RO 486

Shell Oil Products US

May 17, 2004

Don Hwang
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Subject: **Shell-branded Service Station**
4255 MacArthur Boulevard
Oakland, California

Dear Mr. Hwang:

Attached for your review and comment is a copy of the *Subsurface Investigation Work Plan Addendum* for the above referenced site. Upon information and belief, I declare, under penalty of perjury, that the information contained in the attached document is true and correct.

As always, please feel free to contact me directly at (559) 645-9306 with any questions or concerns.

Sincerely,

Shell Oil Products US

Karen Petryna

Karen Petryna
Sr. Environmental Engineer

20945 S. Wilmington Ave., Carson, CA 90810 Phone (559) 645-9306 Facsimile (559) 645-5643

CAMBRIA

May 17, 2004

Mr. Don Hwang
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: **Subsurface Investigation Work Plan Addendum**
Former Shell-branded Service Station
4255 Mac Arthur Boulevard
Oakland, California
Incident # 98995758
Cambria Project #246-0524-008

Dear Mr. Hwang:

Cambria Environmental Technology, Inc. (Cambria) is submitting this *Subsurface Investigation Work Plan Addendum* on behalf of Equilon Enterprises LLC dba Shell Oil Products US (Shell). In the April 28, 2003 *Tank Closure and Soil Investigation Report* and in the September 22, 2003 *Subsurface Investigation Work Plan*, Cambria proposed installing an additional groundwater monitoring well in the southern corner of the former tank pit to monitor chemical concentrations in groundwater and for use during periodic mobile groundwater extraction events, if necessary. This addendum instead proposes advancing 12 borings in the vicinity of wells MW-2 and MW-3 in order to determine the extent of the separate phase hydrocarbon (SPH) plume. Once the SPH plume is defined, Cambria expects to propose the installation of one additional groundwater monitoring well for monitoring and extraction purposes. This well's exact location will be determined from results of the proposed investigation. The site background and proposed activities are presented below.

SITE BACKGROUND

Site Location: The site is a former Shell-branded service station located at the MacArthur Boulevard and High Street intersection in a mixed commercial and residential area of Oakland, California (Figures 1 and 2). An active Unocal service station and a former Chevron service station are located east of the site. A trailer park and adjacent California Department of Transportation (Caltrans) access to Interstate 580 are located immediately southwest of the site. Topography slopes toward the west, with a 5-foot (ft) elevation difference between grade at the site and the trailer park property, and an additional 5-ft elevation difference between grade at the trailer park property and the Caltrans property.

Cambria Environmental Technology, Inc.

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Emeryville, CA 94608
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Soil Lithology: The lithology beneath the site and vicinity typically consists of 12 to 15 ft of silts and clays, underlain by silty and clayey sands.

Groundwater Depth and Flow Direction: Quarterly groundwater monitoring has been conducted at the site since November 1993. The historical depth to groundwater on site has ranged from approximately 4 to 17 feet below grade (fbg), and currently (first quarter of 2004) ranges from 7.45 to 12.47 fbg on site. Groundwater typically flows in a west-southwesterly direction.

June 1985 Subsurface Investigation: In June 1985, Emcon Associates of San Jose, California drilled three soil borings and installed one groundwater monitoring well adjacent to the underground storage tanks (USTs). Up to 15,800 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPHg) were detected in the shallow soil samples from inside the UST area. In July 1992, GeoStrategies, Inc. of Hayward, California performed a site reconnaissance and verified that the original monitoring well had been destroyed during the 1985 UST replacement activities.

December 1985 UST Replacement: In December 1985, the USTs were replaced, and approximately 810 cubic yards of hydrocarbon-bearing soil were transported to a disposal facility. Up to 22,000 ppm total volatile hydrocarbons and 500 ppm benzene were detected in the soil samples from the excavation.

November 1993 Subsurface Investigation: In November 1993, Weiss Associates (WA) of Emeryville, California drilled soil borings BH-A, BH-B and BH-C, which were converted into monitoring wells MW-1, MW-2 and MW-3, respectively. Up to 1,700 ppm TPHg and 3.3 ppm benzene were detected in soil boring BH-C (MW-3) between the 11 ft and 16 ft depth. Up to 66 ppm TPHg and 0.07 ppm benzene were detected in soil boring BH-B (MW-2) between the 9 ft and 14 ft depth.

