70372

Shell Oil Company

EAST BAY MARKETING DISTRICT

P.O. Box 4023
Concord, CA 94524
(415) 676-1414

January 16, 1990

Mr. Larry Seto
County of Alameda
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

90 JAN 18 AM 11:46

SUBJECT: FORMER SHELL SERVICE STATION
15275 WASHINGTON AVENUE
SAN LEANDRO, CALIFORNIA

Dear Mr. Seto:

Enclosed is a of copy of the Quarterly Report, dated January 9, 1990, which documents the groundwater sampling and well installation conducted between October - December 1989 at the subject location.

If you should have any questions or comments regarding this project please do not hesitate to call me at (415) 676-1414 ext. 127.

Very truly yours,

Diane M. Lundquist
District Environmental Engineer

DML/jw

enclosure

cc: Mr. Tom Callaghan, Regional Water Quality Control Board
Mr. John Werfal, Gettler-Ryan Inc.

GeoStrategies Inc.

QUARTERLY REPORT

OCTOBER - DECEMBER 1989

Former Shell Service Station
15275 Washington Avenue
San Leandro, California

Report No. 7615-5

January 9, 1990

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545
(415) 352-4800

January 9, 1990

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

Attn: Mr. John Werfal

Re: QUARTERLY REPORT
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

Gentlemen:

This quarterly report has been prepared for the above referenced site, for the October through December, 1989 quarter.

If you have any questions, please call.

GeoStrategies Inc. by,

Matt J. Janowiak
Geologist

Jeffrey L. Peterson
Senior Hydrogeologist
R.E.A. 1021

REGISTERED GEOLOGIST
CHRISTOPHER M. PALMER
№ 1262
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Christopher M. Palmer
C.E.G. 1262, R.E.A. 285

MJJ/JLP/kjj

Report No. 7615-5

1.0 INTRODUCTION

This Quarterly Report has been prepared for Shell Oil Company for the Former Shell Service Station located at 15275 Washington Avenue in San Leandro, California (Plate 1).

This report describes the results of fourth quarterly groundwater sampling for 1989 performed by Gettler-Ryan Inc. (G-R) in accordance with the current monitoring plan for the site. In addition, this report summarizes soil boring and recovery well installation activities performed at the site during this quarter (see Appendix A for Field Methods and Procedures). All field work and laboratory analyses were performed according to State of California Water Resources Control Board procedures for conducting environmental investigations related to leaking underground fuel storage tanks. The field and chemical analytical data discussed in this report were collected between October 1 and December 31, 1989.

2.0 SITE HISTORY

In June 1985, four ground-water monitoring wells (S-1 through S-4) were installed to assess soil and groundwater conditions beneath the site. Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) were detected in ground-water samples collected from Wells S-1, S-2, and S-4 with concentrations ranging from 0.52 to 32 parts per million (ppm). Well S-3 contained approximately 0.5 feet in measured thickness of floating product. TPH-Gasoline results from soil samples taken from the borings ranged from none detected (ND) to 3,900 ppm. A report documenting the results of this investigation was prepared by EMCON Associates (EMCON) dated August 12, 1985.

In August 1986, four soil borings (S-A through S-D) were drilled within the underground fuel tank complex prior to tank removal. TPH-Gasoline concentrations in soil samples ranged from ND to 1,700 ppm. Boring S-B was converted to a temporary tank backfill monitoring well. Approximately 0.13 feet of floating product was measured in S-B. Boring S-A was drilled adjacent to the former waste oil tank. No waste oil was detected in the analyzed soil samples. A report for this phase of work was prepared by EMCON dated September 12, 1986.

In December 1986, one additional ground-water monitoring well (S-5) was installed adjacent to the former waste oil tank. Groundwater samples collected from Well S-5 contained TPH-Gasoline and benzene at concentrations of 7.8 and 0.38 ppm, respectively. A report documenting the results of this investigation was prepared by EMCON dated January 28, 1987.

In February 1987, a one mile radius well survey was conducted by EMCON.

In June 1987, the underground fuel storage tanks were removed. The temporary tank backfill Well S-B was also removed during construction. All site wells were inaccessible from June to August of 1987, due to these construction activities. Monitoring wells S-2 and S-4 were destroyed during construction activities.

In July 1987, a work plan was prepared by Pacific Environmental Group (PACIFIC), recommending the installation of additional ground-water monitoring wells to further assess the extent of hydrocarbons in the soil and groundwater.

In October 1988, a soil gas survey was conducted by Tracer Research Corporation (TRC) at fifteen off-site locations. The sample locations lie to the south of the site along Lewelling Boulevard and in the adjacent property to the west. The highest soil vapor concentrations were detected to the south of the site along Lewelling Boulevard. The results of the soil gas survey were presented in a TRC report dated October 17, 1988.

In November 1988, seven ground-water monitoring wells (S-6 through S-12) were installed at locations on and off-site by Woodward-Clyde Consultants (WCC). In addition, G-R began quarterly ground-water sampling of all wells at this time. TPH-gasoline concentrations in ground-water samples ranged from ND in Wells S-1 and S-11 to 70 ppm in Well S-3. WCC documented the results of this investigation in a report dated April 7, 1989.

In April 1989, monitoring wells S-13 through S-17 were installed by GSI. Ground-water samples from all wells were also analyzed for TPH-Gasoline and BTEX. TPH-Gasoline was detected in Wells S-3, S-5, S-9, S-10, S-13, S-14, and S-16 at concentrations ranging from 0.15 to 47 ppm. Wells S-1, S-6, S-7, S-8, S-11, S-12, S-15, and S-17 contained no detectable levels of TPH-gasoline. Benzene was detected in Wells S-1, S-3, S-5, S-8, S-9, S-13, S-14, and S-16 at concentrations ranging from 0.001 to 4.4 ppm. These benzene concentrations are either at or above the Regional Water Quality Control Board (RWQCB) Maximum Contaminant Level (MCL) set for benzene. A report was prepared by GSI dated July 13, 1989.

No additional site history data is available for this site.

3.0 GROUNDWATER LEVEL MONITORING

3.1 Potentiometric Data

Prior to ground-water sampling, water levels were measured in each monitoring well using an electronic oil/water interface probe (Table 1). Static water levels were measured from the surveyed top of well box and recorded to ±0.01 foot. Plate 2 presents the location of each well at the site.

Ground-water elevation data for this quarter have been plotted and contoured and are presented on Plate 3. Water-level measurements used to prepare the quarterly potentiometric map were taken on October 9, 1989, the same day that ground-water sampling occurred. Depth to groundwater in the uppermost water-bearing strata ranged from 7.62 to 8.64 feet. The ground-water gradient was calculated to be 0.004, with ground-water flow to the southwest.

3.2 Floating-Product Measurements

Measurements for floating product were made in each monitoring well using an electronic oil/water interface probe. Each well was also inspected with a clean, clear, acrylic bailer to visually confirm interface probe results. A sheen of floating product was observed in Well S-3.

4.0 CHEMICAL ANALYTICAL DATA

Ground-water samples were collected by G-R from site monitoring wells on October 9 and 10, 1989. The ground-water samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. All analyses were performed by International Technology Analytical Services (IT), a State-certified environmental laboratory located in San Jose, California. The G-R Groundwater Sampling Report and Chain-of-Custody documents for the fourth quarter of 1989 are presented in Appendix B.

TPH-Gasoline was were detected in Wells S-3, S-5, S-9, S-10, S-13, and S-14 at concentrations ranging from 0.077 to 52 ppm. Benzene was detected in Wells S-3, S-5, S-9, S-13, and S-14 at concentrations ranging from 0.0014 to 4.6 ppm. TPH-Gasoline and benzene were reported as none detected (ND) in Wells S-1, S-6, S-7, S-8, S-11, S-12, S-15, S-16, and S-17. In addition, Well S-10 was ND for benzene.

4.1 Quality Control

Quality Control (QC) samples for this quarterly sampling included a field blank (SF-8) and a duplicate sample (SD-3). The field blank was poured in the field using organic-free water, provided by IT laboratory, to evaluate sampling procedures and ambient field conditions. The duplicate sample (SD-3) was a second (split) sample taken from Well S-3 to quantitatively evaluate the laboratory handling and analytical precision.

Chemical analytical results for the field blank (ND) indicate that no hydrocarbons were introduced into the samples as a result of sampling procedures or from ambient field conditions. The Relative Percent Difference or RPD between S-3 and SD-3 was calculated to be 23.7%. The data set for this sampling round is comparable to historical data sets. Historical analytical data are presented in Appendix C.

5.0 EXPLORATORY SOIL BORING AND WELL INSTALLATION PROCEDURES

5.1 Field Procedures

One pilot soil boring was drilled using a truck mounted hollow-stem drilling rig in accordance with to GSI Field Methods and Procedures (Appendix A). The soil boring was drilled near the western property boundary to a depth of 40.5 feet below ground surface. Soil was continuously sampled to a depth of 11.5 feet below ground surface and every five feet thereafter. Soil samples were collected using a modified California split-spoon sampler fitted with brass tube liners. A GSI geologist supervised the drilling, described soil samples using the Unified Soil Classification System and Munsell Soil Color Chart, and prepared a lithologic log of the boring (Appendix D).

A 4-inch-long brass tube of soil from each sampled interval was used to perform head-space analysis in the field for the presence of Volatile Organic Compounds (VOCs). The test procedure involved immediately transferring soil from a selected brass liner into a clean glass jar and covering the jar with aluminum foil secured under a ring-type threaded lid. After approximately twenty minutes, the foil was pierced with an Organic Vapor Monitor (OVM) photoionization detector and the head-space within the jar was tested for total organic vapor measured in ppm. The head-space test results are presented on the boring log for SR-1 in Appendix D.

Soil samples retained for chemical and physical analyses 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, placed in a cooler with blue ice, and transported to IT laboratory in San Jose, California.

5.2 Recovery Well Design and Installation

Soil samples were collected from the uppermost water-bearing zone and submitted for a #200 sieve wash to evaluate particle size distribution of the aquifer material. This information was used to select the filter pack and screen size for recovery well SR-1. Since the analyzed samples contained over 90% fine-grained material, standard well methodologies fail because an unrealistically small screen and sand pack size would be required to match the aquifer material (Appendix E).

Recovery well SR-1 was installed by reaming out the pilot boring to a diameter of 20-inches using a bucket rig to a depth of 21.5 feet below ground surface. Well SR-1 was constructed using 6-inch-diameter Schedule 40 PVC well casing and 0.020-inch factory slotted well screen. The well screen was placed from 6.5 feet to 21.5 feet below grade, and extended approximately 2 feet above observed static groundwater. Lonestar #2/12 graded sand was placed in the annular space along the entire screened interval, including one foot above the top of the screen. A 1.5-foot bentonite seal followed by a cement-grout seal was placed above the sand. It is our opinion that this well construction should be sufficient for ground-water extraction while still providing a reasonable match with the aquifer material. Recovery well construction details are presented in Appendix D.

