gettler — ryan inc.

general contractors

April 14, 1989

Mr. Steven R. Ritchie
Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street, Room 6040
Oakland, California 94607

Reference: Former Shell Service Station
461 8th Street
Oakland, California 94607

Gentlemen:

As requested by Ms. Diane Lundquist of Shell Oil Company, Gettler-Ryan Inc. is forwarding a copy of the Quarterly Ground-Water Sampling Report issued by GeoStrategies Inc. on April 14, 1989 for the referenced location. The Quarterly Summary Reports (Shell Oil Company's CALWATER program) are also enclosed. The summary reports cover the first quarter of 1989 (January - March, 1989).

Please do not hesitate to call should you have any questions or comments.

Sincerely,

John P. Werfal
Project Manager

JPW/ns

enclosure

cc: Ms. Diane Lundquist, Shell Oil Company
Mr. Rafat Shahid, Alameda County Environmental Health

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

GeoStrategies Inc.

QUARTERLY GROUND-WATER SAMPLING REPORT

JANUARY - MARCH 1989

Shell Oil Company
461 8th Street
Oakland, California

Project No. 7644

April 14, 1989

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

April 14, 1989

Gettler-Ryan Inc.
1992 National Avenue
Hayward, California 94545

Attn: Mr. John Werfal

Re: Quarterly Monitoring Report
Shell Service Station
461 8th Street
Oakland, California

Gentlemen:

GeoStrategies Inc. has prepared this quarterly monitoring report for the above referenced site for the January through March 1989 quarter.

If you have any questions, please call.

GeoStrategies Inc. by

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

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

JLP/CMP/ja

Project No. 7644

GeoStrageties Inc.
Project 7644

1.0 INTRODUCTION

This Quarterly Ground-water Sampling Report has been prepared by GeoStrategies Inc. (GSI) for Shell Service Station located at 461 8th Street in Oakland California (Plate 1).

This report describes the results of the first quarterly ground-water sampling for 1989 performed by Gettler-Ryan Inc. (G-R) in accordance with the current quarterly monitoring plan for the site. Field work and laboratory analysis methods were performed in accordance with current State of California Water Resources Control Board (SWRCB) procedures for conducting environmental investigations related to leaking underground fuel tanks. The field and chemical analytical data discussed in this report were collected between January 1, and March 31, 1989.

2.0 SITE HISTORY

In January 1979, the Bay Area Rapid Transit (BART) discovered gasoline leaking into an underground rail tube near the corner of the former Shell Service Station located at 461 8th Street in Oakland, California. As a result, a total of seven monitoring wells were installed at the site (Wells S-1 through S-7). These wells were installed to evaluate soil and ground-water quality conditions at the site. Monitoring well S-5 was found to contain separate-phase petroleum hydrocarbons (floating product); approximately 0.5 feet in measured thickness.

In 1982, a ground-water recovery system was installed at the site to attentuate known ground-water quality conditions. In 1983, the discharge permit for the recovery system was revoked because gasoline concentrations in effluent water exceeded established discharge requirements. In 1986, EMCON Associates (EMCON) submitted a report addressing the necessary steps to remove the recovery system. In October 1987, separate-phase product was pumped from well S-5 using a vacuum truck. In November 1987, the BART tube was checked for gasoline seepage. No seepage or vapors were detected at that time.

GeoStrageties Inc.
Project 7644

= 130 to 110,000 ppb TPH-g

Quarterly ground-water sampling at the former Service Station began in October, 1988. Wells S-4, S-5, and S-6 were sampled and analyzed for Total Petroleum Hydrocarbons (TPH); and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX). Low boiling TPH (gasoline concentrations) in ground-water samples ranged from 0.13 to 110.0 parts per million (ppm). Benzene concentrations ranged from 0.0038 to 29.0 ppm. The results of this sampling effort were reported by G-R. (Report dated January 9, 1989).

3.0 GROUND-WATER LEVEL MONITORING

3.1 Potentiometric Data

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

Ground-water elevation data for this quarter have been plotted and contoured and are presented on Plate 2. Water-level data used to prepare the quarterly potentiometric map were taken from data collected on the same day that ground-water sampling occurred. Groundwater elevations may be tidally influenced in the site region. Water-level measurements for this quarter have been compiled with databased historical water-level data presented in Appendix A of this report.

3.2 Floating-Product Measurements

Separate-phase petroleum hydrocarbons (floating product) were measured in monitoring wells using a calibrated portable oil-water interface probe. Floating-product thicknesses were recorded to the nearest ± 0.01 foot. A sheen of petroleum product was observed in monitoring well S-5. Floating-product measurements are presented in the appended Ground Water Sampling Report (See Appendix C). These data have been compiled in Table 1 and have been added to the historical database presented in Appendix A.

TABLE 1

GROUND-WATER ANALYSES DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	ETHYLBENZENE (PPM)	TOLUENE (PPM)	XYLENES (PPM)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
S-4	14-Feb-89	23-Feb-89	<0.05	0.0005	<0.001	<0.001	0.003	93.51	80.69	----	12.82
S-5	14-Feb-89	23-Feb-89	94.00 = 94,000ppb	16.0000	1.800	21.000	10.000	99.36	79.49	sheen	19.87
S-6	14-Feb-89	23-Feb-89	54.00 = 54,000ppb	18.0000	1.400	4.500	4.000	100.58	79.71	----	20.87
SF-5	14-Feb-89	23-Feb-89	<0.05	<0.0005	<0.001	<0.001	<0.003	99.36	79.49	sheen	19.87

TPH = Total Petroleum Hydrocarbons as Gasoline
PPM = parts per million
NA = Not Analyzed
SF = Field Blank

CURRENT DEPARTMENT OF HEALTH SERVICES ACTION LEVELS
Benzene 0.0007 ppm
Toluene 0.100 ppm
Xylenes 0.620 ppm
Ethylbenzene 0.68 ppm

Note: 1. For chemical parameter detection limits, refer to I.T. laboratory reports in Appendix B
2. Water level elevations referenced to project site datum

Project 7644

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Project 7644

4.0 CHEMICAL ANALYTICAL DATA

Ground-water samples were collected from site monitoring wells on March 11, 1989. The ground-water samples were analyzed for Total Petroleum Hydrocarbons (TPH) according to EPA Method 8015 (Modified); and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020. The State-Certified analytical laboratory that performed gas chromatography analysis of the water samples was International Technology Corporation (IT), of Santa Clara, California. The G-R, Ground-water Sampling Report for the first quarter sampling round in 1989 is presented in Appendix C.

Two wells at the site were found to contain aromatic fractions of petroleum hydrocarbon products above established action levels set by the State of California Department of Health Services (DHS). As shown on Table 1, benzene concentrations were identified in ground-water samples above DHS action levels in Wells S-5 and S-6 this quarter. The benzene concentrations in the furthest downgradient well (S-6) suggests that a plume is migrating towards Interstate 880.

Water-quality data for this quarterly report are summarized in Table 1. TPH and Benzene chemical analytical data were used to prepare Isoconcentration maps for this quarter (Refer to Plate 3).

4.1 Quality Control

Quality Control (QC) samples for this quarter ground-water sampling included a trip blank and a field blank. The trip blank was prepared in the IT Laboratory using organic-free water to evaluate laboratory handling and analytical procedures. The field blank was prepared in the field using organic-free water to evaluate field sampling procedures. The IT Laboratory chemical analytical reports for this quarter ground-water sampling are presented in Appendix B. G-R Ground-Water Sampling Forms and Chain-of-Custody Forms are included in the Groundwater Sampling Report presented in Appendix C. The G-R Sampling Protocol are presented in Appendix D.

5.0 SUMMARY

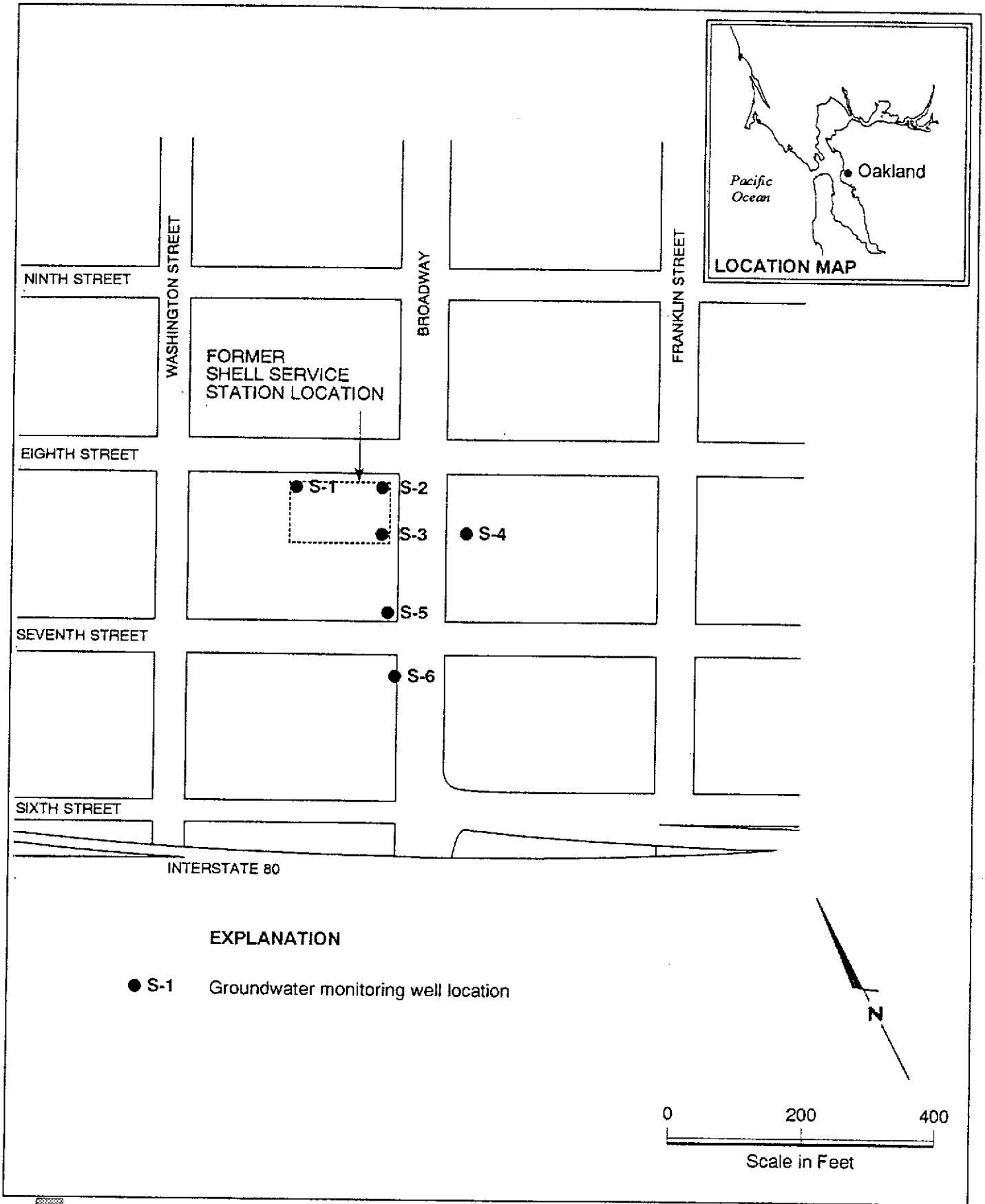
A summary of activities and findings associated with this quarterly report are presented below:

