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Engineering & Environmental Services

A Report Prepared For:

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Attention: Mr. Richard Gilcrease

RESULTS OF ADDITIONAL GROUNDWATER INVESTIGATION AND RISK EVALUATION FORMER YOUNG'S CLEANERS FOOTHILL SQUARE SHOPPING CENTER OAKLAND, CALIFORNIA

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1.0 INTRODUCTION

This report presents the results of implementation of a groundwater investigation and health risk evaluation program for the former Young's Cleaners site at the Foothill Square Shopping Center (Site) in Oakland, California. This program was performed by PES Environmental, Inc. (PES) on behalf of Drake Builders, Inc. (Drake), the property owner. A workplan for the program was presented in a letter dated December 19, 1996, from PES to the Alameda County Health Care Services, Department of Environmental Health (ACDEH) and the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) (PES, 1996b).

The activities comprising the program are intended to address groundwater quality issues and health risk concerns related to dry cleaning operations and suspected solvent releases at the site. These solvents, specifically perchlorethylene (PCE), have adversely affected soil and groundwater quality, as documented by previous investigations (see Section 2.4). In late 1995 and early 1996, affected soil at the source area was excavated and the overlying rental units were renovated. However, monitoring activities indicate that residual PCE is present in groundwater beneath the site. The program was developed to accomplish three primary goals related to the residual PCE: (1) Address regulatory agency concerns regarding the distribution of volatile organic compounds (VOCs) in groundwater; (2) Develop procedures to assess the potential risks to onsite and offsite receptors resulting from the presence of PCE in groundwater; and (3) Establish a monitoring program to provide future evaluation of the position of an offsite groundwater plume, if present. On the basis of regulatory agency comments on the program workplan received in subsequent telephone conversations, an evaluation of potential risks associated with residual PCE in unexcavated soil has been added to the program.

To achieve the three goals described above, the scope of the program included four primary tasks: (1) A review and evaluation of published available records concerning potential sources of solvents in groundwater in the vicinity of Foothill Square; (2) Investigation of current groundwater conditions in the adjacent offsite area generally understood to be downgradient of the Site using HydroPunch™ technology, followed by well installation; (3) Evaluation of potential onsite and downgradient offsite health risks; and (4) Development of recommendations.

Section 2.0 of this report provides background information on the site history, geology and hydrogeology, previous environmental investigations, and removal actions. The results of a records review of potential offsite sources is described in Section 3.0. Section 4.0 presents the methodology and results of the groundwater investigation. The human health risk evaluation is described in Section 5.0. Sections 6.0 and 7.0 present a discussion of the results of the program and make recommendations for further work, respectively. References are listed in Section 8.0.

2.0 BACKGROUND INFORMATION

2.1 Site Location and Description

The Foothill Shopping Center is located at the northeastern corner of MacArthur Boulevard and 108th Avenue in a residential and commercial area in Oakland, California. The location of the site is shown on Plate 1. The site is presently used as a shopping center, which was developed in the early 1960's. From approximately 1916 to 1960, prior to the development of the Foothill Square Shopping Center, the site was a truck manufacturing plant. As shown on Plate 2, the shopping center contains four principal buildings consisting of seven distinct structures, which are currently occupied by various commercial, retail, and governmental human services organizations. Young's Cleaners operated in a leased space in the northeast building at the site between 1984 and 1995. A coin operated dry cleaner, Norge Cleaners, operated at the same location between 1962 and 1983. The cleaners has been on the CALSITES database list since 1980.

Drake Builders is considering renovation of the Foothill Square Shopping Center. The work may include reconstruction of an enlarge major retail space in the western portion of the Site and refurbishment of other retail structures.

2.2 Geology

The site is located along the eastern margin of the San Francisco Bay plain at the foot of the western slope of the Oakland hills. The ground surface at the site slopes gently to the west and elevations range from 80 feet mean sea level (MSL) along the southeastern site boundary adjacent to Foothill Boulevard, to approximately 55 feet MSL along the northwestern site boundary adjacent to MacArthur Boulevard.

The subsurface geology in the vicinity of the site consists of older alluvium of Pleistocene age underlain by undifferentiated bedrock (ACFCWCD, 1988). The alluvium consists of a heterogeneous mixture of unconsolidated clay, silt, sand, and gravel. The sediments represent coalescing alluvial fans on the western edge of the Oakland hills. The thickness of the alluvium at the site and in the near vicinity ranges from 0 feet to greater than 60 feet, on the basis of boring logs. In the southeastern portion of the site, the alluvium is absent and bedrock is present just below the parking lot pavement. The bedrock surface dips to the northwest and the alluvium consequently thickens to greater than 60 feet at the western edge of the site. The northwest-trending Hayward Fault zone is approximately 1,000 feet northeast of the site.

2.3 Hydrogeology

The site is in the upper portion of the San Leandro Cone groundwater subarea of the East Bay Plain groundwater basin (ACFCWCD, 1993). Near the Hayward Fault zone (where Foothill Square is located) the aquifers in the subarea are reported to be relatively thin, with little lateral continuity. Boring and monitoring well logs from current and previous investigations at

the site have confirmed that the uppermost aquifer consists of thin and discontinuous lenses of sand and gravel.

Depth to shallow groundwater at the site varies seasonally and typically ranges from 5 to 25 feet below ground surface. Previous environmental investigations at the site have described two saturated zones in the uppermost aquifer - the shallow groundwater zone and the deep groundwater zone (Augeas, 1994a,1995). There is no continuous aquitard separating the two zones. Rather, the zones have been defined on the basis of permeable zones occurring at regular depths below the ground surface. The shallow groundwater zone typically extends from approximately 20 to 30 feet bgs. The deep groundwater zone extends from about 35 to 50 feet bgs. Groundwater flow in both zones is predominantly to the west or northwest, toward San Francisco Bay.

2.4 Previous Environmental Investigations

Environmental investigations were initially performed at the Site in 1988 by Kaldveer Associates (Kaldveer) as part of a preliminary environmental assessment and a follow-up program of soil and groundwater sampling and analysis (Kaldveer, 1988). The investigation focused on the past use of the site as a truck manufacturing factory, a then operating USA Gasoline service station at the southeast corner of the property, and an ARCO service station adjacent to the northwest corner. Plate 2 shows the approximate locations of the former USA and current ARCO service stations. Kaldveer drilled and sampled 15 borings across the Site. The results of the analytical program indicated the presence of petroleum hydrocarbons in the soil and groundwater in the northwest portion of the site, indicative of tank and/or piping leaks at the ARCO station (Kaldveer, 1988).

Beginning in January 1989, Western Geologic Resources (WGR) installed and monitored Wells WGR MW-1 through WGR MW-5 on the property to characterize the subsurface conditions due to the presence of the adjacent ARCO gas station, northwest of the site (WGR, 1989). Monitoring well locations in the vicinity of the site are shown on Plate 2. Wells WGR MW-1, WGR MW-2, WGR MW-3, and WGR MW-5 were installed in what WGR defined as the shallow groundwater bearing zone, and Well WGR MW-4 was installed in the deep groundwater bearing zone. Petroleum hydrocarbons and related compounds were again detected in both soil and groundwater at the northwest corner of the property (Well WGR-MW3). Additionally, low concentrations of 1,1,1-trichloroethane (TCA) were detected in Wells WGR-MW2 and -MW3.

Between 1991 and 1993, RESNA Consultants (RESNA) conducted an investigation on behalf of ARCO for the service station site in order to define the extent of gasoline contamination caused by leakage of petroleum fuels. During their investigation, RESNA reported detectable concentrations of chlorinated solvents in several soil borings.? As a result, in March 1993 ACDEH requested an investigation of the vertical and lateral extent of tetrachloroethylene (PCE) at both the ARCO site and the Foothill Square Shopping Center.

In order to verify the source and extent of the PCE contamination at Foothill Square, Augeas Corporation (Augeas) drilled eight borings, installed nine monitoring wells, and collected soil and groundwater samples for laboratory analysis. Additionally, targeted soil sampling was performed inside the dry cleaners in 1994. Concentrations of PCE in these soil samples were reported at 5,000 milligrams per kilogram (mg/kg; approximately equivalent to parts per million [ppm]) (Augeas, 1994b). Augeas installed Wells AMW-1 through AMW-3 in September through November of 1994, Wells AMW-4 and AMW-5 in March 1995, and Wells AMW-6 through AMW-9 in July through August of 1995 (Augeas, 1994a,1995). Using the groundwater bearing zones defined by the WGR wells, **Augeas installed Wells AMW-1 through AMW-7 within the shallow groundwater bearing zone, and Wells AMW-8 and AMW-9 within the deep groundwater bearing zone.** A summary of the monitoring well completion details is provided in Table 1.

Based on their soil and groundwater investigations, Augeas concluded that the PCE contamination on the site was caused by a release of solvents from the dry cleaner and the associated underground sanitary sewer lateral. Augeas also concluded that the extent of affected soil was not widespread.

2.5 Removal Actions

As a result of the investigations described above, Augeas recommended that the PCE-affected soil be excavated, thereby removing the source of contaminants that may affect groundwater quality (Augeas, 1994a,b; 1995). It was expected that removal of the source area would result in a reduction in PCE concentrations in groundwater at the site over time.

Between October 1995 and January 1996, All Environmental, Inc. (AEI) excavated the PCE-contaminated soil and backfilled the excavation with clean imported soil fill. During the removal action, the lateral and vertical extent of affected soil was found to be more widespread than initially estimated by Augeas. In addition, degradation products of PCE, and chloroform, were detected in cleanup verification soil samples collected from the bottom and sidewalls of the excavation. Chloroform was not consistently detected during verification sampling and its presence in soil was considered questionable. Augeas initially recommended removing the soils with PCE concentrations in excess of 1 mg/kg. Due to the presence of additional VOCs other than PCE, PES understands the clean-up goal was then revised to include removal of soils having total VOC concentrations above 1 ppm. The resultant excavation extended into adjacent tenant spaces to the west and required removal of approximately 2,500 cubic yards (cy) of affected soil. The details of the soil removal were presented in AEI's report *Soil Remedial Investigation and Excavation Project Summary* (AEI, 1996a).

While the removal action was successful in removing the highest concentrations of chemical-affected soils from beneath the former dry cleaner, soils with residual total VOC concentrations above the 1 ppm goal are still present at two localized areas at the excavation periphery. These two areas are described below:

- The northeast corner of the former Young's Cleaners space where total VOCs were 1.8 and 1.9 mg/kg at depths of 4 and 8 feet, respectively (AEI sampling locations 8 and 12); and

- In the breezeway west of the building containing the former Young's Cleaners where total VOCs were 2.8 mg/kg at a depth of 5 feet (AEI sampling location 50).

During the soil excavation, Wells AMW-2 and AMW-3 were destroyed. Additionally, Well WGR MW-5 was covered by the soil stockpile and has not been accessible since that time.

Soil from the excavation was spread over the southeastern corner of the property by AEI for treatment by aeration. Because the soil contained less than 50 ppm total VOCs, no permit was required by the Bay Area Air Quality Management District. A remediation workplan to treat the excavated soil was prepared by AEI and approved by ACDEH in March 1996 (AEI, 1996b; ACDEH, 1996b). The workplan proposed Target Cleanup Levels (TCLs) for the excavated soil equivalent to two orders of magnitude below the U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for residential soil (EPA, 1995). The equivalent TCL for PCE was 70 micrograms per kilogram (μg/kg; equivalent to parts per billion [ppb]).

In February 1996, ten grab soil samples were collected by AEI from the stockpile and analyzed for VOCs to evaluate baseline concentrations before treatment. The baseline analytical results indicated PCE concentrations ranged from below the detection limit of 5 to 380 μg/kg. AEI calculated a mean PCE concentration of 110 μg/kg, just greater than its TCL of 70 μg/kg. Trichloroethene (TCE) was also detected in three of the samples at concentrations ranging from 11 to 38 μg/kg; the TCL for TCE is 71 μg/kg. No other VOCs were detected.

The soil stockpile was tilled once between February 1996 and January 1997 to accelerate the aeration of VOCs. In January 1997, AEI collected a second set of soil samples to assess residual VOC concentrations and summarized the findings in their report *Soil Remediation Summary* (AEI, 1997). Concentrations of PCE in this set of samples ranged from below the detection of 10 to 110 μg/kg. AEI calculated a mean PCE concentration of 31.8 μg/kg, less than the TCL of 70 μg/kg. A statistical analysis performed by AEI verified that the results were within the 90-percent upper confidence interval. The only other VOC detected was TCE in one sample at a concentration of 5.8 μg/kg. AEI's report concluded that the remediation goals had been achieved and stated that the soil should be considered eligible for limited reuse onsite or disposal offsite. AEI recommended that as a final precaution, if used onsite, the soil should be placed beneath a layer of asphalt to reduce the potential for human contact. Because this report has just been recently completed and submitted to ACDEH for review, no comments on the recent sampling and recommendations have been received from the ACDEH.

3.0 RECORDS REVIEW

The area surrounding Foothill Square Shopping Center has historically consisted of light to heavy industrial uses and commercial businesses with operations or practices that have the potential to have affected groundwater. To identify other potential sources of VOCs in offsite groundwater, PES performed a records review of historical information from a variety of sources. These information sources are listed below:

- City of Oakland Building and Planning Department permits;
- City of Oakland Zoning Department land use permits;
- City of Oakland Business License Department;
- City of Oakland Fire Department permits;
- Alameda County Department of Environmental Health records for USA Gas Station No. 57, ARCO Station No. 276, 10735 MacArthur Boulevard (former Grand Auto), 10621 MacArthur Boulevard (Best Cleaners), and 10511 MacArthur Boulevard (MacArthur Auto Service Center);
- Environmental Data Resources database reports describing sites with known PCE releases;
- Environmental Data Resources database well search;
- Sanborn Fire Insurance Maps for business use;
- Polk Address Directory for business use;
- Aerial photographs of the area on file at Pacific Aerial Surveys for historical information on nearby business operations; and
- Conducted telephone interviews with EBMUD staff who reviewed files for 10600 and 10621 MacArthur Boulevard sites.

Review of these records indicate that the only other sites with environmental regulatory agency concerns in the vicinity of Foothill Square Shopping Center are the USA Gas Station and the ARCO Station. Petroleum hydrocarbon releases have been identified at both of these sites and investigations are currently being performed under ACDEH oversight. No sites with known VOC releases, nor other petroleum hydrocarbon releases, were identified in the information reviewed by PES.

4.0 FIELD INVESTIGATION - PRELIMINARY SAMPLING (HYDROPUNCH)

To assess the potential offsite migration of the residual PCE in groundwater in areas not monitored by previously installed wells, a preliminary investigation consisting of HydroPunch™ sampling was performed by PES. This investigation was considered preliminary only in that long term monitoring (i.e., groundwater monitoring wells) necessary to allow continued evaluation of any detected plume would follow as a recommendation of the current investigation.

The field investigation consisted of: (1) permitting activities; (2) an underground utility survey; (3) a cone penetrometer (CPT) survey; (4) groundwater sampling activities using HydroPunch™ technology; and (5) equipment decontamination, grouting and street repair. Field activities occurred between December 9, 1996 and January 15, 1997. These activities are described below.

4.1 Permitting

All CPT and HydroPunch™ sampling was performed under a drilling permit from the County of Alameda Zone 7 Water Agency (Zone 7). The permit application for the first three sampling locations was approved and PES received a drilling permit from Zone 7 on December 10, 1996 (Permit No. 96871). The permit was extended, via telephone conversations with a Zone 7 representative, to cover the next six sampling locations.

The City of Oakland (City) required an excavation permit, valid for 90 days, for each street where work was performed. Excavation permits were obtained from the City of Oakland Office of Planning and Building Department for work on 106th Avenue and Myers Street (Permit Nos. X9601001 and X9601002) on December 10, 1996, and a permit for work on MacArthur Boulevard (Permit No. X9700034) was obtained on January 14, 1997. A City inspector visited the drilling site on January 15, 1997, and approved of the street repair techniques that were utilized (see section 3.5)

4.2 Utility Survey

Prior to conducting the subsurface work, PES contracted with underground utility locating services, to clear the proposed sampling locations for underground utilities. Down Under Technologies of Hayward, California, and Cruz Brothers, Inc. of Milpitas, California performed utility clearance during the various drilling events. As required by the City excavation permit, Underground Service Alert (USA) was also contacted prior to each drilling event to request that member organizations locate utilities in the vicinity of the work area.

4.3 Cone Penetrometer Survey

In order for the HydroPunch™ sampling to target permeable zones of the uppermost aquifer, a CPT survey was performed to gain real time data on the local soil stratigraphy. The CPT

survey was performed in general accordance with American Society for Testing and Materials (ASTM) Standard D 3441-86 (ASTM, 1988). PES contracted Gregg In Situ, Inc. (Gregg), a state licensed contractor, to perform the CPT and subsequent groundwater sampling activities under PES' direction. The survey consisted of obtaining CPT measurements at each of the nine locations (CPT-1 to CPT-9), to depths of up to 60 feet. The CPT logs are presented in Appendix A. All CPT locations were within several feet of the HydroPunch™ borings shown on Plate 2, and are not posted separately.

To avoid potential cross-contamination between CPT survey locations, all downhole equipment was decontaminated before and after each use by a high pressure steam cleaner. Decontamination rinsate was stored onsite in one labeled 55-gallon drum, pending disposal. At each CPT location, the asphalt ground surface was penetrated to a depth of 1-foot using a hydraulically driven truck-mounted 3-inch diameter solid flight auger. Each hole was then hand-augured to a depth of 5 feet below the asphalt to ensure that no underground utilities were encountered.

Real-time field plots of depth, cone tip resistance, sleeve friction resistance, friction ratio, and pore water pressure were generated during the investigation. Interpretation of soil lithology was performed by the computer program CPTINTR1 (Version 3.02) developed by the University of British Columbia. The program evaluates the relationship of the friction ratio and the overburden-normalized cone tip resistance to interpret soil parameters. Pore pressure dissipation tests were conducted to determine relative transmissiveness of subsurface materials. Once the CPT probe was driven to the desired depth, data collection was terminated and the probe was retracted from the hole. Cuttings from the hand-auguring activity were placed back in each respective hole to provide lateral support for the CPT cone and rod equipment.

The holes generated by the CPT probe were pressure grouted to the surface, via tremie pipe, with a five-percent bentonite/cement mixture. The cement grout was topped off with 2 to 3 inches of concrete in the subsurface interval where gravel baserock underlies the street. The street surface was repaired by filling the remaining space in the hole with cold-patch asphalt, and compacting it with a 5-pound sledge hammer. A City inspector examined the street repairs on January 15, 1997, and gave verbal approval of the repairs.

4.4 Groundwater Sampling Activities

On the basis of the CPT survey results, PES selected the target depths at which to collect the shallow- and deep-zone groundwater samples. Groundwater samples were collected by Gregg personnel, under the supervision of a PES geologist. Groundwater sampling was performed using truck-mounted hydraulically-driven HydroPunch™ sampling equipment. The groundwater sampling locations, designated HP-1 through HP-9, are shown on Plate 2. Sampling locations HP-1 and HP-7 were on the Foothill Square Shopping Center property. The other seven sampling locations were offsite to the west and northwest of the site. The HydroPunch™ sampling locations were within 3 to 10 horizontal feet of the CPT borings.

To avoid potential cross-contamination between sampling locations, all downhole equipment was decontaminated as described above. The HydroPunch™ sampler was driven to the desired depth, then retracted approximately 3 feet to expose the screened sampling chamber. Sampling depths for the nine sampling locations are listed on Table 2. Groundwater samples were collected through the hollow stem of the sampling rods from the inner cylinder with a 1/2-inch diameter stainless steel bailer and decanted into laboratory supplied, pre-cleaned, 40-milliliter volatile organic analysis (VOA) glass sample bottles.

After collection, each sample was labeled with the project name and number, date, time of collection, and sample identification number prior to being stored in a chilled, thermally-insulated cooler. Samples were submitted with chain-of-custody (COC) documentation to Inchcape Testing Services of San Jose, California, a state-certified laboratory. Samples were analyzed for VOCs using EPA Test Method 8021.

4.5 Groundwater Sampling Results

Because of the heterogeneities of the uppermost aquifer, low transmissivity silts and clays prevented the collection of shallow groundwater samples at HP-1, HP-3, HP-5, HP-6, and HP-9. Although attempts were made to collect HydroPunch™ samples at several depth intervals at these locations, no groundwater entered the sampler. On the basis of the CPT logs, the shallow aquifer is saturated, but sample collection efforts suggest that there is very little groundwater production from the formation in these areas. Groundwater samples were successfully collected from the deeper groundwater zone at all nine sampling locations.

In the shallow groundwater zone, PCE was detected only at sampling location HP-7 (230 micrograms per liter [μg/L]). At the other shallow groundwater sampling locations, PCE was not detected or a groundwater sample could not be obtained, as described above. Groundwater analytical results for the HydroPunch™ sampling investigation are presented in Table 2. The analytical laboratory reports and chain-of-custody forms are presented in Appendix B.

For comparison, PCE concentrations detected in monitoring wells completed in the shallow groundwater zone during recent groundwater monitoring events at Foothill Square Shopping Center and the adjacent ARCO service station have been posted along with the current HydroPunch™ results (Plate 3; Tables 2 and 3). These data indicate that although PCE is present in the shallow groundwater zone at concentrations up to 3,400 μg/L (Well AMW-7; October, 1996) onsite, no PCE has been detected in this zone offsite. This indicates that the lateral distribution of PCE in shallow groundwater is limited, and PCE does not appear to be migrating offsite in any significant way in the shallow groundwater zone. During shallow groundwater sampling activities at HP-4, a sheen was observed on the sampling equipment and a petroleum hydrocarbon odor was noted in the water sample. The petroleum hydrocarbons are likely the result of residual contamination associated with the leaking tanks and/or piping at the ARCO service station.

In the deep groundwater zone, PCE was detected onsite at HP-1 at a concentration of 20 μg/L, and offsite at HP-6 and HP-9 at concentrations of 40 and 25 μg/L, respectively. Detected PCE concentrations from the HydroPunch™ investigation, along with recent data from monitoring wells completed in the deep groundwater zone, are posted on Plate 4. These data show that although PCE concentrations have been detected onsite and offsite at the ARCO station at concentrations up to 2,600 μg/L, there is little PCE present in the deep groundwater zone west of MacArthur Boulevard and north of 106th Avenue.

5.0 RISK EVALUATION

A screening-level risk evaluation was performed to assess the potential impact of residual VOCs in soil and groundwater to users of the site. Receptors at the site include workers, shoppers, construction workers, and nearby residents. The primary pathways that are evaluated consist of volatilization of residual VOCs from soil and groundwater to building interiors, and contact with affected soil and groundwater.

5.1 VOC Volatilization From Soil

In February 1996, PES performed a screening-level risk evaluation of estimated air concentrations of VOCs within tenant spaces at the site resulting from volatilization of residual VOCs in soil. This evaluation was submitted to the ACDEH and RWQCB for review and comment (PES, 1996a). It was accepted by the RWQCB and ACDEH in letters dated March 21 and March 26, 1996, respectively (RWQCB, 1996; ACDEH, 1996a).

As described above in Section 2.5, while the removal action was successful in removing the highest concentrations of chemical-affected soils from beneath the former dry cleaner, soil with residual VOC concentrations slightly above the 1 ppm total VOC goal remains in localized areas at the excavation periphery.

The residual VOCs were left in place after the removal action (soil excavation) at the former Young's Cleaners had removed the highest concentrations of chemical-affected soil beneath the building. Because the area overlying the residually-contaminated soil is paved, eliminating direct contact, inhalation was the only complete pathway. Inhalation was, therefore, the only pathway that was modeled in the February 1996 screening-risk evaluation. The estimation of VOC concentrations in ambient air within the tenant spaces was accomplished by modeling volatilization of residual VOCs in soil beneath the buildings.

VOC concentrations within each of the tenant spaces were estimated by modeling VOC volatilization from residually-affected soils. In addition to PCE, TCE, 1,1-dichloroethene (DCE), and total 1,2-DCE were also modeled. The corresponding chemical vapor flux at the ground surface via upward diffusion through the soil column was estimated using the results of the volatilization model. Once the chemical vapor flux at the ground surface was determined,

an estimate of chemical concentrations within each tenant space was made using a simplified air-mixing model.

The results of the volatilization modeling indicate that the estimated concentrations of VOCs within the interior tenant spaces are well below the applicable U.S. EPA PRGs (Table 4). The range of estimated interior concentrations varied widely, depending primarily on the VOC constituent of concern, its concentration in underlying soil, the percentage of the tenant space remediated, and the air circulation rate within the tenant space.

In conclusion, the screening-level risk evaluation for soil demonstrated that the residual VOCs in soil do not present a significant risk to site users.

5.2 VOC Volatilization From Groundwater

As described above in Section 4.5, residual PCE is present in groundwater beneath the site. To assess the potential risk to human health resulting from the residual PCE volatilizing from groundwater, an evaluation similar to that performed for soil (Section 5.1) was performed. Two scenarios were evaluated. One scenario modeled onsite groundwater conditions and the second considered offsite conditions.

For the onsite scenario, worst case concentrations from the October 1996 quarterly monitoring period were assumed to exist under all four tenant units in the northwest building at the site. A PCE concentration of 3,400 μg/L in shallow groundwater was used as input for the volatilization model. Additionally, TCE, cis-1,2-DCE, trans-1,2-DCE, and dichlorodifluoromethane were detected in groundwater and evaluated in this scenario. The other standard assumptions applied to the model are listed in Table 5. Results of the onsite model scenario indicate that PCE concentrations in ambient air resulting from volatilization from groundwater are below the U.S. EPA PRGs (see Table 6). All other calculated VOC concentrations in ambient air were also below the applicable PRG levels. Calculation sheets for the risk evaluation are presented in Appendix C.

The concentration of PCE in offsite HydroPunch™ groundwater samples was significantly lower than onsite and the affected groundwater was deeper than on the site. Because offsite buildings are wood frame residences, the building construction and ventilation model assumptions differ from onsite. Therefore, volatilization of PCE-affected groundwater using these offsite conditions was modeled. Groundwater analytical results from the offsite sampling point containing the highest PCE concentration, HP-6 (PCE = 40 μg/L), were used. Because virtually no other VOCs were detected in offsite sampling, concentrations of TCE and cis-1,2-DCE from HP-1, located onsite but adjacent residential lots north of the Site, were also modeled. Model input and results are presented in Tables 5 and 6, respectively. The model results indicate that calculated PCE concentrations inside of offsite residences would be well below the U.S. EPA PRG for ambient air.

In conclusion, the screening-level risk evaluation for groundwater demonstrated that the residual VOCs in groundwater do not present a significant risk to site users or offsite receptors.

5.3 Direct Contact with Soil

Direct contact with PCE-affected soil is not expected under day-to-day tenant operations at the site because the site is completely paved with concrete or asphaltic concrete. In the event of construction activities penetrating this cap, workers might be exposed to affected soil. The soil remediation program performed in late 1995 removed all residual VOCs above the PRGs for industrial receptors in the immediate vicinity of the former Young's Cleaners (AEI, 1996a).

Additionally, VOC analytical data for soil has been collected at the site during previous investigations. A summary of these data is presented in Table 7. As shown in this table, some of the sample intervals with detected PCE were removed during the soil removal action. In those areas where affected soil remained, the detected PCE concentrations are below PRGs for residential soil. Therefore, there should be no risk to construction workers from direct contact with this soil.

5.4 Direct Contact and Ingestion of Groundwater

To assess the potential for groundwater use in the area of Foothill Square Shopping Center, PES performed a database search for groundwater wells within a 2-mile radius of the site using Environmental Data Resources. One well, located approximately 1.3 miles south-southwest of the site, was reported in the search area. On the basis of the extent of the PCE plume at the site, this well is not close enough to be affected by VOC releases at Foothill Square Shopping Center. All local domestic water is supplied by East Bay Municipal Utility District. There is no evidence of groundwater use in this area and, therefore, little risk to human health from consumption of groundwater at the site.

As discussed above, the depth to groundwater at the site ranges from 5 to 25 feet. It is possible that construction workers may encounter shallow groundwater if excavations extend below the water table. Although groundwater over much of the site has not been affected by the VOC release associated with the former dry cleaner, elevated residual VOC concentrations are present at the former source area and over the northwest corner of the site. If future construction plans indicate that excavation may be deep enough to encounter groundwater in the affected area, a Site Safety and Contingency Plan should be prepared to mitigate potential risks associated with contact with affected water by construction workers.

6.0 DISCUSSION

6.1 PCE Groundwater Plume Definition

The preliminary sampling investigation, consisting of HydroPunch™ sampling of both the shallow and deep zones of the uppermost aquifer downgradient of Foothill Square Shopping Center have characterized the approximate extent of VOCs in groundwater. No PCE has been detected offsite in the shallow groundwater zone (Plate 3). In the deep groundwater zone, PCE is offsite to the northwest near the ARCO station and offsite to the west site near the intersection of Myers Street and 108th Avenue (Plate 4). These data indicate that the VOC groundwater plume has not migrated substantially offsite and appears to be stable.

The stability of the plume is likely the result of several factors. Primary among these factors are hydraulic gradient and natural attenuation. Historical water-level elevation data for wells completed in both the shallow and deep groundwater zones indicate that groundwater flow is to the west to northwest. As demonstrated by the data, the groundwater plume indeed extends from the source area in this general direction (Plates 3 and 4). However, the PCE in the shallow groundwater zone is present primarily near the former source area and has not been observed offsite of Foothill Square Shopping Center at any sampling location. In the deep groundwater zone, PCE does not extend northwest of the ARCO station. Water-level data collected by EMCON for the ARCO station investigation indicate that the groundwater gradient is nearly flat at that site. This flat groundwater gradient is likely the result of the heterogeneous stratigraphy, as discussed above in Sections 2.2 and 2.3.

In addition to the nearly flat gradient near the ARCO station, degradation of the PCE through natural attenuation appears to be occurring. Natural attenuation, or intrinsic remediation, is the degradation of the VOCs through biological and chemical processes. The PCE breaks down initially to TCE, then cis-1,2-DCE, and ultimately to chloride, carbon dioxide, and water as eventual by products of the degradation process. Two of the interim breakdown products (TCE and cis-1,2-DCE) have been detected in onsite groundwater samples indicating these natural remediation processes are occurring at the site.

6.2 Risk Evaluation

The risk to human health resulting from residual VOCs in soil and groundwater has been evaluated. Volatilization of VOCs from soil and groundwater has been shown to yield indoor air concentrations below the U.S. EPA PRG for ambient air in both onsite and offsite scenarios. Direct contact with groundwater by construction workers, while not expected, should be addressed in a Site Safety and Contingency Plan to mitigate any potential risks arising from contact with affected groundwater.

7.0 RECOMMENDATIONS

On the basis of the recent offsite Hydropunch™ sampling results, trends over several years of quarterly results for many of the groundwater monitoring wells, and the results of the screening-level risk evaluation, PCE in the groundwater is not widespread and active groundwater remediation is not warranted. Soil remediation of the source area has already been performed. Residual VOCs in onsite soil and groundwater, and offsite groundwater are below concentrations that would result in unacceptable risks to users of the site, onsite construction workers, and nearby residents.

However, to provide continuing data to evaluate the stability of the PCE groundwater plume, PES recommends the installation and monitoring of sentry wells at the leading edge of the plume. On the basis of the results of the groundwater sampling and the regional direction of groundwater flow, two deep groundwater zone sentry wells are recommended. These wells should be installed 50 to 100 feet downgradient of the leading edge of the plume. One well (FHS-MW-10) should be installed on 106th Avenue, just west of MacArthur Boulevard. The second well (FHS-MW-11) should be installed on 107th Avenue, just west of Myers Street. The recommended well locations are shown on Plate 5.

The wells should be 2-inch-diameter PVC, and installed using hollow-stem auger drilling methodology. Soil samples should be collected at 5-foot intervals to assess lithology and allow selection of the screened interval. Based on the nearby CPT survey data collected during the current investigation, Well FHS-MW-10 should be approximately 52 feet in total depth and screened from 42 to 52 feet bgs. Well FHS-MW-11 should be approximately 60 feet in total depth and screened from 50 to 60 feet bgs.

To provide the maximum benefit of the data produced from these wells, sampling of the sentry wells should be incorporated into the ongoing quarterly sampling program of onsite wells at Foothill Square Shopping Center. Additionally, PES recommends that the analytical program be expanded to evaluate the progress of intrinsic remediation, by testing for geochemical parameters indicative of biological and chemical degradation. The expanded analytical program should include dissolved oxygen, oxygen-reduction potential, sulfate, nitrate, iron^{3+}, carbon dioxide, and methane, in addition to VOCs by EPA Test Method 8021. Collecting and analyzing these data, combined with the distribution and trends in the concentration of PCE and degradation by-products for a period of 1 to 2 years should be sufficient to allow this interpretation.

After one quarter of monitoring all onsite and new offsite sentry wells, PES recommends that the entire sampling program be reevaluated for reduction in the overall number of wells sampled for laboratory analysis. Because several of the onsite wells have historically not detected VOCs, the number of wells in the sampling program should be able to be reduced and still provide adequate data to evaluate the stability of the plume. Additionally, once several quarters of data have been collected from the new sentry wells, it may be possible to change

the frequency of sampling to a semi-annual basis. Water-level measurements should continue to be made in all wells to provide sufficient data for contouring water-level elevations.

Lastly, a risk management plan should be prepared to mitigate potential health and safety issues during any future construction activities at the site. This document will describe plans and procedures to minimize exposure to VOCs and mitigate risks from any potential exposure.

8.0 REFERENCES

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Table 1. Monitoring Well Construction Details

Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Installed	Installed By	GW Zone Monitored	TOC Elevation (feet MSL)	Total Depth of Boring (feet bgs)	Total Depth of Casing (feet bgs)	Total Depth of Casing (feet BTOC)	Screened Interval Depth (feet bgs) Top	Screened Interval Depth (feet bgs) Bottom	Screened Interval Elev. (feet MSL) Top	Screened Interval Elev. (feet MSL) Bottom	Bedrock Depth (feet bgs)	Bedrock Elevation (feet MSL)	Comments
FORMER YOUNG'S CLEANERS														
WGR MW-1	12/5/88	WGR	Shallow	65.97	33.5	28.5	28.3	23.5	28.5	42.5	37.5	NE	--	Paved over w/ asphalt
WGR MW-2	12/6/88	WGR	Shallow	63.18	40.5	28.0	27.9	23	28	40.2	35.2	NE	--	
WGR MW-3	12/7/88	WGR	Shallow	58.34	42.0	27.0	26.8	22	27	36.3	31.3	NE	--	
WGR MW-4	12/7/88	WGR	Deep	60.02	50.5	45.0	44.9	25	45	35.0	15.0	NE	--	
WGR MW-5	12/8/88	WGR	Shallow	68.94	31.5	31.5	NA	23.5	31.5	45.4	37.4	30	38.9	Covered w/ soil
AMW-1	9/12/94	Augeas	Shallow	64.51	34.0	34.0	33.9	24	34	40.5	30.5	NE	--	
AMW-2	9/30/94	Augeas	Shallow	65.33	29.0	29.0	28.9	19	29	46.3	36.3	NE	--	Abandoned 1995
AMW-3	11/18/94	Augeas	Shallow	65.09	29.0	29.0	28.6	19	29	46.1	36.1	NE	--	Abandoned 1995
AMW-4	3/22/95	Augeas	Shallow	64.79	25.0	25.0	24.6	15	25	49.8	39.8	NE	--	
AMW-5	3/22/95	Augeas	Shallow	64.97	30.0	30.0	30.1	20	30	45.0	35.0	NE	--	
AMW-6	Jun-Aug. '95	Augeas	Shallow	65.10	NA	NA	25.0	NA	NA	NA	40.1	NA	NA	
AMW-7	Jun-Aug. '95	Augeas	Shallow	64.24	NA	NA	24.8	NA	NA	NA	39.4	NA	NA	
AMW-8	Jun-Aug. '95	Augeas	Deep	64.55	NA	NA	48.4	NA	NA	NA	16.1	NA	NA	
AMW-9	Jun-Aug. '95	Augeas	Deep	63.48	NA	NA	54.3	NA	NA	NA	9.2	NA	NA	
ARCO STATION #276														
MW-1	3/21/89	AGS	Deep	55.92	40.5	39.0	38.8	19	39	36.9	16.9	NE	--	
MW-2	3/22/89	AGS	Shallow	55.10	28.5	25.5	25.4	15.5	25.5	39.6	29.6	NE	--	
MW-3	3/21/89	AGS	Deep	56.55	40.5	40.0	38.4	20	40	36.6	16.6	NE	--	
MW-4	3/29/89	AGS	Deep	55.98	53.5	50.0	48.0	30	50	26.0	6.0	NE	--	
MW-5	4/6/89	AGS	Deep	55.43	49.0	47.5	47.0	32.5	47.5	22.9	7.9	NE	--	
MW-6	6/16/92	RESNA	Deep	61.78	61.0	56.0	51.7	37.5	56	24.3	5.8	NE	--	
MW-7	6/16/92	RESNA	Shallow	58.64	37.5	37.5	36.6	17.5	37.5	41.1	21.1	NE	--	
MW-8	NA	RESNA	Deep	53.65	49.0	NA	47.8	29	49	NA	NA	NA	NA	
RW-1	NA	RESNA	Deep	56.32	NA	NA	48.9	NA	NA	NA	NA	NA	NA	
USA GAS STATION #57														
S-1	NA	NA	Bedrock	78.68	43.0	43.0	NA	24	43	54.7	35.7	24	50.7	Extended casing
S-2	NA	NA	Bedrock	80.93	40.0	40.0	NA	21	40	59.9	40.9	22	54.9	Extended casing
MW-3	2/28/95	Alton	Bedrock	80.32	44.0	44.0	44.0	24	44	56.3	36.3	16	60.3	Extended casing
MW-4	11/20/95	Alton	Shallow	76.42	40.5	40.0	40.0	10	40	66.4	36.4	NE	--	Extended casing
MW-5	11/20/95	Alton	Shallow	80.52	41.0	40.0	40.0	10	40	70.5	40.5	NE	--	Extended casing
MW-6	11/20/95	Alton	Shallow	81.64	40.5	40.0	40.0	10	40	71.6	41.6	35	42.6	Extended casing
MW-7	11/21/95	Alton	Shallow	78.86	41.0	40.0	40.0	10	40	68.9	38.9	32.5	42.4	Extended casing
MW-8	11/21/95	Alton	Bedrock	79.55	35.5	35.0	35.0	10	35	69.6	44.6	8	67.6	Extended casing

Note:

Alton = Alton Geoscience.
AGS = Applied GeoSystems.
Augeas = Augeas Corporation.
bgs = Below ground surface.
BTOC = Below top of casing.
MSL = Mean sea level (1929 NGVD).
NA = Not available.
-- = Not applicable.
NE = Not encountered.
RESNA = RESNA Consultants.
TOC = Top of casing.
WGR = Western Geologic Resources, Inc.

Table 2. Summary of Analytical Results for HydroPunch™ Groundwater Samples
Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Sample Location	Date Sampled	Sample Depth (ft. bgs)	Concentration in micrograms per liter (µg/L) PCE	TCE	c-1,2-DCE	Comments
HP-0	7/26/96	25	<0.5	<0.5	<0.5	Bailed from temporary casing
	7/26/96	49	**440**	<5	<5	Bailed from temporary casing
HP-1	12/11/96	No free water encountered				
	12/11/96	0-45	**8.6**	<0.5	<0.5	Collected sample from open CPT hole; not a representative sample
	12/16/96	42-45	**21**	**1.3**	**0.52**	
HP-2	12/11/96	22-25	<0.5	<0.5	<0.5	
	12/11/96	45-48	<0.5	<0.5	<0.5	
HP-3	12/11/96	No free water encountered				
	12/11/96	45-48	<0.5	<0.5	<0.5	
HP-4	12/16/96	13-16	<0.5	**0.65**	<0.5	Sheen on HydroPunch, petroleum hydrocarbon odor in water sample
	12/16/96	46-49	<0.5	**0.79**	<0.5	
HP-5	12/16/96	No free water encountered				
	12/16/96	41-44	<0.5	<0.5	<0.5	
HP-6	12/16/96	No free water encountered				
	12/16/96	57-60	**40**	<0.5	<0.5	
HP-7	1/15/97	22-25	**230**	**43**	180	
	1/15/97	39.5-43.5	<0.5	<0.5	<0.5	
HP-8	1/15/97	35-38	<0.5	<0.5	<0.5	
	1/15/97	57-60	<0.5	<0.5	<0.5	
HP-9	1/15/97	No free water encountered				
	1/15/97	42-45	**25**	<0.5	<0.5	

Notes:
PCE = Tetrachloroethene.
TCE = Trichloroethene.
c-1,2-DCE = cis-1,2-Dichloroethene.
< = Not detected at or above the laboratory reporting limit indicated.
All analyses by EPA Test Method 8010. Analytes not listed were not detected at or above the reporting limit.

