Groundwater Sampling

Groundwater samples were collected from Monitoring Wells MW-3, MW-6, MW-7, and MW-8 on September 30, 1999. The locations of the wells are shown in Figure 1. Prior to the collection of the groundwater samples, the four wells were each purged of a minimum of three well volumes of water using a variable-speed submersible pump equipped with new disposable tubing. The purgewater from the four wells is being temporarily stored on-site in a 55-gallon drum. The purgewater from the previous sampling events was collected by APC on October 6, 1999, for treatment. At the time of sampling, temperature, specific conductance, dissolved oxygen, and pH values were measured in the groundwater collected from the four monitoring wells. Water level, purging, and sampling data for the sampling event are presented in Table 2.

Laboratory Analyses

The vapor sample from the VES discharge stack was submitted to CT&E Environmental Services, Inc. (CT&E) of Anchorage, Alaska and analyzed for aromatic volatile organics (BTEX) using EPA Method 8021B and gasoline range organics (GRO) using EPA Method 8015M.

The four groundwater samples, designated Samples MW3, MW6, MW7, and MW8, were analyzed for diesel range organics (DRO) by Alaska Method 102 (AK 102). In addition, Sample MW6 was analyzed for polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8310 and Sample MW8 was analyzed for gasoline range organics (GRO) by AK 101 and aromatic volatile organics (BTEX) by EPA Method 8021B. In addition, a trip blank accompanied the samples to and from the laboratory and was analyzed for GRO by AK 101 and BTEX by EPA 8021B. The samples were submitted to CT&E for analysis.

Analytical Results

Vapor Sample VES1099 contained 0.930 ppm toluene and 2.49 ppm xylenes and did not contain benzene, ethylbenzene, or GRO above the laboratory reporting limit. The previous samples of the VES discharge vapor, collected in September 1998 and January 1999, did not contain detectable GRO or BTEX. The laboratory results of the vapor sample are summarized on Table 1.

The analytical results of the groundwater samples are summarized in Table 3, while a cumulative summary of the current and previous analytical results are included in Table 4. Groundwater Samples MW3 and MW6 contained 4.42 ppm DRO and 1.43 ppm DRO, respectively. Sample MW7 did not contain DRO above the laboratory reporting limit. As shown in Table 4, the concentration of DRO in Well MW3 has increased from the four previous

sampling events and exceeds the applicable ADEC cleanup criteria of 1.5 ppm DRO. The laboratory noted that the DRO pattern for Sample MW3 contained an unknown hydrocarbon with several peaks. The laboratory further noted that the pattern appears to be possible glycol or polyol such as hydraulic fluid. Shannon & Wilson questioned the laboratory about these notes and the laboratory visually examined Sample MW3. Based on these observations, the laboratory reported no hydrocarbon odor in the sample. They further noted that the water contained an abundant filamentous suspension, which they suspect may be microbial colonies. Because the DRO extraction would extract organic cell material, the DRO results may be biased. As indicated in Table 4, the concentration of DRO in Monitoring Well MW6 has decreased to levels below the appropriate cleanup criteria. Sample MW6 was also analyzed for PAHs and contained eleven PAH compounds. With the exception of 0.00109 ppm benzo(b)fluoranthene (cleanup level of 0.001 ppm), the detected PAH compounds were either below the applicable cleanup standards or do not have cleanup standards.

In an effort to further evaluate the site's remediation system a groundwater sample was collected from Monitoring Well MW-8. The well is located in the former gasoline underground storage tank (UST) excavation, as shown on Figure 1. Sample MW8 contained 5.34 ppm DRO, 0.22 ppm GRO, 0.0599 ppm benzene, 0.00584 ppm toluene, and 0.01024 ppm xylenes. The reported concentrations of DRO and benzene exceed the applicable cleanup criteria of 1.5 ppm DRO and 0.005 ppm benzene. As shown in Table 4, the most recent results indicate a decrease in DRO, GRO, and BTEX concentrations from the June 1999 sampling event.

A trip blank, designated TB, accompanied the sample bottles to and from the laboratory. The trip blank did not contain detectable concentrations of GRO or BTEX, indicating that cross-contamination did not occur during the handling of the samples. The individual laboratory reports for the recent sampling event are presented in Attachment 1.

Limitations

This report was prepared for the exclusive use of our client and their representatives in the monitoring of this site. The findings we have presented within this report are based on limited research and information provided by others and on the sampling and analysis that we conducted at this site. It is possible that our tests may have missed some higher levels of petroleum hydrocarbon constituents or hazardous substances. As a result, the analysis and sampling performed can only provide you with our best judgements as to the environmental characteristics of the sample locations, and in no way guarantees that an agency or its staff will reach the same conclusions as Shannon & Wilson, Inc. The data presented in this report should be considered representative of the time of our sampling. Changes in site conditions can occur with time, because of natural forces or human activity. In addition, changes in government

codes, regulation or laws may occur. Because of such changes beyond our control, our observations and interpretations may need to be revised.

Shannon & Wilson has prepared Attachment 2, "Important Information About Your Geotechnical/Environmental Report", to assist you and others in understanding the use and limitations of our report. You are advised that various state and federal agencies (ADEC, EPA, etc.) may require the reporting of this information. Shannon & Wilson does not assume the responsibility for reporting these finding and therefore, has not, and will not disclose the results of this study, except with your permission or as required by law.

We appreciate this opportunity to be of service and your continued confidence in our firm. If you have any questions or comments concerning this report, please call the undersigned.

Sincerely,

SHANNON & WILSON, INC.

Prepared by:

Dan McMahon
Environmental Scientist II

Reviewed by:

John Spielman, C.P.G.
Principal Hydrogeologist

Enc: Tables 1, 2, 3, & 4, Figure 1, Attachments 1 and 2

cc: Mr. Michael Krueger, MOA

TABLE 1 - SUMMARY OF VAPOR SAMPLE FIELD MEASUREMENTS AND ANALYTICAL RESULTS

		Analytical Sample Number and Collection Date (See Attachment 1)		
		VES99		
Parameter Tested	**Method***	10/6/99		
Exhaust Stack FID Reading - ppm	Sensidyne FID	100		
Exhaust Stack Temperature - Fahrenheit	Thermometer	96		
Exhaust Flow Pressure - inches water	Vacuum Gauge	42		
Exhaust Differential Pressure - inches water	Pitot Tube	0.32		
Exhaust Flow Velocity - fpm	Conversion Charts†	2300		
Aromatic Volatile Organics (BTEX)				
Benzene - ppm	EPA 8021B	<0.780		
Toluene - ppm	EPA 8021B	0.930		
Ethylbenzene - ppm	EPA 8021B	<0.580		
Xylenes - ppm	EPA 8021B	2.49		
Gasoline Range Organics (GRO) - ppm	EPA 8015M/8021B	<20.0		
Volatile Petroleum Hydrocarbons - lbs/day	Ideal Gas Law**	<1.6		

KEY	DESCRIPTION
*	See Attachment 1 For Detection Limits
**	Using a Gas Constant of R=75.6 Pa•m^3/Kg•K
†	Flow Rates Calculated From Pitot Tube/ Manometer Conversions
<0.780	Less Than The Detection Limit of 0.780 ppm

WATER LEVEL MEASUREMENT DATA

WELL NUMBER	MW3	MW6	MW7	MW8
DATE WATER LEVEL MEASURED	9/30/99	9/30/99	9/30/99	9/30/99
TIME WATER LEVEL MEASURED	10:35	10:45	10:40	10:50
MP ELEVATION, FT	NM	NM	NM	NM
DEPTH TO WATER BELOW MP, FT	12.18	18.23	16.78	4.23
WATER LEVEL ELEVATION, FT	NM	NM	NM	NM

SAMPLING/PURGING DATA

WELL NUMBER	MW3	MW6	MW7	MW8
DATE SAMPLED	9/30/99	9/30/99	9/30/99	9/30/99
TIME SAMPLED	15:20	15:45	15:30	16:05
DEPTH TO WATER BELOW MP, FT	12.18	18.23	16.78	4.23
TOTAL DEPTH OF WELL BELOW MP, FT	20.01	24.16	20.79	7.09
WATER COLUMN IN WELL, FT	7.83	5.93	4.01	2.86
GALLONS PER FOOT	0.16	0.16	0.16	0.16
GALLONS IN WELL	1.25	0.95	0.64	0.46
TOTAL GALLONS PUMPED/BAILED	4.0	3.0	2.0	1.5
TEMPERATURE, C	10.8	9.5	10.3	11.4
SPECIFIC CONDUCTANCE, UMHOS/CM	516	400	587	610
pH	6.53	6.42	6.32	6.74
DISSOLVED OXYGEN, PPM	0.7	0.4	1.6	0.9
DIAMETER OF WELL CASING	2-inch	2-inch	2-inch	2-inch
REMARKS		Petroleum Odor		

Purging & Sampling Method: Submersible Pump
Sampling Personnel: Lena Hanson

KEY

MP = Measuring Point
NM = Not Measured

TABLE 3 - SUMMARY OF ANALYTICAL RESULTS

Parameter Tested	Method*	Cleanup Level	Source of Sample, Sample Number and Depth in Feet (See Table 2 and Attachment 1)				
			Well MW3	Well MW6	Well MW7	Well MW8	Quality Control
			MW3	MW6	MW7	MW8	TB
			12.18	18.23	16.78	4.23	-
Diesel Range Organics (DRO) - ppm	AK 102	1.5	4.42	1.43	<0.319	5.34	-
Gasoline Range Organics (GRO) - ppm	AK 101	1.3	-	-	-	0.22	<0.0900
Aromatic Volatile Organics (BTEX)							
Benzene - ppm	EPA 8021B	0.005	-	-	-	0.0599	<0.00050
Toluene - ppm	EPA 8021B	1	-	-	-	0.00584	<0.0020
Ethylbenzene - ppm	EPA 8021B	0.7	-	-	-	<0.0020	<0.0020
Xylenes - ppm	EPA 8021B	10	-	-	-	0.01024	<0.0020
Polynuclear Aromatic Hydrocarbons (PAHs)							
Fluorene - ppm	EPA 8310	1.46	-	0.00144	-	-	-
Phenanthrene - ppm	EPA 8310	-	-	0.000549	-	-	-
Fluoranthene - ppm	EPA 8310	1.46	-	0.0000361	-	-	-
Pyrene - ppm	EPA 8310	1.1	-	0.000565	-	-	-
Benzo(a)anthracene - ppm	EPA 8310	0.001	-	0.000140	-	-	-
Chrysene - ppm	EPA 8310	0.1	-	0.000878	-	-	-
Benzo(b)fluoranthene - ppm	EPA 8310	0.001	-	0.00109	-	-	-
Benzo(k)fluoranthene - ppm	EPA 8310	0.01	-	0.000101	-	-	-
Benzo(a)pyrene - ppm	EPA 8310	0.0002	-	0.000130	-	-	-
Benzo(g,h,i)perylene - ppm	EPA 8310	-	-	0.000211	-	-	-
Indeno(1,2,3-c,d)pyrene - ppm	EPA 8310	0.001	-	0.000589	-	-	-
Other Analytes - ppm	EPA 8310	-	-	ND	-	-	-

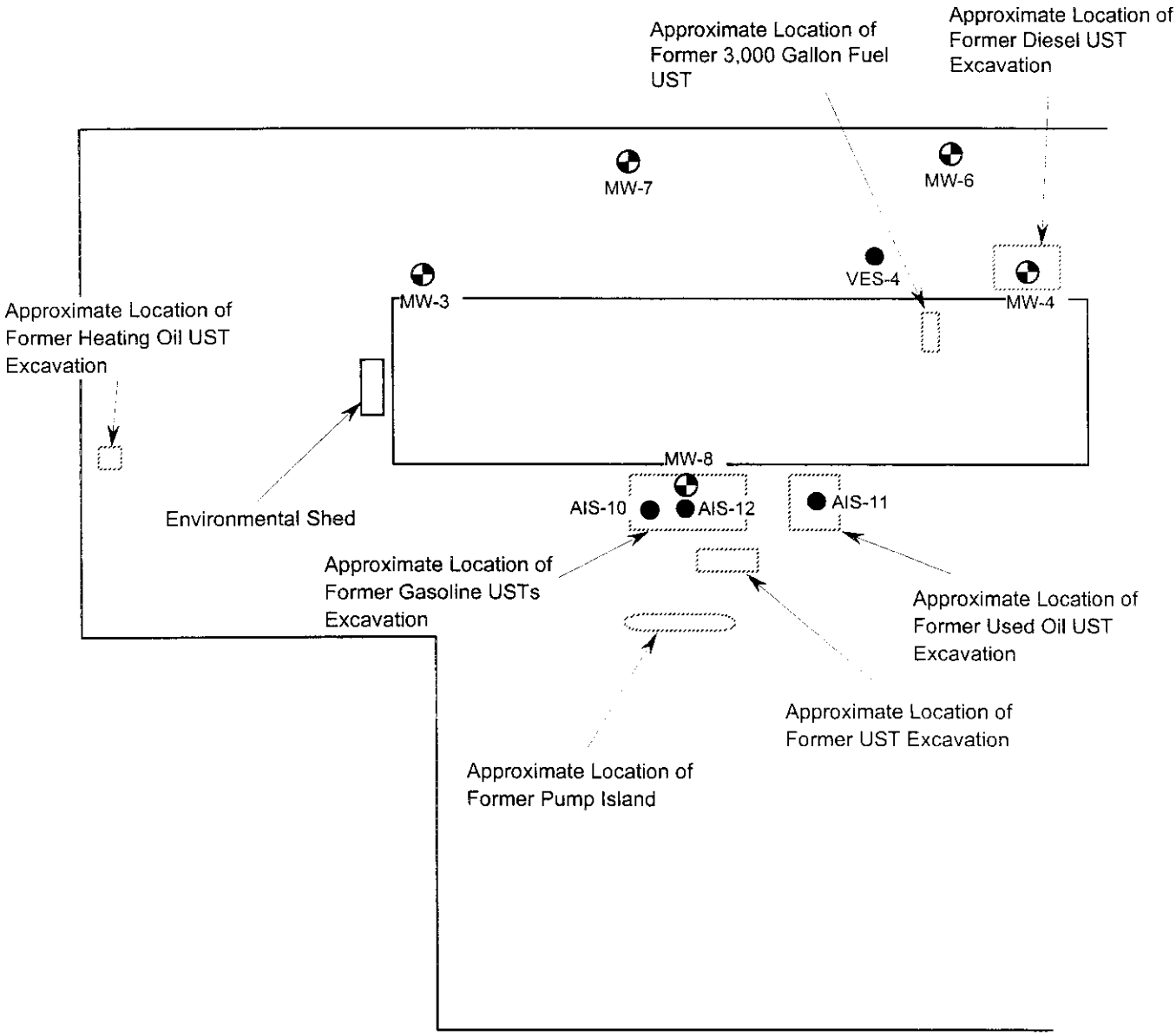
KEY	*DESCRIPTION*
*	See Attachment 1 for compounds tested and limits of detection
ND	Analyte not detected
-	Not applicable or sample not analyzed for parameter
<0.319	Analyte below laboratory reporting limit of 0.319 ppm

TABLE 4 - CUMULATIVE SUMMARY OF ANALYTICAL RESULTS

Monitoring Well	Date	DRO ppm	GRO ppm	Benzene ppm	Total BTEX ppm
MW3	8/27/98	0.206	--	--	--
	12/31/98	0.669	--	--	--
	3/19/99	<0.333	--	--	--
	6/23/99	0.427	--	--	--
	9/30/99	4.42	--	--	--
MW6	8/27/98	0.282	--	--	--
	12/31/98	0.759	--	--	--
	3/19/99	1.21	--	--	--
	6/23/99	2.17	--	--	--
	9/30/99	1.43	--	--	--
MW7	8/27/98	<0.104	--	--	--
	12/31/98	0.158	--	--	--
	3/19/99	<0.309	--	--	--
	6/23/99	<0.297	--	--	--
	9/30/99	<0.319	--	--	--
MW8	6/23/99	7.53	0.25	0.103	0.109
	9/30/99	5.34	0.22	0.0599	0.0759

KEY	DESCRIPTION
ND	*Analyte not detected*
--	Sample not analyzed for parameter
<0.333	Analyte below laboratory reporting limit of 0.333 ppm

0000518



0 30 60 120

Approximate Scale in Feet

LEGEND

MW-7 Approximate location of monitoring well MW-7.

AIS-11 Approximate location of Air Injection Well AIS-11.

Note: Site Plan derived from Harding Lawson Associates, May 1993

N

1201 East Third Avenue
Anchorage, Alaska

SITE MAP

November 1999 Y-5954

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 1

ATTACHMENT 1

RESULTS OF ANALYTICAL TESTING BY

CT&E ENVIRONMENTAL SERVICES, INC.,

ANCHORAGE, ALASKA

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

October 26, 1999

Dan McMahon
Shannon & Wilson Inc.
5430 Fairbanks Street Ste 3
Anchorage, AK 99518

Client Name	Shannon & Wilson Inc.
Project ID	Y5954 1201 E 3rd ML & P [995381]
Printed	October 26, 1999

Enclosed are the analytical results associated with the above project.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U - Indicates the compound was analyzed for but not detected.
J - Indicates an estimated value that falls below PQL, but is greater than the MDL.
B - Indicates the analyte is found in the blank associated with the sample
* - The analyte has exceeded allowable limits.
GT - Greater Than
D - Secondary Dilution
LT - Less Than
! - Surrogate out of range

CT&E Environmental Services Inc.

0000521 ~~000012~~

CT&E Ref.#	995381001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/20/99 10:35
Project Name/#	Y5954 1201 E 3rd ML & P	**Collected Date/Time**	09/30/99 15:20
Client Sample ID	Y5954-MW3	**Received Date/Time**	10/01/99 12:03
Matrix	Water (Surface, Eff., Ground)	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID		**Released By**	

Sample Remarks:
DRO - Unknown hydrocarbon with several peaks.
DRO - Pattern appears to be possible glycol or polyol such as hydraulic fluid.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
AK102								
Diesel Range Organics	4.42	0.324	mg/L	AK102 DRO		10/03/99	10/05/99	MMP
Surrogates								
5a Androstane <surr>	103		%	AK102 DRO	(50-150)	10/03/99	10/05/99	

CT&E Environmental Services Inc.

0000522

~~0000~~13

CT&E Ref.#	995381002	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/20/99 10:35
Project Name/#	Y5954 1201 E 3rd ML & P	**Collected Date/Time**	09/30/99 15:30
Client Sample ID	Y5954-MW7	**Received Date/Time**	10/01/99 12:03
Matrix	Water (Surface, Eff., Ground)	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
AK102								
Diesel Range Organics	0.319 U	0.319	mg/L	AK102 DRO		10/03/99	10/05/99	MMP
Surrogates								
5a Androstane <surr>	86.1		%	AK102 DRO	(50-150)	10/03/99	10/05/99	

CT&E Environmental Services Inc.

0000523

CT&E Ref.#	995381003	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/26/99 11:21
Project Name/#	Y5954 1201 E 3rd ML & P	**Collected Date/Time**	09/30/99 15:45
Client Sample ID	Y5954-MW6	**Received Date/Time**	10/01/99 12:03
Matrix	Water (Surface, Eff., Ground)	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID		**Released By**	

Sample Remarks:
DRO - Pattern consistent with highly weathered middle distillate.
DRO/RRO - Possible lube oil pattern.
PAH/HPLC - Fluorene, Phenanthrene, Pyrene, and Chrysene were biased high in the LCS and LCSD and may be biased high in this sample.

Parameter		Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Polynuclear Aromatics									
Naphthalene		10.3 U	10.3	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Acenaphthylene		10.3 U	10.3	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Acenaphthene		10.3 U	10.3	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Fluorene		1.44	1.03	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Phenanthrene		0.549	0.515	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Anthracene		0.515 U	0.515	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Fluoranthene		0.0361	0.0258	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Pyrene		0.565	0.515	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Benzo(a)Anthracene		0.140	0.0103	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Chrysene		0.878	0.515	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Benzo[b]Fluoranthene		1.09	0.0515	ug/L	SW846-8310		10/03/99	10/22/99	SPM
Benzo[k]fluoranthene		0.101	0.0103	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Benzo[a]pyrene		0.130	0.0515	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Dibenzo[a,h]anthracene		0.103 U	0.103	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Benzo[g,h,i]perylene		0.211	0.0515	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Indeno[1,2,3-c,d] pyrene		0.589	0.103	ug/L	SW846-8310		10/03/99	10/16/99	SPM
Surrogates									
2-Fluorobiphenyl <Surr>	!	27.1		%	SW846-8310	(32-99)	10/03/99	10/16/99	
P-Terphenyl <Surr>	!	129		%	SW846-8310	(47-115)	10/03/99	10/16/99	

CT&E Environmental Services Inc.

0000524

0000015

CT&E Ref.#	995381003	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/26/99 11:21
Project Name/#	Y5954 1201 E 3rd ML & P	**Collected Date/Time**	09/30/99 15:45
Client Sample ID	Y5954-MW6	**Received Date/Time**	10/01/99 12:03
Matrix	Water (Surface, Eff., Ground)	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID			

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
AK102								
Diesel Range Organics	1.43	0.341	mg/L	AK102 DRO		10/03/99	10/05/99	MMP
Surrogates								
5a Androstane <surr>	110		%	AK102 DRO	(50-150)	10/03/99	10/05/99	

CT&E Environmental Services Inc.

0000525

0-0-0-0-1-6

CT&E Ref.#	995381004	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/20/99 10:35
Project Name/#	Y5954 1201 E 3rd ML & P	**Collected Date/Time**	09/30/99 16:05
Client Sample ID	Y5954-MW8	**Received Date/Time**	10/01/99 12:03
Matrix	Water (Surface, Eff., Ground)	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID		**Released By**	

Sample Remarks:
DRO - Pattern consistent with gasoline.
DRO/RRO - Pattern consistent with lube oil.
DRO - Heavier hydrocarbons contributing to diesel range quantitation.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GRO/602 Combo								
Gasoline Range Organics	0.22	0.0900	mg/L	AK101/8021B		10/06/99	10/07/99	ELB
Benzene	0.0599	0.00050	mg/L	AK101/8021B		10/06/99	10/07/99	ELB
Toluene	0.00584	0.0020	mg/L	AK101/8021B		10/06/99	10/07/99	ELB
Ethylbenzene	0.0020 U	0.0020	mg/L	AK101/8021B		10/06/99	10/07/99	ELB
P & M -Xylene	0.00486	0.0020	mg/L	AK101/8021B		10/06/99	10/07/99	ELB
o-Xylene	0.00538	0.0020	mg/L	AK101/8021B		10/06/99	10/07/99	ELB
Surrogates								
4-Bromofluorobenzene <Surr>	85		%	AK101/8021B	(50-150)	10/06/99	10/07/99	
1,4-Difluorobenzene <Surr>	91.3		%	AK101/8021B	(60-120)	10/06/99	10/07/99	
AK102								
Diesel Range Organics	5.34	0.330	mg/L	AK102 DRO		10/03/99	10/05/99	MMP
Surrogates								
5a Androstane <surr>	145		%	AK102 DRO	(50-150)	10/03/99	10/05/99	

CT&E Environmental Services Inc.

0000526 ~~990917~~

CT&E Ref.#	995381005	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/20/99 10:35
Project Name/#	Y5954 1201 E 3rd ML & P	**Collected Date/Time**	
Client Sample ID	Y5954-TB	**Received Date/Time**	10/01/99 12:03
Matrix	Water (Surface, Eff., Ground)	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GRO/602 Combo								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/8021B		10/06/99	10/06/99	ELB
Benzene	0.00050 U	0.00050	mg/L	AK101/8021B		10/06/99	10/06/99	ELB
Toluene	0.0020 U	0.0020	mg/L	AK101/8021B		10/06/99	10/06/99	ELB
Ethylbenzene	0.0020 U	0.0020	mg/L	AK101/8021B		10/06/99	10/06/99	ELB
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/8021B		10/06/99	10/06/99	ELB
o-Xylene	0.0020 U	0.0020	mg/L	AK101/8021B		10/06/99	10/06/99	ELB
Surrogates								
4-Bromofluorobenzene <Surr>	72.8		%	AK101/8021B	(50-150)	10/06/99	10/06/99	
1,4-Difluorobenzene <Surr>	84.5		%	AK101/8021B	(50-150)	10/06/99	10/06/99	

995381

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN OF CUSTODY RECORD

400 N. 34th Street, Suite 100
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Kennewick, WA 99336
(509) 735-1280

2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Page 1 of 1
Laboratory CTEE
Attn: Shane

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	DRO AK102	PAHs EPA 8310	BRO AK101	BTEX EPA8021		Total Number of Containers	Remarks/Matrix
Y5954 - MW3	1	15:20	9-30-94		X	X					2	H_2O
Y5954 - MW7	2	15:30	↓			X					2	↓
Y5954 - MW6	3	15:45				X	X				4	
Y5954 - MW8	4	16:05				X	X	X	X		4	
Y5954 - TB	5						X	X	X		2	Trip Blank

Project Information		Sample Receipt	
Project Number:	Y5954	Total Number of Containers	
Project Name:	1201 E. 3d; MLEP	COC Seals/Intact? Y/N/NA	
Contact:	Dan McMahon	Received Good Cond./Cold	
Ongoing Project?	Yes ☒ No ☐	Delivery Method:	
Sampler:	Lena Hanson	(attach shipping bill, if any)	

Instructions

Requested Turn Around Time: normal

Special Instructions: Quote 3595

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Lena V. Hanson Time: 12:03	Signature: Time:	Signature: Time:
Printed Name: Lena Hanson Date: 9-1-94	Printed Name: Date:	Printed Name: Date:
Company: Shannon & Wilson	Company:	Company:
Received By: 1.	**Received By: 2.**	**Received By: 3.**
Signature: Tara Howell Time: 1203	Signature: Time:	Signature: Time:
Printed Name: Tara Howell Date: 9-1-94	Printed Name: Date:	Printed Name: Date:
Company: CTEE	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No. _____

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

October 11, 1999

Dan McMahon
Shannon & Wilson Inc.
5430 Fairbanks Street Ste 3
Anchorage, AK 99518

Client Name	Shannon & Wilson Inc.
Project ID	Y5954 1201 E. 3rd [995486]
Printed	October 11, 1999

Enclosed are the analytical results associated with the above project.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U - Indicates the compound was analyzed for but not detected.
J - Indicates an estimated value that falls below PQL, but is greater than the MDL.
B - Indicates the analyte is found in the blank associated with the sample.
* - The analyte has exceeded allowable limits.
GT - Greater Than
D - Secondary Dilution
LT - Less Than
! - Surrogate out of range

CT&E Ref.#	995486001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	10/11/99 12:56
Project Name/#	Y5954 1201 E. 3rd	**Collected Date/Time**	10/06/99 12:30
Client Sample ID	Y5954-VES1099	**Received Date/Time**	10/06/99 13:10
Matrix	Gas & Air	**Technical Director: Stephen C. Ede**	
Ordered By			
PWSID		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GRO/602 Combo								
Gasoline Range Organics	20.0 U	20.0	ppm	CTE 8015M/8021B		10/07/99	10/08/99	ELB
Benzene	0.780 U	0.780	ppm	CTE 8015M/8021B		10/07/99	10/08/99	ELB
Toluene	0.930	0.660	ppm	CTE 8015M/8021B		10/07/99	10/08/99	ELB
Ethylbenzene	0.580 U	0.580	ppm	CTE 8015M/8021B		10/07/99	10/08/99	ELB
P & M -Xylene	1.67	0.580	ppm	CTE 8015M/8021B		10/07/99	10/08/99	ELB
o-Xylene	0.820	0.580	ppm	CTE 8015M/8021B		10/07/99	10/08/99	ELB

995486

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN OF CUSTODY RECORD

Page 1 of 1
Laboratory CTE
Attn: Shane

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

1354 N. Grandridge Blvd.
Kennewick, WA 99336
(509) 735-1280

2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

~~6430 Fairbanks Street, Suite 3~~
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	GRO/BTEX					Total Number of Containers	Remarks/Matrix
Y5954-VES1099	1	1230	10/4/99			X					1	Vapor

Project Information		Sample Receipt	
Project Number:	Y5954	Total Number of Containers	
Project Name:	1201 E. 3rd	COC Seals/Intact? Y/N/NA	
Contact:	D. McMahon	Received Good Cond./Cold	
Ongoing Project?	Yes ☒ No ☐	Delivery Method:	
Sampler:	DPM	(attach shipping bill, if any)	

Instructions	
Requested Turn Around Time:	Normal
Special Instructions:	

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 1310	Signature: Time:	Signature: Time:
Printed Name: Dan McMahon Date: 10-6-99	Printed Name: Date:	Printed Name: Date:
Company: Shannon-Wilson	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time: 1310	Signature: Time:	Signature: Time:
Printed Name: Tara Howell Date: 10-6-99	Printed Name: Date:	Printed Name: Date:
Company: CTE	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No.

ATTACHMENT 2

"IMPORTANT INFORMATION ABOUT YOUR

GEOTECHNICAL/ENVIRONMENTAL REPORT"

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to Y-5954
Dated: November 1999
To: Municipal Light & Power
Re: 1201 East Third Avenue, anchorage, Alaska

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

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2/28/00 meeting RW, Jim Pfeifer
John Speilman (STW)
+ Golder Report investigation on VES product
L69.07 ~ Look at HLA Aug 3, 1993 Phase 2
report that STW will provide. System
still treating site, high levels of
BTEX + GRO on south side of building
Need to
Focus system blower on South side.
Getting some fuel old oil product in ves-4.
→ New report out soon has new soil data,
↝ STW to evaluate remediation system
+ recommend modifications/use change
to enhance recovery @ Gasoline UST (South side) area.
Start w/ more blower power on south side,
Currently quarterly on all wells.
Annual all for BTEX, Quarterly all for DRO
Mw 8 BTEX + DRO Quarterly, Suspend all GRO.

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MAR 02 2000
Dept. of Environmental Conservation
Underground Storage Tanks — FAP

A Report Prepared for

Municipality of Anchorage
Department of Public Works
3630 East Tudor Road
Anchorage, Alaska 99507

PHASE II REMEDIAL INVESTIGATION MUNICIPAL LIGHT AND POWER FACILITIES ANCHORAGE, ALASKA

HLA Project No. 10585

Revision No. 2 to
Volume I of II

by

Mark A. Bryant, P.E.
Principal Engineer

George M. Drewett, P.E.
Principal Engineer

Harding Lawson Associates
601 East 57th Place
Anchorage, Alaska 99518
(907) 563-8102

August 2, 1993

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1.0 INTRODUCTION

This report presents the results of Harding Lawson Associates' (HLA's) Phase 2 Subsurface Investigation of the Municipality of Anchorage's (MOA's) Municipal Light and Power (ML&P) facilities at 1120 East First Avenue (Site 1), 1121 East First Avenue (Site 2), and 1201 East Third Avenue (Site 3). A Location Map of these sites is presented on Plate 1. The purpose of this investigation was to assess the extent of soil and groundwater contamination at the three sites and, if appropriate, to identify and evaluate alternative remedial measures. HLA's scope of services for this project was described in our February 12, 1992, letter to the MOA. Authorization to proceed with this project was provided by Mr. Mike Krueger of the MOA and Mr. Ron Kuczek of ML&P under the MOA's 1992 Term Contract with HLA.

1.1 SCOPE OF SERVICES

This Phase 2 Subsurface Investigation was the second of three phases identified for this project. Phase 1 was authorized by the MOA on October 14, 1991, and involved preparing plans for the treatment and/or disposal of stockpiled soil, reviewing data from previous investigations, and preparing recommendations for investigating the subsurface contamination at each site. The Phase 1 recommendations were reported to the MOA in HLA's February 12, 1992, letter, and form the basis for the scope of services

performed in Phase 2. The objective of the Phase 2 Subsurface Investigation was to further evaluate the extent of subsurface contamination at the three sites and to recommend remedial alternatives for implementation in Phase 3.

The Phase 1 recommendations identified six tasks to be completed under Phase 2:

- The preparation of a Work Plan/Quality Assurance Plan (WP/QAP) and a Health and Safety Plan for the Phase 2 investigations (Task 1);
- The performance of water well surveys and water-level surveys (Task 2);
- The performance of investigations of Sites 1, 2, and 3 (Tasks 3, 4, and 5);
- The preparation of a report describing the results of Tasks 2 through 5 (Task 6).

In compliance with Task 6, this report describes the field activities performed during Phase 2 of this project and presents the results.

1.2 BACKGROUND

The three ML&P sites encompass approximately 6 acres within the Anchorage city limits, less than 1 mile northwest of the downtown area (Plate 1). The sites are situated in Ship Creek valley, approximately 1.25 miles east of Ship Creek's terminus at Cook Inlet. Landmarks in the area include the ML&P power plant located approximately 1/2 block west of Site 2, Bean's Cafe located immediately west of Site 3, and the Alaska Native Medical Center located approximately 1 block west of Sites 1 and 3. Land use of the surrounding area is primarily commercial/industrial.

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Dept. of Environmental Conservation
Underground Storage Tanks — FAP

Site 1, 1120 East First Avenue

Site 1 is located on the south side of East First Avenue, between Sites 2 and 3 (Plate 2). It includes a steel industrial building with 8,000 square feet of office space and 10,500 square feet of heated warehouse space, and a 4,000-square foot unheated storage building. Approximately 70 percent of Site 1 is covered with asphalt.

HLA performed a Phase 1 and a Phase 2 Preliminary Hazardous Materials Site Assessment at Site 1 in 1989, prior to purchase of the site by the MOA. Previous ownership and use of the site is documented in the Phase 1 and Phase 2 preliminary assessment report (HLA, 1989). Results from the Phase 1 Site Assessment indicated the presence of a container storage area south of the warehouse and four underground fuel storage tanks (USTs) in the south-central portion of the site. During the Phase 2 Site Assessment, HLA drilled six borings at the site: one near the container storage area, three near the USTs, and two along the northern edge of the property (Plate 2). Each boring was converted to a monitoring well (MW-1 to MW-6), and one groundwater sample from each boring was collected. On October 26, 1989, HLA observed removal of the four USTs at the site and collected soil samples from the excavation.

Analytical results of samples from the soil borings and from the UST excavation indicated the presence of petroleum hydrocarbons in soil near the container storage area (MW-3) and along the northern edge of the property near MW-2. Analytical results for groundwater samples from the monitoring wells indicated the presence of benzene, ethylbenzene, toluene, and xylenes

(BETX) near the former USTs. In addition, halogenated volatile organic compounds (VOCs), including tetrachloroethene (PCE), 1,1-dichloroethane, trichloroethene (TCE), and cis-1,2-dichloroethene, were detected in most of the groundwater samples.

Site 2, 1121 East First Avenue

Site 2 is located on the north side of East First Avenue, across from Site 1 (Plate 2). Ship Creek is approximately 100 feet north of Site 2 (Plate 1). Site 2 includes the ML&P Fleet Service Maintenance Facility (garage) and surrounding property (Plate 2). Since 1989, RZA, Inc., has been remediating gasoline-contaminated groundwater and soil at this site for ML&P. The groundwater remediation consists of pumping water through an air stripper, and the soil remediation consists of extracting soil vapors. The source of this contamination was a leaking gasoline tank formerly located along the southeast end of the garage (at the fuel pumps) (RZA, 1989).

On October 26, 1990, a waste oil tank was removed from the northeastern side of the garage. Chemical & Geological Laboratory (Chem Lab) of Anchorage collected and analyzed samples from the excavation and reported the results to ML&P (Chem Lab, 1990). Analytical results of soil samples collected from the perimeter of the tank excavation indicate that petroleum hydrocarbon concentrations as high as 5,700 milligrams per kilogram (mg/kg) were present in the soil. In addition, halogenated VOCs, PCE, and 1,1,1-trichloroethane (TCA) were detected in the soil samples and in a water sample

from the excavation. Petroleum hydrocarbons and metals were detected in the same water sample.

Site 3, 1201 East Third Avenue

Site 3 is located on the north side of East Third Avenue, immediately south of Site 1 (Plate 2). It includes the former ML&P Technical Service Station, currently used as a storage building (Plate 2). In November 1989, HLA observed the removal of two gasoline USTs and one waste oil UST from locations adjacent to the south side of the building, and the removal of one diesel fuel UST from a location near the northeast corner of the building. In June 1990, HLA observed the removal of an abandoned heating oil UST from a location approximately 100 feet west of the building. HLA collected soil samples from each tank excavation and reported results of the analyses to the MOA (HLA, 1990a; HLA, 1990b). The analytical results indicate that gasoline contamination is present in the soil and groundwater near the former gasoline USTs. The gasoline contamination is also suspected of having migrated to the area of the former waste oil tank. Petroleum hydrocarbons were detected in the soil beneath the former diesel fuel UST and the former heating oil UST.

2.0 FIELD INVESTIGATION

Field activities were initiated at the three ML&P sites on May 6, 1992, and were completed on June 2, 1992. HLA's field activities were performed under the direction of Mr. Bill Burgess, P.E., HLA's Project Manager. Analytica, Inc., of Golden, Colorado, provided laboratory analytical services, and ML&P provided surveying services. The following field activities were conducted during this investigation:

- A water supply well survey was conducted to identify nearby, privately owned, water supply wells.
- At Site 1, 20 surface-soil samples were collected for field screening, and 4 were selected for laboratory analyses.
- A total of 22 soil borings were drilled (3 at Site 1, 5 at Site 2, and 14 at Site 3), and 116 soil samples were collected from the borings for field screening. One sample was selected from each boring for laboratory analysis.
- One existing monitoring well (MW-1 at Site 1) was abandoned.
- A total of 27 groundwater samples were collected for field screening (18 at Site 1, 5 at Site 2, and 4 at Site 3).
- Four new monitoring wells were installed at Site 3. Groundwater samples were collected from each of the new wells at Site 3 and from the five existing wells at Site 1.
- Water levels were measured at available monitoring points located throughout the three sites.

Detailed descriptions of the field investigation and laboratory analytical procedures used to perform this Phase 2 Subsurface Investigation can be found in HLA's May 7, 1992, WP/QAP (HLA, 1992). Boring and monitoring well completion logs are included in Appendix A of this report, and Analytica,

Inc.'s, laboratory report is included in Appendix B. The field activities performed and the investigation results are presented in the following sections.

2.1 WATER SUPPLY WELL SURVEYS AND WATER-LEVEL SURVEYS

In April 1992, HLA contacted the U.S. Geological Survey's (USGS') Water Resources Division and requested listings of registered water supply wells in the vicinity of the ML&P sites. In addition, HLA conducted a door-to-door survey of all establishments within 1/2 mile of the ML&P sites in an attempt to identify unregistered wells in the area. Four registered wells are listed within 1/4 mile of the sites, and 52 additional registered wells are listed within 1 mile of the sites. No unregistered wells were found during the door-to-door survey. Copies of the USGS' registered water supply well lists are included in Appendix C.

A water-level survey was conducted by HLA on June 30, 1992, to estimate water-table contours and groundwater flow directions at the ML&P sites. Water-level measurements were made at 17 monitoring wells at the three sites and at a standpipe in a subsurface drainage system (French drain) at Site 3. An electronic sounder was used to measure the depth to groundwater, and surveyed well locations and elevations were obtained from ML&P. A summary of the water-level survey data is presented in Table 1. Groundwater-level measurement locations and approximate water-table contours, based on the June 30, 1992, water-level survey data, are shown on Plate 3.

Table 1. Water-Level Elevation

Well Number	TOC Elevation (feet MSL)	Ground Elevation (feet MSL)	Date	Water Level (feet BTOC)	Water Level (feet MSL)	Water Level (feet BGS)
1MW-2	36.54	36.8	30-Jun-92	5.69	30.85	6.0
1MW-3	39.20	39.5	30-Jun-92	6.79	32.41	7.1
1MW-4	39.54	38.4	30-Jun-92	7.71	31.83	6.5
1MW-5	40.04	39.2	30-Jun-92	7.15	32.89	6.3
1MW-6	40.75	38.9	30-Jun-92	7.90	32.85	6.1
A3	37.30	37.5	30-Jun-92	3.89	33.41	4.1
A6	36.17	36.4	30-Jun-92	2.90	33.27	3.1
A7	36.75	37.0	30-Jun-92	3.90	32.85	4.2
2A3	36.79	37.0	30-Jun-92	5.15	31.64	5.4
2A4	36.13	36.2	30-Jun-92	4.60	31.53	4.7
2A5	35.28	35.6	30-Jun-92	3.58	31.70	3.9
3A3	35.99	36.2	30-Jun-92	4.51	31.48	4.7
WELL	33.75	36.8	30-Jun-92	2.65	31.10	5.7
3MW02	53.10	50.1	30-Jun-92	18.46	34.64	15.4
3MW03	53.20	50.2	30-Jun-92	14.70	38.50	11.7
3MW04	52.83	49.8	30-Jun-92	19.16	33.67	16.2
3MW05	55.89	56.4	30-Jun-92	5.27	50.62	5.8
DRAIN	55.91	51.0	30-Jun-92	8.93	46.98	4.0

BGS = Below ground surface.
BTOC = Below top of casing.
DRAIN = Standpipe in the French drain located near the southwest corner of the building at 1201 East Third Avenue.
MSL = Mean sea level.
TOC = Top of casing.
WELL = Groundwater extraction well located near the southwest corner of the garage at 1121 East First Avenue.

2.2 SITE 1 INVESTIGATION

The following objectives were identified in the WP/QAP (HLA, 1992) for the Phase 2 Subsurface Investigation at Site 1:

- Assess the lateral extent of petroleum hydrocarbons in surface soil near the container storage area.
- Assess the vertical extent of subsurface contamination near the container storage area.

- Confirm the presence of petroleum hydrocarbons in the soil along the northern edge of the property (near MW-2).
- Assess the source of the halogenated VOCs, and the lateral extent of aromatic and halogenated VOCs in groundwater throughout the site.

The activities performed to achieve these objectives during the investigation of Site 1 are described below.

Surface-Soil Sampling

Surface-soil samples were collected from 20 locations in the vicinity of the container storage area, and field-screening analyses were performed for total petroleum hydrocarbons (TPH) using an infrared (IR) spectrometer. Collocation samples were collected at four of these locations and were submitted to Analytica, Inc., for confirmatory analysis of total recoverable petroleum hydrocarbons (TRPH), diesel-range petroleum hydrocarbons (EPH), gasoline-range petroleum hydrocarbons (VPH), aromatic and halogenated VOCs, polychlorinated biphenyls (PCBs), and leachable metals (arsenic, cadmium, chromium, and lead). The surface-soil sampling locations at Site 1 are shown on Plate 4.

Subsurface-Soil Sampling

Two borings (designated 1B01 and 1B02) were drilled to investigate the vertical extent of contamination in the vicinity of the container storage area, and one boring (designated 1B03) was drilled to confirm the presence of petroleum hydrocarbons in soil at the north property boundary. The locations of Borings 1B01, 1B02, and 1B03 are shown on Plate 4. Borings 1B01 and 1B02

were placed at the surface-soil sampling locations where the highest TPH concentrations were detected by field-screening analyses. In all three borings, soil samples were collected continuously (every 1.5 feet) to groundwater and were field screened for TPH. The sample from each boring with the highest TPH concentration was also submitted to Analytica, Inc., for laboratory analyses of TRPH, EPH, VPH, aromatic and halogenated VOCs, PCBs, and leachable metals.

Groundwater Sampling

To investigate groundwater quality at Site 1, HLA installed and sampled 18 groundwater probes for field-screening analyses and collected groundwater samples from 5 existing monitoring wells (MW-2 through MW-6) for more complete laboratory analyses. One existing monitoring well (MW-1) had been damaged and was not sampled. HLA abandoned this well on June 2, 1992, by drilling out the casing and backfilling the well with bentonite.

The groundwater probes were placed at 15 accessible locations throughout Site 1 (Probes 1GW01 through 1GW15) and at three locations east of Site 1 along Post Road (Probes 1GW16, 1GW17, and 1GW18). The three probes were placed along Post Road to investigate the potential for off-site migration of contaminants onto Site 1. The locations of the groundwater probes and the existing monitoring wells are shown on Plate 5.

Groundwater field-screening analyses for aromatic and halogenated VOCs were performed by Analytica, Inc., on a quick turnaround basis. Analyses of monitoring well samples included aromatic and halogenated VOCs, TRPH, PCBs, arsenic, cadmium, chromium, and lead.

2.3 SITE 2 INVESTIGATION

The following objectives were identified in the WP/QAP (HLA, 1992) for the Phase 2 Subsurface Investigation at Site 2:

- Assess the lateral and vertical extent of subsurface soil contamination in the vicinity of the former waste oil UST.
- Confirm the presence of halogenated VOCs in the groundwater near the location of the former waste oil UST.

The activities performed to achieve these objectives during the investigation of Site 2 involved the drilling of five borings (designated 2B01 through 2B05) near the location of the former waste oil UST. The locations of Borings 2B01 through 2B05 are shown on Plate 6. Soil samples were collected continuously (every 1.5 feet) to groundwater and were field screened for TPH. The sample from each boring with the highest TPH concentration was also submitted to Analytica, Inc., for laboratory analyses of TRPH, EPH, VPH, and aromatic and halogenated VOCs. Groundwater field-screening samples were also collected from each boring and submitted to Analytica, Inc., for analyses of aromatic and halogenated VOCs on a quick turnaround basis.

2.4 SITE 3 INVESTIGATION

The following objectives were identified in the WP/QAP (HLA, 1992) for the Phase 2 Subsurface Investigation at Site 3:

- Assess the lateral and vertical extent of petroleum hydrocarbons in soil surrounding the location of the former heating oil UST.
- Assess the presence of aromatic and halogenated VOCs in groundwater near the location of the former heating oil UST.
- Assess the lateral and vertical extent of petroleum hydrocarbons and aromatic VOCs in soil surrounding the locations of the former gasoline USTs and the former waste oil UST.
- Assess the extent of VOCs in groundwater near the location of the former gasoline USTs and the former waste oil UST.
- Assess the vertical extent of petroleum hydrocarbons in soil near the location of the former diesel fuel UST.
- Assess the presence of VOCs in groundwater near the location of the former diesel fuel UST.
- Assess the groundwater flow direction and background groundwater quality data.

Subsurface-Soil Sampling

Three borings (designated 3MW01, 3B04, and 3B05) were drilled to investigate the lateral and vertical extent of contamination near the location of the former heating oil UST. One boring (designated 3MW04) was drilled to investigate the vertical extent of contamination at the location of the former diesel fuel UST. This boring was completed as a monitoring well. Also, 10 borings (designated 3B01 through 3B03 and 3B06 through 3B12) were drilled to

investigate the lateral and vertical extent of contamination in soil in the vicinity of the former gasoline USTs and the former waste oil UST. Site 3 boring locations are shown on Plate 7.

Soil samples at Site 3 were collected continuously (every 1.5 feet) to groundwater and were field screened for TPH. The sample from each boring with the highest TPH concentration was also submitted to Analytica, Inc., for laboratory analyses of TRPH, EPH, VPH, and aromatic and halogenated VOCs.

Groundwater Sampling

To investigate groundwater quality at Site 3, HLA collected groundwater-screening samples from four of the boring locations, and installed and sampled four monitoring wells. No groundwater-screening samples were obtained and no monitoring wells were installed in the vicinity of the former gasoline USTs and the former waste oil UST because groundwater was not encountered in this area of the site. Groundwater sampling locations at Site 3 are shown on Plate 8.

Groundwater field-screening samples were collected from all three borings drilled at the location of the former heating oil UST (Samples 3GW01, 3GW02, and 3GW03) and from Boring 3B02 drilled west of the location of the former gasoline USTs and the former waste oil UST (Sample 3GW04). These samples were submitted to Analytica, Inc., for analyses of aromatic and halogenated VOCs on a quick turnaround basis.

Monitoring Wells 3MW02 and 3MW03 were installed on the north side of Site 3 (presumed to be the downgradient direction), and Monitoring Well 3MW05 was installed at the southeast corner of the site (presumed to be the upgradient direction). Also, Monitoring Well 3MW04 was installed at the location of the former diesel fuel UST. Samples from these wells were submitted to Analytica, Inc., for analyses of TRPH, and aromatic and halogenated VOCs.

3.0 DISCUSSION OF RESULTS

The data obtained during activities described in section 2 are evaluated in this section. The quality of the data, the interpreted magnitude and extent of contamination, and the remediation needs for each site are discussed. The significance of the detected chemical concentrations is assessed by comparing the concentrations to appropriate standards promulgated by the regulatory agencies (the Environmental Protection Agency [EPA] and the Alaska Department of Environmental Conservation [ADEC]). Where promulgated standards do not exist, the detected chemical concentrations are compared to human health risk-based concentrations (RBCs) taken from the EPA Region 10 Supplemental Risk Assessment Guidance for Superfund, August 16, 1991 (EPA, 1991).

For chemicals detected in groundwater, the appropriate standards are generally maximum contaminant levels (MCLs) established under the federal Safe Drinking Water Act and the State of Alaska's Drinking Water Regulations. The appropriate standards for petroleum hydrocarbon contamination in soil are derived using the ADEC cleanup guidelines established in Title 18, Alaska Administrative Code, Chapter 78 (18 AAC 78.315) and 18 AAC 75.140. A Matrix Score Sheet for the ML&P sites has been completed and is included in this report in Appendix D. Based on the results of this matrix scoring, the applicable cleanup levels for petroleum hydrocarbon contamination in soil are 200 mg/kg for EPH, 100 mg/kg for VPH, 0.5 mg/kg for benzene, and 15 mg/kg for total BETX.

