HARTCROWSER

Hart Crowser, Inc.
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Fax 907.276.2104
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Earth and Environmental Technologies

A-8397-05

February 29, 1996

Mr. Jon Clark
Municipality of Anchorage
Department of Property and Facilities Management
3640 East Tudor Road
Anchorage, Alaska 99519-6650

Re: Remediation System Operation and Monitoring
November 1995 through January 1996
Anchorage Fire Department Station No. 4

Dear Mr. Clark:

This letter report presents the hydrocarbon recovery activities and results of groundwater sampling at the Municipality of Anchorage (MOA) Fire Department Station No. 4 (AFD-4) for the period of November 1995 through January 1996. AFD-4 is located at 4350 MacInnes Road in Anchorage, Alaska.

In January 1995, two recovery wells were installed at the site to collect floating hydrocarbons (Figure 1) using Petro-trap passive hydrocarbon pumps. Work was conducted in accordance with the Corrective Action Plan for this site dated October 19, 1994. This plan was approved by the Alaska Department of Environmental Conservation in a meeting with the MOA - Department of Property and Facility Management and Hart Crowser on January 13, 1995.

WORK PERFORMED BY HART CROWSER

Groundwater elevation and product thickness measurements were made in the monitoring wells (MW-1 through MW-4; Figure 1) on November 21 and December 22, 1995, and January 24, 1996 (Appendix A - Field Methods). Monitoring wells MW-2, MW-3, and MW-4 were purged and sampled on January 24, 1996. Samples were submitted to North Creek Analytical (NCA) laboratory for analyses of benzene, toluene, ethylbenzene, and xylenes (BTEX; EPA Method 8020) and diesel-range organics (DRO; EPA Method 8100M).

WATER TABLE CONDITIONS

Groundwater elevations in the monitoring wells, in general, declined by an average of 1.4 feet over the three month period (Figure 2). The inferred groundwater contours for this site for January 24, 1996 are presented on Figure 1. The groundwater flow direction is inferred to the northeast and the average hydraulic gradient was 0.011 feet/foot. This is generally consistent with previous observations.

HYDROCARBON THICKNESS AND RECOVERY

The hydrocarbon thickness in MW-1 is presented in Table 1 and a comparison between hydrocarbon thickness and groundwater elevation is presented in Figure 3. Hydrocarbon thickness ranged from 0.37 feet in October 1995 to 0.73 feet in December 1995. The thickness of the hydrocarbon layer in January 1996 (0.70 feet) was significantly thinner than in January 1995 (2.56 feet).

Product recovery from RW-1 has continued to be slow since the first quarter of the year with only 0.8 gallons recovered from this well over the quarter (Table 2). Between October 26, 1995 and January 24, 1996, 7.5 gallons of product were recovered from RW-2. A total 16.8 gallons of fuel has been collected since the inception of hydrocarbon recovery, the majority of which has been collected since late September 1995.

PURGE WATER OBSERVATIONS

No odor or sheen was observed in the purge water from MW-2, MW-3, or MW-4.

LABORATORY ANALYSES RESULTS

The results of BTEX laboratory analyses are summarized in Table 3a. No benzene was detected in any of the monitoring wells sampled, and in MW-2 0.0006 mg/L of toluene was detected. No other BTEX constituents were detected in the wells. The DRO results (Table 3b) ranged from 0.30 mg/L in the MW-2 and to 0.14 mg/L in MW-4. All laboratory reports are presented in Appendix B.

Data Validation

Laboratory Quality Control Data provided by NCA on groundwater samples collected at AFD-4 indicated that reported results met the data quality objectives outlined in the Hart

We trust that this report meets your needs. Any questions regarding the field work and this letter report, the presentation of the information, and the interpretation of the data are welcome and should be referred to Nino Muniz at (907) 276-7475.

Sincerely,

HART CROWSER, INC.