6.0 RESULTS

6.1 Hydrogeologic Conditions

The lithology encountered in Boring SR-1 consisted primarily of silt and clays with thin (less than 6-inches thick) interbeds of silty sand. A sand unit was encountered at a depth of approximately 28 feet and extended to the total depth of the boring. This unit appears to represent a deeper water-bearing zone. Based on available hydrogeologic data, it is not possible at this time to evaluate whether these two water-bearing zones are hydraulically interconnected. Groundwater was first encountered at a depth of approximately 16 feet and stabilized at approximately 11 feet. The observed rise in potentiometric surface suggests locally semi-confined to confined conditions in the uppermost water-bearing zone.

6.2 Analytical Results

Soil samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020.

Soil samples from 5 and 10 feet below ground surface (SR-1-5' and SR-1-10') contained TPH-Gasoline at a concentration of 770 and 20 ppm, respectively. Benzene was detected in these samples at concentrations of 0.8 and 0.33 ppm, respectively. The sample from 15 feet below ground surface (SR-1-15') contained only xylenes at a concentration of 0.05 ppm. The soil sample collected from 30 feet contained no detectable (ND) concentrations of TPH-Gasoline and BTEX. Soil analytical data are summarized on Table 2 and the laboratory chemical analytical results are presented in Appendix E.

7.0 SUMMARY

A summary of activities and findings associated with this quarterly report is presented below:

- Water levels were measured in monitoring wells across the site and the data were used to calculate the hydraulic gradient and prepare a potentiometric map (Plate 3). The hydraulic gradient was calculated as 0.004. Ground-water flow is to the southwest.

- **A floating product sheen was observed in Well S-3.** Floating product was not observed in any other monitoring wells during this quarter.

- Detectable TPH-Gasoline concentrations in ground-water samples ranged from 0.077 to 52 ppm. Detectable benzene concentrations ranged from 0.0014 to 4.6 ppm. Benzene concentrations exceeded RWQCB MCLs in five wells.

- One exploratory pilot soil boring was drilled and reamed, and a 6-inch-diameter ground-water recovery well was designed and installed. The well was installed to a total depth of 21.5 feet.

- Detectable TPH-Gasoline concentrations in soil samples collected from Boring SR-1 ranged from 20 to 770 ppm. Soil samples collected from 15 and 30 feet below ground surface did not contain detectable levels of TPH-Gasoline. The sample collected at a depth of 15 feet contained 0.05 ppm xylenes.

8.0 PLANNED SITE ACTIVITIES

The following activities are planned for the first quarter, January to March 1990, at the site:

- All scheduled wells will be sampled and 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.

- Water levels will be measured quarterly and selected data will be used to prepare a potentiometric map across the site. The local ground-water gradient will be calculated.

- Chemical data will be used to construct Isoconcentration maps for TPH and Benzene.

- As outlined in the GSI Work Plan dated October 12, 1989, an aquifer test will be performed to assess aquifer characteristics and evaluate the potential effectiveness of Well SR-1 to pump dissolved hydrocarbons. A treatment system will be designed and installed in accordance with aquifer test results and discharge requirements for the site.

TABLE 1

GROUND-WATER ANALYSIS DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
S-1	10-Oct-89	12-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	21.55	13.46	----	8.09
S-3	10-Oct-89	12-Oct-89	52.	4.6	3.3	2.6	15.	21.14	13.14	sheen	8.00
S-5	10-Oct-89	12-Oct-89	15.	3.3	0.16	0.83	2.2	21.41	13.09	----	8.32
S-6	10-Oct-89	12-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	22.02	13.44	----	8.58
S-7	10-Oct-89	12-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	21.47	13.12	----	8.35
S-8	09-Oct-89	12-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	20.72	12.88	----	7.84
S-9	09-Oct-89	13-Oct-89	0.38	0.082	<0.0005	0.046	0.013	20.96	13.09	----	7.87
S-10	09-Oct-89	12-Oct-89	0.17	<0.0005	<0.0005	<0.0005	<0.001	20.86	12.87	----	7.99
S-11	09-Oct-89	12-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	21.26	12.62	----	8.64

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS

Benzene 0.001 ppm Xylenes 1.750 ppm Ethylbenzene 0.68 ppm

CURRENT DHS ACTION LEVELS

Toluene 0.100 ppm

TPH = Total Petroleum Hydrocarbons as Gasoline
PPM = Parts Per Million SF = Field Blank
ND = None Detected SD = Duplicate Sample

Note: 1. All data shown as <x is reported as ND (none detected)
2. Water level elevations referenced to mean sea level (MSL)
3. DHS Action Levels and MCLs are subject to change pending State review

Project No. 7615-4

TABLE 1

GROUND-WATER ANALYSIS DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
S-12	09-Oct-89	12-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	21.05	12.73	----	8.32
S-13	09-Oct-89	13-Oct-89	0.077	0.0014	<0.0005	<0.0005	<0.001	20.57	12.62	----	7.95
S-14	09-Oct-89	13-Oct-89	1.	0.36	0.06	0.02	0.03	20.44	12.82	----	7.62
S-15	09-Oct-89	13-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	22.22	13.76	----	8.46
S-16	10-Oct-89	13-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	21.82	13.59	----	8.23
S-17	09-Oct-89	13-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	20.95	12.77	----	8.18
SF-8	09-Oct-89	13-Oct-89	<0.05	<0.0005	<0.0005	<0.0005	<0.001	----	----	----	----
SD-3	10-Oct-89	13-Oct-89	66.	4.7	3.3	2.8	16.	----	----	----	----

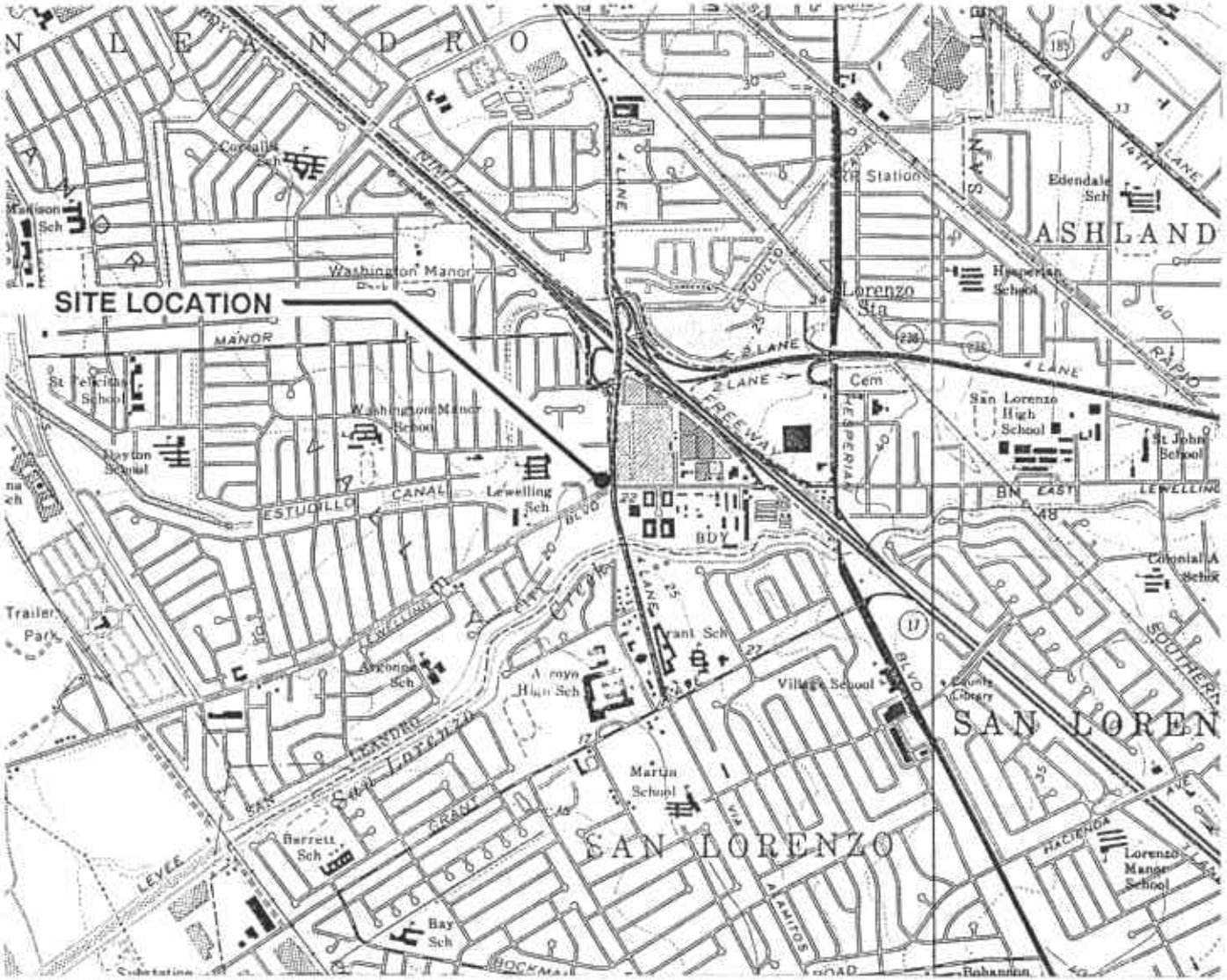
TABLE 2

SOIL SAMPLE ANALYSIS DATA

BORING NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
SR-1-5	27-Oct-89	05-Nov-89	770.	0.8	3.1	5.	33.
SR-1-10	27-Oct-89	05-Nov-89	20.	0.33	0.18	0.27	1.2
SR-1-15	27-Oct-89	05-Nov-89	<2.5	<0.025	<0.025	<0.025	0.05
SR-1-30	27-Oct-89	05-Nov-89	<2.5	<0.025	<0.025	<0.025	<0.05

TPH = Total Petroleum Hydrocarbons as Gasoline
PPM = Parts Per Million

Note: 1. All data shown as <x is reported as ND (none detected)

