# PHASE II GROUNDWATER SAMPLING

for

Bothell 76 / Unocal 5905 18015 Bothell Way Northeast Bothell, Washington 98011

February 21, 2017

AEROTECH

Environmental Consulting Inc.

JUN 14 2017

Anchorage Seattle Portland

Cost-effective environmental solutions for the western United States and Alaska

# *AEROTECH*

Environmental Consulting Inc.

13925 Interurban Avenue South, Suite 210 Seattle, Washington 98168 (360) 710-5899

512 W. International Airport Road, Suite 201 Anchorage, Alaska 99518 (907) 575-6661

February 21, 2017

Oliver Shin, VP & SBA Loan Officer Commonwealth Business Bank 3435 Wilshire Boulevard, Suite 700 Los Angeles, California 90010

SUBJECT: PHASE II – GROUNDWATER SAMPLING

Bothell 76 / Unocal 5905 18015 Bothell Way Northeast Bothell, Washington 98011

At your request, Aerotech Environmental Consulting, Inc. ("Aerotech") conducted well development activities on February 9, 2017 at groundwater monitoring wells MW5, MW9, and MW10. The purpose of the work was to remove silt and fine sand from each well and the associated sand pack since the wells had not been tested for the past ten years.

On February 14, 2017, Aerotech remobilized to the subject Site to gauge and conduct low-flow groundwater sampling at each of the three groundwater monitoring wells. Water levels were recorded prior to the start of groundwater sampling. Groundwater flow direction at the Site has historically ranged from southeast to northeast. Current groundwater flow direction was determined to be southeast.

In 1994 data developed by *GeoEngineers, Inc.* indicated that groundwater from monitoring wells MW5, MW9, and MW10 contained benzene at concentrations exceeding the MTCA Method A Cleanup Levels. Samples during this round of sampling were analyzed for TPHg by Method NWTPH-Gx, Benzene, Toluene, Ethylbenzene, and Xylenes by EPA Method 8021, TPHd and TPHo by EPA Method NWTPH-Dx extended, Fuel Additives by EPA Method 8260, and Total Lead by EPA Method 7010. None of these chemicals were detected above the Laboratory Minimum Reporting Limit or the associated State of Washington Department of Ecology MTCA Method A Cleanup Level.

**Recommendations**. The Site should enter the State of Washington Department of Ecology Voluntary Cleanup Program and complete three more quarters of groundwater monitoring. In our professional opinion, it is likely that at that time, Ecology will issue a No Further Action Determination for the Site.

# AEROTECH\_\_

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# Environmental Consulting Inc.

13925 Interurban Avenue South, Suite 210 Seattle, Washington 98168 (360) 710-5899 512 W. International Airport Road, Suite 201 Anchorage, Alaska 99518 (907) 575-6661

February 21, 2017

Mr. Brent Johnson MOUNTAIN INVESTMENT HOLDING, LLC 18015 Bothell Way Northeast Bothell, Washington 98001

SUBJECT: PHASE II – GROUNDWATER SAMPLING

Bothell 76 / Unocal 5905 18015 Bothell Way Northeast Bothell, Washington 98011

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**Recommendations**. The Site should enter the State of Washington Department of Ecology Voluntary Cleanup Program and complete three more quarters of groundwater monitoring. In our professional opinion, it is likely that at that time, Ecology will issue a No Further Action Determination for the Site.

Please do not hesitate to contact the Aerotech Project Manager for the site, Nick Gerkin at (206) 482-2287, or the President of Aerotech, Alan Blotch, at (360) 710-5899 with any questions regarding work completed at this Site.

Sincerely,

Justin Foslien

Licensed Geologist - No. 2540

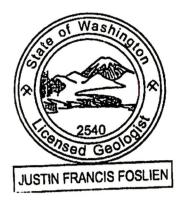
Email: justin@dirtydirt.us



Environmental Professional

Washington State UST Site Assessor ICC UST Decommissioning Supervisor

Email: nick@dirtydirt.us



## **APPENDIX**

- Groundwater Analytical Results Table and Site Figures
- Photographs
- Project Contract Documents
- Laboratory Analytical Results
- Laboratory Chain of Custody
- Acrotech Low-Flow Groundwater Sampling Standard Operating Procedure
- Field Documentation
- Results of Groundwater Sampling December 1994, GeoEngineers, Inc.

# GROUNDWATER ANALYTICAL RESULTS TABLE AND SITE FIGURES

## **GROUNDWATER ANALYTICAL RESULTS**

Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast Bothell, Washington

#### MW5

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHg	TPHd	ТРНо	Benzene	Toluene	Ethyl- benzene	Xylenes	EDB	EDC	МТВЕ	Dissolved Lead	Total Lead
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
11.6	02/14/17	8.74	12.55	3.81	<100	<200	<500	<1.0	<1.0	<1.0	<1.0	<0.01	<1.0	<5.0	<2.0	<2.0
		MTCA	Method A Cleanu	Levels	800	500	500	5	1,000	700	1,000	0.01	5	20	15	15

### MW9

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHg	TPHd	TPHo	Benzene	Toluene	Ethyl- benzene	Xylenes	EDB	EDC	MTBE	Dissolved Lead	Total Lead
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
10.9	02/14/17	8.76	11.62	2.86	<100	<200	<500	<1.0	<1.0	<1.0	<1.0	<0.01	<1.0	<5.0	<2.0	<2.0
100		MTCA	Method A Cleanu	Levels	800	500	500	5	1,000	700	1,000	0.01	5	20	15	15

### **MW10**

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHg	TPHd	ТРНо	Benzene	Toluene	Ethyl- benzene	Xylenes	EDB	EDC	МТВЕ	Dissolved Lead	Total Lead
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
15.0	02/14/17	9.90	10.01	0.11	<100	<200	<500	<1.0	<1.0	<1.0	<1.0	<0.01	<1.0	<5.0	<2.0	<2.0
		MTCA	Method A Cleanup	Levels	800	500	500	5	1,000	700	1,000	0.01	5	20	15	15

#### **EXPLANATION**

MTCA = Model Toxic Control Act Cleanup Level (WAC173-340-900)

TOC = Top of Casing MSL = Mean Sea Level

<= not detected at indicated Laboratory Detection Limits -- not analyzed NM = Not Measure</p>

\* = TOC Elevations sourced from GeoEngineers' Results of Ground Water Sampling - December 1994

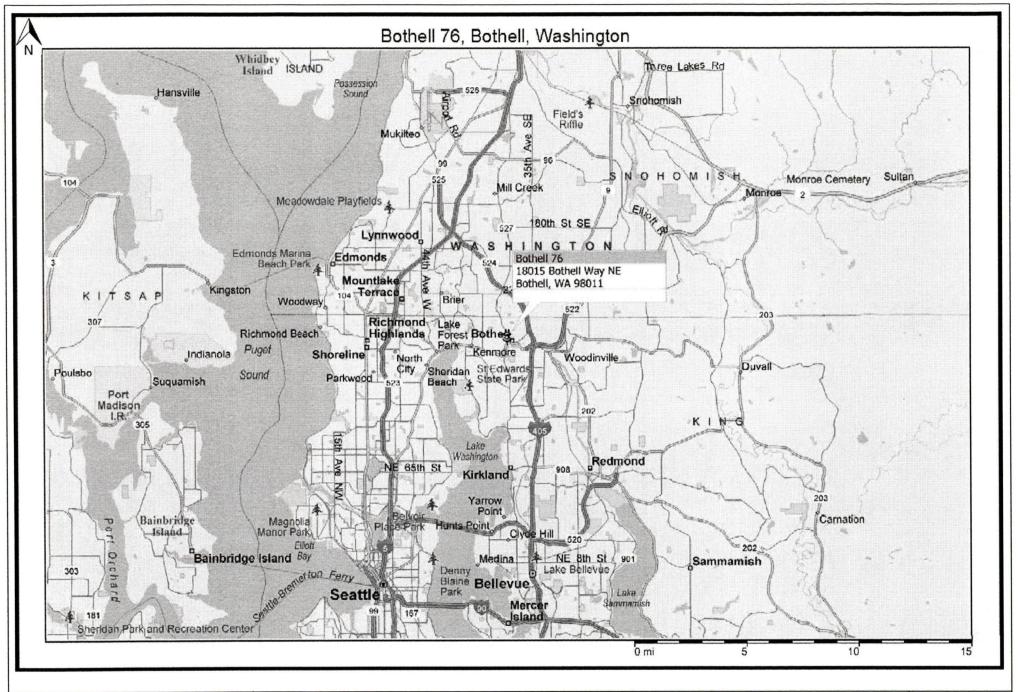
TPHg - Total Petroleum Hydrocarbons - Gasoline by Method NWTPH-Gx

TPHd - Total Petroleum Hydrocarbons - Diesel by Method NWTPH-Dx TPHo - Total Petroleum Hydrocarbons - Motor Oil by Method NWTPH-Dx extended

Benzene, Toluene, Ethylbenzene and Xylenes by EPA Method 8021B

Total and Dissolved Lead by EPA Method 7010

Bolded numbers and red-shaded cells denote concentrations above the MTCA Method A Cleanup Levels for groundwater



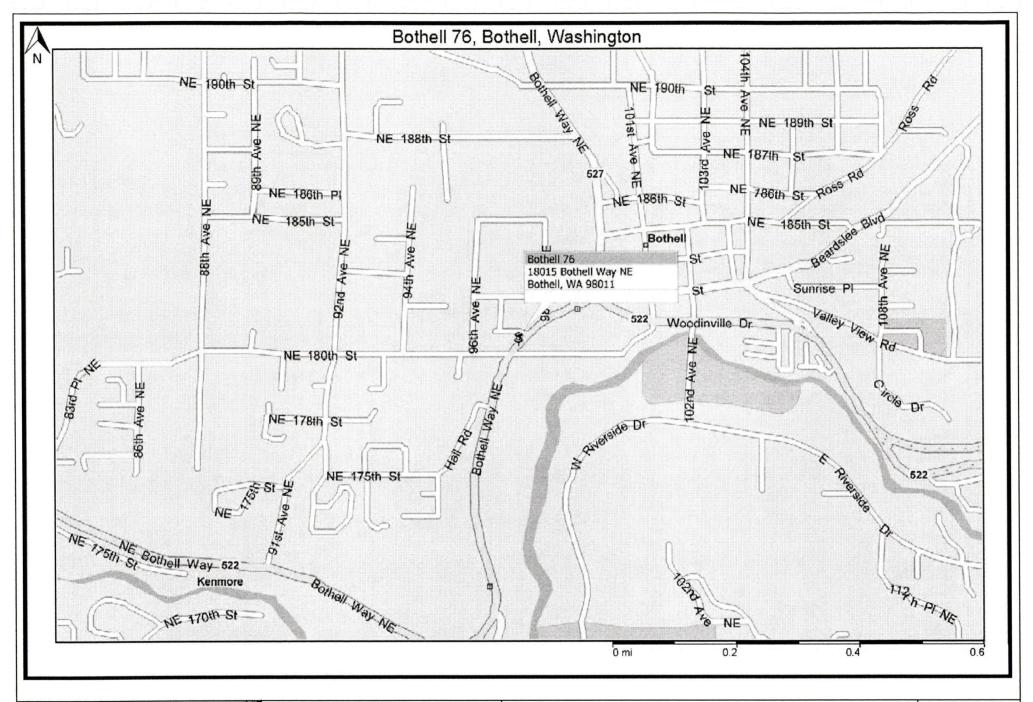
AEROTECH ENVIRONMENTAL CONSULTING

**REGIONAL MAP** 

Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast Bothell, Washington Date: 02/27/17

By: Nick Gerkin

Figure:



