PACIFIC
ENVIRONMENTAL
GROUP, INC.

Date: April 30, 1997
Project: 320-162.1B

To: Ms. Jennifer Eberle
Alameda County Health Care Services
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

We have enclosed:

Copies	Description
1	Work Plan
	Former Signal Service Station 0800
	800 Center Street at Eighth Street
	Oakland, California

For your:
X Use
___ Approval
___ Review
___ Information

Comments: Please find enclosed the work plan for the Former Signal Service Station 0800. Please call if you have any questions.

Ross Tinline

cc: Mr. Jim Scott, BPH Mortgage
Mr. Terrell Sadler, Property Owner
Ms. Sandi Nichols, Esq., Washburn, Briscoe, and McCarthy
Mr. Hollis Rodgers, c/o Victor E. Brown, Esq.

97 MAY -2 PM 2:45

2025 Gateway Place, Suite 440, San Jose, California 95110 (408) 441-7500 FAX (408) 441-7539

PACIFIC
ENVIRONMENTAL
GROUP, INC.

April 30, 1997
Project 320-162.1B

Mr. Phil Briggs
Chevron Products Company
P.O. Box 5004
San Ramon, California 94583

Re: **Work Plan**
Former Signal Service Station 0800
800 Center Street at Eighth Street
Oakland, California

Dear Mr. Briggs:

This letter, prepared by Pacific Environmental Group, Inc. (PACIFIC) on behalf of Chevron Products Company (Chevron), presents a work plan to investigate soil and soil vapor conditions at the site referenced above. The work plan also presents proposed remediation or abatement efforts as necessary based on the results of the proposed investigation. The work plan is presented in accordance with a April 18, 1997 letter from the Alameda County Health Care Services Agency (ACHCSA) and previous conversations with Ms. Jennifer Eberle.

This work plan includes a site background, discussion, proposed scope of work, and proposed field and laboratory procedures (Attachment A).

SITE BACKGROUND

The site is located at the northeast corner of the intersection of Eighth Street and Center Street in Oakland, California. The former station building and the former pump islands remain at the site; however, the site is currently unoccupied. Land use near the site is commercial and residential.

The site was utilized as a retail service station from 1932 to the early 1970s. Station facilities included four 1,000-gallon fuel underground storage tanks (USTs), a waste oil tank, a product island, and associated piping. The USTs were reportedly removed from the site during 1973.

Previous Investigations

Previous investigations at the site have been conducted by Subsurface Consultants, Inc. (SCI), Groundwater Technology, Inc. (GTI), and PACIFIC. In August 1989, SCI installed and sampled five soil borings ranging in depth from 4.5 to 26 feet below ground surface (bgs). Temporary groundwater monitoring wells were installed in two of the five borings. In October 1995, GTI drilled three additional soil borings to a depth of 12 feet bgs, and four groundwater monitoring wells to a depth of 15 feet bgs. In March 1996, PACIFIC drilled nine geoprobe borings to depths ranging from 6 to 20 feet bgs. PACIFIC installed three groundwater monitoring wells and advanced one soil boring on December 18, 1996.

A brief discussion of the findings of these investigations is summarized below:

- The lithology encountered during the site investigations has indicated that the site is underlain by soils consisting of sandy clay to sandy clayey silt.

- In August 1989, groundwater was encountered at depths of 11 to 13 feet bgs; in October 1995, groundwater was encountered at depths of 10 to 11 feet bgs; and in March 1996, groundwater was encountered at depths of approximately 6 feet bgs. Based on gauging data obtained from the groundwater monitoring wells, the groundwater flow direction at the site is toward the southwest at a gradient of 0.002 foot per foot.

- Analytical results of soils have indicated that petroleum hydrocarbon concentrations are present in the area adjacent to the former pump island and in the vicinity of the former USTs. Petroleum hydrocarbon concentrations in soils are generally highest at the 10- to 12-foot bgs interval. During the August 1989 soil and groundwater investigation, maximum total purgeable petroleum hydrocarbons calculated as gasoline (TPPH-g) concentrations in soils ranged from 950 parts per million (ppm) in Boring 3 to 31,000 ppm in Boring 2 (beneath the former USTs). Maximum benzene concentrations ranged from not detected in Boring 3 to 500 ppm in Boring 2. During the October 1995 investigation, maximum TPPH-g concentrations in soils ranged from below detection limit in Wells MW-2, MW-3, MW-4, and SB-3, to 14,000 ppm in Well MW-1. Maximum benzene concentrations ranged from not detected in Wells MW-2, MW-4, and SB-3 to 120 ppm in Well MW-1. During the March 1996 investigation, maximum TPPH-g and benzene concentrations in soils ranged from not

detected in Boring P-8 to 13,000 and 41 ppm, respectively, in Boring P-3.

