	64.2	-	64.2	2.0	-0.9	3.3	4	clayy SILT to silty CLAY	115	2.0	32	16	-	-	4.4	9.9	37	2.63	15	N/A	N/A
34.61	55.3	-	55.3	1.9	-0.7	3.6	4	clayy SILT to silty CLAY	115	2.0	28	14	-	-	3.8	8.7	41	2.71	15	N/A	N/A
34.78	30.5	-	30.5	1.5	0.1	5.3	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	4.6	60	3.03	15	N/A	N/A
34.94	19.6	-	19.7	0.9	1.5	5.1	3	silty CLAY to CLAY	115	1.5	13	6	-	-	1.2	2.9	72	3.18	15	N/A	N/A
35.11	14.9	-	15.0	0.6	1.8	4.3	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.1	77	3.25	15	N/A	N/A
35.27	15.7	-	15.8	1.1	2.0	7.8	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	2.2	88	3.39	15	N/A	N/A
35.43	61.4	-	61.3	1.9	-2.5	3.2	4	clayy SILT to silty CLAY	115	2.0	31	15	-	-	4.2	9.5	38	2.65	15	N/A	N/A
35.60	39.2	-	39.2	2.0	-0.6	5.3	3	silty CLAY to CLAY	115	1.5	26	13	-	-	2.6	5.9	55	2.95	15	N/A	N/A
35.76	25.1	-	25.1	1.3	-0.2	5.5	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.6	3.7	67	3.12	15	N/A	N/A
35.93	25.0	-	25.0	1.2	0.1	5.3	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.6	3.6	67	3.11	15	N/A	N/A
36.09	58.6	-	58.5	1.6	-0.7	2.9	4	clayy SILT to silty CLAY	115	2.0	29	14	-	-	4.0	8.9	38	2.65	15	N/A	N/A
36.26	76.5	128.4	76.5	2.2	-1.8	2.9	4	clayy SILT to silty CLAY	115	2.0	38	26	-	-	5.3	9.9	28	2.45	15	N/A	N/A
36.42	84.9	136.7	84.9	2.5	-0.7	3.0	4	clayy SILT to silty CLAY	115	2.0	42	28	-	-	5.8	9.9	27	2.42	15	N/A	N/A
36.58	87.5	148.1	87.5	2.9	-0.7	3.4	4	clayy SILT to silty CLAY	115	2.0	44	29	-	-	6.0	9.9	29	2.45	15	N/A	N/A
36.75	81.2	-	81.2	3.2	-0.7	4.0	4	clayy SILT to silty CLAY	115	2.0	41	19	-	-	5.6	9.9	37	2.63	15	N/A	N/A
36.91	50.6	-	50.5	2.9	-0.6	6.0	3	silty CLAY to CLAY	115	1.5	34	16	-	-	3.4	7.4	53	2.91	15	N/A	N/A
37.08	31.3	-	31.2	1.8	-0.5	6.3	3	silty CLAY to CLAY	115	1.5	21	10	-	-	2.1	4.5	65	3.09	15	N/A	N/A
37.24	22.0	-	22.0	1.2	-0.3	6.1	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.4	3.0	74	3.21	15	N/A	N/A
37.40	30.1	-	30.1	1.3	-0.1	4.7	3	silty CLAY to CLAY	115	1.5	20	9	-	-	2.0	4.2	60	3.03	15	N/A	N/A
37.57	74.8	125.7	74.8	2.1	-1.0	2.9	4	clayy SILT to silty CLAY	115	2.0	37	25	-	-	5.1	9.9	29	2.46	15	N/A	N/A
37.73	100.9	140.4	100.8	2.8	-5.5	2.8	5	silty SAND to sandy SILT	120	4.0	25	17	53	36	-	-	24	2.35	16	N/A	N/A
37.90	123.3	148.6	123.2	3.1	-2.8	2.6	5	silty SAND to sandy SILT	120	4.0	31	20	60	37	-	-	21	2.27	16	N/A	N/A
38.06	145.8	167.2	145.7	3.9	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	36	24	65	38	-	-	20	2.24	16	N/A	N/A
38.22	147.4	170.2	147.3	4.1	-1.3	2.8	5	silty SAND to sandy SILT	120	4.0	37	24	66	38	-	-	20	2.24	16	N/A	N/A
38.39	150.1	173.2	150.1	4.2	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	38	24	66	38	-	-	20	2.24	16	N/A	N/A
38.55	150.3	174.8	150.3	4.3	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	38	24	66	38	-	-	21	2.25	16	N/A	N/A
38.72	149.8	175.3	149.8	4.4	-1.4	3.0	5	silty SAND to sandy SILT	120	4.0	37	24	66	38	-	-	21	2.25	16	N/A	N/A
38.88	136.5	169.8	136.4	4.1	-1.8	3.1	5	silty SAND to sandy SILT	120	4.0	34	22	63	38	-	-	22	2.29	16	N/A	N/A
39.04	118.7	163.5	118.7	3.8	-2.2	3.3	5	silty SAND to sandy SILT	120	4.0	30	19	58	37	-	-	25	2.36	16	N/A	N/A
39.21	105.1	160.0	105.1	3.6	-1.8	3.5	4	clayy SILT to silty CLAY	115	2.0	53	34	-	-	7.3	9.9	27	2.41	15	N/A	N/A
39.37	80.3	-	80.2	3.4	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	40	17	-	-	5.5	9.9	40	2.68	15	N/A	N/A
39.54	48.0	-	48.0	2.5	-1.9	5.4	3	silty CLAY to CLAY	115	1.5	32	14	-	-	3.2	6.6	53	2.92	15	N/A	N/A
39.70	31.4	-	31.3	1.6	-2.9	5.5	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.1	4.1	64	3.08	15	N/A	N/A
39.86	59.6	-	59.5	1.8	-2.7	3.1	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.0	8.1	40	2.69	15	N/A	N/A
40.03	48.6	-	48.4	1.7	-6.9	3.7	3	silty CLAY to CLAY	115	1.5	32	14	-	-	3.3	6.5	47	2.81	15	N/A	N/A
40.19	39.1	-	38.9	1.3	-6.5	3.5	3	silty CLAY to CLAY	115	1.5	26	11	-	-	2.6	5.2	51	2.88	15	N/A	N/A
40.36	36.5	-	36.3	1.7	-6.3	4.9	3	silty CLAY to CLAY	115	1.5	24	10	-	-	2.4	4.8	58	3.00	15	N/A	N/A
40.52	113.0	133.1	112.9	2.6	-6.9	2.3	5	silty SAND to sandy SILT	120	4.0	28	18	56	36	-	-	22	2.27	16	N/A	N/A
40.68	61.8	-	61.8	2.7	-1.3	4.5	3	silty CLAY to CLAY	115	1.5	41	17	-	-	4.2	8.3	46	2.79	15	N/A	N/A
40.85	30.9	-	30.9	1.8	-1.1	6.4	3	silty CLAY to CLAY	115	1.5	21	9	-	-	2.0	4.0	68	3.13	15	N/A	N/A
41.01	21.5	-	21.5	1.3	-0.9	7.0	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.3	2.6	81	3.30	15	N/A	N/A
41.18	56.8	-	56.8	1.7	-0.7	3.1	4	clayy SILT to silty CLAY	115	2.0	28	12	-	-	3.8	7.5	42	2.72	15	N/A	N/A
41.34	72.9	-	72.9	2.2	-2.1	3.1	4	clayy SILT to silty CLAY	115	2.0	36	15	-	-	5.0	9.7	37	2.64	15	N/A	N/A
41.50	78.5	121.0	78.4	2.0	-2.3	2.7	5	silty SAND to sandy SILT	120	4.0	20	12	43	34	-	-	28	2.44	16	N/A	N/A
41.67	90.1	131.8	90.1	2.5	-2.0	2.8	5	silty SAND to sandy SILT	120	4.0	23	14	48	35	-	-	27	2.41	16	N/A	N/A
41.83	99.0	140.6	99.0	2.9	-1.5	3.0	5	silty SAND to sandy SILT	120	4.0	25	15	51	35	-	-	26	2.39	16	N/A	N/A
42.00	100.3	146.9	100.3	3.1	-1.6	3.2	4	clayy SILT to silty CLAY	115	2.0	50	31	-	-	6.9	9.9	27	2.41	15	N/A	N/A
42.16	92.5	145.4	92.5	3.0	-1.0	3.3	4	clayy SILT to silty CLAY	115	2.0	46	29	-	-	6.4	9.9	29	2.45	15	N/A	N/A
42.32	85.5	-	85.5	3.1	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	43	17	-	-	5.9	9.9	37	2.64	15	N/A	N/A
42.49	103.4	144.2	103.3	3.0	-3.6	3.0	5	silty SAND to sandy SILT	120	4.0	26	16	52	35	-	-	26	2.39	16	N/A	N/A
42.65	93.6	144.0	93.6	3.0	-2.3	3.3	4	clayy SILT to silty CLAY	115	2.0	47	29	-	-	6.4	9.9	28	2.44	15	N/A	N/A
42.82	82.1	-	82.0	2.5	-1.3	3.2	4	clayy SILT to silty CLAY	115	2.0	41	16	-	-	5.6	9.9	36	2.62	15	N/A	N/A
42.98	77.9	-	77.9	2.3	-1.5	3.1	4	clayy SILT to silty CLAY	115	2.0	39	16	-	-	5.3	9.9	37	2.63	15	N/A	N/A
43.15	77.0	-	77.0	2.3	-1.5	3.1	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.3	9.8	37	2.63	15	N/A	N/A
43.31	78.6	-	78.6	2.3	-0.8	3.0	4	clayy SILT to silty CLAY	115	2.0	39	16	-	-	5.4	9.9	36	2.62	15	N/A	N/A
43.47	79.6	-	79.6	2.4	-0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	40	16	-	-	5.4	9.9	36	2.62	15	N/A	N/A
43.64	79.4	-	79.4	2.3	-3.1	3.0	4	clayy SILT to silty CLAY	115	2.0	40	16	-	-	5.4	9.9	36	2.62	15	N/A	N/A
43.80	81.7	126.4	81.6	2.3	-5.3	2.9	4	clayy SILT to silty CLAY	115	2.0	41	25	-	-	5.6	9.9	29	2.45	15	N/A	N/A
43.97	91.4	128.3	91.2	2.4	-7.1	2.7	5	silty SAND to sandy SILT	120	4.0	23	14	48	35	-	-	26	2.40	16	N/A	N/A
44.13	103.1	132.9	103.0	2.7	-9.2	2.6	5	silty SAND to sandy SILT	120	4.0	26	16	51	35	-	-	24	2.35	16	N/A	N/A
44.29	105.9	140.1	105.8	2.9	-6.5	2.9	5	silty SAND to sandy SILT	120	4.0	26	16	52	35	-	-	25	2.37	16	N/A	N/A
44.46	105.7	138.8	105.6	2.9	-5.5	2.8	5	silty SAND to sandy SILT	120	4.0	26	16	52	35	-	-	25	2.36	16	N/A	N/A
44.62	102.1	137.2	101.9	2.8	-6.2	2.8	5	silty SAND to sandy SILT	120	4.0	26	15	51	35	-	-	26	2.38	16	N/A	N/A
44.79	105.9	135.5	105.7	2.8	-7.0	2.7	5	silty SAND to sandy SILT	120	4.0	26	16	52	35	-	-	25	2.35	16	N/A	N/A
44.95	112.9	141.1	112.8	3.0	-7.7	2.7	5	silty SAND to sandy SILT	120	4.0	28	17	54	36	-	-	24	2.34	16	N/A	N/A
45.11	104.6	138.7	104.5	2.9	-6.3	2.8	5	silty SAND to sandy SILT	120	4.0	26	16	52	35	-	-	25	2.37	16	N/A	N/A
45.28	102.1	138.1	102.0	2.9	-6.3	2.9	5	silty SAND to sandy SILT	120	4.0	26	15	51	35	-	-	26	2.39	16	N/A	N/A
45.44	103.2	138.5	103.1	2.9	-7.2	2.9	5	silty SAND to sandy SILT	120	4.0	26	15	51	35	-	-	26	2.38	16	N/A	N/A
45.61	93.9	142.9	93.7	3.0	-8.2	3.3	4	clayy SILT to silty CLAY	115	2.0	47	28	-	-	6.4	9.9	29	2.46	15	N/A	N/A
45.77	75.5	-	75.4	2.7	-8.7	3.7	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.1	9.0	41	2.70	15	N/A	N/A
45.93	53.6	-	53.4	2.2	-8.6	4.3	3	silty CLAY to CLAY	115	1.5	36	13	-	-	3.6	6.3	50	2.87	15	N/A	N/A
46.10	72.7	-	72.6	1.9	-8.6	2.8	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	5.0	8.6	37	2.64	15	N/A	N/A
46.26	71.7	-	71.5	2.4	-9.2	3.4	4	clayy SILT to silty CLAY	115	2.0	36	14	-	-	4.9	8.4	41	2.70	15	N/A	N/A
46.43	44.8	-	44.6	2.0	-9.3	4.7	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	5.1	55	2.95	15	N/A	N/A

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(349).cpt
CPT Date: 11/2/2015 11:45:02 AM
GW During Test: 47 ft

Sounding ID: CPT-01
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
46.59	28.9	-	28.7	1.4	-9.1	5.3	3	silty CLAY to CLAY	115	1.5	19	7	-	-	1.8	3.2	69	3.15	15	N/A	N/A
46.75	57.7	-	57.5	1.5	-9.0	2.7	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	3.9	6.7	41	2.71	15	N/A	N/A
46.92	91.1	122.0	90.9	2.2	-9.7	2.5	5	silty SAND to sandy SILT	120	4.0	23	13	46	34	-	-	26	2.39	16	N/A	N/A
47.08	62.8	-	62.6	2.6	-10.0	4.3	3	silty CLAY to CLAY	115	1.5	42	16	-	-	4.2	7.2	47	2.81	15	-	-
47.25	39.2	-	39.0	1.8	-9.8	4.9	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	4.4	60	3.02	15	-	-
47.41	41.7	-	41.5	1.4	-9.7	3.6	3	silty CLAY to CLAY	115	1.5	28	10	-	-	2.8	4.7	52	2.91	15	-	-
47.57	57.7	-	57.5	1.5	-9.7	2.8	4	clayy SILT to silty CLAY	115	2.0	29	11	-	-	3.9	6.6	42	2.72	15	-	-
47.74	45.4	-	45.2	1.5	-9.6	3.5	3	silty CLAY to CLAY	115	1.5	30	11	-	-	3.0	5.1	50	2.87	15	-	-
47.90	42.7	-	42.5	1.0	-9.6	2.4	4	clayy SILT to silty CLAY	115	2.0	21	8	-	-	2.8	4.8	46	2.80	15	-	-
48.07	42.3	-	42.2	1.2	-9.6	3.1	3	silty CLAY to CLAY	115	1.5	28	11	-	-	2.8	4.7	50	2.86	15	-	-
48.23	40.6	-	40.4	1.5	-9.6	4.0	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.7	4.5	55	2.95	15	-	-
48.39	39.9	-	39.7	1.6	-9.2	4.2	3	silty CLAY to CLAY	115	1.5	27	10	-	-	2.6	4.4	56	2.97	15	-	-
48.56	32.5	-	32.3	1.6	-9.1	5.3	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.1	3.5	66	3.10	15	-	-
48.72	70.4	-	70.2	2.1	-9.3	3.0	4	clayy SILT to silty CLAY	115	2.0	35	13	-	-	4.8	8.0	39	2.68	15	-	-
48.89	78.9	-	78.7	2.5	-9.4	3.2	4	clayy SILT to silty CLAY	115	2.0	39	15	-	-	5.4	9.0	38	2.65	15	-	-
49.05	95.7	-	95.5	3.1	-9.4	3.4	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.6	9.9	35	2.60	15	-	-
49.22	149.8	154.5	149.6	3.8	-9.8	2.6	5	silty SAND to sandy SILT	120	4.0	37	22	62	37	-	-	20	2.24	16	0.15	0.7
49.38	181.2	163.2	181.0	4.1	-10.0	2.3	5	silty SAND to sandy SILT	120	4.0	45	26	69	38	-	-	17	2.15	16	0.00	0.0
49.54	219.4	164.1	219.2	3.6	-9.9	1.7	6	clean SAND to silty SAND	125	5.0	44	25	75	39	-	-	13	1.99	16	0.00	0.0
49.71	236.9	175.0	236.8	4.1	-1.6	1.7	6	clean SAND to silty SAND	125	5.0	47	27	77	40	-	-	12	1.98	16	0.00	0.0
49.87	232.2	178.0	232.2	4.4	-0.1	1.9	5	silty SAND to sandy SILT	120	4.0	58	34	77	39	-	-	13	2.02	16	0.00	0.0
50.04	218.9	179.9	218.9	4.8	-0.6	2.2	5	silty SAND to sandy SILT	120	4.0	55	32	75	39	-	-	15	2.08	16	0.00	0.0
50.20	226.6	181.0	226.5	4.7	-1.1	2.1	5	silty SAND to sandy SILT	120	4.0	57	33	76	39	-	-	15	2.06	16	0.00	0.0
50.36	245.7	187.0	245.6	4.8	-3.4	2.0	5	silty SAND to sandy SILT	120	4.0	61	35	79	40	-	-	13	2.01	16	0.00	0.0
50.53	247.8	190.8	247.7	5.1	-4.2	2.1	5	silty SAND to sandy SILT	120	4.0	62	36	79	40	-	-	14	2.03	16	0.00	0.0
50.69	237.4	187.3	237.3	5.0	-3.0	2.1	5	silty SAND to sandy SILT	120	4.0	59	34	77	40	-	-	14	2.05	16	0.00	0.0
50.86	223.9	178.2	223.8	4.6	-3.0	2.1	5	silty SAND to sandy SILT	120	4.0	56	32	75	39	-	-	15	2.06	16	0.00	0.0
51.02	213.2	171.6	213.1	4.3	-2.9	2.1	5	silty SAND to sandy SILT	120	4.0	53	31	74	39	-	-	15	2.07	16	0.00	0.0
51.18	199.9	156.2	199.8	3.5	-3.0	1.8	5	silty SAND to sandy SILT	120	4.0	50	29	72	39	-	-	14	2.04	16	0.16	1.1
51.35	187.6	146.2	187.6	3.1	-3.1	1.7	5	silty SAND to sandy SILT	120	4.0	47	27	69	38	-	-	14	2.04	16	0.24	1.6
51.51	170.1	135.0	170.1	2.7	-2.4	1.6	5	silty SAND to sandy SILT	120	4.0	43	24	66	38	-	-	15	2.06	16	0.50	2.6
51.68	158.0	127.8	158.0	2.4	-1.0	1.5	5	silty SAND to sandy SILT	120	4.0	39	23	64	37	-	-	15	2.07	16	0.83	3.9
51.84	148.2	122.0	148.2	2.2	0.1	1.5	5	silty SAND to sandy SILT	120	4.0	37	21	62	37	-	-	16	2.09	16	1.21	5.8
52.00	134.4	123.7	134.4	2.4	0.1	1.8	5	silty SAND to sandy SILT	120	4.0	34	19	58	36	-	-	18	2.18	16	1.02	5.2
52.17	91.0	-	91.0	2.8	0.3	3.2	4	clayy SILT to silty CLAY	115	2.0	46	17	-	-	6.2	9.9	35	2.60	15	-	-
52.33	48.6	-	48.6	2.2	1.2	4.8	3	silty CLAY to CLAY	115	1.5	32	12	-	-	3.2	5.2	54	2.94	15	-	-
52.50	75.9	-	75.9	2.4	1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	8.3	39	2.67	15	-	-
52.66	182.1	156.3	182.1	3.8	0.6	2.1	5	silty SAND to sandy SILT	120	4.0	46	26	68	38	-	-	17	2.13	16	0.15	0.9
52.82	212.4	176.5	212.4	4.7	-0.1	2.3	5	silty SAND to sandy SILT	120	4.0	53	30	73	39	-	-	16	2.10	16	0.00	0.0
52.99	232.6	194.2	232.5	5.7	-2.0	2.5	5	silty SAND to sandy SILT	120	4.0	58	33	76	39	-	-	16	2.11	16	0.00	0.0
53.15	251.8	203.9	251.8	6.1	-2.2	2.5	5	silty SAND to sandy SILT	120	4.0	63	36	79	40	-	-	15	2.08	16	0.00	0.0
53.32	265.4	211.1	265.4	6.4	-2.0	2.5	5	silty SAND to sandy SILT	120	4.0	66	38	81	40	-	-	15	2.07	16	0.00	0.0
53.48	286.1	217.1	286.1	6.5	-1.3	2.3	5	silty SAND to sandy SILT	120	4.0	72	41	83	40	-	-	14	2.03	16	0.00	0.0
53.64	292.3	226.6	292.3	7.2	-1.1	2.5	5	silty SAND to sandy SILT	120	4.0	73	42	84	41	-	-	14	2.05	16	0.00	0.0
53.81	289.7	229.9	289.7	7.5	-1.5	2.6	5	silty SAND to sandy SILT	120	4.0	72	41	83	40	-	-	15	2.07	16	0.00	0.0
53.97	266.7	224.0	266.6	7.4	-2.3	2.8	5	silty SAND to sandy SILT	120	4.0	67	38	81	40	-	-	16	2.11	16	0.00	0.0
54.14	255.0	219.6	254.9	7.3	-2.6	2.9	5	silty SAND to sandy SILT	120	4.0	64	36	79	40	-	-	17	2.13	16	0.00	0.0
54.30	260.3	220.5	260.2	7.3	-3.6	2.8	5	silty SAND to sandy SILT	120	4.0	65	37	80	40	-	-	16	2.12	16	0.00	0.0
54.46	259.3	213.4	259.1	6.8	-5.8	2.6	5	silty SAND to sandy SILT	120	4.0	65	37	80	40	-	-	16	2.10	16	0.00	0.0
54.63	257.3	213.2	257.1	6.8	-6.4	2.7	5	silty SAND to sandy SILT	120	4.0	64	36	79	40	-	-	16	2.11	16	0.00	0.0
54.79	251.8	213.1	251.6	6.9	-7.1	2.8	5	silty SAND to sandy SILT	120	4.0	63	36	79	40	-	-	17	2.12	16	0.00	0.0
54.96	241.6	205.9	241.4	6.5	-7.6	2.7	5	silty SAND to sandy SILT	120	4.0	60	34	77	39	-	-	17	2.13	16	0.00	0.0
55.12	231.5	192.8	231.4	5.7	-7.6	2.5	5	silty SAND to sandy SILT	120	4.0	58	33	76	39	-	-	16	2.11	16	0.00	0.0

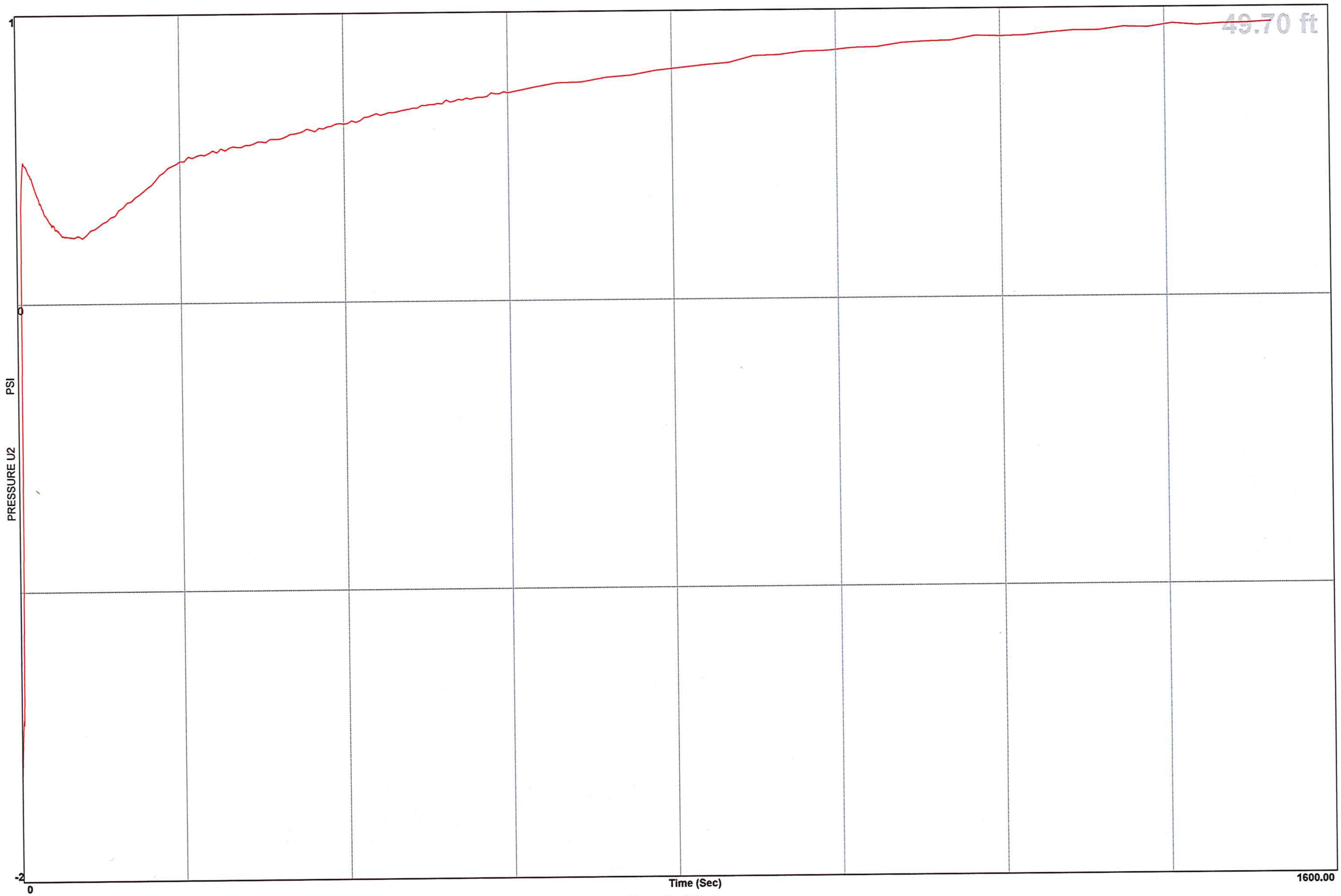
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Heider In ections

LocalInstructional Bldg I El Camino College Comptor		Operator	RC-DG
Job Number	150249	Cone Number	DDG1333
Hole Number	CPT-01	Date and Time	11/2/2015 11:45:02 AM
Equilized Pressure	.9	EST GW Depth During Test	47.3

GPS

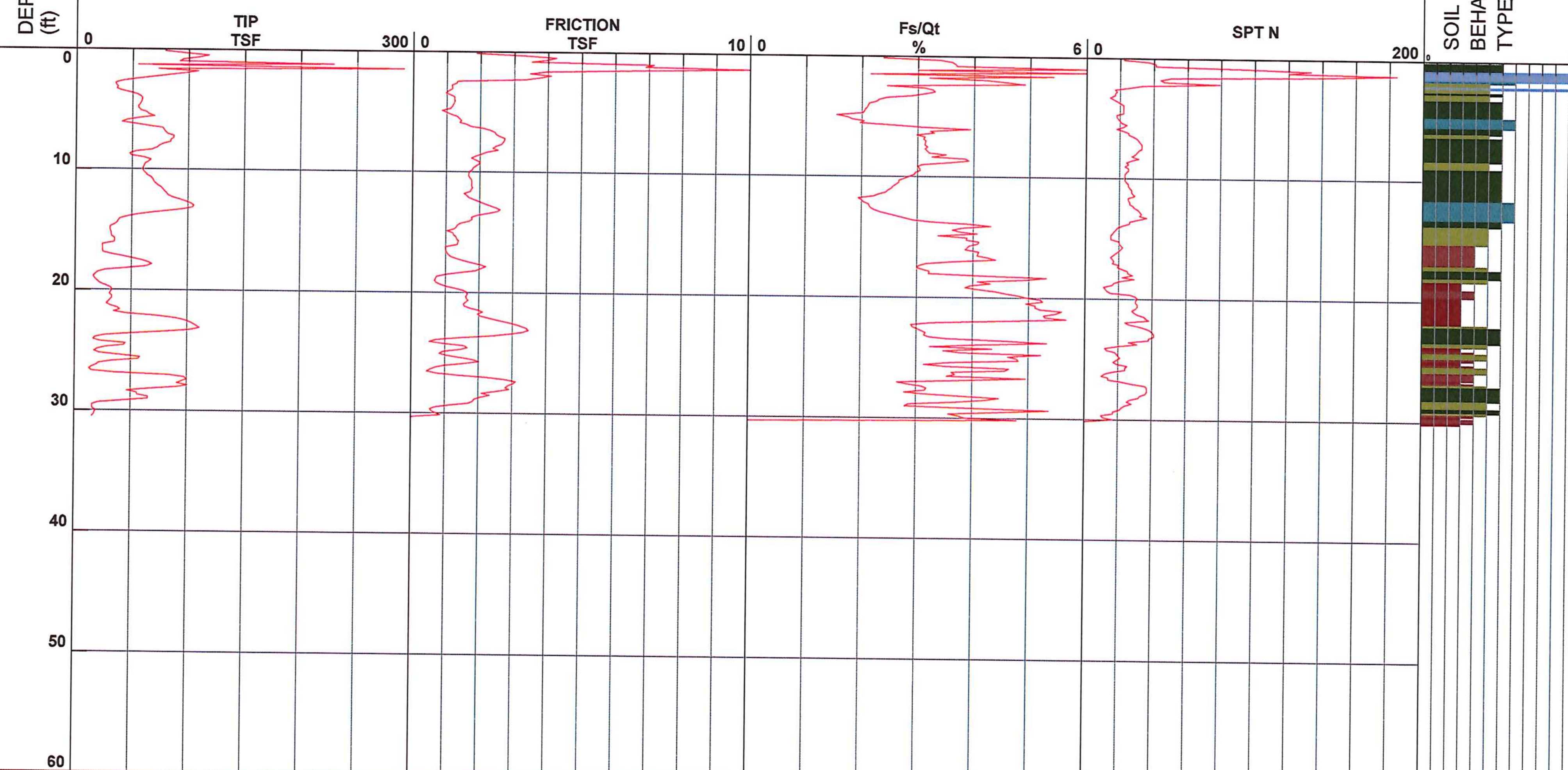


Heider Inspections

Projednstructional Bldg I El Camino College Comptor		Operator	RC-DG	Filename	SDF(350).cpt
Job Number	150249	Cone Number	DDG1333	GPS	
Hole Number	CPT-02	Date and Time	11/2/2015 12:53:31 PM	Maximum Depth	30.51 ft
EST GW Depth During Test		46.00 ft			

Net Area Ratio .8

CPT DATA



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

Cone size 10cm squared

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

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(350).cpt
CPT Date: 11/2/2015 12:53:31 PM
GW During Test: 46 ft

Page: 1
Sounding ID: CPT-02
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR - -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
0.33	97.1	247.8	97.1	3.3	-0.4	3.4	8	stiff SAND to clayy SAND	115	1.0	97	100	-	-	6.4	9.9	18	2.17	16	N/A	N/A
0.49	117.7	289.4	117.6	4.2	-0.6	3.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.8	9.9	17	2.14	16	N/A	N/A
0.66	109.1	277.5	109.1	4.0	-0.6	3.7	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.2	9.9	18	2.17	16	N/A	N/A
0.82	95.1	255.1	95.0	3.5	-0.5	3.7	8	stiff SAND to clayy SAND	115	1.0	95	100	-	-	6.3	9.9	19	2.20	16	N/A	N/A
0.98	92.1	392.9	92.1	7.1	-0.4	7.8	9	very stiff fine SOIL	120	2.0	46	74	80	48	-	-	30	2.48	30	N/A	N/A
1.15	228.9	445.3	228.9	6.9	-0.4	3.0	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	15.2	9.9	11	1.92	16	N/A	N/A
1.31	55.0	-	55.0	11.8	-0.3	9.9	9	very stiff fine SOIL	120	2.0	28	44	63	48	-	-	40	2.69	30	N/A	N/A
1.48	291.4	499.9	291.4	6.3	-1.7	2.2	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	19.3	9.9	7	1.75	16	N/A	N/A
1.64	73.1	273.3	73.1	4.0	-0.6	5.4	9	very stiff fine SOIL	120	2.0	37	59	72	48	-	-	27	2.40	30	N/A	N/A
1.80	108.4	259.0	108.3	3.5	-1.0	3.2	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.2	9.9	16	2.12	16	N/A	N/A
1.97	96.8	277.4	96.7	4.1	-1.2	4.2	9	very stiff fine SOIL	120	2.0	48	78	82	48	-	-	21	2.25	30	N/A	N/A
2.13	82.0	263.7	82.0	3.8	-1.2	4.6	9	very stiff fine SOIL	120	2.0	41	66	76	48	-	-	23	2.32	30	N/A	N/A
2.30	68.0	247.3	68.0	3.3	-1.3	4.9	9	very stiff fine SOIL	120	2.0	34	55	70	48	-	-	26	2.39	30	N/A	N/A
2.46	53.8	149.1	53.7	1.3	-1.2	2.5	5	silty SAND to sandy SILT	120	4.0	13	22	62	47	-	-	20	2.22	16	N/A	N/A
2.62	41.3	147.8	41.3	1.3	-1.2	3.1	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	26	2.38	15	N/A	N/A
2.79	35.1	141.0	35.0	1.1	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	28	2.45	15	N/A	N/A
2.95	35.2	141.9	35.1	1.2	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	28	2.45	15	N/A	N/A
3.12	36.8	141.0	36.8	1.2	-1.2	3.2	4	clayy SILT to silty CLAY	115	2.0	18	30	-	-	2.6	9.9	27	2.42	15	N/A	N/A
3.28	36.0	133.5	36.0	1.0	-1.3	2.9	5	silty SAND to sandy SILT	120	4.0	9	14	49	44	-	-	26	2.40	16	N/A	N/A
3.45	39.8	128.1	39.8	1.0	-1.3	2.5	5	silty SAND to sandy SILT	120	4.0	10	16	52	44	-	-	23	2.32	16	N/A	N/A
3.61	47.6	136.0	47.5	1.1	-1.3	2.3	5	silty SAND to sandy SILT	120	4.0	12	19	58	45	-	-	21	2.24	16	N/A	N/A
3.77	54.3	144.7	54.3	1.2	-1.3	2.3	5	silty SAND to sandy SILT	120	4.0	14	22	62	45	-	-	19	2.20	16	N/A	N/A
3.94	57.4	145.3	57.3	1.2	-1.4	2.1	5	silty SAND to sandy SILT	120	4.0	14	23	64	45	-	-	18	2.16	16	N/A	N/A
4.10	58.8	146.8	58.8	1.2	-1.4	2.1	5	silty SAND to sandy SILT	120	4.0	15	24	65	45	-	-	17	2.15	16	N/A	N/A
4.27	58.2	145.4	58.2	1.2	-1.3	2.1	5	silty SAND to sandy SILT	120	4.0	15	23	65	45	-	-	17	2.15	16	N/A	N/A
4.43	57.7	143.6	57.6	1.2	-1.3	2.1	5	silty SAND to sandy SILT	120	4.0	14	23	64	45	-	-	17	2.15	16	N/A	N/A
4.59	56.4	141.4	56.4	1.2	-1.3	2.1	5	silty SAND to sandy SILT	120	4.0	14	23	64	44	-	-	18	2.15	16	N/A	N/A
4.76	55.1	138.6	55.1	1.1	-1.3	2.0	5	silty SAND to sandy SILT	120	4.0	14	22	63	44	-	-	18	2.16	16	N/A	N/A
4.92	55.5	125.8	55.5	0.9	-1.3	1.6	5	silty SAND to sandy SILT	120	4.0	14	22	63	44	-	-	15	2.08	16	N/A	N/A
5.09	57.7	135.1	57.6	1.0	-1.3	1.8	5	silty SAND to sandy SILT	120	4.0	14	23	64	44	-	-	16	2.10	16	N/A	N/A
5.25	62.5	143.6	62.5	1.1	-1.3	1.8	5	silty SAND to sandy SILT	120	4.0	16	25	67	44	-	-	15	2.09	16	N/A	N/A
5.41	64.4	153.1	64.4	1.3	-1.3	2.0	5	silty SAND to sandy SILT	120	4.0	16	26	68	44	-	-	16	2.11	16	N/A	N/A
5.58	69.4	158.1	69.4	1.4	-1.3	2.0	5	silty SAND to sandy SILT	120	4.0	17	28	71	44	-	-	15	2.08	16	N/A	N/A
5.74	55.8	156.1	55.8	1.4	-1.3	2.6	5	silty SAND to sandy SILT	120	4.0	14	22	63	43	-	-	20	2.23	16	N/A	N/A
5.91	45.0	154.0	45.0	1.4	-1.2	3.1	5	silty SAND to sandy SILT	120	4.0	11	18	56	42	-	-	25	2.35	16	N/A	N/A
6.07	40.8	168.8	40.8	1.6	-1.2	4.0	4	clayy SILT to silty CLAY	115	2.0	20	33	-	-	2.9	9.9	29	2.46	15	N/A	N/A
6.23	53.4	171.5	53.4	1.7	-1.2	3.2	5	silty SAND to sandy SILT	120	4.0	13	21	62	42	-	-	23	2.32	16	N/A	N/A
6.40	63.4	188.6	63.4	2.1	-1.2	3.3	5	silty SAND to sandy SILT	120	4.0	16	25	67	43	-	-	22	2.28	16	N/A	N/A
6.56	77.1	198.8	77.1	2.3	-1.3	3.0	5	silty SAND to sandy SILT	120	4.0	19	30	73	44	-	-	19	2.19	16	N/A	N/A
6.73	78.0	203.5	78.0	2.4	-1.3	3.1	5	silty SAND to sandy SILT	120	4.0	20	30	73	44	-	-	19	2.21	16	N/A	N/A
6.89	79.4	203.3	79.4	2.5	-1.4	3.1	5	silty SAND to sandy SILT	120	4.0	20	30	73	44	-	-	19	2.21	16	N/A	N/A
7.05	81.5	206.4	81.5	2.6	-1.4	3.2	5	silty SAND to sandy SILT	120	4.0	20	31	74	44	-	-	19	2.21	16	N/A	N/A
7.22	87.0	212.8	87.0	2.7	-1.4	3.1	5	silty SAND to sandy SILT	120	4.0	22	32	75	44	-	-	19	2.19	16	N/A	N/A
7.38	86.8	210.8	86.8	2.7	-1.4	3.1	5	silty SAND to sandy SILT	120	4.0	22	32	75	44	-	-	19	2.19	16	N/A	N/A
7.55	84.2	207.3	84.2	2.7	-1.3	3.2	5	silty SAND to sandy SILT	120	4.0	21	31	74	44	-	-	19	2.21	16	N/A	N/A
7.71	84.1	204.3	84.1	2.6	-1.3	3.1	5	silty SAND to sandy SILT	120	4.0	21	30	73	44	-	-	19	2.21	16	N/A	N/A
7.87	77.5	195.0	77.5	2.5	-1.3	3.2	5	silty SAND to sandy SILT	120	4.0	19	28	70	43	-	-	20	2.24	16	N/A	N/A
8.04	73.9	189.8	73.9	2.4	-1.3	3.2	5	silty SAND to sandy SILT	120	4.0	18	26	68	43	-	-	21	2.26	16	N/A	N/A
8.20	72.1	195.4	72.0	2.5	-1.3	3.5	5	silty SAND to sandy SILT	120	4.0	18	25	67	43	-	-	23	2.30	16	N/A	N/A
8.37	67.0	179.7	67.0	2.2	-1.3	3.3	5	silty SAND to sandy SILT	120	4.0	17	23	64	42	-	-	22	2.30	16	N/A	N/A
8.53	53.3	175.4	53.3	2.1	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	27	36	-	-	3.7	9.9	27	2.42	15	N/A	N/A
8.69	47.9	167.6	47.8	1.9	-1.5	4.0	4	clayy SILT to silty CLAY	115	2.0	24	32	-	-	3.3	9.9	29	2.46	15	N/A	N/A
8.86	49.0	159.5	49.0	1.7	-1.5	3.6	4	clayy SILT to silty CLAY	115	2.0	25	33	-	-	3.4	9.9	28	2.43	15	N/A	N/A
9.02	60.6	162.5	60.6	1.9	-1.6	3.1	5	silty SAND to sandy SILT	120	4.0	15	20	60	41	-	-	23	2.32	16	N/A	N/A
9.19	66.6	167.4	66.6	2.0	-1.6	3.0	5	silty SAND to sandy SILT	120	4.0	17	22	63	42	-	-	22	2.29	16	N/A	N/A
9.35	64.7	165.4	64.7	2.0	-1.6	3.1	5	silty SAND to sandy SILT	120	4.0	16	21	61	41	-	-	23	2.30	16	N/A	N/A
9.51	61.5	160.7	61.5	1.9	-1.6	3.1	5	silty SAND to sandy SILT	120	4.0	15	20	59	41	-	-	23	2.32	16	N/A	N/A
9.68	60.9	156.7	60.8	1.8	-1.6	3.0	5	silty SAND to sandy SILT	120	4.0	15	20	59	41	-	-	23	2.32	16	N/A	N/A
9.84	60.1	154.8	60.1	1.8	-1.6	3.0	5	silty SAND to sandy SILT	120	4.0	15	19	58	41	-	-	23	2.32	16	N/A	N/A
10.01	59.0	150.1	59.0	1.7	-1.6	2.9	5	silty SAND to sandy SILT	120	4.0	15	19	57	40	-	-	23	2.32	16	N/A	N/A
10.17	60.4	148.4	60.3	1.7	-1.6	2.8	5	silty SAND to sandy SILT	120	4.0	15	19	58	41	-	-	23	2.31	16	N/A	N/A
10.34	62.1	147.6	62.1	1.7	-1.6	2.7	5	silty SAND to sandy SILT	120	4.0	16	19	58	41	-	-	22	2.29	16	N/A	N/A
10.50	63.5	148.6	63.5	1.7	-1.6	2.7	5	silty SAND to sandy SILT	120	4.0	16	20	59	41	-	-	22	2.28	16	N/A	N/A
10.66	66.7	150.4	66.6	1.7	-1.6	2.6	5	silty SAND to sandy SILT	120	4.0	17	20	60	41	-	-	21	2.27	16	N/A	N/A
10.83	68.5	150.3	68.5	1.8	-1.6	2.6	5	silty SAND to sandy SILT	120	4.0	17	21	61	41	-	-	21	2.25	16	N/A	N/A
10.99	69.0	149.6	68.9	1.7	-1.6	2.6	5	silty SAND to sandy SILT	120	4.0	17	21	61	41	-	-	21	2.25	16	N/A	N/A
11.16	70.7	148.9	70.6	1.7	-1.6	2.5	5	silty SAND to sandy SILT	120	4.0	18	21	61	41	-	-	20	2.24	16	N/A	N/A
11.32	73.0	149.8	73.0	1.8	-1.6	2.5	5	silty SAND to sandy SILT	120	4.0	18	22	62	41	-	-	20	2.23	16	N/A	N/A
11.48	75.4	148.1	75.3	1.7	-1.6	2.3	5	silty SAND to sandy SILT	120	4.0	19	22	63	41	-	-	19	2.20	16	N/A	N/A
11.65	77.4	147.1	77.4	1.7	-1.6	2.2	5	silty SAND to sandy SILT	120	4.0	19	23	64	41	-	-	18	2.18	16	N/A	N/A
11.81	78.9	139.9	78.8	1.5	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	20	23	64	41	-	-	17	2.14	16	N/A	N/A
11.98	80.7	142.9	80.7	1.6	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	20	23	65	41	-	-	17	2.14	16	N/A	N/A
12.14	82.0	144.8	82.0	1.7	-1.5	2.1	5	silty SAND to sandy SILT	120	4.0	21	23	65	41	-	-	17	2.15	16	N/A	N/A
12.30	85.9	150.8	85.8	1.8	-1.6	2.1	5	silty SAND to sandy SILT	120	4.0	21	24	66	41	-	-	17	2.15	16	N/A	N/A
12.47	92.3	157.3	92.3	2.0	-1.6	2.2	5	silty SAND to sandy SILT	120	4.0	23	26	68	42	-	-	17	2.13	16	N/A	N/A
12.63	97.8	163.4	97.8	2.1	-1.6	2.2	5	silty SAND to sandy SILT	120	4.0	24	27	70	42	-	-	16	2.12	16	N/A	N/A
12.80	102.2	168.8	102.2	2.3	-1.6	2.2	5	silty SAND to sandy SILT	120	4.0	26	28	71	42	-	-	16	2.12	16	N/A	N/A
12.96	105.2	174.9	105.1	2.5	-1.6	2.4	5	silty SAND to sandy SILT	120	4.0	26	29	72	42	-	-	17	2.13	16	N/A	N/A
13.12	104.1	177.9	104.0	2.6	-1.6	2.5	5	silty SAND to sandy SILT	120	4.0	26	29	71	42	-	-	17	2.15	16	N/A	N/A
13.29	96.2	173.4	96.2	2.5	-1.5	2.7	5	silty SAND to sandy SILT	120	4.0	24	26	69	42	-	-	19	2.19	16	N/A	N/A
13.45	81.5	161.7	81.4	2.3	-1.5	2.8	5	silty SAND to sandy SILT	120	4.0	20	22	63	41	-	-	21	2.26	16	N/A	N/A
13.62	65.9	149.1	65.9	1.9	-1.4	2.9	5	silty SAND to sandy SILT	120	4.0	16	18	56	39	-	-	24	2.34	16	N/A	N/A
13.78	53.6	144.2	53.6	1.8	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	27	29	-	-	3.7	9.9	28	2.45	15	N/A	N/A
13.94	45.1	148.3	45.1	1.8	-1.4	4.0	4	clayy SILT to silty CLAY	115	2.0	23	24	-	-	3.1	9.9	33	2.56	15	N/A	N/A
14.11	39.1	-	39.1	1.7	-1.5	4.4	4	clayy SILT to silty CLAY	115	2.0	20	22	-	-	2.7	9.9	36	2.62	15	N/A	N/A
14.27	37.9	137.4	37.8	1.4	-1.7	3.9	4	clayy SILT to silty CLAY	115	2.0	19	21	-	-	2.6	9.9	35	2.59	15	N/A	N/A
14.44	36.9	132.2	36.8	1.3	-2.0	3.7	4	clayy SILT to silty CLAY	115	2.0	18	20	-	-	2.5	9.9	35	2.59	15	N/A	N/A
14.60	34.4	-	34.4	1.3	-3.1	3.9	4	clayy SILT to silty CLAY	115	2.0	17	20	-	-	2.4	9.9	36	2.61	15	N/A	N/A
14.76	30.9	-	30.9	1.3	-2.4	4.2	4	clayy SILT to silty CLAY	115	2.0	15	18	-	-	2.1	9.9	39	2.67	15	N/A	N/A
14.93	30.6	-	30.5	1.0	-1.8	3.5	4	clayy SILT to silty CLAY	115	2.0	15	17	-	-	2.1	9.9	37	2.62	15	N/A	N/A
15.09	31.0	-	30.9	1.2	-1.9	4.0	4	clayy SILT to silty CLAY	115	2.0	15	17	-	-	2.1	9.9	39	2.66	15	N/A	N/A
15.26	31.8	-	31.7	1.2	-1.9	4.0	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	38	2.66	15	N/A	N/A
15.42	31.7	-	31.6	1.3	-2.1	4.2	4	clayy SILT to silty CLAY	115	2.0	16	17	-	-	2.2	9.9	39	2.68	15	N/A	N/A

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(350).cpt
CPT Date: 11/2/2015 12:53:31 PM
GW During Test: 46 ft

Page: 2
Sounding ID: CPT-02
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR - -	* Fin Ic %	* Ic SBT Indx	* Nk - -	* Vol Strn %	* Cycl SStn %
15.58	32.2	-	32.1	1.3	-1.8	4.2	4	clayy SILT to silty CLAY	115	2.0	16	17	-	-	2.2	9.9	39	2.68	15	N/A	N/A
15.75	35.0	-	35.0	1.4	-1.8	4.0	4	clayy SILT to silty CLAY	115	2.0	18	19	-	-	2.4	9.9	37	2.64	15	N/A	N/A
16.08	34.7	-	34.6	1.3	-2.1	4.0	4	clayy SILT to silty CLAY	115	2.0	17	18	-	-	2.4	9.9	38	2.64	15	N/A	N/A
16.24	24.0	-	24.0	1.0	-3.4	4.3	3	silty CLAY to CLAY	115	1.5	16	17	-	-	1.6	7.9	46	2.79	15	N/A	N/A
16.57	24.4	-	24.3	1.0	-3.3	4.2	3	silty CLAY to CLAY	115	1.5	16	17	-	-	1.7	7.9	45	2.79	15	N/A	N/A
16.73	24.2	-	24.1	1.0	-2.5	4.4	3	silty CLAY to CLAY	115	1.5	16	16	-	-	1.6	7.7	47	2.81	15	N/A	N/A
16.90	24.5	-	24.5	1.1	-2.5	4.6	3	silty CLAY to CLAY	115	1.5	16	16	-	-	1.7	7.8	47	2.82	15	N/A	N/A
17.06	31.5	-	31.5	1.2	-2.4	3.8	4	clayy SILT to silty CLAY	115	2.0	16	16	-	-	2.2	9.9	39	2.68	15	N/A	N/A
17.23	41.8	122.6	41.7	1.3	-2.9	3.2	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	33	2.55	15	N/A	N/A
17.39	50.4	128.9	50.4	1.5	-2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	25	24	-	-	3.5	9.9	30	2.48	15	N/A	N/A
17.55	59.3	136.7	59.3	1.8	-1.1	3.0	4	clayy SILT to silty CLAY	115	2.0	30	28	-	-	4.1	9.9	27	2.42	15	N/A	N/A
17.72	65.0	145.1	65.0	2.0	-1.0	3.2	4	clayy SILT to silty CLAY	115	2.0	32	31	-	-	4.5	9.9	27	2.41	15	N/A	N/A
17.88	68.1	150.6	68.1	2.2	-1.0	3.3	4	clayy SILT to silty CLAY	115	2.0	34	32	-	-	4.7	9.9	27	2.41	15	N/A	N/A
18.05	63.0	144.8	63.0	2.0	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	31	30	-	-	4.4	9.9	28	2.43	15	N/A	N/A
18.21	45.0	-	45.0	1.9	-1.4	4.3	4	clayy SILT to silty CLAY	115	2.0	23	21	-	-	3.1	9.9	36	2.62	15	N/A	N/A
18.37	26.8	-	26.8	1.4	-1.1	5.5	3	silty CLAY to CLAY	115	1.5	18	16	-	-	1.8	7.8	50	2.87	15	N/A	N/A
18.54	20.3	-	20.3	1.0	-0.8	5.2	3	silty CLAY to CLAY	115	1.5	14	12	-	-	1.4	5.8	55	2.95	15	N/A	N/A
18.70	17.9	-	17.9	0.7	-0.6	4.4	3	silty CLAY to CLAY	115	1.5	12	11	-	-	1.2	5.0	55	2.95	15	N/A	N/A
18.87	16.2	-	16.1	0.7	-1.4	4.6	3	silty CLAY to CLAY	115	1.5	11	10	-	-	1.1	4.5	59	3.00	15	N/A	N/A
19.03	16.9	-	16.9	0.7	-1.3	4.2	3	silty CLAY to CLAY	115	1.5	11	10	-	-	1.1	4.7	56	2.97	15	N/A	N/A
19.19	18.7	-	18.7	0.7	-1.2	4.1	3	silty CLAY to CLAY	115	1.5	12	11	-	-	1.2	5.1	54	2.92	15	N/A	N/A
19.36	20.7	-	20.7	0.9	-1.2	4.4	3	silty CLAY to CLAY	115	1.5	14	12	-	-	1.4	5.7	52	2.91	15	N/A	N/A
19.52	23.3	-	23.2	1.0	-1.1	4.6	3	silty CLAY to CLAY	115	1.5	16	13	-	-	1.6	6.3	51	2.89	15	N/A	N/A
19.69	28.1	-	28.1	1.3	-1.1	4.8	3	silty CLAY to CLAY	115	1.5	19	16	-	-	1.9	7.7	48	2.83	15	N/A	N/A
19.85	31.7	-	31.7	1.5	-1.0	5.0	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	8.6	47	2.81	15	N/A	N/A
20.01	33.0	-	33.0	1.6	-1.0	5.1	3	silty CLAY to CLAY	115	1.5	22	19	-	-	2.2	8.9	46	2.81	15	N/A	N/A
20.18	31.6	-	31.6	1.6	-1.3	5.4	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.1	8.4	48	2.84	15	N/A	N/A
20.34	30.6	-	30.6	1.6	-1.0	5.5	3	silty CLAY to CLAY	115	1.5	20	17	-	-	2.1	8.1	49	2.86	15	N/A	N/A
20.51	32.6	-	32.6	1.6	0.0	5.1	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.2	8.6	47	2.82	15	N/A	N/A
20.67	32.6	-	32.6	1.7	0.3	5.3	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.2	8.5	48	2.83	15	N/A	N/A
20.83	31.2	-	31.2	1.6	0.6	5.3	3	silty CLAY to CLAY	115	1.5	21	17	-	-	2.1	8.1	49	2.85	15	N/A	N/A
21.00	29.6	-	29.6	1.5	1.0	5.4	3	silty CLAY to CLAY	115	1.5	20	16	-	-	2.0	7.6	51	2.88	15	N/A	N/A
21.16	27.9	-	27.9	1.6	0.5	5.8	3	silty CLAY to CLAY	115	1.5	19	15	-	-	1.9	7.1	53	2.92	15	N/A	N/A
21.33	31.8	-	31.8	1.7	1.0	5.7	3	silty CLAY to CLAY	115	1.5	21	17	-	-	2.2	8.0	50	2.87	15	N/A	N/A
21.49	37.8	-	37.8	2.0	0.6	5.4	3	silty CLAY to CLAY	115	1.5	25	20	-	-	2.6	9.5	46	2.80	15	N/A	N/A
21.65	39.7	-	39.7	2.1	0.2	5.5	3	silty CLAY to CLAY	115	1.5	26	21	-	-	2.7	9.9	46	2.79	15	N/A	N/A
21.82	34.5	-	34.5	2.0	0.1	5.9	3	silty CLAY to CLAY	115	1.5	23	18	-	-	2.4	8.6	50	2.86	15	N/A	N/A
21.98	45.3	-	45.3	2.0	0.4	4.6	3	silty CLAY to CLAY	115	1.5	30	23	-	-	3.1	9.9	41	2.70	15	N/A	N/A
22.15	69.8	146.6	69.8	2.3	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	35	30	-	-	4.8	9.9	28	2.44	15	N/A	N/A
22.31	86.3	151.2	86.3	2.5	-0.4	2.9	5	silty SAND to sandy SILT	120	4.0	22	18	57	38	-	-	24	2.33	16	N/A	N/A
22.47	95.7	159.5	95.7	2.8	-0.4	3.0	5	silty SAND to sandy SILT	120	4.0	24	20	60	39	-	-	23	2.31	16	N/A	N/A
22.64	101.5	166.5	101.5	3.1	-0.4	3.1	5	silty SAND to sandy SILT	120	4.0	25	21	62	39	-	-	23	2.30	16	N/A	N/A
22.80	104.8	171.2	104.8	3.2	-0.4	3.1	5	silty SAND to sandy SILT	120	4.0	26	22	63	39	-	-	23	2.30	16	N/A	N/A
22.97	107.6	175.4	107.6	3.4	-0.4	3.2	5	silty SAND to sandy SILT	120	4.0	27	22	64	39	-	-	23	2.30	16	N/A	N/A
23.13	110.7	176.8	110.7	3.5	-0.5	3.2	5	silty SAND to sandy SILT	120	4.0	28	23	64	39	-	-	22	2.29	16	N/A	N/A
23.30	102.3	171.9	102.3	3.3	-0.4	3.3	5	silty SAND to sandy SILT	120	4.0	26	21	62	39	-	-	23	2.32	16	N/A	N/A
23.46	82.2	163.1	82.2	2.9	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	41	34	-	-	5.7	9.9	27	2.42	15	N/A	N/A
23.62	51.9	-	51.9	2.4	-0.1	4.7	3	silty CLAY to CLAY	115	1.5	35	25	-	-	3.6	9.9	40	2.69	15	N/A	N/A
23.79	26.9	-	26.9	1.4	0.0	5.6	3	silty CLAY to CLAY	115	1.5	18	13	-	-	1.8	6.0	56	2.96	15	N/A	N/A
23.95	17.8	-	17.8	0.7	0.1	4.5	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	3.8	62	3.04	15	N/A	N/A
24.12	16.5	-	16.5	0.5	0.6	3.5	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.5	60	3.02	15	N/A	N/A
24.28	22.4	-	22.5	1.0	1.1	4.6	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	4.9	57	2.98	15	N/A	N/A
24.44	45.2	-	45.2	1.6	2.8	3.6	4	clayy SILT to silty CLAY	115	2.0	23	16	-	-	3.1	9.9	39	2.66	15	N/A	N/A
24.61	43.7	-	43.8	1.7	2.4	3.9	4	clayy SILT to silty CLAY	115	2.0	22	15	-	-	3.0	9.7	41	2.70	15	N/A	N/A
24.77	27.8	-	27.8	1.4	1.3	5.5	3	silty CLAY to CLAY	115	1.5	19	13	-	-	1.9	6.0	56	2.96	15	N/A	N/A
24.94	20.3	-	20.3	0.9	2.1	5.0	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.3	4.2	61	3.04	15	N/A	N/A
25.10	17.3	-	17.3	0.8	2.5	5.2	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.1	3.5	67	3.12	15	N/A	N/A
25.26	21.9	-	21.9	1.1	2.6	5.2	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.4	4.5	60	3.03	15	N/A	N/A
25.43	39.6	-	39.7	1.4	2.5	3.8	4	clayy SILT to silty CLAY	115	2.0	20	13	-	-	2.7	8.4	42	2.73	15	N/A	N/A
25.59	58.0	129.3	58.0	1.8	0.8	3.2	4	clayy SILT to silty CLAY	115	2.0	29	23	-	-	4.0	9.9	31	2.51	15	N/A	N/A
25.76	56.6	-	56.5	2.0	-0.8	3.6	4	clayy SILT to silty CLAY	115	2.0	28	19	-	-	3.9	9.9	36	2.61	15	N/A	N/A
25.92	33.4	-	33.4	1.6	0.1	4.9	3	silty CLAY to CLAY	115	1.5	22	15	-	-	2.2	6.9	50	2.87	15	N/A	N/A
26.08	21.4	-	21.4	1.0	0.3	4.9	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	4.3	61	3.04	15	N/A	N/A
26.25	19.6	-	19.6	0.7	0.5	3.9	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	3.9	59	3.01	15	N/A	N/A
26.41	15.0	-	15.0	0.6	0.4	4.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	2.9	67	3.13	15	N/A	N/A
26.58	13.0	-	13.0	0.5	0.8	4.0	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.8	2.4	72	3.18	15	N/A	N/A
26.74	15.1	-	15.1	0.7	0.8	5.5	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	2.8	73	3.20	15	N/A	N/A
26.90	36.1	-	36.1	1.4	0.7	4.0	3	silty CLAY to CLAY	115	1.5	24	15	-	-	2.4	7.2	46	2.80	15	N/A	N/A
27.07	84.4	137.0	84.3	2.2	-0.5	2.7	5	silty SAND to sandy SILT	120	4.0	21	16	53	37	-	-	24	2.35	16	N/A	N/A
27.23	97.7	151.8	97.7	2.8	-0.6	2.9	5	silty SAND to sandy SILT	120	4.0	24	19	58	38	-	-	23	2.32	16	N/A	N/A
27.40	100.0	160.6	100.0	3.1	-0.6	3.2	5	silty SAND to sandy SILT	120	4.0	25	19	58	38	-	-	24	2.34	16	N/A	N/A
27.56	95.2	158.9	95.2	3.0	-0.5	3.2	5	silty SAND to sandy SILT	120	4.0	24	18	57	38	-	-	25	2.37	16	N/A	N/A
27.72	91.3	154.8	91.3	2.9	-0.5	3.2	4	clayy SILT to silty CLAY	115	2.0	46	35	-	-	6.3	9.9	26	2.38	15	N/A	N/A
27.89	100.4	151.4	100.4	2.8	-0.5	2.8	5	silty SAND to sandy SILT	120	4.0	25	19	58	38	-	-	23	2.31	16	N/A	N/A
28.05	92.2	155.1	92.2	2.9	-0.4	3.2	4	clayy SILT to silty CLAY	115	2.0	46	35	-	-	6.4	9.9	26	2.38	15	N/A	N/A
28.22	64.6	-	64.6	2.5	-0.3	4.0	4	clayy SILT to silty CLAY	115	2.0	32	20	-	-	4.4	9.9	36	2.62	15	N/A	N/A
28.38	46.8	-	46.8	2.1	-0.3	4.6	3	silty CLAY to CLAY	115	1.5	31	19	-	-	3.2	8.9	45	2.78	15	N/A	N/A
28.54	55.4	-	55.3	2.3	-0.9	4.3	4	clayy SILT to silty CLAY	115	2.0	28	17	-	-	3.8	9.9	41	2.70	15	N/A	N/A
28.71	55.7	-	55.7	2.1	-1.2	3.8	4	clayy SILT to silty CLAY	115	2.0	28	17	-	-	3.8	9.9	39	2.66	15	N/A	N/A
28.87	65.4	126.2	65.4	1.9	-0.6	2.9	4	clayy SILT to silty CLAY	115	2.0	33	24	-	-	4.5	9.9	29	2.46	15	N/A	N/A
29.04	65.5	124.6	65.5	1.8	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	33	24	-	-	4.5	9.9	29	2.46	15	N/A	N/A
29.20	43.4	-	43.4	1.7	-0.2	4.1	3	silty CLAY to CLAY	115	1.5	29	17	-	-	2.9	8.0	45	2.78	15	N/A	N/A
29.36	21.2	-	21.2	1.1	-0.1	5.8	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	3.7	67	3.13	15	N/A	N/A
29.53	15.9	-	15.9	0.7	0.0	5.0	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	2.7	73	3.20	15	N/A	N/A
29.69	15.8	-	15.8	0.6	0.3	4.0	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	2.7	69	3.15	15	N/A	N/A
29.86	16.0	-	16.0	0.6	0.4	4.2	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	2.7	70	3.16	15	N/A	N/A
30.02	19.0	-	19.0	0.7	-0.1	4.3	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.2	3.2	65	3.09	15	N/A	N/A
30.19	18.0	-	18.0	0.9	-0.8	5.3	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.1	3.0	71	3.17	15	N/A	N/A

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

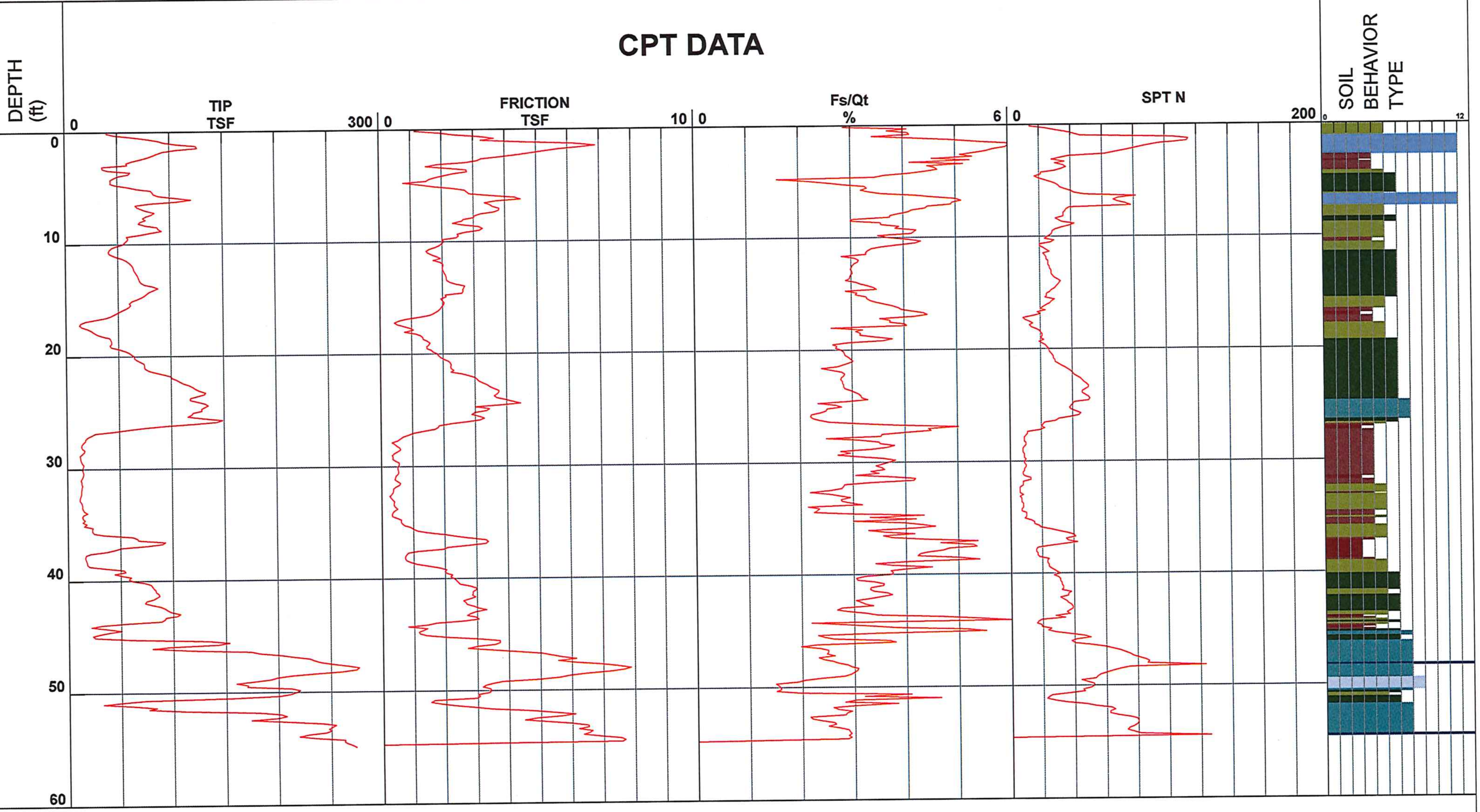
Middle Earth Geo Testing

Heider I[illegible]pections

Projednstructional	Bldg I El Camino College Comptor	Operator	RC-DG	Filename	SDF(351).cpt
Job Number	150249	Cone Number	DDG1333	GPS	
Hole Number	CPT-03	Date and Time	11/2/2015 1:33:51 PM	Maximum Depth	54.95 ft
EST GW Depth During Test			46.40 ft		

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

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

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(351).cpt
CPT Date: 11/2/2015 1:33:51 PM
GW During Test: 46 ft

Sounding ID: CPT-03
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR - -	* Fin Ic %	* Ic SBT Indx	* Nk - -	* Vol Strn %	* Cycl SStn %
0.33	47.6	183.9	47.6	1.9	-0.3	4.1	4	clayy SILT to silty CLAY	115	2.0	24	38	-	-	3.4	9.9	27	2.42	15	N/A	N/A
0.49	64.6	203.5	64.6	2.4	-0.4	3.7	5	silty SAND to sandy SILT	120	4.0	16	26	68	48	-	-	23	2.31	16	N/A	N/A
0.66	77.9	239.7	77.9	3.2	-0.4	4.1	9	very stiff fine SOIL	120	2.0	39	62	74	48	-	-	22	2.29	30	N/A	N/A
0.82	88.7	259.7	88.7	3.7	-0.5	4.1	9	very stiff fine SOIL	120	2.0	44	71	79	48	-	-	21	2.26	30	N/A	N/A
0.98	94.9	244.9	94.9	3.2	-0.5	3.4	8	stiff SAND to clayy SAND	115	1.0	95	100	-	-	6.3	9.9	18	2.18	16	N/A	N/A
1.15	107.6	297.2	107.6	4.6	-0.6	4.2	9	very stiff fine SOIL	120	2.0	54	86	85	48	-	-	20	2.22	30	N/A	N/A
1.31	125.3	355.7	125.2	6.2	-0.7	4.9	9	very stiff fine SOIL	120	2.0	63	100	90	48	-	-	20	2.24	30	N/A	N/A
1.48	126.5	379.9	126.4	6.9	-0.9	5.4	9	very stiff fine SOIL	120	2.0	63	100	90	48	-	-	22	2.28	30	N/A	N/A
1.64	106.5	362.3	106.4	6.4	-0.9	6.0	9	very stiff fine SOIL	120	2.0	53	85	85	48	-	-	24	2.35	30	N/A	N/A
1.80	93.4	338.5	93.4	5.7	-0.8	6.1	9	very stiff fine SOIL	120	2.0	47	75	80	48	-	-	26	2.39	30	N/A	N/A
1.97	88.1	322.8	88.1	5.3	-0.8	6.0	9	very stiff fine SOIL	120	2.0	44	71	78	48	-	-	26	2.39	30	N/A	N/A
2.13	83.6	305.2	83.5	4.8	-0.8	5.7	9	very stiff fine SOIL	120	2.0	42	67	77	48	-	-	26	2.39	30	N/A	N/A
2.30	78.6	290.8	78.6	4.4	-0.9	5.6	9	very stiff fine SOIL	120	2.0	39	63	75	48	-	-	26	2.40	30	N/A	N/A
2.46	71.6	268.8	71.6	3.8	-0.9	5.4	9	very stiff fine SOIL	120	2.0	36	57	72	48	-	-	27	2.41	30	N/A	N/A
2.62	63.8	244.9	63.8	3.3	-0.9	5.1	9	very stiff fine SOIL	120	2.0	32	51	68	47	-	-	27	2.42	30	N/A	N/A
2.79	58.7	240.9	58.7	3.1	-1.0	5.3	9	very stiff fine SOIL	120	2.0	29	47	65	47	-	-	29	2.46	30	N/A	N/A
2.95	59.8	221.0	59.7	2.7	-1.0	4.6	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	26	2.40	30	N/A	N/A
3.12	35.6	187.4	35.6	1.9	-1.2	5.3	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	35	2.59	15	N/A	N/A
3.28	36.1	163.4	36.1	1.5	-1.1	4.2	4	clayy SILT to silty CLAY	115	2.0	18	29	-	-	2.5	9.9	31	2.51	15	N/A	N/A
3.45	41.2	198.0	41.1	2.1	-1.2	5.2	4	clayy SILT to silty CLAY	115	2.0	21	33	-	-	2.9	9.9	33	2.54	15	N/A	N/A
3.61	62.3	223.4	62.2	2.8	-1.3	4.5	9	very stiff fine SOIL	120	2.0	31	50	67	46	-	-	26	2.38	30	N/A	N/A
3.77	60.7	224.6	60.7	2.8	-1.3	4.6	9	very stiff fine SOIL	120	2.0	30	49	66	45	-	-	26	2.40	30	N/A	N/A
3.94	50.7	206.2	50.6	2.4	-1.3	4.7	4	clayy SILT to silty CLAY	115	2.0	25	41	-	-	3.6	9.9	29	2.45	15	N/A	N/A
4.10	46.8	192.4	46.8	2.1	-1.3	4.4	4	clayy SILT to silty CLAY	115	2.0	23	38	-	-	3.3	9.9	29	2.46	15	N/A	N/A
4.27	43.5	178.1	43.4	1.8	-1.4	4.1	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	29	2.46	15	N/A	N/A
4.43	43.6	166.4	43.6	1.6	-1.4	3.7	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	27	2.42	15	N/A	N/A
4.59	43.4	161.0	43.4	1.5	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.0	9.9	26	2.40	15	N/A	N/A
4.76	48.6	117.5	48.5	0.8	-1.5	1.6	5	silty SAND to sandy SILT	120	4.0	12	19	59	43	-	-	17	2.13	16	N/A	N/A
4.92	59.9	150.0	59.9	1.3	-1.6	2.2	5	silty SAND to sandy SILT	120	4.0	15	24	66	44	-	-	17	2.15	16	N/A	N/A
5.09	69.2	176.7	69.2	1.8	-1.8	2.6	5	silty SAND to sandy SILT	120	4.0	17	28	70	45	-	-	18	2.17	16	N/A	N/A
5.25	81.8	204.9	81.8	2.3	-1.8	2.9	5	silty SAND to sandy SILT	120	4.0	20	33	76	45	-	-	17	2.15	16	N/A	N/A
5.41	83.4	221.7	83.4	2.7	-1.8	3.3	5	silty SAND to sandy SILT	120	4.0	21	33	77	45	-	-	19	2.20	16	N/A	N/A
5.58	84.6	225.0	84.5	2.8	-1.8	3.3	5	silty SAND to sandy SILT	120	4.0	21	34	77	45	-	-	19	2.20	16	N/A	N/A
5.74	89.8	229.5	89.8	2.9	-1.9	3.2	5	silty SAND to sandy SILT	120	4.0	22	36	79	45	-	-	18	2.17	16	N/A	N/A
5.91	105.5	260.5	105.4	3.5	-1.9	3.4	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.0	9.9	17	2.14	16	N/A	N/A
6.07	120.2	293.6	120.2	4.3	-2.0	3.6	8	stiff SAND to clayy SAND	115	1.0	100	100	-	-	7.9	9.9	17	2.14	16	N/A	N/A
6.23	106.2	294.8	106.1	4.5	-2.0	4.3	9	very stiff fine SOIL	120	2.0	53	85	85	46	-	-	20	2.23	30	N/A	N/A
6.40	81.8	260.8	81.8	3.7	-1.9	4.6	9	very stiff fine SOIL	120	2.0	41	65	75	44	-	-	23	2.32	30	N/A	N/A
6.56	67.1	245.9	67.1	3.4	-1.9	5.0	9	very stiff fine SOIL	120	2.0	34	52	69	43	-	-	27	2.41	30	N/A	N/A
6.73	68.8	250.8	68.8	3.5	-2.0	5.1	9	very stiff fine SOIL	120	2.0	34	53	69	43	-	-	27	2.41	30	N/A	N/A
6.89	73.1	251.8	73.1	3.6	-2.1	5.0	9	very stiff fine SOIL	120	2.0	37	56	71	44	-	-	26	2.39	30	N/A	N/A
7.05	77.7	257.9	77.7	3.8	-2.1	4.9	9	very stiff fine SOIL	120	2.0	39	58	72	44	-	-	25	2.37	30	N/A	N/A
7.22	85.3	255.0	85.2	3.8	-2.2	4.5	9	very stiff fine SOIL	120	2.0	43	63	75	44	-	-	23	2.32	30	N/A	N/A
7.38	82.5	247.2	82.4	3.6	-2.1	4.4	9	very stiff fine SOIL	120	2.0	41	61	73	44	-	-	24	2.33	30	N/A	N/A
7.55	77.2	228.8	77.2	3.2	-2.2	4.2	9	very stiff fine SOIL	120	2.0	39	56	71	43	-	-	24	2.33	30	N/A	N/A
7.71	74.1	220.4	74.1	3.0	-2.2	4.1	9	very stiff fine SOIL	120	2.0	37	53	69	43	-	-	24	2.34	30	N/A	N/A
7.87	76.9	217.5	76.8	3.0	-2.2	3.9	8	stiff SAND to clayy SAND	115	1.0	77	100	-	-	5.1	9.9	23	2.31	16	N/A	N/A
8.04	71.4	203.0	71.3	2.7	-2.2	3.8	5	silty SAND to sandy SILT	120	4.0	18	25	67	43	-	-	23	2.32	16	N/A	N/A
8.20	70.1	200.0	70.1	2.6	-2.3	3.8	5	silty SAND to sandy SILT	120	4.0	18	24	66	42	-	-	24	2.33	16	N/A	N/A
8.37	77.3	186.9	77.3	2.3	-2.4	3.0	5	silty SAND to sandy SILT	120	4.0	19	27	69	43	-	-	20	2.23	16	N/A	N/A
8.53	88.0	199.4	87.9	2.6	-2.4	3.0	5	silty SAND to sandy SILT	120	4.0	22	30	73	43	-	-	19	2.20	16	N/A	N/A
8.69	88.8	218.2	88.8	3.2	-2.6	3.6	5	silty SAND to sandy SILT	120	4.0	22	30	73	43	-	-	21	2.26	16	N/A	N/A
8.86	91.9	221.4	91.8	3.3	-2.6	3.6	5	silty SAND to sandy SILT	120	4.0	23	31	74	43	-	-	21	2.25	16	N/A	N/A
9.02	81.2	216.3	81.2	3.2	-2.6	3.9	8	stiff SAND to clayy SAND	115	1.0	81	100	-	-	5.3	9.9	23	2.32	16	N/A	N/A
9.19	71.3	198.8	71.2	2.7	-2.6	3.9	4	clayy SILT to silty CLAY	115	2.0	36	47	-	-	5.0	9.9	24	2.35	15	N/A	N/A
9.35	58.5	190.1	58.5	2.5	-2.5	4.3	4	clayy SILT to silty CLAY	115	2.0	29	38	-	-	4.1	9.9	28	2.44	15	N/A	N/A
9.51	59.9	190.3	59.9	2.5	-2.6	4.2	4	clayy SILT to silty CLAY	115	2.0	30	39	-	-	4.2	9.9	28	2.43	15	N/A	N/A
9.68	58.9	186.9	58.9	2.4	-2.6	4.2	4	clayy SILT to silty CLAY	115	2.0	29	38	-	-	4.1	9.9	28	2.44	15	N/A	N/A
9.84	56.7	166.0	56.6	2.0	-2.6	3.6	4	clayy SILT to silty CLAY	115	2.0	28	36	-	-	4.0	9.9	26	2.40	15	N/A	N/A
10.01	55.1	168.0	55.1	2.0	-2.6	3.7	4	clayy SILT to silty CLAY	115	2.0	28	35	-	-	3.9	9.9	27	2.42	15	N/A	N/A
10.17	48.0	167.1	47.9	2.0	-2.5	4.2	4	clayy SILT to silty CLAY	115	2.0	24	30	-	-	3.3	9.9	31	2.50	15	N/A	N/A
10.34	44.1	165.3	44.0	1.9	-2.5	4.4	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.1	9.9	33	2.55	15	N/A	N/A
10.50	42.1	159.2	42.0	1.8	-2.7	4.3	4	clayy SILT to silty CLAY	115	2.0	21	26	-	-	2.9	9.9	33	2.56	15	N/A	N/A
10.66	41.0	149.5	41.0	1.6	-2.8	3.9	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	32	2.54	15	N/A	N/A
10.83	41.7	143.1	41.6	1.5	-3.1	3.6	4	clayy SILT to silty CLAY	115	2.0	21	25	-	-	2.9	9.9	31	2.51	15	N/A	N/A
10.99	44.8	143.0	44.8	1.5	-2.7	3.4	4	clayy SILT to silty CLAY	115	2.0	22	27	-	-	3.1	9.9	30	2.47	15	N/A	N/A
11.16	50.2	147.8	50.1	1.7	-2.5	3.4	4	clayy SILT to silty CLAY	115	2.0	25	30	-	-	3.5	9.9	28	2.43	15	N/A	N/A
11.32	55.6	153.4	55.6	1.8	-2.5	3.3	4	clayy SILT to silty CLAY	115	2.0	28	33	-	-	3.9	9.9	26	2.40	15	N/A	N/A
11.48	58.8	157.2	58.7	1.9	-2.5	3.3	4	clayy SILT to silty CLAY	115	2.0	29	35	-	-	4.1	9.9	26	2.39	15	N/A	N/A
11.65	60.7	146.1	60.6	1.7	-2.5	2.8	5	silty SAND to sandy SILT	120	4.0	15	18	56	40	-	-	24	2.33	16	N/A	N/A
11.81	63.0	155.3	62.9	1.9	-2.5	3.1	5	silty SAND to sandy SILT	120	4.0	16	18	57	40	-	-	24	2.35	16	N/A	N/A
11.98	64.1	158.1	64.0	2.0	-2.3	3.2	5	silty SAND to sandy SILT	120	4.0	16	19	57	40	-	-	25	2.35	16	N/A	N/A
12.14	64.7	157.8	64.7	2.0	-2.2	3.2	5	silty SAND to sandy SILT	120	4.0	16	19	57	40	-	-	24	2.35	16	N/A	N/A
12.30	65.3	156.1	65.2	2.0	-2.2	3.1	5	silty SAND to sandy SILT	120	4.0	16	19	57	40	-	-	24	2.34	16	N/A	N/A
12.47	66.3	155.9	66.3	2.0	-2.2	3.1	5	silty SAND to sandy SILT	120	4.0	17	19	58	40	-	-	24	2.34	16	N/A	N/A
12.63	67.6	156.3	67.5	2.0	-2.2	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	58	40	-	-	24	2.33	16	N/A	N/A
12.80	68.8	156.7	68.8	2.1	-2.2	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	58	40	-	-	24	2.33	16	N/A	N/A
12.96	69.6	157.8	69.5	2.1	-2.1	3.0	5	silty SAND to sandy SILT	120	4.0	17	19	58	40	-	-	24	2.33	16	N/A	N/A
13.12	70.1	158.1	70.0	2.1	-2.1	3.1	5	silty SAND to sandy SILT	120	4.0	18	19	59	40	-	-	24	2.33	16	N/A	N/A
13.29	70.8	157.6	70.7	2.1	-2.1	3.0	5	silty SAND to sandy SILT	120	4.0	18	19	59	40	-	-	23	2.32	16	N/A	N/A
13.45	72.0	157.8	72.0	2.1	-2.1	3.0	5	silty SAND to sandy SILT	120	4.0	18	20	59	40	-	-	23	2.32	16	N/A	N/A
13.62	75.4	160.9	75.4	2.2	-2.1	3.0	5	silty SAND to sandy SILT	120	4.0	19	20	60	40	-	-	23	2.31	16	N/A	N/A
13.78	83.4	166.7	83.4	2.4	-2.1	2.9	5	silty SAND to sandy SILT	120	4.0	21	22	63	41	-	-	21	2.27	16	N/A	N/A
13.94	87.9	176.5	87.8	2.7	-2.1	3.1	5	silty SAND to sandy SILT	120	4.0	22	24	65	41	-	-	22	2.28	16	N/A	N/A
14.11	84.0	174.7	84.0	2.7	-2.1	3.2	5	silty SAND to sandy SILT	120	4.0	21	22	63	41	-	-	23	2.30	16	N/A	N/A
14.27	79.6	173.4	79.6	2.6	-2.1	3.3	5	silty SAND to sandy SILT	120	4.0	20	21	61	40	-	-	24	2.33	16	N/A	N/A
14.44	77.3	173.7	77.3	2.6	-2.0	3.5	4	clayy SILT to silty CLAY	115	2.0	39	41	-	-	5.4	9.9	25	2.35	15	N/A	N/A
14.60	75.0	172.1	74.9	2.6	-2.1	3.5	4	clayy SILT to silty CLAY	115	2.0	37	39	-	-	5.2	9.9	25	2.37	15	N/A	N/A
14.76	72.1	152.3	72.1	2.1	-2.0	2.9	5	silty SAND to sandy SILT	120	4.0	18	19	58	39	-	-	23	2.32	16	N/A	N/A
14.93	67.8	153.4	67.8	2.1	-2.0	3.1	5	silty SAND to sandy SILT	120	4.0	17	18	55	39	-	-	25	2.37	16	N/A	N/A
15.09	62.9	146.9	62.9	1.9	-1.9	3.1	4	clayy SILT to silty CLAY	115	2.0	31	32	-	-	4.4	9.9	26	2.39	15	N/A	N/A
15.26	60.7	149.5	60.7	2.0	-1.9	3.3	4	clayy SILT to silty CLAY	115	2.0	30	31	-	-	4.2	9.9	27	2.42	15	N/A	N/A
15.42	62.0	150.9	62.0	2.0	-1.8	3.3	4	clayy SILT to silty CLAY	115	2.0	31	32	-	-	4.3	9.9	27	2.42	15	N/A	N/A

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(351).cpt
CPT Date: 11/2/2015 1:33:51 PM
GW During Test: 46 ft