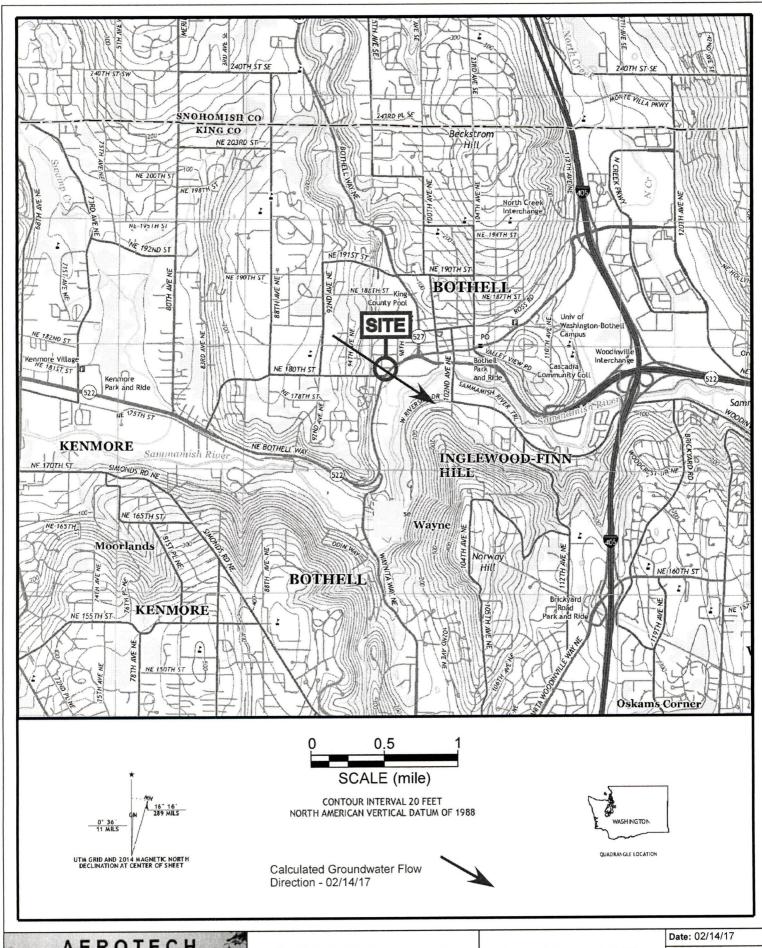
AEROTECH ENVIRONMENTAL CONSULTING

**NEIGHBORHOOD MAP** 

Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast Bothell, Washington Date: 02/27/17

By: Nick Gerkin

Figure:



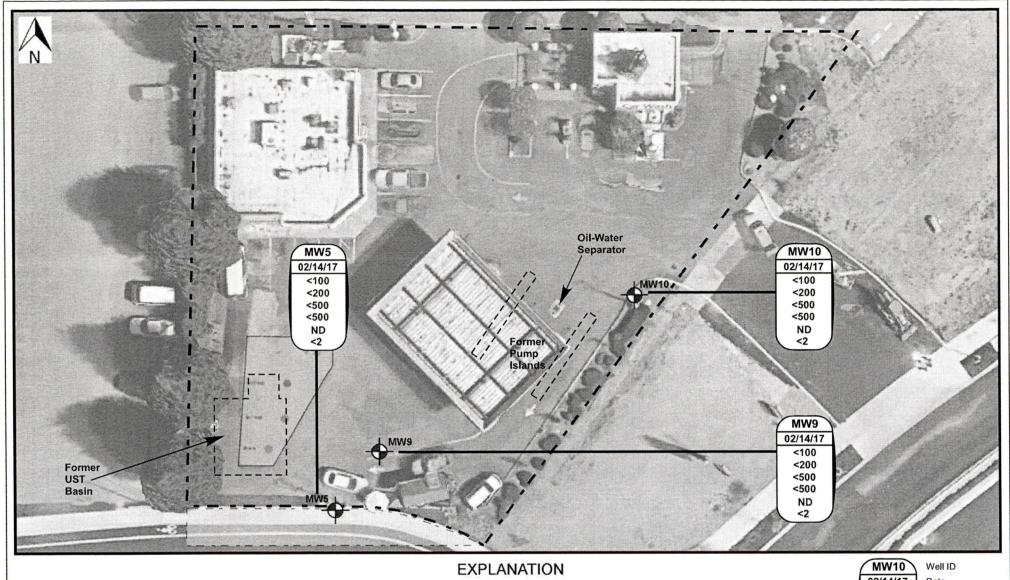
AEROTECH FENVIRONMENTAL CONSULTING

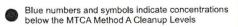
**USGS TOPOGRAPHIC MAP** 

Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast **Bothell, Washington** 

By: Nick Gerkin

Figure:





Red numbers and symbols indicate concentrations above the MTCA Method A Cleanup Levels

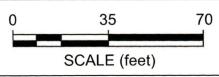


All Concentrations are reported in µg/kg ND = Not Detected (multiple detection limits)

AEROTECH ENVIRONMENTAL CONSULTING

GROUNDWATER
ANALYTICAL RESULTS
MAP - 02/14/17

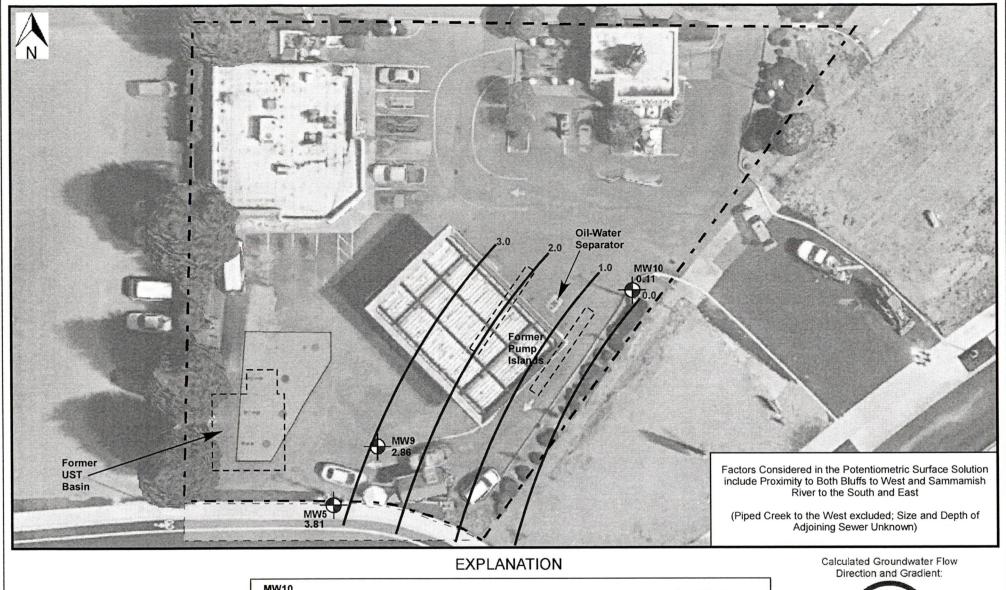
Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast Bothell, Washington



Date: 02/27/17

By: Nick Gerkin

Drawing:



# Blue numbers and symbols indicate concentrations below the MTCA Method A Cleanup Levels

Red numbers and symbols indicate concentrations above the MTCA Method A Cleanup Levels

# MW10 Groundwater Monitoring Well O.11 Groundwater Elevation (Feet Above MSL) Groundwater Elevation Contour Line Groundwater Elevation Contour Line Current UST Basin

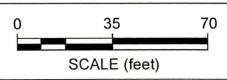


Southeast 0.05 ft/ft

AEROTECH ENVIRONMENTAL CONSULTING

GROUNDWATER
POTENTIOMETRIC
SURFACE MAP - 02/14/17

Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast Bothell, Washington

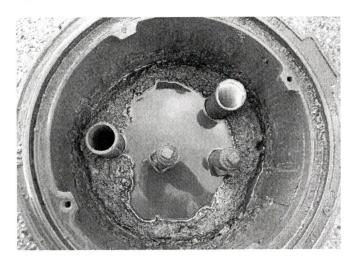


Date: 02/24/17

By: Nick Gerkin

Drawing:

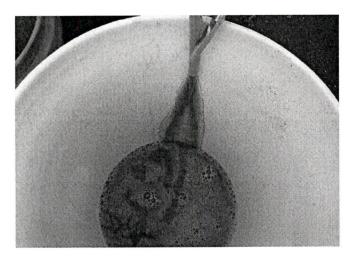




MW9 to the upper right, Vapor Extraction Line to the upper left, and Compressed Air Delivery Line and Water Return Line in the Center



Each Well was Surged using a Surge Block in a Rapid, Repetitive Up-and-Down motion over the Entire Water Column to loosen Silt and Fine Sand



Each Well was then Pumped at an Approximate Rate of 1.5 gallons per minute.

The water was initially a Dark Orange-Brown Color while removing the

Suspended Silt and Fine Sand



The Pump was moved up and down the Well Screen to ensure that excess material was removed from the surrounding Sand Pack. The well was pumped until the water was clear and free of suspended soilds



Pumping from Monitoring Well MW5



Pumping from uncovered Monitoring Well MW10

# PROJECT CONTRACT DOCUMENTS

# ENVIRONMENTAL CONTRACTOR'S CERTIFICATION

Bothell 76 (Unocal 5905) 18015 Bothell Way Northeast Bothell, Washington 98011

Aerotech Environmental Consulting, Inc. Contractor's Name: 1. 13925 Interurban Avenue South, Ste. 210, Seattle, Washington 98168 2. Contractor's Address: Alan T. Blotch / President Name and title of person completing this certification: 3. Answer the following questions about each employee that contractor will have perform the assessment or 4. prepare the report showing the results of the inspection: Alan T. Blotch - Environmental Professional Name and Title of Employee: a. Length of experience doing environmental assessments: 31 years h. Masters of Business Administration Education degrees received: C. Juris Doctor - Environmental Law ASTM E50 Environmental Assessment Committee Meetings Relevant training received: d. Identify any certifications and approvals issued to contractor pursuant to an official Federal, State of local 5. program or policy to conduct environmental assessments: Registered Environmental Assessor Issued by State of California Describe the generally recognized standards which the contractor will use to perform the assessment. 6. Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process (ASTM E 1903) Disclose the nature of any previous environmental inspections contractor has ever performed for the Owner 7. of the property: Phase I Environmental Site Assessment Disclose the nature of any affiliation or association contractor now has, or ever had, with the above 8. referenced seller of the property, of the above referenced buyer of the property: N/A Describe the liability insurance carried by contractor to cover claims in the event that ir fails to discover 9. adverse environmental conditions during an environmental inspection. Professional Errors & Omissions Coverage \$1,000,000 / claim and \$1,000,000 aggregate liability

THE UNDERSIGNED HEREBY CERTIFIES, UNDER PENALTY OF THE CRIMINAL AND/OR CIVIL PENALTIES IN 18 U.S.C. § 1001 FOR FALSE STATEMENTS TO THE UNITED STATES GOVERNMENT, THAT THE ABOVE INFORMATION IS TRUE AND CORRECT.

<u>2-21-17</u>
Signature Date



February 16, 2017

Nick Gerkin Aerotech Environmental, Inc. 13925 Interurban Avenue South, Suite 210 Seattle, WA 98168

Dear Mr. Gerkin:

Please find enclosed the analytical data report for the Bothell 76 (C70214-2) Project.

Samples were received on *February 14, 2017*. The results of the analyses are presented in the attached tables. Applicable reporting limits, QA/QC data and data qualifiers are included. A copy of the chain-of-custody and an invoice for the work is also enclosed.

ADVANCED ANALYTICAL LABORATORY appreciates the opportunity to provide analytical services for this project. Should there be any questions regarding this report, please contact me at (425) 702-8571.

It was a pleasure working with you, and we are looking forward to the next opportunity to work together.

Sincerely,

Val G. Ivanov, Ph.D. Laboratory Manager

V. Franov

4078 148 Ave NE■ Redmond, WA 98052 425.702-8571

E-mail: aachemlab@yahoo.com

# Advanced Analytical Laboratory (425) 702-8571

AAL Job Number:

C70214-2

Client:

Aerotech Environmental

Project Manager: Client Project Name: Client Project Number: Date received:

Nick Gerkin Bothell 76

na

02/14/17

C70214-2

Client:

Aerotech Environmental

Project Manager: Client Project Name: Client Project Number:

Nick Gerkin Bothell 76

na

Date received:

02/14/17

Analytical Results

2000D/l		MTH BLK	LCS	W-MW5	W-MW9	W-MW10
8260B, μg/L						
Matrix	Water	Water	Water	Water	Water	Water
Date analyzed	Reporting Limits	02/14/17 (	02/14/17	02/14/17	02/14/17	02/14/17
MTBE	5.0	nd		nd	nd	nd
1,2-Dichloroethane (EDC)	1.0	nd	88%	nd	nd	nd
1,2-Dibromoethane (EDB)*	0.01	nd		nd	nd	nd
*-instrument detection limits						
Surrogate recoveries						
Dibromofluoromethane		102%	104%	99%	104%	98%
1,2-Dichloroethane-d4		94%	94%	94%	98%	95%

<u>Data Qualifiers and Analytical Comments</u> nd - not detected at listed reporting limits Acceptable Recovery limits: 70% TO 130% Acceptable RPD limit: 30%

C70214-2

Client:

Aerotech Environmental

Project Manager:

Nick Gerkin

Client Project Number:

Bothell 76 na

Date received:

02/14/17

Analytical Results

Analytical Results				
8260B, μg/L		MS	MSD	RPD
Matrix	Water	Water	Water	Water
Date analyzed	Reporting Limits	02/14/17	02/14/17	02/14/17
MTBE	5.0			
1,2-Dichloroethane (EDC)	1.0	90%	88%	3%
1,2-Dibromoethane (EDB)*	0.01			
*-instrument detection limits				
Surrogate recoveries				
Dibromofluoromethane		109%	103%	
1,2-Dichloroethane-d4		99%	98%	