Table 3. Summary of Analytical Results for Groundwater Samples from Wells - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Sampled	Sampled by	Concentrations expressed in micrograms per liter (µg/L)				
			PCE	TCE	c-1,2-DCE	t-1,2-DCE	Freon-12
FOOTHILL SQUARE SHOPPING CENTER WELLS							
WGR MW-1	12/13/88	WGR	<0.1	<0.1	<0.1	<0.1	<0.1
(Shallow Zone)	9/12/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	7/17/96	PES	NS	NS	NS	NS	NS
	10/23/96	PES	NS	NS	NS	NS	NS
WGR MW-2	12/13/88	WGR	<0.1	<0.1	<0.1	<0.1	<0.1
(Shallow Zone)	2/10/94	WGR	<0.5	<0.5	<0.5	<0.5	<0.5
	3/23/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	6/21/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	9/11/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	4/16/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	7/17/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	10/23/96	PES	<0.5	<0.5	<0.5	<0.5	<2
WGR MW-3	12/13/88	WGR	<0.1	<0.1	<0.1	<0.1	<0.1
(Shallow Zone)	5/2/94	EMCON	<1	<1	<1	NS	NS
	8/3/94	EMCON	<1	<1	<1	NS	NS
	12/6/94	EMCON	**4**	<1	<1	<1	–
	3/11/95	EMCON	<1	<1	<1	<1	–
	6/5/95	EMCON	<1	<1	<1	<1	–
	8/29/95	EMCON	<1	<1	<1	<1	–
	9/11/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	11/16/95	EMCON	<1	<1	<1	<1	<1
	2/28/96	EMCON	<1	<1	<1	<1	–
	4/16/96	PES	**0.6**	**0.5**	<0.5	<0.5	**11**
	5/28/96	EMCON	<1	<1	<1	<1	–
	7/17/96	PES	<0.5	0.7	<0.5	<0.5	<2
	8/19/96	EMCON	<1	<1	<1	<1	–
	10/23/96	PES	<0.5	<0.5	<0.5	<0.5	<2
WGR MW-4	12/13/88	WGR	<0.1	<0.1	<0.1	<0.1	<0.1
(Deep Zone)	4/16/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	7/17/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	10/23/96	PES	<0.5	<0.5	<0.5	<0.5	<2
WGR MW-5	12/5/88	WGR	<0.1	<0.1	<0.1	<0.1	<0.1
(Shallow Zone)	7/17/96	PES	NS	NS	NS	NS	NS
	10/23/96	PES	NS	NS	NS	NS	NS
AMW-1	10/4/94	Augeas	<0.2	<0.2	**0.5**	<0.2	–
(Shallow Zone)	3/23/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	6/21/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	9/11/95	Augeas	<0.5	<0.5	–	<0.5	<0.5
	4/16/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	7/17/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	10/23/96	PES	NS	NS	NS	NS	NS

Table 3. Summary of Analytical Results for Groundwater Samples from Wells - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Sampled	Sampled by	Concentrations expressed in micrograms per liter (µg/L)				
			PCE	TCE	c-1,2-DCE	t-1,2-DCE	Freon-12
AMW-2	10/4/94	Augeas	**28,000**	**320**	**110**	**50**	<0.5
(Shallow Zone)	10/18/94	Augeas	**18,000**	<250	<250	<250	<250
	11/8/94	Augeas	**35,000**	<0.5	<0.5	<0.5	<0.5
	3/23/95	Augeas	**13,000**	<250	--	<250	<250
	6/21/95	Augeas	**36,000**	<500	--	<500	<500
	Well abandoned during site remediation in 1995.						
AMW-3	11/28/94	Augeas	**22**	<0.5	<0.5	<0.5	<0.5
(Shallow Zone)	3/23/95	Augeas	**45**	<5.0	--	<5.0	<5.0
	6/21/95	Augeas	<0.5	<0.5	--	<0.5	<0.5
	Well abandoned during site remediation in 1995.						
AMW-4	5/15/95	Augeas	**2,400**	<50	--	<50	<50
(Shallow Zone)	6/21/95	Augeas	**2,500**	<50	--	<50	<50
	9/13/95	Augeas	**1,100**	<25	--	<25	<25
	4/16/96	PES	**1,200**	**10**	<10	<10	<40
	7/17/96	PES	**860**	<10	<10	<10	<40
	10/23/96	PES	**22**	**0.5**	<0.5	<0.5	<2
AMW-5	5/15/95	Augeas	**1.2**	<0.5	--	<0.5	<0.5
(Shallow Zone)	6/21/95	Augeas	<0.5	<0.5	--	<0.5	<0.5
	9/12/95	Augeas	<0.5	<0.5	--	<0.5	<0.5
	4/16/96	PES	<0.5	<0.5	<0.5	<0.5	<2
	7/17/96	PES	**0.6**	<0.5	<0.5	<0.5	<2
	10/23/96	PES	**0.8**	<0.5	<0.5	<0.5	<2
AMW-6	9/13/95	Augeas	**930**	<25	--	<25	<25
(Shallow Zone)	4/16/96	PES	**1,900**	**110**	20	<10	<40
	7/17/96	PES	**3,300**	**280**	<30	<30	<100
	10/23/96	**PES**	**2,900**	**140**	<30	<30	<100
AMW-7	9/12/95	Augeas	**2,350**	**340**	--	<25	<25
(Shallow Zone)	4/16/96	PES	**2,300**	**500**	**2,200**	**60**	<100
	7/17/96	PES	**2,400**	**530**	**2,100**	<30	<100
	10/23/96	PES	**3,400**	**610**	**3,100**	**50**	<100
AMW-8	9/11/95	Augeas	**95**	<25	--	<25	<25
(Deep Zone)	4/16/96	PES	**0.8**	<0.5	<0.5	<0.5	<2
	7/17/96	PES	**1.6**	<0.5	<0.5	<0.5	<2
	10/23/96	PES	<0.5	<0.5	<0.5	<0.5	<2
AMW-9	9/13/95	Augeas	**170**	<25	--	<25	<25
(Deep Zone)	4/16/96	PES	**170**	**4**	**7**	<3	<10
	7/17/96	PES	**190**	**4**	<3	<3	<10
	10/23/96	PES	**190**	<3	<3	<3	<10

Table 3. Summary of Analytical Results for Groundwater Samples from Wells - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Sampled	Sampled by	Concentrations expressed in micrograms per liter (µg/L)				
			PCE	TCE	c-1,2-DCE	t-1,2-DCE	Freon-12
ARCO SERVICE STATION WELLS							
MW-1	9/3/91	RESNA	4.5	ND	ND	ND	
(Deep Zone)	11/6/91	RESNA	<2.0	<2.0	<2.0	<2.0	--
	3/10/92	RESNA	8.2	ND	ND	ND	--
	6/30/92	RESNA	15	ND	ND	ND	--
	9/9/92	RESNA	6	ND	ND	ND	--
	11/20/92	RESNA	2	ND	ND	ND	--
	2/12/93	RESNA	92	ND	ND	ND	--
	5/12/93	RESNA	280	ND	ND	ND	--
	8/18/93	RESNA	120	ND	ND	ND	--
	11/10/93	RESNA	46	ND	ND	ND	--
	2/4/94	RESNA	22	<1	<1	<1	--
	5/2/94	RESNA	35	<1	<1	<1	--
	8/3/94	RESNA	14	<1	--	<1	--
	12/6/94	RESNA	17	<1	--	<1	--
	3/10/95	RESNA	170	<1	--	<1	--
	6/5/95	RESNA	210	<1	--	<1	--
	8/29/95	EMCON	130	<1	--	<1	--
	11/16/95	EMCON	45	<1	--	<1	<1
	2/28/96	EMCON	97	<1	<1	<1	--
	5/28/96	EMCON	160	<5	<5	<5	--
	8/19/96	EMCON	77	<1	<1	<1	--
MW-2	9/3/91	RESNA	Not sampled: well contained floating product				
(Shallow Zone)	11/6/91	RESNA	Not sampled: well contained floating product				
	3/10/92	RESNA	0.9	ND	5.4	ND	--
	6/30/92	RESNA	<2000	<2000	<2000	<2000	
	9/9/92	RESNA	Not sampled: well contained floating product				
	11/20/92	RESNA	Not sampled: well contained floating product				
	2/12/93	RESNA	Not sampled: well contained floating product				
	5/12/93	RESNA	Not sampled: well contained floating product				
	8/18/93	RESNA	Not sampled: well contained floating product				
	11/10/93	RESNA	Not sampled: well contained floating product				
	2/4/94	RESNA	<1	<1	<1	<1	--
	5/2/94	RESNA	<1	<1	<1	<1	--
	8/3/94	RESNA	NS	NS	NS	NS	NS
	12/6/94	RESNA	<5	<5	--	<5	--
	3/11/95	RESNA	<1	<1	--	<1	--
	6/5/95	RESNA	<1	<1	--	<1	--
	8/29/95	EMCON	<5	<5	--	<5	--
	11/16/95	EMCON	NS	NS	NS	NS	NS
	2/28/96	EMCON	<1	<1	<1	<1	--
	5/28/96	EMCON	<1	<1	<1	<1	--
	8/21/96	EMCON	<1	<1	<1	<1	--

Table 3. Summary of Analytical Results for Groundwater Samples from Wells - VOCs

Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Sampled	Sampled by	Concentrations expressed in micrograms per liter (µg/L)				
			PCE	TCE	c-1,2-DCE	t-1,2-DCE	Freon-12
MW-3	9/3/91	RESNA	1,600	ND	ND	ND	
(Deep Zone)	11/6/91	RESNA	400	ND	ND	ND	
	3/10/92	RESNA	980	5.6	1	ND	3.4
	6/30/92	RESNA	1,500	ND	ND	ND	
	9/9/92	RESNA	800	ND	ND	ND	
	11/20/92	RESNA	690	ND	ND	ND	
	2/12/93	RESNA	1,200	ND	ND	ND	
	5/12/93	RESNA	1,600	ND	ND	ND	
	8/18/93	RESNA	1,300	ND	ND	ND	
	11/10/93	RESNA	1,300	ND	ND	ND	
	2/4/94	RESNA	91	<5	<5	<5	--
	5/2/94	RESNA	1,600	<20	<20	<20	--
	8/3/94	RESNA	680	<20	--	<20	--
	12/6/94	RESNA	1,100	<25	--	<25	--
	3/11/95	RESNA	1,700	<10	--	<10	--
	6/5/95	RESNA	2,500	<20	--	<20	--
	8/29/95	EMCON	1,600	<20	--	<20	--
	11/16/95	EMCON	1,100	<20	--	<20	--
	2/28/96	EMCON	1,100	<10	<10	<10	--
	5/28/96	EMCON	1,700	<20	<20	<20	--
	8/19/96	EMCON	1,200	<10	<10	<10	--
MW-4	4/24/89	AGS	1,500	<50	<50	<50	--
(Deep Zone)	7/31/90	RESNA	1,600	7.5	0.7	ND	--
	10/30/90	RESNA	3,600	8.1	0.7	ND	--
	1/30/91	RESNA	4,900	12	ND	ND	--
	4/30/91	RESNA	2,200	ND	ND	ND	--
	8/6/91	RESNA	1,700	ND	ND	ND	--
	9/3/91	RESNA	2,000	ND	ND	ND	--
	11/6/91	RESNA	1,000	6.3	ND	ND	--
	3/10/92	RESNA	2,300	13	4	ND	--
	6/30/92	RESNA	1,800	ND	ND	ND	--
	9/9/92	RESNA	1,300	ND	ND	ND	--
	11/20/92	RESNA	1,700	ND	ND	ND	--
	2/12/93	RESNA	1,800	ND	ND	ND	--
	5/12/93	RESNA	1,500	ND	ND	ND	--
	8/18/93	RESNA	1,800	ND	ND	ND	--
	11/10/93	RESNA	1,800	ND	ND	ND	--
	2/4/94	RESNA	1,900	<20	<20	<20	--
	5/2/94	RESNA	1,700	<20	<20	<20	--
	8/3/94	RESNA	1,200	<20	--	<20	--
	12/6/94	RESNA	2,200	<20	--	<20	--
	3/11/95	RESNA	2,600	<20	--	<20	--
	6/5/95	RESNA	3,100	<20	--	<20	--
	8/29/95	EMCON	2,900	<20	--	<20	--
	11/16/95	EMCON	2,100	<20	--	<20	<20
	2/28/96	EMCON	2,400	<20	<20	<20	--
	5/28/96	EMCON	2,700	<20	<20	<20	--
	8/19/96	EMCON	2,600	<20	<20	<20	--

Table 3. Summary of Analytical Results for Groundwater Samples from Wells - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Sampled	Sampled by	Concentrations expressed in micrograms per liter (µg/L)				
			PCE	TCE	c-1,2-DCE	t-1,2-DCE	Freon-12
MW-5	8/6/91	RESNA	7.3	ND	ND	ND	–
(Deep Zone)	9/3/91	RESNA	25	ND	ND	ND	–
	11/6/91	RESNA	12	ND	ND	ND	–
	3/10/92	RESNA	300	1.3	ND	ND	–
	6/30/92	RESNA	30	ND	ND	ND	–
	9/9/92	RESNA	120	ND	ND	ND	–
	11/24/92	RESNA	93	ND	ND	ND	–
	2/12/93	RESNA	210	ND	ND	ND	–
	5/12/93	RESNA	50	ND	ND	ND	–
	8/18/93	RESNA	80	ND	ND	ND	–
	11/10/93	RESNA	42	ND	ND	ND	–
	2/4/94	RESNA	39	<1	<1	<1	–
	5/2/94	RESNA	35	<1	<1	<1	–
	8/3/94	RESNA	25	<1	–	<1	–
	12/6/94	RESNA	1,800	<20	–	<20	–
	3/10/95	RESNA	270	<5	–	<5	–
	6/5/95	RESNA	310	<5	–	<5	–
	8/29/95	EMCON	240	<5	–	<5	–
	11/16/95	EMCON	940	<5	–	<5	<5
	2/28/96	EMCON	1,100	<10	<10	<10	–
	5/28/96	EMCON	360	<5	<5	<5	–
	8/21/96	EMCON	150	<1	2	<1	–
MW-6	6/30/92	RESNA	2,400	<0.5	<0.5	<0.5	<0.5
	2/12/93	RESNA	4,200	<0.5	<0.5	<0.5	<0.5
	5/12/93	RESNA	3,500	<0.5	<0.5	<0.5	<0.5
	8/18/93	RESNA	3,000	<0.5	<0.5	<0.5	<0.5
	11/10/93	RESNA	3,900	<0.5	<0.5	<0.5	<0.5
	2/4/94	RESNA	2,900	<50	<50	<50	–
	5/2/94	RESNA	2,000	<50	<50	<0.5	<0.5
	8/3/94	RESNA	1,400	<50	<50	<0.5	<0.5
	12/6/94	EMCON	2,000	<50	<50	<0.5	–
	3/11/95	EMCON	1,300	<20	<20	<0.5	–
	6/5/95	EMCON	2,000	<20	<20	<20	–
	8/29/95	EMCON	1,300	<20	<20	<20	–
	9/11/95	Augeus	2,000	<50	–	<50	<50
	11/16/95	EMCON	1,300	<20	<20	<20	<20
	2/28/96	EMCON	960	<20	<20	<20	–
	4/16/96	PES	1,400	10	<10	<10	100
	5/28/96	EMCON	970	<20	<20	<20	–
	7/17/96	PES	590	<5	<5	<5	30
	8/19/96	EMCON	820	<20	<20	<20	–
	10/23/96	PES	680	<5	<5	<5	<20
MW-7	6/30/92	RESNA	<1000	<1000	<1000	<1000	<1000
(Shallow Zone)	9/9/92	RESNA	Not sampled: well contained floating product				
	11/20/92	RESNA	Not sampled: well contained floating product				
	2/12/93	RESNA	Not sampled: well contained floating product				
	5/12/93	RESNA	Not sampled: well contained floating product				
	8/18/93	RESNA	Not sampled: well contained floating product				

Table 3. Summary of Analytical Results for Groundwater Samples from Wells - VOCs

Results of Additional Investigation
Foothill Square Shopping Center
Oakland, California

Well Number	Date Sampled	Sampled by	Concentrations expressed in micrograms per liter (µg/L)				
			PCE	TCE	c-1,2-DCE	t-1,2-DCE	Freon-12
MW-7	11/10/93	RESNA	Not sampled: floating product entering the well during purging				
(continued)	2/4/94	RESNA	<50	<50	<50	<50	<50
	5/2/94	RESNA	<50	<50	<50	<50	<50
	8/3/94	RESNA	<50	<50	<50	<50	<50
	12/6/94	EMCON	<50	<50	<50	<50	–
	3/11/95	EMCON	Not sampled: floating product entering the well during purging				
	6/5/95	EMCON	<10	<10	<10	<10	–
	8/29/95	EMCON	<10	<10	<10	<10	–
	9/11/95	Augeus	85	<50	–	<50	<50
	11/16/95	EMCON	<20	<20	<20	<20	<20
	2/28/96	EMCON	<10	<10	<10	<10	–
	4/16/96	PES	<0.5	<0.5	<0.5	<0.5	8
	5/28/96	EMCON	<10	<10	<10	<10	–
	7/17/96	PES	<0.5	0.6	0.6	<0.5	<2
	8/21/96	EMCON	<1	<1	<1	<1	–
	10/23/96	PES	<0.5	<0.5	0.6	<0.5	<2
MW-8	2/4/94	RESNA	<1	<1	<1	<1	–
(Deep Zone)	5/2/94	RESNA	<1	<1	<1	<1	–
	8/3/94	RESNA	<1	<1	–	<1	–
	12/6/94	RESNA	<1	<1	–	<1	–
	3/11/95	RESNA	<1	<1	–	<1	–
	6/5/95	RESNA	<1	<1	–	<1	–
	8/29/95	EMCON	<1	<1	–	<1	–
	11/16/95	EMCON	<1	<1	–	<1	<1
	2/28/96	EMCON	3	<1	<1	<1	–
	5/28/96	EMCON	<1	<1	<1	<1	–
	8/21/96	EMCON	<1	<1	<1	<1	–
RW-1	2/4/94	RESNA	2,200	<20	<20	<20	–
(Deep Zone)	5/2/94	RESNA	45	<1	<1	<1	–
	8/3/94	RESNA	350	4	–	<1	–
	12/6/94	RESNA	340	<5	–	<5	–
	3/10/95	RESNA	260	<5	–	<5	–
	6/5/95	RESNA	59	<1	–	<1	–
	8/29/95	EMCON	570	<5	–	<5	–
	11/16/95	EMCON	140	<1	–	<1	<1
	2/28/96	EMCON	6	<1	<1	<1	–
	5/28/96	EMCON	12	<1	<1	<1	–
	8/21/96	EMCON	100	<1	<1	<1	–

Notes:

PCE = Tetrachloroethene.
TCE = Trichloroethene.
c-1,2-DCE = cis-1,2-dichloroethene.
t-1,2-DCE = trans-1,2-dichloroethene.
Freon 12 = Dichlorodifluoromethane.
WGR = Western Geologic Resources, Inc.
Augeas = Augeas Corporation.
AGS = Applied GeoSystems.
PES = PES Environmental, Inc.
EMCON = EMCON Associates.
RESNA = RESNA Consultants.
<0.1 = Not detected at or above the detection limit indicated.
ND = Not detected, detection limit not reported by EMCON.
NS = Not sampled because well was inaccessible.
Sources listed in Section 8.0, References.

Table 4. Summary of Estimated Soil Vapor, Emission Flux, and Building Interior Air Concentrations for Soil Source
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Boulevard, Oakland, California

		Unremediated Area			Remediated Area				
Lease Space	Chemical Compound	Concentration in Soil C_{S1} (mg/kg)	Vapor-Phase Concentration from Soil C_{VS1} (mg/cm^3)	Calculated Emission Flux From Soil E_{f1} (mg/m^2 s)	Concentration in Soil C_{S2} (mg/kg)	Vapor-Phase Concentration from Soil C_{VS2} (mg/cm^3)	Calculated Emission Flux From Soil E_{f2} (mg/m^2 s)	Estimated Indoor Air Concentration C_{in} (µg/m^3)	EPA Region IX Ambient Air PRG (µg/m^3)
A	PCE	0.77	5.48E-05	9.15E-07	–	–	–	7.61E-04	3.20E-01
	TCE	0.57	8.11E-05	1.52E-06	–	–	–	1.27E-03	1.10E+00
	1,1-DCE	0.012	5.68E-05	1.04E-06	–	–	–	8.64E-04	3.80E-02
	1,2-DCE (mixture)	0.043	9.84E-06	1.80E-07	–	–	–	1.50E-04	3.30E+01
B	PCE	–	–	–	0.77	5.48E-05	9.15E-07	1.27E-03	3.20E-01
	TCE	–	–	–	0.57	8.11E-05	1.52E-06	2.12E-03	1.10E+00
	1,1-DCE	–	–	–	0.018	8.52E-05	1.56E-06	2.17E-03	3.80E-02
	1,2-DCE (mixture)	–	–	–	0.16	3.66E-05	6.70E-07	9.31E-04	3.30E+01
C	PCE	0.43	3.06E-05	5.11E-07	0.43	3.06E-05	5.11E-07	1.59E-03	3.20E-01
	TCE	0.95	1.35E-04	2.54E-06	0.95	1.35E-04	2.54E-06	7.87E-03	1.10E+00
	1,1-DCE	0.024	1.14E-04	2.08E-06	0.024	1.14E-04	2.08E-06	6.45E-03	3.80E-02
	1,2-DCE (mixture)	0.25	5.72E-05	1.05E-06	0.25	5.72E-05	1.05E-06	3.25E-03	3.30E+01
D	PCE	0.018	1.28E-06	2.14E-08	–	–	–	1.49E-04	3.20E-01
	TCE	0.0005	7.12E-08	1.34E-09	–	–	–	9.28E-06	1.10E+00
	1,1-DCE	0.025	1.18E-04	2.17E-06	–	–	–	1.50E-02	3.80E-02
	1,2-DCE (mixture)	0.28	6.41E-05	1.17E-06	–	–	–	8.15E-03	3.30E+01
E	PCE	0.018	1.28E-06	2.14E-08	0.21	1.50E-05	2.49E-07	2.83E-04	3.20E-01
	TCE	0.0005	7.12E-08	1.34E-09	0.14	1.99E-05	3.74E-07	3.55E-04	1.10E+00
	1,1-DCE	0.025	1.18E-04	2.17E-06	0.027	1.28E-04	2.34E-06	7.06E-03	3.80E-02
	1,2-DCE (mixture)	0.28	6.41E-05	1.17E-06	0.28	6.41E-05	1.17E-06	3.74E-03	3.30E+01
F	PCE	0.0005	3.56E-08	1.25E-09	0.43	3.06E-05	1.07E-06	5.76E-04	3.20E-01
	TCE	0.0005	7.12E-08	2.81E-09	0.12	1.71E-05	6.74E-07	3.63E-04	1.10E+00
	1,1-DCE	0.018	8.52E-05	3.28E-06	0.051	2.41E-04	9.29E-06	7.58E-03	3.80E-02
	1,2-DCE (mixture)	0.0005	1.14E-07	4.40E-09	0.0005	1.14E-07	4.40E-09	5.87E-06	3.30E+01

Notes:
* = U.S. EPA Region IX Preliminary Remediation Goal, August 1, 1996.
PRG for PCE and Freon 12 is "California-Modified" PRG.

Table 5. Site-Specific Modeling Parameters and Assumptions for Soil and Groundwater Sources
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Boulevard, Oakland, California

Parameter	Onsite Lease Space				Offsite Residential
	G	H	I	J	
Footprint Area (sf)	30,450	169	1,238	6,094	1,400
Height of Building (ft)	20	20	20	20	9
Air Exchange Rate (1/hr)	0.5	0.5	0.5	0.5	0.1
Total Porosity (cm^3/cm^3)	0.3	0.3	0.3	0.3	0.3
Air-Filled Porosity (cm^3/cm^3)	0.08	0.08	0.08	0.08	0.08
Organic Carbon Fraction	0.02	0.02	0.02	0.02	0.02
Soil Cover over Groundwater (ft)	16	16	16	16	58
Soil Cover over Affected Soil (ft)	3.5	3.5	3.5	3.5	NA
Area of Emission Flux (ft^2)	30,450	169	1,238	6,094	1,400
Attenuation Factor	0.005	0.005	0.005	0.005	0.1

Table 6. Summary of Estimated Soil Vapor, Emission Flux, and Building Interior Air Concentrations for Soil and Groundwater Sources
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Boulevard, Oakland, California

		Vapor Contribution from Soil			Vapor Contribution from Groundwater				
Area Modeled	Chemical Compound	Concentration in Soil C_s (mg/kg)	Vapor-Phase Concentration from Soil C_{vs} (mg/cm^3)	Calculated Emission Flux from Soil E_{ls} (mg/m^2/s)	Concentration in Groundwater C_w (mg/L)	Vapor-Phase Concentration from Groundwater C_{vw} (mg/cm^3)	Calculated Emission Flux from Groundwater E_{lg} (mg/m^2/s)	Estimated Indoor Air Concentration C_{in} (µg/m^3)	EPA Region IX Ambient Air PRG* (µg/m^3)
Onsite									
Lease Space G	PCE	0.87	6.20E-05	2.26E-07	3.4	3.20E-03	1.17E-05	6.89E-02	3.20E-01
	TCE	0.014	1.99E-06	8.18E-09	0.61	2.26E-04	9.27E-07	5.47E-03	1.10E+00
	c-1,2-DCE	0.0025	5.72E-07	2.29E-09	3.1	8.37E-04	3.35E-06	1.98E-02	3.70E+01
	t-1,2-DCE	0.0025	5.72E-07	2.29E-09	0.05	1.35E-05	5.41E-08	3.19E-04	7.30E+01
	Freon 12	0.0025	8.84E-06	3.58E-08	0.05	2.05E-04	8.31E-07	4.91E-03	2.10E+02
Lease Space H	PCE	0.87	6.20E-05	2.26E-07	3.4	3.20E-03	1.17E-05	6.89E-02	3.20E-01
	TCE	0.014	1.99E-06	8.18E-09	0.61	2.26E-04	9.27E-07	5.47E-03	1.10E+00
	c-1,2-DCE	0.0025	5.72E-07	2.29E-09	3.1	8.37E-04	3.35E-06	1.98E-02	3.70E+01
	t-1,2-DCE	0.0025	5.72E-07	2.29E-09	0.05	1.35E-05	5.41E-08	3.19E-04	7.30E+01
	Freon 12	0.0025	8.84E-06	3.58E-08	0.05	2.05E-04	8.31E-07	4.91E-03	2.10E+02
Lease Space I	PCE	0.87	6.20E-05	2.26E-07	3.4	3.20E-03	1.17E-05	6.89E-02	3.20E-01
	TCE	0.014	1.99E-06	8.18E-09	0.61	2.26E-04	9.27E-07	5.47E-03	1.10E+00
	c-1,2-DCE	0.0025	5.72E-07	2.29E-09	3.1	8.37E-04	3.35E-06	1.98E-02	3.70E+01
	t-1,2-DCE	0.0025	5.72E-07	2.29E-09	0.05	1.35E-05	5.41E-08	3.19E-04	7.30E+01
	Freon 12	0.0025	8.84E-06	3.58E-08	0.05	2.05E-04	8.31E-07	4.91E-03	2.10E+02
Lease Space J	PCE	0.87	6.20E-05	2.26E-07	3.4	3.20E-03	1.17E-05	6.89E-02	3.20E-01
	TCE	0.014	1.99E-06	8.18E-09	0.61	2.26E-04	9.27E-07	5.47E-03	1.10E+00
	c-1,2-DCE	0.0025	5.72E-07	2.29E-09	3.1	8.37E-04	3.35E-06	1.98E-02	3.70E+01
	t-1,2-DCE	0.0025	5.72E-07	2.29E-09	0.05	1.35E-05	5.41E-08	3.19E-04	7.30E+01
	Freon 12	0.0025	8.84E-06	3.58E-08	0.1	2.05E-04	8.31E-07	4.91E-03	2.10E+02
Offsite									
Residential	PCE	--	--	--	0.040	3.76E-05	6.27E-07	3.70E-03	3.20E-01
	TCE	--	--	--	0.0013	4.81E-07	9.03E-09	5.33E-05	1.10E+00
	c-1,2-DCE	--	--	--	0.00052	1.40E-07	2.57E-09	1.52E-05	3.70E+01
	t-1,2-DCE	--	--	--	*0.00025*	6.75E-08	1.24E-09	7.30E-06	7.30E+01
	Freon 12	--	--	--	*0.0005*	2.05E-06	3.80E-08	2.24E-04	2.10E+02

Notes:
* = U.S. EPA Region IX Preliminary Remediation Goal, August 1, 1996.
PRG for PCE and Freon 12 is "California-Modified" PRG.
Italics = Compound not detected; half of laboratory reporting limit used.

Table 7. Summary of Historical Analytical Results for Soil - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comment
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1,1,1-TCA	VC	
WGR MW-1	WGR	20	12/5/88	<5	<5	<5	<5	<5	<5	<5	
		31.5	12/5/88	<1	<1	<1	<1	<1	<1	<1	
WGR MW-2	WGR	20	12/5/88	<1	<1	<1	<1	<1	<1	<1	
		40.5	12/5/88	<1	<1	<1	<1	<1	<1	<1	
WGR MW-3	WGR	18	12/6/88	<1	<1	<1	<1	<1	<1	<1	
		38.5	12/6/88	<2	<2	<2	<2	<2	<2	<2	
WGR MW-4	WGR	14.5	12/7/88	<1	<1	<1	<1	<1	<1	<1	
		49	12/7/88	<1	<1	<1	<1	<1	<1	<1	
WGR MW-4	WGR	14.5	12/8/88	<5	<5	<5	<5	<5	<5	<5	
B-2	Augeus	6	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		11	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		16	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		21	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		24	9/12/94	<5	<5	<5	<5	<5	<5	<5	
B-3	Augeus	6	10/7/94	**15**	<8	<5	<6	<12	<12	<20	Soil removed
		13	10/7/94	<10	<8	<5	<6	<12	<12	<20	
		16	10/7/94	**12**	<8	<5	<6	<12	<12	<20	
		21	10/7/94	**27**	<8	<5	<6	<12	<12	<20	
B-4	Augeus	5.5	10/7/94	**1,600**	**150**	**120**	<6	<12	<12	<20	Soil removed
		11	10/7/94	**70**	<8	**22**	<6	<12	<12	<20	Soil removed
		16	10/7/94	**100**	<8	**9**	<6	<12	<12	<20	
		21	10/7/94	**30**	<8	<5	<6	<12	<12	<20	
B-5	Augeus	6.5	11/3/94	**1,600**	<5	<5	<5	<5	<5	<10	Soil removed
		11	11/3/94	**450**	<5	<5	<5	<5	<5	<10	Soil removed
		16	11/3/94	**440**	<5	<5	<5	<5	<5	<10	
		21	11/3/94	<5	<5	<5	<5	<5	<5	<10	
		26	11/3/94	<5	<5	<5	<5	<5	<5	<10	

Table 7. Summary of Historical Analytical Results for Soil - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comment
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1,1,1-TCA	VC	
B-6	Augeus	11	11/3/94	5,000	<5	<5	<5	<5	<5	<10	Soil removed
		15.5	11/3/94	590	<5	<5	<5	<5	<5	<10	
		21	11/3/94	<5	<5	<5	<5	<5	<5	<10	
		26	11/3/94	<5	<5	<5	<5	<5	<5	<10	
B-7	Augeus	10.5	11/23/94	38	ND	ND	ND	ND	ND	ND	
		15.5	11/23/94	60	ND	ND	ND	ND	ND	ND	
		20.5	11/23/94	ND	ND	ND	ND	ND	ND	ND	
		25.5	11/23/94	ND	ND	ND	ND	ND	ND	ND	
B-8	Augeus	6	3/23/95	<0.5	<0.5	–	<0.5	–	<0.5	<1.0	
AMW-1	Augeus	4	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		6	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		11	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		16	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		21	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		26	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		31	9/12/94	<5	<5	<5	<5	<5	<5	<5	
		34	9/12/94	<5	<5	<5	<5	<5	<5	<5	
AMW-2	Augeus	10	9/30/94	22,000	50	250	<6	<12	<12	<20	Soil removed
		15	9/30/94	90,000	600	210	<6	<12	<12	<20	Soil removed
		20	9/30/94	400	20	30	<6	<12	<12	<20	
		25	9/30/94	30	<8	<5	<6	<12	<12	<20	
AMW-3	Augeus	5.5	11/18/94	6	<5	<5	<5	<5	<5	<10	Soil removed
		10	11/18/94	390	<5	<5	<5	<5	<5	<10	Soil removed
		15.5	11/18/94	59	<5	<5	<5	<5	<5	<10	Soil removed
		20.5	11/18/94	820	<5	<5	<5	<5	<5	<10	
		25.5	11/18/94	1,400	<5	<5	<5	<5	<5	<10	
		30	11/18/94	210	<5	<5	<5	<5	<5	<10	

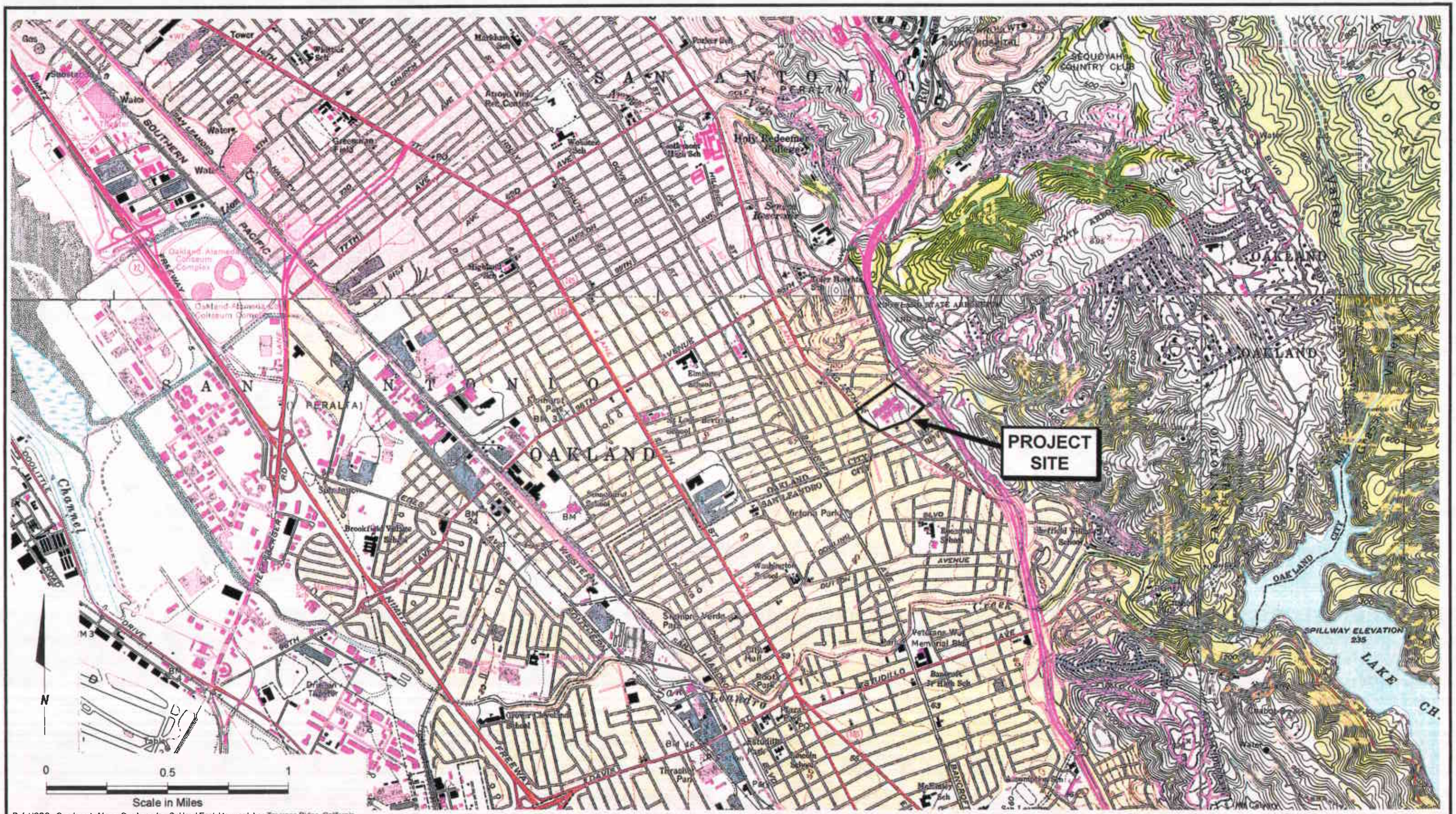
Table 7. Summary of Historical Analytical Results for Soil - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comment
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1,1,1-TCA	VC	
AMW-4	Augeus	6	3/22/95	**870**	<5.0	--	<5.0	--	<5.0	<10	
		11	3/22/95	**13**	<0.5	--	<0.5	--	<0.5	<1.0	
		16	3/22/95	**7.5**	<0.5	--	<0.5	--	<0.5	<1.0	
		21	3/22/95	**5.3**	<0.5	--	<0.5	--	<0.5	<1.0	
		26	3/22/95	<0.5	**21**	--	<0.5	--	<0.5	<1.0	
AMW-5	Augeus	6	3/22/95	**1.1**	<0.5	--	<0.5	--	<0.5	<1.0	
		11	3/22/95	<0.5	<0.5	--	<0.5	--	<0.5	<1.0	
		16	3/22/95	<0.5	<0.5	--	<0.5	--	<0.5	<1.0	
		21	3/22/95	<0.5	<0.5	--	<0.5	--	<0.5	<1.0	
		26	3/22/95	<0.5	<0.5	--	<0.5	--	<0.5	<1.0	
		31	3/22/95	<0.5	<0.5	--	<0.5	--	<0.5	<1.0	
AMW-6	Augeus	6	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		11	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		16.5	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		21	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		26.5	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
AMW-7	Augeus	6.5	8/2/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		11.5	8/2/95	**33**	**14**	ND	ND	ND	ND	ND	
		16	8/2/95	**60**	**10**	ND	ND	ND	ND	ND	
		21	8/2/95	**85**	**11**	ND	ND	ND	ND	ND	
		26	8/2/95	**210**	**39**	ND	ND	ND	ND	ND	
AMW-8	Augeus	6	7/28/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		11	7/28/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		16.5	7/28/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		21	7/28/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		26	7/28/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		31.5	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		36.5	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		41	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		46	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		51.5	8/1/95	<0.5	<0.5	ND	ND	ND	ND	ND	

Table 7. Summary of Historical Analytical Results for Soil - VOCs
Results of Additional Investigation
Foothill Square Shopping Center
10700 MacArthur Blvd., Oakland, California

Sample Location	Sampled By	Depth (ft bgs)	Date Sampled	Concentrations reported in micrograms per kilogram (µg/kg)							Comment
				PCE	TCE	c-1,2-DCE	t-1,2-DCE	1,1-DCE	1,1,1-TCA	VC	
AMW-9	Augeus	5	7/31/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		9.5	7/31/95	**29**	**17**	ND	ND	ND	ND	ND	
		14.5	7/31/95	**120**	**31**	ND	ND	ND	ND	ND	
		19.5	7/31/95	**27**	**7.7**	ND	ND	ND	ND	ND	
		24.5	7/31/95	**110**	**2.1**	ND	ND	ND	ND	ND	
		31	8/2/95	**30**	<0.5	ND	ND	ND	ND	ND	
		36	8/2/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		41	8/2/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		45	8/2/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		51	8/2/95	<0.5	<0.5	ND	ND	ND	ND	ND	
		54.5	8/2/95	<0.5	<0.5	ND	ND	ND	ND	ND	
EPA Region IX PRG*				5,400	3,200	31,000	78,000	37	1,200,000	16	

Notes:
ft bgs = Feet below ground surface.
PCE = Tetrachloroethylene.
TCE = Trichloroethylene.
c-1,2-DCE = cis-1,2-dichloroethene.
t-1,2-DCE = trans-1,2-dichloroethene.
1,1-DCE = 1,1-dichloroethylene.
1,1,1-TCA = 1,1,1-trichloroethane.
<1 = Not detected at or above the indicated detection limit.
ND = Compound not detected, lab reporting limit unknown.
Soil removed = Soil at this depth excavated during soil removal action (AEI, 1996a).
-- = Not analyzed.
* = Environmental Protection Agency Region IX Preliminary Remediation Goal for residential soil (EPA, 1996).
Sources listed in Section 8.0, References.



Ref: USGS - Quadrangle Maps: San Leandro, Oakland East, Hayward, Las Trampas Ridge, California

PES Environmental, Inc.
Engineering & Environmental Services

Site Location Map
Foothill Square Shopping Center
10700 MacArthur Boulevard
Oakland, California

PLATE
1

502.0101.004	01003V02.FH5	DWM	3/97
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

LARGE MAP REMOVED

APPENDIX A

CPT SURVEY AND HYDROPUNCH™ SAMPLING METHODOLOGY

APPENDIX A
CPT SURVEY AND HYDROPUNCH™ SAMPLING METHODOLOGY

CPT

In order for the HydroPunch™ sampling to target permeable zones of the shallow aquifer, a cone penetrometer test (CPT) survey was performed to gain information on the local stratigraphy. The CPT survey was performed in general accordance with American Society for Testing and Materials (ASTM) Standard D 3441-86 (ASTM, 1988). The survey consisted of obtaining CPT measurements at each of the nine locations (CPT-1 to CPT-9), to depths of up to 60 feet.