Sounding ID: CPT-03
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR - -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
15.58	60.4	150.3	60.4	2.0	-1.8	3.4	4	clayy SILT to silty CLAY	115	2.0	30	31	-	-	4.2	9.9	28	2.43	15	N/A	N/A
15.75	57.2	149.2	57.2	2.0	-1.8	3.5	4	clayy SILT to silty CLAY	115	2.0	29	29	-	-	4.0	9.9	29	2.46	15	N/A	N/A
15.91	53.3	148.2	53.3	1.9	-1.8	3.7	4	clayy SILT to silty CLAY	115	2.0	27	27	-	-	3.7	9.9	31	2.50	15	N/A	N/A
16.08	50.3	147.5	50.2	1.9	-1.7	3.8	4	clayy SILT to silty CLAY	115	2.0	25	25	-	-	3.5	9.9	32	2.53	15	N/A	N/A
16.24	46.5	145.1	46.5	1.8	-1.7	4.0	4	clayy SILT to silty CLAY	115	2.0	23	23	-	-	3.2	9.9	34	2.57	15	N/A	N/A
16.40	43.1	142.7	43.0	1.7	-1.7	4.0	4	clayy SILT to silty CLAY	115	2.0	22	22	-	-	3.0	9.9	35	2.59	15	N/A	N/A
16.57	38.5	-	38.4	1.6	-1.9	4.2	4	clayy SILT to silty CLAY	115	2.0	19	20	-	-	2.6	9.9	37	2.64	15	N/A	N/A
16.73	28.6	-	28.5	1.2	-2.1	4.5	3	silty CLAY to CLAY	115	1.5	19	19	-	-	1.9	9.2	44	2.76	15	N/A	N/A
16.90	18.7	-	18.6	0.8	-0.9	4.7	3	silty CLAY to CLAY	115	1.5	12	12	-	-	1.2	5.9	53	2.92	15	N/A	N/A
17.06	14.0	-	14.0	0.6	-0.1	4.5	3	silty CLAY to CLAY	115	1.5	9	9	-	-	0.9	4.3	59	3.01	15	N/A	N/A
17.23	12.8	-	12.8	0.5	0.0	3.8	3	silty CLAY to CLAY	115	1.5	9	8	-	-	0.8	3.8	59	3.01	15	N/A	N/A
17.39	14.8	-	14.8	0.6	0.2	4.0	3	silty CLAY to CLAY	115	1.5	10	10	-	-	1.0	4.4	56	2.97	15	N/A	N/A
17.55	20.3	-	20.3	0.8	0.1	3.9	3	silty CLAY to CLAY	115	1.5	14	13	-	-	1.4	6.2	49	2.85	15	N/A	N/A
17.72	23.9	-	23.9	1.0	-0.2	4.2	3	silty CLAY to CLAY	115	1.5	16	15	-	-	1.6	7.2	47	2.82	15	N/A	N/A
17.88	26.1	-	26.1	1.1	-0.6	4.2	3	silty CLAY to CLAY	115	1.5	17	17	-	-	1.8	7.9	45	2.79	15	N/A	N/A
18.05	29.5	-	29.5	0.8	-0.7	2.7	4	clayy SILT to silty CLAY	115	2.0	15	14	-	-	2.0	8.8	37	2.63	15	N/A	N/A
18.21	35.0	-	35.0	1.1	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	18	16	-	-	2.4	9.9	37	2.63	15	N/A	N/A
18.37	41.5	119.3	41.5	1.3	-2.9	3.2	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	2.9	9.9	33	2.56	15	N/A	N/A
18.54	42.7	122.3	42.6	1.4	-2.2	3.3	4	clayy SILT to silty CLAY	115	2.0	21	20	-	-	2.9	9.9	33	2.56	15	N/A	N/A
18.70	43.4	122.6	43.4	1.4	-2.0	3.2	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	33	2.55	15	N/A	N/A
18.87	43.3	128.2	43.3	1.5	-2.0	3.5	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	34	2.58	15	N/A	N/A
19.03	41.9	-	41.8	1.6	-1.7	3.9	4	clayy SILT to silty CLAY	115	2.0	21	19	-	-	2.9	9.9	37	2.63	15	N/A	N/A
19.19	43.0	-	43.0	1.5	-1.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	19	-	-	3.0	9.9	36	2.61	15	N/A	N/A
19.36	50.6	124.2	50.5	1.5	-2.4	3.0	4	clayy SILT to silty CLAY	115	2.0	25	23	-	-	3.5	9.9	30	2.49	15	N/A	N/A
19.52	56.1	122.3	56.1	1.5	-1.3	2.7	5	silty SAND to sandy SILT	120	4.0	14	13	45	36	-	-	27	2.42	16	N/A	N/A
19.69	59.8	127.2	59.8	1.6	-1.2	2.8	5	silty SAND to sandy SILT	120	4.0	15	13	47	37	-	-	27	2.41	16	N/A	N/A
19.85	62.5	128.7	62.4	1.7	-1.2	2.7	5	silty SAND to sandy SILT	120	4.0	16	14	48	37	-	-	26	2.39	16	N/A	N/A
20.01	65.0	133.4	65.0	1.8	-1.2	2.8	5	silty SAND to sandy SILT	120	4.0	16	15	49	37	-	-	26	2.39	16	N/A	N/A
20.18	65.0	134.4	65.0	1.8	-0.9	2.9	5	silty SAND to sandy SILT	120	4.0	16	14	49	37	-	-	26	2.40	16	N/A	N/A
20.34	67.2	136.6	67.2	1.9	-1.0	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	50	37	-	-	26	2.39	16	N/A	N/A
20.51	70.6	139.7	70.6	2.0	-1.0	2.9	5	silty SAND to sandy SILT	120	4.0	18	16	51	38	-	-	26	2.38	16	N/A	N/A
20.67	74.0	144.2	74.0	2.2	-0.9	3.0	5	silty SAND to sandy SILT	120	4.0	19	16	53	38	-	-	25	2.37	16	N/A	N/A
20.83	74.5	145.5	74.5	2.2	-0.9	3.0	5	silty SAND to sandy SILT	120	4.0	19	16	53	38	-	-	26	2.38	16	N/A	N/A
21.00	74.4	146.2	74.4	2.2	-0.9	3.1	4	clayy SILT to silty CLAY	115	2.0	37	33	-	-	5.2	9.9	26	2.38	15	N/A	N/A
21.16	75.5	145.1	75.5	2.2	-0.9	3.0	5	silty SAND to sandy SILT	120	4.0	19	16	53	38	-	-	25	2.37	16	N/A	N/A
21.33	79.3	144.9	79.3	2.2	-0.9	2.9	5	silty SAND to sandy SILT	120	4.0	20	17	55	38	-	-	24	2.35	16	N/A	N/A
21.49	85.8	147.1	85.8	2.3	-1.0	2.8	5	silty SAND to sandy SILT	120	4.0	21	19	57	38	-	-	23	2.31	16	N/A	N/A
21.65	92.5	143.5	92.5	2.2	-1.0	2.4	5	silty SAND to sandy SILT	120	4.0	23	20	59	39	-	-	21	2.25	16	N/A	N/A
21.82	99.2	154.3	99.1	2.6	-1.0	2.6	5	silty SAND to sandy SILT	120	4.0	25	21	62	39	-	-	21	2.26	16	N/A	N/A
21.98	100.7	160.7	100.7	2.8	-1.1	2.8	5	silty SAND to sandy SILT	120	4.0	25	22	62	39	-	-	22	2.27	16	N/A	N/A
22.15	105.0	165.6	105.0	3.0	-1.1	2.9	5	silty SAND to sandy SILT	120	4.0	26	22	63	39	-	-	21	2.27	16	N/A	N/A
22.31	108.1	167.4	108.1	3.1	-1.1	2.9	5	silty SAND to sandy SILT	120	4.0	27	23	64	39	-	-	21	2.26	16	N/A	N/A
22.47	111.7	168.6	111.7	3.1	-1.1	2.8	5	silty SAND to sandy SILT	120	4.0	28	24	65	40	-	-	21	2.25	16	N/A	N/A
22.64	116.9	172.0	116.9	3.3	-1.1	2.8	5	silty SAND to sandy SILT	120	4.0	29	25	66	40	-	-	20	2.23	16	N/A	N/A
22.80	120.5	175.4	120.4	3.4	-1.2	2.8	5	silty SAND to sandy SILT	120	4.0	30	25	67	40	-	-	20	2.23	16	N/A	N/A
22.97	122.8	177.0	122.7	3.5	-1.2	2.8	5	silty SAND to sandy SILT	120	4.0	31	26	68	40	-	-	20	2.22	16	N/A	N/A
23.13	126.8	180.5	126.7	3.6	-1.2	2.9	5	silty SAND to sandy SILT	120	4.0	32	26	69	40	-	-	20	2.22	16	N/A	N/A
23.30	132.3	184.7	132.3	3.8	-1.3	2.9	5	silty SAND to sandy SILT	120	4.0	33	27	70	40	-	-	19	2.21	16	N/A	N/A
23.46	131.2	184.1	131.2	3.7	-1.3	2.9	5	silty SAND to sandy SILT	120	4.0	33	27	70	40	-	-	19	2.21	16	N/A	N/A
23.62	124.9	181.9	124.9	3.7	-1.3	3.0	5	silty SAND to sandy SILT	120	4.0	31	26	68	40	-	-	20	2.24	16	N/A	N/A
23.79	118.0	178.8	118.0	3.6	-1.3	3.1	5	silty SAND to sandy SILT	120	4.0	29	24	66	40	-	-	21	2.27	16	N/A	N/A
23.95	117.9	180.8	117.8	3.7	-1.3	3.2	5	silty SAND to sandy SILT	120	4.0	29	24	66	40	-	-	22	2.28	16	N/A	N/A
24.12	125.0	187.4	124.9	4.0	-1.4	3.2	5	silty SAND to sandy SILT	120	4.0	31	25	68	40	-	-	21	2.26	16	N/A	N/A
24.28	131.7	192.9	131.7	4.2	-1.5	3.2	5	silty SAND to sandy SILT	120	4.0	33	27	69	40	-	-	21	2.25	16	N/A	N/A
24.44	134.9	198.7	134.8	4.4	-1.5	3.3	5	silty SAND to sandy SILT	120	4.0	34	27	70	40	-	-	21	2.26	16	N/A	N/A
24.61	131.4	182.1	131.3	3.8	-1.5	2.9	5	silty SAND to sandy SILT	120	4.0	33	26	69	40	-	-	20	2.22	16	N/A	N/A
24.77	128.4	163.1	128.4	3.0	-1.6	2.4	5	silty SAND to sandy SILT	120	4.0	32	26	68	40	-	-	18	2.16	16	N/A	N/A
24.94	128.8	173.5	128.8	3.4	-1.7	2.7	5	silty SAND to sandy SILT	120	4.0	32	26	68	40	-	-	19	2.21	16	N/A	N/A
25.10	120.5	170.3	120.4	3.4	-1.9	2.8	5	silty SAND to sandy SILT	120	4.0	30	24	66	39	-	-	20	2.24	16	N/A	N/A
25.26	119.1	160.5	119.1	3.0	-1.9	2.5	5	silty SAND to sandy SILT	120	4.0	30	24	65	39	-	-	19	2.21	16	N/A	N/A
25.43	115.5	157.1	115.5	2.9	-1.9	2.5	5	silty SAND to sandy SILT	120	4.0	29	23	64	39	-	-	20	2.22	16	N/A	N/A
25.59	130.3	164.3	130.3	3.1	-2.0	2.4	5	silty SAND to sandy SILT	120	4.0	33	26	68	40	-	-	18	2.17	16	N/A	N/A
25.76	148.4	171.7	148.3	3.3	-2.0	2.2	5	silty SAND to sandy SILT	120	4.0	37	29	72	40	-	-	16	2.11	16	N/A	N/A
25.92	143.0	166.9	142.9	3.1	-2.0	2.2	5	silty SAND to sandy SILT	120	4.0	36	28	71	40	-	-	16	2.12	16	N/A	N/A
26.08	120.3	151.8	120.2	2.7	-1.9	2.3	5	silty SAND to sandy SILT	120	4.0	30	24	65	39	-	-	18	2.18	16	N/A	N/A
26.25	95.2	136.9	95.2	2.2	-1.8	2.4	5	silty SAND to sandy SILT	120	4.0	24	19	57	38	-	-	21	2.27	16	N/A	N/A
26.41	72.3	125.6	72.3	1.8	-1.8	2.6	5	silty SAND to sandy SILT	120	4.0	18	14	48	36	-	-	26	2.38	16	N/A	N/A
26.58	58.7	127.7	58.7	1.8	-1.7	3.2	4	clayy SILT to silty CLAY	115	2.0	29	23	-	-	4.0	9.9	31	2.51	15	N/A	N/A
26.74	45.0	-	44.9	1.7	-1.7	3.9	4	clayy SILT to silty CLAY	115	2.0	22	14	-	-	3.1	9.1	42	2.72	15	N/A	N/A
26.90	27.0	-	27.0	1.4	-1.7	5.3	3	silty CLAY to CLAY	115	1.5	18	11	-	-	1.8	5.3	58	2.99	15	N/A	N/A
27.07	23.4	-	23.4	1.0	-1.4	4.8	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.5	4.5	59	3.01	15	N/A	N/A
27.23	19.4	-	19.4	0.9	-2.7	4.9	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	3.7	65	3.09	15	N/A	N/A
27.40	17.5	-	17.4	0.7	-2.5	4.4	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.1	3.2	66	3.10	15	N/A	N/A
27.56	17.1	-	17.1	0.6	-2.1	3.9	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	3.1	64	3.08	15	N/A	N/A
27.72	15.0	-	14.9	0.5	-2.2	4.0	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	2.7	68	3.14	15	N/A	N/A
27.89	13.9	-	13.8	0.3	-2.1	2.8	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	2.4	65	3.09	15	N/A	N/A
28.05	13.6	-	13.5	0.4	-2.1	3.5	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.4	70	3.16	15	N/A	N/A
28.22	14.4	-	14.4	0.5	-1.7	4.0	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	2.5	70	3.16	15	N/A	N/A
28.38	16.6	-	16.5	0.6	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	2.9	66	3.11	15	N/A	N/A
28.54	16.0	-	16.0	0.6	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	2.8	68	3.14	15	N/A	N/A
28.71	14.0	-	13.9	0.5	-1.6	4.2	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	2.4	72	3.19	15	N/A	N/A
28.87	12.0	-	12.0	0.4	-1.4	3.9	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.7	2.0	76	3.24	15	N/A	N/A
29.04	12.4	-	12.4	0.3	-1.3	3.2	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	2.1	72	3.18	15	N/A	N/A
29.20	12.6	-	12.6	0.4	-1.3	3.4	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	2.1	72	3.19	15	N/A	N/A
29.36	13.3	-	13.2	0.4	-1.2	3.1	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.2	69	3.15	15	N/A	N/A
29.53	14.2	-	14.2	0.4	-1.1	3.6	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	2.4	70	3.16	15	N/A	N/A
29.69	15.6	-	15.6	0.6	-1.1	4.0	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	2.6	69	3.15	15	N/A	N/A
29.86	14.8	-	14.8	0.6	-1.1	4.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	2.5	72	3.19	15	N/A	N/A
30.02	14.4	-	14.3	0.5	-1.0	4.2	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.4	73	3.20	15	N/A	N/A
30.19	14.3	-	14.3	0.5	-0.6	4.1	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.3	73	3.20	15	N/A	N/A
30.35	15.3	-	15.3	0.5	-0.5	3.9	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	2.5	70	3.16	15	N/A	N/A
30.51	15.3	-	15.3	0.5	-0.5	4.0	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	2.5	71	3.17	15	N/A	N/A
30.68	14.6	-	14.6	0.5	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.3	73	3.20	15	N/A	N/A
30.84	13.8	-	13.8	0.5	-0.4	3.8	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.2	73	3.21	15	N/A	N/A

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(351).cpt
CPT Date: 11/2/2015 1:33:51 PM
GW During Test: 46 ft

Sounding ID: CPT-03
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	qlncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -	* Vol Strn %	* Cycl SStn %
31.01	12.6	-	12.6	0.4	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	1.9	78	3.26	15	N/A	N/A
31.17	13.5	-	13.5	0.4	-0.3	3.5	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.1	73	3.20	15	N/A	N/A
31.33	13.3	-	13.3	0.5	-0.3	4.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.1	77	3.26	15	N/A	N/A
31.50	14.1	-	14.1	0.6	-0.3	4.8	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	2.2	78	3.26	15	N/A	N/A
31.66	13.5	-	13.5	0.6	-0.1	4.8	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.1	80	3.28	15	N/A	N/A
31.83	13.3	-	13.3	0.4	-0.1	3.9	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.0	76	3.24	15	N/A	N/A
31.99	13.0	-	13.0	0.4	0.0	3.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.0	74	3.21	15	N/A	N/A
32.15	13.2	-	13.2	0.4	0.0	3.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.0	73	3.21	15	N/A	N/A
32.32	12.9	-	12.9	0.4	0.1	3.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	1.9	74	3.21	15	N/A	N/A
32.48	12.1	-	12.1	0.3	0.2	3.0	3	silty CLAY to CLAY	115	1.5	8	4	-	-	0.7	1.8	75	3.23	15	N/A	N/A
32.65	11.5	-	11.5	0.3	0.2	2.6	3	silty CLAY to CLAY	115	1.5	8	4	-	-	0.7	1.6	75	3.22	15	N/A	N/A
32.81	11.6	-	11.6	0.3	0.3	3.1	3	silty CLAY to CLAY	115	1.5	8	4	-	-	0.7	1.7	77	3.25	15	N/A	N/A
32.97	12.9	-	12.9	0.4	0.3	3.2	3	silty CLAY to CLAY	115	1.5	9	4	-	-	0.8	1.9	75	3.22	15	N/A	N/A
33.14	13.5	-	13.6	0.4	0.4	3.4	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.0	74	3.22	15	N/A	N/A
33.30	13.9	-	13.9	0.4	0.4	3.2	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.0	72	3.19	15	N/A	N/A
33.47	13.9	-	13.9	0.4	0.5	3.2	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	2.0	73	3.20	15	N/A	N/A
33.63	14.6	-	14.6	0.4	0.5	3.4	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.1	72	3.19	15	N/A	N/A
33.79	15.6	-	15.6	0.5	0.6	3.6	3	silty CLAY to CLAY	115	1.5	10	5	-	-	1.0	2.3	71	3.18	15	N/A	N/A
33.96	18.7	-	18.7	0.4	0.6	2.4	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.2	2.8	59	3.01	15	N/A	N/A
34.12	14.6	-	14.7	0.3	0.7	2.7	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.1	69	3.14	15	N/A	N/A
34.29	13.9	-	13.9	0.3	0.8	2.7	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	1.9	70	3.16	15	N/A	N/A
34.45	14.7	-	14.8	0.3	0.8	2.6	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.1	68	3.13	15	N/A	N/A
34.61	16.1	-	16.1	0.5	0.9	3.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	2.3	70	3.16	15	N/A	N/A
34.78	14.2	-	14.2	0.6	1.0	5.1	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	2.0	82	3.31	15	N/A	N/A
34.94	18.0	-	18.0	0.6	1.1	3.7	3	silty CLAY to CLAY	115	1.5	12	6	-	-	1.1	2.6	69	3.14	15	N/A	N/A
35.11	15.2	-	15.2	0.6	1.5	4.9	3	silty CLAY to CLAY	115	1.5	10	5	-	-	0.9	2.1	79	3.28	15	N/A	N/A
35.27	23.9	-	23.9	0.7	1.6	3.3	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.5	3.5	58	3.00	15	N/A	N/A
35.43	23.0	-	23.1	0.9	1.4	4.3	3	silty CLAY to CLAY	115	1.5	15	7	-	-	1.5	3.3	65	3.09	15	N/A	N/A
35.60	23.3	-	23.3	1.0	1.6	4.7	3	silty CLAY to CLAY	115	1.5	16	7	-	-	1.5	3.4	66	3.11	15	N/A	N/A
35.76	25.0	-	25.0	1.1	1.5	5.0	3	silty CLAY to CLAY	115	1.5	17	8	-	-	1.6	3.6	65	3.10	15	N/A	N/A
35.93	34.8	-	34.8	1.5	1.7	4.4	3	silty CLAY to CLAY	115	1.5	23	11	-	-	2.3	5.1	55	2.95	15	N/A	N/A
36.09	61.7	-	61.7	2.0	-0.5	3.4	4	clayy SILT to silty CLAY	115	2.0	31	15	-	-	4.2	9.3	39	2.67	15	N/A	N/A
36.26	66.2	-	66.2	2.4	-1.2	3.7	4	clayy SILT to silty CLAY	115	2.0	33	16	-	-	4.5	9.9	39	2.68	15	N/A	N/A
36.42	67.1	-	67.0	2.8	-1.1	4.3	4	clayy SILT to silty CLAY	115	2.0	34	16	-	-	4.6	9.9	41	2.72	15	N/A	N/A
36.58	92.7	157.4	92.7	3.3	-1.5	3.6	4	clayy SILT to silty CLAY	115	2.0	46	31	-	-	6.4	9.9	29	2.46	15	N/A	N/A
36.75	90.1	159.5	90.1	3.4	-0.6	3.8	4	clayy SILT to silty CLAY	115	2.0	45	30	-	-	6.2	9.9	30	2.48	15	N/A	N/A
36.91	75.3	-	75.3	3.3	-0.6	4.5	4	clayy SILT to silty CLAY	115	2.0	38	17	-	-	5.2	9.9	40	2.70	15	N/A	N/A
37.08	50.8	-	50.8	2.7	-0.6	5.6	3	silty CLAY to CLAY	115	1.5	34	16	-	-	3.4	7.4	52	2.89	15	N/A	N/A
37.24	44.7	-	44.7	2.1	-0.3	4.9	3	silty CLAY to CLAY	115	1.5	30	14	-	-	3.0	6.4	52	2.90	15	N/A	N/A
37.40	36.7	-	36.6	1.9	-0.8	5.6	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.4	5.2	59	3.01	15	N/A	N/A
37.57	21.5	-	21.5	1.1	0.7	6.0	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.4	2.9	75	3.22	15	N/A	N/A
37.73	17.0	-	17.0	0.8	1.0	5.5	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	2.2	81	3.30	15	N/A	N/A
37.90	16.3	-	16.4	0.8	1.3	5.4	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	2.1	82	3.31	15	N/A	N/A
38.06	16.6	-	16.6	0.7	1.3	5.1	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.0	2.1	80	3.29	15	N/A	N/A
38.22	17.2	-	17.2	0.7	1.3	4.9	3	silty CLAY to CLAY	115	1.5	11	5	-	-	1.1	2.2	78	3.26	15	N/A	N/A
38.39	18.1	-	18.1	0.8	1.3	4.8	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.3	76	3.24	15	N/A	N/A
38.55	18.1	-	18.1	0.9	1.3	5.7	3	silty CLAY to CLAY	115	1.5	12	5	-	-	1.1	2.3	80	3.29	15	N/A	N/A
38.72	20.4	-	20.4	1.1	1.4	6.1	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.3	2.6	77	3.26	15	N/A	N/A
38.88	36.0	-	36.0	1.5	1.2	4.4	3	silty CLAY to CLAY	115	1.5	24	11	-	-	2.4	4.9	56	2.96	15	N/A	N/A
39.04	53.3	-	53.2	1.8	-1.0	3.6	4	clayy SILT to silty CLAY	115	2.0	27	12	-	-	3.6	7.4	44	2.76	15	N/A	N/A
39.21	54.5	-	54.4	2.0	-3.5	3.9	3	silty CLAY to CLAY	115	1.5	36	16	-	-	3.7	7.5	45	2.78	15	N/A	N/A
39.37	44.2	-	44.1	2.0	-3.7	4.7	3	silty CLAY to CLAY	115	1.5	29	13	-	-	3.0	6.0	53	2.91	15	N/A	N/A
39.54	51.2	-	51.2	2.0	-3.5	4.2	3	silty CLAY to CLAY	115	1.5	34	15	-	-	3.5	7.0	48	2.83	15	N/A	N/A
39.70	59.9	-	59.8	2.2	-4.4	3.9	4	clayy SILT to silty CLAY	115	2.0	30	13	-	-	4.1	8.2	43	2.75	15	N/A	N/A
39.86	57.6	-	57.5	2.2	-4.1	3.9	4	clayy SILT to silty CLAY	115	2.0	29	12	-	-	3.9	7.8	44	2.77	15	N/A	N/A
40.03	61.3	-	61.2	2.3	-4.0	3.9	4	clayy SILT to silty CLAY	115	2.0	31	13	-	-	4.2	8.3	43	2.75	15	N/A	N/A
40.19	73.1	-	73.0	2.3	-5.6	3.3	4	clayy SILT to silty CLAY	115	2.0	37	16	-	-	5.0	9.9	38	2.64	15	N/A	N/A
40.36	78.7	-	78.6	2.4	-6.4	3.1	4	clayy SILT to silty CLAY	115	2.0	39	17	-	-	5.4	9.9	36	2.61	15	N/A	N/A
40.52	80.2	-	80.0	2.5	-7.0	3.2	4	clayy SILT to silty CLAY	115	2.0	40	17	-	-	5.5	9.9	36	2.60	15	N/A	N/A
40.68	81.6	-	81.5	2.8	-7.8	3.5	4	clayy SILT to silty CLAY	115	2.0	41	17	-	-	5.6	9.9	37	2.63	15	N/A	N/A
40.85	83.2	-	83.0	3.0	-8.9	3.7	4	clayy SILT to silty CLAY	115	2.0	42	17	-	-	5.7	9.9	37	2.64	15	N/A	N/A
41.01	83.5	-	83.3	3.0	-9.6	3.7	4	clayy SILT to silty CLAY	115	2.0	42	17	-	-	5.7	9.9	37	2.64	15	N/A	N/A
41.18	86.1	-	85.9	2.9	-10.4	3.4	4	clayy SILT to silty CLAY	115	2.0	43	18	-	-	5.9	9.9	36	2.61	15	N/A	N/A
41.34	86.8	-	86.6	2.9	-10.7	3.4	4	clayy SILT to silty CLAY	115	2.0	43	18	-	-	6.0	9.9	36	2.60	15	N/A	N/A
41.50	84.3	-	84.1	2.8	-10.9	3.5	4	clayy SILT to silty CLAY	115	2.0	42	17	-	-	5.8	9.9	36	2.62	15	N/A	N/A
41.67	80.9	-	80.6	2.9	-11.1	3.8	4	clayy SILT to silty CLAY	115	2.0	40	17	-	-	5.5	9.9	38	2.66	15	N/A	N/A
41.83	74.1	-	73.9	2.8	-11.3	3.9	4	clayy SILT to silty CLAY	115	2.0	37	15	-	-	5.1	9.7	40	2.70	15	N/A	N/A
42.00	73.0	-	72.8	2.6	-11.3	3.6	4	clayy SILT to silty CLAY	115	2.0	37	15	-	-	5.0	9.5	40	2.69	15	N/A	N/A
42.16	79.6	-	79.4	2.6	-11.6	3.4	4	clayy SILT to silty CLAY	115	2.0	40	16	-	-	5.5	9.9	37	2.64	15	N/A	N/A
42.32	88.2	136.9	88.0	2.7	-11.7	3.1	4	clayy SILT to silty CLAY	115	2.0	44	27	-	-	6.1	9.9	28	2.45	15	N/A	N/A
42.49	92.2	141.8	91.9	2.9	-11.7	3.2	4	clayy SILT to silty CLAY	115	2.0	46	28	-	-	6.3	9.9	28	2.44	15	N/A	N/A
42.65	94.9	145.5	94.6	3.0	-11.7	3.3	4	clayy SILT to silty CLAY	115	2.0	47	29	-	-	6.5	9.9	28	2.44	15	N/A	N/A
42.82	97.9	151.1	97.7	3.3	-11.8	3.4	4	clayy SILT to silty CLAY	115	2.0	49	30	-	-	6.7	9.9	28	2.45	15	N/A	N/A
42.98	106.7	140.6	106.4	2.9	-11.8	2.8	5	silty SAND to sandy SILT	120	4.0	27	16	53	36	-	-	25	2.36	16	N/A	N/A
43.15	103.5	136.4	103.2	2.8	-11.8	2.7	5	silty SAND to sandy SILT	120	4.0	26	16	52	35	-	-	25	2.36	16	N/A	N/A
43.31	92.7	135.5	92.4	2.7	-11.7	3.0	4	clayy SILT to silty CLAY	115	2.0	46	28	-	-	6.4	9.9	27	2.42	15	N/A	N/A
43.47	91.6	143.4	91.4	3.0	-11.7	3.3	4	clayy SILT to silty CLAY	115	2.0	46	28	-	-	6.3	9.9	29	2.46	15	N/A	N/A
43.64	88.3	-	88.0	3.0	-11.7	3.5	4	clayy SILT to silty CLAY	115	2.0	44	17	-	-	6.1	9.9	37	2.63	15	N/A	N/A
43.80	55.2	-	54.9	2.6	-11.6	4.9	3	silty CLAY to CLAY	115	1.5	37	14	-	-	3.7	6.8	51	2.88	15	N/A	N/A
43.97	31.7	-	31.5	1.7	-11.5	5.8	3	silty CLAY to CLAY	115	1.5	21	8	-	-	2.1	3.7	68	3.13	15	N/A	N/A
44.13	21.6	-	21.4	1.4	-11.3	7.5	3	silty CLAY to CLAY	115	1.5	14	6	-	-	1.3	2.4	85	3.34	15	N/A	N/A
44.29	37.2	-	37.0	0.8	-11.3	2.3	4	clayy SILT to silty CLAY	115	2.0	19	7	-	-	2.4	4.4	48	2.83	15	N/A	N/A
44.46	50.2	-	50.0	1.4	-11.5	3.0	4	clayy SILT to silty CLAY	115	2.0	25	10	-	-	3.4	6.1	45	2.78	15	N/A	N/A
44.62	39.0	-	38.8	1.3	-11.4	3.6	3	silty CLAY to CLAY	115	1.5	26	10	-	-	2.6	4.6	53	2.92	15	N/A	N/A
44.79	29.9	-	29.7	1.1	-11.4	4.2	3	silty CLAY to CLAY	115	1.5	20	8	-	-	1.9	3.4	63	3.07	15	N/A	N/A
44.95	22.9	-	22.7	1.2	-11.3	5.8	3	silty CLAY to CLAY	115	1.5	15	6	-	-	1.4	2.5	77	3.26	15	N/A	N/A
45.11	25.1	-	24.9	1.4	-11.0	6.2	3	silty CLAY to CLAY	115	1.5	17	6	-	-	1.6	2.8	76	3.24	15	N/A	N/A
45.28	59.0	-	58.8	2.0	-11.1	3.6	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.0	7.0	45	2.78	15	N/A	N/A
45.44	132.5	140.6	132.2	3.1	-11.5	2.4	5	silty SAND to sandy SILT	120	4.0	33	20	59	37	-	-	20	2.24	16	N/A	N/A
45.61	153.3	155.1	153.3	3.7	-1.2	2.5	5	silty SAND to sandy SILT	120	4.0	38	23	64	37	-	-	19	2.21	16	N/A	N/A
45.77	142.2	154.6	142.2	3.7	-1.2	2.7	5	silty SAND to sandy SILT	120	4.0	36	21	61	37	-	-	21	2.26	16	N/A	N/A
45.93	97.0	-	96.9	3.6	-0.8	3.8	4	clayy SILT to silty CLAY	115	2.0	48	18	-	-	6.7	9.9	37	2.63	15	N/A	N/A
46.10	79.8	-	79.8	3.0	-1.8	3.9	4	clayy SILT to silty CLAY	115	2.0	40	15	-	-	5.5	9.5	41	2.70	15	-	-
46.26	118.2	131.8	118.1	2.7	-2.8	2.3	5	silty SAND to sandy SILT	120	4.0	30	17	55	36	-	-	22	2.28	16	0.49	2.5

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

Middle Earth Geo Testing

Instructional Bldg I El Camino College Compton Center

Project ID: Heider Inspections
Data File: SDF(351).cpt
CPT Date: 11/2/2015 1:33:51 PM
GW During Test: 46 ft

Sounding ID: CPT-03
Project No: 150249
Cone/Rig: DDG1333

Depth ft	qc PS tsf	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N 60%	* SPT R-N1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR - -	* Fin Ic %	* Ic SBT Indx	* Nk - -	* Vol Strn %	* Cycl SStn %
46.43	173.8	152.0	173.7	3.4	-3.6	2.0	5	silty SAND to sandy SILT	120	4.0	43	26	68	38	-	-	16	2.11	16	0.18	1.1
46.59	182.5	167.8	182.5	4.3	-1.5	2.4	5	silty SAND to sandy SILT	120	4.0	46	27	69	38	-	-	17	2.15	16	0.00	0.0
46.75	202.4	183.6	202.4	5.0	-1.8	2.5	5	silty SAND to sandy SILT	120	4.0	51	30	73	39	-	-	17	2.14	16	0.00	0.0
46.92	215.0	190.4	215.0	5.4	-1.9	2.5	5	silty SAND to sandy SILT	120	4.0	54	32	75	39	-	-	17	2.12	16	0.00	0.0
47.08	230.1	197.9	230.0	5.7	-3.1	2.5	5	silty SAND to sandy SILT	120	4.0	58	34	77	40	-	-	16	2.10	16	0.00	0.0
47.25	234.4	205.0	234.3	6.1	-4.1	2.6	5	silty SAND to sandy SILT	120	4.0	59	34	78	40	-	-	16	2.12	16	0.00	0.0
47.41	240.5	198.2	240.3	5.6	-5.9	2.3	5	silty SAND to sandy SILT	120	4.0	60	35	78	40	-	-	15	2.07	16	0.00	0.0
47.57	252.8	208.0	252.7	6.1	-8.0	2.4	5	silty SAND to sandy SILT	120	4.0	63	37	80	40	-	-	15	2.07	16	0.00	0.0
47.74	266.7	222.0	266.5	6.9	-8.0	2.6	5	silty SAND to sandy SILT	120	4.0	67	39	82	40	-	-	15	2.08	16	0.00	0.0
47.90	276.8	230.5	276.6	7.4	-8.0	2.7	5	silty SAND to sandy SILT	120	4.0	69	41	83	41	-	-	15	2.08	16	0.00	0.0
48.07	274.4	235.9	274.3	7.9	-8.0	2.9	5	silty SAND to sandy SILT	120	4.0	69	40	83	41	-	-	16	2.11	16	0.00	0.0
48.23	260.2	230.3	260.1	7.7	-7.9	3.0	5	silty SAND to sandy SILT	120	4.0	65	38	81	40	-	-	17	2.13	16	0.00	0.0
48.39	236.4	220.9	236.2	7.2	-7.8	3.1	5	silty SAND to sandy SILT	120	4.0	59	35	78	40	-	-	18	2.17	16	0.00	0.0
48.56	212.7	206.7	212.5	6.5	-7.7	3.1	5	silty SAND to sandy SILT	120	4.0	53	31	74	39	-	-	19	2.20	16	0.00	0.0
48.72	198.8	196.5	198.7	5.9	-7.3	3.0	5	silty SAND to sandy SILT	120	4.0	50	29	72	39	-	-	19	2.21	16	0.00	0.0
48.89	192.1	190.7	191.9	5.6	-6.1	3.0	5	silty SAND to sandy SILT	120	4.0	48	28	71	38	-	-	19	2.21	16	0.00	0.0
49.05	176.7	178.2	176.6	5.0	-4.6	2.9	5	silty SAND to sandy SILT	120	4.0	44	26	68	38	-	-	20	2.22	16	0.00	0.0
49.22	159.8	155.3	159.7	3.8	-3.6	2.4	5	silty SAND to sandy SILT	120	4.0	40	23	65	37	-	-	19	2.20	16	0.15	0.8
49.38	170.7	150.7	170.7	3.5	-2.3	2.1	5	silty SAND to sandy SILT	120	4.0	43	25	67	38	-	-	17	2.13	16	0.19	1.1
49.54	169.8	146.8	169.8	3.3	0.4	2.0	5	silty SAND to sandy SILT	120	4.0	42	25	67	38	-	-	16	2.12	16	0.22	1.4
49.71	211.9	155.4	211.9	3.2	-1.5	1.5	6	clean SAND to silty SAND	125	5.0	42	25	74	39	-	-	12	1.97	16	0.17	1.3
49.87	220.2	161.3	220.1	3.4	-1.8	1.6	6	clean SAND to silty SAND	125	5.0	44	26	75	39	-	-	12	1.97	16	0.00	0.0
50.04	216.9	160.5	216.9	3.4	-1.1	1.6	6	clean SAND to silty SAND	125	5.0	43	25	75	39	-	-	12	1.98	16	0.00	0.0
50.20	211.6	158.0	211.6	3.4	-0.1	1.6	6	clean SAND to silty SAND	125	5.0	42	25	74	39	-	-	13	1.99	16	0.15	1.1
50.36	200.3	149.4	200.3	3.0	-0.4	1.5	6	clean SAND to silty SAND	125	5.0	40	23	72	39	-	-	13	1.99	16	0.21	1.5
50.53	154.6	140.4	154.6	3.1	-0.4	2.0	5	silty SAND to sandy SILT	120	4.0	39	22	63	37	-	-	18	2.16	16	0.34	1.8
50.69	72.9	-	72.9	3.0	0.9	4.2	3	silty CLAY to CLAY	115	1.5	49	18	-	-	5.0	8.2	44	2.76	15	-	-
50.86	51.2	-	51.2	1.6	0.3	3.4	3	silty CLAY to CLAY	115	1.5	34	13	-	-	3.4	5.6	47	2.82	15	-	-
51.02	32.5	-	32.5	1.5	0.0	5.1	3	silty CLAY to CLAY	115	1.5	22	8	-	-	2.1	3.4	65	3.10	15	-	-
51.18	59.9	-	60.0	1.8	1.4	3.2	4	clayy SILT to silty CLAY	115	2.0	30	11	-	-	4.0	6.6	43	2.75	15	-	-
51.35	83.1	-	83.1	2.3	-0.3	2.9	4	clayy SILT to silty CLAY	115	2.0	42	16	-	-	5.7	9.3	36	2.61	15	-	-
51.51	76.1	-	76.1	2.9	0.1	4.0	4	clayy SILT to silty CLAY	115	2.0	38	14	-	-	5.2	8.5	42	2.73	15	-	-
51.68	112.7	148.8	112.7	3.4	0.0	3.1	4	clayy SILT to silty CLAY	115	2.0	56	32	-	-	7.8	9.9	26	2.40	15	0.18	0.5
51.84	181.7	172.6	181.6	4.7	-0.5	2.6	5	silty SAND to sandy SILT	120	4.0	45	26	68	38	-	-	19	2.19	16	0.00	0.0
52.00	202.0	186.4	202.0	5.4	1.5	2.7	5	silty SAND to sandy SILT	120	4.0	50	29	72	39	-	-	18	2.17	16	0.00	0.0
52.17	207.3	197.9	207.3	6.1	1.5	3.0	5	silty SAND to sandy SILT	120	4.0	52	30	73	39	-	-	19	2.20	16	0.00	0.0
52.33	199.4	190.2	199.4	5.7	1.5	2.9	5	silty SAND to sandy SILT	120	4.0	50	29	71	39	-	-	19	2.20	16	0.00	0.0
52.50	173.5	175.2	173.6	4.9	1.5	2.9	5	silty SAND to sandy SILT	120	4.0	43	25	67	38	-	-	20	2.24	16	0.00	0.0
52.66	209.7	173.0	209.7	4.5	1.4	2.2	5	silty SAND to sandy SILT	120	4.0	52	30	73	39	-	-	16	2.09	16	0.00	0.0
52.82	241.8	190.9	241.8	5.3	1.3	2.2	5	silty SAND to sandy SILT	120	4.0	60	35	78	40	-	-	15	2.06	16	0.00	0.0
52.99	254.3	202.8	254.3	5.9	0.8	2.4	5	silty SAND to sandy SILT	120	4.0	64	36	79	40	-	-	15	2.06	16	0.00	0.0
53.15	250.5	209.5	250.6	6.5	0.8	2.6	5	silty SAND to sandy SILT	120	4.0	63	36	79	40	-	-	16	2.10	16	0.00	0.0
53.32	247.8	209.0	247.8	6.5	0.8	2.7	5	silty SAND to sandy SILT	120	4.0	62	35	78	40	-	-	16	2.11	16	0.00	0.0
53.48	249.8	205.1	249.8	6.2	0.8	2.5	5	silty SAND to sandy SILT	120	4.0	62	36	79	40	-	-	16	2.09	16	0.00	0.0
53.64	244.8	209.9	244.8	6.6	0.8	2.7	5	silty SAND to sandy SILT	120	4.0	61	35	78	40	-	-	17	2.13	16	0.00	0.0
53.81	228.1	206.2	228.1	6.5	0.9	2.9	5	silty SAND to sandy SILT	120	4.0	57	32	76	39	-	-	18	2.17	16	0.00	0.0
53.97	219.6	202.2	219.6	6.4	0.8	2.9	5	silty SAND to sandy SILT	120	4.0	55	31	74	39	-	-	18	2.18	16	0.00	0.0
54.14	236.2	212.3	236.2	6.9	0.7	3.0	5	silty SAND to sandy SILT	120	4.0	59	34	77	39	-	-	18	2.16	16	0.00	0.0
54.30	263.0	225.0	263.0	7.5	0.5	2.9	5	silty SAND to sandy SILT	120	4.0	66	37	80	40	-	-	17	2.13	16	0.00	0.0
54.46	262.6	226.6	262.6	7.7	0.4	3.0	5	silty SAND to sandy SILT	120	4.0	66	37	80	40	-	-	17	2.13	16	0.00	0.0
54.63	265.4	225.6	265.4	7.6	0.3	2.9	5	silty SAND to sandy SILT	120	4.0	66	38	80	40	-	-	17	2.12	16	0.00	0.0

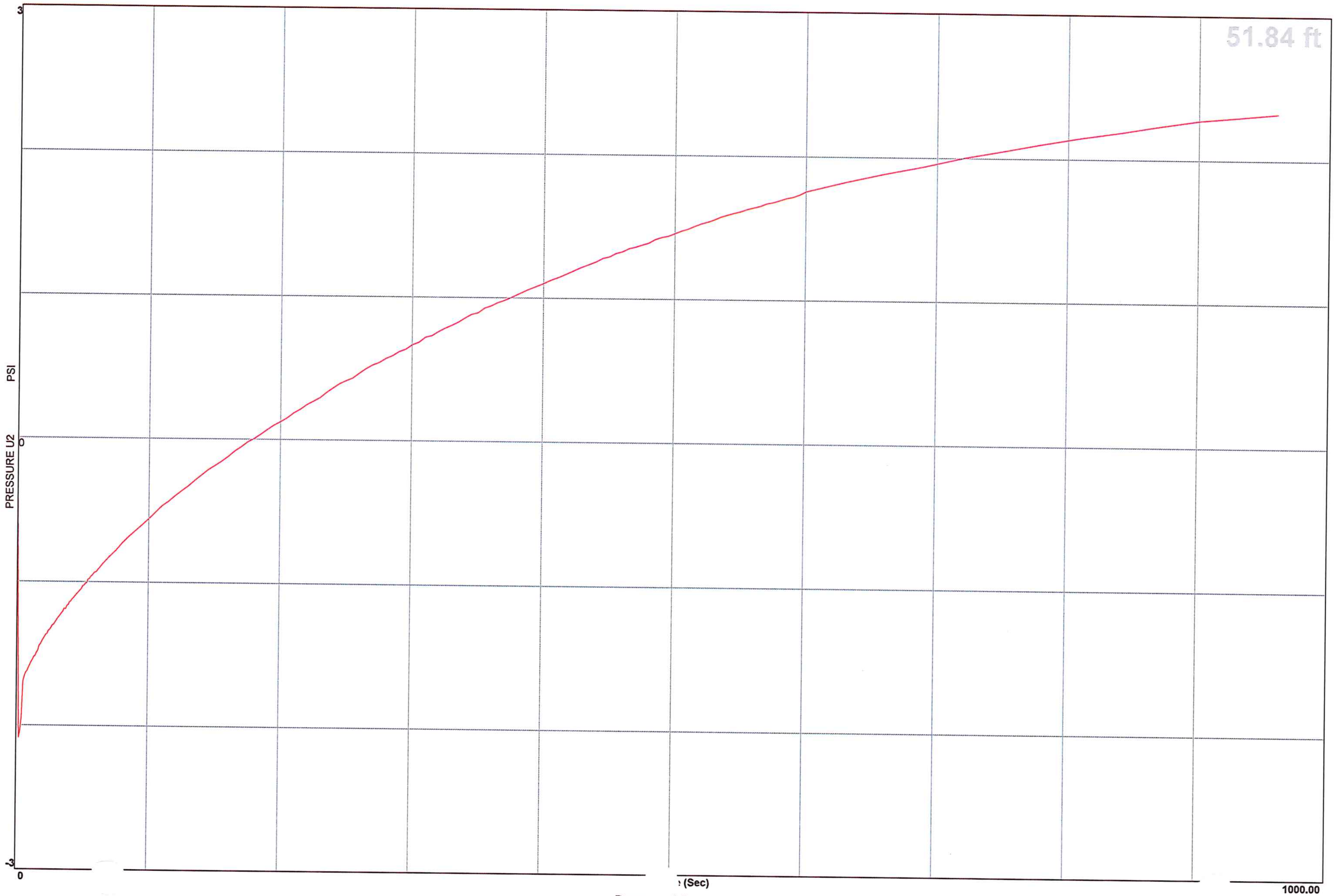
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

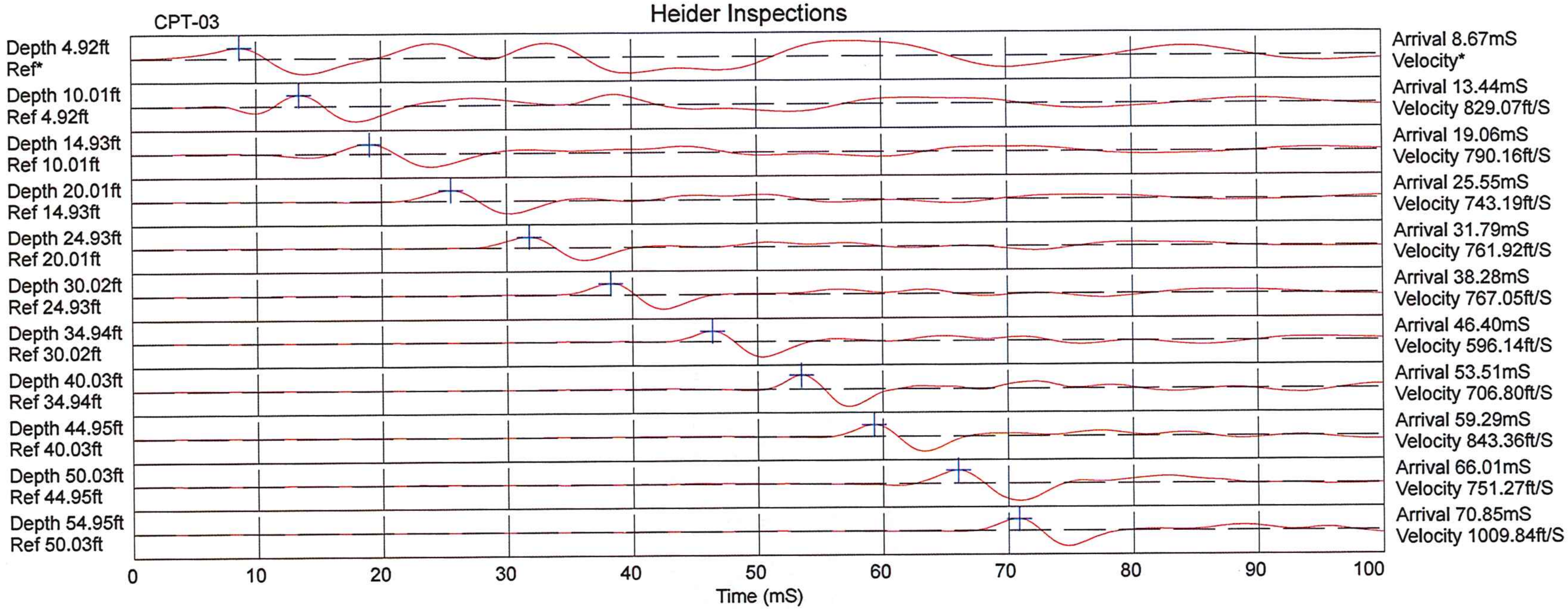
Heider Inspections

LocaInstructional Bldg I El Camino College Compto		Operator	RC-DG
Job Number	150249	Cone Number	DDG1333
Hole Number	CPT-03	Date and Time	11/2/2015 1:33:51 PM
Equilized Pressure	2.3	EST GW Depth During Test	46.4

GPS



Heider Inspections



Hammer to Rod String Distance (ft): 5.83
* = Not Determined

LOCATION: Instructional Bldg I El Camino College Compton Center

APPENDIX B

LABORATORY TEST RESULTS

Atterberg Limits (Liquid and Plastic) Test Results
Sieve Analysis Result (Grain Size Distribution)
Direct Shear Test Results
Collapse Potential Test (Consolidation Test)
Corrosivity Test Results

Heider Inspection Group - An ETS Company
800 S Rochester Ave, Ste A
Ontario, CA 91761
Office: 909-673-0292; Fax: 909-673-0272

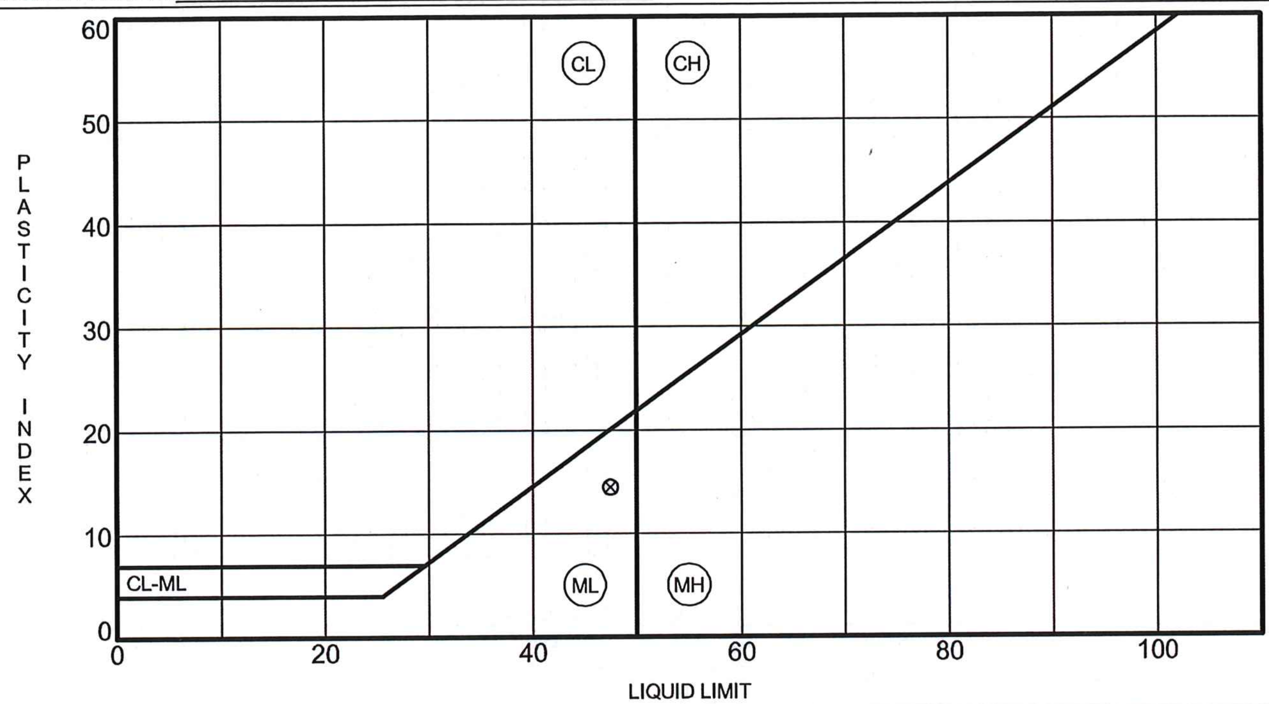
ATTERBERG LIMITS RESULTS

CLIENT El Camino College Compton Center

PROJECT NAME Proposed Instructional Building I

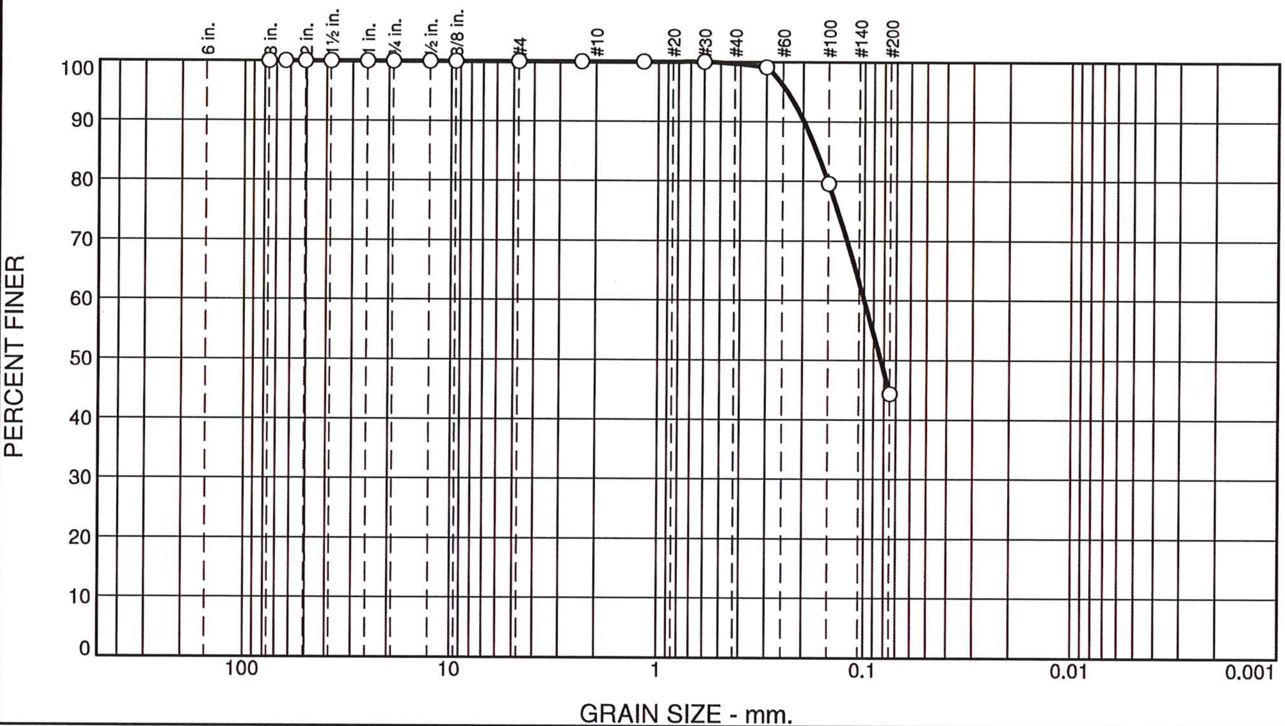
PROJECT NUMBER HE15281-2

PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221



	Specimen Identification		LL	PL	PI	Fines	Classification
⊗	**B-2**	**19.5**	**48**	**33**	**15**	**94**	**SILT (ML)**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	56	44	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100		
2 1/2"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#8	100		
#16	100		
#30	100		
#50	99		
#100	80		
#200	44		

* (no specification provided)

Material Description

Sample Type B-2 @ 5

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 0.1986 D_{85}= 0.1718 D_{60}= 0.1001
D_{50}= 0.0832 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: ____________________

Checked By: ____________________

Title: ____________________

Date Sampled:

CONSOLIDATED ENGINEERING LABORATORIES

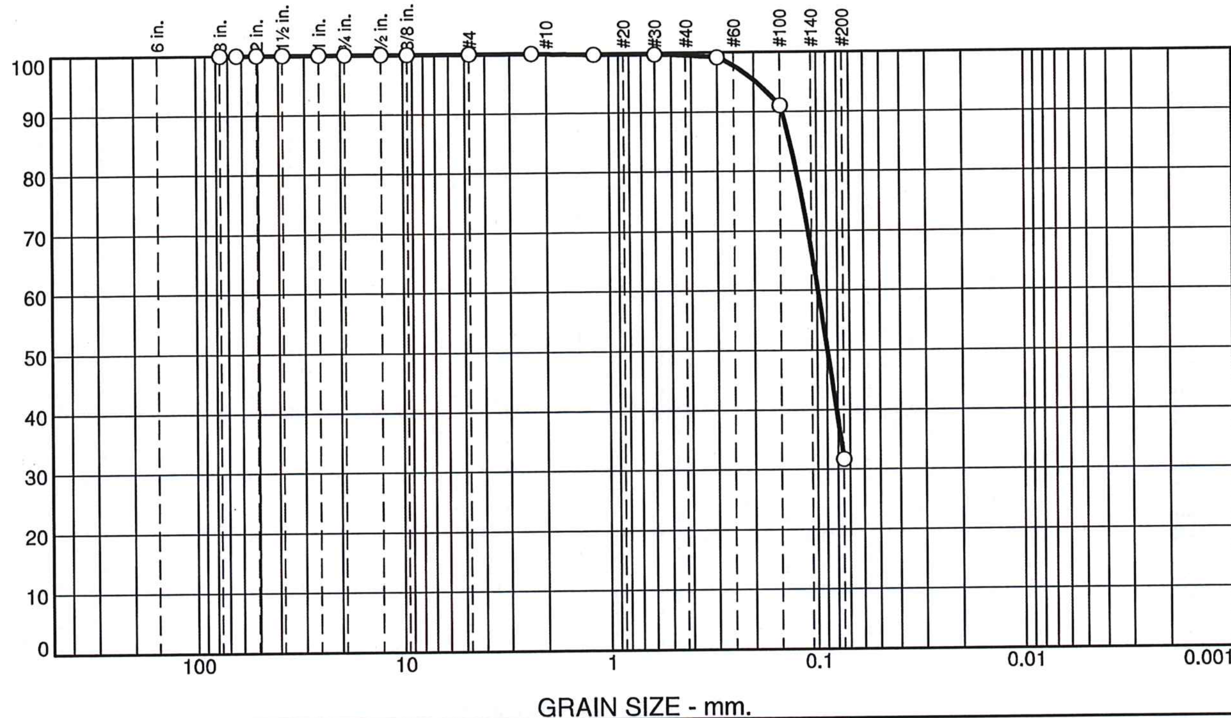
San Ramon, California

Client:

Project: Proposed Instructional Building 1

Project No: HE15281-2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	68	32	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100		
2 1/2"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#8	100		
#16	100		
#30	100		
#50	99		
#100	91		
#200	32		

* (no specification provided)

Material Description

Sample Type: B-3 @ 5

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 0.1469 D_{85}= 0.1347 D_{60}= 0.0991
D_{50}= 0.0895 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**
Tested By:
Checked By:
Title:

Date Sampled:

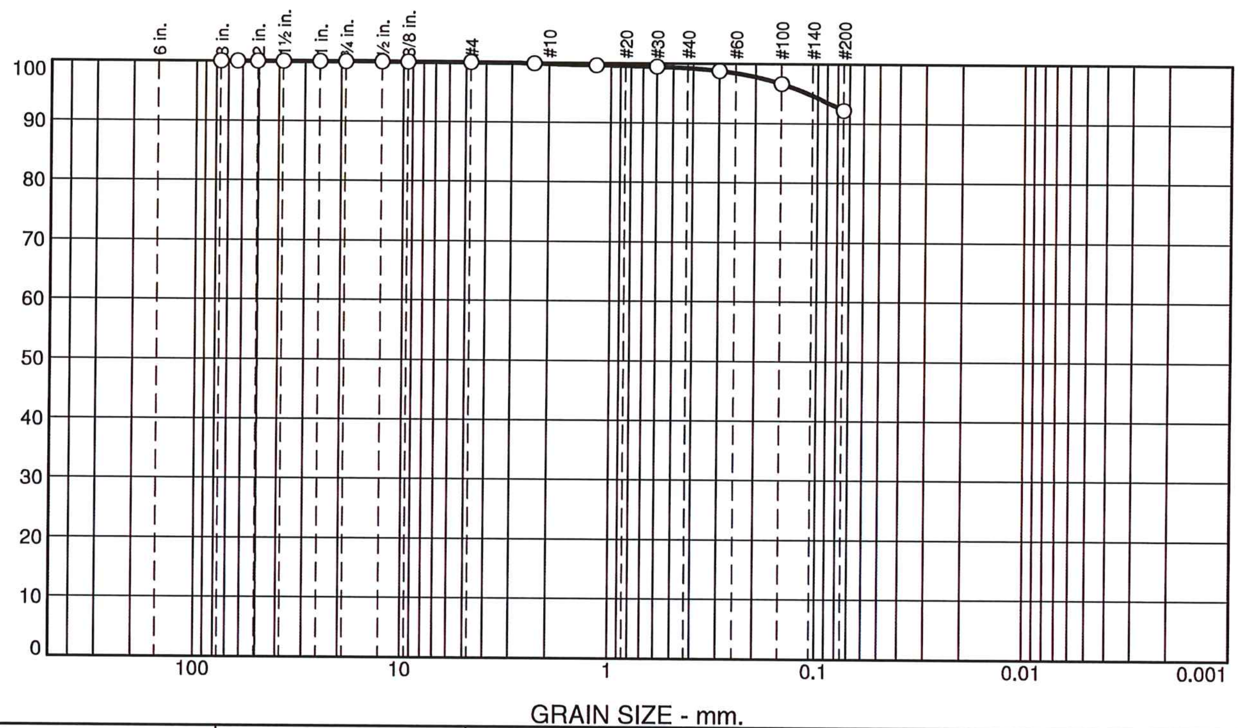
CONSOLIDATED ENGINEERING LABORATORIES

San Ramon, California

Client:
Project: Proposed Instructional Building 1
Project No: HE15281-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	7	92	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100		
2 1/2"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#8	100		
#16	100		
#30	99		
#50	99		
#100	97		
#200	92		

* (no specification provided)

Material Description

Sample Type: B-3 @ 15

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

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

Remarks

Date Received: **Date Tested:**

Tested By:

Checked By:

Title:

Date Sampled:

CONSOLIDATED ENGINEERING LABORATORIES

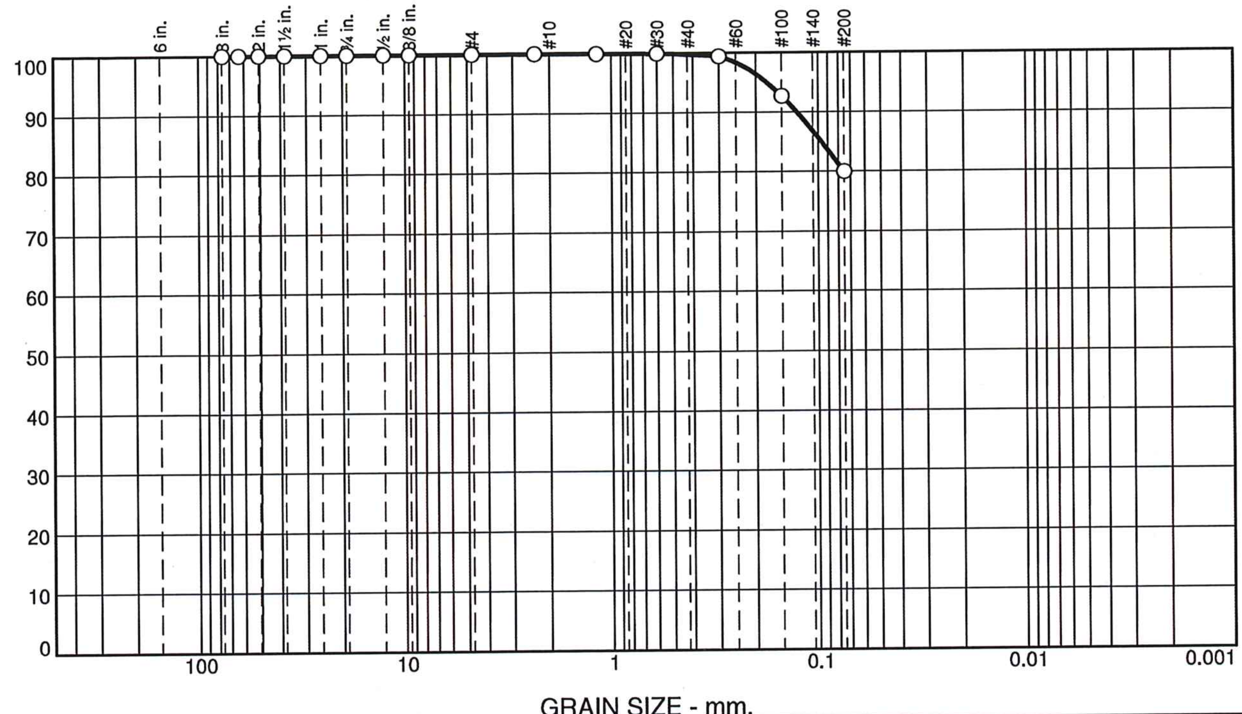
San Ramon, California

Client:

Project: Proposed Instructional Building 1

Project No: HE15281-2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	20	80	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100		
2 1/2"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#8	100		
#16	100		
#30	100		
#50	99		
#100	93		
#200	80		

* (no specification provided)

Material Description

Sample Type: B-3 @ 40

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 0.1269 D_{85}= 0.0967 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: **Date Tested:**

Tested By: ____________

Checked By: ____________

Title: ____________

Date Sampled:

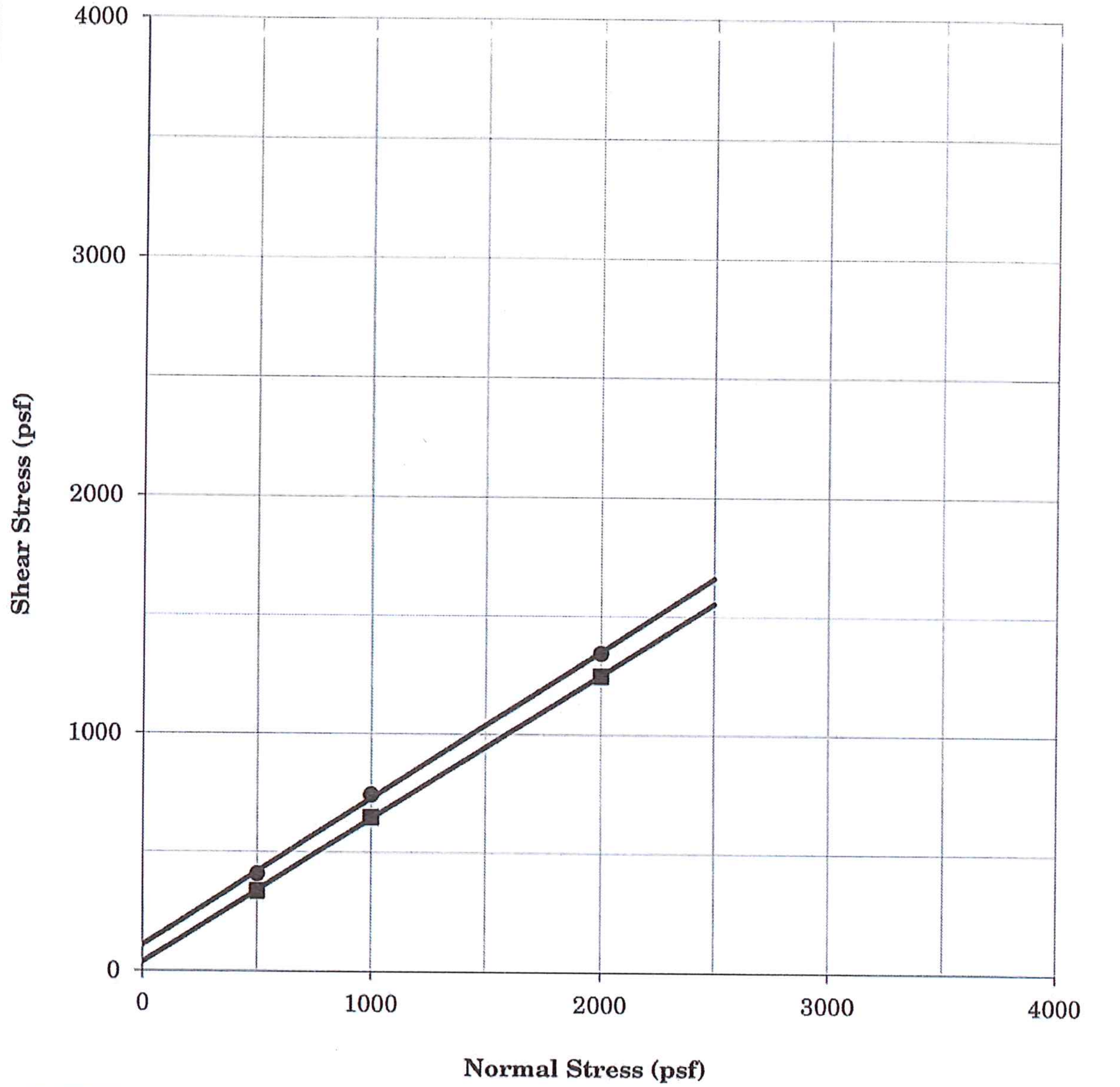
CONSOLIDATED ENGINEERING LABORATORIES

San Ramon, California

Client:

Project: Propsed Instructional Building 1

Project No: HE15281-2



Shear Speed: 0.005 in. / min. Samples tested in a submerged condition.

Average In-Situ Dry Density (pcf)	95.6
Average In-Situ Moisture Content	4.6

Peak	Cohesion	108 psf
	Internal Friction Angle	32 degrees
Ultimate	Cohesion	36 psf
	Internal Friction Angle	31 degrees
Residual	Cohesion	
	Internal Friction Angle	

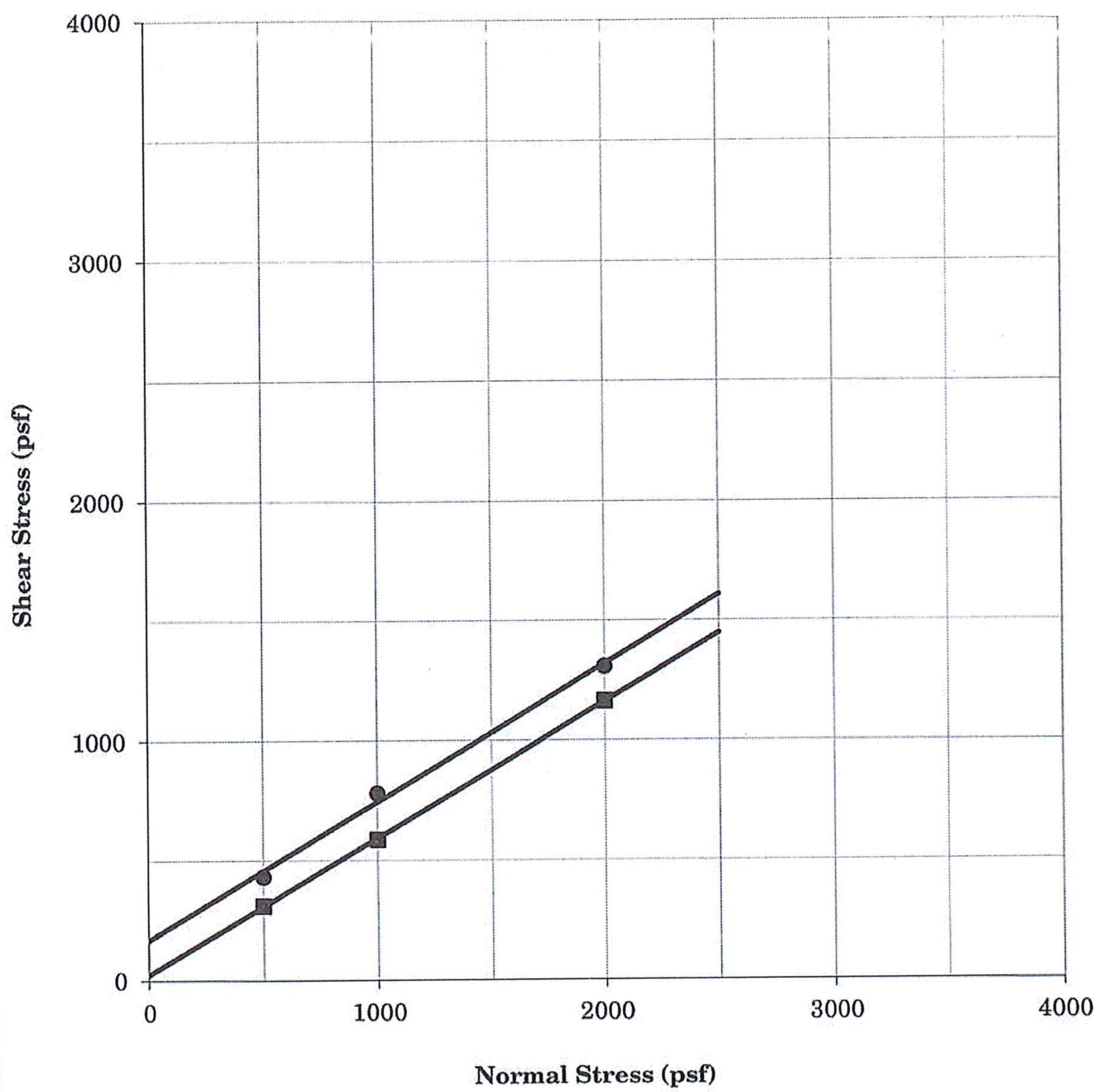
HILLTOP GEOTECHNICAL
INCORPORATED

DIRECT SHEAR TEST RESULTS
(ASTM D3080 Test Method)

SAMPLE: B1, 5.0'

SOIL DESCRIPTION: Silty, fine sand (SM), Grayish brown

BY:	JGS	DATE:	11/2015
PROJECT NO.:	1015-B15	PLATE NO.:	1



Shear Speed: 0.005 in. / min.

Samples tested in a submerged condition.

Average In-Situ Dry Density (pcf)	103.2
Average In-Situ Moisture Content	13.7

Peak	Cohesion	168 psf
	Internal Friction Angle	30 degrees
Ultimate	Cohesion	24 psf
	Internal Friction Angle	30 degrees
Residual	Cohesion	
	Internal Friction Angle	

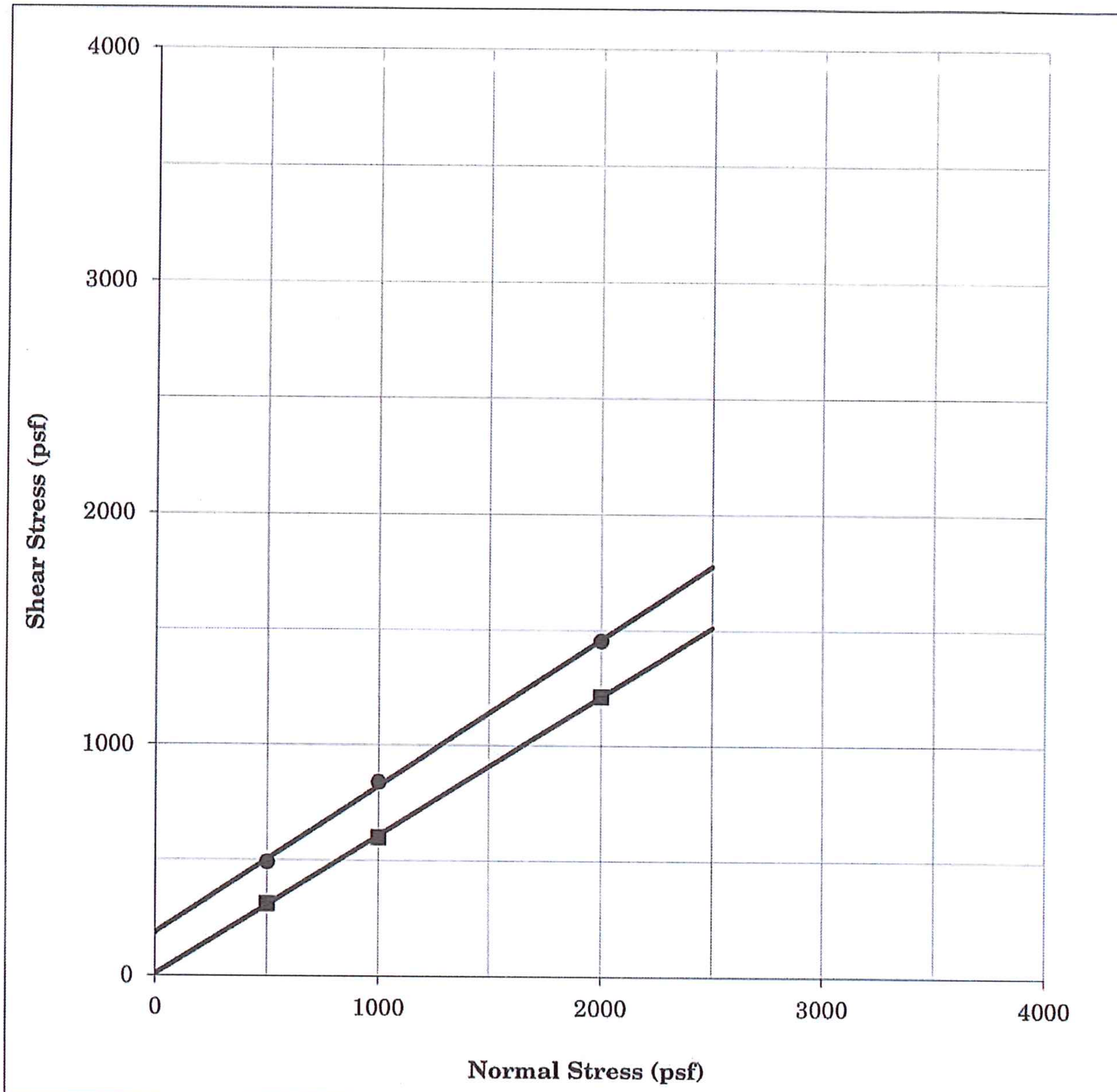
HILLTOP GEOTECHNICAL INCORPORATED

DIRECT SHEAR TEST RESULTS
(ASTM D3080 Test Method)

SAMPLE: B2, 10.0'

SOIL DESCRIPTION: Silty, fine sand (SM), Grayish brown

BY:	JGS	DATE:	11/2015
PROJECT NO.:	1015-B15	PLATE NO.:	2



Shear Speed: 0.005 in. / min. Samples tested in a submerged condition.

Average In-Situ Dry Density (pcf)	108.5
Average In-Situ Moisture Content	13.3

Peak	Cohesion	186 psf
	Internal Friction Angle	32 degrees
Ultimate	Cohesion	6 psf
	Internal Friction Angle	31 degrees
Residual	Cohesion	
	Internal Friction Angle	

HILLTOP GEOTECHNICAL
INCORPORATED

DIRECT SHEAR TEST RESULTS
(ASTM D3080 Test Method)

SAMPLE: B1, 0'-5' (Remolded sample)

SOIL DESCRIPTION: Silty, fine sand (SM), Grayish brown

BY:	JGS	DATE:	11/2015
PROJECT NO.:	1015-B15	PLATE NO.:	3

CONSOLIDATION TEST
For Collapse Potential

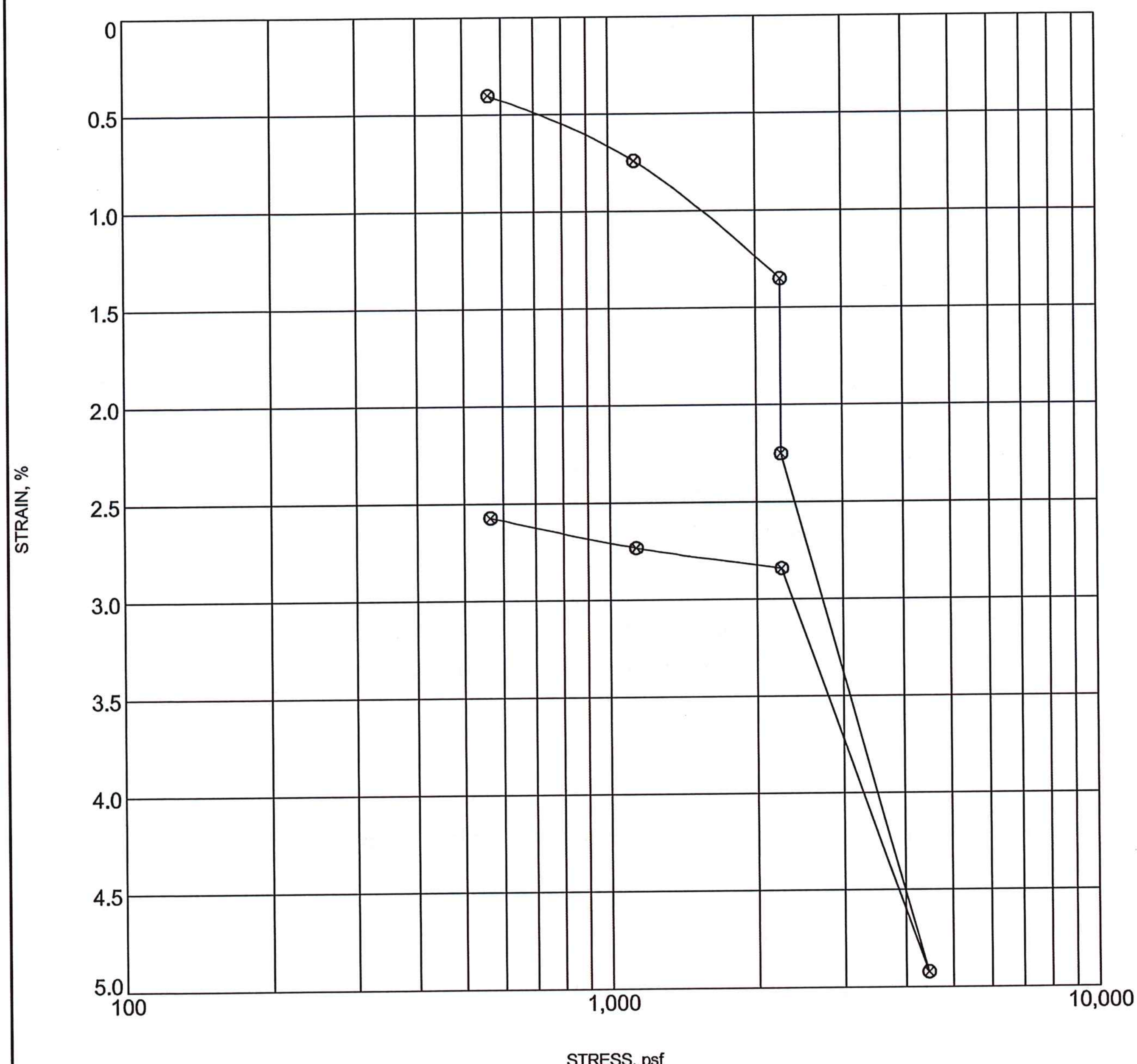
Heider Inspection Group - An ETS Company
800 S Rochester Ave, Ste A
Ontario, CA 91761
Office: 909-673-0292; Fax: 909-673-0272

CLIENT El Camino College Compton Center

PROJECT NUMBER HE15281-2

PROJECT NAME Proposed Instructional Building I

PROJECT LOCATION 1111 E Artesia Blvd, Compton, CA 90221



	Specimen Identification		Classification	γ_d	MC%
⊗	B-2	4.5	(SM) SILTY SAND: Gray, med dense.	95	3%

HDR

TRANSMITTAL LETTER

DATE: December 1, 2015

ATTENTION: **Steven Runyan**

TO: Heider Engineering Services, Inc.
800-A South Rochester Avenue
Ontario, CA 91761

SUBJECT: Laboratory Test Data
Your #150249, HDR Lab #15-0906LAB

COMMENTS: Enclosed are the results for the subject project.

