WEISS ASSOCIATES
Geologic and Environmental Services
Fax: 415-547-5043 Phone: 415-547-5420
5500 Shellmound Street, Emeryville, CA 94608

91 APR 15 AM 10: 14

April 11, 1991

Mr. Lowell Miller
Alameda County Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621-1426

Re: Shell Service Station
WIC #204-6852-1404
1784 150th Avenue
San Leandro, CA 94578
WA Job #81-422-01

Dear Mr. Miller:

This letter describes Weiss Associates' (WA) first quarter 1991 activities at the Shell service station referenced above (Figure 1.) This status report satisfies the quarterly reporting requirements outlined in our February 23, 1990 workplan, and prescribed by California Administrative Code Title 23 Waters, Chapter 3, Subchapter 16, Article 5, Section 265.d. Included below are:

- Descriptions and results of activities performed in the first quarter 1991, and
- Proposed work for the second quarter 1991.

FIRST QUARTER 1991 ACTIVITIES

During this quarter, WA:

- Collected ground water samples from the one site well,
- Measured the ground water depths and determined the ground water elevation,
- Analyzed the ground water samples and tabulated the analytic results, and

- Evaluated the site for a sampling frequency modification.

These activities are described below.

Ground Water Sampling

WA collected ground water samples from one monitoring well on March 7, 1991, as part of the quarterly ground water monitoring program at Shell Service Station WIC #204-6852-1404 in San Leandro, California. Ground water samples from monitoring well MW-1 (Figure 2) contained benzene and 1,2-dichloroethane (DCA) above the California Department of Health Services (DHS) maximum contaminant level (MCL) for drinking water.

Sampling Personnel: WA Environmental Technician Paul Cardoza

Monitoring Well Sampled: MW-1

Method of Purging Well:

- Dedicated PVC bailer

Volume of Water Purged Prior to Sampling:

- Well MW-1 was purged of four well-casing volumes, about 50 gallons.

Method of Collecting Ground Water Samples:

- Drawn through the sampling port on the side of the dedicated PVC bailer

Methods of Containing Ground Water Samples:

- 40 ml glass volatile organic analysis (VOA) vials, preserved with hydrochloric acid and packed in protective foam sleeves for total petroleum hydrocarbons as gasoline (TPH-G) and benzene, ethylbenzene, toluene, and xylene (BETX), and halogenated volatile organic compound (HVOC) analyses

- 1000 ml amber glass bottles for total petroleum hydrocarbons as diesel (TPH-D) analysis

All samples were refrigerated and transported under chain-of-custody to the analytical laboratory.

Water Samples Transported to:

- National Environmental Testing, Inc. (NET) Pacific, Santa Rosa, California, and were received on March 8, 1991

Quality Assurance/Quality Control:

- A travel blank was submitted for analysis.
- An equipment blank was not necessary because the bailer is dedicated to well MW-1.

Water sample collection records and chain-of-custody forms are included in Attachments A and B, respectively.

Ground Water Elevation and Flow Direction

- The depth to water was measured in MW-1 on March 9, 1991. The ground water elevation increased 1.62 ft from the previous quarter.
- Based on the topographic gradient, ground water probably flows westward.

Depth to water measurements and ground water elevations are presented in Table 1.

Chemical Analyses

The Ground Water Samples were Analyzed for:

- TPH-G by modified EPA Method 8015,
- TPH-D by modified EPA Method 8015,
- BETX by EPA Method 602, and
- HVOCs by EPA Method 601.

The laboratory analyzed the samples on March 13, 14, and 17, 1991. The results are presented in Table 2 and the analytic reports are included in Attachment B.

Discussion of Analytic Results of Ground Water for this Quarter:

- Samples contained benzene and DCA above the DHS MCLs for drinking water.
- No toluene was detected for the first time.

Sampling Frequency Modification

WA has developed criteria to determine when the ground water sampling frequency can be modified for ground water monitoring programs (Attachment C). Based on these criteria, WA recommends modifying the sampling frequency of well MW-1 as shown in Table 3. Subject to your approval, WA will initiate this program during the next quarterly sampling, scheduled for June 1991.