3.1 DATA QUALITY ASSESSMENT

HLA performed a data quality assessment (DQA) of Analytica, Inc.'s, laboratory results to identify sampling or analytical problems that could qualify data. The DQA included a review of analyses performed versus requested parameters, completeness of the ADEC data deliverables packages, extraction and analysis performance versus holding time acceptance criteria, analytes detected in method blanks and trip blanks, percent recoveries for surrogate compounds and matrix spikes, and relative percent differences for matrix spikes and field duplicates. Following is a brief summary of DQA findings and conclusions.

Analyses performed by Analytica, Inc., generally conformed to the parameters specified in the WP/QAP (HLA, 1992) with the exception of the analysis of aromatic and halogenated VOCs on field-screening groundwater samples. Because of difficulties in meeting 3-day turnaround times for EPA Method 601/602 analyses, Analytica, Inc., proposed analyzing some of the field-screening groundwater samples by EPA Method 524.2. This modification was approved by HLA.

The ADEC data deliverables packages were incomplete for some of the parameters which had data deliverables reporting requirements. The data deliverables packages were generally lacking the date of refrigeration for all samples upon receipt by the laboratory and the date of extraction before analysis of soil or groundwater samples for purgeable aromatics and purgeable halocarbons. In response to HLA's request for clarification on these data deliverables, Analytica, Inc., indicated that its standard practice is to

place all samples into refrigerated holding (maintained at 4 degrees Celsius [^{o}C]) immediately after sample inventory and log-in at the laboratory. Analytica, Inc., also indicated that extractions are performed immediately before analysis for purgeable aromatic and purgeable halocarbon parameters; therefore, the date of extraction is the same as the date of analysis (which is included in the laboratory report).

Some sample extraction and analyses times for aromatic and halogenated VOCs by EPA Methods 601 and 602 did not meet the maximum allowable holding times. Groundwater samples affected were MW-5, MW-6, 3MW02, 3MW03, and 3MW05. Aromatic and halogenated VOC analyses for these samples should be considered as low estimates.

Metals analyses of Site 1 soil samples were performed and reported on an "as received" basis instead of on a "dry weight" basis.

3.2 HYDROGEOLOGIC CONDITIONS

The near-surface geology of the lower Ship Creek basin, where the three ML&P sites are located, is composed largely of coarse-grained alluvial deposits underlain by a fine-grained confining layer known as the Bootlegger Cove Clay (Miller and Dobrovolny, 1959; Cederstrom, et al., 1964; Freethey, 1976). The shallow unconfined aquifer occurs in these upper alluvial deposits. Ship Creek has eroded into the alluvial deposits and is entrenched into the confining layer in the lower reaches of the stream, causing unconfined groundwater to flow into the stream before reaching the tidal inlet (Freethey, 1976). To illustrate the hydrogeology of this area, copies of a

schematic longitudinal profile of Ship Creek and a water-table contour map from USGS Water-Resources Investigations 48-75 (Freethey, 1976) are presented in this report on Plate 9. These drawings show that flow in the shallow unconfined aquifer in the vicinity of the ML&P sites is believed to be to the north, toward and into Ship Creek.

Boring logs obtained in this investigation indicate that subsurface soil at the sites generally consists of gravelly sand or sandy gravel with some silt and clay interspersed, underlain by fine-grained sediments. Because the three sites are located within developed and paved areas, fill soil exists at some boring locations. The fill typically consists of sand and gravel, and its depth below ground surface (bgs) varies up to about 8 feet. Groundwater was generally found within the sand and gravel layer, with groundwater flow to the north, toward Ship Creek (Plate 3). Groundwater was not encountered in borings near the locations of the former gasoline USTs and the former Waste Oil UST at Site 3. This may be due to a subsurface drain that has intercepted groundwater flow upgradient from these borings (Plate 2).

3.3 SITE 1 DATA INTERPRETATION

Primary concerns at Site 1 are the presence and extent of petroleum hydrocarbon contamination in soil, and the source and extent of aromatic and halogenated VOCs in groundwater.

Soil

Petroleum hydrocarbon-related parameters (TPH, TRPH, VPH, EPH, benzene, and total BETX) detected in Site 1 soil samples are summarized in Table 2 and are presented on Plate 10. Field-screening analyses of surface- and subsurface-soil samples at Site 1 detected TPH at concentrations ranging from less than 10 mg/kg to 6,900 mg/kg.

In general, the samples with relatively high values of TPH were confirmed by laboratory analyses to be in excess of the ADEC guidelines for EPH. Surface-soil samples from the container storage area with relatively high values of TPH include 1SS08, 1SS14, 1SS15, 1SS17, and 1SS18. These samples were collected from below the asphalt pavement, at sporadic locations throughout the container storage area. Also, the field-screening TPH results for samples from Borings 1B01 and 1B02 decrease with depth by 2 orders of magnitude. These data indicate that the petroleum hydrocarbon contamination is limited to the near-surface soil directly beneath the asphalt pavement and does not extend over a wide area.

No significant concentrations of petroleum hydrocarbon-related parameters were found in soil samples from Boring 1B03, located at the northern boundary of Site 1. This indicates that the petroleum hydrocarbons detected in soil at Monitoring Well MW-2 during the Site 1 Preliminary Site Assessment do not extend throughout this area (HLA, 1989).

Table 2. Petroleum Hydrocarbon-Related Analytes Detected in Site 1 Soil Samples

Sample Number	Sample Depth	IR Screen (mg/kg-wet)	TRPH (mg/kg-dry)	VPH (mg/kg-dry)	EPH (mg/kg-dry)	Benzene (µg/kg-dry)	Total BETX (µg/kg-dry)
1SS01	0 to 1.5	38					
1SS02	0 to 1.5	23					
1SS03	0 to 1.5	66					
1SS04	0 to 1.5	200					
1SS05	0 to 1.5	93					
1SS06	0 to 1.5	79					
1SS07	0 to 1.5	20					
1SS08	0 to 1.5	2300					
1SS09	0 to 1.5	53					
1SS10	0 to 1.5	99	190	<0.27	<11	<5	123
1SS10 dup	0 to 1.5	110	250	<0.27	<11	<5	0
1SS11	0 to 1.5	370					
1SS12	0 to 1.5	97					
1SS13	0 to 1.5	360					
1SS14	0 to 1.5	1400	1200	<0.27	<11	<6	22
1SS15	0 to 1.5	1600					
1SS16	0 to 1.5	180					
1SS17	0 to 1.5	4700	13000	21	2800	<110	1600
1SS18	0 to 1.5	1500					
1SS18 dup	0 to 1.5	1200					
1SS19	0 to 1.5	96					
1SS20	0 to 1.5	17	33	<0.27	<11	<6	0
1B01SA	0 to 1.5	310					
1B01SB	1.5 to 3	4400	4600	1.6	1300	<3	121
1B01SC1	3 to 4.5	300					
1B01SC2	3 to 4.5	310					
1B01SD	4.5 to 6	1000					
1B01SE	6 to 7.5	23					
1B01SF	7.5 to 9	20					
1B02SA1	0 to 1.5	190					
1B02SA2	0 to 1.5	80					
1B02SB	1.5 to 3	6900	6800	13	2900	<11	369
1B02SC1	3 to 4.5	41				<56	370
1B02SC2						<560	1900
1B02SD1	4.5 to 6	17					
1B02SD2	4.5 to 6	11					
1B02SE	6 to 7.5	9.1					
1B02SF	7.5 to 9	6.5					
1B03SA	0 to 1.5	62	710	<0.27	16	<3	0
1B03SB	1.5 to 3	11					
1B03SC	3 to 4.5	10					
1B03SD	4.5 to 6	7.9					
1B03SE	6 to 7.5	7.5					
1B03SF	7.5 to 9						

BETX = Benzene, ethylbenzene, toluene, and xylenes.
EPH = Diesel-range petroleum hydrocarbons.
mg/kg-dry = Milligrams per kilogram - dry.
mg/kg-wet = Milligrams per kilogram - wet.
NA = Not analyzed.
NRQ = Not requested.
0 = No individual BETX compound above method detection levels.
TRPH = Total recoverable petroleum hydrocarbons.
µg/kg-dry = Micrograms per kilogram - dry.
VPH = Gasoline-range petroleum hydrocarbons.
< = Less than the detection level shown.

Other analytes detected in Site 1 soil samples are summarized in Table 3. Chemicals detected at concentrations in excess of the EPA Region 10 RBCs (EPA, 1991) include arsenic and PCBs. The detected arsenic concentrations ranged from 3.8 mg/kg to 4.4 mg/kg (wet-weight basis) and exceeded the RBC of 0.4 mg/kg in all Site 1 soil samples analyzed. Because of the consistency of the detected concentrations over a wide area, this is believed to be due to background conditions.

PCB 1254 was detected above the RBC of .08 mg/kg in three shallow-soil samples (1SS14 at 0.32 mg/kg, 1SS17 at 0.11 mg/kg, and 1B02SB at 0.18 mg/kg). These samples were located in the same vicinity of the container storage area, near ground surface immediately beneath the asphalt pavement. PCBs were also detected in several other Site 1 soil samples (1SS10, 1SS10-duplicate, and 1B01SB) but not at concentrations in excess of the RBCs. The available data are insufficient to establish the depth distribution of PCBs in this area. However, PCBs were not detected in the groundwater sample from Monitoring Well MW-3, located nearby. Also, the EPA Region 10 RBC for PCBs is based on conservative exposure assumptions involving direct contact and ingestion by a residential population. Due to the commercial/industrial nature of this site and the surrounding area, the restricted access to the site, and the presence of asphalt pavement over the affected soil, the RBC for PCBs is believed to be overly protective in this situation.

Table 3. Non-Petroleum Hydrocarbon-Related Analytes Detected in Site I Soil Samples

Sample Number	Sample Depth	Methylene Chloride (ug/kg-dry)	Tetrachloro-ethene (ug/kg-dry)	1,1,1-Tri-chloroethane (ug/kg-dry)	1,2-Dichloro-benzene (ug/kg-dry)	1,3-Dichloro benzene (ug/kg-dry)	1,4-Dichloro-benzene (ug/kg-dry)	Arsenic (mg/kg-wet)	Cadmium (mg/kg-wet)	Chromium (mg/kg-wet)	Lead (mg/kg-wet)	PCB 1242/1016 (mg/kg-dry)	PCB 1254 (mg/kg-dry)
1B01S8	1.5 to 3	<270	<54	<54	85	57	88	4	1.4	27	26	<0.017	0.035
1B02SB	1.5 to 3	<27	<5	<5	710	<11	75	4.4	1.2	30	68	0.13	0.18
1B02SC1	3 to 4.5	110	<56	<56	<110	<110	<110	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
1B02SC2	3 to 4.5	2900	<560	<560	<1100	<1100	<1100	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
1B03SA	0 to 1.5	16	<5	<5	<11	<11	<11	4.1	ND	29	14	<0.017	<0.017
1SS10	Surface	<27	<5	<5	<11	<11	<11	5	<0.5	30	18	<0.020	<0.020
1SS10 dup	Surface	<27	<5	<5	<11	<11	<11	5	<0.5	26	11	<0.020	0.029
1SS14	Surface	150	<6	<6	<11	<11	<11	5	<0.5	30	140	<0.020	0.32
1SS17	Surface	<540	<110	<110	<220	<220	<220	5.4	<0.5	27	70	<0.020	0.11
1SS20	Surface	<27	<6	<6	<11	<11	<11	3.8	<0.5	31	3.8	<0.020	<0.020

mg/kg-wet = Milligrams per kilogram - wet.
mg/kg-dry = Milligrams per kilogram - dry.
NRQ = Not requested.
PCB = Polychlorinated biphenyls.
ug/kg-dry = Micrograms per kilogram - dry.
< = Less than the detection level shown.

Groundwater

Analytes detected during field-screening and analytical laboratory analyses of Site 1 groundwater samples are summarized in Table 4. Chemicals (arsenic, chromium, and vinyl chloride) detected at concentrations exceeding MCLs are presented on Plate 11.

Vinyl chloride was detected in three groundwater field-screening samples at concentrations of 1.8 micrograms per liter (μg/l) (Probe 1GW02), 2.4 μg/l (Probe 1GW12), and 3.0 μg/l (Probe 1GW18). The MCL for vinyl chloride is 2.0 μg/l. Because these probe locations are widely scattered throughout Site 1, the occurrence of vinyl chloride is not believed to be due to site conditions.

Arsenic was detected in all five of the Site 1 groundwater monitoring well samples at concentrations ranging from .002 mg/l to 0.160 mg/l. The detected concentrations in two of the samples (0.160 mg/l at MW-3 and 0.090 mg/l at MW-4) exceed the MCL for arsenic of 0.050 mg/l. Also, chromium was detected in Site 1 groundwater samples at concentrations ranging from "not detected" to 0.120 mg/l. The detected concentrations in three of the samples (0.060 mg/l at MW-2, 0.080 mg/l at MW-3, and 0.120 mg/l at MW-4) exceeded the MCL for chromium of 0.050 mg/l. The source of the arsenic and chromium is not known, but is suspected to be background conditions.

Table 4. Analytes Detected in Site 1 Groundwater Samples

Harding Lawson Associates

Sample Number	Benzene (ug/l)	Ethyl-benzene (ug/l)	Toluene (ug/l)	Total Xylenes (ug/l)	1,1-Dichloro-ethane (ug/l)	Methylene Chloride (ug/l)	Trichloro-ethene (ug/l)	Vinyl Chloride (ug/l)	Arsenic (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Lead (mg/l)
1GW01	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW02	<1	<1	<1	<1	1.8	<5	<1	1.8	NRQ	NRQ	NRQ	NRQ
1GW03	1.3	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW04	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW05	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW06	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW07	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW08	<1	<1	<1	<1	3.1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW09	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW10	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW11	<1	<1	<1	<1	1.4	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW12	<1	<1	<1	<1	2.2	<5	1.5	2.4	NRQ	NRQ	NRQ	NRQ
1GW13	<1	<1	<1	<1	1.3	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW14	<1	<1	<1	<1	1.3	5.1	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW15	<1	<1	1.2	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW16	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW17	<1	<1	<1	<1	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
1GW18	<1	<1	<1	<1	2	<5	<1	3.0	NRQ	NRQ	NRQ	NRQ
MW-2	<1	<1	<1	<3	1.7	<5	<1	<1	0.002	<0.005	0.06	0.018
MW-3	<1	<1	<1	<3	<1	<5	<1	<1	0.16	<0.005	0.08	0.017
MW-4	2	3	<1	7	<1	<5	<1	<1	0.09	<0.005	0.12	0.025
MW-5	<1	<1	<1	<3	<1	<5	<1	<1	0.009	<0.005	0.03	0.015
MW-5 dup	<1	<1	<1	<3	<1	<5	<1	<1	0.003	<0.005	0.01	0.004
MW-6	<1	<1	<1	<3	<1	<5	<1	<1	0.002	<0.005	<.01	0.002
Trip Blank 1	<1	<1	<1	<3	<1	<5	<1	<1	NRQ	NRQ	NRQ	NRQ
Trip Blank 2	<1	<1	<1	<3	<1	6	<1	<1	NRQ	NRQ	NRQ	NRQ

mg/l = Milligrams per liter.
NRQ = Not requested.
ug/l = Micrograms per liter.
< = Less than the detection level shown.

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Other aromatic and halogenated VOCs detected in Site 1 groundwater samples include 1,1-dichloroethane (detected in eight samples); benzene (detected in two samples); and methylene chloride, TCE, and toluene (detected in one sample each). None of these were detected at concentrations exceeding MCLs.

3.4 SITE 2 DATA INTERPRETATION

The main areas of concern at Site 2 are the extent of soil contamination in the vicinity of the former waste oil UST and the potential presence of halogenated VOCs in nearby groundwater.

Analytes detected in Site 2 soil samples are summarized in Table 5. The detected concentrations of TRPH, ranging from 83 mg/kg to 750 mg/kg, are well below the TRPH concentrations detected at the time the waste oil tank was removed (255 mg/kg to 5,690 mg/kg, reported by Chem Lab, 1990); and no petroleum hydrocarbon-related parameters (VPH, EPH, benzene, and BETX) were detected at concentrations in excess of ADEC guidelines. Methylene chloride, PCE, and TCA were detected in most of the soil samples submitted for laboratory analyses, but none of the detected concentrations exceeded the EPA Region 10 RBCs (EPA, 1991).

Table 5. Analytes Detected in Site 2 Soil Samples

Sample Number	Sample Depth	IR Screen (mg/kg-wet)	TRPH (mg/kg-dry)	VPH (mg/kg-dry)	EPH (mg/kg-dry)	Benzene (mg/kg-dry)	Total BETX (mg/kg-dry)	Methylene Chloride (ug/kg-dry)	Tetrachloro-ethene (ug/kg-dry)	1,1,1-Tri chloroethane (ug/kg-dry)	1,2-Dichloro benzene (mg/kg-dry)	1,3-Dichloro benzene (mg/kg-dry)	1,4-Dichloro-benzene (mg/kg-dry)
2B01SA	0 to 1.5	67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B01SB	1.5 to 3	280	130	<0.26	12	<0.0026	0	31	<5	<5	<0.0026	<0.0026	<0.0026
2B01SC	3 to 4.5	27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B02SA	0 to 1.5	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B02SB	1.5 to 3	670	97	<0.27	16	<0.0027	0	81	10	5	<0.0027	<0.0027	<0.0027
2B02SC	3 to 4.5	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B03SA	0 to 1.5	170	83	<0.25	<11	<0.0026	0	56	5	5	<0.01	<0.01	<0.01
2B03SB	1.5 to 3	66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B03SC	3 to 4.5	140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B04SA	0 to 1.5	210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B04SB	1.5 to 3	280	720	<0.25	<11	<0.0026	0	55	6	6	<0.011	<0.011	<0.011
2B04SC	3 to 4.5	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B05SA	0 to 1.5	83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2B05SB	1.5 to 3	240	750	<0.28	<10	<0.0026	0	77	6	10	<0.011	<0.011	<0.011
2B05SC	3 to 4.5	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

BETX = Benzene, ethylbenzene, toluene, and total xylenes.
EPH = Diesel-range petroleum hydrocarbons.
mg/kg-dry = Milligrams per kilogram - dry.
mg/kg-wet = Milligrams per kilogram - wet.
NA = Not applicable.
NRQ = Not requested.
0 = No individual BETX compound above method detection limit.
PCB = Polychlorinated biphenyls.
TRPH = Total recoverable petroleum hydrocarbons.
ug/kg-dry = Micrograms per kilogram - dry.
VPH = Gasoline-range petroleum hydrocarbons.
< = Less than the detection level shown.

Analytes detected in Site 2 groundwater samples (1,1-dichloroethane, 1,2-dichloroethane, PCE, TCA, and TCE) are summarized in Table 6. Two of these halogenated VOCs (PCE and TCE) were detected at concentrations exceeding drinking water standards. PCE and TCE were detected in all five Site 2 groundwater samples at concentrations ranging from 4.7 µg/l to 9.0 µg/l for PCE and 27 µg/l to 48 µg/l for TCE. The MCL for both PCE and TCE is 5 µg/l.

The results of the Phase 2 Subsurface Investigation of Site 2 indicate that the extent of the soil contamination is limited to the area within the boundary formed by the boring locations, and that PCE and TCE are present in groundwater at concentrations in excess of drinking water standards.

3.5 SITE 3 DATA INTERPRETATION

The main areas of concern at Site 3 are the extent of petroleum hydrocarbon contamination in soil in the vicinities of the former diesel fuel, waste oil, gasoline, and heating oil USTs, and the potential presence and extent of aromatic and halogenated VOCs in groundwater.

Petroleum hydrocarbon-related analytes detected in Site 3 soil samples from the vicinities of the former diesel fuel and heating oil USTs are summarized in Table 7, and those from the vicinity of the former waste oil and gasoline UST locations are summarized in Table 8.

Table 6. Analytes Detected in Site 2 Groundwater Samples

Sample Number	Benzene (ug/l)	Ethyl-benzene (ug/l)	Toluene (ug/l)	Total Xylenes (ug/l)	1,1-Dichoro-ethane (ug/l)	1,2-Dichloro-ethane (ug/l)	Methylene Chloride (ug/l)	Tetra-chloro-ethene (ug/l)	1,1,1-Trichloro-ethane (ug/l)	Trichloro-ethene (ug/l)	Vinyl Chloride (ug/l)
2GW01	<1	<1	<1	<1	<1	<1	<5	8	<1	27	<1
2GW02	<1	<1	<1	<1	<1	1	<5	9	<1	36	<1
2GW03	<1	<1	<1	<1	<1	1.1	<5	7.2	<1	45	<1
2GW04	<1	<1	<1	<1	1.3	<1	<5	4.7	13	41	<1
2GW05	<1	<1	<1	<1	1.4	1	<5	7.1	12	48	<1

ug/l = Micrograms per liter.
< = Less than the detection level shown.

Table 7. Analytes Detected in Soil Samples from the Site 3 Diesel Fuel and Heating Oil Underground Storage Tank Areas

Sample Number	Sample Depth	IR Screen (mg/kg-dry)	TRPH (mg/kg-dry)	EPH (mg/kg-dry)
3B04SA	0 to 1.5	440	NRQ	NRQ
3B04SB	1.5 to 3	11	NRQ	NRQ
3B04SC	3 to 4.5	20	NRQ	NRQ
3B04SD	4.5 to 6	540	520	210
3B04SE	6 to 7.5	12	NRQ	NRQ
3B04SF	7.5 to 9	13	NRQ	NRQ
3B04SG	9 to 10.5	12	NRQ	NRQ
3B05SA	5 to 6.5	12000	NRQ	NRQ
3B05SB	6.5 to 8	13000	NRQ	3900
3B05SC	8 to 9.5	26	NRQ	NRQ
3B05SD	9.5 to 11	11	NRQ	NRQ
3MW01SA	0 to 1.5	40	NRQ	<11
3MW01SB	1.5 to 3	15	NRQ	NRQ
3MW01SC	3 to 4.5	7.4	NRQ	NRQ
3MW01SD	4.5 to 6	11	NRQ	NRQ
3MW01SE	6 to 7.5	5.4	NRQ	NRQ
3MW04SA	8.5 to 10	1100	NRQ	NRQ
3MW04SB	10 to 11.5	1900	NRQ	NRQ
3MW04SC1	11.5 to 13	15000	NRQ	980
3MW04SC2	11.5 to 13	16000	NRQ	NRQ
3MW04SD	13 to 14.5	19	NRQ	NRQ
3MW04SE	14.5 to 16	11	NRQ	NRQ
3MW04SF	16 to 17.5	130	NRQ	NRQ

EPH = Diesel-range petroleum hydrocarbons.
mg/kg-dry = Milligrams per kilogram - dry.
NRQ = Not requested.
TRPH = Total recoverable petroleum hydrocarbons.
< = Less than the detection level shown.

Table 8. Analytes Detected in Soil Samples from the Site 3 Gasoline and Waste Oil Underground Storage Tank Areas

Sample Number	Sample Depth	IR Screen (mg/kg-wet)	TRPH (mg/kg-dry)	VPH (mg/kg-dry)	EPH (mg/kg-dry)	Benzene (mg/kg-dry)	Toluene (mg/kg-dry)	Ethyl-benzene (mg/kg-dry)	Total Xylenes (mg/kg-dry)	Chloro-benzene (mg/kg-dry)	1,2 Dichloro-benzene (mg/kg-dry)	1 ,3 Dichloro-benzene (mg/kg-dry)	1,4-Dichloro-benzene (mg/kg-dry)
3B01SC	3 to 4.5	9400	NRQ	350	NRQ	8.1	1.1	4.1	21	0.37	1.0	0.98	0.92
3B02SA	0 to 1.5	610	NRQ	<0.26	NRQ	<0.0024	<0.0024	<0.0024	<0.0053	<0.0026	<0.0026	<0.0026	0.012
3B03SB	1.5 to 3	11	NRQ	<0.27	NRQ	0.016	<0.0027	<0.0027	<0.0053	<0.0027	<0.0027	<0.0027	0.0037
3B06SA	0 to 1.5	240	NRQ	<0.26	NRQ	<0.0026	<0.0026	<0.0026	<0.0053	<0.0026	NRQ	NRQ	NRQ
3B07SA	0 to 1.5	470	NRQ	<0.26	NRQ	<0.0026	<0.0026	<0.0026	<0.0053	<0.0026	NRQ	NRQ	NRQ
3B08SF	7.5 to 9	5100	NRQ	430	NRQ	<0.55	1.1	1.1	8.7	1.0	2.9	2.0	0.69
3B09SC1	3 to 4.5	13000	15000	5500	230	4.1	1.7	61	500	3.7	24	5.7	3.9
3B09SC2	3 to 4.5	13000	14000	3600	8400	9.2	160	41	420	2.8	28	<1.1	4.3
3B10SD	4.5 to 6	13000	10000	1800	12000	<0.56	0.79	1.1	160	2.4	28	1.8	4.6
3B11SA	8 to 9.5	7300	NRQ	810	NRQ	11	0.34	5.2	70	1.9	22	0.87	3.0
3B12SE	6 to 7.5	2600	4400	390	2200	0.21	0.18	4.5	37	0.72	2.0	1.3	1.1

EPH = Diesel-range petroleum hydrocarbons.
mg/kg-dry = Milligrams per kilogram - dry.
mg/kg-wet = Milligrams per kilogram - wet.
NRQ = Not requested.
TRPH = Total recoverable petroleum hydrocarbons.
VPH = Gasoline-range petroleum hydrocarbons.
< = Less than the detection level shown.

Analytes detected during field-screening and analytical laboratory analyses of Site 3 groundwater samples are summarized in Table 9 and are presented on Plate 12.

Diesel Fuel UST Area

Subsurface-soil samples from Boring 3MW04, at the location of the former diesel fuel UST, were collected at depths below the base of the fill material (beginning at 8.5 feet bgs). Relatively high values of TPH (ranging from 1,100 mg/kg to 16,000 mg/kg) were detected in samples to a depth of 13 feet bgs; significantly lower values (ranging from 11 mg/kg to 130 mg/kg) were detected in samples to groundwater at a depth of approximately 16 feet bgs. Laboratory analysis of Sample 3MW04SC1 confirmed that the relatively high value of TPH (15,000 mg/kg) corresponds to an EPH value (980 mg/kg) that exceeds the ADEC guidelines. Also, laboratory analysis of a groundwater sample from Monitoring Well 3MW04 did not detect the presence of VOCs.

The vertical extent of petroleum hydrocarbon contamination at the location of the former diesel fuel UST, therefore, appears to be approximately 4.5 to 5 feet below the base of the excavation site and approximately 3 feet above the water table.

Heating Oil UST Area

In general, the samples with relatively high values of TPH were confirmed by laboratory analyses to be in excess of the ADEC guidelines for EPH.

Table 9. Analytes Detected in Site 3 Groundwater Samples

Sample Number	Benzene (ug/l)	Ethyl-benzene (ug/l)	Toluene (ug/l)	Total Xylenes (ug/l)	1,1-Dichloro-ethane (ug/l)	1,2-Dichloro-ethane (ug/l)	Methylene Chloride (ug/l)	Tetra-chloro-ethene (ug/l)	1,1,1-Tri-chloroethane (ug/l)	Trichloro-ethene (ug/l)	Vinyl Chloride (ug/l)
3GW01	2	3	<1	<2	<1	<1	<5	<1	<1	<1	<1
3GW02	<1	26	<1	42	<1	<1	<5	<1	<1	<1	<1
3GW03	<1	31	<1	56	<1	<1	<5	<1	<1	<1	<1
3GW04	170	130	7	6	<1	<1	7	<1	<1	<1	<1
3MW02	5	2	<1	5	<1	<1	<5	<1	<1	<1	<1
3MW03	<1	<1	<1	<3	<1	<1	<5	<1	<1	<1	<1
3MW03 dup	<1	<1	<1	<3	<1	<1	10	<1	<1	<1	<1
3MW04	<1	<1	<1	<3	<1	<1	<5	<1	<1	<1	<1
3MW05	<1	<1	<1	<3	<1	<1	<5	<1	<1	<1	<1
Trip Blank #1	<1	<1	<1	<3	<1	<1	<5	<1	<1	<1	<1
Trip Blank #2	<1	<1	<1	<3	<1	<1	22	<1	<1	<1	<1
Trip Blank #3	<1	<1	<1	<3	<1	<1	<5	<1	<1	<1	<1

ug/l = Micrograms per liter.
< = Less than the detection level shown.

0LS0000

In Boring 3B05, drilled through the excavation of the former heating oil UST, relatively high values of TPH (12,000 mg/kg and 13,000 mg/kg) were detected, respectively, in Soil Samples 3B05SA and 3B05SB (collected from the base of the excavation at approximately 5 feet to 8 feet bgs). Significantly lower values (26 mg/kg and 11 mg/kg) were detected in Samples 3B05SC and 3B05SD, respectively, from 8 feet to 11 feet bgs. Because the water table was encountered at approximately 5 feet bgs, the presence of petroleum hydrocarbon contamination to a depth of 8 feet bgs may represent the extent of water table fluctuation at this location.

No significant values of TPH were detected in samples from Boring 3MW01 drilled approximately 5 feet south (upgradient) of the former heating oil UST excavation, and only moderately high values of TPH (believed to be near the ADEC-recommended cleanup level) were detected in samples from Boring 3B04 drilled approximately 10 feet north (downgradient) of the former excavation. Sample 3B04SA, collected at ground surface, and Sample 3B04SD, collected approximately at the water table, had TPH values of 440 mg/kg and 540 mg/kg, respectively, while Samples 3B04SB and 3B04SC, collected between 3B04SA and 3B04SD, had TPH values of only 11 mg/kg and 20 mg/kg, respectively. These data are interpreted to indicate that petroleum hydrocarbon contamination detected at Boring 3B04 is the result of migration from the former heating oil UST, along the ground surface and on the water table. The downgradient extent of petroleum hydrocarbon contamination in soil is believed to be approximately to the location of Boring 3B04.

Field-screening analyses of groundwater samples (3GW01, 3GW02, and 3GW03) from the vicinity of the former heating oil UST detected the presence of benzene, ethylbenzene, and xylenes, but none of these VOCs were detected at concentrations that exceed drinking water standards.

Gasoline UST and Waste Oil UST Area

Laboratory analyses of soil samples from Borings 3B01, 3B03, 3B08, 3B09, 3B10, 3B11, and 3B12, in the vicinity of the former gasoline UST and waste oil UST, detected VPH at concentrations in excess of the ADEC-recommended cleanup level of 100 mg/kg. The field-screening analyses of soil samples from these borings generally showed relatively high values of TPH in samples to depths ranging from approximately 6 to 12 feet bgs. In Boring 3B12 located east of the former waste oil UST, however, field-screening TPH values for soil samples from ground surface to a depth of 4.5 feet bgs were relatively low (14 mg/kg to 24 mg/kg); the values increased to a maximum of 2,600 mg/kg at 6 to 7.5 feet bgs and decreased to approximately 5 mg/kg at 12 to 12.5 feet bgs. Also, no petroleum hydrocarbon-related chemicals were detected in soil samples from Borings 3B02, 3B06, and 3B07, located at the west and south perimeter of this area. These data indicate that the lateral extent of soil contamination in the vicinity of the former gasoline UST and the former waste oil UST is defined to the south and the west, but that petroleum hydrocarbon contamination has migrated to the east along the water table.

Because groundwater was encountered sporadically in the vicinity of the former gasoline UST and, when encountered, was obviously impacted by petroleum hydrocarbons, only one groundwater field-screening sample (3GW04) was collected from this area. Benzene was detected in this sample at 170 μg/l, which is significantly higher than the MCL of 5 μg/l. Benzene (at 4 μg/l), ethylbenzene (at 2 μg/l), and total xylenes (at 6 μg/l) were detected in Monitoring Well 3MW02 located north (downgradient) of the former gasoline UST excavation; however, no VOCs were detected in samples from Monitoring Well 3MW05 (located upgradient from this area) or in the other downgradient monitoring wells (3MW03 and 3MW04). Groundwater contaminated with benzene in excess of 5 μg/l, therefore, is believed to extend from the immediate vicinity of the former gasoline and waste oil USTs, underneath the building, approximately to Monitoring Well 3MW02.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the Phase 2 Subsurface Investigation, the following areas at Sites 1, 2, and 3 have been identified as potentially requiring remedial action:

Site 1

- Soil in the container storage area

Site 2

- Groundwater in the vicinity of the former waste oil UST

Site 3

- Soil in the vicinity of the former diesel fuel UST,
- Soil in the vicinity of the former heating oil UST,
- Soil and groundwater in the vicinity of the former gasoline and waste oil USTs.

HLA's conclusions and recommendations concerning each of these areas are presented in the following sections.

4.1 SITE 1

Shallow soil in the container storage area was found to contain petroleum hydrocarbons, and possibly PCBs, at concentrations exceeding ADEC and EPA guidelines. However, the occurrence of these contaminants appeared to be limited to soil directly beneath the asphalt pavement. Because the potential for chemical transport and human exposure to these chemicals is limited by the asphalt pavement, we recommend that ML&P request final cleanup levels be established by ADEC that will not require active remediation for this site.

Other chemicals detected in Site 1 soil and groundwater samples at concentrations exceeding ADEC or EPA guidelines include arsenic and vinyl chloride. These chemicals either occur sporadically or are believed to be due to background conditions. No additional investigation or remedial activities are recommended for these chemicals.

4.2 SITE 2

Groundwater samples in the vicinity of the former waste oil tank were found to contain PCE and TCE at concentrations in excess of state and federal drinking water standards. The lateral extent of groundwater contamination in this area is not known. The depth to groundwater is approximately 2 to 3 feet bgs, and groundwater flow is to the west, parallel to the flow of Ship Creek. Although there are registered water supply wells nearby, they are completed in a deeper aquifer and are not expected to be impacted.

The source of the PCE and TCE is believed to be leakage or spillage associated with the former waste oil UST. Analyses of soil samples from borings at the perimeter of the formerly excavated area indicate that little residual contamination remains in the soil. Therefore, soil removal or remediation measures are not believed to be necessary.

HLA recommends that an additional investigation be conducted at Site 2 to evaluate the extent of PCE and TCE contamination in groundwater. As an interim remedial action, we also recommend ML&P consider expansion of the existing groundwater treatment system to include treatment of contaminated groundwater from the former waste oil UST area.

HLA's recommended program for investigation of Site 2 groundwater involves the installation and sampling of groundwater probes at locations extending away from the former waste oil UST to assess the lateral extent of PCE and TCE in the shallow groundwater. Screening analyses of these samples should be performed for halogenated VOCs by EPA Method 601. Based on the results of the groundwater-screening analyses, monitoring wells should be installed upgradient (one well) and downgradient (one to two wells) of the contaminant plume. The main purpose of the monitoring wells will be to investigate the hydrogeology of the shallow water table aquifer in this area and to provide monitoring points for evaluating the effectiveness of any groundwater remediation measures implemented. The cost to perform the additional investigation and to install three new monitoring wells is approximately $35,000.

The recommended interim remedial action involves the installation of a groundwater extraction well near the former waste oil UST with connection to the existing groundwater treatment system. The existing treatment system involves groundwater extraction from two wells near the southwest corner of the garage, treatment in an air-stripping tower, and discharge to a subsurface drain field east of the garage. The permitted capacity of this treatment system is 25 gallons per minute (gpm), but based on a review of available monitoring reports, the system has been operating at 2 to 3 gpm. The existing treatment system, therefore, has treatment capacity available and is capable of treating PCE- and TCE-contaminated water. The cost to install a new groundwater extraction well with a connection to the existing groundwater

treatment system is approximately $30,000. Modification of the ADEC waste disposal permit will likely be required, and additional air monitoring requirements may be imposed.

4.3 SITE 3

The Phase 2 Subsurface Investigation of Site 3 found soil containing petroleum hydrocarbon concentrations in excess of ADEC cleanup guidelines in the former diesel fuel UST area, the former heating oil UST area, and the former gasoline UST and waste oil UST area. Groundwater in the vicinity of the former gasoline UST and the former waste oil UST was also found to contain benzene in excess of drinking water standards. The interpreted extent of petroleum hydrocarbon-contaminated soil and groundwater at Site 3 is shown on Plate 13. Remedial alternatives for each of these areas is discussed below.

Diesel Fuel UST Area

At the location of the former diesel fuel UST, the extent of contamination is interpreted to be limited to the base of the former excavation, from approximately 8.5 to 13 feet bgs. The estimated volume of contaminated soil is approximately 40 cubic yards. The alternatives available for addressing this soil are: 1) request that ADEC establish final cleanup levels that will not require the implementation of active remedial measures, or 2) excavate and dispose of the contaminated soil at the MOA regional landfill. The cost to excavate and dispose of this soil is estimated to be approximately $10,000.

Heating Oil UST Area

At the location of the former heating oil UST, the contamination is interpreted to extend from the bottom of the former excavation site north, approximately to Boring 3B04. Assuming the petroleum hydrocarbon is smeared over a 3-foot thickness along the water table, the estimated volume of contaminated soil is approximately 6 cubic yards. Because this remaining contaminated soil is in contact with the shallow groundwater, and state and federal standards were not exceeded in groundwater samples from this area, we recommend that ML&P request ADEC to establish final cleanup levels that will not require active remedial measures.

Gasoline UST and Waste Oil UST Area

At the former gasoline UST and waste oil UST area, petroleum hydrocarbon contamination in soil is interpreted to extend from ground surface to the water table (approximately 8 feet bgs). Contamination is not present in the backfilled soil in the former excavations or in the upper 4.5 feet of soil in the eastern section of this area. The estimated volume of contaminated soil is approximately 1,000 cubic yards. Also, an unknown volume of soil beneath the building adjacent to the locations of the former USTs is likely contaminated with petroleum hydrocarbons. Three remedial alternatives have been identified for addressing the contaminated soil.

Alternative 1 - In Situ Vapor Extraction System: This alternative consists of the installation of a soil venting system similar to the one presently in operation at Site 2. A subsurface perforated piping array would be installed throughout the area, and a blower would draw vapors from the array with discharge to the atmosphere.

Continuous emissions monitoring would be required. Remediation from operation of the system is expected to require approximately 5 years. The estimated cost for the construction and operation of this system is approximately $84,200. An itemization of the estimated costs for this alternative is presented in Table 10.

Alternative 2 - Excavation and On-Site Lime Treatment: For this alternative, the contaminated soil would be excavated and treated using Sound Environmental Services, Inc.'s, "dispersion by chemical reaction" (DCR) process. In this process the petroleum hydrocarbons are chemically fixed (immobilized) in a complex reaction with hydrophobized calcium oxide (quicklime). The excavation will be backfilled with the treated soil. The estimated cost for this alternative is approximately $177,490. An itemization of the estimated costs for this alternative is presented in Table 11.

Alternative 3 - Excavation and Off-Site Thermal Treatment: For this alternative, the contaminated soil would be excavated and hauled to Alaska Pollution Control's (APC's) thermal processing facility for treatment and disposal. Clean fill would be hauled to the site to fill in the excavation. The estimated cost for this alternative is $639,590. An itemization of the estimated costs for this alternative is presented in Table 12.

All three of the soil remediation measures are expected to be acceptable to ADEC. Alternative 1 has the disadvantage of requiring an extended period of time before ADEC cleanup guidelines are met; however, the excavation activities required for Alternatives 2 and 3 would be more disruptive of ML&P operations for a short (approximately 2-week) period of time. Emissions of volatile and semivolatile organic chemicals into the air during the operation of Alternative 1 could also increase health risks to workers at Site 3. However, the emission concentrations are expected to meet EPA and ADEC standards and not cause unacceptable health risks. HLA, therefore, recommends that ML&P implement Alternative 1, in situ vapor extraction, for remediation of soil at Site 3.

Table 10. Cost Estimate for Alternative 1,
In Situ Vapor Extraction System

Description	Years	1992 Rate	Quantity	Units	Present Cost 1990 Dollars (thousands)	
Capital Costs						
Corrective action plan					$ 7.0	
Piping installation	1	$15.00/foot	260	Foot	3.9	
Blower/emissions system			100 cfm		8.0	
Startup monitoring/reporting					5.0	
Capital cost subtotal					$24.4	
15% Permitting, Design, Const. Management					$ 3.7	
25% Contingency					6.1	
Total Estimated Capital Cost						$34.2
Operation and Maintenance (O&M) Costs						
Process Monitoring and Reporting		$500.00/month	60	Month	$30.0	
Closure testing and report					20.0	
Total O&M Cost						50.0
TOTAL						$84.2

cfm = Cubic feet per minute.

Table 11. Cost Estimate for Alternative 2, Excavation and On-Site Lime Treatment

Description	Years	1992 Rate	Quantity	Units	Present Cost 1990 Dollars (thousands)	
Capital Costs						
Corrective action plan		$7,500/Plan	1	Plan	$ 7.5	
Cut and dispose asphalt		$0.16/Feet^2	6,500	Feet^2	1.04	
Excavate		$5.00/Yard^3	1,800	Yard^3	9.0	
Handling		$2.50/Yard^3	1,000	Yard^3	2.50	
Treatment		$85.00/Yard^3	1,000	Yard^3	85.0	
Sample analyses		$150.00/Sample	12	Samples	1.8	
Placement and compaction		$5.50/Yard^3	1,800	Yard^3	9.90	
Asphalt paving		$1.50/Feet^2	6,500	Feet^2	9.75	
Closure reporting		$5,000	1	Report	5.0	
Capital cost subtotal					$131.49	
10% Const. Management					$13.1	
25% Contingency					32.9	
TOTAL						$177.49

Table 12. Cost Estimate for Alternative 3, Excavation and Off-Site Thermal Treatment

Description	Years	1992 Rate	Quantity	Units	Present Cost 1990 Dollars (thousands)	
Capital Costs						
Corrective Action Plan		$5,000/Plan	1	Plan	$ 5.0	
Cut and Dispose Asphalt		$0.16/Feet^2	6,500	Feet^2	1.04	
Excavate		$5.00/Yard^3	1,800	Yard^3	9.0	
Transport, Treatment, Disposal		$445/Yard^3	1,000	Yard^3	445.0	
Sample analyses		$150.00/Sample	12	Samples	1.8	
Imported Fill		$5.00/Yard^3	1,000	Yard^3	5.0	
Placement and Compaction		$5.50/Yard^3	1,800	Yard^3	9.9	
Asphalt Paving		$1.50/Feet^2	6,500	Feet^2	9.75	
Closure Reporting		$5,000/Report	1	Report	5.0	
Capital Cost Subtotal					$491.99	
5% Const. Management					$24.6	
25% Contingency					123.0	
TOTAL						$639.59

Groundwater contaminated with benzene in excess of the 5 µg/l MCL at Site 3 is believed to extend throughout the area of the former gasoline UST and the former waste oil UST and beneath the storage building. According to the boring logs from this investigation, the impacted shallow water table aquifer occurs in thin, interbedded layers of silty sand, silty sandy gravel, silt, and clay in the vicinity of the former USTs. It occurs in thicker layers of sandy gravel on the north side of the storage building. Groundwater flow is to the north at a gradient of approximately 7 feet per 100 feet.

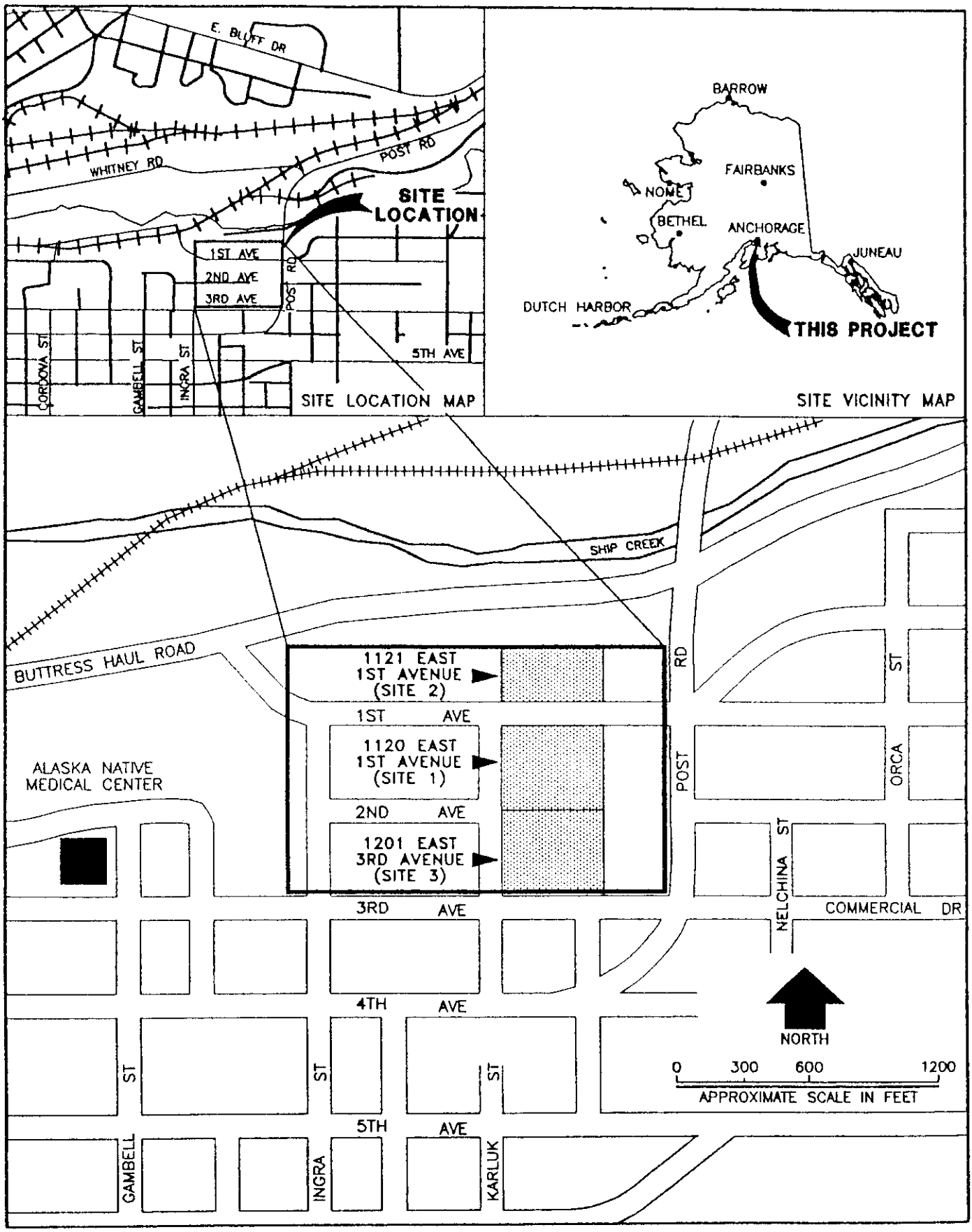
HLA recommends that ML&P install a groundwater extraction and air-stripping treatment system similar to the one presently in operation at Site 2. Groundwater extraction would be accomplished using a subsurface collection drain and sump along the south side of the storage building, with treatment in an air-stripping tower. The treated effluent would be reinjected through a subsurface drain field on the north side of the building. An ADEC permit will be needed, and monthly monitoring is expected to be required for aromatic and halogenated VOCs in the water influent and effluent, and in the air emissions. For cost estimating purposes, 5 years of operation are assumed. The estimated cost for this alternative is $121,500. An itemization of the estimated costs for this alternative is presented in Table 13.