James T. Keegan
Laboratory Services Manager

HDR

Table 1 - Laboratory Tests on Soil Samples

Heider Engineering Services, Inc.
Your #150249, HDR Lab #15-0906LAB
17-Nov-15

Sample ID		Units	#2 @ 0-5'
Resistivity		**Units**	
as-received		ohm-cm	124,000
saturated		ohm-cm	3,120
pH			6.9
Electrical Conductivity		mS/cm	0.16
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	104
magnesium	Mg^{2+}	mg/kg	14
sodium	Na^{1+}	mg/kg	71
potassium	K^{1+}	mg/kg	19
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	366
fluoride	F^{1-}	mg/kg	22
chloride	Cl^{1-}	mg/kg	16
sulfate	SO_4^{2-}	mg/kg	45
phosphate	PO_4^{3-}	mg/kg	ND
Other Tests			
ammonium	NH_4^{1+}	mg/kg	0.8
nitrate	NO_3^{1-}	mg/kg	9.1
sulfide	S^{2-}	qual	na
Redox		mV	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

APPENDIX C

Groundwater Level Data Report

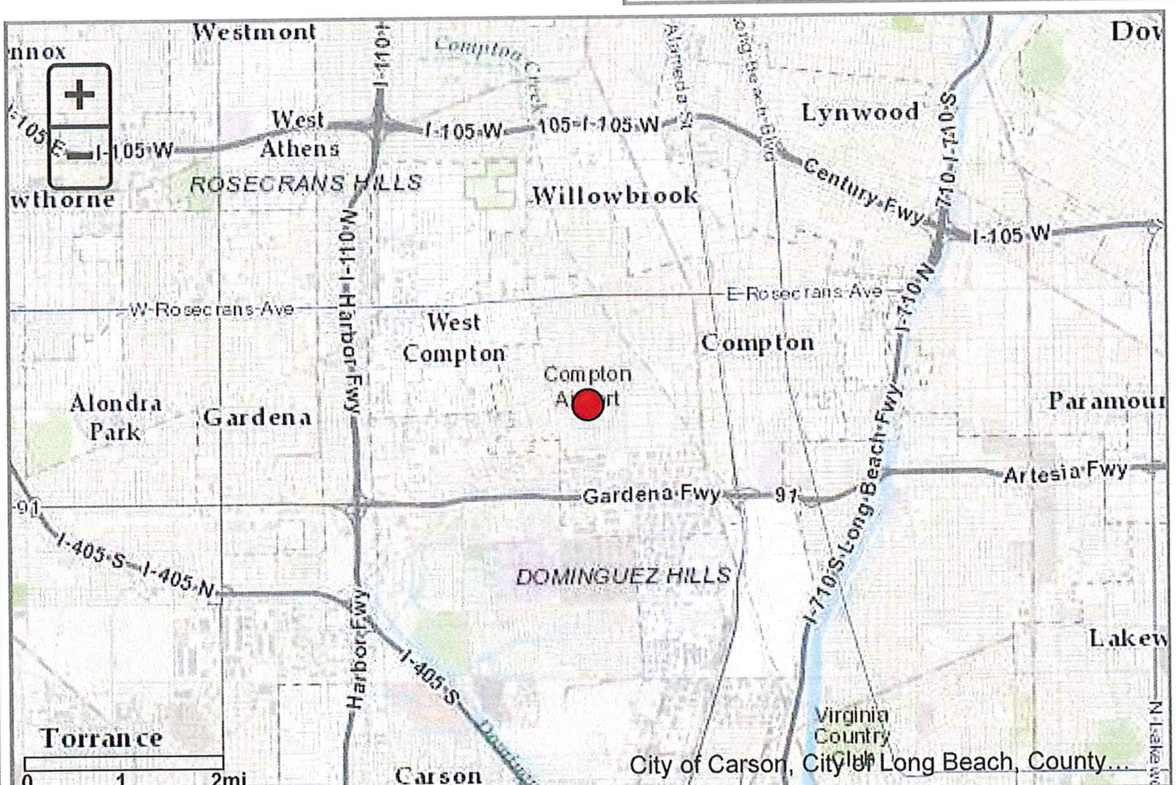
Groundwater Levels for Station 338872N1182432W001

Data for your selected well is shown in the tabbed interface below. To view data managed in the updated WDL tables, including data collected under the CASGEM program, click the "Recent Groundwater Level Data" tab. To view data stored in the former WDL tables, click the "Historical Groundwater Level Data" tab. To download the data in CSV format, click the "Download CSV File" button on the respective tab. Please note that the vertical datum for "recent" measurements is NAVD88, while the vertical datum for "historical" measurements is NGVD29. To change your well selection criteria, click the "Perform a New Well Search" button.

Station Data Recent Groundwater Level Data Historical Groundwater Level Data

State Well Number: 03S13W21R003S
Local Well ID:
Site Code: 338872N1182432W001
Latitude (NAD83): 33.887200
Longitude (NAD83): -118.2432
Groundwater Basin (code): Central (4-11.04)

Well Use: Unknown
Well Status: Active
Well Completion Report Number:
Reference Point Elevation (NAVD88 ft): 92.46
Ground Surface Elevation (NAVD88 ft): 92.46
Total Depth (ft): Confidential
Perforated Interval Depths (ft): Confidential

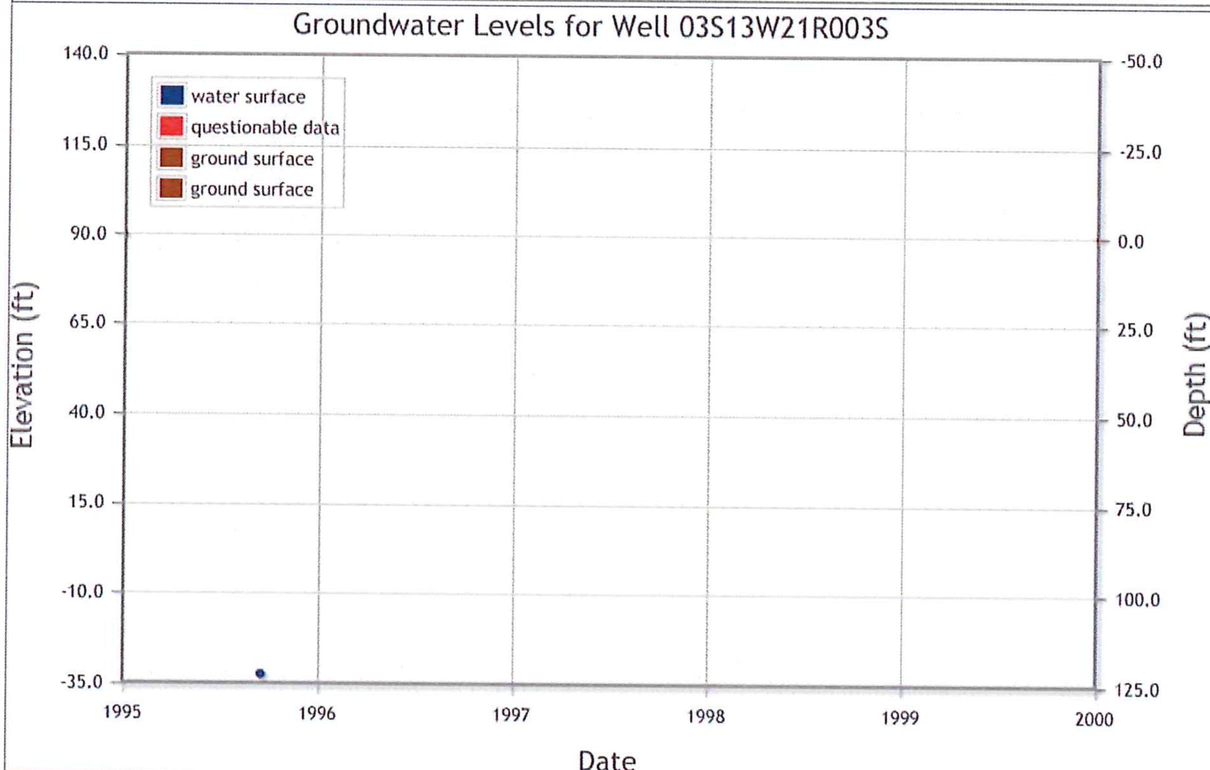


Perform a New Well Search

Groundwater Levels for Station 338872N1182432W001

Data for your selected well is shown in the tabbed interface below. To view data managed in the updated WDL tables, including data collected under the CASGEM program, click the "Recent Groundwater Level Data" tab. To view data stored in the former WDL tables, click the "Historical Groundwater Level Data" tab. To download the data in CSV format, click the "Download CSV File" button on the respective tab. Please note that the vertical datum for "recent" measurements is NAVD88, while the vertical datum for "historical" measurements is NGVD29. To change your well selection criteria, click the "Perform a New Well Search" button.

Station Data | Recent Groundwater Level Data | **Historical Groundwater Level Data**



Download CSV File

Date	RPE	GSE	RPWS	WSE	GS to...	NM Code	QM Code	Agency
09/14/1995 00:00	90	90	122.45	-32.45	122.45			5000

All elevation and depth measurements are in feet. The vertical datum for historical measurements is NGVD29.

Perform a New Well Search

APPENDIX D

Seismic Design Maps and Liquefaction Analysis Results

USGS Design Maps Summary Report

User–Specified Input

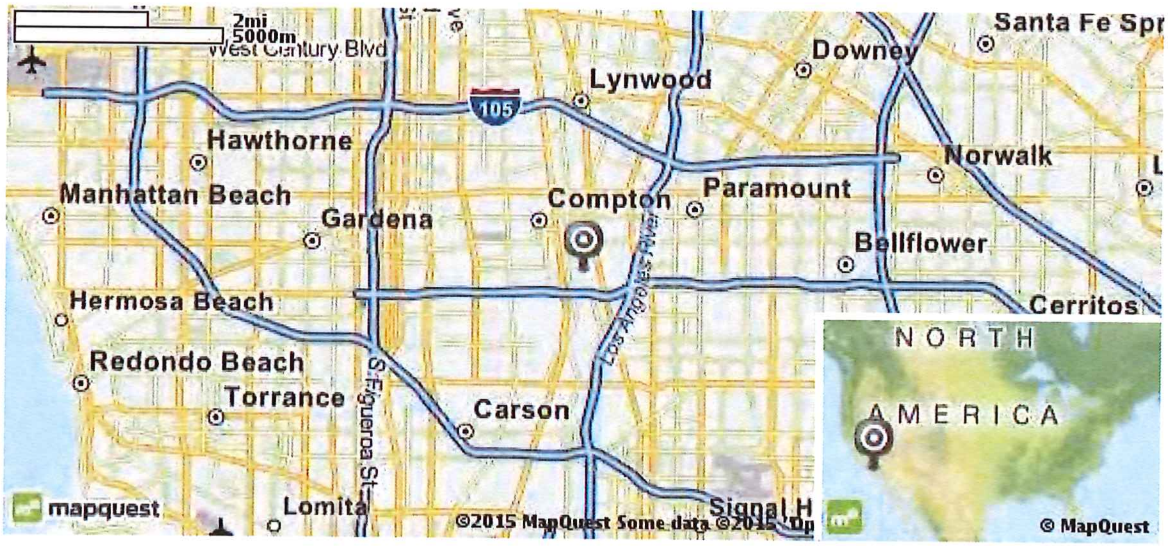
Report Title El Camino Community College - Instrumental Buildling I
Wed November 11, 2015 22:46:53 UTC

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 33.8792°N, 118.21°W

Site Soil Classification Site Class D – "Stiff Soil"

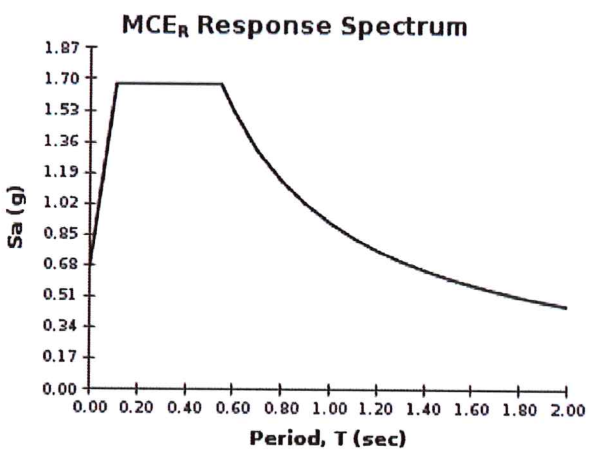
Risk Category I/II/III

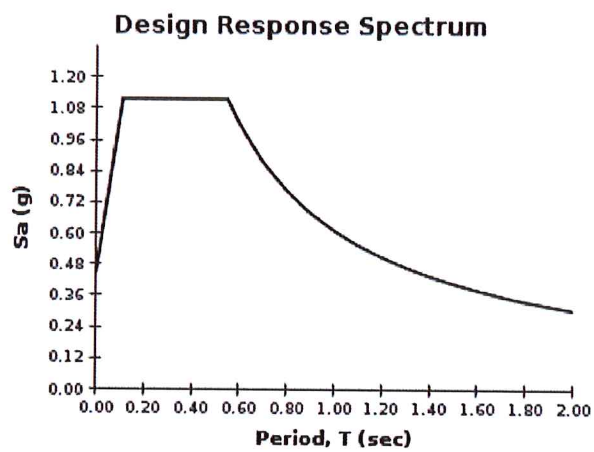


USGS–Provided Output

S_s =	1.674 g	S_{MS} =	1.674 g	S_{DS} =	1.116 g
S_1 =	0.611 g	S_{M1} =	0.916 g	S_{D1} =	0.611 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (33.8792°N, 118.21°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] S_S = 1.674 g

From Figure 22-2 [2] S_1 = 0.611 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_s = 1.674 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.611 g, F_v = 1.500

Equation (11.4-1): $S_{MS} = F_aS_S = 1.000 \times 1.674 = 1.674$ g

Equation (11.4-2): $S_{M1} = F_vS_1 = 1.500 \times 0.611 = 0.916$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

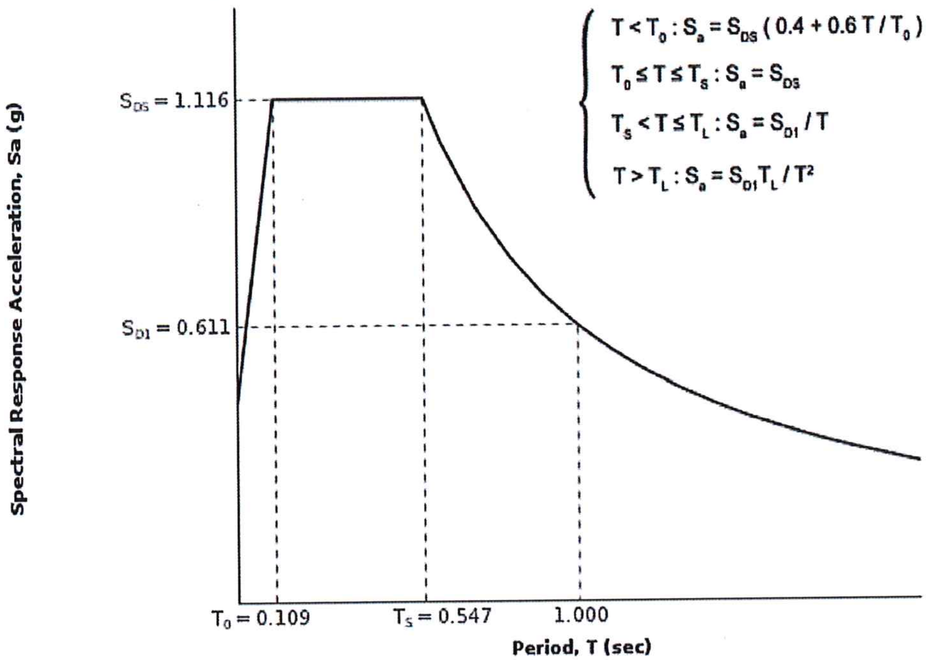
Equation (11.4-3): $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 1.674 = 1.116$ g

Equation (11.4-4): $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.916 = 0.611$ g

Section 11.4.5 — Design Response Spectrum

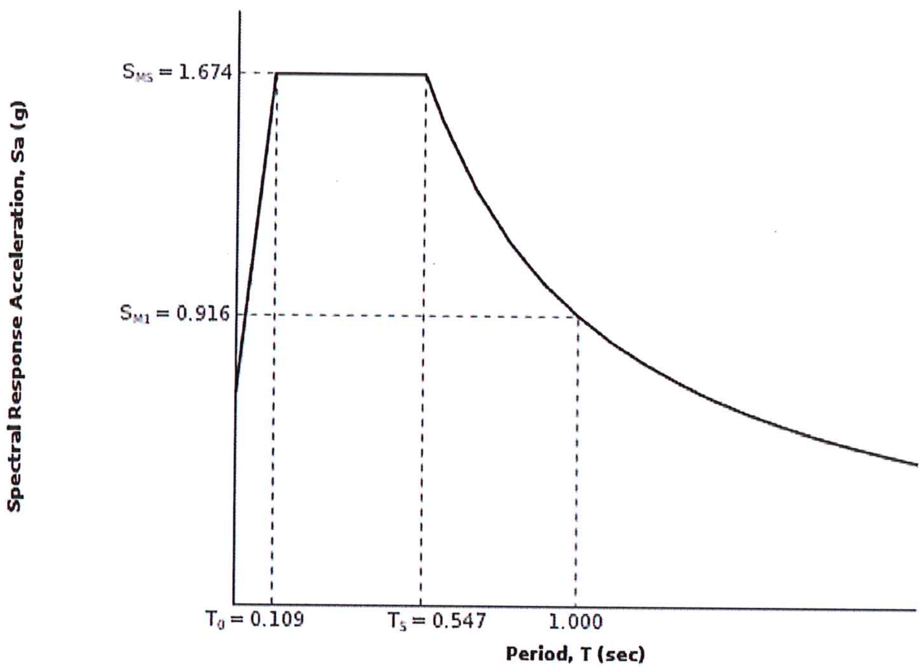
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.623

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.623 = 0.623$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.623 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.981

From Figure 22-18 [6] C_{R1} = 1.000

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.116 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.611 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

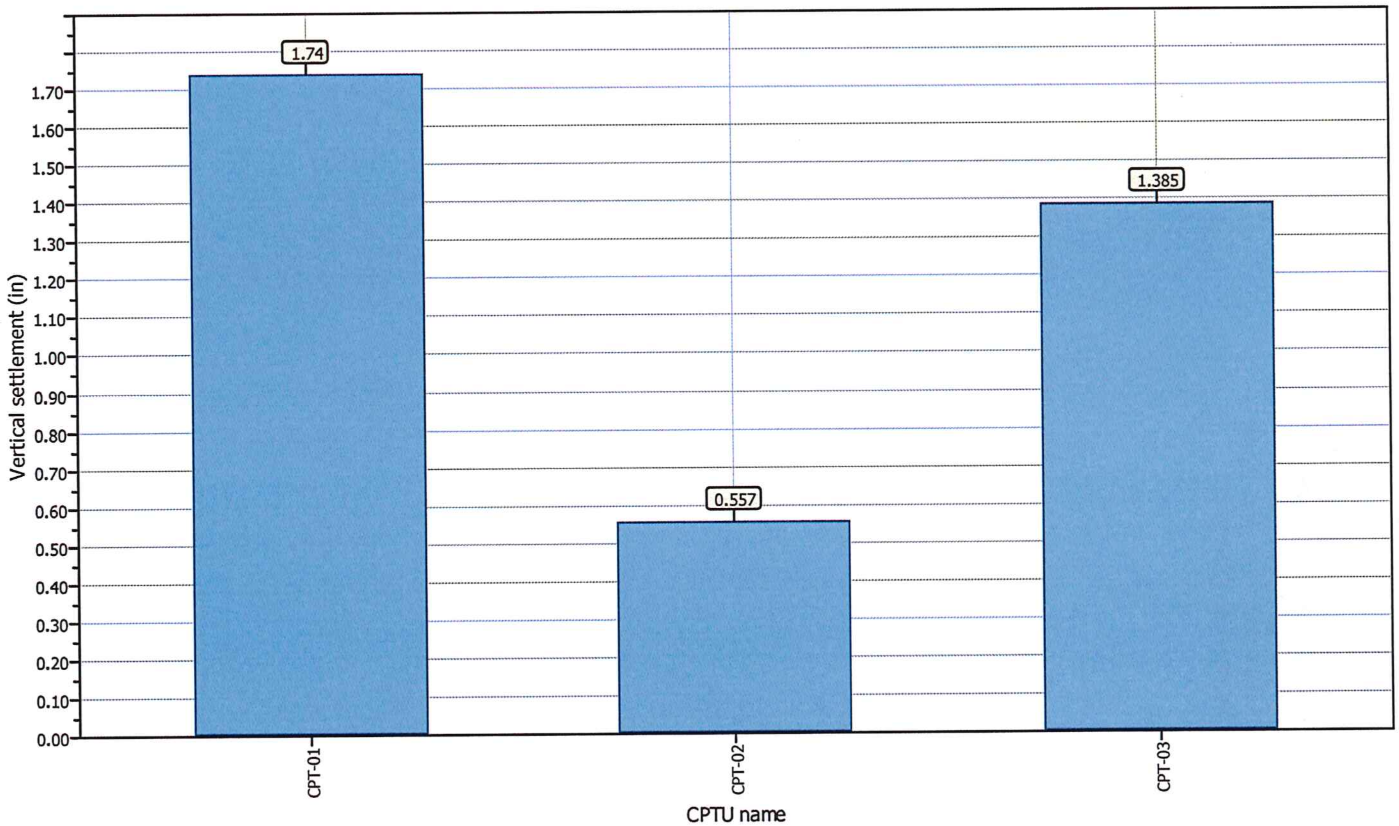
1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

Geosphere Consultants Inc.
2001 Crow Canyon Road, Suite # 210
San Ramon, California 94583

Project title : El Camino College - Comption Center

Location : Compton California

Overall vertical settlements report



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CPT-01 results

Geosphere Consultants Inc.
2001 Crow Canyon Road, Suite # 210
San Ramon, California 94583

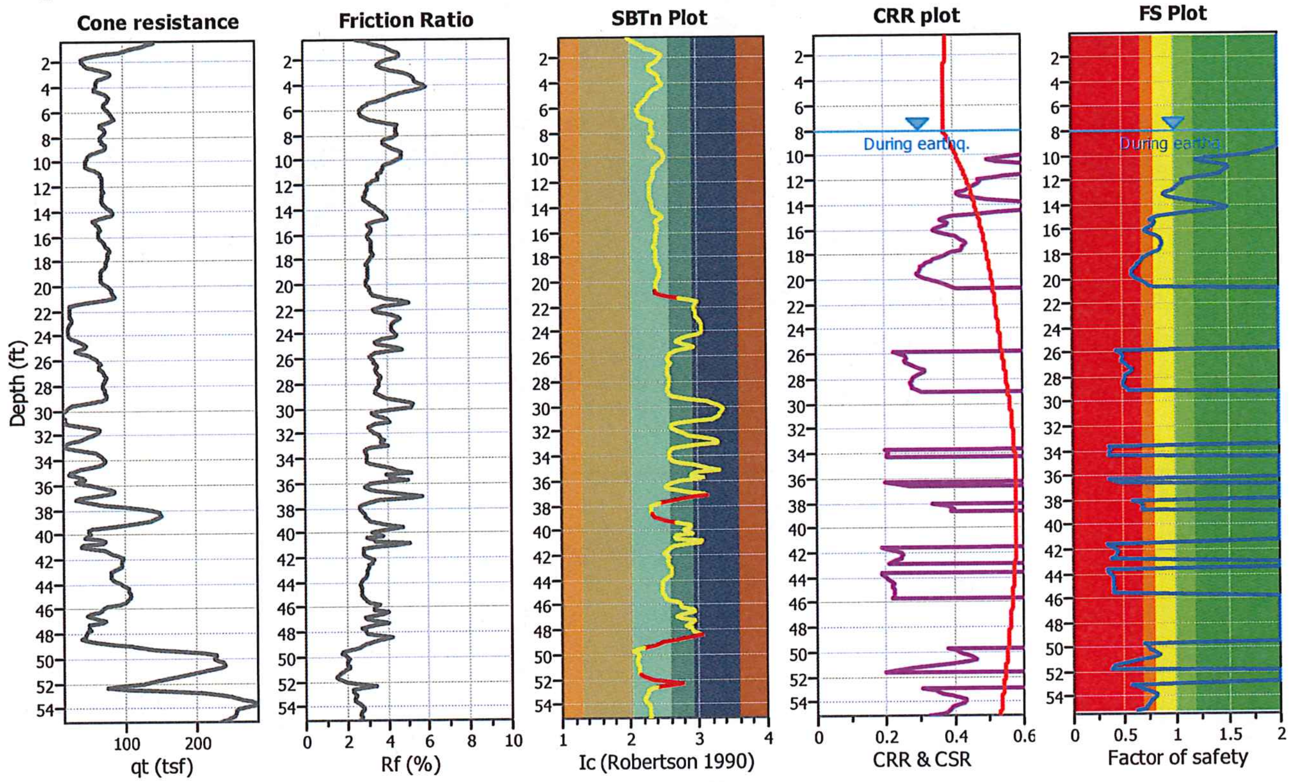
LIQUEFACTION ANALYSIS REPORT

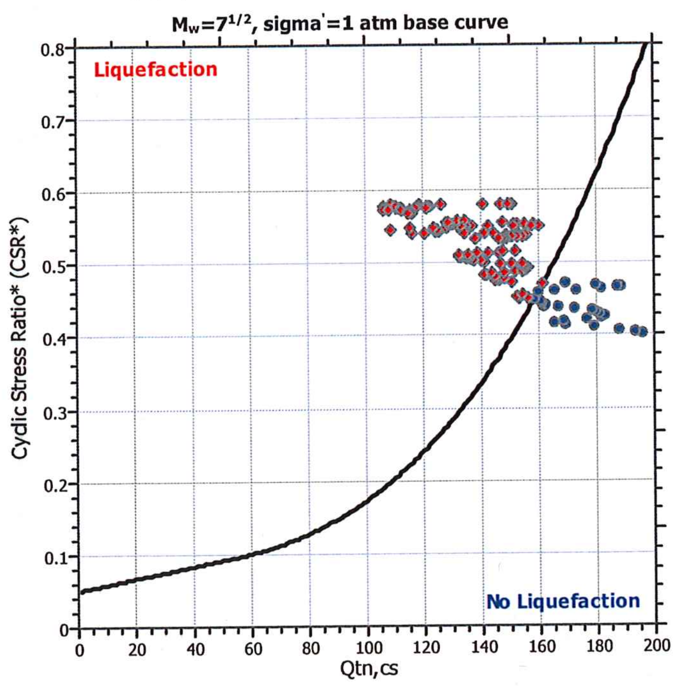
Project title : El Camino College - Comption Center **Location : Compton California**

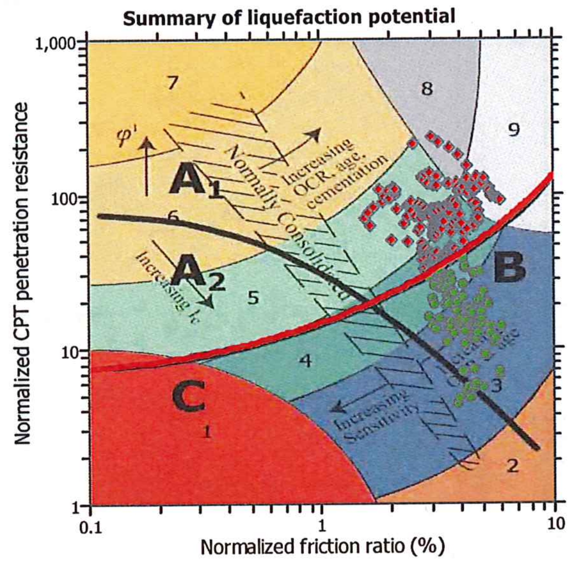
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	47.30 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.60	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.62	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

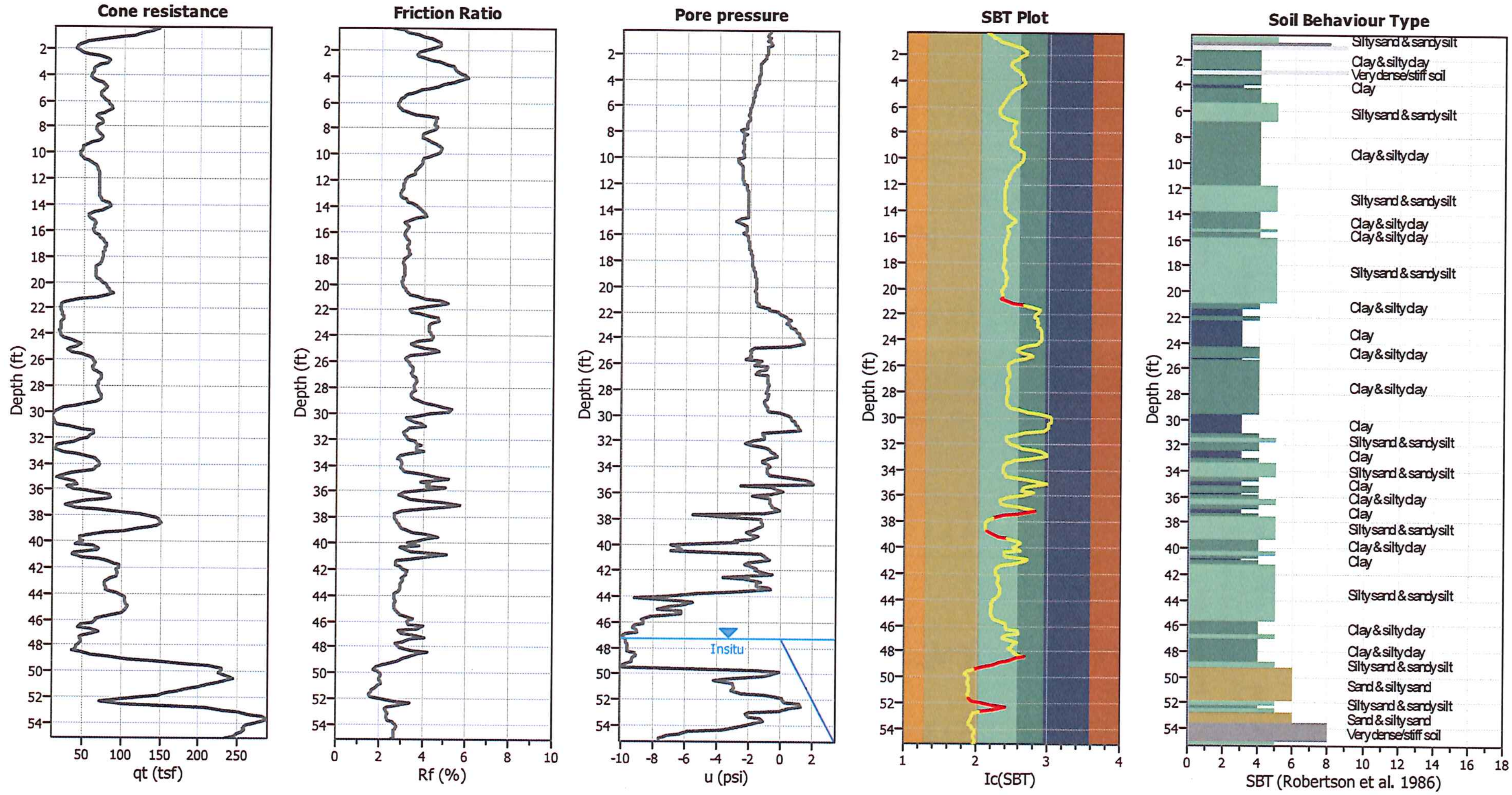






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



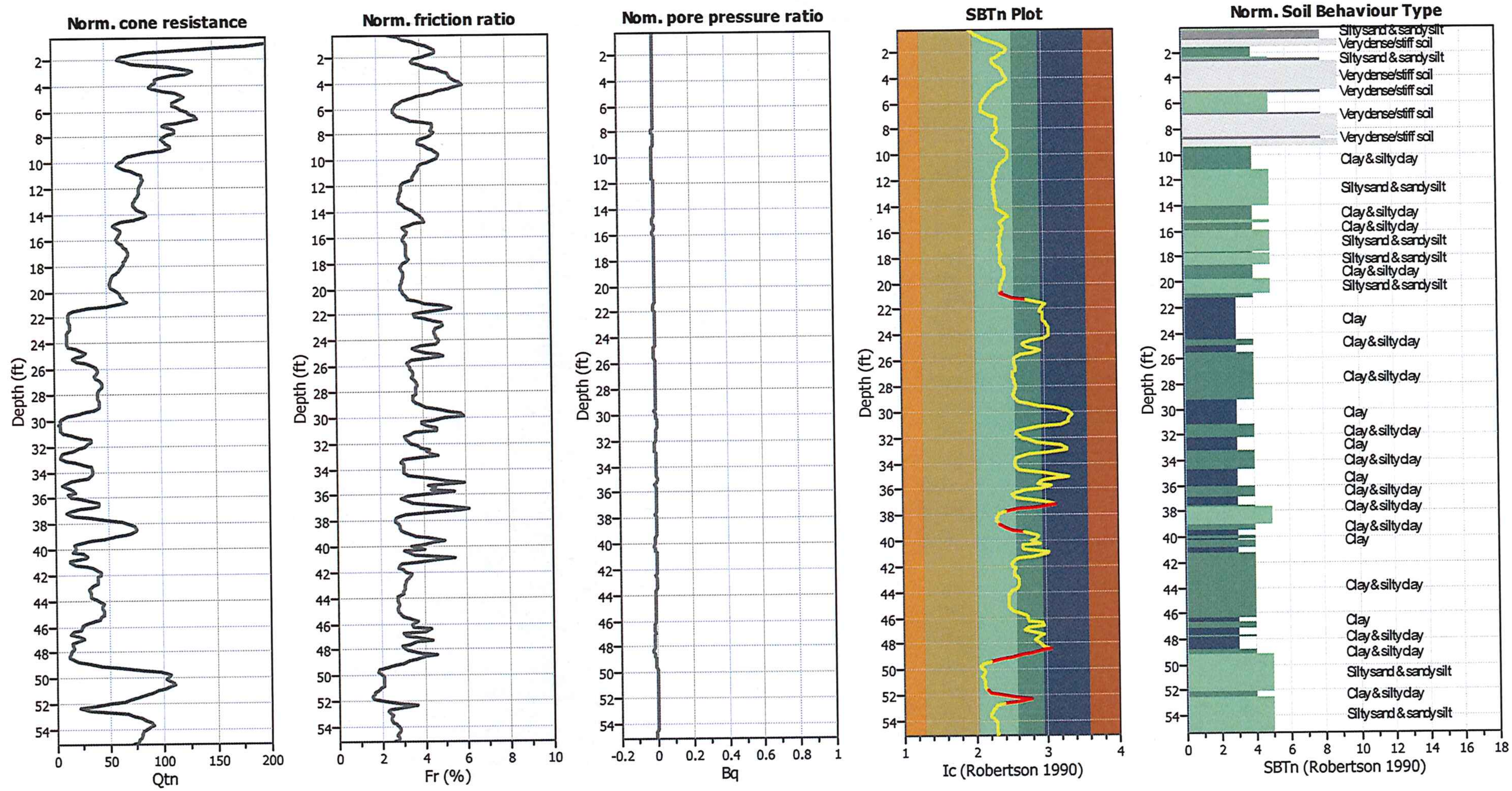
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	47.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

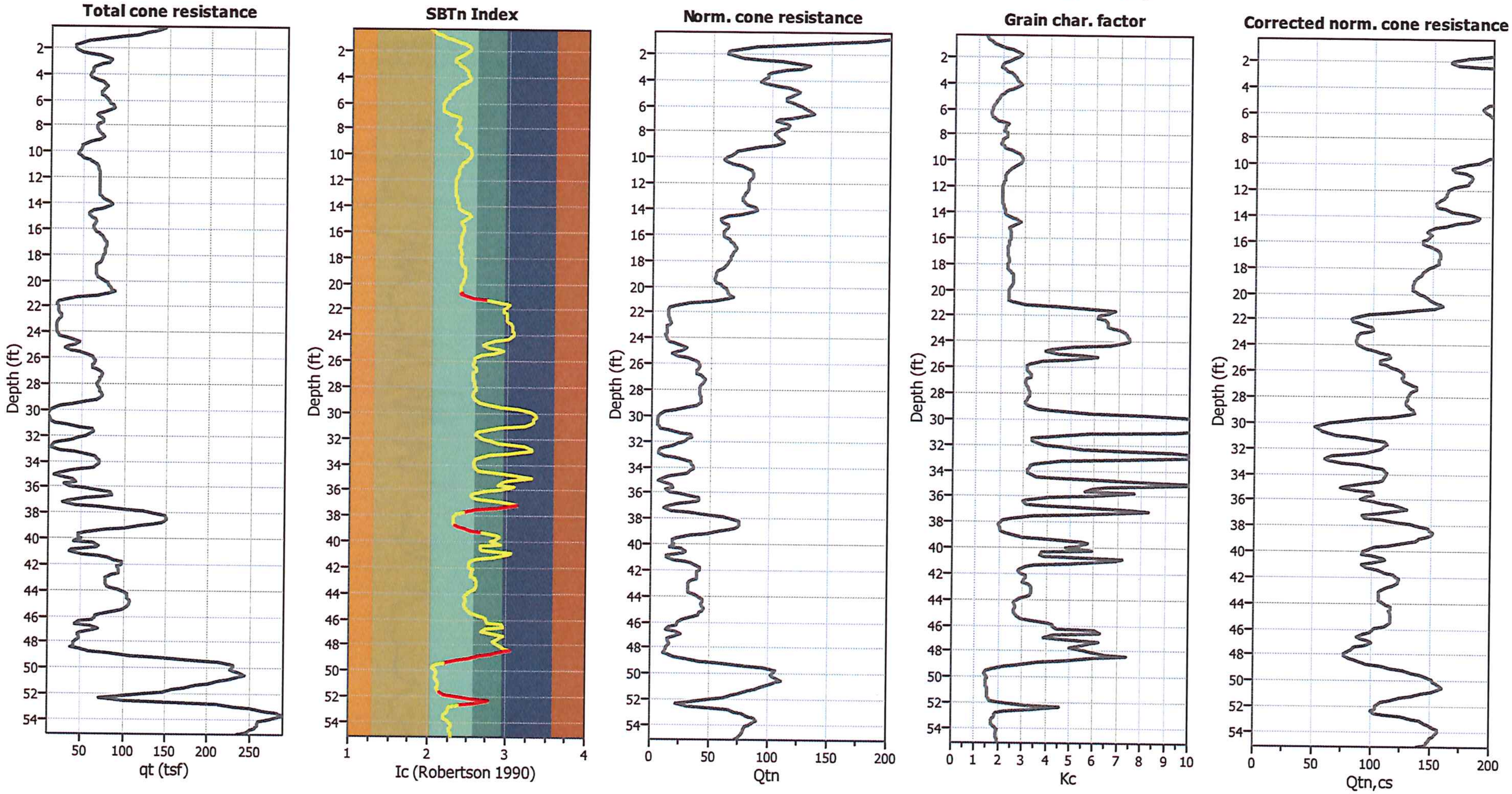
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	47.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CLiq v.1.7.6.49 - CPT Liquefaction Assessment Software - Report created on: 12/15/2015, 2:10:23 PM
Project file: C:\Users\rshrestha\Box Sync\Geosphere-R Drive Folder\Geotech Projects by Number\3600-3699\91-03615-A Compton CCD\Liquefaction Analysis\Liquefaction- (GWT 8 ft with transition and weighted Volu Strain).clq

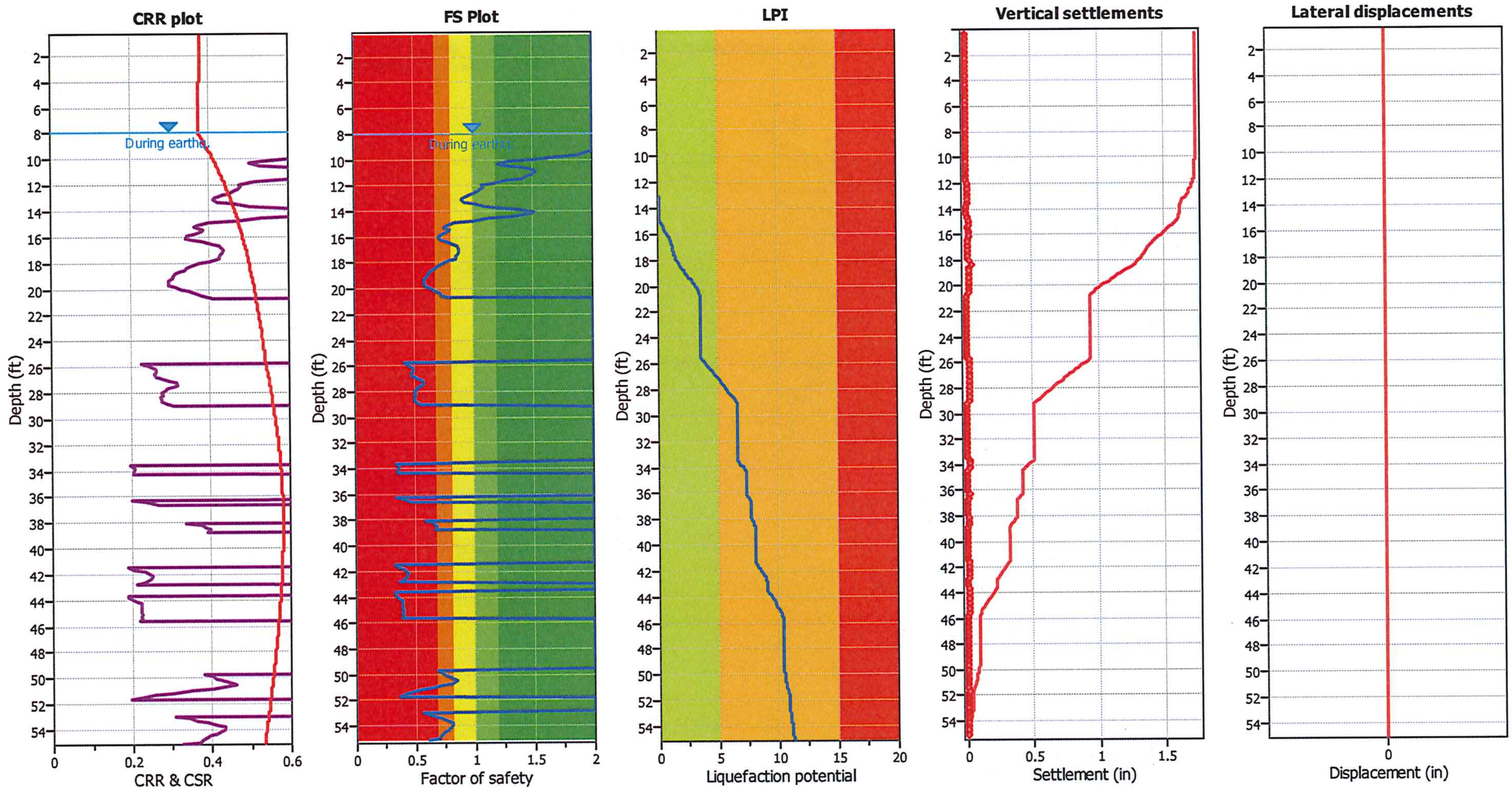
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	47.30 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	47.30 ft	Fill height:	N/A	Limit depth:	N/A

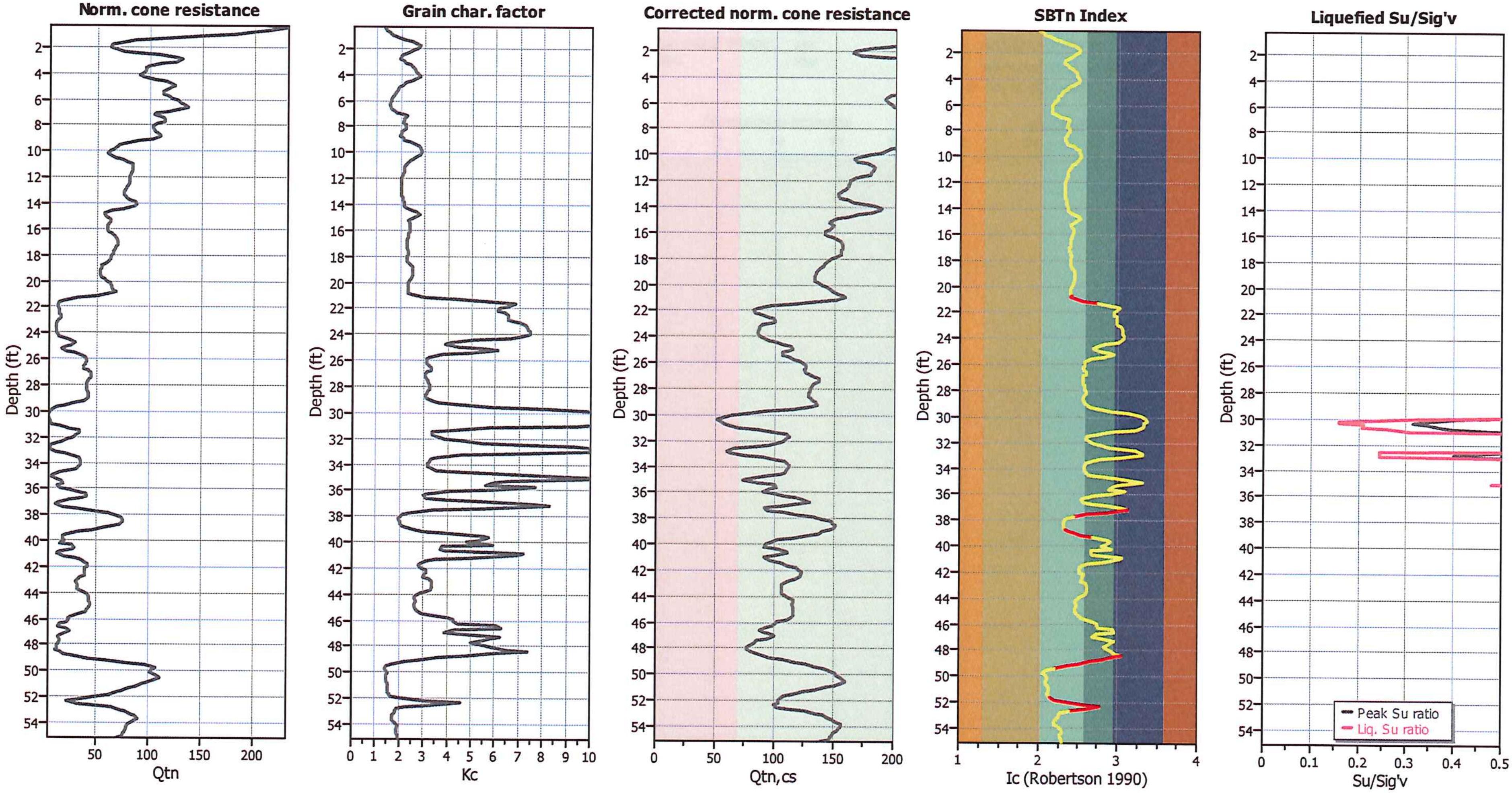
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	47.30 ft	Fill height:	N/A	Limit depth:	N/A

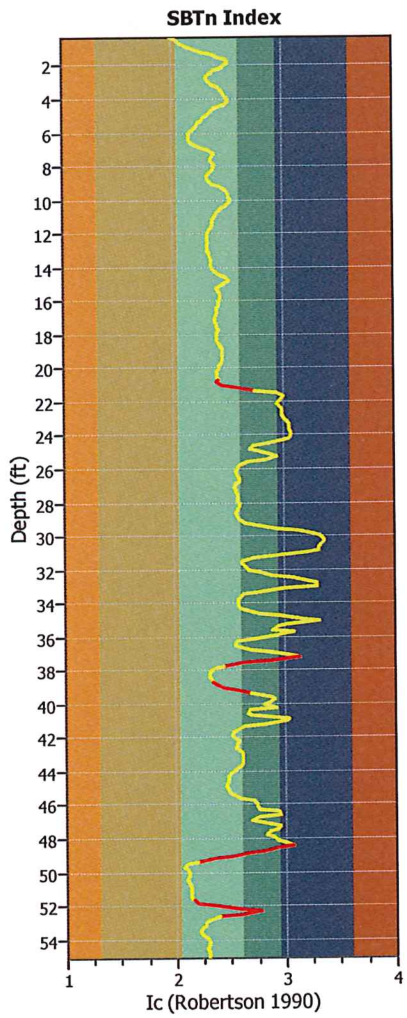
TRANSITION LAYER DETECTION ALGORITHM REPORT

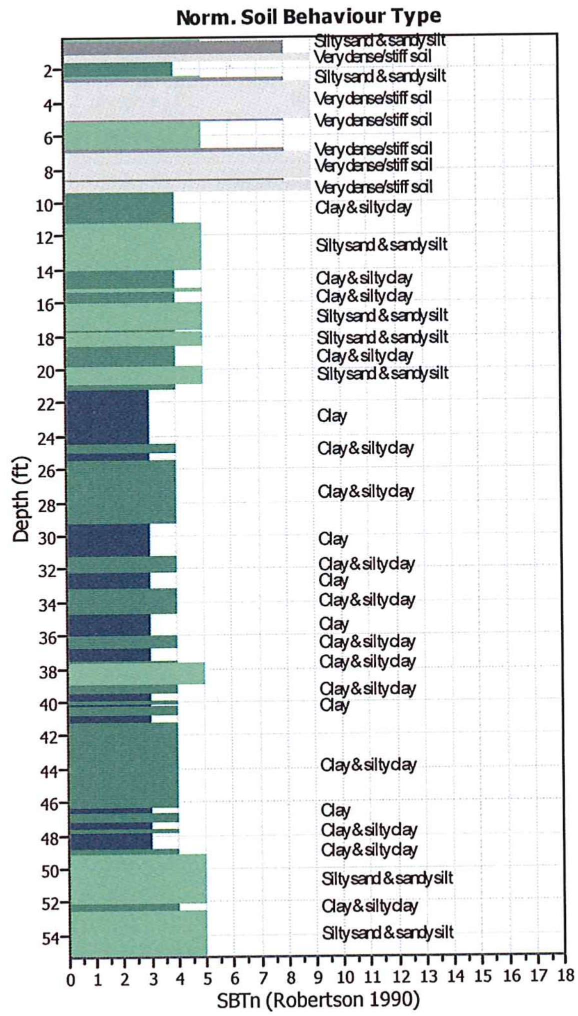
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vise-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between $1.80 < I_c < 3.0$) and a rate of change of I_c. Transitions typically occur when the rate of change of I_c is fast (i.e. delta I_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.





Transition layer algorithm properties	
I_c minimum check value:	1.70
I_c maximum check value:	3.00
I_c change ratio value:	0.0250
Minimum number of points in layer:	4

General statistics	
Total points in CPT file:	334
Total points excluded:	29
Exclusion percentage:	8.68%
Number of layers detected:	6

Transition layer No	Number of points	Depth	SBT_n number	SBT_n description
Transition layer 1	5	Start depth: 20.83 (ft)	5	Silty sand & sandy silt
		End depth: 21.49 (ft)	3	Clay
Transition layer 2	4	Start depth: 37.40 (ft)	3	Clay
		End depth: 37.90 (ft)	5	Silty sand & sandy silt
Transition layer 3	5	Start depth: 38.88 (ft)	5	Silty sand & sandy silt
		End depth: 39.54 (ft)	3	Clay
Transition layer 4	7	Start depth: 48.56 (ft)	3	Clay
		End depth: 49.54 (ft)	5	Silty sand & sandy silt
Transition layer 5	4	Start depth: 51.84 (ft)	5	Silty sand & sandy silt
		End depth: 52.33 (ft)	4	Clay & silty clay
Transition layer 6	4	Start depth: 52.33 (ft)	4	Clay & silty clay
		End depth: 52.82 (ft)	5	Silty sand & sandy silt

Start depth: Depth where the transition layer begins
End depth: Depth where the transition layer ends

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.33	120.80	2.80	-0.80	12.63	130.98
2	0.49	152.40	4.40	-0.90	13.73	133.18
3	0.66	128.10	4.30	-1.00	14.86	132.89
4	0.82	121.00	4.20	-0.80	16.60	133.05
5	0.98	125.90	5.00	-1.00	18.42	132.69
6	1.15	91.30	4.10	-0.80	20.99	131.56
7	1.31	65.10	3.00	-0.70	24.79	129.04
8	1.48	51.30	2.40	-1.00	27.78	126.81
9	1.64	46.10	2.20	-1.00	30.08	124.97
10	1.80	37.10	1.70	-1.00	31.03	123.56
11	1.97	36.50	1.50	-1.00	29.88	122.47
12	2.13	42.50	1.50	-1.10	28.02	122.64
13	2.30	45.60	1.70	-1.10	25.81	123.56
14	2.46	53.80	1.90	-1.20	24.21	125.40
15	2.62	68.80	2.60	-1.30	22.98	127.74
16	2.79	81.30	3.50	-1.40	22.65	129.80
17	2.95	86.00	4.00	-1.40	23.59	130.91
18	3.12	78.20	4.10	-1.40	25.03	130.91
19	3.28	69.10	3.70	-1.40	26.89	130.11
20	3.45	60.40	3.20	-1.40	28.30	129.15
21	3.61	56.60	3.10	-1.40	28.82	128.92
22	3.77	63.40	3.50	-1.50	29.38	129.22
23	3.94	60.70	3.60	-1.50	30.18	129.23
24	4.10	52.30	3.20	-1.50	30.88	129.00
25	4.27	57.10	3.30	-1.50	29.85	129.01
26	4.43	66.30	3.50	-1.60	27.58	129.56
27	4.59	72.50	3.60	-1.70	25.42	129.94
28	4.76	77.20	3.50	-1.70	23.94	129.92
29	4.92	77.70	3.30	-1.80	22.79	129.53
30	5.09	76.20	3.00	-1.80	21.78	128.60
31	5.25	72.00	2.40	-1.80	21.00	127.52
32	5.41	68.90	2.20	-1.90	20.16	126.52
33	5.58	69.70	2.10	-1.90	19.59	126.19
34	5.74	72.50	2.10	-1.90	18.73	126.15
35	5.91	76.00	2.10	-2.00	18.04	126.37
36	6.07	79.30	2.20	-2.00	17.48	126.58
37	6.23	81.00	2.20	-2.10	17.17	126.75
38	6.40	81.80	2.20	-2.10	17.31	127.24
39	6.56	85.50	2.60	-2.10	17.58	127.81
40	6.73	87.20	2.70	-2.20	18.75	128.00
41	6.89	72.70	2.50	-2.10	21.13	127.73
42	7.05	59.40	2.60	-2.10	23.84	127.77
43	7.22	66.70	3.00	-2.20	25.54	128.41
44	7.38	69.10	3.30	-2.30	24.56	129.08
45	7.55	75.10	3.20	-2.30	24.39	129.28
46	7.71	70.80	3.20	-2.30	24.18	129.12
47	7.87	68.50	3.10	-2.60	25.27	128.73
48	8.04	61.90	2.90	-2.40	25.34	128.24

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	64.10	2.70	-2.30	24.91	127.87
50	8.37	66.90	2.70	-2.40	23.56	127.60
51	8.53	68.90	2.50	-2.40	23.22	127.76
52	8.69	70.00	2.80	-2.40	22.90	128.23
53	8.86	77.00	3.10	-2.50	23.65	128.76
54	9.02	71.20	3.10	-2.40	24.85	128.55
55	9.19	58.60	2.70	-2.40	27.16	127.51
56	9.35	49.30	2.30	-2.40	29.47	126.40
57	9.51	47.30	2.30	-2.50	30.59	125.82
58	9.68	48.50	2.30	-2.40	30.98	125.68
59	9.84	47.00	2.20	-2.40	31.36	125.27
60	10.01	42.80	2.00	-2.40	31.57	124.58
61	10.17	42.70	1.80	-2.80	31.08	123.89
62	10.34	44.30	1.70	-2.80	29.79	123.87
63	10.50	48.90	1.90	-2.70	28.29	124.64
64	10.66	57.20	2.20	-2.50	27.13	125.75
65	10.83	62.10	2.40	-2.50	26.07	126.51
66	10.99	64.50	2.40	-2.50	25.36	126.83
67	11.16	66.60	2.40	-2.50	24.88	126.90
68	11.32	67.20	2.40	-2.50	24.65	126.93
69	11.48	67.50	2.40	-2.50	24.63	126.95
70	11.65	67.80	2.40	-2.50	24.01	126.54
71	11.81	67.60	2.00	-2.40	23.62	126.20
72	11.98	67.20	2.10	-2.40	23.14	125.86
73	12.14	68.20	2.10	-2.30	23.26	126.00
74	12.30	69.20	2.10	-2.30	23.16	126.02
75	12.47	69.10	2.10	-2.30	23.20	126.03
76	12.63	68.80	2.10	-2.20	23.14	125.91
77	12.80	69.00	2.00	-2.20	23.24	125.77
78	12.96	67.50	2.00	-2.20	23.14	125.51
79	13.12	67.20	1.90	-2.20	23.36	125.49
80	13.29	67.90	2.00	-2.20	23.54	125.77
81	13.45	70.40	2.20	-2.20	23.95	126.41
82	13.62	72.80	2.40	-2.20	24.10	127.04
83	13.78	75.70	2.50	-2.20	24.28	127.84
84	13.94	80.60	2.90	-2.20	24.28	128.69
85	14.11	85.90	3.20	-2.20	24.73	129.33
86	14.27	82.40	3.20	-2.20	25.51	129.16
87	14.44	72.30	2.80	-2.20	27.43	128.31
88	14.60	59.90	2.50	-2.20	29.63	127.04
89	14.76	53.40	2.20	-2.60	31.22	126.06
90	14.93	54.00	2.10	-2.90	29.65	125.29
91	15.09	61.10	1.80	-2.60	27.63	125.20
92	15.26	64.50	2.00	-2.30	26.33	125.33
93	15.42	64.20	2.10	-2.30	26.77	125.73
94	15.58	63.30	2.10	-2.30	27.27	125.69
95	15.75	61.60	2.00	-2.30	27.34	125.41
96	15.91	61.40	1.90	-2.40	27.19	125.15

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	62.00	1.90	-2.20	26.78	125.20
98	16.24	65.40	2.00	-2.20	26.56	125.66
99	16.40	68.60	2.20	-2.20	26.32	126.23
100	16.57	71.00	2.30	-2.10	26.24	126.76
101	16.73	73.20	2.40	-2.10	25.94	127.16
102	16.90	76.70	2.50	-2.10	25.72	127.43
103	17.06	76.90	2.50	-2.10	25.55	127.57
104	17.23	77.20	2.50	-2.00	25.62	127.57
105	17.39	76.90	2.50	-2.00	25.91	127.55
106	17.55	75.10	2.50	-1.90	26.26	127.53
107	17.72	74.90	2.50	-1.90	26.68	127.49
108	17.88	74.00	2.50	-1.90	26.35	127.19
109	18.05	74.20	2.20	-1.90	26.08	126.86
110	18.37	73.30	2.20	-1.90	26.01	126.37
111	18.54	69.60	2.10	-1.80	26.84	126.17
112	18.70	66.50	2.10	-1.80	27.51	125.84
113	18.87	65.50	2.00	-1.70	28.07	125.66
114	19.03	64.60	2.00	-1.70	28.24	125.52
115	19.19	64.40	2.00	-1.70	28.51	125.50
116	19.36	64.20	2.00	-1.60	28.43	125.37
117	19.52	64.30	1.90	-1.60	28.28	125.40
118	19.69	66.10	2.00	-1.60	27.78	125.59
119	19.85	70.20	2.10	-1.60	27.14	126.07
120	20.01	74.80	2.20	-1.60	26.51	126.66
121	20.18	78.60	2.40	-1.60	26.16	127.20
122	20.34	80.60	2.50	-1.70	26.28	127.66
123	20.51	80.90	2.60	-1.60	26.36	127.89
124	20.67	81.90	2.60	-1.60	26.52	128.42
125	20.83	87.60	3.00	-1.60	26.28	128.96
126	21.00	91.80	3.10	-1.60	28.49	129.05
127	21.16	66.10	2.90	-1.60	33.23	127.65
128	21.33	39.00	2.00	-1.40	42.93	124.78
129	21.49	25.10	1.30	-1.50	53.81	120.82
130	21.65	18.60	0.90	-0.80	58.89	117.44
131	21.82	19.10	0.70	-0.80	57.23	115.24
132	21.98	20.70	0.60	-0.30	54.85	114.59
133	22.15	19.80	0.70	-0.10	54.65	115.02
134	22.31	20.80	0.80	0.20	56.39	116.04
135	22.47	21.80	0.90	0.40	57.15	117.29
136	22.64	23.00	1.10	0.60	57.27	118.41
137	22.80	24.70	1.20	0.30	57.26	118.68
138	22.97	23.00	1.00	0.50	58.28	117.83
139	23.13	18.90	0.80	0.60	60.06	116.55
140	23.30	18.60	0.80	0.80	61.46	115.82
141	23.46	19.50	0.80	0.90	61.79	115.81
142	23.62	18.70	0.80	1.10	62.20	115.80
143	23.79	18.30	0.80	1.10	62.71	115.78
144	23.95	19.10	0.80	1.20	62.74	116.13

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	24.12	19.80	0.90	1.30	61.55	116.84
146	24.28	21.90	1.00	1.40	58.06	117.92
147	24.44	27.20	1.10	1.40	47.97	119.79
148	24.61	44.60	1.40	0.60	41.17	121.77
149	24.77	50.10	1.70	-1.70	39.57	123.01
150	24.94	41.20	1.70	-2.00	43.81	122.91
151	25.10	31.20	1.50	-1.90	50.68	121.77
152	25.26	27.00	1.30	-2.00	54.63	120.78
153	25.43	29.10	1.30	-1.90	46.81	121.44
154	25.59	50.70	1.60	-2.30	39.06	122.91
155	25.76	59.00	1.80	-1.30	34.48	124.42
156	25.92	60.40	2.00	-1.40	33.75	125.23
157	26.08	62.50	2.10	-1.70	33.68	125.80
158	26.25	65.60	2.20	-0.90	33.48	126.09
159	26.41	65.00	2.20	-1.00	34.43	126.02
160	26.58	57.30	2.10	-1.40	35.04	125.85
161	26.74	61.30	2.10	-1.60	34.91	126.00
162	26.90	67.60	2.30	-0.90	33.44	126.62
163	27.07	72.20	2.50	-0.90	32.88	127.38
164	27.23	73.90	2.70	-0.90	33.05	127.81
165	27.40	72.40	2.70	-0.90	33.57	127.89
166	27.56	70.50	2.60	-0.80	33.98	127.65
167	27.72	69.10	2.50	-0.80	34.13	127.31
168	27.89	68.00	2.40	-0.90	34.46	127.06
169	28.05	66.30	2.40	-0.90	34.65	126.94
170	28.22	67.10	2.40	-1.00	34.72	127.06
171	28.38	69.50	2.50	-0.80	33.85	127.01
172	28.54	71.00	2.30	-0.90	33.50	127.16
173	28.71	71.30	2.50	-0.90	33.27	127.30
174	28.87	73.00	2.60	-1.10	33.85	127.71
175	29.04	73.10	2.70	-1.10	34.82	127.96
176	29.20	69.30	2.80	-1.00	37.26	127.89
177	29.36	59.50	2.70	-0.90	42.85	126.65
178	29.53	36.10	1.90	-0.90	53.02	123.84
179	29.69	18.60	1.10	-0.80	66.91	119.48
180	29.86	15.20	0.70	-0.10	79.87	115.31
181	30.02	12.40	0.60	0.50	83.57	111.83
182	30.19	9.90	0.30	0.60	86.74	109.37
183	30.35	10.10	0.30	0.70	86.17	107.92
184	30.51	10.90	0.40	0.80	83.59	108.80
185	30.68	12.30	0.40	0.90	82.58	110.21
186	30.84	12.70	0.50	1.00	81.98	111.41
187	31.01	13.20	0.60	1.10	74.10	114.11
188	31.17	22.90	0.90	1.20	52.37	118.85
189	31.33	55.60	1.60	-1.20	41.19	122.83
190	31.50	64.60	2.10	-1.20	35.50	125.03
191	31.66	65.30	2.00	-1.10	35.38	125.47
192	31.83	61.10	1.90	-1.10	37.13	124.92

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.99	51.30	1.80	-1.70	39.31	124.32
194	32.15	51.10	1.70	-2.30	44.51	123.35
195	32.32	35.60	1.50	-2.00	50.66	121.12
196	32.48	21.60	0.80	-1.00	62.63	117.51
197	32.65	14.60	0.50	-0.80	73.38	113.35
198	32.81	13.00	0.50	-0.60	80.92	111.55
199	32.97	12.90	0.50	-0.40	81.08	112.57
200	33.14	16.40	0.70	-0.30	58.86	116.46
201	33.30	44.90	1.20	-0.60	44.50	120.64
202	33.47	60.70	1.70	-1.20	36.75	123.73
203	33.63	66.30	2.00	-1.20	34.96	125.28
204	33.79	68.70	2.10	-0.90	34.37	125.90
205	33.96	70.80	2.10	-0.70	34.16	126.05
206	34.12	69.60	2.10	-0.90	34.07	125.93
207	34.29	68.20	2.00	-0.90	34.98	125.73
208	34.45	64.20	2.00	-0.90	37.07	125.31
209	34.61	55.30	1.90	-0.70	44.02	124.11
210	34.78	30.50	1.50	0.10	54.99	121.59
211	34.94	19.70	0.90	1.50	70.75	117.78
212	35.11	15.00	0.60	1.80	81.92	116.11
213	35.27	15.80	1.10	2.00	58.03	119.96
214	35.43	61.30	1.90	-2.50	53.93	122.93
215	35.60	39.20	2.00	-0.60	51.36	123.40
216	35.76	25.10	1.30	-0.20	64.01	121.51
217	35.93	25.00	1.20	0.10	53.59	121.31
218	36.09	58.50	1.60	-0.70	41.04	123.71
219	36.26	76.50	2.20	-1.80	33.50	126.17
220	36.42	84.90	2.50	-0.70	32.34	127.85
221	36.58	87.50	2.90	-0.70	33.68	128.80
222	36.75	81.20	3.20	-0.70	39.58	128.78
223	36.91	50.50	2.90	-0.60	49.00	127.10
224	37.08	31.20	1.80	-0.50	63.39	123.86
225	37.24	22.00	1.20	-0.30	67.62	121.01
226	37.40	30.10	1.30	-0.10	49.80	122.53
227	37.57	74.80	2.10	-1.00	36.10	125.89
228	37.73	100.80	2.80	-5.50	27.95	128.67
229	37.90	123.20	3.10	-2.80	24.73	130.67
230	38.06	145.70	3.90	-1.30	23.25	131.87
231	38.22	147.30	4.10	-1.30	22.89	132.72
232	38.39	150.10	4.20	-1.20	23.09	132.98
233	38.55	150.30	4.30	-1.20	23.30	133.17
234	38.72	149.80	4.40	-1.40	24.06	133.03
235	38.88	136.40	4.10	-1.80	25.60	132.56
236	39.04	118.70	3.80	-2.20	28.03	131.78
237	39.21	105.10	3.60	-1.80	32.38	130.91
238	39.37	80.20	3.40	-1.40	39.49	129.32
239	39.54	48.00	2.50	-1.90	50.54	126.67
240	39.70	31.30	1.60	-2.90	52.13	124.57

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.86	59.50	1.80	-2.70	49.34	123.51
242	40.03	48.40	1.70	-6.90	46.08	123.20
243	40.19	38.90	1.30	-6.50	53.39	122.62
244	40.36	36.30	1.70	-6.30	39.06	124.93
245	40.52	112.90	2.60	-6.90	38.53	126.84
246	40.68	61.80	2.70	-1.30	39.81	126.88
247	40.85	30.90	1.80	-1.10	61.22	123.97
248	41.01	21.50	1.30	-0.90	59.75	122.48
249	41.18	56.80	1.70	-0.70	46.86	123.86
250	41.34	72.90	2.20	-2.10	36.61	125.56
251	41.50	78.40	2.00	-2.30	33.48	126.85
252	41.67	90.10	2.50	-2.00	31.64	127.83
253	41.83	99.00	2.90	-1.50	31.22	129.04
254	42.00	100.30	3.10	-1.60	31.88	129.47
255	42.16	92.50	3.00	-1.00	33.85	129.52
256	42.32	85.50	3.10	-0.50	33.38	129.47
257	42.49	103.30	3.00	-3.60	33.31	129.47
258	42.65	93.60	3.00	-2.30	32.73	128.94
259	42.82	82.00	2.50	-1.30	34.68	128.08
260	42.98	77.90	2.30	-1.50	35.62	127.23
261	43.15	77.00	2.30	-1.50	35.74	126.99
262	43.31	78.60	2.30	-0.80	35.78	127.11
263	43.47	79.60	2.40	-0.60	35.49	127.13
264	43.64	79.40	2.30	-3.10	35.12	127.16
265	43.80	81.60	2.30	-5.30	33.57	127.28
266	43.97	91.20	2.40	-7.10	31.50	127.90
267	44.13	103.00	2.70	-9.20	30.00	128.68
268	44.29	105.80	2.90	-6.50	29.46	129.24
269	44.46	105.60	2.90	-5.50	29.79	129.31
270	44.62	101.90	2.80	-6.20	29.68	129.23
271	44.79	105.70	2.80	-7.00	29.20	129.37
272	44.95	112.80	3.00	-7.70	29.16	129.47
273	45.11	104.50	2.90	-6.30	29.74	129.53
274	45.28	102.00	2.90	-6.30	30.60	129.37
275	45.44	103.10	2.90	-7.20	31.99	129.37
276	45.61	93.70	3.00	-8.20	34.86	128.97
277	45.77	75.40	2.70	-8.70	40.95	127.86
278	45.93	53.40	2.20	-8.60	42.36	126.51
279	46.10	72.60	1.90	-8.60	42.43	126.14
280	46.26	71.50	2.40	-9.20	43.81	125.80
281	46.43	44.60	2.00	-9.30	54.12	124.54
282	46.59	28.70	1.40	-9.10	55.68	123.06
283	46.75	57.50	1.50	-9.00	42.96	124.09
284	46.92	90.90	2.20	-9.70	39.63	126.07
285	47.08	62.60	2.60	-10.00	44.21	126.18
286	47.25	39.00	1.80	-9.80	55.19	124.51
287	47.41	41.50	1.40	-9.70	52.80	122.89
288	47.57	57.50	1.50	-9.70	49.56	122.51

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.74	45.20	1.50	-9.60	47.58	121.83
290	47.90	42.50	1.00	-9.60	51.29	120.99
291	48.07	42.20	1.20	-9.60	53.13	120.90
292	48.23	40.40	1.50	-9.60	56.97	121.94
293	48.39	39.70	1.60	-9.20	62.44	122.39
294	48.56	32.30	1.60	-9.10	54.09	123.84
295	48.72	70.20	2.10	-9.30	46.08	125.58
296	48.89	78.70	2.50	-9.40	37.89	127.90
297	49.05	95.50	3.10	-9.40	31.24	130.04
298	49.22	149.60	3.80	-9.80	25.14	131.86
299	49.38	181.00	4.10	-10.00	19.06	132.81
300	49.54	219.20	3.60	-9.90	16.01	133.36
301	49.71	236.80	4.10	-1.60	14.65	133.73
302	49.87	232.20	4.40	-0.10	15.66	134.42
303	50.04	218.90	4.80	-0.60	16.48	134.71
304	50.20	226.50	4.70	-1.10	16.38	134.96
305	50.36	245.60	4.80	-3.40	15.74	135.22
306	50.53	247.70	5.10	-4.20	15.66	135.40
307	50.69	237.30	5.00	-3.00	16.18	135.23
308	50.86	223.80	4.60	-3.00	16.67	134.70
309	51.02	213.10	4.30	-2.90	16.69	133.72
310	51.18	199.80	3.50	-3.00	16.59	132.64
311	51.35	187.60	3.10	-3.10	16.57	131.29
312	51.51	170.10	2.70	-2.40	17.00	130.18
313	51.68	158.00	2.40	-1.00	17.62	129.14
314	51.84	148.20	2.20	0.10	19.03	128.64
315	52.00	134.40	2.40	0.10	24.01	128.64
316	52.17	91.00	2.80	0.30	33.76	127.89
317	52.33	48.60	2.20	1.20	44.47	127.30
318	52.50	75.90	2.40	1.30	34.63	129.09
319	52.66	182.10	3.80	0.60	26.03	132.04
320	52.82	212.40	4.70	-0.10	22.14	134.68
321	52.99	232.50	5.70	-2.00	21.43	136.03
322	53.15	251.80	6.10	-2.20	20.90	136.93
323	53.32	265.40	6.40	-2.00	19.89	137.28
324	53.48	286.10	6.50	-1.30	19.47	137.28
325	53.64	292.30	7.20	-1.10	19.46	137.28
326	53.81	289.70	7.50	-1.50	20.42	137.28
327	53.97	266.60	7.40	-2.30	21.49	137.28
328	54.14	254.90	7.30	-2.60	22.24	137.28
329	54.30	260.20	7.30	-3.60	22.16	137.28
330	54.46	259.10	6.80	-5.80	21.85	137.28
331	54.63	257.10	6.80	-6.40	21.91	137.28
332	54.79	251.60	6.90	-7.10	22.29	137.28
333	54.96	241.40	6.50	-7.60	22.63	137.28
334	55.12	231.40	5.70	-7.60	22.40	136.65

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_c: Measured cone resistance (tsf)
f_s: Sleeve friction resistance (tsf)
u: Pore pressure (tsf)
Fines content: Percentage of fines in soil (%)
Unit weight: Bulk soil unit weight (pcf)

