APPENDIX F:
GEOTECHNICAL INVESTIGATION

F.1: Geolabs-Westlake Village, *Preliminary Geotechnical Investigation, Proposed Malibu Campus, 2355 Civic Center Way, City of Malibu, California*, dated December 18, 2013.

F.2: Geolabs-Westlake Village, *Response to Second Geotechnical Review Sheet, Proposed Malibu Campus, 23555 Civic Center Way, City of Malibu, California*, dated July 22, 2014.

Preliminary Geotechnical Investigation,
Proposed Malibu Campus,
23555 Civic Center Way,
City of Malibu, California

W.O. 9279
June 20, 2012
Revised December 18, 2013

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June 20, 2012
W.O. 9279
December 18, 2013

Santa Monica College
1900 Pico Boulevard
Santa Monica, California 90405-1628

Subject: Preliminary Geotechnical Investigation,
Proposed Malibu Campus,
23555 Civic Center Way,
City of Malibu, California

Gentlemen:

In accordance with your request, our firm has undertaken a study of the geotechnical conditions at the subject property (Plate 1.1). Our purpose was to evaluate the distribution and engineering characteristics of the earth materials that occur at the site so that we might assess their impact upon the proposed development of the property. This report was revised to reflect the construction plans available at the time of this writing, and to address the proposed building's status as an essential facility.

The scope of work for this project included the following tasks:

- logging of five Cone Penetrometer Tests (CPT) soundings;
- logging and sampling of three exploratory borings excavated with a truck-mounted hollow-stem auger;
- selected laboratory testing of the retrieved samples;
- review of previous work which was judged both pertinent to our purpose and readily available to our office;
- soil engineering analysis of the assembled data;
- preparation of this report.

Field data and the approximate locations of exploratory excavations are shown on the enclosed Plot Map (Plate 1.2). Descriptions of the materials encountered in the exploratory excavations are provided on the enclosed logs (Plates B1 to B3 and CPT-01 to CPT-05). Pertinent laboratory test results are also provided herein. Our findings are presented in the following sections, followed by a discussion of these findings and geotechnical design criteria.

SITE DESCRIPTION

The subject site is located at 23555 Civic Center Way in the City of Malibu. It is the westernmost parcel of an approximately 10-acre rectangular lot bordered to the south by Civic Center Way. The west, north, and east sides of the lot are bounded by relatively flat lying, apparently unused land covered in grasses and sparse trees. Total relief across the site is approximately six feet from the low point near Civic Center Way to the high point at the northern boundary of the parcel. There are several improvements on-site including a one-story building with a basement and appurtenant parking areas, a temporary trailer that houses a day-laborer office, a transmission tower, and a compressed natural gas (CNG) refueling station. The building is an old Sheriff's Substation ("Substation Building"). There are also several small retaining walls with a maximum height of five feet. An eight-foot retaining wall marks the boundary between the subject parcel and a helipad northeast of the site. The parking area north of the existing building is currently used as an impound lot and CNG refueling station. A covered walkway connects the existing building to the courthouse to the east. The parcels to the east and north of the subject parcel are occupied by a courthouse, a library, a covered walkway, the aforementioned helipad, a single-story Water Works building, and additional parking areas.

We understand the Substation Building is serviced by a private septic system, and that effluent is discharged in a leach field located approximately 700 feet northeast of the building. We also understand a series of seepage pits services the Water Works building and is located beneath the parking area north of the Substation Building (see Plate 1.2) The site has also housed several fuel storage tanks in the past. The fuel tanks have since been removed (Ellis, 2012).

PROPOSED PROJECT

A two-story building associated with Santa Monica College is proposed in the location of the existing Substation Building. The Substation Building will be demolished, and the basement will be removed and backfilled. The transmission tower and day-laborer's trailer will also be removed. The existing parking lot will be expanded as shown on Plate 1.2.

At the time of this writing, specific foundation information and building loads are not known. For the purposes of this investigation, we have assumed that column loads will be on the order of 100 kips, and wall loads will be on the order of 4 kips per linear foot. We understand the building period is less than 0.5 seconds.

FIELD INVESTIGATION

Our office selected several exploratory locations in order to characterize the nature of the earth materials throughout the site.

The subsurface exploration began on April 23, 2012, with performing three hollow-stem auger borings (Plates B1 through B3). Each boring extended through a thin layer of artificial fill into the underlying alluvial deposits. Drilling rod was used to drive samples with a 140 lb. automatic safety hammer lifted 30 inches. The estimated efficiency of the automatic hammer is approximately 90 percent. The boring diameter was approximately eight inches (outer diameter). The samplers consisted of a SPT Split Spoon Sampler and a lined Modified California split spoon sampler (2.375 inch id.).

Five CPT soundings were also performed (Plates CPT-01 through CPT-05). The soundings were performed using a 23-ton truck-mounted CPT rig provided by Middle Earth Geo Testing, Inc. The cone tip has a cross-sectional area of 10 square centimeters. The CPT is capable of obtaining tip pressure and side friction data at 2 inch (0.05 meter) intervals. The cone tip was pushed to a depth of fifty feet.

Both disturbed (bulk) and relatively undisturbed samples were obtained from each boring. These samples were secured and transported to our laboratory for testing.

LABORATORY TESTING

Selected laboratory tests completed on the retrieved samples are described in Appendix B, along with a comprehensive summary of test results.

CHEMICAL TEST RESULTS AND CORROSION RECOMMENDATIONS

Sample of the on-site soils were submitted to HDR/Schiff for chemical testing for the purpose of evaluating their corrosion potential. The findings indicate some samples have moderate resistivity which is an indicator of corrosive soil behavior. The results of this testing are provided in Appendix B.

GEOLOGIC SETTING

The site is located in the Transverse Ranges geomorphic province of Southern California. The Transverse Ranges are essentially east-west trending elongate mountain ranges and valleys that are geologically complex. Structurally, the province reflects the north-south compressional forces that are the result of a bend in the San Andreas Fault. As the Pacific Plate (westerly side of the fault) and the North American Plate (easterly side) move past one another along the fault the bend creates a deflection which allows for large accumulations of compressional energy. Some of these forces are spent in deforming the crust into roughly east-west trending folds and secondary faults. The most significant of these faults are typically reverse or thrust faults, which allow for the crustal shortening taking place regionally.

The site lies in the south-western portion of the province, in the City of Malibu. It is situated atop relatively flat-lying, near-shore sediments between the coast and the Santa Monica Mountains. These sediments are mapped as Quaternary-age flood plain deposits (Yerkes and Campbell, 1980) and are associated with Malibu Creek.

The site is within the onshore portion of the Malibu Coast Fault *Zone*, which involves a broad, zone of faulting and shearing as much as one mile in width. The Malibu Coast *fault* is only one fault splay within this broad deformation zone, but it is the most prominent feature within the zone. It juxtaposes two crustal blocks of extremely different character on either side of its length (Durrell, 1954; Schoellhamer and Yerkes, 1961; Yerkes and Wentworth, 1965). To the north, a basement terrain of granite and related igneous rocks, intruded into older (probably Jurassic-age) metasedimentary-rocks termed the Santa Monica Slate, which is overlain by a thick sequence of sedimentary rocks ranging in age from Late Cretaceous to Recent; while on the south of this "main trace", a basement complex of mid-Cretaceous-age high-pressure tectonometamorphic rocks termed the Catalina Schist is overlain unconformably by a 5,000-foot thick (Leighton, 1994) sequence of sedimentary rocks no older than Miocene, including the Monterey Formation (Yerkes and Campbell, 1979).

The Malibu Coast fault purportedly passes beneath the flood plain deposits (Treiman, 1995). The assumed location of the fault, at the top of the buried bedrock, is based on poorly constrained, fairly linear, projections from observed exposures of the fault in bedrock outcrops that are on the order of one-half mile to the west and east of the site. Its indicated surface trace (projected from its assumed location in bedrock well beneath the ground surface), runs approximately 20 feet south of the proposed building. We favor an interpretation where the north-dipping Malibu Coast fault would intersect the top of the bedrock at progressively more northerly locations as it traverses the more deeply incised portions of the Malibu Creek drainage.

EARTH MATERIALS

The subject property is underlain by a thin layer of artificial fill over alluvium. A brief description of each material is provided in the following sections.

Artificial Fill (af)

Artificial fill was encountered in each of our exploratory borings. It ranged in thickness from three feet in B1 to seven feet in B3. South and west of the Substation Building, it consisted of silty to clayey SAND in a medium dense and moist condition. North of the substation, it consisted of orangish brown clayey GRAVEL in a dense and wet condition.

Alluvium (Qal)

Alluvium was encountered underlying the fill in each of our exploratory borings. It extended to the maximum depth explored of 50 feet. It consists of dark gray thinly interlayered silty fine SANDS, clayey SAND, and sandy lean CLAY with sparse, laterally continuous interlayers of relatively clean, fine to coarse SAND. The coarse material was found to be in a loose to dense condition, while the fine material was found to be medium stiff to hard. The materials were wet. Very sparse organics and no pores were observed. The organics were decayed root filaments.

GEOLOGIC STRUCTURE

Bedrock was not encountered on-site, and bedding was not observed in the alluvium.

GROUNDWATER

Groundwater was encountered in each of our exploratory borings and CPT soundings at depths ranging from six feet to twenty-three feet. In the CPT soundings, the continuous push on the rods was temporarily halted in deeper sand zones to allow for monitoring of pore pressure dissipations. The groundwater readings for the CPT soundings are based on the dissipation data. The groundwater from six feet was likely perched atop the clayey alluvium in that area. However, the Seismic Hazard Zone Report for the Malibu Beach Quadrangle shows historic high groundwater at five feet below the surface in the vicinity of the subject site (see Plate 1.4).

FAULTING AND SEISMICITY

The subject site might be underlain by the projection of the Malibu Coast fault. Active faulting has been recognized west of the Malibu Creek drainage, specifically at a location that is approximately three miles from the subject property. Furthermore, west of the location where the fault was found to be active, the fault is considered sufficiently well defined to warrant establishment of an Alquist-Priolo Fault Rupture Hazard Zone. Active faulting has not been recognized within or east of the Malibu Creek drainage, consequently the project site is not within an Alquist-Priolo Fault Rupture Hazard Zone.

A detailed study by Leighton and Associates (1994) for the Civic Center Planning Area, which includes the subject site, found "...that the major trace of the Malibu Coast fault through the Civic Center area is not active by Alquist-Priolo definitions, and poses no planning or design constraints."

Their conclusion was based on their observation of a pre-Holocene-age gravel unit underlying their study area that was penetrated by an array of Cone Penetrometer soundings and trenches. It was found to be continuous and unbroken across the site.

Considering the forgoing, it is our opinion that the potential for fault rupture at the ground surface of this site is relatively low.

Historical Seismicity

The software entitled EQSEARCH v.300 (Blake, 2000) for Windows was utilized to provide a summary of historical earthquakes with epicenters within 100 miles of the site (and magnitudes greater than M=4.5) and their estimated ground shaking intensity (per the Modified Mercalli Intensity, MMI) at the subject site. Output is provided in Appendix C and summarized herein.

The highest ground shaking intensities estimated for the site (MMI=VIII) were associated with four moderate to large sized earthquakes (M=5.0 to 7.0). Two of these were moderate sized earthquakes (M=5.0 and 5.2) that occurred within approximately 7 miles of the site. The other two were the Northridge Earthquake of 1994 (M=6.7), and an unnamed earthquake that occurred within 18 miles of the site in 1827 (M=7.0). A Modified Mercalli Intensity scale of VIII corresponds to *"damage slight in specially designed structures, considerable in ordinary substantial buildings, with partial collapse, great in poorly built structures."*

The San Fernando Earthquake of 1971 and the Kern County Earthquake of 1952 caused estimated MMIs of VII at the subject site. The Long Beach earthquake of 1933 was a VI on the MMI scale.

Site Classification for Seismic Design

The Site Class should be considered D based on the soil condition map "Preliminary Statewide Site Condition Map of California (PSSCM) as encoded in EZFRISK. The blow counts from our hollow-stem auger borings and derived N values from our CPTs extend no deeper than 15 meters, but appear to support the designation considering that more dense material was encountered in the lower sections of many of our exploratory excavations.

Regional Faults

Significant active faults in the vicinity that are capable of magnitude 7.0 or greater and with slip rates exceeding 5mm/year include the San Andreas and Cucamonga faults. These faults are approximately 46 miles and 56 miles from the site respectively (see Plate 1.6).

Mapped Spectral Acceleration Parameters

The 2010 California Building Code (CBC) addresses seismic design based on response spectra considering an earthquake with a 2% probability of exceedance in 50 years (2475-year return period). The mapped spectral acceleration values were determined using the U.S. Seismic Design Maps website provided by the USGS. Output from the analyses are provided in Appendix C and summarized herein.

Latitude: 34.0370º Longitude: -118.6897º	Factor/Coefficient	2010 CBC Value	2013 CBC Value
Site Profile Type	Site Class	D	D
Short-Period MCE at 0.2s	S_s	2.272	2.316
1.0s Period MCE	S_1	0.903	0.832
Site Coefficient	F_a	1.0	1.0
Site Coefficient	F_v	1.5	1.5
Adjusted MCE Spectral Response Parameters	S_{ms} S_{m1}	2.272 1.354	2.316 1.248
Design Spectral Acceleration Parameters	S_{DS} S_{D1}	1.515 0.903	1.544 0.832
Peak Ground Acceleration	PGA	0.606	0.972

PGA is set equal to SDS/2.5 for the 2010 CBC and is set equal to the mapped value for the 2013 CBC

Seismic Design Category

The Seismic Design Category is a function of a building's occupancy category and the mapped spectral response acceleration parameter at 1-second period, S_1. For this project, the mapped S_1 parameter exceeds 0.75 and the design team has indicated the planned building will be considered an essential facility, which is occupancy category is IV per CBC Table 1604A.5. CBC §1613A.5.6 indicates structures in this seismic setting shall be assigned to Seismic Design Category F.

Site Specific Horizontal Ground Motion Hazard Analyses

This project site is within a Seismic Hazard Zone for liquefaction. Therefore, in accordance with CBC §1615A.1.2A a ground motion hazard analyses has been performed for this site in accordance with ASCE Standard 7-05, section 21.2. This section of ASCE 7 describes a methodology for estimating the design Maximum Considered Earthquake (MCE) spectral accelerations for 5 percent damping and 2 percent probability of exceedance within a 50-year period. DSA Bulletin 09-01 gives direction regarding the use of new attenuation relations known as "Next Generation Attenuation" or NGA equations available for use in ground motion hazard analyses. The following text describes the methodology and estimated peak ground acceleration for the subject site.

Probabilistic methods of estimating ground motion accelerations allow us to evaluate a composite picture of the probability that a ground motion value will be exceeded in a specified exposure period. In theory, this type of analyses has the ability to weigh all possible events by their relative probabilities of occurrence. A worst-case project site acceleration from a nearby, but low probability, seismic event is not allowed to dominate the analysis.

The fault model used includes faults with surface expression and thrust faults (including known blind thrust faults) in the USGS California 2008 fault catalog. The analysis was conducted using the computer program EZ-FRISK (Risk Engineering, Inc., 2001-2012). The NGA attenuation relationships proposed by Boore and Atkinson (2008), Campbell and Bozorgnia (2008), and Chiou and Youngs (2008) were used in this analysis. Following DSA Bulletin 09-01, the NGA relations used the maximum rotated component of the ground motion using the method proposed by Huang, Whittaker, and Luco (2008) as implemented in EZ-FRISK 7.62.

Spectral response acceleration levels were determined for a two percent exceedance probability for an exposure period of 50 years (2475 year return period). As allowed in ASCE 7-05, a deterministic cap was applied to the probabilistic response spectrum to construct a site-specific MCE spectrum. The cap was modified per DSA Bulletin 09-01. The Horizontal Design Response Spectrum (HDRS) was then developed using the criteria in ASCE 7-05 Section 21.3. Output from the analysis is provided in Appendix C and summarized herein.

Latitude: 34.037º **Longitude: -118.690º**	**Factor/Coefficient**	**Value**
Site Profile Type	Site Class	D
Site-Specific MCE Spectral Response Parameters	S_{ms} S_{m1}	1.627 2.070
Design Spectral Acceleration Parameters	S_{DS} S_{D1}	1.085 1.380

The peak ground acceleration (PGA) value was estimated from the final design response spectrum. This resulted in a PGA of 0.59g, slightly less than the 0.60g estimated from the mapped ground motion parameters. The site specific values were used in the liquefaction analysis. Often the use of the PGA necessitates consideration of an earthquake magnitude and mean distance to causative source. The earthquake magnitude and distance can be derived from a deaggregation of the site-specific study. The deaggregation results indicate an unusually low magnitude as the mean contribution to the seismic hazard. This appears to be caused by the analysis being overwhelmed by the background seismicity. The USGS website "2008 Interactive Deaggregation (Beta)" was used to further evaluate the mean earthquake magnitude. The maximum considered earthquake (mean return time of 2475 years) has a mean distance-to-source (R) of approximately 11km with a peak ground acceleration (PGA) of 0.68g, which is much greater than the 0.59g PGA estimated for the Design Earthquake Ground Motion. We have performed additional deaggregation analysis to estimate a magnitude and distance-to-source value for the design level earthquake. In an attempt to make the distance-to-source relative to the PGA for the Design Earthquake, we performed deaggregations for a variety of mean return times until the resulting PGA closely matched the PGA for the Design Earthquake. It was determined that a mean return time of 1462 years (5% probability of exceedance in 75 years) input into the USGS website provides a PGA of approximately 0.59 g, with a corresponding distance-to-source of 14km. Results from that website indicates the predominant earthquake can be considered an earthquake of magnitude M_W=6.9.

HYDROCONSOLIDATION POTENTIAL

Hydroconsolidation is a condition where dry or moist soils undergo settlement upon being wetted. In many cases, no additional surcharge load is necessary to trigger the hydroconsolidation. Typically, soils that are susceptible to hydroconsolidation include soils containing silt and clay particles, or soils cemented with such agents as iron oxide or calcium carbonate. The geologic environment for these soils is typically loose fills, altered wind-blown sands, or colluvium of loose consistency.

The potential for hydroconsolidation has been evaluated based upon the results of consolidation tests performed on samples taken from the excavated borings. These samples were inundated at normal loads similar to their estimated existing overburden pressures. The amount of consolidation that occurs due to the inundation (without a change in the normal load) is assumed to reflect the potential for in-place hydroconsolidation if these materials were to become inundated.

The data from our laboratory testing indicates the samples tested to determine their consolidation characteristics were not prone to significant hydroconsolidation when inundated during testing. The maximum collapse when inundated was on the order of ¼ of one percent. The moisture levels in the samples were very high, near or at the point of saturation.

The County of Los Angeles Department of Public Works "Manual for Preparation of Geotechnical

Reports" reports that, "soils subject to hydroconsolidation are normally loosely deposited soils (e.g., SM, ML, etc.) that when subject to increased loading and/or saturation experience consolidation greater than 2 percent. Generally, these types of soils, which exhibit in-situ dry density of 108 pcf or less and in-situ moisture content of 8 percent or less, are considered susceptible to hydroconsolidation." This dry density equates to a void ratio of about 0.54 (porosity of 35%) or greater when considering a specific gravity of 2.68. USACE engineering manual EM 1110-2-1904 indicates typical collapsible soils are low in plasticity with liquid limits below 45, plasticity indices below 25, and relatively low dry densities between 65 and 105 lbs/ft^3 (60 to 40 percent porosity). They note collapse rarely occurs in soil with porosity less than 40 percent.

The County of Los Angeles considers there to be an issue when the consolidation upon inundation is 2 percent or greater. NavFac DM 7.01 indicates 0 – 1 % collapse is no problem, while 1 – 5% is moderate trouble.

Based on our observations and laboratory testing, we consider the potential for hydroconsolidation to be low.

LIQUEFACTION POTENTIAL

The subject site in within a zone of required investigation for liquefaction (see Plate 1.7). Liquefaction is a condition where the soil undergoes continued deformation at a constant low residual stress due to the build-up of high pour water pressures. The possibility of liquefaction occurring at a given site is dependent upon the occurrence of a significant earthquake in the vicinity; sufficient groundwater to cause high pore pressures; and on the grain size, relative density, and confining pressures of the soil at the site.

As part of our analyses of the liquefaction potential on the site, we have performed one deep boring and five CPT soundings to obtain subsurface data to a depth of 50 feet. Based upon our subsurface information and review of published data, groundwater is currently present on the site within the upper fifty feet of the soil profile. This, coupled with the likelihood of significant ground shaking, was cause to perform a quantitative evaluation of the liquefaction potential at the site.

General Discussion

In the liquefied condition, soil may deform with little shear resistance. The amount of soil deformation following liquefaction depends on the looseness of the material, the depth, thickness, and areal extent of the liquefied layers, the ground slope, and the distribution of loads applied by structures.

When liquefaction is accompanied by ground displacement or ground failure, it can be destructive. Adverse effects of liquefaction can include ground oscillation, lateral spreads, flow failures, loss of bearing strength, settlement, and increased pressures on retaining walls.

The soils below the site have a low to high risk of liquefaction based on their Liquefaction Potential Index. Based on the analysis of the data from the CPT soundings and exploratory borings, it is our opinion that layers and lenses of coarse-grained soils have a potential to liquefy during a design-level earthquake.

Fine-grained materials may also be susceptible to liquefaction also. To evaluate their susceptibility we used the methods proposed by Bray and Sancio (2006). Nine samples of fine-grained material were tested to determine their moisture levels and liquid limit to aid in determining their potential to liquefy. The results (see Laboratory Appendix B) indicate most of the fine-grained samples tested were not susceptible to liquefaction. However, one sample was moderately susceptible, specifically B2 from 10 feet. We conclude that the fine-grained clay noted in the CPT soundings is not susceptible to liquefaction.

Discussion of Liquefaction Hazard Assessment

To address the possible impacts of liquefaction, the practice of geotechnical engineering currently has methods of approximating the potential liquefaction-induced settlement, lateral spreading, and the possibility of surface manifestations.

Lateral Spreading and Surface Manifestations

The potential for lateral spreading and surface manifestations are in part a function of how shallow the liquefiable soils are. At the subject site, the groundwater is assumed to be capable of reaching the high historic ground water level of five feet below the existing ground surface. We have evaluated the potential for liquefaction using several methods (Kramer [2006], Youd [2002], and Zhang [2004]). The results are listed in the following table. The results present a significant range of postulated magnitudes for the lateral displacement. The results using the methodology propose by Zhang produces, in some cases, displacements with magnitudes several times that of the other methods. Research by Chu (2006) indicates the methods of Zhang and Youd may greatly over-estimate the magnitude of lateral spreading. The Zhang methodology predicts potential maximum displacements rather than the expected displacements that are the product of the Youd et al. (2002) and Kramer models (Kramer, 2008). This may be the case with this analysis. Focusing on the results from the

Kramer and Youd methodology, it is apparent that there is a possibility of lateral spreading during a design level seismic event.

	ESTIMATED LATERAL SPREAD MAGNITUDE		
SOURCE	ZHANG	KRAMER	YOUD
CPT 1	11 ¾"	3"	3½"
CPT 2	64"	3½"	3½"
CPT 3	15 ¾"	4½"	3½"
CPT 4	36"	3½"	3½"
CPT 5	39"	3½"	5"

Liquefaction-Induced Settlement Potential

The potential for liquefaction-induced settlement has been evaluated using the procedures proposed by Zhang (2002). The analysis indicates the potential liquefaction-induced settlement due to a design earthquake ground motions would be on the order of 2/3 to 1 2/3 inches Differential settlement can be assumed to be half the total settlement.

Due to the relatively shallow groundwater at the site, the analysis produced no potential seismic settlement of the unsaturated near surface soils.

EXCEPTIONAL GEOLOGIC HAZARDS

The following paragraphs address unusual or "exceptional" geologic hazards present in the State of California and listed in California Geological Survey Note 48.

Phase I and II Environmental Site Assessment Work

Such environmental consulting services are outside of our expertise and scope of work.

Naturally-Occurring Hazardous Materials

Review of the available geologic literature does not indicate the presence of any naturally occurring hazards such as methane gas, hydrogen sulfide gas, or tar seeps at the project site.

California Environmental Quality Act

We defer issues with respect to the California Environmental Quality Act to the project architect and owner. No paleontological resources were observed in our exploratory excavations.

Groundwater Quality

To our knowledge, no groundwater resources are extracted in the vicinity of the subject site.

On-Site Septic Systems

A series of seepage pits is reportedly located in the parking area north of the proposed building (see Plate 1.2). There is also a reported leach field located approximately 700 feet northeast of the proposed building that services the Substation Building, Water Works building, Courthouse, and Library. It is our understanding that this leach field will be used to service the proposed building until a connection to the City's future sewer line can be made.

Non-Tectonic Faulting and Hydrocollapse of Alluvial Fan Deposits Hazards

Review of the geologic literature does not indicate the historical occurrence of non-tectonic faulting in the site vicinity due to subsurface fluid withdrawal.

The low potential for hydroconsolidation of the on-site soils indicates that the potential for non-tectonic faulting is remote.

Regional Subsidence Hazards

Review of the available literature indicates that the project site has not been subject to historical subsidence.

Volcanic Eruption Hazards

The project site is located well outside areas of active volcanism.

Tsunami and Seiche Hazards

Review of the Safety Element of the City of Malibu indicates that tsunami run-up heights of up to 12± feet could be generated in the Malibu area. The low point of the subject site is 16± feet above mean sea level, therefore the potential for a tsunami to impact the site is considered low. Seiches are seismically-induced waves or oscillations within semi-enclosed bodies of water such as lakes, reservoirs, and bays. In light of the lack of significant bodies of water adjacent to the site, the potential for a seiche to impact the site is considered low.

Naturally-Occurring Asbestos Hazards

Our review of the geologic literature and exploratory findings indicate that naturally occurring asbestos minerals are not present at the site.

Radon-222 Gas

The project site is not immediately underlain by formations known to emit hazardous levels of Radon gas. Notwithstanding, we defer the evaluation of this environmental and public health hazard to the project environmental consultant.

Flood Inundation Hazards

The subject site lies on the flood plain of Malibu Creek. Flood Insurance Rate Maps from the Federal Emergency Management Agency indicate that approximately the eastern half of the site is located in a

Special Flood Hazard Area Zone "AO". This corresponds to average flood depths (usually sheet flow on sloping terrain) of up to two feet during a 100-year flood event (see Plate 1.8).

Review of the Flood and Inundation Hazards Map from the Los Angeles County Safety Element indicates several dammed reservoirs up-canyon from the subject site (see Plate 1.9). From northwest to southeast these reservoirs include Lake Sherwood (LSW), Westlake Lake (PW), the Las Virgenes Reservoir (WLR), Malibu Lake (MBL), and Century River (CTR). The site lies within an inundation area for one or more of these reservoirs. The map is not of sufficient scale or resolution to differentiate which reservoir presents a hazard to the site.

DISCUSSION AND RECOMMENDATIONS

Data from our field exploration, laboratory testing, reference reports, and engineering analyses, coupled with inferred conditions about our exploratory excavations, is the basis for the following discussion. Recommendations, based upon the presently available data, are presented for your consideration.

The results of our engineering analyses indicate the site is feasible for construction of the planned two-story structure. The current building will be demolished, and its basement removed and replaced with compacted fill. The fill should be supported by undisturbed native soils.

The soils below the site have a low to high risk of liquefaction based on their Liquefaction Potential Index. The potential effects of liquefaction could include lateral spreading and seismically-induced settlement. The potential impacts of liquefaction should be considered in the design. Consideration of the on-site liquefaction hazards has been evaluated by our office in conjunction with the design team. It has been determined that ground improvement to reduce the potential for liquefaction will be used for this project. It is proposed to construct stone columns to improve the liquefiable soil supporting the proposed building. Subsequent to successful implementation of ground improvement, conventional shallow foundations are considered appropriate to support the structure based on the geotechnical conditions encountered during this investigation.

Ground Improvement

The potential impacts of liquefaction during a design level earthquake include lateral spreading and seismic settlement. The estimated magnitude of those effects is sufficient to warrant ground improvement. It is recommended that ground improvement consist of the installation of stone columns to improve the soils supporting the structure. The stone columns should be designed and constructed in accordance with the 2013 California Building Code Appendix J. It is proposed to construct stone columns of three-foot diameter at a spacing of approximately eight feet in a square spacing arrangement, extending to a depth of 35 feet. This stone column arrangement should encompass the entire building footprint (not just below isolated foundation elements) and extend beyond the building outline by no less than 18 feet. This arrangement produces an area replacement ratio of approximately 11 percent. Considering that the current SPT blow counts of the liquefiable soils are in the range of 20 to 25 blows per foot, this area replacement ratio should be sufficient to increase the SPT blow count to in excess of 30 blows per foot for the target soils.

The improvement of the liquefiable soil should continue until the acceptance criteria are met. For this project we recommend that post-production CPT soundings be performed to evaluate the liquefaction potential, seismic settlement potential, and lateral spreading potential of the improved soil using identical methodologies to those used in this document. At least six sounding should be performed to determine if the acceptance criteria are met. The ground improvement should be considered acceptable when, in the upper 50 feet of the soil profile, the potential total long-term static settlement and seismic settlement are estimated to be less than one-inch, and the differential static and seismic settlement is less than ¾ inches in a horizontal distance of 30 feet.

Removals

The existing basement and any artificial fill or disturbed soil should be removed in the building area (considered to be the footprint of the building plus the area outside the building to a horizontal distance equal to the thickness of fill below the foundations, but not less than five feet). The thickness of compacted fill below the foundations should, in no case, be less than five feet. The approximate area of the basement has been superimposed on the foundation plans made available to our office (Plate 1.2b). This illustration indicates the existing basement is situated in the area of grid lines 4 through 8. It is recommended that all removals for building foundations located on, or west of grid line 4, should be equivalent in depth to the removal depth required to remove artificial fill and disturbed soil in the basement area.

Along the perimeter of the removal excavation, where the compacted fill will contact the existing soils, the contact should be benched to expose competent undisturbed material. The compacted fill should be placed on the level benches.

Backdrains

Structural details are not available to our office at the time of this writing. Considering that the structure is to be two-stories, we anticipate the design will include an elevator pit. Any retaining walls in the design should incorporate backdrains or be designed to resist hydrostatic pressures.

Compaction Standards

The maximum dry density and optimum moisture content of the material to be used as compacted fill should be determined in accordance with the standard test method ASTM D1557 ("modified proctor"). The density of earth materials is to be measured using the nuclear gauge (ASTM D6938) or sand cone (ASTM D1556) test methods.

Expansive Soils

Based on laboratory testing of representative samples, the on-site materials are considered to have a low expansion potential or be non-expansive.

Grading-Engineered Fills

The following recommendations pertain to the placement of, and preparation for, engineered fills:

1. The on-site soils are suitable for use as engineered fill. Any import materials that are to be used as structural fill should be approved by this office prior to placement. The materials should be tested for expansion potential, corrosivity, material type, and shear strength when considering their use for this project. Import materials should be have an Expansion Index less than 30 and an internal friction angle of at least 30 degrees.
2. All vegetation, trash debris or other deleterious material should be stripped from the area to be graded. Soils bearing sparse grasses may be thoroughly mixed with at least ten parts clean soil and incorporated into the engineered fill. Other materials should be wasted from the site.
3. Compressible soils that lie within the areas to receive engineered fill should be removed to relatively incompressible material, moisture conditioned, and replaced as properly compacted fill. Portions of the compressible materials that are sufficiently thin may be scarified, watered or air dried to approximately the material's optimum moisture content, and compacted in-place. A combination of removal and recompaction in-place may be used, providing the recommended compaction is obtained throughout the recommended depth interval. We anticipate the removal depth to be governed, in most cases, by the depth of the soil disturbance during demolition. Removal depths may be governed by the

four-feet-below-footing-bottom criteria in other areas. The removals should extend to depths sufficient to be supported by undisturbed native materials. In the area of the existing basement that, considered to be the area of gridlines 4 through 8, may be on the order of a dozen feet (details for the existing building are not known at this time). The transition from the deeper removals to the shallower removals should have a bottom gradient no steeper than 3:1 (horizontal to vertical). Final removal bottoms must be field verified by a representative of the geotechnical consultant.

4. Exposed surfaces should be scarified, moistened or air dried as appropriate, and compacted to 90% of the material's maximum dry density prior to placement of fill.

5. We recommend a uniform blanket of compacted fill be created for support of structural footings. The fill cap should extend to at least five feet below the base of proposed footings and a horizontal distance beyond their perimeter equal to the thickness of the fill below the footing, but not less than five feet.

6. Where the ground slopes steeper than 5:1 (H:V), the engineered fill should be properly benched into competent material.

7. Areas that are to be paved should be scarified to at least 12 inches below the existing or rough grade (whichever is <u>deeper</u>), brought to near the material's optimum moisture content, and compacted to at least 95% relative compaction.

8. Fill materials should be placed in thin lifts, watered to near the material's optimum moisture content (or to near 2% over optimum moisture content, and compacted to at least 90% relative compaction prior to placing the next lift).

9. All grading should comply with the grading specifications and requirements of the governing agency.

<u>Grading-Temporary Excavations</u>

Temporary excavations (such as backcuts for stability fills, removals, and retaining wall excavations) may be considered stable if cut vertical, providing they are restricted to a maximum of 5 feet in height, are provided with permanent support as soon as possible, and they are protected from erosion and saturation. Portions of temporary excavations in excess of 5 feet high should be laid back to 1 1/2:1 unless specific alternative treatments are evaluated and found acceptable.

<u>Utility Trench Backfill</u>

Backfill for utility trench excavations should be compacted to 90% relative compaction. Where installed in sloping areas, the backfill should be properly keyed and benched.

Foundation Systems

This section provides preliminary foundation design criteria for conventional shallow spread foundations. Once specific building loads and foundation locations are known, these recommendations should be reviewed. Specific design issues, such as foundations in close proximity to one another, or loads beyond the range anticipated may require supplemental geotechnical recommendations.

Conventional Foundations

Continuous or pad footings may be used to support the proposed structures. In order to achieve the capacities specified below, they should be founded a minimum of 18 inches into engineered fill, with the concrete placed against in-place, undisturbed material. Isolated foundations should be constrained by grade beams in at least two directions. Foundation design criteria are based, in part, upon the expansive properties of the materials anticipated to be present near the finished pad grade. We anticipate the material supporting the structure to have an expansion index of 30 or less. Laboratory testing to verify the expansive properties of the near-pad-grade materials should be performed at the completion of rough grading. The final foundation and slab-on-grade configuration should contain details that are not less than the values provided.

Pre-saturation guidelines are presented in the following table. Pre-saturation of the foundation soils should be initiated well before concrete is scheduled to be placed. Care should be taken to see that the water has properly penetrated the soil. Last minute flooding is not a good practice. Excess water remaining in the target pre-saturation zone at the time of concrete placement will penetrate further into the soil, possibly causing additional expansion and uplift of the curing concrete.

Anticipated Expansion Index Range	**0 - 30**
Pre-moisten	18"
Footings(1)	
Allowable Bearing Capacity	2000 PSF(2)
Lateral Resistance	225 PSF/Ft(2) (3)
Maximum Lateral Resistance	2000 PSF(2) (3)
Coefficient of Friction	0.35
Minimum Embedment Into Foundation Material	18 inches
Minimum Embedment Below Adjacent Grade(4)	18 inches
Minimum Reinforcement	4 #4 bars, 2 near top, 2 near bottom
Slabs-On-Grade	
Thickness	Full 5"
Minimum Reinforcement(6)	#4 bars @ 16" o.c., e.w.

(1) Bearing portions of all footings should be at least five feet (measured horizontally) from the face of adjacent, descending slopes. All footings should bear at least three feet below an imaginary plane projected upward at 1.5:1 from the toe of locally over-steepened slopes. Pad footings should be at least 24 inches square.

(2) May be increased by 1/3 for short duration loading such as by wind or seismic forces. Allowable Bearing Capacity considers a factor of safety of 3 or greater considering bearing failure.

(3) Decrease by 1/3 when combined with friction. The value provided can be used for both static and seismic conditions.

(4) Applies to exterior footings.

Slab-On-Grade Subgrade

Approximately two inches of sand should be placed across the slab subgrade, with a vapor retarder placed on top of the sand in all areas where moisture penetration of the slab is undesirable. The vapor retarder should consist of at least 10 mil thick, polyolefin plastic that complies with specifications in the present version of ASTM E1745. Concrete for the floor slab should be placed directly upon the vapor retarder.

The vapor retarder should be placed in general conformance with ASTM E1643 – 10. The permeance (propensity to transmit water) and strength (i.e. Class A, B or C) of the vapor retarder, as well as the water/cement ratio, mix design and strength of the concrete, will influence a variety of items, including slab finishing, construction schedules, moisture released from the slab, and floor coverings. Project design and construction professionals should consider these factors when developing specifications for, and/or selecting materials for, the vapor retarder, concrete, and floor covering.

Static Settlement

For planning purposes, structural foundations designs should consider total static settlement on the order of 1 inch with differential settlement on the order of 1/2 inch over a distance of 30 feet. Once foundation loads and locations are known, this information should be provided to the geotechnical consultant to verify the magnitudes of estimated total and differential static settlements.

Seismic Geohazards

Pre-ground improvement seismic settlement due to design-level ground motions is anticipated to be on the order of 1 2/3 inches with differential settlement estimated to be ¾ inches.

The potential for lateral spreading at the site is estimated to range from 3 to 5 inches using two different estimation methods, with a maximum variation of only 1.5 inches considering either the Kramer or Youd methodology. Those 1.5 inches of relative lateral spread across the width of the building – approximately 100 to 130 feet – in the assumed direction of movement indicates an average strain rate of less than 0.015 inches per foot.

Post ground improvement settlement will be one inch or less for total static and seismic settlement. Differential static and seismic settlement will be on the order of ¾ inches or less over a horizontal distance of 30 feet.

Retaining Walls

Conventional Cantilever Walls

Retaining walls may be used within the subject project. Foundation design criteria are provided in the preceding section. Lateral loading criteria for cantilevered wall designs with level backfills are presented in the table below. The loading criteria are in part a function of the type of backfill material. Criteria for various Unified Soil Classification designations are provided. Soil classified as CL predominates at the subject site. Lateral earth pressures acting on the wall may be reduced by replacement of these soils with coarser soils, throughout the backfill-backslope area that influences wall design. The zone of influence extends from the back of the wall to a line project upward at about 45 degrees from the back of the footing to the ground surface. Earth materials for backfill and bearing support may be assumed to have a total soil unit weight of 125 pcf.

Lateral Design(1)

	Equivalent Fluid Density (PCF)(1)	
USCS Class:	GW, GP, SW, SP	SC, CL-ML, CL
Active Pressure	30	60
At-rest Pressure	60	100

(1) Based on Table 1610.1 of the 2010 CBC. Special design required for wall height in excess of fifteen feet.

Retaining walls that are free to deflect may be designed for active pressure. Retaining walls that are restrained should be designed for at-rest pressure. The 2010 CBC §1610A.1 allows basement walls which extend not more than eight feet below grade with supporting flexible floor systems to be designed for active pressure. Section 1807A.2.1 of the 2010 CBC requires the lateral soil pressure on both sides of the keyway be considered in the sliding analysis if a keyway is extended below the wall base to enhance sliding stability.

For walls supporting slopes steeper than 5:1 (H:V), the equivalent fluid densities in the table should be increased. The values may be increased 1 pcf for each 2 degrees of backfill gradient. For example, ascending backfill with a gradient of 2:1 may use an equivalent fluid density that is increased by 13 pcf. Recommendations for other backfill conditions may be provided upon request.

All retaining walls should be provided with adequate backdrainage systems. Pipe outlets are generally preferred over weep holes. Free draining material should be used behind weep holes or about pipe drains. Care should be exercised to see that weep holes are installed and maintained above the finish grade adjacent to the face of the wall. Waterproofing should be included in the design where moisture penetration of the wall and mineral deposits/staining on the wall face are undesirable.

Backfill for retaining walls should be properly compacted. An impervious cap should be provided at the top of the backfill to retard infiltration of water. A typical backfill detail is provided in the Typical Details appendix of this report.

Additional surcharge, such as that due to proposed structures, traffic, hydrostatic pressure, or other loading, should be included in the wall design. Use of expansive soil as backfill for retaining walls will result in a surcharge to the wall, the magnitude of which is dependent upon the expansion index of the backfill.

Seismic Increment of Earth Pressure

As required by CBC §1803A.5.12, geotechnical reports for structures assigned to Seismic Design Category D, E or F must include information regarding lateral pressures on basement and retaining walls due to earthquake motions. Recent writings such as Lew et al. (2010) and Al Atik et al. (2010) attempt to address the appropriate means to implement this code requirement. These works conclude in part that seismic earth pressures can be neglected when the peak ground acceleration is below 0.4g. For this site, the peak ground acceleration is considered to be above this threshold.

For retaining walls, the following design criteria are provided considering the general provisional recommendations proposed by Lew et al. (2010) and findings presented in Al Atik (2010) for walls founded on non-saturated, level ground conditions. Cantilever walls free to move and rotate can be designed for a seismic earth pressure increment considering an equivalent fluid pressure of 67 pcf (triangular pressure distribution). Walls restricted from moving or rotating, such as basement walls, can be designed for a seismic earth pressure increment considering an equivalent fluid pressure of 84 pcf (triangular pressure distribution). The resultant of this seismic earth pressure increment is considered to act at one-third H above the base of the wall. The seismic earth pressure increment should be applied to the active earth pressure for both the free-to-rotate and restrained cases. Often, for the case of walls restricted from moving and rotating, this combination of active earth pressure and seismic earth pressure increment will not exceed the at-rest earth pressure for the static case when considering factored loads used for the basic load combinations prescribed in the California Building Code.

Factors of Safety

The factor of safety for the allowable bearing pressure provided is greater than three. The allowable passive pressure provided is based upon a factor of safety of 1.5. The factor of safety for the sliding friction is one. The factor of safety for the active pressure is one.

Corrosion Potential

Soluble Sulfates

Preliminary Testing of a sample obtained from onsite exploration indicates soluble sulfate levels of 350 mg/kg. This equates to 0.035 percent water soluble sulfate by weight. Table 4.3.1 in ACI 318 designates these levels of soluble sulfates as negligible sulfate exposure. The ACI table presents requirements for concrete exposed to sulfate-containing solutions. For the negligible level, no specific requirements are provided.

Soil Resistivity

The testing also indicates resistivity of the saturated sample was 1,200 ohm-cm. Resistivity of soils is inversely proportional to corrosiveness. Thus, the analysis helps in determining whether the soils may have a deleterious effect on underground metallic structures or materials. A generally accepted correlation between resistivity and soil corrosiveness toward metals is provided below.

Resistivity (Ohm-Centimeter)	Corrosiveness
< 1,000	Severely Corrosive
1,000 - 2,000	Corrosive
2,000 - 10,000	Increasingly Moderate
> 10,000	Increasingly Mild

pH Levels

Test results indicate that the sample has a pH level of 7.4, indicating that the soils are generally neutral to slightly basic.

Chlorides

Soils containing high concentrations (on the order of 10,000 ppm) of chlorides can be corrosive to ferrous metals. The sample was found to contain 16 ppm of chlorides, well below levels of concern with respect to corrosion.

Preliminary Pavement Structural Sections

Preliminary pavement structural section information for the project has been prepared considering a preliminary R-Value of 10 for the subgrade soils. The following table presents the pavement section recommendations.

AC PAVEMENT RECOMMENDATION

Assumed Traffic Index	Thickness of Asphalt Concrete (inches)	Thickness of Crushed Aggregate Base (inches)
4	3.0	6.0
5	3.0	9.0
6	4.0	13.0

The upper 12 inches of the subgrade soil should be compacted to at least 95% relative compaction. Base materials should be compacted to at least 95% relative compaction.

R-value tests should be performed at the completion of grading and final pavement section designs developed at that time.

Drainage

Positive drainage should be established to carry pad waters away from structures and foundations, and to prevent uncontrolled or sheet flow over manufactured slopes. We recommend as steep a gradient as practical be established around the structures, to the street or other non-erosive drainage devices. Fine-grade fills placed to create pad drainage should be compacted in order to retard infiltration of surface water.

Preserving proper surface drainage is also important. Planters, decorative walls, plants, trees, or accumulations of organic matter should not be allowed to retard surface drainage. Area drains and roof gutters (if present) should be kept free of obstruction. Roof gutters (if present) and/or condensation lines from air conditioners should outlet to a non-erodible device, i.e., walkways, patios, driveways, drain lines, or splash blocks that direct the water away from the structure. Swales and/or area drains should outlet to the street or acceptable non-erodible device. Positive drainage along the backs of retaining walls should be maintained. Any other measures that will facilitate positive surface drainage should be employed.

CONSTRUCTION MONITORING

Progress site plans, grading plans, and foundation plans should be submitted to this office. Additional recommendations may be provided at that time, if such are considered warranted.

Placement of all fill and backfill should be monitored by representatives of this office. This includes our observation of prepared bottoms prior to filling. All excavated slopes, both temporary and permanent, should be observed by a representative of this office. Supplemental recommendations may prove warranted based upon the materials exposed in the actual excavations.

Foundation excavations should be observed by representatives of this office to see if the recommended penetration of proper supporting strata has been achieved. Such observations should be made prior to placing concrete, steel or forms. This office should be notified at least 24 hours prior to placing concrete.

CLOSURE

This geotechnical report has been prepared in accordance with generally accepted engineering practices at this time and location. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

Thank you for this opportunity to be of service. Please do not hesitate to call if you have any questions regarding this report.

Respectfully submitted,
GEOLABS-WESTLAKE VILLAGE

Lawrence K. Stark
G.E. 2772

Ronald Z. Shmerling
C.E.G. 1047
R.C.E. 35444

XC: (6) Addressee c/o Mr. Lee Paul

REFERENCE LIST:

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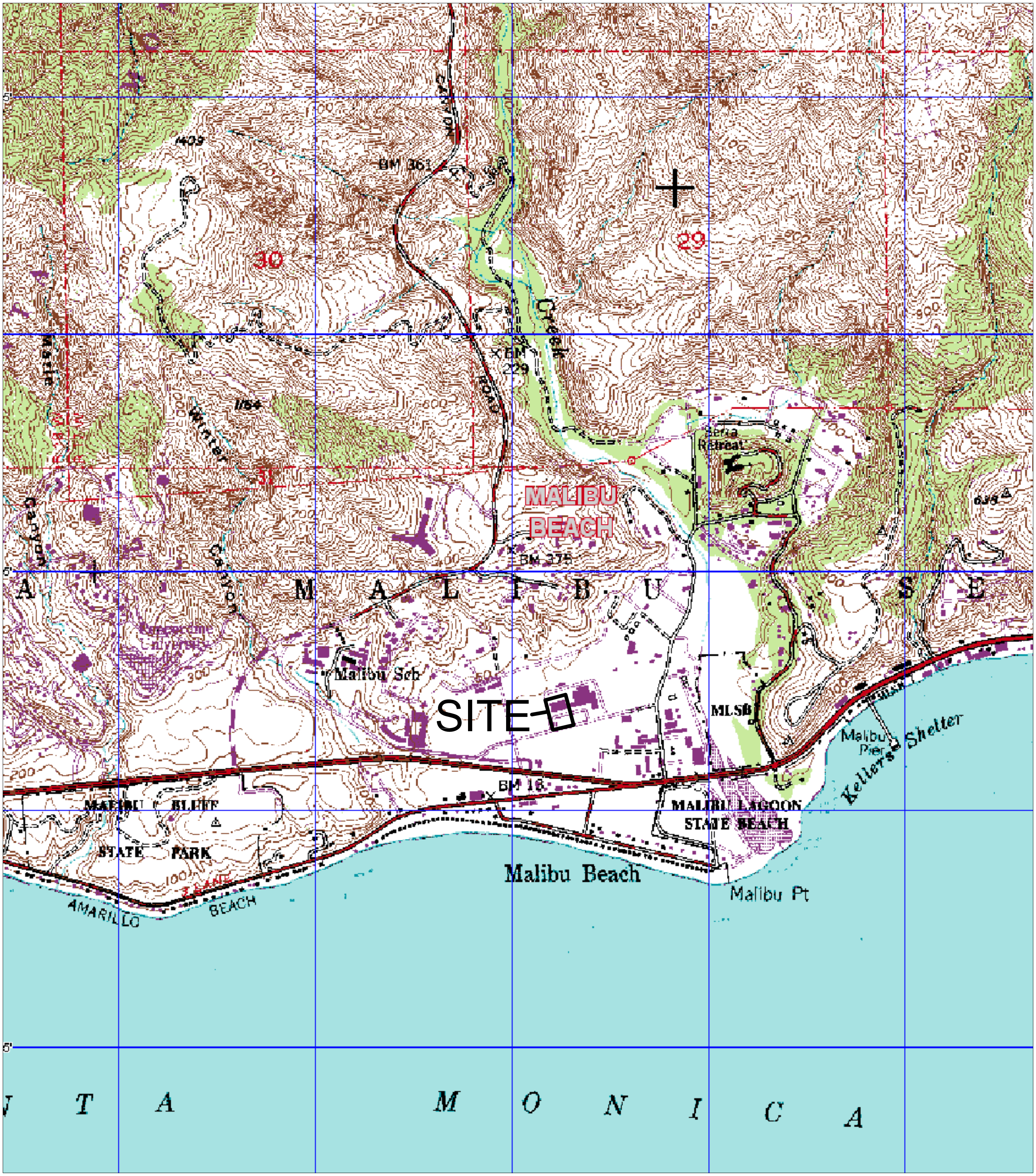
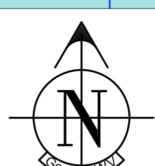
SITE LOCATION MAP

23555 Civic Center Way, Malibu, California





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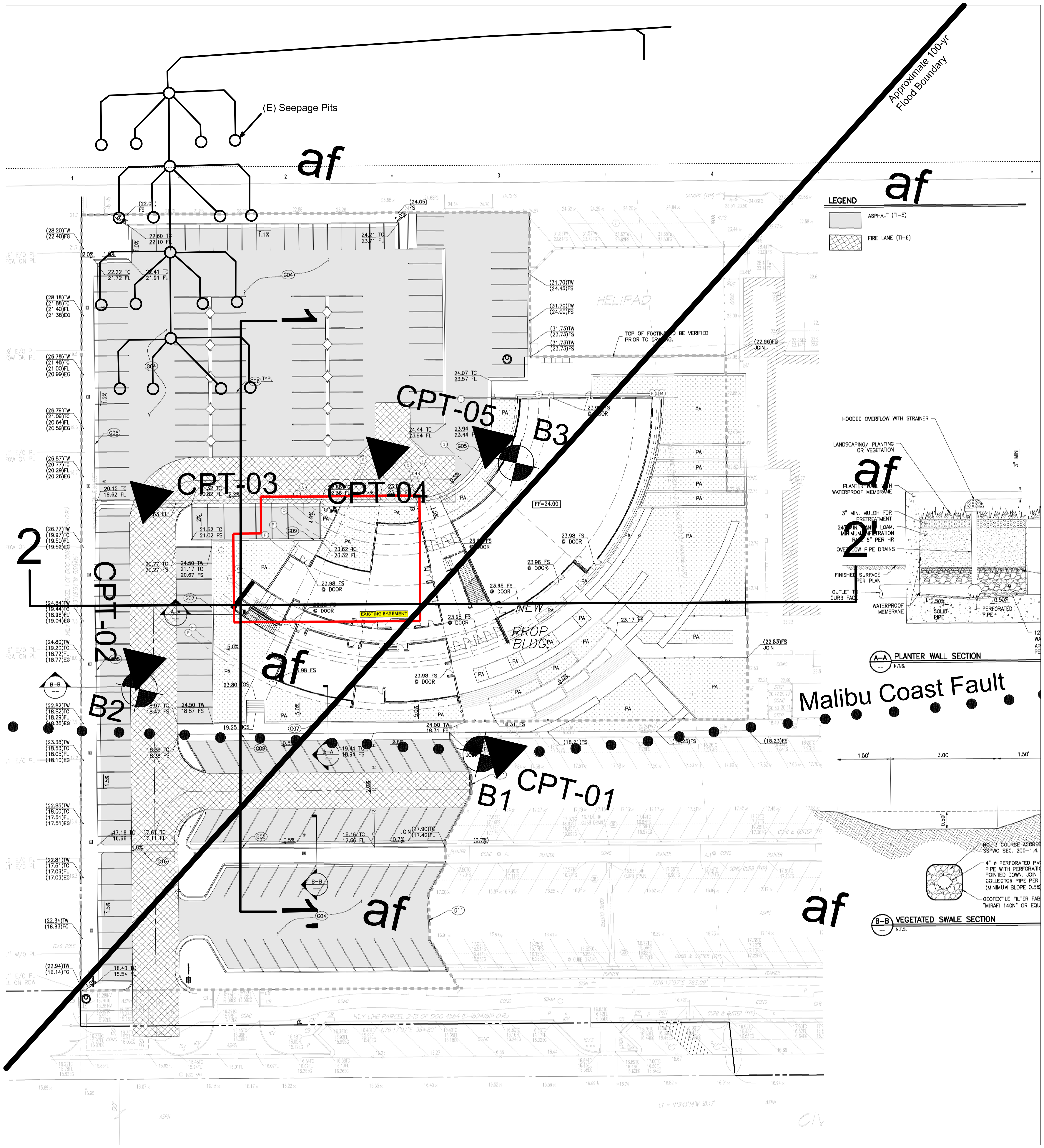
DATE 6/21/2012	BY RMP
SCALE NTS	W.O. 9279

Base Map: DeLorme 3D Topo Quads - Portion of Malibu Beach 7.5-min Quadrangle

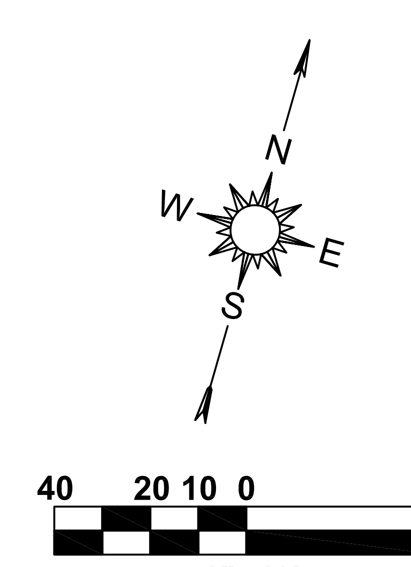
PLATE 1.1

PLOT MAP



EXPLANATION

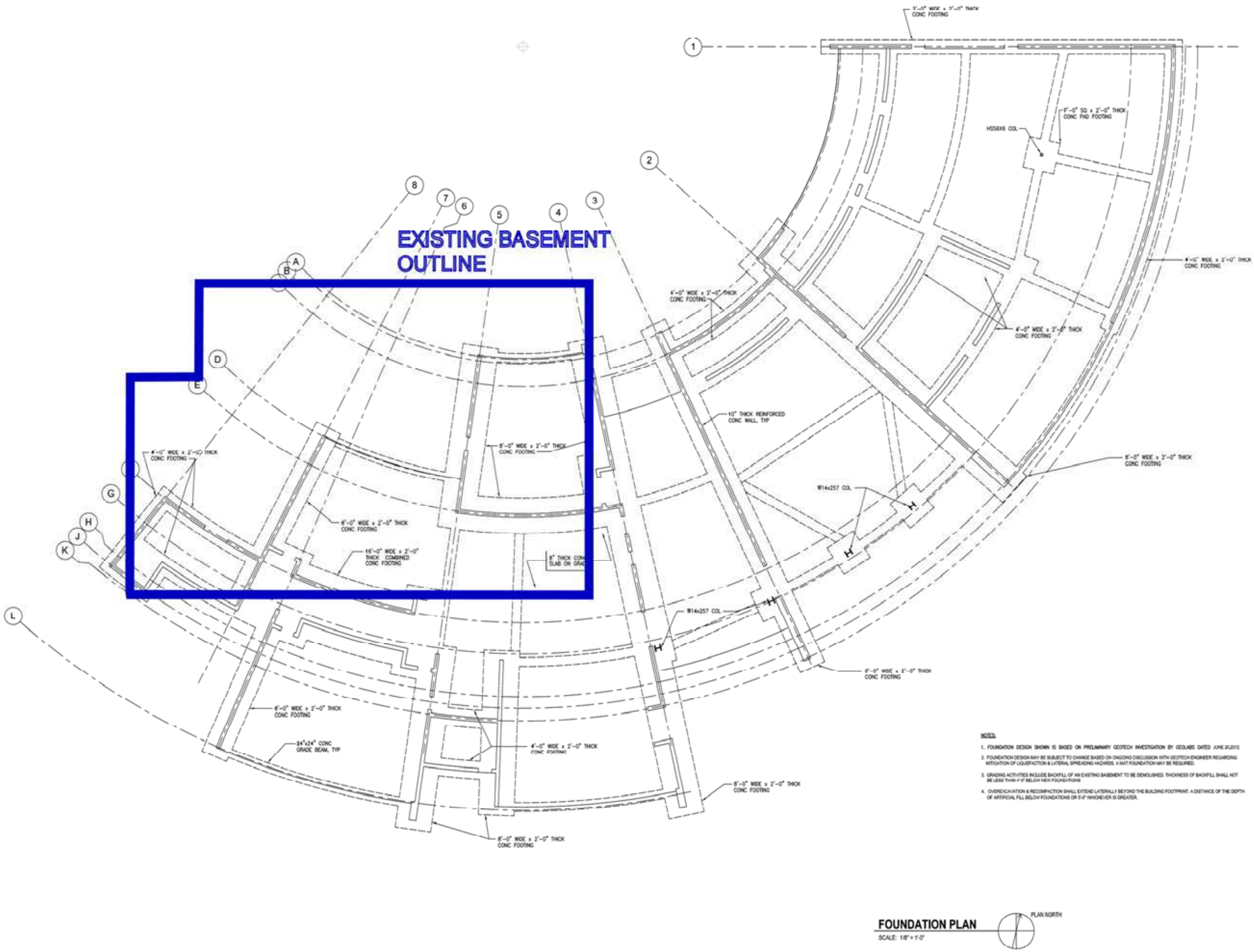
af	Artificial Fill
B3	Approximate location of HSA boring
CPT-05	Approximate location of CPT sounding
2 — 2'	Cross section
	Approximate 100-yr Flood Boundary
	Approximate surface projection of the main trace of the Malibu Coast Fault - dotted where buried
	Subject Parcel Boundary



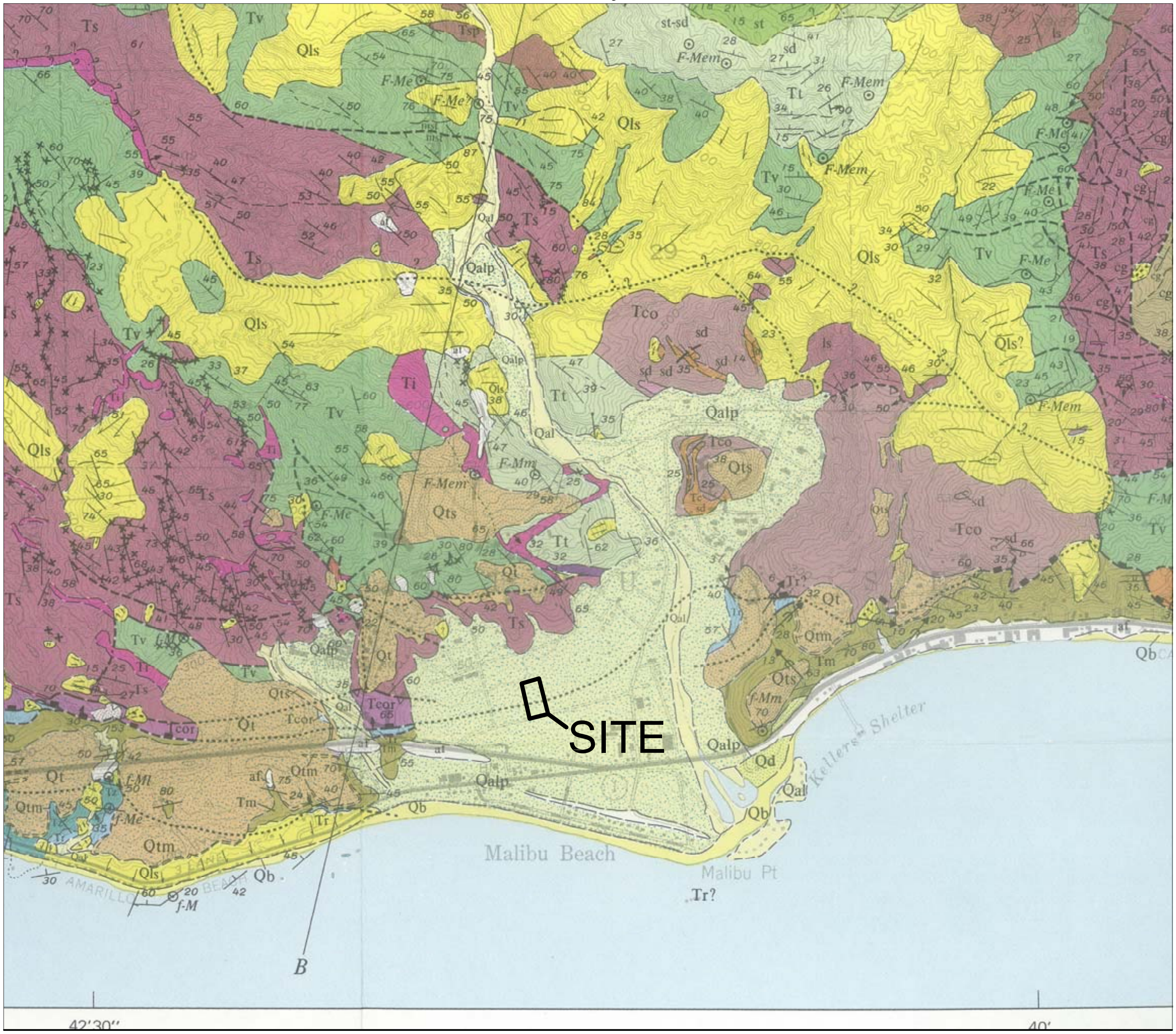
P:\9279 SMC Malibu\Plot Map.dwg | Plot Map

Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING
DATE 6/21/2012 BY RMP
SCALE 1"=40' W.O. 9279

PLATE 1.2


EXISTING BASEMENT OUTLINE
FOUNDATION PLAN
SCALE: 1/8" = 1'-0"
PLAN NORTH
NOTES:
1. FOUNDATION DESIGN SHOWN IS BASED ON PRELIMINARY GEOTECH INVESTIGATION BY GEOLABS DATED JUNE 20,2012.
2. FOUNDATION DESIGN MAY BE SUBJECT TO CHANGE BASED ON ONGOING DISCUSSION WITH GEOTECH ENGINEER REGARDING MITIGATION OF LIQUEFACTION & LATERAL SPREADING HAZARDS. A MAT FOUNDATION MAY BE REQUIRED.
3. GRADING ACTIVITIES INCLUDE BACKFILL OF AN EXISTING BASEMENT TO BE DEMOLISHED. THICKNESS OF BACKFILL SHALL NOT
4. OVEREXCAVATION & RECOMPACTION SHALL EXTEND LATERALLY BEYOND THE BUILDING FOOTPRINT. A DISTANCE OF THE DEPTH OF ARTIFICIAL FILL BELOW FOUNDATIONS OR 5'-0" WHICHEVER IS GREATER.

REGIONAL GEOLOGIC MAP
23555 Civic Center Way, Malibu, California



EXPLANATION

Qalp — Alluvium as flood plain deposits, may include some mudflow deposits

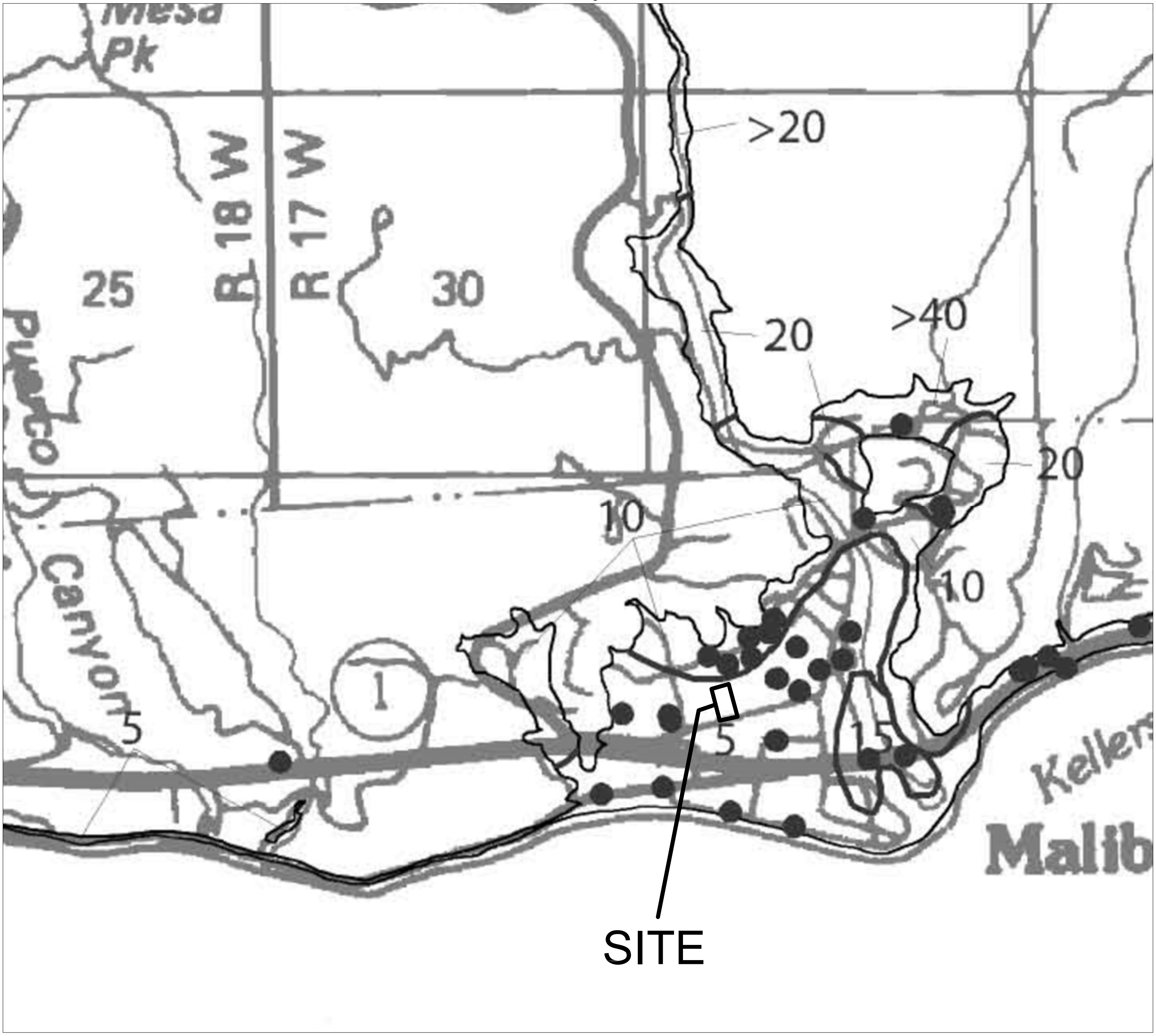
65 — Malibu Coast fault - Boxes on upper plate of reverse fault, dotted where buried

Geolabs – Westlake Village	GEOLOGY AND SOIL ENGINEERING
DATE 6/20/2012	BY RMP
SCALE ~1"=2000'	W.O. 9279

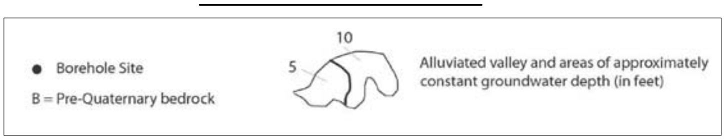
Base Map: Geologic Map of East-Central Santa Monica Mountains, by Yerkes and Campbell, 1980

PLATE 1.3

GROUNDWATER MAP
23555 Civic Center Way, Malibu, California



EXPLANATION

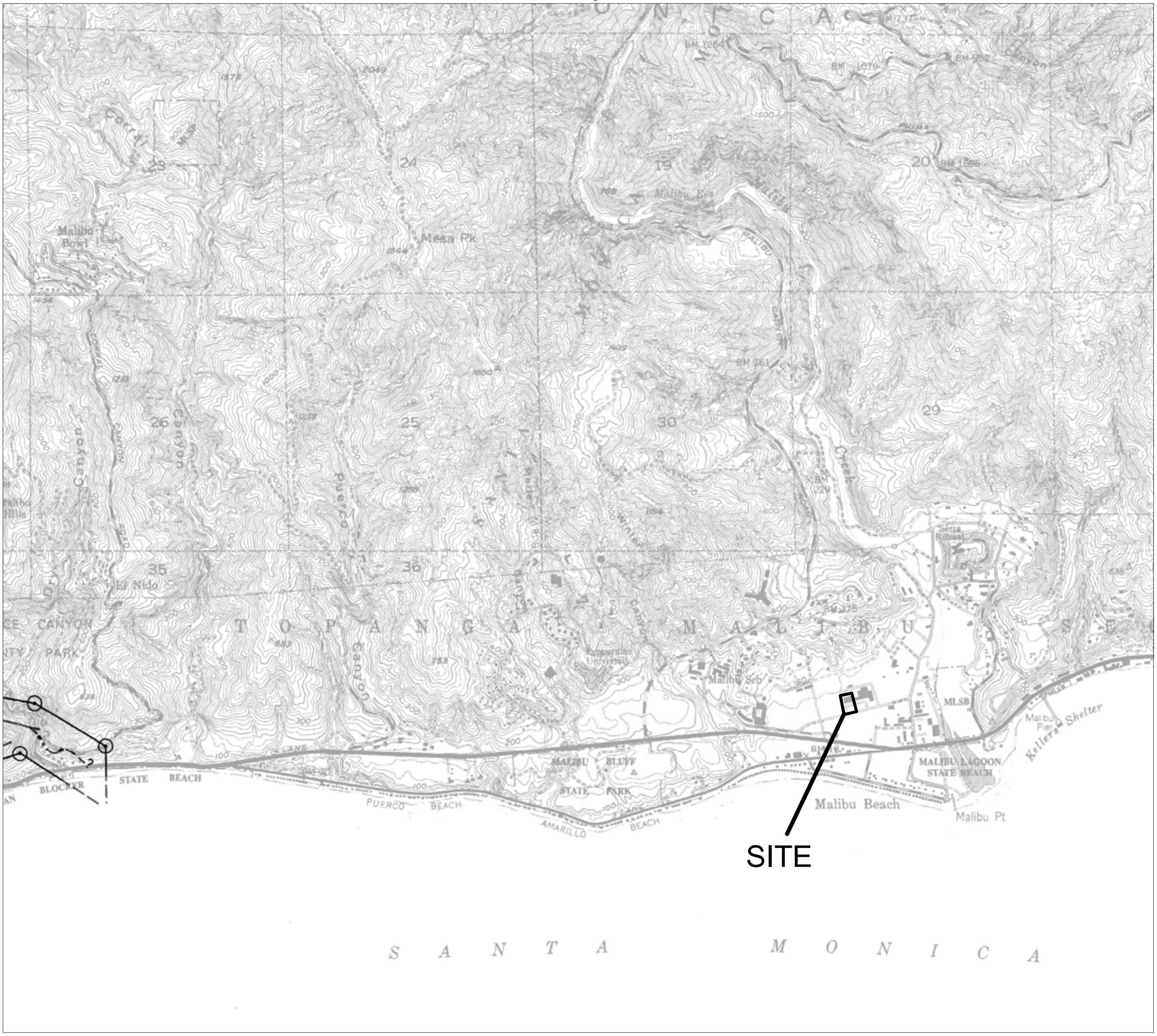


Geolabs – Westlake Village GEOLOGY AND SOIL ENGINEERING	
DATE 6/20/2012	BY RMP
SCALE ~1"=2000'	W.O. 9279

Base Map: Portion of Malibu Beach 7.5-min Quadrangle, SHZR 050, CDMG, 2001

PLATE 1.4

ALQUIST-PRIOLO MAP
23555 Civic Center Way, Malibu, California



MAP EXPLANATION

Active Faults

Faults considered to have been active during Holocene time and to have 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 event or C for displacement caused by fault creep.

Earthquake Fault Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define Earthquake Fault Zone segments.

Seaward projection of zone boundary.

Base Map: Earthquake Fault Zones Map, Malibu Beach 7.5-min Quadrangle by California Geological Survey, 2007

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GEOLOGY AND SOIL ENGINEERING

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SCALE ~1"=3000' W.O. 9279

PLATE 1.5

REGIONAL FAULT MAP

23555 Civic Center Way, Malibu, California

Base Map: CGS, 1999, Simplified Fault Activity Map of California, Compiled by C.W. Jennings and George J. Saucedo (Revised 2002 by Tousson Toppozada and David Branum)

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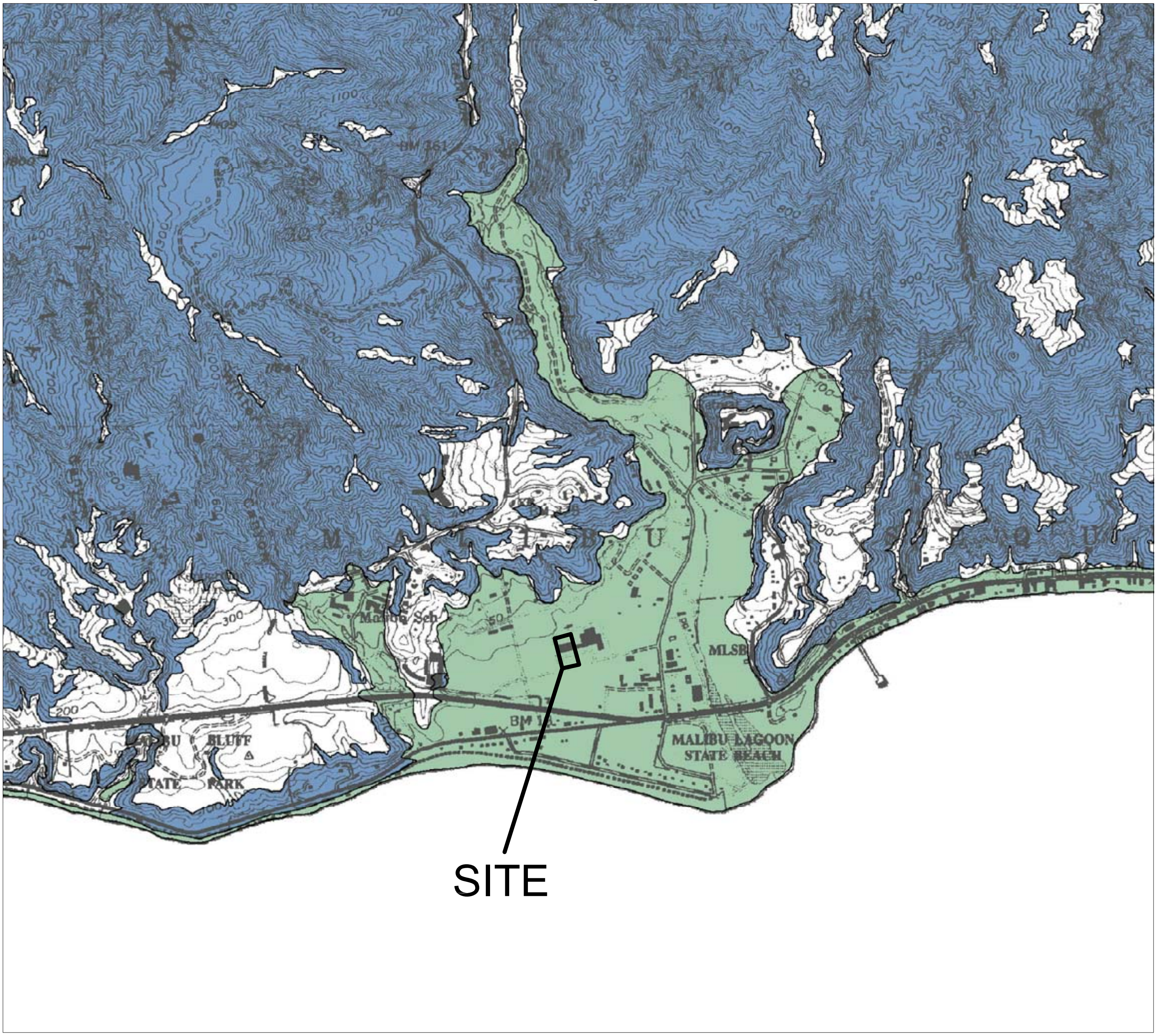
SCALE ~1"=10miles W.O. 9279

PLATE 1.6

SEISMIC HAZARD ZONES MAP
23555 Civic Center Way, Malibu, California



MAP EXPLANATION

Zones of Required Investigation:

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.

Earthquake-Induced Landslides

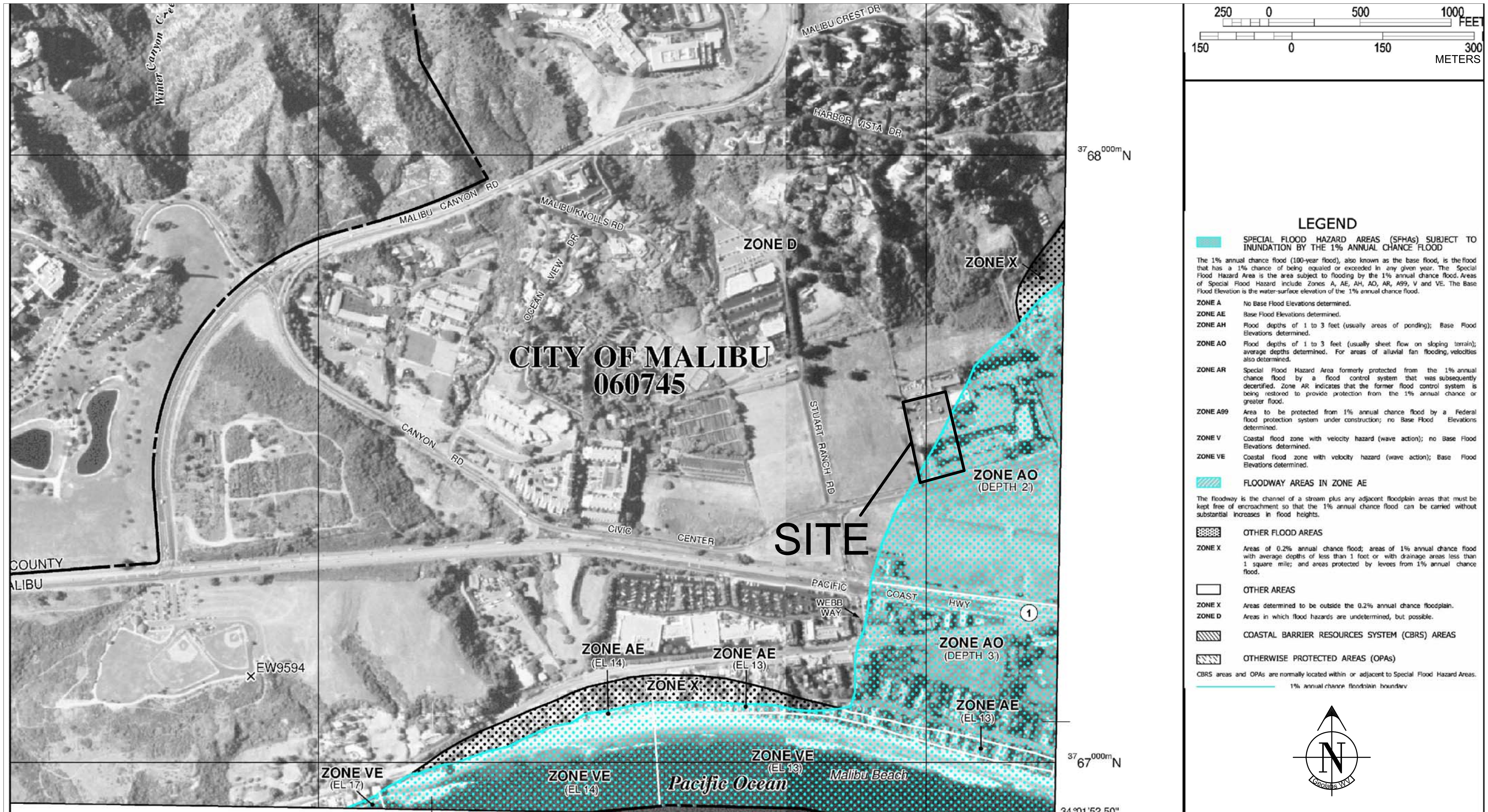
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Base Map: Seismic Hazard Zones Map, Malibu Beach 7.5-min Quadrangle by California Geological Survey, 2001

Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE 6/20/2012 BY RMP
SCALE ~1"=2000' W.O. 9279

PLATE 1.7



This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Base Map: Federal Emergency Management Agency, Flood Insurance Rate Map 06037C1537F, Malibu Area, September 26, 2008

FLOOD HAZARD MAP

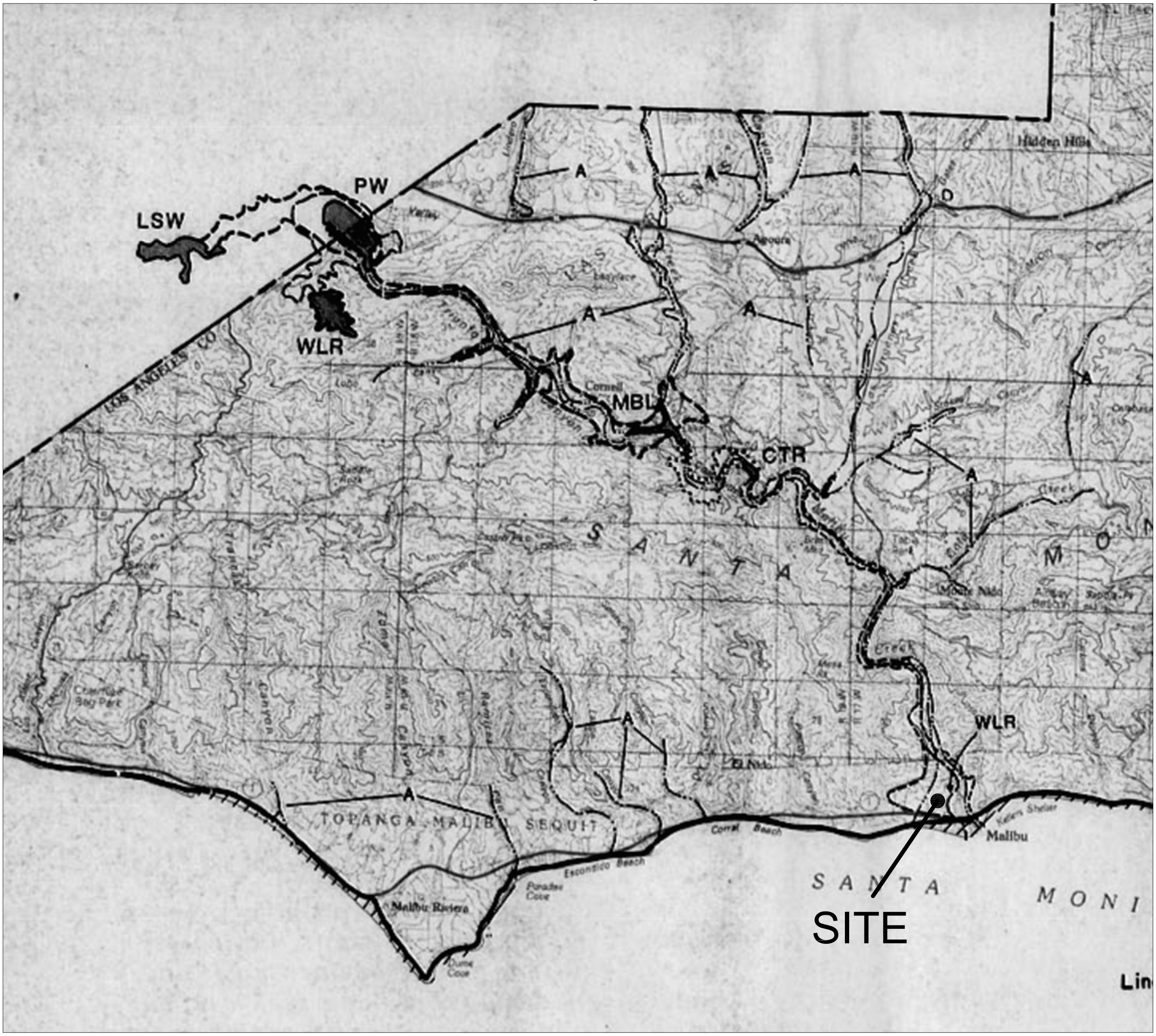
23555 Civic Center Way, Malibu, California

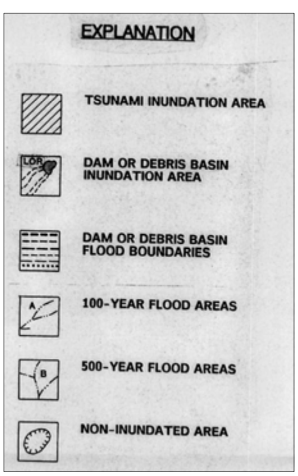
Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

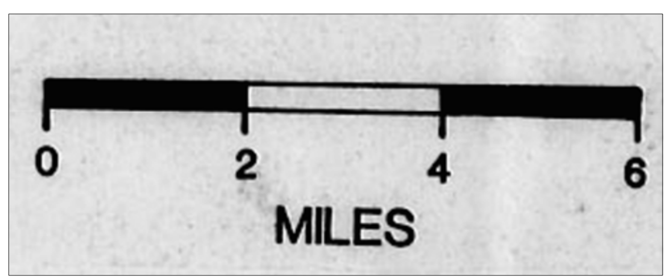
DATE 6/20/2012 BY RMP
SCALE graphic W.O. 9279

PLATE 1.8

DAM INUNDATION MAP
23555 Civic Center Way, Malibu, California







Base Map: Flood and Inundation Hazards Map
Los Angeles County Safety Element, Plate 6

Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE	6/20/2012	BY	RMP
SCALE	graphic	W.O.	9279

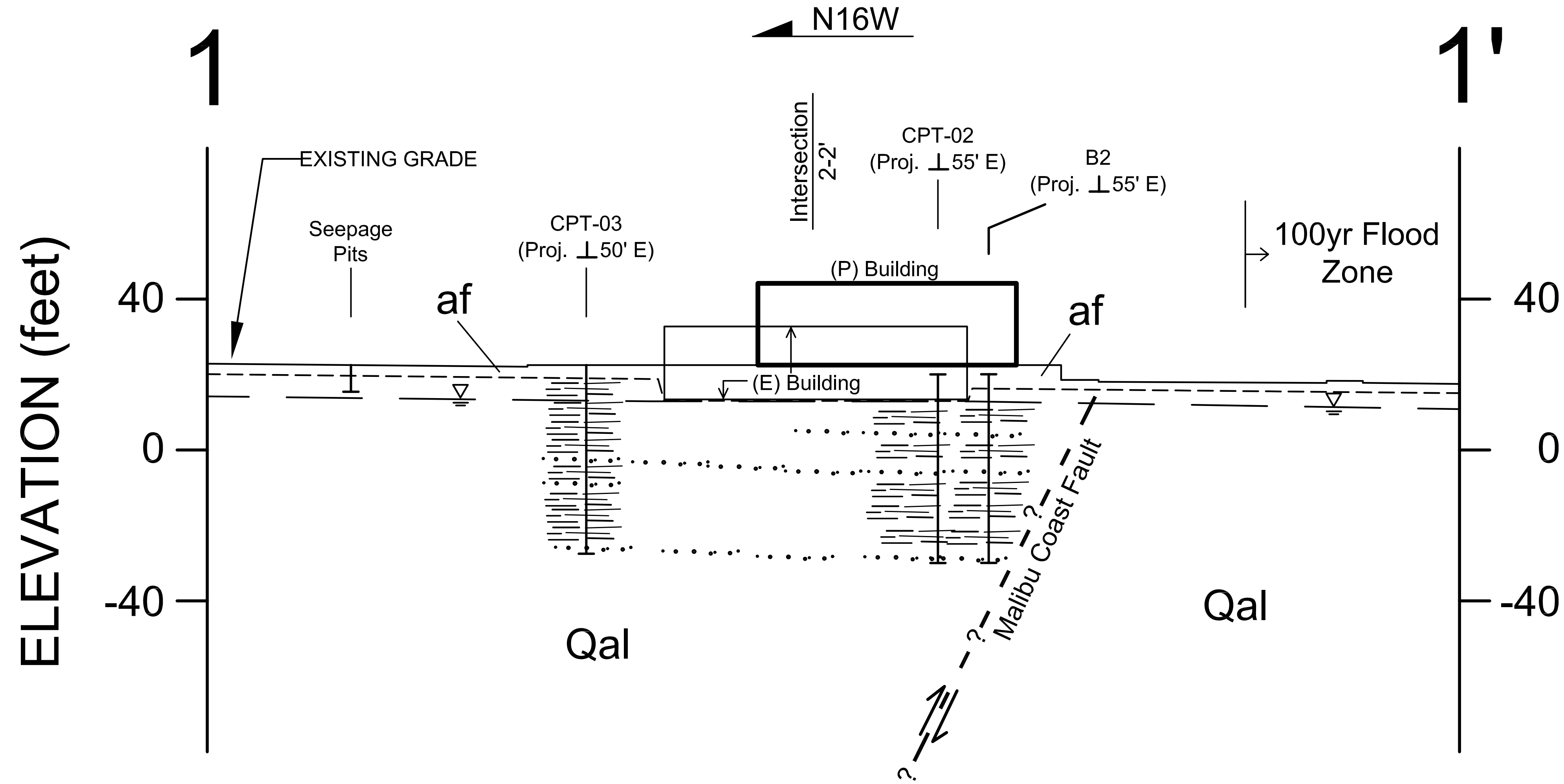
PLATE 1.9

APPENDIX A

FIELD INVESTIGATION RESULTS

Preliminary Geotechnical Investigation,
Proposed Library,
23555 Civic Center Way,
City of Malibu, California

W.O. 9279
June 20, 2012
Revised December 18, 2013

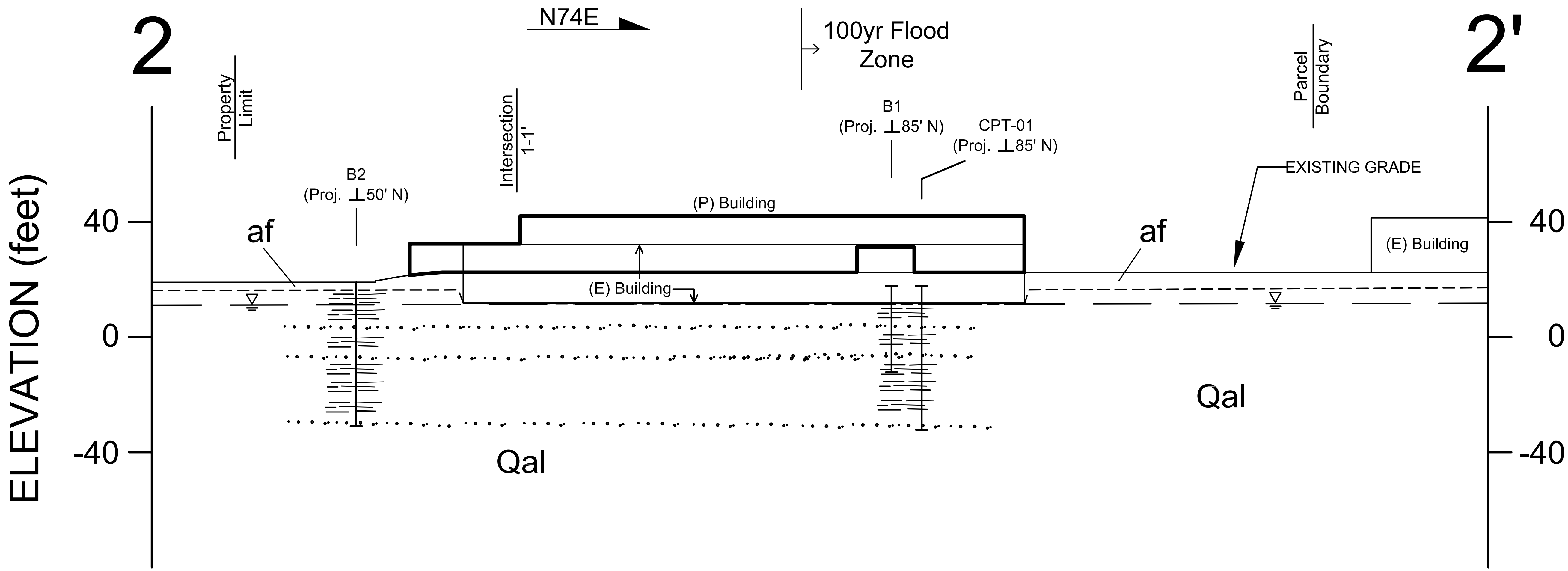


P:\9279 SMC Malibu\Cross Sections.dwg | 1-1'

Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE 6/21/2012 BY RMP
SCALE 1"=40' W.O. 9279

PLATE 2.1



Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE 6/21/2012 BY RMP
SCALE 1"=40' W.O. 9279

PLATE 2.2

SUBSURFACE DATA | LOG OF BORING B1

CLIENT: SMC	PROJECT: Malibu Library	W.O.: 9279
LOCATION: Malibu	ELEVATION: 18'	DATE: 4/23/12
RIG TYPE: 8" HSA	HAMMER WEIGHTS: 140 lbs.	DROP: 30"

Depth	N	U	B	M	DD	DESCRIPTION	PARTICLE SIZE
0						@0' - <u>Artificial Fill:</u> 3" AC over 2" Base over (SM) brown silty SAND	
			X			@1' - (SM) Dark gray silty SAND, very moist	
			X				
			X			@3' - <u>Alluvium:</u> (CL) Mottled very dark gray and brown lean CLAY with fine sand, poorly graded, soft, moist, scattered light gray colored staining, individual stains are max. ⅛" across.	
5	2/3/3		S	26.5	-		*(0,18,45,37)
			X				
			X				
			X				
10	6/9/5	C		24.1	100.8	@10' - (SC) Light brown clayey fine SAND, poorly graded, loose, very moist, light gray staining as above, scattered subhorizontal sandy laminae.	
15	3/4/5		S	22.4	-	@15' - (SM) Brown silty fine to medium SAND, graded, loose, wet; over (CL) very dark gray fine sandy lean CLAY with <5% 1/4" angular gravel, graded, stiff, wet.	**(0,81,19)
				31.9	-		*(3,37,33,27)
20		C		33.3	87.2	@20' - (SC) Mottled olive brown and bluish gray clayey fine SAND, poorly graded, loose, very moist, plastic, sparse root stringers.	
25	1/1/1		S	27.9	-	@25' - (SP-SM) Bluish gray poorly graded fine to medium SAND with silt, very loose, wet; over (CL) dark bluish gray lean CLAY with fine sand, poorly graded, very soft, very moist, spaced ±1" apart are laminae to ⅛" thick interlayers of black silt.	**(1,94,5)
				34.9	-		*(4,22,46,28)
30	7/9/10	C		26.4	96.8	@30' - (SC) Bluish gray clayey fine SAND, poorly graded, loose, very moist, mottled light gray staining (<10%), sparse roothairs.	
35							
40							
45						TD = 30' Groundwater @ 9' Backfilled with grout	

ADDITIONAL COMMENTS:

- C = Modified California Sampler
- S = Standard Penetration Test
- Hand augered upper 3'
- *(% gravel, % sand, % silt, % clay)
- **(%gravel, %sand, %fines)

- N = Field Blowcount
- U = Undisturbed Sample
- B = Disturbed Sample
- X = Disturbed Bulk Sample
- M = Moisture %
- DD = Dry Density (pcf)

SUBSURFACE DATA | LOG OF BORING B2

CLIENT: SMC	PROJECT: Malibu Library	W.O.: 9279
LOCATION: Malibu	ELEVATION: 20'	DATE: 4/23/12
RIG TYPE: 8" HSA	HAMMER WEIGHTS: 140 lbs.	DROP: 30"

Depth	N	U	B	M	DD	DESCRIPTION	PARTICLE SIZE
0						@0' - <u>Artificial Fill:</u> 3" AC over 2" Base over (SC) brown clayey SAND	
			X			@1' - (CL) Dark gray lean CLAY with fine sand, moist.	
			X				
			X				
						@4' - <u>Alluvium:</u> (SC)Brown clayey fine SAND, poorly graded, loose,	
5	5/4/3	C		21.7	101.3	very moist, dendritic orange iron staining.	
10			S	25.9	-	@10' - (CL) Grayish brown sandy lean CLAY, poorly graded, soft, very moist, plastic.	*(0,49,31,20)
	4/5/8	C		28.2	97.5	@12.5' - (CL) Brown sandy lean CLAY, poorly graded, medium stiff, very moist, subhorizontal laminae of grayish brown very silty sand, also sparse manganese stains <⅛" across	
15	6/8/8		S	24.9	-	@15' - (SM) Brown fine to medium SAND, poorly graded, medium dense, wet	**(0,80,20)
	4/4/5	C		30.4	93.1	@17.5' - (CL) Very dark gray sandy lean CLAY, poorly graded, soft, very moist; clean sand in waste rings	
20	1/1/2		S	29.6	-	@20' - (SC) Dark bluish gray clayey fine SAND, poorly graded, very loose, very moist.	*(0,58,27,15)
25	3/7/9		S	26.9	-	@25' - (SC) Same with <5% angular medium to coarse sand and root hairs, medium dense.	*(1,66,21,12)
30	0-3", 1-3"/2/4		S	26.3	-	@30' - (SC) Same as above over 1" thick light brown silty fine to	*(0,39,38,23)
				31.1	-	medium sand layer, loose; over (CL) dark bluish gray sandy lean CLAY, poorly graded, soft, moist, mottled with light gray staining similar to B1@30'.	
35	3/5/6		S	35.7	-	@35' - (CL) Bluish gray sandy lean CLAY, poorly graded, stiff, very moist, ½" thick plastic clayey silt interlayer .	
40	3/3/5		S	34.4	-	@40' - (CL) Bluish gray lean CLAY with sand, poorly graded, medium stiff, very moist, slightly plastic, 1" thick dark gray interlayer with abundant black organic flecks.	*(0,17,56,27)
45							

ADDITIONAL COMMENTS:

C = Modified California Sampler
S = Standard Penetration Test
Hand augered upper 3'
*(% gravel, % sand, % silt, % clay)
**(% gravel, % sand, % fines)

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

CLIENT: SMC	PROJECT: Malibu Library	W.O.: 9279
LOCATION: Malibu	ELEVATION: 20'	DATE: 4/23/12
RIG TYPE: 8" HSA	HAMMER WEIGHTS: 140 lbs.	DROP: 30"

Depth	N	U	B	M	DD	DESCRIPTION	PARTICLE SIZE
40							
45	6/5/8		S	26.7 27.7	- -	@45' - (SM) Bluish gray silty fine to medium SAND, graded, medium dense, wet; over (CL) bluish gray sandy lean CLAY, poorly graded, stiff, very moist.	*(0,42,39,19)
50	3/6/14		S	24.5	-	@50' - (SP-SM) Orangish brown poorly graded fine to coarse SAND with silt and 2" thick interlayers of 1.5" subrounded sandy GRAVEL spaced 6" to 12" apart, medium dense, wet.	**(4,89,7)
55							
60							
65							
70							
75							
80							
85						TD=50' Groundwater @14' Backfilled with grout	

ADDITIONAL COMMENTS:

C = Modified California Sampler
S = Standard Penetration Test
Hand augered upper 3'
*(% gravel, % sand, % silt, % clay)
**(% gravel, % sand, % fines)

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

CLIENT: SMC	PROJECT: Malibu Library	W.O.: 9279
LOCATION: Malibu	ELEVATION: 23'	DATE: 4/23/12
RIG TYPE: 8" HSA	HAMMER WEIGHTS: 140 lbs.	DROP: 30"

Depth	N	U	B	M	DD	DESCRIPTION	PARTICLE SIZE
0						@0' - Artificial Fill: 3" AC over 2" Base over (GC) orangish brown clayey GRAVEL, well graded, medium dense, moist, clasts are angular volcanics.	
			X				
			X				
			X				
5							
	3/4/5		S	24.5	-	@6' - Wet.	
				19.2	-	@7' - Alluvium: (CL) very dark gray sandy lean CLAY, poorly graded, stiff, moist, plastic	*(0,34,39,27)
10	3/6/8		S	23.1	-	@10' - (CL) Very dark gray fine sandy lean CLAY, poorly graded, stiff, moist, mottled light gray staining max ⅛".	*(0,46,35,19)
15	7/7/8	C		23.3	103.3	@15' - (SC) Brown clayey fine to medium SAND, graded, loose, wet; over (CL) mottled brown and dark gray sandy lean CLAY, poorly graded, stiff, very moist, plastic	*(1,51,32,16)
20	1/1/2		S	32.4	-		*(0,40,35,25)
25	6/10/15	C		23.2	105.2	@25' - (SM) Bluish gray silty fine to medium SAND, graded, medium dense, very moist to wet.	*(0,71,18,11)
30	2/6/9		S	25.1	-	@30' - (SC) Bluish gray clayey fine SAND, poorly graded, medium dense, very moist.	*(0,52,29,19)
35							
40							
45						TD = 30' Groundwater @ 6' Backfilled with grout	

ADDITIONAL COMMENTS:

C = Modified California Sampler
S = Standard Penetration Test
Hand augered upper 6'
*(% gravel, % sand, % silt, % clay)

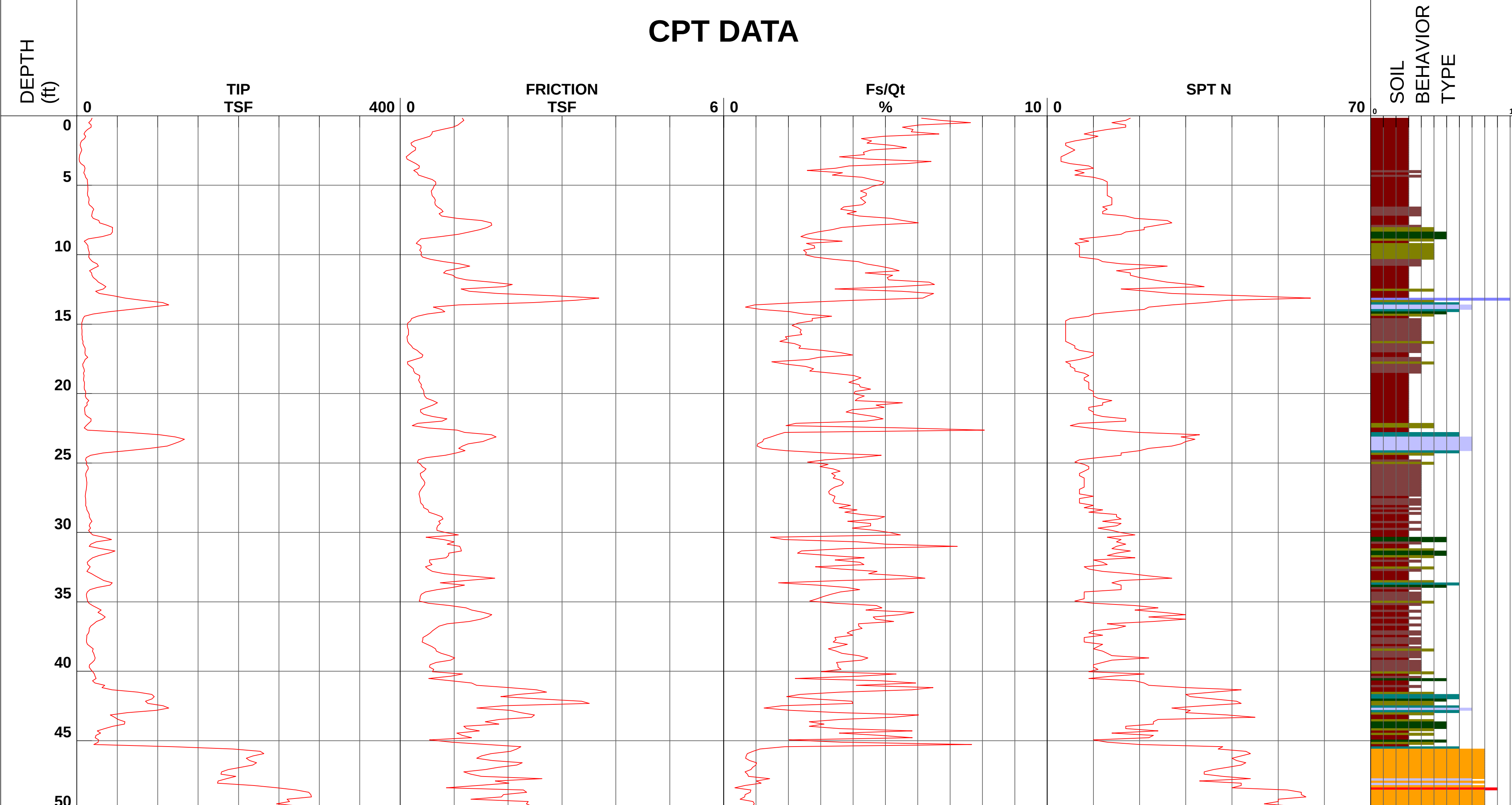
N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(235).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-01	Date and Time	4/30/2012 7:43:37 AM	Maximum Depth	50.20 ft
Water Table Depth	23.00 ft				

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

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

Project ID: Geolabs Westlake Village
Data File: SDF(235).cpt
CPT Date: 4/30/2012 7:43:37 AM
GW During Test: 23 ft