Table 13. Cost Estimate for Groundwater Extraction and Air-Stripping Treatment

Description	Years	1992 Rate	Quantity	Units	Present Cost 1990 Dollars (thousands)	
Capital Costs						
Groundwater Collection System		$6,200/System	1	System	$ 6.2	
Air-Stripper System and Enclosure		$20,000/System	1	System	20.0	
Discharge/Leaching System		$8,000/System	1	System	8.0	
Startup Monitoring and Reporting		$8,000/Report	1	Report	8.0	
Capital cost subtotal					$42.2	
15% Permitting, Design, Const. Management					$ 6.3	
25% Contingency					10.5	
Total Estimated Capital Cost						$ 59.0
Operation and Maintenance (O&M) Costs						
Process Monitoring and Reporting		$1,000.00/Month	60	Month	$60.0	
Maintenance		$500.00/Year	5	Year	2.5	
Total O&M Cost						62.5
TOTAL						$121.5

5.0 ILLUSTRATIONS

0000586



Harding Lawson Associates
Engineering and Environmental Services

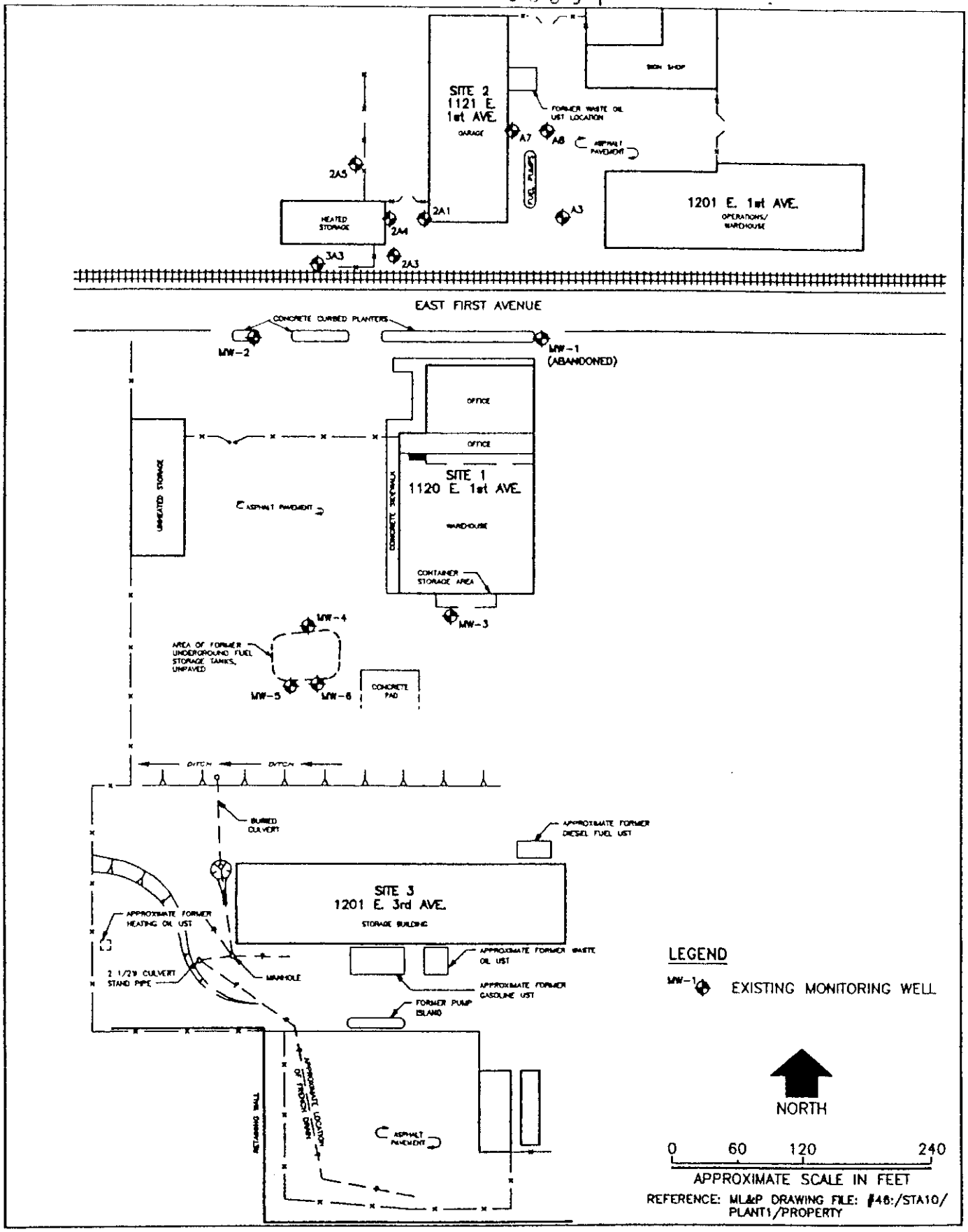
Location Map

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 1

DRAWN	JOB NUMBER	APPROVED	DATE	FILE NAME
JP	10585	MAB	11/92	10585L0C

0000587



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Harding Lawson Associates
Engineering and Environmental Services

ML&P Project Site Map

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 2

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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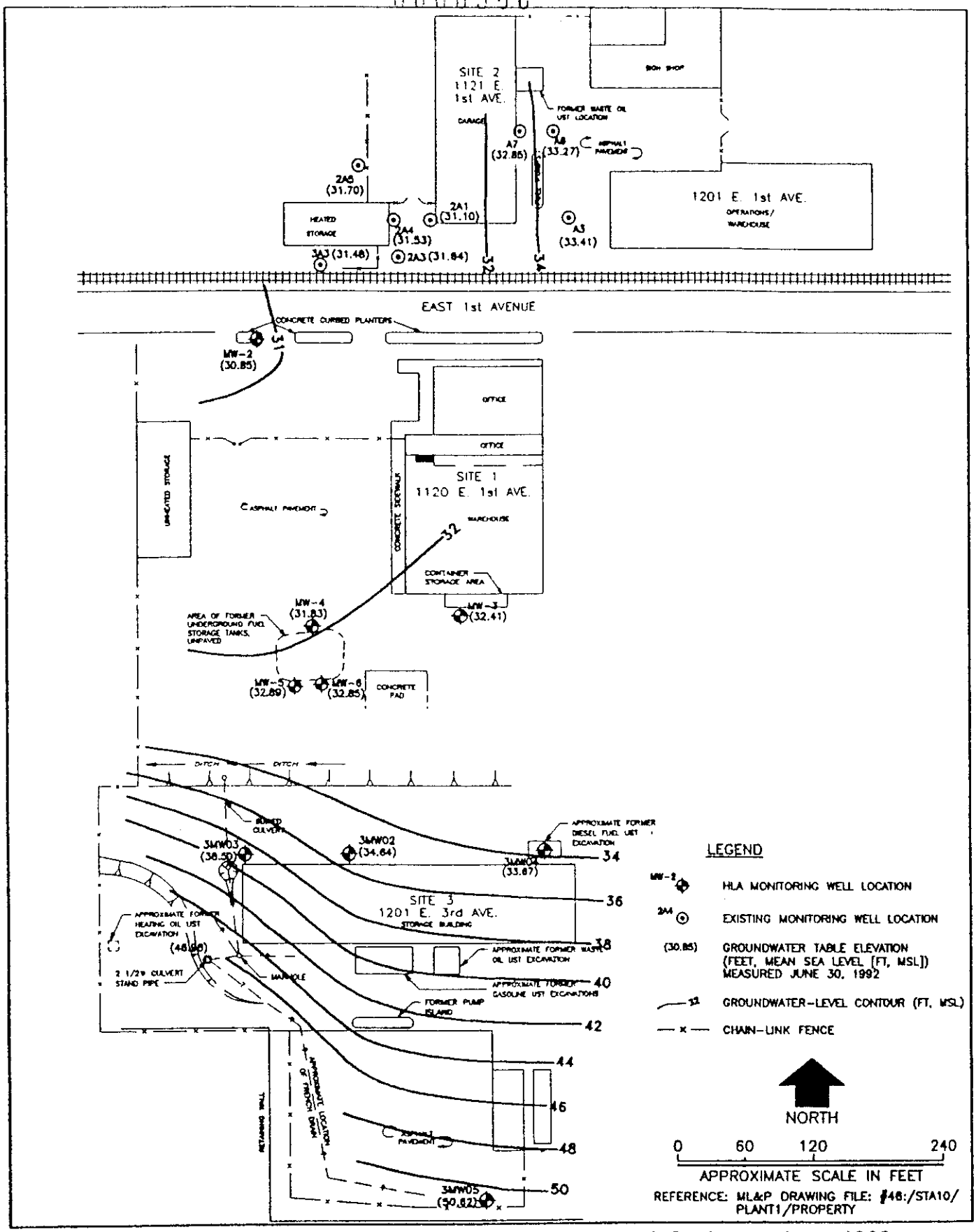

Harding Lawson Associates
Engineering and Environmental Services

Groundwater-Level Contours, June 1992

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 3

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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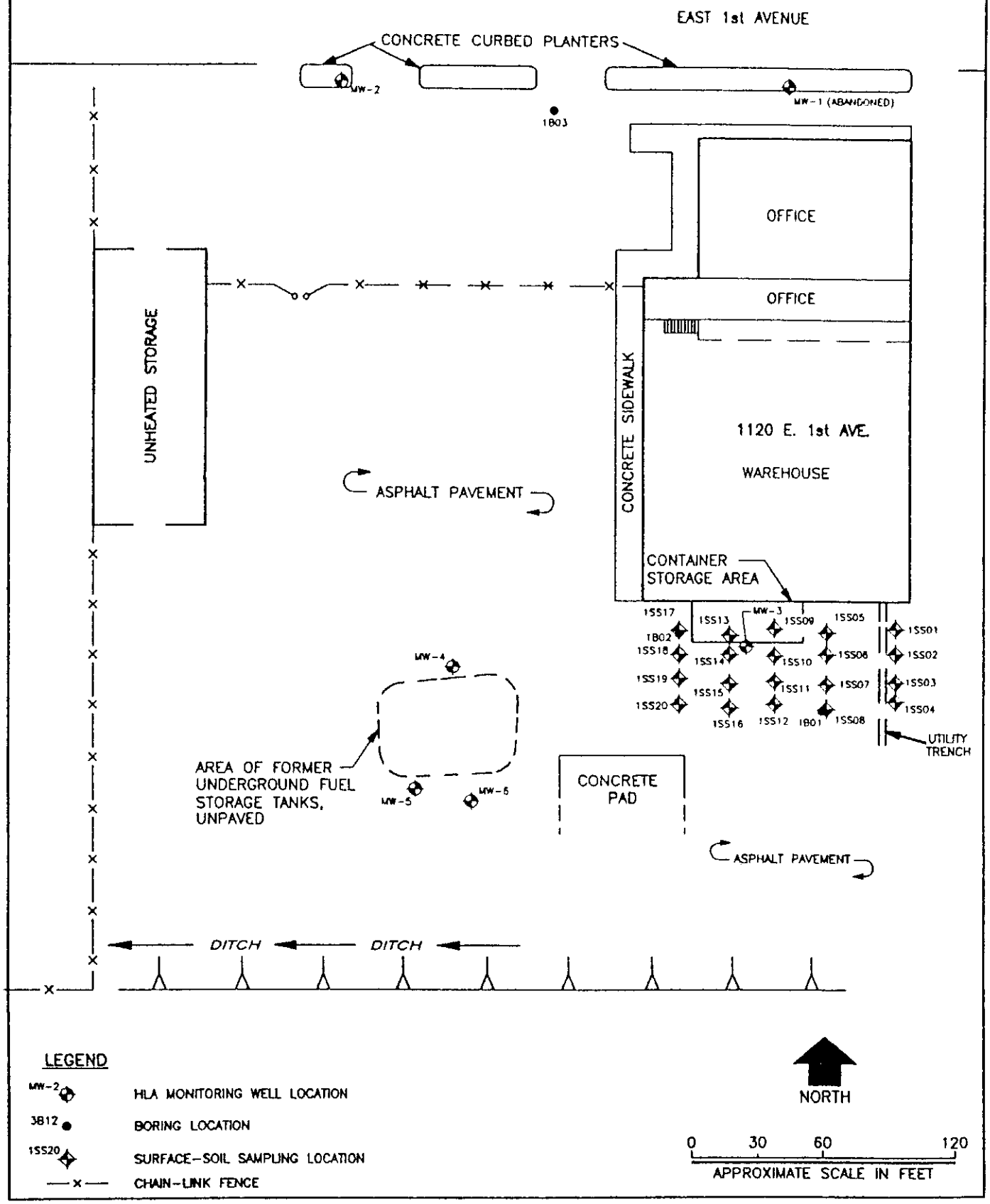

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Site 1 – Soil Sampling Locations

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 4

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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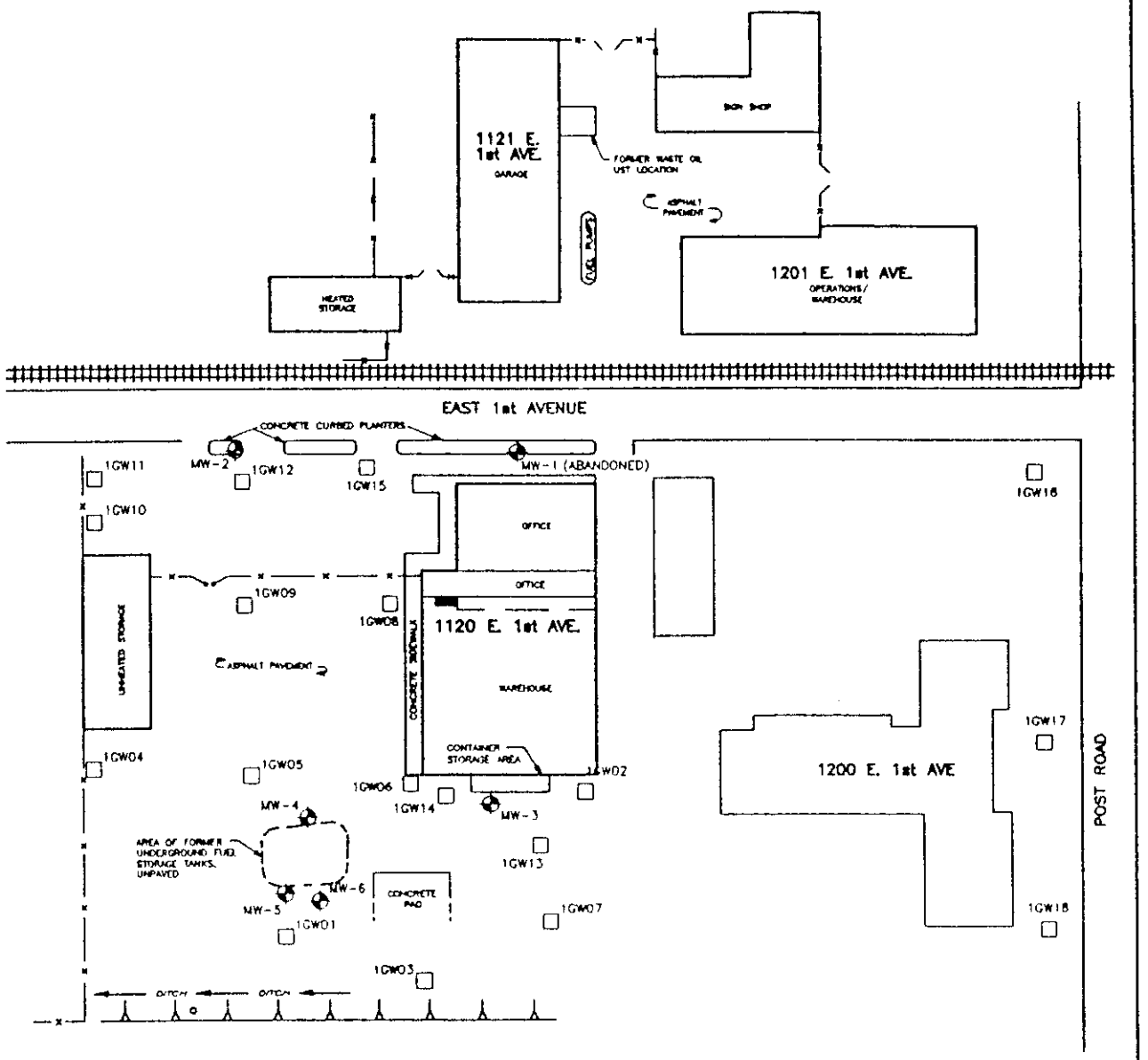
0000590



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LEGEND

MW-2 — HLA MONITORING WELL LOCATION

1GW12 — GROUNDWATER PROBE LOCATION

—x— CHAIN-LINK FENCE

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Site 1 – Groundwater Sampling Locations

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 5

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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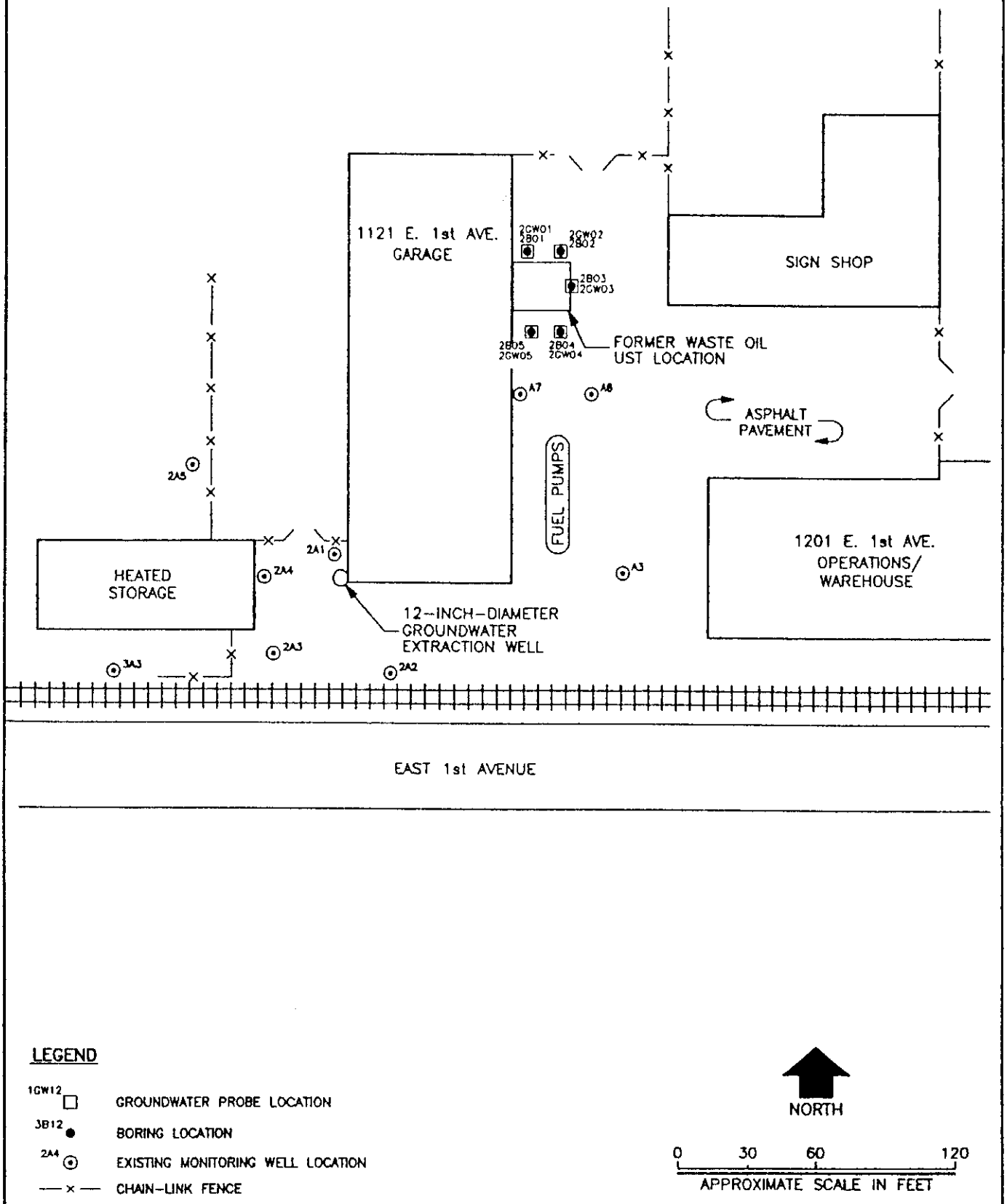
0000591



LEGEND

1GW12 □ GROUNDWATER PROBE LOCATION

3B12 ● BORING LOCATION

2A4 ⊙ EXISTING MONITORING WELL LOCATION

—×— CHAIN-LINK FENCE

NORTH

0 30 60 120

APPROXIMATE SCALE IN FEET

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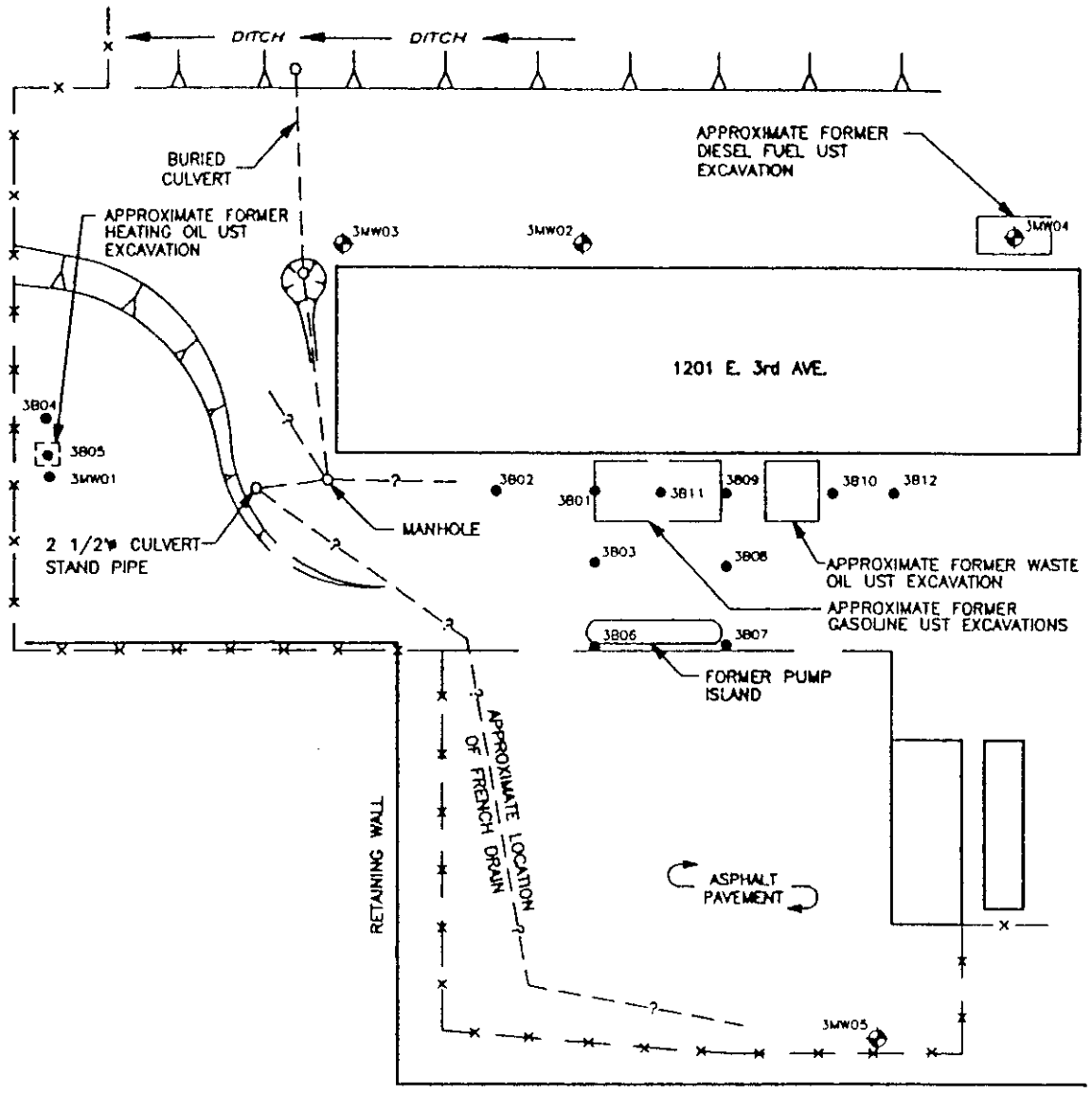
Environmental Services

Site 2 – Sampling Locations

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 6

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
JP	10585	MAB	11/92	134J



LEGEND

3MW02 ◆ HLA MONITORING WELL LOCATION

3B12 ● BORING LOCATION

—×— CHAIN-LINK FENCE

NORTH

0 30 60 120

APPROXIMATE SCALE IN FEET

Harding Lawson Associates
Engineering and Environmental Services

Site 3 – Soil Sampling Locations

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 7

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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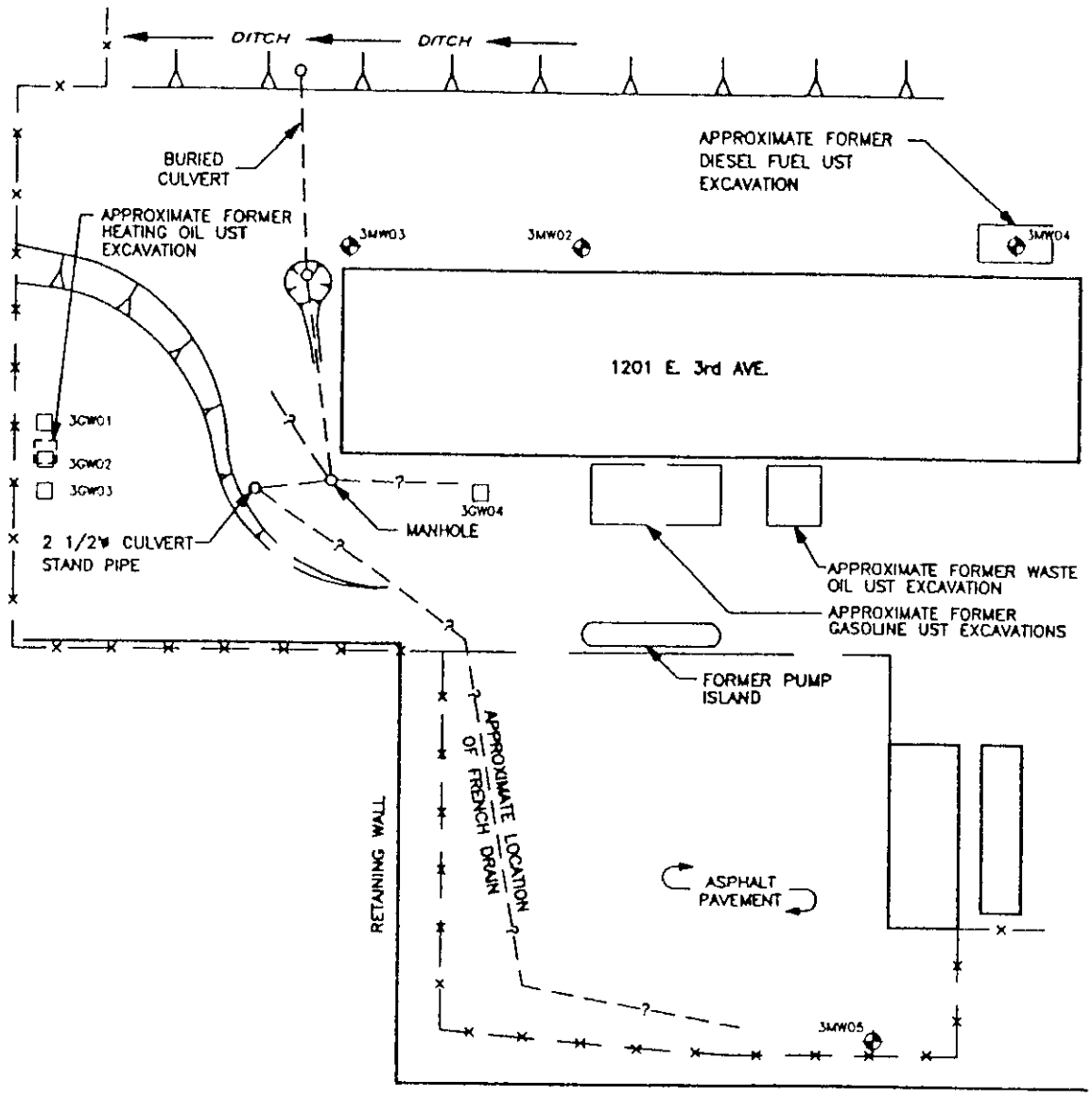

LEGEND

3MW02 HLA MONITORING WELL LOCATION

1GW12 GROUNDWATER PROBE LOCATION

—x— CHAIN-LINK FENCE

NORTH

0 30 60 120

APPROXIMATE SCALE IN FEET

Harding Lawson Associates
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Site 3 – Groundwater Sampling Locations

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 8

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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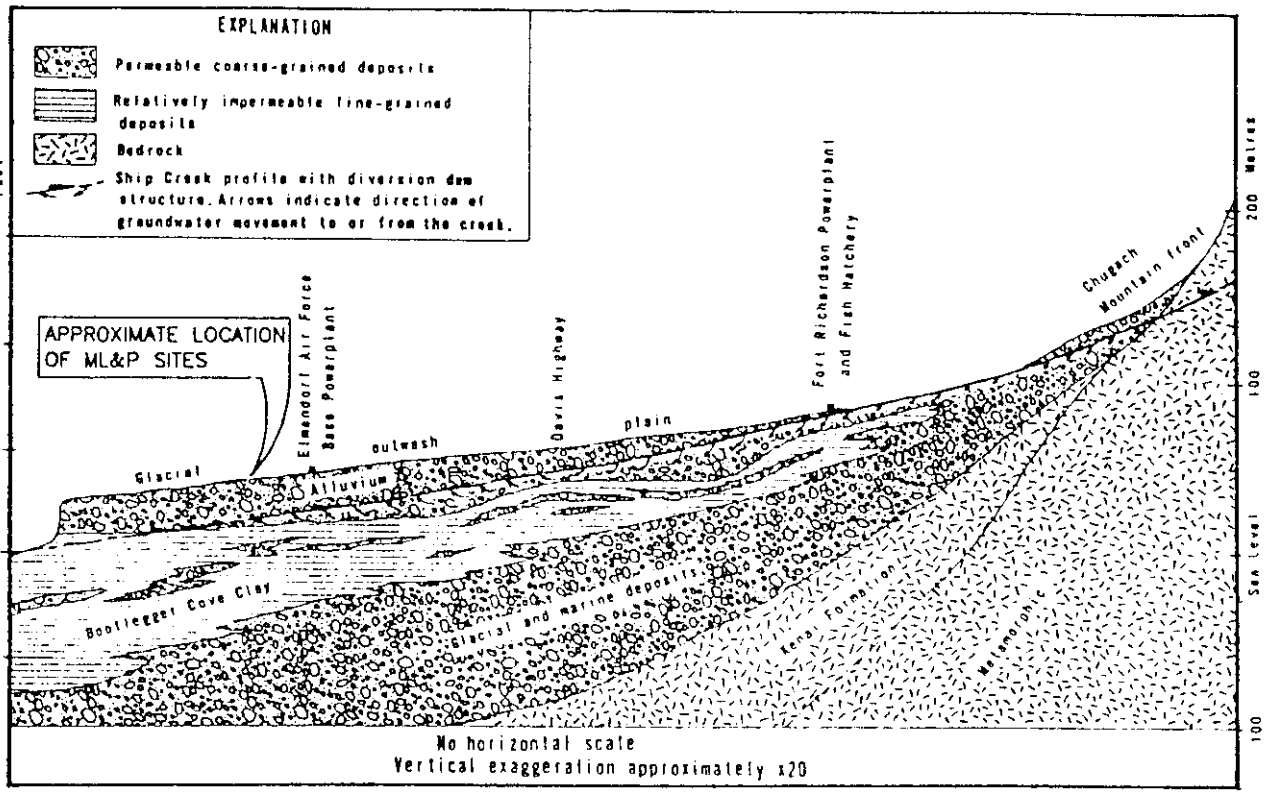

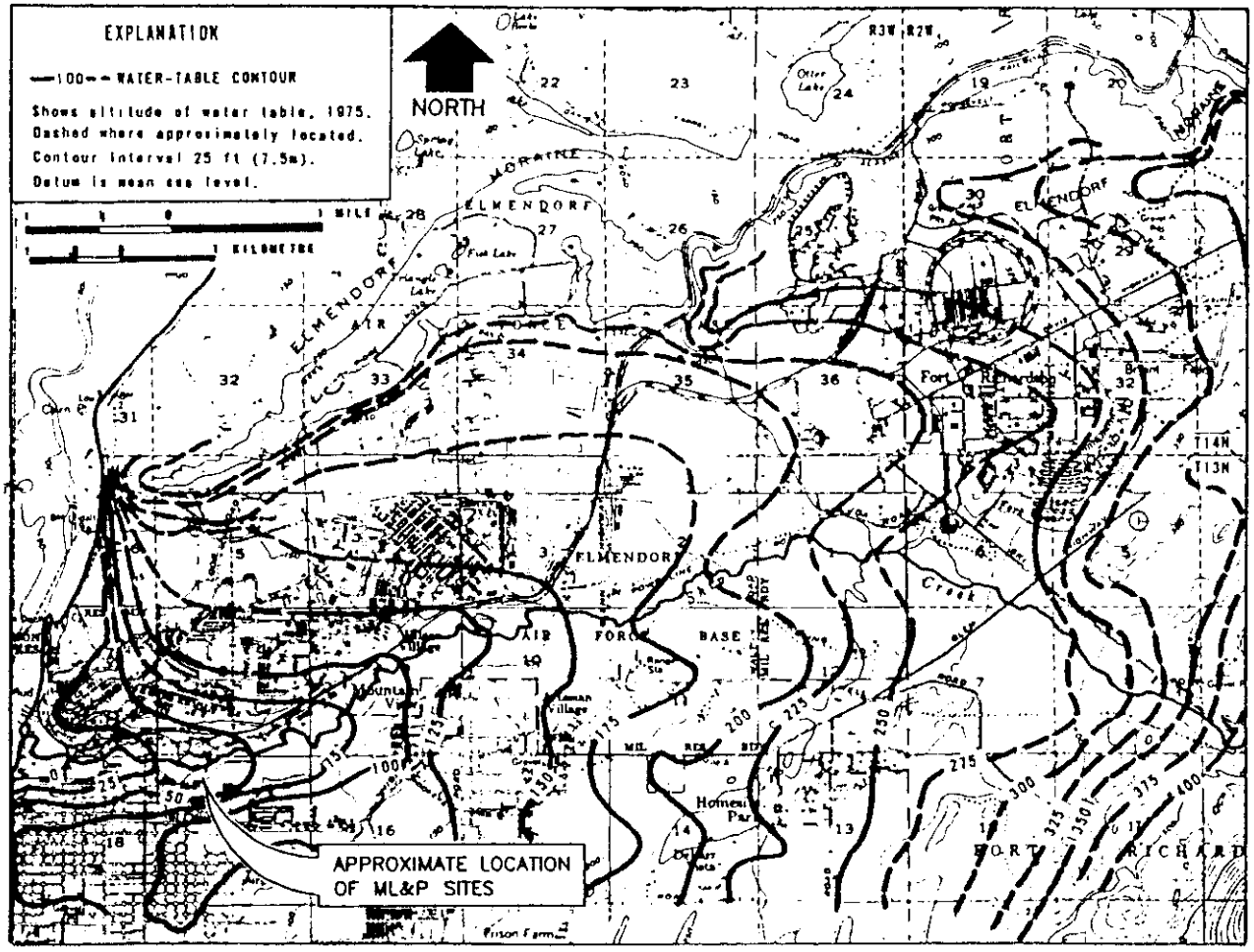

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Schematic Longitudinal Profile of Ship Creek and Water-Table Contours of the Lower Ship Creek Basin
(Source : USGS Water-Resources Investigations 48-75)
ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 9

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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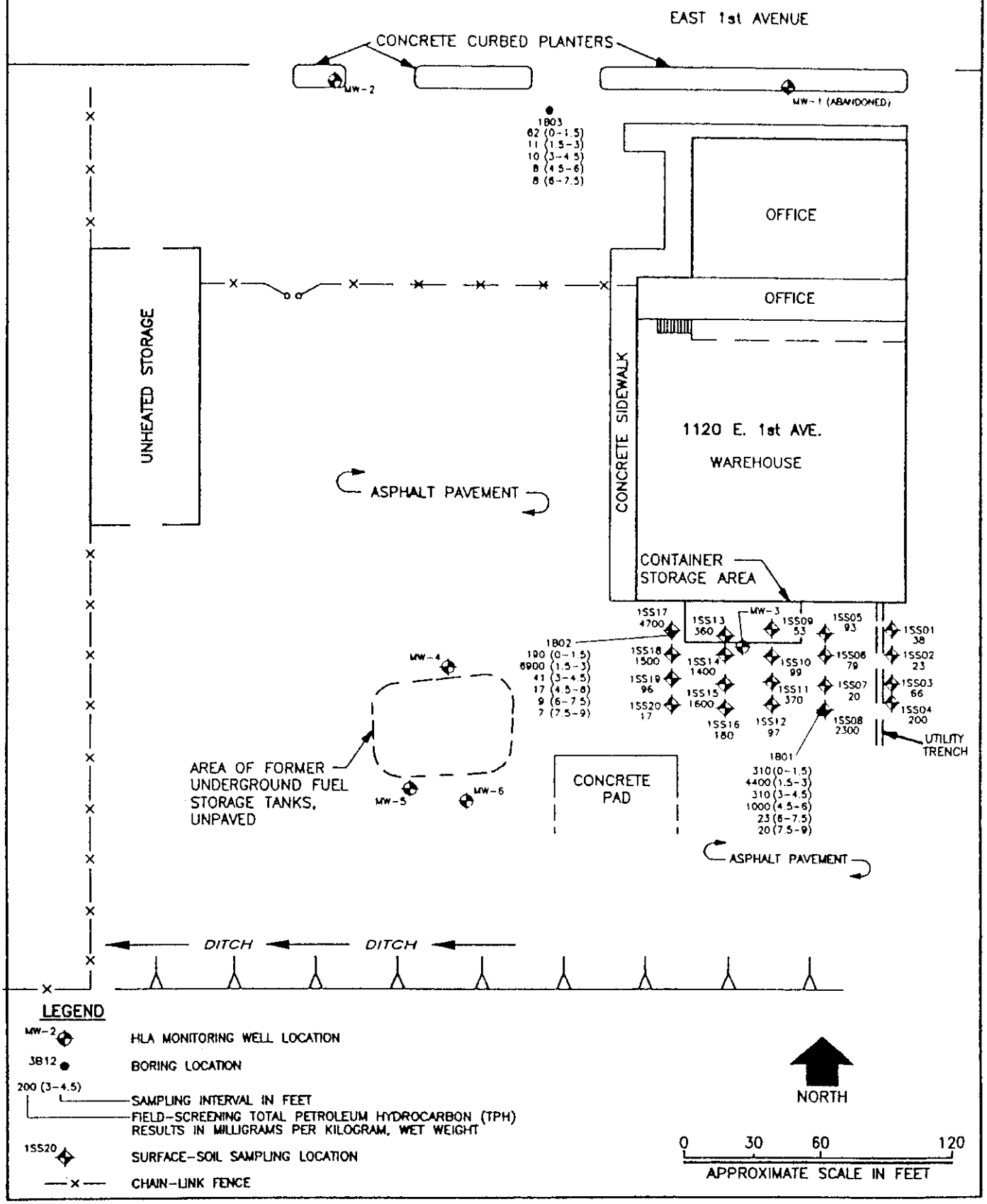

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Field-Screening TPH Results in Site 1 Soil Samples

ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 10

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
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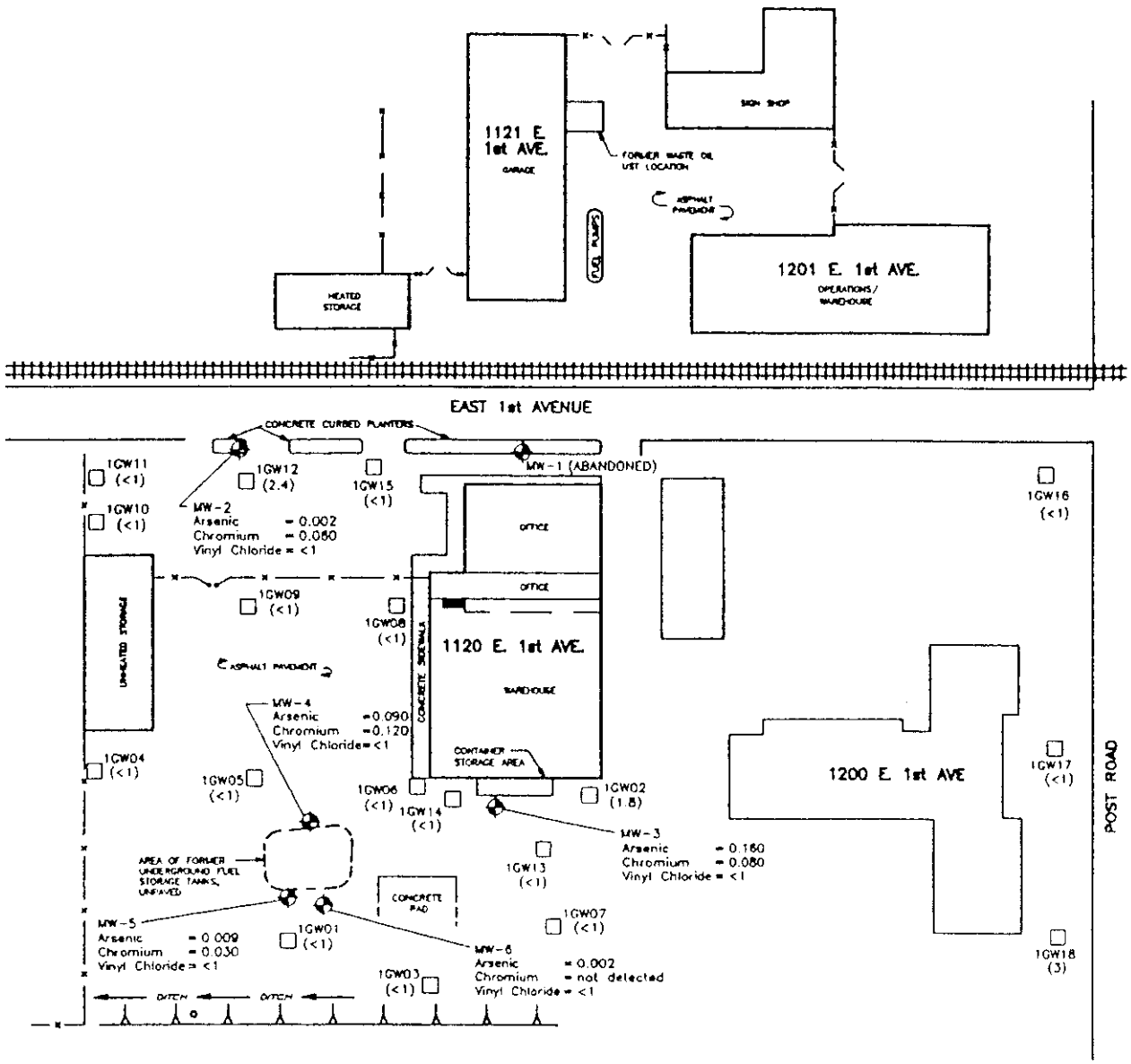

LEGEND

MW-2 ◆ HLA MONITORING WELL LOCATION (ARSENIC AND CHROMIUM CONCENTRATIONS IN MILLIGRAMS PER LITER; VINYL CHLORIDE CONCENTRATION IN MICROGRAMS PER LITER [µg/l])

1GW12 □ GROUNDWATER PROBE LOCATION (VINYL CHLORIDE CONCENTRATION IN µg/l)

—x— CHAIN-LINK FENCE

NORTH

0 60 120 240

APPROXIMATE SCALE IN FEET

REFERENCE: ML&P DRAWING FILE: #46:/STA10/PLANT1/PROPERTY

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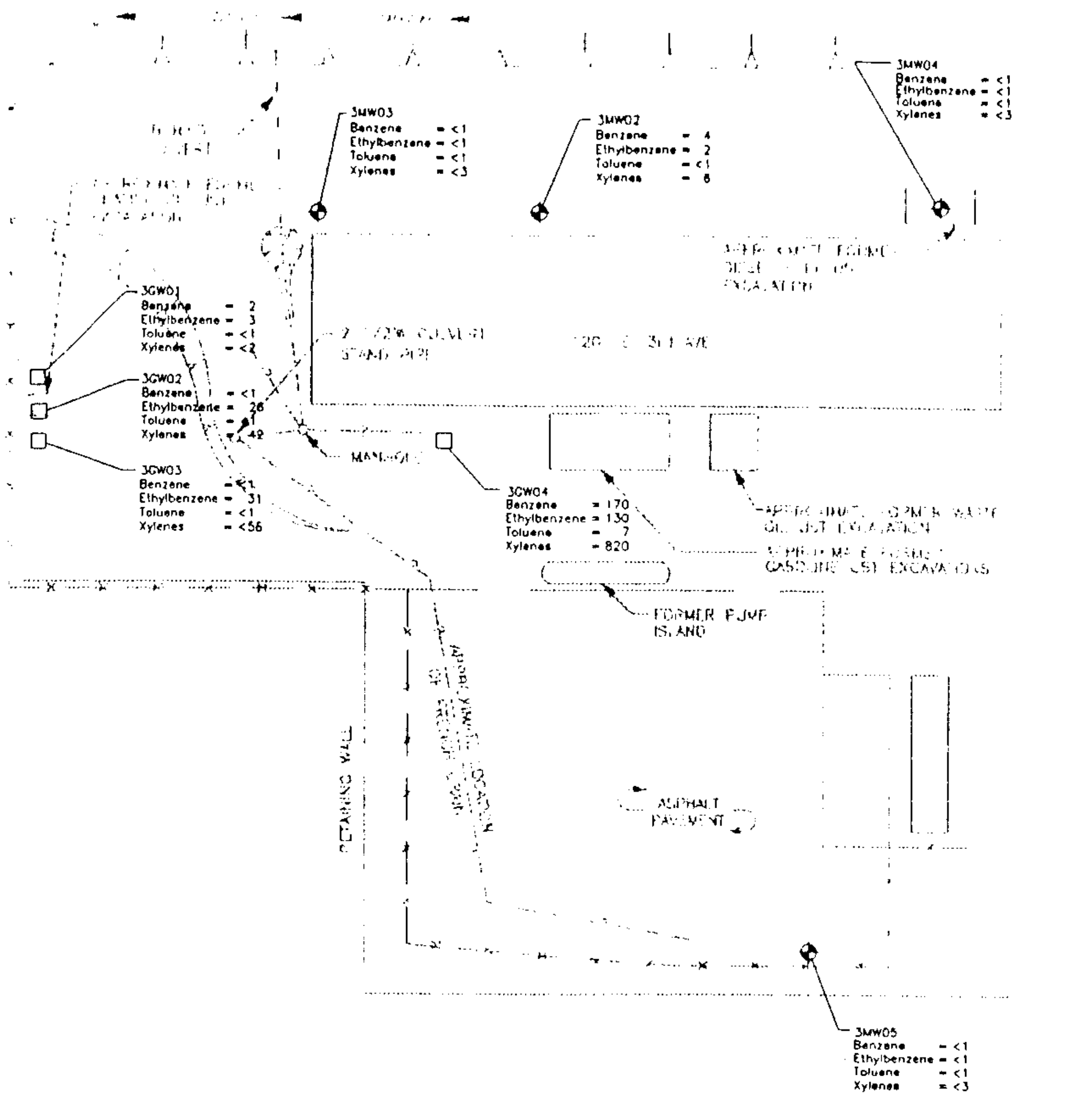
Arsenic, Chromium, and Vinyl Chloride Concentrations Detected in Site 1 Groundwater Samples
ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE 11

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
JP	10585	MAB	11/92	132J

0000597



LEGEND

3MW03 HLA MONITORING WELL LOCATION

1GW12 GROUNDWATER PROBE LOCATION

—x— CHAIN-LINK FENCE

NOTE: ALL RESULTS IN MICROGRAMS PER LITER (μg/l)

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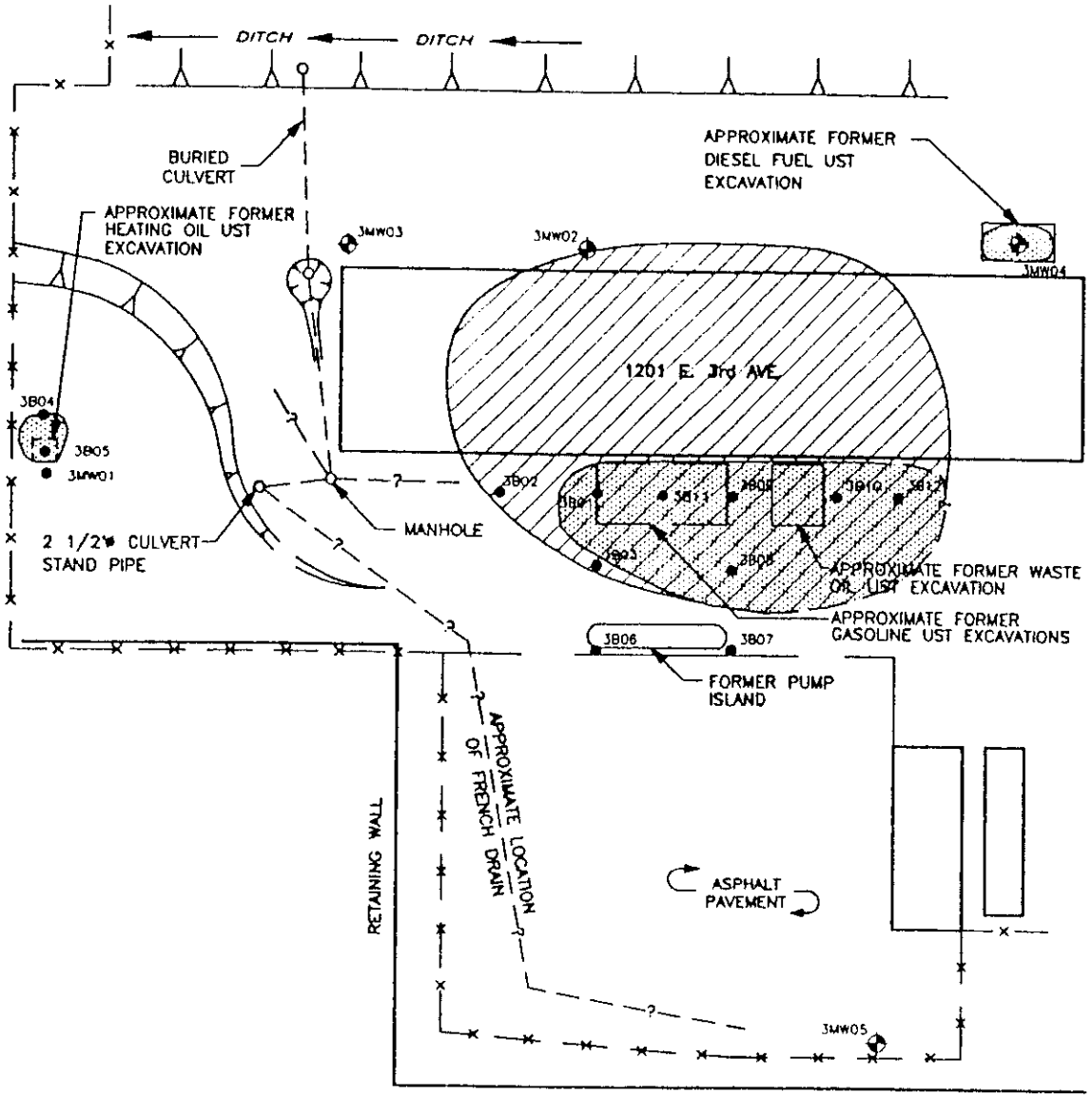
Engineering and Environmental Services

Analytes Detected in Site 3 Groundwater Samples
ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE **12**

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
JP	10585	MAB	11/92	133J

0000598



LEGEND

- APPROXIMATE EXTENT OF SHALLOW GROUNDWATER WITH BENZENE EXCEEDING 5 MICROGRAMS PER LITER
- APPROXIMATE EXTENT OF SOIL CONTAINING PETROLEUM HYDROCARBON EXCEEDING ADEC GUIDELINES
- 3MW03 — HLA MONITORING WELL LOCATION
- 3B12 — BORING LOCATION
- —x— CHAIN-LINK FENCE

NORTH

0 30 60 120

APPROXIMATE SCALE IN FEET

Harding Lawson Associates
Engineering and Environmental Services

Interpreted Extent of Soil and Groundwater Contamination at Site 3
ML&P Phase 2 Remedial Investigation
Anchorage, Alaska

PLATE **13**

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
JP	10585	MAB	11/92	133J

REFERENCES

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Harding Lawson Associates

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PHASE II REMEDIAL INVESTIGATION
MUNICIPAL LIGHT AND POWER FACILITIES
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August 2, 1993

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1200 East First Avenue
Anchorage, Alaska 99501

Attention: Mr. Ron Kuczek

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Paige Herzon Spatz
Principal Geologist

RAM

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Dept. of Environmental Conservation
Underground Storage Tanks — FAP

Golder Associates

December 16, 1997

973-5254x053

Municipal Light & Power
1200 East First Avenue
Anchorage, Alaska 99501

Attention: Mr. Jim Pfeiffer

RE: APRIL 1997 THROUGH DECEMBER 1997
GROUNDWATER MONITORING AND REMEDIATON REPORT
MUNICIPAL LIGHT AND POWER SITE NO. 3, 1201 E. THIRD AVENUE, ANCHORAGE, ALASKA

On behalf of Municipal Light and Power (ML&P), Golder Associates Inc. (GAI) performed monthly maintenance of the soil vapor extraction and air sparging remediation system and semi-annual groundwater monitoring at ML&P Site No. 3, 1201 E. Third Avenue, Anchorage, Alaska (Figure 1). This report summarizes the groundwater sampling results, remediation system monitoring data, and product source identification activities conducted at the site from April through December 1997.

