Appendix H

LAX NORTHSIDE PLAN UPDATE

Geotechnical Report

May 2014

Prepared for:

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Preliminary Geotechnical Assessment
LAX Northside Plan Update Project
Tentative Tract Map No. 72148
Los Angeles, California

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Prepared for

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March 8, 2013

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March 8, 2013

Ms. Veronica Siranosian
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**SUBJECT: PRELIMINARY GEOTECHNICAL ASSESSMENT
LAX NORTHSIDE PLAN UPDATE PROJECT
TENTATIVE TRACT MAP No. 72148
LOS ANGELES, CALIFORNIA**

Dear Ms. Siranosian:

As requested, our preliminary geotechnical assessment report for the Los Angeles International Airport (LAX) Northside Plan Update Project in Los Angeles, California, is attached for your reference. The geologic and geotechnical conditions that are expected to influence the site development are described, and general design parameters and specifications for site grading, foundation design, and other improvements. The results of our preliminary assessment indicate the proposed development is feasible from a geotechnical and geologic perspective. The recommendations contained in the attached report are generalized with the intended purpose of providing preliminary information for planning and design considerations. Project-specific geotechnical evaluation will be needed for future development and construction.

If you should have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Sincerely,
GEOKINETICS, INC.

Glenn D. Tofani, GE/RCE
Principal Engineer

attachment

Table of Contents

Section ***Page***

References

Figures

Tables

Attachments

1.0 INTRODUCTION

GeoKinetics has performed a preliminary geotechnical assessment to provide information on geologic and geotechnical site conditions, and generalized recommendations and preliminary design parameters for the proposed Los Angeles International Airport (LAX) Northside Plan Update Project in Los Angeles, California. The proposed project is a part of the LAX Specific Plan, with the proposed site re-development being submitted as Vesting Tentative Tract Map No. 72148. The site location is shown in Figure 1, with the various defined areas of the project provided in Figure 2. As illustrated in these figures, the approximately 338.5-acre site encompasses the area bound by 91st Street, Manchester Avenue and 88th Street to the north; Sepulveda Westway and Sepulveda Boulevard to the east; LAX to the south; and Pershing Drive to the west. The majority of the site is presently vacant, with scattered developed improvements including a fire station, childcare facility, golf course, and airport support facilities. Major streets traversing through the site include Pacific Coast Highway and Westchester Parkway. PDF copies of the site photographs that were taken in conjunction with our investigation are included on the compact disk (CD) that is attached to the rear cover of this report.

The proposed site re-development, as illustrated on Figure 2, is divided into areas designated for Recreation (Area 12B), Office and Research and Development Use (Areas 1, 2 and 3), Airport Support (Areas 4 through 10), Mixed Use (Areas 11 and 12A East), and Community and Civic Use (Areas 12A West, 13 and the central portion of Area 2). A buffer zone will be provided between existing neighborhoods and the north side of Area 2. Review of the conceptual rough grading plan for Vesting TTM 72148, prepared by VTN West, Inc., indicates grade modifications will include cut/fill of gently sloping terrain to create building pads, and construction of graded slopes. The maximum cut and fill depths, based upon this grading plan, are estimated to be on the order of 15 feet and 5 feet, respectively.

The primary purpose of the current study is to evaluate and characterize the site geologic and geotechnical conditions that may affect the planned improvements, and to provide generalized recommendations and design parameters for the proposed re-development. Only limited exploration and testing of the near-surface soils were performed for this evaluation. Additional subsurface exploration, sampling, and testing will be needed once more detailed grading and building plans have been prepared for the site.

2.0 SCOPE OF SERVICES

Our scope of services for the preliminary geotechnical assessment included the following specific tasks:

- Research and review of readily available pertinent geologic maps, geotechnical reports on file at the City of Los Angeles, aerial photographs, and other historical records pertaining to the site;
- Cursory review of the Vesting Tentative Tract Map for the re-development;
- Reconnaissance of the site, marking of subsurface exploration locations, and notification of Underground Service Alert for delineation of underground utilities;
- The completion of ten (10) Cone Penetrometer Tests (CPTs) to a maximum depth of 50 feet;
- The excavation and sampling of four (4) borings up to a maximum depth of 55.5 feet using truck mounted hollow-stem auger drilling equipment;
- Laboratory analysis of representative soil samples collected from the exploratory borings to ascertain soil engineering parameters;
- Development of a representative cross section depicting the stratigraphic conditions that have been identified based upon the site assessment activities performed to date;
- The completion of a probabilistic seismic analysis for the site to estimate the potential intensity of ground shaking that could be caused by the "design" seismic event and to provide preliminary seismic design parameters for the proposed improvements;
- The completion of site-specific dynamic settlement and soil liquefaction potential assessments;
- Engineering analysis and the preparation of preliminary geotechnical design and construction parameters for the project; and
- The preparation of this report describing the geotechnical assessment activities and presenting the associated conclusions, recommendations, and preliminary design parameters.

The results of these tasks are discussed in the following sections of this report.

3.0 PAST SITE USAGE

Review of historic aerial photographs (1928 to present) and topographic maps (1896 to present) covering the site vicinity (Ref. 17) indicates that the subject study area was essentially vacant land in the early 1900's and remained mostly undeveloped into the early 1950's, with the exception of the eastern end of the site (i.e. Areas 9, 10, 11, 12A, and the east portion of 12B shown in Figure 2). These areas were developed with residential neighborhoods by the early 1950's. Residential development of the central portion of the site (i.e. Areas 2, 3, the eastern portion of Area 4, and Area 5) occurred during the early 1950's. By 1980, Areas 2 through 5, and 9 through 12 had been cleared of homes with only remnant street pavement remaining.

The existing non-residential structures within the far western portion of Area 1 were constructed circa 1954, and former structures/improvements associated with a Nike Missile testing site were located within the southwest portion of Area 1 and the west portion of Area 4. The Nike Missile site was demolished and is currently bisected by Westchester Parkway, which was completed in 1993. The original structures within Area 13 were constructed in 1957. The existing golf course within Area 12B, and the vacant land within Areas 7 and 8 have been used in that capacity since at least 1986, based upon review of readily available information.

4.0 BACKGROUND REVIEW

As a part of our work, we performed a document search at the City of Los Angeles Department of Building & Safety (LADBS) Records Section for grading plans and geotechnical reports issued for the numerous land parcels comprising the project area. A list of the various parcel numbers and site addresses researched are provided in Table 1. LADBS does not have any grading or geotechnical records on file for the residential neighborhoods previously constructed in Areas 2 through 5, and 9 through 12. Two geotechnical reports were on file for a fire station located at the southeast corner of Emerson Avenue and 88th Place (Area 12A East), as well as a geotechnical report for a child care center located at 9320 Lincoln Boulevard (Area 13). Information contained in these reports is summarized below:

Area 12A East: Kleinfelder, Inc. (Ref. 20) prepared a geotechnical data report dated October 23, 2002 to present the findings of their field exploration and laboratory testing performed for a proposed fire station located at the southeast corner of Emerson Avenue and 88th Place in the Westchester area of Los Angeles. The field work included the drilling of eight (8) small-diameter borings to depths of 31 to 51.5 feet, sample collection, and laboratory testing. The tests performed included in-situ moisture and dry density, sieve and hydrometer analysis, direct shear, consolidation, expansion index, maximum dry density, optimum moisture content, R-value, and corrosion analysis. Soils encountered in the borings are described as silty sand (SM) and clayey sand (CL) to depths of approximately 13 to 17 feet, and predominately sand (SP) below those depths.

The Kleinfelder report was incorporated into a geotechnical engineering report prepared by the City of Los Angeles Geotechnical Engineering Division (GED) for the proposed fire station located at the southeast corner of Emerson Avenue and 88th Place. The GED report (Ref. 14) included an evaluation for faulting and seismicity, liquefaction and dynamic settlement potential, and provided recommendations for site grading and foundation design. GED reported that the site was not located within a seismic hazard area for fault rupture, liquefaction, or landslides. The results of dynamic settlement analyses indicate "negligible" total and differential settlement potential. GED recommended over-excavation grading on the order of five (5) feet below grade to mitigate undocumented fill soils and loose native soils, and to provide a uniform soil condition for foundation support.

Area 13: Geobase, Inc. (Ref. 18) issued a preliminary geotechnical investigation report dated November 24, 1997 summarizing the findings of their field exploration and laboratory testing performed for a proposed child care facility located at 9320 Lincoln Boulevard in the Westchester area of Los Angeles. The field work included the drilling of ten (10) small-diameter borings to depths of 5.5 to 45.5 feet, sample collection, and laboratory testing. Laboratory testing included in-situ moisture and dry density, direct shear, consolidation, expansion index, maximum dry density, optimum moisture content, and corrosion analysis. The soils encountered in the borings were described as silty sands (SM) to depths of approximately 13 feet, and predominately fine, poorly graded sands (SP) at depths greater than 13 feet. Geobase reported that the site was not located within a hazard area for fault rupture or landslides, and the potential for liquefaction was very low. Recommendations for over-excavation on the order of three (3) feet below grade were provided to mitigate undocumented fill soils and to provide a uniform soil condition for foundation support.

A cursory document search was also performed with the Department of Toxic Substances Control (DTSC), South Coast Air Quality Management District (SCAQMD), and the Los Angeles Regional Water Quality Control Board (LAWQCB), for the parcel numbers and site addresses located within the project boundaries (see Table 1). No documents were located. However, both SCAQMD and LAWQCB maintain their records based on facility addresses, so it is possible that different search parameters may provide additional results.

5.0 SUBSURFACE EXPLORATION

The field exploration performed in conjunction with the current investigation included the advancement of ten (10) Cone Penetration Tests (CPTs) along with the excavation and sampling of four (4) small-diameter borings spaced across the site. The CPT and boring locations are shown on Figure 3. The CPTs and borings were positioned within accessible areas of the site to provide a reasonable level of coverage across the project area. The boring logs are provided in Attachment A, and the CPT logs are provided in Attachment B. Laboratory test results are provided on the boring logs, and in Attachment C.

Borings: Four (4) borings were drilled up to a maximum depth of 55.5 feet using truck mounted hollow-stem auger drilling equipment. Relatively undisturbed soil samples were collected from the borings at 5-foot vertical intervals to visually assess subsurface soil conditions and to provide samples for laboratory testing. The soil samples were classified in accordance with the Unified Soil Classification System (USCS). The samples were collected using both Modified California ring-lined samplers and Standard Penetration Test (SPT) split-spoon samplers. The Modified California sampler was lined with one-inch high by 2½-inch diameter brass rings. At each sampling interval, the sampler was driven 18 inches into undisturbed soils at the bottom of the bore hole using a 140 lb. auto-trip hammer with a free-fall height of 30 inches. The associated blow counts were recorded for each sampling interval, with the blows for the lower 12 inches reported on the logs. The soil samples collected were transported to GeoKinetics' laboratory in Irvine for measurement of in-situ moisture contents and densities. Boring logs are presented in Attachment A. As indicated on these logs, the soils encountered in the exploratory borings consisted predominately of native soils composed of silty sand (SM) and sand (SP) to the depths explored with the exception of boring B-4 (Area 11) where fine-grained silt sediments were encountered at depths of 34 to 55.5 feet. Undocumented fill was encountered to a depth of 10 feet in boring B-2, located in the northeast portion of Area 2, and to a depth of 5 feet in boring B-4. Groundwater was not encountered in any of the borings.

CPTs: Ten (10) CPTs were performed to a maximum depth of 50 feet at the locations shown in Figure 3. Results of the CPT data interpretations indicate the underlying soils consist predominately of silty sand (SM) and sand (SP), similar to the conditions observed from the borings. Relatively low tip resistance values were recorded for zones of relatively loose soil extending to a maximum depth of approximately 15 feet at the locations of CPT-4 and CPT-6 in Area 2. These low tip resistance values appear to be indicative of relatively loose undocumented fill soil and/or soft native sediments. The CPT logs are provided in Attachment B.

The interpreted subsurface conditions based upon the available data is illustrated on cross-section A–A' in Figure 5. The tip resistance graphs from the CPT logs and simplified boring logs have been superimposed onto this section for reference purposes.

6.0 GEOLOGIC CONDITIONS

6.1 Geomorphology: The site is located on a broad terrace landform within the coastal portion of the Los Angeles Basin. Current site topography varies from relatively level to gently sloping, with ground elevations ranging from approximately 100 to 130 feet. Regional surface drainage is generally directed towards the south, with localized variations from past site grading. Prior to urbanization during the mid-1900's, the terrain consisted of sand dune topography with numerous dome-shaped hills and intervening bowl-shaped depressions. Much of the original undulating topography has been modified by development. Past undocumented grading has consisted of filling low-lying areas and excavating the former sand dunes to create the gently sloping and relatively level landforms present today.

6.2 Regional Geology: Published regional geologic mapping indicates the subject study area is underlain by alluvial sediments (map symbol Qoa) capped by older eolian deposits (map symbol Qoe) of Pleistocene geologic age (Ref. 10). The older eolian deposits generally consist of sand and silty sand while the underlying alluvial sediments generally consist of sand, silty to clayey sand, and lesser amounts of silt, clay, and gravel. Undocumented fill soils (map symbol "af") are also present throughout the study area. A map illustrating the exposed geologic units in the area of the site is provided as Figure 4.

6.3 Groundwater: Groundwater was not encountered during our subsurface exploration. The maximum depth explored was 55.5 feet. Review of the seismic hazards report for the Venice 7.5-minute quadrangle (Ref. 4) indicates historic high groundwater levels greater than approximately 40 feet below the surface. Current groundwater levels are indicated to be more than 100 feet below the ground surface, based on contour maps compiled by the Water Replenishment District of Southern California (Ref. 30). Groundwater levels below the study area will fluctuate over time due to variations in rainfall, irrigation, and groundwater pumping, however, levels shallower than the historic high are not expected in the foreseeable future.

7.0 SEISMIC CONDITIONS

The site is located within an active seismic region. Strong ground shaking, resulting from an earthquake occurring along any of several active faults in the region, is a seismic hazard with a high probability of affecting future site improvements.

7.1 Seismicity: Ground shaking due to earthquakes should be anticipated during the life of the proposed improvements. The California Geologic Survey

(CGS) classifies active faults as those which have, or are suspected to have, ruptured within the Holocene epoch (approximately within the last 11,700 years). CGS classifies potentially active faults as those that have evidence of activity within the Quaternary period (last 1.6 million years) but with no indication of Holocene seismic events. Active faults are typically identified based upon recorded seismic events or by radiocarbon dating recent (Holocene) sediments that have been offset during prior earthquakes.

The United States Geological Survey (USGS) and CGS have identified 20 active faults located within 50 kilometers of the site. Each of these faults is believed to be capable of producing sizeable earthquake events with significant ground motions. These faults are listed in Table 2, while their mapped locations and alignments, as recognized by the CGS, are shown in Figure 6. Active faults within approximately 15 kilometers (km) of the central portion of the site include the Newport-Inglewood fault zone (5 km to the east), the off-shore Palos Verdes fault zone (7 km to the west), and the Santa Monica fault (10 km to the north). An inferred trace of the potentially active Charnock Fault, which trends sub-parallel to the northwest trending Newport-Inglewood fault zone, is mapped approximately 0.5 km east of the far eastern portion of the study area (Ref. 11).

7.2 Ground Motion: The Maximum Considered Earthquake (MCE) peak ground acceleration is defined as the ground motion having a 2% probability of exceedance over a 50 year period. The statistical return period for the MCE is approximately 2,475 years. In accordance with American Society of Civil Engineers (ASCE) Standard 7-10, the peak ground acceleration (PGA) is derived from the MCE, with modifications allowed for Site Class (soil behavior type). The USGS geologic hazards science center web-based program (Ref. 29) was used to calculate the PGA for the site. The design PGA for the site is 0.61g.

7.3 Seismic Design Parameters: The 2010 California Building Code (CBC) requires that structures are designed and constructed to resist the effects of the design earthquake ground motion. These parameters are formulated from the estimated design earthquake ground motion, and the site soil conditions. Based on the site soil properties, the CBC classifies site soils as either Site Class A, B, C, D, E, or F. In accordance with Table 1613.5.2 of the 2010 CBC, the soil conditions below the project are considered Site Class D corresponding to a relatively stiff soil profile.

Preliminary seismic design parameters, based upon Site Class D soil conditions and the provisions of ASCE 7-10, are provided in Table 3. These parameters were calculated using the USGS geologic hazards science center web-based program (Ref. 29).

8.0 GEOLOGIC & SEISMIC HAZARDS

Other geologic and seismic hazards, in addition to ground shaking, were considered in this assessment. These include surface fault rupture, liquefaction, dynamic settlement, lateral spreading, landsliding, earthquake-induced flooding, seiches, tsunamis, and methane. There are numerous published resources by the State of California and local government agencies to screen for, and evaluate, these potential hazards, including Earthquake Fault Zones Maps, Seismic Hazard Zones Maps, Seismic Hazard Evaluation Reports, Tsunami Inundation Maps, Methane Zone Maps, and Special Publications by the CGS. A discussion of regional geologic and seismic hazards and their potential effect on the site is provided in the following report sections.

8.1 Fault Rupture: Prompted by the 1971 San Fernando Earthquake, the State of California has implemented the Alquist-Priolo Earthquake Fault Zoning Act. Regulatory provisions include classification and land-use criteria associated with potential fault rupture hazards, in order to prevent the construction of buildings for human occupancy across the trace of active faults. According to the State Geologist, an active fault is defined as one which has had surface displacement within the Holocene Epoch (roughly the last 11,700 years). Earthquake Fault Zones have been delineated along the traces of active faults within California. Official Maps of new and revised Earthquake Fault Zones issued pursuant to the Alquist-Priolo Earthquake Fault Zoning Act are published by the California Geological Survey (CGS). Where developments for human occupation are proposed within these zones, the state requires detailed fault investigations to be performed so that engineering geologists can mitigate the hazards associated with active faulting by identifying the location of active faults and allowing for a setback from the zone of previous ground rupture.

The subject site is not located within a mapped Earthquake Fault Zone, and no other known faults cross the site (Ref. 7). Accordingly, the potential for surface fault rupture at the site is considered to be low.

8.2 Liquefaction: Liquefaction is the loss of strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to, or exceeds, the overburden pressure. The primary factors which influence the potential for liquefaction include the groundwater table elevation, the soil type and grain size characteristics, the relative density of the soil, the overburden or confining pressure, and the intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d50) grain size in the range of 0.075 to 0.2 mm (Ref. 24). Clayey (cohesive) soils or soils which possess a clay content (particles diameter <0.005 mm) in excess of 20 percent are generally not considered to be susceptible to liquefaction (23).

The Seismic Hazard Zone Map for the Venice 7.5-minute Quadrangle, compiled and published by the California Geological Survey, indicates that the site is not located within a mapped liquefaction zone. Furthermore, the general subsurface conditions for liquefaction-susceptible areas such as groundwater less than 40 feet deep and relatively young (Holocene age) soils are not present.

8.3 Dynamic Settlement: A dynamic settlement analysis was conducted in general accordance with the guidelines of CGS Special Publication 117A (Ref. 8), and currently accepted practice. The potential for dynamic settlement of the soils underlying the subject site was evaluated using the LiquefyPro software developed by CivilTec. The analytical procedures developed by Robertson (Ref. 22) and Zhang (Ref. 32) were utilized to estimate the potential ground settlement associated with "dry sand" dynamic settlement. The design seismic event with an estimated PGA of 0.61g was used in the analysis.