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
1	0.33	0.02	0.00	0.02	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
2	0.49	0.03	0.00	0.03	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
3	0.66	0.04	0.00	0.04	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
4	0.82	0.05	0.00	0.05	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
5	0.98	0.06	0.00	0.06	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
6	1.15	0.08	0.00	0.08	1.00	0.403	1.39	0.290	1.00	1.30	2.000	No
7	1.31	0.09	0.00	0.09	1.00	0.403	1.39	0.290	1.00	1.30	2.000	No
8	1.48	0.10	0.00	0.10	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
9	1.64	0.11	0.00	0.11	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
10	1.80	0.12	0.00	0.12	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
11	1.97	0.13	0.00	0.13	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
12	2.13	0.14	0.00	0.14	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
13	2.30	0.15	0.00	0.15	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
14	2.46	0.16	0.00	0.16	1.00	0.401	1.39	0.290	1.00	1.30	2.000	No
15	2.62	0.17	0.00	0.17	1.00	0.401	1.39	0.289	1.00	1.30	2.000	No
16	2.79	0.18	0.00	0.18	1.00	0.401	1.39	0.289	1.00	1.30	2.000	No
17	2.95	0.19	0.00	0.19	1.00	0.401	1.39	0.289	1.00	1.30	2.000	No
18	3.12	0.20	0.00	0.20	0.99	0.401	1.39	0.289	1.00	1.30	2.000	No
19	3.28	0.21	0.00	0.21	0.99	0.401	1.39	0.289	1.00	1.30	2.000	No
20	3.45	0.22	0.00	0.22	0.99	0.401	1.39	0.289	1.00	1.30	2.000	No
21	3.61	0.23	0.00	0.23	0.99	0.400	1.39	0.289	1.00	1.30	2.000	No
22	3.77	0.24	0.00	0.24	0.99	0.400	1.39	0.289	1.00	1.30	2.000	No
23	3.94	0.25	0.00	0.25	0.99	0.400	1.39	0.289	1.00	1.30	2.000	No
24	4.10	0.26	0.00	0.26	0.99	0.400	1.39	0.288	1.00	1.30	2.000	No
25	4.27	0.27	0.00	0.27	0.99	0.400	1.39	0.288	1.00	1.30	2.000	No
26	4.43	0.29	0.00	0.29	0.99	0.400	1.39	0.288	1.00	1.30	2.000	No
27	4.59	0.30	0.00	0.30	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
28	4.76	0.31	0.00	0.31	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
29	4.92	0.32	0.00	0.32	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
30	5.09	0.33	0.00	0.33	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
31	5.25	0.34	0.00	0.34	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
32	5.41	0.35	0.00	0.35	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
33	5.58	0.36	0.00	0.36	0.99	0.399	1.39	0.287	1.00	1.30	2.000	No
34	5.74	0.37	0.00	0.37	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
35	5.91	0.38	0.00	0.38	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
36	6.07	0.39	0.00	0.39	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
37	6.23	0.40	0.00	0.40	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
38	6.40	0.41	0.00	0.41	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
39	6.56	0.42	0.00	0.42	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
40	6.73	0.43	0.00	0.43	0.99	0.397	1.39	0.287	1.00	1.30	2.000	No
41	6.89	0.44	0.00	0.44	0.99	0.397	1.39	0.287	1.00	1.30	2.000	No
42	7.05	0.45	0.00	0.45	0.99	0.397	1.39	0.286	1.00	1.30	2.000	No
43	7.22	0.46	0.00	0.46	0.99	0.397	1.39	0.286	1.00	1.30	2.000	No
44	7.38	0.47	0.00	0.47	0.98	0.397	1.39	0.286	1.00	1.30	2.000	No
45	7.55	0.48	0.00	0.48	0.98	0.397	1.39	0.286	1.00	1.30	2.000	No
46	7.71	0.50	0.00	0.50	0.98	0.397	1.39	0.286	1.00	1.30	2.000	No
47	7.87	0.51	0.00	0.51	0.98	0.396	1.39	0.286	1.00	1.30	2.000	No
48	8.04	0.52	0.00	0.52	0.98	0.397	1.39	0.286	1.00	1.30	0.372	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
49	8.20	0.53	0.01	0.52	0.98	0.401	1.39	0.289	1.00	1.30	0.376	No
50	8.37	0.54	0.01	0.53	0.98	0.405	1.39	0.292	1.00	1.30	0.379	No
51	8.53	0.55	0.02	0.53	0.98	0.408	1.39	0.294	1.00	1.30	0.383	No
52	8.69	0.56	0.02	0.54	0.98	0.412	1.39	0.297	1.00	1.30	0.386	No
53	8.86	0.57	0.03	0.54	0.98	0.415	1.39	0.299	1.00	1.30	0.389	No
54	9.02	0.58	0.03	0.55	0.98	0.418	1.39	0.302	1.00	1.30	0.392	No
55	9.19	0.59	0.04	0.55	0.98	0.422	1.39	0.304	1.00	1.30	0.395	No
56	9.35	0.60	0.04	0.56	0.98	0.425	1.39	0.306	1.00	1.30	0.398	No
57	9.51	0.61	0.05	0.56	0.98	0.428	1.39	0.309	1.00	1.30	0.401	No
58	9.68	0.62	0.05	0.57	0.98	0.431	1.39	0.311	1.00	1.30	0.404	No
59	9.84	0.63	0.06	0.57	0.98	0.434	1.39	0.313	1.00	1.30	0.407	No
60	10.01	0.64	0.06	0.58	0.98	0.437	1.39	0.315	1.00	1.30	0.410	No
61	10.17	0.65	0.07	0.58	0.98	0.440	1.39	0.317	1.00	1.30	0.413	No
62	10.34	0.66	0.07	0.59	0.98	0.443	1.39	0.320	1.00	1.30	0.415	No
63	10.50	0.67	0.08	0.59	0.98	0.446	1.39	0.322	1.00	1.30	0.418	No
64	10.66	0.68	0.08	0.60	0.98	0.449	1.39	0.324	1.00	1.30	0.421	No
65	10.83	0.69	0.09	0.60	0.98	0.451	1.39	0.326	1.00	1.30	0.423	No
66	10.99	0.70	0.09	0.61	0.98	0.454	1.39	0.327	1.00	1.30	0.426	No
67	11.16	0.71	0.10	0.61	0.98	0.457	1.39	0.329	1.00	1.30	0.428	No
68	11.32	0.72	0.10	0.62	0.98	0.459	1.39	0.331	1.00	1.30	0.431	No
69	11.48	0.73	0.11	0.63	0.98	0.462	1.39	0.333	1.00	1.30	0.433	No
70	11.65	0.74	0.11	0.63	0.98	0.464	1.39	0.335	1.00	1.30	0.435	No
71	11.81	0.75	0.12	0.64	0.98	0.467	1.39	0.336	1.00	1.30	0.437	No
72	11.98	0.77	0.12	0.64	0.97	0.469	1.39	0.338	1.00	1.30	0.440	No
73	12.14	0.78	0.13	0.65	0.97	0.471	1.39	0.340	1.00	1.30	0.442	No
74	12.30	0.79	0.13	0.65	0.97	0.474	1.39	0.341	1.00	1.30	0.444	No
75	12.47	0.80	0.14	0.66	0.97	0.476	1.39	0.343	1.00	1.30	0.446	No
76	12.63	0.81	0.14	0.66	0.97	0.478	1.39	0.345	1.00	1.30	0.448	No
77	12.80	0.82	0.15	0.67	0.97	0.480	1.39	0.346	1.00	1.30	0.450	No
78	12.96	0.83	0.15	0.67	0.97	0.482	1.39	0.348	1.00	1.30	0.452	No
79	13.12	0.84	0.16	0.68	0.97	0.484	1.39	0.349	1.00	1.30	0.454	No
80	13.29	0.85	0.17	0.68	0.97	0.487	1.39	0.351	1.00	1.30	0.456	No
81	13.45	0.86	0.17	0.69	0.97	0.488	1.39	0.352	1.00	1.30	0.458	No
82	13.62	0.87	0.18	0.69	0.97	0.491	1.39	0.354	1.00	1.30	0.460	No
83	13.78	0.88	0.18	0.70	0.97	0.492	1.39	0.355	1.00	1.30	0.462	No
84	13.94	0.89	0.19	0.70	0.97	0.494	1.39	0.356	1.00	1.30	0.463	No
85	14.11	0.90	0.19	0.71	0.97	0.496	1.39	0.358	1.00	1.30	0.465	No
86	14.27	0.91	0.20	0.71	0.97	0.498	1.39	0.359	1.00	1.30	0.467	No
87	14.44	0.92	0.20	0.72	0.97	0.500	1.39	0.360	1.00	1.30	0.469	No
88	14.60	0.93	0.21	0.73	0.97	0.502	1.39	0.362	1.00	1.30	0.470	No
89	14.76	0.94	0.21	0.73	0.97	0.503	1.39	0.363	1.00	1.30	0.472	No
90	14.93	0.95	0.22	0.74	0.97	0.505	1.39	0.364	1.00	1.30	0.473	No
91	15.09	0.96	0.22	0.74	0.97	0.507	1.39	0.365	1.00	1.30	0.475	No
92	15.26	0.97	0.23	0.75	0.97	0.508	1.39	0.367	1.00	1.30	0.477	No
93	15.42	0.98	0.23	0.75	0.97	0.510	1.39	0.368	1.00	1.30	0.478	No
94	15.58	0.99	0.24	0.76	0.97	0.512	1.39	0.369	1.00	1.30	0.480	No
95	15.75	1.00	0.24	0.76	0.97	0.513	1.39	0.370	1.00	1.30	0.481	No
96	15.91	1.01	0.25	0.77	0.97	0.515	1.39	0.371	1.00	1.30	0.483	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
97	16.08	1.02	0.25	0.77	0.97	0.516	1.39	0.372	1.00	1.30	0.484	No
98	16.24	1.03	0.26	0.78	0.97	0.518	1.39	0.374	1.00	1.30	0.486	No
99	16.40	1.04	0.26	0.78	0.97	0.519	1.39	0.375	1.00	1.30	0.487	No
100	16.57	1.06	0.27	0.79	0.97	0.521	1.39	0.376	1.00	1.30	0.488	No
101	16.73	1.07	0.27	0.79	0.96	0.522	1.39	0.377	1.00	1.30	0.490	No
102	16.90	1.08	0.28	0.80	0.96	0.524	1.39	0.378	1.00	1.30	0.491	No
103	17.06	1.09	0.28	0.80	0.96	0.525	1.39	0.379	1.00	1.30	0.492	No
104	17.23	1.10	0.29	0.81	0.96	0.526	1.39	0.380	1.00	1.30	0.494	No
105	17.39	1.11	0.29	0.81	0.96	0.528	1.39	0.381	1.00	1.30	0.495	No
106	17.55	1.12	0.30	0.82	0.96	0.529	1.39	0.382	1.00	1.30	0.496	No
107	17.72	1.13	0.30	0.83	0.96	0.530	1.39	0.382	1.00	1.30	0.497	No
108	17.88	1.14	0.31	0.83	0.96	0.532	1.39	0.383	1.00	1.30	0.498	No
109	18.05	1.15	0.31	0.84	0.96	0.533	1.39	0.384	1.00	1.30	0.500	No
110	18.37	1.17	0.32	0.85	0.96	0.535	1.39	0.386	1.00	1.30	0.502	No
111	18.54	1.18	0.33	0.85	0.96	0.537	1.39	0.387	1.00	1.30	0.503	No
112	18.70	1.19	0.33	0.86	0.96	0.538	1.39	0.388	1.00	1.30	0.504	No
113	18.87	1.20	0.34	0.86	0.96	0.539	1.39	0.389	1.00	1.30	0.505	No
114	19.03	1.21	0.34	0.87	0.96	0.540	1.39	0.389	1.00	1.30	0.506	No
115	19.19	1.22	0.35	0.87	0.96	0.541	1.39	0.390	1.00	1.30	0.507	No
116	19.36	1.23	0.35	0.88	0.96	0.542	1.39	0.391	1.00	1.30	0.508	No
117	19.52	1.24	0.36	0.88	0.96	0.543	1.39	0.392	1.00	1.30	0.509	No
118	19.69	1.25	0.36	0.89	0.96	0.544	1.39	0.393	1.00	1.30	0.510	No
119	19.85	1.26	0.37	0.89	0.96	0.545	1.39	0.393	1.00	1.30	0.511	No
120	20.01	1.27	0.37	0.90	0.96	0.546	1.39	0.394	1.00	1.30	0.512	No
121	20.18	1.28	0.38	0.90	0.96	0.548	1.39	0.395	1.00	1.30	0.513	No
122	20.34	1.29	0.39	0.91	0.96	0.548	1.39	0.396	1.00	1.30	0.514	No
123	20.51	1.30	0.39	0.91	0.96	0.549	1.39	0.396	1.00	1.30	0.515	No
124	20.67	1.32	0.40	0.92	0.96	0.550	1.39	0.397	1.00	1.30	0.516	No
125	20.83	1.33	0.40	0.93	0.95	0.551	1.39	0.398	1.00	1.30	2.000	Yes
126	21.00	1.34	0.41	0.93	0.95	0.552	1.39	0.398	1.00	1.30	2.000	Yes
127	21.16	1.35	0.41	0.94	0.95	0.553	1.39	0.399	1.00	1.30	2.000	Yes
128	21.33	1.36	0.42	0.94	0.95	0.554	1.39	0.399	1.00	1.30	2.000	Yes
129	21.49	1.37	0.42	0.95	0.95	0.555	1.39	0.400	1.00	1.30	2.000	Yes
130	21.65	1.38	0.43	0.95	0.95	0.556	1.39	0.401	1.00	1.30	0.521	No
131	21.82	1.39	0.43	0.95	0.95	0.557	1.39	0.402	1.00	1.30	0.522	No
132	21.98	1.40	0.44	0.96	0.95	0.558	1.39	0.402	1.00	1.30	0.523	No
133	22.15	1.41	0.44	0.96	0.95	0.559	1.39	0.403	1.00	1.30	0.524	No
134	22.31	1.41	0.45	0.97	0.95	0.560	1.39	0.404	1.00	1.30	0.525	No
135	22.47	1.42	0.45	0.97	0.95	0.561	1.39	0.404	1.00	1.30	0.526	No
136	22.64	1.43	0.46	0.98	0.95	0.562	1.39	0.405	1.00	1.30	0.526	No
137	22.80	1.44	0.46	0.98	0.95	0.562	1.39	0.406	1.00	1.30	0.527	No
138	22.97	1.45	0.47	0.99	0.95	0.563	1.39	0.406	1.00	1.30	0.528	No
139	23.13	1.46	0.47	0.99	0.95	0.564	1.39	0.407	1.00	1.30	0.529	No
140	23.30	1.47	0.48	1.00	0.95	0.565	1.39	0.407	1.00	1.30	0.530	No
141	23.46	1.48	0.48	1.00	0.95	0.566	1.39	0.408	1.00	1.30	0.530	No
142	23.62	1.49	0.49	1.00	0.95	0.567	1.39	0.409	1.00	1.30	0.531	No
143	23.79	1.50	0.49	1.01	0.95	0.567	1.39	0.409	1.00	1.30	0.532	No
144	23.95	1.51	0.50	1.01	0.95	0.568	1.39	0.410	1.00	1.30	0.533	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
145	24.12	1.52	0.50	1.02	0.94	0.569	1.39	0.410	1.00	1.30	0.534	No
146	24.28	1.53	0.51	1.02	0.94	0.570	1.39	0.411	1.00	1.30	0.534	No
147	24.44	1.54	0.51	1.03	0.94	0.570	1.39	0.411	1.00	1.30	0.535	No
148	24.61	1.55	0.52	1.03	0.94	0.571	1.39	0.412	1.00	1.30	0.535	No
149	24.77	1.56	0.52	1.04	0.94	0.572	1.39	0.412	1.00	1.30	0.536	No
150	24.94	1.57	0.53	1.04	0.94	0.572	1.39	0.413	1.00	1.30	0.537	No
151	25.10	1.58	0.53	1.05	0.94	0.573	1.39	0.413	1.00	1.30	0.537	No
152	25.26	1.59	0.54	1.05	0.94	0.574	1.39	0.414	1.00	1.30	0.538	No
153	25.43	1.60	0.54	1.06	0.94	0.574	1.39	0.414	1.00	1.30	0.538	No
154	25.59	1.61	0.55	1.06	0.94	0.575	1.39	0.414	1.00	1.30	0.539	No
155	25.76	1.62	0.55	1.07	0.94	0.575	1.39	0.415	1.00	1.30	0.540	No
156	25.92	1.63	0.56	1.07	0.94	0.576	1.39	0.415	1.00	1.30	0.541	No
157	26.08	1.64	0.56	1.08	0.94	0.576	1.39	0.415	1.00	1.30	0.542	No
158	26.25	1.65	0.57	1.08	0.94	0.577	1.39	0.416	1.00	1.30	0.543	No
159	26.41	1.66	0.57	1.09	0.94	0.577	1.39	0.416	0.99	1.30	0.544	No
160	26.58	1.67	0.58	1.09	0.94	0.577	1.39	0.416	0.99	1.30	0.545	No
161	26.74	1.68	0.58	1.10	0.94	0.578	1.39	0.417	0.99	1.30	0.546	No
162	26.90	1.69	0.59	1.10	0.93	0.578	1.39	0.417	0.99	1.30	0.547	No
163	27.07	1.70	0.59	1.11	0.93	0.579	1.39	0.417	0.99	1.30	0.548	No
164	27.23	1.71	0.60	1.11	0.93	0.579	1.39	0.417	0.99	1.30	0.549	No
165	27.40	1.72	0.61	1.12	0.93	0.579	1.39	0.418	0.99	1.30	0.550	No
166	27.56	1.73	0.61	1.12	0.93	0.580	1.39	0.418	0.99	1.30	0.551	No
167	27.72	1.74	0.62	1.13	0.93	0.580	1.39	0.418	0.99	1.30	0.552	No
168	27.89	1.75	0.62	1.13	0.93	0.580	1.39	0.418	0.98	1.30	0.553	No
169	28.05	1.76	0.63	1.14	0.93	0.580	1.39	0.419	0.98	1.30	0.553	No
170	28.22	1.78	0.63	1.14	0.93	0.581	1.39	0.419	0.98	1.30	0.554	No
171	28.38	1.79	0.64	1.15	0.93	0.581	1.39	0.419	0.98	1.30	0.555	No
172	28.54	1.80	0.64	1.16	0.93	0.581	1.39	0.419	0.98	1.30	0.556	No
173	28.71	1.81	0.65	1.16	0.93	0.581	1.39	0.419	0.98	1.30	0.557	No
174	28.87	1.82	0.65	1.17	0.93	0.582	1.39	0.419	0.98	1.30	0.558	No
175	29.04	1.83	0.66	1.17	0.93	0.582	1.39	0.420	0.98	1.30	0.558	No
176	29.20	1.84	0.66	1.18	0.92	0.582	1.39	0.420	0.98	1.30	0.559	No
177	29.36	1.85	0.67	1.18	0.92	0.582	1.39	0.420	0.97	1.30	0.560	No
178	29.53	1.86	0.67	1.19	0.92	0.582	1.39	0.420	0.97	1.30	0.561	No
179	29.69	1.87	0.68	1.19	0.92	0.583	1.39	0.420	0.97	1.30	0.561	No
180	29.86	1.88	0.68	1.20	0.92	0.583	1.39	0.420	0.97	1.30	0.562	No
181	30.02	1.89	0.69	1.20	0.92	0.583	1.39	0.421	0.97	1.30	0.563	No
182	30.19	1.90	0.69	1.20	0.92	0.584	1.39	0.421	0.97	1.30	0.564	No
183	30.35	1.91	0.70	1.21	0.92	0.584	1.39	0.421	0.97	1.30	0.564	No
184	30.51	1.91	0.70	1.21	0.92	0.584	1.39	0.421	0.97	1.30	0.565	No
185	30.68	1.92	0.71	1.22	0.92	0.585	1.39	0.422	0.97	1.30	0.566	No
186	30.84	1.93	0.71	1.22	0.92	0.585	1.39	0.422	0.97	1.30	0.567	No
187	31.01	1.94	0.72	1.22	0.92	0.585	1.39	0.422	0.97	1.30	0.567	No
188	31.17	1.95	0.72	1.23	0.91	0.585	1.39	0.422	0.97	1.30	0.568	No
189	31.33	1.96	0.73	1.23	0.91	0.585	1.39	0.422	0.97	1.30	0.569	No
190	31.50	1.97	0.73	1.24	0.91	0.585	1.39	0.422	0.96	1.30	0.569	No
191	31.66	1.98	0.74	1.24	0.91	0.586	1.39	0.422	0.96	1.30	0.570	No
192	31.83	1.99	0.74	1.25	0.91	0.586	1.39	0.422	0.96	1.30	0.570	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
193	31.99	2.00	0.75	1.25	0.91	0.586	1.39	0.422	0.96	1.30	0.571	No
194	32.15	2.01	0.75	1.26	0.91	0.586	1.39	0.422	0.96	1.30	0.571	No
195	32.32	2.02	0.76	1.26	0.91	0.586	1.39	0.422	0.96	1.30	0.572	No
196	32.48	2.03	0.76	1.27	0.91	0.586	1.39	0.422	0.96	1.30	0.572	No
197	32.65	2.04	0.77	1.27	0.91	0.586	1.39	0.422	0.96	1.30	0.573	No
198	32.81	2.05	0.77	1.28	0.90	0.586	1.39	0.422	0.96	1.30	0.573	No
199	32.97	2.06	0.78	1.28	0.90	0.586	1.39	0.423	0.96	1.30	0.574	No
200	33.14	2.07	0.78	1.28	0.90	0.586	1.39	0.423	0.96	1.30	0.574	No
201	33.30	2.08	0.79	1.29	0.90	0.586	1.39	0.423	0.96	1.30	0.575	No
202	33.47	2.09	0.79	1.29	0.90	0.586	1.39	0.422	0.95	1.30	0.575	No
203	33.63	2.10	0.80	1.30	0.90	0.586	1.39	0.422	0.95	1.30	0.576	No
204	33.79	2.11	0.80	1.30	0.90	0.586	1.39	0.422	0.95	1.30	0.576	No
205	33.96	2.12	0.81	1.31	0.90	0.585	1.39	0.422	0.95	1.30	0.576	No
206	34.12	2.13	0.81	1.32	0.90	0.585	1.39	0.422	0.95	1.30	0.577	No
207	34.29	2.14	0.82	1.32	0.90	0.585	1.39	0.422	0.95	1.30	0.577	No
208	34.45	2.15	0.83	1.33	0.89	0.585	1.39	0.422	0.95	1.30	0.577	No
209	34.61	2.16	0.83	1.33	0.89	0.585	1.39	0.422	0.95	1.30	0.578	No
210	34.78	2.17	0.84	1.34	0.89	0.584	1.39	0.421	0.95	1.30	0.578	No
211	34.94	2.18	0.84	1.34	0.89	0.584	1.39	0.421	0.95	1.30	0.578	No
212	35.11	2.19	0.85	1.34	0.89	0.584	1.39	0.421	0.95	1.30	0.579	No
213	35.27	2.20	0.85	1.35	0.89	0.584	1.39	0.421	0.95	1.30	0.579	No
214	35.43	2.21	0.86	1.35	0.89	0.584	1.39	0.421	0.94	1.30	0.579	No
215	35.60	2.22	0.86	1.36	0.89	0.583	1.39	0.421	0.94	1.30	0.579	No
216	35.76	2.23	0.87	1.36	0.89	0.583	1.39	0.421	0.94	1.30	0.580	No
217	35.93	2.24	0.87	1.37	0.88	0.583	1.39	0.420	0.94	1.30	0.580	No
218	36.09	2.25	0.88	1.37	0.88	0.583	1.39	0.420	0.94	1.30	0.580	No
219	36.26	2.26	0.88	1.38	0.88	0.582	1.39	0.420	0.94	1.30	0.580	No
220	36.42	2.27	0.89	1.38	0.88	0.582	1.39	0.420	0.94	1.30	0.580	No
221	36.58	2.28	0.89	1.39	0.88	0.582	1.39	0.419	0.94	1.30	0.581	No
222	36.75	2.29	0.90	1.40	0.88	0.581	1.39	0.419	0.94	1.30	0.581	No
223	36.91	2.30	0.90	1.40	0.88	0.581	1.39	0.419	0.94	1.30	0.581	No
224	37.08	2.31	0.91	1.41	0.88	0.580	1.39	0.419	0.94	1.30	0.581	No
225	37.24	2.32	0.91	1.41	0.87	0.580	1.39	0.418	0.94	1.30	0.581	No
226	37.40	2.33	0.92	1.42	0.87	0.580	1.39	0.418	0.94	1.30	2.000	Yes
227	37.57	2.34	0.92	1.42	0.87	0.579	1.39	0.418	0.93	1.30	2.000	Yes
228	37.73	2.35	0.93	1.43	0.87	0.579	1.39	0.417	0.93	1.30	2.000	Yes
229	37.90	2.37	0.93	1.43	0.87	0.578	1.39	0.417	0.93	1.30	2.000	Yes
230	38.06	2.38	0.94	1.44	0.87	0.578	1.39	0.417	0.93	1.30	0.581	No
231	38.22	2.39	0.94	1.44	0.87	0.577	1.39	0.416	0.93	1.30	0.581	No
232	38.39	2.40	0.95	1.45	0.86	0.577	1.39	0.416	0.93	1.30	0.581	No
233	38.55	2.41	0.95	1.45	0.86	0.576	1.39	0.415	0.93	1.30	0.581	No
234	38.72	2.42	0.96	1.46	0.86	0.575	1.39	0.415	0.93	1.30	0.581	No
235	38.88	2.43	0.96	1.47	0.86	0.575	1.39	0.414	0.93	1.30	2.000	Yes
236	39.04	2.44	0.97	1.47	0.86	0.574	1.39	0.414	0.93	1.30	2.000	Yes
237	39.21	2.45	0.97	1.48	0.86	0.574	1.39	0.414	0.93	1.30	2.000	Yes
238	39.37	2.46	0.98	1.48	0.86	0.573	1.39	0.413	0.93	1.30	2.000	Yes
239	39.54	2.47	0.98	1.49	0.86	0.572	1.39	0.413	0.92	1.30	2.000	Yes
240	39.70	2.48	0.99	1.49	0.85	0.572	1.39	0.412	0.92	1.30	0.580	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
241	39.86	2.49	0.99	1.50	0.85	0.571	1.39	0.412	0.92	1.30	0.580	No
242	40.03	2.50	1.00	1.50	0.85	0.571	1.39	0.412	0.92	1.30	0.580	No
243	40.19	2.51	1.00	1.51	0.85	0.570	1.39	0.411	0.92	1.30	0.580	No
244	40.36	2.52	1.01	1.51	0.85	0.570	1.39	0.411	0.92	1.30	0.580	No
245	40.52	2.53	1.01	1.52	0.85	0.569	1.39	0.410	0.92	1.30	0.580	No
246	40.68	2.54	1.02	1.52	0.84	0.568	1.39	0.410	0.92	1.30	0.579	No
247	40.85	2.55	1.02	1.53	0.84	0.568	1.39	0.409	0.92	1.30	0.579	No
248	41.01	2.56	1.03	1.53	0.84	0.567	1.39	0.409	0.92	1.30	0.579	No
249	41.18	2.57	1.04	1.54	0.84	0.566	1.39	0.408	0.92	1.30	0.579	No
250	41.34	2.58	1.04	1.54	0.84	0.566	1.39	0.408	0.92	1.30	0.579	No
251	41.50	2.59	1.05	1.55	0.84	0.565	1.39	0.408	0.92	1.30	0.578	No
252	41.67	2.61	1.05	1.56	0.84	0.564	1.39	0.407	0.92	1.30	0.578	No
253	41.83	2.62	1.06	1.56	0.83	0.564	1.39	0.407	0.91	1.30	0.578	No
254	42.00	2.63	1.06	1.57	0.83	0.563	1.39	0.406	0.91	1.30	0.578	No
255	42.16	2.64	1.07	1.57	0.83	0.562	1.39	0.405	0.91	1.30	0.577	No
256	42.32	2.65	1.07	1.58	0.83	0.561	1.39	0.405	0.91	1.30	0.577	No
257	42.49	2.66	1.08	1.58	0.83	0.561	1.39	0.404	0.91	1.30	0.577	No
258	42.65	2.67	1.08	1.59	0.83	0.560	1.39	0.404	0.91	1.30	0.576	No
259	42.82	2.68	1.09	1.59	0.83	0.559	1.39	0.403	0.91	1.30	0.576	No
260	42.98	2.69	1.09	1.60	0.82	0.558	1.39	0.403	0.91	1.30	0.576	No
261	43.15	2.70	1.10	1.60	0.82	0.558	1.39	0.402	0.91	1.30	0.575	No
262	43.31	2.71	1.10	1.61	0.82	0.557	1.39	0.402	0.91	1.30	0.575	No
263	43.47	2.72	1.11	1.61	0.82	0.556	1.39	0.401	0.91	1.30	0.575	No
264	43.64	2.73	1.11	1.62	0.82	0.555	1.39	0.400	0.91	1.30	0.574	No
265	43.80	2.74	1.12	1.63	0.82	0.555	1.39	0.400	0.91	1.30	0.574	No
266	43.97	2.75	1.12	1.63	0.81	0.554	1.39	0.399	0.91	1.30	0.573	No
267	44.13	2.76	1.13	1.64	0.81	0.553	1.39	0.399	0.90	1.30	0.573	No
268	44.29	2.77	1.13	1.64	0.81	0.552	1.39	0.398	0.90	1.30	0.573	No
269	44.46	2.78	1.14	1.65	0.81	0.551	1.39	0.397	0.90	1.30	0.572	No
270	44.62	2.80	1.14	1.65	0.81	0.550	1.39	0.397	0.90	1.30	0.572	No
271	44.79	2.81	1.15	1.66	0.81	0.549	1.39	0.396	0.90	1.30	0.571	No
272	44.95	2.82	1.15	1.66	0.80	0.549	1.39	0.396	0.90	1.30	0.571	No
273	45.11	2.83	1.16	1.67	0.80	0.548	1.39	0.395	0.90	1.30	0.570	No
274	45.28	2.84	1.16	1.67	0.80	0.547	1.39	0.394	0.90	1.30	0.570	No
275	45.44	2.85	1.17	1.68	0.80	0.546	1.39	0.394	0.90	1.30	0.569	No
276	45.61	2.86	1.17	1.69	0.80	0.545	1.39	0.393	0.90	1.30	0.569	No
277	45.77	2.87	1.18	1.69	0.80	0.544	1.39	0.392	0.90	1.30	0.568	No
278	45.93	2.88	1.18	1.70	0.79	0.543	1.39	0.392	0.90	1.30	0.568	No
279	46.10	2.89	1.19	1.70	0.79	0.543	1.39	0.391	0.90	1.30	0.567	No
280	46.26	2.90	1.19	1.71	0.79	0.542	1.39	0.391	0.90	1.30	0.567	No
281	46.43	2.91	1.20	1.71	0.79	0.541	1.39	0.390	0.90	1.30	0.566	No
282	46.59	2.92	1.20	1.72	0.79	0.540	1.39	0.389	0.89	1.30	0.566	No
283	46.75	2.93	1.21	1.72	0.79	0.539	1.39	0.389	0.89	1.30	0.565	No
284	46.92	2.94	1.21	1.73	0.78	0.538	1.39	0.388	0.89	1.30	0.565	No
285	47.08	2.95	1.22	1.73	0.78	0.537	1.39	0.388	0.89	1.30	0.564	No
286	47.25	2.96	1.22	1.74	0.78	0.536	1.39	0.387	0.89	1.30	0.564	No
287	47.41	2.97	1.23	1.74	0.78	0.536	1.39	0.386	0.89	1.30	0.563	No
288	47.57	2.98	1.23	1.75	0.78	0.535	1.39	0.386	0.89	1.30	0.563	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
289	47.74	2.99	1.24	1.75	0.78	0.534	1.39	0.385	0.89	1.30	0.562	No
290	47.90	3.00	1.24	1.76	0.77	0.533	1.39	0.384	0.89	1.30	0.562	No
291	48.07	3.01	1.25	1.76	0.77	0.532	1.39	0.384	0.89	1.30	0.561	No
292	48.23	3.02	1.26	1.77	0.77	0.531	1.39	0.383	0.89	1.30	0.560	No
293	48.39	3.03	1.26	1.77	0.77	0.530	1.39	0.383	0.89	1.30	0.560	No
294	48.56	3.04	1.27	1.78	0.77	0.530	1.39	0.382	0.89	1.30	2.000	Yes
295	48.72	3.05	1.27	1.78	0.77	0.529	1.39	0.381	0.89	1.30	2.000	Yes
296	48.89	3.06	1.28	1.79	0.76	0.528	1.39	0.381	0.89	1.30	2.000	Yes
297	49.05	3.07	1.28	1.79	0.76	0.527	1.39	0.380	0.89	1.30	2.000	Yes
298	49.22	3.08	1.29	1.80	0.76	0.526	1.39	0.379	0.89	1.30	2.000	Yes
299	49.38	3.10	1.29	1.80	0.76	0.525	1.39	0.378	0.88	1.30	2.000	Yes
300	49.54	3.11	1.30	1.81	0.76	0.524	1.39	0.378	0.88	1.30	2.000	Yes
301	49.71	3.12	1.30	1.82	0.76	0.523	1.39	0.377	0.88	1.30	0.555	No
302	49.87	3.13	1.31	1.82	0.75	0.522	1.39	0.376	0.88	1.30	0.554	No
303	50.04	3.14	1.31	1.83	0.75	0.521	1.39	0.376	0.88	1.30	0.554	No
304	50.20	3.15	1.32	1.83	0.75	0.520	1.39	0.375	0.88	1.30	0.553	No
305	50.36	3.16	1.32	1.84	0.75	0.519	1.39	0.374	0.88	1.30	0.552	No
306	50.53	3.17	1.33	1.85	0.75	0.518	1.39	0.373	0.88	1.30	0.552	No
307	50.69	3.18	1.33	1.85	0.75	0.517	1.39	0.373	0.88	1.30	0.551	No
308	50.86	3.19	1.34	1.86	0.74	0.516	1.39	0.372	0.88	1.30	0.550	No
309	51.02	3.21	1.34	1.86	0.74	0.515	1.39	0.371	0.88	1.30	0.550	No
310	51.18	3.22	1.35	1.87	0.74	0.514	1.39	0.370	0.88	1.30	0.549	No
311	51.35	3.23	1.35	1.87	0.74	0.513	1.39	0.370	0.88	1.30	0.548	No
312	51.51	3.24	1.36	1.88	0.74	0.512	1.39	0.369	0.88	1.30	0.548	No
313	51.68	3.25	1.36	1.89	0.74	0.511	1.39	0.368	0.88	1.30	0.547	No
314	51.84	3.26	1.37	1.89	0.73	0.510	1.39	0.368	0.87	1.30	2.000	Yes
315	52.00	3.27	1.37	1.90	0.73	0.509	1.39	0.367	0.87	1.30	2.000	Yes
316	52.17	3.28	1.38	1.90	0.73	0.508	1.39	0.366	0.87	1.30	2.000	Yes
317	52.33	3.29	1.38	1.91	0.73	0.507	1.39	0.366	0.87	1.30	2.000	Yes
318	52.50	3.30	1.39	1.91	0.73	0.506	1.39	0.365	0.87	1.30	2.000	Yes
319	52.66	3.31	1.39	1.92	0.73	0.505	1.39	0.364	0.87	1.30	2.000	Yes
320	52.82	3.32	1.40	1.92	0.72	0.504	1.39	0.364	0.87	1.30	2.000	Yes
321	52.99	3.33	1.40	1.93	0.72	0.503	1.39	0.363	0.87	1.30	0.542	No
322	53.15	3.35	1.41	1.94	0.72	0.502	1.39	0.362	0.87	1.30	0.541	No
323	53.32	3.36	1.41	1.94	0.72	0.501	1.39	0.361	0.87	1.30	0.540	No
324	53.48	3.37	1.42	1.95	0.72	0.500	1.39	0.361	0.87	1.30	0.539	No
325	53.64	3.38	1.42	1.95	0.72	0.499	1.39	0.360	0.87	1.30	0.539	No
326	53.81	3.39	1.43	1.96	0.71	0.498	1.39	0.359	0.87	1.30	0.538	No
327	53.97	3.40	1.43	1.97	0.71	0.497	1.39	0.358	0.87	1.30	0.537	No
328	54.14	3.41	1.44	1.97	0.71	0.496	1.39	0.358	0.87	1.30	0.537	No
329	54.30	3.42	1.44	1.98	0.71	0.495	1.39	0.357	0.87	1.30	0.536	No
330	54.46	3.44	1.45	1.99	0.71	0.494	1.39	0.356	0.87	1.30	0.535	No
331	54.63	3.45	1.45	1.99	0.71	0.493	1.39	0.355	0.86	1.30	0.534	No
332	54.79	3.46	1.46	2.00	0.71	0.492	1.39	0.355	0.86	1.30	0.534	No
333	54.96	3.47	1.47	2.00	0.70	0.491	1.39	0.354	0.86	1.30	0.533	No
334	55.12	3.48	1.47	2.01	0.70	0.490	1.39	0.353	0.86	1.30	0.532	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
σ_v: Total overburden pressure at test point (tsf)
u_0: Water pressure at test point (tsf)
σ_v': Effective overburden pressure based on GWT during earthquake (tsf)
r_d: Nonlinear shear mass factor
CSR: Cyclic Stress Ratio
MSF: Magnitude Scaling Factor
CSR_{eq}: CSR adjusted for M=7.5
K_σ: Effective overburden stress factor
CSR^*: CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.33	131.32	1.99	2.54	0.63	210.95	1.28	271.00	4.000	No	No	2.00
2	0.49	144.29	2.03	3.03	0.65	231.76	1.34	310.31	4.000	No	No	2.00
3	0.66	133.82	2.07	3.21	0.66	214.93	1.40	300.87	4.000	No	No	2.00
4	0.82	124.99	2.13	3.60	0.69	200.72	1.50	301.77	4.000	No	No	2.00
5	0.98	112.72	2.18	3.94	0.71	181.00	1.63	294.17	4.000	No	No	2.00
6	1.15	94.09	2.26	4.29	0.74	151.04	1.82	275.01	4.000	No	No	2.00
7	1.31	69.22	2.36	4.58	0.77	111.08	2.15	239.27	4.000	No	No	2.00
8	1.48	54.15	2.43	4.69	0.80	86.85	2.45	213.01	4.000	No	No	2.00
9	1.64	44.82	2.49	4.70	0.82	71.84	2.70	194.04	4.000	No	No	2.00
10	1.80	39.89	2.51	4.53	0.83	63.89	2.81	179.43	4.000	No	No	2.00
11	1.97	38.69	2.48	4.06	0.82	61.95	2.68	165.96	4.000	No	No	2.00
12	2.13	41.52	2.44	3.79	0.80	66.48	2.48	164.69	4.000	No	No	2.00
13	2.30	47.28	2.39	3.61	0.78	75.73	2.25	170.58	4.000	No	No	2.00
14	2.46	56.05	2.34	3.70	0.77	89.80	2.10	188.59	4.000	No	No	2.00
15	2.62	67.95	2.31	3.93	0.76	108.90	1.99	216.61	4.000	No	No	2.00
16	2.79	78.68	2.30	4.29	0.75	126.12	1.96	247.18	4.000	No	No	2.00
17	2.95	81.81	2.33	4.74	0.76	131.14	2.04	267.96	4.000	No	No	2.00
18	3.12	77.75	2.37	5.07	0.78	124.59	2.18	271.24	4.000	No	No	2.00
19	3.28	69.21	2.41	5.31	0.79	110.86	2.36	261.68	4.000	No	No	2.00
20	3.45	62.01	2.45	5.39	0.81	99.28	2.51	248.95	4.000	No	No	2.00
21	3.61	60.11	2.46	5.46	0.81	96.21	2.56	246.58	4.000	No	No	2.00
22	3.77	60.21	2.47	5.67	0.82	96.35	2.62	252.81	4.000	No	No	2.00
23	3.94	58.78	2.49	5.87	0.82	94.03	2.71	255.02	4.000	No	No	2.00
24	4.10	56.68	2.50	5.97	0.83	90.64	2.79	252.90	4.000	No	No	2.00
25	4.27	58.54	2.48	5.72	0.82	93.62	2.67	250.43	4.000	No	No	2.00
26	4.43	65.28	2.43	5.33	0.80	104.42	2.43	253.95	4.000	No	No	2.00
27	4.59	71.98	2.38	4.93	0.78	115.16	2.22	255.12	4.000	No	No	2.00
28	4.76	75.78	2.34	4.59	0.77	121.25	2.08	251.63	4.000	No	No	2.00
29	4.92	77.01	2.31	4.26	0.75	123.21	1.97	242.95	4.000	No	No	2.00
30	5.09	75.27	2.28	3.87	0.74	120.41	1.89	227.07	4.000	No	No	2.00
31	5.25	72.34	2.26	3.52	0.74	115.68	1.82	210.68	4.000	No	No	2.00
32	5.41	70.17	2.23	3.20	0.73	112.18	1.75	196.88	4.000	No	No	2.00
33	5.58	70.34	2.22	3.05	0.72	112.43	1.71	192.37	4.000	No	No	2.00
34	5.74	72.71	2.19	2.90	0.71	116.22	1.65	191.48	4.000	No	No	2.00
35	5.91	75.91	2.17	2.82	0.70	121.34	1.60	193.97	4.000	No	No	2.00
36	6.07	78.74	2.15	2.77	0.70	125.88	1.56	196.46	4.000	No	No	2.00
37	6.23	80.67	2.14	2.74	0.69	128.97	1.54	198.64	4.000	No	No	2.00
38	6.40	82.74	2.15	2.83	0.69	132.27	1.55	204.94	4.000	No	No	2.00
39	6.56	84.80	2.16	2.96	0.70	135.57	1.57	212.47	4.000	No	No	2.00
40	6.73	81.77	2.19	3.20	0.71	130.68	1.65	215.45	4.000	No	No	2.00
41	6.89	73.07	2.26	3.58	0.74	116.69	1.83	213.71	4.000	No	No	2.00
42	7.05	66.24	2.33	4.10	0.76	105.69	2.07	218.32	4.000	No	No	2.00
43	7.22	65.03	2.38	4.59	0.78	103.74	2.23	230.99	4.000	No	No	2.00
44	7.38	70.27	2.35	4.54	0.77	112.13	2.13	239.16	4.000	No	No	2.00
45	7.55	71.63	2.35	4.54	0.77	114.31	2.12	241.94	4.000	No	No	2.00
46	7.71	71.43	2.34	4.46	0.77	113.97	2.10	239.00	4.000	No	No	2.00
47	7.87	67.03	2.37	4.61	0.78	106.88	2.20	235.20	4.000	No	No	2.00
48	8.04	64.80	2.37	4.51	0.78	103.28	2.21	227.93	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	64.27	2.36	4.34	0.78	102.41	2.17	221.76	4.000	No	No	2.00
50	8.37	66.60	2.33	3.99	0.76	104.64	2.04	213.52	4.000	No	No	2.00
51	8.53	68.57	2.32	3.92	0.76	105.97	2.01	212.97	4.000	No	No	2.00
52	8.69	71.93	2.31	3.92	0.76	109.42	1.98	216.84	4.000	No	No	2.00
53	8.86	72.70	2.33	4.16	0.76	109.48	2.05	224.29	4.000	No	No	2.00
54	9.02	68.90	2.36	4.34	0.78	103.03	2.16	222.54	4.000	No	No	2.00
55	9.19	59.67	2.42	4.57	0.80	88.94	2.39	212.38	4.000	No	No	2.00
56	9.35	51.70	2.47	4.76	0.82	76.79	2.63	202.18	4.000	No	No	2.00
57	9.51	48.33	2.50	4.82	0.83	71.13	2.76	196.14	0.782	No	No	1.95
58	9.68	47.56	2.51	4.83	0.83	69.10	2.80	193.62	0.755	No	No	1.87
59	9.84	46.07	2.52	4.77	0.83	66.10	2.85	188.12	0.699	No	No	1.72
60	10.01	44.13	2.52	4.60	0.84	62.45	2.87	179.19	0.615	No	No	1.50
61	10.17	43.23	2.51	4.31	0.83	60.24	2.81	169.48	0.533	No	No	1.29
62	10.34	45.26	2.48	4.04	0.82	61.95	2.67	165.32	0.500	No	No	1.20
63	10.50	50.09	2.45	3.91	0.81	67.39	2.51	168.90	0.528	No	No	1.26
64	10.66	56.03	2.42	3.91	0.80	74.22	2.39	177.02	0.596	No	No	1.42
65	10.83	61.23	2.39	3.85	0.79	79.84	2.28	181.88	0.640	No	No	1.51
66	10.99	64.36	2.37	3.77	0.78	82.78	2.21	182.88	0.649	No	No	1.52
67	11.16	66.06	2.36	3.67	0.78	83.83	2.16	181.33	0.635	No	No	1.48
68	11.32	67.06	2.36	3.62	0.77	84.10	2.14	180.09	0.623	No	No	1.45
69	11.48	67.46	2.36	3.60	0.77	83.68	2.14	179.04	0.614	No	No	1.42
70	11.65	67.60	2.34	3.39	0.77	82.72	2.08	172.23	0.555	No	No	1.28
71	11.81	67.50	2.33	3.25	0.76	81.63	2.05	167.04	0.513	No	No	1.17
72	11.98	67.63	2.32	3.09	0.76	80.78	2.00	161.80	0.474	No	No	1.08
73	12.14	68.17	2.32	3.12	0.76	80.64	2.01	162.36	0.478	No	No	1.08
74	12.30	68.80	2.32	3.09	0.76	80.57	2.00	161.49	0.472	No	No	1.06
75	12.47	69.00	2.32	3.08	0.76	79.98	2.01	160.65	0.466	No	No	1.04
76	12.63	68.93	2.32	3.03	0.76	79.12	2.00	158.50	0.450	No	No	1.00
77	12.80	68.40	2.32	3.01	0.76	77.72	2.01	156.39	0.436	No	No	0.97
78	12.96	67.87	2.32	2.93	0.76	76.37	2.00	152.95	0.413	No	No	0.91
79	13.12	67.50	2.32	2.95	0.76	75.29	2.02	152.31	0.409	No	No	0.90
80	13.29	68.47	2.33	3.01	0.76	75.66	2.04	154.25	0.421	No	No	0.92
81	13.45	70.33	2.34	3.17	0.77	77.11	2.08	160.11	0.462	No	No	1.01
82	13.62	72.93	2.34	3.28	0.77	79.24	2.09	165.58	0.502	No	No	1.09
83	13.78	76.33	2.35	3.45	0.77	82.25	2.11	173.28	0.564	No	No	1.22
84	13.94	80.70	2.35	3.59	0.77	86.23	2.11	181.67	0.638	No	No	1.38
85	14.11	82.93	2.36	3.78	0.77	87.85	2.15	188.78	0.706	No	No	1.52
86	14.27	80.17	2.38	3.87	0.78	84.23	2.22	187.27	0.691	No	No	1.48
87	14.44	71.50	2.42	4.01	0.80	74.50	2.42	179.96	0.622	No	No	1.33
88	14.60	61.83	2.48	4.10	0.82	63.88	2.65	169.37	0.532	No	No	1.13
89	14.76	55.73	2.51	4.14	0.83	57.05	2.83	161.46	0.471	No	No	1.00
90	14.93	56.13	2.48	3.69	0.82	56.84	2.65	150.81	0.399	No	No	0.84
91	15.09	59.83	2.43	3.34	0.80	60.02	2.44	146.29	0.371	No	No	0.78
92	15.26	63.23	2.40	3.16	0.79	62.86	2.30	144.88	0.363	No	No	0.76
93	15.42	63.97	2.41	3.28	0.79	63.10	2.35	148.22	0.383	No	No	0.80
94	15.58	63.00	2.42	3.33	0.80	61.64	2.40	147.89	0.381	No	No	0.79
95	15.75	62.07	2.42	3.28	0.80	60.19	2.41	144.87	0.363	No	No	0.75
96	15.91	61.63	2.42	3.19	0.80	59.28	2.39	141.75	0.345	No	No	0.71

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	62.90	2.41	3.12	0.79	60.00	2.35	140.94	0.340	No	No	0.70
98	16.24	65.30	2.40	3.16	0.79	61.83	2.33	143.90	0.357	No	No	0.74
99	16.40	68.30	2.40	3.22	0.79	64.21	2.30	147.92	0.381	No	No	0.78
100	16.57	70.90	2.40	3.29	0.79	66.15	2.30	151.83	0.406	No	No	0.83
101	16.73	73.60	2.39	3.31	0.79	68.18	2.27	154.44	0.423	No	No	0.86
102	16.90	75.57	2.38	3.31	0.78	69.47	2.24	155.90	0.432	No	No	0.88
103	17.06	76.90	2.38	3.30	0.78	70.18	2.23	156.31	0.435	No	No	0.88
104	17.23	76.97	2.38	3.29	0.78	69.69	2.23	155.72	0.431	No	No	0.87
105	17.39	76.37	2.39	3.32	0.78	68.62	2.26	155.26	0.428	No	No	0.87
106	17.55	75.61	2.40	3.36	0.79	67.42	2.30	154.84	0.425	No	No	0.86
107	17.72	74.64	2.41	3.40	0.79	66.01	2.34	154.44	0.423	No	No	0.85
108	17.88	74.34	2.40	3.28	0.79	65.28	2.31	150.53	0.397	No	No	0.80
109	18.05	73.81	2.39	3.17	0.79	64.33	2.28	146.63	0.373	No	No	0.75
110	18.37	72.34	2.39	3.04	0.79	62.16	2.27	141.25	0.342	No	No	0.68
111	18.54	69.77	2.41	3.11	0.79	59.43	2.36	139.98	0.335	No	No	0.67
112	18.70	67.17	2.43	3.13	0.80	56.74	2.42	137.59	0.322	No	No	0.64
113	18.87	65.51	2.44	3.16	0.80	54.87	2.48	136.24	0.315	No	No	0.62
114	19.03	64.81	2.44	3.14	0.81	53.89	2.50	134.75	0.308	No	No	0.61
115	19.19	64.38	2.45	3.17	0.81	53.15	2.53	134.43	0.306	No	No	0.60
116	19.36	64.28	2.45	3.12	0.81	52.69	2.52	132.82	0.298	No	No	0.59
117	19.52	64.84	2.44	3.09	0.81	52.82	2.51	132.32	0.295	No	No	0.58
118	19.69	66.84	2.43	3.05	0.80	54.14	2.45	132.76	0.298	No	No	0.58
119	19.85	70.34	2.42	3.04	0.80	56.71	2.39	135.33	0.310	No	No	0.61
120	20.01	74.51	2.40	3.05	0.79	59.80	2.32	138.88	0.329	No	No	0.64
121	20.18	77.98	2.39	3.09	0.79	62.25	2.29	142.39	0.348	No	No	0.68
122	20.34	80.01	2.40	3.18	0.79	63.48	2.30	145.98	0.369	No	No	0.72
123	20.51	81.11	2.40	3.22	0.79	63.92	2.31	147.47	0.378	No	No	0.73
124	20.67	83.44	2.40	3.33	0.79	65.36	2.32	151.87	0.406	No	No	0.79
125	20.83	87.08	2.40	3.38	0.79	67.85	2.30	155.98	4.000	Yes	No	2.00
126	21.00	81.81	2.45	3.73	0.81	62.97	2.53	159.12	4.000	Yes	No	2.00
127	21.16	65.61	2.56	4.15	0.85	49.49	3.06	151.69	4.000	Yes	No	2.00
128	21.33	43.38	2.75	4.92	0.92	31.57	4.34	137.05	4.000	Yes	Yes	2.00
129	21.49	27.55	2.93	5.35	0.99	19.20	5.98	114.88	4.000	Yes	Yes	2.00
130	21.65	20.92	3.01	4.95	1.00	14.20	6.81	96.72	4.000	No	Yes	2.00
131	21.82	19.46	2.98	4.06	1.00	13.04	6.54	85.23	4.000	No	Yes	2.00
132	21.98	19.86	2.94	3.61	1.00	13.24	6.15	81.47	4.000	No	Yes	2.00
133	22.15	20.43	2.94	3.68	1.00	13.56	6.12	82.96	4.000	No	Yes	2.00
134	22.31	20.80	2.97	4.13	1.00	13.71	6.40	87.74	4.000	No	Yes	2.00
135	22.47	21.87	2.98	4.56	1.00	14.36	6.52	93.72	4.000	No	Yes	2.00
136	22.64	23.17	2.98	4.91	1.00	15.16	6.54	99.23	4.000	No	Yes	2.00
137	22.80	23.57	2.98	4.97	1.00	15.33	6.54	100.33	4.000	No	Yes	2.00
138	22.97	22.21	3.00	4.82	1.00	14.28	6.71	95.82	4.000	No	Yes	2.00
139	23.13	20.18	3.02	4.63	1.00	12.79	7.01	89.63	4.000	No	Yes	2.00
140	23.30	19.01	3.04	4.56	1.00	11.91	7.24	86.24	4.000	No	Yes	2.00
141	23.46	18.95	3.05	4.58	1.00	11.79	7.30	86.00	4.000	No	Yes	2.00
142	23.62	18.85	3.05	4.61	1.00	11.64	7.37	85.75	4.000	No	Yes	2.00
143	23.79	18.72	3.06	4.65	1.00	11.47	7.45	85.48	4.000	No	Yes	2.00
144	23.95	19.08	3.06	4.74	1.00	11.64	7.46	86.79	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	24.12	20.29	3.04	4.80	1.00	12.35	7.26	89.58	4.000	No	Yes	2.00
146	24.28	22.99	2.99	4.66	1.00	14.03	6.67	93.63	4.000	No	Yes	2.00
147	24.44	31.25	2.83	3.93	0.95	19.63	5.08	99.70	4.000	No	Yes	2.00
148	24.61	40.63	2.71	3.58	0.91	26.11	4.09	106.94	4.000	No	Yes	2.00
149	24.77	45.29	2.68	3.66	0.90	29.18	3.88	113.10	4.000	No	Yes	2.00
150	24.94	40.81	2.76	4.16	0.93	25.72	4.47	114.87	4.000	No	Yes	2.00
151	25.10	33.11	2.88	4.76	0.97	20.18	5.49	110.88	4.000	No	Yes	2.00
152	25.26	29.07	2.94	4.97	1.00	17.32	6.12	105.94	4.000	No	Yes	2.00
153	25.43	35.57	2.81	4.12	0.95	21.71	4.90	106.46	4.000	No	Yes	2.00
154	25.59	46.24	2.67	3.51	0.89	28.99	3.81	110.38	4.000	No	Yes	2.00
155	25.76	56.68	2.58	3.27	0.86	36.09	3.22	116.13	0.226	No	No	0.42
156	25.92	60.61	2.57	3.33	0.85	38.55	3.13	120.60	0.243	No	No	0.45
157	26.08	62.81	2.57	3.43	0.85	39.79	3.12	124.14	0.258	No	No	0.48
158	26.25	64.35	2.56	3.46	0.85	40.58	3.10	125.63	0.264	No	No	0.49
159	26.41	62.62	2.58	3.55	0.86	39.12	3.21	125.64	0.264	No	No	0.49
160	26.58	61.18	2.59	3.58	0.86	37.89	3.29	124.56	0.260	No	No	0.48
161	26.74	62.05	2.59	3.59	0.86	38.26	3.27	125.14	0.262	No	No	0.48
162	26.90	67.02	2.56	3.52	0.85	41.41	3.09	128.01	0.275	No	No	0.50
163	27.07	71.22	2.55	3.60	0.85	43.93	3.02	132.81	0.298	No	No	0.54
164	27.23	72.82	2.55	3.70	0.85	44.67	3.04	135.98	0.314	No	No	0.57
165	27.40	72.25	2.56	3.78	0.85	43.98	3.11	136.65	0.317	No	No	0.58
166	27.56	70.65	2.57	3.77	0.86	42.70	3.16	134.75	0.308	No	No	0.56
167	27.72	69.19	2.57	3.71	0.86	41.55	3.17	131.89	0.293	No	No	0.53
168	27.89	67.79	2.58	3.69	0.86	40.41	3.22	129.93	0.284	No	No	0.51
169	28.05	67.12	2.59	3.67	0.86	39.77	3.24	128.80	0.279	No	No	0.50
170	28.22	67.62	2.59	3.70	0.86	39.84	3.25	129.36	0.281	No	No	0.51
171	28.38	69.19	2.57	3.56	0.85	40.73	3.14	127.91	0.275	No	No	0.49
172	28.54	70.59	2.56	3.54	0.85	41.43	3.10	128.37	0.277	No	No	0.50
173	28.71	71.75	2.56	3.53	0.85	41.95	3.07	128.83	0.279	No	No	0.50
174	28.87	72.45	2.57	3.68	0.85	42.06	3.14	132.06	0.294	No	No	0.53
175	29.04	71.78	2.59	3.86	0.86	41.27	3.26	134.51	0.306	No	No	0.55
176	29.20	67.29	2.64	4.18	0.88	38.03	3.57	135.72	4.000	No	Yes	2.00
177	29.36	54.95	2.74	4.64	0.92	30.03	4.33	130.00	4.000	No	Yes	2.00
178	29.53	38.05	2.92	5.25	0.99	19.62	5.86	114.97	4.000	No	Yes	2.00
179	29.69	23.29	3.12	5.76	1.00	11.47	8.18	93.73	4.000	No	Yes	2.00
180	29.86	15.40	3.29	5.92	1.00	7.20	10.50	75.55	4.000	No	Yes	2.00
181	30.02	12.50	3.33	5.02	1.00	5.63	11.18	62.91	4.000	No	Yes	2.00
182	30.19	10.81	3.37	4.49	1.00	4.70	11.77	55.32	4.000	No	Yes	2.00
183	30.35	10.31	3.36	3.97	1.00	4.41	11.66	51.46	4.000	No	Yes	2.00
184	30.51	11.11	3.33	3.99	1.00	4.81	11.18	53.75	4.000	No	Yes	2.00
185	30.68	11.98	3.32	4.31	1.00	5.23	11.00	57.51	4.000	No	Yes	2.00
186	30.84	12.75	3.31	4.62	1.00	5.60	10.88	60.93	4.000	No	Yes	2.00
187	31.01	16.28	3.21	4.65	1.00	7.39	9.45	69.77	4.000	No	Yes	2.00
188	31.17	30.57	2.91	3.61	0.98	14.83	5.76	85.36	4.000	No	Yes	2.00
189	31.33	47.69	2.71	3.35	0.91	24.66	4.10	101.04	4.000	No	Yes	2.00
190	31.50	61.82	2.60	3.17	0.87	32.96	3.34	110.22	4.000	No	Yes	2.00
191	31.66	63.65	2.60	3.24	0.87	33.83	3.33	112.65	4.000	No	Yes	2.00
192	31.83	59.21	2.64	3.32	0.88	30.98	3.55	110.10	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	31.99	54.48	2.68	3.43	0.90	28.00	3.84	107.54	4.000	No	Yes	2.00
194	32.15	45.97	2.77	3.79	0.93	22.82	4.57	104.22	4.000	No	Yes	2.00
195	32.32	36.07	2.88	3.92	0.97	17.14	5.49	94.13	4.000	No	Yes	2.00
196	32.48	23.92	3.06	4.27	1.00	10.77	7.44	80.12	4.000	No	Yes	2.00
197	32.65	16.39	3.20	4.18	1.00	7.03	9.32	65.49	4.000	No	Yes	2.00
198	32.81	13.49	3.30	4.37	1.00	5.58	10.69	59.64	4.000	No	Yes	2.00
199	32.97	14.09	3.30	4.71	1.00	5.84	10.72	62.63	4.000	No	Yes	2.00
200	33.14	24.73	3.01	3.53	1.00	10.95	6.81	74.52	4.000	No	Yes	2.00
201	33.30	40.66	2.77	3.11	0.93	19.42	4.57	88.67	4.000	No	Yes	2.00
202	33.47	57.29	2.63	2.96	0.88	28.71	3.50	100.62	4.000	No	Yes	2.00
203	33.63	65.22	2.59	3.06	0.86	33.03	3.28	108.24	0.198	No	No	0.34
204	33.79	68.59	2.58	3.11	0.86	34.75	3.20	111.34	0.208	No	No	0.36
205	33.96	69.69	2.58	3.11	0.86	35.21	3.18	111.91	0.210	No	No	0.36
206	34.12	69.52	2.57	3.07	0.86	34.99	3.17	110.84	0.207	No	No	0.36
207	34.29	67.32	2.59	3.12	0.86	33.53	3.28	109.96	0.204	No	No	0.35
208	34.45	62.55	2.63	3.26	0.88	30.58	3.54	108.40	4.000	No	Yes	2.00
209	34.61	49.99	2.77	3.76	0.93	23.28	4.50	104.68	4.000	No	Yes	2.00
210	34.78	35.17	2.95	4.34	1.00	15.22	6.17	93.94	4.000	No	Yes	2.00
211	34.94	21.75	3.17	5.11	1.00	8.97	8.85	79.41	4.000	No	Yes	2.00
212	35.11	16.86	3.31	5.91	1.00	6.70	10.87	72.81	4.000	No	Yes	2.00
213	35.27	30.71	2.99	4.21	1.00	12.96	6.67	86.40	4.000	No	Yes	2.00
214	35.43	38.76	2.93	4.56	0.99	16.63	6.00	99.86	4.000	No	Yes	2.00
215	35.60	41.85	2.89	4.37	0.98	18.16	5.60	101.68	4.000	No	Yes	2.00
216	35.76	29.76	3.08	5.45	1.00	12.34	7.67	94.74	4.000	No	Yes	2.00
217	35.93	36.20	2.93	4.02	0.99	15.26	5.95	90.81	4.000	No	Yes	2.00
218	36.09	53.32	2.71	3.26	0.91	24.31	4.08	99.11	4.000	No	Yes	2.00
219	36.26	73.28	2.56	2.96	0.85	35.17	3.10	108.94	0.200	No	No	0.35
220	36.42	82.95	2.54	3.14	0.84	40.09	2.96	118.64	0.235	No	No	0.41
221	36.58	84.52	2.57	3.49	0.85	40.37	3.12	125.95	0.266	No	No	0.46
222	36.75	73.06	2.68	4.24	0.90	33.39	3.88	129.46	4.000	No	Yes	2.00
223	36.91	54.29	2.85	5.07	0.96	23.26	5.23	121.75	4.000	No	Yes	2.00
224	37.08	34.56	3.07	6.10	1.00	13.94	7.57	105.48	4.000	No	Yes	2.00
225	37.24	27.76	3.13	5.63	1.00	10.95	8.30	90.87	4.000	No	Yes	2.00
226	37.40	42.29	2.86	3.84	0.97	17.58	5.36	94.21	4.000	Yes	Yes	2.00
227	37.57	68.53	2.62	3.12	0.87	31.28	3.42	107.00	4.000	Yes	Yes	2.00
228	37.73	99.56	2.44	2.74	0.80	48.30	2.47	119.34	4.000	Yes	No	2.00
229	37.90	123.19	2.36	2.70	0.77	61.28	2.15	131.70	4.000	Yes	No	2.00
230	38.06	138.71	2.32	2.71	0.76	69.74	2.01	140.37	0.337	No	No	0.58
231	38.22	147.68	2.31	2.80	0.76	74.29	1.98	147.17	0.376	No	No	0.65
232	38.39	149.22	2.32	2.86	0.76	74.68	2.00	149.25	0.389	No	No	0.67
233	38.55	150.05	2.32	2.91	0.76	74.71	2.02	150.71	0.398	No	No	0.69
234	38.72	145.48	2.34	2.98	0.77	71.69	2.09	149.53	0.391	No	No	0.67
235	38.88	134.94	2.38	3.09	0.78	65.36	2.23	145.90	4.000	Yes	No	2.00
236	39.04	120.04	2.44	3.26	0.80	56.73	2.48	140.64	4.000	Yes	No	2.00
237	39.21	101.31	2.54	3.64	0.84	46.05	2.96	136.48	4.000	Yes	No	2.00
238	39.37	77.74	2.68	4.21	0.90	33.33	3.86	128.82	4.000	Yes	Yes	2.00
239	39.54	53.14	2.88	4.93	0.97	20.99	5.47	114.86	4.000	Yes	Yes	2.00
240	39.70	46.23	2.90	4.50	0.98	17.91	5.72	102.41	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	39.86	46.34	2.86	3.88	0.96	18.14	5.29	95.91	4.000	No	Yes	2.00
242	40.03	48.86	2.80	3.45	0.94	19.45	4.80	93.28	4.000	No	Yes	2.00
243	40.19	41.11	2.92	4.06	0.99	15.51	5.92	91.79	4.000	No	Yes	2.00
244	40.36	62.61	2.67	3.11	0.89	26.11	3.81	99.41	4.000	No	Yes	2.00
245	40.52	70.26	2.66	3.45	0.89	29.43	3.74	109.95	4.000	No	Yes	2.00
246	40.68	68.49	2.69	3.59	0.90	28.29	3.91	110.57	4.000	No	Yes	2.00
247	40.85	38.05	3.04	5.45	1.00	13.90	7.20	100.06	4.000	No	Yes	2.00
248	41.01	36.39	3.02	4.73	1.00	13.19	6.95	91.72	4.000	No	Yes	2.00
249	41.18	50.38	2.81	3.63	0.95	19.44	4.91	95.52	4.000	No	Yes	2.00
250	41.34	69.34	2.63	2.95	0.88	28.86	3.49	100.60	4.000	No	Yes	2.00
251	41.50	80.44	2.56	2.87	0.85	34.28	3.10	106.15	0.191	No	No	0.33
252	41.67	89.14	2.52	2.85	0.84	38.50	2.88	110.82	0.207	No	No	0.36
253	41.83	96.44	2.51	3.02	0.83	41.74	2.83	118.13	0.233	No	No	0.40
254	42.00	97.25	2.53	3.17	0.84	41.74	2.91	121.27	0.246	No	No	0.43
255	42.16	92.75	2.57	3.40	0.85	39.04	3.14	122.59	0.251	No	No	0.44
256	42.32	93.74	2.56	3.33	0.85	39.47	3.08	121.69	0.248	No	No	0.43
257	42.49	94.10	2.56	3.32	0.85	39.50	3.08	121.48	0.247	No	No	0.43
258	42.65	92.93	2.54	3.14	0.84	39.03	3.01	117.32	0.230	No	No	0.40
259	42.82	84.48	2.59	3.18	0.86	34.74	3.24	112.65	0.213	No	No	0.37
260	42.98	78.95	2.61	3.10	0.87	32.06	3.36	107.71	4.000	No	Yes	2.00
261	43.15	77.82	2.61	3.06	0.87	31.44	3.38	106.13	4.000	No	Yes	2.00
262	43.31	78.39	2.61	3.08	0.87	31.57	3.38	106.69	4.000	No	Yes	2.00
263	43.47	79.18	2.60	3.05	0.87	31.86	3.34	106.50	4.000	No	Yes	2.00
264	43.64	80.16	2.60	3.01	0.86	32.24	3.30	106.30	0.192	No	No	0.33
265	43.80	83.99	2.56	2.87	0.85	34.12	3.11	106.00	0.191	No	No	0.33
266	43.97	91.83	2.52	2.77	0.83	37.89	2.86	108.44	0.199	No	No	0.35
267	44.13	99.89	2.48	2.75	0.82	41.69	2.69	112.23	0.211	No	No	0.37
268	44.29	104.70	2.47	2.78	0.82	43.82	2.63	115.32	0.223	No	No	0.39
269	44.46	104.35	2.48	2.82	0.82	43.40	2.67	115.80	0.224	No	No	0.39
270	44.62	104.31	2.48	2.79	0.82	43.29	2.66	114.98	0.221	No	No	0.39
271	44.79	106.70	2.47	2.76	0.82	44.34	2.60	115.44	0.223	No	No	0.39
272	44.95	107.57	2.47	2.77	0.81	44.58	2.60	115.91	0.225	No	No	0.39
273	45.11	106.34	2.48	2.83	0.82	43.71	2.66	116.39	0.227	No	No	0.40
274	45.28	103.10	2.50	2.89	0.83	41.90	2.76	115.61	0.224	No	No	0.39
275	45.44	99.50	2.53	3.04	0.84	39.80	2.92	116.15	0.226	No	No	0.40
276	45.61	90.62	2.59	3.27	0.86	35.20	3.26	114.91	0.221	No	No	0.39
277	45.77	74.04	2.71	3.70	0.91	27.20	4.06	110.56	4.000	No	Yes	2.00
278	45.93	67.01	2.74	3.53	0.92	24.16	4.26	102.95	4.000	No	Yes	2.00
279	46.10	65.71	2.74	3.45	0.92	23.58	4.27	100.69	4.000	No	Yes	2.00
280	46.26	62.77	2.76	3.51	0.93	22.19	4.47	99.11	4.000	No	Yes	2.00
281	46.43	48.13	2.93	4.28	0.99	15.64	6.03	94.35	4.000	No	Yes	2.00
282	46.59	43.47	2.96	4.03	1.00	13.88	6.29	87.27	4.000	No	Yes	2.00
283	46.75	58.90	2.75	3.04	0.92	20.66	4.35	89.78	4.000	No	Yes	2.00
284	46.92	70.20	2.68	3.12	0.90	25.37	3.88	98.56	4.000	No	Yes	2.00
285	47.08	64.03	2.77	3.60	0.93	22.21	4.52	100.47	4.000	No	Yes	2.00
286	47.25	47.56	2.95	4.34	1.00	15.06	6.21	93.43	4.000	No	Yes	2.00
287	47.41	45.86	2.91	3.65	0.99	14.67	5.82	85.45	4.000	No	Yes	2.00
288	47.57	47.93	2.86	3.26	0.97	15.66	5.32	83.34	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	47.74	48.26	2.83	2.95	0.95	15.96	5.02	80.09	4.000	No	Yes	2.00
290	47.90	43.16	2.89	3.07	0.98	13.80	5.59	77.11	4.000	No	Yes	2.00
291	48.07	41.56	2.92	3.20	0.99	13.07	5.88	76.84	4.000	No	Yes	2.00
292	48.23	40.63	2.98	3.81	1.00	12.57	6.50	81.62	4.000	No	Yes	2.00
293	48.39	37.33	3.06	4.57	1.00	11.44	7.41	84.76	4.000	No	Yes	2.00
294	48.56	47.27	2.93	3.99	0.99	14.83	6.03	89.40	4.000	Yes	Yes	2.00
295	48.72	60.27	2.80	3.61	0.94	20.18	4.80	96.79	4.000	Yes	Yes	2.00
296	48.89	81.33	2.65	3.28	0.89	29.29	3.65	106.95	4.000	Yes	Yes	2.00
297	49.05	107.80	2.51	2.99	0.83	41.34	2.83	117.08	4.000	Yes	No	2.00
298	49.22	141.89	2.37	2.64	0.78	57.95	2.19	126.79	4.000	Yes	No	2.00
299	49.38	183.12	2.20	2.13	0.71	80.22	1.67	134.09	4.000	Yes	No	2.00
300	49.54	212.23	2.11	1.88	0.68	96.69	1.47	141.80	4.000	Yes	No	2.00
301	49.71	229.34	2.06	1.78	0.66	106.39	1.39	147.66	0.379	No	No	0.68
302	49.87	229.29	2.09	1.96	0.67	104.78	1.45	151.48	0.403	No	No	0.73
303	50.04	225.86	2.12	2.08	0.68	101.93	1.50	152.47	0.410	No	No	0.74
304	50.20	230.31	2.12	2.10	0.68	103.96	1.49	154.87	0.425	No	No	0.77
305	50.36	239.89	2.10	2.06	0.67	109.12	1.45	158.32	0.449	No	No	0.81
306	50.53	243.48	2.10	2.07	0.67	110.74	1.45	160.14	0.462	No	No	0.84
307	50.69	236.22	2.11	2.10	0.68	106.51	1.48	157.34	0.442	No	No	0.80
308	50.86	224.69	2.13	2.09	0.69	100.45	1.51	151.46	0.403	No	No	0.73
309	51.02	212.19	2.13	1.98	0.69	94.63	1.51	142.79	0.351	No	No	0.64
310	51.18	200.12	2.13	1.85	0.69	89.15	1.50	134.01	0.304	No	No	0.55
311	51.35	185.79	2.12	1.70	0.69	82.58	1.50	123.98	0.257	No	No	0.47
312	51.51	171.87	2.14	1.62	0.69	75.75	1.53	115.85	0.225	No	No	0.41
313	51.68	158.75	2.16	1.56	0.70	69.21	1.57	108.66	0.199	No	No	0.36
314	51.84	146.86	2.20	1.62	0.71	62.72	1.67	104.71	4.000	Yes	No	2.00
315	52.00	124.54	2.34	2.03	0.77	49.97	2.08	104.04	4.000	Yes	No	2.00
316	52.17	91.34	2.57	2.80	0.85	33.00	3.13	103.26	4.000	Yes	No	2.00
317	52.33	71.85	2.77	3.60	1.00	21.88	4.56	99.81	4.000	Yes	Yes	2.00
318	52.50	102.21	2.59	2.83	1.00	31.51	3.24	101.97	4.000	Yes	No	2.00
319	52.66	156.81	2.39	2.37	1.00	48.81	2.27	111.02	4.000	Yes	No	2.00
320	52.82	208.99	2.29	2.30	1.00	65.28	1.92	125.07	4.000	Yes	No	2.00
321	52.99	232.21	2.27	2.40	1.00	72.50	1.86	134.60	0.307	No	No	0.57
322	53.15	249.87	2.26	2.46	1.00	77.95	1.81	141.34	0.343	No	No	0.63
323	53.32	267.74	2.23	2.40	1.00	83.43	1.73	144.64	0.361	No	No	0.67
324	53.48	281.25	2.21	2.41	1.00	87.52	1.70	148.93	0.387	No	No	0.72
325	53.64	289.35	2.21	2.47	1.00	89.90	1.70	152.91	0.413	No	No	0.77
326	53.81	282.84	2.24	2.64	1.00	87.67	1.77	155.62	0.430	No	No	0.80
327	53.97	270.37	2.27	2.77	1.00	83.60	1.86	155.58	0.430	No	No	0.80
328	54.14	260.53	2.29	2.85	1.00	80.35	1.92	154.66	0.424	No	No	0.79
329	54.30	258.01	2.29	2.80	1.00	79.41	1.92	152.33	0.409	No	No	0.76
330	54.46	258.72	2.28	2.73	1.00	79.49	1.89	150.34	0.396	No	No	0.74
331	54.63	255.84	2.28	2.71	1.00	78.43	1.90	148.71	0.386	No	No	0.72
332	54.79	249.93	2.29	2.73	1.00	76.45	1.93	147.45	0.378	No	No	0.71
333	54.96	244.69	2.30	2.75	1.00	74.67	1.96	146.21	0.371	No	No	0.70
334	55.12	234.62	2.30	2.58	1.00	71.42	1.94	138.43	0.327	No	No	0.61

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
I_c: Soil behavior type index
Fr: Normalized friction ratio (%)
n: Stress exponent
Q_{tn}: Normalized cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Normalized and adjusted cone resistance
$CRR_{7.5}$: Cyclic resistance ratio for M_w=7.5
FS: Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.33	2.00	0.00	9.95	0.16	0.00	0.49	2.00	0.00	9.93	0.16	0.00
0.66	2.00	0.00	9.90	0.17	0.00	0.82	2.00	0.00	9.88	0.16	0.00
0.98	2.00	0.00	9.85	0.16	0.00	1.15	2.00	0.00	9.82	0.17	0.00
1.31	2.00	0.00	9.80	0.16	0.00	1.48	2.00	0.00	9.77	0.17	0.00
1.64	2.00	0.00	9.75	0.16	0.00	1.80	2.00	0.00	9.73	0.16	0.00
1.97	2.00	0.00	9.70	0.17	0.00	2.13	2.00	0.00	9.68	0.16	0.00
2.30	2.00	0.00	9.65	0.17	0.00	2.46	2.00	0.00	9.63	0.16	0.00
2.62	2.00	0.00	9.60	0.16	0.00	2.79	2.00	0.00	9.57	0.17	0.00
2.95	2.00	0.00	9.55	0.16	0.00	3.12	2.00	0.00	9.52	0.17	0.00
3.28	2.00	0.00	9.50	0.16	0.00	3.45	2.00	0.00	9.47	0.17	0.00
3.61	2.00	0.00	9.45	0.16	0.00	3.77	2.00	0.00	9.43	0.16	0.00
3.94	2.00	0.00	9.40	0.17	0.00	4.10	2.00	0.00	9.38	0.16	0.00
4.27	2.00	0.00	9.35	0.17	0.00	4.43	2.00	0.00	9.32	0.16	0.00
4.59	2.00	0.00	9.30	0.16	0.00	4.76	2.00	0.00	9.27	0.17	0.00
4.92	2.00	0.00	9.25	0.16	0.00	5.09	2.00	0.00	9.22	0.17	0.00
5.25	2.00	0.00	9.20	0.16	0.00	5.41	2.00	0.00	9.18	0.16	0.00
5.58	2.00	0.00	9.15	0.17	0.00	5.74	2.00	0.00	9.13	0.16	0.00
5.91	2.00	0.00	9.10	0.17	0.00	6.07	2.00	0.00	9.07	0.16	0.00
6.23	2.00	0.00	9.05	0.16	0.00	6.40	2.00	0.00	9.02	0.17	0.00
6.56	2.00	0.00	9.00	0.16	0.00	6.73	2.00	0.00	8.97	0.17	0.00
6.89	2.00	0.00	8.95	0.16	0.00	7.05	2.00	0.00	8.93	0.16	0.00
7.22	2.00	0.00	8.90	0.17	0.00	7.38	2.00	0.00	8.88	0.16	0.00
7.55	2.00	0.00	8.85	0.17	0.00	7.71	2.00	0.00	8.82	0.16	0.00
7.87	2.00	0.00	8.80	0.16	0.00	8.04	2.00	0.00	8.77	0.17	0.00
8.20	2.00	0.00	8.75	0.16	0.00	8.37	2.00	0.00	8.72	0.17	0.00
8.53	2.00	0.00	8.70	0.16	0.00	8.69	2.00	0.00	8.68	0.16	0.00
8.86	2.00	0.00	8.65	0.17	0.00	9.02	2.00	0.00	8.63	0.16	0.00
9.19	2.00	0.00	8.60	0.17	0.00	9.35	2.00	0.00	8.58	0.16	0.00
9.51	1.95	0.00	8.55	0.16	0.00	9.68	1.87	0.00	8.52	0.17	0.00
9.84	1.72	0.00	8.50	0.16	0.00	10.01	1.50	0.00	8.47	0.17	0.00
10.17	1.29	0.00	8.45	0.16	0.00	10.34	1.20	0.00	8.42	0.17	0.00
10.50	1.26	0.00	8.40	0.16	0.00	10.66	1.42	0.00	8.38	0.16	0.00
10.83	1.51	0.00	8.35	0.17	0.00	10.99	1.52	0.00	8.33	0.16	0.00
11.16	1.48	0.00	8.30	0.17	0.00	11.32	1.45	0.00	8.27	0.16	0.00
11.48	1.42	0.00	8.25	0.16	0.00	11.65	1.28	0.00	8.22	0.17	0.00
11.81	1.17	0.00	8.20	0.16	0.00	11.98	1.08	0.00	8.17	0.17	0.00
12.14	1.08	0.00	8.15	0.16	0.00	12.30	1.06	0.00	8.13	0.16	0.00
12.47	1.04	0.00	8.10	0.17	0.00	12.63	1.00	0.00	8.08	0.16	0.00
12.80	0.97	0.03	8.05	0.17	0.01	12.96	0.91	0.09	8.02	0.16	0.03
13.12	0.90	0.10	8.00	0.16	0.04	13.29	0.92	0.08	7.97	0.17	0.03
13.45	1.01	0.00	7.95	0.16	0.00	13.62	1.09	0.00	7.92	0.17	0.00
13.78	1.22	0.00	7.90	0.16	0.00	13.94	1.38	0.00	7.88	0.16	0.00
14.11	1.52	0.00	7.85	0.17	0.00	14.27	1.48	0.00	7.83	0.16	0.00
14.44	1.33	0.00	7.80	0.17	0.00	14.60	1.13	0.00	7.77	0.16	0.00
14.76	1.00	0.00	7.75	0.16	0.00	14.93	0.84	0.16	7.72	0.17	0.06
15.09	0.78	0.22	7.70	0.16	0.08	15.26	0.76	0.24	7.67	0.17	0.09
15.42	0.80	0.20	7.65	0.16	0.07	15.58	0.79	0.21	7.63	0.16	0.08
15.75	0.75	0.25	7.60	0.17	0.10	15.91	0.71	0.29	7.58	0.16	0.11

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
16.08	0.70	0.30	7.55	0.17	0.12	16.24	0.74	0.26	7.53	0.16	0.10
16.40	0.78	0.22	7.50	0.16	0.08	16.57	0.83	0.17	7.47	0.17	0.07
16.73	0.86	0.14	7.45	0.16	0.05	16.90	0.88	0.12	7.42	0.17	0.05
17.06	0.88	0.12	7.40	0.16	0.04	17.23	0.87	0.13	7.37	0.17	0.05
17.39	0.87	0.13	7.35	0.16	0.05	17.55	0.86	0.14	7.33	0.16	0.05
17.72	0.85	0.15	7.30	0.17	0.06	17.88	0.80	0.20	7.28	0.16	0.07
18.05	0.75	0.25	7.25	0.17	0.10	18.37	0.68	0.32	7.20	0.32	0.22
18.54	0.67	0.33	7.17	0.17	0.12	18.70	0.64	0.36	7.15	0.16	0.13
18.87	0.62	0.38	7.12	0.17	0.14	19.03	0.61	0.39	7.10	0.16	0.14
19.19	0.60	0.40	7.08	0.16	0.14	19.36	0.59	0.41	7.05	0.17	0.15
19.52	0.58	0.42	7.03	0.16	0.14	19.69	0.58	0.42	7.00	0.17	0.15
19.85	0.61	0.39	6.97	0.16	0.13	20.01	0.64	0.36	6.95	0.16	0.12
20.18	0.68	0.32	6.92	0.17	0.12	20.34	0.72	0.28	6.90	0.16	0.09
20.51	0.73	0.27	6.87	0.17	0.09	20.67	0.79	0.21	6.85	0.16	0.07
20.83	2.00	0.00	6.83	0.16	0.00	21.00	2.00	0.00	6.80	0.17	0.00
21.16	2.00	0.00	6.78	0.16	0.00	21.33	2.00	0.00	6.75	0.17	0.00
21.49	2.00	0.00	6.72	0.16	0.00	21.65	2.00	0.00	6.70	0.16	0.00
21.82	2.00	0.00	6.67	0.17	0.00	21.98	2.00	0.00	6.65	0.16	0.00
22.15	2.00	0.00	6.62	0.17	0.00	22.31	2.00	0.00	6.60	0.16	0.00
22.47	2.00	0.00	6.58	0.16	0.00	22.64	2.00	0.00	6.55	0.17	0.00
22.80	2.00	0.00	6.53	0.16	0.00	22.97	2.00	0.00	6.50	0.17	0.00
23.13	2.00	0.00	6.47	0.16	0.00	23.30	2.00	0.00	6.45	0.17	0.00
23.46	2.00	0.00	6.42	0.16	0.00	23.62	2.00	0.00	6.40	0.16	0.00
23.79	2.00	0.00	6.37	0.17	0.00	23.95	2.00	0.00	6.35	0.16	0.00
24.12	2.00	0.00	6.32	0.17	0.00	24.28	2.00	0.00	6.30	0.16	0.00
24.44	2.00	0.00	6.28	0.16	0.00	24.61	2.00	0.00	6.25	0.17	0.00
24.77	2.00	0.00	6.23	0.16	0.00	24.94	2.00	0.00	6.20	0.17	0.00
25.10	2.00	0.00	6.17	0.16	0.00	25.26	2.00	0.00	6.15	0.16	0.00
25.43	2.00	0.00	6.12	0.17	0.00	25.59	2.00	0.00	6.10	0.16	0.00
25.76	0.42	0.58	6.07	0.17	0.18	25.92	0.45	0.55	6.05	0.16	0.16
26.08	0.48	0.52	6.03	0.16	0.15	26.25	0.49	0.51	6.00	0.17	0.16
26.41	0.49	0.51	5.98	0.16	0.15	26.58	0.48	0.52	5.95	0.17	0.16
26.74	0.48	0.52	5.92	0.16	0.15	26.90	0.50	0.50	5.90	0.16	0.14
27.07	0.54	0.46	5.87	0.17	0.14	27.23	0.57	0.43	5.85	0.16	0.12
27.40	0.58	0.42	5.82	0.17	0.13	27.56	0.56	0.44	5.80	0.16	0.12
27.72	0.53	0.47	5.78	0.16	0.13	27.89	0.51	0.49	5.75	0.17	0.14
28.05	0.50	0.50	5.73	0.16	0.14	28.22	0.51	0.49	5.70	0.17	0.15
28.38	0.49	0.51	5.67	0.16	0.14	28.54	0.50	0.50	5.65	0.16	0.14
28.71	0.50	0.50	5.62	0.17	0.15	28.87	0.53	0.47	5.60	0.16	0.13
29.04	0.55	0.45	5.57	0.17	0.13	29.20	2.00	0.00	5.55	0.16	0.00
29.36	2.00	0.00	5.53	0.16	0.00	29.53	2.00	0.00	5.50	0.17	0.00
29.69	2.00	0.00	5.48	0.16	0.00	29.86	2.00	0.00	5.45	0.17	0.00
30.02	2.00	0.00	5.42	0.16	0.00	30.19	2.00	0.00	5.40	0.17	0.00
30.35	2.00	0.00	5.37	0.16	0.00	30.51	2.00	0.00	5.35	0.16	0.00
30.68	2.00	0.00	5.32	0.17	0.00	30.84	2.00	0.00	5.30	0.16	0.00
31.01	2.00	0.00	5.27	0.17	0.00	31.17	2.00	0.00	5.25	0.16	0.00
31.33	2.00	0.00	5.23	0.16	0.00	31.50	2.00	0.00	5.20	0.17	0.00
31.66	2.00	0.00	5.18	0.16	0.00	31.83	2.00	0.00	5.15	0.17	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	W_z	d_z	LPI	Depth (ft)	FS	F_L	W_z	d_z	LPI
31.99	2.00	0.00	5.12	0.16	0.00	32.15	2.00	0.00	5.10	0.16	0.00
32.32	2.00	0.00	5.07	0.17	0.00	32.48	2.00	0.00	5.05	0.16	0.00
32.65	2.00	0.00	5.02	0.17	0.00	32.81	2.00	0.00	5.00	0.16	0.00
32.97	2.00	0.00	4.98	0.16	0.00	33.14	2.00	0.00	4.95	0.17	0.00
33.30	2.00	0.00	4.93	0.16	0.00	33.47	2.00	0.00	4.90	0.17	0.00
33.63	0.34	0.66	4.87	0.16	0.16	33.79	0.36	0.64	4.85	0.16	0.15
33.96	0.36	0.64	4.82	0.17	0.16	34.12	0.36	0.64	4.80	0.16	0.15
34.29	0.35	0.65	4.77	0.17	0.16	34.45	2.00	0.00	4.75	0.16	0.00
34.61	2.00	0.00	4.73	0.16	0.00	34.78	2.00	0.00	4.70	0.17	0.00
34.94	2.00	0.00	4.68	0.16	0.00	35.11	2.00	0.00	4.65	0.17	0.00
35.27	2.00	0.00	4.62	0.16	0.00	35.43	2.00	0.00	4.60	0.16	0.00
35.60	2.00	0.00	4.57	0.17	0.00	35.76	2.00	0.00	4.55	0.16	0.00
35.93	2.00	0.00	4.52	0.17	0.00	36.09	2.00	0.00	4.50	0.16	0.00
36.26	0.35	0.65	4.47	0.17	0.15	36.42	0.41	0.59	4.45	0.16	0.13
36.58	0.46	0.54	4.43	0.16	0.12	36.75	2.00	0.00	4.40	0.17	0.00
36.91	2.00	0.00	4.37	0.16	0.00	37.08	2.00	0.00	4.35	0.17	0.00
37.24	2.00	0.00	4.32	0.16	0.00	37.40	2.00	0.00	4.30	0.16	0.00
37.57	2.00	0.00	4.27	0.17	0.00	37.73	2.00	0.00	4.25	0.16	0.00
37.90	2.00	0.00	4.22	0.17	0.00	38.06	0.58	0.42	4.20	0.16	0.09
38.22	0.65	0.35	4.18	0.16	0.07	38.39	0.67	0.33	4.15	0.17	0.07
38.55	0.69	0.31	4.12	0.16	0.06	38.72	0.67	0.33	4.10	0.17	0.07
38.88	2.00	0.00	4.07	0.16	0.00	39.04	2.00	0.00	4.05	0.16	0.00
39.21	2.00	0.00	4.02	0.17	0.00	39.37	2.00	0.00	4.00	0.16	0.00
39.54	2.00	0.00	3.97	0.17	0.00	39.70	2.00	0.00	3.95	0.16	0.00
39.86	2.00	0.00	3.93	0.16	0.00	40.03	2.00	0.00	3.90	0.17	0.00
40.19	2.00	0.00	3.88	0.16	0.00	40.36	2.00	0.00	3.85	0.17	0.00
40.52	2.00	0.00	3.82	0.16	0.00	40.68	2.00	0.00	3.80	0.16	0.00
40.85	2.00	0.00	3.77	0.17	0.00	41.01	2.00	0.00	3.75	0.16	0.00
41.18	2.00	0.00	3.72	0.17	0.00	41.34	2.00	0.00	3.70	0.16	0.00
41.50	0.33	0.67	3.68	0.16	0.12	41.67	0.36	0.64	3.65	0.17	0.12
41.83	0.40	0.60	3.63	0.16	0.11	42.00	0.43	0.57	3.60	0.17	0.11
42.16	0.44	0.56	3.57	0.16	0.10	42.32	0.43	0.57	3.55	0.16	0.10
42.49	0.43	0.57	3.52	0.17	0.10	42.65	0.40	0.60	3.50	0.16	0.10
42.82	0.37	0.63	3.47	0.17	0.11	42.98	2.00	0.00	3.45	0.16	0.00
43.15	2.00	0.00	3.42	0.17	0.00	43.31	2.00	0.00	3.40	0.16	0.00
43.47	2.00	0.00	3.38	0.16	0.00	43.64	0.33	0.67	3.35	0.17	0.12
43.80	0.33	0.67	3.32	0.16	0.11	43.97	0.35	0.65	3.30	0.17	0.11
44.13	0.37	0.63	3.27	0.16	0.10	44.29	0.39	0.61	3.25	0.16	0.10
44.46	0.39	0.61	3.22	0.17	0.10	44.62	0.39	0.61	3.20	0.16	0.10
44.79	0.39	0.61	3.17	0.17	0.10	44.95	0.39	0.61	3.15	0.16	0.09
45.11	0.40	0.60	3.13	0.16	0.09	45.28	0.39	0.61	3.10	0.17	0.10
45.44	0.40	0.60	3.07	0.16	0.09	45.61	0.39	0.61	3.05	0.17	0.10
45.77	2.00	0.00	3.02	0.16	0.00	45.93	2.00	0.00	3.00	0.16	0.00
46.10	2.00	0.00	2.97	0.17	0.00	46.26	2.00	0.00	2.95	0.16	0.00
46.43	2.00	0.00	2.92	0.17	0.00	46.59	2.00	0.00	2.90	0.16	0.00
46.75	2.00	0.00	2.88	0.16	0.00	46.92	2.00	0.00	2.85	0.17	0.00
47.08	2.00	0.00	2.83	0.16	0.00	47.25	2.00	0.00	2.80	0.17	0.00
47.41	2.00	0.00	2.77	0.16	0.00	47.57	2.00	0.00	2.75	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
47.74	2.00	0.00	2.72	0.17	0.00	47.90	2.00	0.00	2.70	0.16	0.00
48.07	2.00	0.00	2.67	0.17	0.00	48.23	2.00	0.00	2.65	0.16	0.00
48.39	2.00	0.00	2.63	0.16	0.00	48.56	2.00	0.00	2.60	0.17	0.00
48.72	2.00	0.00	2.58	0.16	0.00	48.89	2.00	0.00	2.55	0.17	0.00
49.05	2.00	0.00	2.52	0.16	0.00	49.22	2.00	0.00	2.50	0.17	0.00
49.38	2.00	0.00	2.47	0.16	0.00	49.54	2.00	0.00	2.45	0.16	0.00
49.71	0.68	0.32	2.42	0.17	0.04	49.87	0.73	0.27	2.40	0.16	0.03
50.04	0.74	0.26	2.37	0.17	0.03	50.20	0.77	0.23	2.35	0.16	0.03
50.36	0.81	0.19	2.33	0.16	0.02	50.53	0.84	0.16	2.30	0.17	0.02
50.69	0.80	0.20	2.27	0.16	0.02	50.86	0.73	0.27	2.25	0.17	0.03
51.02	0.64	0.36	2.22	0.16	0.04	51.18	0.55	0.45	2.20	0.16	0.05
51.35	0.47	0.53	2.17	0.17	0.06	51.51	0.41	0.59	2.15	0.16	0.06
51.68	0.36	0.64	2.12	0.17	0.07	51.84	2.00	0.00	2.10	0.16	0.00
52.00	2.00	0.00	2.08	0.16	0.00	52.17	2.00	0.00	2.05	0.17	0.00
52.33	2.00	0.00	2.02	0.16	0.00	52.50	2.00	0.00	2.00	0.17	0.00
52.66	2.00	0.00	1.97	0.16	0.00	52.82	2.00	0.00	1.95	0.16	0.00
52.99	0.57	0.43	1.92	0.17	0.04	53.15	0.63	0.37	1.90	0.16	0.03
53.32	0.67	0.33	1.87	0.17	0.03	53.48	0.72	0.28	1.85	0.16	0.03
53.64	0.77	0.23	1.83	0.16	0.02	53.81	0.80	0.20	1.80	0.17	0.02
53.97	0.80	0.20	1.77	0.16	0.02	54.14	0.79	0.21	1.75	0.17	0.02
54.30	0.76	0.24	1.72	0.16	0.02	54.46	0.74	0.26	1.70	0.16	0.02
54.63	0.72	0.28	1.67	0.17	0.02	54.79	0.71	0.29	1.65	0.16	0.02
54.96	0.70	0.30	1.62	0.17	0.03	55.12	0.61	0.39	1.60	0.16	0.03