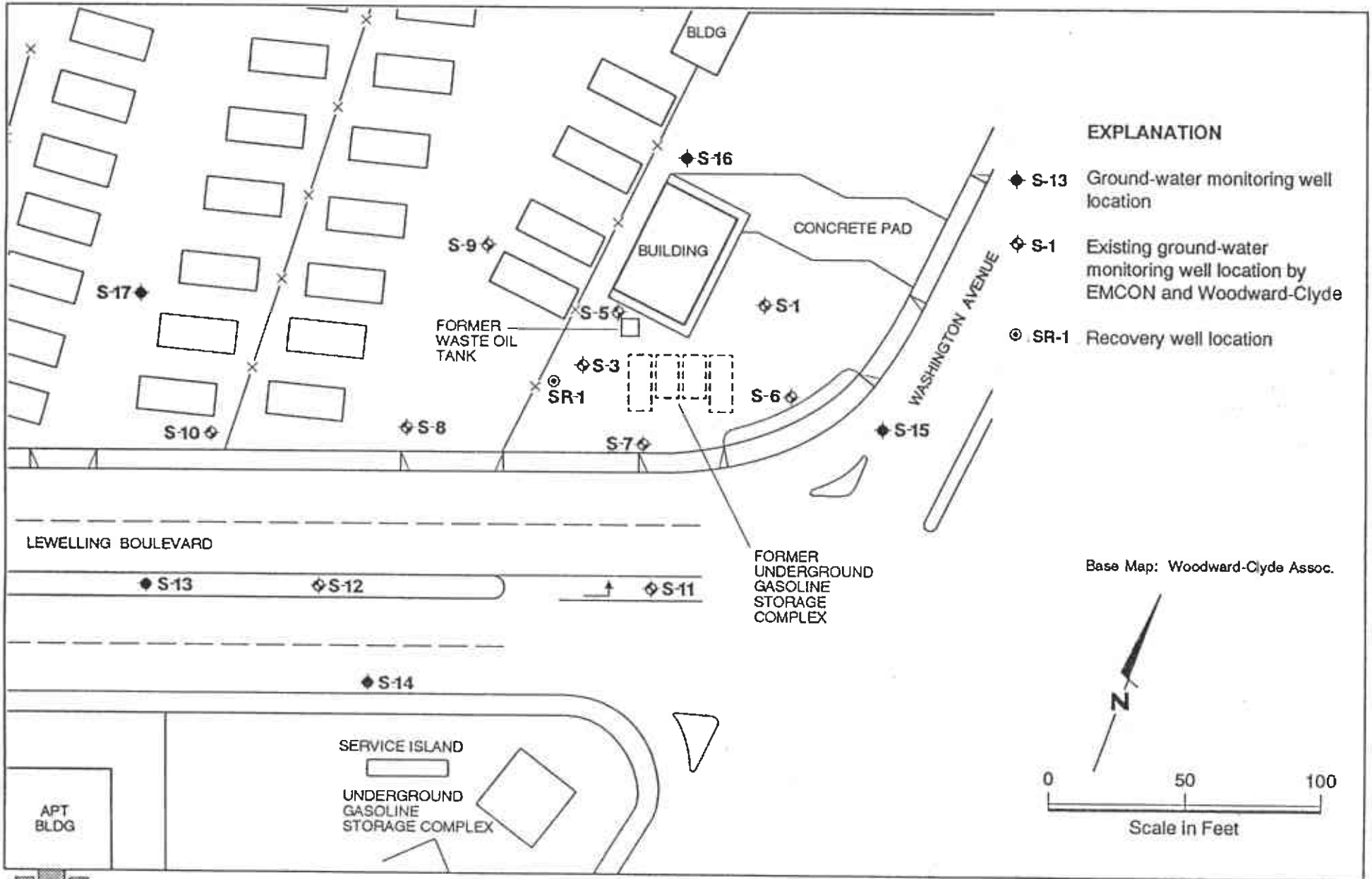


GeoStrategies Inc.

Vicinity Map
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

PLATE
1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7615		11/89		

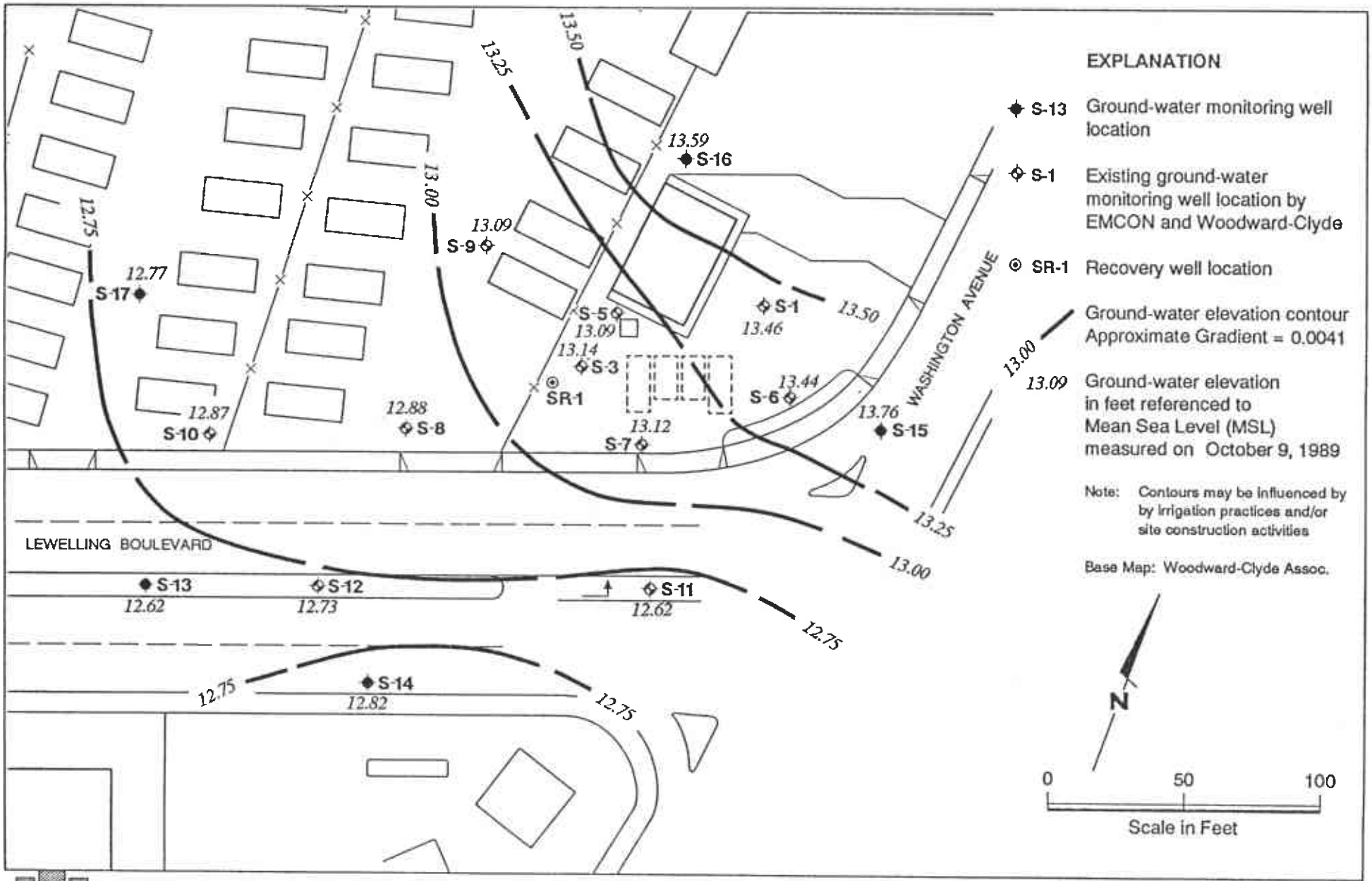


GeoStrategies Inc.

Site Plan
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

PLATE
2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CMP CEG 1262	11/89		

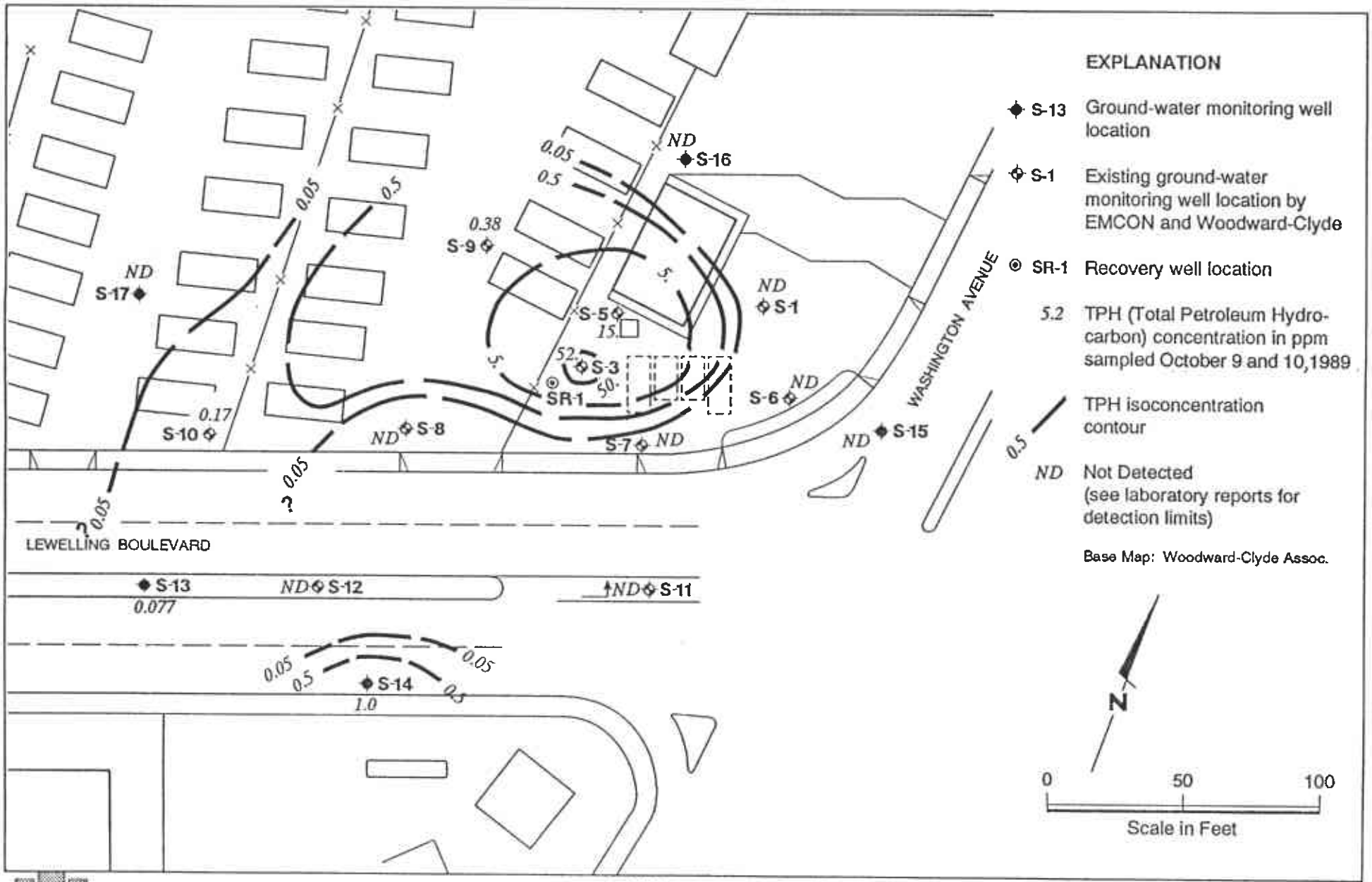


GeoStrategies Inc.

