



GeoStrategies Inc.

SITE UPDATE/WORK PLAN

UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

780901-4

February 22, 1991

RECEIVED

FEB 22 1991



GeoStrategies Inc.

2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545

GETTLER-RYAN INC.

GENERAL CONTRACTORS (415) 352-4800

February 22, 1991

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

Attn: Mr. Keith Bullock

Re: SITE UPDATE/WORK PLAN
UNOCAL Service Station No. 5760
376 Lewelling Blvd.
San Lorenzo, California

Gentlemen:

This Site Update/Work Plan prepared by GeoStrategies Inc. (GSI) presents results of the 1990 fourth quarter ground-water sampling performed by Gettler-Ryan Inc. (G-R) on December 5, 1990, in accordance with the current quarterly monitoring plan for the site. Included is a proposed scope of work to install additional monitoring wells. The scope of work is in response to a letter prepared by the Alameda County Department of Environmental Health dated January 10, 1991. There are currently four monitoring wells at the site (Plate 1 and 2). Field work and laboratory analysis methods were performed to comply with current State of California Water Resources Control Board (SWRCB) guidelines for conducting environmental investigations related to leaking underground tanks. GSI Field Methods and Procedures are presented in Appendix A.

SITE BACKGROUND

Underground storage tanks were replaced at this site during November and December 1987. Well U-1 was installed in February 1988 in response to contamination observed during the underground tank replacement. A groundwater sample collected from Well U-1 on February 9, 1988, contained benzene at a concentration of 3,600 parts per billion (ppb). Woodward-Clyde Consultants (WCC) documented the well installation in a report dated March 25, 1988.

780901-4

GeoStrategies Inc.

Gettler-Ryan Inc.
February 22, 1991
Page 2

On August 6, 1990, three exploratory soil borings were drilled and completed as monitoring wells U-2, U-3 and U-4. August 1990, ground-water chemical analyses detected Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) in Well U-1 at 27,000 ppb and Well U-3 at 110,000 ppb. Benzene was detected in Well U-1 at 1200 ppb and 4400 ppb in Well U-3. Wells U-2 and U-4 did not contain detectable concentrations of TPH-Gasoline or Benzene, Toluene, Ethylbenzene and Xylenes (BTEX).

CURRENT QUARTERLY SAMPLING RESULTS

Potentiometric Data

Prior to ground-water sampling, water-levels were measured in each monitoring well using an electronic interface probe (Table 1). Static water-levels were measured from the surveyed top of well box and recorded to the nearest ± 0.01 foot. Depth to shallow groundwater ranged from 20.82 to 22.52 feet below ground surface, which corresponds to elevations ranging from 18.82 to 19.10 feet above Mean Sea Level (MSL). A potentiometric contour map was prepared from the water-level measurement data and is presented on Plate 3. The potentiometric map indicates shallow groundwater beneath the site flows to the west, at an approximate hydraulic gradient of 0.002.

Floating Product Measurements

Each monitoring well was checked for the presence of floating product with an electronic oil-water interface probe. The probe detects the presence of floating product and allows the thickness to be measured to the nearest ± 0.01 foot. Each well was also checked with a clear acrylic bailer to confirm interface probe results. Floating product was observed in Well U-1 at a measured thickness of 0.10 feet.

Ground-water Analytical Data

Ground-water samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. Chemical analyses were performed by Superior Analytical Laboratory Inc. (Superior) located in San Francisco, California, a State-certified environmental laboratory. Groundwater conformation samples were analyzed by International Technology Corporation (IT) Analytical services located in San Jose, California, a State-certified environmental laboratory.

GeoStrategies Inc.

Gettler-Ryan Inc.
February 22, 1991
Page 3

Comparison of the December 5, 1990 groundwater chemical analytical data with historical data from the site suggests that analytical results reported for Wells U-3 and U-4 were inadvertently interchanged. Monitoring wells U-3 and U-4 were resampled on January 18, 1991 to verify that an error had occurred. The correct December 5, 1990 data have been used in preparing a TPH-Gasoline/Benzene concentration map by interchanging the reported sampling results of Wells U-3 and U-4.

TPH-Gasoline was detected in Well U-3 at a concentration of 69,000 parts per billion (ppb). Benzene was detected in Well U-3 at a concentration of 1900 ppb. Wells U-2 and U-4 were reported as None Detected (ND) for TPH-Gasoline and benzene. These data are consistent with historical and confirmation chemical analytical results. A TPH-Gasoline/Benzene chemical concentration map is presented on Plate 4.

Water-quality data for this quarter including the groundwater confirmation sampling results are summarized in Table 1. Historical chemical analytical data have been tabulated and are presented in Table 2. The G-R Groundwater Sampling Report, including the Superior and IT Analytical Services certified analytical reports, and Chain-of-Custody forms are presented in Appendix B.

Quality Control

Quality Control (QC) samples for this quarter's ground-water sampling were trip blanks. The trip blanks were prepared in the Superior and IT laboratories using organic-free water to evaluate laboratory handling and analytical procedures.

The analyses performed on the trip blanks did not detect any measurable concentrations of TPH-Gasoline or BTEX. These results indicate that petroleum hydrocarbons were not introduced into the samples during sample handling or transport.

GeoStrategies Inc.

Gettler-Ryan Inc.
February 22, 1991
Page 4

WORK PLAN

As requested by the Alameda County Department of Environmental Health (January 10, 1991), GSI proposes the installation of 3 monitoring wells offsite, to further evaluate the extent of petroleum hydrocarbons in groundwater (Plate 2). These wells will also facilitate further assessment evaluation of subsurface hydrogeology/geology. Following installation of these wells, groundwater samples will be collected to evaluate the extent of hydrocarbons. The technical basis for this work includes the following.

- o Soil and groundwater at the site contained detectable concentrations of hydrocarbons when the underground storage tanks (UGSTs) were replaced in 1987 and following installation of Well U-1 by WCC in 1988.
- o Soil and groundwater at the site contained detectable concentrations of hydrocarbons when Well U-3 was installed by GSI in August 1990.
- o The current quarterly groundwater sampling event (December 5, 1990) has detected up to 0.1 foot of floating product in Well U-1.
- o Historical groundwater monitoring data indicate that shallow groundwater beneath the site flows west and southwest and hydrocarbons associated with groundwater may be expected to migrate in approximately the same direction.
- o Chemical analytical data collected to date indicate that the hydrocarbon plume has not been delineated and may have migrated offsite. A summary of historical chemical analytical data is presented in Table 2.

