Chevron

Chevron U.S.A. Products Company
2410 Camino Ramon, San Ramon, California • Phone (510) 842-9500
Mail Address: P.O. Box 5004, San Ramon, CA 94583-0804

Marketing Department

January 31, 1992

Mr. Scott Seery
Alameda County Health Care Services
Department of Environmental Health
Hazardous Materials Program
80 Swan Way, Room 200
Oakland, CA 94621

Re: Chevron Service Station #9-6991
2920 Castro Valley Blvd., Castro Valley

Dear Mr. Seery:

Enclosed we are forwarding the Work Plan - Additional Site Assessment dated January 31, 1992, prepared by our consultant Groundwater Technology, Inc. for the above referenced site outlining additional work steps we propose to take at the above referenced site. The scope of work proposes to install two (2) off-site ground water monitor wells to delineate the extent of the petroleum hydrocarbon plume and one (1) additional on-site ground water monitor well as part of a pilot study to evaluate the effectiveness of the previously installed 3/4-inch diameter monitor wells. The on-site well will be installed in close proximity to one of the existing 3/4-inch wells. The data collected will be evaluated to assess the validity of ground water level and analytical data collected from the 3/4-inch wells in comparison to the conventional 2-inch wells. The comparison of the data will be presented in the report documenting the additional site assessment work.

We would appreciate your review and formal concurrence prior to implementation of this work plan.

If you have any questions or comments, please do not hesitate to contact me at (510) 842-9581.

Very truly yours,
CHEVRON U.S.A. INC.

Nancy Vukelich
Environmental Engineer

Enclosure

cc: Mr. Eddy So, RWQCB-Bay Area
Ms. Sandra Lindsey, GTI-Concord
Mr. W.T. Scudder
File (9-6991W1)

Reviewed
12/24/92
SCS

GROUNDWATER TECHNOLOGY, INC.

4057 Port Chicago Highway, Concord, CA 94520 (415) 671-2387
FAX: (415) 685-9148

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WORK PLAN
ADDITIONAL SITE ASSESSMENT
CHEVRON SERVICE STATION NO. 9-6991
2920 CASTRO VALLEY BOULEVARD
CASTRO VALLEY, CALIFORNIA

1/31/92

JANUARY 31, 1992

Prepared for:

Ms. Nancy Vukelich
Chevron U.S.A. Inc.
P.O. Box 5004
San Ramon, California

R1038A3.GLM
(030522)

GROUNDWATER TECHNOLOGY, INC.

4057 Port Chicago Highway, Concord, CA 94520 (415) 671-2387
FAX: (415) 685-9148

WORK PLAN
ADDITIONAL SITE ASSESSMENT
CHEVRON SERVICE STATION NO. 9-6991
2920 CASTRO VALLEY BOULEVARD
CASTRO VALLEY, CALIFORNIA

JANUARY 31, 1992

Prepared for:

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P.O. Box 5004
San Ramon, CA 94583

Prepared by:

GROUNDWATER TECHNOLOGY, INC.
4057 Port Chicago Highway
Concord, CA 94520

Gregory A. Mischel
Project Geologist

Sandra L. Lindsey
Project Manager

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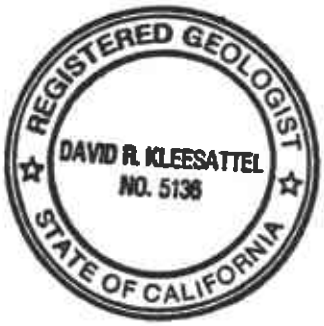
No. 5136



R1038A3.GLM
(030522)

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WORK PLAN
ADDITIONAL SITE ASSESSMENT
CHEVRON SERVICE STATION NO. 9-6991
2920 CASTRO VALLEY BOULEVARD
CASTRO VALLEY, CALIFORNIA

JANUARY 31, 1992

1.0 INTRODUCTION

Groundwater Technology, Inc. has been retained by Chevron U.S.A. Inc. to conduct an additional subsurface assessment at the Chevron Service Station No. 9-6991, located at 2920 Castro Valley Boulevard in Castro Valley, California (Figure 1, Site Location Map). Three 2-inch-diameter monitoring wells will be installed to further assess the possible lateral and vertical extent of adsorbed and dissolved hydrocarbons in the soil and groundwater beneath the site. Data collected from the 2-inch-diameter monitoring wells will be used to verify data collected from the 3/4-inch-diameter groundwater monitoring wells previously installed at this site. This Work Plan contains the details of the proposed scope of work.