- o Water-levels were measured in selected monitoring wells (Table 1). A potentiometric map was constructed from static water-level data.
- o A petroleum product sheen was observed in Well S-5.
- o TPH was detected in Wells S-5 and S-6 (Table 1). TPH concentrations ranged from 54.0 to 94.0 ppm.
- o Benzene concentrations exceed the DHS action level in Wells S-5 (18.0 ppm) and S-6 (16.0 ppm).
- o Chemical analytical results for this quarter indicate that the present ground-water monitoring network at the site does not appear to be adequate for petroleum hydrocarbon plume definition. Additional monitoring wells will be required to evaluate the lateral extent of petroleum aromatic fraction (BTEX) migration from the site. Future scopes of work will be proposed under a separate document and implemented under the site-specific work plan.

6.0 PLANNED SITE ACTIVITIES

The following activities are planned for the second quarter, April to July 1989 at the site:

- o All scheduled wells will be sampled and analyzed for Total Petroleum Hydrocarbons (TPH) according to EPA Method 8015 (Modified); and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020.
- o Water-levels will be measured monthly and selected data will be used to prepare a potentiometric map across the site. The local ground-water gradient will be calculated.
- o Chemical data will be used to construct Isoconcentration maps for TPH and Benzene.

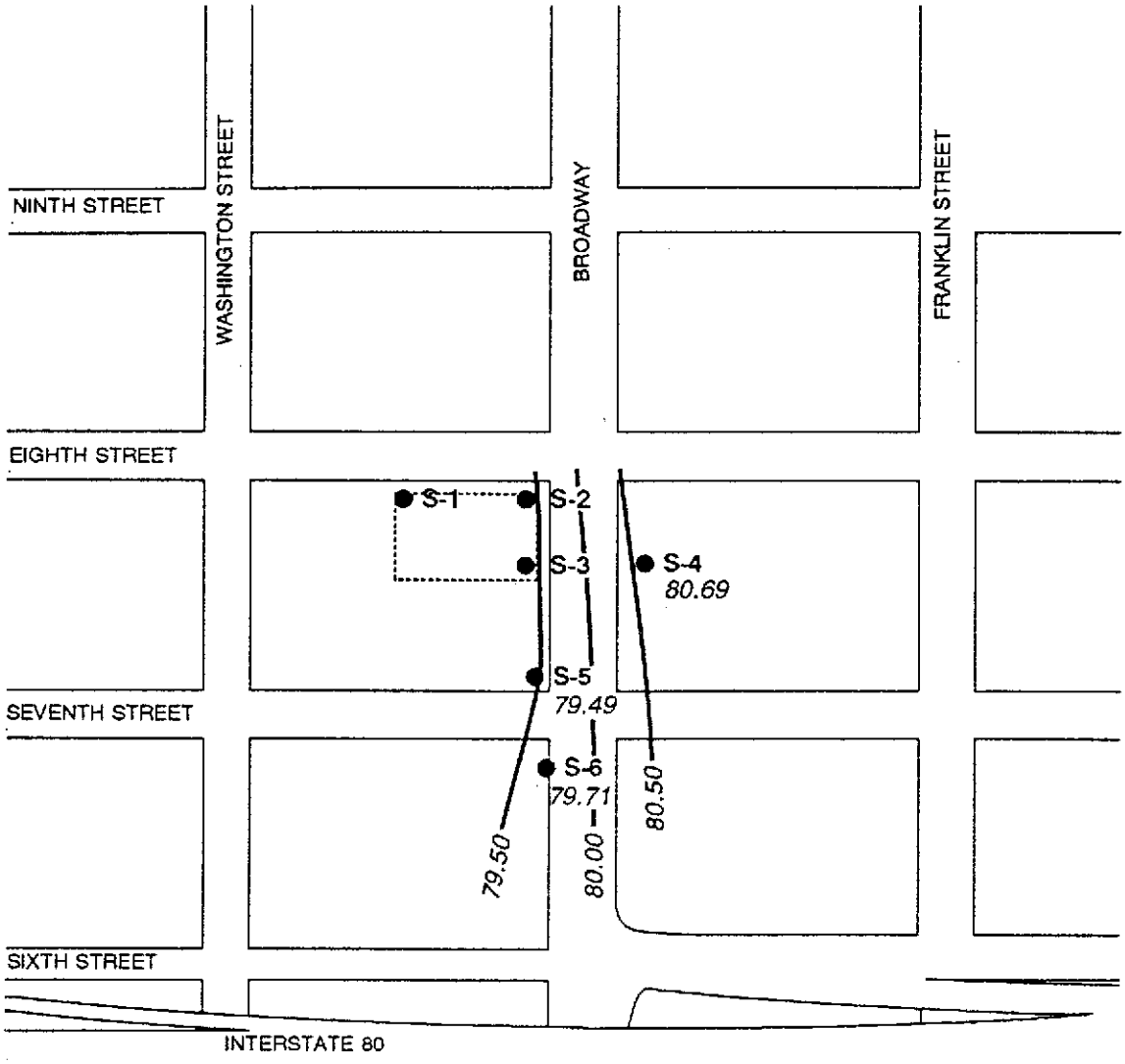


GeoStrategies Inc.

Site Plan
Shell Service Station
461 Eighth Street
Oakland, California

PLATE
1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7644		4/89		



EXPLANATION

- ● S-1 — Groundwater monitoring well location
- —— *80.50* — Groundwater elevation contour interval = 0.50 feet; Approx. Gradient = 0.006
- *79.49* — Groundwater elevation measured on 2/14/89 in feet referenced to project datum

N

0 200 400

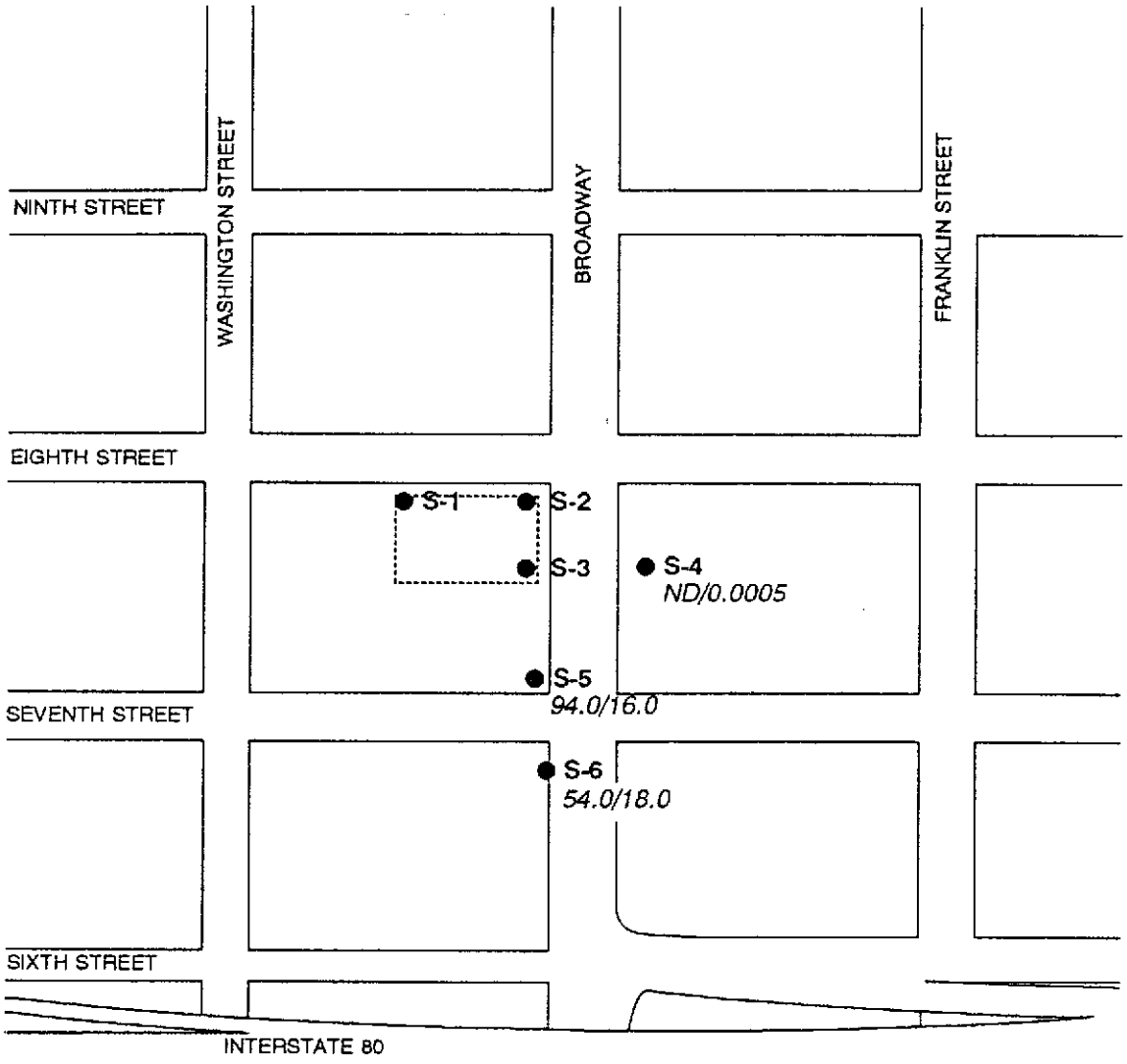
Scale in Feet

GeoStrategies Inc.