<u>Data Qualifiers and Analytical Comments</u> nd - not detected at listed reporting limits Acceptable Recovery limits: 70% TO 130% Acceptable RPD limit: 30%

C70214-2

Client:

Aerotech Environmental

Project Manager: Nic Client Project Name: Bo Client Project Number: na

Nick Gerkin

Bothell 76

Date received:

02/14/17

Analytical Results							Dupl
NWTPH-Gx		MTH BLK	LCS	W-MW5	W-MW9	W-MW10	W-MW10
Matrix	Water	Water	Water	Water	Water	Water	Water
Date analyzed	Reporting Limits	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17
NWTPH-Gx, ug/L							
Mineral spirits/Stoddard	100	nd		nd	nd	nd	nd
Gasoline	100	nd		nd	nd	nd	nd
BTEX 8021B, μg/L							
Benzene	1.0	nd	73%	nd	nd	nd	nd
Toluene	1.0	nd	77%	nd	nd	nd	nd
Ethylbenzene	1.0	nd		nd	nd	nd	nd
Xylenes	1.0	nd		nd	nd	nd	nd
Surrogate recoveries:							
Trifluorotoluene		107%	122%	110%	112%	109%	123%
Bromofluorobenzene		91%	101%	116%	106%	110%	121%

<u>Data Qualifiers and Analytical Comments</u> nd - not detected at listed reporting limits

na - not analyzed
Acceptable Recovery limits: 70% TO 130%
Acceptable RPD limit: 30%

C70214-2

Client:

Aerotech Environmental

Project Manager: Nick Gerki Client Project Name: Bothell 76 Client Project Number: na

Nick Gerkin

Date received:

02/14/17

**Analytical Results** 

NWTPH-Gx		MS	MSD	RPD
Matrix	Water	Water	Water	Water
Date analyzed	Reporting Limits	02/15/17	02/15/17	02/15/17
NWTPH-Gx, ug/L				
Mineral spirits/Stoddard	100			
Gasoline	100			
BTEX 8021B, μg/L				
Benzene	1.0	70%	75%	7%
Toluene	1.0	79%	78%	1%
Ethylbenzene	1.0			
Xylenes	1.0			
Surrogate recoveries:				
Trifluorotoluene		129%	126%	
Bromofluorobenzene		127%	127%	

<u>Data Qualifiers and Analytical Comments</u> nd - not detected at listed reporting limits

na - not analyzed

Acceptable Recovery limits: 70% TO 130% Acceptable RPD limit: 30%

C70214-2

Client:

Aerotech Environmental

Project Manager: Nic Client Project Name: Bo Client Project Number: na

Nick Gerkin

Bothell 76

Date received:

02/14/17

**Analytical Results** 

NWTPH-Dx, mg/L		MTH BLK	W-MW5	W-MW9	W-MW10
Matrix	Water	Water	Water	Water	Water
Date extracted	Reporting	02/14/17	02/14/17	02/14/17	02/14/17
Date analyzed	Limits	02/14/17	02/14/17	02/14/17	02/14/17
	9			,,	
Kerosene/Jet fuel	0.20	nd	nd	nd	nd
Diesel/Fuel oil	0.20	nd	nd	nd	nd
Heavy oil	0.50	nd	nd	nd	nd
0					
Surrogate recoveries:					
Fluorobiphenyl		129%	117%	115%	118%
o-Terphenyl		125%	98%	94%	95%

# <u>Data Qualifiers and Analytical Comments</u> na - not analyzed

C - coelution with sample peaks

Acceptable Recovery limits: 70% TO 130% Acceptable RPD limit: 30%

C70214-2

Aerotech Environmental Nick Gerkin

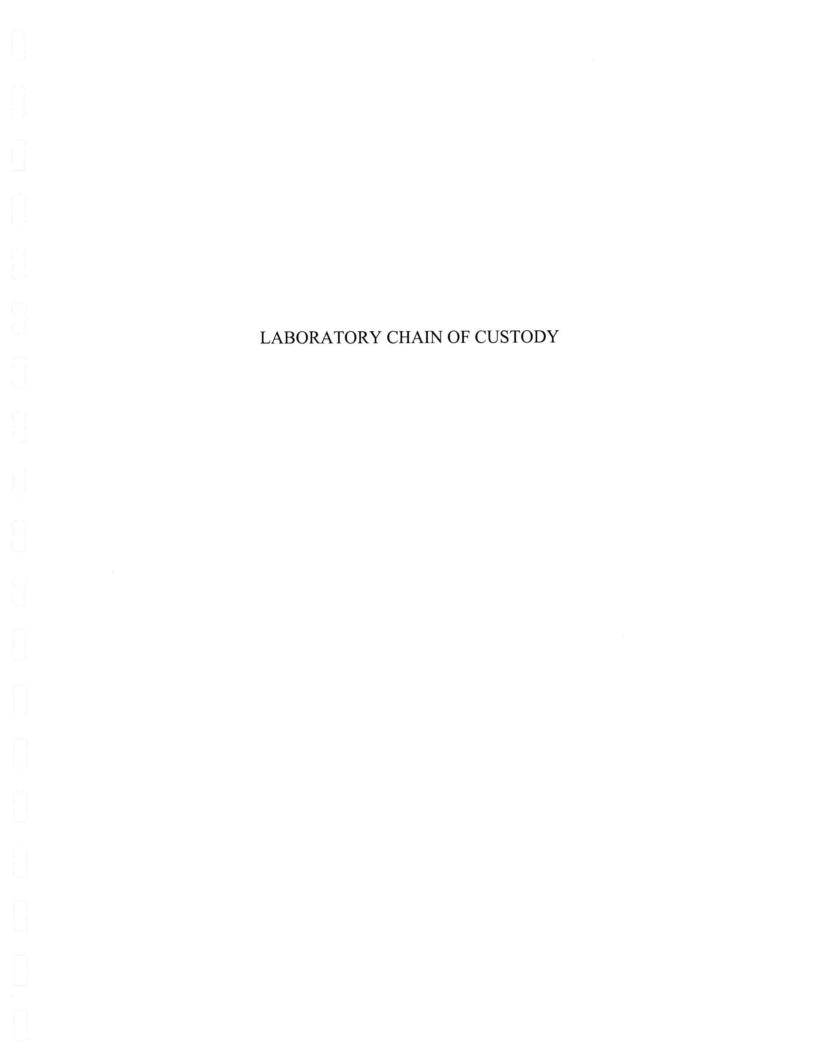
Client: Aerotech E
Project Manager: Nick Gerkir
Client Project Name: Bothell 76
Client Project Number: na
Date received: 02/14/17

**Analytical Results** 

Metals Total (7010), n	ng/L	MTH BLK	LCS	W-MW5	W-MW9	W-MW10	MS	MSD	RPD
Matrix	Water	Water	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17			
Date analyzed	Limits	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17	02/15/17
						-			
Lead Total (Pb)	0.002	nd	118%	nd	nd	nd	113%	124%	9%

<u>Data Qualifiers and Analytical Comments</u> nd - not detected at listed reporting limits na - not analyzed

Acceptable Recovery limits: 70% TO 130% Acceptable RPD limit: 30%



of

Laboratory Job # 6702/4-2

2821 152 Avenue NF.

Redmond, WA 98052

(425) 497-0110 fax: (425) 497-8089

aachemlab@vahoo.com

Clier	n: Aerotech			Pro	ject Name	: Bo	sthel	171	6	_				
Proje	ect Manager: NIZK Gerl ress: 13925 Interv	cin)				***************************************		Project Number.						
Addı	ress: 13925 Interv	Chu	Ave	5	Tike	nila		Col	Collector: Nick Gerkin					
Pho	Phone: 206 482 2287 Fax:							Collector: NICK Gerkin  Date of collection: 2/14/17						
	Sample ID	Time	Matrix	Container type	\$\$62 \$50 \$10 \$60 \$10	\$   18   6   6   6   6   6   6   6   6   6	ANT ST ST	Prist of State of Sta	CO John St. Co.	10° / 2° / 2° / 2° / 2° / 2° / 2° / 2° /	8 18 18 18 18 18 18 18 18 18 18 18 18 18		Notes, comments	# of containers
1				2 y 0 4		ĬŽ	X				X	4		4
2	W-MW5 W-MW9 W-MW10	1110				X	X				$\times$	$\subseteq$		
3	W-MWIO	1135	1	1		$\square$						$\Box$		V
4	•										11	$\perp$		
5			<u> </u>											
6							$\perp$							
7				<u> </u>										
8														<u> </u>
9				ļ						$\perp$	1	$\bot$		-
10														
11														
12	•													<u></u>
										Cample	receipt infe	•	Turnground time	٥.

Relinguished by:	Date/Time	Received by:	Date/Time
2/11/12	1325	V. Tranor 02/	4/17-13:2
Relinguished by:	Date/Time	Received by:	Date/Time

Total # of containers:

2 Condition (temp, °C)

Seals (intact?, Y/N)

Comments:

Same day O

24 hr O

48 hr **O** 

# $\begin{array}{c} \text{LOW-FLOW GROUNDWATER SAMPLING STANDARD OPERATING} \\ \text{PROCEDURE} \end{array}$

# AEROTECH\_\_\_\_\_

# Environmental Consulting Inc.

13925 Interurban Avenue South, Suite No.210 Seattle, Washington 98168 (360)710-5899

512 W. International Airport Road, Suite 201 Anchorage, Alaska 99518 (907) 575-6661 2916 NW Bucklin Hill Road, Suite No.126 Silverdale, Washington 98383 (866) 800-4030

> 5319 SW Westgate Dr., Suite No.24 Portland, Oregon 97221 (503) 360-4701

# LOW-FLOW GROUNDWATER SAMPLING STANDARD OPERATING PROCEDURE

The following protocol and sampling procedures were designed to meet or exceed standards for groundwater monitoring well sampling, as specified by the State of Washington Department of Ecology "Standard Operating Procedures for Purging and Sampling Monitoring Wells, Version 1.0," dated and approved on October 4, 2011. These procedures are strictly adhered to by Aerotech field staff:

## **Cross-Contamination Mitigation Protocol**

A sampling table is set up adjacent to the well head in order to protect field equipment from contact with the ground, to prevent or minimize the possible introduction of foreign materials into the wells, and in general in order to mitigate the possibility of cross-contamination. Where previous laboratory data is available, or where visual of olfactory indicators provide initial evidence, well sampling order is arranged to proceed with the least contaminated well, often the upgradient groundwater monitoring wells, and sampling order proceeds by sampling wells associated with successively higher contamination levels. Thus, the wells exhibiting the highest contamination levels are sampled last, in order to minimize the possibility of cross contamination.

A fresh pair of disposable Nitrile gloves is worn at each well. Equipment neither disposable nor dedicated to wells, is washed in a dedicated container prepared with non-phosphate Alconox detergent and triple rinsed in a second container prepared with distilled and/or deionized water. Surfaces that cannot be readily submerged for the purpose of decontamination, are sprayed with wash water followed by rinse water, and wiped with a fresh disposable paper towel. For shallow wells that require a peristaltic pump, dedicated tubing is left in each well after sampling, however, for deeper wells that require a submersible pump, dedicated tubing is recovered from wells after each use, and deployed to a designated dedicated clean plastic bag, bearing a label indicating well identification information.

### Water Level Measurement

Prior to the well purge process and the collection of groundwater samples, groundwater levels are measured at the north side of the ("TOC") with a piezometer/water level indicator, by slowly lowering the sensor into wells prior to purging, in order to minimize disturbances. The water levels are measured twice, with tape a marked in 0.01 foot increments, in order to reduce possible reading error. Where appropriate, free product thickness is measured with gas level indicator paste or an interface indicator. Upon arrival, each well is visual inspected and the condition of the well and well head are noted.