Potentiometric Map
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

PLATE
3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CWP CEG 1262	11/89		

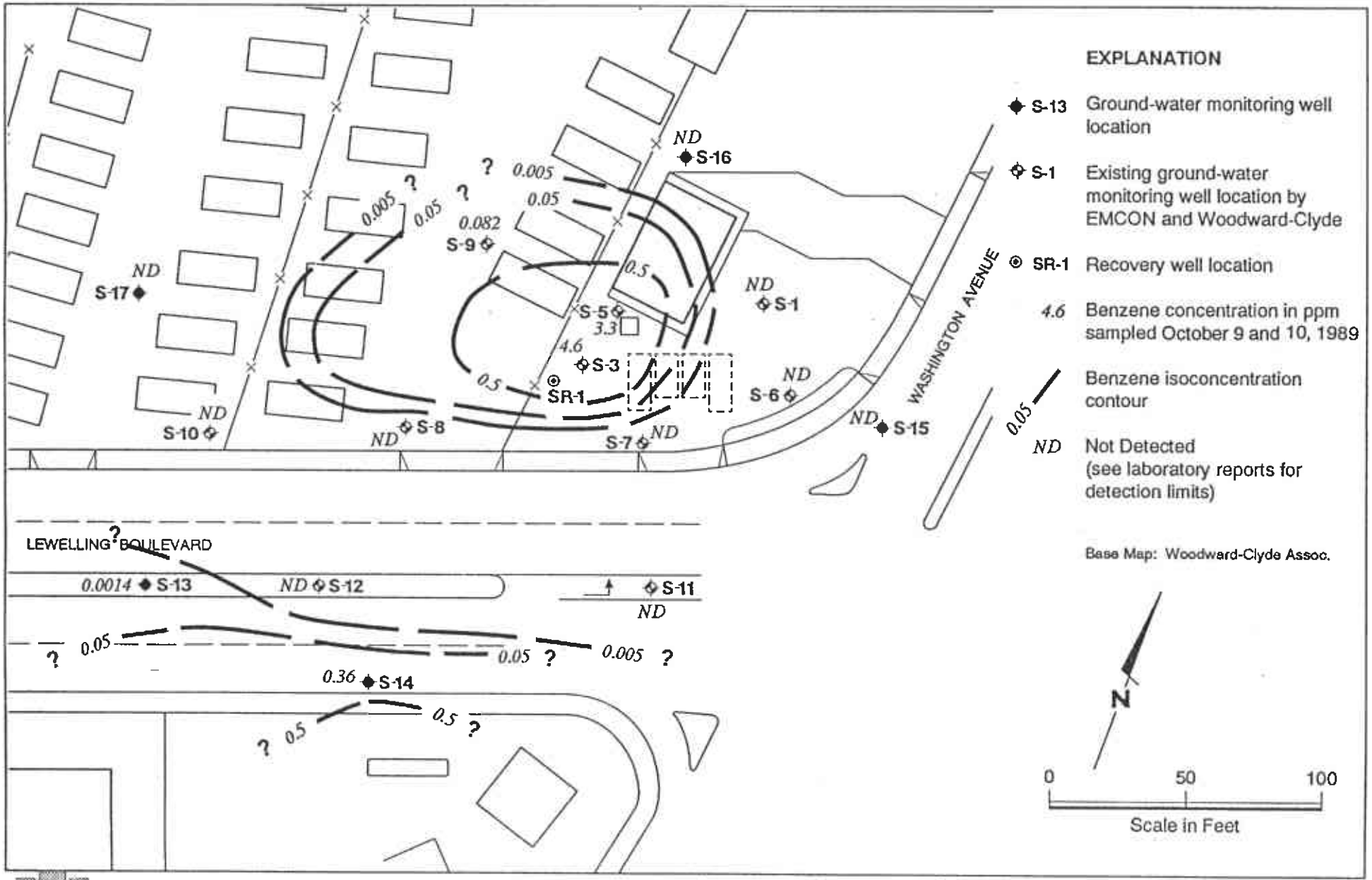


GeoStrategies Inc.

TPH Isoconcentration Map
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

PLATE
4

JOB NUMBER	REVIEWED BY HG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CHP CEG 1262	11/89		



GeoStrategies Inc.

Benzene Isoconcentration Map
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

PLATE
5

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CWP CEG 12/62	11/89		

APPENDIX A

METHODS AND PROCEDURES

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, 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 ground water. 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 tremied 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

Monitoring wells will be developed using a submersible pump, bladder pump or bailer. All well developing equipment will be decontaminated prior to development using a steam cleaner and/or Alconox detergent wash. Wells will be developed until discharge water is visibly clear and free of sediment. The adequacy of well development will be assessed by the GSI geologist. Indicator parameters (pH, specific conductance, and temperature) will be monitored and recorded during well development. Field instrument calibrations will be performed according to manufacturer's specifications.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest $\pm$0.01 foot. Water level measurements will be recorded to the nearest $\pm$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.

gettler — ryan inc. (415) 783-7500
general and environmental contractors

Guidance and Reference Documents Used to Collect Groundwater Samples

These documents are used to verify Gettler-Ryan Inc. sampling procedures and consistent with current regulatory guidance. If site specific work and sampling plans are required, those plans will be developed from these 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)

gettler — ryan inc. (415) 783-7500
general and environmental contractors

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, Section 2647 (October, 1986)
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)
Santa Clara Valley Water District	Guidelines for Preparing or Reviewing Sampling Plans for Soil and Groundwater Investigation of Fuel Contamination Sites (January, 1989)
Santa Clara Valley Water District	Investigation and Remediation at Fuel Leak sites: Guidelines for Investigation and Technical Report Preparation (March 1989)
American Petroleum Institute	Groundwater Monitoring & Sample Bias; API Publication 4367, Environmental Affairs Department, June 1983
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.

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) samples 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.

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 3). 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 3. 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 4). 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 4. Collected field data during purging activities will be entered on the G-R Well Sampling Field Data Sheet shown in Figure 3. 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

gettler — ryan inc. (415) 783-7500
general and environmental contractors

Chain-of-Custody

A Chain-of-Custody record (Figure 5) 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 HC1 to pH<2	14 days (maximum)
Benzene Toluene Ethylbenzene Xylenes (BTEX)	EPA 8020	mg/l ug/l mg/l	50 ml. vial glass, Teflon lined septum 1 l glass, Teflon	cool, 4 C HC1 to pH<2	7 days (w/o preservative) 14 days (w preservative)
Oil & Grease	SM 503E	ug/l	lined septum	H2SO4 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	14 days (maximum)
Semi-Volatile Organics	8270	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool , 4 C	14 days (maximum)
Specific Conductance (Field test)		umhos/cm			
pH (Field test)		pH units			
Temperature (Field test)		Deg F			

GeoStrategies Inc.

FIELD EXPLORATORY BORING LOG

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

Boring No:

Sheet of

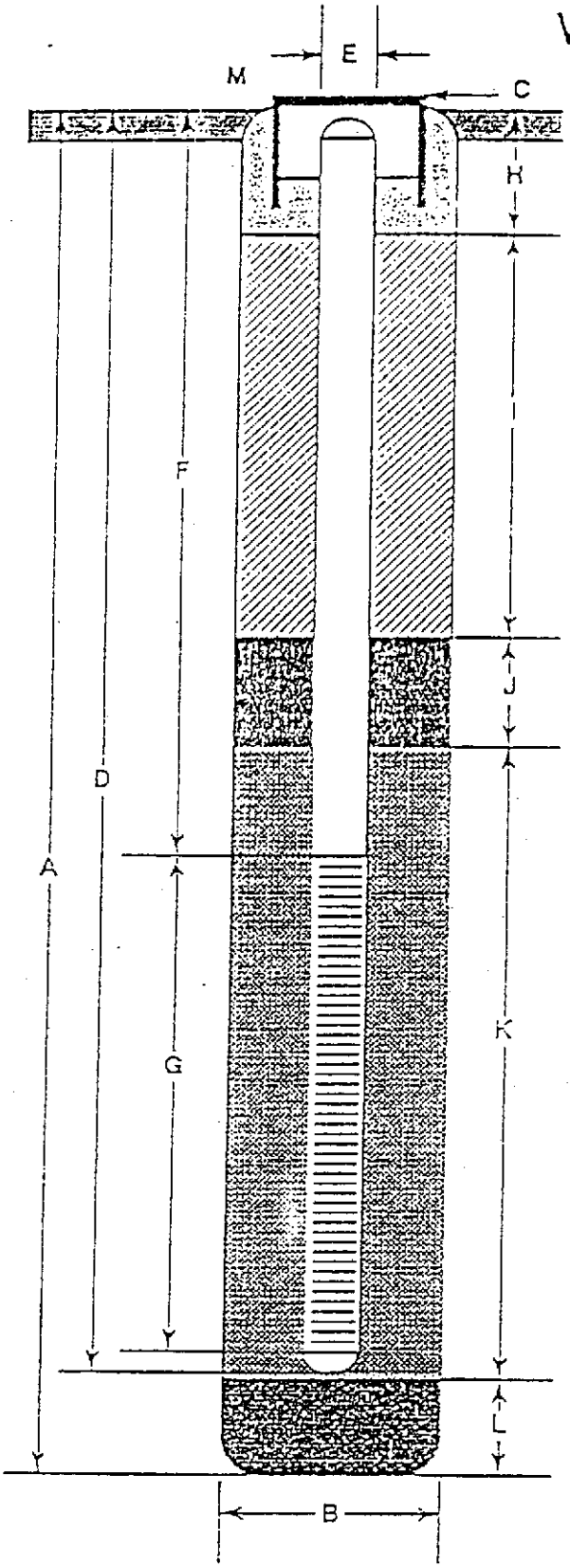
Water Level			
Time			
Date			

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

Remarks:

FIGURE 1

WELL CONSTRUCTION DETAIL



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 _____

GeoStrategies Inc.

Well Construction Detail

WELL NO.

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

FIGURE 2

General and Environmental Contractors

WELL SAMPLING
FIELD DATA SHEET

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 3

Monitoring Well Sampling Protocol Schematic

Sampling Crew Reviews Project Sampling Requirments/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

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

V = Purge volume (gallons)
= 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 Initials Measured Water Column Height in Feet within 24 hrs. of Evacuation.

↓

Measure Groundwater Stability Indicator Parameters (pH, Temp., Conductivity)

↓

Collect Sample and Complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Anayltical 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 degree 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

FIGURE 4

Gettler - Ryan Inc.
ENVIRONMENTAL DIVISION

Chain of Custody

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 _____

FIGURE 5

APPENDIX B
GETTLER-RYAN INC.
GROUNDWATER SAMPLING REPORT

gettler — ryan inc.