ANTICIPATED WORK FOR SECOND QUARTER 1991

Unless you do not agree with our recommended future sampling frequency, WA, on behalf of Shell Oil, does not plan to collect ground water samples for the one well at this site or perform other investigation activities. We plan to sample ground water again in September 1991 and submit a sampling report by October 31, 1991.

We trust that this submittal satisfies your requirements. Please contact Tom Fojut or Eric Anderson if you have any questions.

Sincerely,
Weiss Associates

Thomas Fojut

Thomas J. Fojut
Staff Geologist

Joseph P. Theisen, R.G.
Senior Project Hydrogeologist

TJF/JPT:jg

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Attachments: Figures
Tables
A - Water Sample Collection Records
B - Analytic Report and Chain-of-Custody Form
C - Sampling Frequency Modification Criteria

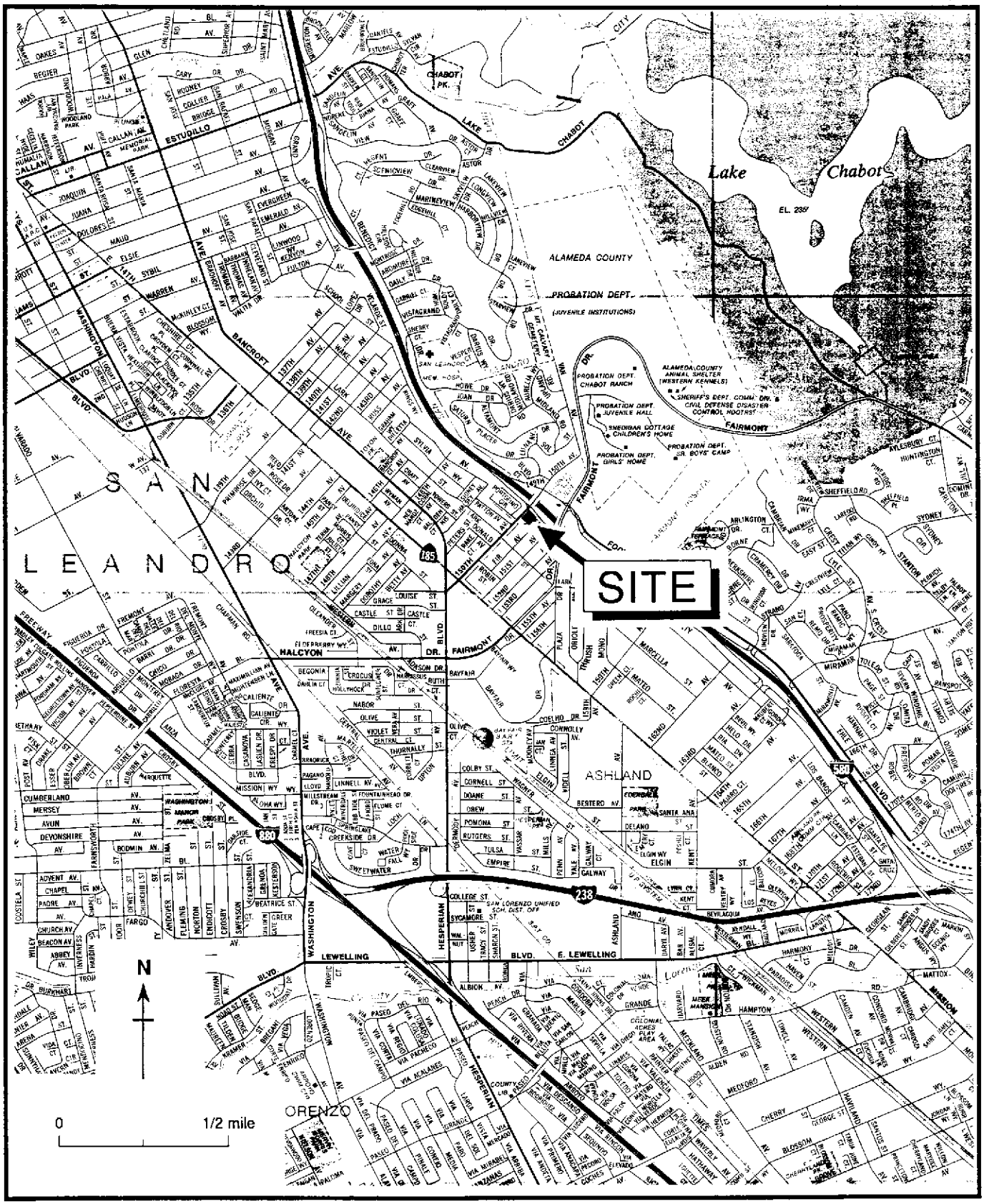

Figure 1. Site Location Map - Shell Service Station WIC #204685214, 1784 150th Avenue, San Leandro, California