Sounding ID: CPT-01
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.13	* Cycl SStn %
0.33	17.6	28.2	-	1.2	0.1	6.7	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	50	15	N/A	0.00	N/A	N/A
0.49	14.8	23.7	-	1.1	0.4	7.6	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	56	15	N/A	0.00	N/A	N/A
0.66	17.7	28.4	-	1.1	3.1	6.1	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	48	15	N/A	0.00	N/A	N/A
0.82	17.7	28.3	-	1.0	1.5	5.5	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	47	15	N/A	0.00	N/A	N/A
0.98	13.3	21.3	-	0.8	-0.5	5.9	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	54	15	N/A	0.00	N/A	N/A
1.15	10.3	16.5	-	0.6	-1.3	5.8	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	N/A	0.00	N/A	N/A
1.31	8.8	14.2	-	0.6	-1.8	6.7	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	65	15	N/A	0.00	N/A	N/A
1.48	11.1	17.8	-	0.5	-2.0	5.0	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	54	15	N/A	0.00	N/A	N/A
1.64	9.6	15.4	-	0.4	-1.9	4.3	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	9.9	55	15	N/A	0.00	N/A	N/A
1.80	5.8	9.3	-	0.3	0.0	4.7	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	68	15	N/A	0.00	N/A	N/A
1.97	4.5	7.2	-	0.2	-0.2	4.5	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	75	15	N/A	0.00	N/A	N/A
2.13	4.1	6.6	-	0.2	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	81	15	N/A	0.00	N/A	N/A
2.30	5.1	8.1	-	0.3	0.2	5.8	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	77	15	N/A	0.00	N/A	N/A
2.46	6.2	9.9	-	0.3	1.2	4.7	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.4	9.9	67	15	N/A	0.00	N/A	N/A
2.62	5.0	7.9	-	0.2	0.2	4.5	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	72	15	N/A	0.00	N/A	N/A
2.79	3.7	6.0	-	0.2	-0.3	4.5	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.3	7.4	81	15	N/A	0.00	N/A	N/A
2.95	3.1	5.0	-	0.1	-0.3	3.8	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	5.7	83	15	N/A	0.00	N/A	N/A
3.12	2.9	4.6	-	0.1	-0.1	4.8	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	4.9	91	15	N/A	0.00	N/A	N/A
3.28	3.3	5.2	-	0.2	-0.1	6.8	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	5.5	94	15	-	-	0.13	-
3.45	5.2	8.3	-	0.3	-0.2	5.9	3	silty CLAY to CLAY	115	1.5	3	6	-	-	0.4	8.7	77	15	-	-	0.13	-
3.61	9.1	14.6	-	0.4	-0.4	4.0	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	55	15	-	-	0.13	-
3.77	10.1	16.2	-	0.3	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	51	15	-	-	0.13	-
3.94	9.7	15.5	-	0.2	-2.4	2.6	4	clayy SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	47	15	-	-	0.13	-
4.10	8.6	13.8	-	0.3	-3.3	3.8	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	55	15	-	-	0.13	-
4.27	10.1	16.2	-	0.3	-3.2	3.4	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	50	15	-	-	0.13	-
4.43	10.8	17.3	-	0.5	-2.9	4.4	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	9.9	53	15	-	-	0.13	-
4.59	13.0	20.8	-	0.6	-2.8	4.7	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	50	15	-	-	0.13	-
4.76	13.2	21.2	-	0.7	-3.0	5.1	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	51	15	-	-	0.13	-
4.92	13.5	21.6	-	0.7	-2.8	5.0	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	51	15	-	-	0.13	-
5.09	13.6	21.8	-	0.6	-2.7	4.7	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	9.9	49	15	-	-	0.13	-
5.25	13.7	21.9	-	0.6	-2.6	4.6	3	silty CLAY to CLAY	115	1.5	9	15	-	-	0.9	9.9	49	15	-	-	0.13	-
5.41	13.6	21.7	-	0.6	-2.3	4.3	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	48	15	-	-	0.13	-
5.58	13.2	21.2	-	0.6	-2.1	4.5	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	49	15	-	-	0.13	-
5.74	13.5	21.6	-	0.6	-2.0	4.5	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	49	15	-	-	0.13	-
5.91	14.9	24.0	-	0.6	-1.8	4.3	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	46	15	-	-	0.13	-
6.07	15.1	24.3	-	0.7	-1.9	4.4	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	46	15	-	-	0.13	-
6.23	14.6	23.5	-	0.6	-1.8	4.5	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	47	15	-	-	0.13	-
6.40	15.2	24.3	-	0.6	-1.6	4.4	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	46	15	-	-	0.13	-
6.56	18.6	29.8	-	0.7	-1.5	3.8	4	clayy SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	40	15	-	-	0.13	-
6.73	20.9	33.5	-	0.8	-1.5	3.7	4	clayy SILT to silty CLAY	115	2.0	10	17	-	-	1.5	9.9	38	15	-	-	0.13	-
6.89	19.4	31.1	-	0.8	-1.5	4.2	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	41	15	-	-	0.13	-
7.05	18.9	30.3	-	0.7	-1.4	3.9	4	clayy SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	40	15	-	-	0.13	-
7.22	18.3	29.3	-	0.8	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	42	15	-	-	0.13	-
7.38	20.4	32.7	-	1.1	-1.3	5.3	3	silty CLAY to CLAY	115	1.5	14	22	-	-	1.4	9.9	44	15	-	-	0.13	-
7.55	27.2	43.6	-	1.5	-0.9	5.6	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	40	15	-	-	0.13	-
7.71	28.0	44.9	-	1.7	-2.3	6.1	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	41	15	-	-	0.13	-
7.87	37.1	53.6	168.7	1.7	-3.4	4.6	4	clayy SILT to silty CLAY	115	2.0	19	27	-	-	2.6	9.9	34	15	0.00	-	0.13	0.0
8.04	44.2	63.1	159.2	1.6	-6.0	3.7	4	clayy SILT to silty CLAY	115	2.0	22	32	-	-	3.1	9.9	28	15	0.30	-	0.13	1.4
8.20	44.0	62.2	150.8	1.5	-8.2	3.4	4	clayy SILT to silty CLAY	115	2.0	22	31	-	-	3.1	9.9	28	15	0.53	-	0.13	3.3
8.37	44.1	61.8	138.9	1.3	-8.6	2.9	5	silty SAND to sandy SILT	120	4.0	11	15	51	42	-	-	26	16	1.11	-	0.13	11.3
8.53	42.0	58.2	126.9	1.1	-6.6	2.6	5	silty SAND to sandy SILT	120	4.0	10	15	49	42	-	-	25	16	1.76	-	0.13	35.6
8.69	31.6	43.3	107.9	0.8	-6.5	2.4	5	silty SAND to sandy SILT	120	4.0	8	11	39	40	-	-	28	16	2.20	-	0.12	51.2
8.86	14.2	22.7	-	0.4	-4.9	2.8	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	41	15	-	-	0.12	-
9.02	9.2	14.7	-	0.3	-3.4	3.9	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	8.5	55	15	-	-	0.12	-
9.19	11.7	18.7	-	0.3	-2.7	2.7	4	clayy SILT to silty CLAY	115	2.0	6	9	-	-	0.8	9.9	44	15	-	-	0.12	-
9.35	13.7	21.9	-	0.4	-2.4	2.9	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	42	15	-	-	0.12	-
9.51	13.7	22.0	-	0.4	-2.0	2.9	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	42	15	-	-	0.12	-
9.68	14.6	23.4	-	0.4	-1.8	2.6	4	clayy SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	39	15	-	-	0.12	-
9.84	15.5	24.8	-	0.4	-1.7	2.7	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	38	15	-	-	0.12	-
10.01	15.1	24.2	-	0.4	-1.7	2.6	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.0	9.9	39	15	-	-	0.12	-
10.17	14.7	23.6	-	0.4	-1.6	2.9	4	clayy SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	41	15	-	-	0.12	-
10.34	16.5	26.5	-	0.6	-1.7	3.5	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	41	15	-	-	0.12	-
10.50	19.3	31.0	-	0.8	-1.6	4.3	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.3	9.9	42	15	-	-	0.12	-
10.66	25.0	40.1	-	1.1	-1.4	4.5	4	clayy SILT to silty CLAY	115	2.0	13	20	-	-	1.7	9.9	38	15	-	-	0.12	-
10.83	26.8	42.9	-	1.3	-1.1	4.9	4	clayy SILT to silty CLAY	115	2.0	13	21	-	-	1.9	9.9	38	15	-	-	0.12	-
10.99	20.7	32.7	-	1.1	-1.0	5.3	3	silty CLAY to CLAY	115	1.5	14	22	-	-	1.4	9.9	44	15	-	-	0.12	-
11.16	15.7	24.4	-	0.9	-1.3	5.7	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	51	15	-	-	0.12	-
11.32	18.4	28.2	-	0.8	-1.2	4.5	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	44	15	-	-	0.12	-
11.48	18.7	28.2	-	1.0	-1.1	5.4	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	47	15	-	-	0.12	-
11.65	20.4	30.4	-	1.0	-1.1	5.2	3	silty CLAY to CLAY	115	1.5	14	20	-	-	1.4	9.9	45	15	-	-	0.12	-
11.81	24.0	35.3	-	1.2	-1.0	5.3	3	silty CLAY to CLAY	115	1.5	16	24	-	-	1.7	9.9	43	15	-	-	0.12	-
11.98	26.7	38.7	-	1.7	-1.0	6.5	3	silty CLAY to CLAY	115	1.5	18	26	-	-	1.9	9.9	45	15	-	-	0.12	-
12.14	31.9	45.6	-	2.1	-1.1	6.7	3	silty CLAY to CLAY	115	1.5	21	30	-	-	2.2	9.9	42	15	-	-	0.12	-
12.30	35.9	50.7	-	1.9	-1.3	5.4	3	silty CLAY to CLAY	115	1.5	24	34	-	-	2.5	9.9	37	15	-	-	0.12	-
12.47	32.8	37.6	124.5	1.1	-1.6	3.5	4	clayy SILT to silty CLAY	115	2.0	16	19	-	-	2.3	9.9	35	15	1.94	-	0.12	51.2
12.63	23.3	32.1	-	1.3	-1.6	5.7	3	silty CLAY to CLAY	115	1.5	16	21	-	-	1.6	9.9	46	15	-	-	0.12	-
12.80	27.8	37.7	-	1.8	-1.4	6.7	3	silty CLAY to CLAY	115	1.5	19	25	-	-	1.9	9.9	46	15	-	-	0.12	-
12.96	45.2	60.5	-	2.8	-1.3	6.4	3	silty CLAY to CLAY	115	1.5	30	40	-	-	3.2	9.9	37	15	-	-	0.12	-
13.12	59.8	71.5	231.9	3.7	-1.6	6.2	9	very stiff fine SOIL	120	2.0	30	36	56	42	-	-	35	30	0.00	-	0.12	0.0
13.29	80.5	89.4	199.9	3.3	-1.8	4.1	4	clayy SILT to silty CLAY	115	2.0	40	45	-	-	5.7	9.9	26	15	0.00	-	0.12	0.0
13.45	106.3	117.2	174.9	2.5	-4.8	2.3	5	silty SAND to sandy SILT	120	4.0	27	29	72	45	-	-	16	16	0.00	-	0.12	0.0
13.62	113.7	124.7	140.6	1.1	-6.7	1.0	6	clean SAND to silty SAND	125	5.0	23	25	74	45	-	-	9	16	1.28	-	0.12	6.0
13.78	91.5	99.7	111.1	0.6	-6.5	0.7	6	clean SAND to silty SAND	125	5.0	18	20	67	44	-	-	8	16	2.14	-	0.11	17.0
13.94	66.5	72.0	100.5	0.8	-5.1	1.2	5	silty SAND to sandy SILT	120	4.0	17	18	56	42	-	-	15	16	2.33	-	0.11	27.1
14.11	40.3	43.3	100.5	0.8	-3.1	2.1	5	silty SAND to sandy SILT	120	4.0	10	11	39	40	-	-	26	16	2.33	-	0.11	51.2
14.27	20.1	24.3	-	0.5	-6.1	2.6	4	clayy SILT to silty CLAY	115	2.0	10	12	-	-	1.4	9.9	38	15	-	-	0.10	-
14.44	9.6	11.5	-	0.3	-4.2	3.7	3	silty CLAY to CLAY	115	1.5	6	8	-	-	0.6	6.0	60	15	-	-	0.10	-
14.60	7.7	9.1	-	0.2	-3.7	3.1	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	4.6	64	15	-	-	0.10	-
14.76	7.0	8.2	-	0.2	-3.6	3.1	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	4.2	67	15	-	-	0.10	-
14.93	6.0	7.0	-	0.1	-3.5	2.7	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.4	70	15	-	-	0.10	-
15.09	6.3	7.2	-	0.1	-3.4	2.5	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.6	67	15	-	-	0.10	-
15.26	6.1	6.9	-	0.1	-3.3	2.7	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.4	70	15	-	-	0.10	-
15.42	6.4	7.2	-	0.2	-3.3	2.8	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.6	70	15	-	-	0.10	-

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

Middle Earth Geo Testing

Project ID: Geolabs Westlake Village
Data File: SDF(235).cpt
CPT Date: 4/30/2012 7:43:37 AM
GW During Test: 23 ft

Sounding ID: CPT-01
Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.13	* Cycl SStn %
15.58	6.5	7.2	-	0.2	-3.2	2.7	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.6	69	15	-	-	0.10	-
15.75	6.3	7.0	-	0.2	-3.1	2.8	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.5	71	15	-	-	0.10	-
15.91	6.7	7.3	-	0.1	-3.1	2.2	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.6	65	15	-	-	0.10	-
16.08	6.6	7.1	-	0.1	-3.0	2.3	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.6	67	15	-	-	0.10	-
16.24	7.8	8.3	-	0.1	-2.9	2.0	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	4.3	60	15	-	-	0.10	-
16.40	7.4	7.8	-	0.2	-2.9	2.5	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	4.0	65	15	-	-	0.10	-
16.57	8.7	9.1	-	0.2	-2.8	2.7	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.8	62	15	-	-	0.10	-
16.73	10.2	10.5	-	0.2	-2.7	2.6	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.6	57	15	-	-	0.10	-
16.90	10.3	10.5	-	0.3	-2.6	3.4	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.6	61	15	-	-	0.10	-
17.06	10.0	10.2	-	0.4	-2.6	4.0	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.4	66	15	-	-	0.10	-
17.23	10.6	10.6	-	0.4	-2.6	4.4	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.7	66	15	-	-	0.10	-
17.39	13.6	13.5	-	0.4	-2.6	3.2	3	silty CLAY to CLAY	115	1.5	9	9	-	-	0.9	7.4	54	15	-	-	0.10	-
17.55	10.4	10.2	-	0.3	-2.6	2.9	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.5	60	15	-	-	0.10	-
17.72	9.0	8.8	-	0.1	-2.5	1.7	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.6	56	15	-	-	0.10	-
17.88	7.3	7.0	-	0.1	-2.5	2.2	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	3.6	66	15	-	-	0.10	-
18.05	7.6	7.3	-	0.2	-2.5	2.9	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	3.7	70	15	-	-	0.10	-
18.21	8.8	8.4	-	0.2	-2.4	3.2	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.4	67	15	-	-	0.10	-
18.37	9.4	8.8	-	0.2	-2.4	3.0	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.7	64	15	-	-	0.10	-
18.54	8.2	7.7	-	0.3	-2.5	3.9	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	4.0	73	15	-	-	0.10	-
18.70	9.0	8.3	-	0.4	-2.5	4.6	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.4	74	15	-	-	0.10	-
18.87	8.6	7.9	-	0.4	-2.5	4.9	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.1	77	15	-	-	0.10	-
19.03	8.4	7.6	-	0.3	-2.5	4.7	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	4.0	77	15	-	-	0.10	-
19.19	9.4	8.5	-	0.4	-2.5	4.4	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.5	73	15	-	-	0.10	-
19.36	9.4	8.4	-	0.4	-2.5	4.8	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	4.4	75	15	-	-	0.10	-
19.52	9.1	8.1	-	0.4	-2.5	4.8	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.3	76	15	-	-	0.10	-
19.69	9.2	8.1	-	0.4	-2.5	5.2	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.3	77	15	-	-	0.10	-
19.85	10.8	9.4	-	0.4	-2.5	4.5	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	5.1	70	15	-	-	0.10	-
20.01	10.9	9.4	-	0.4	-2.5	4.5	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	5.1	70	15	-	-	0.10	-
20.18	10.4	8.9	-	0.5	-2.5	4.9	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.8	73	15	-	-	0.10	-
20.34	11.8	10.0	-	0.5	-2.4	4.6	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	5.5	69	15	-	-	0.10	-
20.51	14.9	12.6	-	0.6	-2.5	4.4	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	7.0	62	15	-	-	0.10	-
20.67	12.5	10.5	-	0.7	-2.5	6.1	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	5.8	73	15	-	-	0.10	-
20.83	12.8	10.7	-	0.6	-2.0	5.2	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.9	69	15	-	-	0.10	-
21.00	9.9	8.2	-	0.5	-1.9	5.7	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.4	79	15	-	-	0.10	-
21.16	9.5	7.7	-	0.4	-1.7	4.6	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.1	76	15	-	-	0.10	-
21.33	10.0	8.1	-	0.4	-1.6	4.3	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.4	74	15	-	-	0.10	-
21.49	10.3	8.3	-	0.4	-1.6	4.8	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.5	75	15	-	-	0.10	-
21.65	12.9	10.3	-	0.6	-1.5	5.2	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.7	70	15	-	-	0.10	-
21.82	17.6	14.0	-	0.9	-1.5	5.3	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	8.0	62	15	-	-	0.10	-
21.98	17.6	13.9	-	0.8	-1.7	4.8	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	7.9	60	15	-	-	0.10	-
22.15	14.5	11.4	-	0.3	-1.9	2.4	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.4	54	15	-	-	0.10	-
22.31	11.5	8.9	-	0.2	-1.8	2.2	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.9	59	15	-	-	0.10	-
22.47	9.1	7.1	-	0.5	-1.6	6.5	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.7	87	15	-	-	0.10	-
22.64	13.1	10.1	-	1.1	-1.4	8.9	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.6	83	15	-	-	0.10	-
22.80	63.4	53.7	105.9	1.2	-1.6	1.9	5	silty SAND to sandy SILT	120	4.0	16	13	46	40	-	-	23	16	2.23	-	0.10	40.2
22.97	102.4	86.4	127.3	1.7	-4.2	1.7	5	silty SAND to sandy SILT	120	4.0	26	22	62	42	-	-	16	16	1.92	-	0.10	20.9
23.13	121.9	102.7	135.9	1.8	-3.0	1.5	6	clean SAND to silty SAND	125	5.0	24	21	68	43	-	-	13	16	1.76	-	0.10	14.5
23.30	133.2	112.0	137.6	1.6	-6.7	1.2	6	clean SAND to silty SAND	125	5.0	27	22	71	44	-	-	11	16	1.70	-	0.09	11.3
23.46	127.3	106.8	132.2	1.5	-7.2	1.2	6	clean SAND to silty SAND	125	5.0	25	21	69	43	-	-	12	16	1.86	-	0.09	15.2
23.62	119.6	100.1	122.2	1.3	-7.3	1.1	6	clean SAND to silty SAND	125	5.0	24	20	67	43	-	-	11	16	1.98	-	0.09	16.9
23.79	111.8	93.5	115.8	1.2	-7.1	1.0	6	clean SAND to silty SAND	125	5.0	22	19	65	43	-	-	12	16	2.07	-	0.08	18.8
23.95	90.3	75.3	105.1	1.1	-1.8	1.2	5	silty SAND to sandy SILT	120	4.0	23	19	58	42	-	-	15	16	2.24	-	0.08	25.4
24.12	62.6	52.1	105.6	1.2	-1.6	2.0	5	silty SAND to sandy SILT	120	4.0	16	13	45	40	-	-	23	16	2.24	-	0.08	41.8
24.28	32.6	23.9	-	1.0	-1.3	3.3	4	clayy SILT to silty CLAY	115	2.0	16	12	-	-	2.3	9.9	42	15	-	-	0.07	-
24.44	17.1	12.5	-	0.8	-1.0	5.3	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.2	6.9	65	15	-	-	0.07	-
24.61	11.8	8.6	-	0.5	-0.5	4.7	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.5	74	15	-	-	0.07	-
24.77	10.7	7.8	-	0.3	-0.7	3.6	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.0	72	15	-	-	0.07	-
24.94	12.2	8.8	-	0.3	-1.0	2.9	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.7	64	15	-	-	0.07	-
25.10	11.8	8.5	-	0.4	-0.9	3.7	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.4	69	15	-	-	0.07	-
25.26	13.8	9.9	-	0.4	-0.8	3.3	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.3	63	15	-	-	0.07	-
25.43	14.1	10.1	-	0.5	-1.0	3.8	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.4	65	15	-	-	0.07	-
25.59	12.2	8.7	-	0.4	-1.1	4.1	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.5	71	15	-	-	0.07	-
25.76	11.1	7.9	-	0.4	-1.2	3.8	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.1	72	15	-	-	0.07	-
25.92	11.0	7.8	-	0.4	-1.2	4.0	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.0	74	15	-	-	0.07	-
26.08	11.8	8.4	-	0.4	-1.3	3.9	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.3	71	15	-	-	0.07	-
26.25	12.0	8.5	-	0.4	-1.3	4.1	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.3	72	15	-	-	0.07	-
26.41	12.3	8.7	-	0.5	-1.3	4.2	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.4	71	15	-	-	0.07	-
26.58	12.3	8.6	-	0.4	-1.4	4.2	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.4	71	15	-	-	0.07	-
26.74	12.0	8.4	-	0.4	-1.5	3.9	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.3	71	15	-	-	0.07	-
26.90	11.6	8.1	-	0.4	-1.5	3.8	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	4.1	72	15	-	-	0.07	-
27.07	11.1	7.7	-	0.4	-1.5	3.8	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.8	73	15	-	-	0.07	-
27.23	10.7	7.4	-	0.3	-1.6	3.8	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.6	75	15	-	-	0.07	-
27.40	10.4	7.2	-	0.4	-1.6	4.1	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.5	77	15	-	-	0.07	-
27.56	10.8	7.4	-	0.4	-1.5	4.0	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.6	75	15	-	-	0.07	-
27.72	11.1	7.6	-	0.4	-1.5	3.9	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.7	74	15	-	-	0.07	-
27.89	11.2	7.6	-	0.4	-1.5	4.0	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.7	75	15	-	-	0.07	-
28.05	10.8	7.4	-	0.4	-1.5	4.6	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.6	79	15	-	-	0.07	-
28.22	12.2	8.3	-	0.4	-1.4	4.1	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.1	72	15	-	-	0.07	-
28.38	12.5	8.5	-	0.5	-1.5	4.7	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.2	75	15	-	-	0.07	-
28.54	14.2	9.6	-	0.5	-1.4	4.2	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	4.8	69	15	-	-	0.07	-
28.71	15.5	10.5	-	0.7	-1.4	4.8	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	5.3	68	15	-	-	0.07	-
28.87	15.4	10.4	-	0.8	-1.4	5.6	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	5.2	72	15	-	-	0.07	-
29.04	16.7	11.2	-	0.8	-1.3	5.3	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.7	69	15	-	-	0.07	-
29.20	18.7	12.5	-	0.7	-1.3	4.2	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.3	6.4	61	15	-	-	0.07	-
29.36	16.4	10.9	-	0.7	-1.3	5.1	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.5	68	15	-	-	0.07	-
29.53	15.3	10.2	-	0.7	-1.2	5.1	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	5.1	71	15	-	-	0.07	-
29.69	17.0	11.3	-	0.7	-1.1	4.4	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	5.7	65	15	-	-	0.07	-
29.86	14.5	9.6	-	0.7	-1.1	5.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.7	73	15	-	-	0.07	-
30.02	16.5	10.9	-	0.8	-1.1	5.8	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.4	71	15	-	-	0.07	-
30.19	19.7	13.0	-	1.1	-1.1	6.0	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	6.6	67	15	-	-	0.07	-
30.35	33.1	26.1	73.0	0.5	-1.1	1.5	5	silty SAND to sandy SILT	120	4.0	8	7	23	35	-	-	31	16	3.02	-	0.07	51.2
30.51	42.9	33.7	88.9	0.8	-2.4	1.9	5	silty SAND to sandy SILT	120	4.0	11	8	31	36	-	-	30	16	2.57	-	0.07	51.2
30.68	24.0	15.7	-	1.0	-2.6	4.5	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	8.0	57	15	-	-	0.06	-
30.84	17.4	11.3	-	0.9	-1.4	5.6	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	5.6	69	15	-	-	0.06	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(235).cpt
CPT Date: 4/30/2012 7:43:37 AM
GW During Test: 23 ft

Sounding ID: CPT-01
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.13	* Cycl SStn %
31.01	15.3	9.9	-	1.1	-1.1	8.2	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	4.8	82	15	-	-	0.06	-
31.17	30.0	19.4	-	1.1	-1.0	4.0	3	silty CLAY to CLAY	115	1.5	20	13	-	-	2.1	9.9	50	15	-	-	0.06	-
31.33	47.3	36.8	104.1	1.1	-2.6	2.5	4	clayy SILT to silty CLAY	115	2.0	24	18	-	-	3.3	9.9	31	15	2.26	-	0.06	51.2
31.50	39.4	25.4	-	0.9	-4.4	2.4	4	clayy SILT to silty CLAY	115	2.0	20	13	-	-	2.7	9.9	37	15	-	-	0.06	-
31.66	27.7	17.7	-	0.9	-5.2	3.5	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	9.1	49	15	-	-	0.06	-
31.83	19.5	12.5	-	0.8	-5.1	4.8	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	6.2	64	15	-	-	0.06	-
31.99	15.8	10.1	-	0.5	-4.7	3.9	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.0	4.8	66	15	-	-	0.06	-
32.15	12.9	8.2	-	0.5	-4.3	4.9	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	3.8	77	15	-	-	0.06	-
32.32	13.6	8.6	-	0.6	-3.9	5.0	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	4.0	75	15	-	-	0.06	-
32.48	16.5	10.4	-	0.5	-3.6	3.2	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.0	61	15	-	-	0.06	-
32.65	14.4	9.1	-	0.5	-3.3	4.2	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	4.3	70	15	-	-	0.06	-
32.81	12.5	7.9	-	0.6	-3.1	5.6	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.6	81	15	-	-	0.06	-
32.97	18.3	11.5	-	0.8	-2.7	5.0	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	5.6	67	15	-	-	0.06	-
33.14	22.8	14.3	-	1.3	-2.7	6.1	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	7.0	65	15	-	-	0.06	-
33.30	28.2	17.6	-	1.8	-2.6	6.7	3	silty CLAY to CLAY	115	1.5	19	12	-	-	1.9	8.8	62	15	-	-	0.06	-
33.47	33.3	20.7	-	1.2	-2.8	3.9	3	silty CLAY to CLAY	115	1.5	22	14	-	-	2.3	9.9	48	15	-	-	0.06	-
33.63	43.8	33.5	85.2	0.7	-3.5	1.8	5	silty SAND to sandy SILT	120	4.0	11	8	31	36	-	-	29	16	2.67	-	0.06	51.2
33.79	41.2	25.5	-	1.2	-4.3	3.0	4	clayy SILT to silty CLAY	115	2.0	21	13	-	-	2.8	9.9	40	15	-	-	0.06	-
33.96	25.5	15.8	-	1.0	-4.9	4.1	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	7.8	55	15	-	-	0.06	-
34.12	16.3	10.0	-	0.7	-2.4	4.8	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	4.7	70	15	-	-	0.06	-
34.29	13.0	8.0	-	0.5	-2.2	4.3	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	3.6	75	15	-	-	0.06	-
34.45	11.9	7.3	-	0.4	-1.9	4.0	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.2	77	15	-	-	0.06	-
34.61	12.0	7.3	-	0.4	-1.8	3.7	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.2	75	15	-	-	0.06	-
34.78	12.7	7.7	-	0.4	-1.7	3.4	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.4	72	15	-	-	0.06	-
34.94	13.3	8.1	-	0.4	-1.6	3.1	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	3.6	69	15	-	-	0.06	-
35.11	15.0	9.1	-	0.5	-1.5	4.0	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.2	69	15	-	-	0.06	-
35.27	19.4	11.7	-	0.9	-1.5	5.3	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	5.5	67	15	-	-	0.06	-
35.43	24.9	15.0	-	1.2	-1.4	5.3	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	7.3	61	15	-	-	0.06	-
35.60	30.1	18.1	-	1.3	-1.3	4.7	3	silty CLAY to CLAY	115	1.5	20	12	-	-	2.1	8.9	54	15	-	-	0.06	-
35.76	26.2	15.7	-	1.5	-1.4	6.4	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.8	7.6	63	15	-	-	0.06	-
35.93	31.1	18.6	-	1.7	-1.3	5.9	3	silty CLAY to CLAY	115	1.5	21	12	-	-	2.1	9.1	58	15	-	-	0.06	-
36.09	35.1	20.9	-	1.6	-1.7	4.9	3	silty CLAY to CLAY	115	1.5	23	14	-	-	2.4	9.9	52	15	-	-	0.06	-
36.26	31.8	18.9	-	1.5	-2.2	5.0	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.2	54	15	-	-	0.06	-
36.42	24.4	14.5	-	1.3	-2.3	5.8	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	6.9	63	15	-	-	0.06	-
36.58	21.0	12.4	-	0.9	-2.1	4.6	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	5.8	63	15	-	-	0.06	-
36.75	17.3	10.2	-	0.7	-1.8	4.8	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.1	4.7	69	15	-	-	0.06	-
36.91	15.4	9.1	-	0.7	-1.6	5.0	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.1	74	15	-	-	0.06	-
37.08	15.2	8.9	-	0.6	-1.4	4.6	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.0	73	15	-	-	0.06	-
37.24	14.7	8.6	-	0.6	-1.3	4.5	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	3.8	74	15	-	-	0.06	-
37.40	12.4	7.3	-	0.5	-1.1	4.8	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.1	81	15	-	-	0.06	-
37.57	12.3	7.1	-	0.4	-1.1	4.2	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.0	78	15	-	-	0.06	-
37.73	12.1	7.0	-	0.4	-1.1	4.2	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.0	79	15	-	-	0.06	-
37.90	12.0	7.0	-	0.4	-1.1	4.1	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	2.9	79	15	-	-	0.06	-
38.06	13.0	7.5	-	0.5	-1.0	4.6	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.8	3.2	79	15	-	-	0.06	-
38.22	16.5	9.5	-	0.6	-1.0	4.1	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.2	69	15	-	-	0.06	-
38.39	20.2	11.6	-	0.7	-1.0	3.6	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.4	5.3	61	15	-	-	0.06	-
38.55	19.3	11.1	-	0.7	-1.1	3.9	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	5.0	64	15	-	-	0.06	-
38.72	20.8	11.9	-	0.8	-1.0	4.1	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	5.4	62	15	-	-	0.06	-
38.88	21.7	12.4	-	0.9	-1.0	4.7	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.5	5.7	63	15	-	-	0.06	-
39.04	22.7	12.9	-	1.0	-1.0	5.0	3	silty CLAY to CLAY	115	1.5	15	9	-	-	1.5	5.9	64	15	-	-	0.06	-
39.21	21.9	12.5	-	0.9	-1.0	4.8	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.7	64	15	-	-	0.06	-
39.37	19.1	10.8	-	0.7	-1.0	4.0	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.9	64	15	-	-	0.06	-
39.54	15.6	8.9	-	0.6	-0.9	4.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	3.8	71	15	-	-	0.06	-
39.70	15.3	8.6	-	0.5	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	3.7	72	15	-	-	0.06	-
39.86	17.1	9.6	-	0.6	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.2	69	15	-	-	0.06	-
40.03	19.8	11.1	-	0.6	-0.8	3.4	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	5.0	61	15	-	-	0.06	-
40.19	21.7	12.1	-	1.2	-0.7	6.0	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	5.5	69	15	-	-	0.06	-
40.36	22.5	12.6	-	0.9	-0.1	4.7	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.7	63	15	-	-	0.06	-
40.52	23.9	13.3	-	0.5	-0.5	2.4	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	6.1	51	15	-	-	0.06	-
40.68	19.4	10.8	-	0.9	-0.5	5.5	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.8	71	15	-	-	0.06	-
40.85	22.3	12.4	-	1.3	-0.2	6.6	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.6	71	15	-	-	0.06	-
41.01	34.5	19.1	-	1.4	-0.4	4.4	3	silty CLAY to CLAY	115	1.5	23	13	-	-	2.4	8.9	52	15	-	-	0.06	-
41.18	31.2	17.2	-	2.0	-0.8	7.0	3	silty CLAY to CLAY	115	1.5	21	11	-	-	2.1	8.0	63	15	-	-	0.06	-
41.34	43.5	24.0	-	2.5	-0.8	6.1	3	silty CLAY to CLAY	115	1.5	29	16	-	-	3.0	9.9	53	15	-	-	0.06	-
41.50	75.0	54.0	151.2	2.7	-2.0	3.7	4	clayy SILT to silty CLAY	115	2.0	38	27	-	-	5.2	9.9	31	15	1.07	-	0.06	27.4
41.67	92.8	66.7	131.4	2.2	-4.9	2.4	5	silty SAND to sandy SILT	120	4.0	23	17	54	39	-	-	23	16	1.87	-	0.05	30.0
41.83	95.7	68.7	121.6	1.9	-6.4	2.0	5	silty SAND to sandy SILT	120	4.0	24	17	55	39	-	-	20	16	1.99	-	0.05	28.8
42.00	92.8	66.6	143.1	2.6	-7.1	2.9	5	silty SAND to sandy SILT	120	4.0	23	17	54	39	-	-	25	16	1.47	-	0.05	28.0
42.16	84.8	60.8	167.5	3.4	-7.6	4.1	4	clayy SILT to silty CLAY	115	2.0	42	30	-	-	5.9	9.9	31	15	0.00	-	0.05	0.0
42.32	87.8	62.8	170.7	3.5	-8.0	4.1	4	clayy SILT to silty CLAY	115	2.0	44	31	-	-	6.1	9.9	30	15	0.00	-	0.05	0.0
42.49	106.7	76.2	123.7	1.9	-8.1	1.8	5	silty SAND to sandy SILT	120	4.0	27	19	58	40	-	-	18	16	1.96	-	0.05	24.9
42.65	113.7	81.2	111.9	1.4	-8.4	1.3	5	silty SAND to sandy SILT	120	4.0	28	20	60	40	-	-	14	16	2.13	-	0.04	22.6
42.82	98.3	70.1	126.4	2.0	-8.5	2.1	5	silty SAND to sandy SILT	120	4.0	25	18	55	39	-	-	21	16	1.93	-	0.04	28.1
42.98	62.6	33.6	-	2.2	-8.5	3.7	4	clayy SILT to silty CLAY	115	2.0	31	17	-	-	4.3	9.9	38	15	-	-	0.04	-
43.15	41.3	22.2	-	2.5	-8.3	6.4	3	silty CLAY to CLAY	115	1.5	28	15	-	-	2.8	9.9	56	15	-	-	0.04	-
43.31	46.7	25.0	-	2.4	-7.9	5.5	3	silty CLAY to CLAY	115	1.5	31	17	-	-	3.2	9.9	50	15	-	-	0.04	-
43.47	51.1	27.3	-	1.8	-7.6	3.8	4	clayy SILT to silty CLAY	115	2.0	26	14	-	-	3.5	9.9	42	15	-	-	0.04	-
43.64	59.6	42.2	116.1	1.6	-7.5	2.8	4	clayy SILT to silty CLAY	115	2.0	30	21	-	-	4.1	9.9	31	15	2.07	-	0.04	51.2
43.80	59.0	31.3	-	1.8	-5.6	3.2	4	clayy SILT to silty CLAY	115	2.0	30	16	-	-	4.1	9.9	37	15	-	-	0.03	-
43.97	44.5	23.6	-	1.2	-5.7	2.8	4	clayy SILT to silty CLAY	115	2.0	22	12	-	-	3.1	9.9	40	15	-	-	0.03	-
44.13	34.6	18.3	-	1.2	-5.6	3.8	3	silty CLAY to CLAY	115	1.5	23	12	-	-	2.4	8.3	51	15	-	-	0.03	-
44.29	25.2	13.3	-	1.5	-5.3	6.5	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	5.9	68	15	-	-	0.03	-
44.46	29.4	15.5	-	1.0	-4.9	3.9	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	6.9	55	15	-	-	0.03	-
44.62	23.7	12.5	-	1.1	-4.8	5.4	3	silty CLAY to CLAY	115	1.5	16	8	-	-	1.6	5.4	67	15	-	-	0.03	-
44.79	22.7	11.9	-	1.3	-4.4	6.6	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.2	72	15	-	-	0.03	-
44.95	27.0	14.1	-	0.5	-4.3	2.2	4	clayy SILT to silty CLAY	115	2.0	13	7	-	-	1.8	6.2	48	15	-	-	0.03	-
45.11	26.4	13.8	-	1.0	-4.2	4.0	3	silty CLAY to CLAY	115	1.5	18	9	-	-	1.8	6.0	58	15	-	-	0.03	-
45.28	21.0	10.9	-	1.6	-4.0	8.8	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	4.7	81	15	-	-	0.03	-
45.44	118.7	83.1	132.2	2.2	-4.2	1.9	5	silty SAND to sandy SILT	120	4.0	30	21	61	40	-	-	18	16	1.86	-	0.03	22.0
45.61	193.3	135.1	155.0	2.2	-6.4	1.1	6	clean SAND to silty SAND	125	5.0	39	27	77	43	-	-	9	16	1.05	-	0.03	5.3
45.77	226.8	158.4	168.4	2.0	-7.6	0.9	6	clean SAND to silty SAND	125	5.0	45	32	82	43	-	-	7	16	0.00	-	0.03	0.0
45.93	231.3	161.2	164.1	1.7	-8.7	0.7	6	clean SAND to silty SAND	125	5.0	46	32	83	43	-	-	6	16	0.00	-	0.03	0.0
46.10	218.0	151.8	155.1	1.5	-9.1	0.7	6	clean SAND to silty SAND	125	5.0	44	30	81	43	-	-	6	16	1.07	-	0.03	5.1
46.26	209.7	145.8	149.7	1.4	-9.6	0.7	6	clean SAND to silty SAND	125	5.0	42	29	79	43	-	-	6	16	1.29	-	0.03	6.2

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

Project ID: Geolabs Westlake Village
Data File: SDF(235).cpt
CPT Date: 4/30/2012 7:43:37 AM
GW During Test: 23 ft

Sounding ID: CPT-01
Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.13	* Cycl SStn %
46.43	213.7	148.4	156.5	1.7	-10.6	0.8	6	clean SAND to silty SAND	125	5.0	43	30	80	43	-	-	7	16	1.00	-	0.02	4.9
46.59	222.4	154.2	168.7	2.3	-11.4	1.0	6	clean SAND to silty SAND	125	5.0	44	31	81	43	-	-	8	16	0.00	-	0.02	0.0
46.75	217.6	150.7	164.9	2.2	-11.0	1.0	6	clean SAND to silty SAND	125	5.0	44	30	81	43	-	-	8	16	0.00	-	0.02	0.0
46.92	202.5	140.1	152.6	1.8	-11.0	0.9	6	clean SAND to silty SAND	125	5.0	40	28	78	43	-	-	8	16	1.15	-	0.02	5.6
47.08	187.4	129.5	141.9	1.6	-5.8	0.9	6	clean SAND to silty SAND	125	5.0	37	26	76	42	-	-	8	16	1.60	-	0.02	9.0
47.25	179.0	123.5	131.1	1.2	-7.8	0.7	6	clean SAND to silty SAND	125	5.0	36	25	74	42	-	-	7	16	1.87	-	0.02	12.7
47.41	178.2	122.8	133.0	1.3	-8.9	0.7	6	clean SAND to silty SAND	125	5.0	36	25	74	42	-	-	7	16	1.85	-	0.01	12.9
47.57	196.7	135.3	144.5	1.5	-10.1	0.8	6	clean SAND to silty SAND	125	5.0	39	27	77	42	-	-	7	16	1.49	-	0.01	7.8
47.74	185.3	127.3	157.1	2.6	-11.0	1.4	6	clean SAND to silty SAND	125	5.0	37	25	75	42	-	-	12	16	0.94	-	0.01	4.9
47.90	174.7	119.9	138.6	1.8	-11.0	1.0	6	clean SAND to silty SAND	125	5.0	35	24	73	42	-	-	10	16	1.71	-	0.01	10.9
48.07	174.0	119.3	142.3	2.0	-10.5	1.2	6	clean SAND to silty SAND	125	5.0	35	24	73	42	-	-	10	16	1.56	-	0.00	9.3
48.23	218.6	149.7	152.1	1.4	-10.5	0.7	6	clean SAND to silty SAND	125	5.0	44	30	80	43	-	-	6	16	1.18	-	0.00	5.5
48.39	247.5	169.3	169.3	0.9	-7.2	0.4	6	clean SAND to silty SAND	125	5.0	50	34	84	43	-	-	5	16	0.00	-	0.00	0.0
48.56	271.4	185.3	188.1	2.3	-6.5	0.9	6	clean SAND to silty SAND	125	5.0	54	37	87	44	-	-	6	16	0.00	-	0.00	0.0
48.72	286.8	195.6	195.0	2.3	-6.8	0.8	6	clean SAND to silty SAND	125	5.0	57	39	89	44	-	-	5	16	0.00	-	0.00	0.0
48.89	289.4	197.2	197.2	1.9	-5.0	0.7	6	clean SAND to silty SAND	125	5.0	58	39	89	44	-	-	5	16	0.00	-	0.00	0.0
49.05	290.2	197.5	197.5	1.9	-6.4	0.7	6	clean SAND to silty SAND	125	5.0	58	39	89	44	-	-	5	16	0.00	-	0.00	0.0
49.22	259.9	176.6	176.6	1.3	-6.1	0.5	6	clean SAND to silty SAND	125	5.0	52	35	86	44	-	-	5	16	0.00	-	0.00	0.0
49.38	263.1	178.6	185.3	2.4	-7.3	0.9	6	clean SAND to silty SAND	125	5.0	53	36	86	44	-	-	6	16	0.00	-	0.00	0.0
49.54	247.0	167.4	177.7	2.3	-8.2	1.0	6	clean SAND to silty SAND	125	5.0	49	33	84	43	-	-	7	16	0.00	-	0.00	0.0
49.71	275.9	186.7	191.1	2.4	-7.9	0.9	6	clean SAND to silty SAND	125	5.0	55	37	88	44	-	-	6	16	0.00	-	0.00	0.0
49.87	279.4	188.9	188.9	1.7	-7.5	0.6	6	clean SAND to silty SAND	125	5.0	56	38	88	44	-	-	5	16	0.00	-	0.00	0.0

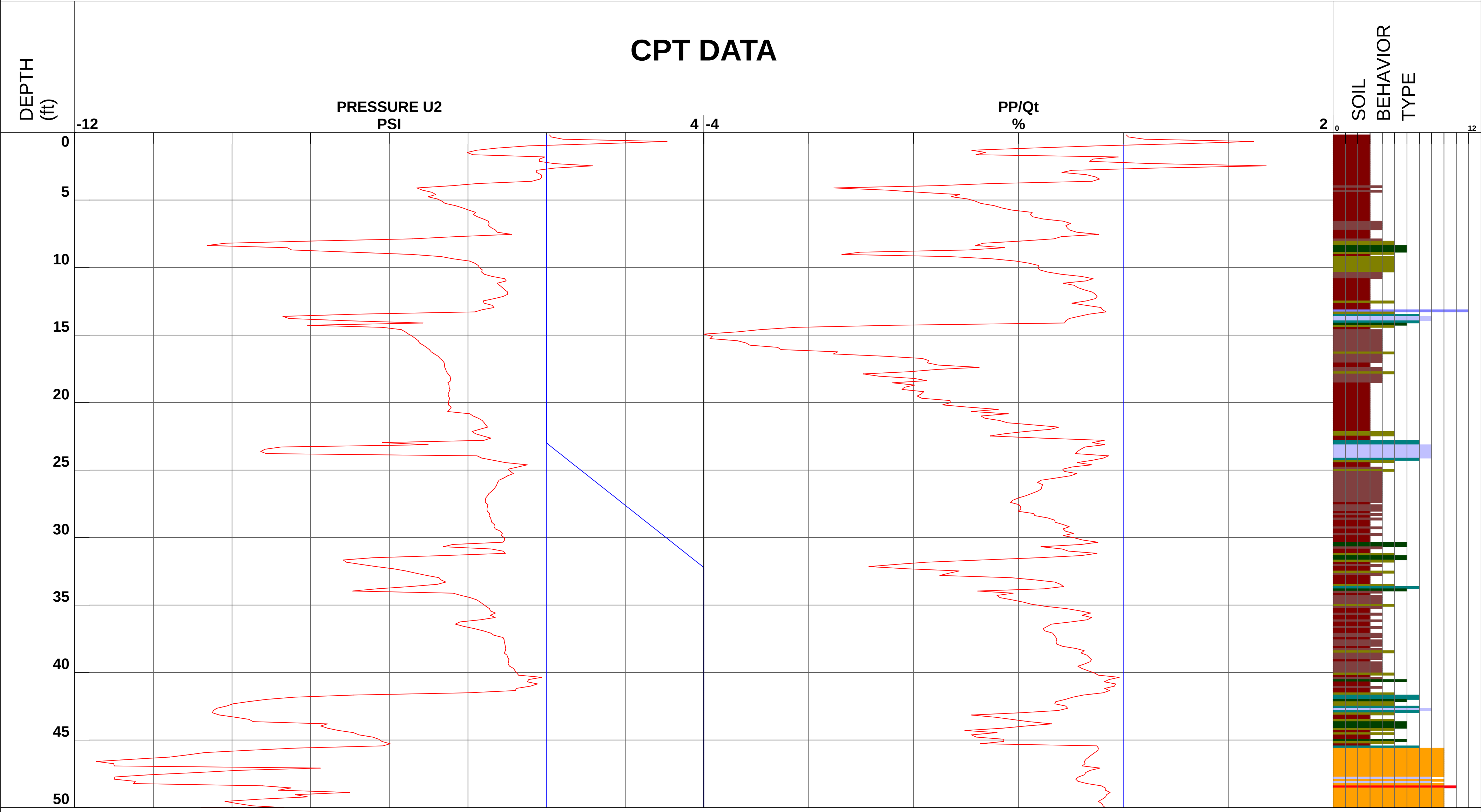
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(235).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-01	Date and Time	4/30/2012 7:43:37 AM	Maximum Depth	50.20 ft
Water Table Depth			23.00 ft		

Net Area Ratio .8



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

Cone Size 10cm squared

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

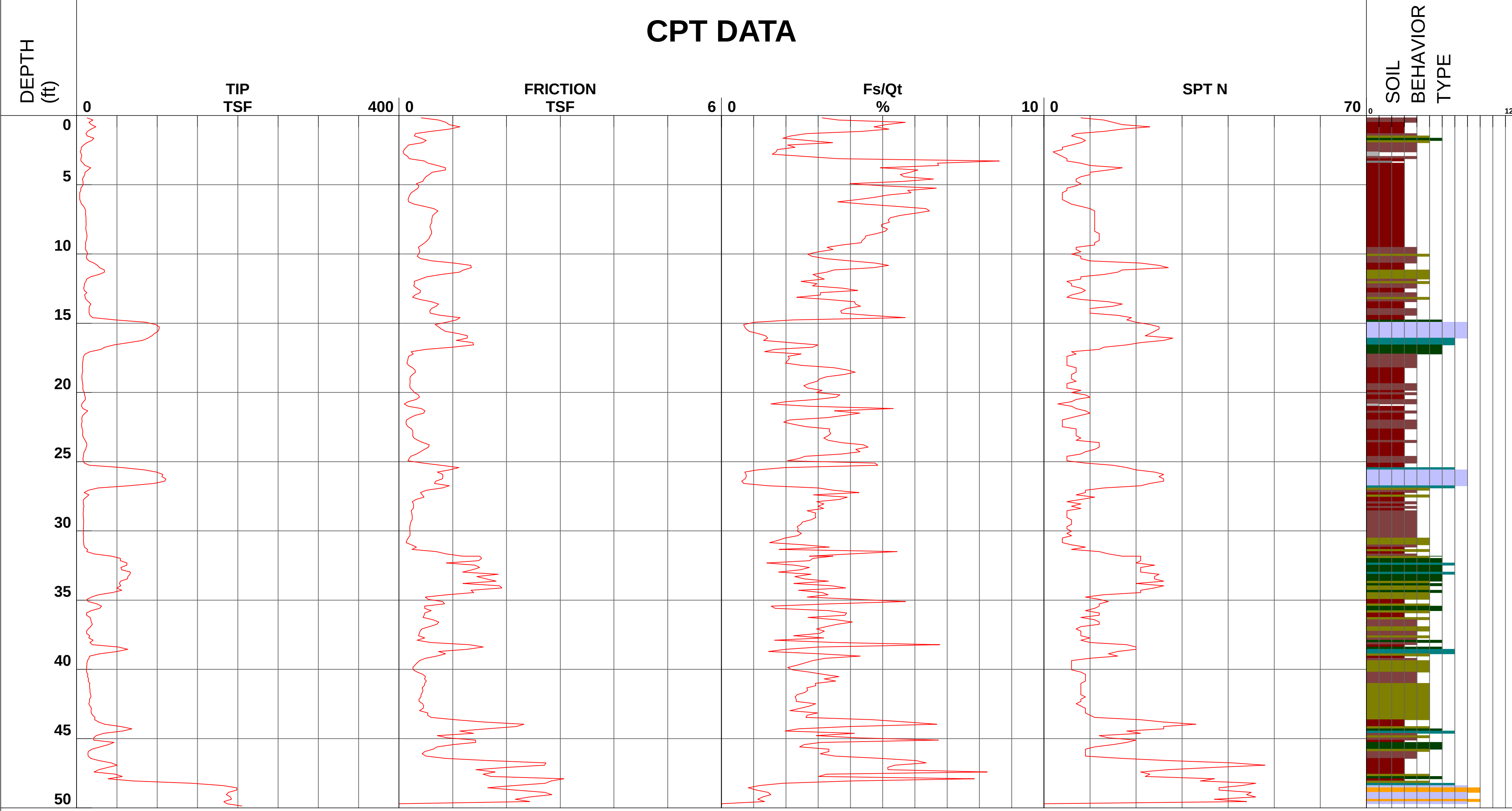
Geolabs Westlake Village

Middle Earth Geo Testing Inc.

Project	SMC Library	Operator	RA/JC	Filename	SDF(236).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-02	Date and Time	4/30/2012 8:57:54 AM	Maximum Depth	49.87 ft
Water Table Depth	8.00 ft				

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

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

Project ID: Geolabs Westlake Village
Data File: SDF(236).cpt
CPT Date: 4/30/2012 8:57:54 AM
GW During Test: 8 ft

Sounding ID: CPT-02
Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
0.33	20.3	32.6	-	0.7	0.0	3.6	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	38	15	N/A	0.00	N/A	N/A
0.49	15.3	24.6	-	0.9	0.1	5.7	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	50	15	N/A	0.00	N/A	N/A
0.66	18.3	29.3	-	0.9	0.2	5.1	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	45	15	N/A	0.00	N/A	N/A
0.82	23.9	38.4	-	1.1	0.3	4.7	4	clayy SILT to silty CLAY	115	2.0	12	19	-	-	1.7	9.9	39	15	N/A	0.00	N/A	N/A
0.98	18.1	29.0	-	0.9	-0.2	5.2	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.3	9.9	45	15	N/A	0.00	N/A	N/A
1.15	13.6	21.8	-	0.6	-0.1	4.4	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	48	15	N/A	0.00	N/A	N/A
1.31	11.5	18.5	-	0.3	0.0	2.7	4	clayy SILT to silty CLAY	115	2.0	6	9	-	-	0.8	9.9	43	15	N/A	0.00	N/A	N/A
1.48	13.2	21.2	-	0.3	0.0	2.2	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	38	15	N/A	0.00	N/A	N/A
1.64	21.5	34.5	87.0	0.4	0.0	1.9	5	silty SAND to sandy SILT	120	4.0	5	9	32	45	-	-	28	16	N/A	0.00	N/A	N/A
1.80	18.9	30.2	98.2	0.5	0.0	2.7	4	clayy SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	35	15	N/A	0.00	N/A	N/A
1.97	12.7	20.3	-	0.4	0.1	3.5	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	46	15	N/A	0.00	N/A	N/A
2.13	8.7	13.9	-	0.2	0.1	2.1	4	clayy SILT to silty CLAY	115	2.0	4	7	-	-	0.6	9.9	46	15	N/A	0.00	N/A	N/A
2.30	6.0	9.7	-	0.1	0.1	2.3	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	56	15	N/A	0.00	N/A	N/A
2.46	5.6	9.0	-	0.1	0.1	1.8	4	clayy SILT to silty CLAY	115	2.0	3	5	-	-	0.4	9.9	53	15	N/A	0.00	N/A	N/A
2.62	4.4	7.1	-	0.1	0.1	1.8	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.3	60	15	N/A	0.00	N/A	N/A
2.79	6.2	9.9	-	0.1	0.2	1.6	4	clayy SILT to silty CLAY	115	2.0	3	5	-	-	0.4	9.9	50	15	N/A	0.00	N/A	N/A
2.95	6.3	10.0	-	0.2	0.3	2.6	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.4	9.9	57	15	N/A	0.00	N/A	N/A
3.12	5.3	8.5	-	0.2	0.3	3.7	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.4	67	15	N/A	0.00	N/A	N/A
3.28	5.5	8.7	-	0.5	0.2	8.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.4	85	15	-	-	0.17	-
3.45	8.1	12.9	-	0.5	0.2	6.9	3	silty CLAY to CLAY	115	1.5	5	9	-	-	0.6	9.9	68	15	-	-	0.17	-
3.61	10.6	17.0	-	0.7	0.4	6.9	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	62	15	-	-	0.17	-
3.77	17.6	28.2	-	0.9	0.6	5.0	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	45	15	-	-	0.17	-
3.94	14.2	22.8	-	0.9	0.4	6.2	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	53	15	-	-	0.17	-
4.10	10.6	17.0	-	0.6	0.4	6.0	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	-	-	0.17	-
4.27	10.1	16.2	-	0.6	0.4	5.7	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	-	-	0.17	-
4.43	8.8	14.1	-	0.5	-0.2	5.8	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	63	15	-	-	0.17	-
4.59	7.1	11.4	-	0.5	0.0	6.8	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	72	15	-	-	0.17	-
4.76	7.8	12.5	-	0.4	0.1	5.9	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	66	15	-	-	0.17	-
4.92	8.1	13.0	-	0.3	0.2	4.1	3	silty CLAY to CLAY	115	1.5	5	9	-	-	0.6	9.9	58	15	-	-	0.17	-
5.09	7.4	11.8	-	0.4	0.2	5.2	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	65	15	-	-	0.17	-
5.25	5.3	8.5	-	0.4	0.7	7.1	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	7.0	81	15	-	-	0.17	-
5.41	5.1	8.1	-	0.3	0.6	6.2	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	6.5	79	15	-	-	0.17	-
5.58	3.9	6.3	-	0.2	0.6	6.4	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.8	88	15	-	-	0.17	-
5.74	3.9	6.2	-	0.2	0.7	5.6	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.7	86	15	-	-	0.17	-
5.91	3.8	6.2	-	0.2	0.7	5.2	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.6	84	15	-	-	0.17	-
6.07	4.0	6.4	-	0.2	0.8	4.6	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.7	81	15	-	-	0.17	-
6.23	5.0	8.1	-	0.2	0.8	3.9	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	5.9	70	15	-	-	0.17	-
6.40	6.3	10.2	-	0.3	0.7	4.7	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.4	7.4	67	15	-	-	0.17	-
6.56	8.6	13.8	-	0.5	0.6	5.7	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.9	63	15	-	-	0.17	-
6.73	10.2	16.4	-	0.6	0.6	6.6	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	62	15	-	-	0.17	-
6.89	11.3	18.1	-	0.7	0.6	6.7	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	60	15	-	-	0.17	-
7.05	11.2	18.0	-	0.7	0.6	6.3	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	59	15	-	-	0.17	-
7.22	11.3	18.1	-	0.6	0.6	5.8	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	57	15	-	-	0.17	-
7.38	11.7	18.8	-	0.6	0.6	5.4	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	55	15	-	-	0.17	-
7.55	11.8	18.9	-	0.6	0.6	5.4	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	55	15	-	-	0.17	-
7.71	11.8	18.9	-	0.6	0.6	5.4	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	55	15	-	-	0.17	-
7.87	11.9	19.0	-	0.6	0.6	5.2	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	54	15	-	-	0.17	-
8.04	11.6	18.6	-	0.6	0.6	5.2	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	55	15	-	-	0.17	-
8.20	11.5	18.4	-	0.6	0.6	5.4	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	56	15	-	-	0.17	-
8.37	12.0	19.2	-	0.6	0.6	5.3	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	54	15	-	-	0.17	-
8.53	12.7	20.3	-	0.6	0.6	5.0	3	silty CLAY to CLAY	115	1.5	8	14	-	-	0.9	9.9	52	15	-	-	0.17	-
8.69	12.9	20.8	-	0.6	0.6	4.7	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	51	15	-	-	0.17	-
8.86	12.6	20.2	-	0.6	0.6	4.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	51	15	-	-	0.17	-
9.02	12.1	19.3	-	0.5	0.6	4.6	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	52	15	-	-	0.17	-
9.19	11.1	17.8	-	0.5	0.6	4.5	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	53	15	-	-	0.17	-
9.35	11.2	18.0	-	0.4	0.6	3.9	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	51	15	-	-	0.17	-
9.51	11.0	17.6	-	0.4	0.6	3.4	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	9.9	49	15	-	-	0.17	-
9.68	10.9	17.5	-	0.4	0.6	3.6	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	9.7	50	15	-	-	0.17	-
9.84	12.9	20.7	-	0.4	0.6	3.1	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	44	15	-	-	0.17	-
10.01	13.5	21.7	-	0.4	0.7	2.8	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	42	15	-	-	0.17	-
10.17	12.2	19.5	-	0.3	0.7	2.9	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.8	9.9	45	15	-	-	0.17	-
10.34	12.4	19.9	-	0.4	0.6	3.4	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	46	15	-	-	0.17	-
10.50	15.5	24.8	-	0.6	0.6	4.2	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	45	15	-	-	0.17	-
10.66	21.6	34.6	-	1.0	0.7	4.9	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	42	15	-	-	0.17	-
10.83	25.8	41.4	-	1.3	0.6	5.3	3	silty CLAY to CLAY	115	1.5	17	28	-	-	1.8	9.9	40	15	-	-	0.17	-
10.99	28.5	45.8	-	1.3	-0.7	4.8	4	clayy SILT to silty CLAY	115	2.0	14	23	-	-	2.0	9.9	37	15	-	-	0.17	-
11.16	34.5	45.6	135.5	1.2	-1.9	3.6	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	32	15	1.45	-	0.17	48.5
11.32	34.4	45.3	130.4	1.1	-3.7	3.3	4	clayy SILT to silty CLAY	115	2.0	17	23	-	-	2.4	9.9	32	15	1.71	-	0.17	49.7
11.48	27.8	36.4	111.1	0.8	-3.8	2.9	4	clayy SILT to silty CLAY	115	2.0	14	18	-	-	1.9	9.9	33	15	2.14	-	0.16	51.2
11.65	17.4	27.9	-	0.5	-3.7	3.1	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	39	15	-	-	0.16	-
11.81	12.6	20.1	-	0.4	-1.8	3.4	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.6	46	15	-	-	0.16	-
11.98	11.5	18.4	-	0.3	-1.7	2.6	4	clayy SILT to silty CLAY	115	2.0	6	9	-	-	0.8	8.6	44	15	-	-	0.16	-
12.14	9.8	15.7	-	0.3	-1.7	3.2	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.2	51	15	-	-	0.16	-
12.30	9.7	15.5	-	0.3	-1.6	3.0	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	7.0	50	15	-	-	0.16	-
12.47	8.8	14.1	-	0.3	-1.6	4.1	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	6.3	58	15	-	-	0.16	-
12.63	9.5	15.2	-	0.4	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	6.7	58	15	-	-	0.16	-
12.80	12.8	20.4	-	0.4	-1.7	3.3	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.1	45	15	-	-	0.16	-
12.96	9.8	15.8	-	0.3	-2.0	3.3	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	6.8	51	15	-	-	0.16	-
13.12	10.7	17.2	-	0.3	-1.9	2.5	4	clayy SILT to silty CLAY	115	2.0	5	9	-	-	0.7	7.4	45	15	-	-	0.16	-
13.29	11.8	18.9	-	0.4	-1.8	3.5	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	8.1	48	15	-	-	0.16	-
13.45	14.7	23.6	-	0.6	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	47	15	-	-	0.16	-
13.62	17.7	28.4	-	0.7	-1.7	4.4	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	44	15	-	-	0.16	-
13.78	16.0	25.7	-	0.7	-1.6	4.5	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	46	15	-	-	0.16	-
13.94	15.6	25.1	-	0.6	-1.6	4.1	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	45	15	-	-	0.16	-
14.11	15.5	24.9	-	0.6	-1.6	3.9	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	44	15	-	-	0.16	-
14.27	15.6	25.0	-	0.6	-1.6	3.9	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	44	15	-	-	0.16	-
14.44	16.7	26.8	-	0.8	-1.6	4.8	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.1	9.9	46	15	-	-	0.16	-
14.60	19.9	31.6	-	1.1	-1.6	6.0	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	47	15	-	-	0.16	-
14.76	48.2	58.8	118.8	1.1	-1.7	2.3	5	silty SAND to sandy SILT	120	4.0	12	15	49	40	-	-	23	16	2.03	-	0.16	35.0
14.93	85.4	103.7	124.9	0.9	-4.2	1.1	6	clean SAND to silty SAND	125	5.0	17	21	68	43	-	-	11	16	1.95	-	0.16	15.9
15.09	98.1	118.7	127.6	0.7	-0.8	0.7	6	clean SAND to silty SAND	125	5.0	20	24	73	44	-	-	7	16	1.88	-	0.15	11.6
15.26	102.6	123.7	132.8	0.7	-2.2	0.7	6	clean SAND to silty SAND	125	5.0	21	25	74	44	-	-	7	16	1.69	-	0.15	8.8
15.42	102.4	123.0	133.9	0.8	-3.6	0.8	6	clean SAND to silty SAND	125	5.0	20	25	74	44	-	-	8	16	1.65	-	0.15	8.5

* 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

Project ID: Geolabs Westlake Village
Data File: SDF(236).cpt
CPT Date: 4/30/2012 8:57:54 AM
GW During Test: 8 ft

Sounding ID: CPT-02
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
15.58	100.8	120.5	134.3	0.9	-4.2	0.9	6	clean SAND to silty SAND	125	5.0	20	24	73	44	-	-	8	16	1.63	-	0.14	8.5
15.75	96.7	115.2	137.9	1.1	-4.6	1.2	6	clean SAND to silty SAND	125	5.0	19	23	72	44	-	-	11	16	1.46	-	0.14	7.6
15.91	93.3	110.7	140.3	1.3	-5.3	1.4	6	clean SAND to silty SAND	125	5.0	19	22	70	43	-	-	12	16	1.35	-	0.14	7.0
16.08	88.5	104.7	136.9	1.3	-6.5	1.4	6	clean SAND to silty SAND	125	5.0	18	21	69	43	-	-	13	16	1.52	-	0.14	9.3
16.24	81.8	96.3	125.9	1.1	-6.7	1.3	6	clean SAND to silty SAND	125	5.0	16	19	66	43	-	-	13	16	1.93	-	0.14	17.7
16.40	65.1	76.4	131.8	1.4	-6.5	2.1	5	silty SAND to sandy SILT	120	4.0	16	19	58	42	-	-	20	16	1.74	-	0.13	24.6
16.57	46.4	54.2	134.5	1.4	-6.3	3.1	4	clayy SILT to silty CLAY	115	2.0	23	27	-	-	3.2	9.9	28	15	1.64	-	0.13	39.6
16.73	35.0	40.9	116.7	1.0	-5.9	2.9	4	clayy SILT to silty CLAY	115	2.0	18	20	-	-	2.4	9.9	31	15	2.06	-	0.13	51.2
16.90	30.3	35.2	84.3	0.5	-6.0	1.7	5	silty SAND to sandy SILT	120	4.0	8	9	33	37	-	-	27	16	2.69	-	0.12	51.2
17.06	16.9	19.6	64.7	0.2	-5.5	1.4	4	clayy SILT to silty CLAY	115	2.0	8	10	-	-	1.2	9.5	35	15	3.34	-	0.12	51.2
17.23	10.7	15.1	-	0.3	-5.5	2.7	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	5.7	50	15	-	-	0.11	-
17.39	8.7	12.2	-	0.2	-5.5	2.3	3	silty CLAY to CLAY	115	1.5	6	8	-	-	0.6	4.5	53	15	-	-	0.11	-
17.55	8.1	11.3	-	0.2	-5.3	2.4	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	4.1	55	15	-	-	0.11	-
17.72	7.8	10.9	-	0.2	-5.3	2.4	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.9	56	15	-	-	0.11	-
17.88	7.4	10.2	-	0.1	-5.2	2.3	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.6	57	15	-	-	0.11	-
18.05	7.2	9.9	-	0.2	-5.2	2.9	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.5	62	15	-	-	0.11	-
18.21	7.2	9.8	-	0.2	-5.2	4.1	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.4	68	15	-	-	0.11	-
18.37	7.7	10.4	-	0.3	-3.3	4.5	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.7	68	15	-	-	0.11	-
18.54	7.5	10.0	-	0.3	-4.2	4.8	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.5	71	15	-	-	0.11	-
18.70	6.6	8.9	-	0.3	-4.1	4.6	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	3.1	74	15	-	-	0.11	-
18.87	6.5	8.7	-	0.2	-4.0	3.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	3.0	71	15	-	-	0.11	-
19.03	6.7	8.8	-	0.2	-3.9	3.6	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	3.0	69	15	-	-	0.11	-
19.19	7.0	9.2	-	0.2	-3.8	3.5	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.4	3.2	68	15	-	-	0.11	-
19.36	7.6	9.9	-	0.2	-3.7	3.2	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.5	64	15	-	-	0.11	-
19.52	7.8	10.1	-	0.2	-3.6	3.0	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.5	62	15	-	-	0.11	-
19.69	7.8	10.1	-	0.2	-3.5	3.1	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.5	63	15	-	-	0.11	-
19.85	8.2	10.5	-	0.3	-3.4	3.6	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	3.7	64	15	-	-	0.11	-
20.01	9.7	12.4	-	0.3	-3.3	3.3	3	silty CLAY to CLAY	115	1.5	6	8	-	-	0.6	4.5	58	15	-	-	0.11	-
20.18	9.8	12.5	-	0.4	-3.2	4.2	3	silty CLAY to CLAY	115	1.5	7	8	-	-	0.6	4.5	62	15	-	-	0.11	-
20.34	10.7	13.5	-	0.4	-3.2	4.0	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	4.9	59	15	-	-	0.11	-
20.51	10.9	13.8	-	0.3	-3.1	3.3	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	5.0	55	15	-	-	0.11	-
20.67	8.7	10.9	-	0.2	-3.0	2.3	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	3.8	56	15	-	-	0.11	-
20.83	6.4	8.0	-	0.1	-3.0	1.9	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	2.6	62	15	-	-	0.11	-
21.00	6.2	7.7	-	0.2	-2.9	3.4	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	2.5	73	15	-	-	0.11	-
21.16	7.8	9.6	-	0.4	-2.8	6.3	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.3	78	15	-	-	0.11	-
21.33	13.8	16.9	-	0.5	-2.7	3.8	3	silty CLAY to CLAY	115	1.5	9	11	-	-	0.9	6.2	53	15	-	-	0.11	-
21.49	10.7	13.1	-	0.5	-2.7	4.8	3	silty CLAY to CLAY	115	1.5	7	9	-	-	0.7	4.7	63	15	-	-	0.11	-
21.65	7.9	9.6	-	0.3	-1.8	4.6	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.2	71	15	-	-	0.11	-
21.82	6.5	7.8	-	0.2	-1.8	4.1	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	2.5	76	15	-	-	0.11	-
21.98	6.8	8.1	-	0.1	-1.8	2.6	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.4	2.7	67	15	-	-	0.11	-
22.15	6.8	8.1	-	0.1	-1.8	2.4	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.4	2.6	65	15	-	-	0.11	-
22.31	6.0	7.1	-	0.1	-1.8	2.9	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	2.2	73	15	-	-	0.11	-
22.47	6.4	7.5	-	0.2	-1.8	3.3	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	2.4	73	15	-	-	0.11	-
22.64	7.0	8.3	-	0.2	-1.8	4.1	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.4	2.7	74	15	-	-	0.11	-
22.80	7.7	9.0	-	0.3	-1.8	4.0	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.0	71	15	-	-	0.11	-
22.97	7.6	8.9	-	0.3	-1.8	4.1	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	2.9	72	15	-	-	0.11	-
23.13	7.6	8.8	-	0.3	-1.8	4.0	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	2.9	72	15	-	-	0.11	-
23.30	8.7	10.1	-	0.3	-1.8	3.7	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	3.4	66	15	-	-	0.11	-
23.46	10.5	12.1	-	0.3	-1.8	3.8	3	silty CLAY to CLAY	115	1.5	7	8	-	-	0.7	4.2	61	15	-	-	0.11	-
23.62	12.1	13.8	-	0.4	-1.8	4.2	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	4.9	59	15	-	-	0.11	-
23.79	12.8	14.5	-	0.6	-1.8	4.9	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.8	5.1	61	15	-	-	0.11	-
23.95	12.1	13.6	-	0.5	-1.8	5.1	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	4.8	63	15	-	-	0.11	-
24.12	11.3	12.7	-	0.5	-1.8	4.8	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.7	4.4	64	15	-	-	0.11	-
24.28	9.3	10.5	-	0.4	-1.8	5.1	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	3.5	71	15	-	-	0.11	-
24.44	8.7	9.7	-	0.3	-1.7	4.5	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.2	71	15	-	-	0.11	-
24.61	8.4	9.3	-	0.2	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	3.1	65	15	-	-	0.11	-
24.77	7.9	8.7	-	0.2	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	2.8	67	15	-	-	0.11	-
24.94	8.1	8.9	-	0.2	-1.9	2.5	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	2.9	63	15	-	-	0.11	-
25.10	9.5	10.4	-	0.5	-1.8	5.6	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	3.5	73	15	-	-	0.11	-
25.26	16.1	17.5	-	0.8	-1.8	5.3	3	silty CLAY to CLAY	115	1.5	11	12	-	-	1.1	6.3	58	15	-	-	0.11	-
25.43	56.6	57.2	111.9	1.1	-2.1	2.0	5	silty SAND to sandy SILT	120	4.0	14	14	49	39	-	-	23	16	2.13	-	0.11	36.6
25.59	84.1	84.8	111.0	0.9	-3.1	1.1	6	clean SAND to silty SAND	125	5.0	17	17	62	41	-	-	13	16	2.15	-	0.11	21.4
25.76	99.2	99.7	112.8	0.7	-4.1	0.7	6	clean SAND to silty SAND	125	5.0	20	20	67	42	-	-	9	16	2.12	-	0.11	17.0
25.92	106.9	107.2	120.3	0.8	-4.4	0.8	6	clean SAND to silty SAND	125	5.0	21	21	69	42	-	-	9	16	2.01	-	0.10	15.1
26.08	105.9	105.9	119.5	0.8	0.7	0.8	6	clean SAND to silty SAND	125	5.0	21	21	69	42	-	-	9	16	2.02	-	0.10	15.4
26.25	110.7	110.3	122.1	0.8	-0.5	0.7	6	clean SAND to silty SAND	125	5.0	22	22	70	42	-	-	8	16	1.98	-	0.10	14.4
26.41	109.4	108.8	117.8	0.7	-1.7	0.6	6	clean SAND to silty SAND	125	5.0	22	22	70	42	-	-	7	16	2.04	-	0.09	14.7
26.58	96.1	95.3	108.2	0.7	-1.9	0.7	6	clean SAND to silty SAND	125	5.0	19	19	65	41	-	-	9	16	2.19	-	0.09	18.3
26.74	64.7	64.0	103.1	0.9	-1.5	1.5	5	silty SAND to sandy SILT	120	4.0	16	16	52	39	-	-	18	16	2.28	-	0.09	31.5
26.90	26.8	27.6	-	0.8	-0.8	3.2	4	clayy SILT to silty CLAY	115	2.0	13	14	-	-	1.8	9.9	39	15	-	-	0.08	-
27.07	14.7	15.1	-	0.5	-0.3	3.9	3	silty CLAY to CLAY	115	1.5	10	10	-	-	1.0	5.3	56	15	-	-	0.08	-
27.23	9.4	9.6	-	0.4	0.2	5.1	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.1	74	15	-	-	0.08	-
27.40	15.2	15.5	-	0.4	0.4	3.2	3	silty CLAY to CLAY	115	1.5	10	10	-	-	1.0	5.4	52	15	-	-	0.08	-
27.56	12.0	12.1	-	0.5	0.3	4.5	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.8	4.1	64	15	-	-	0.08	-
27.72	8.7	8.8	-	0.3	0.3	4.5	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	2.8	74	15	-	-	0.08	-
27.89	8.4	8.4	-	0.2	0.4	3.7	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	2.6	72	15	-	-	0.08	-
28.05	8.4	8.4	-	0.3	0.4	3.9	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	2.6	73	15	-	-	0.08	-
28.22	9.1	9.1	-	0.3	0.5	3.6	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	2.9	69	15	-	-	0.08	-
28.38	8.4	8.3	-	0.3	0.5	3.9	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	2.6	74	15	-	-	0.08	-
28.54	8.5	8.4	-	0.2	0.5	3.3	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	2.6	70	15	-	-	0.08	-
28.71	8.1	8.0	-	0.2	0.5	3.7	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	2.5	74	15	-	-	0.08	-
28.87	8.3	8.2	-	0.2	0.6	3.6	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.5	73	15	-	-	0.08	-
29.04	8.5	8.3	-	0.2	0.6	3.6	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	2.6	72	15	-	-	0.08	-
29.20	8.8	8.5	-	0.2	0.6	3.4	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	2.7	70	15	-	-	0.08	-
29.36	8.7	8.4	-	0.2	0.6	3.1	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	2.6	69	15	-	-	0.08	-
29.53	8.6	8.3	-	0.2	0.6	3.1	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	2.6	69	15	-	-	0.08	-
29.69	8.5	8.2	-	0.2	0.6	2.9	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.5	69	15	-	-	0.08	-
29.86	8.5	8.1	-	0.2	0.6	3.0	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.5	70	15	-	-	0.08	-
30.02	8.7	8.2	-	0.2	0.6	2.9	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.5	69	15	-	-	0.08	-
30.19	8.4	7.9	-	0.2	0.6	3.1	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.4	71	15	-	-	0.08	-
30.35	8.6	8.1	-	0.2	0.6	3.0	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.5	69	15	-	-	0.08	-
30.51	8.7	8.2	-	0.2	0.6	2.5	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.5	66	15	-	-	0.08	-
30.68	8.5	7.9	-	0.1	0.6	2.2	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.4	65	15	-	-	0.08	-
30.84	8.8	8.2	-	0.1	0.7	1.9	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	2.5	62	15	-	-	0.08	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(236).cpt
CPT Date: 4/30/2012 8:57:54 AM
GW During Test: 8 ft

Sounding ID: CPT-02
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
31.01	9.1	8.4	-	0.2	0.7	3.2	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	2.6	69	15	-	-	0.08	-
31.17	9.7	9.0	-	0.3	0.7	4.1	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	2.8	72	15	-	-	0.08	-
31.33	13.5	12.5	-	0.2	0.6	2.1	4	clayy SILT to silty CLAY	115	2.0	7	6	-	-	0.9	4.1	51	15	-	-	0.08	-
31.50	12.7	11.7	-	0.7	0.6	6.4	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.8	3.8	72	15	-	-	0.08	-
31.66	21.8	19.9	-	0.9	0.7	4.4	3	silty CLAY to CLAY	115	1.5	15	13	-	-	1.5	7.0	51	15	-	-	0.08	-
31.83	43.5	40.3	115.8	1.2	0.5	2.8	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.0	9.9	32	15	2.07	-	0.08	51.2
31.99	54.3	50.2	128.3	1.5	3.5	2.9	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	29	15	1.91	-	0.08	43.9
32.15	54.2	50.1	125.7	1.5	1.1	2.8	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	28	15	1.94	-	0.08	44.1
32.32	62.5	57.6	97.2	0.9	-0.4	1.5	5	silty SAND to sandy SILT	120	4.0	16	14	49	38	-	-	19	16	2.39	-	0.07	36.2
32.48	62.3	57.3	120.6	1.4	-1.9	2.3	5	silty SAND to sandy SILT	120	4.0	16	14	49	38	-	-	24	16	2.00	-	0.07	36.4
32.65	54.9	50.4	126.0	1.5	-2.2	2.8	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	28	15	1.93	-	0.07	43.7
32.81	55.8	51.1	119.7	1.4	-2.3	2.5	5	silty SAND to sandy SILT	120	4.0	14	13	45	37	-	-	27	16	2.02	-	0.06	42.9
32.97	66.8	61.1	110.3	1.2	-3.1	1.8	5	silty SAND to sandy SILT	120	4.0	17	15	51	38	-	-	21	16	2.16	-	0.06	33.3
33.14	66.3	60.4	137.1	1.8	-3.0	2.9	5	silty SAND to sandy SILT	120	4.0	17	15	50	38	-	-	26	16	1.61	-	0.06	33.5
33.30	63.6	57.9	121.3	1.4	-3.1	2.3	5	silty SAND to sandy SILT	120	4.0	16	14	49	38	-	-	24	16	1.99	-	0.05	35.9
33.47	63.1	57.3	128.4	1.6	-3.2	2.6	5	silty SAND to sandy SILT	120	4.0	16	14	49	38	-	-	26	16	1.90	-	0.05	36.4
33.63	54.5	49.4	139.2	1.8	-3.3	3.4	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	31	15	1.51	-	0.05	44.8
33.79	53.0	48.0	111.6	1.2	-3.4	2.3	5	silty SAND to sandy SILT	120	4.0	13	12	43	37	-	-	27	16	2.13	-	0.04	46.5
33.96	54.8	49.5	141.5	1.9	-3.8	3.5	4	clayy SILT to silty CLAY	115	2.0	27	25	-	-	3.8	9.9	31	15	1.40	-	0.04	42.9
34.12	49.8	42.8	-	1.9	-4.1	4.0	4	clayy SILT to silty CLAY	115	2.0	25	21	-	-	3.4	9.9	35	15	-	-	0.04	-
34.29	56.1	50.5	117.7	1.3	-4.2	2.5	5	silty SAND to sandy SILT	120	4.0	14	13	44	37	-	-	27	16	2.04	-	0.04	43.6
34.45	44.4	39.8	124.4	1.4	-4.2	3.3	4	clayy SILT to silty CLAY	115	2.0	22	20	-	-	3.1	9.9	34	15	1.95	-	0.03	51.2
34.61	27.3	23.2	-	0.9	-4.3	3.6	4	clayy SILT to silty CLAY	115	2.0	14	12	-	-	1.9	8.1	45	15	-	-	0.03	-
34.78	18.4	15.6	-	0.5	-4.3	3.0	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.2	5.2	51	15	-	-	0.03	-
34.94	12.9	10.9	-	0.5	-4.3	5.0	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.8	3.5	70	15	-	-	0.03	-
35.11	14.2	12.0	-	0.8	-4.3	6.7	3	silty CLAY to CLAY	115	1.5	9	8	-	-	0.9	3.9	73	15	-	-	0.03	-
35.27	25.2	21.1	-	0.8	-4.3	3.7	3	silty CLAY to CLAY	115	1.5	17	14	-	-	1.7	7.3	47	15	-	-	0.03	-
35.43	30.9	27.5	77.9	0.5	-4.3	1.7	5	silty SAND to sandy SILT	120	4.0	8	7	24	33	-	-	31	16	2.87	-	0.03	51.2
35.60	28.6	25.3	78.9	0.5	-4.3	1.8	4	clayy SILT to silty CLAY	115	2.0	14	13	-	-	1.9	8.3	34	15	2.84	-	0.03	51.2
35.76	18.0	14.9	-	0.6	-4.3	3.8	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.2	5.0	56	15	-	-	0.02	-
35.93	12.5	10.3	-	0.5	-4.3	4.7	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	3.2	70	15	-	-	0.02	-
36.09	12.3	10.1	-	0.5	-4.2	4.6	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	3.1	71	15	-	-	0.02	-
36.26	16.7	13.7	-	0.4	-4.2	3.1	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	4.5	54	15	-	-	0.02	-
36.42	17.8	14.5	-	0.6	-4.1	4.0	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.2	4.8	58	15	-	-	0.02	-
36.58	18.3	14.9	-	0.7	-4.1	4.6	3	silty CLAY to CLAY	115	1.5	12	10	-	-	1.2	4.9	59	15	-	-	0.02	-
36.75	19.6	15.9	-	0.7	-4.1	4.0	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	5.3	55	15	-	-	0.02	-
36.91	17.4	14.1	-	0.6	-4.0	3.7	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.6	57	15	-	-	0.02	-
37.08	14.4	11.6	-	0.4	-4.0	3.5	3	silty CLAY to CLAY	115	1.5	10	8	-	-	0.9	3.7	61	15	-	-	0.02	-
37.24	12.3	9.9	-	0.4	-3.9	3.9	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	3.0	68	15	-	-	0.02	-
37.40	12.4	9.9	-	0.4	-3.7	3.7	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	3.1	67	15	-	-	0.02	-
37.57	16.2	13.0	-	0.4	-3.7	2.6	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	4.2	53	15	-	-	0.02	-
37.73	15.1	12.0	-	0.5	-3.7	3.7	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	3.9	61	15	-	-	0.02	-
37.90	20.5	16.3	-	0.3	-3.6	1.8	4	clayy SILT to silty CLAY	115	2.0	10	8	-	-	1.4	5.4	43	15	-	-	0.02	-
38.06	16.5	13.0	-	0.6	-3.6	4.1	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	4.2	61	15	-	-	0.02	-
38.22	19.3	15.2	-	1.3	-3.9	7.6	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	5.0	69	15	-	-	0.02	-
38.39	51.9	44.6	127.7	1.6	-3.8	3.2	4	clayy SILT to silty CLAY	115	2.0	26	22	-	-	3.6	9.9	31	15	1.91	-	0.02	50.6
38.55	63.4	54.5	111.4	1.3	-3.8	2.1	5	silty SAND to sandy SILT	120	4.0	16	14	47	37	-	-	24	16	2.14	-	0.02	39.3
38.72	50.5	43.3	88.0	0.7	-3.9	1.5	5	silty SAND to sandy SILT	120	4.0	13	11	39	36	-	-	23	16	2.59	-	0.02	51.2
38.88	28.5	22.1	-	0.9	-4.2	3.3	4	clayy SILT to silty CLAY	115	2.0	14	11	-	-	1.9	7.6	44	15	-	-	0.01	-
39.04	16.3	12.6	-	0.7	-4.3	5.0	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.0	65	15	-	-	0.01	-
39.21	15.3	11.8	-	0.5	-4.2	3.8	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	3.7	62	15	-	-	0.01	-
39.37	13.6	10.5	-	0.4	-4.1	3.4	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.2	64	15	-	-	0.01	-
39.54	12.9	9.9	-	0.3	-4.0	3.2	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.8	3.0	64	15	-	-	0.01	-
39.70	12.7	9.7	-	0.3	-3.9	2.9	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	3.0	63	15	-	-	0.01	-
39.86	12.6	9.6	-	0.3	-3.9	2.5	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	2.9	62	15	-	-	0.01	-
40.03	12.2	9.2	-	0.3	-3.8	2.7	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	2.8	64	15	-	-	0.01	-
40.19	12.5	9.4	-	0.3	-3.8	3.3	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	2.9	67	15	-	-	0.01	-
40.36	14.0	10.6	-	0.4	-3.7	3.8	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.3	65	15	-	-	0.01	-
40.52	13.6	10.2	-	0.5	-3.5	4.4	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.1	70	15	-	-	0.01	-
40.68	14.9	11.1	-	0.5	-3.5	3.8	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.5	64	15	-	-	0.01	-
40.85	14.4	10.7	-	0.5	-3.5	4.2	3	silty CLAY to CLAY	115	1.5	10	7	-	-	0.9	3.3	67	15	-	-	0.01	-
41.01	16.4	12.2	-	0.5	-3.4	3.4	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.9	59	15	-	-	0.01	-
41.18	16.1	11.9	-	0.5	-3.4	3.4	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.8	60	15	-	-	0.01	-
41.34	16.3	12.0	-	0.4	-3.4	3.1	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.8	58	15	-	-	0.01	-
41.50	16.7	12.3	-	0.4	-3.4	3.1	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.9	58	15	-	-	0.01	-
41.67	16.8	12.3	-	0.4	-3.3	3.0	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.9	57	15	-	-	0.01	-
41.83	17.5	12.8	-	0.4	-3.2	2.7	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.1	4.1	54	15	-	-	0.01	-
42.00	17.9	13.0	-	0.4	-3.2	2.6	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.2	53	15	-	-	0.01	-
42.16	16.0	11.7	-	0.4	-3.2	2.7	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.0	3.7	57	15	-	-	0.01	-
42.32	16.1	11.7	-	0.4	-3.1	2.7	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.7	57	15	-	-	0.01	-
42.49	15.1	10.9	-	0.4	-3.1	3.5	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.4	63	15	-	-	0.01	-
42.65	16.8	12.1	-	0.5	-3.1	3.2	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.8	59	15	-	-	0.01	-
42.82	18.5	13.3	-	0.4	-3.0	2.8	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.2	54	15	-	-	0.01	-
42.98	18.0	12.9	-	0.4	-2.9	2.5	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.1	53	15	-	-	0.01	-
43.15	18.1	12.9	-	0.5	-2.9	3.5	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.1	58	15	-	-	0.01	-
43.31	20.0	14.3	-	0.5	-2.8	3.0	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	4.6	53	15	-	-	0.01	-
43.47	22.9	16.2	-	0.6	-2.8	2.9	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.5	5.3	50	15	-	-	0.01	-
43.64	22.4	15.8	-	1.1	-2.8	5.3	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.5	5.2	60	15	-	-	0.01	-
43.80	27.4	19.3	-	1.6	-2.7	6.3	3	silty CLAY to CLAY	115	1.5	18	13	-	-	1.8	6.5	59	15	-	-	0.01	-
43.97	34.8	24.4	-	2.3	-2.5	7.2	3	silty CLAY to CLAY	115	1.5	23	16	-	-	2.4	8.3	56	15	-	-	0.01	-
44.13	54.8	38.4	-	2.2	-2.5	4.2	4	clayy SILT to silty CLAY	115	2.0	27	19	-	-	3.8	9.9	38	15	-	-	0.01	-
44.29	68.4	55.6	123.0	1.6	-2.7	2.5	5	silty SAND to sandy SILT	120	4.0	17	14	48	37	-	-	25	16	1.97	-	0.01	38.2
44.46	57.2	46.4	104.3	1.1	-3.1	2.1	5	silty SAND to sandy SILT	120	4.0	14	12	42	36	-	-	26	16	2.26	-	0.01	48.4
44.62	33.7	23.4	-	1.4	-3.6	4.5	3	silty CLAY to CLAY	115	1.5	22	16	-	-	2.3	7.9	48	15	-	-	0.00	-
44.79	24.3	16.8	-	0.7	-3.6	3.3	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.6	5.5	51	15	-	-	0.00	-
44.95	21.4	14.8	-	0.9	-3.5	4.8	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	4.8	60	15	-	-	0.00	-
45.11	21.2	14.6	-	1.4	-3.3	7.7	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	4.7	70	15	-	-	0.00	-
45.28	46.3	31.8	-	1.4	-3.3	3.3	4	clayy SILT to silty CLAY	115	2.0	23	16	-	-	3.2	9.9	37	15	-	-	0.00	-
45.44	39.3	26.9	-	1.0	-3.5	2.8	4	clayy SILT to silty CLAY	115	2.0	20	13	-	-	2.7	9.2	38	15	-	-	0.00	-
45.61	29.2	19.9	-	0.7	-3.5	2.7	4	clayy SILT to silty CLAY	115	2.0	15	10	-	-	2.0	6.7	44	15	-	-	0.00	-
45.77	19.1	13.0	-	0.6	-3.4	3.9	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.1	60	15	-	-	0.00	-
45.93	14.5	9.8	-	0.5	-3.3	4.1	3	silty CLAY to CLAY	115	1.5	10	7	-	-	0.9	2.9	69	15	-	-	0.00	-
46.10	14.1	9.5	-	0.4	-3.2	3.8	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	2.8	69	15	-	-	0.00	-
46.26	14.3	9.7	-	0.5	-3.1	4.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	2.9	71	15	-	-	0.00	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(236).cpt
CPT Date: 4/30/2012 8:57:54 AM
GW During Test: 8 ft

Page: 4
Sounding ID: CPT-02
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
46.43	17.6	11.8	-	0.9	-3.1	5.8	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.1	3.7	71	15	-	-	0.00	-
46.59	27.7	18.6	-	1.7	-3.0	6.7	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	6.1	61	15	-	-	0.00	-
46.75	43.1	28.8	-	2.7	-3.1	6.8	3	silty CLAY to CLAY	115	1.5	29	19	-	-	2.9	9.9	52	15	-	-	0.00	-
46.92	50.4	33.6	-	2.7	-3.1	5.7	3	silty CLAY to CLAY	115	1.5	34	22	-	-	3.5	9.9	45	15	-	-	0.00	-
47.08	39.0	25.9	-	2.0	-3.2	5.5	3	silty CLAY to CLAY	115	1.5	26	17	-	-	2.7	8.8	50	15	-	-	0.00	-
47.25	27.7	18.4	-	1.4	-2.9	5.7	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	6.1	58	15	-	-	0.00	-
47.41	21.7	14.3	-	1.8	-3.0	9.4	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	4.6	76	15	-	-	0.00	-
47.57	48.1	31.7	-	1.6	-2.9	3.5	4	clayy SILT to silty CLAY	115	2.0	24	16	-	-	3.3	9.9	38	15	-	-	0.00	-
47.74	56.7	44.7	128.4	1.7	-3.5	3.2	4	clayy SILT to silty CLAY	115	2.0	28	22	-	-	3.9	9.9	32	15	1.86	-	0.00	50.5
47.90	39.1	25.6	-	3.1	-3.9	8.4	3	silty CLAY to CLAY	115	1.5	26	17	-	-	2.7	8.7	58	15	-	-	0.00	-
48.07	70.4	55.2	163.8	2.8	-4.1	4.2	4	clayy SILT to silty CLAY	115	2.0	35	28	-	-	4.9	9.9	32	15	0.00	-	0.00	0.0
48.23	143.2	112.3	158.8	2.7	-4.6	1.9	5	silty SAND to sandy SILT	120	4.0	36	28	71	41	-	-	15	16	0.64	-	0.00	3.5
48.39	181.4	142.0	163.1	2.1	-4.8	1.2	6	clean SAND to silty SAND	125	5.0	36	28	79	42	-	-	9	16	0.00	-	0.00	0.0
48.56	198.6	155.2	163.4	1.7	-5.1	0.8	6	clean SAND to silty SAND	125	5.0	40	31	82	42	-	-	7	16	0.00	-	0.00	0.0
48.72	198.8	155.1	171.8	2.2	-5.3	1.1	6	clean SAND to silty SAND	125	5.0	40	31	81	42	-	-	8	16	0.00	-	0.00	0.0
48.89	188.5	146.8	175.3	2.7	-5.4	1.5	6	clean SAND to silty SAND	125	5.0	38	29	80	42	-	-	11	16	0.00	-	0.00	0.0
49.05	185.7	144.4	176.0	2.8	-5.4	1.6	6	clean SAND to silty SAND	125	5.0	37	29	79	42	-	-	11	16	0.00	-	0.00	0.0
49.22	190.7	148.0	171.5	2.4	-5.8	1.3	6	clean SAND to silty SAND	125	5.0	38	30	80	42	-	-	10	16	0.00	-	0.00	0.0
49.38	192.1	148.9	167.6	2.2	-6.6	1.1	6	clean SAND to silty SAND	125	5.0	38	30	80	42	-	-	9	16	0.00	-	0.00	0.0
49.54	182.7	141.3	167.2	2.4	-7.2	1.4	6	clean SAND to silty SAND	125	5.0	37	28	78	42	-	-	10	16	0.00	-	0.00	0.0

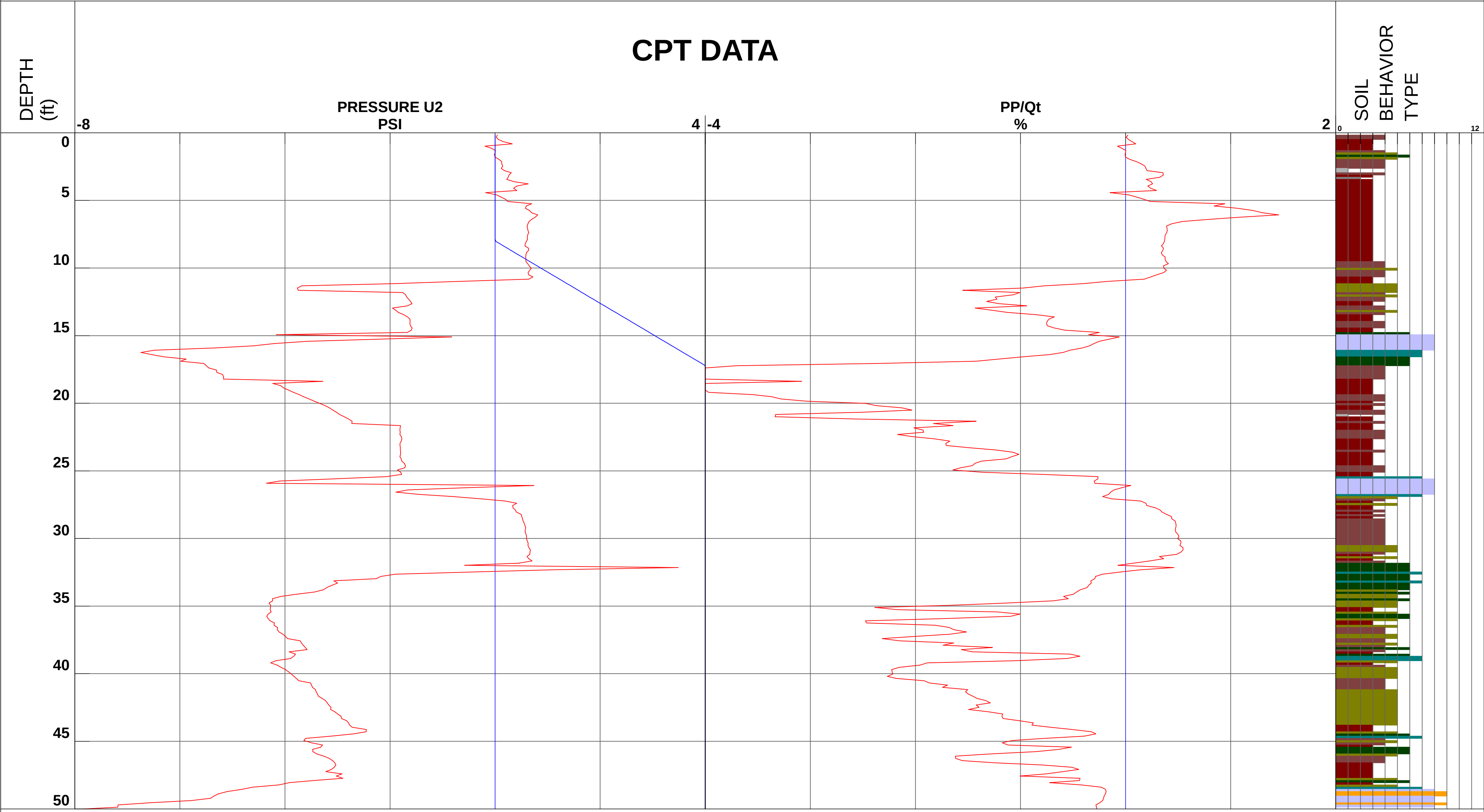
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(236).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-02	Date and Time	4/30/2012 8:57:54 AM	Maximum Depth	50.03 ft
Water Table Depth	8.00 ft				

Net Area Ratio .8



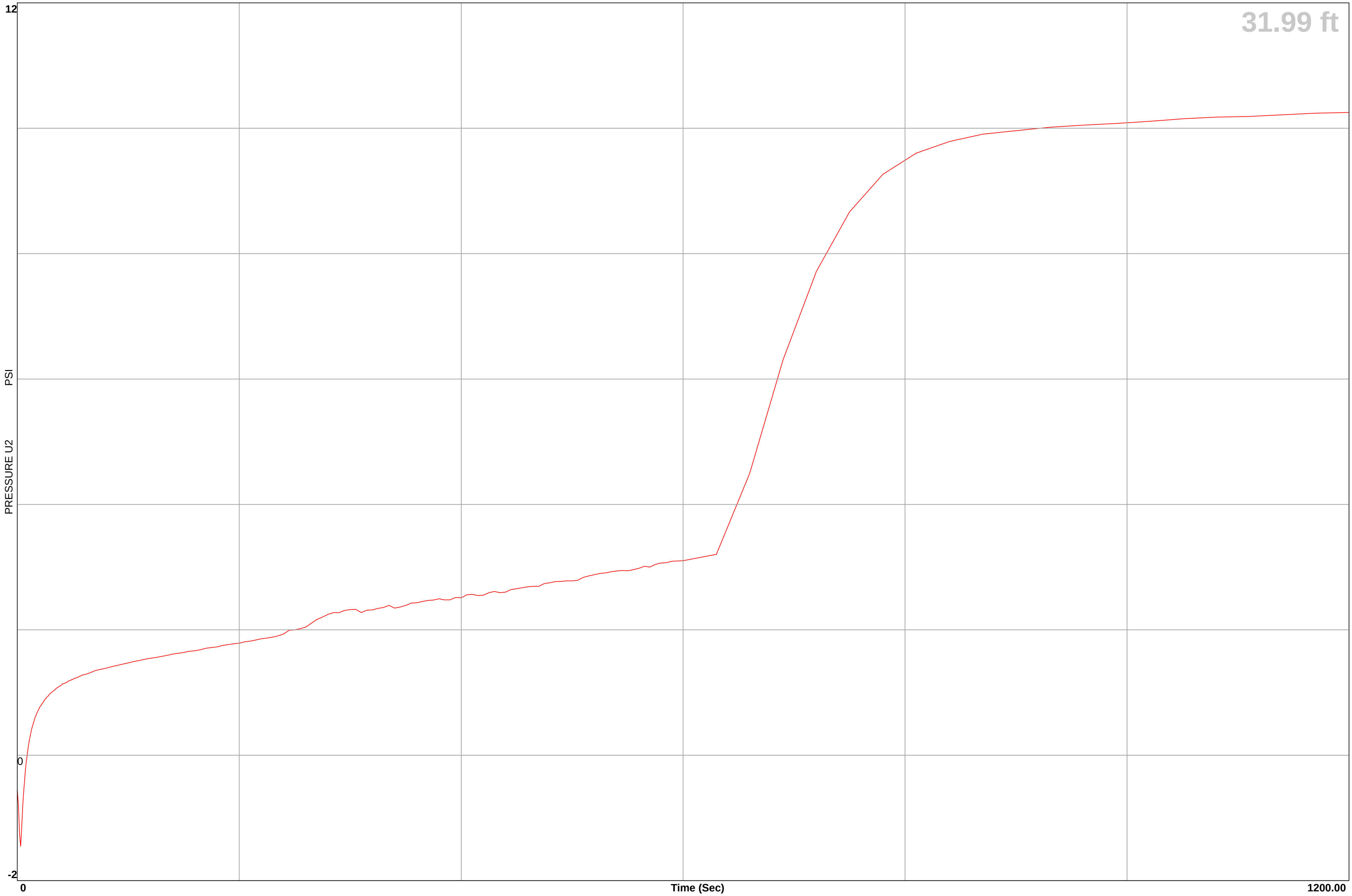
1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

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

Geolabs Westlake Village

Location	SMC Library	Operator	RA/JC		
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-02	Date and Time	4/30/2012 8:57:54 AM		
Equilized Pressure	10.2	Ground Water Depth	8.3		

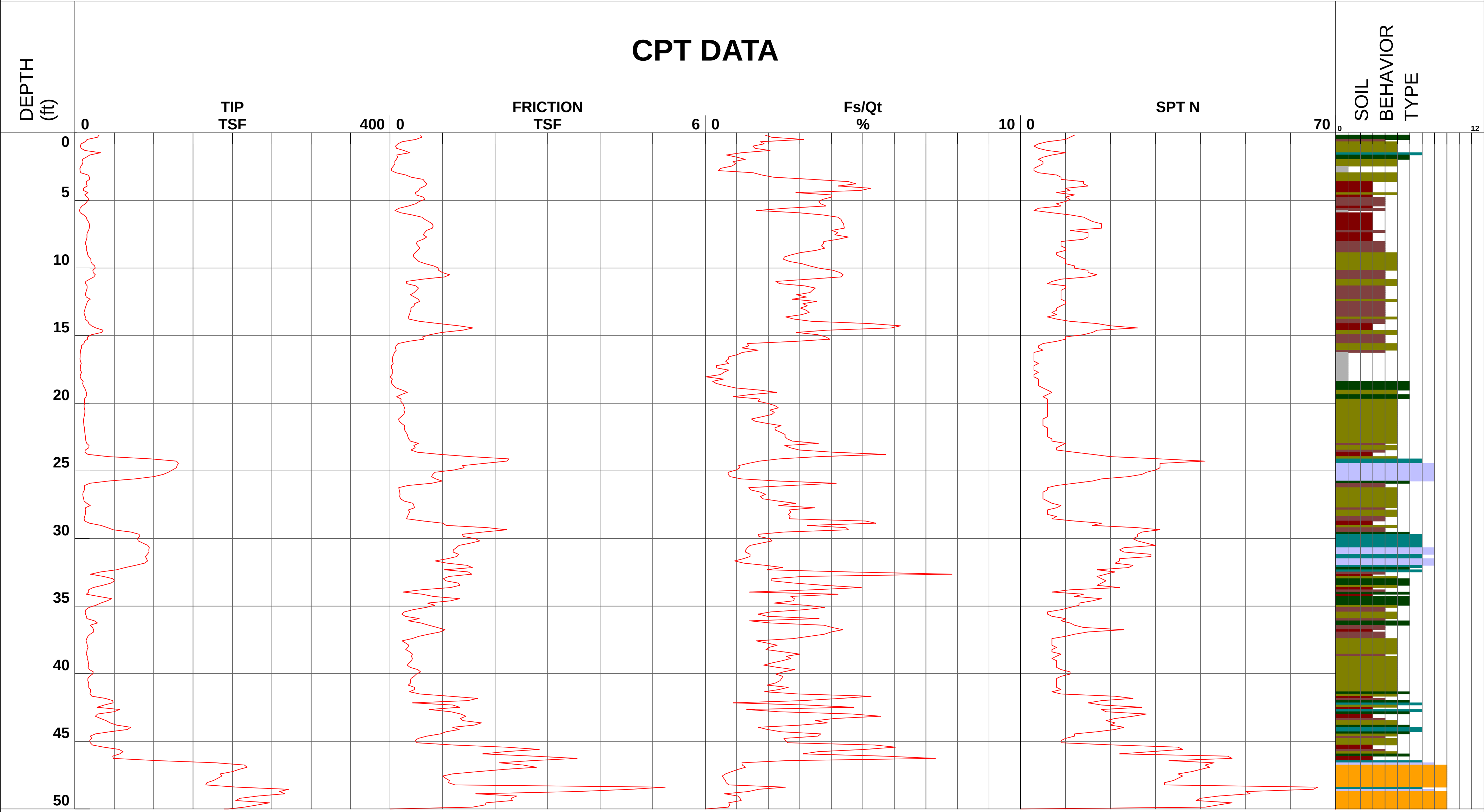


Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(237).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-03	Date and Time	4/30/2012 11:54:24 AM	Maximum Depth	50.20 ft
Water Table Depth		11.00 ft			

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

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

Project ID: Geolabs Westlake Village
Data File: SDF(237).cpt
CPT Date: 4/30/2012 11:54:24 AM
GW During Test: 11 ft

Sounding ID: CPT-03
Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.01	* Liq Stlmt 0.18	* Cycl SStn %
0.33	28.6	45.9	102.0	0.6	-0.2	2.1	5	silty SAND to sandy SILT	120	4.0	7	11	41	48	-	-	25	16	N/A	0.01	N/A	N/A
0.49	15.6	25.0	-	0.5	-0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	40	15	N/A	0.01	N/A	N/A
0.66	13.2	21.1	70.1	0.2	-0.2	1.8	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	35	15	N/A	0.01	N/A	N/A
0.82	8.0	12.9	-	0.1	-0.1	1.9	4	clayy SILT to silty CLAY	115	2.0	4	6	-	-	0.6	9.9	46	15	N/A	0.01	N/A	N/A
0.98	6.9	11.1	-	0.1	-0.1	1.5	4	clayy SILT to silty CLAY	115	2.0	3	6	-	-	0.5	9.9	46	15	N/A	0.01	N/A	N/A
1.15	8.0	12.8	-	0.1	0.0	1.6	4	clayy SILT to silty CLAY	115	2.0	4	6	-	-	0.6	9.9	44	15	N/A	0.01	N/A	N/A
1.31	12.8	20.6	-	0.3	-0.1	2.1	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	38	15	N/A	0.01	N/A	N/A
1.48	32.7	52.5	83.8	0.4	-0.1	1.2	5	silty SAND to sandy SILT	120	4.0	8	13	46	47	-	-	18	16	N/A	0.01	N/A	N/A
1.64	19.0	30.4	54.7	0.1	-0.1	0.7	5	silty SAND to sandy SILT	120	4.0	5	8	28	44	-	-	21	16	N/A	0.01	N/A	N/A
1.80	14.3	23.0	57.3	0.1	-0.2	1.0	5	silty SAND to sandy SILT	120	4.0	4	6	18	42	-	-	28	16	N/A	0.01	N/A	N/A
1.97	9.3	15.0	-	0.1	-0.3	1.3	4	clayy SILT to silty CLAY	115	2.0	5	7	-	-	0.7	9.9	38	15	N/A	0.00	N/A	N/A
2.13	10.2	16.4	49.3	0.1	-0.3	0.9	5	silty SAND to sandy SILT	120	4.0	3	4	7	39	-	-	33	16	N/A	0.00	N/A	N/A
2.30	9.7	15.6	50.4	0.1	-0.3	1.0	4	clayy SILT to silty CLAY	115	2.0	5	8	-	-	0.7	9.9	35	15	N/A	0.00	N/A	N/A
2.46	7.7	12.3	-	0.1	-0.3	0.9	4	clayy SILT to silty CLAY	115	2.0	4	6	-	-	0.5	9.9	38	15	N/A	0.00	N/A	N/A
2.62	6.4	10.3	-	0.0	-0.4	0.5	4	clayy SILT to silty CLAY	115	2.0	3	5	-	-	0.4	9.9	37	15	N/A	0.00	N/A	N/A
2.79	6.5	10.4	-	0.0	-0.4	0.4	5	silty SAND to sandy SILT	120	4.0	2	3	5	35	-	-	35	16	N/A	0.00	N/A	N/A
2.95	7.4	11.8	-	0.1	-0.4	1.6	4	clayy SILT to silty CLAY	115	2.0	4	6	-	-	0.5	9.9	46	15	N/A	0.00	N/A	N/A
3.12	16.8	27.0	77.8	0.3	-0.3	1.8	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.2	9.9	32	15	N/A	0.00	N/A	N/A
3.28	18.5	29.7	88.3	0.4	-0.1	2.2	4	clayy SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	32	15	2.59	-	0.20	51.2
3.45	18.6	29.8	-	0.6	0.1	3.4	4	clayy SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	38	15	-	-	0.20	-
3.61	14.5	23.3	-	0.7	-0.1	4.6	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	48	15	-	-	0.20	-
3.77	14.6	23.5	-	0.7	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	48	15	-	-	0.20	-
3.94	15.8	25.3	-	0.7	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	45	15	-	-	0.20	-
4.10	10.9	17.4	-	0.6	-0.6	5.4	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	56	15	-	-	0.20	-
4.27	11.1	17.8	-	0.5	-0.3	5.0	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	55	15	-	-	0.20	-
4.43	16.8	27.0	-	0.5	-0.2	2.9	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.2	9.9	38	15	-	-	0.20	-
4.59	12.4	19.9	-	0.5	-0.4	4.1	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	49	15	-	-	0.20	-
4.76	15.8	25.4	-	0.6	-0.3	4.1	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	44	15	-	-	0.20	-
4.92	17.7	28.4	-	0.7	-0.5	3.8	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	41	15	-	-	0.20	-
5.09	15.4	24.7	-	0.6	-1.4	3.7	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	43	15	-	-	0.20	-
5.25	13.3	21.3	-	0.5	-1.4	3.7	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	46	15	-	-	0.20	-
5.41	9.2	14.7	-	0.4	-1.0	4.0	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	55	15	-	-	0.20	-
5.58	6.7	10.8	-	0.2	-0.8	2.7	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	8.6	56	15	-	-	0.20	-
5.74	5.8	9.3	-	0.1	-0.7	1.7	4	clayy SILT to silty CLAY	115	2.0	3	5	-	-	0.4	7.2	53	15	-	-	0.20	-
5.91	6.9	11.0	-	0.2	-0.6	3.1	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	8.4	58	15	-	-	0.20	-
6.07	11.2	18.0	-	0.4	-0.6	3.8	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	50	15	-	-	0.20	-
6.23	14.4	23.0	-	0.6	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	10	15	-	-	1.0	9.9	47	15	-	-	0.20	-
6.40	15.3	24.6	-	0.7	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	46	15	-	-	0.20	-
6.56	17.0	27.3	-	0.7	-0.5	4.4	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	44	15	-	-	0.20	-
6.73	18.3	29.4	-	0.8	-0.4	4.5	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	43	15	-	-	0.20	-
6.89	18.7	30.0	-	0.8	-0.4	4.5	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	43	15	-	-	0.20	-
7.05	18.3	29.3	-	0.8	-0.4	4.5	3	silty CLAY to CLAY	115	1.5	12	20	-	-	1.3	9.9	43	15	-	-	0.20	-
7.22	17.4	27.8	-	0.7	-0.4	4.1	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	43	15	-	-	0.20	-
7.38	15.7	25.2	-	0.7	-0.3	4.3	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	45	15	-	-	0.20	-
7.55	15.4	24.6	-	0.6	-0.3	4.2	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	45	15	-	-	0.20	-
7.71	15.4	24.7	-	0.7	-0.3	4.7	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	47	15	-	-	0.20	-
7.87	14.9	23.9	-	0.6	-0.3	4.3	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	46	15	-	-	0.20	-
8.04	13.8	22.1	-	0.5	-0.3	3.9	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	46	15	-	-	0.20	-
8.20	13.3	21.4	-	0.5	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	47	15	-	-	0.20	-
8.37	14.6	23.4	-	0.5	-0.4	3.8	4	clayy SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	45	15	-	-	0.20	-
8.53	15.0	24.1	-	0.6	-0.4	3.9	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.0	9.9	45	15	-	-	0.20	-
8.69	14.9	23.9	-	0.5	-0.3	3.6	4	clayy SILT to silty CLAY	115	2.0	7	12	-	-	1.0	9.9	44	15	-	-	0.20	-
8.86	15.9	25.5	-	0.5	-0.3	3.1	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	40	15	-	-	0.20	-
9.02	16.3	26.1	-	0.4	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	38	15	-	-	0.20	-
9.19	18.0	27.5	-	0.5	-0.3	2.6	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	36	15	-	-	0.20	-
9.35	20.3	30.6	97.2	0.5	-0.3	2.5	4	clayy SILT to silty CLAY	115	2.0	10	15	-	-	1.4	9.9	34	15	2.39	-	0.20	51.2
9.51	20.5	30.6	101.1	0.5	-0.3	2.8	4	clayy SILT to silty CLAY	115	2.0	10	15	-	-	1.4	9.9	35	15	2.32	-	0.19	51.2
9.68	21.8	32.2	-	0.7	-0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	11	16	-	-	1.5	9.9	36	15	-	-	0.19	-
9.84	25.0	36.5	120.6	0.8	-0.1	3.4	4	clayy SILT to silty CLAY	115	2.0	13	18	-	-	1.7	9.9	35	15	2.00	-	0.18	51.2
10.01	25.8	37.2	-	0.9	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	13	19	-	-	1.8	9.9	36	15	-	-	0.18	-
10.17	22.8	36.5	-	0.9	-0.1	4.2	4	clayy SILT to silty CLAY	115	2.0	11	18	-	-	1.6	9.9	38	15	-	-	0.18	-
10.34	23.3	37.4	-	1.0	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	12	19	-	-	1.6	9.9	39	15	-	-	0.18	-
10.50	25.9	41.6	-	1.1	0.0	4.5	4	clayy SILT to silty CLAY	115	2.0	13	21	-	-	1.8	9.9	37	15	-	-	0.18	-
10.66	24.1	38.6	-	1.0	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	12	19	-	-	1.7	9.9	38	15	-	-	0.18	-
10.83	18.8	30.1	-	0.6	0.0	3.4	4	clayy SILT to silty CLAY	115	2.0	9	15	-	-	1.3	9.9	39	15	-	-	0.18	-
10.99	13.9	21.9	-	0.3	0.0	2.3	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	39	15	-	-	0.18	-
11.16	13.6	21.2	-	0.3	0.1	2.5	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	40	15	-	-	0.18	-
11.32	15.6	24.2	-	0.5	0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	42	15	-	-	0.18	-
11.48	15.5	24.0	-	0.5	0.2	3.6	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	44	15	-	-	0.18	-
11.65	14.8	22.7	-	0.5	0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	44	15	-	-	0.18	-
11.81	13.8	21.1	-	0.5	0.1	3.5	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	0.9	9.9	46	15	-	-	0.18	-
11.98	13.4	20.3	-	0.4	0.2	3.1	4	clayy SILT to silty CLAY	115	2.0	7	10	-	-	0.9	9.9	44	15	-	-	0.18	-
12.14	14.5	21.8	-	0.5	0.2	3.4	4	clayy SILT to silty CLAY	115	2.0	7	11	-	-	1.0	9.9	45	15	-	-	0.18	-
12.30	19.5	29.1	-	0.5	-0.4	2.9	4	clayy SILT to silty CLAY	115	2.0	10	15	-	-	1.3	9.9	37	15	-	-	0.18	-
12.47	15.9	23.7	-	0.6	-2.4	3.7	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	44	15	-	-	0.18	-
12.63	15.1	22.3	-	0.5	-2.4	3.3	4	clayy SILT to silty CLAY	115	2.0	8	11	-	-	1.0	9.9	43	15	-	-	0.18	-
12.80	14.1	20.7	-	0.5	-2.4	3.4	4	clayy SILT to silty CLAY	115	2.0	7	10	-	-	1.0	9.9	46	15	-	-	0.18	-
12.96	13.1	19.1	-	0.4	-2.3	3.2	4	clayy SILT to silty CLAY	115	2.0	7	10	-	-	0.9	9.3	46	15	-	-	0.18	-
13.12	12.4	17.9	-	0.4	-2.3	3.4	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	8.6	49	15	-	-	0.18	-
13.29	11.5	16.6	-	0.4	-2.3	3.5	3	silty CLAY to CLAY	115	1.5	8	11	-	-	0.8	7.9	51	15	-	-	0.18	-
13.45	12.2	17.4	-	0.4	-2.2	3.3	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	8.3	49	15	-	-	0.18	-
13.62	13.5	19.2	-	0.3	-2.2	2.7	4	clayy SILT to silty CLAY	115	2.0	7	10	-	-	0.9	9.1	44	15	-	-	0.18	-
13.78	12.9	18.2	-	0.4	-2.2	3.0	4	clayy SILT to silty CLAY	115	2.0	6	9	-	-	0.9	8.6	47	15	-	-	0.18	-
13.94	16.5	23.2	-	0.6	-2.2	3.6	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	44	15	-	-	0.18	-
14.11	17.8	24.8	-	0.9	-2.2	5.5	3	silty CLAY to CLAY	115	1.5	12	17	-	-	1.2	9.9	50	15	-	-	0.18	-
14.27	21.1	29.3	-	1.3	-2.3	6.4	3	silty CLAY to CLAY	115	1.5	14	20	-	-	1.5	9.9	50	15	-	-	0.18	-
14.44	26.8	36.9	-	1.6	-2.3	6.1	3	silty CLAY to CLAY	115	1.5	18	25	-	-	1.9	9.9	44	15	-	-	0.18	-
14.60	35.8	43.9	141.9	1.4	-3.6	4.0	4	clayy SILT to silty CLAY	115	2.0	18	22	-	-	2.5	9.9	35	15	1.24	-	0.18	51.2
14.76	34.1	38.6	115.0	1.0	-6.2	3.0	4	clayy SILT to silty CLAY	115	2.0	17	19	-	-	2.4	9.9	32	15	2.08	-	0.18	51.2
14.93	21.3	28.9	-	0.8	-6.3	3.7	4	clayy SILT to silty CLAY	115	2.0	11	14	-	-	1.5	9.9	41	15	-	-	0.17	-
15.09	16.2	21.8	-	0.6	-6.2	4.0	3	silty CLAY to CLAY	115	1.5	11	15	-	-	1.1	9.9	47	15	-	-	0.17	-
15.26	16.2	21.6	-	0.6	-6.1	4.2	3	silty CLAY to CLAY	115	1.5	11	14	-	-	1.1	9.9	48	15	-	-	0.17	-
15.42	12.3	16.3	-	0.4	-6.0	3.1	3	silty CLAY to CLAY	115	1.5	8	11	-	-	0.8	7.4	50	15	-	-	0.17	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(237).cpt
CPT Date: 4/30/2012 11:54:24 AM
GW During Test: 11 ft