November 1994 Subsurface Investigation: In November 1994, WA drilled on-site soil borings BH-D and BH-E, located on the northeastern end of the lot, and off-site boring BH-F (MW-4), located near the Highway 580 on-ramp. Up to 5,900 ppm TPHg and 23 ppm benzene were detected at 5 fbg in soil boring BH-E, located adjacent to the central eastern pump island. Trace hydrocarbon concentrations were detected in the capillary fringe soil samples collected from each of the borings.

November 1995 Dispenser and Piping Removal and Sampling: In November 1995, WA collected 15 soil samples during dispenser and piping replacement activities. Up to 7,800 ppm TPHg were detected in samples collected from beneath the former middle dispenser, and 2,800 ppm TPHg were detected in the sample collected from beneath the adjacent product piping.

Up to 7,300 ppm TPHg were detected in the sample collected from beneath the northeast dispenser island. No benzene above 1 ppm was detected in any of the 15 samples collected. During the dispenser replacements, horizontal wells HW-1 through HW-4 were installed in the vadose zone about 5 ft below ground surface and adjacent to the former piping and dispensers to facilitate future removal of petroleum hydrocarbons from the impacted soil.

August 1997 Soil Vapor Extraction (SVE) Test: In August 1997, Cambria performed short-term SVE tests using a VR Systems Model V3 internal combustion engine on horizontal vapor extraction wells HW-1 through HW-4 and on monitoring wells MW-2 and MW-3. Cambria measured vapor extraction flow rates, the vacuum applied to the wellheads, and the vacuum influence in nearby wells. Cambria calculated an effective radius of influence of 35 to 50 ft during testing of wells MW-3 and MW-2. The relatively high TPHg removal rates measured in horizontal wells HW-1 through HW-4 were most likely temporary, and are not believed to be representative of site conditions due to extensive well screen in permeable fill material. The results of the short-term testing indicated that SVE achieves only low hydrocarbon removal rates in wells MW-2 and MW-3, which are more representative of native soil conditions.

February 1998 Subsurface Investigation: In February 1998, Cambria drilled two off-site borings (SB-1 and SB-2) in the trailer park adjacent to the Shell site. No TPHg or benzene was detected in the soil samples collected from the two borings. The highest methyl-tert-butyl ether (MTBE) concentration detected in soil was 1.4 ppm detected in soil boring SB-2 at a depth of 7 fbg. Up to 7,700 parts per billion (ppb) TPHg, 210 ppb benzene, and 46,000 ppb MTBE were detected in the grab groundwater sample collected from soil boring SB-2. In sample analysis of soil physical parameters, total organic carbon was detected at 2,140 ppm and 7,210 ppm at a depth of 5.5 fbg in borings SB-1 and SB-2, respectively, and total porosity was measured as 35.2% and 37.4%, respectively. Specific permeability values were 181 millidarcies (md) for SB-1-5.5 and 71 md for SB-2-5.5, but the lab noted that due to fine fractures developed in the samples upon drying, the measured values were an order or more of magnitude too high. Permeability measurements confirmed the low permeability of the shallow soils beneath the site.

2001 Sensitive Receptor Survey, Conduit Study and Site Conceptual Model (SCM): Cambria included a sensitive receptor survey, conduit study results, and an SCM in the *First Quarter 2001 Monitoring Report.* The sensitive receptor survey identified 25 monitoring wells, 4 cathodic protection wells, and 1 domestic well within ½ mile of the site. Given the conduit study results, Cambria concluded that nearby sewer, storm drain, and water lines located between 8 to 13 fbg could serve as preferential pathways for the migration of petroleum hydrocarbons and MTBE. However, Cambria did not identify any conduits in the nearby downgradient direction.

November 2001 Off-Site Monitoring Well Installation: Shell voluntarily instructed Cambria to delineate the off-site plume, and on November 12, 2001, Cambria supervised the installation of

one downgradient monitoring well (MW-5) approximately 200 ft southwest of the site, on the Caltrans right-of-way adjacent to the I-580 on-ramp. No TPHg, benzene, toluene, ethylbenzene and xylenes (BTEX) or MTBE were detected in the soil sample collected during the investigation. MW-5 has been included in the quarterly groundwater monitoring schedule since the first quarter of 2002. MTBE concentrations have ranged from 32 to 110 ppb. No other hydrocarbons have been detected in groundwater from this well.