3/16/90

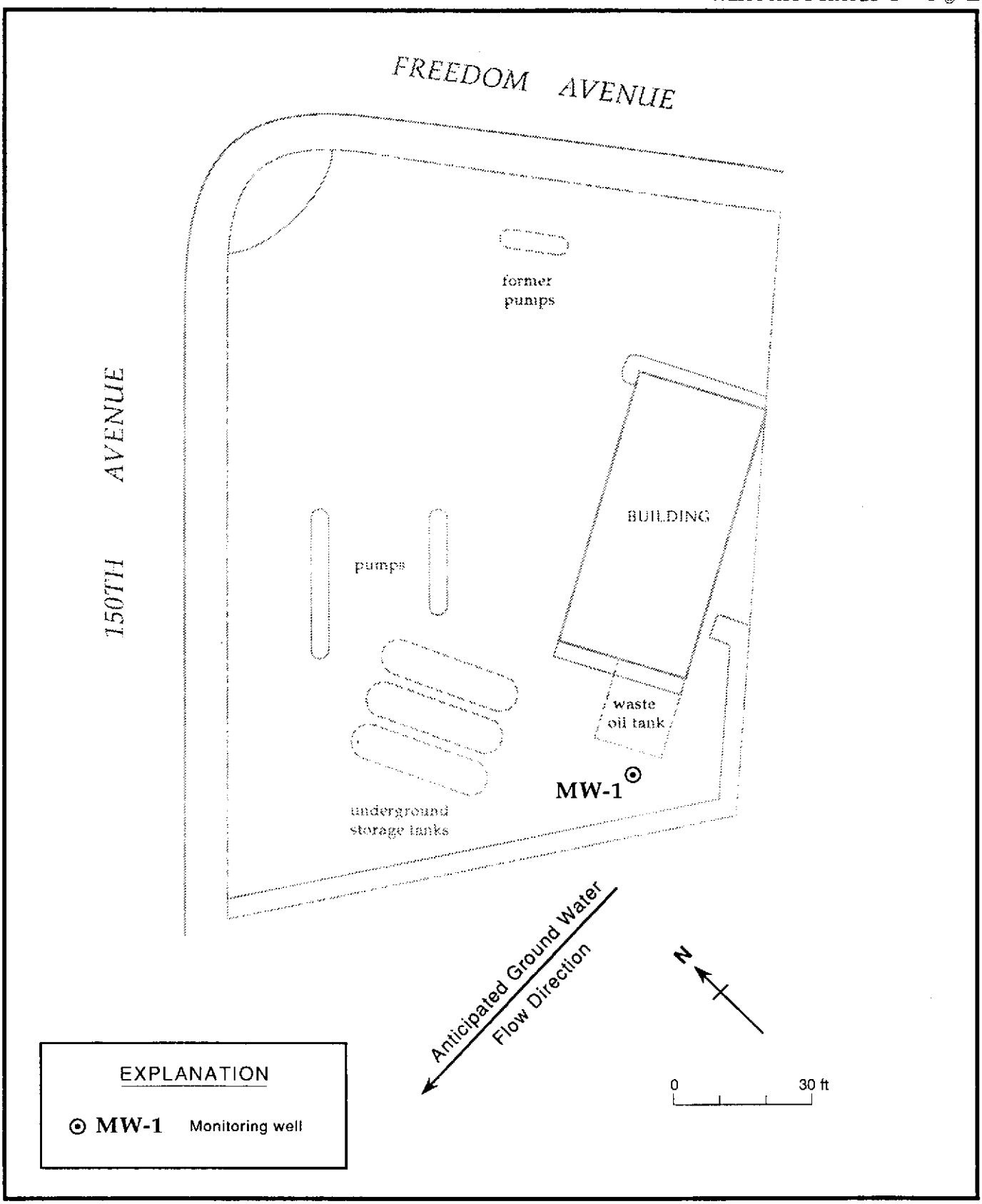

Figure 1. Monitoring Well Location - Shell Service Station WIC #204-6852-1404, 1784 150th Avenue, San Leandro, California

4/11/91

TABLE 1. Ground Water Elevation Data, Shell Service Station WIC #204-6852-1404, 1784 150th Avenue, San Leandro, California

Well ID	Date	Top-of-Casing Elevation (ft above msl)	Depth to Water (ft)	Ground Water Elevation (ft above msl)
MW-1	03/08/90	49.13	25.29	23.84
	06/12/90		25.85	23.28
	09/13/90		27.49	21.64
	12/18/90		27.41	21.72
	03/07/91		25.79	23.34

TABLE 2. Analytic Results for Ground Water - Shell Service Station WIC #204-6852-1404, 1784 150th Avenue, San Leandro, California

Well ID	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D[a]	B	E	T	X	TOG	HVOCs
			<--------			mg/ℓ (ppm)				-------->
MW-1	03/08/90	25.29	0.29	0.12	0.0015	<0.0005	0.0008	0.0054	<10	0.012[b]
	06/12/90	25.85	0.51	0.10	0.086	0.0007	0.0013	0.0062	<10	ND
	09/13/90	27.49	0.27	0.13	0.056	0.0024	0.00075	0.0028	<10	0.024[c]
	12/18/90	27.41	0.27	<0.05	0.054	0.0033	0.0017	0.0037	<10	0.0053[b]
	03/07/91	25.79	0.06	<0.05	0.026	0.0012	<0.0005	0.0015	---	0.0067[b]
Trip Blank	03/08/90		<0.05	---	<0.0005	<0.0005	<0.0005	<0.0005	---	---
	06/12/90		<0.05	---	<0.0005	<0.0005	<0.0005	<0.0005	---	---
	12/18/90		<0.05	---	<0.0005	<0.0005	<0.0005	<0.0005	---	---
	03/07/91		<0.05	---	<0.0005	<0.0005	<0.0005	<0.0005	---	---