## Groundwater Monitoring Well Purge and Sampling Methodologies

Prior to groundwater sample collection, A dedicated length of high density polyethylene tubing is lowered into each well to a level near the middle of the screened interval. A dedicated length of clean silicone tubing is utilized within the pump mechanism. The wells are purged by means of low flow techniques, during which time groundwater is monitored for physical parameters, including temperature, pH, specific conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP), by means of a multi-parameter device mounted upon a flow cell, until such time as values recorded have stabilized and equilibrium conditions are verified according to State guidelines. This protocol ensures that collected groundwater samples are representative of in-situ groundwater conditions. Readings are recorded once every 2 to 5 minutes, including water level measurement. The pumping rate shall remain below 1 L/min during monitoring and sampling procedures. This is verified by periodically filling a one-Liter graduated cylinder and recording the rate, adjusting the pump as necessary. The water column within the well should remain within 5% of the static height during the purge and sample process, if this cannot be achieved, the pump rate will be reduced until the water level stabilizes. The following conditions must be met in three consecutive readings prior to sampling:

•	pH	+/- 0.1 standard units
•	Specific Conductivity	+/- $10.0$ mS/cm for values $< 1,000$ mS/cm +/- $20.0$ mS/cm for values $> 1,000$ mS/cm
•	DO	+/- $0.05$ mg/L for values $< 1$ mg/L +/- $0.2$ mg/L for values $> 1$ mg/L
•	Temperature	+/- 0.1 degrees Celcius
•	ORP	+/- 10 mV

Groundwater samples are collected in containers specified by the laboratory for the analyses established at the Site, and in accordance with State of Washington regulations or guidelines. Sample containers are labeled with site name, well identification, and date of collection information. Each sample is documented on a *Chain of Custody* (""COC") form, and immediately placed in an iced cooler (maintained at 4 degrees Celcius or less) for transport to a certified laboratory for analysis. Please note that any purge water suspected or confirmed to contain concentrations above the MTCA Cleanup Levels is drummed and left on Site

Please feel free to contact the Aerotech Geologist/Hydrogeologist, Mr. James McDermott, at (425) 686-0032, or the Aerotech Environmental Scientist/Field Sampling Coordinator, Mr. Nicholas Gerkin, at (206) 482-2287, if you have questions regarding work completed at this Site.





#### www. AerotechEnvironmental.com

# GROUNDWATER MONITORING WELL GAUGING RECORD

FIELD CREW: NAG

PROJECT NAME: Bothell 76

DATE: 02/14/17

PROJECT ADDRESS:

18015 Bothell Way Northeast, Bothell, Washington

Well ID	Time	Wellhead Elevation	Depth to Water	Groundwater Elevation	Depth of Well	Well Diameter	Comments	
	hh:mm	Feet Above MSL	Feet Below TOC	Feet Above MSL	Feet Below TOC	Inches		
MW5	9:45	12.55	8.74	3.81	11.6	2	Well Vault Dry. Well Plug Replaced.	
MW9	9:49	11.62	8.76	2.86	10.9	2	Former Extraction Well. Vault full of Water. Plug was in Good Condition	
MW10	9:47	10.01	9.90	0.11	15.0	4	Former Extraction Well. Vault full of Water. Plug was in Good Condition	

#### **EXPLANATION**

MSL = Mean Sea Level

TOC = Top of Casing

-- = Not Measured or Not Calculated



#### www. AerotechEnvironmental.com

# GROUNDWATER MONITORING WELL LOW FLOW SAMPLING FIELD LOG

FIELD CREW: NAG

PROJECT NAME: Bothell 76

**DATE:** 02/14/17

PROJECT ADDRESS:

18015 Bothell Way Northeast, Bothell, WA

MW5		*					
Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	рН	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
09:45	8.74						
11:54	8.89	250	10.90	0.130	2.45	6.65	156.2
11:56	8.90	250	10.84	0.130	2.78	6.49	163.8
11:58	8.90	250	10.87	0.130	2.80	6.44	166.0
12:00	8.90	250	10.90	0.130	2.89	6.42	167.0
12:02	8.90	250	10.92	0.130	2.85	6.41	168.4
Ecology Parameter Limits (3 Consecutive Readings)		+/- 0.1	+/- 10	+/- 0.2	+/- 0.1	+/- 10	
12:10	SAMPLE						

#### Comments:

Well Vault dry. Well Plug was deteriorated, it was replaced.

MW9							
Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	рН	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
09:49	8.76						
11:00	8.93	250	10.38	0.196	1.86	7.06	139.2
11:02	8.98	250	10.58	0.196	1.94	6.95	139.0
11:04	8.99	250	10.53	0.192	2.47	6.84	141.0
11:06	9.00	250	10.60	0.188	2.53	6.78	141.4
11:08	9.01	250	10.53	0.186	2.43	6.75	142.0
Ecology Param	eter Limits (3 Conse	ecutive Readings)	+/- 0.1	+/- 10	+/- 0.2	+/- 0.1	+/- 10
11:10	SAMPLE						

## Comments:

Former SVE/AS Location. Well Vault was full of water. Well Plug was in good condition.



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# GROUNDWATER MONITORING WELL LOW FLOW SAMPLING FIELD LOG

FIELD CREW: NAG

**PROJECT NAME:** Bothell 76

**DATE:** 02/14/17

PROJECT ADDRESS:

18015 Bothell Way Northeast, Bothell, WA

MW10							
Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	рН	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
09:47	9.90						
11:26	10.06	250	13.17	0.129	3.79	6.94	135.6
11:28	10.08	250	13.15	0.128	3.77	6.90	137.5
11:30	10.09	250	13.21	0.128	3.76	6.88	139.0
11:32	10.10	250	13.13	0.128	3.80	6.85	140.8
Ecology Parameter Limits (3 Consecutive Readings)		+/- 0.1	+/- 10	+/- 0.2	+/- 0.1	+/- 10	
11:35	SAMPLE						

#### Comments:

Former SVE/AS Location. Well Vault was dry. Well Plug was in good condition.

RESULTS OF GROUNDWATER SAMPLING - DECEMBER 1994, GeoEngineers, Inc.





January 19, 1996

Consulting Engineers and Geoscientists Offices in Washington, Oregon, and Alaska

Unocal ERS - Western Region P.O. Box 76 Seattle, Washington 98111

Attention: Mr. Leigh Carlson

Results of Ground Water Sampling December 1994 Former Unocal Service Station 5905 Bothell, Washington File No. 9161-183-04

# INTRODUCTION

This letter summarizes the results of our December 1994 ground water monitoring and sampling at former Unocal Service Station 5905. The site is located at 18015 Bothell Way Northeast in Bothell, Washington. The Ecology (Washington State Department of Ecology) UST (underground storage tank) site identification number for Service Station 5905 is 008485. The LUST (leaking UST) incident number for the site is 1659. The property currently is owned by Mr. Lowell Haynes. All Unocal facilities were removed from the site in 1991 and 1992; extensive excavation of petroleum-contaminated soil occurred during this time interval. A new service station facility was constructed at the site in 1993 by parties other than Unocal. The general layout of the site, with approximate monitoring well locations and former and current facilities, is shown in Figure 1.

## SCOPE

GeoEngineers' scope of services completed during this reporting period is summarized below.

- Measure the depths to ground water in the existing monitoring wells.
- 2. Measure combustible vapor concentrations in the monitoring well casings.

GeoEngineers, Inc. 8410-154th Avenue N.E. Redmond, WA 98052 Telephone (206) 861-6000 Fax (206) 861-6050

- 3. Obtain ground water samples from the existing monitoring wells for laboratory testing of the following: BETX (benzene, ethylbenzene, toluene and xylenes) by EPA Method 8020, gasoline-range hydrocarbons by Ecology Method WTPH-G, and diesel- and heavy oil-range hydrocarbons by Ecology Method WTPH-D extended.
- 4. Obtain a sample from the purge and decontamination water generated during ground water sampling and submit the sample for analytical testing of BETX, and fats, oil and grease by EPA Method 413.2 for disposal characterization.

#### **DECEMBER 1994 SAMPLING EVENT**

# **GROUND WATER ELEVATIONS**

A representative of GeoEngineers measured the depths to ground water in MW-5 and MW-9 through MW-11 on December 29, 1994. The depths to ground water and ground water elevations measured from March 1992 through the current reporting period are presented in Table 1. Ground water elevations, inferred ground water contours and inferred ground water flow directions based on the December 1994 measurements are shown in Figure 2. Field procedures are described in Attachment A.

The depths to ground water beneath the site ranged from approximately 7.5 to 8.6 feet on December 29, 1994. The apparent shallow ground water flow direction indicated by the June and December measurements is toward the east-southeast, which is generally consistent with our previous measurements.

# **COMBUSTIBLE VAPOR CONCENTRATIONS**

GeoEngineers measured combustible vapor concentrations in the monitoring well casings of MW-5 and MW-9 through MW-11 on December 29, 1994. The measurements from March 1992 through the current reporting period are presented in Table 1. Field procedures are described in Attachment A.

The combustible vapor concentrations ranged from 450 ppm (parts per million) to 700 ppm in MW-5, MW-9 and MW-10. The combustible vapor concentrations were less than the lower threshold of significance of the TLV Sniffer, 400 ppm (parts per million), in MW-11 during the December monitoring event. The combustible vapor concentrations in the on-site monitoring wells generally decreased since the June 1994 monitoring event.

# **GROUND WATER ANALYTICAL RESULTS**

GeoEngineers obtained ground water samples from MW-5 and MW-9 through MW-11 in December 1994. The samples were analyzed for BETX, and gasoline-, diesel- and heavy oil-range hydrocarbons. The ground water analytical data from March 1992 through the current reporting period are summarized in Table 2 and Figure 3. The MTCA Method A ground water cleanup levels also are included in Table 2 and Figure 3 for reference. Field procedures are

Unocal ERS - Western Region January 19, 1996 Page 3

described in Attachment A. The laboratory reports, chain-of-custody records and our evaluation of the laboratory quality assurance/quality control program are included in Attachment B.

Ethylbenzene, toluene, xylenes and petroleum hydrocarbons either were not detected or were detected at concentrations less than the MTCA Method A cleanup levels in the ground water samples obtained from the monitoring wells in December 1994. Benzene was not detected in the December sample obtained from MW-11. Benzene was detected at concentrations exceeding the MTCA Method A cleanup level in the December samples obtained from MW-5, MW-9 and MW-10 at concentrations ranging from 6.5 to 43  $\mu$ g/l (micrograms per liter).

# DISCUSSION

Diesel- and heavy oil-range hydrocarbons have been detected in the past in ground water samples obtained from MW-5, MW-9 and MW-10 at concentrations exceeding the MTCA Method A ground water cleanup level. Diesel- and heavy oil-range hydrocarbons have not been detected in ground water samples since March 1993 in MW-5 and since June 1993 in MW-9 and MW-10.

Gasoline-range hydrocarbons and BETX were not detected at concentrations exceeding MTCA Method A cleanup levels in the ground water samples obtained from the existing monitoring wells through the June 1993 sampling event, with the exception of the initial sample (March 1992) from MW-10. Gasoline-range hydrocarbons and BETX were detected in MW-9 and benzene was detected in MW-5 at concentrations exceeding the MTCA Method A cleanup levels during the March 1994 sampling event. Only trace amounts of BETX and gasoline-range hydrocarbons had been detected previously in these wells.

Gasoline-range hydrocarbons have not been detected in ground water samples obtained from MW-9 since April 1994. Benzene concentrations detected in ground water samples obtained from MW-5, MW-9 and MW-10 generally have decreased since March 1994, but still exceed the MTCA Method A cleanup level.

As discussed in our report dated November 18, 1994, the available data suggest that a release occurred in late 1993 or early 1994 in the gasoline UST area, and that (1) the rate of the release has diminished significantly since that time, or (2) the release was a one-time event over a relatively short period of time.

#### **FUTURE MONITORING**

We recommend that ground water monitoring be discontinued at the site. The diesel- and heavy oil-range hydrocarbons previously present in MW-5, MW-9 and MW-10 have not been detected for the past seven to eight monitoring events. Remaining ground water contamination at the site is related to activities at the site subsequent to Unocal's operations, in our opinion.

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We appreciate the opportunity to provide these continued services to Unocal. Please contact us if you have questions regarding our ongoing monitoring activities at the site.

Yours very truly,

GeoEngineers, Inc.

Suay. Bonc

Lisa J. Bona Project Geologist

James A. Miller, P.E.

Principal

LJB:JAM:cms
Document ID: 9161183.R4

Attachments

Four copies submitted

cc: Mr. Wally Moon
Washington State Dept. of Ecology
3190 - 160th Ave. S.E.
Bellevue, WA 98008-5452

# TABLE 1 (Page 1 of 2) GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

		Water		Combustible
		Depth from	Ground Water	Vapor
Monitoring	Date	Ground Surface	Elevation <sup>2</sup>	Concentration <sup>3</sup>
Well <sup>1</sup>	Measured	(feet)	(feet)	(ppm)
MW-5	03/23/92	8.20	4.53	<400
	06/09/92	7.85	4.74	<400
	09/01/92	9.23	3.36	<400
	12/03/92	8.82	3.77	<400
	03/19/93	9.57	3.02	<400
	06/16/93	8.42	4.13	<400
	09/22/93	9.02	3.53	<400
	01/12/94	8.77	3.78	<400
	03/30/94	8.43	4.12	
	06/21/94	8.75	3.80	>10,000
	09/30/94	9.17	3.38	>10,000
	12/29/94	8.55	4.00	700
MW-6 <sup>4</sup>	03/23/92	7.49	3.58	<400
	06/09/92	8.14	2.93	<400
	09/01/92	8.64	2.43	<400
	12/03/92	8.31	2.76	<400
MW-9	03/23/92	7.13	4.70	<400
	06/09/92	7.91	3,93	<400
	09/01/92	8.65	3.19	<400
	12/03/92 <sup>5</sup>	-		
	03/19/93	8.12	3.72	<400
	06/16/93	7.46	4.16	<400
	09/22/93	8.35	3.27	<400
	01/12/94	7.94	3.68	<400
	03/30/94	7.26	4.36	-
	06/22/94		-	
	09/30/94	8.47	3.15	>10,000
	12/29/94	7.53	4.09	450
MW-10	03/23/92	7.56	2.38	<400
	06/09/92	8.12	2.06	<400
	09/01/92	8.46	1.72	<400
	12/03/92	9.11	0.83	<400
	03/19/93	8.05	2.13	<400
	06/16/93	7.83	2.18	<400
	09/22/93	8.32	1.69	<400
	01/12/94	8.06	1.95	<400
	03/30/94	7.94	2.07	•••
	06/21/94	8.17	1.84	>10,000
İ	09/30/94	8.26	1.75	2,000
	12/29/94	7.63	2.39	500

Notes appear on page 2 of 2.

TABLE 1 (Page 2 of 2)

		Water		Combustible
		Depth from	Ground Water	Vapor
Monitoring	Date	Ground Surface	Elevation <sup>2</sup>	Concentration <sup>3</sup>
Well <sup>1</sup>	Measured	(feet)	(feet)	(ppm)
MW-11 <sup>6</sup>	06/22/92	8.71	0.74	<400
	09/01/92	8.77	0.68	<400
	12/03/92	8.35	1.10	<400
	03/19/93	8.51	0.94	<400
	06/16/93	8.27	1.00	<400
	09/22/93	8.59	0.68	<400
	01/12/94	8.45	0.82	<400
	03/30/94	8.37	0.90	-
	06/21/94	8.45	0.82	900
	09/30/94	8.56	0.71	<400
	12/29/94	7.82	1.45	<400

#### Notes

ppm = parts per million

'-' = not measured

Document ID: 161183H1.WK1

<sup>&</sup>lt;sup>1</sup>Approximate locations of monitoring wells are shown in Figures 1, 2 and 3.

<sup>&</sup>lt;sup>2</sup>Elevations are measured relative to the benchmark shown in Figure 2. The benchmark has an elevation of 10.41 feet.

<sup>&</sup>lt;sup>3</sup>Measured with a Bacharach TLV Sniffer calibrated to hexane equipped with a 2-inch-diameter slip cap. Field procedures are described in Attachment A. The lower threshold of significance for this instrument in this application is 400 ppm.

<sup>&</sup>lt;sup>4</sup>MW-6 was destroyed during construction of new facilities after the 12/03/92 monitoring event.

<sup>&</sup>lt;sup>5</sup>MW-9 was not accessible during this monitoring episode because of construction damage to the well.

<sup>&</sup>lt;sup>6</sup>MW-11 was installed on 06/19/93.

# TABLE 2 (PAGE 1 OF 4) SUMMARY OF GROUND WATER CHEMICAL ANALYTICAL DATA

UNOCAL SERVICE STATION 5905 BOTHELL, WASHINGTON

Monitoring	Date			TX <sup>1</sup> - g/l)		Gasoline-range Hydrocarbons <sup>2</sup>	Diesel-range Hydrocarbons <sup>3</sup>	Heavy Oil-range Hydrocarbons <sup>3</sup>	Dissolved Lead <sup>4</sup>
Well	Sampled	В	E	T	Х	(mg/l)	(mg/l)	(mg/l)	(µg/l)
MW-3	06/09/92	3.2	0,66	<0.50	1.1	<0.05	<0.50	-	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	0.40	_	<2.0
MW-5	03/23/92	<0.50	< 0.50	<0.50	2.5	0.40	< 0.50		_
	04/20/92	_	_	_	_	_	_	_	<2.0
	06/09/92	<0.50	<0.50	1.0	<0.50	0.24	<0.50	_	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	0.12	<0.25	_	<2.0
	12/03/92	<0.50	0.95	2.3	3.5	<0.05	0.30	<0.38	_
	03/19/93	<0.50	< 0.50	<0.50	< 0.50	< 0.05	0.28	1.5	-
	06/16/93	<0.50	< 0.50	<0.50	<0.50	<0.01	<0.25	<0.75	_
	09/22/93	-	-			_	<0.25	<0.75	
	01/12/94	-	-	_	_	_	<0.25	<0.75	
	03/30/94	23	<0.50	6.6	0.60	0.14	<0.25	<0.75	_
	04/13/94	220	<0.50	60	11	0.29	<0.25	<0.75	<3.0 <sup>5</sup>
	06/21/94	26	<0.50	0.60	< 0.50	<0.10	<0.25	<0.75	_
	09/30/94	29	<0.50	<0.50	<1.0	0.17	<0.25	<0.75	_
	12/29/94	6.5	<0.50	<0.50	<1.0	0.10	<0.25	0.80	_
MW-6	03/23/92	<0.50	< 0.50	<0.50	<0.50	<0.10	<0.50	-	
	04/20/92	_	_	_		-	-	_	<2.0
	06/09/92	<0.50	<0.50	<0.50	<0.50	<0.05	<0.50	_	<1.0
	09/01/92	<0.50	< 0.50	<0.50	<1.0	<0.05	<0.25		2.2
Dup 1 <sup>6</sup>	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	<b>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</b>	_	2.2
	12/03/92	<0.50	<0.50	<0.50	<0.50	<0.50	<0.12	<0.38	<2.0
921203-D <sup>6</sup>	12/03/92	<0.50	<0.50	<0.50	<0.50	<0.50		-	-
MW-7	03/23/92	<0.50	<0.50	<0.50	<0.50	<0.10	<0.50	_	
	04/20/92	_	-	_	-	-	-		<2.0
	06/09/92	<0.50	<0.50	<0.50	<0.50	<0.05	<0.50		<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	<0.31		<2.0
TCA Method A Clea	THE RESERVE OF THE PERSON NAMED IN COLUMN 2 IS NOT THE OWNER.	5.0	30.0	40.0	20.0	10.00	1.07		5

Notes appear on page 4 of 4.

TABLE 2 (Page 2 of 4)

	_			TX <sup>1</sup>		Gasoline-range	Diesel-range	Heavy Oil-range	Dissolved
Monitoring	Date			g/I)		Hydrocarbons <sup>2</sup>	Hydrocarbons <sup>3</sup>	Hydrocarbons <sup>3</sup>	Lead <sup>4</sup>
Well	Sampled	В	E	Т	Χ	(mg/l)	(mg/l)	(mg/l)	(µg/l)
8-WM	03/23/92	< 0.50	<0.50	<0.50	< 0.50	<0.10	<0.50	-	
	04/20/92	-	-	_	-		_	_	<2.0
	06/09/92	< 0.50	<0.50	<0.50	<0.50	<0.05	<0.50	_	<1.0
	09/01/92	< 0.50	<0.50	<0.50	<1.0	<0.05	<0.25	_	<2.0
e-WM	03/23/92	< 0.50	<0.50	<0.50	<0.50	<0.10	0.88	<1.08	_
	04/20/92	-	_	_		_	_	_	<2.0
	06/09/92 <sup>9</sup>	0.56	< 0.50	0.95	1.2	<0.05	<0.50	_	<1.0
	09/01/9210,11	< 0.50	<0.50	<0.50	<1.0	<0.05	0.46	_	<2.0
	12/03/92	-	_	_		_	_	_	_
	03/19/93	< 0.50	<0.50	<0.50	< 0.50	<0.05	. 0.39	1.7	_
	06/16/93	< 0.50	<0.50	<0.50	<0.50	<0.10	0,31	1.1	_
930616-D <sup>6</sup>	06/16/93	< 0.50	<0.50	<0.50	< 0.50	<0.10	_	_	~
	09/22/93 <sup>6</sup>	< 0.50	<0.50	<0.50	< 0.50	_	< 0.25	<0.75	_
	01/12/94	-	-		_	_	< 0.25	<0.75	_
	03/30/94	2,200	42	660	37	1.9	<0.25	<0.75	
	04/13/94	1,700	0.90	610	40	1,6	< 0.25	<0.75	<3.0 <sup>5</sup>
	06/22/94	350	<0.50	3.6	7.2	<0.10	<0.25	<0.75	_
	09/30/94	52	<0.50	<0.50	4.9	<0.05	<0.25	<0.75	_
	12/29/94	24	<0.50	<0.50	2.7	<0.05	<0.25	0.93	_
MW-10	03/23/92	55 .	<0.50	<0.50	10	<0.1	<0.50	- 0.55	
Dup <sup>6</sup>	04/20/92					-	70.50		<2.0
•	06/09/92	1.3	<0.50	<0.50	<0.50	0.073	<0.50	-	<b>\2.0</b>
	06/09/92	_	_	-	-	-	<0.50	_	_
	09/01/92	4.9	<0.50	<0.50	<1.0	<0.05		_	
	12/03/92	< 0.50	<0.50	<0.50	<0.50	<0.05	<0.25 0.17		<2.0 10.5
	03/19/93	< 0.50	<0.50	<0.50	<0.50	<0.05	0.17	<0.38 <0.38	
	06/16/93	< 0.50	<0.50	<0.50	<0.50	<0.1	1.00 NOON NOON NOON NOON NOON NOON NOON N	0.90	 <3.0
-	09/22/93	-				-	0,29	1	<3.0
	01/12/94	_	_	_	_	_	<0.25 <0.25	<0.75 <0.75	<3.0
	03/30/94	< 0.50	<0.50	<0.50	< 0.50			1	
CA Method A Clea		5.0	30.0	40.0	20.0	<0.10	<0.25 1.0 <sup>7</sup>	<0.75	5

Notes appear on page 4 of 4.

TABLE 2 (Page 3 of 4)

Monitoring Date			BETX¹ (μg/l)				Diesel-range	Heavy Oil-range	Dissolved
Well	Sampled	В	E			Hydrocarbons <sup>2</sup>	Hydrocarbons <sup>3</sup>	Hydrocarbons <sup>3</sup>	Lead <sup>4</sup>
MW-10	04/13/94	17		T	X	(mg/l)	(mg/l)	(mg/l)	
(Continued)	06/21/94	10	<0.50	1.7	< 0.50	<0.10	< 0.25	<0.75	(μg/l)
	09/30/94	88	<0.50	0.60	< 0.50	<0.10	< 0.25	<0.75	-
	12/29/94		<0.50	<0.50	<1.0	<0.05	< 0.25	<0.75	-
MW-11	06/22/92	43	<0.50	<0.50	< 0.50	<0.05	<0.25	<0.75	-
	09/01/92	<0.50	<0.50	<0.50	< 0.50	<0.05	_	-	
12/03/92	< 0.50	<0.50	<0.50	<1.0	<0.05	<0.25	_	<1.0	
	03/19/93	<0.50	<0.50	<0.50	< 0.50	<0.05	0.16	<0.38	<2.0
930319-D <sup>6</sup>		<0.50	<0.50	<0.50	< 0.50	<0.05	0.17	<0.38	-
	03/19/93 06/16/93	<0.50	<0.50	<0.50	< 0.50	<0.05	_	_	
1		<0.50	<0.50	<0.50	< 0.50	<0.10	<0.25	<0.75	-
	09/22/93	-	- ,	-	-	-	< 0.25	<0.75	_
1	01/12/94	-	-	-	-	_	< 0.25	<0.75	
1	03/30/94	<0.50	<0.50	<0.50	< 0.50	<0.10	< 0.25	<0.75	-
	04/13/94	<0.50	<0.50	<0.50	<0.50	<0.10	< 0.25	<0.75	<3.0 <sup>5</sup>
	06/21/94	< 0.50	<0.50	<0.50	< 0.50	<0.10	<0.25	<0.75	₹3.0°
	09/30/94	<0.5	<0.50	<0.50	<1.0	<0.05	< 0.25	<0.75	-
	12/29/94	< 0.5	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75	_
CA Method A Clea es appear on page		5.0	30	40	20		1.07	1 (0.13	5

# TABLE 2 (Page 4 of 4)

#### Notes:

<sup>1</sup>B = benzene, E = ethylbenzene, T = toluene, X = total xylenes. BETX analyzed by EPA Method 8020.

<sup>2</sup>Analyzed by Ecology Method WTPH-G.

<sup>3</sup>Analyzed by Ecology Method WTPH-D extended, except where footnoted.

<sup>4</sup>Dissolved lead analysis conducted on field-filtered ground water samples. Lead analyzed by EPA Method 7421.

Sample also analyzed for total lead by EPA Method 7421. Total lead was detected at the following concentrations: 4.9 µg/l (MW-5), 5.9 µg/l (MW-9 and MW-10), and 6.9 µg/l (MW-11).

<sup>6</sup>Sample was obtained as a blind field duplicate.

<sup>2</sup>The MTCA Method A ground water cleanup level for the total of gasoline-, diesel- and heavy oil-range hydrocarbons is 1 mg/l if carbon ranges are distinctly quantified using gas chromatography methods.

Chemical analysis by EPA Method 418.1.

Additional samples were obtained from MW-9 on 06/09/92 and 07/15/92 and submitted to North Creek Analytical for analysis of heavy oil-range hydrocarbons by Ecology Method WTPH-418.1. Heavy oil-range hydrocarbons were detected in the 06/09/92 sample at a concentration of 8.2 mg/l, but were not detected in the 07/15/92 sample. Additional samples were obtained from MW-9 on 06/12/92 and 07/15/92 and submitted to NATEX/PNELI for analysis of heavy oil-range hydrocarbons by Ecology Method WTPH-418.1. Heavy oil-range hydrocarbons were not detected in the 06/12/92 sample, but were detected at a concentration of 1.3 mg/l in the 07/15/92 sample.

<sup>10</sup>Sample also analyzed for selected metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) by EPA 6000 and 7000 series methodology, flash point by ASTM Method D-93, and VOCs (volatile organic compounds) by EPA Methods 8010 and 8020. Barium was detected at a concentration of 0.33 mg/l. Other analytes were not detected. Flash point was greater than 210 degrees Fahrenheit.

11 Sample analyzed by North Creek Analytical for heavy oil-range hydrocarbons by Ecology Method WTPH-418.1. The analyte was not detected.

ppm = parts per million

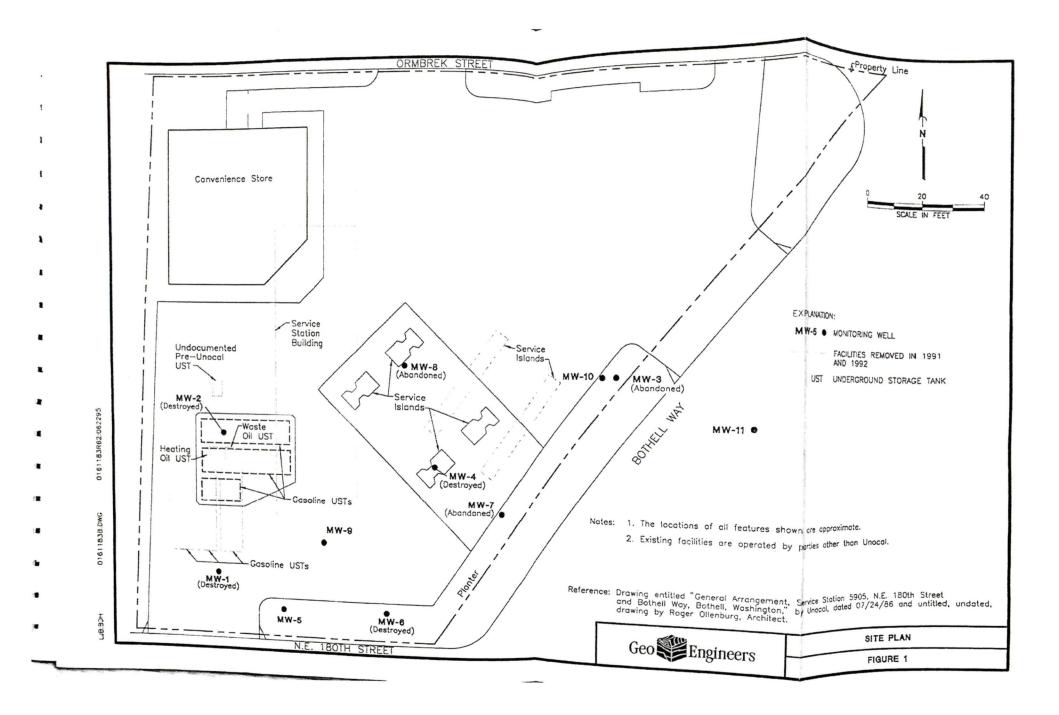
µg1 = micrograms per liter

mg/l = miligrams per liter

"-" = not tested

Shading indicates that analyte was detected at concentration greater than the MTCA Method A ground water cleanup level.

Document ID: 161183H2.WK1



#### ATTACHMENT A

# **FIELD METHODS**

#### **GROUND WATER ELEVATIONS**

The depths to the shallow ground water surface relative to the monitoring well casing rims were measured on December 29, 1994 using an electric water level indicator. The indicator was cleaned with an Liquinox wash solution and a distilled water rinse prior to its use in each well. Ground water elevations were calculated by subtracting the depths to water from the casing rim elevations. The ground water elevations measured on December 29 are summarized in Table 1. The ground water elevations measured in December are shown in Figure 2.

# COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in monitoring wells MW-5 and MW-9 through MW-11 on December 29, 1994 using a Bacharach TLV Sniffer calibrated to hexane. The measurements in MW-5, MW-9 and MW-11 were obtained from each well casing using a 2-inch-diameter slip cap connected to the TLV Sniffer. A 4-inch-diameter slip cap was connected to the TLV Sniffer when measuring MW-10. The lower threshold of significance for the TLV Sniffer in this application is 400 ppm (parts per million), or 3.6 percent of the lower explosive limit of hexane. The combustible vapor concentrations measured on June 21 and September 30 are presented in Table 1.

#### **GROUND WATER SAMPLING PROGRAM**

Ground water samples were obtained by GeoEngineers from MW-5 and MW-9 through MW-11 on December 29, 1994. The water samples were obtained with disposable polyethylene bailers after at least three well volumes of water were removed from each well casing. A new bailer and cord were used to sample each monitoring well. The water samples were transferred to laboratory-prepared bottles in the field and were kept cold during transport to the analytical laboratory. Chain-of-custody procedures were followed during transport of the samples to the analytical laboratory.

# **PURGE WATER DISPOSAL**

Purge and decontamination water generated during the December 1994 sampling events was collected temporarily in a 55-gallon drum. We understand that Unocal arranged for disposal of the drum of purge and decontamination water.

#### ATTACHMENT B

#### CHEMICAL ANALYTICAL PROGRAM

# **ANALYTICAL METHODS**

Chain-of-custody procedures were followed during the transport of the field samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory QA/QC (quality assurance/quality control) records are included in this attachment. The analytical results are also summarized in the text and tables of this report.

#### **ANALYTICAL DATA REVIEW**

The laboratory maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. The laboratory QA/QC and data quality exceptions documented by the laboratory were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "Guidance Document for the Assessment of RCRA Environmental Data Quality" draft dated 1988; "National Functional Guidelines for Organic Data Review" draft dated 1991; and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" dated 1988.

#### **ANALYTICAL DATA REVIEW SUMMARY**

No significant data quality exceptions were noted in the laboratory report or during our review. Based on our data quality review, it is our opinion that the analytical data are of acceptable quality for their intended use.



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(503) 643-9200 • FAX 644-2202

GeoEngineers, Inc. UNOCAL #5905, #9161-183-R04 Dec 29, 1994 Client Project ID: Sampled: Dec 30, 1994 Jan 7, 1995 8410 154th Avenue N.E. Sample Matrix: Received: Water Redmond, WA 98052 Attention: Lisa Bona Analysis Method: WTPH-G Analyzed: First Sample #: 412-1820 Reported: Jan 10, 1995

# TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

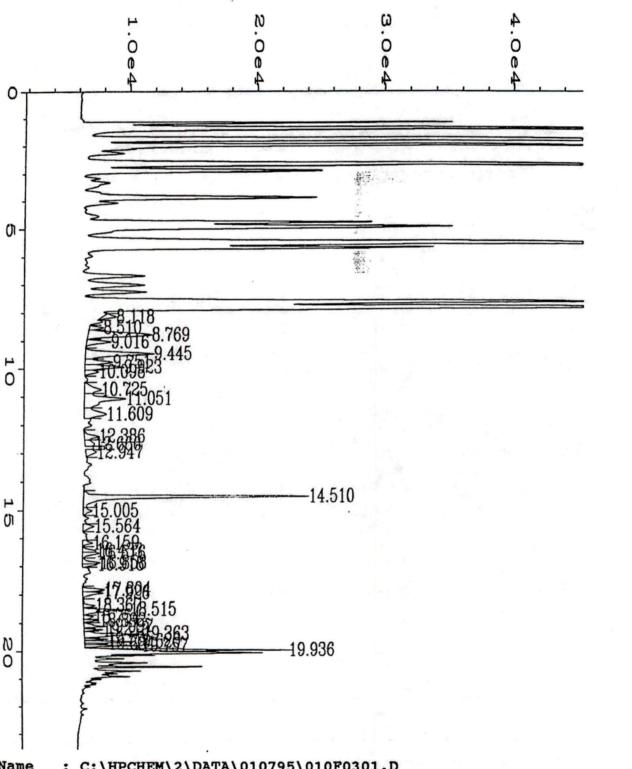
Sample Number	Sample Description	Sample Result μg/L (ppb)	Surrogate Recovery %	
412-1820	MW-5	100	93	GeoEngineers
412-1821	MW-9	N.D.	93	JAN 1 9 1995 Routing Like
412-1822	MW-10	N.D.	90	File the attion of the variety
412-1823	MW-11	N.D.	85	
BLK010795	Method Blank	N.D.	87	

Reporting Limit: 50						
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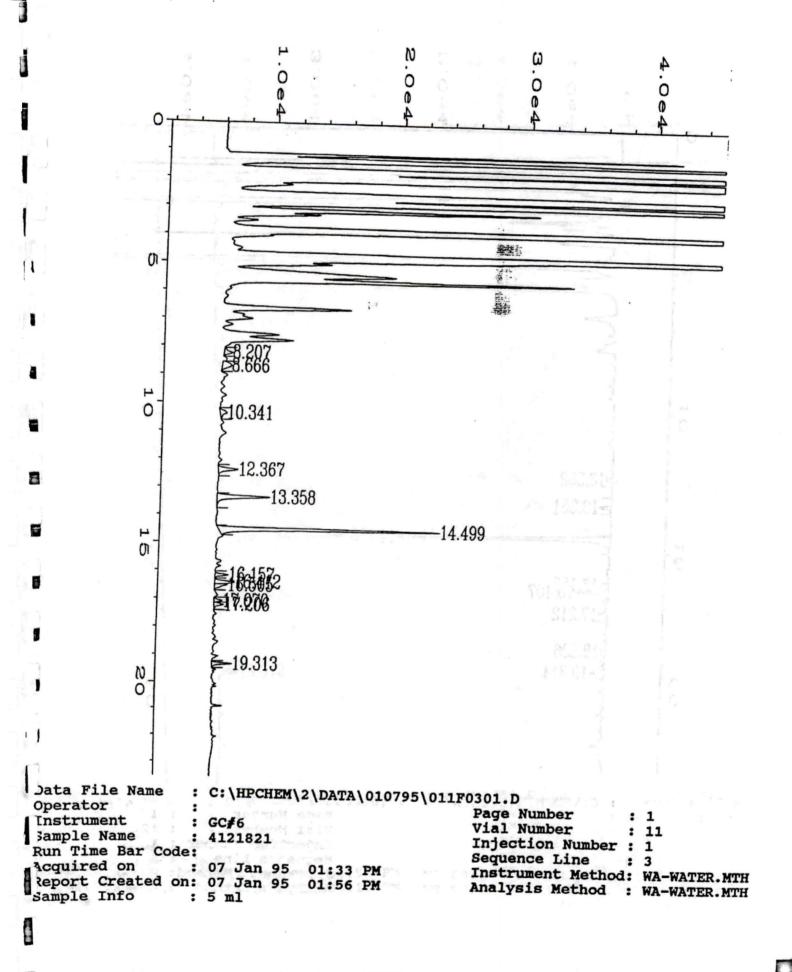
4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %. Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane). Analytes reported as N.D. were not detected above the stated Reporting Limit.

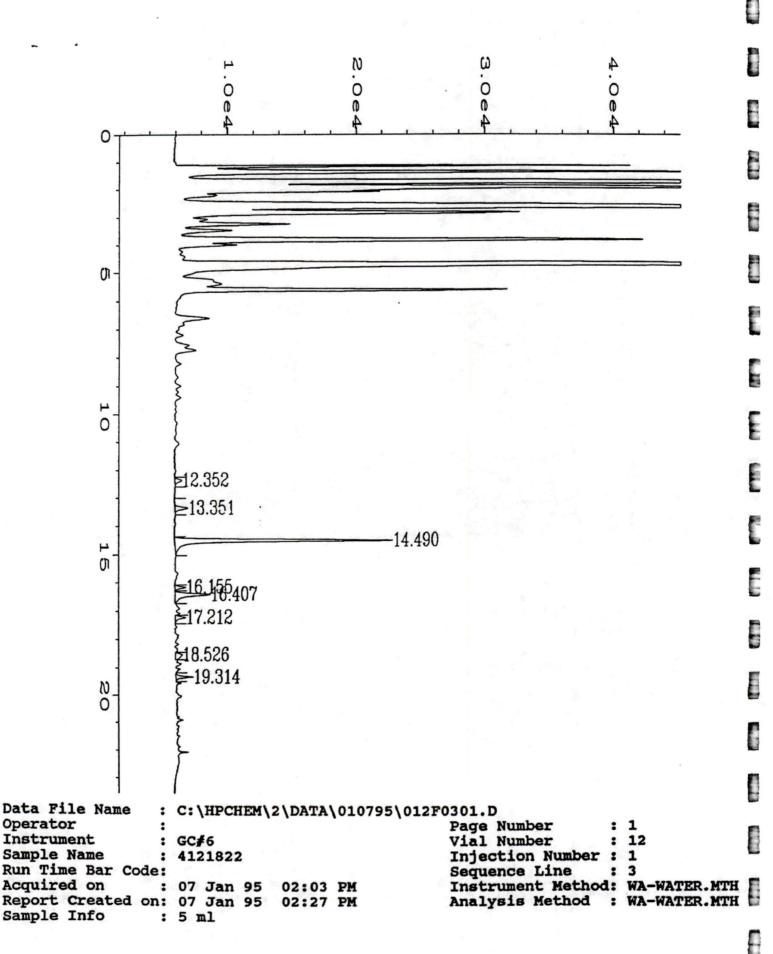
NORTH CREEK ANALYTICAL Inc.

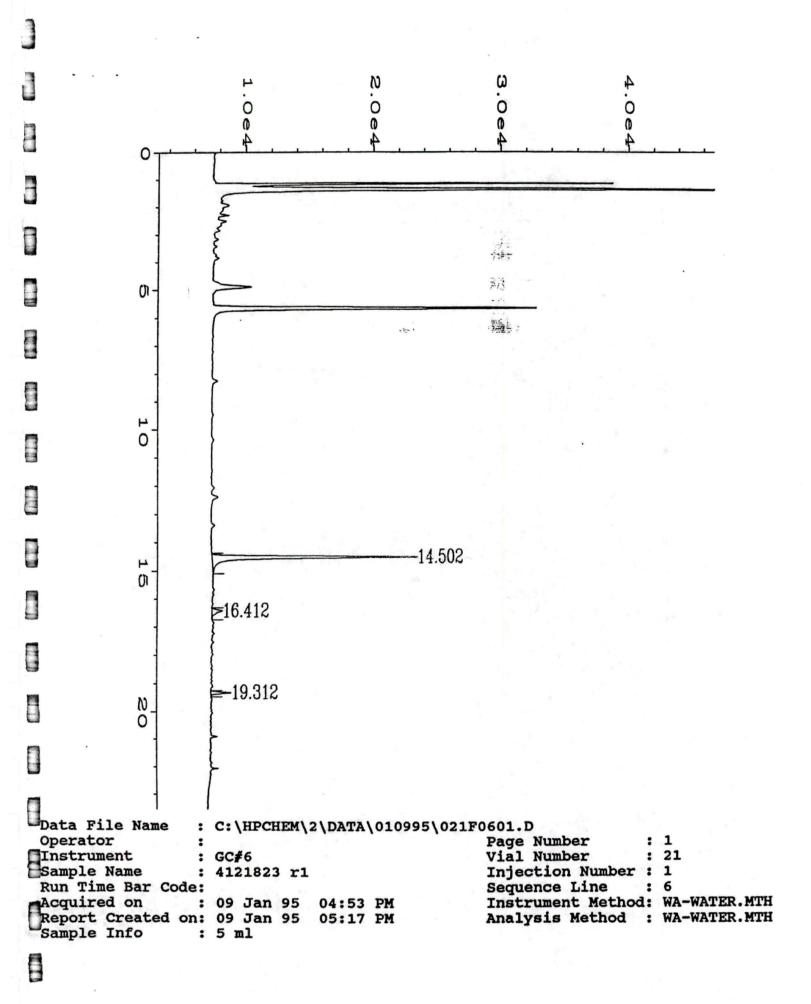


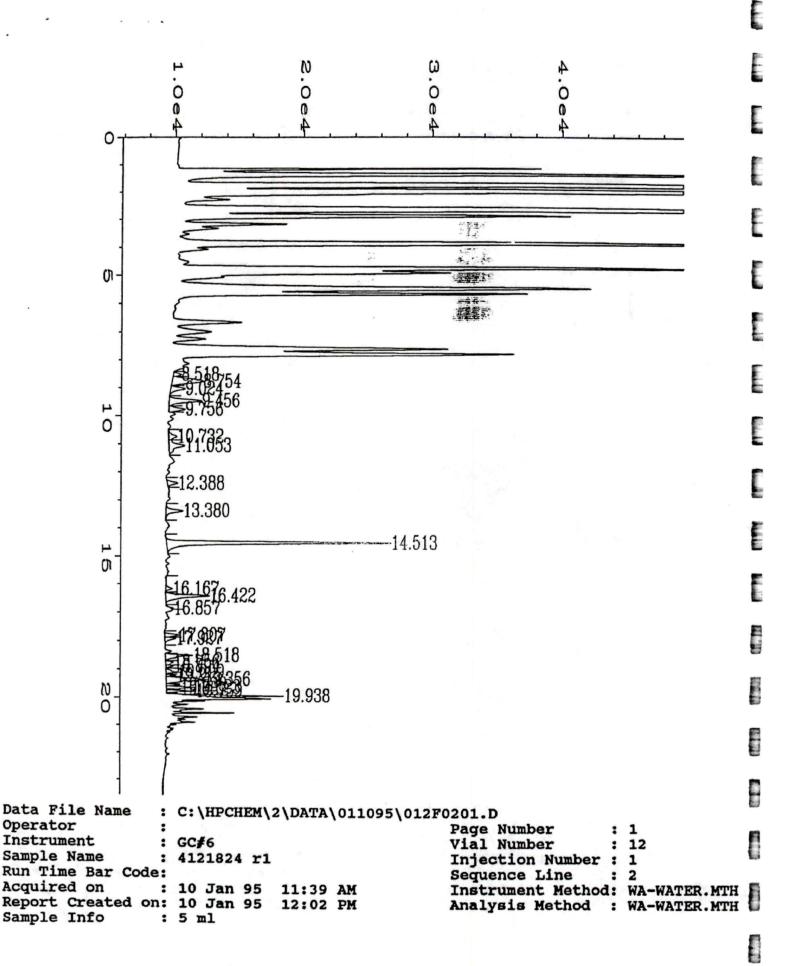
Data File Name : C:\HPCHEM\2\DATA\010795\010F0301.D Operator Page Number Instrument : GC#6 Vial Number : 10 Injection Number: 1 Sample Name : 4121820 Run Time Bar Code: : 3 Sequence Line Acquired on : 07 Jan 95 Report Created on: 07 Jan 95 Instrument Method: WA-WATER.MTH 01:03 PM Analysis Method : WA-WATER.MTH 01:26 PM

Sample Info : 5 ml











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(503) 643-9200 • FAX 644-2202

GeoEngineers, Inc. 8410 154th Avenue N.E. Redmond, WA 98052 Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #9161-183-R04

Sample Matrix: Water

Analysis Method: WTPH-G Units: µg/L (ppb) Analyst:

R. Lister F. Shino

Analyzed: Reported:

Jan 7, 1995 Jan 10, 1995

# HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT **Laboratory Control Sample** 

Gasoline

Spike Conc.

Added:

100

Spike Result:

79

Recovery:

79

**Upper Control** 

Limit %:

114

55

Lower Control Limit %:

PRECISION ASSESSMENT Sample Duplicate

Gasoline Range **Organics** 

Sample

Number: 412-1822

Original

Result: N.D.

Duplicate

Result:

N.D.

Relative Relative Percent Difference values are not % Difference reported at sample concentration levels

less than 10 times the Detection Limit.

Maximum

RPD:

38

NORTH CREEK ANALYTICAL Inc. % Recovery:

auce Dutten

Laura Dutton Project Manager

Spike Result Spike Concentration Added x 100

Relative % Difference:

Original Result - Duplicate Result (Original Result + Duplicate Result) / 2

x 100

4121820.GEO <2>



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GeoEngineers, Inc. 8410 154th Avenue N.E. Redmond, WA 98052 Attention: Lisa Bona Client Project ID: Sample Matrix:

Water EPA 8020

UNOCAL #5905, #9161-183-R04 Water

Sampled: Received: Analyzed:

Dec 29, 1994 Dec 30, 1994 Jan 7, 1995

Analysis Method: First Sample #:

412-1820

Reported:

Jan 10, 1995

# **BTEX DISTINCTION**

Sample Number	Sample Description	Benzene μg/L (ppb)	Toluene μg/L (ppb)	Ethyl Benzene μg/L (ppb)	Xylenes μg/L (ppb)	Surrogate Recovery %
412-1820	MW-5	6.5	N.D.	N.D.	N.D.	90
412-1821	MW-9	24	N.D.	N.D.	2.7	87
412-1822	MW-10	43	N.D.	N.D.	N.D.	87
412-1823	MW-11	N.D.	N.D.	N.D.	N.D.	92
412-1824	PURGE	11	N.D.	N.D.	N.D.	94
BLK010795	Method Blank	N.D.	N.D.	N.D.	N.D.	88

Reporting Limits:	0.50	0.50	0.50	1.0	

4-Bromofluorobenzene surrogate recovery control limits are 55 - 144 %.

Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Yacca Dutto



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GeoEngineers, Inc. 8410 154th Avenue N.E.

Redmond, WA 98052 Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #9161-183-R04

Sample Matrix: Water

Analysis Method: EPA 8020 Units: µg/L (ppb) QC Sample #: 412-1824

Analyst:

Analyzed:

Reported:

R. Lister

F. Shino

Jan 7, 1995 Jan 10, 1995

# MATRIX SPIKE QUALITY CONTROL DATA REPORT

NALYTE	_		Ethyl			
	Benzene	Toluene	Benzene	Xylenes		
Sample Result:	11	· N.D.	N.D.	N.D.		
Spike Conc. Added:	20.0	20.0	20.0	60.0		
Spike Result:	24.8	19.2	19.6	53.1		
Spike % Recovery:	69%	96%	98%	89%		
Spike Dup. Result:	23.9	17.2	18.2	56.0		
Spike Duplicate % Recovery:	65%	86%	91%	93%		
Jpper Control Limit %:	138	121	126	130		
Lower Control Limit %:	57	78	83	77		
Relative % Difference:	3.7%	11%, Q-7	7.4%	5.5%		
Maximum RPD:	9.0	9.0	13	20		

Q-7 = The RPD value for this QC sample is outside of the advisory limit established by NCA. Additional sources for assessment of method precision, such as field dups, should be referenced.



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GeoEngineers, Inc. 8410 154th Avenue N.E. Redmond, WA 98052 Attention: Lisa Bona Client Project ID: Sample Matrix: UNOCAL #5905, #9161-183-R04 Water Sampled: Received: Dec 29, 1994 Dec 30, 1994

Analysis Method: First Sample #: WTPH-D Extended 412-1820 Extracted: Analyzed: Jan 4, 1995 Jan 7, 1995

Reported:

Jan 7, 1995 Jan 10, 1995

# TOTAL PETROLEUM HYDROCARBONS - DIESEL RANGE EXTENDED

Sample Number	Sample Description	Diesel Result mg/L (ppm)	Heavy Oil Result mg/L (ppm)	Surrogate Recovery %
412-1820	MW-5	N.D.	0.80	95
412-1821	MW-9	N.D.	0.93	92
412-1822	MW-10	N.D.	N.D.	93
412-1823	MW-11	N.D.	N.D.	104
BLK010495	Method Blank	N.D.	N.D.	101

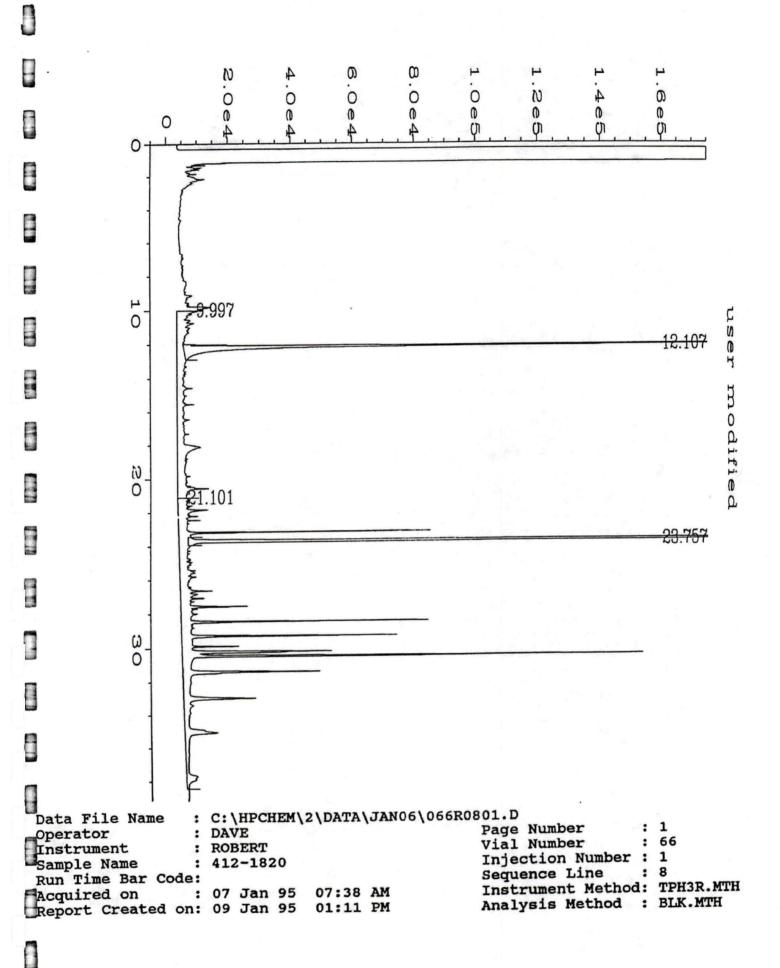
Reporting Limit: 0.25 0.75

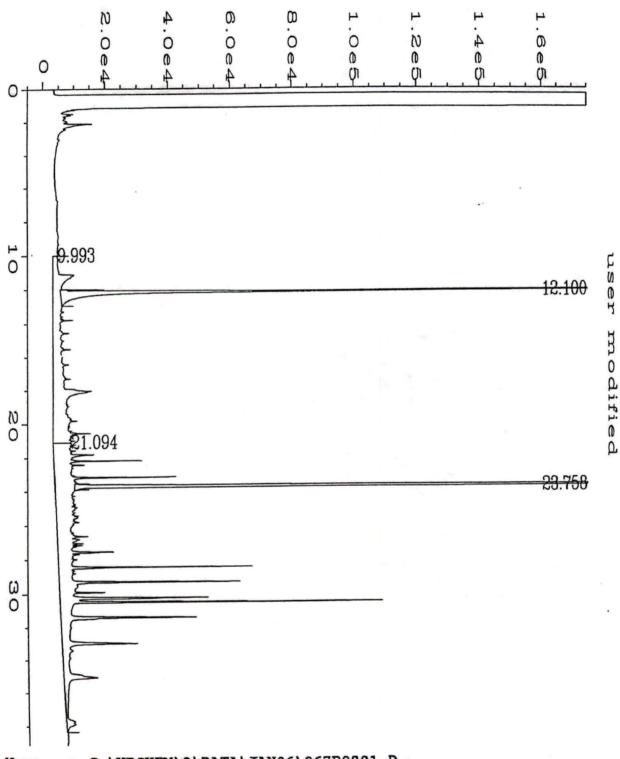
2-Fluorobiphenyl surrogate recovery control limits are 50 - 150%.

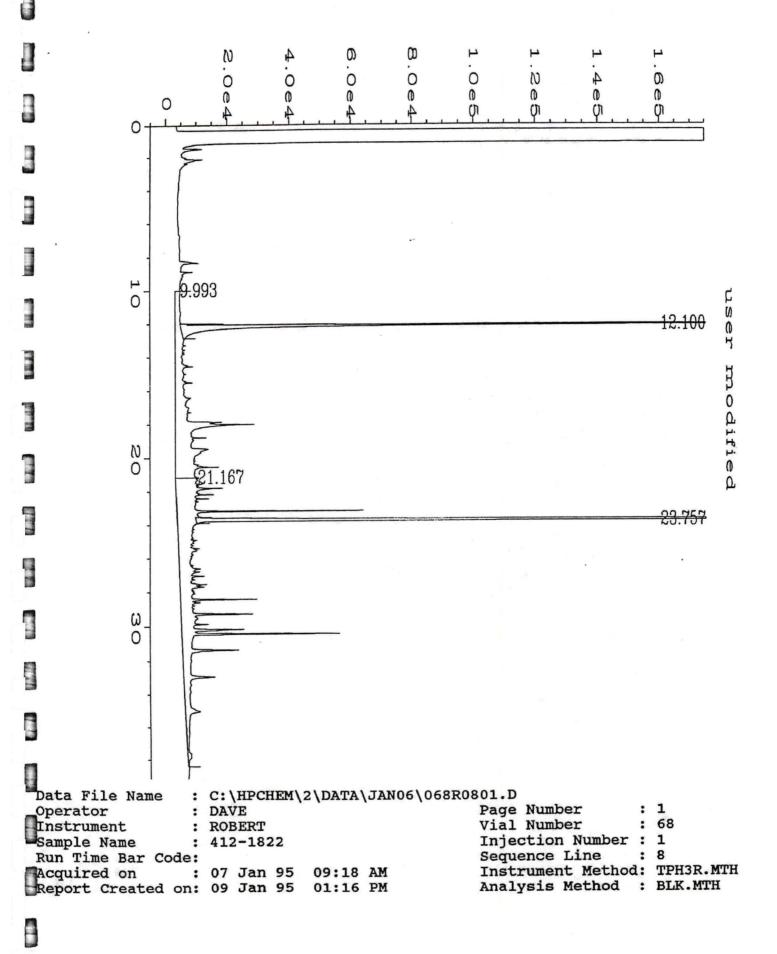
Extractable Hydrocarbons are quantitated as Diesel Range Organics (C12 - C24) and Heavy Oil Range Organics (>C24).

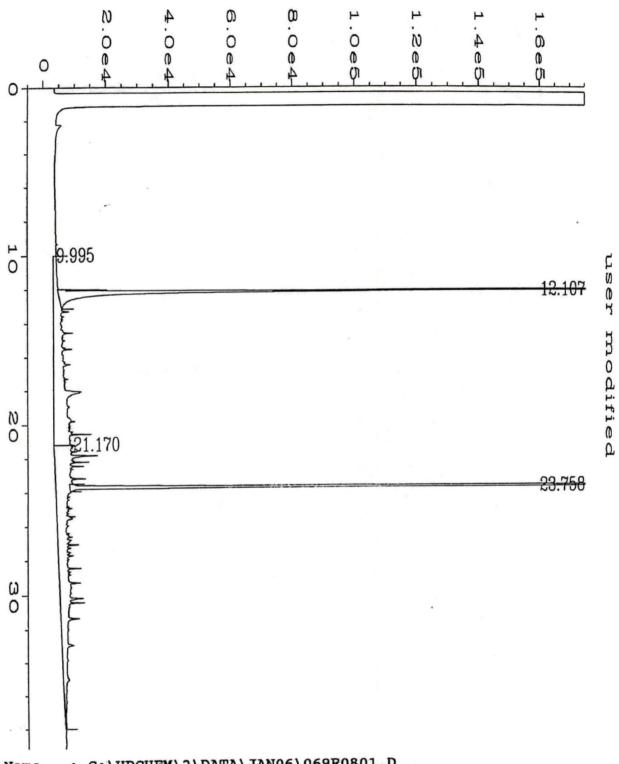
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.









Data File Name	•	C:\HPCHEM\2\DATA\JAN06\069R0	801.D		
Operator		DAVE	Page Number	:	1
Instrument		ROBERT	Vial Number	:	69
	-	412-1823	Injection Number	:	1
		412-1623	Sequence Line	:	8
Run Time Bar Code			Instrument Method	:	TPH3R.MTH
		07 Jan 95 10:08 AM	Analygic Method		

Report Created on: 09 Jan 95 01:19 PM Analysis Method : BLK.MTH



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GeoEngineers, Inc.

8410 154th Avenue N.E.

Redmond, WA 98052 Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #9161-183-R04

Sample Matrix: Water Analysis Method: WTPH-D

Units: mg/L (ppm)

Analyst:

D. Anderson

Extracted: Analyzed: Jan 4, 1995 Jan 7, 1995

Reported:

Jan 10, 1995

# HYDROCARBON QUALITY CONTROL DATA REPORT

**ACCURACY ASSESSMENT Laboratory Control Sample** 

Diesel

PRECISION ASSESSMENT

Sample Duplicate Diesel Range

**Organics** 

Spike Conc.

Added:

2.1

Spike Result:

Recovery:

**Upper Control** 

Limit %:

**Lower Control** Limit %:

110

2.3

126

71

Sample

Number: 412-1796

Original

Result: N.D.

Duplicate

Result: N.D.

Relative

Relative Percent Difference values are not % Difference reported at sample concentration levels

less than 10 times the Detection Limit.

Maximum

RPD:

39

NORTH CREEK ANALYTICAL Inc.

Yama Dutter

Laura Dutton Project Manager % Recovery:

Spike Result

x 100

Relative % Difference:

Original Result - Duplicate Result

Spike Concentration Added

(Original Result + Duplicate Result) / 2

4121820.GEO <6>



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(509) 924-9200 • FAX 924-9290

Client Project ID: UNOCAL #5905, #9161-183-R04 Sampled: Dec 29, 1994 GeoEngineers, Inc. Sample Matrix: Water Received: 8410 154th Avenue N.E. Dec 30, 1994 Redmond, WA 98052 Analysis Method: EPA 413.2 (I.R.) Extracted: Jan 4, 1995 First Sample #: 412-1824 Attention: Lisa Bona Analyzed: Jan 5, 1995 Reported: Jan 10, 1995

# **TOTAL OIL & GREASE**

Sample	Sample	Sample Result	
Number	Description	mg/L (ppm)	
412-1824	PURGE	2.7	
BLK010495	Method Blank	N.D.	

Reporting Limit:

1.0

Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Yama Dutter

Laura Dutton Project Manager

4121820.GEO <7>



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GeoEngineers, Inc. 8410 154th Avenue N.E.

Redmond, WA 98052 Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #9161-183-R04

Sample Matrix: Water

Analysis Method: EPA 413.2 (I.R.)

Units: mg/L (ppm)

Analyst:

C. Days

Extracted:

Jan 4, 1995 Jan 5, 1995

Analyzed: Reported:

Jan 10, 1995

# HYDROCARBON QUALITY CONTROL DATA REPORT

**ACCURACY ASSESSMENT Laboratory Control Sample** 

Oil and

Grease

4.2

3.8

Spike Conc.

Added:

Spike

Result:

Recovery:

91

Upper Control

Limit %:

Lower Control Limit %:

60

134

PRECISION ASSESSMENT

Sample Duplicate

Oil and Grease

Sample

Number: 412-1871

Original

Result:

5.3

Duplicate

Result:

4.3

Relative

Relative Percent Difference values are not % Difference reported at sample concentration levels less than ten times the Detection Limit.

Maximum

RPD:

45

NORTH CREEK ANALYTICAL Inc. % Recovery:

una Dutto

Laura Dutton **Project Manager** 

Spike Result Spike Concentration Added x 100

Relative % Difference:

Original Result - Duplicate Result (Original Result + Duplicate Result) / 2

x 100

4121820.GEO <8>



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INICAL CILADI OF CUCEODY DEPONE																											
						OF CUSTODY REPORT												Chain of Custody Record #:									
UNOCAL INFORMATION																											
Facility Number: 5905						EUE	ngih	veers				Proje	ect N	umbe	T:	9161	-183	3 - 1	254								
Site Address: Bothe	WA			Ad	dress:	841			~ /	120		NE										Quality Assurance Data Level:					
City, State, ZIP:					1 comonos												A B										
Site Release Number:					Phone: 8-61-6000 Fax: 8-61-6050												A: Standard Summary										
Unocal Manager: Leigh	Canlson			1	CERT CRRS Code:600													B: Standard + Chromatograms									
		,		Pro	ject N	Manager	2.	SA	130	nd												Laboratory Turnaround Days:					
				Sar	Sample Collection by: Don Wz/1													10 5 3 2 1									
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						C X	T			ន	S		86	ls.		p											
,						BTEX (EPA 8020 Mod.) TPH-Gas + BTEX				olatil	olati	g A	latile /826(	niVo	27.	Lead: Total or Dissolved	88										
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Page 1 of 1 Comments: NURMAL TAT PICUL																		1									
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