January 2003 Tank Removal and Soil Excavation: Between January 27 and February 7, 2003, all surface features, USTs, fuel dispensers, and associated product piping were removed from the site. Cambria conducted soil and groundwater sampling, and supervised overexcavation to remove hydrocarbon-impacted soils to the practical extents. Approximately 875 cubic yards of soil were removed from the site during the tank-pull and overexcavation activities. Approximately 4,600 gallons of groundwater were pumped to dewater the UST excavation prior to removing the tanks. The highest chemical concentrations in soil in the former UST area were 380 parts ppm TPHg, 1.7 ppm benzene and 1.2 ppm MTBE, detected in the southeast corner of the tank pit in sample TP-5. The grab groundwater sample from the former tank pit area (TP-1-Water) contained 11,000 ppb TPHg, 410 ppb benzene and 5,200 ppb MTBE. The highest hydrocarbon concentrations remaining in soil in any of the former dispenser areas were 980 ppm TPHg and 1.2 ppm benzene, detected in sample P-2-8 at 8 fbg. The highest detected MTBE concentration remaining in soil in any of the former dispenser areas was 0.9 ppm, detected in sample D-5-S10. Following overexcavation, approximately 720 pounds of oxygen-releasing compound were mixed in the excavation base before backfilling with 1.5-inch drain rock to 4 fbg. The remainder of the tank pit and the over-excavation was backfilled and compacted with Class II road base material. In the April 28, 2003 *Tank Closure and Soil Excavation Report,* Cambria recommended installing one additional groundwater monitoring well in the southern corner of the former tank pit. Cambria submitted a September 22, 2003, *Subsurface Investigation Work Plan* detailing the proposed monitoring well installation activities.

PROPOSED SCOPE OF WORK

Cambria proposes to advance up to 12 soil borings with a cone penetration testing (CPT) drill rig. An ultraviolet induced fluorescence (UVIF) module will be used to horizontally and vertically delineate the SPH plume in the vicinity of wells MW-2 and MW-3 (Figure 2). Upon approval of this work plan by Alameda County Health Care Services, Cambria will complete the following tasks:

Utility Location: Cambria will notify Underground Service Alert (USA) of our drilling activities. USA will identify utilities in the site vicinity. Cambria will also retain a private utility locator to more accurately determine the location of any subsurface utilities,

Site Health and Safety Plan: Cambria will prepare a comprehensive site safety plan to protect site workers. The plan will be reviewed and signed by each site worker and kept on site during field activities.

Permits: Cambria will obtain required permits for soil boring installation.

Soil Borings: Cambria will advance up to 12 soil boring using a CPT drill rig to a maximum depth of 25 fbg. First encountered groundwater is expected to be at an approximate depth of 14 to 18 fbg. A UVIF module will be used to identify the presence of SPH as described in Cambria's Standard Field Procedures for Cone Penetrometer Testing with Ultraviolet Induced Fluorescence Module (Attachment A). Information on the UVIF module is presented in Gregg In Situ, Inc.'s Ultraviolet Induced Fluorescence Information Sheet (Attachment B).

Soil will be continuously sampled for logging only in up to two locations. The boring will be completed as described in Attachment A.

Reporting: Upon receipt of the analytical results, we will prepare a report that, at a minimum, will contain:

- A summary of the site background and history;
- Descriptions of the drilling and testing methods;
- CPT data and soil boring logs;
- UVIF testing results; and
- Cambria's conclusions and recommendations.

SCHEDULE

Upon receiving written work plan approval, Cambria will acquire permits and schedule field activities. An investigation report will be submitted approximately 60 days after completing the field activities.

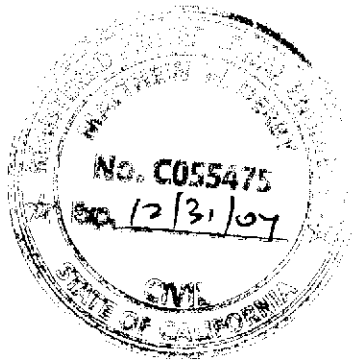
CLOSING

Please call Caryl Weekley at (510) 420-3324 if you have any questions or comments. Thank you for your assistance.