Groundwater sampling activities were performed consistent with the Alaska Department of Environmental Conservation (ADEC) *Underground Storage Tanks Procedures Manual* dated September 22, 1995. Remediation monitoring activities were performed in general accordance with guidelines presented in the operations and maintenance (O&M) manual [1] for the system.

1. BACKGROUND

Five underground storage tanks (USTs) formerly existed at the site, including a diesel tank, heating oil tank, waste oil tank, and two gasoline tanks, as shown in Figure 2. The tanks were removed in 1989 and 1990.

1.1 Remedial Construction

Evidence of soil and groundwater contamination underlying the gasoline and waste oil tanks prompted further investigation and the construction of a soil vapor extraction (SVE) and air sparging system (AS) in 1994. The construction of the remediation system included the installation of three horizontal SVE lines and four SVE wells (VES-1 through VES-4), an

[1] Shannon & Wilson, Inc., June 1995, *Operation & Maintenance Manual*, 1201 East Third Avenue, Anchorage, Alaska.

air sparging system (AS) which includes 12 air injection wells (AIS-1 through AIS-12), and a bio-infiltration system (Figure 3).[2]

The purpose of the remediation system is to treat impacted soils and groundwater at the source (and groundwater downgradient of the source) by volatilization and biodegradation. The SVE component of the remediation system has been operating continuously since October 14, 1994. The AS system began operating on November 4, 1994.

1.2 Post-Construction Investigation

During installation of remediation wells AIS-5, AIS-6, AIS-7, AIS-8, VES-3 and VES-4, a viscous, oily product was observed in soil samples collected from these borings at depths of 15 ft below ground surface (bgs) to 17 ft bgs. The thickness of the product in well VES-4 was not determined due to the viscous nature of the product; however oily water and product coated sampling equipment lowered into the well following installation of the remediation system.

Subsequent investigation[3] of the oily product indicated that it contained concentrations of Polynuclear Aromatic Hydrocarbons (PAH) and petroleum hydrocarbon constituents. However, groundwater samples collected from monitoring well MW-6, located downgradient and cross-gradient of the impacted area, did not contain concentrations of PAH above regulated limits. The investigation also included collecting samples of the product for characterization, attempted product recovery, and a geophysical investigation to locate the source of the product. The results of the product characterization determined that the product was similar to an AC 5.0 asphalt. Attempts at product recovery were of limited success due to the physical nature of the product (similar to a crude oil). The results of the geophysical investigation were inconclusive as far as determining the source of the product.

1.3 Previous Groundwater Monitoring

Periodic groundwater monitoring activities have been conducted at the site since the removal of the USTs in 1992 and the installation of the remedial system in 1994.

GAI has performed groundwater monitoring at the site since 1995. The purpose of the groundwater monitoring has been to evaluate the concentration of hydrocarbons remaining in groundwater beneath the site, determine the direction of groundwater flow, and to gauge the progress of the remedial effort. Four monitoring wells (MW-3, MW-6, MW-7, MW-8) are included in the monitoring program, as shown on Figure 2. Monitoring well MW-5, located upgradient of the former UST locations, is also sampled periodically.

In November 1995, monitoring well MW-8 was found to have been damaged by an unknown activity (i.e. filled with dirt), and therefore removed from the sampling program.

---

2 Shannon & Wilson, Inc., May 1994, "Soil and Groundwater Corrective Action Plan, 1201 East Third Avenue, Anchorage, Alaska".

3 Shannon & Wilson, Inc., January 25, 1995, "Unknown Product Characterization and Source Identification, ML&P Site No. 3, 1201 East Third Avenue, Anchorage, Alaska".

In June 1996, air sparging well AIS-10 was added to the monitoring program to supplement the loss of well MW-8. Wells MW-8 and AIS-10 are both located in the area of the former gasoline UST excavation. However, the well screen intervals differ for these wells, with MW-8 being screened across the water table interval and AIS-10 screened approximately 5 ft below the water table.

2. FIELD ACTIVITIES

2.1 Monitoring Well Repair Activities

On June 2, 1997, Golder personnel cleared well MW-8 of dirt and sand by injecting compressed air inside the well casing. The well was cleared of dirt and sand to an approximate depth of 7 ft below the top of the well casing. An obstruction or damaged casing prevented the well from being cleared to the original installation depth of approximately 12 ft below the top of casing.

2.2 Groundwater Monitoring

On September 18, 1997, Golder personnel collected groundwater samples from wells MW-3, MW-6, MW-7, and MW-8. One quality assurance/quality control water sample was collected during this sampling event. The groundwater sample, designated MW-D6, is a duplicate sample from well MW-6.

Prior to sample collection, a minimum of three well casing volumes of water were removed from each monitoring well. Monitoring wells were purged using 2-in. disposable polyethylene bailers. Field measurements of water depth, temperature, specific conductance, and pH were recorded during removal of the purge water. In addition, dissolved oxygen (DO) was measured in each well prior to purging using a downhole DO meter. Field measurement data from the sampling activities are included in Appendix A.

Groundwater samples were submitted to Analytica Alaska, Inc. under chain-of-custody procedures for analysis of diesel-range organics (DRO) by Alaska Method AK102 and for benzene, toluene, ethylbenzene, and xylenes (BTEX) by U.S. Environmental Protection Agency (EPA) Method 8020. Select groundwater samples were also submitted for testing of PAH by EPA Method 8270 (MW-6).

Purgewater and decontamination water generated during the March and September 1997 groundwater sampling activities were placed in a labeled 55-gallon drum and stored on site. The purgewater and decontamination water was subsequently pumped from the drum on November 6, 1997 by Alaska Pollution Control (APC).

2.3 Remediation System Monitoring

GAI turned off the SVE/AS system during the months of June and September 1997 to allow the subsurface soils to regain moisture content. During this period, slow release oxygen socks (ORC®) were placed into AS wells AIS-6, AIS-8, AIS-10 and AIS-12 to passively

supply oxygen to groundwater. In October 1997, the SVE/AS was returned to full time operation and the ORC socks were removed from the AS wells.

During the reporting period of April 1997 through December 1997, the SVE/AS system was monitored monthly for applied vacuum and flow rate. Remediation system field measurements and other pertinent data for this reporting period are presented in Appendix B. Vapor samples were collected from the SVE emissions stack on October 23 and November 7, 1997. These samples were submitted to CT&E Environmental Services, Inc., and analyzed for gasoline-range organics (GRO) by EPA Method 8015M and for BTEX by EPA Method 8020.

2.4 Product Recovery

On August 15, September 19, and November 6, 1997, product and oily water were pumped from well VES-4 using a vacuum truck supplied by APC. A total of approximately 4 gallons of oil and oily water were recovered from well VES-4 during this reporting period.

On December 5, 1997, Golder personnel measured approximately 1/2-in. of product in well VES-4 using an electronic oil/water interface probe.

2.5 Product Source Identification

GAI personnel reviewed previous site investigation reports, historical photographs, and facility diagrams in an effort to identify the source of product discovered in well VES-4. Review of historical photographs did not identify any potential sources of contamination (see Appendix C). However, the original shop oil water separator and a former 3,000 gallon UST were investigated further as potential product sources, as described below.

2.5.1 Investigation of the Original Shop Oil/Water Separator

During a site facility inspection, two oil/water separators were observed to be in use. One is located in the original shop and the second is located in the Addition No. 1 of the facility (see Figure 4). Communication with ML&P personnel and inspection of the construction diagrams for Addition No. 1[4] indicate that the oil/water separator is plumbed directly to the main line sewer. However, there was no documentation confirming that the oil/water separator in the original shop building was plumbed to the main line sewer, and further investigation was undertaken (see Figure 4).

On July 17, 1997, Pacific Rehab Construction advanced a video camera into the effluent pipe of the original shop oil/water separator. Review of the video tape indicates that the oil/water separator in the original shop is connected to the main line sewer system.

[4] City of Anchorage, Public Works Department, July 23, 1963, "Addition to Shop Building, Sheet No. M-2."

2.5.2 Investigation of the Former 3,000 Gallon UST

Review of plans for the original shop[5] indicate that a 3,000 gallon UST was located outside the northeast wall of the building. The UST was reportedly used to fuel the boilers in the original shop building. Communication with MOA and ML&P personnel did not reveal any records of the UST having been removed prior to the addition being built and fueling records were not available for the tank.

On August 19 and 22, 1997, Golder personnel advanced two soil gas probes through the concrete floor of Addition No.2 in the vicinity of the 3,000 gallon UST (see Figure 4). The soil gas equipment consisted of 1-in. diameter tubing, stainless steel probes, and a jack hammer to advance the probes. The soil gas probes were advanced to approximately 14 ft below the concrete slab (bcs). The uniform penetration resistance of the soil gas probes indicates that the UST was removed prior to the construction of Addition No.2. A hand auger boring was also advanced to approximately 4 ft bcs in the location of soil gas probe SG-1 to further confirm the absence of a UST.

A soil sample (S-1) was collected from soil gas probe SG-2 (see Figure 4) from a depth interval of approximately 11 - 13 ft bcs. The soil sample was collected by advancing the geoprobe assembly to approximately 11 ft bcs, releasing the drive tip at the forefront of the geoprobe assembly (which would allow recovery of the soil column), and driving the geoprobe to approximately 13 ft bcs.

The description of the recovered soil column was the following:

- brown
- silty sand with gravel (SM-GM)
- Unsaturated (vadose zone soils)
- Stained with a very weathered, heavy weight, oil

A soil sample was collected from this interval and submitted under chain-of-custody to Columbia Analytical Services (CAS) for analysis of residual-range organics (RRO) by Alaska Method AK103, DRO, GRO, BTEX, and PAH. Chromatography was also requested for use in determining the fuel type.

3. INVESTIGATION RESULTS

The groundwater monitoring analytical results for BTEX, GRO, DRO, and PAH are presented in Tables 1 and 2. Analytical results from the vapor samples collected from the SVE effluent air stream are presented in Table 3. Soil sample results from the product source investigation are presented in Table 4. Laboratory analytical reports and chain-of-custody for the air samples and groundwater samples are included in Appendix D.

---

5 City of Anchorage, Public Works Department, July 23, 1963, "Addition to Shop Building, Sheet No. M-1."

3.1 Hydrocarbons in Groundwater

A review of the analytical results indicates that benzene was detected in sample MW-8 at a concentration of 26 micrograms per liter (µg/L). Benzene was not detected in samples collected from wells MW-3, MW-6, or MW-7 during this monitoring event.

DRO were detected in samples collected from wells MW-3, MW-6, MW-8 at concentrations of 0.3 milligrams per liter (mg/L), 2.1 mg/L, and 19 mg/L, respectively. DRO were not detected in the groundwater sample collected from well MW-7.

Total PAH concentrations in MW-6 remained comparable to the levels reported for the past three years of groundwater monitoring.

3.2 Soil Vapor

Review of the analytical results for the vapor samples collected from the SVE emissions stack indicate that VPH concentrations for samples SVE102397 and SVE110797 were detected at a concentration of 288 parts per million (ppm) and 20.8 ppm, respectively (Table 3).

The total hydrocarbon mass removal rates for the remedial system, based on field air flow rates and the laboratory analytical results for VPH, were approximately 19.1 and 1.38 pounds per day (lbs/d).

The vapor sample (SVE102397) and its corresponding mass removal rate of 19.1 lbs/d are anomalous and exceed the vapor emissions and mass removal rates observed during startup of the SVE in 1994. Following receipt of this result from the lab, Golder personnel collected an additional vapor sample on November 11, 1997 (designated SVE110797). Analytical results and its corresponding mass removal rate for this sample were similar to those observed for the past two years of monitoring.

3.3 Hydrocarbons in Soil

A review of the analytical results indicate that benzene and GRO were not detected in soil sample S-1 above the method reporting limit (MRL) (Table 4). Xylenes were detected at a concentration of 0.13 milligrams per kilogram (mg/Kg). DRO and RRO were detected at a concentration of 3,600 mg/Kg and 2,200 mg/Kg, respectively. Total PAH concentrations in S-1 were not detected above 12 mg/Kg.

3.4 Product Source Identification

Laboratory analytical reports, raw data, and chromatography for soil sample S-1 and for the product samples collected from VES-4 (during previous investigations conducted at the site in 1994) were submitted to Wade Research, Inc. of Marshfield, Massachusetts for geochemical interpretation.

The conclusion from geochemical review of the data was that the overall petroleum contamination was strongly similar in both the soil sample (S-1) collected in the unsaturated zone and the product sample collected from VES-4. Furthermore, Wade Research Inc. concluded that the hydrocarbon assemblages in the product and soil samples are consistent with a severely altered No.2 fuel oil, or a No. 4 fuel oil with some lighter range hydrocarbons present, which were probably used to help the liquid to flow from the tank to the boilers.

Based on our field observations that the product in VES-4 is viscous and tends to harden on sampling equipment lowered into the well, GAI concludes that the product is consistent with an altered No. 4 fuel oil rather than a No. 2 fuel oil. However, both of these fuel types may have been used to fuel the boilers.

4. CONCLUSIONS

Based on the results of this investigation and review of previous investigations performed at the site, Golder concludes the following:

- Benzene was detected at a concentration of 26 µg/L in MW-8, which exceeds the ADEC MCL of 5 µg/L. MW-8 is located in a former UST excavation. Benzene concentrations in samples collected from well MW-8 have been observed to decrease by over 95 percent since the initiation of the SVE/AS system. Benzene was not detected in downgradient monitoring wells MW-3, MW-6, or MW-7.
- PAH concentrations were not detected above EPA regulated levels in the sample collected from monitoring well MW-6 (located downgradient/cross gradient of well VES-4).
- Approximately 1/2-in. of product was measured in VES-4 on December 5, 1997.
- The direction of groundwater flow beneath the site is to the northwest based on groundwater elevation data on September 18, 1997 (Figure 5). This is consistent with historical measurements for the site. The hydraulic gradient across the site is highly variable and ranges from approximately 0.011 feet per foot (ft/ft) between wells MW-6 and MW-7 to approximately 0.10 ft/ft between wells MW-3 and MW-8.
- The mass of volatile hydrocarbons removed by the SVE system increased by an order of magnitude following intermittent operation of the system. The increased mass removal rates were temporary based on the difference in results from the SVE vapor samples collected on October 23 and November 7, 1997 (Table 3). The analytical result for vapor samples SVE102397 is anomalous and exceeds the vapor sample results observed during startup of the SVE system in 1994. In general, the hydrocarbon mass removal rates for the SVE system have averaged approximately 1 pound per day between January 1996 and November 1997.
- Based on a review of the laboratory analytical results and chromatography for soil sample S-1 and product samples from VES-4, it appears that the source of the product in well VES-4 is the former 3,000 gallon UST which was used to heat the boilers in the original shop building. The hydrocarbon fuel assemblage is similar to

that of a No. 4 fuel oil with some lighter range hydrocarbon assemblages present, which were probably for enhancing flow from the tank to the boilers.

5. RECOMMENDATIONS

Based on the results stated above, Golder recommends the following:

- Continue to operate the SVE/AS system to enhance the biodegradation of the contaminant mass in the subsurface soils and groundwater in the vicinity of monitoring well MW-8.
- Operate the SVE/AS on an intermittent basis during the 1998 spring and summer season. Intermittent operation of the SVE/AS is not recommended during the winter months to avoid the buildup of frost in the horizontal piping plumbed to the SVE and AS wells.
- Additional 4-in. wells should be installed (one near AIS-8 and the second just north of the building wall from where the UST was located) in an effort to remove the product from the groundwater table. APC could pump the product and oily water from these wells and VES-4 on an intermittent basis rather than installing a product recovery system at the site.

6. LIMITATIONS AND USE OF THIS REPORT

The findings presented in this report are intended for the sole use of our client and their representatives. This report represents our professional opinions, which are based in part on interpretation of data from discrete sampling locations that may not represent actual conditions at unsampled locations. The data presented in this report should be considered representative of the time of our site assessment.

No investigation is thorough enough to describe all the geologic or hydrogeologic conditions of interest at the site. If conditions have not been identified during the study, such a finding should not be construed as a guarantee of the absence of such conditions at the site, but rather as a result of the services performed within the scope, limitations, and cost of the work performed. This site assessment followed the standard of care expected of professionals undertaking similar work in Alaska under similar conditions. No warranty expressed or implied is made.

If you have any questions or comments, please do not hesitate to call us.

Sincerely,

GOLDER ASSOCIATES INC.

Mark R. Musial, P.E.
Associate and Senior Geotechnical Engineer

Craig T. Boeckman
Project Manager

Attachments: Table 1 - Historical Groundwater Analytical Results (Nov. 1994 - Sept. 1997)
Table 2 - Detected PAH Compounds in Groundwater
Table 3 - Vapor Sample Analytical Results
Table 4 - Soil Sample Analytical Results
Figure 1 - Vicinity Map
Figure 2 - Site Plan
Figure 3 - Vapor Extraction/Air Injection System - Line Detail
Figure 4 - Soil Quality Profile Map
Figure 5 - Piezometric Surface and Hydrocarbon Concentration Map
Appendix A - Water Sample Field Data
Appendix B - Remedial System O&M Data
Appendix C - Historical Site Photographs
Appendix D - Laboratory Reports for Air and Groundwater Analyses

cc: Jim Pfeiffer (ML&P) - 2 copies
Mike Krueger (MOA) - 1copy
Robert Weimer (ADEC) - 1 copy

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TABLE 1

Historical Groundwater Analytical Results (November 1994 through September 1997)
1201 E. Third Ave., ML&P Facility

Sample Location	Sample Identification	Date Sample Collected	Aromatic Volatile Organics (BTEX) and Gasoline-Range Organics (GRO) USEPA Method 602 or 8020 (µg/L)					Diesel-Range Organics (DRO) USEPA 8100M or AK 102 (mg/L)
			Benzene	Toluene	Ethylbenzene	Xylenes	GRO	
MW-3	MW3W2	11/28/94	ND	ND	ND	ND	--	ND
	MW3W3	1/19/95	ND	ND	ND	ND	--	ND
	MW3W4	5/31/95	ND	ND	ND	ND	--	ND
	MW-3	11/2/95	ND	ND	ND	ND	--	0.54
	MW-3	3/28/96	ND	ND	ND	ND	--	0.22
	MW-3A(D)	3/28/96	ND	ND	ND	ND	--	0.33
	MW-3	6/25/96	ND	ND	ND	ND	--	0.45
	MW-13(D)	6/25/96	ND	ND	ND	ND	--	0.24
	MW-3	9/30/96	ND	ND	ND	ND	--	ND
	MW-13(D)	9/30/96	ND	ND	ND	ND	--	ND
	MW-3	3/28/97	ND	ND	ND	ND	--	0.46
	MW-3	9/18/97	ND	5.7	ND	ND	--	0.3
MW-5	MW-5	9/30/96	ND	ND	ND	ND	--	ND
MW-6	MW6W2	11/28/94	ND	0.9	0.9	3.4	--	0.51
	MW6W3	1/19/95	ND	ND	0.9	2.5	--	0.97
	MW6W4	5/31/95	17	12	8.3	29	--	0.92
	MW-6	11/2/95	ND	ND	2	3	--	16*
	MW-6	3/28/96	ND	ND	1.5	2.6	--	1.44
	MW-6	6/25/96	ND	ND	ND	ND	--	1.9
	MW-6	9/30/96	ND	ND	ND	ND	--	1.2
	MW-6	3/28/97	ND	ND	ND	ND	--	1.1
	MW-6(D)	3/28/97	ND	ND	ND	ND	--	1.0
	MW-6	9/18/97	ND	1.5	ND	ND	--	1.9
	MW-D6 (D)	9/18/97	ND	ND	ND	ND	--	2.1
MW-7	MW7W2	11/28/94	ND	ND	ND	ND	--	ND
	MW7W4	5/31/95	ND	ND	ND	ND	--	ND
	MW-7	11/2/95	ND	ND	ND	ND	--	0.2
	MW-7	4/18/96	ND	ND	ND	ND	--	ND
	MW-7	6/25/96	ND	ND	ND	ND	--	ND
	MW-7	9/30/96	ND	ND	ND	ND	--	ND
	MW-7	3/28/97	ND	ND	ND	ND	--	ND
	MW-7	9/18/97	ND	1.7	ND	ND	--	ND
MW-8	MW8W2	11/28/94	3,000	1,100	300	2,200	--	10
	MW8W3	1/19/95	1,600	2,500	350	3,500	--	4.1
	MW8W4	5/31/95	70	20	ND	220	--	1.4
	MW-8	9/18/97	26	33	4	41	--	19
VES-4	Y-5216-33-P1**	10/21/94	--	--	--	--	230	530,000*
	Y-5216-33-P1A**	11/28/94	ND	17	21	120	--	--
AIS-10	AIS-10***	6/28/96	470	4	ND(2)	5	--	13
	MW-10***	9/30/96	520	ND(5)	ND(5)	ND(5)	--	18
	AIS-10	3/28/97	1,600	ND	ND	ND	2,900	5.0
MRL		--	1	1	1	1.0 - 2.0	--	0.1 - 0.25

Note:

-- = Not Applicable or Not Analyzed

MRL = Method Reporting Limit

ND = Not detected above the MRL

(5) = Elevated MRL

* = Chromatograph pattern indicative of both a diesel or fuel oil, and heavier grease type contamination

mg/L = Milligrams per litre

µg/L = Micrograms per litre

*** = Samples were collected as no purge "grab" samples.

** = Product sample collected from VES-4

(D) = Duplicate sample designation

See analytical reports for documentation on Trip Blank, Method Blank, MRL, and QA/QC

TABLE 2
Detected PAH Compounds in Groundwater (November 1994 through September 1997)
1201 E. Third Ave., ML&P Facility

Sample Location	Date Sample Collected	Polynuclear Aromatic Hydrocarbons (PAH) USEPA Method 8310 (mg/L)													
		Acena-phthylene	Anthracene	Benzo-anthracene	Benzo-fluoranthene	Benzo-a-pyrene	Benzo-perylene	Chrysene	Dibenzo-anthracene	Fluor-anthrene	Fluorene	Indeno-pyrene	Naphthalene	Phen-anthrene	Pyrene
VES-4**	10/21/94	1,800	66	43	38	21	58	13	7	100	170	6	1,900	1,400	90
MW-6	10/21/94	0.012	ND	ND	ND	ND	0.0002	ND	ND	ND	0.0003	ND	0.017	0.0009	ND
MW-6	11/7/95	ND(<.033)	0.0002	ND(<.0003)	ND(<.0003)	ND(<.0003)	ND	0.0019	ND	ND	0.0021	ND	0.015	ND(<.0035)	ND(<.0005)
MW-6	3/28/97	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0061	ND	ND
MW-6 (D)	3/28/97	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0062	ND	ND
MW-6	9/18/97	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	0.0031	ND(<0.01)	ND(<0.01)
Method Blank		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MRL		0.001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.001	0.0001	0.0002

Note:
** = Product sample collected from well VES-4
ND = Not Detected or Not Applicable
mg/L = milligrams per litre
See Analytical Reports for complete listing of Analytes, MRLs, and QA/QC reporting
MRL = Method Reporting Limit. Except where noted by ( ). This indicates elevated MRL.
(D) = Duplicate sample designation.

TABLE 3
Vapor Sample Analytical Results (January 1996 through November 1997)
1201 E. Third Ave., ML&P Facility

PARAMETER TESTED	UNITS	METHOD	Analytical Sample Number & Date						
			MLP-01A 1/23/96	1079-01 3/28/96	MLP-01 6/24/96	MLP-01 9/30/96	Exhaust Stack 1 3/28/97	SVE102397 10/23/97	SVE110797 11/7/97
Vapor Extraction Exhaust Stack									
Volatile Petroleum Hydrocarbons (VPH)	ppm	5030/8015M	21.7	15.7	5.38*	13.3*	ND	288	20.8
Aromatic Volatile Organics-BTEX									
Benzene	ppm	EPA 8020	0.335	ND	ND	ND	ND	2.11	ND
Toluene	ppm	EPA 8020	1.03	0.69	ND	ND	ND	3.68	ND
Ethylbenzene	ppm	EPA 8020	0.903	ND	ND	ND	ND	1.08	ND
P & M - Xylene	ppm	EPA 8020	2.26	0.53	ND	ND	ND	2.86	ND
o - Xylene	ppm	EPA 8020	1.37	ND	ND	ND	ND	0.96	ND
Petroleum Hydrocarbon Mass Removal Rates	**lbs/day**	Ideal Gas Law	**1.29**	**0.86**	**0.30**	**0.80**	**0.30****	**19.1**	**1.38**

ND = Not detected above the laboratories Practical Quantification Limit (PQL). *The PQL is the laboratories acceptable limit of* quantifying the air sample based on the calibration limit for their equipment. The PQL is approximately 3-4 times the method detection limit (MDL).

* Estimated value. Result was below the calibration range for the lab but above the MDL.

** Estimated value. VPH value was non-detect with a MDL of 20 ppm.

TABLE 4
Soil Sample Analytical Results
1201 E. Third Ave., ML&P Facility

Sample Location	Date Sample Collected	Aromatic Volatile Organics (BTEX) and Gasoline-Range Organics (GRO) USEPA Method 8015M/8020 (mg/Kg)					(DRO) AK 102 (mg/Kg)	(RRO) AK 103 (mg/Kg)	(PAH) EPA 8270 (mg/Kg)
		Benzene	Toluene	Ethylbenzene	Xylenes	GRO			
S-1	8/22/97	ND	ND	ND	0.13	ND	3,600	2,200	< 12
MRL	--	0.05	0.05	0.05	0.05	5	200	800	0.6

Note:
See analytical reports for documentation on Trip Blank, Method Blank, MRL, and QA/QC
MRL = Method Reporting Limit
ND = Not detected above the MRL
mg/Kg = Milligrams per kilogram
DRO = Diesel-range hydrocarbons
RRO = Residual-range hydrocarbons
PAH = Polynuclear Aromatic hydrocarbons

000613

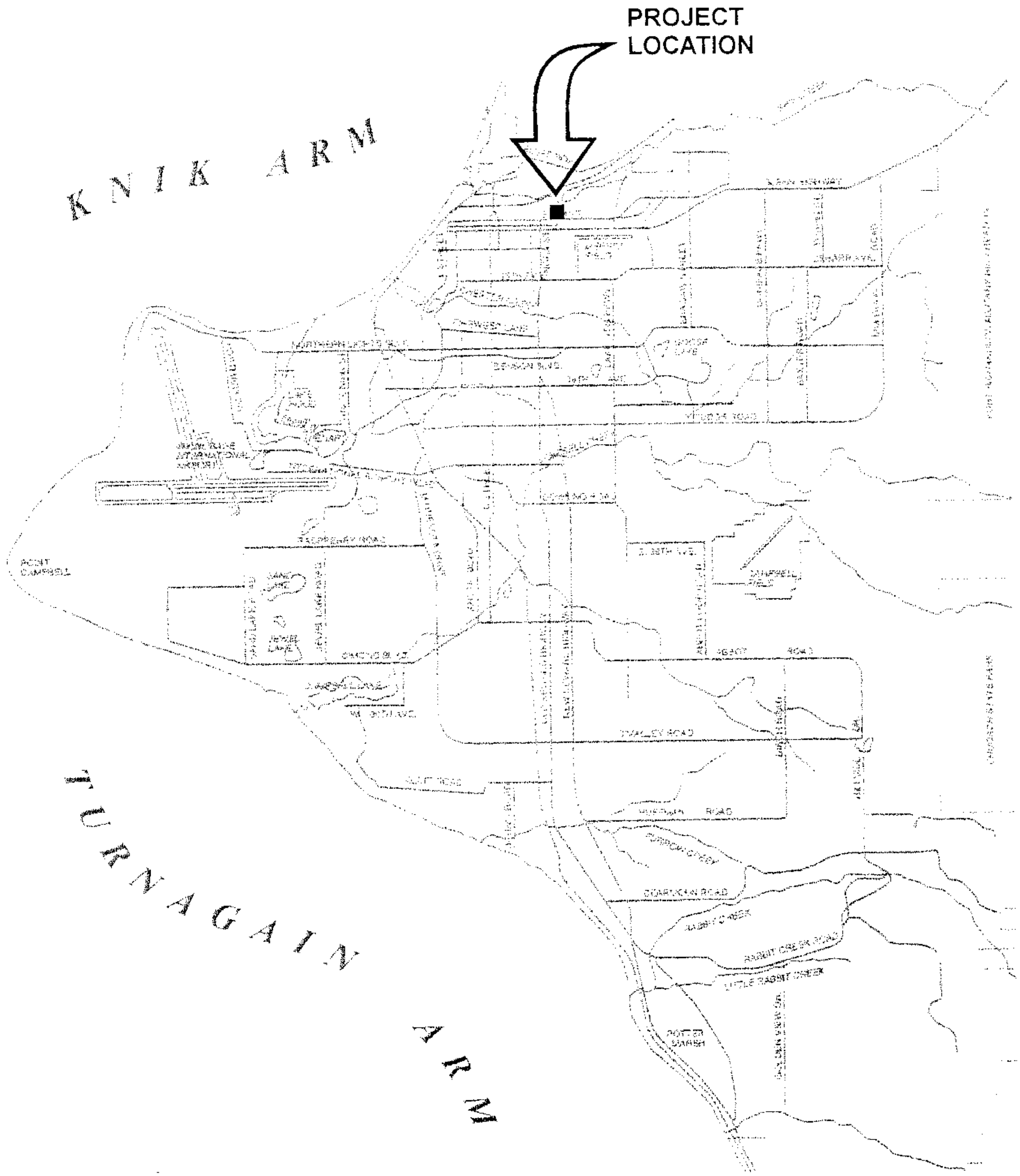


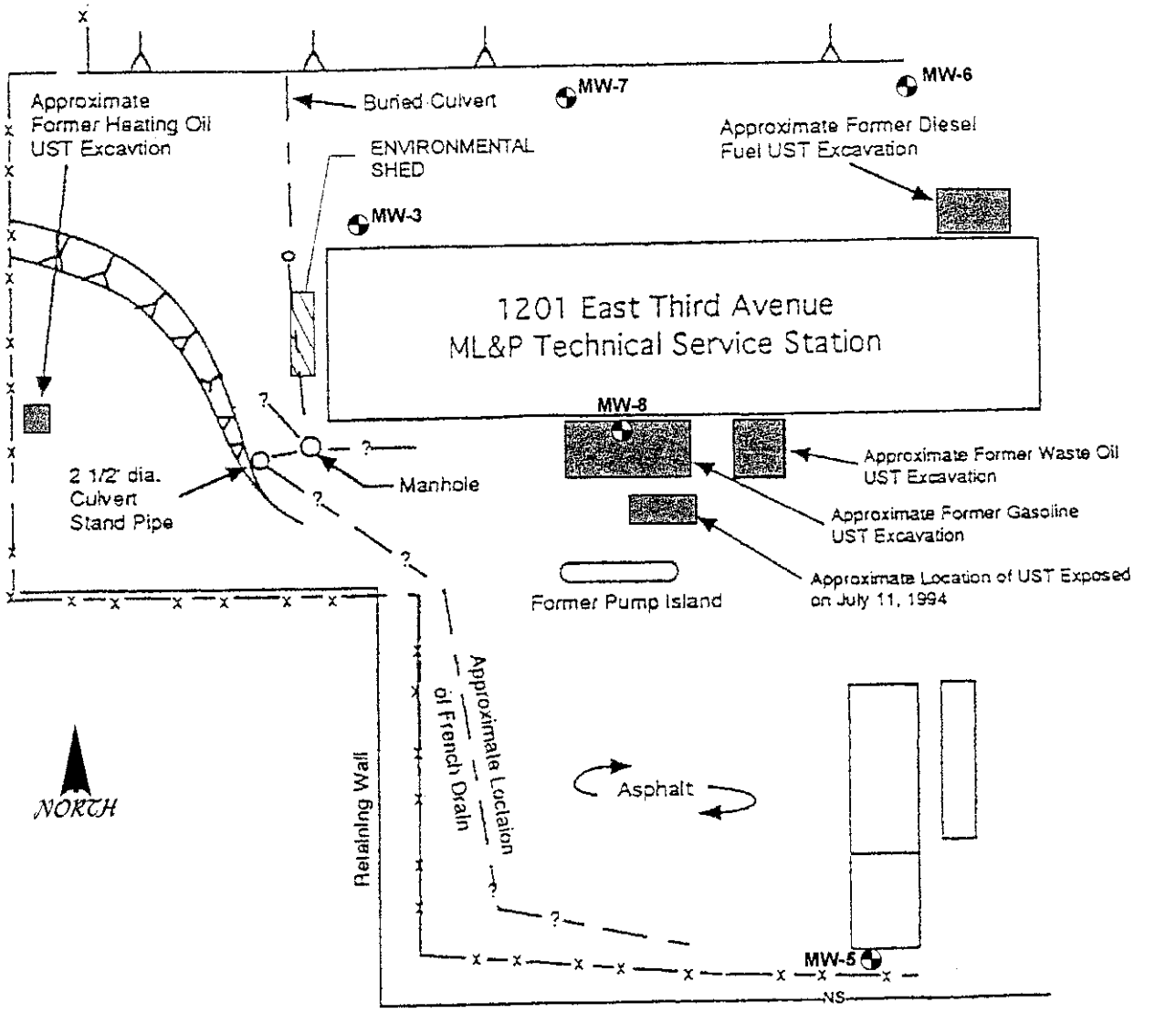
Figure 1

VICINITY MAP

MOA / VAPOR EXTRACTION // AK

JOB NUMBER: 953-5254x013 FILE NAME: VICINMAP.CD7 DATE: 3/97 DRAWN: SJM

Golder Associates



0 60 120 FEET

APPROXIMATE SCALE

LEGEND:

MW-1 NUMBER AND LOCATION OF MONITORING WELL

REFERENCE: SITE PLAN DERIVED FROM HARDING LAWSON ASSOCIATES, MAY 1993 AND SHANNON & WILSON, INC., DECEMBER 1994.

Figure 2

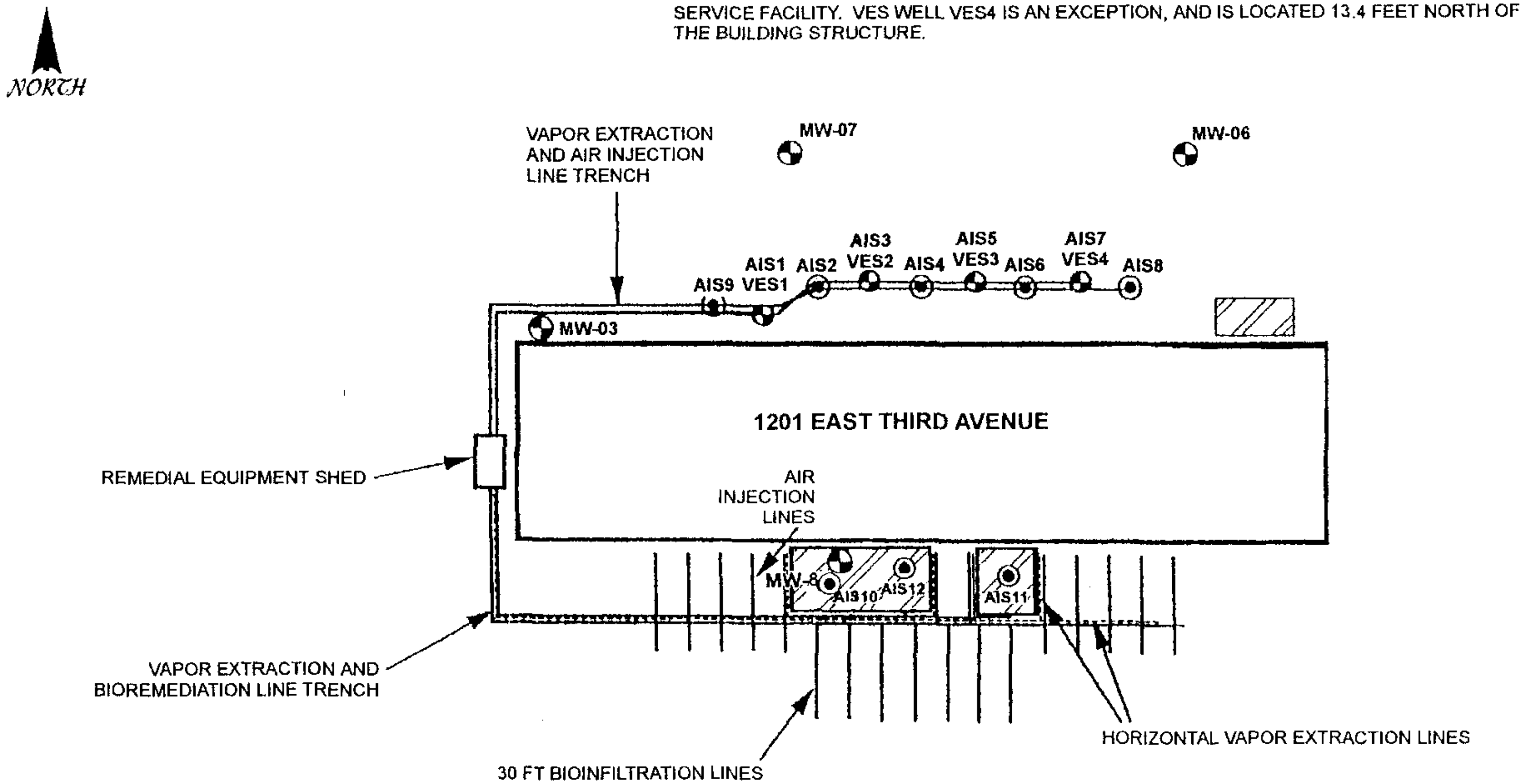
SITE PLAN

MOA / VAPOR EXTRACTION / AK

JOB NUMBER: 953-5254x013 FILE NAME: SITEPLAN2.CDT DATE: 3/97 DRAWN: SJM REV. 12/97

Golder Associates

NOTE: AIS WELLS AIS2 THROUGH AIS8 AND VES WELLS VES2 THROUGH VES4 ARE LOCATED WITHINE 1.5 FEET OF AN EAST-WEST AXIS LOCATED 17.0 FEET NORTH OF THE TECHNICAL SERVICE FACILITY. VES WELL VES4 IS AN EXCEPTION, AND IS LOCATED 13.4 FEET NORTH OF THE BUILDING STRUCTURE.



LEGEND:

AIS1 VES1 — CO-LOCATED VAPOR EXTRACTION WELL VESI & AIR INJECTION WELL AISI

AIS9 — AIR INJECTION WELL AIS9

FORMER LOCATION OF GASOLINE, WASTE OIL AND DIESEL UST EXCAVATIONS

MW-03 — GROUNDWATER MONITORING WELL

0 50 100 FEET
APPROXIMATE SCALE

REFERENCE:
FIGURE DERIVED FROM
SHANNON & WILSON, 1994.

Figure 3

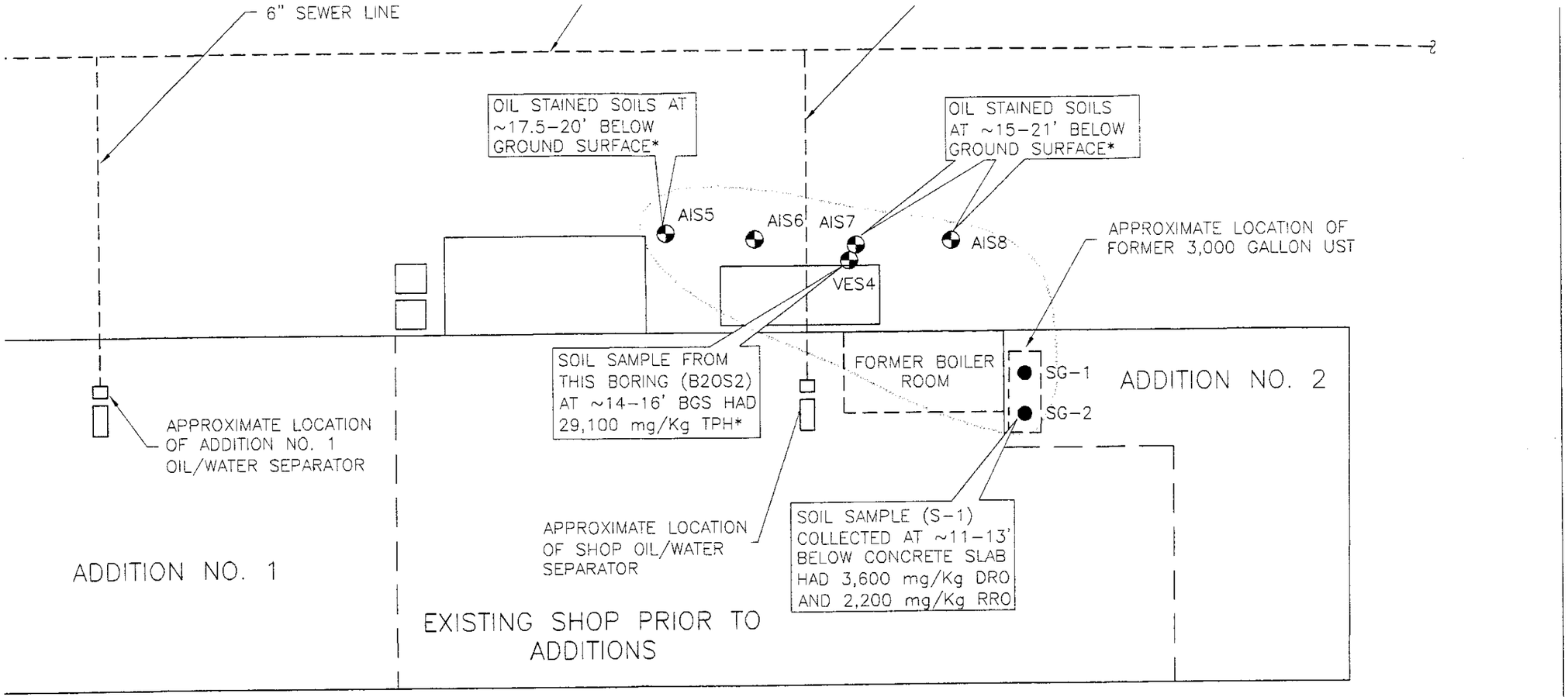
VAPOR EXTRACTION / AIR INJECTION SYSTEM - LINE DETAIL

MOA / VAPOR EXTRACTION / AK

JOB NUMBER: 973-5254x013 FILE NAME: DETAIL..CRD DATE: 3/97 DRAWN: SJM REV. 12/97

Golder Associates

0000616



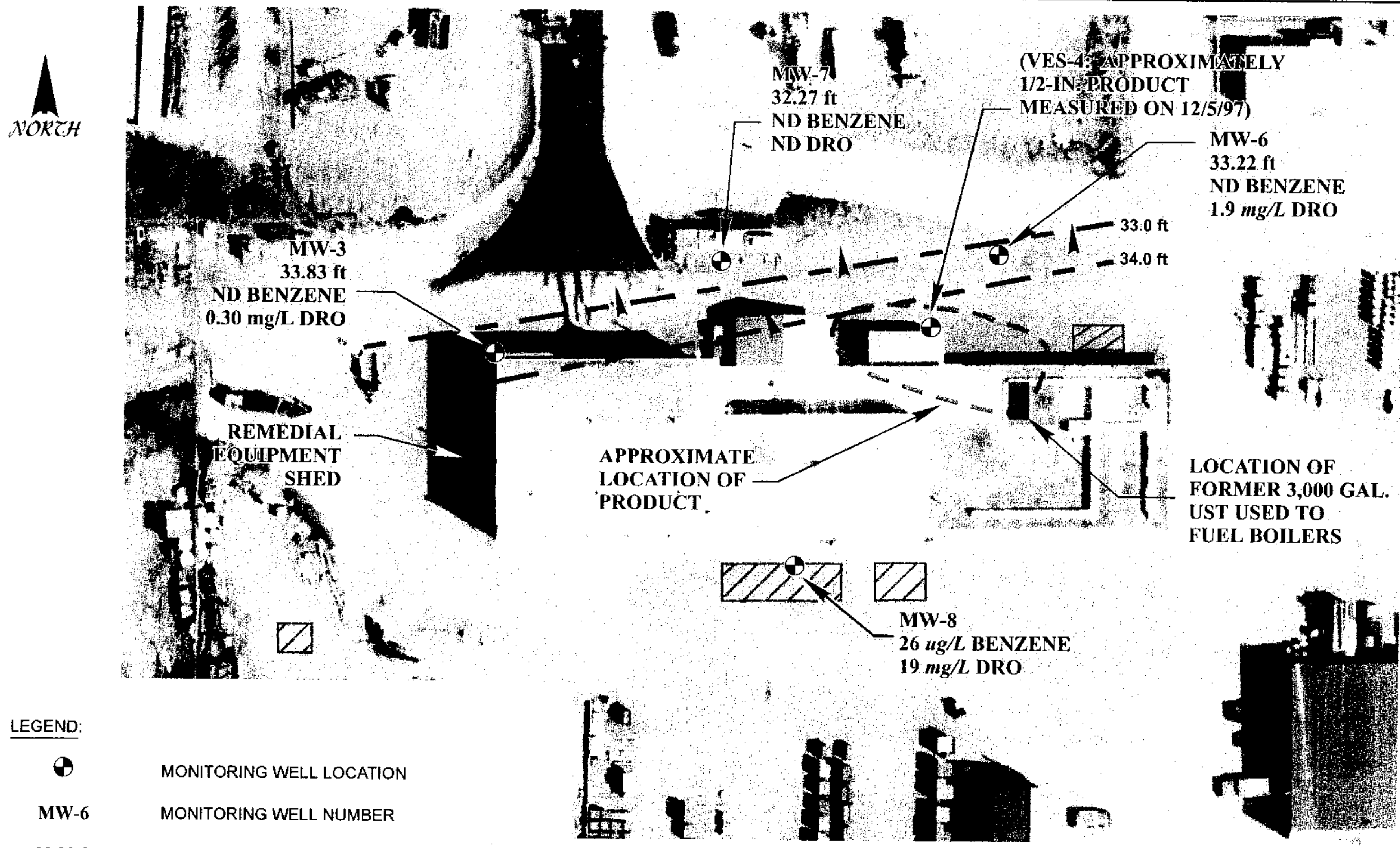
PPROXIMATELY 15 FT BELOW GROUND SURFACE DURING INSTALLATION
S8.
TELY 1.5 FT HIGHER IN ELEVATION THAN PARKING AREA NEAR VES–4.

UARY 25, 1995, "UNKNOWN PRODUCT CHARACTERIZATION AND SOURCE
, 1201 EAST THIRD AVENUE, ANCHORAGE, ALASKA".