Sounding ID: CPT-03
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.01	* Liq Stlmt 0.18	* Cycl SStn %
15.58	11.5	15.2	-	0.2	-5.9	1.4	4	clayy SILT to silty CLAY	115	2.0	6	8	-	-	0.8	6.9	41	15	-	-	0.17	-
15.75	8.2	10.8	-	0.1	-5.8	1.6	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.5	4.7	50	15	-	-	0.17	-
15.91	8.6	11.3	-	0.1	-5.7	1.3	4	clayy SILT to silty CLAY	115	2.0	4	6	-	-	0.6	4.9	46	15	-	-	0.17	-
16.08	7.2	9.3	-	0.1	-5.2	1.9	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.9	56	15	-	-	0.17	-
16.24	7.0	9.1	-	0.1	-4.9	1.3	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.5	3.8	52	15	-	-	0.17	-
16.40	6.7	8.6	-	0.1	-4.6	1.2	4	clayy SILT to silty CLAY	115	2.0	3	4	-	-	0.4	3.6	52	15	-	-	0.17	-
16.57	6.7	8.6	-	0.0	-4.3	0.9	4	clayy SILT to silty CLAY	115	2.0	3	4	-	-	0.4	3.5	49	15	-	-	0.17	-
16.73	6.4	8.1	-	0.0	-4.0	0.9	4	clayy SILT to silty CLAY	115	2.0	3	4	-	-	0.4	3.3	50	15	-	-	0.17	-
16.90	7.2	9.1	-	0.0	-3.8	0.7	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.5	3.8	46	15	-	-	0.17	-
17.06	8.1	10.2	-	0.1	-3.7	0.9	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.5	4.3	44	15	-	-	0.17	-
17.23	7.0	8.7	-	0.0	-3.5	0.4	1	sensitive fine SOIL	115	2.0	3	4	-	-	0.5	3.6	42	15	-	-	0.17	-
17.39	7.0	8.7	-	0.0	-3.5	0.4	4	clayy SILT to silty CLAY	115	2.0	4	4	-	-	0.5	3.6	42	15	-	-	0.17	-
17.55	6.9	8.5	-	0.1	-3.4	0.9	4	clayy SILT to silty CLAY	115	2.0	3	4	-	-	0.4	3.3	49	15	-	-	0.17	-
17.72	8.5	10.5	-	0.0	-3.3	0.7	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.6	4.4	41	15	-	-	0.17	-
17.88	7.2	8.8	-	0.0	-3.3	0.6	4	clayy SILT to silty CLAY	115	2.0	4	4	-	-	0.5	3.6	44	15	-	-	0.17	-
18.05	6.8	8.3	-	0.0	-3.2	0.1	1	sensitive fine SOIL	115	2.0	3	4	-	-	0.4	3.3	37	15	-	-	0.17	-
18.21	7.9	9.6	-	0.0	-3.2	0.7	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.5	3.9	43	15	-	-	0.17	-
18.37	10.5	11.2	33.8	0.0	-3.2	0.3	5	silty SAND to sandy SILT	120	4.0	3	3	5	30	-	-	33	16	5.68	-	0.17	51.2
18.54	9.9	11.1	-	0.0	-3.1	0.4	5	silty SAND to sandy SILT	120	4.0	2	3	5	29	-	-	36	16	-	-	0.16	-
18.70	10.7	12.8	-	0.1	-2.9	0.7	4	clayy SILT to silty CLAY	115	2.0	5	6	-	-	0.7	5.4	37	15	-	-	0.16	-
18.87	12.5	14.8	-	0.1	-3.0	1.1	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	6.3	38	15	-	-	0.16	-
19.03	13.5	15.9	-	0.2	-3.0	1.9	4	clayy SILT to silty CLAY	115	2.0	7	8	-	-	0.9	6.8	43	15	-	-	0.16	-
19.19	14.7	17.2	-	0.3	-2.7	2.4	4	clayy SILT to silty CLAY	115	2.0	7	9	-	-	1.0	7.4	45	15	-	-	0.16	-
19.36	15.0	17.5	-	0.2	-2.7	1.5	4	clayy SILT to silty CLAY	115	2.0	8	9	-	-	1.0	7.5	38	15	-	-	0.16	-
19.52	14.1	15.4	-	0.1	-2.7	1.0	4	clayy SILT to silty CLAY	115	2.0	7	8	-	-	1.0	7.0	36	15	-	-	0.16	-
19.69	12.1	14.0	-	0.2	-2.6	1.9	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	5.9	46	15	-	-	0.15	-
19.85	12.2	14.1	-	0.2	-2.6	1.8	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	5.9	46	15	-	-	0.15	-
20.01	12.1	13.9	-	0.2	-2.6	2.2	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	5.8	48	15	-	-	0.15	-
20.18	11.8	13.4	-	0.3	-2.6	2.5	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.5	51	15	-	-	0.15	-
20.34	11.9	13.5	-	0.3	-2.5	2.6	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.6	51	15	-	-	0.15	-
20.51	12.8	14.4	-	0.3	-2.5	2.3	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.9	6.0	48	15	-	-	0.15	-
20.67	12.8	14.3	-	0.3	-2.5	2.4	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.9	5.9	49	15	-	-	0.15	-
20.83	12.3	13.8	-	0.3	-2.5	2.3	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	5.6	49	15	-	-	0.15	-
21.00	11.7	13.1	-	0.2	-2.4	2.0	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	5.3	49	15	-	-	0.15	-
21.16	11.1	12.3	-	0.2	-2.4	1.6	4	clayy SILT to silty CLAY	115	2.0	6	6	-	-	0.7	5.0	47	15	-	-	0.15	-
21.33	11.1	12.2	-	0.2	-2.4	1.8	4	clayy SILT to silty CLAY	115	2.0	6	6	-	-	0.7	4.9	48	15	-	-	0.15	-
21.49	11.3	12.4	-	0.2	-2.4	2.2	4	clayy SILT to silty CLAY	115	2.0	6	6	-	-	0.8	5.0	51	15	-	-	0.15	-
21.65	11.5	12.5	-	0.3	-1.9	2.7	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.8	5.0	54	15	-	-	0.15	-
21.82	12.3	13.4	-	0.3	-1.9	2.5	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.4	51	15	-	-	0.15	-
21.98	12.5	13.6	-	0.3	-1.8	2.5	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.5	51	15	-	-	0.15	-
22.15	12.7	13.6	-	0.3	-1.8	2.7	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.5	52	15	-	-	0.15	-
22.31	13.0	13.9	-	0.3	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	9	9	-	-	0.9	5.6	52	15	-	-	0.15	-
22.47	13.5	14.4	-	0.3	-1.7	2.8	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	5.8	51	15	-	-	0.15	-
22.64	13.6	14.4	-	0.4	-1.7	2.9	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	5.8	51	15	-	-	0.15	-
22.80	14.1	14.9	-	0.4	-1.7	3.1	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	6.0	52	15	-	-	0.15	-
22.97	15.1	15.8	-	0.5	-1.7	3.9	3	silty CLAY to CLAY	115	1.5	10	11	-	-	1.0	6.4	54	15	-	-	0.15	-
23.13	18.0	18.8	-	0.5	-1.7	2.7	4	clayy SILT to silty CLAY	115	2.0	9	9	-	-	1.2	7.8	45	15	-	-	0.15	-
23.30	17.7	18.5	-	0.5	-1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	9	9	-	-	1.2	7.6	46	15	-	-	0.15	-
23.46	13.3	13.8	-	0.4	-1.5	3.3	3	silty CLAY to CLAY	115	1.5	9	9	-	-	0.9	5.5	55	15	-	-	0.15	-
23.62	12.8	13.2	-	0.5	-1.4	4.6	3	silty CLAY to CLAY	115	1.5	9	9	-	-	0.9	5.2	62	15	-	-	0.15	-
23.79	16.6	17.0	-	0.9	-1.4	6.2	3	silty CLAY to CLAY	115	1.5	11	11	-	-	1.1	6.9	61	15	-	-	0.15	-
23.95	42.6	41.9	135.0	1.5	-1.6	3.7	4	clayy SILT to silty CLAY	115	2.0	21	21	-	-	3.0	9.9	35	15	1.68	-	0.15	51.2
24.12	96.1	94.3	155.5	2.3	-2.5	2.4	5	silty SAND to sandy SILT	120	4.0	24	24	65	42	-	-	19	16	0.76	-	0.15	4.5
24.28	129.0	126.2	164.9	2.2	-6.6	1.7	6	clean SAND to silty SAND	125	5.0	26	25	75	43	-	-	13	16	0.00	-	0.14	0.0
24.44	131.5	128.3	156.0	1.8	-8.0	1.4	6	clean SAND to silty SAND	125	5.0	26	26	75	43	-	-	11	16	0.74	-	0.14	3.8
24.61	129.8	126.3	145.3	1.4	-8.8	1.1	6	clean SAND to silty SAND	125	5.0	26	25	75	43	-	-	9	16	1.21	-	0.14	5.9
24.77	128.9	125.2	145.4	1.4	-9.1	1.1	6	clean SAND to silty SAND	125	5.0	26	25	74	43	-	-	10	16	1.21	-	0.14	5.9
24.94	123.7	119.8	137.4	1.2	-8.2	1.0	6	clean SAND to silty SAND	125	5.0	25	24	73	43	-	-	9	16	1.58	-	0.14	8.6
25.10	118.5	114.4	125.4	0.9	-8.8	0.7	6	clean SAND to silty SAND	125	5.0	24	23	71	43	-	-	8	16	1.94	-	0.14	13.9
25.26	112.2	108.1	120.1	0.8	-8.9	0.7	6	clean SAND to silty SAND	125	5.0	22	22	70	42	-	-	8	16	2.01	-	0.13	14.8
25.43	100.1	96.2	111.6	0.8	-9.0	0.8	6	clean SAND to silty SAND	125	5.0	20	19	66	42	-	-	10	16	2.14	-	0.13	18.0
25.59	76.5	73.3	101.9	0.9	-8.8	1.2	5	silty SAND to sandy SILT	120	4.0	19	18	57	40	-	-	15	16	2.30	-	0.13	26.4
25.76	42.9	41.1	106.0	1.0	-8.6	2.4	5	silty SAND to sandy SILT	120	4.0	11	10	38	37	-	-	29	16	2.23	-	0.12	51.2
25.92	19.1	18.4	-	0.8	-8.4	4.5	3	silty CLAY to CLAY	115	1.5	13	12	-	-	1.3	7.3	53	15	-	-	0.12	-
26.08	12.5	12.0	-	0.3	-8.2	3.1	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.8	4.6	57	15	-	-	0.12	-
26.25	12.0	11.5	-	0.2	-8.1	1.6	4	clayy SILT to silty CLAY	115	2.0	6	6	-	-	0.8	4.3	49	15	-	-	0.12	-
26.41	12.1	11.6	-	0.2	-8.0	1.6	4	clayy SILT to silty CLAY	115	2.0	6	6	-	-	0.8	4.3	49	15	-	-	0.12	-
26.58	10.6	10.1	-	0.2	-8.0	2.0	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	3.7	56	15	-	-	0.12	-
26.74	10.0	9.4	-	0.2	-7.9	2.3	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.6	3.4	59	15	-	-	0.12	-
26.90	10.5	9.8	-	0.2	-7.9	2.1	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	3.6	57	15	-	-	0.12	-
27.07	11.1	10.4	-	0.2	-7.8	2.1	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	3.9	55	15	-	-	0.12	-
27.23	11.6	10.9	-	0.3	-7.9	2.7	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	4.0	58	15	-	-	0.12	-
27.40	15.1	14.1	-	0.4	-7.8	3.2	3	silty CLAY to CLAY	115	1.5	10	9	-	-	1.0	5.4	54	15	-	-	0.12	-
27.56	19.5	18.0	-	0.5	-7.8	2.5	4	clayy SILT to silty CLAY	115	2.0	10	9	-	-	1.3	7.1	45	15	-	-	0.12	-
27.72	13.4	12.4	-	0.5	-7.8	3.9	3	silty CLAY to CLAY	115	1.5	9	8	-	-	0.9	4.7	61	15	-	-	0.12	-
27.89	13.2	12.1	-	0.4	-7.8	3.0	3	silty CLAY to CLAY	115	1.5	9	8	-	-	0.9	4.5	57	15	-	-	0.12	-
28.05	13.6	12.5	-	0.4	-7.7	3.1	3	silty CLAY to CLAY	115	1.5	9	8	-	-	0.9	4.7	56	15	-	-	0.12	-
28.22	13.3	12.1	-	0.3	-7.5	3.0	3	silty CLAY to CLAY	115	1.5	9	8	-	-	0.9	4.5	57	15	-	-	0.12	-
28.38	12.3	11.2	-	0.3	-7.5	3.1	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	4.1	60	15	-	-	0.12	-
28.54	11.8	10.7	-	0.3	-7.5	3.1	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	3.9	61	15	-	-	0.12	-
28.71	12.5	11.3	-	0.6	-7.4	5.9	3	silty CLAY to CLAY	115	1.5	8	8	-	-	0.8	4.2	71	15	-	-	0.12	-
28.87	18.5	16.6	-	1.0	-7.4	6.0	3	silty CLAY to CLAY	115	1.5	12	11	-	-	1.2	6.4	61	15	-	-	0.12	-
29.04	33.0	29.6	-	1.1	-7.4	3.4	4	clayy SILT to silty CLAY	115	2.0	17	15	-	-	2.3	9.9	39	15	-	-	0.12	-
29.20	41.5	37.0	-	1.9	-7.7	4.7	3	silty CLAY to CLAY	115	1.5	28	25	-	-	2.9	9.9	40	15	-	-	0.12	-
29.36	48.9	43.4	-	2.2	-7.9	4.7	4	clayy SILT to silty CLAY	115	2.0	24	22	-	-	3.4	9.9	38	15	-	-	0.12	-
29.53	71.0	64.9	133.3	1.8	-8.5	2.6	5	silty SAND to sandy SILT	120	4.0	18	16	53	39	-	-	24	16	1.78	-	0.12	31.0
29.69	81.7	74.5	118.6	1.4	-9.6	1.7	5	silty SAND to sandy SILT	120	4.0	20	19	57	40	-	-	18	16	2.03	-	0.12	25.8
29.86	81.9	74.5	119.2	1.4	-10.6	1.7	5	silty SAND to sandy SILT	120	4.0	20	19	57	40	-	-	18	16	2.02	-	0.11	25.8
30.02	79.5	72.1	126.9	1.6	-10.6	2.1	5	silty SAND to sandy SILT	120	4.0	20	18	56	40	-	-	20	16	1.92	-	0.11	27.0
30.19	80.5	72.9	129.9	1.7	-10.7	2.2	5	silty SAND to sandy SILT	120	4.0	20	18	57	40	-	-	20	16	1.89	-	0.11	26.6
30.35	86.4	78.1	124.2	1.5	-10.7	1.8	5	silty SAND to sandy SILT	120	4.0	22	20	59	40	-	-	18	16	1.96	-	0.10	24.0
30.51	92.6	83.6	118.7	1.3	-10.8	1.4	5	silty SAND to sandy SILT	120	4.0	23	21	61	41	-	-	15	16	2.03	-	0.10	21.8
30.68	94.5	85.1	117.6	1.3	-10.8	1.4	5	silty SAND to sandy SILT	120	4.0	24	21	62	41	-	-	15	16	2.05	-	0.10	21.3
30.84	93.6	84.1	115.3	1.2	-10.8	1.3	5	silty SAND to sandy SILT	120	4.0	23	21	61	41	-	-	14	16	2.08	-	0.09	21.6

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

Project ID: Geolabs Westlake Village
Data File: SDF(237).cpt
CPT Date: 4/30/2012 11:54:24 AM
GW During Test: 11 ft

Sounding ID: CPT-03
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.01	* Liq Stlmt 0.18	* Cycl SStn %
31.01	94.1	84.4	115.2	1.2	-10.9	1.3	5	silty SAND to sandy SILT	120	4.0	24	21	61	41	-	-	14	16	2.08	-	0.09	21.5
31.17	91.9	82.2	117.7	1.3	-10.6	1.5	5	silty SAND to sandy SILT	120	4.0	23	21	61	40	-	-	15	16	2.04	-	0.09	22.3
31.33	89.7	80.1	115.7	1.3	-10.7	1.4	5	silty SAND to sandy SILT	120	4.0	22	20	60	40	-	-	16	16	2.07	-	0.08	23.1
31.50	90.8	80.9	110.5	1.1	-10.7	1.2	5	silty SAND to sandy SILT	120	4.0	23	20	60	40	-	-	14	16	2.15	-	0.08	22.7
31.66	92.4	82.1	103.7	0.9	-10.8	0.9	6	clean SAND to silty SAND	125	5.0	18	16	61	40	-	-	12	16	2.27	-	0.08	22.3
31.83	88.4	78.5	109.0	1.1	-10.8	1.3	5	silty SAND to sandy SILT	120	4.0	22	20	59	40	-	-	15	16	2.18	-	0.07	23.9
31.99	77.0	68.2	119.6	1.5	-10.8	1.9	5	silty SAND to sandy SILT	120	4.0	19	17	54	39	-	-	20	16	2.02	-	0.07	29.1
32.15	63.8	56.4	124.5	1.6	-10.8	2.5	5	silty SAND to sandy SILT	120	4.0	16	14	48	38	-	-	25	16	1.95	-	0.07	37.3
32.32	52.8	46.6	103.0	1.0	-10.8	2.0	5	silty SAND to sandy SILT	120	4.0	13	12	42	37	-	-	25	16	2.28	-	0.06	48.2
32.48	32.7	26.9	-	1.5	-10.8	4.8	3	silty CLAY to CLAY	115	1.5	22	18	-	-	2.2	9.9	47	15	-	-	0.06	-
32.65	19.9	16.3	-	1.6	-10.6	8.7	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	6.1	70	15	-	-	0.06	-
32.81	36.2	29.5	-	1.1	-10.8	3.3	4	clayy SILT to silty CLAY	115	2.0	18	15	-	-	2.5	9.9	39	15	-	-	0.06	-
32.97	48.1	42.2	103.0	1.0	-10.9	2.2	5	silty SAND to sandy SILT	120	4.0	12	11	39	36	-	-	28	16	2.28	-	0.06	51.2
33.14	50.3	43.9	104.6	1.1	-11.0	2.2	5	silty SAND to sandy SILT	120	4.0	13	11	40	37	-	-	27	16	2.25	-	0.06	51.2
33.30	46.0	40.2	117.6	1.3	-10.9	2.9	4	clayy SILT to silty CLAY	115	2.0	23	20	-	-	3.2	9.9	32	15	2.05	-	0.05	51.2
33.47	35.4	28.5	-	1.3	-10.9	4.0	4	clayy SILT to silty CLAY	115	2.0	18	14	-	-	2.4	9.9	42	15	-	-	0.05	-
33.63	23.2	18.6	-	1.1	-10.8	5.4	3	silty CLAY to CLAY	115	1.5	15	12	-	-	1.6	7.0	57	15	-	-	0.05	-
33.79	17.4	13.9	-	0.6	-10.8	3.8	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	5.1	57	15	-	-	0.05	-
33.96	17.6	14.0	-	0.2	-10.8	1.6	4	clayy SILT to silty CLAY	115	2.0	9	7	-	-	1.2	5.1	44	15	-	-	0.05	-
34.12	14.5	11.5	-	0.6	-10.8	4.9	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	4.1	67	15	-	-	0.05	-
34.29	30.4	24.0	-	0.8	-10.8	2.9	4	clayy SILT to silty CLAY	115	2.0	15	12	-	-	2.1	9.2	41	15	-	-	0.05	-
34.45	46.8	40.4	118.2	1.3	-10.9	3.0	4	clayy SILT to silty CLAY	115	2.0	23	20	-	-	3.2	9.9	32	15	2.04	-	0.05	51.2
34.61	41.1	32.2	-	1.2	-11.0	2.9	4	clayy SILT to silty CLAY	115	2.0	21	16	-	-	2.8	9.9	36	15	-	-	0.04	-
34.78	32.8	25.7	-	0.7	-10.9	2.3	4	clayy SILT to silty CLAY	115	2.0	16	13	-	-	2.2	9.8	36	15	-	-	0.04	-
34.94	26.5	20.7	-	0.9	-10.9	3.5	3	silty CLAY to CLAY	115	1.5	18	14	-	-	1.8	7.8	47	15	-	-	0.04	-
35.11	18.0	14.0	-	0.7	-10.8	4.3	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	5.1	59	15	-	-	0.04	-
35.27	14.0	10.9	-	0.4	-10.8	3.7	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.8	64	15	-	-	0.04	-
35.43	13.1	10.1	-	0.3	-10.7	2.5	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.5	59	15	-	-	0.04	-
35.60	13.4	10.3	-	0.2	-10.7	2.0	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.6	55	15	-	-	0.04	-
35.76	14.7	11.3	-	0.3	-10.6	2.3	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	3.9	55	15	-	-	0.04	-
35.93	15.4	11.8	-	0.6	-10.6	4.2	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	4.1	64	15	-	-	0.04	-
36.09	24.9	19.0	-	0.3	-10.6	1.5	4	clayy SILT to silty CLAY	115	2.0	12	9	-	-	1.7	7.1	37	15	-	-	0.04	-
36.26	28.6	21.7	-	0.6	-10.7	2.2	4	clayy SILT to silty CLAY	115	2.0	14	11	-	-	1.9	8.2	39	15	-	-	0.04	-
36.42	19.6	14.9	-	0.7	-10.6	4.2	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	5.4	58	15	-	-	0.04	-
36.58	22.4	16.9	-	0.9	-10.6	4.4	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.5	6.2	55	15	-	-	0.04	-
36.75	24.0	18.0	-	1.0	-10.6	4.8	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	6.6	55	15	-	-	0.04	-
36.91	23.9	17.9	-	1.0	-10.6	4.4	3	silty CLAY to CLAY	115	1.5	16	12	-	-	1.6	6.6	54	15	-	-	0.04	-
37.08	19.4	14.5	-	0.7	-10.5	4.3	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	5.2	58	15	-	-	0.04	-
37.24	16.5	12.3	-	0.5	-10.4	3.8	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.3	61	15	-	-	0.04	-
37.40	15.1	11.2	-	0.4	-10.3	3.3	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.9	61	15	-	-	0.04	-
37.57	14.2	10.5	-	0.2	-10.4	1.9	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	3.6	54	15	-	-	0.04	-
37.73	15.1	11.2	-	0.3	-10.3	2.3	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.8	55	15	-	-	0.04	-
37.90	15.7	11.6	-	0.4	-10.0	2.7	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	4.0	56	15	-	-	0.04	-
38.06	16.7	12.3	-	0.3	-10.0	2.3	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.3	53	15	-	-	0.04	-
38.22	15.5	11.4	-	0.3	-10.0	2.2	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	3.9	54	15	-	-	0.04	-
38.39	15.2	11.0	-	0.4	-9.9	2.9	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.8	59	15	-	-	0.04	-
38.55	14.3	10.4	-	0.4	-9.9	3.6	3	silty CLAY to CLAY	115	1.5	10	7	-	-	0.9	3.5	65	15	-	-	0.04	-
38.72	15.9	11.5	-	0.4	-9.9	3.0	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.0	4.0	59	15	-	-	0.04	-
38.88	15.7	11.3	-	0.4	-9.9	3.2	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	3.9	60	15	-	-	0.04	-
39.04	16.8	12.1	-	0.4	-9.9	2.8	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.2	56	15	-	-	0.04	-
39.21	17.1	12.3	-	0.4	-9.8	2.5	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.3	54	15	-	-	0.04	-
39.37	17.7	12.6	-	0.3	-9.8	2.1	4	clayy SILT to silty CLAY	115	2.0	9	6	-	-	1.2	4.4	51	15	-	-	0.04	-
39.54	16.7	11.9	-	0.4	-9.8	2.6	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.1	56	15	-	-	0.04	-
39.70	18.6	13.2	-	0.5	-9.8	3.2	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.6	56	15	-	-	0.04	-
39.86	23.5	16.6	-	0.6	-9.7	2.8	4	clayy SILT to silty CLAY	115	2.0	12	8	-	-	1.6	6.0	48	15	-	-	0.04	-
40.03	22.5	15.9	-	0.5	-9.7	2.5	4	clayy SILT to silty CLAY	115	2.0	11	8	-	-	1.5	5.7	47	15	-	-	0.04	-
40.19	18.5	13.0	-	0.5	-9.7	2.8	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.5	54	15	-	-	0.04	-
40.36	16.5	11.6	-	0.4	-9.6	2.8	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.0	57	15	-	-	0.04	-
40.52	16.4	11.5	-	0.4	-9.6	2.8	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.9	57	15	-	-	0.04	-
40.68	17.6	12.3	-	0.4	-9.5	2.6	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	4.2	54	15	-	-	0.04	-
40.85	17.6	12.3	-	0.3	-9.5	2.3	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	4.2	53	15	-	-	0.04	-
41.01	17.6	12.2	-	0.5	-9.5	3.0	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	4.2	57	15	-	-	0.04	-
41.18	19.9	13.8	-	0.5	-9.2	2.6	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.8	52	15	-	-	0.04	-
41.34	19.7	13.6	-	0.4	-9.2	2.1	4	clayy SILT to silty CLAY	115	2.0	10	7	-	-	1.3	4.7	49	15	-	-	0.04	-
41.50	19.2	13.2	-	0.6	-9.1	3.4	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.6	57	15	-	-	0.04	-
41.67	21.7	14.8	-	1.1	-9.1	5.9	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	5.2	64	15	-	-	0.04	-
41.83	38.7	26.4	-	1.7	-9.1	4.6	3	silty CLAY to CLAY	115	1.5	26	18	-	-	2.6	9.8	46	15	-	-	0.04	-
42.00	48.2	32.8	-	1.5	-9.3	3.2	4	clayy SILT to silty CLAY	115	2.0	24	16	-	-	3.3	9.9	37	15	-	-	0.04	-
42.16	48.5	38.8	69.1	0.4	-9.3	0.9	5	silty SAND to sandy SILT	120	4.0	12	10	36	35	-	-	20	16	3.16	-	0.04	51.2
42.32	37.3	25.3	-	1.2	-9.3	3.4	4	clayy SILT to silty CLAY	115	2.0	19	13	-	-	2.6	9.4	42	15	-	-	0.04	-
42.49	28.1	19.0	-	1.3	-9.2	5.2	3	silty CLAY to CLAY	115	1.5	19	13	-	-	1.9	6.9	55	15	-	-	0.04	-
42.65	56.7	45.2	85.5	0.7	-9.3	1.4	5	silty SAND to sandy SILT	120	4.0	14	11	41	36	-	-	22	16	2.66	-	0.04	49.8
42.82	49.7	39.6	106.9	1.2	-9.4	2.5	4	clayy SILT to silty CLAY	115	2.0	25	20	-	-	3.4	9.9	30	15	2.21	-	0.04	51.2
42.98	28.9	19.3	-	1.3	-9.3	5.1	3	silty CLAY to CLAY	115	1.5	19	13	-	-	2.0	7.0	55	15	-	-	0.03	-
43.15	25.9	17.3	-	1.4	-9.1	6.2	3	silty CLAY to CLAY	115	1.5	17	12	-	-	1.7	6.2	61	15	-	-	0.03	-
43.31	32.7	21.7	-	1.3	-9.1	4.4	3	silty CLAY to CLAY	115	1.5	22	14	-	-	2.2	7.9	50	15	-	-	0.03	-
43.47	39.7	26.3	-	1.4	-9.2	3.7	4	clayy SILT to silty CLAY	115	2.0	20	13	-	-	2.7	9.7	43	15	-	-	0.03	-
43.64	44.9	29.7	-	1.7	-9.2	4.1	4	clayy SILT to silty CLAY	115	2.0	22	15	-	-	3.1	9.9	42	15	-	-	0.03	-
43.80	53.1	41.9	124.9	1.6	-9.2	3.2	4	clayy SILT to silty CLAY	115	2.0	27	21	-	-	3.7	9.9	33	15	1.95	-	0.03	51.2
43.97	70.9	55.8	103.9	1.2	-9.3	1.7	5	silty SAND to sandy SILT	120	4.0	18	14	48	37	-	-	21	16	2.27	-	0.03	37.9
44.13	66.7	52.5	109.2	1.3	-9.3	2.1	5	silty SAND to sandy SILT	120	4.0	17	13	46	37	-	-	24	16	2.17	-	0.02	41.4
44.29	44.4	29.0	-	1.1	-9.0	2.5	4	clayy SILT to silty CLAY	115	2.0	22	15	-	-	3.0	9.9	36	15	-	-	0.02	-
44.46	26.2	17.1	-	1.0	-8.9	4.1	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.8	6.0	54	15	-	-	0.02	-
44.62	19.6	12.7	-	0.7	-8.8	4.1	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	4.3	61	15	-	-	0.02	-
44.79	21.5	13.9	-	0.5	-8.7	2.8	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	4.8	53	15	-	-	0.02	-
44.95	18.9	12.2	-	0.5	-8.7	3.0	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.2	4.1	57	15	-	-	0.02	-
45.11	19.5	12.6	-	0.5	-8.7	3.0	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	4.3	56	15	-	-	0.02	-
45.28	22.4	14.4	-	1.2	-8.6	6.1	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	5.0	65	15	-	-	0.02	-
45.44	36.5	23.4	-	2.2	-8.7	6.5	3	silty CLAY to CLAY	115	1.5	24	16	-	-	2.5	8.5	55	15	-	-	0.02	-
45.61	55.9	35.8	-	2.8	-8.9	5.3	3	silty CLAY to CLAY	115	1.5	37	24	-	-	3.9	9.9	43	15	-	-	0.02	-
45.77	61.2	39.0	-	2.2	-8.9	3.7	4	clayy SILT to silty CLAY	115	2.0	31	20	-	-	4.2	9.9	36	15	-	-	0.02	-
45.93	56.9	44.1	129.4	1.8	-9.0	3.3	4	clayy SILT to silty CLAY	115	2.0	28	22	-	-	3.9	9.9	32	15	1.85	-	0.02	51.2
46.10	48.1	30.5	-	2.7	-9.0	6.0	3	silty CLAY to CLAY	115	1.5	32	20	-	-	3.3	9.9	48	15	-	-	0.02	-
46.26	48.7	30.8	-	3.6	-8.9	7.7	3	silty CLAY to CLAY	115	1.5	32	21	-	-	3.4	9.9	53	15	-	-	0.02	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(237).cpt
CPT Date: 4/30/2012 11:54:24 AM
GW During Test: 11 ft

Sounding ID: CPT-03
Project No: 9279
Cone/Rig: DSG0906

. . Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.01	* Liq Stlmt 0.18	* Cycl SStn %
46.43	105.0	81.0	151.3	2.7	-9.2	2.6	5	silty SAND to sandy SILT	120	4.0	26	20	60	39	-	-	22	16	0.96	-	0.02	7.1
46.59	178.7	137.7	158.7	2.1	-9.7	1.2	6	clean SAND to silty SAND	125	5.0	36	28	78	42	-	-	9	16	0.73	-	0.02	3.8
46.75	215.3	165.5	183.8	2.5	-10.0	1.2	6	clean SAND to silty SAND	125	5.0	43	33	84	43	-	-	8	16	0.00	-	0.02	0.0
46.92	218.7	167.9	189.1	2.8	-10.1	1.3	6	clean SAND to silty SAND	125	5.0	44	34	84	43	-	-	9	16	0.00	-	0.02	0.0
47.08	208.3	159.7	174.3	2.2	-10.0	1.1	6	clean SAND to silty SAND	125	5.0	42	32	82	43	-	-	8	16	0.00	-	0.02	0.0
47.25	199.9	152.9	161.5	1.7	-9.9	0.8	6	clean SAND to silty SAND	125	5.0	40	31	81	42	-	-	7	16	0.00	-	0.02	0.0
47.41	184.5	141.0	144.7	1.2	-8.8	0.7	6	clean SAND to silty SAND	125	5.0	37	28	78	42	-	-	6	16	1.33	-	0.02	6.2
47.57	186.7	142.4	142.4	1.0	-8.9	0.5	6	clean SAND to silty SAND	125	5.0	37	28	79	42	-	-	5	16	1.44	-	0.01	6.7
47.74	181.3	138.1	140.0	1.1	-9.0	0.6	6	clean SAND to silty SAND	125	5.0	36	28	78	42	-	-	5	16	1.54	-	0.01	7.5
47.90	176.0	133.8	139.0	1.1	-9.0	0.7	6	clean SAND to silty SAND	125	5.0	35	27	77	42	-	-	6	16	1.58	-	0.01	8.0
48.07	167.6	127.3	134.4	1.1	-9.1	0.7	6	clean SAND to silty SAND	125	5.0	34	25	75	41	-	-	7	16	1.76	-	0.01	10.1
48.23	166.1	125.9	136.0	1.2	-9.2	0.8	6	clean SAND to silty SAND	125	5.0	33	25	75	41	-	-	7	16	1.69	-	0.00	9.5
48.39	206.0	155.9	220.2	5.2	-9.8	2.6	5	silty SAND to sandy SILT	120	4.0	52	39	82	43	-	-	15	16	0.00	-	0.00	0.0
48.56	271.2	205.0	236.6	4.6	-11.2	1.7	6	clean SAND to silty SAND	125	5.0	54	41	91	44	-	-	9	16	0.00	-	0.00	0.0
48.72	259.8	196.1	217.2	3.5	-8.7	1.4	6	clean SAND to silty SAND	125	5.0	52	39	89	44	-	-	8	16	0.00	-	0.00	0.0
48.89	266.6	200.8	200.8	1.6	-8.8	0.6	6	clean SAND to silty SAND	125	5.0	53	40	90	44	-	-	5	16	0.00	-	0.00	0.0
49.05	232.2	174.7	187.2	2.4	-8.4	1.1	6	clean SAND to silty SAND	125	5.0	46	35	85	43	-	-	7	16	0.00	-	0.00	0.0
49.22	209.6	157.5	174.3	2.3	-7.6	1.1	6	clean SAND to silty SAND	125	5.0	42	31	82	43	-	-	8	16	0.00	-	0.00	0.0
49.38	204.2	153.1	171.8	2.3	-7.6	1.2	6	clean SAND to silty SAND	125	5.0	41	31	81	42	-	-	9	16	0.00	-	0.00	0.0
49.54	246.9	184.9	184.9	1.8	-8.9	0.7	6	clean SAND to silty SAND	125	5.0	49	37	87	43	-	-	5	16	0.00	-	0.00	0.0
49.71	232.0	173.5	176.1	1.8	-9.4	0.8	6	clean SAND to silty SAND	125	5.0	46	35	85	43	-	-	6	16	0.00	-	0.00	0.0
49.87	215.0	160.5	163.6	1.6	-9.9	0.7	6	clean SAND to silty SAND	125	5.0	43	32	83	43	-	-	6	16	0.00	-	0.00	0.0

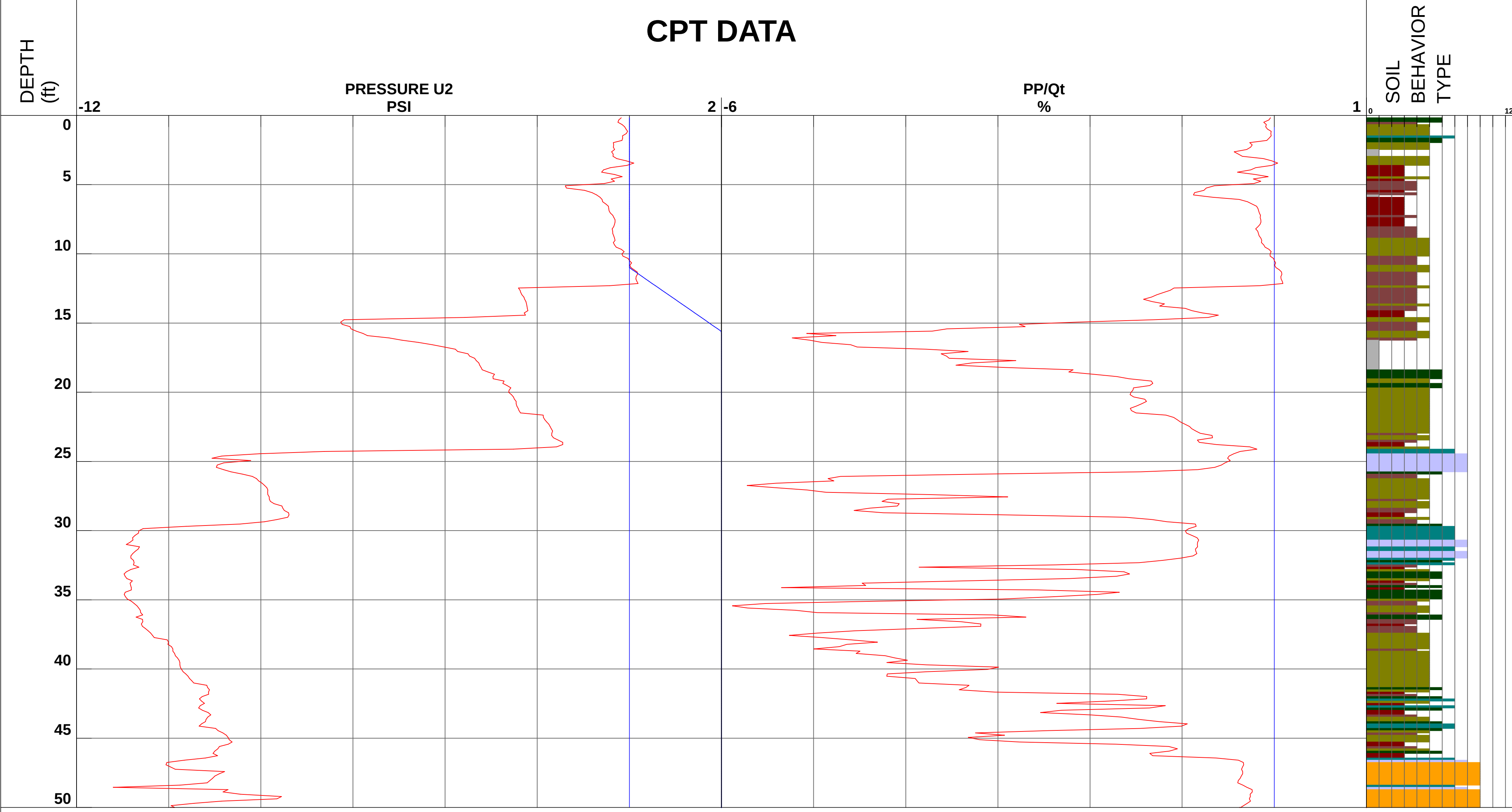
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(237).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-03	Date and Time	4/30/2012 11:54:24 AM	Maximum Depth	50.20 ft
Water Table Depth	11.00 ft				

Net Area Ratio .8

CPT DATA



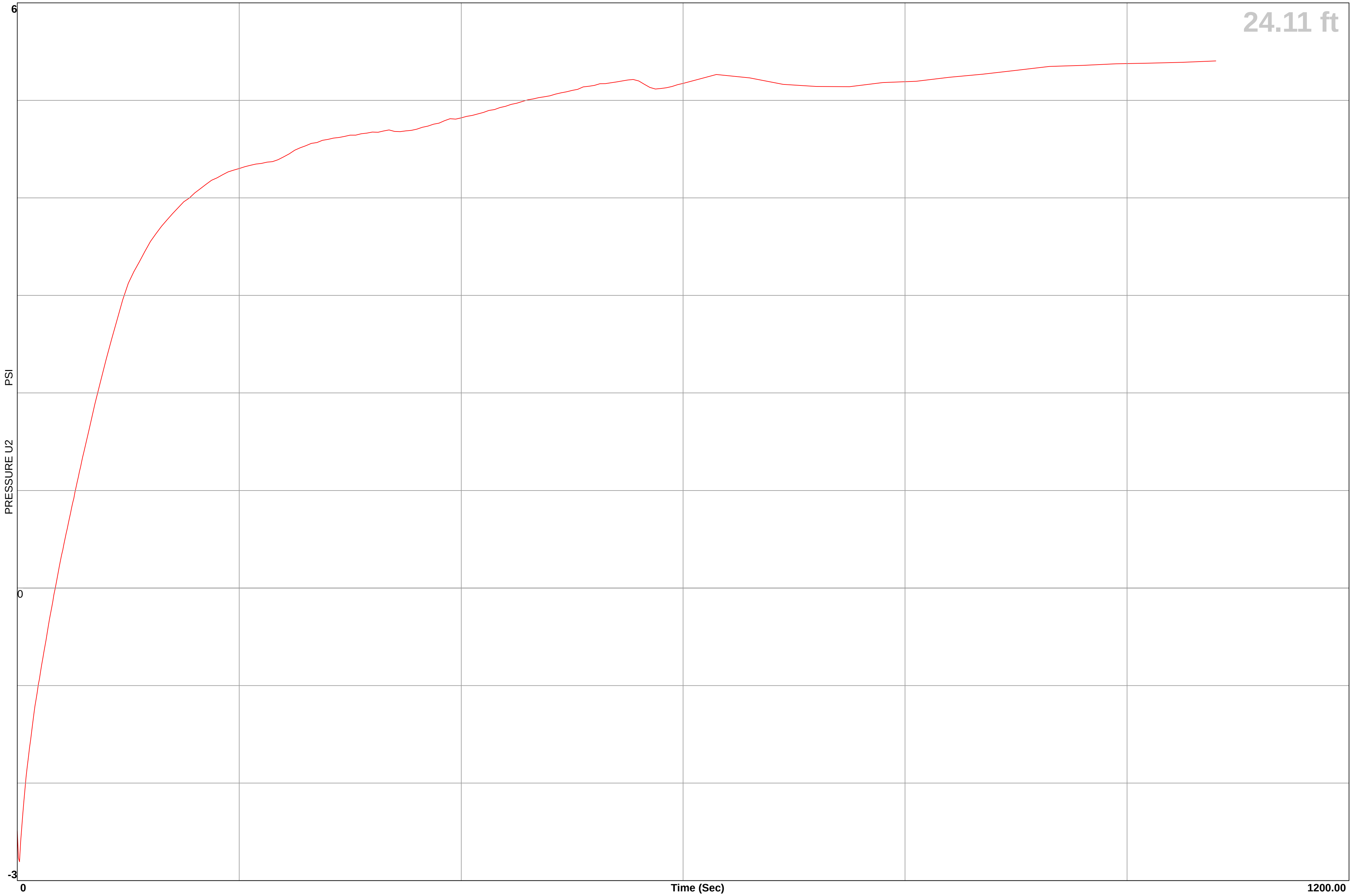
1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 10cm squared

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

Geolabs Westlake Village

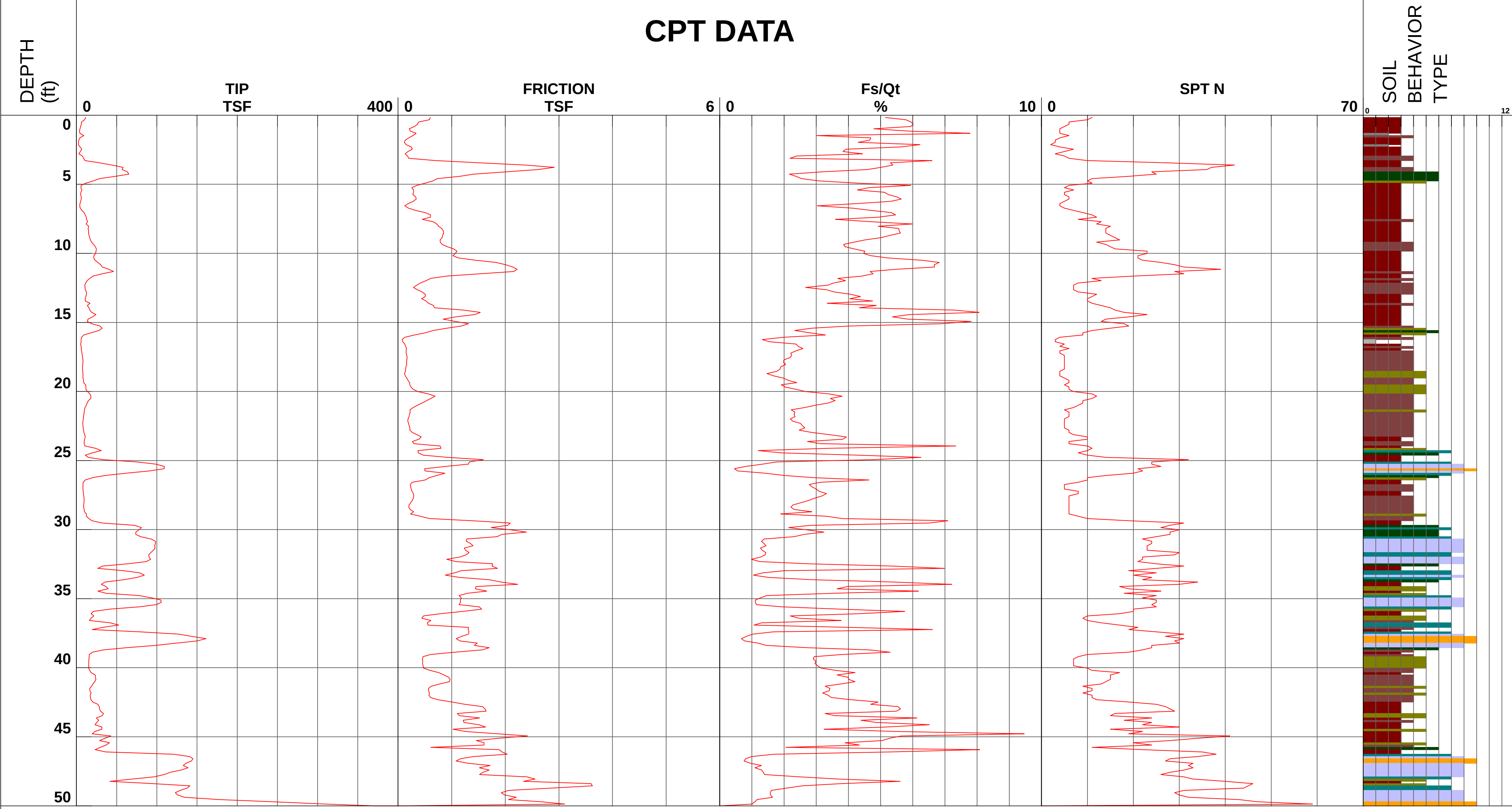
Location	SMC Library	Operator	RA/JC		
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-03	Date and Time	4/30/2012 11:54:24 AM		
Equilized Pressure	5.3	Ground Water Depth	11.6		



Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(238).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-04	Date and Time	4/30/2012 12:54:02 PM	Maximum Depth	50.20 ft
Water Table Depth	12.00 ft				

Net Area Ratio .8



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

Cone Size 10cm squared

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

SMC Library

Project ID: Geolabs Westlake Village
Data File: SDF(238).cpt
CPT Date: 4/30/2012 12:54:02 PM
GW During Test: 12 ft

Page: 1
Sounding ID: CPT-04
Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.22	* Cycl SStn %
0.33	10.1	16.2	-	0.6	0.1	5.8	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	59	15	N/A	0.00	N/A	N/A
0.49	6.4	10.3	-	0.4	-0.1	6.0	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.5	9.9	70	15	N/A	0.00	N/A	N/A
0.66	6.0	9.6	-	0.4	4.1	6.1	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.9	73	15	N/A	0.00	N/A	N/A
0.82	5.2	8.3	-	0.3	4.8	6.0	3	silty CLAY to CLAY	115	1.5	3	6	-	-	0.4	9.9	76	15	N/A	0.00	N/A	N/A
0.98	4.4	7.0	-	0.2	5.5	4.9	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	77	15	N/A	0.00	N/A	N/A
1.15	3.9	6.3	-	0.2	5.7	6.0	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.9	85	15	N/A	0.00	N/A	N/A
1.31	4.3	6.9	-	0.3	-1.3	7.9	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	88	15	N/A	0.00	N/A	N/A
1.48	9.2	14.8	-	0.3	0.1	3.0	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.9	50	15	N/A	0.00	N/A	N/A
1.64	4.2	6.8	-	0.2	0.1	4.8	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	78	15	N/A	0.00	N/A	N/A
1.80	2.9	4.7	-	0.1	0.0	4.8	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	9.0	89	15	N/A	0.00	N/A	N/A
1.97	2.7	4.4	-	0.1	0.0	4.5	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	7.6	90	15	N/A	0.00	N/A	N/A
2.13	2.4	3.9	-	0.2	0.2	6.6	2	Organic SOILS - Peats	100	1.0	2	4	-	-	0.2	6.2	95	10	N/A	0.00	N/A	N/A
2.30	4.4	7.0	-	0.2	0.3	5.8	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	81	15	N/A	0.00	N/A	N/A
2.46	6.8	10.9	-	0.3	0.5	4.0	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	9.9	62	15	N/A	0.00	N/A	N/A
2.62	4.8	7.8	-	0.2	0.6	4.0	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	9.9	70	15	N/A	0.00	N/A	N/A
2.79	3.0	4.8	-	0.1	0.6	4.7	3	silty CLAY to CLAY	115	1.5	2	3	-	-	0.2	5.8	89	15	N/A	0.00	N/A	N/A
2.95	7.4	11.8	-	0.2	0.6	2.4	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	52	15	N/A	0.00	N/A	N/A
3.12	9.0	14.5	-	0.2	0.8	2.2	4	clayy SILT to silty CLAY	115	2.0	5	7	-	-	0.6	9.9	46	15	N/A	0.00	N/A	N/A
3.28	10.7	17.1	-	0.7	0.8	6.7	3	silty CLAY to CLAY	115	1.5	7	11	-	-	0.7	9.9	61	15	-	-	0.22	-
3.45	28.4	45.6	-	1.5	1.1	5.3	3	silty CLAY to CLAY	115	1.5	19	30	-	-	2.0	9.9	38	15	-	-	0.22	-
3.61	44.2	70.8	210.4	2.4	0.7	5.4	4	clayy SILT to silty CLAY	115	2.0	22	35	-	-	3.1	9.9	32	15	0.00	-	0.22	0.0
3.77	58.1	93.2	231.0	2.9	-0.1	5.0	9	very stiff fine SOIL	120	2.0	29	47	65	46	-	-	28	30	0.00	-	0.22	0.0
3.94	56.9	91.3	216.6	2.6	-1.7	4.6	9	very stiff fine SOIL	120	2.0	28	46	64	46	-	-	27	30	0.00	-	0.22	0.0
4.10	63.3	101.6	186.2	2.0	-2.5	3.2	5	silty SAND to sandy SILT	120	4.0	16	25	68	46	-	-	21	16	0.00	-	0.22	0.0
4.27	65.2	104.5	158.0	1.4	-1.7	2.2	5	silty SAND to sandy SILT	120	4.0	16	26	68	46	-	-	17	16	0.15	-	0.22	1.0
4.43	48.7	78.1	139.5	1.2	0.7	2.4	5	silty SAND to sandy SILT	120	4.0	12	20	59	45	-	-	21	16	0.48	-	0.22	2.5
4.59	28.8	46.1	113.6	0.7	0.5	2.6	5	silty SAND to sandy SILT	120	4.0	7	12	41	42	-	-	28	16	2.05	-	0.22	48.7
4.76	21.0	33.7	111.2	0.6	0.4	3.1	4	clayy SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	35	15	2.13	-	0.22	51.2
4.92	11.5	18.5	-	0.5	0.5	4.4	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	9.9	52	15	-	-	0.22	-
5.09	5.9	9.4	-	0.3	0.4	6.3	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	7.9	75	15	-	-	0.22	-
5.25	5.5	8.9	-	0.3	0.4	4.9	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	7.3	72	15	-	-	0.22	-
5.41	6.8	10.9	-	0.3	0.5	4.5	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	8.9	64	15	-	-	0.22	-
5.58	5.6	9.0	-	0.3	-0.2	5.4	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	7.1	73	15	-	-	0.22	-
5.74	5.3	8.5	-	0.3	-1.7	5.6	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	6.5	76	15	-	-	0.22	-
5.91	6.0	9.6	-	0.3	-2.1	5.8	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	7.4	73	15	-	-	0.22	-
6.07	6.0	9.6	-	0.3	-2.0	6.0	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	7.2	74	15	-	-	0.22	-
6.23	5.3	8.5	-	0.3	-1.9	5.7	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	6.2	76	15	-	-	0.22	-
6.40	4.4	7.1	-	0.2	-1.6	4.6	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	5.0	78	15	-	-	0.22	-
6.56	4.1	6.6	-	0.1	-1.4	3.3	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	4.5	74	15	-	-	0.22	-
6.73	4.7	7.6	-	0.2	-1.3	4.5	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	5.2	75	15	-	-	0.22	-
6.89	6.9	11.1	-	0.3	-1.2	5.0	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	7.7	66	15	-	-	0.22	-
7.05	9.5	15.3	-	0.5	-1.1	5.6	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	9.9	61	15	-	-	0.22	-
7.22	11.1	17.8	-	0.6	-1.1	5.7	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	57	15	-	-	0.22	-
7.38	12.2	19.6	-	0.6	-1.0	5.1	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	53	15	-	-	0.22	-
7.55	12.6	20.2	-	0.5	-1.0	3.7	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.9	9.9	47	15	-	-	0.22	-
7.71	14.0	22.4	-	0.7	-1.0	4.8	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	50	15	-	-	0.22	-
7.87	12.1	19.4	-	0.7	-0.7	6.2	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	57	15	-	-	0.22	-
8.04	15.4	24.6	-	0.8	-0.7	5.1	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	49	15	-	-	0.22	-
8.20	14.6	23.5	-	0.8	-0.7	5.7	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	52	15	-	-	0.22	-
8.37	15.1	24.2	-	0.8	-0.7	5.8	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	51	15	-	-	0.22	-
8.53	15.1	24.3	-	0.8	-0.6	5.8	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	51	15	-	-	0.22	-
8.69	15.7	25.2	-	0.8	-0.6	5.5	3	silty CLAY to CLAY	115	1.5	10	17	-	-	1.1	9.9	49	15	-	-	0.22	-
8.86	16.4	26.3	-	0.8	-0.6	5.2	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.1	9.9	48	15	-	-	0.22	-
9.02	17.4	27.9	-	0.8	-0.6	4.7	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	45	15	-	-	0.22	-
9.19	18.8	30.2	-	0.8	-0.6	4.3	3	silty CLAY to CLAY	115	1.5	13	20	-	-	1.3	9.9	42	15	-	-	0.22	-
9.35	21.3	34.2	-	0.8	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	11	17	-	-	1.5	9.9	39	15	-	-	0.22	-
9.51	23.6	37.8	-	0.9	-0.5	4.0	4	clayy SILT to silty CLAY	115	2.0	12	19	-	-	1.6	9.9	37	15	-	-	0.22	-
9.68	24.9	39.9	-	1.0	-0.5	4.3	4	clayy SILT to silty CLAY	115	2.0	12	20	-	-	1.7	9.9	37	15	-	-	0.22	-
9.84	24.4	39.1	-	1.1	-0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	12	20	-	-	1.7	9.9	39	15	-	-	0.22	-
10.01	23.9	38.3	-	1.1	-0.4	4.6	4	clayy SILT to silty CLAY	115	2.0	12	19	-	-	1.7	9.9	39	15	-	-	0.22	-
10.17	21.8	35.0	-	1.0	-0.4	4.8	3	silty CLAY to CLAY	115	1.5	15	23	-	-	1.5	9.9	41	15	-	-	0.22	-
10.34	21.6	34.6	-	1.1	-0.3	5.4	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	43	15	-	-	0.22	-
10.50	23.1	37.0	-	1.4	-0.3	6.4	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	45	15	-	-	0.22	-
10.66	26.8	42.9	-	1.8	-0.2	7.0	3	silty CLAY to CLAY	115	1.5	18	29	-	-	1.9	9.9	44	15	-	-	0.22	-
10.83	30.1	48.3	-	2.0	-0.5	6.8	3	silty CLAY to CLAY	115	1.5	20	32	-	-	2.1	9.9	42	15	-	-	0.22	-
10.99	32.1	50.7	-	2.1	-0.6	6.8	3	silty CLAY to CLAY	115	1.5	21	34	-	-	2.2	9.9	41	15	-	-	0.22	-
11.16	40.5	54.3	-	2.2	-2.0	5.6	4	clayy SILT to silty CLAY	115	2.0	20	27	-	-	2.8	9.9	37	15	-	-	0.22	-
11.32	46.2	55.5	174.1	2.2	-2.3	4.7	4	clayy SILT to silty CLAY	115	2.0	23	28	-	-	3.2	9.9	34	15	0.00	-	0.22	0.0
11.48	32.0	48.4	-	1.5	-2.6	4.9	4	clayy SILT to silty CLAY	115	2.0	16	24	-	-	2.2	9.9	36	15	-	-	0.22	-
11.65	20.6	30.7	-	0.9	-2.7	4.6	3	silty CLAY to CLAY	115	1.5	14	20	-	-	1.4	9.9	43	15	-	-	0.22	-
11.81	16.6	24.5	-	0.6	-2.6	3.8	4	clayy SILT to silty CLAY	115	2.0	8	12	-	-	1.1	9.9	44	15	-	-	0.22	-
11.98	13.3	19.3	-	0.5	-2.6	4.1	3	silty CLAY to CLAY	115	1.5	9	13	-	-	0.9	9.9	50	15	-	-	0.22	-
12.14	11.8	17.0	-	0.4	-2.6	3.8	3	silty CLAY to CLAY	115	1.5	8	11	-	-	0.8	8.8	51	15	-	-	0.22	-
12.30	10.4	14.9	-	0.3	-2.6	3.6	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.6	54	15	-	-	0.22	-
12.47	10.7	15.3	-	0.3	-2.6	2.9	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.7	49	15	-	-	0.22	-
12.63	10.9	15.5	-	0.4	-2.6	3.6	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.8	53	15	-	-	0.22	-
12.80	12.6	17.7	-	0.4	-2.5	3.8	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.9	9.0	51	15	-	-	0.22	-
12.96	12.5	17.4	-	0.5	-2.5	4.3	3	silty CLAY to CLAY	115	1.5	8	12	-	-	0.8	8.8	53	15	-	-	0.22	-
13.12	11.6	16.1	-	0.5	-2.2	4.7	3	silty CLAY to CLAY	115	1.5	8	11	-	-	0.8	8.1	57	15	-	-	0.22	-
13.29	10.9	15.0	-	0.4	-2.1	4.4	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.5	57	15	-	-	0.22	-
13.45	11.0	15.0	-	0.5	-2.1	5.1	3	silty CLAY to CLAY	115	1.5	7	10	-	-	0.7	7.4	60	15	-	-	0.22	-
13.62	17.0	23.2	-	0.6	-2.1	3.5	4	clayy SILT to silty CLAY	115	2.0	9	12	-	-	1.2	9.9	44	15	-	-	0.22	-
13.78	13.6	18.4	-	0.7	-2.1	5.2	3	silty CLAY to CLAY	115	1.5	9	12	-	-	0.9	9.2	55	15	-	-	0.22	-
13.94	15.6	21.1	-	0.7	-2.0	4.6	3	silty CLAY to CLAY	115	1.5	10	14	-	-	1.1	9.9	50	15	-	-	0.22	-
14.11	16.7	22.4	-	1.2	-1.9	7.6	3	silty CLAY to CLAY	115	1.5	11	15	-	-	1.1	9.9	59	15	-	-	0.22	-
14.27	19.0	25.4	-	1.5	-1.9	8.4	3	silty CLAY to CLAY	115	1.5	13	17	-	-	1.3	9.9	58	15	-	-	0.22	-
14.44	24.3	32.2	-	1.4	-1.3	6.1	3	silty CLAY to CLAY	115	1.5	16	21	-	-	1.7	9.9	47	15	-	-	0.22	-
14.60	20.1	26.5	-	1.1	-1.4	5.6	3	silty CLAY to CLAY	115	1.5	13	18	-	-	1.4	9.9	49	15	-	-	0.22	-
14.76	14.4	18.8	-	0.8	-1.4	6.2	3	silty CLAY to CLAY	115	1.5	10	13	-	-	1.0	9.2	58	15	-	-	0.22	-
14.93	13.6	17.7	-	1.1	-1.3	8.3	3	silty CLAY to CLAY	115	1.5	9	12	-	-	0.9	8.6	66	15	-	-	0.22	-
15.09	19.0	24.7	-	1.3	-1.3	7.2	3	silty CLAY to CLAY	115	1.5	13	16	-	-	1.3	9.9	55	15	-	-	0.22	-
15.26	29.4	37.9	-	1.2	-1.3	4.1	4	clayy SILT to silty CLAY	115	2.0	15	19	-	-	2.0	9.9	38	15	-	-	0.22	-
15.42	32.0	35.2	110.3	0.9	-2.0	2.9	4	clayy SILT to silty CLAY	115	2.0	16	18	-	-	2.2	9.9	34	15	2.16	-	0.22	51.2

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

Middle Earth Geo Testing

Project ID: Geolabs Westlake Village
Data File: SDF(238).cpt
CPT Date: 4/30/2012 12:54:02 PM
GW During Test: 12 ft

Sounding ID: CPT-04
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.22	* Cycl SStn %
15.58	28.1	30.8	95.0	0.7	-2.3	2.4	4	clayy SILT to silty CLAY	115	2.0	14	15	-	-	1.9	9.9	33	15	2.44	-	0.21	51.2
15.75	18.3	23.2	-	0.5	-2.5	2.9	4	clayy SILT to silty CLAY	115	2.0	9	12	-	-	1.3	9.9	41	15	-	-	0.21	-
15.91	9.3	11.7	-	0.3	-2.6	3.6	3	silty CLAY to CLAY	115	1.5	6	8	-	-	0.6	5.4	60	15	-	-	0.21	-
16.08	6.4	8.0	-	0.1	-2.6	2.3	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.5	64	15	-	-	0.21	-
16.24	5.8	7.2	-	0.1	-2.6	1.6	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.0	61	15	-	-	0.21	-
16.40	5.8	7.2	-	0.1	-2.6	1.8	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.0	63	15	-	-	0.21	-
16.57	5.3	6.5	-	0.1	-2.6	2.9	3	silty CLAY to CLAY	115	1.5	4	4	-	-	0.3	2.7	74	15	-	-	0.21	-
16.73	5.8	7.1	-	0.1	-2.5	2.9	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.0	71	15	-	-	0.21	-
16.90	6.0	7.3	-	0.2	-2.5	3.1	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.0	72	15	-	-	0.21	-
17.06	6.4	7.7	-	0.2	-2.5	2.8	3	silty CLAY to CLAY	115	1.5	4	5	-	-	0.4	3.2	68	15	-	-	0.21	-
17.23	6.9	8.3	-	0.2	-2.5	2.6	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.4	3.5	64	15	-	-	0.21	-
17.39	7.3	8.8	-	0.2	-2.5	2.6	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.8	63	15	-	-	0.21	-
17.55	7.7	9.2	-	0.2	-2.5	2.5	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.9	61	15	-	-	0.21	-
17.72	8.2	9.8	-	0.2	-2.3	2.3	3	silty CLAY to CLAY	115	1.5	5	7	-	-	0.5	4.2	58	15	-	-	0.21	-
17.88	8.1	9.6	-	0.2	-2.3	2.3	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	4.1	58	15	-	-	0.21	-
18.05	7.9	9.3	-	0.2	-2.3	2.4	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	4.0	60	15	-	-	0.21	-
18.21	7.7	9.0	-	0.1	-2.3	2.2	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.8	60	15	-	-	0.21	-
18.37	7.6	8.8	-	0.1	-2.3	2.2	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.7	60	15	-	-	0.21	-
18.54	7.8	9.1	-	0.1	-2.3	2.1	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.8	58	15	-	-	0.21	-
18.70	8.2	9.4	-	0.1	-2.2	1.7	4	clayy SILT to silty CLAY	115	2.0	4	5	-	-	0.5	4.0	54	15	-	-	0.21	-
18.87	8.1	9.3	-	0.1	-2.2	1.9	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.9	57	15	-	-	0.21	-
19.03	8.2	9.4	-	0.2	-2.2	2.3	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.9	59	15	-	-	0.21	-
19.19	8.8	10.0	-	0.2	-2.2	2.4	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	4.2	58	15	-	-	0.21	-
19.36	9.0	10.2	-	0.2	-2.1	2.7	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	4.3	60	15	-	-	0.21	-
19.52	11.4	12.9	-	0.2	-2.0	2.1	4	clayy SILT to silty CLAY	115	2.0	6	6	-	-	0.8	5.6	50	15	-	-	0.21	-
19.69	11.9	13.3	-	0.2	-2.0	2.3	4	clayy SILT to silty CLAY	115	2.0	6	7	-	-	0.8	5.7	50	15	-	-	0.21	-
19.85	11.9	13.3	-	0.3	-2.0	2.6	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.7	52	15	-	-	0.21	-
20.01	13.8	15.3	-	0.4	-2.0	2.9	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	6.7	50	15	-	-	0.21	-
20.18	16.6	18.3	-	0.6	-2.0	3.6	3	silty CLAY to CLAY	115	1.5	11	12	-	-	1.1	8.1	50	15	-	-	0.21	-
20.34	18.1	19.9	-	0.7	-1.9	4.1	3	silty CLAY to CLAY	115	1.5	12	13	-	-	1.2	8.8	50	15	-	-	0.21	-
20.51	17.8	19.4	-	0.6	-1.9	3.7	3	silty CLAY to CLAY	115	1.5	12	13	-	-	1.2	8.6	48	15	-	-	0.21	-
20.67	14.9	16.2	-	0.5	-1.9	3.9	3	silty CLAY to CLAY	115	1.5	10	11	-	-	1.0	7.0	54	15	-	-	0.21	-
20.83	13.4	14.5	-	0.5	-1.6	3.7	3	silty CLAY to CLAY	115	1.5	9	10	-	-	0.9	6.2	55	15	-	-	0.21	-
21.00	12.3	13.2	-	0.4	-1.6	3.3	3	silty CLAY to CLAY	115	1.5	8	9	-	-	0.8	5.6	56	15	-	-	0.21	-
21.16	10.7	11.4	-	0.3	-1.6	3.0	3	silty CLAY to CLAY	115	1.5	7	8	-	-	0.7	4.8	58	15	-	-	0.21	-
21.33	10.0	10.7	-	0.2	-1.6	2.5	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	4.4	57	15	-	-	0.21	-
21.49	9.7	10.3	-	0.2	-1.6	2.7	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	4.2	59	15	-	-	0.21	-
21.65	9.3	9.8	-	0.2	-1.6	2.7	3	silty CLAY to CLAY	115	1.5	6	7	-	-	0.6	4.0	60	15	-	-	0.21	-
21.82	8.8	9.3	-	0.2	-1.5	2.7	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.7	62	15	-	-	0.21	-
21.98	8.5	8.9	-	0.2	-1.5	2.6	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.5	63	15	-	-	0.21	-
22.15	8.0	8.4	-	0.2	-1.5	2.7	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.3	65	15	-	-	0.21	-
22.31	7.8	8.1	-	0.2	-1.5	3.0	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	3.1	68	15	-	-	0.21	-
22.47	8.1	8.3	-	0.2	-1.5	3.1	3	silty CLAY to CLAY	115	1.5	5	6	-	-	0.5	3.2	68	15	-	-	0.21	-
22.64	8.4	8.7	-	0.2	-1.5	3.1	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.5	3.4	67	15	-	-	0.21	-
22.80	8.9	9.1	-	0.2	-1.5	2.9	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.6	64	15	-	-	0.21	-
22.97	9.3	9.5	-	0.3	-1.4	3.3	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.7	65	15	-	-	0.21	-
23.13	10.3	10.5	-	0.4	-1.4	3.9	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	4.2	65	15	-	-	0.21	-
23.30	11.0	11.1	-	0.4	-1.4	4.5	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	4.5	66	15	-	-	0.21	-
23.46	10.2	10.3	-	0.4	-1.4	4.4	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	4.1	68	15	-	-	0.21	-
23.62	9.8	9.8	-	0.3	-1.3	3.2	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.6	3.9	63	15	-	-	0.21	-
23.79	9.5	9.5	-	0.3	-1.3	3.6	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.7	67	15	-	-	0.21	-
23.95	10.7	10.6	-	0.8	-1.3	8.4	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	4.2	81	15	-	-	0.21	-
24.12	23.6	23.4	-	0.8	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	12	12	-	-	1.6	9.9	44	15	-	-	0.21	-
24.28	30.9	29.8	69.9	0.4	-1.3	1.3	5	silty SAND to sandy SILT	120	4.0	8	7	27	35	-	-	27	16	3.13	-	0.21	51.2
24.44	19.7	19.4	-	0.4	-0.6	2.1	4	clayy SILT to silty CLAY	115	2.0	10	10	-	-	1.3	8.2	40	15	-	-	0.20	-
24.61	10.9	10.7	-	0.5	-0.6	5.0	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	4.2	69	15	-	-	0.20	-
24.77	14.8	14.4	-	0.9	-0.5	6.9	3	silty CLAY to CLAY	115	1.5	10	10	-	-	1.0	5.9	68	15	-	-	0.20	-
24.94	33.4	32.4	-	1.6	-0.4	5.0	3	silty CLAY to CLAY	115	1.5	22	22	-	-	2.3	9.9	43	15	-	-	0.20	-
25.10	75.4	72.0	118.5	1.3	-1.2	1.8	5	silty SAND to sandy SILT	120	4.0	19	18	56	40	-	-	19	16	2.03	-	0.20	27.1
25.26	98.7	94.0	124.9	1.3	-2.3	1.4	6	clean SAND to silty SAND	125	5.0	20	19	65	42	-	-	14	16	1.95	-	0.20	18.6
25.43	109.5	104.0	118.8	0.9	-3.3	0.8	6	clean SAND to silty SAND	125	5.0	22	21	68	42	-	-	9	16	2.03	-	0.20	15.9
25.59	109.1	103.4	107.8	0.5	-5.2	0.5	6	clean SAND to silty SAND	125	5.0	22	21	68	42	-	-	6	16	2.20	-	0.19	16.1
25.76	91.2	86.3	96.7	0.5	-5.5	0.6	6	clean SAND to silty SAND	125	5.0	18	17	62	41	-	-	9	16	2.40	-	0.19	21.0
25.92	62.0	58.5	97.5	0.9	-5.4	1.4	5	silty SAND to sandy SILT	120	4.0	16	15	49	39	-	-	19	16	2.39	-	0.19	35.3
26.08	35.7	33.6	92.4	0.7	-5.3	2.1	4	clayy SILT to silty CLAY	115	2.0	18	17	-	-	2.5	9.9	31	15	2.49	-	0.18	51.2
26.25	19.9	18.6	-	0.6	-3.6	3.2	3	silty CLAY to CLAY	115	1.5	13	12	-	-	1.4	7.7	47	15	-	-	0.18	-
26.41	10.9	10.2	-	0.5	-3.9	5.4	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	3.9	73	15	-	-	0.18	-
26.58	8.4	7.8	-	0.3	-3.8	3.8	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.8	74	15	-	-	0.18	-
26.74	8.2	7.6	-	0.2	-3.7	3.4	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	2.7	73	15	-	-	0.18	-
26.90	8.2	7.5	-	0.2	-3.6	3.5	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	2.7	74	15	-	-	0.18	-
27.07	8.2	7.5	-	0.2	-3.6	3.7	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	2.7	75	15	-	-	0.18	-
27.23	8.4	7.7	-	0.3	-3.5	3.8	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.5	2.8	75	15	-	-	0.18	-
27.40	8.6	7.9	-	0.3	-3.3	4.1	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	2.8	75	15	-	-	0.18	-
27.56	9.2	8.3	-	0.3	-3.3	3.8	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.0	72	15	-	-	0.18	-
27.72	9.6	8.7	-	0.3	-3.2	3.5	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.2	69	15	-	-	0.18	-
27.89	9.6	8.6	-	0.3	-3.2	3.3	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.2	68	15	-	-	0.18	-
28.05	9.4	8.4	-	0.2	-3.1	3.0	3	silty CLAY to CLAY	115	1.5	6	6	-	-	0.6	3.0	68	15	-	-	0.18	-
28.22	9.0	8.0	-	0.2	-3.1	2.8	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	2.9	68	15	-	-	0.18	-
28.38	9.0	8.0	-	0.2	-3.0	2.7	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	2.9	67	15	-	-	0.18	-
28.54	9.8	8.7	-	0.2	-3.0	2.8	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.6	3.1	65	15	-	-	0.18	-
28.71	10.1	8.9	-	0.3	-2.9	3.4	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	3.3	68	15	-	-	0.18	-
28.87	12.4	10.9	-	0.2	-2.8	2.2	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	4.1	55	15	-	-	0.18	-
29.04	12.4	10.8	-	0.4	-2.7	3.8	3	silty CLAY to CLAY	115	1.5	8	7	-	-	0.8	4.1	64	15	-	-	0.18	-
29.20	15.5	13.5	-	0.6	-2.6	4.3	3	silty CLAY to CLAY	115	1.5	10	9	-	-	1.0	5.2	60	15	-	-	0.18	-
29.36	19.4	16.9	-	1.4	-2.5	7.8	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	6.7	66	15	-	-	0.18	-
29.53	32.1	27.7	-	2.1	-2.4	6.9	3	silty CLAY to CLAY	115	1.5	21	18	-	-	2.2	9.9	52	15	-	-	0.18	-
29.69	72.5	65.4	142.5	2.0	-2.5	2.9	5	silty SAND to sandy SILT	120	4.0	18	16	53	39	-	-	25	16	1.41	-	0.18	27.1
29.86	81.0	72.9	130.5	1.7	-3.5	2.2	5	silty SAND to sandy SILT	120	4.0	20	18	57	40	-	-	21	16	1.88	-	0.18	26.6
30.02	77.9	69.9	143.2	2.1	-4.5	2.7	5	silty SAND to sandy SILT	120	4.0	19	17	55	40	-	-	24	16	1.39	-	0.17	22.2
30.19	73.9	66.3	154.4	2.4	-2.4	3.3	4	clayy SILT to silty CLAY	115	2.0	37	33	-	-	5.2	9.9	27	15	0.88	-	0.17	8.6
30.35	73.7	66.0	137.7	1.9	-5.3	2.7	5	silty SAND to sandy SILT	120	4.0	18	16	53	39	-	-	24	16	1.63	-	0.17	29.8
30.51	79.9	71.4	133.8	1.8	-6.4	2.4	5	silty SAND to sandy SILT	120	4.0	20	18	56	40	-	-	22	16	1.78	-	0.17	27.4
30.68	92.9	82.8	116.9	1.3	-5.8	1.4	5	silty SAND to sandy SILT	120	4.0	23	21	61	41	-	-	15	16	2.06	-	0.16	22.1
30.84	98.3	87.4	118.4	1.3	-6.3	1.3	5	silty SAND to sandy SILT	120	4.0	25	22	63	41	-	-	14	16	2.03	-	0.16	20.6

* 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.

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Project ID: Geolabs Westlake Village
Data File: SDF(238).cpt
CPT Date: 4/30/2012 12:54:02 PM
GW During Test: 12 ft

Sounding ID: CPT-04
Project No: 9279
Cone/Rig: DSG0906

. . Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.22	* Cycl SStn %
31.01	98.3	87.3	120.5	1.4	-6.4	1.4	5	silty SAND to sandy SILT	120	4.0	25	22	63	41	-	-	15	16	2.01	-	0.16	20.6
31.17	97.2	86.1	121.4	1.4	-6.5	1.5	5	silty SAND to sandy SILT	120	4.0	24	22	62	41	-	-	15	16	1.99	-	0.15	21.0
31.33	97.9	86.5	116.7	1.2	-6.7	1.3	5	silty SAND to sandy SILT	120	4.0	24	22	62	41	-	-	14	16	2.06	-	0.15	20.9
31.50	95.7	84.5	116.5	1.3	-6.8	1.3	5	silty SAND to sandy SILT	120	4.0	24	21	61	41	-	-	14	16	2.06	-	0.15	21.5
31.66	92.6	81.5	117.3	1.3	-6.9	1.5	5	silty SAND to sandy SILT	120	4.0	23	20	60	40	-	-	16	16	2.05	-	0.14	22.5
31.83	89.9	79.0	114.7	1.3	-6.9	1.4	5	silty SAND to sandy SILT	120	4.0	22	20	59	40	-	-	16	16	2.09	-	0.14	23.6
31.99	90.4	79.3	110.9	1.2	-7.1	1.3	5	silty SAND to sandy SILT	120	4.0	23	20	59	40	-	-	15	16	2.15	-	0.14	23.5
32.15	92.3	80.8	104.0	0.9	-7.1	1.0	6	clean SAND to silty SAND	125	5.0	18	16	60	40	-	-	13	16	2.26	-	0.13	22.7
32.32	87.0	76.0	107.4	1.1	-7.2	1.3	5	silty SAND to sandy SILT	120	4.0	22	19	58	40	-	-	15	16	2.20	-	0.13	25.1
32.48	64.1	55.9	131.7	1.8	-7.2	2.8	5	silty SAND to sandy SILT	120	4.0	16	14	48	38	-	-	27	16	1.84	-	0.13	37.8
32.65	32.5	26.1	-	1.8	-7.2	5.7	3	silty CLAY to CLAY	115	1.5	22	17	-	-	2.2	9.9	50	15	-	-	0.12	-
32.81	26.6	21.3	-	1.9	-7.1	7.5	3	silty CLAY to CLAY	115	1.5	18	14	-	-	1.8	8.4	60	15	-	-	0.12	-
32.97	58.5	50.8	108.0	1.2	-7.1	2.1	5	silty SAND to sandy SILT	120	4.0	15	13	45	38	-	-	25	16	2.19	-	0.12	43.3
33.14	78.9	68.3	103.8	1.1	-7.3	1.4	5	silty SAND to sandy SILT	120	4.0	20	17	54	39	-	-	17	16	2.27	-	0.12	29.1
33.30	84.4	72.9	99.2	0.9	-7.3	1.1	6	clean SAND to silty SAND	125	5.0	17	15	57	40	-	-	14	16	2.35	-	0.12	26.6
33.47	75.4	65.0	106.3	1.1	-7.3	1.6	5	silty SAND to sandy SILT	120	4.0	19	16	53	39	-	-	19	16	2.22	-	0.11	30.9
33.63	58.8	50.6	130.0	1.7	-7.3	3.0	4	clayy SILT to silty CLAY	115	2.0	29	25	-	-	4.1	9.9	29	15	1.88	-	0.11	43.5
33.79	35.5	27.8	-	1.9	-7.3	5.7	3	silty CLAY to CLAY	115	1.5	24	19	-	-	2.4	9.9	49	15	-	-	0.10	-
33.96	30.9	24.1	-	2.2	-7.3	7.7	3	silty CLAY to CLAY	115	1.5	21	16	-	-	2.1	9.5	58	15	-	-	0.10	-
34.12	36.6	28.4	-	1.5	-7.4	4.2	3	silty CLAY to CLAY	115	1.5	24	19	-	-	2.5	9.9	43	15	-	-	0.10	-
34.29	39.6	30.7	-	1.4	-7.5	3.8	4	clayy SILT to silty CLAY	115	2.0	20	15	-	-	2.7	9.9	40	15	-	-	0.10	-
34.45	26.7	20.7	-	1.7	-7.7	6.7	3	silty CLAY to CLAY	115	1.5	18	14	-	-	1.8	8.0	58	15	-	-	0.10	-
34.61	36.8	28.3	-	1.3	-7.8	3.7	4	clayy SILT to silty CLAY	115	2.0	18	14	-	-	2.5	9.9	41	15	-	-	0.10	-
34.78	78.1	66.5	105.7	1.1	-7.8	1.5	5	silty SAND to sandy SILT	120	4.0	20	17	54	39	-	-	18	16	2.23	-	0.10	30.1
34.94	93.6	79.5	110.8	1.2	-7.9	1.3	5	silty SAND to sandy SILT	120	4.0	23	20	59	40	-	-	15	16	2.15	-	0.10	23.4
35.11	105.2	89.2	114.6	1.2	-7.9	1.1	6	clean SAND to silty SAND	125	5.0	21	18	63	41	-	-	13	16	2.09	-	0.10	20.1
35.27	105.4	89.2	114.6	1.2	-8.0	1.1	6	clean SAND to silty SAND	125	5.0	21	18	63	41	-	-	13	16	2.09	-	0.09	20.1
35.43	99.6	84.1	111.3	1.1	-8.0	1.2	6	clean SAND to silty SAND	125	5.0	20	17	61	40	-	-	13	16	2.14	-	0.09	21.6
35.60	78.0	65.7	118.8	1.5	-8.0	2.0	5	silty SAND to sandy SILT	120	4.0	19	16	53	39	-	-	21	16	2.03	-	0.09	30.5
35.76	41.8	31.3	-	1.6	-7.9	3.9	4	clayy SILT to silty CLAY	115	2.0	21	16	-	-	2.9	9.9	40	15	-	-	0.08	-
35.93	20.9	15.7	-	1.2	-8.0	6.4	3	silty CLAY to CLAY	115	1.5	14	10	-	-	1.4	5.9	64	15	-	-	0.08	-
36.09	18.3	13.7	-	0.8	-8.0	4.9	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	5.0	62	15	-	-	0.08	-
36.26	21.6	16.1	-	0.5	-7.9	2.4	4	clayy SILT to silty CLAY	115	2.0	11	8	-	-	1.5	6.0	47	15	-	-	0.08	-
36.42	18.1	13.4	-	0.4	-7.9	2.8	3	silty CLAY to CLAY	115	1.5	12	9	-	-	1.2	4.9	53	15	-	-	0.08	-
36.58	16.2	12.0	-	0.6	-7.9	4.3	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.3	64	15	-	-	0.08	-
36.75	41.8	34.8	77.4	0.5	-8.0	1.4	5	silty SAND to sandy SILT	120	4.0	10	9	32	35	-	-	26	16	2.88	-	0.08	51.2
36.91	52.5	43.7	77.2	0.6	-8.0	1.1	5	silty SAND to sandy SILT	120	4.0	13	11	40	36	-	-	20	16	2.89	-	0.08	51.2
37.08	32.8	23.9	-	1.3	-8.0	4.3	3	silty CLAY to CLAY	115	1.5	22	16	-	-	2.2	9.2	47	15	-	-	0.07	-
37.24	19.8	14.4	-	1.3	-8.0	7.4	3	silty CLAY to CLAY	115	1.5	13	10	-	-	1.3	5.3	69	15	-	-	0.07	-
37.40	79.5	65.8	111.1	1.3	-7.9	1.7	5	silty SAND to sandy SILT	120	4.0	20	16	53	39	-	-	19	16	2.14	-	0.07	30.5
37.57	127.9	105.6	126.5	1.3	-8.0	1.0	6	clean SAND to silty SAND	125	5.0	26	21	69	41	-	-	11	16	1.93	-	0.07	15.5
37.73	143.3	118.2	131.8	1.2	-8.0	0.8	6	clean SAND to silty SAND	125	5.0	29	24	73	42	-	-	8	16	1.86	-	0.07	12.9
37.90	161.1	132.6	139.0	1.1	-8.2	0.7	6	clean SAND to silty SAND	125	5.0	32	27	76	42	-	-	6	16	1.61	-	0.06	8.4
38.06	150.1	123.3	134.4	1.2	-8.0	0.8	6	clean SAND to silty SAND	125	5.0	30	25	74	42	-	-	8	16	1.78	-	0.06	11.0
38.22	124.5	102.1	128.1	1.5	-7.9	1.2	6	clean SAND to silty SAND	125	5.0	25	20	68	41	-	-	12	16	1.91	-	0.06	16.4
38.39	98.5	80.6	117.2	1.4	-7.7	1.5	5	silty SAND to sandy SILT	120	4.0	25	20	60	40	-	-	16	16	2.05	-	0.06	22.8
38.55	62.4	51.0	126.7	1.7	-7.5	2.8	4	clayy SILT to silty CLAY	115	2.0	31	26	-	-	4.3	9.9	28	15	1.92	-	0.05	43.0
38.72	33.8	23.9	-	1.6	-7.6	5.0	3	silty CLAY to CLAY	115	1.5	23	16	-	-	2.3	9.1	49	15	-	-	0.05	-
38.88	20.1	14.1	-	1.1	-7.6	6.0	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	5.1	66	15	-	-	0.05	-
39.04	16.0	11.3	-	0.6	-7.5	4.4	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.0	66	15	-	-	0.05	-
39.21	15.8	11.0	-	0.5	-7.4	3.4	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.0	3.9	62	15	-	-	0.05	-
39.37	15.7	10.9	-	0.5	-7.3	3.4	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.8	62	15	-	-	0.05	-
39.54	15.4	10.7	-	0.5	-7.3	3.5	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.7	63	15	-	-	0.05	-
39.70	15.4	10.7	-	0.5	-7.3	3.5	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.7	63	15	-	-	0.05	-
39.86	15.3	10.6	-	0.5	-7.3	3.6	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.7	64	15	-	-	0.05	-
40.03	15.1	10.4	-	0.5	-7.2	3.7	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	3.6	65	15	-	-	0.05	-
40.19	16.6	11.4	-	0.6	-7.2	4.2	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	4.0	65	15	-	-	0.05	-
40.36	18.0	12.4	-	0.8	-7.2	4.8	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	4.4	65	15	-	-	0.05	-
40.52	23.4	16.0	-	0.9	-6.9	4.1	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.6	5.8	55	15	-	-	0.05	-
40.68	23.7	16.1	-	0.9	-6.9	4.4	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.6	5.9	56	15	-	-	0.05	-
40.85	24.2	16.5	-	1.0	-6.9	4.4	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.6	6.0	56	15	-	-	0.05	-
41.01	22.8	15.4	-	1.0	-6.8	4.7	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	5.6	59	15	-	-	0.05	-
41.18	20.6	13.9	-	0.8	-6.8	4.3	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	5.0	59	15	-	-	0.05	-
41.34	19.0	12.8	-	0.6	-6.7	3.7	3	silty CLAY to CLAY	115	1.5	13	9	-	-	1.3	4.5	59	15	-	-	0.05	-
41.50	16.6	11.1	-	0.6	-6.7	4.0	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	3.8	65	15	-	-	0.05	-
41.67	16.7	11.2	-	0.6	-6.6	4.0	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	3.9	64	15	-	-	0.05	-
41.83	18.3	12.2	-	0.6	-6.5	3.7	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	4.3	60	15	-	-	0.05	-
42.00	17.1	11.4	-	0.6	-6.4	3.9	3	silty CLAY to CLAY	115	1.5	11	8	-	-	1.1	3.9	64	15	-	-	0.05	-
42.16	17.5	11.6	-	0.6	-6.4	4.0	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.1	4.0	64	15	-	-	0.05	-
42.32	18.2	12.0	-	0.7	-6.3	4.7	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	4.2	65	15	-	-	0.05	-
42.49	20.4	13.4	-	1.0	-6.3	5.6	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	4.8	66	15	-	-	0.05	-
42.65	26.6	17.5	-	1.2	-6.2	5.2	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.8	6.4	57	15	-	-	0.05	-
42.82	28.4	18.7	-	1.6	-6.2	6.1	3	silty CLAY to CLAY	115	1.5	19	12	-	-	1.9	6.9	59	15	-	-	0.05	-
42.98	28.8	18.9	-	1.6	-6.1	6.2	3	silty CLAY to CLAY	115	1.5	19	13	-	-	1.9	6.9	59	15	-	-	0.05	-
43.15	29.9	19.5	-	1.6	-6.1	6.0	3	silty CLAY to CLAY	115	1.5	20	13	-	-	2.0	7.2	57	15	-	-	0.05	-
43.31	33.7	21.9	-	1.1	-6.0	3.5	4	clayy SILT to silty CLAY	115	2.0	17	11	-	-	2.3	8.2	46	15	-	-	0.05	-
43.47	32.1	20.8	-	1.1	-6.1	3.9	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.2	7.7	48	15	-	-	0.05	-
43.64	24.8	16.0	-	1.5	-6.0	6.8	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	5.8	65	15	-	-	0.05	-
43.80	27.7	17.9	-	1.2	-5.4	4.8	3	silty CLAY to CLAY	115	1.5	18	12	-	-	1.9	6.5	55	15	-	-	0.05	-
43.97	25.2	16.2	-	1.2	-5.4	5.4	3	silty CLAY to CLAY	115	1.5	17	11	-	-	1.7	5.9	60	15	-	-	0.05	-
44.13	23.2	14.9	-	1.5	-5.3	7.3	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	5.3	68	15	-	-	0.05	-
44.29	31.7	20.3	-	1.6	-5.2	5.6	3	silty CLAY to CLAY	115	1.5	21	14	-	-	2.1	7.5	55	15	-	-	0.05	-
44.46	31.6	20.2	-	1.0	-5.2	3.5	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.1	7.4	47	15	-	-	0.05	-
44.62	22.9	14.6	-	1.3	-5.2	6.2	3	silty CLAY to CLAY	115	1.5	15	10	-	-	1.5	5.2	66	15	-	-	0.05	-
44.79	19.7	12.5	-	1.9	-5.1	9.9	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	4.3	80	15	-	-	0.05	-
44.95	42.8	27.1	-	2.4	-5.0	6.0	3	silty CLAY to CLAY	115	1.5	29	18	-	-	2.9	9.9	50	15	-	-	0.05	-
45.11	35.5	22.4	-	1.9	-5.1	5.7	3	silty CLAY to CLAY	115	1.5	24	15	-	-	2.4	8.3	53	15	-	-	0.05	-
45.28	28.9	18.2	-	1.5	-5.1	5.6	3	silty CLAY to CLAY	115	1.5	19	12	-	-	2.0	6.6	58	15	-	-	0.05	-
45.44	41.2	25.8	-	1.6	-5.0	4.2	3	silty CLAY to CLAY	115	1.5	27	17	-	-	2.8	9.7	45	15	-	-	0.05	-
45.61	36.9	23.1	-	1.6	-5.2	4.7	3	silty CLAY to CLAY	115	1.5	25	15	-	-	2.5	8.6	49	15	-	-	0.05	-
45.77	29.8	18.6	-	0.6	-5.1	2.3	4	clayy SILT to silty CLAY	115	2.0	15	9	-	-	2.0	6.8	43	15	-	-	0.05	-
45.93	23.3	14.5	-	1.9	-5.0	9.1	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	5.1	74	15	-	-	0.05	-
46.10	36.6	22.7	-	1.9	-4.8	5.7	3	silty CLAY to CLAY	115	1.5	24	15	-	-	2.5	8.4	53	15	-	-	0.05	-
46.26	120.6	92.2	134.5	2.0	-5.3	1.7	5	silty SAND to sandy SILT	120	4.0	30	23	64	40	-	-	16	16	1.74	-	0.05	17.9

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

Middle Earth Geo Testing

Project ID: Geolabs Westlake Village
Data File: SDF(238).cpt
CPT Date: 4/30/2012 12:54:02 PM
GW During Test: 12 ft

Sounding ID: CPT-04
Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.22	* Cycl SStn %
46.43	140.9	107.5	127.6	1.4	-5.3	1.0	6	clean SAND to silty SAND	125	5.0	28	22	69	41	-	-	10	16	1.91	-	0.05	15.0
46.59	145.0	110.5	124.7	1.2	-5.4	0.8	6	clean SAND to silty SAND	125	5.0	29	22	70	41	-	-	9	16	1.95	-	0.04	14.4
46.75	143.0	108.8	121.8	1.1	-5.6	0.8	6	clean SAND to silty SAND	125	5.0	29	22	70	41	-	-	9	16	1.99	-	0.04	14.7
46.92	136.1	103.4	123.0	1.3	-5.9	1.0	6	clean SAND to silty SAND	125	5.0	27	21	68	41	-	-	10	16	1.97	-	0.04	16.1
47.08	132.8	100.7	130.1	1.7	-4.4	1.3	6	clean SAND to silty SAND	125	5.0	27	20	67	40	-	-	13	16	1.88	-	0.03	16.6
47.25	138.8	105.1	128.2	1.5	-5.0	1.1	6	clean SAND to silty SAND	125	5.0	28	21	69	41	-	-	11	16	1.91	-	0.03	15.6
47.41	130.1	98.4	128.5	1.7	-5.6	1.3	6	clean SAND to silty SAND	125	5.0	26	20	66	40	-	-	13	16	1.90	-	0.03	17.4
47.57	117.0	88.4	121.3	1.6	-5.9	1.4	5	silty SAND to sandy SILT	120	4.0	29	22	63	40	-	-	14	16	1.99	-	0.02	20.3
47.74	109.2	82.3	117.3	1.5	-6.1	1.4	5	silty SAND to sandy SILT	120	4.0	27	21	61	39	-	-	15	16	2.05	-	0.02	22.2
47.90	96.5	72.7	141.2	2.4	-6.4	2.6	5	silty SAND to sandy SILT	120	4.0	24	18	56	39	-	-	22	16	1.41	-	0.02	19.6
48.07	69.6	52.3	151.8	2.6	-6.7	3.8	4	clayy SILT to silty CLAY	115	2.0	35	26	-	-	4.8	9.9	32	15	0.86	-	0.02	27.4
48.23	41.8	25.0	-	2.3	-7.0	6.0	3	silty CLAY to CLAY	115	1.5	28	17	-	-	2.9	9.2	52	15	-	-	0.01	-
48.39	95.2	71.4	175.9	3.6	-7.4	3.9	4	clayy SILT to silty CLAY	115	2.0	48	36	-	-	6.6	9.9	28	15	0.00	-	0.01	0.0
48.56	141.2	105.7	173.9	3.6	-7.4	2.6	5	silty SAND to sandy SILT	120	4.0	35	26	69	41	-	-	19	16	0.00	-	0.01	0.0
48.72	137.7	103.0	155.8	2.9	-7.6	2.1	5	silty SAND to sandy SILT	120	4.0	34	26	68	40	-	-	17	16	0.79	-	0.01	4.5
48.89	128.9	96.2	135.4	2.1	-7.7	1.6	5	silty SAND to sandy SILT	120	4.0	32	24	66	40	-	-	15	16	1.69	-	0.01	15.9
49.05	122.9	91.6	130.4	1.9	-7.9	1.6	5	silty SAND to sandy SILT	120	4.0	31	23	64	40	-	-	15	16	1.86	-	0.01	18.9
49.22	125.8	93.6	132.6	2.0	-8.1	1.6	5	silty SAND to sandy SILT	120	4.0	31	23	65	40	-	-	15	16	1.79	-	0.01	17.6
49.38	134.3	99.8	139.8	2.2	-8.3	1.7	5	silty SAND to sandy SILT	120	4.0	34	25	67	40	-	-	15	16	1.51	-	0.00	11.2
49.54	177.9	132.1	153.7	2.1	-8.8	1.2	6	clean SAND to silty SAND	125	5.0	36	26	76	42	-	-	10	16	0.92	-	0.00	4.6
49.71	244.3	181.1	194.6	2.7	-9.6	1.1	6	clean SAND to silty SAND	125	5.0	49	36	87	43	-	-	7	16	0.00	-	0.00	0.0
49.87	310.0	229.5	231.2	3.1	-9.8	1.0	6	clean SAND to silty SAND	125	5.0	62	46	94	44	-	-	5	16	0.00	-	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.