Sincerely,
Cambria Environmental Technology, Inc.

Caryl A. Weekley, R.G.
Senior Project Geologist

Matthew W. Derby, P.E.
Senior Project Engineer



Figures: 1 - Vicinity/Area Well Survey Map
2 - Proposed Soil Boring Location Map

Attachments: A - Standard Field Procedures for Cone Penetrometer Testing with Ultraviolet Induced Fluorescence Module
B - Gregg In Situ, Inc., Ultraviolet Induced Fluorescence Information Sheet

cc: Karen Petryna, Shell Oil Products US, 20945 S. Wilmington Avenue, Carson, CA 90810
Roland C. Malone, Jr., PO Box 2744, Castro Valley, CA 94546
Walt Parrish, MacArthur/High Trailer Park, PO Box 5561, Eugene, OR 97405

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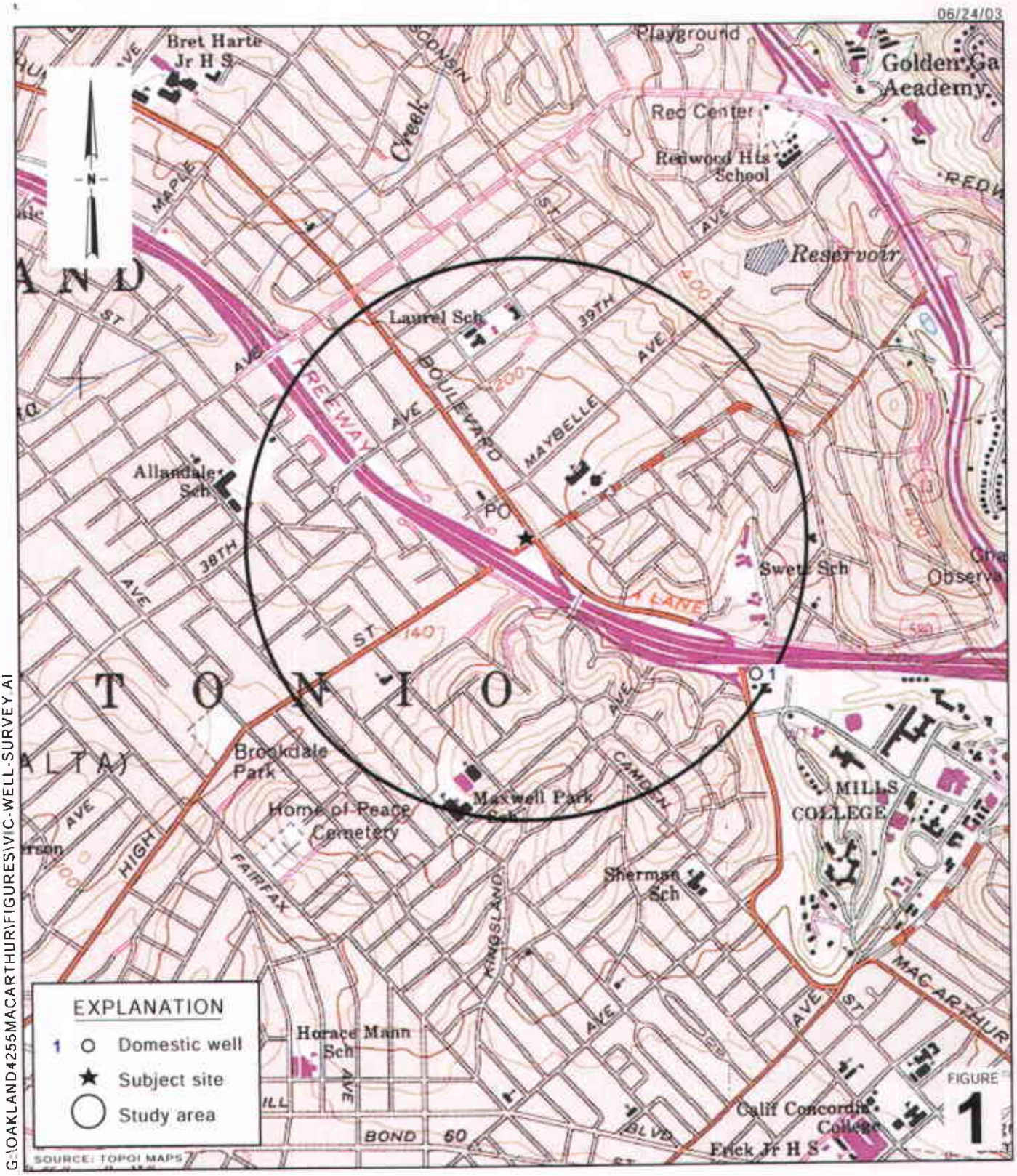

FIGURE 1

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Former Shell-branded Service Station
4255 MacArthur Boulevard
Oakland, California
Incident #98995758

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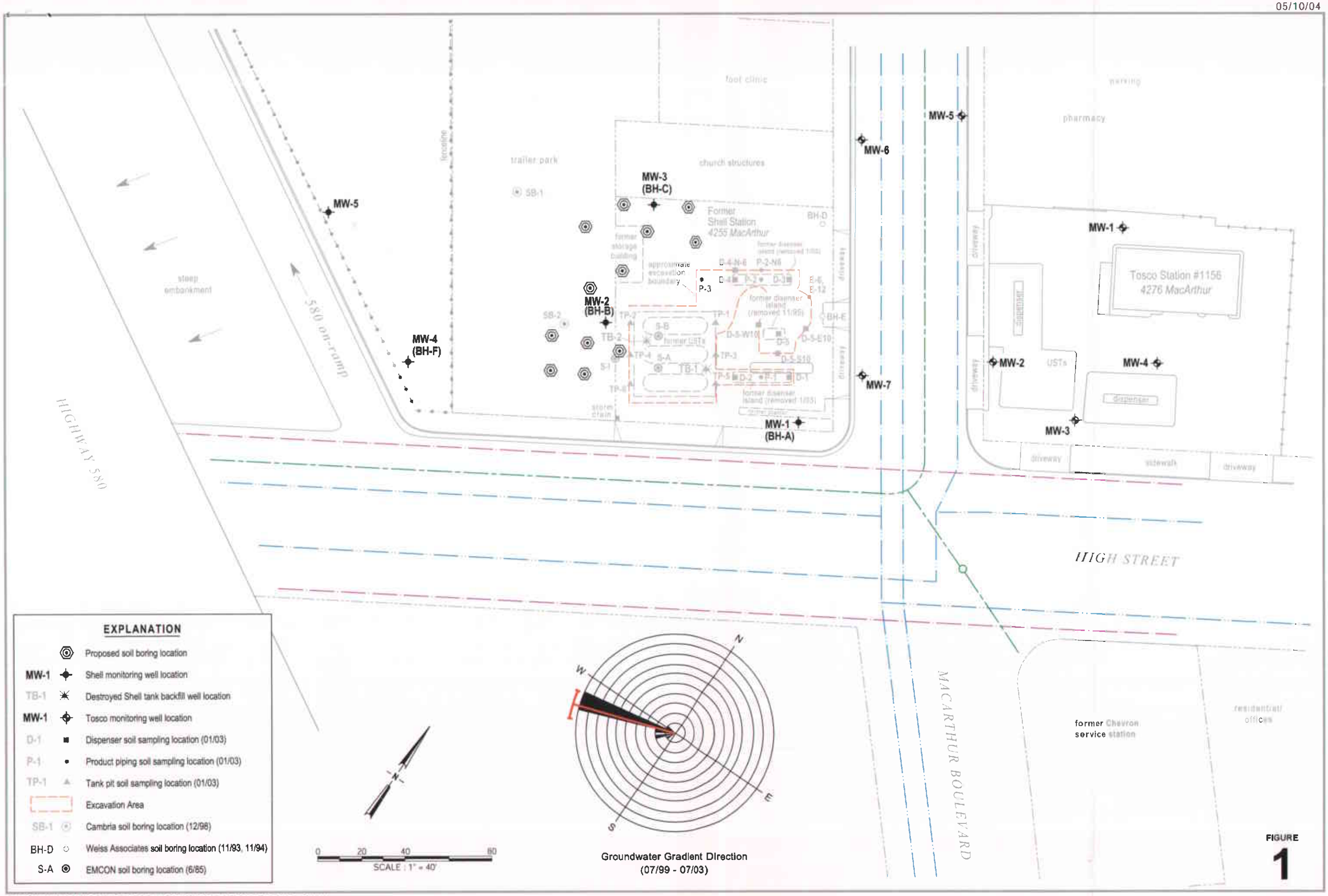
Vicinity/Area Well Survey Map

(1/2 Mile Radius)

05/10/04

Proposed Soil Boring Location Map



EXPLANATION

- Proposed soil boring location
- MW-1 — Shell monitoring well location
- TB-1 — Destroyed Shell tank backfill well location
- MW-1 — Tosco monitoring well location
- D-1 — Dispenser soil sampling location (01/03)
- P-1 — Product piping soil sampling location (01/03)
- TP-1 — Tank pit soil sampling location (01/03)
- Excavation Area
- SB-1 — Cambria soil boring location (12/98)
- BH-D — Weiss Associates soil boring location (11/93, 11/94)
- S-A — EMCON soil boring location (6/85)

0 20 40 80
SCALE : 1" = 40'

Groundwater Gradient Direction
(07/99 - 07/03)

FIGURE
1

Former Shell-branded Service Station
4255 MacArthur Boulevard
Oakland, California
Incident #98995758

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ATTACHMENT A

Standard Field Procedures for Cone Penetrometer Testing with Ultra Violet Induced Fluorescence Module

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STANDARD FIELD PROCEDURES FOR CONE PENETROMETER TESTING WITH ULTRAVIOLET INDUCED FLUORESCENCE MODULE

This document describes Cambria Environmental Technology's standard field methods for Cone Penetrometer Testing (CPT) and direct-push soil and groundwater sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines.

Use of CPT for logging and soil and groundwater sampling requires separate borings. Typically an initial boring is advanced to estimate soil and groundwater characteristics as described below. To collect soil samples a separate boring must be advanced using a soil sampling device. If groundwater samples are collected, another separate boring must be advanced using a groundwater sampling device. Specific field procedures are summarized below.

Cone Penetrometer Testing (CPT) with Ultraviolet Induced Fluorescence (UVIF) Module

Cone Penetrometer Testing is performed by a trained geologist or engineer working under the supervision of a California Registered Geologist (RG) or a Certified Engineering Geologist (CEG). According to Gregg In Situ, Inc., Cone Penetrometer Tests (CPT) are carried out by pushing an integrated electronic piezocone into the subsurface. The piezocone is pushed using a specially designed CPT rig with a force capacity of 20 to 25 tons. The piezocones are capable of recording the following parameters:

Tip Resistance (Qc)
Sleeve Friction (Fs)
Pore Water Pressure (U)
Bulk Soil Resistivity (rho) - with an added module

A compression cone is used for each CPT sounding. Piezocones with rated load capacities of 5, 10 or 20 tons are used depending on soil conditions. The 5 and 10 ton cones have a tip area of 10 sq. cm. and a friction sleeve area of 150 sq. cm. The 20 ton cones have a tip area of 15 sq. cm. and a friction sleeve area of 250 sq. cm. A pore water pressure filter is located directly behind the cone tip. Each of the filters is saturated in glycerin under vacuum pressure prior to penetration. Pore Pressure Dissipation Tests (PPDT) are recorded at 5 second intervals during pauses in penetration. The equilibrium pore water pressure from the dissipation test can be used to identify the depth to groundwater.

The measured parameters are printed simultaneously on a printer and stored on a computer disk for future analysis. All CPTs are carried out in accordance with ASTM D-3441. A complete set of baseline readings is taken prior to each sounding to determine any zero load offsets.

The inferred stratigraphic profile at each CPT location is included on the plotted CPT logs. The stratigraphic interpretations are based on relationships between cone bearing (Qc) and friction ratio (Rf). The friction ratio is a calculated parameter (Fs/Qc) used in conjunction with the cone bearing to identify the soil type. Generally, soft cohesive soils have low cone bearing pressures and high friction ratios. Cohesionless soils (sands) have high cone bearing pressures and low friction ratios. The classification of soils is based on correlations developed by Robertson et al (1986). It is not always possible to clearly identify a soil type based on Qc and Rf alone. Correlation with existing soils information and analysis of pore water pressure measurements should also be used in determining soil type.

CAMBRIA

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The UVIF module is located behind the standard piezocone. The UVIF cone works on the principle that hydrocarbons and their polyaromatic hydrocarbon(PAH's) constituents, mixed with soil and groundwater, fluoresce when irradiated by ultra violet light. Therefore, by measuring the UVIF intensity of the soil and groundwater the lateral and vertical extent of hydrocarbon contamination in the ground can be determined.

The UVIF module uses principles of fluorescence spectrometry by irradiating the soil with ultraviolet (UV) light. The hydrocarbon molecules absorb the UV light energy during radiation and immediately re-emit the light at a longer wavelength. This re-emission is termed fluorescence. The difference between the excitation (250 nanometers (nm)) and emission (275-550 nm) wavelengths is called the Stokes shift. Specific hydrocarbon compounds can be identified by the magnitude of their Stokes shift. In general, as the number of aromatic rings increase the fluorescent response shifts toward longer wavelengths. Therefore, lighter compounds tend to fluoresce at shorter wavelengths and heavier compounds fluoresce at longer wavelengths.

The UVIF module contains a fiber optic cable that captures the emitted radiation and sends it to an amplifier at the surface so the intensity can be recorded. Therefore, the soil parameters are recorded along with the UVIF intensity in real time.

CPT and sampling equipment are steam-cleaned or washed prior to work and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent. Groundwater samples are decanted into appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

After the CPT probes are removed, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound by vapor odor or staining, estimate groundwater depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Registered Geologist (RG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e., sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or separate-phase hydrocarbon saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e., cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Sampling

Soil samples are collected from borings driven using hydraulic push technologies. A minimum of one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples can be collected near the water table and at lithologic changes. Samples are collected using samplers lined with polyethylene or brass tubes driven into undisturbed sediments at the bottom of the borehole. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent on-site reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned or washed prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon® tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

After a soil sample has been collected, soil from the remaining tubing is placed inside a sealed plastic bag and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector measures volatile hydrocarbon vapor concentrations in the bag=s headspace, extracting the vapor through a slit in the plastic bag. The measurements are used along with the field observations, odors, stratigraphy and groundwater depth to select soil samples for analysis.

Grab Groundwater Sampling

Groundwater samples are collected from the open borehole using bailers, advancing disposable Tygon® tubing into the borehole and extracting groundwater using a diaphragm pump, or using a hydro-punch style sampler with a bailer or tubing. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

ATTACHMENT B

Gregg In Situ, Inc., Ultraviolet Induced Fluorescence Information Sheet

Ultra Violet Induced Flourescence (UVIFCPTu)

Gregg In Situ, Inc. conducts Ultra Violet Induced Fluorescence (UVIF) Cone Penetration Tests using a UVIF module that is located behind the standard piezocone, *Figure UVIF*. The ultra violet induced fluorescence cone works on the principle that polyaromatic hydrocarbons (PAH's), mixed with soil and groundwater, fluoresce when irradiated by ultra violet light. Therefore, by measuring the UVIF intensity of the soil and groundwater the lateral and vertical extent of polyaromatic hydrocarbon contamination in the ground can be determined.

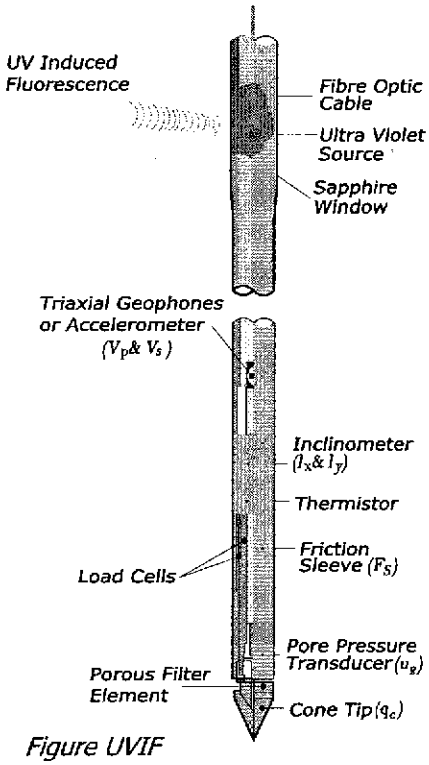

Figure UVIF

The UVIF module uses principles of fluorescence spectrometry by irradiating the soil with ultra violet light. The hydrocarbon molecules absorb the UV light energy during radiation and immediately re-emit the light at a longer wavelength. This re-emission is termed fluorescence. The difference between the excitation (250 nm) and emission (275-550 nm) wavelengths is called the Stokes shift. Specific hydrocarbon compounds can be identified by the magnitude of their Stokes shift, *Figure EWL*.

In general, as the number of aromatic rings increase the fluorescent response shifts toward longer wavelengths. Therefore, lighter compounds tend to fluoresce at shorter wavelengths and heavier compounds fluoresce at longer wavelengths.

The UVIF module contains a fiber optic cable that captures the emitted radiation and sends it to an amplifier at the surface so the intensity can be recorded. Therefore, the soil parameters are recorded along with the UVIF intensity in real time, *Figure Output*.

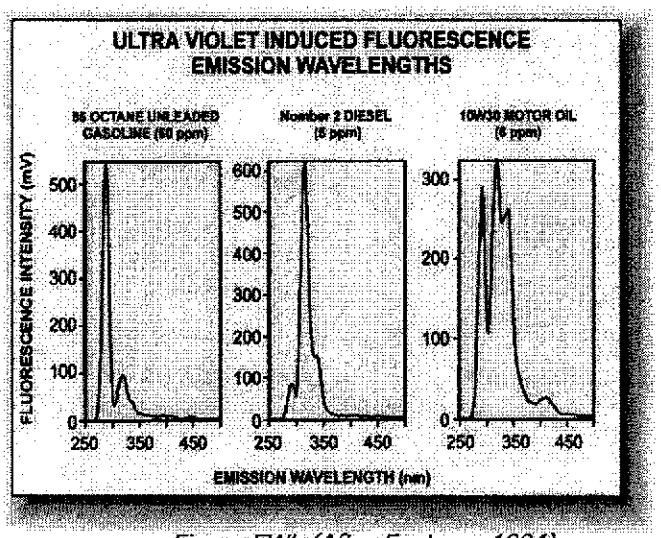

Figure EWL (After Fontana, 1994)

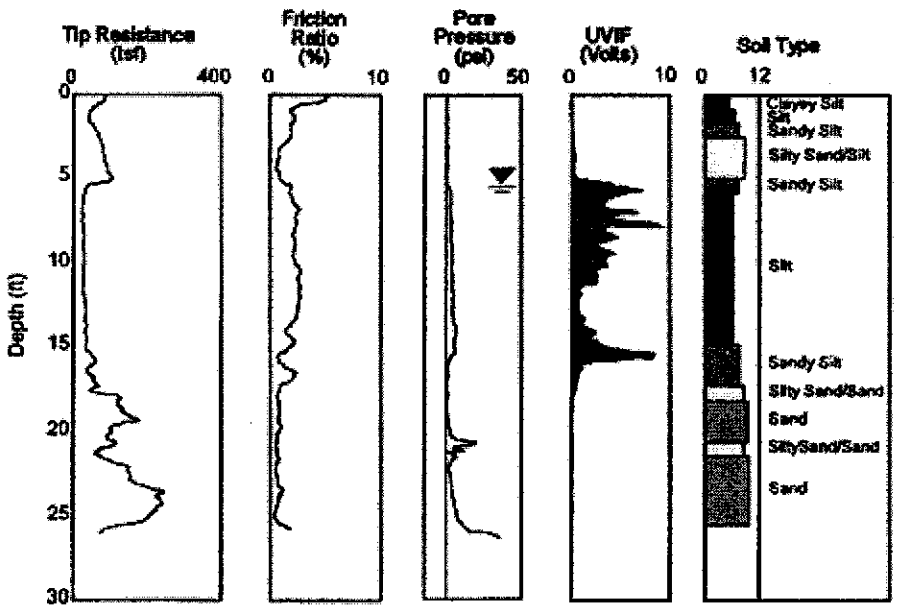

Figure Output

For a detailed reference on UVIF cone testing, refer to Woeller et. al., 2000.

GREGG

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