1.1 Objective

The objective of the proposed work is to determine the extent of gasoline and diesel fuel hydrocarbons in the soil and groundwater beneath this site. This will be accomplished by installing a groundwater monitoring well in one on-site soil boring and two off-site soil borings, collecting and analyzing soil and groundwater samples, and collecting depth to groundwater data. An additional objective is to evaluate the validity of data collected from a 3/4-inch-diameter monitoring well by comparing data collected from an adjacent 2-inch-diameter monitoring well.

2.0 SCOPE OF WORK

The following work steps will be completed as part of this assessment:

- Secure the required permits from The Alameda County Flood Control and Water Conservation District, Zone 7.
- Secure necessary encroachment permits for off-site wells.
- Notify Underground Service Alert for utility locations.
- Drill one on-site and two off-site soil borings. Collect soil samples for laboratory analyses.
- Submit the soil samples to a California-certified laborabory for analyses of benzene, toluene, ethylbenzene, xylenes (BTEX), TPH-as-gasoline, and TPH-as-diesel.
- Install a 2-inch-diameter groundwater monitoring well within each of the soil borings.
- Professionally survey the elevations of the wellheads and collect groundwater level data to determine the hydraulic gradient. Proceed with monitoring and sampling on a monthly basis for one quarter, then monitor and sample quarterly thereafter.
  monthly for 12 consec. months
- Develop the wells and collect groundwater samples for laboratory analyses.
- Submit the groundwater samples to a California-certified laboratory for chemical analyses of BTEX, TPH-as-gasoline, and TPH-as-diesel.
- Prepare a technical report presenting the results and findings of this additional assessment. This report will present data collected from the 2-inch-diameter wells and 3/4-inch-diameter wells separately. A comparison of the data sets will be presented to assess the validity of the data collected from the 3/4-inch-diameter wells.

2.1 Permitting

Groundwater Technology will obtain monitoring well installation permits from the Alameda County Flood Control and Water Conservation District. Encroachment permits will also be obtained to install the off-site monitoring wells. The proposed well locations will be marked with white paint and, as required by state law, Underground Service Alert will be contacted before field operations start.

2.2 Soil Boring and Monitoring Well Installation

Three soil borings will be drilled in the approximate locations shown on Figure 2. One of the three borings will be located on site near existing monitoring well MW-3. One soil boring will be drilled on Anita Avenue to assess the downgradient and crossgradient subsurface conditions. One soil boring will be drilled on Castro Valley Boulevard to assess the downgradient extent of the plume. The borings will be drilled using a truck-mounted drill rig equipped with 8-inch-diameter hollow-stem augers to a depth of approximately 20 feet below grade. During drilling, soil samples from each borehole will be logged by a field geologist who will classify sediments encountered according to the unified soil classification system. Undisturbed soil samples will be collected at 5-foot intervals for visual inspection and laboratory analysis. Soil sampling will be accomplished using Groundwater Technology standard operating procedures (SOPs). Copies of all applicable SOPs are attached in Appendix A. The soil samples will be analyzed for total petroleum hydrocarbons (TPH)-as-gasoline, TPH-diesel, benzene, toluene, ethylbenzene, and total xylenes (BTEX) at a California-certified analytical laboratory using U. S. Environmental Protection Agency (EPA) Methods 8015/8020.

All equipment used for drilling will be high-temperature pressure washed between boreholes to minimize the risk of cross-contamination between wells. Additionally, all soils produced as a result of drilling will be contained in Department of Transportation (DOT)-approved containers for disposal at an appropriate facility. Rinsate from equipment cleaning will also be placed in appropriate containers for proper disposal.

A groundwater monitoring well will be installed in each borehole. Each monitoring well will be constructed of 15 feet of 2-inch-diameter polyvinyl chloride (PVC) well screen with 0.02-inch slots. Blank 2-inch-diameter casing will be installed over the well screen to surface grade. A filter pack comprised of No. 2/12 Lapis Lustre sand will be set in the annular space around the well screen to approximately 1 foot above the top of the screen interval. A seal of hydrated, powdered bentonite will be set above the filter pack and the well will be sealed to grade surface with neat cement grout. The wellhead will be outfitted with a water-tight expansion cap and locked for security. The well construction will be similar to that presented in the Groundwater Technology SOP (Appendix A).

