Weiss Associates *Environmental and Geologic Services*

5500 Shellmound Street, Emeryville, CA 94608-2411 *Fax: 510-547-5043* *Phone: **510-450-6000***

January 14, 1997

Mr. Scott Seery
Alameda County Health Services Agency
1131 Harbor Bay Parkway, Room 250
Alameda, California 94502

RE: Final Soil Vapor Survey Report
Shell Service Station
1784 150th Avenue
San Leandro, California
WIC #204-6852-1404
WA Job #81-0422

Dear Mr. Seery:

On behalf of Shell Oil Products Company (Shell), Weiss Associates has prepared the attached Soil Vapor Survey Report for the Shell Station at 1784 150th Avenue, San Leandro, California. If you have any questions or comments regarding the report, please do not hesitate to contact me at (510) 450-6115.

Sincerely,
Weiss Associates

Steve Long, P.E.
Project Engineer

ENVIRONMENTAL PROTECTION
97 JAN 16 PM 3:38

Enclosures: Draft Soil Vapor Survey Report

cc: Mr. R. Jeff Granberry, Shell Oil Products Company, Concord
Mr. H. B. Boschetto, Shell Oil Products Company, Santa Ana
Mr. Erik Hansen, Shell Development Company, Houston

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Weiss Associates *Environmental and Geologic Services*

5500 Shellmound Street, Emeryville, CA 94608-2411 *Fax: 510-547-5043* *Phone:* ***510-450-6000***

SOIL VAPOR SURVEY REPORT

for

1-14-97

Shell Service Station
WIC # 204-6852-1404
1784 150th Avenue
San Leandro, California

prepared for

Shell Oil Products Company
P.O. Box 4023
Concord, California 94524

January 14, 1997

Weiss Associates *Environmental and Geologic Services*

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SOIL VAPOR SURVEY REPORT

for

Shell Service Station
WIC # 204-6852-1404
1784 150th Avenue
San Leandro, California

prepared by

Weiss Associates
5500 Shellmound Street
Emeryville, CA 94608

WA Job # 81-0422-06

Tim R. Utterback
Senior Staff Engineer

Weiss Associates work for the soil vapor survey, was conducted under my supervision. To the best of my knowledge, the data contained herein are true and accurate and satisfy the scope of work prescribed by the client for this project. The data, findings, or professional opinions were prepared solely for the use of Shell Oil Products Company in accordance with generally accepted professional engineering and geologic practice. We make no other warranty, either expressed or implied, and are not responsible for the interpretation by others of the contents herein.

1/14/97

Stephen P. Long, P.E. Date
Project Engineer
No. C055060

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TABLES

APPENDICES

1. INTRODUCTION

On behalf of Shell Oil Products Company (Shell), Weiss Associates (WA) is presenting the results of the soil vapor survey data collected on July 18 and 19, 1996 at the subject site. This work was requested in the letter from Mr. Scott Seery, Alameda County Health Care Services Agency (ACHCSA) to Shell Engineer Jeff Granberry, dated January 24, 1996 and further clarified in the meeting between Shell, WA and ACHCSA on February 22, 1996.

1.1 Objective

The objective of the soil vapor survey was to determine the location and concentration of petroleum hydrocarbons in vadose zone pore air and vadose zone soil and to collect soil physical parameters.

1.2 Scope of Work

The soil vapor survey included:

- Collecting vapor samples from ten sample locations and soil samples from 3 sample locations;
- Recording the soil type encountered in 3 sample locations;
- Submitting the vapor and soil samples to analytical laboratories for analysis; and,
- Reporting the results.

1.3 Parties Present

During the performance of the soil vapor survey, the following individuals were onsite either all or part of the time:

- David Hinton and Paul Fassoth, InterPhase Inc. (InterPhase); and,
- Chuck Headlee, Weiss Associates (WA).

1.4 Sampling Dates

July 18 and 19, 1996.

1.5 Site Location, Depth to Ground Water and Ground Water Gradient

The Shell Service Station is located on the southwest corner of 150th Avenue and Freedom Avenue in San Leandro, California (Figure 1). The samples were collected on service station property and in the sidewalk on the north side of 150th Avenue (Figure 2). The depth to ground water at the subject site has ranged from 17 to 30 feet below ground surface with a variable gradient of typically less than 0.001 ft/ft.

2. BORING LOG RESULTS

Lithological logging of soil cores collected from soil sample locations SVS-3, SVS-5 and SVS-9 indicate that soil below the service station and across 150th avenue to the north consists of interbedded clays, gravels and clayey sands to the total depth explored. Lithological logs for the three soil boring locations are included in Appendix A.

Why only these 3 ?

3. SOIL VAPOR SAMPLING AND RESULTS

3.1 Sample Locations

Nineteen vapor samples were collected from the ten locations depicted in Figure 2. One sample each was collected from SVS-1, SVS-2, SVS-4, SVS-6, SVS-7 SVS-8 and SVS-10. Vapor concentration profile samples were collected from SVS-3, SVS-5 and SVS-9.

3.2 Vapor Sampling Method

Vapor samples were collected concurrently for on-site vapor analysis and off-site laboratory analysis. InterPhase collected the vapor samples that were analyzed on-site and WA collected the vapor samples that were shipped off-site for laboratory analysis.

Both sets of vapor samples were collected by advancing the vapor sampling rod to a specified depth with a hydraulically powered Geoprobe. InterPhase operated the Geoprobe equipment and vapor sampling rod. InterPhase followed their standard vapor sample collection procedures to collect vapor samples for on site analysis. The InterPhase sample collection standard operating procedure is presented in Appendix C. WA collected vapor samples for laboratory analysis by the following procedure:

- A Summa canister was connected to the 1/4-inch polyethylene tubing provided by InterPhase with a three-way-valve and in line vacuum gauge.
- The three-way-valve was initially opened to the purge line to remove discrete purge volumes from the tubing with a 60 ml syringe.
- Upon removing the purge gas, the three-way-valve was closed to the purge line and opened to the Summa line.
- The Summa sample collection valve was slowly opened while monitoring the in-line vacuum.
- The Summa canister valve was closed when the vacuum in the line dropped to approximately 1 inch of mercury.
- After sample collection, the Summa canister was disconnected, labeled and stored for shipment to the laboratory.
- The purge and Summa lines were replaced after collecting each sample to prevent cross contamination.

3.3 Analytical Laboratory

The vapor samples collected by WA were shipped under chain-of-custody to Air Toxics Ltd. of Folsom, California for analysis. Vapor samples collected by InterPhase were analyzed on-site by InterPhase.

3.4 Analytical Methods

Vapor samples collected by WA were analyzed for benzene, toluene, ethylbenzene, and xylenes by California Air Resources Board Method 410 A and oxygen, carbon dioxide and methane by ASTM Method D3416. Vapor samples collected by InterPhase were analyzed for methylene chloride, chloroform, tetrachloroethene, vinyl chloride and total volatile hydrocarbons by InterPhase *Standard Operating Procedure for the Collection and Analysis of Soil Gas Samples*. The InterPhase standard operating procedure is included in Appendix C.

3.5 Analytical Results

The analytical results for vapor samples collected by WA are summarized in Table 1. Analytical laboratory reports are included in Appendix B. Benzene was detected in all of the vapor samples collected. The concentration of benzene in soil vapor ranged from 21 parts per billion by volume (ppbv) in sample SVS-9 at 3 feet below ground surface (bgs) to 7,600 ppbv in sample SVS-5 at 3 feet bgs. The three vapor profile samples collected from sample location SVS-5 near the northwest corner of the [redacted] complex contained the highest concentrations of benzene in vapor (1,400 ppbv to 7,600 ppbv benzene). Benzene concentrations in

pore vapor were approximately an order of magnitude lower in vapor profile samples collected from sample location SVS-3 near the southwest corner of the UST complex.

The concentration of oxygen in vapor samples ranged from 5.8 percent by volume (pbv) in sample SVS-5 at 3 feet bgs to 22 pbv in sample SVS-8 at 5 feet bgs. The concentration of carbon dioxide in vapor samples ranged from 0.046 percent by volume (pbv) in sample SVS-9 at 18 feet bgs to 23 pbv in sample SVS-5 at 3 feet bgs. The concentration of methane was below laboratory detection limits in all of the samples collected except SVS-3 at 2 feet bgs and SVS-5 at 3, 13 and 20 feet bgs.

Concentrations of halogenated volatile organic compounds in soil gas samples were below InterPhase detection limits[1] in most of the samples collected. Concentrations of vinyl chloride were detected in shallow vapor samples (< 5 feet bgs) from sample locations SVS-3 and SVS-4 located on the west border of service station property. The InterPhase soil gas survey results are summarized and tabulated in the InterPhase report presented in Appendix C.

4. SOIL SAMPLING RESULTS

4.1 Sample Locations

Eight soil boring samples were collected from sample locations SVS-3, SVS-5, and SVS-9. Seven of these samples were collected for hydrocarbon analysis and eight samples were collected for percent moisture, pH, particle size distribution, dry bulk density, natural bulk density and fraction of organic carbon analysis. Please refer to Figure 2 for the sample locations.

4.2 Soil Sampling Method

Soil samples were collected by advancing a 1-inch diameter soil sampling rod using a hydraulically powered Geoprobe. Soil samples were collected in clean polyethylene terephthalate[2] tubes. The tubes were immediately cut and sealed with Teflon squares, capped and refrigerated for transport to the laboratory.

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[1] InterPhase detection limits range from 0.01ug/l to 1.0 ug/l depending on the compound analyzed. These detection limits are reported in the Field Sheet/Raw Data section of the Inter Phase Soil Gas Survey Results report presented in Appendix C.

[2] Terephthalate liners have a history of no detectable concentrations of chemicals except terephthalate and the liners are commonly used by the California EPA and Federal EPA for environmental sampling projects.

4.3 Analytical Laboratory

Soil samples were shipped under chain-of-custody to Sequoia Analytical Laboratory of Redwood City, California for petroleum hydrocarbon, percent moisture, pH, bulk density, particle size distribution, and fraction of organic carbon analysis. Sequoia Analytical shipped the bulk density samples to Core Laboratories of Bakersfield, California for geotechnical analysis.

4.4 Analytical Methods

Seven soil samples were analyzed for total petroleum hydrocarbons as gasoline (TPH-G) by modified EPA Method 8015 and methyl-t-butyl ether (MTBE) benzene, toluene, ethylbenzene and xylenes (BTEX) by EPA Method 8020. Eight soil samples were analyzed for percent moisture by EPA Method 160.3, pH by EPA Method 9045, particle size distribution by ASTM Method D422, fraction of organic carbon by the Walkey-Black method and dry bulk density and natural bulk density by American Petroleum Institute (API) RP-40, API Recommended Practice for Core-Analysis Procedure, 1960.

4.5 Analytical Results

TPH-G and BTEX analytical results for soil borings samples are presented in Table 2 and percent moisture, pH, particle size distribution, dry bulk density, natural bulk density and fraction of organic carbon results are presented in Table 3. Laboratory data sheets are included in Appendix B. TPH-G, MTBE and BTEX concentrations were below laboratory detection limits in all of the soil boring samples except SVS-5 at 18-20 ft bgs which contained a TPH-G concentration of 1.1 mg/kg. The percent moisture in soil samples ranged from 14% in sample SVS-9 at 16-18 ft bgs to 24% in sample SVS-5 at 4-6 ft bgs. The pH was approximately 9 in all of the soil samples. Soil sample SVS-3 at 16-18 ft bgs contained the greatest amount of fines (15.89% passing #70 sieve) and soil sample SVS-5 at 8-10 ft bgs contained the least amount of fines (1.28% passing #70 sieve). Dry bulk density and natural bulk density ranged from 1.37 gm/cc and 1.84 gm/cc respectively in soil sample SVS-5 (4-6 ft bgs) to 1.91 gm/cc and 2.22 gm/cc respectively in soil sample SVS-9 (16-18 ft bgs). The fraction of organic carbon ranged from 0.12% in soil sample SVS-5 at 18-20 ft bgs to 1.2% in soil sample SVS-5 at 4-6 ft bgs.

5. CONCLUSIONS

Hydrocarbon concentrations in soil vapor were highest near the northwest corner of the service station UST complex. Soil vapor profile samples indicate hydrocarbon vapors do not show vertical attenuation[3] in the vicinity of the service station. However, vapor concentrations show vertical attenuation in the vicinity of the north pedestrian walkway on 150th Avenue at sample location SVS-9. In contrast, hydrocarbon concentrations in soil were below laboratory detection limits in all of the soil samples collected except for low levels of TPH-G in sample SVS-5 at 18-20 ft bgs.

The greatest indication of biodegradation was detected in vapor sample SVS-5 at 3 ft bgs where oxygen is significantly depleted and carbon dioxide and methane concentrations are highest. Elevated carbon dioxide concentrations were also detected in shallow (<5 ft bgs) soil gas samples from locations SVS-1, SVS-2, SVS-3, SVS-4 and SVS-10. The depleted oxygen and elevated carbon dioxide vapor concentrations measured in shallow soil may be due to phytoremediation occurring within the shallow soil where much larger numbers of bacteria and fungi are likely to occur.

[3] Vertical attenuation is a decline in vapor concentration in the vertical direction from the depth of the impacted soil or ground water source to the ground surface.

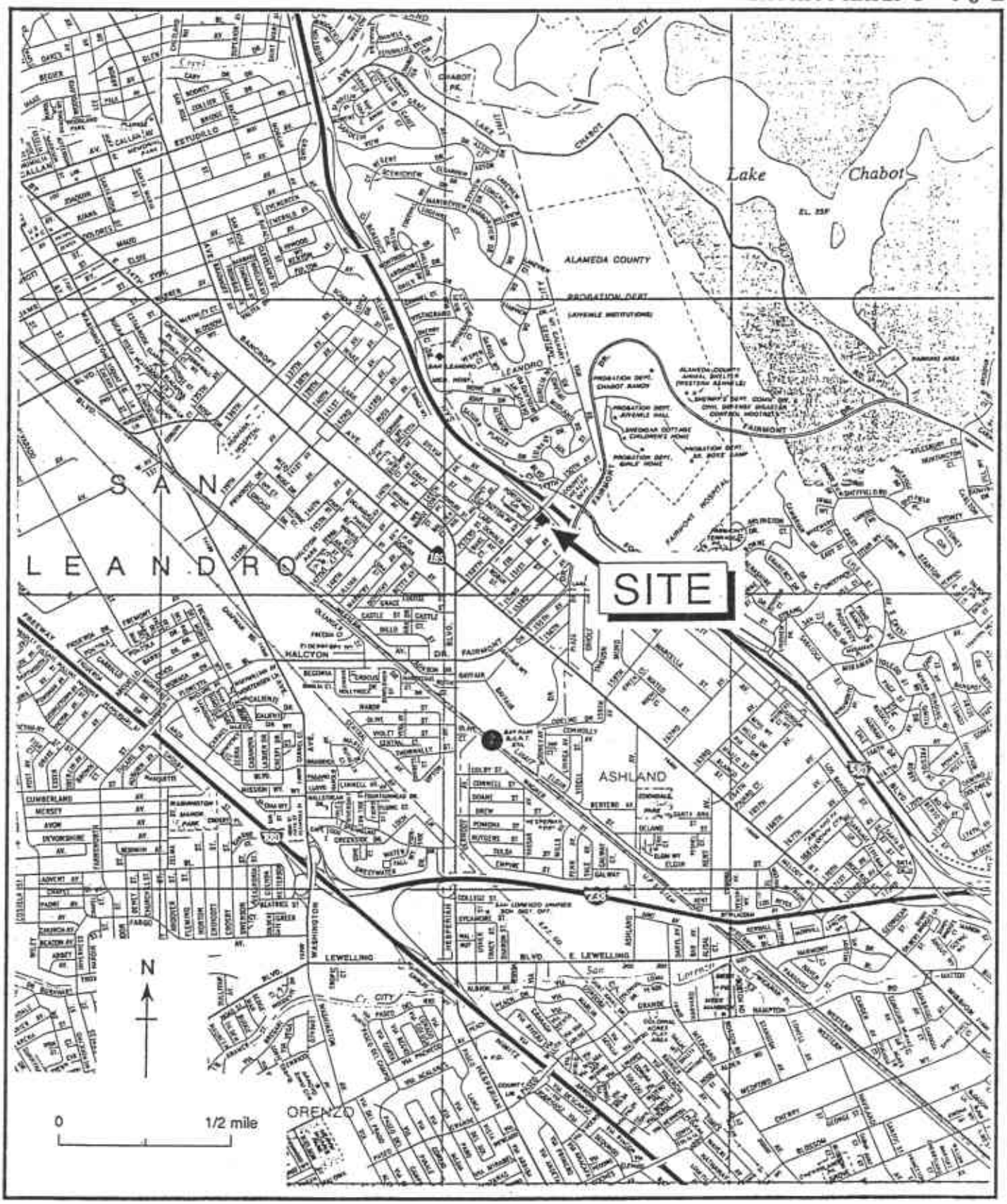

Figure 1. Site Location Map - Shell Service Station WIC #204-6852-1404, 1784 150th Avenue, San Leandro, California

