



**Chevron**

May 7, 1993

**Chevron U.S.A. Products Company**  
2410 Camino Ramon  
San Ramon, CA 94583

**Marketing Department**  
Phone 510 842 9500

Ms. Juliet Shin  
Alameda County Health Care Services  
Department of Environmental Health  
80 Swan Way, Room 200  
Oakland, CA 94621

**Re: Former Chevron Service Station #9-2384  
15526 Hesperian Boulevard, San Lorenzo, CA**

Dear Ms. Shin:

Enclosed is the Work Plan for Additional Site Assessment dated April 30, 1993, prepared by our consultant Groundwater Technology, Inc. for the above referenced site. The proposed work includes drilling three soil borings, installing ground water monitoring wells within the borings, and collecting and analyzing soil and ground water samples for total petroleum hydrocarbons as gasoline (TPH-G) and BTEX. This work will be done to define the extent of hydrocarbon impacts to ground water beneath the site in the crossgradient and downgradient directions.

As we discussed in our recent phone conversation, the selection of appropriate downgradient well locations at this site is limited. Three possible well locations were investigated at this time. It appears that a well located on the west side of Hesperian Boulevard would provide adequate downgradient delineation, however this is quite far from the former source location. Additionally, the former use of the property adjacent to this location is uncertain. Installing a well in a traffic lane or the median of Hesperian Boulevard is not feasible due to the high traffic volumes which consistently occupy the roadway. The optimum location for a downgradient well appears to be in the former planter area of the subject site.

This conclusion is based upon preliminary ground water modeling studies which indicate that the dissolved hydrocarbon plume is limited to the site boundary in the downgradient direction. However, laboratory analyses performed on a soil sample collected from boring 3 at a depth of 10.5 feet below grade during the initial site assessment performed in May of 1992 indicate that hydrocarbon constituents were present in low concentrations. This sample was collected near the capillary fringe and may indicate that hydrocarbons are present in low concentrations in the ground water near the property boundary.

At this time, it is felt that a well located closer to the former source area which exhibits low to non-detectable concentrations of dissolved hydrocarbons is better suited for delineation than a well located quite a distance from the former source area which consistently exhibits dissolved hydrocarbons constituents below method detection limits.

Chevron will proceed with this work plan following your review and formal concurrence. If you have any questions or comments, please do not hesitate to contact me at (510) 842-8134.

Page 2  
May 7, 1993  
Former SS#9-2384

Very truly yours,  
CHEVRON U.S.A. PRODUCTS COMPANY



Mark A. Miller  
Site Assessment and Remediation Engineer

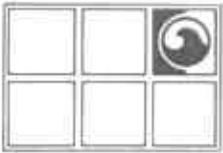
Enclosure

cc: Mr. Eddy So, RWQCB - Bay Area  
Ms. B.C. Owen  
File (9-2384 WP1)

Mr. Ken Williams  
Century 21 Korpi & Associates  
15200 Hesperian Blvd.  
San Leandro, CA 94570

Dr. Beryl Bearint  
19135 S.E. Coral Reef Lane  
Jupiter, FL 33458-1051

MAY 6 '93 J.M.N.



**GROUNDWATER  
TECHNOLOGY, INC.**

4057 Port Chicago Highway, Concord, CA 94520 (415) 671-2387

FAX: (415) 685-9148

**WORK PLAN FOR ADDITIONAL SITE ASSESSMENT  
CHEVRON SERVICE STATION NO. 9-2384  
15526 HESPERIAN BOULEVARD  
SAN LORENZO, CALIFORNIA**

020203215

April 30, 1993

Prepared for:  
Mr. Mark Miller  
Chevron U.S.A. Products Company  
2410 Camino Ramon  
San Ramon, California 94583-0804

**Groundwater Technology, Inc.**  
Written/Submitted by

*Tim Watchers*

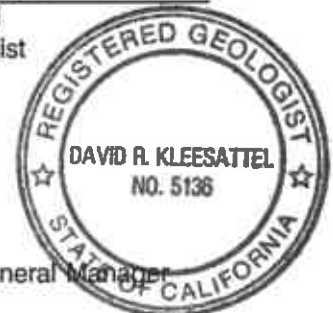
Tim Watchers  
Project Geologist

**Groundwater Technology, Inc.**  
Reviewed/Approved by

*David R. Kleesattel*

David R. Kleesattel  
Registered Geologist  
No. 5136

For:  
John S. Gaines  
Vice President, General Manager  
West Region



3215W013

**CONTENTS**

	<b>PAGE</b>
1.0 INTRODUCTION .....	1
2.0 SCOPE OF WORK .....	1
2.1 Site-Specific Health and Safety Plan, Background Review, and Permitting .....	1
2.2 Soil Borings, Sampling and Analyses, and Monitoring Well Installation .....	2
2.3 Well Development, Surveying, and Groundwater Monitoring .....	3
2.4 Well Purging, Water Sampling, and Analysis .....	3
2.5 Report Preparation .....	4
3.0 PROJECT SCHEDULE .....	4