2.3 Site Survey

Groundwater Technology will coordinate the performance of a professional survey of the wellhead elevations and locations for the three monitoring wells. This will be scheduled to coincide with well development and sampling activities.

2.4 Well Monitoring, Development, and Sampling

Concurrent with the site survey, Groundwater Technology will develop the wells. Each well will be developed by alternately surging and extracting groundwater to remove fine sediments from the well and to increase hydraulic communication with the aquifer. Approximately 24 hours following development, each monitoring well will be monitored for depth to water, purged of four well volumes of water, and sampled according to the Groundwater Technology SOPs (Appendix A). Water samples from each well will be analyzed for TPH-as-gasoline, TPH-as-diesel, and BTEX, using EPA Methods 8015/8020 at a California-certified laboratory. The development and purge water produced will be contained as previously described. A Chevron representative will be notified so the disposal of the water can be arranged.

2.5 Report Preparation

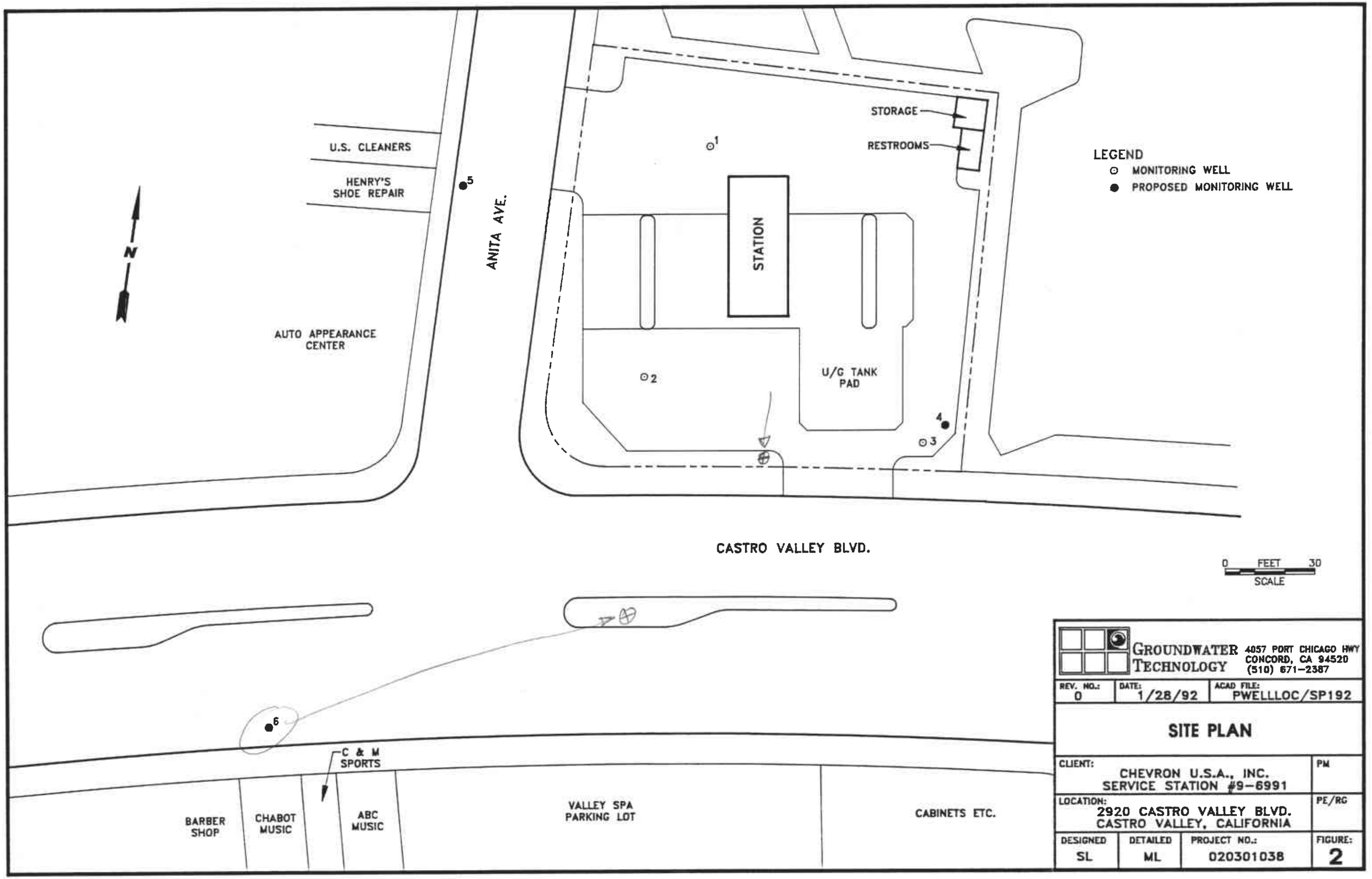
Groundwater Technology will prepare a technical report presenting the results and findings of this assessment. In addition to describing the site background, project scope of work, subsurface conditions, and a comparison of data from the 3/4-inch wells and the 2-inch wells, the report will include the following:

- Site Location Map and Site Plan
- Groundwater Gradient Map
- Map of Dissolved Petroleum Hydrocarbons, if necessary
- Table of Wellhead and Groundwater Elevations
- Table of Groundwater Analytical Results
- Table of Soil Analytical Results
- Geologic Cross-Section
- Well Logs
- Laboratory Reports

This concludes Groundwater Technology's Work Plan for Additional Site Assessment for Chevron Service Station No. 9-6991 at 2920 Castro Valley Boulevard in Castro Valley, California.

FIGURES

GROUNDWATER TECHNOLOGY 4057 PORT CHICAGO HWY CONCORD, CA 94520 (510) 671-2387	N	SCALE: 0 FEET 2000	**SITE LOCATION MAP**
		CLIENT: CHEVRON U.S.A., INC. SERVICE STATION #9-6991	DATE: 1/29/92
		LOCATION: 2920 CASTRO VALLEY BLVD. CASTRO VALLEY, CALIFORNIA	FIGURE: 1



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

REV. NO.:	DATE:	ACAD FILE:
0	1/28/92	PWELLLOC/SP192

SITE PLAN

CLIENT: CHEVRON U.S.A., INC.
SERVICE STATION #9-6991

PM

LOCATION: 2920 CASTRO VALLEY BLVD.
CASTRO VALLEY, CALIFORNIA

PE/RG

DESIGNED	DETAILED	PROJECT NO.:	FIGURE:
SL	ML	020301038	2

APPENDIX A

GROUNDWATER TECHNOLOGY
STANDARD OPERATION 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:

(Product Thickness) (0.8) + (Water Elevation)
= 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 1/16-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

Prior to 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 in accordance with GTEL Environmental Laboratories Standard Operating Procedure (GTEL SOP 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 Manifest forms shall be completed in accordance with GTEL Environmental Laboratories, Inc. Standard Operating Procedures (GTEL 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). Samples which are received at GTEL above 10° C will be considered substandard. 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 analyses.

GTEL ENVIRONMENTAL LABORATORIES, INC. (GTEL)
STANDARD OPERATING PROCEDURE 10
CONCERNING SAMPLING FOR VOLATILES IN WATER
(DISSOLVED GASOLINE, SOLVENTS, ETC.)
SOP 10

1. Use only vials properly washed and baked available from GTEL Environmental Laboratories, Inc. (GTEL) or I-Chem.

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 for GTEL. 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 from GTEL, 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^{R} septum from cap by not inverting cap until it is in contact with the vial. Disc should have Teflon^{R} face toward the water. Also avoid touching white Teflon^{R} face with dirty fingers.

9. Tighten cap securely, invert vial and tap against hand to see there are no 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. (Coolers are available from GTEL).

14. Fill out Chain-of-Custody Manifest and Analysis Request Form. (See Chain-of-Custody Procedures, SOP 11).

SOP 11

STANDARD OPERATING PROCEDURE
CONCERNING CHAIN OF CUSTODY

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 you view after being in your possession

    c) You locked it up in your possession

    d) It is in a designated secure area

2. Custody of samples may be transferred from one person to the next. Each transferee 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, bearing the sender's signature across the area of bonding at the ends of the tape in order 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 up the box. Place form in a plastic bag and seal it inside the box.

5. The "REMARKS" section in the upper right part 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 a note of the time made by a laboratory representative. The form along with shipping bills and receipts will be retained in the laboratory files.