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Weiss Associates

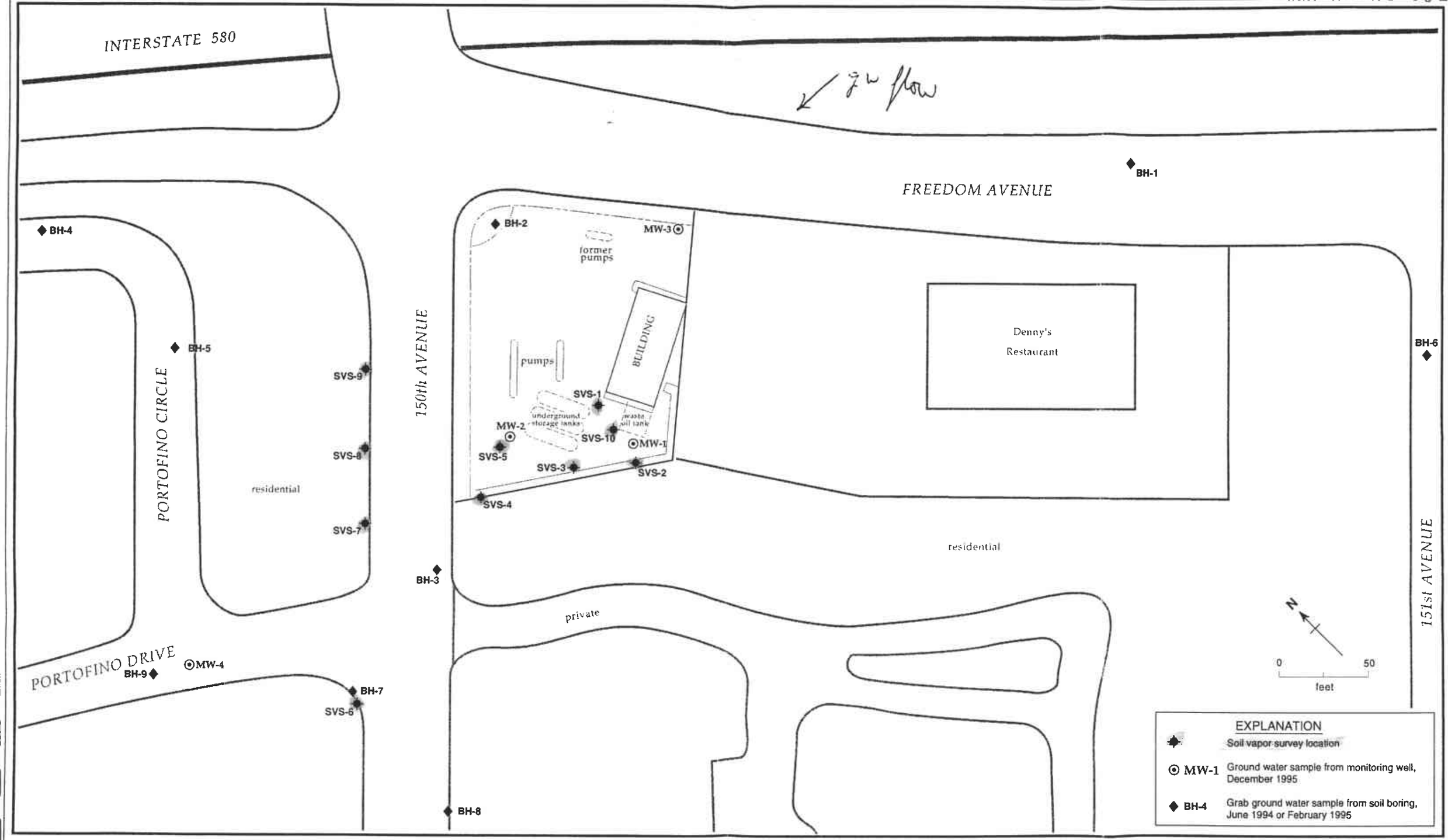

Figure 2. Soil Vapor Survey Boring Locations - Shell Service Station WIC #204-6852-1404, 1784 150th Avenue, San Leandro, California

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Table 1. Analytic Results for Vapor Samples - Shell Service Station WIC #204-6852-1404, 1784 - 150th Avenue, San Leandro, California.

Sample ID	Sample Depth (ft)	B	E	T	X	O_2	CO_2	CH_4
		← parts per billion by volume (ppbv) →				← percent by volume →		
SVS-1	4	37	130	100	390	18	2.1	<0.002
SVS-2	4	50	36	85	150	19	2.8	<0.002
SVS-3	1	410	190	560	660	18	3.8	<0.002
SVS-3	2	130	75	350	220[m]	18	3.0	0.003
SVS-3	3	230	84	420	200[m]	17	5.4	<0.002
SVS-3	8	210	210	190	340	21	0.23	<0.002
SVS-3	18	26	61	170	230	20	0.45	0.004
SVS-4	4	140	160	320	280[m]	15	7.9	<0.002
SVS-5	3	7,600	1,200	4,900	4,500[m]	5.8	23	1.6
SVS-5	13	1,400	55[m]	260	660[m]	21	0.57	0.036
SVS-5dup	13	1,400	96[m]	270	620[m]	N/A	N/A	N/A
SVS-5	20	2,500	300	570	740	20	0.38	0.039
SV-6	4	180[m]	33	180	170[m]	21	0.066	<0.002
SVS-7	4	25	66	21	70	20	0.049	<0.002
SVS-8	5	180	88	190	330	21	0.057	<0.002
SVS-8dup	5	N/A	N/A	N/A	N/A	22	0.057	<0.002
SVS-9	3	21	25	24	230[m]	21	0.058	<0.002
SVS-9	6.5	150[m]	68	72	380	21	0.099	<0.002
SVS-9	13	360	290	180	220	21	0.056	0.003
SVS-9	18	320	49	110	70	21	0.046	<0.002
SVS-10	3	110	100	89	430[m]	19	1.8	<0.002

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Table 1. Analytic Results for Vapor Samples - Shell Service Station WIC #204-6852-1404, 1784 - 150th Avenue, San Leandro, California (continued).

Abbreviations:

B = Benzene by Modified California Air Resources Board Method 410A
E = Ethylbenzene by Modified California Air Resources Board Method 410A
T = Toluene by Modified California Air Resources Board Method 410A
X = Xylenes by Modified California Air Resources Board Method 410A
O_2 = Oxygen by ASTM Method D3416
CO_2 = Carbon dioxide by ASTM Method D3416
CH_4 = Methane by ASTM Method D3416
<n = Not detected at detection limits of n ppbv
m = Reported value may be biased due to apparent matrix interferences
N/A = Duplicate sample not analyzed for these compounds

Notes:

Samples collected on 7/18/96 and 7/19/96 by Weiss Associates and analyzed by Air Toxics, Folsom, California

Table 2. Analytic Results for Soil Samples - Shell Service Station, WIC #204-6852-1404, 1784 - 150th Avenue, San Leandro, California

Sample ID	Depth (feet)	TPH-G	MTBE	B	E	T	X
		← parts per million (mg/kg) →					
SVS-3	16-18	<1.0	<0.025	<0.005	<0.005	<0.005	<0.005
SVS-5	4-6	<1.0	<0.025	<0.005	<0.005	<0.005	<0.005
	8-10	<1.0	<0.025	<0.005	<0.005	<0.005	<0.005
	18-20	1.1	<0.025	<0.005	<0.005	<0.005	<0.005
SVS-9	3-5	<1.0	<0.025	<0.005	<0.005	<0.005	<0.005
	8-10	<1.0	<0.025	<0.005	<0.005	<0.005	<0.005
	16-18	<1.0	<0.025	<0.005	<0.005	<0.005	<0.005

Abbreviations:

TPH-G = Total petroleum hydrocarbons as gasoline by Modified EPA Method 8015
MTBE = Methyl-t-butyl-ether by EPA Method 8020
B = Benzene by EPA Method 8020
E = Ethylbenzene by EPA Method 8020
T = Toluene by EPA Method 8020
X = Total xylenes by EPA Method 8020
<n = Not detected at laboratory reporting limit of n ppm

Notes:

Samples collected on 7/18/96 and 7/19/96 and analyzed by Sequoia Analytical of Redwood City, California.

Table 3. Analytic Results for Soil Samples - Shell Service Station, WIC #204-6852-1404, 1784 - 150th Avenue, San Leandro, California

Sample ID	Depth (feet)	Moisture (%)	pH (pH units)	Particle Size Distribution (<70%)	Dry Bulk Density (gm/cc)	Natural Bulk Density (gm/cc)	Fraction O.C. (%)
SVS-3	4-6	16	9.0	4.87	1.79	2.11	0.31
	16-18	16	8.8	15.89	1.65	2.04	0.13
SVS-5	4-6	24	8.9	4.1	1.37	1.84	1.20
	8-10	24	9.0	1.28	1.42	1.87	1.00
	18-20	14	9.2	5.27	1.69	2.07	0.12
SVS-9	3-5	23	9.0	1.79	1.45	1.90	0.98
	8-10	21	8.9	2.44	1.53	1.95	0.43
	16-18	14	8.7	4.37	1.91	2.22	0.14

Notes:

Moisture Percent by EPA Method 160.3.
pH by EPA Method 9045.
Particle Size Distribution by ASTM Method D422.
Dry Bulk Density by American Petroleum Institute Recommended Procedure-40.
Natural Bulk Density by American Petroleum Institute Recommended Procedure-40.
Samples collected on 7/18/96 and 7/19/96 and analyzed by Sequoia Analytical of Redwood City, California and Core Laboratories of Bakersfield, California.

Abbreviations:

Fraction O.C. = Organic Carbon by Walkey Black Method
gm/cc = grams per cubic centimeter

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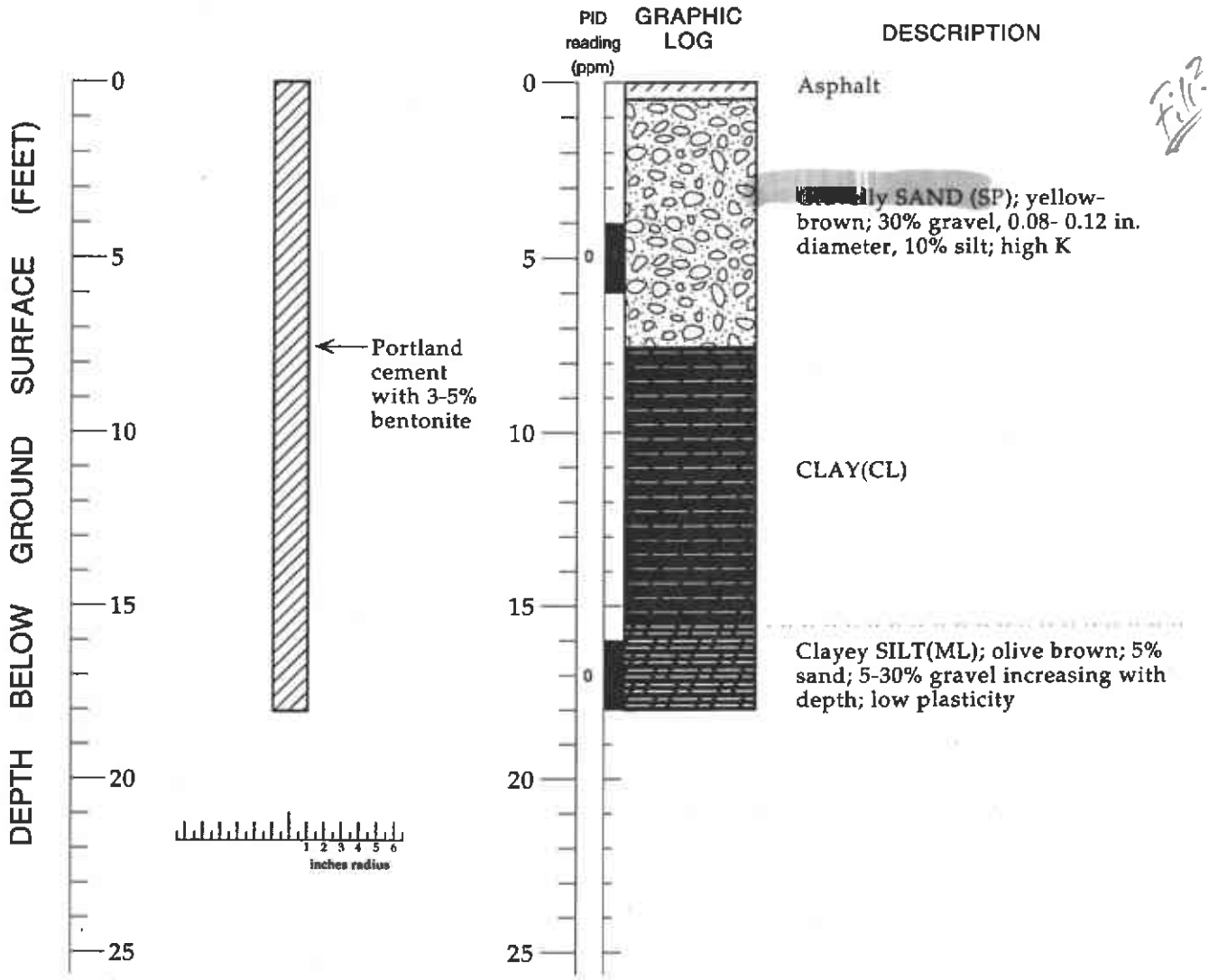
APPENDIX A

LITHOLOGICAL LOGS

LITHOLOGIC LOG SVS-3



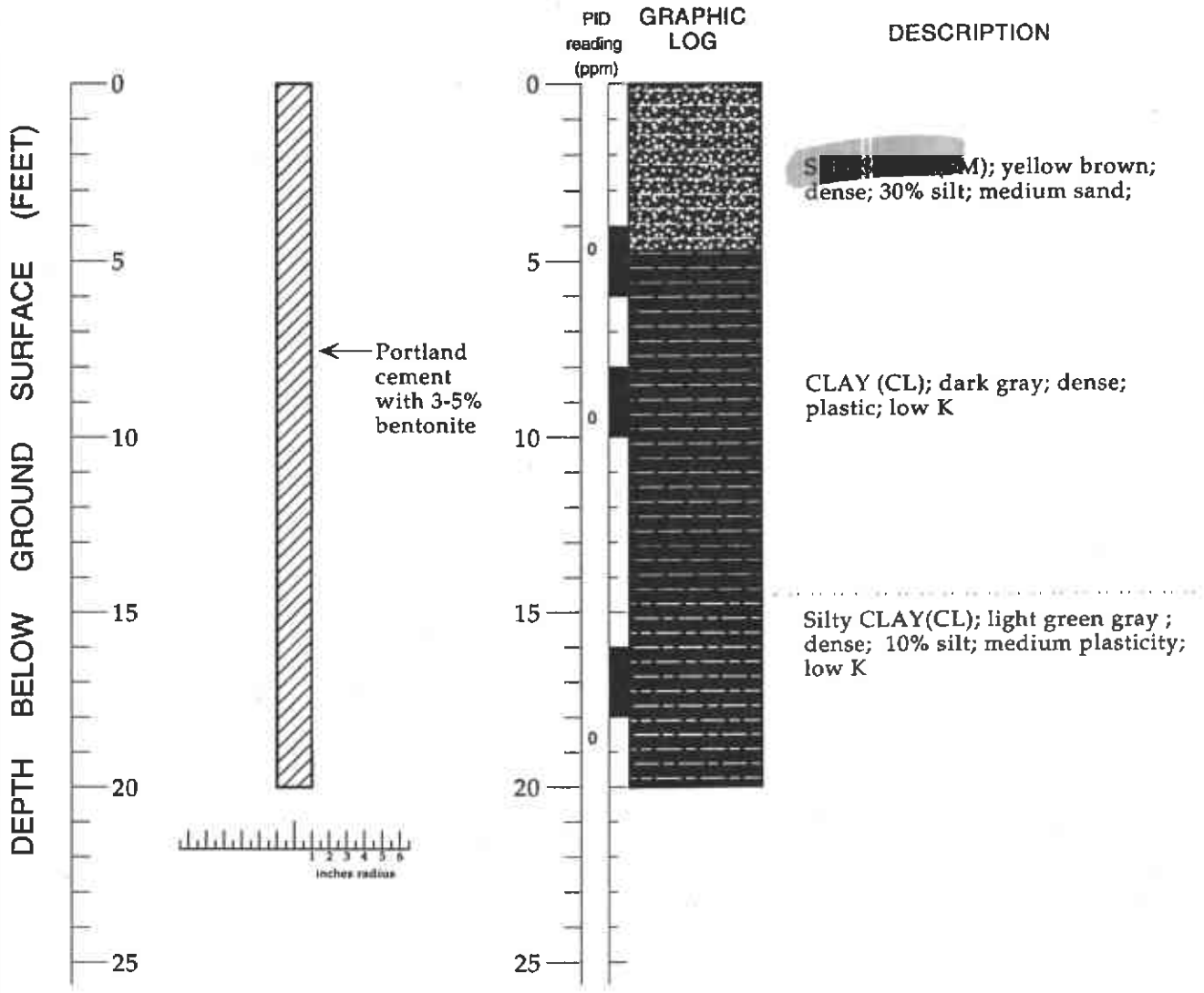
EXPLANATION

- ▼ Water level during drilling (date)
- ▽ Water level (date)
- ——..... Contact (dotted where approximate)
- —?—?— Uncertain contact
- //////// Gradational contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