Bailer Blank	03/08/90		<0.05	---	<0.0005	<0.0005	<0.0005	<0.0005	---	---
DHS MCLs			NE	NE	0.001	0.680	0.100[d]	1.75	NE	[e]

Abbreviations:

TPH-G = Total Petroleum Hydrocarbons as Gasoline by Modified EPA Method 8015
TPH-D = Total Petroleum Hydrocarbons as Diesel by Modified EPA Method 8015
B = Benzene by EPA Method 602
E = Ethylbenzene by EPA Method 602
T = Toluene by EPA Method 602
X = Xylenes by EPA Method 602
TOG = Total hydrocarbon (non-polar) oil and grease by American Public Health Association Standard Methods 503A&E
HVOCs = Halogenated Volatile Organic Compounds by EPA Method 601
--- = Not analyzed
<n = Not detected at detection limit of n ppm
ND = Not detected at detection limits between .0004 and .010 ppm
DHS MCLs = California Department of Health Services Maximum Contaminant Levels for drinking water
ppm = parts per million
NE = Not established by DHS

Analytical Laboratory:

National Environmental Testing (NET) Pacific, Inc., Santa Rosa, California

Notes:

[a] = Samples analyzed for total petroleum hydrocarbons as motor oil (TPH-M) as part of the TPH-D analysis. No TPH-M has been detected to date at detection limit of 0.5 ppm.
[b] = 1,2-dichloroethane (DCA) detected at n ppm
[c] = tetrachloroethylene (PCE) detected at n ppm
[d] = DHS recommended action level, MCL not established
[e] = DHS MCL for DCA: 0.0005 ppm; DHS MCL for PCE: 0.005 ppm

TABLE 3. Modifications to Ground Water Sampling Schedule, Shell Service Station, WIC #204-6852-1404, 1784 150th Avenue, San Leandro, California

Well ID	Current Sampling Frequency	Recommended Future Sampling Frequency	Rationale for Recommended Sampling Frequency
MW-1	Quarterly	Semi-Annually	Source area well; stable hydrocarbon concentration for five quarters

ATTACHMENT A

WATER SAMPLE COLLECTION RECORDS

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name MW-1 Date 3/7/91 Time of Sampling 12:55
Job Name Shell-San Leandro I Job Number 81-422-01 Initials PC
Sample Point Description MW
Location South side of station (M = Monitoring Well)

WELL DATA: Depth to Water 25.79 ft (static, pumping) Depth to Product — ft.
Product Thickness — Well Depth 45 ft (spec) Well Depth 44.79 ft (sounded) Well Diameter 4 in
Initial Height of Water in Casing 19.0 ft. = volume 12.41 gal.
4 Casing Volumes to be Evacuated. Total to be evacuated 49.63 gal.

EVACUATION METHOD: Pump # and type — Hose # and type —
Bailer# and type 3" x 36" PVC Dedicated Y (Y/N)
Other —

Evacuation Time: Stop 12:37
Start 12:02
Total Evacation Time 35 min
Total Evacuated Prior to Sampling 50 gal.
Evacuation Rate 1.43 gal. per minute
Depth to Water during Evacuation — ft. — time
Depth to Water at Sampling 25.76 ft. 13:01 time
Evacuated Dry? No After — gal. Time —
80% Recovery = —
% Recovery at Sample Time — Time —

Formulas/Conversions
r = well radius in ft.
h = ht of water col in ft.
vol. in cyl. = $\pi r^2 h$
7.48 gal/ft^3
V_2" casing = 0.163 gal/ft
V_3" casing = 0.367 gal/ft
V_4" casing = 0.653 gal/ft
$V_{4.5}$" casing = 0.826 gal/ft
V_6" casing = 1.47 gal/ft
V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number —
Calibration: — 4.0 — 7.0 — 10.0

Measured: SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color slightly cloudy Odor None
Description of matter in sample: Small amount - sand
Sampling Method: From sampling port on side of dedicated bailer.
Sample Port: Rate — gpm Totalizer — gal.
Time —

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	021-01	w/cv	40ml	N	Y	None	EPA 8015/8020	N	NET Pacific
							EPA 601		
		w/AG-TV	1L				EPA 8015		

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

Travel Blanks

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name — Date 3/7/91 Time of Sampling 9:30

Job Name Shell-San Leandro I Job Number 81-422-01 Initials PC

Sample Point Description — (M = Monitoring Well)

Location

WELL DATA: Depth to Water ____ ft (static/pumping) Depth to Product ____ ft.

Product Thickness ____ Well Depth ____ ft (spec) Well Depth ____ ft(sounded) Well Diameter ____ in

Initial Height of Water in Casing ____ ft. = volume ____ gal.

____ Casing Volumes to be Evacuated. Total to be evacuated ____ gal.

EVACUATION METHOD: Pump # and type ____ Hose # and type ____

Bailer# and type ____ Dedicated ____ (Y/N)

Other

Evacuation Time: Stop

Start

Total Evacation Time

Total Evacuated Prior to Sampling ____ gal.

Evacuation Rate ____ gal. per minute

Depth to Water during Evacuation ____ ft. ____ time

Depth to Water at Sampling ____ ft. ____ time

Evacuated Dry? ____ After ____ gal. Time ____

80% Recovery = ____

% Recovery at Sample Time ____ Time ____

Formulas/Conversions

r = well radius in ft.

h = ht of water col in ft.

vol in cyl. = $\pi r^2 h$

7.48 gal/ft^3

V_2" casing = 0.163 gal/ft

V_3" casing = 0.367 gal/ft

V_4" casing = 0.653 gal/ft

$V_{4.5}$" casing = 0.826 gal/ft

V_6" casing = 1.47 gal/ft

V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number ____

Calibration: ____ 4.0 ____ 7.0 ____ 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color ____ Odor ____

Description of matter in sample:

Sampling Method:

Sample Port: Rate ____ gpm Totalizer ____ gal.

Time

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	021-21	o/cv	40ml	N	Y	None	EPA 8015/8020	N	NET Pacific

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

ATTACHMENT B

ANALYTIC REPORT AND CHAIN-OF-CUSTODY FORM

NATIONAL
ENVIRONMENTAL
TESTING, INC.

NET Pacific, Inc.
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Tom Fojut
Weiss Associates
5500 Shellmound St.
Emeryville, CA 94608

Date: 03-22-91
NET Client Acct. No: 18.09
NET Pacific Log No: 6435
Received: 03-08-91 2300

Client Reference Information

SHELL-1784 150th Ave, San Leandro, Project: 81-422-01

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

Enclosure(s)

Ref: SHELL-1784 150th Ave, San Leandro, Project: 81-422-01

SAMPLE DESCRIPTION: 031-01 03-07-91
LAB Job No: (-79638)

Parameter	Method	Reporting Limit	Results	Units
METHOD 60[illegible]				
DATE ANALYZED			03-14-91	
DILUTION FACTOR*			1	
Bromodichloromethane		0.4	ND	ug/L
Bromoform		0.4	ND	ug/L
Bromomethane		0.4	ND	ug/L
Carbon tetrachloride		0.4	ND	ug/L
Chlorobenzene		0.4	ND	ug/L
Chloroethane		0.4	ND	ug/L
2-Chloroethylvinyl ether		1.0	ND	ug/L
Chloroform		0.4	ND	ug/L
Chloromethane		0.4	ND	ug/L
Dibromochloromethane		0.4	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ug/L
Dichlorodifluoromethane		0.4	ND	ug/L
1,1-Dichloroethane		0.4	ND	ug/L
1,2-Dichloroethane		0.4	[illegible]7	ug/L
1,1-Dichloroethene		0.4	ND	ug/L
trans-1,2-Dichloroethene		0.4	ND	ug/L
1,2-Dichloropropane		0.4	ND	ug/L
cis-1,3-Dichloropropene		0.4	ND	ug/L
trans-1,3-Dichloropropene		0.4	ND	ug/L
Methylene Chloride		10	ND	ug/L
1,1,2,2-Tetrachloroethane		0.4	ND	ug/L
Tetrachloroethene		0.1	ND	ug/L
1,1,1-Trichloroethane		0.4	ND	ug/L
1,1,2-Trichloroethane		0.4	ND	ug/L
Trichloroethene		0.4	ND	ug/L
Trichlorofluoromethane		0.4	ND	ug/L
Vinyl chloride		2.0	ND	ug/L
PETROLEUM HYDROCARBONS			--	
VOLATILE (WATER)			--	
DILUTION FACTOR *			1	
DATE ANALYZED			03-13-91	
METHOD GC FID/5030			--	
as Gasoline		0.05	[illegible].06 *	mg/L
METHOD 602*			--	
DILUTION FACTOR *			1	
DATE ANALYZED			03-13-91	
Benzene		0.5	[illegible]5	ug/L
Ethylbenzene		0.5	[illegible].2 *	ug/L
Toluene		0.5	ND	ug/L
Xylenes, total		0.5	[illegible]5	ug/L

Ref: SHELL-1784 150th Ave, San Leandro, Project: 81-422-01

SAMPLE DESCRIPTION: 031-01 03-07-91
LAB Job No: (-79638)

Parameter	Method	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS			--	
EXTRACTABLE (WATER)			--	
DILUTION FACTOR *			1	
DATE EXTRACTED			03-13-91	
DATE ANALYZED			03-17-91	
METHOD GC FID/3510			--	
as Diesel		0.05	ND	mg/L
as Motor Oil		0.5	ND	mg/L

Ref: SHELL- 1784 150th Ave, San Leandro, Project: 81-422-01

SAMPLE DESCRIPTION: 031-21 03-07-91
LAB Job No: (-79639)

Parameter	Method	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS			--	
VOLATILE (WATER)			--	
DILUTION FACTOR *			1	
DATE ANALYZED			03-13-91	
METHOD GC FID/5030			--	
as Gasoline		0.05	ND	mg/L
METHOD 602			--	
DILUTION FACTOR *			1	
DATE ANALYZED			03-13-91	
Benzene		0.5	ND	ug/L
Ethylbenzene		0.5	ND	ug/L
Toluene		0.5	ND	ug/L
Xylenes, total		0.5	ND	ug/L

NET Pacific, Inc.

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following. This datum supercedes the listed Reporting Limit.
*	:	Reporting Limits are a function of the dilution factor for any given sample. To obtain the actual reporting limits for this sample, multiply the stated Reporting Limits by the dilution factor (but do not multiply reported values).
ICVS	:	Initial Calibration Verification Standard (External Standard).
mean	:	Average; sum of measurements divided by number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, wet-weight basis (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
NA	:	Not analyzed.
ND	:	Not detected; the analyte concentration is less than applicable listed reporting limit.
NTU	:	Nephelometric turbidity units.
RPD	:	Relative percent difference, 100 [Value 1 - Value 2]/mean value.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, wet-weight basis (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
umhos/cm	:	Micromhos per centimeter.

Method References

Methods 100 through 493: see "Methods for Chemical Analysis of Water & Wastes", U.S. EPA, 600/4-79-020, rev. 1983.

Methods 601 through 625: see "Guidelines Establishing Test Procedures for the Analysis of Pollutants" U.S. EPA, 40 CFR, Part 136, rev. 1988.

Methods 1000 through 9999: see "Test Methods for Evaluating Solid Waste", U.S. EPA SW-846, 3rd edition, 1986.

SM: see "Standard Methods for the Examination of Water & Wastewater, 16th Edition, APHA, 1985.

WEISS ASSOCIATES
5500 Shellmound St., Emeryville, CA 94608
Phone: 415-547-5420 FAX: 415-547-5043

Shell Service Station Address: 1784 150TH AV SAN LEANDRO, CA

Shell Contact: ~~E PAUL HAYES~~ KURT MILLER

WIC #: 204-6852-1404

AFE #:

Please send analytic results and a copy of the signed chain of custody form to:

TOM FOJUT

Project ID: 81-422-01

C0435

CHAIN-OF-CUSTODY RECORD AND ANALYTIC INSTRUCTIONS

Lab Personnel:
1) Specify analytic method and detection limit in report.
2) Notify us if there are any anomalous peaks on GC or other scans.
3) ANY QUESTIONS/CLARIFICATIONS: CALL US.

Sampled by: Paul Cardoza

Laboratory Name: NET

No. of Containers	Sample ID	Container Type[1]	Sample Date	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analyze for	Analytic Method	Turn[5]	COMMENTS
3	031-01	w/cv	3/7/91	40ml	N	Y	None	TPH-G/BETX	EPA 8015/8020	N	
								HVOCs	EPA 601		
		w/BG-Pv		1L				TPH-D	EPA 8015		
	031-21	w/cv		40ml				TPH-G/BETX	EPA 8015/8020		

CUSTODY SEALED 3/8/91 @ 1400 MWT

1 Paul Cardoza 3/7/91 16:10
Released by (Signature), Date

1 Weiss Assoc.
Affiliation

2 Tom Fojut 16:10 3-7-91
Received by (Signature), Date

2 WEISS
Affiliation

3 Tom Fojut 14:35 3-8-91
Released by (Signature), Date

3 WEISS
Affiliation

4 Mike Tamura 3/8/91 1455
Shipping Carrier, Method, Date

4 NET
Affiliation

5 Mike Tamura 3/8/91
Released by (Signature), Date

5 NET (VIA NCS)
Affiliation

6 Sample 3/8/91
Received by Lab Personnel, Date

6 NET Pacific 2500
Affiliation, Telephone

x Yes
Seal Intact?