Herminio R. Muniz
Sr. Project Hydrogeologist

Mark G. Madden, P.E.
Associate

HRM/mm

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Attachments:

	Table 1	Groundwater Elevations and Hydrocarbon Thickness in MW-1
	Table 2	Hydrocarbon Recovery Record for RW-1 and RW-2
	Table 3a	Groundwater Laboratory Analyses Results - BTEX
	Table 3b	Groundwater Laboratory Analyses Results - DRO
	Figure 1	Site Plan and Water Table Elevation on July 27, 1995
	Figure 2	Monitoring Well Hydrographs
	Figure 3	Hydrocarbon Thickness and Groundwater Elevation in MW-1
	Appendix A	Field Explorations Methods and Analyses
	Appendix B	Laboratory Reports

REFERENCES

Hart Crowser, 1994; Remedial Site Investigation, Fire Station No. 4, Municipality of Anchorage, Anchorage, Alaska; 6 pp.

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TABLE 1: Groundwater Elevations and Hydrocarbon Thickness in MW-1
AFD - 4
Anchorage, Alaska

Date	Depth to Hydrocarbon (Feet)	Depth to Groundwater (Feet)	Groundwater Elevation (Feet) {1} {2}	Hydrocarbon Thickness (Feet)
8/1/94	Not Observed	10.30	89.07	0.00
8/10/94	9.73	10.58	89.50	0.85
9/8/94	9.99	11.86	89.08	1.87
1/24/95	10.69	13.43	88.24	2.74
1/27/95	10.77	13.33	88.19	2.56
2/3/95	10.99	12.19	88.19	1.20
2/10/95	10.97	12.15	88.21	1.18
2/15/95	10.85	11.97	88.34	1.12
2/24/95	10.88	12.09	88.30	1.21
3/9/95	11.03	12.33	88.13	1.30
3/27/95	11.20	12.56	87.95	1.36
4/21/95	9.34	9.92	89.94	0.58
5/22/95	7.86	8.19	91.46	0.33
6/12/95	8.29	8.60	91.03	0.31
7/7/95	8.83	9.19	90.48	0.36
7/17/95	9.02	9.35	90.30	0.33
7/27/95	8.57	8.96	90.74	0.39
8/3/95	8.08	8.44	91.23	0.36
8/29/95	8.60	8.95	90.71	0.35
9/28/95	8.43	8.81	90.88	0.38
10/25/95	8.68	9.05	90.63	0.37
11/21/95	9.11	9.51	90.20	0.40
12/22/95	9.74	10.47	89.51	0.73
1/24/96	10.15	10.85	89.11	0.70

Notes: PRODLVL.XLS

{1} Vertical Survey conducted on 7/2/94; elevation of 100.00 assumed at northeast corner of concrete flagpole footing.
MW-1 measuring point elevation =99.37

{2} Groundwater elevation corrected using measured hydrocarbon specific gravity of 0.84 as determined by laboratory.

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Table 2: Hydrocarbon Recovery Record for RW-1 and RW-2
AFD- 4
Anchorage, Alaska

Dates	Recovery Well RW-1 (Ounces)	Cumulative (Ounces)	Cumulative (Gallons)	Recovery Well RW-2 (Ounces)	Cumulative (Ounces)	Cumulative (Gallons)
1/25/95 - 2/15/95	328	328	2.6	0	0	0
2/16/95 - 3/9/95	55	383	3.0	0	0	0
3/10/95 - 3/24/95	7	390	3.0	0	0	0
3/25/95 - 3/29/95	Frozen	390	3.0	0	0	0
3/30/95 - 4/21/95	0	390	3.0	0	0	0
9/22/95-9/28/95	23	413	3.2	436	436	3.4
9/29/95-10/25/95	4	417	3.3	216	652	5.1
10/25/95-11/21/95	18	435	3.4	388	1040	8.1
11/22/95-12/22/95	72	507	4.0	463	1503	11.7
12/23/95-1/24/96	32	539	4.2	108	1611	12.6

NOTE: Hydrocarbon recovery system was out of service from April 22 through September 15, 1995 due to high water levels.