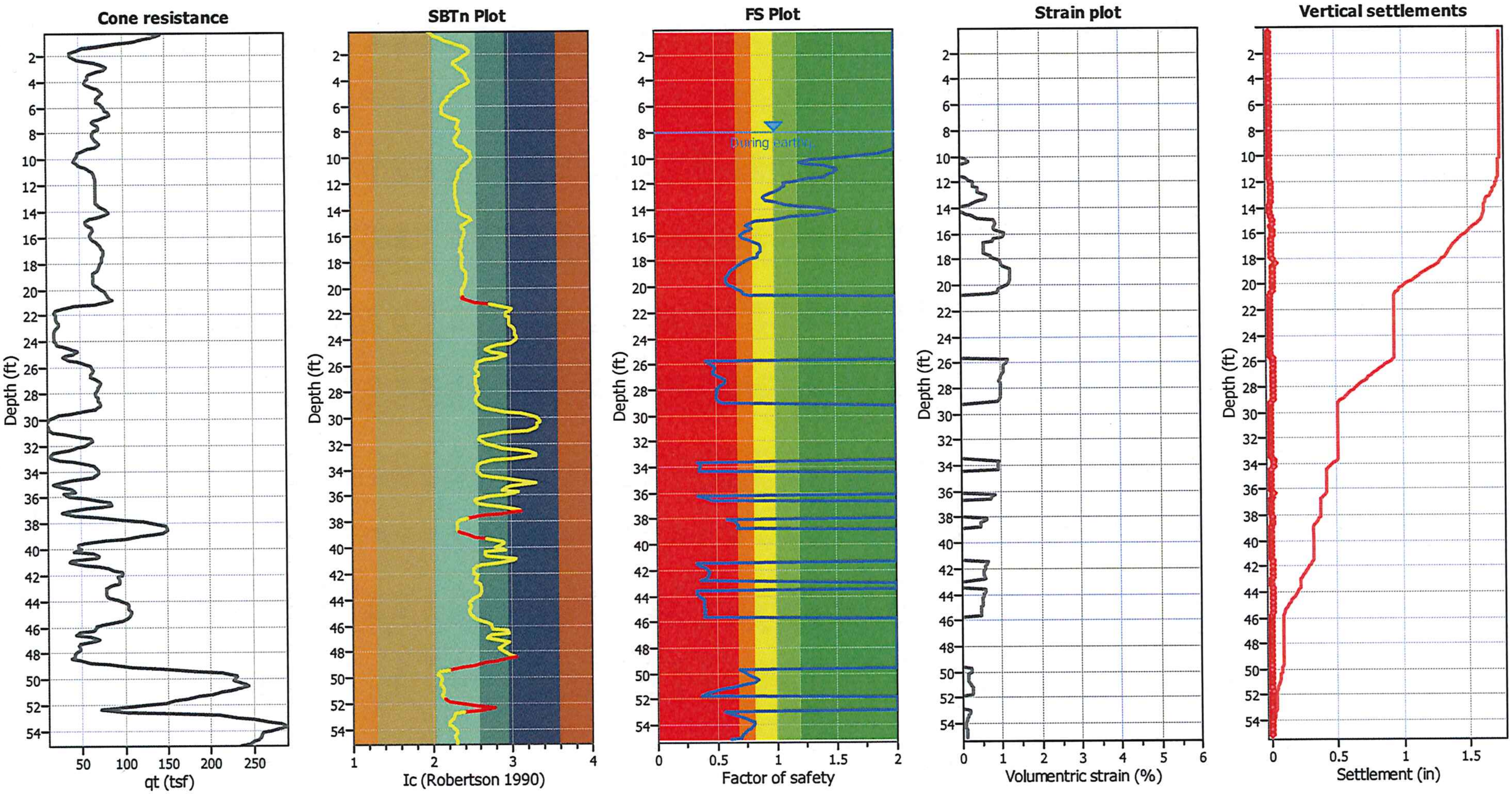
Overall liquefaction potential: 11.23

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Kc	Qc1n	Qc1n,cs	N1,60 (blows)	Vs (ft/s)	Gmax (tsf)	CSR	Shear, γ (%)	Svol,15 (%)	Nc	ev (%)	Settle. (in)
0.33	1.99	1.28	210.95	271.00	56	890.3	1613	0.38	0.001	0.00	7.95	0.00	0.000
0.49	2.03	1.34	231.76	310.31	65	957.4	1896	0.38	0.001	0.00	7.95	0.00	0.000
0.66	2.07	1.40	214.93	300.87	64	945.5	1845	0.38	0.001	0.00	7.95	0.00	0.000
0.82	2.13	1.50	200.72	301.77	66	947.6	1856	0.38	0.001	0.00	7.95	0.00	0.000
0.98	2.18	1.63	181.00	294.17	66	932.9	1794	0.38	0.001	0.00	7.95	0.00	0.000
1.15	2.26	1.82	151.04	275.01	64	893.8	1633	0.38	0.002	0.00	7.95	0.00	0.000
1.31	2.36	2.15	111.08	239.27	58	817.3	1339	0.38	0.003	0.00	7.95	0.00	0.000
1.48	2.43	2.45	86.85	213.01	53	757.3	1130	0.38	0.004	0.00	7.95	0.00	0.000
1.64	2.49	2.70	71.84	194.04	50	712.4	985	0.38	0.005	0.00	7.95	0.00	0.000
1.80	2.51	2.81	63.89	179.43	46	681.0	890	0.38	0.006	0.00	7.95	0.00	0.000
1.97	2.48	2.68	61.95	165.96	42	659.7	828	0.38	0.008	0.00	7.95	0.00	0.000
2.13	2.44	2.48	66.48	164.69	41	664.9	842	0.38	0.008	0.00	7.95	0.00	0.000
2.30	2.39	2.25	75.73	170.58	42	685.9	903	0.38	0.008	0.00	7.95	0.00	0.000
2.46	2.34	2.10	89.80	188.59	45	728.0	1033	0.38	0.007	0.00	7.95	0.00	0.000
2.62	2.31	1.99	108.90	216.61	51	785.6	1225	0.38	0.006	0.00	7.95	0.00	0.000
2.79	2.30	1.96	126.12	247.18	58	840.6	1425	0.38	0.005	0.00	7.95	0.00	0.000
2.95	2.33	2.04	131.14	267.96	64	870.9	1542	0.38	0.005	0.00	7.95	0.00	0.000
3.12	2.37	2.18	124.59	271.24	66	869.0	1536	0.38	0.006	0.00	7.95	0.00	0.000
3.28	2.41	2.36	110.86	261.68	65	844.0	1440	0.38	0.006	0.00	7.95	0.00	0.000
3.45	2.45	2.51	99.28	248.95	63	816.0	1336	0.38	0.008	0.00	7.95	0.00	0.000
3.61	2.46	2.56	96.21	246.58	62	809.5	1312	0.38	0.008	0.00	7.95	0.00	0.000
3.77	2.47	2.62	96.35	252.81	64	816.7	1339	0.38	0.008	0.00	7.95	0.00	0.000
3.94	2.49	2.71	94.03	255.02	65	816.2	1337	0.38	0.009	0.00	7.95	0.00	0.000
4.10	2.50	2.79	90.64	252.90	65	809.3	1312	0.37	0.009	0.00	7.95	0.00	0.000
4.27	2.48	2.67	93.62	250.43	64	810.5	1317	0.37	0.010	0.00	7.95	0.00	0.000
4.43	2.43	2.43	104.42	253.95	63	827.9	1379	0.37	0.010	0.00	7.95	0.00	0.000
4.59	2.38	2.22	115.16	255.12	62	840.8	1427	0.37	0.010	0.00	7.95	0.00	0.000
4.76	2.34	2.08	121.25	251.63	60	842.3	1432	0.37	0.010	0.00	7.95	0.00	0.000
4.92	2.31	1.97	123.21	242.95	57	832.8	1396	0.37	0.011	0.00	7.95	0.00	0.000
5.09	2.28	1.89	120.41	227.07	53	809.2	1308	0.37	0.012	0.00	7.95	0.00	0.000
5.25	2.26	1.82	115.68	210.68	49	782.3	1212	0.37	0.014	0.00	7.95	0.00	0.000
5.41	2.23	1.75	112.18	196.88	45	758.8	1132	0.37	0.016	0.01	7.95	0.00	0.000
5.58	2.22	1.71	112.43	192.37	44	751.7	1108	0.37	0.017	0.01	7.95	0.00	0.000
5.74	2.19	1.65	116.22	191.48	43	752.0	1108	0.37	0.018	0.01	7.95	0.00	0.000
5.91	2.17	1.60	121.34	193.97	43	758.2	1129	0.37	0.018	0.01	7.95	0.00	0.000
6.07	2.15	1.56	125.88	196.46	43	763.8	1147	0.37	0.018	0.01	7.95	0.00	0.000
6.23	2.14	1.54	128.97	198.64	44	768.4	1163	0.37	0.018	0.01	7.95	0.00	0.000
6.40	2.15	1.55	132.27	204.94	45	780.4	1204	0.37	0.018	0.01	7.95	0.00	0.000
6.56	2.16	1.57	135.57	212.47	47	794.2	1252	0.37	0.017	0.01	7.95	0.00	0.000
6.73	2.19	1.65	130.68	215.45	48	797.7	1265	0.37	0.017	0.01	7.95	0.00	0.000
6.89	2.26	1.83	116.69	213.71	49	787.4	1230	0.37	0.019	0.01	7.95	0.00	0.000
7.05	2.33	2.07	105.69	218.32	52	785.0	1223	0.37	0.019	0.01	7.95	0.00	0.000
7.22	2.38	2.23	103.74	230.99	56	799.5	1275	0.37	0.019	0.01	7.95	0.00	0.000
7.38	2.35	2.13	112.13	239.16	58	818.2	1342	0.37	0.018	0.01	7.95	0.00	0.000
7.55	2.35	2.12	114.31	241.94	58	823.8	1363	0.37	0.018	0.00	7.95	0.00	0.000
7.71	2.34	2.10	113.97	239.00	57	819.7	1348	0.37	0.019	0.01	7.95	0.00	0.000
7.87	2.37	2.20	106.88	235.20	57	808.0	1306	0.37	0.020	0.01	7.95	0.00	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Kc	Qc1n	Qc1n,cs	N1,60 (blows)	Vs (ft/s)	Gmax (tsf)	CSR	Shear, γ (%)	Svol,15 (%)	Nc	ev (%)	Settle. (in)

Total estimated settlement: 0.00

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.04	227.93	2.00	0.00	0.86	0.00	8.20	221.76	2.00	0.00	0.86	0.00
8.37	213.52	2.00	0.00	0.86	0.00	8.53	212.97	2.00	0.00	0.86	0.00
8.69	216.84	2.00	0.00	0.85	0.00	8.86	224.29	2.00	0.00	0.85	0.00
9.02	222.54	2.00	0.00	0.85	0.00	9.19	212.38	2.00	0.00	0.84	0.00
9.35	202.18	2.00	0.00	0.84	0.00	9.51	196.14	1.95	0.00	0.84	0.00
9.68	193.62	1.87	0.00	0.84	0.00	9.84	188.12	1.72	0.00	0.83	0.00
10.01	179.19	1.50	0.00	0.83	0.00	10.17	169.48	1.29	0.16	0.83	0.00
10.34	165.32	1.20	0.24	0.82	0.00	10.50	168.90	1.26	0.16	0.82	0.00
10.66	177.02	1.42	0.00	0.82	0.00	10.83	181.88	1.51	0.00	0.82	0.00
10.99	182.88	1.52	0.00	0.81	0.00	11.16	181.33	1.48	0.00	0.81	0.00
11.32	180.09	1.45	0.00	0.81	0.00	11.48	179.04	1.42	0.00	0.81	0.00
11.65	172.23	1.28	0.16	0.80	0.00	11.81	167.04	1.17	0.23	0.80	0.00
11.98	161.80	1.08	0.32	0.80	0.01	12.14	162.36	1.08	0.32	0.79	0.01
12.30	161.49	1.06	0.32	0.79	0.01	12.47	160.65	1.04	0.45	0.79	0.01
12.63	158.50	1.00	0.45	0.79	0.01	12.80	156.39	0.97	0.46	0.78	0.01
12.96	152.95	0.91	0.65	0.78	0.01	13.12	152.31	0.90	0.65	0.78	0.01
13.29	154.25	0.92	0.64	0.77	0.01	13.45	160.11	1.01	0.44	0.77	0.01
13.62	165.58	1.09	0.31	0.77	0.01	13.78	173.28	1.22	0.21	0.77	0.00
13.94	181.67	1.38	0.00	0.76	0.00	14.11	188.78	1.52	0.00	0.76	0.00
14.27	187.27	1.48	0.00	0.76	0.00	14.44	179.96	1.33	0.14	0.76	0.00
14.60	169.37	1.13	0.29	0.75	0.01	14.76	161.46	1.00	0.42	0.75	0.01
14.93	150.81	0.84	0.83	0.75	0.02	15.09	146.29	0.78	0.87	0.74	0.02
15.26	144.88	0.76	0.88	0.74	0.02	15.42	148.22	0.80	0.84	0.74	0.02
15.58	147.89	0.79	0.84	0.74	0.02	15.75	144.87	0.75	0.87	0.73	0.02
15.91	141.75	0.71	1.09	0.73	0.02	16.08	140.94	0.70	1.10	0.73	0.02
16.24	143.90	0.74	1.06	0.72	0.02	16.40	147.92	0.78	0.83	0.72	0.02
16.57	151.83	0.83	0.79	0.72	0.02	16.73	154.44	0.86	0.59	0.72	0.01
16.90	155.90	0.88	0.58	0.71	0.01	17.06	156.31	0.88	0.58	0.71	0.01
17.23	155.72	0.87	0.58	0.71	0.01	17.39	155.26	0.87	0.58	0.71	0.01
17.55	154.84	0.86	0.58	0.70	0.01	17.72	154.44	0.85	0.75	0.70	0.02
17.88	150.53	0.80	0.78	0.70	0.01	18.05	146.63	0.75	0.99	0.69	0.02
18.37	141.25	0.68	1.04	0.69	0.04	18.54	139.98	0.67	1.05	0.69	0.02
18.70	137.59	0.64	1.23	0.68	0.02	18.87	136.24	0.62	1.23	0.68	0.03
19.03	134.75	0.61	1.24	0.68	0.02	19.19	134.43	0.60	1.24	0.67	0.02
19.36	132.82	0.59	1.24	0.67	0.03	19.52	132.32	0.58	1.24	0.67	0.02
19.69	132.76	0.58	1.23	0.67	0.03	19.85	135.33	0.61	1.21	0.66	0.02
20.01	138.88	0.64	1.18	0.66	0.02	20.18	142.39	0.68	0.98	0.66	0.02
20.34	145.98	0.72	0.94	0.66	0.02	20.51	147.47	0.73	0.92	0.65	0.02
20.67	151.87	0.79	0.72	0.65	0.01	20.83	155.98	2.00	0.00	0.65	0.00
21.00	159.12	2.00	0.00	0.64	0.00	21.16	151.69	2.00	0.00	0.64	0.00
21.33	137.05	2.00	0.00	0.64	0.00	21.49	114.88	2.00	0.00	0.64	0.00
21.65	96.72	2.00	0.00	0.63	0.00	21.82	85.23	2.00	0.00	0.63	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
21.98	81.47	2.00	0.00	0.63	0.00	22.15	82.96	2.00	0.00	0.62	0.00
22.31	87.74	2.00	0.00	0.62	0.00	22.47	93.72	2.00	0.00	0.62	0.00
22.64	99.23	2.00	0.00	0.62	0.00	22.80	100.33	2.00	0.00	0.61	0.00
22.97	95.82	2.00	0.00	0.61	0.00	23.13	89.63	2.00	0.00	0.61	0.00
23.30	86.24	2.00	0.00	0.61	0.00	23.46	86.00	2.00	0.00	0.60	0.00
23.62	85.75	2.00	0.00	0.60	0.00	23.79	85.48	2.00	0.00	0.60	0.00
23.95	86.79	2.00	0.00	0.59	0.00	24.12	89.58	2.00	0.00	0.59	0.00
24.28	93.63	2.00	0.00	0.59	0.00	24.44	99.70	2.00	0.00	0.59	0.00
24.61	106.94	2.00	0.00	0.58	0.00	24.77	113.10	2.00	0.00	0.58	0.00
24.94	114.87	2.00	0.00	0.58	0.00	25.10	110.88	2.00	0.00	0.57	0.00
25.26	105.94	2.00	0.00	0.57	0.00	25.43	106.46	2.00	0.00	0.57	0.00
25.59	110.38	2.00	0.00	0.57	0.00	25.76	116.13	0.42	1.16	0.56	0.02
25.92	120.60	0.45	1.12	0.56	0.02	26.08	124.14	0.48	1.09	0.56	0.02
26.25	125.63	0.49	1.08	0.56	0.02	26.41	125.64	0.49	1.07	0.55	0.02
26.58	124.56	0.48	1.07	0.55	0.02	26.74	125.14	0.48	1.06	0.55	0.02
26.90	128.01	0.50	1.04	0.54	0.02	27.07	132.81	0.54	1.00	0.54	0.02
27.23	135.98	0.57	0.98	0.54	0.02	27.40	136.65	0.58	0.97	0.54	0.02
27.56	134.75	0.56	0.98	0.53	0.02	27.72	131.89	0.53	0.99	0.53	0.02
27.89	129.93	0.51	0.99	0.53	0.02	28.05	128.80	0.50	1.00	0.52	0.02
28.22	129.36	0.51	0.99	0.52	0.02	28.38	127.91	0.49	0.99	0.52	0.02
28.54	128.37	0.50	0.98	0.52	0.02	28.71	128.83	0.50	0.97	0.51	0.02
28.87	132.06	0.53	0.95	0.51	0.02	29.04	134.51	0.55	0.93	0.51	0.02
29.20	135.72	2.00	0.00	0.51	0.00	29.36	130.00	2.00	0.00	0.50	0.00
29.53	114.97	2.00	0.00	0.50	0.00	29.69	93.73	2.00	0.00	0.50	0.00
29.86	75.55	2.00	0.00	0.49	0.00	30.02	62.91	2.00	0.00	0.49	0.00
30.19	55.32	2.00	0.00	0.49	0.00	30.35	51.46	2.00	0.00	0.49	0.00
30.51	53.75	2.00	0.00	0.48	0.00	30.68	57.51	2.00	0.00	0.48	0.00
30.84	60.93	2.00	0.00	0.48	0.00	31.01	69.77	2.00	0.00	0.47	0.00
31.17	85.36	2.00	0.00	0.47	0.00	31.33	101.04	2.00	0.00	0.47	0.00
31.50	110.22	2.00	0.00	0.47	0.00	31.66	112.65	2.00	0.00	0.46	0.00
31.83	110.10	2.00	0.00	0.46	0.00	31.99	107.54	2.00	0.00	0.46	0.00
32.15	104.22	2.00	0.00	0.46	0.00	32.32	94.13	2.00	0.00	0.45	0.00
32.48	80.12	2.00	0.00	0.45	0.00	32.65	65.49	2.00	0.00	0.45	0.00
32.81	59.64	2.00	0.00	0.44	0.00	32.97	62.63	2.00	0.00	0.44	0.00
33.14	74.52	2.00	0.00	0.44	0.00	33.30	88.67	2.00	0.00	0.44	0.00
33.47	100.62	2.00	0.00	0.43	0.00	33.63	108.24	0.34	0.94	0.43	0.02
33.79	111.34	0.36	0.91	0.43	0.02	33.96	111.91	0.36	0.90	0.42	0.02
34.12	110.84	0.36	0.91	0.42	0.02	34.29	109.96	0.35	0.91	0.42	0.02
34.45	108.40	2.00	0.00	0.42	0.00	34.61	104.68	2.00	0.00	0.41	0.00
34.78	93.94	2.00	0.00	0.41	0.00	34.94	79.41	2.00	0.00	0.41	0.00
35.11	72.81	2.00	0.00	0.40	0.00	35.27	86.40	2.00	0.00	0.40	0.00
35.43	99.86	2.00	0.00	0.40	0.00	35.60	101.68	2.00	0.00	0.40	0.00
35.76	94.74	2.00	0.00	0.39	0.00	35.93	90.81	2.00	0.00	0.39	0.00
36.09	99.11	2.00	0.00	0.39	0.00	36.26	108.94	0.35	0.84	0.39	0.02
36.42	118.64	0.41	0.78	0.38	0.01	36.58	125.95	0.46	0.73	0.38	0.01
36.75	129.46	2.00	0.00	0.38	0.00	36.91	121.75	2.00	0.00	0.37	0.00
37.08	105.48	2.00	0.00	0.37	0.00	37.24	90.87	2.00	0.00	0.37	0.00
37.40	94.21	2.00	0.00	0.37	0.00	37.57	107.00	2.00	0.00	0.36	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
37.73	119.34	2.00	0.00	0.36	0.00	37.90	131.70	2.00	0.00	0.36	0.00
38.06	140.37	0.58	0.63	0.35	0.01	38.22	147.17	0.65	0.61	0.35	0.01
38.39	149.25	0.67	0.49	0.35	0.01	38.55	150.71	0.69	0.48	0.35	0.01
38.72	149.53	0.67	0.48	0.34	0.01	38.88	145.90	2.00	0.00	0.34	0.00
39.04	140.64	2.00	0.00	0.34	0.00	39.21	136.48	2.00	0.00	0.34	0.00
39.37	128.82	2.00	0.00	0.33	0.00	39.54	114.86	2.00	0.00	0.33	0.00
39.70	102.41	2.00	0.00	0.33	0.00	39.86	95.91	2.00	0.00	0.32	0.00
40.03	93.28	2.00	0.00	0.32	0.00	40.19	91.79	2.00	0.00	0.32	0.00
40.36	99.41	2.00	0.00	0.32	0.00	40.52	109.95	2.00	0.00	0.31	0.00
40.68	110.57	2.00	0.00	0.31	0.00	40.85	100.06	2.00	0.00	0.31	0.00
41.01	91.72	2.00	0.00	0.30	0.00	41.18	95.52	2.00	0.00	0.30	0.00
41.34	100.60	2.00	0.00	0.30	0.00	41.50	106.15	0.33	0.66	0.30	0.01
41.67	110.82	0.36	0.63	0.29	0.01	41.83	118.13	0.40	0.59	0.29	0.01
42.00	121.27	0.43	0.57	0.29	0.01	42.16	122.59	0.44	0.56	0.29	0.01
42.32	121.69	0.43	0.56	0.28	0.01	42.49	121.48	0.43	0.56	0.28	0.01
42.65	117.32	0.40	0.57	0.28	0.01	42.82	112.65	0.37	0.58	0.27	0.01
42.98	107.71	2.00	0.00	0.27	0.00	43.15	106.13	2.00	0.00	0.27	0.00
43.31	106.69	2.00	0.00	0.27	0.00	43.47	106.50	2.00	0.00	0.26	0.00
43.64	106.30	0.33	0.58	0.26	0.01	43.80	106.00	0.33	0.57	0.26	0.01
43.97	108.44	0.35	0.56	0.25	0.01	44.13	112.23	0.37	0.54	0.25	0.01
44.29	115.32	0.39	0.52	0.25	0.01	44.46	115.80	0.39	0.51	0.25	0.01
44.62	114.98	0.39	0.51	0.24	0.01	44.79	115.44	0.39	0.50	0.24	0.01
44.95	115.91	0.39	0.49	0.24	0.01	45.11	116.39	0.40	0.49	0.24	0.01
45.28	115.61	0.39	0.48	0.23	0.01	45.44	116.15	0.40	0.48	0.23	0.01
45.61	114.91	0.39	0.47	0.23	0.01	45.77	110.56	2.00	0.00	0.22	0.00
45.93	102.95	2.00	0.00	0.22	0.00	46.10	100.69	2.00	0.00	0.22	0.00
46.26	99.11	2.00	0.00	0.22	0.00	46.43	94.35	2.00	0.00	0.21	0.00
46.59	87.27	2.00	0.00	0.21	0.00	46.75	89.78	2.00	0.00	0.21	0.00
46.92	98.56	2.00	0.00	0.20	0.00	47.08	100.47	2.00	0.00	0.20	0.00
47.25	93.43	2.00	0.00	0.20	0.00	47.41	85.45	2.00	0.00	0.20	0.00
47.57	83.34	2.00	0.00	0.19	0.00	47.74	80.09	2.00	0.00	0.19	0.00
47.90	77.11	2.00	0.00	0.19	0.00	48.07	76.84	2.00	0.00	0.19	0.00
48.23	81.62	2.00	0.00	0.18	0.00	48.39	84.76	2.00	0.00	0.18	0.00
48.56	89.40	2.00	0.00	0.18	0.00	48.72	96.79	2.00	0.00	0.17	0.00
48.89	106.95	2.00	0.00	0.17	0.00	49.05	117.08	2.00	0.00	0.17	0.00
49.22	126.79	2.00	0.00	0.17	0.00	49.38	134.09	2.00	0.00	0.16	0.00
49.54	141.80	2.00	0.00	0.16	0.00	49.71	147.66	0.68	0.22	0.16	0.00
49.87	151.48	0.73	0.21	0.15	0.00	50.04	152.47	0.74	0.21	0.15	0.00
50.20	154.87	0.77	0.16	0.15	0.00	50.36	158.32	0.81	0.15	0.15	0.00
50.53	160.14	0.84	0.15	0.14	0.00	50.69	157.34	0.80	0.15	0.14	0.00
50.86	151.46	0.73	0.19	0.14	0.00	51.02	142.79	0.64	0.24	0.14	0.00
51.18	134.01	0.55	0.24	0.13	0.00	51.35	123.98	0.47	0.25	0.13	0.01
51.51	115.85	0.41	0.26	0.13	0.01	51.68	108.66	0.36	0.27	0.12	0.01
51.84	104.71	2.00	0.00	0.12	0.00	52.00	104.04	2.00	0.00	0.12	0.00
52.17	103.26	2.00	0.00	0.12	0.00	52.33	99.81	2.00	0.00	0.11	0.00
52.50	101.97	2.00	0.00	0.11	0.00	52.66	111.02	2.00	0.00	0.11	0.00
52.82	125.07	2.00	0.00	0.10	0.00	52.99	134.60	0.57	0.19	0.10	0.00
53.15	141.34	0.63	0.17	0.10	0.00	53.32	144.64	0.67	0.14	0.10	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
53.48	148.93	0.72	0.13	0.09	0.00	53.64	152.91	0.77	0.10	0.09	0.00
53.81	155.62	0.80	0.09	0.09	0.00	53.97	155.58	0.80	0.09	0.09	0.00
54.14	154.66	0.79	0.09	0.08	0.00	54.30	152.33	0.76	0.09	0.08	0.00
54.46	150.34	0.74	0.11	0.08	0.00	54.63	148.71	0.72	0.10	0.07	0.00
54.79	147.45	0.71	0.10	0.07	0.00	54.96	146.21	0.70	0.10	0.07	0.00
55.12	138.43	0.61	0.12	0.07	0.00						

Total estimated settlement: 1.74

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

:: Strength loss calculation (Robertson (2009) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.33	131.32	210.95	1.28	271.00	1.99	0.94	0.94
0.49	144.29	231.76	1.34	310.31	2.03	0.95	0.95
0.66	133.82	214.93	1.40	300.87	2.07	0.94	0.94
0.82	124.99	200.72	1.50	301.77	2.13	0.93	0.93
0.98	112.72	181.00	1.63	294.17	2.18	0.91	0.91
1.15	94.09	151.04	1.82	275.01	2.26	0.89	0.89
1.31	69.22	111.08	2.15	239.27	2.36	0.84	0.84
1.48	54.15	86.85	2.45	213.01	2.43	0.81	0.81
1.64	44.82	71.84	2.70	194.04	2.49	0.78	0.78
1.80	39.89	63.89	2.81	179.43	2.51	0.77	0.77
1.97	38.69	61.95	2.68	165.96	2.48	0.76	0.76
2.13	41.52	66.48	2.48	164.69	2.44	0.77	0.77
2.30	47.28	75.73	2.25	170.58	2.39	0.79	0.79
2.46	56.05	89.80	2.10	188.59	2.34	0.81	0.81
2.62	67.95	108.90	1.99	216.61	2.31	0.84	0.84
2.79	78.68	126.12	1.96	247.18	2.30	0.86	0.86
2.95	81.81	131.14	2.04	267.96	2.33	0.87	0.87
3.12	77.75	124.59	2.18	271.24	2.37	0.86	0.86
3.28	69.21	110.86	2.36	261.68	2.41	0.84	0.84
3.45	62.01	99.28	2.51	248.95	2.45	0.83	0.83
3.61	60.11	96.21	2.56	246.58	2.46	0.82	0.82
3.77	60.21	96.35	2.62	252.81	2.47	0.82	0.82
3.94	58.78	94.03	2.71	255.02	2.49	0.82	0.82
4.10	56.68	90.64	2.79	252.90	2.50	0.81	0.81
4.27	58.54	93.62	2.67	250.43	2.48	0.82	0.82
4.43	65.28	104.42	2.43	253.95	2.43	0.83	0.83
4.59	71.98	115.16	2.22	255.12	2.38	0.85	0.85
4.76	75.78	121.25	2.08	251.63	2.34	0.85	0.85
4.92	77.01	123.21	1.97	242.95	2.31	0.86	0.86
5.09	75.27	120.41	1.89	227.07	2.28	0.85	0.85
5.25	72.34	115.68	1.82	210.68	2.26	0.85	0.85
5.41	70.17	112.18	1.75	196.88	2.23	0.84	0.84
5.58	70.34	112.43	1.71	192.37	2.22	0.84	0.84
5.74	72.71	116.22	1.65	191.48	2.19	0.85	0.85
5.91	75.91	121.34	1.60	193.97	2.17	0.85	0.85
6.07	78.74	125.88	1.56	196.46	2.15	0.86	0.86
6.23	80.67	128.97	1.54	198.64	2.14	0.86	0.86
6.40	82.74	132.27	1.55	204.94	2.15	0.87	0.87
6.56	84.80	135.57	1.57	212.47	2.16	0.87	0.87
6.73	81.77	130.68	1.65	215.45	2.19	0.87	0.87
6.89	73.07	116.69	1.83	213.71	2.26	0.85	0.85
7.05	66.24	105.69	2.07	218.32	2.33	0.84	0.84
7.22	65.03	103.74	2.23	230.99	2.38	0.83	0.83
7.38	70.27	112.13	2.13	239.16	2.35	0.84	0.84
7.55	71.63	114.31	2.12	241.94	2.35	0.85	0.85
7.71	71.43	113.97	2.10	239.00	2.34	0.85	0.85
7.87	67.03	106.88	2.20	235.20	2.37	0.84	0.84
8.04	64.80	103.28	2.21	227.93	2.37	0.83	0.83

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.20	64.27	102.41	2.17	221.76	2.36	0.83	0.83
8.37	66.60	104.64	2.04	213.52	2.33	0.83	0.83
8.53	68.57	105.97	2.01	212.97	2.32	0.84	0.84
8.69	71.93	109.42	1.98	216.84	2.31	0.84	0.84
8.86	72.70	109.48	2.05	224.29	2.33	0.84	0.84
9.02	68.90	103.03	2.16	222.54	2.36	0.83	0.83
9.19	59.67	88.94	2.39	212.38	2.42	0.81	0.81
9.35	51.70	76.79	2.63	202.18	2.47	0.79	0.79
9.51	48.33	71.13	2.76	196.14	2.50	0.78	0.78
9.68	47.56	69.10	2.80	193.62	2.51	0.78	0.78
9.84	46.07	66.10	2.85	188.12	2.52	0.77	0.77
10.01	44.13	62.45	2.87	179.19	2.52	0.76	0.76
10.17	43.23	60.24	2.81	169.48	2.51	0.76	0.76
10.34	45.26	61.95	2.67	165.32	2.48	0.76	0.76
10.50	50.09	67.39	2.51	168.90	2.45	0.77	0.77
10.66	56.03	74.22	2.39	177.02	2.42	0.79	0.79
10.83	61.23	79.84	2.28	181.88	2.39	0.80	0.80
10.99	64.36	82.78	2.21	182.88	2.37	0.80	0.80
11.16	66.06	83.83	2.16	181.33	2.36	0.80	0.80
11.32	67.06	84.10	2.14	180.09	2.36	0.80	0.80
11.48	67.46	83.68	2.14	179.04	2.36	0.80	0.80
11.65	67.60	82.72	2.08	172.23	2.34	0.80	0.80
11.81	67.50	81.63	2.05	167.04	2.33	0.80	0.80
11.98	67.63	80.78	2.00	161.80	2.32	0.80	0.80
12.14	68.17	80.64	2.01	162.36	2.32	0.80	0.80
12.30	68.80	80.57	2.00	161.49	2.32	0.80	0.80
12.47	69.00	79.98	2.01	160.65	2.32	0.80	0.80
12.63	68.93	79.12	2.00	158.50	2.32	0.79	0.79
12.80	68.40	77.72	2.01	156.39	2.32	0.79	0.79
12.96	67.87	76.37	2.00	152.95	2.32	0.79	0.79
13.12	67.50	75.29	2.02	152.31	2.32	0.79	0.79
13.29	68.47	75.66	2.04	154.25	2.33	0.79	0.79
13.45	70.33	77.11	2.08	160.11	2.34	0.79	0.79
13.62	72.93	79.24	2.09	165.58	2.34	0.80	0.80
13.78	76.33	82.25	2.11	173.28	2.35	0.80	0.80
13.94	80.70	86.23	2.11	181.67	2.35	0.81	0.81
14.11	82.93	87.85	2.15	188.78	2.36	0.81	0.81
14.27	80.17	84.23	2.22	187.27	2.38	0.80	0.80
14.44	71.50	74.50	2.42	179.96	2.42	0.79	0.79
14.60	61.83	63.88	2.65	169.37	2.48	0.77	0.77
14.76	55.73	57.05	2.83	161.46	2.51	0.75	0.75
14.93	56.13	56.84	2.65	150.81	2.48	0.75	0.75
15.09	59.83	60.02	2.44	146.29	2.43	0.76	0.76
15.26	63.23	62.86	2.30	144.88	2.40	0.76	0.76
15.42	63.97	63.10	2.35	148.22	2.41	0.76	0.76
15.58	63.00	61.64	2.40	147.89	2.42	0.76	0.76
15.75	62.07	60.19	2.41	144.87	2.42	0.76	0.76
15.91	61.63	59.28	2.39	141.75	2.42	0.76	0.76

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
16.08	62.90	60.00	2.35	140.94	2.41	0.76	0.76
16.24	65.30	61.83	2.33	143.90	2.40	0.76	0.76
16.40	68.30	64.21	2.30	147.92	2.40	0.77	0.77
16.57	70.90	66.15	2.30	151.83	2.40	0.77	0.77
16.73	73.60	68.18	2.27	154.44	2.39	0.77	0.77
16.90	75.57	69.47	2.24	155.90	2.38	0.78	0.78
17.06	76.90	70.18	2.23	156.31	2.38	0.78	0.78
17.23	76.97	69.69	2.23	155.72	2.38	0.78	0.78
17.39	76.37	68.62	2.26	155.26	2.39	0.78	0.78
17.55	75.61	67.42	2.30	154.84	2.40	0.77	0.77
17.72	74.64	66.01	2.34	154.44	2.41	0.77	0.77
17.88	74.34	65.28	2.31	150.53	2.40	0.77	0.77
18.05	73.81	64.33	2.28	146.63	2.39	0.77	0.77
18.37	72.34	62.16	2.27	141.25	2.39	0.76	0.76
18.54	69.77	59.43	2.36	139.98	2.41	0.76	0.76
18.70	67.17	56.74	2.42	137.59	2.43	0.75	0.75
18.87	65.51	54.87	2.48	136.24	2.44	0.75	0.75
19.03	64.81	53.89	2.50	134.75	2.44	0.74	0.74
19.19	64.38	53.15	2.53	134.43	2.45	0.74	0.74
19.36	64.28	52.69	2.52	132.82	2.45	0.74	0.74
19.52	64.84	52.82	2.51	132.32	2.44	0.74	0.74
19.69	66.84	54.14	2.45	132.76	2.43	0.74	0.74
19.85	70.34	56.71	2.39	135.33	2.42	0.75	0.75
20.01	74.51	59.80	2.32	138.88	2.40	0.76	0.76
20.18	77.98	62.25	2.29	142.39	2.39	0.76	0.76
20.34	80.01	63.48	2.30	145.98	2.40	0.77	0.77
20.51	81.11	63.92	2.31	147.47	2.40	0.77	0.77
20.67	83.44	65.36	2.32	151.87	2.40	0.77	0.77
20.83	87.08	67.85	2.30	155.98	2.40	0.77	0.77
21.00	81.81	62.97	2.53	159.12	2.45	0.76	0.76
21.16	65.61	49.49	3.06	151.69	2.56	0.73	0.73
21.33	43.38	31.57	4.34	137.05	2.75	2.21	2.21
21.49	27.55	19.20	5.98	114.88	2.93	1.37	1.37
21.65	20.92	14.20	6.81	96.72	3.01	1.01	1.01
21.82	19.46	13.04	6.54	85.23	2.98	0.93	0.93
21.98	19.86	13.24	6.15	81.47	2.94	0.95	0.95
22.15	20.43	13.56	6.12	82.96	2.94	0.97	0.97
22.31	20.80	13.71	6.40	87.74	2.97	0.98	0.98
22.47	21.87	14.36	6.52	93.72	2.98	1.03	1.03
22.64	23.17	15.16	6.54	99.23	2.98	1.08	1.08
22.80	23.57	15.33	6.54	100.33	2.98	1.10	1.10
22.97	22.21	14.28	6.71	95.82	3.00	1.02	1.02
23.13	20.18	12.79	7.01	89.63	3.02	0.91	0.91
23.30	19.01	11.91	7.24	86.24	3.04	0.85	0.85
23.46	18.95	11.79	7.30	86.00	3.05	0.84	0.84
23.62	18.85	11.64	7.37	85.75	3.05	0.83	0.83
23.79	18.72	11.47	7.45	85.48	3.06	0.82	0.82
23.95	19.08	11.64	7.46	86.79	3.06	0.83	0.83

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
24.12	20.29	12.35	7.26	89.58	3.04	0.88	0.88
24.28	22.99	14.03	6.67	93.63	2.99	1.00	1.00
24.44	31.25	19.63	5.08	99.70	2.83	1.38	1.38
24.61	40.63	26.11	4.09	106.94	2.71	1.80	1.80
24.77	45.29	29.18	3.88	113.10	2.68	2.00	2.00
24.94	40.81	25.72	4.47	114.87	2.76	1.79	1.79
25.10	33.11	20.18	5.49	110.88	2.88	1.43	1.43
25.26	29.07	17.32	6.12	105.94	2.94	1.24	1.24
25.43	35.57	21.71	4.90	106.46	2.81	1.52	1.52
25.59	46.24	28.99	3.81	110.38	2.67	1.98	1.98
25.76	56.68	36.09	3.22	116.13	2.58	0.69	0.69
25.92	60.61	38.55	3.13	120.60	2.57	0.70	0.70
26.08	62.81	39.79	3.12	124.14	2.57	0.71	0.71
26.25	64.35	40.58	3.10	125.63	2.56	0.71	0.71
26.41	62.62	39.12	3.21	125.64	2.58	0.70	0.70
26.58	61.18	37.89	3.29	124.56	2.59	0.70	0.70
26.74	62.05	38.26	3.27	125.14	2.59	0.70	0.70
26.90	67.02	41.41	3.09	128.01	2.56	0.71	0.71
27.07	71.22	43.93	3.02	132.81	2.55	0.72	0.72
27.23	72.82	44.67	3.04	135.98	2.55	0.72	0.72
27.40	72.25	43.98	3.11	136.65	2.56	0.72	0.72
27.56	70.65	42.70	3.16	134.75	2.57	0.71	0.71
27.72	69.19	41.55	3.17	131.89	2.57	0.71	0.71
27.89	67.79	40.41	3.22	129.93	2.58	0.71	0.71
28.05	67.12	39.77	3.24	128.80	2.59	0.71	0.71
28.22	67.62	39.84	3.25	129.36	2.59	0.71	0.71
28.38	69.19	40.73	3.14	127.91	2.57	0.71	0.71
28.54	70.59	41.43	3.10	128.37	2.56	0.71	0.71
28.71	71.75	41.95	3.07	128.83	2.56	0.71	0.71
28.87	72.45	42.06	3.14	132.06	2.57	0.71	0.71
29.04	71.78	41.27	3.26	134.51	2.59	0.71	0.71
29.20	67.29	38.03	3.57	135.72	2.64	2.54	2.54
29.36	54.95	30.03	4.33	130.00	2.74	2.05	2.05
29.53	38.05	19.62	5.86	114.97	2.92	1.39	1.39
29.69	23.29	11.47	8.18	93.73	3.12	0.82	0.82
29.86	15.40	7.20	10.50	75.55	3.29	0.51	0.51
30.02	12.50	5.63	11.18	62.91	3.33	0.32	0.40
30.19	10.81	4.70	11.77	55.32	3.37	0.16	0.34
30.35	10.31	4.41	11.66	51.46	3.36	0.16	0.32
30.51	11.11	4.81	11.18	53.75	3.33	0.21	0.34
30.68	11.98	5.23	11.00	57.51	3.32	0.21	0.37
30.84	12.75	5.60	10.88	60.93	3.31	0.26	0.40
31.01	16.28	7.39	9.45	69.77	3.21	0.31	0.53
31.17	30.57	14.83	5.76	85.36	2.91	1.05	1.05
31.33	47.69	24.66	4.10	101.04	2.71	1.67	1.67
31.50	61.82	32.96	3.34	110.22	2.60	2.17	2.17
31.66	63.65	33.83	3.33	112.65	2.60	2.22	2.22
31.83	59.21	30.98	3.55	110.10	2.64	2.05	2.05

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.99	54.48	28.00	3.84	107.54	2.68	1.87	1.87
32.15	45.97	22.82	4.57	104.22	2.77	1.56	1.56
32.32	36.07	17.14	5.49	94.13	2.88	1.20	1.20
32.48	23.92	10.77	7.44	80.12	3.06	0.77	0.77
32.65	16.39	7.03	9.32	65.49	3.20	0.24	0.50
32.81	13.49	5.58	10.69	59.64	3.30	0.24	0.40
32.97	14.09	5.84	10.72	62.63	3.30	0.24	0.42
33.14	24.73	10.95	6.81	74.52	3.01	0.78	0.78
33.30	40.66	19.42	4.57	88.67	2.77	1.33	1.33
33.47	57.29	28.71	3.50	100.62	2.63	1.89	1.89
33.63	65.22	33.03	3.28	108.24	2.59	0.68	0.68
33.79	68.59	34.75	3.20	111.34	2.58	0.69	0.69
33.96	69.69	35.21	3.18	111.91	2.58	0.69	0.69
34.12	69.52	34.99	3.17	110.84	2.57	0.69	0.69
34.29	67.32	33.53	3.28	109.96	2.59	0.68	0.68
34.45	62.55	30.58	3.54	108.40	2.63	2.01	2.01
34.61	49.99	23.28	4.50	104.68	2.77	1.58	1.58
34.78	35.17	15.22	6.17	93.94	2.95	1.09	1.09
34.94	21.75	8.97	8.85	79.41	3.17	0.64	0.64
35.11	16.86	6.70	10.87	72.81	3.31	0.48	0.48
35.27	30.71	12.96	6.67	86.40	2.99	0.93	0.93
35.43	38.76	16.63	6.00	99.86	2.93	1.18	1.18
35.60	41.85	18.16	5.60	101.68	2.89	1.27	1.27
35.76	29.76	12.34	7.67	94.74	3.08	0.88	0.88
35.93	36.20	15.26	5.95	90.81	2.93	1.08	1.08
36.09	53.32	24.31	4.08	99.11	2.71	1.62	1.62
36.26	73.28	35.17	3.10	108.94	2.56	0.69	0.69
36.42	82.95	40.09	2.96	118.64	2.54	0.71	0.71
36.58	84.52	40.37	3.12	125.95	2.57	0.71	0.71
36.75	73.06	33.39	3.88	129.46	2.68	2.20	2.20
36.91	54.29	23.26	5.23	121.75	2.85	1.61	1.61
37.08	34.56	13.94	7.57	105.48	3.07	1.00	1.00
37.24	27.76	10.95	8.30	90.87	3.13	0.78	0.78
37.40	42.29	17.58	5.36	94.21	2.86	1.22	1.22
37.57	68.53	31.28	3.42	107.00	2.62	2.02	2.02
37.73	99.56	48.30	2.47	119.34	2.44	0.73	0.73
37.90	123.19	61.28	2.15	131.70	2.36	0.76	0.76
38.06	138.71	69.74	2.01	140.37	2.32	0.78	0.78
38.22	147.68	74.29	1.98	147.17	2.31	0.79	0.79
38.39	149.22	74.68	2.00	149.25	2.32	0.79	0.79
38.55	150.05	74.71	2.02	150.71	2.32	0.79	0.79
38.72	145.48	71.69	2.09	149.53	2.34	0.78	0.78
38.88	134.94	65.36	2.23	145.90	2.38	0.77	0.77
39.04	120.04	56.73	2.48	140.64	2.44	0.75	0.75
39.21	101.31	46.05	2.96	136.48	2.54	0.72	0.72
39.37	77.74	33.33	3.86	128.82	2.68	2.18	2.18
39.54	53.14	20.99	5.47	114.86	2.88	1.46	1.46
39.70	46.23	17.91	5.72	102.41	2.90	1.26	1.26

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.86	46.34	18.14	5.29	95.91	2.86	1.26	1.26
40.03	48.86	19.45	4.80	93.28	2.80	1.32	1.32
40.19	41.11	15.51	5.92	91.79	2.92	1.10	1.10
40.36	62.61	26.11	3.81	99.41	2.67	1.70	1.70
40.52	70.26	29.43	3.74	109.95	2.66	1.91	1.91
40.68	68.49	28.29	3.91	110.57	2.69	1.85	1.85
40.85	38.05	13.90	7.20	100.06	3.04	0.99	0.99
41.01	36.39	13.19	6.95	91.72	3.02	0.94	0.94
41.18	50.38	19.44	4.91	95.52	2.81	1.33	1.33
41.34	69.34	28.86	3.49	100.60	2.63	1.84	1.84
41.50	80.44	34.28	3.10	106.15	2.56	0.69	0.69
41.67	89.14	38.50	2.88	110.82	2.52	0.70	0.70
41.83	96.44	41.74	2.83	118.13	2.51	0.71	0.71
42.00	97.25	41.74	2.91	121.27	2.53	0.71	0.71
42.16	92.75	39.04	3.14	122.59	2.57	0.70	0.70
42.32	93.74	39.47	3.08	121.69	2.56	0.70	0.70
42.49	94.10	39.50	3.08	121.48	2.56	0.70	0.70
42.65	92.93	39.03	3.01	117.32	2.54	0.70	0.70
42.82	84.48	34.74	3.24	112.65	2.59	0.69	0.69
42.98	78.95	32.06	3.36	107.71	2.61	2.02	2.02
43.15	77.82	31.44	3.38	106.13	2.61	1.99	1.99
43.31	78.39	31.57	3.38	106.69	2.61	1.99	1.99
43.47	79.18	31.86	3.34	106.50	2.60	2.01	2.01
43.64	80.16	32.24	3.30	106.30	2.60	0.68	0.68
43.80	83.99	34.12	3.11	106.00	2.56	0.69	0.69
43.97	91.83	37.89	2.86	108.44	2.52	0.70	0.70
44.13	99.89	41.69	2.69	112.23	2.48	0.71	0.71
44.29	104.70	43.82	2.63	115.32	2.47	0.72	0.72
44.46	104.35	43.40	2.67	115.80	2.48	0.72	0.72
44.62	104.31	43.29	2.66	114.98	2.48	0.72	0.72
44.79	106.70	44.34	2.60	115.44	2.47	0.72	0.72
44.95	107.57	44.58	2.60	115.91	2.47	0.72	0.72
45.11	106.34	43.71	2.66	116.39	2.48	0.72	0.72
45.28	103.10	41.90	2.76	115.61	2.50	0.71	0.71
45.44	99.50	39.80	2.92	116.15	2.53	0.71	0.71
45.61	90.62	35.20	3.26	114.91	2.59	0.69	0.69
45.77	74.04	27.20	4.06	110.56	2.71	1.77	1.77
45.93	67.01	24.16	4.26	102.95	2.74	1.59	1.59
46.10	65.71	23.58	4.27	100.69	2.74	1.55	1.55
46.26	62.77	22.19	4.47	99.11	2.76	1.47	1.47
46.43	48.13	15.64	6.03	94.35	2.93	1.11	1.11
46.59	43.47	13.88	6.29	87.27	2.96	0.99	0.99
46.75	58.90	20.66	4.35	89.78	2.75	1.36	1.36
46.92	70.20	25.37	3.88	98.56	2.68	1.63	1.63
47.08	64.03	22.21	4.52	100.47	2.77	1.48	1.48
47.25	47.56	15.06	6.21	93.43	2.95	1.08	1.08
47.41	45.86	14.67	5.82	85.45	2.91	1.03	1.03
47.57	47.93	15.66	5.32	83.34	2.86	1.08	1.08

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.74	48.26	15.96	5.02	80.09	2.83	1.09	1.09
47.90	43.16	13.80	5.59	77.11	2.89	0.96	0.96
48.07	41.56	13.07	5.88	76.84	2.92	0.92	0.92
48.23	40.63	12.57	6.50	81.62	2.98	0.90	0.90
48.39	37.33	11.44	7.41	84.76	3.06	0.82	0.82
48.56	47.27	14.83	6.03	89.40	2.93	1.05	1.05
48.72	60.27	20.18	4.80	96.79	2.80	1.36	1.36
48.89	81.33	29.29	3.65	106.95	2.65	1.86	1.86
49.05	107.80	41.34	2.83	117.08	2.51	0.71	0.71
49.22	141.89	57.95	2.19	126.79	2.37	0.75	0.75
49.38	183.12	80.22	1.67	134.09	2.20	0.80	0.80
49.54	212.23	96.69	1.47	141.80	2.11	0.82	0.82
49.71	229.34	106.39	1.39	147.66	2.06	0.84	0.84
49.87	229.29	104.78	1.45	151.48	2.09	0.83	0.83
50.04	225.86	101.93	1.50	152.47	2.12	0.83	0.83
50.20	230.31	103.96	1.49	154.87	2.12	0.83	0.83
50.36	239.89	109.12	1.45	158.32	2.10	0.84	0.84
50.53	243.48	110.74	1.45	160.14	2.10	0.84	0.84
50.69	236.22	106.51	1.48	157.34	2.11	0.84	0.84
50.86	224.69	100.45	1.51	151.46	2.13	0.83	0.83
51.02	212.19	94.63	1.51	142.79	2.13	0.82	0.82
51.18	200.12	89.15	1.50	134.01	2.13	0.81	0.81
51.35	185.79	82.58	1.50	123.98	2.12	0.80	0.80
51.51	171.87	75.75	1.53	115.85	2.14	0.79	0.79
51.68	158.75	69.21	1.57	108.66	2.16	0.78	0.78
51.84	146.86	62.72	1.67	104.71	2.20	0.76	0.76
52.00	124.54	49.97	2.08	104.04	2.34	0.73	0.73
52.17	91.34	33.00	3.13	103.26	2.57	0.68	0.68
52.33	71.85	21.88	4.56	99.81	2.77	1.56	1.56
52.50	102.21	31.51	3.24	101.97	2.59	0.68	0.68
52.66	156.81	48.81	2.27	111.02	2.39	0.73	0.73
52.82	208.99	65.28	1.92	125.07	2.29	0.77	0.77
52.99	232.21	72.50	1.86	134.60	2.27	0.78	0.78
53.15	249.87	77.95	1.81	141.34	2.26	0.79	0.79
53.32	267.74	83.43	1.73	144.64	2.23	0.80	0.80
53.48	281.25	87.52	1.70	148.93	2.21	0.81	0.81
53.64	289.35	89.90	1.70	152.91	2.21	0.81	0.81
53.81	282.84	87.67	1.77	155.62	2.24	0.81	0.81
53.97	270.37	83.60	1.86	155.58	2.27	0.80	0.80
54.14	260.53	80.35	1.92	154.66	2.29	0.80	0.80
54.30	258.01	79.41	1.92	152.33	2.29	0.80	0.80
54.46	258.72	79.49	1.89	150.34	2.28	0.80	0.80
54.63	255.84	78.43	1.90	148.71	2.28	0.79	0.79
54.79	249.93	76.45	1.93	147.45	2.29	0.79	0.79
54.96	244.69	74.67	1.96	146.21	2.30	0.79	0.79
55.12	234.62	71.42	1.94	138.43	2.30	0.78	0.78

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$

Abbreviations

q_t:	Total cone resistance
K_c:	Cone resistance correction factor due to fines
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
I_c:	Soil behavior type index
$S_{u(liq)}/\sigma'_v$:	Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$:	Calculated peak undrained strength ratio

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

q_c : tip resistance, f_s : sleeve friction
σ_{vo}, σ_{vo}' : in-situ vertical total and effective stress
units : all in kPa

initial stress exponent[a] : n = 1.0 and calculate Q, F, and I_c
if $I_c \leq 1.64$, $n = 0.5$
if $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
if $I_c \geq 3.30$, $n = 1.0$
iterate until the change in n, $\Delta n < 0.01$
if $\sigma_{vo}' > 300$ kPa, let n = 1.0 for all soils

[a]updated from Robertson and Wride (1998)

$$C_n = \left(\frac{100}{\sigma_{vo}'}\right)^n$$

$$Q = \frac{(q_c - \sigma_{vo})}{100} \cdot C_n \qquad F = \frac{f_s}{(q_c - \sigma_{vo})} \cdot 100$$

$$I_c = \sqrt{\left[(3.47 - \log Q)^2 + (1.22 + \log F)^2\right]}$$

if $I_c \leq 1.64$, $K_c = 1.0$
if $1.64 < I_c < 2.60$, $K_c = -0.403\, I_c^4 + 5.581\, I_c^3 - 21.63\, I_c^2 + 33.75\, I_c - 17.88$
if $I_c \geq 2.60$, evaluate using other criteria; likely nonliquefiable if F > 1%
BUT, if $1.64 < I_c < 2.36$ and F < 0.5%, set $K_c = 1.0$

$$(q_{c1N})_{cs} = K_c Q$$

$$CRR_{7.5} = 93 \cdot \left[\frac{(q_{c1N})_{cs}}{1000}\right]^3 + 0.08, \text{ if } 50 \leq (q_{c1N})_{cs} < 160$$

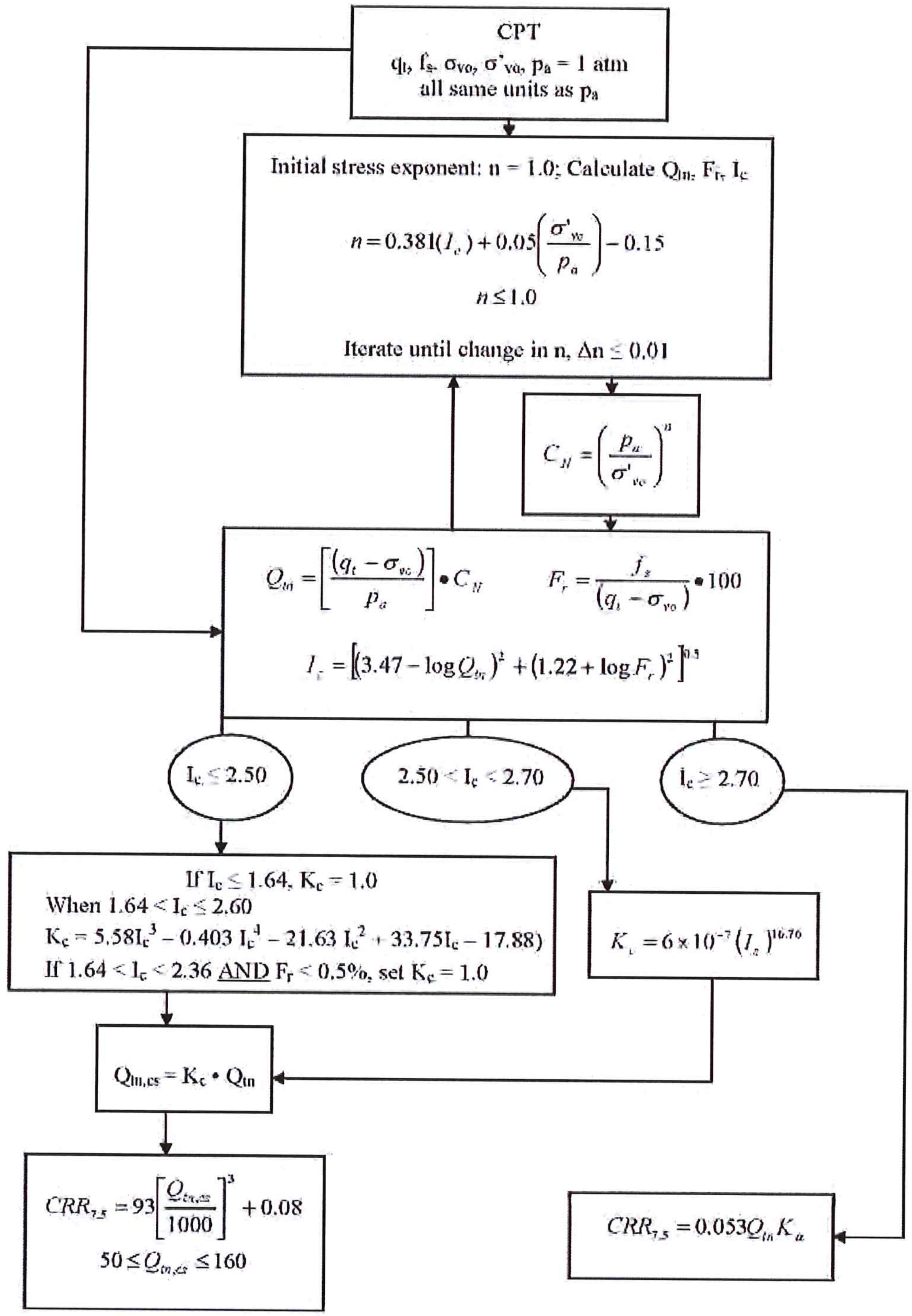
$$CRR_{7.5} = 0.833 \cdot \left[\frac{(q_{c1N})_{cs}}{1000}\right] + 0.05, \text{ if } (q_{c1N})_{cs} < 50$$

if $I_c \geq 2.60$, evaluate using other criteria; likely nonliquifiable if F > 1%

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

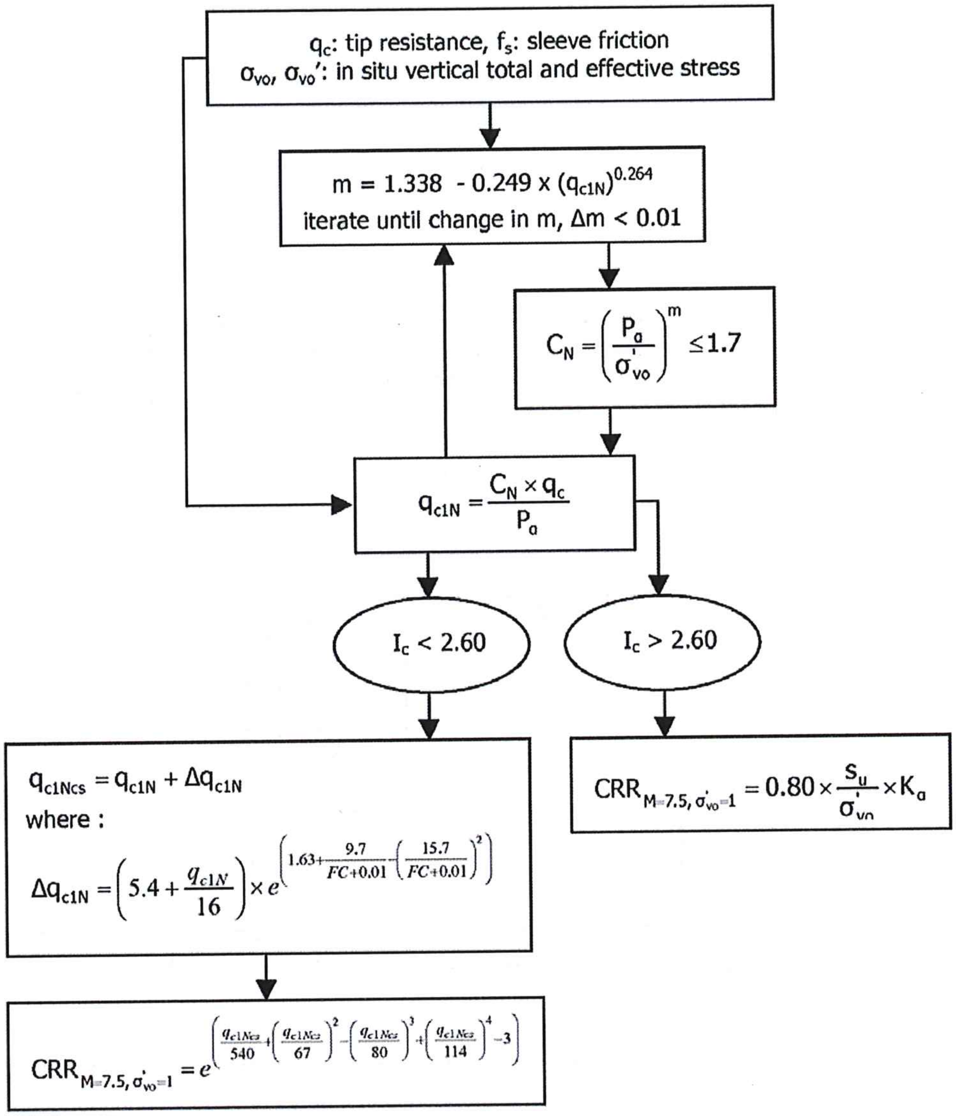
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

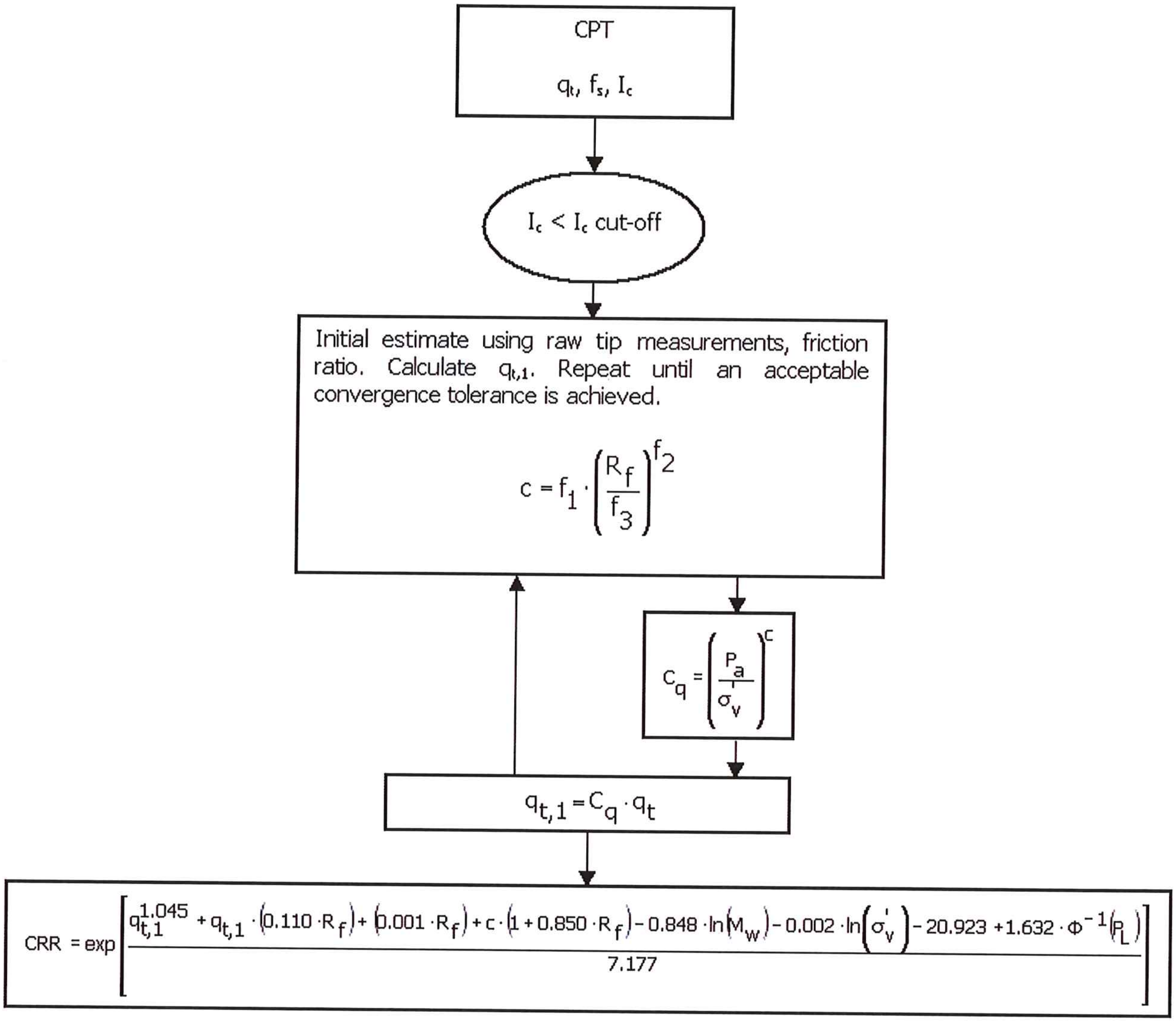


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

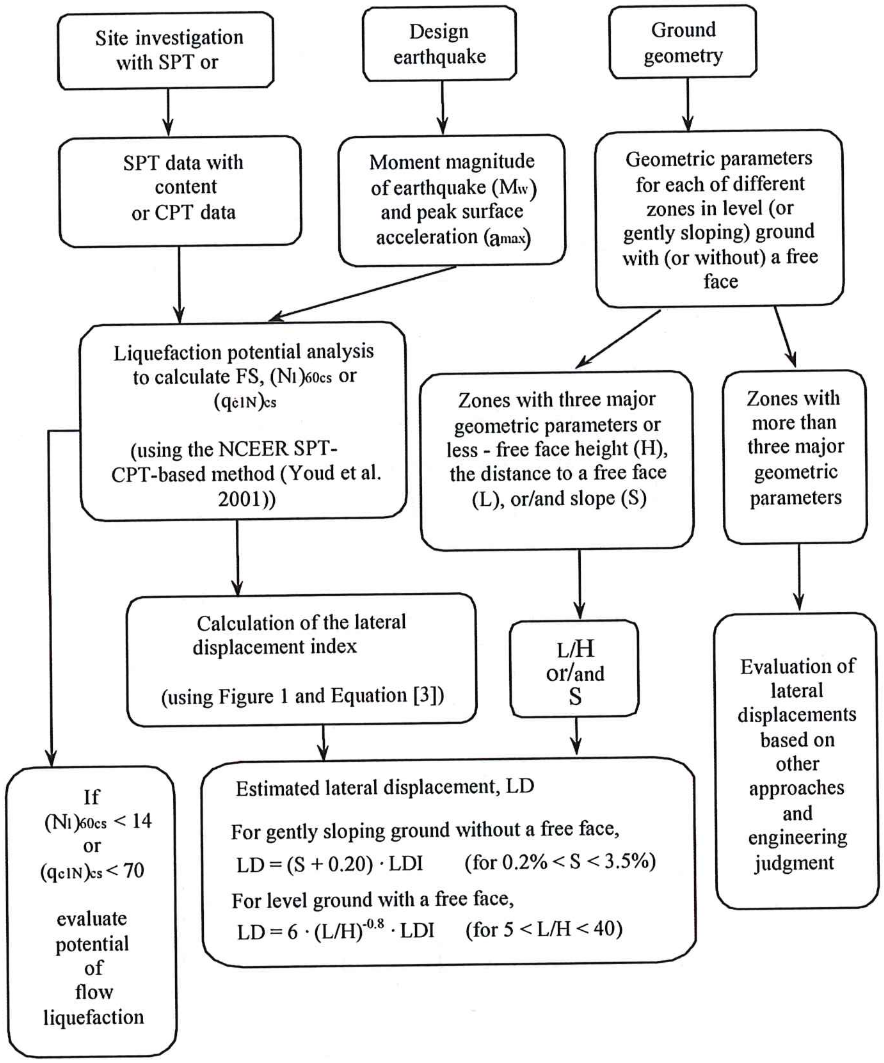
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



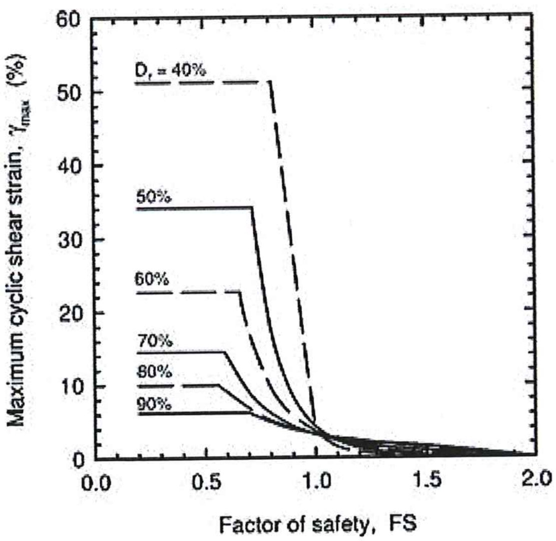
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



[1] **Figure 1**

$$LDI = \int_0^{Z_{max}} \gamma_{max} dz$$

[1] **Equation [3]**

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands

Average shear stress, τ_{av}

$$\tau_{av} = CSR^{*} \cdot \sigma_{v0}' = 0.65 \cdot \frac{a_{max}}{g} \cdot \sigma_{v0} \cdot \tau_a$$

↓

Estimate small shear strain modulus, G_0

$$G_0 = 0.0188 \cdot \left[10^{(0.55 I_c - 1.68)}\right] \cdot (q_t - \sigma_v)$$

↓

Estimate shear strain amplitude, γ (based on Pradel (1998))

$$\gamma = \left[\frac{1 + a \cdot e^{bR}}{1 + a}\right] \cdot R \cdot 100\ (\%)$$

$$R = \frac{\tau_{av}}{G_0}\ \text{(Note } \tau_{av} \text{ and } G_0 \text{ same units)}$$

$$a = 0.0389 \cdot \left(\frac{\sigma_v}{p_a}\right) + 0.124$$

$$b = 6400 \cdot \left(\frac{\sigma_v}{p_a}\right)$$

↓

Estimate volumetric strain in 15 cycles

$$\epsilon_{vol(15)} = \gamma \cdot \left[\frac{(N_1)_{60cs}}{20}\right]^{-1.20}$$

$$(N_1)_{60,cs} = \frac{Q_{tn,cs}}{8.5 \cdot \left[1 - \frac{I_c}{4.6}\right]}$$

↓

Volumetric strain in design earthquake

$$\Sigma_{vol} = \epsilon_{vol(15)} \cdot \left[\frac{N_c}{15}\right]^{0.45}$$

$$N_c = (M - 4)^{2.17}$$

↓

Seismic settlement, s

$$s = 2 \cdot \int_0^{GWT} \Sigma_{vol} \cdot dz$$

Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

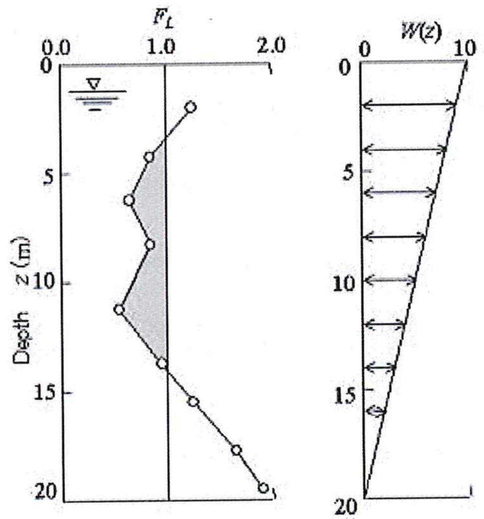
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\textbf{LPI} = \int_{0}^{20} (10 - 0{,}5_{z}) \times F_{L} \times d_{z}$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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- Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, *Symposium in honor of professor I. M. Idriss,* SAN diego, CA
- R. E. S. Moss, R. B. Seed, R. E. Kayen, J. P. Stewart, A. Der Kiureghian, K. O. Cetin, CPT-Based Probabilistic and Deterministic Assessment of In Situ Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 8, August 1, 2006

TABLE OF CONTENTS

Geosphere Consultants Inc.
2001 Crow Canyon Road, Suite # 210
San Ramon, California 94583

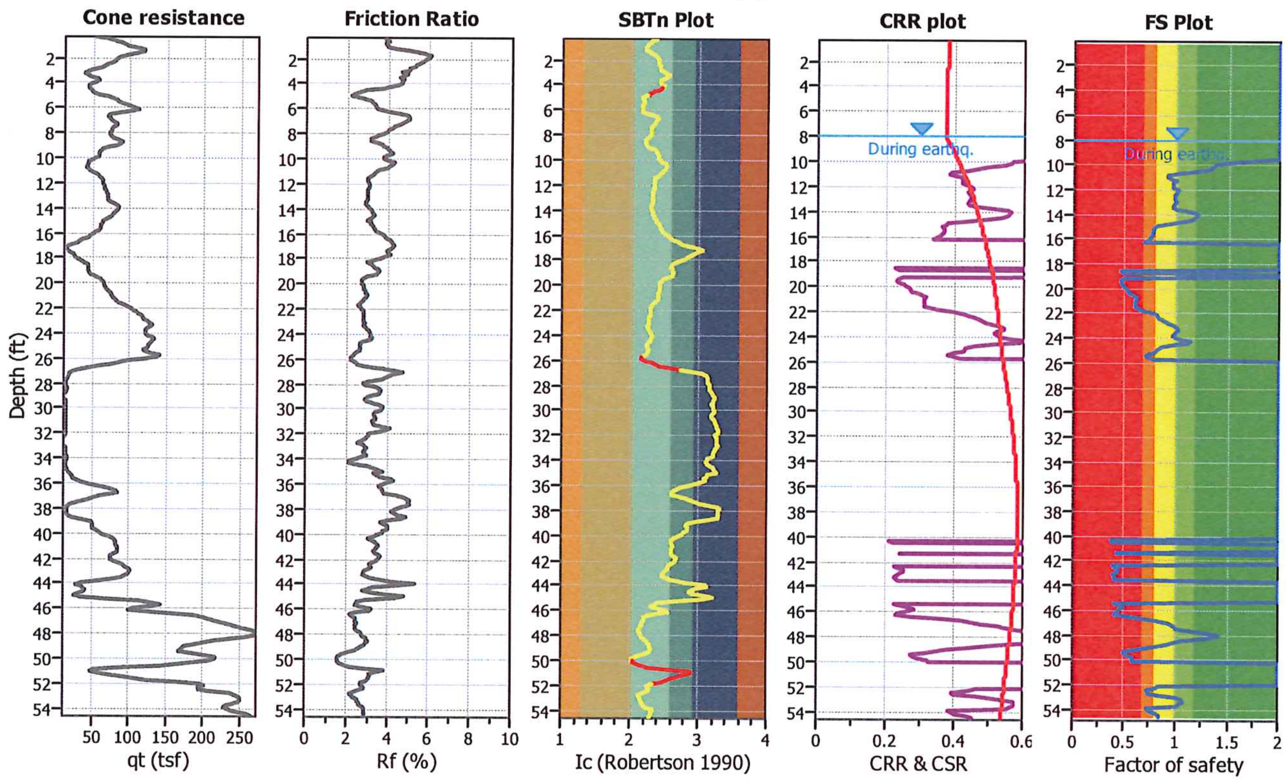
LIQUEFACTION ANALYSIS REPORT

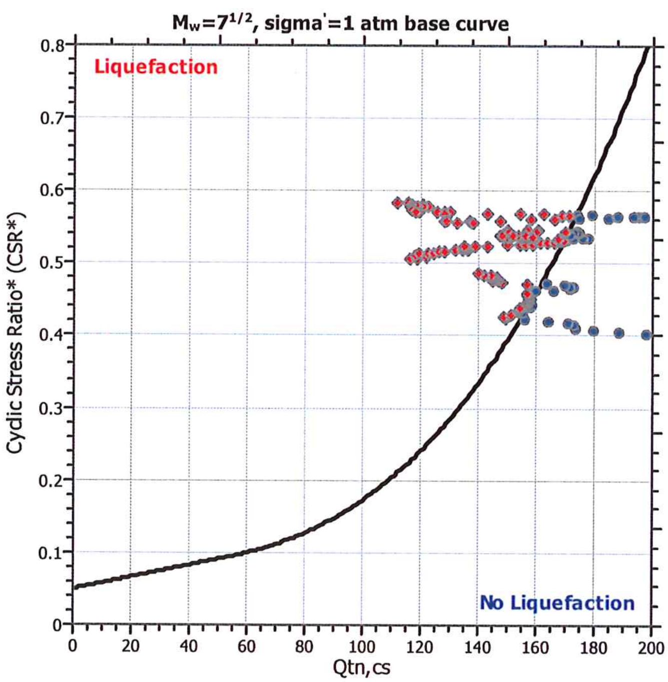
Project title : El Camino College - Comption Center **Location : Compton California**

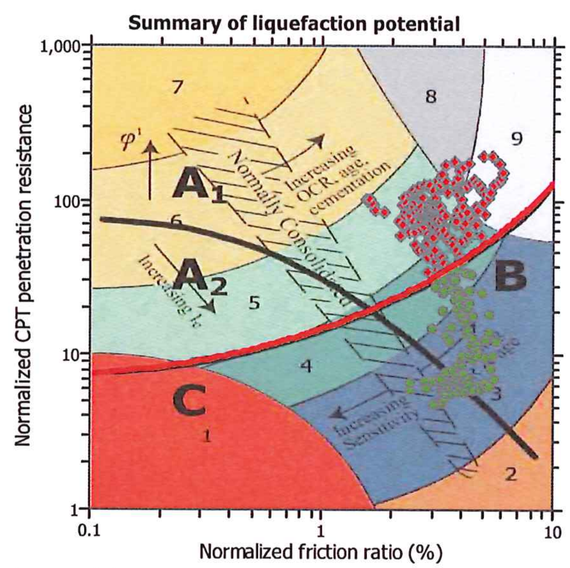
CPT file : CPT-03

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	46.40 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.60	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.62	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

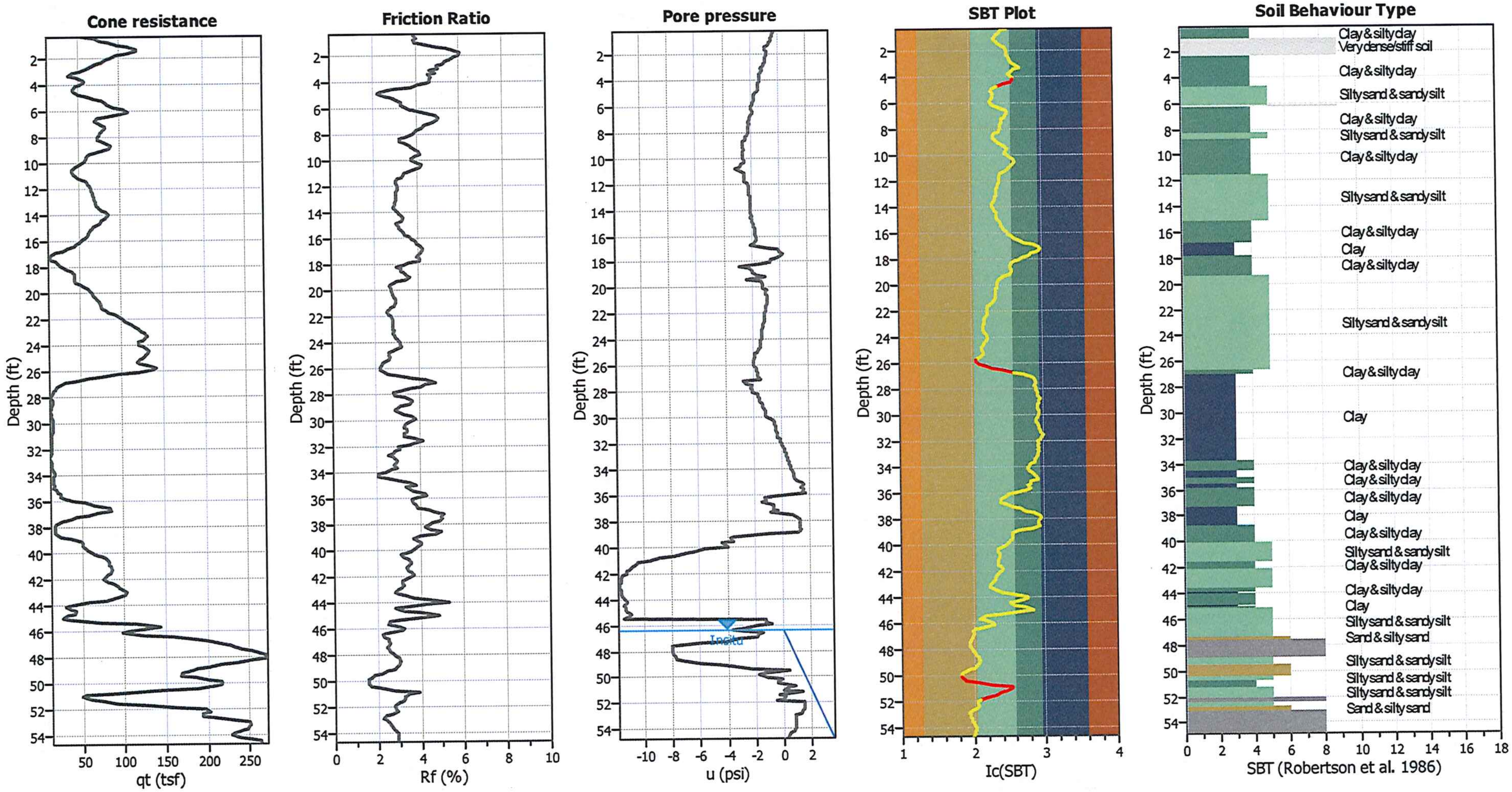






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



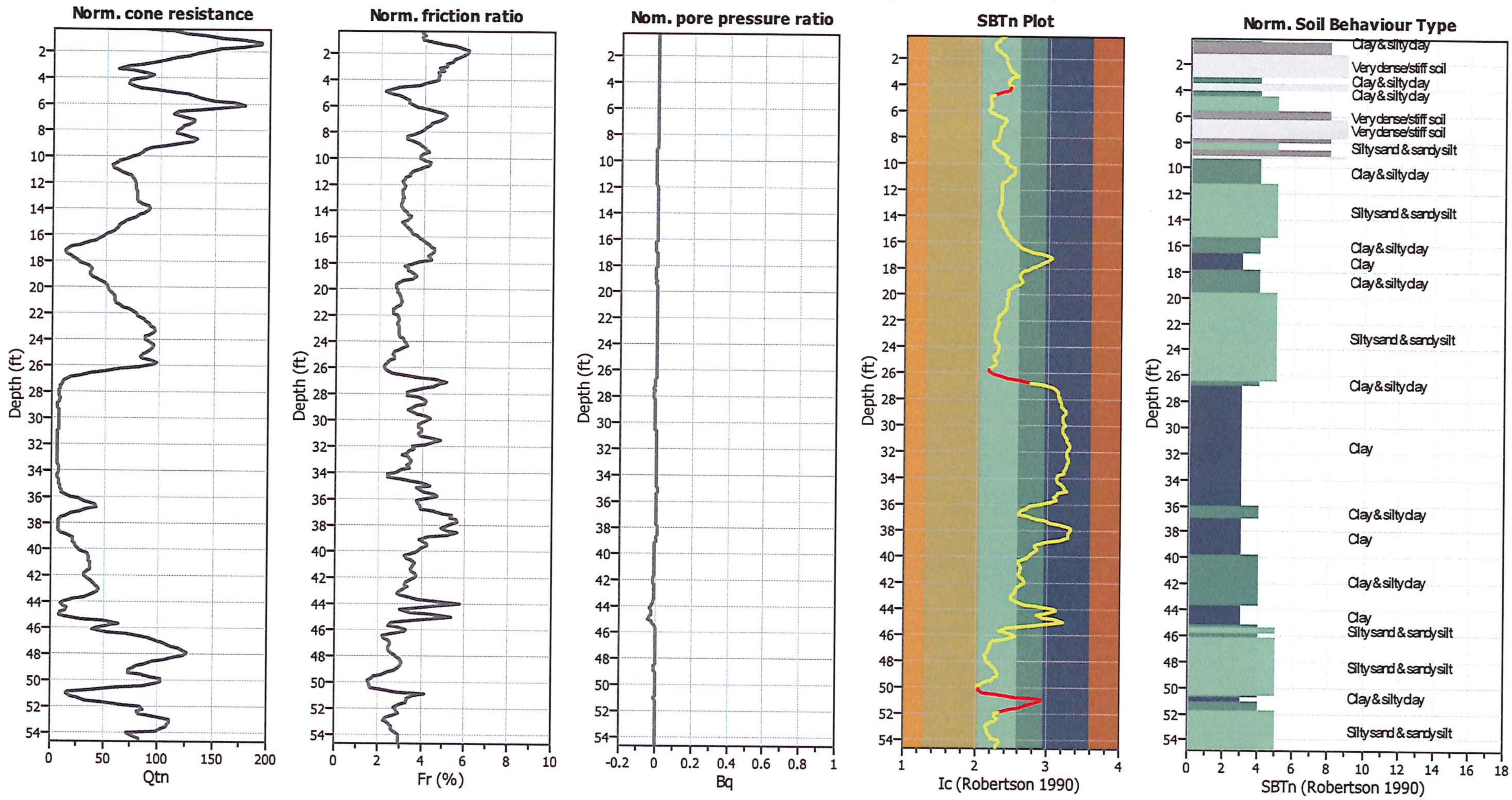
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	46.40 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



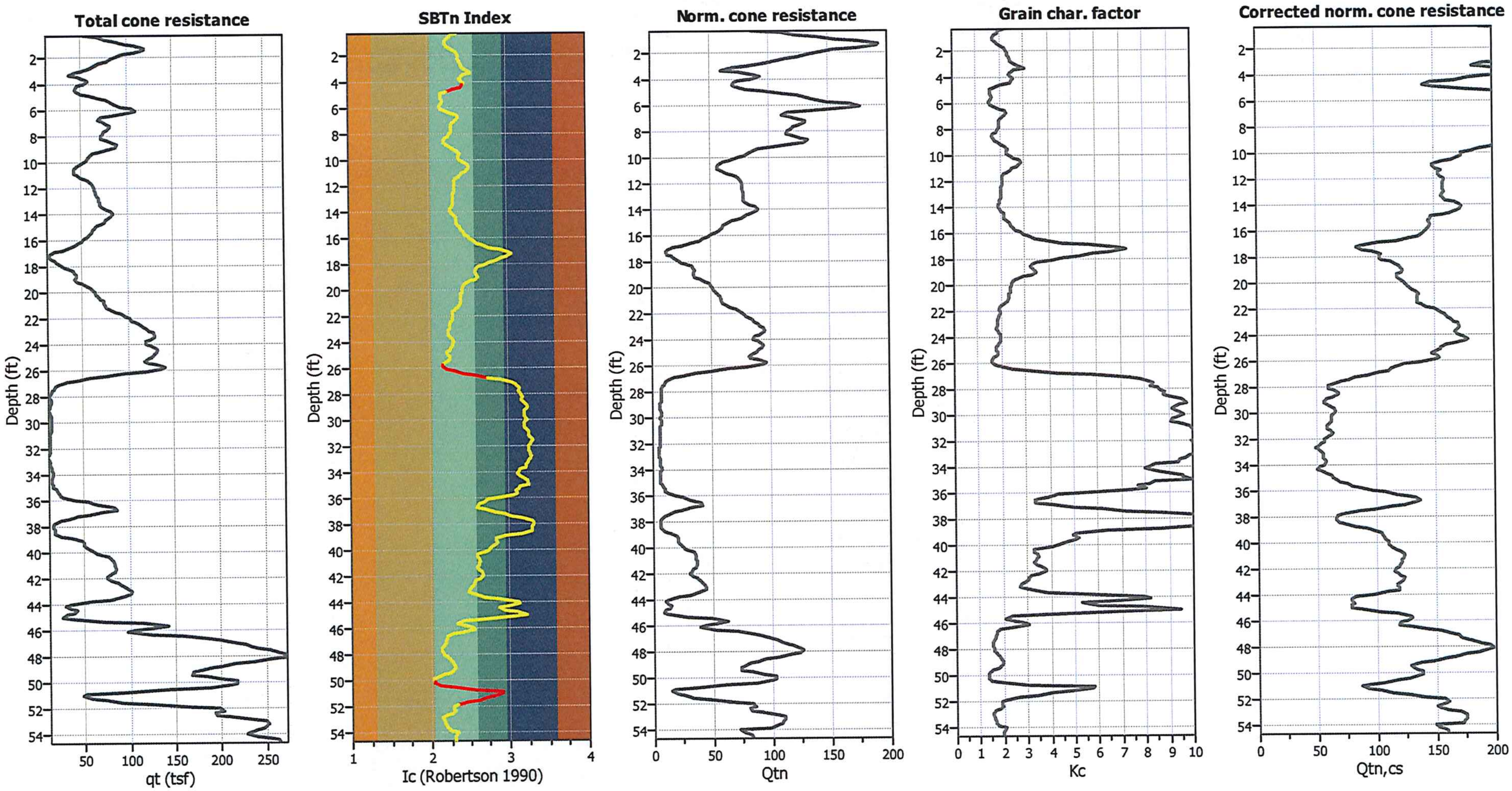
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	46.40 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

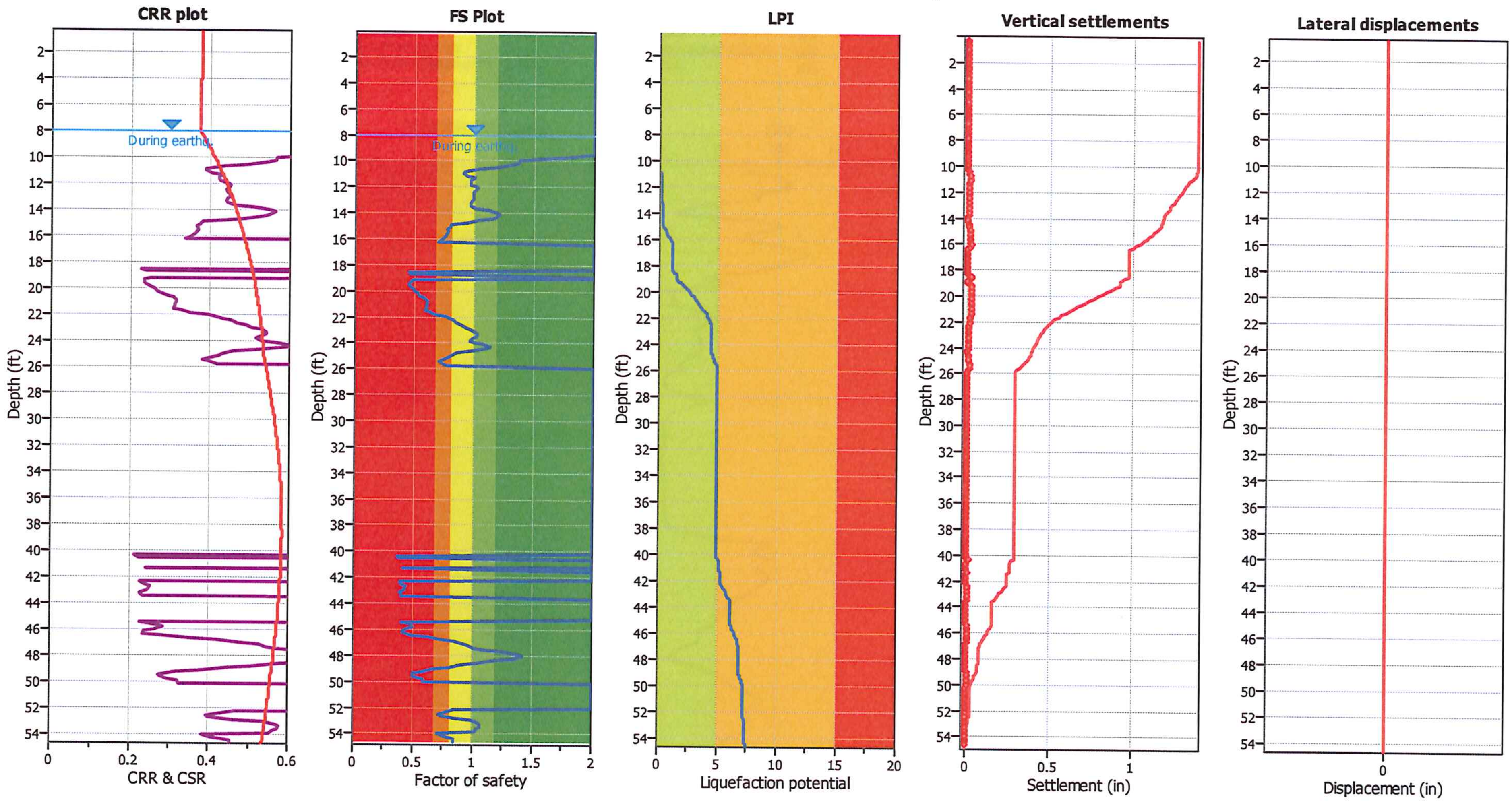
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	46.40 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	46.40 ft	Fill height:	N/A	Limit depth:	N/A

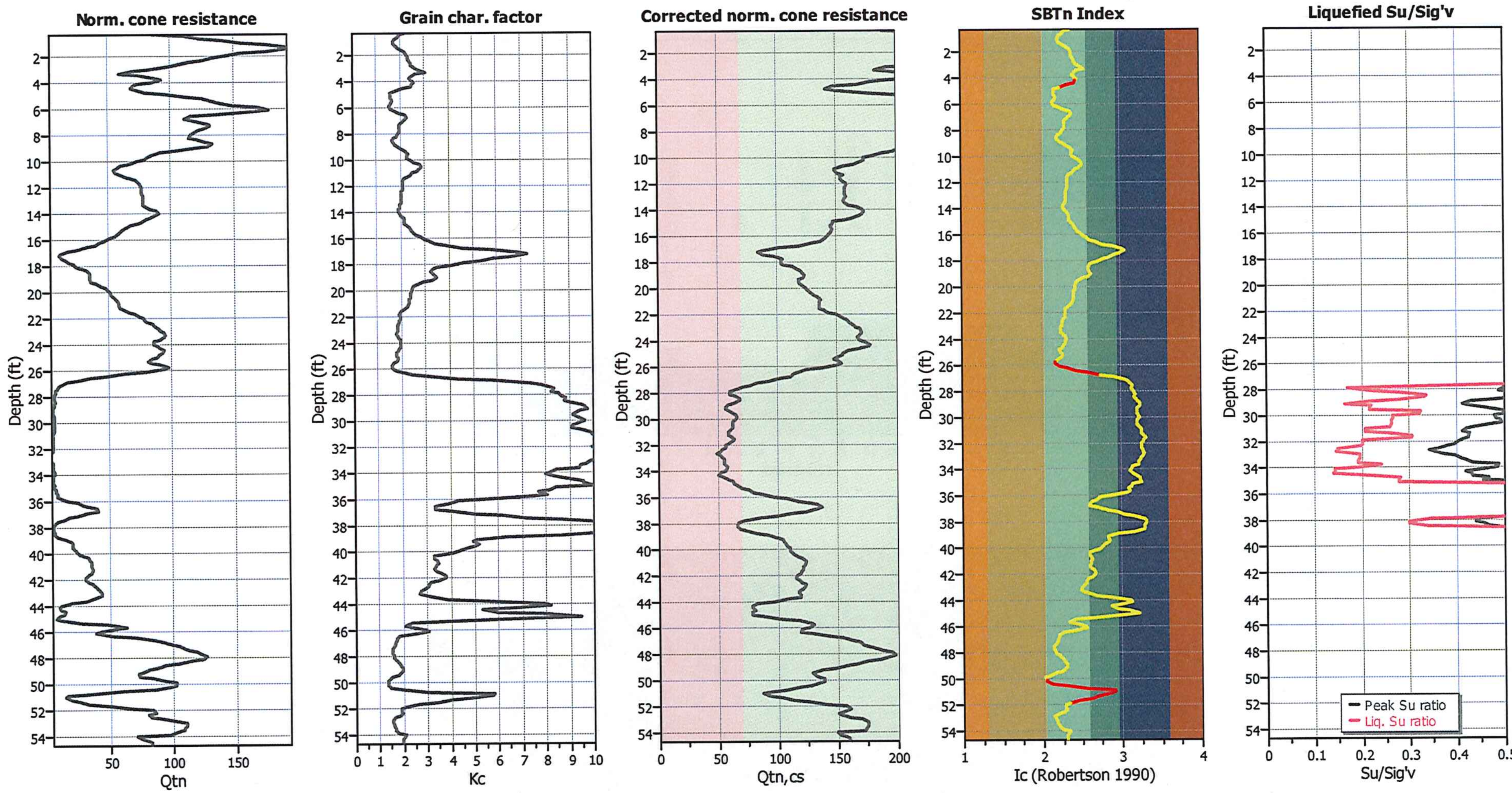
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

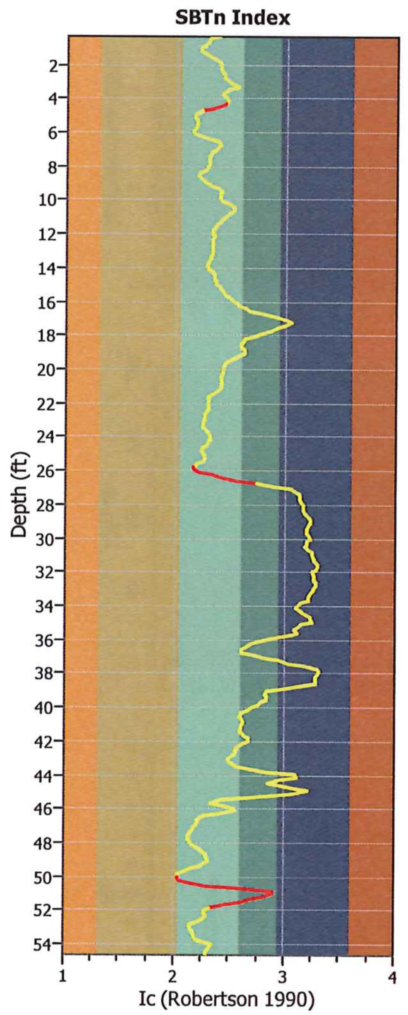
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	46.40 ft	Fill height:	N/A	Limit depth:	N/A

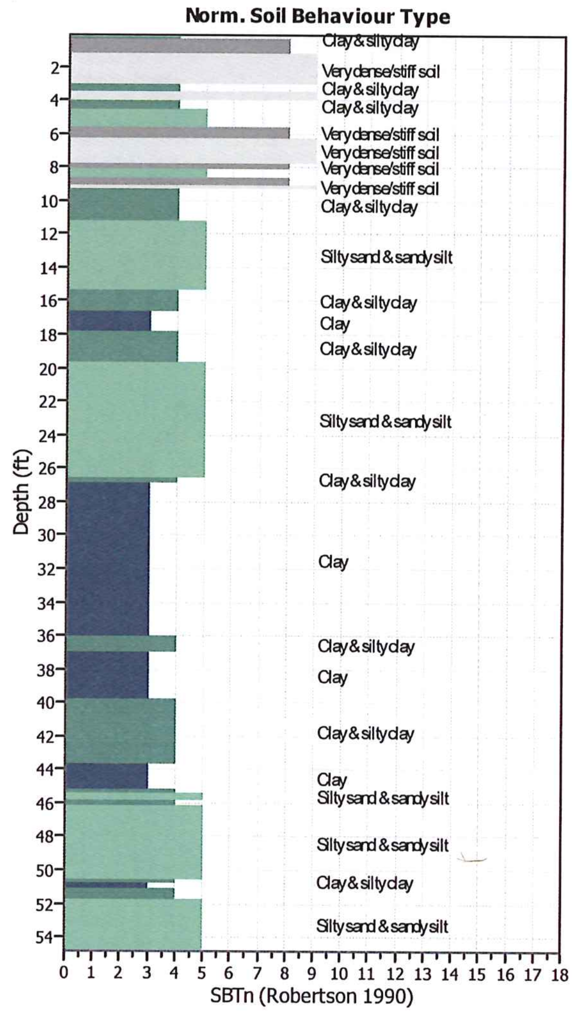
TRANSITION LAYER DETECTION ALGORITHM REPORT
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vise-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between $1.80 < I_c < 3.0$) and a rate of change of I_c. Transitions typically occur when the rate of change of I_c is fast (i.e. delta I_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.