Potentiometric Map
Shell Service Station
461 Eighth Street
Oakland, California

PLATE **2**

JOB NUMBER	REVIEWED BY BG/CEG	DATE	REVISED DATE	REVISED DATE
7644		4/89		



EXPLANATION

● S-1	Groundwater monitoring well location
94.0/16.0	TPH (Total Petroleum Hydrocarbon)/Benzene concentrations measured on 2/14/89 in ppm (parts per million)
ND	Not Detected (see laboratory reports for detection limits)

N

0 200 400

Scale in Feet

GeoStrategies Inc.

TPH/Benzene Isoconcentration Map
Shell Service Station
461 Eighth Street
Oakland, California

PLATE **3**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7644		4/89		

APPENDIX A

HISTORICAL DATABASE

A-1: Chemical Analytical Data

A-2: Well Monitoring Data

ITAS/San Jose to Gettler-Ryan
ATTN: John Werfal

March 4, 1989

Project: GR #3644, Shell, 7th and Broadway, Oakland

ND = None Detected

Summary of Results
Milligrams per Liter

Lab Number	Sample Identification	Low Boiling Hydrocarbons (calculated as gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes
S9-02-193-01	S-4	ND	0.0005	ND	ND	0.003
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-02-193-02	S-5	94.	16.	21.	1.8	10.
Detection Limit		20.	0.2	0.3	0.3	1.
S9-02-193-03	S-6	54.	18.	4.5	1.4	4.
Detection Limit		20.	0.2	0.3	0.3	1.
S9-02-193-04	SF-5	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003

ANALYTICAL LOG

DATE	SAMPLE POINT	TVHC (PPM)	BENZENE (PPM)	TOLUENE (PPM)	XYLENES (PPM)
DETECTION LIMITS ---		0.05	0.0005	0.001	0.004
16-Apr-87	2	47.00	8.2000	4.700	3.100
16-Apr-87	5	130.00	15.0000	16.000	14.000
16-Apr-87	6	81.00	16.0000	9.000	6.400

DATE	SAMPLE POINT	TVHC (PPM)	BENZENE (PPM)	TOLUENE (PPM)	E.B. (PPM)	XYLENES (PPM)
DETECTION LIMITS ---		0.05	0.0005	0.001	0.001	0.003
26-Oct-88	S-4	0.13	0.0038	0.013	0.004	0.030
26-Oct-88	S-5	110.00	20.0000	25.000	2.300	10.000
26-Oct-88	S-6	110.00	29.0000	18.000	2.500	8.200

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
02-Dec-87	RW		18.04	0.00	18.04	0.0	18.04	-18.04			
04-Dec-87	RW		18.02	0.00	18.02	0.0	18.02	-18.02			
07-Dec-87	RW		18.27	0.00	18.27	0.0	18.27	-18.27			
09-Dec-87	RW		18.14	0.00	18.14	0.0	18.14	-18.14			
11-Dec-87	RW		18.13	0.00	18.13	0.0	18.13	-18.13			
14-Dec-87	RW		18.21	0.00	18.21	0.0	18.21	-18.21			
16-Dec-87	RW		18.25	0.00	18.25	0.0	18.25	-18.25			
18-Dec-87	RW		18.07	0.00	18.07	0.0	18.07	-18.07			
21-Dec-87	RW		18.20	0.00	18.20	0.0	18.20	-18.20			
23-Dec-87	RW		18.04	0.00	18.04	0.0	18.04	-18.04			
28-Dec-87	RW		18.02	0.00	18.02	0.0	18.02	-18.02			
08-Jan-88	RW		18.04	0.00	18.04	0.0	18.04	-18.04			
15-Jan-88	RW		17.91	0.00	17.91	0.0	17.91	-17.91			
22-Jan-88	RW		17.98	0.00	17.98	0.0	17.98	-17.98			
29-Jan-88	RW		17.70	0.00	17.70	0.0	17.70	-17.70			
05-Feb-88	RW		17.85	0.00	17.85	0.0	17.85	-17.85			
12-Feb-88	RW		17.65	0.00	17.65	0.0	17.65	-17.65			
19-Feb-88	RW		17.68	0.00	17.68	0.0	17.68	-17.68			
26-Feb-88	RW		17.42	0.00	17.42	0.0	17.42	-17.42			
04-Mar-88	RW		17.70	0.00	17.70	0.0	17.70	-17.70			
11-Mar-88	RW		17.75	0.00	17.75	0.0	17.75	-17.75			
18-Mar-88	RW		17.81	0.00	17.81	0.0	17.81	-17.81			
25-Mar-88	RW		17.73	0.00	17.73	0.0	17.73	-17.73			
01-Apr-88	RW		17.74	0.00	17.74	0.0	17.74	-17.74			
08-Apr-88	RW		17.68	0.00	17.68	0.0	17.68	-17.68			
15-Apr-88	RW		17.70	0.00	17.70	0.0	17.70	-17.70			
22-Apr-88	RW		18.82	0.00	18.82	0.0	18.82	-18.82			
29-Apr-88	RW		17.96	0.00	17.96	0.0	17.96	-17.96			
06-May-88	RW		17.94	0.00	17.94	0.0	17.94	-17.94			
10-May-88	RW		17.99	0.00	17.99	0.0	17.99	-17.99			
17-May-88	RW		18.04	0.00	18.04	0.0	18.04	-18.04			
24-May-88	RW		17.86	0.00	17.86	0.0	17.86	-17.86			
31-May-88	RW		18.00	0.00	18.00	0.0	18.00	-18.00			
26-Jun-86	RW		16.00	0.00	16.00	0.0	16.00	-16.00			
24-Jul-86	RW		N/A		ERR	0.0	ERR	ERR			
07-Aug-86	RW		16.15	0.00	16.15	0.0	16.15	-16.15			
11-Sep-86	RW		16.37	0.00	16.37	0.0	16.37	-16.37			
16-Oct-86	RW		16.57	0.00	16.57	0.0	16.57	-16.57			
11-Nov-86	RW		N/A		ERR	0.0	ERR	ERR			
13-Jan-87	RW		17.60	0.00	17.60	0.0	17.60	-17.60			
10-Feb-87	RW		17.40	0.00	17.40	0.0	17.40	-17.40			
10-Mar-87	RW		17.27	0.00	17.27	0.0	17.27	-17.27			
14-Apr-87	RW		17.45	0.00	17.45	0.0	17.45	-17.45			
12-May-87	RW		17.50	0.00	17.50	0.0	17.50	-17.50			
09-Jun-87	RW		17.34	0.00	17.34	0.0	17.34	-17.34			
14-Jul-87	RW		17.51	0.00	17.51	0.0	17.51	-17.51			
04-Aug-87	RW		17.88	0.00	17.88	0.0	17.88	-17.88			
01-Sep-87	RW		18.13	0.00	18.13	0.0	18.13	-18.13			
01-Sep-87	RW		18.13	0.00	18.13	0.0	18.13	-18.13			
06-Oct-87	RW		17.90	0.00	17.90	0.0	17.90	-17.90			
06-Oct-87	RW		17.90	0.00	17.90	0.0	17.90	-17.90			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
31-Oct-87	RW		17.92	0.00	17.92	0.0	17.92	-17.92			
31-Oct-87	RW		17.92	0.00	17.92	0.0	17.92	-17.92			
03-Nov-87	RW		18.07	0.00	18.07	0.0	18.07	-18.07			
03-Nov-87	RW		18.07	0.00	18.07	0.0	18.07	-18.07			
10-Nov-87	RW		18.15	0.00	18.15	0.0	18.15	-18.15			
12-Nov-87	RW		18.05	0.00	18.05	0.0	18.05	-18.05			
16-Nov-87	RW		18.12	0.00	18.12	0.0	18.12	-18.12			
18-Nov-87	RW		18.12	0.00	18.12	0.0	18.12	-18.12			
20-Nov-87	RW		18.10	0.00	18.10	0.0	18.10	-18.10			
23-Nov-87	RW		18.08	0.00	18.08	0.0	18.08	-18.08			
25-Nov-87	RW		18.23	0.00	18.23	0.0	18.23	-18.23			
30-Nov-87	RW		18.10	0.00	18.10	0.0	18.10	-18.10			
07-Jun-88	RW		18.12	0.00	18.12	0.0	18.12	-18.12			
14-Jun-88	RW		17.95	0.00	17.95	0.0	17.95	-17.95			
21-Jun-88	RW		17.97	0.00	17.97	0.0	17.97	-17.97			
28-Jun-88	RW		17.92	0.00	17.92	0.0	17.92	-17.92			
05-Jul-88	RW		18.22	0.00	18.22	0.0	18.22	-18.22			
12-Jul-88	RW		18.15	0.00	18.15	0.0	18.15	-18.15			
19-Jul-88	RW		18.05	0.00	18.05	0.0	18.05	-18.05			
26-Jul-88	RW		18.17	0.00	18.17	0.0	18.17	-18.17			
02-Aug-88	RW		18.10	0.00	18.10	0.0	18.10	-18.10			
09-Aug-88	RW		18.09	0.00	18.09	0.0	18.09	-18.09			
19-Aug-88	RW		18.10	0.00	18.10	0.0	18.10	-18.10			
26-Aug-88	RW		18.12	0.00	18.12	0.0	18.12	-18.12			
31-Aug-88	RW		18.11	0.00	18.11	0.0	18.11	-18.11			
09-Sep-88	RW		18.30	0.00	18.30	0.0	18.30	-18.30			
16-Sep-88	RW		18.30	0.00	18.30	0.0	18.30	-18.30			
23-Sep-88	RW		18.35	0.00	18.35	0.0	18.35	-18.35			
30-Sep-88	RW		18.25	0.00	18.25	0.0	18.25	-18.25			
07-Oct-88	RW		18.48	0.00	18.48	0.0	18.48	-18.48			
14-Oct-88	RW		18.44	0.00	18.44	0.0	18.44	-18.44			
21-Oct-88	RW		18.45	0.00	18.45	0.0	18.45	-18.45			
27-Oct-88	RW		18.38	0.00	18.38	0.0	18.38	-18.38			
04-Nov-88	RW		18.50	0.00	18.50	0.0	18.50	-18.50			
11-Nov-88	RW		18.56	0.00	18.56	0.0	18.56	-18.56			
18-Nov-88	RW		18.77	0.00	18.77	0.0	18.77	-18.77			
22-Nov-88	RW		18.52	0.00	18.52	0.0	18.52	-18.52			
02-Dec-88	RW		18.60	0.00	18.60	0.0	18.60	-18.60			
09-Dec-88	RW		18.64	0.00	18.64	0.0	18.64	-18.64			
16-Dec-88	RW		18.71	0.00	18.71	0.0	18.71	-18.71			
22-Dec-88	RW		18.68	0.00	18.68	0.0	18.68	-18.68			
30-Dec-88	RW		18.75	0.00	18.75	0.0	18.75	-18.75			
06-Jan-89	RW		18.85	0.00	18.85	0.0	18.85	-18.85			
13-Jan-89	RW		18.78	0.00	18.78	0.0	18.78	-18.78			
20-Jan-89	RW		18.58	0.00	18.58	0.0	18.58	-18.58			
27-Jan-89	RW		18.79	0.00	18.79	0.0	18.79	-18.79			
03-Feb-89	RW		18.70	0.00	18.70	0.0	18.70	-18.70			
10-Feb-89	RW		19.01	0.00	19.01	0.0	19.01	-19.01			
17-Feb-89	RW		18.80	0.00	18.80	0.0	18.80	-18.80			
24-Feb-89	RW		18.78	0.00	18.78	0.0	18.78	-18.78			
03-Mar-89	RW		18.80	0.00	18.80	0.0	18.80	-18.80			
11-Nov-86	2		N/A		ERR	0.0	ERR	ERR			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
16-Dec-86	2		D/W		ERR	0.0	ERR	ERR			
13-Jan-87	2		D/W		ERR	0.0	ERR	ERR			
12-May-87	2		21.31	0.00	21.31	0.0	21.31	-21.31			
09-Jun-87	2		21.42	0.00	21.42	0.0	21.42	-21.42			
14-Jul-87	2		21.55	0.00	21.55	0.0	21.55	-21.55			
04-Aug-87	2		N/A		ERR	0.0	ERR	ERR			
01-Sep-87	2		N/A	PAVED OV	ERR	0.0	ERR	ERR			
01-Sep-87	2		N/A	PAVED OV	ERR	0.0	ERR	ERR			
11-Nov-86	3		D/W		ERR	0.0	ERR	ERR			
16-Dec-86	3		20.89	0.00	20.89	0.0	20.89	-20.89			
13-Jan-87	3		21.30	0.00	21.30	0.0	21.30	-21.30			
12-May-87	3		D/W		ERR	0.0	ERR	ERR			
09-Jun-87	3		D/W		ERR	0.0	ERR	ERR			
14-Jul-87	3		D/W		ERR	0.0	ERR	ERR			
04-Aug-87	3		N/A		ERR	0.0	ERR	ERR			
01-Sep-87	3		N/A	PAVED OV	ERR	0.0	ERR	ERR			
01-Sep-87	3		N/A	PAVED OV	ERR	0.0	ERR	ERR			
26-Jun-86	4		N/A		ERR	0.0	ERR	ERR			
24-Jul-86	4		N/A		ERR	0.0	ERR	ERR			
07-Aug-86	4		21.25	0.00	21.25	0.0	21.25	-21.25			
11-Sep-86	4		D/W		ERR	0.0	ERR	ERR			
16-Oct-86	4		D/W		ERR	0.0	ERR	ERR			
11-Nov-86	4		D/W		ERR	0.0	ERR	ERR			
16-Dec-86	4		16.70	0.00	16.70	0.0	16.70	-16.70			
13-Jan-87	4		17.62	0.00	17.62	0.0	17.62	-17.62			
10-Feb-87	4		N/A	FILLED WITH	ERR	0.0	ERR	ERR			
10-Mar-87	4		0.53	0.00	0.53	0.0	0.53	-0.53			
14-Apr-87	4		0.87	0.00	0.87	0.0	0.87	-0.87			
12-May-87	4		1.36	0.00	1.36	0.0	1.36	-1.36			
09-Jun-87	4		1.98	0.00	1.98	0.0	1.98	-1.98			
14-Jul-87	4		2.74	0.00	2.74	0.0	2.74	-2.74			
04-Aug-87	4		3.29	0.00	3.29	0.0	3.29	-3.29			
01-Sep-87	4		4.01	0.00	4.01	0.0	4.01	-4.01			
01-Sep-87	4		4.01	0.00	4.01	0.0	4.01	-4.01			
06-Oct-87	4		4.25	0.00	4.25	0.0	4.25	-4.25			
06-Oct-87	4		4.25	0.00	4.25	0.0	4.25	-4.25			
31-Oct-87	4		0.40	0.00	0.40	0.0	0.40	-0.40			
31-Oct-87	4		0.40	0.00	0.40	0.0	0.40	-0.40			
03-Nov-87	4		0.60	0.00	0.60	0.0	0.60	-0.60			
03-Nov-87	4		0.60	0.00	0.60	0.0	0.60	-0.60			
10-Nov-87	4		0.65	0.00	0.65	0.0	0.65	-0.65			
12-Nov-87	4		0.70	0.00	0.70	0.0	0.70	-0.70			
16-Nov-87	4		0.48	0.00	0.48	0.0	0.48	-0.48			
18-Nov-87	4		0.40	0.00	0.40	0.0	0.40	-0.40			
20-Nov-87	4		0.31	0.00	0.31	0.0	0.31	-0.31			
23-Nov-87	4		0.45	0.00	0.45	0.0	0.45	-0.45			
25-Nov-87	4		0.50	0.00	0.50	0.0	0.50	-0.50			
30-Nov-87	4		0.81	0.00	0.81	0.0	0.81	-0.81			
02-Dec-87	4		0.30	0.00	0.30	0.0	0.30	-0.30			
04-Dec-87	4		0.25	0.00	0.25	0.0	0.25	-0.25			
07-Dec-87	4		N/A	FLOODED	ERR	0.0	ERR	ERR			
09-Dec-87	4		N/A	FLOODED	ERR	0.0	ERR	ERR			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
11-Dec-87	4		0.10	0.00	0.10	0.0	0.10	-0.10			
14-Dec-87	4		0.33	0.00	0.33	0.0	0.33	-0.33			
16-Dec-87	4		0.22	0.00	0.22	0.0	0.22	-0.22			
18-Dec-87	4		0.28	0.00	0.28	0.0	0.28	-0.28			
21-Dec-87	4		0.30	0.00	0.30	0.0	0.30	-0.30			
23-Dec-87	4		0.39	0.00	0.39	0.0	0.39	-0.39			
28-Dec-87	4		0.12	0.00	0.12	0.0	0.12	-0.12			
08-Jan-88	4		0.35	0.00	0.35	0.0	0.35	-0.35			
15-Jan-88	4		N/A	FLOODED	ERR	0.0	ERR	ERR			
22-Jan-88	4		0.45	0.00	0.45	0.0	0.45	-0.45			
29-Jan-88	4		N/A	FLOODED	ERR	0.0	ERR	ERR			
05-Feb-88	4		0.42	0.00	0.42	0.0	0.42	-0.42			
12-Feb-88	4		0.57	0.00	0.57	0.0	0.57	-0.57			
19-Feb-88	4		0.56	0.00	0.56	0.0	0.56	-0.56			
26-Feb-88	4		0.90	0.00	0.90	0.0	0.90	-0.90			
04-Mar-88	4		0.45	0.00	0.45	0.0	0.45	-0.45			
11-Mar-88	4		0.52	0.00	0.52	0.0	0.52	-0.52			
18-Mar-88	4		0.92	0.00	0.92	0.0	0.92	-0.92			
25-Mar-88	4		0.76	0.00	0.76	0.0	0.76	-0.76			
01-Apr-88	4		0.80	0.00	0.80	0.0	0.80	-0.80			
08-Apr-88	4		1.00	0.00	1.00	0.0	1.00	-1.00			
15-Apr-88	4		0.37	0.00	0.37	0.0	0.37	-0.37			
22-Apr-88	4		N/A		ERR	0.0	ERR	ERR			
29-Apr-88	4		0.45	0.00	0.45	0.0	0.45	-0.45			
06-May-88	4		0.52	0.00	0.52	0.0	0.52	-0.52			
10-May-88	4		0.38	0.00	0.38	0.0	0.38	-0.38			
17-May-88	4		0.50	0.00	0.50	0.0	0.50	-0.50			
24-May-88	4		0.59	0.00	0.59	0.0	0.59	-0.59			
31-May-88	4		0.73	0.00	0.73	0.0	0.73	-0.73			
07-Jun-88	4		0.25	0.00	0.25	0.0	0.25	-0.25			
14-Jun-88	4		0.50	0.00	0.50	0.0	0.50	-0.50			
21-Jun-88	4		0.69	0.00	0.69	0.0	0.69	-0.69			
28-Jun-88	4		0.86	0.00	0.86	0.0	0.86	-0.86			
05-Jul-88	4		0.88	0.00	0.88	0.0	0.88	-0.88			
12-Jul-88	4		1.00	0.00	1.00	0.0	1.00	-1.00			
19-Jul-88	4		1.12	0.00	1.12	0.0	1.12	-1.12			
26-Jul-88	4		1.26	0.00	1.26	0.0	1.26	-1.26			
02-Aug-88	4		1.51	0.00	1.51	0.0	1.51	-1.51			
09-Aug-88	4		1.60	0.00	1.60	0.0	1.60	-1.60			
19-Aug-88	4		1.75	0.00	1.75	0.0	1.75	-1.75			
26-Aug-88	4		1.98	0.00	1.98	0.0	1.98	-1.98			
31-Aug-88	4		2.13	0.00	2.13	0.0	2.13	-2.13			
09-Sep-88	4		2.31	0.00	2.31	0.0	2.31	-2.31			
16-Sep-88	4		2.49	0.00	2.49	0.0	2.49	-2.49			
23-Sep-88	4		2.62	0.00	2.62	0.0	2.62	-2.62			
30-Sep-88	4		2.74	0.00	2.74	0.0	2.74	-2.74			
07-Oct-88	4		3.00	0.00	3.00	0.0	3.00	-3.00			
14-Oct-88	4		3.15	0.00	3.15	0.0	3.15	-3.15			
21-Oct-88	4		3.18	0.00	3.18	0.0	3.18	-3.18			
27-Oct-88	4		14.95	0.00	14.95	0.0	14.95	-14.95			
04-Nov-88	4		14.74	0.00	14.74	0.0	14.74	-14.74			
11-Nov-88	4		14.61	0.00	14.61	0.0	14.61	-14.61			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
18-Nov-88	4		14.25	0.00	14.25	0.0	14.25	-14.25			
22-Nov-88	4		N/A		ERR	0.0	ERR	ERR			
02-Dec-88	4		14.29	0.00	14.29	0.0	14.29	-14.29			
09-Dec-88	4		14.45	0.00	14.45	0.0	14.45	-14.45			
16-Dec-88	4		14.53	0.00	14.53	0.0	14.53	-14.53			
22-Dec-88	4		N/A	FLOODED	ERR	0.0	ERR	ERR			
30-Dec-88	4		13.71	0.00	13.71	0.0	13.71	-13.71			
06-Jan-89	4		13.30	0.00	13.30	0.0	13.30	-13.30			
13-Jan-89	4		13.02	0.00	13.02	0.0	13.02	-13.02			
20-Jan-89	4		13.21	0.00	13.21	0.0	13.21	-13.21			
27-Jan-89	4		13.60	0.00	13.60	0.0	13.60	-13.60			
03-Feb-89	4		12.91	0.00	12.91	0.0	12.91	-12.91			
10-Feb-89	4		12.75	0.00	12.75	0.0	12.75	-12.75			
17-Feb-89	4		15.95	0.00	15.95	0.0	15.95	-15.95			
24-Feb-89	4		15.93	0.00	15.93	0.0	15.93	-15.93			
03-Mar-89	4		16.03	0.00	16.03	0.0	16.03	-16.03			
26-Jun-86	5		16.53	0.00	16.53	0.0	16.53	-16.53			
24-Jul-86	5		17.00	0.00	17.00	0.0	17.00	-17.00			
07-Aug-86	5		16.80	0.00	16.80	0.0	16.80	-16.80			
11-Sep-86	5		16.65	0.00	16.65	0.0	16.65	-16.65			
16-Oct-86	5		17.21	0.00	17.21	0.0	17.21	-17.21			
11-Nov-86	5		17.60	0.00	17.60	0.0	17.60	-17.60			
16-Dec-86	5		18.08	0.00	18.08	0.0	18.08	-18.08			
13-Jan-87	5		18.41	0.00	18.41	0.0	18.41	-18.41			
10-Feb-87	5	18.12	(1.00)	.00	18.12	.0	18.12	-18.12			
10-Mar-87	5		17.95	0.00	17.95	0.0	17.95	-17.95			
14-Apr-87	5		18.15	0.00	18.15	0.0	18.15	-18.15			
12-May-87	5	18.14	(1.00)	0.58	18.19	0.6	18.14	-18.15			
09-Jun-87	5	18.18	(1.00)	0.60	18.23	0.6	18.18	-18.19			
14-Jul-87	5	18.44	(1.00)	0.75	18.50	0.8	18.44	-18.46			
04-Aug-87	5	18.49	(1.00)	0.36	18.52	0.4	18.49	-18.50			
01-Sep-87	5	18.60	(1.00)	0.61	18.65	0.6	18.60	-18.61			
01-Sep-87	5	18.60	(1.00)	0.61	18.65	0.6	18.60	-18.61			
06-Oct-87	5	18.58	(1.00)	0.67	18.64	0.7	18.58	-18.59			
06-Oct-87	5	18.58	(1.00)	0.67	18.64	0.7	18.58	-18.59			
31-Oct-87	5	18.59	(1.00)	0.34	18.62	0.3	18.59	-18.60			
31-Oct-87	5	18.59	(1.00)	0.34	18.62	0.3	18.59	-18.60			
03-Nov-87	5	18.88	(1.00)	.00	18.88	.0	18.88	-18.88			
03-Nov-87	5	18.88	(1.00)	.00	18.88	.0	18.88	-18.88			
10-Nov-87	5	19.00	(1.00)	.00	19.00	.0	19.00	-19.00			
12-Nov-87	5	18.85	(1.00)	.00	18.85	.0	18.85	-18.85			
16-Nov-87	5	19.01	(1.00)	.00	19.01	.0	19.01	-19.01			
18-Nov-87	5		19.03	0.00	19.03	0.0	19.03	-19.03			
20-Nov-87	5	18.93	(1.00)	.00	18.93	.0	18.93	-18.93			
23-Nov-87	5	18.9	(1.00)	.00	18.90	.0	18.90	-18.90			
25-Nov-87	5	18.95	(1.00)	.00	18.95	.0	18.95	-18.95			
30-Nov-87	5	18.92	(1.00)	.00	18.92	.0	18.92	-18.92			
02-Dec-87	5	18.82	(1.00)	.00	18.82	.0	18.82	-18.82			
04-Dec-87	5	18.79	(1.00)	.00	18.79	.0	18.79	-18.79			
07-Dec-87	5	19.04	(1.00)	.00	19.04	.0	19.04	-19.04			
09-Dec-87	5	18.95	(1.00)	.00	18.95	.0	18.95	-18.95			
11-Dec-87	5	18.97	(1.00)	.00	18.97	.0	18.97	-18.97			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
14-Dec-87	5	18.92	(1.00)	.00	18.92	.0	18.92	-18.92			
16-Dec-87	5	18.95	(1.00)	.00	18.95	.0	18.95	-18.95			
18-Dec-87	5	18.87	(1.00)	.00	18.87	.0	18.87	-18.87			
21-Dec-87	5	18.79	(1.00)	.00	18.79	.0	18.79	-18.79			
23-Dec-87	5	18.98	(1.00)	.00	18.98	.0	18.98	-18.98			
28-Dec-87	5	18.68	(1.00)	.00	18.68	.0	18.68	-18.68			
08-Jan-88	5	18.84	(1.00)	.00	18.84	.0	18.84	-18.84			
15-Jan-88	5	18.55	(1.00)	.00	18.55	.0	18.55	-18.55			
22-Jan-88	5	18.8	(1.00)	.00	18.80	.0	18.80	-18.80			
29-Jan-88	5	18.50	(1.00)	.00	18.50	.0	18.50	-18.50			
05-Feb-88	5	18.61	(1.00)	.00	18.61	.0	18.61	-18.61			
12-Feb-88	5		18.41	0.00	18.41	0.0	18.41	-18.41			
19-Feb-88	5	18.50	(1.00)	.00	18.50	.0	18.50	-18.50			
26-Feb-88	5		18.21	0.00	18.21	0.0	18.21	-18.21			
04-Mar-88	5		18.45	0.00	18.45	0.0	18.45	-18.45			
11-Mar-88	5		18.67	0.00	18.67	0.0	18.67	-18.67			
18-Mar-88	5		18.48	0.00	18.48	0.0	18.48	-18.48			
25-Mar-88	5		18.52	0.00	18.52	0.0	18.52	-18.52			
01-Apr-88	5		18.56	0.00	18.56	0.0	18.56	-18.56			
08-Apr-88	5		18.43	0.00	18.43	0.0	18.43	-18.43			
15-Apr-88	5		18.50	0.00	18.50	0.0	18.50	-18.50			
22-Apr-88	5		18.57	0.00	18.57	0.0	18.57	-18.57			
29-Apr-88	5		18.89	0.00	18.89	0.0	18.89	-18.89			
06-May-88	5	18.81	(1.00)	.00	18.81	.0	18.81	-18.81			
10-May-88	5		18.75	0.00	18.75	0.0	18.75	-18.75			
17-May-88	5		18.94	0.00	18.94	0.0	18.94	-18.94			
24-May-88	5		18.77	0.00	18.77	0.0	18.77	-18.77			
31-May-88	5		18.92	0.00	18.92	0.0	18.92	-18.92			
07-Jun-88	5		19.01	0.00	19.01	0.0	19.01	-19.01			
14-Jun-88	5	18.90	(1.00)	.00	18.90	.0	18.90	-18.90			
21-Jun-88	5		18.94	0.00	18.94	0.0	18.94	-18.94			
28-Jun-88	5		18.95	0.00	18.95	0.0	18.95	-18.95			
05-Jul-88	5		19.24	0.00	19.24	0.0	19.24	-19.24			
12-Jul-88	5		19.10	0.00	19.10	0.0	19.10	-19.10			
19-Jul-88	5		19.02	0.00	19.02	0.0	19.02	-19.02			
26-Jul-88	5		19.07	0.00	19.07	0.0	19.07	-19.07			
02-Aug-88	5		N/A		ERR	0.0	ERR	ERR			
09-Aug-88	5		19.09	0.00	19.09	0.0	19.09	-19.09			
19-Aug-88	5		19.05	0.00	19.05	0.0	19.05	-19.05			
26-Aug-88	5		19.08	0.00	19.08	0.0	19.08	-19.08			
31-Aug-88	5		19.10	0.00	19.10	0.0	19.10	-19.10			
09-Sep-88	5		19.26	0.00	19.26	0.0	19.26	-19.26			
16-Sep-88	5		19.25	0.00	19.25	0.0	19.25	-19.25			
23-Sep-88	5		19.30	0.00	19.30	0.0	19.30	-19.30			
30-Sep-88	5		19.20	0.00	19.20	0.0	19.20	-19.20			
07-Oct-88	5		19.41	0.00	19.41	0.0	19.41	-19.41			
14-Oct-88	5		19.40	0.00	19.40	0.0	19.40	-19.40			
21-Oct-88	5		19.42	0.00	19.42	0.0	19.42	-19.42			
27-Oct-88	5	19.42	(1.00)	0.01	19.42	.0	19.42	-19.42			
04-Nov-88	5	19.64	(1.00)	.00	19.64	.0	19.64	-19.64			
11-Nov-88	5	19.59	(1.00)	.00	19.59	.0	19.59	-19.59			
18-Nov-88	5	19.64	(1.00)	.00	19.64	.0	19.64	-19.64			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
22-Nov-88	5	19.48	(1.00)	.00	19.48	.0	19.48	-19.48			
02-Dec-88	5	19.58	(1.00)	.00	19.58	.0	19.58	-19.58			
09-Dec-88	5	19.66	(1.00)	.00	19.66	.0	19.66	-19.66			
16-Dec-88	5		19.80	0.00	19.80	0.0	19.80	-19.80			
22-Dec-88	5		N/A	FLOODED	ERR	0.0	ERR	ERR			
30-Dec-88	5	19.88	(1.00)	.00	19.88	.0	19.88	-19.88			
06-Jan-89	5		19.92	0.00	19.92	0.0	19.92	-19.92			
13-Jan-89	5	19.86	(1.00)	.00	19.86	.0	19.86	-19.86			
20-Jan-89	5	19.73	(1.00)	.00	19.73	.0	19.73	-19.73			
27-Jan-89	5	19.90	(1.00)	.00	19.90	.0	19.90	-19.90			
03-Feb-89	5		19.85	0.00	19.85	0.0	19.85	-19.85			
10-Feb-89	5	20.18	(1.00)	.00	20.18	.0	20.18	-20.18			
17-Feb-89	5	19.95	(1.00)	.00	19.95	.0	19.95	-19.95			
24-Feb-89	5	19.88	(1.00)	0.01	19.88	.0	19.88	-19.88			
03-Mar-89	5	19.95	(1.00)	.00	19.95	.0	19.95	-19.95			
26-Jun-86	6		18.00	0.00	18.00	0.0	18.00	-18.00			
24-Jul-86	6		18.43	0.00	18.43	0.0	18.43	-18.43			
07-Aug-86	6		18.12	0.00	18.12	0.0	18.12	-18.12			
11-Sep-86	6		18.36	0.00	18.36	0.0	18.36	-18.36			
16-Oct-86	6		18.58	0.00	18.58	0.0	18.58	-18.58			
11-Nov-86	6		18.77	0.00	18.77	0.0	18.77	-18.77			
16-Dec-86	6		19.22	0.00	19.22	0.0	19.22	-19.22			
13-Jan-87	6		19.46	0.00	19.46	0.0	19.46	-19.46			
10-Feb-87	6		19.39	0.00	19.39	0.0	19.39	-19.39			
10-Mar-87	6		19.34	0.00	19.34	0.0	19.34	-19.34			
14-Apr-87	6		19.44	0.00	19.44	0.0	19.44	-19.44			
12-May-87	6		19.53	0.00	19.53	0.0	19.53	-19.53			
09-Jun-87	6		19.41	0.00	19.41	0.0	19.41	-19.41			
14-Jul-87	6		19.53	0.00	19.53	0.0	19.53	-19.53			
04-Aug-87	6		19.87	0.00	19.87	0.0	19.87	-19.87			
01-Sep-87	6		20.02	0.00	20.02	0.0	20.02	-20.02			
01-Sep-87	6		20.02	0.00	20.02	0.0	20.02	-20.02			
06-Oct-87	6		19.92	0.00	19.92	0.0	19.92	-19.92			
06-Oct-87	6		19.92	0.00	19.92	0.0	19.92	-19.92			
31-Oct-87	6		19.93	0.00	19.93	0.0	19.93	-19.93			
31-Oct-87	6		19.93	0.00	19.93	0.0	19.93	-19.93			
03-Nov-87	6		20.05	0.00	20.05	0.0	20.05	-20.05			
03-Nov-87	6		20.05	0.00	20.05	0.0	20.05	-20.05			
10-Nov-87	6		20.11	0.00	20.11	0.0	20.11	-20.11			
12-Nov-87	6		20.10	0.00	20.10	0.0	20.10	-20.10			
16-Nov-87	6		20.15	0.00	20.15	0.0	20.15	-20.15			
18-Nov-87	6		20.23	0.00	20.23	0.0	20.23	-20.23			
20-Nov-87	6		20.08	0.00	20.08	0.0	20.08	-20.08			
23-Nov-87	6		20.10	0.00	20.10	0.0	20.10	-20.10			
25-Nov-87	6		20.20	0.00	20.20	0.0	20.20	-20.20			
30-Nov-87	6		20.11	0.00	20.11	0.0	20.11	-20.11			
02-Dec-87	6		20.08	0.00	20.08	0.0	20.08	-20.08			
04-Dec-87	6		20.07	0.00	20.07	0.0	20.07	-20.07			
07-Dec-87	6		20.31	0.00	20.31	0.0	20.31	-20.31			
09-Dec-87	6		20.20	0.00	20.20	0.0	20.20	-20.20			
11-Dec-87	6		20.21	0.00	20.21	0.0	20.21	-20.21			
14-Dec-87	6		20.19	0.00	20.19	0.0	20.19	-20.19			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
16-Dec-87	6		20.11	0.00	20.11	0.0	20.11	-20.11			
18-Dec-87	6		20.10	0.00	20.10	0.0	20.10	-20.10			
21-Dec-87	6		20.12	0.00	20.12	0.0	20.12	-20.12			
23-Dec-87	6		20.11	0.00	20.11	0.0	20.11	-20.11			
28-Dec-87	6		19.81	0.00	19.81	0.0	19.81	-19.81			
08-Jan-88	6		20.12	0.00	20.12	0.0	20.12	-20.12			
15-Jan-88	6		19.89	0.00	19.89	0.0	19.89	-19.89			
22-Jan-88	6		20.00	0.00	20.00	0.0	20.00	-20.00			
29-Jan-88	6		19.71	0.00	19.71	0.0	19.71	-19.71			
05-Feb-88	6		19.85	0.00	19.85	0.0	19.85	-19.85			
12-Feb-88	6		19.68	0.00	19.68	0.0	19.68	-19.68			
19-Feb-88	6		19.72	0.00	19.72	0.0	19.72	-19.72			
26-Feb-88	6		19.50	0.00	19.50	0.0	19.50	-19.50			
04-Mar-88	6		19.77	0.00	19.77	0.0	19.77	-19.77			
11-Mar-88	6		19.78	0.00	19.78	0.0	19.78	-19.78			
18-Mar-88	6		19.82	0.00	19.82	0.0	19.82	-19.82			
25-Mar-88	6		19.74	0.00	19.74	0.0	19.74	-19.74			
01-Apr-88	6		19.80	0.00	19.80	0.0	19.80	-19.80			
08-Apr-88	6		19.70	0.00	19.70	0.0	19.70	-19.70			
15-Apr-88	6		19.72	0.00	19.72	0.0	19.72	-19.72			
22-Apr-88	6		19.54	0.00	19.54	0.0	19.54	-19.54			
29-Apr-88	6		19.97	0.00	19.97	0.0	19.97	-19.97			
06-May-88	6		19.93	0.00	19.93	0.0	19.93	-19.93			
10-May-88	6		20.01	0.00	20.01	0.0	20.01	-20.01			
17-May-88	6		19.91	0.00	19.91	0.0	19.91	-19.91			
24-May-88	6		19.90	0.00	19.90	0.0	19.90	-19.90			
31-May-88	6		20.01	0.00	20.01	0.0	20.01	-20.01			
07-Jun-88	6		19.98	0.00	19.98	0.0	19.98	-19.98			
14-Jun-88	6		20.00	0.00	20.00	0.0	20.00	-20.00			
21-Jun-88	6		20.01	0.00	20.01	0.0	20.01	-20.01			
28-Jun-88	6		19.97	0.00	19.97	0.0	19.97	-19.97			
05-Jul-88	6		20.18	0.00	20.18	0.0	20.18	-20.18			
12-Jul-88	6		20.20	0.00	20.20	0.0	20.20	-20.20			
19-Jul-88	6		20.10	0.00	20.10	0.0	20.10	-20.10			
26-Jul-88	6		20.17	0.00	20.17	0.0	20.17	-20.17			
02-Aug-88	6		20.12	0.00	20.12	0.0	20.12	-20.12			
09-Aug-88	6		20.17	0.00	20.17	0.0	20.17	-20.17			
19-Aug-88	6		20.14	0.00	20.14	0.0	20.14	-20.14			
26-Aug-88	6		20.19	0.00	20.19	0.0	20.19	-20.19			
31-Aug-88	6		20.21	0.00	20.21	0.0	20.21	-20.21			
09-Sep-88	6		20.40	0.00	20.40	0.0	20.40	-20.40			
16-Sep-88	6		20.34	0.00	20.34	0.0	20.34	-20.34			
23-Sep-88	6		20.41	0.00	20.41	0.0	20.41	-20.41			
30-Sep-88	6		20.32	0.00	20.32	0.0	20.32	-20.32			
07-Oct-88	6		20.48	0.00	20.48	0.0	20.48	-20.48			
14-Oct-88	6		20.47	0.00	20.47	0.0	20.47	-20.47			
21-Oct-88	6		20.46	0.00	20.46	0.0	20.46	-20.46			
27-Oct-88	6		20.52	0.00	20.52	0.0	20.52	-20.52			
04-Nov-88	6		20.60	0.00	20.60	0.0	20.60	-20.60			
11-Nov-88	6		20.60	0.00	20.60	0.0	20.60	-20.60			
18-Nov-88	6		20.70	0.00	20.70	0.0	20.70	-20.70			
22-Nov-88	6		20.58	0.00	20.58	0.0	20.58	-20.58			

DATE	WELL	DTH	DTW	HT	(DTW)	(HT)	DTL	WT-ELEV	WT-G	HC	C.ELEV
					0.00	0.0	0.00	0.00			
02-Dec-88	6		20.60	0.00	20.60	0.0	20.60	-20.60			
09-Dec-88	6		20.70	0.00	20.70	0.0	20.70	-20.70			
16-Dec-88	6		20.75	0.00	20.75	0.0	20.75	-20.75			
22-Dec-88	6		N/A	FLOODED	ERR	0.0	ERR	ERR			
30-Dec-88	6		20.79	0.00	20.79	0.0	20.79	-20.79			
06-Jan-89	6		20.89	0.00	20.89	0.0	20.89	-20.89			
13-Jan-89	6		20.82	0.00	20.82	0.0	20.82	-20.82			
20-Jan-89	6		20.70	0.00	20.70	0.0	20.70	-20.70			
27-Jan-89	6		20.84	0.00	20.84	0.0	20.84	-20.84			
03-Feb-89	6		20.79	0.00	20.79	0.0	20.79	-20.79			
10-Feb-89	6		21.03	0.00	21.03	0.0	21.03	-21.03			
17-Feb-89	6		20.99	0.00	20.99	0.0	20.99	-20.99			
24-Feb-89	6		19.85	0.00	19.85	0.0	19.85	-19.85			
03-Mar-89	6		20.83	0.00	20.83	0.0	20.83	-20.83			
26-Jun-86	7		N/A		ERR	0.0	ERR	ERR			
24-Jul-86	7		16.42	0.00	16.42	0.0	16.42	-16.42			
07-Aug-86	7		N/A		ERR	0.0	ERR	ERR			

APPENDIX B

CHEMICAL ANALYTICAL REPORTS

(January through March, 1989)

INTERNATIONAL TECHNOLOGY CORPORATION

March 4, 1989

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545

ATTN: John Werfal

Following are the results of analyses on the samples described below.

Project:	GR #3644, Shell, 7th and Broadway, Oakland
Lab Numbers:	S9-Ø2-193-Ø1 thru S9-Ø2-193-Ø4
Number of Samples:	4
Sample Type:	Water
Date Received:	2/15/89
Analyses Requested:	Low Boiling Hydrocarbons

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 8Ø15, 8Ø2Ø and 5Ø3Ø. 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.

ITAS/San Jose Lab Number	Client Sample Identification	Sample Date	Date Analysis Completed	Sample Condition on receipt
S9-Ø2-193-Ø1	S-4	2/14/89	2/23/89	cool pH ≤2
S9-Ø2-193-Ø2	S-5	2/14/89	2/23/89	cool pH ≤2
S9-Ø2-193-Ø3	S-6	2/14/89	2/23/89	cool pH ≤2
S9-Ø2-193-Ø4	SF-5	2/14/89	2/23/89	cool pH ≤2

Fred Rouse

FR/an

1 Page Following - Table of Results

ITAS/San Jose to Gettler-Ryan
ATTN: John Werfal

March 4, 1989

Project: GR #3644, Shell, 7th and Broadway, Oakland

ND = None Detected

Summary of Results
Milligrams per Liter

Lab Number	Sample Identification	Low Boiling Hydrocarbons (calculated as gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes
S9-02-193-01	S-4	ND	0.0005	ND	ND	0.003
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-02-193-02	S-5	94.	16.	21.	1.8	10.
Detection Limit		20.	0.2	0.3	0.3	1.
S9-02-193-03	S-6	54.	18.	4.5	1.4	4.
Detection Limit		20.	0.2	0.3	0.3	1.
S9-02-193-04	SF-5	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003

APPENDIX C

GETTLER-RYAN INC. GROUNDWATER SAMPLING REPORT

gettler — ryan inc.

March 10, 1989

GROUNDWATER SAMPLING REPORT

Shell Oil Company
Post Office Box 4023
Concord, California 94520

Referenced Site: Former Shell Service Station
7th and Broadway
Oakland, California

Sampling Date: February 14, 1989

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on February 14, 1989 at the referenced location. The site, located on the northwest corner of 8th Street and Broadway, is no longer an operating service station. The former station had underground storage tanks which contained petroleum products.

There are currently three groundwater monitoring wells on site and three wells off site at the locations shown on the attached site map. The three on site groundwater monitoring wells were not accessible on the February 14, 1989 sampling event. 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 12.82 to 20.87 feet below grade. A sheen was observed in Well S-5.

The wells were then 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. Field and trip blanks, supplied by the laboratory were included and analyzed to assess quality control. 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.

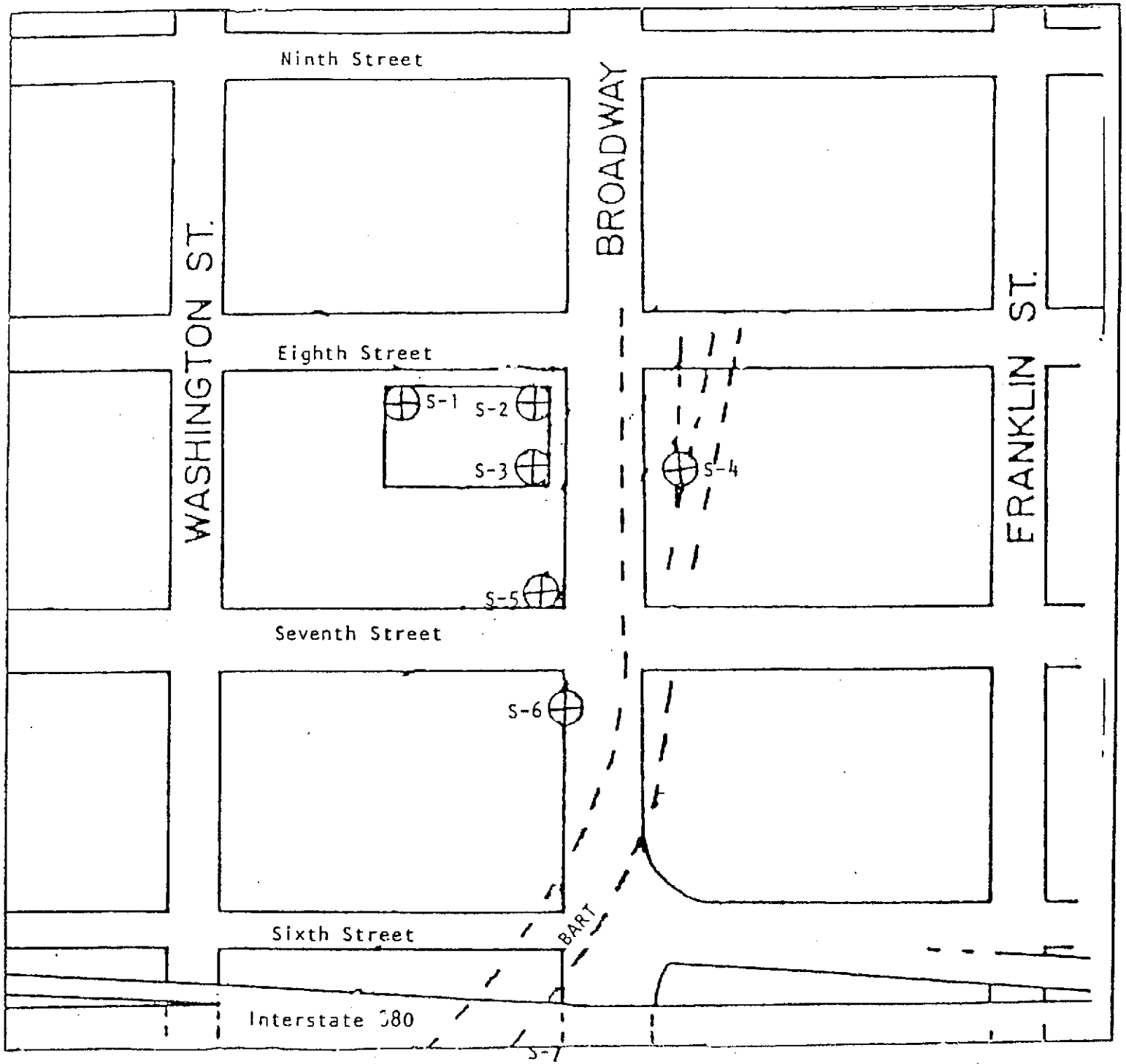
Tom Paulson
Sampling Manager

attachments

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	S-1	S-2	S-3	S-4	S-5	S-6
Casing Diameter (inches)	4	4	4	4	4	4
Total Well Depth (feet)				16.1	38.3	38.4
Depth to Water (feet)	----	----	----	12.82	19.87	20.87
Free Product (feet)	----	----	----	none	sheen	none
Reason Not Sampled	inaccessible	inaccessible	inaccessible	----	----	----
Ideal 5 Case Vol.(gallons)	----	----	----	10.8	60.8	57.8
Did Well Dewater?	----	----	----	yes	no	no
Volume Evacuated (gallons)	----	----	----	2.5	60.0	58.0
Purging Device	----	----	----	Bailer	Airlift	Airlift
Sampling Device	----	----	----	Bailer	Bailer	Bailer
Time	----	----	----	12:07	10:30	11:55
Temperature (F)*	----	----	----	63.3	67.7	67.7
pH*	----	----	----	6.75	6.66	6.66
Conductivity (umhos/cm)*	----	----	----	640	571	913

* Indicates Stabilized Value



LEGEND

SITE:

Shell Service Station

SITE LOC.:

7th and Broadway
Oakland, California
JOB # 644

FIGURE

INTERNATIONAL TECHNOLOGY CORPORATION

March 4, 1989

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545

ATTN: John Werfal

Following are the results of analyses on the samples described below.

Project:	GR #3644, Shell, 7th and Broadway, Oakland
Lab Numbers:	S9-Ø2-193-Ø1 thru S9-Ø2-193-Ø4
Number of Samples:	4
Sample Type:	Water
Date Received:	2/15/89
Analyses Requested:	Low Boiling Hydrocarbons

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 8Ø15, 8Ø2Ø and 5Ø3Ø. 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.

ITAS/San Jose Lab Number	Client Sample Identification	Sample Date	Date Analysis Completed	Sample Condition on receipt
S9-Ø2-193-Ø1	S-4	2/14/89	2/23/89	cool pH ≤2
S9-Ø2-193-Ø2	S-5	2/14/89	2/23/89	cool pH ≤2
S9-Ø2-193-Ø3	S-6	2/14/89	2/23/89	cool pH ≤2
S9-Ø2-193-Ø4	SF-5	2/14/89	2/23/89	cool pH ≤2

Fred Rouse

FR/an

1 Page Following - Table of Results

ITAS/San Jose to Gettler-Ryan
ATTN: John Werfal

March 4, 1989

Project: GR #3644, Shell, 7th and Broadway, Oakland

ND = None Detected

Summary of Results
Milligrams per Liter

Lab Number	Sample Identification	Low Boiling Hydrocarbons (calculated as gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes
S9-02-193-01	S-4	ND	0.0005	ND	ND	0.003
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-02-193-02	S-5	94.	16.	21.	1.8	10.
Detection Limit		20.	0.2	0.3	0.3	1.
S9-02-193-03	S-6	54.	18.	4.5	1.4	4.
Detection Limit		20.	0.2	0.3	0.3	1.
S9-02-193-04	SF-5	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003

Geller - Ryan Inc. ENVIRONMENTAL DIVISION — **Chain of Custody**

COMPANY Shell Oil Company JOB NO. 0128

JOB LOCATION 7th + Broadway Sts

CITY Oakland, CA PHONE NO. (415) 783-7500

AUTHORIZED John Werfal DATE 2/14/89 P.O. NO. 3644

	SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
01	S-4	3	Liquid	2-14/1207	TPH(Gas) BTXE	OK/Cool
02	S-5	↓	↓	/1030	↓	↓
03	S-6	↓	↓	/1155	↓	↓
04	SF-5	↓	↓	/1030	↓	↓
05	Trip blank	1	↓	2-6/—	↓	↓

RELINQUISHED BY: Phillip J. Dye 2/15/89 0900

RECEIVED BY: 2-15-89 9:00 am

RELINQUISHED BY: Guadalupe R Sandy 2/15/89 0900

RECEIVED BY:

RELINQUISHED BY: 2/15/89 11:35

RECEIVED BY LAB: Joanne DeHerrera 2-15-89 11:46

DESIGNATED LABORATORY: ET SCV DHS #: 137

REMARKS: Normal TAT Results Due 3-7-89

DATE COMPLETED 2/14/89 FOREMAN Sampler Phillip J Dye
Sampler Guadalupe R Sandy

ORIGINAL

APPENDIX D

GETTLER-RYAN INC. SAMPLING PROTOCOL

ATTACHMENT A
SAMPLING AND ANALYSIS PROCEDURES

INTRODUCTION

The sampling and analysis procedures for Gettler-Ryan Inc. groundwater quality monitoring projects are explained in the appendix, including procedures and techniques for groundwater sample collection, analytical procedures, and chain-of-custody control. These procedures ensure that (1) consistent and reproducible methods will be used to obtain samples from monitoring wells and that (2) proper analyses will be performed on the samples.

The procedures described in this appendix are based on:

Procedures Manual for Ground-Water Monitoring at Solid Waste Disposal Facilities (EPA-530/SW-611, August 1977)

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (EPA SW-846, 3rd. edition, November 1986)

Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA-600/4-82/057, July 1982)

RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (OSWER 9950.1, September 1986)

SAMPLE COLLECTION

Sample collection procedures include equipment cleaning, water level measurements, well purging, sampling and sample preservation and shipment.

Equipment Cleaning

Before starting the sampling event, all equipment that would be placed in the well or come in contact with ground water will be disassembled and cleaned thoroughly with detergent water, and then steamed with deionized water. Any parts that might absorb contaminants, such as plastic pump valves, will be cleaned as described above.

Sample bottles, bottle caps, and septa for use in sampling for volatile organics will be thoroughly cleaned laboratory prepared containers. Sample bottles, bottle caps and septa will be protected from all phases of hydrocarbon contact before the actual usage at the sample site. When plastic bottles and caps are used, they will be constructed of linear polyethylene.

When required, a positive displacement Teflon and stainless steel bladder pump will be cleaned as described above and reassembled. Organic free water will be then pumped through the system to obtain a pump blank. The pump effluent will be sampled and analyzed for the indicator compounds trichloroethylene, tetrachloroethylene, benzene, toluene, xylenes, and ethylbenzenes; the result of the analysis must be below the instrument detection limit for each parameter before the pump is taken to the site for use.

During field sampling, all equipment surfaces that are placed in the well or in contact with ground water will be cleaned before purging or sampling the next well. The surfaces will be cleaned by steam cleaning with deionized water.

Water-Level Measurements

Prior to purging and sampling, the water level in each well will be measured with an electric sounder. A reel mounted, two conductor audible sensor with indicator light allows for the measurement of both water and separate phase product interfaces. Depth to water and product measurements are recorded to the nearest 0.01 foot. The absence or presence of separate phase product is confirmed with a clean, acrylic or polyvinylchloride bailer, by measuring the thickness to the nearest 0.01 foot with an engineer's scale tape. Any observations (eg. well integrity, product color, turbidity, water color, odors etc.) should be noted on the Water Sample Field Data Sheet shown in Figure A-2. Before and after each use, the sounder will be decontaminated by rinsing with a detergent and deionized water.

Wells are monitored from the lowest dissolved product concentrations to the highest dissolved concentrations. To avoid cross contamination, all monitoring equipment is decontaminated after each well by rinsing with detergent and deionized water.

Well Purging

Before sampling, standing water in the casing and sand pack will be purged from the well 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 bailer. Individual purge volumes are calculated for each well from casing size and length of standing water. When possible, five (5) case volumes will be purged. Wells which dewater or have slow recharge periods are often sampled after fewer purging cycles, once sufficient water volumes have recovered. Temperature, pH, and conductivity are closely monitored throughout the evacuation process. Purging is continued until all three (3) parameters have stabilized. Conductivity and pH meters are calibrated daily. Monitoring wells will be purged according to the protocol presented in Figure A-1.

All records of field data will be entered on the Well Sampling Field Data Sheet shown in Figure A-2. Copies of the field data sheets will be reviewed by the sampling supervisor after the sampling event is completed. Field meters will be calibrated each morning before initiating sampling. The calibration will be checked once each day to verify meter performance.

Sampling

Samples are only collected from groundwater wells free of separate phase product or from wells containing product sheens. Wells containing product films or free product levels $\geq$ 0.01 foot are not normally sampled. When specific situations require samples and free product exists, the field sampler will be informed of this special requirement.

Samples will be collected with a Teflon bailer or positive displacement Teflon bladder pump. Groundwater samples that are analyzed for total petroleum hydrocarbons (calculated as gasoline), benzene, toluene, xylenes, and ethylbenzene will be collected in duplicate utilizing 40 milliliter glass vials with Teflon lined septums, preserved with hydrochloric acid to a pH of less than 2.

Sample bottles for volatile organics analysis will be filled completely to prevent any air from remaining in the bottle. A positive meniscus forms when the bottle is completely full. A Teflon lined septum will be placed over the positive meniscus to seal the container. After capping, the bottle will be inverted and tapped to check that no air bubbles are present.

When required, field blanks and trip blanks made with organic free water will be carried into the field and delivered with the samples to the laboratory. Field blanks will be opened in the field during sample collection to detect any influences from the ambient atmosphere on sample quality. Trip blanks will remain with the bottles used for sampling for the duration of the sampling event. At no time will the trip blanks be uncapped. Trip blanks provide a check on laboratory bottle-cleaning procedures.

All sampling containers will be prelabeled with preservatives information prior to initiating the sampling event. Labels will be completed during sample collection. Containers will be placed on blue ice immediately upon sampling until delivery to the laboratory. At the time of sampling, the sample will be logged on a chain-of-custody form, which will accompany the sample to the laboratory. Laboratory personnel will accept the samples and assign a unique laboratory number to each sample.

Sample Preservation and Shipment

Sample containers will vary with each type of analytical parameter to be tested. Selected container types and materials will be nonreactive with the sample and the particular analytical parameter to be tested. As noted, sample containers will be properly cleaned and sterilized according to the EPA protocol for the specific analyses to be performed. All samples will be shipped on blue ice to a California state certified laboratory. Chain-of-custody documentation will accompany all sample containers.

ANALYTICAL METHODS

Groundwater samples will be analyzed in a California state certified analytical laboratory in accordance with the methods listed below. All testing procedures follow Regional Water Quality Control Board (RWQCB) guidelines.

Total petroleum hydrocarbons calculated as gasoline: modified EPA method 8015 (headspace) or modified EPA method 5030 (purge and trap).

Benzene, toluene, xylenes and ethylbenzene (BTX and E): modified EPA Method 8020 or 602.

Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, 3rd. edition, November 1986

Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA 600/4-82-057, U.S. EPA Environmental Monitoring and Support laboratory, Cincinnati, OH 1982

Methods of Chemical Analysis of Water and Wastes, EPA 600/4-49-020, Revised March 1983. U.S. Environmental Monitoring Laboratory Cincinnati, OH

Leaking Underground Fuel Tank (LUFT) Manual, State Water Resources Control Board,
State of California Leaking Underground Fuel Tank Task Force, May 1988

CHAIN-OF-CUSTODY

The following procedures will be used during sampling and analytical activities to provide chain-of-custody control during transfer of samples from collection through storage. Record keeping activities and tools will include:

Well Sampling Field Data Sheet

Sample labels

Chain-of-custody record

Well Sampling Field Data Sheet

In the field, the sampler 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 and water-surface elevation, pH, conductivity, temperature)

Calculated and actual purge volumes

Purging equipment

Sampling equipment

Appearance of each sample (e.g., color, turbidity, sediment, floating product/product odor, etc.)

General comments

Sampler's signature

Sample Labels

Each sample container will be labeled immediately after the sample is taken. Label information will include:

Sample point designation

Sampler's identification

Project number

Date and time of collection

Type of preservation used

Analysis requested

Chain-of-Custody Record

The chain-of-custody records initiated at the time of sampling will contain the following information: Sample type, container type, well number, date of sampling, and name of the sampler. Figure A-3 shows a typical chain-of-custody record. The record sheet will be signed by the sampler when transferring possession of the samples. Custody transfers will be recorded for each individual sample; for example, if samples are split and sent to multiple laboratories, a record sheet will accompany each sample. The number of custodians in the chain of possession will be kept to a minimum.

Groundwater Monitoring

Wells are monitored from the lowest dissolved product concentrations to the highest dissolved concentrations. Wells that contain separate phase product are monitored last. To avoid cross contamination, all monitoring equipment is decontaminated after each well by rinsing with detergent and deionized water.

Prior to purging and sampling, the water level in each well will be measured with an electric sounder. A reel mounted, two conductor audible sensor with indicator light allows for the measurement of both water and separate phase product interfaces. Depth to water and product measurements are recorded to the nearest 0.01 foot. The absence or presence of separate phase product is confirmed with a clean, acrylic or polyvinylchloride bailer, by measuring the thickness to the nearest 0.01 foot with an engineer's scale tape. Any observations (eg. well integrity, product color, turbidity, water color, odors etc.) should be noted on the Water Sample Field Data Sheet shown in Figure A-2.

FIGURE A-1
MONITORING WELL PURGING PROTOCOL