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Table 3a: Groundwater Laboratory Analysis Results - BTEX
AFD-4
Anchorage, Alaska

Monitoring Well	Benzene (mg/L) - EPA 5030/8020					
	8/1/94	1/25/95	4/21/95	7/27/95	10/26/95	1/24/96
MW-1	**2.3**	N/S {2}	N/S	N/S	N/S	N/S
Field Duplicate	**2.2**					
MW-2	ND(0.0005) {1}	N/S{3}	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)
Field Duplicate			ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)
MW-3	ND(0.0005)	ND(0.0005)	N/S{4}	ND(0.0005)	ND(0.0005)	ND(0.0005)
Field Duplicate		ND(0.0005)				
MW-4	**0.0005**	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)
Trip Blank	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)

Monitoring Well	Total BTEX (mg/L) - EPA 5030/8020					
	8/1/94	1/25/95	4/21/95	7/27/95	10/26/95	1/24/96
MW-1	**40**	N/S	N/S	N/S	N/S	N/S
Field Duplicate	**38**					
MW-2	**0.003**	N/S	ND	ND	ND	**0.0006**
Field Duplicate			ND	ND	ND	ND
MW-3	**0.006**	ND	N/S	ND	ND	ND
Field Duplicate		ND				
MW-4	**0.004**	ND	ND	ND	ND	ND
Trip Blank	ND	ND	ND	ND	ND	ND

NOTES: {1} ND(0.0005) - Not Detected (Detection Limit)
{2} N/S - Not sampled due to floating hydrocarbons in well.
{3} N/S - Not sampled due to large snowpile over well.
{4} N/S - Not sampled due to ice blockage in well riser.

H2OBTEX.XLS

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Table 3b: Groundwater Laboratory Analysis Results - DRO
AFD-4
Anchorage, Alaska

Monitoring Well	DRO (mg/L) - EPA 3510/8100M			
	4/21/95	7/27/95	10/26/95	1/24/96
MW-1	N/S {1}	N/S {1}	N/S {1}	N/S {1}
MW-2	ND(0.25)	**0.17**	**0.14**	**0.30**
Field Duplicate	ND(0.25)	**0.17**	**0.16**	**0.17**
MW-3	N/S {2}	**0.27**	**0.16**	**0.16**
MW-4	ND(0.25)	**0.16**	**0.13**	**0.14**

NOTES:

H20DRO.XLS

ND(0.0005) - Not Detected (Detection Limit)

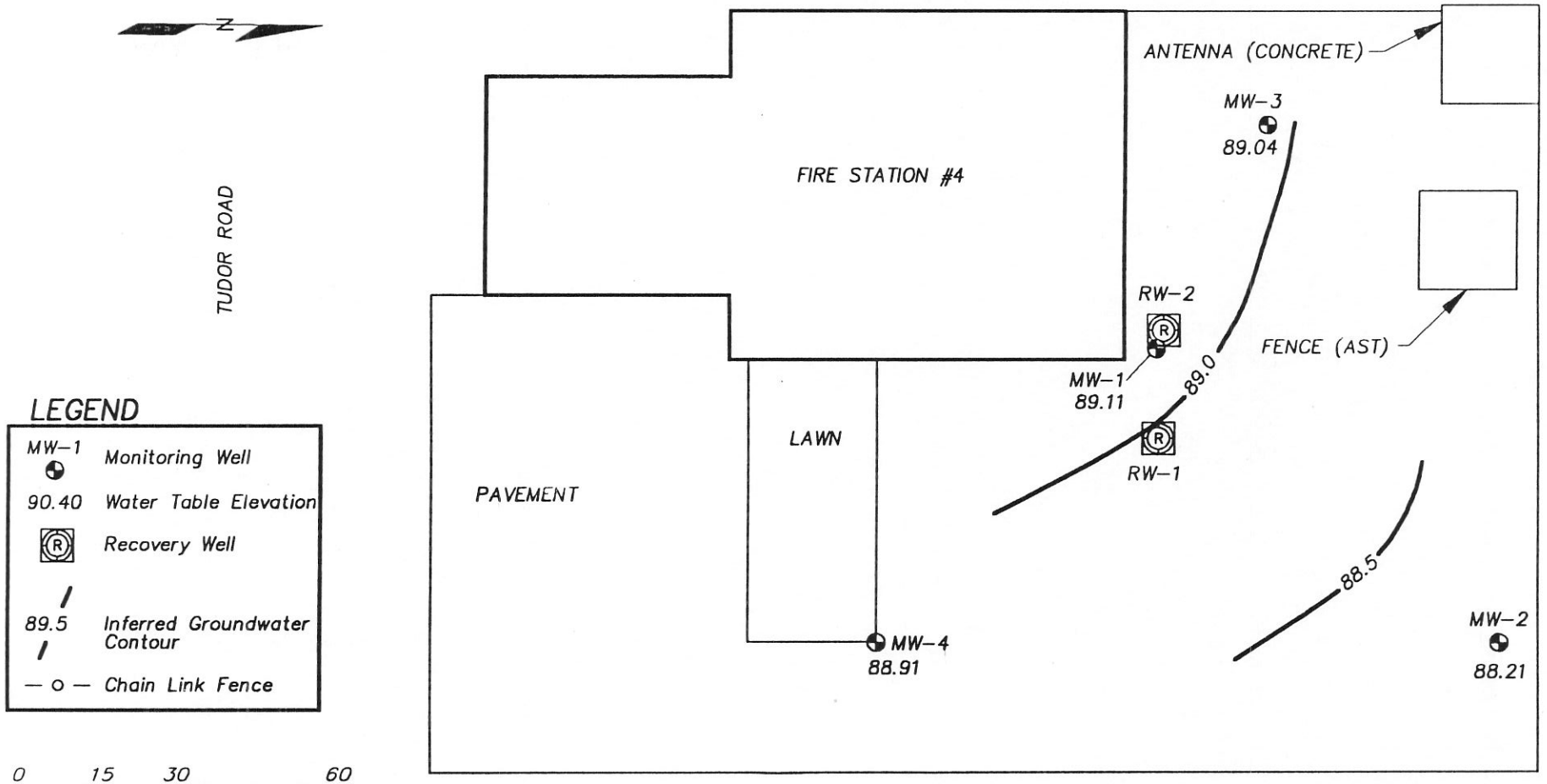
{1} N/S - Not sampled due to floating hydrocarbon in well.

{2} N/S - Not sampled due to ice blockage in well riser.

Site Plan and Water Table Elevations on January 24, 1996

AFD-4

Anchorage, Alaska



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A-8397-05 2-96
FIGURE 1

REF. NO: \ACAD-DWG\8397\WL12496

Monitoring Well Hydrographs
AFD-4
Anchorage, Alaska

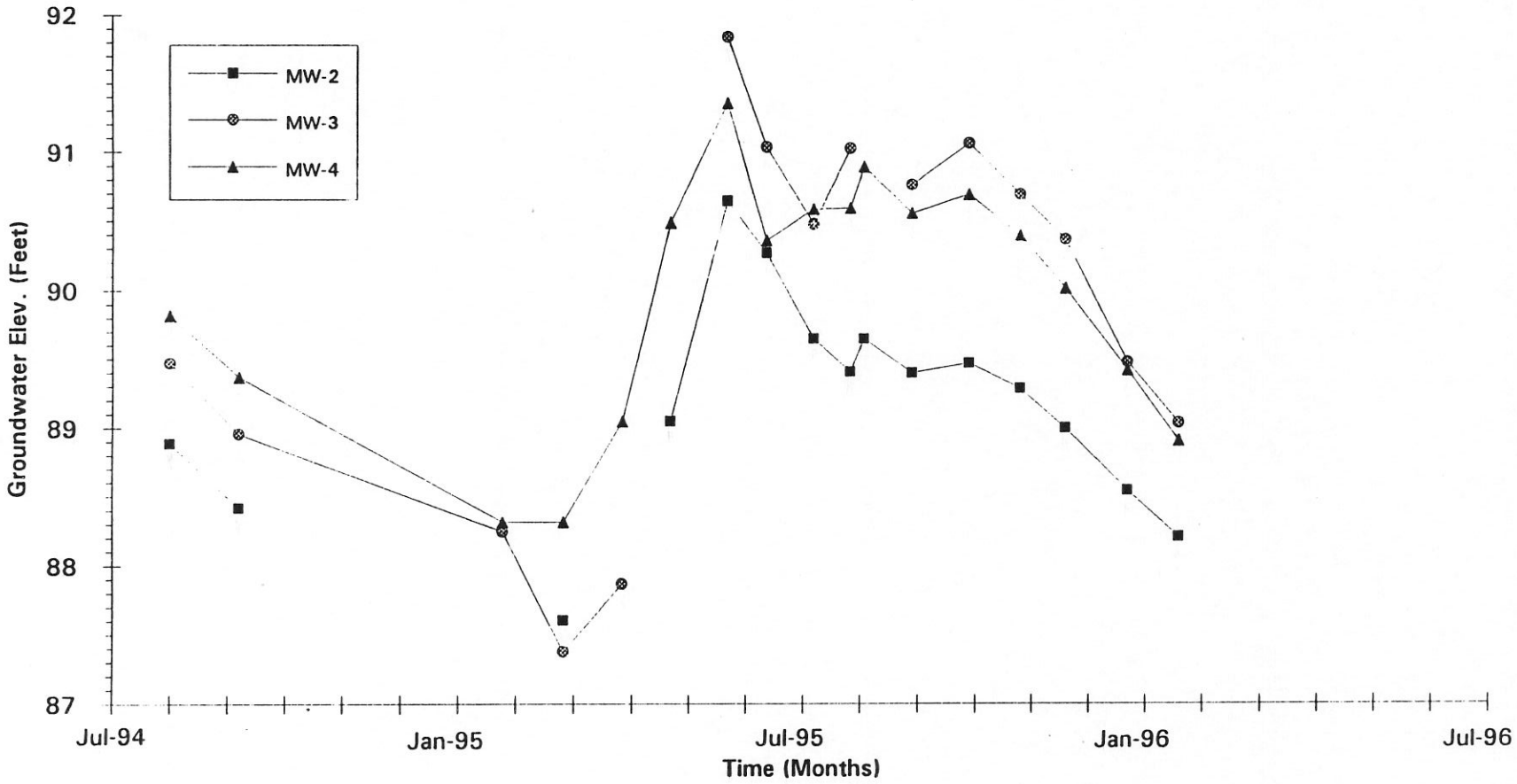

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FIGURE 2

Hydrocarbon Thickness and Groundwater Elevation in MW-1

AFD-4

Anchorage, Alaska

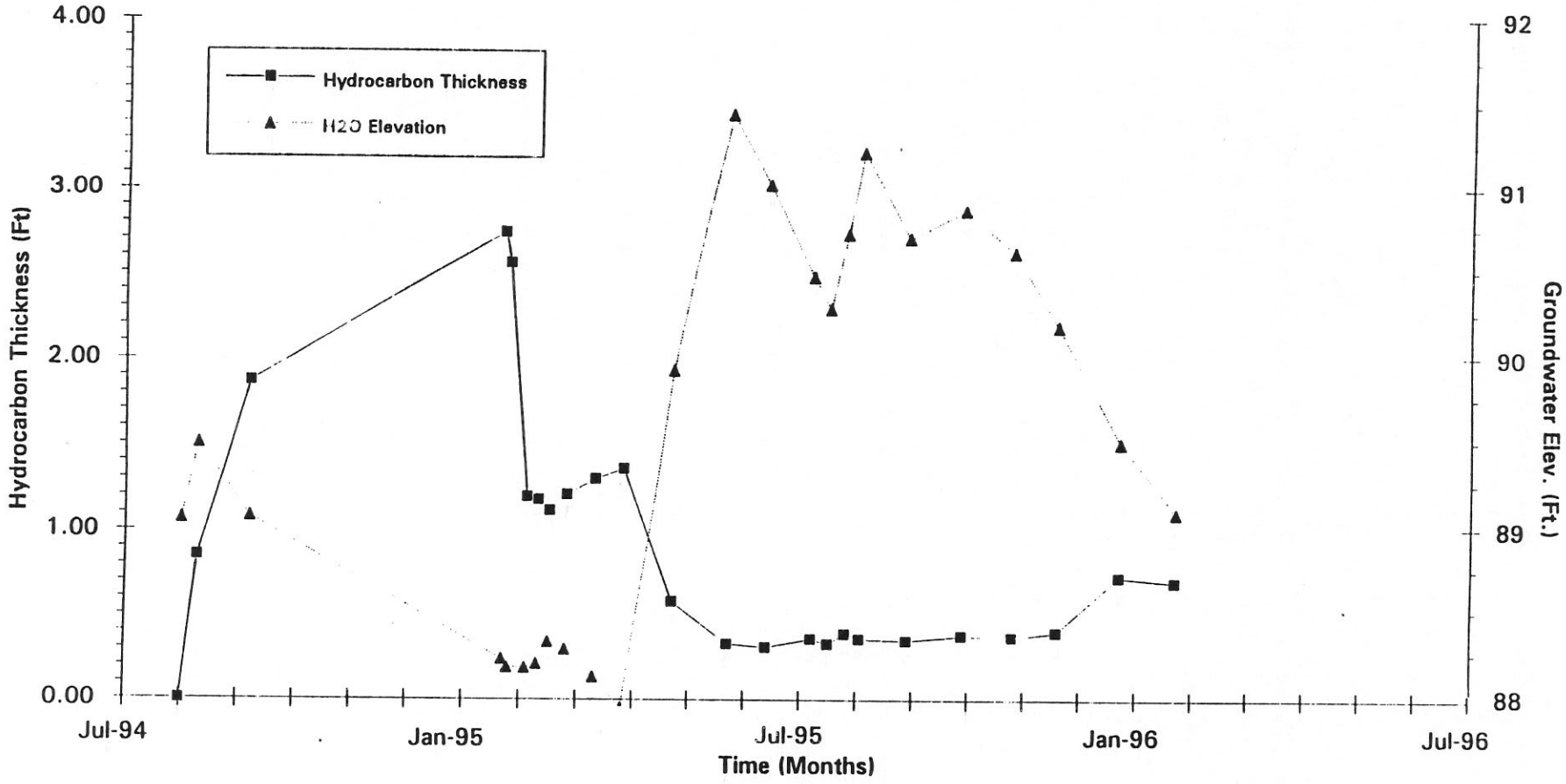

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FIGURE 3

APPENDIX A
FIELD EXPLORATIONS METHODS AND ANALYSES

APPENDIX A
FIELD EXPLORATIONS METHODS AND ANALYSES

This appendix documents the field methods used by Hart Crowser in determining the nature of the conditions underlying the project site addressed by this report. The discussion includes information on the following subjects:

- ***Water/Floating Hydrocarbon Level Measurements***
- ***Water Quality Sampling***
- ***Petro-trap Operations***
- ***Decontamination of Field Equipment***

Water/Floating Hydrocarbon Level Measurements

The water level and floating hydrocarbon in each well was measured from a reference point or "measuring point" marked on the PVC casing. A Flexidip electronic oil/water interface well sounder was used to make the measurements which were recorded to an accuracy of ± 0.01 feet.

Water Quality Sampling

Monitoring wells were purged immediately prior to sampling until a minimum of 3 casing volumes of water were removed. All purge water was containerized. Purging and sampling were performed by lowering a factory-decontaminated disposable bailer into the well with single-use polypropylene rope. Samples were collected in 40-ml clear, glass VOA vials fitted with Teflon septa and 1-Liter brown bottles provided by the laboratory. A duplicate sample was collected from one well for each well sampling event. Immediately after collection, the samples were labeled and placed in a cooler with "blue-ice" for shipment to NCA laboratories under chain-of-custody procedures.

Petro-trap Operations

Petro-trap hydrocarbon collectors were placed in recovery wells with their screened sections within the floating hydrocarbon zone. Hydrocarbon collection was performed by slowly removing the petro-trap from the recovery well and emptying its contents into a graduated container. The petro-trap was then slowly lowered back into position in the well.

The hydrocarbon quantity was read from the graduated container and recorded on a log sheet. Hydrocarbons were then placed in a 55-gallon drum.

Equipment Decontamination

The Flexi-dip interphase probe was cleaned prior to and between sampling attempts using an anionic detergent wash (Alconox) followed by two potable water rinses.

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APPENDIX B
LABORATORY REPORTS

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-9508 (206) 481-9200 • FAX 485-2992
East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

00220

Hart Crowser, Anchorage	Project Name:	Firestation #4	
2550 Denali Street, #705	Client Project :	#A-8397-05	
Anchorage, AK 99503			Received: Jan 26, 1996
Attention: Nino Muniz	NCA Project #:	B601394	Reported: Feb 2, 1996

PROJECT SUMMARY PAGE

Laboratory Sample Number	Sample Description	Sample Matrix	Date Sampled
B601394-01	MW-2	Water	1/24/96
B601394-02	MW-3	Water	1/24/96
B601394-03	MW-4	Water	1/24/96
B601394-04	MW-5	Water	1/24/96
B601394-05	TRIP BLANK	Water	1/24/96

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FEB - 8 1996
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The results in this report apply to the samples analyzed in accordance with the chain of custody document.
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Matthew T. Essig
Project Manager

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

00221

Hart Crowser, Anchorage	Client Project ID:	Firestation #4	Sampled:	Jan 24, 1996
2550 Denali Street, #705	Sample Matrix:	Water	Received:	Jan 26, 1996
Anchorage, AK 99503	Analysis Method:	EPA 8020	Analyzed:	Jan 31, 1996
Attention: Nino Muniz	First Sample #:	B601394-01	Reported:	Feb 2, 1996

BTEX DISTINCTION

Sample Number	Sample Description	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)	Surrogate Recovery %
B601394-01	MW-2	N.D.	0.58	N.D.	N.D.	89
B601394-02	MW-3	N.D.	N.D.	N.D.	N.D.	85
B601394-03	MW-4	N.D.	N.D.	N.D.	N.D.	86
B601394-04	MW-5	N.D.	N.D.	N.D.	N.D.	86
B601394-05	TRIP BLANK	N.D.	N.D.	N.D.	N.D.	83
BLK013196	Method Blank	N.D.	N.D.	N.D.	N.D.	87

REC
FEB
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Reporting Limits:	**0.50**	**0.50**	**0.50**	**1.0**	

4-Bromofluorobenzene surrogate recovery control limits are 59 - 144 %.
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

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00222

Hart Crowser, Anchorage
2550 Denali Street, #705
Anchorage, AK 99503
Attention: Nino Muniz

Client Project ID: Firestation #4
Sample Matrix: Water
Analysis Method: EPA 8020
Units: µg/L (ppb)
QC Sample #: B601404-01

Analyzed: Jan 31, 1996
Reported: Feb 2, 1996

MATRIX SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Sample Result:	5.1	3.2	7	35
Spike Conc. Added:	10.0	10.0	10.0	30.0
Spike Result:	13.9	12.4	17.0	64.8
Spike % Recovery:	88%	92%	100%	99%
Spike Dup. Result:	13.6	12.3	16.8	62.5
Spike Duplicate % Recovery:	85%	91%	98%	92%
Upper Control Limit %:	115	116	122	122
Lower Control Limit %:	82	81	85	85
Relative % Difference:	2.2%	<1.0%	1.2%	3.6%
Maximum RPD:	16	16	16	17

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Matthew T. Essig
Project Manager

% Recovery: $\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Spike Result - Spike Dup. Result}}{\text{(Spike Result + Spike Dup. Result) / 2}} \times 100$

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00223

Hart Crowser, Anchorage	Client Project ID:	Firestation #4	Sampled:	Jan 24, 1996
2550 Denali Street, #705	Matrix Descript:	Water	Received:	Jan 26, 1996
Anchorage, AK 99503	Analysis Method:	EPA 8100 Modified	Extracted:	Jan 29, 1996
Attention: Nino Muniz	First Sample #:	B601394-01	Analyzed:	Feb 1, 1996
			Reported:	Feb 2, 1996

EXTRACTABLE PETROLEUM HYDROCARBONS - DIESEL RANGE ORGANICS

Sample Number	Sample Description	Sample Result mg/L (ppm)	Surrogate Recovery %
B601394-01	MW-2	0.30	74
B601394-02	MW-3	0.16	76
B601394-03	MW-4	0.14	70
B601394-04	MW-5	0.17	66
BLK012996	Method Blank	N.D.	69

Reporting Limit:	**0.10**

Extractable Petroleum Hydrocarbons are quantitated as Diesel Range Organics (C10 - C28). Surrogate recovery reported is for 2-Fluorobiphenyl.
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

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Hart Crowser, Anchorage
2550 Denali Street, #705
Anchorage, AK 99503
Attention: Nino Muniz

Client Project ID: Firestation #4
Sample Matrix: Water
Analysis Method: TPH-D
Units: mg/L (ppm)

Extracted: Jan 29, 1996
Analyzed: Feb 1, 1996
Reported: Feb 2, 1996

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

	Diesel
Spike Conc. Added:	2.04
Spike Result:	1.87
% Recovery:	92
Upper Control Limit %:	107
Lower Control Limit %:	69

PRECISION ASSESSMENT
Sample Duplicate

	Diesel Range Organics
Sample Number:	B601402-04
Original Result:	14
Duplicate Result:	17
Relative % Difference	19
Maximum RPD:	44

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Project Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$

Sample Custody Record

DATE 1/24/96 PAGE 1 OF 1

HARTCROWSER
Hart Crowser, Inc
2550 Denali Street, Suite 705
Anchorage, Alaska 99503

JOB NUMBER A-8397-05 LAB NUMBER
PROJECT MANAGER Nino Muniz
PROJECT NAME Firestation #4
SAMPLED BY: Matt Flynn

LAB NO.	SAMPLE	TIME	STATION	MATRIX	BTEX	D20	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
B601394-01	MW-2	2:40P		Water	X	X	3	Sampled ~~MW-2~~ 1/24/96
-02	MW-3	2:00P		↓	X	X	3	↓
-03	MW-4	2:20P			X	X	3	
-04	MW-5	2:45P			X	X	3	
-05	Trip Blank			Water	X		1	Bubble in blank

RELINQUISHED BY	DATE	RECEIVED BY	DATE
Matt Flynn (SIGNATURE)	1/25/96	Margaret Girard (SIGNATURE)	1/26/96
Matt Flynn (PRINTED NAME)	TIME	Margaret Girard (PRINTED NAME)	TIME
HCI - AK (COMPANY)	10:45 A	NCA (COMPANY)	10:00
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	TIME	SIGNATURE	TIME
PRINTED NAME		PRINTED NAME	
COMPANY		COMPANY	

TOTAL NUMBER OF CONTAINERS 13

METHOD OF SHIPMENT Fed. Ex.

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS Normal TAT

Results to Nino Muniz

DISTRIBUTION:

1. PROVIDE WHITE AND YELLOW COPIES TO LABORATORY
2. RETURN PINK COPY TO PROJECT MANAGER
3. LABORATORY TO FILL IN SAMPLE NUMBER AND SIGN FOR RECEIPT
4. LABORATORY TO RETURN WHITE COPY TO HART CROWSER

000225