1 Sample Type Codes: W = Water, S = Soil, Describe Other; Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B - Clear/Brown Glass, Describe Other; Cap Codes: PT = Plastic, Teflon Lined 2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 Week, R = 24 Hour, HOLD (write out)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

Stored overnight 3-7-91 → 3/8/91 in secure locked area.

F:\ALL\ADMIN\FORMS\COCSHELL.WP2

ATTACHMENT C

SAMPLING FREQUENCY MODIFICATION CRITERIA

SAMPLING FREQUENCY MODIFICATION CRITERIA

Shell typically samples ground water quarterly at their operating or former service stations. The California Water Quality Control Board's ground water monitoring guidelines state that: "Quarterly (ground water) monitoring is the maximum sampling interval typically allowed when ground water contamination is present unless other arrangements are made with Regional Water Quality Control Board staff"[1]. California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB-SFBR) personnel have indicated that the Board will allow sampling frequency reductions on a site-specific basis if the frequency modification is justified by site conditions. Therefore, WA has developed generalized criteria for determining when sampling frequency can be modified.

The recommended sampling frequency for specific monitoring wells is based upon the following factors:

- The reliability of the ground water quality analytic data,
- The trend of the dissolved hydrocarbon concentration in water samples from the well, and
- The location of the well in relation to the hydrocarbon source.

Each of these factors is discussed below.

Reliability of Ground Water Quality Analytic Data

Since the reproducibility of ground water analytic data is highly sensitive to hydrogeologic conditions as well as field sampling and laboratory analytic procedures, ground water analytic data often vary between sampling episodes. Seasonal ground water elevation fluctuations can also affect hydrocarbon concentrations in ground water. Therefore, WA will reduce the sampling frequency only for wells that:

- Have been sampled quarterly for at least one year, and
- Have consistent historical analytic results allowing a reliable assessment of hydrocarbon concentrations in the well. If the variability of the analytic data prevents a reliable assessment of hydrocarbon concentrations, then we will continue to sample the well(s) quarterly until a reliable assessment can be made.

---

1 North Coast, San Francisco Bay, Central Valley Regional Water Quality Control Boards, June 2, 1988 (revised May 18, 1989), "Regional Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks; pg.12.

Trend of Hydrocarbon Concentration

Sampling frequency will be reduced only for wells showing stable or decreasing hydrocarbon concentrations. Wells with increasing concentration trends will be sampled quarterly to monitor the trends and determine whether the hydrocarbon concentration in a particular well is approaching a threshold concentration such as the saturation concentration, maximum contaminant level (MCL) for drinking water or a California Department of Health Services action level.

Well Location

Ground water monitoring wells generally fall into one of the following classifications relative to the suspected hydrocarbon source:

1) Clean up- and cross-gradient wells,

2) Clean down-gradient wells,

3) High concentration source-area wells, and

4) Low to high concentration intermediate wells.

WA recommends the following sampling frequency for each of these classifications:

1) If no offsite source is indicated by the initial sampling of the up-gradient and cross-gradient site wells, and if no hydrocarbons are detected in water samples from the wells, WA recommends sampling these wells annually.

2) Since clean down-gradient wells define the "leading edge" of dissolved hydrocarbons in ground water and hence are used to monitor hydrocarbon breakthrough, WA usually recommends sampling these wells quarterly. However, WA may recommend annual or semi-annual sampling of down-gradient wells if hydrocarbons are not detected or detected at low concentrations for at least four consecutive quarters.

3) High hydrocarbon concentration source-area wells are used to monitor source-area hydrocarbon concentrations and the effectiveness of natural biodegradation. WA recommends sampling these wells semi-annually unless the hydrocarbon concentrations are increasing, in which case the wells will be sampled quarterly. High hydrocarbon concentration source area wells with a history of floating hydrocarbons will be inspected at least quarterly, and sampled if possible.

4) Intermediate wells are located at a distance from the source area and may contain low to high dissolved hydrocarbon concentrations, depending on their distance from the source and hydrogeologic factors. Although these wells are not used to track the migration of the dissolved-hydrocarbon front, they can be used to track the migration of the dissolved hydrocarbon plume and the rates of natural biodegradation. Therefore, WA recommends sampling these wells semi-annually.