October 31, 1989

GROUNDWATER SAMPLING REPORT

Referenced Site: Former Shell Service Station
15275 Washington Avenue
San Leandro, California

Sampling Date: October 9 & 10, 1989

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on October 9 and 10, 1989 at the referenced location. The site, located on the northwest corner of Washington Avenue and Lewelling Boulevard, is no longer an operating service station. The former station had underground storage tanks which contained petroleum products.

There are currently six groundwater monitoring wells on site and nine off site at the locations 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 7.62 to 8.64 feet below grade. Separate phase product was not observed in any monitoring wells.

The wells were then were purged and sampled. 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. In cases where a well dewatered or less than four case volumes were purged, groundwater samples were obtained after the physical parameters had stabilized. The purge water was contained in drums for proper disposal. Details of the final well purging results are presented on the attached Table of Monitoring Data.

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 field blank (SF-8), supplied by the laboratory, was included and analyzed to assess quality control. A duplicate sample (SD-3), 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.

1992 national avenue • hayward, california 94545-1787 • (415) 783-7500

The samples were analyzed at International Technology Corporation - Santa Clara Valley Laboratory located at 2055 Junction Avenue, San Jose, California. The laboratory is assigned a California DHS-HMTL Certification number of 137. 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.	S-1	S-3 SD-3	S-5	S-6	S-7	S-8
Casing Diameter (inches)	3	3	4	3	3	3
Total Well Depth (feet)	19.9	15.2	13.4	24.7	20.5	24.3
Depth to Water (feet)	8.09	8.00	8.32	8.58	8.35	7.84
Free Product (feet)	none	sheen	none	none	none	none
Reason Not Sampled	----	----	----	----	----	----
Calculated 4 Case Vol.(gal.)	17.9	19.0	13.4	25.6	18.5	25.0
Did Well Dewater?	no	yes	no	yes	yes	no
Volume Evacuated (gal.)	25	10	19	16	10	17
Purging Device	Suction	Suction	Suction	Suction	Suction	Suction
Sampling Device	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer
Time	10:54	09:18	08:51	10:24	09:49	13:36
Temperature (F)*	73.5	70.3	68.2	69.9	70.4	72.1
pH*	7.36	6.91	6.99	7.47	7.31	7.17
Conductivity (umhos/cm)*	1216	1170	1633	1128	1325	1651

* Indicates Stabilized Value

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

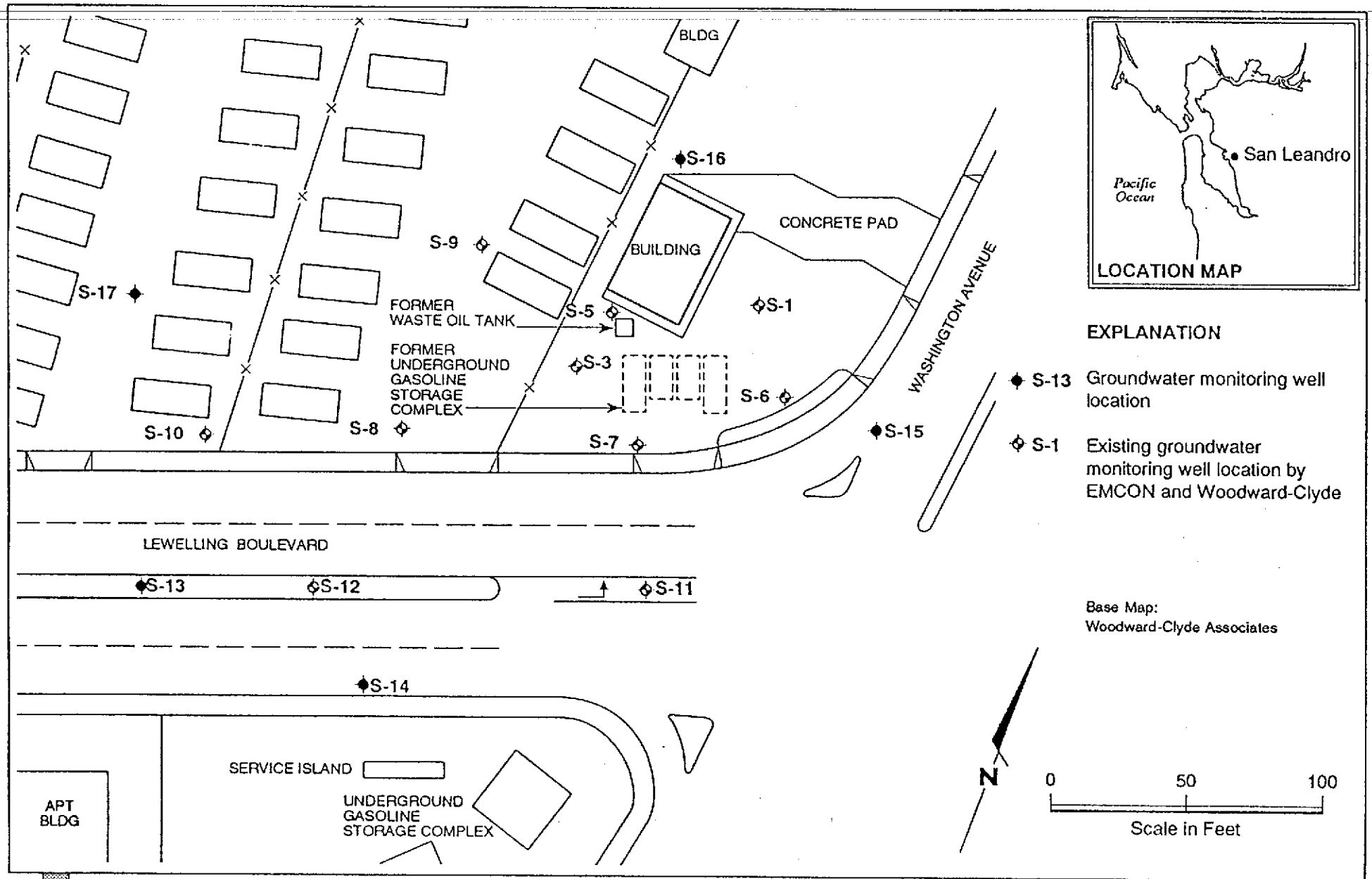
WELL I.D.	S-9	S-10	S-11	S-12	S-13	S-14
Casing Diameter (inches)	3	3	3	3	3	3
Total Well Depth (feet)	17.9	18.1	24.5	24.0	24.0	20.0
Depth to Water (feet)	7.87	7.99	8.64	8.32	7.95	7.62
Free Product (feet)	none	none	none	none	none	none
Reason Not Sampled	----	----	----	----	----	----
Calculated 4 Case Vol.(gal.)	13.6	15.2	24.1	23.8	24.4	18.8
Did Well Dewater?	yes	yes	yes	yes	no	yes
Volume Evacuated (gal.)	9	9	13	17	33	13
Purging Device	Suction	Suction	Suction	Suction	Suction	Suction
Sampling Device	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer
Time	13:16	12:46	11:07	10:44	10:16	11:33
Temperature (F)*	73.6	68.0	69.4	71.8	69.1	69.6
pH*	7.01	7.06	7.63	7.46	7.30	7.31
Conductivity (umhos/cm)*	1447	948	1094	1140	1372	1228

* Indicates Stabilized Value

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	S-15	S-16	S-17
Casing Diameter (inches)	3	3	3
Total Well Depth (feet)	23.3	19.9	24.4
Depth to Water (feet)	8.46	8.23	8.18
Free Product (feet)	none	none	none
Reason Not Sampled	----	----	----
Calculated 4 Case Vol.(gal.)	22.4	17.7	24.8
Did Well Dewater?	no	no	no
Volume Evacuated (gal.)	29	25	33
Purging Device	Suction	Suction	Suction
Sampling Device	Bailer	Bailer	Bailer
Time	09:42	11:30	12:28
Temperature (F)*	65.6	68.1	68.6
pH*	7.45	7.32	7.41
Conductivity (umhos/cm)*	942	1324	1121

* Indicates Stabilized Value



GeoStrategies Inc.

Site Plan
Former Shell Service Station
15275 Washington Avenue
San Leandro, California

PLATE
1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
615		6/89		

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545
ATTN: John Werfal

Date: October 23, 1989

Work Order Number: S9-10-111, S9-10-112

P.O. Number: MOH 890501A

This is the Certificate of Analysis for the following samples:

Client Project ID:	GR #3615, Shell, 15275 Washington/ Lewelling, San Leandro, CA
Date Received by Lab:	10/11/89
Number of Samples:	17
Sample Type:	Water

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 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 as well as a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline and includes benzene, toluene, ethyl benzene and xylenes.

Reviewed and Approved

Michael E. Dean
Project Manager

MED/jd
3 Pages Following - Tables of Results

Date: October 23, 1989
Client Project ID: GR #3615, Shell, 15275 Washington/ Lewelling, San Leandro, CA

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number:
S9-10-111, S9-10-112

Lab Sample ID	Client Sample ID	Sample Date	Date Analysis Completed	Sample Condition on Receipt
S9-10-111-01	S-1	10/10/89	10/12/89	Cool, pH ≤2
S9-10-111-02	S-3	10/10/89	10/12/89	Cool, pH ≤2
S9-10-111-03	S-5	10/10/89	10/12/89	Cool, pH ≤2
S9-10-111-04	S-6	10/10/89	10/12/89	Cool, pH ≤2
S9-10-111-05	S-7	10/10/89	10/12/89	Cool, pH ≤2
S9-10-111-06	S-8	10/09/89	10/12/89	Cool, pH ≤2

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Liter

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-10-111-01	S-1	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-02	S-3	52.	4.6	3.3	2.6	15.
Detection Limit		2.5	0.02	0.05	0.05	0.2
S9-10-111-03	S-5	15.	3.3	0.16	0.83	2.2
Detection Limit		2.5	0.02	0.05	0.05	0.2
S9-10-111-04	S-6	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-05	S-7	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-06	S-8	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003

Date: October 23, 1989
Client Project ID: GR #3615, Shell, 15275 Washington/ Lewelling, San Leandro, CA

IT ANALYTICAL SERVICES SAN JOSE, CA

Work Order Number: S9-10-111, S9-10-112

Lab Sample ID	Client Sample ID	Sample Date	Date Analysis Completed	Sample Condition on Receipt
S9-10-111-07	S-9	10/09/89	10/13/89	Cool, pH ≤2
S9-10-111-08	S-10	10/09/89	10/12/89	Cool, pH ≤2
S9-10-111-09	S-11	10/09/89	10/12/89	Cool, pH ≤2
S9-10-111-10	S-12	10/09/89	10/12/89	Cool, pH ≤2
S9-10-111-11	S-13	10/09/89	10/13/89	Cool, pH ≤2
S9-10-111-12	S-14	10/09/89	10/13/89	Cool, pH ≤2