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 samples integrity will be returned to the sampler.

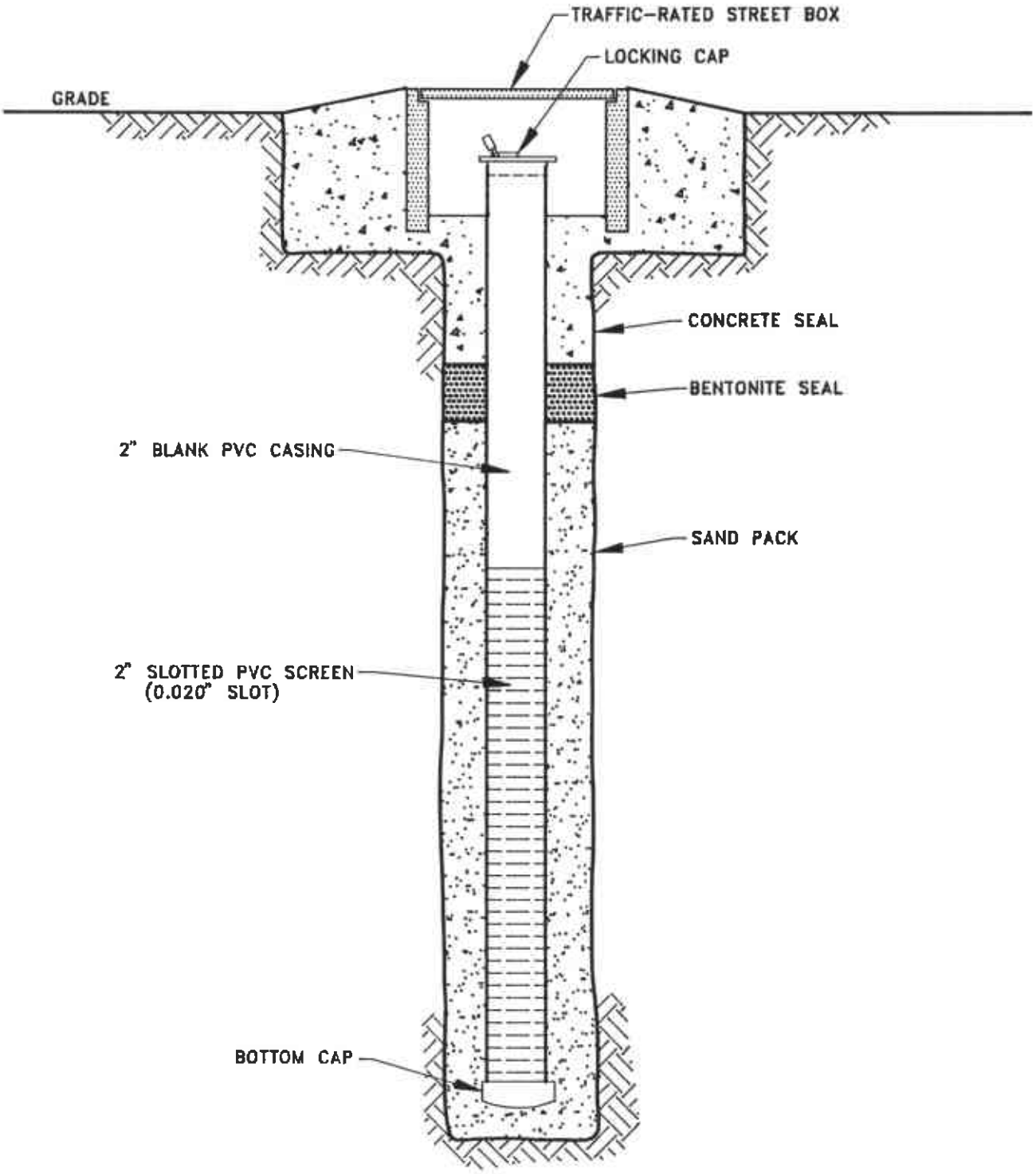
GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING MONITORING WELL INSTALLATION
SOP 13

The boreholes for the monitoring wells shall be drilled using a truck-mounted, hollow-stem auger drill rig. The outside diameter (O.D.) of the auger should be a minimum of 8 inches when installing 4-inch well screen. The hollow-stem auger provides minimal interruption of drilling while at the same time permitting soil sampling at specific intervals. Soil samples can be taken at desired depths by hammering a conventional split-barrel sampler containing pre-cleaned 2-inch brass sample tubes.

The construction details of the monitoring wells to be drilled at the site are graphically depicted in the attached figure titled "Typical Detail of Monitoring Well Construction" (See Figure 1). The wells should be constructed of 4-inch PVC .020-inch machine-slotted screen and blank casing. The screened portion of the well will extend 5-feet above and 10-feet below the present water table. An appropriate sand pack, as determined by grain-size analyses, shall be placed in the annular space between the casing and drilled hole to inhibit silt build up around the well. An annular seal installed above the sand pack should consist of bentonite pellets overlain by neat cement or cement grout to the surface. The wellhead shall be protected below grade within a traffic-rated street box. Each well shall have a permanently attached identification plate containing the following information: (1) Well Number, (2) Wellhead Elevation, (3) Depth of Well, (4) Screened Interval.

Subsequent to installation the wells shall be developed to remove silts and improve well performance. The well development shall be conducted by air lifting the water within the well until groundwater pumped from the wells is silt free.

To assure that cross contamination does not occur between the drilling and development of successive wells all equipment contacting subsurface soils or groundwater shall be steam cleaned. The steam-cleaned equipment should include, but not be limited to the following: (1) Drilling Augers, (2) Split Barrel Sampler (3) Groundwater Monitoring and Sampling Equipment, (4) Well Development Piping and Sparging Equipment.



NOT TO SCALE

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

TYPICAL MONITORING WELL CONSTRUCTION

CLIENT:	LOCATION:	REV. NO.:	DATE:
CHEVRON U.S.A., INC. SERVICE STATION #9-6991	2920 CASTRO VALLEY BLVD. CASTRO VALLEY, CALIFORNIA	0	1/30/92

PM	PE/RG	DESIGNED	DETAILED	ACAD FILE:	PROJECT NO.:	FIGURE:
			ML	MONWELL	020301038	3

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

Soil samples should be collected and preserved in accordance with GTEL Environmental Laboratories, Inc. (GTEL) Standard Operating Procedure 15 (GTEL SOP 15) concerning Soil Sample Collection and Handling when Sampling for Volatile Organics. A hollow-stem soil auger should be used to drill 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).

The split-spoon sampler should be driven the full depth of the spoon into the soil using a 140-pound hammer. The spoon shall then be extracted form 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 then 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.

One of the three soil samples retrieved at each sample depth shall be analyzed in the field using a photo-ionization detector and/or explosionmeter. The purpose of the field analysis is to provide a means to select samples to be laboratory analyzed for hydrocarbon concentrations and to enable comparisons between the field analyses and the laboratory analyses. The soil sample shall be sealed in vaporization of volatile hydrocarbons from the soil. 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

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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. At the discretion of the project manager, the samples should be either:

   A. Sealed in liner with Teflon® plugs (The "California Sampler") or

   B. Field-prepped for sample analysis.

   Projects using method "A" will incur a separate sample preparation charge of $10.00 per sample in the laboratory. For method "B", prepared and pre-weighed vials, and sample-coring syringes must be ordered at least two weeks ahead of time from the laboratory before sampling. (Vials are free if samples will be sent to GTEL Environmental Laboratories, Inc. (GTEL).

3. For sending whole-core samples (2A above):

   A. Seal ends of liner with Teflon® tape or aluminum foil leaving no free air space inside.

   B. Tape with duct tape.

   C. Place in plastic bag labeled with indelible marker. Use well number, depth, date, and job number.

   D. Place inside a second bag and place a labelling tag inside outer bag.

   E. Enclose samples in a cooler with sufficient ice or dry ice to maintain samples at 4 Celsius (C) during shipment.

   F. Seal cooler with a lock or tape with sampler's signature so tampering can be detected.

   G. Package cooler in a box with insulating material. Chain-of-Custody Manifest forms can be placed in a plastic bag in this outer box.

   H. If dry ice is used, a maximum of five pounds is allowed by Federal Express without special documents (documents are easy to obtain, but just not necessary for under five pounds). Write "ORM-A dry ice, UN-1845,____ pounds, on the package. On the airbill under "Delivery and Special Handling" check item 6, (dry ice). Lastly, place the number of pounds of dry ice in the blank provided in item 6. UPS does not accept dry ice in air freight.