PES contracted Gregg In Situ, Inc. (Gregg), a state licensed contractor, to perform the CPT and subsequent groundwater sampling activities. At each CPT location, the asphalt ground surface was penetrated to a depth of 1-foot using a hydraulically driven truck-mounted 3-inch diameter solid flight auger. Each hole was then hand-augured to a depth of 5 feet below the asphalt to insure that no underground utilities were encountered. Cuttings from the hand-auguring activity were placed back in each respective hole to provide lateral support for the CPT cone and rod equipment.

The CPT probe consisted of a cylindrical electronic cone which was attached to flush-threaded steel pipe segments. For this investigation, a piezometric CPT probe was used to allow for the measurement of pore water pressure. The piezometric CPT probe is comprised of an electronic cone equipped with a ceramic filter and a fluid pressure transducer to measure the pore water pressure at the filter location. The CPT probe was driven into the subsurface using truck-mounted 20 ton capacity hydraulic equipment. Prior to driving the CPT probe, a baseline calibration test of the electronic cone was performed at zero load in air and water. The CPT probe was driven at a controlled rate of 1 to 2 centimeters per second. An electric cable was strung through each pipe segment in advance which connected the electric cone to a computer-controlled data acquisition system located inside the CPT rig.

The following measurements were made with the piezometric electronic cone:

- Soil bearing resistance on the cone tip;
- Soil friction resistance along the cylindrical friction sleeve;
- Probe inclination;
- Probe depth; and
- Pore water pressure.

Real-time field plots of depth, cone tip resistance, sleeve friction resistance, friction ratio, and pore water pressure were generated. Pore pressure dissipation tests were conducted to determine relative transmissiveness of subsurface materials within each aquifer. Once the CPT probe was driven to the desired depth, data collection was terminated and the probe was retracted from the hole.

CPT-derived stratigraphic information was obtained by means of established correlations between soil type and the measured cone tip and sleeve resistance. The sleeve friction value was normalized with respect to the cone tip resistance to create a friction ratio parameter. The friction ratio parameter was plotted against the overburden-normalized cone tip resistance. Interpretation of soil lithology was performed by the computer program CPTINTR1 (Version 3.02) developed by the University of British Columbia. The program evaluates the relationship of the friction ratio and the overburden-normalized cone tip resistance to interpret soil parameters.

HydroPunch™

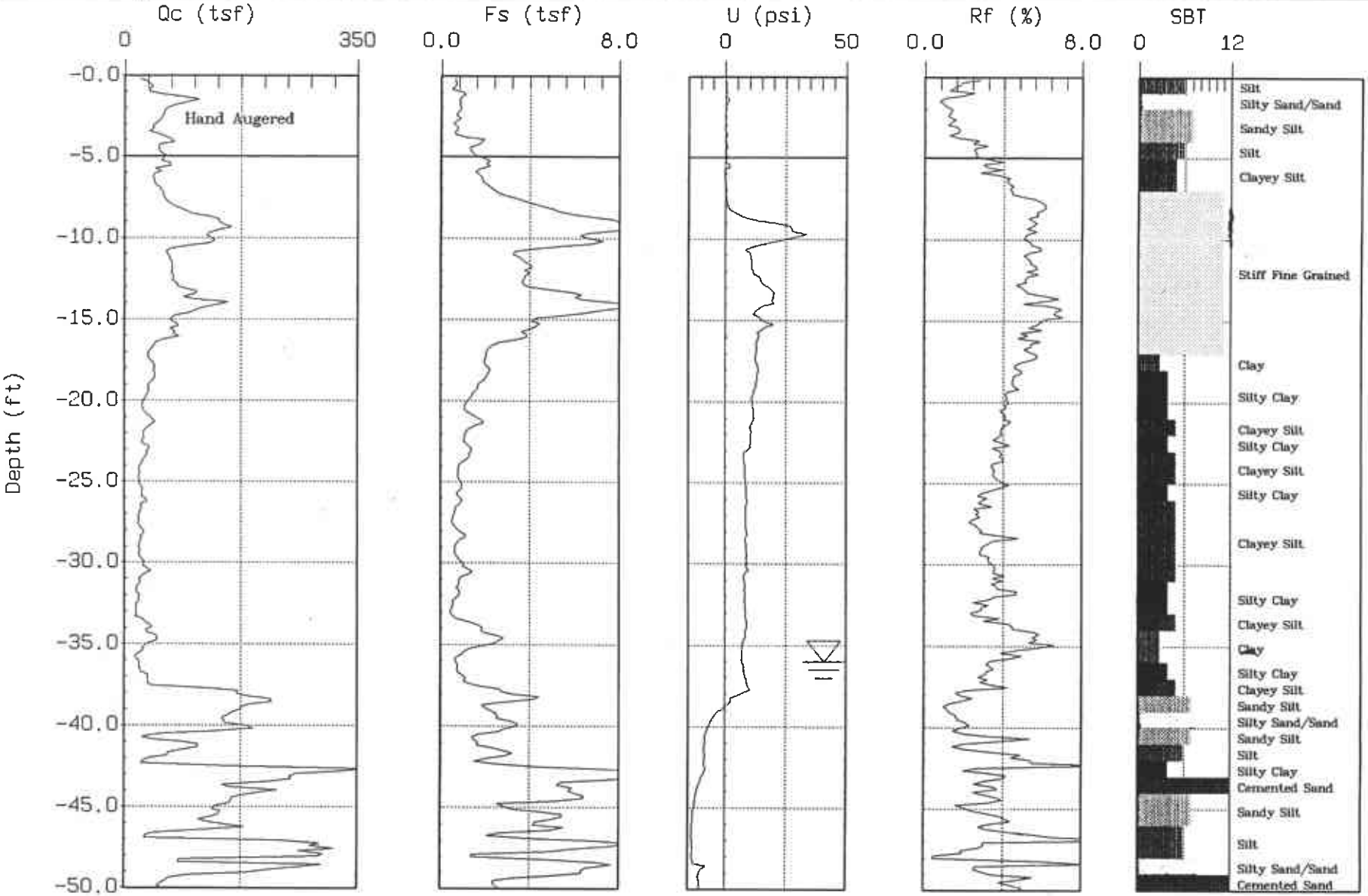
The top of the HydroPunch™ sampling equipment is attached to drive rods and the bottom to a detachable pointed drive tip. The sampling device consists of a 1.25-inch diameter stainless steel or polyvinyl chloride (PVC) cylinder inside an outer 2-inch diameter stainless steel 5-foot long retractable cylinder. The 4-foot long inner cylinder is screened to allow water to enter the screened sampling chamber when the outer cylinder is retracted. Groundwater samples were collected through the hollow stem of the sampling rods from the inner cylinder with a 1/2-inch diameter stainless steel bailer and decanted into laboratory supplied, pre-cleaned, 40-milliliter volatile organic analysis (VOA) glass sample bottles.

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : HP-1

Job Number : 502.0201.003
Date : 12:11:96 07:56



Max. Depth: 50.69 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Estimated Phreatic Surface

PES ENVIRONMENTAL

Contractor: GREGG
Location: HP-1
Project: FOOTHILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 12:11:96 07:56
JOB NO: 502.0201.003
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	34.89	0.65	1.87	0.03	sandy silt to clayey silt	UNDFND	UNDFD	13	2.6
2	81.20	0.89	1.09	0.09	sand to silty sand	>90	>48	19	UNDEFINED
3	53.34	0.71	1.34	0.15	silty sand to sandy silt	70-80	44-46	17	UNDEFINED
4	56.12	1.13	2.02	0.22	silty sand to sandy silt	70-80	42-44	18	UNDEFINED
5	54.51	1.51	2.77	0.28	sandy silt to clayey silt	UNDFND	UNDFD	21	4.1
6	56.17	1.89	3.37	0.33	sandy silt to clayey silt	UNDFND	UNDFD	22	4.2
7	47.31	2.05	4.33	0.39	silty clay to clay	UNDFND	UNDFD	30	3.6
8	63.30	3.54	5.59	0.45	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
9	115.39	6.48	5.62	0.51	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
10	138.29	7.34	5.31	0.57	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
11	91.68	5.04	5.50	0.63	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
12	69.99	3.80	5.42	0.69	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
13	73.77	3.79	5.14	0.75	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
14	108.07	6.12	5.66	0.81	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
15	101.98	6.76	6.63	0.87	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
16	73.60	4.04	5.49	0.93	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
17	51.46	2.72	5.28	0.98	clay	UNDFND	UNDFD	49	3.8
18	39.18	2.00	5.11	1.02	clay	UNDFND	UNDFD	38	2.9
19	43.36	2.01	4.64	1.04	silty clay to clay	UNDFND	UNDFD	28	3.2
20	34.08	1.48	4.35	1.07	silty clay to clay	UNDFND	UNDFD	22	2.5
21	29.50	1.20	4.08	1.10	silty clay to clay	UNDFND	UNDFD	19	2.1
22	36.28	1.47	4.06	1.13	clayey silt to silty clay	UNDFND	UNDFD	17	2.6
23	30.42	1.15	3.78	1.16	clayey silt to silty clay	UNDFND	UNDFD	15	2.2
24	28.32	1.06	3.75	1.19	clayey silt to silty clay	UNDFND	UNDFD	14	2.0
25	21.43	0.81	3.76	1.22	silty clay to clay	UNDFND	UNDFD	14	1.5
26	26.66	0.84	3.15	1.25	clayey silt to silty clay	UNDFND	UNDFD	13	1.9
27	24.70	0.69	2.81	1.28	clayey silt to silty clay	UNDFND	UNDFD	12	1.7
28	22.72	0.60	2.65	1.31	clayey silt to silty clay	UNDFND	UNDFD	11	1.6
29	23.44	0.83	3.55	1.34	clayey silt to silty clay	UNDFND	UNDFD	11	1.6
30	24.05	0.77	3.18	1.36	clayey silt to silty clay	UNDFND	UNDFD	12	1.7
31	29.58	1.09	3.67	1.39	clayey silt to silty clay	UNDFND	UNDFD	14	2.1
32	20.05	0.78	3.91	1.42	silty clay to clay	UNDFND	UNDFD	13	1.3
33	18.12	0.52	2.85	1.45	clayey silt to silty clay	UNDFND	UNDFD	9	1.2
34	28.27	1.11	3.94	1.48	silty clay to clay	UNDFND	UNDFD	18	2.0
35	41.00	2.35	5.72	1.51	clay	UNDFND	UNDFD	39	2.9
36	22.63	1.04	4.62	1.53	clay	UNDFND	UNDFD	22	1.5
37	24.60	0.77	3.12	1.56	clayey silt to silty clay	UNDFND	UNDFD	12	1.7
38	73.28	1.73	2.36	1.59	silty sand to sandy silt	50-60	32-34	23	UNDEFINED
39	192.82	3.05	1.58	1.62	sand to silty sand	70-80	38-40	46	UNDEFINED
40	156.49	2.71	1.73	1.65	sand to silty sand	70-80	36-38	37	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su; Nk= 13

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

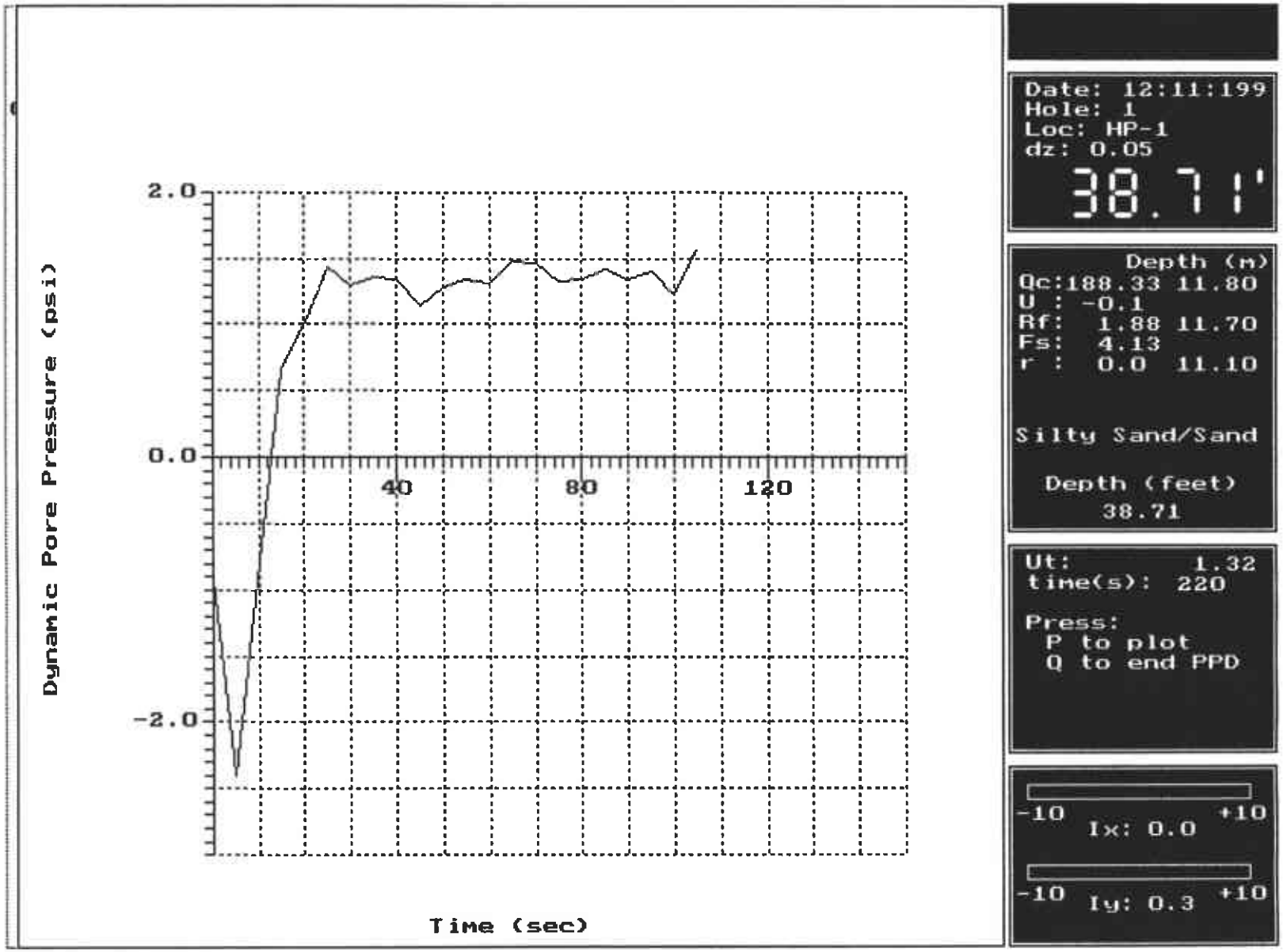
Contractor: GREGG Location: HP-1

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	104.94	2.22	2.11	1.68	silty sand to sandy silt	60-70	34-36	34	UNDEFINED
42	80.37	2.34	2.92	1.71	sandy silt to clayey silt	UNDFND	UNDFD	31	5.9
43	191.89	6.11	3.19	1.74	sandy silt to clayey silt	UNDFND	UNDFD	>50	14.5
44	208.08	6.61	3.18	1.77	sand to clayey sand (*)	UNDFND	UNDFD	>50	UNDEFINED
45	160.75	4.65	2.89	1.80	silty sand to sandy silt	70-80	36-38	>50	UNDEFINED
46	134.65	4.76	3.54	1.83	sandy silt to clayey silt	UNDFND	UNDFD	>50	10.1
47	106.32	4.30	4.04	1.86	clayey silt to silty clay	UNDFND	UNDFD	>50	7.9
48	289.96	5.02	1.73	1.88	sand to silty sand	80-90	40-42	>50	UNDEFINED
49	186.16	6.44	3.46	1.91	sand to clayey sand (*)	UNDFND	UNDFD	>50	UNDEFINED
50	63.66	3.03	4.76	1.94	silty clay to clay	UNDFND	UNDFD	41	4.6

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****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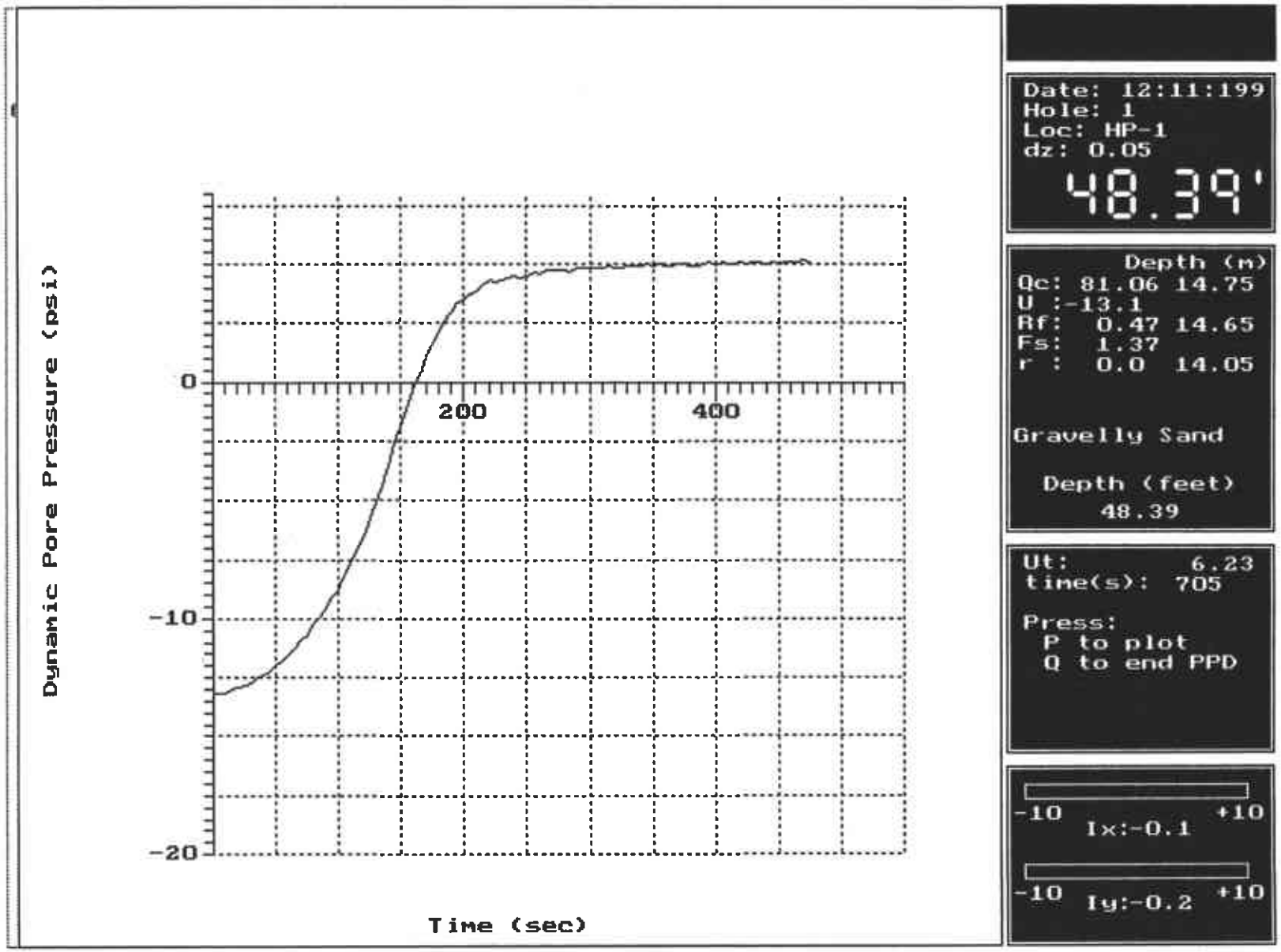
0.0
-2.0
40
80
120
Time (sec)
Date: 12:11:199
Hole: 1
Loc: HP-1
dz: 0.05
38.71'
Depth (m)
Qc:188.33 11.80
U : -0.1
Rf: 1.88 11.70
Fs: 4.13
r : 0.0 11.10
Silty Sand/Sand
Depth (feet)
38.71
Ut: 1.32
time(s): 220
Press:
P to plot
Q to end PPD
-10 +10
Ix: 0.0
-10 +10
Iy: 0.3

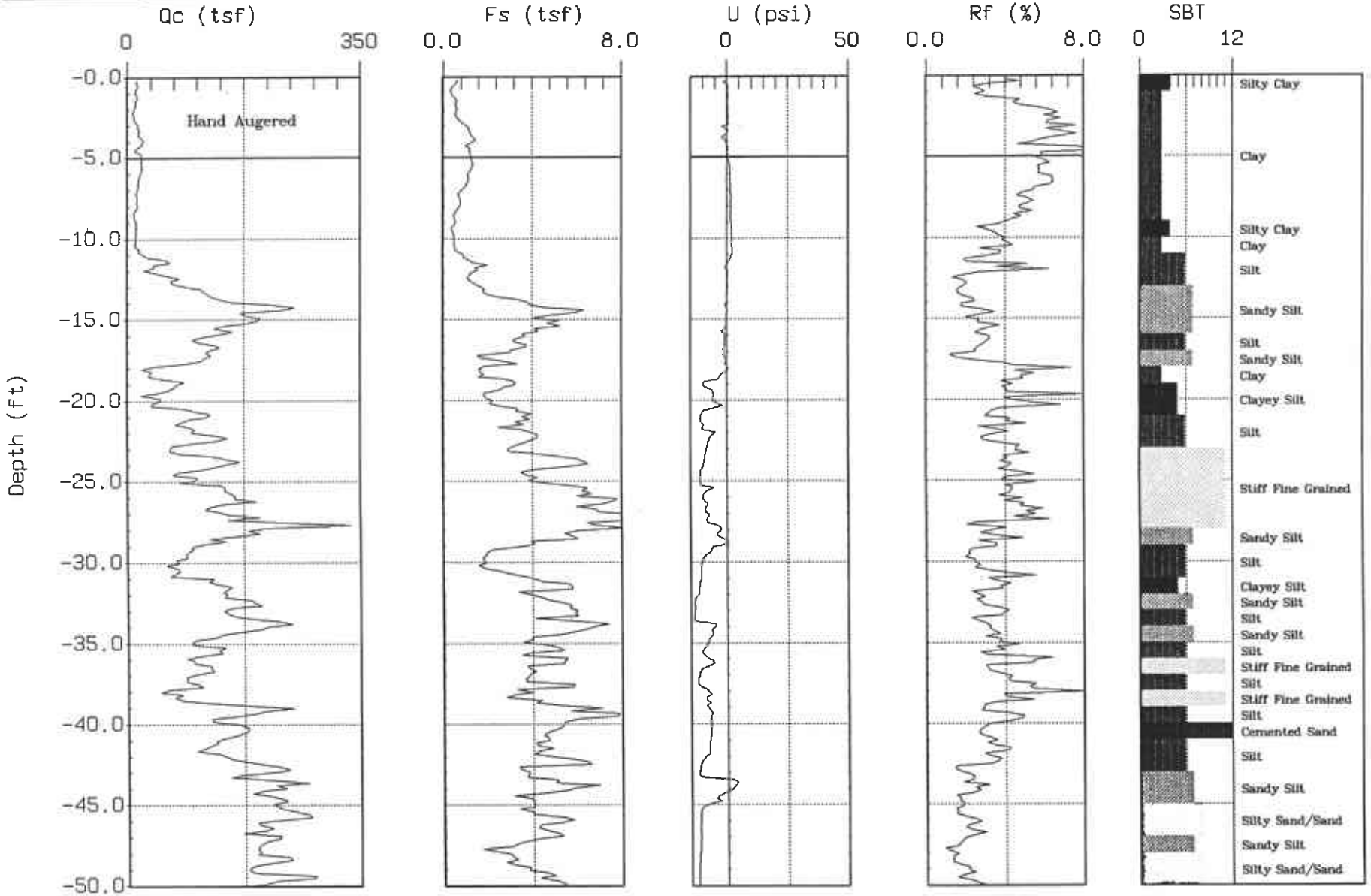

Dynamic Pore Pressure (psi)
0
-10
-20
200
400
Time (sec)
Date: 12:11:199
Hole: 1
Loc: HP-1
dz: 0.05
48.39'
Depth (m)
Qc: 81.06 14.75
U :-13.1
Rf: 0.47 14.65
Fs: 1.37
r : 0.0 14.05
Gravelly Sand
Depth (feet)
48.39
Ut: 6.23
time(s): 705
Press:
P to plot
Q to end PPD
-10 +10
Ix:-0.1
-10 +10
Iy:-0.2

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : HP-2

Job Number : 502.0201.003
Date : 12:11:96 09:47



Max. Depth: 50.20 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

PES ENVIRONMENTAL

Contractor: GREGG
Location: HP-2
Project: FOOTHILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 12:11:96 09:47
JOB NO: 502.0201.003
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	13.77	0.45	3.28	0.03	silty clay to clay	UNDFND	UNDFD	9	1.0
2	13.01	0.53	4.03	0.09	clay	UNDFND	UNDFD	12	.9
3	11.28	0.74	6.55	0.15	clay	UNDFND	UNDFD	11	.8
4	19.88	1.26	6.33	0.22	clay	UNDFND	UNDFD	19	1.5
5	18.17	1.16	6.38	0.28	clay	UNDFND	UNDFD	17	1.3
6	20.80	1.22	5.86	0.33	clay	UNDFND	UNDFD	20	1.5
7	16.13	0.99	6.11	0.39	clay	UNDFND	UNDFD	15	1.2
8	14.22	0.71	4.99	0.45	clay	UNDFND	UNDFD	14	1.0
9	11.16	0.51	4.60	0.51	clay	UNDFND	UNDFD	11	.8
10	12.73	0.43	3.39	0.57	silty clay to clay	UNDFND	UNDFD	8	.9
11	15.71	0.58	3.71	0.63	silty clay to clay	UNDFND	UNDFD	10	1.1
12	42.34	1.37	3.24	0.69	clayey silt to silty clay	UNDFND	UNDFD	20	3.2
13	66.80	1.27	1.91	0.75	silty sand to sandy silt	50-60	36-38	21	UNDEFINED
14	127.71	2.51	1.97	0.81	silty sand to sandy silt	70-80	40-42	41	UNDEFINED
15	207.79	4.88	2.35	0.87	silty sand to sandy silt	80-90	42-44	>50	UNDEFINED
16	157.72	4.51	2.86	0.93	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
17	118.37	3.41	2.88	0.98	sandy silt to clayey silt	UNDFND	UNDFD	45	9.0
18	99.29	2.31	2.33	1.02	silty sand to sandy silt	60-70	38-40	32	UNDEFINED
19	44.82	2.13	4.75	1.04	silty clay to clay	UNDFND	UNDFD	29	3.3
20	53.42	2.33	4.36	1.07	clayey silt to silty clay	UNDFND	UNDFD	26	4.0
21	79.36	2.98	3.76	1.10	clayey silt to silty clay	UNDFND	UNDFD	38	6.0
22	88.81	3.44	3.88	1.13	clayey silt to silty clay	UNDFND	UNDFD	43	6.7
23	107.88	3.67	3.40	1.16	sandy silt to clayey silt	UNDFND	UNDFD	41	8.1
24	124.58	5.19	4.17	1.19	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
25	89.69	3.94	4.39	1.22	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
26	152.65	6.47	4.24	1.25	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
27	144.98	7.17	4.95	1.28	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
28	219.83	7.65	3.48	1.31	sand to clayey sand (*)	UNDFND	UNDFD	>50	UNDEFINED
29	141.51	4.78	3.38	1.34	sandy silt to clayey silt	UNDFND	UNDFD	>50	10.7
30	85.52	1.92	2.25	1.36	silty sand to sandy silt	50-60	34-36	27	UNDEFINED
31	79.14	2.74	3.46	1.39	sandy silt to clayey silt	UNDFND	UNDFD	30	5.9
32	142.43	4.81	3.38	1.42	sandy silt to clayey silt	UNDFND	UNDFD	>50	10.8
33	171.02	5.30	3.10	1.45	sandy silt to clayey silt	UNDFND	UNDFD	>50	13.0
34	196.33	6.03	3.07	1.48	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
35	141.45	4.85	3.43	1.51	sandy silt to clayey silt	UNDFND	UNDFD	>50	10.7
36	121.10	4.68	3.86	1.53	sandy silt to clayey silt	UNDFND	UNDFD	46	9.1
37	113.77	4.40	3.86	1.56	clayey silt to silty clay	UNDFND	UNDFD	>50	8.5
38	90.56	4.35	4.81	1.59	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
39	97.82	3.98	4.07	1.62	clayey silt to silty clay	UNDFND	UNDFD	47	7.3
40	176.30	6.66	3.78	1.65	sand to clayey sand (*)	UNDFND	UNDFD	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

(*) overconsolidated or cemented

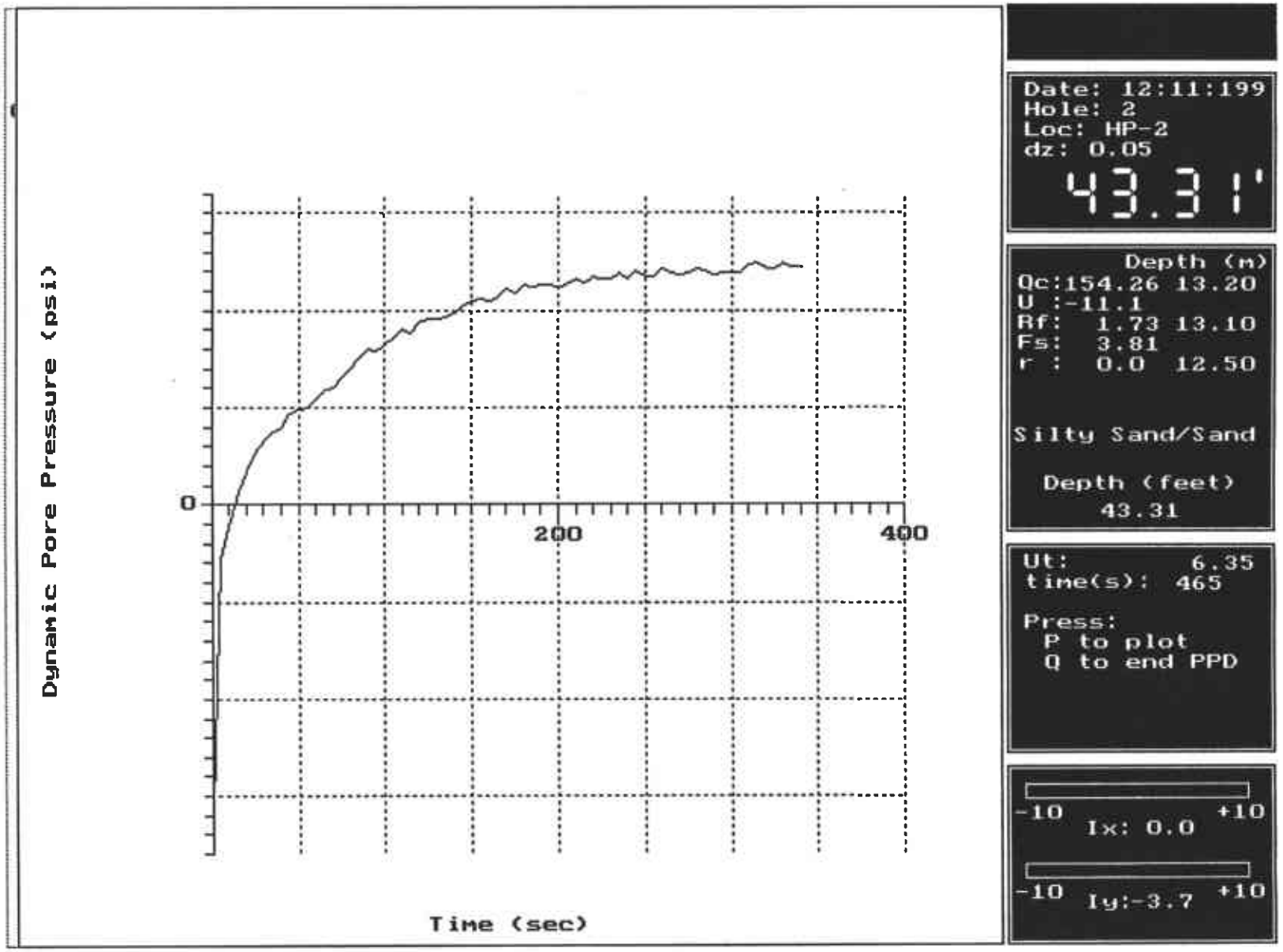
**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

Contractor: GREGG Location: HP-2

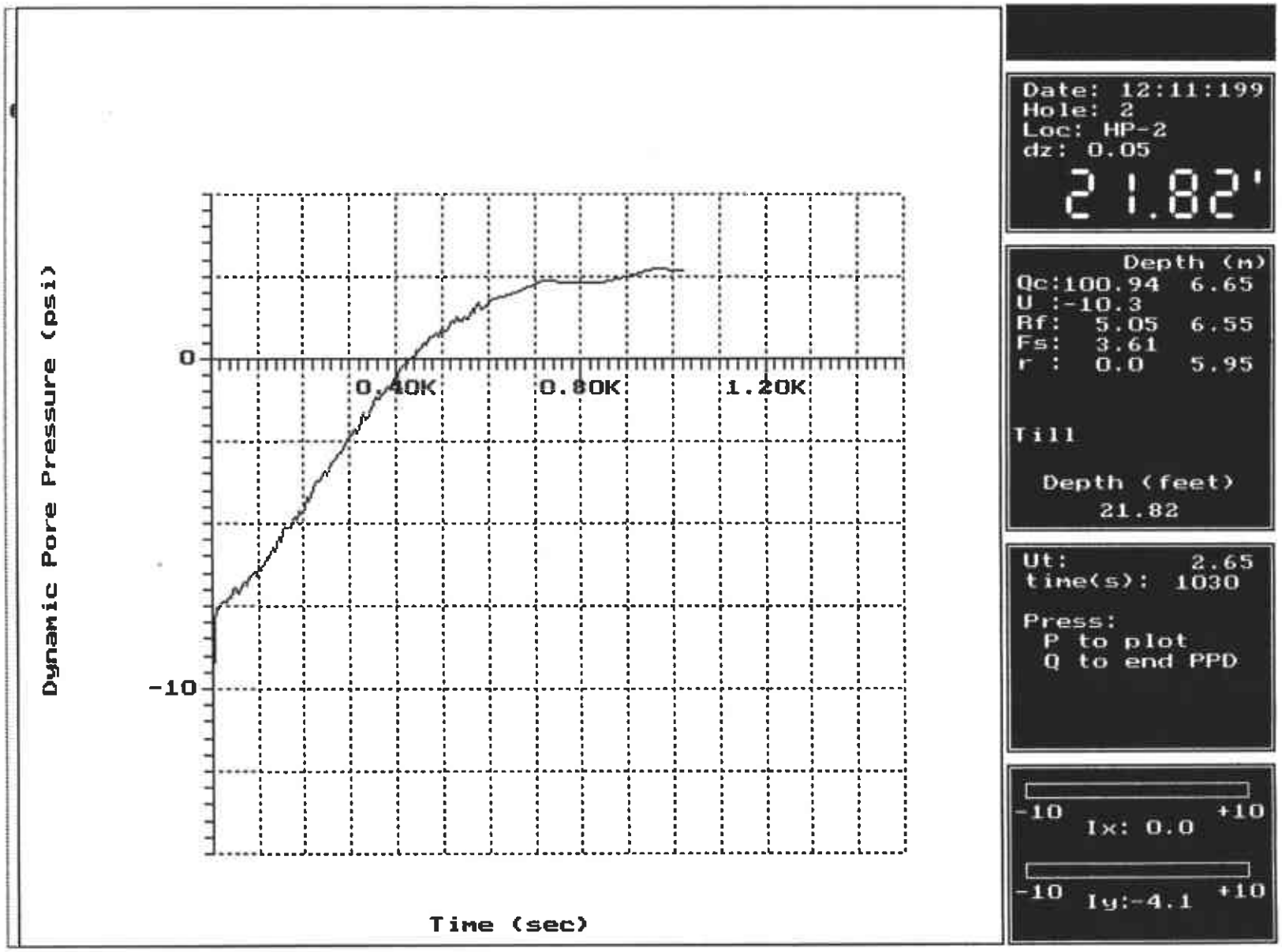
DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	169.38	4.90	2.89	1.68	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
42	127.36	4.42	3.47	1.71	sandy silt to clayey silt	UNDFND	UNDFD	49	9.6
43	204.96	4.92	2.40	1.74	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
44	212.65	5.06	2.38	1.77	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
45	216.14	4.14	1.91	1.80	sand to silty sand	80-90	38-40	>50	UNDEFINED
46	243.70	4.63	1.90	1.83	sand to silty sand	80-90	38-40	>50	UNDEFINED
47	207.70	4.66	2.24	1.86	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
48	198.04	2.85	1.44	1.88	sand to silty sand	70-80	38-40	47	UNDEFINED
49	210.32	3.32	1.58	1.91	sand to silty sand	70-80	38-40	>50	UNDEFINED
50	226.41	4.95	2.19	1.94	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****



2.7 2.7 2.6 2.7 2.8 2.7 2.6 2.8 2.6 2.8 2.8 2.7

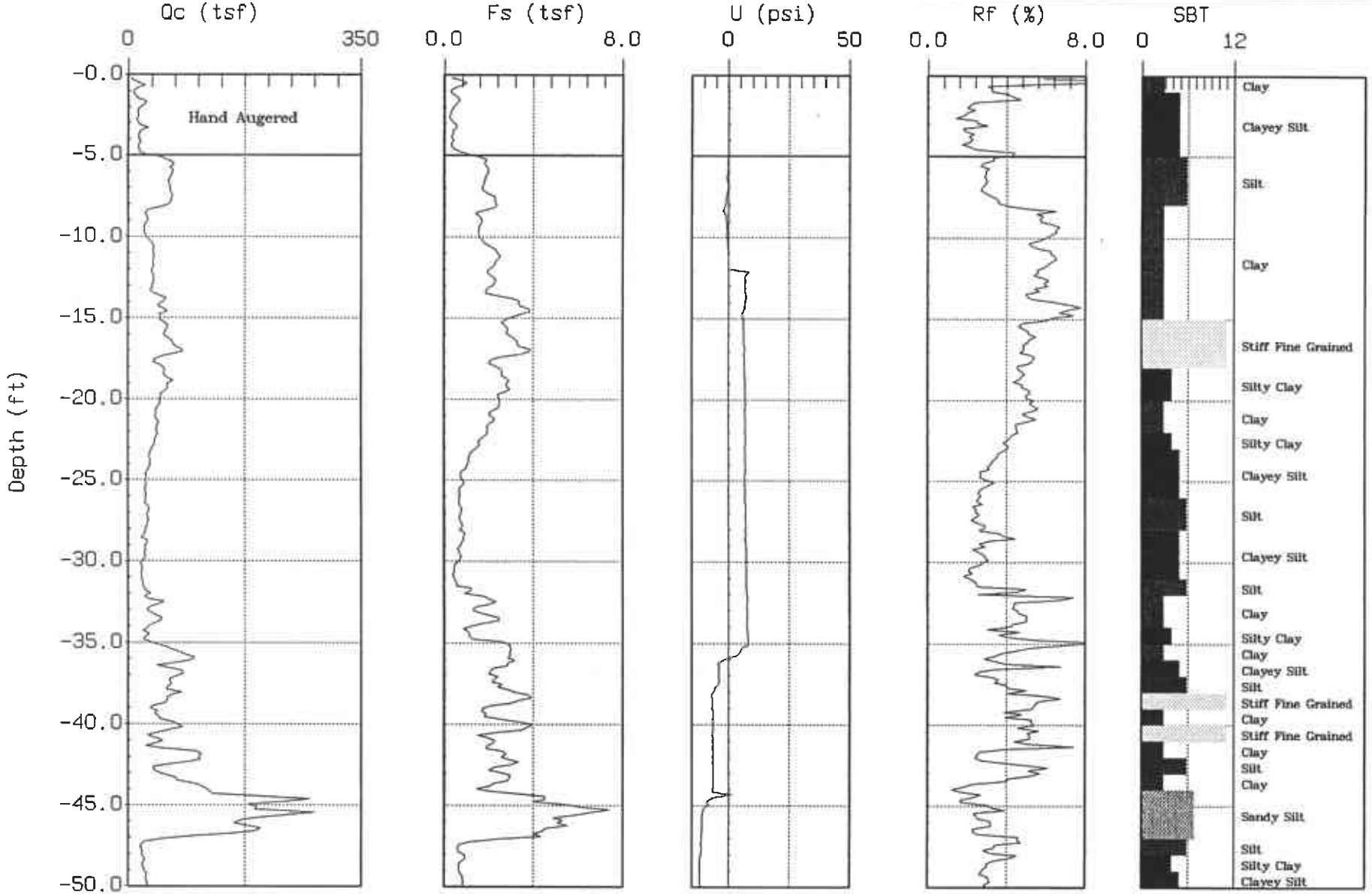

Dynamic Pore Pressure (psi)
0
-10
0.40K
0.80K
1.20K
Time (sec)
Date: 12:11:199
Hole: 2
Loc: HP-2
dz: 0.05
21.82'
Depth (m)
Qc:100.94 6.65
U :-10.3
Rf: 5.05 6.55
Fs: 3.61
r : 0.0 5.95
Till
Depth (feet)
21.82
Ut: 2.65
time(s): 1030
Press:
P to plot
Q to end PPD
-10 +10
Ix: 0.0
-10 +10
Iy:-4.1