GeoStrategies Inc.

Gettler-Ryan Inc.
February 22, 1991
Page 5

SCOPE OF WORK

Three soil borings will be drilled using hollow-stem auger drilling equipment to an anticipated depth of 30 feet or until an aquitard is reached. Soil samples will be collected by California Modified split-barrel sampler equipped with pre-cleaned liners, and advanced ahead of the drill bit. Soil samples will be collected at five-foot intervals and significant lithologic changes, as a minimum, for lithologic identification, field head-space analysis, physical testing, and chemical analysis. The borings will be logged by a GSI geologist using the Unified Soil Classification System (ASTM-D2488-84). Selected soil samples collected above the saturated zone will be analyzed for the presence of petroleum hydrocarbons. Additional samples may be selected for chemical analysis. Soil and groundwater samples collected from the exploratory borings and the wells will be analyzed at a California State-certified analytical laboratory for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020.

The monitoring wells will be constructed using 3-inch-diameter Schedule 40 PVC casing. The well screens will extend a minimum of 5 feet above the equilibrated water-level. The annular sandpack will be placed from the total depth of the designed well and will extend to a minimum of 2-feet above the well screen. A minimum 1-foot bentonite seal, followed by a cement-grout seal to one-half foot below ground surface, will be placed above the sandpack. The well screens will be emplaced so that well designs are compatible with subsurface geologic conditions. No well screens will be installed that potentially could permit cross contamination of adjacent aquifers. Due to declining water levels caused by recent drought conditions, it may be necessary to explore the vertical extent of the aquifer beyond the depth explored in previous investigations at the site. In addition, one well may be extended to evaluate the competency of the basal aquitard. A laboratory falling-head permeability test will be performed on an aquitard sample.

GeoStrategies Inc.

Gettler-Ryan Inc.
February 22, 1991
Page 6

Upon completion of field work and receipt of chemical analytical data, a report will be prepared presenting the field and laboratory data including copies of the exploratory boring logs, chemical analytical reports, updated geologic cross-sections, site history as available, and narrative. In addition, subsurface utilities will be assessed as potential hydrocarbon migration pathways. A 1/2-mile radius well survey will be conducted to ascertain any potential impact on the groundwater in the area. This report will be prepared under the supervision of a State of California Registered Geologist.


The groundwater sampling/monitoring program will continue and floating product will be bailed from Well U-1 during monitoring activities.

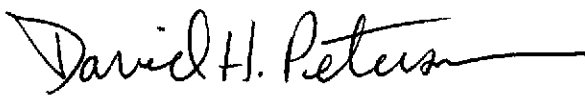
GeoStrategies Inc.

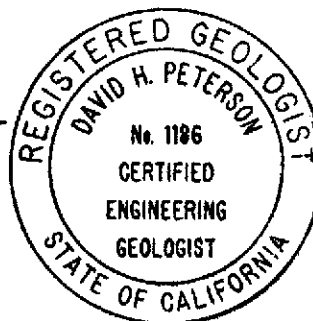
Gettler-Ryan Inc.
February 22, 1991
Page 7

If you have any questions, please call.

GeoStrategies Inc. by,


Douglas Wolfe
Geologist


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



DW/DHP/mlg

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

- Appendix A: GSI Field Methods and Procedures
- Appendix B: Gettler-Ryan Inc. Groundwater Sampling Reports

TABLE 1

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)
U-1	05-Dec-90	12-Dec-90	----	----	----	----	----	40.51	18.98	0.10	21.61
U-2	05-Dec-90	12-Dec-90	<50.	<0.3	<0.3	<0.3	<0.3	41.62	19.10	----	22.52
*U-3	05-Dec-90	12-Dec-90	69,000	1900	3500	1600	9800	39.64	18.82	----	20.82
+U-3	18-Jan-91	24-Jan-91	51000.	1700.	3100.	1500.	7500.	----	----	----	----
*U-4	05-Dec-90	12-Dec-90	<50	<0.3	<0.3	<0.3	<0.3	40.53	18.90	----	21.63
+U-4	18-Jan-91	25-Jan-91	<50.	<0.5	<0.5	<0.5	<0.5	----	----	----	----
TB	----	12-Dec-90	<50.	<0.3	<0.3	<0.3	<0.3	----	----	----	----
TB	----	22-Jan-91	<50.	<0.5	<0.5	<0.5	<0.5	----	----	----	----

TPH = Total Petroleum Hydrocarbons as Gasoline

PPB = Parts Per Billion

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.* Values as reported by Superior were interchanged. Analytical values have been corrected to reflect historical trend.

4.+ Conformation sampling performed 18-Jan-91 and reported by IT.