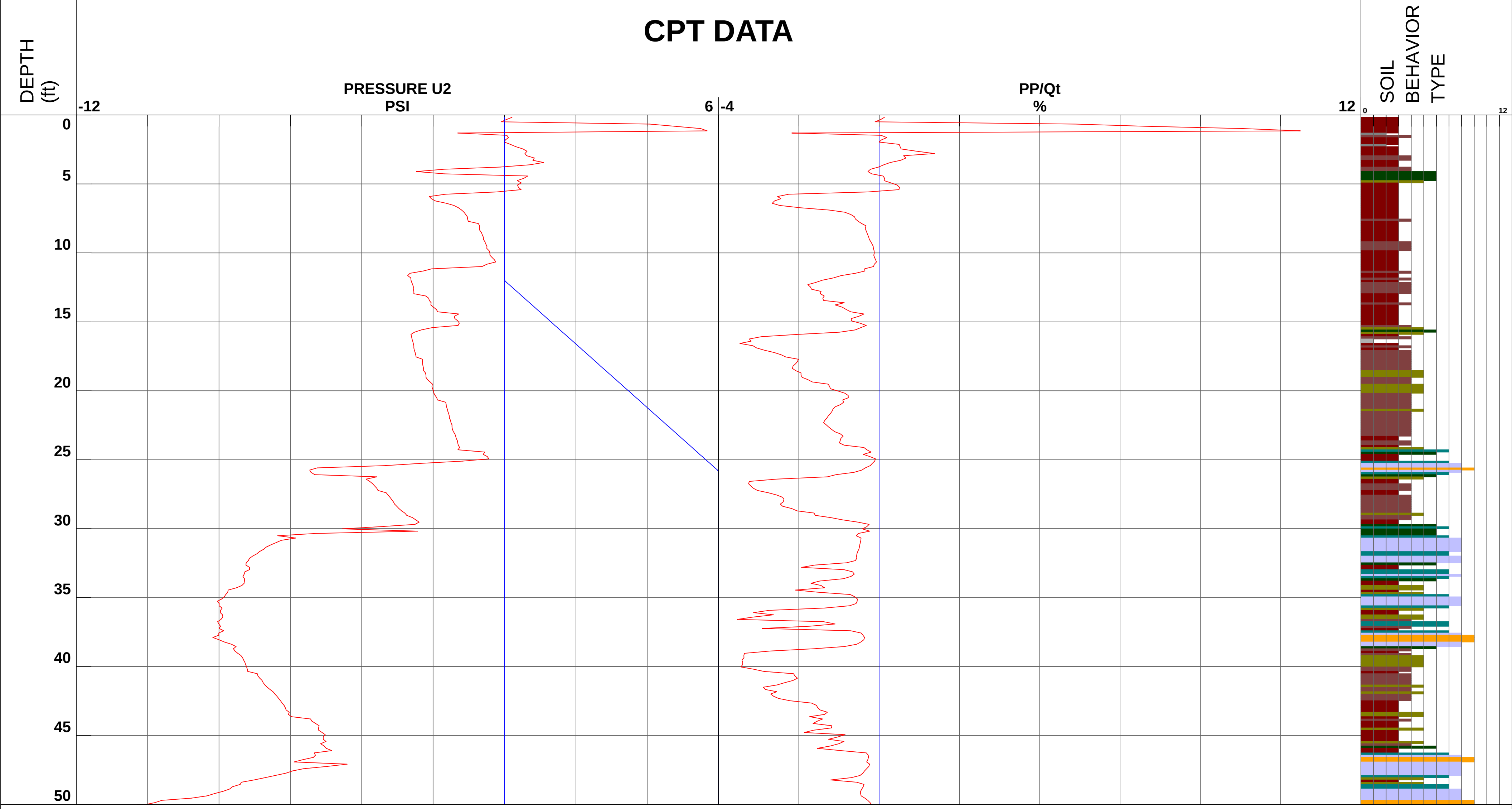
Middle Earth Geo Testing

Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(238).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-04	Date and Time	4/30/2012 12:54:02 PM	Maximum Depth	50.20 ft
Water Table Depth		12.00 ft			

Net Area Ratio .8

CPT DATA



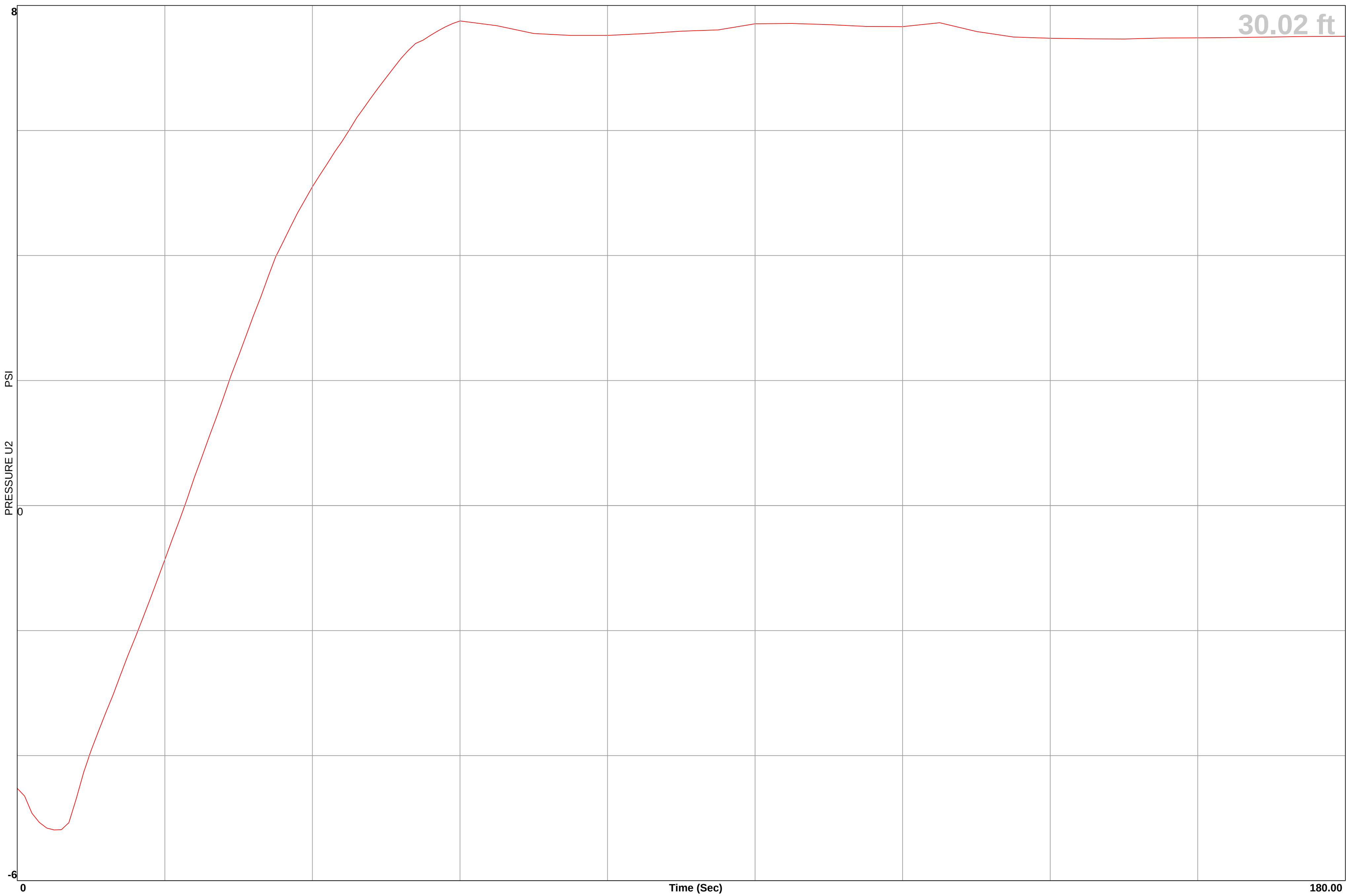
- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey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

Cone Size 10cm squared

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

Geolabs Westlake Village

Location	SMC Library	Operator	RA/JC		
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-04	Date and Time	4/30/2012 12:54:02 PM		
Equilized Pressure	7.5	Ground Water Depth	12.6		

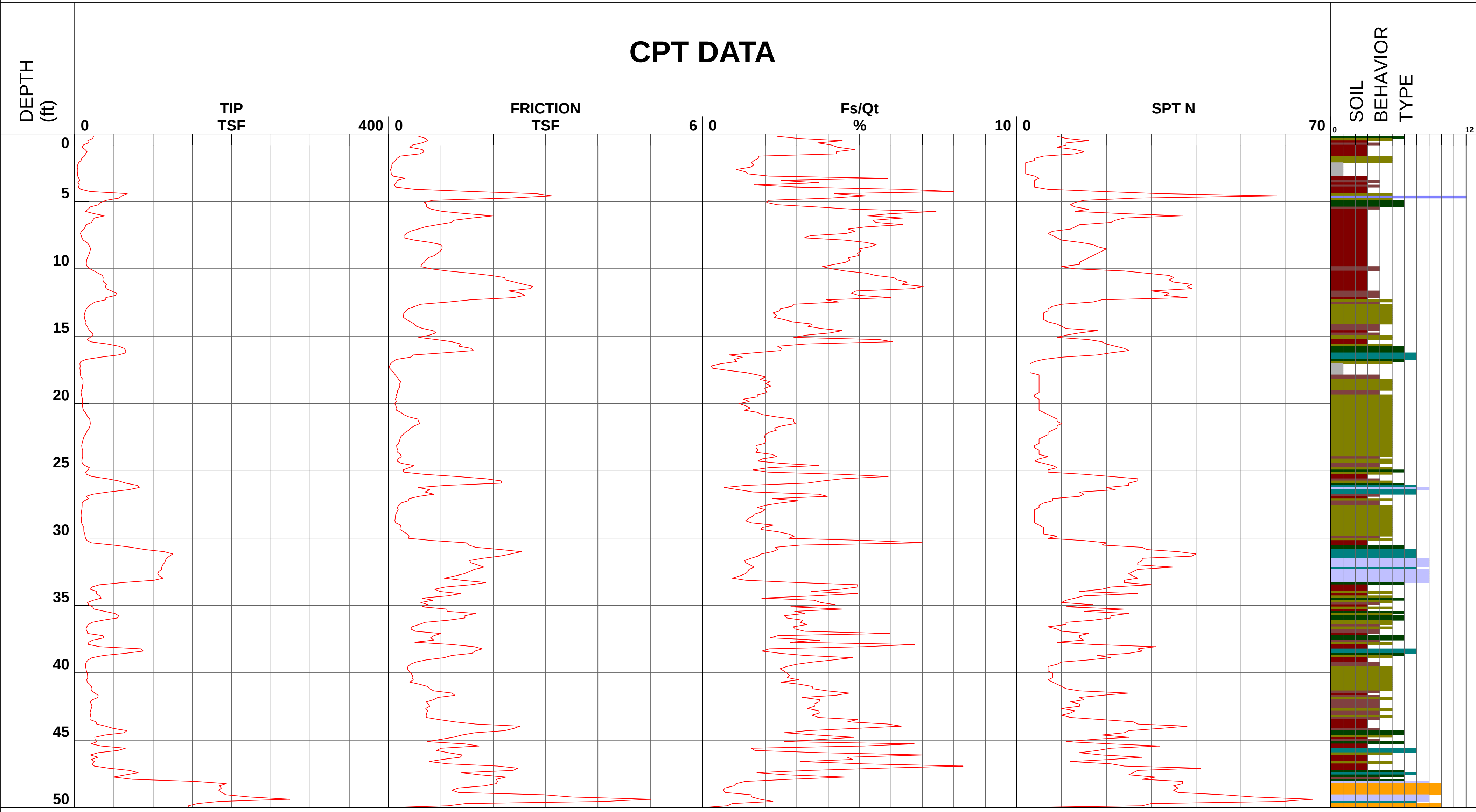


Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(239).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-05	Date and Time	4/30/2012 1:47:00 PM	Maximum Depth	50.20 ft
Water Table Depth	22.00 ft				

Net Area Ratio .8

CPT DATA



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

Cone Size 10cm squared

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

SMC Library

Project ID: Geolabs Westlake Village
Data File: SDF(239).cpt
CPT Date: 4/30/2012 1:47:00 PM
GW During Test: 22 ft

Sounding ID: CPT-05
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
0.33	23.2	37.1	113.3	0.7	0.0	3.0	4	clayy SILT to silty CLAY	115	2.0	12	19	-	-	1.6	9.9	33	15	N/A	0.00	N/A	N/A
0.49	16.7	26.8	-	0.7	-0.1	4.5	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	44	15	N/A	0.00	N/A	N/A
0.66	17.4	27.8	-	0.6	0.0	3.7	4	clayy SILT to silty CLAY	115	2.0	9	14	-	-	1.2	9.9	40	15	N/A	0.00	N/A	N/A
0.82	11.2	18.0	-	0.5	-0.2	4.1	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.8	9.9	51	15	N/A	0.00	N/A	N/A
0.98	9.4	15.1	-	0.4	-0.3	4.3	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.7	9.9	55	15	N/A	0.00	N/A	N/A
1.15	13.3	21.3	-	0.6	-0.3	4.9	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	50	15	N/A	0.00	N/A	N/A
1.31	15.8	25.4	-	0.7	-0.2	4.3	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	45	15	N/A	0.00	N/A	N/A
1.48	14.0	22.4	-	0.6	-1.3	4.3	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	47	15	N/A	0.00	N/A	N/A
1.64	12.4	19.9	-	0.2	0.2	1.8	4	clayy SILT to silty CLAY	115	2.0	6	10	-	-	0.9	9.9	37	15	N/A	0.00	N/A	N/A
1.80	9.1	14.6	-	0.2	0.3	1.8	4	clayy SILT to silty CLAY	115	2.0	5	7	-	-	0.6	9.9	43	15	N/A	0.00	N/A	N/A
1.97	8.0	12.9	-	0.1	0.0	1.7	4	clayy SILT to silty CLAY	115	2.0	4	6	-	-	0.6	9.9	44	15	N/A	0.00	N/A	N/A
2.13	5.2	8.3	-	0.1	0.0	1.6	4	clayy SILT to silty CLAY	115	2.0	3	4	-	-	0.4	9.9	54	15	N/A	0.00	N/A	N/A
2.30	3.8	6.2	-	0.1	0.0	1.7	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.3	63	15	N/A	0.00	N/A	N/A
2.46	4.1	6.6	-	0.1	0.0	1.6	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	9.3	60	15	N/A	0.00	N/A	N/A
2.62	3.4	5.5	-	0.0	0.0	1.1	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.2	7.1	61	15	N/A	0.00	N/A	N/A
2.79	3.4	5.5	-	0.0	0.0	1.4	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.2	6.7	64	15	N/A	0.00	N/A	N/A
2.95	3.6	5.8	-	0.1	0.0	1.5	3	silty CLAY to CLAY	115	1.5	2	4	-	-	0.2	6.7	63	15	N/A	0.00	N/A	N/A
3.12	4.0	6.4	-	0.1	0.0	2.2	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	7.1	66	15	N/A	0.00	N/A	N/A
3.28	5.4	8.6	-	0.3	0.0	6.1	3	silty CLAY to CLAY	115	1.5	4	6	-	-	0.4	9.3	77	15	-	-	0.17	-
3.45	6.4	10.3	-	0.2	0.1	2.6	3	silty CLAY to CLAY	115	1.5	4	7	-	-	0.4	9.9	56	15	-	-	0.17	-
3.61	4.2	6.7	-	0.2	0.1	3.9	3	silty CLAY to CLAY	115	1.5	3	4	-	-	0.3	6.8	75	15	-	-	0.17	-
3.77	6.2	10.0	-	0.1	0.1	1.7	4	clayy SILT to silty CLAY	115	2.0	3	5	-	-	0.4	9.9	51	15	-	-	0.17	-
3.94	4.6	7.5	-	0.1	0.0	3.1	3	silty CLAY to CLAY	115	1.5	3	5	-	-	0.3	7.3	68	15	-	-	0.17	-
4.10	7.8	12.5	-	0.5	0.0	6.6	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	9.9	68	15	-	-	0.17	-
4.27	19.8	31.8	-	1.6	0.1	8.1	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	52	15	-	-	0.17	-
4.43	67.1	107.6	224.2	2.8	-0.7	4.2	9	very stiff fine SOIL	120	2.0	34	54	69	46	-	-	24	30	0.00	-	0.17	0.0
4.59	60.1	96.4	240.6	3.1	-0.5	5.2	9	very stiff fine SOIL	120	2.0	30	48	66	46	-	-	28	30	0.00	-	0.17	0.0
4.76	56.8	91.0	201.9	2.3	-2.4	4.1	4	clayy SILT to silty CLAY	115	2.0	28	46	-	-	4.0	9.9	25	15	0.00	-	0.17	0.0
4.92	40.3	64.7	119.7	0.8	-4.1	2.1	5	silty SAND to sandy SILT	120	4.0	10	16	53	43	-	-	21	16	1.74	-	0.17	23.5
5.09	33.4	53.5	108.4	0.7	-4.1	2.1	5	silty SAND to sandy SILT	120	4.0	8	13	46	42	-	-	23	16	2.19	-	0.17	40.3
5.25	30.7	49.2	112.7	0.7	-0.4	2.4	5	silty SAND to sandy SILT	120	4.0	8	12	44	42	-	-	26	16	2.10	-	0.16	45.0
5.41	20.0	32.1	-	0.7	-0.5	3.7	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	38	15	-	-	0.16	-
5.58	17.1	27.4	-	0.8	-0.1	4.9	3	silty CLAY to CLAY	115	1.5	11	18	-	-	1.2	9.9	46	15	-	-	0.16	-
5.74	13.9	22.2	-	1.0	-2.5	7.6	3	silty CLAY to CLAY	115	1.5	9	15	-	-	1.0	9.9	58	15	-	-	0.16	-
5.91	24.8	39.8	-	1.5	-2.8	6.1	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.7	9.9	43	15	-	-	0.16	-
6.07	38.4	61.5	194.1	2.0	-3.2	5.3	4	clayy SILT to silty CLAY	115	2.0	19	31	-	-	2.7	9.9	34	15	0.00	-	0.16	0.0
6.23	25.1	40.2	-	1.6	-3.3	6.5	3	silty CLAY to CLAY	115	1.5	17	27	-	-	1.8	9.9	44	15	-	-	0.16	-
6.40	22.9	36.8	-	1.2	-3.2	5.5	3	silty CLAY to CLAY	115	1.5	15	25	-	-	1.6	9.9	43	15	-	-	0.16	-
6.56	21.7	34.8	-	1.2	-3.2	5.6	3	silty CLAY to CLAY	115	1.5	14	23	-	-	1.5	9.9	44	15	-	-	0.16	-
6.73	14.7	23.5	-	0.9	-3.3	6.6	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	54	15	-	-	0.16	-
6.89	13.4	21.5	-	0.7	-3.0	5.3	3	silty CLAY to CLAY	115	1.5	9	14	-	-	0.9	9.9	52	15	-	-	0.16	-
7.05	12.2	19.5	-	0.6	-3.1	4.8	3	silty CLAY to CLAY	115	1.5	8	13	-	-	0.8	9.9	52	15	-	-	0.16	-
7.22	8.5	13.7	-	0.4	-3.2	5.1	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	9.3	62	15	-	-	0.16	-
7.38	7.5	12.1	-	0.3	-3.0	4.8	3	silty CLAY to CLAY	115	1.5	5	8	-	-	0.5	8.0	64	15	-	-	0.16	-
7.55	8.5	13.6	-	0.3	-2.8	3.6	3	silty CLAY to CLAY	115	1.5	6	9	-	-	0.6	8.9	55	15	-	-	0.16	-
7.71	9.2	14.8	-	0.3	-2.7	3.4	3	silty CLAY to CLAY	115	1.5	6	10	-	-	0.6	9.6	53	15	-	-	0.16	-
7.87	10.8	17.3	-	0.5	-2.7	4.7	3	silty CLAY to CLAY	115	1.5	7	12	-	-	0.7	9.9	55	15	-	-	0.16	-
8.04	15.2	24.3	-	0.8	-2.7	5.3	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.1	9.9	50	15	-	-	0.16	-
8.20	17.9	28.7	-	1.0	-2.6	5.7	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	48	15	-	-	0.16	-
8.37	19.1	30.6	-	1.0	-2.6	5.5	3	silty CLAY to CLAY	115	1.5	13	20	-	-	1.3	9.9	46	15	-	-	0.16	-
8.53	20.5	32.9	-	1.0	-2.4	5.1	3	silty CLAY to CLAY	115	1.5	14	22	-	-	1.4	9.9	43	15	-	-	0.16	-
8.69	19.6	31.4	-	1.0	-2.4	5.2	3	silty CLAY to CLAY	115	1.5	13	21	-	-	1.4	9.9	44	15	-	-	0.16	-
8.86	18.9	30.3	-	0.9	-2.4	5.1	3	silty CLAY to CLAY	115	1.5	13	20	-	-	1.3	9.9	45	15	-	-	0.16	-
9.02	17.6	28.3	-	0.9	-2.3	5.1	3	silty CLAY to CLAY	115	1.5	12	19	-	-	1.2	9.9	46	15	-	-	0.16	-
9.19	16.3	26.2	-	0.8	-2.3	4.8	3	silty CLAY to CLAY	115	1.5	11	17	-	-	1.1	9.9	46	15	-	-	0.16	-
9.35	15.2	24.4	-	0.7	-2.3	4.9	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	48	15	-	-	0.16	-
9.51	15.0	24.0	-	0.7	-2.0	4.7	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	48	15	-	-	0.16	-
9.68	14.9	23.9	-	0.6	-1.8	4.4	3	silty CLAY to CLAY	115	1.5	10	16	-	-	1.0	9.9	47	15	-	-	0.16	-
9.84	16.2	26.0	-	0.6	-1.8	4.0	4	clayy SILT to silty CLAY	115	2.0	8	13	-	-	1.1	9.9	43	15	-	-	0.16	-
10.01	19.7	31.7	-	0.8	-1.7	4.2	4	clayy SILT to silty CLAY	115	2.0	10	16	-	-	1.4	9.9	41	15	-	-	0.16	-
10.17	24.8	39.8	-	1.1	-1.8	4.6	4	clayy SILT to silty CLAY	115	2.0	12	20	-	-	1.7	9.9	39	15	-	-	0.16	-
10.34	30.0	48.1	-	1.6	-1.8	5.3	3	silty CLAY to CLAY	115	1.5	20	32	-	-	2.1	9.9	38	15	-	-	0.16	-
10.50	35.5	57.0	-	2.0	-1.8	5.6	4	clayy SILT to silty CLAY	115	2.0	18	28	-	-	2.5	9.9	36	15	-	-	0.16	-
10.66	36.4	58.4	-	2.2	-1.7	6.2	3	silty CLAY to CLAY	115	1.5	24	39	-	-	2.5	9.9	37	15	-	-	0.16	-
10.83	35.9	57.5	-	2.2	-1.7	6.3	3	silty CLAY to CLAY	115	1.5	24	38	-	-	2.5	9.9	38	15	-	-	0.16	-
10.99	36.9	58.3	-	2.4	-1.5	6.6	3	silty CLAY to CLAY	115	1.5	25	39	-	-	2.6	9.9	39	15	-	-	0.16	-
11.16	40.7	63.3	-	2.6	-1.5	6.4	9	very stiff fine SOIL	120	2.0	20	32	52	41	-	-	37	30	-	-	0.16	-
11.32	39.3	60.1	-	2.8	-1.4	7.1	3	silty CLAY to CLAY	115	1.5	26	40	-	-	2.7	9.9	39	15	-	-	0.16	-
11.48	40.3	60.8	-	2.7	-1.4	6.8	3	silty CLAY to CLAY	115	1.5	27	41	-	-	2.8	9.9	38	15	-	-	0.16	-
11.65	47.0	55.6	178.8	2.3	-1.5	5.0	4	clayy SILT to silty CLAY	115	2.0	23	28	-	-	3.3	9.9	34	15	0.00	-	0.16	0.0
11.81	53.3	62.7	185.4	2.5	-1.8	4.8	4	clayy SILT to silty CLAY	115	2.0	27	31	-	-	3.7	9.9	32	15	0.00	-	0.16	0.0
11.98	52.3	61.1	188.7	2.6	-5.3	5.0	4	clayy SILT to silty CLAY	115	2.0	26	31	-	-	3.7	9.9	33	15	0.00	-	0.16	0.0
12.14	39.8	56.8	-	2.4	-6.4	6.1	3	silty CLAY to CLAY	115	1.5	27	38	-	-	2.8	9.9	38	15	-	-	0.16	-
12.30	39.7	45.8	145.3	1.6	-6.3	4.0	4	clayy SILT to silty CLAY	115	2.0	20	23	-	-	2.8	9.9	34	15	1.01	-	0.16	46.3
12.47	26.3	36.6	-	1.1	-6.2	4.5	4	clayy SILT to silty CLAY	115	2.0	13	18	-	-	1.8	9.9	39	15	-	-	0.16	-
12.63	21.3	29.2	-	0.6	-5.7	3.0	4	clayy SILT to silty CLAY	115	2.0	11	15	-	-	1.5	9.9	37	15	-	-	0.16	-
12.80	17.8	24.1	-	0.5	-5.3	3.0	4	clayy SILT to silty CLAY	115	2.0	9	12	-	-	1.2	9.9	41	15	-	-	0.16	-
12.96	15.2	20.3	-	0.4	-4.8	2.6	4	clayy SILT to silty CLAY	115	2.0	8	10	-	-	1.0	9.9	42	15	-	-	0.16	-
13.12	13.9	18.4	-	0.3	-4.4	2.6	4	clayy SILT to silty CLAY	115	2.0	7	9	-	-	1.0	9.8	44	15	-	-	0.16	-
13.29	13.0	16.9	-	0.3	-4.0	2.4	4	clayy SILT to silty CLAY	115	2.0	6	8	-	-	0.9	9.0	44	15	-	-	0.16	-
13.45	12.1	15.6	-	0.3	-3.6	2.5	4	clayy SILT to silty CLAY	115	2.0	6	8	-	-	0.8	8.3	47	15	-	-	0.16	-
13.62	12.6	16.0	-	0.3	-3.3	2.4	4	clayy SILT to silty CLAY	115	2.0	6	8	-	-	0.9	8.5	46	15	-	-	0.16	-
13.78	13.2	16.7	-	0.3	-3.0	2.8	4	clayy SILT to silty CLAY	115	2.0	7	8	-	-	0.9	8.9	47	15	-	-	0.16	-
13.94	14.7	18.3	-	0.4	-2.8	3.0	4	clayy SILT to silty CLAY	115	2.0	7	9	-	-	1.0	9.9	46	15	-	-	0.16	-
14.11	14.2	17.4	-	0.5	-2.7	3.7	3	silty CLAY to CLAY	115	1.5	9	12	-	-	1.0	9.3	51	15	-	-	0.16	-
14.27	16.0	19.4	-	0.5	-2.5	3.5	3	silty CLAY to CLAY	115	1.5	11	13	-	-	1.1	9.9	48	15	-	-	0.16	-
14.44	17.3	20.8	-	0.7	-2.4	4.0	3	silty CLAY to CLAY	115	1.5	12	14	-	-	1.2	9.9	48	15	-	-	0.16	-
14.60	19.2	22.8	-	0.9	-2.3	4.6	3	silty CLAY to CLAY	115	1.5	13	15	-	-	1.3	9.9	49	15	-	-	0.16	-
14.76	22.2	26.1	-	0.9	-2.3	4.2	3	silty CLAY to CLAY	115	1.5	15	17	-	-	1.5	9.9	44	15	-	-	0.16	-
14.93	23.7	27.5	-	0.8	-2.3	3.4	4	clayy SILT to silty CLAY	115	2.0	12	14	-	-	1.6	9.9	40	15	-	-	0.16	-
15.09	19.7	22.7	-	0.6	-2.0	3.0	4	clayy SILT to silty CLAY	115	2.0	10	11	-	-	1.4	9.9	42	15	-	-	0.16	-
15.26	16.2	18.5	-	0.9	-1.9	6.0	3	silty CLAY to CLAY	115	1.5	11	12	-	-	1.1	9.9	58	15	-	-	0.16	-
15.42	20.0	22.5	-	1.2	-1.9	6.3	3	silty CLAY to CLAY	115	1.5	13	15	-	-	1.4	9.9	55	15	-	-	0.16	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(239).cpt
CPT Date: 4/30/2012 1:47:00 PM
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Project No: 9279
Cone/Rig: DSG0906

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* 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 %	* Nk -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
15.58	41.7	42.7	128.3	1.4	-2.0	3.4	4	clayy SILT to silty CLAY	115	2.0	21	21	-	-	2.9	9.9	33	15	1.86	-	0.16	51.2
15.75	56.3	57.4	122.0	1.3	-3.7	2.4	5	silty SAND to sandy SILT	120	4.0	14	14	49	41	-	-	24	16	1.99	-	0.16	36.4
15.91	62.9	63.8	131.1	1.6	-5.3	2.5	5	silty SAND to sandy SILT	120	4.0	16	16	52	42	-	-	24	16	1.77	-	0.15	31.7
16.08	65.1	65.6	132.2	1.6	-6.0	2.5	5	silty SAND to sandy SILT	120	4.0	16	16	53	42	-	-	23	16	1.73	-	0.15	30.3
16.24	65.1	65.3	108.4	1.1	-5.3	1.7	5	silty SAND to sandy SILT	120	4.0	16	16	53	42	-	-	19	16	2.19	-	0.15	30.7
16.40	55.7	55.6	79.2	0.5	-5.3	0.9	5	silty SAND to sandy SILT	120	4.0	14	14	48	41	-	-	15	16	2.83	-	0.14	38.2
16.57	33.0	32.7	72.9	0.4	-5.1	1.3	5	silty SAND to sandy SILT	120	4.0	8	8	30	38	-	-	26	16	3.03	-	0.14	51.2
16.73	14.6	15.1	-	0.1	-4.2	1.1	4	clayy SILT to silty CLAY	115	2.0	7	8	-	-	1.0	8.3	37	15	-	-	0.13	-
16.90	7.8	8.0	-	0.1	-3.4	1.2	4	clayy SILT to silty CLAY	115	2.0	4	4	-	-	0.5	4.1	54	15	-	-	0.13	-
17.06	6.8	6.9	-	0.0	-2.8	0.7	4	clayy SILT to silty CLAY	115	2.0	3	3	-	-	0.4	3.5	52	15	-	-	0.13	-
17.23	7.1	7.2	-	0.0	-2.4	0.3	1	sensitive fine SOIL	115	2.0	4	4	-	-	0.5	3.6	44	15	-	-	0.13	-
17.39	6.7	6.6	-	0.0	-2.2	0.4	1	sensitive fine SOIL	115	2.0	3	3	-	-	0.4	3.3	48	15	-	-	0.13	-
17.55	7.2	7.1	-	0.1	-2.2	0.9	4	clayy SILT to silty CLAY	115	2.0	4	4	-	-	0.5	3.6	55	15	-	-	0.13	-
17.72	7.0	6.8	-	0.1	-2.1	1.6	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	3.5	63	15	-	-	0.13	-
17.88	7.3	7.1	-	0.1	-2.1	2.0	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	3.6	65	15	-	-	0.13	-
18.05	8.1	7.8	-	0.2	-2.1	2.3	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	4.1	64	15	-	-	0.13	-
18.21	10.5	10.0	-	0.2	-1.7	2.0	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.4	55	15	-	-	0.13	-
18.37	10.7	10.1	-	0.2	-1.7	2.4	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.4	57	15	-	-	0.13	-
18.54	10.7	10.0	-	0.2	-1.7	2.2	3	silty CLAY to CLAY	115	1.5	7	7	-	-	0.7	5.4	56	15	-	-	0.13	-
18.70	9.9	9.1	-	0.2	-1.7	2.4	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.9	60	15	-	-	0.13	-
18.87	10.2	9.4	-	0.2	-1.6	2.2	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	5.0	58	15	-	-	0.13	-
19.03	8.6	7.8	-	0.2	-1.7	2.3	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.1	64	15	-	-	0.13	-
19.19	8.2	7.4	-	0.2	-1.6	2.4	3	silty CLAY to CLAY	115	1.5	5	5	-	-	0.5	3.9	66	15	-	-	0.13	-
19.36	8.6	7.7	-	0.2	-1.6	2.0	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.1	62	15	-	-	0.13	-
19.52	9.3	8.2	-	0.2	-1.5	2.0	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	4.4	60	15	-	-	0.13	-
19.69	10.0	8.8	-	0.1	-1.6	1.5	4	clayy SILT to silty CLAY	115	2.0	5	4	-	-	0.7	4.7	54	15	-	-	0.13	-
19.85	9.9	8.6	-	0.1	-1.5	1.7	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.6	56	15	-	-	0.13	-
20.01	9.9	8.6	-	0.1	-1.6	1.3	4	clayy SILT to silty CLAY	115	2.0	5	4	-	-	0.7	4.6	53	15	-	-	0.13	-
20.18	10.1	8.7	-	0.1	-1.5	1.6	4	clayy SILT to silty CLAY	115	2.0	5	4	-	-	0.7	4.7	55	15	-	-	0.13	-
20.34	10.5	8.9	-	0.2	-1.5	1.7	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.8	55	15	-	-	0.13	-
20.51	11.3	9.5	-	0.2	-1.5	1.5	4	clayy SILT to silty CLAY	115	2.0	6	5	-	-	0.8	5.2	52	15	-	-	0.13	-
20.67	13.5	11.3	-	0.2	-1.4	1.9	4	clayy SILT to silty CLAY	115	2.0	7	6	-	-	0.9	6.3	51	15	-	-	0.13	-
20.83	15.2	12.6	-	0.3	-1.4	2.1	4	clayy SILT to silty CLAY	115	2.0	8	6	-	-	1.0	7.1	49	15	-	-	0.13	-
21.00	16.5	13.6	-	0.4	-1.4	2.5	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	7.7	50	15	-	-	0.13	-
21.16	19.3	15.8	-	0.6	-1.4	3.1	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.0	50	15	-	-	0.13	-
21.33	19.8	16.0	-	0.6	-1.4	3.1	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.3	9.2	50	15	-	-	0.13	-
21.49	20.0	16.1	-	0.6	-1.4	3.2	3	silty CLAY to CLAY	115	1.5	13	11	-	-	1.4	9.3	50	15	-	-	0.13	-
21.65	19.6	15.7	-	0.5	-1.3	2.7	4	clayy SILT to silty CLAY	115	2.0	10	8	-	-	1.3	9.0	48	15	-	-	0.13	-
21.82	18.6	14.8	-	0.4	-1.3	2.5	4	clayy SILT to silty CLAY	115	2.0	9	7	-	-	1.3	8.5	48	15	-	-	0.13	-
21.98	16.5	13.0	-	0.4	-1.3	2.5	3	silty CLAY to CLAY	115	1.5	11	9	-	-	1.1	7.4	51	15	-	-	0.13	-
22.15	15.1	11.9	-	0.3	-1.2	2.3	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.7	52	15	-	-	0.13	-
22.31	13.6	10.7	-	0.3	-1.2	2.2	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.9	54	15	-	-	0.13	-
22.47	11.9	9.3	-	0.2	-1.2	2.2	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	5.0	58	15	-	-	0.13	-
22.64	10.9	8.5	-	0.2	-1.2	2.3	3	silty CLAY to CLAY	115	1.5	7	6	-	-	0.7	4.5	61	15	-	-	0.13	-
22.80	10.3	8.0	-	0.2	-1.2	2.3	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.2	63	15	-	-	0.13	-
22.97	9.5	7.3	-	0.2	-1.2	2.3	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.8	66	15	-	-	0.13	-
23.13	9.0	6.9	-	0.2	-1.2	2.0	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.6	65	15	-	-	0.13	-
23.30	9.2	7.1	-	0.2	-1.2	2.0	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.6	65	15	-	-	0.13	-
23.46	10.2	7.8	-	0.2	-1.1	2.0	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.0	62	15	-	-	0.13	-
23.62	10.2	7.8	-	0.2	-1.1	2.0	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.0	61	15	-	-	0.13	-
23.79	10.3	7.8	-	0.2	-1.1	2.5	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.0	66	15	-	-	0.13	-
23.95	10.4	7.9	-	0.2	-1.1	2.7	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	4.1	66	15	-	-	0.13	-
24.12	9.5	7.2	-	0.2	-1.1	2.2	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.6	66	15	-	-	0.13	-
24.28	9.2	6.9	-	0.2	-1.1	2.1	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.5	66	15	-	-	0.13	-
24.44	9.8	7.4	-	0.2	-1.0	2.9	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.6	3.7	70	15	-	-	0.13	-
24.61	13.2	9.9	-	0.5	-1.0	4.1	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.2	67	15	-	-	0.13	-
24.77	18.6	13.9	-	0.4	-1.0	2.3	4	clayy SILT to silty CLAY	115	2.0	9	7	-	-	1.3	7.5	48	15	-	-	0.13	-
24.94	17.3	12.8	-	0.3	-0.9	1.8	4	clayy SILT to silty CLAY	115	2.0	9	6	-	-	1.2	6.9	47	15	-	-	0.13	-
25.10	13.9	10.3	-	0.3	-0.8	2.3	3	silty CLAY to CLAY	115	1.5	9	7	-	-	0.9	5.4	56	15	-	-	0.13	-
25.26	15.3	11.3	-	0.7	-0.8	4.8	3	silty CLAY to CLAY	115	1.5	10	8	-	-	1.0	6.0	66	15	-	-	0.13	-
25.43	22.1	16.2	-	1.3	-0.8	6.3	3	silty CLAY to CLAY	115	1.5	15	11	-	-	1.5	8.8	62	15	-	-	0.13	-
25.59	41.5	30.5	-	1.9	-0.9	4.6	3	silty CLAY to CLAY	115	1.5	28	20	-	-	2.9	9.9	43	15	-	-	0.13	-
25.76	56.0	40.9	-	2.2	-1.3	3.9	4	clayy SILT to silty CLAY	115	2.0	28	20	-	-	3.9	9.9	36	15	-	-	0.13	-
25.92	65.0	53.9	142.6	2.2	-2.3	3.4	4	clayy SILT to silty CLAY	115	2.0	32	27	-	-	4.5	9.9	30	15	1.47	-	0.13	39.9
26.08	79.8	66.0	102.6	1.1	-2.9	1.4	5	silty SAND to sandy SILT	120	4.0	20	17	53	41	-	-	17	16	2.29	-	0.13	30.3
26.25	82.5	68.1	85.2	0.6	-3.3	0.7	6	clean SAND to silty SAND	125	5.0	16	14	54	41	-	-	12	16	2.67	-	0.13	29.2
26.41	68.6	56.6	88.6	0.8	-3.6	1.2	5	silty SAND to sandy SILT	120	4.0	17	14	48	40	-	-	18	16	2.58	-	0.12	37.2
26.58	43.0	35.4	84.2	0.7	-3.4	1.7	5	silty SAND to sandy SILT	120	4.0	11	9	33	37	-	-	27	16	2.69	-	0.12	51.2
26.74	23.3	16.7	-	0.9	-3.7	4.0	3	silty CLAY to CLAY	115	1.5	16	11	-	-	1.6	8.9	53	15	-	-	0.11	-
26.90	14.6	10.5	-	0.6	-3.3	4.4	3	silty CLAY to CLAY	115	1.5	10	7	-	-	1.0	5.3	67	15	-	-	0.11	-
27.07	17.7	12.6	-	0.4	-3.0	2.4	3	silty CLAY to CLAY	115	1.5	12	8	-	-	1.2	6.5	52	15	-	-	0.11	-
27.23	12.3	8.8	-	0.4	-2.8	3.5	3	silty CLAY to CLAY	115	1.5	8	6	-	-	0.8	4.3	68	15	-	-	0.11	-
27.40	9.5	6.7	-	0.2	-2.5	2.9	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.6	3.2	73	15	-	-	0.11	-
27.56	9.6	6.8	-	0.2	-2.4	2.4	3	silty CLAY to CLAY	115	1.5	6	5	-	-	0.6	3.2	69	15	-	-	0.11	-
27.72	9.4	6.6	-	0.2	-2.3	2.1	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.6	3.1	68	15	-	-	0.11	-
27.89	9.2	6.5	-	0.2	-2.3	2.4	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.6	3.0	71	15	-	-	0.11	-
28.05	8.6	6.0	-	0.2	-2.1	2.3	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.5	2.7	73	15	-	-	0.11	-
28.22	8.3	5.8	-	0.1	-2.1	2.0	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.5	2.6	72	15	-	-	0.11	-
28.38	8.2	5.7	-	0.1	-2.1	2.0	3	silty CLAY to CLAY	115	1.5	5	4	-	-	0.5	2.6	72	15	-	-	0.11	-
28.54	8.7	6.1	-	0.1	-2.0	1.8	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.6	2.7	69	15	-	-	0.11	-
28.71	8.8	6.1	-	0.1	-2.0	1.7	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.6	2.7	68	15	-	-	0.11	-
28.87	8.9	6.1	-	0.1	-1.9	1.9	3	silty CLAY to CLAY	115	1.5	6	4	-	-	0.6	2.8	70	15	-	-	0.11	-
29.04	10.1	6.9	-	0.2	-1.9	2.7	3	silty CLAY to CLAY	115	1.5	7	5	-	-	0.7	3.2	71	15	-	-	0.11	-
29.20	11.7	8.0	-	0.2	-1.4	2.2	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.8	63	15	-	-	0.11	-
29.36	11.7	8.0	-	0.2	-1.3	2.2	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.8	63	15	-	-	0.11	-
29.53	11.9	8.1	-	0.3	-1.3	2.8	3	silty CLAY to CLAY	115	1.5	8	5	-	-	0.8	3.8	66	15	-	-	0.11	-
29.69	13.0	8.8	-	0.4	-1.2	3.2	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	4.2	66	15	-	-	0.11	-
29.86	13.4	9.0	-	0.4	-1.2	3.3	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	4.3	66	15	-	-	0.11	-
30.02	14.0	9.5	-	0.4	-1.1	3.1	3	silty CLAY to CLAY	115	1.5	9	6	-	-	0.9	4.5	64	15	-	-	0.11	-
30.19	15.9	10.7	-	0.8	-1.0	6.0	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	5.2	73	15	-	-	0.11	-
30.35	21.2	14.2	-	1.5	-1.0	7.6	3	silty CLAY to CLAY	115	1.5	14	9	-	-	1.4	7.1	70	15	-	-	0.11	-
30.51	49.2	32.9	-	1.5	-1.1	3.2	4	clayy SILT to silty CLAY	115	2.0	25	16	-	-	3.4	9.9	36	15	-	-	0.11	-
30.68	72.1	57.2	120.6	1.7	-1.6	2.4	5	silty SAND to sandy SILT	120	4.0	18	14	49	39	-	-	24	16	2.00	-	0.11	36.5
30.84	89.6	71.0	135.4	2.1	-2.2	2.4	5	silty SAND to sandy SILT	120	4.0	22	18	56	40	-	-	22	16	1.81	-	0.11	27.6

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

Project ID: Geolabs Westlake Village
Data File: SDF(239).cpt
CPT Date: 4/30/2012 1:47:00 PM
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Sounding ID: CPT-05
Project No: 9279
Cone/Rig: DSG0906

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	Slv Stss tsf	pore prss (psi)	Frct Rato %	* 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 %	* Nk - -	* Vol Strn %	* Dry Stlmt 0.00	* Liq Stlmt 0.17	* Cycl SStn %
31.01	114.0	90.2	148.0	2.5	-3.0	2.3	5	silty SAND to sandy SILT	120	4.0	29	23	64	42	-	-	19	16	1.33	-	0.11	12.0
31.17	125.0	98.7	145.0	2.3	0.6	1.9	5	silty SAND to sandy SILT	120	4.0	31	25	67	42	-	-	16	16	1.47	-	0.11	12.3
31.33	120.9	95.3	138.6	2.1	-1.0	1.8	5	silty SAND to sandy SILT	120	4.0	30	24	65	42	-	-	16	16	1.73	-	0.10	17.1
31.50	116.9	92.0	129.1	1.8	-1.8	1.6	5	silty SAND to sandy SILT	120	4.0	29	23	64	42	-	-	15	16	1.89	-	0.10	19.2
31.66	115.7	90.9	122.5	1.5	-2.4	1.4	5	silty SAND to sandy SILT	120	4.0	29	23	64	42	-	-	14	16	1.98	-	0.10	19.5
31.83	114.6	89.9	122.6	1.6	-3.4	1.4	5	silty SAND to sandy SILT	120	4.0	29	22	63	42	-	-	14	16	1.98	-	0.09	19.8
31.99	112.4	88.0	125.0	1.7	-4.5	1.5	5	silty SAND to sandy SILT	120	4.0	28	22	63	41	-	-	15	16	1.95	-	0.09	20.4
32.15	111.0	86.9	127.7	1.8	-4.7	1.7	5	silty SAND to sandy SILT	120	4.0	28	22	62	41	-	-	16	16	1.91	-	0.09	20.8
32.32	111.0	86.7	122.8	1.6	-4.9	1.5	5	silty SAND to sandy SILT	120	4.0	28	22	62	41	-	-	15	16	1.97	-	0.08	20.8
32.48	107.1	83.5	119.2	1.5	-5.2	1.5	5	silty SAND to sandy SILT	120	4.0	27	21	61	41	-	-	15	16	2.02	-	0.08	21.8
32.65	105.9	82.4	116.0	1.4	-5.4	1.4	5	silty SAND to sandy SILT	120	4.0	26	21	61	41	-	-	15	16	2.07	-	0.08	22.2
32.81	108.0	84.0	111.8	1.3	-5.6	1.2	6	clean SAND to silty SAND	125	5.0	22	17	61	41	-	-	14	16	2.13	-	0.07	21.7
32.97	112.7	87.5	108.6	1.1	-6.0	1.0	6	clean SAND to silty SAND	125	5.0	23	17	63	41	-	-	12	16	2.18	-	0.07	20.6
33.14	101.1	78.4	113.0	1.4	-6.2	1.4	5	silty SAND to sandy SILT	120	4.0	25	20	59	41	-	-	16	16	2.11	-	0.07	23.9
33.30	61.9	47.9	129.2	1.9	-6.1	3.1	4	clayy SILT to silty CLAY	115	2.0	31	24	-	-	4.3	9.9	30	15	1.89	-	0.06	46.6
33.47	31.9	20.2	-	1.6	-5.9	5.3	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.9	54	15	-	-	0.06	-
33.63	21.9	13.8	-	1.1	-5.7	5.4	3	silty CLAY to CLAY	115	1.5	15	9	-	-	1.5	6.6	63	15	-	-	0.06	-
33.79	20.1	12.6	-	0.9	-5.5	4.9	3	silty CLAY to CLAY	115	1.5	13	8	-	-	1.3	6.0	64	15	-	-	0.06	-
33.96	28.3	17.8	-	1.0	-5.5	3.7	3	silty CLAY to CLAY	115	1.5	19	12	-	-	1.9	8.7	51	15	-	-	0.06	-
34.12	27.9	17.4	-	1.4	-5.5	5.3	3	silty CLAY to CLAY	115	1.5	19	12	-	-	1.9	8.5	57	15	-	-	0.06	-
34.29	31.9	19.9	-	1.1	-5.5	3.8	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	9.7	48	15	-	-	0.06	-
34.45	34.1	21.2	-	0.6	-5.5	2.0	4	clayy SILT to silty CLAY	115	2.0	17	11	-	-	2.3	9.9	38	15	-	-	0.06	-
34.61	23.8	14.8	-	0.8	-5.1	3.9	3	silty CLAY to CLAY	115	1.5	16	10	-	-	1.6	7.0	56	15	-	-	0.06	-
34.78	16.4	10.1	-	0.6	-5.0	4.3	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	4.6	67	15	-	-	0.06	-
34.94	18.0	11.1	-	0.8	-4.9	4.8	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	5.1	67	15	-	-	0.06	-
35.11	23.0	14.1	-	0.6	-4.9	3.1	3	silty CLAY to CLAY	115	1.5	15	9	-	-	1.5	6.7	53	15	-	-	0.06	-
35.27	24.9	15.3	-	1.1	-4.9	4.9	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	7.3	59	15	-	-	0.06	-
35.43	38.2	23.4	-	1.1	-4.9	3.1	4	clayy SILT to silty CLAY	115	2.0	19	12	-	-	2.6	9.9	42	15	-	-	0.06	-
35.60	51.2	31.3	-	1.7	-4.9	3.4	4	clayy SILT to silty CLAY	115	2.0	26	16	-	-	3.5	9.9	38	15	-	-	0.06	-
35.76	56.2	42.6	114.7	1.5	-5.0	2.7	4	clayy SILT to silty CLAY	115	2.0	28	21	-	-	3.9	9.9	30	15	2.09	-	0.06	51.2
35.93	54.5	41.2	115.2	1.5	-5.2	2.8	4	clayy SILT to silty CLAY	115	2.0	27	21	-	-	3.8	9.9	31	15	2.08	-	0.06	51.2
36.09	35.9	21.8	-	1.1	-5.2	3.4	4	clayy SILT to silty CLAY	115	2.0	18	11	-	-	2.5	9.9	45	15	-	-	0.05	-
36.26	22.4	13.6	-	0.7	-5.0	3.4	3	silty CLAY to CLAY	115	1.5	15	9	-	-	1.5	6.3	56	15	-	-	0.05	-
36.42	17.5	10.5	-	0.6	-4.8	3.8	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	4.7	64	15	-	-	0.05	-
36.58	15.5	9.3	-	0.4	-4.7	3.3	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	4.1	66	15	-	-	0.05	-
36.75	14.4	8.6	-	0.4	-4.6	3.5	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	3.7	69	15	-	-	0.05	-
36.91	15.8	9.4	-	0.5	-4.6	3.8	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	4.2	67	15	-	-	0.05	-
37.08	16.8	10.0	-	1.0	-4.5	6.8	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	4.5	78	15	-	-	0.05	-
37.24	36.2	21.6	-	0.9	-4.6	2.6	4	clayy SILT to silty CLAY	115	2.0	18	11	-	-	2.5	9.9	41	15	-	-	0.05	-
37.40	37.2	22.1	-	0.8	-4.7	2.3	4	clayy SILT to silty CLAY	115	2.0	19	11	-	-	2.6	9.9	39	15	-	-	0.05	-
37.57	23.4	13.8	-	0.9	-4.6	4.1	3	silty CLAY to CLAY	115	1.5	16	9	-	-	1.6	6.4	58	15	-	-	0.05	-
37.73	18.0	10.6	-	0.5	-3.7	3.2	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	4.7	61	15	-	-	0.05	-
37.90	17.7	10.4	-	1.2	-3.6	7.7	3	silty CLAY to CLAY	115	1.5	12	7	-	-	1.2	4.6	79	15	-	-	0.05	-
38.06	32.1	18.9	-	1.6	-3.7	5.5	3	silty CLAY to CLAY	115	1.5	21	13	-	-	2.2	8.9	56	15	-	-	0.05	-
38.22	84.3	62.7	121.1	1.8	-3.9	2.2	5	silty SAND to sandy SILT	120	4.0	21	16	52	39	-	-	22	16	2.00	-	0.05	32.3
38.39	87.5	65.0	116.5	1.6	-4.2	1.9	5	silty SAND to sandy SILT	120	4.0	22	16	53	39	-	-	21	16	2.06	-	0.05	30.9
38.55	64.3	47.7	117.0	1.6	-4.5	2.6	5	silty SAND to sandy SILT	120	4.0	16	12	43	37	-	-	28	16	2.05	-	0.05	46.8
38.72	37.1	21.6	-	1.2	-4.7	3.5	4	clayy SILT to silty CLAY	115	2.0	19	11	-	-	2.5	9.9	45	15	-	-	0.04	-
38.88	22.3	12.9	-	1.1	-4.5	5.3	3	silty CLAY to CLAY	115	1.5	15	9	-	-	1.5	5.8	65	15	-	-	0.04	-
39.04	17.2	10.0	-	0.7	-4.3	4.8	3	silty CLAY to CLAY	115	1.5	11	7	-	-	1.1	4.3	70	15	-	-	0.04	-
39.21	14.9	8.6	-	0.5	-4.1	4.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	3.7	72	15	-	-	0.04	-
39.37	13.8	8.0	-	0.4	-4.0	3.6	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	3.3	72	15	-	-	0.04	-
39.54	13.8	7.9	-	0.4	-3.9	3.2	3	silty CLAY to CLAY	115	1.5	9	5	-	-	0.9	3.3	70	15	-	-	0.04	-
39.70	14.5	8.3	-	0.4	-3.8	2.9	3	silty CLAY to CLAY	115	1.5	10	6	-	-	0.9	3.5	67	15	-	-	0.04	-
39.86	15.0	8.6	-	0.4	-3.8	3.1	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	3.6	67	15	-	-	0.04	-
40.03	16.0	9.1	-	0.4	-3.7	3.1	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.0	3.9	65	15	-	-	0.04	-
40.19	16.6	9.4	-	0.5	-3.7	3.2	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.0	65	15	-	-	0.04	-
40.36	16.6	9.4	-	0.4	-3.6	3.1	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	4.0	64	15	-	-	0.04	-
40.52	15.5	8.7	-	0.5	-3.6	3.6	3	silty CLAY to CLAY	115	1.5	10	6	-	-	1.0	3.7	69	15	-	-	0.04	-
40.68	16.2	9.1	-	0.4	-3.5	2.9	3	silty CLAY to CLAY	115	1.5	11	6	-	-	1.1	3.9	64	15	-	-	0.04	-
40.85	19.1	10.8	-	0.6	-3.5	3.5	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.7	62	15	-	-	0.04	-
41.01	21.4	12.0	-	0.7	-3.1	3.9	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	5.3	61	15	-	-	0.04	-
41.18	22.3	12.5	-	0.8	-3.0	3.9	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.5	60	15	-	-	0.04	-
41.34	21.8	12.2	-	0.9	-2.8	4.4	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.3	63	15	-	-	0.04	-
41.50	25.9	14.5	-	1.2	-2.8	5.1	3	silty CLAY to CLAY	115	1.5	17	10	-	-	1.7	6.5	61	15	-	-	0.04	-
41.67	29.9	16.6	-	1.3	-2.7	4.6	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.0	7.5	56	15	-	-	0.04	-
41.83	29.7	16.5	-	0.9	-2.6	3.5	3	silty CLAY to CLAY	115	1.5	20	11	-	-	2.0	7.4	51	15	-	-	0.04	-
42.00	23.0	12.7	-	0.9	-2.5	4.2	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.6	61	15	-	-	0.04	-
42.16	19.4	10.7	-	0.7	-2.3	4.2	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.6	66	15	-	-	0.04	-
42.32	21.4	11.8	-	0.8	-2.2	4.0	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	5.1	62	15	-	-	0.04	-
42.49	22.1	12.1	-	0.8	-2.1	4.0	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	5.3	61	15	-	-	0.04	-
42.65	21.3	11.7	-	0.7	-2.0	3.8	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	5.0	61	15	-	-	0.04	-
42.82	20.2	11.0	-	0.7	-1.9	4.2	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.7	65	15	-	-	0.04	-
42.98	19.6	10.7	-	0.7	-1.8	4.3	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.5	66	15	-	-	0.04	-
43.15	20.7	11.2	-	0.7	-1.6	4.0	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	4.8	63	15	-	-	0.04	-
43.31	19.5	10.6	-	0.7	-1.5	4.2	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.5	66	15	-	-	0.04	-
43.47	19.6	10.6	-	1.0	-1.4	5.7	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.5	72	15	-	-	0.04	-
43.64	27.2	14.7	-	1.3	-1.4	5.1	3	silty CLAY to CLAY	115	1.5	18	10	-	-	1.8	6.5	61	15	-	-	0.04	-
43.80	28.1	15.2	-	1.7	-1.3	6.5	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	6.7	65	15	-	-	0.04	-
43.97	39.6	21.3	-	2.5	-1.2	6.8	3	silty CLAY to CLAY	115	1.5	26	14	-	-	2.7	9.6	58	15	-	-	0.04	-
44.13	49.4	26.5	-	2.4	-1.2	5.1	3	silty CLAY to CLAY	115	1.5	33	18	-	-	3.4	9.9	48	15	-	-	0.04	-
44.29	66.5	35.6	-	2.2	-1.4	3.5	4	clayy SILT to silty CLAY	115	2.0	33	18	-	-	4.6	9.9	36	15	-	-	0.04	-
44.46	63.3	45.0	118.0	1.6	1.0	2.7	4	clayy SILT to silty CLAY	115	2.0	32	22	-	-	4.4	9.9	29	15	2.04	-	0.04	50.2
44.62	38.7	20.6	-	1.4	-0.4	3.9	3	silty CLAY to CLAY	115	1.5	26	14	-	-	2.6	9.3	48	15	-	-	0.04	-
44.79	25.7	13.7	-	1.2	-0.3	5.4	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	5.9	64	15	-	-	0.04	-
44.95	25.9	13.8	-	1.0	-0.1	4.2	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	5.9	59	15	-	-	0.04	-
45.11	28.4	15.0	-	0.7	0.0	2.9	3	silty CLAY to CLAY	115	1.5	19	10	-	-	1.9	6.5	50	15	-	-	0.04	-
45.28	21.5	11.4	-	1.5	0.0	7.7	3	silty CLAY to CLAY	115	1.5	14	8	-	-	1.4	4.8	77	15	-	-	0.04	-
45.44	33.7	17.8	-	1.7	0.2	5.6	3	silty CLAY to CLAY	115	1.5	22	12	-	-	2.3	7.8	58	15	-	-	0.04	-
45.61	64.7	45.6	91.9	1.0	-0.1	1.6	5	silty SAND to sandy SILT	120	4.0	16	11	41	36	-	-	23	16	2.50	-	0.04	49.4
45.77	55.0	38.7	89.7	0.9	-0.8	1.8	5	silty SAND to sandy SILT	120	4.0	14	10	36	35	-	-	26	16	2.55	-	0.04	51.2
45.93	30.0	15.7	-	1.1	-0.8	4.2	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	6.8	56	15	-	-	0.03	-
46.10	20.1	10.5	-	1.4	-0.6	8.1	3	silty CLAY to CLAY	115	1.5	13	7	-	-	1.3	4.3	80	15	-	-	0.03	-
46.26	29.7	15.5	-	1.4	-0.4	5.1	3	silty CLAY to CLAY	115	1.5	20	10	-	-	2.0	6.7	60	15	-	-	0.03	-

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

Project ID: Geolabs Westlake Village
Data File: SDF(239).cpt
CPT Date: 4/30/2012 1:47:00 PM
GW During Test: 22 ft

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Sounding ID: CPT-05
Project No: 9279
Cone/Rig: DSG0906

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.	qc	qc1n	q1ncs	Slv	pore	Frct	Mat	Material	Unit	Qc	SPT	SPT	Rel	Ftn	Und	OCR	Fin	Nk	Vol	Dry	Liq	Cycl
Depth	PS	PS	PS	Stss	prss	Rato	Typ	Behavior	Wght	to	R-N	R-N1	Den	Ang	Shr	-	Ic	-	Strn	Stlmt	Stlmt	SStn
ft	tsf	-	-	tsf	(psi)	%	Zon	Description	pcf	N	60%	60%	%	deg	tsf	-	%	-	%	0.00	0.17	%
46.43	21.6	11.2	-	1.0	-0.5	5.4	3	silty CLAY to CLAY	115	1.5	14	7	-	-	1.4	4.7	70	15	-	-	0.03	-
46.59	25.1	13.0	-	0.8	-0.5	3.5	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	5.5	57	15	-	-	0.03	-
46.75	22.2	11.5	-	1.1	-0.4	5.8	3	silty CLAY to CLAY	115	1.5	15	8	-	-	1.5	4.8	70	15	-	-	0.03	-
46.92	25.1	13.0	-	2.1	-0.3	9.3	3	silty CLAY to CLAY	115	1.5	17	9	-	-	1.7	5.5	77	15	-	-	0.03	-
47.08	43.2	22.3	-	2.5	-0.3	6.1	3	silty CLAY to CLAY	115	1.5	29	15	-	-	3.0	9.9	55	15	-	-	0.03	-
47.25	70.1	36.0	-	2.4	-0.6	3.5	4	clayy SILT to silty CLAY	115	2.0	35	18	-	-	4.9	9.9	36	15	-	-	0.03	-
47.41	80.9	56.3	105.3	1.4	-1.2	1.8	5	silty SAND to sandy SILT	120	4.0	20	14	48	38	-	-	22	16	2.24	-	0.03	37.5
47.57	65.2	45.3	120.3	1.7	-1.9	2.8	4	clayy SILT to silty CLAY	115	2.0	33	23	-	-	4.5	9.9	30	15	2.01	-	0.03	49.7
47.74	49.3	25.2	-	2.2	-0.9	4.8	3	silty CLAY to CLAY	115	1.5	33	17	-	-	3.4	9.9	48	15	-	-	0.03	-
47.90	73.6	51.0	128.8	2.1	-0.8	2.9	4	clayy SILT to silty CLAY	115	2.0	37	26	-	-	5.1	9.9	28	15	1.90	-	0.03	43.0
48.07	153.7	106.5	136.8	2.1	-1.9	1.4	6	clean SAND to silty SAND	125	5.0	31	21	69	41	-	-	13	16	1.75	-	0.02	13.4
48.23	193.4	133.8	152.3	2.1	-3.4	1.1	6	clean SAND to silty SAND	125	5.0	39	27	77	42	-	-	9	16	1.14	-	0.02	5.7
48.39	184.6	127.5	144.7	1.8	-4.2	1.0	6	clean SAND to silty SAND	125	5.0	37	26	75	42	-	-	9	16	1.45	-	0.02	7.9
48.56	187.1	129.1	137.5	1.3	-5.0	0.7	6	clean SAND to silty SAND	125	5.0	37	26	75	42	-	-	7	16	1.75	-	0.02	10.5
48.72	183.6	126.5	133.6	1.2	-5.6	0.7	6	clean SAND to silty SAND	125	5.0	37	25	75	42	-	-	7	16	1.84	-	0.01	12.3
48.89	187.5	129.0	137.5	1.3	-6.3	0.7	6	clean SAND to silty SAND	125	5.0	38	26	75	42	-	-	7	16	1.74	-	0.01	10.4
49.05	192.7	132.4	165.3	3.0	-6.5	1.6	6	clean SAND to silty SAND	125	5.0	39	26	76	42	-	-	12	16	0.00	-	0.01	0.0
49.22	223.4	153.3	185.1	3.5	-6.9	1.6	6	clean SAND to silty SAND	125	5.0	45	31	81	43	-	-	11	16	0.00	-	0.01	0.0
49.38	274.3	188.1	225.4	5.0	-7.3	1.8	6	clean SAND to silty SAND	125	5.0	55	38	88	44	-	-	11	16	0.00	-	0.01	0.0
49.54	184.0	126.0	181.7	4.1	-6.5	2.3	5	silty SAND to sandy SILT	120	4.0	46	31	75	42	-	-	16	16	0.00	-	0.01	0.0
49.71	156.5	107.0	125.4	1.5	-6.1	1.0	6	clean SAND to silty SAND	125	5.0	31	21	69	41	-	-	10	16	1.94	-	0.01	15.1
49.87	145.2	99.1	114.3	1.1	-6.1	0.8	6	clean SAND to silty SAND	125	5.0	29	20	67	41	-	-	9	16	2.09	-	0.00	17.2

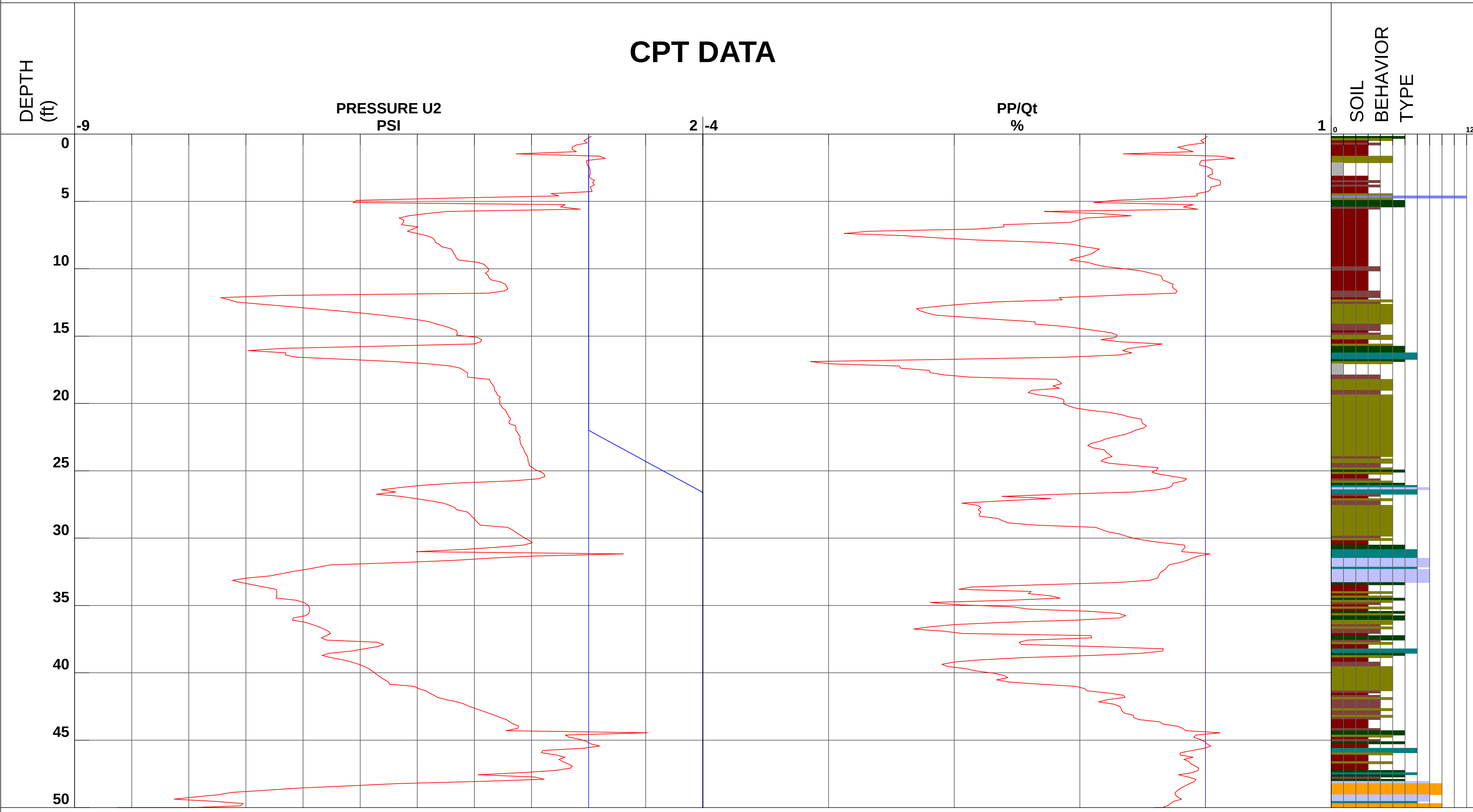
* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Geolabs Westlake Village

Project	SMC Library	Operator	RA/JC	Filename	SDF(239).cpt
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-05	Date and Time	4/30/2012 1:47:00 PM	Maximum Depth	50.20 ft
Water Table Depth	22.00 ft				

Net Area Ratio .8

CPT DATA



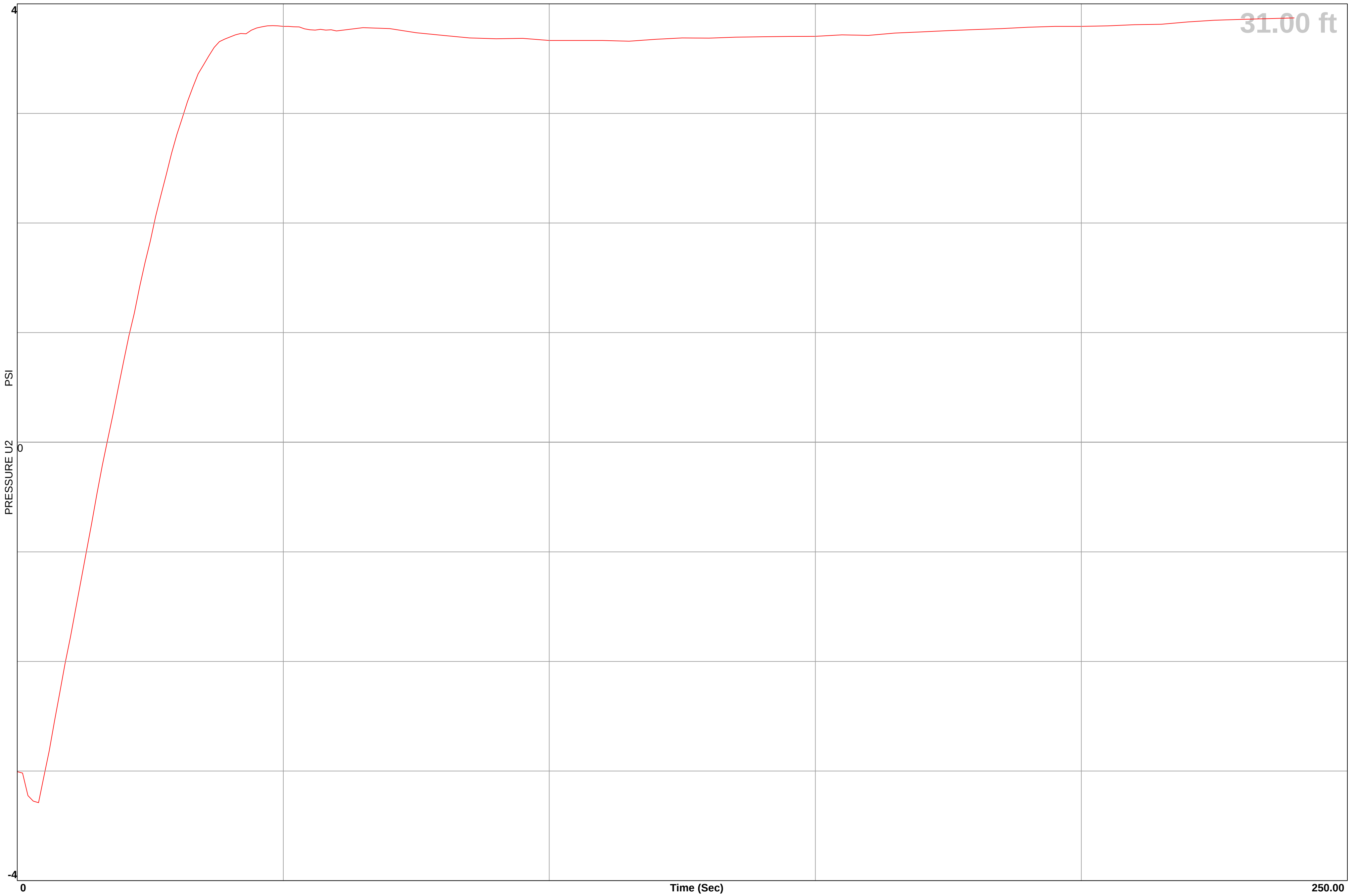
1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 10cm squared

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

Geolabs Westlake Village

Location	SMC Library	Operator	RA/JC		
Job Number	9279	Cone Number	DSG0906	GPS	
Hole Number	CPT-05	Date and Time	4/30/2012 1:47:00 PM		
Equilized Pressure	3.8	Ground Water Depth	22.0		



APPENDIX B

LABORATORY TEST RESULTS

Preliminary Geotechnical Investigation,
Proposed Library,
23555 Civic Center Way,
City of Malibu, California

W.O. 9279
June 20, 2012
Revised December 18, 2013

LABORATORY TESTING

Moisture-Density

The field moisture content and dry unit weight were determined for each undisturbed sample. Dry unit weight is expressed in pounds per cubic foot and the moisture content represents a percentage of the dry unit weight. This test data is presented on the boring logs and Plate LS.1to LS.2.

Particle Size Analyses

Particle size analyses were performed on selected samples from the borings in general conformance with ASTM D 422. The results of this testing are presented on Plate PS.1 to PS.4

Compaction and Expansion Tests

To determine the compaction characteristics of the onsite materials, compaction tests are performed in general accordance with the current ASTM D 1557 standard. The maximum dry density is reported in pounds per cubic foot and the optimum moisture content as a percentage of the maximum dry density. Expansion index tests were performed in accordance with the criteria in ASTM D4829. The results of these tests are included in Plate LS.1 & LS.2.

Shear Test

Shear tests were performed in a Direct Shear Machine of the strain control type in accordance with ASTM 3080. The rate of deformation is approximately 0.01 inches per minute. Shearing occurred under a variety of confining loads in order to determine the Coulomb shear strength parameters. The test was performed on undisturbed and remolded (@ 90% relative compaction) samples in an artificially saturated condition. The test results are presented graphically on Plates S-B1.1-3, to S-B2.12.5.

Consolidation Test

Consolidation characteristics of a soil sample under load are established using consolidation tests. A one inch high sample is loaded in a geometric progression and the resulting deformation is recorded at selected time intervals. Porous stones are placed in contact with the sample (top and bottom) to permit addition and release of pore fluid. The sample is inundated at a selected load during the progression. Results are plotted on the enclosed Consolidation-Pressure Curves (Plates C-B01.10 through C-B03.25). Various correlations regarding the results of these tests under a variety of normal loads and moisture conditions are presented on plates C-Hydro.Qal.1 and C-Hydro.B.Qal.1 .

Laboratory Test Summary

W.O. 9279

Depth	Geology	Sample Description	ST	w	DD	S	Max	Opt	EI	LL	PI	e	n	WD	SD	R-Value
Excavation: B01 (TD= 30 ft, GW @ 9 ft)																
1	Artificial Fill	silty SAND	(B)				122	12.5	26							
5	Alluvium	lean CLAY with sand	(S)	26.5						47	30					
10	Alluvium	clayey SAND	(U)	24.1	100.8	98						0.66	40	125	126	
15	Alluvium	SAND	(S)	22.4												
15.5	Alluvium	sandy lean CLAY	(S)	31.9						45	30					
20	Alluvium	clayey fine SAND	(U)	33.3	87.2	97						0.92	48	116	117	
25	Alluvium	SAND	(S)	27.9												
25.5	Alluvium	lean CLAY with sand	(S)	34.9						45	28					
30	Alluvium	clayey SAND	(U)	26.4	96.8	97						0.73	42	122	123	
Excavation: B02 (TD= 50 ft, GW @ 14 ft)																
1	Artificial Fill	lean CLAY with sand	(B)				126	12	24							10
5	Alluvium	clayey SAND	(U)	21.7	101.3	89						0.65	40	123	126	
10	Alluvium	sandy lean CLAY	(S)	25.9						30	16					
12.5	Alluvium	sandy lean CLAY	(U)	28.2	97.5	100						0.71	42	125	124	
15	Alluvium	SAND	(S)	24.9												
17.5	Alluvium	sandy lean CLAY	(U)	30.4	93.1	100						0.8	44	121	121	
20	Alluvium	clayey SAND	(S)	29.6						31	16					
25	Alluvium	clayey SAND	(S)	26.9						27	12					
30	Alluvium	clayey SAND	(S)	26.3												
30.5	Alluvium	sandy lean CLAY	(S)	31.1						37	21					
35	Alluvium	sandy lean CLAY	(S)	35.7												
40	Alluvium	lean CLAY with sand	(S)	34.4						44	24					
45	Alluvium	silty SAND	(S)	26.7												
45.5	Alluvium	sandy lean CLAY	(S)	27.7						35	16					
50	Alluvium	SAND	(S)	25.1												

For abbreviation explanation see Legend on PLATE LS 2

Depth	Geology	Sample Description	ST	w	DD	S	Max	Opt	EI	LL	PI	e	n	WD	SD	R-Value
Excavation: B03 (TD= 30 ft, GW @ 6 ft)																
1	Artificial Fill	clayey GRAVEL	(B)													
6.5	Artificial Fill	clayey GRAVEL	(S)	24.5												
7	Alluvium	sandy lean CLAY	(S)	19.2												
10	Alluvium	sandy lean CLAY	(S)	23.1						33	17					
15	Alluvium	clayey SAND	(U)	23.3	103.3	100				29	15	0.62	38	127	127	
20	Alluvium	sandy lean CLAY	(S)	32.4						44	29					
25	Alluvium	silty SAND	(U)	23.2	105.2	100				25	3	0.59	37	130	128	
30	Alluvium	clayey SAND	(S)	25.1						30	16					

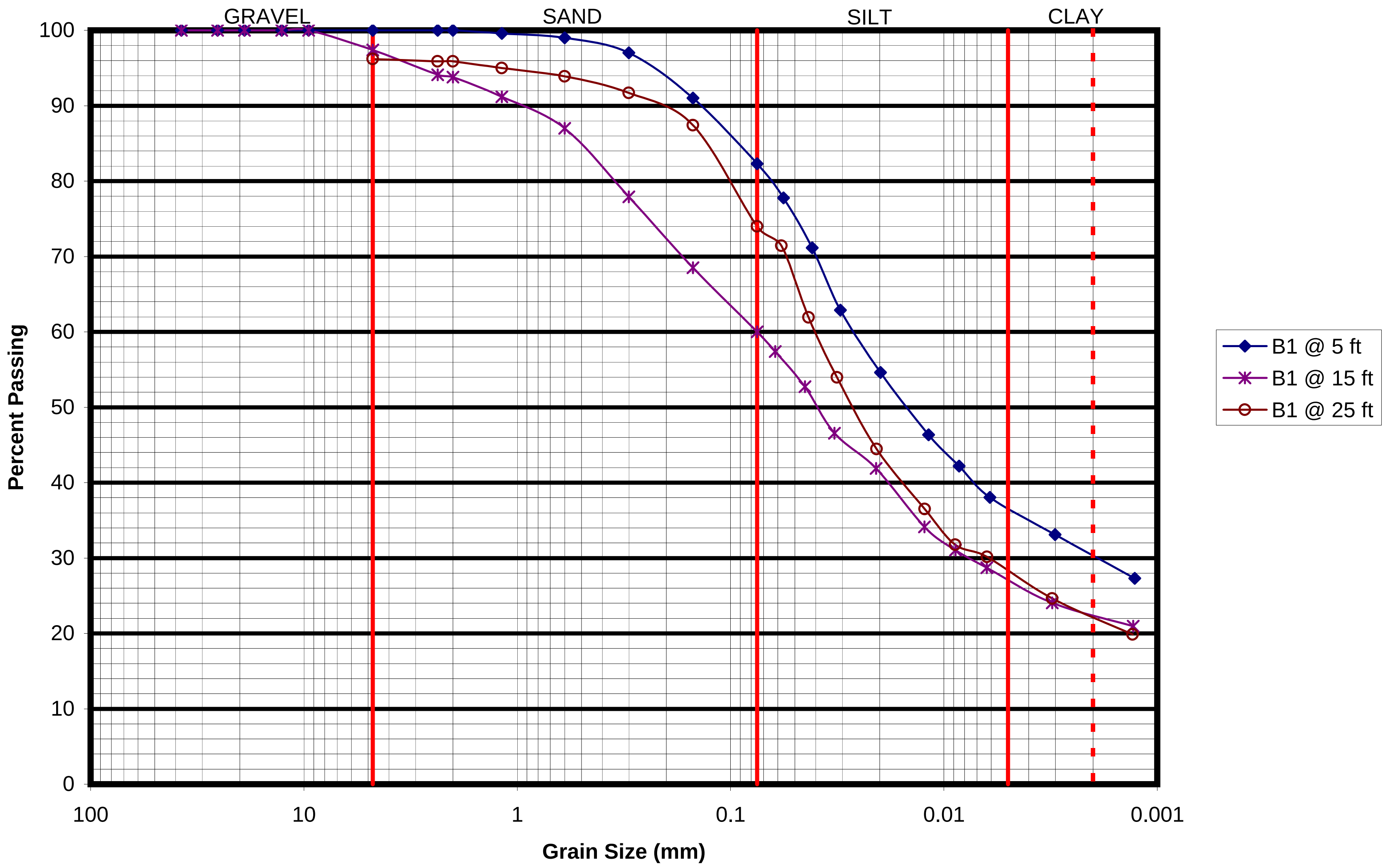
LEGEND

Depth = Sample Depth (ft) below ground surface
ST = Sample Type*
w = Initial Moisture Content (%)
DD = Initial Dry Unit Weight (pcf)
Max = Maximum Dry Unit Weight (pcf)
Opt = Optimum Moisture Content (%)
EI = Expansion Index
S = Degree of Saturation (%)

LL = Liquid Limit
PI = Plasticity Index
e = Void Ratio
n = Porosity (%)
WD = Initial Wet Unit Weight (pcf)
SD = Saturated Unit Weight (pcf)
BD = Bouyant (Submerged) Unit Weight (pcf) - Assuming water unit weight of 62.4 pcf

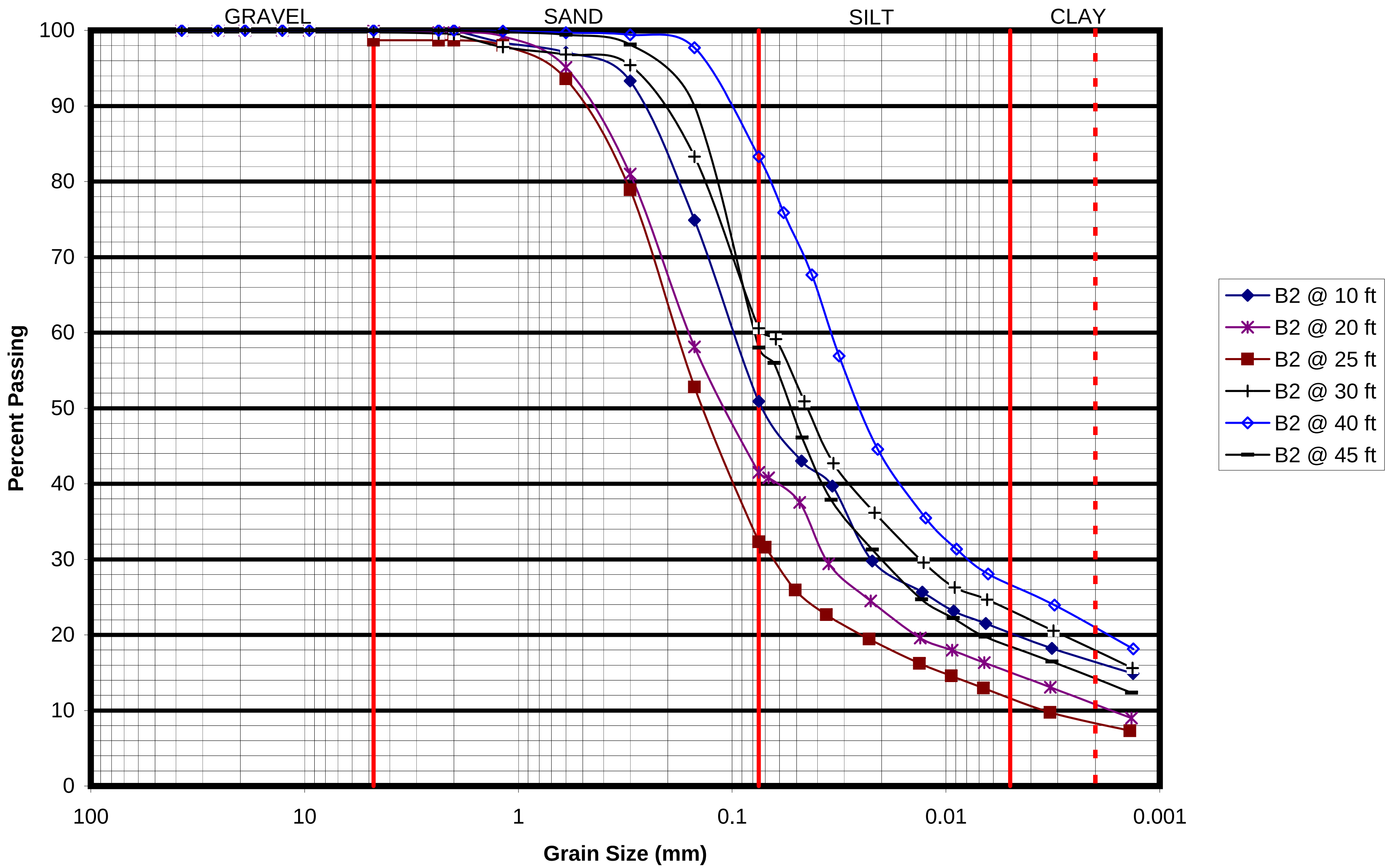
*** Sample Types: (U) = relatively Undisturbed; (S) = SPT; (B) = Bulk; (N) = Nuclear**

PARTICLE SIZE ANALYSIS



GEOLABS-WESTLAKE VILLAGE

PARTICLE SIZE ANALYSIS



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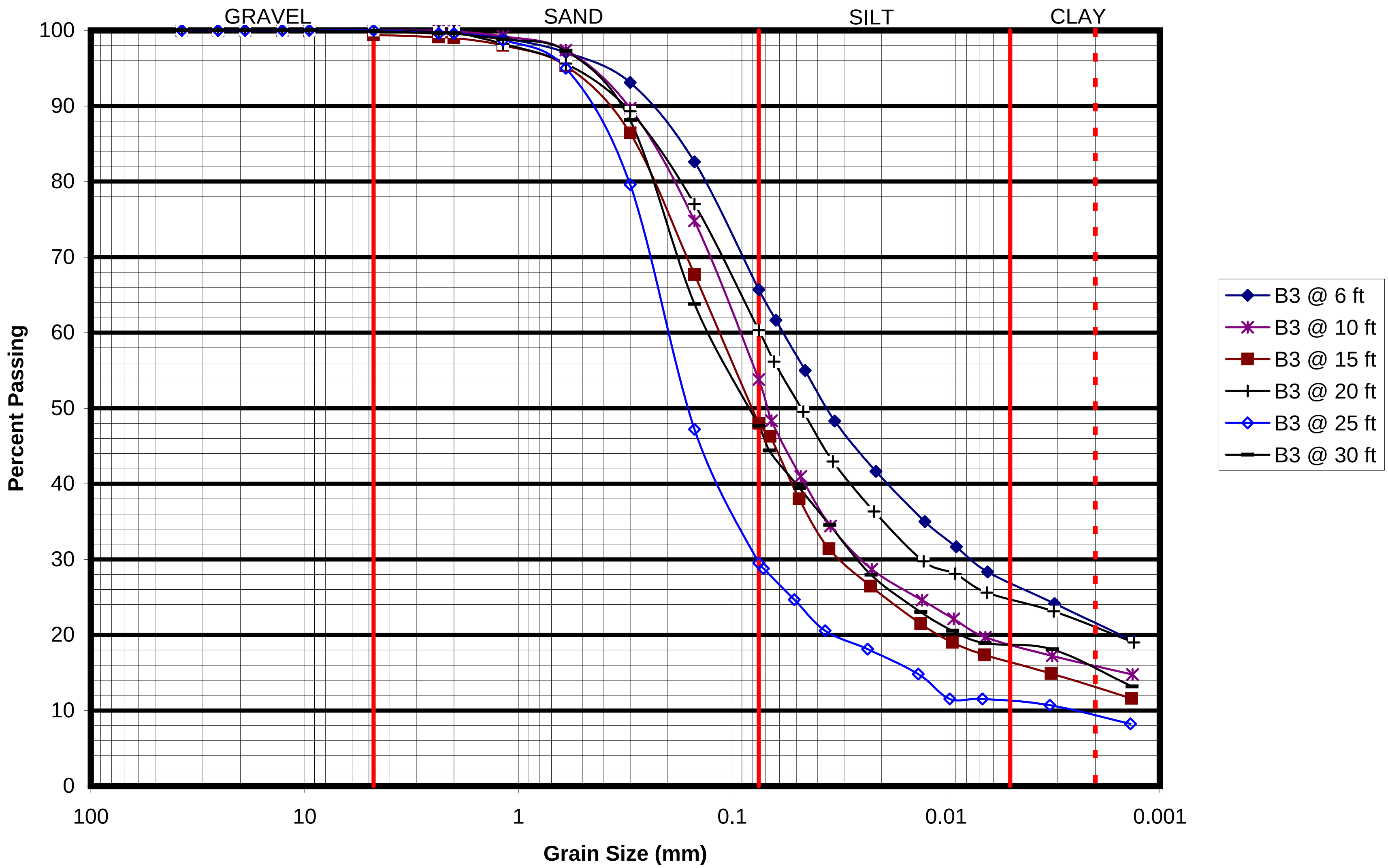
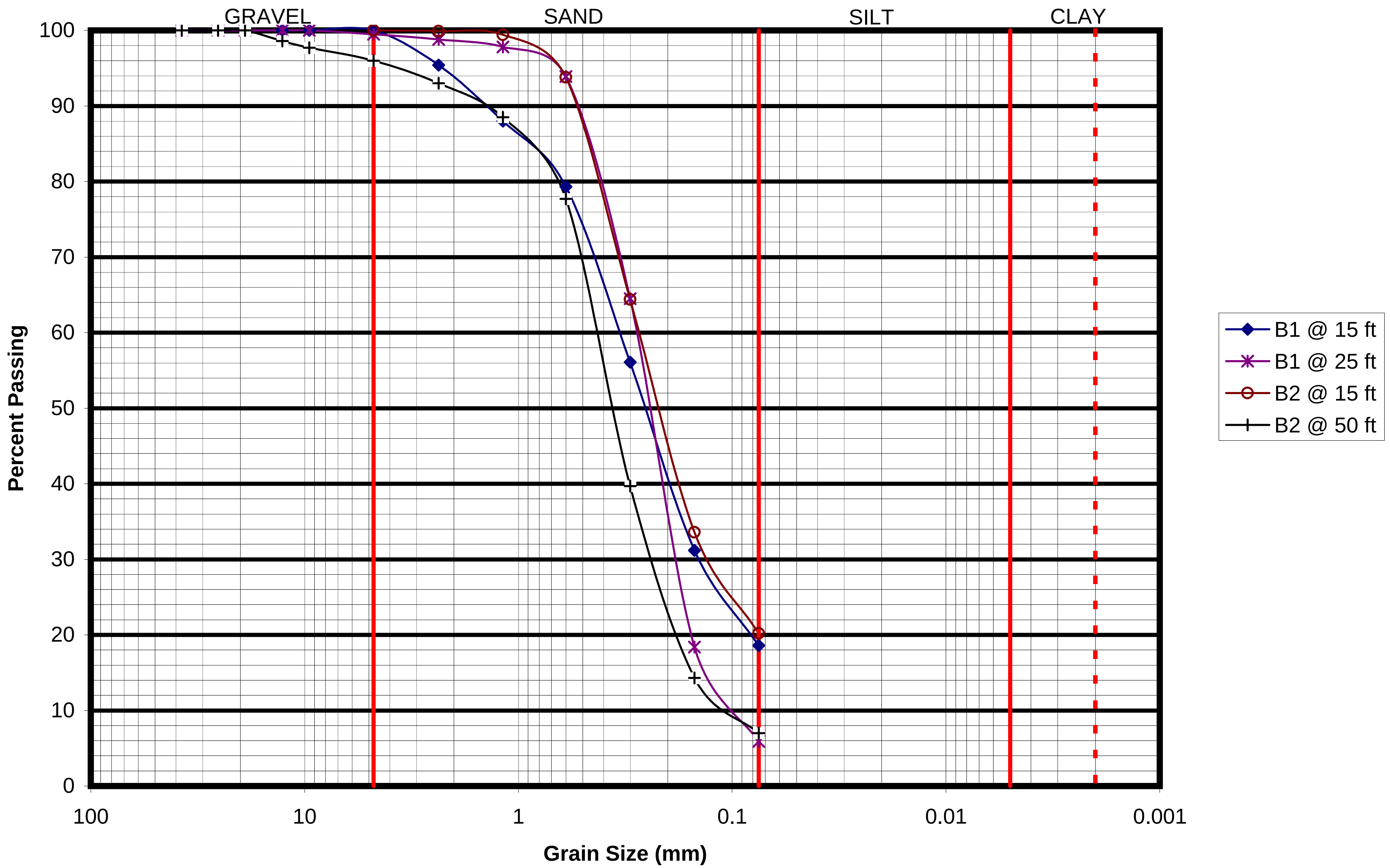
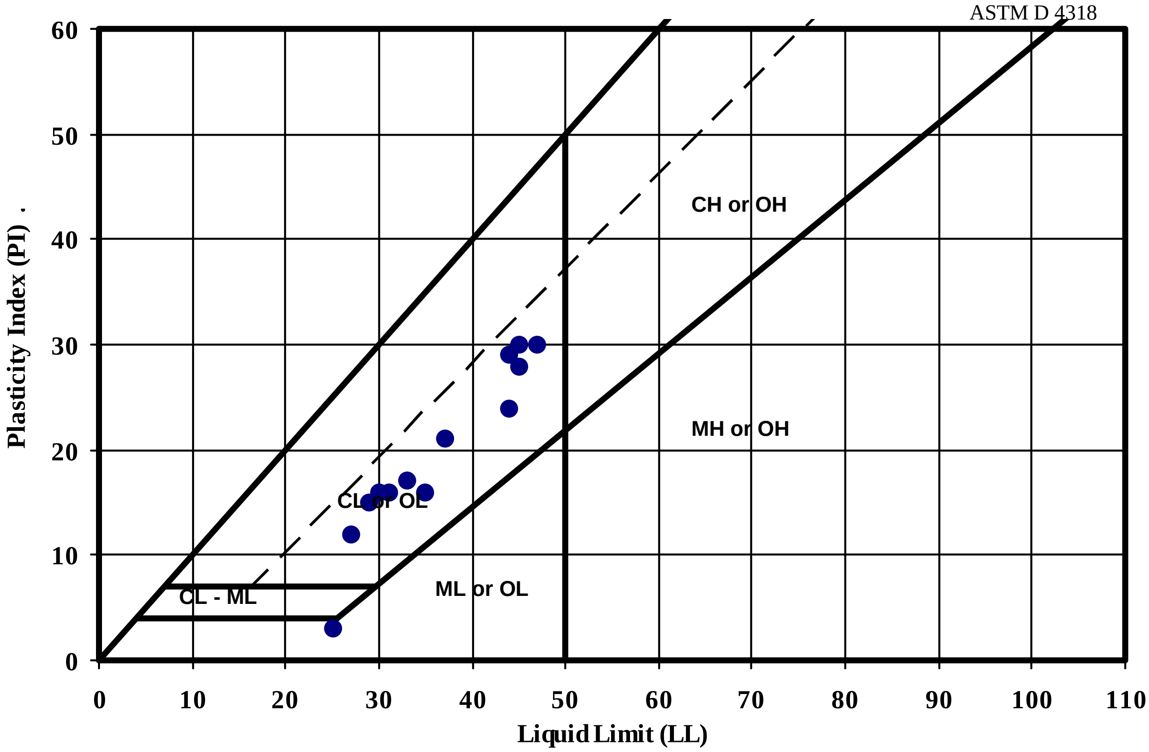


PARTICLE SIZE ANALYSIS



ATTERBERG LIMITS

PLASTICITY CHART

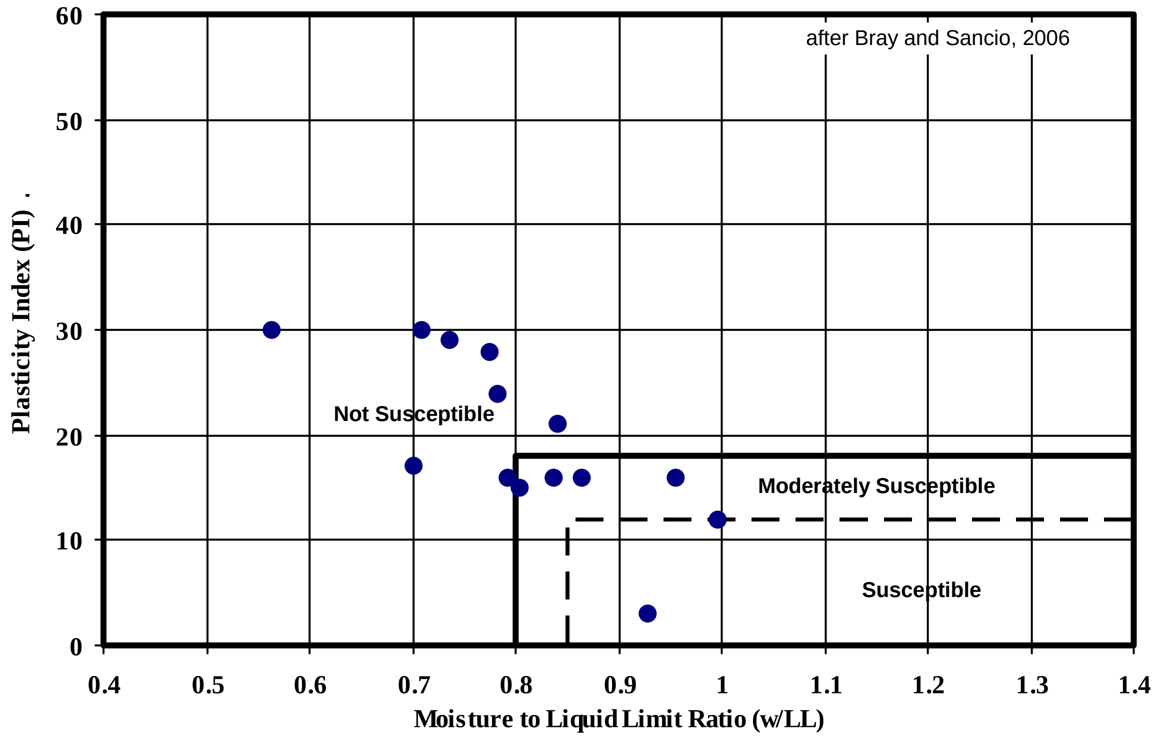


Excavation	Depth (ft)	Geology	Soil Description	LL	PI	Fines Class	w	w/LL
B01	5	Qal	lean CLAY with sand	47	30	CL	26.5	0.56
B01	15.5	Qal	sandy lean CLAY	45	30	CL	31.9	0.71
B01	25.5	Qal	lean CLAY with sand	45	28	CL	34.9	0.78
B02	10	Qal	sandy lean CLAY	30	16	CL	25.9	0.86
B02	20	Qal	clayey SAND	31	16	CL	29.6	0.95
B02	25	Qal	clayey SAND	27	12	CL	26.9	1
B02	30.5	Qal	sandy lean CLAY	37	21	CL	31.1	0.84
B02	40	Qal	lean CLAY with sand	44	24	CL	34.4	0.78
B02	45.5	Qal	sandy lean CLAY	35	16	CL	27.7	0.79
B03	10	Qal	sandy lean CLAY	33	17	CL	23.1	0.7
B03	15	Qal	clayey SAND	29	15	CL	23.3	0.8
B03	20	Qal	sandy lean CLAY	44	29	CL	32.4	0.74
B03	25	Qal	silty SAND	25	3	ML	23.2	0.93
B03	30	Qal	clayey SAND	30	16	CL	25.1	0.84

LL = Liquid Limit, PI = Plasticity Index, NP = Non-Plastic , w = Field Moisture

LIQUEFACTION SUSCEPTIBILITY OF FINE-GRAINED SOILS

LIQUEFACTION SUSCEPTIBILITY CHART



Excavation	Depth (ft)	Geology	Soil Description	LL	PI	Fines Class	w	w/LL	Est. Liq Catagory*
B01	5	Qal	lean CLAY with sand	47	30	CL	26.5	0.56	Not Susceptible
B01	15.5	Qal	sandy lean CLAY	45	30	CL	31.9	0.71	Not Susceptible
B01	25.5	Qal	lean CLAY with sand	45	28	CL	34.9	0.78	Not Susceptible
B02	10	Qal	sandy lean CLAY	30	16	CL	25.9	0.86	More Resistant
B02	20	Qal	clayey SAND	31	16	CL	29.6	0.95	More Resistant
B02	25	Qal	clayey SAND	27	12	CL	26.9	1.00	More Resistant
B02	30.5	Qal	sandy lean CLAY	37	21	CL	31.1	0.84	Not Susceptible
B02	40	Qal	lean CLAY with sand	44	24	CL	34.4	0.78	Not Susceptible
B02	45.5	Qal	sandy lean CLAY	35	16	CL	27.7	0.79	Not Susceptible
B03	10	Qal	sandy lean CLAY	33	17	CL	23.1	0.70	Not Susceptible
B03	15	Qal	clayey SAND	29	15	CL	23.3	0.80	More Resistant
B03	20	Qal	sandy lean CLAY	44	29	CL	32.4	0.74	Not Susceptible
B03	25	Qal	silty SAND	25	3	ML	23.2	0.93	Susceptible
B03	30	Qal	clayey SAND	30	16	CL	25.1	0.84	More Resistant

LL = Liquid Limit, PI = Plasticity Index, NP = Non-Plastic , w = Field Moisture

* Considers Methodology Proposed by Bray and Sancio (2006) for fine-grained soils:

Loose soils with PI < 12 and w/LL > 0.85 are considered susceptible to liquefaction

Loose soils with 12 < PI < 18 and w/LL > 0.8 are considered more resistant

Soils with PI > 18 at low effective confining stresses are considered not susceptible

GEOLABS-WESTLAKE VILLAGE

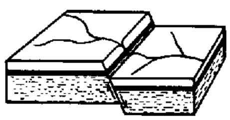
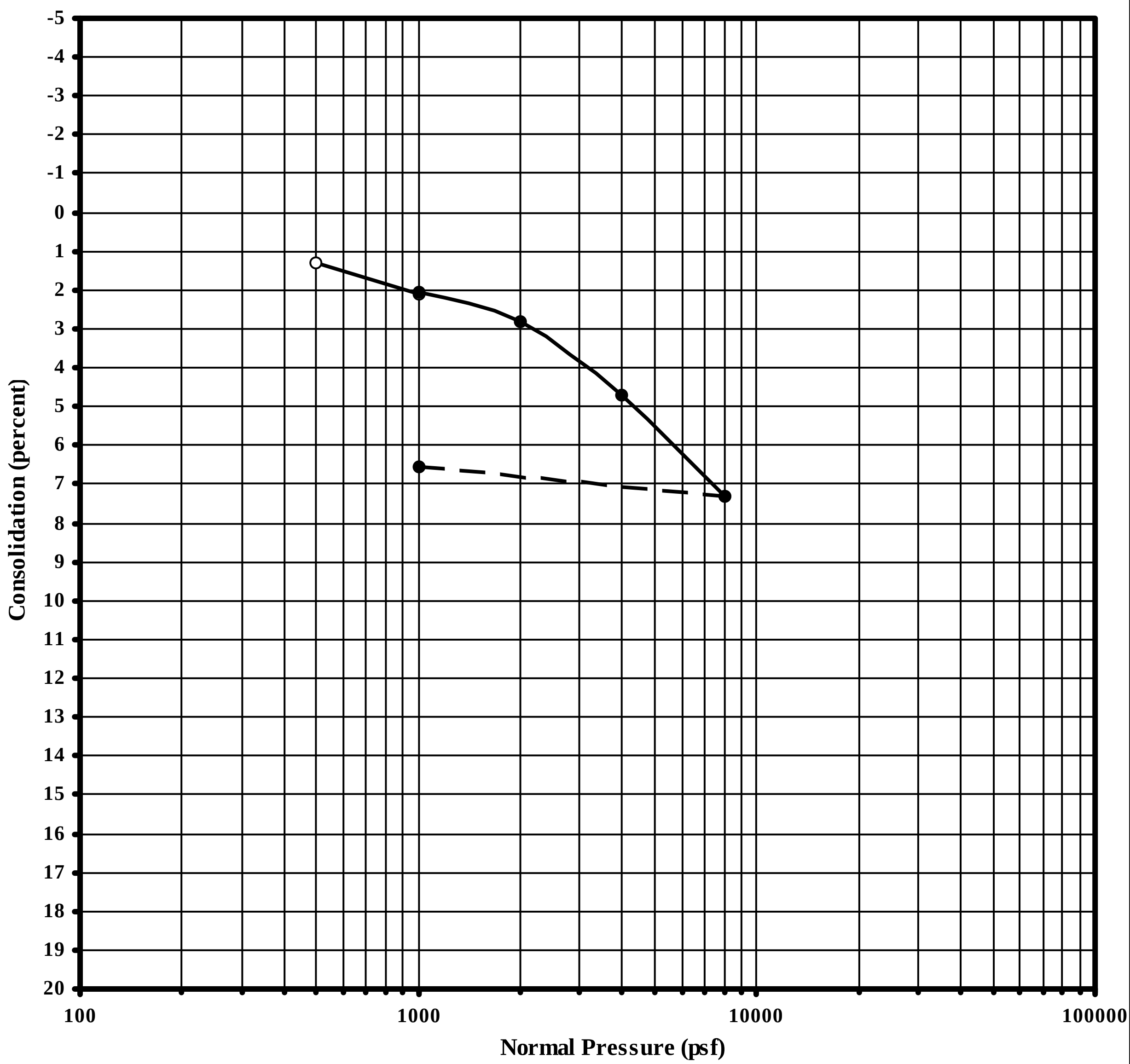


PLATE wLL.1

CONSOLIDATION RESULTS

Undisturbed Sample



Sample Inundated At Normal Pressure of 1000 psf

Sample Location: B01

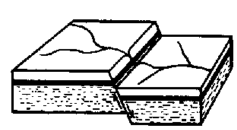
Sample Depth: 10 ft.

Initial Moisture: 24.1 %

Init. Dry Density: 100.8 pcf

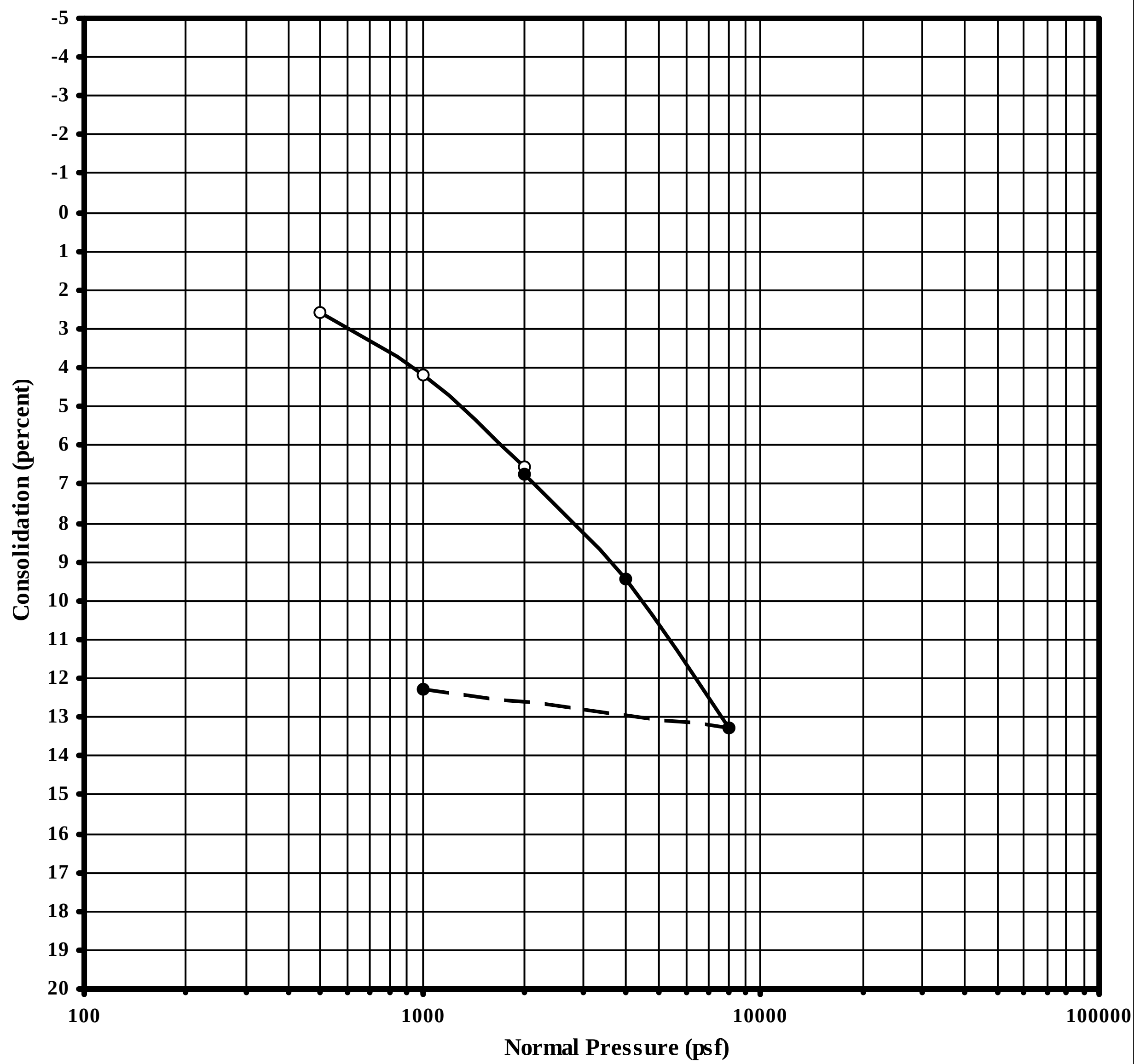
Geologic Unit: Alluvium

Material: clayey SAND



CONSOLIDATION RESULTS

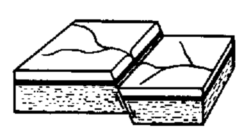
Undisturbed Sample



Sample Inundated At Normal Pressure of 2000 psf

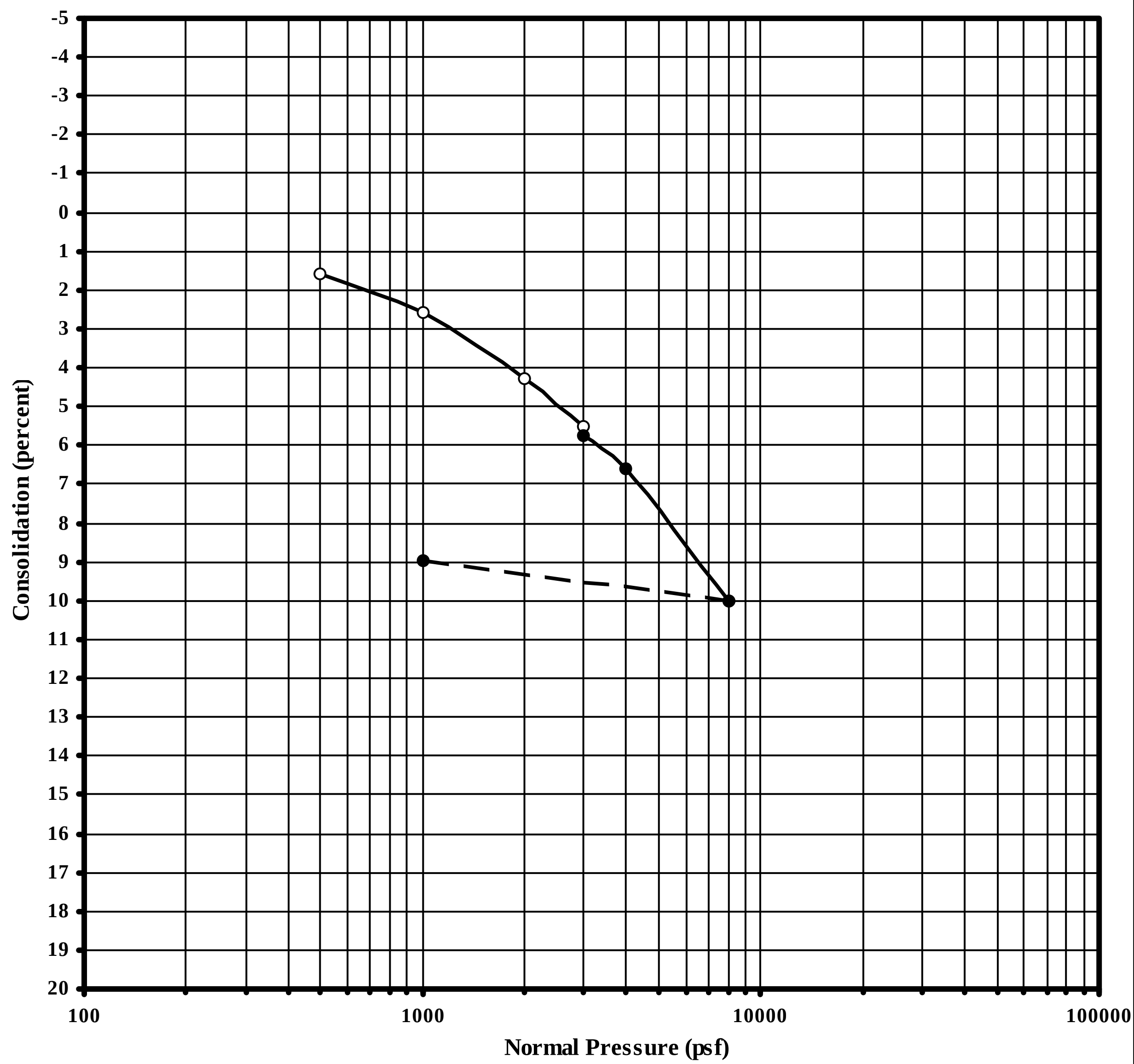
Sample Location: B01
Sample Depth: 20 ft.
Initial Moisture: 33.3 %
Init. Dry Density: 87.2 pcf

Geologic Unit: Alluvium
Material: clayey fine SAND



CONSOLIDATION RESULTS

Undisturbed Sample



Sample Inundated At Normal Pressure of 3000 psf

Sample Location: B01

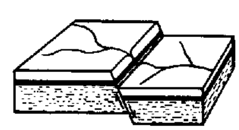
Sample Depth: 30 ft.

Initial Moisture: 26.4 %

Init. Dry Density: 96.8 pcf

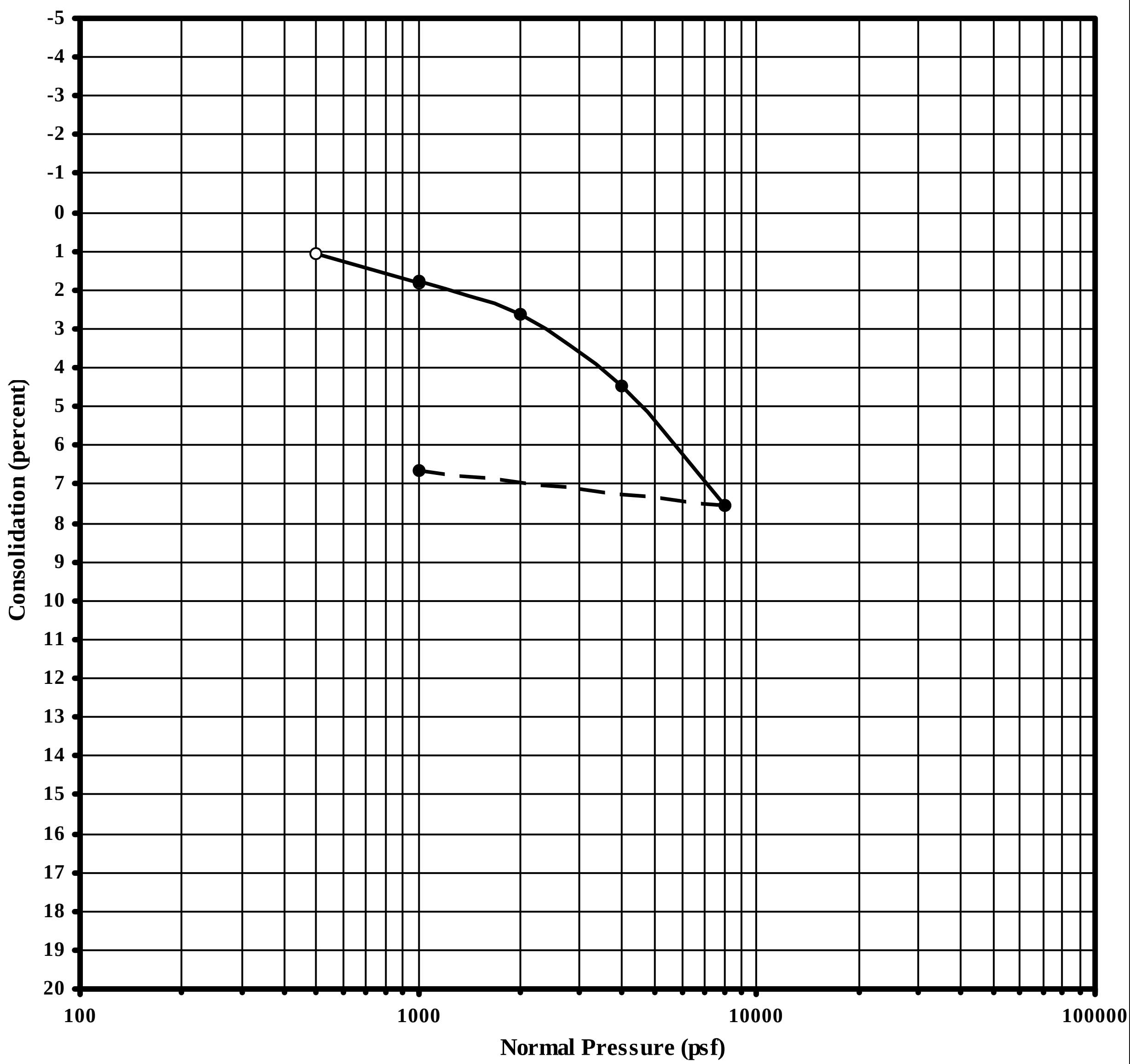
Geologic Unit: Alluvium

Material: clayey SAND



CONSOLIDATION RESULTS

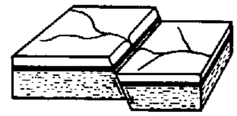
Undisturbed Sample



Sample Inundated At Normal Pressure of 1000 psf

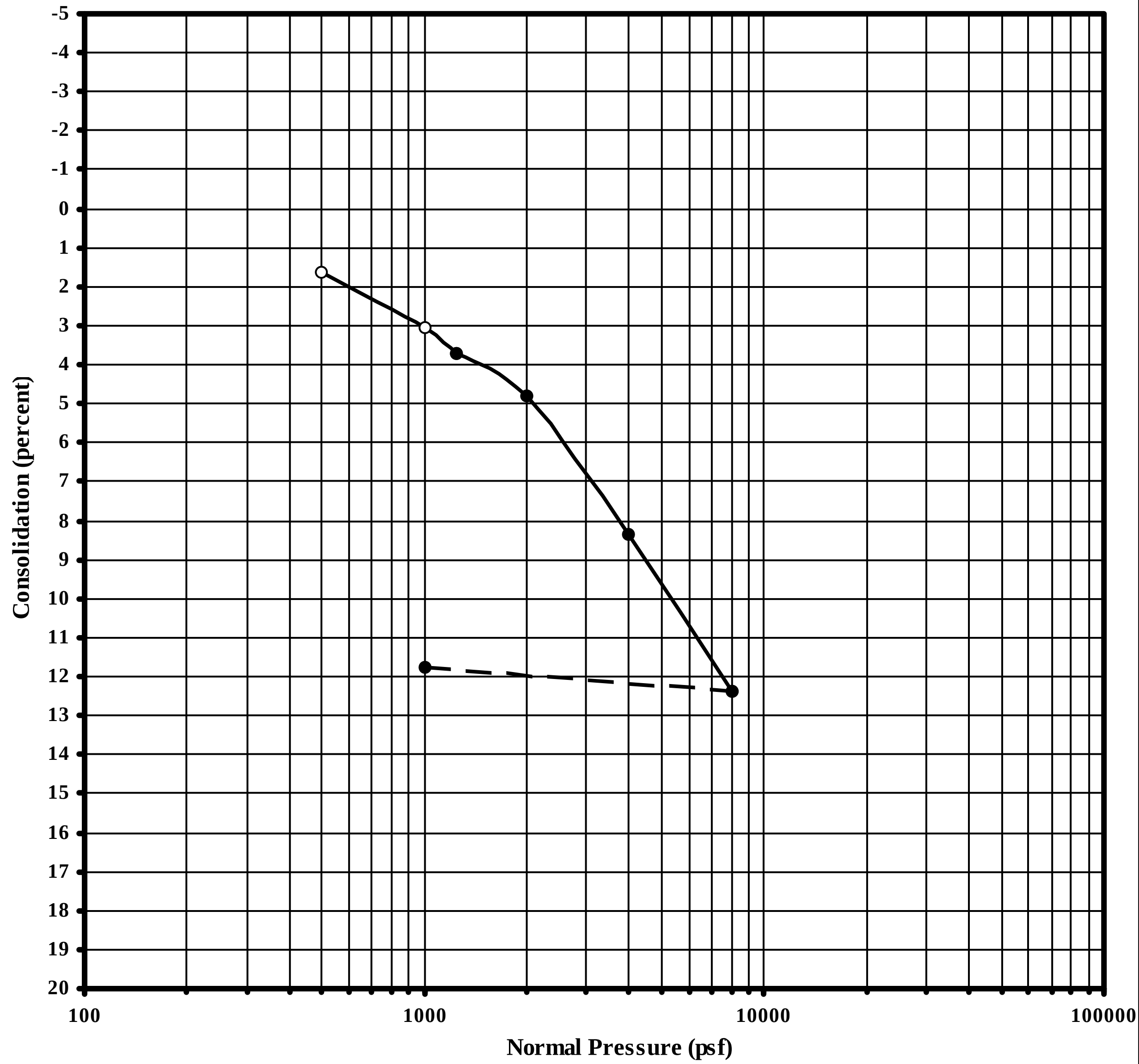
Sample Location: B02
Sample Depth: 5 ft.
Initial Moisture: 21.7 %
Init. Dry Density: 101.3 pcf

Geologic Unit: Alluvium
Material: clayey SAND



CONSOLIDATION RESULTS

Undisturbed Sample



Sample Inundated At Normal Pressure of 1250 psf

Sample Location: B02

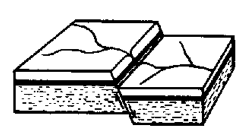
Sample Depth: 12.5 ft.

Initial Moisture: 28.2 %

Init. Dry Density: 97.5 pcf

Geologic Unit: Alluvium

Material: sandy lean CLAY

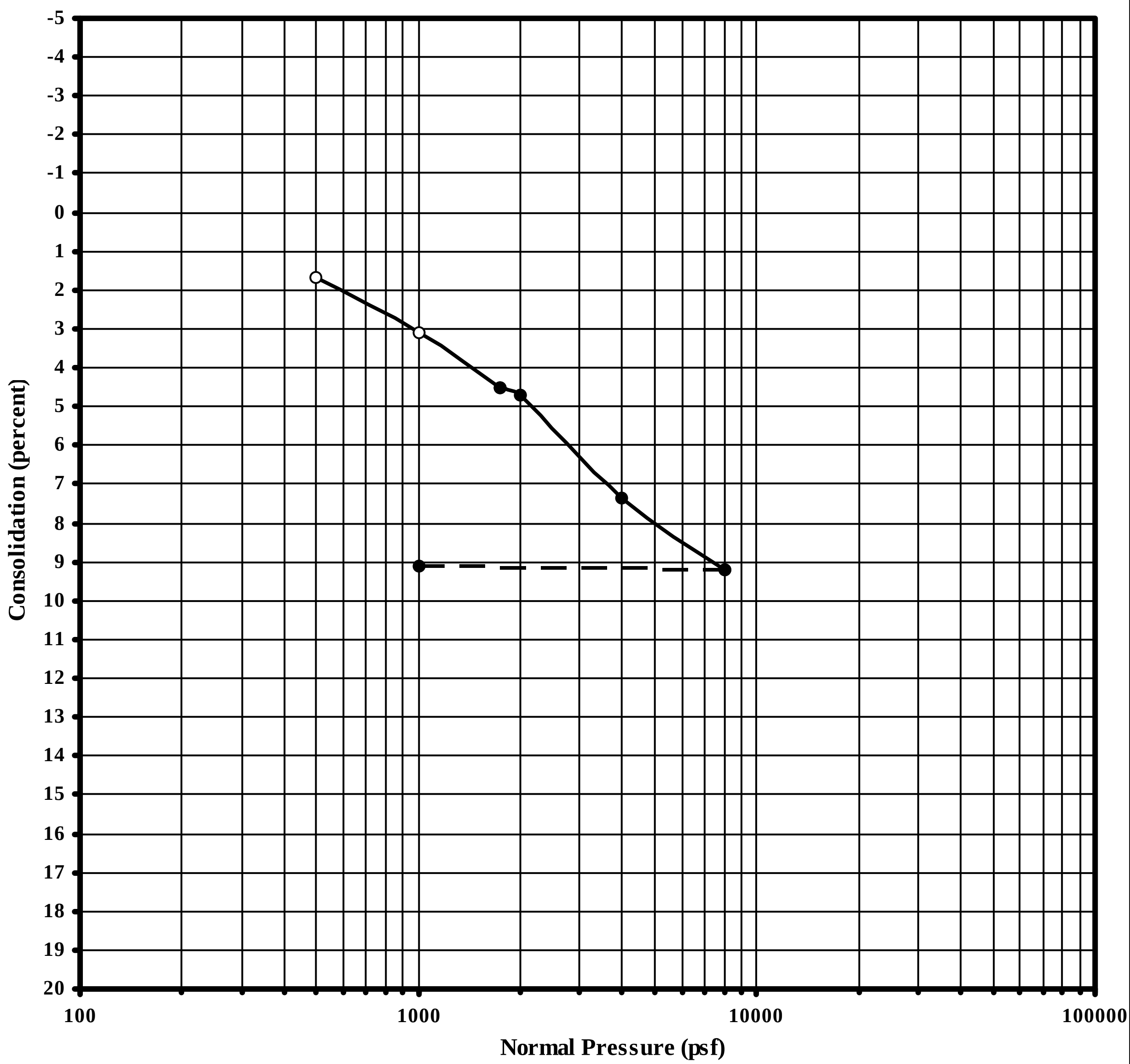


GEOLABS-WESTLAKE VILLAGE

PLATE C-B02.12.5

CONSOLIDATION RESULTS

Undisturbed Sample



Sample Inundated At Normal Pressure of 1750 psf

Sample Location: B02

Sample Depth: 17.5 ft.