Logged By: Chuck Headlee
Supervisor: Jim Carmody; CEG 1576
Drilling Company: Interphase Inc.
License Number: C57-485165
Driller: Rick Nessinger
Drilling Method: Geoprobe
Date Drilled: August 18, 1996
Type of Sampler: Geoprobe Sampler
PID: Photoionization detector

Lithographic Log Details - Lithographic Log SVS-3, Shell Service Station WIC# 204-6852-1404, 1784 150th Avenue, San Leandro, California

LITHOLOGIC LOG SVS-5



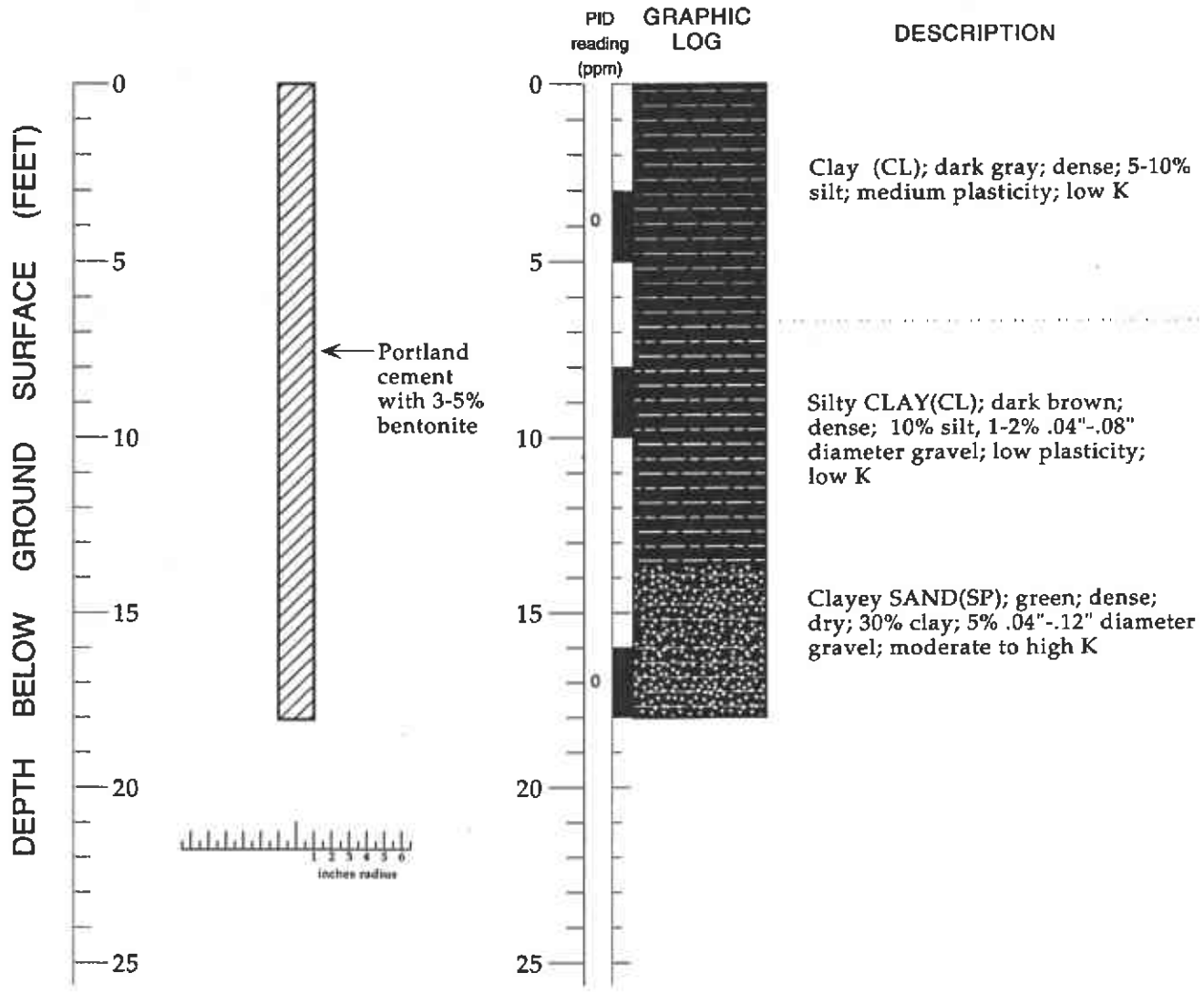
EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approximate)
- Uncertain contact
- Gradational contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

Logged By: Chuck Headlee
Supervisor: Jim Carmody, CEG 1576
Drilling Company: Interphase Inc.
License Number: C57-606481
Driller: Rick Nessinger
Drilling Method: Geoprobe
Date Drilled: August 18, 1996
Type of Sampler: Geoprobe Sampler
PID: Photoionization detector

Lithographic Log Details - Lithographic Log SVS-5, Shell Service Station, WIC#204-6852-1404, 1784 150th Avenue, San Leandro, California

LITHOLOGIC LOG SVS-9



EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approximate)
- Uncertain contact
- Gradational contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

Logged By: Chuck Headlee
Supervisor: Jim Carmody, CEG 1576
Drilling Company: Interphase Inc.
License Number: C57-606481
Driller: Rick Nessinger
Drilling Method: Geoprobe
Date Drilled: July 19, 1996
Type of Sampler: Geoprobe Sampler
PID: Photionization detector

Lithographic Log Details - Lithographic Log SVS-9, Shell Service Station, WIC#204-6852-1404, 1784 150th Avenue San Leandro, California

APPENDIX B

LABORATORY ANALYTICAL AND GEOTECHNICAL RESULTS

AIR TOXICS LTD.

SAMPLE NAME: SVS-1 4'

ID#: 9607243A-01A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072905**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.05**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.016	0.037	0.12
Toluene	0.005	0.019	0.10	0.38
Ethyl Benzene	0.005	0.022	0.13	0.57
Total Xylenes	0.005	0.022	0.39	1.7

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-2 4'

ID#: 9607243A-02A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072906**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.22**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.017	0.050	0.16
Toluene	0.005	0.020	0.085	0.32
Ethyl Benzene	0.005	0.023	0.036	0.16
Total Xylenes	0.005	0.023	0.15	0.66

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 1'

ID#: 9607243A-03A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072907**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**2.05**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.41	1.3
Toluene	0.002	0.008	0.56	2.1
Ethyl Benzene	0.002	0.009	0.19	0.84
Total Xylenes	0.002	0.009	0.66	2.9

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 2'

ID#: 9607243A-04A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072908**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.22**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.017	0.13	0.42
Toluene	0.005	0.020	0.35	1.3
Ethyl Benzene	0.005	0.023	0.075	0.33
Total Xylenes	0.005	0.023	0.22 M	0.97 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 3'

ID#: 9607243A-05A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072909**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.12**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.017	0.23	0.75
Toluene	0.005	0.020	0.42	1.6
Ethyl Benzene	0.005	0.023	0.084	0.37
Total Xylenes	0.005	0.023	0.20 M	0.88 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 8'
ID#: 9607243A-06A

STATE OF CALIFORNIA "LUFT"
(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072910**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.05**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.016	0.21	0.68
Toluene	0.005	0.019	0.19	0.73
Ethyl Benzene	0.005	0.022	0.21	0.93
Total Xylenes	0.005	0.022	0.34 M	1.5 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 18'

ID#: 9607243A-07A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072911**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.05**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.016	0.026	0.084
Toluene	0.005	0.019	0.17	0.65
Ethyl Benzene	0.005	0.022	0.061	0.27
Total Xylenes	0.005	0.022	0.23	1.0

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-4 4'

ID#: 9607243A-08A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072912 **Date of Collection: 7/18/96**

Dil. Factor: 5.22 **Date of Analysis: 7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.017	0.14	0.45
Toluene	0.005	0.020	0.32	1.2
Ethyl Benzene	0.005	0.023	0.16	0.71
Total Xylenes	0.005	0.023	0.28 M	1.2 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 3'

ID#: 9607243A-09A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072913 **Date of Collection: 7/18/96**

Dil. Factor: 53.2 **Date of Analysis: 7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.053	0.17	7.6	25
Toluene	0.053	0.20	4.9	19
Ethyl Benzene	0.053	0.23	1.2	5.3
Total Xylenes	0.053	0.23	4.5 M	20 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 13'

ID#: 9607243A-10A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072914**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.05**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.016	1.4	4.5
Toluene	0.005	0.019	0.26	1.0
Ethyl Benzene	0.005	0.022	0.055 M	0.24 M
Total Xylenes	0.005	0.022	0.66 M	2.9 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 13' Duplicate

ID#: 9607243A-10AA

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072915**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**5.05**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.016	1.4	4.5
Toluene	0.005	0.019	0.27	1.0
Ethyl Benzene	0.005	0.022	0.096 M	0.42 M
Total Xylenes	0.005	0.022	0.62 M	2.7 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 20

ID#: 9607243A-11A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072916 **Date of Collection:** 7/18/96

Dil. Factor: 12.6 **Date of Analysis:** 7/29/96

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.013	0.041	2.5	8.1
Toluene	0.013	0.048	0.57	2.2
Ethyl Benzene	0.013	0.056	0.30	1.3
Total Xylenes	0.013	0.056	0.74	3.3

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-6 4'
ID#: 9607243A-12A

STATE OF CALIFORNIA "LUFT"
(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072917**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**5.22**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.017	0.18 M	0.58 M
Toluene	0.005	0.020	0.18	0.69
Ethyl Benzene	0.005	0.023	0.033	0.14
Total Xylenes	0.005	0.023	0.17 M	0.75 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-7 4'

ID#: 9607243A-13A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072919 **Date of Collection: 7/19/96**

Dil. Factor: 2.09 **Date of Analysis: 7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.025	0.081
Toluene	0.002	0.008	0.021	0.080
Ethyl Benzene	0.002	0.009	0.066	0.29
Total Xylenes	0.002	0.009	0.070	0.31

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-8 5'

ID#: 9607243A-14A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072920**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**2.09**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.18	0.58
Toluene	0.002	0.008	0.19	0.73
Ethyl Benzene	0.002	0.009	0.088	0.39
Total Xylenes	0.002	0.009	0.33 M	1.4 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 3'

ID#: 9607243A-15A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072921**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**2.13**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.021	0.068
Toluene	0.002	0.008	0.024	0.092
Ethyl Benzene	0.002	0.009	0.025	0.11
Total Xylenes	0.002	0.009	0.23 M	1.0 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 6.5'

ID#: 9607243A-16A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072922**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**2.09**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.15 M	0.49 M
Toluene	0.002	0.008	0.072	0.28
Ethyl Benzene	0.002	0.009	0.068	0.30
Total Xylenes	0.002	0.009	0.38	1.7

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 13'

ID#: 9607243A-17A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072924 **Date of Collection: 7/19/96**

Dil. Factor: 5.22 **Date of Analysis: 7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.005	0.017	0.36	1.2
Toluene	0.005	0.020	0.18	0.69
Ethyl Benzene	0.005	0.023	0.29	1.3
Total Xylenes	0.005	0.023	0.22	0.97

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 18'

ID#: 9607243A-18A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072926 **Date of Collection:** 7/19/96

Dil. Factor: 2.09 **Date of Analysis:** 7/29/96

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.32	1.0
Toluene	0.002	0.008	0.11	0.42
Ethyl Benzene	0.002	0.009	0.049	0.22
Total Xylenes	0.002	0.009	0.070	0.31

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-10 3'

ID#: 9607243A-19A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name: 6072927 **Date of Collection: 7/19/96**

Dil. Factor: 2.09 **Date of Analysis: 7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.002	0.007	0.11	0.36
Toluene	0.002	0.008	0.089	0.34
Ethyl Benzene	0.002	0.009	0.10	0.44
Total Xylenes	0.002	0.009	0.43 M	1.9 M

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Method Spike
ID#: 9607243A-20A

STATE OF CALIFORNIA "LUFT"
(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072902**	**Date of Collection:**	**NA**
Dil. Factor:	**1.00**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	% Recovery
Benzene	0.001	0.003	115
Toluene	0.001	0.004	119
Ethyl Benzene	0.001	0.004	125
Total Xylenes	0.001	0.004	114

Container Type: NA

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9607243A-21A

STATE OF CALIFORNIA "LUFT"

(Modified CARB Method 410A - Low Level Aromatics in Air)

GC/PID

File Name:	**6072904**	**Date of Collection:**	**NA**
Dil. Factor:	**1.00**	**Date of Analysis:**	**7/29/96**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.001	0.003	Not Detected	Not Detected
Toluene	0.001	0.004	Not Detected	Not Detected
Ethyl Benzene	0.001	0.004	Not Detected	Not Detected
Total Xylenes	0.001	0.004	Not Detected	Not Detected

Container Type: NA

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX: (916) 985-1020

CHAIN-OF-CUSTODY RECORD

No 007849 Page 1 of ___

Contact Person: Tom Fojut
Company: Weiss Associates
Address: 5500 Shellmound St City: Emeryville State: CA Zip: 94608
Phone: (510) 450-6120 FAX: (510) 547-5043
Collected By: Signature: Chuck Headlee

Project info:
P.O. #:
Project #: 81-0422-007
Project Name:

Turn Around Time:
☑ Normal
☐ Rush ___ Specify

Lab I.D.	Field Sample I.D.	Date & Time	Analyses Requested	Canister Pressure / Vacuum Initial	Final	Receipt
[illegible]1A	SVS-1 4'	7/18/96 1000	BTEX, O_2, CO_2, CH_4	-30	-1	0"Hg
[illegible]2A	SVS-2 4'	7/18/96 1030	BTEX, O_2, CO_2, CH_4	-30	-	1.0"Hg
[illegible]3A	SVS-3 1'	7/18/96 1100	BTEX, O_2, CO_2, CH_4	-30	-	0.5"Hg
[illegible]4A	SVS-3 2'	7/18/96 1105	BTEX, O_2, CO_2, CH_4	-30	-	1.0"Hg
[illegible]5A	SVS-3 3'	7/18/96 1110	BTEX, O_2, CO_2, CH_4	-30	-1	0.5"Hg
[illegible]6A	SVS-3 8'	7/18/96 1200	BTEX, O_2, CO_2, CH_4	-30	-1	0"Hg
[illegible]7A	SVS-3 18'	7/18/96 1250	BTEX, O_2, CO_2, CH_4	-30	-1	0"Hg
[illegible]8A	SVS-4 4'	7/18/96 1415	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
[illegible]9A	SVS-5 3'	7/18/96 1430	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
[illegible]10A	SVS-5 13'	7/18/96 1525	BTEX, O_2, CO_2, CH_4	-30	-1	0"Hg

Relinquished By: (Signature) Date/Time: Chuck Headlee 7/22/96 1600
Print Name: Chuck Headlee
Relinquished By: (Signature) Date/Time
Received By: (Signature) Date/Time
Relinquished By: (Signature) Date/Time
Received By: (Signature) Date/Time: Jodi Remington ATL 7/24/96 1215

Notes:

Lab Use Only	Shipper Name	Air Bill #	Opened By:	Date/Time	Temp. (°C)	Condition	Custody Seals Intact?	Work Order #
	UPS	[illegible]	JD	7/24/96 1215	AMBIENT	GOOD	Yes No (None) N/A	96072431

Form 1293 rev. 06

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX: (916) 985-1020

CHAIN-OF-CUSTODY RECORD

No: 007848

Contact Person: Tom Fojut
Company: Weiss Associates
Address: 5500 Shellmound St City: Emeryville State: CA Zip: 94608
Phone: (510) 450-6120 FAX: (510) 547-5043
Collected By: Signature: Chuck Headlee

Project info:
P.O. #:
Project #: 81-0422-007
Project Name:

Turn Around Time:
☑ Normal
☐ Rush ____ Specify

Lab I.D.	Field Sample I.D.	Date & Time	Analyses Requested	Canister Pressure / Vacuum Initial	Final	Receipt
~~11A~~	SVS-5 20	7/18/96 1545	BTEX, O_2, CO_2, CH_4	-30	-1	0.5"Hg
~~12A~~	SVS-6 4'	7/19/96 0830	BTEX, O_2, CO_2, CH_4	-28	-1	1.0"Hg
13A	SVS-7 4'	7/19/96 0915	BTEX, O_2, CO_2, CH_4	-29	-1	1.0"Hg
14A	SVS-8 5'	7/19/96 0850	BTEX, O_2, CO_2, CH_4	-29	-1	1.0"Hg
15A	SVS-~~9~~9 3'	7/19/96 0950	BTEX, O_2, CO_2, CH_4	-28.5	-1	1.5"Hg
16A	SVS-~~9~~9 6.5'	7/19/96 1030	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
17A	SVS-9 13'	7/19/96 1130	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
18A	SVS-9 18'	7/19/96 1140	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
19A	SVS-10 3'	7/19/96 1300	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
						7/24/96

Relinquished By: (Signature) Date/Time: Chuck Headlee 7/22/96 1600
Print Name: Chuck Headlee
Relinquished By: (Signature) Date/Time
Received By: (Signature) Date/Time
Relinquished By: (Signature) Date/Time
Received By: (Signature) Date/Time: Scott Ameson ATL 7/24/96 1215

Notes:

Lab Use Only	Shipper Name	Air Bill #	Opened By:	Date/Time	Temp. (°C)	Condition	Custody Seals Intact?	Work Order #
	UPS	1Z9633E71102302444	JC	7/24/96 1215	AMBIENT	GOOD	Yes No (None) N/A	9607243

Form 1293 rev. 06

AIR TOXICS LTD.

SAMPLE NAME: SVS-1 4'

ID#: 9607243B-01A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072509**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**2.02**	**Date of Analysis:**	**7/25/96**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.020	18
Methane	0.002	Not Detected
Carbon Dioxide	0.002	2.1

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-2 4'
ID#: 9607243B-02A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072510**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	19
Methane	0.002	Not Detected
Carbon Dioxide	0.002	2.8

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 1'
ID#: 9607243B-03A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072511**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.05**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	18
Methane	0.002	Not Detected
Carbon Dioxide	0.002	3.8

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 2'
ID#: 9607243B-04A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072512**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.12**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	18
Methane	0.002	0.003
Carbon Dioxide	0.002	3.0

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 3'
ID#: 9607243B-05A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072513**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.05**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	17
Methane	0.002	Not Detected
Carbon Dioxide	0.002	5.4

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 8'
ID#: 9607243B-06A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072517**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.02**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.020	21
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.23

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-3 18'
ID#: 9607243B-07A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072518**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.02**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.020	20
Methane	0.002	0.004
Carbon Dioxide	0.002	0.45

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-4 4'
ID#: 9607243B-08A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072519**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	15
Methane	0.002	Not Detected
Carbon Dioxide	0.002	7.9

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 3'
ID#: 9607243B-09A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072520**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**2.13**	**Date of Analysis:**	**7/25/96**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	5.8
Methane	0.002	1.6
Carbon Dioxide	0.002	23

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 13'
ID#: 9607243B-10A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072521**	**Date of Collection: 7/18/96**	
Dil. Factor:	**2.02**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.020	21
Methane	0.002	0.036
Carbon Dioxide	0.002	0.57

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-5 20

ID#: 9607243B-11A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072522**	**Date of Collection:**	**7/18/96**
Dil. Factor:	**2.02**	**Date of Analysis:**	**7/25/96**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.020	20
Methane	0.002	0.039
Carbon Dioxide	0.002	0.38

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-6 4'
ID#: 9607243B-12A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072525**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**2.09**	**Date of Analysis:**	**7/25/96**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	21
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.066

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-7 4'
ID#: 9607243B-13A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072527**	**Date of Collection: 7/19/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	20
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.049

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-8 5'
ID#: 9607243B-14A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072528**	**Date of Collection: 7/19/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	21
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.057

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-8 5' Duplicate
ID#: 9607243B-14AA

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072529**	**Date of Collection: 7/19/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	22
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.057

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 3'
ID#: 9607243B-15A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072530**	**Date of Collection: 7/19/96**	
Dil. Factor:	**2.13**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	21
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.058

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 6.5'
ID#: 9607243B-16A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072534**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**2.09**	**Date of Analysis:**	**7/25/96**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	21
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.099

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 13'
ID#: 9607243B-17A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072535**	**Date of Collection: 7/19/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	21
Methane	0.002	0.003
Carbon Dioxide	0.002	0.056

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-9 18'
ID#: 9607243B-18A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072536**	**Date of Collection:**	**7/19/96**
Dil. Factor:	**2.09**	**Date of Analysis:**	**7/25/96**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	21
Methane	0.002	Not Detected
Carbon Dioxide	0.002	0.046

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: SVS-10 3'
ID#: 9607243B-19A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072537**	**Date of Collection: 7/19/96**	
Dil. Factor:	**2.09**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.021	19
Methane	0.002	Not Detected
Carbon Dioxide	0.002	1.8

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Method Spike
ID#: 9607243B-20A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072538**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	% Recovery
Oxygen	0.010	99
Methane	0.001	99
Carbon Dioxide	0.001	93

Container Type: NA

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank
ID#: 9607243B-21A

Atmospheric Gases by Modified ASTM D-3416
GC/TCD/FID

File Name:	**3072504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/96**	

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.010	Not Detected
Methane	0.001	Not Detected
Carbon Dioxide	0.001	Not Detected

Container Type: NA

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX: (916) 985-1020

CHAIN-OF-CUSTODY RECORD

Nº 007849
Page 1 of ___

Contact Person: Tom Fojut
Company: Weiss Associates
Address: 5500 Shellmound St City: Emeryville State: CA Zip: 94608
Phone: (510) 450-6120 FAX: (510) 547-5043
Collected By: Signature: Chuck Headlee

Project info:
P.O. #:
Project #: 81-0422-007
Project Name:

Turn Around Time:
☑ Normal
☐ Rush ___ Specify

Lab I.D.	Field Sample I.D.	Date & Time	Analyses Requested	Canister Pressure / Vacuum Initial	Final	Receipt
01A	SVS - 1 4'	7/18/96 1000	BTEX, O_2, CO_2, CH_4	-30	-1	~~25~~ "Hg
02A	SVS - 2 4'	7/18/96 1030	BTEX, O_2, CO_2, CH_4	-30	-1	~~0~~ "Hg
03A	SVS - 3 1'	7/18/96 1100	BTEX, O_2, CO_2, CH_4	-30	-1	~~30~~ "Hg
04A	SVS - 3 2'	7/18/96 1105	BTEX, O_2, CO_2, CH_4	-30	-1	~~25~~ "Hg
05A	SVS - 3 3'	7/18/96 1110	BTEX, O_2, CO_2, CH_4	-30	-1	0.5 "Hg
06A	SVS - 3 8'	7/18/96 1200	BTEX, O_2, CO_2, CH_4	-30	-1	0 "Hg
07A	SVS - 3 18'	7/18/96 1250	BTEX, O_2, CO_2, CH_4	-30	-1	0 "Hg
08A	SVS - 4 4'	7/18/96 1415	BTEX, O_2, CO_2, CH_4	-30	-1	1.0 "Hg
09A	SVS - 5 3'	7/18/96 1430	BTEX, O_2, CO_2, CH_4	-30	-1	1.5 "Hg
10A/AA	SVS - 5 13'	7/18/96 1525	BTEX, O_2, CO_2, CH_4	-30	-1	0 "Hg

Relinquished By: (Signature) Date/Time: Chuck Headlee 7/22/96 1600
Print Name: Chuck Headlee
Relinquished By: (Signature) Date/Time:
Received By: (Signature) Date/Time:
Relinquished By: (Signature) Date/Time:
Received By: (Signature) Date/Time: Scott Amerson ATL 7/24/96 1215

Notes:

Lab Use Only	Shipper Name	Air Bill #	Opened By:	Date/Time	Temp. (°C)	Condition	Custody Seals Intact?	Work Order #
	UPS	12 963 307 12 0230 0004	AL	7/24/96 1215	AMBIENT	Good	Yes No (None) N/A	96072432

Form 1293 rev. 06

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX: (916) 985-1020

CHAIN-OF-CUSTODY RECORD

Nº 007848

Contact Person: Tom Fojut
Company: Weiss Associates
Address: 5500 Shellmound St City: Emeryville State: CA Zip: 94608
Phone: (510) 450-6120 FAX: (510) 547-5643
Collected By: Signature: Chuck Headlee

Project info:
P.O. #:
Project #: 81-0422-007
Project Name:

Turn Around Time:
☑ Normal
☐ Rush ____ Specify

Lab I.D.	Field Sample I.D.	Date & Time	Analyses Requested	Canister Pressure / Vacuum Initial	Final	Receipt
11A	SVS-5 20	7/18/96 1545	BTEX, O_2, CO_2, CH_4	-30	-1	0.5"Hg
12A	SVS-6 4'	7/19/96 0830	BTEX, O_2, CO_2, CH_4	-28	-1	1.0"Hg
13A	SVS-7 4'	7/19/96 0915	BTEX, O_2, CO_2, CH_4	-29	-1	1.0"Hg
14A	SVS-8 5'	7/19/96 0850	BTEX, O_2, CO_2, CH_4	-29	-1	1.0"Hg
15A	SVS-9 3'	7/19/96 0950	BTEX, O_2, CO_2, CH_4	-28.5	-1	1.5"Hg
16A	SVS-9 6.5'	7/19/96 1030	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
17A	SVS-9 13'	7/19/96 1130	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
18A	SVS-9 18'	7/19/96 1140	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
19A	SVS-10 3'	7/19/96 1300	BTEX, O_2, CO_2, CH_4	-30	-1	1.0"Hg
						7/24/96

Relinquished By: (Signature) Date/Time: Chuck Headlee 7/22/96 1600
Print Name: Chuck Headlee
Relinquished By: (Signature) Date/Time
Received By: (Signature) Date/Time
Relinquished By: (Signature) Date/Time
Received By: (Signature) Date/Time: Scott Ameuxx ATL 7/24/96 1215

Notes:

Lab Use Only	Shipper Name	Air Bill #	Opened By:	Date/Time	Temp. (°C)	Condition	Custody Seals Intact?	Work Order #
	UPS	1Z9633071202300004	JL	7/24/96 1215	AMBIENT	GOOD	Yes No (None) N/A	960724JB

Form 1293 rev 06

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
5500 Shellmound
Emeryville, CA 94608
Attention: Tom Fojut

Project: Shell 1784 150th Ave, S.Leand

Enclosed are the results from samples received at Sequoia Analytical on July 25, 1996. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE COLLECTED	TEST METHOD
9607E85 -01	SOLID, SVS-3 4-6	07/18/96	Fraction Organic Carbon
9607E85 -01	SOLID, SVS-3 4-6	07/18/96	Moisture, Percent
9607E85 -01	SOLID, SVS-3 4-6	07/18/96	pH
9607E85 -01	SOLID, SVS-3 4-6	07/18/96	PSDSA Particle Size Distri
9607E85 -01	SOLID, SVS-3 4-6	07/18/96	TPGBMS Purgeable TPH/BTEX
9607E85 -01	SOLID, SVS-3 4-6	07/18/96	Bulk Density
9607E85 -02	SOLID, SVS-3 16-18	07/18/96	Fraction Organic Carbon
9607E85 -02	SOLID, SVS-3 16-18	07/18/96	Moisture, Percent
9607E85 -02	SOLID, SVS-3 16-18	07/18/96	pH
9607E85 -02	SOLID, SVS-3 16-18	07/18/96	PSDSA Particle Size Distri
9607E85 -02	SOLID, SVS-3 16-18	07/18/96	TPGBMS Purgeable TPH/BTEX
9607E85 -02	SOLID, SVS-3 16-18	07/18/96	Bulk Density
9607E85 -03	SOLID, SVS-5 4-6	07/18/96	Fraction Organic Carbon
9607E85 -03	SOLID, SVS-5 4-6	07/18/96	Moisture, Percent
9607E85 -03	SOLID, SVS-5 4-6	07/18/96	pH
9607E85 -03	SOLID, SVS-5 4-6	07/18/96	PSDSA Particle Size Distri
9607E85 -03	SOLID, SVS-5 4-6	07/18/96	TPGBMS Purgeable TPH/BTEX
9607E85 -03	SOLID, SVS-5 4-6	07/18/96	Bulk Density
9607E85 -04	SOLID, SVS-5 8-10	07/18/96	Fraction Organic Carbon
9607E85 -04	SOLID, SVS-5 8-10	07/18/96	Moisture, Percent
9607E85 -04	SOLID, SVS-5 8-10	07/18/96	pH

SEQUOIA ANALYTICAL

Sequoia Analytical

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SAMPLE #	SAMPLE DESCRIPTION	DATE COLLECTED	TEST METHOD
[redacted]607E85 -04	SOLID, SVS-5 8-10	07/18/96	PSDSA Particle Size Distri
9607E85 -04	SOLID, SVS-5 8-10	07/18/96	TPGBMS Purgeable TPH/BTEX
[redacted]607E85 -04	SOLID, SVS-5 8-10	07/18/96	Bulk Density
[redacted]607E85 -05	SOLID, SVS-5 18-20	07/18/96	Fraction Organic Carbon
[redacted]607E85 -05	SOLID, SVS-5 18-20	07/18/96	Moisture, Percent
[redacted]607E85 -05	SOLID, SVS-5 18-20	07/18/96	pH
9607E85 -05	SOLID, SVS-5 18-20	07/18/96	PSDSA Particle Size Distri
[redacted]607E85 -05	SOLID, SVS-5 18-20	07/18/96	TPGBMS Purgeable TPH/BTEX
9607E85 -05	SOLID, SVS-5 18-20	07/18/96	Bulk Density
[redacted]607E85 -06	SOLID, SVS-9 3-5	07/19/96	Fraction Organic Carbon
9607E85 -06	SOLID, SVS-9 3-5	07/19/96	Moisture, Percent
[redacted]607E85 -06	SOLID, SVS-9 3-5	07/19/96	pH
9607E85 -06	SOLID, SVS-9 3-5	07/19/96	PSDSA Particle Size Distri
[redacted]607E85 -06	SOLID, SVS-9 3-5	07/19/96	TPGBMS Purgeable TPH/BTEX
[redacted]607E85 -06	SOLID, SVS-9 3-5	07/19/96	Bulk Density
[redacted]607E85 -07	SOLID, SVS-9 8-10	07/19/96	Fraction Organic Carbon
[redacted]607E85 -07	SOLID, SVS-9 8-10	07/19/96	Moisture, Percent
9607E85 -07	SOLID, SVS-9 8-10	07/19/96	pH
[redacted]607E85 -07	SOLID, SVS-9 8-10	07/19/96	PSDSA Particle Size Distri
9607E85 -07	SOLID, SVS-9 8-10	07/19/96	TPGBMS Purgeable TPH/BTEX
[redacted]607E85 -07	SOLID, SVS-9 8-10	07/19/96	Bulk Density
9607E85 -08	SOLID, SVS-9 16-18	07/19/96	Fraction Organic Carbon
[redacted]607E85 -08	SOLID, SVS-9 16-18	07/19/96	Moisture, Percent
9607E85 -08	SOLID, SVS-9 16-18	07/19/96	pH
[redacted]607E85 -08	SOLID, SVS-9 16-18	07/19/96	PSDSA Particle Size Distri

SEQUOIA ANALYTICAL

Sequoia Analytical

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SAMPLE #	SAMPLE DESCRIPTION	DATE COLLECTED	TEST METHOD
9607E85 -08	SOLID, SVS-9 16-18	07/19/96	TPGBMS Purgeable TPH/BTEX
9607E85 -08	SOLID, SVS-9 16-18	07/19/96	Bulk Density

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Mike Gregory
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
6500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand

Lab Proj. ID: 9607E85

Sampled: 07/18/96
Received: 07/25/96
Analyzed: see below

Reported: 08/08/96

LABORATORY ANALYSIS

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9607E85-01				
Sample Desc : **SOLID,SVS-3 4-6**				
Bulk Density	mg/L			Attached
Fraction Organic Carbon	%	07/30/96	0.029	0.31
Moisture, Percent	%	07/29/96	1.0	16
pH	pH Units	07/26/96	N/A	9.0
Lab No: 9607E85-02				
Sample Desc : **SOLID,SVS-3 16-18**				
Bulk Density	mg/L			Attached
Fraction Organic Carbon	%	07/30/96	0.033	0.13
Moisture, Percent	%	07/29/96	1.0	16
pH	pH Units	07/26/96	N/A	8.8
Lab No: 9607E85-03				
Sample Desc : **SOLID,SVS-5 4-6**				
Bulk Density	mg/L			Attached
Fraction Organic Carbon	%	07/30/96	0.10	1.2
Moisture, Percent	%	07/29/96	1.0	24
pH	pH Units	07/26/96	N/A	8.9
Lab No: 9607E85-04				
Sample Desc : **SOLID,SVS-5 8-10**				
Bulk Density	mg/L			Attached
Fraction Organic Carbon	%	07/30/96	0.10	1.0
Moisture, Percent	%	07/29/96	1.0	24
pH	pH Units	07/26/96	N/A	9.0

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Lab Proj. ID: 9607E85

Sampled: 07/18/96
Received: 07/25/96
Analyzed: see below

Attention: Tom Fojut

Reported: 08/08/96

LABORATORY ANALYSIS

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9607E85-05				
Sample Desc : **SOLID,SVS-5 18-20**				
Bulk Density	**mg/L**			**Attached**
Fraction Organic Carbon	**%**	**07/30/96**	**0.025**	**0.12**
Moisture, Percent	**%**	**07/29/96**	**1.0**	**14**
pH	**pH Units**	**07/26/96**	**N/A**	**9.2**

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
[illegible]500 Shellmound
[illegible]meryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand

Lab Proj. ID: 9607E85

Sampled: 07/19/96
Received: 07/25/96
Analyzed: see below

Reported: 08/08/96

LABORATORY ANALYSIS

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9607E85-06				
Sample Desc : **SOLID,SVS-9 3-5**				
Bulk Density	**mg/L**			**Attached**
Fraction Organic Carbon	**%**	**07/30/96**	**0.10**	**0.98**
Moisture, Percent	**%**	**07/29/96**	**1.0**	**23**
pH	**pH Units**	**07/26/96**	**N/A**	**9.0**
Lab No: 9607E85-07				
Sample Desc : **SOLID,SVS-9 8-10**				
Bulk Density	**mg/L**			**Attached**
Fraction Organic Carbon	**%**	**07/30/96**	**0.050**	**0.43**
Moisture, Percent	**%**	**07/29/96**	**1.0**	**21**
pH	**pH Units**	**07/26/96**	**N/A**	**8.9**
Lab No: 9607E85-08				
Sample Desc : **SOLID,SVS-9 16-18**				
Bulk Density	**mg/L**			**Attached**
Fraction Organic Carbon	**%**	**07/30/96**	**0.029**	**0.14**
Moisture, Percent	**%**	**07/29/96**	**1.0**	**14**
pH	**pH Units**	**07/26/96**	**N/A**	**8.7**

[illegible]alytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

[illegible]ke Gregory
[illegible]oject Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-3 4-6
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-01

Sampled: 07/18/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
4	22.79	19.71
6	13.61	11.77
8	13.39	11.58
12	21.55	18.64
16	2.88	2.49
20	7.26	6.28
30	6.03	5.22
40	3.18	2.75
50	3.20	2.77
70	1.25	1.08
pan	4.87	4.21

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/18/96
6500 Shellmound	Sample Descript: SVS-3 4-6	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-01	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	88

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-3 16-18
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-02

Sampled: 07/18/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
4	2.37	1.62
6	8.16	5.58
8	12.37	8.64
12	19.49	13.33
16	3.98	2.72
20	8.99	6.15
30	7.66	5.24
40	5.20	3.56
50	13.24	9.06
70	2.66	1.82
pan	15.89	10.87

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/18/96
5500 Shellmound	Sample Descript: SVS-3 16-18	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-02	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	84

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
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Weiss Associates
6500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-5 4-6
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-03

Sampled: 07/18/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080206D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
4	34.40	45.59
6	21.84	28.94
8	12.39	16.42
12	11.09	14.70
16	2.47	3.27
20	3.77	4.99
30	4.19	5.56
40	1.95	2.58
50	2.51	3.33
70	1.29	1.71
pan	4.10	5.43

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

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Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-5 4-6
Matrix: SOLID
Analysis Method: 8015Mod/8020
Lab Number: 9607E85-03

Sampled: 07/18/96
Received: 07/25/96
Extracted: 07/26/96
Analyzed: 07/27/96
Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	86

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

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Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-5 8-10
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-04

Sampled: 07/18/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
[illegible]	57.78	45.30
[illegible]	14.36	11.26
8	8.69	6.82
12	6.68	5.24
16	2.10	1.65
20	3.90	3.06
30	2.60	2.04
40	0.92	0.72
50	1.20	0.94
70	0.47	0.37
Pan	1.28	1.00

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
6500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-9 3-5
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-06

Sampled: 07/19/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
4	61.01	76.71
6	12.45	15.65
8	7.17	9.01
12	6.74	8.47
16	1.54	1.93
20	2.75	3.46
30	2.70	3.39
40	1.39	1.75
50	1.58	1.99
70	0.89	1.12
pan	1.79	2.25

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

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Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/18/96
5500 Shellmound	Sample Descript: SVS-5 18-20	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-05	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	**1.0**	**1.1**
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		**C6-C12**

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	88

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-5 18-20
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-05

Sampled: 07/18/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
[illegible]	23.57	26.67
5	15.74	17.81
8	12.46	14.10
12	15.61	17.66
16	2.57	2.91
20	5.67	6.42
30	8.39	9.49
40	3.46	3.91
50	5.66	6.41
70	1.61	1.82
pan	5.27	5.96

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/18/96
5500 Shellmound	Sample Descript: SVS-5 8-10	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-04	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	82

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/19/96
6500 Shellmound	Sample Descript: SVS-9 3-5	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-06	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	91

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-9 8-10
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-07

Sampled: 07/19/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
4	67.98	91.02
6	8.09	10.83
8	6.06	8.12
12	5.70	7.63
16	1.30	1.74
20	2.52	3.38
30	2.38	3.19
40	1.26	1.69
50	1.46	1.96
70	0.79	1.06
pan	2.44	3.27

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

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Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/19/96
5500 Shellmound	Sample Descript: SVS-9 8-10	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-07	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	88

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

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Weiss Associates
5500 Shellmound
Emeryville, CA 94608

Attention: Tom Fojut

Client Proj. ID: Shell 1784 150th Ave, S.Leand
Sample Descript: SVS-9 16-18
Matrix: SOLID
Analysis Method: D422
Lab Number: 9607E85-08

Sampled: 07/19/96
Received: 07/25/96

Analyzed: 08/02/96
Reported: 08/08/96

QC Batch Number: IN080296D42200A

Particle Size Distribution

Sieve Number	% Distribution	Weight Retained (g)
4	38.56	42.94
6	10.94	12.18
8	8.32	9.26
12	11.44	12.47
16	2.06	2.29
20	5.89	6.56
30	7.99	8.90
40	2.31	2.57
50	5.42	6.04
70	2.69	3.00
pan	4.37	4.87

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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Weiss Associates	Client Proj. ID: Shell 1784 150th Ave, S.Leand	Sampled: 07/19/96
5500 Shellmound	Sample Descript: SVS-9 16-18	Received: 07/25/96
Emeryville, CA 94608	Matrix: SOLID	Extracted: 07/26/96
	Analysis Method: 8015Mod/8020	Analyzed: 07/27/96
Attention: Tom Fojut	Lab Number: 9607E85-08	Reported: 08/08/96

QC Batch Number: GC072696BTEXEXB
Instrument ID: GCHP18

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX and MTBE

Analyte	Detection Limit mg/Kg	Sample Results mg/Kg
TPPH as Gas	1.0	N.D.
Methyl t-Butyl Ether	0.025	N.D.
Benzene	0.0050	N.D.
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	N.D.
Xylenes (Total)	0.0050	N.D.
Chromatogram Pattern:		

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	87

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Mike Gregory
Project Manager

Sequoia Analytical

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Weiss & Associates	Client Project ID:	Shell 1784 150th Ave., S. Leand.	
5500 Shellmound	Matrix:	Solid	
Emeryville, CA 94608			
Attention: Tom Fojut	Work Order #:	9607E85 -01 - 08	Reported: Aug 7, 1996

QUALITY CONTROL DATA REPORT

Analyte:	pH	Total Solids	Fractional Organic Carbon
QC Batch:	IN072696904500A	IN072995160300A	IN073096WALK00A
Analy. Method:	EPA 9045	EPA 160.3	Walkey-Black
Prep Method:	N.A.	N.A.	N.A.
Analyst:	J. Clark	N. Le	J. Clark
Duplicate Sample #:	9607F02-01	9607E85-08	9607E85-06
Prepared Date:	7/26/96	7/29/96	7/30/96
Analyzed Date:	7/26/96	7/29/96	7/30/96
Instrument I.D.#:	MANUAL	MANUAL	MANUAL
Sample Concentration:	8.4	86	0.98
Dup. Sample Concentration:	8.3	86	0.98
RPD:	1.2	0.0	0.0
RPD Limit:	0-20	0-20	0-20

SEQUOIA ANALYTICAL

Mike Gregory
Project Manager

** RPD = Relative % Difference

Sequoia Analytical

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Weiss & Associates	Client Project ID:	Shell 1784 150th Ave., S. Leand.	
5500 Shellmound	Matrix:	Solid	
Emeryville, CA 94608			
Attention: Tom Fojut	Work Order #:	9607E85 -01 - 08	Reported: Aug 7, 1996

QUALITY CONTROL DATA REPORT

Analyte:	Benzene	Toluene	Ethyl Benzene	Xylenes
QC Batch#:	GC072696BTEXEXB	GC072696BTEXEXB	GC072696BTEXEXB	GC072696BTEXEXB
Analy. Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Prep. Method:	EPA 5030	EPA 5030	EPA 5030	EPA 5030
Analyst:	M. Otte	M. Otte	M. Otte	M. Otte
MS/MSD #:	G9607C96-02	G9607C96-02	G9607C96-02	G9607C96-02
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Prepared Date:	7/26/96	7/26/96	7/26/96	7/26/96
Analyzed Date:	7/26/96	7/26/96	7/26/96	7/26/96
Instrument I.D.#:	GCHP1	GCHP1	GCHP1	GCHP1
Conc. Spiked:	0.20 mg/kg	0.20 mg/kg	0.20 mg/kg	0.60 mg/kg
Result:	0.16	0.15	0.15	0.47
MS % Recovery:	80	75	75	78
Dup. Result:	0.15	0.15	0.12	0.47
MSD % Recov.:	75	75	60	78
RPD:	6.5	0.0	22	0.0
RPD Limit:	0-25	0-25	0-25	0-25

LCS #:	GBLK072696BS	GBLK072696BS	GBLK072696BS	GBLK072696BS
Prepared Date:	7/26/96	7/26/96	7/26/96	7/26/96
Analyzed Date:	7/26/96	7/26/96	7/26/96	7/26/96
Instrument I.D.#:	GCHP1	GCHP1	GCHP1	GCHP1
Conc. Spiked:	0.20 mg/kg	0.20 mg/kg	0.20 mg/kg	0.60 mg/kg
LCS Result:	0.20	0.18	0.18	0.54
LCS % Recov.:	100	90	90	90
MS/MSD	60-140	60-140	60-140	60-140
LCS	70-130	70-130	70-130	70-130
Control Limits				

SEQUOIA ANALYTICAL

Mike Gregory
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

** MS = Matrix Spike, MSD = MS Duplicate, RPD = Relative % Difference

CORE LABORATORIES

GEOTECHNICAL ANALYSIS RESULTS

SEQUOIA ANALYTICAL
SA PROJECT NO. 9607E85

CL FILE 57111-096211

PERFORMED BY:
CORE LABORATORIES
3430 UNICORN ROAD
BAKERSFIELD, CA 93308
(805) 392-8600

FINAL REPORT PRESENTED
AUGUST 6, 1996

CORELAB

ENVIRONMENTAL TESTING SERVICES

Sequoia Analytical
SA Work Order : 9607E85

CL File No. 57111-96211

Geotechnical Analysis Results

Sample ID	Bulk Density		Description
	Dry gm/cc	Natural gm/cc	
SVS-3 4-6'	1.79	2.11	Clay dk gry vf-pbl sand v silty
SVS-3 16-18'	1.65	2.04	Sand gry vfgr v silty v clay
SVS-5 4-6'	1.37	1.84	Clay dk gry v silty
SVS-5 8-10'	1.42	1.87	Clay dk gry v silty
SVS-5 18-20'	1.69	2.07	Silt gry vfgr sand v clay
SVS-9 3-5'	1.45	1.90	Clay dk gry v silty
SVS-9 8-10'	1.53	1.95	Clay gry vf-vcgr sand v silty
SVS-9 16-18'	1.91	2.22	Silt gry vf-mgr sand v clay

Analyses were performed as described in API RP-40, API Recommended Practice for Core-Analysis Procedure, 1960.

SHELL OIL COMPANY
RETAIL ENVIRONMENTAL ENGINEERING - WEST

CHAIN OF CUSTODY RECORD
Serial No: _____

Date: 7/24/96
Page 1 of 1

Site Address: 1784 150th Avenue, San Leandro

WIC#: 204-6852-1404

Shell Engineer: J. Granberry
Phone No.: (510) 675-6168
Fax #: 510/675-6172

Consultant Name & Address: WEISS ASSOCIATES
5500 SHELLMOUND ST EMERYVILLE CA 94608

Consultant Contact: Tom Fojut
Phone No.: (510) 450-6000
Fax #: 547-5043

WA JOB # 81-0422-007

Comments:

Sampled by: Chuck Headlee

Printed Name: Chuck Headlee

LAB: Sequoia

CHECK ONE (1) BOX ONLY	CT/DT
G.W. Monitoring	☐ 4461
Site Investigation	☑ 4441
Soil Classify/Disposal	☐ 4442
Water Classify/Disposal	☐ 4443
Soil/Air Rem. or Sys. O & M	☐ 4452
Water Rem. or Sys. O & M	☐ 4453
Other	☐

TURN AROUND TIME
24 hours ☐
48 hours ☐
15 days ☑ (Normal)
Other ☐ ____

NOTE: Notify Lab as soon as Possible of 24/48 hrs. TAT.

UST AGENCY: Alameda County

Analysis Required

Sample ID	Date	Sludge	Soil	Water	Air	No. of conts.	TPH (EPA 8015 Mod. Gas)	TPH (EPA 8015 Mod. Diesel)	BTEX (EPA 8020/602)	Volatile Organics (EPA 8240)	Test for Disposal	Combination TPH 8015 & BTEX 8020 + MTBE	Fraction organic carbon, pH, grain size distribution, moisture content, bulk density	Asbestos	Container Size	Preparation Used	Composite Y/N	MATERIAL DESCRIPTION	SAMPLE CONDITION/ COMMENTS
SVS-3 4'-6'	7/18/96		X			1						X	X						
SVS-3 16'-18'	7/18/96		X			1						X	X						
SVS-5 4'-6'	7/18/96		X			1						X	X						
SVS-5 8'-10'	7/18/96		X			1						X	X						
SVS-5 18'-20'	7/18/96		X			1						X	X						
SVS-9 3'-5'	7/19/96		X			1						X	X						
SVS-9 8'-10'	7/19/96		X			1						X	X						
SVS-9 16'-18'	7/19/96		X			1						X	X						

Relinquished By (signature): Chuck Headlee	Printed Name: Chuck Headlee	Date: 7/25/96 Time: 1200	Received (signature):	Printed Name:	Date: 7/25/96 Time: 1200
Relinquished By (signature):	Printed Name:	Date: Time:	Received (signature):	Printed Name:	Date: Time:
Relinquished By (signature):	Printed Name:	Date: Time:	Received (signature):	Printed Name: SCOT ROSS	Date: 7-25-96 Time: 1520

THE LABORATORY MUST PROVIDE A COPY OF THIS CHAIN-OF-CUSTODY WITH INVOICE AND RESULTS

Rev. 1/12/93

Shell Oil Chn. of Custody

APPENDIX C

INTERPHASE SOIL GAS SURVEY REPORT AND STANDARD OPERATING PROCEDURES

July 23, 1996

INTERPHASE
ENVIRONMENTAL CHEMISTRY SPECIALISTS

WEISS ASSOCIATES
5500 Shellmound Street
Emeryville, California 94608
Attention: Mr. Tom Fojut

SOIL GAS SURVEY RESULTS
Shell Service Station
Emeryville, California
InterPhase Project #: 9634 **(WIC # 204-6852-1404)**

Dear Mr. Fojut:

InterPhase is pleased to submit the results of the soil gas survey conducted at the Shell Service Station located at 1784 150th Avenue in ~~Emeryville~~, California on July 18 & 19, 1996. Our analytical services and data package have been completed in accordance with InterPhase's Standard Operating Procedures, which are based on the Los Angeles Regional Water Quality Control Board (LARWQCB) guidelines for active soil gas investigations under the Well Investigation Program (WIP).

Included in the submittals are the Quality Control Summary Sheets, the Data Summary Results Table and copies of the field sheets which document the raw analytical results, the complete analyte list and the practical quantitation limit (PQL) for each compound in each analysis.

Nineteen soil gas samples and one duplicate soil gas sample were collected and analyzed for this project. Vapor sampling depths ranged from 1 to 20 feet below ground surface (BGS). Five of the target analytes for this soil gas survey were detected in excess of their PQL in one or more samples analyzed. The detected analytes included methylene chloride (CH_2Cl_2), chloroform ($CHCl_3$), tetrachloroethene (PCE), vinyl chloride and total volatile hydrocarbons (TVH) in the C_4 to C_{10} range. The Data Summary Results Table presents these compounds and the concentrations at which they were detected. Measurements of uncertainty in the analytical results are presented in the Quality Control Summary Sheets.

Additionally, InterPhase personnel collected seven soil samples at this site. Sampling depths ranged from 4 to 20 feet BGS. Soil samples were given to Weiss Associates on-site representative.

If you have any questions regarding the results, please call me at (800) 457-3300. We appreciate the opportunity to have worked with you on this project and look forward to working with you in the future.

Sincerely,
InterPhase Environmental, Inc.

Scott A. Norris
Senior Chemist

Enclosures

11558 SORRENTO VALLEY ROAD
SAN DIEGO · CA 92121
619·481·2200 800·457·3300
FAX 619·481·1855

SOIL GAS SAMPLE RESULTS SUMMARY

SITE NAME: Shell Service Station, San Leandro, California (Project 9634)
LAB NAME: InterPhase Environmental, Inc.
DATE: July 18, 1996

Sample ID:	SVS-1	SVS-2	SVS-3	SVS-3	SVS-3	SVS-3	SVS-3	SVS-4	SVS-5	SVS-5	SVS-5 duplicate	SVS-5
Sampling Depth (ft):	4	4	1	2	3	8	18	4	3	13	13	20
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
methylene chloride (CH_2Cl_2)	ND	ND	*1.4 B*	ND	ND	*1.4 B*	ND	3.9	ND	ND	ND	ND
chloroform ($CHCl_3$)	ND	ND	0.020	ND	ND	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene (PCE)	ND	0.010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	ND	4.9	1.2	1.4	ND	ND	1.8	ND	ND	ND	ND
TVH (C_4-C_{10})	ND	ND	43	ND	22	ND	ND	ND	ND	ND	ND	ND

µg/L: micrograms per liter
Note: undetected compounds not listed
B: below calibration range
ND: not detected above Practicle Quantitation Limit

Why do these data not reflect those soil vapor samples collected in Summa canisters for lab analysis?
(Ex: TVH results for all SVS-5 samples)

SOIL GAS SAMPLE RESULTS SUMMARY

SITE NAME: Shell Service Station, San Leandro, California (Project 9634)
LAB NAME: InterPhase Environmental, Inc.
DATE: July 19, 1996

Sample ID:	SVS-6	SVS-8	SVS-7	SVS-9	SVS-9	SVS-9	SVS-9	SVS-10
Sampling Depth (ft):	4	5	4	3	6.5	13	18	3
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
methylene chloride (CH_2Cl_2)	ND	ND	ND	ND	ND	ND	ND	1.6
chloroform ($CHCl_3$)	ND	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND
TVH (C_4-C_{10})	ND	ND	ND	ND	ND	ND	ND	ND

µg/L: micrograms per liter
Note: undetected compounds not listed
B : below calibration range
ND: not detected above Practicle Quantitation Limit

QUALITY CONTROL SUMMARY

Date : July 18, 1996
Project # : 9634
Chemist : David Hinton
Machine ID: Phase 9
Supply Source: Chem Service

				MID-POINT CALIBRATION CHECK						LCS					
				Calibration Information and Detector Response						Laboratory Control Sample					
		COLUMN	STDconc	Injection 1			mean		ACC	Actual					ACC
	DETECTOR	TYPE/SERIAL #	µg/L	µL	area	rf	rf	% Dif	RGE	µg/L	µL	area	rf	% Dif	RGE
CFC-11	ECD	DB-624/1213537	0.05	200	173053	17305	16410	5%	25%	0.04212	200	144517	17155	5%	30%
CH_2Cl_2	ECD	DB-624/1213537	22.06	200	137385	31	33	7%	15%	20.42	200	132299	32	3%	20%
1,1-DCA	ECD	DB-624/1213537	25.43	200	102531	20	19	8%	15%	20.675	200	66497	16	14%	20%
$CHCl_3$	ECD	DB-624/1213537	0.49	200	211406	2157	2374	9%	15%	0.3946	200	183610	2327	2%	20%
1,1,1-TCA	ECD	DB-624/1213537	0.0765	200	197622	12916	13940	7%	15%	0.0631	200	170236	13489	3%	20%
CCl_4	ECD	DB-624/1213537	0.0157	200	125201	39873	43101	7%	15%	0.01265	200	101152	39997	7%	20%
1,2-DCA	ECD	DB-624/1213537	20.61	200	128119	31	30	3%	15%	22.03	200	113731	26	14%	20%
TCE	ECD	DB-624/1213537	0.439	200	456387	5198	4653	12%	15%	0.34685	200	310313	4473	4%	20%
1,1,2-TCA	ECD	DB-624/1213537	5.52	200	299495	271	260	4%	15%	5.37	200	239188	223	14%	20%
PCE	ECD	DB-624/1213537	0.113	200	548747	24281	21422	13%	15%	0.09975	200	388062	19452	9%	20%
1,1-DCE	PID	DB1/5762234	27.5	200	550276	100	111	10%	15%	18.025	200	417419	116	5%	20%
t-1,2-DCE	PID	DB1/5762234	23.05	200	1041533	226	257	12%	15%	14.94	200	640257	214	17%	20%
c-1,2-DCE	PID	DB1/5762234	26.28	200	620936	118	130	9%	15%	17.545	200	404053	115	11%	20%
benzene	PID	DB1/5762234	14.33	200	667233	233	254	8%	15%	9.5	200	440064	232	9%	20%
TCE	PID	DB1/5762234	20.41	200	573212	140	138	1%	15%	14.945	200	357705	120	14%	20%
toluene	PID	DB1/5762234	18.38	200	853366	232	233	0%	15%	12.125	200	583815	241	3%	20%
PCE	PID	DB1/5762234	28.11	200	598910	107	98	9%	15%	21.295	200	374580	88	10%	20%
ethylbenzene	PID	DB1/5762234	19.6	200	786859	201	183	10%	15%	13.735	200	475730	173	6%	20%
m,p-xylenes	PID	DB1/5762234	21.38	200	1053756	246	232	6%	15%	14.87	200	606106	204	12%	20%
o-xylene	PID	DB1/5762234	21.37	200	839260	196	188	5%	15%	15.1	200	546989	181	3%	20%
vinyl chloride	PID	DB1/5762234	25	150	304316	81	87	7%	25%	50	200	752341	75	14%	30%
hexane	FID	DB1/5762234	343	300	55193	0.54	0.56	4%	15%	646	200	79244	0.61	10%	20%

µg/L: micrograms per liter

rf: response factor

STDconc : standard concentration

QUALITY CONTROL SUMMARY

Date : July 19, 1996
Project # : 9634
Chemist : David Hinton
Machine ID: Phase 9
Supply Source: Chem Service

				MID-POINT CALIBRATION CHECK						LCS					
				Calibration Information and Detector Response						Laboratory Control Sample					
		COLUMN	STDconc	Injection 1			mean		ACC	Actual					ACC
	DETECTOR	TYPE/SERIAL #	µg/L	µL	area	rf	rf	% Dif	RGE	µg/L	µL	area	rf	% Dif	RGE
CFC-11	ECD	DB-624/1213537	0.05	250	196688	15735	16410	4%	25%	0.04212	200	135795	16120	2%	30%
CH_2Cl_2	ECD	DB-624/1213537	22.06	250	196404	36	33	6%	15%	20.42	200	137746	34	1%	20%
1,1-DCA	ECD	DB-624/1213537	25.43	150	69012	18	19	3%	15%	20.675	200	67252	16	13%	20%
$CHCl_3$	ECD	DB-624/1213537	0.49	250	276974	2261	2374	5%	15%	0.3946	200	172425	2185	8%	20%
1,1,1-TCA	ECD	DB-624/1213537	0.0765	250	250503	13098	13940	6%	15%	0.0631	200	161917	12830	8%	20%
CCl_4	ECD	DB-624/1213537	0.0157	250	155535	39627	43101	8%	15%	0.01265	200	96321	38087	12%	20%
1,2-DCA	ECD	DB-624/1213537	20.61	250	157875	31	30	2%	15%	22.03	200	116801	27	12%	20%
TCE	ECD	DB-624/1213537	0.439	250	549952	5011	4653	8%	15%	0.34685	200	343189	4947	6%	20%
1,1,2-TCA	ECD	DB-624/1213537	5.52	250	335656	243	260	6%	15%	5.37	200	237753	221	15%	20%
PCE	ECD	DB-624/1213537	0.113	250	681504	24124	21422	13%	15%	0.09975	200	410349	20569	4%	20%
1,1-DCE	PID	DB1/5762234	27.5	200	543513	99	111	11%	15%	18.025	200	352935	98	12%	20%
t-1,2-DCE	PID	DB1/5762234	23.05	200	1051315	228	257	11%	15%	14.94	200	706941	237	8%	20%
c-1,2-DCE	PID	DB1/5762234	26.28	200	607302	116	130	11%	15%	17.545	200	439208	125	3%	20%
benzene	PID	DB1/5762234	14.33	200	638179	223	254	12%	15%	9.5	200	481169	253	0%	20%
TCE	PID	DB1/5762234	20.41	200	513755	126	138	9%	15%	14.945	200	389763	130	6%	20%
toluene	PID	DB1/5762234	18.38	200	774158	211	233	9%	15%	12.125	200	589310	243	4%	20%
PCE	PID	DB1/5762234	28.11	200	502955	89	98	8%	15%	21.295	200	399140	94	4%	20%
ethylbenzene	PID	DB1/5762234	19.6	200	695616	177	183	3%	15%	13.735	200	559240	204	11%	20%
m,p-xylenes	PID	DB1/5762234	21.38	200	878195	205	232	11%	15%	14.87	200	713527	240	3%	20%
o-xylene	PID	DB1/5762234	21.37	200	782386	183	188	2%	15%	15.1	200	558654	185	1%	20%
vinyl chloride	PID	DB1/5762234	25	150	312102	83	87	5%	25%	50	200	741747	74	15%	30%
hexane	FID	DB1/5762234	343	200	42607	0.62	0.56	11%	15%	646	200	76401	0.59	6%	20%

µg/L: micrograms per liter

rf: response factor

STDconc : standard concentration

FIELD SHEET / RAW DATA

DRAFT

DATE: 7-18-96

PROJECT #: 9634

CHEMIST: DAVID HINTON

ON SITE: 0730

LUNCH: 0

DEPART: 1830

Sample(#/ft)	Star file Name	Time Samp	Time Inj	Evac. Volume (ml or L)	InjVol (uL)	Dil	CFC-11 Retention Time 2.0	CFC-11 Area	CFC-11 Conc. (µg/L)	CH_2Cl_2 Retention Time 2.629	CH_2Cl_2 Area	CH_2Cl_2 Conc. (µg/L)
Ambient Air	012	0934	0934	—	300	—			<.01			<1
System Sryng.	013	0950	0950	—	300	—			<.01			<1
SVS-1-4'	014	1003	1003	90	300	—			<.01			<1
SVS-2-4'	015	1040	1040	90	300	—			<.01			<1
SVS-3-1'	016	1112	1112	45	300	—			<.01	2.492	14277	1.4 B
SVS-3-2'	017	1134	1134	45	300	—			<.01			<1
SVS-3-3'	018	1157	1157	45	300	—			<.01			<1
SVS-3-8'	019	1216	1216	135	300	—			<.01	2.524	13907	1.4 B
SVS-3-15'	020	1252	1252	270	300	—			<.01			<1
SVS-4-4'	021	1416	1416	90	300	—			<.01	2536	38732	3.9
SVS-5-3'	022	1441	1441	45	300	—			<.01			<1
~~SVS-5-13'~~	023	~~1532~~	~~1532~~	~~225~~	300	—		Power Fail	—	—	—	—
~~Dup~~ SVS-5-13'	024	1544	1544	~~225~~	300	—			<.01			<1
Dup SVS-5-13'	025	1559	1559	—	300	—			<.01			<1
SVS-5-20'	026	1614	1614	315	300	—			<.01			<1
System Sryng	027	1722	1722	—	300	—			<.01			<1
Ambient Air	028	1733	1733	—	~~300~~	—			<.01			<1

JSJ 7/22/96

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	11-DCA. Retention Time 3.117	11-DCA. Area	11-DCA. Conc. (µg/L)	$CHCl_3$ Retention Time 3.805	$CHCl_3$ Area	$CHCl_3$ Conc. (µg/L)	111-TCA Retention Time 3.986	111-TCA Area	111-TCA Conc. (µg/L)	CCl_4 Retention Time 4.135	CCl_4 Area	CCl_4 Conc. (µg/L)	12-DCA Retention Time 4.326	12-DCA Area	12-DCA Conc. (µg/L)
A. A			<.01			<.01			<.01			<.01			<.01
S.S.B			<.01			<.01			<.01			<.01			<.01
SVS-1-4'			<.01			<.01			<.01			<.01			<.01
SVS-2-4'			<.01			<.01			<.01			<.01			<.01
SVS-3-1'			<.01	3.881	~~14344~~	102			<.01			<.01			<.01
SVS-3-2'			<.01			<.01			<.01			<.01			<.01
SVS-3-3'			<.01			<.01			<.01			<.01			<.01
SVS-3-8'			<.01			<.01			<.01			<.01			<.01
SVS-3-18'			<.01			<.01			<.01			<.01			<.01
SVS-4-4'			<.01			<.01			<.01			<.01			<.01
SVS-5-3'			<.01			<.01			<.01			<.01			<.01
SVS-5-13'			<.01			<.01			<.01			<.01			<.01
DUP → SVS-5-13'			<.01			<.01			<.01			<.01			<.01
SVS-5-20'			<.01			<.01			<.01			<.01			<.01
SS B			<.01			<.01			<.01			<.01			<.01
A. A			<.01			<.01			<.01			<.01			<.01

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	TCE Retention Time 4.976	TCE Area	TCE Conc. (µg/L)	112-TCA Retention Time 6.943	112-TCA Area	112-TCA Conc. (µg/L)	PCE Retention Time 7.032	PCE Area	PCE Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)
A. A			<.01			<.01			<.01						
S.S.B			<.01			<.01			<.01						
SVS-1-4'			<.01			<.01			<.01						
SVS-2-4'			<.01			<.01	7.113	64512	~~Srot~~ 0.010	5/4/22					
SVS-3-1'			<.01			<.01			<.01						
SVS-3-2'			<.01			<.01			<.01						
SVS-3-3'			<.01			<.01			<.01						
SVS-3-8'			<.01			<.01			<.01						
SVS-3-14'			<.01			<.01			<.01						
SVS-4-4'			<.01			<.01			<.01						
SVS-5-3'			<.01			<.01			<.01						
SVS-5-8'			<.01			<.01			<.01						
Dup SVS-5-13'			<.01			<.01			<.01						
SVS-5-20'			<.01			<.01			<.01						
S.S.B			<.01			<.01			<.01						
A. A			<.01			<.01			<.01						

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	Star File Name	InjVol (µL)	Dil	1.768 vinyl chloride Retention Time	vinyl chloride Area	vinyl chloride Conc. (µg/L)	chloroethane Retention Time	chloroethane Area	chloroethane Conc. (µg/L)	2.498 11-DCE Retention Time	11-DCE Area	11-DCE Conc. (µg/L)	t-12-DCE Retention Time	t-12-DCE Area	t-12-DCE Conc. (µg/L)
Ambient Air	012	500	–			<1			<1			<1			<1
System Surging	013	500	–			<1			<1			<1			<1
SVS-1-4'	014	500	–			<1			<1			<1			<1
SVS-2-4'	015	500	–			<1			<1			<1			<1
SVS-3-1'	016	500	–	1.794	213553	4.9			<1			<1			<1
SVS-3-2'	017	500	–	1.794	52000	1.2			<1			<1			<1
SVS-3-3'	018	500	–	1.789	59551	1.4			<1			<1			<1
SVS-3-8'	019	500	–			<1			<1			<1			<1
SVS-3-18'	020	500	–	1.924	5537	1.2	<1		<1			<1			<1
SVS-4-4'	021	500	–	1.762	77392	1.8			<1			<1			<1
SVS-5-3'	022	500	–			<1			<1			<1			<1
SVS-5-13'	024	500	–			<1			<1			<1			<1
Dup SVS-5-13'	025	500	–			<1			<1			<1			<1
SVS-5-20'	026	500	–			<1			<1			<1			<1
S.S.B	027	500	–			<1			<1			<1			<1
A.A	028	500	–			<1			<1			<1			<1

Not Integrated (<1 or)

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	c-12-DCE Retention Time 3.291	c-12-DCE Area	c-12-DCE Conc. (µg/L)	benzene Retention Time 4.130	benzene Area	benzene Conc. (µg/L)	toluene Retention Time 5.825	toluene Area	toluene Conc. (µg/L)	ethylbenzene Retention Time 7.493	ethylbenzene Area	ethylbenzene Conc. (µg/L)	m,p-xylenes Retention Time 7.645	m,p-xylenes Area	m,p-xylenes Conc. (µg/L)
A.A			<1			<1			<1			<1			<1
S.S.B			<1			<1			<1			<1			<1
SVS-1-4'			<1			<1			<1			<1			<1
SVS-2-4'			<1			<1			<1			<1			<1
SVS-3-1'			<1			<1			<1			<1			<1
SVS-3-2'			<1			<1			<1			<1			<1
SVS-3-3'			<1			<1			<1			<1			<1
SVS-3-8'			<1			<1			<1			<1			<1
SVS-3-18'			<1			<1			<1			<1			<1
SVS-4-4'			<1			<1			<1			<1			<1
SVS-5-3'			<1			<1			<1			<1			<1
SVS-5-13'			<1			<1			<1			<1			<1
Dup SVS-5-13'			<1			<1			<1			<1			<1
SVS-5-20'			<1			<1			<1			<1			<1
S.S.B			<1			<1			<1			<1			<1
A.A			<1			<1			<1			<1			<1

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	o-xylene Retention Time	o-xylene Area (9.065)	o-xylene Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)
A.A			<1									
S.S.B			<1									
SVS-1-4'			<1									
SVS-2-4'			<1									
SVS-3-1'			<1									
SVS-3-2'			<1									
SVS-3-3'			<1									
SVS-3-8'			<1									
SVS-3-18'			<1									
SVS-4-4'			<1									
SVS-5-3'			<1									
SVS-5-13'			<1									
Dup SVS-5-13'			<1									
SVS-5-20'			<1									
S.S.B			<1									
A.A			<1									

RF = 0.56

FIELD SHEET / RAW DATA
DRAFT

	Sample(#/ft)	Star File Name	InjVol (µL)	Dil	TVH 3.217 Retention Time	TVH 3.217 Area	TVH 3.217 Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)
✓	A.A	014	500	—			<10									
	S.S.B	—	—	—	—	—	—									
✓	SVS-1-4'	017	500	—			<10									
✓	SVS-2-4'	018	500	—			<10									
✓	SVS-3-1'	019	500	—	1.0-1.2	12058	43	✓								
✓	SVS-3-2'	020	500	—			<10									
✓	SVS-3-3'	021	500	—	1.0-1.3	6283	22	✓								
✓	SVS-3-8'	022	500	—			<10									
✓	SVS-3-18'	023	500	—			<10									
✓	SVS-4-4'	024	500	—			<10									
✓	SVS-5-3'	025	500	—			<10									
✓	SVS-5-13'	026	500	—			<10									
Dup ✓	SVS-5-13'	027	500	—			<10									
	SVS-5-20'	029	500	—			<10									
	S.S.B	—	—	—	—	—	—									
	A.A	031	500	—			<10									

FIELD SHEET / RAW DATA
DRAFT

DATE: 7-9-96

PROJECT #: 9634

CHEMIST: Darrell Hamlin

ON SITE: 0530

LUNCH: 0

DEPART: 1530

Sample(#/ft)	Star file Name	Time Samp	Time Inj	Evac. Volume (ml or L)	InjVol (uL)	Dil	CFC-11 Retention Time (1.997)	CFC-11 Area	CFC-11 Conc. (µg/L)	CH_2Cl_2 Retention Time (2.624)	CH_2Cl_2 Area	CH_2Cl_2 Conc. (µg/L)
Ambient Air	039	0740	0740	—	300	—			<.01			<1
System Service	040	0754	0754	—	300	—			<.01			<1
SVS-6-4'	041	0833	0833	90	300	—			<.01			<1
SVS-8-5'	042	0854	0854	90	300	—			<.01			<1
SVS-7-4'	043	0916	0916	90	300	—			<.01			<1
SVS-9-3'	044	959	959	45	300	—			<.01			<1
SVS-9-6.5'	045	1029	1029	135	300	—			<.01			<1
SVS-9-13'	046	1124	1124	225	300	—			<.01			<1
SVS-9-18'	048	1149	1149	270	300	—			<.01			<1
SVS-10-3'	049	1313	1313	45	300	—			<.01	2.648	16344	1.6
System Service	050	1328	1328	—	300	—			<.01			<1
Ambient Air	051	1340	1340	—	300	—			<.01			<1

JW 7/22/96

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	11-DCA Retention Time	11-DCA Area	11-DCA Conc. (µg/L)	$CHCl_3$ Retention Time	$CHCl_3$ Area	$CHCl_3$ Conc. (µg/L)	111-TCA Retention Time	111-TCA Area	111-TCA Conc. (µg/L)	CCl_4 Retention Time	CCl_4 Area	CCl_4 Conc. (µg/L)	12-DCA Retention Time	12-DCA Area	12-DCA Conc. (µg/L)
	3.112			3.8			3.581			4.13			4.32		
A.A			<.01			<.01			<.01			<.01			<.01
S.S.B			<.01			<.01			<.01			<.01			<.01
SVS-6-4'			<.01			<.01			<.01			<.01			<.01
SVS-8-5'			<.01			<.01			<.01			<.01			<.01
SVS-7-4'			<.01			<.01			<.01			<.01			<.01
SVS-9-3'			<.01			<.01			<.01			<.01			<.01
SVS-9-6.5'			<.01			<.01			<.01			<.01			<.01
SVS-9-13'			<.01			<.01			<.01			<.01			<.01
SVS-9-18'			<.01			<.01			<.01			<.01			<.01
SVS-10-3'			<.01			<.01			<.01			<.01			<.01
S.S.B			<.01			<.01			<.01			<.01			<.01
A.A			<.01			<.01			<.01			<.01			<.01

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	TCE Retention Time 4.92	TCE Area	TCE Conc. (µg/L)	112-TCA Retention Time 6.834	112-TCA Area	112-TCA Conc. (µg/L)	PCE Retention Time 7.027	PCE Area	PCE Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)
A.A			<.01			<.01			<.01						
S.S.13			<.01			<.01			<.01						
SVS-6-4'			<.01			<.01			<.01						
SVS-8-5'			<.01			<.01			<.01						
SVS-7-4'			<.01			<.01			<.01						
SVS-9-3'			<.01			<.01			<.01						
SVS-9-6.5'			<.01			<.01			<.01						
SVS-9-13'			<.01			<.01			<.01						
SVS-9-18"			<.01			<.01			<.01						
SVS-10-3'			<.01			<.01			<.01						
S.S.13			<.01			<.01			<.01						
A.A			<.01			<.01			<.01						

FIELD SHEET / RAW DATA

DRAFT

	Sample(#/ft)	Star File Name	InjVol (µL)	Dil	vinyl chloride Retention Time 1.817	vinyl chloride Area	vinyl chloride Conc. (µg/L)	chloroethane Retention Time	chloroethane Area	chloroethane Conc. (µg/L)	11-DCE Retention Time 2.515	11-DCE Area	11-DCE Conc. (µg/L)	t-12-DCE Retention Time 2.898	t-12-DCE Area	t-12-DCE Conc. (µg/L)
✓	A.A	039	500	—			<1						<1			<1
✓	S.S.B	040	500	—			<1						<1			<1
✓	SVS-6-4'	041	500	—			<1						<1			<1
✓	SVS-8-5'	042	500	—			<1						<1			<1
✓	SVS-7-4'	043	500	—			<1						<1			<1
✓	SVS-9-3'	044	500	—			<1						<1			<1
✓	SVS-9-6.5'	045	500	—			<1						<1			<1
✓	SVS-9-13'	047	500	—			<1						<1			<1
✓	SVS-9-18'	048	500	—			<1						<1			<1
✓	SVS-10-3'	049	500	—			<1						<1			<1
✓	S.S.B	050	500	—			<1						<1			<1
✓	A.A	051	500	—			<1						<1			<1

FIELD SHEET / RAW DATA

DRAFT

Sample(#/ft)	c-12-DCE Retention Time 3.317	Area	Conc. (µg/L)	benzene Retention Time 4.166	Area	Conc. (µg/L)	5.882 toluene Retention Time ~~4.745~~	Area	Conc. (µg/L)	7.566 ethylbenzene Retention Time ~~5.882~~	Area	Conc. (µg/L)	m,p-xylenes Retention Time 7.718	Area	Conc. (µg/L)
A.A			<1			<1			<1			<1			<1
S.S.13			<1			<1			<1			<1			<1
SVS-6-4'			<1			<1			<1			<1			<1
SVS-8-5'			<1			<1			<1			<1			<1
SVS-7-4'			<1			<1			<1			<1			<1
SVS-9-3'			<1			<1			<1			<1			<1
SVS-9-6.5'			<1			<1			<1			<1			<1
SVS-9-13'			<1			<1			<1			<1			<1
SVS-9-18'			<1			<1			<1			<1			<1
SVS-10-3'			<1			<1			<1			<1			<1
S.S.B			<1			<1			<1			<1			<1
A.A			<1			<1			<1			<1			<1

FIELD SHEET / RAW DATA
DRAFT

Sample(#/ft)	o-xylene Retention Time	o-xylene Area (8.144)	o-xylene Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)
A.A			<1									
S.S.13			<1									
SVS-6-4'			<1									
SVS-8-5'			<1									
SVS-7-4'			<1									
SVS-9-3'			<1									
SVS-9-6.5'			<1									
SVS-9-13'			<1									
SVS-9-18'			<1									
SVS-10-3'			<1									
S.S.B			<1									
A.A			<1									

RF = 0.56

FIELD SHEET / RAW DATA
DRAFT

Sample(#/ft)	Star File Name	InjVol (µL)	Dil	TVH Retention Time	TVH 2,851 Area	TVH Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)	Retention Time	Area	Conc. (µg/L)
✓ A.A	052	500	—			<10									
S.S.B	—	—	—	—	—	—									
✓ SVS-6-4'	053	500	—			<10									
✓ SVS-8-5'	054	500	—			<10									
✓ SVS-7-4'	055	500	—			<10									
✓ SVS-9-3'	056	500	—			<10									
✓ SVS-9-6.5'	057	500	—			<10									
SVS-9-13'	058	500	—			<10									
✓ SVS-9-18'	059	500	—			<10									
~ SVS-10-3'	060	500	—			<10									
✓ S.S.B	~~060~~	~~500~~	—	—	—	~~<10~~	LD								
✓ A.A	062	500	—			<10									

STANDARD OPERATING PROCEDURES FOR THE COLLECTION AND ANALYSIS OF SOIL GAS SAMPLES

Equipment/Instrumentation

InterPhase operates a mobile sampling and analytical van which is capable of collecting soil gas and ambient air samples. Real-time chemical analyses of soil gas and air samples are performed for indicator compounds (analytes) selected for each project site. Field equipment and sampling systems used by InterPhase are as follows:

* Modified one-ton Ford E350 van;
* Two gasoline-powered AC generators;
* Van-mounted hydraulic driving/hammering system designed to install or remove sampling probes;
* 100 feet of percussion drill steel in 3-foot probe sections;
* Oilless air pump and evacuation chamber for collecting exact volumes of soil gas at atmospheric pressure;

Analytical instrumentation and chemical supplies include the following:

* Varian 3400, Hewlett-Packard 5890 and SRI 8610 gas chromatographs;
* 486 PC-based data management and GC integration systems;
* A combination of ECD (electron capture), FID (flame ionization), PID (photoionization), and TCD (thermal conductivity) detectors;
* UHP grade compressed analytical gases (nitrogen, helium, hydrogen);
* Analytical vapor and methanolic standards for priority pollutants, gaseous hydrocarbons and fixed/biogenic gases;
* High resolution megabore, capillary, and packed gas chromatographic columns;
* Fittings, tools, plumbing and syringes required for normal GC operation.

Sampling Procedures

Soil gas samples are collected at designated depths by filling a sampling syringe from a length of polyethylene tubing installed within the bore of 1" OD percussion drill steel sampling probes. An unbroken length of 1/4 " polyethylene tubing is connected via a threaded adapter the deepest probe. Probes are driven into the ground by a vehicle-mounted hydraulic hammer which loads the probe with the weight of the vehicle. Pre-designated sampling depths are reached by coupling the

three foot sections of probe. Discrete volumes of gas are removed by 60 ml syringe to purge the tubing of atmospheric air and to allow subsurface air to enter. The volume of gas removed is determined by the volume of tubing employed and results of purge volume tests. Unlike groundwater sampling, purging of a soil gas probe is designed to remove only the ambient air in the system.

A minimum sampling depth of 3 to 5 feet below ground surface (bgs) is recommended in areas where bare soil is the surface cover in an effort to minimize sample dilution with atmospheric air. Soil gas samples may be collected at depths less than 3 feet bgs to assess the accumulation of vapors under a surface cover such as asphalt or concrete. Comparing contaminant concentrations and fixed/biogenic gas composition as a function of purge volume may be performed at the beginning of a survey. Purge volume experiments may be conducted in an area where subsurface contamination is expected to be greatest and are designed to assess optimal purge times and potential sample dilution with atmospheric air. done?