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : HP-3

Job Number : 205.0201.003
Date : 12:11:96 13:19



Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

PES ENVIRONMENTAL

Contractor: GREGG
Location: HP-3
Project: FOOTHILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 12:11:96 13:19
JOB NO: 205.0201.003
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	12.25	0.57	4.67	0.03	clay	UNDFND	UNDFD	12	.9
2	17.10	0.49	2.89	0.09	clayey silt to silty clay	UNDFND	UNDFD	8	1.3
3	14.31	0.32	2.24	0.15	clayey silt to silty clay	UNDFND	UNDFD	7	1.0
4	18.57	0.38	2.04	0.22	sandy silt to clayey silt	UNDFND	UNDFD	7	1.4
5	22.19	0.71	3.19	0.28	clayey silt to silty clay	UNDFND	UNDFD	11	1.6
6	64.54	1.90	2.94	0.33	sandy silt to clayey silt	UNDFND	UNDFD	25	4.9
7	62.11	1.77	2.85	0.39	sandy silt to clayey silt	UNDFND	UNDFD	24	4.7
8	63.46	2.17	3.42	0.45	sandy silt to clayey silt	UNDFND	UNDFD	24	4.8
9	30.20	1.71	5.66	0.51	clay	UNDFND	UNDFD	29	2.2
10	24.36	1.55	6.37	0.57	clay	UNDFND	UNDFD	23	1.8
11	35.58	2.03	5.71	0.63	clay	UNDFND	UNDFD	34	2.6
12	37.28	2.29	6.13	0.69	clay	UNDFND	UNDFD	36	2.8
13	36.54	2.13	5.84	0.75	clay	UNDFND	UNDFD	35	2.7
14	43.43	2.39	5.51	0.81	clay	UNDFND	UNDFD	42	3.2
15	49.19	3.48	7.07	0.87	clay	UNDFND	UNDFD	47	3.7
16	54.18	2.73	5.05	0.93	silty clay to clay	UNDFND	UNDFD	35	4.0
17	65.70	3.31	5.04	0.98	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
18	52.86	2.66	5.03	1.02	silty clay to clay	UNDFND	UNDFD	34	3.9
19	56.77	2.64	4.66	1.04	silty clay to clay	UNDFND	UNDFD	36	4.2
20	53.70	2.68	4.98	1.07	silty clay to clay	UNDFND	UNDFD	34	4.0
21	43.68	2.30	5.26	1.10	clay	UNDFND	UNDFD	42	3.2
22	42.72	2.03	4.75	1.13	silty clay to clay	UNDFND	UNDFD	27	3.1
23	40.01	1.63	4.09	1.16	clayey silt to silty clay	UNDFND	UNDFD	19	2.9
24	32.45	1.11	3.41	1.19	clayey silt to silty clay	UNDFND	UNDFD	16	2.3
25	27.04	0.78	2.90	1.22	clayey silt to silty clay	UNDFND	UNDFD	13	1.9
26	25.65	0.70	2.73	1.25	clayey silt to silty clay	UNDFND	UNDFD	12	1.8
27	27.94	0.70	2.49	1.28	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
28	27.66	0.72	2.59	1.31	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
29	24.34	0.82	3.35	1.34	clayey silt to silty clay	UNDFND	UNDFD	12	1.7
30	23.62	0.65	2.74	1.36	clayey silt to silty clay	UNDFND	UNDFD	11	1.6
31	19.42	0.42	2.16	1.39	sandy silt to clayey silt	UNDFND	UNDFD	7	1.3
32	24.31	0.80	3.28	1.42	clayey silt to silty clay	UNDFND	UNDFD	12	1.7
33	35.26	1.79	5.09	1.45	clay	UNDFND	UNDFD	34	2.5
34	40.13	1.90	4.75	1.48	silty clay to clay	UNDFND	UNDFD	26	2.9
35	26.65	1.32	4.97	1.51	clay	UNDFND	UNDFD	26	1.8
36	71.42	2.93	4.10	1.53	clayey silt to silty clay	UNDFND	UNDFD	34	5.3
37	71.94	2.50	3.48	1.56	sandy silt to clayey silt	UNDFND	UNDFD	28	5.3
38	62.67	2.42	3.87	1.59	clayey silt to silty clay	UNDFND	UNDFD	30	4.6
39	59.02	3.20	5.43	1.62	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
40	45.01	2.13	4.74	1.65	silty clay to clay	UNDFND	UNDFD	29	3.2

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

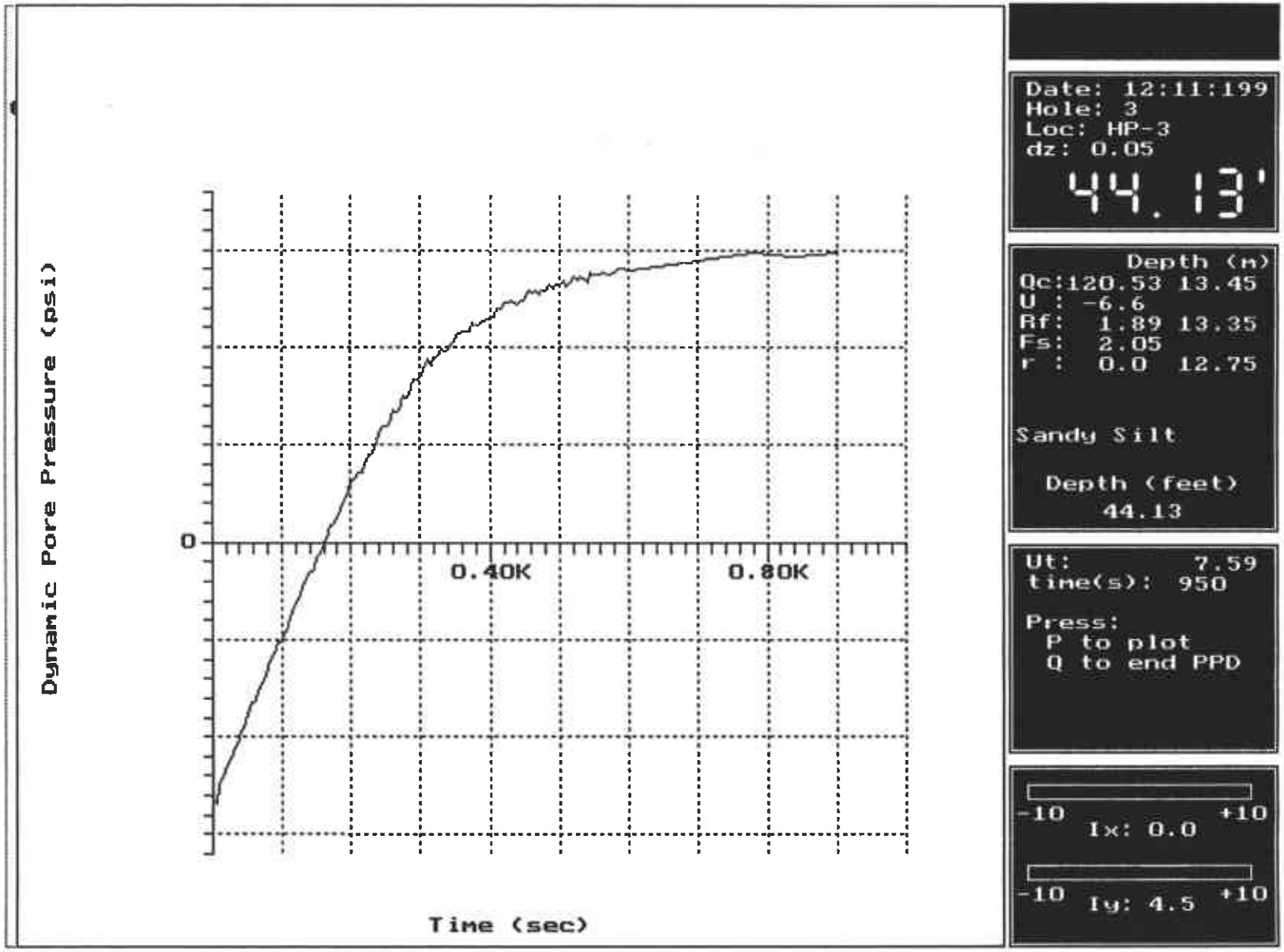
PES ENVIRONMENTAL

Contractor: GREGG Location: HP-3

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	54.94	2.83	5.15	1.68	silty clay to clay	UNDFND	UNDFD	35	4.0
42	69.21	2.30	3.32	1.71	sandy silt to clayey silt	UNDFND	UNDFD	27	5.1
43	62.86	2.65	4.22	1.74	clayey silt to silty clay	UNDFND	UNDFD	30	4.6
44	87.01	2.40	2.75	1.77	sandy silt to clayey silt	UNDFND	UNDFD	33	6.4
45	189.04	4.28	2.27	1.80	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
46	206.01	5.84	2.83	1.83	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
47	144.46	4.19	2.90	1.86	silty sand to sandy silt	60-70	36-38	46	UNDEFINED
48	20.15	0.74	3.68	1.88	silty clay to clay	UNDFND	UNDFD	13	1.3
49	22.45	0.70	3.11	1.91	clayey silt to silty clay	UNDFND	UNDFD	11	1.5
50	26.82	0.78	2.93	1.94	clayey silt to silty clay	UNDFND	UNDFD	13	1.8

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

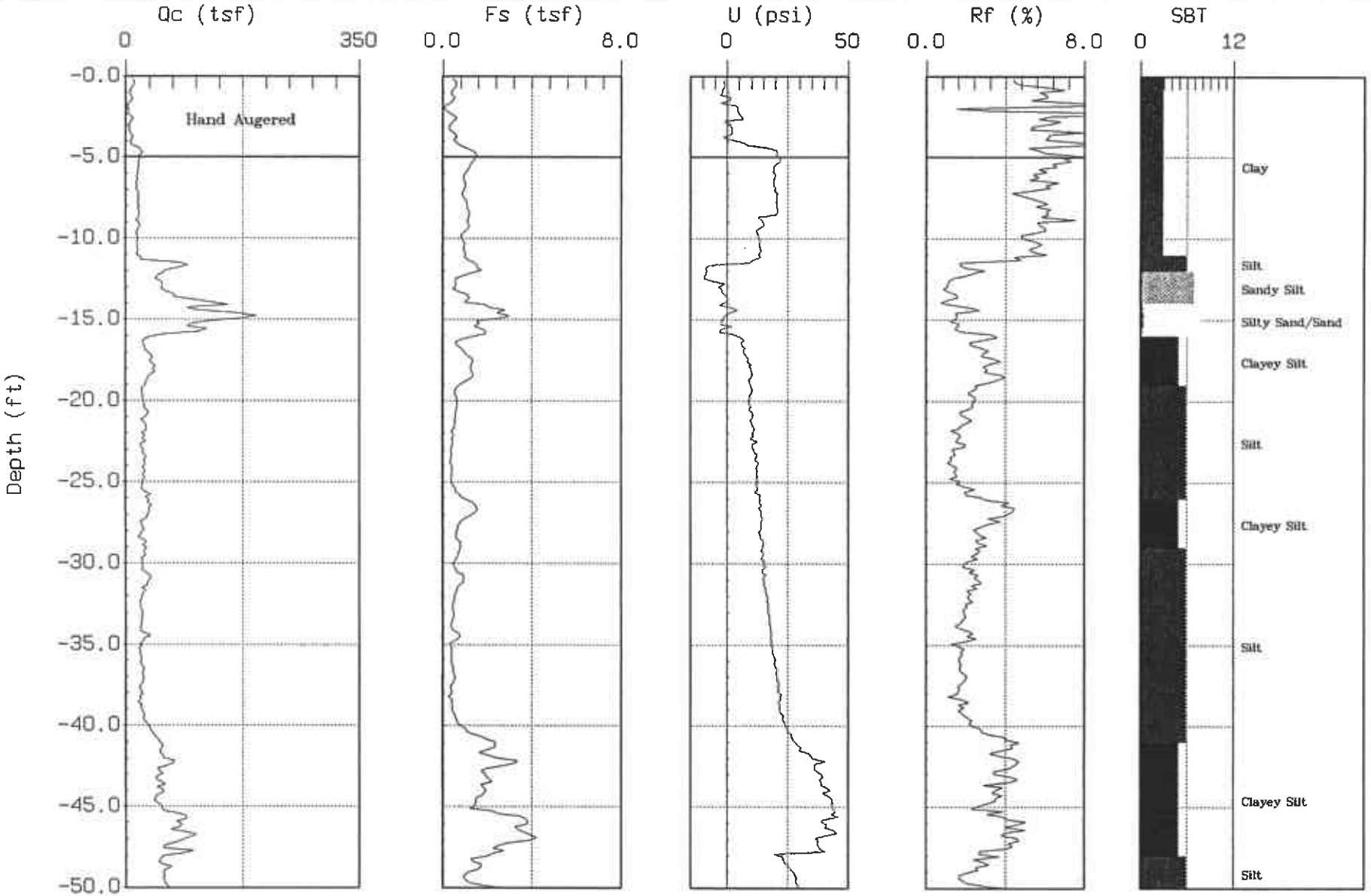

Dynamic Pore Pressure (psi)
0
0.40K
0.80K
Time (sec)
Date: 12:11:199
Hole: 3
Loc: HP-3
dz: 0.05
44.13'
Depth (m)
Qc:120.53 13.45
U : -6.6
Rf: 1.89 13.35
Fs: 2.05
r : 0.0 12.75
Sandy Silt
Depth (feet)
44.13
Ut: 7.59
time(s): 950
Press:
P to plot
Q to end PPD
-10 +10
Ix: 0.0
-10 +10
Iy: 4.5

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : CPT-4

Job Number : 205.0201.003
Date : 12:16:96 09:09



Max. Depth: 60.37 (ft)

Depth Inc.: 0.164 (ft)

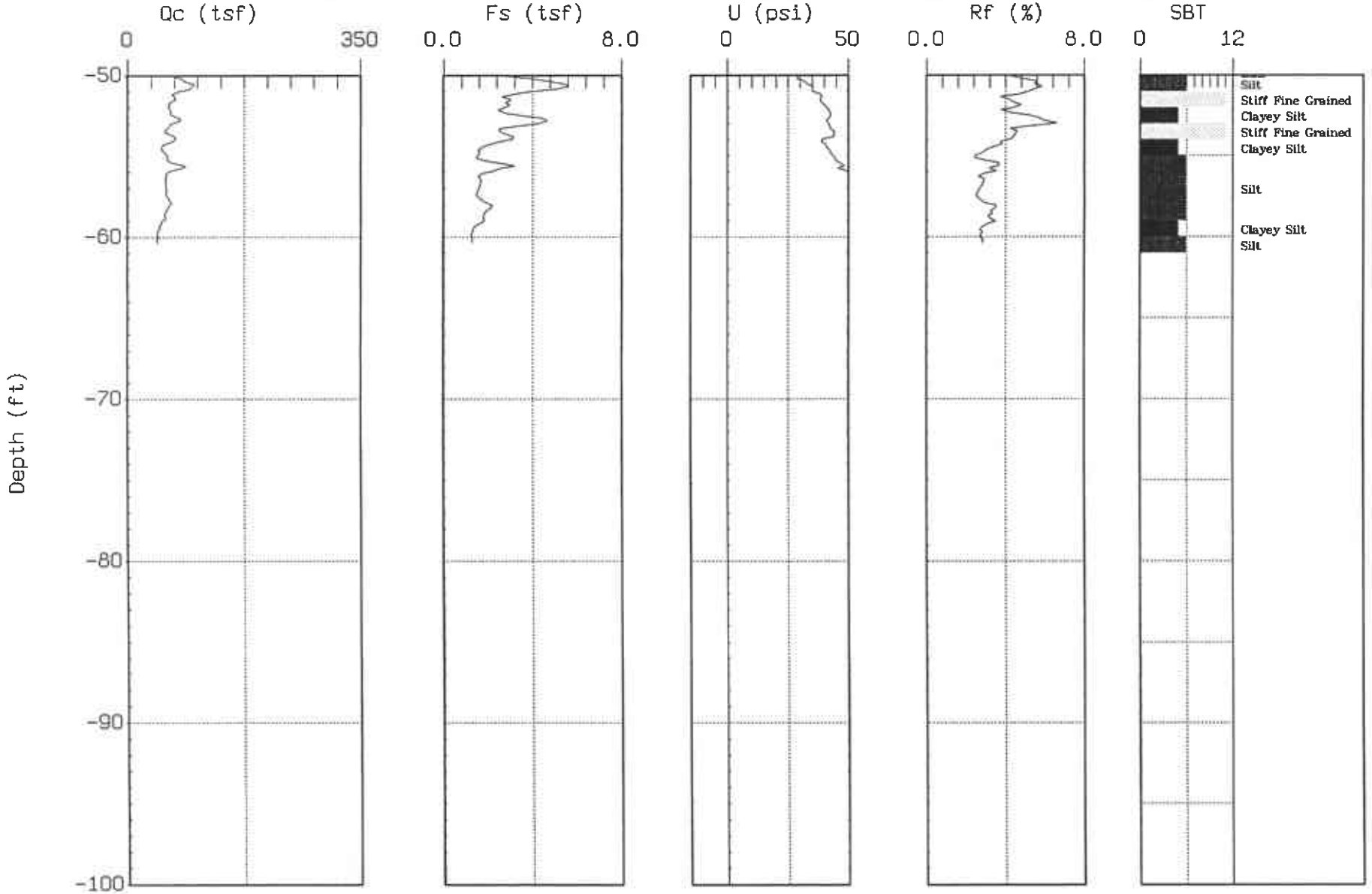
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : CPT-4

Job Number : 205.0201.003
Date : 12:16:96 09:09



Max. Depth: 60.37 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

PES ENVIRONMENTAL

Contractor: GREGG
Location: CPT-4
Project: FOOTHILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 12:16:96 09:09
JOB NO: 205.0201.003
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	9.56	0.49	5.16	0.03	clay	UNDFND	UNDFD	9	.7
2	5.33	0.31	5.78	0.09	clay	UNDFND	UNDFD	5	.4
3	5.89	0.37	6.28	0.15	clay	UNDFND	UNDFD	6	.4
4	7.29	0.48	6.63	0.22	clay	UNDFND	UNDFD	7	.5
5	18.76	1.24	6.59	0.28	clay	UNDFND	UNDFD	18	1.4
6	18.18	1.15	6.31	0.33	clay	UNDFND	UNDFD	17	1.3
7	16.03	0.94	5.90	0.39	clay	UNDFND	UNDFD	15	1.2
8	18.23	0.98	5.36	0.45	clay	UNDFND	UNDFD	17	1.3
9	17.94	1.12	6.23	0.51	clay	UNDFND	UNDFD	17	1.3
10	17.54	0.96	5.50	0.57	clay	UNDFND	UNDFD	17	1.3
11	16.83	0.95	5.62	0.63	clay	UNDFND	UNDFD	16	1.2
12	58.61	1.37	2.33	0.69	sandy silt to clayey silt	UNDFND	UNDFD	22	4.4
13	50.55	0.74	1.47	0.75	silty sand to sandy silt	50-60	34-36	16	UNDEFINED
14	81.68	0.90	1.10	0.81	sand to silty sand	60-70	38-40	20	UNDEFINED
15	146.91	2.46	1.67	0.87	sand to silty sand	70-80	40-42	35	UNDEFINED
16	100.21	1.68	1.67	0.93	silty sand to sandy silt	60-70	38-40	32	UNDEFINED
17	28.09	0.80	2.85	0.98	clayey silt to silty clay	UNDFND	UNDFD	13	2.0
18	38.36	1.20	3.12	1.02	clayey silt to silty clay	UNDFND	UNDFD	18	2.8
19	35.26	1.20	3.39	1.04	clayey silt to silty clay	UNDFND	UNDFD	17	2.6
20	24.80	0.59	2.38	1.07	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
21	28.74	0.59	2.05	1.10	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
22	27.30	0.47	1.73	1.13	sandy silt to clayey silt	UNDFND	UNDFD	10	2.0
23	25.12	0.41	1.65	1.16	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
24	26.87	0.35	1.31	1.19	sandy silt to clayey silt	UNDFND	UNDFD	10	1.9
25	26.08	0.38	1.46	1.22	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
26	29.15	0.69	2.37	1.25	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
27	33.67	1.40	4.15	1.28	silty clay to clay	UNDFND	UNDFD	22	2.4
28	25.00	0.74	2.94	1.31	clayey silt to silty clay	UNDFND	UNDFD	12	1.7
29	25.32	0.68	2.70	1.34	clayey silt to silty clay	UNDFND	UNDFD	12	1.8
30	25.66	0.60	2.36	1.36	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
31	30.17	0.72	2.38	1.39	sandy silt to clayey silt	UNDFND	UNDFD	12	2.1
32	27.71	0.65	2.36	1.42	sandy silt to clayey silt	UNDFND	UNDFD	11	1.9
33	22.26	0.45	2.04	1.45	sandy silt to clayey silt	UNDFND	UNDFD	9	1.5
34	23.27	0.41	1.78	1.48	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
35	26.68	0.55	2.07	1.51	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
36	21.15	0.37	1.74	1.53	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
37	24.35	0.44	1.79	1.56	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
38	23.37	0.42	1.78	1.59	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
39	21.72	0.37	1.68	1.62	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
40	26.54	0.53	2.00	1.65	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

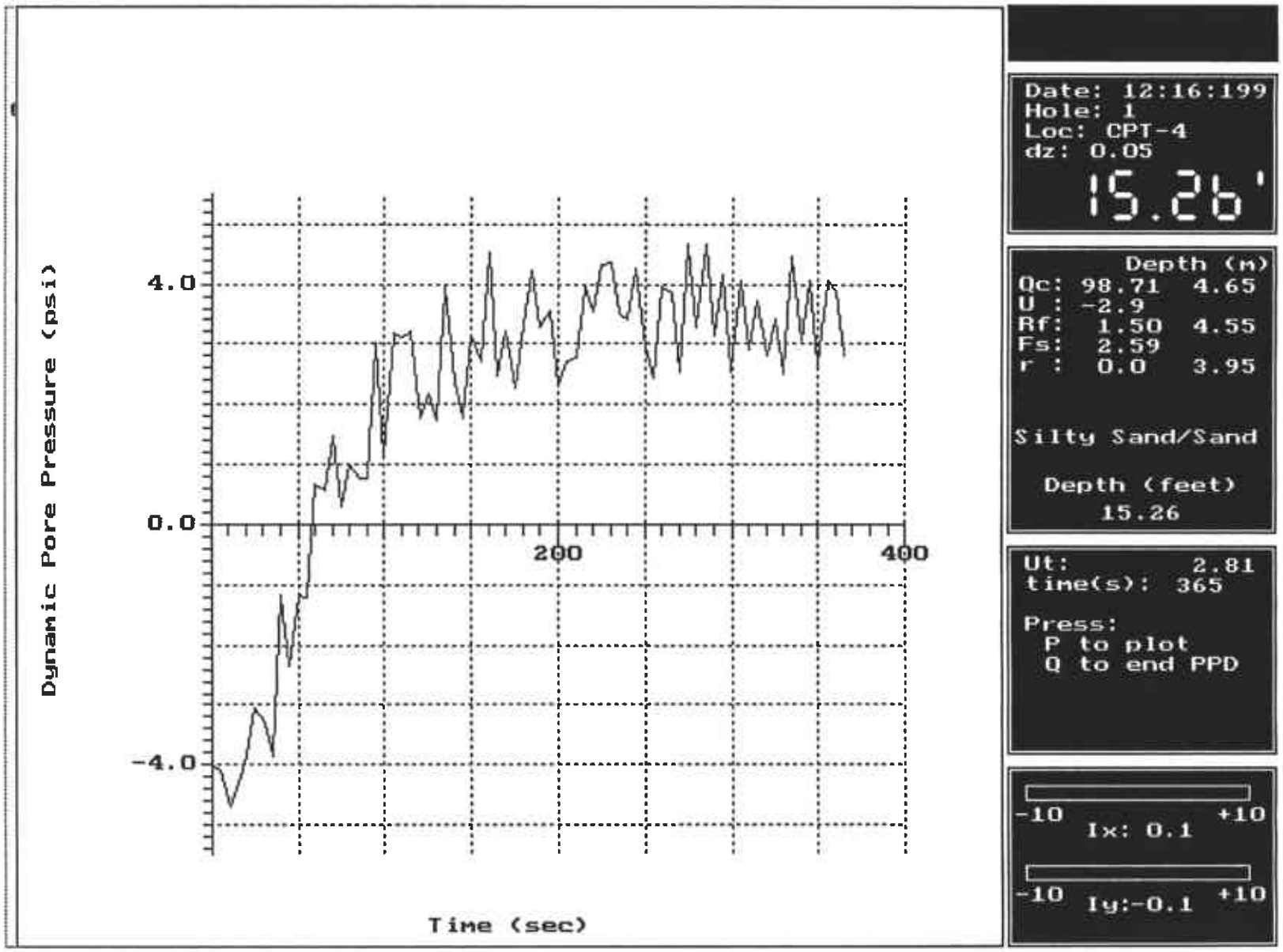
**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	39.78	1.29	3.25	1.68	clayey silt to silty clay	UNDFND	UNDFD	19	2.8
42	52.71	2.16	4.10	1.71	clayey silt to silty clay	UNDFND	UNDFD	25	3.8
43	58.81	2.45	4.17	1.74	clayey silt to silty clay	UNDFND	UNDFD	28	4.3
44	49.96	1.94	3.87	1.77	clayey silt to silty clay	UNDFND	UNDFD	24	3.6
45	48.28	1.53	3.16	1.80	sandy silt to clayey silt	UNDFND	UNDFD	18	3.5
46	78.77	3.23	4.10	1.83	clayey silt to silty clay	UNDFND	UNDFD	38	5.8
47	86.30	3.71	4.30	1.86	clayey silt to silty clay	UNDFND	UNDFD	41	6.4
48	70.01	2.43	3.48	1.88	sandy silt to clayey silt	UNDFND	UNDFD	27	5.1
49	56.00	1.45	2.59	1.91	sandy silt to clayey silt	UNDFND	UNDFD	21	4.0
50	58.78	1.44	2.45	1.94	sandy silt to clayey silt	UNDFND	UNDFD	23	4.2
51	87.78	4.77	5.43	1.97	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
52	64.93	2.86	4.40	2.00	clayey silt to silty clay	UNDFND	UNDFD	31	4.7
53	68.86	3.66	5.31	2.03	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
54	62.79	2.87	4.57	2.05	silty clay to clay	UNDFND	UNDFD	40	4.5
55	55.71	1.81	3.25	2.08	sandy silt to clayey silt	UNDFND	UNDFD	21	4.0
56	68.91	2.28	3.30	2.11	sandy silt to clayey silt	UNDFND	UNDFD	26	5.0
57	56.84	1.62	2.85	2.14	sandy silt to clayey silt	UNDFND	UNDFD	22	4.1
58	59.65	1.62	2.71	2.17	sandy silt to clayey silt	UNDFND	UNDFD	23	4.3
59	57.22	1.92	3.35	2.20	sandy silt to clayey silt	UNDFND	UNDFD	22	4.1
60	46.90	1.40	3.00	2.22	sandy silt to clayey silt	UNDFND	UNDFD	18	3.3

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

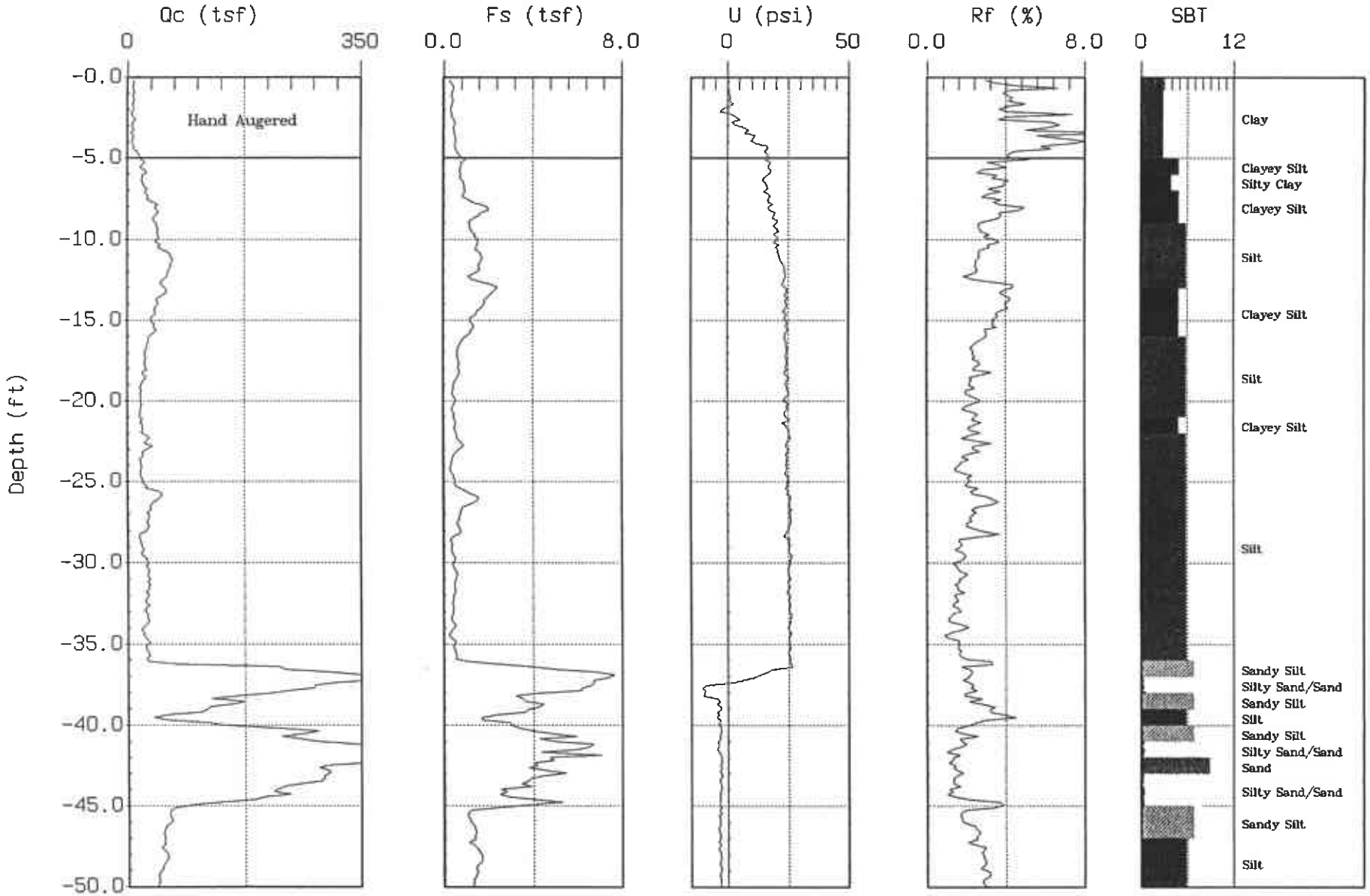

Dynamic Pore Pressure (psi)
4.0
0.0
-4.0
200
400
Time (sec)
Date: 12:16:199
Hole: 1
Loc: CPT-4
dz: 0.05
15.26'
Depth (m)
Qc: 98.71 4.65
U : -2.9
Rf: 1.50 4.55
Fs: 2.59
r : 0.0 3.95
Silty Sand/Sand
Depth (feet)
15.26
Ut: 2.81
time(s): 365
Press:
P to plot
Q to end PPD
-10 +10
Ix: 0.1
-10 +10
Iy:-0.1

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : CPT-5

Job Number : 205.0201.003
Date : 12:16:96 12:22



Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

PES ENVIRONMENTAL

Contractor: GREGG
Location: CPT-5
Project: FOOTHILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 12:16:96 12:22
JOB NO: 205.0201.003
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	8.65	0.36	4.13	0.03	clay	UNDFND	UNDFD	8	.6
2	8.25	0.35	4.22	0.09	clay	UNDFND	UNDFD	8	.6
3	7.57	0.40	5.23	0.15	clay	UNDFND	UNDFD	7	.5
4	7.05	0.49	6.95	0.22	clay	UNDFND	UNDFD	7	.5
5	13.52	0.66	4.86	0.28	clay	UNDFND	UNDFD	13	1.0
6	23.14	0.74	3.21	0.33	clayey silt to silty clay	UNDFND	UNDFD	11	1.7
7	23.76	0.87	3.65	0.39	clayey silt to silty clay	UNDFND	UNDFD	11	1.7
8	34.37	1.26	3.68	0.45	clayey silt to silty clay	UNDFND	UNDFD	16	2.6
9	41.29	1.48	3.59	0.51	clayey silt to silty clay	UNDFND	UNDFD	20	3.1
10	44.69	1.31	2.93	0.57	sandy silt to clayey silt	UNDFND	UNDFD	17	3.3
11	52.19	1.53	2.93	0.63	sandy silt to clayey silt	UNDFND	UNDFD	20	3.9
12	63.88	1.62	2.53	0.69	sandy silt to clayey silt	UNDFND	UNDFD	24	4.8
13	54.29	1.64	3.01	0.75	sandy silt to clayey silt	UNDFND	UNDFD	21	4.1
14	50.11	2.00	4.00	0.81	clayey silt to silty clay	UNDFND	UNDFD	24	3.7
15	39.05	1.46	3.74	0.87	clayey silt to silty clay	UNDFND	UNDFD	19	2.9
16	38.38	1.23	3.20	0.93	clayey silt to silty clay	UNDFND	UNDFD	18	2.8
17	28.74	0.72	2.51	0.98	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
18	25.60	0.63	2.48	1.02	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
19	24.31	0.61	2.49	1.04	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
20	18.93	0.42	2.23	1.07	clayey silt to silty clay	UNDFND	UNDFD	9	1.3
21	18.62	0.43	2.29	1.10	clayey silt to silty clay	UNDFND	UNDFD	9	1.3
22	20.33	0.49	2.41	1.13	clayey silt to silty clay	UNDFND	UNDFD	10	1.4
23	29.62	0.70	2.38	1.16	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
24	19.99	0.39	1.96	1.19	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
25	19.98	0.39	1.98	1.22	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
26	40.68	1.07	2.63	1.25	sandy silt to clayey silt	UNDFND	UNDFD	16	3.0
27	33.47	0.94	2.80	1.28	sandy silt to clayey silt	UNDFND	UNDFD	13	2.4
28	29.31	0.67	2.27	1.31	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
29	18.46	0.40	2.17	1.34	clayey silt to silty clay	UNDFND	UNDFD	9	1.2
30	24.85	0.41	1.67	1.36	sandy silt to clayey silt	UNDFND	UNDFD	10	1.7
31	29.71	0.51	1.73	1.39	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
32	30.19	0.48	1.57	1.42	sandy silt to clayey silt	UNDFND	UNDFD	12	2.1
33	26.86	0.40	1.50	1.45	sandy silt to clayey silt	UNDFND	UNDFD	10	1.9
34	28.03	0.40	1.42	1.48	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
35	25.64	0.35	1.37	1.51	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
36	28.41	0.48	1.70	1.53	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
37	203.38	4.48	2.20	1.56	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
38	307.42	6.63	2.16	1.59	sand to silty sand	>90	40-42	>50	UNDEFINED
39	160.37	3.85	2.40	1.62	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
40	84.04	2.68	3.19	1.65	sandy silt to clayey silt	UNDFND	UNDFD	32	6.2

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Contractor: GREGG Location: CPT-5

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	234.00	4.21	1.80	1.68	sand to silty sand	80-90	40-42	>50	UNDEFINED
42	388.86	5.76	1.48	1.71	sand	>90	42-44	>50	UNDEFINED
43	324.74	4.49	1.38	1.74	sand	>90	40-42	>50	UNDEFINED
44	266.49	3.65	1.37	1.77	sand	80-90	40-42	>50	UNDEFINED
45	166.47	3.37	2.02	1.80	silty sand to sandy silt	70-80	36-38	>50	UNDEFINED
46	62.74	1.12	1.79	1.83	silty sand to sandy silt	40-50	30-32	20	UNDEFINED
47	53.97	1.37	2.54	1.86	sandy silt to clayey silt	UNDFND	UNDFD	21	3.9
48	53.87	1.42	2.64	1.88	sandy silt to clayey silt	UNDFND	UNDFD	21	3.9
49	53.24	1.55	2.90	1.91	sandy silt to clayey silt	UNDFND	UNDFD	20	3.8
50	44.64	1.34	3.01	1.94	sandy silt to clayey silt	UNDFND	UNDFD	17	3.2

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

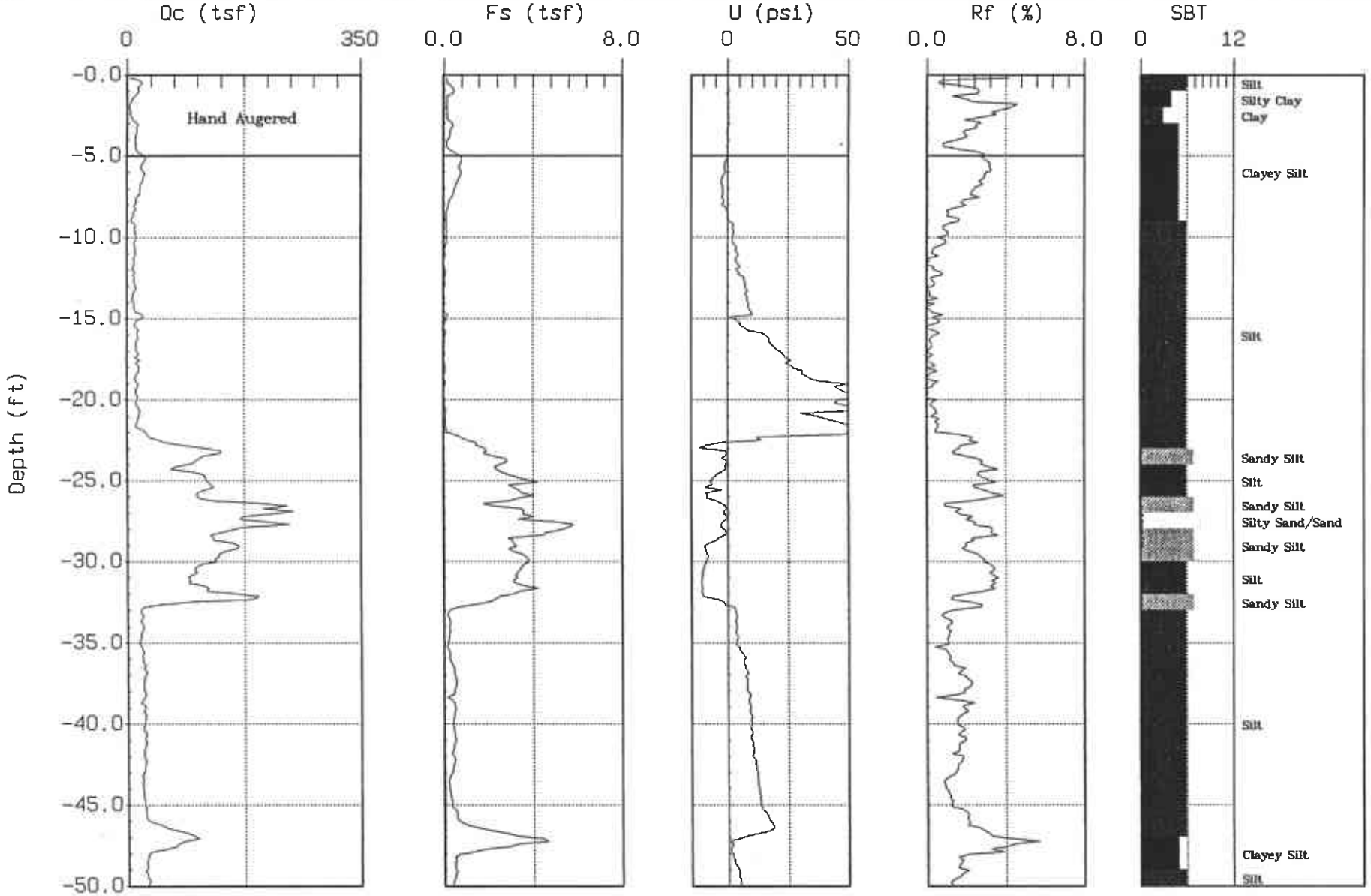
**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : CPT-6

Job Number : 205.0201.003
Date : 12:16:96 14:55



Max. Depth: 60.04 (ft)

Depth Inc.: 0.164 (ft)