**FIGURES**

- FIGURE 1 SITE LOCATION MAP
- FIGURE 2 PROPOSED MONITORING WELL LOCATIONS

**APPENDICES**

- APPENDIX A GROUNDWATER TECHNOLOGY, INC. STANDARD OPERATING PROCEDURES
- APPENDIX B WELL CONSTRUCTION SPECIFICATIONS

**WORK PLAN FOR ADDITIONAL SITE ASSESSMENT  
CHEVRON SERVICE STATION NO. 9-2384  
15526 HESPERIAN BOULEVARD  
SAN LORENZO, CALIFORNIA**

**APRIL 30, 1993**

## **1.0 INTRODUCTION**

---

Groundwater Technology, Inc. has prepared this Work Plan for Additional Site Assessment to investigate subsurface soil and groundwater conditions at Chevron Service Station No. 9-2384, located at 15526 Hesperian Boulevard in San Lorenzo, California (Figure 1).

## **2.0 SCOPE OF WORK**

---

The scope of work consists of installing three groundwater monitoring wells, collecting soil and groundwater samples, submitting the soil and groundwater samples for laboratory analyses, and preparing a summary report. The tasks required to meet these objectives are discussed below.

### **2.1 Site-Specific Health and Safety Plan, Background Review, and Permitting**

A site-specific Health and Safety Plan has been previously prepared by Groundwater Technology as required by the Occupational Health and Safety Administration Standard "Hazardous Waste Operations and Emergency Response" guidelines (29 CFR 1910.120). The Health and Safety Plan will be reviewed and signed by all Groundwater Technology personnel and subcontractors performing work at the site before field operations begin.

Groundwater Technology will review historical site information. This information will consist of Groundwater Technology reports and additional historical data provided by Chevron U.S.A. Products Company (Chevron). Monitoring well permit applications will be completed and submitted to Zone 7 Alameda County Flood Control and Conservation District. Encroachment permits will be obtained from the Alameda County Public Works Department.

## 2.2 Soil Borings, Sampling and Analyses, and Monitoring Well Installation

Groundwater Technology will supervise the drilling of three soil borings using a Mobile B-53 drilling rig equipped with 8-inch hollow-stem augers. The soil borings will be drilled to approximately 25 feet below grade or 10 feet below the water table. The water table is expected to be encountered at approximately 15 feet deep. To avoid introducing off-site or cross contamination, the hollow-stem augers will be steam cleaned before each boring, and all sampling equipment will be properly cleaned before sampling. It is assumed that the drilling will be completed in two days. Soil samples will be collected at 5-foot intervals and at notable lithologic changes using a split-spoon sampler lined with three 2-inch-diameter by 6-inch-long brass sample tubes. Groundwater Technology Standard Operating Procedures (SOPs) are included in Appendix A. Each soil sample will be screened for volatile organic compounds using a photo-ionization detector (PID). The soil samples will be logged using the Unified Soil Classification System by a Groundwater Technology field geologist working under the supervision of a California Registered Geologist. One sample from every 5-foot interval will be sealed with aluminum foil, capped with plastic caps, taped, labeled, and placed on ice in an insulated container. The soil samples will be transported to a California-certified laboratory under chain-of-custody protocol. Soil generated through drilling activities will be placed on and covered with plastic sheets. After characterization, the soil will be transported to a licensed disposal facility by a licensed transportation company.

The two soil samples from each boring producing the highest response on the PID will be submitted for chemical analysis. Within 14 days of the collection date, each sample will be analyzed by a California-certified laboratory for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and total petroleum hydrocarbons-as-gasoline (TPH-G) using Environmental Protection Agency (EPA) Methods 5030/8020/8015. One composite soil sample from the drill cuttings will be analyzed for BTEX and TPH-G to characterize the cuttings for disposal.

Groundwater Technology personnel will install a groundwater monitoring well in each of the soil borings (Figure 2). The well will be constructed of 2-inch-diameter Schedule 40 polyvinylchloride (PVC) casing with flush threads and 0.020-inch-slot well screen. The well screen for the monitoring wells will be installed approximately 5 feet above and 10 feet below the current water table to permit entry of separate-phase hydrocarbons, if present, and to allow for seasonal fluctuation of the water table. A sand filter will be placed around the well screen to a maximum height of 2 feet above the

top of the screen. Each well will be sealed to grade with 1 foot of bentonite followed by a neat-cement grout containing 95 pounds Portland Type I/II cement to 5 gallons of clean water. Each wellhead will be protected by a watertight locking cap and a road box. A typical groundwater monitoring well construction diagram is presented in Appendix B.

If an aquitard greater than 5 feet thick is observed below the water table in the monitoring well boring, the boring will be sealed to the top of the aquitard with neat cement using a tremie pipe before setting the monitoring well.

### **2.3 Well Development, Surveying, and Groundwater Monitoring**

Approximately 48 hours after installation, the monitoring wells will be developed by hand bailing to remove fine-grain sediments from the well and filter pack. Water from the development process will be transported by Groundwater Technology to the Chevron Terminal in Richmond, California for recycling.