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Liter

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-10-111-07	S-9	0.38	0.082	ND	0.046	0.013
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-08	S-10	0.17	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-09	S-11	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-10	S-12	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-11	S-13	0.077	0.0014	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-111-12	S-14	1.0	0.36	0.06	0.02	0.03
Detection Limit		0.50	0.005	0.01	0.01	0.03

Date: October 23, 1989
Client Project ID: GR #3615, Shell, 15275 Washington/ Lewelling, San Leandro, CA

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number:
S9-10-111, S9-10-112

Lab Sample ID	Client Sample ID	Sample Date	Date Analysis Completed	Sample Condition on Receipt
S9-10-111-13	S-15	10/09/89	10/13/89	Cool, pH ≤2
S9-10-112-01	S-16	10/10/89	10/13/89	Cool, pH ≤2
S9-10-112-02	S-17	10/09/89	10/13/89	Cool, pH ≤2
S9-10-112-03	SF-8	10/09/89	10/13/89	Cool, pH ≤2
S9-10-112-04	SD-3		10/13/89	Cool, pH ≤2

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Liter

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-10-111-13	S-15	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-112-01	S-16	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-112-02	S-17	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-112-03	SF-8	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003
S9-10-112-04	SD-3	66.	4.7	3.3	2.8	16.
Detection Limit		2.5	0.02	0.05	0.05	0.2

Geltler - Ryan Inc. 89-10-111 ENVIRONMENTAL DIVISION 1104 Chain of Custody

COMPANY Shell Oil Co. JOB NO.

JOB LOCATION 15275 Washington / Lewelling

CITY San Leandro, CA PHONE NO. 538-7500

AUTHORIZED John Werfal DATE 10-9-89 P.O. NO. 3615

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
S-1	3	liquid	10/9/89 10:54	THC (gas), BTXE	OK/COOL
S-3	3		9:18		
S-5	3		8:51		
S-6	3		10:24		
S-7	3		9:49		
S-8	3		10/9/89 13:36		
S-9	3		13:16		
S-10	3		12:46		
S-11	3		11:09		
S-12	3		10:44		
S-13	3		10:16		
S-14	3		11:33		
S-15	3		9:42		

RELINQUISHED BY: John P. Zwerzyski RECEIVED BY:

RELINQUISHED BY: RECEIVED BY:

RELINQUISHED BY: RECEIVED BY LAB:

Julie Clifford 10/11/89 10:30

DESIGNATED LABORATORY: IT (SCV) DHS #: 137

REMARKS: Normal TAT

Engineer Diane Lundquist.

WIC 204-6852-1008 APE: 986612 Exp Code 5440

DATE COMPLETED 10-10-89 FOREMAN John P. Zwerzyski

ORIGINAL

Gettler - Ryan Inc. 59-10-112 ENVIRONMENTAL DIVISION 1103 **Chain of Custody**

COMPANY Shell Oil Co. JOB NO.

JOB LOCATION 15275 Washington / Lewelling

CITY San Leandro, CA. PHONE NO.

AUTHORIZED John Werfal DATE 10-9-89 P.O. NO. 3615

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
S-16	3	liquid	10/10/89/11:30	THC(gas), BTXE	OK/COOL
S-17	3	↓	10/9/89/12:28	↓	↓
SF-8	3		10/9/89/13:36		
SD-3	3		—		

RELINQUISHED BY: John P. Zwerzycki RECEIVED BY:

RELINQUISHED BY: RECEIVED BY:

RELINQUISHED BY: RECEIVED BY LAB: Julie Clifford 10/11/89 10:30

DESIGNATED LABORATORY: IT (SCV) DHS #: 137

REMARKS:

Engineer Diane Lundquist

WIC 204-6852-1008, AFE 986612 Exp Cod 5440

DATE COMPLETED 10-10-89 FOREMAN John P. Zwerzycki

ORIGINAL

APPENDIX C
HISTORICAL ANALYTICAL DATA

ANALYTICAL LOG

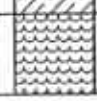
SAMPLE DATE	SAMPLE POINT	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	E.B. (PPM)	XYLENES (1) (PPM)
08-Jul-85	S-1	0.52	N/A	N/A	N/A	N/A
06-Sep-88	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Nov-88	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
27-Feb-89	S-1	<0.05	0.0005	<0.001	<0.001	<0.003
04-May-89	S-1	<0.05	0.001	<0.001	<0.001	<0.003
10-Aug-89	S-1	<0.05	0.0007	<0.001	<0.001	<0.003
10-Oct-89	S-1	<0.05	<0.0005	<0.001	<0.001	<0.003
08-Jul-85	S-2	2.20	N/A	N/A	N/A	N/A
06-Sep-88	S-3	96.	3.4	9.5	2.7	17.
16-Nov-88	S-3	70.	4.6	8.4	2.5	13.
27-Feb-89	S-3	32.	2.4	3.1	1.5	6.4
04-May-89	S-3	47.	4.4	6.3	2.4	15.
09-Aug-89	S-3	110.	5.7	5.7	3.2	19.
10-Oct-89	S-3	52.	4.6	3.3	2.6	15.
08-Jul-85	S-4	32.	N/A	N/A	N/A	N/A
08-Jan-87	S-5	7.8	0.38	0.510	----	1.0
06-Sep-88	S-5	7.	2.6	0.06	0.4	0.7
16-Nov-88	S-5	3.	0.66	0.06	0.12	0.22
27-Feb-89	S-5	5.7	2.	0.22	0.26	0.32
04-May-89	S-5	9.	3.	0.6	0.63	1.7
09-Aug-89	S-5	5.1	1.1	<0.05	0.27	0.4
10-Oct-89	S-5	15.	3.3	0.16	0.83	2.2
16-Nov-88	S-6	0.05	0.0007	<0.001	<0.001	<0.003
27-Feb-89	S-6	<0.05	<0.0005	<0.001	<0.001	<0.003
04-May-89	S-6	<0.05	<0.0005	<0.001	<0.001	<0.003
10-Aug-89	S-6	<0.05	<0.0005	<0.001	<0.001	<0.003
10-Oct-89	S-6	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Nov-88	S-7	0.1	0.0051	0.015	0.002	0.013
27-Feb-89	S-7	0.05	0.0005	0.003	0.001	0.011
04-May-89	S-7	<0.05	<0.0005	<0.001	<0.001	<0.003
10-Aug-89	S-7	<0.05	<0.0005	<0.001	<0.001	<0.003
10-Oct-89	S-7	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Nov-88	S-8	0.21	0.005	<0.001	0.001	0.005
27-Feb-89	S-8	<0.05	0.0024	<0.001	<0.001	<0.003
03-May-89	S-8	<0.05	0.0075	<0.001	0.002	<0.003
09-Aug-89	S-8	<0.05	0.0006	<0.001	<0.001	<0.003
09-Oct-89	S-8	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Nov-88	S-9	1.4	0.069	0.003	0.052	0.18
27-Feb-89	S-9	1.6	0.24	0.004	0.13	0.18

ANALYTICAL LOG

SAMPLE DATE	SAMPLE POINT	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	E.B. (PPM)	XYLENES (1) (PPM)
03-May-89	S-9	2.6	0.47	0.01	0.24	0.48
09-Aug-89	S-9	0.52	0.073	<0.01	0.04	<0.03
09-Oct-89	S-9	0.38	0.082	<0.001	0.046	0.013
16-Nov-88	S-10	0.33	0.0005	<0.001	0.001	0.011
27-Feb-89	S-10	0.14	<0.0005	<0.003	0.002	0.006
03-May-89	S-10	0.22	<0.0005	0.001	0.002	0.007
09-Aug-89	S-10	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Oct-89	S-10	0.17	<0.0005	<0.001	<0.001	<0.003
16-Nov-88	S-11	<0.05	<0.0005	<0.001	<0.001	<0.003
27-Feb-89	S-11	<0.05	<0.0005	<0.001	<0.001	<0.003
03-May-89	S-11	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Aug-89	S-11	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Oct-89	S-11	<0.05	<0.0005	<0.001	<0.001	<0.003
16-Nov-88	S-12	0.05	0.0035	<0.001	<0.001	<0.003
27-Feb-89	S-12	<0.05	0.0008	<0.001	<0.001	<0.003
03-May-89	S-12	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Aug-89	S-12	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Oct-89	S-12	<0.05	<0.0005	<0.001	<0.001	<0.003
03-May-89	S-13	0.15	0.0049	0.004	0.002	0.014
09-Aug-89	S-13	0.11	0.0029	<0.001	<0.001	<0.003
09-Oct-89	S-13	0.077	0.0014	<0.001	<0.001	<0.003
03-May-89	S-14	5.3	0.75	0.4	0.200	0.800
09-Aug-89	S-14	1.8	0.54	0.14	0.042	0.050
09-Oct-89	S-14	1.0	0.36	0.06	0.020	0.030
03-May-89	S-15	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Aug-89	S-15	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Oct-89	S-15	<0.05	<0.0005	<0.001	<0.001	<0.003
04-May-89	S-16	0.38	0.044	0.003	0.002	<0.003
10-Aug-89	S-16	<0.05	0.0006	<0.001	<0.001	<0.003
10-Oct-89	S-16	<0.05	<0.0005	<0.001	<0.001	<0.003
03-May-89	S-17	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Aug-89	S-17	<0.05	<0.0005	<0.001	<0.001	<0.003
09-Oct-89	S-17	<0.05	<0.0005	<0.001	<0.001	<0.003

NOTES: 1. ETHYLBENZENE & XYLENES COMBINED IN 1985 THROUGH 1987
2. ALL DATA SHOWN AS <X IS REPORTED AS ND (NONE DETECTED)

APPENDIX D
BORING LOGS AND
WELL CONSTRUCTION DETAILS

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

Perm	- Permeability
Consol	- Consolidation
LL	- Liquid Limit (%)
PI	- Plastic Index (%)
G_s	- Specific Gravity
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.: 7615	Date: 10/27/89	Boring No: SR-1
	Client: Shell Oil Company		
	Location: 15275 Washington Avenue		
	City: San Leandro, California		Sheet 1 of 3
	Logged by: M.J.J.	Driller: Bayland	
Drilling method: Hollow-Stem Auger	Casing installation data: Pilot Boring		
Hole diameter: 8-inches	Top of Box Elevation:		Datum:

Water Level	12.5	10.9	
Time			
Date	10/27/89	10/27/89	

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
								PAVEMENT SECTION - 4 inches
				1				FILL - Gravel (GW) - dark brown (10YR 3/3), damp, very loose.
				2				FILL - Clay with Silt (CL) - black (5Y 2.5/1), damp, soft, high plasticity; ≤ 5% coarse sand; strong chemical odor.
				3				
				4				
231	2			5				
	3	S&H	SR1-5					CLAY (CL) - black (2.5Y N3/2), damp, soft, medium plasticity; interbeds of clayey sand (SP-SC); sand is very fine to fine; interbeds occur as discrete units 3 to 5 inches thick; contain 10-20% fines; strong chemical odor.
	4							
	3			6				
243	4	S&H	SR1-6.5					
	5			7				
	1							
296	2	S&H	SR1-8	8				
	3							
	2			9				moderate chemical odor.
	4							
373	6	S&H	SR1-10	10				COLOR CHANGE to black (10YR 3.3) at 10.5 feet.
	2							SILTY SAND (SM) - moist, loose, interbedded with clayey silt (ML-CL), medium plasticity; no chemical odor.
108	4	S&H		11		▼		
	6		SR1-					
			11.5	12				
								CLAY (CL) - very dark grayish brown (10YR 3/2), damp, stiff, high plasticity; fractured texture; no chemical odor.
				13				
				14				
	2							
4.3	4	S&H	SR1-15	15				
	8							first encountered water at 16.0 feet. Increasing sand at 16 feet. Interbedded clay with sand and clayey sand (observed during drilling with bucket auger, 11/16/89)
				16		▽		
				17				
				18				
				19				

Remarks:

Log of Boring

BORING NO. SR-1

GeoStrategies Inc.