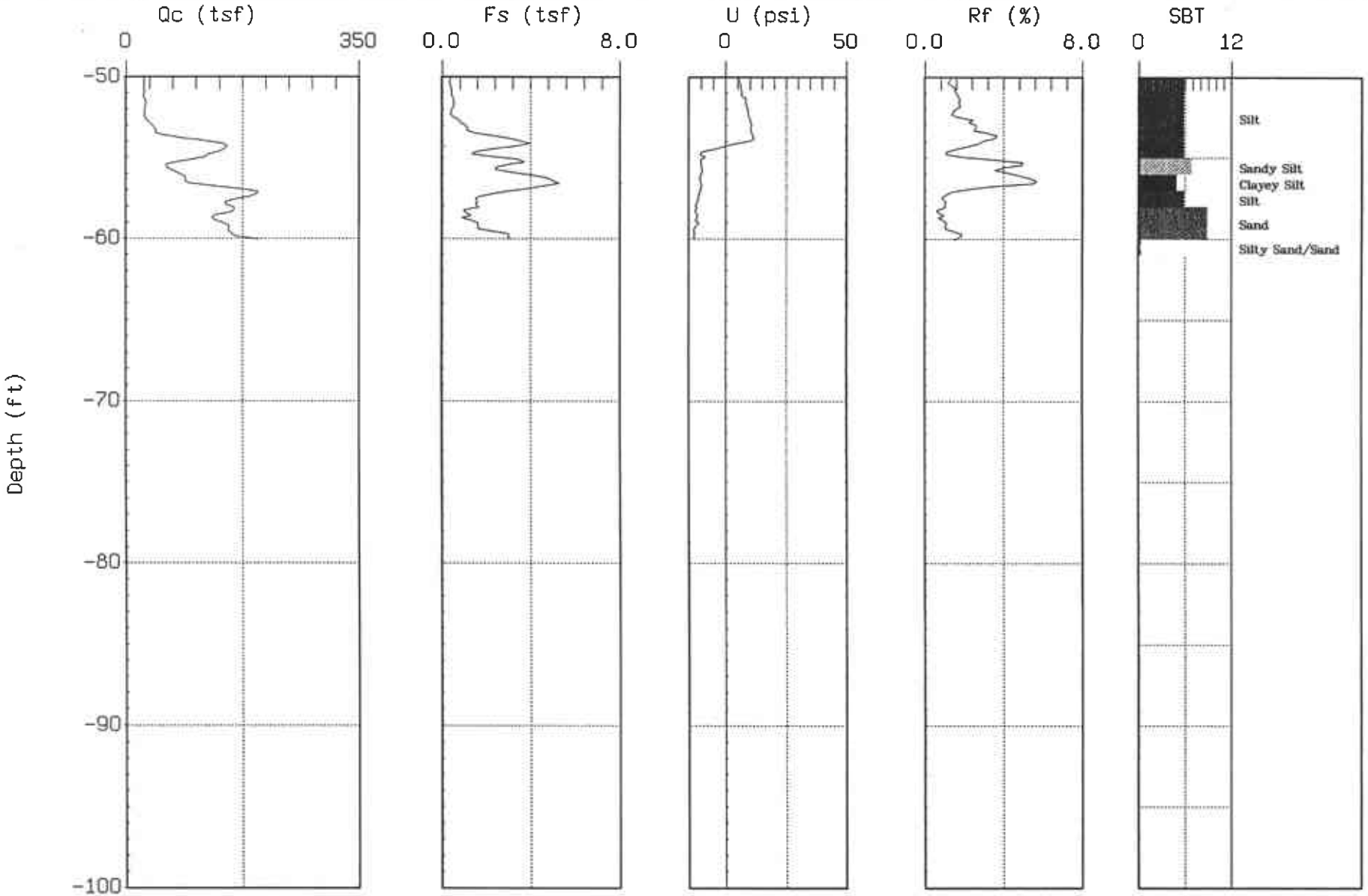
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

PES ENVIRONMENTAL

Site : FOOTHILL SQ.
Location : CPT-6

Job Number : 205.0201.003
Date : 12:16:96 14:55



Max. Depth: 60.04 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

PES ENVIRONMENTAL

Contractor: GREGG IN SITU
Location: CPT-6
Project: FOOTHILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 12:16:96 14:55
JOB NO: 205.0201.003
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	15.94	0.26	1.62	0.03	sandy silt to clayey silt	UNDFND	UNDFD	6	1.2
2	7.66	0.18	2.37	0.09	silty clay to clay	UNDFND	UNDFD	5	.5
3	7.67	0.21	2.72	0.15	silty clay to clay	UNDFND	UNDFD	5	.5
4	13.19	0.25	1.88	0.22	clayey silt to silty clay	UNDFND	UNDFD	6	.9
5	17.56	0.38	2.16	0.28	clayey silt to silty clay	UNDFND	UNDFD	8	1.3
6	23.46	0.73	3.10	0.33	clayey silt to silty clay	UNDFND	UNDFD	11	1.7
7	21.49	0.58	2.68	0.39	clayey silt to silty clay	UNDFND	UNDFD	10	1.6
8	14.32	0.30	2.11	0.45	clayey silt to silty clay	UNDFND	UNDFD	7	1.0
9	8.79	0.11	1.21	0.51	clayey silt to silty clay	UNDFND	UNDFD	4	.6
10	11.47	0.10	0.87	0.57	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
11	11.48	0.06	0.55	0.63	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
12	9.36	0.02	0.18	0.69	sensitive fine grained	UNDFND	UNDFD	4	.6
13	10.47	0.04	0.43	0.75	sandy silt to clayey silt	UNDFND	UNDFD	4	.7
14	9.27	0.01	0.07	0.81	sensitive fine grained	UNDFND	UNDFD	4	.6
15	14.89	0.05	0.36	0.87	sandy silt to clayey silt	UNDFND	UNDFD	6	1.0
16	13.65	0.05	0.38	0.93	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
17	13.65	0.03	0.18	0.98	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
18	15.35	0.03	0.17	1.02	sandy silt to clayey silt	UNDFND	UNDFD	6	1.1
19	13.94	0.03	0.22	1.04	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
20	13.86	0.01	0.08	1.07	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
21	15.46	0.05	0.34	1.10	sandy silt to clayey silt	UNDFND	UNDFD	6	1.0
22	16.81	0.08	0.49	1.13	sandy silt to clayey silt	UNDFND	UNDFD	6	1.1
23	59.97	1.15	1.92	1.16	silty sand to sandy silt	40-50	32-34	19	UNDEFINED
24	109.88	2.33	2.12	1.19	silty sand to sandy silt	60-70	36-38	35	UNDEFINED
25	104.07	3.13	3.00	1.22	sandy silt to clayey silt	UNDFND	UNDFD	40	7.8
26	113.91	3.36	2.95	1.25	sandy silt to clayey silt	UNDFND	UNDFD	44	8.6
27	204.82	2.91	1.42	1.28	sand to silty sand	80-90	40-42	49	UNDEFINED
28	187.10	4.84	2.59	1.31	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
29	140.60	3.54	2.52	1.34	silty sand to sandy silt	70-80	38-40	45	UNDEFINED
30	140.57	3.44	2.45	1.36	silty sand to sandy silt	70-80	38-40	45	UNDEFINED
31	100.20	3.36	3.35	1.39	sandy silt to clayey silt	UNDFND	UNDFD	38	7.5
32	116.17	3.44	2.96	1.42	sandy silt to clayey silt	UNDFND	UNDFD	45	8.7
33	95.79	1.51	1.58	1.45	silty sand to sandy silt	60-70	34-36	31	UNDEFINED
34	21.24	0.21	0.98	1.48	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
35	19.86	0.21	1.07	1.51	sandy silt to clayey silt	UNDFND	UNDFD	8	1.3
36	20.77	0.19	0.94	1.53	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
37	24.75	0.37	1.51	1.56	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
38	23.94	0.50	2.08	1.59	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
39	23.40	0.37	1.57	1.62	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
40	25.03	0.43	1.73	1.65	sandy silt to clayey silt	UNDFND	UNDFD	10	1.7

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

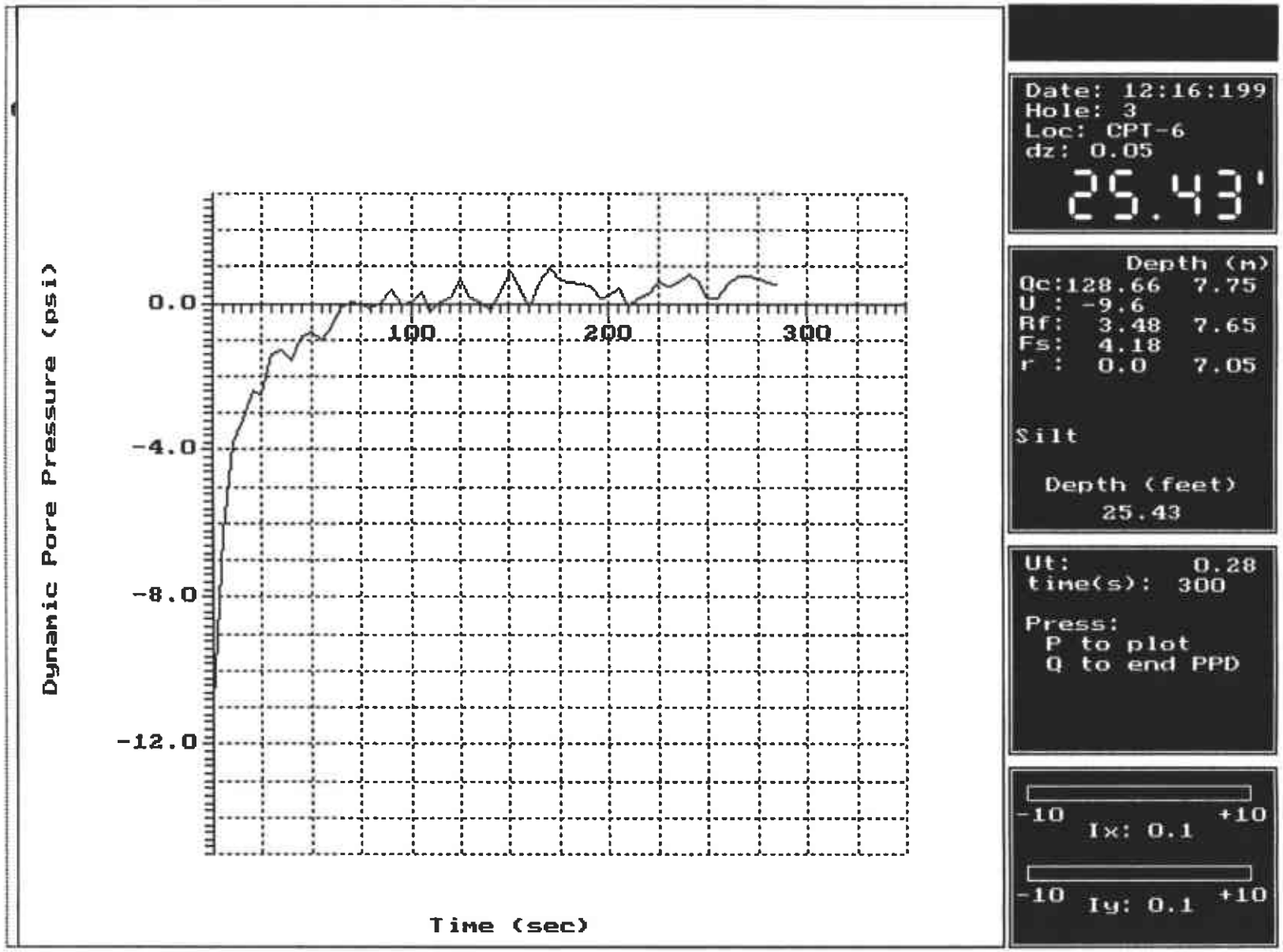
**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	24.74	0.42	1.71	1.68	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
42	24.79	0.41	1.64	1.71	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
43	24.98	0.40	1.60	1.74	sandy silt to clayey silt	UNDFND	UNDFD	10	1.7
44	21.23	0.21	0.98	1.77	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
45	23.26	0.27	1.16	1.80	sandy silt to clayey silt	UNDFND	UNDFD	9	1.5
46	27.97	0.57	2.04	1.83	sandy silt to clayey silt	UNDFND	UNDFD	11	1.9
47	78.65	2.51	3.19	1.86	sandy silt to clayey silt	UNDFND	UNDFD	30	5.8
48	57.85	2.44	4.21	1.88	clayey silt to silty clay	UNDFND	UNDFD	28	4.2
49	27.23	0.47	1.71	1.91	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
50	28.85	0.41	1.43	1.94	sandy silt to clayey silt	UNDFND	UNDFD	11	1.9
51	26.64	0.37	1.40	1.97	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
52	27.72	0.47	1.71	2.00	sandy silt to clayey silt	UNDFND	UNDFD	11	1.8
53	30.82	0.63	2.03	2.03	sandy silt to clayey silt	UNDFND	UNDFD	12	2.1
54	65.66	2.06	3.14	2.05	sandy silt to clayey silt	UNDFND	UNDFD	25	4.8
55	137.52	2.48	1.81	2.08	sand to silty sand	60-70	34-36	33	UNDEFINED
56	73.42	3.03	4.13	2.11	clayey silt to silty clay	UNDFND	UNDFD	35	5.3
57	109.85	4.57	4.16	2.14	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
58	173.58	1.88	1.08	2.17	sand	70-80	36-38	33	UNDEFINED
59	146.08	1.19	0.81	2.20	sand	60-70	34-36	28	UNDEFINED
60	155.32	2.18	1.40	2.22	sand to silty sand	60-70	34-36	37	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****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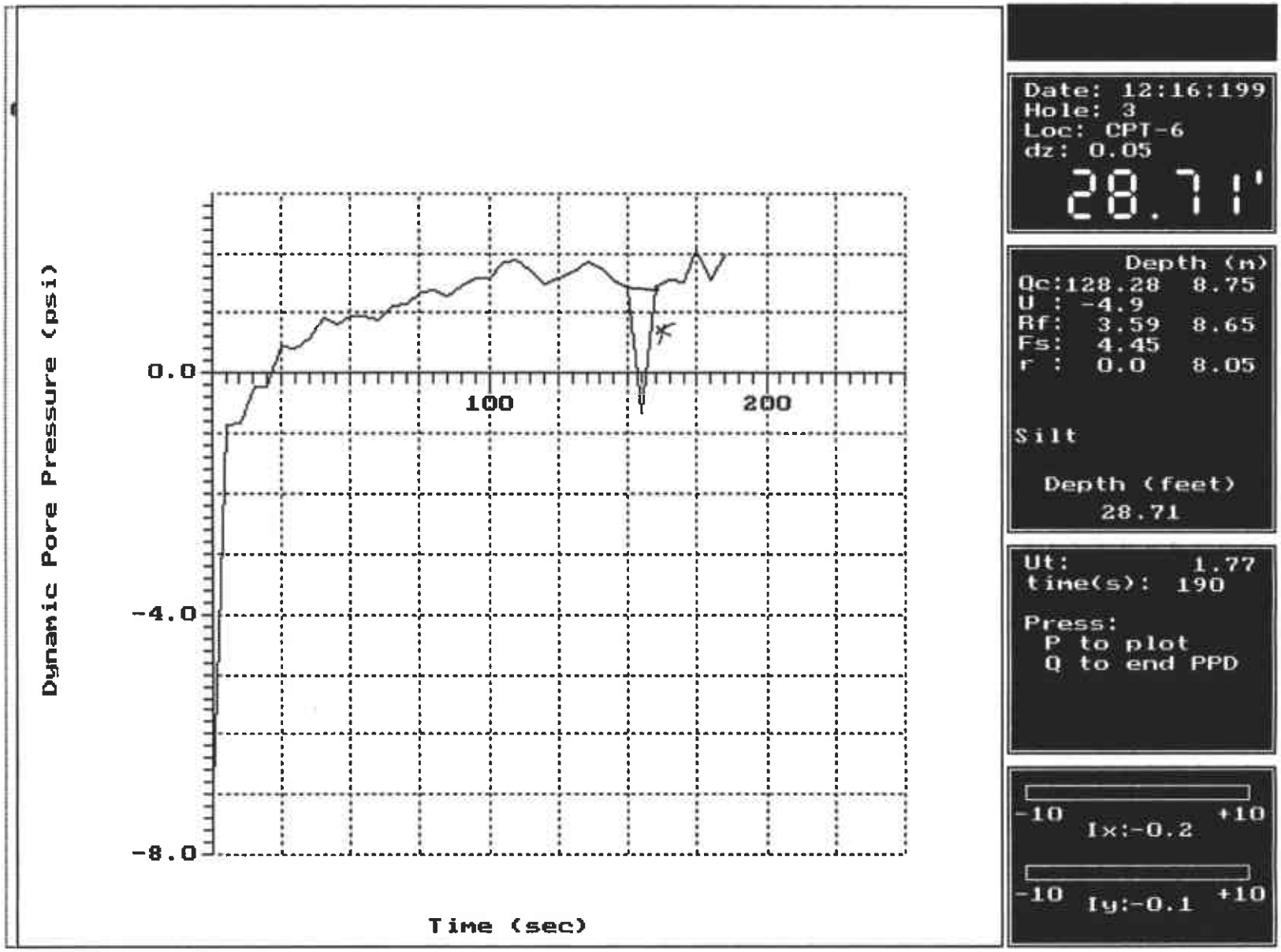
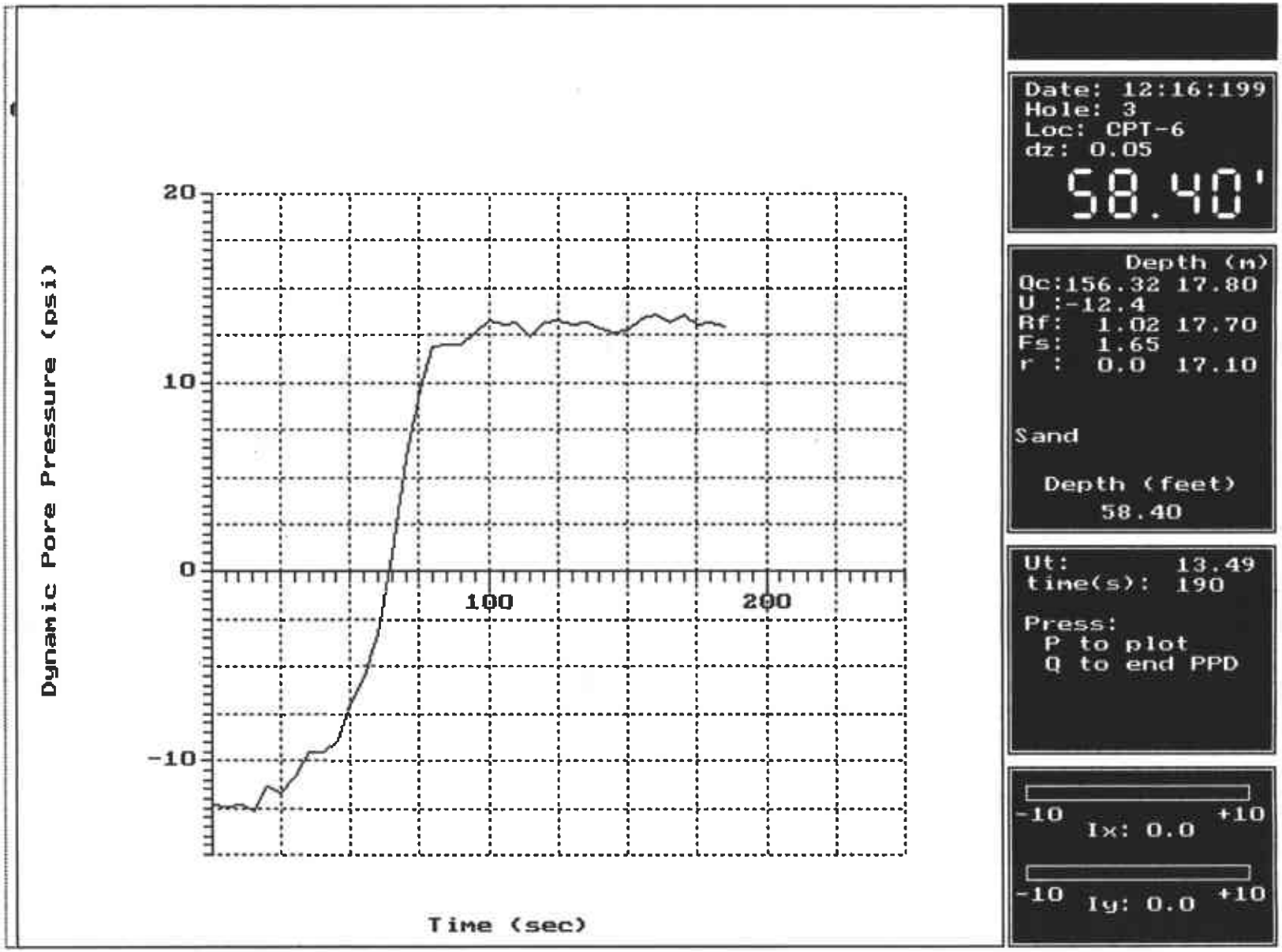
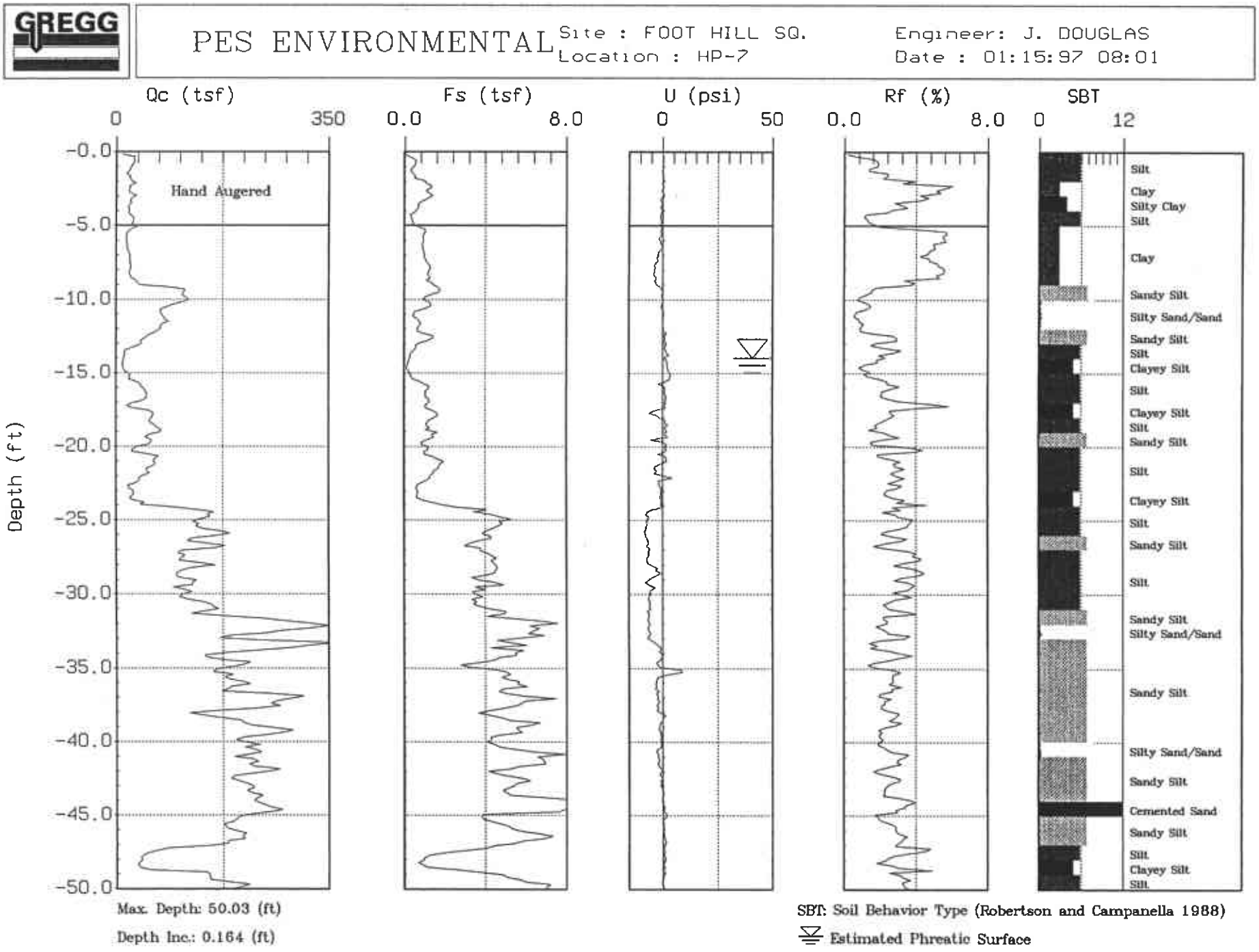
0.0
-4.0
-8.0
-12.0
100
200
300
Time (sec)
Date: 12:16:199
Hole: 3
Loc: CPT-6
dz: 0.05
25.43'
Depth (m)
Qc:128.66 7.75
U : -9.6
Rf: 3.48 7.65
Fs: 4.18
r : 0.0 7.05
Silt
Depth (feet)
25.43
Ut: 0.28
time(s): 300
Press:
P to plot
Q to end PPD
-10 +10
Ix: 0.1
-10 +10
Iy: 0.1

* driller hit down switch accidentally




Dynamic Pore Pressure (psi)
20
10
0
-10
100
200
Time (sec)
Date: 12:16:199
Hole: 3
Loc: CPT-6
dz: 0.05
58.40'
Depth (m)
Qc:156.32 17.80
U :-12.4
Rf: 1.02 17.70
Fs: 1.65
r : 0.0 17.10
Sand
Depth (feet)
58.40
Ut: 13.49
time(s): 190
Press:
P to plot
Q to end PPD
-10 +10
Ix: 0.0
-10 Iy: 0.0 +10


GREGG
PES ENVIRONMENTAL
Site : FOOT HILL SQ.
Location : HP-7
Engineer: J. DOUGLAS
Date : 01:15:97 08:01
Qc (tsf)
0
350
Fs (tsf)
0.0
8.0
U (psi)
0
50
Rf (%)
0.0
8.0
SBT
0
12
Depth (ft)
-0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
Hand Augered
Silt
Clay
Silty Clay
Silt
Clay
Sandy Silt
Silty Sand/Sand
Sandy Silt
Silt
Clayey Silt
Silt
Clayey Silt
Silt
Sandy Silt
Silt
Clayey Silt
Silt
Sandy Silt
Silt
Sandy Silt
Silty Sand/Sand
Sandy Silt
Silty Sand/Sand
Sandy Silt
Cemented Sand
Sandy Silt
Silt
Clayey Silt
Silt
Max. Depth: 50.03 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson and Campanella 1988)
Estimated Phreatic Surface

PES ENVIRONMENTAL

Contractor: GREGG
Location: HP-7
Project: FOOT HILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 01:15:97 08:01
Geologist: J. DOUGLAS
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	24.95	0.37	1.48	0.03	sandy silt to clayey silt	UNDFND	UNDFD	10	1.9
2	21.54	0.50	2.31	0.09	sandy silt to clayey silt	UNDFND	UNDFD	8	1.6
3	25.14	1.20	4.76	0.15	clay	UNDFND	UNDFD	24	1.9
4	21.32	0.67	3.14	0.22	clayey silt to silty clay	UNDFND	UNDFD	10	1.6
5	27.55	0.40	1.46	0.28	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
6	17.81	0.95	5.31	0.33	clay	UNDFND	UNDFD	17	1.3
7	19.22	0.91	4.73	0.39	clay	UNDFND	UNDFD	18	1.4
8	22.20	1.14	5.15	0.45	clay	UNDFND	UNDFD	21	1.6
9	28.28	1.22	4.30	0.51	silty clay to clay	UNDFND	UNDFD	18	2.1
10	109.45	1.37	1.25	0.57	sand to silty sand	70-80	40-42	26	UNDEFINED
11	84.10	0.93	1.10	0.63	sand to silty sand	60-70	38-40	20	UNDEFINED
12	77.01	0.64	0.83	0.69	sand to silty sand	60-70	38-40	18	UNDEFINED
13	50.50	1.01	2.00	0.75	sandy silt to clayey silt	UNDFND	UNDFD	19	3.8
14	18.57	0.40	2.14	0.81	clayey silt to silty clay	UNDFND	UNDFD	9	1.3
15	11.25	0.15	1.36	0.87	clayey silt to silty clay	UNDFND	UNDFD	5	.7
16	28.96	0.64	2.23	0.93	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
17	46.72	1.09	2.34	0.98	sandy silt to clayey silt	UNDFND	UNDFD	18	3.5
18	40.29	1.29	3.21	1.02	clayey silt to silty clay	UNDFND	UNDFD	19	3.0
19	61.78	1.18	1.90	1.04	silty sand to sandy silt	50-60	34-36	20	UNDEFINED
20	56.24	1.20	2.12	1.07	sandy silt to clayey silt	UNDFND	UNDFD	22	4.2
21	46.97	1.29	2.76	1.10	sandy silt to clayey silt	UNDFND	UNDFD	18	3.5
22	53.23	1.53	2.88	1.13	sandy silt to clayey silt	UNDFND	UNDFD	20	3.9
23	28.28	0.81	2.88	1.16	clayey silt to silty clay	UNDFND	UNDFD	14	2.0
24	39.76	1.18	2.98	1.19	sandy silt to clayey silt	UNDFND	UNDFD	15	2.9
25	142.49	4.39	3.08	1.22	sandy silt to clayey silt	UNDFND	UNDFD	>50	10.8
26	154.40	4.30	2.78	1.25	silty sand to sandy silt	70-80	38-40	49	UNDEFINED
27	138.61	3.60	2.59	1.28	silty sand to sandy silt	70-80	38-40	44	UNDEFINED
28	120.69	4.36	3.61	1.31	sandy silt to clayey silt	UNDFND	UNDFD	46	9.1
29	110.45	4.10	3.71	1.34	sandy silt to clayey silt	UNDFND	UNDFD	42	8.3
30	114.69	3.96	3.46	1.36	sandy silt to clayey silt	UNDFND	UNDFD	44	8.6
31	140.65	3.70	2.63	1.39	silty sand to sandy silt	70-80	38-40	45	UNDEFINED
32	214.65	5.62	2.62	1.42	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
33	257.37	6.33	2.46	1.45	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
34	273.14	5.26	1.92	1.48	sand to silty sand	80-90	40-42	>50	UNDEFINED
35	180.73	4.07	2.25	1.51	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
36	181.14	5.05	2.79	1.53	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
37	220.59	5.35	2.42	1.56	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
38	247.64	5.66	2.28	1.59	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
39	178.57	5.13	2.87	1.62	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
40	245.74	5.05	2.05	1.65	sand to silty sand	80-90	40-42	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Contractor: GREGG Location: HP-7

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	223.69	5.53	2.47	1.68	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
42	231.07	6.03	2.61	1.71	silty sand to sandy silt	80-90	40-42	>50	UNDEFINED
43	206.13	5.46	2.65	1.74	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
44	227.09	5.97	2.63	1.77	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
45	239.63	7.05	2.94	1.80	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
46	187.76	4.88	2.60	1.83	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
47	192.24	6.08	3.16	1.86	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
48	54.27	2.02	3.73	1.88	clayey silt to silty clay	UNDFND	UNDFD	26	3.9
49	77.34	2.33	3.02	1.91	sandy silt to clayey silt	UNDFND	UNDFD	30	5.7
50	183.38	6.32	3.45	1.94	sand to clayey sand (*)	UNDFND	UNDFD	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

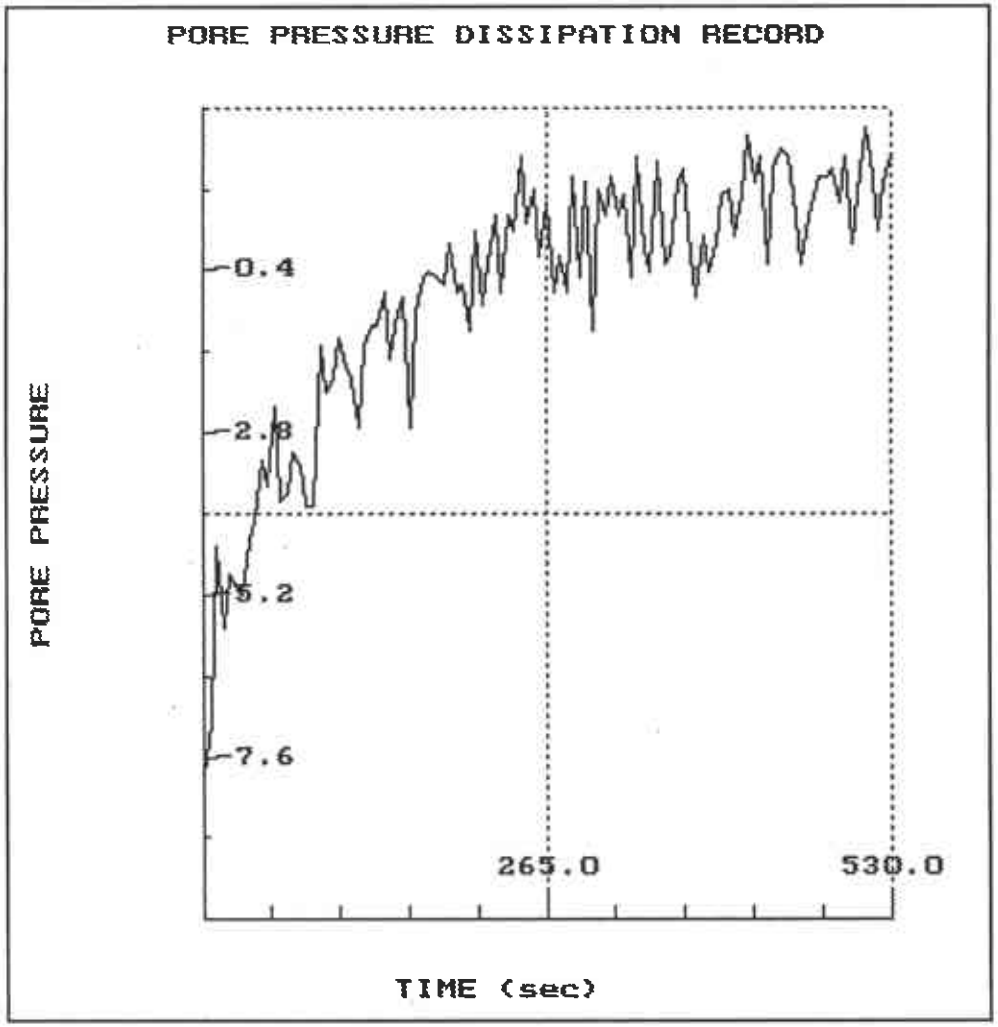
(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Site:FOOT HILL SQ.
Location:HP-7

Geologist:J. DOUGLAS
Date:01:15:97 08:01



File: 061-C07.PPD
Depth (m): 7.50
Duration : 535.0s
U-0 : -6.50
U-min: -7.90 0.0s
U-max: 1.70 510.0s
U-50 : -2.40 534.2s
ch : 0.894 cm^2/min
%Ut: 0.59

Plot u-min: -10.00
u-max: 2.00
t-min: 0.00
t-max:530.0
Rigidity Ir:100.0
Water table: 14.00

Depth Down

Depth Up

t axis type

Print

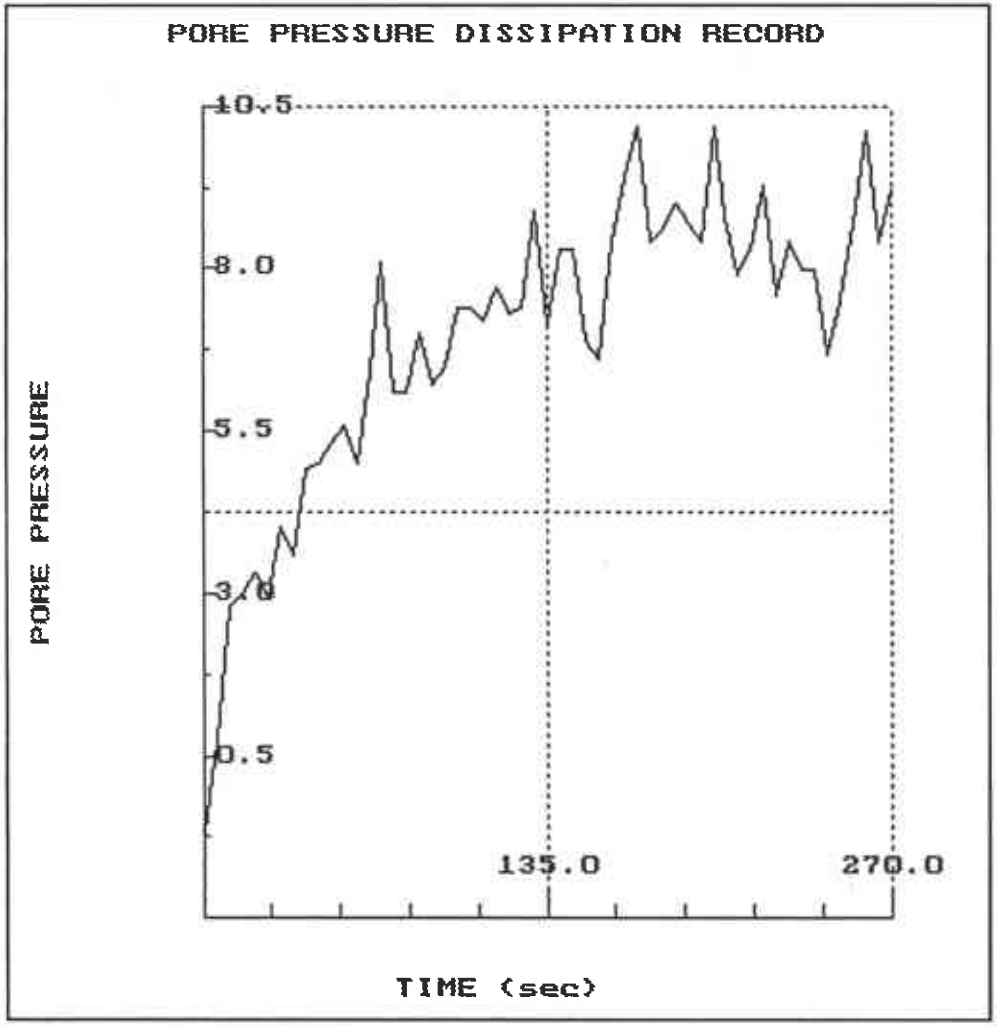
Save

Exit

PES ENVIRONMENTAL

Site:FOOT HILL SQ.
Location:HP-7

Geologist:J. DOUGLAS
Date:01:15:97 08:01



File: 061-C07.PPD
Depth (m): 10.65
Duration : 270.0s
U-0 : -3.35
U-min: -0.70 0.0s
U-max: 10.20 200.0s
U-50 : 3.42 0.0s
ch : 0.000 cm^2/min
%Ut: 0.26

Plot u-min: -2.00
u-max:10.50
t-min: 0.00
t-max:270.0
Rigidity Ir:100.0
Water table: 14.00