TABLE 2

 =====
 HISTORICAL GROUNDWATER QUALITY DATABASE

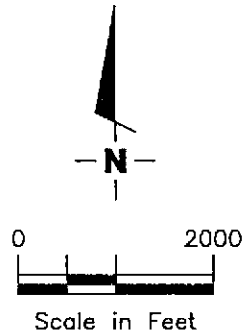
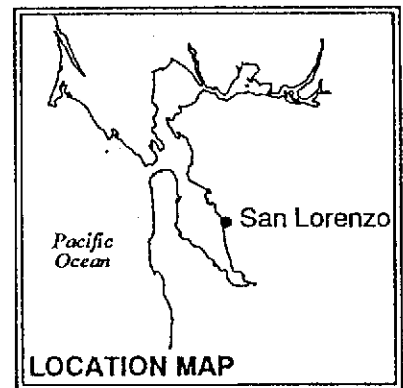
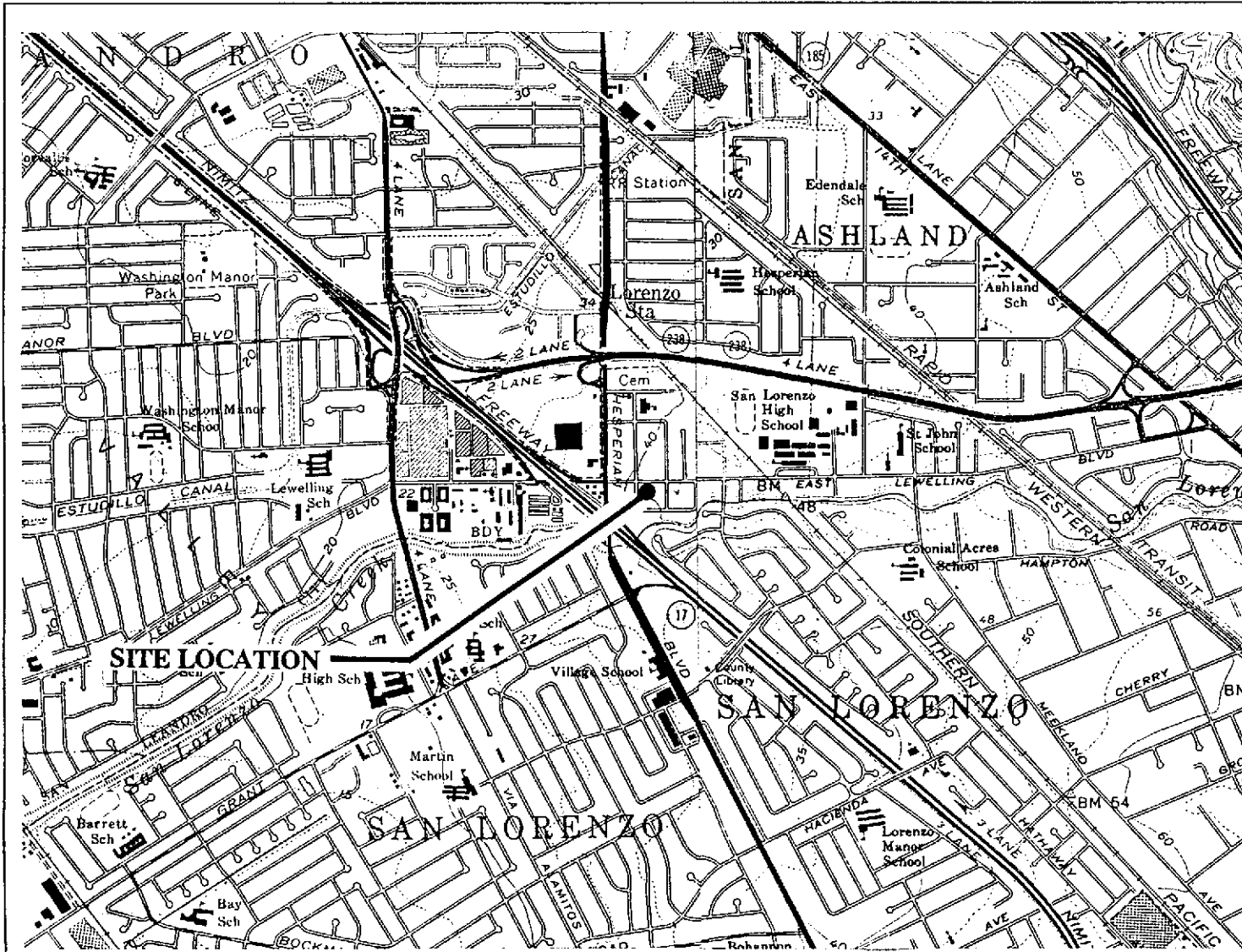
SAMPLE DATE	SAMPLE POINT	TPH (PPB)	BENZENE (PPB)	TOLUENE (PPB)	E.B. (PPB)	XYLENES (PPB)
09-Feb-88	U-1	93000.	3600.	11000.	----	20000.
20-Mar-90	U-1	36000.	2100.	5500.	1900.	9300.
05-Jun-90	U-1	46000.	2300.	5500.	2500.	11000.
24-Aug-90	U-1	27000.	1200.	1800.	1400.	5500.
23-Aug-90	U-2	<50.	<0.5	<0.5	<0.5	<0.5
05-Dec-90	U-2	<50	<0.3	<0.3	<0.3	<0.3
23-Aug-90	U-3	110000.	4400.	13000.	2800.	17000.
05-Dec-90	U-3*	69000	1900	3500	1600	9800
18-Jan-91	U-3	51000.	1700.	3100.	1500.	7500.
23-Aug-90	U-4	<50.	<0.5	1.0	<0.5	1.8
05-Dec-90	U-4*	<50	<0.3	<0.3	<0.3	<0.3
18-Jan-91	U-4	<50.	<0.5	<0.5	<0.5	<0.5

TPH = Total Petroleum Hydrocarbons

PPB = Parts per Billion

E.B. = Ethylbenzene

- NOTE:
1. Ethylbenzene and Xylenes were combined prior to February 9, 1988
 2. All data shown as <X are reported as ND (none detected)
 3. *Analytical data for Wells U-3 and U-4 have been changed to reflect the correct values.



Base Map: USGS Topographic Map



GeoStrategies Inc.

VICINITY MAP
 UNOCAL Service Station #5760
 376 Lewelling Boulevard
 San Lorenzo, California