Initial Moisture: 30.4 %

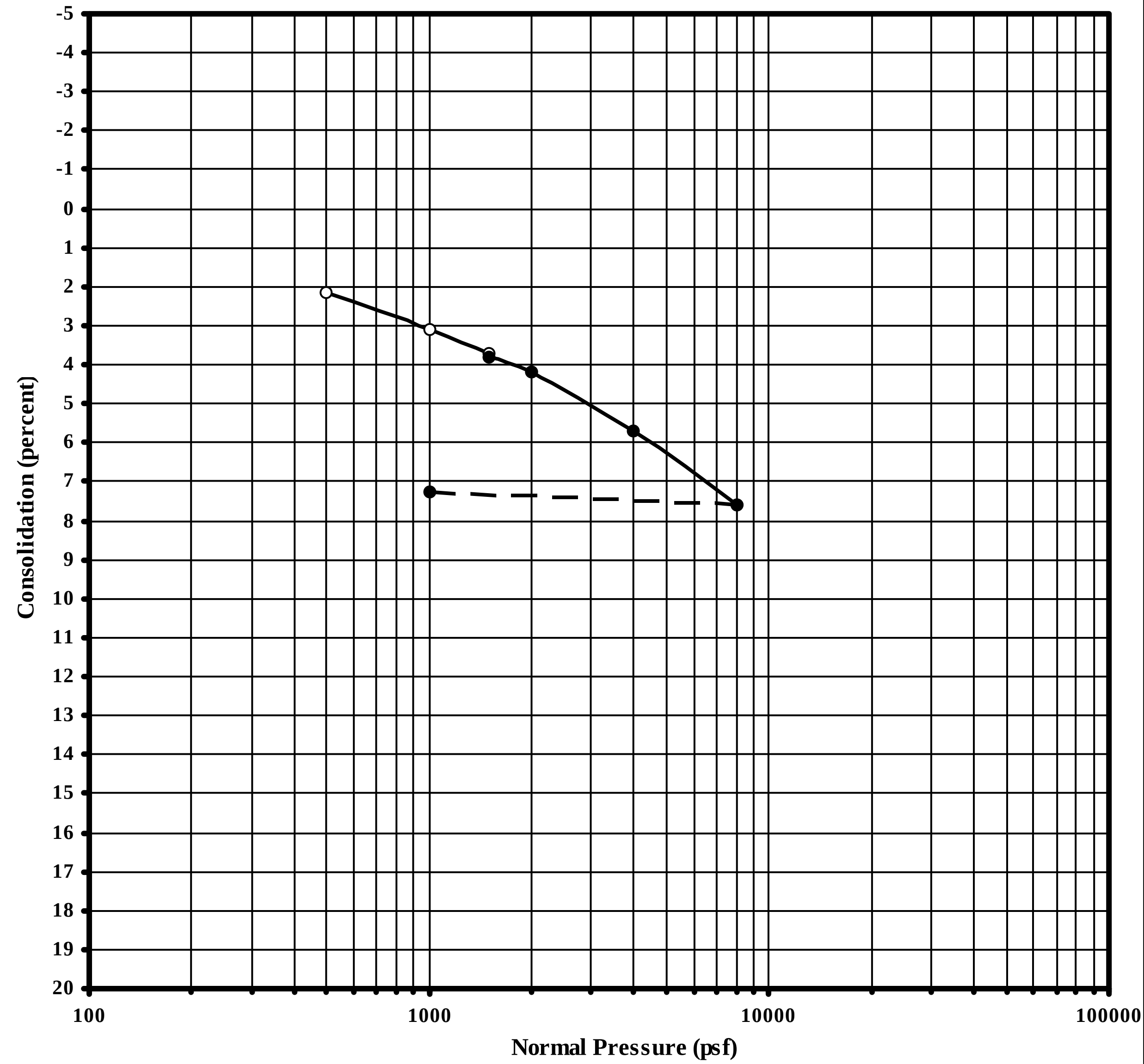
Init. Dry Density: 93.1 pcf

Geologic Unit: Alluvium

Material: sandy lean CLAY

CONSOLIDATION RESULTS

Undisturbed Sample



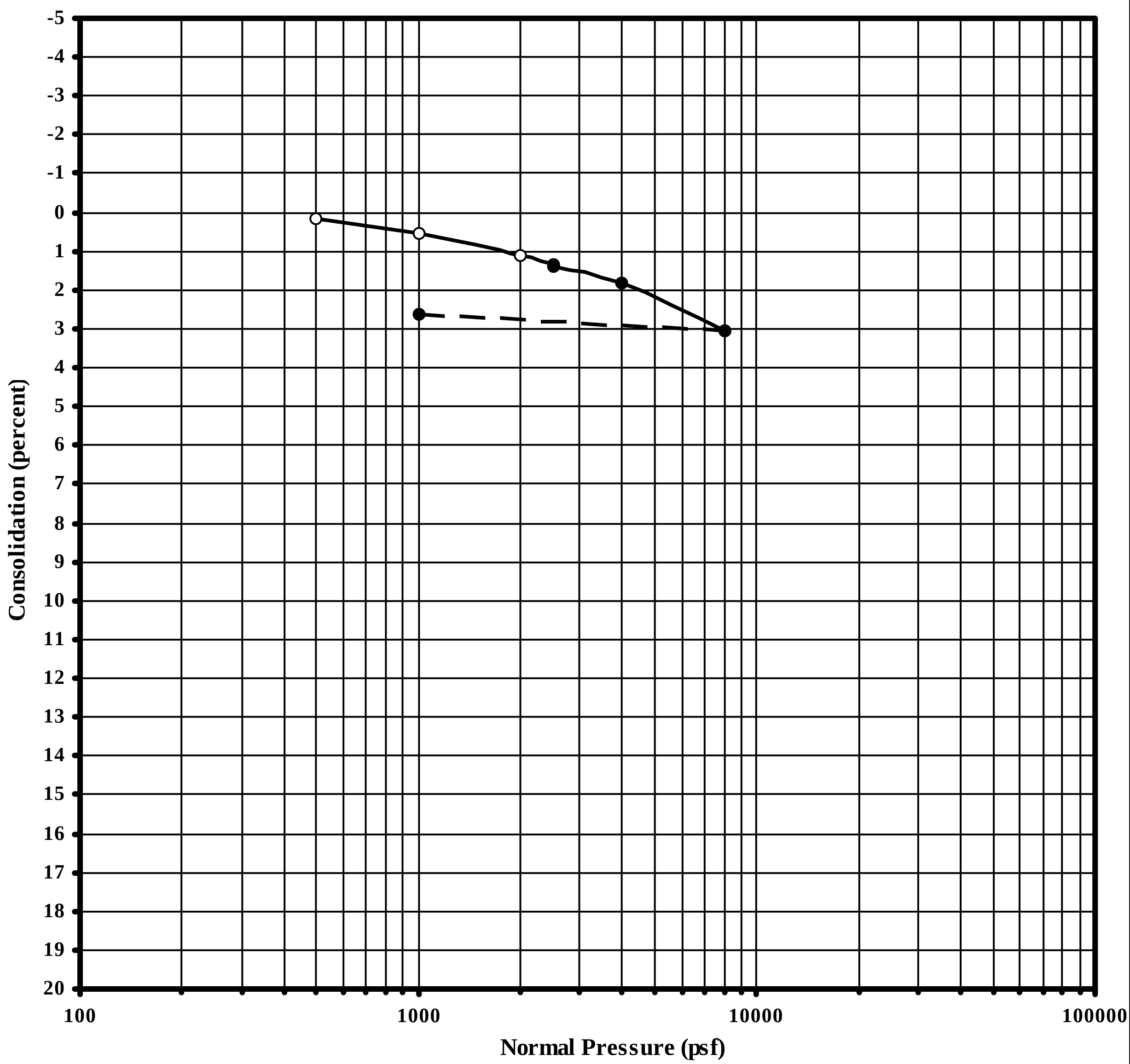
Sample Inundated At Normal Pressure of 1500 psf

Sample Location: B03
Sample Depth: 15 ft.
Initial Moisture: 23.3 %
Init. Dry Density: 103.3 pcf

Geologic Unit: Alluvium
Material: clayey SAND

CONSOLIDATION RESULTS

Undisturbed Sample



Sample Inundated At Normal Pressure of 2500 psf

Sample Location: B03

Sample Depth: 25 ft.

Initial Moisture: 23.2 %

Init. Dry Density: 105.2 pcf

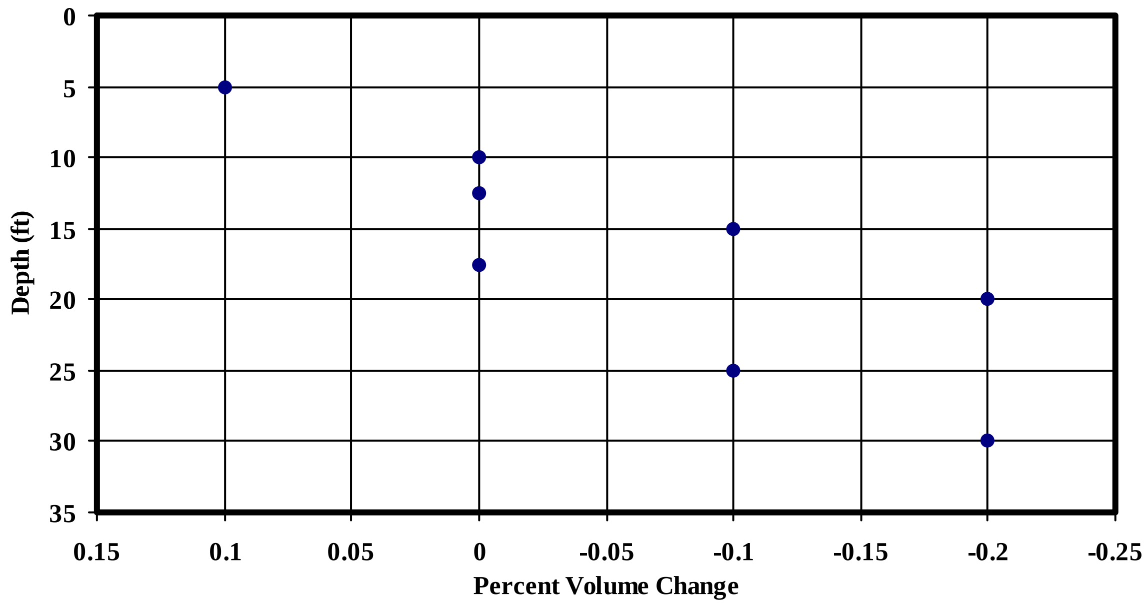
Geologic Unit: Alluvium

Material: silty SAND

GEOLABS-WESTLAKE VILLAGE

PLATE C-B03.25

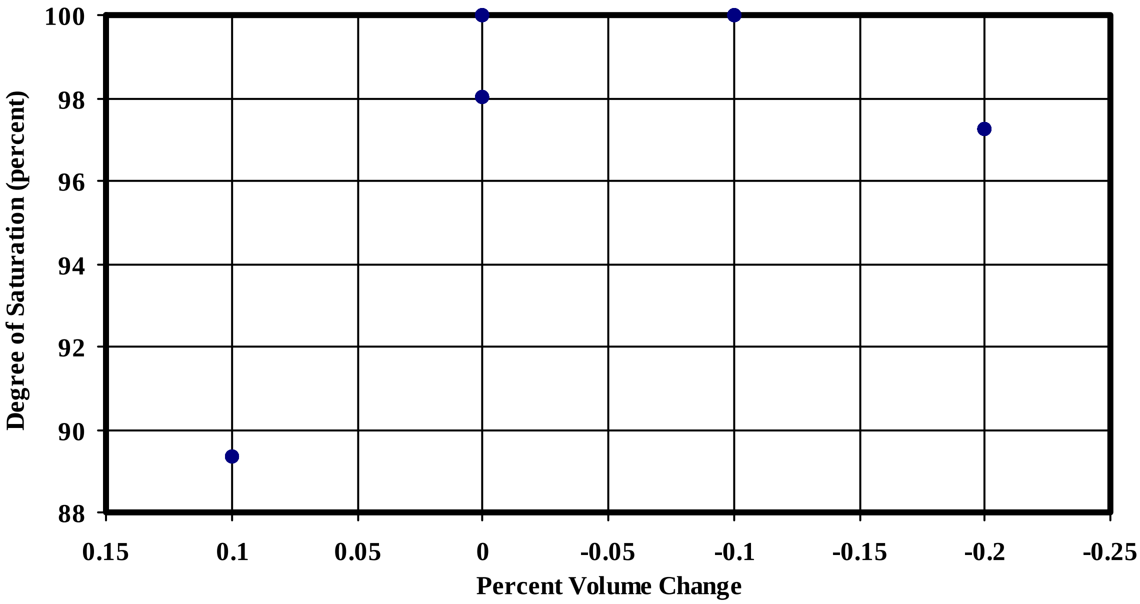
HYDROCONSOLIDATION/EXPANSION VS. DEPTH
Alluvium



Note: Expansion (+), Collapse (-)

Excavation	Depth (ft)	Field DD (pcf)	M (%)	e	S (%)	Volume Change (%)	Alluvium Material
B01	10	100.8	24.1	0.66	98	0.0	clayey SAND
B01	20	87.2	33.3	0.92	97.1	-0.2	clayey fine SAND
B01	30	96.8	26.4	0.73	97.1	-0.2	clayey SAND
B02	5	101.3	21.7	0.65	88.9	0.1	clayey SAND
B02	12.5	97.5	28.2	0.71	100	0.0	sandy lean CLAY
B02	17.5	93.1	30.4	0.80	100	0.0	sandy lean CLAY
B03	15	103.3	23.3	0.62	100	-0.1	clayey SAND
B03	25	105.2	23.2	0.59	100	-0.1	silty SAND

HYDROCONSOLIDATION/EXPANSION VS. SATURATION
Alluvium

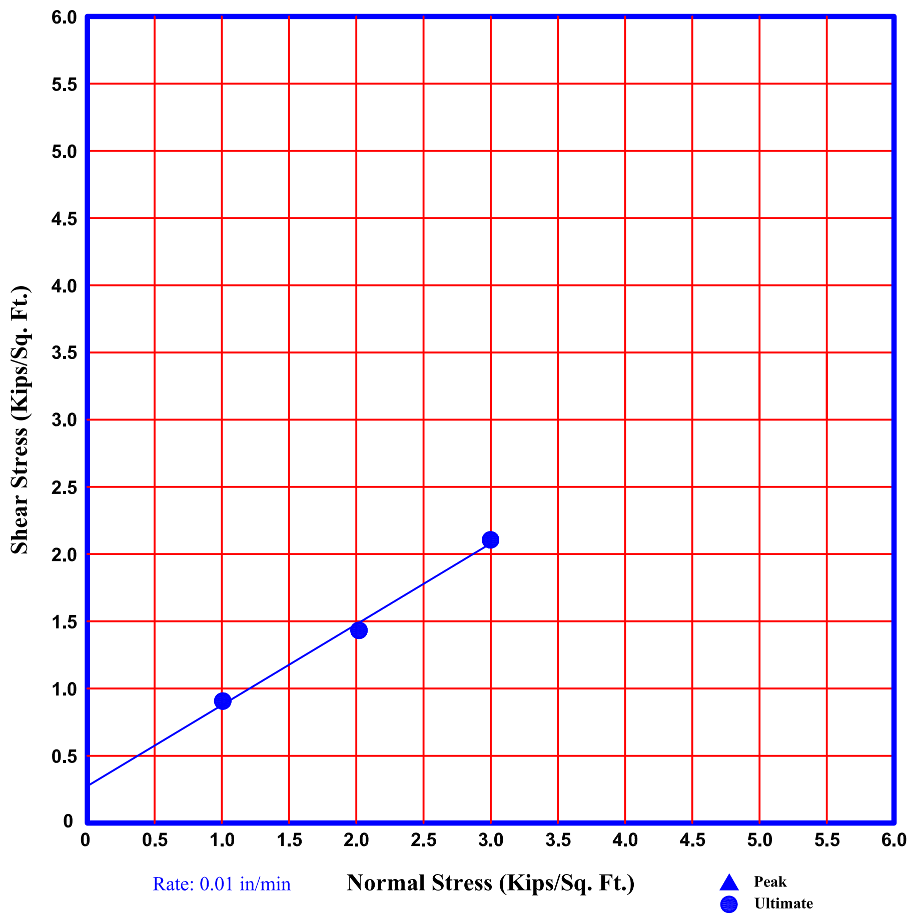


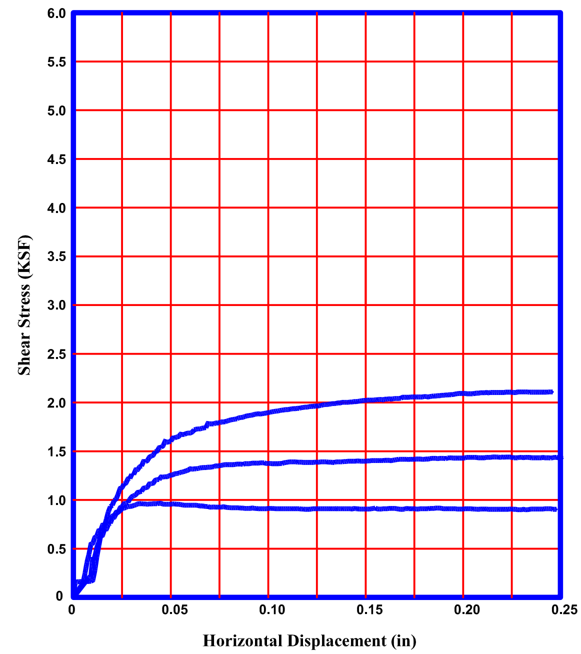
Note: Expansion (+), Collapse (-)

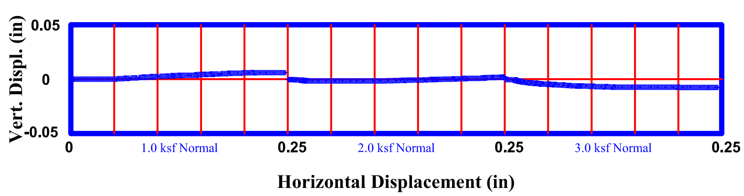
Excavation	Depth (ft)	Field DD (pcf)	M (%)	e	S (%)	Volume Change (%)	Alluvium Material
B01	10	100.8	24.1	0.66	98	0.0	clayey SAND
B01	20	87.2	33.3	0.92	97.1	-0.2	clayey fine SAND
B01	30	96.8	26.4	0.73	97.1	-0.2	clayey SAND
B02	5	101.3	21.7	0.65	88.9	0.1	clayey SAND
B02	12.5	97.5	28.2	0.71	100	0.0	sandy lean CLAY
B02	17.5	93.1	30.4	0.80	100	0.0	sandy lean CLAY
B03	15	103.3	23.3	0.62	100	-0.1	clayey SAND
B03	25	105.2	23.2	0.59	100	-0.1	silty SAND

DIRECT SHEAR TEST RESULTS

SAMPLE REMOLDED TO 90% RELATIVE COMPACTION







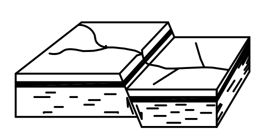
	Peak	Ultimate	Residual
Cohesion (ksf)		0.275	
Phi (deg)		31	

Project	SMC - Civic Center Drive
W.O.	9279
Excavation	B1
Depth	1 -3 ft

Test Data	#1	#2	#3	#4
Norm. Pres.(ksf)	1.0	2.0	3.0	
Shear stress (Peak/Ult. ksf)	--/0.9	--/1.4	--/2.1	
H. Displ. (in)	--/0.24	--/0.24	--/0.24	
V. Displ. (in)	--/0.01	--/0.00	--/-0.01	
e (preshear)	0.51	0.50	0.48	

Dry Density (pcf)	109.8
Moisture (%)	22.2

S:\GEOTEST\shears\9279\B1@1-3A.lst
S:\GEOTEST\shears\9279\B1@1-3B.lst
S:\GEOTEST\shears\9279\B1@1-3C.lst

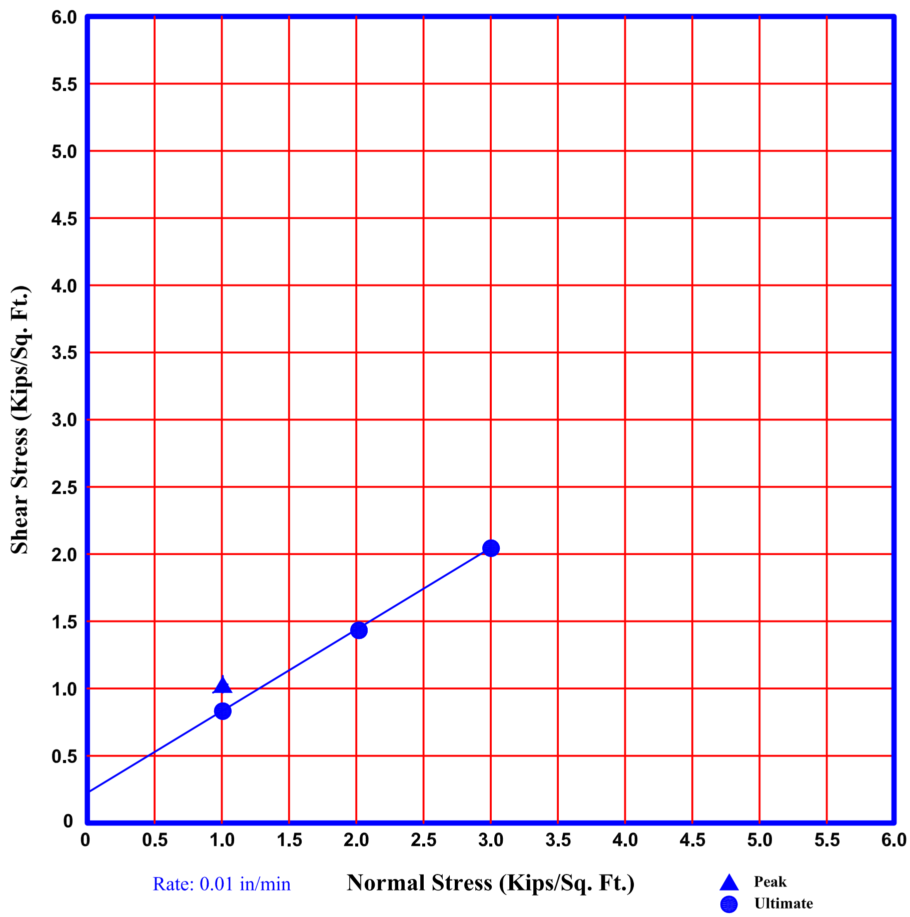


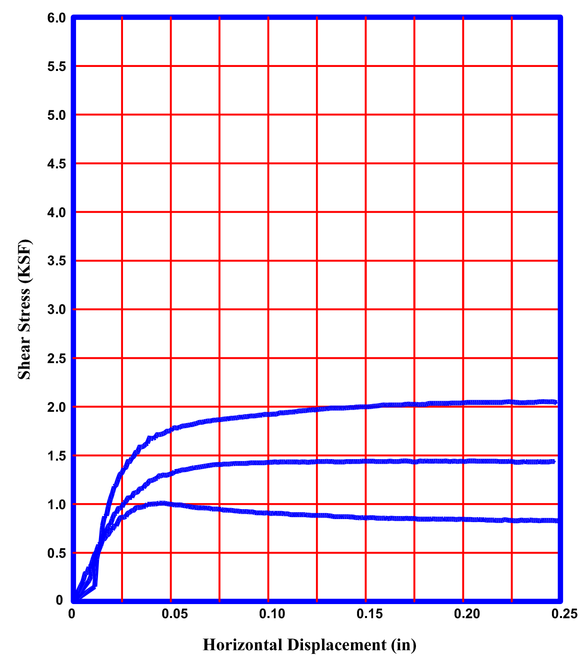
GEOLABS-WESTLAKE VILLAGE

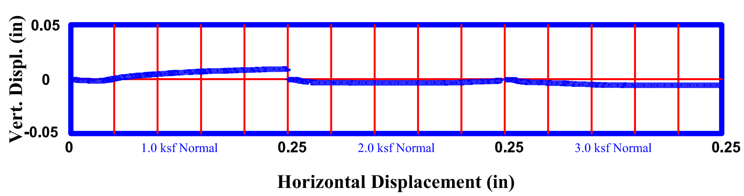
PLATE S-B1.1 -3

DIRECT SHEAR TEST RESULTS

SAMPLE REMOLDED TO 90% RELATIVE COMPACTION







	Peak	Ultimate	Residual
Cohesion (ksf)		0.225	
Phi (deg)		31	

Project	SMC - Civic Center Drive			
W.O.	9279			
Excavation	B2			
Depth	1 -3 ft			
Test Data	**#1**	**#2**	**#3**	**#4**
Norm. Pres.(ksf)	1.0	2.0	3.0	
Shear stress (Peak/Ult. ksf)	1.0/0.8	--/1.4	--/2.0	
H. Displ. (in)	0.04/0.24	--/0.24	--/0.24	
V. Displ. (in)	0.00/0.01	--/0.00	--/-0.01	
e (preshear)	0.47	0.45	0.44	
Dry Density (pcf)	113			
Moisture (%)	22.3			

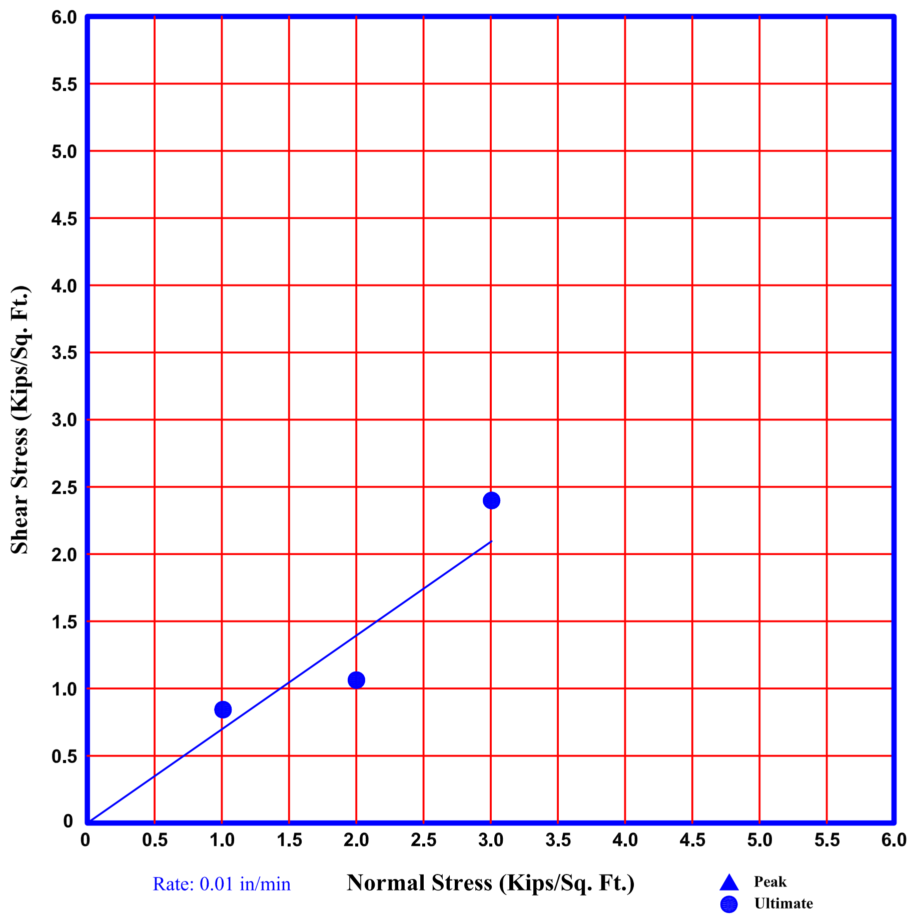
S:\GEOTEST\shears\9279\B2@1-3A.lst
S:\GEOTEST\shears\9279\B2@1-3B.lst
S:\GEOTEST\shears\9279\B2@1-3C.lst

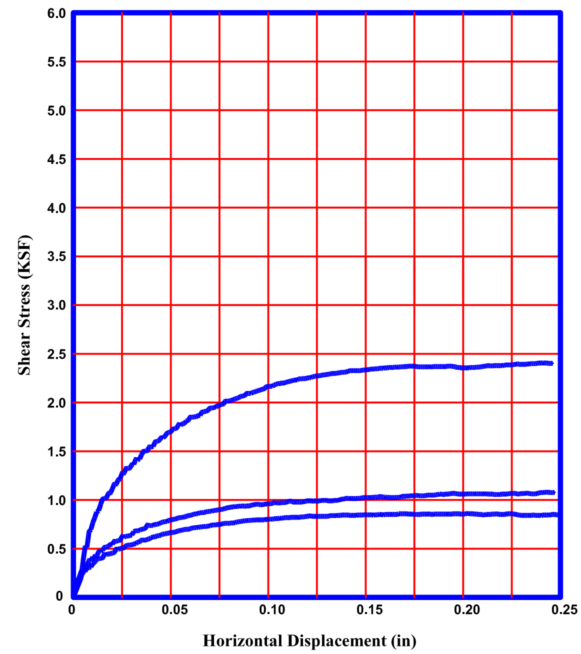
GEOLABS-WESTLAKE VILLAGE

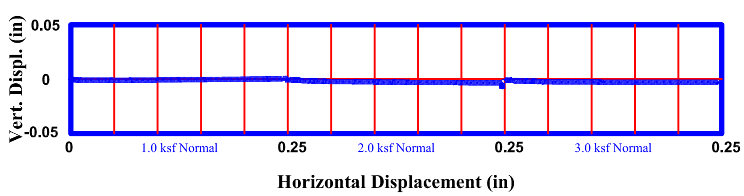
PLATE S-B2.1 -3

DIRECT SHEAR TEST RESULTS

UNDISTURBED SAMPLE







	Peak	Ultimate	Residual
Cohesion (ksf)		0	
Phi (deg)		35	

Project	SMC - Civic Center Drive			
W.O.	9279			
Excavation	B2			
Depth	12.5 ft			
Test Data	**#1**	**#2**	**#3**	**#4**
Norm. Pres.(ksf)	1.0	2.0	3.0	
Shear stress (Peak/Ult. ksf)	--/0.8	--/1.1	--/2.4	
H. Displ. (in)	--/0.24	--/0.24	--/0.24	
V. Displ. (in)	--/0.00	--/0.00	--/0.00	
e (preshear)	0.70	0.68	0.68	
Dry Density (pcf)	97.5			
Moisture (%)	27.2			

S:\GEOTEST\shears\9279\B2@12A.lst
S:\GEOTEST\shears\9279\B2@12B.lst
S:\GEOTEST\shears\9279\B2@12C.lst

GEOLABS-WESTLAKE VILLAGE

PLATE S-B2.12.5

HDR | SCHIFF RECEIVED JUN 1 1 2012

www.hdrinc.com
Corrosion Control and Condition Assessment (C3A) Department

TRANSMITTAL LETTER

DATE: May 21, 2012

ATTENTION: **Larry Stark**

TO: Geolabs Westlake Village
31119 Via Colinas Suite #502
Westlake Village, CA 91362

SUBJECT: Laboratory Test Data
Malibu Library
Your #9279, HDR|Schiff #12-0425LAB

COMMENTS: Enclosed are the results for the subject project.

Leo Solis
Laboratory Manager

431 West Baseline Road · Claremont, CA 91711
Phone: 909.626.0967 · Fax: 909.626.3316

Table 1 - Laboratory Tests on Soil Samples

Geolabs Westlake Village
Malibu Library
Your #9279, HDR|Schiff #12-0425LAB
14-May-12

Sample ID			B1 @ 1'-3'
Resistivity		**Units**	
as-received		ohm-cm	3,680
saturated		ohm-cm	1,200
pH			7.4
Electrical Conductivity		mS/cm	0.41
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	218
magnesium	Mg^{2+}	mg/kg	89
sodium	Na^{1+}	mg/kg	96
potassium	K^{1+}	mg/kg	29
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	522
fluoride	F^{1-}	mg/kg	3.6
chloride	Cl^{1-}	mg/kg	16
sulfate	SO_4^{2-}	mg/kg	350
phosphate	PO_4^{3-}	mg/kg	7.6
Other Tests			
ammonium	NH_4^{1+}	mg/kg	21
nitrate	NO_3^{1-}	mg/kg	0.9
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

SEISMICITY ANALYSES

Preliminary Geotechnical Investigation,
Proposed Library,
23555 Civic Center Way,
City of Malibu, California

W.O. 9279
June 20, 2012
Revised December 18, 2013

EQSEARCH

ESTIMATION OF PEAK ACCELERATION FROM CALIFORNIA EARTHQUAKE CATALOG

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*                      *
*    E Q S E A R C H   *
*                      *
*     Version 3.00     *
*                      *
************************
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 9279

DATE: 05-09-2012

JOB NAME: SMC - Malibu Library

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
MINIMUM MAGNITUDE: 4.50
MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
SITE LATITUDE: 34.0370
SITE LONGITUDE: 118.6897

SEARCH DATES:
START DATE: 1800
END DATE: 2000

SEARCH RADIUS:
100.0 mi
160.9 km

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
ASSUMED SOURCE TYPE: BT [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
SCOND: 0 Depth Source: A
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	33.9440	118.6810	01/01/1979	231438.9	11.3	5.00	0.146	VIII	6.4(10.4)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.156	VIII	6.9(11.0)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.119	VII	8.9(14.3)
DMG	34.0000	118.5000	11/08/1914	1140 0.0	0.0	4.50	0.078	VII	11.1(17.9)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.101	VII	11.1(17.9)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.101	VII	11.1(17.9)
DMG	34.0000	118.5000	06/22/1920	248 0.0	0.0	4.90	0.096	VII	11.1(17.9)
GSP	34.2280	118.5730	01/17/1994	175608.2	19.0	4.60	0.067	VI	14.8(23.8)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.201	VIII	15.0(24.1)
DMG	34.0170	118.9670	04/16/1948	222624.0	0.0	4.70	0.067	VI	15.9(25.6)
GSP	34.2150	118.5100	01/19/1994	140914.8	17.0	4.50	0.060	VI	16.0(25.8)
MGI	34.0000	118.4000	10/01/1930	040 0.0	0.0	4.60	0.061	VI	16.8(27.0)
MGI	34.0000	118.4000	02/22/1920	1610 0.0	0.0	4.60	0.061	VI	16.8(27.0)
MGI	34.0000	118.4000	02/07/1927	429 0.0	0.0	4.60	0.061	VI	16.8(27.0)
GSP	34.2540	118.5450	01/17/1994	130627.9	0.0	4.60	0.060	VI	17.1(27.5)
PAS	34.0160	118.9880	10/26/1984	172043.5	13.3	4.60	0.060	VI	17.1(27.6)
GSB	34.2850	118.6240	01/17/1994	135602.4	19.0	4.70	0.062	VI	17.5(28.2)
GSP	34.2610	118.5340	01/17/1994	123939.8	14.0	4.50	0.055	VI	17.8(28.7)
GSP	34.2740	118.5630	01/27/1994	171958.8	14.0	4.60	0.058	VI	17.9(28.8)
MGI	34.0000	119.0000	12/14/1912	0 0 0.0	0.0	5.70	0.104	VII	17.9(28.9)
DMG	34.0000	119.0000	09/24/1827	4 0 0.0	0.0	7.00	0.206	VIII	17.9(28.9)
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.083	VII	18.2(29.2)
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.117	VII	18.9(30.4)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.071	VI	19.6(31.5)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.075	VII	19.6(31.5)
DMG	34.0650	119.0350	02/21/1973	144557.3	8.0	5.90	0.107	VII	19.8(31.9)
DMG	34.2860	118.5150	03/31/1971	145222.5	2.1	4.60	0.054	VI	19.9(32.0)
GSP	34.3260	118.6980	01/17/1994	233330.7	9.0	5.60	0.091	VII	20.0(32.1)
GSB	34.3190	118.5580	01/18/1994	132444.1	1.0	4.50	0.049	VI	20.9(33.6)
DMG	34.3440	118.6360	02/09/1971	143436.1	-2.0	4.90	0.059	VI	21.4(34.5)
PAS	34.3470	118.6560	04/08/1976	152138.1	14.5	4.60	0.051	VI	21.5(34.6)
GSB	34.3000	118.4660	01/21/1994	183915.3	10.0	4.70	0.052	VI	22.2(35.7)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.071	VI	22.4(36.1)
GSB	34.3580	118.6220	01/18/1994	040126.8	1.0	4.50	0.046	VI	22.5(36.2)
GSB	34.3450	118.5520	01/24/1994	041518.8	6.0	4.80	0.054	VI	22.7(36.5)
MGI	34.1000	118.3000	07/16/1920	2127 0.0	0.0	4.60	0.049	VI	22.7(36.5)
MGI	34.1000	118.3000	07/16/1920	2130 0.0	0.0	4.60	0.049	VI	22.7(36.5)
MGI	34.1000	118.3000	07/16/1920	2022 0.0	0.0	4.60	0.049	VI	22.7(36.5)
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.063	VI	22.9(36.9)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.066	VI	23.0(37.1)
DMG	33.7670	118.4500	10/11/1940	55712.3	0.0	4.70	0.050	VI	23.2(37.3)
GSB	34.3600	118.5710	01/19/1994	044048.0	2.0	4.50	0.045	VI	23.3(37.5)
GSP	34.3770	118.6980	01/18/1994	004308.9	11.0	5.20	0.065	VI	23.5(37.8)
GSP	34.3170	118.4550	01/17/1994	132644.7	2.0	4.70	0.050	VI	23.5(37.9)
GSP	34.3740	118.6220	01/17/1994	155410.8	12.0	4.80	0.052	VI	23.6(38.0)
GSP	34.3770	118.6490	04/27/1997	110928.4	15.0	4.80	0.052	VI	23.6(38.0)
GSB	34.3790	118.7110	01/19/1994	210928.6	14.0	5.50	0.076	VII	23.6(38.0)
DMG	33.8830	118.3170	03/11/1933	1457 0.0	0.0	4.90	0.055	VI	23.8(38.4)
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.061	VI	23.9(38.5)
GSP	34.2930	118.3890	12/06/1994	034834.5	9.0	4.50	0.043	VI	24.6(39.7)
GSP	34.3940	118.6690	06/26/1995	084028.9	13.0	5.00	0.056	VI	24.7(39.7)
GSP	34.3790	118.5610	01/18/1994	152346.9	7.0	4.80	0.051	VI	24.7(39.8)
GSP	34.3310	118.4420	01/17/1994	141430.3	1.0	4.50	0.043	VI	24.7(39.8)

EARTHQUAKE SEARCH RESULTS

Page 2

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.056	VI	24.8(39.8)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.055	VI	25.3(40.7)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.055	VI	25.3(40.7)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.055	VI	25.3(40.7)
DMG	34.3530	118.4560	03/07/1971	13340.5	3.3	4.50	0.042	VI	25.6(41.2)
PAS	34.3800	118.4590	08/12/1977	21926.1	9.5	4.50	0.040	V	27.1(43.6)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.052	VI	27.4(44.1)
DMG	34.3990	118.4730	03/09/1974	05431.9	24.4	4.70	0.044	VI	27.9(44.9)
MGI	34.0000	118.2000	06/26/1917	2115 0.0	0.0	4.60	0.041	V	28.1(45.3)
MGI	34.0000	118.2000	06/26/1917	2130 0.0	0.0	4.60	0.041	V	28.1(45.3)
MGI	34.0000	118.2000	02/13/1917	13 5 0.0	0.0	4.60	0.041	V	28.1(45.3)
MGI	34.0000	118.2000	06/26/1917	2120 0.0	0.0	4.60	0.041	V	28.1(45.3)
DMG	34.3970	118.4390	02/21/1971	55052.6	6.9	4.70	0.043	VI	28.7(46.2)
DMG	34.3920	118.4270	02/21/1971	71511.7	7.2	4.50	0.038	V	28.7(46.2)
DMG	34.3350	118.3310	02/09/1971	155820.7	14.2	4.80	0.045	VI	29.0(46.7)
DMG	33.8670	118.2170	06/19/1944	0 333.0	0.0	4.50	0.038	V	29.5(47.5)
MGI	33.9000	118.2000	10/08/1927	1914 0.0	0.0	4.60	0.040	V	29.6(47.6)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.100	VII	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 231.0	8.0	4.70	0.041	V	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 150.0	8.0	4.50	0.037	V	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 745.0	8.0	4.50	0.037	V	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.073	VII	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.056	VI	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.073	VII	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 838.0	8.0	4.50	0.037	V	30.6(49.3)
DMG	34.4110	118.4010	02/09/1971	14 853.0	8.0	4.60	0.039	V	30.6(49.3)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.059	VI	30.7(49.4)
DMG	34.1180	119.2200	03/18/1957	185628.0	13.8	4.70	0.040	V	30.8(49.6)
DMG	33.8170	118.2170	10/22/1941	65718.5	0.0	4.90	0.045	VI	31.0(50.0)
DMG	34.4260	118.4140	02/10/1971	518 7.2	5.8	4.50	0.036	V	31.1(50.1)
MGI	34.2000	119.2000	06/16/1914	1052 0.0	0.0	4.60	0.038	V	31.3(50.3)
DMG	34.3610	118.3060	02/09/1971	141021.5	5.0	4.70	0.040	V	31.3(50.4)
DMG	33.7590	118.2530	08/31/1938	31814.2	10.0	4.50	0.036	V	31.5(50.7)
PAS	34.1490	118.1350	12/03/1988	113826.4	13.3	4.90	0.043	VI	32.6(52.5)
DMG	33.7830	118.2000	12/27/1939	192849.0	0.0	4.70	0.038	V	33.1(53.2)
PAS	34.0490	118.1010	10/01/1987	144541.5	13.6	4.70	0.038	V	33.7(54.2)
PAS	34.0600	118.1000	10/01/1987	1449 5.9	11.7	4.70	0.038	V	33.8(54.3)
PAS	33.6300	119.0200	10/23/1981	172816.9	12.0	4.60	0.036	V	33.9(54.5)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.052	VI	33.9(54.6)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.087	VII	34.0(54.7)
PAS	34.0520	118.0900	10/01/1987	151231.8	10.8	4.70	0.037	V	34.3(55.2)
PAS	33.6370	119.0560	10/23/1981	191552.5	6.3	4.60	0.035	V	34.7(55.8)
PAS	33.6710	119.1110	09/04/1981	155050.3	5.0	5.30	0.050	VI	35.0(56.3)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.069	VI	35.0(56.3)
DMG	34.4830	118.9830	09/03/1942	14 6 1.0	0.0	4.50	0.033	V	35.0(56.4)
DMG	34.4830	118.9830	09/04/1942	63433.0	0.0	4.50	0.033	V	35.0(56.4)
DMG	33.9000	118.1000	07/08/1929	1646 6.7	13.0	4.70	0.037	V	35.1(56.4)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.052	VI	36.4(58.6)
PAS	34.0770	118.0470	02/11/1988	152555.7	12.5	4.70	0.035	V	36.9(59.3)
DMG	33.7500	118.1330	03/11/1933	11 4 0.0	0.0	4.60	0.033	V	37.6(60.4)
DMG	34.5860	118.6130	02/07/1956	31638.6	2.6	4.60	0.033	V	38.2(61.4)
MGI	34.3000	119.3000	05/01/1904	1830 0.0	0.0	4.60	0.032	V	39.3(63.3)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.039	V	39.5(63.6)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.0000	118.0000	05/05/1929	1 7 0.0	0.0	4.60	0.032	V	39.5(63.6)
MGI	34.1000	118.0000	01/27/1930	2026 0.0	0.0	4.60	0.032	V	39.7(63.9)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.039	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	2 4 0.0	0.0	4.90	0.037	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	8 8 0.0	0.0	4.50	0.030	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	440 0.0	0.0	4.70	0.033	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	1653 0.0	0.0	4.80	0.035	V	40.0(64.4)
DMG	33.7500	118.0830	03/12/1933	2354 0.0	0.0	4.50	0.030	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	216 0.0	0.0	4.80	0.035	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.039	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.041	V	40.0(64.4)
DMG	33.7500	118.0830	03/12/1933	1738 0.0	0.0	4.50	0.030	V	40.0(64.4)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.045	VI	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	210 0.0	0.0	4.60	0.031	V	40.0(64.4)
DMG	33.7500	118.0830	03/14/1933	1219 0.0	0.0	4.50	0.030	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	439 0.0	0.0	4.90	0.037	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	436 0.0	0.0	4.60	0.031	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	513 0.0	0.0	4.70	0.033	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	259 0.0	0.0	4.60	0.031	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.041	V	40.0(64.4)
DMG	33.7500	118.0830	03/13/1933	432 0.0	0.0	4.70	0.033	V	40.0(64.4)
DMG	33.7500	118.0830	03/12/1933	616 0.0	0.0	4.60	0.031	V	40.0(64.4)
DMG	33.7500	118.0830	03/11/1933	227 0.0	0.0	4.60	0.031	V	40.0(64.4)
DMG	34.1000	119.4000	05/19/1893	035 0.0	0.0	5.50	0.050	VI	40.9(65.7)
MGI	34.2000	118.0000	01/09/1921	530 0.0	0.0	4.60	0.031	V	41.0(66.0)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.046	VI	42.3(68.0)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.039	V	42.6(68.6)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.039	V	42.6(68.6)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.036	V	43.5(70.0)
DMG	33.6170	118.1170	01/20/1934	2117 0.0	0.0	4.50	0.028	V	43.8(70.5)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.047	VI	44.1(70.9)
DMG	33.5000	118.2500	06/18/1920	10 8 0.0	0.0	4.50	0.027	V	44.8(72.2)
DMG	33.9860	119.4750	08/06/1973	232917.0	16.9	5.00	0.035	V	45.1(72.5)
DMG	34.6170	119.0830	02/26/1950	0 622.0	0.0	4.70	0.030	V	45.9(73.9)
DMG	34.0000	119.5000	02/18/1926	1818 0.0	0.0	5.00	0.035	V	46.4(74.7)
DMG	34.2000	117.9000	07/13/1935	105416.5	0.0	4.70	0.029	V	46.5(74.9)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.045	VI	46.5(74.9)
DMG	33.9170	119.5000	08/26/1954	1348 3.0	0.0	4.80	0.031	V	47.1(75.8)
DMG	33.4300	119.0960	10/31/1969	103929.0	7.3	4.80	0.030	V	48.0(77.2)
DMG	33.6170	118.0170	03/15/1933	111332.0	0.0	4.90	0.032	V	48.3(77.7)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.035	V	48.3(77.7)
DMG	34.2500	119.5000	04/13/1917	359 0.0	0.0	4.50	0.026	V	48.6(78.2)
DMG	33.6000	118.0170	12/25/1935	1715 0.0	0.0	4.50	0.026	V	49.0(78.8)
DMG	34.7000	119.0000	10/23/1916	254 0.0	0.0	5.50	0.043	VI	49.1(79.0)
DMG	33.6000	118.0000	03/11/1933	217 0.0	0.0	4.50	0.025	V	49.8(80.1)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.064	VI	50.6(81.4)
DMG	34.3490	119.4920	07/14/1958	52555.3	16.0	4.70	0.028	V	50.6(81.5)
PAS	33.5080	118.0710	11/20/1988	53928.7	6.0	4.50	0.025	V	50.9(82.0)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.035	V	51.6(83.0)
MGI	33.8000	117.8000	11/10/1926	1723 0.0	0.0	4.60	0.025	V	53.5(86.2)
MGI	33.8000	117.8000	11/04/1926	2238 0.0	0.0	4.60	0.025	V	53.5(86.2)
MGI	33.8000	117.8000	11/07/1926	1948 0.0	0.0	4.60	0.025	V	53.5(86.2)
MGI	33.8000	117.8000	11/09/1926	1535 0.0	0.0	4.60	0.025	V	53.5(86.2)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	33.6200	117.9000	04/07/1989	200730.2	13.0	4.50	0.024	IV	53.7(86.4)
DMG	33.3390	119.1040	10/24/1969	202642.5	-1.8	4.70	0.026	V	53.7(86.5)
T-A	34.8300	118.7500	11/27/1852	0 0 0.0	0.0	7.00	0.087	VII	54.9(88.3)
DMG	34.3330	119.5830	09/08/1941	31245.0	0.0	4.50	0.023	IV	55.0(88.4)
DMG	34.3330	119.5830	07/12/1941	1618 0.0	0.0	4.50	0.023	IV	55.0(88.4)
DMG	34.3330	119.5830	07/01/1941	2354 0.0	0.0	4.50	0.023	IV	55.0(88.4)
GSP	34.1100	117.7200	04/17/1990	223227.2	4.0	4.60	0.024	V	55.7(89.6)
DMG	34.3670	119.5830	07/01/1941	75054.8	0.0	5.90	0.048	VI	55.9(89.9)
GSP	34.1500	117.7200	03/01/1990	032303.0	11.0	4.70	0.026	V	56.0(90.1)
DMG	34.5000	119.5000	12/05/1920	1158 0.0	0.0	4.50	0.023	IV	56.2(90.5)
DMG	34.5000	119.5000	06/29/1926	2321 0.0	0.0	5.50	0.039	V	56.2(90.5)
DMG	34.5000	119.5000	08/05/1930	1125 0.0	0.0	5.00	0.030	V	56.2(90.5)
PAS	34.1360	117.7090	06/26/1988	15 458.5	7.9	4.60	0.024	V	56.5(90.9)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.033	V	57.0(91.8)
GSP	34.1400	117.6900	03/02/1990	172625.4	6.0	4.60	0.024	IV	57.6(92.7)
DMG	34.8000	119.1000	09/05/1883	1230 0.0	0.0	6.00	0.050	VI	57.6(92.7)
DMG	34.1000	117.6830	01/09/1934	1410 0.0	0.0	4.50	0.022	IV	57.7(92.9)
DMG	34.1180	119.7020	07/05/1968	04517.2	5.9	5.20	0.032	V	58.2(93.6)
DMG	34.8670	118.9330	09/21/1941	1953 7.2	0.0	5.20	0.032	V	59.0(94.9)
DMG	33.2910	119.1930	10/24/1969	82912.1	10.0	5.10	0.030	V	59.1(95.1)
DMG	34.9000	118.9000	10/23/1916	244 0.0	0.0	6.00	0.048	VI	60.8(97.8)
DMG	33.5450	117.8070	10/27/1969	1316 2.3	6.5	4.50	0.022	IV	61.0(98.1)
DMG	34.8850	119.0020	02/23/1939	91846.7	10.0	4.50	0.021	IV	61.2(98.5)
PAS	34.3470	119.6960	08/13/1978	225453.4	12.8	5.10	0.029	V	61.3(98.7)
DMG	34.9000	118.9500	08/01/1952	13 430.0	0.0	5.10	0.029	V	61.4(98.8)
DMG	34.1760	119.7540	07/07/1968	143330.8	12.8	4.50	0.021	IV	61.6(99.1)
T-A	34.9200	118.9200	05/23/1857	0 0 0.0	0.0	5.00	0.028	V	62.4(100.3)
T-A	34.9200	118.9200	01/20/1857	0 0 0.0	0.0	5.00	0.028	V	62.4(100.3)
DMG	34.9110	118.9730	02/23/1939	84551.7	10.0	4.50	0.021	IV	62.5(100.5)
PAS	34.9430	118.7430	06/10/1988	23 643.0	6.8	5.40	0.034	V	62.6(100.8)
MGI	34.4000	119.7000	03/25/1806	8 0 0.0	0.0	5.00	0.027	V	62.9(101.2)
DMG	34.9030	119.0380	05/08/1939	248 5.3	10.0	4.50	0.021	IV	63.0(101.4)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.078	VII	63.7(102.5)
DMG	34.9500	118.8670	07/21/1952	121936.0	0.0	5.30	0.032	V	63.8(102.7)
DMG	34.9320	118.9760	03/01/1963	02557.9	13.9	5.00	0.027	V	63.9(102.8)
T-A	34.5000	119.6700	06/01/1893	12 0 0.0	0.0	5.00	0.027	V	64.4(103.7)
DMG	34.2000	119.8000	12/21/1812	19 0 0.0	0.0	7.00	0.077	VII	64.5(103.7)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.027	V	64.5(103.9)
DMG	34.9410	118.9870	11/15/1961	53855.5	10.7	5.00	0.027	V	64.7(104.1)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.045	VI	64.8(104.3)
DMG	34.9330	119.0670	02/10/1954	235838.0	0.0	4.50	0.020	IV	65.5(105.4)
DMG	34.3000	119.8000	06/29/1925	144216.0	0.0	6.25	0.051	VI	66.0(106.2)
MGI	34.3000	119.8000	07/03/1925	1821 0.0	0.0	5.30	0.031	V	66.0(106.2)
MGI	34.3000	119.8000	07/03/1925	1638 0.0	0.0	5.30	0.031	V	66.0(106.2)
DMG	34.1830	117.5480	09/01/1937	163533.5	10.0	4.50	0.020	IV	66.0(106.3)
DMG	35.0000	118.7330	04/29/1953	124745.0	0.0	4.70	0.022	IV	66.5(107.1)
DMG	34.9670	119.0000	09/02/1952	204556.0	0.0	4.70	0.022	IV	66.6(107.2)
DMG	34.1670	117.5330	03/01/1948	81213.0	0.0	4.70	0.022	IV	66.7(107.4)
DMG	35.0000	118.8330	07/23/1952	75319.0	0.0	5.40	0.032	V	67.0(107.8)
DMG	35.0000	118.8330	07/23/1952	181351.0	0.0	5.20	0.029	V	67.0(107.8)
DMG	34.2110	117.5300	09/01/1937	1348 8.2	10.0	4.50	0.020	IV	67.4(108.4)
DMG	34.9830	118.9830	05/23/1954	235243.0	0.0	5.10	0.027	V	67.4(108.5)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.032	V	67.6(108.8)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.074	VII	68.1(109.6)
MGI	34.4000	119.8000	09/09/1929	515 0.0	0.0	4.60	0.021	IV	68.2(109.7)
DMG	34.9830	119.0330	07/21/1952	235328.0	0.0	4.50	0.020	IV	68.2(109.7)
DMG	35.0000	119.0000	03/13/1929	228 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1240 0.0	0.0	4.90	0.024	V	68.8(110.7)
DMG	35.0000	119.0000	02/16/1919	1557 0.0	0.0	5.00	0.026	V	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1553 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	12 6 0.0	0.0	4.80	0.023	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1225 0.0	0.0	4.70	0.022	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	18 0 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1222 0.0	0.0	4.90	0.024	V	68.8(110.7)
DMG	35.0000	119.0000	07/22/1952	133143.0	0.0	4.80	0.023	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1638 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	12 7 0.0	0.0	4.70	0.022	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1212 0.0	0.0	4.60	0.021	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1210 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1359 0.0	0.0	4.60	0.021	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	132512.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	1313 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	13 8 0.0	0.0	4.50	0.020	IV	68.8(110.7)
DMG	35.0000	119.0000	07/21/1952	12 531.0	0.0	6.40	0.053	VI	68.8(110.7)
DMG	33.2670	119.4500	11/18/1947	2159 3.0	0.0	5.00	0.025	V	68.8(110.7)
DMG	34.2000	117.5000	06/14/1892	1325 0.0	0.0	4.90	0.024	V	68.9(110.9)
DMG	35.0000	119.0170	05/25/1953	324 1.0	0.0	4.80	0.023	IV	69.0(111.1)
DMG	35.0000	119.0170	07/21/1952	115214.0	0.0	7.70	0.106	VII	69.0(111.1)
DMG	35.0000	119.0170	01/12/1954	233349.0	0.0	5.90	0.041	V	69.0(111.1)
DMG	35.0000	119.0330	07/21/1952	1159 0.0	0.0	4.50	0.019	IV	69.3(111.5)
DMG	35.0000	119.0330	07/21/1952	1155 0.0	0.0	4.50	0.019	IV	69.3(111.5)
DMG	35.0000	119.0330	07/21/1952	1154 0.0	0.0	4.50	0.019	IV	69.3(111.5)
DMG	35.0000	119.0330	07/21/1952	1157 0.0	0.0	4.50	0.019	IV	69.3(111.5)
DMG	35.0000	119.0330	07/21/1952	12 2 0.0	0.0	5.60	0.035	V	69.3(111.5)
DMG	35.0000	119.0330	07/21/1952	1158 0.0	0.0	4.60	0.021	IV	69.3(111.5)
DMG	35.0330	118.8500	10/07/1953	145921.0	0.0	4.90	0.024	V	69.4(111.6)
DMG	35.0000	119.0500	09/12/1952	103525.0	0.0	4.50	0.019	IV	69.6(112.0)
DMG	33.6820	117.5530	07/05/1938	18 655.7	10.0	4.50	0.019	IV	69.6(112.0)
T-A	34.4200	119.8200	00/00/1862	0 0 0.0	0.0	5.70	0.036	V	69.7(112.2)
DMG	35.0330	118.9330	07/22/1952	223133.0	0.0	4.70	0.021	IV	70.1(112.9)
DMG	35.0000	119.0830	11/07/1952	85535.0	0.0	4.60	0.020	IV	70.2(112.9)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.055	VI	70.3(113.2)
PAS	35.0000	119.1030	05/13/1975	02135.6	19.1	4.50	0.019	IV	70.5(113.5)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.032	V	71.5(115.0)
DMG	33.7250	117.4980	01/03/1956	02548.9	13.7	4.70	0.021	IV	71.6(115.3)
DMG	35.0330	119.0500	08/07/1952	163151.0	0.0	4.90	0.023	IV	71.8(115.5)
DMG	35.0330	119.0500	08/18/1952	44010.0	0.0	4.70	0.021	IV	71.8(115.5)
DMG	35.0830	118.7500	07/22/1952	84734.0	0.0	4.70	0.021	IV	72.3(116.3)
PAS	35.0180	119.1410	11/10/1981	223435.5	3.1	4.50	0.019	IV	72.4(116.6)
DMG	34.1320	117.4260	04/15/1965	20 833.3	5.5	4.50	0.019	IV	72.6(116.8)
MGI	34.0000	117.4000	05/22/1907	652 0.0	0.0	4.60	0.020	IV	73.8(118.8)
DMG	35.0670	119.0670	02/24/1954	223022.0	0.0	4.50	0.018	IV	74.3(119.5)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.031	V	74.6(120.0)
GSP	34.1900	117.3900	12/28/1989	094108.1	15.0	4.50	0.018	IV	75.0(120.8)
DMG	35.1000	118.9670	08/25/1952	62026.0	0.0	4.70	0.020	IV	75.1(120.8)
DMG	35.1330	118.7000	09/02/1952	124132.0	0.0	4.60	0.019	IV	75.7(121.8)

EARTHQUAKE SEARCH RESULTS

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	35.1330	118.7670	07/21/1952	194122.0	0.0	5.50	0.031	V	75.8(122.0)
DMG	34.0000	120.0170	04/01/1945	234342.0	0.0	5.40	0.029	V	76.0(122.3)
DMG	35.1330	118.5170	07/22/1952	141 2.0	0.0	4.50	0.018	IV	76.3(122.8)
DMG	35.0500	119.2330	08/19/1952	191226.0	0.0	4.50	0.018	IV	76.5(123.0)
DMG	35.1500	118.6830	08/13/1952	173925.0	0.0	4.70	0.020	IV	76.8(123.7)
DMG	35.1500	118.6330	01/27/1954	141948.0	0.0	5.00	0.023	IV	76.9(123.8)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.023	IV	77.5(124.7)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.039	V	77.5(124.7)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.023	IV	77.5(124.7)
DMG	34.1270	117.3380	02/23/1936	222042.7	10.0	4.50	0.018	IV	77.5(124.8)
DMG	34.0330	117.3170	09/03/1935	647 0.0	0.0	4.50	0.018	IV	78.5(126.4)
DMG	35.1830	118.6500	07/21/1952	151358.0	0.0	5.10	0.024	V	79.2(127.4)
DMG	35.1830	118.6000	07/26/1952	2241 3.0	0.0	4.60	0.019	IV	79.3(127.6)
DMG	35.1830	118.6000	07/29/1952	154950.0	0.0	4.90	0.022	IV	79.3(127.6)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.027	V	79.6(128.1)
MGI	34.1000	117.3000	12/27/1901	11 0 0.0	0.0	4.60	0.018	IV	79.6(128.1)
GSP	35.1490	119.1040	05/28/1993	044740.6	21.0	5.20	0.025	V	80.3(129.2)
DMG	34.0000	117.2830	11/07/1939	1852 8.4	0.0	4.70	0.019	IV	80.5(129.6)
DMG	33.9960	117.2700	02/17/1952	123658.3	16.0	4.50	0.017	IV	81.3(130.8)
DMG	35.2170	118.8170	12/15/1953	124436.0	0.0	4.60	0.018	IV	81.8(131.6)
DMG	35.2170	118.8170	07/23/1952	1317 5.0	0.0	5.70	0.032	V	81.8(131.6)
GDP	34.0470	117.2550	02/21/2000	134943.1	15.0	4.50	0.017	IV	82.1(132.1)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.043	VI	82.4(132.6)
DMG	35.1840	119.0990	07/01/1959	234923.4	9.0	4.70	0.019	IV	82.5(132.8)
PAS	34.0230	117.2450	10/02/1985	234412.4	15.2	4.80	0.020	IV	82.7(133.0)
DMG	35.2330	118.6000	07/22/1952	91025.0	0.0	4.50	0.017	IV	82.7(133.1)
DMG	35.2330	118.5330	07/21/1952	174244.0	0.0	5.10	0.023	IV	83.1(133.7)
GSP	34.0240	117.2300	03/11/1998	121851.8	14.0	4.50	0.017	IV	83.5(134.4)
DMG	32.8670	118.2500	02/13/1952	151337.0	0.0	4.70	0.019	IV	84.7(136.2)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.036	V	85.8(138.1)
DMG	35.2830	118.5830	07/31/1952	1719 8.0	0.0	4.50	0.016	IV	86.2(138.8)
DMG	35.2830	118.5500	08/01/1952	31611.6	0.0	4.50	0.016	IV	86.4(139.0)
DMG	35.2830	118.5500	07/23/1952	34928.0	0.0	4.70	0.018	IV	86.4(139.0)
DMG	35.2830	118.5500	07/23/1952	737 0.0	0.0	4.80	0.019	IV	86.4(139.0)
DMG	32.8170	118.3500	12/26/1951	04654.0	0.0	5.90	0.034	V	86.5(139.2)
PAS	32.9900	117.8490	07/13/1986	14 133.0	12.0	4.60	0.017	IV	87.0(140.0)
DMG	35.3000	118.8000	12/23/1905	2223 0.0	0.0	5.00	0.021	IV	87.4(140.7)
PAS	32.9710	117.8700	07/13/1986	1347 8.2	6.0	5.30	0.025	V	87.4(140.7)
DMG	35.3000	118.5330	07/21/1952	182338.0	0.0	4.50	0.016	IV	87.7(141.1)
DMG	35.2890	118.4110	08/10/1952	122318.0	4.0	4.60	0.017	IV	87.9(141.4)
DMG	35.2940	118.4010	08/13/1952	42940.6	14.5	4.60	0.017	IV	88.3(142.1)
DMG	35.2990	118.4350	07/25/1952	20 6 6.1	-1.4	4.80	0.019	IV	88.3(142.1)
GSP	35.2100	118.0660	07/11/1992	181416.2	10.0	5.70	0.030	V	88.4(142.3)
DMG	35.3110	118.4990	07/25/1952	1313 8.2	2.8	5.00	0.021	IV	88.6(142.6)
DMG	35.3150	118.5160	07/25/1952	194323.7	11.2	5.70	0.030	V	88.8(142.9)
DMG	35.3140	118.4820	08/30/1952	45559.8	5.5	4.70	0.018	IV	89.0(143.1)
MGI	35.3000	119.0000	09/04/1908	0 0 0.0	0.0	4.60	0.017	IV	89.0(143.2)
MGI	35.3000	119.0000	01/08/1903	030 0.0	0.0	4.60	0.017	IV	89.0(143.2)
DMG	35.3160	118.4870	09/15/1952	44013.2	4.2	4.90	0.020	IV	89.1(143.3)
DMG	35.3170	118.4940	07/25/1952	19 944.6	5.5	5.70	0.030	V	89.1(143.3)
DMG	35.3210	118.4940	02/11/1955	194431.5	14.7	4.50	0.016	IV	89.3(143.8)
DMG	35.3330	118.6000	07/23/1952	164853.0	0.0	4.50	0.016	IV	89.6(144.2)
DMG	35.3330	118.6000	07/31/1952	12 9 9.0	0.0	5.80	0.032	V	89.6(144.2)

EARTHQUAKE SEARCH RESULTS

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	35.3330	118.6000	07/23/1952	161838.0	0.0	4.50	0.016	IV	89.6(144.2)
DMG	35.3330	118.9170	07/29/1952	195132.0	0.0	4.50	0.016	IV	90.4(145.5)
DMG	35.3330	118.9170	08/22/1952	224124.0	0.0	5.80	0.031	V	90.4(145.5)
DMG	35.3330	118.9170	07/31/1952	195314.0	0.0	4.50	0.016	IV	90.4(145.5)
DMG	35.3350	118.4740	07/23/1952	172224.0	6.6	4.50	0.016	IV	90.5(145.6)
DMG	35.3400	118.4730	07/24/1952	5 249.6	2.1	4.50	0.016	IV	90.8(146.1)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.035	V	91.6(147.3)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.018	IV	91.8(147.7)
DMG	35.3670	118.5830	07/23/1952	31923.0	0.0	5.00	0.020	IV	92.0(148.1)
DMG	35.3670	118.5830	07/23/1952	03832.0	0.0	6.10	0.036	V	92.0(148.1)
DMG	35.3670	118.5830	07/23/1952	4 140.0	0.0	4.70	0.017	IV	92.0(148.1)
DMG	35.3670	118.5830	07/23/1952	04738.0	0.0	4.60	0.016	IV	92.0(148.1)
MGI	35.2000	119.5000	12/01/1920	130 0.0	0.0	4.60	0.016	IV	92.6(149.0)
DMG	35.3830	118.5670	07/23/1952	546 3.0	0.0	4.70	0.017	IV	93.2(150.0)
DMG	32.7500	118.2000	06/25/1939	149 0.0	0.0	4.50	0.015	IV	93.2(150.0)
DMG	35.3830	118.8500	07/29/1952	7 347.0	0.0	6.10	0.036	V	93.4(150.3)
DMG	34.0170	117.0500	02/19/1940	12 655.7	0.0	4.60	0.016	IV	93.8(151.0)
DMG	35.3950	118.6200	08/08/1955	32150.5	4.1	4.70	0.017	IV	93.8(151.0)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.015	IV	94.1(151.4)
DMG	35.4000	118.8170	07/29/1952	8 146.0	0.0	5.10	0.021	IV	94.4(151.9)
DMG	32.7180	118.1720	04/28/1938	6 728.0	10.0	4.50	0.015	IV	95.8(154.2)
PAS	34.7370	120.1480	10/25/1984	1036 2.4	6.0	4.50	0.015	IV	96.1(154.7)
DMG	34.0000	117.0000	06/30/1923	022 0.0	0.0	4.50	0.015	IV	96.7(155.7)
PAS	32.7560	117.9880	01/12/1975	212214.8	15.3	4.80	0.018	IV	97.3(156.5)
MGI	34.0000	120.4000	03/29/1911	425 0.0	0.0	4.60	0.016	IV	97.9(157.6)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.040	V	98.2(158.0)
PAS	35.4520	118.8990	02/08/1985	65816.9	11.1	4.60	0.016	IV	98.4(158.4)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.050	VI	98.8(159.1)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.019	IV	98.8(159.1)
GSP	35.4530	118.4310	05/06/1997	191253.8	6.0	4.50	0.015	IV	98.9(159.1)
GSP	32.6810	118.1090	06/20/1997	043540.5	6.0	4.70	0.016	IV	99.4(160.0)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.025	V	99.7(160.4)

****

-END OF SEARCH- 350 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2000

LENGTH OF SEARCH TIME: 201 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 6.4 MILES (10.4 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.7

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.206 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 2.879
b-value= 0.624
beta-value= 1.437

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	350	1.74129
4.5	350	1.74129
5.0	128	0.63682
5.5	52	0.25871
6.0	25	0.12438
6.5	9	0.04478
7.0	6	0.02985
7.5	1	0.00498

MAPPED EARTHQUAKE GROUND MOTION PARAMETERS

USGS JAVA APPLICATION

VERSION: 5.1.0

Conterminous 48 States
2009 International Building Code
Latitude = 34.036978
Longitude = -118.68967400000001
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	2.272 (Ss, Site Class B)
1.0	0.903 (S1, Site Class B)

Conterminous 48 States
2009 International Building Code
Latitude = 34.036978
Longitude = -118.68967400000001
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	2.272 (SMs, Site Class D)
1.0	1.354 (SM1, Site Class D)

Conterminous 48 States
2009 International Building Code
Latitude = 34.036978
Longitude = -118.68967400000001
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.515 (SDs, Site Class D)
1.0	0.903 (SD1, Site Class D)

Conterminous 48 States
2009 International Building Code
Latitude = 34.036978
Longitude = -118.68967400000001
MCE Response Spectrum for Site Class B
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0

Period (sec)	Sa (g)	Sd (inches)
0.000	0.909	0.000
0.079	2.272	0.140
0.200	2.272	0.888
0.397	2.272	3.503
0.400	2.257	3.527
0.500	1.805	4.409
0.600	1.504	5.291
0.700	1.289	6.173
0.800	1.128	7.055
0.900	1.003	7.937
1.000	0.903	8.818
1.100	0.821	9.700
1.200	0.752	10.582
1.300	0.694	11.464
1.400	0.645	12.346
1.500	0.602	13.228
1.600	0.564	14.109
1.700	0.531	14.991
1.800	0.501	15.873
1.900	0.475	16.755
2.000	0.451	17.637

Conterminous 48 States
2009 International Building Code
Latitude = 34.036978
Longitude = -118.68967400000001
Site Modified Response Spectrum for Site Class D
SMs = FaSs and SM1 = FvS1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)	Sd (inches)
0.000	0.909	0.000
0.119	2.272	0.315
0.200	2.272	0.888
0.596	2.272	7.883
0.600	2.257	7.937
0.700	1.934	9.259
0.800	1.692	10.582
0.900	1.504	11.905
1.000	1.354	13.228
1.100	1.231	14.550
1.200	1.128	15.873
1.300	1.041	17.196
1.400	0.967	18.519
1.500	0.903	19.841
1.600	0.846	21.164
1.700	0.796	22.487
1.800	0.752	23.810
1.900	0.713	25.133
2.000	0.677	26.455

Conterminous 48 States
2009 International Building Code
Latitude = 34.036978
Longitude = -118.68967400000001
Design Response Spectrum for Site Class D
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)	Sd (inches)
0.000	0.606	0.000
0.119	1.515	0.210
0.200	1.515	0.592
0.596	1.515	5.255
0.600	1.504	5.291
0.700	1.289	6.173
0.800	1.128	7.055
0.900	1.003	7.937
1.000	0.903	8.818
1.100	0.821	9.700
1.200	0.752	10.582
1.300	0.694	11.464
1.400	0.645	12.346
1.500	0.602	13.228
1.600	0.564	14.109
1.700	0.531	14.991
1.800	0.501	15.873
1.900	0.475	16.755
2.000	0.451	17.637

MAPPED EARTHQUAKE GROUND MOTION PARAMETERS

USGS DESIGN MAPS APPLICATION

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.037°N, 118.6897°W)

Site Class D – "Stiff Soil", Risk Category IV (e.g. essential facilities)

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 = 2.316 g
From Figure 22-2 [2]	S_1 = 0.832 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 = 2.316 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 = 0.832 g, F_v = 1.500

Equation (11.4–1):	$S_{MS} = F_aS_S = 1.000 \times 2.316 = 2.316$ g
Equation (11.4–2):	$S_{M1} = F_vS_1 = 1.500 \times 0.832 = 1.248$ g

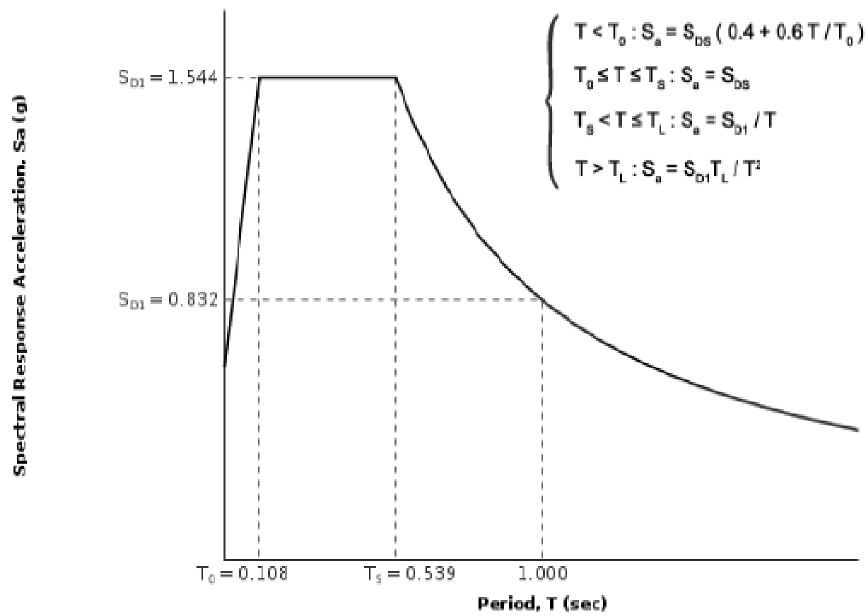
Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–3):	$S_{DS} = ⅔\ S_{MS} = ⅔ \times 2.316 = 1.544$ g
Equation (11.4–4):	$S_{D1} = ⅔\ S_{M1} = ⅔ \times 1.248 = 0.832$ g

Section 11.4.5 — Design Response Spectrum

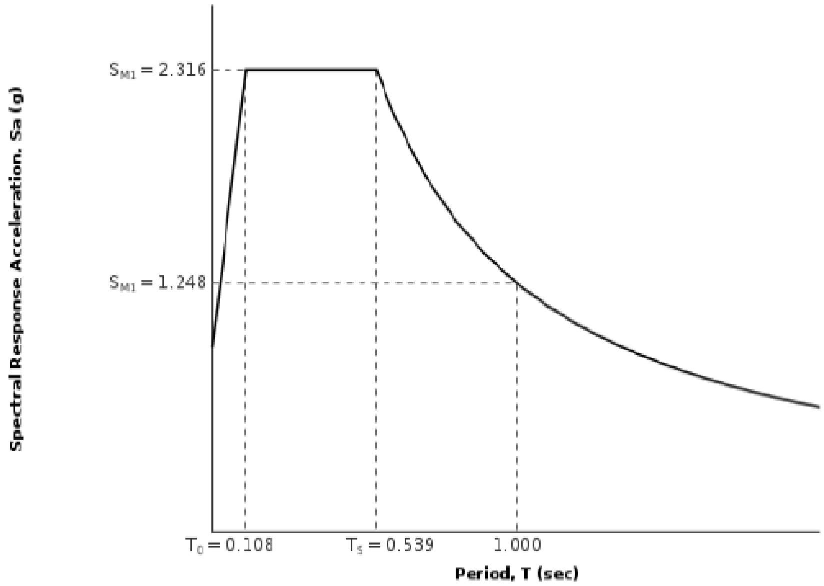
From Figure 22-12 [3]	$T_L = 8$ seconds

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 = 0.972

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.972 = 0.972$ 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 = 0.972 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] $C_{RS} = 0.863$

From Figure 22-18 [6] $C_{R1} = 0.871$

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 = IV and S_{DS} = 1.544 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 = IV and S_{D1} = 0.832 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" = F

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

SITE SPECIFIC EARTHQUAKE GROUND MOTION

DESIGN RESPONSE SPECTRUM ANALYSIS

ASCE 7/05 - Section 21.2 Ground Motion Hazard Analysis

21.2.1 Probabilistic MCE

Probabilistic Spectra Results using EZ-FRISK 7.26
PROBABILITY OF EXCEEDENCE 2.00% IN 50 YEARS

T	Sa
PGA	0.8835
0.05	0.9791
0.1	1.263
0.2	1.673
0.3	1.785
0.4	1.78
0.5	1.808
0.75	1.708
1	1.541
2	1.035
3	0.6564
4	0.4681

21.2.2 Deterministic MCE

Deterministic Spectra Results using EZ-FRISK 7.62.001
Largest Amplitudes of Ground Motions using Weighted Mean of Attenuation Equations
Fractile: 0.84

T	Sa	Magnitude Mw	Closest Dist. (km)	Region	Controlling Source
PGA	9.04E-01	7.4	4.13	USGS 2008 California	Santa Monica
0.05	9.69E-01	7.4	4.13	USGS 2008 California	Santa Monica
0.1	1.15E+00	7.4	4.13	USGS 2008 California	Santa Monica
0.2	1.51E+00	7.4	4.13	USGS 2008 California	Santa Monica
0.3	1.69E+00	7.4	4.13	USGS 2008 California	Santa Monica
0.4	1.80E+00	7.4	4.13	USGS 2008 California	Santa Monica
0.5	1.92E+00	7.4	4.13	USGS 2008 California	Santa Monica
0.75	1.99E+00	7.4	4.13	USGS 2008 California	Santa Monica
1	1.90E+00	7.4	4.13	USGS 2008 California	Santa Monica
2	1.35E+00	7.4	4.13	USGS 2008 California	Santa Monica
3	8.91E-01	7	0.08	USGS 2008 California	Malibu Coast
4	6.37E-01	7	0.08	USGS 2008 California	Malibu Coast

For Deterministic MCE response acceleration conforming with DSA Bulletin 09-01, the value at each period shall use the 84th percentile of the maximum rotated component of ground motion in lieu of using 150% of the median value

T	Sa
0.00	0.904
0.05	0.969
0.10	1.146
0.20	1.508
0.30	1.691
0.40	1.801
0.50	1.916
0.75	1.986
1.00	1.901
2.00	1.351
3.00	0.891
4.00	0.637

The ordinates of the deterministic MCE ground motion response spectrum shall not be taken lower than the corresponding ordinates of the response spectrum determined in accordance with Fig. 21.2-1 where Fa and Fv are determined using Tables 11.4-1 and 11.4-2, respectively, with the value of Ss taken as 1.5 and value of S1 taken as 0.6.

TABLE 11.4-1 SITE COEFFICIENT, F_a

Site Class	Mapped Maximum Considered Earthquake Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.5$	$S_S = 0.75$	$S_S = 1.0$	$S_S \ge 1.25$
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				

NOTE: Use straight-line interpolation for intermediate values of S_S.

TABLE 11.4-2 SITE COEFFICIENT, F_V

Site Class	Mapped Maximum Considered Earthquake Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \ge 0.5$
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				

NOTE: Use straight-line interpolation for intermediate values of S_1.

Deterministic Lower Limit on MCE Response Spectrum Using: Site Class D

Ss:	1.5	SMs:	1.5	SDs:	1
S1:	0.6	SM1:	0.9	SD1:	0.6

Fa: 1
Fv: 1.5
Ts: 0.600 $T_S = S_{D1}/S_{DS}$

where:

$$S_{MS} = F_a S_s$$
$$S_{M1} = F_v S_1$$
$$S_{DS} = \frac{2}{3} S_{MS}$$
$$S_{D1} = \frac{2}{3} S_{M1}$$

T	Sa
0.00	1.500
0.05	1.500
0.10	1.500
0.20	1.500
0.30	1.500
0.40	1.500
0.50	1.500
0.75	1.200
1.00	0.900
2.00	0.450
3.00	0.300
4.00	0.225

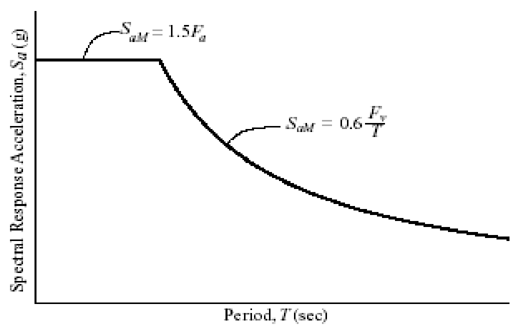


FIGURE 21.2-1 DETERMINISTIC LOWER LIMIT ON MCE RESPONSE SPECTRUM

Final Deterministic MCE Response Spectrum

T	Sa
0.00	1.500
0.05	1.500
0.10	1.500
0.20	1.508
0.30	1.691
0.40	1.801
0.50	1.916
0.75	1.986
1.00	1.901
2.00	1.351
3.00	0.891
4.00	0.637

21.2.3 Site - Specific MCE

The Site - Specific MCE spectral response acceleration at any period, SaM, shall be taken as the lesser of the spectral response accelerations from the probabilistic MCE and the determinisitic MCE.

Probabilistic MCE		Deterministic MCE		Site - Specific MCE	
T	Sa	T	Sa	T	Sa
PGA	0.8835	PGA	1.5	PGA	0.8835
0.05	0.9791	0.05	1.5	0.05	0.9791
0.1	1.263	0.1	1.5	0.1	1.263
0.2	1.673	0.2	1.508	0.2	1.508
0.3	1.785	0.3	1.691	0.3	1.691
0.4	1.78	0.4	1.801	0.4	1.78
0.5	1.808	0.5	1.916	0.5	1.808
0.75	1.708	0.75	1.986	0.75	1.708
1	1.541	1	1.901	1	1.541
2	1.035	2	1.351	2	1.035
3	0.6564	3	0.8909	3	0.6564
4	0.4681	4	0.6365	4	0.4681

21.3 Design Response Spectrum

The initial design spectral response acceleration at any period shall be determined from:

$$S_a = \frac{2}{3} S_{aM}$$

where SaM is the MCE spectral response acceleration obtained from Section 21.1 or 21.2.

Initial Design Response Spectrum

T	Sa
PGA	0.5890
0.05	0.6527
0.1	0.8420
0.2	1.0053
0.3	1.1273
0.4	1.1867
0.5	1.2053
0.75	1.1387
1	1.0273
2	0.6900
3	0.4376
4	0.3121

The design spectral response acceleration at any period shall not be taken less than 80 percent of Sa determined in accordance with Section 11.4.5.

1. For periods less than T_0, the design spectral response acceleration, S_a, shall be taken as given by Eq. 11.4-5:

$$S_a = S_{DS}\left(0.4 + 0.6\frac{T}{T_0}\right) \quad (11.4\text{-}5)$$

SDs:	1	SMs:	1.5
SD1:	0.6	SM1:	0.9
To:	0.12		
Ts:	0.6		
TL:	8	(Fig 22-15 in ASCE 7)	

Sa for T < To

T	Sa:
PGA	0.4
0.05	0.6500
0.1	0.9000

where

S_{DS} = the design spectral response acceleration parameter at short periods

S_{D1} = the design spectral response acceleration parameter at 1-s period

T = the fundamental period of the structure, s

$T_0 = 0.2\frac{S_{D1}}{S_{DS}}$

$T_S = \frac{S_{D1}}{S_{DS}}$ and

T_L = long-period transition period (s) shown in Fig. 22-15 (Conterminous United States), Fig. 22-16 (Region 1), Fig. 22-17 (Alaska), Fig. 22-18 (Hawaii), Fig. 22-19 (Puerto Rico, Culebra, Vieques, St. Thomas, St. John, and St. Croix), and Fig. 22-20 (Guam and Tutuila).

2. For periods greater than or equal to T_0 and less than or equal to T_S, the design spectral response acceleration, S_a, shall be taken equal to S_{DS}.

Sa for To ≤ T ≤Ts

T	Sa:
0.2	1
0.3	1
0.4	1
0.5	1

3. For periods greater than T_S, and less than or equal to T_L, the design spectral response acceleration, S_a, shall be taken as given by Eq. 11.4-6:

$$S_a = \frac{S_{D1}}{T} \quad (11.4\text{-}6)$$

Sa for Ts < T ≤ TL

T	Sa:
0.75	0.8
1	0.6
2	0.3
3	0.2
4	0.15

Per Section 11.4.5:

T	Sa:
PGA	0.4000
0.05	0.6500
0.1	0.9000
0.2	1.0000
0.3	1.0000
0.4	1.0000
0.5	1.0000
0.75	0.8000
1	0.6000
2	0.3000
3	0.2000
4	0.1500

Lower Limit as 80% of Section 11.4.5:

T	Sa:
PGA	0.3200
0.05	0.5200
0.1	0.7200
0.2	0.8000
0.3	0.8000
0.4	0.8000
0.5	0.8000
0.75	0.6400
1	0.4800
2	0.2400
3	0.1600
4	0.1200

Initial Design Response Spectrum

T	Sa
PGA	0.5890
0.05	0.6527
0.1	0.8420
0.2	1.0053
0.3	1.1273
0.4	1.1867
0.5	1.2053
0.75	1.1387
1	1.0273
2	0.6900
3	0.4376
4	0.3121

Final Design Response Spectrum:

T	Sa:
PGA	0.5890
0.05	0.6527
0.1	0.8420
0.2	1.0053
0.3	1.1273
0.4	1.1867
0.5	1.2053
0.75	1.1387
1	1.0273
2	0.6900
3	0.4376
4	0.3121

Final MCE Response Spectrum:

T	Sa:
PGA	0.8835
0.05	0.9791
0.1	1.2630
0.2	1.5080
0.3	1.6910
0.4	1.7800
0.5	1.8080
0.75	1.7080
1	1.5410
2	1.0350
3	0.6564
4	0.4681

per ASCE 7-05 Section 11.4.6

21.4 Design Acceleration Parameters

Where the site - specific procedure is used to determine the design ground motion in accordance with Section 21.3, the parameter SDs shall be taken as the spectral acceleration, Sa, obtained from the site - specific spectra at a period of 0.2s, except that is shall not be taken less than 90 percent of the peak spectral acceleration, Sa, at any period larger than 0.2s.

Sa at T = 0.2s:

T	Sa:
0.2	1.0053

Sa as 90% of maximum Sa at T > 0.2s:

Sa:
1.0848

SDs: 1.0848

The parameter SD1 shall be taken as the greater of the spectral acceleration, Sa, at a period 1s or two times the spectral acceleration , Sa, at a period of 2 sec.

Sa at T = 1s:

T	Sa:
1	1.0273

2 x Sa at T = 2s:

T	Sa:
2	1.3800

SD1: 1.3800

The parameters SMs and SM1 shall be taken as 1.5 times SDs and SD1 respectively. The values so obtained shall not be less than 80 percent of the values determined in accordance with Section 11.4.3 for SMs and SM1 and Section 11.4.4 for SDs and SD1.

SMs: 1.6272
SM1: 2.0700

Site Specific Design Acceleration Parameters:

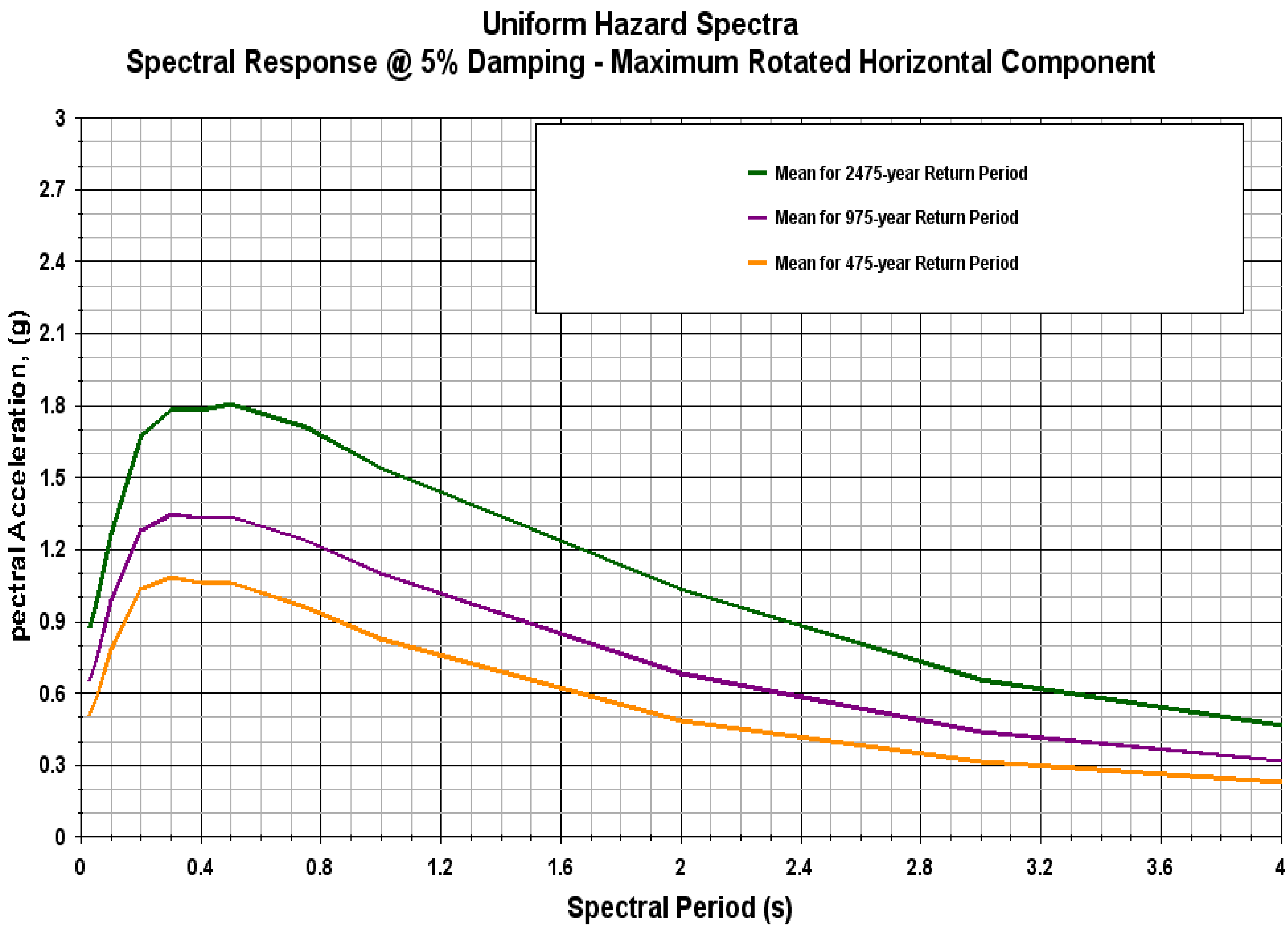
SMs: 1.6272
SM1: 2.07
SDs: 1.085
SD1: 1.380

PGA: 0.59g

SITE SPECIFIC

GROUND MOTION HAZARD ANALYSIS

EZFRISK OUTPUT



Uniform Hazard Spectra
Spectral Response @ 5% Damping - Maximum Rotated Horizontal Component
Mean for 2475-year Return Period
Mean for 975-year Return Period
Mean for 475-year Return Period
pectral Acceleration, (g)
3
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0
0.4
0.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
Spectral Period (s)

Probabilistic Spectra results for EZ-FRISK 7.62 Build 001

ANNUAL FREQUENCY OF EXCEEDANCE: 4.041e-004
RETURN PERIOD: 2474.9
PROBABILITY OF EXCEEDENCE: 2.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	8.835e-001	8.176e-001	8.334e-001	1.012e+000
0.05	9.791e-001	9.109e-001	8.847e-001	1.122e+000
0.1	1.263e+000	1.280e+000	1.121e+000	1.370e+000
0.2	1.673e+000	1.850e+000	1.415e+000	1.709e+000
0.3	1.785e+000	2.005e+000	1.511e+000	1.777e+000
0.4	1.780e+000	1.973e+000	1.536e+000	1.777e+000
0.5	1.808e+000	1.992e+000	1.609e+000	1.762e+000
0.75	1.708e+000	1.760e+000	1.612e+000	1.726e+000
1	1.541e+000	1.415e+000	1.561e+000	1.657e+000
2	1.035e+000	7.934e-001	1.203e+000	1.090e+000
3	6.564e-001	5.378e-001	7.462e-001	6.943e-001
4	4.681e-001	3.948e-001	5.263e-001	4.854e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 1.026e-003
RETURN PERIOD: 974.8
PROBABILITY OF EXCEEDENCE: 5.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	6.567e-001	6.533e-001	6.100e-001	7.083e-001
0.05	7.309e-001	7.248e-001	6.639e-001	8.054e-001
0.1	9.865e-001	1.023e+000	8.746e-001	1.039e+000
0.2	1.278e+000	1.405e+000	1.118e+000	1.285e+000
0.3	1.347e+000	1.511e+000	1.175e+000	1.315e+000
0.4	1.331e+000	1.484e+000	1.171e+000	1.294e+000
0.5	1.338e+000	1.497e+000	1.198e+000	1.259e+000
0.75	1.238e+000	1.328e+000	1.157e+000	1.182e+000
1	1.100e+000	1.086e+000	1.094e+000	1.117e+000
2	6.822e-001	5.923e-001	7.813e-001	7.014e-001
3	4.411e-001	3.993e-001	4.938e-001	4.411e-001
4	3.189e-001	2.907e-001	3.576e-001	3.101e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 2.107e-003

RETURN PERIOD: 474.6
PROBABILITY OF EXCEEDENCE: 10.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	5.139e-001	5.376e-001	4.690e-001	5.204e-001
0.05	5.728e-001	5.923e-001	5.190e-001	6.008e-001
0.1	7.827e-001	8.283e-001	7.050e-001	8.063e-001
0.2	1.037e+000	1.136e+000	9.135e-001	1.032e+000
0.3	1.084e+000	1.214e+000	9.590e-001	1.042e+000
0.4	1.063e+000	1.190e+000	9.399e-001	1.013e+000
0.5	1.060e+000	1.200e+000	9.461e-001	9.676e-001
0.75	9.605e-001	1.068e+000	8.827e-001	8.656e-001
1	8.289e-001	8.648e-001	8.080e-001	7.916e-001
2	4.845e-001	4.639e-001	5.301e-001	4.648e-001
3	3.168e-001	3.081e-001	3.442e-001	2.983e-001
4	2.307e-001	2.229e-001	2.556e-001	2.114e-001

Probabilistic Hazard Results for EZ-FRISK 7.62 Build 001

SPECTRAL PERIOD: PGA
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.879e-001	5.921e-001	5.928e-001	5.788e-001
0.010	3.886e-001	4.013e-001	4.626e-001	3.020e-001
0.020	2.630e-001	2.793e-001	3.105e-001	1.993e-001
0.050	1.266e-001	1.494e-001	1.333e-001	9.716e-002
0.070	9.039e-002	1.126e-001	8.898e-002	6.962e-002
0.100	5.955e-002	7.876e-002	5.404e-002	4.586e-002
0.200	2.014e-002	2.906e-002	1.574e-002	1.562e-002
0.300	8.547e-003	1.219e-002	6.421e-003	7.030e-003
0.400	4.188e-003	5.587e-003	3.181e-003	3.796e-003
0.500	2.284e-003	2.754e-003	1.785e-003	2.312e-003
0.700	8.506e-004	7.948e-004	6.995e-004	1.057e-003
1.000	2.719e-004	1.681e-004	2.277e-004	4.200e-004
2.000	1.942e-005	4.027e-006	1.395e-005	4.027e-005
3.000	2.800e-006	2.868e-007	1.681e-006	6.431e-006

SPECTRAL PERIOD: 0.05
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.869e-001	5.924e-001	5.928e-001	5.755e-001
0.010	4.052e-001	4.218e-001	4.835e-001	3.103e-001
0.020	2.827e-001	2.988e-001	3.374e-001	2.119e-001
0.050	1.418e-001	1.627e-001	1.531e-001	1.096e-001
0.070	1.031e-001	1.237e-001	1.047e-001	8.087e-002
0.100	6.962e-002	8.787e-002	6.557e-002	5.543e-002
0.200	2.522e-002	3.437e-002	2.051e-002	2.079e-002
0.300	1.121e-002	1.525e-002	8.602e-003	9.770e-003
0.400	5.646e-003	7.346e-003	4.257e-003	5.337e-003
0.500	3.127e-003	3.787e-003	2.349e-003	3.245e-003
0.700	1.178e-003	1.182e-003	8.790e-004	1.471e-003
1.000	3.777e-004	2.761e-004	2.691e-004	5.879e-004
2.000	2.822e-005	8.412e-006	1.485e-005	6.139e-005
3.000	4.350e-006	7.041e-007	1.710e-006	1.064e-005

SPECTRAL PERIOD: 0.1
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.897e-001	5.928e-001	5.928e-001	5.836e-001
0.010	4.574e-001	4.843e-001	5.261e-001	3.618e-001
0.020	3.420e-001	3.632e-001	4.014e-001	2.613e-001
0.050	1.877e-001	2.081e-001	2.066e-001	1.485e-001
0.070	1.420e-001	1.619e-001	1.491e-001	1.149e-001
0.100	1.012e-001	1.195e-001	1.003e-001	8.394e-002
0.200	4.352e-002	5.475e-002	3.806e-002	3.773e-002
0.300	2.222e-002	2.862e-002	1.819e-002	1.984e-002
0.400	1.238e-002	1.600e-002	9.732e-003	1.142e-002
0.500	7.354e-003	9.422e-003	5.605e-003	7.034e-003
0.700	2.983e-003	3.685e-003	2.158e-003	3.107e-003
1.000	9.832e-004	1.127e-003	6.558e-004	1.167e-003
2.000	7.034e-005	6.344e-005	3.458e-005	1.130e-004
3.000	1.060e-005	8.028e-006	3.944e-006	1.984e-005

SPECTRAL PERIOD: 0.2
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.924e-001	5.928e-001	5.928e-001	5.917e-001
0.010	5.185e-001	5.465e-001	5.618e-001	4.474e-001
0.020	4.179e-001	4.458e-001	4.698e-001	3.382e-001
0.050	2.478e-001	2.691e-001	2.743e-001	2.002e-001
0.070	1.918e-001	2.112e-001	2.068e-001	1.574e-001
0.100	1.407e-001	1.583e-001	1.460e-001	1.178e-001
0.200	6.634e-002	7.927e-002	6.213e-002	5.761e-002
0.300	3.713e-002	4.617e-002	3.243e-002	3.280e-002
0.400	2.246e-002	2.869e-002	1.862e-002	2.007e-002
0.500	1.430e-002	1.861e-002	1.136e-002	1.293e-002
0.700	6.467e-003	8.614e-003	4.777e-003	6.009e-003
1.000	2.392e-003	3.248e-003	1.596e-003	2.333e-003
2.000	2.182e-004	3.103e-004	1.030e-004	2.414e-004
3.000	3.917e-005	5.832e-005	1.349e-005	4.571e-005

SPECTRAL PERIOD: 0.3
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.927e-001	5.928e-001	5.928e-001	5.924e-001
0.010	5.333e-001	5.646e-001	5.627e-001	4.727e-001
0.020	4.373e-001	4.808e-001	4.712e-001	3.599e-001
0.050	2.624e-001	2.993e-001	2.776e-001	2.101e-001
0.070	2.034e-001	2.350e-001	2.114e-001	1.639e-001
0.100	1.494e-001	1.756e-001	1.512e-001	1.213e-001
0.200	7.073e-002	8.805e-002	6.610e-002	5.803e-002
0.300	3.984e-002	5.197e-002	3.491e-002	3.266e-002
0.400	2.430e-002	3.280e-002	2.021e-002	1.989e-002
0.500	1.561e-002	2.160e-002	1.243e-002	1.279e-002
0.700	7.203e-003	1.027e-002	5.340e-003	5.996e-003
1.000	2.750e-003	3.993e-003	1.862e-003	2.395e-003
2.000	2.771e-004	4.079e-004	1.430e-004	2.804e-004
3.000	5.397e-005	8.145e-005	2.181e-005	5.863e-005

SPECTRAL PERIOD: 0.4
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.927e-001	5.928e-001	5.928e-001	5.925e-001
0.010	5.290e-001	5.560e-001	5.523e-001	4.785e-001
0.020	4.231e-001	4.603e-001	4.464e-001	3.626e-001
0.050	2.463e-001	2.774e-001	2.532e-001	2.083e-001
0.070	1.903e-001	2.174e-001	1.922e-001	1.613e-001
0.100	1.398e-001	1.632e-001	1.377e-001	1.185e-001
0.200	6.626e-002	8.315e-002	6.028e-002	5.533e-002
0.300	3.714e-002	4.931e-002	3.168e-002	3.043e-002
0.400	2.250e-002	3.109e-002	1.825e-002	1.817e-002
0.500	1.438e-002	2.040e-002	1.120e-002	1.154e-002
0.700	6.618e-003	9.630e-003	4.859e-003	5.365e-003
1.000	2.559e-003	3.722e-003	1.768e-003	2.187e-003
2.000	2.783e-004	3.866e-004	1.628e-004	2.855e-004
3.000	5.661e-005	7.895e-005	2.804e-005	6.283e-005

SPECTRAL PERIOD: 0.5
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.927e-001	5.928e-001	5.928e-001	5.925e-001
0.010	5.200e-001	5.496e-001	5.390e-001	4.713e-001
0.020	4.085e-001	4.491e-001	4.247e-001	3.517e-001
0.050	2.351e-001	2.688e-001	2.386e-001	1.980e-001
0.070	1.819e-001	2.113e-001	1.819e-001	1.524e-001
0.100	1.341e-001	1.596e-001	1.314e-001	1.113e-001
0.200	6.399e-002	8.256e-002	5.855e-002	5.086e-002
0.300	3.584e-002	4.937e-002	3.089e-002	2.726e-002
0.400	2.166e-002	3.131e-002	1.775e-002	1.593e-002
0.500	1.383e-002	2.064e-002	1.088e-002	9.966e-003
0.700	6.396e-003	9.811e-003	4.760e-003	4.616e-003
1.000	2.525e-003	3.817e-003	1.814e-003	1.946e-003
2.000	2.954e-004	3.988e-004	2.033e-004	2.841e-004
3.000	6.192e-005	8.201e-005	3.931e-005	6.444e-005

SPECTRAL PERIOD: 0.75
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.926e-001	5.928e-001	5.928e-001	5.921e-001
0.010	4.744e-001	5.102e-001	4.865e-001	4.263e-001
0.020	3.490e-001	3.897e-001	3.559e-001	3.015e-001
0.050	1.921e-001	2.226e-001	1.916e-001	1.622e-001
0.070	1.476e-001	1.745e-001	1.452e-001	1.231e-001
0.100	1.080e-001	1.317e-001	1.042e-001	8.811e-002
0.200	4.990e-002	6.652e-002	4.542e-002	3.775e-002
0.300	2.707e-002	3.841e-002	2.355e-002	1.926e-002
0.400	1.600e-002	2.359e-002	1.343e-002	1.097e-002
0.500	1.009e-002	1.515e-002	8.262e-003	6.852e-003
0.700	4.664e-003	6.940e-003	3.740e-003	3.314e-003
1.000	1.905e-003	2.617e-003	1.547e-003	1.549e-003
2.000	2.556e-004	2.650e-004	2.205e-004	2.814e-004
3.000	5.805e-005	5.434e-005	4.936e-005	7.044e-005

SPECTRAL PERIOD: 1
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.919e-001	5.926e-001	5.925e-001	5.907e-001
0.010	4.179e-001	4.501e-001	4.261e-001	3.775e-001
0.020	2.912e-001	3.212e-001	2.951e-001	2.573e-001
0.050	1.565e-001	1.793e-001	1.544e-001	1.357e-001
0.070	1.197e-001	1.408e-001	1.162e-001	1.021e-001
0.100	8.663e-002	1.056e-001	8.240e-002	7.192e-002
0.200	3.797e-002	5.001e-002	3.461e-002	2.929e-002
0.300	1.962e-002	2.677e-002	1.752e-002	1.456e-002
0.400	1.121e-002	1.539e-002	9.939e-003	8.295e-003
0.500	6.931e-003	9.358e-003	6.170e-003	5.266e-003
0.700	3.180e-003	3.944e-003	2.917e-003	2.680e-003
1.000	1.335e-003	1.370e-003	1.300e-003	1.334e-003
2.000	1.964e-004	1.195e-004	2.108e-004	2.589e-004
3.000	4.606e-005	2.197e-005	5.022e-005	6.599e-005

SPECTRAL PERIOD: 2
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

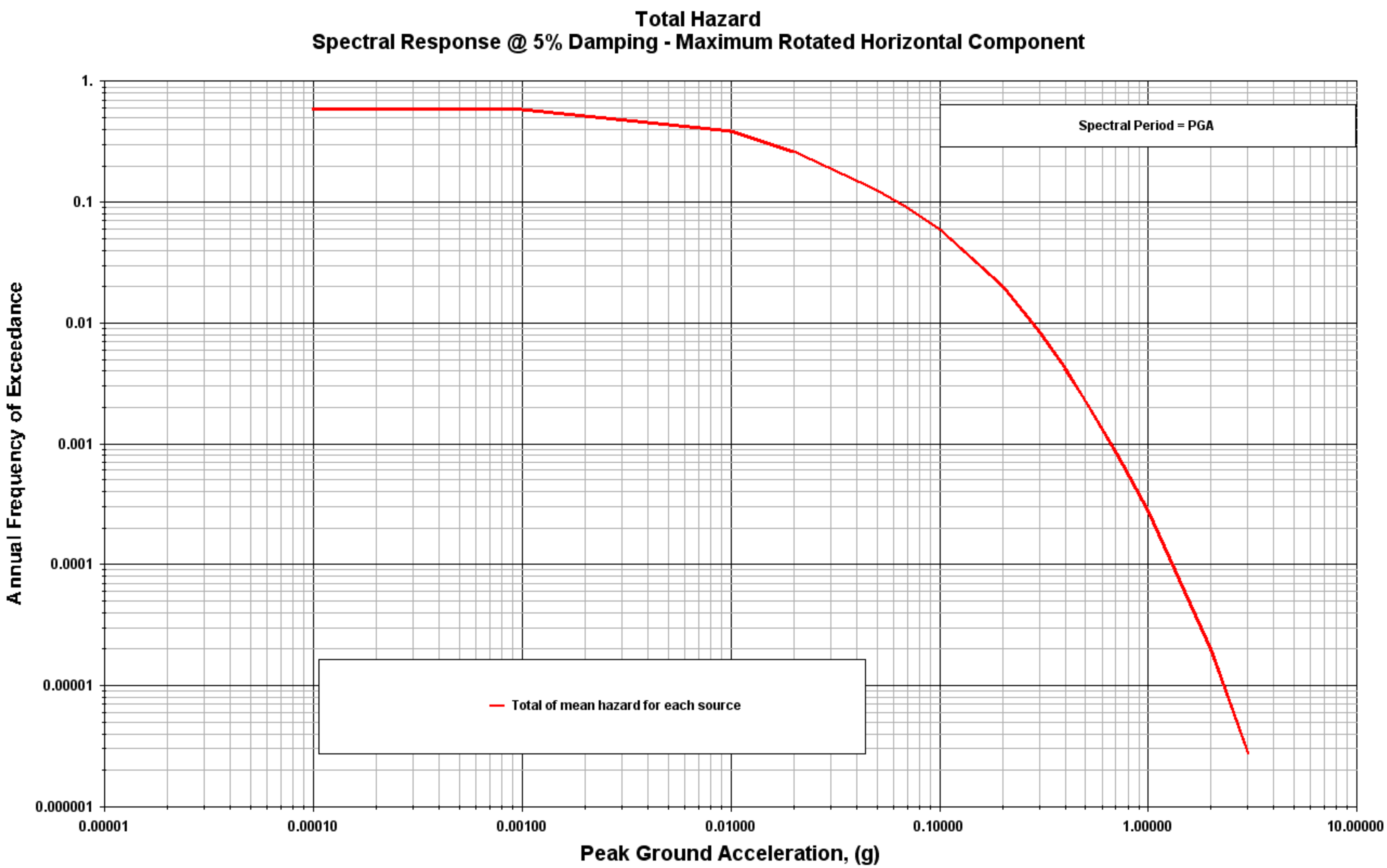
1	2	3	4	5
1.0e-004	5.928e-001	5.928e-001	5.928e-001	5.928e-001
1.0e-003	5.637e-001	5.749e-001	5.651e-001	5.512e-001
0.010	2.368e-001	2.638e-001	2.336e-001	2.129e-001
0.020	1.550e-001	1.760e-001	1.508e-001	1.381e-001
0.050	7.828e-002	9.371e-002	7.514e-002	6.598e-002
0.070	5.631e-002	6.888e-002	5.416e-002	4.589e-002
0.100	3.690e-002	4.592e-002	3.583e-002	2.896e-002
0.200	1.248e-002	1.533e-002	1.266e-002	9.446e-003
0.300	5.698e-003	6.472e-003	6.081e-003	4.542e-003
0.400	3.147e-003	3.166e-003	3.545e-003	2.730e-003
0.500	1.973e-003	1.715e-003	2.345e-003	1.859e-003
0.700	9.717e-004	6.179e-004	1.267e-003	1.030e-003
1.000	4.436e-004	1.842e-004	6.378e-004	5.087e-004
2.000	6.898e-005	1.147e-005	1.155e-004	7.994e-005
3.000	1.666e-005	1.661e-006	2.994e-005	1.839e-005

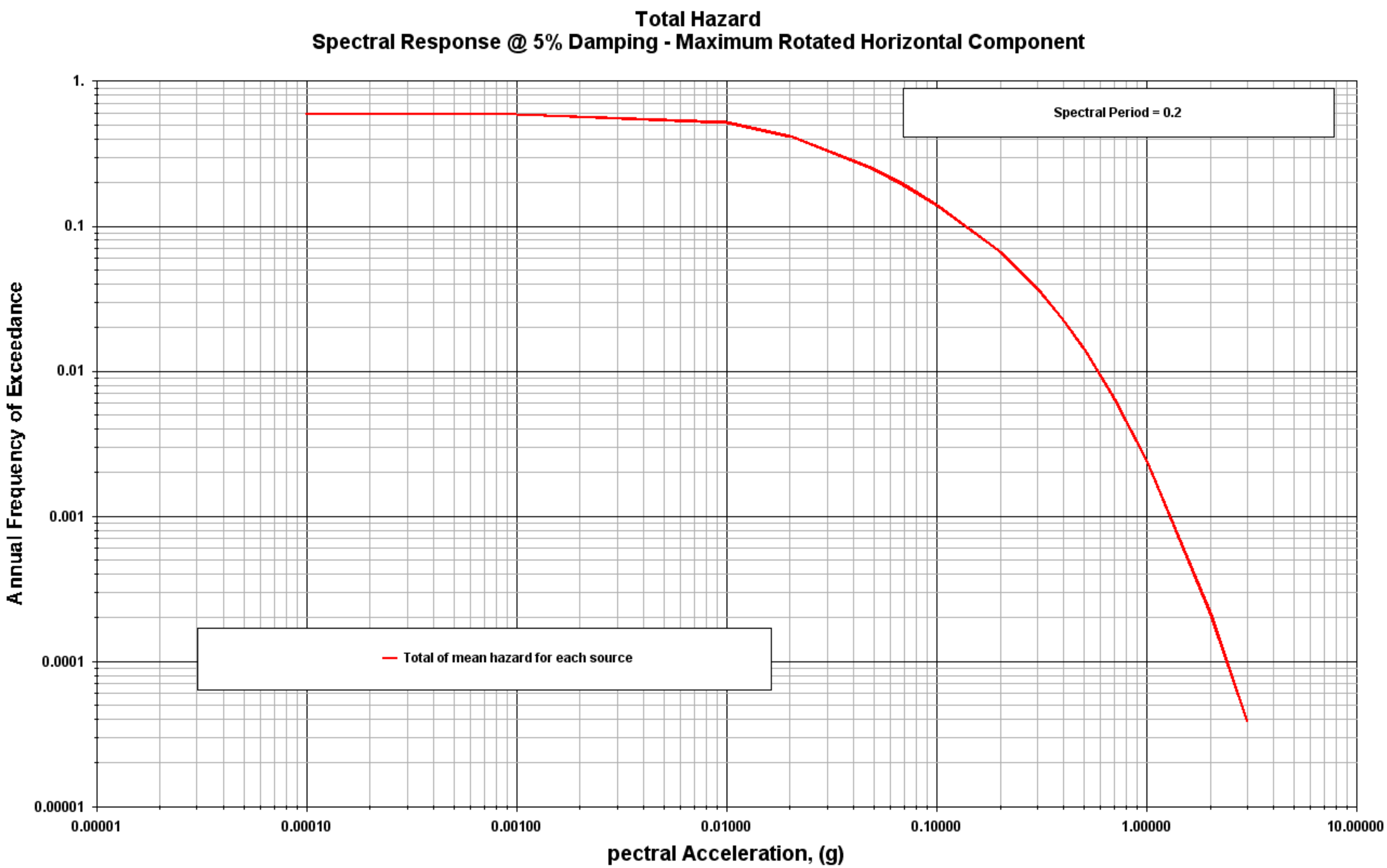
SPECTRAL PERIOD: 3
Column 1: Acceleration (g) Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