Depth Down

Depth Up

t axis type

Print

Save

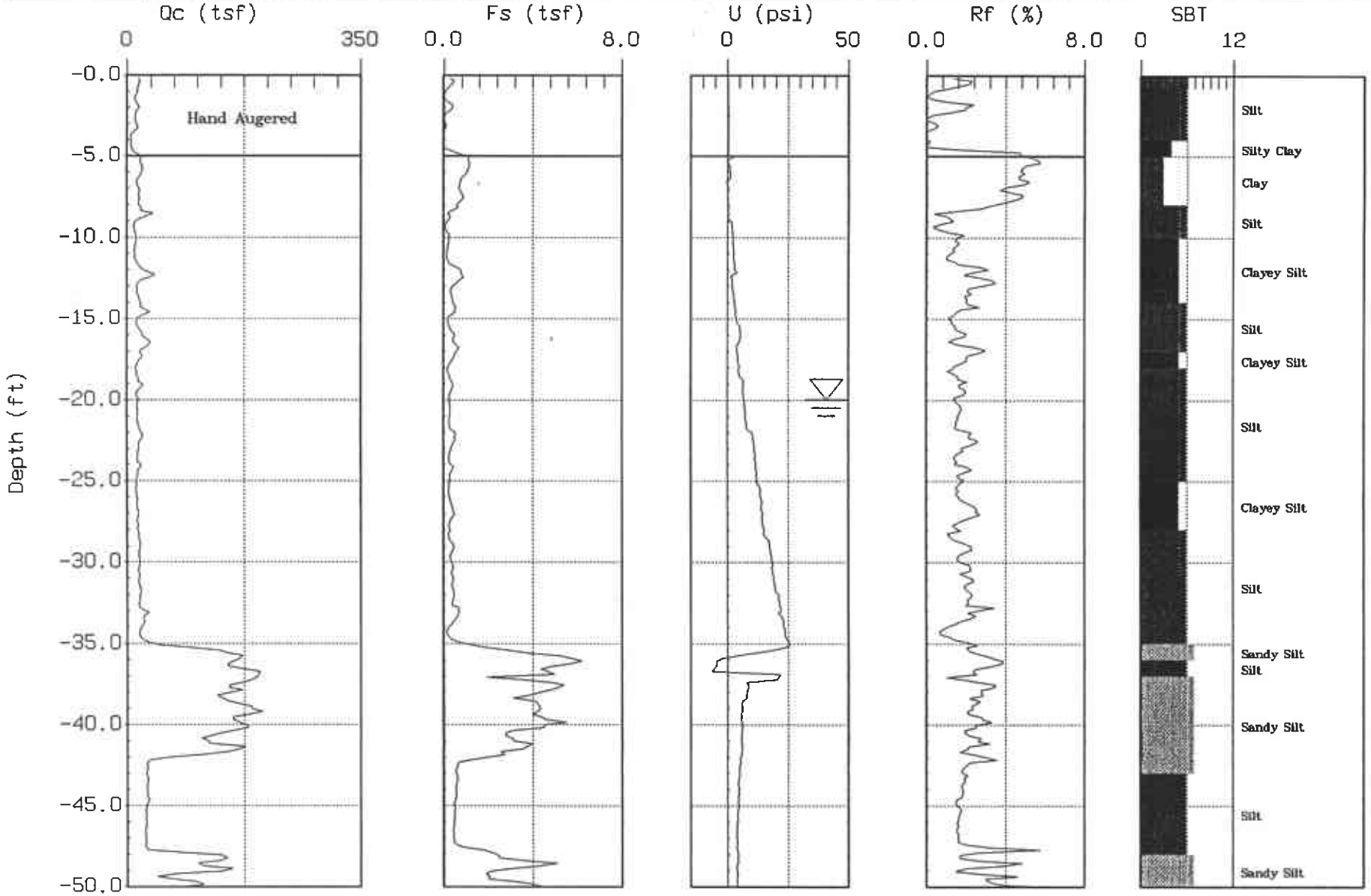
Exit

GREGG

PES ENVIRONMENTAL

Site : FOOT HILL SQ.
Location : HP-8

Engineer: J. DOUGLAS
Date : 01:15:97 14:18



Max. Depth: 60.04 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

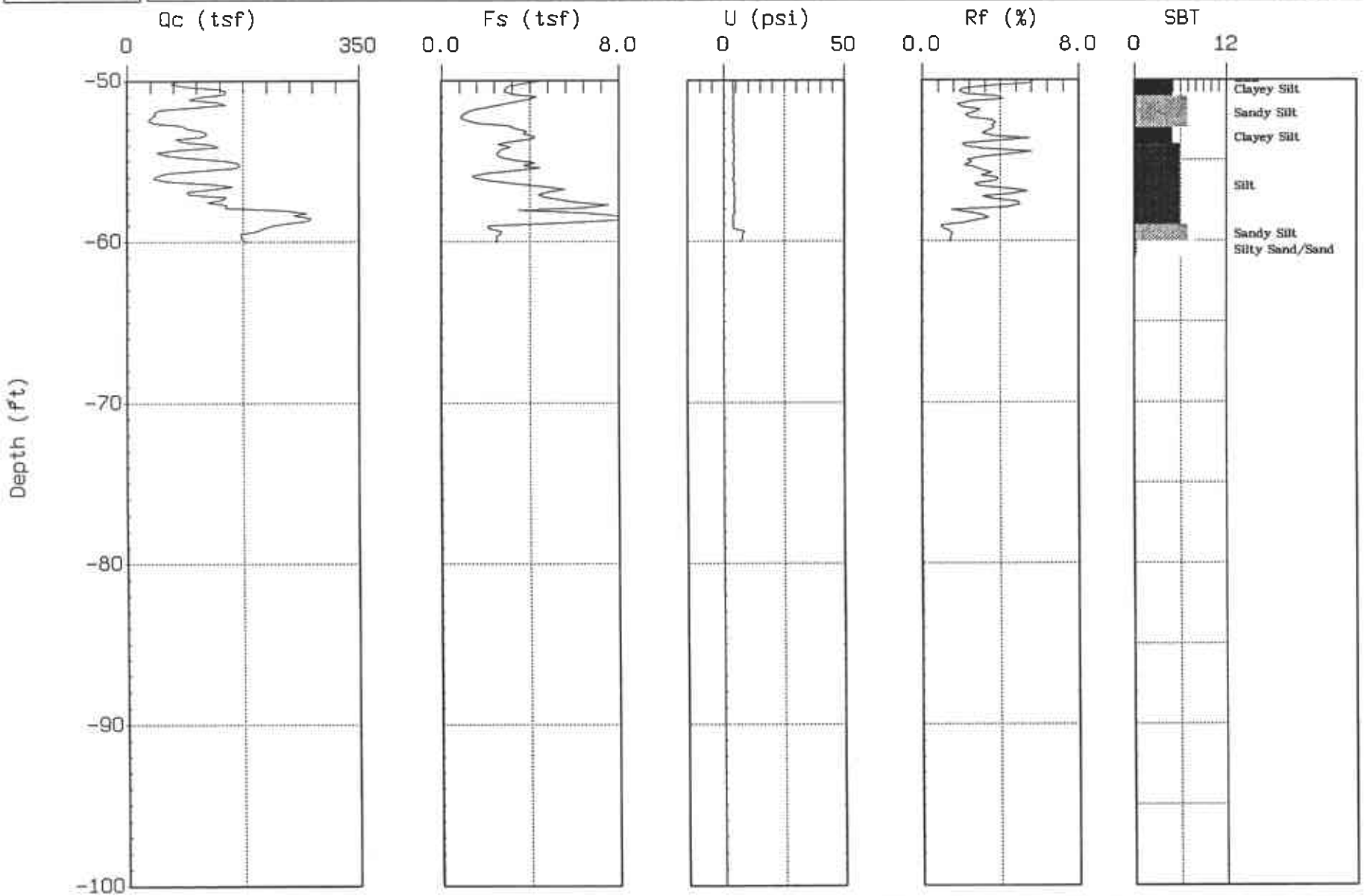
Estimated Phreatic Surface

GREGG

PES ENVIRONMENTAL

Site : FOOT HILL SQ.
Location : HP-8

Engineer: J. DOUGLAS
Date : 01:15:97 14:18



Max. Depth: 60.04 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

PES ENVIRONMENTAL

Contractor: GREGG
Location: HP-8
Project: FOOT HILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 01:15:97 14:18
Geologist: J. DOUGLAS
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	16.68	0.25	1.53	0.03	sandy silt to clayey silt	UNDFND	UNDFD	6	1.2
2	13.53	0.15	1.11	0.09	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
3	12.83	0.09	0.68	0.15	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
4	8.16	0.01	0.14	0.22	sensitive fine grained	UNDFND	UNDFD	4	.6
5	11.11	0.42	3.78	0.28	clay	UNDFND	UNDFD	11	.8
6	20.93	1.07	5.13	0.33	clay	UNDFND	UNDFD	20	1.5
7	16.11	0.72	4.50	0.39	clay	UNDFND	UNDFD	15	1.2
8	17.33	0.73	4.22	0.45	clay	UNDFND	UNDFD	17	1.2
9	22.90	0.28	1.24	0.51	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
10	11.17	0.12	1.09	0.57	sandy silt to clayey silt	UNDFND	UNDFD	4	.8
11	11.47	0.16	1.42	0.63	clayey silt to silty clay	UNDFND	UNDFD	5	.8
12	15.47	0.32	2.06	0.69	clayey silt to silty clay	UNDFND	UNDFD	7	1.1
13	25.87	0.67	2.59	0.75	sandy silt to clayey silt	UNDFND	UNDFD	10	1.9
14	15.93	0.33	2.06	0.81	clayey silt to silty clay	UNDFND	UNDFD	8	1.1
15	22.88	0.40	1.73	0.87	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
16	16.51	0.25	1.53	0.93	sandy silt to clayey silt	UNDFND	UNDFD	6	1.1
17	27.83	0.50	1.79	0.98	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
18	17.89	0.37	2.06	1.02	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
19	14.47	0.22	1.52	1.04	sandy silt to clayey silt	UNDFND	UNDFD	6	1.0
20	17.44	0.30	1.72	1.07	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
21	15.05	0.24	1.62	1.10	sandy silt to clayey silt	UNDFND	UNDFD	6	1.0
22	16.87	0.28	1.68	1.13	sandy silt to clayey silt	UNDFND	UNDFD	6	1.1
23	18.92	0.42	2.21	1.16	clayey silt to silty clay	UNDFND	UNDFD	9	1.3
24	16.35	0.26	1.62	1.19	sandy silt to clayey silt	UNDFND	UNDFD	6	1.1
25	14.47	0.27	1.85	1.22	clayey silt to silty clay	UNDFND	UNDFD	7	.9
26	13.56	0.21	1.57	1.25	sandy silt to clayey silt	UNDFND	UNDFD	5	.9
27	15.26	0.37	2.39	1.28	clayey silt to silty clay	UNDFND	UNDFD	7	1.0
28	15.23	0.26	1.73	1.31	sandy silt to clayey silt	UNDFND	UNDFD	6	1.0
29	17.81	0.28	1.58	1.34	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
30	17.75	0.32	1.82	1.36	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
31	17.33	0.37	2.13	1.39	clayey silt to silty clay	UNDFND	UNDFD	8	1.1
32	18.30	0.39	2.15	1.42	clayey silt to silty clay	UNDFND	UNDFD	9	1.2
33	18.99	0.47	2.47	1.45	clayey silt to silty clay	UNDFND	UNDFD	9	1.3
34	24.84	0.47	1.91	1.48	sandy silt to clayey silt	UNDFND	UNDFD	10	1.7
35	21.22	0.27	1.27	1.51	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
36	128.13	3.46	2.70	1.53	silty sand to sandy silt	60-70	36-38	41	UNDEFINED
37	171.40	5.13	2.99	1.56	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
38	171.96	4.24	2.46	1.59	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
39	154.72	3.95	2.55	1.62	silty sand to sandy silt	70-80	36-38	49	UNDEFINED
40	175.98	4.48	2.55	1.65	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Contractor: GREGG Location: HP-8

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	148.71	3.43	2.31	1.68	silty sand to sandy silt	70-80	36-38	47	UNDEFINED
42	130.78	3.08	2.36	1.71	silty sand to sandy silt	60-70	36-38	42	UNDEFINED
43	29.87	0.67	2.26	1.74	sandy silt to clayey silt	UNDFND	UNDFD	11	2.1
44	29.57	0.56	1.89	1.77	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
45	29.78	0.50	1.67	1.80	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
46	27.54	0.45	1.65	1.83	sandy silt to clayey silt	UNDFND	UNDFD	11	1.9
47	26.95	0.43	1.58	1.86	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
48	56.36	1.36	2.41	1.88	sandy silt to clayey silt	UNDFND	UNDFD	22	4.1
49	133.84	3.45	2.58	1.91	silty sand to sandy silt	60-70	34-36	43	UNDEFINED
50	79.38	2.95	3.72	1.94	clayey silt to silty clay	UNDFND	UNDFD	38	5.8
51	116.26	3.30	2.84	1.97	sandy silt to clayey silt	UNDFND	UNDFD	45	8.7
52	93.53	2.39	2.56	2.00	silty sand to sandy silt	50-60	32-34	30	UNDEFINED
53	54.43	1.81	3.33	2.03	sandy silt to clayey silt	UNDFND	UNDFD	21	3.9
54	105.83	3.57	3.37	2.05	sandy silt to clayey silt	UNDFND	UNDFD	41	7.8
55	92.71	2.81	3.03	2.08	sandy silt to clayey silt	UNDFND	UNDFD	36	6.8
56	117.84	3.17	2.69	2.11	silty sand to sandy silt	60-70	34-36	38	UNDEFINED
57	101.39	3.73	3.68	2.14	sandy silt to clayey silt	UNDFND	UNDFD	39	7.5
58	134.54	5.70	4.24	2.17	very stiff fine grained (*)	UNDFND	UNDFD	>50	UNDEFINED
59	257.83	6.61	2.56	2.20	silty sand to sandy silt	80-90	38-40	>50	UNDEFINED
60	188.92	2.43	1.29	2.22	sand to silty sand	70-80	36-38	45	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

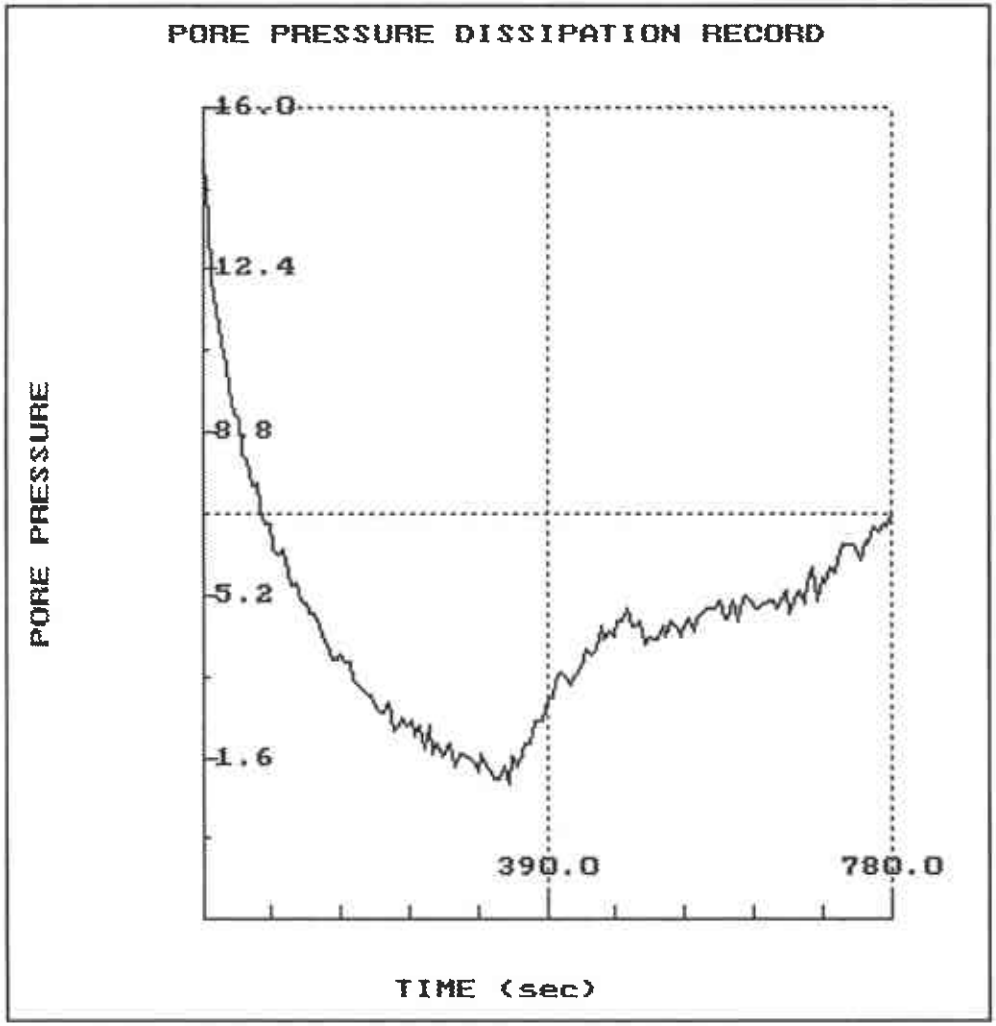
(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Site:FOOT HILL SQ.
Location:HP-8

Geologist:J. DOUGLAS
Date:01:15:97 14:18



File: 061-C08.PPD
Depth (m): 11.35
Duration : 785.0s
U-0 : -8.65
U-min: 1.00 345.0s
U-max: 15.50 785.0s
U-50 : 3.43 0.0s
ch : 0.000 cm^2/min
%Ut: 0.00

Plot u-min: -2.00
u-max:16.00
t-min: 0.00
t-max:780.0
Rigidity Ir:100.0
Water table: 20.00

Depth Down

Depth Up

t axis type

Print

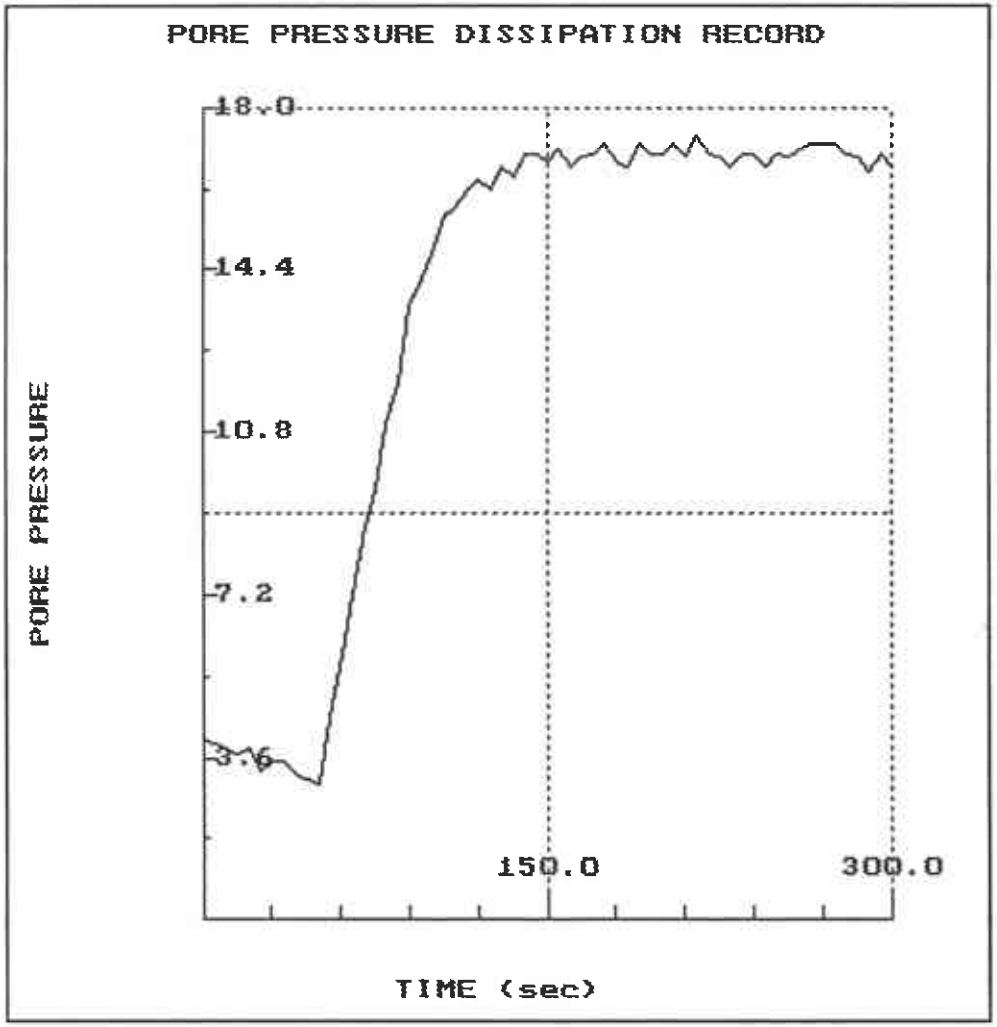
Save

Exit

PES ENVIRONMENTAL

Site:FOOT HILL SQ.
Location:HP-8

Geologist:J. DOUGLAS
Date:01:15:97 14:18



File: 061-C08.PPD
Depth (m): 18.05
Duration : 305.0s
U-0 : -1.95
U-min: 3.00 50.0s
U-max: 17.70 305.0s
U-50 : 7.88 0.0s
ch : 0.000 cm^2/min
%Ut: 0.00

Plot u-min: 0.00
u-max:18.00
t-min: 0.00
t-max:300.0
Rigidity Ir:100.0
Water table: 20.00

Depth Down

Depth Up

t axis type

Print

Save

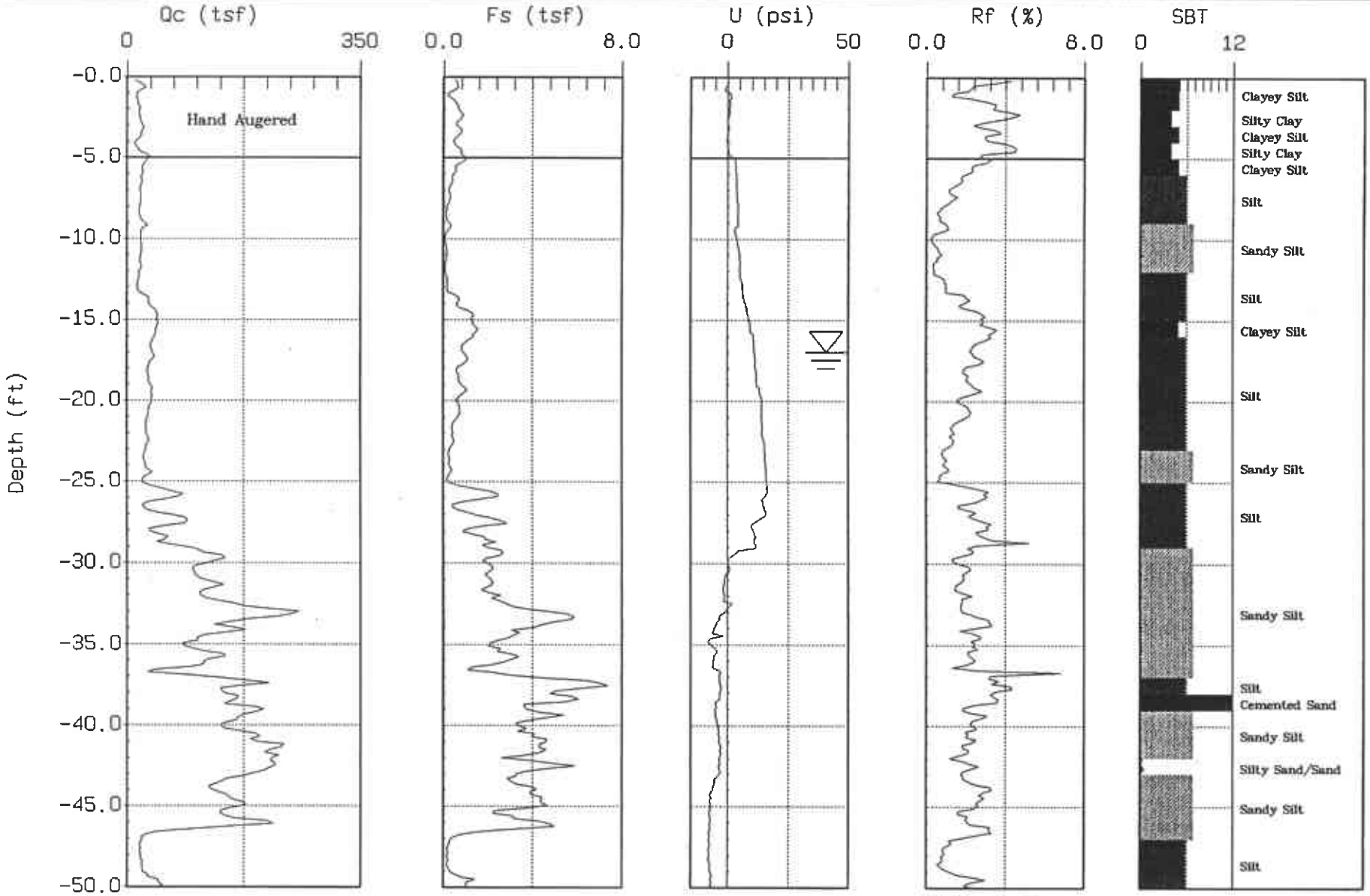
Exit

GREGG

PES ENVIRONMENTAL

Site : FOOT HILL SQ.
Location : HP-9

Engineer: J. DOUGLAS
Date : 01:15:97 10:54



Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

Estimated Phreatic Surface

PES ENVIRONMENTAL

Contractor: GREGG
Location: HP-9
Project: FOOT HILL SQ.
Tot. Unit Wt. (avg) : 120 pcf

Date: 01:15:97 10:54
Geologist: J. DOUGLAS
Water table (feet) : 16.50262

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
1	19.19	0.49	2.54	0.03	clayey silt to silty clay	UNDFND	UNDFD	9	1.4
2	16.38	0.47	2.86	0.09	clayey silt to silty clay	UNDFND	UNDFD	8	1.2
3	20.17	0.70	3.48	0.15	clayey silt to silty clay	UNDFND	UNDFD	10	1.5
4	17.95	0.60	3.37	0.22	silty clay to clay	UNDFND	UNDFD	11	1.3
5	23.19	0.80	3.43	0.28	clayey silt to silty clay	UNDFND	UNDFD	11	1.7
6	23.53	0.56	2.37	0.33	sandy silt to clayey silt	UNDFND	UNDFD	9	1.7
7	20.33	0.30	1.49	0.39	sandy silt to clayey silt	UNDFND	UNDFD	8	1.5
8	19.66	0.23	1.19	0.45	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
9	20.12	0.14	0.70	0.51	sandy silt to clayey silt	UNDFND	UNDFD	8	1.5
10	22.58	0.15	0.68	0.57	silty sand to sandy silt	<40	32-34	7	UNDEFINED
11	20.69	0.11	0.53	0.63	silty sand to sandy silt	<40	30-32	7	UNDEFINED
12	19.56	0.08	0.40	0.69	silty sand to sandy silt	<40	<30	6	UNDEFINED
13	16.62	0.13	0.78	0.75	sandy silt to clayey silt	UNDFND	UNDFD	6	1.2
14	25.37	0.45	1.79	0.81	sandy silt to clayey silt	UNDFND	UNDFD	10	1.8
15	41.57	1.03	2.48	0.87	sandy silt to clayey silt	UNDFND	UNDFD	16	3.1
16	44.03	1.38	3.13	0.93	sandy silt to clayey silt	UNDFND	UNDFD	17	3.3
17	36.72	0.96	2.63	0.98	sandy silt to clayey silt	UNDFND	UNDFD	14	2.7
18	36.45	0.92	2.51	1.02	sandy silt to clayey silt	UNDFND	UNDFD	14	2.7
19	31.39	0.64	2.02	1.04	sandy silt to clayey silt	UNDFND	UNDFD	12	2.3
20	36.72	0.83	2.27	1.07	sandy silt to clayey silt	UNDFND	UNDFD	14	2.7
21	33.13	0.66	2.00	1.10	sandy silt to clayey silt	UNDFND	UNDFD	13	2.4
22	28.28	0.40	1.43	1.13	sandy silt to clayey silt	UNDFND	UNDFD	11	2.0
23	30.32	0.37	1.21	1.16	silty sand to sandy silt	<40	<30	10	UNDEFINED
24	25.60	0.23	0.90	1.19	silty sand to sandy silt	<40	<30	8	UNDEFINED
25	28.22	0.24	0.86	1.22	silty sand to sandy silt	<40	<30	9	UNDEFINED
26	61.59	1.75	2.84	1.25	sandy silt to clayey silt	UNDFND	UNDFD	24	4.6
27	36.64	0.79	2.17	1.28	sandy silt to clayey silt	UNDFND	UNDFD	14	2.6
28	64.72	1.85	2.86	1.31	sandy silt to clayey silt	UNDFND	UNDFD	25	4.8
29	62.17	1.83	2.95	1.34	sandy silt to clayey silt	UNDFND	UNDFD	24	4.6
30	127.11	2.23	1.76	1.36	silty sand to sandy silt	60-70	36-38	41	UNDEFINED
31	103.48	2.06	1.99	1.39	silty sand to sandy silt	60-70	36-38	33	UNDEFINED
32	122.97	2.09	1.70	1.42	sand to silty sand	60-70	36-38	29	UNDEFINED
33	175.85	3.14	1.78	1.45	sand to silty sand	70-80	38-40	42	UNDEFINED
34	183.38	5.09	2.78	1.48	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
35	122.85	2.82	2.30	1.51	silty sand to sandy silt	60-70	36-38	39	UNDEFINED
36	118.75	2.73	2.30	1.53	silty sand to sandy silt	60-70	36-38	38	UNDEFINED
37	81.72	2.06	2.52	1.56	sandy silt to clayey silt	UNDFND	UNDFD	31	6.1
38	163.94	6.05	3.69	1.59	sand to clayey sand (*)	UNDFND	UNDFD	>50	UNDEFINED
39	162.33	4.87	3.00	1.62	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
40	174.41	4.19	2.40	1.65	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

(*) overconsolidated or cemented

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Contractor: GREGG Location: HP-9

DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
41	171.66	3.84	2.24	1.68	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
42	218.62	4.03	1.84	1.71	sand to silty sand	80-90	38-40	>50	UNDEFINED
43	210.26	4.40	2.09	1.74	sand to silty sand	80-90	38-40	>50	UNDEFINED
44	141.00	3.42	2.42	1.77	silty sand to sandy silt	60-70	36-38	45	UNDEFINED
45	157.47	4.17	2.65	1.80	silty sand to sandy silt	70-80	36-38	>50	UNDEFINED
46	169.76	3.30	1.95	1.83	sand to silty sand	70-80	36-38	41	UNDEFINED
47	60.66	1.78	2.94	1.86	sandy silt to clayey silt	UNDFND	UNDFD	23	4.4
48	18.96	0.18	0.92	1.88	sandy silt to clayey silt	UNDFND	UNDFD	7	1.2
49	21.41	0.18	0.83	1.91	sandy silt to clayey silt	UNDFND	UNDFD	8	1.4
50	41.38	0.93	2.25	1.94	sandy silt to clayey silt	UNDFND	UNDFD	16	2.9

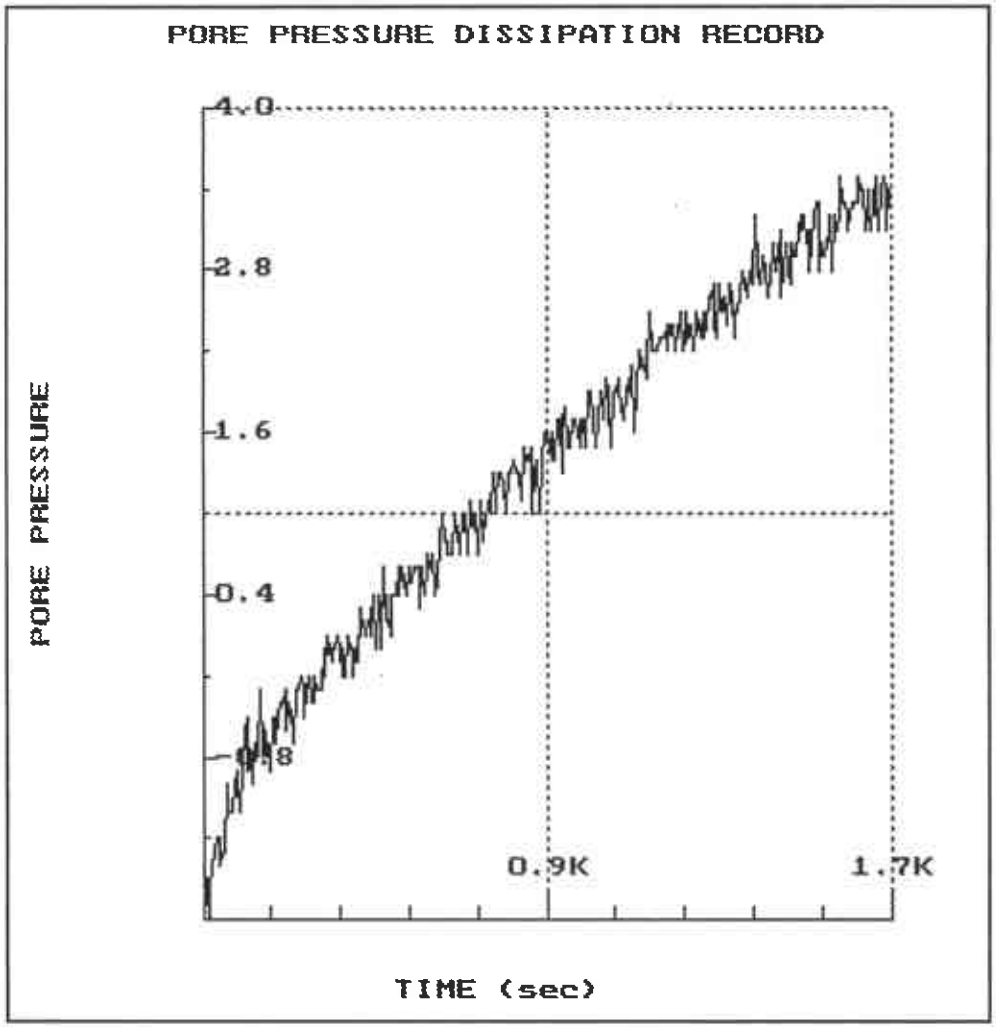
Dr - All sands (Jamiolkowski et al. 1985) PHI - Durgunoglu and Mitchell 1975 Su: Nk= 13

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.02) ****

PES ENVIRONMENTAL

Site:FOOT HILL SQ.
Location:HP-9

Geologist:J. DOUGLAS
Date:01:15:97 10:54



File: 061-C09.PPD
Depth (m): 9.85
Duration : 1695.0s
U-0 : -9.15
U-min: -2.10 10.0s
U-max: 3.50 1680.0s
U-50 : -2.82 0.0s
ch : 0.000 cm^2/min
%Ut: 0.03

Plot u-min: -2.00
u-max: 4.00
t-min: 0.00
t-max:1700.0
Rigidity Ir:100.0
Water table: 19.00

Depth Down

Depth Up

t axis type

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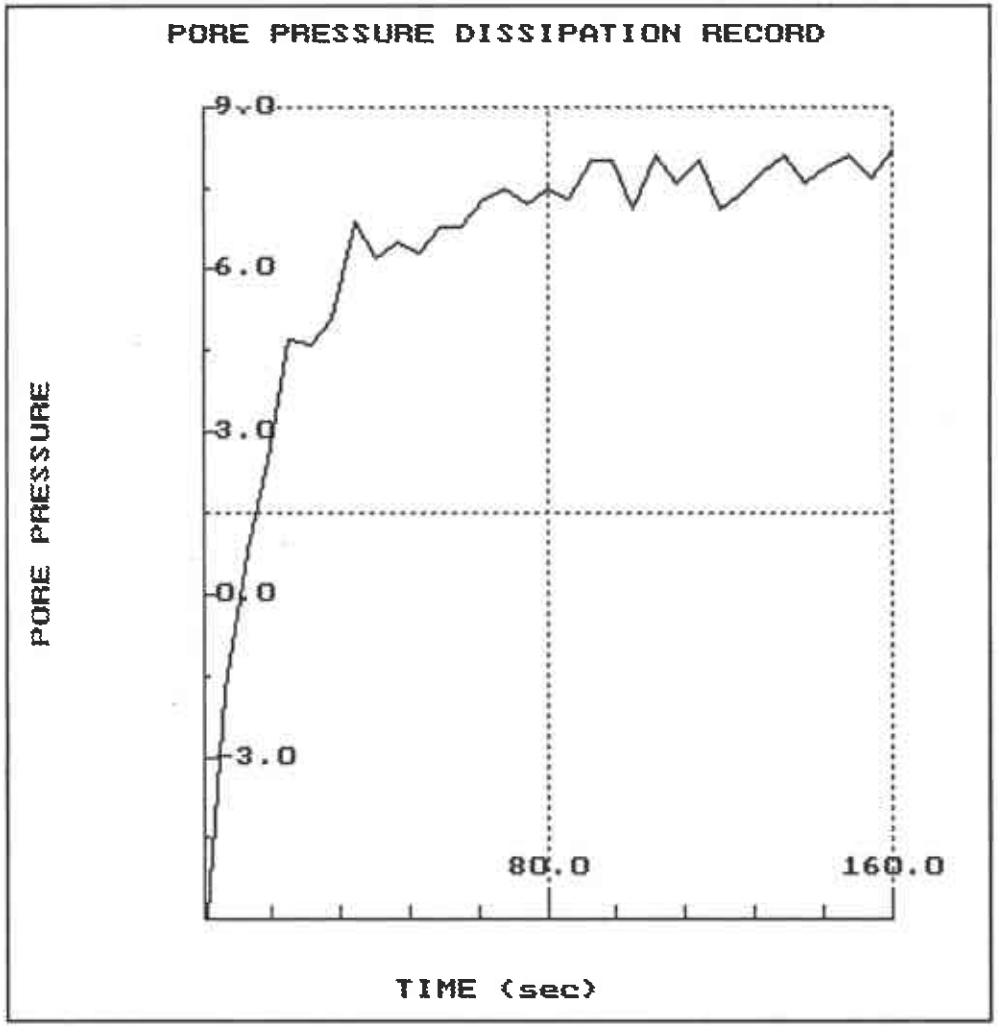
Exit

PES ENVIRONMENTAL

Site:FOOT HILL SQ.
Location:HP-9

Geologist:J. DOUGLAS
Date:01:15:97 10:54



File: 061-c09.ppd
Depth (m): 10.45
Duration : 165.0s
U-0 : 10.45
U-min: -6.70 0.0s
U-max: 8.20 160.0s
U-50 : 9.32 0.0s
ch : 0.000 cm^2/min
%Ut: 0.00

Plot u-min: -6.00
u-max: 9.00
t-min: 0.00
t-max:160.0
Rigidity Ir:100.0
Water table: 0.00

Depth Down

Depth Up

t axis type

Print

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Exit

APPENDIX B

LABORATORY REPORTS
AND
CHAIN-OF-CUSTODY RECORDS

Inchcape Testing Services
Environmental Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9612113
Date Received : 12/11/96
Project ID : 502.0201.003
Purchase Order: N/A

The following samples were received at Inchcape for analysis :

ANAMETRIX ID	CLIENT SAMPLE ID
9612113- 1	96121101
9612113- 2	96121102
9612113- 3	96121103
9612113- 4	96121104

This report is organized in sections according to the specific Inchcape laboratory group which performed the analysis(es) and generated the data.

The results contained within this report relate to only the sample(s) tested. Additionally, these data should be considered in their entirety and Inchcape cannot be responsible for the detachment, separation, or otherwise partial use of this report.

Inchcape is certified by the California Department of Health Services (DHS) to perform environmental testing under Certificate Number 1234.

If you have any further questions or comments on this report, please call your project manager as soon as possible. Thank you for using Inchcape Testing Services.

Khalil

RECEIVED DEC 16 1996

Project Manager

12-12-96

Date

This report consists of 14 pages.

REPORT SUMMARY
INCHCAPE, INC. (408)432-8192

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9612113
Date Received : 12/11/96
Project ID : 502.0201.003
Purchase Order: N/A
Department : GC
Sub-Department: VOA

SAMPLE INFORMATION:

INCHCAPE SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9612113- 1	96121101	WATER	12/11/96	H8021
9612113- 2	96121102	WATER	12/11/96	H8021
9612113- 3	96121103	WATER	12/11/96	H8021
9612113- 4	96121104	WATER	12/11/96	H8021

GC VOA REPORT DESCRIPTION

Organic Analysis Data Sheets (OADS)
OADS forms contain tabulated results for target compounds. The OADS are grouped by method and, within each method, organized sequentially in order of increasing Inchcape Testing Services ID number.

Surrogate Recovery Summary (SRS)
SRS forms contain quality assurance data. An SRS form will be printed for each method, if the method requires surrogate compounds. They will list surrogate percent recoveries for all samples and any method blanks. Any surrogate recovery outside the established limits will be flagged with an "*", and the total number of surrogates outside the limits will be listed in the column labeled 'Total Out."

Matrix Spike Recovery Form (MSR)
MSR forms contain quality assurance data. They summarize percent recovery and relative percent difference information for matrix spikes and matrix spike duplicates. This information is a statement of both accuracy and precision. Any percent recovery or relative percent difference outside established limits will be flagged with an "*", and the total number outside the limits will be listed at the bottom of the page. Not all reports will contain an MSR form.

Qualifiers
Inchcape Testing Services uses several data qualifiers (Q) in its report forms. These qualifiers give additional information on the compounds reported. They should help a data reviewer to verify the integrity of the analytical results. The following is a list of qualifiers and their meanings:

- U - Indicates that the compound was analyzed for, but was not detected at or above the specified reporting limit.
- B - Indicates that the compound was detected in the associated method blank.
- J - Indicates that the compound was detected at an amount below the specified reporting limit. Consequently, the amount should be considered an approximate value. Tentatively identified compounds will always have a "J" qualifier because they are not included in the instrument calibration.
- E - Indicates that the reported amount exceeded the linear range of the instrument calibration.
- D - Indicates that the compound was detected in an analysis performed at a secondary dilution.

Absence of a qualifier indicates that the compound was detected at a concentration at or above the specified reporting limit.

REPORTING CONVENTIONS

- Due to a size limitation in our data processing step, only the first eight (8) characters of your project ID and sample ID will be printed on the report forms. However, the report cover letter and report summary pages display up to twenty (20) characters of your project and sample IDs.
- Amounts reported are gross values, i.e., not corrected for method blank contamination.

REPORT SUMMARY
INCHCAPE, INC. (408)432-8192

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9612113
Date Received : 12/11/96
Project ID : 502.0201.003
Purchase Order: N/A
Department : GC
Sub-Department: VOA

QA/QC SUMMARY :

- All holding times have been met for the analyses reported in this section.