PLATE

1

JOB NUMBER
7809

REVIEWED BY

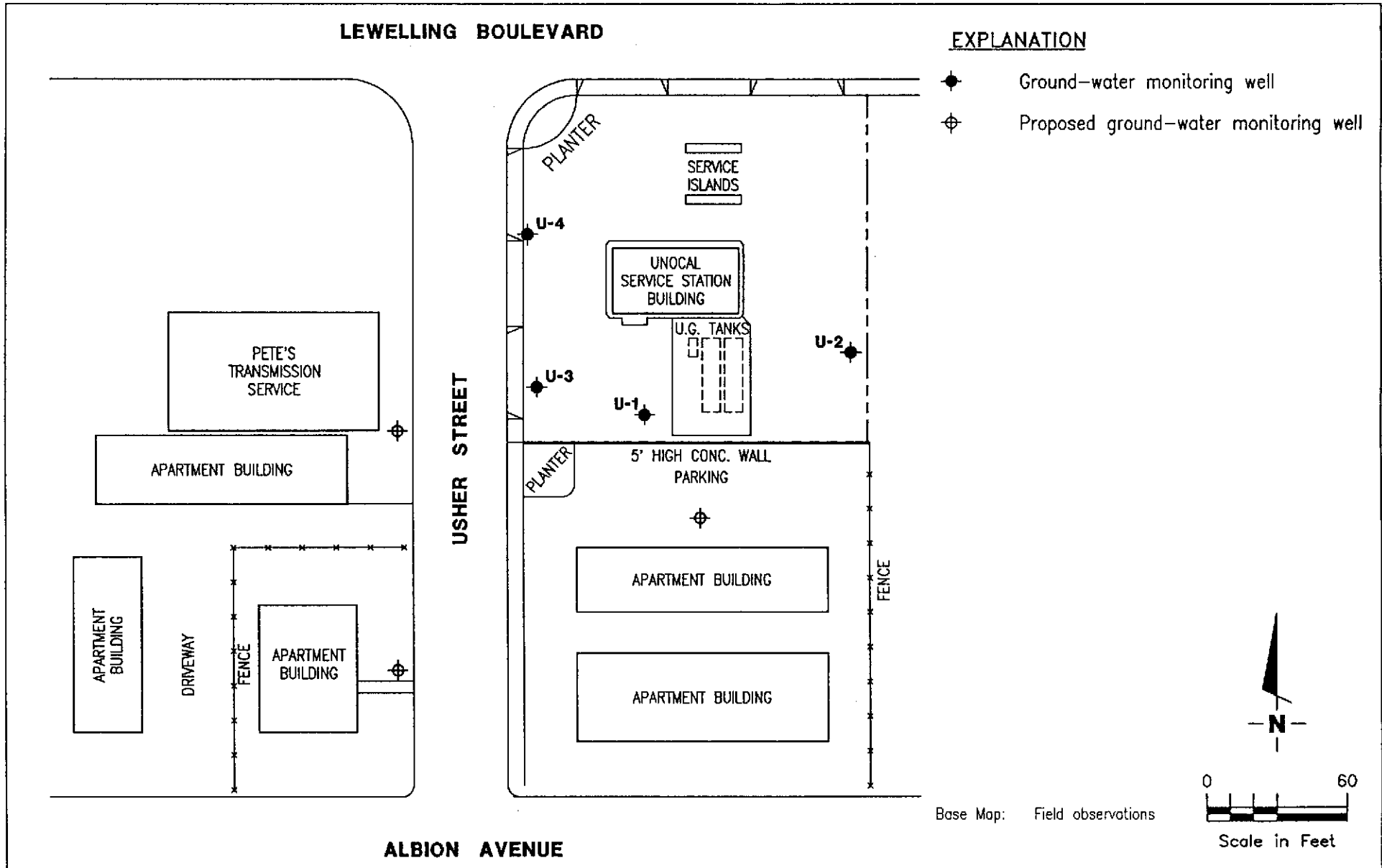
DATE
2/91

REVISED DATE

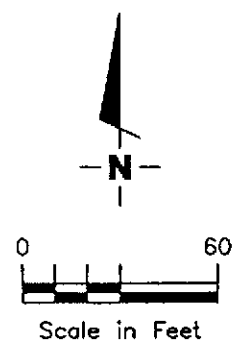
LEWELLING BOULEVARD

EXPLANATION

- ◆ Ground-water monitoring well
- ⊕ Proposed ground-water monitoring well



Base Map: Field observations



ALBION AVENUE



GeoStrategies Inc.

EXTENDED SITE PLAN
 UNOCAL Service Station #5760
 376 Lewelling Boulevard
 San Lorenzo, California

PLATE

2

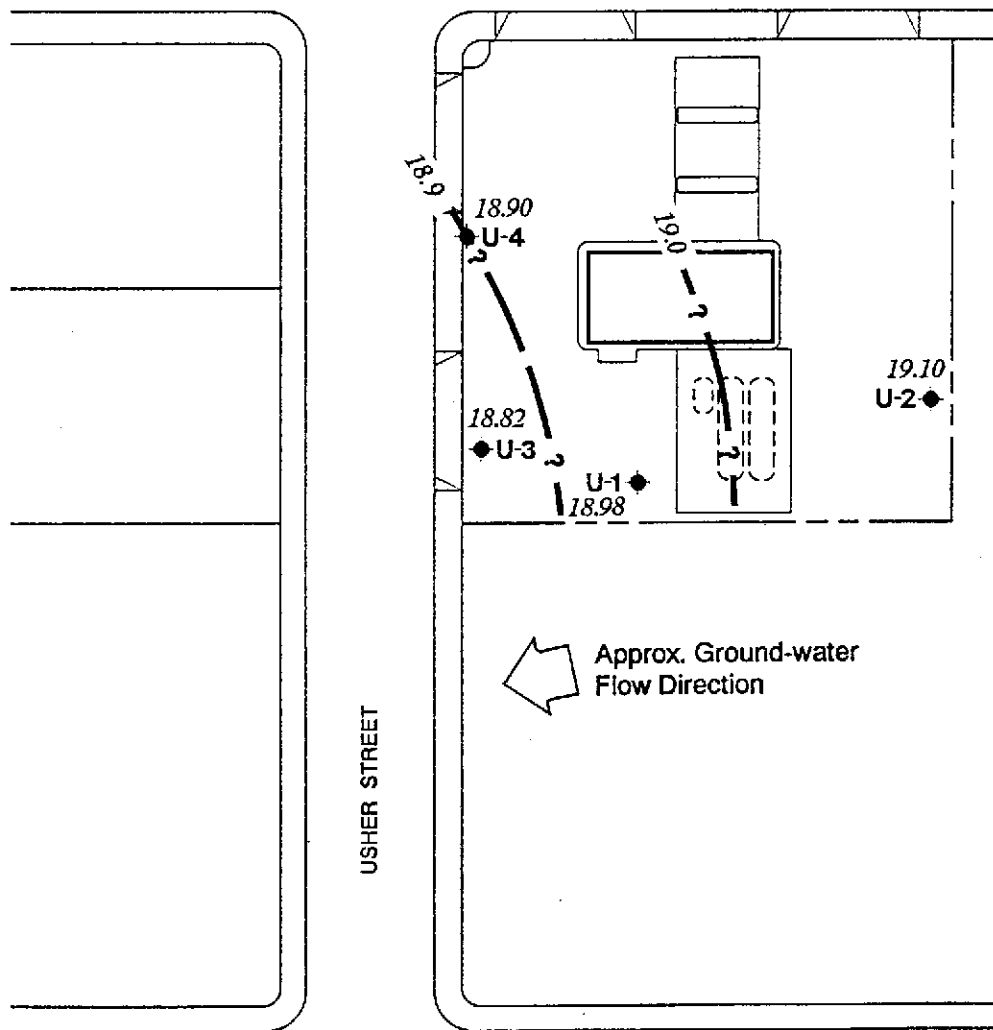
JOB NUMBER
780901-4

REVIEWED BY
DHP

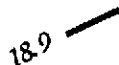
DATE
2/91

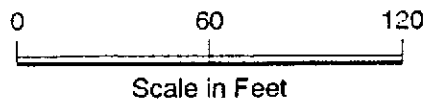
REVISED DATE

LEWELLING BOULEVARD



EXPLANATION

- ◆ U-1 Approximate ground-water monitoring well location
-  Ground-water elevation contour
Approximate Gradient = 0.002
- 21.53 Ground-water elevation in feet referenced to
Mean Sea Level (MSL) measured on
December 5, 1990