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CEG 1262	11/89		

Field location of boring:

(See Plate 2)

Project No.: 7615	Date: 10/27/89	Boring No: SR-1	
Client: Shell Oil Company			
Location: 15275 Washington Avenue			
City: San Leandro, California		Sheet 2 of 3	
Logged by: M.J.J.	Driller: Bayland		
Casing installation data: Pilot Boring			
Drilling method: Hollow-Stem Auger			
Hole diameter: 8-inches	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				
	2											
80	4	S&H	SR1-20	20								
	6											
				21				CLAYEY SILT (ML-CL) - light olive brown (2.5Y 5/4), saturated, medium plasticity; 30% clay; 5% fine to medium sand; no chemical odor.				
				22								
				23								
				24				CLAY with SAND (CL) - olive gray (5Y 4/2), saturated, stiff, high plasticity; 20% very fine to fine sand; no chemical odor.				
	3											
66	3	S&H	SR1-30	25								
	6											
				26				SILT with SAND (ML) - light olive brown (2.5Y 5/4), saturated, stiff; 15% fine to medium sand; 20-30% clay; no chemical odor.				
				27								
				28								
				29				SAND with SILT (SP-SM) - light olive brown (5Y 4/2), fine sand, saturated, medium dense; well sorted; 10% silt; trace clay; laminae of silt 0.25 inches thick in shoe; iron oxide staining; no chemical odor.				
	3											
10	8	S&H	SR1-30	30								
	10											
				31								
				32								
				33								
				34				SILTY SAND (SM) - light olive brown (5Y 4/2), saturated, dense; very fine to medium sand; 15% silt; trace clay; no chemical odor.				
	5											
34	7	S&H	SR1-35	35								
	18											
				36								
				37								
				38								
				39				SAND (SP) - dark grayish brown (2.5Y 3/2), saturated, dense, very fine to medium sand; interbeds of fine				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. SR-1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CEG 1262	11/89		

Field location of boring: (See Plate 2)	Project No.: 7615	Date: 10/27/89	Boring No.: SR-1
	Client: Shell Oil Company		
	Location: 15275 Washington Avenue		
	City: San Leandro, California		Sheet 3 of 3
	Logged by: M.J.J.	Driller: Bayland	
Drilling method: Hollow-Stem Auger	Casing installation data: Pilot Boring		
Hole diameter: 8-inches	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
	9			40				silty sand 0.5 to 3.0 inches thick; no chemical odor.
8.2	13	S&H	SR1-40					
	17							Bottom of boring at 40.5 feet.
				41				Bottom of sample at 40.5 feet.
								10/27/89
				42				
				43				
				44				
				45				
				46				
				47				
				48				
				49				
				50				
				51				
				52				
				53				
				54				
				55				
				56				
				57				
				58				
				59				

Remarks: Boring caved to 30 feet, Bentonite from 19 to 30 feet.

GeoStrategies Inc.

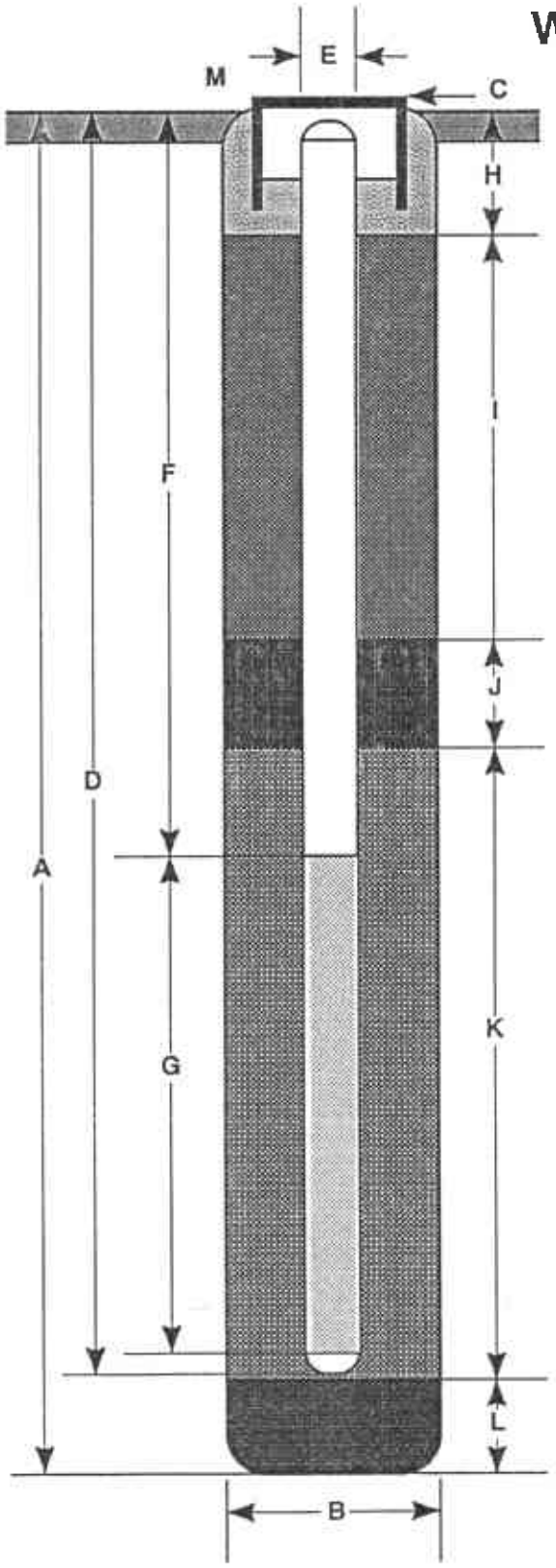
Log of Boring

BORING NO.

SR-1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7615	CWP 06 G 1262	11/89		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 40.5 ft.

B Diameter of Boring 20 in.
Drilling Method Bucket Auger

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

D Casing Length 21 ft.
Material Schedule 40 PVC

E Casing Diameter 6 in.

F Depth to Top Perforations 6.5 ft.

G Perforated Length [redacted] ft.
Perforated Interval from 6.5 to 21.5 ft.
Perforation Type Machine Slot
Perforation Size 0.020 in.

H Surface Seal from 0.5 to 1.0 ft.
Seal Material concrete

I Backfill from 1.0 to 4.5 ft.
Backfill Material cement

J Seal from 4.5 to 5.5 ft.
Seal Material Bentonite

K Gravel Pack from 5.5 to 21.5 ft.
Pack Material 2/12 Lonestar sand

L Bottom Seal 21.5-30 ft.
Seal Material Bentonite

M Christy Box

Note: 30 to 40.5 Native Material (slough)

GeoStrategies Inc.

