GeoStrategies Inc.

SITE UPDATE

Chevron Service Station No. 4587
609 Oak Street
Oakland, California

719102-7

March 11, 1991

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545

(415) 352-4800

March 11, 1991

Gettler-Ryan Inc.
2150 West Winton Avenue
Hayward, California 94545

Attn: Mr. Jeff Monroe

Re: SITE UPDATE
Chevron Service Station No. 4587
609 Oak Street
Oakland, California

Gentlemen:

This Site Update report by GeoStrategies Inc. (GSI) summarizes the ground-water monitoring well installation and soil sampling performed at the above referenced location (Plate 1). One exploratory soil boring was drilled on February 1, 1991 and completed as ground-water monitoring well C-7. This well was subsequently developed and then sampled on February 7, 1991. In addition, this report includes results of the first quarter ground-water sampling conducted by Gettler-Ryan Inc. (G-R) on January 14, 1991, in accordance with the scope of work requested by Chevron U.S.A. Inc. Field work and laboratory analyses were performed to comply with current State of California Water Resources Control Board guidelines. GSI Field Methods and Procedures are presented in Appendix A.

SITE BACKGROUND

Ground-water monitoring wells C-1, C-2 and C-3 were installed by Gettler-Ryan Inc. (G-R) in July 1983. G-R prepared a letter dated July 19, 1983, documenting the monitoring well installations. In addition, three tank backfill monitoring wells (A, B and C) are located on the site. In July 1986, monitoring of the ground-water and tank backfill wells was implemented.

In December 1989, G-R conducted ground-water sampling at the site. Results were presented in a G-R Groundwater Sampling Report dated December 21, 1989.

GSI prepared a work plan dated April 4, 1990, to address the need for further delineation of the hydrocarbon plume.

In September 1990, four exploratory borings were drilled and subsequently completed as ground-water monitoring wells C-4 through C-6 and recovery well CR-1. Ground-water samples were collected from the monitoring well network by G-R on October 30, 1990. Results of this investigation are presented in the GSI Well Installation Report dated November 30, 1990.

FIELD PROCEDURES

One exploratory soil boring was drilled on February 1, 1991, using a truck-mounted hollow-stem auger rig and completed as a ground-water monitoring well C-7. Field work was performed according to GSI Field Methods and Procedures presented in Appendix A. Soil samples were collected at five-foot depth intervals, using a modified California split-spoon sampler fitted with clean brass tube liners. A GSI geologist observed the drilling, described soil samples using the Unified Soil Classification System (ASTM D-2488) and Munsell Soil Color Chart, and prepared a lithologic log for the borehole. The exploratory boring log is presented in Appendix B.

Soil Sampling

A four-inch-long brass tube of soil from each sample interval was used to perform head-space analysis in the field to screen for the presence of volatile organic compounds (VOCs). Head-space analysis involved transferring soil from a brass liner into a clean glass jar and immediately covering the jar with aluminum foil secured with a ring-type threaded lid. After approximately twenty minutes, the foil was pierced and the head-space within the jar was tested for total organic vapor measured in parts per million using an Organic Vapor Monitor (OVM) photoionization detector. Head-space analysis results are presented on the boring log in Appendix B.

Selected soil samples retained for chemical analysis were collected in clean brass liners, covered on both ends with aluminum foil and sealed with plastic end caps. The samples were labeled, entered on a Chain-of-Custody form and transported in a cooler with blue ice to Superior Analytical Laboratory (Superior), a State-certified laboratory located in San Francisco, California.

Monitoring Well Construction

Boring C-7 was drilled to a total depth of 30.0 feet. Well C-7 was constructed through the hollow-stem augers using 2-inch-diameter Schedule 40 PVC well casing and 0.020-inch factory-slotted well screen. Lonestar #2/12 sand was placed in the annular space across the entire screened interval and extended two feet above the top of the screen. A one-foot bentonite seal was placed above the sand pack, followed by concrete to the surface. The surface completion consisted of installing a waterproof locking well-cap, lock, and a traffic-rated vault set in concrete. The well construction details are presented with the boring log in Appendix B.

SOIL CHEMICAL ANALYSES

Soil samples were analyzed for Total Petroleum Hydrocarbons calculated as gasoline (TPH-Gasoline) according to EPA Method 8015 (Modified), and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020 by Superior.

Soil Analytical Results

Soil samples retained for chemical analysis were selected from boring C-7 at the 9.5 foot and 15.0 foot sample intervals. TPH-Gasoline and benzene were reported as ND in each sample. A summary of the soil analytical data is presented in Table 2. A copy of the Superior soil analytical report is presented in Appendix C.

CURRENT QUARTER GROUND-WATER SAMPLING RESULTS

Potentiometric Data

Prior to ground-water sampling, depth to ground-water levels were measured using an oil-water interface probe. Static ground-water levels were measured from the surveyed top of the well box and recorded to the nearest ± 0.01 foot. Corresponding ground-water elevations referenced to Mean Sea Level (MSL) are presented in Table 2. Water-level data have been plotted and contoured and are presented on Plate 3 as a potentiometric map.

Separate-phase Hydrocarbon Measurements

Each well was monitored for the presence of separate-phase hydrocarbons using an electronic oil-water interface probe. A clear acrylic bailer was used to confirm probe results. Separate-phase hydrocarbons were observed in monitoring Well C-1 and tank backfill Wells B and C at measured thicknesses of 0.02, 0.01, and 0.11 feet, respectively. Separate-phase hydrocarbons were not detected in the remaining wells.

Observed separate-phase hydrocarbons are bailed from site monitoring wells by G-R on a weekly basis. During the period from December, 1990 through February, 1991, approximately 4.25 gallons of separate-phase hydrocarbons were recovered from monitoring well C-1 and tank backfill well C. Bailing estimates are included with the G-R ground-water monitoring data presented in Appendix D.

Chemical Analytical Data

Ground-water samples were collected from site monitoring wells on January 14 and February 7, 1991 by G-R. The samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020 by Superior.

TPH-Gasoline was detected in Wells C-2, C-3, C-5, CR-1, and A at concentrations ranging from 54 parts per billion (ppb) to 24,000 ppb. Benzene was identified in Wells C-2, CR-1, and A at concentrations ranging from 3200 ppb to 30,000 ppb. A summary of the chemical analytical results is presented in Table 2. Available historical chemical analytical are presented in Table 3. TPH-Gasoline and benzene results from this sampling are presented on Plate 4 as a concentration map. The G-R ground-water sampling report, Chain-of-Custody forms, and Superior analytical reports are presented in Appendix E.

SUMMARY

The results of this investigation are summarized below.

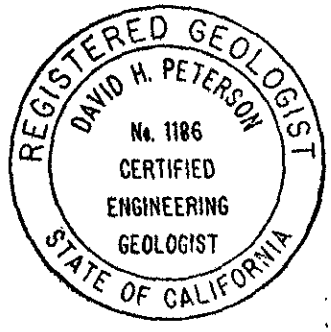
- One exploratory boring was drilled and completed as ground-water monitoring well C-7 on February 1, 1991.
- TPH-Gasoline and benzene analyses for soil samples from Boring C-7 at the 9.5 foot and 15.0 foot sample intervals were reported as ND.
- Separate-phase hydrocarbons were observed in Wells C-1, B, and C at measured thicknesses of 0.02, 0.01, and 0.11 feet, respectively.
- Ground-water samples were collected by G-R on January 14 and February 7, 1991. TPH-Gasoline was reported in Wells C-2, C-3, C-5, CR-1, and A at concentrations ranging from 54 ppb (C-5) to 24,000 ppb (C-2). Benzene was identified in Wells C-2, CR-1, and A at concentrations ranging from 3200 ppb (CR-1) to 30,000 ppb (A).

If you have any questions, please call.

GeoStrategies Inc. by,

Robert C. Mallory
Geologist

David H. Peterson
Senior Geologist
C.E.G. 1186



RCM/DHP/mlg

Plate 1. Vicinity Map
Plate 2. Site Plan
Plate 3. Potentiometric Map
Plate 4. TPH-Gasoline/Benzene Concentration Map

Appendix A: GSI Field Methods and Procedures
Appendix B: Exploratory Boring Log and Well Construction Detail
Appendix C: Soil Analytical Report
Appendix D: Gettler-Ryan Inc. Groundwater Monitoring Data
Appendix E: Gettler-Ryan Inc. Groundwater Sampling Report

QC Review: DQV

TABLE 1

SOIL ANALYSES DATA

SAMPLE I.D.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
C-7-9.5	01-Feb-91	06-Feb-91	<1	<.005	<.005	<.005	<.005
C-7-15.0	01-Feb-91	06-Feb-91	<1	<.005	0.010	<.005	0.015

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

Note: 1. All data shown as <x are reported as not detected (ND).

TABLE 2

GROUND-WATER ANALYSES DATA

WELL NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
C-1	14-Jan-91	18-Jan-91	----	----	----	----	----	16.07	4.70	0.02	11.39
C-2	14-Jan-91	18-Jan-91	24000	3300	1200	1100	4100	16.84	5.73	----	11.11
C-3	14-Jan-91	18-Jan-91	80	<0.5	<0.5	<0.5	1	16.48	6.14	----	10.34
C-4	14-Jan-91	18-Jan-91	<50	<0.5	<0.5	<0.5	<0.5	16.53	5.09	----	11.44
C-5	14-Jan-91	18-Jan-91	54	<0.5	<0.5	<0.5	<0.5	14.70	4.83	----	9.87
C-6	14-Jan-91	18-Jan-91	<50	<0.5	<0.5	<0.5	<0.5	13.87	4.46	----	9.41
C-7	07-Feb-91	15-Feb-91	<50	<0.5	0.8	<0.5	<0.5	15.78	5.90	----	9.88
CR-1	14-Jan-91	18-Jan-91	1500	3200	52	190	77	----	----	----	10.29

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS
Benzene 1.0 ppb Xylenes 1750 ppb Ethylbenzene 680 ppb

CURRENT DHS ACTION LEVELS
Toluene 100 ppb

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPB = Parts Per Billion

CD = Duplicate Sample
TB = Trip Blank

Notes: 1. All data shown as <x are reported as ND (none detected)
2. Static Water elevations referenced to mean sea level (MSL). Elevations are corrected for free product using a correction factor of 0.8.
3. DHS Action Levels and MCLs are subject to change pending State review.

TABLE 2

GROUND-WATER ANALYSES DATA

WELL NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
A	14-Jan-91	18-Jan-91	12000	30000	540	1400	560	----	----	----	11.25
B	14-Jan-91	18-Jan-91	----	----	----	----	----	----	----	0.01	11.40
C	14-Jan-91	18-Jan-91	----	----	----	----	----	----	----	0.11	11.01
CD-2	14-Jan-91	18-Jan-91	30000	3900	1500	1500	5000	----	----	----	----
TB	14-Jan-91	18-Jan-91	<50	<0.5	<0.5	<0.5	<0.5	----	----	----	----
TB	07-Feb-91	15-Feb-91	<50	<0.5	<0.5	<0.5	<0.5	----	----	----	----

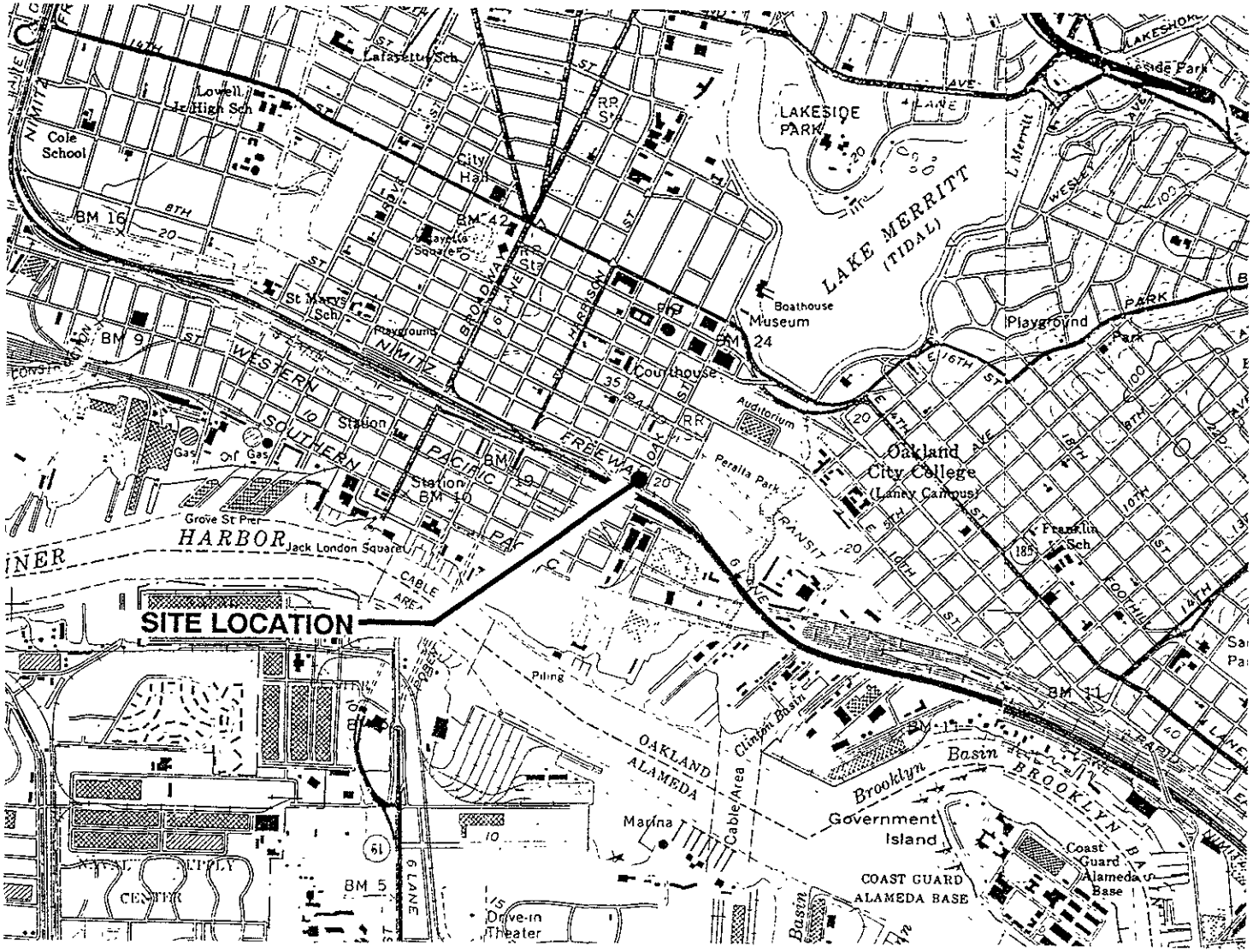
TABLE 3

HISTORICAL GROUND-WATER QUALITY DATABASE

SAMPLE DATE	SAMPLE POINT	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
06-Dec-89	A	44000.	20000.	66.	1600.	2220.
14-Jan-91	A	12000	30000	540	1400	560
06-Dec-89	C-2	16000.	250.	1200.	550.	1400.
14-Jan-91	C-2	24000	3300	1200	1100	4100
06-Dec-89	C-3	<500.	<0.5	<0.5	<0.5	0.74
14-Jan-91	C-3	80	<0.5	<0.5	<0.5	1
14-Jan-91	C-4	<50	<0.5	<0.5	<0.5	<0.5
14-Jan-91	C-5	54	<0.5	<0.5	<0.5	<0.5
14-Jan-91	C-6	<50	<0.5	<0.5	<0.5	<0.5
07-Feb-91	C-7	<50	<0.5	0.8	<0.5	<0.5
14-Jan-91	CR-1	1500	3200	52	190	77

TPH-G - Total Petroleum Hydrocarbons as Gasoline
PPB - Parts per Billion
NOTE - All data shown as <X are reported as ND (none detected)

ILLUSTRATIONS



Base Map: USGS Topographic Map

GeoStrategies Inc.

VICINITY MAP
Chevron Service Station #4587
609 Oak Street
Oakland, California

PLATE
1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7191	RG/CEG	10/90	

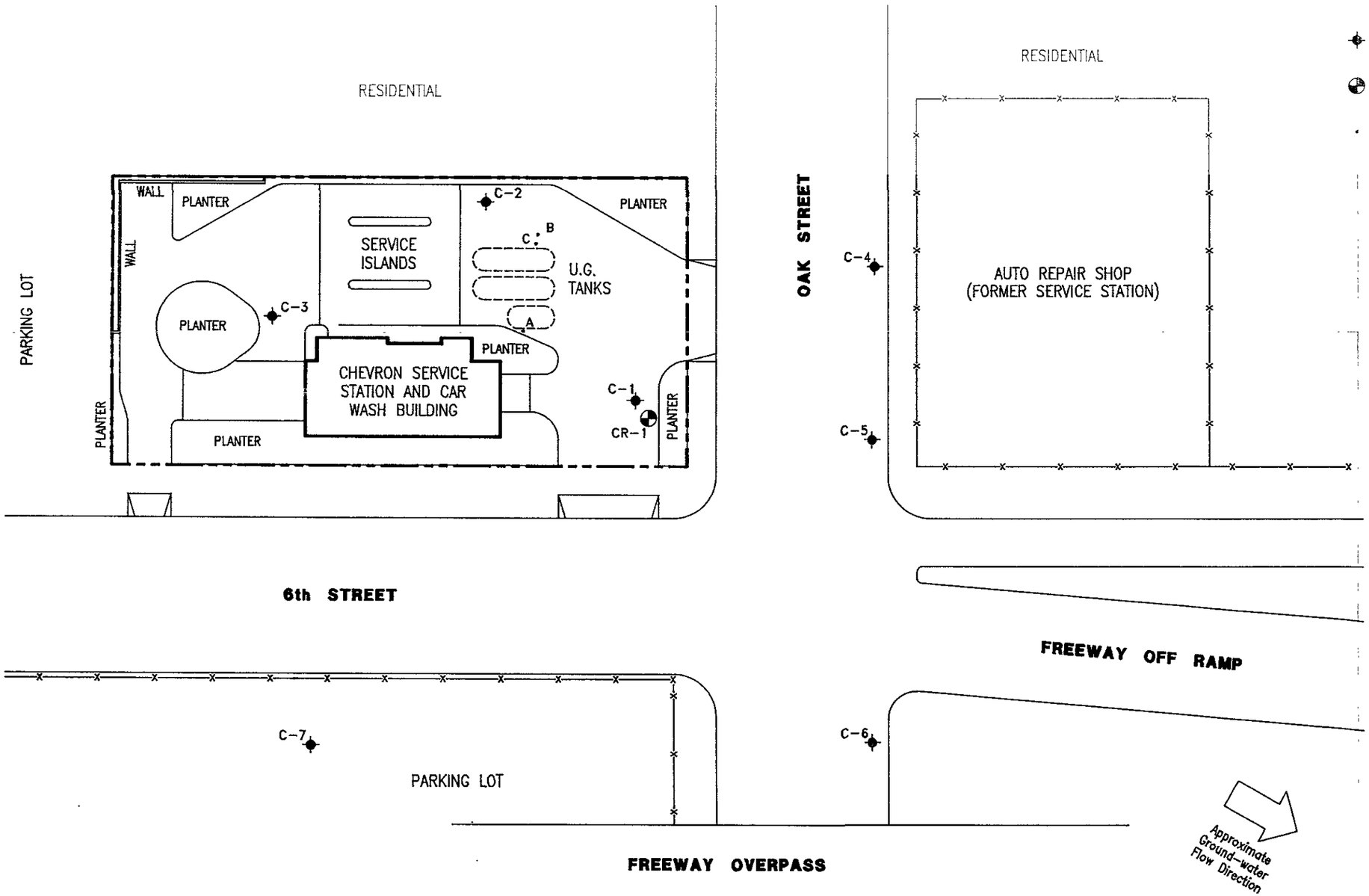
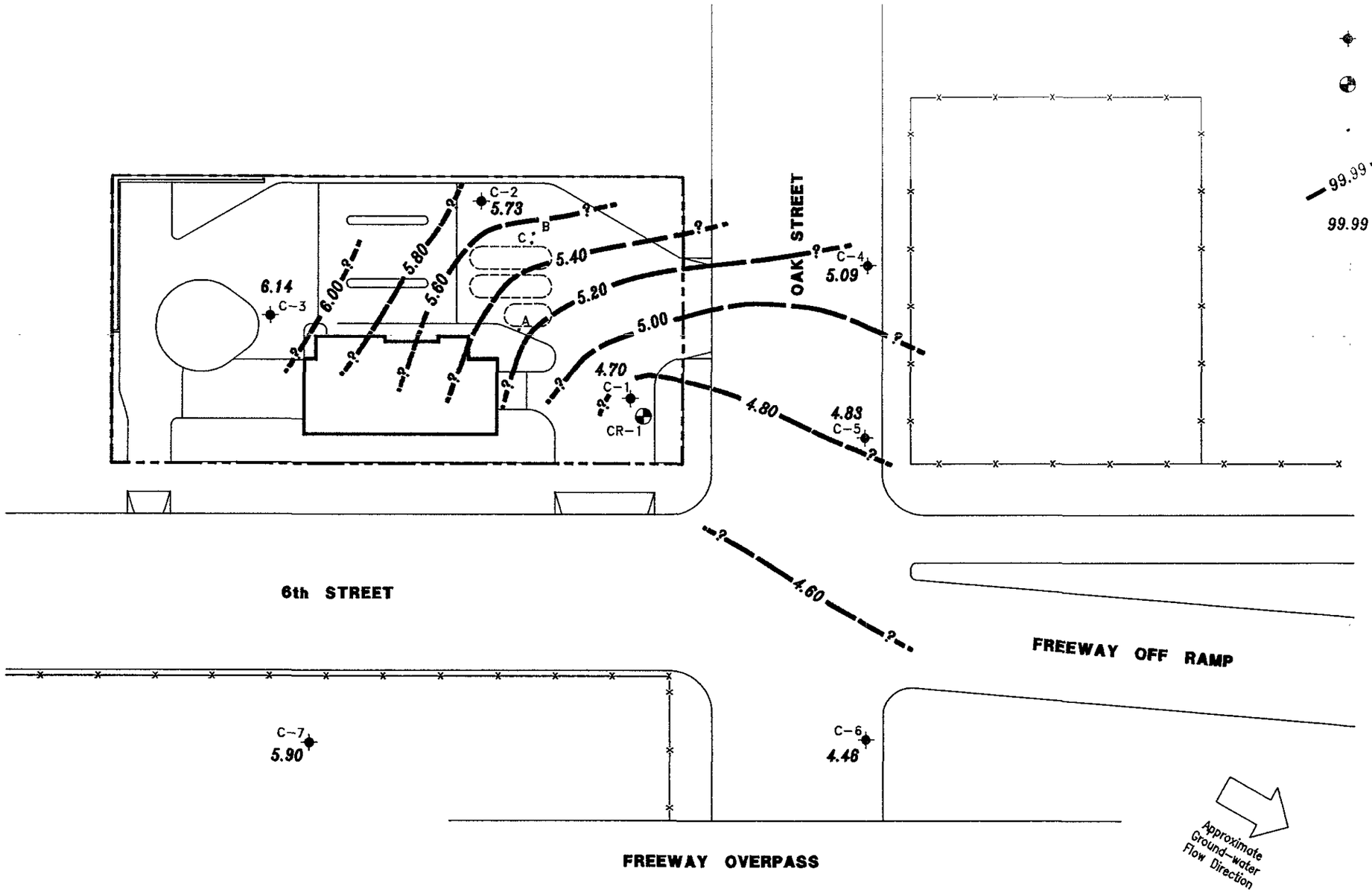


PLATE 2

SITE PLAN
Chevron Service Station #4587
609 Oak Street
Oakland, California

GeoStrategies Inc.

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
719102-7	DHP	3/91	



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Tank hole monitoring well
- 99.99 Ground-water elevation contour
  Approximate Gradient = 0.006
- 99.99 Ground-water elevation in feet referenced to Mean Sea Level (MSL) measured on January 14, 1991

Notes:
1. Contours may be influenced by irrigation practices and/or site construction activities.
2. Well C-7 was sampled on February 7, 1991 and was not used in contouring.
3. Tank hole monitoring wells were not used in contouring.

PLATE 3

POTENTIOMETRIC MAP
Chevron Service Station #4587
609 Oak Street
Oakland, California

GeoStrategies Inc.

JOB NUMBER 719102-7
REVIEWED BY DHP
DATE 3/91
REVISED DATE

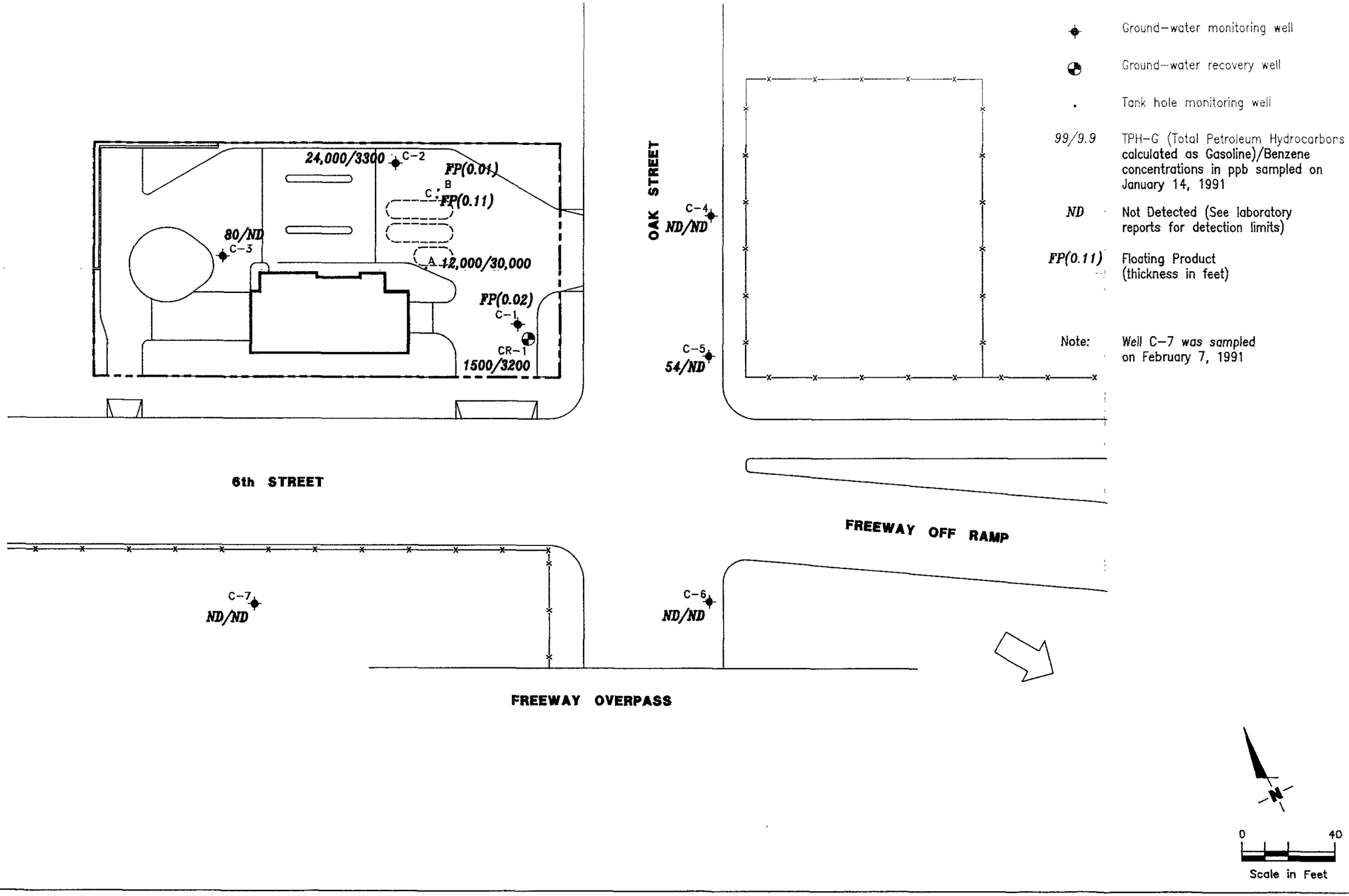


PLATE 4

TPH-G/BENZENE CONCENTRATION MAP
Chevron Service Station #4587
609 Oak Street
Oakland, California

GeoStrategies Inc.

REVISED DATE

DATE 3/91

REVIEWED BY PHP

JOB NUMBER 719102-7

APPENDIX A

GSI FIELD METHODS AND PROCEDURES

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, GeoStrategies Inc. (GSI) will verify that necessary drilling permits have been secured.

Utility locations will be located and drilling will be conducted so as not to disrupt activities at a project site. GSI will obtain and review available public data on subsurface geology and if warranted, the location of wells within a half-mile of the project site will be identified. Drillers will be notified in advance so that drilling equipment can be inspected prior to performing work.

Drilling

The subsurface investigations are typically performed to assess the lateral and vertical extent of petroleum hydrocarbons present in soils and groundwater. Drilling methods will be selected to optimize field data requirements as well as be compatible with known or suspected subsurface geologic conditions.

Monitoring wells are installed using a truck-mounted hollow-stem auger drill rig or mud-rotary drill rig. Typically, the hollow-stem rig is used for wells up to 100 feet, if subsurface conditions are favorable. Wells greater than 100-feet deep are typically drilled using mud-rotary techniques. When mud rotary drilling is used, an electric log will be performed for additional lithological information. Also during mud rotary drilling, precautions will be taken to prevent mud from circulating contaminants by using a conductor casing to seal off contaminated zones. Samples will be collected for lithologic logging by continuous chip, and where needed by drive sample or core as specified by the supervising geologist.

Soil Sampling

Shallow soil borings will be drilled using a truck-mounted hollow-stem auger drilling rig, unless site conditions favor a different drilling method. Drilling and sampling methods will be consistent with ASTM Method D-1452-80. The auger size will be a minimum 6-inch nominal outside-diameter (O.D). No drilling fluids will be used during this drilling method. The augers and other tools used in the bore hole will be steam cleaned before use and between borings to minimize the possibilities of cross-contamination between borings.

Soil samples are typically collected at 5-foot intervals as a minimum from ground surface to total depth of boring. Additional soil samples will be collected based on significant lithologic changes and/or potential chemical content. Soil samples from each sampling interval will be lithologically described by a GSI geologist (Figure 1). Soil colors will be described using the Munsell Color Chart. Rock units will be logged using appropriate lithologic terms, and colors described by the G.S.A. Rock Color Chart.

Head-space analyses will be performed to check for the evidence of volatile organic compounds. Head-space analyses will be performed using an organic vapor analyzer; either an OVA, HNU, or OVM. Organic vapor concentrations will be recorded on the GSI field log of boring (Figure 1). The selection of soil samples for chemical analysis are typically based on the following criteria:

1) Soil discoloration
2) Soil odors
3) Visual confirmation of chemical in soil
4) Depth with respect to underground tanks (or existing grade)
5) Depth with respect to ground water
6) OVA reading

Soil samples (full brass liners) selected for chemical analysis are immediately covered with aluminum foil and the liner ends are capped to prevent volatilization. The samples are labeled and entered onto a Chain-of-Custody form, and placed in a cooler on blue ice for transport to a State-certified analytical laboratory.

Soil cuttings are stockpiled on-site. Soils are sampled and analyzed for site-specific chemical parameters. Disposition of soils is dependent of chemical analytical results of the samples.

Soil Sampling - cont.

Soil borings not converted to monitoring wells will be backfilled (sealed) to ground surface using either a neat cement or cement-bentonite grout mixture. Backfilling will be tremied by continuously pumping grout from the bottom to the top of the boring where depth exceeds 20' or as required by local permit requirements.

All field and office work, including exploratory boring logs, are prepared under the direction of a registered geologist.

Monitoring Well Installation

Monitoring well casing and screen will be constructed of Schedule 40, flush-joint threaded polyvinylchloride (PVC). The well screen will be factory mill-slotted unless additional open area is required (eg. conversion to an extraction well in a low-yield aquifer). The screen length will be placed adjacent to the aquifer material to a minimum of 2-feet above encountered water. No screen shall be placed in a borehole that potentially creates hydraulic interconnection of two or more aquifer units. Screen slot size and well sand pack will be compatible with encountered aquifer materials, as confirmed by sieve analysis.

Monitoring wells will be completed below grade (Figure 2) unless special conditions exist that require above-grade completion design. In the event a monitoring well is required in an aquifer unit beneath an existing aquifer, the upper aquifer will be sealed off by installing a steel conductor casing with an annular neat cement or cement-bentonite grout seal. This seal will be continuously tremie pumped from the bottom of the annulus to ground surface.

The monitoring well sand pack will be placed adjacent to the entire screened interval and will extend a recommended minimum distance of 2-feet above the top of the screen. No sand pack will be placed that interconnects two or more aquifer units. A minimum 2-foot bentonite pellet or bentonite slurry seal will be placed above the sand pack. Sand pack, bentonite, and cement seal levels will be confirmed by sounding the annulus with a calibrated weighted tape. The remaining annular space above the bentonite seal will be grouted with a bentonite-cement mixture and will be tremie-pumped from the bottom of the annular space to the ground surface. The bentonite content of the grout will not exceed 5 percent by weight. A field log of boring and a field well completion form will be prepared by GSI for each well installed.

Decontamination of drilling equipment before drilling and between wells will consist of steam cleaning, and/or Alconox wash.

Well Development

All newly installed wells will be properly developed within 48 hours of completion. No well will be developed until the well seal has set a minimum of 12 hours. Development procedures will include one or more of the methods described below:

Bailing

Bailing will be used to remove suspended sediments and drilling fluids from the well, where applicable. The bailer will be raised and lowered through the column of water in the well so as to create a gentle surging action in the screened interval. This technique may be used in conjunction with other techniques, such as pumping, and may be used alone if the well is of low yield.

Pumping

Pumping will be used in conjunction with bailing or surging. The pump will be operated in such a manner as to gently surge the entire screened interval of the well. This may involve operating the pump with a packer type mechanism attached and slowly raising and lowering the pump, or by cycling the pump off and on to allow water to move in and out of the screened interval. Care will be used not to overpump a well.

Surging

Surging will be performed on wells that are screened in known or suspected high yield formations and/or on larger diameter (recovery) wells. A surge block will be raised and lowered through the entire screened interval, forcing water in and out of the well screen and sand pack. Pumping or air lifting will be used in conjunction with this method of development to remove any sediment brought into the well during surging.

Air Lifting

Air lifting will be used to remove sediment from wells as an alternative to pumping under certain conditions. When appropriate, a surge block designed for use with air lifting will be used to agitate the entire screened interval and water will be lifted out of the well using forced air. When air lifting is performed, the air source will be either nitrogen or filtered air and the procedure will be performed gently to prevent any damage to the well screen or casing and to insure that discharged water is contained.

Well Development - cont.

All well developing equipment will be thoroughly decontaminated prior to development using a steam cleaner and/or Alconox detergent wash and clean water rinse. During development procedures, field parameters (temperature, specific conductance and pH) will be monitored and recorded on well development forms (Figure 3). Equilibration requirements consist of a minimum of three readings with the following accuracy standards:

pH	± 0.1 pH units
Specific Conductance	± 10% of full scale reading
Temperature	± 0.5 degrees Celsius

The wells will be developed until water is visibly clear and free of sediment, and well purging parameters stabilized. A minimum of 8 to 10 well volumes will be purged from each well, if feasible. If well purging parameters have not stabilized before 10 casing volumes have been removed, well development will continue until purging parameters have stabilized and formation water is being drawn into the well. The adequacy of well development will be judged by the field technician performing the well development and based on known formation conditions.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest ±0.01 foot. Water level measurements will be recorded to the nearest ±0.01 foot and referenced to Mean Sea Level (MSL). If additional wells are required, then existing and newly installed wells are surveyed relative to MSL.

GROUND-WATER SAMPLING AND ANALYSIS

Quality Assurance/Quality Control Objectives

The sampling and analysis procedures employed by Gettler-Ryan Inc. (G-R) for ground-water sampling and monitoring follow specific Quality Assurance/Quality Control (QA/QC) guidelines. Quality Assurance objectives have been established by G-R to develop and implement procedures for obtaining and evaluating water quality and field data in an accurate, precise, and complete manner so that sampling procedures and field measurements provide information that is comparable and representative of actual field conditions. Quality Control (QC) is maintained by G-R by using specific field protocols and requiring the analytical laboratory to perform internal and external QC checks. It is the goal of G-R to provide data that are accurate, precise, complete, comparable, and representative. The definitions for accuracy, precision, completeness, comparability, and representativeness are as follows:

- Accuracy - the degree of agreement of a measurement with an accepted referenced or true value.

- Precision - a measure of agreement among individual measurements under similar conditions. Usually expressed in terms of the standard deviation.

- Completeness - the amount of valid data obtained from a measurement system compared to the amount that was expected to meet the project data goals.

- Comparability - expresses the confidence with which one data set can be compared to another.

- Representativeness - a sample or group of samples that reflects the characteristics of the media at the sampling point. It also includes how well the sampling point represents the actual parameter variations which are under study.

As part of the G-R QA/QC program, applicable federal, state, and local reference guidance documents are followed. The procedures outlined in these regulations, manuals, handbooks, guidance documents, and journals are incorporated into the G-R sampling procedures to assure that; (1) ground-water samples are properly collected, (2) ground-water samples are identified, preserved, and transported in a manner such that they are representative of field conditions, and (3) chemical analysis of samples are accurate and reproducible.

Guidance and Reference Documents Used to Collect Groundwater Samples

These documents are used to verify G-R sampling procedures and are consistent with current regulatory guidance. If site specific work and sampling plans are required, those plans will be developed from these documents, and newly received applicable documents.

U.S.E.P.A. - 330/9-51-002	NEIC Manual for Groundwater/Subsurface Investigation at Hazardous Waste Sites
U.S.E.P.A. - 530/SW611	Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities (August, 1977)
U.S.E.P.A. - 600/4-79-020	Methods for Chemical Analysis of Water and Wastes (1983)
U.S.E.P.A. - 600/4-82-029	Handbook for Sampling and Sample Preservation of Water and Wastewater (1982)
U.S.E.P.A. - 600/4-82-057	Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (July, 1982)
U.S.E.P.A. - SW-846#, 3rd Edition	Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (November, 1986)
40 CFR 136.3e,Table II (Code of Federal Regulations)	Required Containers, Preservation Techniques, and Holding Times
Resources Conservation and Recover Act (OSWER 9950.1)	Groundwater Monitoring Technical Enforcement Guidance Document (September, 1986)
California Regional Water Quality Control Board (Central Valley Region)	A Compilation of Water Quality Goals (September, 1988); Updates (October, 1988)
California Regional Water Quality Control Board (North Coast, San Francisco Bay, and Central Valley)	Regional Board Staff Recommendations for Initial Evaluations and Investigation of Underground Tanks: Tri-Regional Recommendations (June, 1988)

Guidance and Reference Documents Used to Collect Groundwater Samples (cont.)

Regional Water Quality Control Board (Central Valley Region)	Memorandum: Disposal, Treatment, and Refuse of Soils Contaminated with Petroleum Fractions (August, 1986)
State of California Department of Health Services	Hazardous Waste Testing Laboratory Certification List (March, 1987)
State of California Water Resources Control Board	Leaking Underground Fuel Tank (LUFT) Field Manual (May, 1988), and LUFT Field Manual Revision (April, 1989)
State of California Water Resources Control Board	Title 23, (Register #85.#33-8-17-85), Subchapter 16: Underground Tank Regulations; Article 3, Sections 2632 and 2634; Article 4, Sections 2645, 2646, 2647, and 2648; Article 7, Sections 2670, 2671, and 2672 (October, 1986: including 1988 Amendments)
Alameda County Water District	Groundwater Protection Program: Guidelines for Groundwater and Soil Investigations at Leaking Underground Fuel Tank Sites (November, 1988)
American Public Health Association	Standard Methods for the Examination of Water and Wastewaters, 16th Edition
Analytical Chemistry (journal)	Principles of Environmental Analysis, Volume 55, Pages 2212-2218 (December, 1983)
Napa County	Napa County Underground Storage Tank Program: Guidelines for Site Investigations; February 1989.
Santa Clara Valley Water District	Guidelines for Preparing or Reviewing Sampling Plans for Soil and Groundwater Investigation of Fuel Contamination Sites (January, 1989)

Guidance and Reference Documents Used to Collect Groundwater Samples (cont.)

Santa Clara Valley Water District	Investigation and Remediation at Fuel Leak sites: Guidelines for Investigation and Technical Report Preparation (March 1989)
Santa Clara Valley Water District	Revised Well Standards for Santa Clara County (July 18, 1989)
American Petroleum Institute	Groundwater Monitoring & Sample Bias; API Publication 4367, Environmental Affairs Department, June 1983
American Petroleum Institute	A Guide to the Assessment and Remediation of Underground Petroleum Releases; API Publication 1628, February 1989
American Petroleum Institute	Literature Summary: Hydrocarbon Solubilities and Attenuations Mechanisms, API Publication 4414, August 1985
Site Specific (as needed)	General and specific regulatory documents as required.

Because ground-water samples collected by G-R are analyzed to the parts per billion (ppb) range for many compounds, extreme care is exercised to prevent contamination of samples. When volatile or semi-volatile organic compounds are included for analysis, G-R sampling crew members will adhere to the following precautions in the field:

1. A clean pair of new, disposable gloves are worn for each well being sampled.

2. When possible, samples are collected from known or suspected wells that are least contaminated (i.e. background) followed by wells in increasing order of contamination.

3. Ambient conditions are continually monitored to maintain sample integrity.

When known or potential organic compounds are being sampled for, the following additional precautions are taken:

1. All sample bottles and equipment are kept away from fuels and solvents. When possible, gasoline (used in generators) is stored away from bailers, sample bottles, purging pumps, etc.

2. Bailers are made of Teflon or Stainless Steel. Other materials such as plastic may contaminate samples with phthalate esters which interfere with many Gas Chromatography (GC) analyses.

3. Volatile organic ground-water samples are collected so that air passage through the sample does not occur or is minimal (to prevent volatiles from being stripped from the samples): sample bottles are filled by slowly running the sample down the side of the bottle until there is a positive convex meniscus over the neck of the bottle; the Teflon side of the septum (in cap) is positioned against the meniscus, and the cap screwed on tightly; the sample is inverted and the bottle lightly tapped. The absence of an air bubble indicates a successful seal; if a bubble is evident, the cap is removed, more sample is added, and the bottle is resealed.

4. Extra Teflon seals are brought into the field in case seals are difficult to handle and/or are dropped. Dropped seals are considered contaminated and are not used. When replacing seals or if seals become flipped, care is taken to assure that the Teflon seal faces down.

Sample analysis methods, containers, preservatives and holding times are shown on Table 1.

Laboratory and field handling procedures of samples are monitored by including QC samples for analysis with every submitted sample lot from a project site. QC samples may include any combination of the following:

A. Trip Blank: Used for purgeable organic compounds only; QC samples are collected in 40 milliliter (ml) sample vials filled in the analytical laboratory with organic-free water. Trip blanks are sent to the project site, and travel with project site samples. Trip blanks are not opened, and are returned from a project site with the project site samples for analysis.

B. Field Blank: Prepared in the field using organic-free water. These QC samples accompany project site samples to the laboratory and are analyzed for specific chemical parameters unique to the project site where they were prepared.

C. Duplicates: Duplicated samples are collected "second samples" from a selected well and project site. They are collected as either split samples or second-run samples collected from the same well.

D. Equipment Blank: Periodic QC sample collected from field equipment rinsate to verify decontamination procedures.

The number and types of QC samples are determined as follows:

A. Up to 2 wells - Trip Blank Only

B. 2 to 5 Wells - 1 Field Blank and 1 Trip Blank

C. 5 to 10 Wells - 1 Field blank, 1 Trip Blank, and 1 Duplicate

D. More than 10 Wells - 1 Field Blank, 1 Trip Blank, and 1 Duplicate per each 12 wells

E. If sampling extends beyond one day, quality control samples will be collected for each day.

Additional QC is performed through ongoing and random reviews of duplicate samples to evaluate the precision of the field sampling procedures and analytical laboratory. Precision of QC data is accomplished by calculating the Relative Percent Difference (RPD). The RPD is evaluated to assess whether values are within an acceptable range (typically ± 20% of duplicate sample).

SAMPLE COLLECTION

This section describes the routine procedures followed by G-R while collecting ground-water samples for chemical analysis. These procedures include decontamination, water-level measurements, well purging, physical parameter measurements, sample collection, sample preservation, sample handling, and sample documentation. Critical sampling objectives for G-R are to:

1. Collect ground-water samples that are representative of the sampled matrix and,

2. Maintain sample integrity from the time of sample collection to receipt by the analytical laboratory.

Sample analyses methods, containers, preservation, and holding times are presented in Table 1.

Decontamination Procedures

All physical parameter measuring and sampling equipment are decontaminated prior to sample collection using Alconox or equivalent detergent followed by steam cleaning with deionized water. Any sampling equipment surfaces or parts that might absorb specific contaminants, such as plastic pump valves, impellers, etc., are cleaned in the same manner.

Sample bottles, bottle caps, and septa used for sampling volatile organics are thoroughly cleaned and prepared in the laboratory. Sample bottles, bottle caps, and septa are protected from all potential chemical contact before actual usage at a sample location.

During field sampling, equipment placed in a well are decontaminated before purging or sampling the next well. The equipment are decontaminated by cleaning with Alconox or equivalent detergent followed by steam cleaning with deionized water.

Water-Level Measurements

Prior to purging and sampling a well, the static-water levels are measured in all wells at a project site using an electric sounder and/or calibrated portable oil-water interface probe (Figure 4). Both static water-level and separate-phase product thickness are measured to the nearest ±0.01 foot. The presence of separate-phase product is confirmed using a clean, acrylic or polyvinylchloride (PVC) bailer, measured to the nearest ±0.01 foot with a decimal scale tape.

Water-Level Measurements (continued)

The monofilament line used to lower the bailer is replaced between wells with new line to preclude the possibility of cross-contamination. Field observations (e.g. well integrity, product color, turbidity, water color, odors, etc.) are noted on the G-R Well Sampling Field Data Sheet shown in Figure 4. Before and after each use, the electric sounder, interface probe and bailer are decontaminated by washing with Alconox or equivalent detergent followed by rinsing with deionized water to prevent cross-contamination.

As mentioned previously, water-levels are measured in wells with known or suspected lowest dissolved chemical concentrations to the highest dissolved concentrations.

Well Purging

Before sampling occurs, well casing storage water and interstitial water in the artificial sand pack will be purged using (1) a positive displacement bladder pump constructed of inert, non-wetting, Teflon and stainless steel, (2) a pneumatic-airlift pumping system, (3) a centrifigal pumping system, or (4) a Teflon or Stainless steel bailer (Figure 5). Methods of purging will be assessed based on well size, location, accessibility, and known chemical conditions. Individual well purge volumes are calculated from borehole volumes which take into account the sand packed interval in the well annular space. As a general rule, a minimum of 3 and a maximum of 10 borehole volumes will be purged. Wells which dewater or demonstrate slow recharge periods (i.e. low-yield wells) during purging activities may be sampled after fewer purging cycles. If a low-yield (low recovery) well is to be sampled, sampling will not take place until at least 80 percent of the previously measured water column has been replaced by recharge, or as per local requirements. Physical parameter measurements (temperature, pH, and specific conductance) are closely monitored throughout the well purging process and are used by the G-R sampling crew as indicators for assessing sufficient purging. Purging is continued until all three physical parameters have stabilized. Specific conductance (conductivity) meters are read to the nearest ± 10 umhos/cm, and are calibrated daily. pH meters are read to the nearest ± 0.1 pH units and are calibrated daily. Temperature is read to the nearest 0.1 degree F. Calibration of physical parameter meters will follow manufacturers specifications. Monitoring wells will be purged according to the protocol presented in Figure 5. Collected field data during purging activities will be entered on the G-R Well Sampling Field Data Sheet shown in Figure 4. Copies of the G-R Field Data Sheets will be reviewed by the G-R Sampling Manager for accuracy and completeness.

DOCUMENTATION

Sample Container Labels

Each sample container will be labeled by an adhesive label, noted in permanent ink immediately after the sample is collected. Label information will include:

Sample point designation (i.e. well number or code)

Sampler's identification

Project number

Date and time of collection

Type of preservation used

Well Sampling Data Forms

In the field, the G-R sampling crew will record the following information on the Well Sampling Data Sheet for each sample collected:

Project number

Client

Location

Source (i.e. well number)

Time and date

Well accessibility and integrity

Pertinent well data (e.g. depth, product thickness, static water-level, pH, specific conductance, temperature)

Calculated and actual purge volumes

Chain-of-Custody

A Chain-of-Custody record (Figure 6) shall be completed and accompany every sample and every shipment of samples to the analytical laboratory in order to establish the documentation necessary to trace sample possession from time of collections. The record will contain the following information:

- Sample or station number or sample identification (ID)
- Signature of collector, sampler, or recorder
- Date and time of collection
- Place of collection
- Sample type
- Signatures of persons involved in chain of possession
- Inclusive dates of possession

Samples shall always be accompanied by a Chain-of-Custody record. When transferring the samples, the individual relinquishing and receiving the samples will sign, date, and note the time on the Chain-of-Custody record. G-R will be responsible for notifying the laboratory coordinator when and how many samples will be sent to the laboratory for analysis, and what types of analyses shall be performed.

TABLE 1

SAMPLE ANALYSIS METHODS, CONTAINERS, PRESERVATIONS, AND HOLDING TIMES

Parameter	Analytical Method	Reporting Units	Container	Preservation	Maximum Holding Time
Total Petroleum Hydrocarbons (Gasoline)	EPA 8015 (modified)	mg/l ug/l	40 ml. vial glass, Teflon	cool, 4 C HCl to pH<2	14 days (maximum)
Benzene Toluene Ethylbenzene Xylenes (BTEX	EPA 8020	mg/l ug/l	50 ml. vial glass, Teflon lined septum	cool, 4 C HCl to pH<2	7 days (w/o preservative) 14 days (w preservative)
Oil & Grease	SM 503E	mg/l ug/l	1 l glass, Teflon lined septum	H2SO4 or HCl to pH<2	28 days (maximum)
Total Petroleum Hydrocarbons (Diesel)	EPA 8015 (modified)	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C	14 days (maximum)
Halogented Volatile Organics (chlorinated solvents)	8010	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C	14 days (maximum)
Non chlorinated solvents	8020	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C HCl to pH<2	14 days (maximum)
Volatile Organics	8240	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C HCl to pH<2	14 days (maximum)
Semi-Volatile Organics	8270	mg/l ug/l	1 l amber glass, Teflon lined septum	cool, 4 C	7 days extract 40 days (maximum to analyze)
Specific Conductance (Field test)		umhos/cm			
pH (Field test)		pH units			
Temperature (Field test)		Deg F			

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FIELD EXPLORATORY BORING LOG

FIGURE 1

Field location of boring:	Project No.:	Date:	Boring No:
	Client:		
	Location:		
	City:		Sheet
	Logged by:	Driller:	of
Drilling method:	Casing installation data:		
Hole diameter:	Top of Box Elevation:		Datum:

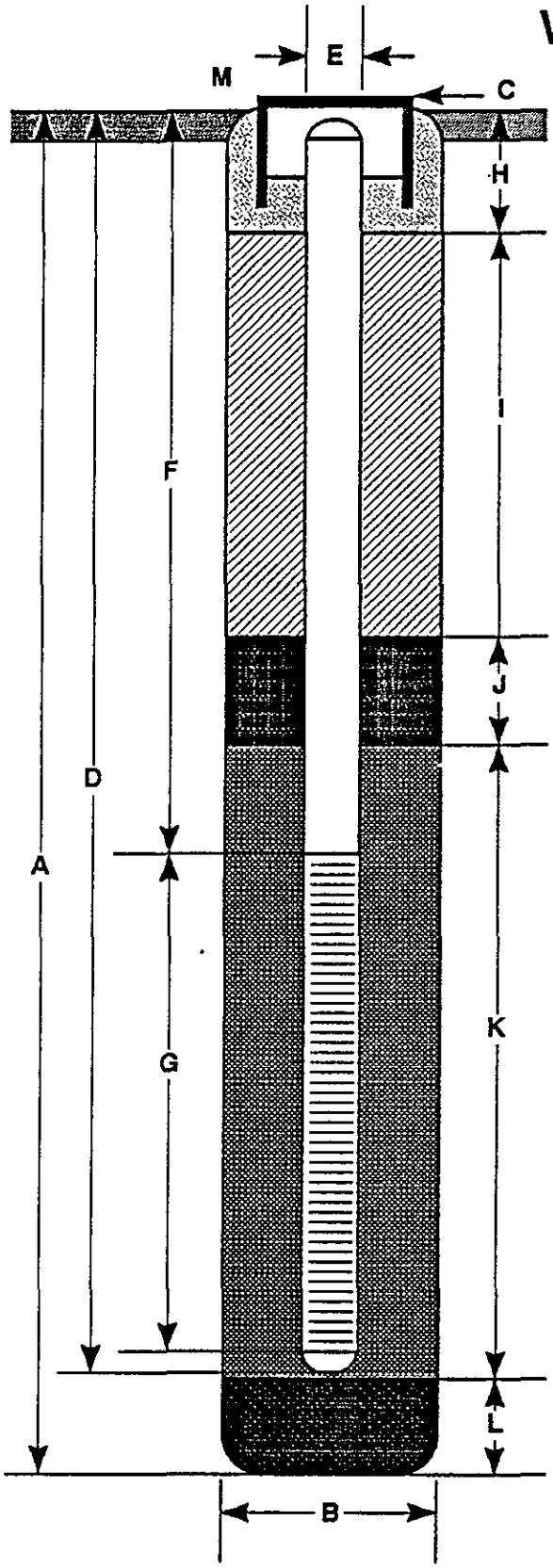
Water Level				
Time				
Date				

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description

Remarks:

WELL CONSTRUCTION DETAIL

FIGURE 2



A Total Depth of Boring _____ ft.

B Diameter of Boring _____ in.
Drilling Method _____

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length _____ ft.
Material _____

E Casing Diameter _____ in.

F Depth to Top Perforations _____ ft.

G Perforated Length _____ ft.
Perforated Interval from _____ to _____ ft.
Perforation Type _____
Perforation Size _____ in.

H Surface Seal from _____ to _____ ft.
Seal Material _____

I Backfill from _____ to _____ ft.
Backfill Material _____

J Seal from _____ to _____ ft.
Seal Material _____

K Gravel Pack from _____ to _____ ft.
Pack Material _____

L Bottom Seal _____ ft.
Seal Material _____

M _____

Note: Depths measured from initial ground surface

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Well Construction Detail

WELL NO.

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE

WELL DEVELOPMENT FORM FIGURE 3

Page_____ of_____

==========

(to be filled out in office)

Client_____ SS#_____ Job#_____

Name_____ Location_____

Well#_____ Screened Interval_____ Depth_____

Aquifer Material_____ Installation Date _____

Drilling Method_____ Borehole Diameter_____

Comments regarding well installation:_____

_____

_____

==========

(to be filled out in the field) Name_____

Date_____ Development Method_____

Total Depth_____ - Depth to liquid_____ = WaterColumn_____

Product thickness_____

_____ x _____ x _____ x 0.0408 = _____gals
Water Column Diameter (in.) #Vol

Purge Start_____ Stop_____ Rate_____ gpm

Gallons	Time	Clarity	Temp.	pH	Conductivity
0					

Total gallons removed_____ Development stop time_____

Depth to liquid _____at_____(time)

Odor of water_____ Water discharged to_____

Comments_____

_____

GETTLER–RYAN INC.

General and Environmental Contractors

WELL SAMPLING FIELD DATA SHEET

FIGURE 4

COMPANY _____ JOB # _____

LOCATION _____ DATE _____

CITY _____ TIME _____

Well ID. _____ Well Condition _____

Well Diameter _____ in. Hydrocarbon Thickness _____ ft.

Total Depth _____ ft.

Depth to Liquid- _____ ft.

Volume Factor (VF)			
	2" = 0.17	6" = 1.50	12" = 5.80
	3" = 0.38	8" = 2.60	
	4" = 0.66	10" = 4.10	

(# of casing volumes) _____ x _____ x(VF) _____ = (Estimated Purge Volume) _____ gal.

Purging Equipment _____

Sampling Equipment _____

Starting Time _____ Purging Flow Rate _____ gpm.

(Estimated Purge Volume) _____ gal. / (Purging Flow Rate) _____ gpm. = (Anticipated Purging Time) _____ min.

Time	pH	Conductivity	Temperature	Volume

Did well dewater? _____ If yes, time _____ Volume _____

Sampling Time _____ Weather Conditions _____

Analysis _____ Bottles Used _____

Chain of Custody Number _____

COMMENTS _____

FOREMAN _____ ASSISTANT _____

FIGURE 5

Monitoring Well Sampling Protocol Schematic

Sampling Crew Reviews Project Sampling Requirements/Schedule

↓

Field Decontamination and Instrumentation Calibration

↓

Check Integrity of Well (Inspect for Well Damage)

↓

Measure and Record Depth to Water and Total Well Depth (Electric Well Sounder)

↓

Check for Floating Product (Oil/Water Interface Probe)

Floating Product Present

↓

Confirm Product Thickness (Acrylic or PVC Bailer)

↓

Collect Free-Product Sample

↓

Dissolved Product Sample Not Required

↓

Record Data on Field Data Form

Floating Product Not Present

↓

Purge Volume Calculation

$V = \pi (r/12)^2 h(\_\% \text{ vol})(7.48) = \_\_\_ / \text{gallons}$

V = Purge volume (gallons)

$\pi = 3.14159$

h = Height of Water Column (feet)

r = Borehole radius (inches)

↓

Evacuate water from well equal to the calculated purge volume while monitoring groundwater stabilization indicator parameters (pH, conductivity, temperature) at intervals of one casing volume.

Well Dewaters after One Purge Volume (Low yield well)

↓

Well Recharges to 80% of Initial Measured Water Column Height in Feet within 24 hrs. of Evacuation.

↓

Measure Groundwater Stability Indicator Parameters (pH, Temperature, Conductivity)

↓

Collect Sample and Complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Analytical Laboratory

Well Readily Recovers

↓

Record Groundwater Stability Indicator Parameters from each Additional Purge Volume

Stability indicated when the following Criteria are met:

pH :	± 0.1 pH units
Conductivity:	± 10%
Temperature:	1.0 degrees F

Groundwater Stability Achieved

↓

Collect Sample and Complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Analytical Laboratory

Groundwater Stability Not Achieved

↓

Continue Purging Until Stability is Achieved

↓

Collect Sample and complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Analytical Laboratory

Gettler - Ryan Inc.
ENVIRONMENTAL DIVISION

Chain of Custody
FIGURE 6

COMPANY _____ JOB NO. _____

JOB LOCATION _____

CITY _____ PHONE NO. _____

AUTHORIZED _____ DATE _____ P.O. NO. _____

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY: _____

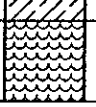
RELINQUISHED BY: _____ RECEIVED BY LAB: _____

DESIGNATED LABORATORY: _____ DHS #: _____

REMARKS: _____

DATE COMPLETED _____ FOREMAN _____

APPENDIX B
EXPLORATORY BORING LOG
WELL CONSTRUCTION DETAIL

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 15% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 15% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT		PEAT AND OTHER HIGHLY ORGANIC SOILS

LL - Liquid Limit (%)
PI - Plastic Index (%)
PID - Volatile Vapors in ppm
MA - Particle Size Analysis
2.5 YR 6/2 - Soil Color according to Munsell Soil Color Charts (1975 Edition)
5 GY 5/2 - GSA Rock Color Chart

 - No Soil Sample Recoverd
 - "Undisturbed" Sample
 - Bulk or Classification Sample
 - First Encountered Ground Water Level
 - Piezometric Ground Water Level

Penetration - Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs

GeoStrategies Inc.

Unified Soil Classification - ASTM D 2488-85 and Key to Test Data

Field location of boring: (See Plate 2)	Project No.: 719102	Date: 02/01/91	Boring No: C-7
	Client: Chevron Service Station No. 4587		
	Location: 609 Oak Street/6th Street		
	City: Oakland, California		Sheet 1 of 2
	Logged by: RCM	Driller: Bayland	
Drilling method: Hollow Stem Auger	Casing installation data:		
Hole diameter: 8-inches	Top of Box Elevation: 15.78		Datum: MSL

Water Level	13.5'	9.9'
Time	10:30	12:15
Date	02/01/91	02/01/91

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1 ft.
				2				SAND (SW) - very dark brown(10YR 3/2), loose, damp; 85% fine to coarse sand; 15% gravel; brick fragments. (Fill)
				3				
	250	S&H		4				
	500		C-7-4.5	5				
0	500	push		5				SAND (SP) - yellowish brown (10YR 5/6), loose, damp; 95% fine sand; 5% silt.
				6				
				7				
				8				
				9				
0	33	S&H	C-7-10.0	10		▼		SAND with CLAY (SP-SC) - yellowish brown (10YR 5/6), dense, moist; 90% fine to medium sand; 10% clay.
				11				
				12				
				13				
				14		▽		medium dense, saturated, minor greenish gray discoloration at 13.5 ft.
0	26	S&H	C-7-15.0	15				
				16				
				17				
				18				
				19				CLAYEY SAND (SC) - light olive brown (2.5Y 5/6), loose, saturated, 80% sand; 20% clay; minor greenish gray discoloration.
0	4	S&H	C-7-20.0	20				

Remarks:

* Converted to equivalent standard penetration blows/ft.

GeoStrategies Inc.

Log of Boring

BORING NO. C-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
719102	DHP	1/91		

Field location of boring: (See Plate 2)	Project No.: 719102	Date: 02/01/91	Boring No: C-7
	Client: Chevron Service Station No. 4587		
	Location: 609 Oak Street/6th Street		
	City: Oakland, California		Sheet 1 of 2
	Logged by: RCM	Driller: Bayland	
Drilling method: Hollow Stem Auger	Casing installation data:		
Hole diameter: 8-inches	Top of Box Elevation: 15.78		Datum: MSL

Water Level	13.5'	9.9'
Time	10:30	12:15
Date	02/01/91	02/01/91

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				1				PAVEMENT SECTION - 1 ft.
				2				SAND (SW) - very dark brown(10YR 3/2), loose, damp; 85% fine to coarse sand; 15% gravel; brick fragments. (Fill)
				3				
	250	S&H		4				
	500		C-7-4.5	5				
0	500	push		6				SAND (SP) - yellowish brown (10YR 5/6), loose, damp; 95% fine sand; 5% silt.
				7				
				8				
				9				
0	33	S&H	C-7-10.0	10		▼		SAND with CLAY (SP-SC) - yellowish brown (10YR 5/6), dense, moist; 90% fine to medium sand; 10% clay.
				11				
				12				
				13				
				14		▽		medium dense, saturated, minor greenish gray discoloration at 13.5 ft.
0	26	S&H	C-7-15.0	15				
				16				
				17				
				18				
				19				CLAYEY SAND (SC) - light olive brown (2.5Y 5/6), loose, saturated, 80% sand; 20% clay; minor greenish gray discoloration.
0	4	S&H	C-7-20.0	20				

Remarks:

* Converted to equivalent standard penetration blows/ft.

GeoStrategies Inc.

Log of Boring

BORING NO. C-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
719102	DHP	1/91		

Field location of boring:	Project No.: 719102	Date: 02/01/91	Boring No:
(See Plate 2)	Client: Chevron Service Station No. 4587		C-7
	Location: 609 Oak Street/6th Street		
	City: Oakland, California		Sheet 2 of 2
	Logged by: RCM	Driller: Bayland	

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Casing installation data:

Top of Box Elevation: Datum:

Water Level				
Time				
Date				

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				21				
				22				
				23				
				24				dense, Fe oxide stains at 25.0 ft.
1.5	33	S&H	C-7-25.0	25				
				26				
				27				
				28				
				29				SAND (SP) - olive brown (2.5Y 4/4), dense, saturated; 100% medium sand.
0	38	S&H	C-7-30.0	30				
				31				Bottom of Boring at 30.0 ft. 02/01/91
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Remarks:

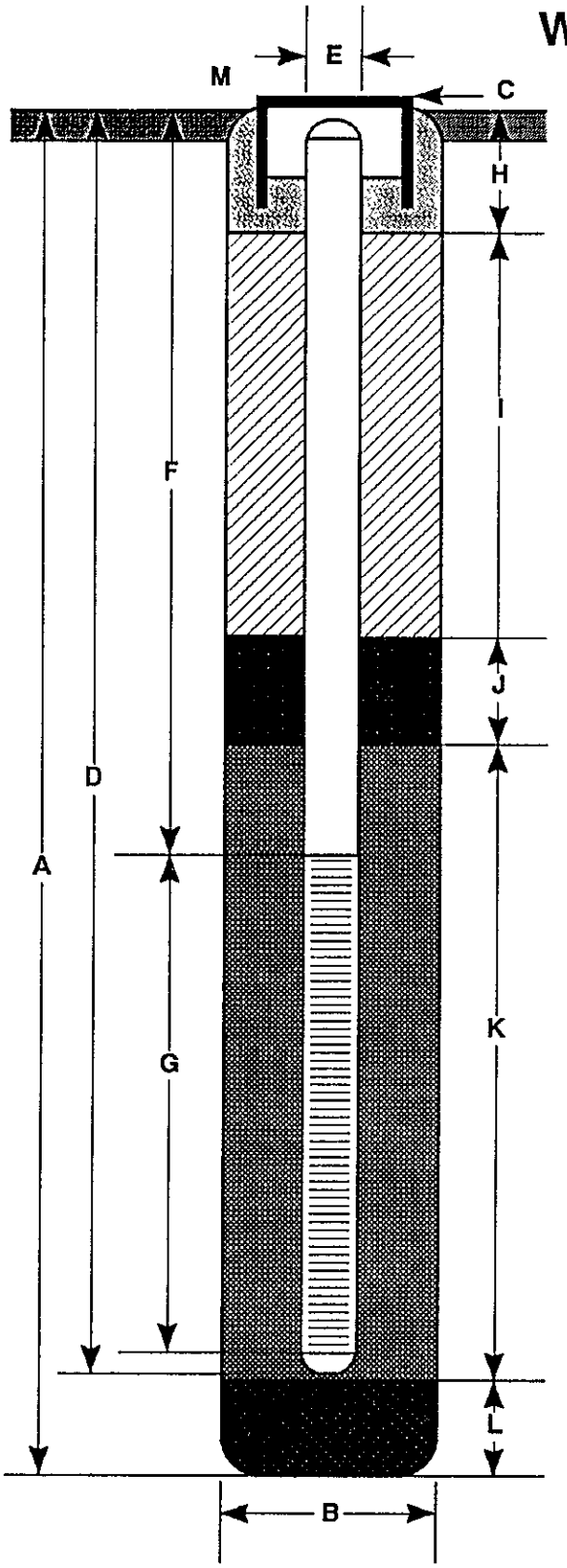
GeoStrategies Inc.

Log of Boring

BORING NO. C-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
719102	PHP	1/91		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 30 ft.

B Diameter of Boring: 8 in.
Drilling Method: Hollow Stem Auger

C Top of Box Elevation: 15.78 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length: 30 ft.
Material: Schedule 40 PVC

E Casing Diameter: 2 in.

F Depth to Top Perforations: 7 ft.

G Perforated Length: 23 ft.
Perforated Interval from 7 to 30 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.020 in.

H Surface Seal from 0 to 1.5 ft.
Seal Material: Concrete

I Backfill from 1.5 to 4 ft.
Backfill Material: Concrete

J Seal from 4 to 5 ft.
Seal Material: Bentonite Pellets

K Gravel Pack from 5 to 30 ft.
Pack Material: Lonestar #2/12 sand

L Bottom Seal: ft.
Seal Material:

M Vault box with locking cap, lock and cover

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO. C-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
719102	DHP	1/91		

APPENDIX C

SOIL ANALYTICAL REPORT

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081 DOHS #1332

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 11451
CLIENT: Geo Strategies Inc.
CLIENT JOB NO.: 7191

DATE RECEIVED: 02/01/91
DATE REPORTED: 02/08/91

Lab Number	Customer Sample Identification	Date Sampled	Date Analyzed
11451- 1	C-7-9.5	02/01/91	02/06/91
11451- 2	C-7-15.0	02/01/91	02/06/91

Laboratory Number:	11451 1	11451 2
ANALYTE LIST	Amounts/Quantitation Limits (mg/kg)	
OIL AND GREASE:	NA	NA
TPH/GASOLINE RANGE:	ND<1	ND<1
TPH/DIESEL RANGE:	NA	NA
BENZENE:	ND<.005	ND<.005
TOLUENE:	ND<.005	0.010
ETHYL BENZENE:	ND<.005	ND<.005
XYLENES:	ND<.005	0.015

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081 DOHS #1332

C E R T I F I C A T E O F A N A L Y S I S

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS

QA/QC INFORMATION
SET: 11451

NA = ANALYSIS NOT REQUESTED
ND = ANALYSIS NOT DETECTED ABOVE QUANTITATION LIMIT
mg/kg = part per million (ppm)

OIL AND GREASE ANALYSIS By Standard Methods Method 503E:
Minimum Detection Limit in Soil: 50mg/kg

Modified EPA-SW846 Method 8015 for Extractable Hydrocarbons:
Minimum Quantitation Limit for Diesel in Soil: 1mg/kg
Standard Reference: NA

EPA-SW846 Method 8015/5030 Total Purgable Petroleum Hydrocarbons:
Minimum Quantitation Limit for Gasoline in Soil: 1mg/kg
Standard Reference: 08/24/90

SW-846 Method 8020/BTXE
Minimum Quantitation Limit in Soil: 0.005mg/kg
Standard Reference: 01/09/91

ANALYTE	REFERENCE	SPIKE LEVEL	MS/MSD RECOVERY	RPD	CONTROL LIMIT
Oil & Grease	NA	NA	NA	NA	NA
Diesel	NA	NA	NA	NA	NA
Gasoline	01/09/91	200ng	95/95	0.7	58-120
Benzene	01/09/91	200ng	84/81	4.3	65-121
Toluene	01/09/91	200ng	90/91	1.1	65-120
Ethyl Benzene	01/09/91	200ng	95/96	1.0	65-122
Total Xylene	01/09/91	600ng	95/95	0.0	65-122

Richard Srna, Ph.D.
Laboratory Director

Chain-of-Custody-Record

1175

Chevron U.S.A. Inc.
P.O. BOX 5004
San Ramon, CA 94583
FAX (415)842-9591

Chevron Facility Number 4587
Facility Address 609 6TH ST./OAK ST. OAKLAND
Consultant Project Number 7191
Consultant Name GEOSTRATEGIES INC.
Address 2150 W. WINTON AVE.
Project Contact (Name) RANDY YOUNG
(Phone) 352-4800 (Fax Number) 783-1089

Chevron Contact (Name) NANCY VUKELICH
(Phone) 842-9581
Laboratory Name SUPERIOR
Laboratory Release Number 274-6840
Samples Collected by (Name) ROBERT MALLORY
Collection Date 2/1/91
Signature Robert C. Mallory

Sample Number	Number of Containers	Matrix S = Soil W = Water A = Air C = Charcoal	Type G = Grab C = Composite D = Discrete	Time	Sample Preservation	Iced (Yes or No)	Analyses To Be Performed: BTEX + TPH GAS (8020 + 8015)	TPH Diesel (8015)	Oil and Grease (5520)	Chlorinated HC (8010)	Non Chlorinated HC (8020)	Total Lead (AA)	Metals Cd,Cr,Pb,Zn,Ni (ICAP or AA)	ORGANIC LEAD DHS					Remarks
C-7-9.5	1	S	D	10:24		YES	✓												
C-7-15.0	1	S	D	10:32		↓	✓												ISSUE CP-7 ON A SEPARATE CERTIFICATE OF ANALYSIS
CP-7	1	S	G	11:25		↓	✓							✓					

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
Robert C. Mallory	GSI	2/1/91 15:00		GIR	2-1-9 15:00
Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
	GIR	2-1-91 16:25			
Relinquished By (Signature)	Organization	Date/Time	Received For Laboratory By (Signature)		Date/Time
			SNL 2-1-91		16:25

Turn Around Time (Circle Choice)
24 Hrs.
48 Hrs.
5 Days
10 Days
As Contracted

COC-1.DWG/1- 90-TCH

APPENDIX D

GETTLER-RYAN INC.

GROUND-WATER MONITORING DATA

DATE	WELL	DTH	DTW	HT	BAILED	FLOWMETER	PT-LIQ.	PT-H2O	EMP	C.ELEV
06-Dec-90	A		11.27	0.00					RA	
13-Dec-90	A		11.25	0.00					RA	
20-Dec-90	A		11.20	0.00					RA	
27-Dec-90	A		11.15	0.00					SM	
03-Jan-91	A		11.16	0.00					RA	
10-Jan-91	A		11.09	0.00					SM	
17-Jan-91	A		11.04	0.00					RA	
24-Jan-91	A		11.14	0.00					RA	
31-Jan-91	A		11.18	0.00					SM	
07-Feb-91	A		10.90	0.00					RA	
14-Feb-91	A		10.80	0.00					RA	
21-Feb-91	A		10.92	0.00					SM	
28-Feb-91	A		10.82	0.00					RA	
06-Dec-90	B		11.27	0.00						
13-Dec-90	B		11.19	0.00						
20-Dec-90	B		11.08	0.00						
27-Dec-90	B	11.08	(1.00)	0.00						
03-Jan-91	B	11.09	(1.00)	0.00						
10-Jan-91	B	11.14	(1.00)	0.00						
17-Jan-91	B	11.12	(1.00)	0.00						
24-Jan-91	B	11.14	(1.00)	0.00						
31-Jan-91	B	11.15	(1.00)	0.00						
07-Feb-91	B	10.82	(1.00)	0.00						
14-Feb-91	B		10.82	0.00						
21-Feb-91	B	10.80	(1.00)	0.00						
28-Feb-91	B	10.82	(1.00)	0.00						
06-Dec-90	C	11.01	11.24	0.23	0.50					
13-Dec-90	C	10.96	11.09	0.13	0.50					
20-Dec-90	C	10.89	11.00	0.11	0.0					
27-Dec-90	C	10.87	10.91	0.04	0.0					
03-Jan-91	C	10.88	11.02	0.14	0.25					
10-Jan-91	C	10.88	11.01	0.13	0.5					
17-Jan-91	C	10.90	11.02	0.12	0.25					
24-Jan-91	C	10.92	11.05	0.13	0.10					
31-Jan-91	C	10.95	11.03	0.08	0.25					
07-Feb-91	C	10.80	10.86	0.06	0.5					
14-Feb-91	C	10.74	10.80	0.06	0.25					
21-Feb-91	C	10.72	10.84	0.12	0.5					
28-Feb-91	C	10.59	10.72	0.13	0.25					
06-Dec-90	CR1		10.59	0.00						
13-Dec-90	CR1		10.54	0.00						
20-Dec-90	CR1		10.43	0.00						
27-Dec-90	CR1		10.43	0.00						
03-Jan-91	CR1		10.42	0.00						

DATE	WELL	DTH	DTW	HT	BAILED	FLOWMETER	PT-LIQ.	PT-H2O	EMP	C.ELEV
10-Jan-91	CR1		10.46	0.00						
17-Jan-91	CR1		10.44	0.00						
24-Jan-91	CR1		10.52	0.00						
31-Jan-91	CR1		10.30	0.00						
07-Feb-91	CR1		10.22	0.00						
14-Feb-91	CR1		10.21	0.00						
21-Feb-91	CR1		10.25	0.00						
28-Feb-91	CR1		10.15	0.00						
06-Dec-90	1	10.88	10.89	0.01	0.1					
13-Dec-90	1	10.79	10.80	0.01	0.1					
20-Dec-90	1	10.68	10.69	0.01	0.0					
27-Dec-90	1	10.64	10.66	0.02	0.0					
03-Jan-91	1	10.72	10.74	0.02	0.1					
10-Jan-91	1	10.72	10.73	0.01	0.1					
17-Jan-91	1	10.74	(1.00)	0.00						
24-Jan-91	1	10.76	(1.00)	0.00						
31-Jan-91	1	10.76	(1.00)	0.00						
07-Feb-91	1	10.46	(1.00)	0.00						
14-Feb-91	1		N/A							
21-Feb-91	1	10.49	(1.00)	0.00						
28-Feb-91	1		9.69	0.00						
06-Dec-90	2		11.23	0.00						
13-Dec-90	2		11.14	0.00						
20-Dec-90	2		11.03	0.00						
27-Dec-90	2		11.02	0.00						
03-Jan-91	2		11.08	0.00						
10-Jan-91	2		11.09	0.00						
17-Jan-91	2		11.09	0.00						
24-Jan-91	2		11.12	0.00						
31-Jan-91	2		11.12	0.00						
07-Feb-91	2		10.75	0.00						
14-Feb-91	2		10.77	0.00						
21-Feb-91	2		10.82	0.00						
28-Feb-91	2		10.73	0.00						
06-Dec-90	3		10.56	0.00						
13-Dec-90	3		N/A							
20-Dec-90	3		10.33	0.00						
27-Dec-90	3		10.30	0.00						
03-Jan-91	3		10.36	0.00						
10-Jan-91	3		10.37	0.00						
17-Jan-91	3		10.37	0.00						
24-Jan-91	3		10.42	0.00						
31-Jan-91	3		10.43	0.00						
07-Feb-91	3		10.05	0.00						
14-Feb-91	3		N/A							
21-Feb-91	3		10.12	0.00						

DATE	WELL	DTH	DTW	HT	BAILED	FLOWMETER	PT-LIQ.	PT-H2O	EMP	C.ELEV
28-Feb-91	3		9.98	0.00						
06-Dec-90	4		11.60	0.00						
13-Dec-90	4		11.52	0.00						
20-Dec-90	4		11.42	0.00						
27-Dec-90	4		11.40	0.00						
03-Jan-91	4		11.43	0.00						
10-Jan-91	4		11.43	0.00						
17-Jan-91	4		11.56	0.00						
24-Jan-91	4		11.56	0.00						
31-Jan-91	4		11.51	0.00						
07-Feb-91	4		11.35	0.00						
14-Feb-91	4		11.27	0.00						
21-Feb-91	4		11.27	0.00						
28-Feb-91	4		11.13	0.00						
06-Dec-90	5		9.97	0.00						
13-Dec-90	5		9.89	0.00						
20-Dec-90	5		9.80	0.00						
27-Dec-90	5		9.79	0.00						
03-Jan-91	5		9.83	0.00						
10-Jan-91	5		9.85	0.00						
17-Jan-91	5		9.84	0.00						
24-Jan-91	5		9.90	0.00						
31-Jan-91	5		N/A							
07-Feb-91	5		9.62	0.00						
14-Feb-91	5		9.62	0.00						
21-Feb-91	5		9.66	0.00						
28-Feb-91	5		9.57	0.00						
06-Dec-90	6		9.47	0.00						
13-Dec-90	6		9.43	0.00						
20-Dec-90	6		9.32	0.00						
27-Dec-90	6		9.36	0.00						
03-Jan-91	6		9.36	0.00						
10-Jan-91	6		9.38	0.00						
17-Jan-91	6		9.36	0.00						
24-Jan-91	6		9.42	0.00						
31-Jan-91	6		N/A							
07-Feb-91	6		9.25	0.00						
14-Feb-91	6		9.25	0.00						
21-Feb-91	6		9.24	0.00						
28-Feb-91	6		9.20	0.00						

APPENDIX E
GETTLER-RYAN INC. GROUNDWATER SAMPLING REPORTS

gettler — ryan inc.

January 28, 1991

GROUNDWATER SAMPLING REPORT

Chevron U.S.A. Inc.
Post Office Box 5004
San Ramon, California 94583-0804

Referenced Site: Chevron Service Station #4587
609 Oak Street/6th
Oakland, California

Sampling Date: January 14, 1991

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on January 14, 1991 at the referenced location. The site is occupied by an operating service station located on the northwest corner of Oak Street and Sixth Street. The service station has underground storage tanks containing regular leaded, unleaded and super unleaded gasoline products.

There are currently six groundwater monitoring wells and one recovery well on site, and three groundwater monitoring wells off site at the location shown on the attached site map. Prior to sampling, all wells were inspected for total well depth, water levels, and the presence of separate phase hydrocarbons using an electronic interface probe. A clean acrylic bailer was used to visually confirm the presence and thickness of separate phase hydrocarbons. Groundwater depths ranged from 9.41 to 11.44 feet below grade. Separate phase hydrocarbons were observed in wells C-1, B and C.

Wells that did not contain separate phase hydrocarbons were then purged and sampled. The purge water was contained in drums for proper disposal. Standard sampling procedure calls for a minimum of four case volumes to be purged from each well. Each well was purged while pH, temperature, and conductivity measurements were monitored for stability. Details of the final well purging results are presented on the attached Table of Monitoring Data. In cases where a well dewatered or less than four case volumes were purged, groundwater samples were obtained after the physical parameters had stabilized. Under such circumstances the sample may not represent actual formation water, due to low flow conditions.

2150 west winton avenue • hayward, california 94545-1210 • (415) 783-7500

Samples were collected, using Teflon bailers or bladder pumps, in properly cleaned and laboratory prepared containers. All sampling equipment was thoroughly cleaned after each well was sampled and steam cleaned upon completion of work at the site. The samples were labeled, stored on blue ice, and transported to the laboratory for analysis. A trip blank supplied by the laboratory, was included for analyzed to assess quality control. A duplicate sample (CD-2), was submitted without well designation to assess laboratory performance. Analytical results for the blanks are included in the Certified Analytical Report (CAR's). Chain of custody records were established noting sample identification numbers, time, date, and custody signatures.

The samples were analyzed by Superior Analytical Incorporated, located at 1555 Burke, Unit 1, San Francisco, California. The laboratory is assigned a California DHS-HMTL Certification number of 1332. The results are presented as a Certified Analytical Report, a copy of which is attached to this report.

Tom Paulson
Sampling Manager

attachments

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	C-1	C-2 CD-2	C-3	C-4	C-5	C-6
Casing Diameter (inches)	3	3	3	2	2	2
Total Well Depth (feet)	----	18.4	17.5	30.0	30.0	30.2
Depth to Water (feet)	11.39 **	11.11	10.34	11.44	9.87	9.41
Free Product (feet)	0.02	none	none	none	none	none
Reason Not Sampled	free product	----	----	----	----	----
Calculated 4 Case Vol.(gal.)	----	10.8	10.9	12.8	13.6	14.2
Did Well Dewater?	----	no	yes	no	no	no
Volume Evacuated (gal.)	----	14.0	4.0	13.0	17.0	18.0
Purging Device	----	Bailer	Bailer	Bailer	Bailer	Bailer
Sampling Device	----	Bailer	Bailer	Bailer	Bailer	Bailer
Time	----	15:32	16:50	14:00	14:32	14:05
Temperature (F)*	----	67.1	61.1	69.6	69.1	66.1
pH*	----	6.63	6.37	6.68	6.57	6.66
Conductivity (umhos/cm)*	----	742	426	549	641	593

* Indicates Stabilized Value

** Not corrected for presence of free product

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	A	B	C	CR-1
Casing Diameter (inches)	2	4	----	6
Total Well Depth (feet)	19.6	----	----	29.5
Depth to Water (feet)	11.25	11.40 **	11.01 **	10.29
Free Product (feet)	none	0.01	0.11	none
Reason Not Sampled	----	free product	free product	----
Calculated 4 Case Vol.(gal.)	5.7	----	----	115.3
Did Well Dewater?	yes	----	----	no
Volume Evacuated (gal.)	4.0	----	----	147.0
Purging Device	Bailer	----	----	Bladder/Suction
Sampling Device	Bailer	----	----	Bladder
Time	17:30	----	----	15:38
Temperature (F)*	66.7	----	----	68.1
pH*	6.70	----	----	6.60
Conductivity (umhos/cm)*	1014	----	----	645

* Indicates Stabilized Value

** Not corrected for presence of free product

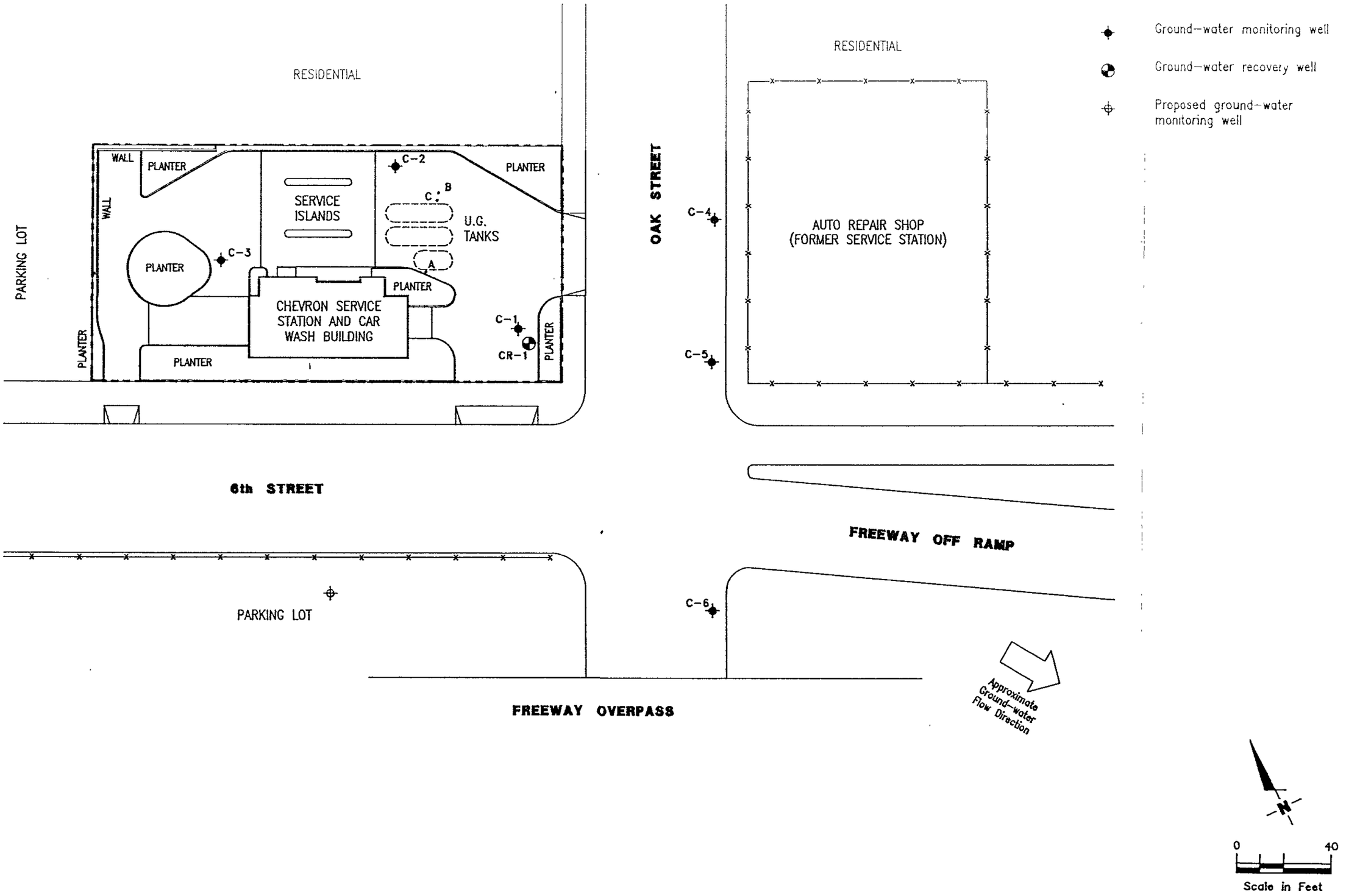


PLATE 2

SITE PLAN
Chevron Service Station #4587
609 Oak Street
Oakland, California

DATE 11/90

REVISED DATE

GeoStrategies Inc.

GSI

REVIEWED BY RG/CEG

JOB NUMBER 7191

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

DOHS #1332

GETTLER-RYAN INC.
GENERAL CONTRACTORS

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 11387
CLIENT: Chevron USA Inc.
CLIENT JOB NO.: 3191

DATE RECEIVED: 01/15/91
DATE REPORTED: 01/22/91

Lab Number	Customer Sample Identification	Date Sampled	Date Analyzed
11387- 1	C-2	01/14/91	01/18/91
11387- 2	C-3	01/14/91	01/18/91
11387- 3	C-4	01/14/91	01/18/91
11387- 4	C-5	01/14/91	01/18/91
11387- 5	C-6	01/14/91	01/18/91
11387- 6	A	01/14/91	01/18/91
11387- 7	CR-1	01/14/91	01/18/91
11387- 8	CD-2	01/14/91	01/18/91
11387- 9	TRIP BLANK	01/14/91	01/18/91

Laboratory Number:	11387 1	11387 2	11387 3	11387 4	11387 5
ANALYTE LIST	Amounts/Quantitation Limits (ug/L)				
OIL AND GREASE:	NA	NA	NA	NA	NA
TPH/GASOLINE RANGE:	24000	80	ND<50	54	ND<50
TPH/DIESEL RANGE:	NA	NA	NA	NA	NA
BENZENE:	3300	ND<0.5	ND<0.5	ND<0.5	ND<0.5
TOLUENE:	1200	ND<0.5	ND<0.5	ND<0.5	ND<0.5
ETHYL BENZENE:	1100	ND<0.5	ND<0.5	ND<0.5	ND<0.5
XYLENES:	4100	1	ND<0.5	ND<0.5	ND<0.5

Laboratory Number:	11387 6	11387 7	11387 8	11387 9
ANALYTE LIST	Amounts/Quantitation Limits (ug/L)			
OIL AND GREASE:	NA	NA	NA	NA
TPH/GASOLINE RANGE:	12000	1500	30000	ND<50
TPH/DIESEL RANGE:	NA	NA	NA	NA
BENZENE:	30000	3200	3900	ND<0.5
TOLUENE:	540	52	1500	ND<0.5
ETHYL BENZENE:	1400	190	1500	ND<0.5
XYLENES:	560	77	5000	ND<0.5

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081 DOHS #1332

CERTIFICATE OF ANALYSIS

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS

QA/QC INFORMATION
SET: 11387

NA = ANALYSIS NOT REQUESTED
ND = ANALYSIS NOT DETECTED ABOVE QUANTITATION LIMIT
ug/l = part per billion (ppb)

OIL AND GREASE ANALYSIS By Standard Methods Method 503E:
Minimum Detection Limit in Water: 5000ug/L

Modified EPA-SW846 Method 8015 for Extractable Hydrocarbons:
Minimum Quantitation Limit for Diesel in Water: 50ug/l
Standard Reference: NA

EPA-SW846 Method 8015/5030 Total Purgable Petroleum Hydrocarbons:
Minimum Quantitation Limit for Gasoline in Water: 50ug/l
Standard Reference: 08/24/90

SW-846 Method 8020/BTXE
Minimum Quantitation Limit in Water: 0.5ug/l
Standard Reference: 10/22/90

ANALYTE	REFERENCE	SPIKE LEVEL	MS/MSD RECOVERY	RPD	CONTROL LIMIT
Oil & Grease	NA	NA	NA	NA	NA
Diesel	NA	NA	NA	NA	NA
Gasoline	10/22/90	200ng	80/80	0.3	75-125
Benzene	10/22/90	200ng	89/86	3.4	75-130
Toluene	10/22/90	200ng	91/88	2.8	75-130
Ethyl Benzene	10/22/90	200ng	96/92	4.8	75-130
Total Xylene	10/22/90	600ng	95/91	3.6	75-130

Richard Srna, Ph.D.
Laboratory Director

OUTSTANDING QUALITY AND SERVICE

SA# 11387

Chain-of-Custody-Record

Chevron U.S.A. Inc.
P.O. BOX 5004
San Ramon, CA 94583
FAX (415)842-9591

Chevron Facility Number: 4587
Facility Address: 609 Oak St, Oakland
Consultant Project Number: 3191
Consultant Name: Gettler-Ryan Inc
Address: 2150 W. Winton Ave Hayward
Project Contact (Name): Tom Paulson
(Phone) (415) 783-7500 (Fax Number)

Chevron Contact (Name)
(Phone)
Laboratory Name: Superior
Laboratory Release Number: 2746840
Samples Collected by (Name): Guadalupe Sanchez
Collection Date: 1-14-91
Signature: Guadalupe Sanchez

Sample Number	Number of Containers	Matrix S = Soil A = Air W = Water C = Charcoal	Type G = Grab C = Composite D = Discrete	Time	Sample Preservation	Iced (Yes or No)	Analyses To Be Performed: BTEX + TPH GAS (8020 + 8015)	TPH Diesel (8015)	Oil and Grease (5520)	Chlorinated HC (8010)	Non Chlorinated HC (8020)	Total Lead (AA)	Metals Cd,Cr,Pb,Zn,Ni (ICAP or AA)						Remarks
C-2	3	W		15:32	HCl	Yes	✓												
C-3	↓	↓		16:50	↓	↓	/												
C-4				14:00			/												
C-5				14:32			/												
C-6				14:05			/												
A				17:30			/												
CR-1				15:38			/												
CD-2	↓			—			/												
trip blank	2	↓		—	↓	↓	/												

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
Guadalupe Sanchez	Gettler-Ryan	1-14-91 / 17:32	Refrig #1	G/R	1/14/91 1733
Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
Refrig #1	G/R	1-15-91 / 800	BW Baba	G/R	1-15-91 801
Relinquished By (Signature)	Organization	Date/Time	Received For Laboratory By (Signature)		Date/Time
BW Baba	G/R	1-15-91 1728	M. Hallberg	1/15/91	17:40

Turn Around Time (Circle Choice)
24 Hrs.
48 Hrs.
5 Days
10 Days
As Contracted

COC-1.DWG/*** 80/MC-

gettler — ryan inc.

February 25, 1991

GROUNDWATER SAMPLING REPORT

Chevron U.S.A. Inc.
Post Office Box 5004
San Ramon, California 94583-0804

Referenced Site: Chevron Service Station #4587
609 Oak Street/6th
Oakland, California

Sampling Date: February 7, 1991

This report presents the results of the groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on February 7, 1991 at the referenced location. The site is occupied by an operating service station located on the northwest corner of Oak Street and Sixth Street. The service station has underground storage tanks containing regular leaded, unleaded and super unleaded gasoline products.

There are currently six groundwater monitoring wells and one recovery well on site, and four groundwater monitoring wells off site at the locations shown on the attached site map. Newly installed well C-7 was developed February 5, 1991. Prior to sampling, well C-7 was inspected for total well depth, water level, and the presence of separate phase hydrocarbons using an electronic interface probe. A clean acrylic bailer was used to visually confirm the presence or absence of separate phase hydrocarbons. Groundwater depth was 9.88 feet below grade. Separate phase hydrocarbons were not observed in well C-7.

The well was then purged and sampled. The purge water was drummed for proper disposal. Standard sampling procedure calls for a minimum of four case volumes to be purged from each well. Well C-7 was purged while pH, temperature, and conductivity measurements were monitored for stability. Details of the final well purging results are presented on the attached Table of Monitoring Data. In cases where a well dewatered or less than four case volumes were purged, groundwater samples were obtained after the physical parameters had stabilized. Under such circumstances the sample may not represent actual formation water, due to low flow conditions.

Samples were collected, using a Teflon bailer in properly cleaned and laboratory prepared containers. All sampling equipment was thoroughly cleaned after each well was sampled and steam cleaned upon completion of work at the site. The samples were labeled, stored on blue ice, and transported to the laboratory for analysis. A trip blank supplied by the laboratory, was included for analyzed to assess quality control. Analytical results for the trip blank are included in the Certified Analytical Report (CAR's). Chain of custody records were established noting sample identification numbers, time, date, and custody signatures.

2150 west winton avenue • hayward, california 94545-1210 • (415) 783-7500

The samples were analyzed by Superior Analytical Incorporated, located at 1555 Burke, Unit 1, San Francisco, California. The laboratory is assigned a California DHS-HMTL Certification number of 1332. The results are presented as a Certified Analytical Report, a copy of which is attached to this report.

Tom Paulson
Sampling Manager

attachments

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	C-7
Casing Diameter (inches)	2
Total Well Depth (feet)	30.0
Depth to Water (feet)	9.88
Free Product (feet)	none
Reason Not Sampled	-----
Calculated 4 Case Vol.(gal.)	13.6
Did Well Dewater?	no
Volume Evacuated (gal.)	17.0
Purging Device	Bailer
Sampling Device	Bailer
Time	10:03
Temperature (F)*	65.4
pH*	6.55
Conductivity (umhos/cm)*	631

* Indicates Stabilized Value

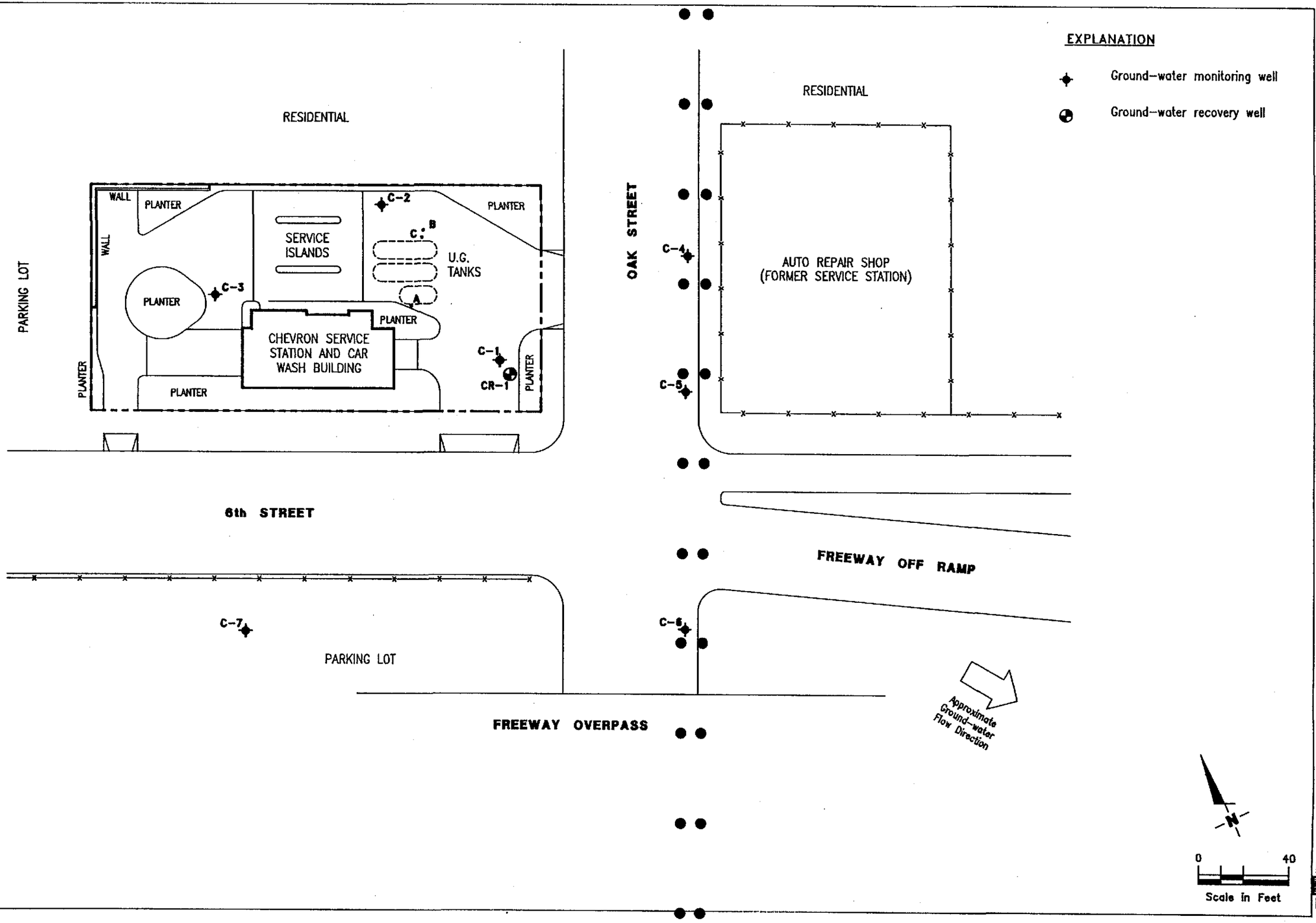


PLATE 2

SITE PLAN
Chevron Service Station #4587
609 Oak Street
Oakland, California

DATE 2/91
REVISED DATE

GeoStrategies Inc.

JOB NUMBER 719102
REVIEWED BY

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081 DOHS #1332

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 11469
CLIENT: Chevron, USA
CLIENT JOB NO.: 3191.01

DATE RECEIVED: 02/08/91
DATE REPORTED: 02/15/91

Lab Number	Customer Sample Identification	Date Sampled	Date Analyzed
11469- 1	C-7	02/07/91	02/15/91
11469- 2	TRIP	02/07/91	02/15/91

Laboratory Number:	11469 1	11469 2
ANALYTE LIST	Amounts/Quantitation Limits (ug/L)	
OIL AND GREASE:	NA	NA
TPH/GASOLINE RANGE:	ND<50	ND<50
TPH/DIESEL RANGE:	NA	NA
BENZENE:	ND<0.5	ND<0.5
TOLUENE:	0.8	ND<0.5
ETHYL BENZENE:	ND<0.5	ND<0.5
XYLENES:	ND<0.5	ND<0.5

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081 DOHS #1332

C E R T I F I C A T E O F A N A L Y S I S

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS

QA/QC INFORMATION
SET: 11469

NA = ANALYSIS NOT REQUESTED
ND = ANALYSIS NOT DETECTED ABOVE QUANTITATION LIMIT
ug/l = part per billion (ppb)

OIL AND GREASE ANALYSIS By Standard Methods Method 503E:
Minimum Detection Limit in Water: 5000ug/L

Modified EPA-SW846 Method 8015 for Extractable Hydrocarbons:
Minimum Quantitation Limit for Diesel in Water: 50ug/l
Standard Reference: NA

EPA-SW846 Method 8015/5030 Total Purgable Petroleum Hydrocarbons:
Minimum Quantitation Limit for Gasoline in Water: 50ug/l
Standard Reference: 08/24/90

SW-846 Method 8020/BTXE
Minimum Quantitation Limit in Water: 0.5ug/l
Standard Reference: 01/09/91

ANALYTE	REFERENCE	SPIKE LEVEL	MS/MSD RECOVERY	RPD	CONTROL LIMIT
Oil & Grease	NA	NA	NA	NA	NA
Diesel	NA	NA	NA	NA	NA
Gasoline	01/09/91	200ng	86/91	5.8	63-111
Benzene	01/09/91	200ng	97/93	3.7	72-119
Toluene	01/09/91	200ng	96/95	1.6	70-116
Ethyl Benzene	01/09/91	200ng	100/98	1.5	73-119
Total Xylene	01/09/91	600ng	102/100	2.2	71-118

Richard Srna, Ph.D.
Laboratory Director

Chain-of-Custody-Record

11469

Chevron U.S.A. Inc.
P.O. BOX 5004
San Ramon, CA 94583
FAX (415)842-9591

Chevron Facility Number 4587
Facility Address 609 OAK ST / 6TH - OAKLAND
Consultant Project Number 3191.01
Consultant Name Gettler-Ryan
Address 2150 W. Winton Ave / Hayward
Project Contact (Name) T. Paulson
(Phone) 783-7500 (Fax Number)

Chevron Contact (Name)
(Phone)
Laboratory Name Superior
Laboratory Release Number 2746840
Samples Collected by (Name) Chris O'Connor
Collection Date 2-7-91
Signature

Sample Number	Number of Containers	Matrix S = Soil A = Air W = Water C = Charcoal	Type G = Grab C = Composite D = Discrete	Time	Sample Preservation	Iced (Yes or No)	Analyses To Be Performed: BTEX + TPH GAS (8020 + 8015)	TPH Diesel (8015)	Oil and Grease (5520)	Chlorinated HC (8010)	Non Chlorinated HC (8020)	Total Lead (AA)	Metals Cd,Cr,Pb,Zn,Ni (ICAP or AA)	Remarks
C-7	2	W		10:03	HCL	Y	✓							
Trip Blnk	1	↓		2-6-91	↓	↓	↓							

Please initial:
Samples Stored in ice.
Appropriate containers.
Samples preserved.
VOA's without headspace.
Comments:

	Organization	Date/Time		Organization	Date/Time	
Relinquished By (Signature)	Gettler-Ryan	2-7-91	1606	Received By (Signature) REPRIG #1	Gettler-Ryan	2-7-91 1606
Relinquished By (Signature) Refrig #1	G/R	2-8-91 ~~0700~~	800	Received By (Signature)	G/R	2-8-91 801
Relinquished By (Signature)	G/R	2-8-91	1211	Received For Laboratory By (Signature)		2/8/91 12:14P.

Turn Around Time (Circle Choice)
24 Hrs.
48 Hrs.
5 Days
10 Days
As Contracted