Note: Contours may be influenced by irrigation practices and/or site construction activities



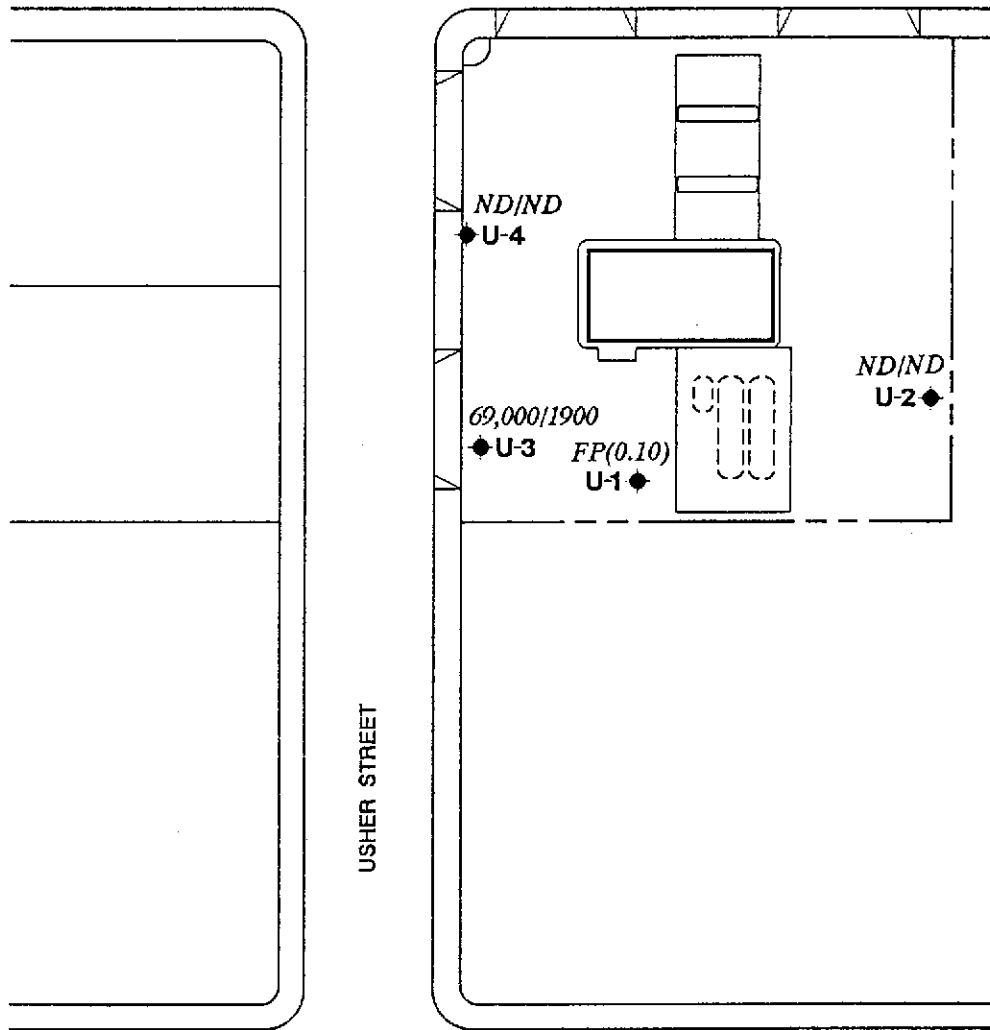
GeoStrategies Inc.

Potentiometric Map
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

PLATE

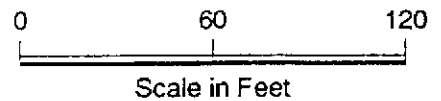
3

LEWELLING BOULEVARD



EXPLANATION

- ◆ U-1 Approximate ground-water monitoring well location
- 69,000/1900 TPH-G (Total Petroleum Hydrocarbons calculated as Gasoline)/Benzene concentrations in ppb sampled on December 5, 1990
- ND Not Detected
(see laboratory reports for detection limits)
- FP(0.10) Floating Product
(thickness in feet)



GeoStrategies Inc.

TPH-G/Benzene Concentration Map
 UNOCAL Service Station #5760
 376 Lewelling Boulevard
 San Lorenzo, California

PLATE

4

GeoStrategies Inc.

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 ANALYSISQuality 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 $\pm 20\%$ 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 centrifugal 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.