Well Construction Detail

WELL NO.
SR-1

JOB NUMBER	REVIEWED BY PG/CEG	DATE	REVISED DATE	REVISED DATE
7615	PG, CEG 1262	10/89		

APPENDIX E

SIEVE ANALYSIS
AND
SOIL ANALYTICAL RESULTS

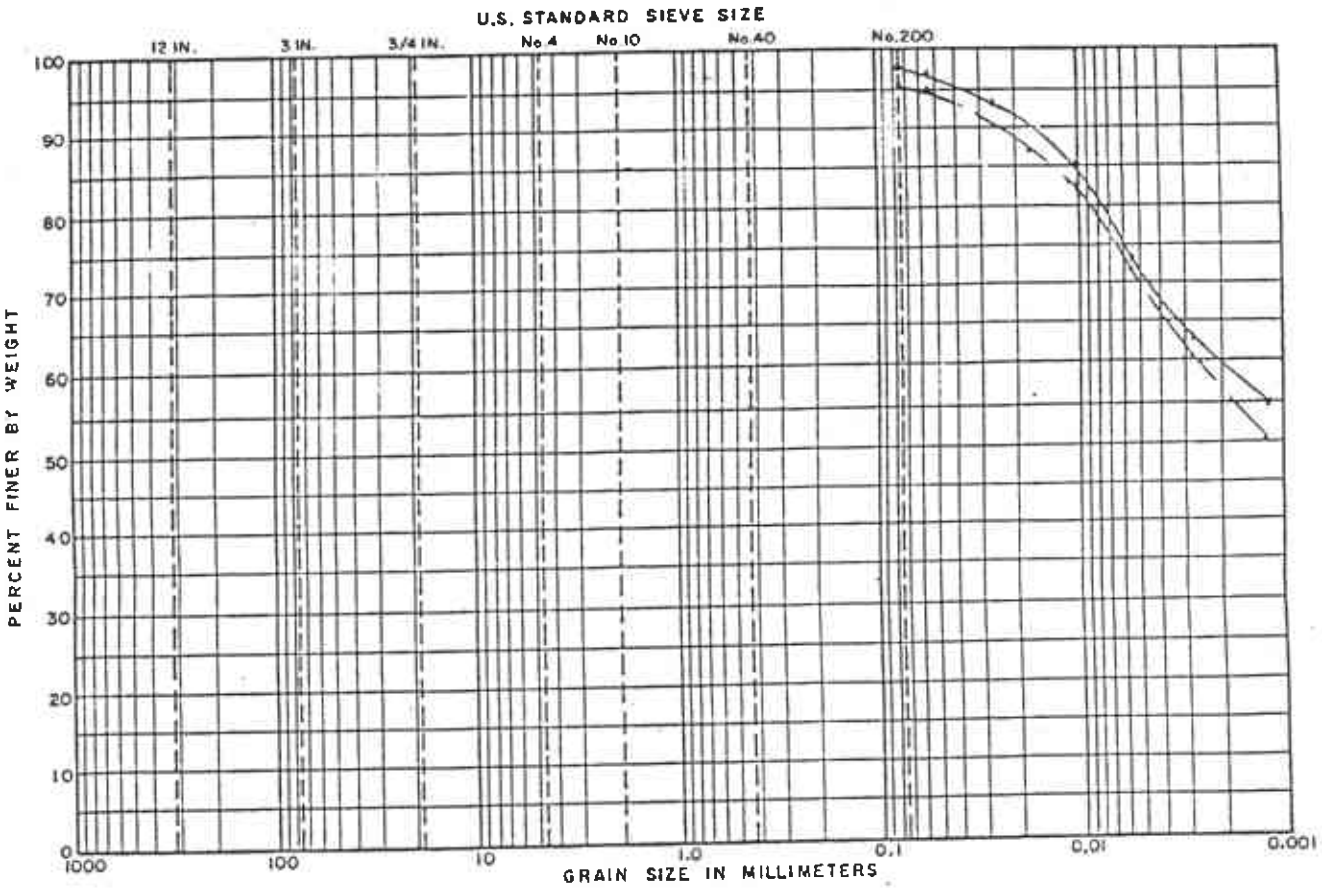
COOPER TESTING LABORATORY

JOB NUMBER 067-3 CLIENT Geo STRATEGIES 7615

LOCATION

DRAWN BY JC DATE 11/7/89

CHECKED BY DATE



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUN	FINE	

(U N I F I E D S O I L C L A S S I F I C A T I O N S Y S T E N)

LEGEND	———	— — —	
BORING NUMBER	SR-1	SB-1	
DEPTH (FEET)	15	20	
SOIL DESCRIPTION	CL/CH	CL/CH	
EFFECTIVE SIZE, D_{10}			
COEFFICIENT OF UNIFORMITY D_{60}/D_{10}			
COEFFICIENT OF CURVATURE $D_{30}^2/(D_{10} \times D_{60})$			

GRADATION TEST DATA

COOPER TESTING LABORATORY

DATA SHEET FOR GRAIN SIZE ANALYSES

JOB 067-3 (GEO STRATEGIES 765) BORING NO. _____ SAMPLE NO. SB-1 DEPTH 20'

DATE SAMPLED 10/27 BY _____ TEST STARTED 11/1/89 BY DC COMPUTED _____ BY _____

DESCRIPTION OF SOIL BROWN SILTY CLAY

SIEVE ANALYSIS

U.S. SIEVE NUMBER	SIZE OF OPENING IN MM	CUMULATIVE WEIGHT RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING (% FINER)
3"*	76.1			
1½"	38.1			
1"	25.4			
¾"*	19.1			
½"	12.7			
#4*	4.76			
#8	2.38			
#10*	2.00			
#16	1.19			
#30	.590			
#40*	.420			
#50	.297			
#80	.190			
#100	.149			
#200*	.074	2.1	4.4	95.6
Pan	—			

*Sieves used to separate soils according to the Unified Soil Classification System

WASH ANALYSIS (Sieve #____)

	Before Wash	After Wash
Weight of Dish + Oven-Dry Soil		
Weight of Dish No. H	53.4	G
Weight of Oven-Dry Soil		

% Retained After Wash _____

Hydrometer Jar No. 5

Hydrometer No. (Type 152H) . . . ✓

Test performed on what fraction of original sample? . . . . . _____

Specific gravity of Soil . (ASSUMED) 2.7

Specific gravity correction, ... a .99
(from Table I, Page 90)

Before Test:

Weight of Beaker + Oven-Dry Soil #102 68.1

Weight of Beaker No. 5 . . 20.5 65.6

Weight of Oven-Dry Soil, . . W 50 ÷ 5.5%
CORRECTED W 47.4

$\frac{100\,a}{W} = 2.09$

HYDROMETER ANALYSIS

(ASTM Designation D422-59T: April 1958 Edition, "ASTM Procedures For Testing Soils," Revised Nov. 9, 1959)

Date	Time 827	Elapsed Time, T In. Min.	$\sqrt{L/T}$ [1]	K [2]	Particle Diam, D in mm [3]
11/3		½	3.95	.01378	.054
	828	1	2.85		.039
	829	2	2.04		.028
	832	5	1.30		.018
	842	15	.764	.01361	.010
	857	30	.553		.0075
	927	60	.402	.01344	.0054
	1027	120	.291		.0039
	1227	240	.210		.0028
	1627	480	.152	.01312	.0020
11/4	827	1440	.0879	.01396	.0012

Temp. in °C	Original Hydrom Rdg.	Composite Correction [4]	Corrected Hydrom. Rdg R	% of Soil in Suspension [5] P
18	52/52	-6.5	45.5	95.0
	50		43.5	90.9
	49		42.5	88.8
	48		41.5	86.7
19	46	-6.3	39.7	82.9
	43		36.7	76.7
20	40	-5.9	34.1	71.2
	37		31.1	65.0
	35		29.1	60.8
22	32	-5.3	26.7	55.8
17	31	-6.7	24.3	50.8

[1] From C&C chart for determination of $\sqrt{L/T}$ from the *original* hydrometer reading.

[2] From Table III, page 92.

[3] $D = K\sqrt{L/T}$.

[4] From Hydrometer Calibration Chart.

Subtract this correction from the original hydrometer reading to get the corrected hydrometer reading, R

[5] $P = R\left\{\frac{100a}{W}\right\}$

COOPER TESTING LABORATORY

DATA SHEET FOR GRAIN SIZE ANALYSES

JOB 067-3 (620 STRATEGIES 7615) BORING NO. _____ SAMPLE NO. SR-1 DEPTH 15'

DATE SAMPLED 10/27/89 BY _____ TEST STARTED 11/1/89 BY DC COMPUTED _____ BY _____

DESCRIPTION OF SOIL BROWN SILTY CLAY

SIEVE ANALYSIS

U.S. SIEVE NUMBER	SIZE OF OPENING IN MM	CUMULATIVE WEIGHT RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING (% FINER)
3"*	76.1			
1½"	38.1			
1"	25.4			
¾"*	19.1			
½"	12.7			
#4*	4.76			
#8	2.38			
#10*	2.00			
#16	1.19			
#30	.590			
#40*	.420			
#50	.297			
#80	.190			
#100	.149			
#200*	.074	1.0	2.1	97.9
Pan	——			

*Sieves used to separate soils according to the Unified Soil Classification System

WASH ANALYSIS (Sieve #____)

	Before Wash	After Wash
Weight of Dish + Oven-Dry Soil		
Weight of Dish No. C-1	51.5	C
Weight of Oven-Dry Soil		

% Retained After Wash _____

Hydrometer Jar No. 3

Hydrometer No. (Type 152H) . . . ✓

Test performed on what fraction of original sample? . . . . . _____

Specific gravity of Soil . (ASSUMED) 2.7

Specific gravity correction, ... a .99
(from Table I, Page 90)

Before Test:

Weight of Beaker + Oven-Dry Soil #44 59.8

Weight of Beaker No. 4 . . A-4 57.6

Weight of Oven-Dry Soil, . . W 50 ÷ 5.8
CORRECTED w 47.3

$\frac{100\,a}{W} = 2.09$

HYDROMETER ANALYSIS

(ASTM Designation D422-59T: April 1958 Edition, "ASTM Procedures For Testing Soils," Revised Nov. 9, 1959)

Date	Time 833	Elapsed Time, T In. Min.	[1] √L/T	[2] K	[3] Particle Diam, D in mm
11/3		½	3.9	.01378	.054
	834	1	2.79		.038
	835	2	1.99		.027
	838	5	1.27	.01361	.017
	848	15	.755		.010
	903	30	.545		.0074
	933	60	.400	.01344	.0054
	1033	120	.290		.0039
	1233	240	.208		.0028
	1633	480	.150	.01312	.0020
11/4	833	1440	.0866	.01396	.0012

Temp. in °C	Original Hydrom Rdg.	[4] Composite Correction	Corrected Hydrom. Rdg. R	[5] % of Soil in Suspension P
18	53/53	-6.5	46.5	97.2
	52		45.5	95.1
	51		44.5	93.0
19	50	-6.3	43.7	91.3
	47		40.7	85.1
	45		38.7	80.8
20	41	-5.9	35.1	73.4
	38		32.1	67.1
	36		30.1	62.9
22	34	-5.3	28.7	60.0
17	33	-6.7	26.3	55.0

[1] From C&C chart for determination of $\sqrt{L/T}$ from the *original* hydrometer reading.

[2] From Table III, page 92.

[3] $D = K\sqrt{L/T}$, $\sqrt{L/T}$.

[4] From Hydrometer Calibration Chart.

Subtract this correction from the original hydrometer reading to get the corrected hydrometer reading, R

[5] $P = R\left\{\frac{100a}{W}\right\}$

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545
ATTN: John Werfal

Date: November 9, 1989

Work Order Number: S9-11-010

P.O. Number: MOH 890501A

This is the Certificate of Analysis for the following samples:

Client Project ID:	GR #7615, Shell, 15272 Washington/ Lewelling, San Leandro, CA
Date Received by Lab:	11/1/89
Number of Samples:	4
Sample Type:	Soil

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 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 as well as a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline and includes benzene, toluene, ethyl benzene and xylenes.

Reviewed and Approved

Michael E. Dean
Project Manager

MED/an
1 Page Following - Table of Results

Date: November 9, 1989
Client Project ID: GR #7615, Shell,
15272 Washington/Lewelling, San Leandro, CA

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number: S9-11-010

Lab Sample ID	Client Sample ID	Sample Date	Extraction Date	Date Analysis Completed	Sample Condition on Receipt
S9-11-010-01	SR-1 5'	10/27/89	11/2/89	11/5/89	cool
S9-11-010-02	SR-1 10'	10/27/89	11/2/89	11/5/89	cool
S9-11-010-03	SR-1 15'	10/27/89	11/2/89	11/5/89	cool
S9-11-010-04	SR-1 30'	10/27/89	11/2/89	11/5/89	cool

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Kilogram

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-11-010-01	SR-1 5'	770.	0.8	3.1	5.0	33.
Detection Limit		21.	0.2	0.2	0.2	0.4
S9-11-010-02	SR-1 10'	20.	0.33	0.18	0.27	1.2
Detection Limit		2.5	0.025	0.025	0.025	0.05
S9-11-010-03	SR-1 15'	ND	ND	ND	ND	0.05
Detection Limit		2.5	0.025	0.025	0.025	0.05
S9-11-010-04	SR-1 30'	ND	ND	ND	ND	ND
Detection Limit		2.5	0.025	0.025	0.025	0.05