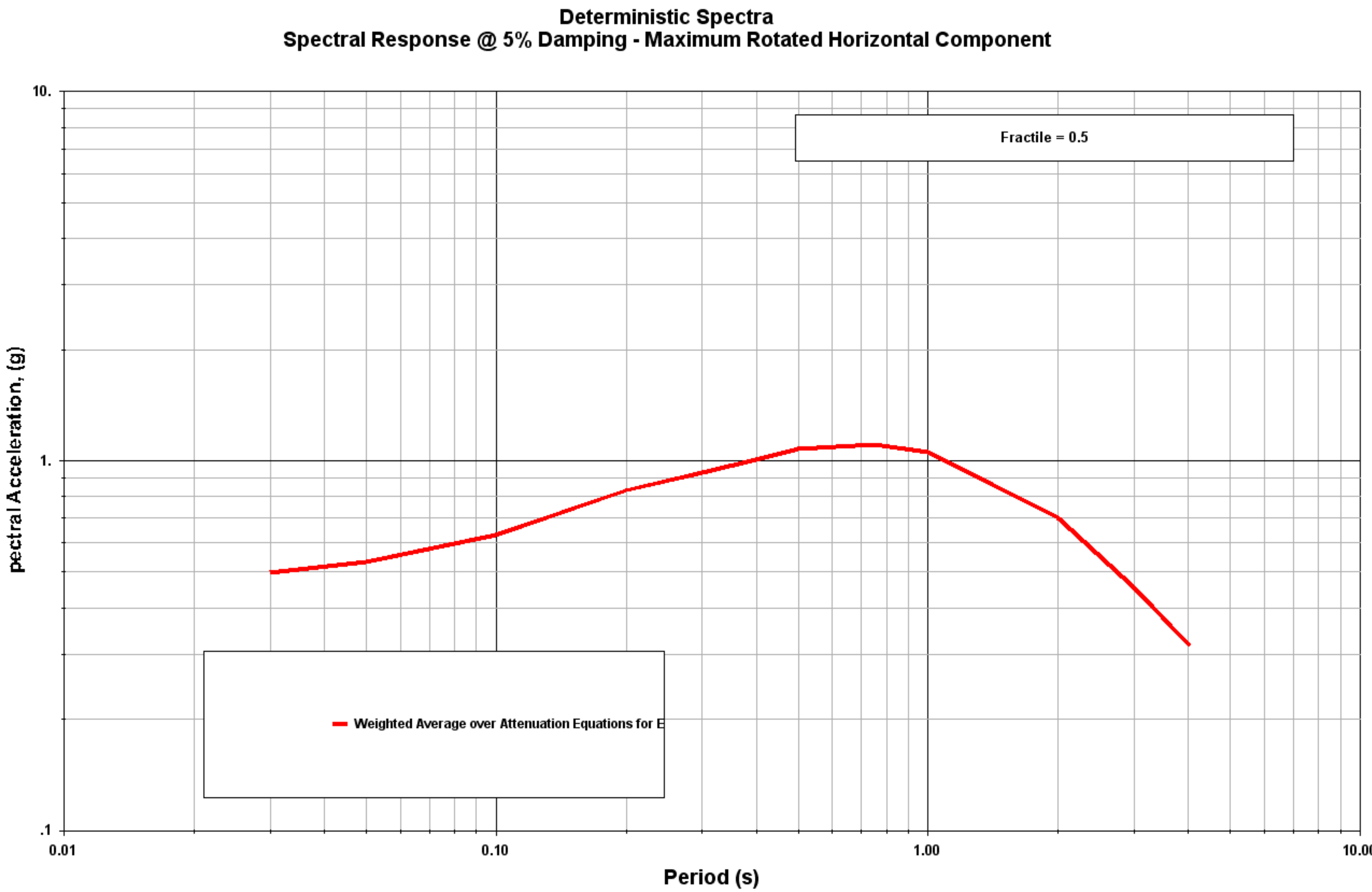
1	2	3	4	5
1.0e-004	5.926e-001	5.927e-001	5.927e-001	5.924e-001
1.0e-003	4.801e-001	5.095e-001	4.721e-001	4.589e-001
0.010	1.598e-001	1.808e-001	1.528e-001	1.459e-001
0.020	1.043e-001	1.203e-001	1.007e-001	9.212e-002
0.050	4.706e-002	5.639e-002	4.660e-002	3.818e-002
0.070	3.133e-002	3.787e-002	3.154e-002	2.459e-002
0.100	1.873e-002	2.260e-002	1.925e-002	1.433e-002
0.200	5.431e-003	6.052e-003	5.931e-003	4.311e-003
0.300	2.369e-003	2.268e-003	2.754e-003	2.085e-003
0.400	1.276e-003	1.021e-003	1.572e-003	1.236e-003
0.500	7.749e-004	5.168e-004	1.000e-003	8.076e-004
0.700	3.464e-004	1.659e-004	4.762e-004	3.971e-004
1.000	1.323e-004	4.255e-005	1.903e-004	1.641e-004
2.000	1.261e-005	1.803e-006	1.835e-005	1.766e-005
3.000	2.224e-006	1.998e-007	3.116e-006	3.355e-006

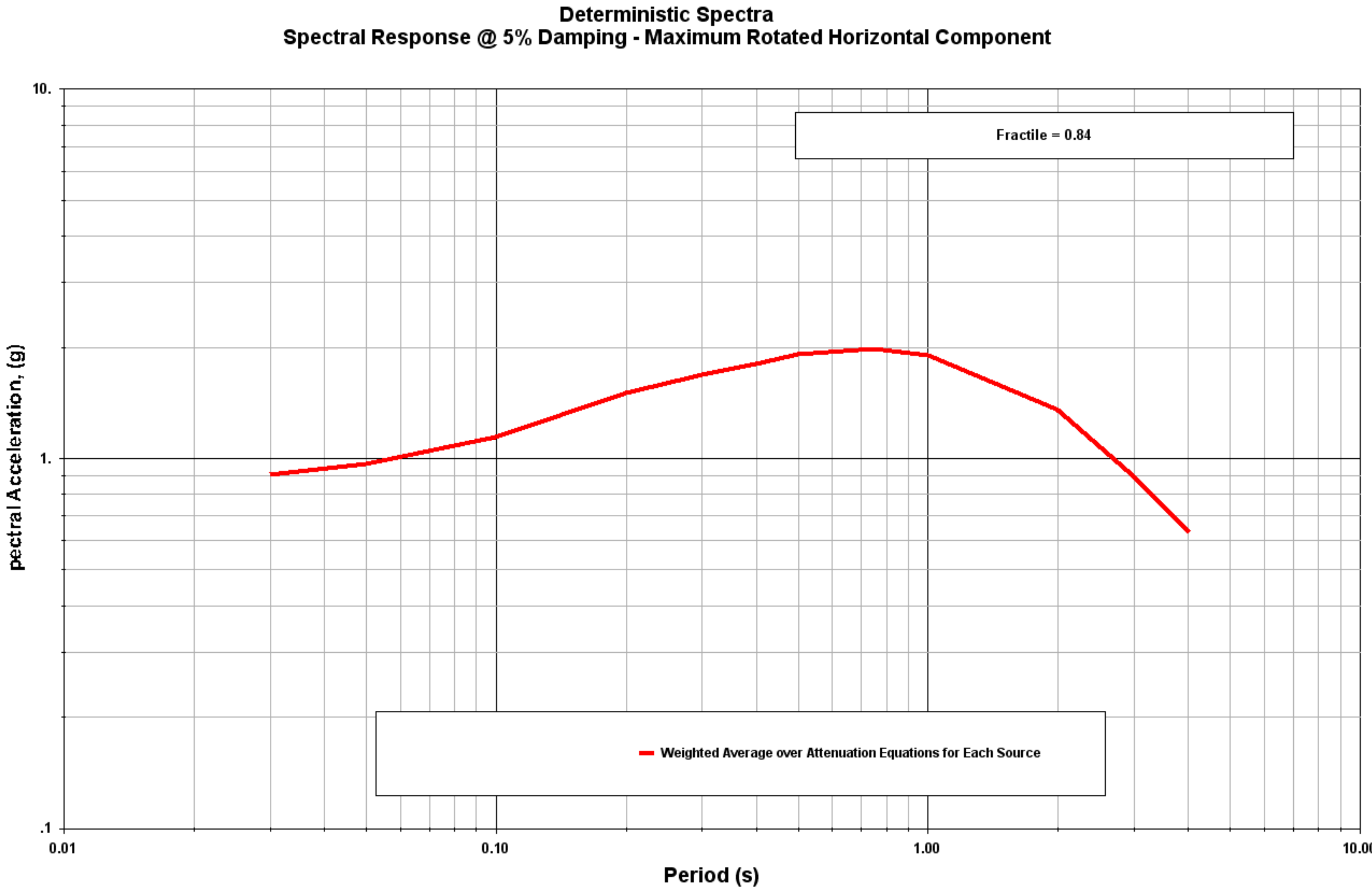
SPECTRAL PERIOD: 4
Column 1: Acceleration (g)
Column 2: Mean
Column 3: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
1.0e-004	5.903e-001	5.920e-001	5.904e-001	5.884e-001
1.0e-003	3.912e-001	4.319e-001	3.734e-001	3.682e-001
0.010	1.238e-001	1.393e-001	1.213e-001	1.109e-001
0.020	7.887e-002	9.104e-002	7.939e-002	6.617e-002
0.050	3.153e-002	3.736e-002	3.347e-002	2.376e-002
0.070	1.975e-002	2.327e-002	2.151e-002	1.447e-002
0.100	1.106e-002	1.272e-002	1.241e-002	8.048e-003
0.200	2.884e-003	2.825e-003	3.487e-003	2.338e-003
0.300	1.185e-003	9.417e-004	1.517e-003	1.096e-003
0.400	6.011e-004	3.880e-004	7.992e-004	6.161e-004
0.500	3.421e-004	1.826e-004	4.650e-004	3.787e-004
0.700	1.345e-004	5.214e-005	1.853e-004	1.661e-004
1.000	4.344e-005	1.169e-005	5.869e-005	5.995e-005
2.000	2.911e-006	3.707e-007	3.360e-006	5.002e-006
3.000	4.276e-007	3.420e-008	4.115e-007	8.370e-007


Total Hazard
Spectral Response @ 5% Damping - Maximum Rotated Horizontal Component
Spectral Period = PGA
Total of mean hazard for each source
Annual Frequency of Exceedance
1.
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.00001
0.00010
0.00100
0.01000
0.10000
1.00000
10.00000
Peak Ground Acceleration, (g)


Total Hazard
Spectral Response @ 5% Damping - Maximum Rotated Horizontal Component
Spectral Period = 0.2
Annual Frequency of Exceedance
1.
0.1
0.01
0.001
0.0001
0.00001
Total of mean hazard for each source
0.00001
0.00010
0.00100
0.01000
0.10000
1.00000
10.00000
pectral Acceleration, (g)


Deterministic Spectra
Spectral Response @ 5% Damping - Maximum Rotated Horizontal Component
Fractile = 0.5
Weighted Average over Attenuation Equations for E
10.
1.
.1
0.01
0.10
1.00
10.00
Period (s)
pectral Acceleration, (g)


Deterministic Spectra
Spectral Response @ 5% Damping - Maximum Rotated Horizontal Component
Fractile = 0.84
Weighted Average over Attenuation Equations for Each Source
pectral Acceleration, (g)
10.
1.
.1
0.01
0.10
1.00
10.00
Period (s)

Deterministic Spectra Results using EZ-FRISK 7.62 Build 001

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations
Amplitude Units: Acceleration (g)

Fractile: 0.5

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	4.991e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.05	5.344e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.1	6.304e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.2	8.319e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.3	9.298e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.4	1.005e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.5	1.079e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	1.107e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	1.057e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	6.992e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
3	4.529e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
4	3.188e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast

Fractile: 0.84

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	9.044e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.05	9.685e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.1	1.146e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.2	1.508e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.3	1.691e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.4	1.801e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.5	1.916e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	1.986e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	1.901e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	1.351e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
3	8.909e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
4	6.365e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast

Largest Amplitudes of Ground Motions Considering Sources Calculated with Boore-Atkinson (2008) NGA USGS 2008 MRC

Amplitude Units: Acceleration (g)

Fractile: 0.5

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	3.401e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.05	3.920e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
0.1	5.789e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.2	9.541e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.3	1.051e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.4	1.048e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.5	1.022e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	9.073e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	7.235e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	3.777e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
3	2.754e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
4	2.042e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica

Fractile: 0.84

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	6.162e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.05	7.103e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
0.1	1.060e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.2	1.729e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.3	1.923e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.4	1.908e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.5	1.884e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	1.723e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	1.377e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	7.576e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
3	5.496e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
4	4.087e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica

Largest Amplitudes of Ground Motions Considering Sources Calculated with Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Amplitude Units: Acceleration (g)

Fractile: 0.5

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	5.010e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.05	4.876e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.1	5.288e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.2	6.319e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.3	7.378e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.4	8.649e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.5	1.027e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	1.164e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	1.204e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	9.649e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
3	5.463e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
4	3.668e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast

Fractile: 0.84

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	9.079e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.05	8.836e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.1	9.582e-001	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.2	1.145e+000	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.3	1.337e+000	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.4	1.537e+000	7.20 Mw	4.45	USGS 2008 California	Anacapa-Dume
0.5	1.792e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	2.041e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	2.133e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	1.849e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
3	1.048e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
4	7.049e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast

Largest Amplitudes of Ground Motions Considering Sources Calculated with Chiou-Youngs (2007) NGA USGS 2008 MRC
Amplitude Units: Acceleration (g)

Fractile: 0.5

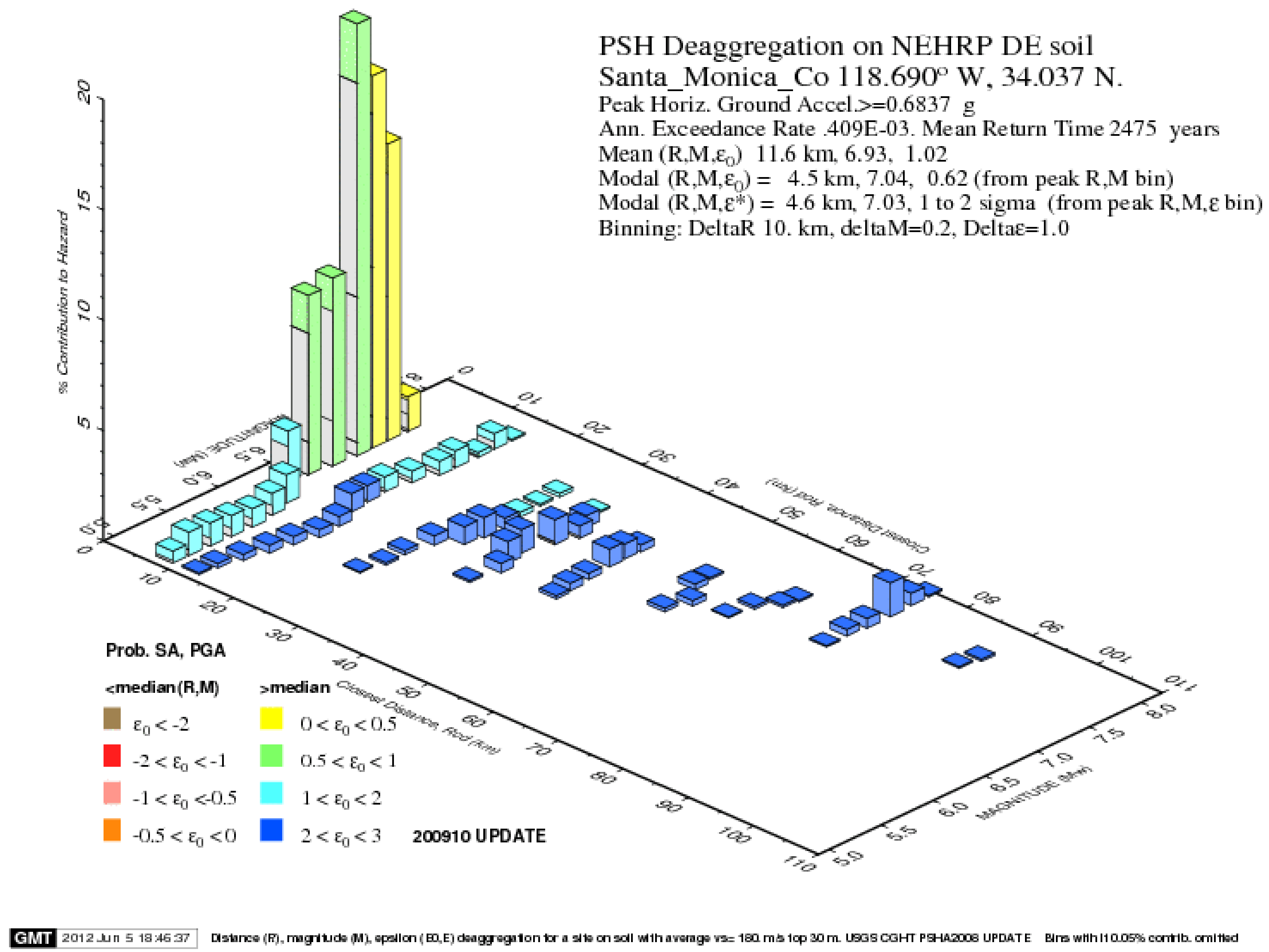
Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	6.795e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.05	7.472e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.1	8.018e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.2	9.193e-001	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.3	1.006e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.4	1.106e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.5	1.187e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	1.250e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	1.243e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	8.338e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
3	5.744e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
4	4.064e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast

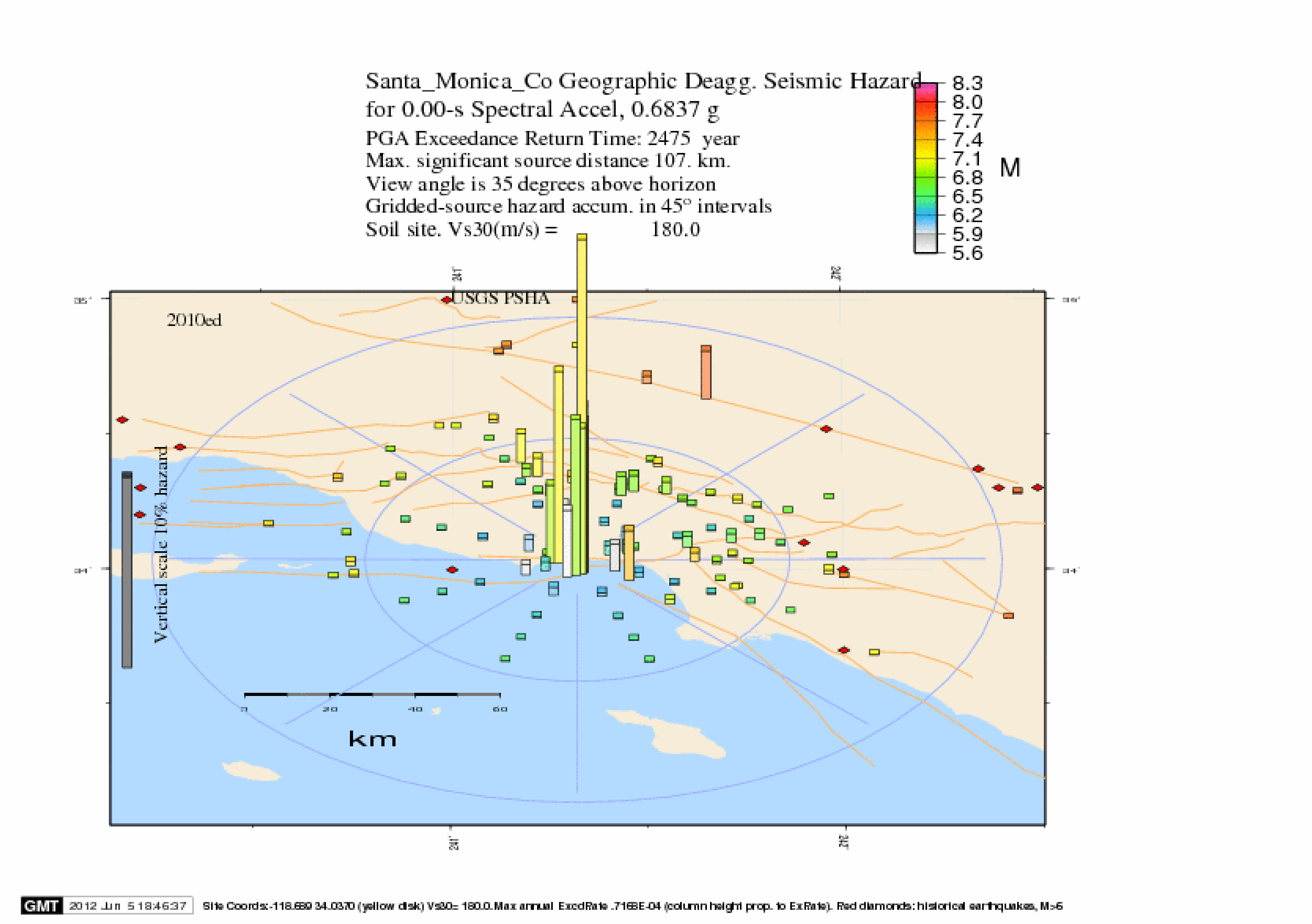
Fractile: 0.84

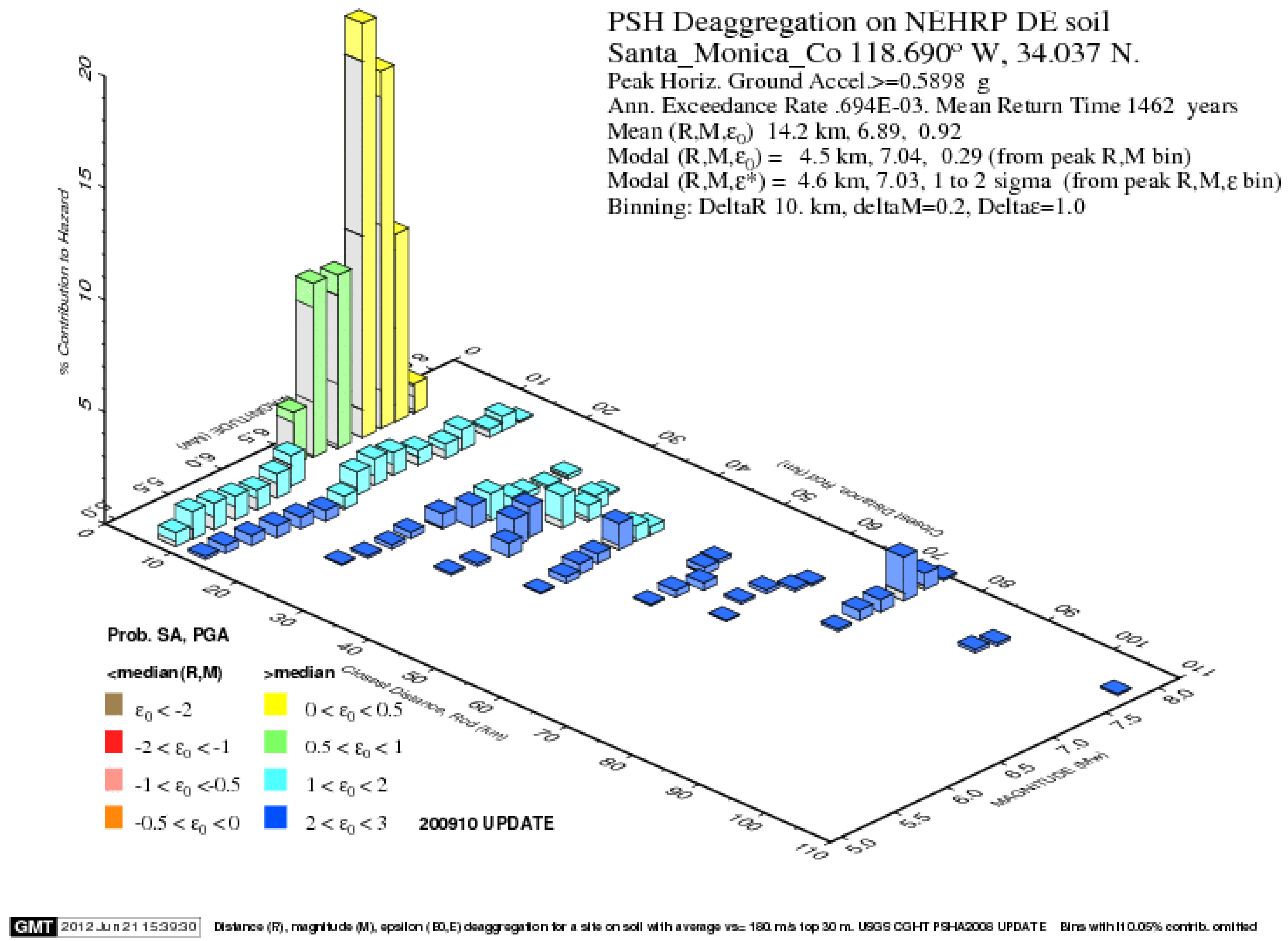
Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	1.231e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.05	1.354e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.1	1.453e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.2	1.666e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.3	1.823e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.4	1.966e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.5	2.071e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
0.75	2.193e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
1	2.193e+000	7.40 Mw	4.13	USGS 2008 California	Santa Monica
2	1.598e+000	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
3	1.149e+000	7.00 Mw	0.08	USGS 2008 California	Malibu Coast
4	8.379e-001	7.00 Mw	0.08	USGS 2008 California	Malibu Coast

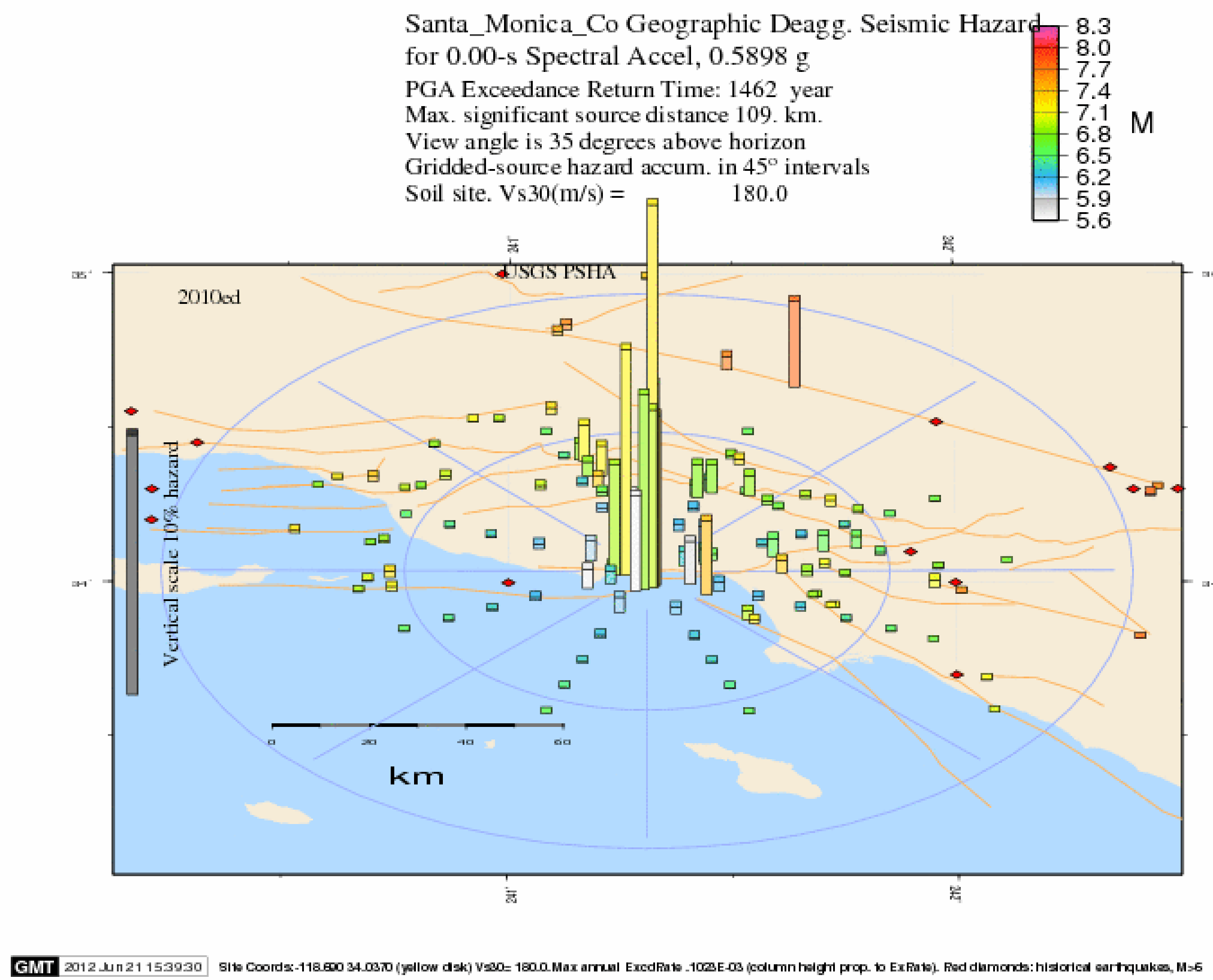
USGS INTERACTIVE

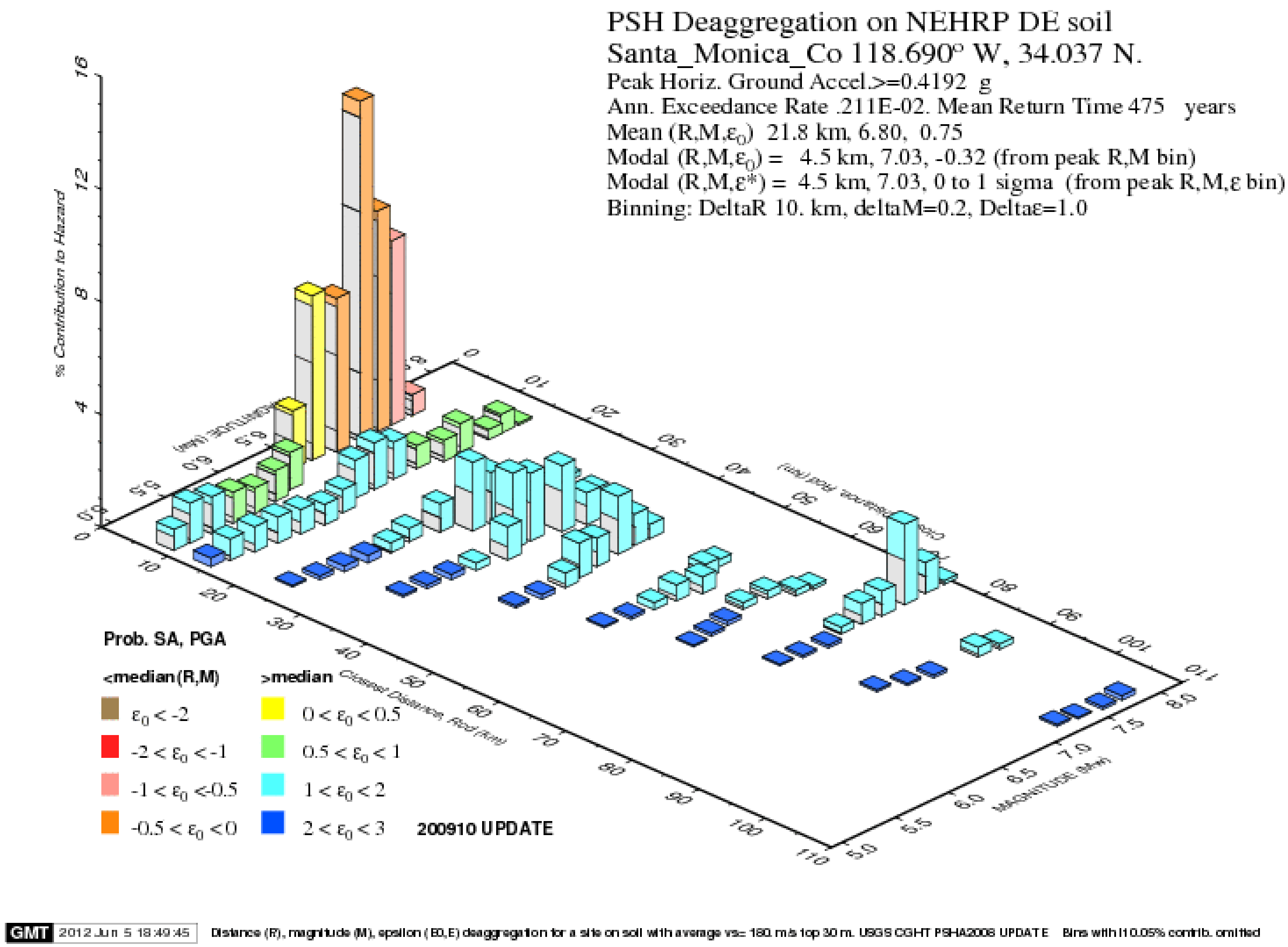
DEAGGREGATION WEBSITE OUTPUT

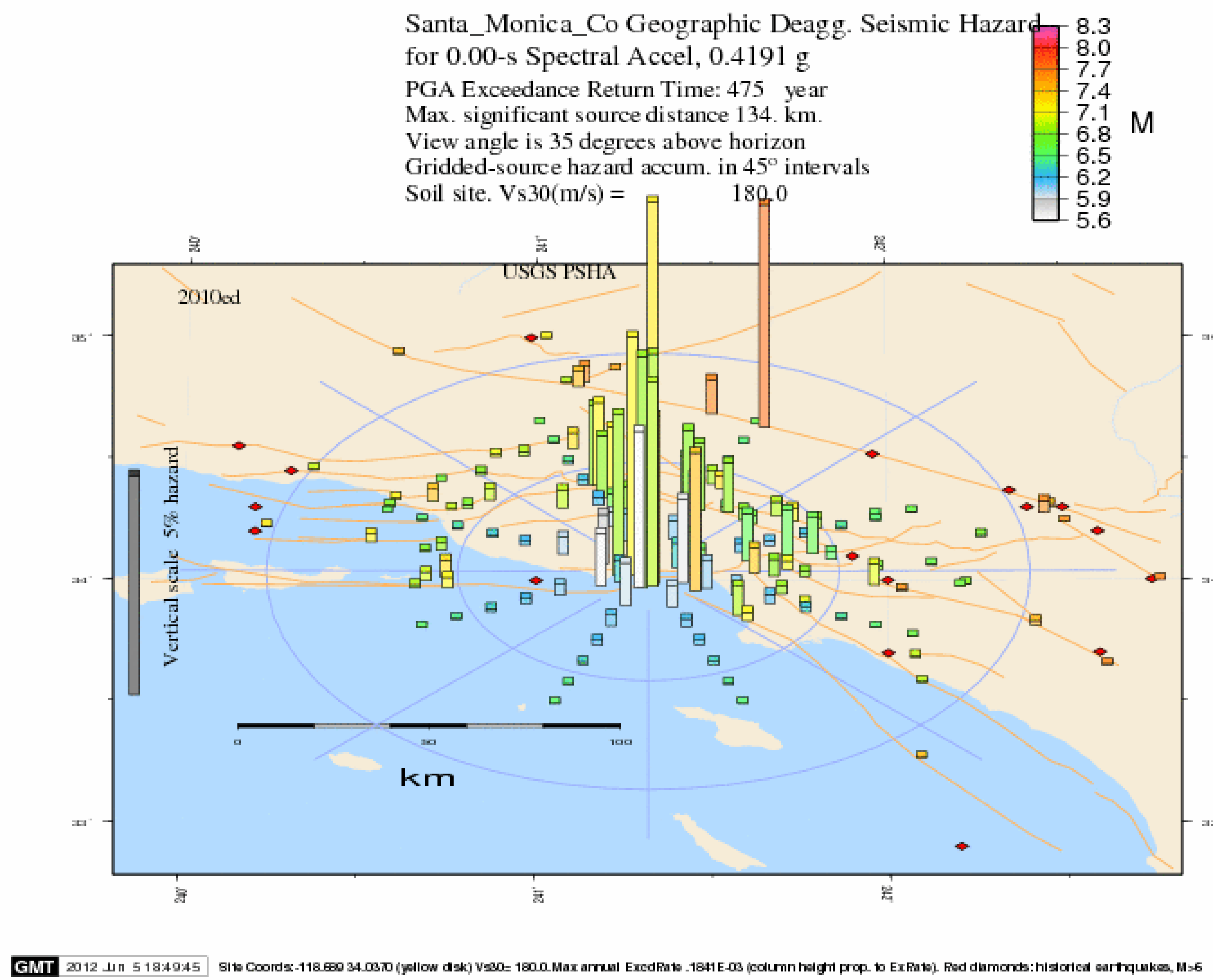

PSH Deaggregation on NEHRP DE soil
Santa_Monica_Co 118.690° W, 34.037 N.
Peak Horiz. Ground Accel.>=0.6837 g
Ann. Exceedance Rate .409E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 11.6 km, 6.93, 1.02
Modal (R,M,ε_0) = 4.5 km, 7.04, 0.62 (from peak R,M bin)
Modal (R,M,ε^*) = 4.6 km, 7.03, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
$\varepsilon_0 < -2$
$-2 < \varepsilon_0 < -1$
$-1 < \varepsilon_0 < -0.5$
$-0.5 < \varepsilon_0 < 0$
$0 < \varepsilon_0 < 0.5$
$0.5 < \varepsilon_0 < 1$
$1 < \varepsilon_0 < 2$
$2 < \varepsilon_0 < 3$
200910 UPDATE
GMT 2012 Jun 5 18:46:37
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 180. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted


Santa_Monica_Co Geographic Deagg. Seismic Hazard
for 0.00-s Spectral Accel, 0.6837 g
PGA Exceedance Return Time: 2475 year
Max. significant source distance 107. km.
View angle is 35 degrees above horizon
Gridded-source hazard accum. in 45° intervals
Soil site. Vs30(m/s) = 180.0
8.3
8.0
7.7
7.4
7.1
6.8
6.5
6.2
5.9
5.6
M
USGS PSHA
2010ed
Vertical scale 10% hazard
km
GMT 2012 Jun 5 18:46:37
Site Coords:-118.689 34.0370 (yellow disk) Vs30= 180.0. Max annual ExcdRate .7168E-04 (column height prop. to ExRate). Red diamonds: historical earthquakes, M>6


PSH Deaggregation on NEHRP DE soil
Santa_Monica_Co 118.690° W, 34.037 N.
Peak Horiz. Ground Accel.>=0.5898 g
Ann. Exceedance Rate .694E-03. Mean Return Time 1462 years
Mean (R,M,ε_0) 14.2 km, 6.89, 0.92
Modal (R,M,ε_0) = 4.5 km, 7.04, 0.29 (from peak R,M bin)
Modal (R,M,ε^*) = 4.6 km, 7.03, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
$\varepsilon_0 < -2$
$-2 < \varepsilon_0 < -1$
$-1 < \varepsilon_0 < -0.5$
$-0.5 < \varepsilon_0 < 0$
$0 < \varepsilon_0 < 0.5$
$0.5 < \varepsilon_0 < 1$
$1 < \varepsilon_0 < 2$
$2 < \varepsilon_0 < 3$
200910 UPDATE
GMT 2012 Jun 21 15:39:30
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 180. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted


Santa_Monica_Co Geographic Deagg. Seismic Hazard
for 0.00-s Spectral Accel, 0.5898 g
PGA Exceedance Return Time: 1462 year
Max. significant source distance 109. km.
View angle is 35 degrees above horizon
Gridded-source hazard accum. in 45° intervals
Soil site. Vs30(m/s) = 180.0
8.3
8.0
7.7
7.4
7.1
6.8
6.5
6.2
5.9
5.6
M
USGS PSHA
2010ed
Vertical scale 10% hazard
0
20
40
60
km
GMT
2012 Jun 21 15:39:30
Site Coords: -118.690 34.0370 (yellow disk) Vs30= 180.0. Max annual ExcdRate .1023E-03 (column height prop. to ExRate). Red diamonds: historical earthquakes, M>6


PSH Deaggregation on NEHRP DE soil
Santa_Monica_Co 118.690° W, 34.037 N.
Peak Horiz. Ground Accel.>=0.4192 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 years
Mean (R,M,ε0) 21.8 km, 6.80, 0.75
Modal (R,M,ε0) = 4.5 km, 7.03, -0.32 (from peak R,M bin)
Modal (R,M,ε*) = 4.5 km, 7.03, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jun 5 18:49:45
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 180. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted



Santa_Monica_Co Geographic Deagg. Seismic Hazard
for 0.00-s Spectral Accel, 0.4191 g
PGA Exceedance Return Time: 475 year
Max. significant source distance 134. km.
View angle is 35 degrees above horizon
Gridded-source hazard accum. in 45° intervals
Soil site. Vs30(m/s) = 180.0
8.3
8.0
7.7
7.4
7.1
6.8
6.5
6.2
5.9
5.6
M
USGS PSHA
2010ed
Vertical scale 5% hazard
0
50
100
km
GMT
2012 Jun 5 18:49:45
Site Coords:-118.689 34.0370 (yellow disk) Vs30= 180.0.Max annual ExcdRate .1841E-03 (column height prop. to ExRate). Red diamonds: historical earthquakes, M>6

APPENDIX D

LIQUEFACTION / SEISMIC SETTLEMENT ANALYSES

Preliminary Geotechnical Investigation,
Proposed Library,
23555 Civic Center Way,
City of Malibu, California

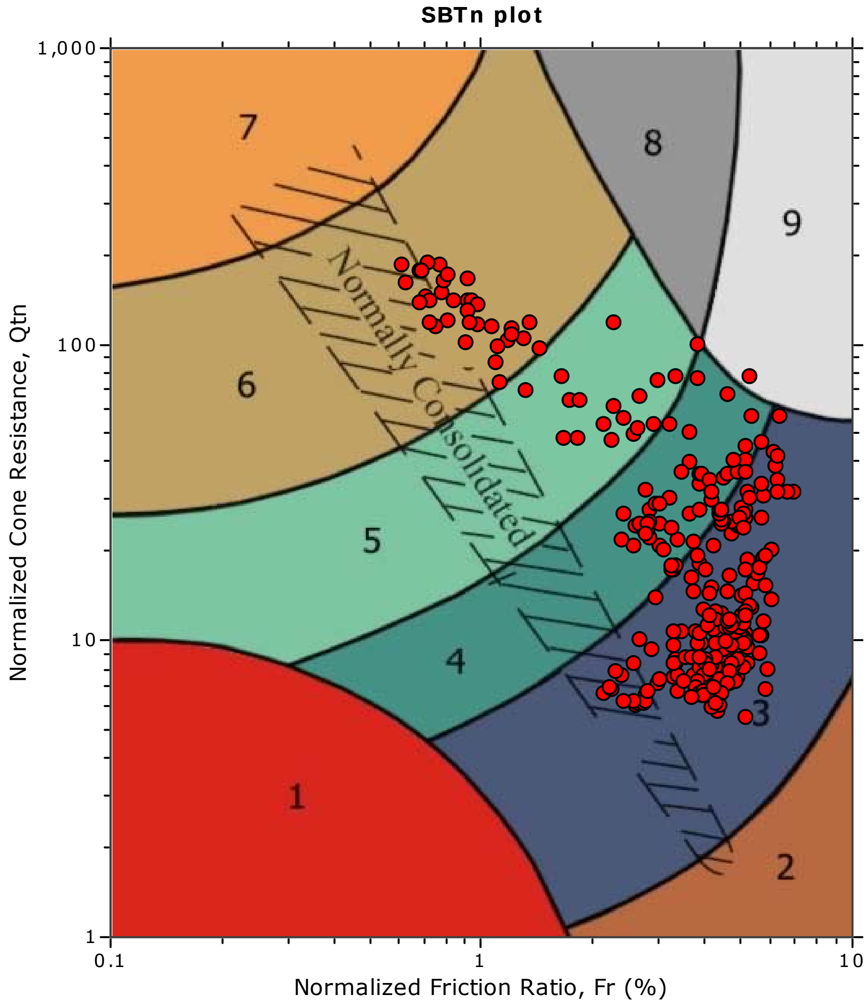
W.O. 9279
June 20, 2012
Revised December 18, 2013

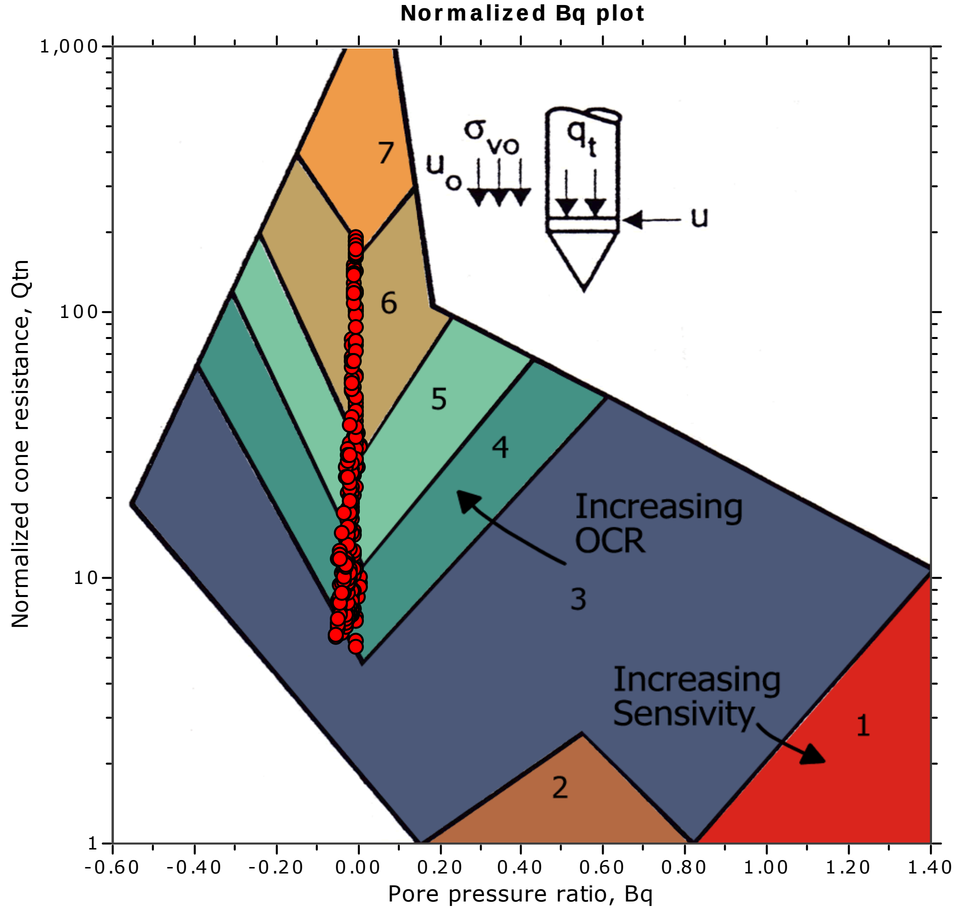
GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
31119 Via Colinas, Suite 502
Westlake Village, CA 91362

CPT: CPT-01
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 17.80 ft

Project: Santa Monica College - Malibu Civic Center
Location: 23555 Civic Center Way

SBT - Bq plots (normalized)





SBTn legend

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

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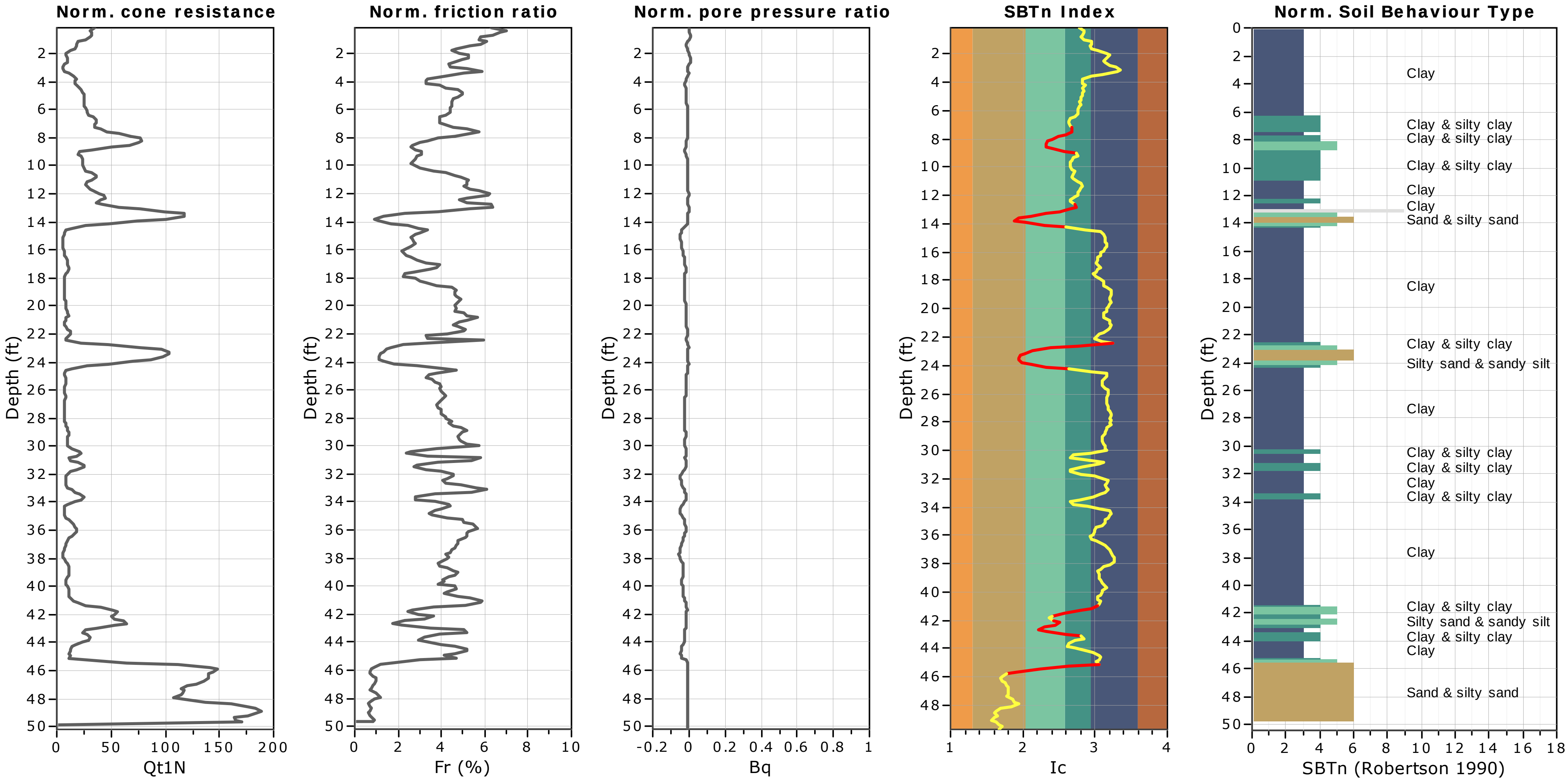
CPT: CPT-01
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 17.80 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



SBTn legend

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

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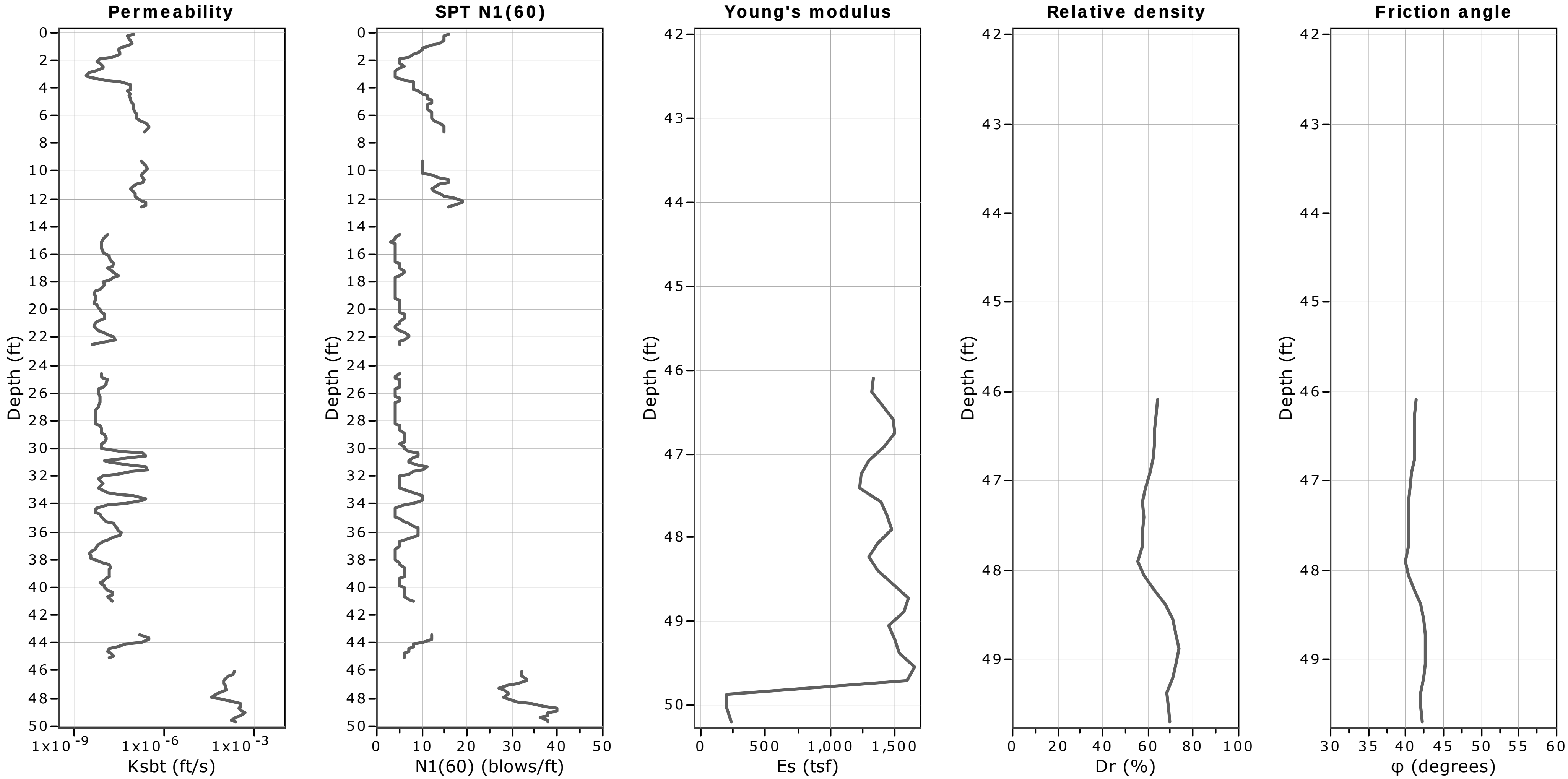
Total depth: 50.20 ft, Date: 4/30/2012

Surface Elevation: 17.80 ft

Project: **Santa Monica College - Malibu Civic Center**

Location: **23555 Civic Center Way**



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative desnisty constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)

User defined estimation data

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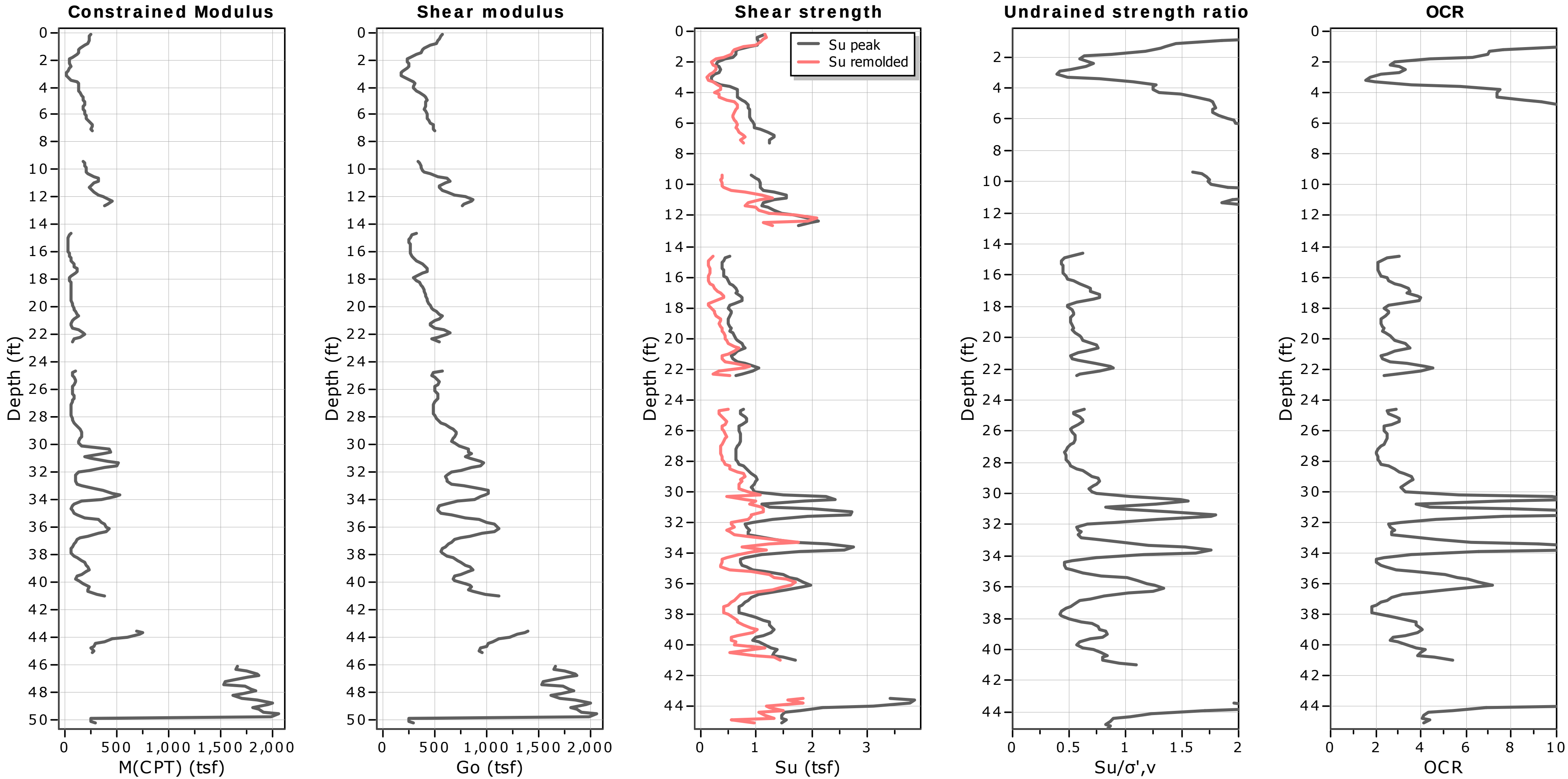
CPT: CPT-01

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**

Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 17.80 ft



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: Auto

OCR factor for clays, N_{kt}: Auto
User defined estimation data

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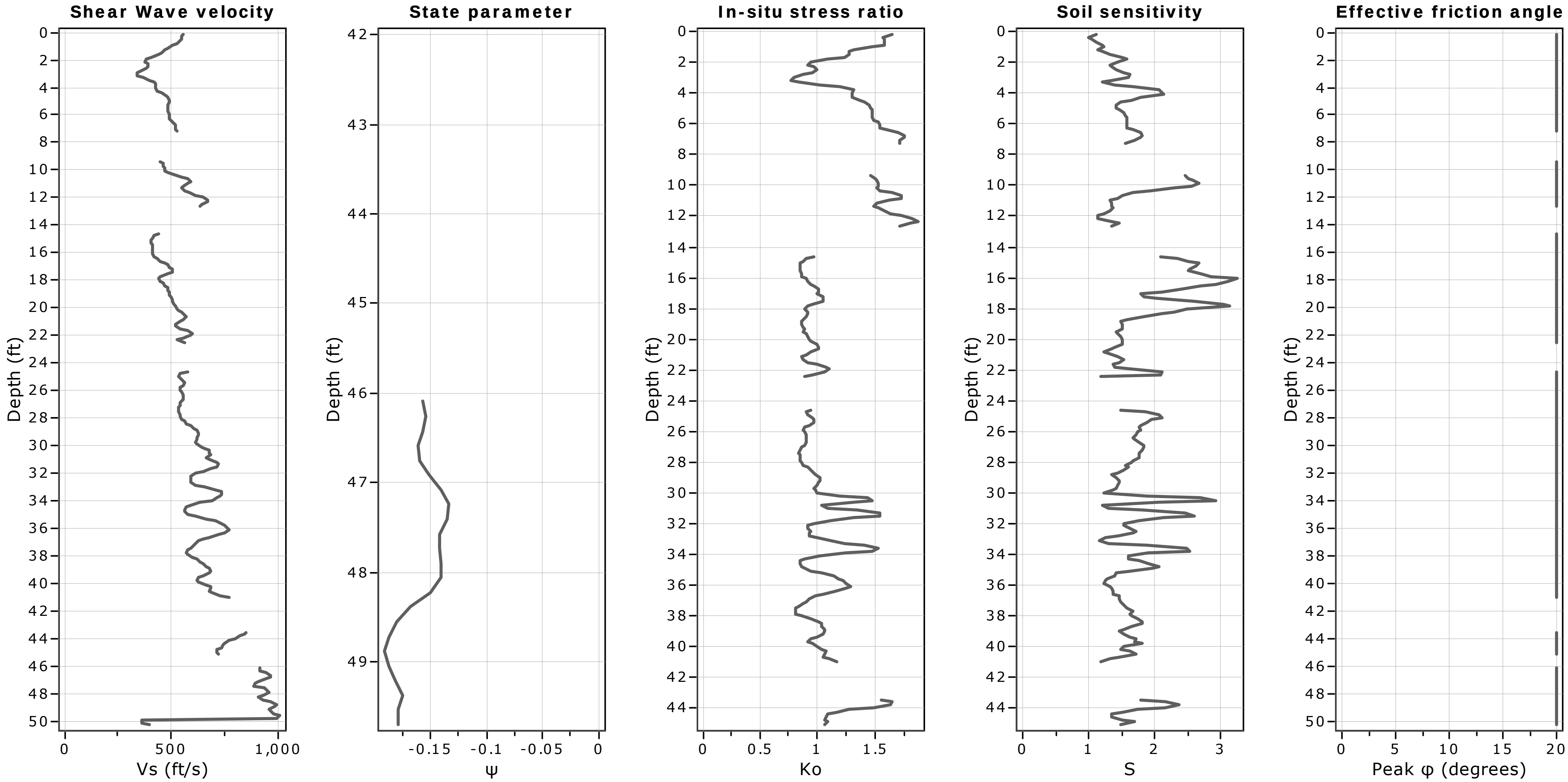

Calculation parameters

Soil Sensitivity factor, N_S: 7.00

User defined estimation data

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
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Westlake Village, CA 91362

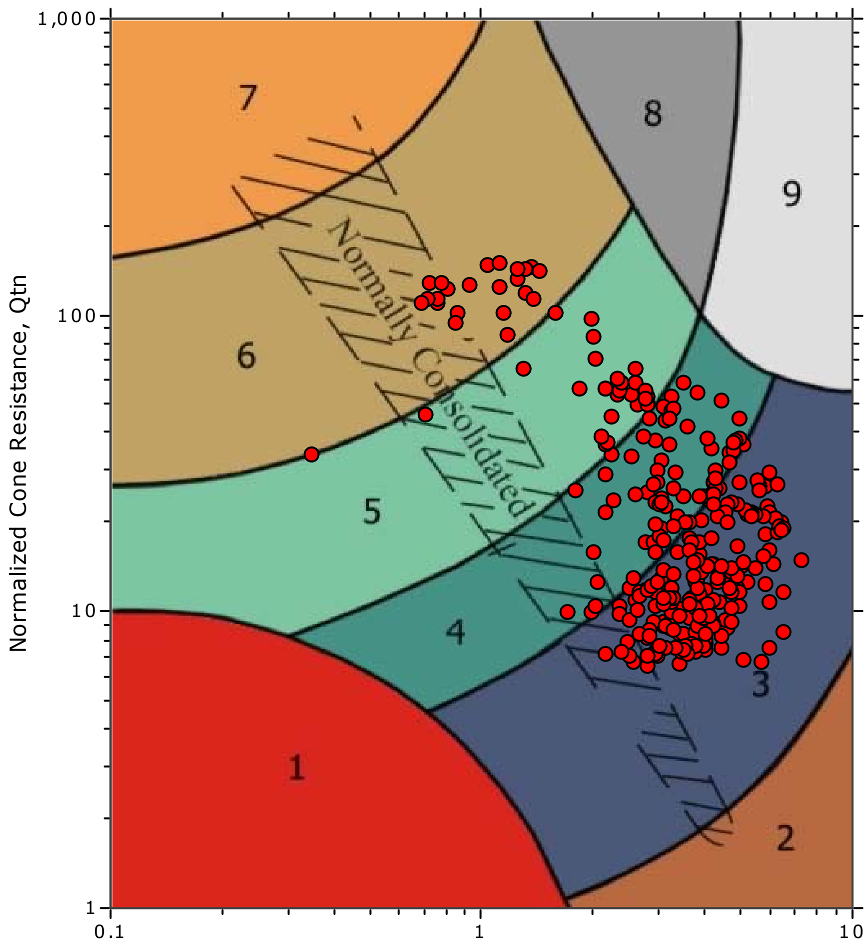
CPT: CPT-02

Project: Santa Monica College - Malibu Civic Center
Location: 23555 Civic Center Way

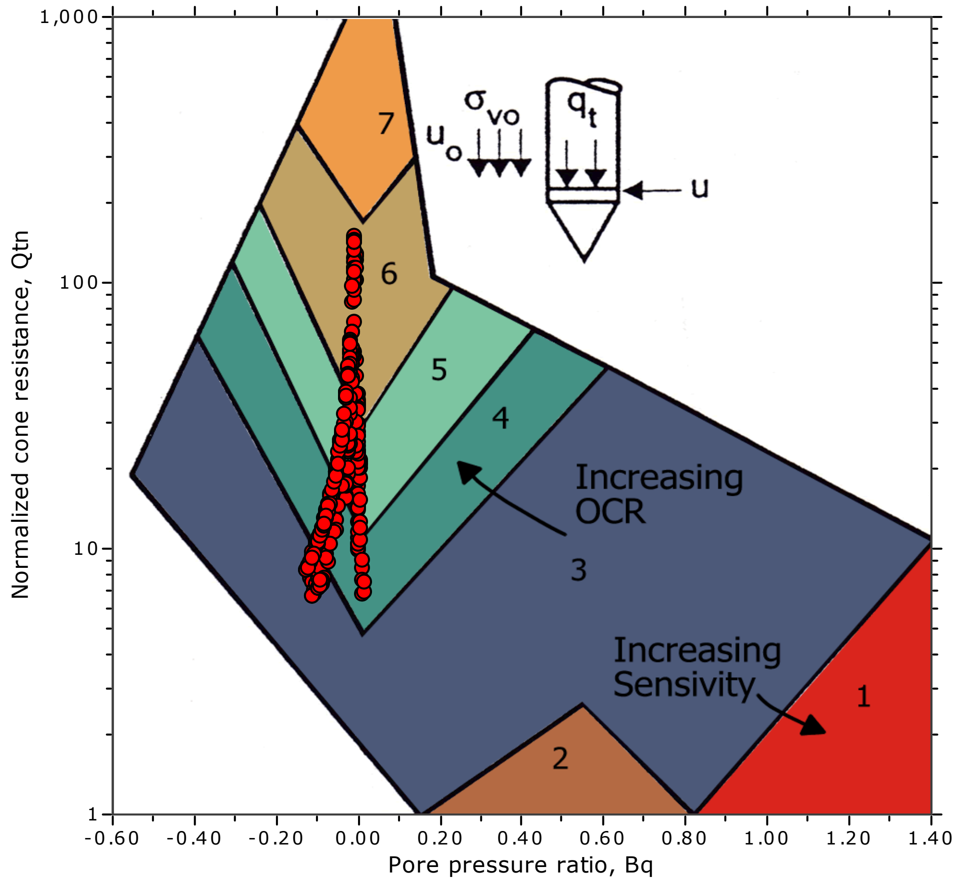
Total depth: 50.03 ft, Date: 4/30/2012
Surface Elevation: 19.30 ft

SBT - Bq plots (normalized)

SBTn plot



Normalized Bq plot



SBTn legend

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

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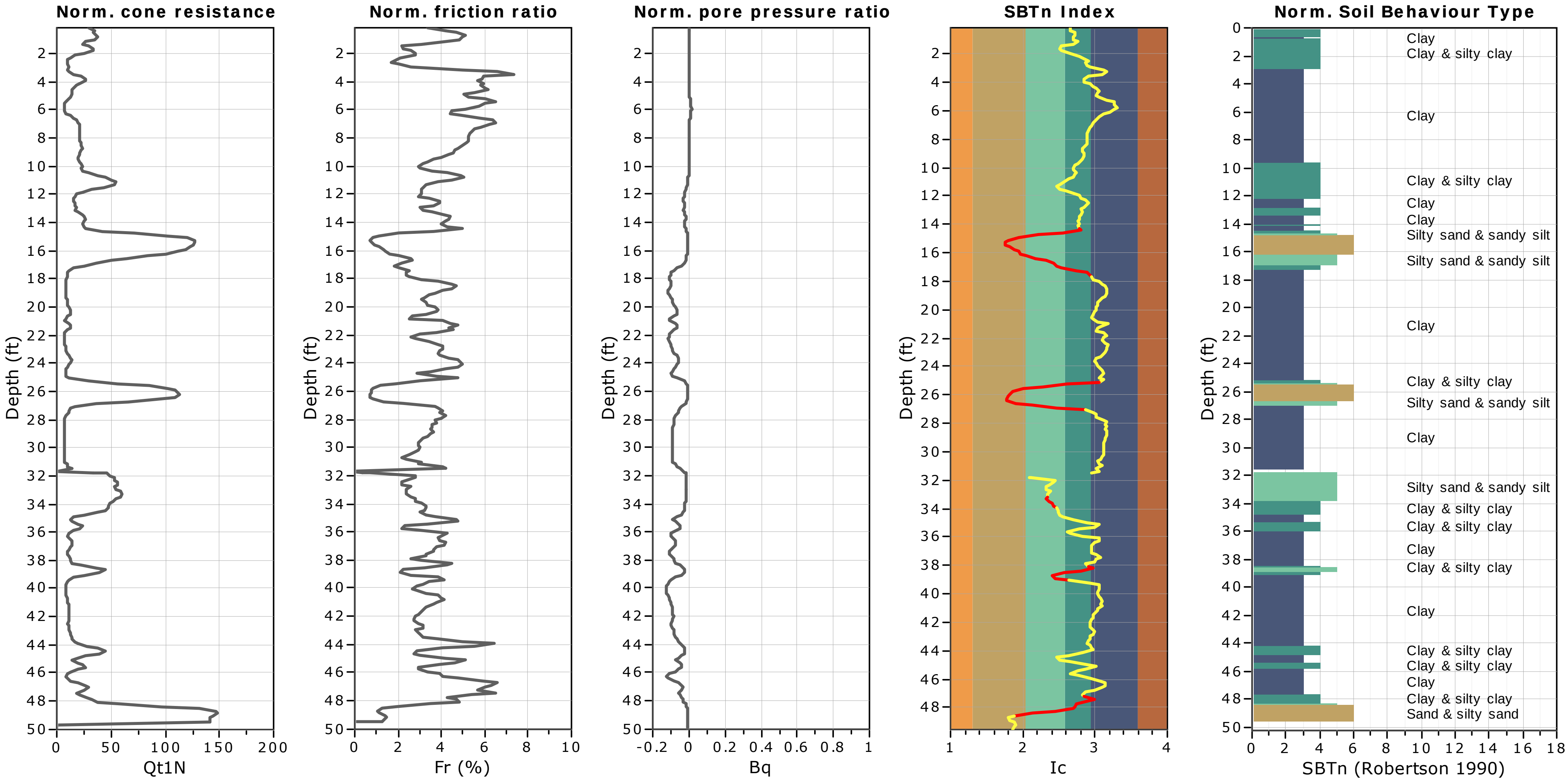
Westlake Village, CA 91362

CPT: CPT-02
Total depth: 50.03 ft, Date: 4/30/2012
Surface Elevation: 19.30 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



SBTn legend

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

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Surface Elevation: 19.30 ft

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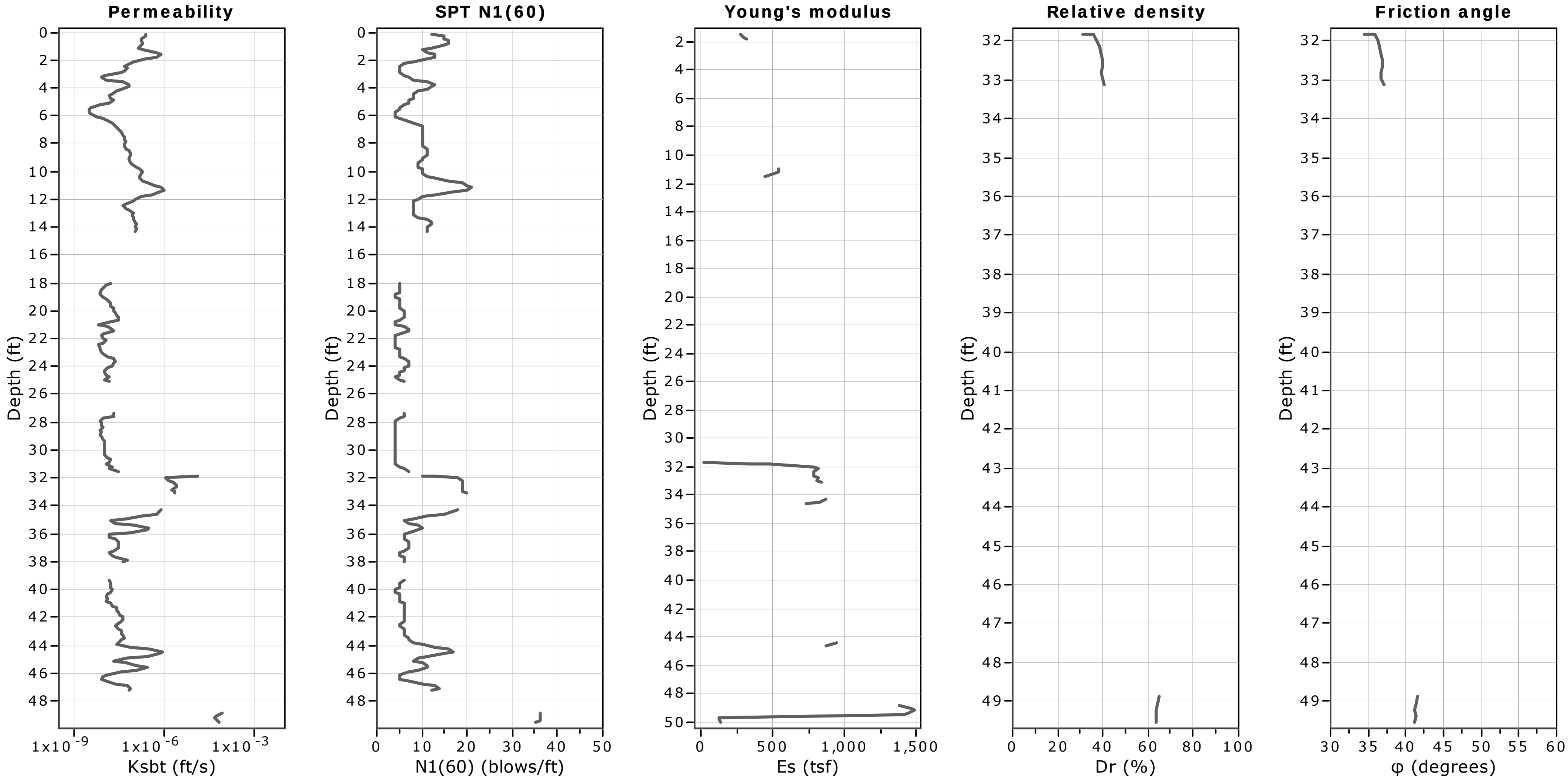
Location: **23555 Civic Center Way**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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Project: Santa Monica College - Malibu Civic Center
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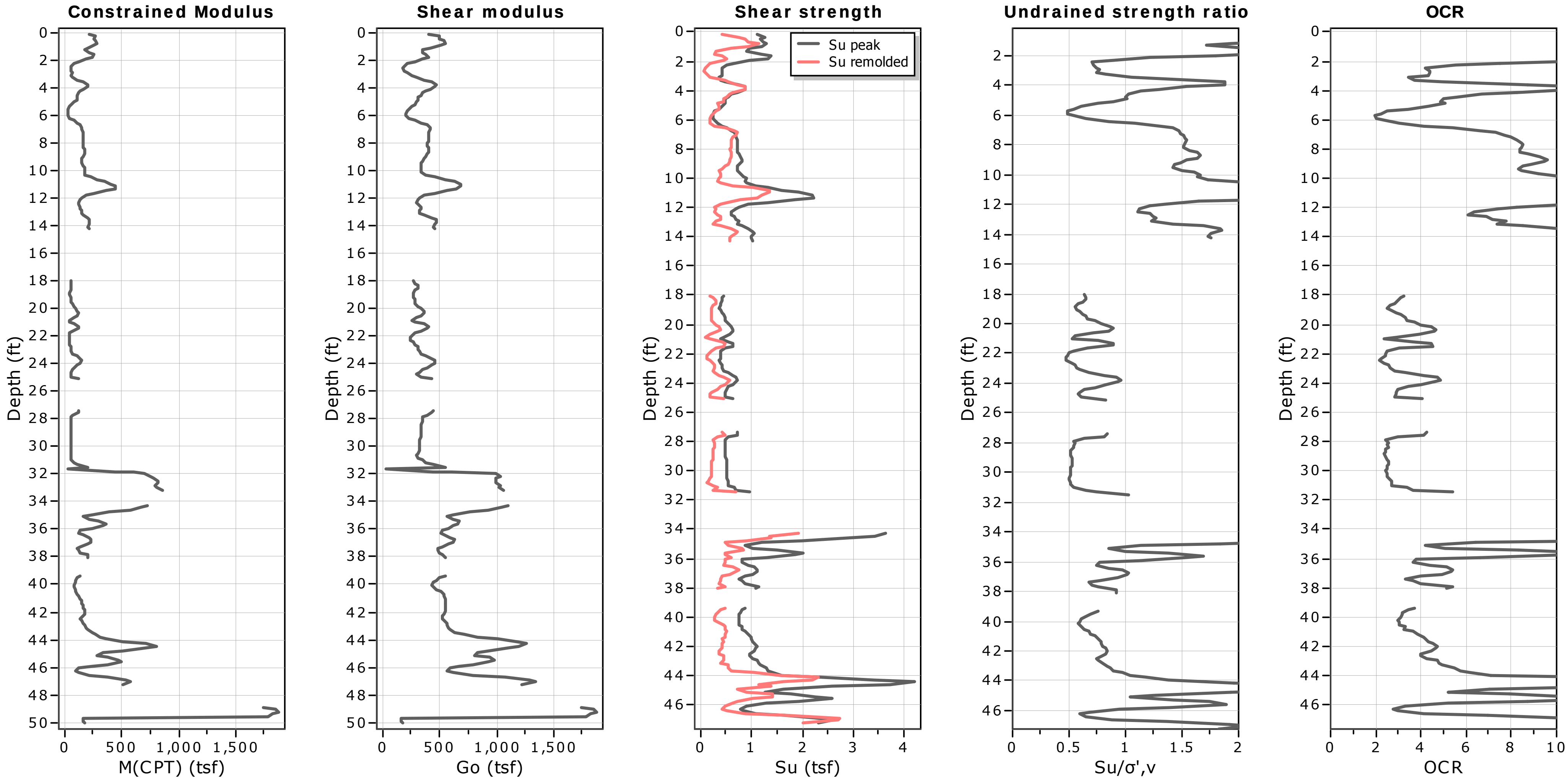

Calculation parameters
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: Auto
OCR factor for clays, N_{kt}: Auto
User defined estimation data

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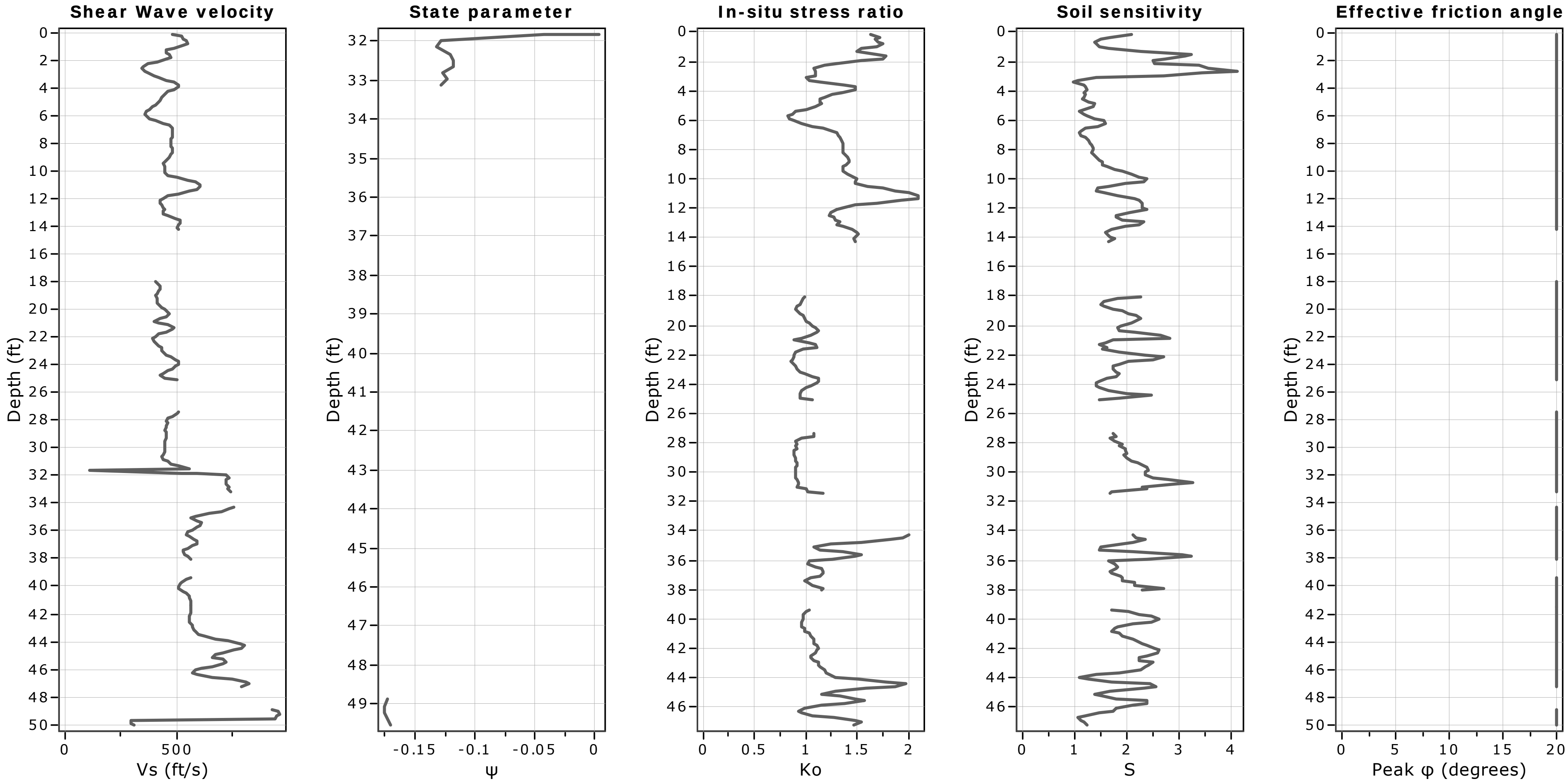
Total depth: 50.03 ft, Date: 4/30/2012
Surface Elevation: 19.30 ft



Calculation parameters

Soil Sensitivity factor, N_S: 7.00

User defined estimation data

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
31119 Via Colinas, Suite 502
Westlake Village, CA 91362

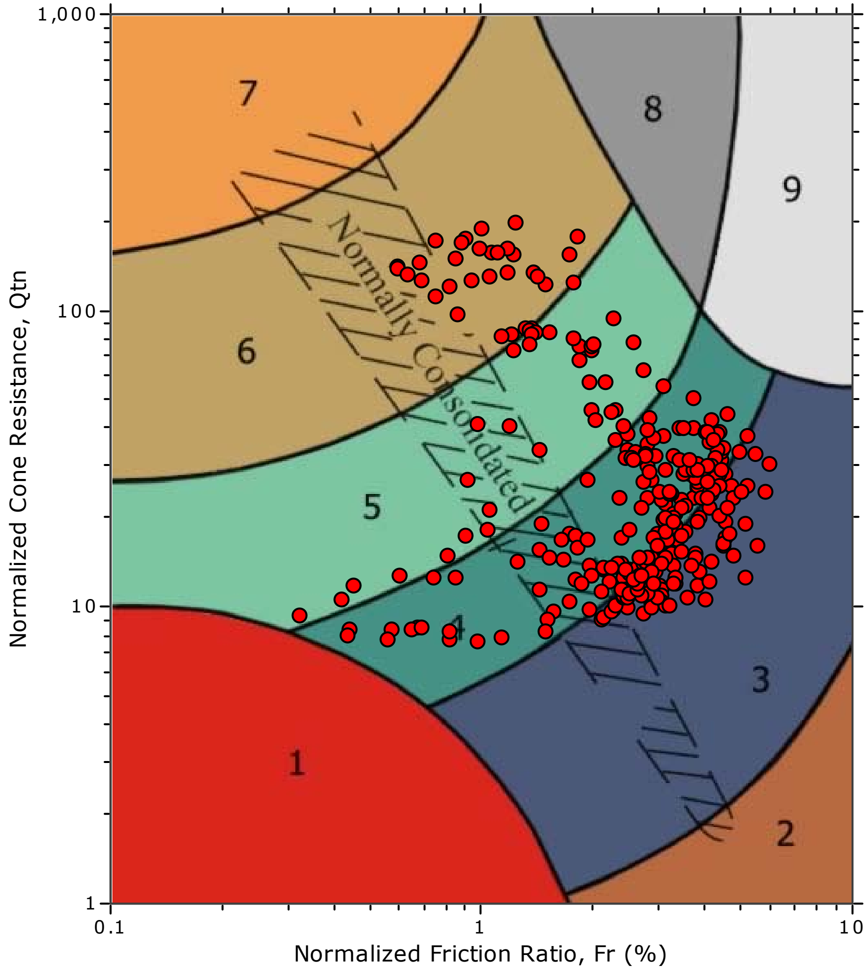
CPT: CPT-03

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**

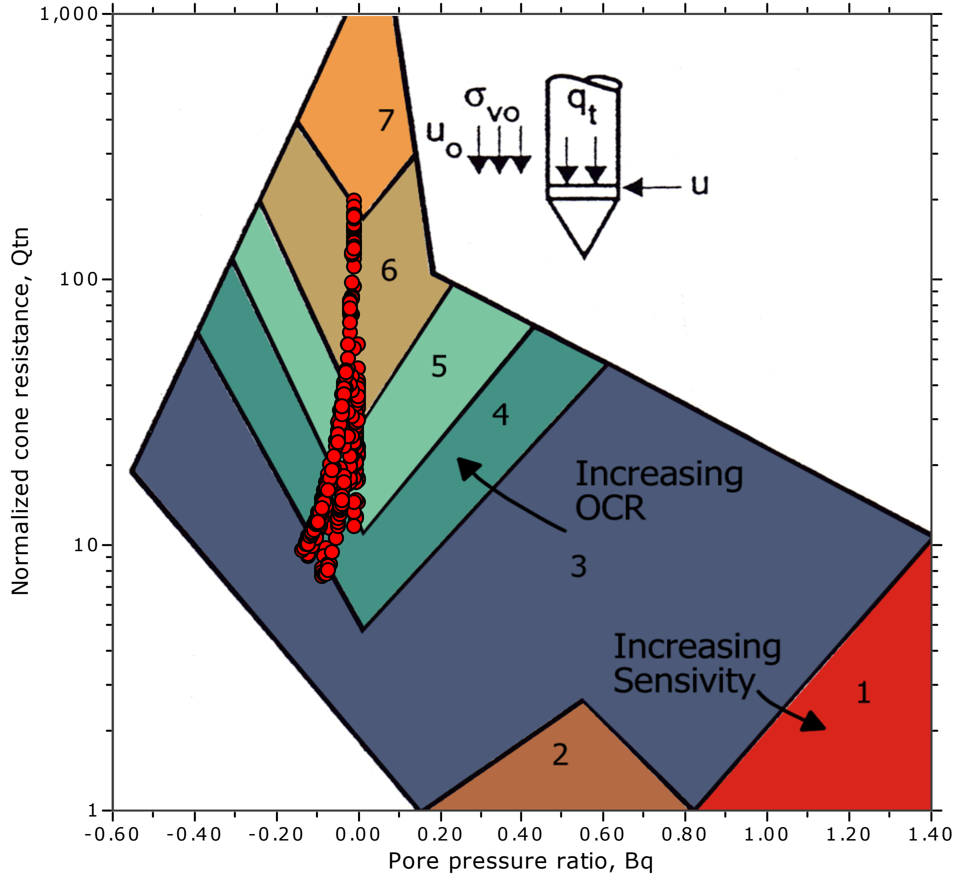
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 21.00 ft

SBT - Bq plots (normalized)

SBTn plot



Normalized Bq plot



SBTn legend

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

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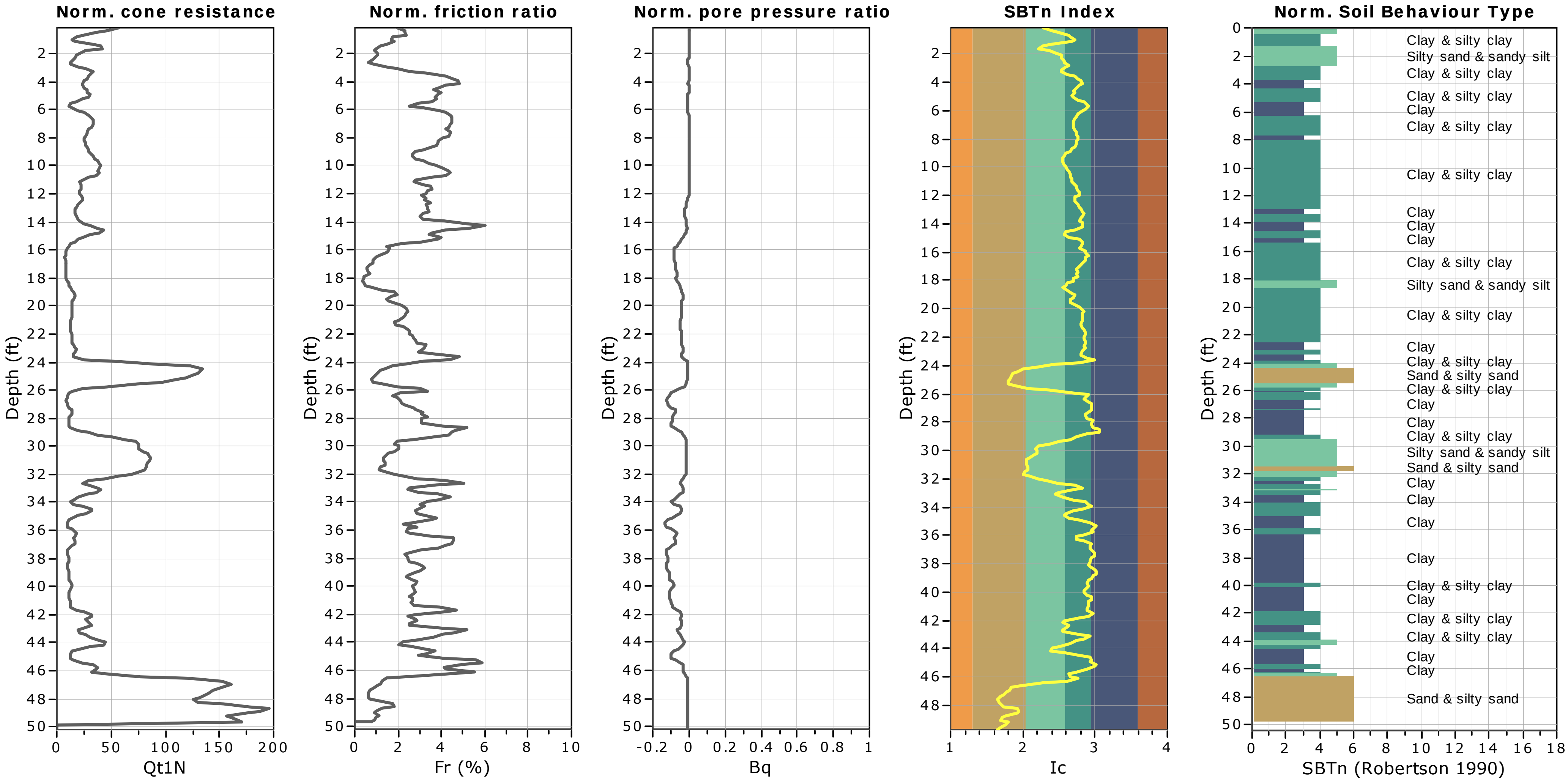
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 21.00 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



SBTn legend

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

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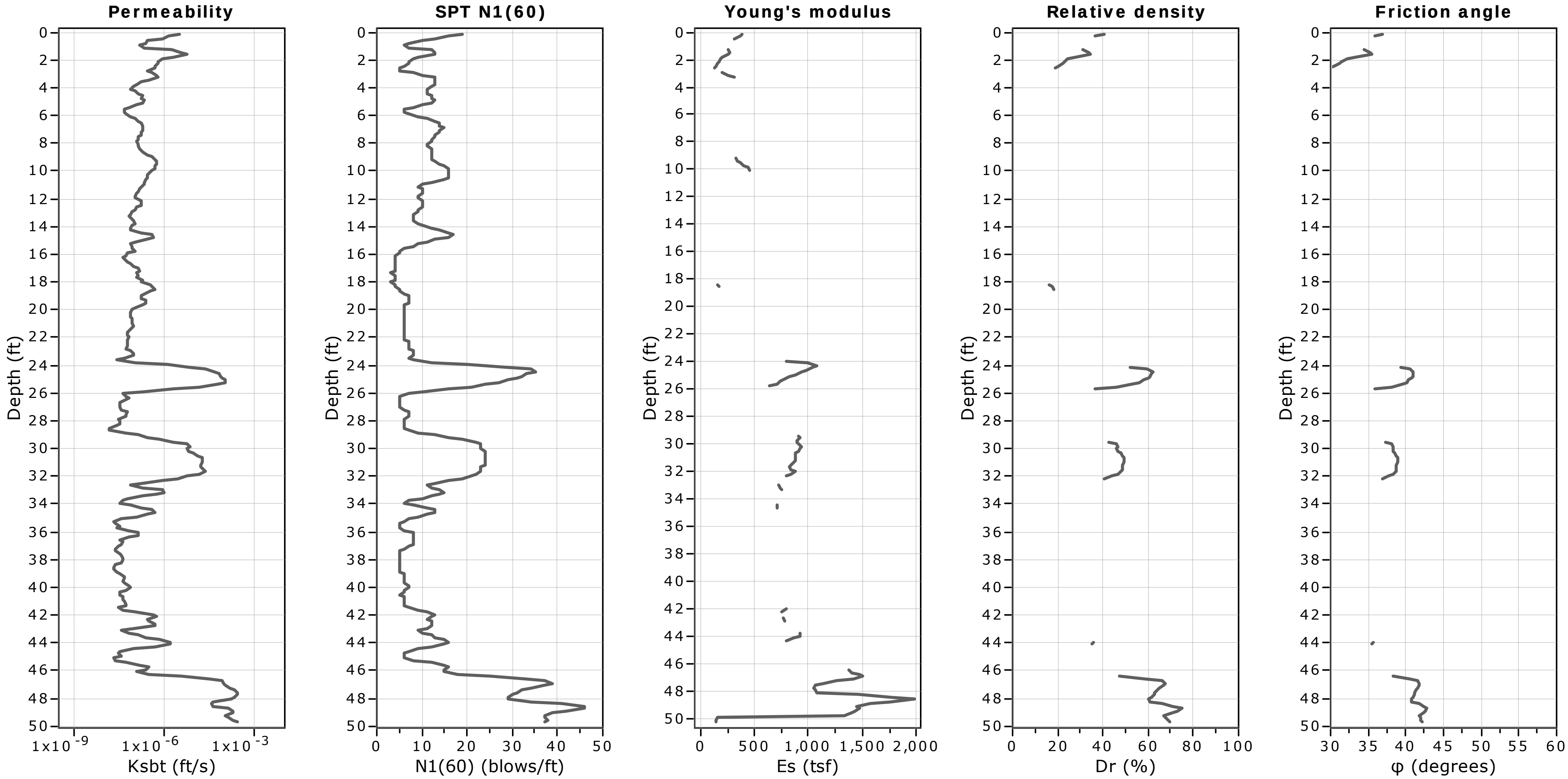
CPT: CPT-03
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 21.00 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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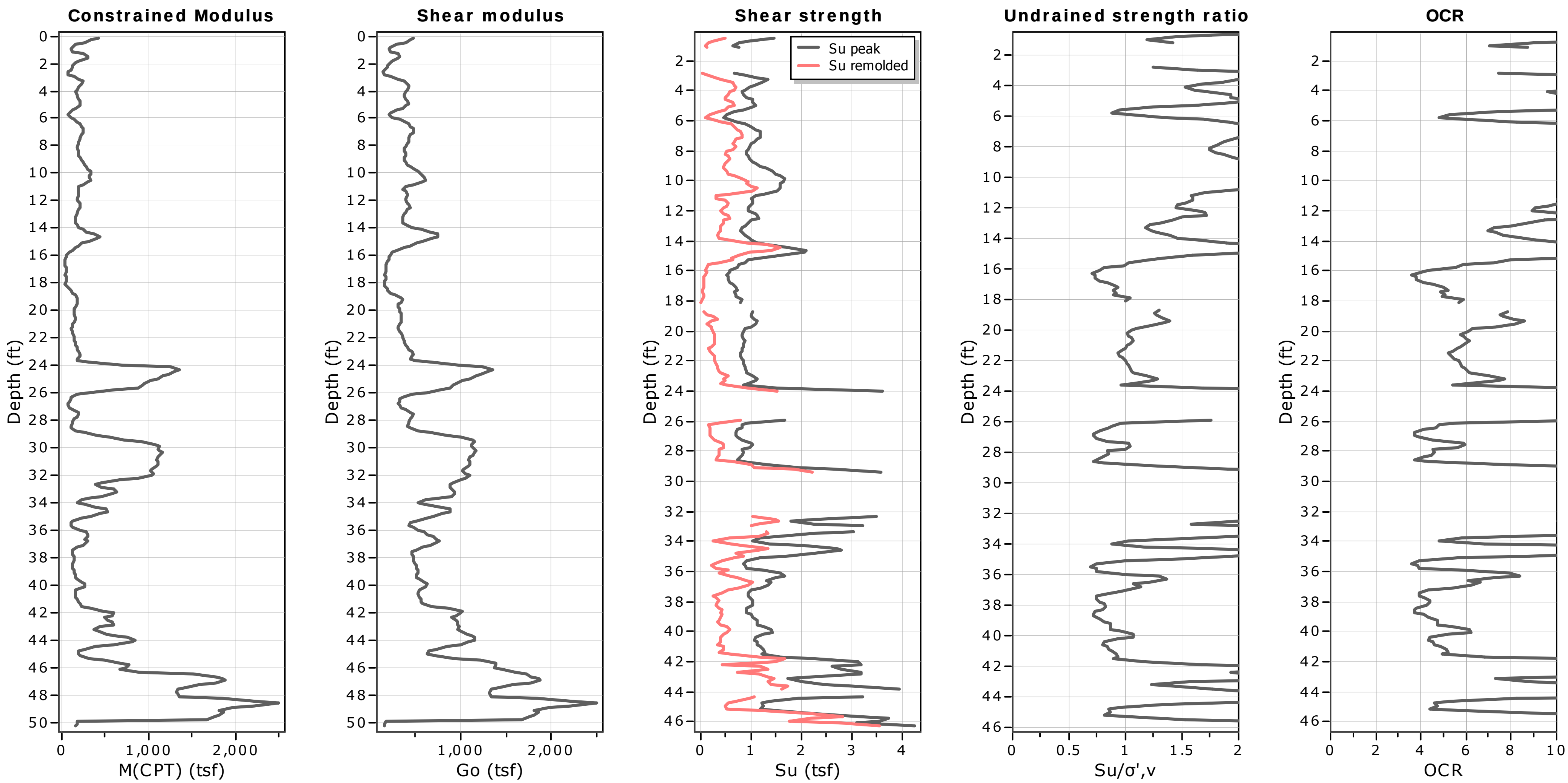
CPT: CPT-03
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 21.00 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: Auto

OCR factor for clays, N_{kt}: Auto
User defined estimation data

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
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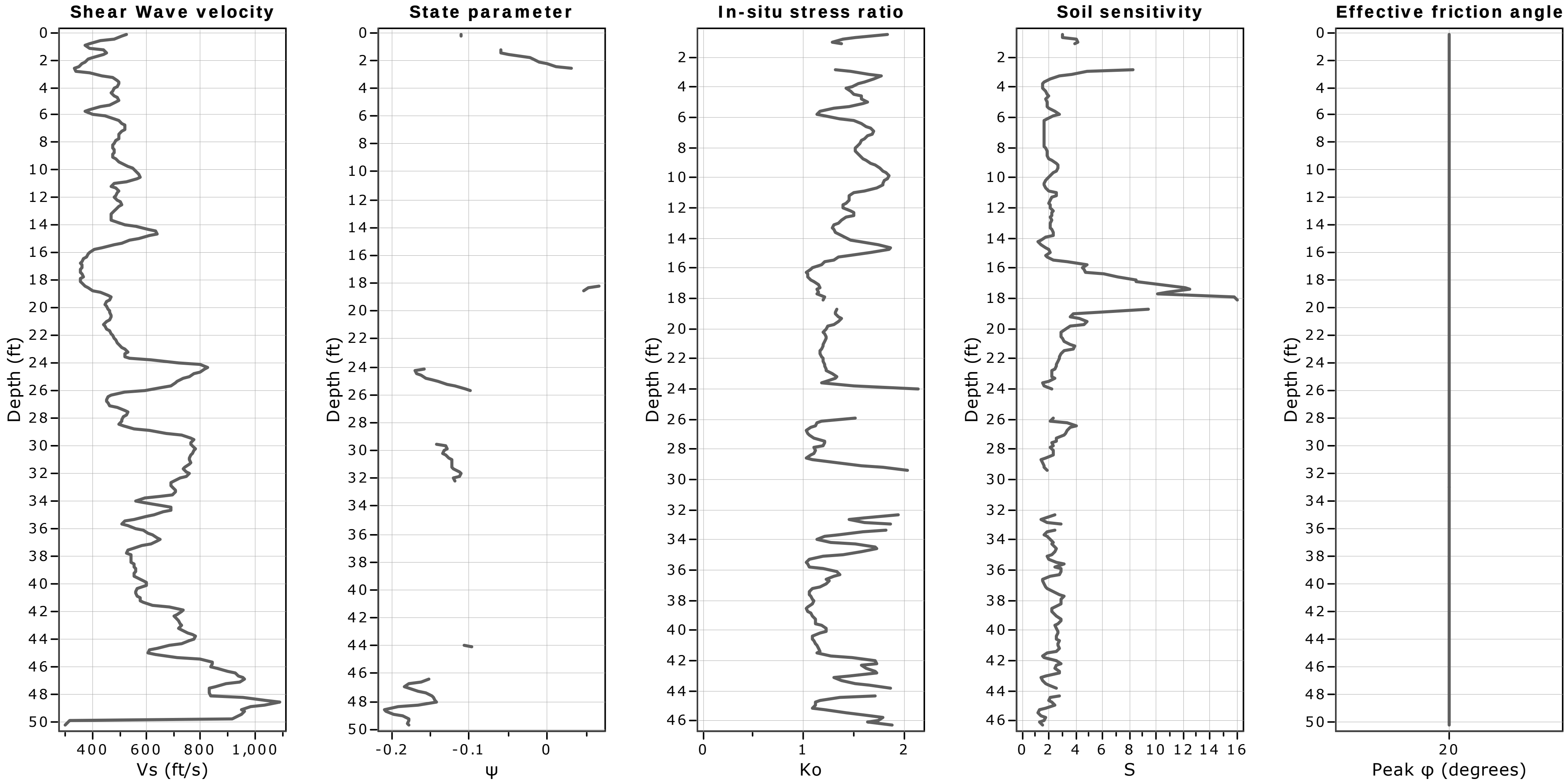
Westlake Village, CA 91362

CPT: CPT-03
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 21.00 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters

Soil Sensitivity factor, N_S: 7.00

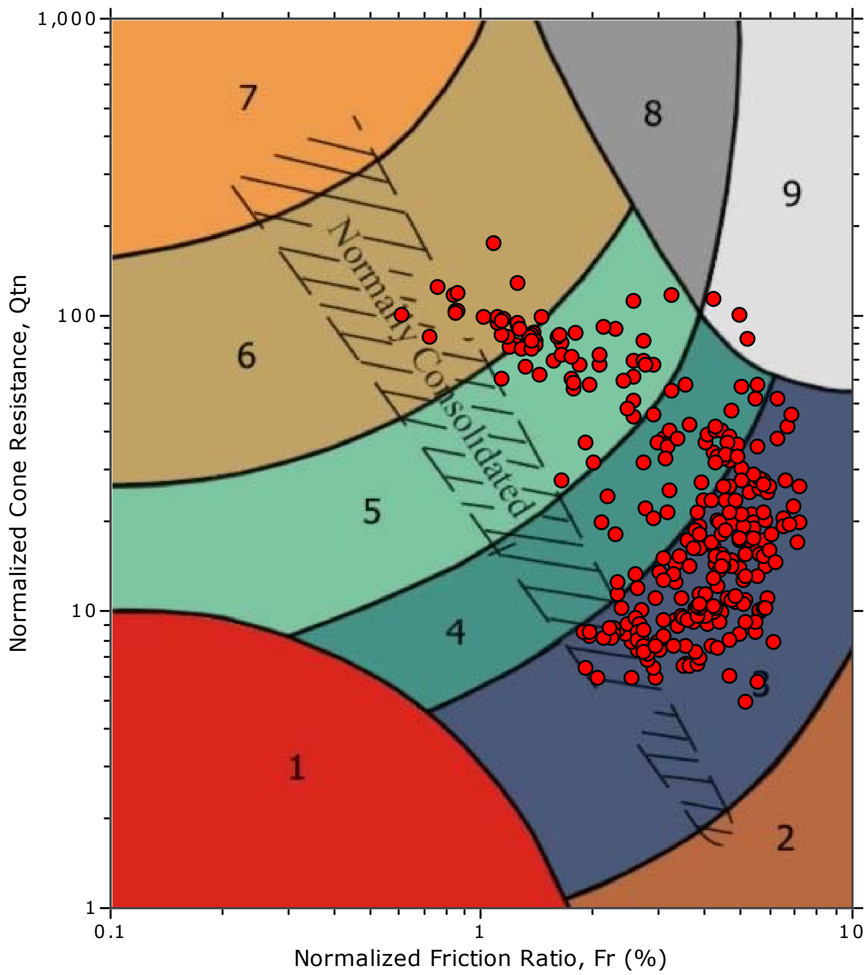
User defined estimation data

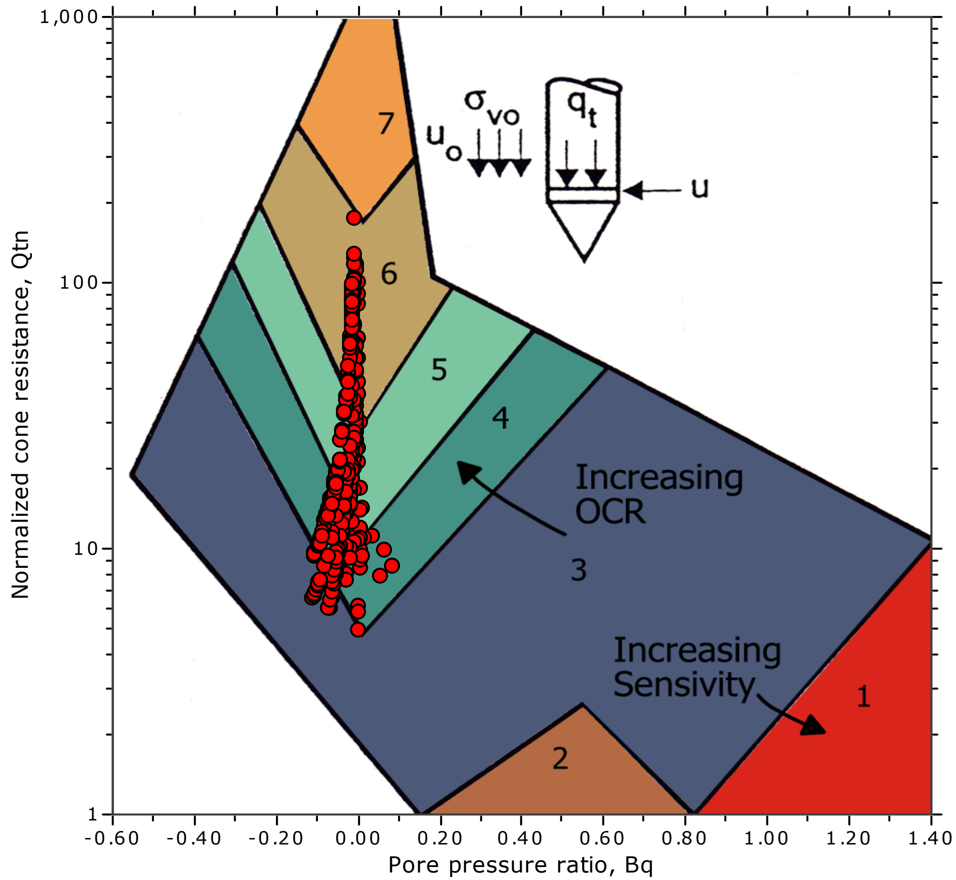
GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
31119 Via Colinas, Suite 502
Westlake Village, CA 91362