Transition layer algorithm properties	
I_c minimum check value:	1.70
I_c maximum check value:	3.00
I_c change ratio value:	0.0250
Minimum number of points in layer:	4

General statistics	
Total points in CPT file:	332
Total points excluded:	23
Exclusion percentage:	6.93%
Number of layers detected:	4

Transition layer No	Number of points	Depth	SBT_n number	SBT_n description
Transition layer 1	4	Start depth: 4.43 (ft)	4	Clay & silty clay
		End depth: 4.92 (ft)	5	Silty sand & sandy silt
Transition layer 2	7	Start depth: 25.92 (ft)	5	Silty sand & sandy silt
		End depth: 26.90 (ft)	3	Clay
Transition layer 3	5	Start depth: 50.20 (ft)	5	Silty sand & sandy silt
		End depth: 50.86 (ft)	3	Clay
Transition layer 4	7	Start depth: 51.02 (ft)	3	Clay
		End depth: 52.00 (ft)	5	Silty sand & sandy silt

Start depth: Depth where the transition layer begins
End depth: Depth where the transition layer ends

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.33	47.60	1.90	-0.30	25.38	125.28
2	0.49	64.60	2.40	-0.40	22.58	127.78
3	0.66	77.90	3.20	-0.40	22.02	129.15
4	0.82	88.70	3.70	-0.50	20.37	130.05
5	0.98	94.90	3.20	-0.50	19.70	131.26
6	1.15	107.60	4.60	-0.60	19.68	132.99
7	1.31	125.20	6.20	-0.70	20.75	134.93
8	1.48	126.40	6.90	-0.90	22.11	135.63
9	1.64	106.40	6.40	-0.90	23.84	135.21
10	1.80	93.40	5.70	-0.80	25.50	134.26
11	1.97	88.10	5.30	-0.80	26.10	133.36
12	2.13	83.50	4.80	-0.80	26.25	132.59
13	2.30	78.60	4.40	-0.90	26.35	131.62
14	2.46	71.60	3.80	-0.90	26.76	130.51
15	2.62	63.80	3.30	-0.90	27.49	129.40
16	2.79	58.70	3.10	-1.00	27.46	128.41
17	2.95	59.70	2.70	-1.00	29.43	126.77
18	3.12	35.60	1.90	-1.20	30.31	124.68
19	3.28	36.10	1.50	-1.10	33.06	123.55
20	3.45	41.10	2.10	-1.20	29.42	125.18
21	3.61	62.20	2.80	-1.30	27.80	126.93
22	3.77	60.70	2.80	-1.30	26.90	127.34
23	3.94	50.60	2.40	-1.30	28.00	126.45
24	4.10	46.80	2.10	-1.30	28.95	125.09
25	4.27	43.40	1.80	-1.40	28.39	123.97
26	4.43	43.60	1.60	-1.40	27.49	123.06
27	4.59	43.40	1.50	-1.40	23.65	121.48
28	4.76	48.50	0.80	-1.50	20.19	121.17
29	4.92	59.90	1.30	-1.60	17.78	122.14
30	5.09	69.20	1.80	-1.80	17.73	124.94
31	5.25	81.80	2.30	-1.80	18.11	126.89
32	5.41	83.40	2.70	-1.80	18.37	128.05
33	5.58	84.50	2.80	-1.80	18.58	128.67
34	5.74	89.80	2.90	-1.90	17.97	129.53
35	5.91	105.40	3.50	-1.90	17.33	130.93
36	6.07	120.20	4.30	-2.00	17.94	132.07
37	6.23	106.10	4.50	-2.00	19.62	132.01
38	6.40	81.80	3.70	-1.90	22.78	131.00
39	6.56	67.10	3.40	-1.90	25.28	129.96
40	6.73	68.80	3.50	-2.00	26.15	129.79
41	6.89	73.10	3.60	-2.10	25.46	130.18
42	7.05	77.70	3.80	-2.10	24.12	130.56
43	7.22	85.20	3.80	-2.20	23.22	130.65
44	7.38	82.40	3.60	-2.10	22.54	130.24
45	7.55	77.20	3.20	-2.20	22.58	129.55
46	7.71	74.10	3.00	-2.20	22.32	129.03
47	7.87	76.80	3.00	-2.20	22.21	128.56
48	8.04	71.30	2.70	-2.20	22.03	128.17

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	70.10	2.60	-2.30	21.07	127.53
50	8.37	77.30	2.30	-2.40	19.59	127.61
51	8.53	87.90	2.60	-2.40	19.05	128.36
52	8.69	88.80	3.20	-2.60	19.35	129.35
53	8.86	91.80	3.30	-2.60	20.69	129.76
54	9.02	81.20	3.20	-2.60	21.64	129.20
55	9.19	71.20	2.70	-2.60	23.85	128.18
56	9.35	58.50	2.50	-2.50	25.32	127.28
57	9.51	59.90	2.50	-2.60	26.54	126.83
58	9.68	58.90	2.40	-2.60	26.06	126.29
59	9.84	56.60	2.00	-2.60	25.91	125.67
60	10.01	55.10	2.00	-2.60	26.84	125.03
61	10.17	47.90	2.00	-2.50	28.81	124.71
62	10.34	44.00	1.90	-2.50	30.94	124.23
63	10.50	42.00	1.80	-2.70	31.52	123.57
64	10.66	41.00	1.60	-2.80	31.12	122.95
65	10.83	41.60	1.50	-3.10	29.86	122.54
66	10.99	44.80	1.50	-2.70	28.50	122.87
67	11.16	50.10	1.70	-2.50	26.98	123.56
68	11.32	55.60	1.80	-2.50	25.91	124.34
69	11.48	58.70	1.90	-2.50	24.57	124.49
70	11.65	60.60	1.70	-2.50	23.97	124.72
71	11.81	62.90	1.90	-2.50	23.64	124.92
72	11.98	64.00	2.00	-2.30	23.87	125.36
73	12.14	64.70	2.00	-2.20	23.91	125.51
74	12.30	65.20	2.00	-2.20	23.75	125.54
75	12.47	66.30	2.00	-2.20	23.54	125.57
76	12.63	67.50	2.00	-2.20	23.43	125.74
77	12.80	68.80	2.10	-2.20	23.37	125.89
78	12.96	69.50	2.10	-2.10	23.39	126.04
79	13.12	70.00	2.10	-2.10	23.29	126.06
80	13.29	70.70	2.10	-2.10	23.12	126.09
81	13.45	72.00	2.10	-2.10	22.84	126.27
82	13.62	75.40	2.20	-2.10	22.20	126.74
83	13.78	83.40	2.40	-2.10	21.81	127.53
84	13.94	87.80	2.70	-2.10	21.91	128.10
85	14.11	84.00	2.70	-2.10	22.64	128.25
86	14.27	79.60	2.60	-2.10	23.56	128.05
87	14.44	77.30	2.60	-2.00	24.41	127.86
88	14.60	74.90	2.60	-2.10	24.47	127.30
89	14.76	72.10	2.10	-2.00	24.73	126.68
90	14.93	67.80	2.10	-2.00	24.90	125.74
91	15.09	62.90	1.90	-1.90	26.22	125.48
92	15.26	60.70	2.00	-1.90	26.89	125.28
93	15.42	62.00	2.00	-1.80	27.56	125.37
94	15.58	60.40	2.00	-1.80	28.18	125.32
95	15.75	57.20	2.00	-1.80	29.39	125.08
96	15.91	53.30	1.90	-1.80	30.97	124.80

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	50.20	1.90	-1.70	32.57	124.38
98	16.24	46.50	1.80	-1.70	34.26	123.94
99	16.40	43.00	1.70	-1.70	36.25	123.31
100	16.57	38.40	1.60	-1.90	39.35	122.02
101	16.73	28.50	1.20	-2.10	44.58	119.77
102	16.90	18.60	0.80	-0.90	52.06	116.57
103	17.06	14.00	0.60	-0.10	59.24	113.55
104	17.23	12.80	0.50	0.00	61.37	112.53
105	17.39	14.80	0.60	0.20	57.30	113.69
106	17.55	20.30	0.80	0.10	52.83	115.90
107	17.72	23.90	1.00	-0.20	49.30	117.72
108	17.88	26.10	1.10	-0.60	44.82	118.02
109	18.05	29.50	0.80	-0.70	40.88	118.58
110	18.21	35.00	1.10	-1.30	36.77	119.44
111	18.37	41.50	1.30	-2.90	35.68	120.98
112	18.54	42.60	1.40	-2.20	34.78	121.70
113	18.70	43.40	1.40	-2.00	35.15	122.08
114	18.87	43.30	1.50	-2.00	36.13	122.40
115	19.03	41.80	1.60	-1.70	36.68	122.55
116	19.19	43.00	1.50	-1.00	35.07	122.69
117	19.36	50.50	1.50	-2.40	31.84	122.77
118	19.52	56.10	1.50	-1.30	29.20	123.19
119	19.69	59.80	1.60	-1.20	27.96	123.67
120	19.85	62.40	1.70	-1.20	27.51	124.24
121	20.01	65.00	1.80	-1.20	27.36	124.58
122	20.18	65.00	1.80	-0.90	27.27	124.91
123	20.34	67.20	1.90	-1.00	27.07	125.24
124	20.51	70.60	2.00	-1.00	26.88	125.85
125	20.67	74.00	2.20	-0.90	26.69	126.28
126	20.83	74.50	2.20	-0.90	26.71	126.55
127	21.00	74.40	2.20	-0.90	26.62	126.56
128	21.16	75.50	2.20	-0.90	26.15	126.62
129	21.33	79.30	2.20	-0.90	25.17	126.84
130	21.49	85.80	2.30	-1.00	23.55	127.01
131	21.65	92.50	2.20	-1.00	22.52	127.62
132	21.82	99.10	2.60	-1.00	22.15	128.24
133	21.98	100.70	2.80	-1.10	22.42	129.08
134	22.15	105.00	3.00	-1.10	22.50	129.57
135	22.31	108.10	3.10	-1.10	22.15	129.90
136	22.47	111.70	3.10	-1.10	21.75	130.22
137	22.64	116.90	3.30	-1.10	21.36	130.53
138	22.80	120.40	3.40	-1.20	21.18	130.90
139	22.97	122.70	3.50	-1.20	20.97	131.18
140	23.13	126.70	3.60	-1.20	20.75	131.53
141	23.30	132.30	3.80	-1.30	20.53	131.72
142	23.46	131.20	3.70	-1.30	20.80	131.77
143	23.62	124.90	3.70	-1.30	21.50	131.55
144	23.79	118.00	3.60	-1.30	22.43	131.46

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.95	117.80	3.70	-1.30	22.82	131.66
146	24.12	124.90	4.00	-1.40	22.64	132.13
147	24.28	131.70	4.20	-1.50	22.36	132.65
148	24.44	134.80	4.40	-1.50	21.83	132.57
149	24.61	131.30	3.80	-1.50	20.85	131.81
150	24.77	128.40	3.00	-1.60	20.15	131.09
151	24.94	128.80	3.40	-1.70	20.38	130.73
152	25.10	120.40	3.40	-1.90	21.01	130.66
153	25.26	119.10	3.00	-1.90	21.31	130.19
154	25.43	115.50	2.90	-1.90	20.34	130.02
155	25.59	130.30	3.10	-2.00	19.05	130.45
156	25.76	148.30	3.30	-2.00	17.88	130.77
157	25.92	142.90	3.10	-2.00	17.98	130.39
158	26.08	120.20	2.70	-1.90	19.64	129.11
159	26.25	95.20	2.20	-1.80	22.83	127.28
160	26.41	72.30	1.80	-1.80	27.41	125.64
161	26.58	58.70	1.80	-1.70	33.73	124.36
162	26.74	44.90	1.70	-1.70	42.87	123.06
163	26.90	27.00	1.40	-1.70	52.50	120.99
164	27.07	23.40	1.00	-1.40	62.37	118.64
165	27.23	19.40	0.90	-2.70	64.94	116.54
166	27.40	17.40	0.70	-2.50	67.31	115.04
167	27.56	17.10	0.60	-2.10	68.02	113.36
168	27.72	14.90	0.50	-2.20	67.36	111.34
169	27.89	13.80	0.30	-2.10	68.94	110.01
170	28.05	13.50	0.40	-2.10	69.72	109.98
171	28.22	14.40	0.50	-1.70	70.73	111.77
172	28.38	16.50	0.60	-1.70	70.40	112.82
173	28.54	16.00	0.60	-1.60	71.13	112.79
174	28.71	13.90	0.50	-1.60	74.35	111.63
175	28.87	12.00	0.40	-1.40	75.18	109.77
176	29.04	12.40	0.30	-1.30	75.65	109.05
177	29.20	12.60	0.40	-1.30	74.04	109.13
178	29.36	13.20	0.40	-1.20	73.30	109.88
179	29.53	14.20	0.40	-1.10	72.46	111.19
180	29.69	15.60	0.60	-1.10	73.21	112.25
181	29.86	14.80	0.60	-1.10	74.45	112.70
182	30.02	14.30	0.50	-1.00	75.04	112.19
183	30.19	14.30	0.50	-0.60	73.32	111.74
184	30.35	15.30	0.50	-0.50	72.26	111.80
185	30.51	15.30	0.50	-0.50	72.07	111.81
186	30.68	14.60	0.50	-0.40	74.06	111.73
187	30.84	13.80	0.50	-0.40	76.43	111.07
188	31.01	12.60	0.40	-0.40	76.70	110.46
189	31.17	13.50	0.40	-0.30	77.59	110.43
190	31.33	13.30	0.50	-0.30	78.45	111.57
191	31.50	14.10	0.60	-0.30	81.20	112.49
192	31.66	13.50	0.60	-0.10	80.11	112.04

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.83	13.30	0.40	-0.10	79.17	111.00
194	31.99	13.00	0.40	0.00	76.76	109.85
195	32.15	13.20	0.40	0.00	77.50	109.83
196	32.32	12.90	0.40	0.10	77.36	109.14
197	32.48	12.10	0.30	0.20	78.37	108.33
198	32.65	11.50	0.30	0.20	78.71	107.47
199	32.81	11.60	0.30	0.30	79.53	108.29
200	32.97	12.90	0.40	0.30	78.17	109.13
201	33.14	13.60	0.40	0.40	76.63	109.91
202	33.30	13.90	0.40	0.40	75.40	109.97
203	33.47	13.90	0.40	0.50	74.24	110.03
204	33.63	14.60	0.40	0.50	73.71	110.71
205	33.79	15.60	0.50	0.60	68.37	110.96
206	33.96	18.70	0.40	0.60	67.03	110.38
207	34.12	14.70	0.30	0.70	65.89	108.96
208	34.29	13.90	0.30	0.80	68.70	107.98
209	34.45	14.80	0.30	0.80	70.59	109.53
210	34.61	16.10	0.50	0.90	74.78	111.31
211	34.78	14.20	0.60	1.00	74.88	112.90
212	34.94	18.00	0.60	1.10	77.20	113.27
213	35.11	15.20	0.60	1.50	68.41	114.12
214	35.27	23.90	0.70	1.60	66.96	115.40
215	35.43	23.10	0.90	1.40	64.21	116.92
216	35.60	23.30	1.00	1.60	66.29	118.00
217	35.76	25.00	1.10	1.50	62.64	119.71
218	35.93	34.80	1.50	1.70	50.35	122.43
219	36.09	61.70	2.00	-0.50	42.91	124.96
220	36.26	66.20	2.40	-1.20	39.59	126.86
221	36.42	67.00	2.80	-1.10	37.15	128.43
222	36.58	92.70	3.30	-1.50	35.57	129.49
223	36.75	90.10	3.40	-0.60	35.37	129.95
224	36.91	75.30	3.30	-0.60	40.69	129.06
225	37.08	50.80	2.70	-0.60	47.30	127.40
226	37.24	44.70	2.10	-0.30	54.90	125.38
227	37.40	36.60	1.90	-0.80	60.79	122.77
228	37.57	21.50	1.10	0.70	70.15	119.86
229	37.73	17.00	0.80	1.00	80.05	116.59
230	37.90	16.40	0.80	1.30	82.21	115.19
231	38.06	16.60	0.70	1.30	81.17	114.88
232	38.22	17.20	0.70	1.30	79.38	114.96
233	38.39	18.10	0.80	1.30	79.71	115.66
234	38.55	18.10	0.90	1.30	79.79	116.93
235	38.72	20.40	1.10	1.40	69.74	119.24
236	38.88	36.00	1.50	1.20	56.17	121.85
237	39.04	53.20	1.80	-1.00	47.76	123.87
238	39.21	54.40	2.00	-3.50	47.22	124.66
239	39.37	44.10	2.00	-3.70	48.51	124.88
240	39.54	51.20	2.00	-3.50	47.72	125.20

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.70	59.80	2.20	-4.40	44.96	125.64
242	39.86	57.50	2.20	-4.10	43.54	126.11
243	40.03	61.20	2.30	-4.00	41.11	126.40
244	40.19	73.00	2.30	-5.60	37.78	126.86
245	40.36	78.60	2.40	-6.40	35.32	127.28
246	40.52	80.00	2.50	-7.00	35.21	127.85
247	40.68	81.50	2.80	-7.80	35.85	128.45
248	40.85	83.00	3.00	-8.90	36.41	128.91
249	41.01	83.30	3.00	-9.60	36.05	129.03
250	41.18	85.90	2.90	-10.40	35.44	128.98
251	41.34	86.60	2.90	-10.70	35.04	128.82
252	41.50	84.10	2.80	-10.90	35.83	128.77
253	41.67	80.60	2.90	-11.10	37.55	128.56
254	41.83	73.90	2.80	-11.30	39.00	128.27
255	42.00	72.80	2.60	-11.30	38.64	127.98
256	42.16	79.40	2.60	-11.60	36.32	128.04
257	42.32	88.00	2.70	-11.70	34.32	128.50
258	42.49	91.90	2.90	-11.70	33.20	128.99
259	42.65	94.60	3.00	-11.70	33.15	129.57
260	42.82	97.70	3.30	-11.80	31.58	129.69
261	42.98	106.40	2.90	-11.80	30.40	129.60
262	43.15	103.20	2.80	-11.80	29.99	129.05
263	43.31	92.40	2.70	-11.70	31.85	129.01
264	43.47	91.40	3.00	-11.70	34.09	129.05
265	43.64	88.00	3.00	-11.70	39.28	128.60
266	43.80	54.90	2.60	-11.60	48.31	126.68
267	43.97	31.50	1.70	-11.50	65.41	123.69
268	44.13	21.40	1.40	-11.30	66.87	120.47
269	44.29	37.00	0.80	-11.30	56.79	120.34
270	44.46	50.00	1.40	-11.50	49.51	120.50
271	44.62	38.80	1.30	-11.40	53.92	120.96
272	44.79	29.70	1.10	-11.40	65.06	119.92
273	44.95	22.70	1.20	-11.30	74.19	119.72
274	45.11	24.90	1.40	-11.00	62.54	122.09
275	45.28	58.80	2.00	-11.10	38.30	126.35
276	45.44	132.20	3.10	-11.50	27.33	129.71
277	45.61	153.30	3.70	-1.20	23.59	131.53
278	45.77	142.20	3.70	-1.20	26.67	131.66
279	45.93	96.90	3.60	-0.80	32.18	130.68
280	46.10	79.80	3.00	-1.80	33.26	129.74
281	46.26	118.10	2.70	-2.80	25.78	130.14
282	46.43	173.70	3.40	-3.60	20.95	131.72
283	46.59	182.50	4.30	-1.50	19.36	133.58
284	46.75	202.40	5.00	-1.80	19.44	134.82
285	46.92	215.00	5.40	-1.90	18.76	135.67
286	47.08	230.00	5.70	-3.10	18.46	136.27
287	47.25	234.30	6.10	-4.10	17.78	136.45
288	47.41	240.30	5.60	-5.90	17.35	136.69

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.57	252.70	6.10	-8.00	16.93	137.12
290	47.74	266.50	6.90	-8.00	17.00	137.28
291	47.90	276.60	7.40	-8.00	17.43	137.28
292	48.07	274.30	7.90	-8.00	18.05	137.28
293	48.23	260.10	7.70	-7.90	19.13	137.28
294	48.39	236.20	7.20	-7.80	20.32	137.28
295	48.56	212.50	6.50	-7.70	21.43	137.11
296	48.72	198.70	5.90	-7.30	22.13	136.32
297	48.89	191.90	5.60	-6.10	22.58	135.53
298	49.05	176.60	5.00	-4.60	22.65	134.36
299	49.22	159.70	3.80	-3.60	21.70	133.11
300	49.38	170.70	3.50	-2.30	20.22	131.99
301	49.54	169.80	3.30	0.40	17.22	131.80
302	49.71	211.90	3.20	-1.50	15.26	131.94
303	49.87	220.10	3.40	-1.80	13.83	132.19
304	50.04	216.90	3.40	-1.10	14.05	132.34
305	50.20	211.60	3.40	-0.10	14.30	131.97
306	50.36	200.30	3.00	-0.40	16.20	131.49
307	50.53	154.60	3.10	-0.40	22.51	130.49
308	50.69	72.90	3.00	0.90	33.21	128.22
309	50.86	51.20	1.60	0.30	52.45	125.11
310	51.02	32.50	1.50	0.00	52.26	123.30
311	51.18	60.00	1.80	1.40	45.77	124.76
312	51.35	83.10	2.30	-0.30	40.61	126.94
313	51.51	76.10	2.90	0.10	35.99	128.97
314	51.68	112.70	3.40	0.00	29.45	131.52
315	51.84	181.60	4.70	-0.50	23.79	133.74
316	52.00	202.00	5.40	1.50	21.61	135.50
317	52.17	207.30	6.10	1.50	21.65	136.01
318	52.33	199.40	5.70	1.50	22.52	135.67
319	52.50	173.60	4.90	1.50	21.11	134.95
320	52.66	209.70	4.50	1.40	19.07	134.92
321	52.82	241.80	5.30	1.30	17.06	135.70
322	52.99	254.30	5.90	0.80	17.20	136.71
323	53.15	250.60	6.50	0.80	17.81	137.21
324	53.32	247.80	6.50	0.80	18.15	137.28
325	53.48	249.80	6.20	0.80	18.41	137.28
326	53.64	244.80	6.60	0.80	19.05	137.27
327	53.81	228.10	6.50	0.90	20.23	137.24
328	53.97	219.60	6.40	0.80	23.89	137.28
329	54.14	236.20	6.90	0.70	23.33	137.28
330	54.30	263.00	7.50	0.50	22.71	137.28
331	54.46	262.60	7.70	0.40	22.37	137.28
332	54.63	265.40	7.60	0.30	22.24	137.28

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_c: Measured cone resistance (tsf)
f_s: Sleeve friction resistance (tsf)
u: Pore pressure (tsf)
Fines content: Percentage of fines in soil (%)
Unit weight: Bulk soil unit weight (pcf)

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
1	0.33	0.02	0.00	0.02	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
2	0.49	0.03	0.00	0.03	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
3	0.66	0.04	0.00	0.04	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
4	0.82	0.05	0.00	0.05	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
5	0.98	0.06	0.00	0.06	1.00	0.403	1.39	0.291	1.00	1.30	2.000	No
6	1.15	0.07	0.00	0.07	1.00	0.403	1.39	0.290	1.00	1.30	2.000	No
7	1.31	0.08	0.00	0.08	1.00	0.403	1.39	0.290	1.00	1.30	2.000	No
8	1.48	0.10	0.00	0.10	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
9	1.64	0.11	0.00	0.11	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
10	1.80	0.12	0.00	0.12	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
11	1.97	0.13	0.00	0.13	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
12	2.13	0.14	0.00	0.14	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
13	2.30	0.15	0.00	0.15	1.00	0.402	1.39	0.290	1.00	1.30	2.000	No
14	2.46	0.16	0.00	0.16	1.00	0.401	1.39	0.290	1.00	1.30	2.000	No
15	2.62	0.17	0.00	0.17	1.00	0.401	1.39	0.289	1.00	1.30	2.000	No
16	2.79	0.18	0.00	0.18	1.00	0.401	1.39	0.289	1.00	1.30	2.000	No
17	2.95	0.19	0.00	0.19	1.00	0.401	1.39	0.289	1.00	1.30	2.000	No
18	3.12	0.20	0.00	0.20	0.99	0.401	1.39	0.289	1.00	1.30	2.000	No
19	3.28	0.21	0.00	0.21	0.99	0.401	1.39	0.289	1.00	1.30	2.000	No
20	3.45	0.22	0.00	0.22	0.99	0.401	1.39	0.289	1.00	1.30	2.000	No
21	3.61	0.23	0.00	0.23	0.99	0.400	1.39	0.289	1.00	1.30	2.000	No
22	3.77	0.24	0.00	0.24	0.99	0.400	1.39	0.289	1.00	1.30	2.000	No
23	3.94	0.26	0.00	0.26	0.99	0.400	1.39	0.289	1.00	1.30	2.000	No
24	4.10	0.27	0.00	0.27	0.99	0.400	1.39	0.288	1.00	1.30	2.000	No
25	4.27	0.28	0.00	0.28	0.99	0.400	1.39	0.288	1.00	1.30	2.000	No
26	4.43	0.29	0.00	0.29	0.99	0.400	1.39	0.288	1.00	1.30	2.000	Yes
27	4.59	0.30	0.00	0.30	0.99	0.399	1.39	0.288	1.00	1.30	2.000	Yes
28	4.76	0.31	0.00	0.31	0.99	0.399	1.39	0.288	1.00	1.30	2.000	Yes
29	4.92	0.32	0.00	0.32	0.99	0.399	1.39	0.288	1.00	1.30	2.000	Yes
30	5.09	0.33	0.00	0.33	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
31	5.25	0.34	0.00	0.34	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
32	5.41	0.35	0.00	0.35	0.99	0.399	1.39	0.288	1.00	1.30	2.000	No
33	5.58	0.36	0.00	0.36	0.99	0.399	1.39	0.287	1.00	1.30	2.000	No
34	5.74	0.37	0.00	0.37	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
35	5.91	0.38	0.00	0.38	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
36	6.07	0.39	0.00	0.39	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
37	6.23	0.40	0.00	0.40	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
38	6.40	0.41	0.00	0.41	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
39	6.56	0.42	0.00	0.42	0.99	0.398	1.39	0.287	1.00	1.30	2.000	No
40	6.73	0.43	0.00	0.43	0.99	0.397	1.39	0.287	1.00	1.30	2.000	No
41	6.89	0.44	0.00	0.44	0.99	0.397	1.39	0.287	1.00	1.30	2.000	No
42	7.05	0.45	0.00	0.45	0.99	0.397	1.39	0.286	1.00	1.30	2.000	No
43	7.22	0.46	0.00	0.46	0.99	0.397	1.39	0.286	1.00	1.30	2.000	No
44	7.38	0.47	0.00	0.47	0.98	0.397	1.39	0.286	1.00	1.30	2.000	No
45	7.55	0.49	0.00	0.49	0.98	0.397	1.39	0.286	1.00	1.30	2.000	No
46	7.71	0.50	0.00	0.50	0.98	0.397	1.39	0.286	1.00	1.30	2.000	No
47	7.87	0.51	0.00	0.51	0.98	0.396	1.39	0.286	1.00	1.30	2.000	No
48	8.04	0.52	0.00	0.52	0.98	0.397	1.39	0.286	1.00	1.30	0.372	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
49	8.20	0.53	0.01	0.52	0.98	0.401	1.39	0.289	1.00	1.30	0.376	No
50	8.37	0.54	0.01	0.53	0.98	0.405	1.39	0.292	1.00	1.30	0.379	No
51	8.53	0.55	0.02	0.53	0.98	0.408	1.39	0.294	1.00	1.30	0.383	No
52	8.69	0.56	0.02	0.54	0.98	0.412	1.39	0.297	1.00	1.30	0.386	No
53	8.86	0.57	0.03	0.54	0.98	0.415	1.39	0.299	1.00	1.30	0.389	No
54	9.02	0.58	0.03	0.55	0.98	0.418	1.39	0.302	1.00	1.30	0.392	No
55	9.19	0.59	0.04	0.55	0.98	0.422	1.39	0.304	1.00	1.30	0.395	No
56	9.35	0.60	0.04	0.56	0.98	0.425	1.39	0.306	1.00	1.30	0.398	No
57	9.51	0.61	0.05	0.56	0.98	0.428	1.39	0.309	1.00	1.30	0.401	No
58	9.68	0.62	0.05	0.57	0.98	0.431	1.39	0.311	1.00	1.30	0.404	No
59	9.84	0.63	0.06	0.57	0.98	0.434	1.39	0.313	1.00	1.30	0.407	No
60	10.01	0.64	0.06	0.58	0.98	0.437	1.39	0.315	1.00	1.30	0.410	No
61	10.17	0.65	0.07	0.59	0.98	0.440	1.39	0.317	1.00	1.30	0.413	No
62	10.34	0.66	0.07	0.59	0.98	0.443	1.39	0.320	1.00	1.30	0.415	No
63	10.50	0.67	0.08	0.60	0.98	0.446	1.39	0.321	1.00	1.30	0.418	No
64	10.66	0.68	0.08	0.60	0.98	0.449	1.39	0.323	1.00	1.30	0.420	No
65	10.83	0.69	0.09	0.61	0.98	0.451	1.39	0.325	1.00	1.30	0.423	No
66	10.99	0.70	0.09	0.61	0.98	0.454	1.39	0.327	1.00	1.30	0.426	No
67	11.16	0.71	0.10	0.62	0.98	0.457	1.39	0.329	1.00	1.30	0.428	No
68	11.32	0.72	0.10	0.62	0.98	0.459	1.39	0.331	1.00	1.30	0.430	No
69	11.48	0.73	0.11	0.63	0.98	0.462	1.39	0.333	1.00	1.30	0.433	No
70	11.65	0.74	0.11	0.63	0.98	0.464	1.39	0.335	1.00	1.30	0.435	No
71	11.81	0.75	0.12	0.64	0.98	0.467	1.39	0.336	1.00	1.30	0.437	No
72	11.98	0.77	0.12	0.64	0.97	0.469	1.39	0.338	1.00	1.30	0.440	No
73	12.14	0.78	0.13	0.65	0.97	0.471	1.39	0.340	1.00	1.30	0.442	No
74	12.30	0.79	0.13	0.65	0.97	0.474	1.39	0.341	1.00	1.30	0.444	No
75	12.47	0.80	0.14	0.66	0.97	0.476	1.39	0.343	1.00	1.30	0.446	No
76	12.63	0.81	0.14	0.66	0.97	0.478	1.39	0.345	1.00	1.30	0.448	No
77	12.80	0.82	0.15	0.67	0.97	0.480	1.39	0.346	1.00	1.30	0.450	No
78	12.96	0.83	0.15	0.67	0.97	0.482	1.39	0.348	1.00	1.30	0.452	No
79	13.12	0.84	0.16	0.68	0.97	0.484	1.39	0.349	1.00	1.30	0.454	No
80	13.29	0.85	0.17	0.68	0.97	0.487	1.39	0.351	1.00	1.30	0.456	No
81	13.45	0.86	0.17	0.69	0.97	0.489	1.39	0.352	1.00	1.30	0.458	No
82	13.62	0.87	0.18	0.69	0.97	0.491	1.39	0.354	1.00	1.30	0.460	No
83	13.78	0.88	0.18	0.70	0.97	0.492	1.39	0.355	1.00	1.30	0.462	No
84	13.94	0.89	0.19	0.70	0.97	0.494	1.39	0.356	1.00	1.30	0.463	No
85	14.11	0.90	0.19	0.71	0.97	0.496	1.39	0.358	1.00	1.30	0.465	No
86	14.27	0.91	0.20	0.71	0.97	0.498	1.39	0.359	1.00	1.30	0.467	No
87	14.44	0.92	0.20	0.72	0.97	0.500	1.39	0.360	1.00	1.30	0.469	No
88	14.60	0.93	0.21	0.73	0.97	0.502	1.39	0.362	1.00	1.30	0.470	No
89	14.76	0.94	0.21	0.73	0.97	0.503	1.39	0.363	1.00	1.30	0.472	No
90	14.93	0.95	0.22	0.74	0.97	0.505	1.39	0.364	1.00	1.30	0.474	No
91	15.09	0.96	0.22	0.74	0.97	0.507	1.39	0.365	1.00	1.30	0.475	No
92	15.26	0.97	0.23	0.75	0.97	0.509	1.39	0.367	1.00	1.30	0.477	No
93	15.42	0.98	0.23	0.75	0.97	0.510	1.39	0.368	1.00	1.30	0.478	No
94	15.58	0.99	0.24	0.76	0.97	0.512	1.39	0.369	1.00	1.30	0.480	No
95	15.75	1.00	0.24	0.76	0.97	0.513	1.39	0.370	1.00	1.30	0.481	No
96	15.91	1.01	0.25	0.77	0.97	0.515	1.39	0.371	1.00	1.30	0.483	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
97	16.08	1.02	0.25	0.77	0.97	0.517	1.39	0.373	1.00	1.30	0.484	No
98	16.24	1.03	0.26	0.78	0.97	0.518	1.39	0.374	1.00	1.30	0.486	No
99	16.40	1.04	0.26	0.78	0.97	0.520	1.39	0.375	1.00	1.30	0.487	No
100	16.57	1.05	0.27	0.79	0.97	0.521	1.39	0.376	1.00	1.30	0.489	No
101	16.73	1.06	0.27	0.79	0.96	0.523	1.39	0.377	1.00	1.30	0.490	No
102	16.90	1.07	0.28	0.80	0.96	0.524	1.39	0.378	1.00	1.30	0.491	No
103	17.06	1.08	0.28	0.80	0.96	0.526	1.39	0.379	1.00	1.30	0.493	No
104	17.23	1.09	0.29	0.80	0.96	0.527	1.39	0.380	1.00	1.30	0.494	No
105	17.39	1.10	0.29	0.81	0.96	0.529	1.39	0.381	1.00	1.30	0.496	No
106	17.55	1.11	0.30	0.81	0.96	0.530	1.39	0.382	1.00	1.30	0.497	No
107	17.72	1.12	0.30	0.82	0.96	0.532	1.39	0.384	1.00	1.30	0.499	No
108	17.88	1.13	0.31	0.82	0.96	0.533	1.39	0.385	1.00	1.30	0.500	No
109	18.05	1.14	0.31	0.83	0.96	0.535	1.39	0.386	1.00	1.30	0.501	No
110	18.21	1.15	0.32	0.83	0.96	0.536	1.39	0.386	1.00	1.30	0.502	No
111	18.37	1.16	0.32	0.84	0.96	0.537	1.39	0.387	1.00	1.30	0.504	No
112	18.54	1.17	0.33	0.84	0.96	0.538	1.39	0.388	1.00	1.30	0.505	No
113	18.70	1.18	0.33	0.85	0.96	0.540	1.39	0.389	1.00	1.30	0.506	No
114	18.87	1.19	0.34	0.85	0.96	0.541	1.39	0.390	1.00	1.30	0.507	No
115	19.03	1.20	0.34	0.86	0.96	0.542	1.39	0.391	1.00	1.30	0.508	No
116	19.19	1.21	0.35	0.86	0.96	0.543	1.39	0.392	1.00	1.30	0.509	No
117	19.36	1.22	0.35	0.87	0.96	0.544	1.39	0.393	1.00	1.30	0.510	No
118	19.52	1.23	0.36	0.87	0.96	0.546	1.39	0.393	1.00	1.30	0.511	No
119	19.69	1.24	0.36	0.88	0.96	0.547	1.39	0.394	1.00	1.30	0.513	No
120	19.85	1.25	0.37	0.88	0.96	0.548	1.39	0.395	1.00	1.30	0.514	No
121	20.01	1.26	0.37	0.89	0.96	0.549	1.39	0.396	1.00	1.30	0.515	No
122	20.18	1.27	0.38	0.89	0.96	0.550	1.39	0.397	1.00	1.30	0.516	No
123	20.34	1.28	0.39	0.90	0.96	0.551	1.39	0.397	1.00	1.30	0.516	No
124	20.51	1.29	0.39	0.90	0.96	0.552	1.39	0.398	1.00	1.30	0.517	No
125	20.67	1.30	0.40	0.91	0.96	0.553	1.39	0.399	1.00	1.30	0.518	No
126	20.83	1.31	0.40	0.91	0.95	0.554	1.39	0.399	1.00	1.30	0.519	No
127	21.00	1.32	0.41	0.92	0.95	0.555	1.39	0.400	1.00	1.30	0.520	No
128	21.16	1.33	0.41	0.92	0.95	0.556	1.39	0.401	1.00	1.30	0.521	No
129	21.33	1.34	0.42	0.93	0.95	0.556	1.39	0.401	1.00	1.30	0.522	No
130	21.49	1.35	0.42	0.93	0.95	0.557	1.39	0.402	1.00	1.30	0.522	No
131	21.65	1.36	0.43	0.94	0.95	0.558	1.39	0.403	1.00	1.30	0.523	No
132	21.82	1.37	0.43	0.94	0.95	0.559	1.39	0.403	1.00	1.30	0.524	No
133	21.98	1.38	0.44	0.95	0.95	0.560	1.39	0.404	1.00	1.30	0.525	No
134	22.15	1.40	0.44	0.95	0.95	0.561	1.39	0.404	1.00	1.30	0.525	No
135	22.31	1.41	0.45	0.96	0.95	0.561	1.39	0.405	1.00	1.30	0.526	No
136	22.47	1.42	0.45	0.97	0.95	0.562	1.39	0.405	1.00	1.30	0.527	No
137	22.64	1.43	0.46	0.97	0.95	0.563	1.39	0.406	1.00	1.30	0.527	No
138	22.80	1.44	0.46	0.98	0.95	0.563	1.39	0.406	1.00	1.30	0.528	No
139	22.97	1.45	0.47	0.98	0.95	0.564	1.39	0.407	1.00	1.30	0.529	No
140	23.13	1.46	0.47	0.99	0.95	0.565	1.39	0.407	1.00	1.30	0.529	No
141	23.30	1.47	0.48	0.99	0.95	0.565	1.39	0.408	1.00	1.30	0.530	No
142	23.46	1.48	0.48	1.00	0.95	0.566	1.39	0.408	1.00	1.30	0.530	No
143	23.62	1.49	0.49	1.00	0.95	0.566	1.39	0.408	1.00	1.30	0.531	No
144	23.79	1.50	0.49	1.01	0.95	0.567	1.39	0.409	1.00	1.30	0.532	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
145	23.95	1.51	0.50	1.02	0.95	0.568	1.39	0.409	1.00	1.30	0.532	No
146	24.12	1.53	0.50	1.02	0.94	0.568	1.39	0.410	1.00	1.30	0.533	No
147	24.28	1.54	0.51	1.03	0.94	0.569	1.39	0.410	1.00	1.30	0.533	No
148	24.44	1.55	0.51	1.03	0.94	0.569	1.39	0.410	1.00	1.30	0.534	No
149	24.61	1.56	0.52	1.04	0.94	0.570	1.39	0.411	1.00	1.30	0.534	No
150	24.77	1.57	0.52	1.04	0.94	0.570	1.39	0.411	1.00	1.30	0.534	No
151	24.94	1.58	0.53	1.05	0.94	0.571	1.39	0.412	1.00	1.30	0.535	No
152	25.10	1.59	0.53	1.06	0.94	0.571	1.39	0.412	1.00	1.30	0.535	No
153	25.26	1.60	0.54	1.06	0.94	0.572	1.39	0.412	1.00	1.30	0.536	No
154	25.43	1.61	0.54	1.07	0.94	0.572	1.39	0.413	1.00	1.30	0.537	No
155	25.59	1.62	0.55	1.07	0.94	0.572	1.39	0.413	1.00	1.30	0.538	No
156	25.76	1.63	0.55	1.08	0.94	0.573	1.39	0.413	1.00	1.30	0.539	No
157	25.92	1.64	0.56	1.08	0.94	0.573	1.39	0.413	0.99	1.30	2.000	Yes
158	26.08	1.65	0.56	1.09	0.94	0.574	1.39	0.414	0.99	1.30	2.000	Yes
159	26.25	1.66	0.57	1.09	0.94	0.574	1.39	0.414	0.99	1.30	2.000	Yes
160	26.41	1.67	0.57	1.10	0.94	0.575	1.39	0.414	0.99	1.30	2.000	Yes
161	26.58	1.68	0.58	1.11	0.94	0.575	1.39	0.415	0.99	1.30	2.000	Yes
162	26.74	1.69	0.58	1.11	0.94	0.575	1.39	0.415	0.99	1.30	2.000	Yes
163	26.90	1.70	0.59	1.11	0.93	0.576	1.39	0.415	0.99	1.30	2.000	Yes
164	27.07	1.71	0.59	1.12	0.93	0.576	1.39	0.416	0.99	1.30	0.547	No
165	27.23	1.72	0.60	1.12	0.93	0.577	1.39	0.416	0.99	1.30	0.548	No
166	27.40	1.73	0.61	1.13	0.93	0.577	1.39	0.416	0.99	1.30	0.549	No
167	27.56	1.74	0.61	1.13	0.93	0.578	1.39	0.417	0.98	1.30	0.550	No
168	27.72	1.75	0.62	1.14	0.93	0.578	1.39	0.417	0.98	1.30	0.551	No
169	27.89	1.76	0.62	1.14	0.93	0.579	1.39	0.418	0.98	1.30	0.552	No
170	28.05	1.77	0.63	1.14	0.93	0.580	1.39	0.418	0.98	1.30	0.553	No
171	28.22	1.78	0.63	1.15	0.93	0.580	1.39	0.418	0.98	1.30	0.554	No
172	28.38	1.79	0.64	1.15	0.93	0.581	1.39	0.419	0.98	1.30	0.555	No
173	28.54	1.80	0.64	1.16	0.93	0.581	1.39	0.419	0.98	1.30	0.556	No
174	28.71	1.81	0.65	1.16	0.93	0.581	1.39	0.419	0.98	1.30	0.557	No
175	28.87	1.82	0.65	1.16	0.93	0.582	1.39	0.420	0.98	1.30	0.558	No
176	29.04	1.82	0.66	1.17	0.93	0.582	1.39	0.420	0.98	1.30	0.559	No
177	29.20	1.83	0.66	1.17	0.92	0.583	1.39	0.420	0.98	1.30	0.559	No
178	29.36	1.84	0.67	1.18	0.92	0.583	1.39	0.421	0.98	1.30	0.560	No
179	29.53	1.85	0.67	1.18	0.92	0.584	1.39	0.421	0.98	1.30	0.561	No
180	29.69	1.86	0.68	1.18	0.92	0.584	1.39	0.421	0.97	1.30	0.562	No
181	29.86	1.87	0.68	1.19	0.92	0.584	1.39	0.421	0.97	1.30	0.563	No
182	30.02	1.88	0.69	1.19	0.92	0.585	1.39	0.422	0.97	1.30	0.563	No
183	30.19	1.89	0.69	1.20	0.92	0.585	1.39	0.422	0.97	1.30	0.564	No
184	30.35	1.90	0.70	1.20	0.92	0.585	1.39	0.422	0.97	1.30	0.565	No
185	30.51	1.91	0.70	1.20	0.92	0.586	1.39	0.422	0.97	1.30	0.566	No
186	30.68	1.92	0.71	1.21	0.92	0.586	1.39	0.423	0.97	1.30	0.566	No
187	30.84	1.93	0.71	1.21	0.92	0.586	1.39	0.423	0.97	1.30	0.567	No
188	31.01	1.93	0.72	1.22	0.92	0.587	1.39	0.423	0.97	1.30	0.568	No
189	31.17	1.94	0.72	1.22	0.91	0.587	1.39	0.423	0.97	1.30	0.568	No
190	31.33	1.95	0.73	1.22	0.91	0.587	1.39	0.423	0.97	1.30	0.569	No
191	31.50	1.96	0.73	1.23	0.91	0.587	1.39	0.424	0.97	1.30	0.570	No
192	31.66	1.97	0.74	1.23	0.91	0.587	1.39	0.424	0.97	1.30	0.570	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
193	31.83	1.98	0.74	1.24	0.91	0.588	1.39	0.424	0.96	1.30	0.571	No
194	31.99	1.99	0.75	1.24	0.91	0.588	1.39	0.424	0.96	1.30	0.572	No
195	32.15	2.00	0.75	1.24	0.91	0.588	1.39	0.424	0.96	1.30	0.572	No
196	32.32	2.01	0.76	1.25	0.91	0.588	1.39	0.424	0.96	1.30	0.573	No
197	32.48	2.02	0.76	1.25	0.91	0.588	1.39	0.424	0.96	1.30	0.573	No
198	32.65	2.02	0.77	1.26	0.91	0.589	1.39	0.425	0.96	1.30	0.574	No
199	32.81	2.03	0.77	1.26	0.90	0.589	1.39	0.425	0.96	1.30	0.575	No
200	32.97	2.04	0.78	1.26	0.90	0.589	1.39	0.425	0.96	1.30	0.575	No
201	33.14	2.05	0.78	1.27	0.90	0.589	1.39	0.425	0.96	1.30	0.576	No
202	33.30	2.06	0.79	1.27	0.90	0.589	1.39	0.425	0.96	1.30	0.576	No
203	33.47	2.07	0.79	1.28	0.90	0.589	1.39	0.425	0.96	1.30	0.577	No
204	33.63	2.08	0.80	1.28	0.90	0.589	1.39	0.425	0.96	1.30	0.577	No
205	33.79	2.09	0.80	1.28	0.90	0.589	1.39	0.425	0.96	1.30	0.578	No
206	33.96	2.10	0.81	1.29	0.90	0.589	1.39	0.425	0.96	1.30	0.578	No
207	34.12	2.11	0.81	1.29	0.90	0.589	1.39	0.425	0.96	1.30	0.578	No
208	34.29	2.11	0.82	1.29	0.90	0.590	1.39	0.425	0.95	1.30	0.579	No
209	34.45	2.12	0.83	1.30	0.89	0.590	1.39	0.425	0.95	1.30	0.579	No
210	34.61	2.13	0.83	1.30	0.89	0.590	1.39	0.425	0.95	1.30	0.580	No
211	34.78	2.14	0.84	1.31	0.89	0.589	1.39	0.425	0.95	1.30	0.580	No
212	34.94	2.15	0.84	1.31	0.89	0.589	1.39	0.425	0.95	1.30	0.580	No
213	35.11	2.16	0.85	1.31	0.89	0.589	1.39	0.425	0.95	1.30	0.581	No
214	35.27	2.17	0.85	1.32	0.89	0.589	1.39	0.425	0.95	1.30	0.581	No
215	35.43	2.18	0.86	1.32	0.89	0.589	1.39	0.425	0.95	1.30	0.581	No
216	35.60	2.19	0.86	1.33	0.89	0.589	1.39	0.425	0.95	1.30	0.582	No
217	35.76	2.20	0.87	1.33	0.89	0.589	1.39	0.424	0.95	1.30	0.582	No
218	35.93	2.21	0.87	1.34	0.88	0.588	1.39	0.424	0.95	1.30	0.582	No
219	36.09	2.22	0.88	1.34	0.88	0.588	1.39	0.424	0.95	1.30	0.582	No
220	36.26	2.23	0.88	1.35	0.88	0.588	1.39	0.424	0.95	1.30	0.582	No
221	36.42	2.24	0.89	1.35	0.88	0.587	1.39	0.423	0.94	1.30	0.583	No
222	36.58	2.25	0.89	1.36	0.88	0.587	1.39	0.423	0.94	1.30	0.583	No
223	36.75	2.26	0.90	1.36	0.88	0.586	1.39	0.423	0.94	1.30	0.583	No
224	36.91	2.27	0.90	1.37	0.88	0.586	1.39	0.422	0.94	1.30	0.583	No
225	37.08	2.28	0.91	1.38	0.88	0.585	1.39	0.422	0.94	1.30	0.583	No
226	37.24	2.29	0.91	1.38	0.87	0.585	1.39	0.422	0.94	1.30	0.583	No
227	37.40	2.30	0.92	1.39	0.87	0.585	1.39	0.422	0.94	1.30	0.583	No
228	37.57	2.31	0.92	1.39	0.87	0.584	1.39	0.421	0.94	1.30	0.583	No
229	37.73	2.32	0.93	1.39	0.87	0.584	1.39	0.421	0.94	1.30	0.583	No
230	37.90	2.33	0.93	1.40	0.87	0.584	1.39	0.421	0.94	1.30	0.583	No
231	38.06	2.34	0.94	1.40	0.87	0.583	1.39	0.421	0.94	1.30	0.583	No
232	38.22	2.35	0.94	1.41	0.87	0.583	1.39	0.420	0.94	1.30	0.584	No
233	38.39	2.36	0.95	1.41	0.86	0.582	1.39	0.420	0.94	1.30	0.584	No
234	38.55	2.37	0.95	1.42	0.86	0.582	1.39	0.420	0.94	1.30	0.584	No
235	38.72	2.38	0.96	1.42	0.86	0.582	1.39	0.419	0.93	1.30	0.584	No
236	38.88	2.39	0.96	1.43	0.86	0.581	1.39	0.419	0.93	1.30	0.584	No
237	39.04	2.40	0.97	1.43	0.86	0.581	1.39	0.419	0.93	1.30	0.584	No
238	39.21	2.41	0.97	1.44	0.86	0.580	1.39	0.418	0.93	1.30	0.583	No
239	39.37	2.42	0.98	1.44	0.86	0.580	1.39	0.418	0.93	1.30	0.583	No
240	39.54	2.43	0.98	1.45	0.86	0.579	1.39	0.418	0.93	1.30	0.583	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
241	39.70	2.44	0.99	1.45	0.85	0.578	1.39	0.417	0.93	1.30	0.583	No
242	39.86	2.45	0.99	1.46	0.85	0.578	1.39	0.417	0.93	1.30	0.583	No
243	40.03	2.46	1.00	1.46	0.85	0.577	1.39	0.416	0.93	1.30	0.583	No
244	40.19	2.47	1.00	1.47	0.85	0.577	1.39	0.416	0.93	1.30	0.583	No
245	40.36	2.48	1.01	1.47	0.85	0.576	1.39	0.415	0.93	1.30	0.583	No
246	40.52	2.49	1.01	1.48	0.85	0.575	1.39	0.415	0.93	1.30	0.582	No
247	40.68	2.50	1.02	1.48	0.84	0.575	1.39	0.414	0.93	1.30	0.582	No
248	40.85	2.51	1.02	1.49	0.84	0.574	1.39	0.414	0.92	1.30	0.582	No
249	41.01	2.52	1.03	1.49	0.84	0.573	1.39	0.413	0.92	1.30	0.582	No
250	41.18	2.54	1.04	1.50	0.84	0.572	1.39	0.413	0.92	1.30	0.582	No
251	41.34	2.55	1.04	1.51	0.84	0.572	1.39	0.412	0.92	1.30	0.581	No
252	41.50	2.56	1.05	1.51	0.84	0.571	1.39	0.412	0.92	1.30	0.581	No
253	41.67	2.57	1.05	1.52	0.84	0.570	1.39	0.411	0.92	1.30	0.581	No
254	41.83	2.58	1.06	1.52	0.83	0.570	1.39	0.411	0.92	1.30	0.580	No
255	42.00	2.59	1.06	1.53	0.83	0.569	1.39	0.410	0.92	1.30	0.580	No
256	42.16	2.60	1.07	1.53	0.83	0.568	1.39	0.410	0.92	1.30	0.580	No
257	42.32	2.61	1.07	1.54	0.83	0.567	1.39	0.409	0.92	1.30	0.580	No
258	42.49	2.62	1.08	1.54	0.83	0.566	1.39	0.409	0.92	1.30	0.579	No
259	42.65	2.63	1.08	1.55	0.83	0.566	1.39	0.408	0.92	1.30	0.579	No
260	42.82	2.64	1.09	1.55	0.83	0.565	1.39	0.407	0.92	1.30	0.579	No
261	42.98	2.65	1.09	1.56	0.82	0.564	1.39	0.407	0.91	1.30	0.578	No
262	43.15	2.66	1.10	1.57	0.82	0.563	1.39	0.406	0.91	1.30	0.578	No
263	43.31	2.67	1.10	1.57	0.82	0.562	1.39	0.406	0.91	1.30	0.577	No
264	43.47	2.68	1.11	1.58	0.82	0.562	1.39	0.405	0.91	1.30	0.577	No
265	43.64	2.69	1.11	1.58	0.82	0.561	1.39	0.404	0.91	1.30	0.577	No
266	43.80	2.70	1.12	1.59	0.82	0.560	1.39	0.404	0.91	1.30	0.576	No
267	43.97	2.71	1.12	1.59	0.81	0.559	1.39	0.403	0.91	1.30	0.576	No
268	44.13	2.72	1.13	1.60	0.81	0.558	1.39	0.403	0.91	1.30	0.576	No
269	44.29	2.73	1.13	1.60	0.81	0.558	1.39	0.402	0.91	1.30	0.575	No
270	44.46	2.74	1.14	1.61	0.81	0.557	1.39	0.402	0.91	1.30	0.575	No
271	44.62	2.75	1.14	1.61	0.81	0.556	1.39	0.401	0.91	1.30	0.574	No
272	44.79	2.76	1.15	1.62	0.81	0.555	1.39	0.400	0.91	1.30	0.574	No
273	44.95	2.77	1.15	1.62	0.80	0.555	1.39	0.400	0.91	1.30	0.574	No
274	45.11	2.78	1.16	1.63	0.80	0.554	1.39	0.399	0.91	1.30	0.573	No
275	45.28	2.79	1.16	1.63	0.80	0.553	1.39	0.399	0.91	1.30	0.573	No
276	45.44	2.80	1.17	1.64	0.80	0.552	1.39	0.398	0.90	1.30	0.572	No
277	45.61	2.82	1.17	1.64	0.80	0.551	1.39	0.397	0.90	1.30	0.572	No
278	45.77	2.83	1.18	1.65	0.80	0.550	1.39	0.397	0.90	1.30	0.571	No
279	45.93	2.84	1.18	1.65	0.79	0.549	1.39	0.396	0.90	1.30	0.571	No
280	46.10	2.85	1.19	1.66	0.79	0.548	1.39	0.395	0.90	1.30	0.570	No
281	46.26	2.86	1.19	1.66	0.79	0.547	1.39	0.395	0.90	1.30	0.570	No
282	46.43	2.87	1.20	1.67	0.79	0.546	1.39	0.394	0.90	1.30	0.569	No
283	46.59	2.88	1.20	1.68	0.79	0.545	1.39	0.393	0.90	1.30	0.568	No
284	46.75	2.89	1.21	1.68	0.79	0.544	1.39	0.393	0.90	1.30	0.568	No
285	46.92	2.90	1.21	1.69	0.78	0.543	1.39	0.392	0.90	1.30	0.567	No
286	47.08	2.91	1.22	1.69	0.78	0.542	1.39	0.391	0.90	1.30	0.567	No
287	47.25	2.92	1.22	1.70	0.78	0.541	1.39	0.390	0.90	1.30	0.566	No
288	47.41	2.94	1.23	1.71	0.78	0.540	1.39	0.390	0.90	1.30	0.565	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
289	47.57	2.95	1.23	1.71	0.78	0.539	1.39	0.389	0.90	1.30	0.565	No
290	47.74	2.96	1.24	1.72	0.78	0.538	1.39	0.388	0.89	1.30	0.564	No
291	47.90	2.97	1.24	1.72	0.77	0.537	1.39	0.387	0.89	1.30	0.564	No
292	48.07	2.98	1.25	1.73	0.77	0.536	1.39	0.387	0.89	1.30	0.563	No
293	48.23	2.99	1.26	1.74	0.77	0.535	1.39	0.386	0.89	1.30	0.562	No
294	48.39	3.00	1.26	1.74	0.77	0.534	1.39	0.385	0.89	1.30	0.562	No
295	48.56	3.01	1.27	1.75	0.77	0.533	1.39	0.384	0.89	1.30	0.561	No
296	48.72	3.03	1.27	1.75	0.77	0.532	1.39	0.384	0.89	1.30	0.560	No
297	48.89	3.04	1.28	1.76	0.76	0.531	1.39	0.383	0.89	1.30	0.560	No
298	49.05	3.05	1.28	1.77	0.76	0.530	1.39	0.382	0.89	1.30	0.559	No
299	49.22	3.06	1.29	1.77	0.76	0.529	1.39	0.381	0.89	1.30	0.558	No
300	49.38	3.07	1.29	1.78	0.76	0.528	1.39	0.381	0.89	1.30	0.558	No
301	49.54	3.08	1.30	1.78	0.76	0.527	1.39	0.380	0.89	1.30	0.557	No
302	49.71	3.09	1.30	1.79	0.76	0.526	1.39	0.379	0.89	1.30	0.556	No
303	49.87	3.10	1.31	1.80	0.75	0.525	1.39	0.379	0.89	1.30	0.556	No
304	50.04	3.11	1.31	1.80	0.75	0.524	1.39	0.378	0.88	1.30	0.555	No
305	50.20	3.12	1.32	1.81	0.75	0.523	1.39	0.377	0.88	1.30	2.000	Yes
306	50.36	3.13	1.32	1.81	0.75	0.522	1.39	0.376	0.88	1.30	2.000	Yes
307	50.53	3.15	1.33	1.82	0.75	0.521	1.39	0.376	0.88	1.30	2.000	Yes
308	50.69	3.16	1.33	1.82	0.75	0.520	1.39	0.375	0.88	1.30	2.000	Yes
309	50.86	3.17	1.34	1.83	0.74	0.519	1.39	0.374	0.88	1.30	2.000	Yes
310	51.02	3.18	1.34	1.83	0.74	0.518	1.39	0.374	0.88	1.30	2.000	Yes
311	51.18	3.19	1.35	1.84	0.74	0.517	1.39	0.373	0.88	1.30	2.000	Yes
312	51.35	3.20	1.35	1.84	0.74	0.516	1.39	0.372	0.88	1.30	2.000	Yes
313	51.51	3.21	1.36	1.85	0.74	0.515	1.39	0.372	0.88	1.30	2.000	Yes
314	51.68	3.22	1.36	1.86	0.74	0.514	1.39	0.371	0.88	1.30	2.000	Yes
315	51.84	3.23	1.37	1.86	0.73	0.513	1.39	0.370	0.88	1.30	2.000	Yes
316	52.00	3.24	1.37	1.87	0.73	0.512	1.39	0.369	0.88	1.30	2.000	Yes
317	52.17	3.25	1.38	1.87	0.73	0.511	1.39	0.369	0.88	1.30	0.547	No
318	52.33	3.26	1.38	1.88	0.73	0.510	1.39	0.368	0.88	1.30	0.546	No
319	52.50	3.27	1.39	1.89	0.73	0.509	1.39	0.367	0.88	1.30	0.545	No
320	52.66	3.28	1.39	1.89	0.73	0.508	1.39	0.366	0.87	1.30	0.544	No
321	52.82	3.30	1.40	1.90	0.72	0.507	1.39	0.366	0.87	1.30	0.544	No
322	52.99	3.31	1.40	1.90	0.72	0.506	1.39	0.365	0.87	1.30	0.543	No
323	53.15	3.32	1.41	1.91	0.72	0.505	1.39	0.364	0.87	1.30	0.542	No
324	53.32	3.33	1.41	1.92	0.72	0.504	1.39	0.363	0.87	1.30	0.542	No
325	53.48	3.34	1.42	1.92	0.72	0.503	1.39	0.363	0.87	1.30	0.541	No
326	53.64	3.35	1.42	1.93	0.72	0.502	1.39	0.362	0.87	1.30	0.540	No
327	53.81	3.36	1.43	1.93	0.71	0.501	1.39	0.361	0.87	1.30	0.539	No
328	53.97	3.37	1.43	1.94	0.71	0.500	1.39	0.360	0.87	1.30	0.539	No
329	54.14	3.39	1.44	1.95	0.71	0.499	1.39	0.360	0.87	1.30	0.538	No
330	54.30	3.40	1.44	1.95	0.71	0.498	1.39	0.359	0.87	1.30	0.537	No
331	54.46	3.41	1.45	1.96	0.71	0.497	1.39	0.358	0.87	1.30	0.537	No
332	54.63	3.42	1.45	1.96	0.71	0.496	1.39	0.358	0.87	1.30	0.536	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
σ_v: Total overburden pressure at test point (tsf)
u_0: Water pressure at test point (tsf)
σ_v': Effective overburden pressure based on GWT during earthquake (tsf)
r_d: Nonlinear shear mass factor
CSR: Cyclic Stress Ratio
MSF: Magnitude Scaling Factor
CSR_{eq}: CSR adjusted for M=7.5
K_σ: Effective overburden stress factor
CSR^*: CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.33	53.26	2.37	3.88	0.78	85.54	2.21	189.10	4.000	No	No	2.00
2	0.49	69.03	2.30	3.86	0.75	110.85	1.95	216.57	4.000	No	No	2.00
3	0.66	77.06	2.29	4.03	0.75	123.74	1.91	235.80	4.000	No	No	2.00
4	0.82	87.16	2.24	3.86	0.73	139.95	1.77	247.88	4.000	No	No	2.00
5	0.98	97.06	2.22	3.95	0.72	155.84	1.72	267.97	4.000	No	No	2.00
6	1.15	109.22	2.22	4.28	0.72	175.37	1.72	301.23	4.000	No	No	2.00
7	1.31	119.72	2.25	4.93	0.73	192.22	1.80	346.15	4.000	No	No	2.00
8	1.48	119.32	2.29	5.45	0.75	191.55	1.91	366.51	4.000	No	No	2.00
9	1.64	108.72	2.33	5.83	0.76	174.50	2.07	360.48	4.000	No	No	2.00
10	1.80	95.95	2.38	6.05	0.78	153.98	2.22	342.27	4.000	No	No	2.00
11	1.97	88.32	2.39	5.97	0.79	141.69	2.28	323.25	4.000	No	No	2.00
12	2.13	83.39	2.40	5.81	0.79	133.75	2.30	307.16	4.000	No	No	2.00
13	2.30	77.89	2.40	5.57	0.79	124.89	2.31	287.99	4.000	No	No	2.00
14	2.46	71.32	2.41	5.39	0.79	114.33	2.35	268.39	4.000	No	No	2.00
15	2.62	64.69	2.43	5.27	0.80	103.65	2.42	251.06	4.000	No	No	2.00
16	2.79	60.72	2.43	5.01	0.80	97.26	2.42	235.28	4.000	No	No	2.00
17	2.95	51.32	2.47	5.02	0.82	82.14	2.63	215.93	4.000	No	No	2.00
18	3.12	43.78	2.49	4.67	0.82	70.02	2.73	190.88	4.000	No	No	2.00
19	3.28	37.58	2.55	4.91	0.85	60.04	3.04	182.81	4.000	No	No	2.00
20	3.45	46.45	2.47	4.62	0.82	74.27	2.63	195.16	4.000	No	No	2.00
21	3.61	54.65	2.43	4.72	0.80	87.42	2.45	214.56	4.000	No	No	2.00
22	3.77	57.81	2.41	4.63	0.79	92.49	2.36	218.48	4.000	No	No	2.00
23	3.94	52.68	2.44	4.64	0.80	84.23	2.48	208.50	4.000	No	No	2.00
24	4.10	46.91	2.46	4.50	0.81	74.95	2.58	193.13	4.000	No	No	2.00
25	4.27	44.58	2.45	4.14	0.81	71.18	2.52	179.17	4.000	No	No	2.00
26	4.43	43.45	2.43	3.78	0.80	69.34	2.42	167.98	4.000	Yes	No	2.00
27	4.59	45.15	2.33	2.90	0.76	72.06	2.05	147.65	4.000	Yes	No	2.00
28	4.76	50.58	2.24	2.39	0.73	80.77	1.76	141.91	4.000	Yes	No	2.00
29	4.92	59.18	2.16	2.21	0.70	94.57	1.58	149.53	4.000	Yes	No	2.00
30	5.09	70.28	2.16	2.57	0.70	112.38	1.58	177.34	4.000	No	No	2.00
31	5.25	78.11	2.17	2.91	0.70	124.95	1.60	200.42	4.000	No	No	2.00
32	5.41	83.21	2.18	3.14	0.71	133.13	1.62	215.94	4.000	No	No	2.00
33	5.58	85.87	2.19	3.27	0.71	137.39	1.64	224.85	4.000	No	No	2.00
34	5.74	93.21	2.17	3.30	0.70	149.16	1.59	237.77	4.000	No	No	2.00
35	5.91	105.11	2.15	3.41	0.69	168.26	1.55	260.88	4.000	No	No	2.00
36	6.07	110.54	2.17	3.72	0.70	176.97	1.59	281.74	4.000	No	No	2.00
37	6.23	102.67	2.22	4.07	0.72	164.31	1.71	281.58	4.000	No	No	2.00
38	6.40	84.97	2.31	4.57	0.75	135.86	1.97	267.84	4.000	No	No	2.00
39	6.56	72.54	2.37	4.90	0.78	115.87	2.20	255.03	4.000	No	No	2.00
40	6.73	69.64	2.39	5.06	0.79	111.19	2.29	254.21	4.000	No	No	2.00
41	6.89	73.17	2.38	5.00	0.78	116.85	2.22	259.28	4.000	No	No	2.00
42	7.05	78.64	2.34	4.78	0.77	125.61	2.09	262.71	4.000	No	No	2.00
43	7.22	81.74	2.32	4.59	0.76	130.57	2.01	262.46	4.000	No	No	2.00
44	7.38	81.57	2.30	4.36	0.75	130.29	1.95	254.16	4.000	No	No	2.00
45	7.55	77.87	2.30	4.22	0.75	124.33	1.95	242.94	4.000	No	No	2.00
46	7.71	76.00	2.29	4.06	0.75	121.31	1.93	234.33	4.000	No	No	2.00
47	7.87	74.03	2.29	3.94	0.75	118.13	1.92	227.03	4.000	No	No	2.00
48	8.04	72.70	2.29	3.83	0.75	115.97	1.91	221.10	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	72.87	2.26	3.50	0.74	114.14	1.83	208.55	4.000	No	No	2.00
50	8.37	78.40	2.22	3.21	0.72	119.72	1.71	204.89	4.000	No	No	2.00
51	8.53	84.63	2.20	3.21	0.71	127.04	1.67	212.28	4.000	No	No	2.00
52	8.69	89.46	2.21	3.41	0.72	132.84	1.69	224.89	4.000	No	No	2.00
53	8.86	87.23	2.25	3.73	0.73	128.85	1.80	231.51	4.000	No	No	2.00
54	9.02	81.36	2.28	3.80	0.74	119.27	1.87	223.45	4.000	No	No	2.00
55	9.19	70.26	2.34	4.02	0.77	102.80	2.07	212.46	4.000	No	No	2.00
56	9.35	63.16	2.37	4.10	0.78	91.85	2.21	202.56	4.000	No	No	2.00
57	9.51	59.06	2.40	4.22	0.79	85.21	2.33	198.15	0.804	No	No	2.00
58	9.68	58.43	2.39	3.98	0.79	82.92	2.28	188.81	0.706	No	No	1.75
59	9.84	56.83	2.39	3.80	0.78	79.54	2.26	179.97	0.622	No	No	1.53
60	10.01	53.16	2.41	3.81	0.79	73.69	2.36	173.62	0.567	No	No	1.38
61	10.17	48.96	2.46	4.07	0.81	67.54	2.56	173.06	0.562	No	No	1.36
62	10.34	44.60	2.51	4.32	0.83	61.17	2.80	171.12	0.546	No	No	1.31
63	10.50	42.29	2.52	4.24	0.84	57.37	2.86	164.31	0.493	No	No	1.18
64	10.66	41.49	2.51	4.00	0.83	55.49	2.82	156.40	0.436	No	No	1.04
65	10.83	42.43	2.48	3.67	0.82	55.78	2.68	149.28	0.389	No	No	0.92
66	10.99	45.46	2.45	3.50	0.81	58.85	2.53	148.81	0.386	No	No	0.91
67	11.16	50.13	2.41	3.37	0.80	63.85	2.37	151.34	0.402	No	No	0.94
68	11.32	54.76	2.39	3.33	0.79	68.80	2.26	155.70	0.431	No	No	1.00
69	11.48	58.26	2.35	3.13	0.77	72.12	2.13	153.90	0.419	No	No	0.97
70	11.65	60.70	2.34	3.06	0.77	74.18	2.08	154.12	0.420	No	No	0.97
71	11.81	62.46	2.33	3.02	0.76	75.49	2.05	154.57	0.423	No	No	0.97
72	11.98	63.83	2.34	3.12	0.77	76.39	2.07	158.05	0.447	No	No	1.02
73	12.14	64.60	2.34	3.13	0.77	76.55	2.07	158.63	0.451	No	No	1.02
74	12.30	65.37	2.33	3.10	0.76	76.66	2.06	157.73	0.445	No	No	1.00
75	12.47	66.30	2.33	3.05	0.76	76.91	2.04	156.79	0.438	No	No	0.98
76	12.63	67.50	2.32	3.05	0.76	77.54	2.03	157.31	0.442	No	No	0.99
77	12.80	68.57	2.32	3.05	0.76	77.97	2.02	157.79	0.445	No	No	0.99
78	12.96	69.40	2.32	3.06	0.76	78.18	2.03	158.35	0.449	No	No	0.99
79	13.12	70.04	2.32	3.03	0.76	78.15	2.02	157.55	0.444	No	No	0.98
80	13.29	70.87	2.32	3.00	0.76	78.29	2.00	156.70	0.438	No	No	0.96
81	13.45	72.67	2.31	2.97	0.75	79.53	1.98	157.16	0.441	No	No	0.96
82	13.62	76.90	2.29	2.94	0.75	83.30	1.92	160.01	0.461	No	No	1.00
83	13.78	82.17	2.28	2.99	0.74	88.22	1.89	166.54	0.510	No	No	1.10
84	13.94	85.04	2.28	3.09	0.75	90.55	1.90	171.70	0.551	No	No	1.19
85	14.11	83.77	2.30	3.22	0.75	88.48	1.96	173.32	0.564	No	No	1.21
86	14.27	80.27	2.33	3.32	0.76	84.13	2.04	171.68	0.551	No	No	1.18
87	14.44	77.24	2.35	3.41	0.77	80.27	2.12	170.07	0.537	No	No	1.15
88	14.60	74.74	2.35	3.30	0.77	76.98	2.12	163.55	0.487	No	No	1.04
89	14.76	71.57	2.36	3.21	0.77	73.08	2.15	157.05	0.440	No	No	0.93
90	14.93	67.57	2.36	3.05	0.78	68.34	2.16	147.93	0.381	No	No	0.80
91	15.09	63.77	2.40	3.18	0.79	63.99	2.29	146.73	0.374	No	No	0.79
92	15.26	61.84	2.41	3.23	0.79	61.50	2.36	145.22	0.365	No	No	0.77
93	15.42	61.01	2.43	3.33	0.80	60.19	2.43	146.25	0.371	No	No	0.78
94	15.58	59.84	2.44	3.40	0.81	58.55	2.49	146.02	0.370	No	No	0.77
95	15.75	56.94	2.47	3.52	0.82	55.21	2.63	144.93	0.363	No	No	0.75
96	15.91	53.54	2.51	3.68	0.83	51.46	2.80	144.13	0.358	No	No	0.74