- Analytical results from the October 1995 investigation indicated that dissolved TPPH-g concentrations in groundwater ranged from below the detection limit in Well MW-2 (in the southeastern corner of the site) to 170,000 parts per billion (ppb) in Well MW-1 (near the former UST). Benzene concentrations in the groundwater monitoring wells ranged from below detection limit in Well MW-2 to 19,000 ppb in Well MW-1. Groundwater analytical data from Borings P-1 through P-9 during the March 1996 investigation indicated that TPPH-g and benzene concentrations ranged from not detected in Boring P-9 to 800,000 and 13,000 ppb, respectively in Boring P-2.

- Hydrocarbon concentrations in groundwater at the site are defined upgradient and laterally. Downgradient Monitoring Well MW-6 during the February groundwater monitoring event reported 800 ppb TPPH-g and 310 ppb benzene. Further delineation may be necessary if petroleum hydrocarbons continue to be detected in Well MW-6. An additional groundwater sampling event was performed during April 1997. Analytical results will are forthcoming.

DISCUSSION

It is understood that site development consisting of residential housing is proposed for the subject site and two adjacent parcels which are owned by the City of Oakland. Due to remaining concentrations of petroleum hydrocarbons in both soil and groundwater at the former Signal Station, PACIFIC performed an initial Risk-Based Corrective Action (RBCA) analysis utilizing existing data to establish risk-based cleanup goals at the site. The cleanup goals were to be used to complete the site redevelopment as a residential housing complex. During the RBCA analysis, both a Tier 1 and a Tier 2 RBCA were utilized in order to determine the appropriate site-specific cleanup goals.

The exposure routes deemed possible at the site are groundwater and subsurface soil (>3 feet bgs) volatilization to inhalation to indoor air and outdoor air (and volatilization and dermal contact from any surficial soils that may be impacted). Groundwater ingestion was not examined as a possible exposure route since Oakland does not receive its drinking water from groundwater.

All exposure parameters during both the Tier 1 and the subsequent Tier 2 were set for residential exposures with a target risk of 10^{-6} and a hazard quotient of 1. The site-specific representative concentrations for the benzene, toluene, ethylbenzene, and xylenes (BTEX compounds) were calculated in the following manner:

- Groundwater. Since the site had not been monitored for some time, the most recent sampling and monitoring data, collected on February 20, 1997, for groundwater was used to calculate the representative concentrations. No non-detectable concentrations were included in the calculation in order to make them more conservative. Once the calculations were completed, the 90 percent upper confidence interval (UCI) for each BTEX compound was utilized to compare against GSI's risk-based screening levels (RBSLs).

- Subsurface Soil: The geoprobe samples collected in March 1996, the most current soil data available for the site, were used to calculate the subsurface soil site-specific representative concentrations. No non-detectable concentrations were included in the calculations in order to make them more conservative. As previously discussed, the subsurface soil data, as well as the groundwater data, was tested for normality. All BTEX compounds, except benzene, were found to be lognormally distributed while benzene was normally distributed. With this data, the 90 percent UCI was calculated for each BTEX compound in order to compare it to GSI's Tier 1 RBSLs.

Results of the Tier 1 analysis indicated that groundwater benzene concentrations exceed the allowable RBSL for volatilization to indoor air while subsurface soil benzene and toluene concentrations exceed the Tier 1 RBSLs for volatilization to indoor air. In addition, the benzene subsurface soil concentration exceeds the RBSLs for ambient air. Due to these particular concentrations that exceed the Tier 1 RBSLs, a Tier 2 RBCA was completed using additional site-specific data.

Physical soil data collected during the installation of Monitoring Well MW-7, plus other site-specific data such as the actual gradient, were used in the volatilization models for the Tier 2 RBCA. The Tier 2 RBCA results indicate that the groundwater and subsurface soil benzene concentrations are still above the Tier 2 site-specific target levels (SSTLs) for volatilization to indoor air and that subsurface soil concentrations are also above the Tier 2 SSTLs for volatilization to ambient air. However, the subsurface soil toluene concentration was found to be below the Tier 2 SSTL for volatilization to indoor air.

It is important to recognize that the groundwater and subsurface soil volatilization to indoor air models which were used to generate the Tier 1 RBSLs and Tier 2 SSTLs do not include any biodegredation rate. Therefore, these models are overly conservative. However, these are the models currently recommended by ASTM and GSI. Several members of the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) have suggested alternatives to resolve the issue of the overly conservative inhalation models. PACIFIC proposes the following scope of work as an alternative to the overly conservative inhalation models.