CPT: CPT-04
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.20 ft

Project: Santa Monica College - Malibu Civic Center
Location: 23555 Civic Center Way

SBT - Bq plots (normalized)





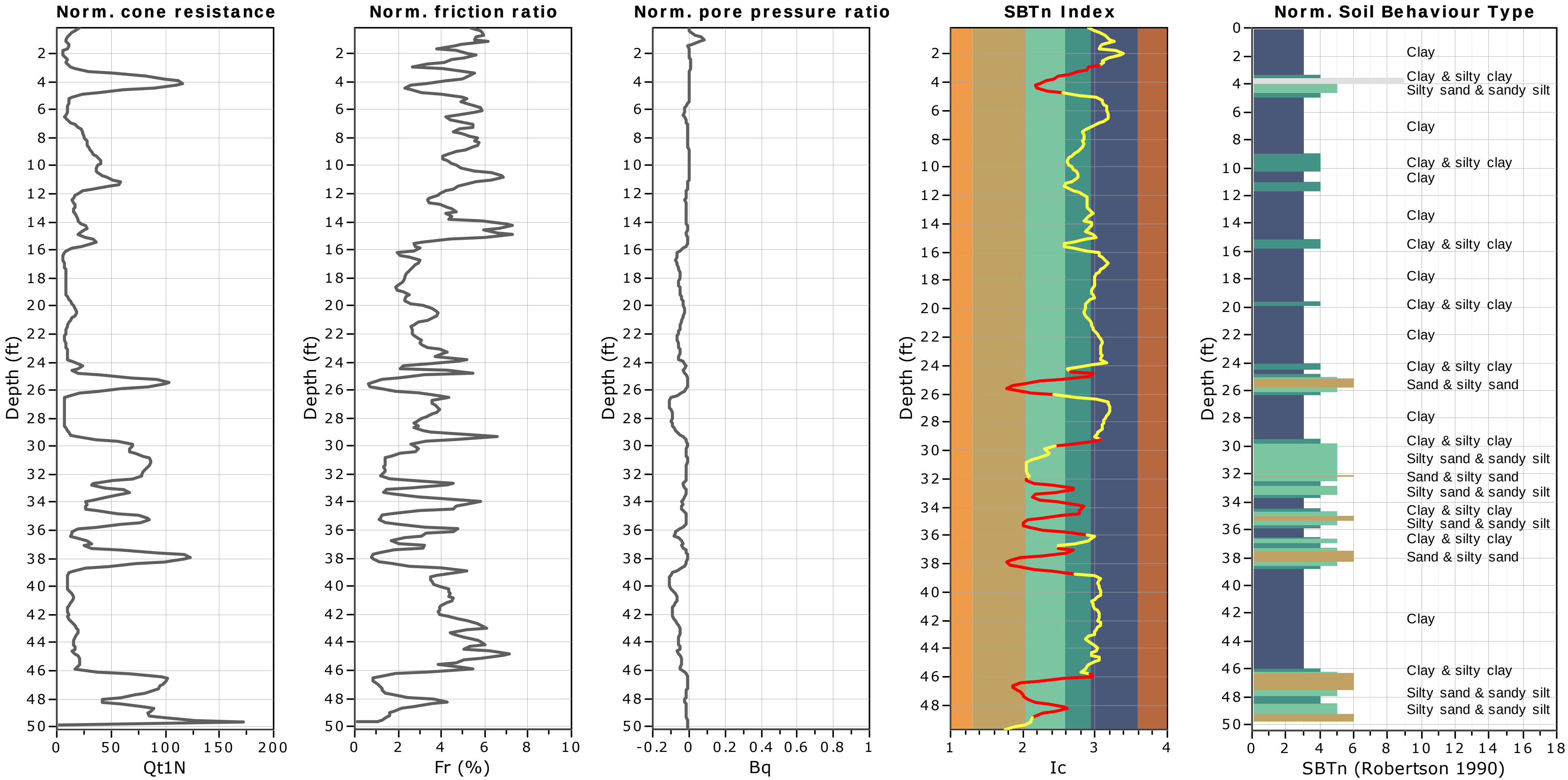
SBTn legend

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

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
31119 Via Colinas, Suite 502
Westlake Village, CA 91362

CPT: CPT-04
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.20 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



SBTn legend

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

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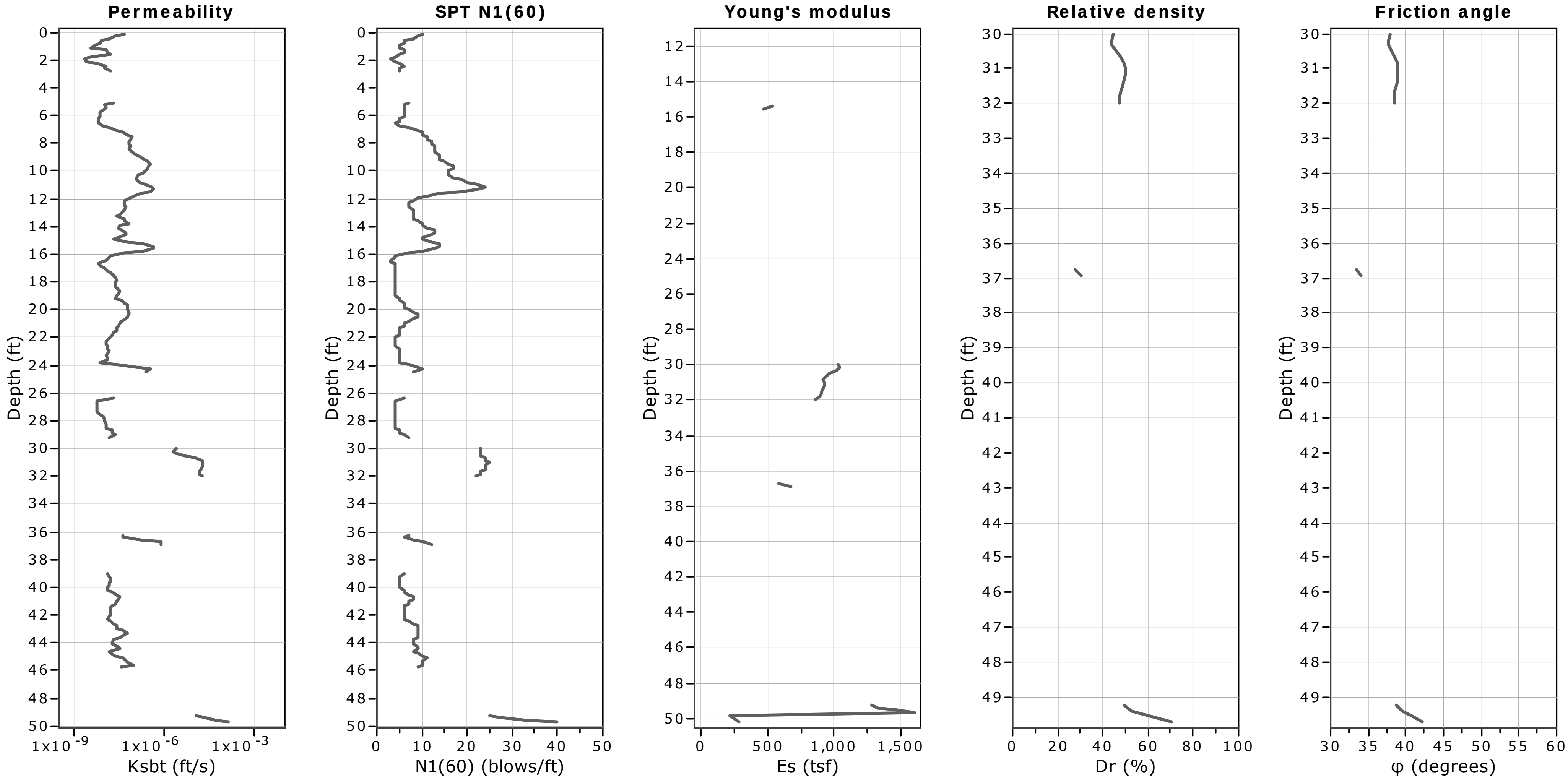
CPT: CPT-04
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.20 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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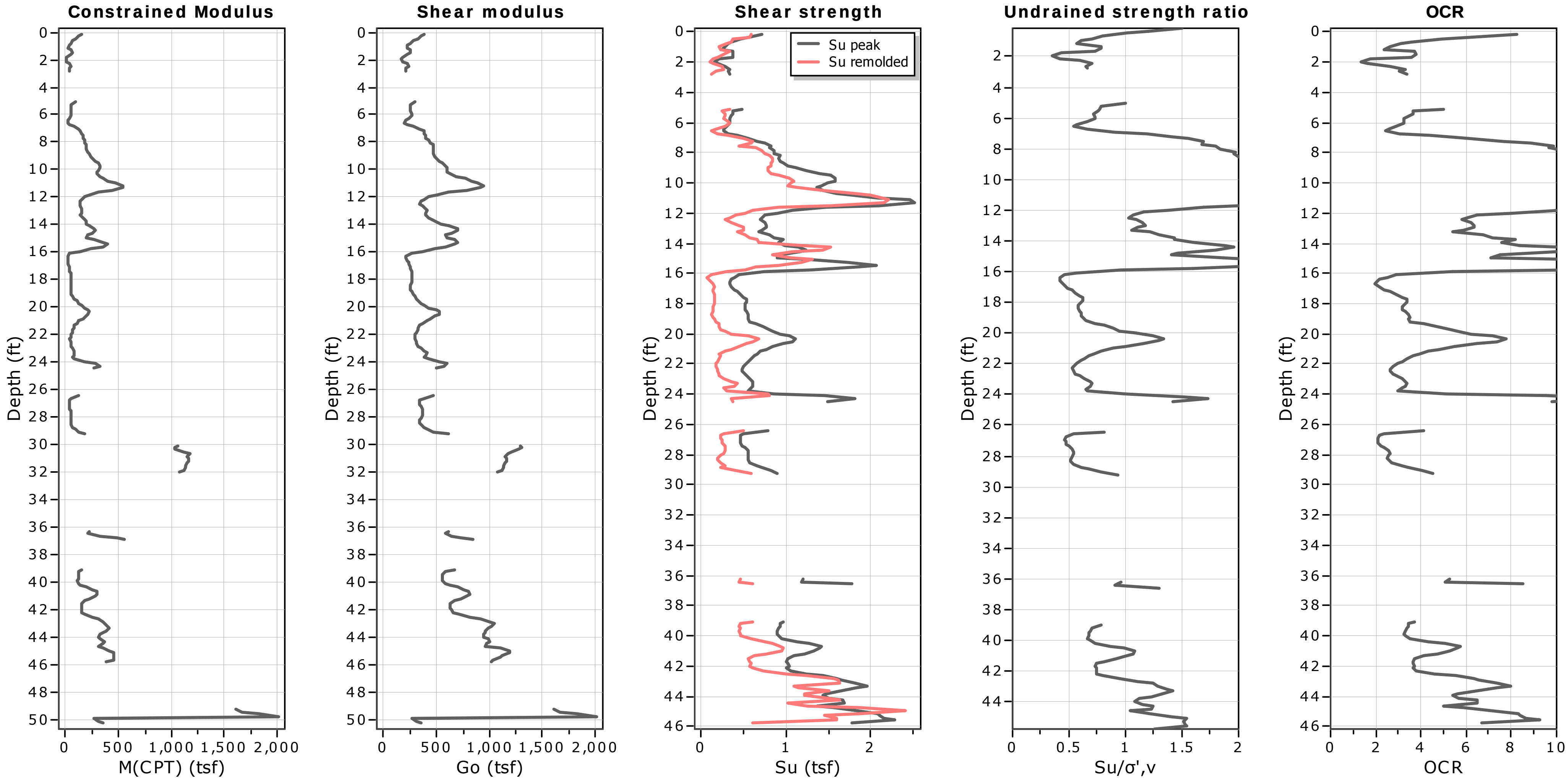
CPT: CPT-04
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.20 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: Auto
OCR factor for clays, N_{kt}: Auto
User defined estimation data

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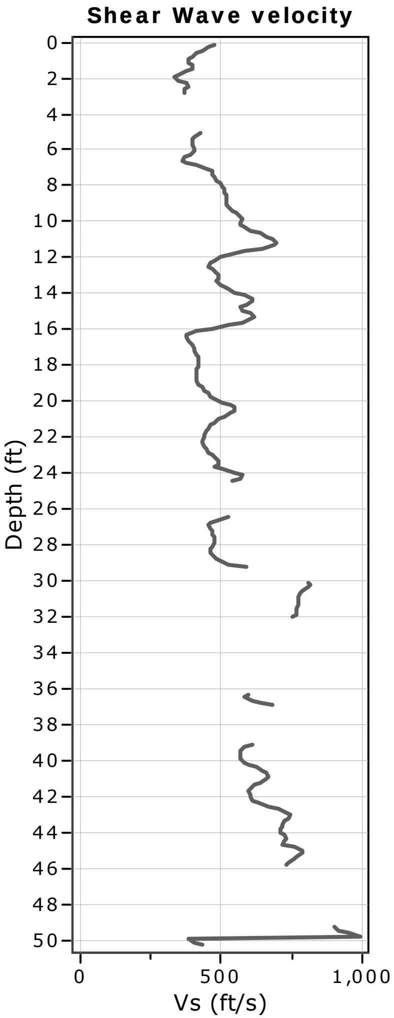
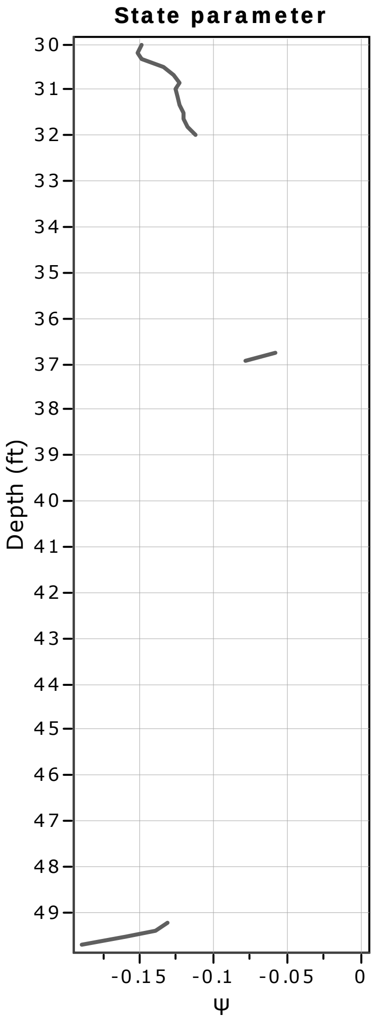
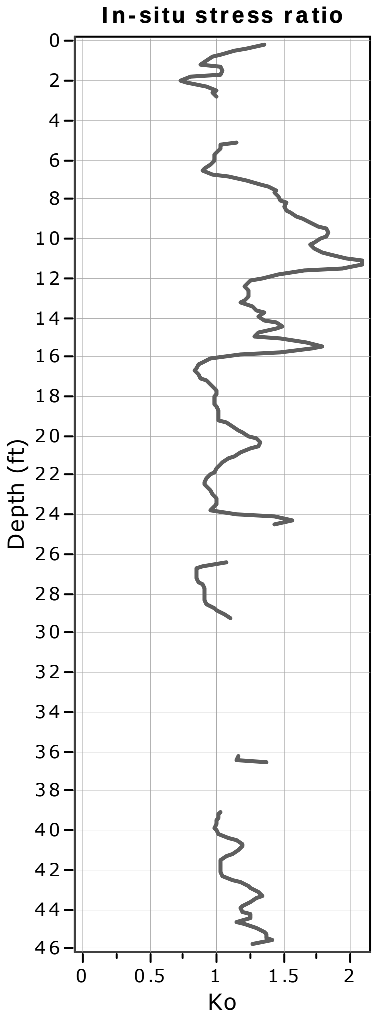
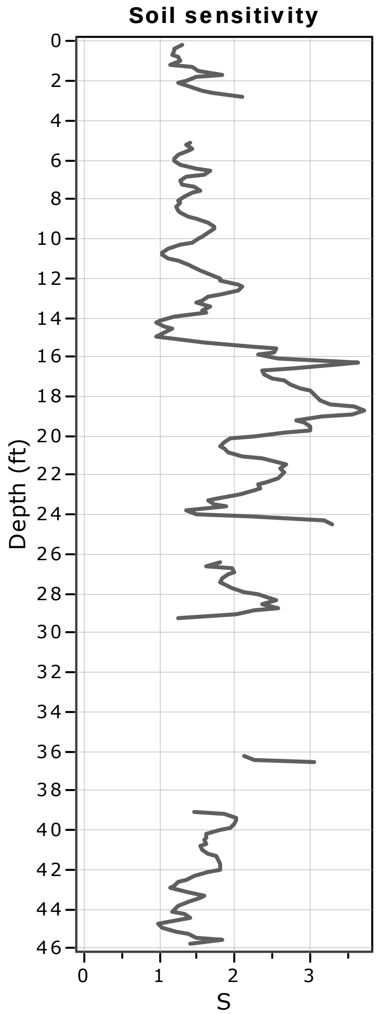
CPT: CPT-04
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.20 ft

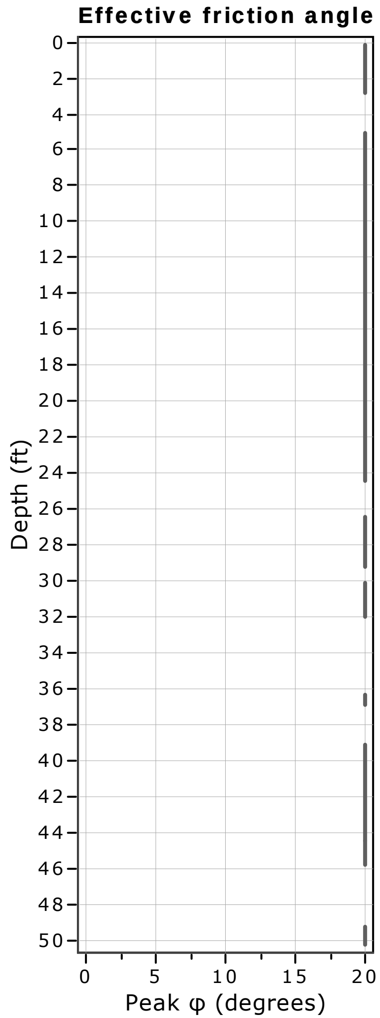
Project: Santa Monica College - Malibu Civic Center
Location: 23555 Civic Center Way









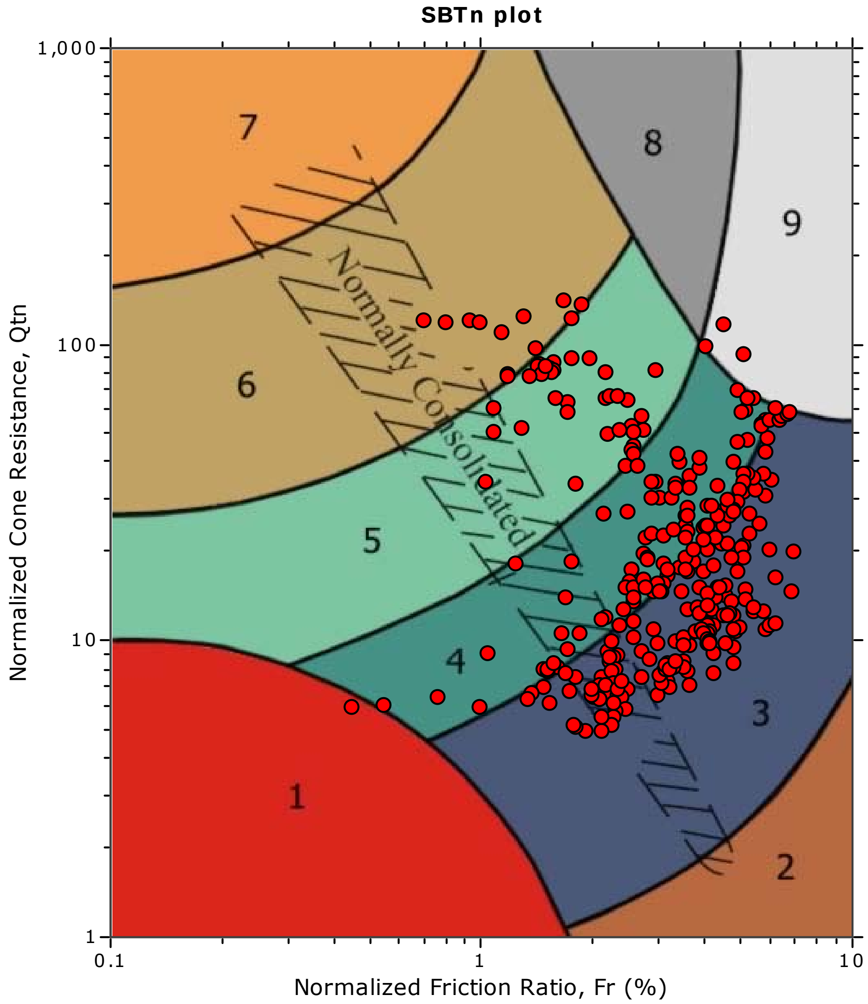


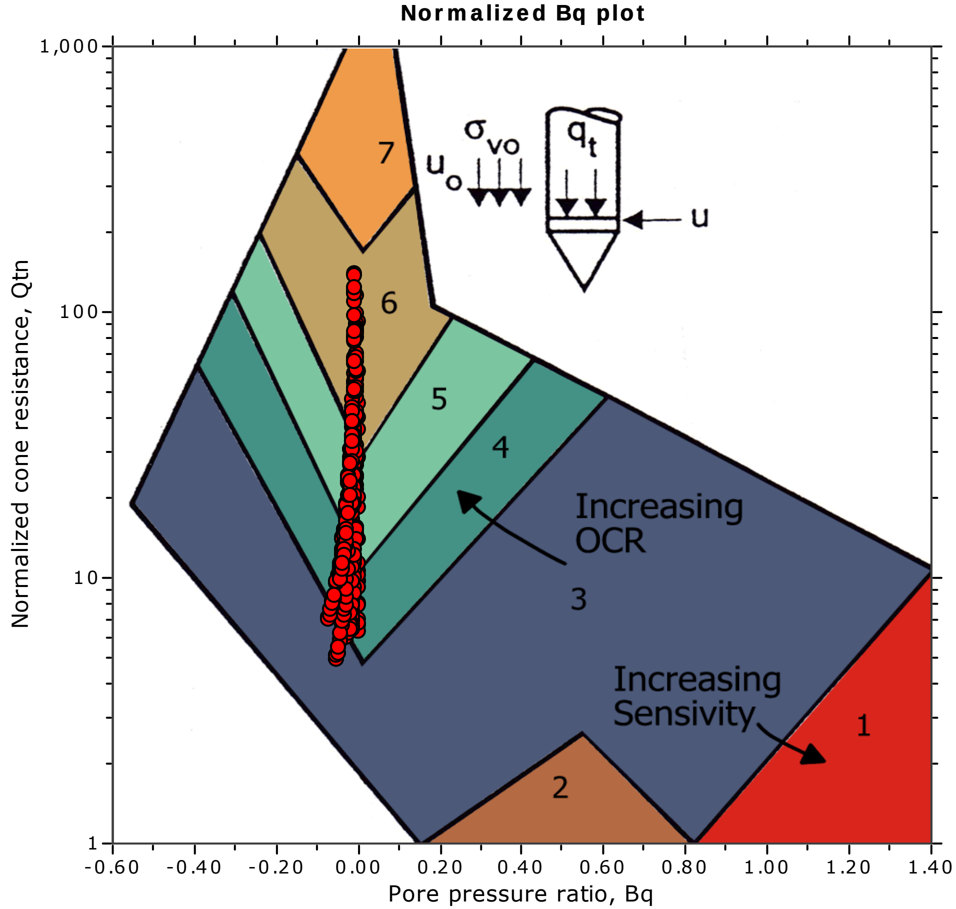
Calculation parameters

Soil Sensitivity factor, N_S: 7.00

User defined estimation data

SBT - Bq plots (normalized)





SBTn legend

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

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
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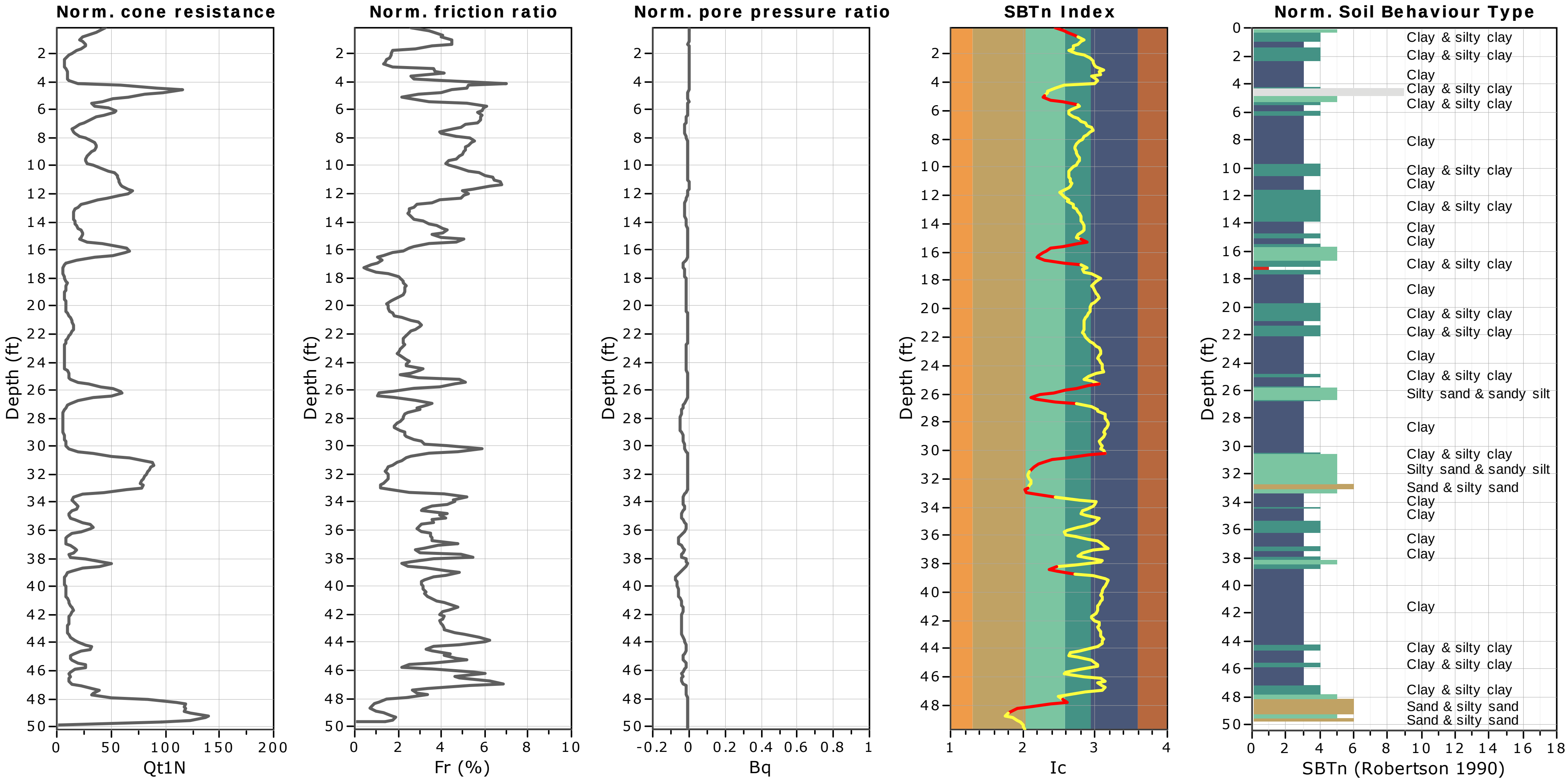
Westlake Village, CA 91362

CPT: CPT-05
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.80 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



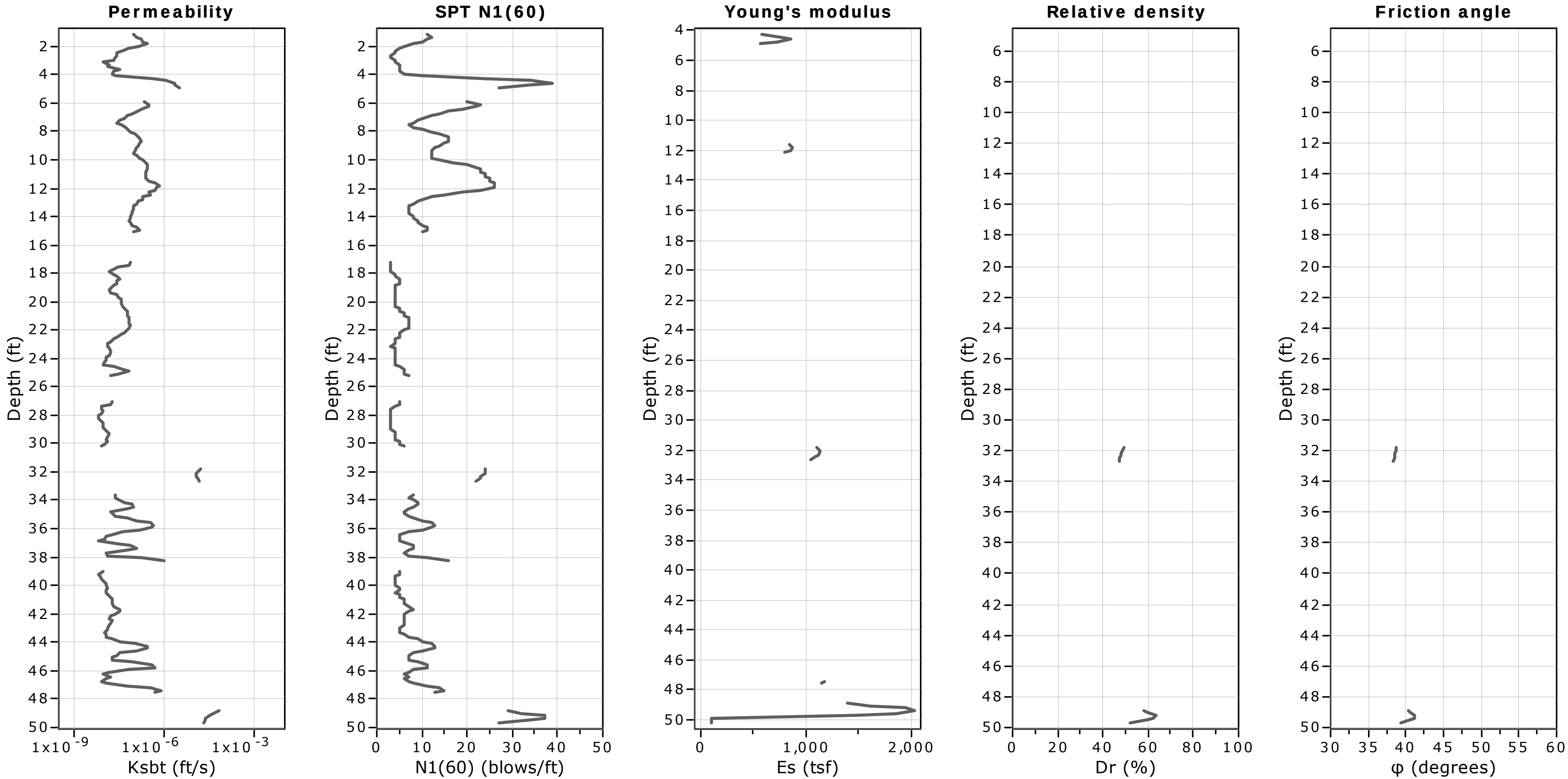
SBTn legend

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

CPT: CPT-05

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**

Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.80 ft



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

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Foundation and Soils Engineering, Geology
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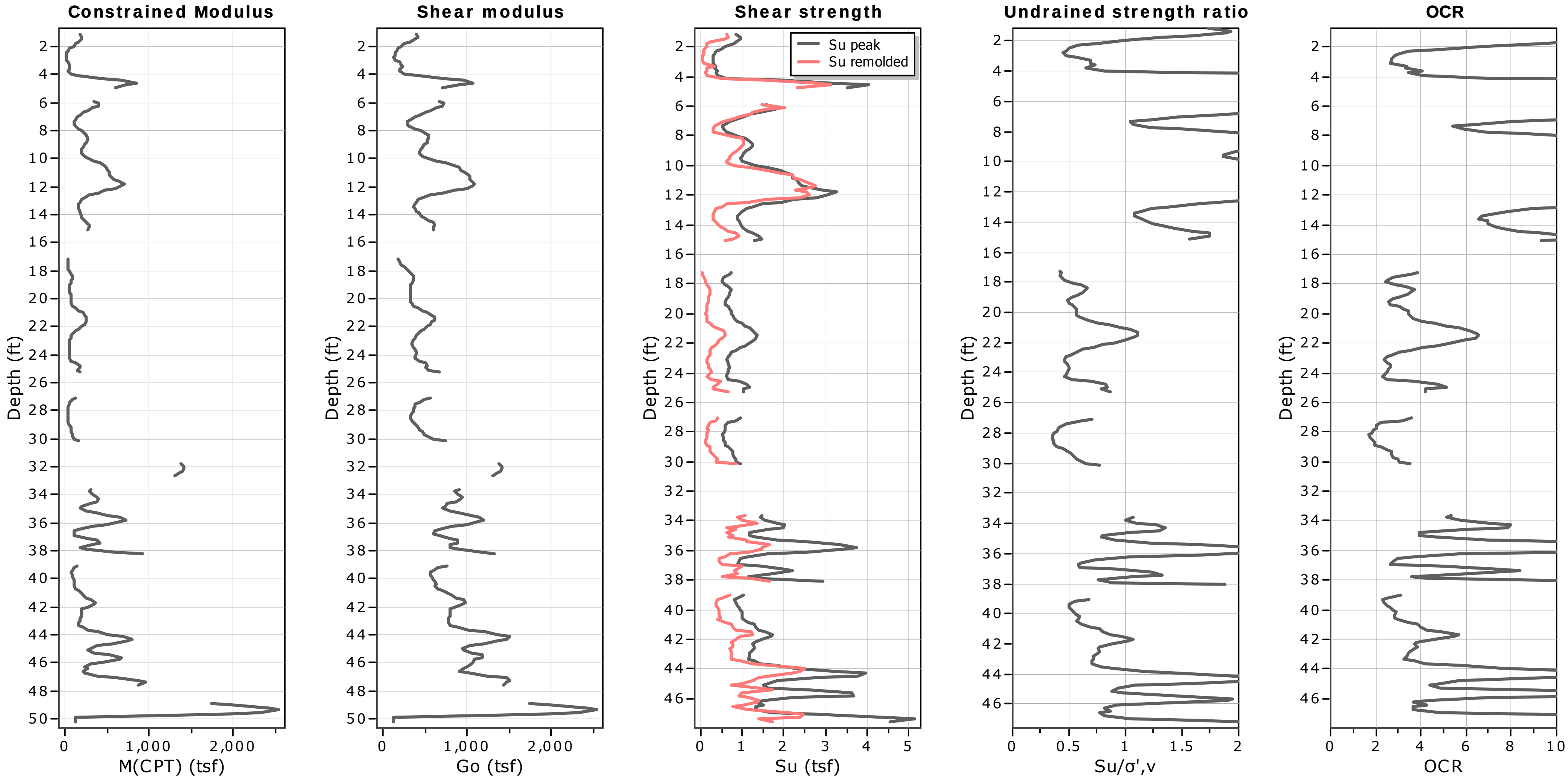
Westlake Village, CA 91362

CPT: CPT-05
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.80 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: Auto
OCR factor for clays, N_{kt}: Auto
User defined estimation data

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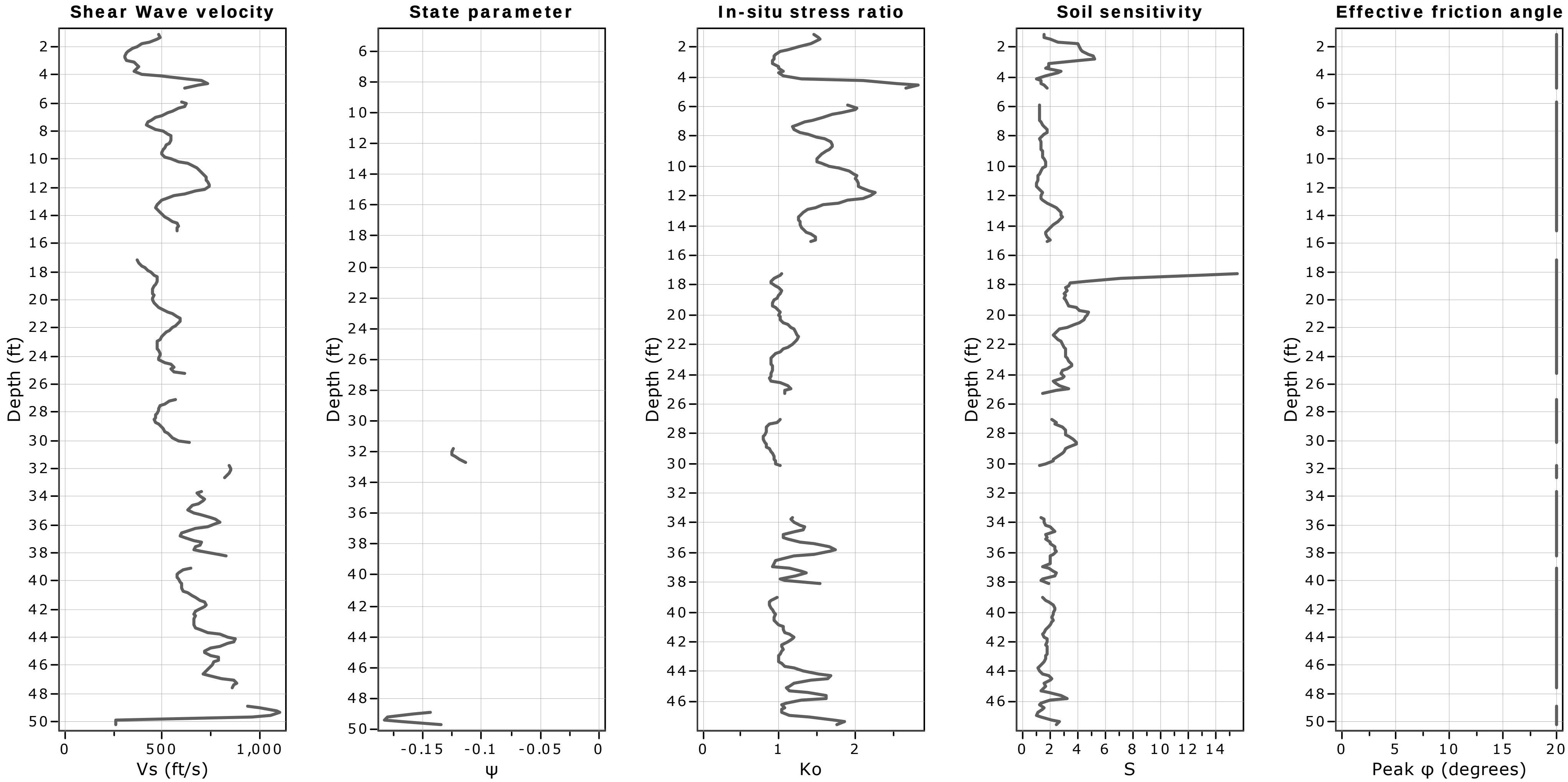
CPT: CPT-05
Total depth: 50.20 ft, Date: 4/30/2012
Surface Elevation: 22.80 ft

Project: **Santa Monica College - Malibu Civic Center**
Location: **23555 Civic Center Way**



Calculation parameters

Soil Sensitivity factor, N_S: 7.00
User defined estimation data

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236\right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \leq 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a}\right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c\_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c\_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Peak drained friction angle, φ (°) ::

$$\varphi = 17.60 + 11 \cdot \log(Q_{tn})$$

(applicable only to SBT_n: 5, 6, 7 and 8)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$

$a = 14$ for $Q_{tn} > 14$

$a = Q_{tn}$ for $Q_{tn} \leq 14$

$M_{CPT} = a \cdot (q_t - \sigma_v)$

If $I_c \leq 2.20$

$M_{CPT} = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho}\right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 \cdot + 7 \cdot \log(F_r))}\right]^{1.25}$$ or user defined

$$OCR = k_{OCR} \cdot Q_{tn}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_O = 0.1 \cdot \left(\frac{q_t - \sigma_v}{\sigma'_{vo}}\right)$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Effective Stress Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10 < B_q < 1.00$)

References

• Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 4th Edition, July 2010

• Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

GEOLABS-WESTLAKE VILLAGE
Soils Engineering and Geology
31119 Via Colinas, Suite 502
Westlake Village, CA 91362

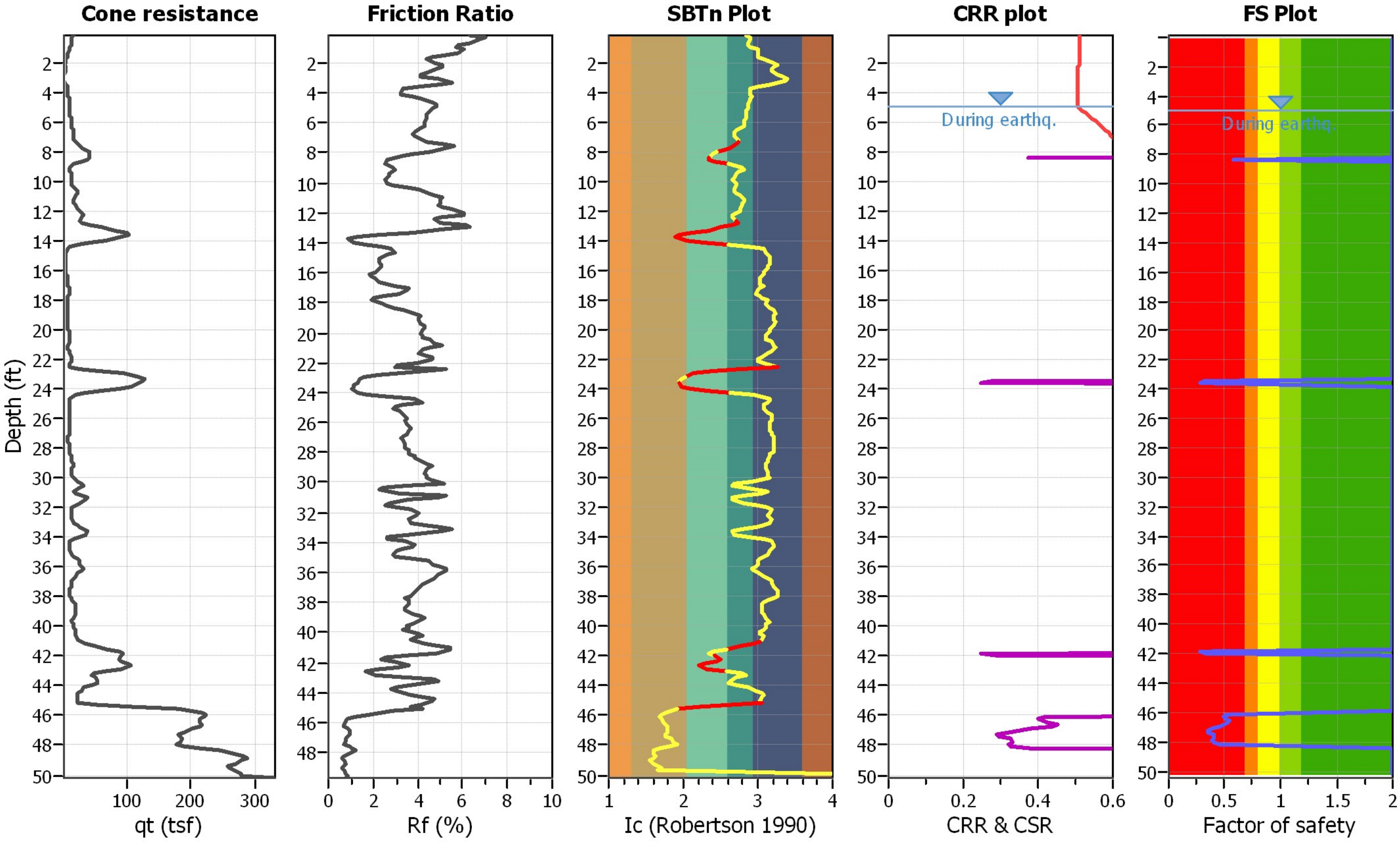
LIQUEFACTION ANALYSIS REPORT

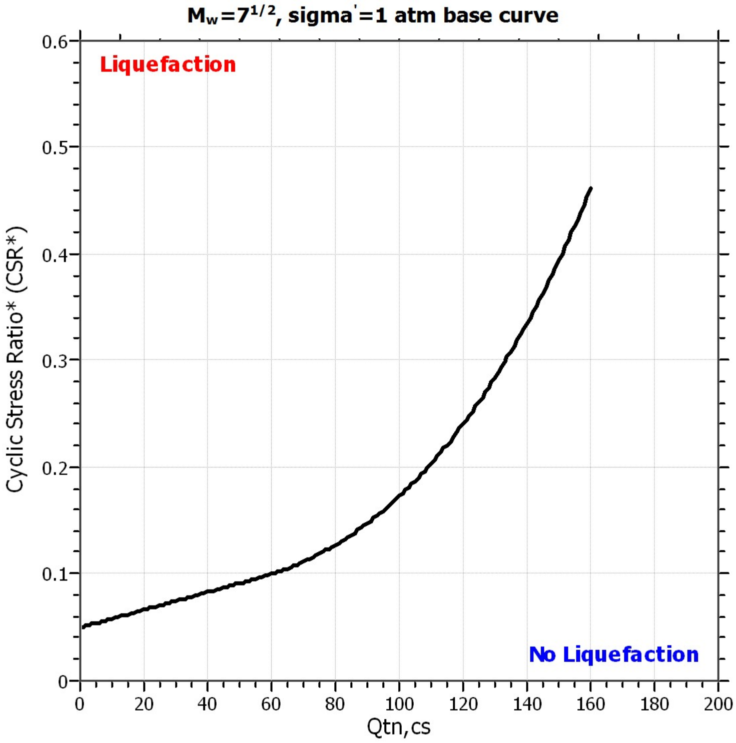
Project title : Santa Monica College - Malibu Civic Center **Location : 23555 Civic Center Way**

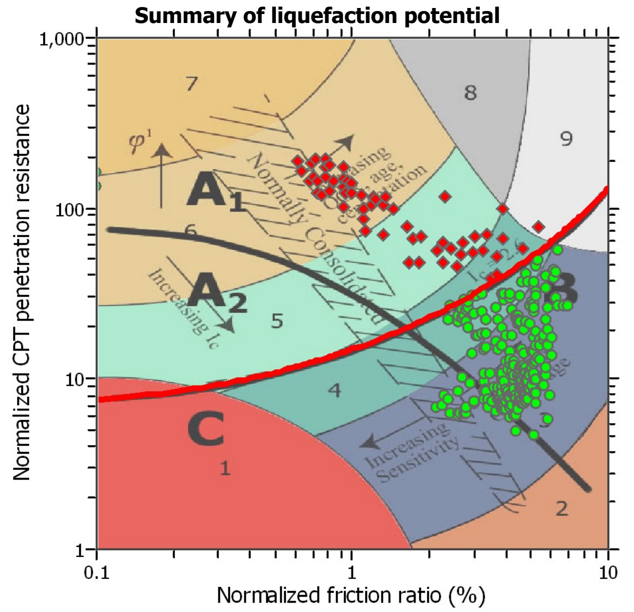
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	23.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.97	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

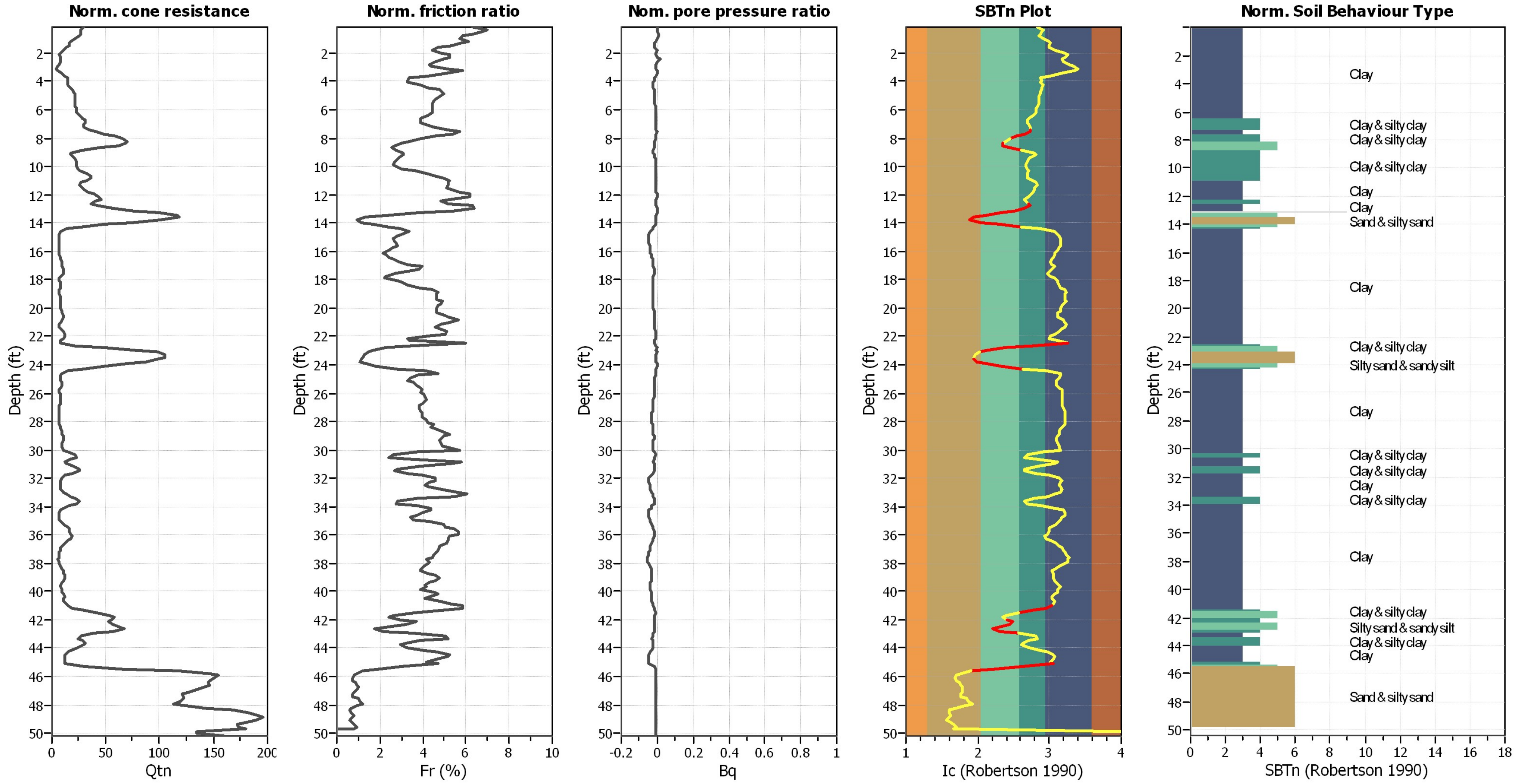






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots (normalized)



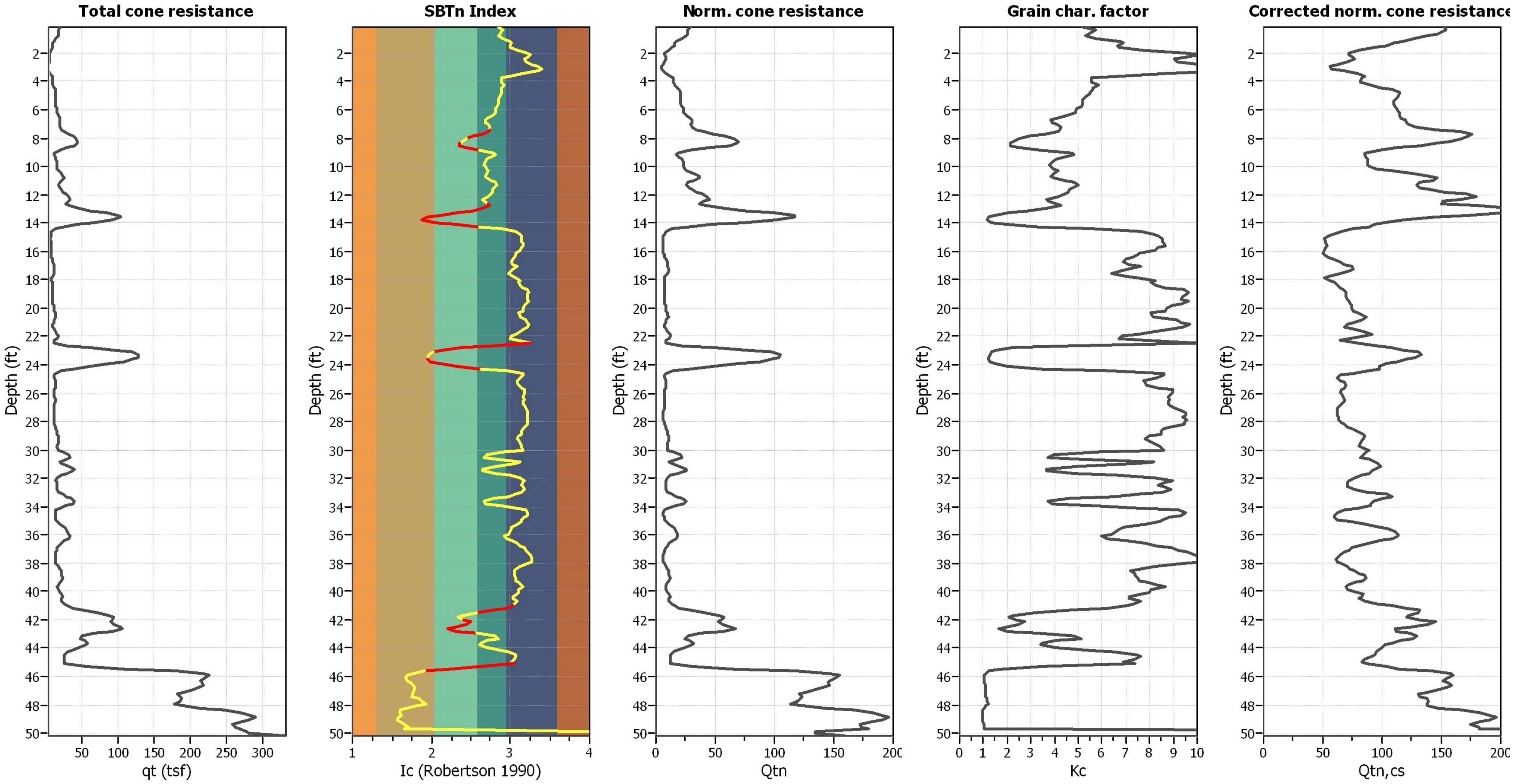
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

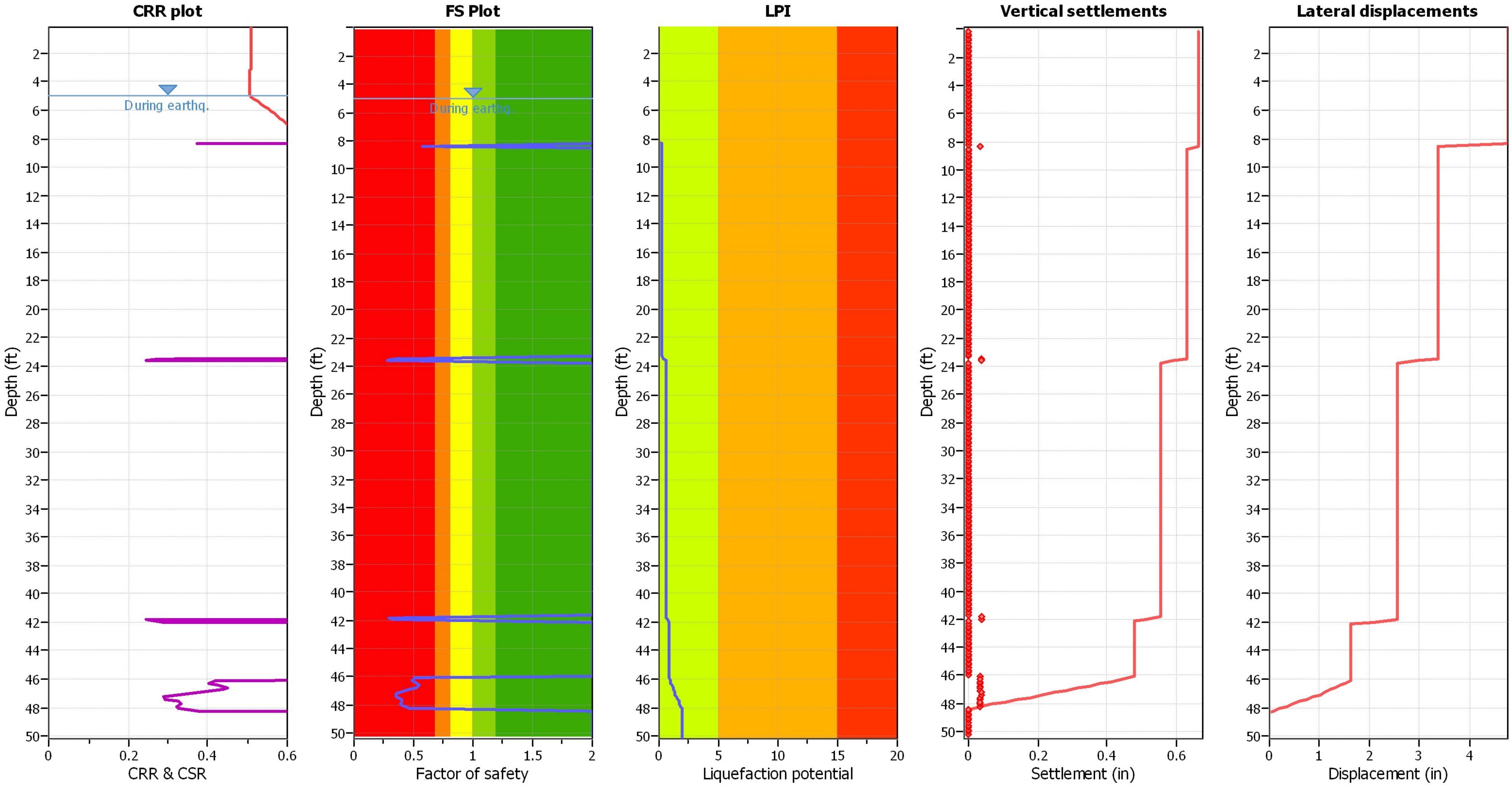
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

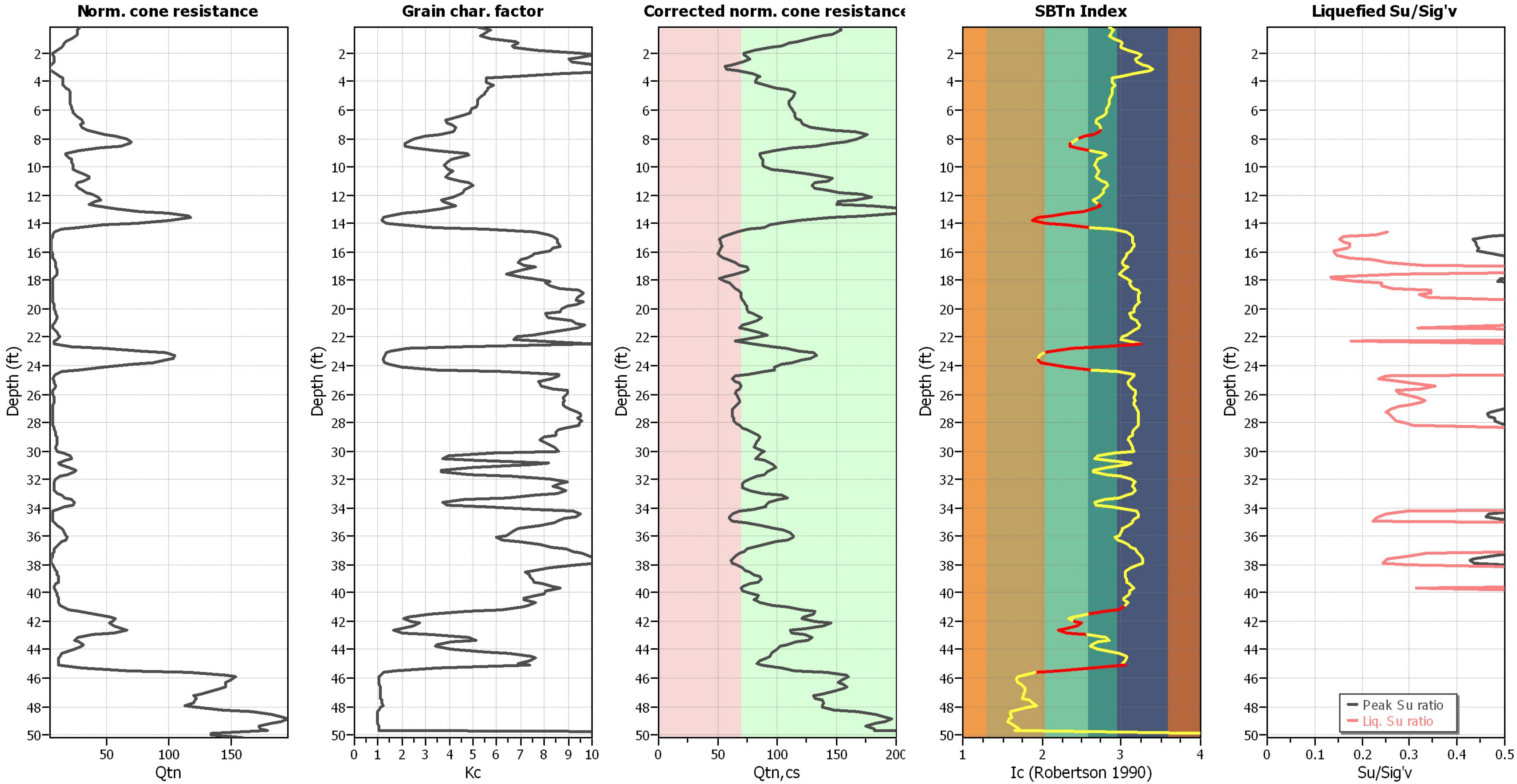
F.S. color scheme

- 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

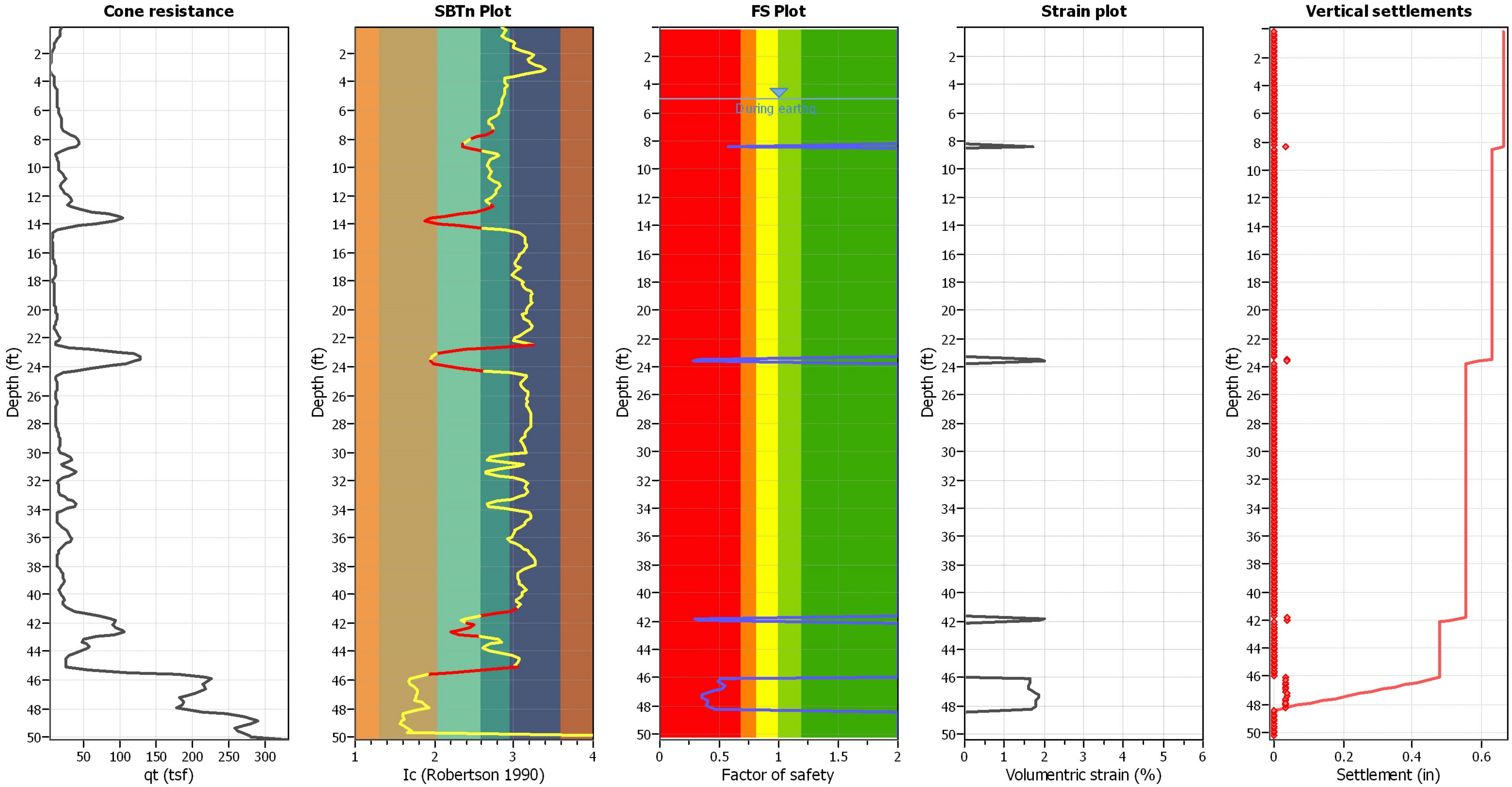
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

GEOLABS-WESTLAKE VILLAGE
Soils Engineering and Geology
31119 Via Colinas, Suite 502
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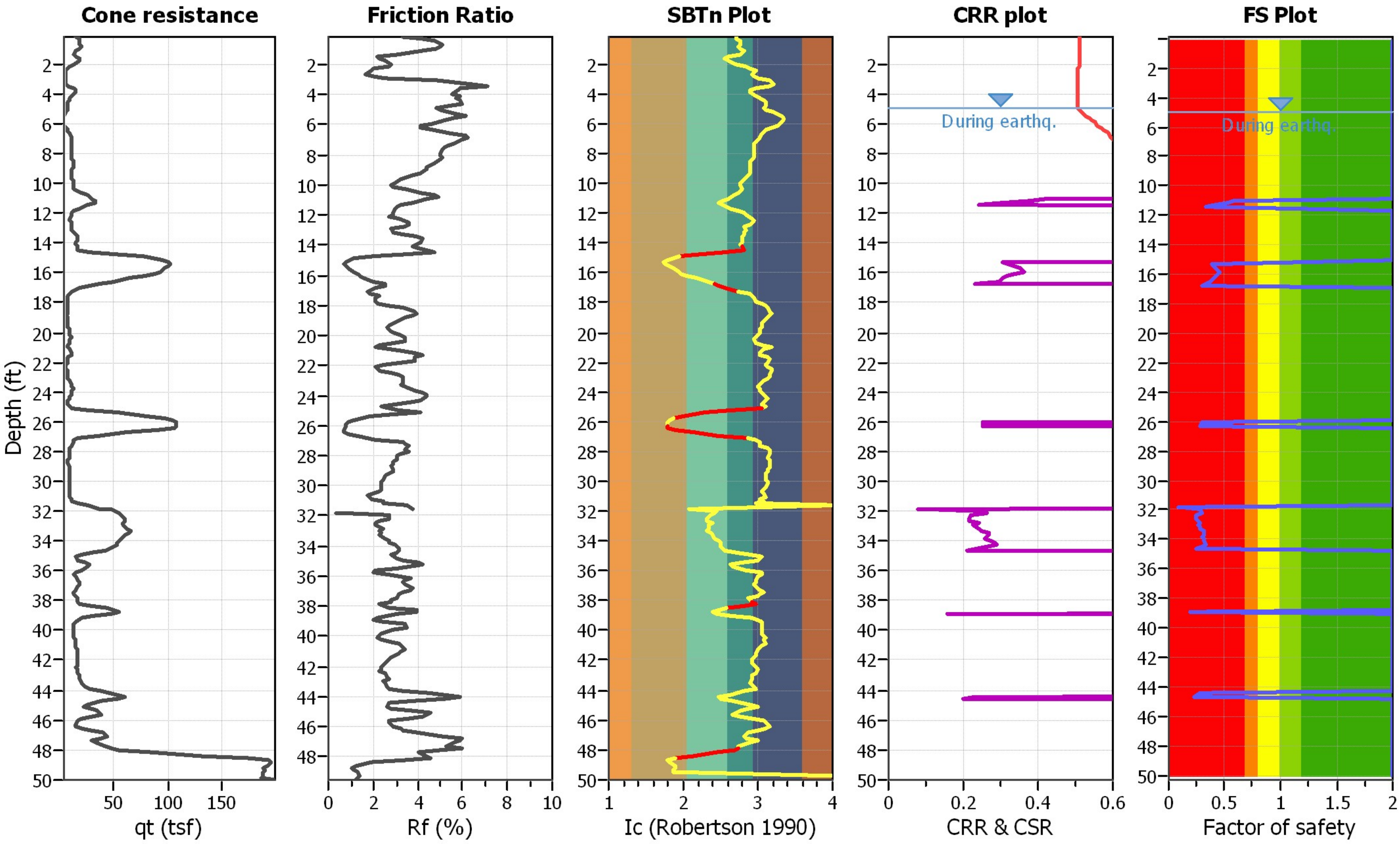
LIQUEFACTION ANALYSIS REPORT

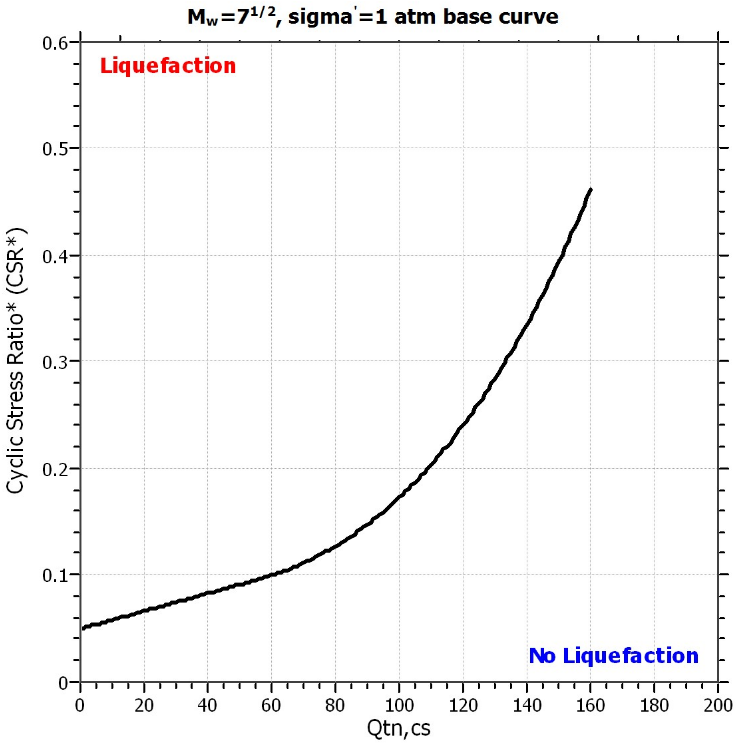
Project title : Santa Monica College - Malibu Civic Center **Location : 23555 Civic Center Way**

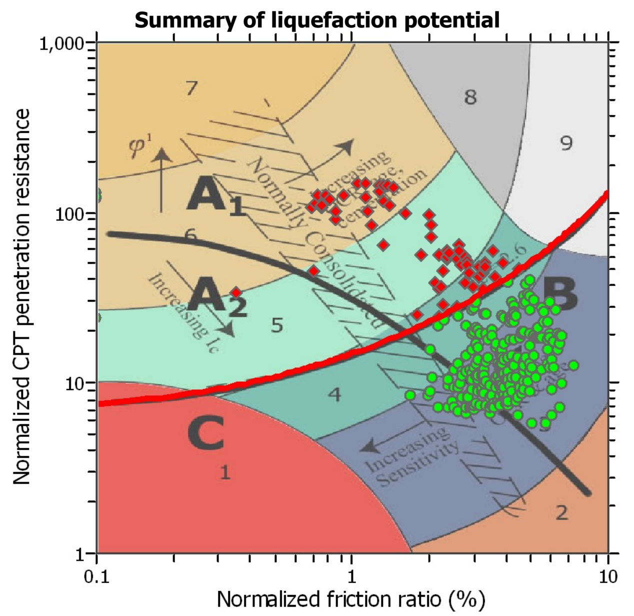
CPT file : CPT-02

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.97	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

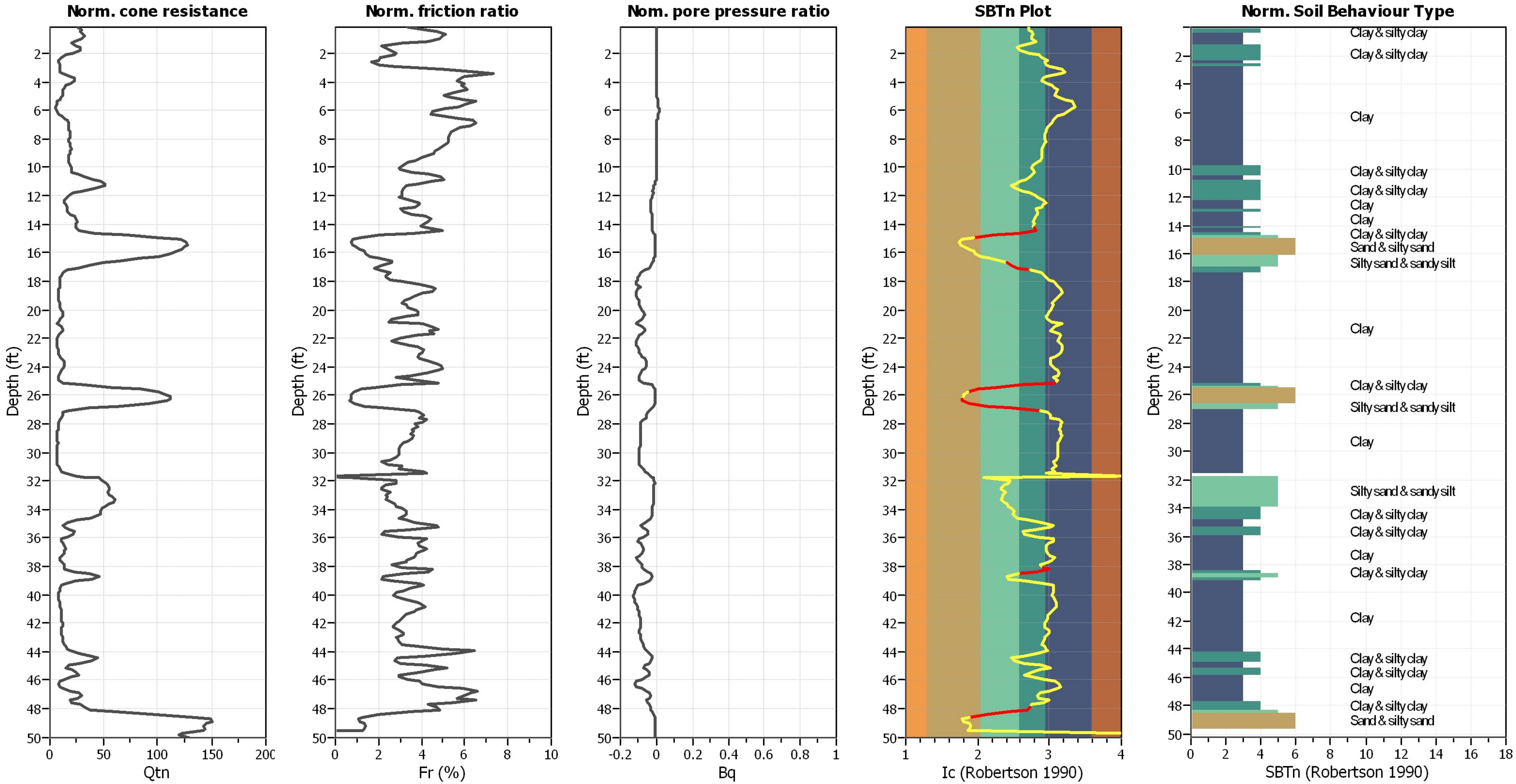






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots (normalized)



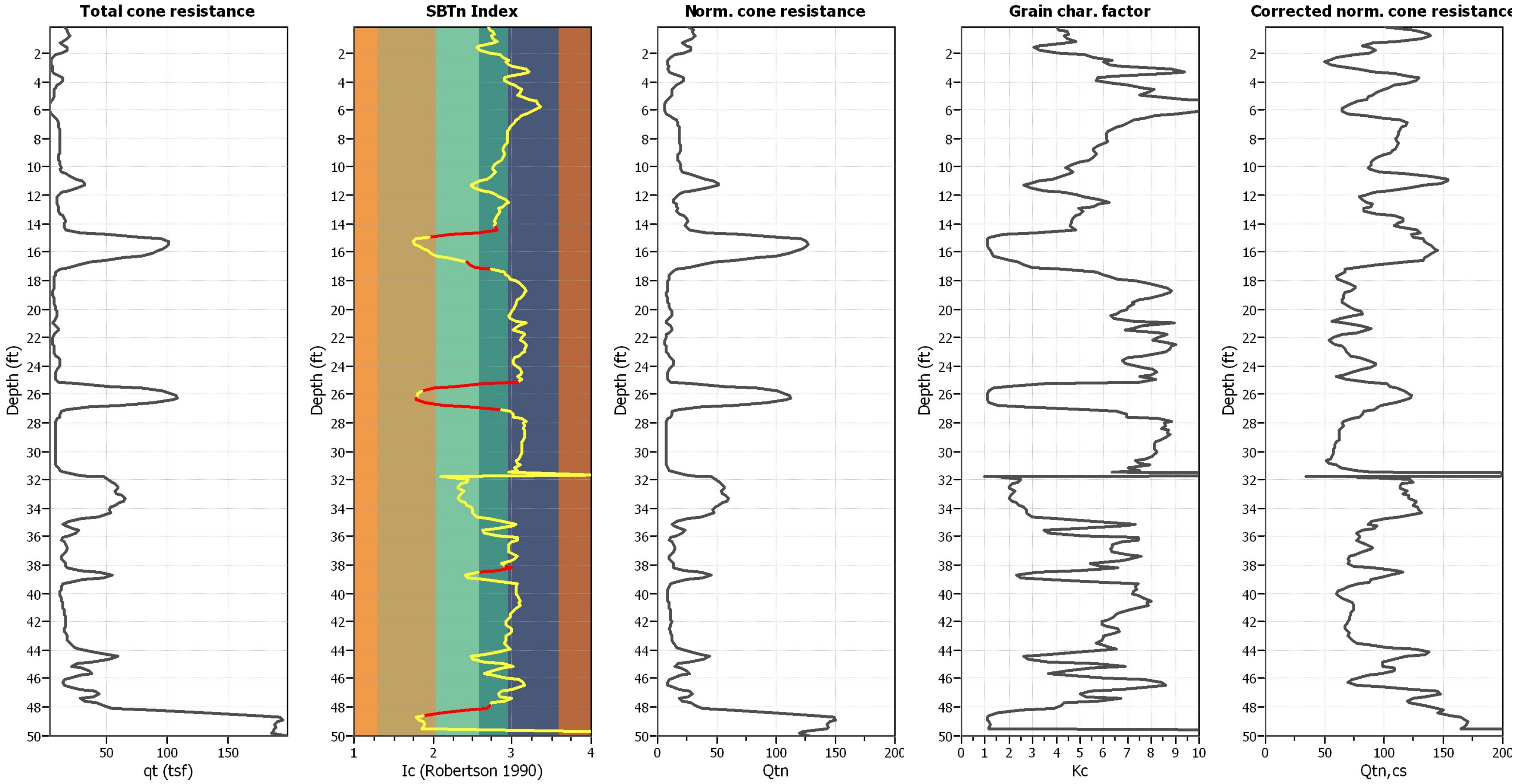
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

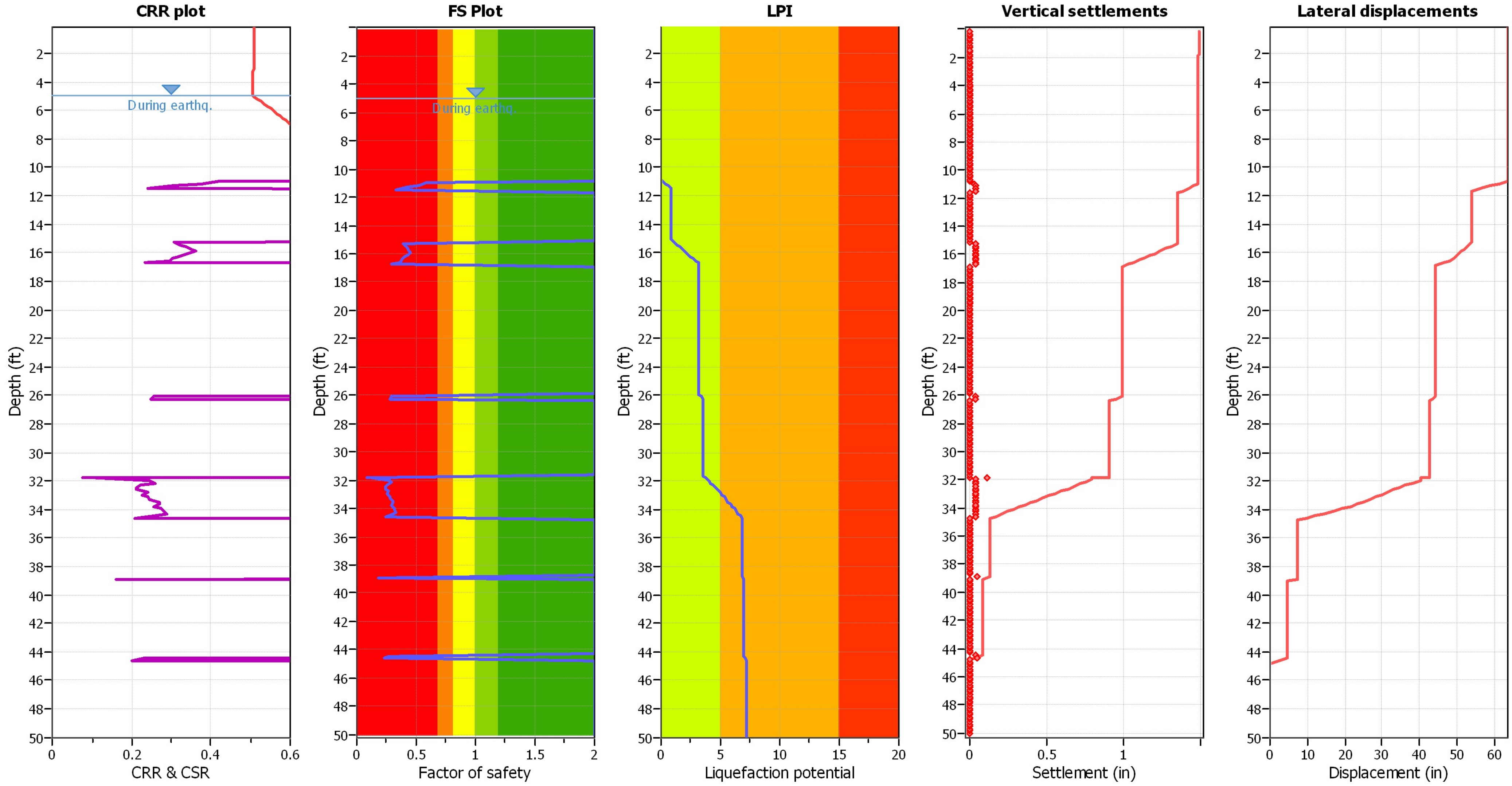
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

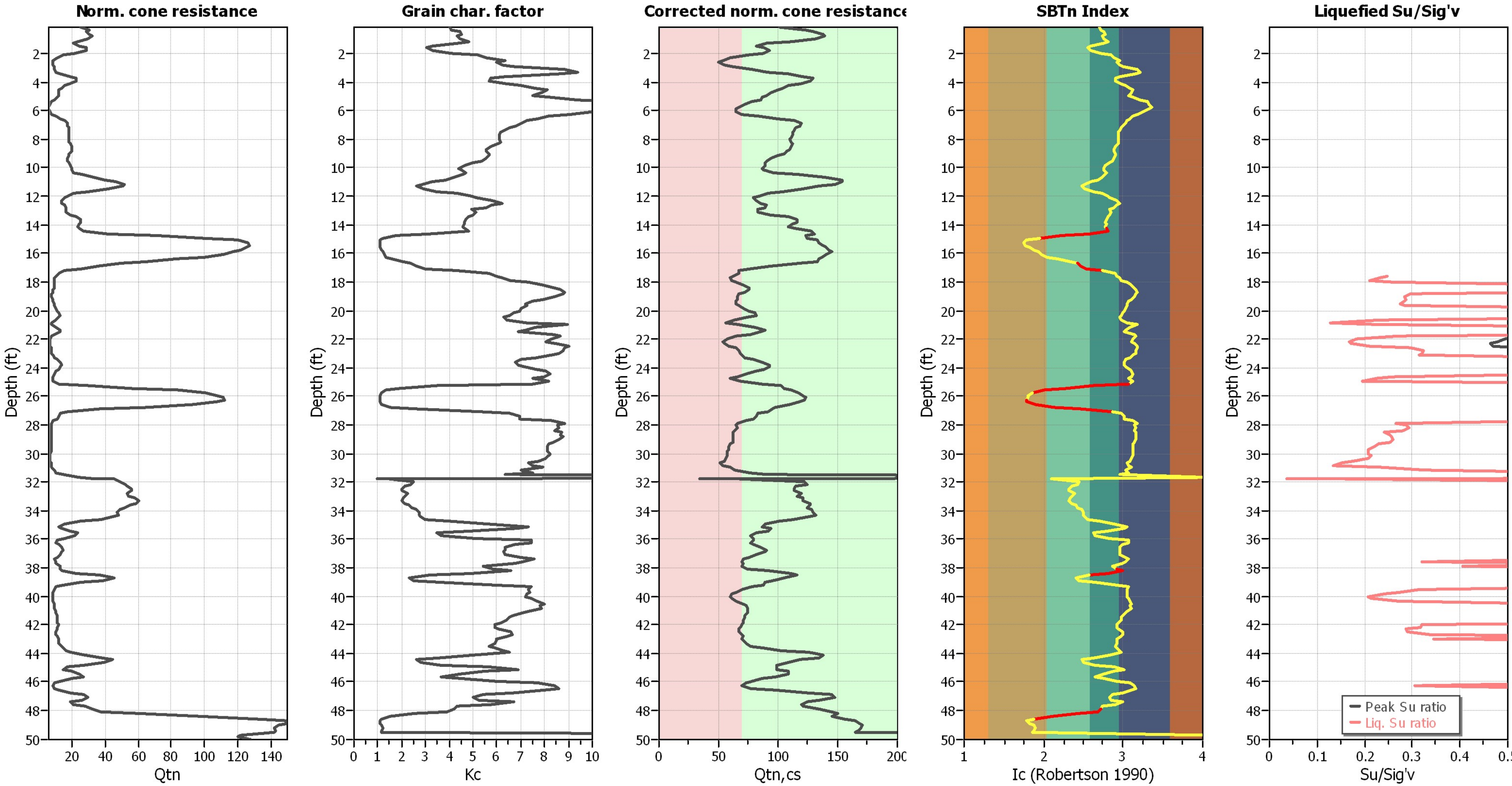
F.S. color scheme

- 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

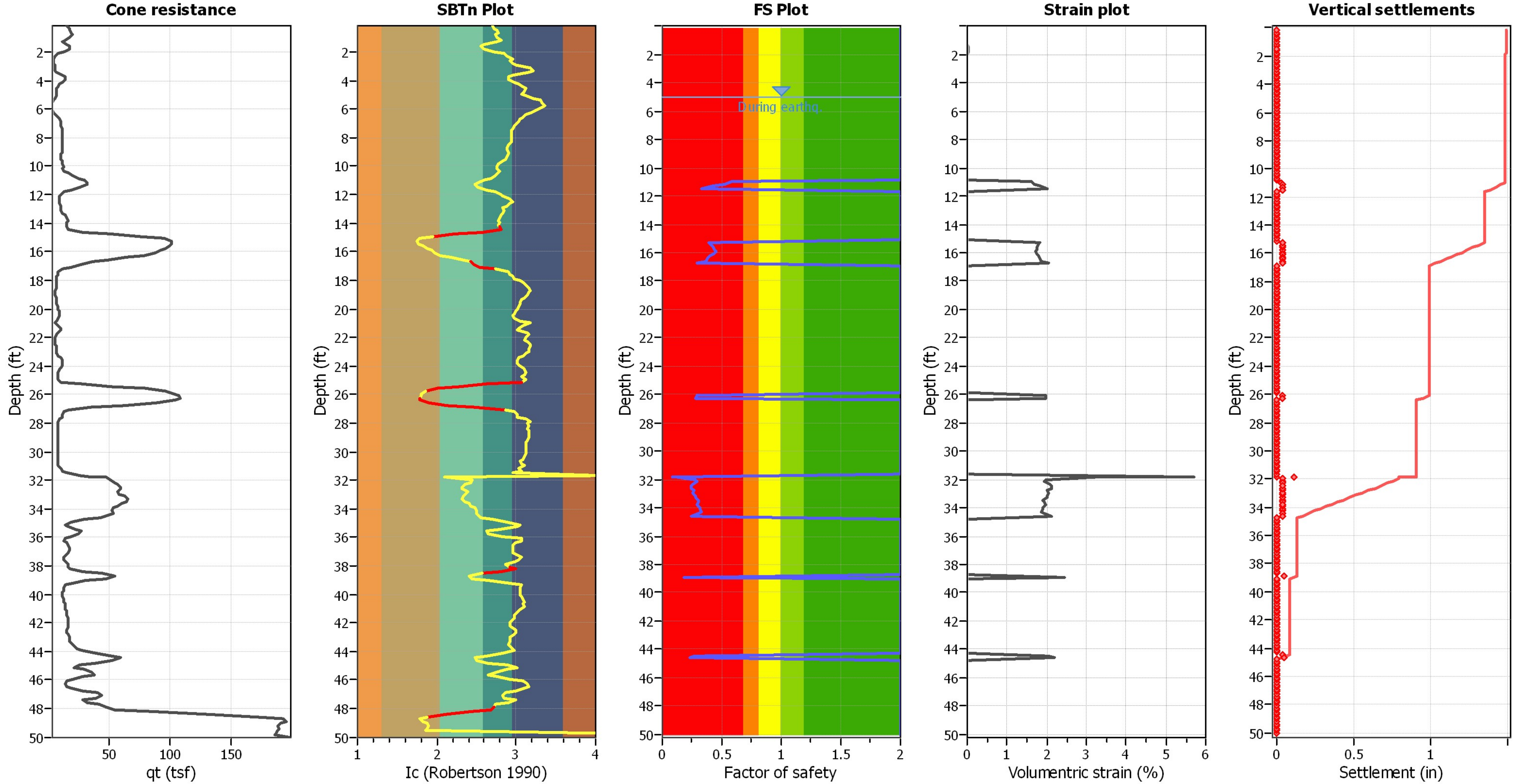
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

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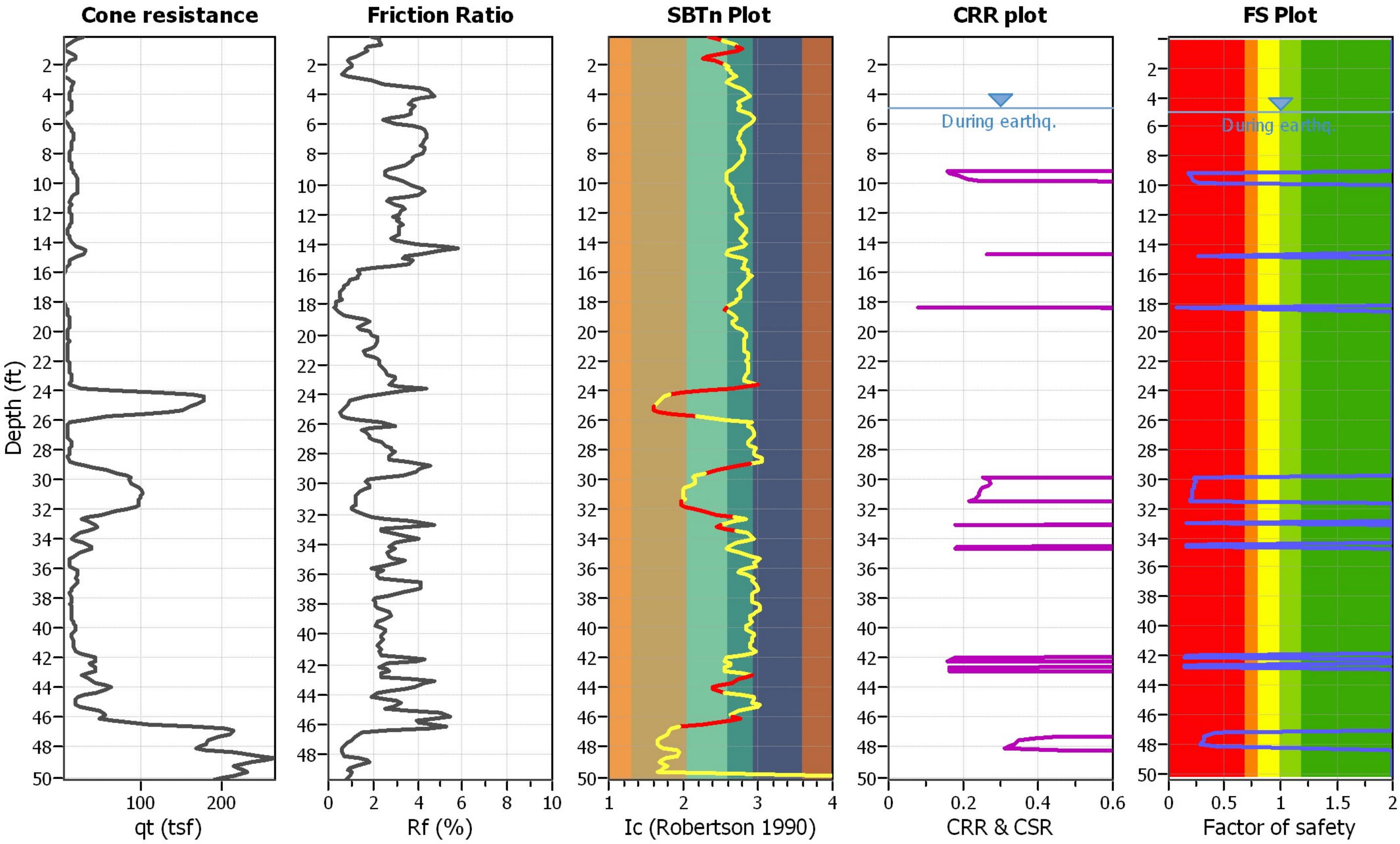
LIQUEFACTION ANALYSIS REPORT

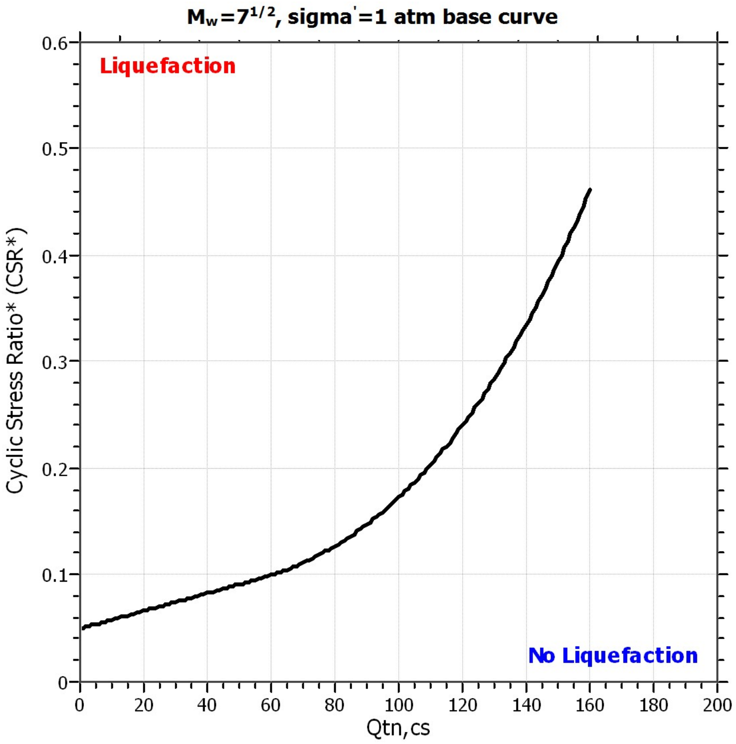
Project title : Santa Monica College - Malibu Civic Center **Location : 23555 Civic Center Way**

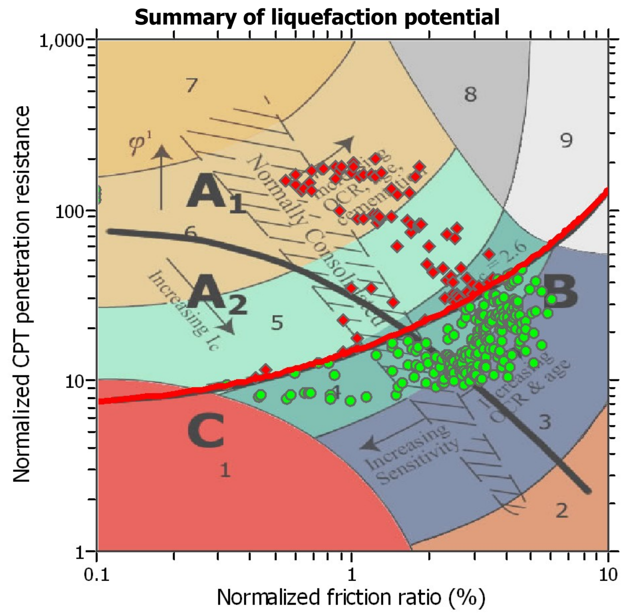
CPT file : CPT-03

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	11.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.97	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

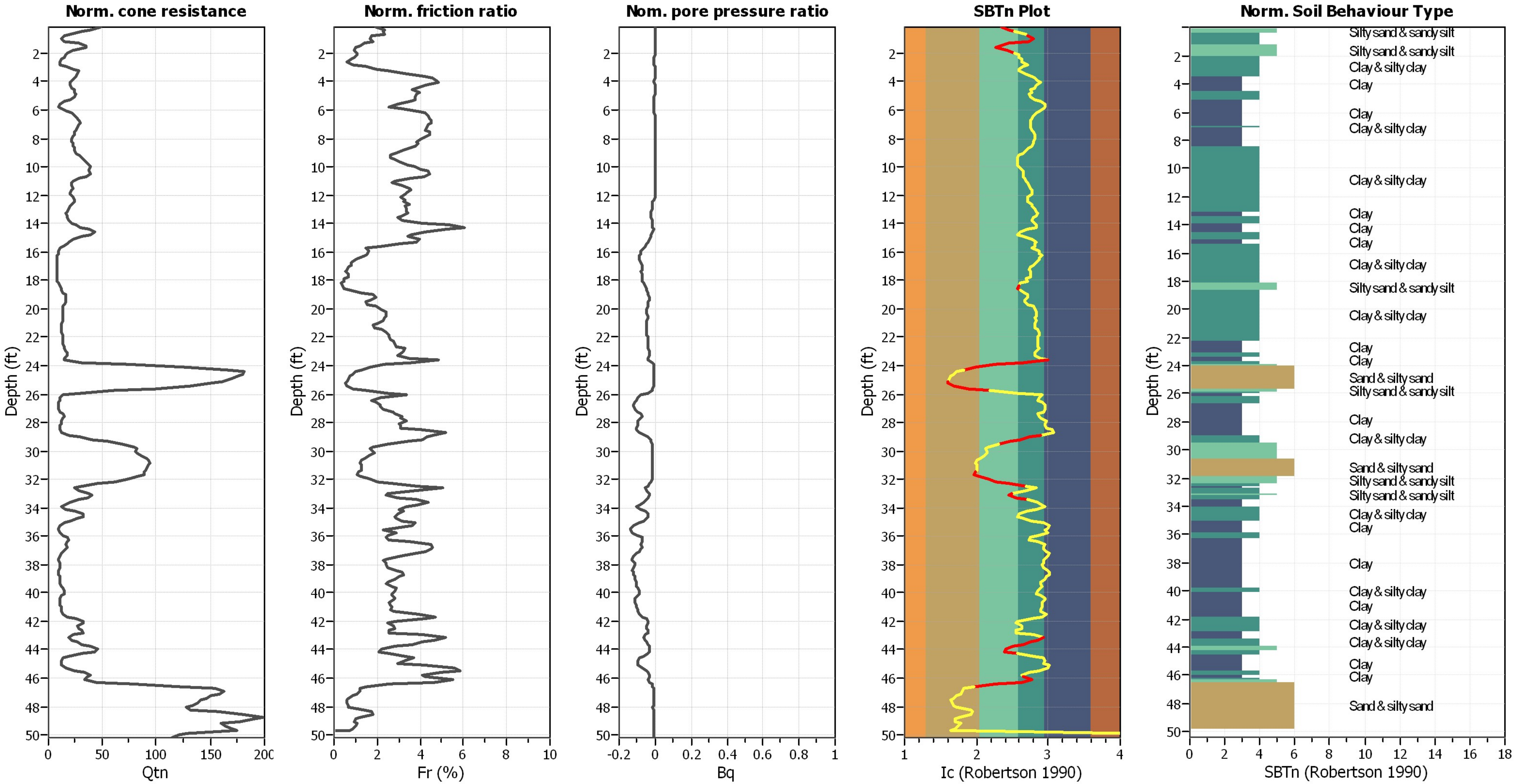






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots (normalized)



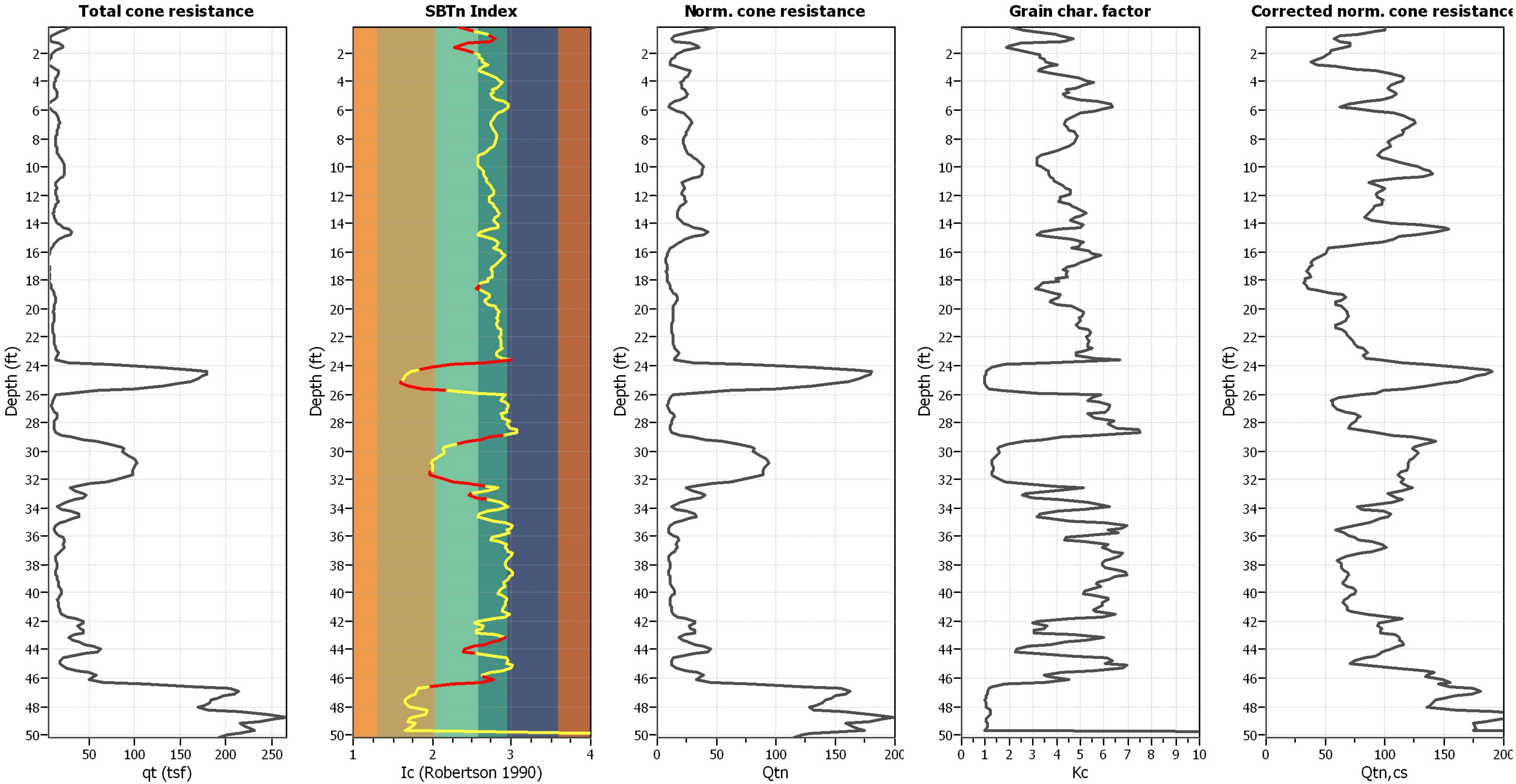
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBTn legend

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

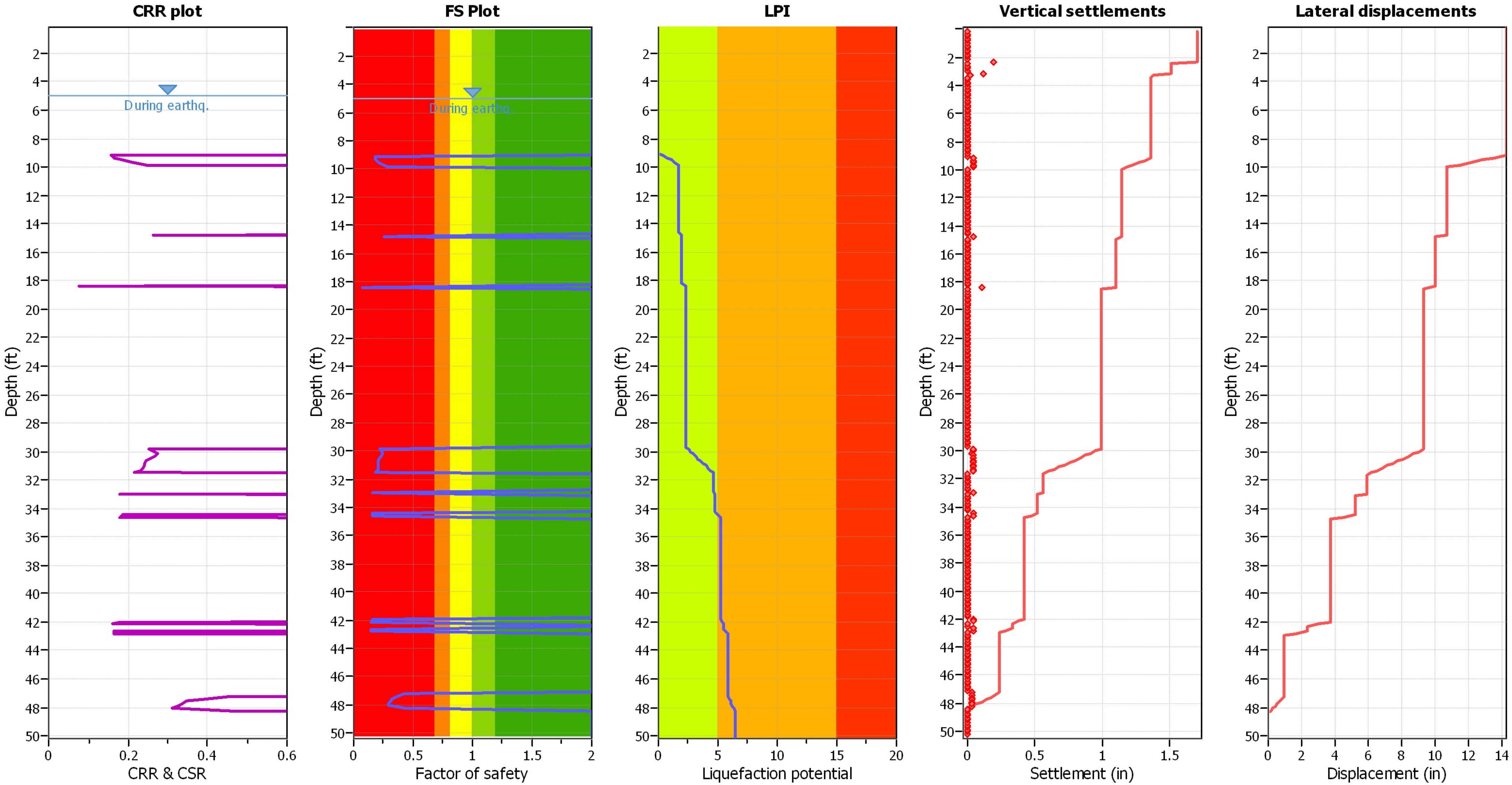
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