I. Make a necessary supplies list before going into the field.

J. Soil cores kept at 4° C are only viable for up to 7 days when aromatic hydrocarbons are involved. The lab will prepare them in methanol following procedures above once in the lab, but it is necessary to call ahead of time to schedule personnel.

4. For field-prepping (Step 2B above):

A. Obtain prepared sample containers from the laboratory. Order enough for number of samples intended and add 50 percent. This should be sufficient for Quality Assurance (QA) requirements (below), breakage, and additional samples taken at the discretion of sampler.

B. Organize containers consecutively, they are all numbered and pre-weighed. Make a necessary supplies list before going into the field.

C. For a 6-inch liner section retrieved from the spoon sampler, spread a 12-inch square piece of broiler (heavy) aluminum foil and slice it lengthwise with a clean stainless-steel spatula.

D. Immediately sample with a coring syringe with plunger removed. Poke tube into mid-section of core (into undisturbed soil) to capture a 1/2-to 1-inch plug.

CAUTION: WORK ONLY IN WELL VENTILATED AREA. DO NOT BREATHE METHANOL VAPOR. IT IS TOXIC. SEE MSDS ATTACHED.

E. Immediately transfer plug to the sample vial with methanol by using plunger. Clean around lip of vial to remove soil with clean laboratory paper toweling and seal septum onto the vial with lid, Teflon® -side (shiny) toward the sample. Shake sample enough to break it up so that whole sample is immersed in methanol. The rapid progression of steps indicated here is necessary to prevent loss of volatiles from the soil. Do not leave vials unopened for any extended period - the methanol evaporates quickly. Grit left on threads of vial can cause vial to break.

F. (If required, see 5 below). Take a duplicate sample from the other half directly across from the first sample, or wherever undisturbed, yet representative soil occurs.

G. Label vial with legible information as follows:

1. Job name or number.
2. Date.
3. Time.
4. Depth and well number.
5. Sampler's initials.

H. Tape vial across septum with Scotch ™ tape and around cap and sign on the tape with indelible ink to prevent tampering.

I. Wrap up a representative section of the core equivalent in volume to cube three centimeters on a side in the aluminum foil square, discarding the rest appropriately. Seal in Saran wrap. This section is for dry-weight determination. Close it in plastic bag with a tag or write on the bag with an indelible marker. These samples go into a separate cooler or box and not with the vials. The cooler for dry-weight samples need not be iced, but overnight delivery is requested.

J. Discard plastic-coring syringe, clean the spatula, and get clean equipment ready for next sample.

K. Ice the sample vials immediately and keep them iced through shipment.

L. Fill out Chain-of-Custody Manifest form. SOP 11 gives major details. Make sure sample requests is for proper analysis type.

M. Shipping of hazardous materials (methanol) requires special documents from Federal Express and UPS. The following labels must be placed on the outside of package and on documents when appropriate:

1. Flammable liquid label (some will come from lab with the vials).

2. "UN1230 methyl alcohol".

3. For UPS, a "Hazardous Material" label.

N. Ship overnight delivery to the lab. If dry ice is available, up to 5 pounds per package can be sent via Federal Express by simply writing "ORM-A dry ice, _____ pounds, for research" on outside of package and on shipping document. UPS does not accept dry-ice shipments.

5. Good sampling practice would include one out of five samples being prepared in duplicates for analysis. These four out of twenty samples will be for the following purposes:

A. One in every twenty samples should be analyzed as a field replicate to evaluate the precision of the sampling technique. A minimum of one sample per data set is suggested.

B. An additional one in twenty 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 lab does spiking with reference materials for their internal Quality Control (QC) so in addition, a minimum of two in twenty samples need to be prepared in duplicate.

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

7. Decontamination of equipment in the field requires a detergent wash, a water rinse, and spectrographic-quality acetone rinse followed by distilled water.

REFERENCES

1. Soil Sampling Quality Assurance Users Guide, USEPA Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA 600/4-84-043, May 1984.

2. Preparation of Soil Sampling Protocol. Techniques and Strategies, USEPA, Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA 600/4-83-020, August 1983 (PB83-206979).

3. Test Methods for Evaluating Solid Waste, USEPA, Office of Solid Waste and Emergency Response, Washington, D.C., SW 846, July 1982.