Approximately three days after development, the water table will be monitored to measure static groundwater levels and the thickness of separate-phase hydrocarbons, if present. The water-table levels will be measured using an ORS Environmental Equipment INTERFACE PROBE™ Well Monitoring System, which consists of a dual optical sensor and electrical conductivity probe that distinguishes between water and petroleum products. The top of the casing of each well installed during the assessment will be surveyed relative to an established benchmark by a licensed surveyor. The survey data will be used with the depth-to-water measurements to calculate water elevation in the monitoring wells and to estimate the local groundwater flow direction and gradient.

### **2.4 Well Purging, Water Sampling, and Analysis**

After groundwater monitoring, 4 to 10 well-casing volumes of water will be removed from each well before sampling. The field technician will maintain a log that includes observations and measurements of pH, temperature, and conductivity values for the water purged. Groundwater Technology personnel will collect groundwater samples from the three wells installed during the additional site assessment. Each water sample will be analyzed for BTEX and TPH-G using EPA Methods 5030/8020/8015. The groundwater monitoring and sampling activities will be conducted

according to Groundwater Technology's SOPs (Appendix A). Purge water from the monitoring wells will be transported by Groundwater Technology to the Chevron Terminal in Richmond, California for recycling.

## 2.5 Report Preparation

Groundwater Technology will prepare an assessment report summarizing the data collected. The report will include descriptions of methods used, laboratory results, and site-specific maps.

## 3.0 PROJECT SCHEDULE

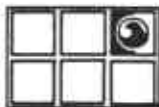
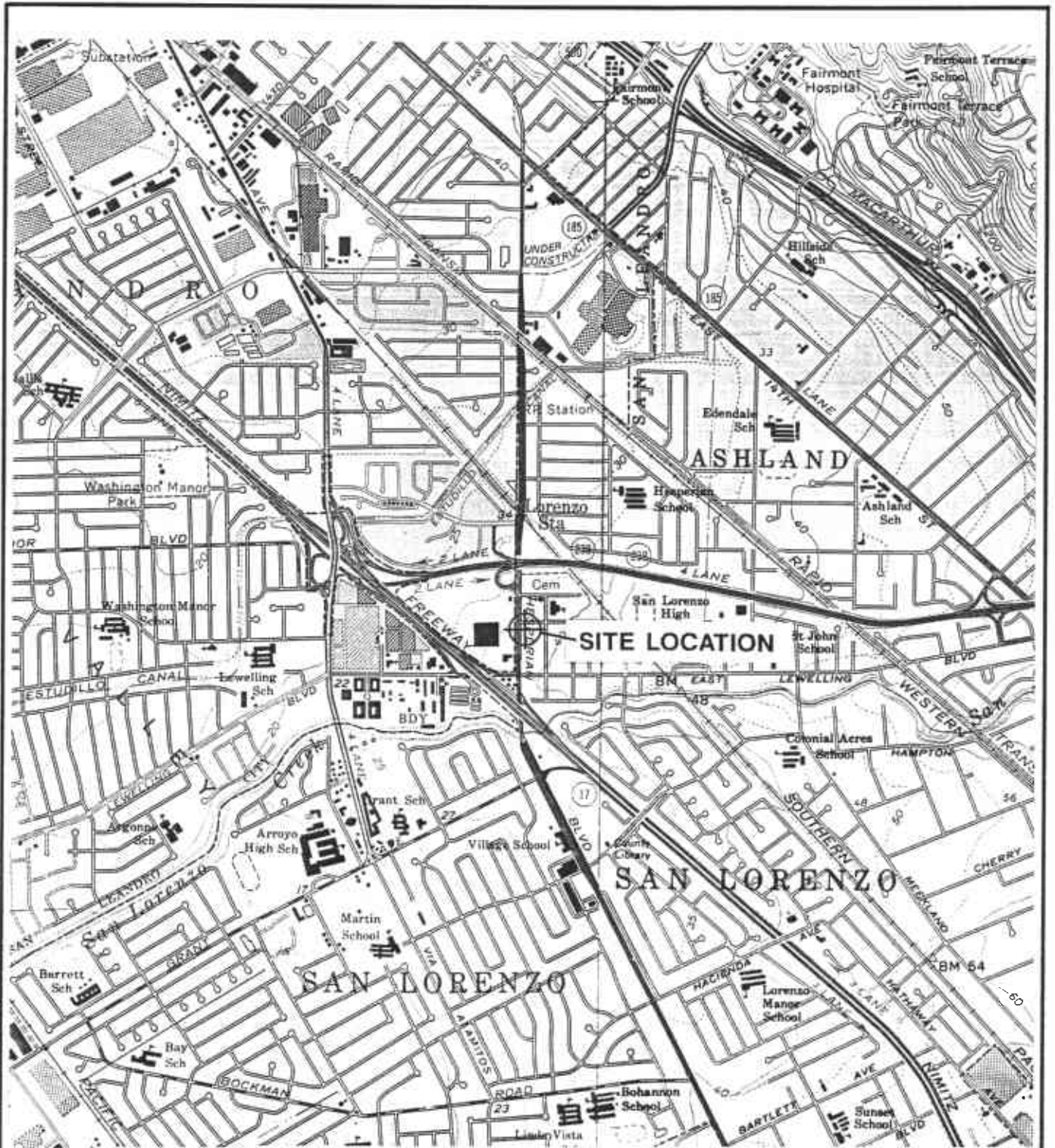
---

Groundwater Technology is prepared to begin work on this project immediately after approval by Chevron and the Alameda County Health Care Services Agency. Groundwater Technology estimates the project will be completed approximately three weeks after receiving data from the laboratory.



**FIGURES**

- FIGURE 1      SITE LOCATION MAP  
FIGURE 2      PROPOSED MONITORING WELL LOCATIONS



**GROUNDWATER  
TECHNOLOGY**

4057 PORT CHICAGO HWY  
CONCORD, CA 94520  
(510) 671-2387



SCALE:

0 FEET 2000

**SITE LOCATION MAP**

CLIENT:

**CHEVRON U.S.A. PRODUCTS CO.  
SERVICE STATION No. 9-2384**

DATE:

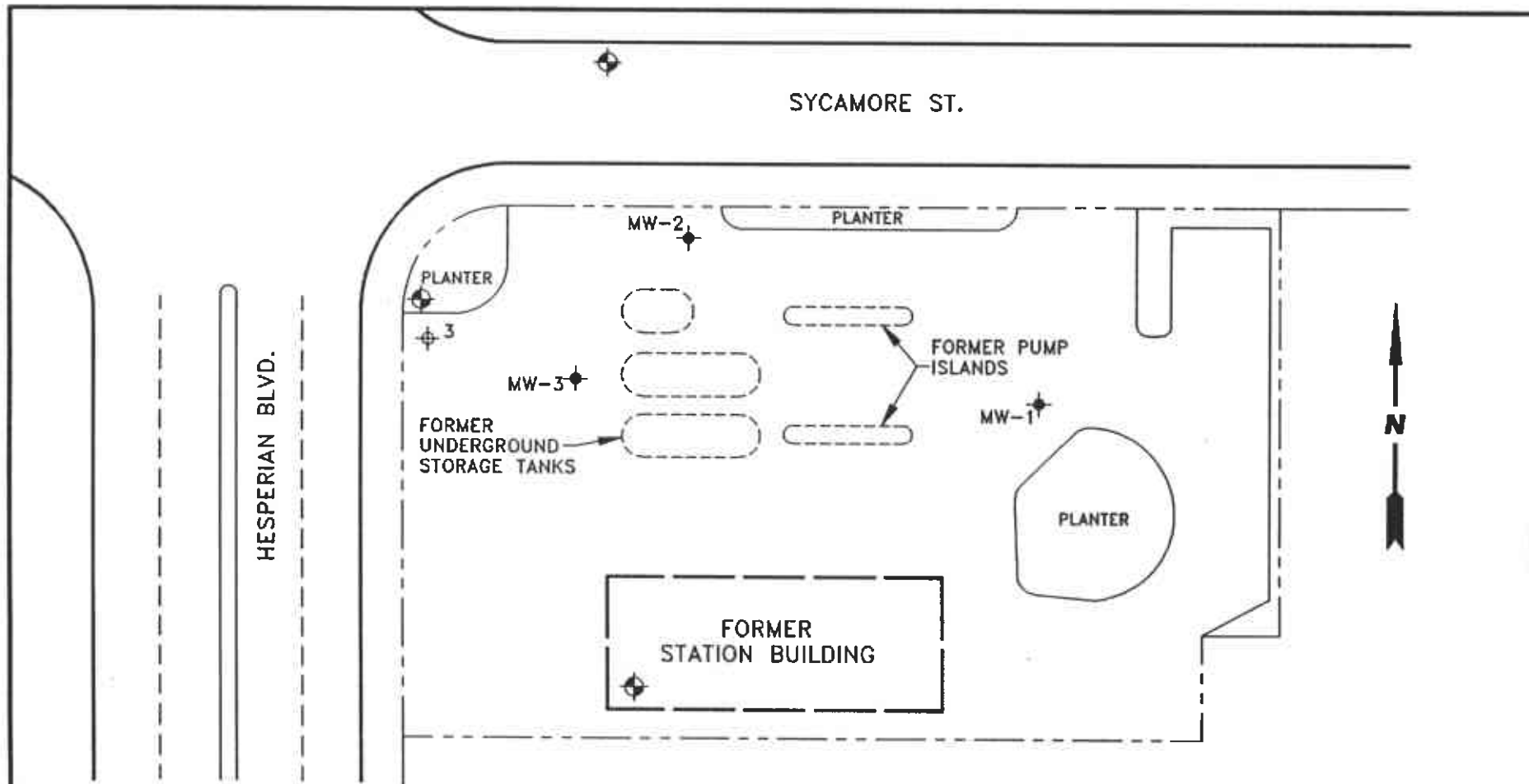
**5/13/92**

LOCATION:

**15526 HESPERIAN BLVD.  
SAN LORENZO, CALIFORNIA**

FIGURE:

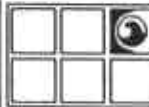
**1**



**LEGEND**

- ◆ MONITORING WELL
- ⊕ ABANDONED MONITORING WELL (FORMER LOCATION OF MW-3)
- ◆ PROPOSED MONITORING WELL LOCATION



 <b>GROUNDWATER TECHNOLOGY</b>				4057 PORT CHICAGO HWY CONCORD, CA 94520 (510) 671-2387		<b>PROPOSED MONITORING WELL LOCATIONS</b>	
CLIENT: <b>CHEVRON U.S.A. PRODUCTS CO.</b> SERVICE STATION No. 9-2384			LOCATION: <b>15526 HESPERIAN BLVD.</b> <b>SAN LORENZO, CALIFORNIA</b>		REV. NO.: 1	DATE: 4/28/93	
PW <i>SAW</i>	PE/RG <i>DRK</i>	DESIGNED TW	DETAILED CY	ACAD FILE: PWELLOC/SP692	PROJECT NO.: 020202746	FIGURE: <b>2</b>	

**APPENDIX A**

**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURES**

**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURE  
CONCERNING GROUNDWATER MONITORING  
SOP 8**

---

Groundwater monitoring of wells at the site shall be conducted using an ORS Environmental Equipment (ORS) INTERFACE PROBE™ and SURFACE SAMPLER™. The INTERFACE PROBE™ is a hand-held, battery-operated device for measuring depth to petroleum product and depth to water as measured from an established datum (*i.e.*, top of the well casing which has been surveyed). Separate-phase hydrocarbon (product) thickness is then calculated by subtracting the depth to product from the depth to water. In addition, water elevations are adjusted for the presence of fuel with the following calculation:

$$(\text{Product Thickness}) (0.8) + (\text{Water Elevation}) = \text{Corrected Water Elevation}$$

Note: The factor of 0.8 accounts for the density difference between water and petroleum hydrocarbons.

The INTERFACE PROBE™ consists of a dual-sensing probe which utilizes an optical liquid sensor and electrical conductivity to distinguish between water and petroleum products. A coated steel measuring tape transmits the sensor's signals to the reel assembly where an audible alarm sounds a continuous tone when the sensor is immersed in petroleum product and an oscillating tone when immersed in water. The INTERFACE PROBE™ is accurate to 1/16th inch.

A SURFACE SAMPLER™ shall be used for visual inspection of the groundwater to note sheens (difficult to detect with the INTERFACE PROBE™), odors, microbial action, etc.

The SURFACE SAMPLER™ used consists of a 12-inch-long case acrylic tube with a Delrin ball which closes onto a conical surface creating a seal as the sampler is pulled up. The sampler is calibrated in inches and centimeters for visual inspection of product thickness.

To reduce the potential for cross contamination between wells, the monitorings shall take place in order from the least to the most contaminated wells. Wells containing separate-phase hydrocarbons (free product) should be monitored last. Between each monitoring the equipment shall be washed with laboratory-grade detergent and double rinsed with distilled water.

**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURE  
CONCERNING WATER SAMPLING METHODOLOGY  
SOP 9**

---

Before water sampling, each well shall be purged by pumping a minimum of four well volumes or until the discharge water indicates stabilization of temperature conductivity and pH. If the well is evacuated before four well volumes are removed or stabilization is achieved, the sample should be taken when the water level in the well recovers to 80 percent of its initial level.

Retrieval of the water sample, sample handling and sample preservation shall be conducted according to Standard Operating Procedure 10 concerning "Sampling for Volatiles in Water." The sampling equipment used shall consist of a Teflon® and/or stainless steel samplers which meet U.S. Environmental Protection Agency (EPA) regulations. Glass vials with Teflon® lids should be used to store the collected samples.

To ensure sample integrity, each vial shall be filled with the sampled water in such a way that the water stands above the lip of the vial. The cap should then be quickly placed on the vial and tightened securely. The vial should then be checked to ensure that air bubbles are not present prior to labeling of the sample. Label information should include a sample identification number, job identification, date, time, type of analysis requested, and sampler's name. Chain-of-custody records shall be completed according to Standard Operating Procedure (SOP) 11 concerning chain of custody.

The vials should be immediately placed in high quality coolers for shipment to the laboratory. The coolers should be packed with sufficient ice or freezer packs to ensure that the samples are kept below 4° Celsius (C). To minimize sample degradation the prescribed analysis shall take place within seven days of sample collection unless specially prepared acidified vials are used.

To minimize the potential for cross contamination between wells, all the well development and water sampling equipment which contacts the groundwater shall be cleaned between each sampling. As a second precautionary measure, the wells shall be sampled in order of increasing contaminant concentrations (the least contaminated well first, the most contaminated well last) as established by previous analysis.

**STANDARD OPERATING PROCEDURE 10  
CONCERNING SAMPLING FOR VOLATILES IN WATER  
(DISSOLVED GASOLINE, SOLVENTS, ETC.)  
SOP 10**

---

1. Use only vials properly washed and baked.
2. Use clean sampling equipment. Scrub with Alconox or equivalent laboratory detergent and water followed by a thorough water rinse. Complete with a distilled water rinse.

Sampling equipment which has come into contact with liquid hydrocarbons (free product) should be regarded with suspicion. Such equipment should have tubing and cables replaced and all resilient parts washed with laboratory detergent solution as indicated above. Visible deposits may have to be removed with hexane. Solvent washing should be followed by detergent washing, as indicated above.

This procedure is valid for volatile organic analysis only. For extractable organics (for example, pesticides, or base neutrals for U.S. Environmental Protection Agency [EPA] Method 625 a final rinse with pesticide-grade isopropyl alcohol), followed by overnight or oven drying will be necessary.

3. Take duplicate samples. Mark on forms as a single sample with two containers to avoid duplication of analyses.
4. Take a site blank using distilled water or known uncontaminated source. This sample will be run at the discretion of the project manager.
5. Fill out labels and forms as much as possible ahead of time. Use an indelible marker.
6. Preservatives are required for some types of samples. Use specially prepared vials marked as indicated below, or use the appropriate field procedure (SOP 12 for acidification). Make note on forms that samples were preserved. Always have extra vials in case of problems. Samples for volatile analyses should be acidified below pH 2 upright. Eye protection, foot protection, and disposable vinyl gloves are required for handling. Samples designated for expedited service and analyzed within seven (7) days of sampling will be acceptable without preservation. Acid-causing burns. Glasses or goggles (not contact lenses) are necessary for protection of the eyes. Flush eyes with water for 15 minutes if contact occurs and seek medical attention. Rinse off hands frequently with water during handling.

For sampling chlorinated drinking water supplies for chlorinated volatiles, samples shall be preserved with sodium thiosulfate. Use vials labeled "CONTAINS THIOSULFATE." No particular cautions are necessary.

7. Fill vial to overflowing with water, avoiding turbulence and bubbling as much as possible. Water should stand above lip of vial.
8. Carefully, but quickly, slip cap onto vial. Avoid dropping the Teflon® septum from cap by not inverting cap until it is in contact with the vial. Disc should have Teflon® face toward the water. Also avoid touching white Teflon® face with dirty fingers.
9. Tighten cap securely, invert vial, and tap against hand to see there are not bubbles inside.

10. Label vial, using indelible ink, as follows:
- A. Sample I.D. No.
  - B. Job I.D. No.
  - C. Date and Time
  - D. Type of analysis required
  - E. Your name
11. Unless the fabric-type label is used, place Scotch™ tape over the label to preserve its integrity.
12. For chain-of-custody reasons, sample vial should be wrapped end-for-end with Scotch™ tape or evidence tape and signed with indelible ink where the end of the tape seals on itself. The septum needs to be covered.
13. Chill samples immediately. Samples to be stored should be kept at 4° Celsius (C) (30° Fahrenheit [F]). Samples received at the laboratory above 10°C (as measured at glass surface by a thermocouple probe), after overnight shipping, will be considered substandard, so use a high quality cooler with sufficient ice or freezer packs.
14. Fill out Chain-of-Custody Manifest and Analysis Request Form (see Chain of Custody Procedures, SOP 11).



**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURE  
CONCERNING CHAIN OF CUSTODY  
SOP 11**

---

1. Samples must be maintained under custody until shipped or delivered to the laboratory. The laboratory will then maintain custody. A sample is under custody if:
  - a) It is in your possession
  - b) It is in your view after being in your possession
  - c) You locked it up after it was in your possession
  - d) It is in a designated secure area
2. Custody of samples may be transferred from one person to another. Each transferrer and recipient must date, sign and note the time on the chain-of-custody form.
3. In shipping, the container must be sealed with tape, and bear the sender's signature across the area of bonding at the ends of the tape to prevent undetected tampering. Each sampling jar should be taped and signed as well. Scotch tape works well.
4. Write "sealed by" and sign in the "Remarks" box at the bottom of the form before sealing the box. Place form in a plastic bag and seal it inside the box.
5. The "REMARKS" section of the form is for documenting details such as:
  - a) Correlation of sample numbers if samples are split between labs.
  - b) QC numbers when lab is logging in the samples.
  - c) Sample temperature and condition when received by lab.
  - d) Preservation notation.
  - e) pH of samples when opened for analysis (if acidified).
  - f) Sampling observation or sampling problem.
6. The chain-of-custody form should be included inside the shipping container. A copy should be sent to the project manager.
7. When the samples are received by the lab, the chain-of-custody form will be dated, signed, and the time noted by a laboratory representative. The form will be retained in the laboratory files along with shipping bills and receipts .
8. At the time of receipt of samples by the laboratory, the shipping container will be inspected and the sealing signature will be checked. The samples will be inspected for condition and bubbles, and the temperature of a representative sample container will be measured externally by a thermocouple probe (held tightly between two samples) and recorded. The laboratory QC numbers will be placed on the labels, in the accession log, and on the chain-of-custody form. If samples are acidified, their pH will be measured by narrow range pH paper at the time of opening for analysis. All comments concerning procedures requiring handling of the samples will be dated and initialed on the form by the laboratory person performing the procedure. A copy of the completed chain-of-custody form with the comments on sample integrity will be returned to the sampler.