SCOPE OF WORK

The proposed scope of work is designed to collect the necessary data for modeling the risk to human health and safety and the environment from subsurface soil and groundwater. Soil vapor petroleum hydrocarbon concentration data and physical soil data will be collected. A truck mounted geoprobe will be used to complete the soil vapor probes and the soil boring tasks. Sampling locations are shown on Figure 1. Proposed field and laboratory procedures are presented as Attachment A and task details are discussed below.

- **Permitting.** Appropriate boring permits will be obtained from the County of Alameda.
- **Soil Vapor.** Soil vapor will be measured by advancing 9-foot deep soil vapor probes at three locations representing the maximum concentrations of petroleum hydrocarbons (Figure 1). Three vapor samples per probe will be collected and analyzed from 3-, 6- and 9-foot depth intervals. A vapor sample will also be collected from the capillary fringe from one probe (Probe SV-1). Proposed soil vapor probe locations are shown on Figure 1.
- **Soil.** Select soil samples will be collected from the vadose zone and saturated zone soils for additional physical testing including organic carbon content, water content, and bulk density.
- **Report.** A report will be prepared which will present a risk evaluation to determine the threat to human health, based on a residential scenario.

PROPOSED REMEDIAL PLAN

Site development for residential housing requires that a target risk of 10^{-6} be utilized. Based on the initial RBCA cleanup standards for this site, it is not technically nor monetarily feasible to meet those standards. Therefore, the above scope of work has been proposed to establish the actual soil vapor flux. Based on the outcome of the scope of work, the following remedial or abatement alternatives are proposed:

1. If soil vapor flux is less than that calculated for a target risk of 10^{-6}, then no remedial efforts for volatilization would be needed. During construction and in areas of potential future excavation by residents (landscaped areas), measures will be taken to minimize possible dermal contact with subsurface soil. Soil beneath landscaped areas will be excavated to 3 feet bgs and sampled to minimize potential future exposure.

2. If soil vapor flux is greater than that calculated for a target risk of 10^{-6}, then a liner would be incorporated in the foundation of the housing complex during construction which would prevent groundwater or subsurface soil benzene from volatilizing into indoor air. Dependent upon concentrations, prior to liner installation, horizontal piping may be laid with an applied small vacuum. The vapors would be ambiently vented above the roof of one of the houses. Operation of the low flow vacuum system would abate vapor from entering the housing.

SCHEDULE

Upon approval of the work plan by Chevron and ACHCSA, PACIFIC will commence field work within 1 week after the acquisition of the necessary permits. The risk evaluation will be submitted to Chevron within 4 weeks after commencement of field work.

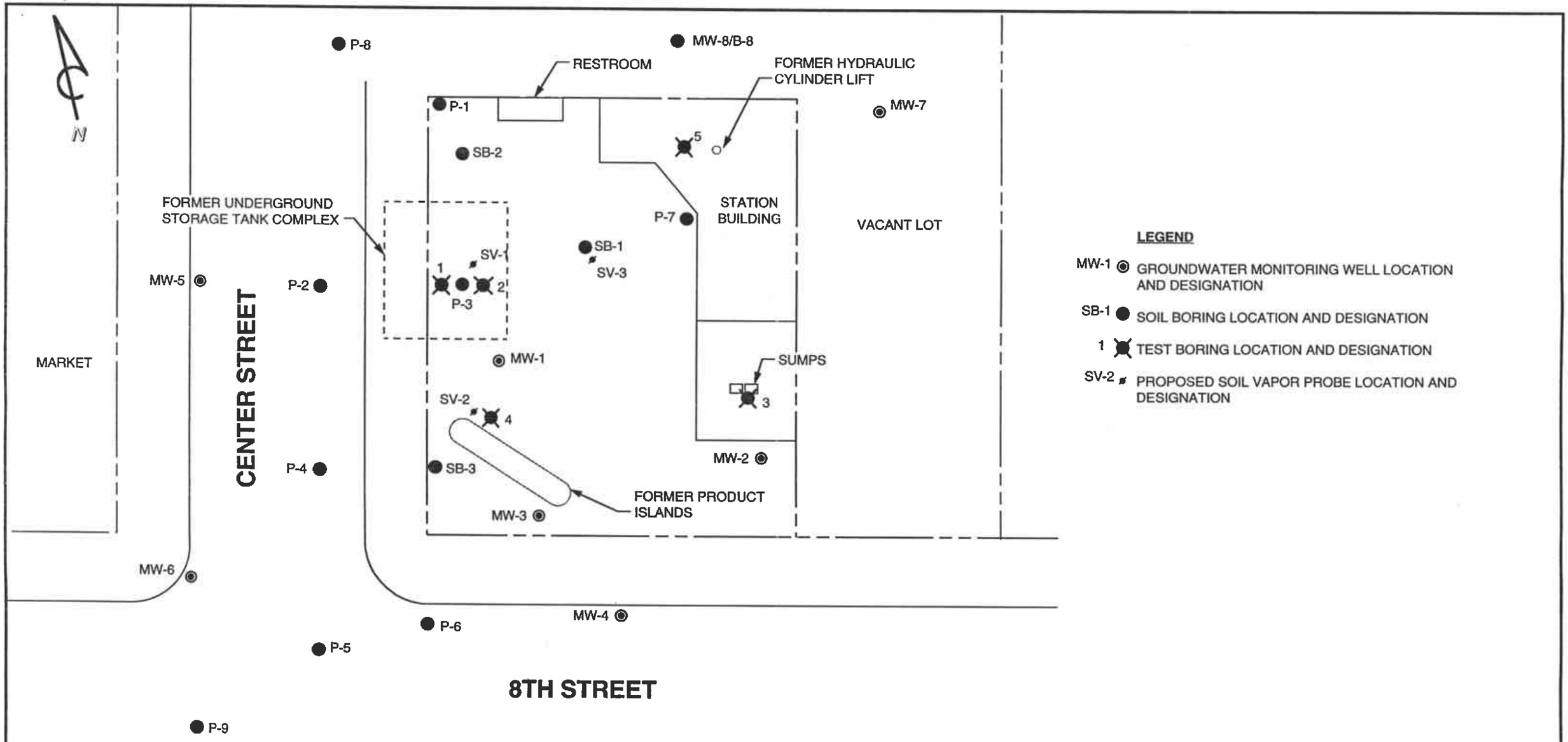
If you have any questions regarding the contents of this letter, please call.

Sincerely,

Pacific Environmental Group, Inc.

Ross Tinline
Project Geologist
RG 5860

Attachments: Figure 1 - Site Map
Attachment A - Proposed Field and Laboratory Procedures



LEGEND

- MW-1 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- SB-1 ● SOIL BORING LOCATION AND DESIGNATION
- 1 ✕ TEST BORING LOCATION AND DESIGNATION
- SV-2 ⸗ PROPOSED SOIL VAPOR PROBE LOCATION AND DESIGNATION

SOURCE: MAP BY GROUNDWATER TECHNOLOGY; DATED: 3-7-95

PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE
0 20 40 FEET

FORMER SIGNAL SERVICE STATION S0800
800 Center Street at 8th Street
Oakland, California

SITE MAP

FIGURE: 1
PROJECT: 320-162.1B

ATTACHMENT A

PROPOSED FIELD AND LABORATORY PROCEDURES

ATTACHMENT A
PROPOSED FIELD AND LABORATORY PROCEDURES

Exploratory Probe Procedures

Geoprobe borings for physical and chemical soil sampling will be advanced using 1- or 2-inch diameter hollow-stem rods. The soil boring will be logged by a Pacific Environmental Group, Inc. (PACIFIC) geologist using the Unified Soil Classification System and standard geologic techniques. Soil samples for logging and chemical analysis may be collected by advancing the hollow-stem rods into undisturbed soil. The sampler is driven a maximum of 4 feet using a pneumatic hammer and hydraulic pressure.

Soil samples will be analyzed in the field for volatile organic compounds using a photo-ionization detector (PID). Results of the PID tests may be used to assist in selection of samples for laboratory analysis. Soil samples for physical or chemical analysis will be retained in acetate or brass liners, capped with Teflon® and plastic end caps, taped with a non-volatile rubber-based tape, and sealed in zip-lock plastic bags. These samples will be placed in a cooler with ice for transport to the laboratory, accompanied by chain-of-custody documentation. The temperature of the cooler will be recorded upon delivery to the laboratory.

Soil vapor samples will be collected by hydraulically advancing a 1- to 2-inch diameter rod with a retractable tip at approximately the 3-, 6-, and 9-foot depth intervals, when the rod will be raised slightly and tip retracted. Disposable tubing with a filter tip will be lowered within the rods and vapor will be extracted into a Tedlar bag or SUMMA canister utilizing a diaphragm pump.