LEGEND

AIS5	AIR INJECTION WELL NUMBER AND LOCATION
SG–1	SOIL GAS PROBE EXPLORATION HOLE
.....	ESTIMATED EXTENT OF OIL SATURATED SOILS
~	APPROXIMATE
mg/Kg	MILLIGRAMS PER KILOGRAM

0 20 40
SCALE, FEET



LEGEND:

(symbol)	MONITORING WELL LOCATION
MW-6	MONITORING WELL NUMBER
33.32 ft	WATER LEVEL ELEVATION (FEET)
ND BENZENE	BBENZENE GROUNDWATER CONCENTRATION
0.3 *mg/L* DRO	DRO GROUNDWATER CONCENTRATION
(hatched box)	FORMER UST EXCAVATION AREA (APPROXIMATE)
– — -33.0 ft	GROUNDWATER SURFACE CONTOUR
(arrow)	INFERRED DIRECTION OF GROUNDWATER FLOW

NOTE: PIEZOMETRIC SURFACE AND HYDROCARBON CONCENTRATIONS FOR SEPTEMBER 18, 1997.

REFERENCE: PHOTO TAKEN MAY 30, 1996 BY AEROMAP U.S. INC.

Figure 5

PIEZOMETRIC SURFACE AND HYDROCARBON CONCENTRATION MAP

MOA / VAPOR EXTRACTION / AK

JOB NUMBER: 973-5254x013 FILE NAME: CONCENTS.CRD DATE: 3/97 DRAWN: SJM

Golder Associates

0000619

Golder Associates

WATER SAMPLE FIELD DATA SHEET

SITE: ML&P - 1201 E 3rd Ave.

Project Number:	973-5254x053	Sample ID:	MW-3
Client:	ML&P	Date:	9-18-97
Location:	1201 E 3rd Ave.	Sample Point Designation:	MW-3
Sampler:	Craig Boeckman		

Groundwater	x	Casing Diameter:	2 inch	x	Casing Elevation (ft/datum):	50.59
Surface Water			3 inch		Depth to Water (ft/TOC):	16.76
Other (NR)			4 inch		Depth of Well (ft/TOC):	20
			6 inch		Calculated Purge Volume (gal.):	1.6
			Other		Actual Purge Volume (gal):	2

Field Measurements

Time	Volume	pH	Cond. (µS)	Temp. (°F)	DO (mg/L)	Color	Other
1235	.5	7.1	680	48	1.0	Brown	Silty
1240	1	6.9	630	51	--	"	"
1245	2	6.9	630	51	--	"	"

Odor: NA

Purge Method

Sub. Pump		Bailer (Teflon)		Dedicated	
Peristaltic Pump		Bailer (Disposable)	x	Other	
		Disposable Pump		Items Used:	
		Well Wizard			

Sample Method

Sub. Pump		Bailer (Teflon)		Other	
Peristaltic Pump		Bailer (Disposable)	x	Items Used:	
		Disposable Pump			

Well Integrity: Good

Remarks:

Signature: Craig Boeck

0000620

000161

Golder Associates

WATER SAMPLE FIELD DATA SHEET

SITE: ML&P - 1201 E 3rd Ave.

Project Number:	973-5254x053	Sample ID:	MW-6
Client:	ML&P	Date:	9-18-97
Location:	1201 E 3rd Ave.	Sample Point Designation:	MW-6
Sampler:	Craig Boeckman		

Groundwater	x	Casing Diameter:	2 inch	x	Casing Elevation (ft/datum):	51.48
Surface Water			3 inch		Depth to Water (ft/TOC):	18.26
Other (NR)			4 inch		Depth of Well (ft/TOC):	23.7
			6 inch		Calculated Purge Volume (gal.):	2.6
			Other		Actual Purge Volume (gal):	3

Field Measurements

Time	Volume	pH	Cond. (µS)	Temp. (°F)	DO (mg/L)	Color	Other
1350	1	7.4	420	52	0.95	Gry/Blk	Silty
1355	2	7.1	430	51	--	"	"
1400	3	7.1	440	51	--	"	"

Odor: Hydrocarbon-like odor

Purge Method

Sub. Pump		Bailer (Teflon)		Dedicated	
Peristaltic Pump		Bailer (Disposable)	x	Other	
		Disposable Pump		Items Used:	
		Well Wizard			

Sample Method

Sub. Pump		Bailer (Teflon)		Other	
Peristaltic Pump		Bailer (Disposable)	x	Items Used:	
		Disposable Pump			

Well Integrity: Good

Remarks: Hydrocarbon-like sheen. Duplicate sample MW-6D collected from this well.

Signature: Craig Boeck

000621

~~09142~~

Golder Associates

WATER SAMPLE FIELD DATA SHEET

SITE: ML&P - 1201 E 3rd Ave.

Project Number:	973-5254x053	Sample ID:	MW-7
Client:	ML&P	Date:	9-18-97
Location:	1201 E 3rd Ave.	Sample Point Designation:	MW-7
Sampler:	Craig Boeckman		

Groundwater	x	Casing Diameter:	2 inch	x	Casing Elevation (ft/datum):	49.205
Surface Water			3 inch		Depth to Water (ft/TOC):	16.94
Other (NR)			4 inch		Depth of Well (ft/TOC):	20.5
			6 inch		Calculated Purge Volume (gal.):	1.7
			Other		Actual Purge Volume (gal):	2

Field Measurements

Time	Volume	pH	Cond. (µS)	Temp. (°F)	DO (mg/L)	Color	Other
1315	.5	7.4	660	54	1.0	Red	Silty
1320	1	7.1	670	51	--	Brown	"
1325	2	7.1	690	50	--	"	"

Odor: NA

Purge Method

Sub. Pump		Bailer (Teflon)		Dedicated	
Peristaltic Pump		Bailer (Disposable)	x	Other	
		Disposable Pump		Items Used:	
		Well Wizard			

Sample Method

Sub. Pump		Bailer (Teflon)		Other	
Peristaltic Pump		Bailer (Disposable)	x	Items Used:	
		Disposable Pump			

Well Integrity: Good

Remarks:

Signature: Craig Boeck

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Golder Associates

WATER SAMPLE FIELD DATA SHEET

SITE: ML&P - 1201 E 3rd Ave.

Project Number:	973-5254x053	Sample ID:	MW-8
Client:	ML&P	Date:	9-18-97
Location:	1201 E 3rd Ave.	Sample Point Designation:	MW-8
Sampler:	Craig Boeckman		

Groundwater	x	Casing Diameter:	2 inch	x	Casing Elevation (ft/datum):	51.14
Surface Water			3 inch		Depth to Water (ft/TOC):	4.5
Other (NR)			4 inch		Depth of Well (ft/TOC):	7
			6 inch		Calculated Purge Volume (gal.):	1
			Other		Actual Purge Volume (gal):	1.5

Field Measurements

Time	Volume	pH	Cond. (µS)	Temp. (°F)	DO (mg/L)	Color	Other
1435	.5	7.7	660	59	1.0	Brown	Silty
1440	1	7.8	700	55	--	"	"
1445	1.5	7.8	820	55	--	"	"

Odor: NA

Purge Method

Sub. Pump		Bailer (Teflon)		Dedicated	
Peristaltic Pump		Bailer (Disposable)	x	Other	
		Disposable Pump		Items Used:	
		Well Wizard			

Sample Method

Sub. Pump		Bailer (Teflon)		Other	
Peristaltic Pump		Bailer (Disposable)	x	Items Used:	
		Disposable Pump			

Well Integrity: Good

Remarks:

Signature: Craig Boeck

Golder Associates Inc.

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Telephone (907) 344-6001
Fax (907) 344-6011

0000623 000114

Golder Associates

SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 5/5/97

Technician: JJC

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.12 - .2		
Horiz. Well 2	.01		
Horiz. Well 3	.04		
VES-1	.03		
VES-2	.02		
VES-3	.01		
VES-4	.23		
VES Exhaust Stack	.37		

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 34

Air Injection Manifold Pressure (PSI): 5

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	30		
AS-2	30		
AS-3	55		
AS-4	50		
AS-5	200		
AS-6	250		
AS-7	200		
AS-8	200		
AS-9	25		
AS-10	350		
AS-11	~~350~~ 25		
AS-12	200		

Comments: It is not legal to run Anemometer on VES side gases may be combustable.

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Golder Associates

SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 6/9/97

Technician: C.S.

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.19 - .24		
Horiz. Well 2	.015		
Horiz. Well 3	.05		
VES-1	-.02		
VES-2	.015		
VES-3	.02		
VES-4	.005 Add Fluid		
VES Exhaust Stack	35		

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 38"

Air Injection Manifold Pressure (PSI): 5

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	25	Same	
AS-2	25		
AS-3	50		
AS-4	50		
AS-5	250		
AS-6	300		
AS-7	200		
AS-8	200		
AS-9	25		
AS-10	400		
AS-11	25		
AS-12	200		

Comments: A-7% B-2 Calibrate sensors

0000525 ~~000146~~

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Golder Associates

SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 7/7/97

Technician: JTL

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	~~.06~~ .02		
Horiz. Well 2	~~.01~~ .01		
Horiz. Well 3	.055		
VES-1	~~.03~~ .09		
VES-2	.01		
VES-3	~~.01~~ ~~.05~~ .02		
VES-4	~~.01~~ 0		
VES Exhaust Stack	.35		

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 36"

Air Injection Manifold Pressure (PSI):

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1			
AS-2			
AS-3			
AS-4			
AS-5			
AS-6			
AS-7			
AS-8			
AS-9			
AS-10			
AS-11			
AS-12			

Comments: ZERO ALL MAN → BIG POWER DRAW FROM BLOWER MAY BE FROZEN UP
[illegible] ON → SHUT OFF INFORM Golder of problem.

ML&P repairs AS blower.
System off from 7-7-97 to 8-1-97.

0000626 ~~000117~~

Golder Associates Inc.

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Golder Associates

SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 8/11/97

Technician: JJC

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.001		
Horiz. Well 2	.01		
Horiz. Well 3	.045		
VES-1	.035		
VES-2	.001		
VES-3	.02		
VES-4	.07		
VES Exhaust Stack	.35		

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 35"

Air Injection Manifold Pressure (PSI): 1 psi ADJUST TO 4 psi

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	0		
AS-2	0		
AS-3	0		
AS-4	0		
AS-5	0		
AS-6	0		
AS-7	0		
AS-8	0		
AS-9	0		
AS-10	~~15~~ 0		
AS-11	0		
AS-12	~~25~~ 0		

Comments: Sys Down Tox A 13 Some One shut off Valves
B 2 No Reason to take
Any Readings Golder Needs to inform us of what is happening to this system!

System off from 7-7-97 to 8-1-97

Golder Associates Inc.

1750 Abbott Road, Suite 200
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Fax (907) 344-6011

0000627

Golder Associates

SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 8/18/97

Technician: ~~JJC~~

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.01		
Horiz. Well 2	.005		
Horiz. Well 3	.035		
VES-1	.035		
VES-2	.005		
VES-3	.02		
VES-4	.07		
VES Exhaust Stack	.35		

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 34

Air Injection Manifold Pressure (PSI): 5.0

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	~~340~~ 400		
AS-2	~~350~~ 400		
AS-3	350		
AS-4	400		
AS-5	400		
AS-6	400		
AS-7	400		
AS-8	350		
AS-9	400		
AS-10	250		
AS-11	400		
AS-12	400		

Comments: Checke wells that are below 400 to see if inject has increased underground

TBX A 11
B 1

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SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 9/2/97

Technician: JTL

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	-.01		
Horiz. Well 2	.14		
Horiz. Well 3	.16		
VES-1	.04		
VES-2	.013		
VES-3	.03		
VES-4	.07		
VES Exhaust Stack			

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 38"

Air Injection Manifold Pressure (PSI): 3.8

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	200		
AS-2	250		
AS-3	300		
AS-4	250		
AS-5	350		
AS-6	300		
AS-7	750		
AS-8	150		
AS-9	200		
AS-10	750		
AS-11	300		
AS-12	350		

Comments: Alarm Flash System → Shut Down Sys For 1 month

Tox A 6
B 2

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SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 9-30-97

Technician: Craig B.

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	Ø		
Horiz. Well 2	Ø		
Horiz. Well 3	0.15		
VES-1	0.035		
VES-2	0.005		
VES-3	0.02		
VES-4	0.04		
VES Exhaust Stack	0.32	2100	8.0

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 37

Air Injection Manifold Pressure (PSI): 4.5

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1			
AS-2 Dry			
AS-3			
AS-4			
AS-5 Dry			
AS-6 Dry			
AS-7 Dry			
AS-8			
AS-9			
AS-10 Dry			
AS-11 [illegible]			
AS-12 Dry			

Comments: AS-11. No air pressure @ well head. System shut down from 9-2-97 to 9-30-97 Pulsing system.

SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 10-5-97

Technician: CB

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	open		
Horiz. Well 2	↓		
Horiz. Well 3			
VES-1			
VES-2	↓		
VES-3			
VES-4	Keep open to enhance product recovery		
VES Exhaust Stack			

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water):

Air Injection Manifold Pressure (PSI): 4

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	200		
AS-2	50	Dry - No water	
AS-3	200		
AS-4	200		
AS-5	50	Dry - No water	
AS-6	↓	Dry - No water	
AS-7	↓	Dry - No water	
AS-8	200		
~~AS-9~~	~~Off~~		
AS-10	50	Dry - No water	
AS-11	No Air Pressure	Dry - No water	
~~AS-12~~	leave off	No air pressure @ well head. Blocked? AS-11	
~~Manifold~~			
AS-12	50	Dry - No water	

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00006-1

~~00122~~

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SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 10/6/97

Technician: BCX

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.015		
Horiz. Well 2	0		
Horiz. Well 3	.145		
VES-1	.035		
VES-2	.005		
VES-3	.015		
VES-4	.025		
VES Exhaust Stack	.33		

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 42"

Air Injection Manifold Pressure (PSI): 4

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	200		
AS-2	50		
AS-3	200		
AS-4	200		
AS-5	50		
AS-6	50		
AS-7	50		
AS-8	200		
AS-9	OFF		
AS-10	50		
AS-11	50		
AS-12	OFF		

Comments: SETTINGS AS PER CRAIG BOECKMAN OF GOLDER

TOX A 6

B 1

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000052 ~~000123~~

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SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 10-23-97

Technician: CB

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.025		1.2
Horiz. Well 2	0.001		1.5
Horiz. Well 3	.15		2.1
VES-1	.04		4.1
VES-2	.005		4.5
VES-3	.12		4.0
VES-4	.03		9.0
VES Exhaust Stack	.31	2200	6.1

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

Knock-out Drum Pressure (inches of water): 42"

Air Injection Manifold Pressure (PSI): NA

Well Designation	Anemometer Reading (FPM)	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	NA		
AS-2			
AS-3			
AS-4			
AS-5			
AS-6			
AS-7			
AS-8			
AS-9			
AS-10			
AS-11			
AS-12			

Comments: Air sample collected SVE-102397

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000063 - 00121

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SVE MAINTENANCE DATA
ML&P FACILITY, SITE NO.3

Date: 11/5/97

Technician: JTC

11-7-97 CB

Well Designation	Manometer Reading (Inches-Water)	Air Flow Velocity (FPM)	PID Readings (ppm)
Horiz. Well 1	.06		0.0
Horiz. Well 2	0		1.6
Horiz. Well 3	.16		0.9
VES-1	.04		0.1
VES-2	.05		0.1
VES-3	.03		0.5
VES-4	.02		1.4
VES Exhaust Stack	.31	2200	1.2 *

* - Air Flow Velocity value is obtained from chart of manometer reading vs fpm flow velocity

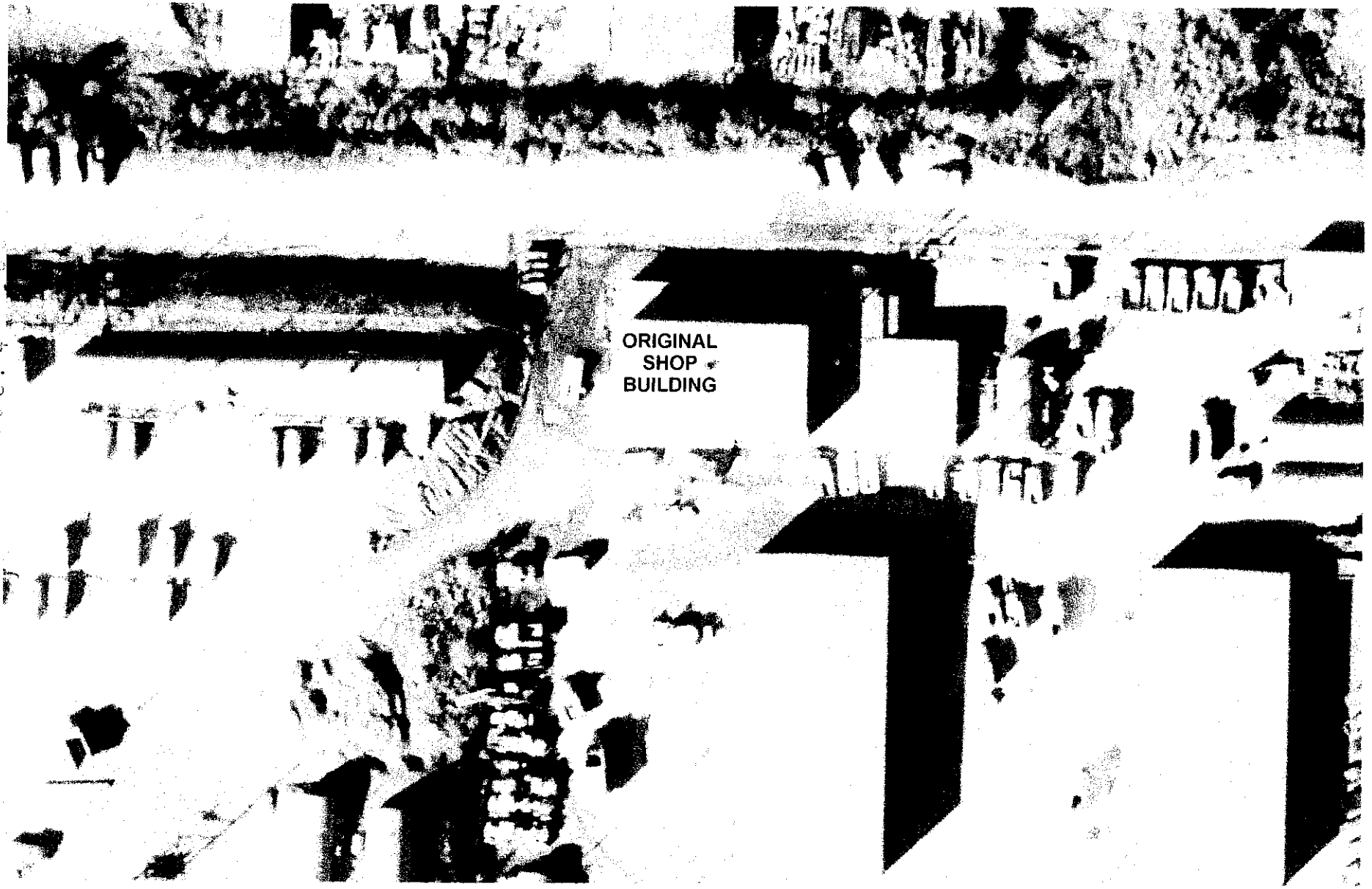
Knock-out Drum Pressure (inches of water): 4/3

Air Injection Manifold Pressure (PSI): 3.5 → 4

Well Designation	Anemometer Reading (FPM) Was	Adjusted	Air Pressure (PSI)	Air Flow Velocity (CFM)
AS-1	200	—		
AS-2	50	—		
AS-3	200	—		
AS-4	195	200		
AS-5	50	—		
AS-6	50	—		
AS-7	70			
AS-8	300	200		
AS-9	off			
AS-10	50	—		
AS-11	40	50		
AS-12	REDUCED			

Comments: ~~To:~~ A 6
B 2

CB * Sample SVE 110797 collected on 11-07-97



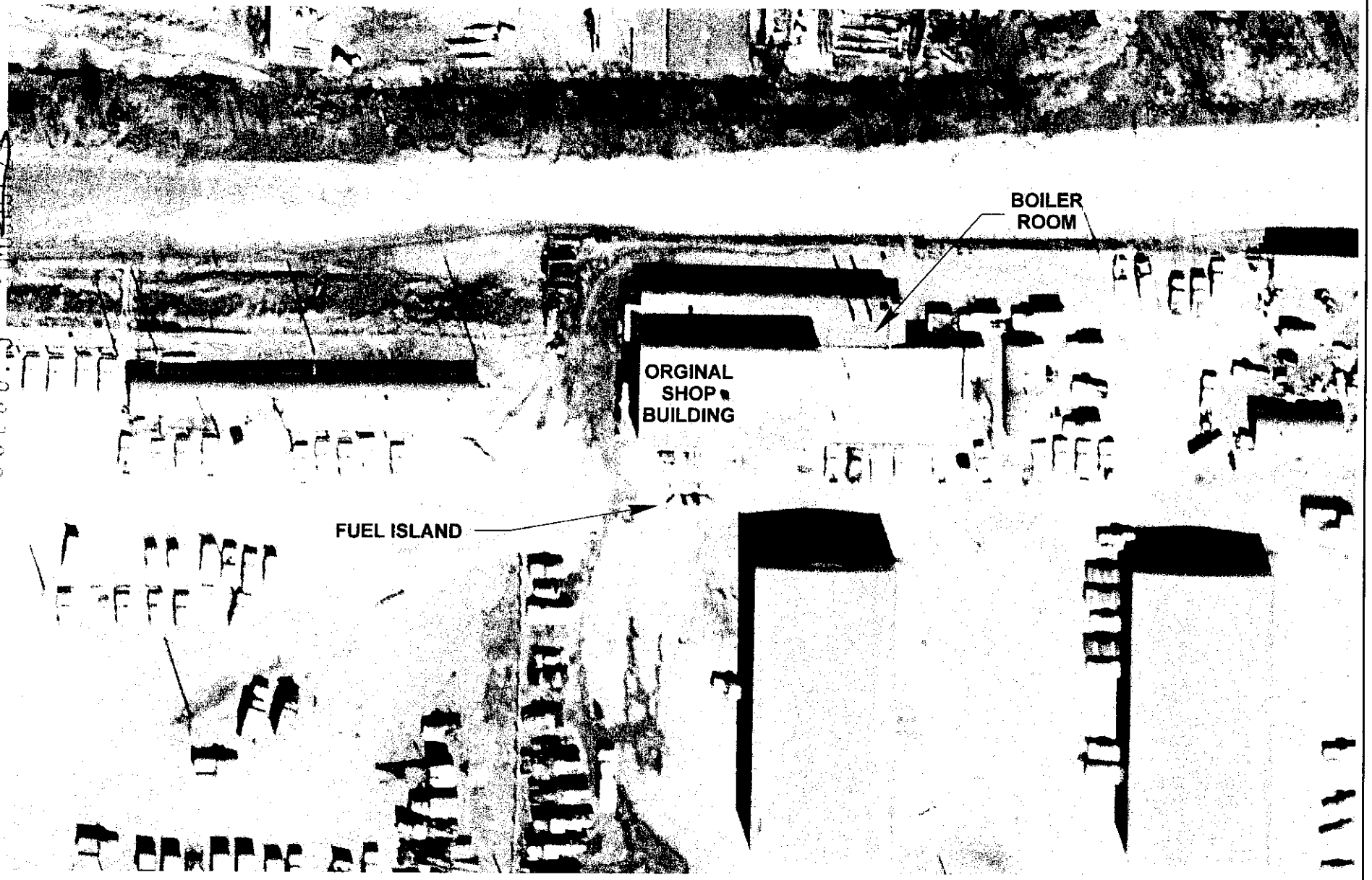
0 50 100 FT
APPROXIMATE SCALE

REFERENCE: PHOTO TAKEN IN MAY 1959 BY AEROMAP U.S. INC.

Figure C-1
HISTORICAL PHOTOGRAPHIC REVIEW - MAY 1959
MOA / 1201 E. 3rd AVE. / / AK

JOB NUMBER: 973-5254x053.04 FILE NAME: 1959.CD7 DATE: 9/97 DRAWN: SJM

Golder Associates



0 50 100 FT
APPROXIMATE SCALE

REFERENCE: PHOTO TAKEN MAY 16, 1963 BY AEROMAP U.S. INC.

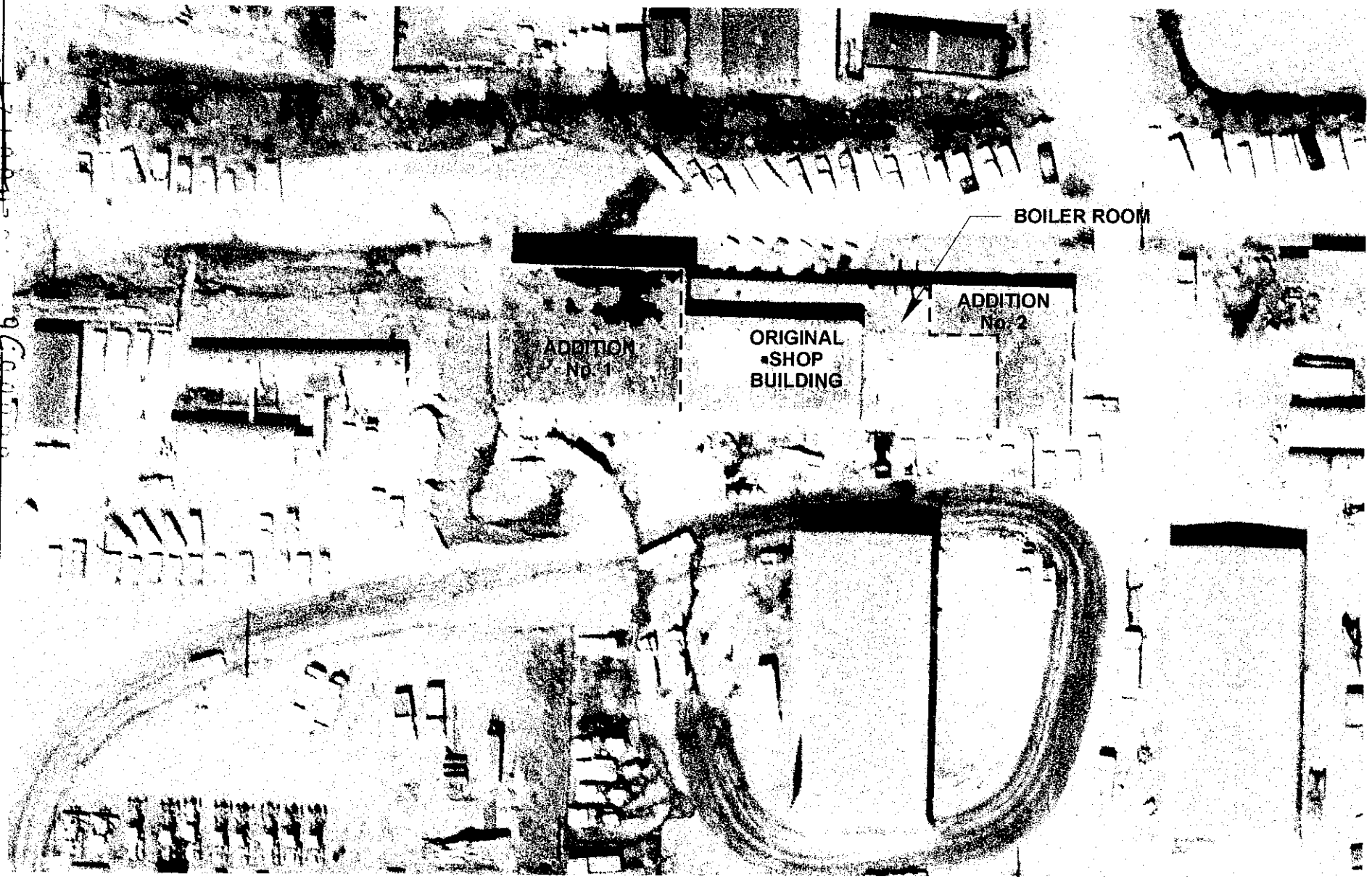
Figure C-2

HISTORICAL PHOTOGRAPHIC REVIEW - MAY 19, 1963

MOA / 1201 E. 3rd AVE. / AK

JOB NUMBER: 973-5254x053.04 FILE NAME: 1963.CD7 DATE: 9/97 DRAWN: SJM

Golder Associates



0 50 100 FT
APPROXIMATE SCALE

REFERENCE: PHOTO TAKEN JUNE 1, 1964 BY AEROMAP U.S. INC.

Figure C-3

HISTORICAL PHOTOGRAPHIC REVIEW - JUNE 1, 1964

MOA / 1201 E. 3rd AVE. / / AK

JOB NUMBER: 973-5254x053.04 FILE NAME: 1964.CD7 DATE: 9/97 DRAWN: SJM

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0 50 100 FT

APPROXIMATE SCALE

REFERENCE: PHOTO TAKEN IN SEPTEMBER 27, 1982 BY AEROMAP U.S. INC.

Figure C-4

HISTORICAL PHOTOGRAPHIC REVIEW - SEPTEMBER 27, 1982

MOA / 1201 E. 3rd AVE. / / AK

JOB NUMBER: 973-5254x053.04 FILE NAME: 1982.CD7 DATE: 9/97 DRAWN: SJM

Golder Associates

ANALYTICA
ALASKA INC

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0000437

GOLDER ASSOCIATES, INC.
1750 ABBOTT ROAD, #200
ANCHORAGE, AK 99507-3443
(907)344-6001/FAX 6011
Attn: MR. CRAIG BOECKMAN

Order #: A7-09-076
Date Reported: 10/15/97 09:43
Project Name: ML&P SITE NO.3
Date Received: 09/19/97

SAMPLE IDENTIFICATION

Sample Number	Client Description
01	MW 3
02	MW 6
03	MW 7
04	MW 8
05	MW 06
06	TRIP BLANK

Enclosed are the analytical results for the submitted samples. All analyses met quality assurance objectives, except where noted in the case narratives. If you have any questions regarding the analyses, please feel free to call.

Bradley C. Olson
Vice President - Operations

Printed on Recycled Paper

Analytica Alaska, Inc.

811 W. 8th Ave. Anchorage, AK 99501 Phone-(907)258-2155 FAX-(907)258-6634

tabular sample report - fuels

AAI Project ID: **A709076**

Client: **GOLDER ASSOCIATES, INC.**

15-Oct-97

Project Name: **ML&P SITE NO.3**

Sample ID	Client Sample ID	Matrix	Benzene	Toluene	Ethylbenzene	Xylenes, Total	GRO	Units	DRO	RRO	Units
A709076-01	MW 3	WATER	U (1.0)	5.7 (1.0)	U (1.0)	U (1.0)	()	µg/L	0.30 (0.25)	()	µg/mL
A709076-02	MW 6	WATER	U (1.0)	1.5 (1.0)	U (1.0)	U (1.0)	()	µg/L	1.9 (0.26)	()	µg/mL
A709076-03	MW 7	WATER	U (1.0)	1.7 (1.0)	U (1.0)	U (1.0)	()	µg/L	U (0.25)	()	µg/mL
A709076-04	MW 8	WATER	26 (1.0)	33 (1.0)	3.6 (1.0)	41 (1.0)	()	µg/L	19 (0.27)	()	µg/mL
A709076-05	MW 06	WATER	U (1.0)	U (1.0)	U (1.0)	U (1.0)	()	µg/L	2.1 (0.26)	()	µg/mL
A709076-06	TRIP BLANK	WATER	U (1.0)	U (1.0)	U (1.0)	U (1.0)	()	µg/L	()	()	µg/mL

000638

The number in parentheses is the reporting limit. "U" indicates analyte was not detected. "()" indicates analyte was not analyzed for. "J" indicates value is estimated.

The Science of Analysis, The Art of Service

ADEC Laboratory Approval Number: UST-014

The samples were received properly packed in one cooler at 5.1°C and were refrigerated upon receipt.

Data Flag Definitions:

U - Indicates this analytes was searched for and not detected at the reporting limits listed.

D - Indicates the surrogate was diluted out of the sample due to high levels of organics native to the samples.

M - Indicates matrix effects are responsible for surrogate recoveries which are out of limits.

NC - Indicates analyte was detected in original analysis but not confirmed in secondary analysis.

DR - Indicates result is from secondary analysis at dilution.

S - Indicates corrective action did not accomplish desired results or corrective action not performed for cause. See QC Evaluation Summary for details.

B - Indicates analyte was found in Method Blank. See QC Evaluation Summary for details.

< - Indicates sample not preserved according to AK101 requirements. True value is greater than or equal to the reported value.

Analyst: _____ Date: 10/16/97

Analyst: _____ Date: 10/16/97

Client ID: MW 3 — Lab ID: 01A
Test Description: BTEX in water by EPA 8020. — Method: 5030/8020
Collected: 09/18/97 — Matrix: WATER

ANALYSIS DATE: 09/25/97 — FILE ID: J:\D1\A7090
ANALYST: SG — UNITS: µg/L
INSTRUMENT ID: NAT — DILUTION: 1

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Benzene	71-43-2	U	1.0	
Toluene	108-88-3	5.7	1.0	
Ethylbenzene	100-41-4	U	1.0	
Xylenes, Total	1330-20-7	U	1.0	

SURROGATE	%RECOVERY	LIMITS
1,4-Difluorobenzene	94 %	60 - 120
p-Bromofluorobenzene	108 %	80 - 125

Client ID: MW 3 — Lab ID: 01B
Test Description: DRO in water by AK102. — Method: 3510\AK102
Collected: 09/18/97 — Matrix: WATER

EXTRACTION DATE: 09/19/97 — FILE ID: B7100718.D
ANALYSIS DATE: 10/07/97 — UNITS: µg/ml
ANALYST: PWS — DILUTION: 1
INSTRUMENT ID: BERTHA

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Diesel Range Organics	DRO	0.30	0.25	

SURROGATE	%RECOVERY	LIMITS
o-Terphenyl	92 %	60 - 120

Client ID: MW 6 Lab ID: 02A
Test Description: BTEX in water by EPA 8020. Method: 5030/8020
Collected: 09/18/97 Matrix: WATER

ANALYSIS DATE: 09/25/97 FILE ID: J:\D1\A7090
ANALYST: SG UNITS: µg/L
INSTRUMENT ID: NAT DILUTION: 1

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Benzene	71-43-2	U	1.0	
Toluene	108-88-3	1.5	1.0	
Ethylbenzene	100-41-4	U	1.0	
Xylenes, Total	1330-20-7	U	1.0	

SURROGATE	%RECOVERY	LIMITS
1,4-Difluorobenzene	107 %	60 - 120
p-Bromofluorobenzene	113 %	80 - 125

Client ID: MW 6 Lab ID: 02B
Test Description: DRO in water by AK102. Method: 3510\AK102
Collected: 09/18/97 Matrix: WATER

EXTRACTION DATE: 09/19/97 FILE ID: B7100720.D
ANALYSIS DATE: 10/07/97 UNITS: µg/ml
ANALYST: PWS DILUTION: 1
INSTRUMENT ID: BERTHA

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Diesel Range Organics	DRO	1.9	0.26	

SURROGATE	%RECOVERY	LIMITS
o-Terphenyl	96 %	60 - 120

Client ID: MW 7 Lab ID: 03A
Test Description: BTEX in water by EPA 8020. Method: 5030/8020
Collected: 09/18/97 Matrix: WATER

ANALYSIS DATE: 09/25/97 FILE ID: J:\D1\A7090
ANALYST: SG UNITS: µg/L
INSTRUMENT ID: NAT DILUTION: 1

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Benzene	71-43-2	U	1.0	
Toluene	108-88-3	1.7	1.0	
Ethylbenzene	100-41-4	U	1.0	
Xylenes, Total	1330-20-7	U	1.0	

SURROGATE	%RECOVERY	LIMITS
1,4-Difluorobenzene	96 %	60 - 120
p-Bromofluorobenzene	108 %	80 - 125

Client ID: MW 7 Lab ID: 03B
Test Description: DRO in water by AK102. Method: 3510\AK102
Collected: 09/18/97 Matrix: WATER

EXTRACTION DATE: 09/19/97 FILE ID: B7100722.D
ANALYSIS DATE: 10/07/97 UNITS: µg/ml
ANALYST: PWS DILUTION: 1
INSTRUMENT ID: BERTHA

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Diesel Range Organics	DRO	U	0.25	

SURROGATE	%RECOVERY	LIMITS
o-Terphenyl	120 %	60 - 120

Client ID: MW 8 Lab ID: 04A
Test Description: BTEX in water by EPA 8020. Method: 5030/8020
Collected: 09/18/97 Matrix: WATER

ANALYSIS DATE: 09/25/97 FILE ID: J:\D1\A7090
ANALYST: SG UNITS: µg/L
INSTRUMENT ID: NAT DILUTION: 1

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Benzene	71-43-2	26	1.0	
Toluene	108-88-3	33	1.0	
Ethylbenzene	100-41-4	3.6	1.0	
Xylenes, Total	1330-20-7	41	1.0	

SURROGATE	%RECOVERY	LIMITS
1,4-Difluorobenzene	98 %	60 - 120
p-Bromofluorobenzene	110 %	80 - 125

Client ID: MW 8 Lab ID: 04B
Test Description: DRO in water by AK102. Method: 3510\AK102
Collected: 09/18/97 Matrix: WATER

EXTRACTION DATE: 09/19/97 FILE ID: B7100724.D
ANALYSIS DATE: 10/07/97 UNITS: µg/ml
ANALYST: PWS DILUTION: 1
INSTRUMENT ID: BERTHA

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Diesel Range Organics	DRO	19	0.27	

SURROGATE	%RECOVERY	LIMITS
o-Terphenyl	114 %	60 - 120

Order # A7-09-076 GOLDER ASSOCIATES, INC.
Analytica Ak. TEST RESULTS by SAMPLE

Client ID: MW 06 Lab ID: 05A
Test Description: BTEX in water by EPA 8020. Method: 5030/8020
Collected: 09/18/97 Matrix: WATER

ANALYSIS DATE: 09/25/97 FILE ID: J:\D1\A7090
ANALYST: SG UNITS: µg/L
INSTRUMENT ID: NAT DILUTION: 1

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Benzene	71-43-2	U	1.0	
Toluene	108-88-3	U	1.0	
Ethylbenzene	100-41-4	U	1.0	
Xylenes, Total	1330-20-7	U	1.0	

SURROGATE	%RECOVERY	LIMITS
1,4-Difluorobenzene	95 %	60 - 120
p-Bromofluorobenzene	112 %	80 - 125

Client ID: MW 06 Lab ID: 05B
Test Description: DRO in water by AK102. Method: 3510\AK102
Collected: 09/18/97 Matrix: WATER

EXTRACTION DATE: 09/19/97 FILE ID: B7100726.D
ANALYSIS DATE: 10/07/97 UNITS: µg/ml
ANALYST: PWS DILUTION: 1
INSTRUMENT ID: BERTHA

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Diesel Range Organics	DRO	2.1	0.26	

SURROGATE	%RECOVERY	LIMITS
o-Terphenyl	109 %	60 - 120

Client ID: TRIP BLANK Lab ID: 06A
Test Description: BTEX in water by EPA 8020. Method: 5030/8020
Collected: 09/18/97 Matrix: WATER

ANALYSIS DATE: 09/25/97 FILE ID: J:\D1\A7090
ANALYST: SG UNITS: µg/L
INSTRUMENT ID: NAT DILUTION: 1

PARAMETER	CAS # or ID	RESULT	LIMIT	Q
Benzene	71-43-2	U	1.0	
Toluene	108-88-3	U	1.0	
Ethylbenzene	100-41-4	U	1.0	
Xylenes, Total	1330-20-7	U	1.0	

SURROGATE	%RECOVERY	LIMITS
1,4-Difluorobenzene	96 %	60 - 120
p-Bromofluorobenzene	111 %	80 - 125

Method 8020 from Test Methods for Evaluating Solid Waste, USEPA SW-846, third edition, September 1986, is used for the analysis of volatile organics; benzene, toluene, ethylbenzene, xylenes (BTEX) in an aqueous matrix.

Method AK102 from the State of Alaska Department of Environmental Conservation (ADEC), Storage Tank Program, Underground Storage Tanks Procedures Manual, 18 AAC 78, as amended through January 31, 1996; is referenced for the analysis of diesel range organics (DRO).

The quantitation range extends from the beginning of C10 to the beginning of C25. The standard used is a 1:1:1 mixture of Kerosine, DF1, and DF2.

Waters are prepared via liquid/liquid extraction per AK102.

0000645

Analytica
Alaska, Inc.

QA
Summary

Analytica Alaska, Inc. QC Evaluation Summary - Fuels

Client..... GOLDER ASSOCIATES, INC.
Method..... SW-8020M - AK 102
Criteria..... ADEC
AAI Project Id..... A709076
Client Project Id..... ML&P SITE NO.3
Matrix..... Water
Number of Samples..... 6

QC Parameter	Method Criteria Acceptance (%)	Comments/Actions
Holding Times	100 %	
Initial Calibration	100 %	
Continuing Calibration	100 %	
Method Blanks	100 %	
QC Spike Samples	100 %	
MS/MSD	50 %	Observation: Samples not available for AK102 matrix spikes. Action: Use QC spikes for precision and accuracy. Data Impact: None should be observed.
Calculations	100 %	
Surrogate Recoveries	100 %	
Retention Times	100 %	
Completeness	100 %	Completeness is the percentage of useable results.

Comments/ Identifications	BTEX: None
	DRO: None

QA/QC:

Data meets guidelines established within the SOP for the Analytica Alaska, Inc. Data Reporting Level 3.

Approved: Phyllis A. Walters

Analytica Alaska, Inc.

811 W. 8th Ave. Anchorage, AK 99501 Phone-(907)258-2155 FAX-(907)258-6634

tabular surrogate report

AAI Project ID: **A709076**

Client: **GOLDER ASSOCIATES, INC.**

15-Oct-97

Project Name: **ML&P SITE NO.3**

Sample No	Client Sample ID	Matrix	1,4-DFB	Limits	TFT	Limits	p-BFB	Limits	p-BFB(GRO)	Limits	Terphenyl	Limits	Squalane	Limits
A709076-01	MW 3	WATER	**94**	60 - 120	--	60 - 120	**108**	60 - 120	--	60 - 120	**92**	60 - 120	--	60 - 120
A709076-02	MW 6	WATER	**107**	60 - 120	--	60 - 120	**113**	60 - 120	--	60 - 120	**96**	60 - 120	--	60 - 120
A709076-03	MW 7	WATER	**96**	60 - 120	--	60 - 120	**108**	60 - 120	--	60 - 120	**120***	60 - 120	--	60 - 120
A709076-04	MW 8	WATER	**98**	60 - 120	--	60 - 120	**110**	60 - 120	--	60 - 120	**114**	60 - 120	--	60 - 120
A709076-05	MW 06	WATER	**95**	60 - 120	--	60 - 120	**112**	60 - 120	--	60 - 120	**109**	60 - 120	--	60 - 120
A709076-06	TRIP BLANK	WATER	**96**	60 - 120	--	60 - 120	**111**	60 - 120	--	60 - 120	--	60 - 120	--	60 - 120

L49000

"--" Indicates analysis was not performed for this analyte. "*" Incidates surrogate out of limits, see QC Summary report.

Abbreviations: 1,4-DFB = 1,4-Difluorobenzene; TFT = a,a,a-Trifluorotoluene; p-BFB = p-Bromofluorobenzene.

BLANK

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
2	MB 0919	AK102W	B P	W			1.0	1.0	1000	1.0		PWS

Analytes	Result	Detection Limit			Specs Low	Specs High		
DIESEL RANGE ORGANICS	U	0.25						Y
O-TERPHENYL	0.213	0.000	0.250	85.2	60	120		Y

SPIKE

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
3	LCS 0919	AK102W	K S	W	2		1.0	1.0	1000	1.0		PWS

Analytes	Result	Unspiked Result	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High		
DIESEL RANGE ORGANICS	2.27	U	0.25	2.50	90.8	60	120		N
O-TERPHENYL	0.238	0.213	0.000	0.250	95.2	60	120		N

SPIKE DUPLICATE

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
4	LCSD 0919	AK102W	K S D	W	2	3	1.0	1.0	1000	1.0		PWS

Analytes	Result	Unspiked Result	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	RPD Specs Low	RPD Specs High	Reference Recovery	Reference RPD	
DIESEL RANGE ORGANICS	2.65	U	0.25	2.50	106	60	120		20	90.8	15.4	N
O-TERPHENYL	0.294	0.213	0.000	0.250	118	60	120			95.2	21.4	N

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
1	CDCF 1007-0	AK102W	T I	W			1.0	1.0	1.0	1.0		PWS

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High		
DIESEL RANGE ORGANICS	528.30	500	50.00	500.00	106	75	125		N
O-TERPHENYL	59.817	50	0.050	50.000	120	75	125		N

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
10	CDCF 1007-2	AK102W	T I	W			1.0	1.0	1.0	1.0		PWS

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High		
DIESEL RANGE ORGANICS	481.70	500	50.00	500.00	96.3	75	125		N
O-TERPHENYL	59.560	50	0.050	50.000	119	75	125		N

BLANK

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
2	MB1	BTX_8W	B P	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Detection Limit			Specs Low	Specs High	
BENZENE	U	1.00					Y
TOLUENE	U	1.00					Y
ETHYLBENZENE	U	1.00					
XYLENES, TOTAL	U	1.00					
1,4-DIFLUOROBENZENE	46.90	0.01	50.00	93.8	60	120	
P-BROMOFLUOROBENZENE	110.88	0.01	100.00	111	80	125	

BLANK

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
18	MB 1 092697	BTX_8W	B P	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Detection Limit			Specs Low	Specs High	
Benzene	U	1.00					Y
Toluene	U	1.00					Y
Ethylbenzene	U	1.00					
Xylenes, Total	U	1.00					
1,4-Difluorobenzene	49.53	0.01	50.00	99.1	60	120	
p-Bromofluorobenzene	112.64	0.01	100.00	113	80	125	

SPIKE

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
13	K709075-01K	BTX_8W	K M	W	6		1.0	1.0	1.0	1.0		PAW

Analytes	Result	Unspiked Result	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
BENZENE	14.22	U	1.00	13.00	109	40	163	Y
TOLUENE	80.74	U	1.00	79.60	101	90	110	Y
ETHYLBENZENE	18.52	U	1.00	17.80	104	90	114	
XYLENES, TOTAL	98.58	U	1.00	93.40	106	88	110	
1,4-DIFLUOROBENZENE	49.26	49.10	0.01	50.00	98.5	50	150	
P-BROMOFLUOROBENZENE	107.37	109.43	0.01	100.00	107	80	125	

SPIKE DUPLICATE

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
14	K709075-01K	BTX_8W	K M D	W	6	13	1.0	1.0	1.0	1.0		PAW

Analytes	Result	Unspiked Result	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	RPD Specs Low	RPD Specs High	Reference Recovery	Reference RPD	
BENZENE	14.03	U	1.00	13.00	108	40	163		20	109	0.922	Y
TOLUENE	73.05	U	1.00	79.60	91.8	90	110		20	101	9.54	Y
ETHYLBENZENE	18.94	U	1.00	17.80	106	90	114		20	104	1.90	
XYLENES, TOTAL	91.91	U	1.00	93.40	98.4	88	110		20	106	7.44	
1,4-DIFLUOROBENZENE	43.72	49.10	0.01	50.00	87.4	50	150			98.5	11.9	
P-BROMOFLUOROBENZENE	96.96	109.43	0.01	100.00	97.0	80	125			107	9.80	

SPIKE

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
4	LCS1	BTX_8W	K S	W	2		1.0	1.0	1.0	1.0		PAW

Analytes	Result	Unspiked Result	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High					
BENZENE	14.79	U	1.00	13.00	114	90	116					Y
TOLUENE	74.03	U	1.00	79.60	93.0	90	110					Y
ETHYLBENZENE	18.64	U	1.00	17.80	105	90	115					
XYLENES, TOTAL	93.42	U	1.00	93.40	100	87	110					
1,4-DIFLUOROBENZENE	45.92	46.90	0.01	50.00	91.8	60	120					
P-BROMOFLUOROBENZENE	102.15	110.88	0.01	100.00	102	80	125					

SPIKE DUPLICATE

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
5	LCS2	BTX_8W	K S D	W	2	4	1.0	1.0	1.0	1.0		PAW

Analytes	Result	Unspiked Result	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	RPD Specs Low	RPD Specs High	Reference Recovery	Reference RPD	
BENZENE	15.24	U	1.00	13.00	117	90	116		20	114	2.60	Y
TOLUENE	78.04	U	1.00	79.60	98.0	90	110		20	93.0	5.24	Y
ETHYLBENZENE	18.75	U	1.00	17.80	105	90	115		20	105	0	
XYLENES, TOTAL	97.55	U	1.00	93.40	104	87	110		20	100	3.92	
1,4-DIFLUOROBENZENE	47.79	46.90	0.01	50.00	95.6	60	120			91.8	4.06	
P-BROMOFLUOROBENZENE	100.46	110.88	0.01	100.00	100	80	125			102	1.98	

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
15	CVB4	BTX_8W	T I	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
BENZENE	14.38	13.00	1.00	13.00	111	85	115	Y
TOLUENE	73.95	79.60	1.00	79.60	92.9	85	115	Y
ETHYLBENZENE	18.72	17.80	1.00	17.80	105	85	115	
XYLENES, TOTAL	94.37	93.40	1.00	93.40	101	85	115	
1,4-DIFLUOROBENZENE	43.78	50.00	0.01	50.00	87.6	60	120	
P-BROMOFLUOROBENZENE	95.72	100.00	0.01	100.00	95.7	80	125	

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
16	CVB1 092697	BTX_8W	T I	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
Benzene	14.66	13.00	1.00	13.00	113	85	115	Y
Toluene	81.17	79.60	1.00	79.60	102	85	115	Y
Ethylbenzene	19.12	17.80	1.00	17.80	107	85	115	
Xylenes, Total	100.69	93.40	1.00	93.40	108	85	115	
1,4-Difluorobenzene	47.33	50.00	0.01	50.00	94.7	60	120	
p-Bromofluorobenzene	110.11	100.00	0.01	100.00	110	80	125	

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
17	CVB2 092697	BTX_8W	T I	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
Benzene	14.67	13.00	1.00	13.00	113	85	115	Y
Toluene	73.68	79.60	1.00	79.60	92.6	85	115	Y
Ethylbenzene	17.31	17.80	1.00	17.80	97.2	85	115	
Xylenes, Total	89.04	93.40	1.00	93.40	95.3	85	115	
1,4-Difluorobenzene	45.43	50.00	0.01	50.00	90.9	60	120	
p-Bromofluorobenzene	97.55	100.00	0.01	100.00	97.6	80	125	

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
1	CVB1	BTX_8W	T I	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
BENZENE	14.26	13.00	1.00	13.00	110	85	115	Y
TOLUENE	83.55	79.60	1.00	79.60	105	85	115	Y
ETHYLBENZENE	18.46	17.80	1.00	17.80	104	85	115	
XYLENES, TOTAL	102.96	93.40	1.00	93.40	110	85	115	
1,4-DIFLUOROBENZENE	49.45	50.00	0.01	50.00	98.9	60	120	
P-BROMOFLUOROBENZENE	107.85	100.00	0.01	100.00	108	80	125	

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
3	CVB2	BTX_8W	T I	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
BENZENE	14.22	13.00	1.00	13.00	109	85	115	Y
TOLUENE	75.26	79.60	1.00	79.60	94.5	85	115	Y
ETHYLBENZENE	19.87	17.80	1.00	17.80	112	85	115	
XYLENES, TOTAL	96.33	93.40	1.00	93.40	103	85	115	
1,4-DIFLUOROBENZENE	45.55	50.00	0.01	50.00	91.1	60	120	
P-BROMOFLUOROBENZENE	102.30	100.00	0.01	100.00	102	80	125	

CONTROL

Seq.	Sample ID	Test Code	Class/ Sub/Dup	Matrix/ Sub	Ref Seq	Spk Seq	Dilution	Weight	Volume	Conv. Factor	Flag	Ver
11	CVB3	BTX_8W	T I	W			1.0	1.0	1.0	1.0		PAW

Analytes	Result	Theoretical Value	Detection Limit	Spike Value	Rec-overy	Specs Low	Specs High	
BENZENE	14.79	13.00	1.00	13.00	114	85	115	Y
TOLUENE	86.26	79.60	1.00	79.60	108	85	115	Y
ETHYLBENZENE	18.62	17.80	1.00	17.80	105	85	115	
XYLENES, TOTAL	105.41	93.40	1.00	93.40	113	85	115	
1,4-DIFLUOROBENZENE	51.17	50.00	0.01	50.00	102	60	120	
P-BROMOFLUOROBENZENE	111.85	100.00	0.01	100.00	112	80	125	

0000653

Analytica
Alaska, Inc.