**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURE  
CONCERNING SOIL SAMPLING METHODOLOGY  
SOP 14**

---

1. Soil samples should be collected and preserved in accordance with Groundwater Technology Standard Operating Procedure (SOP 15) concerning Soil Sample Collection and Handling when Sampling for Volatile Organics. A hollow stem soil auger should be used to drill to the desired sampling depth. A standard 2 inch diameter split spoon sampler 18 inches in length shall be used to collect the samples. The samples are contained in 2 inch diameter by 6 inch long thin walled brass tube liners fitted into the split spoon sampler (three per sampler).
2. The split spoon sampler should be driven the full depth of the spoon into the soil by a 140 pound hammer. The spoon shall then be extracted from the borehole and the brass tube liners containing the soil sample removed from the sampler. The ends of the liner tubes should be immediately covered with aluminum foil, sealed with a teflon or plastic cap, and taped with duct tape. After being properly identified with sample data entered on a standard chain of custody form the samples shall be placed on dry ice (maintained below 4~C) and transported to the laboratory within 24 hours.
3. One of the three soil samples retrieved at each sample depth shall be analyzed in the field using a photoionization detector and/or explosimeter. The purpose of the field analysis is to provide a means to choose samples to be laboratory analyzed for hydrocarbon concentrations and to enable comparisons between the field and laboratory analyses. The soil sample shall be sealed in a plastic bag and allowed to equilibrate with the air surrounding the soil for approximately 10 minutes. One of the two field vapor instruments shall be used to quantify the amount of hydrocarbon released to the air from the soils. The data shall be recorded on the drill logs at the depth corresponding to the sample point.

**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURE  
CONCERNING SOIL SAMPLE COLLECTION AND  
HANDLING WHEN SAMPLING FOR VOLATILE ORGANICS  
SOP 15**

---

1. Use a sampling means which maintains the physical integrity of the samples. The project sampling protocol will designate a preferred sampling tool. A split spoon sampler with liners, or similar tube sampler which can be sealed, is best.
2. The samples should be sealed in the liner, with teflon plugs (The "California Sampler") or plastic caps.
3. For sending whole-core samples (above):
  - A. Seal ends of liner with teflon plugs or plastic caps, leaving no free air space inside.
  - B. Tape with duct tape.
  - C. Label the sample with the following information: sample identification, depth, date and time, project number and required analyses.
  - D. Place in plastic bag labeled with indelible marker. Use Well #, depth, date, and job #.
  - E. Place inside a second bag and place a labelling tag inside outer bag.
  - F. Enclose samples in a cooler with sufficient ice or dry ice to maintain samples at 4 degrees C during shipment.
  - G. Seal cooler with a lock, or tape with samplers signature so tampering can be detected.
  - H. Package cooler in a box with insulating material. Chain of custody forms can be placed in a plastic bag in this outer box.
  - I. If dry ice is used, a maximum of 5 pounds is allowed by Federal Express without special documents (documents are easy to obtain but are not necessary for under 5 pounds). Write "ORM-A dry ice", " \_\_\_\_\_ pounds, for research" on outside packaging and on regular airbill under classification. UPS does not accept dry ice.
  - J. Soil cores kept a 4 degrees C are only viable for up to 7 days when aromatic hydrocarbons are involved. The lab should prepare the samples in methanol once in the lab.
4. Good sampling practice would include preparing 1 out of 5 samples to be prepared in duplicates for analysis. These 4 out of 20 samples will be used for the following purposes:
  - A. One in every 20 samples should be analyzed as a field replicate to evaluate the precision of the sampling technique. A minimum of 1 sample per data set is suggested.
  - B. An additional 1 in 20 samples should be selected by sampler to be prepared in duplicate as alternative to Step (A). Choose a different soil type if available.

- C. The remaining 2 in 20 samples should be used by lab for spiking with reference materials for internal QC.

Other QC procedures can be specified at the project manager's discretion. See Table 3-2 (reference 2) attached.

5. Decontamination of equipment in the field requires a detergent wash, with a distilled water rinse.

#### REFERENCES

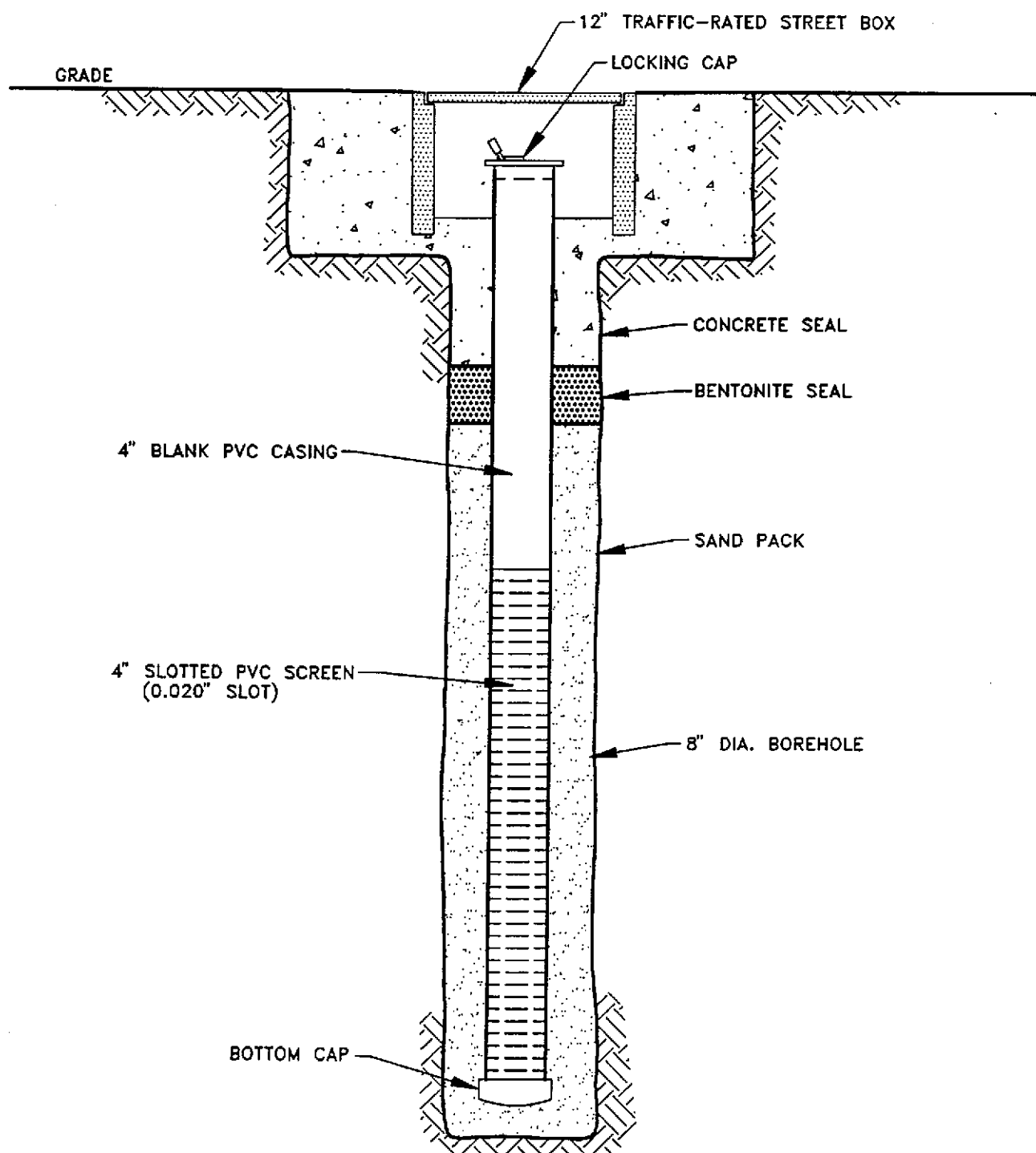
1. Soil Sampling Quality Assurance Users Guide, U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA 600/4-84-043, May 1984.
2. Preparation of Soil Sampling Protocol. Techniques and Strategies, U.S. EPA, Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA 600/4-83-020, August 1983 (PB83-206979).
3. Test Methods for Evaluating Solid Waste, U.S. EPA, Office of Solid Waste and Emergency Response, Washington, D.C., SW 846, July 1982.

**GROUNDWATER TECHNOLOGY, INC.  
STANDARD OPERATING PROCEDURE  
CONCERNING OPERATION/CALIBRATION OF  
PHOTOIONIZATION ANALYZER  
SOP 19**

---

1. The Thermo Environmental Instruments Inc. Model 580B OVM Photoionization Analyzer shall be used, using photoionization, to measure the concentration of trace gases over a range of less than 1 ppm to 2,000 ppm. The specific instrument used for investigations related to hydrocarbon contamination should be calibrated for direct readings in parts per million (ppm) volume/volume of isobutylene. Specifics of the detection principle/theory and functions of various components can be found in the manufactures instruction manual.
2. To assure optimum performance, the photoionization analyzer should be calibrated with a standard gas mixture of known concentration from a pressurized container. A daily procedure for calibration involves bringing the probe and readout close to the calibration gas, cracking the valve on the tank and checking the instrument reading. This provides a useful spot check for the instrument.
3. A procedure conducted weekly for more accurate calibration of the instrument from a pressurized container is to connect one side of a "T" to the pressurized container of calibration gas, another side of the "T" to a rotameter and the third side of the "T" directly to the 8" extension to the photoionization probe (see Figure 2). Crack the valve of the pressurized container until a slight flow is indicated on the rotameter. The instrument draws in the volume of sample required for detection, and the flow in the rotameter indicates an excess of sample. Now adjust the span pot so that the instrument reads the exact value of the calibration gas. (If the instrument span setting is changed, the instrument should be turned back to the standby position and the electronic zero should be readjusted, if necessary).

**APPENDIX B**  
**WELL CONSTRUCTION SPECIFICATIONS**



NOT TO SCALE

**TYPICAL MONITORING WELL CONSTRUCTION**