Laboratory Procedures

Soil vapor samples will be analyzed for total purgeable petroleum hydrocarbons calculated as gasoline, benzene, toluene, ethylbenzene, and xylenes, total extractable petroleum hydrocarbons calculated as jet fuel, and methyl tert-butyl ether by EPA Methods 8015 (modified) and 8020. The physical soil samples will be analyzed for soil bulk density, soil moisture, and pH by American Society for Testing and Materials (ASTM) Method 584, and for fraction of organic carbon by ASTM Method D-2974.

Exploratory Drilling

The soil borings will be drilled using 8-inch hollow-stem auger drilling equipment to a depth of approximately 50 feet below ground surface (or deeper depending on field conditions) and logged by a Pacific Environmental Group, Inc. geologist using the Unified Soil Classification System and standard geologic techniques. Soil samples for logging will be collected at 5-foot depth intervals using a California-modified split-spoon sampler. The sampler will be driven a maximum of 18 inches using a 140-pound hammer with a 30-inch drop. All soil samples for chemical analysis will be retained in brass liners, capped with Teflon® squares and plastic end caps, and sealed in clean zip-lock bags. The samples will be placed on ice for transport to the laboratory accompanied by chain-of-custody documentation. All down-hole drilling and sampling equipment will be steam-cleaned following the completion of the soil borings. Down-hole sampling equipment will be washed in a tri-sodium phosphate solution between samples.

Monitoring Well Construction

After drilling to the proposed depth and obtaining the appropriate soil samples, the soil boring will be converted to a groundwater monitoring well with the installation of 2-inch diameter flush-threaded Schedule 40 PVC casings. The monitoring well will be constructed by placing approximately 10 feet of 0.020-inch factory-slotted screen into the saturated zone and extending approximately 5 feet bgs above the saturated zone. Solid casing will then be placed on the top of the screened casing to the ground surface. An RMC 2 x 12 sand will be placed in the annular space and will extend 2 feet above the screened interval. A 2 foot thick bentonite seal will be placed on top of the sand pack. The remainder of the well will be grouted with neat cement to ground surface. A locking water-tight cap and a protective vault box will be installed on the monitoring wells. The boring logs for the wells will show well construction details.

Monitoring Well Development and Sampling

Well development procedures consist of purging a minimum of ten casing volumes of groundwater (unless the well is dewatered) from the well. The well screen will be surged along the full screen length with a surge block. During the purging, the well will be monitored for temperature, pH, and electrical conductivity (EC). A well will be considered "developed" when the temperature, pH, and EC parameters have stabilized.

Sampling procedures consist of purging the well of approximately three casing volumes of water (or until dry), during which time temperature, pH, and electrical conductivity will be monitored to indicate that a representative sample will be taken. Dissolved oxygen and oxidation reduction potential will be measured before and after purging. After purging, the

water levels of the wells will be allowed to restabilize. Groundwater samples will then be collected using a Teflon bailer, placed into appropriate EPA-approved containers, labeled, logged onto chain-of-custody documents, and transported on ice to a California State-certified laboratory.

Organic Vapor Procedures

Soil samples collected at 5-foot depth intervals during drilling will be analyzed in the field for ionizable organic compounds using the HNU Model PI-101 (or equivalent) photo-ionization detector (PID) with a 10.2 eV lamp. The test procedure will involve measuring approximately 30 grams from an undisturbed soil sample, placing this subsample in a clean glass jar, and sealing the jar with aluminum foil secured under a ring-type threaded lid. The jar will be warmed for approximately 20 minutes (in the sun), then the foil will be pierced and the head-space within the jar will be tested for total organic vapor, measured in parts per million as benzene (ppm; volume/volume). The instrument will be calibrated prior to drilling using a 100-ppm isobutylene standard (in air) and a sensitivity factor of 55 which relates the photo-ionization potential of benzene to that of isobutylene at 100 ppm. The results of the field testing will be noted on the boring logs. PID readings are useful for indicating relative levels of contamination, but cannot be used to evaluate hydrocarbon levels with the confidence of laboratory analyses.

Laboratory Procedures

Selected soil and groundwater samples will be analyzed for the presence of total petroleum hydrocarbons calculated as gasoline, benzene, toluene, ethylbenzene, and xylenes (BTEX compounds) using modified EPA Methods 8015 and 8020. Groundwater samples will also be analyzed for alkalinity, sulfate, ferrous iron, and nitrates. Additionally, a minimum of two soil samples from the wellbores will be analyzed for Fractional Organic Compounds according to the Walkley-Black Procedure, and physical parameters of the soil will be measured including bulk density, porosity, and water content. All analyses will be performed by a California State-certified laboratory.