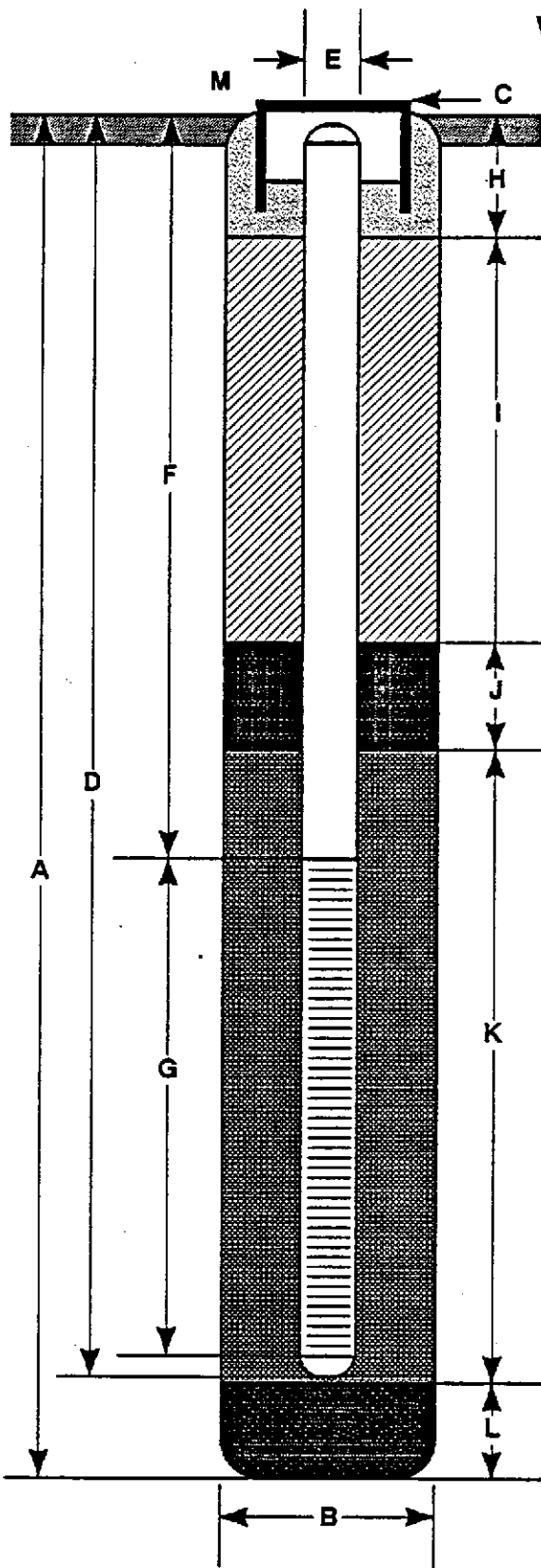
TABLE 1

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	EPA 8020	mg/l	50 ml. vial glass, Teflon	cool, 4 C HCl to pH<2	7 days (w/o preservative)
Toluene		ug/l	lined septum		14 days (w preservative)
Ethylbenzene					
Xylenes (BTEX)					
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)
Halogenated 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			

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



GeoStrategies Inc.

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 _____

Acquifer 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 _____ = Water Column _____

Product thickness _____

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

Purge Start _____ Stop _____ Rate _____ gpm

Gallons	Time	Clarity	Temp.	pH	Conductivity
00	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Total gallons removed _____ Development stop time _____

Depth to liquid _____ at _____ (time)

Color 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 _____

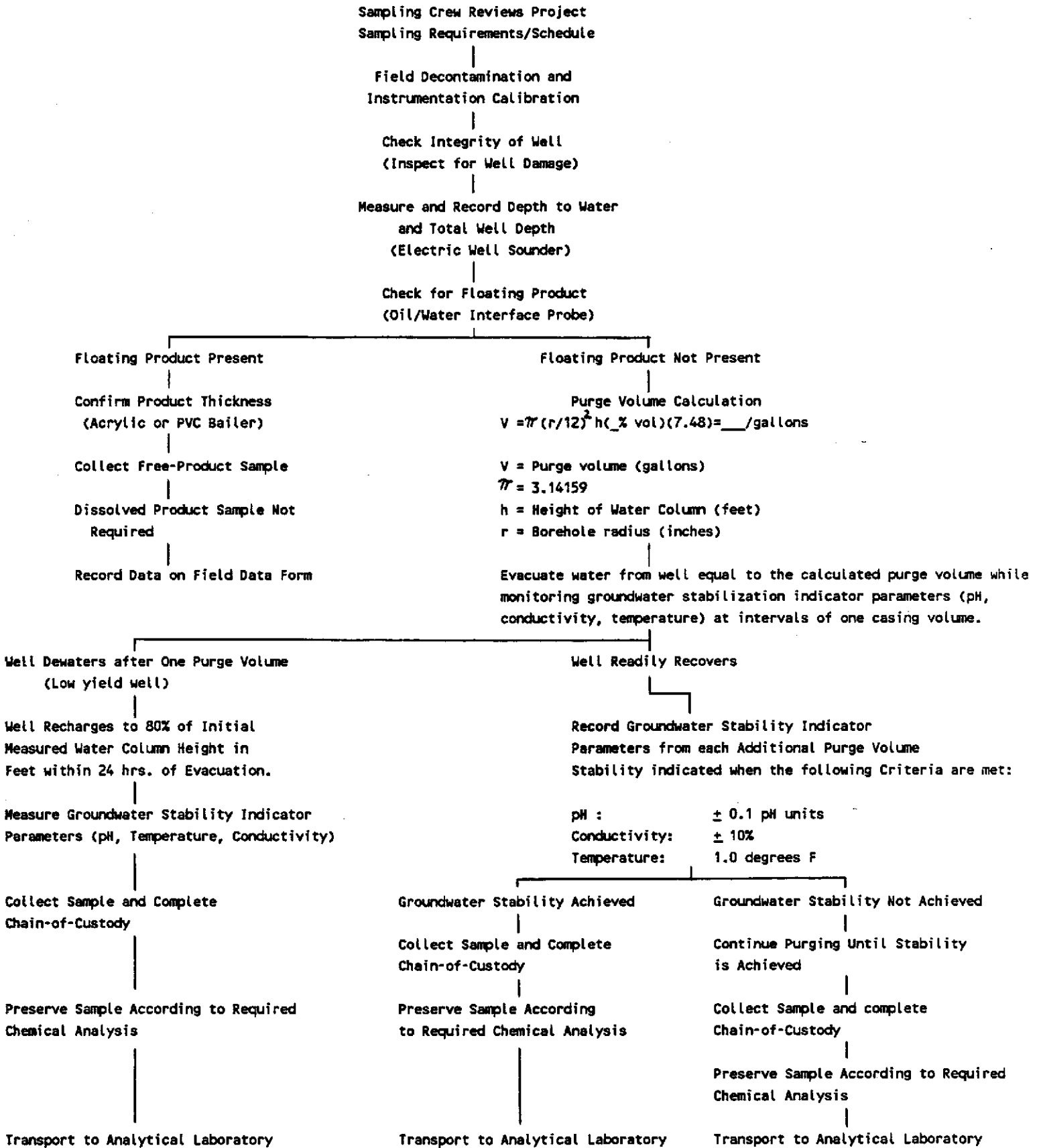
Analysis _____ Bottles Used _____

Chain of Custody Number _____

COMMENTS _____

FOREMAN _____ ASSISTANT _____

Monitoring Well Sampling Protocol Schematic



GeoStrategies Inc.