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	49.98	2.54	3.81	0.84	47.56	2.99	142.05	0.347	No	No	0.72
98	16.24	46.54	2.58	3.96	0.86	43.87	3.19	140.01	0.335	No	No	0.69
99	16.40	42.61	2.62	4.09	0.87	39.76	3.44	136.73	4.000	No	Yes	2.00
100	16.57	36.61	2.68	4.22	0.90	33.72	3.85	129.66	4.000	No	Yes	2.00
101	16.73	28.48	2.78	4.38	0.93	25.78	4.58	118.04	4.000	No	Yes	2.00
102	16.90	20.35	2.90	4.50	0.98	17.96	5.71	102.55	4.000	No	Yes	2.00
103	17.06	15.13	3.01	4.51	1.00	12.97	6.87	89.13	4.000	No	Yes	2.00
104	17.23	13.87	3.04	4.44	1.00	11.70	7.23	84.52	4.000	No	Yes	2.00
105	17.39	15.97	2.98	4.26	1.00	13.50	6.55	88.42	4.000	No	Yes	2.00
106	17.55	19.67	2.91	4.31	0.99	16.72	5.83	97.48	4.000	No	Yes	2.00
107	17.72	23.43	2.86	4.33	0.96	19.95	5.28	105.35	4.000	No	Yes	2.00
108	17.88	26.49	2.78	3.81	0.93	22.54	4.61	103.98	4.000	No	Yes	2.00
109	18.05	30.19	2.71	3.44	0.91	25.66	4.06	104.04	4.000	No	Yes	2.00
110	18.21	35.31	2.63	3.12	0.88	30.02	3.51	105.28	4.000	No	Yes	2.00
111	18.37	39.67	2.61	3.29	0.87	33.62	3.37	113.21	4.000	No	Yes	2.00
112	18.54	42.47	2.59	3.31	0.86	35.80	3.25	116.52	0.227	No	No	0.45
113	18.70	43.07	2.60	3.42	0.86	36.05	3.30	118.96	0.237	No	No	0.47
114	18.87	42.81	2.62	3.60	0.87	35.51	3.42	121.60	4.000	No	Yes	2.00
115	19.03	42.68	2.63	3.70	0.88	35.12	3.49	122.73	4.000	No	Yes	2.00
116	19.19	45.08	2.59	3.50	0.86	36.94	3.29	121.56	0.247	No	No	0.49
117	19.36	49.84	2.53	3.08	0.84	40.79	2.90	118.36	0.234	No	No	0.46
118	19.52	55.44	2.47	2.83	0.81	45.33	2.60	118.05	0.233	No	No	0.46
119	19.69	59.42	2.44	2.75	0.80	48.39	2.47	119.59	0.239	No	No	0.47
120	19.85	62.38	2.43	2.78	0.80	50.56	2.42	122.59	0.251	No	No	0.49
121	20.01	64.12	2.42	2.81	0.80	51.67	2.41	124.47	0.259	No	No	0.50
122	20.18	65.72	2.42	2.84	0.80	52.63	2.40	126.29	0.267	No	No	0.52
123	20.34	67.59	2.42	2.87	0.80	53.83	2.38	128.05	0.275	No	No	0.53
124	20.51	70.59	2.41	2.93	0.79	55.90	2.36	131.91	0.293	No	No	0.57
125	20.67	73.02	2.41	2.97	0.79	57.52	2.34	134.61	0.307	No	No	0.59
126	20.83	74.29	2.41	3.01	0.79	58.17	2.34	136.28	0.315	No	No	0.61
127	21.00	74.79	2.41	2.99	0.79	58.19	2.33	135.81	0.313	No	No	0.60
128	21.16	76.39	2.39	2.93	0.79	59.15	2.29	135.26	0.310	No	No	0.60
129	21.33	80.19	2.37	2.83	0.78	61.88	2.19	135.60	0.312	No	No	0.60
130	21.49	85.85	2.33	2.64	0.76	66.20	2.04	135.00	0.309	No	No	0.59
131	21.65	92.45	2.30	2.60	0.75	71.14	1.95	138.62	0.328	No	No	0.63
132	21.82	97.42	2.29	2.64	0.75	74.63	1.92	143.08	0.352	No	No	0.67
133	21.98	101.58	2.30	2.79	0.75	77.37	1.94	150.10	0.394	No	No	0.75
134	22.15	104.58	2.30	2.88	0.75	79.19	1.95	154.15	0.421	No	No	0.80
135	22.31	108.25	2.29	2.87	0.75	81.62	1.92	156.43	0.436	No	No	0.83
136	22.47	112.22	2.28	2.86	0.74	84.28	1.88	158.72	0.452	No	No	0.86
137	22.64	116.32	2.27	2.84	0.74	86.99	1.85	160.97	0.468	No	No	0.89
138	22.80	119.98	2.26	2.87	0.74	89.33	1.84	163.99	0.490	No	No	0.93
139	22.97	123.25	2.26	2.87	0.74	91.32	1.82	166.12	0.506	No	No	0.96
140	23.13	127.22	2.25	2.89	0.73	93.86	1.80	169.08	0.530	No	No	1.00
141	23.30	130.05	2.24	2.88	0.73	95.50	1.78	170.36	0.540	No	No	1.02
142	23.46	129.45	2.25	2.92	0.73	94.46	1.81	170.52	0.541	No	No	1.02
143	23.62	124.68	2.27	2.98	0.74	90.23	1.86	168.06	0.521	No	No	0.98
144	23.79	120.21	2.30	3.09	0.75	86.18	1.94	167.24	0.515	No	No	0.97

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	23.95	120.21	2.31	3.17	0.75	85.60	1.98	169.07	0.529	No	No	1.00
146	24.12	124.78	2.30	3.22	0.75	88.45	1.96	173.30	0.564	No	No	1.06
147	24.28	130.45	2.30	3.26	0.75	92.12	1.93	178.25	0.607	No	No	1.14
148	24.44	132.58	2.28	3.15	0.74	93.36	1.89	176.46	0.591	No	No	1.11
149	24.61	131.48	2.25	2.87	0.73	92.45	1.81	167.23	0.515	No	No	0.96
150	24.77	129.48	2.23	2.66	0.73	90.84	1.75	159.31	0.456	No	No	0.85
151	24.94	125.84	2.24	2.63	0.73	87.71	1.77	155.44	0.429	No	No	0.80
152	25.10	122.74	2.26	2.70	0.74	84.87	1.82	154.65	0.424	No	No	0.79
153	25.26	118.31	2.27	2.66	0.74	81.26	1.85	150.01	0.394	No	No	0.73
154	25.43	121.61	2.24	2.50	0.73	83.49	1.77	147.69	0.380	No	No	0.71
155	25.59	131.34	2.20	2.39	0.71	90.38	1.67	150.99	0.400	No	No	0.74
156	25.76	140.47	2.17	2.28	0.70	96.83	1.59	153.77	0.418	No	No	0.78
157	25.92	137.11	2.17	2.24	0.70	94.01	1.59	149.92	4.000	Yes	No	2.00
158	26.08	119.41	2.22	2.26	0.72	80.67	1.71	138.34	4.000	Yes	No	2.00
159	26.25	95.87	2.31	2.37	0.75	63.26	1.98	125.00	4.000	Yes	No	2.00
160	26.41	75.37	2.42	2.62	0.80	48.28	2.41	116.52	4.000	Yes	No	2.00
161	26.58	58.61	2.57	3.10	0.85	36.17	3.13	113.05	4.000	Yes	No	2.00
162	26.74	43.51	2.74	3.91	0.92	25.61	4.33	110.94	4.000	Yes	Yes	2.00
163	26.90	31.74	2.91	4.55	0.98	17.77	5.78	102.65	4.000	Yes	Yes	2.00
164	27.07	23.24	3.06	5.11	1.00	12.55	7.39	92.82	4.000	No	Yes	2.00
165	27.23	20.03	3.09	4.73	1.00	10.62	7.83	83.20	4.000	No	Yes	2.00
166	27.40	17.93	3.13	4.53	1.00	9.34	8.25	77.04	4.000	No	Yes	2.00
167	27.56	16.43	3.13	4.08	1.00	8.43	8.37	70.54	4.000	No	Yes	2.00
168	27.72	15.24	3.13	3.46	1.00	7.70	8.25	63.53	4.000	No	Yes	2.00
169	27.89	14.04	3.15	3.26	1.00	6.97	8.53	59.46	4.000	No	Yes	2.00
170	28.05	13.87	3.16	3.31	1.00	6.84	8.67	59.26	4.000	No	Yes	2.00
171	28.22	14.77	3.17	3.85	1.00	7.30	8.85	64.60	4.000	No	Yes	2.00
172	28.38	15.61	3.17	4.10	1.00	7.73	8.79	67.91	4.000	No	Yes	2.00
173	28.54	15.44	3.18	4.15	1.00	7.59	8.92	67.69	4.000	No	Yes	2.00
174	28.71	13.94	3.22	4.12	1.00	6.72	9.49	63.77	4.000	No	Yes	2.00
175	28.87	12.75	3.23	3.66	1.00	6.02	9.64	58.05	4.000	No	Yes	2.00
176	29.04	12.31	3.23	3.50	1.00	5.75	9.73	55.91	4.000	No	Yes	2.00
177	29.20	12.72	3.21	3.37	1.00	5.93	9.44	56.01	4.000	No	Yes	2.00
178	29.36	13.32	3.20	3.49	1.00	6.23	9.30	57.94	4.000	No	Yes	2.00
179	29.53	14.32	3.19	3.74	1.00	6.73	9.15	61.61	4.000	No	Yes	2.00
180	29.69	14.85	3.20	4.11	1.00	6.98	9.29	64.84	4.000	No	Yes	2.00
181	29.86	14.88	3.22	4.35	1.00	6.96	9.51	66.18	4.000	No	Yes	2.00
182	30.02	14.45	3.23	4.24	1.00	6.69	9.62	64.34	4.000	No	Yes	2.00
183	30.19	14.62	3.20	3.93	1.00	6.74	9.31	62.75	4.000	No	Yes	2.00
184	30.35	14.96	3.19	3.83	1.00	6.88	9.12	62.75	4.000	No	Yes	2.00
185	30.51	15.06	3.19	3.80	1.00	6.90	9.08	62.66	4.000	No	Yes	2.00
186	30.68	14.56	3.21	3.95	1.00	6.60	9.44	62.29	4.000	No	Yes	2.00
187	30.84	13.66	3.24	3.98	1.00	6.10	9.87	60.16	4.000	No	Yes	2.00
188	31.01	13.29	3.25	3.81	1.00	5.87	9.92	58.24	4.000	No	Yes	2.00
189	31.17	13.13	3.26	3.87	1.00	5.76	10.08	58.01	4.000	No	Yes	2.00
190	31.33	13.63	3.27	4.28	1.00	5.98	10.24	61.22	4.000	No	Yes	2.00
191	31.50	13.63	3.30	4.86	1.00	5.95	10.74	63.88	4.000	No	Yes	2.00
192	31.66	13.63	3.29	4.57	1.00	5.92	10.54	62.36	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	31.83	13.27	3.28	4.14	1.00	5.70	10.37	59.09	4.000	No	Yes	2.00
194	31.99	13.17	3.25	3.58	1.00	5.62	9.93	55.79	4.000	No	Yes	2.00
195	32.15	13.03	3.26	3.62	1.00	5.52	10.06	55.59	4.000	No	Yes	2.00
196	32.32	12.73	3.25	3.42	1.00	5.34	10.04	53.65	4.000	No	Yes	2.00
197	32.48	12.17	3.27	3.28	1.00	5.04	10.22	51.48	4.000	No	Yes	2.00
198	32.65	11.74	3.27	3.09	1.00	4.80	10.28	49.32	4.000	No	Yes	2.00
199	32.81	12.00	3.28	3.34	1.00	4.90	10.43	51.15	4.000	No	Yes	2.00
200	32.97	12.70	3.26	3.44	1.00	5.22	10.19	53.18	4.000	No	Yes	2.00
201	33.14	13.47	3.25	3.50	1.00	5.57	9.90	55.13	4.000	No	Yes	2.00
202	33.30	13.81	3.23	3.41	1.00	5.70	9.68	55.19	4.000	No	Yes	2.00
203	33.47	14.14	3.22	3.31	1.00	5.83	9.47	55.24	4.000	No	Yes	2.00
204	33.63	14.71	3.21	3.43	1.00	6.08	9.38	56.97	4.000	No	Yes	2.00
205	33.79	16.31	3.14	3.05	1.00	6.81	8.43	57.43	4.000	No	Yes	2.00
206	33.96	16.34	3.12	2.81	1.00	6.79	8.20	55.68	4.000	No	Yes	2.00
207	34.12	15.78	3.11	2.44	1.00	6.49	8.00	51.93	4.000	No	Yes	2.00
208	34.29	14.48	3.14	2.43	1.00	5.85	8.49	49.62	4.000	No	Yes	2.00
209	34.45	14.95	3.17	2.86	1.00	6.04	8.82	53.26	4.000	No	Yes	2.00
210	34.61	15.05	3.22	3.61	1.00	6.06	9.57	57.95	4.000	No	Yes	2.00
211	34.78	16.11	3.22	4.06	1.00	6.52	9.59	62.54	4.000	No	Yes	2.00
212	34.94	15.82	3.25	4.39	1.00	6.35	10.01	63.58	4.000	No	Yes	2.00
213	35.11	19.05	3.14	3.75	1.00	7.82	8.44	65.96	4.000	No	Yes	2.00
214	35.27	20.75	3.12	3.95	1.00	8.56	8.18	70.09	4.000	No	Yes	2.00
215	35.43	23.46	3.08	4.07	1.00	9.76	7.71	75.25	4.000	No	Yes	2.00
216	35.60	23.82	3.11	4.62	1.00	9.88	8.07	79.71	4.000	No	Yes	2.00
217	35.76	27.72	3.06	4.70	1.00	11.61	7.44	86.37	4.000	No	Yes	2.00
218	35.93	40.51	2.87	4.00	0.97	17.72	5.44	96.44	4.000	No	Yes	2.00
219	36.09	54.23	2.75	3.78	0.92	24.83	4.34	107.74	4.000	No	Yes	2.00
220	36.26	64.95	2.68	3.83	0.90	30.34	3.88	117.68	4.000	No	Yes	2.00
221	36.42	75.28	2.64	3.88	0.88	35.66	3.56	126.80	4.000	No	Yes	2.00
222	36.58	83.25	2.60	3.91	0.87	39.77	3.35	133.36	4.000	No	Yes	2.00
223	36.75	86.02	2.60	3.98	0.87	41.00	3.33	136.45	4.000	No	Yes	2.00
224	36.91	72.06	2.70	4.49	0.91	32.99	4.03	132.91	4.000	No	Yes	2.00
225	37.08	56.93	2.82	4.94	0.95	24.86	4.98	123.75	4.000	No	Yes	2.00
226	37.24	44.03	2.95	5.35	1.00	18.23	6.16	112.30	4.000	No	Yes	2.00
227	37.40	34.26	3.03	5.32	1.00	13.88	7.13	98.94	4.000	No	Yes	2.00
228	37.57	25.04	3.16	5.57	1.00	9.82	8.74	85.90	4.000	No	Yes	2.00
229	37.73	18.31	3.29	5.63	1.00	6.89	10.53	72.51	4.000	No	Yes	2.00
230	37.90	16.68	3.31	5.34	1.00	6.15	10.93	67.25	4.000	No	Yes	2.00
231	38.06	16.75	3.30	5.09	1.00	6.15	10.74	66.08	4.000	No	Yes	2.00
232	38.22	17.32	3.28	4.90	1.00	6.37	10.41	66.26	4.000	No	Yes	2.00
233	38.39	17.82	3.28	5.18	1.00	6.55	10.47	68.55	4.000	No	Yes	2.00
234	38.55	18.89	3.28	5.65	1.00	6.97	10.48	73.06	4.000	No	Yes	2.00
235	38.72	24.85	3.16	5.19	1.00	9.44	8.67	81.87	4.000	No	Yes	2.00
236	38.88	36.54	2.97	4.29	1.00	14.29	6.36	90.96	4.000	No	Yes	2.00
237	39.04	47.85	2.83	3.89	0.95	19.67	5.05	99.28	4.000	No	Yes	2.00
238	39.21	50.53	2.82	4.02	0.95	20.80	4.97	103.27	4.000	No	Yes	2.00
239	39.37	49.85	2.84	4.22	0.96	20.28	5.16	104.66	4.000	No	Yes	2.00
240	39.54	51.64	2.83	4.20	0.95	21.04	5.04	106.08	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	39.70	56.11	2.78	3.98	0.94	23.20	4.63	107.48	4.000	No	Yes	2.00
242	39.86	59.44	2.76	3.92	0.93	24.74	4.43	109.56	4.000	No	Yes	2.00
243	40.03	63.83	2.71	3.69	0.91	26.91	4.09	109.98	4.000	No	Yes	2.00
244	40.19	70.86	2.65	3.41	0.88	30.52	3.64	111.01	4.000	No	Yes	2.00
245	40.36	77.11	2.60	3.22	0.87	33.71	3.32	111.98	0.211	No	No	0.36
246	40.52	79.93	2.60	3.31	0.86	34.88	3.31	115.38	0.223	No	No	0.38
247	40.68	81.39	2.61	3.51	0.87	35.26	3.39	119.47	4.000	No	Yes	2.00
248	40.85	82.47	2.62	3.67	0.87	35.47	3.46	122.72	4.000	No	Yes	2.00
249	41.01	83.93	2.61	3.64	0.87	36.07	3.41	123.13	4.000	No	Yes	2.00
250	41.18	85.12	2.60	3.55	0.87	36.60	3.34	122.16	4.000	No	Yes	2.00
251	41.34	85.38	2.59	3.46	0.86	36.69	3.29	120.56	0.243	No	No	0.42
252	41.50	83.61	2.61	3.54	0.87	35.58	3.39	120.46	4.000	No	Yes	2.00
253	41.67	79.37	2.64	3.69	0.88	33.20	3.61	119.77	4.000	No	Yes	2.00
254	41.83	75.60	2.67	3.79	0.89	31.16	3.80	118.35	4.000	No	Yes	2.00
255	42.00	75.20	2.67	3.67	0.89	30.94	3.75	116.06	4.000	No	Yes	2.00
256	42.16	79.90	2.62	3.41	0.87	33.34	3.45	114.95	4.000	No	Yes	2.00
257	42.32	86.27	2.58	3.27	0.86	36.46	3.20	116.59	0.227	No	No	0.39
258	42.49	91.33	2.55	3.23	0.85	38.84	3.06	118.93	0.236	No	No	0.41
259	42.65	94.56	2.55	3.34	0.85	40.13	3.06	122.65	0.252	No	No	0.43
260	42.82	99.40	2.52	3.17	0.84	42.59	2.87	122.28	0.250	No	No	0.43
261	42.98	102.26	2.49	3.01	0.83	44.10	2.74	120.70	0.244	No	No	0.42
262	43.15	100.50	2.48	2.86	0.82	43.31	2.69	116.55	0.227	No	No	0.39
263	43.31	95.50	2.53	3.05	0.84	40.37	2.90	117.18	0.230	No	No	0.40
264	43.47	90.43	2.57	3.30	0.86	37.40	3.17	118.53	0.235	No	No	0.41
265	43.64	77.93	2.68	3.81	0.90	30.80	3.84	118.14	4.000	No	Yes	2.00
266	43.80	57.97	2.84	4.40	0.96	21.27	5.13	109.11	4.000	No	Yes	2.00
267	43.97	35.77	3.10	5.75	1.00	12.18	7.91	96.38	4.000	No	Yes	2.00
268	44.13	29.80	3.12	4.80	1.00	9.94	8.17	81.19	4.000	No	Yes	2.00
269	44.29	35.97	2.97	3.61	1.00	12.16	6.47	78.62	4.000	No	Yes	2.00
270	44.46	41.77	2.86	2.99	0.97	14.70	5.31	78.12	4.000	No	Yes	2.00
271	44.62	39.34	2.93	3.46	0.99	13.38	6.00	80.31	4.000	No	Yes	2.00
272	44.79	30.24	3.09	4.37	1.00	9.94	7.85	78.08	4.000	No	Yes	2.00
273	44.95	25.60	3.22	5.40	1.00	8.23	9.46	77.91	4.000	No	Yes	2.00
274	45.11	35.31	3.06	4.71	1.00	11.69	7.42	86.74	4.000	No	Yes	2.00
275	45.28	71.81	2.66	3.14	0.89	27.53	3.71	102.04	4.000	No	Yes	2.00
276	45.44	114.65	2.42	2.62	0.80	48.55	2.41	116.79	0.228	No	No	0.40
277	45.61	142.50	2.33	2.51	0.76	62.59	2.04	127.88	0.275	No	No	0.48
278	45.77	130.78	2.41	2.87	0.79	55.53	2.34	129.84	0.284	No	No	0.50
279	45.93	106.28	2.53	3.32	0.84	42.68	2.94	125.51	0.264	No	No	0.46
280	46.10	98.24	2.56	3.25	0.85	38.89	3.07	119.36	0.238	No	No	0.42
281	46.26	123.83	2.38	2.51	0.78	52.46	2.25	118.02	0.233	No	No	0.41
282	46.43	158.06	2.26	2.23	0.74	70.45	1.82	128.04	0.275	No	No	0.48
283	46.59	186.17	2.21	2.31	0.72	84.54	1.69	143.21	0.353	No	No	0.62
284	46.75	199.94	2.21	2.49	0.72	90.69	1.70	154.12	0.420	No	No	0.74
285	46.92	215.77	2.19	2.52	0.71	98.57	1.65	162.60	0.480	No	No	0.85
286	47.08	226.39	2.18	2.57	0.71	103.69	1.63	168.82	0.527	No	No	0.93
287	47.25	234.80	2.16	2.50	0.70	108.29	1.58	171.20	0.547	No	No	0.97
288	47.41	242.35	2.15	2.48	0.69	112.21	1.55	174.20	0.572	No	No	1.01

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	47.57	253.06	2.14	2.48	0.69	117.67	1.52	179.39	0.617	No	No	1.09
290	47.74	265.15	2.14	2.59	0.69	123.06	1.53	188.18	0.700	No	No	1.24
291	47.90	272.35	2.15	2.75	0.70	125.60	1.56	195.59	0.776	No	No	1.38
292	48.07	270.22	2.17	2.87	0.70	123.49	1.60	197.50	0.796	No	No	1.42
293	48.23	256.75	2.20	2.99	0.72	115.62	1.68	193.83	0.757	No	No	1.35
294	48.39	236.15	2.24	3.06	0.73	104.64	1.77	184.95	0.668	No	No	1.19
295	48.56	215.69	2.27	3.07	0.74	94.14	1.86	174.80	0.577	No	No	1.03
296	48.72	200.93	2.29	3.03	0.75	86.83	1.91	166.25	0.507	No	No	0.91
297	48.89	188.98	2.30	2.96	0.75	81.06	1.95	158.35	0.449	No	No	0.80
298	49.05	176.00	2.30	2.78	0.75	75.22	1.96	147.45	0.378	No	No	0.68
299	49.22	168.95	2.28	2.47	0.74	72.78	1.88	136.74	0.318	No	No	0.57
300	49.38	166.71	2.24	2.16	0.73	72.87	1.76	128.23	0.276	No	No	0.49
301	49.54	184.12	2.15	1.84	0.69	83.43	1.54	128.79	0.279	No	No	0.50
302	49.71	200.59	2.08	1.67	0.67	93.21	1.42	132.61	0.297	No	No	0.53
303	49.87	216.28	2.03	1.56	0.65	102.48	1.34	137.76	0.323	No	No	0.58
304	50.04	216.19	2.04	1.60	0.65	101.99	1.36	138.25	0.326	No	No	0.59
305	50.20	209.59	2.05	1.58	0.66	98.36	1.37	134.63	4.000	Yes	No	2.00
306	50.36	188.83	2.11	1.71	0.68	86.13	1.48	127.32	4.000	Yes	No	2.00
307	50.53	142.60	2.30	2.18	0.75	59.96	1.95	116.81	4.000	Yes	No	2.00
308	50.69	92.90	2.56	2.86	0.85	34.80	3.06	106.60	4.000	Yes	No	2.00
309	50.86	52.21	2.91	4.15	0.98	16.49	5.77	95.14	4.000	Yes	Yes	2.00
310	51.02	47.91	2.90	3.65	0.98	15.04	5.74	86.30	4.000	Yes	Yes	2.00
311	51.18	58.54	2.80	3.37	0.94	19.39	4.75	92.12	4.000	Yes	Yes	2.00
312	51.35	73.07	2.70	3.34	0.91	25.39	4.02	102.00	4.000	Yes	Yes	2.00
313	51.51	90.63	2.61	3.28	0.87	32.88	3.41	112.02	4.000	Yes	Yes	2.00
314	51.68	123.46	2.47	3.05	0.82	47.79	2.63	125.73	4.000	Yes	No	2.00
315	51.84	165.44	2.33	2.77	0.76	68.07	2.06	140.32	4.000	Yes	No	2.00
316	52.00	196.98	2.28	2.79	0.74	83.13	1.87	155.57	4.000	Yes	No	2.00
317	52.17	202.92	2.28	2.87	0.74	85.51	1.87	160.32	0.463	No	No	0.85
318	52.33	193.45	2.30	2.93	0.75	80.56	1.95	156.97	0.440	No	No	0.81
319	52.50	194.25	2.26	2.64	0.74	82.05	1.83	150.19	0.395	No	No	0.72
320	52.66	208.39	2.20	2.39	0.71	90.13	1.67	150.73	0.398	No	No	0.73
321	52.82	235.28	2.14	2.26	0.69	104.42	1.53	160.05	0.461	No	No	0.85
322	52.99	248.91	2.14	2.40	0.69	110.19	1.54	169.93	0.536	No	No	0.99
323	53.15	250.91	2.16	2.54	0.70	110.07	1.58	174.23	0.572	No	No	1.05
324	53.32	249.41	2.17	2.60	0.70	108.77	1.61	174.74	0.576	No	No	1.06
325	53.48	247.48	2.18	2.64	0.71	107.42	1.62	174.52	0.574	No	No	1.06
326	53.64	240.91	2.20	2.71	0.71	103.55	1.67	173.05	0.562	No	No	1.04
327	53.81	230.85	2.24	2.86	0.73	97.61	1.76	171.82	0.552	No	No	1.02
328	53.97	227.98	2.34	2.94	1.00	71.57	2.07	148.24	0.383	No	No	0.71
329	54.14	239.61	2.32	2.94	1.00	75.12	2.02	151.74	0.405	No	No	0.75
330	54.30	253.94	2.31	2.94	1.00	79.53	1.97	156.31	0.435	No	No	0.81
331	54.46	262.74	2.30	2.94	1.00	82.16	1.94	159.04	0.454	No	No	0.85
332	54.63	264.47	2.29	2.92	1.00	82.54	1.92	158.87	0.453	No	No	0.85

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
I_c: Soil behavior type index
Fr: Normalized friction ratio (%)
n: Stress exponent
Q_{tn}: Normalized cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Normalized and adjusted cone resistance
$CRR_{7.5}$: Cyclic resistance ratio for M_w=7.5
FS: Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.33	2.00	0.00	9.95	0.16	0.00	0.49	2.00	0.00	9.93	0.16	0.00
0.66	2.00	0.00	9.90	0.17	0.00	0.82	2.00	0.00	9.88	0.16	0.00
0.98	2.00	0.00	9.85	0.16	0.00	1.15	2.00	0.00	9.82	0.17	0.00
1.31	2.00	0.00	9.80	0.16	0.00	1.48	2.00	0.00	9.77	0.17	0.00
1.64	2.00	0.00	9.75	0.16	0.00	1.80	2.00	0.00	9.73	0.16	0.00
1.97	2.00	0.00	9.70	0.17	0.00	2.13	2.00	0.00	9.68	0.16	0.00
2.30	2.00	0.00	9.65	0.17	0.00	2.46	2.00	0.00	9.63	0.16	0.00
2.62	2.00	0.00	9.60	0.16	0.00	2.79	2.00	0.00	9.57	0.17	0.00
2.95	2.00	0.00	9.55	0.16	0.00	3.12	2.00	0.00	9.52	0.17	0.00
3.28	2.00	0.00	9.50	0.16	0.00	3.45	2.00	0.00	9.47	0.17	0.00
3.61	2.00	0.00	9.45	0.16	0.00	3.77	2.00	0.00	9.43	0.16	0.00
3.94	2.00	0.00	9.40	0.17	0.00	4.10	2.00	0.00	9.38	0.16	0.00
4.27	2.00	0.00	9.35	0.17	0.00	4.43	2.00	0.00	9.32	0.16	0.00
4.59	2.00	0.00	9.30	0.16	0.00	4.76	2.00	0.00	9.27	0.17	0.00
4.92	2.00	0.00	9.25	0.16	0.00	5.09	2.00	0.00	9.22	0.17	0.00
5.25	2.00	0.00	9.20	0.16	0.00	5.41	2.00	0.00	9.18	0.16	0.00
5.58	2.00	0.00	9.15	0.17	0.00	5.74	2.00	0.00	9.13	0.16	0.00
5.91	2.00	0.00	9.10	0.17	0.00	6.07	2.00	0.00	9.07	0.16	0.00
6.23	2.00	0.00	9.05	0.16	0.00	6.40	2.00	0.00	9.02	0.17	0.00
6.56	2.00	0.00	9.00	0.16	0.00	6.73	2.00	0.00	8.97	0.17	0.00
6.89	2.00	0.00	8.95	0.16	0.00	7.05	2.00	0.00	8.93	0.16	0.00
7.22	2.00	0.00	8.90	0.17	0.00	7.38	2.00	0.00	8.88	0.16	0.00
7.55	2.00	0.00	8.85	0.17	0.00	7.71	2.00	0.00	8.82	0.16	0.00
7.87	2.00	0.00	8.80	0.16	0.00	8.04	2.00	0.00	8.77	0.17	0.00
8.20	2.00	0.00	8.75	0.16	0.00	8.37	2.00	0.00	8.72	0.17	0.00
8.53	2.00	0.00	8.70	0.16	0.00	8.69	2.00	0.00	8.68	0.16	0.00
8.86	2.00	0.00	8.65	0.17	0.00	9.02	2.00	0.00	8.63	0.16	0.00
9.19	2.00	0.00	8.60	0.17	0.00	9.35	2.00	0.00	8.58	0.16	0.00
9.51	2.00	0.00	8.55	0.16	0.00	9.68	1.75	0.00	8.52	0.17	0.00
9.84	1.53	0.00	8.50	0.16	0.00	10.01	1.38	0.00	8.47	0.17	0.00
10.17	1.36	0.00	8.45	0.16	0.00	10.34	1.31	0.00	8.42	0.17	0.00
10.50	1.18	0.00	8.40	0.16	0.00	10.66	1.04	0.00	8.38	0.16	0.00
10.83	0.92	0.08	8.35	0.17	0.03	10.99	0.91	0.09	8.33	0.16	0.04
11.16	0.94	0.06	8.30	0.17	0.03	11.32	1.00	0.00	8.27	0.16	0.00
11.48	0.97	0.03	8.25	0.16	0.01	11.65	0.97	0.03	8.22	0.17	0.01
11.81	0.97	0.03	8.20	0.16	0.01	11.98	1.02	0.00	8.17	0.17	0.00
12.14	1.02	0.00	8.15	0.16	0.00	12.30	1.00	0.00	8.13	0.16	0.00
12.47	0.98	0.02	8.10	0.17	0.01	12.63	0.99	0.01	8.08	0.16	0.01
12.80	0.99	0.01	8.05	0.17	0.00	12.96	0.99	0.01	8.02	0.16	0.00
13.12	0.98	0.02	8.00	0.16	0.01	13.29	0.96	0.04	7.97	0.17	0.02
13.45	0.96	0.04	7.95	0.16	0.01	13.62	1.00	0.00	7.92	0.17	0.00
13.78	1.10	0.00	7.90	0.16	0.00	13.94	1.19	0.00	7.88	0.16	0.00
14.11	1.21	0.00	7.85	0.17	0.00	14.27	1.18	0.00	7.83	0.16	0.00
14.44	1.15	0.00	7.80	0.17	0.00	14.60	1.04	0.00	7.77	0.16	0.00
14.76	0.93	0.07	7.75	0.16	0.03	14.93	0.80	0.20	7.72	0.17	0.08
15.09	0.79	0.21	7.70	0.16	0.08	15.26	0.77	0.23	7.67	0.17	0.09
15.42	0.78	0.22	7.65	0.16	0.08	15.58	0.77	0.23	7.63	0.16	0.09
15.75	0.75	0.25	7.60	0.17	0.10	15.91	0.74	0.26	7.58	0.16	0.10

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	W_z	d_z	LPI	Depth (ft)	FS	F_L	W_z	d_z	LPI
16.08	0.72	0.28	7.55	0.17	0.11	16.24	0.69	0.31	7.53	0.16	0.11
16.40	2.00	0.00	7.50	0.16	0.00	16.57	2.00	0.00	7.47	0.17	0.00
16.73	2.00	0.00	7.45	0.16	0.00	16.90	2.00	0.00	7.42	0.17	0.00
17.06	2.00	0.00	7.40	0.16	0.00	17.23	2.00	0.00	7.37	0.17	0.00
17.39	2.00	0.00	7.35	0.16	0.00	17.55	2.00	0.00	7.33	0.16	0.00
17.72	2.00	0.00	7.30	0.17	0.00	17.88	2.00	0.00	7.28	0.16	0.00
18.05	2.00	0.00	7.25	0.17	0.00	18.21	2.00	0.00	7.22	0.16	0.00
18.37	2.00	0.00	7.20	0.16	0.00	18.54	0.45	0.55	7.17	0.17	0.20
18.70	0.47	0.53	7.15	0.16	0.19	18.87	2.00	0.00	7.12	0.17	0.00
19.03	2.00	0.00	7.10	0.16	0.00	19.19	0.49	0.51	7.08	0.16	0.18
19.36	0.46	0.54	7.05	0.17	0.20	19.52	0.46	0.54	7.03	0.16	0.19
19.69	0.47	0.53	7.00	0.17	0.19	19.85	0.49	0.51	6.97	0.16	0.17
20.01	0.50	0.50	6.95	0.16	0.17	20.18	0.52	0.48	6.92	0.17	0.17
20.34	0.53	0.47	6.90	0.16	0.16	20.51	0.57	0.43	6.87	0.17	0.15
20.67	0.59	0.41	6.85	0.16	0.14	20.83	0.61	0.39	6.83	0.16	0.13
21.00	0.60	0.40	6.80	0.17	0.14	21.16	0.60	0.40	6.78	0.16	0.13
21.33	0.60	0.40	6.75	0.17	0.14	21.49	0.59	0.41	6.72	0.16	0.13
21.65	0.63	0.37	6.70	0.16	0.12	21.82	0.67	0.33	6.67	0.17	0.11
21.98	0.75	0.25	6.65	0.16	0.08	22.15	0.80	0.20	6.62	0.17	0.07
22.31	0.83	0.17	6.60	0.16	0.06	22.47	0.86	0.14	6.58	0.16	0.05
22.64	0.89	0.11	6.55	0.17	0.04	22.80	0.93	0.07	6.53	0.16	0.02
22.97	0.96	0.04	6.50	0.17	0.01	23.13	1.00	0.00	6.47	0.16	0.00
23.30	1.02	0.00	6.45	0.17	0.00	23.46	1.02	0.00	6.42	0.16	0.00
23.62	0.98	0.02	6.40	0.16	0.01	23.79	0.97	0.03	6.37	0.17	0.01
23.95	1.00	0.00	6.35	0.16	0.00	24.12	1.06	0.00	6.32	0.17	0.00
24.28	1.14	0.00	6.30	0.16	0.00	24.44	1.11	0.00	6.28	0.16	0.00
24.61	0.96	0.04	6.25	0.17	0.01	24.77	0.85	0.15	6.23	0.16	0.04
24.94	0.80	0.20	6.20	0.17	0.06	25.10	0.79	0.21	6.17	0.16	0.06
25.26	0.73	0.27	6.15	0.16	0.08	25.43	0.71	0.29	6.12	0.17	0.09
25.59	0.74	0.26	6.10	0.16	0.08	25.76	0.78	0.22	6.07	0.17	0.07
25.92	2.00	0.00	6.05	0.16	0.00	26.08	2.00	0.00	6.03	0.16	0.00
26.25	2.00	0.00	6.00	0.17	0.00	26.41	2.00	0.00	5.98	0.16	0.00
26.58	2.00	0.00	5.95	0.17	0.00	26.74	2.00	0.00	5.92	0.16	0.00
26.90	2.00	0.00	5.90	0.16	0.00	27.07	2.00	0.00	5.87	0.17	0.00
27.23	2.00	0.00	5.85	0.16	0.00	27.40	2.00	0.00	5.82	0.17	0.00
27.56	2.00	0.00	5.80	0.16	0.00	27.72	2.00	0.00	5.78	0.16	0.00
27.89	2.00	0.00	5.75	0.17	0.00	28.05	2.00	0.00	5.73	0.16	0.00
28.22	2.00	0.00	5.70	0.17	0.00	28.38	2.00	0.00	5.67	0.16	0.00
28.54	2.00	0.00	5.65	0.16	0.00	28.71	2.00	0.00	5.62	0.17	0.00
28.87	2.00	0.00	5.60	0.16	0.00	29.04	2.00	0.00	5.57	0.17	0.00
29.20	2.00	0.00	5.55	0.16	0.00	29.36	2.00	0.00	5.53	0.16	0.00
29.53	2.00	0.00	5.50	0.17	0.00	29.69	2.00	0.00	5.48	0.16	0.00
29.86	2.00	0.00	5.45	0.17	0.00	30.02	2.00	0.00	5.42	0.16	0.00
30.19	2.00	0.00	5.40	0.17	0.00	30.35	2.00	0.00	5.37	0.16	0.00
30.51	2.00	0.00	5.35	0.16	0.00	30.68	2.00	0.00	5.32	0.17	0.00
30.84	2.00	0.00	5.30	0.16	0.00	31.01	2.00	0.00	5.27	0.17	0.00
31.17	2.00	0.00	5.25	0.16	0.00	31.33	2.00	0.00	5.23	0.16	0.00
31.50	2.00	0.00	5.20	0.17	0.00	31.66	2.00	0.00	5.18	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
31.83	2.00	0.00	5.15	0.17	0.00	31.99	2.00	0.00	5.12	0.16	0.00
32.15	2.00	0.00	5.10	0.16	0.00	32.32	2.00	0.00	5.07	0.17	0.00
32.48	2.00	0.00	5.05	0.16	0.00	32.65	2.00	0.00	5.02	0.17	0.00
32.81	2.00	0.00	5.00	0.16	0.00	32.97	2.00	0.00	4.98	0.16	0.00
33.14	2.00	0.00	4.95	0.17	0.00	33.30	2.00	0.00	4.93	0.16	0.00
33.47	2.00	0.00	4.90	0.17	0.00	33.63	2.00	0.00	4.87	0.16	0.00
33.79	2.00	0.00	4.85	0.16	0.00	33.96	2.00	0.00	4.82	0.17	0.00
34.12	2.00	0.00	4.80	0.16	0.00	34.29	2.00	0.00	4.77	0.17	0.00
34.45	2.00	0.00	4.75	0.16	0.00	34.61	2.00	0.00	4.73	0.16	0.00
34.78	2.00	0.00	4.70	0.17	0.00	34.94	2.00	0.00	4.68	0.16	0.00
35.11	2.00	0.00	4.65	0.17	0.00	35.27	2.00	0.00	4.62	0.16	0.00
35.43	2.00	0.00	4.60	0.16	0.00	35.60	2.00	0.00	4.57	0.17	0.00
35.76	2.00	0.00	4.55	0.16	0.00	35.93	2.00	0.00	4.52	0.17	0.00
36.09	2.00	0.00	4.50	0.16	0.00	36.26	2.00	0.00	4.47	0.17	0.00
36.42	2.00	0.00	4.45	0.16	0.00	36.58	2.00	0.00	4.43	0.16	0.00
36.75	2.00	0.00	4.40	0.17	0.00	36.91	2.00	0.00	4.37	0.16	0.00
37.08	2.00	0.00	4.35	0.17	0.00	37.24	2.00	0.00	4.32	0.16	0.00
37.40	2.00	0.00	4.30	0.16	0.00	37.57	2.00	0.00	4.27	0.17	0.00
37.73	2.00	0.00	4.25	0.16	0.00	37.90	2.00	0.00	4.22	0.17	0.00
38.06	2.00	0.00	4.20	0.16	0.00	38.22	2.00	0.00	4.18	0.16	0.00
38.39	2.00	0.00	4.15	0.17	0.00	38.55	2.00	0.00	4.12	0.16	0.00
38.72	2.00	0.00	4.10	0.17	0.00	38.88	2.00	0.00	4.07	0.16	0.00
39.04	2.00	0.00	4.05	0.16	0.00	39.21	2.00	0.00	4.02	0.17	0.00
39.37	2.00	0.00	4.00	0.16	0.00	39.54	2.00	0.00	3.97	0.17	0.00
39.70	2.00	0.00	3.95	0.16	0.00	39.86	2.00	0.00	3.93	0.16	0.00
40.03	2.00	0.00	3.90	0.17	0.00	40.19	2.00	0.00	3.88	0.16	0.00
40.36	0.36	0.64	3.85	0.17	0.13	40.52	0.38	0.62	3.82	0.16	0.12
40.68	2.00	0.00	3.80	0.16	0.00	40.85	2.00	0.00	3.77	0.17	0.00
41.01	2.00	0.00	3.75	0.16	0.00	41.18	2.00	0.00	3.72	0.17	0.00
41.34	0.42	0.58	3.70	0.16	0.11	41.50	2.00	0.00	3.68	0.16	0.00
41.67	2.00	0.00	3.65	0.17	0.00	41.83	2.00	0.00	3.63	0.16	0.00
42.00	2.00	0.00	3.60	0.17	0.00	42.16	2.00	0.00	3.57	0.16	0.00
42.32	0.39	0.61	3.55	0.16	0.11	42.49	0.41	0.59	3.52	0.17	0.11
42.65	0.43	0.57	3.50	0.16	0.10	42.82	0.43	0.57	3.47	0.17	0.10
42.98	0.42	0.58	3.45	0.16	0.10	43.15	0.39	0.61	3.42	0.17	0.11
43.31	0.40	0.60	3.40	0.16	0.10	43.47	0.41	0.59	3.38	0.16	0.10
43.64	2.00	0.00	3.35	0.17	0.00	43.80	2.00	0.00	3.32	0.16	0.00
43.97	2.00	0.00	3.30	0.17	0.00	44.13	2.00	0.00	3.27	0.16	0.00
44.29	2.00	0.00	3.25	0.16	0.00	44.46	2.00	0.00	3.22	0.17	0.00
44.62	2.00	0.00	3.20	0.16	0.00	44.79	2.00	0.00	3.17	0.17	0.00
44.95	2.00	0.00	3.15	0.16	0.00	45.11	2.00	0.00	3.13	0.16	0.00
45.28	2.00	0.00	3.10	0.17	0.00	45.44	0.40	0.60	3.07	0.16	0.09
45.61	0.48	0.52	3.05	0.17	0.08	45.77	0.50	0.50	3.02	0.16	0.07
45.93	0.46	0.54	3.00	0.16	0.08	46.10	0.42	0.58	2.97	0.17	0.09
46.26	0.41	0.59	2.95	0.16	0.09	46.43	0.48	0.52	2.92	0.17	0.08
46.59	0.62	0.38	2.90	0.16	0.05	46.75	0.74	0.26	2.88	0.16	0.04
46.92	0.85	0.15	2.85	0.17	0.02	47.08	0.93	0.07	2.83	0.16	0.01
47.25	0.97	0.03	2.80	0.17	0.00	47.41	1.01	0.00	2.77	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	W_z	d_z	LPI
47.57	1.09	0.00	2.75	0.16	0.00
47.90	1.38	0.00	2.70	0.16	0.00
48.23	1.35	0.00	2.65	0.16	0.00
48.56	1.03	0.00	2.60	0.17	0.00
48.89	0.80	0.20	2.55	0.17	0.03
49.22	0.57	0.43	2.50	0.17	0.06
49.54	0.50	0.50	2.45	0.16	0.06
49.87	0.58	0.42	2.40	0.16	0.05
50.20	2.00	0.00	2.35	0.16	0.00
50.53	2.00	0.00	2.30	0.17	0.00
50.86	2.00	0.00	2.25	0.17	0.00
51.18	2.00	0.00	2.20	0.16	0.00
51.51	2.00	0.00	2.15	0.16	0.00
51.84	2.00	0.00	2.10	0.16	0.00
52.17	0.85	0.15	2.05	0.17	0.02
52.50	0.72	0.28	2.00	0.17	0.03
52.82	0.85	0.15	1.95	0.16	0.01
53.15	1.05	0.00	1.90	0.16	0.00
53.48	1.06	0.00	1.85	0.16	0.00
53.81	1.02	0.00	1.80	0.17	0.00
54.14	0.75	0.25	1.75	0.17	0.02
54.46	0.85	0.15	1.70	0.16	0.01
47.74	1.24	0.00	2.72	0.17	0.00
48.07	1.42	0.00	2.67	0.17	0.00
48.39	1.19	0.00	2.63	0.16	0.00
48.72	0.91	0.09	2.58	0.16	0.01
49.05	0.68	0.32	2.52	0.16	0.04
49.38	0.49	0.51	2.47	0.16	0.06
49.71	0.53	0.47	2.42	0.17	0.06
50.04	0.59	0.41	2.37	0.17	0.05
50.36	2.00	0.00	2.33	0.16	0.00
50.69	2.00	0.00	2.27	0.16	0.00
51.02	2.00	0.00	2.22	0.16	0.00
51.35	2.00	0.00	2.17	0.17	0.00
51.68	2.00	0.00	2.12	0.17	0.00
52.00	2.00	0.00	2.08	0.16	0.00
52.33	0.81	0.19	2.02	0.16	0.02
52.66	0.73	0.27	1.97	0.16	0.03
52.99	0.99	0.01	1.92	0.17	0.00
53.32	1.06	0.00	1.87	0.17	0.00
53.64	1.04	0.00	1.83	0.16	0.00
53.97	0.71	0.29	1.77	0.16	0.03
54.30	0.81	0.19	1.72	0.16	0.02
54.63	0.85	0.15	1.67	0.17	0.01

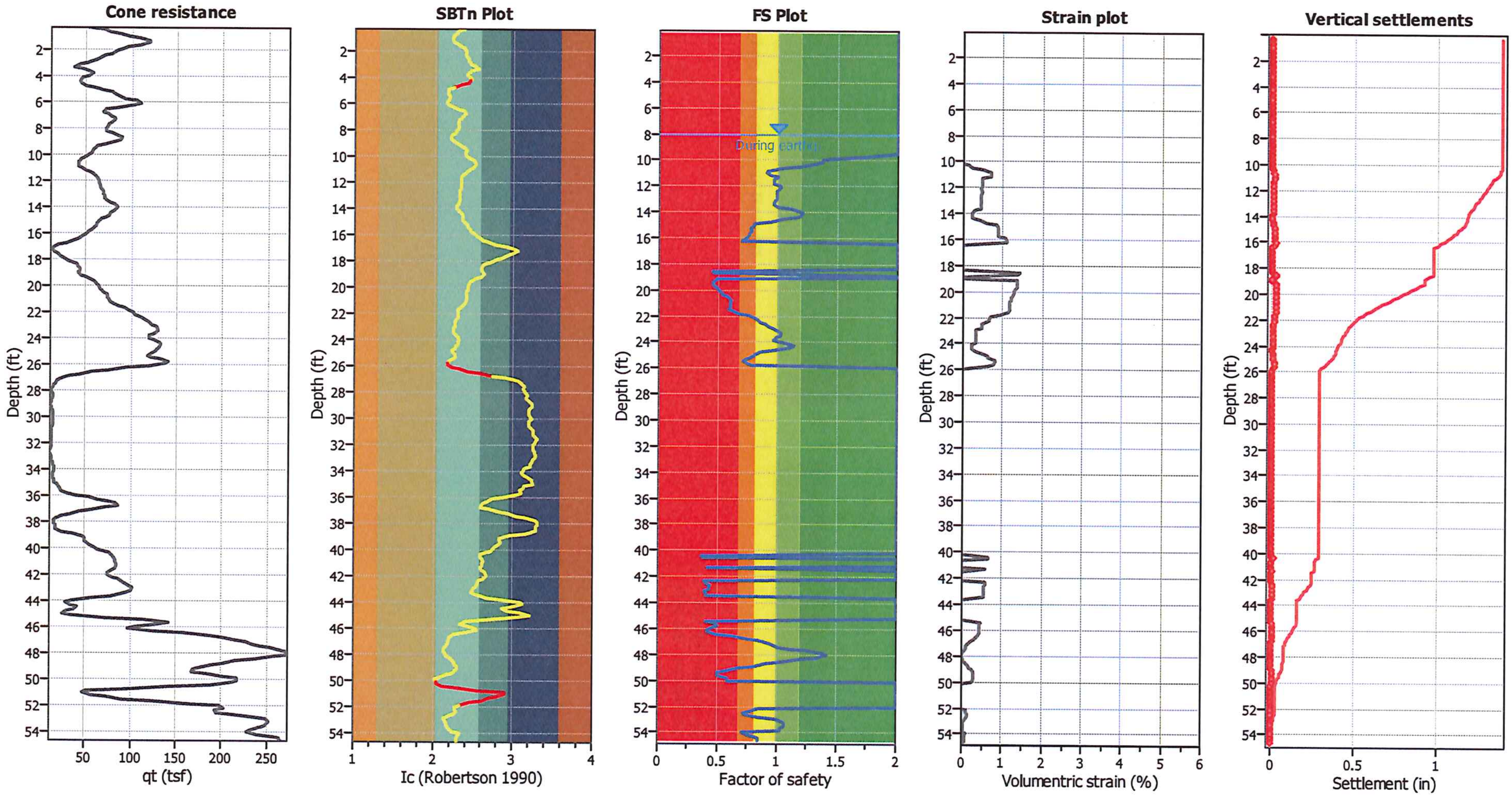
Overall liquefaction potential: 7.40

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
W_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

Estimation of post-earthquake settlements



Abbreviations

q_t: Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c: Soil Behaviour Type Index
FS: Calculated Factor of Safety against liquefaction
Volumentric strain: Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Kc	Qc1n	Qc1n,cs	N1,60 (blows)	Vs (ft/s)	Gmax (tsf)	CSR	Shear, γ (%)	Svol,15 (%)	Nc	ev (%)	Settle. (in)
0.33	2.37	2.21	85.54	189.10	46	724.1	1020	0.38	0.001	0.00	7.95	0.00	0.000
0.49	2.30	1.95	110.85	216.57	51	787.2	1230	0.38	0.001	0.00	7.95	0.00	0.000
0.66	2.29	1.91	123.74	235.80	55	823.7	1361	0.38	0.001	0.00	7.95	0.00	0.000
0.82	2.24	1.77	139.95	247.88	57	850.8	1462	0.38	0.001	0.00	7.95	0.00	0.000
0.98	2.22	1.72	155.84	267.97	61	886.8	1604	0.38	0.002	0.00	7.95	0.00	0.000
1.15	2.22	1.72	175.37	301.23	69	940.4	1827	0.38	0.002	0.00	7.95	0.00	0.000
1.31	2.25	1.80	192.22	346.15	80	1003.8	2112	0.38	0.002	0.00	7.95	0.00	0.000
1.48	2.29	1.91	191.55	366.51	86	1026.4	2220	0.38	0.002	0.00	7.95	0.00	0.000
1.64	2.33	2.07	174.50	360.48	86	1008.7	2137	0.38	0.002	0.00	7.95	0.00	0.000
1.80	2.38	2.22	153.98	342.27	83	973.4	1976	0.38	0.002	0.00	7.95	0.00	0.000
1.97	2.39	2.28	141.69	323.25	79	942.6	1841	0.38	0.003	0.00	7.95	0.00	0.000
2.13	2.40	2.30	133.75	307.16	75	918.0	1736	0.38	0.003	0.00	7.95	0.00	0.000
2.30	2.40	2.31	124.89	287.99	71	888.4	1614	0.38	0.004	0.00	7.95	0.00	0.000
2.46	2.41	2.35	114.33	268.39	66	855.4	1484	0.38	0.005	0.00	7.95	0.00	0.000
2.62	2.43	2.42	103.65	251.06	62	823.6	1364	0.38	0.006	0.00	7.95	0.00	0.000
2.79	2.43	2.42	97.26	235.28	59	797.5	1269	0.38	0.006	0.00	7.95	0.00	0.000
2.95	2.47	2.63	82.14	215.93	55	754.6	1121	0.38	0.008	0.00	7.95	0.00	0.000
3.12	2.49	2.73	70.02	190.88	49	705.6	964	0.38	0.011	0.00	7.95	0.00	0.000
3.28	2.55	3.04	60.04	182.81	48	678.8	884	0.38	0.013	0.00	7.95	0.00	0.000
3.45	2.47	2.63	74.27	195.16	50	717.4	1001	0.38	0.011	0.00	7.95	0.00	0.000
3.61	2.43	2.45	87.42	214.56	54	759.9	1139	0.38	0.010	0.00	7.95	0.00	0.000
3.77	2.41	2.36	92.49	218.48	54	771.1	1176	0.38	0.010	0.00	7.95	0.00	0.000
3.94	2.44	2.48	84.23	208.50	52	748.2	1100	0.38	0.011	0.00	7.95	0.00	0.000
4.10	2.46	2.58	74.95	193.13	49	715.8	996	0.37	0.014	0.00	7.95	0.00	0.000
4.27	2.45	2.52	71.18	179.17	45	691.9	922	0.37	0.016	0.01	7.95	0.00	0.000
4.43	2.43	2.42	69.34	167.98	0	0.0	0	0.37	0.000	0.00	0.00	0.00	0.000
4.59	2.33	2.05	72.06	147.65	0	0.0	0	0.37	0.000	0.00	0.00	0.00	0.000
4.76	2.24	1.76	80.77	141.91	0	0.0	0	0.37	0.000	0.00	0.00	0.00	0.000
4.92	2.16	1.58	94.57	149.53	0	0.0	0	0.37	0.000	0.00	0.00	0.00	0.000
5.09	2.16	1.58	112.38	177.34	39	725.4	1021	0.37	0.017	0.01	7.95	0.01	0.000
5.25	2.17	1.60	124.95	200.42	45	770.6	1170	0.37	0.015	0.01	7.95	0.00	0.000
5.41	2.18	1.62	133.13	215.94	48	799.3	1271	0.37	0.013	0.00	7.95	0.00	0.000
5.58	2.19	1.64	137.39	224.85	50	815.3	1328	0.37	0.013	0.00	7.95	0.00	0.000
5.74	2.17	1.59	149.16	237.77	53	839.6	1418	0.37	0.012	0.00	7.95	0.00	0.000
5.91	2.15	1.55	168.26	260.88	58	880.4	1577	0.37	0.011	0.00	7.95	0.00	0.000
6.07	2.17	1.59	176.97	281.74	63	914.0	1714	0.37	0.010	0.00	7.95	0.00	0.000
6.23	2.22	1.71	164.31	281.58	64	909.3	1696	0.37	0.011	0.00	7.95	0.00	0.000
6.40	2.31	1.97	135.86	267.84	63	874.5	1556	0.37	0.012	0.00	7.95	0.00	0.000
6.56	2.37	2.20	115.87	255.03	62	841.4	1429	0.37	0.014	0.00	7.95	0.00	0.000
6.73	2.39	2.29	111.19	254.21	62	835.6	1408	0.37	0.015	0.00	7.95	0.00	0.000
6.89	2.38	2.22	116.85	259.28	63	847.4	1452	0.37	0.015	0.00	7.95	0.00	0.000
7.05	2.34	2.09	125.61	262.71	63	859.7	1499	0.37	0.014	0.00	7.95	0.00	0.000
7.22	2.32	2.01	130.57	262.46	62	863.6	1514	0.37	0.015	0.00	7.95	0.00	0.000
7.38	2.30	1.95	130.29	254.16	60	852.9	1472	0.37	0.016	0.00	7.95	0.00	0.000
7.55	2.30	1.95	124.33	242.94	57	833.7	1399	0.37	0.017	0.00	7.95	0.00	0.000
7.71	2.29	1.93	121.31	234.33	55	819.9	1347	0.37	0.019	0.01	7.95	0.00	0.000
7.87	2.29	1.92	118.13	227.03	53	807.4	1302	0.37	0.020	0.01	7.95	0.00	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Kc	Qc1n	Qc1n,cs	N1,60 (blows)	Vs (ft/s)	Gmax (tsf)	CSR	Shear, γ (%)	Svol,15 (%)	Nc	ev (%)	Settle. (in)

Total estimated settlement: 0.00

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.04	221.10	2.00	0.00	0.86	0.00
8.37	204.89	2.00	0.00	0.86	0.00
8.69	224.89	2.00	0.00	0.85	0.00
9.02	223.45	2.00	0.00	0.85	0.00
9.35	202.56	2.00	0.00	0.84	0.00
9.68	188.81	1.75	0.00	0.84	0.00
10.01	173.62	1.38	0.00	0.83	0.00
10.34	171.12	1.31	0.16	0.82	0.00
10.66	156.40	1.04	0.48	0.82	0.01
10.99	148.81	0.91	0.71	0.81	0.01
11.32	155.70	1.00	0.47	0.81	0.01
11.65	154.12	0.97	0.47	0.80	0.01
11.98	158.05	1.02	0.46	0.80	0.01
12.30	157.73	1.00	0.46	0.79	0.01
12.63	157.31	0.99	0.46	0.79	0.01
12.96	158.35	0.99	0.45	0.78	0.01
13.29	156.70	0.96	0.45	0.77	0.01
13.62	160.01	1.00	0.44	0.77	0.01
13.94	171.70	1.19	0.21	0.76	0.00
14.27	171.68	1.18	0.21	0.76	0.00
14.60	163.55	1.04	0.42	0.75	0.01
14.93	147.93	0.80	0.86	0.75	0.02
15.26	145.22	0.77	0.87	0.74	0.02
15.58	146.02	0.77	0.86	0.74	0.02
15.91	144.13	0.74	1.07	0.73	0.02
16.24	140.01	0.69	1.10	0.72	0.02
16.57	129.66	2.00	0.00	0.72	0.00
16.90	102.55	2.00	0.00	0.71	0.00
17.23	84.52	2.00	0.00	0.71	0.00
17.55	97.48	2.00	0.00	0.70	0.00
17.88	103.98	2.00	0.00	0.70	0.00
18.21	105.28	2.00	0.00	0.69	0.00
18.54	116.52	0.45	1.41	0.69	0.03
18.87	121.60	2.00	0.00	0.68	0.00
19.19	121.56	0.49	1.34	0.67	0.03
19.52	118.05	0.46	1.36	0.67	0.03
19.85	122.59	0.49	1.31	0.66	0.03
20.18	126.29	0.52	1.27	0.66	0.03
20.51	131.91	0.57	1.21	0.65	0.02
20.83	136.28	0.61	1.17	0.65	0.02
21.16	135.26	0.60	1.17	0.64	0.02
21.49	135.00	0.59	1.16	0.64	0.02

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
8.20	208.55	2.00	0.00	0.86	0.00
8.53	212.28	2.00	0.00	0.86	0.00
8.86	231.51	2.00	0.00	0.85	0.00
9.19	212.46	2.00	0.00	0.84	0.00
9.51	198.15	2.00	0.00	0.84	0.00
9.84	179.97	1.53	0.00	0.83	0.00
10.17	173.06	1.36	0.00	0.83	0.00
10.50	164.31	1.18	0.24	0.82	0.00
10.83	149.28	0.92	0.71	0.82	0.01
11.16	151.34	0.94	0.69	0.81	0.01
11.48	153.90	0.97	0.48	0.81	0.01
11.81	154.57	0.97	0.47	0.80	0.01
12.14	158.63	1.02	0.46	0.79	0.01
12.47	156.79	0.98	0.46	0.79	0.01
12.80	157.79	0.99	0.45	0.78	0.01
13.12	157.55	0.98	0.45	0.78	0.01
13.45	157.16	0.96	0.45	0.77	0.01
13.78	166.54	1.10	0.30	0.77	0.01
14.11	173.32	1.21	0.21	0.76	0.00
14.44	170.07	1.15	0.29	0.76	0.01
14.76	157.05	0.93	0.60	0.75	0.01
15.09	146.73	0.79	0.86	0.74	0.02
15.42	146.25	0.78	0.86	0.74	0.02
15.75	144.93	0.75	0.87	0.73	0.02
16.08	142.05	0.72	1.09	0.73	0.02
16.40	136.73	2.00	0.00	0.72	0.00
16.73	118.04	2.00	0.00	0.72	0.00
17.06	89.13	2.00	0.00	0.71	0.00
17.39	88.42	2.00	0.00	0.71	0.00
17.72	105.35	2.00	0.00	0.70	0.00
18.05	104.04	2.00	0.00	0.69	0.00
18.37	113.21	2.00	0.00	0.69	0.00
18.70	118.96	0.47	1.38	0.68	0.03
19.03	122.73	2.00	0.00	0.68	0.00
19.36	118.36	0.46	1.37	0.67	0.03
19.69	119.59	0.47	1.34	0.67	0.03
20.01	124.47	0.50	1.29	0.66	0.02
20.34	128.05	0.53	1.25	0.66	0.02
20.67	134.61	0.59	1.19	0.65	0.02
21.00	135.81	0.60	1.17	0.64	0.02
21.33	135.60	0.60	1.16	0.64	0.02
21.65	138.62	0.63	1.13	0.63	0.02

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
21.82	143.08	0.67	0.93	0.63	0.02	21.98	150.10	0.75	0.70	0.63	0.01
22.15	154.15	0.80	0.67	0.62	0.01	22.31	156.43	0.83	0.66	0.62	0.01
22.47	158.72	0.86	0.49	0.62	0.01	22.64	160.97	0.89	0.48	0.62	0.01
22.80	163.99	0.93	0.46	0.61	0.01	22.97	166.12	0.96	0.34	0.61	0.01
23.13	169.08	1.00	0.33	0.61	0.01	23.30	170.36	1.02	0.33	0.61	0.01
23.46	170.52	1.02	0.32	0.60	0.01	23.62	168.06	0.98	0.33	0.60	0.01
23.79	167.24	0.97	0.33	0.60	0.01	23.95	169.07	1.00	0.32	0.59	0.01
24.12	173.30	1.06	0.23	0.59	0.00	24.28	178.25	1.14	0.22	0.59	0.00
24.44	176.46	1.11	0.22	0.59	0.00	24.61	167.23	0.96	0.32	0.58	0.01
24.77	159.31	0.85	0.46	0.58	0.01	24.94	155.44	0.80	0.62	0.58	0.01
25.10	154.65	0.79	0.62	0.57	0.01	25.26	150.01	0.73	0.79	0.57	0.02
25.43	147.69	0.71	0.80	0.57	0.02	25.59	150.99	0.74	0.78	0.57	0.01
25.76	153.77	0.78	0.61	0.56	0.01	25.92	149.92	2.00	0.00	0.56	0.00
26.08	138.34	2.00	0.00	0.56	0.00	26.25	125.00	2.00	0.00	0.56	0.00
26.41	116.52	2.00	0.00	0.55	0.00	26.58	113.05	2.00	0.00	0.55	0.00
26.74	110.94	2.00	0.00	0.55	0.00	26.90	102.65	2.00	0.00	0.54	0.00
27.07	92.82	2.00	0.00	0.54	0.00	27.23	83.20	2.00	0.00	0.54	0.00
27.40	77.04	2.00	0.00	0.54	0.00	27.56	70.54	2.00	0.00	0.53	0.00
27.72	63.53	2.00	0.00	0.53	0.00	27.89	59.46	2.00	0.00	0.53	0.00
28.05	59.26	2.00	0.00	0.52	0.00	28.22	64.60	2.00	0.00	0.52	0.00
28.38	67.91	2.00	0.00	0.52	0.00	28.54	67.69	2.00	0.00	0.52	0.00
28.71	63.77	2.00	0.00	0.51	0.00	28.87	58.05	2.00	0.00	0.51	0.00
29.04	55.91	2.00	0.00	0.51	0.00	29.20	56.01	2.00	0.00	0.51	0.00
29.36	57.94	2.00	0.00	0.50	0.00	29.53	61.61	2.00	0.00	0.50	0.00
29.69	64.84	2.00	0.00	0.50	0.00	29.86	66.18	2.00	0.00	0.49	0.00
30.02	64.34	2.00	0.00	0.49	0.00	30.19	62.75	2.00	0.00	0.49	0.00
30.35	62.75	2.00	0.00	0.49	0.00	30.51	62.66	2.00	0.00	0.48	0.00
30.68	62.29	2.00	0.00	0.48	0.00	30.84	60.16	2.00	0.00	0.48	0.00
31.01	58.24	2.00	0.00	0.47	0.00	31.17	58.01	2.00	0.00	0.47	0.00
31.33	61.22	2.00	0.00	0.47	0.00	31.50	63.88	2.00	0.00	0.47	0.00
31.66	62.36	2.00	0.00	0.46	0.00	31.83	59.09	2.00	0.00	0.46	0.00
31.99	55.79	2.00	0.00	0.46	0.00	32.15	55.59	2.00	0.00	0.46	0.00
32.32	53.65	2.00	0.00	0.45	0.00	32.48	51.48	2.00	0.00	0.45	0.00
32.65	49.32	2.00	0.00	0.45	0.00	32.81	51.15	2.00	0.00	0.44	0.00
32.97	53.18	2.00	0.00	0.44	0.00	33.14	55.13	2.00	0.00	0.44	0.00
33.30	55.19	2.00	0.00	0.44	0.00	33.47	55.24	2.00	0.00	0.43	0.00
33.63	56.97	2.00	0.00	0.43	0.00	33.79	57.43	2.00	0.00	0.43	0.00
33.96	55.68	2.00	0.00	0.42	0.00	34.12	51.93	2.00	0.00	0.42	0.00
34.29	49.62	2.00	0.00	0.42	0.00	34.45	53.26	2.00	0.00	0.42	0.00
34.61	57.95	2.00	0.00	0.41	0.00	34.78	62.54	2.00	0.00	0.41	0.00
34.94	63.58	2.00	0.00	0.41	0.00	35.11	65.96	2.00	0.00	0.40	0.00
35.27	70.09	2.00	0.00	0.40	0.00	35.43	75.25	2.00	0.00	0.40	0.00
35.60	79.71	2.00	0.00	0.40	0.00	35.76	86.37	2.00	0.00	0.39	0.00
35.93	96.44	2.00	0.00	0.39	0.00	36.09	107.74	2.00	0.00	0.39	0.00
36.26	117.68	2.00	0.00	0.39	0.00	36.42	126.80	2.00	0.00	0.38	0.00
36.58	133.36	2.00	0.00	0.38	0.00	36.75	136.45	2.00	0.00	0.38	0.00
36.91	132.91	2.00	0.00	0.37	0.00	37.08	123.75	2.00	0.00	0.37	0.00
37.24	112.30	2.00	0.00	0.37	0.00	37.40	98.94	2.00	0.00	0.37	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
37.57	85.90	2.00	0.00	0.36	0.00	37.73	72.51	2.00	0.00	0.36	0.00
37.90	67.25	2.00	0.00	0.36	0.00	38.06	66.08	2.00	0.00	0.35	0.00
38.22	66.26	2.00	0.00	0.35	0.00	38.39	68.55	2.00	0.00	0.35	0.00
38.55	73.06	2.00	0.00	0.35	0.00	38.72	81.87	2.00	0.00	0.34	0.00
38.88	90.96	2.00	0.00	0.34	0.00	39.04	99.28	2.00	0.00	0.34	0.00
39.21	103.27	2.00	0.00	0.34	0.00	39.37	104.66	2.00	0.00	0.33	0.00
39.54	106.08	2.00	0.00	0.33	0.00	39.70	107.48	2.00	0.00	0.33	0.00
39.86	109.56	2.00	0.00	0.32	0.00	40.03	109.98	2.00	0.00	0.32	0.00
40.19	111.01	2.00	0.00	0.32	0.00	40.36	111.98	0.36	0.67	0.32	0.01
40.52	115.38	0.38	0.65	0.31	0.01	40.68	119.47	2.00	0.00	0.31	0.00
40.85	122.72	2.00	0.00	0.31	0.00	41.01	123.13	2.00	0.00	0.30	0.00
41.18	122.16	2.00	0.00	0.30	0.00	41.34	120.56	0.42	0.60	0.30	0.01
41.50	120.46	2.00	0.00	0.30	0.00	41.67	119.77	2.00	0.00	0.29	0.00
41.83	118.35	2.00	0.00	0.29	0.00	42.00	116.06	2.00	0.00	0.29	0.00
42.16	114.95	2.00	0.00	0.29	0.00	42.32	116.59	0.39	0.58	0.28	0.01
42.49	118.93	0.41	0.57	0.28	0.01	42.65	122.65	0.43	0.55	0.28	0.01
42.82	122.28	0.43	0.54	0.27	0.01	42.98	120.70	0.42	0.54	0.27	0.01
43.15	116.55	0.39	0.55	0.27	0.01	43.31	117.18	0.40	0.55	0.27	0.01
43.47	118.53	0.41	0.54	0.26	0.01	43.64	118.14	2.00	0.00	0.26	0.00
43.80	109.11	2.00	0.00	0.26	0.00	43.97	96.38	2.00	0.00	0.25	0.00
44.13	81.19	2.00	0.00	0.25	0.00	44.29	78.62	2.00	0.00	0.25	0.00
44.46	78.12	2.00	0.00	0.25	0.00	44.62	80.31	2.00	0.00	0.24	0.00
44.79	78.08	2.00	0.00	0.24	0.00	44.95	77.91	2.00	0.00	0.24	0.00
45.11	86.74	2.00	0.00	0.24	0.00	45.28	102.04	2.00	0.00	0.23	0.00
45.44	116.79	0.40	0.47	0.23	0.01	45.61	127.88	0.48	0.43	0.23	0.01
45.77	129.84	0.50	0.42	0.22	0.01	45.93	125.51	0.46	0.43	0.22	0.01
46.10	119.36	0.42	0.44	0.22	0.01	46.26	118.02	0.41	0.44	0.22	0.01
46.43	128.04	0.48	0.41	0.21	0.01	46.59	143.21	0.62	0.37	0.21	0.01
46.75	154.12	0.74	0.28	0.21	0.01	46.92	162.60	0.85	0.20	0.20	0.00
47.08	168.82	0.93	0.15	0.20	0.00	47.25	171.20	0.97	0.11	0.20	0.00
47.41	174.20	1.01	0.10	0.20	0.00	47.57	179.39	1.09	0.07	0.19	0.00
47.74	188.18	1.24	0.05	0.19	0.00	47.90	195.59	1.38	0.00	0.19	0.00
48.07	197.50	1.42	0.00	0.19	0.00	48.23	193.83	1.35	0.03	0.18	0.00
48.39	184.95	1.19	0.05	0.18	0.00	48.56	174.80	1.03	0.09	0.18	0.00
48.72	166.25	0.91	0.13	0.17	0.00	48.89	158.35	0.80	0.18	0.17	0.00
49.05	147.45	0.68	0.24	0.17	0.00	49.22	136.74	0.57	0.30	0.17	0.01
49.38	128.23	0.49	0.31	0.16	0.01	49.54	128.79	0.50	0.30	0.16	0.01
49.71	132.61	0.53	0.29	0.16	0.01	49.87	137.76	0.58	0.28	0.15	0.01
50.04	138.25	0.59	0.27	0.15	0.01	50.20	134.63	2.00	0.00	0.15	0.00
50.36	127.32	2.00	0.00	0.15	0.00	50.53	116.81	2.00	0.00	0.14	0.00
50.69	106.60	2.00	0.00	0.14	0.00	50.86	95.14	2.00	0.00	0.14	0.00
51.02	86.30	2.00	0.00	0.14	0.00	51.18	92.12	2.00	0.00	0.13	0.00
51.35	102.00	2.00	0.00	0.13	0.00	51.51	112.02	2.00	0.00	0.13	0.00
51.68	125.73	2.00	0.00	0.12	0.00	51.84	140.32	2.00	0.00	0.12	0.00
52.00	155.57	2.00	0.00	0.12	0.00	52.17	160.32	0.85	0.12	0.12	0.00
52.33	156.97	0.81	0.12	0.11	0.00	52.50	150.19	0.72	0.15	0.11	0.00
52.66	150.73	0.73	0.15	0.11	0.00	52.82	160.05	0.85	0.11	0.10	0.00
52.99	169.93	0.99	0.05	0.10	0.00	53.15	174.23	1.05	0.04	0.10	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
53.32	174.74	1.06	0.04	0.10	0.00	53.48	174.52	1.06	0.04	0.09	0.00
53.64	173.05	1.04	0.05	0.09	0.00	53.81	171.82	1.02	0.05	0.09	0.00
53.97	148.24	0.71	0.12	0.09	0.00	54.14	151.74	0.75	0.09	0.08	0.00
54.30	156.31	0.81	0.08	0.08	0.00	54.46	159.04	0.85	0.08	0.08	0.00
54.63	158.87	0.85	0.08	0.07	0.00						

Total estimated settlement: 1.38

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

:: Strength loss calculation (Robertson (2009) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.33	53.26	85.54	2.21	189.10	2.37	0.81	0.81
0.49	69.03	110.85	1.95	216.57	2.30	0.84	0.84
0.66	77.06	123.74	1.91	235.80	2.29	0.86	0.86
0.82	87.16	139.95	1.77	247.88	2.24	0.88	0.88
0.98	97.06	155.84	1.72	267.97	2.22	0.89	0.89
1.15	109.22	175.37	1.72	301.23	2.22	0.91	0.91
1.31	119.72	192.22	1.80	346.15	2.25	0.92	0.92
1.48	119.32	191.55	1.91	366.51	2.29	0.92	0.92
1.64	108.72	174.50	2.07	360.48	2.33	0.91	0.91
1.80	95.95	153.98	2.22	342.27	2.38	0.89	0.89
1.97	88.32	141.69	2.28	323.25	2.39	0.88	0.88
2.13	83.39	133.75	2.30	307.16	2.40	0.87	0.87
2.30	77.89	124.89	2.31	287.99	2.40	0.86	0.86
2.46	71.32	114.33	2.35	268.39	2.41	0.85	0.85
2.62	64.69	103.65	2.42	251.06	2.43	0.83	0.83
2.79	60.72	97.26	2.42	235.28	2.43	0.82	0.82
2.95	51.32	82.14	2.63	215.93	2.47	0.80	0.80
3.12	43.78	70.02	2.73	190.88	2.49	0.78	0.78
3.28	37.58	60.04	3.04	182.81	2.55	0.76	0.76
3.45	46.45	74.27	2.63	195.16	2.47	0.79	0.79
3.61	54.65	87.42	2.45	214.56	2.43	0.81	0.81
3.77	57.81	92.49	2.36	218.48	2.41	0.82	0.82
3.94	52.68	84.23	2.48	208.50	2.44	0.80	0.80
4.10	46.91	74.95	2.58	193.13	2.46	0.79	0.79
4.27	44.58	71.18	2.52	179.17	2.45	0.78	0.78
4.43	43.45	69.34	2.42	167.98	2.43	0.78	0.78
4.59	45.15	72.06	2.05	147.65	2.33	0.78	0.78
4.76	50.58	80.77	1.76	141.91	2.24	0.80	0.80
4.92	59.18	94.57	1.58	149.53	2.16	0.82	0.82
5.09	70.28	112.38	1.58	177.34	2.16	0.84	0.84
5.25	78.11	124.95	1.60	200.42	2.17	0.86	0.86
5.41	83.21	133.13	1.62	215.94	2.18	0.87	0.87
5.58	85.87	137.39	1.64	224.85	2.19	0.87	0.87
5.74	93.21	149.16	1.59	237.77	2.17	0.89	0.89
5.91	105.11	168.26	1.55	260.88	2.15	0.90	0.90
6.07	110.54	176.97	1.59	281.74	2.17	0.91	0.91
6.23	102.67	164.31	1.71	281.58	2.22	0.90	0.90
6.40	84.97	135.86	1.97	267.84	2.31	0.87	0.87
6.56	72.54	115.87	2.20	255.03	2.37	0.85	0.85
6.73	69.64	111.19	2.29	254.21	2.39	0.84	0.84
6.89	73.17	116.85	2.22	259.28	2.38	0.85	0.85
7.05	78.64	125.61	2.09	262.71	2.34	0.86	0.86
7.22	81.74	130.57	2.01	262.46	2.32	0.87	0.87
7.38	81.57	130.29	1.95	254.16	2.30	0.87	0.87
7.55	77.87	124.33	1.95	242.94	2.30	0.86	0.86
7.71	76.00	121.31	1.93	234.33	2.29	0.85	0.85
7.87	74.03	118.13	1.92	227.03	2.29	0.85	0.85
8.04	72.70	115.97	1.91	221.10	2.29	0.85	0.85

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.20	72.87	114.14	1.83	208.55	2.26	0.85	0.85
8.37	78.40	119.72	1.71	204.89	2.22	0.85	0.85
8.53	84.63	127.04	1.67	212.28	2.20	0.86	0.86
8.69	89.46	132.84	1.69	224.89	2.21	0.87	0.87
8.86	87.23	128.85	1.80	231.51	2.25	0.86	0.86
9.02	81.36	119.27	1.87	223.45	2.28	0.85	0.85
9.19	70.26	102.80	2.07	212.46	2.34	0.83	0.83
9.35	63.16	91.85	2.21	202.56	2.37	0.82	0.82
9.51	59.06	85.21	2.33	198.15	2.40	0.81	0.81
9.68	58.43	82.92	2.28	188.81	2.39	0.80	0.80
9.84	56.83	79.54	2.26	179.97	2.39	0.80	0.80
10.01	53.16	73.69	2.36	173.62	2.41	0.79	0.79
10.17	48.96	67.54	2.56	173.06	2.46	0.77	0.77
10.34	44.60	61.17	2.80	171.12	2.51	0.76	0.76
10.50	42.29	57.37	2.86	164.31	2.52	0.75	0.75
10.66	41.49	55.49	2.82	156.40	2.51	0.75	0.75
10.83	42.43	55.78	2.68	149.28	2.48	0.75	0.75
10.99	45.46	58.85	2.53	148.81	2.45	0.76	0.76
11.16	50.13	63.85	2.37	151.34	2.41	0.77	0.77
11.32	54.76	68.80	2.26	155.70	2.39	0.78	0.78
11.48	58.26	72.12	2.13	153.90	2.35	0.78	0.78
11.65	60.70	74.18	2.08	154.12	2.34	0.79	0.79
11.81	62.46	75.49	2.05	154.57	2.33	0.79	0.79
11.98	63.83	76.39	2.07	158.05	2.34	0.79	0.79
12.14	64.60	76.55	2.07	158.63	2.34	0.79	0.79
12.30	65.37	76.66	2.06	157.73	2.33	0.79	0.79
12.47	66.30	76.91	2.04	156.79	2.33	0.79	0.79
12.63	67.50	77.54	2.03	157.31	2.32	0.79	0.79
12.80	68.57	77.97	2.02	157.79	2.32	0.79	0.79
12.96	69.40	78.18	2.03	158.35	2.32	0.79	0.79
13.12	70.04	78.15	2.02	157.55	2.32	0.79	0.79
13.29	70.87	78.29	2.00	156.70	2.32	0.79	0.79
13.45	72.67	79.53	1.98	157.16	2.31	0.80	0.80
13.62	76.90	83.30	1.92	160.01	2.29	0.80	0.80
13.78	82.17	88.22	1.89	166.54	2.28	0.81	0.81
13.94	85.04	90.55	1.90	171.70	2.28	0.81	0.81
14.11	83.77	88.48	1.96	173.32	2.30	0.81	0.81
14.27	80.27	84.13	2.04	171.68	2.33	0.80	0.80
14.44	77.24	80.27	2.12	170.07	2.35	0.80	0.80
14.60	74.74	76.98	2.12	163.55	2.35	0.79	0.79
14.76	71.57	73.08	2.15	157.05	2.36	0.78	0.78
14.93	67.57	68.34	2.16	147.93	2.36	0.78	0.78
15.09	63.77	63.99	2.29	146.73	2.40	0.77	0.77
15.26	61.84	61.50	2.36	145.22	2.41	0.76	0.76
15.42	61.01	60.19	2.43	146.25	2.43	0.76	0.76
15.58	59.84	58.55	2.49	146.02	2.44	0.75	0.75
15.75	56.94	55.21	2.63	144.93	2.47	0.75	0.75
15.91	53.54	51.46	2.80	144.13	2.51	0.74	0.74

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
16.08	49.98	47.56	2.99	142.05	2.54	0.73	0.73
16.24	46.54	43.87	3.19	140.01	2.58	0.72	0.72
16.40	42.61	39.76	3.44	136.73	2.62	2.84	2.84
16.57	36.61	33.72	3.85	129.66	2.68	2.41	2.41
16.73	28.48	25.78	4.58	118.04	2.78	1.84	1.84
16.90	20.35	17.96	5.71	102.55	2.90	1.28	1.28
17.06	15.13	12.97	6.87	89.13	3.01	0.93	0.93
17.23	13.87	11.70	7.23	84.52	3.04	0.84	0.84
17.39	15.97	13.50	6.55	88.42	2.98	0.96	0.96
17.55	19.67	16.72	5.83	97.48	2.91	1.19	1.19
17.72	23.43	19.95	5.28	105.35	2.86	1.42	1.42
17.88	26.49	22.54	4.61	103.98	2.78	1.60	1.60
18.05	30.19	25.66	4.06	104.04	2.71	1.82	1.82
18.21	35.31	30.02	3.51	105.28	2.63	2.12	2.12
18.37	39.67	33.62	3.37	113.21	2.61	2.37	2.37
18.54	42.47	35.80	3.25	116.52	2.59	0.69	0.69
18.70	43.07	36.05	3.30	118.96	2.60	0.69	0.69
18.87	42.81	35.51	3.42	121.60	2.62	2.50	2.50
19.03	42.68	35.12	3.49	122.73	2.63	2.47	2.47
19.19	45.08	36.94	3.29	121.56	2.59	0.70	0.70
19.36	49.84	40.79	2.90	118.36	2.53	0.71	0.71
19.52	55.44	45.33	2.60	118.05	2.47	0.72	0.72
19.69	59.42	48.39	2.47	119.59	2.44	0.73	0.73
19.85	62.38	50.56	2.42	122.59	2.43	0.74	0.74
20.01	64.12	51.67	2.41	124.47	2.42	0.74	0.74
20.18	65.72	52.63	2.40	126.29	2.42	0.74	0.74
20.34	67.59	53.83	2.38	128.05	2.42	0.74	0.74
20.51	70.59	55.90	2.36	131.91	2.41	0.75	0.75
20.67	73.02	57.52	2.34	134.61	2.41	0.75	0.75
20.83	74.29	58.17	2.34	136.28	2.41	0.75	0.75
21.00	74.79	58.19	2.33	135.81	2.41	0.75	0.75
21.16	76.39	59.15	2.29	135.26	2.39	0.76	0.76
21.33	80.19	61.88	2.19	135.60	2.37	0.76	0.76
21.49	85.85	66.20	2.04	135.00	2.33	0.77	0.77
21.65	92.45	71.14	1.95	138.62	2.30	0.78	0.78
21.82	97.42	74.63	1.92	143.08	2.29	0.79	0.79
21.98	101.58	77.37	1.94	150.10	2.30	0.79	0.79
22.15	104.58	79.19	1.95	154.15	2.30	0.80	0.80
22.31	108.25	81.62	1.92	156.43	2.29	0.80	0.80
22.47	112.22	84.28	1.88	158.72	2.28	0.80	0.80
22.64	116.32	86.99	1.85	160.97	2.27	0.81	0.81
22.80	119.98	89.33	1.84	163.99	2.26	0.81	0.81
22.97	123.25	91.32	1.82	166.12	2.26	0.81	0.81
23.13	127.22	93.86	1.80	169.08	2.25	0.82	0.82
23.30	130.05	95.50	1.78	170.36	2.24	0.82	0.82
23.46	129.45	94.46	1.81	170.52	2.25	0.82	0.82
23.62	124.68	90.23	1.86	168.06	2.27	0.81	0.81
23.79	120.21	86.18	1.94	167.24	2.30	0.81	0.81

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
23.95	120.21	85.60	1.98	169.07	2.31	0.81	0.81
24.12	124.78	88.45	1.96	173.30	2.30	0.81	0.81
24.28	130.45	92.12	1.93	178.25	2.30	0.82	0.82
24.44	132.58	93.36	1.89	176.46	2.28	0.82	0.82
24.61	131.48	92.45	1.81	167.23	2.25	0.82	0.82
24.77	129.48	90.84	1.75	159.31	2.23	0.81	0.81
24.94	125.84	87.71	1.77	155.44	2.24	0.81	0.81
25.10	122.74	84.87	1.82	154.65	2.26	0.80	0.80
25.26	118.31	81.26	1.85	150.01	2.27	0.80	0.80
25.43	121.61	83.49	1.77	147.69	2.24	0.80	0.80
25.59	131.34	90.38	1.67	150.99	2.20	0.81	0.81
25.76	140.47	96.83	1.59	153.77	2.17	0.82	0.82
25.92	137.11	94.01	1.59	149.92	2.17	0.82	0.82
26.08	119.41	80.67	1.71	138.34	2.22	0.80	0.80
26.25	95.87	63.26	1.98	125.00	2.31	0.76	0.76
26.41	75.37	48.28	2.41	116.52	2.42	0.73	0.73
26.58	58.61	36.17	3.13	113.05	2.57	0.69	0.69
26.74	43.51	25.61	4.33	110.94	2.74	1.76	1.76
26.90	31.74	17.77	5.78	102.65	2.91	1.26	1.26
27.07	23.24	12.55	7.39	92.82	3.06	0.90	0.90
27.23	20.03	10.62	7.83	83.20	3.09	0.76	0.76
27.40	17.93	9.34	8.25	77.04	3.13	0.67	0.67
27.56	16.43	8.43	8.37	70.54	3.13	0.60	0.60
27.72	15.24	7.70	8.25	63.53	3.13	0.29	0.55
27.89	14.04	6.97	8.53	59.46	3.15	0.17	0.50
28.05	13.87	6.84	8.67	59.26	3.16	0.23	0.49
28.22	14.77	7.30	8.85	64.60	3.17	0.28	0.52
28.38	15.61	7.73	8.79	67.91	3.17	0.34	0.55
28.54	15.44	7.59	8.92	67.69	3.18	0.33	0.54
28.71	13.94	6.72	9.49	63.77	3.22	0.28	0.48
28.87	12.75	6.02	9.64	58.05	3.23	0.22	0.43
29.04	12.31	5.75	9.73	55.91	3.23	0.16	0.41
29.20	12.72	5.93	9.44	56.01	3.21	0.22	0.42
29.36	13.32	6.23	9.30	57.94	3.20	0.22	0.44
29.53	14.32	6.73	9.15	61.61	3.19	0.22	0.48
29.69	14.85	6.98	9.29	64.84	3.20	0.32	0.50
29.86	14.88	6.96	9.51	66.18	3.22	0.32	0.50
30.02	14.45	6.69	9.62	64.34	3.23	0.27	0.48
30.19	14.62	6.74	9.31	62.75	3.20	0.26	0.48
30.35	14.96	6.88	9.12	62.75	3.19	0.26	0.49
30.51	15.06	6.90	9.08	62.66	3.19	0.26	0.49
30.68	14.56	6.60	9.44	62.29	3.21	0.26	0.47
30.84	13.66	6.10	9.87	60.16	3.24	0.26	0.44
31.01	13.29	5.87	9.92	58.24	3.25	0.21	0.42
31.17	13.13	5.76	10.08	58.01	3.26	0.21	0.41
31.33	13.63	5.98	10.24	61.22	3.27	0.26	0.43
31.50	13.63	5.95	10.74	63.88	3.30	0.31	0.42
31.66	13.63	5.92	10.54	62.36	3.29	0.30	0.42

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.83	13.27	5.70	10.37	59.09	3.28	0.20	0.41
31.99	13.17	5.62	9.93	55.79	3.25	0.20	0.40
32.15	13.03	5.52	10.06	55.59	3.26	0.20	0.39
32.32	12.73	5.34	10.04	53.65	3.25	0.20	0.38
32.48	12.17	5.04	10.22	51.48	3.27	0.15	0.36
32.65	11.74	4.80	10.28	49.32	3.27	0.15	0.34
32.81	12.00	4.90	10.43	51.15	3.28	0.15	0.35
32.97	12.70	5.22	10.19	53.18	3.26	0.20	0.37
33.14	13.47	5.57	9.90	55.13	3.25	0.19	0.40
33.30	13.81	5.70	9.68	55.19	3.23	0.19	0.41
33.47	14.14	5.83	9.47	55.24	3.22	0.19	0.42
33.63	14.71	6.08	9.38	56.97	3.21	0.19	0.43
33.79	16.31	6.81	8.43	57.43	3.14	0.24	0.49
33.96	16.34	6.79	8.20	55.68	3.12	0.19	0.49
34.12	15.78	6.49	8.00	51.93	3.11	0.14	0.46
34.29	14.48	5.85	8.49	49.62	3.14	0.14	0.42
34.45	14.95	6.04	8.82	53.26	3.17	0.14	0.43
34.61	15.05	6.06	9.57	57.95	3.22	0.23	0.43
34.78	16.11	6.52	9.59	62.54	3.22	0.28	0.47
34.94	15.82	6.35	10.01	63.58	3.25	0.28	0.45
35.11	19.05	7.82	8.44	65.96	3.14	0.28	0.56
35.27	20.75	8.56	8.18	70.09	3.12	0.61	0.61
35.43	23.46	9.76	7.71	75.25	3.08	0.70	0.70
35.60	23.82	9.88	8.07	79.71	3.11	0.71	0.71
35.76	27.72	11.61	7.44	86.37	3.06	0.83	0.83
35.93	40.51	17.72	5.44	96.44	2.87	1.24	1.24
36.09	54.23	24.83	4.34	107.74	2.75	1.67	1.67
36.26	64.95	30.34	3.88	117.68	2.68	2.01	2.01
36.42	75.28	35.66	3.56	126.80	2.64	2.33	2.33
36.58	83.25	39.77	3.35	133.36	2.60	2.57	2.57
36.75	86.02	41.00	3.33	136.45	2.60	2.65	2.65
36.91	72.06	32.99	4.03	132.91	2.70	2.19	2.19
37.08	56.93	24.86	4.98	123.75	2.82	1.71	1.71
37.24	44.03	18.23	6.16	112.30	2.95	1.30	1.30
37.40	34.26	13.88	7.13	98.94	3.03	0.99	0.99
37.57	25.04	9.82	8.74	85.90	3.16	0.70	0.70
37.73	18.31	6.89	10.53	72.51	3.29	0.49	0.49
37.90	16.68	6.15	10.93	67.25	3.31	0.34	0.44
38.06	16.75	6.15	10.74	66.08	3.30	0.30	0.44
38.22	17.32	6.37	10.41	66.26	3.28	0.30	0.45
38.39	17.82	6.55	10.47	68.55	3.28	0.34	0.47
38.55	18.89	6.97	10.48	73.06	3.28	0.50	0.50
38.72	24.85	9.44	8.67	81.87	3.16	0.67	0.67
38.88	36.54	14.29	6.36	90.96	2.97	1.02	1.02
39.04	47.85	19.67	5.05	99.28	2.83	1.35	1.35
39.21	50.53	20.80	4.97	103.27	2.82	1.43	1.43
39.37	49.85	20.28	5.16	104.66	2.84	1.40	1.40
39.54	51.64	21.04	5.04	106.08	2.83	1.45	1.45

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.70	56.11	23.20	4.63	107.48	2.78	1.57	1.57
39.86	59.44	24.74	4.43	109.56	2.76	1.66	1.66
40.03	63.83	26.91	4.09	109.98	2.71	1.78	1.78
40.19	70.86	30.52	3.64	111.01	2.65	1.98	1.98
40.36	77.11	33.71	3.32	111.98	2.60	0.68	0.68
40.52	79.93	34.88	3.31	115.38	2.60	0.69	0.69
40.68	81.39	35.26	3.39	119.47	2.61	2.25	2.25
40.85	82.47	35.47	3.46	122.72	2.62	2.27	2.27
41.01	83.93	36.07	3.41	123.13	2.61	2.30	2.30
41.18	85.12	36.60	3.34	122.16	2.60	2.33	2.33
41.34	85.38	36.69	3.29	120.56	2.59	0.70	0.70
41.50	83.61	35.58	3.39	120.46	2.61	2.27	2.27
41.67	79.37	33.20	3.61	119.77	2.64	2.14	2.14
41.83	75.60	31.16	3.80	118.35	2.67	2.02	2.02
42.00	75.20	30.94	3.75	116.06	2.67	2.00	2.00
42.16	79.90	33.34	3.45	114.95	2.62	2.13	2.13
42.32	86.27	36.46	3.20	116.59	2.58	0.69	0.69
42.49	91.33	38.84	3.06	118.93	2.55	0.70	0.70
42.65	94.56	40.13	3.06	122.65	2.55	0.71	0.71
42.82	99.40	42.59	2.87	122.28	2.52	0.71	0.71
42.98	102.26	44.10	2.74	120.70	2.49	0.72	0.72
43.15	100.50	43.31	2.69	116.55	2.48	0.72	0.72
43.31	95.50	40.37	2.90	117.18	2.53	0.71	0.71
43.47	90.43	37.40	3.17	118.53	2.57	0.70	0.70
43.64	77.93	30.80	3.84	118.14	2.68	1.99	1.99
43.80	57.97	21.27	5.13	109.11	2.84	1.46	1.46
43.97	35.77	12.18	7.91	96.38	3.10	0.87	0.87
44.13	29.80	9.94	8.17	81.19	3.12	0.71	0.71
44.29	35.97	12.16	6.47	78.62	2.97	0.87	0.87
44.46	41.77	14.70	5.31	78.12	2.86	1.02	1.02
44.62	39.34	13.38	6.00	80.31	2.93	0.95	0.95
44.79	30.24	9.94	7.85	78.08	3.09	0.71	0.71
44.95	25.60	8.23	9.46	77.91	3.22	0.59	0.59
45.11	35.31	11.69	7.42	86.74	3.06	0.83	0.83
45.28	71.81	27.53	3.71	102.04	2.66	1.76	1.76
45.44	114.65	48.55	2.41	116.79	2.42	0.73	0.73
45.61	142.50	62.59	2.04	127.88	2.33	0.76	0.76
45.77	130.78	55.53	2.34	129.84	2.41	0.75	0.75
45.93	106.28	42.68	2.94	125.51	2.53	0.71	0.71
46.10	98.24	38.89	3.07	119.36	2.56	0.70	0.70
46.26	123.83	52.46	2.25	118.02	2.38	0.74	0.74
46.43	158.06	70.45	1.82	128.04	2.26	0.78	0.78
46.59	186.17	84.54	1.69	143.21	2.21	0.80	0.80
46.75	199.94	90.69	1.70	154.12	2.21	0.81	0.81
46.92	215.77	98.57	1.65	162.60	2.19	0.83	0.83
47.08	226.39	103.69	1.63	168.82	2.18	0.83	0.83
47.25	234.80	108.29	1.58	171.20	2.16	0.84	0.84
47.41	242.35	112.21	1.55	174.20	2.15	0.84	0.84

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.57	253.06	117.67	1.52	179.39	2.14	0.85	0.85
47.74	265.15	123.06	1.53	188.18	2.14	0.86	0.86
47.90	272.35	125.60	1.56	195.59	2.15	0.86	0.86
48.07	270.22	123.49	1.60	197.50	2.17	0.86	0.86
48.23	256.75	115.62	1.68	193.83	2.20	0.85	0.85
48.39	236.15	104.64	1.77	184.95	2.24	0.83	0.83
48.56	215.69	94.14	1.86	174.80	2.27	0.82	0.82
48.72	200.93	86.83	1.91	166.25	2.29	0.81	0.81
48.89	188.98	81.06	1.95	158.35	2.30	0.80	0.80
49.05	176.00	75.22	1.96	147.45	2.30	0.79	0.79
49.22	168.95	72.78	1.88	136.74	2.28	0.78	0.78
49.38	166.71	72.87	1.76	128.23	2.24	0.78	0.78
49.54	184.12	83.43	1.54	128.79	2.15	0.80	0.80
49.71	200.59	93.21	1.42	132.61	2.08	0.82	0.82
49.87	216.28	102.48	1.34	137.76	2.03	0.83	0.83
50.04	216.19	101.99	1.36	138.25	2.04	0.83	0.83
50.20	209.59	98.36	1.37	134.63	2.05	0.82	0.82
50.36	188.83	86.13	1.48	127.32	2.11	0.81	0.81
50.53	142.60	59.96	1.95	116.81	2.30	0.76	0.76
50.69	92.90	34.80	3.06	106.60	2.56	0.69	0.69
50.86	52.21	16.49	5.77	95.14	2.91	1.16	1.16
51.02	47.91	15.04	5.74	86.30	2.90	1.05	1.05
51.18	58.54	19.39	4.75	92.12	2.80	1.30	1.30
51.35	73.07	25.39	4.02	102.00	2.70	1.64	1.64
51.51	90.63	32.88	3.41	112.02	2.61	2.05	2.05
51.68	123.46	47.79	2.63	125.73	2.47	0.73	0.73
51.84	165.44	68.07	2.06	140.32	2.33	0.77	0.77
52.00	196.98	83.13	1.87	155.57	2.28	0.80	0.80
52.17	202.92	85.51	1.87	160.32	2.28	0.81	0.81
52.33	193.45	80.56	1.95	156.97	2.30	0.80	0.80
52.50	194.25	82.05	1.83	150.19	2.26	0.80	0.80
52.66	208.39	90.13	1.67	150.73	2.20	0.81	0.81
52.82	235.28	104.42	1.53	160.05	2.14	0.83	0.83
52.99	248.91	110.19	1.54	169.93	2.14	0.84	0.84
53.15	250.91	110.07	1.58	174.23	2.16	0.84	0.84
53.32	249.41	108.77	1.61	174.74	2.17	0.84	0.84
53.48	247.48	107.42	1.62	174.52	2.18	0.84	0.84
53.64	240.91	103.55	1.67	173.05	2.20	0.83	0.83
53.81	230.85	97.61	1.76	171.82	2.24	0.82	0.82
53.97	227.98	71.57	2.07	148.24	2.34	0.78	0.78
54.14	239.61	75.12	2.02	151.74	2.32	0.79	0.79
54.30	253.94	79.53	1.97	156.31	2.31	0.80	0.80
54.46	262.74	82.16	1.94	159.04	2.30	0.80	0.80
54.63	264.47	82.54	1.92	158.87	2.29	0.80	0.80

:: Strength loss calculation (Robertson (2009) :: (continued)

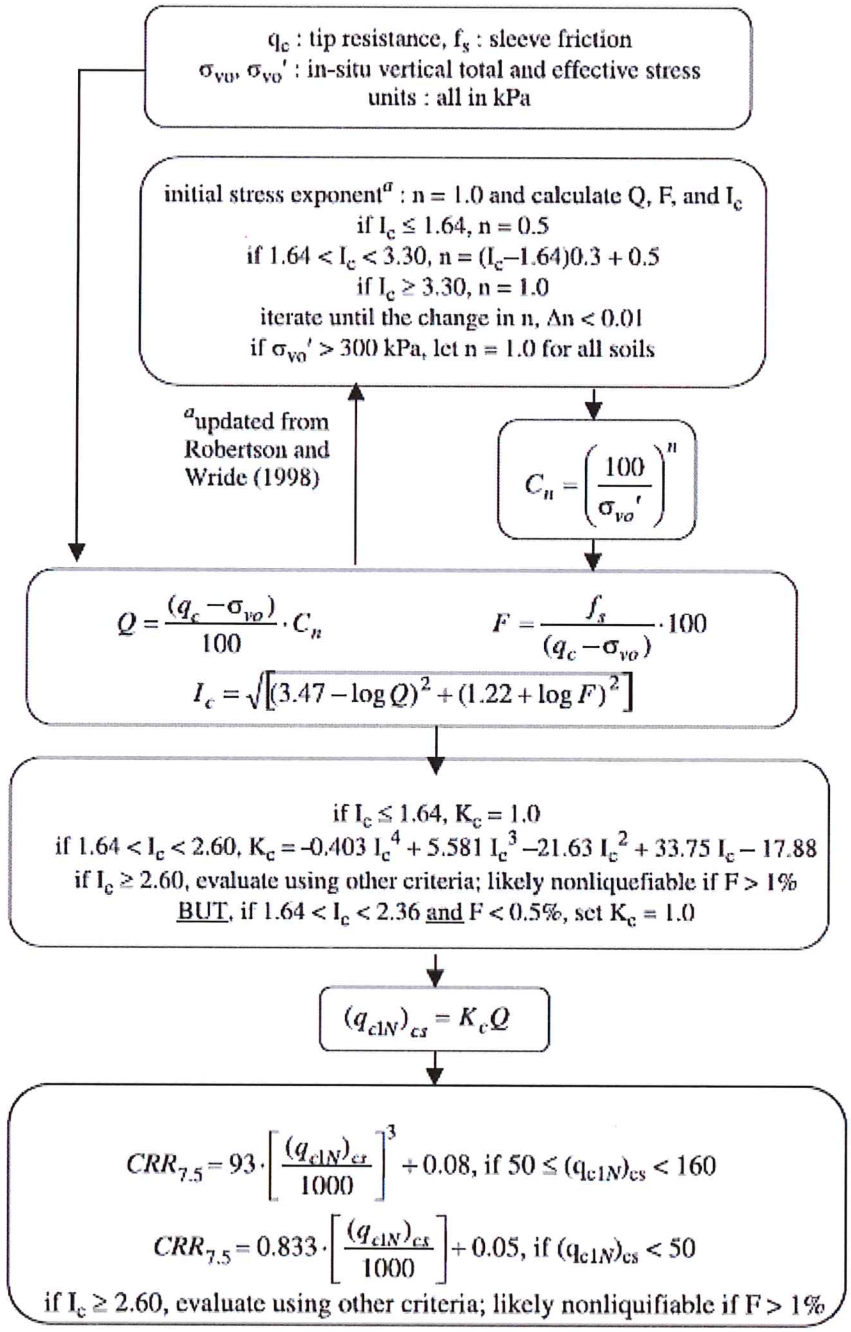
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$

Abbreviations

q_t:	Total cone resistance
K_c:	Cone resistance correction factor due to fines
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
I_c:	Soil behavior type index
$S_{u(liq)}/\sigma'_v$:	Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$:	Calculated peak undrained strength ratio

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

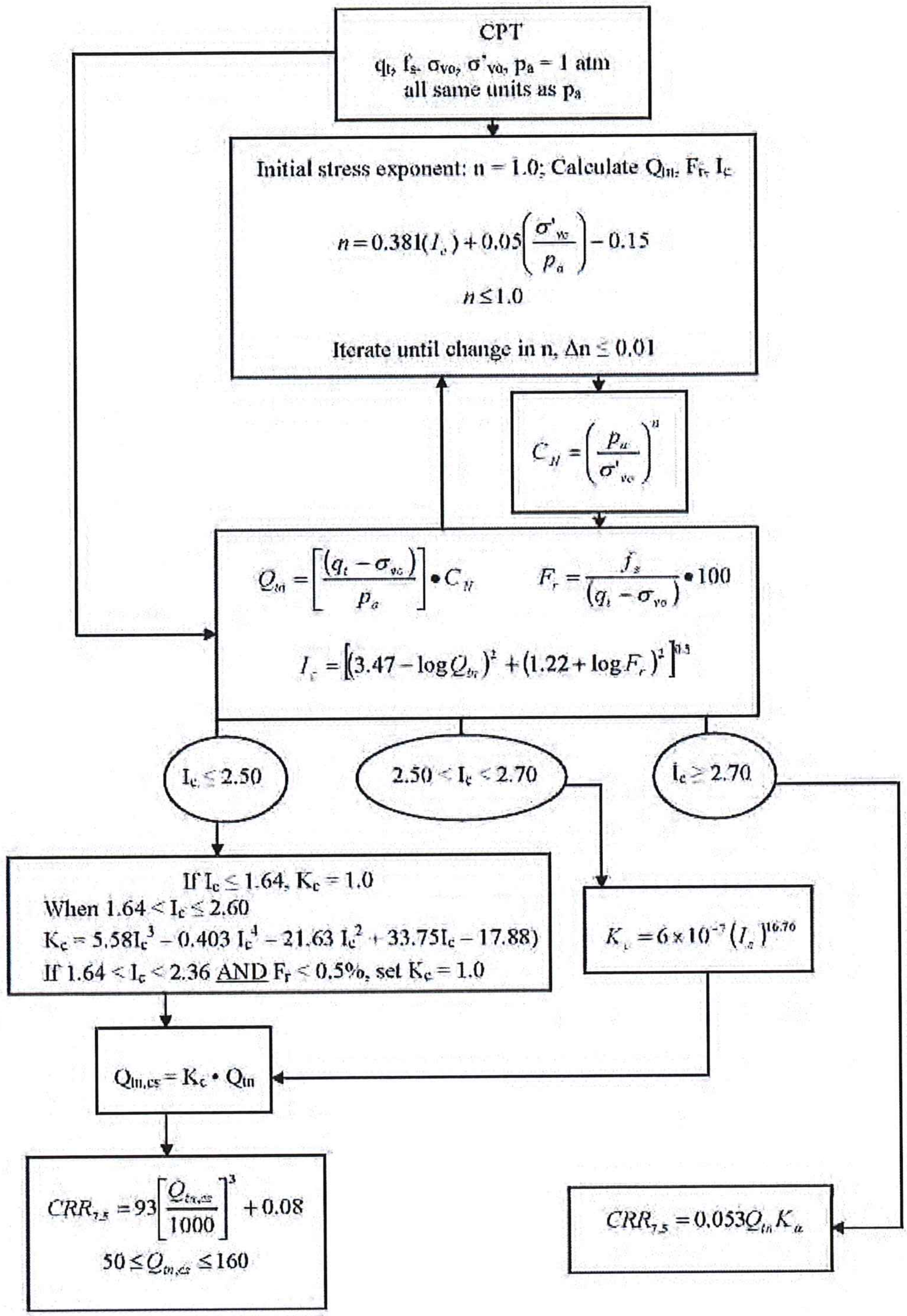
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

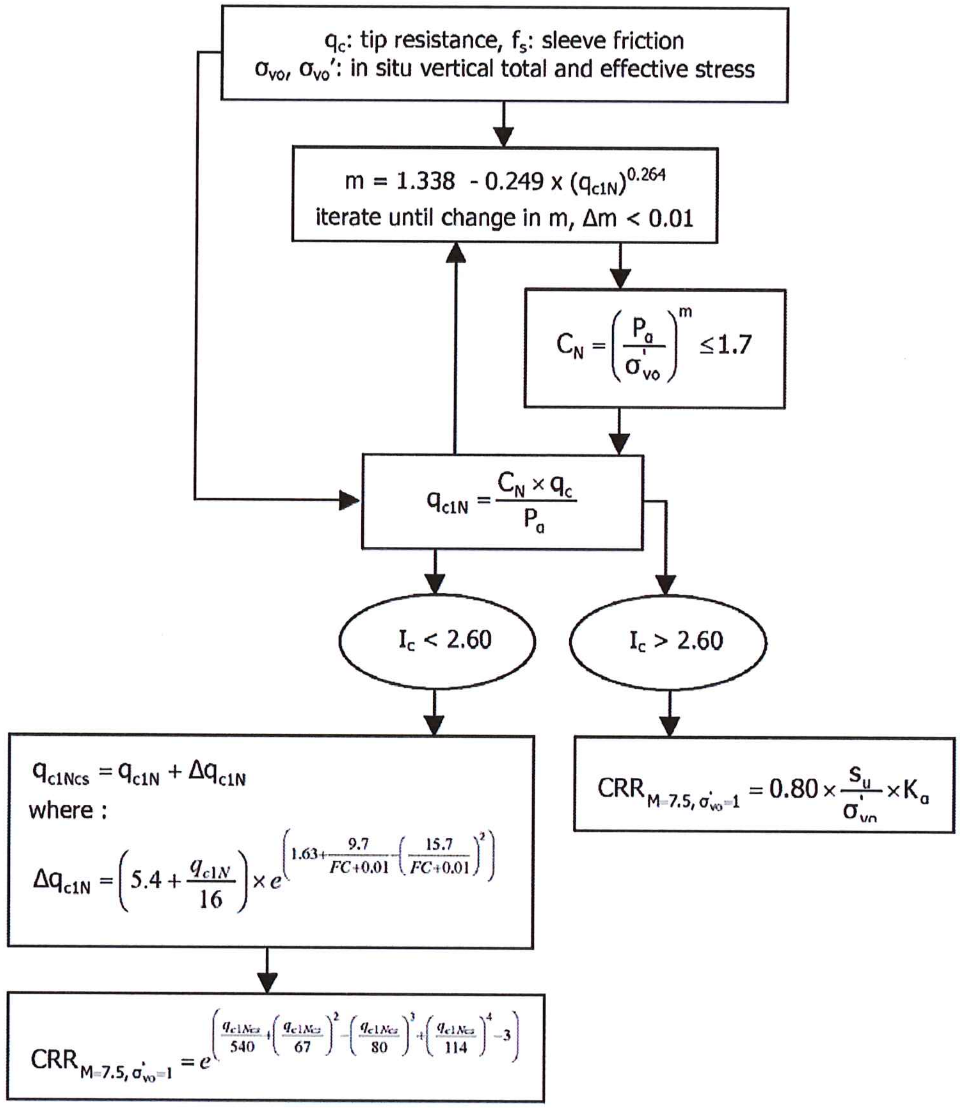
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)

CPT

q_t, f_s, I_c

↓

$I_c < I_c$ cut-off

↓

Initial estimate using raw tip measurements, friction ratio. Calculate $q_{t,1}$. Repeat until an acceptable convergence tolerance is achieved.

$$c = f_1 \cdot \left(\frac{R_f}{f_3}\right)^{f_2}$$

↓

$$C_q = \left(\frac{P_a}{\sigma'_v}\right)^c$$

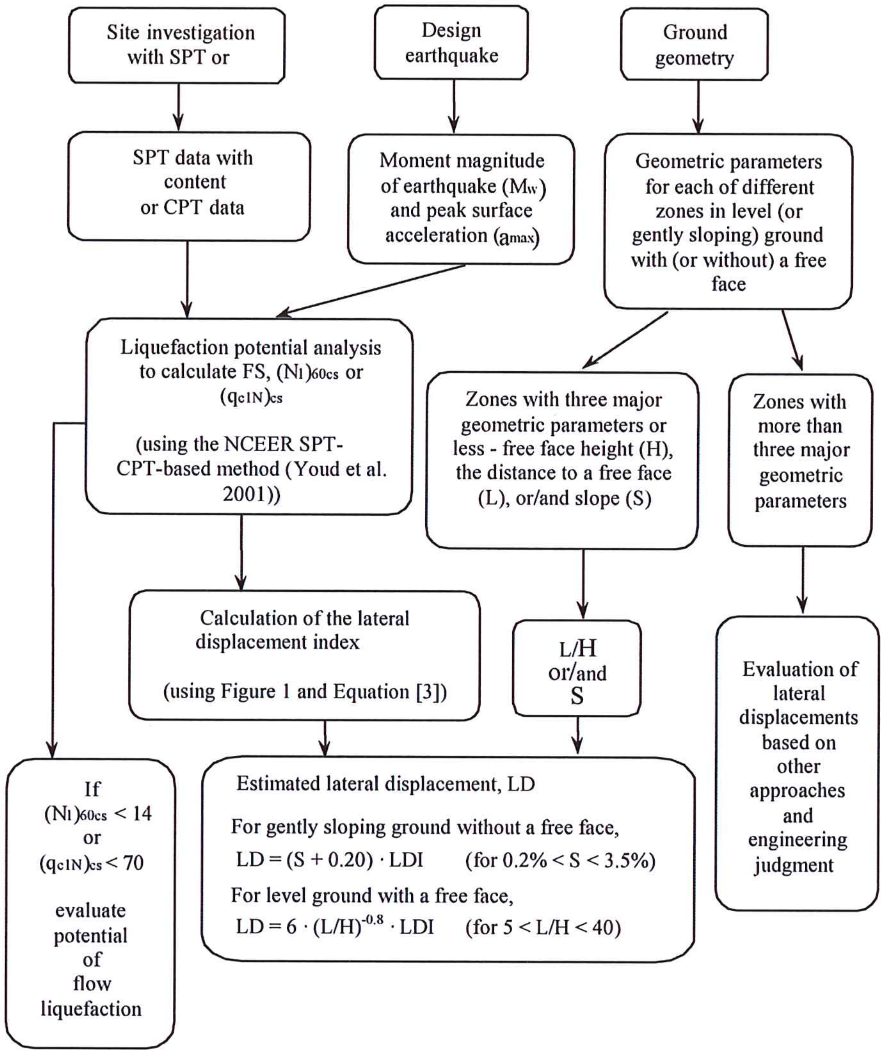
↓

$$q_{t,1} = C_q \cdot q_t$$

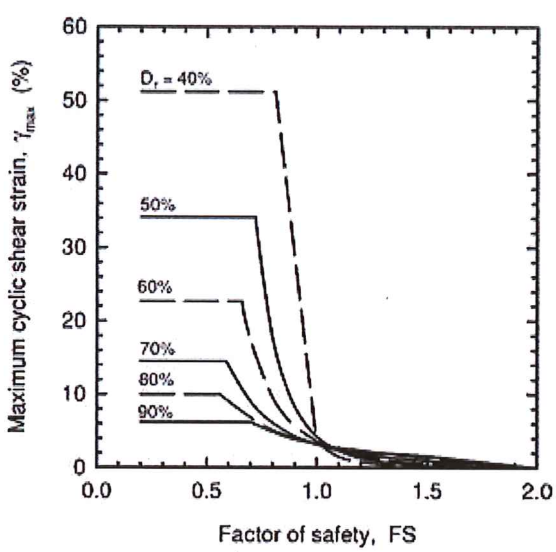
↓

$$CRR = \exp\left[\frac{q_{t,1}^{1.045} + q_{t,1} \cdot (0.110 \cdot R_f) + (0.001 \cdot R_f) + c \cdot (1 + 0.850 \cdot R_f) - 0.848 \cdot \ln(M_w) - 0.002 \cdot \ln(\sigma'_v) - 20.923 + 1.632 \cdot \Phi^{-1}(P_L)}{7.177}\right]$$

Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



[1] **Figure 1**

$$LDI = \int_0^{z_{max}} \gamma_{max} \, dz$$

[1] **Equation [3]**

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands

Average shear stress, τ_{av}

$$\tau_{av} = CSR^{*} \cdot \sigma_{v0}' = 0.65 \cdot \frac{a_{max}}{g} \cdot \sigma_{v0} \cdot r_d$$

↓

Estimate small shear strain modulus, G_0

$$G_0 = 0.0188 \cdot \left[10^{(0.55 I_c - 1.68)}\right] \cdot (q_t - \sigma_v)$$

↓

Estimate shear strain amplitude, γ

(based on Pradel (1998))

$$\gamma = \left[\frac{1 + a \cdot e^{bR}}{1 + a}\right] \cdot R \cdot 100\ (\%)$$

$$R = \frac{\tau_{av}}{G_0}\ \text{(Note } \tau_{av} \text{ and } G_0 \text{ same units)}$$

$$a = 0.0389 \cdot \left(\frac{\sigma_v}{p_a}\right) + 0.124$$

$$b = 6400 \cdot \left(\frac{\sigma_v}{p_a}\right)$$

↓

Estimate volumetric strain in 15 cycles

$$\varepsilon_{vol(15)} = \gamma \cdot \left[\frac{(N_1)_{60,cs}}{20}\right]^{-1.20}$$

$$(N_1)_{60,cs} = \frac{Q_{tn,cs}}{8.5 \cdot \left[1 - \frac{I_c}{4.6}\right]}$$

↓

Volumetric strain in design earthquake

$$\varepsilon_{vol} = \varepsilon_{vol(15)} \cdot \left[\frac{N_c}{15}\right]^{0.45}$$

$$N_c = (M - 4)^{2.17}$$

↓

Seismic settlement, s

$$s = 2 \cdot \int_0^{GWT} \varepsilon_{vol} \cdot dz$$

Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

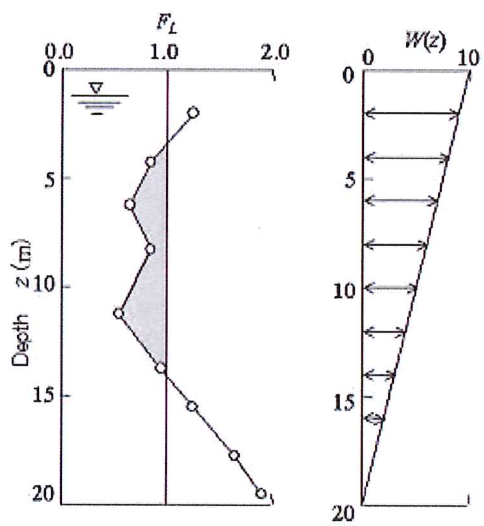
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\textbf{LPI} = \int_0^{20} (10 - 0{,}5_z) \times F_L \times d_z$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

References

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- Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J.T., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J., Liao, S., Marcuson III, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R., and Stokoe, K.H., Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 127, October, pp 817-833

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- P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering - from case history to practice, IS-Tokyo, June 2009

- Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, *Symposium in honor of professor I. M. Idriss,* SAN diego, CA

- R. E. S. Moss, R. B. Seed, R. E. Kayen, J. P. Stewart, A. Der Kiureghian, K. O. Cetin, CPT-Based Probabilistic and Deterministic Assessment of In Situ Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 8, August 1, 2006

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STATE OF CALIFORNIA, NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., GOVERNOR

DEPARTMENT OF CONSERVATION

CALIFORNIA GEOLOGICAL SURVEY

2016 NOV 18 AM 9: 12

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Felipe R. Lopez
Chief Business Officer
Compton Community College District
1111 East Artesia Boulevard
Compton, CA 90221

November 9, 2016

Subject: **Engineering Geology and Seismology Review for Compton Community College – New Two-Story Building 1111 East Artesia Boulevard, Compton, CA CGS Application No. 03-CGS2518**

Dear Mr. Lopez:

In accordance with your request and transmittal of documents received on August 30, 2016, the California Geological Survey has reviewed the engineering geology and seismology aspects of the consulting report prepared for Compton Community College in Compton. It is our understanding that this project involves construction of a new two-story building. This review was performed in accordance with Title 24, California Code of Regulations, 2013 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report:

> **Geotechnical Engineering and Geologic Hazards Study, Proposed Instructional Building 1, El Camino College Compton Center, 1111 E Artesia Boulevard, Compton, California 90221:** Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated December 21, 2015, 36 pages, 9 figures, 4 appendices.

Based on our review of the data and reports presented by Heider Inspection Group, additional information is requested to address the engineering geology and seismology issues with respect to the proposed new two-story building. Specifically, the consultants are requested to evaluate and discuss the potential for surface manifestation of liquefaction and loss of bearing capacity at the site. Additional information is provided in the attached Checklist Comments.

In conclusion, ***the engineering geology and seismology issues at this site are not adequately assessed in the referenced report.*** It is recommended that additional information be provided as requested in the attached Note 48 Checklist Review Comments portion of this letter. The consultants are reminded that one copy of all supplemental documents should be submitted directly to CGS and should include the CGS application number. If you have any further questions about this review letter, please contact the reviewer at (213) 239-0884 or michael.defrisco@conservation.ca.gov.

Respectfully submitted,

Michael J. DeFrisco
Engineering Geologist
PG 8624, CEG 2574

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Jennifer Thornburg
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STATE OF CALIFORNIA

Enclosures:

Note 48 Checklist Review Comments
Keyed to: *Note 48 - Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings*

Copies to:

Eric J. Swenson, *Certified Engineering Geologist* and *Registered Geotechnical Engineer*
Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, CA 91761

Eric Goldberg, *Architect*
DLR Group, 3130 Wilshire Boulevard, 6th Floor, Santa Monica, CA 90403

Ted Beckwith, *Senior Structural Engineer*
Division of State Architect, 700 North Alameda Street, Suite 5-500, Los Angeles, CA 90012

Note 48 Checklist Review Comments

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1. Site Location Map, Street Address, County Name: Adequately addressed.
2. Plot Plan with Exploration Data with Building Footprint: Adequately addressed. CGS notes that a Site Data Report and/or site plan with the proposed structure location was not received with the application for this project, and therefore assumes that Figure 2 – Development Site Plan in the referenced report is accurate for purposes of this review.
3. Site Coordinates: Adequately addressed. Latitude and Longitude provided in report: 33.8789 °N, 118.2100°W

Engineering Geology/Site Characterization

4. Regional Geology and Regional Fault Maps: Adequately addressed.
5. Geologic Map of Site: Adequately addressed.
6. Subsurface Geology: Adequately addressed. Based on regional mapping, 4 borings, and 3 Cone Penetration Tests (CPTs) performed to a maximum depth of 55 feet, the consultants report the site is underlain by younger alluvial fan and valley deposits consisting of sand, sandy silt, and silty/clayey layers. Groundwater was reportedly encountered at depths of 46 to 48.5 feet in the explorations.
7. Geologic Cross Sections: Adequately addressed.
8. Active Faulting & Coseismic Deformation Across Site: Adequately addressed. The consultants report the site is not within an Earthquake Fault Zone as defined by the State of California, and they conclude that potential fault ground rupture and fault creep hazard are judged to be low.
9. Geologic Hazard Zones (Liquefaction & Landslides): Adequately addressed. The consultants report the site is within a State of California liquefaction susceptibility hazard zone, and is not within an earthquake induced landslide area.
10. Geotechnical Testing of Representative Samples: Adequately addressed.
11. Geological Consideration of Grading Plans and Foundation Plans: **Additional information may be needed.** Based on conversation with the project architect, it is our understanding that the design team has chosen a foundation option consisting of a structural mat foundation supported on a layer of engineered fill. The consultants should reassess and update their recommendations if needed based on their response to Items 21 and 22.

Seismology & Calculation of Earthquake Ground Motion

12. Evaluation of Historic Seismicity: Marginally adequate. The consultants provide a general summary of historical seismicity in the Los Angeles area. In future reports, the consultants should provide a list of historical earthquakes that have impacted the area, and generally discuss the effects of such earthquakes at the site. CGS notes that according to the Seismic Hazard Zone Report for the South Gate 7.5 Minute Quadrangle, a site of historical earthquake-generated liquefaction following the 1933 Long Beach earthquake is located approximately one half-mile northeast of the site, and that surface effects from this earthquake included cracks where water, sand, and mud were ejected.
13. Classify the Geologic Subgrade (Site Class): Adequately addressed. The consultants classify the site soil profile as **Site Class D**, Stiff Soil, based on subsurface conditions and measured shear wave velocities, which appears reasonable based on the data provided.
14. General Procedure Seismic Parameters: Adequately addressed. The consultants report the following parameters derived from a map-based analysis, which are consistent with the USGS Seismic Design Maps website:
    $S_S = 1.674g$ and $S_1 = 0.611g$
    $\mathbf{S_{DS} = 1.116g}$ and $\mathbf{S_{D1} = 0.611g}$
15. Seismic Design Category: Not applicable. $S_1 < 0.75$
16. Site-Specific Ground Motion Analysis: Not applicable
17. Deaggregated Seismic Source Parameters: Adequately addressed.
18. Time-Histories of Earthquake Ground Motion: Not applicable.

Liquefaction/Seismic Settlement Analysis

19. Geologic Setting for Occurrence of Seismically Induced Liquefaction: Adequately addressed. The consultants report significant liquefaction potential for the site based on the subsurface soils encountered, and a reported historic high groundwater depth on the order of 8 feet. The data presented appear to support this conclusion.
20. Seismic Settlement Calculations: Adequately addressed. The consultants provide results of liquefaction analyses performed with CLiq software assuming a groundwater depth of 8 feet, PGA of 0.62, and earthquake magnitude 6.6. Based on their analyses, the consultants calculated **potential post-seismic liquefaction settlement between 1.4 to 1.7 inches**. The data presented appear to support this conclusion. They **estimate 0.6 to 1.2 inches of potential differential settlement across the structure.**
21. Other Liquefaction Effects: **Additional information is requested**. Based on the results of their liquefaction analyses, the consultants report the liquefaction potential at the site is considered to be significant at depths between 10 and 45 feet. They also report the major impact of potential liquefaction would be post-earthquake settlement due to much of the calculated liquefaction occurring relatively deep. However, the consultants do not address the potential for ground surface disruption, which is reported to have occurred in the vicinity of the college campus following the 1933 Long Beach earthquake (see Item 12). The consultants should evaluate and discuss the potential for surface manifestation of

liquefaction at the site, considering the SCEC guidelines for implementation of Special Publication 117 (Martin and Lew, 1999, p. 33).

In addition, the consultants provide recommendations for allowable bearing pressure of the proposed mat foundation, but do not appear to assess the potential loss of bearing capacity due to shallow liquefaction induced soil strength loss. The bearing capacity of the soil while in its liquefied state (residual undrained shear strength) should be considered in foundation loads. The consultants should evaluate the potential for liquefaction in shallow layers to impact the proposed building footings, taking into account the residual strength of the shallow soils in their liquefied state, and provide ground improvement mitigation measures and/or revised foundation recommendations, if necessary.

22. Mitigation Options for Liquefaction: **Additional information may be needed**. If their evaluation indicates potential for surface manifestation of liquefaction and/or loss of bearing capacity to impact the foundation, the consultants should provide appropriate mitigation options.

Slope Stability Analysis

23. Geologic Setting for Occurrence of Landslides: Adequately addressed. The consultants report the site is relatively flat with no slopes, and does not exhibit landslide features based on site reconnaissance. They conclude the potential for seismically induced landslides affecting the building is considered to be nil. This appears reasonable based on the data provided.
24. Determination of Static and Dynamic Strength Parameters: Not applicable.
25. Determination of Pseudo-Static Coefficient (Keq): Not applicable.
26. Identify Critical Slip Surfaces for Static and Dynamic Analyses: Not applicable.
27. Dynamic Site Conditions: Not applicable.
28. Mitigation Options/Other Slope Failure: Not applicable.

Other Geologic Hazards or Adverse Site Conditions

29. Expansive Soils: Adequately addressed. The consultants report that Plasticity Index testing on a representative sample indicates low expansion.
30. Corrosive/Reactive Geochemistry of the Geologic Subgrade: Adequately addressed. The consultants report that test results suggest site soil should have a negligible impact on buried concrete, and that soil is considered to be of low corrosion potential to cast and ductile iron pipes.
31. Conditional Geologic Assessment: Selected geologic hazards addressed by the consultant are listed below:

    G. Hydrocollapse: Adequately addressed. The consultants anticipate approximately **1 inch of collapse settlement** due to the presence of approximately 8 feet of surficial soils that may be susceptible to collapse under saturation.

Report Documentation

32. Geology, Seismology, and Geotechnical References: Adequately addressed.
33. Certified Engineering Geologist: Adequately addressed.
    Eric J. Swenson, Certified Engineering Geologist #1855
34. Registered Geotechnical Engineer: Adequately addressed.
    Eric J Swenson, Registered Geotechnical Engineer #2474

(3)

HEIDER
INSPECTION GROUP
An ETS Company

January 20, 2017

CGS Application No. 03-CGS2518

California Geological Survey
School Review Unit, 801 K Street, MS 12-31
Sacramento, California 95814

Attention: Mr. Michael J. DeFrisco, CEG

Subject: ***Response to CGS November 9, 2016 Review Letter of Geotechnical Engineering and Geologic Hazards Investigation***
Compton Community College-New Two-Story Building
1111 East Artesia Boulevard
Compton, California 90221
Heider Inspection Group, HE 15281-2

Project Reference Documents:

1) Geotechnical Engineering and Geologic Hazards Study, Proposed Instructional Building 1, El Camino College Compton Center, 1111 E Artesia Boulevard, Compton, California 90221: Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated December 21, 2015, 36 pages, 9 figures, 4 appendices.

Dear Mr. DeFrisco:

In response to your request for additional information regarding the potential for ground surface disruption and subsequent loss of capacity, as detailed in Note 48, Section 21 and 22, we have provided the following clarifications to your concerns associated with this project.

Comment, Note 48 #21:

Other Liquefaction Effects: Additional information is requested. Based on the results of their liquefaction analyses, the consultant report the liquefaction potential at the site is considered to be significant at depths between 10 and 45 feet. They also report the major impact of potential liquefaction would be post-earthquake settlement due to much of the calculated liquefaction occurring relatively deep. However, the consultants do not address the potential for ground surface disruption, which is reported to have occurred in the vicinity of the college campus following the 1933 Long Beach earthquake (see Item 12). The consultants should evaluate and discuss the potential for surface manifestation of liquefaction at the site, considering the SCEC guidelines for implementation of Special Publication 117 (Martin and Lew, 1999, p. 33).

In addition, the consultants provide recommendations for allowable bearing pressure of the proposed mat foundation, but do not appear to assess the potential loss of bearing capacity due to shallow liquefaction induced soil strength loss. The bearing capacity of the soil while in its liquefied state (residual undrained shear strength) should be considered in foundation loads. The consultants should evaluate the potential for liquefaction in shallow layers to impact the proposed building footings, taking into account the residual strength of the shallow soils in their liquefied state, and provide ground improvement mitigation measures and/or revised foundation recommendations, if necessary.

Heider Response:

As requested, we are providing clarifications to the review comments. We note our estimated liquefaction settlements range from 0.55 to 1.7 inches, respectively in CPT-1 and CPT-2, which are approximately 190 feet apart. Therefore potential differential settlement is anticipated to be about ¼" within a span of 50 feet. Furthermore, potential maximum vertical settlement is 1.7" which is a small magnitude and considered to be a small localized failure (Youd 1989, cited data from Japan). These can be mitigated by treating the site with soil improvement methods such as soil densification or other types of in-situ ground modifications and/or reinforced shallow foundations and improved structural design to withstand predicted vertical and lateral ground displacements (Localized Failure - SP117A-2008, pg-55).

As requested, we have evaluated potential loss of bearing strength/surface manifestation due to liquefaction. Loss of bearing capacity due to liquefaction can occur in saturated clean sand under strong earthquake loading conditions. The fill deposits most susceptible to liquefaction and excessive settlement are thick accumulations of clean, cohesionless sand that are saturated and do not strengthen substantially with depth. Using an analysis based on recommendations provided by Ishihara (1985) for stratified soils, the upper most non-liquefiable soil layer (H_1) is 12.5 feet over a liquefiable layer (H_2) 8.0 ft (20.5-12.5 = 8.0 ft), and the ratio of non-liquefiable to potential liquefiable layer is 1.56, which indicates that a potential for surface manifestation is unlikely. For detail thickness analysis please refer to liquefaction analysis result, page 5 – CRR Plot.

In addition, we considered a worse scenario for allowable bearing capacity recommendations, considering a shallow ground water level as well as safe soil strengths for an engineered fill. We also have attached two foundation analysis results with two different mat sizes. The analysis was conducted considering the mat as a huge isolated footing; see attached footing analysis results.

Therefore, we conclude our mat foundation recommendation for the project to be appropriate, and should handle the estimated total and differential settlements, provided mat structure is properly designed from a structural standpoint.

Comment, Note 48 #22:

Mitigation Options for Liquefaction: Additional information may be needed. If their evaluation indicates potential for surface manifestation of liquefaction and/or loss of bearing capacity to impact the foundation, the consultants should provide appropriate mitigation options.

Heider Response:

See response to Comment, Note 48, #21.

We trust that this letter provides the information needed at this time. Should you or members of the review team have questions or need additional information, please contact us at (925) 314-7180.

Sincerely,
HEIDER INSPECTION GROUP

Raghubar Shrestha, Ph.D., P.E.
Senior Engineer

Eric J. Swenson, GE2474, CEG1855
Principal Geotechnical Engineer and
Principal Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER ERIC J. SWENSON No. 2474 Exp. 12/2018 GEOTECHNICAL STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST ERIC J. SWENSON No. 1855 Exp. 09/2017 REGISTERED STATE OF CALIFORNIA

Enclosures: CGS Review Comments Letter
Fig 2- Development Site Plan
Abstract of the Liquefaction Analysis Results
Footing Analysis Results

Distribution: 1 to Addressee
PDF to Ted Beckwith, DSA, 700 North Alameda Street, Suite 5-500, Los Angeles, California 90012 (Ted.Beckwith@dgs.ca.gov)
PDF to Felipe R. Lopez, CCCD 1111 East Artesia Boulevard, Compton, California 90221 (flopez@elcamino.edu)
PDF to Eric Goldberg, Architect, DLR Group, 3130 Wilshire Boulevard, 6th Floor, Santa Monica, California 90403 (egoldberg@dlrgroup.com)

RS/EJS:pmf

STATE OF CALIFORNIA, NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., GOVERNOR

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November 9, 2016

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7. Geologic Cross Sections: Adequately addressed.
8. Active Faulting & Coseismic Deformation Across Site: Adequately addressed. The consultants report the site is not within an Earthquake Fault Zone as defined by the State of California, and they conclude that potential fault ground rupture and fault creep hazard are judged to be low.
9. Geologic Hazard Zones (Liquefaction & Landslides): Adequately addressed. The consultants report the site is within a State of California liquefaction susceptibility hazard zone, and is not within an earthquake induced landslide area.
10. Geotechnical Testing of Representative Samples: Adequately addressed.
11. Geological Consideration of Grading Plans and Foundation Plans: **Additional information may be needed.** Based on conversation with the project architect, it is our understanding that the design team has chosen a foundation option consisting of a structural mat foundation supported on a layer of engineered fill. The consultants should reassess and update their recommendations if needed based on their response to Items 21 and 22.

Seismology & Calculation of Earthquake Ground Motion

12. Evaluation of Historic Seismicity: Marginally adequate. The consultants provide a general summary of historical seismicity in the Los Angeles area. In future reports, the consultants should provide a list of historical earthquakes that have impacted the area, and generally discuss the effects of such earthquakes at the site. CGS notes that according to the Seismic Hazard Zone Report for the South Gate 7.5 Minute Quadrangle, a site of historical earthquake-generated liquefaction following the 1933 Long Beach earthquake is located approximately one half-mile northeast of the site, and that surface effects from this earthquake included cracks where water, sand, and mud were ejected.
13. Classify the Geologic Subgrade (Site Class): Adequately addressed. The consultants classify the site soil profile as **Site Class D,** Stiff Soil, based on subsurface conditions and measured shear wave velocities, which appears reasonable based on the data provided.
14. General Procedure Seismic Parameters: Adequately addressed. The consultants report the following parameters derived from a map-based analysis, which are consistent with the USGS Seismic Design Maps website:
    $S_S = 1.674g$ and $S_1 = 0.611g$
    $S_{DS} = 1.116g$ and $S_{D1} = 0.611g$
15. Seismic Design Category: Not applicable. $S_1 < 0.75$
16. Site-Specific Ground Motion Analysis: Not applicable
17. Deaggregated Seismic Source Parameters: Adequately addressed.
18. Time-Histories of Earthquake Ground Motion: Not applicable.

Liquefaction/Seismic Settlement Analysis

19. Geologic Setting for Occurrence of Seismically Induced Liquefaction: Adequately addressed. The consultants report significant liquefaction potential for the site based on the subsurface soils encountered, and a reported historic high groundwater depth on the order of 8 feet. The data presented appear to support this conclusion.
20. Seismic Settlement Calculations: Adequately addressed. The consultants provide results of liquefaction analyses performed with CLiq software assuming a groundwater depth of 8 feet, PGA of 0.62, and earthquake magnitude 6.6. Based on their analyses, the consultants calculated **potential post-seismic liquefaction settlement between 1.4 to 1.7 inches.** The data presented appear to support this conclusion. They **estimate 0.6 to 1.2 inches of potential differential settlement across the structure.**
21. Other Liquefaction Effects: **Additional information is requested.** Based on the results of their liquefaction analyses, the consultants report the liquefaction potential at the site is considered to be significant at depths between 10 and 45 feet. They also report the major impact of potential liquefaction would be post-earthquake settlement due to much of the calculated liquefaction occurring relatively deep. However, the consultants do not address the potential for ground surface disruption, which is reported to have occurred in the vicinity of the college campus following the 1933 Long Beach earthquake (see Item 12). The consultants should evaluate and discuss the potential for surface manifestation of

liquefaction at the site, considering the SCEC guidelines for implementation of Special Publication 117 (Martin and Lew, 1999, p. 33).

In addition, the consultants provide recommendations for allowable bearing pressure of the proposed mat foundation, but do not appear to assess the potential loss of bearing capacity due to shallow liquefaction induced soil strength loss. The bearing capacity of the soil while in its liquefied state (residual undrained shear strength) should be considered in foundation loads. The consultants should evaluate the potential for liquefaction in shallow layers to impact the proposed building footings, taking into account the residual strength of the shallow soils in their liquefied state, and provide ground improvement mitigation measures and/or revised foundation recommendations, if necessary.

22. Mitigation Options for Liquefaction: **Additional information may be needed**. If their evaluation indicates potential for surface manifestation of liquefaction and/or loss of bearing capacity to impact the foundation, the consultants should provide appropriate mitigation options.

Slope Stability Analysis

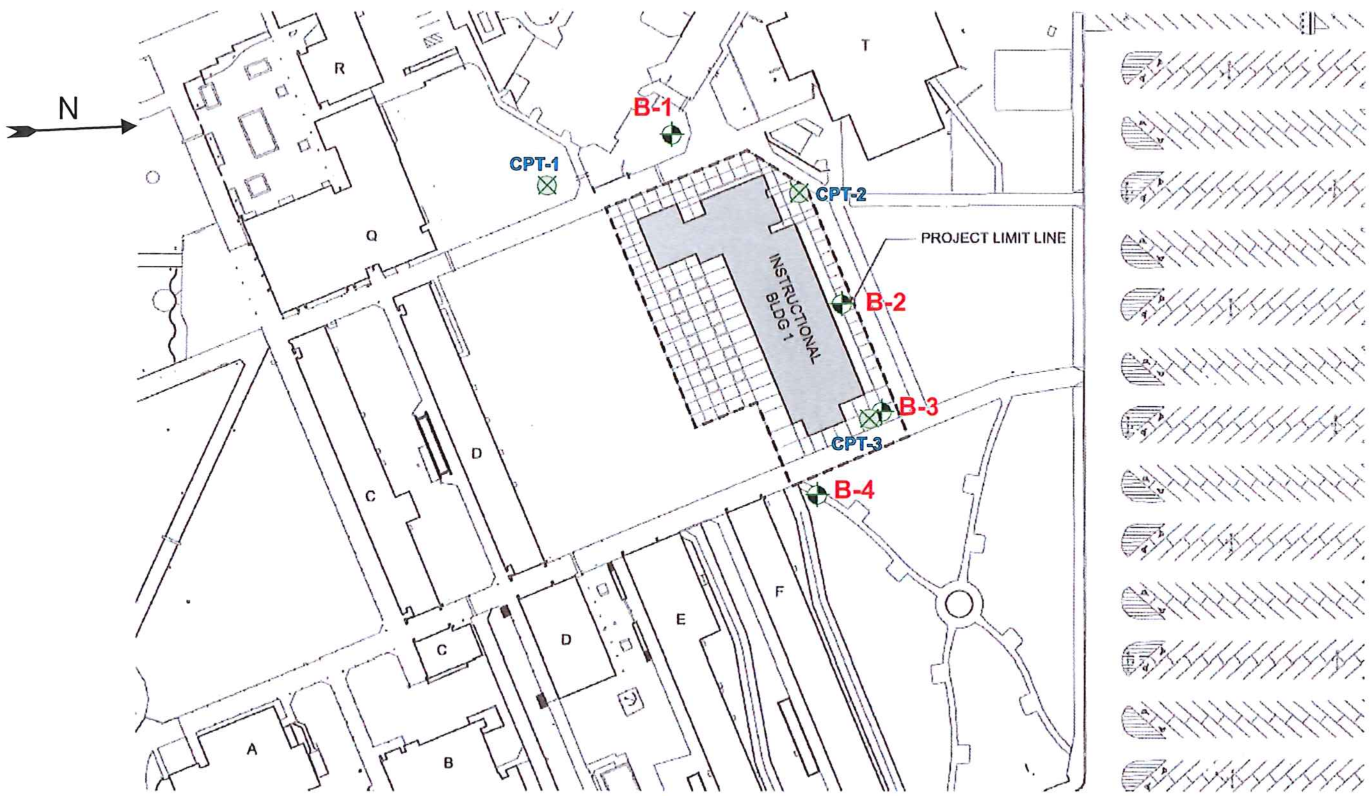
23. Geologic Setting for Occurrence of Landslides: Adequately addressed. The consultants report the site is relatively flat with no slopes, and does not exhibit landslide features based on site reconnaissance. They conclude the potential for seismically induced landslides affecting the building is considered to be nil. This appears reasonable based on the data provided.
24. Determination of Static and Dynamic Strength Parameters: Not applicable.
25. Determination of Pseudo-Static Coefficient (Keq): Not applicable.
26. Identify Critical Slip Surfaces for Static and Dynamic Analyses: Not applicable.
27. Dynamic Site Conditions: Not applicable.
28. Mitigation Options/Other Slope Failure: Not applicable.

Other Geologic Hazards or Adverse Site Conditions

29. Expansive Soils: Adequately addressed. The consultants report that Plasticity Index testing on a representative sample indicates low expansion.
30. Corrosive/Reactive Geochemistry of the Geologic Subgrade: Adequately addressed. The consultants report that test results suggest site soil should have a negligible impact on buried concrete, and that soil is considered to be of low corrosion potential to cast and ductile iron pipes.
31. Conditional Geologic Assessment: Selected geologic hazards addressed by the consultant are listed below:
    G. Hydrocollapse: Adequately addressed. The consultants anticipate approximately **1 inch of collapse settlement** due to the presence of approximately 8 feet of surficial soils that may be susceptible to collapse under saturation.

Report Documentation

32. Geology, Seismology, and Geotechnical References: Adequately addressed.
33. Certified Engineering Geologist: Adequately addressed.
    Eric J. Swenson, Certified Engineering Geologist #1855
34. Registered Geotechnical Engineer: Adequately addressed.
    Eric J Swenson, Registered Geotechnical Engineer #2474



- Approximate CPT Location

- Approximate Boring Location

Base Map: El Camino College Compton Center - Instructional BLDG 1
Dated 8/20/15, prepared by DLR Group

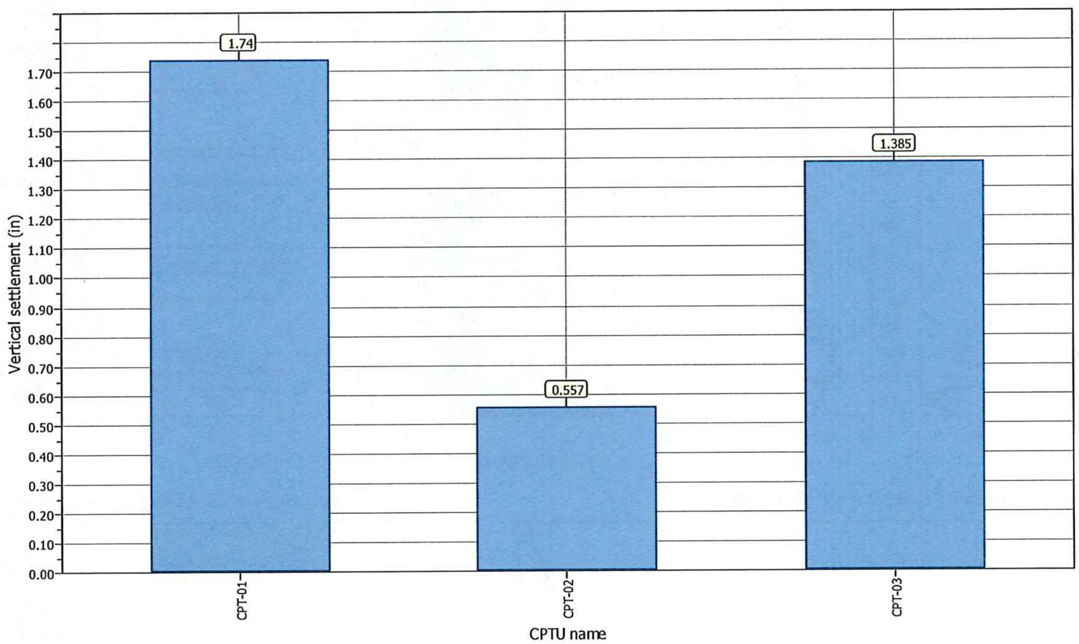
Compton Center - Instructional BLDG 1 1111 E. Artesia Blvd Compton, California	HE15281-2	December 2015
HEIDER INSPECTION GROUP	Development Site Plan	Figure 2

Geosphere Consultants Inc.
2001 Crow Canyon Road, Suite # 210
San Ramon, California 94583

Project title : El Camino College - Comption Center

Location : Compton California

Overall vertical settlements report



Geosphere Consultants Inc.
2001 Crow Canyon Road, Suite # 210
San Ramon, California 94583

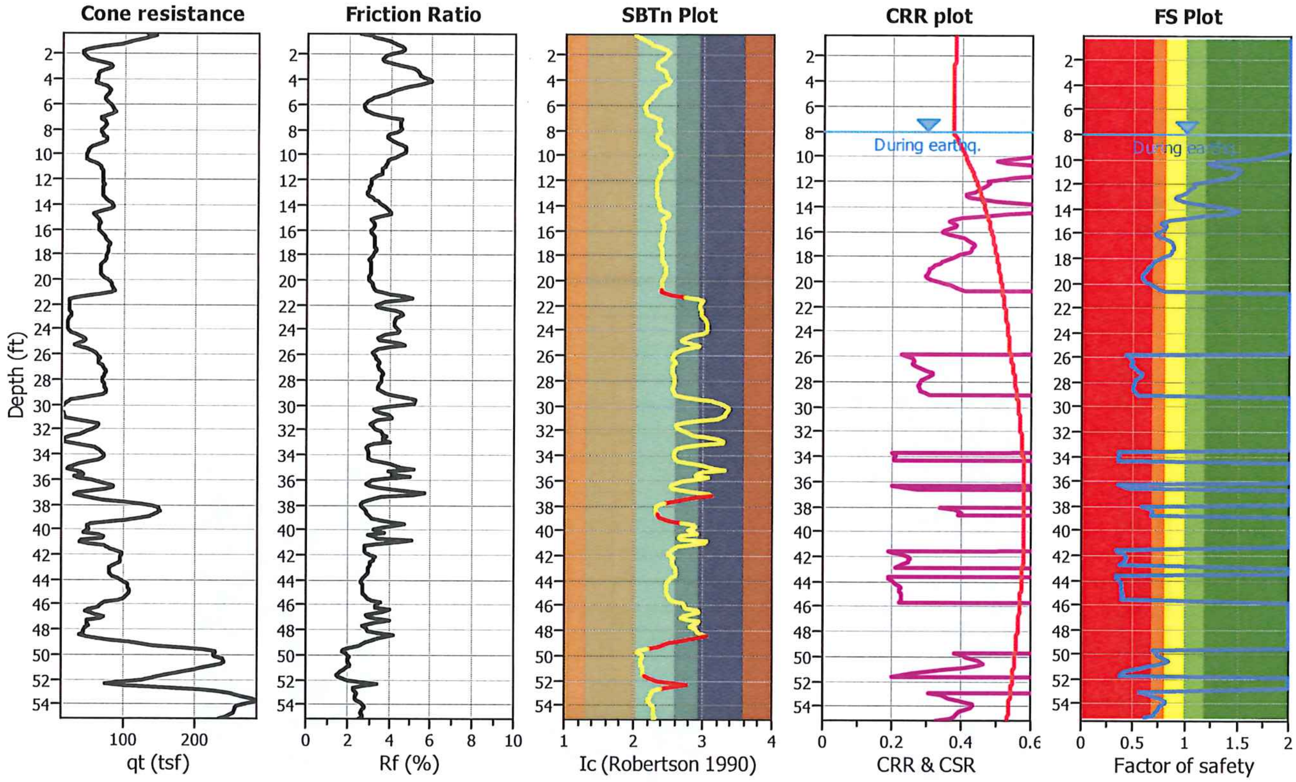
LIQUEFACTION ANALYSIS REPORT

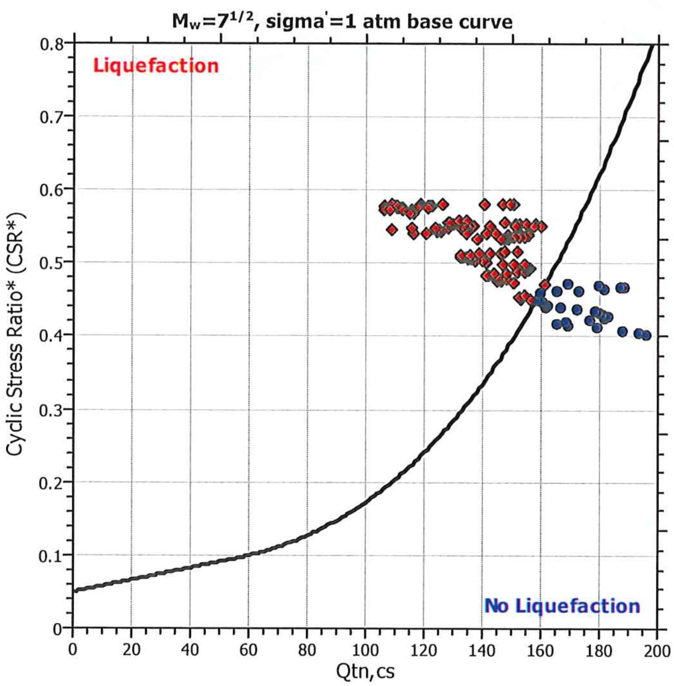
Project title : El Camino College - Comption Center **Location : Compton California**

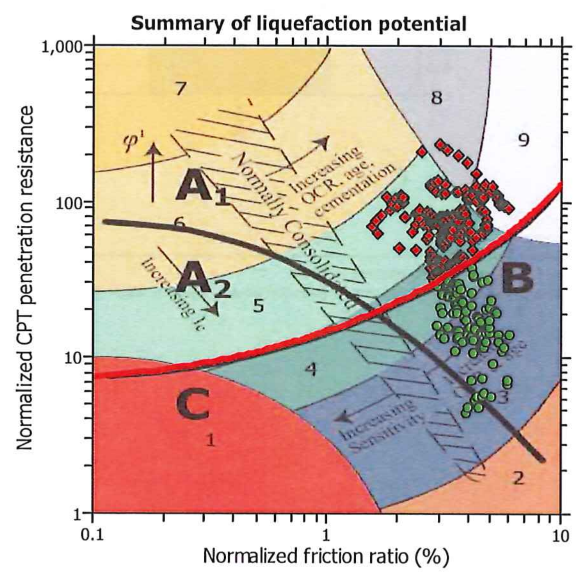
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	47.30 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.60	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.62	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

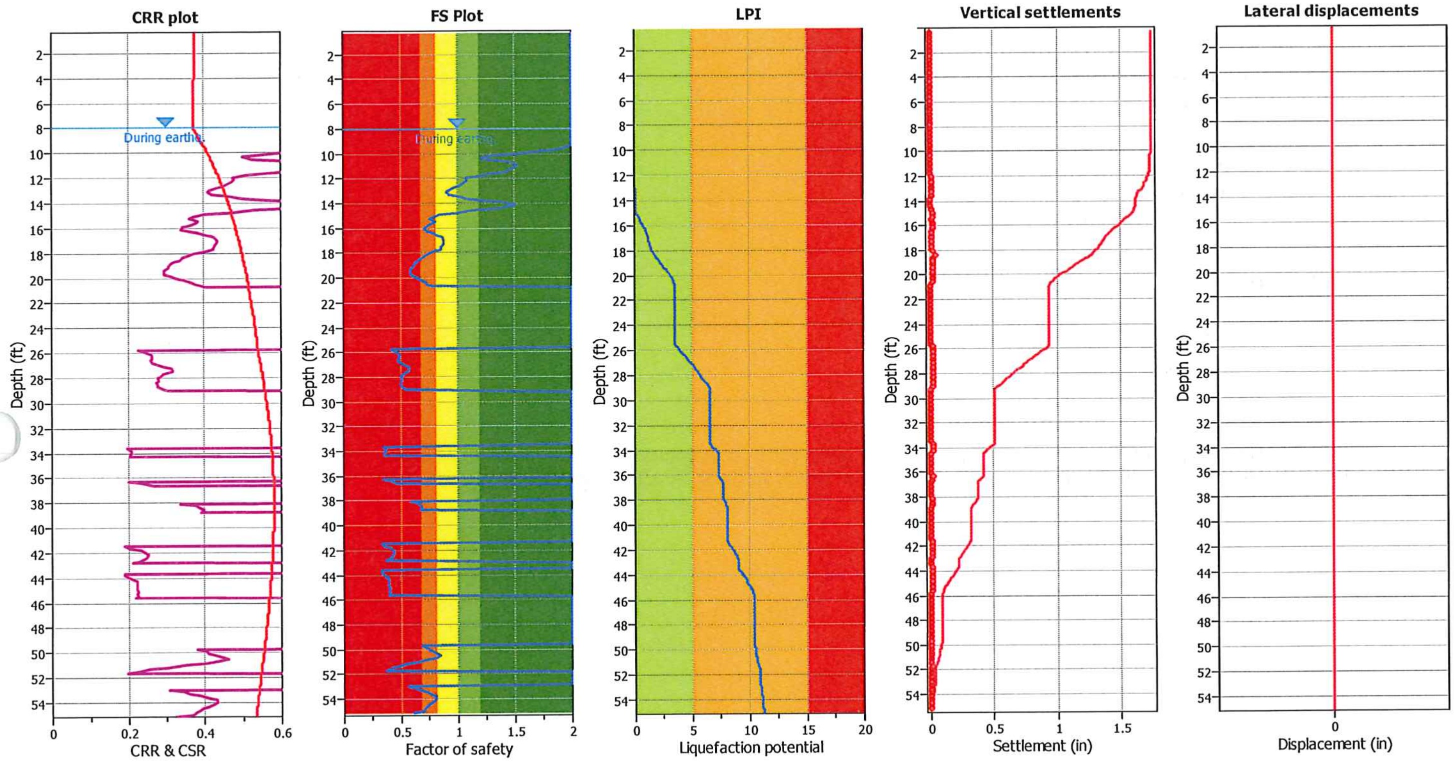






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	8.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.60	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.62	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	47.30 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

FOOTING - Analysis of Spread Footings

Compton Community College
January 25, 2017   3:37 pm

Input Data

Footing data

Footing shape: Square
$P = 1920$ k
$B = 40$ ft
$D = 2$ ft

General soil data

$D_W = 8$ ft
$\gamma = 98$ lb/ft³

Soil compressibility data

$N_{60} = 15$

Soil strength data

$c = 0$ lb/ft²
$\phi = 35$ Deg

Results

$q = 1500$ lb/ft²
$F = 28.08$
$\delta = 0.4$ in

Program FOOTING is part of a geotechnical analysis software package that accompanies the book *Geotechnical Engineering: Principles and Practices* by Donald P. Coduto (Prentice Hall, 1999). Please consult this book for additional information.

FOOTING - Analysis of Spread Footings

Net 1200 psf - 60 ft x 60 ft
January 25, 2017 3:40 pm

Input Data

Footing data

Footing shape: Square
$P = 4320$ k
$B = 60$ ft
$D = 2$ ft

General soil data

$D_W = 8$ ft
$\gamma = 98$ lb/ft³

Soil compressibility data

$N_{60} = 15$

Soil strength data

$c = 0$ lb/ft²
$\phi = 35$ Deg

Results

$q = 1500$ lb/ft²
$F = 37.06$
$\delta = 0.4$ in

Program FOOTING is part of a geotechnical analysis software package that accompanies the book *Geotechnical Engineering: Principles and Practices* by Donald P. Coduto (Prentice Hall, 1999). Please consult this book for additional information.

State of California • Natural Resources Agency
Department of Conservation
California Geological Survey
801 K Street • MS 12-31
Sacramento, CA 95814
(916) 324-7324 • FAX (916) 445-3334

Edmund G. Brown Jr., *Governor*
John G. Parrish, Ph.D., *State Geologist*

4

March 10, 2017

Felipe R. Lopez
Chief Business Officer
Compton Community College District
1111 East Artesia Boulevard
Compton, CA 90221

Subject: **Second Engineering Geology and Seismology Review for Compton Community College – New Two-Story Building
1111 East Artesia Boulevard, Compton, CA
CGS Application No. 03-CGS2518**

Dear Mr. Lopez:

In accordance with your request and transmittal of documents received on February 21, 2017, the California Geological Survey has reviewed the engineering geology and seismology aspects of the consulting report prepared for Compton Community College in Compton. This second review was performed in accordance with Title 24, California Code of Regulations, 2013 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report:

> **Response to CGS November 9, 2016 Review Letter of Geotechnical Engineering and Geologic Hazards Study, Compton Community College – New Two-Story Building, 1111 E Artesia Boulevard, Compton, California 90221:** Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated January 20, 2017, 3 pages, 4 enclosures.

Previously, we reviewed the following report:

> **Geotechnical Engineering and Geologic Hazards Study, Proposed Instructional Building 1, El Camino College Compton Center, 1111 E Artesia Boulevard, Compton, California 90221:** Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated December 21, 2015, 36 pages, 9 figures, 4 appendices.

CGS previously reviewed and submitted our findings regarding this project in our review letter dated November 9, 2016. Based on our first review, CGS requested the consultants evaluate and discuss the potential for surface manifestation of liquefaction and loss of bearing capacity at the site.

Discussion of Liquefaction Effects
In their January, 2016 Response report, the consultants provide an evaluation for potential surface manifestation of liquefaction, based on criteria published by Ishihara (1985). They conclude that potential for surface manifestation is unlikely, which appears reasonable based on Ishihara criteria for predicted horizontal ground acceleration of 0.25g or less. However, based on review of liquefaction analysis vertical settlement plots for CPT-01 and CPT-03 in the consultants' December, 2015 report, and **considering a reported PGA_M of 0.623g and earthquake magnitude 6.6 for the site, CGS notes that surface manifestation of liquefaction would be predicted at the site based on Ishihara criteria.** In addition, as previously noted, a site of historical earthquake-generated liquefaction following the 1933 Long Beach earthquake, is located approximately one half-mile northeast of the site, and surface effects from this earthquake included cracks where water, sand, and mud were ejected. The soil conditions at the proposed project site appear to be similar to the location where surface effects of liquefaction previously occurred. The consultants should address this concern.

CGS previously requested the consultants evaluate the potential for liquefaction in shallow layers to impact the proposed building's shallow foundations, considering the bearing capacity of the underlying soil while in its liquefied state. The consultants provide results of analysis of the recommended mat foundation considered as "a huge isolated footing" performed with FOOTING software, and conclude their recommendations for a mat foundation are appropriate, and should handle the estimated total and differential settlements. However, it appears the consultants' analysis evaluates bearing capacity of the recommended engineered fill cap, but it is not clear if they have addressed the bearing capacity of the underlying native soil in its liquefied state and the potential for bearing capacity failure or punching shear failure related to liquefaction of underlying soils. The consultants should address this concern and/or provide additional bearing capacity calculations for review. If the consultants judge the potential for bearing capacity failure is unlikely or mat foundation design recommendations are adequate to mitigate potential loss of soil bearing capacity due to liquefaction, the consultants should state so or provide additional recommendations, as appropriate.

In conclusion, ***the engineering geology and seismology issues at this site are not adequately assessed in the referenced report.*** It is recommended that additional information be provided as requested in this letter. The consultants are reminded that one copy of all supplemental documents should be submitted directly to CGS and should include the CGS application number. If you have any further questions about this review letter, please contact the reviewer at (213) 239-0884 or michael.defrisco@conservation.ca.gov.

Respectfully submitted,

Michael J. DeFrisco
Engineering Geologist
PG 8624, CEG 2574

CERTIFIED ENGINEERING GEOLOGIST
Michael J. DeFrisco
No. 2574
STATE OF CALIFORNIA

Chase White
Senior Geotechnical Engineer
PG 8530, CEG 2489, PE 73664, GE 2938

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CHASE A. WHITE
No. 2938
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STATE OF CALIFORNIA

Concur:

Anne Rosinski
Senior Engineering Geologist
PG 7481, CEG 2353

CERTIFIED ENGINEERING GEOLOGIST
Anne M. Rosinski
No. 2353
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Copies to:

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Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, CA 91761

Eric Goldberg, *Architect*
DLR Group, 3130 Wilshire Boulevard, 6th Floor, Santa Monica, CA 90403

Ted Beckwith, *Senior Structural Engineer*
Division of State Architect, 700 North Alameda Street, Suite 5-500, Los Angeles, CA 90012

5

UNITED-HEIDER
INSPECTION GROUP
An ETS Company

April 11, 2017

CGS Application No. 03-CGS2518

California Geological Survey
School Review Unit, 801 K Street, MS 12-31
Sacramento, California 95814

Attention: Mr. Michael J. DeFrisco, CEG

Subject: **Second Response to CGS Review Letter of**
Geotechnical Engineering and Geologic Hazards Investigation
Compton Community College-New Two-Story Building
1111 East Artesia Boulevard
Compton, California 90221
Heider Inspection Group, HE 15281-2

Project Reference Documents:

1) Geotechnical Engineering and Geologic Hazards Study, Proposed Instructional Building 1, El Camino College Compton Center, 1111 E Artesia Boulevard, Compton, California 90221: Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated December 21, 2015, 36 pages, 9 figures, 4 appendices.
2) Response to CGS November 9, 2016 Review Letter of Geotechnical Engineering and Geologic Hazards Investigation, Compton Community College-New Two-Story Building, 1111 East Artesia Boulevard, Compton, California 90221, Heider Inspection Group, HE 15281-2.

Dear Mr. DeFrisco:

In response to your second review comments and request for additional information regarding the potential for ground surface disruption and questions about bearing capacity of the native soils below engineered fill, we have provided the following responses to the California Geological Survey (CGS) additional questions associated with this project.

Discussion of Liquefaction Effects:

We performed an evaluation for potential surface manifestation of liquefaction based on criteria published by Ishihara (1985) considering the SCEC guidelines for implementation of Special Publication 117 (Martin and Lew, 1999, p. 33). Unfortunately, that was not for a general site condition but was developed for a PGA 0.25g at a given site. Based on Ishihara (1985) criteria for evaluation of a liquefiable layer and surface manifestation due to these effects, we previously determined that the site had no surface manifestation potential. However, in your comment letter CGS indicated that based on this criterion, the site had a potential for a surface manifestation at a higher seismic acceleration of 0.62g. In addition, CGS also provided evidence of historical earthquake-generated liquefaction following the 1933 Long Beach earthquake occurring approximately one half-mile northeast of the site where surface effects from this earthquake included cracks where water, sand, and mud were ejected. With regard to this, we performed further research to find reasonable approaches to evaluate the site conditions. As recommended by CGS, we reviewed " Liquefaction-Induced Ground-Surface Disruption" (Youd & Garris, 1995), which concludes that the thickness boundaries proposed by Ishihara (1985) appear valid for the prediction of ground-surface disruption at sites that are not susceptible to ground oscillation or lateral spread and not generally valid for the prediction of liquefaction-induced ground-surface disruption. The paper is based on borehole data taken from field investigations following several earthquakes which included a wider range of Seismic Moment Magnitudes, and a broader range of seismic ground accelerations (PGA). As noted in this paper, the most comparable chart found to compare with the project site conditions was Figure 3-D (Journal of Geotechnical Engineering, 1 November 1995/ pp-807) which considered magnitudes ranging from 5.9 M to 8.0 M and accelerations ranging from 0.56 to 0.78g. Based on that figure, the project site appeared to experience surface manifestation (H1/H2 =3.0).

However, there are several factors that impact the project site such as subsurface conditions, acceleration, Moment Magnitude, factor-of-safety (FS), etc. The calculated factors-of-safety used in the paper against liquefaction in the liquefiable layers were from 0.1 to 0.99. At this project site, FS against liquefaction of less than 1.0 begins only at a depth of 15 feet or below the existing ground surface, providing more of a surficial capping layer. Similarly, acceleration and Moment Magnitude are at the lower ends. Since there is no specific established correlation developed to estimate surface manifestation effects, we have to rely on the comparable charts developed by others or the most widely accepted paper published by Youd & Garris (1995). Based on our review of this paper, the estimated magnitude of the vertical liquefaction settlement (max 1.7"), and use of a mat foundation on improved subgrade soils with a minimum of two layers of woven geo-fabric placed at the bottom of the engineered fill layer, in our opinion, we anticipate an insignificant effect of surface manifestation if any caused by liquefaction at the project site.

Regarding whether the underlying native soil in its liquefied state is capable of handling bearing and punching failure, we reiterate that analyses were performed considering the underlying native soils below the engineered fill. The parameters, SPT blow counts, angle of friction, unit weights used in footing analyses were average values derived from CPT test results. In addition, the upper at least 12 feet of the subsurface soils are not liquefiable. Therefore, footing analysis software used for bearing and settlement analyses are valid and applicable for both underlying native as well as engineered fill. It is our opinion that the recommended mat foundation should be capable of absorbing estimated total and differential settlements, provided the mat foundation is properly designed from a structural standpoint.

We trust that this letter provides the information needed at this time. Should you or members of the review team have questions or need additional information, please contact us at (925) 314-7180.

Sincerely,

UNITED-HEIDER INSPECTION GROUP

Raghubar Shrestha, Ph.D., P.E.
Senior Engineer

Dennis Heider, PE
Principal Engineer

Corey T. Dare, GE2013
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
COREY T. DARE
No. 2013
Exp. 6-30-2018
GEOTECHNICAL
STATE OF CALIFORNIA

Enclosures: Second CGS Review Comments Letter, dated March 10, 2017

Distribution: 1 to Addressee
PDF to Ted Beckwith, DSA, 700 North Alameda Street, Suite 5-500, Los Angeles, California 90012 (Ted.Beckwith@dgs.ca.gov)
PDF to Felipe R. Lopez, CCCD 1111 East Artesia Boulevard, Compton, California 90221 (flopez@elcamino.edu)
PDF to Eric Goldberg, Architect, DLR Group, 3130 Wilshire Boulevard, 6th Floor, Santa Monica, California 90403 (egoldberg@dlrgroup.com)

RS/CTD:pmf

State of California • Natural Resources Agency
Department of Conservation
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Edmund G. Brown Jr., *Governor*
John G. Parrish, Ph.D., *State Geologist*

Felipe R. Lopez
Chief Business Officer
Compton Community College District
1111 East Artesia Boulevard
Compton, CA 90221

March 10, 2017

Subject: **Second Engineering Geology and Seismology Review for Compton Community College – New Two-Story Building 1111 East Artesia Boulevard, Compton, CA CGS Application No. 03-CGS2518**

Dear Mr. Lopez:

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Respectfully submitted,

Michael J. DeFrisco
Engineering Geologist
PG 8624, CEG 2574

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Ted Beckwith, *Senior Structural Engineer*
Division of State Architect, 700 North Alameda Street, Suite 5-500, Los Angeles, CA 90012

UNITED-HEIDER
INSPECTION GROUP
An ETS Company

April 28, 2017

Project Management & Construction
El Camino College Compton Center
800 West 6th Street, 16th Floor
Los Angeles, California 90017

Attention: Mr. Steven Haigler

Subject: **Addendum to Geotechnical Engineering and Geologic Hazards Study**
Proposed Instructional Building 1 (Two Story Building)
El Camino College Compton Center
1111 E. Artesia Boulevard, Compton, California 90221
United-Heider Inspection Group Project # HE15281-2

Dear Mr. Haigler:

As requested by the Division of the State Architect (DSA), United-Heider Inspection Group has issued this Letter as an addendum to our Geotechnical Engineering and Geologic Hazards Study Report issued on December 21, 2015. The intent of this letter is to clarify that the estimated differential settlement of ¾ inch can be considered to be applicable over a 50-foot span, and total settlement is not expected to exceed about 2½ inches for a structural mat foundation provided the building pad is constructed as recommended in the report using a minimum two layers of geo-fabric within the supporting engineered fill layer.

Should you or members of the design team have questions or need additional information, please contact us at (951) 697-4777. The opportunity to be of service to you and to be involved in the design of this project is appreciated.

Respectfully submitted,

UNITED-HEIDER INSPECTION GROUP

Raghubar Shrestha, PhD, PE
Senior Engineer

Dennis W. Heider, PE
Principal Engineer

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Edmund G. Brown Jr., *Governor*
John G. Parrish, Ph.D., *State Geologist*

June 5, 2017

Felipe R. Lopez
Chief Business Officer
Compton Community College District
1111 East Artesia Boulevard
Compton, CA 90221

Subject: **Third Engineering Geology and Seismology Review for Compton Community College – New Two-Story Building 1111 East Artesia Boulevard, Compton, CA CGS Application No. 03-CGS2518**

Dear Mr. Lopez:

In accordance with your request and transmittal of documents received on May 25, 2017, the California Geological Survey has reviewed the engineering geology and seismology aspects of the consulting report prepared for Compton Community College in Compton. This third review was performed in accordance with Title 24, California Code of Regulations, 2013 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report:

> **Second Response to CGS Review Letter of Geotechnical Engineering and Geologic Hazards Investigation, Compton Community College – New Two-Story Building, 1111 East Artesia Boulevard, Compton, California 90221:** Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated January 20, 2017, 2 pages.

Previously, we reviewed the following reports:

> **Response to CGS November 9, 2016 Review Letter of Geotechnical Engineering and Geologic Hazards Study, Compton Community College – New Two-Story Building, 1111 E Artesia Boulevard, Compton, California 90221:** Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated January 20, 2017, 3 pages, 4 enclosures.

> **Geotechnical Engineering and Geologic Hazards Study, Proposed Instructional Building 1, El Camino College Compton Center, 1111 E Artesia Boulevard, Compton, California 90221:** Heider Inspection Group, 800 S Rochester Avenue, Suite A, Ontario, California 91761; company Project No. HE15281-2, report dated December 21, 2015, 36 pages, 9 figures, 4 appendices.

CGS previously reviewed and submitted our findings regarding this project in our review letters dated November 9, 2016 and March 10, 2017.

Discussion of Liquefaction Effects

Based on review of liquefaction analysis reports for CPT-01 and CPT-03 provided by the consultants in their report dated December 21, 2015 and published criteria by Ishihara (1985) for evaluation of potential surface manifestation of liquefaction, CGS previously noted that surface manifestation of liquefaction would be predicted at the site, and requested the consultants address this concern. In their Second Response report dated April 11, 2017, the consultants acknowledge the site would appear to experience surface manifestation of liquefaction following Ishihara criteria, and considering subsequent analyses and conclusions documented by Youd and Garris (1995). Based on review of the referenced reports prepared by the consultants, it is our understanding they **recommend use of a mat foundation on a five-feet thick layer of engineered fill, with a minimum of two layers of woven geo-fabric placed at the bottom of the engineered fill layer**. Considering these recommendations, the consultants report they anticipate an insignificant effect of surface manifestation, if any, caused by liquefaction at the project site.

CGS also previously requested the consultants address the potential for bearing capacity failure or punching shear failure related to liquefaction of soils underlying the recommended five-feet thick engineered fill layer. In their Response report dated January 20, 2017, the consultants provided results of foundation analyses performed with FOOTING software and considering two different mat foundation sizes. However, it appeared the consultants' analyses evaluated bearing capacity of the recommended engineered fill cap, and it was not clear they had addressed the bearing capacity of the underlying native soil in its liquefied state. In their Second Response report dated April 11, 2017, the consultants explain the foundation analyses utilized average values derived from CPT results, and were performed considering the underlying native soils below the recommended engineered fill. They conclude the analyses are valid and applicable for both engineered fill and underlying native soil.

Based on the information provided, the consultants have addressed our remaining concerns regarding liquefaction hazard, and their conclusions appear reasonable.

In conclusion, ***the engineering geology and seismology issues at this site are adequately assessed in the referenced report.*** If you have any further questions about this review letter, please contact the reviewer at (213) 239-0884 or michael.defrisco@conservation.ca.gov.

Respectfully submitted,

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PG 8624, CEG 2574

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