As the pressure within the sampling system reaches atmospheric, a 10 cc vapor sample is collected in a glass syringe by inserting the needle through the wall of the tubing. In order to minimize the possibility of cross-contamination among sampling locations; dedicated lengths of polyethylene tubing and drive points are used for each sampling location, and non-dispensable tools are baked in an oven at 80 degrees C for 10 minutes.

Two ambient air samples are collected over the course of each day and analyzed for background concentrations of the target compounds. All components of the sampling system are checked for contamination prior to sampling at the beginning of the day by drawing atmospheric air or nitrogen gas through the system, subjecting it to GC analysis, and comparing the resulting chromatogram with that of ambient air or UHP nitrogen. Steel sampling components are cleaned using steam or pressurized water and detergent (Alconox) at the conclusion of each day.

As part of the sampling procedure, probe locations are recorded on the field sampling sheets. In addition, field data forms (and chain-of-custody forms, if necessary) are used to record observations regarding vapor sampling and probe installation. These field data forms may include, but are not limited to, sample identification, sampling depth, time of sample collection and analysis, volume of soil gas extracted, and observations of soil characteristics.

Confirmatory soil vapor samples are collected by connecting dedicated sections of polyethylene tubing to an evacuated canister. Gas canisters are normally transferred under chain-of-custody procedures to a commercial laboratory where they are analyzed according to the specified methods. The percentage of duplicates submitted for laboratory analysis is dependent on project objectives and

regulatory specifications. InterPhase recommends that duplicates be collected at 5% of the sampling points.

InterPhase scientists have conducted field experiments to estimate the capture zone around the end of the soil gas sampling probe in order to demonstrate that vapor samples are not diluted with atmospheric air. Capture zone estimates were calculated for sandy soils and for silty or clayey soils as follows:

Sampling Depth: 6 feet

Volume of sampling probe: 15 cm^3/3-foot length

Purge Volume: 60 cm^3 (Approximately 2 probe volumes)

Air porosity of sandy soils: 30% = 0.3

Air porosity of silt or clay soils: 20% = 0.2

Volume of soil gas collected from sandy materials:

60 cm^3/0.3 = 200 cm^3

Volume of soil gas collected from silty or clayey materials:

60 cm^3/0.2 = 300 cm^3

Assuming isotropic vapor flow, the volume of soil gas collected may be described as a sphere with the origin at the tip of the soil gas probe. Therefore,

$$(4/3)(pi)(r^3) = 200\ cm^3 \text{ (sand)}$$
$$r = 3.6\ cm$$

$$(4/3)(pi)(r^3) = 300\ cm^3 \text{ (silt/clay)}$$
$$r = 4.1\ cm.$$

The purge volume of 60 cm^3 ensures that two volumes of the sampling apparatus are evacuated (2 probe lengths x 15 cm^3 = 30 cm^3). The calculated radius of influence is substantially less than the distance to ground surface (182.9 cm), thus minimizing the potential for sample dilution with atmospheric air.

Analytical Procedures

The 10 cc soil gas samples are subsampled and analyzed within 30 minutes of collection in order to preserve the integrity of the vapor sample. Duplicates may be analyzed approximately every twenty samples by gas chromatography for documentation of reproducibility. Analytes are identified by their respective elution times through the selected columns and detectors. Retention or elution times are compared with external standards injected in a gaseous, organic, or

aqueous phase. Analyte separation for compounds detected by the FID (e.g. petroleum hydrocarbons and ketones) is performed using a 30 m x 0.53 mm DB-624 or DB-1 megabore capillary column (J&W Scientific). Analyte separation for compounds detected by the ECD (e.g. halogenated aliphatics) is performed by using a 30 m x 0.53 mm DB-624 or DB-1 megabore capillary column (J&W Scientific). Identification of vinyl chloride and alkyl benzenes may be performed using the aforementioned capillary columns and a PID. Analyte separation for compounds detected by the TCD is performed by using either a molecular sieve or CTR-1 2 m stainless steel packed columns (Alltech Associates), ranging in diameter from 0.64 to 0.32 cm. Difficulties associated with peak separation are minimized by the use of low viscosity carrier gases, compound-specific detectors, megabore capillary columns, and method-specific temperature programs.

Analyte concentrations are estimated by comparing the detector response for a known concentration or mass of the external standard with the detector response for the sample. Multi-point calibration curves are computer-generated by plotting the detector response for external standards against a range of analyte concentrations. The detector response is checked at the beginning and end of each day during a survey to ensure that the calibration curves are accurate. Analyte detection limits are determined by the response factor for each day.

Although preliminary results are often available in the field, all chromatograms generated during a soil gas survey are subsequently reviewed by another chemist to ensure that computer identification and quantification of analytes are correct. The InterPhase van operates directly under the supervision of a degreed project chemist.

The following procedures are employed during all soil gas surveys:

* High-volume sampling and subsampling syringes are decontaminated by washing with a mild detergent and drying at a minimum temperature of 90 degrees Celsius;

* Microliter syringes (used for sample injection onto the GC column) are solvent rinsed, purged with an inert gas, and checked for contamination by immediate injection into the appropriate gas chromatograph;

* External standards are either commercially-prepared EPA chemical standards or mixtures of commercially-prepared gases;

* Detector response to analytes is documented over a 10 to 50-fold range in mass or concentration and compared to the theoretical responses in order to check the linearity of the detector response to analytes;

* Septa on the GC column injectors are replaced daily to minimize the possibility of carrier gas leaks (only UHP gases are used for chromatography); and

* All analytical data (e.g., chromatograms, calibration curves, integration reports) are stored on a computer floppy disk or hard copy, transmitted to the InterPhase office, and reviewed by a second chemist.

In the unlikely event that chromatograph sensitivity is affected by electrical surges or vibration, resulting changes are immediately observed by continuously monitoring the baseline voltage for all detectors. It should be noted that the analytical instruments are powered by a generator system which is completely separate from that running either the hydraulic/pneumatic equipment or the motor vehicle.

Determination of Detection Limits

Limits of detection for quantitative analysis are determined by the following factors:
1) Analytical Method
2) Specific Analyte
3) Instrumentation (detector)
4) Injection Size

Practical quantitation limits (PQLs) are tabulated in the results describing analyte concentrations. PQLs are defined by the precision of a detector's response to an analyte over the range of mass the detector is calibrated for the selected method.

Data Interpretation

Vapor-phase diffusion is the prevailing mechanism by which soil gas analytes are transported in the subsurface. The presence of an analyte in soil gas is a function of the phase, location and concentration of the source, physical properties of the analyte, and the media through which transport occurs. The site-specific variability among soil properties profoundly affect vapor-phase diffusion and must be considered in the interpretation of analyte distribution in the soil gas. Among these soil properties are: soil moisture, soil particle size and distribution, and air-filled porosity. Anomalies in the spatial distribution (vertically or laterally) of analyte concentrations in soil gas samples will be noted. InterPhase provides an interpretive report upon request of the client.

Although isoconcentration contours of soil gas data can be plotted on site maps, it should be emphasized that these isotherms are only representative of the

contaminant distribution in soil vapor. Isoconcentration contours for compounds in soil or groundwater may differ in extent and orientation from those delineated in soil gas. Inherent assumptions that are infrequently discussed in preparing soil gas isotherms are:

* Soil gas concentration data are adequate to describe the spatial distribution of contaminants underlying the site;

* Vertical anisotropy is either insignificant or can be described by existing site data;

* Vapor barriers that may impede the gaseous diffusion of analytes are either nonexistent or do not vary over the investigation site; and

* Soil texture, water content, and air-filled porosity are spatially uniform over the site.

Standard Operating Procedures Prepared for the California Regional Water Quality Control Board (CRWQCB) Well Investigation Program (WIP)

SCOPE OF THE METHOD

This document describes a procedure for the analysis of volatile organic compounds (VOCs) in soil gas. The method is based on EPA Method TO-14 (The Determination of VOCs in Ambient Air Using Summa Passivated Canister Sampling & Gas Chromatographic Analysis) with modifications for the collection of subsurface rather than above-ground air. This method describes the procedures for analyzing samples collected with glass syringes at ambient atmospheric pressures. Soil gas surveys are performed by collecting vapor samples from probes installed within a specified area and analyzing these samples on-site using laboratory grade, multi-detector gas chromatographs (GC). The primary objective of soil gas surveys is the real-time collection of semi-quantitative and qualitative data regarding the presence and spatial distribution of subsurface contamination.

SYSTEM DESCRIPTION

The analytical system is comprised of traditional stationary laboratory grade gas chromatographs configured with capillary and packed columns and a combination of compound-selective detectors. The three gas chromatographs employed in the analysis of soil gas and ambient air include Varian 3400, Hewlett-Packard 5890a, and SRI 8610 instruments. A total of five detectors are used for vapor and air analyses. These detectors include electron capture (ECD), electrolytic conductivity (ELCD or Hall), photoionization (PID), flame ionization (FID), and thermal conductivity (TCD).

Analyte separation for compounds detected by the FID (e.g. petroleum hydrocarbons and ketones) is performed using a 30 m x 0.53 mm DB-1 or DB-624 megabore capillary column (J&W Scientific). Analyte separation for compounds detected by the ECD and ELCD (e.g., halogenated hydrocarbons) is performed by using a 30 m x 0.53 mm DB-624 or DB-1 megabore capillary column (J&W Scientific). Analyte separation of vinyl chloride and alkylbenzenes is performed using a 30 m x 0.53 mm DB-1 megabore capillary column (J&W Scientific), quantification is by PID. Analyte separation for compounds detected by the TCD is performed by using a molecular sieve/porous polymer CTR-1, 2 m stainless steel packed column (Alltech Associates) with diameters of 0.64 and 0.32 cm.

Samples are introduced into the instruments by direct injection in volumes ranging from 25 µL to 1000 µL; aliquots are injected within 30 minutes of collection in order to preserve the integrity of the sample. Once introduced into the injector, samples are transported by carrier gas (i.e., the mobile phase) at a rate of 4 to 30 cm^3/min; makeup gas flow rates designed to maximize detector responses are adjusted according to manufacturer's instructions. Detector response is integrated by a data processing software system loaded on an IBM-compatible 486DX personal computer.

Only UHP helium, hydrogen, and nitrogen are used as carrier and make-up gases. Air required by the FID is filtered through a drierite/silica gel and 5Å molecular sieve in order to remove moisture and organic impurities.

GC System Performance Criteria

Initial Certification of the Instrument

Prior to system calibration and sample analysis, the chromatographic instruments are checked according to (i) manufacturer's instructions, (ii) method requirements, and (iii) temporal conditions [e.g., warm-up period, baseline stabilization]. Upon satisfying these check procedures, an injection of UHP nitrogen is made to document that unacceptable levels of residual contamination are not present. The target compounds must not be present above their respective limits of detection (LOD) to be considered acceptable.

Retention Time Determination

Windows for analyte retention time are determined prior to GC analyses. After assuring that the operating conditions for the daily analyses have been satisfied, three injections are made using a mixed standard containing all of the required analytes. For each single component of the standard mixture, standard deviations are calculated from a total of three absolute measurements. The retention window is describe as the mean ± 3 ð standard deviations. A recalculated window is calculated for each compound on each GC column whenever (i) a new column is installed, (ii) changes are made in operational parameters, or (iii) reprogramming of oven temperature profiles or carrier gas flow rates occurs. Windows are re-established at no greater than 72 hour intervals during system operation. These data are noted in a log book, which is kept in the analytical van as part of the standard operating procedure (SOP). Hence, a quality check on the new operating parameters of the system is conducted.

Analyte Confirmation

Confirmation of the designated analytes may be performed by submitting samples to a certified laboratory for GC/MS analysis. Vapor samples are collected in 1 liter Tedlar bags or Summa Canisters and submitted under chain-of-custody procedures. Due to differences in the degradability, volatility and sorption among VOC's holding times should not exceed 48 hours and 2 weeks respectively. The independent analysis of samples by an outside laboratory allows a positive identification of the analyte by atomic mass in a separate and independent environment.

Initial GC Calibration

An initial multi-point dynamic calibration is performed before samples are analyzed. The calibration procedure employs traceable, commercially-prepared standards in methanolic solution. Aliquots are flash evaporated into 125 mL glass bombs to provide standard concentrations over 2 orders-of-magnitude. This method of sample preparation is specifically described by EPA in the SW-846 protocols for the headspace analysis of solid waste. After permitting the system to equilibrate, the standard vapor mixture is injected into the GC system. Injection sizes may vary from 50 to 200 µL, with greater ranges in mass addressed by dilutionary admixtures. Response factors are calculated by the following equation:

$$RF_{analyte} = concentration_{analyte} \times volume\ (\mu L) \div area\ units_{analyte}$$

Once the GC is initially calibrated, a 1-point calibration is performed daily on the analytical system to verify the initial 3-point calibration. Criteria for the acceptance of the initial calibration procedure include: (i) a variation among the determined response factors from the multi-point calibration of less than 15% relative standard deviation (RSD) , (ii) agreement between static and initial calibration checks within 15% relative percent difference (RPD), and (iii) agreement within 15% RPD between average calibration RF and a laboratory control standard. In the event that variance exceeds the stated confidence intervals, recalibration is performed until acceptable confidence intervals are achieved.

The concentration of each analyte in the vapor sample can then be determined by using the previously calculated response factor, the area under the peak, and the volume of sample injected as shown in the following equation:

$$\text{concentration}_{\text{analyte}} = \text{RF}_{\text{analyte}} \times \text{area units}_{\text{analyte}} \div \text{volume } (\mu\text{L})$$

Linearity of Response

Linearity in detector response for an analyte is established by the constancy of the calculated response factors over the range of concentrations used for the calibration standards. Variations in response factors not exceeding 15% RSD permit the use of average calibration factors, while greater variations in response factors over the linear range of the detector require the use of calibration curves to quantitate peak area counts as analyte concentrations.

Response Out-of-Range

Response factors exceeding the linear range of the detector are unacceptable because the calibration curves may not be representative. Responses within the working range of the instrument are provided by sample dilution into a 125 mL glass sampling bulb, which is blanked with nitrogen gas prior to each use. Target compounds must not be present above the limits of detection (LOD) to be considered acceptable.

Control Charts

The historical performance of the system is tracked through the used of control charts. Out-of-control events are identified by wide or consistent fluctuations in detector response and logged as to the time and cause. Control charts are maintained in a log book as part of the standard operating procedure (SOP).

Calibration Checks

The detector response is checked (i) after the initial multi-point calibration, (ii) after every daily 1-point calibration, and (iii) at the completion of GC analyses each day. This procedure evaluates the accuracy of the initial calibration and the reproducibility of that detector response over the duration of each day's analyses. Laboratory Control Samples which are employed to perform a calibration check are prepared by the same procedure as initial calibration standards (see section titled Initial GC Calibration). Acceptable concentrations for check standards must differ from concentrations of standards employed in other calibrations. Commercially prepared gas standards (e.g., Scotty Specialty Gases) may be utilized as a check

standard. Accuracy of these standards are reported to be $\pm$ 2%. Detector stability is assessed by comparing these periodic response factors to those generated in the initial calibration. A difference in response of less than 15% is considered to be acceptable.

Instrument Detection Limits

Background noise is for each of the detectors is monitored and recorded throughout the survey to identify any temporal changes in chromatographic conditions. Detection limits are defined as detector signals that are two-fold greater than background levels.

Chromatographic Performance

The performance of the chromatographic system is assessed on the basis of compound identification and the resolution of target analytes. A quantitative indication of chromatographic separation among analytes is provided by calculating the resolution, "R", of two peaks as follows:

Peak Resolution:

$$R = 2 \cdot [RT(A) - RT(B)] \div [width(A) - width(B)]$$

where,

A & B = contiguous chromatographic peaks;
width = peak width at the baseline of each peak;
RT = analyte retention time.

An "*R*" value equal to or greater than 1.0 indicates complete baseline resolution of peaks A and B, indicating that the detector response signal drops to the baseline between the peaks. Excessive dead volume, fluctuations in operating conditions or column variations are signaled by variations in resolution between peaks over the course of a survey.

As an indication of chromatographic efficiency, the number of theoretical plates (N) is calculated.

Theoretical Plates:

$$N = 16 (RT/width)^2$$