**APPENDIX B
GETTLER-RYAN INC.
GROUNDWATER SAMPLING REPORTS**



January 10, 1991

GROUNDWATER SAMPLING REPORT

UNOCAL
Post Office Box 5155
San Ramon, California 94583

Referenced Site: UNOCAL Service Station #5760
376 Lewelling/Usher
San Lorenzo, California

Sampling Dates: December 5, 1990

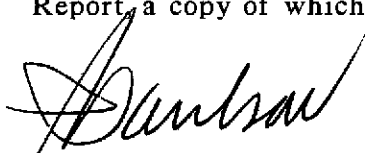
This report presents the results of the quarterly groundwater sampling and analytical program conducted by Grettler-Ryan Inc. on December 5, 1990 at the referenced location. The site is occupied by an operating service station located on the southeast corner of Lewelling Blvd. and Usher Street. The service station has underground storage tanks containing unleaded and super unleaded gasoline products and waste oil.

There are currently four groundwater monitoring wells on site at the location shown on the attached site map. Prior to sampling, all wells were inspected for total well depth, water levels, and presence of separate phase product using an electronic interface probe. A clean acrylic bailer was used to visually confirm the presence and thickness of separate phase product. Groundwater depths ranged from 20.82 to 22.52 feet below grade. Separate phase product was observed in well U-1.

Wells that did not contain separate phase product 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.

Samples were collected, using Teflon bailers, 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 and analyzed to assess quality control. Analytical results for the trip blank are included in the Certified Analytical Reports (CAR's). Chain of custody records were established noting sample identification numbers, time, date, and custody signatures.

The samples were analyzed by Superior Analytical Laboratory Inc., 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

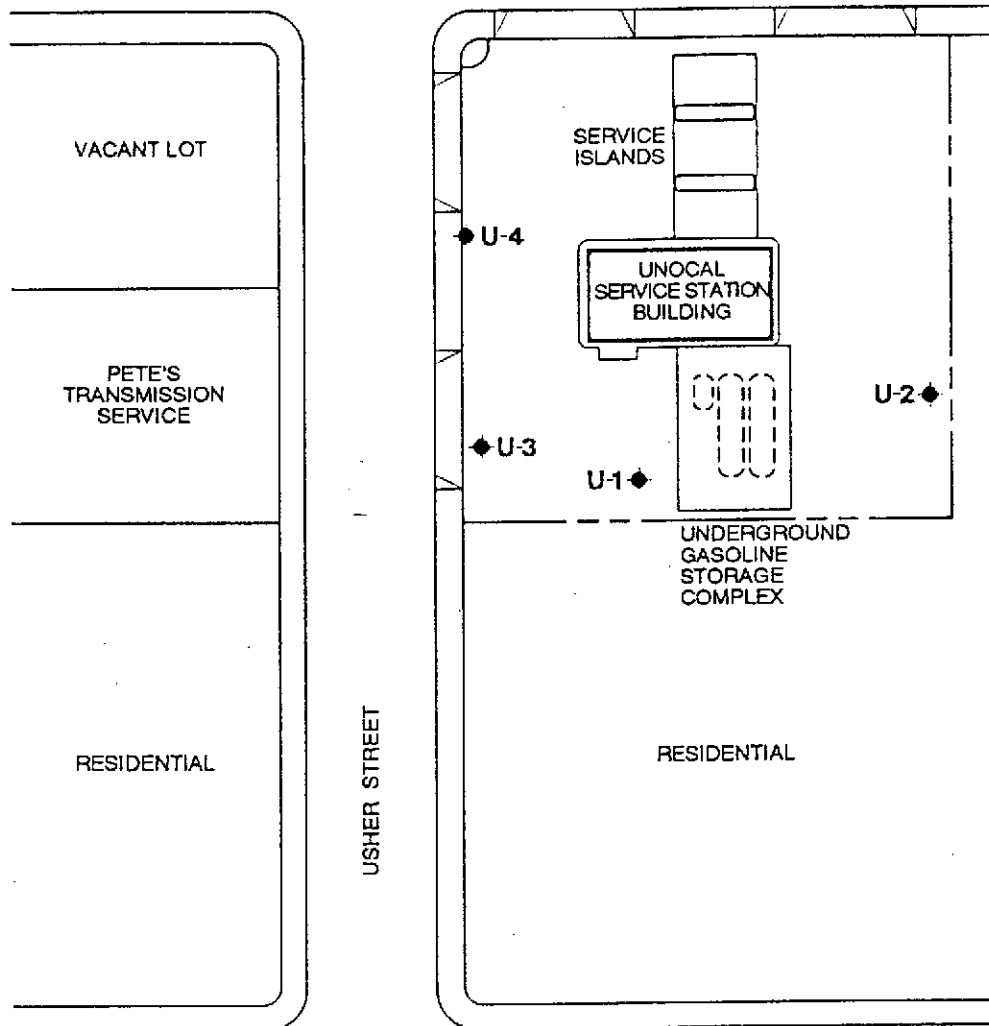
TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

<u>WELL I.D.</u>	U-1	U-2	U-3	U-4
Casing Diameter (inches)	3	3	3	3
Total Well Depth (feet)	----	30.3	25.4	28.1
Depth to Water (feet)	21.61 **	22.52	20.82	21.63
Free Product (feet)	0.10	none	none	none
Reason Not Sampled	free product	----	----	----
Calculated 4 Case Vol.(gal.)	----	13.4	6.9	9.8
Did Well Dewater?	----	no	yes	yes
Volume Evacuated (gallons)	----	16.5	5.5	3.5
Purging Device	----	Bailer	Bailer	Bailer
Sampling Device	----	Bailer	Bailer	Bailer
Time	----	13:25	12:40	12:59
Temperature (F)*	----	65.1	66.9	68.1
pH*	----	7.42	6.99	6.83
Conductivity (umhos/cm)*	----	758	856	1006

* Indicates Stabilized Value

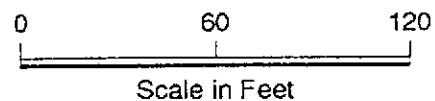
** Not corrected for presence of free product

LEWELLING BOULEVARD



EXPLANATION

◆ U-1 Approximate ground-water monitoring well location



GeoStrategies Inc.

Site Plan
 UNOCAL Service Station #5760
 376 Lewelling Boulevard
 San Lorenzo, California

PLATE

2

SUPERIOR ANALYTICAL LABORATORY, INC.

REC-111

1555 BURKE, UNIT I • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

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

LABORATORY NO.: 52869
CLIENT: Gettler Ryan Consultants
CLIENT JOB NO.: UNOCAL #5760

DATE RECEIVED: 12/06/90
DATE REPORTED: 12/12/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/l)			
		Benzene	Toluene	Ethyl Benzene	Xylenes
1	U-2	ND<0.3	ND<0.3	ND<0.3	ND<0.3
2	U-3	ND<0.3	ND<0.3	ND<0.3	ND<0.3
3	U-4	1900	3500	1600	9800
4	Trip Blank	ND<0.3	ND<0.3	ND<0.3	ND<0.3

ug/L - parts per billion (ppb)

Minimum Detection Limit in Water:0.3ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 88% : Duplicate RPD = <2%

Richard Srna, Ph.D.

Richard Srna (FOR)
Laboratory Director

SUPERIOR ANALYTICAL LABORATORY, INC.

1555 BURKE, UNIT I • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

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

LABORATORY NO.: 52869
CLIENT: Gettler Ryan Consultants
CLIENT JOB NO.: UNOCAL #5760

DATE RECEIVED: 12/06/90
DATE REPORTED: 12/12/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

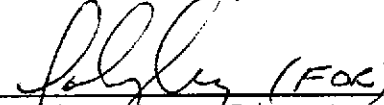
LAB #	Sample Identification	Concentration (ug/l) Gasoline Range
1	U-2	ND<50
2	U-3	ND<50
3	U-4	69000
4	Trip Blank	ND<50

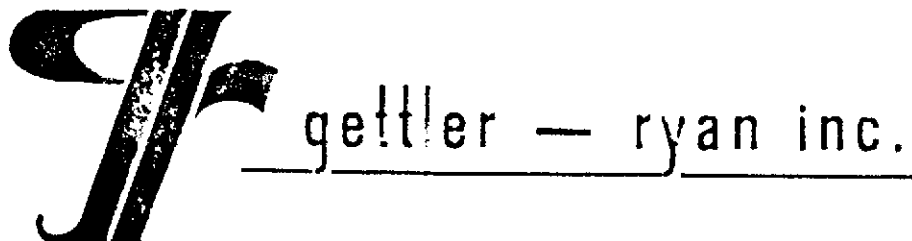
ug/L - parts per billion (ppb)
Minimum Detection Limit for Gasoline in Water: 50ug/L

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = <15%
MS/MSD Average Recovery = 89%: Duplicate RPD = 6%

Richard Srna, Ph.D.


Laboratory Director



January 30, 1991

Mr. Keith Bullock
Project Manager
Gettler Ryan Inc.
2150 West Winton Avenue
Hayward, California 94588

Reference: Unocal Service Station #5760
376 Lewelling Blvd./Usher
San Lorenzo, California

Dear Keith:

Attached please find a copy of the Certified Analytical Report and Gettler-Ryan Chain of Custody for the resampling of wells U-3 and U-4 at the referenced location. This sampling occurred January 18, 1991.

Please give me a call if there are any questions.

Very truly yours,



Tom Paulson

attachments



INTERNATIONAL
TECHNOLOGY
CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Gettler-Ryan
2150 West Winton
Hayward, CA 94545
Tom Paulson

Date: 01/29/91

Work Order: T1-01-183

P.O. Number: 3809


This is the Certificate of Analysis for the following samples:

Client Work ID: GR3809, Unocal #5760
Date Received: 01/21/91
Number of Samples: 3
Sample Type: aqueous

TABLE OF CONTENTS FOR ANALYTICAL RESULTS

<u>PAGES</u>	<u>LABORATORY #</u>	<u>SAMPLE IDENTIFICATION</u>
2	T1-01-183-01	U-3
3	T1-01-183-02	U-4
4	T1-01-183-03	Trip Blank

Reviewed and Approved:


Suzanne Veaudry
Project Manager

American Council of Independent Laboratories
International Association of Environmental Testing Laboratories
American Association for Laboratory Accreditation

Company: Gettler-Ryan
 Date: 01/29/91
 Client Work ID: GR3809, Unocal #5760

IT ANALYTICAL SERVICES
 SAN JOSE, CA

Work Order: T1-01-183

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: U-3
 SAMPLE DATE: 01/18/91
 LAB SAMPLE ID: T101183-01
 SAMPLE MATRIX: aqueous
 RECEIPT CONDITION: Cool pH < 2

RESULTS in Micrograms per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		01/24/91
Low Boiling Hydrocarbons	Mod.8015		01/24/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	1000.	51000.
BTEX		
Benzene	10.	1700.
Toluene	10.	3100.
Ethylbenzene	10.	1500.
Xylenes (total)	10.	7500.

Company: Gettler-Ryan

Date: 01/29/91

Client Work ID: GR3809, Unocal #5760

Work Order: T1-01-183

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: U-4

SAMPLE DATE: 01/18/91

LAB SAMPLE ID: T101183-02

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH < 2

RESULTS in Micrograms per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		01/25/91
Low Boiling Hydrocarbons	Mod.8015		01/25/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	50.	None
BTEX		
Benzene	0.5	None
Toluene	0.5	None
Ethylbenzene	0.5	None
Xylenes (total)	0.5	None

Company: Gettler-Ryan
Date: 01/29/91
Client Work ID: GR3809, Unocal #5760

Work Order: T1-01-183

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: Trip Blank
SAMPLE DATE: not spec
LAB SAMPLE ID: T101183-03
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Micrograms per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		01/22/91
Low Boiling Hydrocarbons	Mod.8015		01/22/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	50.	None
BTEX		
Benzene	0.5	None
Toluene	0.5	None
Ethylbenzene	0.5	None
Xylenes (total)	0.5	None

Company: Gettler-Ryan

Date: 01/29/91

Client Work ID: GR3809, Unocal #5760

Work Order: T1-01-183

TEST CODE TPHVB TEST NAME TPE Gas, BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from EPA Methods modified 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography using a flame ionization detector in series with a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