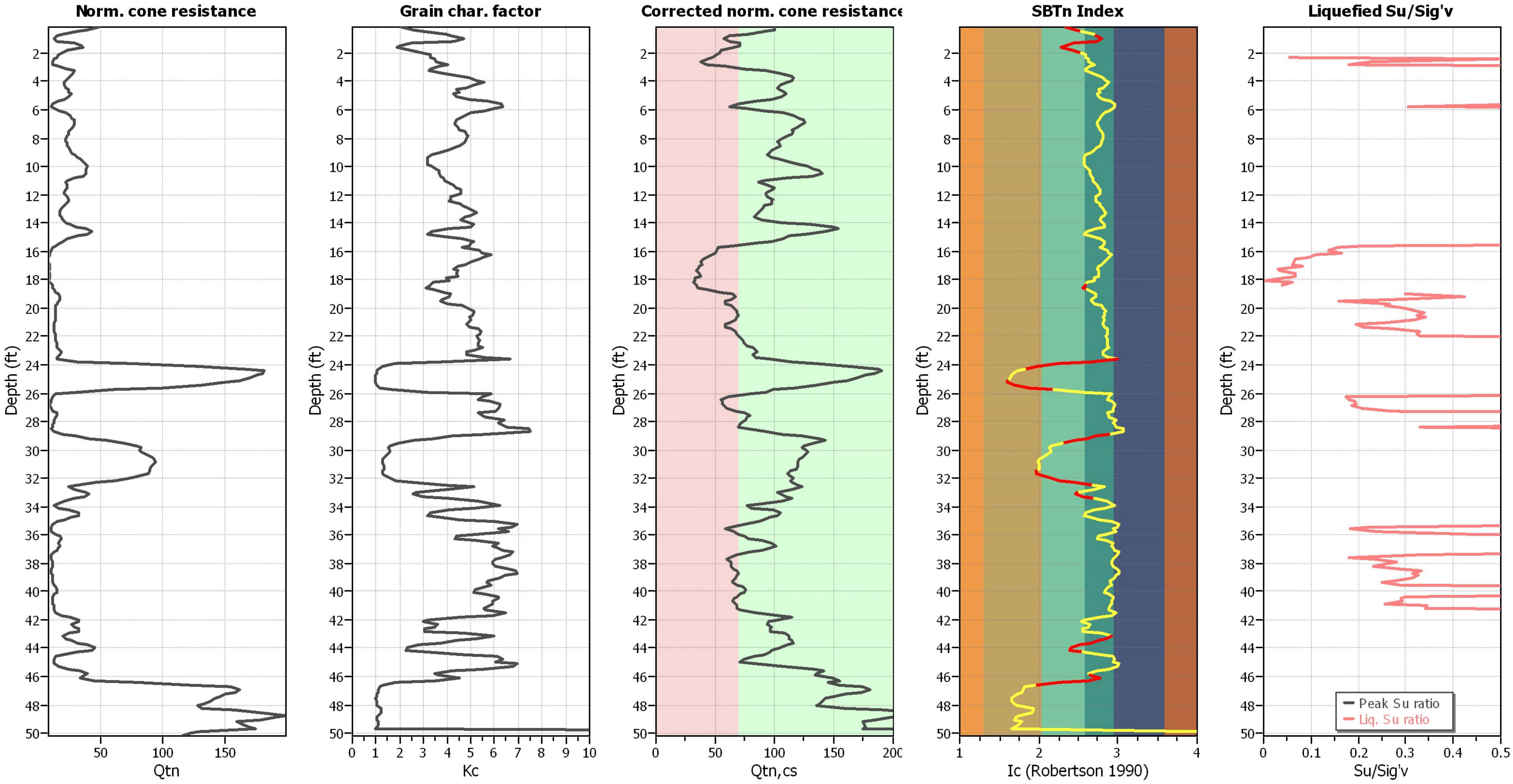
F.S. color scheme

- 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

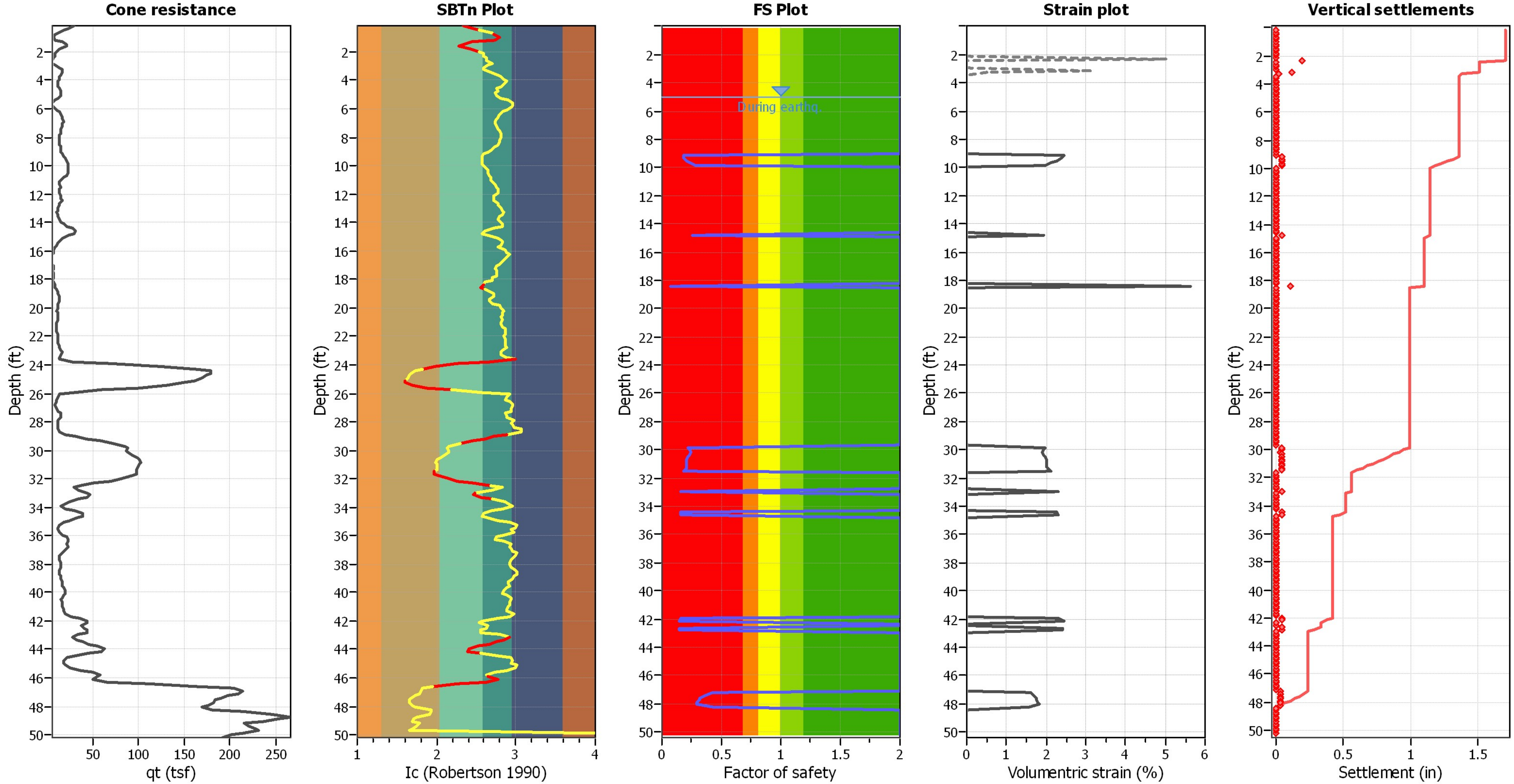
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

GEOLABS-WESTLAKE VILLAGE
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31119 Via Colinas, Suite 502
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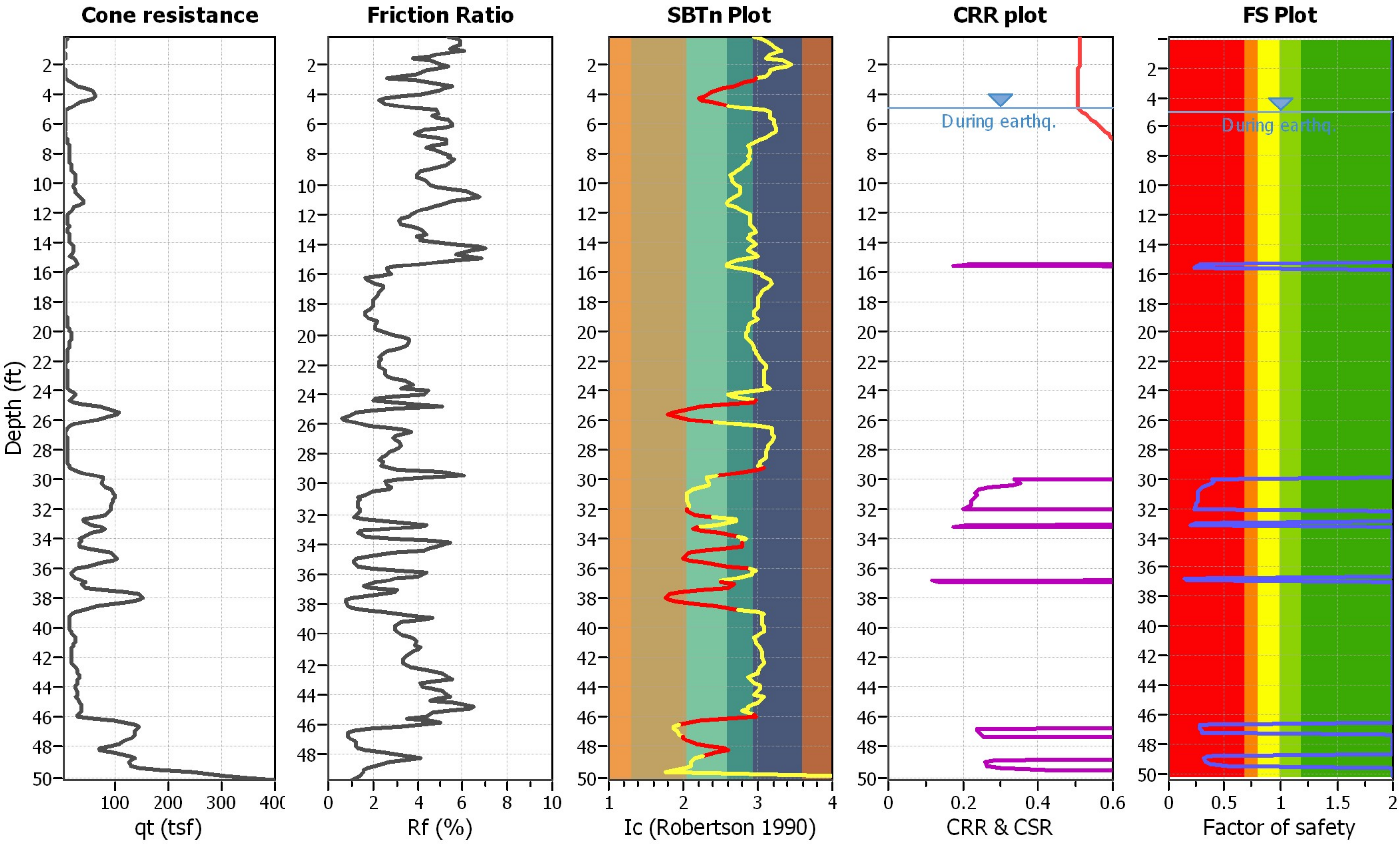
LIQUEFACTION ANALYSIS REPORT

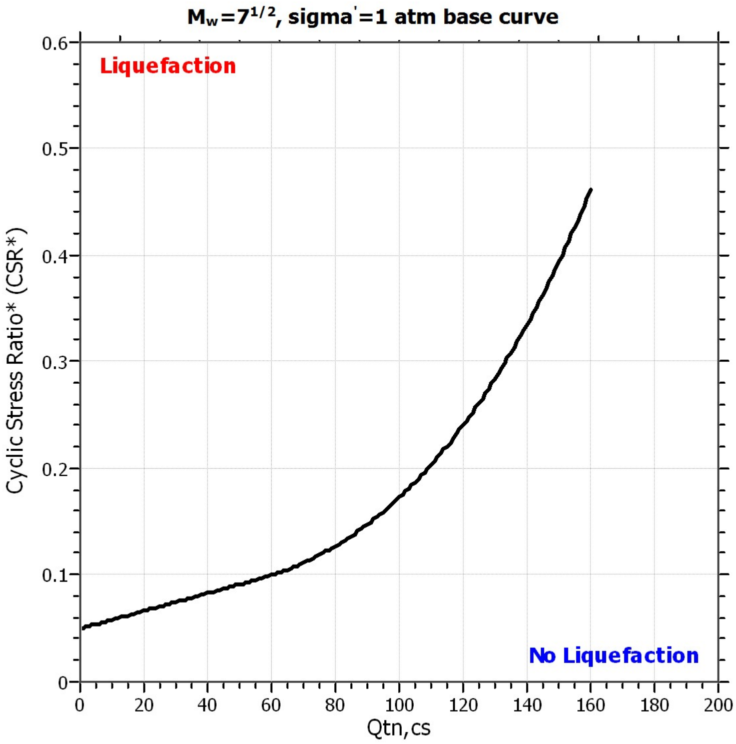
Project title : Santa Monica College - Malibu Civic Center **Location : 23555 Civic Center Way**

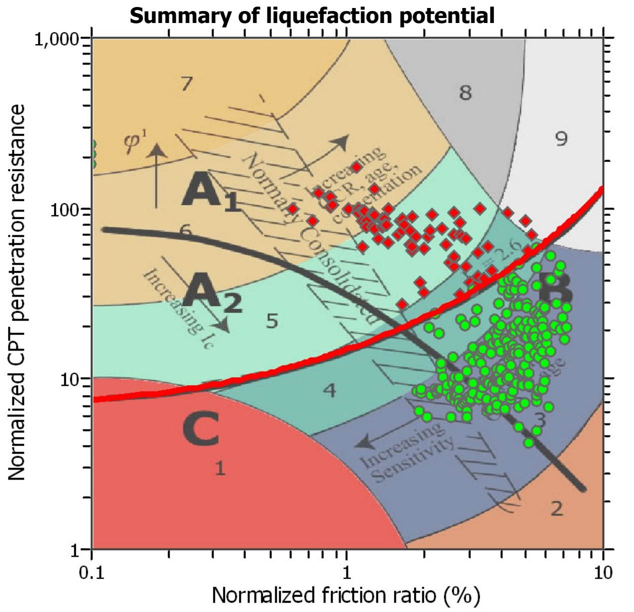
CPT file : CPT-04

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	12.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.97	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

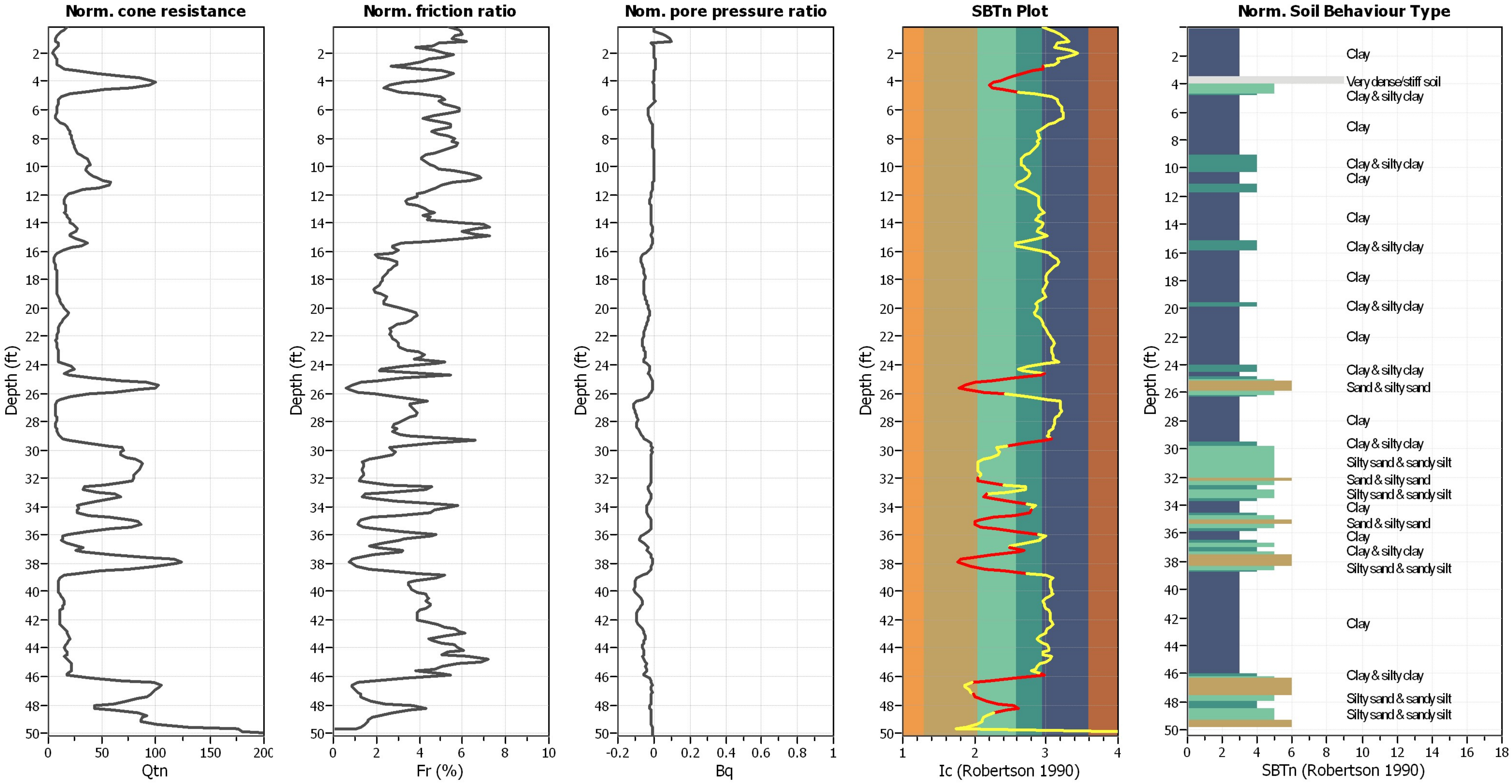






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots (normalized)



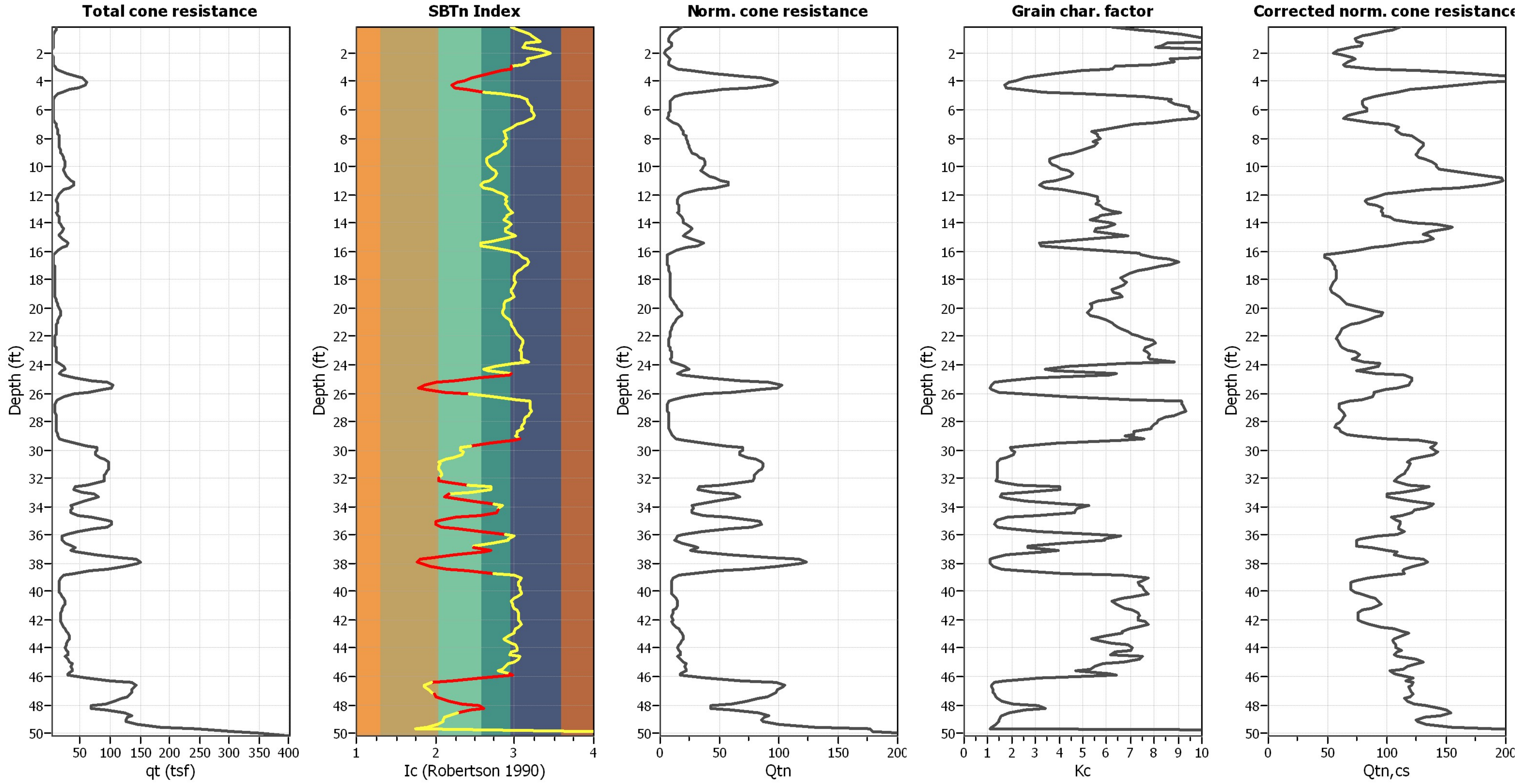
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	12.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

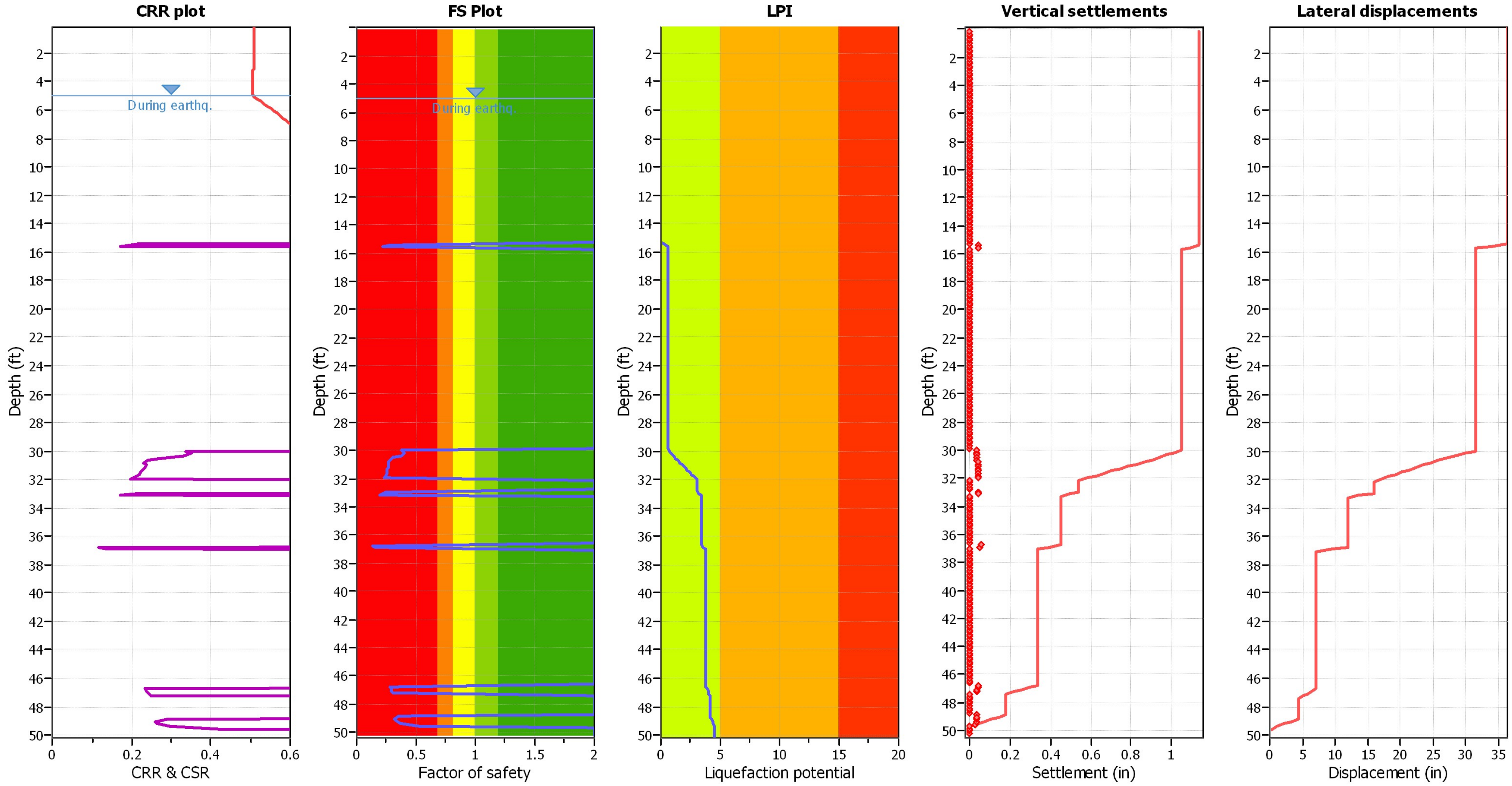
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	12.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	12.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

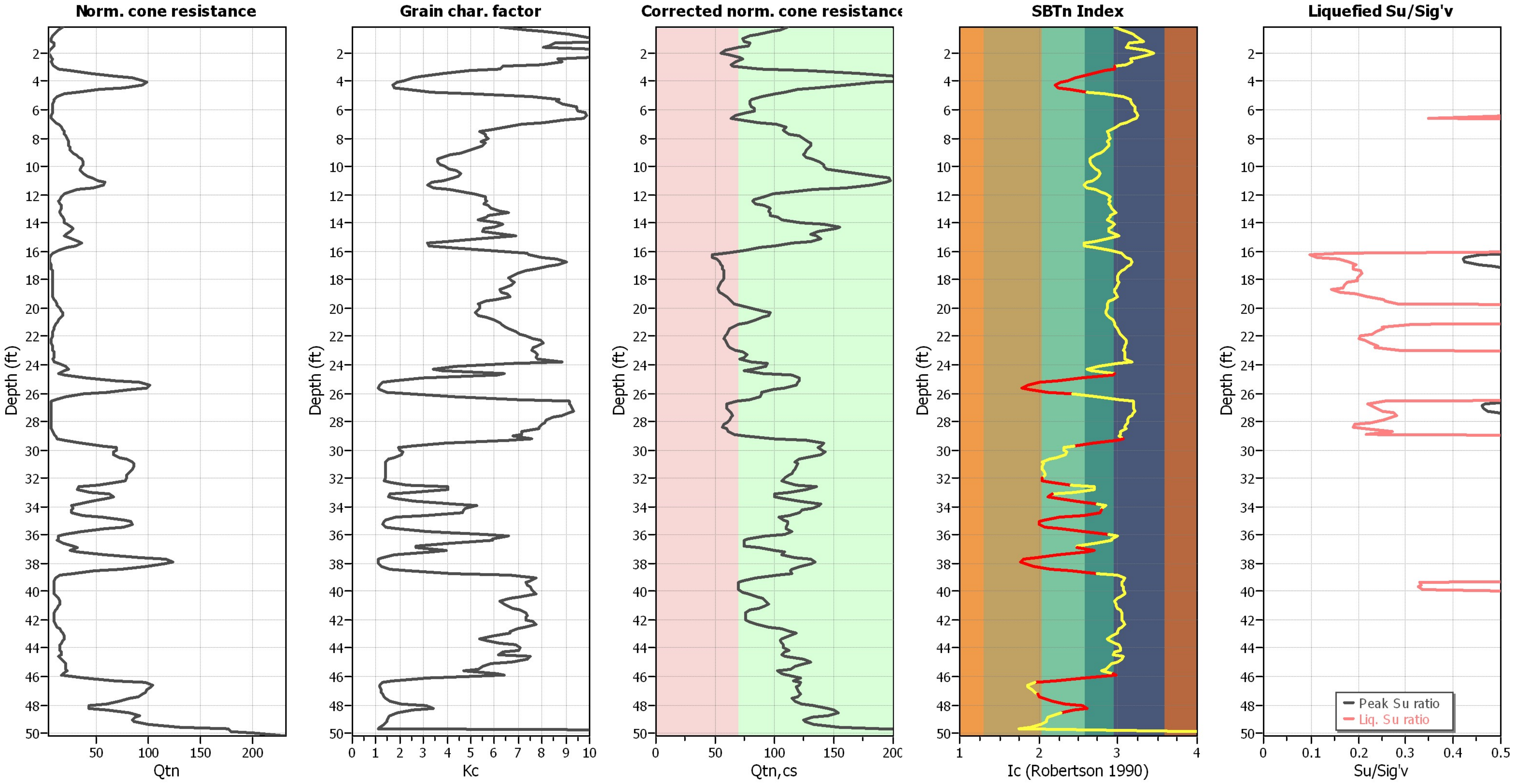
F.S. color scheme

- 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

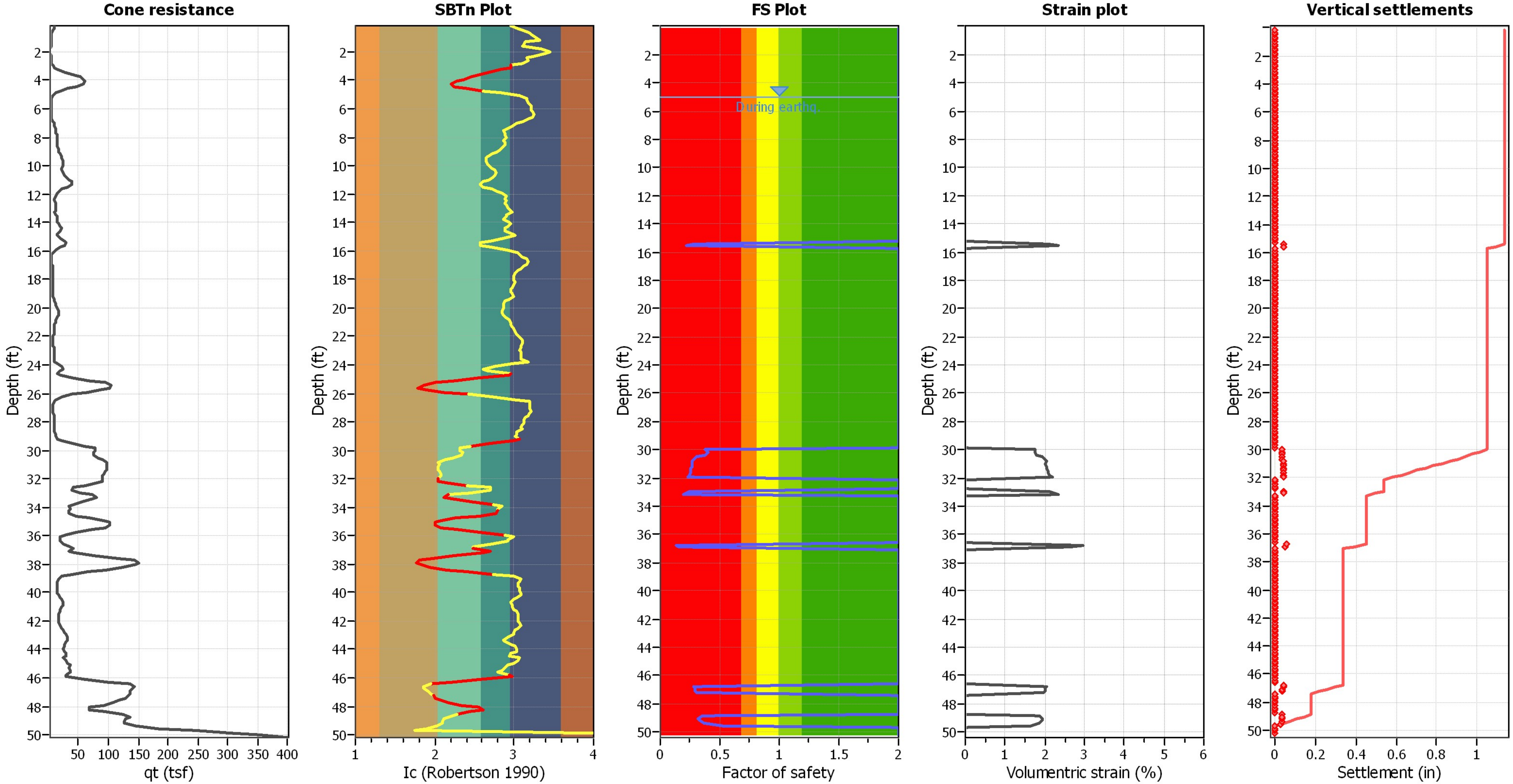
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	12.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

GEOLABS-WESTLAKE VILLAGE
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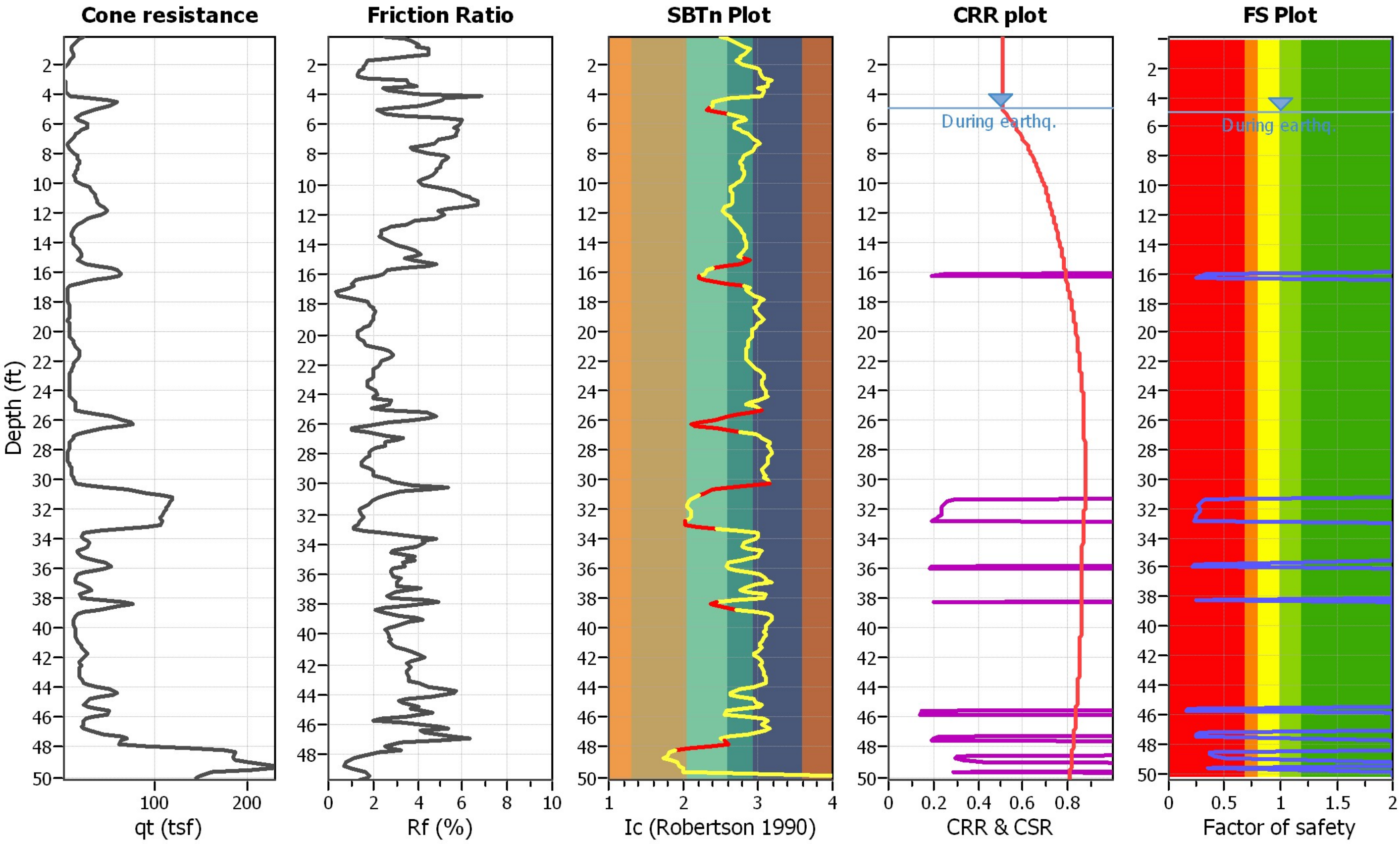
LIQUEFACTION ANALYSIS REPORT

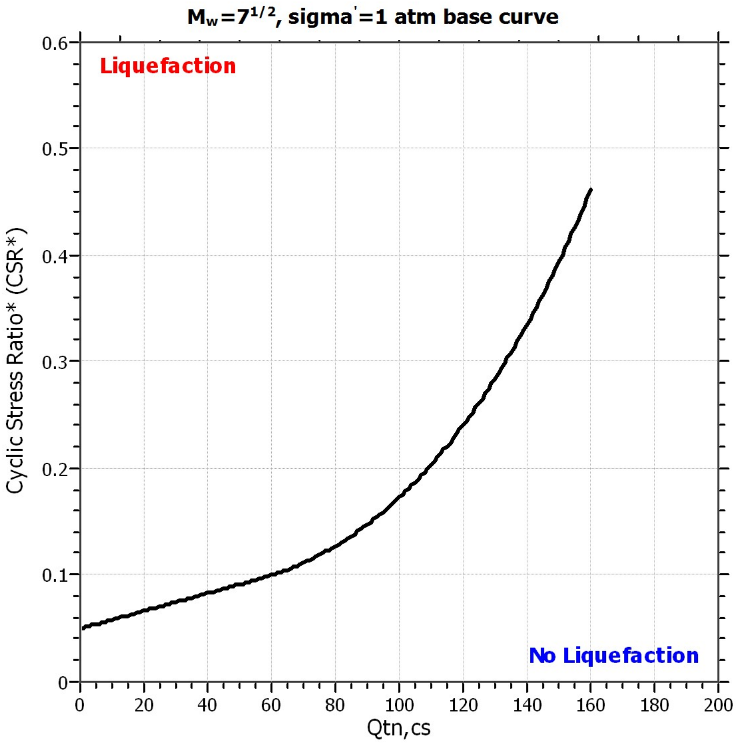
Project title : Santa Monica College - Malibu Civic Center **Location : 23555 Civic Center Way**

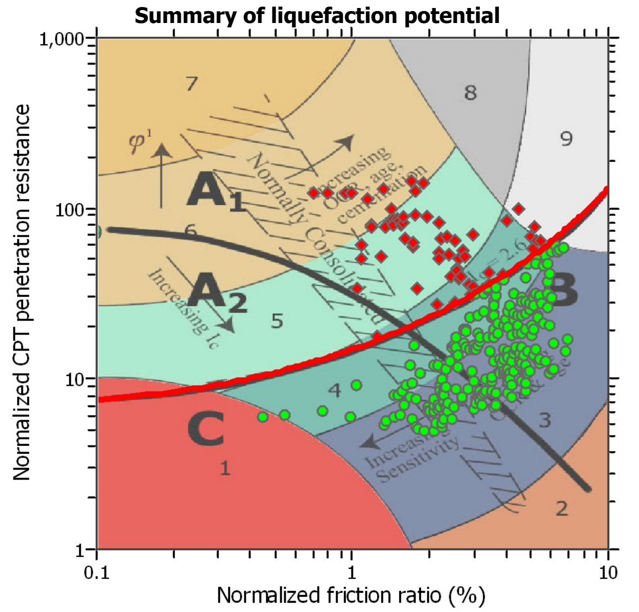
CPT file : CPT-05

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	22.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.97	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

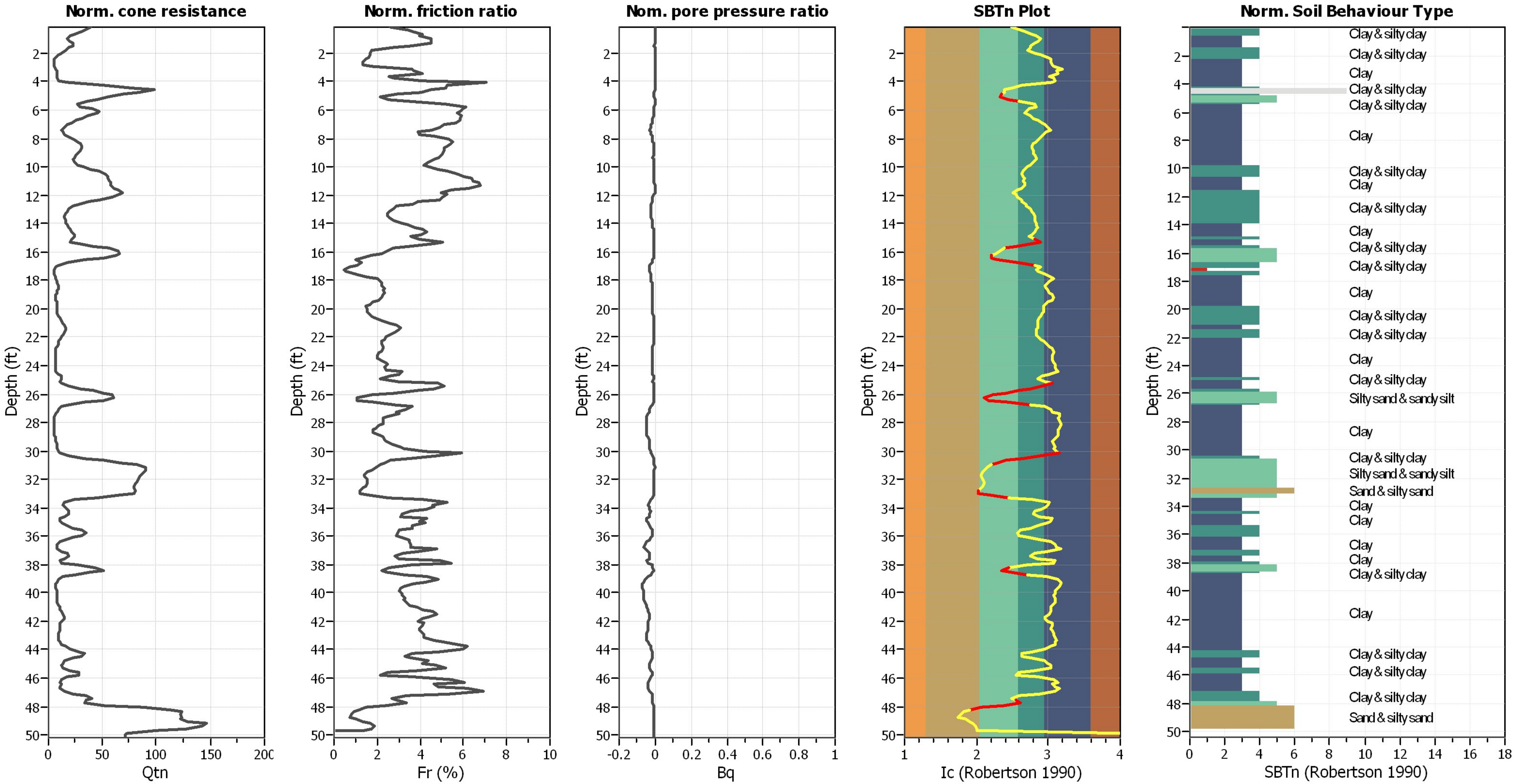






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots (normalized)



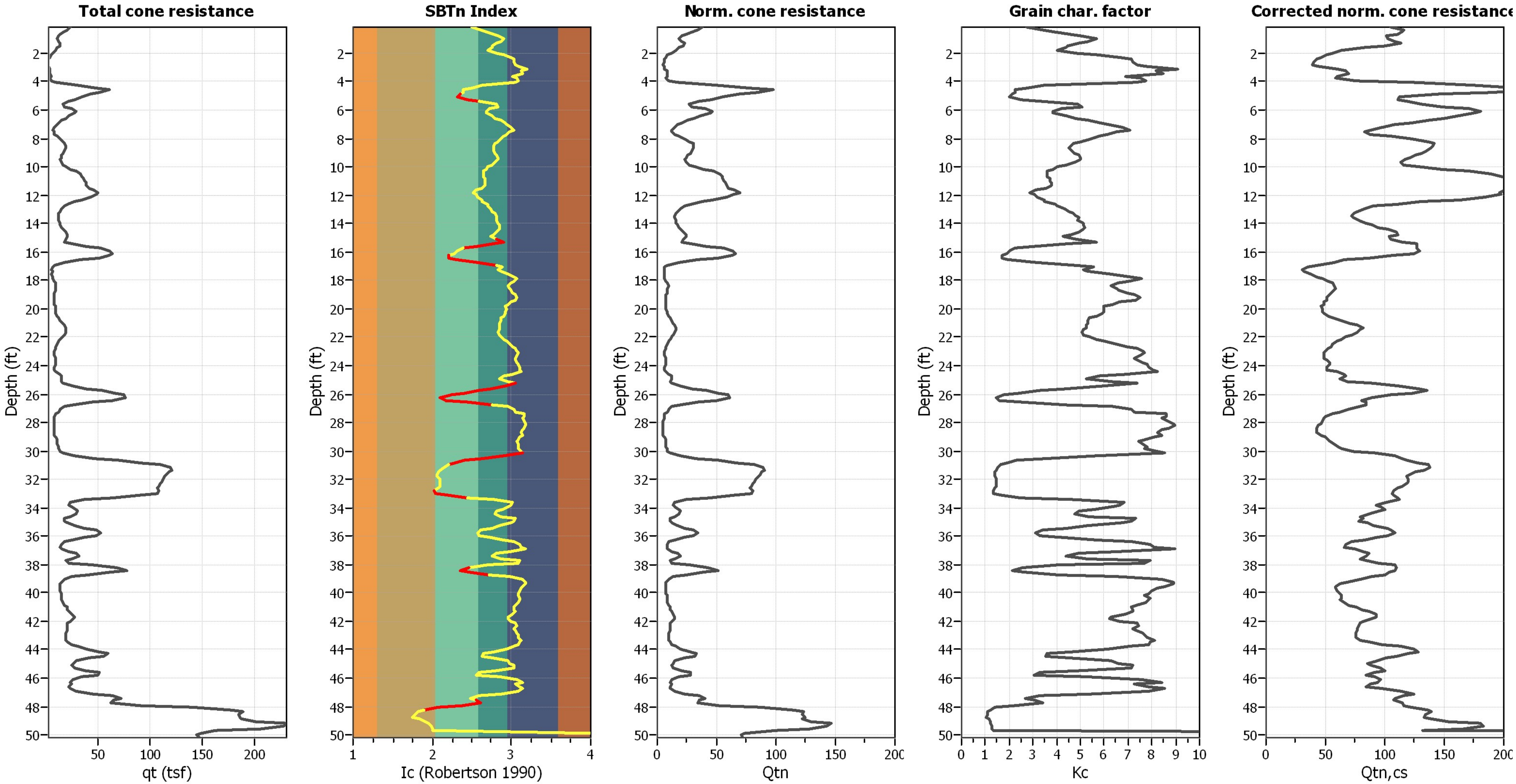
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes		
Depth to water table (insitu):	22.00 ft	Fill height:	N/A	Limit depth:	60.00 ft		

SBTn legend

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

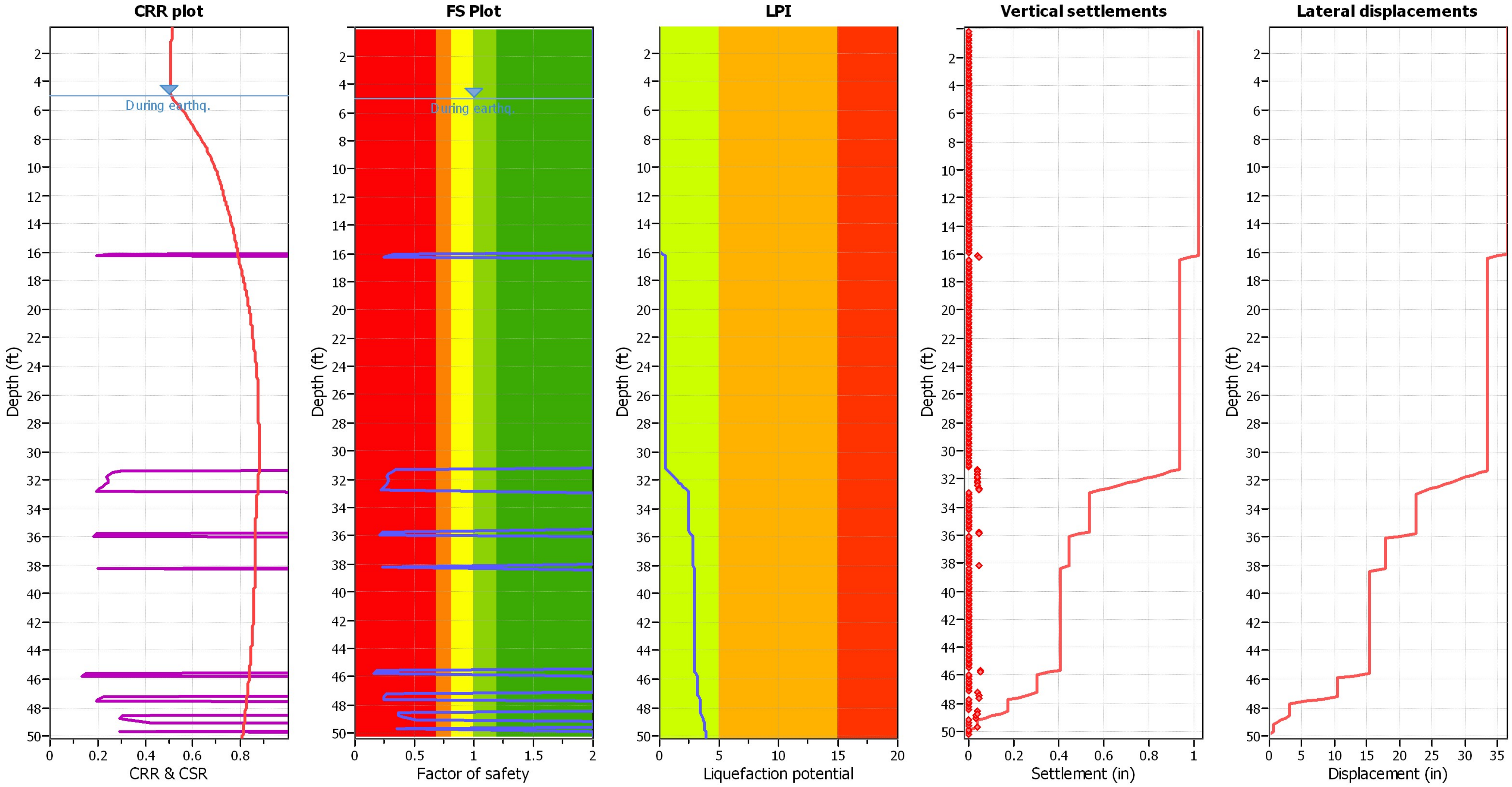
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	22.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	22.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

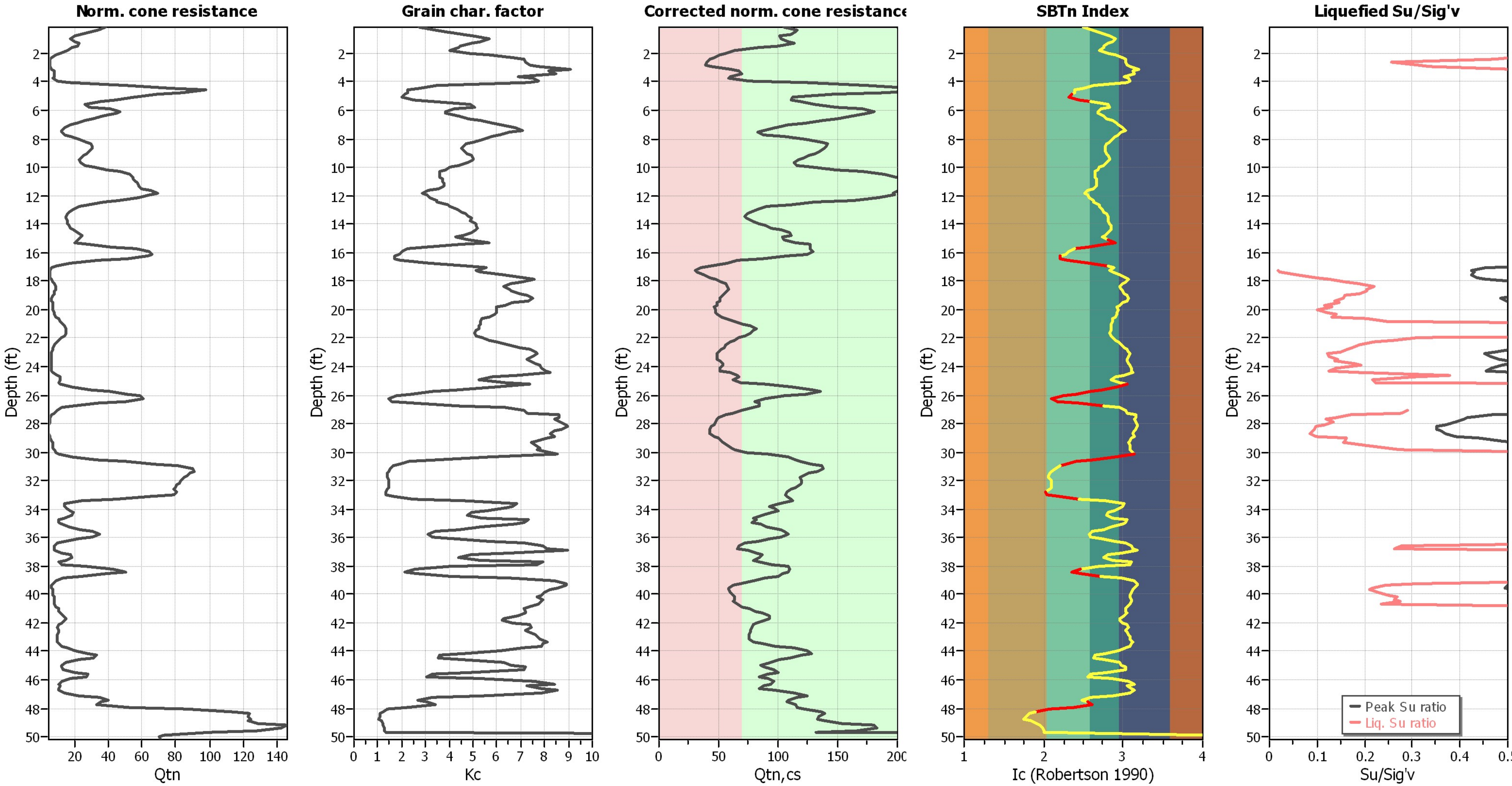
F.S. color scheme

- 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

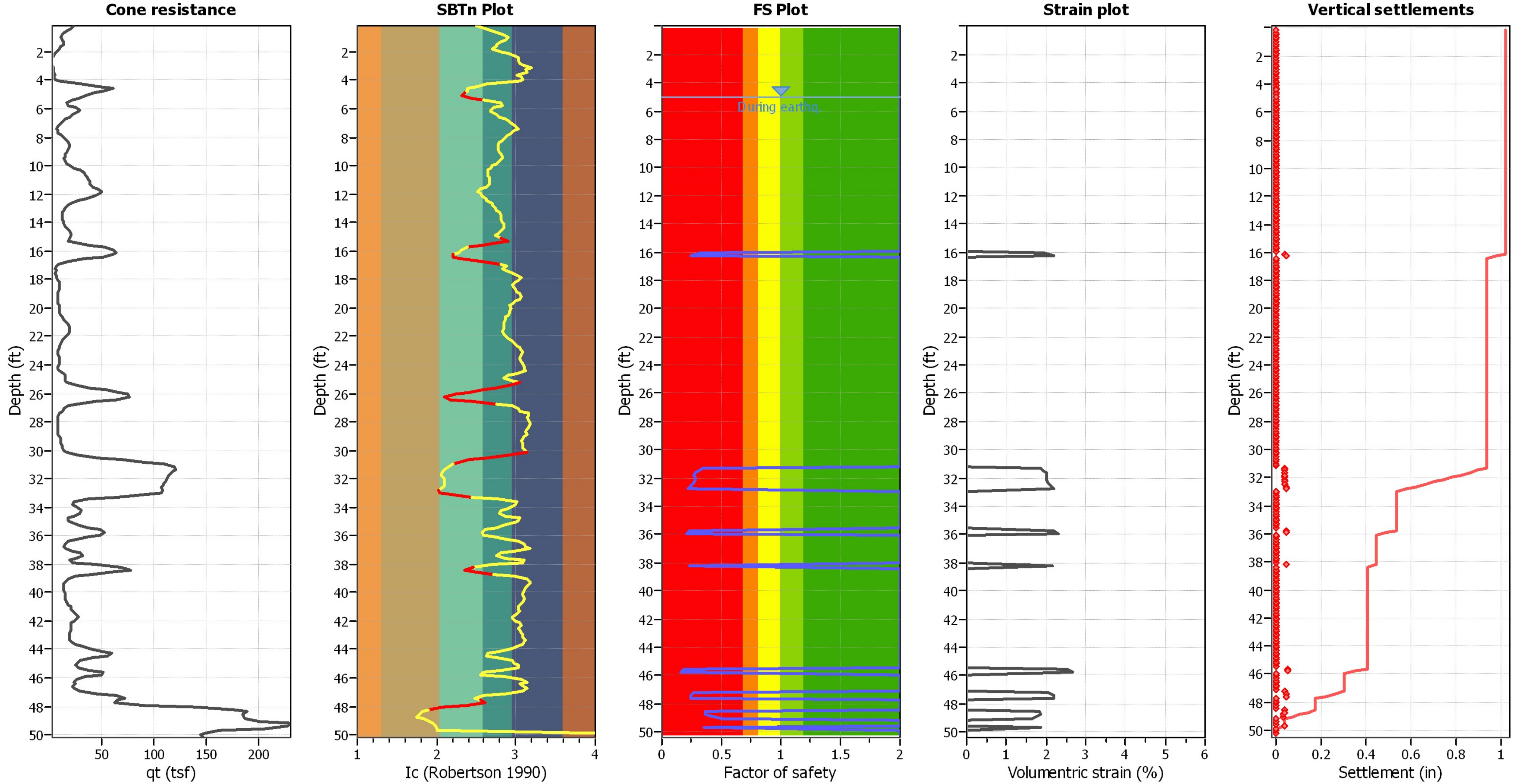
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 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:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.97	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	22.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Estimation of post-earthquake settlements

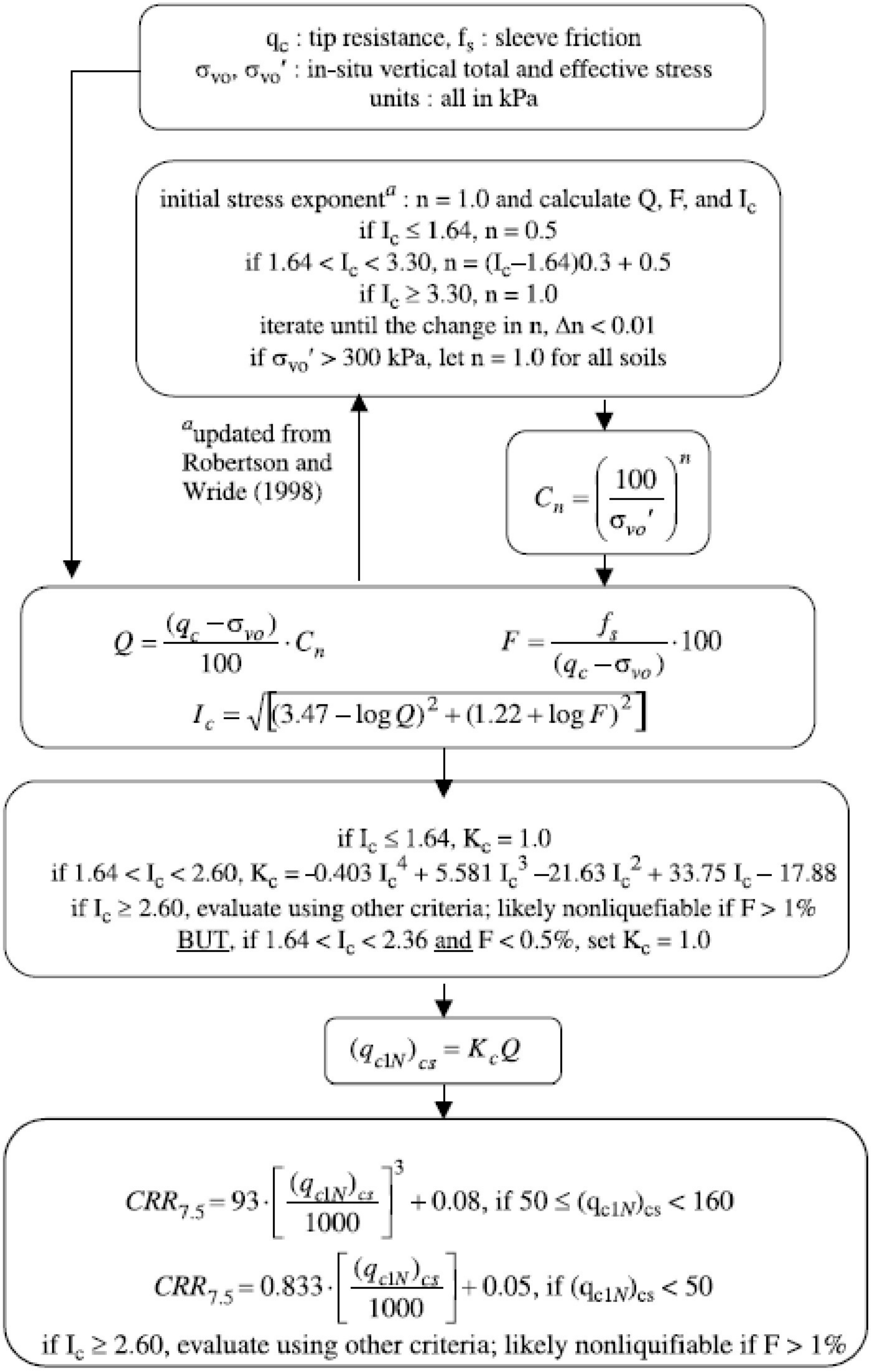


Abbreviations

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

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

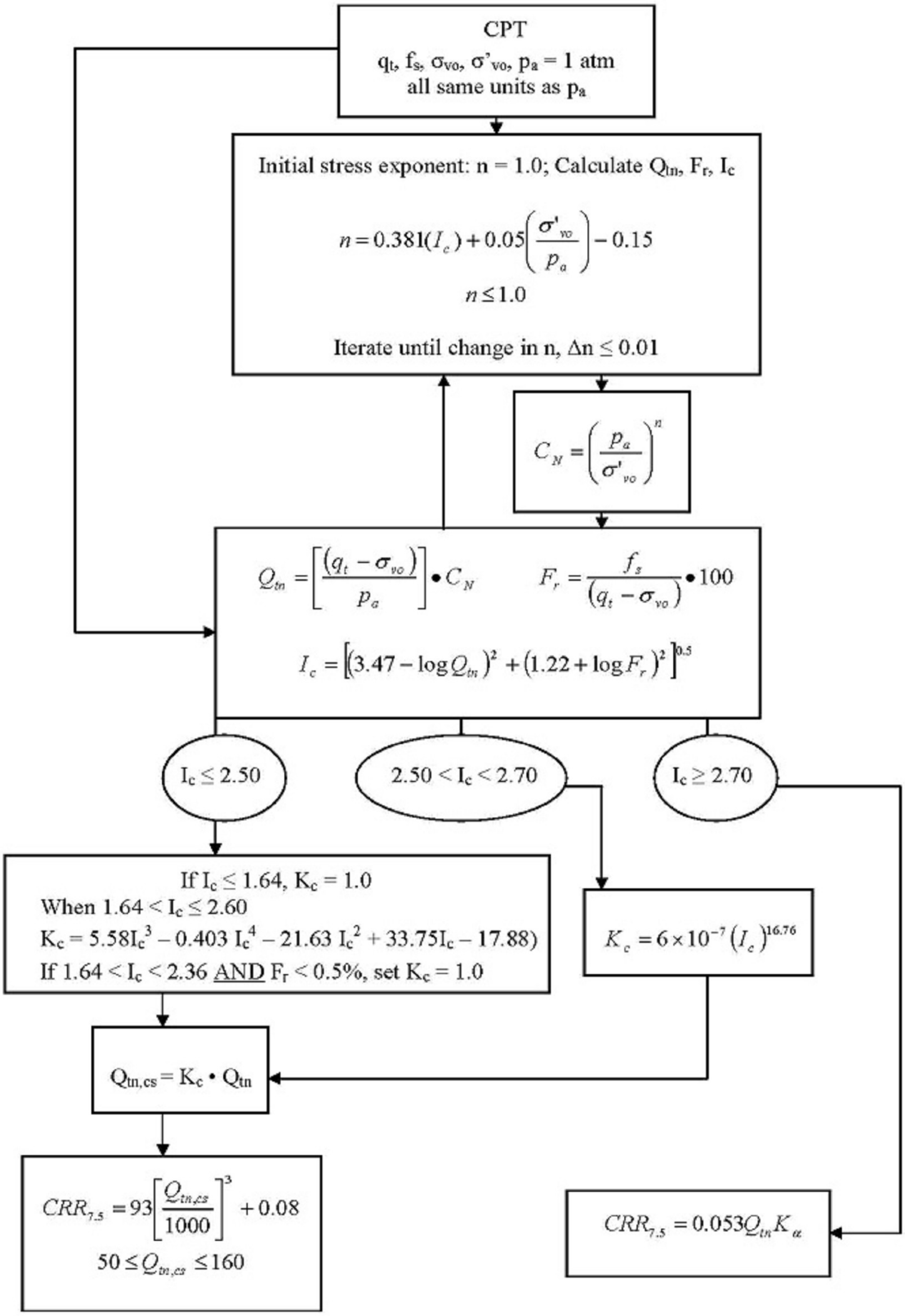
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of 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

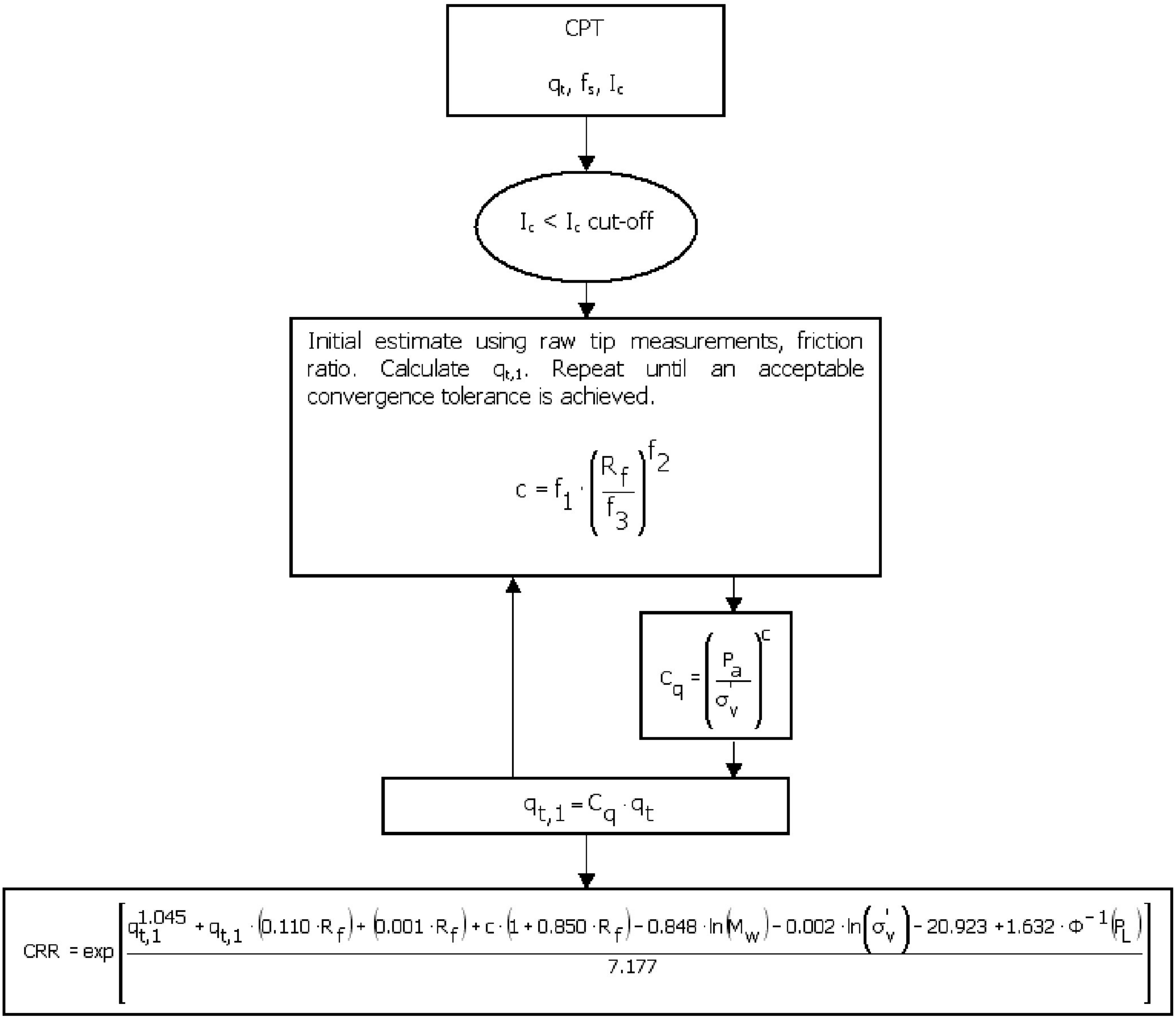
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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]:

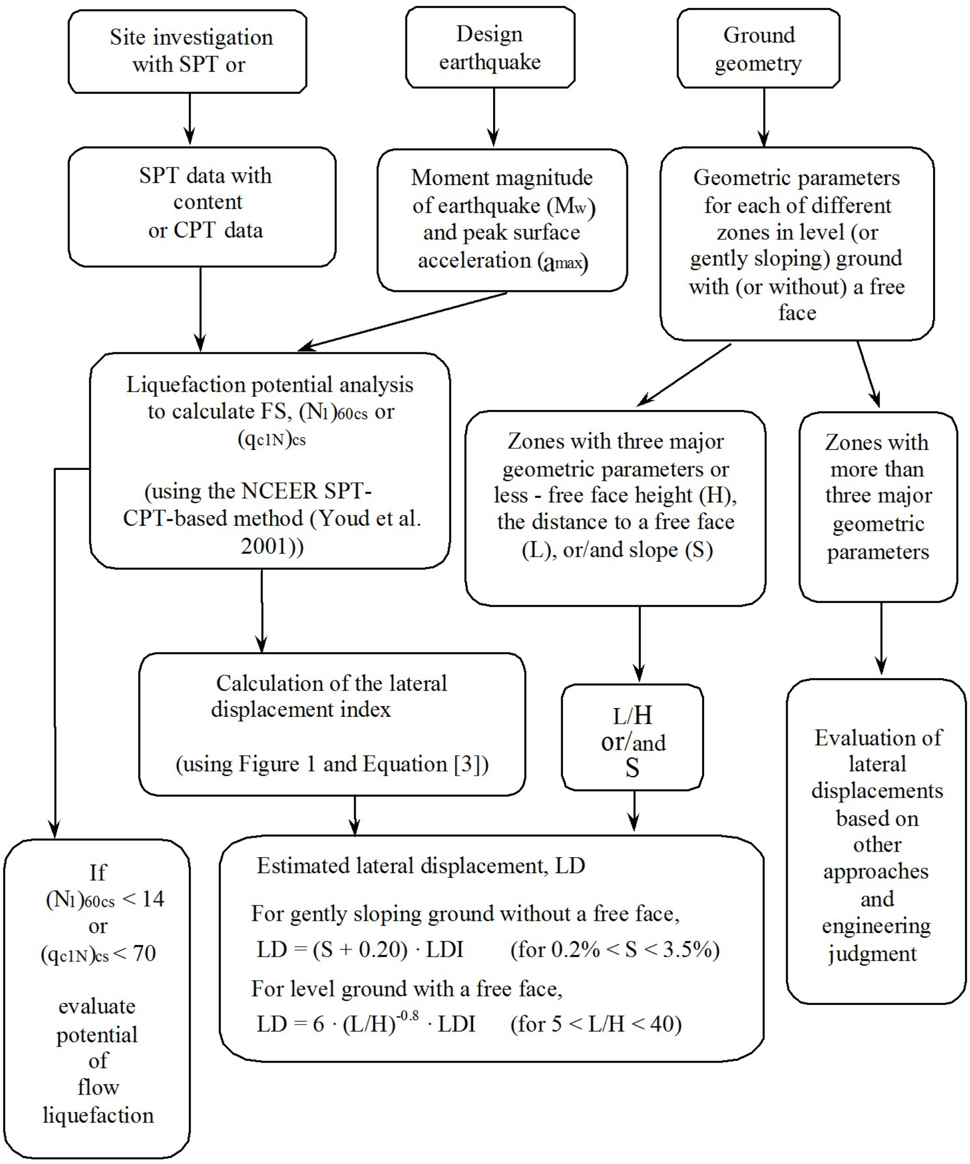


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

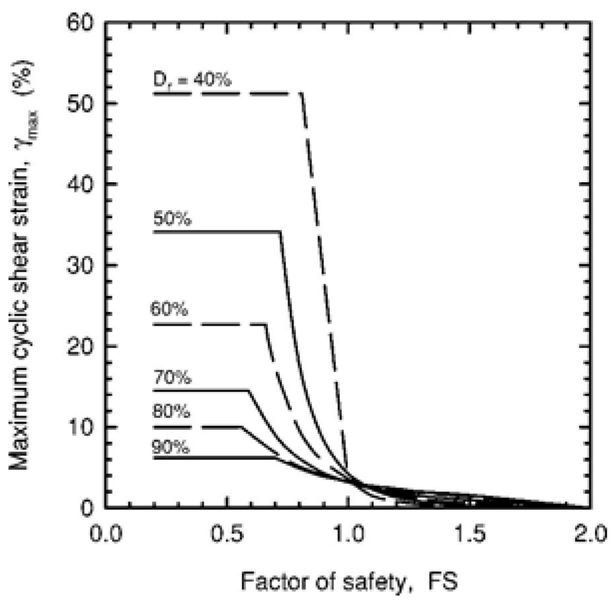
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



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}

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

↓

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))

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

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

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

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

↓

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

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

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

↓

Seismic settlement, s

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

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.

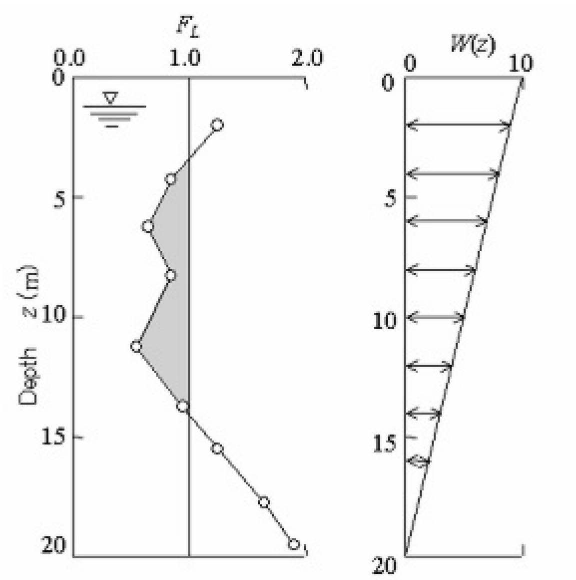
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

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

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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- Zhang, G., Robertson. P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180
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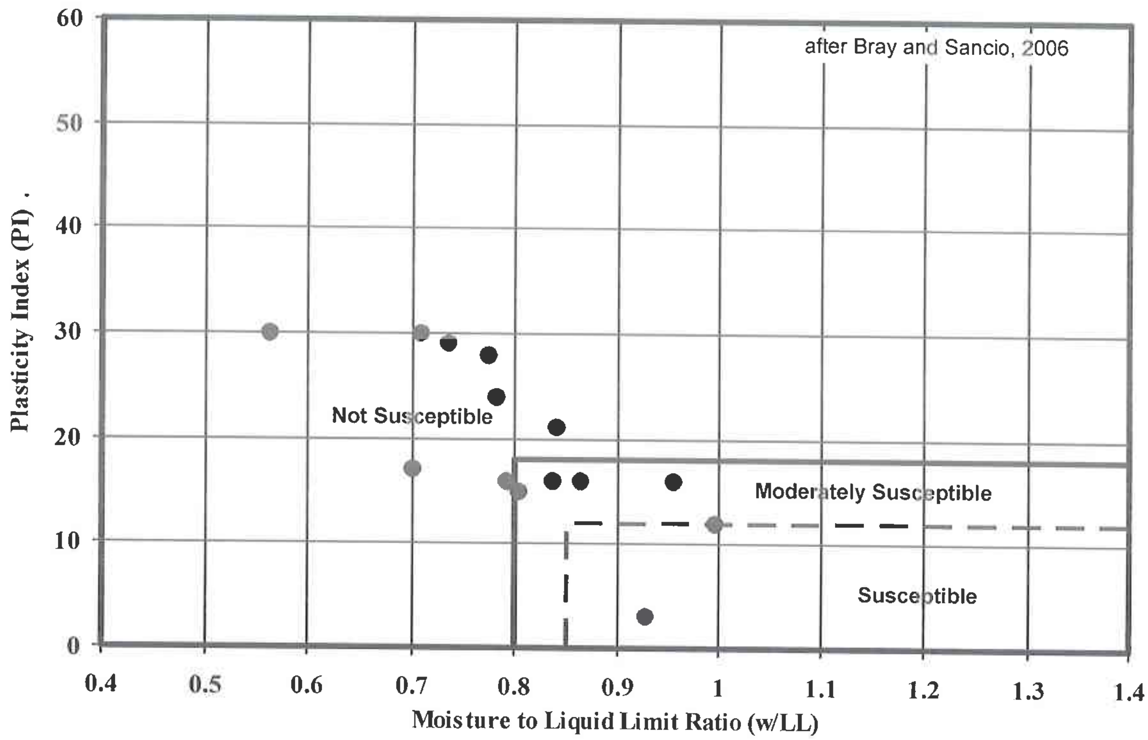
- P.K. Robertson, 2009, Interpretation of Cone Penetration Tests - a unified approach., Canadian Geotechnical Journal, Vol. 46, No. 11, pp 1337-1355
- P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake 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
- I. M. Idriss and R. W. Boulanger, Soil liquefaction during earthquakes, Earthquake Engineering Research Institute MNO-12

LIQUEFACTION SUSCEPTIBILITY OF FINE-GRAINED SOILS

LIQUEFACTION SUSCEPTIBILITY CHART



Excavation	Depth (ft)	Geology	Soil Description	LL	PI	Fines Class	w	w/LL	Est. Liq Catagory*
B01	5	Qal	lean CLAY with sand	47	30	CL	26.5	0.56	Not Susceptible
B01	15.5	Qal	sandy lean CLAY	45	30	CL	31.9	0.71	Not Susceptible
B01	25.5	Qal	lean CLAY with sand	45	28	CL	34.9	0.78	Not Susceptible
B02	10	Qal	sandy lean CLAY	30	16	CL	25.9	0.86	More Resistant
B02	20	Qal	clayey SAND	31	16	CL	29.6	0.95	More Resistant
B02	25	Qal	clayey SAND	27	12	CL	26.9	1.00	More Resistant
B02	30.5	Qal	sandy lean CLAY	37	21	CL	31.1	0.84	Not Susceptible
B02	40	Qal	lean CLAY with sand	44	24	CL	34.4	0.78	Not Susceptible
B02	45.5	Qal	sandy lean CLAY	35	16	CL	27.7	0.79	Not Susceptible
B03	10	Qal	sandy lean CLAY	33	17	CL	23.1	0.70	Not Susceptible
B03	15	Qal	clayey SAND	29	15	CL	23.3	0.80	More Resistant
B03	20	Qal	sandy lean CLAY	44	29	CL	32.4	0.74	Not Susceptible
B03	25	Qal	silty SAND	25	3	ML	23.2	0.93	Susceptible
B03	30	Qal	clayey SAND	30	16	CL	25.1	0.84	More Resistant

LL = Liquid Limit, PI = Plasticity Index, NP = Non-Plastic , w = Field Moisture

* Considers Methodology Proposed by Bray and Sancio (2006) for fine-grained soils:

Loose soils with PI < 12 and w/LL > 0.85 are considered susceptible to liquefaction

Loose soils with 12 < PI < 18 and w/LL > 0.8 are considered more resistant

Soils with PI > 18 at low effective confining stresses are considered not susceptible

Empirical Prediction of liquefaction-Induced Lateral Spread
(Kramer and Baska [2006] Method)

Ground Slope Inclination, S: 2.2 %
Moment Magnitude, Mw: 6.9
Horizontal Distance to Energy Source, R: 22 KM

R*: 25.2 KM

CPT	Layers (i)	Average SPT N1 (60)(i)	Average FC (%)(i)	FC Corr. Variable $\alpha(i)$	FC Corr. Variable $\beta(i)$	SPT (N1)60cs(i)	T* (M)(i)	T*gs	z(i)	Elev(i)	Sqrt DH	DH (M)	DH (FT)	DH (IN)
1	1	30.2	7.8	0.25	1.01	30.8	0.70	0.22	14.38	-29.4				
							Σ	0.22			0.275	0.076	0.25	3.0
2	1	19.5	32.1	4.83	1.17	27.7	0.20	0.11	3.43	8.1				
	2	17.5	23.3	4.10	1.10	23.4	0.50	0.27	9.93	-13.3				
	3	16.7	31.5	4.80	1.17	24.3	0.15	0.08	10.55	-15.3				
	4	16.0	30.3	4.73	1.16	23.2	0.10	0.05	13.63	-25.4				
							Σ	0.50			0.295	0.087	0.29	3.4
3	1	14.0	34.4	4.95	1.19	21.6	0.25	0.20	2.90	11.5				
	2	16.0	34.2	4.94	1.19	24.0	0.05	0.03	4.50	6.2				
	3	4.5	34.3	4.94	1.19	10.3	0.10	0.12	5.63	2.5				
	4	31.3	8.9	0.52	1.02	32.3	0.20	0.08	7.58	-3.9				
	5	23.6	16.0	2.76	1.05	27.7	0.55	0.25	9.35	-9.7				
	6	14.0	30.1	4.72	1.16	20.9	0.05	0.03	10.05	-12.0				
	7	13.0	34.4	4.95	1.19	20.5	0.10	0.06	10.53	-13.5				
	8	12.5	33.4	4.90	1.18	19.7	0.10	0.06	12.83	-21.1				
	9	12.0	33.2	4.89	1.18	19.1	0.10	0.06	13.03	-21.7				
	10	31.3	6.7	0.08	1.01	31.6	0.35	0.10	14.55	-26.7				
							Σ	0.99			0.327	0.107	0.35	4.2
4	1	13.5	34.2	4.94	1.19	21.0	0.10	0.07	4.73	6.7				
	2	23.5	17.3	3.09	1.06	28.0	0.65	0.28	9.45	-8.8				
	3	11.0	30.2	4.72	1.16	17.4	0.10	0.07	11.23	-14.6				
	4	28.3	13.1	1.94	1.04	31.3	0.20	0.06	15.05	-27.2				
							Σ	0.48			0.294	0.086	0.28	3.4
5	1	23.3	15.5	2.62	1.05	27.1	0.30	0.13	9.83	-9.4				
	2	12.5	34.5	4.95	1.19	19.9	0.10	0.06	10.93	-13.0				
	3	16.0	28.7	4.62	1.14	22.9	0.05	0.03	11.65	-15.4				
	4	11.0	34.1	4.93	1.19	18.0	0.10	0.06	13.93	-22.9				
	5	14.0	32.8	4.87	1.18	21.4	0.15	0.07	14.45	-24.6				
	6	30.5	9.8	0.81	1.02	31.9	0.10	0.03	14.93	-26.2				
							Σ	0.39			0.287	0.082	0.27	3.2

Empirical Prediction of liquefaction-Induced Lateral Spread
(Youd Method)

SITE INPUT:

Earthquake Magnitude:	M=	6.9	
Hor. Distance to Nearest Seismic Energy Source:	R=	22	km
Free Face Ratio (100 x H/L):	W=	0	%

EXPLORATION INPUT:

Thickness of Saturated Layers with $N_{1(60)}$ < 15: T_{15}

Average $N_{1(60)}$ in T_{15}: $N_{1(60)}$

Average Fines Content in T_{15}: Fc_{15}

Average D_{50} in T_{15}: $D50_{15}$

RESULTS:

R*: 25.16957

			Averages (from CPT correlations)			Free-Face	Sloping	
Exploration Designation	Ground Slope (%)	T_{15} (ft)	$N_{1(60)}$ (bpf)	Fc_{15} (%)	D50 (mm)	D_H (ft)	D_H (ft)	
CPT1	2.2	0.66	13	20.5	0.102		0.3	Violates T15
CPT2	2.2	0.82	10.4	29.7	0.021		0.3	Violates T15
CPT3	2.2	1.15	8.8	26.3	0.06		0.3	Violates T15
CPT4	2.2	0.98	9.8	25.1	0.069		0.3	Violates T15
CPT5	2.2	1.31	11.3	18.4	0.102		0.4	Violates T15

References:

Bartlett, S.F., and Youd, T.L. (1995), "Empirical Prediction of Liquefaction-Induced Lateral Spread." J. Geotech. Engrg., ASCE, 121(4), 316-329.

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APPENDIX E

TYPICAL DETAILS

Preliminary Geotechnical Investigation,
Proposed Library,
23555 Civic Center Way,
City of Malibu, California

W.O. 9279
June 20, 2012
Revised December 18, 2013

RETAINING WALL
BACKDRAIN & BACKFILL

Native or Import soil - USCS Class GC, GM, SM**** with EI < 20 or SE> 20 **

Upper 1 foot of backfill (level backslope) or backfill in sloping area should contain sufficient fines to provide adequate surficial slope stability and retard water infiltration.

Backfill should be compacted to a minimum of 90% relative compaction.

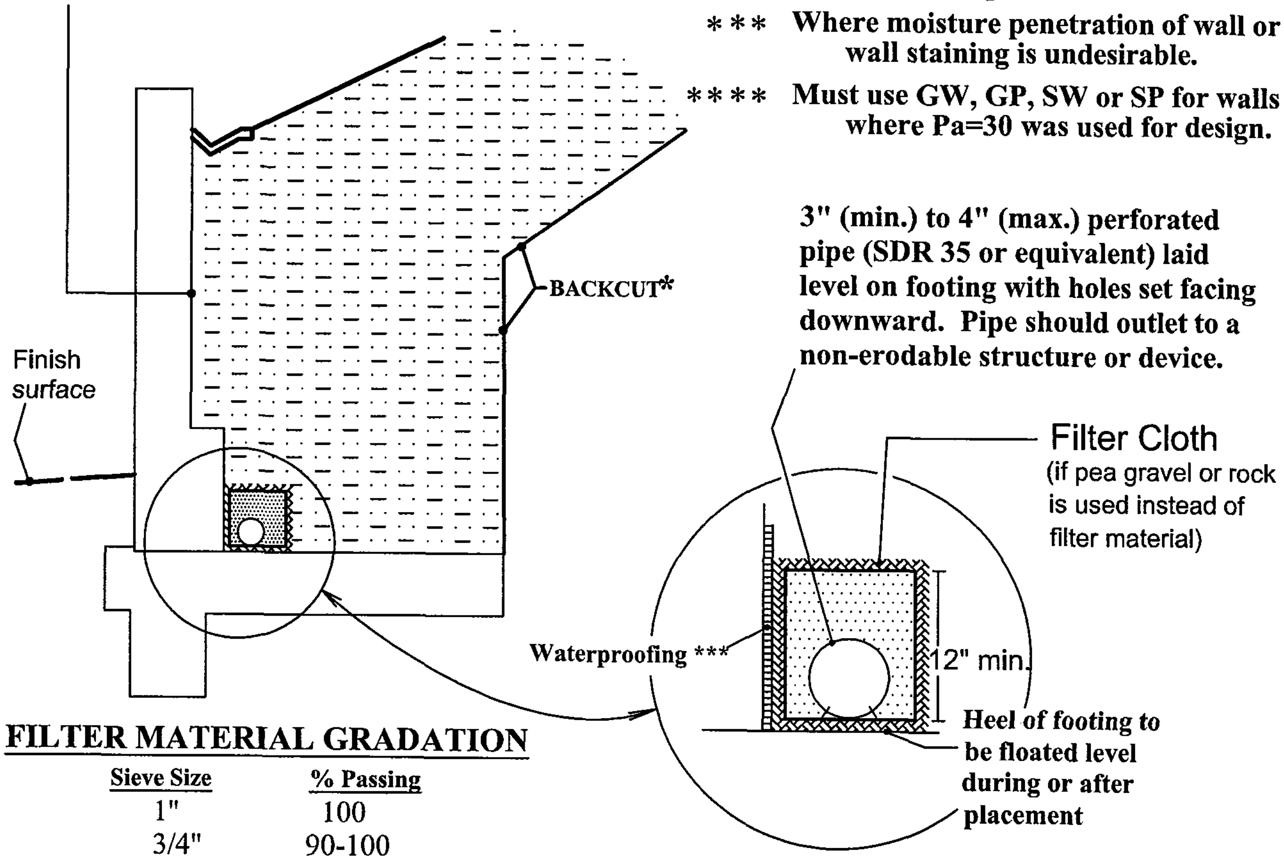
FILTER MATERIAL (see gradation), pea gravel or rock - Geotextile should be used to separate pea gravel or rock from backcut and backfill.

* All backcuts shall be in accordance with OSHA standards.

** EI 21-30 may be used if placed at 2% over optimum

*** Where moisture penetration of wall or wall staining is undesirable.

**** Must use GW, GP, SW or SP for walls where Pa=30 was used for design.



FILTER MATERIAL GRADATION

Sieve Size	% Passing
1"	100
3/4"	90-100
3/8"	40-100
#4	24-50
#8	15-35
#30	5-15
#50	0-7
#200	0-2

Geolabs - Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE ______ BY ______
SCALE N.T.S. W.O. ______

PLATE RW1a

Ret Wall Group 1or2.dwg

March 2012

RETAINING WALL BACKDRAIN & BACKFILL

Native or Import soil - USCS Class SC, CL-ML or CL
EI < 20 or SE> 20 **

Upper 1 foot of backfill (level backslope) or backfill in sloping area should contain sufficient fines to provide adequate surficial slope stability and retard water infiltration.

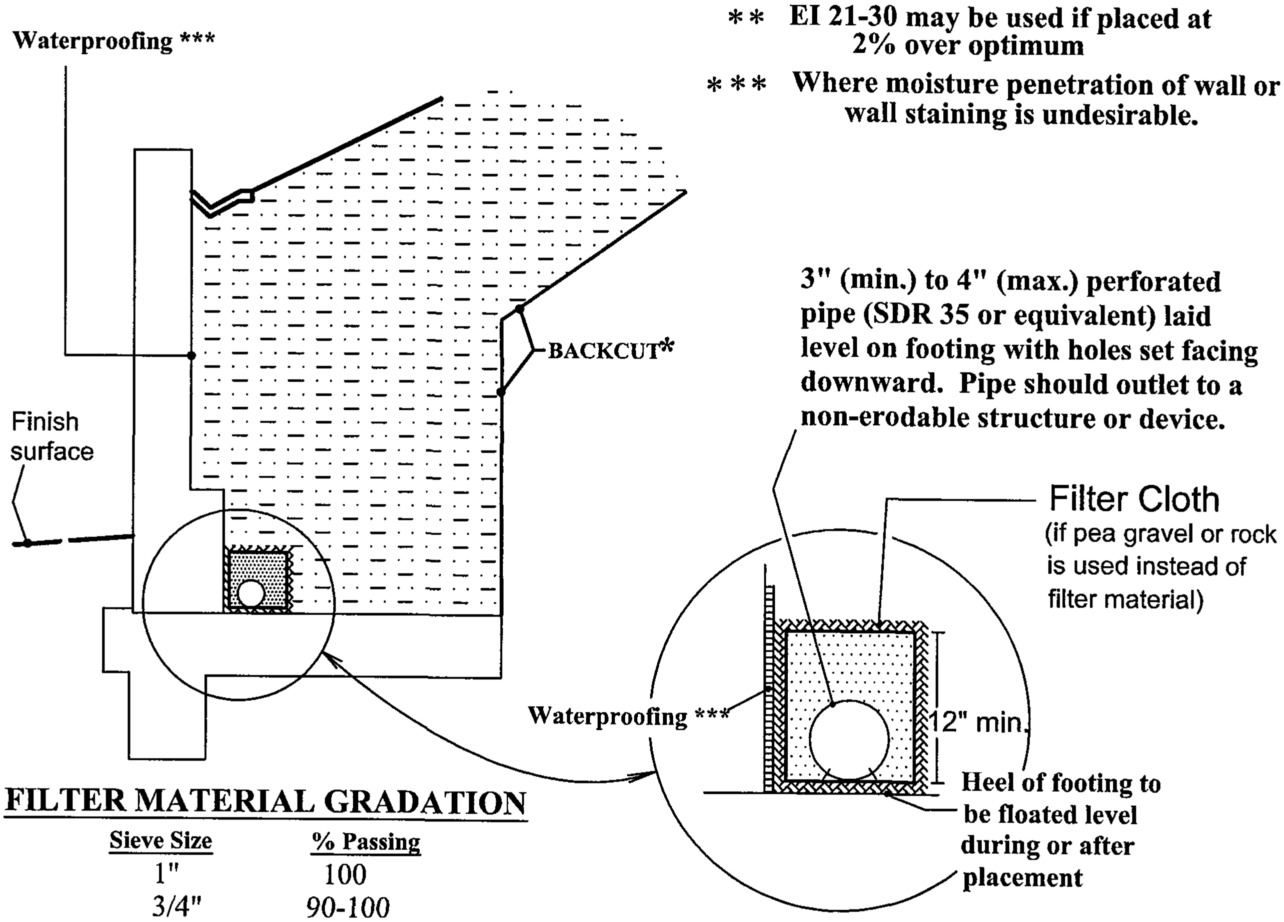
Backfill should be compacted to a minimum of 90% relative compaction.

FILTER MATERIAL (see gradation), pea gravel or rock - Geotextile should be used to separate pea gravel or rock from backcut and backfill.

* All backcuts shall be in accordance with OSHA standards.

** EI 21-30 may be used if placed at 2% over optimum

*** Where moisture penetration of wall or wall staining is undesirable.



FILTER MATERIAL GRADATION

Sieve Size	% Passing
1"	100
3/4"	90-100
3/8"	40-100
#4	24-50
#8	15-35
#30	5-15
#50	0-7
#200	0-2

Geolabs - Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE ______ BY ______
SCALE N.T.S. W.O. ______

PLATE RW1b

Ret Wall Group 4.dwg

March 2012

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
31119 Via Colinas, Suite 502 • Westlake Village, CA 91362
Voice: (818) 889-2562 (805) 495-2197
Fax: (818) 889-2995 (805) 379-2603
a dba of
R & R Services
Corporation

July 22, 2014
W.O. 9279

Santa Monica College
1900 Pico Boulevard
Santa Monica, California 90405-1628

Subject: Response to Second Geotechnical Review Sheet,
Proposed Malibu Campus,
23555 Civic Center Way,
City of Malibu, California

Gentlemen:

In accordance with your request, our firm has prepared this response to the Geotechnical Review Sheet prepared by Fugro Consultants, Inc., dated June 12, 2014 for the City of Malibu. The reviewer has prepared review comments requiring responses. This document presents our responses to the review sheet. A copy of the review sheet is attached to this document for the reader's convenience.

REVIEW COMMENT #1:

The Consultant states that the Civic Center gravels were estimated to be 15,000 to 20,000 years old. What is the basis for that age range? Were materials found within the gravels that were dated?

RESPONSE:

The March 18, 1994 report by Leighton and Associates prepared for planning purposes in the Civic Center Area focused, in large part, on the impacts of faulting within the planning area. A primary consideration in their conclusion that active faulting was not a constraint in the Civic Center planning area was a previous 1989 GeoSoils report that utilized CPT data to show continuous, unbroken sequences of alluvial deposits underlying the Civic Center study area (including the site of the Santa Monica Community College Malibu Campus improvements). According to the Leighton report, Geosoils obtained radiocarbon dates on the Civic Center Gravels in the 15,000 to 20,000 year range. We contacted Mr. Rudy Ruberti (GeoSoils) for additional details, however he was unable to recover a copy of the 1989 report, but he stated that he did find a receipt from Beta-Analytical (an age-dating laboratory) in the job file.

Additional detailed studies by Earth Consultants International in 1999 and 2003 included some reinterpretation of the GeoSoils 1989 study and a review of local uplift rates postulated by other workers and concluded that the top of the Civic Center Gravels may indeed have been deposited as early as 60,000 years ago (somewhat older than that postulated by GeoSoils). ECI also concluded that faulting does not affect Holocene sediments beneath the site, suggesting that faulting is inactive or not located beneath the Civic Center site. The ECI reports were subsequently reviewed and approved by the City.

In light of the foregoing, it is our opinion that the potential for surface rupture due to faulting on the Santa Monica Community College Campus Improvements site is low.

REVIEW COMMENT #2:

Please clearly depict the proposed development footprint on Cross Section A. Additional comments may be raised regarding the Civic Center Gravels and the siting of the proposed development.

RESPONSE:

The proposed development footprint has been printed on the attached Cross-Section A at reduced scale to illustrate its position on the full scale sections provided in the reviewed report.

BUILDING PLAN-CHECK STAGE REVIEW COMMENTS

BUILDING PLAN-CHECK COMMENT #1:

The following note must appear on the grading and foundation plans: "Testing shall be performed prior to pouring footings and slabs to evaluate the Weighted Plasticity and the Expansion Index of the supporting soils, and foundation and slab plans should be reviewed by the Civil and Structural Engineer and revised, if necessary."

RESPONSE:

Acknowledged.

BUILDING PLAN-CHECK COMMENT #2:

Section 7.2.1 of the City's geotechnical guidelines requires a minimum thickness of 10 mils for vapor barriers beneath slabs-on-grade. Building plans shall reflect this requirement.

RESPONSE:

The recommendations of the reviewed geotechnical report also refer to a minimum thickness of 10 mils for the vapor barrier beneath the slab-on-grade. We concur with the reviewer.

BUILDING PLAN-CHECK COMMENT #3:

Please depict the limits and depths of over-excavation and structural fill to be placed on the grading plan, and cross-sectional view of the proposed building area.

RESPONSE:

We defer this item to the project civil engineer. The grading plans should be provided to our office for geotechnical review.

BUILDING PLAN-CHECK COMMENT #4:

Show the area and depth of the (existing) basement backfill on the grading plans.

RESPONSE:

We defer this item to the project civil engineer.

BUILDING PLAN-CHECK COMMENT #5:

The Consultant's recommendations to perform post-production CPT-soundings to evaluate the liquefaction potential of the improved soil shall be included as notes on the grading and building plans.

RESPONSE:

We defer this item to the project civil engineer.

BUILDING PLAN-CHECK COMMENT #6:

An agreement must be prepared by the property owners and City of Malibu that provides the procedures and methodologies for the post-production CPT-soundings recommended by the Project Geotechnical Consultant. Please submit the agreement to the City prior to permit issuance.

RESPONSE:

Acknowledged.

BUILDING PLAN-CHECK COMMENT #7:

Two sets of final grading, retaining wall, OWTS, stone column, and educational facility plans (APPROVED BY BUILDING AND SAFETY) incorporating the Project Geotechnical Consultant's recommendations and items in this review sheet must be reviewed and wet stamped and manually signed by the Project Engineering Geologist and Project Geotechnical/Civil Engineer.

City geotechnical staff will review the plans for conformance with the Project Geotechnical Consultant's recommendations and items in this review sheet over the counter at City Hall. Appointments for final review and approval of the plans may be made by calling or emailing City Geotechnical Staff.

RESPONSE:

Acknowledged.

CLOSURE

This geotechnical report has been prepared in accordance with generally accepted engineering practices at this time and location. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report. All previous recommendations from the 2013 geotechnical report that are not addressed in this report, remain applicable

Thank you for this opportunity to be of service. Please do not hesitate to call if you have any questions regarding this report.

Respectfully submitted,
GEOLABS-WESTLAKE VILLAGE

Lawrence K. Stark
G.E. 2772

REGISTERED PROFESSIONAL ENGINEER
LAWRENCE K. STARK
No. 2772
GEOTECHNICAL
STATE OF CALIFORNIA

Charles A. Swift
C.E.G. 948

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RONALD Z. SHMERLING
No. 35444
CIVIL
STATE OF CALIFORNIA

ENCLOSURE LIST:

Reference List	Plate R1-R6
Revised Cross-Section A	Plate 1
City of Malibu Review Letter	Appendix A

XC: (3) Addressee c/o Mr. Lee Paul
(1) M2 Strategic, Attn: Mr. Masoud Mahmoud
(2) City of Malibu, Attn: Mr. Christopher Dean (Via M2 Strategic)

REFERENCE LIST:

Project References:

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AERIAL PHOTOGRAPHS

Fairchild Collection, Flight C300, (1928), Frames J55 and J56, black and white

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Flight IMC392, (1964), Frames 1-13-254, 1-13-255, 1-13-256, black and white

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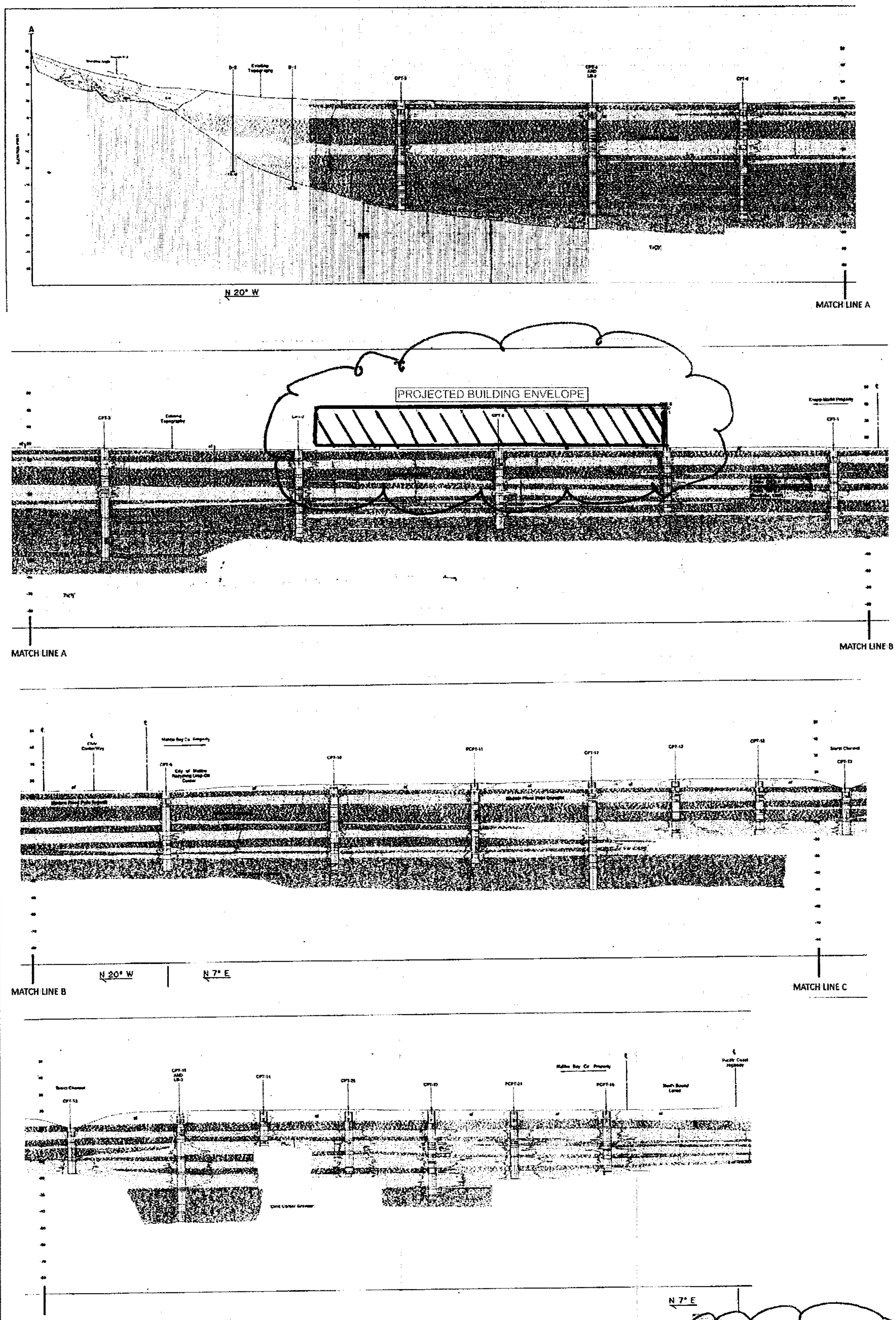

FROM: LEIGHTON AND ASSOCIATES (1994)

REVISED JULY 17, 2014

LEIGHTON AND ASSOCIATES CROSS SECTION A-A'

GeoLabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING
DATE 5/22/14
W.O. 9279

PLATE 1

Appendix A

City of Malibu Review Letter

July 22, 2014

W.O. 9279

City of Malibu

23825 Stuart Ranch Road • Malibu, California 90265-4861
(310) 456-2489 • Fax (310) 317-1950 • www.malibucity.org

GEOTECHNICAL REVIEW SHEET

Project Information

Date:	June 12, 2014	**Review Log #:**	**3558**
Site Address:	23525 Civic Center Way		
Lot/Tract/PM #:		**Planning #:**	**CDP 13-056** **CUP 13-011**
Applicant/Contact:	Masoud Mahmoud, masoud@m2strategic.com	**BPC/GPC #:**	
Contact Phone #:	310-434-4203 **Fax#:**	**Planner:**	**Bonnie Blue**
Project Type:	Santa Monica Community College Malibu Campus Improvements		

Submittal Information

Consultant(s) / Report Date(s):
(Current submittal(s) in Bold.)

GeoLabs Westlake Village (Stark, RGE 2772; Shmerling, CEG 1047): **5-22-14**, 6-20-12 (revised 12-18-13)

Grading plans prepared by kpff Consulting Engineers dated August 15, 2013, five sheets.
Building plans prepared by Quatro Design Group dated October 11, 2013.

Previous Reviews: 1-17-14, Geotechnical Review Referral Sheet dated 11-19-13

Review Findings

Coastal Development Permit Review

☐ The Santa Monica Community College project is **APPROVED** from a geotechnical perspective.

☒ The Santa Monica Community College project is **NOT APPROVED** from a geotechnical perspective. The listed 'Review Comments' shall be addressed prior to approval of the OWTS.

Building Plan-Check Stage Review

☒ Awaiting Building plan check submittal. Please respond to the listed 'Building Plan-Check Stage Review Comments' AND review and incorporate the attached 'Geotechnical Notes for Building Plan Check' into the plans.

☐ **APPROVED** from a geotechnical perspective. Please review the attached 'Geotechnical Notes for Building Plan Check' and incorporate into Building Plan-Check submittals.

☐ **NOT APPROVED** from a geotechnical perspective. Please respond to the listed 'Building Plan-Check Stage Review Comments' AND review and incorporate the attached 'Geotechnical Notes for Building Plan Check' into the plans.

Remarks

The referenced response report was reviewed by the City from a geotechnical perspective. Based on the submitted information and a site reconnaissance, the project comprises the demolition and removal of an existing sheriff's department, exterior arcade structure, communication tower, and a portion of the existing hardscape, landscape, and paved parking area. The improvements for the Malibu Campus of Santa Monica Community College include the construction of a new 25,600 square foot 2-story educational facility with an interpretive center, art studio, computer classroom, multi-purpose physical activity space, lecture hall, science lab, and sheriff's substation. New landscaping, hardscape and paved parking are proposed, as well as a new 75' communication tower.

Grading consists of 14,000 yards of R & R; 4,000 yards of fill under structure; 3,000 yards of cut and 1,500 yards of fill non-exempt; and 2,500 yards of import).

Ground improvements consisting of the installation of stone columns will be utilized to reduce the potential for liquefaction across the site.

The proposed development will be connected to the City's wastewater treatment plant. No onsite wastewater treatment system is proposed as part of this project.

NOTICE: Applicants shall be required to submit all Geotechnical reports for this project as searchable PDF files on a CD. At the time of Building Plan Check application, the Consultant must provide searchable PDF files on a CD to the Building Department for ALL previously submitted reports that have been reviewed by City Geotechnical Staff.

Review Comments:

1. The Consultant states that the Civic Center gravels were estimated to be 15,000 to 20,000 years old. What is the basis for that age range? Were materials found within the gravels that were dated?
2. Please clearly depict the proposed development footprint on Cross-Section A. Additional comments may be raised regarding the Civic Center Gravels and the siting of the proposed development.

Building Plan-Check Stage Review Comments:

1. The following note must appear on the grading and foundation plans: "Tests shall be performed prior to *pouring footings and slabs to evaluate the Weighted Plasticity and the Expansion Index of the supporting soils, and foundation and slab plans should be reviewed by the Civil or Structural Engineer and revised, if necessary.*"
2. Section 7.2.1 of the City's geotechnical guidelines requires a minimum thickness of 10 mils for vapor barriers beneath slabs-on-grade. Building plans shall reflect this requirement.
3. Please depict limits and depths of over-excavation and structural fill to be placed on the grading plan, and cross-sectional view of the proposed building area.
4. Show the area and depth of the (existing) basement backfill on the grading plans.
5. The Consultant's recommendations to perform post-production CPT-soundings to evaluate the liquefaction potential of the improved soil shall be included as notes on the grading and building plans.
6. An agreement must be prepared by the property owners and City of Malibu that provides the procedures and methodologies for the post-production CPT-soundings recommended by the Project Geotechnical Consultant. Please submit the agreement to the City prior to permit issuance.
7. Two sets of final grading, retaining wall, OWTS, stone column, and educational facility plans **(APPROVED BY BUILDING AND SAFETY)** incorporating the Project Geotechnical Consultant's recommendations and items in this review sheet must be **reviewed and wet stamped and manually signed by the Project Engineering Geologist and Project Geotechnical/Civil Engineer.** City geotechnical staff will review the plans for conformance with the Project Geotechnical Consultants' recommendations and items in this review sheet over the counter at City Hall. **Appointments for final review and approval of the plans may be made by calling or emailing City Geotechnical staff.**

Please direct questions regarding this review sheet to City Geotechnical staff listed below.

Engineering Geology Review by: 6/12/14

Christopher Dean, C.E.G. #1751, Exp. 9-30-14 Date
Engineering Geology Reviewer (310-456-2489, x306)
Email: cdean@malibucity.org

Geotechnical Engineering Review by: *June 12, 2014*

Kenneth Clements, G. E. # 2010, Exp. 6-30-14 Date
Geotechnical Engineering Reviewer (805-563-8909)
Email:kclements@fugro.com

This review sheet was prepared by City Geotechnical Staff contracted with Fugro as an agent of the City of Malibu.

FUGRO CONSULTANTS, INC.
4820 McGrath Street, Suite 100
Ventura, California 93003-7778
(805) 650-7000 (*Ventura office*)
(310) 456-2489, x306 (*City of Malibu*)