Support Documentation

ANALYTICA ALASKA INC
811 W. 8th Ave.
Anchorage, AK 99501
(907) 258-2155
FAX: (907) 258-6634

325 Interlocken Parkway, Suite 200
Broomfield, Colorado 80021
(303) 469-8868
FAX: (303) 469-5254

LGN: A709076
CSN:

Chain of Custody Record / Analysis Request

Company Name	Project Name
Golder Assoc	ML&P Site NO.3
Company Address	Report To: Craig Boeckman
1750 A60th Rd. #200 Anch AK 99507	Sampler: "
Telephone 907-344-6001	P.O. Number: 973-5254x053
FAX 907-344-6011	

Sample ID	Date Collected	Time Collected	Matrix	# Containers/Preservation: 8 oz Glass	4 oz Glass	40 mL VOA-HCl	1 L Glass /	1 L Poly /	BTEX by 5030/8020 or 602 (specify)	GRPH by 5030/8015M	DRPH by 3550/8100M	TPH by 3540/418.1	GRO by AK101	DRO by AK102	RRO by AK103	Volatiles by EPA 8240 or 624	Semi-Volatiles by EPA 8270 or 625 PAH	PCB by EPA 8080 or 608	Metals (specify)							PH<2	Hold for Further Analysis	RUSH (see below)	LAB ID
MW-3	9-18-97	1245	W			2	1		X					X														1
MW-6		1410					3		X					X			X												2
MW-7		1330					1		X					X															3
MW-8		1445					1		X					X															4
MW-D6		1430					1		X					X															5
Trip blank		--					--		X																			6

COMMENTS ⊗ to AEL for analysis ⊗

DELIVERABLES
- [ ] ACOE
- [X] Standard - ADEC Format
- [ ] Level I
- [ ] EDF - Format: _____ specify
- [ ] other: _____ specify

TURNAROUND
- [ ] 2 Business Days
- [ ] 5 Business Days
- [X] 10-15 Business Days
- [ ] other: _____ #Business Days

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Craig Boeckman	Signature:	Signature:	Signature:
Printed Name: Craig Boeckman	Printed Name: P.W. Smith	Printed Name: Lorraine Andela	Printed Name:
Firm: Golder Assoc	Firm: AAI	Firm: Analytica, AK	Firm:
Date/Time: 9-18-97 / 1755	Date/Time: 5:30pm 9/18/97	Date/Time: 9/19/97 1015	Date/Time:

ANALYTICA USE ONLY:
Airbill / Freight #:
Condition of Sample Containers:
Temp Received: 5.1 °C
# of Coolers: 1 NS
Seals: 2

h590000

0000655

ANALYTICA ALASKA INC

811 W. 8th Avenue, Anchorage, AK 99501 • (907) 258-2155 • FAX (907) 258-6634

COOLER RECEIPT FORM

Project: MLP SITE #3 Company GOLDER

Cooler received on: 9/18/97 Opened on: 9/18/97 By: RWSmith & Thomaine 9/19

1. Were custody seals on the outside of the cooler? If yes, how many and where? 2	(YES)	NO
Were the signature and date correct?	(YES)	NO
2. Were the custody papers taped to the lid inside the cooler?	(YES)	NO
3. Were the custody papers properly filled out (ink, signed, etc.)?	(YES)	NO
4. Did you sign the custody papers in the appropriate place?	(YES)	NO
5. Did you attach the shipper's packing slip (if applicable) to this form?	NA	~~YES~~ ~~NO~~
6. What kind of packing material was used? BUBBLE WRAP		
7. Was sufficient ice used (if applicable)?	(YES)	NO
8. Were all bottles/jars sealed in separate plastic bags?	(YES)	NO
9. Did all bottles/jars arrive in good condition (unbroken)?	(YES)	NO
10. Were all bottle/jar labels complete (no., date, signed, analysis, pres. etc.)?	(YES)	NO
11. Did all bottle/jar labels and tags agree with the custody papers?	(YES)	NO
12. Were correct bottles/jars used for the tests indicated?	(YES)	NO
13. Were VOA vials checked for absence of air bubbles, and noted if so?	(YES)	N/A
14. Was sufficient amount of sample sent in each bottle/jar?	(YES)	NO

15. Temperature of cooler upon receipt: 5.1 ID # of Thermometer 250657

16. Is the temperature within 4 +/- 2 degrees Celsius? ~~YES~~ NO

EXPLAIN ANY DISCREPANCIES: All DRO's < 2 pH except MW-8. Added HCL to bring to < pH at lab by Andela 9/19/97

Printed on Recycled Paper

ANALYTICA
ENVIRONMENTAL
LABORATORIES
an Analytica Group company

325 Interlocken Parkway
Suite 200
Broomfield, CO 80021
(303) 469-8868
(800) 873-8707
FAX: (303) 469-5254

0000656

Golder Associates Inc.
1750 Abbott Road #200
Anchorage, AK 99507-3443

Attn: Craig Boeckman

Order #: 97-09-174
Date: 10/14/97 11:14
Work ID: ML&P SITE NO. 3
Date Received: 09/22/97
Date Completed: 10/13/97

SAMPLE IDENTIFICATION

Sample Number	Client Description	Sample Number	Client Description
01	MW-6		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. A listing of data qualifiers and analytical codes is located on the TEST METHODOLOGIES page at the end of the report.

If you have any questions regarding the analyses, please feel free to call.

Sincerely,

Wendell D. Fischer
Inorganic Manager

RECEIVED
OCT 22 1997
GOLDER ASSOCIATES

0000657

Sample: 01A MW-6 Collected: 09/18/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units		Analyzed
Semivolatile Organics	SW 8270A						
Naphthalene		3.1	J	10	ug/L		09/29/97
Acenaphthylene		ND		10	ug/L		09/29/97
Acenaphthene		ND		10	ug/L		09/29/97
Fluorene		ND		10	ug/L		09/29/97
Phenanthrene		ND		10	ug/L		09/29/97
Anthracene		ND		10	ug/L		09/29/97
Fluoranthene		ND		10	ug/L		09/29/97
Pyrene		ND		10	ug/L		09/29/97
Benzo(a)Anthracene		ND		10	ug/L		09/29/97
Chrysene		ND		10	ug/L		09/29/97
Benzo(b)fluoranthene		ND		10	ug/L		09/29/97
Benzo(k)fluoranthene		ND		10	ug/L		09/29/97
Benzo(a)pyrene		ND		10	ug/L		09/29/97
Indeno(1,2,3-cd)pyrene		ND		10	ug/L		09/29/97
Dibenz(a,h)anthracene		ND		10	ug/L		09/29/97
Benzo(g,h,i)perylene		ND		10	ug/L		09/29/97
SURROGATES, % Recovery							
2-Fluorophenol		46.0		Min:	21	Max:	100
d5-Phenol		36.7		Min:	10	Max:	94
d5-Nitrobenzene		54.0		Min:	35	Max:	114
2-Fluorobiphenyl		69.0		Min:	43	Max:	116
2,4,6-Tribromophenol		54.7		Min:	10	Max:	123
d14-Terphenyl		27.0	*	Min:	33	Max:	141

Samples were prepared and analyzed according to methods outlined in the following references:

- Test Methods for Evaluating Solid Waste, USEPA SW-846, Third Edition, Revision 3, January 1995.

Problems encountered with the analyses are discussed in the following narrative.

All analyses meet quality assurance objectives.

THE FOLLOWING CODES APPLY TO THE ANALYTICAL REPORT

RESULT field...
- ND = not detected at the reported limit
- NA = analyte not applicable (see case narrative/methods for discussion)

Q (qualifier) field...

GENERAL:
- * = Recovery or %RPD outside method specifications
- H = value is estimated due to analysis run outside EPA holding times
- E = reported concentration is above the instrument calibration range
- D = analyte was diluted to bring within instrument calibration range or to remove matrix interferences

ORGANIC ANALYSIS DATA QUALIFIERS:
- B = analyte was detected in the laboratory method blank
- J = analyte was detected above the instrument detection limit (IDL) but below the analytical reporting limit (CRDL)

INORGANIC ANALYSIS DATA QUALIFIERS:
- B = analyte was detected above the instrument detection limit (IDL) but below the analytical reporting limit (CRDL)
- A = post digestion spike did not meet criteria (70-130%), therefore the reporting limit was raised by a factor of two to reflect spike failure
- S = reported value determined by the Method of Standard Additions

3520_B: Continuous Liquid-Liquid Extraction - BNAs METHOD: 3520B
The continuous liquid-liquid extraction used with this method (3520) is modified to conform with the EPA-CLP methodology (OLM01.0) in which dual pH extraction has been replaced with one 18 hour extraction at a pH of <2.0.

8270_W: SEMIVOLATILE ORGANIC COMPOUNDS (GC/MS) METHOD: 8270

Sample: 01A MW-6

Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
Semivolatile Organics	SW 8270A	09/18/97	09/22/97	NA	09/23/97	09/29/97

3520_B: Continuous Liquid-Liquid Extraction - BNAs METHOD: 3520B
The continuous liquid-liquid extraction used with this method (3520) is modified to conform with the EPA-CLP methodology (OLM01.0) in which dual pH extraction has been replaced with one 18 hour extraction at a pH of <2.0.

8270_W: SEMIVOLATILE ORGANIC COMPOUNDS (GC/MS) METHOD: 8270

Order # 97-09-174
ANALYTICA, INC.

Golder Associates Inc.
DATES REPORT

Sample: 01A MW-6

Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
Semivolatile Organics	SW 8270A	09/18/97	09/22/97	NA	09/23/97	09/29/97

QA/QC REPORT

METHOD BLANK SUMMARY

PAGE: 1

CLIENT: GOLDER_AK

10/14/97

ORDER#: 9709174

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	%REC	FLAG	QC SPECS LOW	QC SPECS UPPER
MB-9701315	SEMIVOLATILE ORGANICS	ug/L	09/23/97							
	Naphthalene			ND	10					
	Acenaphthylene			ND	10					
	Acenaphthene			ND	10					
	Fluorene			ND	10					
	Phenanthrene			ND	10					
	Anthracene			ND	10					
	Fluoranthene			ND	10					
	Pyrene			ND	10					
	Chrysene			ND	10					
	Benzo(b)fluoranthene			ND	10					
	Benzo(k)fluoranthene			ND	10					
	Benzo(a)pyrene			ND	10					
	Indeno(1,2,3-cd)pyrene			ND	10					
	Dibenz(a,h)anthracene			ND	10					
	Benzo(g,h,i)perylene			ND	10					
	2-Fluorophenol			93		150	62.0		21	100
	d5-Phenol			68		150	45.3		10	94
	d5-Nitrobenzene			80		100	80.0		35	114
	2-Fluorobiphenyl			69		100	69.0		43	116
	2,4,6-Tribromophenol			130		150	86.7		10	123
	d14-Terphenyl			90		100	90.0		33	141

QA/QC REPORT

METHOD BLANK SPIKE SUMMARY

PAGE: 2

CLIENT: GOLDER_AK

10/14/97

ORDER#: 9709174

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	REF VAL	%REC	FLAG	QC SPECS LOW	QC SPECS UPPER
MBS-9701315	SEMIVOLATILE ORGANICS	ug/L	09/23/97								
	Naphthalene			49	10	50	ND	98.0			
	Acenaphthylene			50	10	50	ND	100			
	Acenaphthene			51	10	50	ND	102		46	118
	Fluorene			56	10	50	ND	112			
	Phenanthrene			53	10	50	ND	106			
	Anthracene			54	10	50	ND	108			
	Fluoranthene			57	10	50	ND	114			
	Pyrene			52	10	50	ND	104		26	127
	Benzo(a)Anthracene			51	10	50	ND	102			
	Chrysene			55	10	50	ND	110			
	Benzo(b)fluoranthene			46	10	50	ND	92.0			
	Benzo(k)fluoranthene			61	10	50	ND	122			
	Benzo(a)pyrene			49	10	50	ND	98.0			
	Indeno(1,2,3-cd)pyrene			57	10	50	ND	114			
	Dibenz(a,h)anthracene			57	10	50	ND	114			
	Benzo(g,h,i)perylene			58	10	50	ND	116			
	2-Fluorophenol			120		150		80.0		21	100
	d5-Phenol			100		150		66.7		10	94
	d5-Nitrobenzene			97		100		97.0		35	114
	2-Fluorobiphenyl			100		100		100		43	116
	2,4,6-Tribromophenol			130		150		86.7		10	123
	d14-Terphenyl			99		100		99.0		33	141

QA/QC REPORT

MATRIX SPIKE SUMMARY

CLIENT: GOLDER_AK

10/14/97

ORDER#: 9709174

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	REF VAL	%REC	FLAG	QC SPECS LOW	QC SPECS UPPER
S709174-01A	SEMIVOLATILE ORGANICS	ug/L	09/23/97								
	Naphthalene			36	10	50	3.1	65.8			
	Acenaphthylene			34	10	50	ND	68.0			
	Acenaphthene			40	10	50	ND	80.0		46	118
	Fluorene			43	10	50	ND	86.0			
	Phenanthrene			45	10	50	ND	90.0			
	Anthracene			45	10	50	ND	90.0			
	Fluoranthene			47	10	50	ND	94.0			
	Pyrene			47	10	50	ND	94.0		26	127
	Benzo(a)Anthracene			47	10	50	ND	94.0			
	Chrysene			44	10	50	ND	88.0			
	Benzo(b)fluoranthene			42	10	50	ND	84.0			
	Benzo(k)fluoranthene			54	10	50	ND	108			
	Benzo(a)pyrene			42	10	50	ND	84.0			
	Indeno(1,2,3-cd)pyrene			45	10	50	ND	90.0			
	Dibenz(a,h)anthracene			45	10	50	ND	90.0			
	Benzo(g,h,i)perylene			45	10	50	ND	90.0			
	2-Fluorophenol			69		150	69	46.0		21	100
	d5-Phenol			62		150	55	41.3		10	94
	d5-Nitrobenzene			61		100	54	61.0		35	114
	2-Fluorobiphenyl			68		100	59	68.0		43	116
	2,4,6-Tribromophenol			85		150	82	56.7		10	123
	d14-Terphenyl			37		100	27	37.0		33	141

ANALYTICA
ALASKA INC

811 W. 8th Ave.
Anchorage, AK 99501
(907) 258-2155
FAX: (907) 258-6634

325 Interlocken Parkway, Suite 200
Broomfield, Colorado 80021
(303) 469-8868
FAX: (303) 469-5254

LGN: A709076
CSN: 9709174

Chain of Custody Record / Analysis Request

Company Name: Golder Assoc
Company Address: 1750 Abbott Rd. #200 Anch AK 99507
Telephone: 907-344-6001
FAX: 907-344-6011

Project Name: ML&P Site NO.3
Report To: Craig Boeckman
Sampler: "
P.O. Number: 973-5254x053

Sample ID	Date Collected	Time Collected	Matrix	8 oz Glass	4 oz Glass	40 ml. VOA HCl	1 L Glass /	1 L Poly /	BTEX by 5030/8020 or 602 (specify)	GRPH by 5030/8015M	DRPH by 3550/8100M	TPH by 3540/418.1	GRO by AK101	DRO by AK102	RRO by AK103	Volatiles by EPA 8240 or 624	Semi-Volatiles by EPA 8270 or 625 PAH	PCB by EPA 8080 or 608	Metals (specify)	PH<2	Hold for Further Analysis	RUSH (see below)	LAB ID
MW-3	9-18-97	1245	W			2	1		X					X						[illegible]			1
MW-6	↓	1410	↓			↓	3		X					X			X			[illegible]			2
MW-7	↓	1336	↓			↓	1		X					X						[illegible]			3
MW-8	↓	1445	↓			↓	1		X					X						HCl added (B)			4
MW-D6	↓	1430	↓			↓	1		X					X						[illegible]			5
Trip blank		--					--		X														

COMMENTS: ⊗ to AEL for analysis (b)

DELIVERABLES
- ☐ ACOE
- ☒ Standard - ADEC Format
- ☐ Level I
- ☐ EDF - Format: ______ specify
- ☐ other: ______ specify

TURNAROUND
- ☐ 2 Business Days
- ☐ 5 Business Days
- ☒ 10-15 Business Days
- ☐ other: ______ #Business Days

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Craig Boeckman	Signature: [signature]	Signature: L. Andelin	Signature: [signature]
Printed Name: Craig Boeckman	Printed Name: P.W. Smith	Printed Name: Lorraine Andelin	Printed Name: P. L. Sinec
Firm: Golder Assoc	Firm: AAI	Firm: Analytica AK	Firm: Analytica
Date/Time: 9-18-97 / 1755	Date/Time: 5:50pm 9/18/97	Date/Time: 9/19/97 1015	Date/Time: 9-22-97 9:30

ANALYTICA USE ONLY:
Airbill / Freight #:
Condition of Sample Containers:
Temp Received: 5.1 °C
# of Coolers: 1 RS
Seals: 2

PAGE 1 OF 1

0000667

000159

QA/QC REPORT
SPIKE DUPLICATE SUMMARY
10/14/97

ORDER#: 9709174

CLIENT: GOLDER_AK

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	REF VAL	%REC	FL	%RPD	QC SPECS LOW	QC SPECS UPPER
S709174-01A	SEMIVOLATILE ORGANICS	ug/L	09/23/97									
	Naphthalene			33	10	50	3.1	59.8		9.55		
	Acenaphthylene			12	10	50	ND	64.0		6.06		
	Acenaphthene			36	10	50	ND	72.0		10.5	46	118
	Fluorene			42	10	50	ND	84.0		2.35		
	Phenanthrene			43	10	50	ND	86.0		4.55		
	Anthracene			44	10	50	ND	88.0		2.25		
	Fluoranthene			48	10	50	ND	96.0		2.11		
	Pyrene			47	10	50	ND	94.0		0	26	127
	Benzo(a)Anthracene			44	10	50	ND	88.0		6.59		
	Chrysene			46	10	50	ND	92.0		4.44		
	Benzo(b)fluoranthene			45	10	50	ND	90.0		6.90		
	Benzo(k)fluoranthene			51	10	50	ND	102		5.71		
	Benzo(a)pyrene			41	10	50	ND	82.0		2.41		
	Indeno(1,2,3-cd)pyrene			42	10	50	ND	84.0		6.90		
	Dibenz(a,h)anthracene			44	10	50	ND	88.0		2.25		
	Benzo(g,h,i)perylene			43	10	50	ND	86.0		4.55		
	2-Fluorophenol			52		150	69	34.7		28.0	21	100
	d5-Phenol			44		150	55	29.3		34.0	10	94
	d5-Nitrobenzene			53		100	54	53.0		14.0	35	114
	2-Fluorobiphenyl			61		100	69	61.0		10.9	43	116
	2,4,6-Tribromophenol			67		150	82	44.7		23.7	10	123
	d14-Terphenyl			40		100	27	40.0		7.79	33	141

ANALYTICA ALASKA INC

811 W. 8th Ave.
Anchorage, AK 99501
(907) 258-2155
FAX: (907) 258-6634

325 Interlocken Parkway, Suite 200
Broomfield, Colorado 80021
(303) 469-8868
FAX: (303) 469-5254

LGN: A709076
CSN:

Chain of Custody Record / Analysis Request

Company Name: Golder Assoc
Company Address: 1750 Abbott Rd. #200, Anch AK 99507
Telephone: 907-344-6001
FAX: 907-344-6011

Project Name: MLAP Site NO.3
Report To: Craig Boeckman
Sampler: "
P.O. Number: 973-5254x053

Sample ID	Date Collected	Time Collected	Matrix	# Containers/Preservation: 8 oz Glass	4 oz Glass	40 mL VOA(2)	1 L Glass /	1 L Poly /.	BTEX by 5030/8020 or 602 (specify)	GRPH by 5030/8015M	DRPH by 3550/8100M	TPH by 3540/418.1	GRO by AK101	DRO by AK102	RRO by AK103	Volatiles by EPA 8240 or 624	Semi-Volatiles by EPA 8270 or 625 PAH	PCB by EPA 8080 or 608	Metals (specify)	PH-2	Hold for Further Analysis	RUSH (see below)	LAB ID
mw-3	9/18/97	1295	W			2	1		X					X			X						1
mw-6		1410					3		X					X									2
mw-7		1330					1		X					X									3
mw-8		1445					1		X					X									4
mw-D6		1430					1		X					X									5
Trip blank		--					--		X														

COMMENTS: ⊗ to AEL for analysis (6)

DELIVERABLES
- ☐ ACOE
- ☒ Standard - ADEC Format
- ☐ Level I
- ☐ EDF - Format: _____ specify
- ☐ other: _____ specify

TURNAROUND
- ☐ 2 Business Days
- ☐ 5 Business Days
- ☒ 10-15 Business Days
- ☐ other: _____ #Business Days

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Craig Boeckman	Signature: P.W. Smith	Signature: Lorraine Andela	Signature:
Printed Name: Craig Boeckman	Printed Name: P.W. Smith	Printed Name: Lorraine Andela	Printed Name:
Firm: Golder Assoc	Firm: AAI	Firm: Analytica, AK	Firm:
Date/Time: 9-18-97 / 1755	Date/Time: 5:30pm 9/18/97	Date/Time: 9/19/97 1015	Date/Time:

ANALYTICA USE ONLY:
Airbill / Freight #:
Condition of Sample Containers:
Temp Received: 5.1 °C
# of Coolers: 1 NS
Seals: 2

6990000

1007

0000670 ~~22112~~

COOLER RECEIPT FORM

CLIENT Golder-AK SN# No Quote PROJECT MLSP Site #3 ORD# 9709174

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS/DISCREPANCIES

A. PRELIMINARY EXAMINATION PHASE: Date cooler opened: 9-22-97 Chain of Custody # ____
by print D L SINEL sign D L Sinel

1. Did cooler come with a shipping slip air bill, etc. ? ____ (YES) NO
   If YES, enter carrier name & air bill number here: Fedex 2782177544
2. Were custody seals on outside of cooler? ____ (YES) NO
   How many & where: 1 front seal date: 9-18-97 seal name: L. Andela
3. Were custody seals unbroken and intact on the date and time of arrival? ____ (YES) NO
4. Did you screen samples for radioactivity using the Geiger Counter? ____ YES (NO)
5. Were custody papers sealed in a plastic bag & taped inside to the lid? ____ (YES) NO
6. Were custody papers filled out properly ink, signed, etc ? ____ (YES) NO
7. Did you sign custody papers in the appropriate place? ____ (YES) NO
8. Was project identifiable from custody paper?, If yes, enter project name at the top of this form ____ (YES) NO
9. If required, was enough ice used? (YES) NO Type of ice: WET (BLUE) Temp 4 °C
10. Have designate person initial here to acknowledge receipt of cooler: ____ date: 9-22-97

B. LOG-IN PHASE: Date samples were logged-in: 9-22-97
by print D L SINEL sign D L Sinel

11. Describe type of packing in cooler: Green Foam / Bubble Wrap
12. Were all bottles sealed in separate plastic bags? ____ (YES) NO
13. Did all bottles arrive unbroken & were labels in good condition? ____ (YES) NO
14. Were all bottle labels complete ID, date, time, signature, preservative, etc. ? ____ (YES) NO
15. Did all bottle labels agree with custody papers? ____ (YES) NO
16. Number of samples received 1 Number of bottles received 2
17. Were correct containers used for the tests indicated? ____ (YES) NO
18. Were correct preservatives added to samples? ____ (YES) NO
19. Was a sufficient amount of sample sent for tests indicated? ____ (YES) NO
20. Were bubbles absent in volatile samples? If NO, list by Sample # ID ____ ~~YES~~ ~~NO~~
21. Was the project manager called and status discussed? If yes, give details on the back of this form ____ YES (NO)
22. Who was called? ____ By whom? ____ date ____

0000671

CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

November 06, 1997

Craig Boekman
Golder & Associates, Inc.
1750 Abbott Road, #2000
Anchorage, AK 99507-3443

Client Name	Golder & Associates, Inc.
Project ID	ML and P Site No. 3 [976569]
Printed	November 06, 1997

Enclosed are the analytical results associated with the above project.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U - Indicates the compound was analyzed for but not detected.
J - Indicates an estimated value that falls below PQL, but is greater than the MDL.
B - Indicates the analyte is found in the blank associated with the sample.
* - The analyte has exceeded allowable limits.
GT - Greater Than
D - Secondary Dilution
LT - Less Than
! - Surrogate out of range

RECEIVED
NOV 1 0 1997

0000672

CT&E Environmental Services Inc.

CT&E Ref.#	976569001	Client PO#	
Client Name	Golder & Associates, Inc.	Printed Date/Time	11/06/97 10:19
Project Name/#	ML and P Site No. 3	Collected Date/Time	10/23/97 13:15
Client Sample ID	SVE102397	Received Date/Time	10/23/97 14:00
Matrix	Gas & Air	Technical Director: Stephen C. Ede	
Ordered By			
PWSID		Released By	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Gasoline Range Organics	288	20.0	ppm	CTE 8015M/8020		11/05/97	11/05/97	GSM
Benzene	2.11	0.780	ppm	CTE 8015M/8020		11/05/97	11/05/97	GSM
Toluene	3.68	0.660	ppm	CTE 8015M/8020		11/05/97	11/05/97	GSM
Ethylbenzene	1.08	0.580	ppm	CTE 8015M/8020		11/05/97	11/05/97	GSM
P & M -Xylene	2.86	0.580	ppm	CTE 8015M/8020		11/05/97	11/05/97	GSM
o-Xylene	0.960	0.580	ppm	CTE 8015M/8020		11/05/97	11/05/97	GSM

CT&E Environmental Services Inc.

CHAIN OF CUSTODY

PO#: _____

Page 1 of 1

Reports to:
Golder Associates
1750 Abbott Rd, Suite 200
Anchorage AK
Phone: 344-6001 Fax: 344-6011

Invoice to: ←

QUOTE # _____

Laboratory:
CT&E Environmental Services Inc.
200 W Potter Dr.
Anchorage, AK 99518-1605
Phone (907) 562-2343 Fax: (907) 561-5301

Contact person for questions concerning these samples: Craig Boeckman Phone: _____ Fax: _____

Special Instructions: _____

Project Name/Number: ML&P Site No. 3

Sampled By: Craig Boeckman

Lab #	Sample #	Date/Time Sampled	# of Containers	Sample Matrix	GRO/BTEX 8015M/8020									Comments
	SVE102397	10-23-97 1315	1	Air	X									

Sample Receipt:
- Number of Containers
- COC Seals/Intact Y/N/NA
- Temperature
- Turnaround Required
- Data Deliverables Required Level I Level II Level III

Relinquished By: Signature: Craig Boeck Time: 1400 Printed Name: Craig Boeckman Date: 10-23-97

Received By: Signature: _____ Time: _____ Printed Name _____ Date: _____

Relinquished By: Signature: _____ Time: _____ Printed Name: _____ Date: _____

Received By: Signature: _____ Time: _____ Printed Name: _____ Date: _____

Relinquished By: Signature: _____ Time: _____ Printed Name: _____ Date: _____

Received at Laboratory By: Signature: Joyce m WindeBanks Time: 1400 Printed Name: Joyce m Windebank Date: 10-23-97

0000674

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

November 13, 1997

Craig Boekman
Golder & Associates, Inc.
1750 Abbott Road, #2000
Anchorage, AK 99507-3443

Client Name	Golder & Associates, Inc.
Project ID	ML&P Site No. 3 VES System [976938]
Printed	November 13, 1997

Enclosed are the analytical results associated with the above project.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U - Indicates the compound was analyzed for but not detected.
J - Indicates an estimated value that falls below PQL, but is greater than the MDL.
B - Indicates the analyte is found in the blank associated with the sample.
* - The analyte has exceeded allowable limits.
GT - Greater-Than
D - Secondary Dilution
LT - Less Than
! - Surrogate out of range

200 W. Potter Drive, **Anchorage, AK 99518-1605** – Tel: (907) 562-2343 Fax: (907) 561-5301
3180 Peger Road, **Fairbanks, AK 99709-5471** – Tel: (907) 474-8656 Fax: (907) 474-9685

0000675

CT&E Environmental Services Inc.

CT&E Ref.#	976938001	Client PO#	
Client Name	Golder & Associates, Inc.	Printed Date/Time	11/13/97 11:15
Project Name/#	ML&P Site No. 3 VES System	Collected Date/Time	11/07/97 14:15
Client Sample ID	SVE110797	Received Date/Time	11/07/97 14:40
Matrix	Gas & Air	Technical Director: Stephen C. Ede	
Ordered By			
PWSID		Released By	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Gasoline Range Organics	20.8	20.0	ppm	CTE 8015M/8020		11/11/97	11/11/97	MMP
Benzene	0.780 U	0.780	ppm	CTE 8015M/8020		11/11/97	11/11/97	MMP
Toluene	0.660 U	0.660	ppm	CTE 8015M/8020		11/11/97	11/11/97	MMP
Ethylbenzene	0.580 U	0.580	ppm	CTE 8015M/8020		11/11/97	11/11/97	MMP
P & M -Xylene	0.580 U	0.580	ppm	CTE 8015M/8020		11/11/97	11/11/97	MMP
o-Xylene	0.580 U	0.580	ppm	CTE 8015M/8020		11/11/97	11/11/97	MMP

CT&E Environmental Services Inc.

CHAIN OF CUSTODY

CT&E # 976938

PO#: _____

Reports to:
Golder Assoc.
17520 Abbott Rd, Suite 200

Phone: 344-6001 Fax: 344-6011

Invoice to:
←

QUOTE #

Laboratory:
CT&E Environmental Serv.
200 W Potter Dr.
Anchorage, AK 99518-1605
Phone (907) 562-2343 Fax: (907) 561-5301

Contact person for questions concerning these samples: Craig Beekman Phone: 344-6001 Fax: 344-6011

Special Instructions: _____

Project Name/Number

Sampled By:

Lab #	Sample #	Date/Time Sampled	# of Containers	Sample Matrix	GRO EPA 8015M	BTEX EPA 8020								Comments
	SVE110797	11-7-97/1405	1	Air	X	X								Canister # Pb5450

Sample Receipt:
- Number of Containers: 1
- COC Seals/Intact Y/N/NA:
- Temperature:
- Turnaround Required:
- Data Deliverables Required: Level I Level II Level III

Relinquished By:
Signature: Craig Beek Time: 1550
Printed Name: Craig Beekman Date: 11-7-97

Received By:
Signature: Time:
Printed Name: Date:

Relinquished By:
Signature: Time:
Printed Name: Date:

Received By:
Signature: Time:
Printed Name: Date:

Relinquished By:
Signature: Time:
Printed Name: Date:

Received at Laboratory By:
Signature: Time: 14:40
Printed Name: E A Larsen Date: 11/7

Columbia Analytical Services, Inc.

September 24, 1997 Service Request No: A9700735

Craig Boeckman
Golder Associates
8740 Hartzell Road
Anchorage, AK 99507-3444

Re: ML+P

Dear Craig:

Enclosed are the results of the sample(s) submitted to our laboratory on August 27, 1997. For your reference, these analyses have been assigned our service request number A9700735.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 0821.

Respectfully submitted,

COLUMBIA ANALYTICAL SERVICES, INC.

Mike Shelton
Laboratory Manager

MIS/jas

AK 99503-7100 • 907.563.0846 • Fax 907-563-2973

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Golder Associates	Service Request No.:	A9700735
Project:	ML+P	Date Received:	8/27/97
Sample Matrix:	Soil		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier ADEC data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS) and Initial Continuing Calibration Verification Standards (ICV/CCV).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The analyses for PAH by 8270 were performed in our San Jose, California laboratory. The service request number for this work is S9701667.

Samples confirmed two distinct chromatographic patterns. Light grade diesel/kerosene and heavier oil Bunker C type fuel characterized these patterns.

Approved by Mike Skelton Date 9/24/97

COLUMBIA ANALYTICAL SERVICES, INC. 000179 ~~000171~~

Analytical Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97

Gasoline Range Organics (GRO)

Prep Method:	EPA 5030A	Units:	mg/Kg (ppm)
Analysis Method:	8015M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
S-1	A9700735-001	5	0.3	1	8/27/97	9/4/97	ND	
Method Blank	A970827-SB1	5	0.3	1	8/27/97	8/29/97	ND	

Approved By: _____ Date: 9/23/97

1A/020597p

00735VOA.RL2 - Sample 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97

Aromatic Volatile Organics

Sample Name:	S-1	Units:	mg/Kg (ppm)
Lab Code:	A9700735-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030A	8020A	0.05	0.01	1	8/27/97	9/4/97	ND	
Toluene	EPA 5030A	8020A	0.05	0.01	1	8/27/97	9/4/97	ND	
Ethylbenzene	EPA 5030A	8020A	0.05	0.01	1	8/27/97	9/4/97	ND	
Xylenes, Total	EPA 5030A	8020A	0.05	0.03	1	8/27/97	9/4/97	0.13	

Approved By: _____ Date: 9/23/97

1ST2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	NA
Sample Matrix:	Soil	Date Received:	NA

Aromatic Volatile Organics

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	A970827-SB1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030A	8020A	0.05	0.01	1	8/27/97	8/29/97	ND	
Toluene	EPA 5030A	8020A	0.05	0.01	1	8/27/97	8/29/97	ND	
Ethylbenzene	EPA 5030A	8020A	0.05	0.01	1	8/27/97	8/29/97	ND	
Xylenes, Total	EPA 5030A	8020A	0.05	0.03	1	8/27/97	8/29/97	ND	

Approved By: _____ Date: 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97

Diesel Range Organics (DRO)

Prep Method:	EPA 3540	Units:	mg/Kg
Analysis Method:	AK102.0	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
S-1	A9700735-001	200	100	1	9/2/97	9/16/97	3600	C
Method Blank	A970902-SB1	10	5	1	9/2/97	9/15/97	ND	

C The MRL is elevated because the sample required diluting.

Approved By: _____ Date: 9/22/97

1A/020597p

00735PHC.AG1 - Sample 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97

Residual Range Organics (RRO)

Prep Method:	EPA 3540	Units:	mg/Kg
Analysis Method:	AK103.0	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
S-1	A9700735-001	800	200	1	9/2/97	9/16/97	2200	C
Method Blank	A970902-SB1	800	10	1	9/2/97	9/15/97	ND	

C The MRL is elevated because the sample required diluting.

Approved By: _____ Date: 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC. 000084

Analytical Report

Client:	Golder Associates Inc.	Service Request:	S9701667
Project:	ML & P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97

Polynuclear Aromatic Hydrocarbons

Sample Name:	S-1	Units:	mg/Kg (ppm)
Lab Code:	S9701667-001	Basis:	Dry
Test Notes:	M1		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Acenaphthylene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Acenaphthene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Fluorene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Phenanthrene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Anthracene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Fluoranthene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Pyrene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Benz(a)anthracene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Chrysene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Benzo(b)fluoranthene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Benzo(k)fluoranthene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Benzo(a)pyrene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Indeno(1,2,3-cd)pyrene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Dibenz(a,h)anthracene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	
Benzo(g,h,i)perylene	3550	8270B	0.6	20	9/5/97	9/9/97	<12	

M1 The MRL was elevated because of matrix interferences.

Approved By: _____ Date: 9/24/97

000008

Page No.:

APPENDEX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

000088

Client:	Golder Associates Inc.	Service Request:	9701667
Project:	ML & P	Date Collected:	NA
Sample Matrix:	Soil	Date Received:	NA

Polynuclear Aromatic Hydrocarbons

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	S970905-SB1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Acenaphthylene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Acenaphthene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Fluorene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Phenanthrene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Anthracene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Fluoranthene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Pyrene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Benz(a)anthracene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Chrysene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Benzo(b)fluoranthene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Benzo(k)fluoranthene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Benzo(a)pyrene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Indeno(1,2,3-cd)pyrene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Dibenz(a,h)anthracene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	
Benzo(g,h,i)perylene	3550	8270B	0.6	1	9/5/97	9/8/97	<12	

* Quantified as 4-methylphenol.

Approved By: NTH Date: 9/24/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97
		Date Extracted:	8/27/97
		Date Analyzed:	9/4/97

Surrogate Recovery Summary
Gasoline Range Organics (GRO)

Prep Method:	EPA 5030A	Units:	PERCENT
Analysis Method:	AK101.0	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 4-Bromofluorobenzene
S-1	A9700735-001		84
Method Blank	A970827-SB1		98
Lab Control Sample	A970827-SL1		96
Lab Control Sample	A970827-SL2		95

CAS Acceptance Limits: 57-137

Approved By: MG Date: 9/4/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	NA
LCS Matrix:	Soil	Date Received:	NA
		Date Extracted:	8/27/97
		Date Analyzed:	8/29/97

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
Gasoline Range Organics (GRO)

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	A970827-SL1 A970827-SL2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Gasoline Range Organics (GRO)	EPA 5030A	AK101.0	25.0	25.0	23.7	24.0	95	96	67-129	1	

Approved By: _____ Date: 9/23/97

DLCS/020597p
00735VOA.RL2 - DLCS 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 8/28/97

Initial Calibration Verification (ICV) Summary
Gasoline Range Organics (GRO)

Sample Name: A970828-ICV
Lab Code: ICV
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source: V082007

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Gasoline Range Organics (GRO)	8015M	500	430	86	

Approved By: _____ Date: 9/23/97

ICV/032196

00735VOA.RL4 - ICV 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

WCCA 20182

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 8/29/97

Continuing Calibration Verification (CCV) Summary
Gasoline Range Organics (GRO)

Sample Name: A970828-WL4
Lab Code: CCV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Gasoline Range Organics (GRO)	8015M	500	492	98	

Approved By: _____ Date: 9/23/97

CCV/021397p

00735VOA.RL4 - CCV 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 8/29/97

Continuing Calibration Verification (CCV) Summary
Gasoline Range Organics (GRO)

Sample Name: A970828-WL6
Lab Code: CCV2
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Gasoline Range Organics (GRO)	8015M	500	506	101	

Approved By: _____ Date: 9/23/97

CCV/021397p

00735VOA.RL4 - CCV (2) 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/4/97]

Continuing Calibration Verification (CCV) Summary
Gasoline Range Organics (GRO)

Sample Name: A970903-WL4
Lab Code: CCV3
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Gasoline Range Organics (GRO)	8015M	500	479	96	

Approved By: _____ Date: 9/23/97

CCV/021397p

00735VOA.RL4 - CCV (3) 9/23/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/4/97

Continuing Calibration Verification (CCV) Summary
Gasoline Range Organics (GRO)

Sample Name: A970903-WL6
Lab Code: CCV4
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Gasoline Range Organics (GRO)	8015M	500	495	99	

Approved By: _____ Date: 9/23/97

CCV/021397p

00735VOA.RL4 - CCV (4) 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97
		Date Extracted:	8/27/97
		Date Analyzed:	9/4/97

Surrogate Recovery Summary
Aromatic Volatile Organics

Prep Method:	EPA 5030A	Units:	PERCENT
Analysis Method:	8020A	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 4-Bromofluorobenzene
S-1	A9700735-001		88
Method Blank	A970827-SB1		89
Lab Control Sample	A970827-SL1		85
Lab Control Sample	A970827-SL2		88

CAS Acceptance Limits: 76-120

Approved By: _____ Date: 9/23/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/4/97

Continuing Calibration Verification (CCV) Summary
Gasoline Range Organics (GRO)

Sample Name: A970903-WL6
Lab Code: CCV4
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Gasoline Range Organics (GRO)	8015M	500	495	99	

Approved By: _____ Date: 9/23/97

CCV/021397p

00735VOA.RL4 - CCV (4) 9/12/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97
		Date Extracted:	8/27/97
		Date Analyzed:	9/4/97

Surrogate Recovery Summary
Aromatic Volatile Organics

Prep Method:	EPA 5030A	Units:	PERCENT
Analysis Method:	8020A	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 4-Bromofluorobenzene
S-1	A9700735-001		88
Method Blank	A970827-SB1		89
Lab Control Sample	A970827-SL1		85
Lab Control Sample	A970827-SL2		88

CAS Acceptance Limits: 76-120

Approved By: _____ Date: 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

000189

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	NA
LCS Matrix:	Soil	Date Received:	NA
		Date Extracted:	8/27/97
		Date Analyzed:	8/29/97

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
Aromatic Volatile Organics

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	A970827-SL1, A970827-SL2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Benzene	EPA 5030A	8020A	2.50	2.50	2.48	2.56	99	102	71-128	3	
Toluene	EPA 5030A	8020A	2.50	2.50	2.58	2.66	103	106	74-125	3	
Ethylbenzene	EPA 5030A	8020A	2.50	2.50	2.66	2.76	106	110	71-122	4	
Xylenes, Total	EPA 5030A	8020A	7.50	7.50	7.90	8.17	105	109	71-122	3	

Approved By: _____ Date: 9/23/97

DLCS/020597p
00735VOA.RL1 - DLCS 9/23/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 6/30/97

Initial Calibration Verification (ICV) Summary
Aromatic Volatile Organics

Sample Name: A970630-ICV
Lab Code: ICV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source: V062103

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	8020A	50.0	44.4	89	
Toluene	8020A	50.0	46.1	92	
Ethylbenzene	8020A	50.0	47.6	95	
Xylenes, Total	8020A	150	144	96	

Approved By: _____ Date: 9/24/97

ICV/032196

00735VOA.RL3 - ICV 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC. ~~000191~~

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/1/97

Initial Calibration Verification (ICV) Summary
Aromatic Volatile Organics

Sample Name: A970901-ICV
Lab Code: ICV2
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source: V090101

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	8020A	50.0	50.2	100	
Toluene	8020A	50.0	50.1	100	
Ethylbenzene	8020A	50.0	54.0	108	
Xylenes, Total	8020A	150	159	106	

Approved By: _____ Date: 9/24/97

ICV/032196

00735VOA.RL3 - ICV (2) 9/23/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 8/29/97

Continuing Calibration Verification (CCV) Summary
Aromatic Volatile Organics

Sample Name: A970828-WL3
Lab Code: CCV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	8020A	50.0	51.8	104	
Toluene	8020A	50.0	53.9	108	
Ethylbenzene	8020A	50.0	55.4	111	
Xylenes, Total	8020A	150	165	110	

Approved By: _____ Date: 9/24/97

CCV/021397p

00735VOA.RL3 - CCV 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 8/29/97

Continuing Calibration Verification (CCV) Summary
Aromatic Volatile Organics

Sample Name: A970828-WL5
Lab Code: CCV2
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	8020A	50.0	51.8	104	
Toluene	8020A	50.0	53.8	108	
Ethylbenzene	8020A	50.0	55.8	112	
Xylenes, Total	8020A	150	166	111	

Approved By: _____ Date: 9/24/97

CCV/072397g

00735VOA.RLJ - CCV (2) 9/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/4/97

Continuing Calibration Verification (CCV) Summary
Aromatic Volatile Organics

Sample Name: A970903-WL3
Lab Code: CCV3
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	8020A	50.0	49.3	99	
Toluene	8020A	50.0	48.9	98	
Ethylbenzene	8020A	50.0	51.9	104	
Xylenes, Total	8020A	150	151	101	

Approved By: _____ Date: 9/24/97

CCV/021397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/4/97

Continuing Calibration Verification (CCV) Summary
Aromatic Volatile Organics

Sample Name: A970903-WL5
Lab Code: CCV4
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	8020A	50.0	51.2	102	
Toluene	8020A	50.0	50.2	100	
Ethylbenzene	8020A	50.0	52.8	106	
Xylenes, Total	8020A	150	155	103	

Approved By: _____ Date: 9/24/97

CCV/021397p

COLUMBIA ANALYTICAL SERVICES, INC. ~~000196~~

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	8/22/97
Sample Matrix:	Soil	Date Received:	8/27/97
		Date Extracted:	9/2/97
		Date Analyzed:	9/16/97

Surrogate Recovery Summary
Diesel Range Organics (DRO)

Prep Method:	EPA 3540	Units:	PERCENT
Analysis Method:	AK102.0	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery p-Terphenyl
S-1	A9700735-001		114
Method Blank	A970902-SB1		84
Lab Control Sample	A970902-SL1		97
Lab Control Sample	A970902-SL2		79

CAS Acceptance Limits: 50-150

Approved By: _____ Date: 9/22/97

SUR1/020597p
00735PHC_AG1 - SUR 9/17/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Collected:	NA
LCS Matrix:	Soil	Date Received:	NA
		Date Extracted:	9/2/97
		Date Analyzed:	9/15/97

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
Diesel Range Organics (DRO)

Sample Name:	Lab Control Sample	Units:	mg/Kg
Lab Code:	A970902-SL1, A970902-SL2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Diesel Range Organics (DRO)	EPA 3540	AK102.0	267	267	283	257	106	96	60-120	10	

Approved By: _____ Date: 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Initial Calibration Verification (ICV) Summary
Diesel Range Organics (DRO)

Sample Name: ICV AK102
Lab Code: ICV1
Test Notes:

Units: mg/L
Basis: NA

ICV Source: SV7031905

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2060	1980	96	

Approved By: _____ Date: 9/22/97

ICV/032196

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/16/97

Initial Calibration Verification (ICV) Summary
Diesel Range Organics (DRO)

Sample Name: ICV AK102
Lab Code: ICV1
Test Notes:

Units: mg/L
Basis: NA

ICV Source: SV7031905

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2060	2090	101	

Approved By: _____ Date: 9/22/97

ICV/032196

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Golder Associates	Service Request:	A9700735
Project:	ML+P	Date Analyzed:	9/15/97

Continuing Calibration Verification (CCV) Summary
Diesel Range Organics (DRO)

Sample Name:	A970915-CCV1	Units:	mg/L
Lab Code:	CCV1	Basis:	NA
Test Notes:			

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2500	2360	94	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG2 - CCV 9/22/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/16/97

Continuing Calibration Verification (CCV) Summary
Diesel Range Organics (DRO)

Sample Name: A970916-AK1
Lab Code: CCV1
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2500	2470	99	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG4 - CCV 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Diesel Range Organics (DRO)

Sample Name: A970915-CCV3
Lab Code: CCV2
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2500	2430	97	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG2 - CCV (2) 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/16/97

Continuing Calibration Verification (CCV) Summary
Diesel Range Organics (DRO)

Sample Name: A970916-AK2
Lab Code: CCV2
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2500	2180	87	

Approved By: _____ Date: 9/22/97

CCV/021397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Diesel Range Organics (DRO)

Sample Name: A970915-CCV5
Lab Code: CCV3
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2500	2360	94	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG2 - CCV (3) 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Diesel Range Organics (DRO)

Sample Name: A970915-CCV7
Lab Code: CCV4
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Diesel Range Organics (DRO)	AK102.0	2500	2500	100	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG2 - CCV (4) 9/22/97

QA/QC Report

Client:	Golder Associates	**Service Request:**	A9700735
Project:	ML+P	**Date Collected:**	8/22/97
Sample Matrix:	Soil	**Date Received:**	8/27/97
		Date Extracted:	9/2/97
		Date Analyzed:	9/16/97

Surrogate Recovery Summary
Residual Range Organics (RRO)

Prep Method:	EPA 3540	Units:	PERCENT
Analysis Method:	AK103.0	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery n-Triacontane
S-1	A9700735-001		98
Method Blank	A970902-SB1		82
Lab Control Sample	A970902-SL3		76
Lab Control Sample	A970902-SL4		83

CAS Acceptance Limits: 50-150

Approved By: _____ Date: 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

~~00207~~

QA/QC Report

Client: Golder Associates
Project: ML+P
LCS Matrix: Soil

Service Request: A9700735
Date Collected: NA
Date Received: NA
Date Extracted: 9/2/97
Date Analyzed: 9/15/97

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
Residual Range Organics (RRO)

Sample Name: Lab Control Sample
Lab Code: A970902-SL3, A970902-SL4
Test Notes:

Units: mg/Kg
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Residual Range Organics (RRO)	EPA 3540	AK103.0	267	267	200	207	75	78	60-100	3	

Approved By: _____ Date: 9/22/97

DLCS/020597p
00735PHC.AG6 - DLCS 9/22/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Initial Calibration Verification (ICV) Summary
Residual Range Organics (RRO)

Sample Name: ICV AK103
Lab Code: ICV1
Test Notes:

Units: mg/L
Basis: NA

ICV Source: SV7031906

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2006	1550	77	

Approved By: _____ Date: 9/22/97

ICV/032196

00735PHC.AG3 - ICV 9/22/97

~~00209~~

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/16/97

Initial Calibration Verification (ICV) Summary
Residual Range Organics (RRO)

Sample Name: ICV AK103
Lab Code: ICV1
Test Notes:

Units: mg/L
Basis: NA

ICV Source:

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2006	1760	88	

Approved By: _____ Date: 9/22/97

ICV/032196

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Residual Range Organics (RRO)

Sample Name: A970915-CCV2
Lab Code: CCV1
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2500	1910	76	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG3 - CCV 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC. ~~000711~~

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/16/97

Continuing Calibration Verification (CCV) Summary
Residual Range Organics (RRO)

Sample Name: A970916-RR1
Lab Code: CCV1
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2500	1930	77	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG5 - CCV 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Residual Range Organics (RRO)

Sample Name: A970915-CCV4
Lab Code: CCV2
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2500	2040	82	

Approved By: _____ Date: 9/22/97

CCV/021397p

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/16/97

Continuing Calibration Verification (CCV) Summary
Residual Range Organics (RRO)

Sample Name: A970916-RR2
Lab Code: CCV2
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2500	1870	75	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG5 - CCV (2) 9/22/97

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Residual Range Organics (RRO)

Sample Name: A970915-CCV6
Lab Code: CCV3
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2500	2380	95	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG3 - CCV (3) 9/22/97

COLUMBIA ANALYTICAL SERVICES, IN

QA/QC Report

Client: Golder Associates
Project: ML+P

Service Request: A9700735
Date Analyzed: 9/15/97

Continuing Calibration Verification (CCV) Summary
Residual Range Organics (RRO)

Sample Name: A970915-CCV8
Lab Code: CCV4
Test Notes:

Units: mg/L
Basis: NA

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Residual Range Organics (RRO)	AK103.0	2500	2270	91	

Approved By: _____ Date: 9/22/97

CCV/021397p

00735PHC.AG3 - CCV (4) 9/22/97

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Golder Associates Inc.
Project: ML & P
Sample Matrix: Soil

Service Request: S9701667
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
Polynuclear Aromatic Hydrocarbons

Prep Method: 3550
Analysis Method: 8270B

Units: mg/Kg (ppm)
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FP	PHL	NBZ	FBP	TBP	TPH
S-1	S9701667-001		9 S1	60	62	89	7 S1	190 S1
Method Blank	S970905-SB1		55	74	104	78	58	59

CAS Acceptance Limits:	25-121	24-113	19-122	23-128	30-115	18-137

2FP	2-Fluorophenol
PHL	Phenol-D6
NBZ	Nitrobenzene-D5
FBP	2-Fluorobiphenyl
TBP	2,4,6-Tribromophenol
TPH	Terphenyl-D14

S1 Surrogate recovery out of control limits due to matrix interference.