The cumulative dynamic settlements calculated for each CPT and boring location are presented in Table 4. As shown, the anticipated dynamic settlement values range from approximately 0.3 to 4.6 inches. The majority of the calculated settlement estimates are less than 1 inch. Estimates greater than 1 inch were calculated for soil conditions at boring locations B-2 (2.2 inches) and B-4 (1.2 inches), and CPT locations CPT-4 (4.6 inches) and CPT-6 (1.1 inches). The majority of the estimated settlements are realized in the upper approximately 10 to 15 feet.

Dynamic settlement of the underlying site soils should be expected to occur at the site in conjunction with the design seismic event. The differential settlement associated with the design event is estimated to be up to one-half of the total settlement.

8.4 Landslides: Review of the Seismic Hazard Zone Map for the Venice 7.5-minute Quadrangle (Ref. 5) indicates that the site is not located within a mapped earthquake-induced landslide zone. Graded and natural slopes within the project area relatively low in height with gentle gradients. The potential for seismically induced landslides is considered low.

8.5 Lateral Spreading: Seismically induced lateral spreading is a potential hazard characterized by lateral movement of saturated soil due to ground shaking. Unlike landslides which occur on steep slopes, lateral spreading can occur on gentle slopes, generally along river banks and shorelines where loose sediments are commonly found. In the absence of shallow groundwater and unsupported embankments, the potential for lateral spreading is low.

8.6 Earthquake-Induced Flooding: Failure of dams, reservoirs, and other large water retaining structures as a result of earthquakes could present a potential flood hazard. Large water retaining structures are not located within or near the project area, therefore, there is no potential for earthquake-induced flooding at the site. Furthermore, review of flood maps compiled by the Federal Emergency Management Agency (FEMA) indicates the project site is not located within a flood hazard area.

8.7 Seiches: Seiches are standing waves generated within enclosed or partially enclosed bodies of water such rivers, reservoirs, and lakes as a result of seismic waves from an earthquake. Large bodies of open water are not located within or near the project area. Seiches do not present a potential hazard to the site.

8.8 Tsunamis: A tsunami is a sea wave generated by either ground movement from earthquakes, or water displacement from large submarine landslides. Based on review of the Tsunami Inundation Map for the Venice 7.5-minute Quadrangle (Ref. 12), the project area is not located within a tsunami inundation hazard area.

8.9 Methane: The project study area is located in close proximity to the Playa Del Rey Oil Field, located along the north portion of Area 1, as mapped by the State of California Division of Oil, Gas and Geothermal Resources (DOGGR). Review of DOGGR oil well location maps indicates no existing or abandoned wells are present within the site boundaries. However, portions of the project area are located within designated methane and methane buffer zones, as delineated by the LADBS (Ref. 13). The limits of the designated Methane and Methane Buffer Zones are shown in Figure 6. LADBS requires sites within designated methane zones be assigned a classification ranging from Level I (lowest methane level) to Level V (highest methane level) for the purpose of designing and constructing methane mitigation systems. The completion of the required LADBS methane survey for the Methane and Buffer Zone parcels was beyond the scope of the current investigation. LADBS requires all new structures located within a designated methane zone be provided with methane mitigation improvements (Ref. 15). A list of parcels included in the LADBS methane and methane buffer zones is presented in Table 5.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of our background review, field exploration, and engineering and geologic analyses, it is our opinion that development within the project area is feasible from a geotechnical perspective. Additional subsurface exploration, sampling and testing, and geotechnical analyses will be needed once more detailed grading and building plans have been prepared for the site. Preliminary recommendations are provided in the following paragraphs to assist in the initial planning and design of site improvements.

9.1 Site Earthwork: Mitigation of undocumented fill soils will be needed to prepare building pad areas for foundation support. Over-excavation to the depth of undocumented fill, or to a depth of three (3) feet below foundations – whichever is deeper - is expected for the building pad areas, based upon the available data. Low density or otherwise unacceptable native soil deposits may locally require similar mitigation. Final removal and re-compaction depths should be determined based upon the results of more detailed geotechnical evaluation, and site-specific inspection and testing performed at the time of grading.

The base level of over-excavation areas should be scarified, moisture conditioned as needed, and compacted prior to the placement of fill. If relatively clean sands are encountered at the base of excavations, those materials should be thoroughly wetted and densified using vibratory compaction equipment. All bottom excavations should be observed, tested, and approved by a representative of the Geotechnical Engineer before the placement of any compacted fill is initiated. Existing site soils are anticipated to be generally suitable for re-use as compacted fill, provided that organic material and demolition debris are excluded and removed from the site. All engineered fill should be placed at a minimum 90% relative compaction in accordance with ASTM D-1557 criteria at a moisture level between optimum and optimum +3%. A minimum thickness of three (3) feet of engineered fill should generally be provided beneath footings, flatwork, and pavement. Column footings may bear directly on dense native soil at specific locations approved by the project Geotechnical Engineer.

9.2 Graded Slopes: Cut slopes and fill slopes constructed at gradients of 2:1 (horizontal to vertical) or less are anticipated to be grossly stable, provided that the general provisions of the 2010 CBC and City of Los Angeles Grading Code are followed. Additional subsurface exploration, sampling and testing, and geotechnical analyses will be needed once more detailed grading plans have been prepared for the site.

9.3 Utility Trench Backfill: All utility trench backfill should be compacted to a minimum of 90% relative compaction in accordance with ASTM D-1557 criteria. Soils used for bedding and shading of pipelines should be sandy with a minimum sand equivalent (SE) of 30. Flooding and/or jetting of bedding and shading materials is not advised. Soils placed as trench backfill should be moisture conditioned as necessary to achieve near optimum moisture levels, and mechanically compacted in lifts less than approximately 10 inches. A representative of the project Geotechnical Engineer should be present during the backfilling operations to observe backfill operations and to provide field density testing to confirm that adequate compaction is achieved.

9.4 Shrinkage and Subsidence Estimates: The existing site soils that are over-excavated and re-compacted during the grading activities will likely undergo shrinkage as a result of densification. The average level of shrinkage is anticipated to be on the order of 15% for undocumented fill soil, and 5% to 10% for native soils. Subsidence resulting from the scarification and compaction of the exposed ground surface at the base removal excavations is anticipated to be on the order of 0.10 feet.

The above estimates for shrinkage and subsidence are intended for preliminary use by project planners in evaluating earthwork quantities. These estimates should not be considered absolute values. Contingencies should be made for balancing earthwork quantities based upon the actual shrinkage and subsidence values that occur at the time of grading.

9.5 Surface Drainage: In the preparation of grading plans, surface drainage should be sloped away from building foundations at a minimum 2% gradient within a 5-foot zone around the building perimeter. Area drains should be installed in all isolated planters. Drainage swales and a minimum 2% surface gradient should be maintained in other areas to provide positive drainage to acceptable conveyance facilities. Landscaped areas or planters should be provided with a 5% slope to suitable drain inlets or structures.

A Storm Water Pollution Prevention Plan (SWPPP) should be prepared prior to initiation of site grading and construction activities. The SWPPP should identify the measures that will be taken to minimize the potential for erosion of the site soils and transport of sediment, and other impacts to run-off, in accordance with current Best Management Practices (BMPs).

10.0 PROVISIONAL DESIGN PARAMETERS

Provided that future building pads are underlain by engineered fill, and that undocumented fill soils have been properly mitigated, we anticipate future buildings may be supported on conventional foundation systems consisting of continuous spread footing, pad footings, and slab-on-grade flooring.

Additional subsurface exploration, sampling and testing, and geotechnical analyses will be needed to further evaluate allowable soil bearing capacity and foundation design. In the interim, the following provisional design parameters may be considered:

10.1 Foundation System Design: Footings should extend at least 18 inches below the lowest adjacent grade, and founded on at least three (3) feet of engineered fill. A minimum width of 18 inches for continuous footings, and 24 inches for pad footings is recommended. Footings with these minimum dimensions and bearing on at least three (3) feet of engineered fill, may be designed for a net allowable soil bearing capacity of 2,500 pounds per square foot (psf) for dead and applied live loads. The bearing capacity may be increased by 400 psf for each additional foot of footing width and depth to a maximum value of 4,000 psf. A one-third increase may be used for short-term loading conditions such as wind or seismic forces.

The foundation system for future buildings should be designed to accommodate the estimated amount of total and differential settlement imparted by structural loading. We anticipate such settlement potential to be on the order of 1 to 2 inches total, and 0.5 to 1 inches differential based upon the results of our background review and limited subsurface exploration.

10.2 Floor Slab Design: Building floor slabs should be a minimum of 5-inches in thickness with minimum reinforcement consisting of No. 4 bars at 16-inch spacing (both ways) positioned at the center of the slab. The soil subgrade beneath the flatwork should be moisture conditioned to achieve a level of 90% relative saturation to a depth of at least 12-inches immediately prior to the placement of concrete. Slabs-on-grade which will have moisture sensitive floor coverings should be provided with a minimum 12-mil thick High Density Polyethylene (HDPE) or 15-mil thick Stego vapor barrier, that meets or exceeds ASTM E 1745 for Class A. A two (2) inch of layer of sand may be provided both above and below the vapor barrier for its protection and to facilitate proper curing of the concrete.

10.3 Concrete Flatwork: Soil expansion potential testing was not performed as a part of this preliminary assessment and should be performed to better define the effects of shrinkage or swelling of soils that will be supporting concrete flatwork at the site. However, near-surface soils encountered within our borings were observed to be sand soils estimated to have a very low to low expansion potential. Exterior concrete flatwork constructed on these soils should typically be a minimum of 4-inches in thickness. Where the potential for the development of open cracks is to be minimized, flatwork should be reinforced with minimum No. 3 bars spaced 18 inches (both ways) at the middle of the slab. Saw-cut or construction joints should be provided every 8 to 10 feet in order to control the location and configuration of shrinkage cracking. Heavier reinforcement, in the form of No. 4 bars at 16-inch centers, can be used to further reduce the potential for open cracks to develop in concrete flatwork. The soil subgrade beneath the flatwork should be moisture conditioned to achieve a level of 90% relative saturation to a depth of at least 12 inches immediately prior to the placement of concrete.

10.4 Soil Corrosivity: Based on review of geotechnical reports prepared within and adjacent to the project area (Table 1) site soils are anticipated to have negligible soluble sulfate levels. However, the sulfate level in potable or irrigation water within the southern California area is typically on the order of 150 to 250 mg/I. Water with this concentration of sulfate is considered moderately corrosive to concrete and prescribes the use of Type II cement with a maximum water to cement ratio of 0.50. This corresponds to a 28-day concrete compressive strength of approximately 4,000 psi. If localized etching and/or efflorescence of concrete would be problematic, these specifications should be followed where concrete may be exposed to irrigation water. Otherwise, the use of concrete with a minimum 28-day compressive strength of 3,000 psi is acceptable from a geotechnical perspective for exterior flatwork and other ancillary improvements. Proper finishing and curing of the concrete will be critical in order to reduce the prevalence of shrinkage cracks - particularly during warm weather. The minimum required concrete compressive strength for the building foundations and floor slabs should be specified by the project Structural Engineer.

Based on our experience with similar site locations, the site soils are anticipated to have low to moderate levels of soluble chloride and relatively low electrical resistivity. For preliminary planning, the site soils should be considered moderately corrosive to buried metal. We recommend additional subsurface exploration, sampling and testing, and geotechnical analyses to further evaluate soil corrosivity. The consultation of a corrosion engineer is also recommended.

11.0 LIMITATIONS & CLOSING

We have prepared this preliminary assessment report with the degree of skill and care ordinarily exercised by geotechnical professionals practicing in this, and similar, localities. No other warranty, expressed or implied, is given regarding the conclusions or professional opinions given in this report. The scope of this report is limited to the matters expressly covered herein. This report is prepared for the sole benefit of URS and may not be relied upon by any other person or entity without the written authorization of GeoKinetics. All recommendations, findings, and conclusions stated in this report are based upon facts and circumstances, as they existed at the time the associated investigation was performed. A change in any fact or circumstance upon which this report is based may necessitate re-evaluation and/or modification of the recommendations, findings, and conclusions presented in this report. In preparing this report, we have relied on information derived from secondary sources. Except as set forth in this report, we have made no independent investigation as to the accuracy of the information derived from secondary sources, and have assumed that such information is accurate and complete. More extensive studies may be performed to reduce any inherent uncertainties.

We hope that this information is helpful to you. Thank you for the opportunity to be of service. If you have any questions, comments, or require any additional information regarding our reported findings and conclusions, please do not hesitate to contact either of the undersigned at your convenience.

Prepared by:
GEOKINETICS, INC.

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Registered Professional Engineer — Glenn D. Tofani — No. GE 2496 — Exp. 06-30-13 — Geotechnical — State of California

Attachments

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{ END }

Table 1 - Document Search Results

Within Project Area	
Addresses/A.P.N. Numbers	Results
8800 South Liberator Ave.	Kleinfelder/GED- Report 10/30/2002
9014 Pershing Drive/ 8118-013-915	No Documents Found
9320 Lincoln Blvd/ 4122-022-931	Geobase- Report 1997
4117-036-900	No Documents Found
4117-036-901	No Documents Found
4117-036-903	No Documents Found
4122-023-916	No Documents Found
4122-023-917	No Documents Found
4122-022-930	No Documents Found
4122-022-929	No Documents Found
4122-022-928	No Documents Found
4119-006-912	No Documents Found
4119-006-913	No Documents Found
Adjacent to Project Area	
Addresses	Results
7270 West Manchester	Geotechnologies-Report and Update Letter 10/4/2011
8639 South Lincoln	Geocon- Report 5/22/2006
380 World Way Tom Bradley Terminal	Diaz-Yourman- Report 1/6/2010
380 World Way Tom Bradley Terminal	Diaz-Yourman- Settlement Calc's 7/27/2006
380 World Way Tom Bradley Terminal	Diaz-Yourman- Addendum 1 4/21/2005
7270-7250 W. Manchester & 8601-8731 Lincoln Blvd.	Geotechnologies-Report 10/11/2004
7270-7250 W. Manchester & 8601-8731 Lincoln Blvd.	Geotechnologies- Consultation Letter 1/18/2006

Table 2 - Regional Faults Within 50 Km of Site

Fault System	Distance from Site (Kilometers)	Moment Magnitude (M_w)
Newport-Inglewood	5.0	7.1
Palos Verdes	7.0	7.3
Santa Monica	11.9	6.6
Malibu Coast	13.7	6.7
Hollywood	14.3	6.4
Puente Hills Blind Thrust	15.5	7.1
Upper Elysian Park	21.6	6.4
Northridge (E. Oak Ridge)	22.6	7.0
Raymond	25.8	6.5
Anacapa-Dume	25.9	7.5
Verdugo	28.2	6.9
Sierra Madre	34.2	7.2
Sierra Madre (San Fernando)	36.7	6.7
Whitter	36.9	6.8
Santa Susana	40.3	6.7
San Gabriel	42.3	7.2
Clamshell-Sawpit	45.7	6.5
Holser	48.2	6.5
San Jose	49.3	6.4
Simi-Santa Rosa	51.3	7.0

Table 3 - Seismic Design Parameters

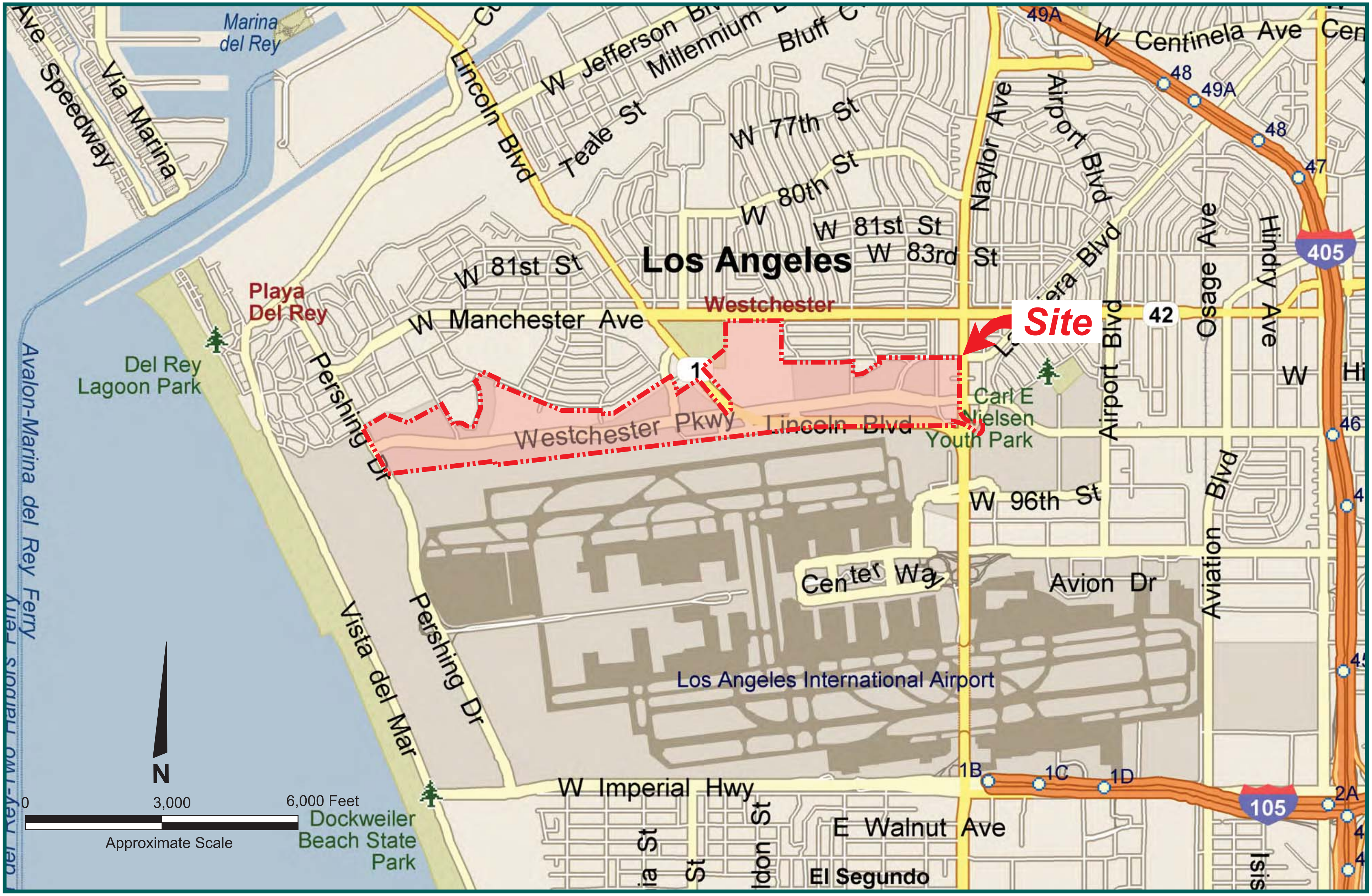
Factors	Values
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Mapped Short Period Acceleration, S_s	1.683
Mapped 1-Second Period Acceleration, S_1	0.617
Short Period Acceleration Adjusted for Site Class, S_{MS}	1.683
1-Second Period Acceleration Adjusted for Site Class, S_{M1}	0.926
Design Short Period Acceleration, S_{DS}	1.122
Design 1-Second Period Acceleration, S_{D1}	0.617

Table 4 - Dynamic Settlement Estimates

CPT No.	Total Depth (feet)	Cumulative Dynamic Settlement (inches)
CPT-1	50	0.4
CPT-2	50	0.4
CPT-3	50	0.3
CPT-4	50	4.6
CPT-5	50	0.6
CPT-6	50	1.1
CPT-7	50	0.4
CPT-8	50	0.4
CPT-9	45	0.7
CPT-10	50	0.5
B-1	50.5	0.5
B-2	50.5	2.2
B-3	50.5	0.4
B-4	55.5	1.2

Table 5 - Methane and Methane Buffer Zones

Addresses/A.P.N. Numbers	LADBS Search Results
4118-012-009 (Area 1)	Methane Zone
4119-006-912 (Area 2)	Methane Zone
4119-006-913 (Area 3)	Not in Methane Zone
4117-036-900 (Area 4)	Methane Buffer Zone
4117-036-901 (Area 5)	Not in Methane Zone
4117-036-902 (Area 6)	Not in Methane Zone
4122-023-916 (Area 8)	Not in Methane Zone
4122-023-917 (Area 9)	Not in Methane Zone
4122-022-928 (Area 11)	Not in Methane Zone
4122-022-929 (Area 12A East)	Not in Methane Zone
4122-022-930 (Area 12A West & 12B)	Not in Methane Zone
4122-022-931 (Area 13)	Not in Methane Zone



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Site Location Map

Figure 1

Legend

Blue	Office, and Research and Development Use
Yellow	Community and Civic Use
Orange	Mixed Use
Pink	Airport Support
Green	Recreation
Dark red	Buffer

Preliminary
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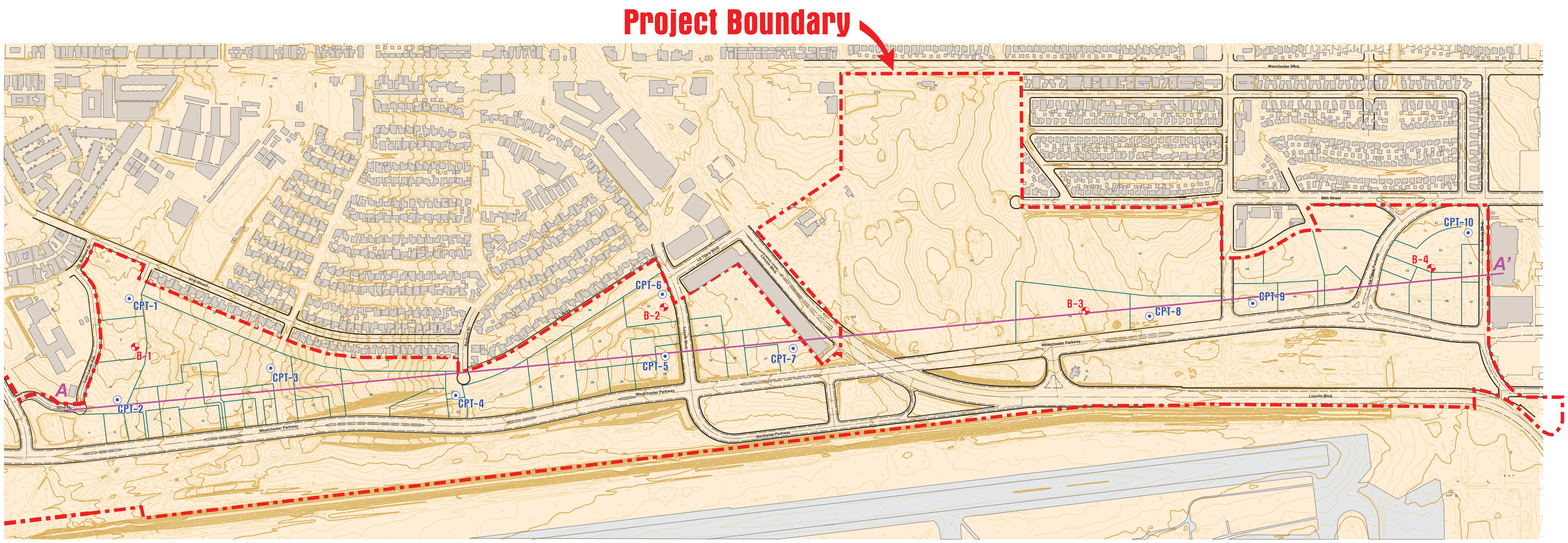
Aerial Photograph of Project

Figure 2



Legend

CPT-10 Location of Cone Penetrometer Test

B-4 Location of Boring

A — A' Location of Cross Section A-A'

Proposed Lot Line

58 Proposed Lot Number

Existing 5 Foot Elevation Contour

Existing 1 Foot Elevation Contour

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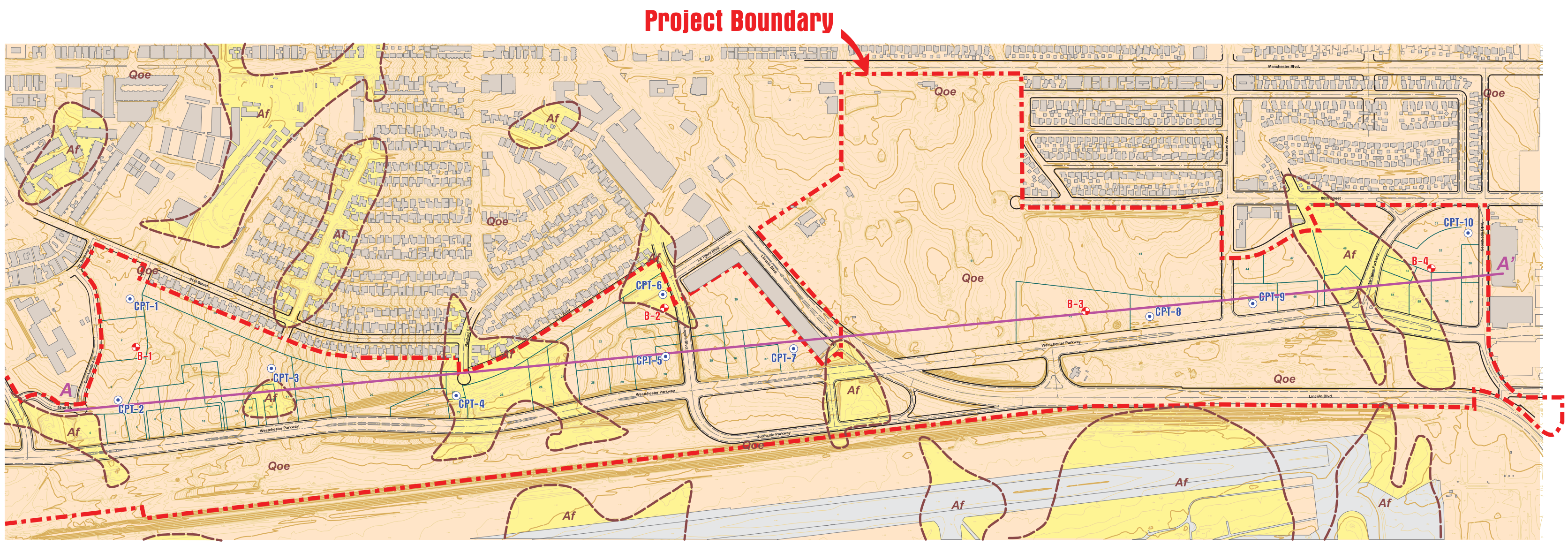
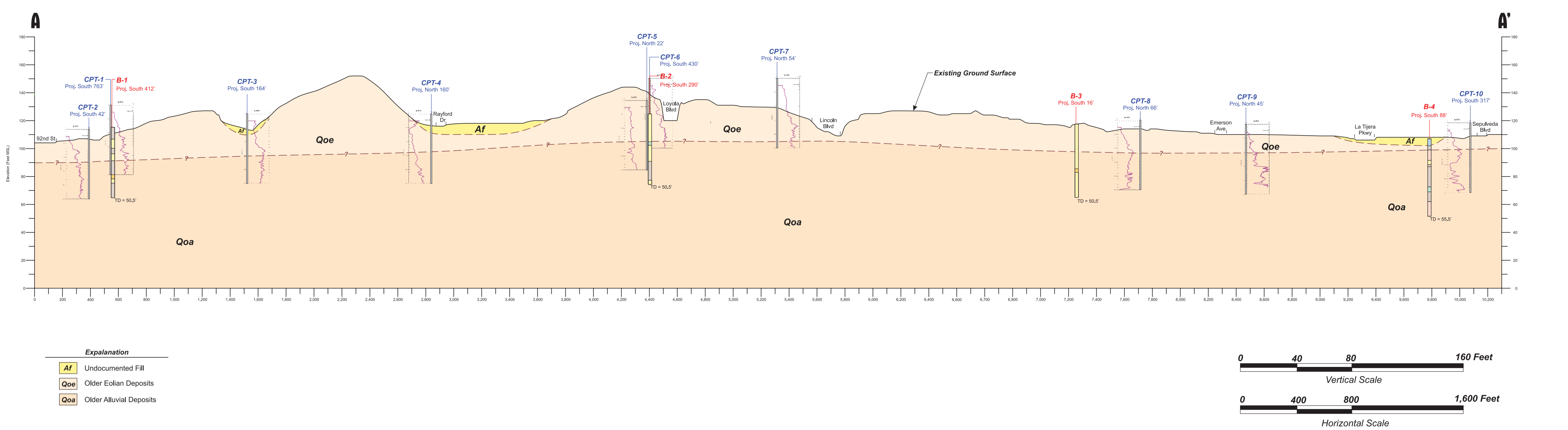
Boring and CPT Locations Map

Figure 3



Legend

	Geologic Contact
Af	Undocumented Fill
Qoe	Older Eolian Deposits
CPT-10	Location of Cone Penetrometer Test
B-4	Location of Boring
A — A'	Location of Cross Section A-A'
	Proposed Lot Line
58	Proposed Lot Number
	Existing 5 Foot Elevation Contour
	Existing 1 Foot Elevation Contour



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Cross Section A-A'

Figure 5

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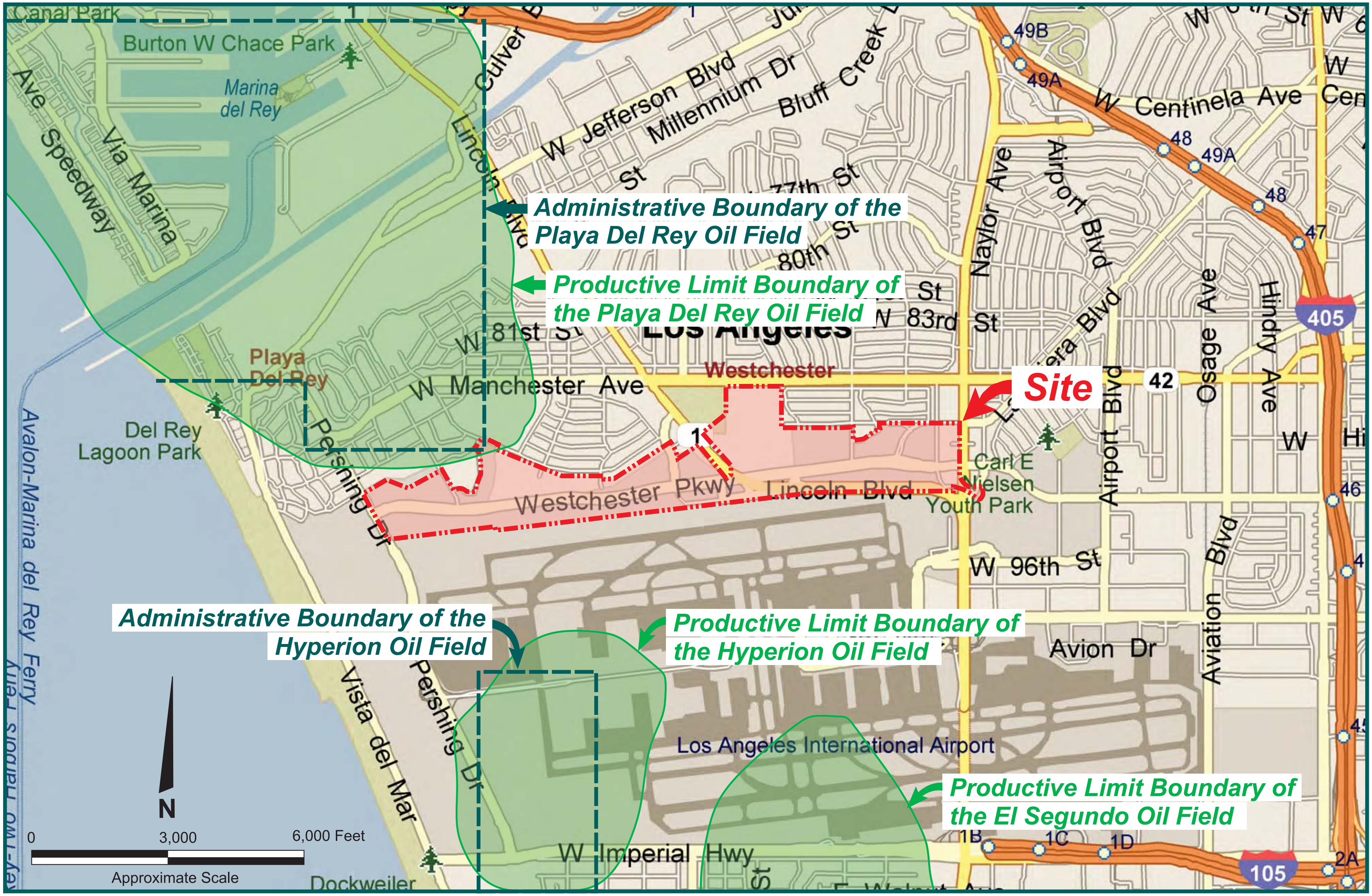
Southern California Fault Map

Figure 6



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Oil Field Map

Figure 7

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Methane Map

Figure 8

Attachment A

Boring Logs

BORING LOG NO.: B-1

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
					SM	Silty fine Sand (SM): Reddish brown, moist, dense, semi well graded.				
6.3	112.1	4/5/7	R	5	SM/SC	Silty fine Sand (SM/SC): Reddish brown, moist, dense, semi well graded, to clayey sand.		33.5	0.50	
4.5	107.9	11/14/ 20	R	10	SM	Silty Sand (SM): Orange tan, dry to moist, firm/dense, poorly graded rounded sands. Slightly cemented.		21.7	0.56	
		8/10/11	SPT							
6.9	106.8	12/20/ 23	R	15	SP	Sand (SP): Reddish medium brown, dense, moist to dry, poorly graded rounded grains from fine sand to medium mostly iron stained quartz grains.		32.0	0.58	
		8/18/ 29	SPT	20	SM	Silty fine Sand (SM): Yellow tan, moist to dry, dense, well graded.				
3.8	102.6	30/50 for 5"	R	25		Sand (SP): Yellow tan, very dense, dry to moist, well graded, grains are sub-angular. Fine to coarse grains.		15.9	0.64	
		14/19/ 22	SPT	30	SP	Sand (SP): Intertonguing, reddish laminations. Damp, fine to medium sand, well graded 1" thick hematitic gravel layer (dark red).				
6.5	98.1	24/40/ 50	R	35	SM (SP-SM)	Sand (SM): Yellow tan, very dense, dry to moist, well graded, grains are sub-angular. Small to coarse grains. Coarse Sand with Silt (SP-SM): Damp, dense.		24.4	0.72	
		15/24/ 35	SPT		SM	Silty Fine Sand to medium well graded (SM) very dense. Tan/ yellow with 1 cm pockets of tan white burrows of finer sand.				

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Project Name: LAX Northside
Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-1
Logged by: GS
Date Drilled: 1/23/13
Equipment Used: CME-75
Ring Type:
Ground Elevation:
Notes:

BORING LOG NO.: B-1 (cont.)

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
						Silty fine Sand (SM): Orange yellow to pale yellow tan, inter-tonguing colors, well graded silts and fine sand. Moist to damp. Very dense.				
6.8	93.0	37/50 for 5"	R	45	SM	Silty fine Sand (SM): Orange yellow to pale yellow tan, inter-tonguing colors, well graded silts and fine sand. Moist to damp. Very dense.		22.7	0.81	
						Silty fine Sand (SM): Yellow tan, very dense, damp, well graded. Fine to medium coarse grains, sub-angular.				
		15/26/37	SPT	50						
						Total Depth = 50.5 ft bgs Groundwater not encountered. Hole backfilled.				
				55						
				60						
				65						
				70						
				75						

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Project Name: LAX Northside

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-1

Logged by: GS

Date Drilled: 1/23/13

Equipment Used: CME-75

Ring Type:

Ground Elevation:

Notes:

BORING LOG NO.: B-2

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
			B		Af	Sand (SP) - FILL: Reddish brown (med), loose to very loose. Moist to damp, sub-angular grains. Poorly graded, fine to medium sands.				
						Soil moist to wet.				
10.9	125.2	3/4/3	R	5		Some free moisture squeezed out of sand, roots, some coarse grained sub-angular sand / fine gravel (SM-SC).		85.1	0.35	
			B			Dark red/ brown Sand (SM): Moist (increased moisture) some sand.				
		4/4/4	SPT			Fine to medium Sand (SM): Reddish brown, more red, moist to damp. loose to firm, poorly graded.				
				10	SM					
9.6	107.0	9/15/ 20	R	15		Silty fine Sand (SM): Two colors intermixed, yellow tan and reddish brown. Large pockets with discrete transitions on edges, reddish brown pockets are more cemented. Tan and yellow pockets, dense, moist.		45.0	0.58	
		9/11/ 10	SPT			Silty fine Sand (SM): Black swirls now present, intermixing yellow, red / brown sands. Pockets of iron oxide, dense, damp.				
				20	CL	Clay (CL): Olive green / dark brown, very stiff, damp, 10-20% medium grained sand intermixed.				
						Harder drilling.				
					SM	Silty Sand (SM): Some trace clay, red/brown, dense, moist to damp.				
4.0	100.8	11/17/ 20	R	25		Clay pockets (1-3 cm) transition zone.		16.1	0.67	
					SP	Sand (SP): Fine to medium grains, yellow tan, damp, dense, 1-2 mm black pockets (iron oxide) (5-10%).				
		11/22/ 26	SPT	30	SM	Silty/Fine Sand (SM): Yellow tan, silts to medium grained sand, dense, few (5-10%) coarse grains, sub-rounded, damp.				
						Silty Fine Sand (SM): Intermittent laminations of coarse sand and fine sub-rounded gravels.				
4.9	99.6	25/55	R	35				19.2	0.69	
					SP	Coarse to medium Sand (SP): Fine to coarse intermittent, laminations, fine sands have fine sub-rounded gravels (5-10%), very dense, damp.				
		15/25/ 30	SPT							

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Project Name: LAX Northside

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-2

Logged by: GS

Date Drilled: 1/23/13

Equipment Used: CME-75

Ring Type:

Ground Elevation:

Notes:

BORING LOG NO.: B-2

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
Cont. from 39 ft.			SPT			Intermittent layers/laminations of coarse sand in fine to medium sands, layer are poorly graded, overall well graded, from fine to coarse sands.				
3.5	97.4	25/50	R	45	SP	Intertonguing layers of coarse sand and fine sand, poorly graded matrix. Fine sand has (5%) coarse sand grains/ fine gravel, sub-rounded (1 mm dia.)		12.9	0.73	
		20/30/40	SPT	50	SM	Silty fine Sand (SM): Orange tan with pockets of tan / white tan silty sand, very dense. Damp, poorly graded.				
						Total Depth = 50.5 ft bgs Groundwater not encountered. Hole backfilled.				
				55						
				60						
				65						
				70						
				75						

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Project Name: LAX Northside

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-2
Logged by: GS

Date Drilled: 1/23/13
Equipment Used: CME-75
Ring Type:

Ground Elevation:
Notes:

BORING LOG NO.: B-3

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
					SM	Silty fine Sands (SM): Reddish brown, dense, damp, poorly graded. Fine sub-rounded grains.				
					ML	— ? — — — ? — — — ? — Sandy Silt (ML), soft gray brown, silts and fine sand, moist, cobbles encountered, semi-angular.				
5.4	108.2	10/12/ 16	R	5		Silty Sand (SM): Reddish brown, dense fine sand and silt, poorly graded, damp.		26.2	0.56	
		7/10/ 14	SPT	10	SM	Silty Sand (SM): Orangish red and yellow tan cross bedded pockets, tan is loosely cemented, red is iron cemented sands and more dense. Damp.				
4.6	101.0	11/21/ 37	R	15		Silty Sand (SM): Fine grains, reddish brown color intermittent with yellow / tan fine Sand (SP), Red sands are cemented, slightly more moisture. Dense.		18.7	0.67	
		11/16/ 22	SPT	20		Silty Sand (SM): Fine grains, reddish brown color intermittent with yellow / tan fine Sand (SP), Red sands are cemented, increased moisture. Free moisture on sampler. Free moisture squeezed out from sampling.				
5.5	100.1	20/50	R	25	SP	Silty Sand (SP): Mostly reddish brown, moist, dense, poorly graded, few pockets of yellow tan sands.		21.8	0.68	
		17/36/ 37	SPT	30		Silty fine Sand (SM): Yellow tan and reddish brown. Damp, very dense.				
4.0	101.2	27/50 for 5"	R	35	SM	Silty fine Sands (SM): Yellow tan/white cross bedding swirls/ laminations, mostly fine with thin laminations 2-3 cm of medium coarse sands, very dense, damp.		16.1	0.67	
		16/26/ 38	SPT			Fine Sands/Silts (SM): Yellowish white poorly graded matrix 5% coarse sand grains.				

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: LAX Northside
Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-3
Logged by: GS
Date Drilled: 1/23/13
Equipment Used: CME-75
Ring Type:
Ground Elevation:
Notes:

BORING LOG NO.: B-3

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
Cont. from 39 ft.			SPT			Silty fine Sand (SM): Whitish tan, poorly graded. 5-10% coarse sand grains, damp, very dense.				
6.2	92.9	40/50 for 5"	R	45	SM	Silty fine Sand (SM): Whitish tan, fine gravel present, rounded oblate (1-2 cm) (20-30%) little cross bedding, poorly graded matrix.		20.5	0.81	
		13/27/36	SPT	50		Silty fine Sand (SM): Orangish tan, very dense, intermittent fine sands. Fine gravel layers (up to 6cm) mixed in fine sand (50-60%), moist to damp, very well graded, rounded to sub-rounded gravel.				
						Total Depth = 50.5 ft bgs Groundwater not encountered. Hole backfilled.				
				55						
				60						
				65						
				70						
				75						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: LAX Northside

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-3 Logged by: GS

Date Drilled: 1/23/13 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: B-4

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
					af	Sand and Gravel - FILL: Silty Sands with gravels and debris (asphalt, crushed concrete (~1 in), loose, moist, well graded.				
11.8	122.6	11/12/ 15	R	5	SM	Silty Sand (SM): Reddish brown, fine sand, rounded grains. Dense, damp to moist, poorly graded, 5% coarse sand.		84.7	0.38	
		4/7/12	SPT	10	ML	Clayey Silt (ML): Reddish brown, damp.				
15.5	106.0	1/3/19	R					70.8	0.59	
				15	SM	Sand (SM): Silty sand, fine to medium sands. Moist to wet, loose, poorly graded rust red/brownish color.				
					ML	Clayey Silt (ML): Reddish brown, dense, poorly graded, black iron oxide spots, cross bedding.				
		6/12/ 16	SPT	20	SP	Sand (SP): Fine grained poorly graded.				
3.5	102.4	22/40/ 50-3”	R	25		Sand (SP): Yellow tan, fine grain rounded sands, moist, very dense, some cross bedding, poorly graded.		14.7	0.65	
		14/26 37	SPT	30		Sand (SP): Yellow tan, fine grain rounded sands, moist, very dense, some cross bedding, poorly graded.				
28.6	93.9	10/17/ 30	R	35	CL	Clay - mottled clay and silt clasts, color is olive gray clay, red/brown and tan silts. Not laminated. Moist, very stiff, semi-plastic.		97.2	0.80	
		11/27/ 40	SPT		SP	Sand (SP): with some silts, fine grained sand, poorly graded, yellow tan.				

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: LAX Northside

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-4 Logged by: GS

Date Drilled: 1/23/13 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: B-4

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/Foot)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
Cont. from 39 ft.			SPT		SP	Sand (SP): Fine grained, trace silt, poorly graded.				
32.5	83.5	7/15/22	R	45	CL	Silty Clay (CL): Clay/silt laminations (1 mm to several cm's), clay - olive gray silts are red swirls in orange brown matrix. Stiff, moist.		86.1	1.02	
		6/7/15	SPT	50	ML	Silt (ML): Sandy silt, light brown/red colored swirls, moist, sands are fine to medium grained, semi-plastic elastic silt. clays.				
		10/17/22	SPT	55		Silt (ML): Sandy silt, light brown/red colored swirls, moist, sands are fine to medium grained, semi-plastic elastic silt.				
						Total Depth = 55.5 ft bgs Groundwater not encountered. Hole backfilled.				
				60						
				65						
				70						
				75						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: LAX Northside

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: B-4 Logged by: GS

Date Drilled: 1/23/13 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

Attachment B

CPT Logs

GREGG DRILLING & TESTING, INC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

January 24, 2013

GeoKinetics
Attn: Greg Shagam

Subject: CPT Site Investigation
LAX Northside
Los Angeles, California
GREGG Project Number: 13-844SH

Dear Mr. Shagam:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☐
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	UVOST Laser Induced Fluorescence	(UVOST)	☐
5	Groundwater Sampling	(GWS)	☐
6	Soil Sampling	(SS)	☐
7	Vapor Sampling	(VS)	☐
8	Pressuremeter Testing	(PMT)	☐
9	Vane Shear Testing	(VST)	☐
10	Dilatometer Testing	(DMT)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Peter Robertson
Technical Director, Gregg Drilling & Testing, Inc.

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (feet)	Depth of Groundwater Samples (feet)	Depth of Soil Samples (feet)	Depth of Pore Pressure Dissipation Tests (feet)
CPT-01	1/23/13	50	-	-	-
CPT-02	1/23/13	50	-	-	-
CPT-03	1/23/13	50	-	-	-
CPT-04	1/23/13	50	-	-	-
CPT-05	1/23/13	50	-	-	-
CPT-06	1/23/13	50	-	-	-
CPT-07	1/23/13	50	-	-	-
CPT-08	1/23/13	50	-	-	-
CPT-09	1/23/13	50	-	-	-
CPT-10	1/23/13	50	-	-	-

Bibliography

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Mayne, P.W., "NHI (2002) Manual on Subsurface Investigations: Geotechnical Site Characterization", available through www.ce.gatech.edu/~geosys/Faculty/Mayne/papers/index.html, Section 5.3, pp. 107-112.

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Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

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Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

Copies of ASTM Standards are available through www.astm.org

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.80.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and penetration pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2007) ASTM standards (D 5778-07).

The cone also contains a porous filter element located directly behind the cone tip (u_2). It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain penetration pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (*PPDT's*) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with oil under vacuum pressure to ensure accurate and fast dissipation.

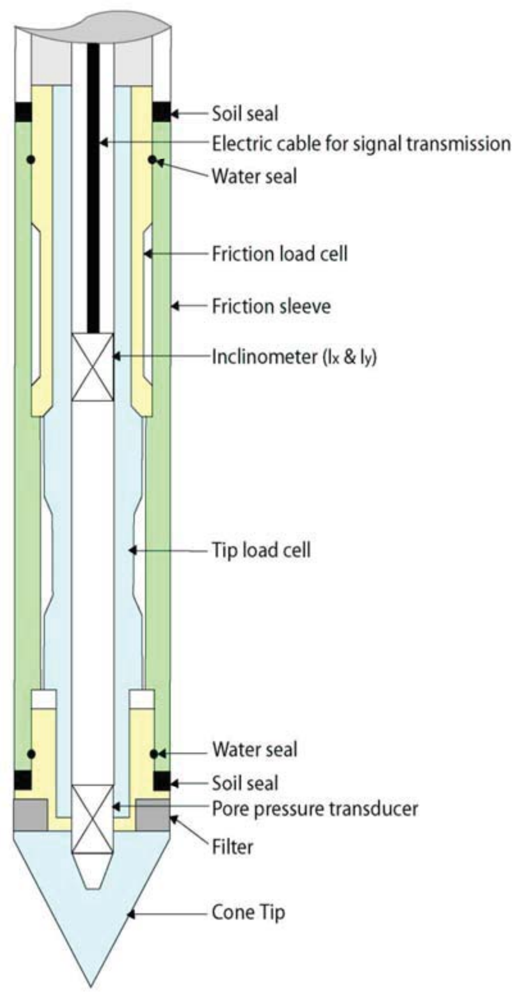


Figure CPT

The cone has the following accuracy:
1 tsf for q_c, 0.02 tsf for f_s and 0.5 psi for u_2. In soft clays, a lower capacity cone should be used for improved accuracy.

When the soundings are complete, the test holes are grouted. The grouting procedures generally consist of pushing a hollow tremie pipe with a "knock out" plug to the termination depth of the CPT hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

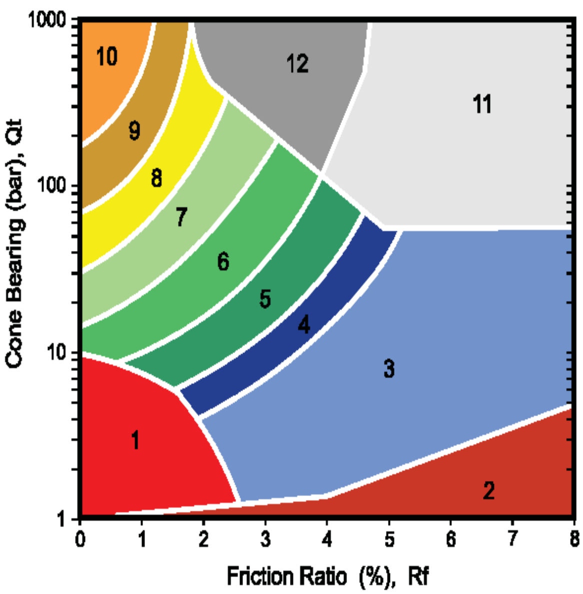
Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected from your site are presented in graphical form in the attached report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings extending greater than 50 feet, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling & Testing Inc. do not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and do not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



(After Robertson, et al., 1986)

ZONE		SBT
1		Sensitive, fine grained
2		Organic materials
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		Gravely sand to sand
11		Very stiff fine grained*
12		Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Cone Penetration Test (CPT) Interpretation

Gregg has recently updated their CPT interpretation and plotting software (2007). The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warrant the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1 Units for display (Imperial or metric) (atm. pressure, pa = 0.96 tsf or 0.1 MPa)
2 Depth interval to average results,(ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3 Elevation of ground surface (ft or m)
4 Depth to water table, z_w (ft or m) – input required
5 Net area ratio for cone, a (default to 0.80)
6 Relative Density constant, C_{Dr} (default to 350)
7 Young's modulus number for sands, α (default to 5)
8 Small strain shear modulus number
 a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
 b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9 Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10 Over Consolidation ratio number, k_{ocr} (default to 0.3)
11 Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1 Depth, z, (m) – CPT data is collected in meters
2 Depth (ft)
3 Cone resistance, q_c (tsf or MPa)
4 Sleeve friction, f_s (tsf or MPa)
5 Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6 Other – any additional data, if collected, e.g. electrical resistivity or UVIF
7 Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \gamma z$
12	Insitu pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with Ic)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT Lunne et al. (1997) listed below

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT (Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n Lunne et al. (1997)

4 SBT_n Index, I_c $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, n = 0.5 (clean sand)
When $I_c > 3.30$, n = 1.0 (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} (based on Normalized SBT_n)
(Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft — Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft — $(N_1)_{60} = N_{60}\,C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) — $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 — *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, φ', (degrees) — $\tan \phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$
Only SBT_n 5, 6, 7 & 8 — *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s — $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 — *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go
a. $G_o = S_G\,(q_t\;\; \sigma'_{vo}\; pa)^{1/3}$ — *For SBT_n 5, 6, 7*
b. $G_o = C_G\, q_t$ — *For SBT_n 1, 2, 3& 4*
Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u — $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 — *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR — $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 — *Show 'N/A' in zones 5, 6, 7 & 8*

The following updated and simplified SBT descriptions have been used in the software:

SBT Zones		**SBT_n Zones**	
1	sensitive fine grained	1	sensitive fine grained
2	organic soil	2	organic soil
3	clay	3	clay
4	clay & silty clay	4	clay & silty clay
5	clay & silty clay		
6	sandy silt & clayey silt		
7	silty sand & sandy silt	5	silty sand & sandy silt
8	sand & silty sand	6	sand & silty sand
9	sand		
10	sand	7	sand

11	very dense/stiff soil*	8	very dense/stiff soil*
12	very dense/stiff soil*	9	very dense/stiff soil*

*heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print ‘clays & silty clays’)

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

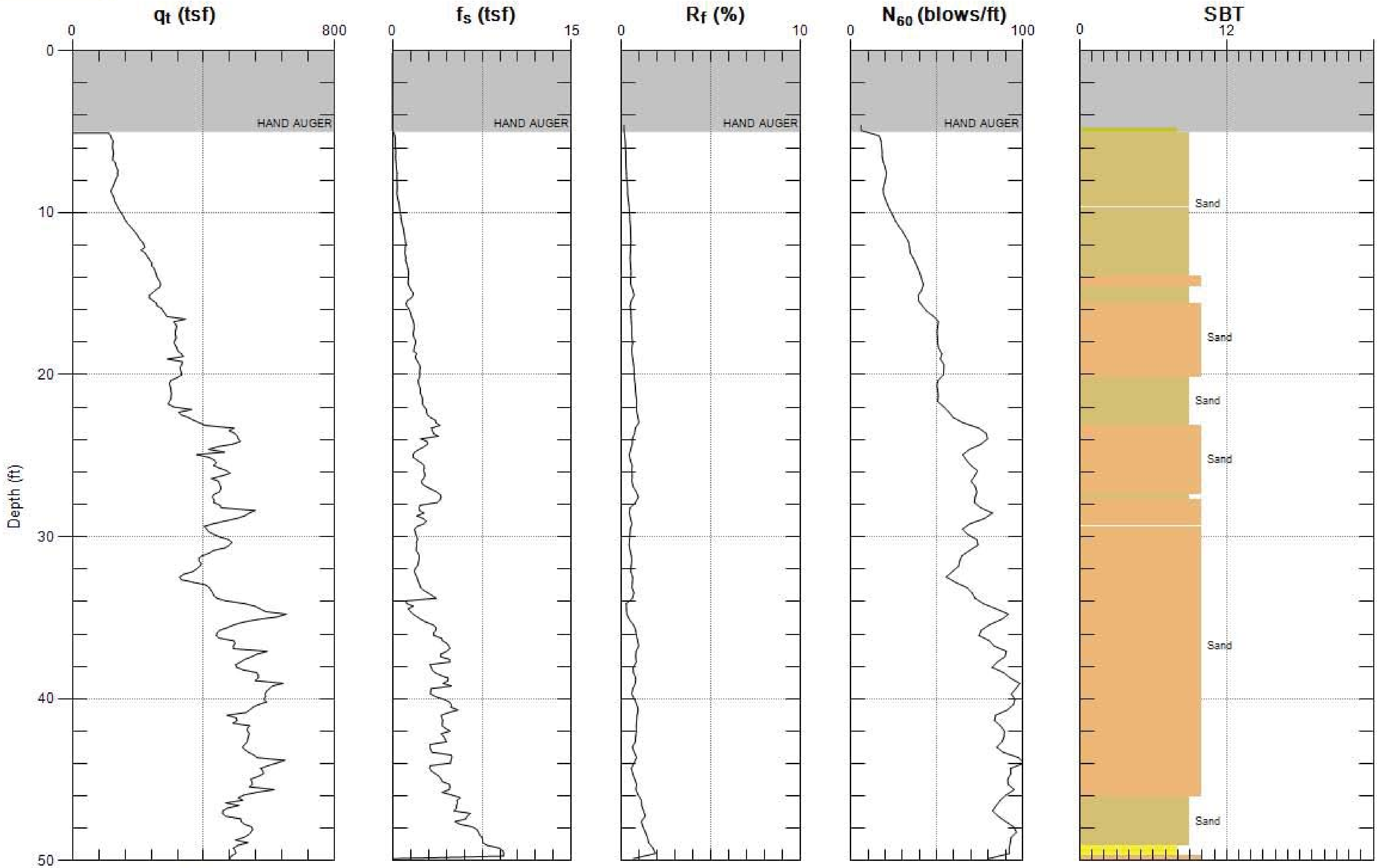
Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-01

Engineer: G.SHAGAM
Date: 1/23/2013 08:04



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

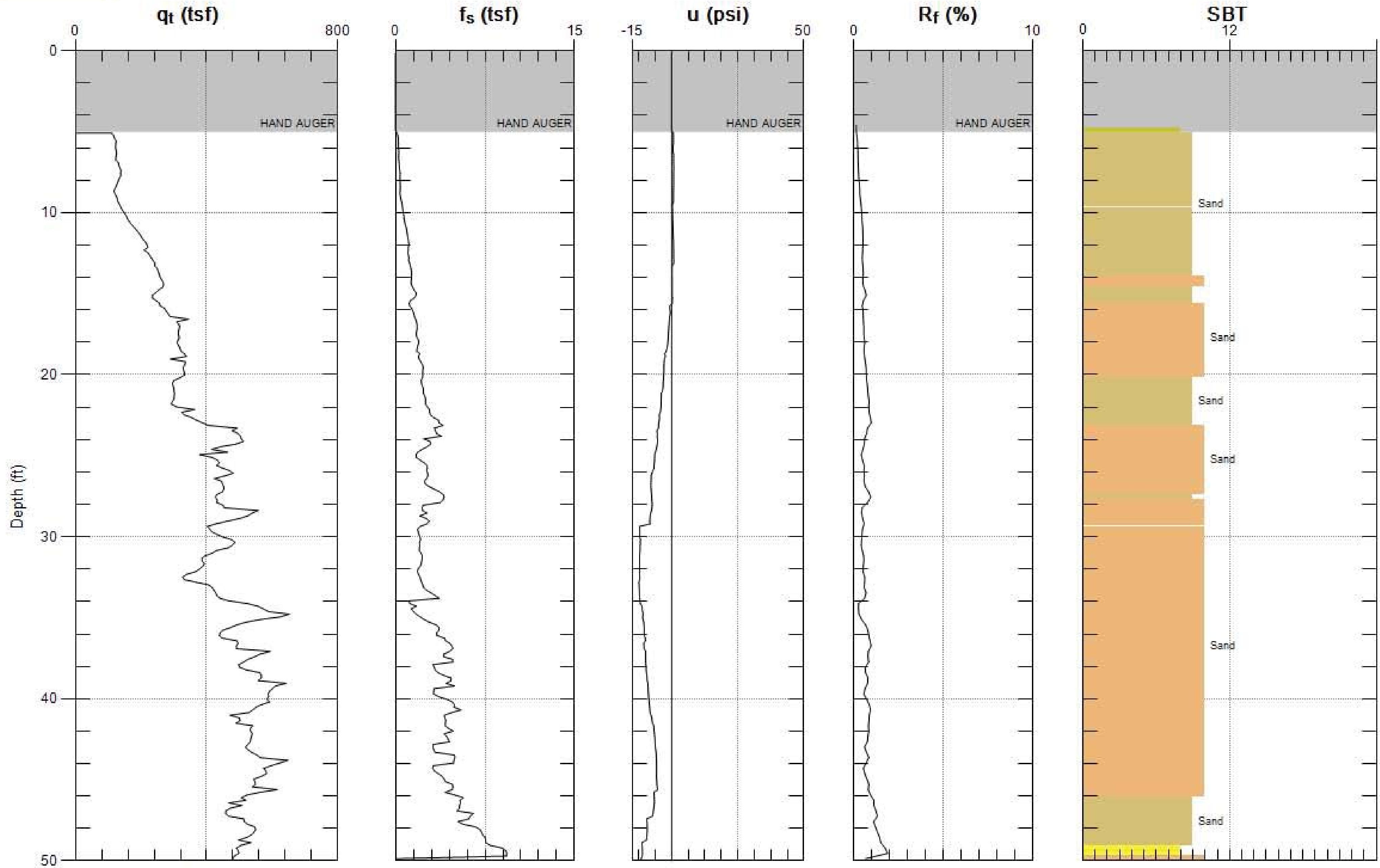
GREGG **GEOKINETICS**

Site: LAX NORTHSIDE

Sounding: CPT-01

Engineer: G.SHAGAM

Date: 1/23/2013 08:04



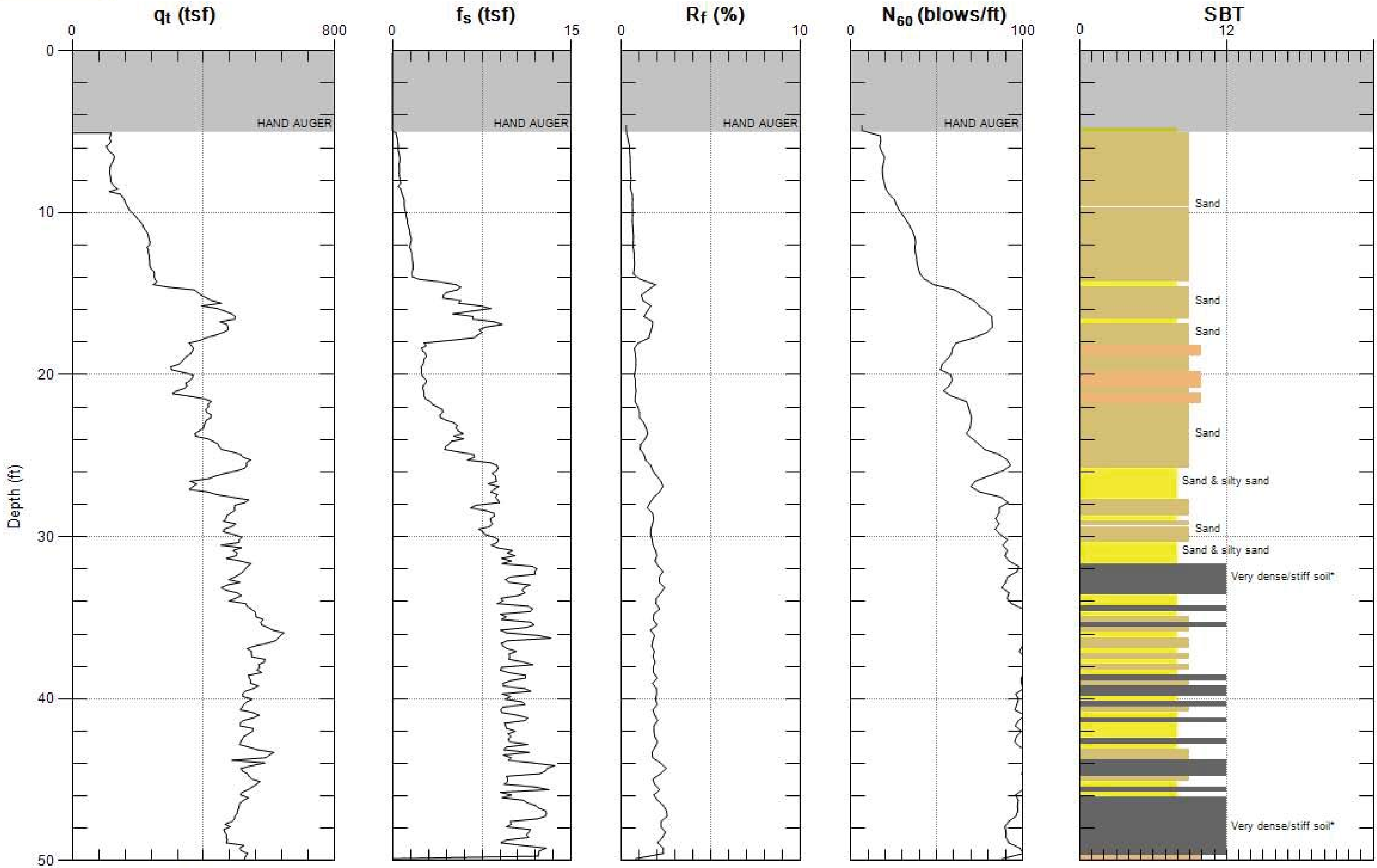
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-02

Engineer: G.SHAGAM
Date: 1/23/2013 08:59



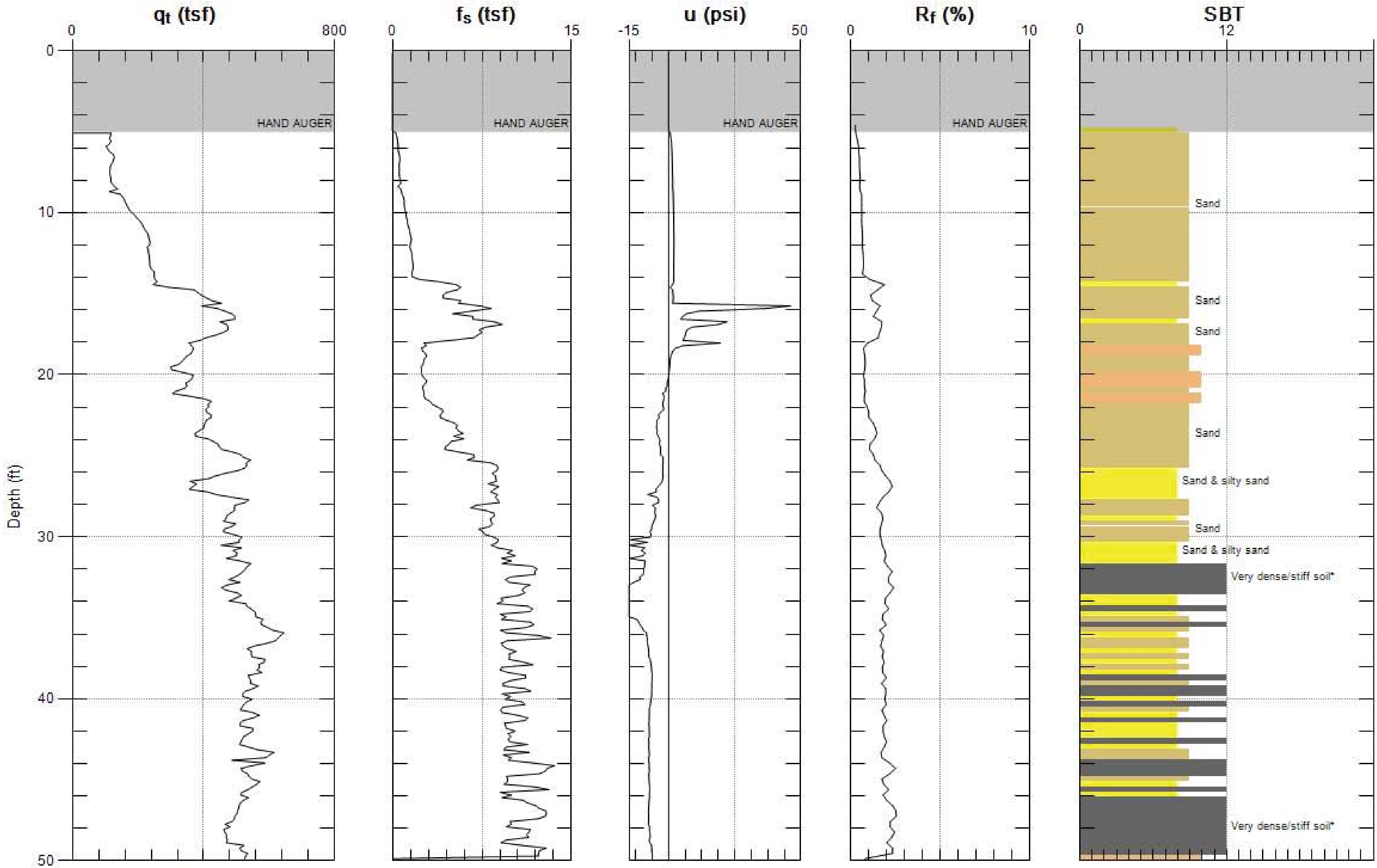
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-02

Engineer: G.SHAGAM
Date: 1/23/2013 08:59



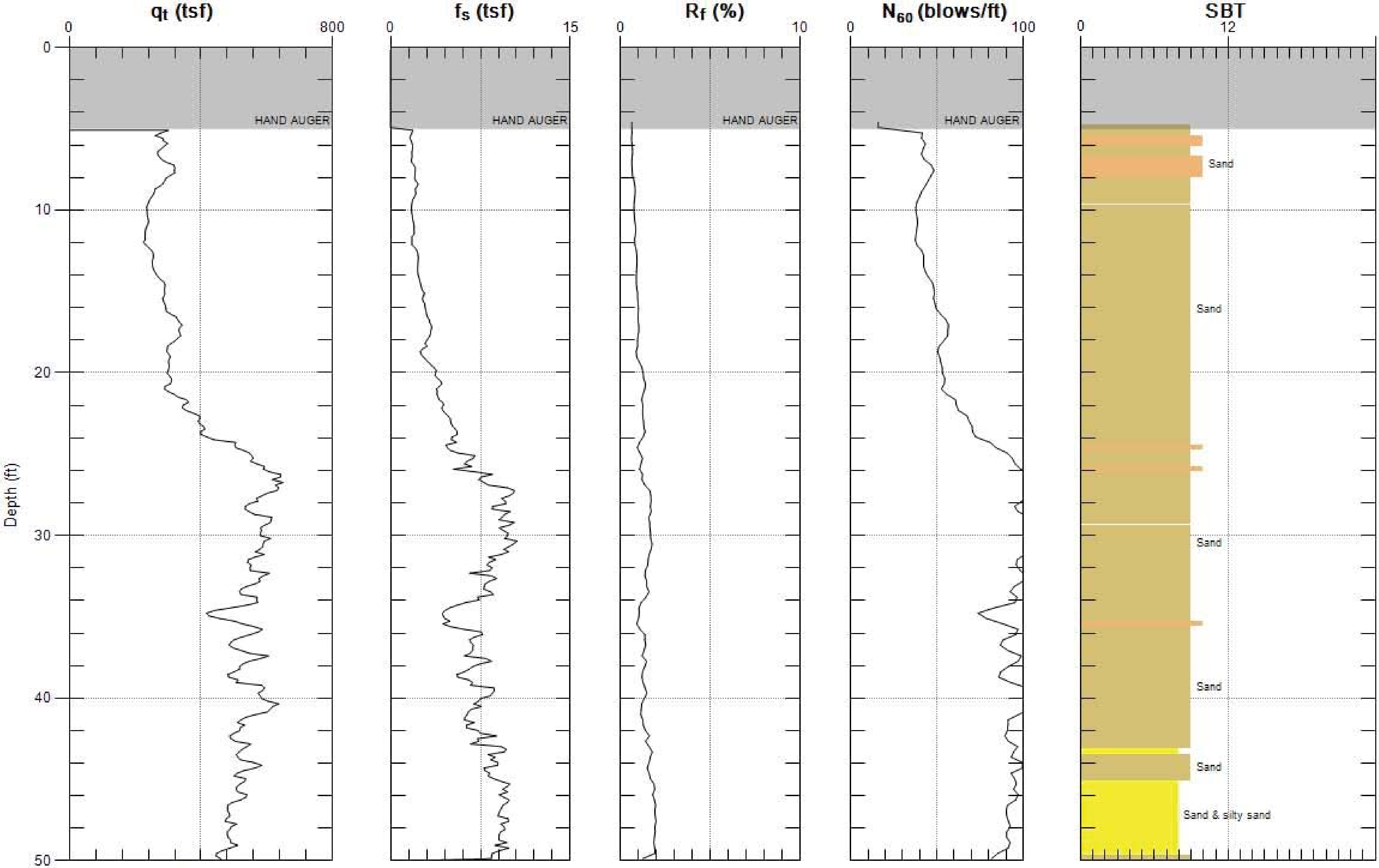
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE
Sounding: CPT-03

Engineer: G.SHAGAM
Date: 1/23/2013 09:33



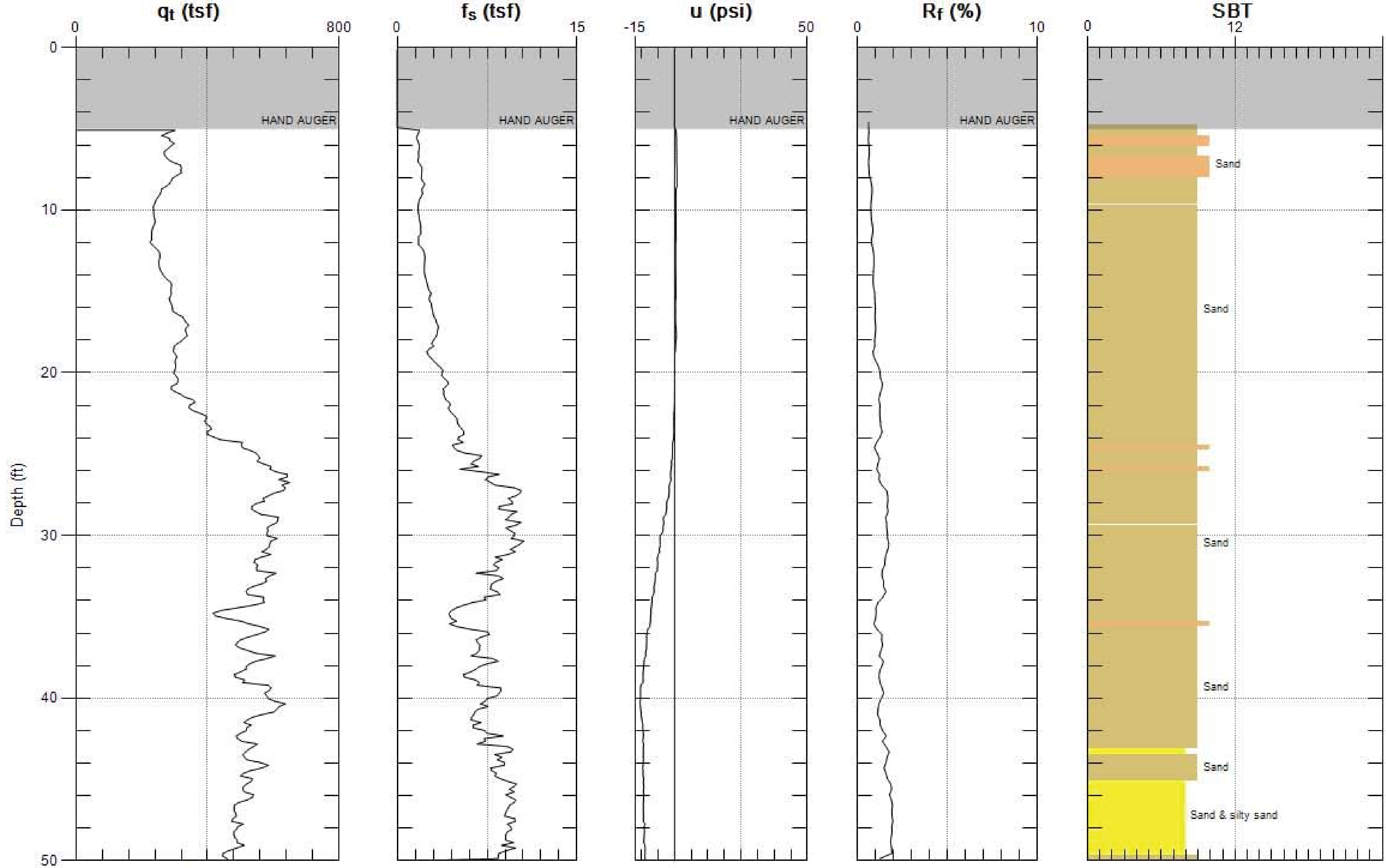
Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE
Sounding: CPT-03

Engineer: G.SHAGAM
Date: 1/23/2013 09:33



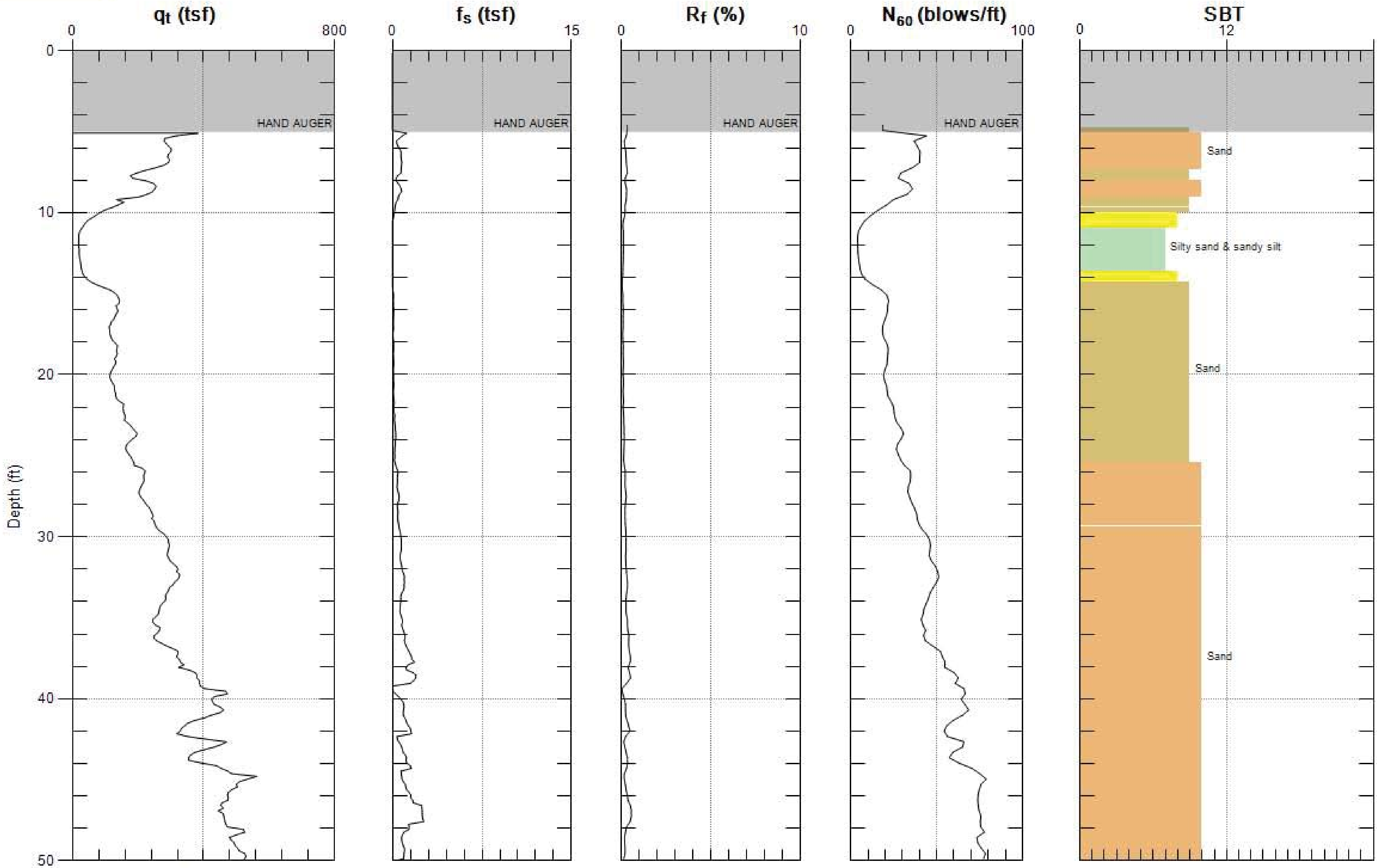
Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE
Sounding: CPT-04

Engineer: G.SHAGAM
Date: 1/23/2013 10:06



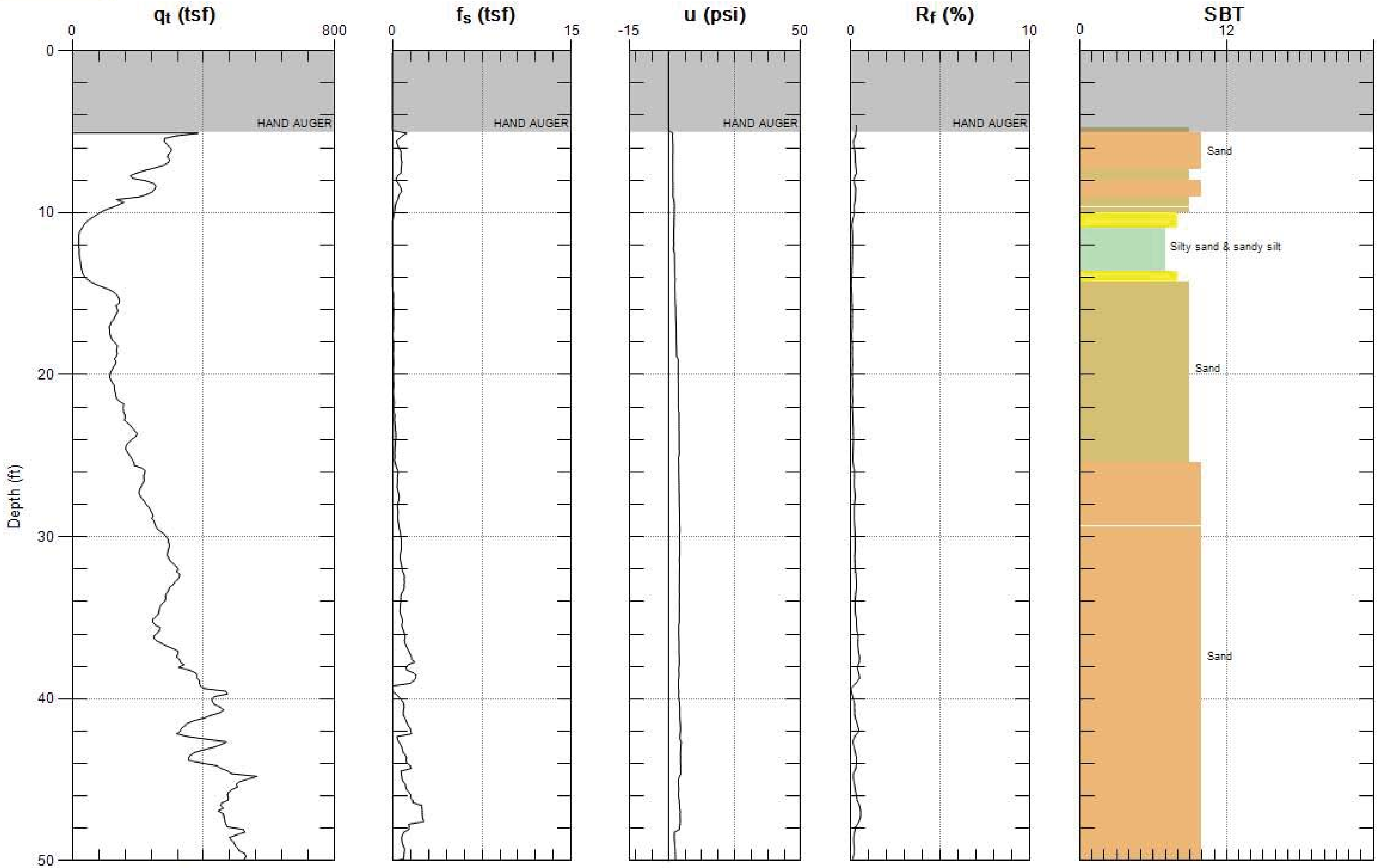
Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-04

Engineer: G.SHAGAM
Date: 1/23/2013 10:06



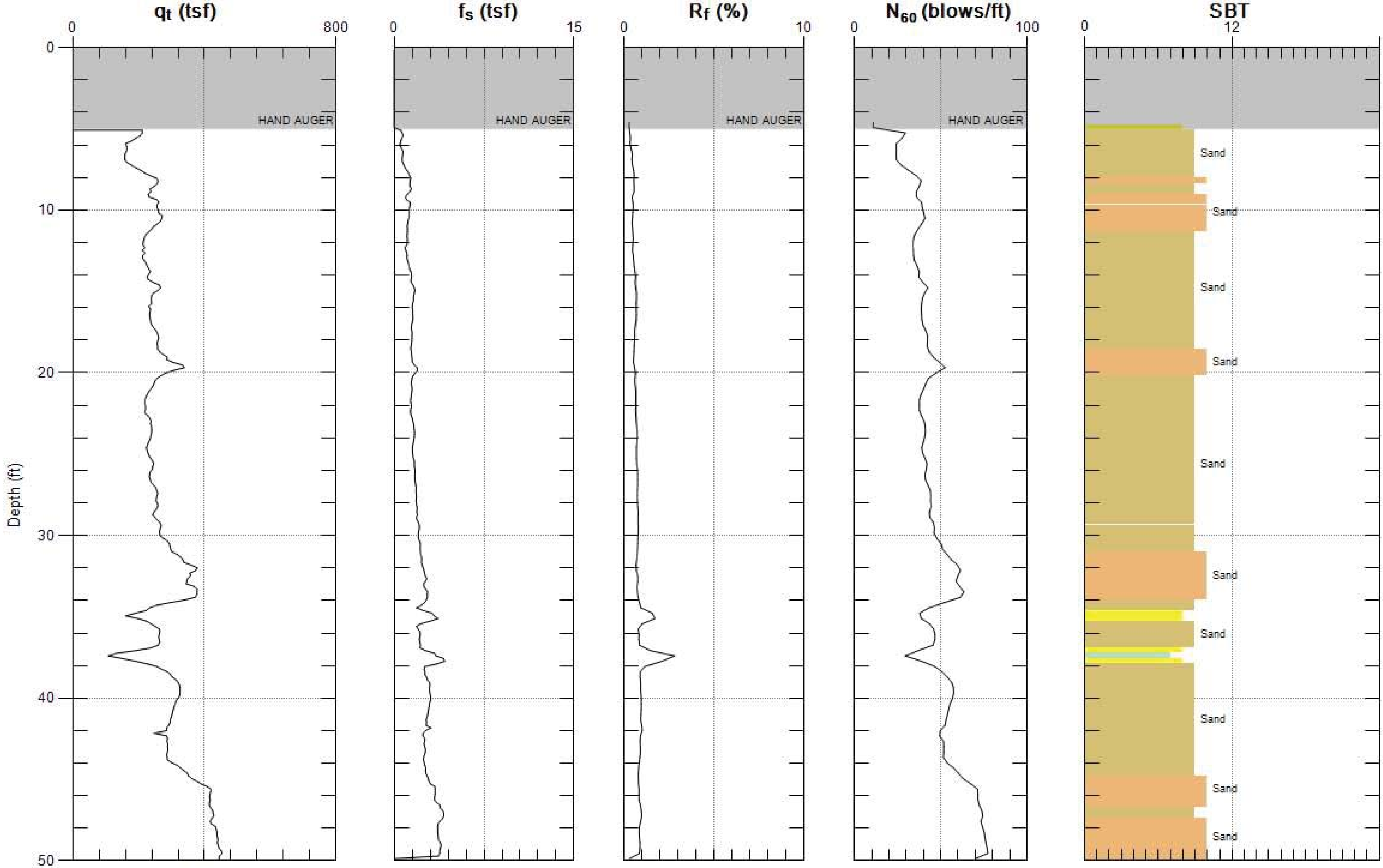
Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE
Sounding: CPT-05

Engineer: G.SHAGAM
Date: 1/23/2013 10:41



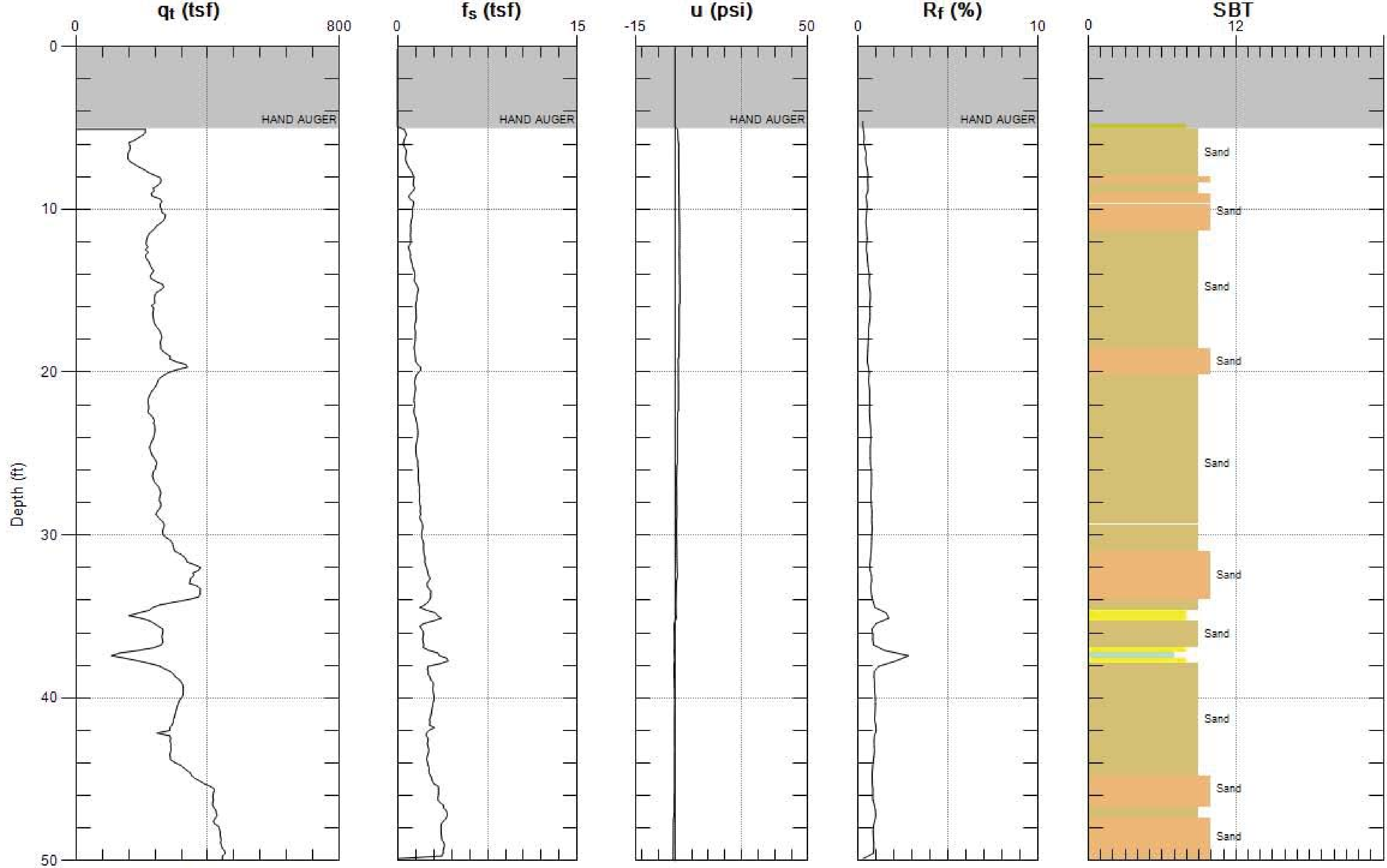
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-05

Engineer: G.SHAGAM
Date: 1/23/2013 10:41



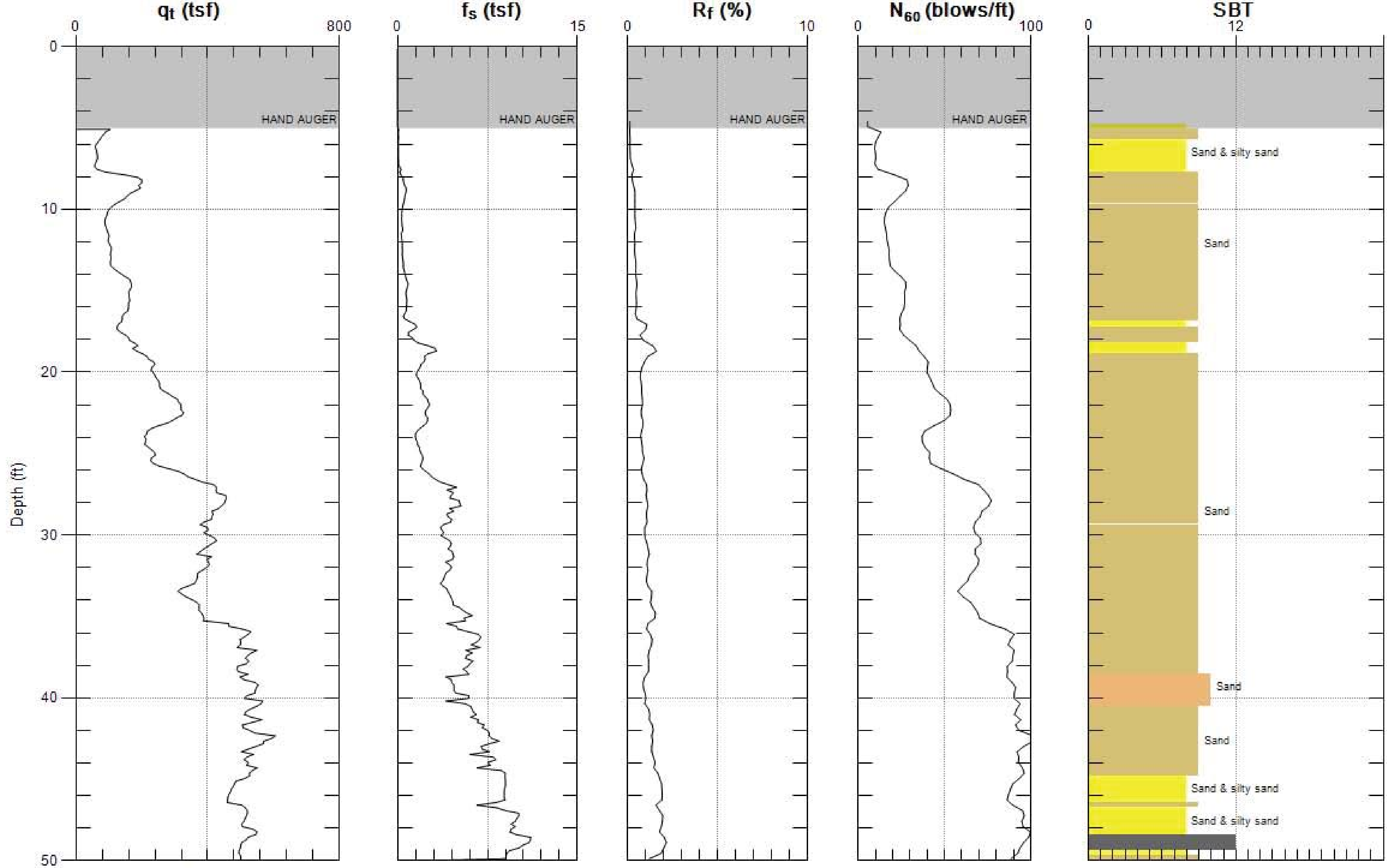
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE
Sounding: CPT-06

Engineer: G.SHAGAM
Date: 1/23/2013 10:59



Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

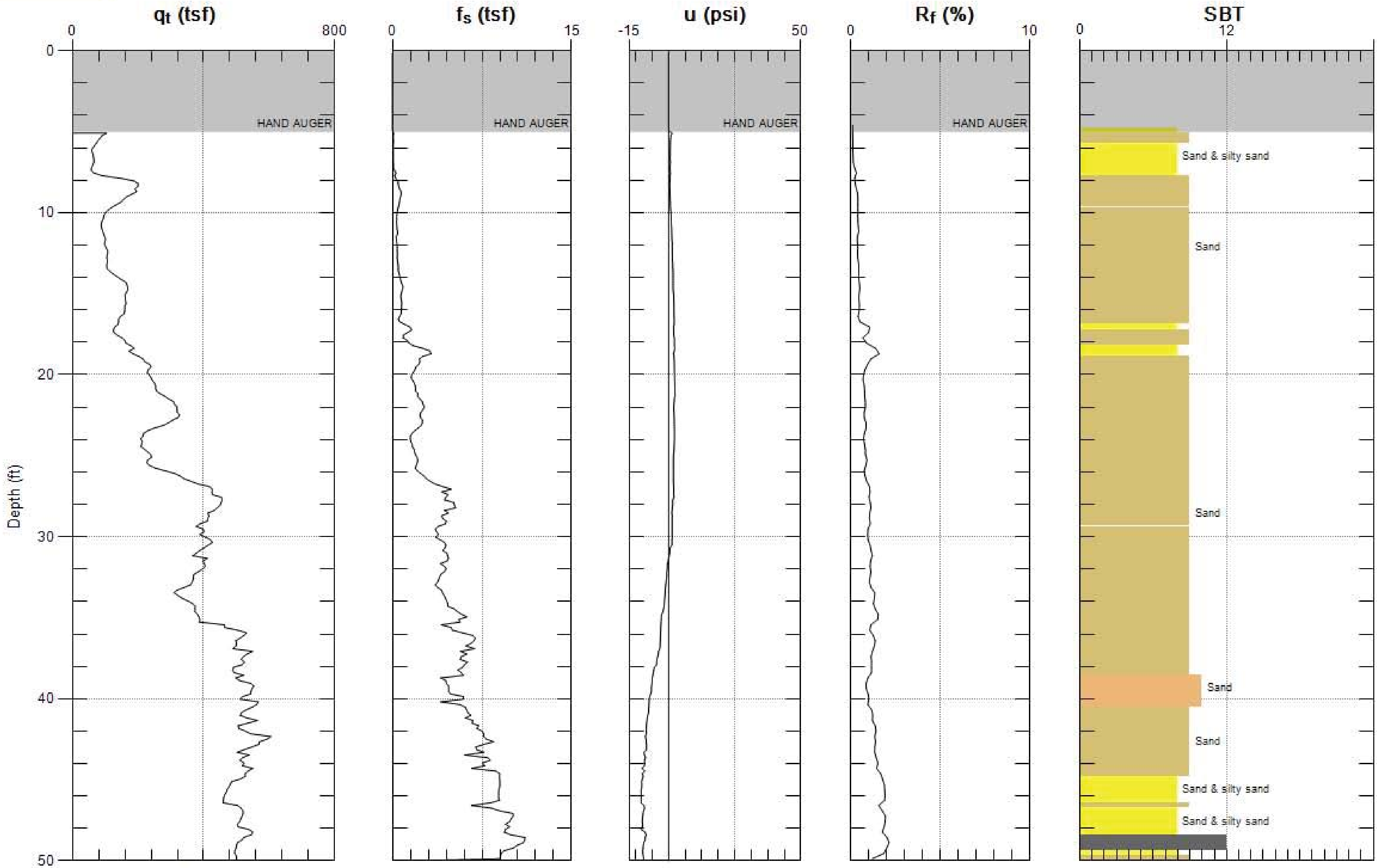
GREGG GEOKINETICS

Site: LAX NORTHSIDE

Sounding: CPT-06

Engineer: G.SHAGAM

Date: 1/23/2013 10:59



Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

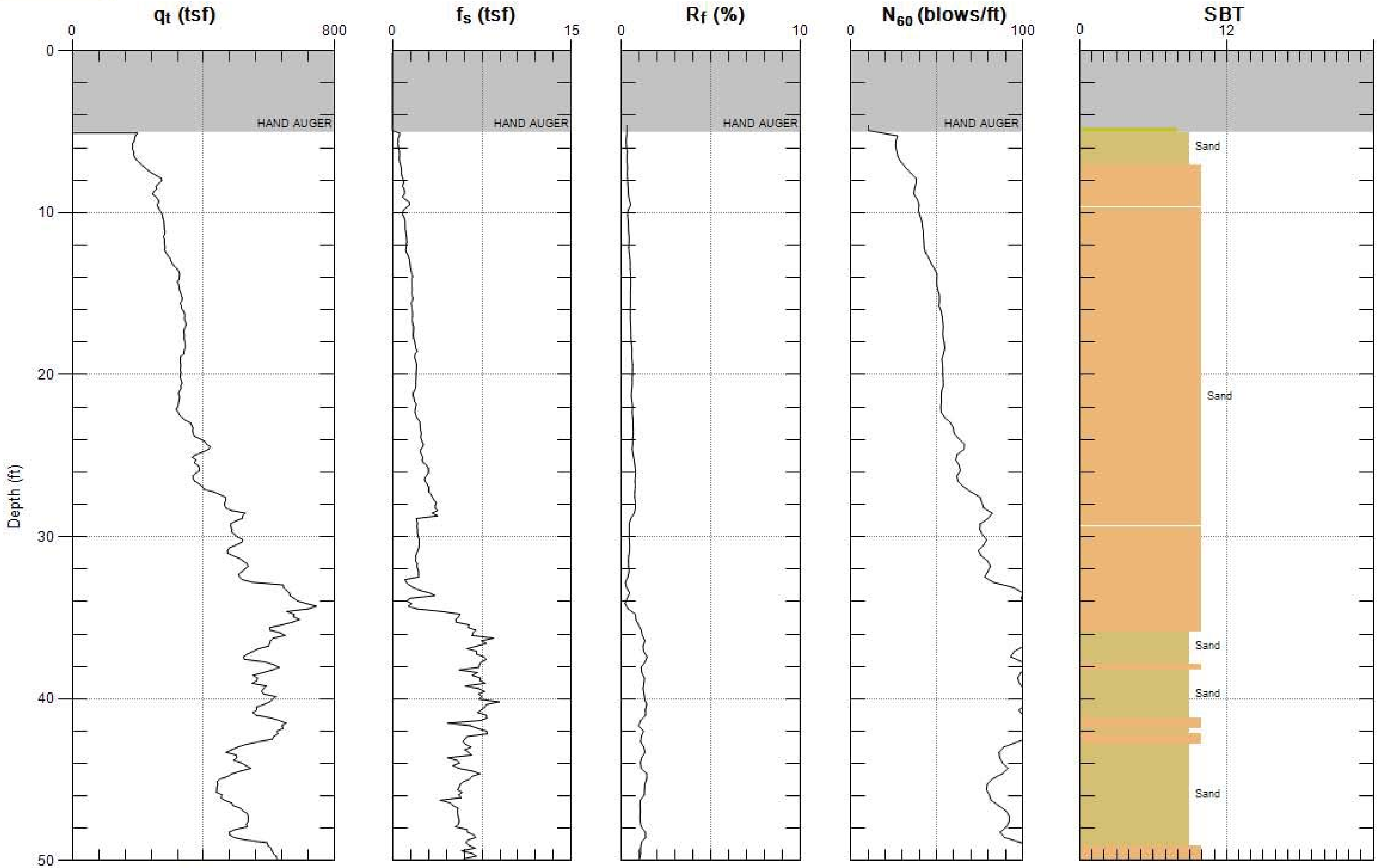
SBT: Soil Behavior Type (Robertson 1990)

GREGG

GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-07

Engineer: G.SHAGAM
Date: 1/23/2013 11:26



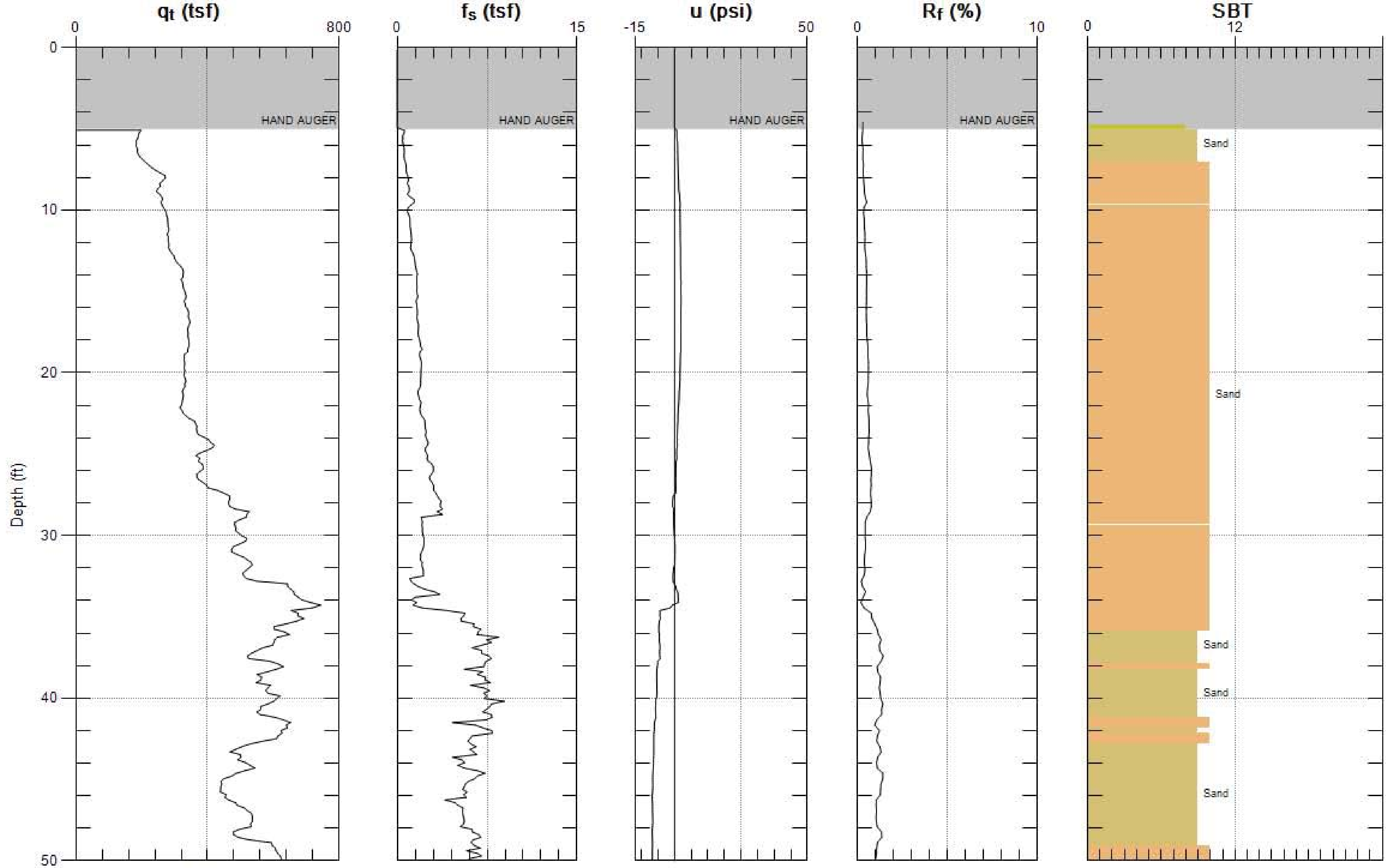
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE **Engineer: G.SHAGAM**

Sounding: CPT-07 **Date: 1/23/2013 11:26**



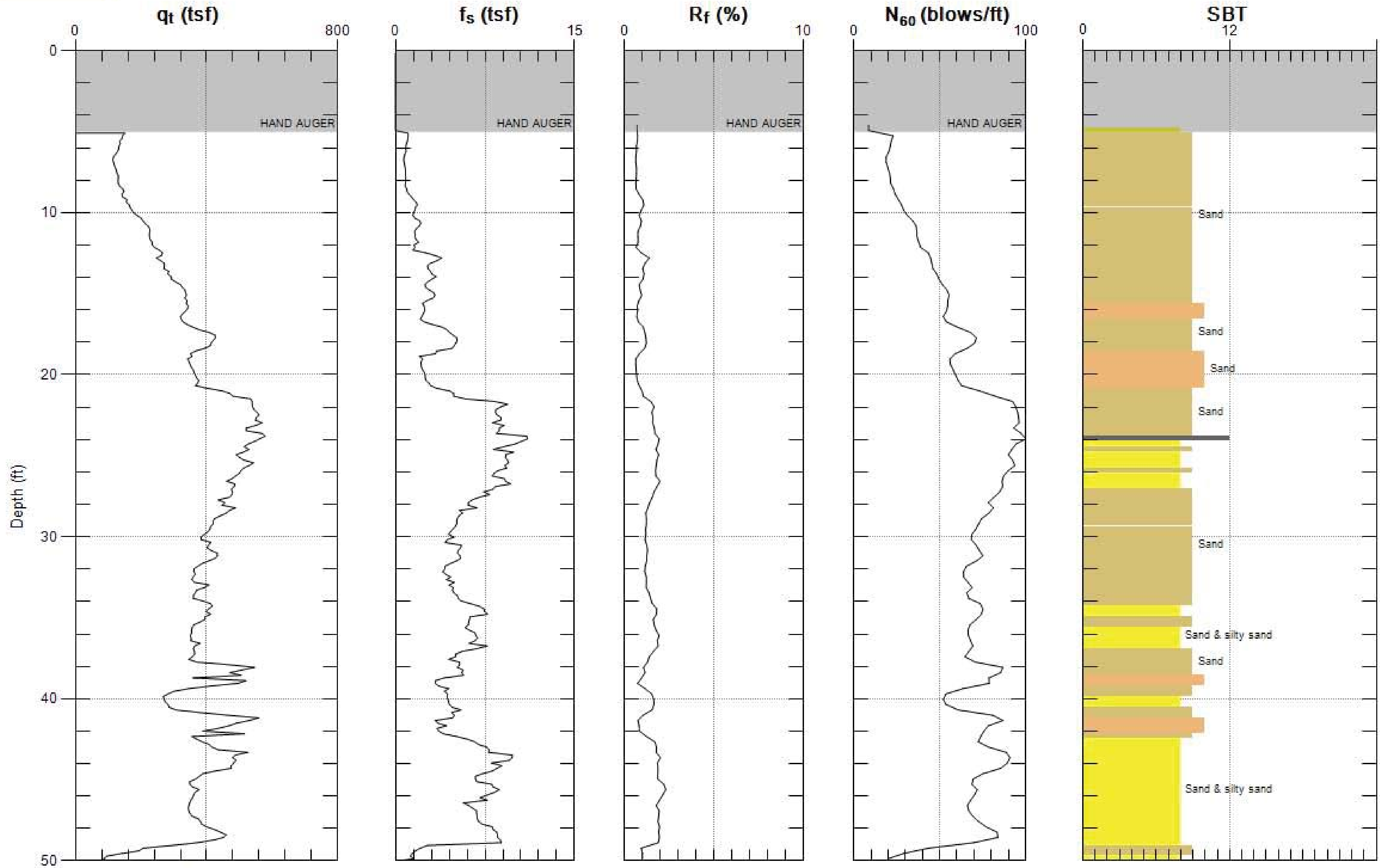
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE **Engineer: G.SHAGAM**

Sounding: CPT-08 **Date: 1/23/2013 01:02**



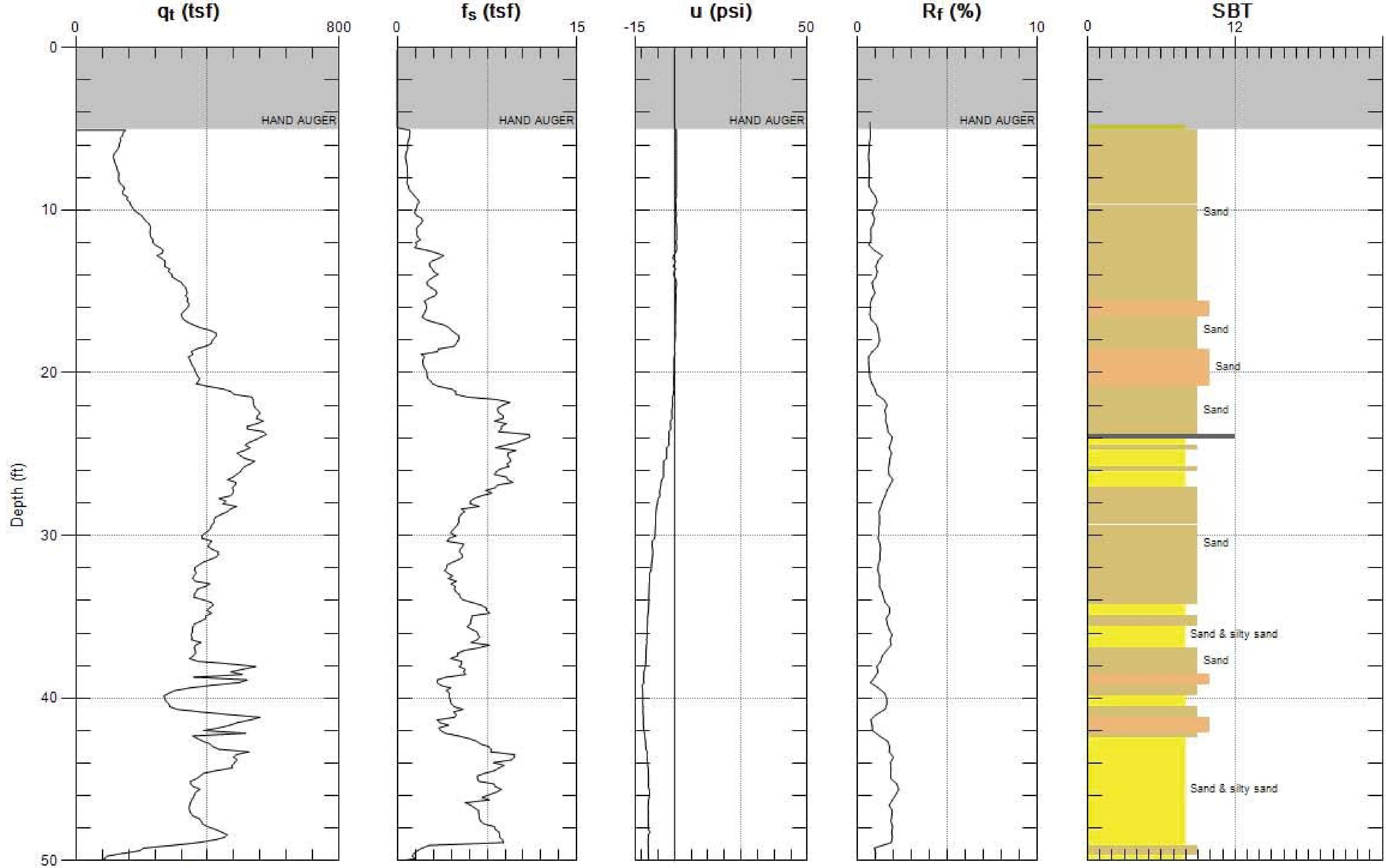
Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE **Engineer: G.SHAGAM**

Sounding: CPT-08 **Date: 1/23/2013 01:02**

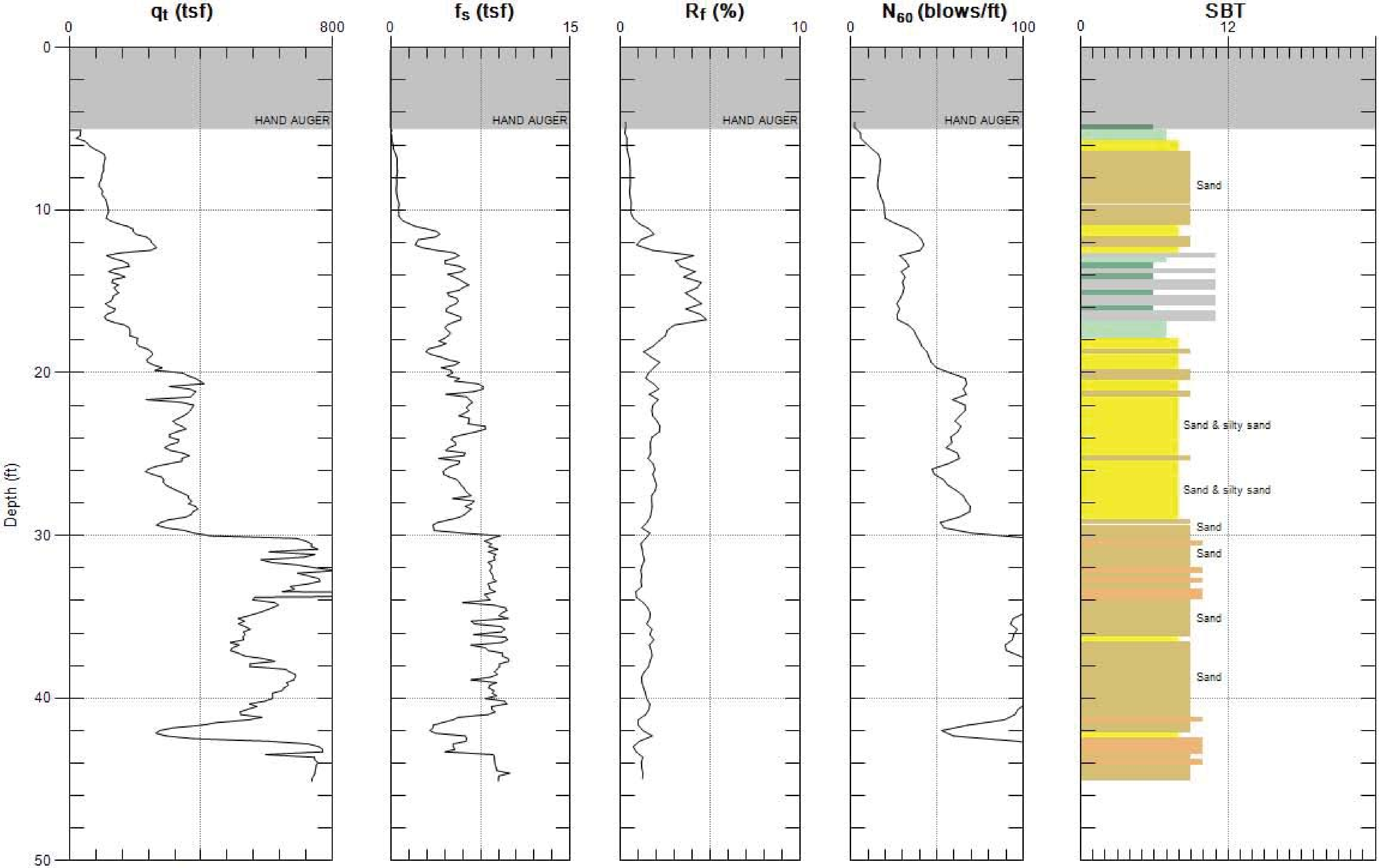


Max. Depth: 50.197 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-09
Engineer: G.SHAGAM
Date: 1/23/2013 12:19



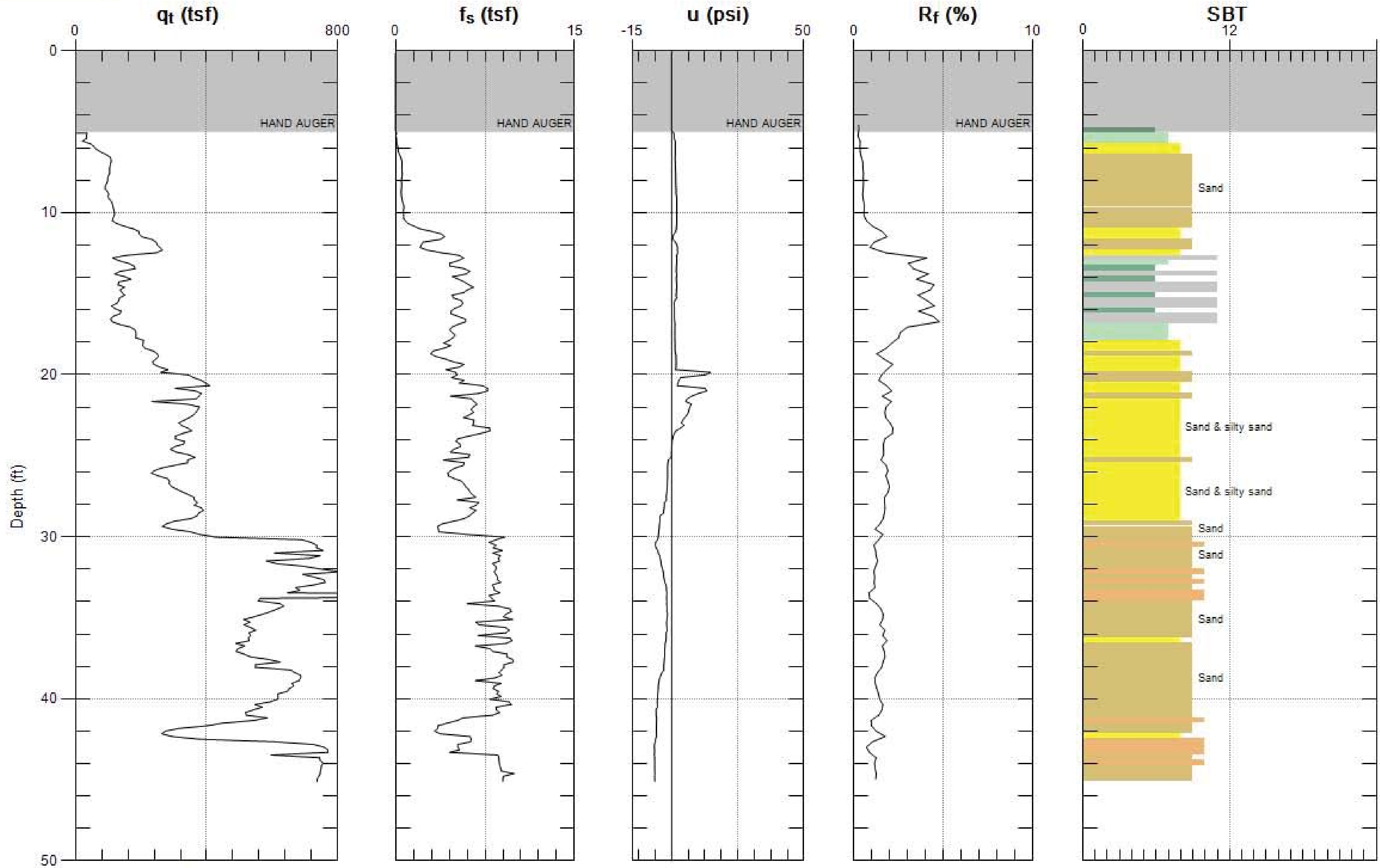
Max. Depth: 45.112 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **GEOKINETICS**

Site: LAX NORTHSIDE **Engineer: G.SHAGAM**

Sounding: CPT-09 **Date: 1/23/2013 12:19**



Max. Depth: 45.112 (ft)
Avg. Interval: 0.328 (ft)

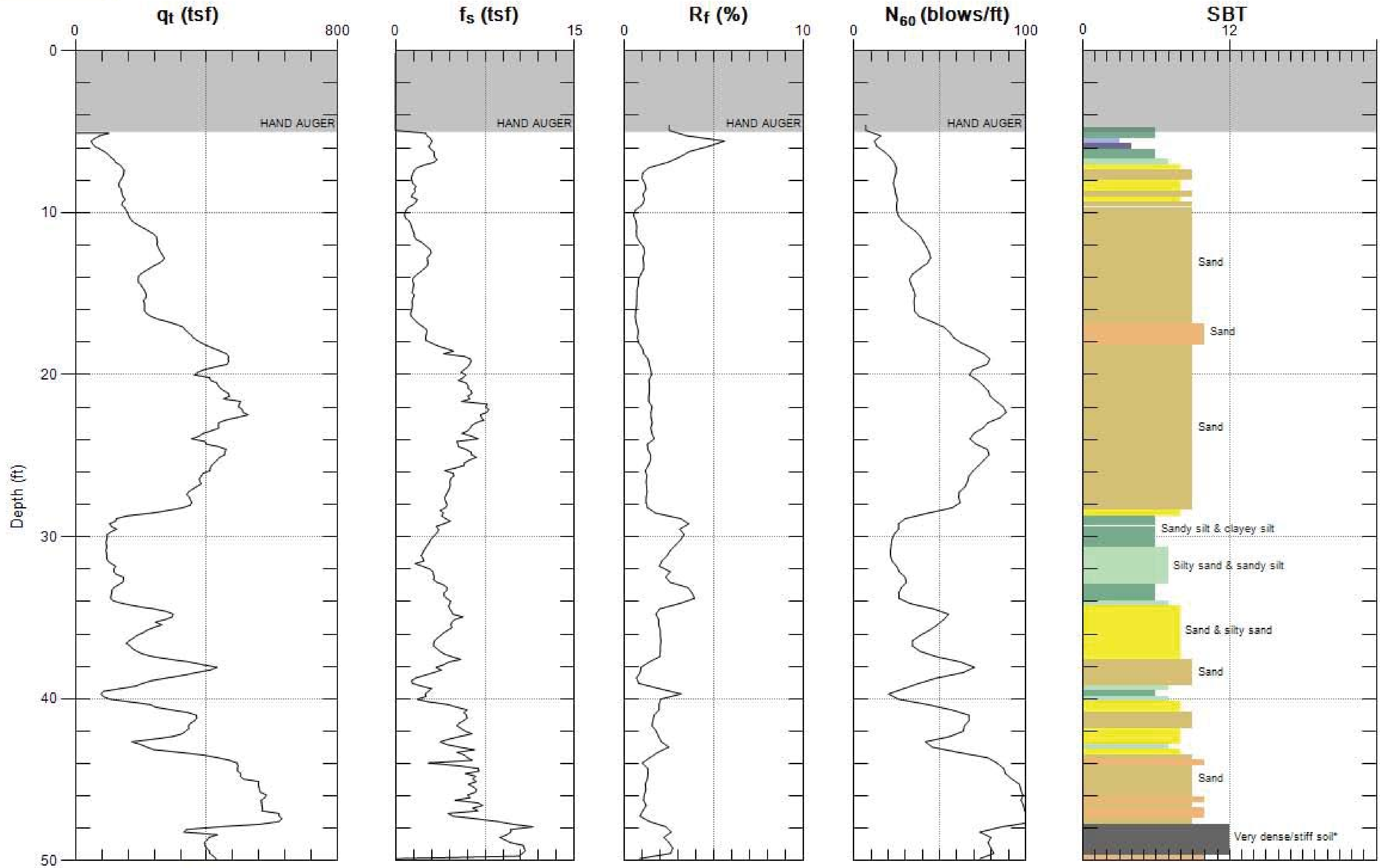
SBT: Soil Behavior Type (Robertson 1990)

GREGG

GEOKINETICS

Site: LAX NORTHSIDE **Engineer: G.SHAGAM**

Sounding: CPT-10 **Date: 1/23/2013 01:38**



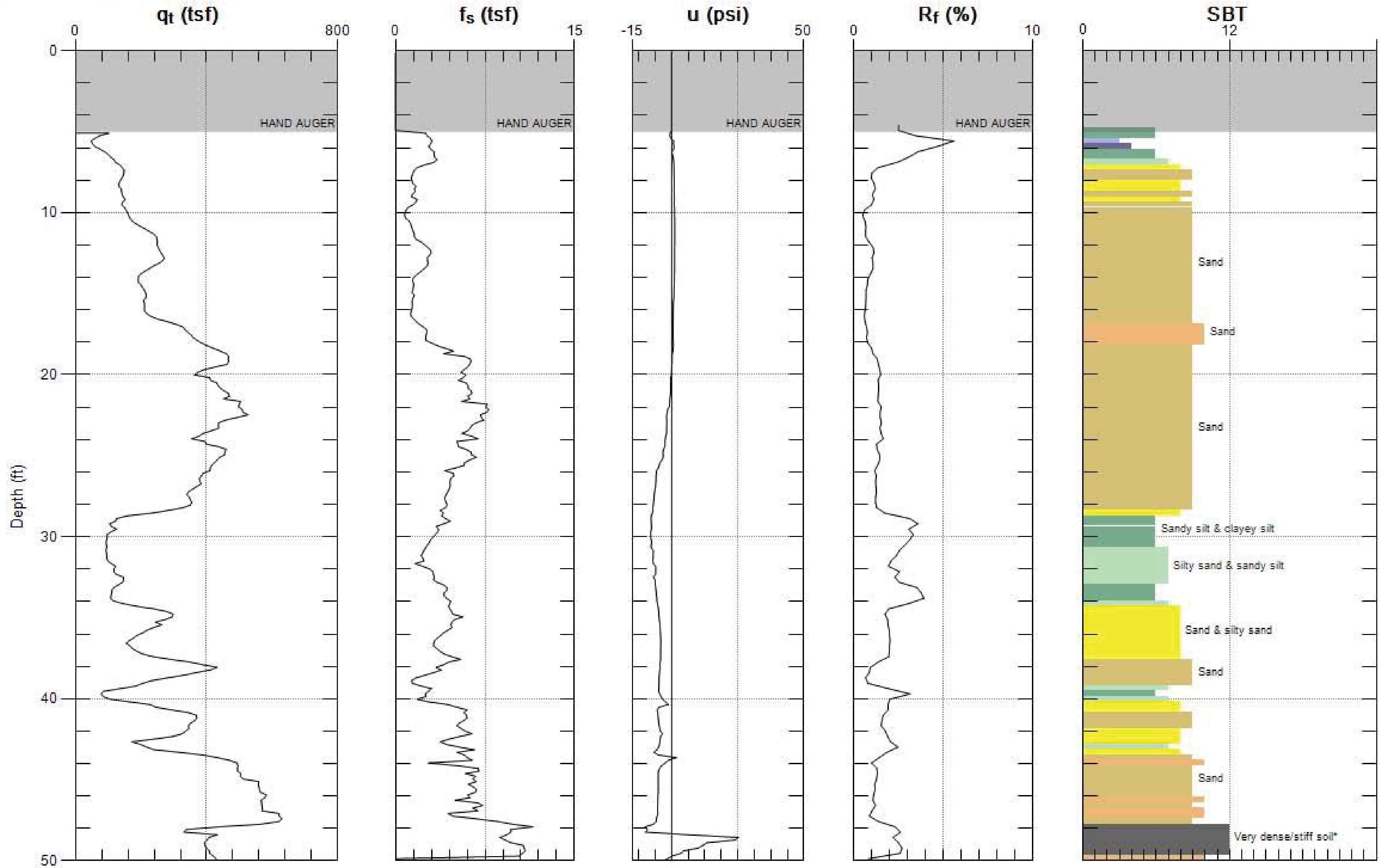
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG GEOKINETICS

Site: LAX NORTHSIDE
Sounding: CPT-10

Engineer: G.SHAGAM
Date: 1/23/2013 01:38



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Attachment C

Laboratory Testing Results

Summary of Laboratory Testing Results

Boring	Depth (feet)	Soil Type	Wet Density (pcf)	Dry Density (pcf)	Moisture Content (%)	Saturation (%)	Void Ratio
B-1	5	SM/SC	119.1	112.1	6.3%	33.5%	0.5
	9	SM	112.8	107.9	4.5%	21.7	0.56
	14	SP	114.1	106.8	6.9%	32	0.58
	24.8	SP	106.5	102.6	3.8%	15.9	0.64
	34.8	SP-SM	104.4	98.1	6.5%	24.4	0.72
	44.8	SM	99.3	93.0	6.8%	22.7	0.81
B-2	5.8	SM/SC	138.8	125.2	10.9%	85.1	0.35
	14.8	SM	117.3	107.0	9.6%	45.0%	0.58
	24.8	SP	104.8	100.8	4.0%	16.1%	0.67
	34.8	SP	104.5	99.6	4.9%	19.2%	0.69
	44.8	SP	100.8	97.4	3.5%	12.9	0.73

Summary of Laboratory Testing Results

Boring	Depth (feet)	Soil Type	Wet Density (pcf)	Dry Density (pcf)	Moisture Content (%)	Saturation (%)	Void Ratio
B-3	5.5	SM	114	108.2	5.4%	26.2%	0.58
	14.8	SM	105.7	101.0	4.6%	18.7	0.67
	24.7	SP	105.6	100.1	5.5%	21.8	0.68
	34.8	SM	105.2	101.2	4.0%	16.1	0.67
	44.8	SM	98.7	92.9	6.2%	20.5	0.81
B-4	5.8	SM	137	122.6	11.8%	84.7	0.38
	14.8	ML	122.4	106.0	15.5%	70.8%	0.59
	24.8	SP	106	102.4	3.5%	14.7%	0.65
	34.8	CL	120.8	93.9	28.6%	97.2%	0.8
	44.8	CL	110.6	83.5	32.5%	86.1	1.02

Project: **LAX Northside**	Job Number:	Sheet **1** of **1**

Tested by: ______________________ Project Description: ______________________

Location: ______________________

Borehole Depth Elev.	Specimen Description (LL / PL / PI / Fines)	Wet Density	Dry Density	Water Content	Specific Gravity	Sample Data: % Saturation	Void Ratio	Porosity
HS-1 5.0	Brown Silty SAND w/Clay (SM/SC)	119.1	112.1	6.3		33.5	0.50	
HS-1 9.0	Light Brown Silty SAND (SM)	112.8	107.9	4.5		21.7	0.56	
HS-1 14.0	Light Gray Poorrly Graded SAND (SP)	114.1	106.8	6.9		32.0	0.58	
HS-1 24.8	Light Yellowish Brown Poorly Graded SAND (SP)	106.5	102.6	3.8		15.9	0.64	
HS-1 34.8	Light Grayish Brown Poorly Graded SAND w/Silt (SP-SM)	104.4	98.1	6.5		24.4	0.72	
HS-1 44.8	Light Brown Silty SAND (SM)	99.3	93.0	6.8		22.7	0.81	

Project: **LAX Northside** Job Number: Sheet **1** of **1**

Tested by: ______________________ Project Description: ______________________

Location: ______________________

Borehole Depth Elev.	Specimen Description (LL / PL / PI / Fines)	Wet Density	Dry Density	Water Content	Specific Gravity	Sample Data: % Saturation	Sample Data: Void Ratio	Sample Data: Porosity
HS-4 5.8	Dark Brown Clayey SAND (SC)	137.0	122.6	11.8		84.7	0.38	
HS-4 14.8	Brown Clayey SAND (SC)	122.4	106.0	15.5		70.8	0.59	
HS-4 24.8	Light Grayish Brown Poorly Graded SAND (SP)	106.0	102.4	3.5		14.7	0.65	
HS-4 34.8	Dark brown Silty Lean CLAY (CL) * Bedrock	120.8	93.9	28.6		97.2	0.80	
HS-4 44.8	Dark Brown Silty Lean CLAY (CL) * Bedrock	110.6	83.5	32.5		86.1	1.02	

Summary of Material Properties

GeoKinetics
Geotechnical & Environmental Engineers

Project: **LAX Northside**	Job Number:	Sheet **1** of **1**

Tested by: ______________________ Project Description: ______________________

Location: ______________________

Borehole Depth Elev.	Specimen Description (LL / PL / PI / Fines)	Wet Density	Dry Density	Water Content	Specific Gravity	Sample Data: % Saturation	Sample Data: Void Ratio	Sample Data: Porosity
HS-3 5.5	Brown Silty Fine SAND (SM)	114.0	108.2	5.4		26.2	0.56	
HS-3 14.8	Brown Silty SAND (SM)	105.7	101.0	4.6		18.7	0.67	
HS-3 24.7	Brown Silty SAND (SM)	105.6	100.1	5.5		21.8	0.68	
HS-3 34.8	Grayish Brown Poorly Graded SAND w/Silt (SP-SM)	105.2	101.2	4.0		16.1	0.67	
HS-3 44.8	Light Brownish Gray Silty Fine SAND (SM)	98.7	92.9	6.2		20.5	0.81	

Project:	**LAX Northside**	Job Number:	Sheet **1** of **1**

Tested by: ______________________ Project Description: ______________________

Location: ______________________

Borehole Depth Elev.	Specimen Description (LL / PL / PI / Fines)	Wet Density	Dry Density	Water Content	Specific Gravity	Sample Data: % Saturation	Void Ratio	Porosity
HS-2 5.8	Dark Brown Silty SAND w/Clay (SM/SC)	138.8	125.2	10.9		85.1	0.35	
HS-2 14.8	Light Brown Silty SAND (SM)	117.3	107.0	9.6		45.0	0.58	
HS-2 24.8	Light Grayish Brown Poorly Graded SAND (SP)	104.8	100.8	4.0		16.1	0.67	
HS-2 34.8	Light Brown Poorly Graded SAND (SP)	104.5	99.6	4.9		19.2	0.69	
HS-2 44.8	Light Gray Poorly Graded SAND (SP)	100.8	97.4	3.5		12.9	0.73	

Summary of Material Properties

GeoKinetics
Geotechnical & Environmental Engineers