M. Hosseini 12/12/96
Department Supervisor Date

Chemist 12/12/96
Date

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121101
Matrix : WATER
Date Sampled :12/11/96
Date Analyzed :12/12/96
Instrument ID : HP24

Anametrix ID : 9612113-01
Analyst : [illegible]
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121102
Matrix : WATER
Date Sampled :12/11/96
Date Analyzed :12/12/96
Instrument ID : HP24

Anametrix ID : 9612113-02
Analyst :
Supervisor :

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121103
Matrix : WATER
Date Sampled :12/11/96
Date Analyzed :12/12/96
Instrument ID : HP24

Anametrix ID : 9612113-03
Analyst : [signature]
Supervisor : [signature]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.02
Sample ID : VBLKC1
Matrix : WATER
Date Sampled : 0/ 0/ 0
Date Analyzed :12/12/96
Instrument ID : HP24

Anametrix ID : BD1202I1
Analyst : [illegible]
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID	: 502.0201	Anametrix ID	: 9612113-04
Sample ID	: 96121104	Analyst	:
Matrix	: WATER	Supervisor	:
Date Sampled	:12/11/96		
Date Analyzed	:12/12/96	Dilution Factor	: 1.0
Instrument ID	: HP24	Conc. Units	: ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	8.6	
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

SURROGATE RECOVERY SUMMARY -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Matrix : LIQUID

Anametrix ID : 9612113
Analyst : [signature]
Supervisor : [signature]

	SAMPLE ID	SU1	SU2	SU3
1	VBLKC1	84	89	94
2	96121102	87	93	97
3	96121103	87	92	99
4	96121104	91	102	107
5	96121101	89	94	102
6				
7				
8				
9				
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29				
30				

	QC LIMITS
SU1 = Bromochloromethane	(33-141)
SU2 = 1-Chloro-2-fluorobenze	(53-125)
SU3 = 2-Bromochlorobenzene	(60-118)

* Values outside of Anametrix QC limits

EPA METHOD 8021
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	MD1201I1
Batch:	12113	Instrument ID:	HP24
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	12/12/96	Analyst:	
		Supervisor:	

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
1,1-Dichloroethene	20	19.3	97%	64-125
Trichlorotrifluoroethane	20	20.9	105%	65-116
trans-1,2-Dichloroethene	20	21.0	105%	77-113
1,1-Dichloroethane	20	21.3	107%	85-129
cis-1,2-Dichloroethene	20	21.1	106%	78-130
1,1,1-Trichloroethane	20	19.5	98%	83-125
Trichloroethene	20	20.0	100%	76-124
Tetrachloroethene	20	20.6	103%	80-118
Chlorobenzene	20	21.2	106%	81-130
1,3-Dichlorobenzene	20	21.2	106%	82-115
1,4-Dichlorobenzene	20	20.9	105%	85-122
1,2-Dichlorobenzene	20	21.1	106%	86-122

SURROGATE NAME	SPIKE AMT	SURR. REC	% REC	% REC LIMITS
Bromochloromethane	5	5.2	104%	33-141
1-Chloro-2-fluorobenzene	5	4.9	98%	53-125
2-Bromochlorobenzene	5	5.1	102%	60-118

PES ENVIRONMENTAL, Inc.
Engineering & Environmental Services

CHAIN OF CUSTODY RECORD

9612113 (16)

1682 NOVATO BOULEVARD, SUITE 100
NOVATO, CALIFORNIA 94947
(415) 899-1600 FAX (415) 899-1601

JOB NUMBER: 502.0201.003

NAME / LOCATION: Foothill Square

PROJECT MANAGER: Will Mast

SAMPLERS: Jed Douglas

RECORDER:

	DATE				SAMPLE NUMBER / DESIGNATION	SOURCE CODE	MATRIX					# CONTAINERS & PRESERV.						DEPTH IN FEET	COL MTD CD	QA CODE	ANALYSIS REQUESTED						
	YR	MO	DY	TIME			Water	Sedim't	Soil	Oil		Unpres.	H_2SO_4	HNO_3	HCl	Filtered					EPA 601 / 8010	EPA 602 / 8020 (BTEX)	EPA 624 / 8240	EPA 625 / 8270	TPHg by 5030 / 8015 (mod)	TPHd by 3550 / 8015 (mod)
①	96	12	11	1115	961211101		X					3									X					see note below
②	96	12	11	1240	961211102		X					3									X					
③	96	12	11	1500	961211103		X					3									X					
④	96	12	11	1645	961211104		X					3									X					

NOTE

Sample 961211101 has an air bubble in one of the vials, Please do not use this vial unless absolutely necessary.

ASAP TAT need results by 5:00pm or earlier on Thursday 12/12

Please fax results to Will Mast at 415-899-1601

CHAIN OF CUSTODY RECORD

		DATE	TIME
RELINQUISHED BY: (Signature) Jed Douglas	RECEIVED BY: (Signature) Laura Olson	12/11/96	1800
RELINQUISHED BY: (Signature) Laura Olson	RECEIVED BY: (Signature)	12/11/96	1910
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
DISPATCHED BY: (Signature) DATE TIME	RECEIVED FOR LAB BY: (Signature)	12/11/96	1910

METHOD OF SHIPMENT: Courier to ITS

WHITE-Laboratory COPY YELLOW-Project Office Copy PINK-Field or Office Copy

Inchcape Testing Services
Environmental Laboratories

SAMPLE RECEIVING CHECKLIST

Workorder Number: 9612113	*Client Project ID:* 502.0201.003	*Quote Number:*

Cooler			
Shipping documentation present? If YES, enter Carrier and Airbill #:	YES	NO	(N/A)
Custody Seal on the outside of cooler? *Condition*: Intact ☐ Broken ☐	YES	NO	(N/A)
Temperature of sample(s) within range? List temperatures of cooler(s): 4°C Note: If all samples taken within previous 4 hr, circle N/A and place in sample storage area as soon as possible.	(YES) IR #1	NO Temp Blank ____	N/A
Samples			
Chain of custody seal present for each container? *Condition*: Intact ☐ Broken ☐	YES	NO	(N/A)
Samples arrived within holding time?	(YES)	NO	N/A
Samples in proper containers for methods requested? *Condition of containers*: Intact ☑ Broken ☐ If NO, were samples transferred to proper container(s)? Yes ☐ No ☐	(YES)	NO	
VOA containers received with zero headspace er bubbles < 6 mm?	(YES)	NO	N/A
Container labels complete? (ID, date, time, preservative)	(YES)	NO	N/A
Samples properly preserved? If NO, was the preservative added at time of receipt? Yes ☐ No ☐	(YES)	NO	N/A
pH check of samples required at time of receipt?(volatiles checked at analysis) If YES, pH checked and recorded by:	YES	(NO)	
Sufficient amount of sample received for methods requested? If NO, has the client or PM been notified? Yes ☐ No ☐	(YES)	NO	
Field blanks received with sample batch?	YES	NO	(N/A)
Trip blanks received with sample batch?	YES	NO	(N/A)
Chain of Custody			
Chain of custody form received with samples?	(YES)		NO
Has it been filled out completely and in ink?	(YES)		NO
Sample IDs on chain of custody form agree with labels?	(YES)		NO
Number of containers on chain agree with number received?	(YES)		NO
Analysis methods specified?	(YES)		NO
Sampling date and time indicated?	(YES)		NO
Proper signatures of sampler, courier and custodian in appropriate spaces? With time and date? Yes ☑ No ☐	(YES)		NO
Turnaround time? Standard ☐ Rush ☑			

Any NO responses and/or any BROKEN that was checked must be detailed in a Corrective Action Form.

Sample Custodian: SP Date: 12-11-96 Project Manager: SP Date: 12/12/96

Inchcape Testing Services
Environmental Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

INCIDENT REPORT

Sample Receiving

Sample Custodian: Jose Perez Date: 12-11-96

Workorder Number: 9612113 Proj. ID/SDG: 502.0201.003

SAMPLE

___ Containers with headspace
___ Containers without labels
___ Improper containers
___ Containers broken
___ Not properly preserved
___ Transferred upon receipt
___ Cooler temperature outside of range: _____
___ Arrived outside of hold time for _____
METHOD (S)
___ Other (please specify): _____

CHAIN OF CUSTODY

___ Not received
___ Illegible
___ Containers do not match
___ Incomplete _____
___ NO CORRECTIVE ACTION REQUIRED

Affected Samples (s): _____

Corrective Action: _____

Supervisor Verification: _____ Date: 12-11-96

Project Manager Verification: _____ Date: 12/12/96

Inchcape Testing Services
Environmental Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

RECEIVED DEC 20 1996

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9612160
Date Received : 12/17/96
Project ID : 502.0201.003
Purchase Order: N/A

The following samples were received at Inchcape for analysis :

ANAMETRIX ID	CLIENT SAMPLE ID
9612160- 1	96121603
9612160- 2	96121604
9612160- 3	96121605
9612160- 4	96121601
9612160- 5	96121602

This report is organized in sections according to the specific Inchcape laboratory group which performed the analysis(es) and generated the data.

The results contained within this report relate to only the sample(s) tested. Additionally, these data should be considered in their entirety and Inchcape cannot be responsible for the detachment, separation, or otherwise partial use of this report.

Inchcape is certified by the California Department of Health Services (DHS) to perform environmental testing under Certificate Number 1234.

If you have any further questions or comments on this report, please call your project manager as soon as possible. Thank you for using Inchcape Testing Services.

Sparlil
Project Manager

12-18-96
Date

This report consists of 19 pages.

REPORT SUMMARY
INCHCAPE, INC. (408)432-8192

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9612160
Date Received : 12/17/96
Project ID : 502.0201.003
Purchase Order: N/A
Department : GC
Sub-Department: VOA

SAMPLE INFORMATION:

INCHCAPE SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9612160- 1	96121603	WATER	12/16/96	H8021
9612160- 2	96121604	WATER	12/16/96	H8021
9612160- 3	96121605	WATER	12/16/96	H8021
9612160- 4	96121601	WATER	12/16/96	H8021
9612160- 5	96121602	WATER	12/16/96	H8021

GC VOA REPORT DESCRIPTION

Organic Analysis Data Sheets (OADS)
OADS forms contain tabulated results for target compounds. The OADS are grouped by method and, within each method, organized sequentially in order of increasing Inchcape Testing Services ID number.

Surrogate Recovery Summary (SRS)
SRS forms contain quality assurance data. An SRS form will be printed for each method, if the method requires surrogate compounds. They will list surrogate percent recoveries for all samples and any method blanks. Any surrogate recovery outside the established limits will be flagged with an "*", and the total number of surrogates outside the limits will be listed in the column labeled 'Total Out."

Matrix Spike Recovery Form (MSR)
MSR forms contain quality assurance data. They summarize percent recovery and relative percent difference information for matrix spikes and matrix spike duplicates. This information is a statement of both accuracy and precision. Any percent recovery or relative percent difference outside established limits will be flagged with an "*", and the total number outside the limits will be listed at the bottom of the page. Not all reports will contain an MSR form.

Qualifiers
Inchcape Testing Services uses several data qualifiers (Q) in its report forms. These qualifiers give additional information on the compounds reported. They should help a data reviewer to verify the integrity of the analytical results. The following is a list of qualifiers and their meanings:

- **U** - Indicates that the compound was analyzed for, but was not detected at or above the specified reporting limit.
- **B** - Indicates that the compound was detected in the associated method blank.
- **J** - Indicates that the compound was detected at an amount below the specified reporting limit. Consequently, the amount should be considered an approximate value. Tentatively identified compounds will always have a "J" qualifier because they are not included in the instrument calibration.
- **E** - Indicates that the reported amount exceeded the linear range of the instrument calibration.
- **D** - Indicates that the compound was detected in an analysis performed at a secondary dilution.

Absence of a qualifier indicates that the compound was detected at a concentration at or above the specified reporting limit.

REPORTING CONVENTIONS

- Due to a size limitation in our data processing step, only the first eight (8) characters of your project ID and sample ID will be printed on the report forms. However, the report cover letter and report summary pages display up to twenty (20) characters of your project and sample IDs.
- Amounts reported are gross values, i.e., not corrected for method blank contamination.

REPORT SUMMARY
INCHCAPE, INC. (408)432-8192

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9612160
Date Received : 12/17/96
Project ID : 502.0201.003
Purchase Order: N/A
Department : GC
Sub-Department: VOA

QA/QC SUMMARY :

- All holding times have been met for the analyses reported in this section.
- The recovery for Bromomethane is outside of acceptance criteria in the closing bracketing standard associated with these samples. This compound is not detected in any of the samples for this project. The recovery for all compounds is within limits in the associated LCS.
- The difference between responses from Rtx-502.2 and Rtx-1 columns is greater than 25% for Trichloroethene in sample 96121601. The lower value from Rtx-502.2 has been repored.
- The concentration for Tetrachloroethene in sample 96121605 is above the instrument linear range by less than 1%. After rounding, the concentration reported is at the upper range of the instrument calibration.

M. Hosseini 12/18/96
Department Supervisor Date

12/18/96
Chemist Date

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID	: 502.0201	Anametrix ID	: 9612160-01
Sample ID	: 96121603	Analyst	:
Matrix	: WATER	Supervisor	:
Date Sampled	:12/16/96		
Date Analyzed	:12/17/96	Dilution Factor	: 1.0
Instrument ID	: HP24	Conc. Units	: ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	.79	
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121604
Matrix : WATER
Date Sampled :12/16/96
Date Analyzed :12/17/96
Instrument ID : HP24

Anametrix ID : 9612160-02
Analyst : CP
Supervisor : DL

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121605
Matrix : WATER
Date Sampled :12/16/96
Date Analyzed :12/17/96
Instrument ID : HP24

Anametrix ID : 9612160-03
Analyst : [illegible]
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	40.	E
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121601
Matrix : WATER
Date Sampled :12/16/96
Date Analyzed :12/17/96
Instrument ID : AD15

Anametrix ID : 9612160-04
Analyst : TS
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	.52	
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	1.3	
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	21.	
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121602
Matrix : WATER
Date Sampled :12/16/96
Date Analyzed :12/17/96
Instrument ID : HP24

Anametrix ID : 6612160-05
Analyst : TB
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	.65	
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.02
Sample ID : VBLKC1
Matrix : WATER
Date Sampled : 0/ 0/ 0
Date Analyzed :12/17/96
Instrument ID : HP24

Anametrix ID : BD1702I1
Analyst : ZB
Supervisor : NL

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.02
Sample ID : VBLKA1
Matrix : WATER
Date Sampled : 0/ 0/ 0
Date Analyzed :12/17/96
Instrument ID : AD15

Anametrix ID : BD1702I1
Analyst : [illegible]
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

SURROGATE RECOVERY SUMMARY -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Matrix : LIQUID

Anametrix ID : 9612160
Analyst : [signature]
Supervisor : [signature]

	SAMPLE ID	SU1	SU2	SU3
1	VBLKC1	82	95	96
2	96121603	88	100	103
3	96121604	89	99	104
4	96121605	91	102	105
5	96121602	89	99	98
6	96121MS	94	106	106
7	96121MSD	93	101	105
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

	QC LIMITS
SU1 = Bromochloromethane	(33-141)
SU2 = 1-Chloro-2-fluorobenze	(53-125)
SU3 = 2-Bromochlorobenzene	(60-118)

* Values outside of Anametrix QC limits

SURROGATE RECOVERY SUMMARY -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Matrix : LIQUID

Anametrix ID : 9612160
Analyst : ZB
Supervisor : JL

	SAMPLE ID	SU1	SU2	SU3
1	VBLKA1	110	107	114
2	96121601	113	107	115
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

	QC LIMITS
SU1 = Bromochloromethane	(33-141)
SU2 = 1-Chloro-2-fluorobenze	(53-125)
SU3 = 2-Bromochlorobenzene	(60-118)

* Values outside of Anametrix QC limits

MATRIX SPIKE RECOVERY FORM -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502.0201
Sample ID : 96121603
Matrix : WATER
Date Sampled :12/16/96
Date Analyzed :12/17/96
Instrument ID : HP24

Anametrix ID : 9612160-01
Analyst : JB
Supervisor : DL

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC	%REC LIMITS
Trichlorotrifluoroethan	10.0	.0	8.4	84	42-111
1,1-Dichloroethene	10.0	.0	9.1	91	47-128
trans-1,2-Dichloroethen	10.0	.0	10.1	101	63-110
1,1-Dichloroethane	10.0	.0	10.2	102	72-128
cis-1,2-Dichloroethene	10.0	.0	9.9	99	62-126
1,1,1-Trichloroethane	10.0	.0	9.4	94	65-128
Trichloroethene	10.0	.8	10.1	93	64-115
Tetrachloroethene	10.0	.0	10.0	100	64-111
Chlorobenzene	10.0	.0	10.1	101	75-124
1,3-Dichlorobenzene	10.0	.0	10.0	100	68-119
1,4-Dichlorobenzene	10.0	.0	10.0	100	72-125
1,2-Dichlorobenzene	10.0	.0	10.3	103	70-131

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC	% RPD	RPD LIMITS	%REC LIMITS
Trichlorotrifluoroethan	10.0	8.8	88	5	16	42-111
1,1-Dichloroethene	10.0	9.4	94	3	14	47-128
trans-1,2-Dichloroethen	10.0	10.2	102	1	12	63-110
1,1-Dichloroethane	10.0	10.4	104	2	12	72-128
cis-1,2-Dichloroethene	10.0	10.0	100	0	17	62-126
1,1,1-Trichloroethane	10.0	9.5	95	1	25	65-128
Trichloroethene	10.0	10.2	94	1	24	64-115
Tetrachloroethene	10.0	9.9	99	1	12	64-111
Chlorobenzene	10.0	10.1	101	0	10	75-124
1,3-Dichlorobenzene	10.0	10.2	102	1	9	68-119
1,4-Dichlorobenzene	10.0	10.2	102	2	9	72-125
1,2-Dichlorobenzene	10.0	10.5	105	2	9	70-131

* Value is outside of Anametrix QC limits

RPD: 0 out of 12 outside limits
Spike Recovery: 0 out of 24 outside limits

EPA METHOD 8021
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	MD01701I1
Batch:	12160	Instrument ID:	HP24
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	12/17/96	Analyst:	
		Supervisor:	

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
1,1-Dichloroethene	10	19.2	192%	64-125
Trichlorotrifluoroethane	10	18.9	189%	65-116
trans-1,2-Dichloroethene	10	20.2	202%	77-113
1,1-Dichloroethane	10	20.0	200%	85-129
cis-1,2-Dichloroethene	10	20.1	201%	78-130
1,1,1-Trichloroethane	10	18.7	187%	83-125
Trichloroethene	10	19.9	199%	76-124
Tetrachloroethene	10	19.9	199%	80-118
Chlorobenzene	10	19.1	191%	81-130
1,3-Dichlorobenzene	10	20.4	204%	82-115
1,4-Dichlorobenzene	10	19.6	196%	85-122
1,2-Dichlorobenzene	10	19.8	198%	86-122

SURROGATE NAME	SPIKE AMT	SURR. REC	% REC	% REC LIMITS
Bromochloromethane	5	5.2	104%	33-141
1-Chloro-2-fluorobenzene	5	5.1	102%	53-125
2-Bromochlorobenzene	5	4.9	98%	60-118

EPA METHOD 8010
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	MD1701I1
Batch:	12160	Instrument ID:	AD15
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	12/17/96	Analyst:	ZS
		Supervisor:	

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
1,1-Dichloroethene	20	19.7	99%	64-125
Trichlorotrifluoroethane	20	20.7	104%	65-116
trans-1,2-Dichloroethene	20	21.0	105%	77-113
1,1-Dichloroethane	20	21.4	107%	85-129
cis-1,2-Dichloroethene	20	21.7	109%	78-130
1,1,1-Trichloroethane	20	20.9	105%	83-125
Trichloroethene	20	21.2	106%	76-124
Tetrachloroethene	20	22.0	110%	80-118
Chlorobenzene	20	22.1	111%	81-130
1,3-Dichlorobenzene	20	22.0	110%	82-115
1,4-Dichlorobenzene	20	22.0	110%	85-122
1,2-Dichlorobenzene	20	22.6	113%	86-122

SURROGATE NAME	SPIKE AMT	SURR. REC	% REC	% REC LIMITS
Bromochloromethane	16	18.1	113%	33-141
1-Chloro-2-fluorobenzene	16	17.7	111%	53-125
2-Bromochlorobenzene	16	18.8	118%	60-118

EPA METHOD 8010
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	ND1701I1
Batch:	12160	Instrument ID:	AD15
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	12/17/96	Analyst:	
		Supervisor:	

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
1,1-Dichloroethene	20	20.7	104%	64-125
trans-1,2-Dichloroethene	20	21.9	110%	77-113
1,1-Dichloroethane	20	22.4	112%	85-129
cis-1,2-Dichloroethene	20	22.4	112%	78-130
1,1,1-Trichloroethane	20	21.0	105%	83-125
Trichloroethene	20	21.8	109%	76-124
Tetrachloroethene	20	21.8	109%	80-118
Chlorobenzene	20	22.1	111%	81-130
1,3-Dichlorobenzene	20	21.6	108%	82-115
1,4-Dichlorobenzene	20	21.7	109%	85-122
1,2-Dichlorobenzene	20	22.4	112%	86-122

SURROGATE NAME	SPIKE AMT	SURR. REC	% REC	% REC LIMITS
Bromochloromethane	16	17.2	108%	33-141
1-Chloro-2-fluorobenzene	16	16.0	100%	53-125
2-Bromochlorobenzene	16	17.4	109%	60-118

PES Environmental, Inc.
Engineering & Environmental Services

CHAIN OF CUSTODY RECORD

9612160 (16)

1682 NOVATO BOULEVARD, SUITE 100
NOVATO, CALIFORNIA 94947
(415) 899-1600 FAX (415) 899-1601

JOB NUMBER: 502.0201.003

NAME/LOCATION: Foothill Square

PROJECT MANAGER: Will Mast

SAMPLERS: Jed Douglas

RECORDER: _____ (Signature Required)

	DATE YR	MO	DY	TIME	SAMPLE NUMBER/ DESIGNATION	SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	# CONTAINERS & PRESERV: Unpres.	H_2SO_4	HNO_3	HCl	Filtered	DEPTH IN FEET	COL MTD CD	QA CODE
(4)	96	12	16	0740	961216 01		X				W					42-45		
(5)	96	12	16	1015	961216 02		X				W					13-16		
(1)	96	12	16	1115	961216 03		X				W					46-49		
(2)	96	12	16	1350	961216 04		X				W					41-44		
(3)	96	12	16	1700	961216 05		X				W					57-60		

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020 (BTEX)	EPA 624/8240	EPA 625/8270	TPHg by 5030/8015 (mod)	TPHd by 3550/8015 (mod)	
X						
X						NOTE:
X						
X						
X						

NOTES

ASAP Turnaround Time, need results by end of business on Tuesday, 12/17 or sooner.

Please fax results to Will Mast @ 415-899-1601

NOTE: May contain Petroleum hydrocarbons
Need low detection limit for PCE
① Analyze by priority Numbers please

CHAIN OF CUSTODY RECORD

		DATE	TIME
RELINQUISHED BY: (Signature) William Mast	RECEIVED BY: (Signature) Laura Olson	12/17/96	0950
RELINQUISHED BY: (Signature) Laura Olson	RECEIVED BY: (Signature)	12/17/96	1130
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
DISPATCHED BY: (Signature)	DATE / TIME	RECEIVED FOR LAB BY: (Signature)	DATE 12/17/96 TIME 1130

METHOD OF SHIPMENT: Courier to ITS

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

Inchcape Testing Services
Environmental Laboratories

SAMPLE RECEIVING CHECKLIST

Workorder Number: 9612160	*Client Project ID:* 502.0261.003	*Quote Number:*

Cooler			
Shipping documentation present? If YES, enter Carrier and Airbill #:	(YES)	NO	(N/A)
Custody Seal on the outside of cooler? *Condition*: Intact ☐ Broken ☐	YES	NO	(N/A)
Temperature of sample(s) within range? List temperatures of cooler(s): 1° Note: If all samples taken within previous 4 hr, circle N/A and place in sample storage area as soon as possible.	(YES) IR -1	NO Temp Blank	N/A _____
Samples			
Chain of custody seal present for each container? *Condition*: Intact ☐ Broken ☐	YES	NO	(N/A)
Samples arrived within holding time?	(YES)	NO	N/A
Samples in proper containers for methods requested? *Condition of containers*: Intact ☐ Broken ☒ If NO, were samples transferred to proper container(s)? Yes ☐ No ☐	(YES)	NO	
VOA containers received with zero headspace or bubbles < 6 mm?	(YES)	NO	N/A
Container labels complete? (ID, date, time, preservative)	(YES)	NO	N/A
Samples properly preserved? If NO, was the preservative added at time of receipt? Yes ☐ No ☐	YES	NO	(N/A)
pH check of samples required at time of receipt?(volatiles checked at analysis) If YES, pH checked and recorded by:	YES	(NO)	
Sufficient amount of sample received for methods requested? If NO, has the client or PM been notified? Yes ☐ No ☐	(YES)	NO	
Field blanks received with sample batch?	YES	NO	(N/A)
Trip blanks received with sample batch?	YES	NO	(N/A)
Chain of Custody			
Chain of custody form received with samples?	(YES)		NO
Has it been filled out completely and in ink?	(YES)		NO
Sample IDs on chain of custody form agree with labels?	(YES)		NO
Number of containers on chain agree with number received?	(YES)		NO
Analysis methods specified?	(YES)		NO
Sampling date and time indicated?	(YES)		NO
Proper signatures of sampler, courier and custodian in appropriate spaces? With time and date? Yes ☒ No ☐	(YES)		NO
Turnaround time? Standard ☐ Rush ☒			

Any NO responses and/or any BROKEN that was checked must be detailed in a Corrective Action Form.

Sample Custodian: _____ Date: 12/17/96 Project Manager: _____ Date: 12/17/96

f:\forms\newscr2.doc

Inchcape Testing Services
Environmental Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

INCIDENT REPORT

Sample Receiving

Sample Custodian: tng Date: 12/17/96

Workorder Number: 9612160 Proj. ID/SDG: 502.0201.003

SAMPLE

___ Containers with headspace
___ Containers without labels
___ Improper containers
(1) X Containers broken
___ Not properly preserved
___ Transferred upon receipt
___ Cooler temperature outside of range: _____
___ Arrived outside of hold time for _____ METHOD (S)

CHAIN OF CUSTODY

___ Not received
___ Illegible
___ Containers do not match
___ Incomplete _____

___ NO CORRECTIVE ACTION REQUIRED

___ Other (please specify): _____

Affected Samples (s): (1) 9612160 5 (#3) 1x VOA REC'D BROKEN (SAMPLE WAS FROZEN).

Corrective Action: _____

Supervisor Verification: tng Date: 12/17/96

Project Manager Verification: [signature] Date: 12-17-96

Inchcape Testing Services
Environmental Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9701091
Date Received : 01/15/97
Project ID : 502-0201-003
Purchase Order: N/A

The following samples were received at Inchcape for analysis :

ANAMETRIX ID	CLIENT SAMPLE ID
9701091- 1	97011501
9701091- 2	97011502
9701091- 3	97011503
9701091- 4	97011504
9701091- 5	97011505

This report is organized in sections according to the specific Inchcape laboratory group which performed the analysis(es) and generated the data.

The results contained within this report relate to only the sample(s) tested. Additionally, these data should be considered in their entirety and Inchcape cannot be responsible for the detachment, separation, or otherwise partial use of this report.

Inchcape is certified by the California Department of Health Services (DHS) to perform environmental testing under Certificate Number 1234.

If you have any further questions or comments on this report, please call your project manager as soon as possible. Thank you for using Inchcape Testing Services.

Project Manager

1/24/97
Date

This report consists of 15 pages.

GC VOA REPORT DESCRIPTION

Organic Analysis Data Sheets (OADS)
OADS forms contain tabulated results for target compounds. The OADS are grouped by method and, within each method, organized sequentially in order of increasing Inchcape Testing Services ID number.

Surrogate Recovery Summary (SRS)
SRS forms contain quality assurance data. An SRS form will be printed for each method, if the method requires surrogate compounds. They will list surrogate percent recoveries for all samples and any method blanks. Any surrogate recovery outside the established limits will be flagged with an "*", and the total number of surrogates outside the limits will be listed in the column labeled 'Total Out."

Matrix Spike Recovery Form (MSR)
MSR forms contain quality assurance data. They summarize percent recovery and relative percent difference information for matrix spikes and matrix spike duplicates. This information is a statement of both accuracy and precision. Any percent recovery or relative percent difference outside established limits will be flagged with an "*", and the total number outside the limits will be listed at the bottom of the page. Not all reports will contain an MSR form.

Qualifiers
Inchcape Testing Services uses several data qualifiers (Q) in its report forms. These qualifiers give additional information on the compounds reported. They should help a data reviewer to verify the integrity of the analytical results. The following is a list of qualifiers and their meanings:

- **U** - Indicates that the compound was analyzed for, but was not detected at or above the specified reporting limit.
- **B** - Indicates that the compound was detected in the associated method blank.
- **J** - Indicates that the compound was detected at an amount below the specified reporting limit. Consequently, the amount should be considered an approximate value. Tentatively identified compounds will always have a "J" qualifier because they are not included in the instrument calibration.
- **E** - Indicates that the reported amount exceeded the linear range of the instrument calibration.
- **D** - Indicates that the compound was detected in an analysis performed at a secondary dilution.

Absence of a qualifier indicates that the compound was detected at a concentration at or above the specified reporting limit.

REPORTING CONVENTIONS

- Due to a size limitation in our data processing step, only the first eight (8) characters of your project ID and sample ID will be printed on the report forms. However, the report cover letter and report summary pages display up to twenty (20) characters of your project and sample IDs.
- Amounts reported are gross values, i.e., not corrected for method blank contamination.

REPORT SUMMARY
INCHCAPE, INC. (408)432-8192

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9701091
Date Received : 01/15/97
Project ID : 502-0201-003
Purchase Order: N/A
Department : GC
Sub-Department: VOA

SAMPLE INFORMATION:

INCHCAPE SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9701091- 1	97011501	WATER	01/15/97	H8021
9701091- 2	97011502	WATER	01/15/97	H8021
9701091- 3	97011503	WATER	01/15/97	H8021
9701091- 4	97011504	WATER	01/15/97	H8021
9701091- 5	97011505	WATER	01/15/97	H8021

REPORT SUMMARY
INCHCAPE, INC. (408)432-8192

MR. WILL MAST
PES ENVIRONMENTAL
1682 NOVATO BOULEVARD, SUITE #100
NOVATO, CA 94947

Workorder # : 9701091
Date Received : 01/15/97
Project ID : 502-0201-003
Purchase Order: N/A
Department : GC
Sub-Department: VOA

QA/QC SUMMARY :

- All holding times have been met for the analyses reported in this section.

M. Hess 1/24/97
Department Supervisor Date

Chemist 1/23/97
Date

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-0201
Sample ID : 97011501
Matrix : WATER
Date Sampled : 1/15/97
Date Analyzed : 1/16/97
Instrument ID : HP24

Anametrix ID : 9701091-01
Analyst : [illegible]
Supervisor : [illegible]

Dilution Factor : 10.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	10.	ND	U
74-87-3	Chloromethane	10.	ND	U
75-01-4	Vinyl chloride	5.0	ND	U
74-83-9	Bromomethane	5.0	ND	U
75-00-3	Chloroethane	5.0	ND	U
75-69-4	Trichlorofluoromethane	5.0	ND	U
76-13-1	Trichlorotrifluoroethane	5.0	ND	U
75-35-4	1,1-Dichloroethene	5.0	ND	U
75-09-2	Methylene chloride	10.	ND	U
156-60-5	trans-1,2-Dichloroethene	5.0	ND	U
75-34-3	1,1-Dichloroethane	5.0	ND	U
156-59-2	cis-1,2-Dichloroethene	5.0	180.	
67-66-3	Chloroform	5.0	ND	U
71-55-6	1,1,1-Trichloroethane	5.0	ND	U
56-23-5	Carbon tetrachloride	5.0	ND	U
107-06-2	1,2-Dichloroethane	5.0	ND	U
79-01-6	Trichloroethene	5.0	43.	
78-87-5	1,2-Dichloropropane	5.0	ND	U
75-27-4	Bromodichloromethane	5.0	ND	U
10061-01-5	cis-1,3-Dichloropropene	5.0	ND	U
10061-02-6	trans-1,3-Dichloropropene	5.0	ND	U
79-00-5	1,1,2-Trichloroethane	5.0	ND	U
127-18-4	Tetrachloroethene	5.0	230.	
124-48-1	Dibromochloromethane	5.0	ND	U
108-90-7	Chlorobenzene	5.0	ND	U
75-25-2	Bromoform	5.0	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	5.0	ND	U
541-73-1	1,3-Dichlorobenzene	5.0	ND	U
106-46-7	1,4-Dichlorobenzene	5.0	ND	U
95-50-1	1,2-Dichlorobenzene	5.0	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-0201
Sample ID : 97011502
Matrix : WATER
Date Sampled : 1/15/97
Date Analyzed : 1/16/97
Instrument ID : HP24

Anametrix ID : 9701091-02
Analyst : [illegible]
Supervisor : [illegible]
Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-0201
Sample ID : 97011503
Matrix : WATER
Date Sampled : 1/15/97
Date Analyzed : 1/16/97
Instrument ID : HP24

Anametrix ID : 9701091-03
Analyst :
Supervisor :

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	25.	
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-0201
Sample ID : 97011504
Matrix : WATER
Date Sampled : 1/15/97
Date Analyzed : 1/16/97
Instrument ID : HP24

Anametrix ID : 9701091-04
Analyst :
Supervisor :

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-0201
Sample ID : 97011505
Matrix : WATER
Date Sampled : 1/15/97
Date Analyzed : 1/16/97
Instrument ID : HP24

Anametrix ID : 9701091-05
Analyst : [signature]
Supervisor : [signature]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-02
Sample ID : VBLKC1
Matrix : WATER
Date Sampled : 0/ 0/ 0
Date Analyzed : 1/16/97
Instrument ID : HP24

Anametrix ID : BJ1602I1
Analyst : [illegible]
Supervisor : [illegible]

Dilution Factor : 1.0
Conc. Units : ug/L

CAS No.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
75-71-8	Dichlorodifluoromethane	1.0	ND	U
74-87-3	Chloromethane	1.0	ND	U
75-01-4	Vinyl chloride	.50	ND	U
74-83-9	Bromomethane	.50	ND	U
75-00-3	Chloroethane	.50	ND	U
75-69-4	Trichlorofluoromethane	.50	ND	U
76-13-1	Trichlorotrifluoroethane	.50	ND	U
75-35-4	1,1-Dichloroethene	.50	ND	U
75-09-2	Methylene chloride	1.0	ND	U
156-60-5	trans-1,2-Dichloroethene	.50	ND	U
75-34-3	1,1-Dichloroethane	.50	ND	U
156-59-2	cis-1,2-Dichloroethene	.50	ND	U
67-66-3	Chloroform	.50	ND	U
71-55-6	1,1,1-Trichloroethane	.50	ND	U
56-23-5	Carbon tetrachloride	.50	ND	U
107-06-2	1,2-Dichloroethane	.50	ND	U
79-01-6	Trichloroethene	.50	ND	U
78-87-5	1,2-Dichloropropane	.50	ND	U
75-27-4	Bromodichloromethane	.50	ND	U
10061-01-5	cis-1,3-Dichloropropene	.50	ND	U
10061-02-6	trans-1,3-Dichloropropene	.50	ND	U
79-00-5	1,1,2-Trichloroethane	.50	ND	U
127-18-4	Tetrachloroethene	.50	ND	U
124-48-1	Dibromochloromethane	.50	ND	U
108-90-7	Chlorobenzene	.50	ND	U
75-25-2	Bromoform	.50	ND	U
79-34-5	1,1,2,2-Tetrachloroethane	.50	ND	U
541-73-1	1,3-Dichlorobenzene	.50	ND	U
106-46-7	1,4-Dichlorobenzene	.50	ND	U
95-50-1	1,2-Dichlorobenzene	.50	ND	U

SURROGATE RECOVERY SUMMARY -- EPA METHOD H8021
ANAMETRIX, INC. (408)432-8192

Project ID : 502-0201
Matrix : LIQUID

Anametrix ID : 9701091
Analyst :
Supervisor :

	SAMPLE ID	SU1	SU2	SU3
1	VBLKC1	83	95	97
2	97011502	113	111	107
3	97011503	117	108	109
4	97011504	120	109	110
5	97011505	116	111	112
6	97011501	130	104	112
7				
8				
9				
10				
11				
12				
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26				
27				
28				
29				
30				

	QC LIMITS
SU1 = Bromochloromethane	(33-141)
SU2 = 1-Chloro-2-fluorobenze	(53-125)
SU3 = 2-Bromochlorobenzene	(60-118)

* Values outside of Anametrix QC limits

EPA METHOD 8021
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	MJ1601I1
Batch:	1091	Instrument ID:	HP24
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	1/16/97	Analyst:	
		Supervisor:	

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
1,1-Dichloroethene	10	9.6	96%	64-125
Trichlorotrifluoroethane	10	8.3	83%	65-116
trans-1,2-Dichloroethene	10	9.7	97%	77-113
1,1-Dichloroethane	10	9.8	98%	85-129
cis-1,2-Dichloroethene	10	10.0	100%	78-130
1,1,1-Trichloroethane	10	9.4	94%	83-125
Trichloroethene	10	10.2	102%	76-124
Tetrachloroethene	10	10.4	104%	80-118
Chlorobenzene	10	10.4	104%	81-130
1,3-Dichlorobenzene	10	10.1	101%	82-115
1,4-Dichlorobenzene	10	9.8	98%	85-122
1,2-Dichlorobenzene	10	10.5	105%	86-122

SURROGATE NAME	SPIKE AMT	SURR. REC	% REC	% REC LIMITS
Bromochloromethane	5	6.0	120%	33-141
1-Chloro-2-fluorobenzene	5	5.6	112%	53-125
2-Bromochlorobenzene	5	5.5	110%	60-118

EPA METHOD 8021
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE

Sample ID:	LAB CONTROL SAMPLE	Laboratory ID:	NJ1601I1
Batch:	1091	Instrument ID:	HP24
Matrix:	WATER	Concentration Units:	ug/L
Date Analyzed:	1/16/97	Analyst: VJ	
		Supervisor: DL	

COMPOUND NAME	SPIKE AMOUNT	LCS REC	%REC LCS	%RECOVERY LIMITS
1,1-Dichloroethene	10	9.3	93%	64-125
Trichlorotrifluoroethane	10	9.0	90%	65-116
trans-1,2-Dichloroethene	10	10.3	103%	77-113
1,1-Dichloroethane	10	10.3	103%	85-129
cis-1,2-Dichloroethene	10	10.4	104%	78-130
1,1,1-Trichloroethane	10	9.3	93%	83-125
Trichloroethene	10	10.1	101%	76-124
Tetrachloroethene	10	10.2	102%	80-118
Chlorobenzene	10	10.5	105%	81-130
1,3-Dichlorobenzene	10	10.5	105%	82-115
1,4-Dichlorobenzene	10	10.5	105%	85-122
1,2-Dichlorobenzene	10	11.0	110%	86-122

SURROGATE NAME	SPIKE AMT	SURR. REC	% REC	% REC LIMITS
Bromochloromethane	5	6.2	124%	33-141
1-Chloro-2-fluorobenzene	5	5.5	110%	53-125
2-Bromochlorobenzene	5	5.7	114%	60-118

9701071

CHAIN OF CUSTODY RECORD

PES ENVIRONMENTAL, Inc.
Engineering & Environmental Services

1682 NOVATO BOULEVARD, SUITE 100
NOVATO, CALIFORNIA 94947
(415) 899-1600 FAX (415) 899-1601

JOB NUMBER: 502.0201-003
NAME / LOCATION: FOOTHILL SQUARE
PROJECT MANAGER: Will Mast

SAMPLERS: Joel Douglas
RECORDER: Joel Douglas

	DATE				SAMPLE NUMBER / DESIGNATION	SOURCE CODE	MATRIX					# CONTAINERS & PRESERV.								DEPTH IN FEET	COL MTD CD	QA CODE
	YR	MO	DY	TIME			Water	Sedim't	Soil	Oil		Unpres.	H_2SO_4	HNO_3	HCl	Filtered						
1	97	01	15	0900	970115001		X					3								22-25		
2	97	01	15	0940	970115002		X					3								39.5-43.5		
3	97	01	15	1300	970115003		X					3								42-45		
4	97	01	15	1530	970115004		X					3								35-38		
5	97	01	15	1600	970115005		X					3								57-60		

ANALYSIS REQUESTED

EPA 601 / 8010	EPA 602 / 8020 (BTEX)	EPA 624 / 8240	EPA 625 / 8270	TPHg by 5030 / 8015 (mod)	TPHd by 3550 / 8015 (mod)
X					
X					
X					
X					
X					

NOTE

24 HOUR ~~TAT~~, need results by e.o.d. ~~business~~ (5:00 pm) on Thursday 1/16/97, if possible

Please fax results to Will Mast @ 415-899-1601

CHAIN OF CUSTODY RECORD

		DATE	TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature) Steven J. Boyle	1/15/97	17:03
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
DISPATCHED BY: (Signature) Steven J. Boyle — DATE 1/15/97 — TIME 19:00	RECEIVED FOR LAB BY: (Signature)	DATE 1/15/97	TIME 1910

METHOD OF SHIPMENT: lab courier to ITS

WHITE-Laboratory COPY YELLOW-Project Office Copy PINK-Field or Office Copy

Inchcape Testing Services
Environmental Laboratories

SAMPLE RECEIVING CHECKLIST

Workorder Number: 9701091	*Client Project ID:* 502-0201-003	*Quote Number:*

Cooler			
Shipping documentation present? If YES, enter Carrier and Airbill #:	YES	NO	(N/A)
Custody Seal on the outside of cooler? *Condition*: Intact ☐ Broken ☐	YES	NO	(N/A)
Temperature of sample(s) within range? List temperatures of cooler(s): 6°C **Note:** If all samples taken within previous 4 hr, circle N/A and place in sample storage area as soon as possible.	(YES) IR —/	NO Temp Blank	N/A ____
Samples			
Chain of custody seal present for each container? *Condition*: Intact ☐ Broken ☐	YES	NO	(N/A)
Samples arrived within holding time?	(YES)	NO	N/A
Samples in proper containers for methods requested? *Condition of containers*: Intact ☑ Broken ☐ If NO, were samples transferred to proper container(s)? Yes ☐ No ☐	(YES)	NO	
VOA containers received with zero headspace or bubbles < 6 mm?	(YES)	NO	N/A
Container labels complete? (ID, date, time, preservative)	(YES)	NO	N/A
Samples properly preserved? If NO, was the preservative added at time of receipt? Yes ☐ No ☑	YES	(NO)	N/A
pH check of samples required at time of receipt?(volatiles checked at analysis) If YES, pH checked and recorded by:	YES	(NO)	
Sufficient amount of sample received for methods requested? If NO, has the client or PM been notified? Yes ☐ No ☐	(YES)	NO	
Field blanks received with sample batch?	YES	NO	(N/A)
Trip blanks received with sample batch?	YES	NO	(N/A)
Chain of Custody			
Chain of custody form received with samples?	(YES)		NO
Has it been filled out completely and in ink?	(YES)		NO
Sample IDs on chain of custody form agree with labels?	(YES)		NO
Number of containers on chain agree with number received?	(YES)		NO
Analysis methods specified?	(YES)		NO
Sampling date and time indicated?	(YES)		NO
Proper signatures of sampler, courier and custodian in appropriate spaces? With time and date? Yes ☑ No ☐	(YES)		NO
Turnaround time? Standard ☐ Rush ☑			

Any NO responses and/or any BROKEN that was checked must be detailed in a Corrective Action Form.

Sample Custodian: SP Date: 1-15-97 Project Manager: [signature] Date: 1/20/97

f:\forms\newscr2.doc

APPENDIX C

SCREENING-LEVEL EVALUATION OF VOC EXPOSURE FROM SOILS AND GROUNDWATER

APPENDIX C

SCREENING-LEVEL EVALUATION OF VOC EXPOSURE FROM SOILS AND GROUNDWATER

C1.0 INTRODUCTION

This Appendix presents the details of a screening-level risk evaluation of exposure to chlorinated volatile organic compounds (VOCs) at the Foothill Shopping Center (Site) in Oakland, California (see Plate 1). Evaluations were prepared for two exposure scenarios: (1) Evaluation of construction worker exposure to VOC concentrations in residual soils; and (2) Evaluation of tenant and public exposure to VOC concentrations in air that may result from volatilization of VOC residuals in soil and groundwater beneath the two northernmost buildings. These buildings were selected for evaluation because of the presence of residual VOCs in soils and groundwater beneath these buildings; residual VOCs have not been observed in soil or groundwater under the other buildings at the site. The intent of these evaluations is to demonstrate that residual VOC concentrations in soil that remain after excavation activities conducted in 1995 and residual groundwater contamination do not present a significant risk to tenants, the public, or future construction workers.

After summarizing site background information, previous remedial activities, and screening-level risk assessments, this appendix documents the methodology used in the evaluation. In summary, for construction workers, residual VOC concentrations in soil are compared to U.S. EPA Region IX Preliminary Remediation Goals (PRGs); for tenants and public users of the shopping center, a comparison is made between estimated indoor VOC concentrations and U.S. EPA PRGs for ambient air (EPA, 1996). The results of this comparison are provided, and conclusions concerning the significance of the results are presented below.

C2.0 BACKGROUND INFORMATION

C2.1 Site Location and Description

The Foothill Shopping Center is located at the northeastern corner of MacArthur Boulevard and 108th Avenue in Oakland, California. As shown on Plate 2, the shopping center consists of four principal structures currently used by various commercial, retail, and governmental human services organizations. The area of focus for this evaluation are two buildings of approximately 53,480 square feet (sf) of retail and commercial space located on the north side of the complex. This space is currently occupied by ten individual tenant spaces, as follows:

Tenant Space Designation	Proposed Use/Tenant Name	Footprint Area (sf)
A	Parent/Child Center	8,520
B	General Retail	1,200
C	Storage	1,200
D	Na Mele Hula Ohana	1,860
E	Counseling/Job Training	1,700
F	Shoe Repair	1,045
G	Lucky	30,450
H		170
I		1,240
J		6,095

C2.2 Soil Remediation Activities

During previous environmental investigation activities at the site conducted by other environmental consultants, tetrachloroethylene (PCE) was detected in near-surface soils beneath the former dry cleaning operation at the site. On the basis of these findings, Augeas Corporation (Augeas) concluded that chemical-affected soils were not widespread and recommended removing the soils with PCE concentrations in excess of 1 milligram per kilogram [mg/kg or parts per million (ppm)]. In late 1995, Drake Builders (Drake) contracted with All Environmental, Inc. (AEI) to complete the recommended soil removal activities. The results of AIE's work was summarized in their report *Soil Remediation Investigation and Excavation Project Summary*, dated February 7, 1996 (AEI, 1996a). During that removal action, the lateral and vertical extent of affected soil was found to be more widespread than initially estimated. In addition, breakdown products of PCE and chloroform[1] were detected in soil samples. Due to the presence of VOCs other than PCE, PES understands the clean-up goal was then revised to include removal of soils having total VOC concentrations above 1 ppm. The resultant excavation extended into adjacent tenant spaces to the west and required removal of approximately 2,500 cubic yards of soil. The limits of the excavation are shown on Plate 2 in the main body of this report.

[1] The detection, using GC methods, of chloroform by Priority Environmental Laboratory (PEL) (AEI's analytical laboratory) during the soil excavation project is considered suspect. Chloroform was not detected in samples collected during previous environmental investigations in the remediation area. Due to this concern, additional quality control tests were performed by AEI. A sample with high reported concentrations of chloroform (by GC methods) was reanalyzed by PEL using GC/MS methods to confirm its presence. Chloroform was detected but at an order of magnitude lower concentration, and may be attributed to laboratory contamination. A second QC sample was collected by AEI and split for second laboratory confirmation. In this case, chloroform was again identified by PEL but was not detected by the second laboratory, American Environmental Network Laboratories. Based on this information, AEI concluded that the presence of chloroform is questionable. PES concurs with this conclusion.

While the removal action was successful in removing the highest concentrations of chemical-affected soils from beneath the former dry cleaner, soils with residual total VOC concentrations above the 1 ppm goal are still present at two localized areas at the excavation periphery. These two areas are described below:

- The northeast corner of the former Young's Cleaners space where total VOCs were 1.8 and 1.9 mg/kg at depths of 4 and 8 feet, respectively (AEI sampling locations 8 and 12);

- In the breezeway west of the building formerly containing Young's Cleaners where total VOCs were 2.8 mg/kg at a depth of 5 feet (AEI sampling location 50).

All confirmation sampling data and plates showing sampling locations were presented in AEI's summary report (AEI, 1996a).

C3.0 FOCUSED RISK EVALUATION

PES has completed a screening-risk evaluation to: (1) establish whether future construction workers would be exposed to any significant risk if exposed to low-level residual VOCs in soils and (2) assess the potential risk to tenants and the public from residual VOCs volatilizing from soil or groundwater. Initially, an assessment of the potential exposure pathways for construction workers, tenants and the public was made to develop reasonable exposure scenarios, then risk evaluations were prepared as follows.

C3.1 Risk to On-Site Construction Workers

Plans are currently in preparation that detail the redevelopment of the Site; preliminary indications are that excavation depths are not likely to extend beyond several feet into the soils. Depth to the uppermost groundwater zone in the VOC-affected area ranges from 11 to 16 feet below ground surface. Thus the only potentially viable pathways for VOC exposure to construction workers are: (1) ingestion of soil; (2) dermal contact with soil; (3) inhalation of particulates (soil particles); and (4) inhalation of VOCs, via vapor-phase transport of VOCs from soil or groundwater. Because groundwater is found below the construction work zone in the soil, direct contact with groundwater is incomplete and is not considered further.

To evaluate potential risks to onsite construction workers from exposure to onsite soils, the maximum values of each residual VOC in soils was compared to Residential and Industrial Land Use soil U.S. EPA PRG values. Calculation of both Residential and Industrial PRGs for soil includes consideration of ingestion of soil, inhalation of particulates, inhalation of volatiles and dermal adsorption pathways - the same pathways considered viable for construction workers at the Site. Accounting for potential construction worker risk via comparison of soils data to PRGs is conservative for several reasons: (1) Exposure duration's used for calculation of Residential and Industrial PRGs (30 years and 25 years, respectively) are far longer than the

anticipated construction times for redevelopment of the Site (at most a few years); (2) Residential PRGs include exposure of soils to more sensitive children receptors; (3) Using maximum soil VOC values overstates the degree of chemical exposure.

The results of this comparison, tabulated below, indicate that exposure to residual VOCs in soils is not a risk to construction workers involved with redevelopment of the Site since all values in soil are below the PRGs.

Compound	Maximum Concentration in Remaining Soil (mg/Kg)	Residential Soil PRG (mg/Kg)	Industrial Soil PRG (mg/Kg)
PCE	0.87	5.4	17
TCE	0.014	3.2	7.0
cis 1,2-DCE	ND (0.005)	31	100
trans 1,2-DCE	ND (0.005)	78	270
Freon 12	ND (0.005)	94	310

C3.2 Risk to Tenants and Public Users

For tenants and public users of the Site, because of the location of the VOC-affected soils beneath the concrete slabs and asphalt-covered parking lots, inhalation of particulates, ingestion of soil, or dermal contact with soil exposure pathways are incomplete, and therefore do not require further evaluation. Local groundwater is not used as a source of drinking water for tenants or the public at the Site; consequently ingestion of groundwater is not a pathway and is not considered further. The inhalation pathway, via vapor-phase transport of VOCs into the tenant spaces, is considered a complete exposure pathway. Accordingly, the risk evaluation was focused on assessing the potential ambient air concentrations of VOCs within the retail spaces overlying remaining residually affected soils and groundwater. The methodology, assumptions, and results of that evaluation follow.

C3.3 Methodology Summary and Assumptions

Previous work by PES (PES, 1996), presented a screening-level evaluation of the risk from residual VOCs remaining in soils beneath tenant spaces A-F. The following methodology builds on this evaluation by factoring in the contribution of volatilization of VOCs from groundwater beneath buildings A-F and evaluating the risk at tenant spaces G-H. Additionally, a similar evaluation of offsite residences has been performed.

VOC concentrations within each of the tenant spaces were estimated by modeling VOC volatilization from residually affected soils and underlying groundwater. The corresponding chemical vapor flux at the ground surface via upward diffusion through the soil column was estimated using the results of a volatilization model. Once the chemical vapor flux at the ground surface was determined, an estimate of chemical concentrations within each tenant space was made using a simplified air-mixing model. Details of the VOC estimation process and a list of supporting references are provided in Appendix D. This method has been used by

PES at other Bay Area facilities with similar environmental issues and accepted by the Regional Water Quality Control Board (RWQCB) and other local environmental health agencies.

For the volatilization model, site-specific assumptions were made based on field measurements and/or typical default criteria. The following assumptions were used in the model:

- Chemical concentrations in soil at the surface are assumed to be not detectable or below laboratory reporting limits;

- Chemical constituents used in the model include those found in soil during the investigative and remedial phases. The constituents include PCE and its breakdown products: trichloroethylene (TCE), cis- and trans-1,2-dichloroethylene (1,2-DCE), 1,1-dichloroethylene (1,1-DCE) and Freon 12. Vinyl Chloride has not been detected.

- Vapor transport is limited to upward diffusion [general model assumption, (see Appendix D)]

- The following criteria were assumed in modeling chemical concentrations in tenant spaces A-F:

  - In portions of those tenant spaces where soil excavation was performed, the highest detected concentration of each VOC in post-removal confirmation samples was used; and

  - In portions of each tenant space where soil excavation was not performed, the highest detected concentration of each VOC located in the post-removal confirmation sidewall samples closest to the unremediated area in the tenant space was used.

  - The highest concentration of VOCs in existing on-site wells (at Monitoring well AMW-7) was used to model volatilization from groundwater.

  The thickness of soil cover over areas that were remediated correspond to average depths of excavation in each tenant space. The thickness of the soil cover over soil containing residual VOCs in unremediated areas was estimated to be 3.5 feet.

- The following criteria were assumed in modeling chemical concentrations in tenant spaces G-J:

  - The highest concentration of VOCs in existing on-site wells (at Monitoring well AMW-7) was used to model volatilization from groundwater.

- The highest concentration of VOCs in soils adjacent to the northwestern building at the site (containing tenant spaces G-J) was used.

- The thickness of soil cover was estimated to be 3.5 feet.

- The following criteria were assumed in modeling chemical concentrations in a hypothetical offsite residence in the area adjacent to and downgradient of Foothill Square:

  - The highest concentration of VOCs in observed in offsite HydroPunch™ samples collected during December 1996 and January 1997 (sampling location HP-6 for PCE and HP-1 for TCE and cis-1,2-DCE) was used to model volatilization from groundwater.

  - No analysis of VOCs in soils was performed for offsite soils; therefore, this source is not evaluated.

  - The thickness of soil cover was estimated to be 58 feet.

- Soil properties are considered constant over space and time. The total porosity of the soil cover was estimated to be 0.30 cm^3/cm^3, which corresponds to a clayey silty sand. The air-filled porosity was assumed to be 0.08 cm^3/cm^3, which corresponds to a moist, compacted clayey silty sand.

- The area of emission flux is estimated to include the entire tenant space, or entire building in the case of the offsite residence, footprint (which assumes that the residual soil contamination beneath the tenant space is uniform), unless supporting data were available to limit the size of the flux area.

- The attenuation factor of the existing concrete slab floors within each tenant space was assumed to be 0.005 (Johnson and Ettinger, 1991). For an offsite wood frame residence, an attenuation factor of 0.1 was used.

- The volume of air space within each tenant space was calculated using the approximate area of the existing building shell. The height used in the model for each tenant space was 20 feet, which assumes that false ceilings do not appreciably inhibit air circulation. The interior height of the hypothetical offsite residence was assumed to be 9 feet.

- The air exchange rate for each tenant space and offsite residence was assumed to be 0.5 and 0.1 per hour, respectively.

C3.4 Results of Evaluation

Using the methodology and assumptions outlined in the previous section, estimates of the indoor concentration for each space were determined. The results of the VOC estimation are summarized in Table 4 for tenant spaces A through F, where only volatilization from soil was modeled, and in Table 6 for tenant spaces G through J and the hypothetical offsite residence, where the model included volatilization from both soil and groundwater.

The calculation sheets for estimating the indoor VOC concentration in tenant spaces A through F were presented in PES' February 1996 report and are not included herein. The new calculation sheets for tenant spaces G through J and the offsite residences are provided in Tables C1 through C10.

The results of the volatilization modeling indicate that the estimated concentrations of VOCs within the interior tenant spaces and hypothetical offsite residence are below the applicable PRGs. The range of estimated interior concentrations varied widely, depending primarily on the VOC constituent of concern, its concentration in underlying soil, the composition of the underlying barrier (slab or crawl space), the percentage of the tenant space remediated, and the air circulation rate within the tenant space.

It should be noted that the methodology used to calculate ambient air VOC concentrations likely overestimates the actual interior concentrations for several reasons: (1) the method conservatively estimates emission flux and indoor air concentrations; (2) site-specific input parameter values were conservatively chosen (i.e., the highest observed concentrations were used); (3) it was assumed that contaminant concentrations are uniform and ubiquitous in the emission flux area; (4) it was assumed that no adsorption of upward diffusing soil vapor occurs; and (5) it was assumed that no reduction in contaminant concentrations from biological or chemical degradation is occurring over time. A more detailed evaluation of these factors would likely result in significantly lower estimated ambient air concentrations.

C4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the focused risk evaluation, the residual VOCs in soils or in groundwater below the subject tenant spaces and hypothetical offsite residence do not present a significant health threat to users of the site or nearby offsite residents. Therefore, groundwater remediation or further soil removal for the protection of human health is not warranted.

C5.0 REFERENCES

Farmer, W.J., M.S. Jang, J. Letey, and W.F. Spencer, 1980. *Land Disposal of Hexachlorobenzene Wastes: Controlling Vapor Movement in Soil*, EPA - 600/2-80-119, U.S. EPA.

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Table C1. Area G Site-Specific Modeling Parameters

Chemical Specific Data

Compound	D_{air} (cm^2/s)	H (unitless)	K_{oc} (ml/g)
PCE	0.072	0.94	660
TCE	0.081	0.37	130
c-1,2-DCE	0.079	0.27	59
t-1,2-DCE	0.079	0.27	59
Freon 12	0.08	4.1	58

Site Specific and Default Data

chemical concentration at surface	C_i	0	cm		
soil cover over groundwater	L_w	488	cm	16	ft
soil cover over contaminated soil	L_s	107	cm	3.5	ft
air-filled porosity of soil cover	P_a	0.08	cm^3/cm^3		
total porosity of soil cover (silty clay)	P_t	0.3	cm^3/cm^3		
area of emission flux	A_f	2828.8	m^2	30450	ft^2
attenuation factor	b	0.005			
area of building	$A_{building}$	2828.8	m^2	30450	ft^2
inside height of building	h	6.1	m	20	ft
air exchange rate	R	1.39E-04	1/s	0.5	1/hr
organic carbon fraction in soil	f_{oc}	0.02	g/g		

Table C2. Area G Calculations

Estimation of Chemical Vapor Concentrations

Soil:

formula: $C_{vs} = C_s \times (H/K_d) \times 10^{-3}$

chemical	C_s (mg/kg)	H (unitless)	K_d (ml/g)	C_{vs} (mg/cm3)
PCE	0.87	0.94	13.2	**6.20E-05**
TCE	0.014	0.37	2.6	**1.99E-06**
c-1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
t-1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
Freon 12	0.0025	4.1	1.16	**8.84E-06**

Groundwater:

formula: $C_{vw} = C_w \times H \times 10^{-3}$

chemical	C_w (mg/L)	H (unitless)	C_{vw} (mg/cm^3)
PCE	3.4	0.94	**3.20E-03**
TCE	0.61	0.37	**2.26E-04**
c-1,2-DCE	3.1	0.27	**8.37E-04**
t-1,2-DCE	0.05	0.27	**1.35E-05**
Freon 12	0.1	4.1	**2.05E-04**

Estimation of Chemical Flux

formula: $E_i = D_{air}*C_v*1/L*(P_a\text{^}3.33/P_t\text{^}2)*(10^4)$

L (cm) = 488 P_a = 0.08 P_t = 0.3

chemical	D_{air} (cm^2/sec)	Soil E_{is} (mg/m^2/sec)	Groundwater E_{ig} (mg/m^2/sec)
PCE	0.072	**2.26E-07**	**1.17E-05**
TCE	0.081	**8.18E-09**	**9.27E-07**
c-1,2-DCE	0.079	**2.29E-09**	**3.35E-06**
t-1,2-DCE	0.079	**2.29E-09**	**5.41E-08**
Freon 12	0.080	**3.58E-08**	**8.31E-07**

Estimating Indoor Air Concentrations

formula: $C_{in} = (E_i bA_f)/V*10^3$

$A_{building}$ (m^2) = 2828.805 h (m) = 6.1 R (1/sec) = 1.39E-04

chemical	Matrix Used	E_i (mg/m^2/sec)	b (unitless)	A_f (m^2)	V (m^3/sec)	C_{in} (µg/m^3)	PRG (µg/m^3)
PCE	Groundwater	1.17E-05	0.005	2828.8	2.40E+00	**6.89E-02**	3.20E-01
TCE	Groundwater	9.27E-07	0.005	2828.8	2.40E+00	**5.47E-03**	1.10E+00
c-1,2-DCE	Groundwater	3.35E-06	0.005	2828.8	2.40E+00	**1.98E-02**	3.70E+01
t-1,2-DCE	Groundwater	5.41E-08	0.005	2828.8	2.40E+00	**3.19E-04**	7.30E+01
Freon 12	Groundwater	8.31E-07	0.005	2828.8	2.40E+00	**4.91E-03**	2.10E+02

PRG = U.S. EPA Region IX Preliminary Remediation Goal

Table C3. Area H Site-Specific Modeling Parameters

Chemical Specific Data

Compound	D_{air} (cm^2/s)	H (unitless)	K_{oc} (ml/g)
PCE	0.072	0.94	660
TCE	0.081	0.37	130
c1,2-DCE	0.079	0.27	59
t1,2-DCE	0.079	0.27	59
Freon 12	0.08	4.1	58

Site Specific and Default Data

chemical concentration at surface	C_i	0	cm		
soil cover over groundwater	L_w	488	cm	16	ft
soil cover over contaminated soil	L_s	107	cm	3.5	ft
air-filled porosity of soil cover	P_a	0.08	cm^3/cm^3		
total porosity of soil cover (silty clay)	P_t	0.3	cm^3/cm^3		
area of emission flux	A_f	15.7	m^2	169	ft^2
attenuation factor	b	0.005			
area of building	$A_{building}$	15.7	m^2	169	ft^2
inside height of building	h	6.1	m	20	ft
air exchange rate	R	1.39E-04	1/s	0.5	1/hr
organic carbon fraction in soil	f_{oc}	0.02	g/g		

Table C4. Area H Calculations

Estimation of Chemical Vapor Concentrations

Soil:

formula $C_{vs} = C_s \times (H/K_d) \times 10^{-3}$

chemical	C_s (mg/kg)	H (unitless)	K_d (ml/g)	C_{vs} (mg/cm3)
PCE	0.87	0.94	13.2	**6.20E-05**
TCE	0.014	0.37	2.6	**1.99E-06**
c1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
t1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
Freon 12	0.0025	4.1	1.16	**8.84E-06**

Groundwater:

formula $C_{vw} = C_w \times H \times 10^{-3}$

chemical	C_w (mg/L)	H (unitless)	C_{vw} (mg/cm^3)
PCE	3.4	0.94	**3.20E-03**
TCE	0.61	0.37	**2.26E-04**
c1,2-DCE	3.1	0.27	**8.37E-04**
t1,2-DCE	0.05	0.27	**1.35E-05**
Freon 12	0.1	4.1	**2.05E-04**

Estimation of Chemical Flux

formula $E_I = D_{air}{}^*C_v{}^*1/L^*(P_e\text{^}3.33/P_t\text{^}2)^*(10^4)$

L (cm) = 488 P_e = 0.08 P_t = 0.3

chemical	D_{air} (cm^2/sec)	Soil E_{Ie} (mg/m^2/sec)	Groundwater E_{Ig} (mg/m^2/sec)
PCE	0.072	**2.26E-07**	**1.17E-05**
TCE	0.081	**8.18E-09**	**9.27E-07**
c1,2-DCE	0.079	**2.29E-09**	**3.35E-06**
1,2-DCE	0.079	**2.29E-09**	**5.41E-08**
Freon 12	0.080	**3.58E-08**	**8.31E-07**

Estimating Indoor Air Concentrations

formula $C_{in} = (E_I b A_f)/V^*10^3$

$A_{building}$ (m^2) = 15.7001 h (m) = 6.1 R (1/sec) = 1.39E-04

chemical	Matrix Used	E_I (mg/m^2/sec)	b (unitless)	A_f (m^2)	V (m^3/sec)	C_{in} (µg/m^3)	PRG (µg/m^3)
PCE	Groundwater	1.17E-05	0.005	15.7	1.33E-02	**6.89E-02**	3.20E-01
TCE	Groundwater	9.27E-07	0.005	15.7	1.33E-02	**5.47E-03**	1.10E+00
c1,2-DCE	Groundwater	3.35E-06	0.005	15.7	1.33E-02	**1.98E-02**	3.70E+01
t1,2-DCE	Groundwater	5.41E-08	0.005	15.7	1.33E-02	**3.19E-04**	7.30E+01
Freon 12	Groundwater	8.31E-07	0.005	15.7	1.33E-02	**4.91E-03**	2.10E+02

PRG = U.S. EPA Region IX Preliminary Remediation Goal

Table C5. Area I Site-Specific Modeling Parameters

Chemical Specific Data

Compound	D_{air} (cm^2/s)	H (unitless)	K_{oc} (ml/g)
PCE	0.072	0.94	660
TCE	0.081	0.37	130
c1,2-DCE	0.079	0.27	59
t1,2-DCE	0.079	0.27	59
Freon 12	0.08	4.1	58

Site Specific and Default Data

chemical concentration at surface	C_i	0	cm		
soil cover over groundwater	L_w	488	cm	16	ft
soil cover over contaminated soil	L_s	107	cm	3.5	ft
air-filled porosity of soil cover	P_a	0.08	cm^3/cm^3		
total porosity of soil cover (silty clay)	P_t	0.3	cm^3/cm^3		
area of emission flux	A_f	115.0	m^2	1238	ft^2
attenuation factor	b	0.005			
area of building	$A_{building}$	115.0	m^2	1238	ft^2
inside height of building	h	6.1	m	20	ft
air exchange rate	R	1.39E-04	1/s	0.5	1/hr
organic carbon fraction in soil	f_{oc}	0.02	g/g		

Table C6. Area I Calculations

Estimation of Chemical Vapor Concentrations

Soil:

formula $C_{vs} = C_s \times (H/K_d) \times 10^{-3}$

chemical	C_s (mg/kg)	H (unitless)	K_d (ml/g)	C_{vs} (mg/cm3)
PCE	0.87	0.94	13.2	**6.20E-05**
TCE	0.014	0.37	2.6	**1.99E-06**
c1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
t1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
Freon 12	0.0025	4.1	1.16	**8.84E-06**

Groundwater:

formula $C_{vw} = C_w \times H \times 10^{-3}$

chemical	C_w (mg/L)	H (unitless)	C_{vw} (mg/cm^3)
PCE	3.4	0.94	**3.20E-03**
TCE	0.61	0.37	**2.26E-04**
c1,2-DCE	3.1	0.27	**8.37E-04**
t1,2-DCE	0.05	0.27	**1.35E-05**
Freon 12	0.1	4.1	**2.05E-04**

Estimation of Chemical Flux

formula $E_I = D_{air} * C_v * 1/L * (P_a \text{^} 3.33/P_t \text{^} 2) * (10^4)$

L (cm) = 488 P_a = 0.08 P_t = 0.3

chemical	D_{air} (cm^2/sec)	Soil E_{Is} (mg/m^2/sec)	Groundwater E_{Ig} (mg/m^2/sec)
PCE	0.072	**2.26E-07**	**1.17E-05**
TCE	0.081	**8.18E-09**	**9.27E-07**
c1,2-DCE	0.079	**2.29E-09**	**3.35E-06**
1,2-DCE	0.079	**2.29E-09**	**5.41E-08**
Freon 12	0.080	**3.58E-08**	**8.31E-07**

Estimating Indoor Air Concentrations

formula $C_{in} = (E_I b A_f)/V * 10^3$

$A_{building}$ (m^2) = 115.0102 h (m) = 6.1 R (1/sec) = 1.39E-04

chemical	Matrix Used	E_I (mg/m^2/sec)	b (unitless)	A_f (m^2)	V (m^3/sec)	C_{in} (µg/m^3)	PRG (µg/m^3)
PCE	Groundwater	1.17E-05	0.005	115.0	9.74E-02	**6.89E-02**	3.20E-01
TCE	Groundwater	9.27E-07	0.005	115.0	9.74E-02	**5.47E-03**	1.10E+00
c1,2-DCE	Groundwater	3.35E-06	0.005	115.0	9.74E-02	**1.98E-02**	3.70E+01
t1,2-DCE	Groundwater	5.41E-08	0.005	115.0	9.74E-02	**3.19E-04**	7.30E+01
Freon 12	Groundwater	8.31E-07	0.005	115.0	9.74E-02	**4.91E-03**	2.10E+02

PRG = U.S. EPA Region IX Preliminary Remediation Goal

Table C7. Area J Site-Specific Modeling Parameters

Chemical Specific Data

Compound	D_{air} (cm^2/s)	H (unitless)	K_{oc} (ml/g)
PCE	0.072	0.94	660
TCE	0.081	0.37	130
c1,2-DCE	0.079	0.27	59
t1,2-DCE	0.079	0.27	59
Freon 12	0.08	4.1	58

Site Specific and Default Data

chemical concentration at surface	C_i	0	cm		
soil cover over groundwater	L_w	488	cm	16	ft
soil cover over contaminated soil	L_s	107	cm	3.5	ft
air-filled porosity of soil cover	P_a	0.08	cm^3/cm^3		
total porosity of soil cover (silty clay)	P_t	0.3	cm^3/cm^3		
area of emission flux	A_f	566.1	m^2	6094	ft^2
attenuation factor	b	0.005			
area of building	$A_{building}$	566.1	m^2	6094	ft^2
inside height of building	h	6.1	m	20	ft
air exchange rate	R	1.39E-04	1/s	0.5	1/hr
organic carbon fraction in soil	f_{oc}	0.02	g/g		

Table C8. Area J Calculations

Estimation of Chemical Vapor Concentrations

Soil:

formula: $C_{vs} = C_s \times (H/K_d) \times 10^{-3}$

chemical	C_s (mg/kg)	H (unitless)	K_d (ml/g)	C_{vs} (mg/cm3)
PCE	0.87	0.94	13.2	**6.20E-05**
TCE	0.014	0.37	2.6	**1.99E-06**
c1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
t1,2-DCE	0.0025	0.27	1.18	**5.72E-07**
Freon 12	0.0025	4.1	1.16	**8.84E-06**

Groundwater:

formula: $C_{vw} = C_w \times H \times 10^{-3}$

chemical	C_w (mg/L)	H (unitless)	C_{vw} (mg/cm^3)
PCE	3.4	0.94	**3.20E-03**
TCE	0.61	0.37	**2.26E-04**
c1,2-DCE	3.1	0.27	**8.37E-04**
t1,2-DCE	0.05	0.27	**1.35E-05**
Freon 12	0.1	4.1	**2.05E-04**

Estimation of Chemical Flux

formula: $E_i = D_{air}*C_v*1/L*(P_a\text{^}3.33/P_t\text{^}2)*(10^4)$

L (cm) = 488 P_a = 0.08 P_t = 0.3

chemical	D_{air} (cm^2/sec)	Soil E_{is} (mg/m^2/sec)	Groundwater E_{ig} (mg/m^2/sec)
PCE	0.072	**2.26E-07**	**1.17E-05**
TCE	0.081	**8.18E-09**	**9.27E-07**
c1,2-DCE	0.079	**2.29E-09**	**3.35E-06**
1,2-DCE	0.079	**2.29E-09**	**5.41E-08**
Freon 12	0.080	**3.58E-08**	**8.31E-07**

Estimating Indoor Air Concentrations

formula: $C_{in} = (E_i b A_f)/V*10^3$

$A_{building}$ (m^2) = 566.1326 h (m) = 6.1 R (1/sec) = 1.39E-04

chemical	Matrix Used	E_i (mg/m^2/sec)	b (unitless)	A_f (m^2)	V (m^3/sec)	C_{in} (µg/m^3)	PRG (µg/m^3)
PCE	Groundwater	1.17E-05	0.005	566.1	4.79E-01	**6.89E-02**	3.20E-01
TCE	Groundwater	9.27E-07	0.005	566.1	4.79E-01	**5.47E-03**	1.10E+00
c1,2-DCE	Groundwater	3.35E-06	0.005	566.1	4.79E-01	**1.98E-02**	3.70E+01
t1,2-DCE	Groundwater	5.41E-08	0.005	566.1	4.79E-01	**3.19E-04**	7.30E+01
Freon 12	Groundwater	8.31E-07	0.005	566.1	4.79E-01	**4.91E-03**	2.10E+02

PRG = U.S. EPA Region IX Preliminary Remediation Goal

Table C9. Offsite Site-Specific Modeling Parameters

Chemical Specific Data

Compound	D_{air} (cm^2/s)	H (unitless)	K_{oc} (ml/g)
PCE	0.072	0.94	660
TCE	0.081	0.37	130
c1,2-DCE	0.079	0.27	59
t1,2-DCE	0.079	0.27	59
Freon 12	0.08	4.1	58

Site Specific and Default Data

chemical concentration at surface	C_i	0	cm		
soil cover over groundwater	L_w	1768	cm	58	ft
soil cover over contaminated soil	L_s	0	cm	0	ft
air-filled porosity of soil cover	P_a	0.08	cm^3/cm^3		
total porosity of soil cover (silty clay)	P_t	0.3	cm^3/cm^3		
area of emission flux	A_f	130.1	m^2	1,400	ft^2
attenuation factor	b	0.1			
area of building	$A_{building}$	130.1	m^2	1,400	ft^2
inside height of building	h	2.7	m	9	ft
air exchange rate	R	2.78E-05	1/s	0.1	1/hr
organic carbon fraction in soil	f_{oc}	0.02	g/g		

Table C10. Offsite Calculations

Estimation of Chemical Vapor Concentrations

Soil:

formula: $C_{vs} = C_s \times (H/K_d) \times 10^{-3}$

chemical	C_s (mg/kg)	H (unitless)	K_d (ml/g)	C_{vs} (mg/cm3)
PCE	--			--
TCE	--			--
c1,2-DCE	--			--
t1,2-DCE	--			--
Freon 12	--			--

Groundwater:

formula: $C_{vw} = C_w \times H \times 10^{-3}$

chemical	C_w (mg/L)	H (unitless)	C_{vw} (mg/cm^3)
PCE	0.04	0.94	**3.76E-05**
TCE	0.0013	0.37	**4.81E-07**
c1,2-DCE	0.00052	0.27	**1.40E-07**
t1,2-DCE	*0.00025*	0.27	**6.75E-08**
Freon 12	*0.0005*	4.1	**2.05E-06**

Estimation of Chemical Flux

formula: $E_i = D_{air}*C_v*1/L*(P_a\text{^}3.33/P_t\text{^}2)*(10^4)$

L (cm) = 107 P_a = 0.08 P_t = 0.3

chemical	D_{air} (cm^2/sec)	Soil E_{is} (mg/m^2/sec)	Groundwater E_{ig} (mg/m^2/sec)
PCE	0.072	--	**6.27E-07**
TCE	0.081	--	**9.03E-09**
c1,2-DCE	0.079	--	**2.57E-09**
1,2-DCE	0.079	--	**1.24E-09**
Freon 12	0.080	--	**3.80E-08**

Estimating Indoor Air Concentrations

formula: $C_{in} = (E_i b A_f)/V*10^3$

$A_{building}$ (m^2) = 566.133 h (m) = 6.1 R (1/sec) = 1.39E-04

chemical	Matrix Used	E_i (mg/m^2/sec)	b (unitless)	A_f (m^2)	V (m^3/sec)	C_{in} (µg/m^3)	PRG (µg/m^3)
PCE	Groundwater	6.27E-07	0.005	566.1	4.79E-01	**3.70E-03**	3.20E-01
TCE	Groundwater	9.03E-09	0.005	566.1	4.79E-01	**5.33E-05**	1.10E+00
c1,2-DCE	Groundwater	2.57E-09	0.005	566.1	4.79E-01	**1.52E-05**	3.70E+01
t1,2-DCE	Groundwater	1.24E-09	0.005	566.1	4.79E-01	**7.30E-06**	7.30E+01
Freon 12	Groundwater	3.80E-08	0.005	566.1	4.79E-01	**2.24E-04**	2.10E+02

NA = Not applicable.
PRG = U.S. EPA Region IX Preliminary Remediation Goal.
Italics = Compound not detected; half of laboratory reporting limit used.

APPENDIX D

EVALUATION METHODOLOGY FOR ASSESSMENT OF RESIDUAL VOC VOLATILIZATION TO BUILDING INTERIORS

APPENDIX D

EVALUATION METHODOLOGY FOR ASSESSMENT OF RESIDUAL VOC VOLATILIZATION TO BUILDING INTERIORS

The estimation of volatile organic compounds (VOC) concentrations in ambient air within the building interiors was accomplished by modeling volatilization of VOCs from residually contaminated soil and groundwater beneath the building. In general, the model included three primary steps: (1) calculation of the chemical vapor concentrations of VOCs at the source soil and groundwater, (2) calculation of the chemical vapor flux at the ground surface due to upward diffusion of the VOCs through the soil cover, and (3) estimation of the building interior ambient air chemical concentration using a simplified air-mixing model. A discussion of each of these steps is presented in the following sections. Each section also includes general model assumptions. Site-specific assumptions are presented in the main document and attachments, where appropriate.

Estimation of Chemical Vapor Concentrations

Chemical vapor in soil pores volatilizes from contaminated groundwater at the groundwater surface or from contaminated pore water in the vadose zone. The dissolved and vapor phases are in equilibrium in accordance with Henry's Law:

$$C_{vw} = HC_w\left(10^{-3}\right)$$

where:

C_{vw} = chemical concentration in the vapor phase arising from volatilization from groundwater, in mg/cm^3;
H = Henry's Law coefficient for chemical i (dimensionless); and
C_w = chemical i concentration dissolved in groundwater, in mg/ℓ.

Chemical vapor in soil pores can also arise from volatilization from residually-contaminated soil (i.e., adsorbed phase). The vapor-phase and adsorbed-phase concentrations are also in equilibrium in accordance with Jury's Behavior Assessment Model (Jury et al, 1983 and Jury et al, 1990) and the following:

$$C_{vs} = C_s \frac{H}{K_d}\left(10^{-3}\right)$$

C_{vs} = chemical concentration in the vapor phase arising from volatilization from soil in, mg/cm^3;
C_s = chemical i concentration in soil in, mg/kg;
H = Henry's Law coefficient for chemical i, (dimensionless); and
K_d = distribution coefficient for chemical, in cm^3/g.

and:

$$K_d = K_{oc} f_{oc}$$

where:

K_{oc} = organic carbon partition coefficient for chemical i, in ml/g; and
f_{oc} = organic carbon fraction in the soil be weight, in g/g.

Because the chemical vapor concentration in soil is in equilibrium with the adsorbed and dissolved phases (Jury et. al., 1983), the vapor concentrations from groundwater (C_{vw}) and soil (C_{vs}) sources are not additive. The vapor-phase concentration, C_v, used to estimate emission flux in the Farmer Model is the larger concentration of the two sources (C_{vw} or C_{vs}).

Estimation of Chemical Vapor Flux

Steady-state vapor flux at the ground surface within each remediated and unremediated portion of a tenant space is estimated using the following equation (Farmer et. al., 1980), which is a modified form of Fick's law of diffusion:

$$E_i = D_{air} \frac{C_v}{L} \left(\frac{P_a^{3.33}}{P_t^2} \right) (10^4)$$

where:

E_i = emission flux of chemical i at the ground surface, in mg/m^2•s;
D_{air} = chemical air diffusion coefficient of chemical i, in cm^2/s;
C_v = chemical i concentration in the vapor phase in the remediated or unremediated portions of a tenant space at depth L, in mg/cm^3;
L = soil cover thickness in the remediated or unremediated portion of a tenant space, in cm;
P_t = total porosity of soil cover, (dimensionless); and
P_a = air-filled porosity of soil cover, (dimensionless).

In this model, the following assumptions are made:

- steady-state single direction (upward) movement of soil vapors occur;
- diffusive transport dominates over convective transport and no net upward dissolved-phase flux occurs (Johnson and Ettinger, 1991);
- soil properties are constant over space and time;
- the chemical concentration at the ground surface (C_o) is negligible relative to the chemical concentration at depth (C_v), therefore the concentration gradient (C_v - C_o) equals C_v; and

- soil porosity and tortuosity factors are assumed to follow the model of Millington and Quirk (1961).

Estimating Indoor Air Concentrations

Indoor air concentrations were estimated using the methodology of the Orange County Public Health Care Agency Vapor Diffusion Model (Orange County, 1994).

$$C_{in} = \frac{\left[\left(E_{i_r} b_r A_{f_r}\right) + \left(E_{i_u} b_u A_{f_u}\right)\right]}{V}\left(10^3\right)$$

where:

C_{in} = indoor air concentration of chemical i, in $\mu g/m^3$;
E_{ir} = emission flux in remediated portion, in $mg/m^2 \cdot s$;
b_r = attention factor remediated portion, based on surface cover type, (dimensionless);
A_{fr} = area of emission flux in remediated area; in m^2;
E_{iu} = emission flux in unremediated portion, in $mg/m^2 \cdot s$;
b_u = attenuation factor in unremediated portion, based on surface cover type, (dimensionless);
A_{fu} = area of emission flux in unremediated portion, in m^2; and
V = indoor ventilation rate, in m^3/s.

and:

$$V = A_{building} hR$$

where:

$A_{building}$ = indoor tenant space area where chemical vapors concentrate, in m^2;
h = indoor height of tenant space, in m; and
R = air exchange rate in, s^{-1}.

The following assumptions are made in applying this method:

- Vapor emissions are constant over time (i.e., steady-state);

- Vapors emissions are instantaneously and uniformly mixed within the tenant space;

Note - All references are listed in Appendix C of this report.

DISTRIBUTION

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