Approved By: ML Date: 9/24/97

SUR6/020597p

ANALYTICA
ALASKA INC

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(907) 258-2155
FAX: (907) 258-6634
E-Mail: www.analyticagroup.com

...0 Interlocken Parkway, Suite 200
Broomfield, Colorado 80021
(303) 469-8868
FAX: (303) 469-5254

LGN:
CSN: 43

A9700735 Chain of Custody Record / Analysis Request

Company Name: Golder Associates
Company Address: 1450 Abbott Rd Suite 200 Anchorage, AK 99507
Telephone: 907-344-6001
FAX: 907-344-6011

Project Name: MLLP
Report To: Craig Boeckman
Sampler: " "
P.O. Number: 973525-1k053

Sample ID	Date Collected	Time Collected	Matrix Soil/Water (Circle One)	# Containers: 8 oz Glass	4 oz Glass	40 ml. VOA/HCl	1 Liter	BTEX by 5030/8020 or 602 (specify)	GRO by 5030/8015M	GRO by AK101	DRO by 3550/8100M	DRO by AK102	RRO by AK103	PAH by 8270	PH<2	Hold for Further Analysis	RUSH (see below)	LAB ID
S-1	8-22-97	1600	Soil	1				X	X			X	X	X		X		735-1

COMMENTS: Hold until notified by MLLP or Golder to go ahead w/ analysis
"NEEDS CHROMATOGRAPHY"

DELIVERABLES
- ☐ ACOE
- ☒ Standard - ADEC Formal
- ☐ Level I
- ☐ EDF - Formal: _____ specify
- ☐ other: _____ specify

TURNAROUND
- ☐ 2 Business Days
- ☐ 5 Business Days
- ☒ 10-15 Business Days
- ☐ other: _____ #Business Days

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Craig Boeckman	Signature: Lorraine Andela	Signature: Lorraine Andela	Signature: Meghan Kennish
Printed Name: Craig Boeckman	Printed Name: Lorraine Andela	Printed Name: Lorraine Andela	Printed Name: Meghan Kennish
Firm: Golder Assoc	Firm: Analytica AK	Firm: Analytica AK	Firm: CAS/AKA
Date/Time: 8-22-97/1615	Date/Time: 8/22/97 1615	Date/Time: 8/27/97 1220	Date/Time: 8/27/97 1330

ANALYTICA USE ONLY:
Airbill / Freight #:
Condition of Sample Containers:
Temp Received: X °C
# of Coolers: 0
Seals: 0
Hand delivered by Craig Boeckman directly from field

APPENDEX B

CHAIN OF CUSTODY INFORMATION
COOLER RECEIPT FORM

000727

~~000219~~

Columbia Analytical Services, Inc.

Cooler Receipt and Preservation From

Client: Golder Associates Work order: A9700735

Project: ML+P

Cooler received on: 8/27/97 and opened on 8/27/97 by Meghan Kennish

		Yes	No	N/A
1	Were custody seals on outside of cooler?	x	o	o
	If yes, how many and where? 1f			
	Were signature and date correct?	x	o	o
2	Were custody papers properly filled out (ink, signed, etc....)?	x	o	o
3	Did all bottles arrive in good condition (unbroken, etc....)?	x	o	o
4	Were all bottle labels correct (analysis, preservation, etc....)?	x	o	o
5	Did all bottle labels and tags agree with custody papers?	x	o	o
6	Were correct bottles used for test indicated?	x	o	o
7	Were VOA vials checked for absence of air bubbles, and noted?	o	o	x
8	Temperature of cooler upon receipt	3.2 Degrees C		

Explain any discrepancies:

		Yes	No
pH	Reagent		
12	NaOH		
2	HNO_3		
2	H_2SO_4		

Yes = all samples OK

No = Samples were preserved at lab as listed

Sample I.D.	Reage	Vol.

Comments:

Number of pages (including cover sheet): 1

000049

0000728

~~100220~~

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

RECEIVED
MAR 08 2000
Dept. of Environmental Conservation
Underground Storage Tanks — FAP

March 7, 2000

Municipal Light and Power
1201 East Third Avenue
Anchorage, Alaska 99501

Attn: Mr. Jim Pfeiffer

Fax: 263-5836

RE: FEBRUARY 2000 SITE ACTIVITIES AT 1201 EAST THIRD AVENUE, MUNICIPAL LIGHT AND POWER SITE 3, ANCHORAGE, ALASKA

This letter report presents the results of our February 2000 site activities at Municipal Light and Power's (ML&P) Transformer Shop, 1201 East Third Avenue, Anchorage, Alaska. This work effort is in general accordance with our November 24, 1999 proposal which was approved by Mr. Jim Pfeiffer of ML&P on December 13, 1999, and Mr. Michael Krueger of the Municipality of Anchorage (MOA) on December 14, 1999. This report includes a summary of remediation system monitoring, product recovery, monitoring well installation, and soil and groundwater sampling performed by Shannon & Wilson.

Remediation System Monitoring

A vapor sample, designated VEAIS, was collected from the exhaust stack of the on-site vapor extraction system (VES) on February 3, 2000. This is the fourth sampling of the VES as part of this on-going project. The previous monitoring and sampling results for the remediation system have been provided in previous status reports. Prior to the collection of the analytical vapor sample, field measurements of the stack exhaust were collected. Temperature and flame-ionization detector (FID) readings of the stack emissions were recorded and the velocity of air movement in the stack exhaust and the individual VES lines was determined using pitot tubes. Once these parameters stabilized, the analytical sample was collected from the VES exhaust sample port in a 1-liter stainless steel cylinder provided by the laboratory. A description of the VES sample and field measurements are provided in Table 1.

Product Recovery

On February 28, 2000, Alaska Pollution Control (APC) attempted to pump oily water from Vapor Extraction Well VES-4 using a vacuum truck. The well was dry, therefore, oily water was not recovered. Typically, about 5 gallons of oily water has been removed from this well on a quarterly basis.

5430 FAIRBANKS STREET • SUITE 3
ANCHORAGE, ALASKA 99518
907-561-2120 FAX 907-561-4483

Monitoring Well Installation

Boring MW9 was advanced on February 1, 2000 near the location of Monitoring Well MW8, as shown in Figure 1. To advance and sample the boring, Discovery Drilling provided a truck-mounted CME-75 drill rig equipped with a 4-inch I.D. hollow-stem auger and 3-inch O.D. split-spoon samplers. A representative of Shannon & Wilson was present continuously during field activities to log the materials encountered during drilling and screen the subsurface soils. This information has been summarized on the boring log, included as Figure 2.

The augers and split-spoon samplers were steam cleaned offsite prior to use at the site to avoid potential cross-contamination of soil residue from previous activities. The boring was advanced to approximately 9.5 feet bgs and soil samples were collected during drilling at approximately 2.5-foot intervals. Although, groundwater was not encountered during drilling the boring was completed as a monitoring well. The well was allowed to sit for about 24-hours in an effort to allow groundwater to enter the well. Drill cuttings were placed in a 55-gallon drum and stored on site.

During drilling activities, soil samples were collected for field headspace screening and potential laboratory analysis. Soil from the split-spoon samplers was placed in sealable plastic bags and the appropriate analytical sample containers using decontaminated stainless steel spoons. The analytical sample containers were immediately placed in a cooler following collection and maintained at a temperature of approximately 4° C in the field. The headspace samples were allowed to equilibrate to a common temperature and screened following headspace sampling protocols. Screening was accomplished by inserting a sampling probe into the plastic bag using an OVM 580B photoionization detector (PID). The maximum PID reading was then recorded for each sample. Based on headspace screening one analytical soil sample was selected from the boring for testing. The results of the field screening are summarized in Table 2 and Figure 2. The sampler's name, the date, and time of sample collection are listed on the chain-of-custody forms included in Attachment 1.

After completing the boring to the desired depth, the well casing was installed inside the auger string to the bottom of the boring. The well was constructed of 2-inch nominal I.D., schedule 40 PVC pipe with threaded connections. The lower portion of the monitoring well was made up of a 6.5 foot section of PVC well screen with 0.010-inch slots. The screened portion of the well was placed such that the slots would span the expected low and high groundwater levels. A continuous silica sand pack was used to backfill around the well screen to about one foot

above the screen. Bentonite chips were used to backfill around the PVC in the vadose zone above the sand pack to about one foot below grade. A flush mount protective casing was installed around the monitoring well and was embedded in a portland cement grout. The location of the monitoring well is shown on Figure 1 and the monitoring well construction details are shown on Figure 3.

On February 2, 2000 the depth to groundwater was recorded for the well using an electronic water level indicator. The well contained approximately 0.4 inches of water. The well was, therefore, considered dry and was not developed or sampled.

As part of this project Monitoring Well MW8 was to be decommissioned. Since Monitoring Well MW9 was considered dry, Monitoring Well MW8 was not removed. The wells will be reevaluated in April 2000, during the next quarterly groundwater sampling event.

Groundwater Sampling

Groundwater samples were collected from Monitoring Wells MW-3, MW-6, MW-7, and MW-8 on February 2, 2000. The locations of the wells are shown in Figure 1. Prior to the collection of the groundwater samples, the four wells were each purged of a minimum of three well volumes of water using a variable-speed submersible pump equipped with new disposable tubing. The purgewater from the four wells is being temporarily stored on-site in a 55-gallon drum. At the time of sampling, temperature, specific conductance, dissolved oxygen, and pH values were measured in the groundwater collected from the four monitoring wells. Water level, purging, and sampling data for the sampling event are presented in Table 3.

Laboratory Analyses

The vapor sample from the VES discharge stack was submitted to CT&E Environmental Services, Inc. (CT&E) of Anchorage, Alaska and analyzed for aromatic volatile organics (BTEX) using EPA Method 8021B and gasoline range organics (GRO) using EPA Method 8015M.

The soil sample, designated MW9-S2, was analyzed for diesel range organics by Alaska Method 102 (AK 102) and GRO/BTEX by AK 101/EPA 8021B. In addition, a trip blank accompanied the samples to and from the laboratory and was analyzed for GRO/BTEX by AK 101/EPA 8021B.

Four groundwater samples and a duplicate sample, designated Samples MW3, MW6, MW7, MW8, and MW10, were analyzed for DRO by AK 102 and GRO/BTEX by AK 101/EPA 602. In addition, Sample MW6 was analyzed for polynuclear aromatic hydrocarbons (PAHs) by EPA Method 610. A trip blank accompanied the samples to and from the laboratory and was analyzed for GRO/BTEX by AK 101/EPA 8021B. The soil and groundwater samples were also submitted to CT&E for analysis.

Cleanup Criteria

The applicable soil and groundwater cleanup criteria are contained in the January 22, 1999 Oil and Hazardous Substances Pollution Control Regulations. The applicable cleanup criteria for soil were developed using Tables B1 and B2 of 18 AAC 75.340 for Method Two cleanup criteria. These levels are less than 300 ppm GRO, 250 ppm DRO, 0.02 ppm benzene, 5.4 ppm toluene, 5.5 ppm ethylbenzene, and 78 ppm xylenes.

The applicable groundwater cleanup criteria are contained in Table C of 18 AAC 75.345. These levels are less than 1.3 ppm GRO, 1.5 ppm DRO, 0.005 ppm benzene, 1.0 ppm toluene, 0.7 ppm ethylbenzene, and 10.0 ppm xylenes. The cleanup levels for the PAH compounds vary and results which exceed the applicable cleanup levels are discussed below.

Analytical Results

Vapor Sample VEAIS did not contain benzene, toluene, ethylbenzene, xylenes, or GRO above the laboratory reporting limit. The September 1999 sampling of the system contained 0.930 ppm toluene and 2.49 ppm xylenes and did not contain benzene, ethylbenzene, or GRO above the laboratory reporting limit. The September 1998 and January 1999 samples did not contain detectable GRO or BTEX. The laboratory results of the vapor sample are summarized on Table 1.

Soil Sample MW9-S2 was collected from about 5.0 to 7.0 feet bgs in Boring MW9 and contained 1,330 ppm DRO, 3,880 ppm GRO, 59.4 ppm benzene, 244 ppm toluene, 61.3 ppm ethylbenzene, and 282.2 ppm xylenes. The concentration of GRO, DRO, and the BTEX constituents exceed the applicable cleanup criteria. The soil analytical results are summarized on Table 4.

The analytical results of the groundwater samples are summarized in Table 4, while a cumulative summary of the current and previous groundwater analytical results are included in Table 5. Monitoring Wells MW3 and MW7 did not contain detectable GRO, DRO, or BTEX. Monitoring Well MW6 contained 0.419 ppm GRO and did not contain detectable DRO, BTEX, or PAH compounds. Sample MW8 and Duplicate Sample MW10, collected from Monitoring Well MW8 contained a maximum of 12.0 ppm DRO, 0.33 ppm GRO, 0.172 ppm benzene, and 0.00532 ethylbenzene and did not contain toluene or xylenes. Monitoring Well MW8 exceeds the applicable cleanup levels for DRO and benzene. The individual laboratory reports for the February 2000 sampling event are presented in Attachment 1.

Quality Control

For quality control purposes a duplicate sample, designated Sample MW10, was collected and analyzed for DRO, GRO, and BTEX. The duplicate water sample was submitted to the laboratory to provide the data necessary to assess sampling and analytical precision. The results of the project sample were compared to the duplicate sample results using the summary statistic of relative percent difference (RPD). Based on these calculations, the RPD of the DRO, GRO, benzene, and ethylbenzene analyses is 3.4%, 6.3%, 6.6%, and 13%, respectively. Toluene and xylenes were not detected in the sample set therefore, the RPD could not be calculated. The precision of the DRO, GRO, benzene, and ethylbenzene results are within the data quality objective (DQO) of +/-40% for DRO and GRO and +/-30% for the BTEX constituents. The DQOs for this project are contained in Shannon & Wilson's April 20, 1991 Quality Assurance Project Plan (QAPP) for UST Site Assessments, as amended by the adoption of the ADEC UST Procedures Manual, dated March 1, 1999.

A soil trip blank and a water trip blank, designated TBS and TB, respectively, were also submitted to the laboratory for analysis. The trip blanks did not contain detectable GRO or BTEX. Therefore, the samples were not impacted by the sampling handling or shipment process.

Discussion of Results

Groundwater measurements indicated that the water level in Monitoring Well MW8 and MW9, was about 5.36 feet bgs and 9.17 feet bgs, respectively. Monitoring Well MW8 is located about three feet northwest of Monitoring Well MW9. Monitoring Well MW8 was installed in May 1994 and at the time of drilling groundwater was encountered at about 5.5 feet bgs. No groundwater was encountered during the drilling of Monitoring Well MW9 in February 2000.

During the drilling of Monitoring Well MW8 and MW9, a silt confining layer was encountered at about 9.25 feet bgs and at about 5.0 feet bgs, respectively. It appears that the fine grained soil in the vicinity of the Transformer Shop, including Monitoring Well MW8, was excavated deeper than in the vicinity of Monitoring Well MW9. Therefore, the gravel fill underlying the footprint of the building may be creating a 'bathtub' where water accumulates above the silt beneath and surrounding the building's footprint.

The groundwater sampling results indicate that the wells north of the building continue to contain concentrations of petroleum hydrocarbons that are below the appropriate cleanup levels. The groundwater samples collected from Monitoring Well MW8, which is located south of the Transformer Shop in a former UST excavation, contain concentrations of DRO and benzene that continue to exceed the appropriate cleanup criteria.

The results of the on-going remediation system monitoring indicate that the system is removing low levels of volatile petroleum hydrocarbons from the subsurface. Based on the results of the soil samples collected from Monitoring Well MW9 and the groundwater samples from Monitoring Well MW8 it is apparent that the soil and groundwater south of the building is still impacted with petroleum hydrocarbons. Therefore, the system is doing little to remediate this area south of the building. As a result, the system needs to be modified to address this area of impacted soil and groundwater south of the building.

Limitations

This report was prepared for the exclusive use of our client and their representatives in the monitoring of this site. The findings we have presented within this report are based on limited research and information provided by others and on the sampling and analysis that we conducted at this site. It is possible that our tests may have missed some higher levels of petroleum hydrocarbon constituents or hazardous substances. As a result, the analysis and sampling performed can only provide you with our best judgements as to the environmental characteristics of the sample locations, and in no way guarantees that an agency or its staff will reach the same conclusions as Shannon & Wilson, Inc. The data presented in this report should be considered representative of the time of our sampling. Changes in site conditions can occur with time, because of natural forces or human activity. In addition, changes in government codes, regulation or laws may occur. Because of such changes beyond our control, our observations and interpretations may need to be revised.

Shannon & Wilson has prepared Attachment 2, "Important Information About Your Geotechnical/Environmental Report", to assist you and others in understanding the use and limitations of our report. You are advised that various state and federal agencies (ADEC, EPA, etc.) may require the reporting of this information. Shannon & Wilson does not assume the responsibility for reporting these finding and therefore, has not, and will not disclose the results of this study, except with your permission or as required by law.

We appreciate this opportunity to be of service and your continued confidence in our firm. If you have any questions or comments concerning this report, please call the undersigned.

Sincerely,

SHANNON & WILSON, INC.

Prepared by:

Dan P. McMahon
Environmental Scientist II

Reviewed by:

John Spielman, C.P.G.
Principal Hydrogeologist

Enc: Tables 1 through 5, Figures 1, 2, & 3, and Attachments 1 & 2

cc: Mr. Michael Krueger, MOA

TABLE 1 - SUMMARY OF VAPOR SAMPLE FIELD MEASUREMENTS AND ANALYTICAL RESULTS

		Analytical Sample Number and Collection Date (See Attachment 1)		
Parameter Tested	**Method***	VEAIS 2/3/2000		
Exhaust Stack FID Reading - ppm	Sensidyne FID	50		
Exhaust Stack Temperature - Fahrenheit	Thermometer	50		
Exhaust Flow Pressure - inches water	Vacuum Gauge	53		
Exhaust Differential Pressure - inches water	Pitot Tube	0.27		
Exhaust Flow Velocity - fpm	Conversion Charts†	2000		
Aromatic Volatile Organics (BTEX)				
Benzene - ppm	EPA 8021B	<0.780		
Toluene - ppm	EPA 8021B	<0.660		
Ethylbenzene - ppm	EPA 8021B	<0.580		
Xylenes - ppm	EPA 8021B	<0.580		
Gasoline Range Organics (GRO) - ppm	EPA 8015M/8021B	<20.0		
Volatile Petroleum Hydrocarbons - lbs/day	Ideal Gas Law**	<1.5		

KEY	DESCRIPTION
*	See Attachment 1 For Detection Limits
**	Using a Gas Constant of R=75.6 Pa•m^3/Kg•K
†	Flow Rates Calculated From Pitot Tube/ Manometer Conversions
<0.780	Less Than The Detection Limit of 0.780 ppm

TABLE 2 - SAMPLE LOCATIONS AND DESCRIPTIONS

Sample No. ~	Date	Sample Location (See Tables 3 & 4 and Figures 1 & 2)	Depth (ft.)	Headspace Result (ppm) ^	Sample Classification
Boring B1					
MW9-S1	2/1/2000	Boring No. MW9, Sample No. 1	2.5-4.0	9.8	Brown, silty, gravelly SAND; moist
MW9-S2*	2/1/2000	Boring No. MW9, Sample No. 2	5.0-7.0	481	Gray, sandy SILT; moist; petroleum odor
MW9-S3	2/1/2000	Boring No. MW9, Sample No. 3	7.5-9.5	64	Gray SILT; moist; petroleum odor
Groundwater					
MW3*	2/2/2000	Monitoring Well MW3	12.02	-	Groundwater
MW6*	2/2/2000	Monitoring Well MW6	18.75	-	Groundwater
MW7*	2/2/2000	Monitoring Well MW7	17.13	-	Groundwater
MW8*	2/2/2000	Monitoring Well MW8	5.36	-	Groundwater
MW10*	2/2/2000	Duplicate of Sample MW8	5.36	-	Groundwater
Quality Control					
TBS*	2/1/2000	Trip blank accompanied soil sample jars to/from laboratory	-	-	Methanol and Ottawa Sand
TB*	2/2/2000	Trip blank accompanied water sample bottles to/from laboratory	-	-	Organic Free Water

KEY	DESCRIPTION
*	Sample analyzed by the laboratory
-	Not applicable
^	Field screening instrument was an 580B OVM PID
~	Sample number preceded by Y5954 on chain-of-custody

0000736

WATER LEVEL MEASUREMENT DATA

WELL NUMBER	MW3	MW6	MW7	MW8	MW9
DATE WATER LEVEL MEASURED	2/2/2000	2/2/2000	2/2/2000	2/2/2000	2/2/2000
TIME WATER LEVEL MEASURED	11:10	11:00	11:05	11:15	11:20
MP ELEVATION, FT	NM	NM	NM	NM	NM
DEPTH TO WATER BELOW MP, FT	12.02	18.75	17.13	5.36	9.17
WATER LEVEL ELEVATION, FT	NM	NM	NM	NM	NM

SAMPLING/PURGING DATA

WELL NUMBER	MW3	MW6	MW7	MW8	MW9
DATE SAMPLED	2/2/2000	2/2/2000	2/2/2000	2/2/2000	2/2/2000
TIME SAMPLED	13:00	11:40	12:20	13:50	NS
DEPTH TO WATER BELOW MP, FT	12.02	18.75	17.13	5.36	9.17
TOTAL DEPTH OF WELL BELOW MP, FT	20.01	24.16	20.79	7.09	9.55
WATER COLUMN IN WELL, FT	7.99	5.41	3.66	1.73	0.38
GALLONS PER FOOT	0.16	0.16	0.16	0.16	0.16
GALLONS IN WELL	1.28	0.87	0.59	0.28	0.06
TOTAL GALLONS PUMPED/BAILED	4.0	4.0	3.0	1.5	0
TEMPERATURE, C	3.8	3.9	3.7	3.9	NM
SPECIFIC CONDUCTANCE, UMHOS/CM	223	123	221	410	NM
pH	6.58	6.38	6.41	6.87	NM
DISSOLVED OXYGEN, PPM	0.8	0.5	2.0	1.2	NM
DIAMETER OF WELL CASING	2-inch	2-inch	2-inch	2-inch	2-inch
REMARKS					

Purging & Sampling Method: Submersible Pump
Sampling Personnel: Stafford Glashan

KEY

MP = Measuring Point
NM = Not Measured
NS = Not Sampled

TABLE 4 - SUMMARY OF ANALYTICAL RESULTS

GROUNDWATER

			Source of Sample, Sample Number and Depth in Feet (See Table 3 and Attachment 1)					
			Well MW3	Well MW6	Well MW7	Well MW8		Quality Control
		Cleanup	MW3	MW6	MW7	MW8	MW10^	TB
Parameter Tested	**Method***	**Level**	12.02	18.75	17.13	5.36	5.36	-
Diesel Range Organics (DRO) - ppm	AK 102	1.5	<0.395	0.419	<0.357	12.0	11.6	-
Gasoline Range Organics (GRO) - ppm	AK 101	1.3	<0.0900	<0.0900	<0.0900	0.31	0.33	<0.0900
Aromatic Volatile Organics (BTEX)								
Benzene - ppm	EPA 602	0.005	<0.00050	<0.00050	<0.00050	0.161	0.172	<0.00050
Toluene - ppm	EPA 602	1	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Ethylbenzene - ppm	EPA 602	0.7	<0.0020	<0.0020	<0.0020	0.00468	0.00532	<0.0020
Xylenes - ppm	EPA 602	10	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Polynuclear Aromatic Hydrocarbons (PAHs) - ppm	EPA 610	Various	-	ND	-	-	-	-

SOIL

			Source of Sample, Sample Number and Depth in Feet (See Table 2 and Attachment 1)					
			Boring MW9	Quality Control				
		Cleanup	MW9-S2	TBS				
Parameter Tested	**Method***	**Level**	5.0-7.0	-				
Total Solids - percent	SM18 2540G	NA	88.7	100				
Diesel Range Organics (DRO) - ppm	AK 102	250	1330	-				
Gasoline Range Organics (GRO) - ppm	AK 101	300	3880	<2.49				
Aromatic Volatile Organics (BTEX)								
Benzene - ppm	EPA 8021B/AK 101	0.02	59.4	<0.0124				
Toluene - ppm	EPA 8021B/AK 101	5.4	244	<0.0498				
Ethylbenzene - ppm	EPA 8021B/AK 101	5.5	61.3	<0.0498				
Xylenes - ppm	EPA 8021B/AK 101	78	282.2	<0.0498				

KEY	DESCRIPTION
*	See Attachment 1 for compounds tested and limits of detection
ND	Analyte not detected
-	Sample not analyzed for parameter
<0.395	Analyte below laboratory reporting limit of 0.395 ppm
^	Duplicate of Sample MW8
NA	Not Applicable

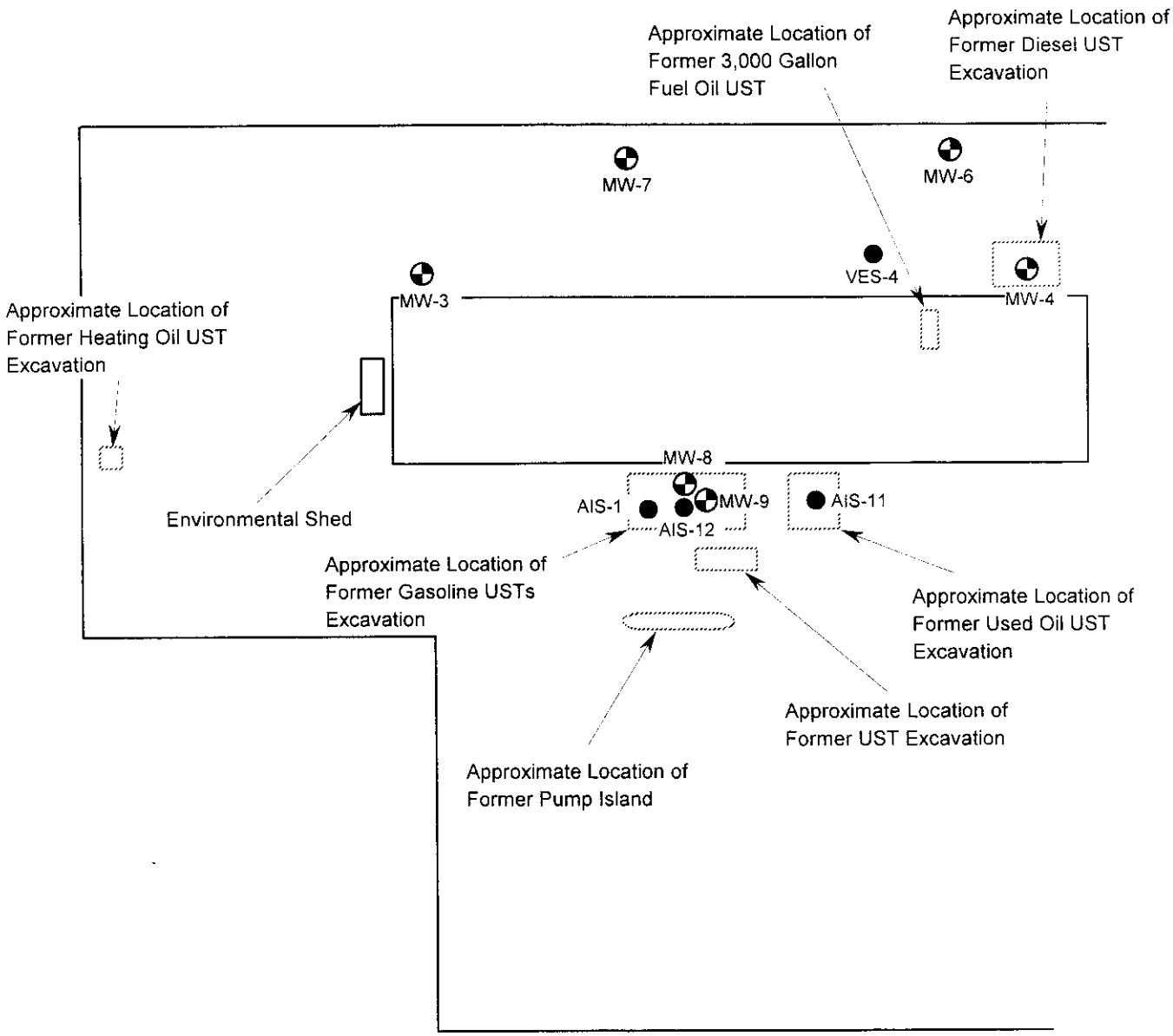
0000738

TABLE 5 - CUMULATIVE SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

Monitoring Well	Date	DRO ppm	GRO ppm	Benzene ppm
MW3	8/27/1998	0.206	--	--
	12/31/1998	0.669	--	--
	3/19/1999	<0.333	--	--
	6/23/1999	0.427	--	--
	9/30/1999	4.42	--	--
	2/2/2000	<0.395	<0.0900	<0.0050
MW6	8/27/1998	0.282	--	--
	12/31/1998	0.759	--	--
	3/19/1999	1.21	--	--
	6/23/1999	2.17	--	--
	9/30/1999	1.43	--	--
	2/2/2000	0.419	<0.0900	<0.0050
MW7	8/27/1998	<0.104	--	--
	12/31/1998	0.158	--	--
	3/19/1999	<0.309	--	--
	6/23/1999	<0.297	--	--
	9/30/1999	<0.319	--	--
	2/2/2000	<0.357	<0.0900	<0.0050
MW8	6/23/1999	7.53	0.25	0.103
	9/30/1999	5.34	0.22	0.0599
	2/2/2000	12.0	0.33	0.172

KEY	DESCRIPTION
ND	Analyte not detected
--	Sample not analyzed for parameter
<0.333	Analyte below laboratory reporting limit of 0.333 ppm

93006739



0 30 60 120

Approximate Scale in Feet

LEGEND

MW-7 Approximate location of monitoring well MW-7.

AIS-11 Approximate location of Air Injection Well AIS-11.

Note: Site Plan derived from Harding Lawson Associates, May 1993

N

1201 East Third Avenue
Anchorage, Alaska

SITE MAP

March 2000 Y-5954-2

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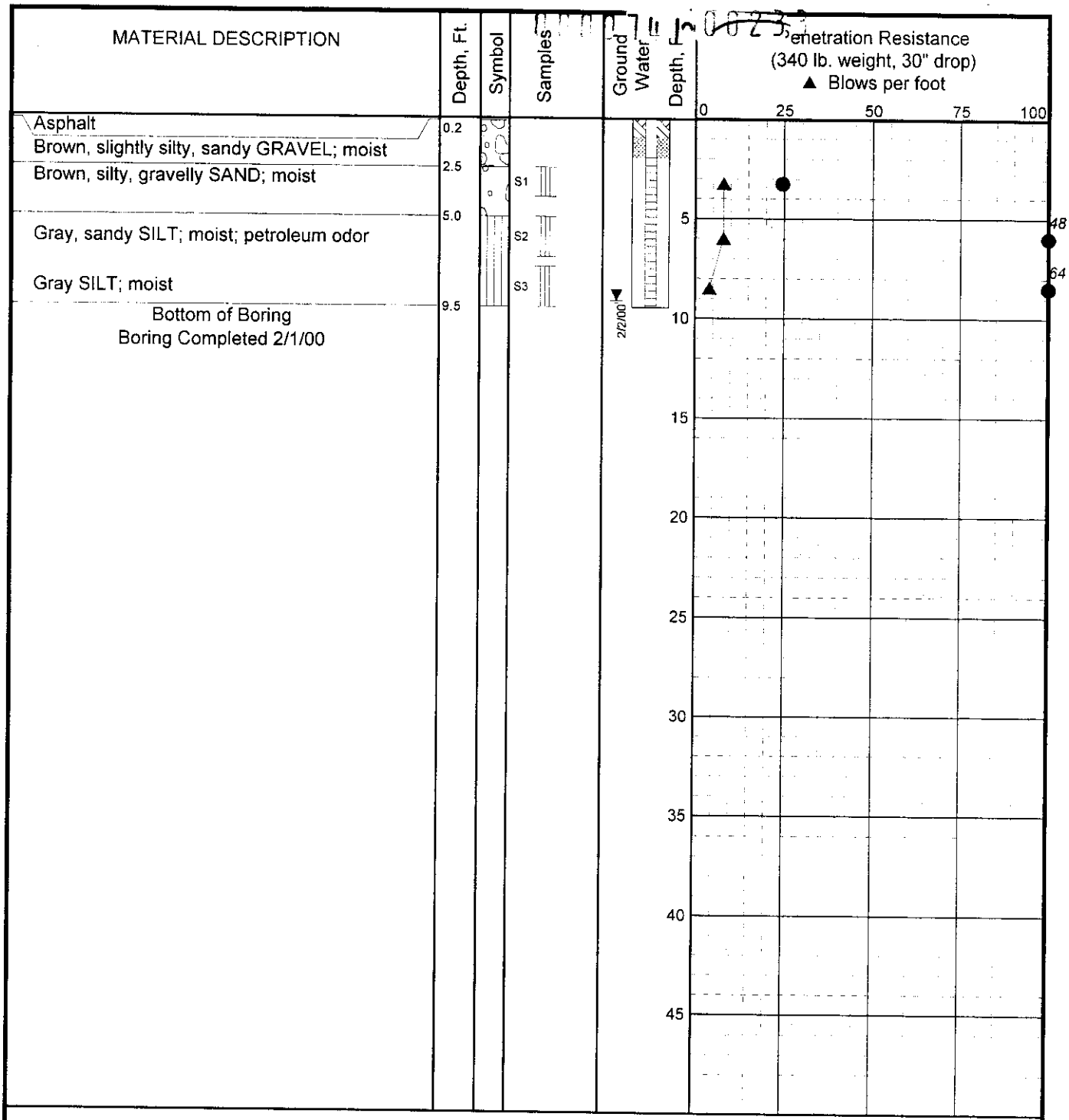
Fig. 1



LEGEND

- * Sample Not Recovered
- 2" O.D. Split Spoon Sample
- 3" O.D. Split Spoon Sample
- Surface Seal
- Solid Casing and Annular Sealant
- Well Screen and Filter Sand
- Cuttings Backfill
- Ground Water Level ATD
- Static Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. USC letter symbol based on visual classification.

1201 East Third Avenue
Anchorage, Alaska

LOG OF BORING NO. MW9

March 2000 Y-5954-2

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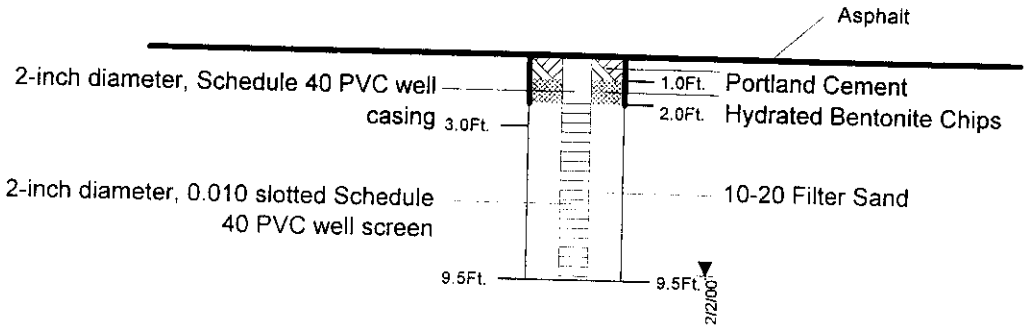
Fig. 2

MASTER LOG Y5954-2.GPJ SHAN_WIL.GDT 3/1/00

Casing Description

Backfill Description



LEGEND

▽ Ground Water Level ATD

▼ Static Ground Water Level

NOTE: All joints use threaded connections.

1201 East Third Avenue
Anchorage, Alaska

MONITORING WELL MW9
CONSTRUCTION DETAIL

March 2000 Y-5954-2

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Fig. 3

ATTACHMENT 1

RESULTS OF ANALYTICAL TESTING BY

CT&E ENVIRONMENTAL SERVICES, INC.,

ANCHORAGE, ALASKA

CT&E Environmental Services Inc.

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.cteesi.com

Dan McMahon Stafford Glashan
Shannon & Wilson Inc.
5430 Fairbanks Street Ste 3
Anchorage, AK 99518

Work Order:	1000415
	Y5954-2 ML&P Site 3
Client:	Shannon & Wilson Inc.
Report Date:	February 10, 2000

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintaned by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U	Indicates the analyte was analyzed for but not detected.
J	Indicates an estimated value that falls below PQL, but is greater than the MDL.
B	Indicates the analyte is found in the blank associated with the sample.
*	The analyte has exceeded allowable limits.
GT	Greater Than
D	Secondary Dilution
LT	Less Than
!	Surrogate out of range

0000745

CT&E Environmental Services Inc.

CT&E Ref.#	1000415001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/10/2000 9:03
Project Name/#	Y5954-2 ML&P Site 3	**Collected Date/Time**	02/01/2000 10:25
Client Sample ID	Y5954-MW9-S2	**Received Date/Time**	02/01/2000 16:15
Matrix	Soil/Solid	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

DRO/RRO - Pattern consistent with weathered middle distillate.

DRO/RRO - Surrogate recoveries outside controls due to matrix interference.

GRO/BTEX- Surrogate recoveries do not meet QC goals due to sample dilution. Results are not affected.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
SOLIDS								
Total Solids	88.7		%	SM18 2540G			02/08/00	KWM
VOLATILE FUELS DEPT								
Gasoline Range Organics	3880	164	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Benzene	59.4	0.818	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Toluene	244	3.27	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Ethylbenzene	61.3	3.27	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
P & M -Xylene	205	3.27	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
o-Xylene	77.2	3.27	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	4170 !		%	AK101/8021B	50-150	02/01/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	2410 !		%	AK101/8021B	60-120	02/01/00	02/04/00	MAH
SEMI VOA FUELS DEPT								
Diesel Range Organics	1330	110	mg/Kg	AK102 DRO		02/03/00	02/06/00	MMP
Surrogates								
5a Androstane <surr>	292 !		%	AK102 DRO	50-150	02/03/00	02/06/00	MMP

0000746

~~00238~~

CT&E Environmental Services Inc.

CT&E Ref.#	1000415002	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/10/2000 9:03
Project Name/#	Y5954-2 ML&P Site 3	**Collected Date/Time**	02/01/2000 0:00
Client Sample ID	Y5954-TBS	**Received Date/Time**	02/01/2000 16:15
Matrix	Soil/Solid	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shawn Paton

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
SOLIDS								
Total Solids	100		%	SM18 2540G			02/08/00	KWM
VOLATILE FUELS DEPT								
Gasoline Range Organics	2.49 U	2.49	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Benzene	0.0124 U	0.0124	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Toluene	0.0498 U	0.0498	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Ethylbenzene	0.0498 U	0.0498	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
P & M -Xylene	0.0498 U	0.0498	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
o-Xylene	0.0498 U	0.0498	mg/Kg	AK101/8021B		02/01/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	94.2		%	AK101/8021B	50-150	02/01/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	97.9		%	AK101/8021B	50-150	02/01/00	02/04/00	MAH

1000415

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN OF CUSTODY RECORD

Page 1 of 1
Laboratory CT+E
Attn: Shane

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

1354 N. Grandridge Blvd.
Kennewick, WA 99336
(509) 735-1280

2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	GRO/BTEX AK101/BO21	DRO AK102					Total Number of Containers	Remarks/Matrix
Y5954-MW9-S2	①	1025	2/1/00			X	X					2	Soil
Y5954-TBS	②		2/1/00			X						1	trip blank

Project Information	
Project Number: Y5954-2	
Project Name: ML&P Site 3	
Contact: D McMahon	
Ongoing Project? Yes ☒ No ☐	
Sampler: DM	

Sample Receipt	
Total Number of Containers	
COC Seals/Intact? Y/N/NA	
Received Good Cond./Cold	
Delivery Method: (attach shipping bill, if any)	

Instructions
Requested Turn Around Time: Normal
Special Instructions:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: [signature] Time: 1615	Signature: Time:	Signature: Time:
Printed Name: Dan McMahon Date: 2/1/00	Printed Name: Date:	Printed Name: Date:
Company: Shannon & Wilson	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Joyce M Windebank Time: 16/5	Signature: Time:	Signature: Time:
Printed Name: Joyce M Windebank Date: 2-1-00	Printed Name: Date:	Printed Name: Date:
Company: CTE Anch	Company:	Company:

F-19-91/UR

No.

CT&E Environmental Services Inc.

0000748 ~~020240~~

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.cteesi.com

Dan McMahon
Shannon & Wilson Inc.
5430 Fairbanks Street, Suite 3
Anchorage, AK 99518

Work Order:	1000438
	Y5954-2 ML&P
Client:	Shannon & Wilson Inc.
Report Date:	February 10, 2000

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintaned by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

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If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U	Indicates the analyte was analyzed for but not detected.
J	Indicates an estimated value that falls below PQL, but is greater than the MDL.
B	Indicates the analyte is found in the blank associated with the sample.
*	The analyte has exceeded allowable limits.
GT	Greater Than
D	Secondary Dilution
LT	Less Than
!	Surrogate out of range

CT&E Environmental Services Inc.

CT&E Ref.#	1000438001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/10/2000 17:49
Project Name/#	Y5954-2 ML&P	**Collected Date/Time**	02/03/2000 13:30
Client Sample ID	Y5954-VEAIS	**Received Date/Time**	02/03/2000 14:00
Matrix	Gas & Air	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shannon Parker

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	20.0 U	20.0	ppm	CTE 8015M/8021B		02/09/00	02/09/00	MAH
Benzene	0.780 U	0.780	ppm	CTE 8015M/8021B		02/09/00	02/09/00	MAH
Toluene	0.660 U	0.660	ppm	CTE 8015M/8021B		02/09/00	02/09/00	MAH
Ethylbenzene	0.580 U	0.580	ppm	CTE 8015M/8021B		02/09/00	02/09/00	MAH
P & M -Xylene	0.580 U	0.580	ppm	CTE 8015M/8021B		02/09/00	02/09/00	MAH
o-Xylene	0.580 U	0.580	ppm	CTE 8015M/8021B		02/09/00	02/09/00	MAH

1000438

CHAIN OF CUSTODY RECORD

1 of 1

Laboratory CTE

Attn: Steve

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

1354 N. Grandridge Blvd.
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2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	T-PH 8015	VPH	EPA 8021 B BTEX					Total Number of Containers	Remarks/Matrix
K6954-AWES VEALS		1330	2/3/00		X	X	X						1	Water

Project Information

Project Number: K5954-2
Project Name: MLP
Contact: DM
Ongoing Project? Yes ☒ No ☐
Sampler: SSC

Sample Receipt

Total Number of Containers:
COC Seals/Intact? Y/N/NA:
Received Good Cond./Cold:
Delivery Method:
(attach shipping bill, if any)

Instructions

Requested Turn Around Time: Normal
Special Instructions:

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 1400	Signature: Time:	Signature: Time:
Printed Name: Date: 2/3/00 Steve Stanford	Printed Name: Date:	Printed Name: Date:
Company: SAW	Company:	Company:
Received By: 1.	**Received By: 2.**	**Received By: 3.**
Signature: Time: 1400 Joyce M Windebank	Signature: Time:	Signature: Time:
Printed Name: Date: Joyce M Windebank	Printed Name: Date:	Printed Name: Date:
Company: CTE Anch	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

No. _____

0000751 00243

CT&E Environmental Services Inc.

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.cteesi.com

Dan McMahon Stafford Glashan
Shannon & Wilson Inc.
5430 Fairbanks Street Ste 3
Anchorage, AK 99518

Work Order:	1000427
	Y5954-2 MLP
Client:	Shannon & Wilson Inc.
Report Date:	February 16, 2000

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintaned by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U	Indicates the analyte was analyzed for but not detected.
J	Indicates an estimated value that falls below PQL, but is greater than the MDL.
B	Indicates the analyte is found in the blank associated with the sample.
*	The analyte has exceeded allowable limits.
GT	Greater Than
D	Secondary Dilution
LT	Less Than
!	Surrogate out of range

0000752

~~03244~~

CT&E Environmental Services Inc.

CT&E Ref.#	1000427001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 13:00
Client Sample ID	Y5954-MW3	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Benzene	0.00050 U	0.00050	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Toluene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Ethylbenzene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
o-Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	89.8		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	105		%	AK101/602 Combo	60-120	02/04/00	02/04/00	MAH
SEMI VOA FUELS DEPT								
Diesel Range Organics	0.395 U	0.395	mg/L	AK102 DRO		02/04/00	02/05/00	MMP
Surrogates								
5a Androstane <surr>	69		%	AK102 DRO	50-150	02/04/00	02/05/00	MMP

0000753 ~~00245~~

CT&E Environmental Services Inc.

CT&E Ref.#	1000427002	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 11:40
Client Sample ID	Y5954-MW6	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shawn Parker

Sample Remarks:
DRO/RRO - Unknown hydrocarbon with several peaks.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Benzene	0.00050 U	0.00050	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Toluene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Ethylbenzene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
o-Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	92.2		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	107		%	AK101/602 Combo	60-120	02/04/00	02/04/00	MAH
HPLC								
Naphthalene	12.0 U	12.0	ug/L	EPA 610		02/04/00	02/14/00	SPM
Acenaphthylene	12.0 U	12.0	ug/L	EPA 610		02/04/00	02/14/00	SPM
Acenaphthene	12.0 U	12.0	ug/L	EPA 610		02/04/00	02/14/00	SPM
Fluorene	1.20 U	1.20	ug/L	EPA 610		02/04/00	02/14/00	SPM
Phenanthrene	0.602 U	0.602	ug/L	EPA 610		02/04/00	02/14/00	SPM
Anthracene	0.602 U	0.602	ug/L	EPA 610		02/04/00	02/14/00	SPM
Fluoranthene	0.0301 U	0.0301	ug/L	EPA 610		02/04/00	02/14/00	SPM
Pyrene	0.602 U	0.602	ug/L	EPA 610		02/04/00	02/14/00	SPM
Benzo(a)Anthracene	0.0120 U	0.0120	ug/L	EPA 610		02/04/00	02/14/00	SPM
Chrysene	0.602 U	0.602	ug/L	EPA 610		02/04/00	02/14/00	SPM
Benzo[b]Fluoranthene	0.0120 U	0.0120	ug/L	EPA 610		02/04/00	02/14/00	SPM
Benzo[k]fluoranthene	0.0120 U	0.0120	ug/L	EPA 610		02/04/00	02/14/00	SPM
Benzo[a]pyrene	0.0602 U	0.0602	ug/L	EPA 610		02/04/00	02/14/00	SPM
Dibenzo[a,h]anthracene	0.120 U	0.120	ug/L	EPA 610		02/04/00	02/14/00	SPM
Benzo[g,h,i]perylene	0.0602 U	0.0602	ug/L	EPA 610		02/04/00	02/14/00	SPM
Indeno[1,2,3-c,d] pyrene	0.120 U	0.120	ug/L	EPA 610		02/04/00	02/14/00	SPM
Surrogates								

0000754

CT&E Environmental Services Inc.

CT&E Ref.#	1000427002	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 11:40
Client Sample ID	Y5954-MW6	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By			

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
HPLC								
P-Terphenyl <Surr>	100		%	EPA 610	47-115	02/04/00	02/14/00	SPM
2-Fluorobiphenyl <Surr>	81.7		%	EPA 610	32-99	02/04/00	02/14/00	SPM
SEMI VOA FUELS DEPT								
Diesel Range Organics	0.419	0.357	mg/L	AK102 DRO		02/04/00	02/05/00	MMP
Surrogates								
5a Androstane <surr>	115		%	AK102 DRO	50-150	02/04/00	02/05/00	MMP

CT&E Environmental Services Inc.

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CT&E Ref.#	1000427003	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 12:30
Client Sample ID	Y5954-MW7	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shawn Paxton

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Benzene	0.00050 U	0.00050	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Toluene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Ethylbenzene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
o-Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	92.4		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	108		%	AK101/602 Combo	60-120	02/04/00	02/04/00	MAH
SEMI VOA FUELS DEPT								
Diesel Range Organics	0.357 U	0.357	mg/L	AK102 DRO		02/04/00	02/05/00	MMP
Surrogates								
5a Androstane <surr>	97.7		%	AK102 DRO	50-150	02/04/00	02/05/00	MMP

CT&E Environmental Services Inc.

0000756

CT&E Ref.#	1000427004	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 13:50
Client Sample ID	Y5954-MW8	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shawn Paton

Sample Remarks:

DRO - Heavier hydrocarbons contributing to diesel range quantitation.

DRO/RRO - Pattern consistent with lube oil.

DRO - Surrogate does not meet QC goals due to heaveier hydrocarbon interference.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	0.31	0.0900	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Benzene	0.161	0.00050	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Toluene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Ethylbenzene	0.00468	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
o-Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	92		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	114		%	AK101/602 Combo	60-120	02/04/00	02/04/00	MAH
SEMI VOA FUELS DEPT								
Diesel Range Organics	12.0	0.345	mg/L	AK102 DRO		02/04/00	02/05/00	MMP
Surrogates								
5a Androstane <surr>	323 !		%	AK102 DRO	50-150	02/04/00	02/05/00	MMP

CT&E Environmental Services Inc.

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CT&E Ref.#	1000427005	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 14:00
Client Sample ID	Y5954-MW10	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shannon Parker

Sample Remarks:

DRO/RRO - Pattern consistent with lube oil.
DRO - Heavier hydrocarbons contributing to diesel range quantitation.
DRO - Surrogate does not meet QC goals due to heavier hydrocarbon interference.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	0.33	0.0900	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Benzene	0.172	0.00050	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Toluene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Ethylbenzene	0.00532	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
o-Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	90		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	116		%	AK101/602 Combo	60-120	02/04/00	02/04/00	MAH
SEMI VOA FUELS DEPT								
Diesel Range Organics	11.6	0.385	mg/L	AK102 DRO		02/04/00	02/05/00	MMP
Surrogates								
5a Androstane <surr>	293 !		%	AK102 DRO	50-150	02/04/00	02/05/00	MMP

CT&E Environmental Services Inc.

0000758

CT&E Ref.#	1000427006	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	02/16/2000 14:05
Project Name/#	Y5954-2 MLP	**Collected Date/Time**	02/02/2000 0:00
Client Sample ID	Y5954-TB	**Received Date/Time**	02/02/2000 14:30
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	Shawn Parker

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
VOLATILE FUELS DEPT								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Benzene	0.00050 U	0.00050	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Toluene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Ethylbenzene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
P & M -Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
o-Xylene	0.0020 U	0.0020	mg/L	AK101/602 Combo		02/04/00	02/04/00	MAH
Surrogates								
4-Bromofluorobenzene <Surr>	77.4		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH
1,4-Difluorobenzene <Surr>	99.4		%	AK101/602 Combo	50-150	02/04/00	02/04/00	MAH

1000427

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN OF CUSTODY RE(

Page 1 of 1
Laboratory CTE
Attn: Shane

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

1354 N. Grandridge Blvd.
Kennewick, WA 99336
(509) 735-1280

2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

6430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	AK101/602 GRO/BTEX	AK 102 DRO	PAH EPA 610				Total Number of Containers	Remarks/Matrix
Y5954-MW3	(1)	1300	2/2/00			X	X					4	H_2O
-MW6	(2)	1140				X	X	X				6	
-MW7	(3)	1220				X	X					4	
-MW8	(4)	1350				X	X					4	
-MW10	(5)	1400				X	X					4	
-TB	(6)					X						2	

Project Information		Sample Receipt	
Project Number:	Y5954-2	Total Number of Containers	
Project Name:	MCP	COC Seals/Intact? Y/N/NA	
Contact:	D2	Received Good Cond./Cold	6.1°
Ongoing Project?	Yes ☒ No ☐	Delivery Method:	
Sampler:	SJL	(attach shipping bill, if any)	

Instructions	
Requested Turn Around Time:	
Special Instructions:	Quote 3595 A MOA Subsurface

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Stafford Glashan Time: 1430	Signature: Time:	Signature: Time:
Printed Name: Stafford Glashan Date: 2/2/00	Printed Name: Date:	Printed Name: Date:
Company: 3C	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Rhonda Struchen Time: 1430	Signature: Time:	Signature: Time:
Printed Name: Rhonda Struchen Date: 2/2/00	Printed Name: Date:	Printed Name: Date:
Company: CTE	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No.

0000760 00252

ATTACHMENT 2

"IMPORTANT INFORMATION ABOUT YOUR

GEOTECHNICAL/ENVIRONMENTAL REPORT"

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to Y-5954-2
Dated: March 2000
To: Municipal Light and Power
Re: 1201 East Third Avenue

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

000763

~~00255~~

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

LETTER OF TRANSMITTAL

TO:
ADEC
555 Cordova Street
Anchorage, Alaska 99501

ATTENTION:
Mr. Robret Weimer

DATE:
October 18, 2000

JOB NUMBER:
Y-5954-2

L69.07

FROM:
Ms. Lena Hansen

RE:
1201 East Third Avenue

We are sending the following items:

☑Report ☐Proposal ☐Drawings ☐Sample ☐Specifications

☐ Other _____

Copies	Date	Description
1	10-18-00	~~February~~ August 2000 Site Activities at 1201 East Third Avenue, Municipal Light and Power Site 3, Anchorage, Alaska

The above are transmitted:

☑For your retention
☐For review and comment
☐Please return by:

☐For your use
☐For action specified below
☐Prints returned after use by us

☐As requested
☐With corrections

Remarks:

RECEIVED
OCT 20 2000
Dept. of Environmental Conservation
Underground Storage Tanks — FAP

Transmitted by:
Paula Lovett
Receptionist

5430 FAIRBANKS STREET, SUITE 3, ANCHORAGE, ALASKA 99518
PH: 907-561-2120 FAX: 907-561-4483

SHANNON & WILSON, INC.

October 16, 2000

Municipal Light and Power
1201 East Third Avenue
Anchorage, Alaska 99501

Attn: Ms. Jacqueline Rose Fax: 263-5836

RE: AUGUST 2000 SITE ACTIVITIES AT 1201 EAST THIRD AVENUE, MUNICIPAL LIGHT AND POWER SITE 3, ANCHORAGE, ALASKA

This letter report presents the results of our August 2000 site activities at Municipal Light and Power's (ML&P) Transformer Shop, 1201 East Third Avenue, Anchorage, Alaska. This work effort is in general accordance with our November 24, 1999 proposal which was approved by Mr. Jim Pfeiffer of ML&P on December 13, 1999, and Mr. Michael Krueger of the Municipality of Anchorage (MOA) on December 14, 1999. This report includes a summary of remediation system monitoring, product recovery, and groundwater sampling performed by Shannon & Wilson.

Remediation System Monitoring

A vapor sample, designated VES2, was collected from the exhaust stack of the on-site vapor extraction system (VES) on August 28, 2000. This is the third sampling of the VES as part of this project. The previous monitoring and sampling results for the remediation system have been provided in our May/June 2000 status report. Prior to the collection of the analytical vapor sample, field measurements of the stack exhaust were collected. Temperature and flame-ionization detector (FID) readings of the stack emissions were recorded and the velocity of air movement in the stack exhaust and the individual VES lines was determined using pitot tubes. Once these parameters stabilized, the analytical sample was collected from the VES exhaust sample port in a 1-liter stainless steel cylinder provided by the laboratory. A description of the VES sample and field measurements are provided in Table 1.

An evaluation of the air injection system (AIS) and VES was conducted on June 6 and June 26, 2000, in an effort to focus remedial effort in the former area of the USTs on the south side of the building. Three vertical air injection wells, designated AIS-10, AIS-11, and AIS-12 are located in this area. It was discovered that the air flow valve for AIS-12 was shut off. Additionally, it was discovered that AIS-12 was not connected to the AIS and that Monitoring Well MW-8 was the recipient of air flow for AIS-12. Inspection of AIS-12 indicated air bubbles reaching the water surface in the well were due to the air injection at AIS-10. Based on the absence of bubbling in Monitoring Well MW-9 (located approximately 3 feet from Monitoring

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[illegible] FAX 907-561-4483

Well MW-8) and the positive air flow exiting the well when opened, the air injection at Monitoring Well MW-8 appears to disperse through the unsaturated zone. The observation of bubbles entering AIS-12 suggests a reasonable degree of air injection surrounding AIS-10. Furthermore, the air injection at Monitoring Well MW-8 appears to provide subsurface air flow through the soils surrounding the well and this should enhance subsurface oxygen levels.

Product Recovery

Typically, a small amount of oily water has been removed from the Vapor Extraction well VES-4 on a quarterly basis. Because no product was found in this well in June 2000 by Alaska Pollution Control (APC), another product recovery effort was not initiated in August 2000.

Groundwater Sampling

Groundwater samples were collected from Monitoring Wells MW-3, MW-6, MW-7, and MW-9 on August 25, 2000. Monitoring Well MW-8 was dry at the time of sampling. The locations of the wells are shown in Figure 1. Prior to the collection of the groundwater samples, the four wells were each purged of a minimum of three well volumes of water using a variable-speed, submersible pump equipped with new disposable tubing. The purgewater from the five wells is being temporarily stored on-site in steel drums. The purgewater from the previous sampling events was collected by APC for treatment. At the time of sampling, temperature, specific conductance, dissolved oxygen, and pH values were measured in the groundwater collected from the five monitoring wells. Water level, purging, and sampling data for the sampling event are presented in Table 2.

Laboratory Analyses

The vapor sample from the VES discharge stack was submitted to CT&E Environmental Services, Inc. (CT&E) of Anchorage, Alaska and analyzed for aromatic volatile organics (BTEX) using EPA Method 8021B and gasoline range organics (GRO) using EPA Method 8015M.

The four groundwater samples, designated Samples MW3, MW6, MW7, and MW9 were submitted to CT&E and analyzed for diesel range organics (DRO) by Alaska Method 102 (AK 102), gasoline range organics (GRO) by AK 101, and aromatic volatile organics (BTEX) by EPA Method 8021B. In addition, Sample MW6 was analyzed for polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8310. A duplicate sample from Monitoring Well MW-9, designated Sample MW10, was analyzed for GRO, and BTEX. Monitoring Well MW-9 did not contain sufficient water to collect a DRO duplicate sample. A trip blank accompanied the samples to and from the laboratory and was analyzed for GRO and BTEX.

Analytical Results

Vapor Sample VES2 did not contain benzene, toluene, ethylbenzene, xylenes, or GRO above the laboratory reporting limit. The laboratory results of the vapor sample are summarized on Table 1 and a copy of the analytical report is included in Attachment 1. The previous samples of the VES discharge vapor, collected in September 1998, January 1999, and February 2000, did not contain detectable GRO or BTEX. The September 1999 sample contained 0.930 ppm toluene and 2.49 ppm xylenes but did not contain benzene, ethylbenzene, or GRO above the laboratory reporting limit. The May/June 2000 sample contained 0.591 ppm xylenes and did not contain benzene, toluene, ethylbenzene, or GRO above the laboratory reporting limit.

The analytical results of the groundwater samples are summarized in Table 3, while a cumulative summary of the current and previous analytical results is included in Table 4. The highest hydrocarbon concentrations were detected in Sample MW9, collected from Monitoring Well MW-9. Sample MW9 contained 36.1 ppm DRO, 47.6 ppm GRO, 9.25 ppm benzene, 8.15 ppm toluene, 0.605 ppm ethylbenzene, and 3.42 ppm xylenes. Sample MW10, a duplicate of Sample MW9, contained 67.1 ppm GRO, 12.7 ppm benzene, 11.5 ppm toluene, 0.886 ppm ethylbenzene, and 5.07 ppm xylenes.

Sample MW3, collected from Monitoring Well MW-3, was reported to contain 0.622 ppm DRO, 0.0194 ppm toluene and did not contain GRO, benzene, ethylbenzene or xylenes above the laboratory detection limit. Sample MW6, collected from Monitoring Well MW-6, did not contain DRO, GRO, or BTEX above the laboratory detection limit. Three PAH analytes were reported in Sample MW6 at levels below the applicable cleanup levels. Sample MW7, collected from Monitoring Well MW-7, did not contain DRO, GRO, or BTEX above the laboratory detection limit.

The groundwater at Monitoring Well MW-9 exceeds the ADEC cleanup levels for DRO (1.5 ppm), GRO (1.3 ppm), benzene (0.005 ppm), toluene (1.0 ppm), and ethylbenzene (0.7 ppm). The concentration of DRO and GRO in Monitoring Well MW-9 has increased, while the concentration of benzene has decreased from the previous sampling event. Based on the current analytical results, the groundwater at Monitoring Wells MW-3, MW-6, and MW-7 does not exceed the ADEC cleanup levels. As shown in Table 4, a DRO decreasing trend has been established in Monitoring Well MW-6 since the June 1999 peak. The DRO concentrations in Monitoring Well MW-3 usually range from non-detectable to 0.700 ppm, except 4.42 ppm DRO was reported in September 1999 (presumably due to biogenic matter). Monitoring Well MW-7 has a history of low or non-detectable DRO concentrations.

The laboratory noted that the DRO pattern for Sample MW3 contained an unknown hydrocarbon with several peaks. The laboratory also noted that the DRO pattern for Sample MW9 was consistent with weathered middle distillate.

A trip blank, designated TB, accompanied the sample bottles to and from the laboratory. The trip blank did not contain detectable concentrations of GRO or BTEX, indicating that cross-contamination did not occur during the handling of the samples. The individual laboratory reports for the recent sampling event are presented in Attachment 1.

Limitations

This report was prepared for the exclusive use of our client and their representatives in the monitoring of this site. The findings we have presented within this report are based on limited research and information provided by others and on the sampling and analysis that we conducted at this site. It is possible that our tests may have missed some higher levels of petroleum hydrocarbon constituents or hazardous substances. As a result, the analysis and sampling performed can only provide you with our best judgements as to the environmental characteristics of the sample locations, and in no way guarantees that an agency or its staff will reach the same conclusions as Shannon & Wilson, Inc. The data presented in this report should be considered representative of the time of our sampling. Changes in site conditions can occur with time, because of natural forces or human activity. In addition, changes in government codes, regulation or laws may occur. Because of such changes beyond our control, our observations and interpretations may need to be revised.

Shannon & Wilson has prepared Attachment 2, "Important Information About Your Geotechnical/Environmental Report", to assist you and others in understanding the use and limitations of our report. You are advised that various state and federal agencies (ADEC, EPA, etc.) may require the reporting of this information. Shannon & Wilson does not assume the responsibility for reporting these finding and therefore, has not, and will not disclose the results of this study, except with your permission or as required by law.

We appreciate this opportunity to be of service and your continued confidence in our firm. If you have any questions or comments concerning this report, please call the undersigned.

Sincerely,

SHANNON & WILSON, INC.

Prepared by:

Lena K. Hanson

Lena Hanson
Engineer I

Reviewed by:

John Spielman

John Spielman, C.P.G.
Principal Hydrogeologist

Enc: Tables 1, 2, 3, & 4, Figure 1, Attachments 1 and 2

cc: Mr. Michael Krueger, MOA

TABLE 1 - SUMMARY OF VAPOR SAMPLE FIELD MEASUREMENTS AND ANALYTICAL RESULTS

		Analytical Sample Number and Collection Date (See Attachment 1)		
Parameter Tested	**Method***	VES2 8/28/2000		
Exhaust Stack PID Reading - ppm	Sensidyne FID	6.6		
Exhaust Stack Temperature - Fahrenheit	Thermometer	91		
Exhaust Flow Pressure - inches water	Vacuum Gauge	53		
Exhaust Differential Pressure - inches water	Pitot Tube	0.26		
Exhaust Flow Velocity - fpm	Conversion Charts†	2000		
Aromatic Volatile Organics (BTEX)				
Benzene - ppm	EPA 8021B	<0.780		
Toluene - ppm	EPA 8021B	<0.660		
Ethylbenzene - ppm	EPA 8021B	<0.580		
Xylenes - ppm	EPA 8021B	<0.580		
Gasoline Range Organics (GRO) - ppm	EPA 8015M/8021B	<20.0		
Volatile Petroleum Hydrocarbons - lbs/day	Ideal Gas Law**	<1.4		

KEY	DESCRIPTION
*	See Attachment 1 For Detection Limits
**	Using a Gas Constant of R=75.6 Pa•m^3/Kg•K
†	Flow Rates Calculated From Pitot Tube/ Manometer Conversions
<0.780	Less Than The Detection Limit of 0.780 ppm

TABLE 2 - WATER SAMPLING

WATER LEVEL MEASUREMENT DATA

WELL NUMBER	MW-3	MW-6	MW-7	MW-8	MW-9
DATE WATER LEVEL MEASURED	8/25/2000	8/25/2000	8/25/2000	8/25/2000	8/25/2000
TIME WATER LEVEL MEASURED	12:10	12:00	12:05	12:13	12:15
MP ELEVATION, FT	98.41	99.30	97.02	96.43	96.49
DEPTH TO WATER BELOW MP, FT	13.87	18.05	16.76	NM	6.40
WATER LEVEL ELEVATION, FT	84.54	81.30	80.41	NM	92.10

SAMPLING/PURGING DATA

WELL NUMBER	MW-3	MW-6	MW-7	MW-8	MW-9
DATE SAMPLED	8/25/2000	8/25/2000	8/25/2000	NS	8/25/2000
TIME SAMPLED	14:00	12:35	13:15	NS	15:10
DEPTH TO WATER BELOW MP, FT	13.87	18.05	16.76	NM	6.40
TOTAL DEPTH OF WELL BELOW MP, FT	20.01	24.16	20.79	7.09	9.55
WATER COLUMN IN WELL, FT	6.14	6.11	4.03	NM	3.15
GALLONS PER FOOT	0.16	0.16	0.16	0.16	0.16
GALLONS IN WELL	0.98	0.98	0.64	0.0	0.50
TOTAL GALLONS PUMPED/BAILED	3.0	3.0	2.0	0.0	1.8
TEMPERATURE, C	9.6	11.5	10.0	NM	12.8
SPECIFIC CONDUCTANCE, UMHOS/CM	695	928	916	NM	1860
pH	7.11	5.19	6.03	NM	7.33
DISSOLVED OXYGEN, PPM	3.1	1.3	2.1	NM	1.8
DIAMETER OF WELL CASING	2-inch	2-inch	2-inch	2-inch	2-inch
REMARKS					Sheen

Purging & Sampling Method: Submersible Pump
Sampling Personnel: Lena Hanson

KEY

MP = Measuring Point
NM = Not Measured
NS = Not Sampled

TABLE 3 - SUMMARY OF ANALYTICAL RESULTS

			Sample Source, Sample Number & Depth in Feet (See Table 2, Figure 1, and Attachment 1)					
			Well MW-3	Well MW-6	Well MW-7	Well MW-9		QC
Parameter Tested	Method*	Cleanup Level	MW3 13.87	MW6 18.05	MW7 16.76	MW9 6.40	MW10^ -	TB -
Diesel Range Organics (DRO) - ppm	AK 102	1.5	0.622	<0.323	<0.333	36.1	-	-
Gasoline Range Organics (GRO) - ppm	AK 101	1.3	<0.0900	<0.0900	<0.0900	47.6	67.1	<0.0900
Aromatic Volatile Organics (BTEX)								
Benzene - ppm	EPA 8021B	0.005	<0.000500	<0.000500	<0.000500	9.25	12.7	<0.000500
Toluene - ppm	EPA 8021B	1	0.0194	<0.00200	<0.00200	8.15	11.5	<0.00200
Ethylbenzene - ppm	EPA 8021B	0.7	<0.00200	<0.00200	<0.00200	0.605	0.886	<0.00200
Xylenes - ppm	EPA 8021B	10	<0.00200	<0.00200	<0.00200	3.42	5.07	<0.00200
Polynuclear Aromatic Hydrocarbons (PAHs)								
Fluorene - ppm	EPA 8310	1.46	-	0.000118	-	-	-	-
Phenanthrene - ppm	EPA 8310	-	-	<0.0000556	-	-	-	-
Fluoranthene - ppm	EPA 8310	1.46	-	<0.0000556	-	-	-	-
Pyrene - ppm	EPA 8310	1.1	-	<0.0000556	-	-	-	-
Benzo(a)anthracene - ppm	EPA 8310	0.001	-	<0.0000556	-	-	-	-
Chrysene - ppm	EPA 8310	0.1	-	<0.0000556	-	-	-	-
Benzo(b)fluoranthene - ppm	EPA 8310	0.001	-	<0.0000556	-	-	-	-
Benzo(k)fluoranthene - ppm	EPA 8310	0.01	-	<0.0000556	-	-	-	-
Benzo(a)pyrene - ppm	EPA 8310	0.0002	-	<0.0000556	-	-	-	-
Benzo(g,h,i)perylene - ppm	EPA 8310	-	-	<0.0000556	-	-	-	-
Indeno(1,2,3-c,d)pyrene - ppm	EPA 8310	0.001	-	<0.0000556	-	-	-	-
Naphthalene - ppm	EPA 8310	1.5	-	0.0000797				
Acenaphthene - ppm	EPA 8310	2.2		0.000180				
Other Analytes - ppm	EPA 8310	-	-	ND	-	-	-	-

KEY	DESCRIPTION
*	See Attachment 1 for compounds tested and limits of detection
QC	Quality Control
ND	Analyte not detected
-	Not applicable or sample not analyzed for parameter
<0.319	Analyte below laboratory reporting limit of 0.319 ppm
^	Duplicate of Sample MW9

0000771

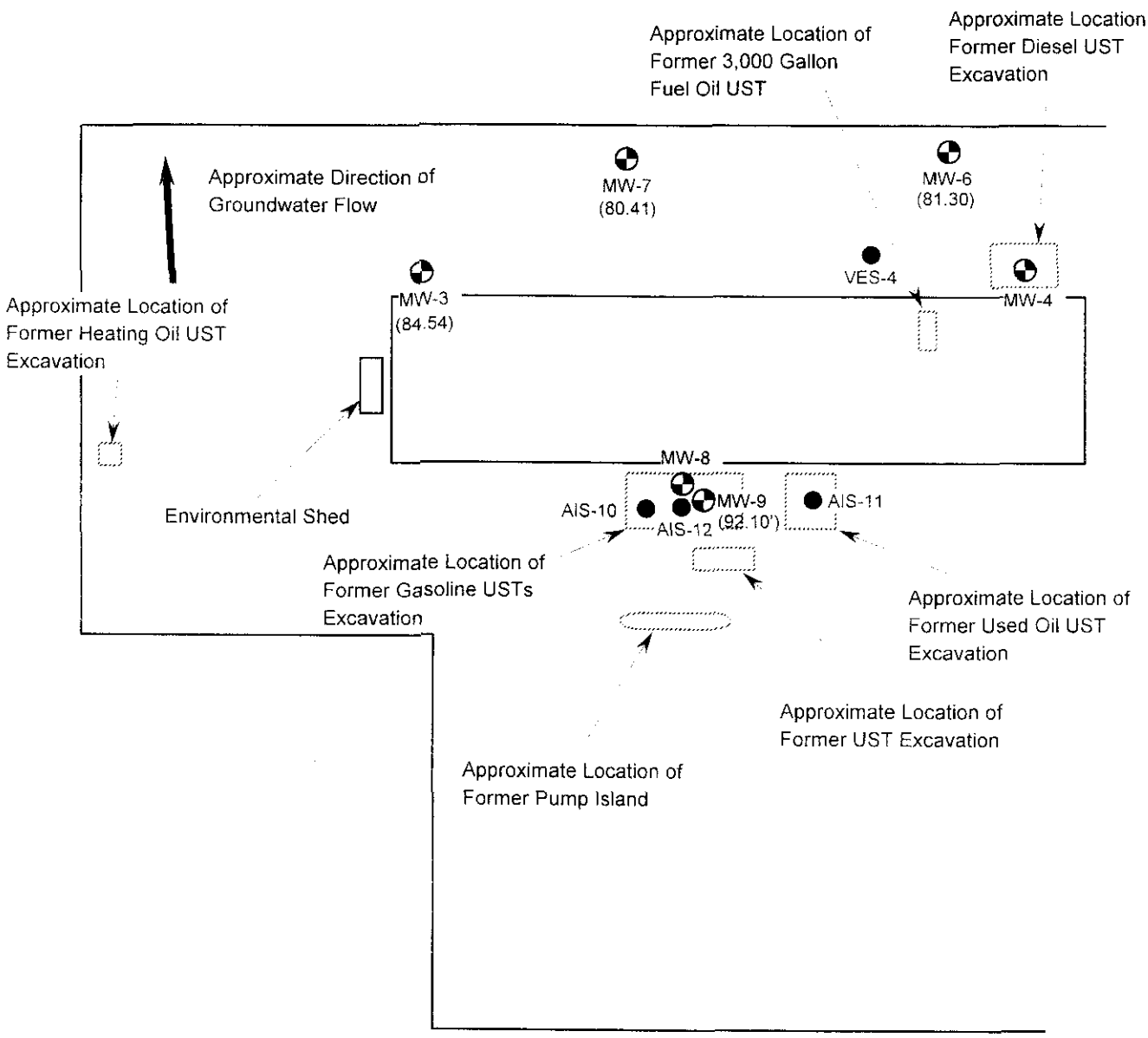
TABLE 4 - CUMULATIVE SUMMARY OF ANALYTICAL RESULTS

Monitoring Well	Date	DRO ppm	GRO ppm	Benzene ppm	Total BTEX ppm
MW-3	8/27/1998	0.206	--	--	--
(Main)	12/31/1998	0.669	--	--	--
	3/19/1999	<0.333	--	--	--
	6/23/1999	0.427	--	--	--
	9/30/1999	4.42	--	--	--
	2/2/2000	<0.395	<0.0900	<0.00050	--
	5/26/2000	0.700	<0.0900	<0.00050	--
	8/25/2000	0.622	<0.0900	<0.00050	0.0194
MW-6	8/27/1998	0.282	--	--	--
(Main)	12/31/1998	0.759	--	--	--
	3/19/1999	1.21	--	--	--
	6/23/1999	2.17	--	--	--
	9/30/1999	1.43	--	--	--
	2/2/2000	0.419	<0.0900	<0.00050	--
	5/26/2000	<0.674	<0.0900	<0.00050	--
	8/25/2000	<0.323	<0.0900	<0.00050	--
MW-7	8/27/1998	<0.104	--	--	--
(Main)	12/31/1998	0.158	--	--	--
	3/19/1999	<0.309	--	--	--
	6/23/1999	<0.297	--	--	--
	9/30/1999	<0.319	--	--	--
	2/2/2000	<0.357	<0.0900	<0.00050	--
	5/26/2000	<0.674	<0.0900	<0.00050	--
	8/25/2000	<0.333	<0.0900	<0.00050	--
MW-8	6/23/1999	7.53	0.25	0.103	0.109
	9/30/1999	5.34	0.22	0.0599	0.0759
	2/2/2000	12	0.33	0.172	0.177
	5/26/2000	4.73	0.94	0.473	0.473
MW-9	5/26/2000	18.8	31	7.97	19.8
	8/25/2000	36.1	47.6	~~3.42~~ 9.25	21.4

Abolish wells 8.15

KEY	DESCRIPTION
ND	Analyte not detected
--	Sample not analyzed for parameter
<0.333	Analyte below laboratory reporting limit of 0.333 ppm

0000773



0 30 60 120

Approximate Scale in Feet

LEGEND

MW-7 (80.41) Approximate location of Monitoring Well MW-7. Groundwater elevation in feet, measured August 2000.

AIS-11 Approximate location of Air Injection Well AIS-11.

Note: Site Plan derived from Harding Lawson Associates, May 1993

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1201 East Third Avenue
Anchorage, Alaska

SITE MAP

October 2000 Y-5954-2

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 1

ATTACHMENT 1

RESULTS OF ANALYTICAL TESTING BY

CT&E ENVIRONMENTAL SERVICES, INC.,

ANCHORAGE, ALASKA

0000775 00267

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.cteesi.com

Lena Hansen
Shannon & Wilson Inc.
5430 Fairbanks Street, Suite 3
Anchorage, AK 99518

Work Order:	1004977
	Y5954-2 1201 E 3rd Ave
Client:	Shannon & Wilson Inc.
Report Date:	September 12, 2000

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintaned by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U	Indicates the analyte was analyzed for but not detected.
J	Indicates an estimated value that falls below PQL, but is greater than the MDL.
B	Indicates the analyte is found in the blank associated with the sample.
*	The analyte has exceeded allowable limits.
GT	Greater Than
D	Secondary Dilution
LT	Less Than
!	Surrogate out of range

CT&E Environmental Services Inc.

CT&E Ref.#	1004977001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 12:35
Client Sample ID	Y5954-2-MW6	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

PAHSIM - The sample was extracted outside of hold time since original extraction had 2x surrogate added. The results confirm original quantitation. Results are not affected.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Benzene	0.000500 U	0.000500	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Ethylbenzene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
P & M -Xylene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
o-Xylene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Toluene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Surrogates								
1,4-Difluorobenzene <Surr>	81.4		%	AK101/8021B	60-120	09/03/00	09/03/00	MAH
4-Bromofluorobenzene <Surr>	78.1		%	AK101/8021B	50-150	09/03/00	09/03/00	MAH
Semivolatile Organic Fuels Department								
Diesel Range Organics	0.323 U	0.323	mg/L	AK102 DRO		08/30/00	08/31/00	MCM
Surrogates								
5a Androstane <surr>	73.3		%	AK102 DRO	60-120	08/30/00	08/31/00	MCM
Semivolatile Organic GC/MS								
Acenaphthylene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Acenaphthene	0.180	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Fluorene	0.118	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Phenanthrene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Anthracene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Fluoranthene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Pyrene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Benzo(a)Anthracene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Chrysene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Benzo[b]Fluoranthene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM

CT&E Ref.#	1004977001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 12:35
Client Sample ID	Y5954-2-MW6	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By			

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Semivolatile Organic GC/MS								
Benzo[k]fluoranthene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Benzo[a]pyrene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Indeno[1,2,3-c,d] pyrene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Dibenzo[a,h]anthracene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Benzo[g,h,i]perylene	0.0556 U	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Naphthalene	0.0797	0.0556	ug/L	PAH SIM		09/05/00	09/06/00	KWM
Surrogates								
Naphthalene-d8 <surr/IS>	48		%	PAH SIM	14-125	09/05/00	09/06/00	KWM
Acenaphthene-d10 <surr/IS>	59.6		%	PAH SIM	23-125	09/05/00	09/06/00	KWM
Chrysene-d12 <surr/IS>	87.1		%	PAH SIM	43-125	09/05/00	09/06/00	KWM

CT&E Environmental Services Inc.

0000778 200270

CT&E Ref.#	1004977002	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 13:15
Client Sample ID	Y5954-2-MW7	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Benzene	0.000500 U	0.000500	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Ethylbenzene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
P & M -Xylene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
o-Xylene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Toluene	0.00200 U	0.00200	mg/L	AK101/8021B		09/03/00	09/03/00	MAH
Surrogates								
1,4-Difluorobenzene <Surr>	81.2		%	AK101/8021B	60-120	09/03/00	09/03/00	MAH
4-Bromofluorobenzene <Surr>	78.6		%	AK101/8021B	50-150	09/03/00	09/03/00	MAH
Semivolatile Organic Fuels Department								
Diesel Range Organics	0.333 U	0.333	mg/L	AK102 DRO		08/30/00	08/31/00	MCM
Surrogates								
5a Androstane <surr>	84.8		%	AK102 DRO	60-120	08/30/00	08/31/00	MCM

CT&E Environmental Services Inc.

0000779 30271

CT&E Ref.#	1004977003	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 14:00
Client Sample ID	Y5954-2-MW3	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

DRO - Unknown hydrocarbon with several peaks.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department								
Gasoline Range Organics	0.0900 U	0.0900	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Benzene	0.000500 U	0.000500	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Ethylbenzene	0.00200 U	0.00200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
P & M -Xylene	0.00200 U	0.00200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
o-Xylene	0.00200 U	0.00200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Toluene	0.0194	0.00200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Surrogates								
1,4-Difluorobenzene <Surr>	83.7		%	AK101/8021B	60-120	09/04/00	09/04/00	MAH
4-Bromofluorobenzene <Surr>	77.6		%	AK101/8021B	50-150	09/04/00	09/04/00	MAH
Semivolatile Organic Fuels Department								
Diesel Range Organics	0.622	0.345	mg/L	AK102 DRO		08/30/00	08/31/00	MCM
Surrogates								
5a Androstane <surr>	101		%	AK102 DRO	60-120	08/30/00	08/31/00	MCM

CT&E Environmental Services Inc.

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CT&E Ref.#	1004977004	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 15:10
Client Sample ID	Y5954-2-MW9	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

DRO - Surrogate recoveries outside controls due to matrix interference.
DRO - Pattern consistent with weathered middle distillate.
GRO/BTEX - Surrogate recovery does not meet QC goals due to sample dilution. Results are not affected.

Parameter	Results		PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department									
Gasoline Range Organics	47.6		9.00	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Benzene	9.25		0.0500	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Ethylbenzene	0.605		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
P & M -Xylene	2.31		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
o-Xylene	1.11		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Toluene	8.15		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Surrogates									
1,4-Difluorobenzene <Surr>	0	!		%	AK101/8021B	60-120	09/04/00	09/04/00	MAH
4-Bromofluorobenzene <Surr>	427	!		%	AK101/8021B	50-150	09/04/00	09/04/00	MAH
Semivolatile Organic Fuels Department									
Diesel Range Organics	36.1		0.345	mg/L	AK102 DRO		08/30/00	08/31/00	MCM
Surrogates									
5a Androstane <surr>	225	!		%	AK102 DRO	60-120	08/30/00	08/31/00	MCM

0000781 00273

CT&E Environmental Services Inc.

CT&E Ref.#	1004977005	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 15:30
Client Sample ID	Y5954-2-MW10	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

GRO/BTEX - Surrogate recovery does not meet QC goals due to sample dilution. Results are not affected.

Parameter	Results		PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department									
Gasoline Range Organics	67.1		9.00	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Benzene	12.7		0.0500	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Ethylbenzene	0.886		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
P & M -Xylene	3.48		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
o-Xylene	1.59		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Toluene	11.5		0.200	mg/L	AK101/8021B		09/04/00	09/04/00	MAH
Surrogates									
1,4-Difluorobenzene <Surr>	0	!		%	AK101/8021B	60-120	09/04/00	09/04/00	MAH
4-Bromofluorobenzene <Surr>	396	!		%	AK101/8021B	50-150	09/04/00	09/04/00	MAH

CT&E Environmental Services Inc.

0000782

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CT&E Ref.#	1004977006	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/12/2000 16:45
Project Name/#	Y5954-2 1201 E 3rd Ave	**Collected Date/Time**	08/25/2000 0:00
Client Sample ID	Y954-2-TB	**Received Date/Time**	08/25/2000 15:35
Matrix	Water (Surface, Eff., Ground)	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department								
Benzene	0.000500 U	0.000500	mg/L	BTX SW846-8021B		09/03/00	09/04/00	MAH
Toluene	0.00200 U	0.00200	mg/L	BTX SW846-8021B		09/03/00	09/04/00	MAH
Ethylbenzene	0.00200 U	0.00200	mg/L	BTX SW846-8021B		09/03/00	09/04/00	MAH
P & M -Xylene	0.00200 U	0.00200	mg/L	BTX SW846-8021B		09/03/00	09/04/00	MAH
o-Xylene	0.00200 U	0.00200	mg/L	BTX SW846-8021B		09/03/00	09/04/00	MAH
Surrogates								
1,4-Difluorobenzene <Surr>	83.3		%	BTX SW846-8021B		09/03/00	09/04/00	MAH
4-Bromofluorobenzene <Surr>	80.1		%	BTX SW846-8021B		09/03/00	09/04/00	MAH

1004977

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN OF CUSTODY RECORD

400 N 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

1354 N. Grandridge Blvd.
Kennewick, WA 99336
(509) 735-1280

2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Attn: Shane

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	DRO AK102	GRO AK101	BTEX EPA8021B	PAHs EPA 8310			Total Number of Containers	Remarks/Matrix
Y5954-2-MW6	1	12:35	8-25-00		X	X	X	X	X			6	H2O
Y5954-2-MW7	2	13:15	8-25-00		X	X	X	X				4	
Y5954-2-MW3	3	14:00	8-25-00		X	X	X	X				4	
Y5954-2-MW9	4	15:10	8-25-00		X	X	X	X				3	
Y5954-2-MW10	5	15:30	8-25-00		X		X	X				2	
Y5954-2-TB	6							X				2	Trip Blank

Project Information	
Project Number:	Y5954-2
Project Name:	1201 E 3d Ave
Contact:	Lena Hanson
Ongoing Project?	Yes ☒ No ☐
Sampler:	LVH

Sample Receipt	
Total Number of Containers	
COC Seals/Intact? Y/N/NA	
Received Good Cond /Cold	
Delivery Method: (attach shipping bill, if any)	

Instructions	
Requested Turn Around Time:	normal
Special Instructions:	

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 15:35	Signature: Time:	Signature: Time:
Printed Name: Lena V. Hanson Date: 8-25-00	Printed Name: Date:	Printed Name: Date:
Company: Shannon & Wilson	Company:	Company:
Received By: 1.	**Received By: 2.**	**Received By: 3.**
Signature: Time: 15:35	Signature: Time:	Signature: Time:
Printed Name: Date: 8/25/00	Printed Name: Date:	Printed Name: Date:
Company: CT & E	Company:	Company:

F-19-91/UR

No.

CT&E Environmental Services Inc.

SAMPLE RECEIPT FORM

CT&E WO#: 1004977

Yes	No		
	✓	Are samples **RUSH**, priority, or *within 72 hrs* of **hold time**?	
		If yes, have you done *e-mail notification*?	
	✓	Are samples *within 24 hrs* of **hold time** or **due date**?	
		If yes, have you *spoken with* Supervisor?	
	✓	Are there any **problems** (e.g., ids, analyses)?	
	✓	Were samples preserved correctly and pH verified?	

HCl was added to #4
#6 (TB) has 5 mm bubble

	✓	Has Project Manager been notified of problems?	
	✓	Is this an ACOE/AFCEE/ADEC project?	
		Will a **data package** be required?	
		If this is for PWS, provide **PWSID**.	
		Is there a **quote** for this project?	
	✓	Will **courier** charges apply?	

Completed by (sign): _____ (print): _____

***** The following *must* be completed for *all* ACOE & AFCEE projects: *****

Yes	No		Notes:
		Is cooler temperature 4 ± C?	
		thermometer used:	
		Was there an airbill, etc? note #:	
		Was cooler sealed with custody seals?	
		#/where?	
		Were seals intact upon arrival?	
		Was there a COC with cooler?	
		Was the COC filled out properly?	
		Did the COC indicate ACOE/AFCEE project?	
		Did the COC and samples correspond?	
		Were samples screened with Geiger counter?	
		Were all samples packed to prevent breakage?	
		packing material:	
		Were all samples unbroken and clearly labelled?	
		Were all samples sealed in separate plastic bags?	
		Were all bottles for volatiles free of headspace?	
		Were correct container/sample sizes submitted?	
		Was client notified of problems? (specify below)	

Individual contacted: _____

Date & Time: _____ Phone/Fax #: _____

Due Date: 9/6/00
Received Date/Time: 8/25 - 15:35
Cooler Temperature: 3.2°C
Sample Condition: (Good) / Poor

Matrix of each Sample:

1	" "	1 - 5
	" "	
	" "	
	" "	
1	Trip Blank	6
	MS/MSD	

Additional Sample Remarks:

_____ AK101s/_____ 8260s field pres'd?
_____ Field-filtered for dissolved_____?
_____ Lab-filter for dissolved_____?
_____ Ref Lab required?
Notes:

# of each Container Received:

2	950 ml amber	unpres'd
7	950 ml amber	w/ HCl
	500 ml amber	w/ H2SO4
	1L cubies	unpres'd
	1L cubies	w/ HNO3
	1L cubies	w/ H2SO4
	1L cubies	w/ NaOH + ZnAc
	120 ml coli	bottles
	60 ml	Nalg
	8 oz amber	unpres'd
	4 oz amber	unpres'd
	4 oz w/ septa	w/ MeOH
12	40 ml vials	w/ HCl
	Other (specify)	
	Other (specify)	

#/Log In Proofed by: _____

Form Number: F004r2
Printed: 7/12/99

1004977

0004784

CT&E Environmental Services Inc.
Laboratory Division

Laboratory Analysis Report

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.cteesi.com

Lena Hansen
Shannon & Wilson Inc.
5430 Fairbanks Street, Suite 3
Anchorage, AK 99518

Work Order:	1005024
	Y5954-2 1201 E 3rd Ave ML & P
Client:	Shannon & Wilson Inc.
Report Date:	September 01, 2000

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintaned by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

U	Indicates the analyte was analyzed for but not detected.
J	Indicates an estimated value that falls below PQL, but is greater than the MDL.
B	Indicates the analyte is found in the blank associated with the sample.
*	The analyte has exceeded allowable limits.
GT	Greater Than
D	Secondary Dilution
LT	Less Than
!	Surrogate out of range

CT&E Environmental Services Inc.

0000736 ~~00278~~

CT&E Ref.#	1005024001	**Client PO#**	
Client Name	Shannon & Wilson Inc.	**Printed Date/Time**	09/01/2000 15:06
Project Name/#	Y5954-2 1201 E 3rd Ave ML & P	**Collected Date/Time**	08/28/2000 16:00
Client Sample ID	Y5954-2-VES2	**Received Date/Time**	08/29/2000 9:53
Matrix	Gas & Air	**Technical Director**	**Stephen C. Ede**
Ordered By		**Released By**	

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department								
Gasoline Range Organics	20.0 U	20.0	ppm	CTE 8015M/8021B		09/01/00	09/01/00	MAH
Benzene	0.780 U	0.780	ppm	CTE 8015M/8021B		09/01/00	09/01/00	MAH
Toluene	0.660 U	0.660	ppm	CTE 8015M/8021B		09/01/00	09/01/00	MAH
Ethylbenzene	0.580 U	0.580	ppm	CTE 8015M/8021B		09/01/00	09/01/00	MAH
P & M -Xylene	0.580 U	0.580	ppm	CTE 8015M/8021B		09/01/00	09/01/00	MAH
o-Xylene	0.580 U	0.580	ppm	CTE 8015M/8021B		09/01/00	09/01/00	MAH

1005024

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

CHAIN OF CUSTODY REC(

Page 1 of 1
Laboratory CTEE
Attn: Shane

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

1354 N. Grandridge Blvd
Kennewick, WA 99336
(509) 735-1280

2055 Hill Road
Fairbanks, AK 99709
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

2412 N. 30th St., Suite 201
Tacoma, WA 98407
(206) 759-0156

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab	BTEX EPA 8021B	GRO EPA 8015M/8021B	Total Number of Containers	Remarks/Matrix
Y5954-2VES2	(1)	16:00	8-28-00			X	X	1	Vapor

Project Information		Sample Receipt	
Project Number:	Y5954-2	Total Number of Containers	
Project Name:	1201 E 3d Ave, MLSP	COC Seals/Intact? Y/N/NA	
Contact:	Lena Hanson	Received Good Cond./Cold	
Ongoing Project?	Yes ☒ No ☐	Delivery Method:	
Sampler:	LVH	(attach shipping bill, if any)	

Instructions

Requested Turn Around Time: normal

Special Instructions:

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time: 9:53	Signature: Time:	Signature: Time:
Printed Name: Lena V. Hanson Date: 8-28-00	Printed Name: Date:	Printed Name: Date:
Company: Shannon & Wilson	Company:	Company:
Received By: 1.	**Received By: 2.**	**Received By: 3.**
Signature: Time: 9:53	Signature: Time:	Signature: Time:
Printed Name: Rebecca Tackett Date: 8-29	Printed Name: Date:	Printed Name: Date:
Company:	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No.

CT&E Environmental Services Inc.

SAMPLE RECEIPT FORM

CT&E WO#: 1005024

Yes	No		
	✓	Are samples **RUSH**, priority, or *within 72 hrs* of **hold time**?	
		If yes, have you done *e-mail notification*?	
	✓	Are samples *within 24 hrs* of **hold time** or **due date**?	
		If yes, have you *spoken with* Supervisor?	
	✓	Are there any **problems** (e.g., ids, analyses)?	
		Were samples preserved correctly and pH verified?	
	✓	Has Project Manager been notified of problems?	
	✓	Is this an ACOE/AFCEE/ADEC project?	
	✓	Will a **data package** be required?	
		If this is for PWS, provide **PWSID**.	
		Is there a **quote** for this project?	
	✓	Will **courier** charges apply?	

Completed by (sign): [signature] (print): Eva Thuncen

Due Date: 9/4/00
Received Date/Time: 8/29 - 9:53
Cooler Temperature: ambient
Sample Condition: (Good) / Poor

Matrix of each Sample:

4	" "	1
	" "	
	" "	
	" "	
	Trip Blank	
	MS/MSD	

Additional Sample Remarks:

	AK101s/_____ 8260s field pres'd?
	Field-filtered for dissolved_____?
	Lab-filter for dissolved_____?
	Ref Lab required?

Notes:

*** The following *must* be completed for *all* ACOE & AFCEE projects: ***

Yes	No		Notes:
		Is cooler temperature 4 ± C?	
		thermometer used:	
		Was there an airbill, etc? note #:	
		Was cooler sealed with custody seals?	
		#/where?	
		Were seals intact upon arrival?	
		Was there a COC with cooler?	
		Was the COC filled out properly?	
		Did the COC indicate ACOE/AFCEE project?	
		Did the COC and samples correspond?	
		Were samples screened with Geiger counter?	
		Were all samples packed to prevent breakage?	
		packing material:	
		Were all samples unbroken and clearly labelled?	
		Were all samples sealed in separate plastic bags?	
		Were all bottles for volatiles free of headspace?	
		Were correct container/sample sizes submitted?	
		Was client notified of problems?	(specify below)

Individual contacted:

Date & Time: Phone/Fax #:

# of each Container Received:

	950 ml amber	unpres'd
	950 ml amber	w/ HCl
	500 ml amber	w/ H2SO4
	1L cubies	unpres'd
	1L cubies	w/ HNO3
	1L cubies	w/ H2SO4
	1L cubies	w/ NaOH + ZnAc
	120 ml coli	bottles
	60 ml	Nalg
	8 oz amber	unpres'd
	4 oz amber	unpres'd
	4 oz w/ septa	w/ MeOH
	40 ml vials	w/ HCl
1	Other (specify)	S/S cylinder
	Other (specify)	

#/Log In Proofed by:

00000788

Form Number: F004r2
Printed: 7/12/99

ATTACHMENT 2

"IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT"

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to Y-5954-2
Dated: October 2000
To: ML&P
Re: 1201 E. 3d avenue

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland