

Fort Richardson Landfill Closure Monitoring April 2002 Sampling Event

Prepared for



U.S. Army, Directorate of Public Works
Contract No. DAPC49-01-F-0167

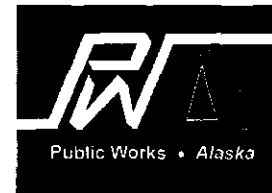
December 2002



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CH2MHILL

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Abbreviations

AAC	<i>Alaska Administrative Code</i>
ADEC	Alaska Department of Environmental Conservation
AMSL	above mean sea level
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degrees Celsius
CRREL	Cold Regions Research and Environmental Laboratory
DPW	Directorate of Public Works
E&E	Ecology & Environment, Inc.
EPA	U.S. Environmental Protection Agency
GRO	gasoline-range organic compounds
LCS	laboratory control sample
µg/L	micrograms per liter
MS	matrix spike
MSD	matrix spike duplicate
QA	quality assurance
QC	quality control
RPD	relative percent difference
TDS	Total dissolved solids
TOC	total organic carbon

SECTION 1

Introduction

This report presents the results of the April 2002 groundwater sampling event conducted at the Fort Richardson Landfill. This effort was completed by CH2M HILL for the U.S. Army Directorate of Public Works (DPW) in accordance with the scope of work for Contract Number DAPC49-01-F-0167.

1.1 Project Overview

The purpose of this reporting effort is to transmit the results of groundwater monitoring completed as part of the Fort Richardson Landfill closure. CH2M HILL completed the groundwater sampling and is providing this report to the DPW for their use in meeting the requirements of a landfill closure plan prepared for the closure of the Fort Richardson Landfill.

1.2 Site Location and Description

Fort Richardson is located within the Cook Inlet-Susitna Lowland Section of the Coastal Trough physiographic province of Alaska. The majority of Fort Richardson lies less than 500 feet above mean sea level (AMSL) with local relief varying between 50 and 250 feet. The geology of Fort Richardson occurred primarily as a result of past glacial events and consists of the Elmendorf moraine, alluvial fans, and glacial outwash deposits. The hydrogeology of Fort Richardson, while extremely variable across the facility, is made up of three primary aquifers. A discontinuous perched unconfined aquifer, a shallow unconfined aquifer, and a deep confined aquifer have all been observed on base. Monitoring locations are described in Section 2.2.

The Fort Richardson Landfill is located approximately 0.75 mile north of the main cantonment area, just north of Circle Road. The landfill is unlined and covers about 400 acres.

1.3 Site History

The initial date of landfill operations is not known. However, the portion of the landfill that was first used was closed prior to 1966. The landfill accepted sanitary waste and mess hall grease until after 1987, when solid waste was sent to the Anchorage Regional Landfill. Construction rubble, grease, paint, and solvent waste were also accepted at the landfill. In addition, a former fire training pit and a human waste disposal trench were located at the landfill. The landfill is no longer active and the latest documented active disposal was in 1989.

Groundwater monitoring associated with landfill closure has been ongoing since 1995.

Groundwater Quality Monitoring Program

The objective of the groundwater quality monitoring program is to evaluate conditions around the closed Fort Richardson Landfill to ensure that degradation of groundwater adjacent to the landfill does not occur. Groundwater quality monitoring is also a portion of the monitoring required for closure of the landfill.

2.1 Regulatory Requirements

Closure of the Fort Richardson Landfill was initiated in 1993 and is subject to monitoring and closure requirements in place at that time, specifically Title 18, Chapter 60, of the *Alaska Administrative Code* (AAC). A landfill closure plan was prepared and approved by the Alaska Department of Environmental Conservation (ADEC) in 1994. Landfill monitoring has been conducted in accordance with the closure plan since that time.

2.2 Monitoring Locations

Table 2-1 lists the groundwater monitoring wells that are sampled as part of the landfill closure plan. The table also provides information on the screened interval of each well, relative well locations, based upon previous reports, and updated relative well locations based on recently completed work. Approximate well locations are provided on Figure 2-1.

2.3 Monitoring Frequency

According to the landfill closure plan, well sampling is required twice yearly, with sampling scheduled for April and October. Depending on weather conditions and site accessibility, the actual sampling dates may be adjusted.

2.4 Groundwater Monitoring Parameters

The landfill closure plan specified monitoring for the parameters listed in Table 2-2 following the completion of baseline monitoring. Samples will be analyzed using the methods described in the most recent edition of *Test Methods for Evaluating Solid Waste* (U.S. Environmental Protection Agency [EPA], 1996), *Methods for Chemical Analysis of Water and Wastes* (EPA, 1983), and *Underground Storage Tanks Procedures Manual* (ADEC, 1998).

TABLE 2-1
Monitoring Well Information Summary

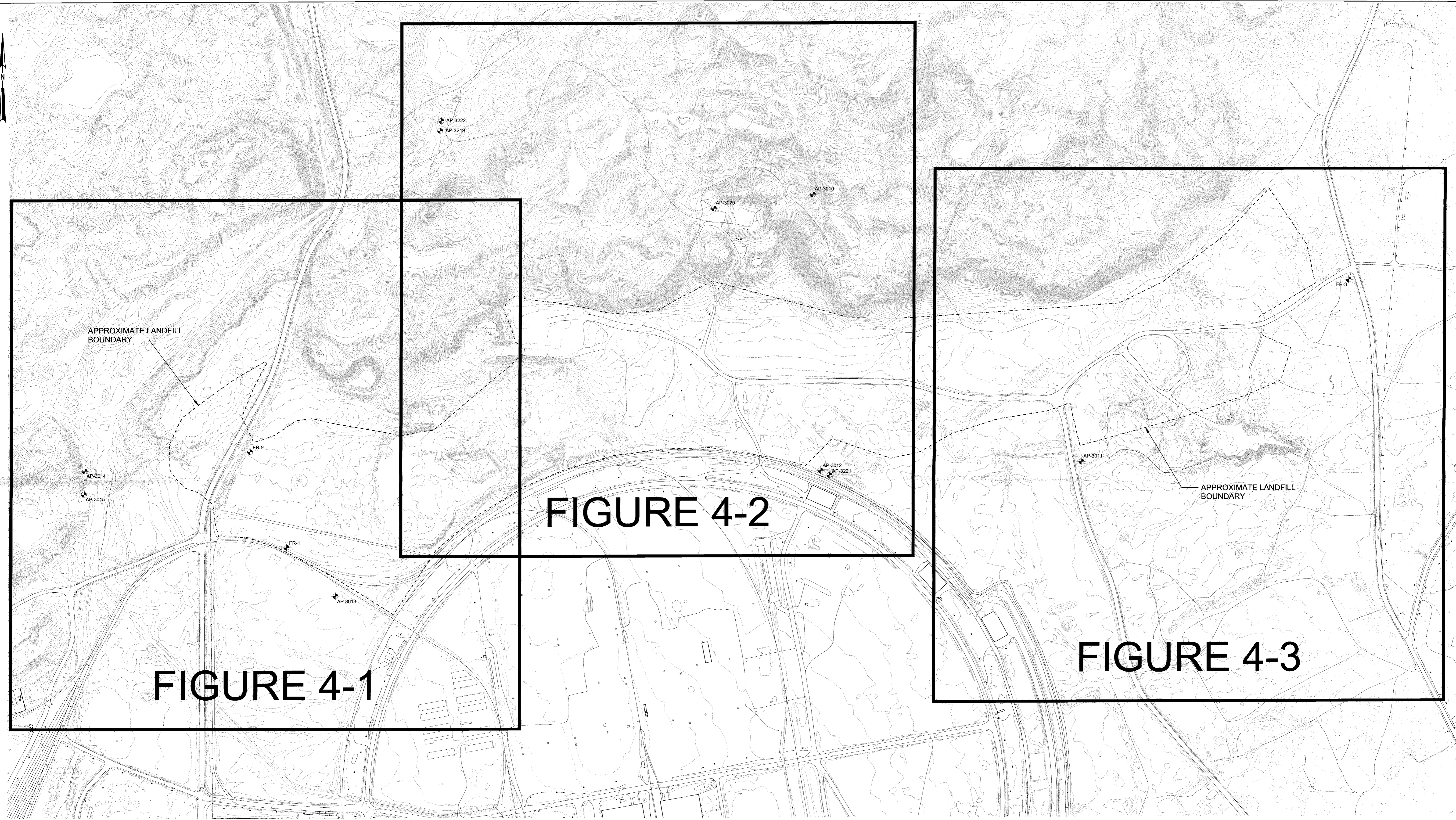
Monitoring Well	Screened Interval ^a	Total Depth ^a	Aquifer	Historical Relative Location	Updated Relative Location
FR-1	139-149	149	Confined glacial till	Crossgradient	Downgradient
FR-2	156.5-166.5	166.5	Confined glacial till	Crossgradient	Downgradient
FR-3	156.5-166.5	166.5	Deep perched	NA	NA
AP-3010	221-236	236	Confined glacial till	Downgradient	Downgradient
AP-3011	123-138	138	Screened in deep perched aquifer but consistently dry	NA	NA
AP-3012	176-191	191	Screened in deep perched aquifer but consistently dry	NA	NA
AP-3013	135-150	150	Confined glacial till	Upgradient	Upgradient
AP-3014	15-30	30	Unconfined perched	Crossgradient	Downgradient
AP-3015	115-130	130	Confined glacial till	Crossgradient	Downgradient
AP-3219	19.4-39.4	39.4	Unconfined perched	Downgradient	Downgradient
AP-3220	221.4-241.4	241.4	Confined glacial till	Downgradient	Upgradient
AP-3221	158.4-178.4	178.4	Confined glacial till	Upgradient	Downgradient
AP-3222	119-139	139	Confined glacial till	Downgradient	Downgradient

Notes:

^aAll depths are provided in feet below top of casing.

NA = not applicable (Well FR-3 appears to be screened in a perched aquifer.)

Samples will not be filtered, and all metal analyses will be for total metals. Other parameters that will be measured in the field during each sampling event include water level, conductivity, temperature, and pH. Table 2-2 also provides the analytical methods for the specified parameters.



NOTE
GROUNDWATER ELEVATIONS IN FEET

BASE MAP

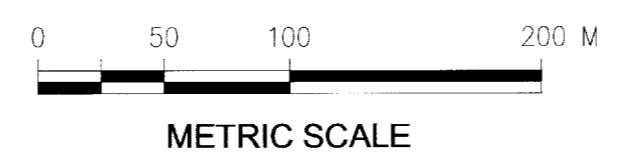


Figure 2-1
Well Locations

Fort Richardson Landfill
Fort Richardson, Alaska

TABLE 2-2
Groundwater Quality Monitoring Parameters

Purging Parameters^a	Equipment
Water level	Measuring tape or sounder
Conductivity	Calibrated field meter
Temperature	Calibrated field meter
pH	Calibrated field meter
Parameter	Analytical Method^b
Total dissolved solids	160.1
Turbidity	180.1
Total organic carbon	9060
Chloride	300.0
Sulfate	300.0
Nitrate/Nitrite	300.0P
Arsenic (total)	6020
Barium (total)	6020
Cadmium (total)	6020
Chromium (total)	6020
Lead (total)	6020
Mercury (total)	245.1
Potassium (total)	6020
Selenium (total)	6020
Silver (total)	6020
Sodium (total)	6020
Gasoline-range organic compounds	AK101
Benzene, ethylbenzene, toluene, and total xylenes	8021B

Notes:

^aAnalyzed in the field at the time of sample collection

^b Test Methods for Evaluating Solid Waste, SW-846 (EPA), Methods for Chemical Analysis of Water and Wastes (EPA), and Storage Tank Program, Underground Storage Tanks Procedures Manual, 18 AAC 78.090 (ADEC)

SECTION 3

Field Activities

The April 2002 Landfill Groundwater Monitoring Event was conducted from 1 to 7 May, 2002.

3.1 Groundwater Elevations and Gradient

Table 3-1 provides the depths to water and the determined groundwater elevations as observed in the wells sampled during the 2002 sampling event.

TABLE 3-1
Groundwater Conditions April 2002 (May 2002)

Monitoring Well	Depth to Water (feet below top of casing)	Groundwater Elevation (above mean sea level)
FR-1 ^a	130.05	176.78
FR-2 ^a	150.64	171.09
FR-3	153.05	198.47
AP-3010 ^a	232.05	171.25
AP-3011	Dry	NA
AP-3012	Dry	NA
AP-3013 ^a	139.08	172.55
AP-3014	21.72	274.81
AP-3015 ^a	123.06	171.09
AP-3219	Dry	NA
AP-3220 ^a	231.48	176.6
AP-3221 ^a	175	157.84
AP-3222 ^a	131.72	168.19

^aMonitoring well screened in the confined glacial till aquifer and used to determine the groundwater gradient.

NA = not applicable

Figure 3-1 provides the groundwater gradient as determined from the groundwater elevations provided in Table 3-1. The groundwater gradient was determined using the eight wells screened in the glacial till aquifer. Those wells are indicated on the figure and are also noted in Table 3-1.

As seen on the figure, groundwater flow is generally to the northwest. However, a groundwater divide is indicated along a line between wells AP-3220 and FR-1. It should be noted that the groundwater divide is not observed by CRREL and does not fit the contours of the overall groundwater flow map maintained by them. The measured groundwater elevation data for this report are limited and are not consistent with the overall groundwater flow direction as predicted by CRREL. A few other items are worth noting regarding the groundwater elevations and gradient are as follows:

- The groundwater elevation for well AP-3221 has been listed as "???" on Figure 3-1, and the groundwater elevation contours on that side of the groundwater divide are shown as dashed lines. The information is presented in this manner because Cold Regions Research and Environmental Laboratory (CRREL) personnel have consistently classified well AP-3221 as dry and not factored that groundwater elevation into the groundwater elevation contours near the landfill. CH2M HILL, and previously COE, personnel have detected water and collected samples from this well, but have reported problems obtaining an accurate water level measurement due to the dedicated pump apparatus.
- Not all of the monitoring wells could be accurately placed on the updated Fort Richardson base map due to differences in coordinate sets. Resurveying of the wells to accurately locate them on a map and verify their elevations is recommended.

3.2 Groundwater Sample Collection

Groundwater samples were collected in accordance with procedures outlined in the Fort Richardson Landfill Sampling and Analysis Plan (Ecology & Environment, Inc. [E&E], 1995) and CH2M HILL's Quality Assurance Project Plan (CH2M HILL, 2000). Table 3-2 summarizes the sampling method used for the wells sampled as part of this event. As seen in the table, wells were purged and sampled using dedicated submersible pumps, submersible pumps, and bailers. Wells AP-301, AP-3012, and AP-3219 are not included in Table 3-2 because they were observed to be dry at the time of sample collection.



NOTE
GROUNDWATER ELEVATIONS IN FEET

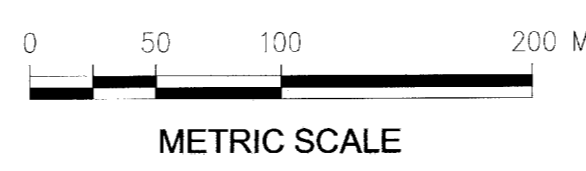


Figure 3-1
Groundwater Gradient
April 2002
Fort Richardson Landfill
Fort Richardson, Alaska

TABLE 3-2
Sampling Methodology

Monitoring Well	Purging and Sampling Method
FR-1	Dedicated submersible pump
FR-2	Dedicated submersible pump
FR-3	Bailer
AP-3010	Bailer
AP-3013	Dedicated submersible pump
AP-3014	Submersible pump
AP-3015	Dedicated submersible pump
AP-3220	Bailer
AP-3221	Dedicated submersible pump
AP-3222	Submersible pump

Well purge and sampling field sheets and a sample record log are provided in Appendix A.

3.3 Quality Assurance/Quality Control

Three types of quality assurance (QA)/quality control (QC) samples were collected to ensure data quality: trip blanks, field duplicates, matrix spike (MS)/matrix spike duplicate (MSD) samples, and rinsate blanks.

For this sampling event, four trip blanks, one field duplicate, one MS/MSD, and one rinsate blank were submitted to the laboratory for analysis.

3.4 Investigation-Derived Waste Handling and Disposal

All water generated from well purging and equipment decontamination was collected in 15-gallon drums and transported to the environmental staging facility located at the southeast corner of the intersection of Warehouse Road and the Davis Highway for treatment and disposal. The water was transferred to the temporary storage tanks at the facility in coordination the contractor operating the environmental staging facility.

Results

This section provides a discussion of the analytical results for the analyses completed.

4.1 Analytical Methods

The samples were analyzed for the parameters listed in Table 2-2 and are divided into the following categories:

- Fuel-related compounds
- Total organic carbon (TOC)
- Total dissolved solids (TDS)
- Metals
- Turbidity
- Water quality parameters (chloride, nitrite/nitrate, and sulfate)

4.2 Analytical Results

Figures 4-1 through 4-3 provide historical groundwater analytical results for the monitored wells since 1995. The following sections summarize the analytical results for each category of analysis. Complete analytical results are provided in Appendix B.

4.2.1 Gasoline-Range Organic Compounds

No detectable concentrations of gasoline-range organic compounds (GRO) were observed.

4.2.2 Benzene, Toluene, Ethylbenzene, and Xylenes

No detectable concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents were observed.

4.2.3 TOC

TOC was detected in four of the samples analyzed.

4.2.4 TDS

TDS concentrations ranged from nondetect in the rinsate blank and from 85.2 to 465 milligrams per liter in the remaining samples.

4.2.5 Metals

Each of the metals analyzed for, except mercury, was detected at least once. None of the concentrations exceeded cleanup levels.

Figure 4-4 presents the concentrations of arsenic and lead for well AP-3220 over time. Figure 4-5 presents the concentrations of arsenic and lead and Figure 4-6 presents the

concentration of chromium for well FR-3 over time. All the figures show decreased concentrations of the metals in question. Seasonal variations are suggested and will be tracked in upcoming monitoring events.

4.2.6 Turbidity

Turbidity concentrations ranged from nondetect to 60 NTUs.

4.2.7 Water Quality Parameters

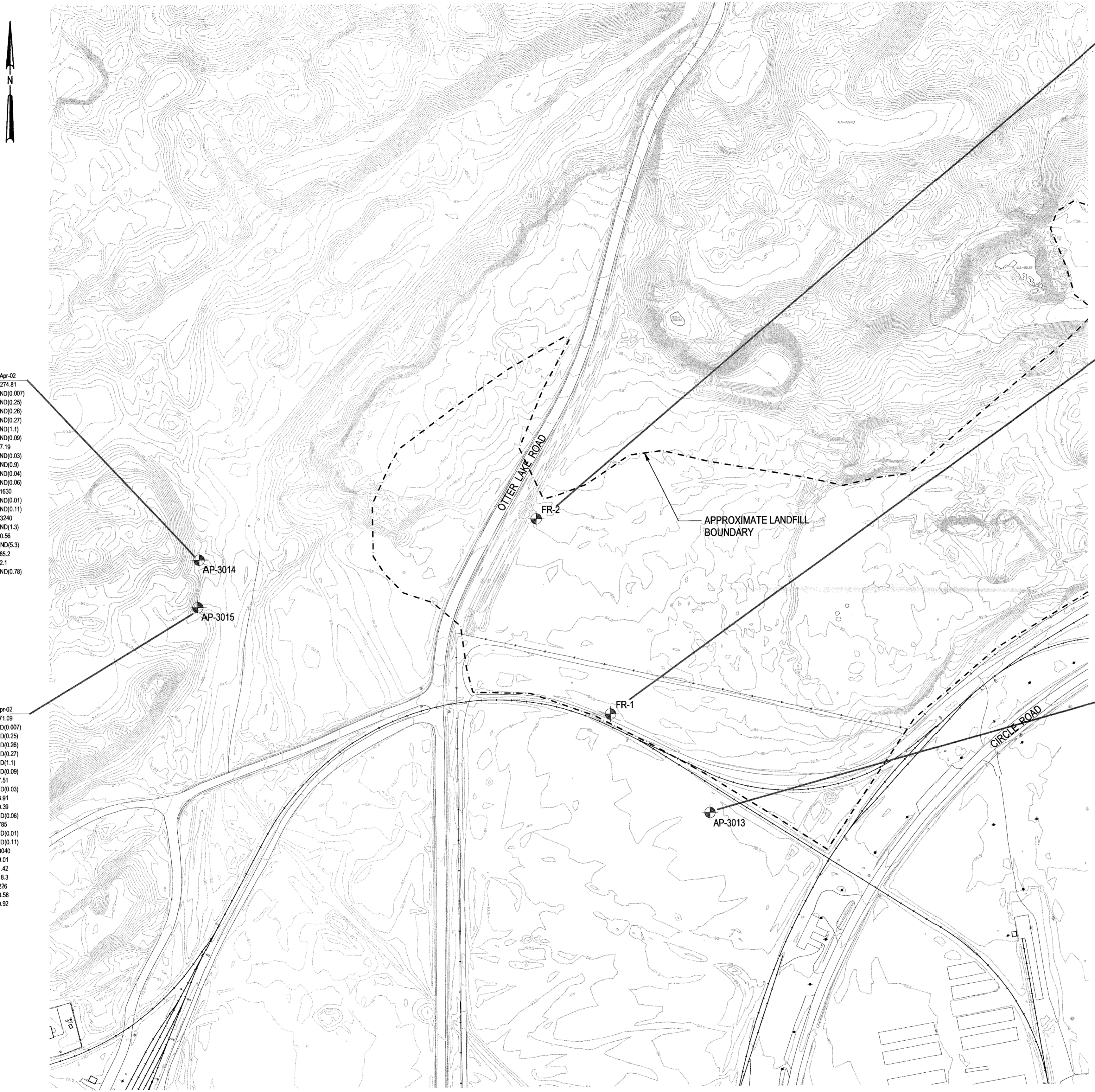
Positive results were observed for the analyzed water quality parameters but none at values exceeding the cleanup levels.

4.2.8 Regulatory Exceedances

No regulatory exceedances were observed in samples collected during this sampling event.

4.3 Degradation Evaluation

Concentrations of the monitored parameters were compared to the established background levels. While fluctuations and occasional exceedances have previously been observed in wells AP-3220 and FR-3, no exceedances were observed during this sampling event. Overall, significant increases in constituent concentrations have not been observed.



AP-3014	Oct-95	Jun-96	Nov-96	May-97	Dec-97	Jun-98	Nov-98	Nov-99	Jul-00	Aug-01	Dec-01	Apr-02
GW EL	NR	NR	NR	NR	NR	NR	NR	NR	277.34	278.48	277.25	274.53
GRO	ND(0.05)	ND(0.05)	0.584	ND(0.05)	ND(0.05)	ND(0.05)	ND	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	ND(2)	0.062	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.25)	ND(0.25)	ND(0.25)
Toluene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Ethylbenzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.27)	ND(0.27)	ND(0.27)
Xylenes	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.4)	ND(2)	ND(1.1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	ND(5)	9	ND(1)	ND(1)	ND(1)	5.7	ND(2)	1	ND(0.09)	ND(0.09)
Barium	6	6.9	7	118	13	9.9	43	12.8	19	12.7	5.6	7.19
Cadmium	ND(5)	ND(0.2)	ND(5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(0.3)	ND(5)	ND(0.052)	ND(0.03)	ND(0.03)
Chromium	ND(10)	ND(8.7)	ND	25	ND(10)	ND(10)	ND(10)	ND(1.3)	2.7	16.3	0.54	ND(0.9)
Lead	ND(2)	ND(0.27)	ND	10	0.78	0.51	3	ND(2.1)	ND(10)	0.842	ND(0.04)	ND(0.04)
Mercury	ND(0.5)	ND(0.17)	ND	0.2	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.06)	ND(0.06)
Potassium	1000	1100	1100	2500	ND(1,000)	ND(5,000)	ND(5,000)	875	1200	1130	1130	1630
Selenium	ND(5)	ND(1.5)	ND(5)	ND(5)	ND(2)	ND(2)	3.3	ND(1.7)	19	ND(0.24)	ND(0.01)	ND(0.01)
Silver	ND(5)	0.41	ND(5)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	ND(0.07)	ND(0.11)	ND(0.11)
Sodium	2560	2900	2900	4500	2700	3700	5200	2300	3100	2820	3740	3740
Chloride	1.1	2	1.2	1.1	0.84	0.82	0.58	ND(1)	0.78	1.72	0.52	ND(1.3)
Nitrate/Nitrite	ND(0.2)	0.13	0.1	0.2	0.23	ND(0.3)	ND(0.3)	0.3	0.12	0.303	0.53	0.56
Sulfate	7.4	11	8.1	8.9	6.6	7.1	6.1	5	4.9	4.4	4	ND(5.3)
TDS	88	940	43	93	96	52	110	84	110	70	102	85.2
TOC	ND(0.5)	1.3	0.7	3.4	2.1	1.4	9.5	ND(1.0)	1.5	1.9	1.2	2.1
Turbidity	1.7	0.59	ND(1)	175	11	8.6	36	24	16	NM	NM	ND(0.78)

AP-3015	Oct-95	Jun-96	Nov-96	May-97	Dec-97	Jun-98	Nov-98	Nov-99	Jul-00	Aug-01	Dec-01	Apr-02
GW EL	NR	NR	NR	NR	NR	NR	NR	NR	171.97	172.20	171.29	171.15
GRO	ND(0.05)	0.079	ND(0.05)	NS	ND(0.05)	ND(0.05)	0.32	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	ND(2)	ND(0.2)	ND(1)	NS	ND(0.4)	ND(1)	NS	ND(0.2)	ND(1)	ND(0.25)	ND(0.25)	ND(0.25)
Toluene	ND(2)	ND(0.2)	ND(1)	NS	ND(0.4)	ND(1)	NS	ND(0.3)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Ethylbenzene	ND(2)	ND(0.2)	ND(1)	NS	ND(0.4)	ND(1)	NS	ND(0.2)	ND(1)	ND(0.27)	ND(0.27)	ND(0.27)
Xylenes	ND(2)	ND(0.2)	ND(1)	NS	ND(0.4)	ND(1)	NS	ND(0.4)	ND(2)	ND(1.1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	1	NS	ND(1)	ND(1)	ND(1)	ND(0.9)	ND(1)	ND(0.09)	ND(0.09)	ND(0.09)
Barium	63	12	14	NS	9.4	ND(10)	16	8.1	5.2	8.5	6.6	7.51
Cadmium	ND(5)	ND(0.2)	ND(5)	NS	ND(0.5)	ND(0.5)	ND(1)	ND(0.3)	0.99	ND(0.052)	ND(0.03)	ND(0.03)
Chromium	10	ND(8.7)	8	NS	ND(10)	ND(10)	ND(10)	9.2	2.8	1.71	2.2	3.91
Lead	ND(2)	1.1	3	NS	0.71	0.4	1.1	ND(2.1)	ND(10)	7.37	0.23	0.38
Mercury	ND(0.5)	ND(0.17)	ND	NS	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.06)	ND(0.06)
Potassium	1000	2300	900	NS	ND(1,000)	ND(5,000)	ND(5,000)	728	610	757	772	785
Selenium	ND(5)	ND(1.5)	ND(5)	NS	ND(2)	ND(2)	ND(3)	ND(1.7)	27	ND(0.24)	ND(0.01)	ND(0.01)
Silver	ND(5)	ND(0.3)	ND(5)	NS	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	ND(0.07)	ND(0.11)	ND(0.11)
Sodium	3950	2900	3200	NS	3100	3300	4000	2570	2500	3240	2900	3040
Chloride	9.5	12	9.3	NS	11	13	11	10	11	8.15	6.5	9.01
Nitrate/Nitrite	1.1	1.4	1.2	NS	1.2	1.3	1.1	1.2	1.4	1.17	1.3	1.42
Sulfate	17	22	18	NS	20	23	21	21	22	18.5	17	18.3
TDS	248	240	211	NS	230	220	230	220	230	207	231	226
TOC	ND(0.5)	0.67	0.5	NS	0.81	0.87	0.62	ND(1.0)	0.92	1.3	0.62	0.58
Turbidity	76	11.6	16	NS	3	2.2	1.6	4	ND(1)	NM	NM	0.92

FR-2	Oct-95	Jun-96	Nov-96	May-97	Dec-97	May-98	Nov-98	Nov-99	Jul-00	Aug-01	Dec-01	Apr-02
GW EL	NR	NR	NR	NR	NR	NR	NR	NR	172.38	172.17	171.08	171.08
GRO	ND(0.05)	ND(0.05)	0.025	ND(0.05)	ND(0.05)	ND(0.05)	ND	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Toluene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Ethylbenzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.27)	ND(0.27)	ND(0.27)
Xylenes	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.4)	ND(2)	ND(1.1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	1	ND(5)	ND(1)	ND(1)	ND(1)	ND(2)	ND(1)	ND(0.09)	ND(0.09)	ND(0.09)
Barium	ND(5)	7.8	10	107	9.8	11	9.6	9.2	7	7.14	7.1	9
Cadmium	ND(5)	ND(0.2)	ND(5)	ND(4)	ND(0.5)	ND(0.5)	ND(1)	ND(0.3)	1.2	ND(0.052)	ND(0.03)	ND(0.03)
Chromium	ND(10)	ND(8.7)	5	ND(5)	ND(10)	10	5	7.3	4.6	ND(0.5)	1.2	1.5
Lead	ND(2)	ND(0.27)	ND	ND(2)	ND(0.5)	ND(0.5)	ND(1)	ND(2.1)	ND(10)	ND(0.04)	ND(0.04)	0.27
Mercury	ND(0.5)	ND(0.17)	ND	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.06)	ND(0.06)
Potassium	ND(1,000)	1600	800	2200	ND(1,000)	ND(5,000)	ND(5,000)	750	620	705	791	775
Selenium	ND(5)	ND(1.5)	ND(5)	ND(5)	ND(2)	ND(2)	3.8	ND(1.7)	38	ND(0.24)	ND(0.01)	ND(0.01)
Silver	ND(5)	ND(0.3)	ND(5)	ND(10)	ND(0.5)	ND(0.5)	0.71	ND(0.5)	ND(10)	ND(0.07)	ND(0.11)	ND(0.11)
Sodium	2600	2900	3100	3420	3200	3300	3000	2560	2400	3040	2800	3050
Chloride	8.6	9	8.3	9.6	11	11	11	10	9.3	8.07	7	8.06
Nitrate/Nitrite	0.9	1.1	1	0.9	0.94	0.88	0.91	1	1.1	0.969	1.2	1.4
Sulfate	18	19	18	17	20	23	22	21	18.7	18	19	18.1
TDS	248	260	268	294	270	270	250	250	260	233	229	266
TOC	ND(0.5)	0.52	0.4	ND(0.5)	0.66	0.90	0.63	ND(1.0)	0.65	0.79	1	0.71
Turbidity	ND(0.5)	2.9	2	0.27	0.9	2.5	4.0	2	1	NM	NM	0.68

FR-1	Oct-95	Jun-96	Nov-96	May-97	Nov-97	Nov-98	Nov-99	Jul-00	Aug-01	Dec-01	Apr-02	
GW EL	NR	NR	NR	NR	NR	NR	NR	NR	133.25	133.41	130.05	130.05
GRO	ND(0.05)	ND(0.05)	0.026	ND(0.05)	ND(0.05)	ND(0.05)	ND	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Toluene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Ethylbenzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.27)	ND(0.27)	ND(0.27)
Xylenes	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.4)	ND(2)	ND(1.1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	2	ND(5)	ND(1)	ND(1)	ND(1)	ND(2)	0.48	ND(0.09)	ND(0.09)	ND(0.09)
Barium	6	5.7	7	9	7.2	7.6	6.1	6.7	5.5	6.22	6	6.33
Cadmium	ND(5)	ND(0.2)	ND(5)	ND(4)	ND(0.5)	ND(0.5)	ND(1)	ND(0.3)	1.2	ND(0.052)	ND(0.03)	ND(0.03)
Chromium	ND(10)	ND(8.7)	ND	ND(5)	ND(10)	ND(10)	ND(10)	ND(0.6)	ND(10)	ND(0.5)	1.1	0.5
Lead	ND(2)	ND(0.27)	ND	ND(2)	ND(0.5)	ND(0.5)	ND(1)	ND(2.1)	ND(10)	ND(0.04)	ND(0.04)	0.2
Mercury	ND(0.5)	ND(0.17)	ND	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.06)	ND(0.06)
Potassium	ND(1,000)	ND(1,000)	700	ND(2,000)	ND(1,000)	ND(5,000)	ND(5,000)	688	630	697	741	750
Selenium	ND(5)	ND(1.5)	4	ND(5)	ND(2)	ND(2)	6	ND(1.7)	38	ND(0.24)	ND(0.01)	ND(0.01)
Silver	ND(5)	ND(0.3)	ND(5)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	ND(0.07)	ND(0.11)	ND(0.11)
Sodium	2780	2700	3000	3290	3200	3200	2600	2570	2400	3080	2810	3090
Chloride	7.5	8	7.1	9.1	8.9	9.6	8.5	9	7.9	7.33	6	7.12
Nitrate/Nitrite	1	1	0.9	0.9	0.95	0.89	0.96	37	1	1.02	1.3	1.2
Sulfate	18	19	12	18	19	20	21	21	20	18.6	18	18.4
TDS	211	240	260	234	230	240	230	230	255	207	226	226
TOC	ND(0.5)	0.5	0.4	ND(0.5)	0.64	0.85	0.65	ND(1.0)	0.62	0		

AP-3222	Oct-95	Jun-96	Nov-96	May-97	Dec-97	May-98	Nov-98	Dec-99	Jul-00	Aug-01	Dec-01	Apr-02
GW El.	NR	NR	NR	NR	NR	NR	NR	169.41	169.08	169.31	169.47	168.16
GRO	ND(0.05)	ND(0.0098)	ND(0.05)	ND(0.05)	ND(0.05)	ND(1)	ND(1)	0.012	ND(0.05)	ND(0.07)	ND(0.07)	ND(0.07)
Benzene	0.2	0.05	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.25)	ND(0.25)	ND(0.26)
Toluene	ND(0.5)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	ND(0.26)	ND(0.26)	ND(0.26)
Ethylbenzene	ND(0.5)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.27)	ND(0.27)	ND(0.27)
Xylenes	ND(0.5)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(1.1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	1	ND(5)	0.81	ND(1)	ND(1)	ND(2)	ND(1)	ND(0.5)	ND(0.59)	ND(0.59)
Barium	10	6.6	7	9	6.7	7.8	8.1	7.9	6	6.43	6.5	6.2
Cadmium	ND(5)	ND(0.2)	ND(5)	ND(0.5)	ND(0.4)	ND(0.5)	ND(1)	ND(0.3)	0.99	ND(0.052)	ND(0.03)	ND(0.03)
Chromium	8	0.94	4	ND(5)	ND(10)	ND(10)	ND(10)	0.9	ND(10)	ND(0.5)	0.99	ND(6.6)
Lead	ND(2)	ND(0.27)	ND	ND(2)	ND(0.5)	ND(0.5)	ND(1)	ND(2.1)	1.89	ND(0.06)	ND(0.23)	ND(0.23)
Mercury	ND(0.5)	ND(0.17)	ND	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.01)	ND(0.06)	ND(0.06)
Potassium	ND(1,000)	ND(1,000)	800	2000	ND(1,000)	ND(5,000)	ND(5,000)	784	630	735	814	ND(0.01)
Selenium	ND(5)	ND(1.5)	ND(5)	ND(5)	ND(2)	ND(2)	ND(3)	ND(1.7)	33	ND(0.24)	ND(0.11)	ND(0.11)
Silver	ND(5)	ND(0.3)	ND(5)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	2500	3130	3040	3180
Sodium	2900	2900	3300	3200	2900	3400	3400	2660	2500	3400	3400	3180
Chloride	8	8	7.8	8.2	7.7	9.4	8.7	11	9.4	8.47	7.4	7.7
Nitrate/Nitrite	0.5	0.87	0.8	0.8	0.88	0.78	0.78	1.2	1	0.926	1.2	1.13
Sulfate	18	19	13	17	17	18	21	20	19	18.6	18	17.7
TDS	205	240	170	244	250	240	240	220	220	223	221	228
TOC	0.3	0.6	0.4	ND(0.5)	0.75	0.76	0.88	ND(1.0)	1.2	1.1	0.5	ND(0.5)
Turbidity	ND(0.5)	ND(0.2)	ND(1)	0.41	ND(0.2)	0.4	0.5	800	ND(1)	NM	NA	ND(3.2)

AP-3219	Oct-95	Jun-96	Nov-96	May-97	Dec-97	May-98	Nov-98	Dec-99	Jul-00	Jul-01	Dec-01	Apr-02
GW El.	NR	NA	NA	NA	NR	NR	NR	267.70	268.02	262.77	NA	NA
GRO	ND(0.05)	NS	NS	NS	ND(0.05)	ND(0.05)	NM	ND(0.05)	ND(0.05)	ND(0.07)	NS	NS
Benzene	ND(0.5)	NS	NS	NS	ND(0.4)	ND(1)	NM	ND(0.3)	ND(1)	ND(0.26)	NS	NS
Toluene	ND(0.5)	NS	NS	NS	ND(0.4)	ND(1)	NM	ND(0.3)	ND(1)	ND(0.26)	NS	NS
Ethylbenzene	ND(0.5)	NS	NS	NS	ND(0.4)	ND(1)	NM	ND(0.2)	ND(1)	ND(0.27)	NS	NS
Xylenes	ND(0.5)	NS	NS	NS	ND(0.4)	ND(1)	NM	ND(0.4)	ND(2)	ND(1.1)	NS	NS
Arsenic	ND(5)	NS	NS	NS	2.6	ND(1)	12	2.5	ND(4)	ND(0.5)	NS	NS
Barium	24	NS	NS	NS	110	7	130	26.5	5.5	26.7	NS	NS
Cadmium	ND(5)	NS	NS	NS	ND(0.5)	ND(1)	ND(0.3)	ND(5)	ND(0.052)	NS	NS	NS
Chromium	ND(10)	NS	NS	NS	17	ND(10)	2.8	5.8	ND(10)	30.8	NS	NS
Lead	ND(2)	NS	NS	NS	4.8	0.42	10	3.8	ND(10)	1.1	NS	NS
Mercury	ND(0.5)	NS	NS	NS	ND(0.2)	ND(0.2)	1.9	ND(0.2)	ND(0.05)	NS	NS	NS
Potassium	500	NS	NS	NS	2700	ND(5,000)	ND(5,000)	972	1100	1200	NS	NS
Selenium	ND(5)	NS	NS	NS	ND(2)	ND(2)	4.3	ND(1.7)	22	ND(0.24)	NS	NS
Silver	ND(5)	NS	NS	NS	ND(0.5)	ND(0.5)	0.55	ND(0.5)	ND(0.07)	NS	NS	NS
Sodium	1000	NS	NS	NS	2200	1200	1400	1040	1500	1520	NS	NS
Chloride	1	NS	NS	NS	1.2	1	1	1	1.83	NS	NS	NS
Nitrate/Nitrite	0.5	NS	NS	NS	0.79	0.64	0.57	2.7	0.36	0.642	NS	NS
Sulfate	3.1	NS	NS	NS	3.7	5	4.5	4	4.9	3.74	NS	NS
TDS	40	NS	NS	NS	33	63	100	56	54	42.4	NS	NS
TOC	1.3	NS	NS	NS	2.7	1.7	7.3	1	1.1	1.9	NS	NS
Turbidity	60	NS	NS	NS	3	9.8	150	66	6	NM	NS	NS

LEGEND
 AP-3010 MONITORING WELL

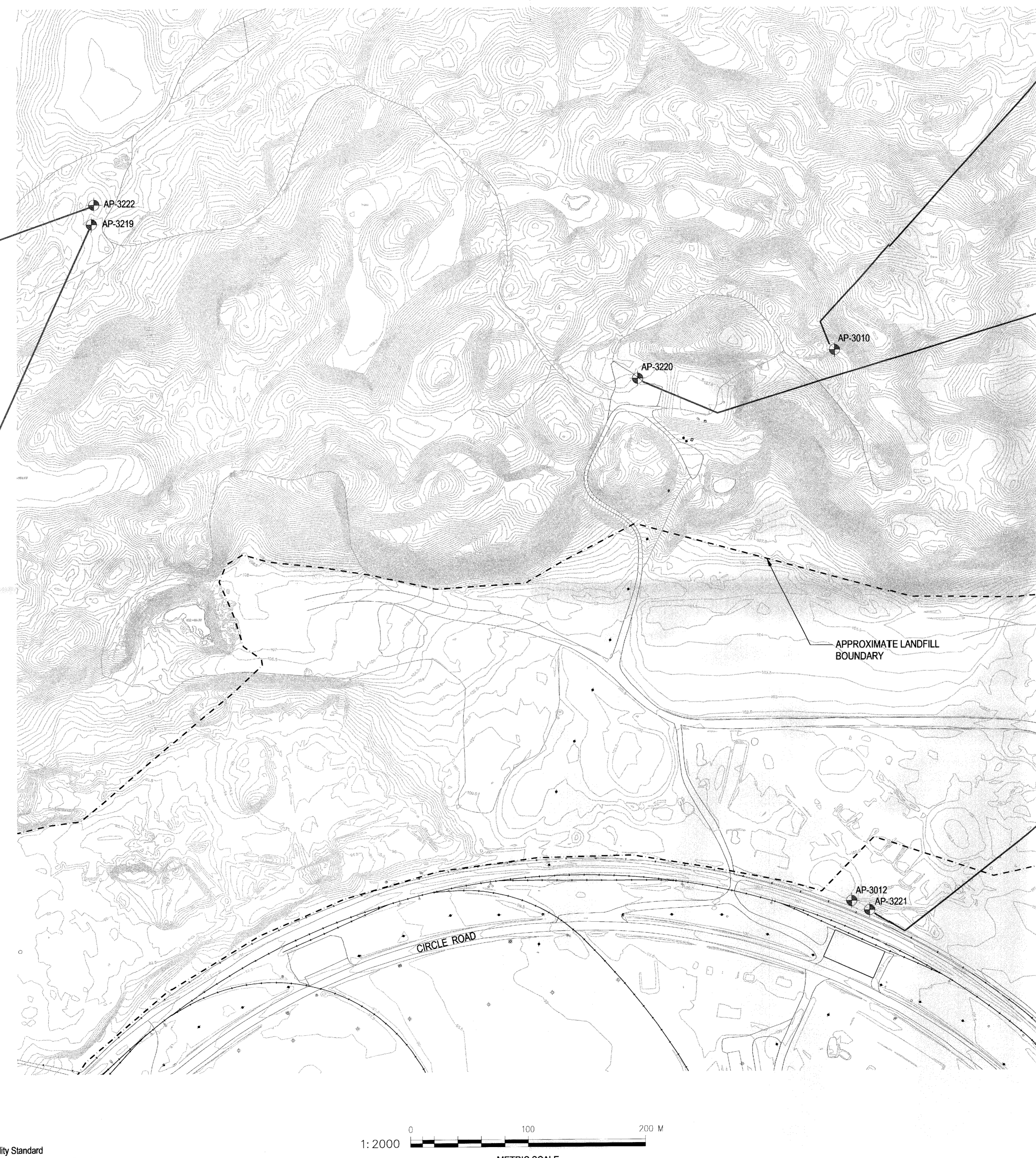
UNITS
 Groundwater Elevations in Feet
 BTEX and Metals in µg/L
 GRO, Chloride, Nitrate/Nitrite, Sulfate, TDS, and TOC in mg/L
 Turbidity in NTU

NOTES
 GW El. = Groundwater Elevation
 GRO = Gasoline Range Organics
 TDS = Total Dissolved Solids
 TOC = Total Organic Carbon
 BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
 NA = Not Applicable
 NR = Not Measured
 ND = Not Reported
 NS = Not Sampled
 Metals are total analysis

CLEANUP LEVELS µg/L

	AK	MCL
GRO	1,300	
Benzene	5	5
Toluene	1,000	1,000
Ethylbenzene	700	700
Xylenes	10,000	10,000
Arsenic	50	10
Barium	2,000	2,000
Cadmium	5	5
Chromium	100	100
Lead	15	15
Mercury	2	2
Potassium	NA	NA
Selenium	50	50
Silver	180	100
Sodium	NA	NA
Chloride	NA	NA
Nitrate/Nitrite	NA	10,000/1,000
Sulfate	NA	250,000
TDS	NA	500,000
TOC	NA	NA
Turbidity	NA	NA

AK = State of Alaska Groundwater Quality Standard
 MCL = Maximum Contaminant Level, Federal Drinking Water Standard
 23.9 = Concentrations Exceeding Cleanup Standards



AP-3010	Oct-95	Jun-96	Nov-96	May-97	Nov-97	May-98	Nov-98	Dec-99	Jun-00	Aug-01	Dec-01	Apr-02
GW El.	NR	NR	NR	NR	NR	NR	NR	171.35	171.41	171.50	171.80	171.25
GRO	ND(0.05)	0.15	0.04	ND(0.05)	ND(0.05)	0.058	0.46	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	ND(2)	ND(0.2)	ND(1)	0.4	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	ND(0.001)	ND(0.25)	ND(0.25)
Toluene	ND(2)	ND(0.2)	ND(1)	0.2	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	2.9	ND(0.26)	ND(0.26)
Ethylbenzene	ND(2)	ND(0.2)	ND(1)	0.2	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	ND(0.001)	ND(0.27)	ND(0.27)
Xylenes	ND(2)	ND(0.2)	ND(1)	0.8	ND(0.4)	ND(1)	ND(1)	ND(0.4)	ND(2)	ND(1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	2	3	ND(1)	ND(1)	ND(1)	13.3	ND(4)	ND(0.5)	3.1	ND(0.09)
Barium	10	10	10	32	16	14	12	215	17	8.15	45	11.8
Cadmium	ND(20)	ND(0.2)	ND(5)	ND(4)	ND(0.5)	ND(0.5)	ND(1)	1.7	0.76	ND(0.052)	ND(0.03)	ND(0.03)
Chromium	ND(20)	14	6	27	6	9.7	5	51.2	4.1	4.4	9.9	2.7
Lead	4	1.8	2	14	0.83	1.8	0.31	23.9	ND(10)	0.16	6.5	0.55
Mercury	ND(0.2)	ND(0.17)	ND	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.058)	ND(0.06)
Potassium	1000	1800	1100	ND(2,000)	ND(1,000)	ND(5,000)	ND(1,000)	4126	1700	1020	1930	1170
Selenium	ND(5)	ND(1.5)	ND(5)	ND(5)	ND(2)	ND(2)	2.3	4.1	ND(50)	ND(0.24)	0.58	0.72
Silver	ND(20)	ND(0.3)	ND(5)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	0.042	ND(0.07)	0.11	ND(0.11)	ND(0.11)
Sodium	3200	3200	3500	3900	3200	3600	3300	4590	3400	3430	3720	3510
Chloride	1.8	1	1.8	2.4	1.9	2	1.5	2	2.1	2.45	1.3	1.78
Nitrate/Nitrite	0.3	0.36	0.3	0.4	0.39	0.34	0.31	17	0.37	0.5	0.68	0.67
Sulfate	14	16	14	17	16	18	16	16	17	12.8	13	13.3
TDS	289	290	265	319	280	290	320	390	300	NR	307	321
TOC	0.8	1.1	0.9	2	1.5	1.4	3.9	2.8	6.2	1.5	3.9	1.12
Turbidity	6.8	7.2	6	72.5	4.9	13	11	800	29	NM	NM	8.2

AP-3220	Oct-95	Jun-96	Nov-96	May-97	Dec-97	May-98	Nov-98	Nov-99	Jun-00	Aug-01	Dec-01	Apr-02
GW El.	NA	NR	NR	NR	NR	NR	NR	176.82	176.76	176.53	168.33	176.6
GRO	NS	ND(0.0088)	0.026	ND(0.05)	0.03	ND(0.05)	ND	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	NA	0.073	ND(1)	ND(0.5)	7.7	ND(1)	0.31	ND(0.2)	ND(1)	ND(0.001)	ND(0.25)	ND(0.26)
Toluene	NA	0.3	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	ND(0.001)	ND(0.25)	ND(0.26)
Ethylbenzene	NA	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.001)	ND(0.27)	ND(0.27)
Xylenes	NA	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.4)	ND(2)	ND(1)	ND(1.1)	ND(1.1)
Arsenic	NA	4.9	4	15	8.9	8.6	5.9	5.1	6	7.5	20	6.1
Barium	NA	100	78	221	120	150	74	63.9	7.9	138	267	118
Cadmium	NA	ND(0.2)	ND(5)	ND(4)	0.46	0.68	ND(1)	0.3	1.6	0.64	0.47	0.28
Chromium	NA	2.2	4	32	ND(10)	4.8	ND(10)	1	2.6	6.06	47	10.7
Lead	NA	1.7	3	15	5	12	ND(1)	ND(2.1)	ND(10)	7.8	25	6.1
Mercury	NA	ND(0.17)	ND	ND(0.5)	0.24	0.32	ND(0.2)	ND(0.2)	ND(0.05)	ND(0.06)	ND(0.06)	ND(0.06)
Potassium	NA	2900	3600	4300	4900	2900	2200	1800	3100	4950	4880	2950
Selenium	NA	7.4	ND(5)	ND(5)	18	6.5	17	ND(1.7)	ND(50)	ND(0.24)	1.7	0.52
Silver	NA	ND(0.3)	ND(5)	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(10)	0.373	ND(0.11		



AP-3011	Oct-95
GW EL	NR
GRO	ND(0.05)
Benzene	ND(0.5)
Toluene	ND(0.5)
Ethylbenzene	ND(0.5)
Xylenes	ND(0.5)
Arsenic	ND(5)
Barium	20
Cadmium	ND(5)
Chromium	ND(10)
Lead	7
Mercury	ND(0.5)
Potassium	ND(1,000)
Selenium	ND(5)
Silver	ND(5)
Sodium	4200
Chloride	61
Nitrate/Nitrite	ND(0.2)
Sulfate	31
TDS	562
TOC	2.3
Turbidity	11.5

FR-3	Oct-95	Jun-96	Nov-96	May-97	Dec-97	Jun-98	Nov-98	Nov-99	Jul-00	Aug-01	Dec-01	Apr-02
GW EL	NR	NR	NR	NR	NR	NR	NR	154.30	154.85	152.98	152.33	210.30
GRO	ND(0.05)	ND(0.0098)	0.028	ND(0.05)	0.026	ND(0.05)	ND	ND(0.025)	ND(0.05)	ND(0.007)	ND(0.007)	ND(0.007)
Benzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.0001)	ND(0.25)	ND(0.25)
Toluene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.3)	ND(1)	ND(0.0001)	ND(0.26)	ND(0.26)
Ethylbenzene	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.2)	ND(1)	ND(0.0001)	ND(0.27)	ND(0.27)
Xylenes	ND(2)	ND(0.2)	ND(1)	ND(0.5)	ND(0.4)	ND(1)	ND(1)	ND(0.4)	ND(2)	ND(1)	ND(1.1)	ND(1.1)
Arsenic	ND(5)	ND(0.8)	3	8	19	1.8	ND(1)	17	ND(2)	31.3	27	1.45
Barium	24	13	38	135	330	6	10	270	17	435	335	28.5
Cadmium	ND(5)	ND(0.2)	ND(5)	ND(4)	0.71	ND(0.5)	ND(1)	ND(0.3)	1.1	0.828	ND(0.15)	ND(0.03)
Chromium	10	11	ND	575	670	160	15	2200	32	406	673	7.65
Lead	ND(2)	1.1	4	17	65	9.4	ND(1)	31	ND(10)	59.2	53	1.81
Mercury	ND(0.5)	ND(0.17)	ND	ND(0.5)	ND(0.2)	0.2	ND(0.2)	0.23	ND(0.2)	ND(0.05)	0.3	ND(0.06)
Potassium	1000	1900	1600	3610	4400	ND(5,000)	6400	1100	3670	5770	1290	
Selenium	ND(5)	ND(1.5)	ND(5)	ND(5)	ND(2)	ND(2)	3.8	6.8	20	3.08	ND(0.05)	0.57
Silver	ND(5)	ND(0.3)	ND(5)	ND(10)	1.7	0.35	ND(0.5)	1.3	ND(10)	1.16	3.9	ND(0.11)
Sodium	2100	1800	2400	3520	3600	2500	1500	4060	1700	2990	6110	2320
Chloride	3.2	3	2.7	3.6	3	2.7	3	2.9	3.4	3.3	3.3	2.71
Nitrate/Nitrite	0.5	0.5	ND(0.2)	0.7	0.43	0.35	0.39	1.2	0.46	0.55	0.75	0.61
Sulfate	12	12	11	12	13	13	13	12	12	11.8	11	12.4
TDS	348	230	198	218	190	180	200	180	ND(10)	175	473	198
TOC	0.2	0.85	1	3.5	18	5.7	0.72	ND(1.0)	1.6	12	9	1.3
Turbidity	84	60.5	660	137	170	160	15	104	44	NM	NM	6.0

LEGEND

AP-3010 MONITORING WELL

UNITS

Groundwater Elevations in Feet
 BTEX and Metals in µg/L
 GRO, Chloride, Nitrate/Nitrite, Sulfate, TDS, and TOC in mg/L
 Turbidity in NTU

NOTES

GW EL = Groundwater Elevation
 GRO = Gasoline Range Organics
 TDS = Total Dissolved Solids
 TOC = Total Organic Carbon
 BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
 NA = Not Applicable
 NM = Not Measured
 NR = Not Reported
 NS = Not Sampled
 Metals are total analysis

CLEANUP LEVELS µg/L

	AK	MCL
GRO	1,300	
Benzene	5	5
Toluene	1,000	1,000
Ethylbenzene	700	700
Xylenes	10,000	10,000
Arsenic	50	10
Barium	2,000	2,000
Cadmium	5	5
Chromium	100	100
Lead	15	15
Mercury	2	2
Potassium	NA	NA
Selenium	50	50
Silver	180	100
Sodium	NA	NA
Chloride	NA	NA
Nitrate/Nitrite	NA	10,000/1,000
Sulfate	NA	250,000
TDS	NA	500,000
TOC	NA	NA
Turbidity	NA	NA

AK = State of Alaska Groundwater Quality Standard
 MCL = Maximum Contaminant Level, Federal Drinking Water Standard
 23.9 = Concentrations Exceeding Cleanup Standards

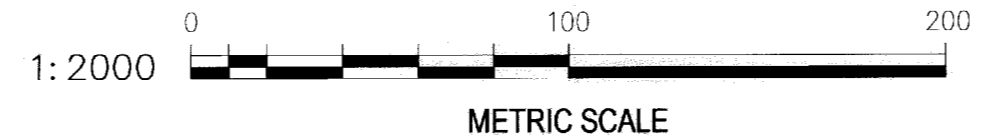


Figure 4-3
 Groundwater Analytical Results

Fort Richardson Landfill
 Fort Richardson, Alaska

Figure 4-4
Arsenic and Lead Concentrations in Well AP-3220

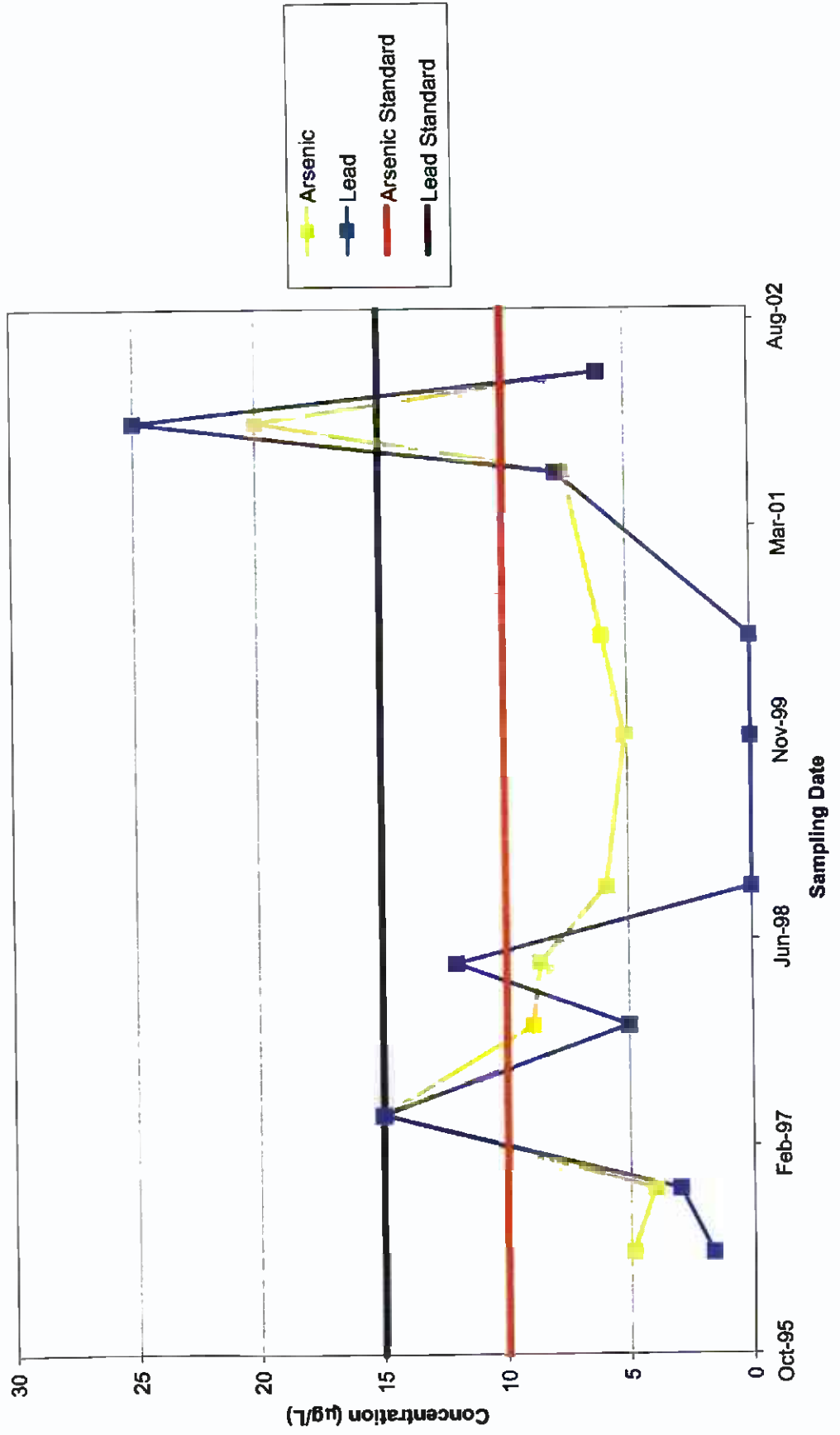
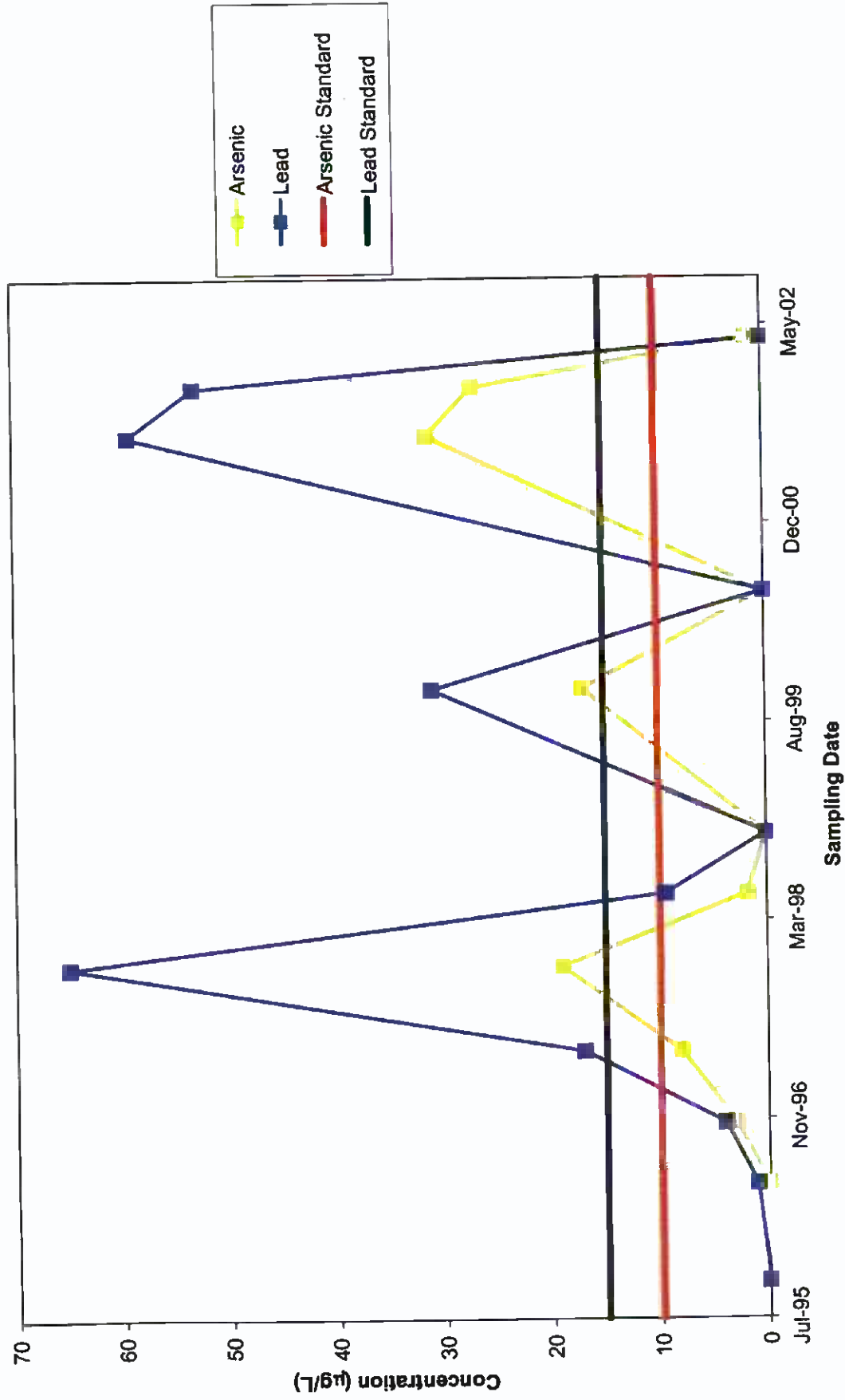
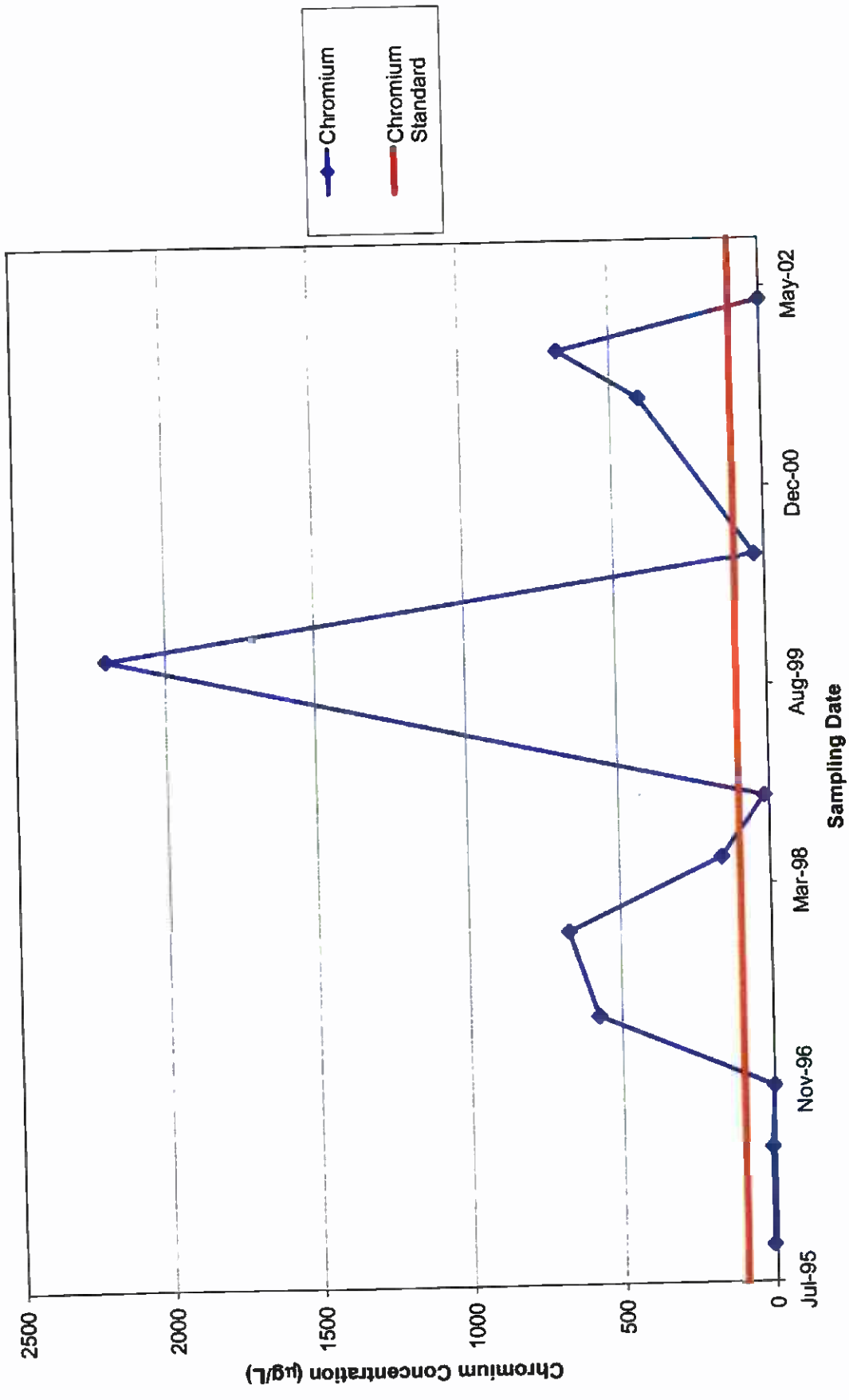


Figure 4-5
Arsenic and Lead Concentrations in Well FR-3



**Figure 4-6
Chromium Concentrations in Well FR-3**



SECTION 5

Data Quality Review

CH2M HILL completed a data quality review to assess the appropriate use or "useability" of the analytical data based on the QA/QC data submitted. QA/QC data associated with the analysis of 10 groundwater samples, 1 field duplicate, 4 trip blanks, one MS/MSD, and 1 rinsate blank sample were reviewed. The following sections summarize the reviewed analytical parameters and provide any data quality issues. The complete data quality assessment memo is provided in Appendix C.

5.1 GRO and BTEX

GRO and BTEX results met all data quality requirements, and no data were qualified as a result of the assessment.

5.2 TOC

Five of the samples analyzed for TOC were qualified because the sample cooler arrived at the laboratory at 0.5 degrees Celsius ($^{\circ}\text{C}$), outside the allowable range. Those results (samples 07 through 11) were qualified with a "J" flag. TOC was detected in the rinsate blank. Therefore, sample locations where a nondedicated pump was used were qualified with a "U" and reported as not detected for TOC. The affected sample locations were AP-3014 (02FRLFWA09) and AP-3220 (02FRLFWA).

5.3 TDS

TDS results met all data quality requirements and no data were qualified as a result of the assessment.

5.4 Metals

Barium, chromium, lead, potassium, and sodium were detected in the rinsate blank. Therefore, sample locations where a nondedicated pump was used were qualified with a "U" and reported as not detected for those metals meeting the qualification criteria. The affected sample locations were AP-3014 (02FRLFWA09) for chromium and AP-3220 (02FRLFWA) for chromium and lead.

5.5 Turbidity

Turbidity was detected in the rinsate blank. Therefore, sample locations where a nondedicated pump was used were qualified with a "U" and reported as not detected for turbidity. The affected sample locations were AP-3014 (02FRLFWA09) and AP-3220 (02FRLFWA).

5.6 Water Quality Parameters

Chloride and sulfate were detected in the rinsate blank. Therefore, sample locations where a nondedicated pump was used were qualified with a "U" and reported as not detected for chloride and sulfate meeting the qualification criteria. The affected sample location was AP-3014 (02FRLFWA09), which was qualified for both chloride and sulfate.

5.7 Summary

With the exception of the qualified data associated with the undercooled cooler of TOC samples and the two sampling locations impacted by rinsate blank, the rest of the data have met the QA/QC acceptance criteria outlined for the Fort Richardson groundwater sampling study.

Conclusions and Recommendations

6.1 Conclusions

Groundwater quality continues to be good as no exceedances of groundwater cleanup standards were observed from this sampling event. Significant increases in constituent concentrations have not been observed.

6.2 Recommendations

On the basis of the results of this and previous sampling events, the following recommendations are offered:

- Collection of dissolved metals samples from wells FR-3 and AP-3220 for potential analysis is still recommended if total metals exceedances are observed.
- Concentrations of metals in Monitoring Wells FR-3 and AP-3220 should continue to be observed for trends. Although metals concentrations in these wells were below regulatory standards, metals concentrations have exceeded such standards during previous events.
- Resurveying the wells monitored at the landfill to acquire accurate horizontal locations and verification of top of casing elevations is suggested.
- The suspected groundwater divide across the landfill should be investigated more fully. The landfill is at the extent of the existing Fort Richardson groundwater monitoring network. Installation of additional monitoring wells north of the landfill would be worthwhile to gain a greater understanding of local groundwater flow.

SECTION 7

References

Alaska Department of Environmental Conservation. *Storage Tank Program, Underground Storage Tanks Procedures Manual*, 18 AAC 78.090. 1998.

CH2M HILL. *Quality Assurance Program Plan, Fort Richardson, Anchorage, Alaska*. 2000.

Ecology and Environment, Inc. *Sampling and Analysis Plan, Fort Richardson Landfill, Anchorage, Alaska*. 1995.

U.S. Army Corps of Engineers. *Landfill Monitoring, Chemical Data Report, Spring 2000, Fort Richardson, Alaska*. 2000.

U.S. Environmental Protection Agency. *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed., rev. 4. 1996.

U.S. Environmental Protection Agency. *Methods for Chemical Analysis of Water and Wastes*. 1983.

Appendix A

Groundwater Sampling Forms



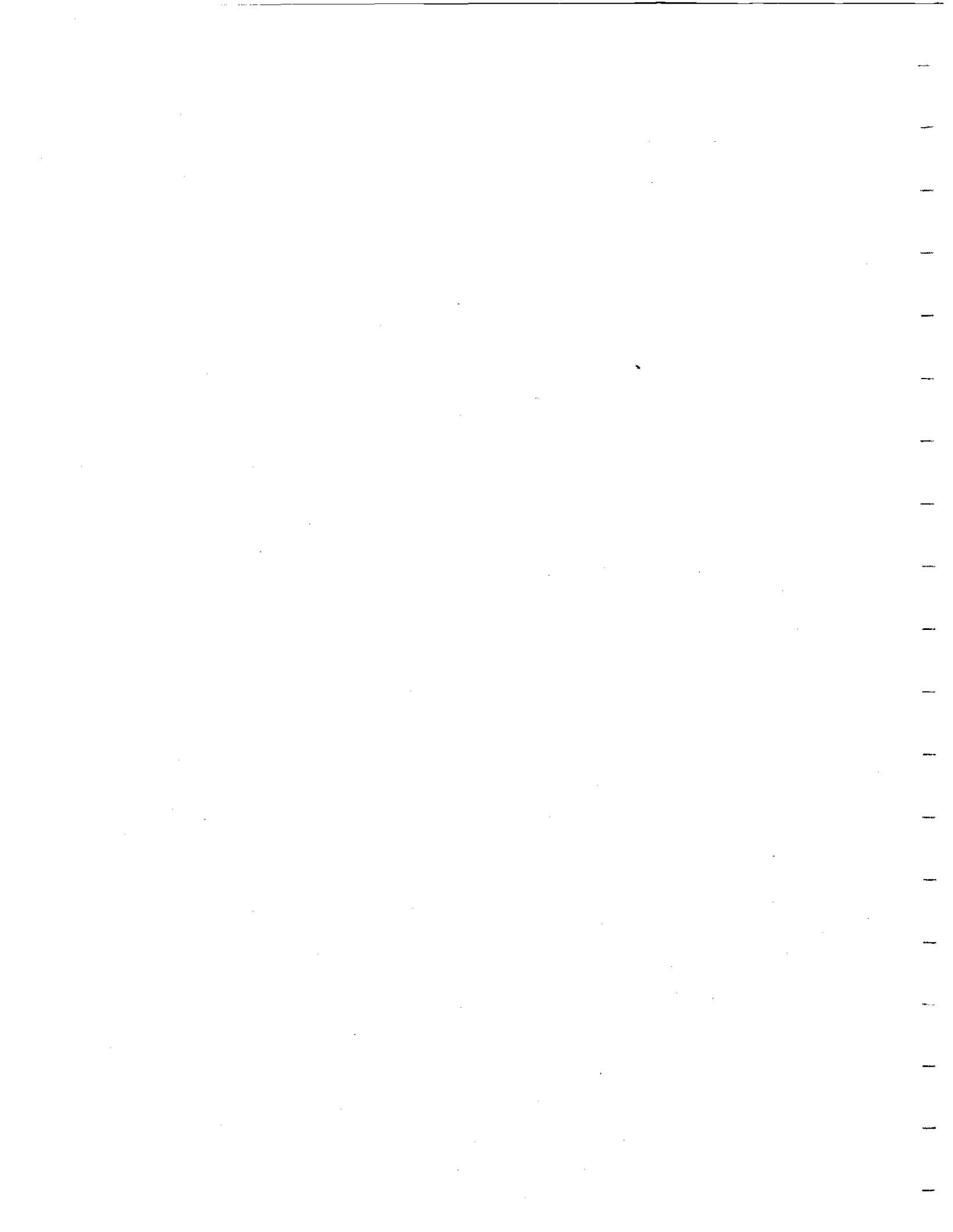
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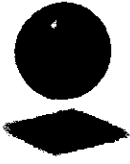
SAMPLE TRACKING LOG

Fort Richardson Groundwater Monitoring Program

Landfill, April 2002 Sampling Event

Date	Sample Location	Sample ID	Depth (ft BTOC)	Matrix	Type
05/01/2002	FR-2	02FRLFWA01	166	Water	FIELD
05/01/2002	FR-1	02FRLFWA02	149	Water	FIELD
05/02/2002	AP-3010	02FRLFWA03	232	Water	FIELD
05/02/2002	AP-3220	02FRLFWA04	231	Water	FIELD
05/02/2002	AP-3221	02FRLFWA05	178	Water	FIELD
05/03/2002	FR-3	02FRLFWA06	165	Water	FIELD
05/06/2002	AP-3015	02FRLFWA07	129	Water	FIELD
05/06/2002	AP-3015	02FRLFWA08	129	Water	DUPLICATE
05/06/2002	AP-3014	02FRLFWA09	26	Water	FIELD
05/06/2002	AP-3222	02FRLFWA10	136	Water	FIELD
05/06/2002	N/A	02FRLFWA11	N/A	Water	RINSATE
05/07/2002	AP-3013	02FRLFWA12	150	Water	FIELD/MS/MSD





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WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: Ft. Richardson - Landfill

PROJECT # 166825.09.LF

WELL DEPTH (FT):	166.48	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	02F2LFWA01
DEPTH TO WATER (FT):	150.64	1.25 IN	0.0637	WELL ID	FR-2
WATER COLUMN (FT):	15.84	2 IN	0.1632	INTERVAL	
GAL/FT OF CASING	0.1632	4 IN.	0.6528	SAMPLER	Stacey Cooper Bob Trebble
CASING VOLUME (GAL)	2.59	6 IN.	1.4688	DATE	5/1/02
NO. OF VOLUMES min.(3)	3	8 IN.	2.611	TIME	1425
PURGE VOLUME (GAL)	5	10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: <u>SUB</u> CENT PERIST OTHER:	BAILER: TEFLON SS OTHER:
TIME ON: 1400-1445	DEDICATED
FLOW RATE (gpm): 0.1	BAILER VOL. (gal) .25 / .33
PUMP TIME (min): 45	REQUIRED PULLS:
VOL PURGED (gals): 5	VOL. PURGED (gals):
	OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	1400	1405	1410	1415	1420	
VOL (gal) <i>Water level Draw down</i>	NA	→				
pH (s.units)	6.15	6.25	6.33	6.38	6.44	
TEMP (C)	4.6	6.4	7.6	8.2	8.9	
COND (umhos/cm)	0.517	0.439	0.432	0.429	0.427	
TURBIDITY (NTU)	0	0	0	0	0	
REDOX (-/+ mV)	246	216	205	202	194	
DO (mg/L) / %satnity	17.4 / %	10.20 / %	9.94 / %	7.09 / %	7.04 / %	

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:
 FILTERED? (Y) / N 1.0um 0.45um OTHER: Dissolved metals were filtered

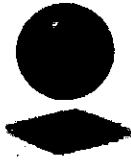
OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER:

ODOR: NONE, LOW, MEDIUM, HIGH, VERY STRONG, H2S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID, HEAVY SILTS

COMMENTS: Couldn't take water levels b/c pump was in Dewey. Low Flow. Used historical WLP/DO



CH2MHILL

WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: Ft. Richardson
PROJECT # 166825.09.LF

WELL DEPTH (FT):	149	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	02FR LFWA02
DEPTH TO WATER (FT):	130.05	1.25 IN	0.0637	WELL ID	FR-1
WATER COLUMN (FT):	18.95	2 IN	0.1632	INTERVAL	149
GAL/FT OF CASING	0.1632	4 IN.	0.6528	SAMPLER	Stacy Cochrane for Bob Trubbe
CASING VOLUME (GAL)	3.09	6 IN.	1.4688	DATE	5/1/02
NO. OF VOLUMES min.(3)		8 IN.	2.611	TIME	1600
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: SUB CENT PERIST OTHER:
 TIME ON: 1535-1615 DEDICATED
 FLOW RATE (gpm): 0.2
 PUMP TIME (min): 40
 VOL PURGED (gals): 8

BAILER: TEFLON SS OTHER:
 BAILER VOL.. (gal) .25 / .35
 REQUIRED PULLS:
 VOL PURGED (gals):
 OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	1535	1540	1545	1550	1555	
VOL(gal) Water level Draw down	NA					→
pH (s.units)	7.31	7.10	7.0	7.01	7.11	
TEMP (C)	4.4	4.6	6.0	7.7	8.6	
COND (umhos/cm)	0.397	0.382	0.375	0.372	0.372	
TURBIDITY (NTU)	0	0	0	0	0	
REDOX (-/+ mV)	194	195	174	169	165	
DO (mg/L)	10.00	8.07	7.51	7.55	7.72	

SAMPLE PARAMETERS: GRAB COMPOSITE
 SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:
 FILTERED? Y / N 1.0um 0.45um OTHER:

OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER:
 ODOR: NONE LOW, MEDIUM, HIGH, VERY STRONG, H2S FUEL LIKE, CHEMICAL?, UNKNOWN
 TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID, HEAVY SILTS
 COMMENTS: used historical w/TO - Low flow



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WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: FR Landfill

PROJECT # 106

WELL DEPTH (FT):	<u>234.40</u>	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	<u>02FRLFO3</u>
DEPTH TO WATER (FT):	<u>232.05</u>	1.25 IN	0.0637	WELL ID	<u>AP-3010</u>
WATER COLUMN (FT):	<u>2.35</u>	2 IN.	0.1632	INTERVAL	<u>234</u>
GAL/FT OF CASING	<u>0.6528</u>	<u>4 IN.</u>	<u>0.6528</u>	SAMPLER	<u>BT, SC</u>
CASING VOLUME (GAL)		6 IN.	1.4688	DATE	<u>5/2/02</u>
NO. OF VOLUMES mln.(3)		8 IN.	2.611	TIME	<u>0935</u>
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: SUB CENT PERIST OTHER: BAILER: TEFLON SS OTHER:

TIME ON: BAILER VOL.. (gal) .25 / .33

FLOW RATE (gpm): REQUIRED PULLS:

PUMP TIME (min): VOL. PURGED (gals):

VOL PURGED (gals): 1 Gal OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	<u>0934</u>	<u>0945</u>				
VOL (gal)	<u>0.5</u>	<u>1</u>				
pH (s.units)	<u>6.63</u>	<u>6.46</u>				
TEMP (C)	<u>3.7</u>	<u>4.0</u>				
COND (umhos/cm)	<u>0.657</u>	<u>0.602</u>				
TURBIDITY (NTU)	<u>0.9</u>	<u>10</u>				
REDOX (-/+ mV)	<u>198</u>	<u>128</u>				
DO (mg/L)	<u>12.09</u>	<u>10.17</u>				

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:

FILTERED? Y / N 1.0um 0.45um OTHER:

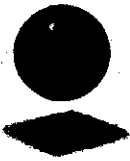
OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER:

ODOR: NONE, LOW, MEDIUM, HIGH, VERY STRONG, H2S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID, HEAVY SILTS

COMMENTS: Used Bailor



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WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: FR Landfill

PROJECT # 166825 09 LP

WELL DEPTH (FT):	239.75 244	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	D2PRLF04
DEPTH TO WATER (FT):	231.48	1.25 IN	0.0637	WELL ID	AP-3220
WATER COLUMN (FT):	8.27	2 IN.	0.1632	INTERVAL	SC, BT
GAL/FT OF CASING	0.6528	4 IN.	0.6528	SAMPLER	BT, SC
CASING VOLUME (GAL)	5.4	6 IN.	1.4688	DATE	5/2/02
NO. OF VOLUMES min.(3)		8 IN.	2.611	TIME	1245
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: SUB CENT PERIST OTHER: BAILER: TEFLON SS OTHER:

TIME ON: BAILER VOL. (gal) 25 / 30

FLOW RATE (gpm): REQUIRED PULLS:

PUMP TIME (min): VOL PURGED (gals): 77

VOL PURGED (gals): 7 OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	1137	1205	1232	1300		
VOL (gal)	0.5	3	6	7		
pH (s.units)	6.87	7.40	7.70	7.81		
TEMP (C)	4.8	5.0	4.1	3.4		
COND (umhos/cm)	0.559	0.572	0.593	0.649		
TURBIDITY (NTU)	0	3.1	12.3	86		
REDOX (-/+ mV)	102	101	46	1		
DO (mg/L) / subunit	7.05/0	6.03	4.20	4.57		

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:

FILTERED? Y / N 1.0um 0.45um OTHER:

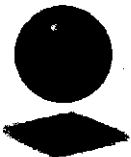
OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER:

ODOR: NONE, LOW, MEDIUM, HIGH, VERY STRONG, H2S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID. HEAVY SILTS

COMMENTS: used historical TD, well went dry



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WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: Ft. Rich Landfill

PROJECT # 166825.09. LP

WELL DEPTH (FT):	179 179	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	02FRLP05
DEPTH TO WATER (FT):	NA	1.25 IN	0.0637	WELL ID	AP-3012 3221
WATER COLUMN (FT):		2 IN.	0.1632	INTERVAL	
GAL/FT OF CASING	0.0528	4 IN.	0.6528	SAMPLER	SC/BT
CASING VOLUME (GAL)		6 IN.	1.4688	DATE	5/2/02
NO. OF VOLUMES min.(3)		8 IN.	2.611	TIME	1410
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: <u>SUB</u> CENT PERIST OTHER:	BAILER: TEFLON SS OTHER:
TIME ON: <u>1342 - 1415</u> DEDICATED	BAILER VOL., (gal) .25 / .33
FLOW RATE (gpm): <u>0.1</u>	REQUIRED PULLS: _____
PUMP TIME (min): <u>28</u>	VOL. PURGED (gals): _____
VOL PURGED (gals): <u>2.3</u>	OTHER: _____

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	1343	1348	1353	1358	1403	
VOL (gal) <i>Water level draw down</i>	—	—	—	—	—	
pH (s.units)	7.84	7.39	7.63	7.16	7.13	
TEMP (C)	3.9	4.1	4.1	4.4	4.9	
COND (umhos/cm)	0.809	0.792	0.794	0.818	0.829	
TURBIDITY (NTU)	10	10	10	10	10	
REDOX (-/+ mV)	134	69	59	67	78	
DO (mg/L) <i>sat min H</i>	13.10 / 0	11.78 / 0	11.17 / 0	10.76 / 0	10.37 / 0	

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:

FILTERED? Y / N 1.0um 0.45um OTHER:

OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER:

ODOR: NONE LOW, MEDIUM, HIGH, VERY STRONG, H₂S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID, HEAVY SILTS

COMMENTS: Can't take the level bc wires of pump are in the way.



CH2MHILL

3012
14.9 TD

WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: Ft. Rich Landfill

PROJECT # 164925.02 LF

WELL DEPTH (FT):	165.7	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	02FRLF06
DEPTH TO WATER (FT):	153.05	1.25 IN	0.0637	WELL ID	AR FR-3
WATER COLUMN (FT):	12.65	2 IN.	0.1632	INTERVAL	165
GAL/FT OF CASING	0.1632	4 IN.	0.6528	SAMPLER	SC, BT
CASING VOLUME (GAL)	2.06	6 IN.	1.4688	DATE	5/2/02 / 5/3/02
NO. OF VOLUMES mln.(3)		8 IN.	2.611	TIME	0815 (5/3/02)
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: SUB CENT PERIST OTHER: BAILER: (TEFLON) SS OTHER:

TIME ON: BAILER VOL. (gal) 25 / 30

FLOW RATE (gpm): REQUIRED PULLS:

PUMP TIME (min): VOL PURGED (gals): 4

VOL PURGED (gals): OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	1515	1521	1534	1545	0810	
VOL (gal)	1	2	2.5	3.0	After Sample	
pH (s.units)	7.95	7.89	7.90	7.79	5.94	
TEMP (C)	3.7	3.6	4.2	3.3	5.4	
COND (umhos/cm)	0.347	0.332	0.326	0.325	0.427	
TURBIDITY (NTU)	>100	>100	>100	>100	57.5	
REDOX (-/+ mV)	140	119	126	144	293	
DO (mg/L) / salinity	10.42 / 0	8.22 / 0	8.99 / 0	7.82 / 0	/ 0	

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:

FILTERED? Y / N 1.0um 0.45um OTHER:

OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER: DUM / 0.88

ODOR: NONE, LOW, MEDIUM, HIGH, VERY STRONG, H2S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID, HEAVY SILTS

COMMENTS: unable to collect any more H2O, come back 5/3 collect samples/parameters wells per 3.0 gpl



CH2MHILL

WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: Ft Rich

PROJECT # 166825.09.LF

WELL DEPTH (FT):	130	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	02FRLF WA07
DEPTH TO WATER (FT):	123.06	1.25 IN	0.0637	WELL ID	AP-3015
WATER COLUMN (FT):	7'	2 IN.	0.1632	INTERVAL	129
GAL/FT OF CASING	0.6528	4 IN.	0.6528	SAMPLER	AL, SC
CASING VOLUME (GAL)		6 IN.	1.4688	DATE	5/6/02
NO. OF VOLUMES min.(3)		8 IN.	2.611	TIME	1140
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: <u>SUB</u> CENT PERIST OTHER:	BAILER: TEFLON SS OTHER:
TIME ON: <u>1105 - 1150</u> <u>DEDICATED</u>	BAILER VOL. (gal) .25 / .33
FLOW RATE (gpm): <u>0.45 - 0.22</u>	REQUIRED PULLS:
PUMP TIME (min): <u>45</u>	VOL. PURGED (gals):
VOL PURGED (gals): <u>5+5=10</u>	OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS						
	1st	2nd	3rd	4th	5th	6th	
TIME	1105	1110	1115	1120	1125	1130	1135
VOL (gal) <u>water level</u>	—						
pH (s.units) <u>0.2</u>	5.69	6.37	6.44	6.64	6.88	7.12	7.27
TEMP (C) <u>1</u>	5.0	4.3	4.6	7.2	7.9	7.7	7.6
COND (umhos/cm) <u>3%</u>	0.454	0.435	0.434	0.426	0.422	0.421	0.419
TURBIDITY (NTU)	55.8	10 15.5	21.4	7.9	1.1	1	1
REDOX (-/+ mV) <u>20mV</u>	291	261	239	203	194	184	181
DO (mg/L) <u>100% Sal.=0</u>	9.12/0	7.43/0	7.45/0	7.70/0	7.92/0	7.90/0	7.83/0

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:

FILTERED? Y / N 1.0um 0.45um OTHER:

OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER:

ODOR: NONE, LOW, MEDIUM, HIGH, VERY STRONG, H2S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID. HEAVY SILTS

COMMENTS: 3015-well) Check hose fitting - Did Duplicate @ this well
Took sample through flow-through 02FRLF WA08
Cell. couldn't take water levels b/c pump in the way.



CH2MHILL

WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: PT RICH

PROJECT # 166825.09.CP

WELL DEPTH (FT):	<u>31</u>	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	<u>02FRLW2A09</u>
DEPTH TO WATER (FT):	<u>21.72</u>	1.25 IN	0.0637	WELL ID	<u>AP-3014</u>
WATER COLUMN (FT):	<u>9</u>	2 IN.	0.1632	INTERVAL	<u>26</u>
GAL/FT OF CASING	<u>0.6528</u>	<u>4 IN.</u>	0.6528	SAMPLER	<u>AL5C</u>
CASING VOLUME (GAL)		6 IN.	1.4688	DATE	<u>5/6/02</u>
NO. OF VOLUMES min.(3)		8 IN.	2.611	TIME	<u>1245</u>
PURGE VOLUME (GAL)		10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: SUB CENT PERIST OTHER: _____ BAILER: TEFLON SS OTHER: _____

TIME ON: 1217-1255 NOT DEDICATED BAILER VOL., (gal) .25 / 3-

FLOW RATE (gpm): 0.2 REQUIRED PULLS: _____

PUMP TIME (min): 38 VOL. PURGED (gals): _____

VOL PURGED (gals): 8 OTHER: _____

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	<u>1218</u>	<u>1223</u>	<u>1228</u>	<u>1233</u>	<u>1238</u>	<u>1243</u>
VOL (gal) <i>Water level Draw Down</i>	<u>21.70</u> <u>0.02</u>	<u>21.70</u> <u>0.02</u>	<u>21.70</u> <u>0.02</u>	<u>21.72</u> <u>0</u>	<u>21.72</u> <u>0</u>	<u>21.72</u> <u>0</u>
pH (s.units)	<u>7.67</u>	<u>6.88</u>	<u>6.75</u>	<u>6.20</u>	<u>6.70</u>	<u>6.71</u>
TEMP (C)	<u>4.5</u>	<u>5.9</u>	<u>6.1</u>	<u>6.2</u>	<u>6.2</u>	<u>6.2</u>
COND (umhos/cm)	<u>0.151</u>	<u>0.147</u>	<u>0.148</u>	<u>0.148</u>	<u>0.147</u>	<u>0.147</u>
TURBIDITY (NTU)	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
REDOX (-/+ mV) 20mV	<u>146</u>	<u>133</u>	<u>132</u>	<u>116</u>	<u>115</u>	<u>115</u>
DO (mg/L) <i>Salinity</i>	<u>10.09</u> <u>0</u>	<u>8.36</u> <u>0</u>	<u>7.94</u> <u>0</u>	<u>7.07</u> <u>0</u>	<u>6.61</u> <u>0</u>	<u>6.19</u> <u>0</u>

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER: _____

FILTERED? Y / N 1.0um 0.45um OTHER: _____

OBSERVATIONS

COLOR: CLEAR, AMBER, TAN, BROWN, GREY, MILKY WHITE, OTHER: _____

ODOR: NONE, LOW, MEDIUM, HIGH, VERY STRONG, H2S, FUEL LIKE, CHEMICAL?, UNKNOWN

TURBIDITY: NONE, LOW, MEDIUM, HIGH, VERY TURBID, HEAVY SILTS

COMMENTS: _____



CH2MHILL

WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: Pt Rich
PROJECT # 166825-09 LP

WELL DEPTH (FT):	<u>141</u>	CASING DIAMETER	<u>1.25 IN</u>	GAL/FT OF CASING	<u>0.0637</u>	SAMPLE ID	<u>02FRLF NA10</u>
DEPTH TO WATER (FT):	<u>131.72</u>					WELL ID	<u>AP-3222</u>
WATER COLUMN (FT):	<u>10'</u>		<u>2 IN.</u>		<u>0.1632</u>	INTERVAL	<u>136</u>
GAL/FT OF CASING	<u>0.6528</u>		<u>4 IN</u>		<u>0.6528</u>	SAMPLER	<u>SC, BAL</u>
CASING VOLUME (GAL)	<u>6.5</u>		<u>6 IN.</u>		<u>1.4688</u>	DATE	<u>5/6/02</u>
NO. OF VOLUMES min.(3)			<u>8 IN.</u>		<u>2.611</u>	TIME	<u>1625</u>
PURGE VOLUME (GAL)			<u>10 IN.</u>		<u>4.0797</u>		

METHOD OF PURGING (circle one)

PUMP: SUB CENT PERIST OTHER: _____ BAILER: TER ON SS OTHER: (SC)

TIME ON: 1010 - 1625 NOT DEDICATED BAILER VOL.. (gal) 25 / .33

FLOW RATE (gpm): 0.45 REQUIRED PULLS: _____

PUMP TIME (min): 15 VOL. PURGED (gals): _____

VOL PURGED (gals): 7 OTHER: _____

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	<u>1520</u>	<u>1530</u>	<u>1610</u>	<u>1615</u>	<u>1620</u>	
VOL (gal) <i>water used Draw down?</i>	<u>~0.25</u>	<u>~0.5</u>	<u>131.72</u>	<u>131.72</u>	<u>131.76</u>	
pH (s.units)	<u>7.18</u>	<u>7.40</u>	<u>7.56</u>	<u>7.56</u>	<u>7.58</u>	
TEMP (C)	<u>4.7</u>	<u>4.3</u>	<u>~7.9</u>	<u>7.9</u>	<u>7.9</u>	
COND (umhos/cm)	<u>429</u>	<u>422</u>	<u>0.408</u>	<u>0.409</u>	<u>0.409</u>	
TURBIDITY (NTU)	<u>23.5</u>	<u>21.5</u>	<u>22.0</u>	<u>6.6</u>	<u>5.6</u>	
REDOX (-/+ mV)	<u>287</u>	<u>283</u>	<u>115</u>	<u>119</u>	<u>122</u>	
DO (mg/L) <i>Salinity</i>	<u>10.81</u>	<u>10.11</u>	<u>9.09 / 0</u>	<u>8.10 / 0</u>	<u>8.75 / 0</u>	

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER: _____

FILTERED? Y / N 1.0um 0.45um OTHER: _____

OBSERVATIONS

COLOR: CLEAR , AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER: _____

ODOR: NONE LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ? , UNKNOWN

TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS

COMMENTS: High-Put pump back on. Started pumping used water a beginning had some problems



CH2MHILL

WELL PURGE AND SAMPLING FIELD SHEET

PROJECT SITE: FT RICH

PROJECT # 166825.01.LF

WELL DEPTH (FT):	<u>150</u>	CASING DIAMETER	GAL/FT OF CASING	SAMPLE ID	<u>02FRLFWA12</u>
DEPTH TO WATER (FT):	<u>139.02</u>	1.25 IN	0.0637	WELL ID	<u>AP-3013</u>
WATER COLUMN (FT):	<u>11</u>	2 IN.	0.1632	INTERVAL	<u>150</u>
GAL/FT OF CASING	<u>0.6528</u>	<u>4 IN.</u>	<u>0.6528</u>	SAMPLER	<u>AL, SC</u>
CASING VOLUME (GAL)	<u>7.18</u>	6 IN.	1.4688	DATE	<u>5/7/02</u>
NO. OF VOLUMES min.(3)		8 IN.	2.611	TIME	<u>1600 1610</u>
PURGE VOLUME (GAL)	<u>10</u>	10 IN.	4.0797		

METHOD OF PURGING (circle one)

PUMP: <u>SUB</u> CENT PERIST OTHER:	BAILER: TEFLON SS OTHER:
TIME ON: <u>1540 - 1625</u> <u>DEDICATED</u>	BAILER VOL. (gal) <u>.25 / .33</u>
FLOW RATE (gpm): <u>0.22</u>	REQUIRED PULLS:
PUMP TIME (min): <u>45</u>	VOL. PURGED (gals):
VOL PURGED (gals): <u>10</u>	OTHER:

FIELD PARAMETERS	FIELD MEASUREMENTS					
	1st	2nd	3rd	4th	5th	6th
TIME	<u>1540</u>	<u>1545</u>	<u>1550</u>	<u>1555</u>	<u>1600</u>	<u>1605</u>
VOL (gal) <u>Water Level Draw Point</u>						
pH (s.units)	<u>6.23</u>	<u>6.45</u>	<u>6.51</u>	<u>6.68</u>	<u>6.82</u>	<u>6.90</u>
TEMP (C)	<u>4.7</u>	<u>4.9</u>	<u>4.9</u>	<u>5.1</u>	<u>5.2</u>	<u>5.2</u>
COND (umhos/cm)	<u>0.471</u>	<u>0.418</u>	<u>0.416</u>	<u>0.407</u>	<u>0.402</u>	<u>0.399</u>
TURBIDITY (NTU)	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
REDOX (-/+ mV)	<u>240</u>	<u>252</u>	<u>251</u>	<u>246</u>	<u>242</u>	<u>239</u>
DO (mg/L) <u>/ Satinity</u>	<u>11.89 / 0</u>	<u>10.32 / 0</u>	<u>10.41 / 0</u>	<u>10.46 / 0</u>	<u>10.73 / 0</u>	<u>10.76 / 0</u>

SAMPLE PARAMETERS: GRAB COMPOSITE

SAMPLE TYPE: PROJECT DUPLICATE QA EQUIPMENT BLANK OTHER:
 FILTERED? Y / N 1.0um 0.45um OTHER:

OBSERVATIONS

COLOR: CLEAR AMBER , TAN , BROWN , GREY , MILKY WHITE , OTHER:
 ODOR: NONE LOW , MEDIUM , HIGH , VERY STRONG , H2S , FUEL LIKE , CHEMICAL ? , UNKNOWN
 TURBIDITY: NONE , LOW , MEDIUM , HIGH , VERY TURBID. HEAVY SILTS
 COMMENTS: Had to turn Control on up to 352 on pump.

Appendix B
Analytical Results

TABLE B-1
Validated Analytical Results for Groundwater, April 2002 Sampling Event
Groundwater Monitoring Program
Fort Richardson Landfill, Alaska

Location	Field Sample ID	Parameter	Value	Qualifier	Detection Limit	Reporting Limit	Units	Date	Lab	QA/QC
BIEX (SW04)										
FR-2	02FRLFWA01	BENZENE	0.25	U	0.25	1.0	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	TOLUENE	0.26	U	0.26	1.0	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	BENZENE	0.25	U	0.25	1.0	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	TOLUENE	0.26	U	0.26	1.0	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/01/02	ATCA	
AP-3010	02FRLFWA03	BENZENE	0.25	U	0.25	1.0	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	TOLUENE	0.26	U	0.26	1.0	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	BENZENE	0.25	U	0.25	1.0	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	TOLUENE	0.26	U	0.26	1.0	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	BENZENE	0.25	U	0.25	1.0	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	TOLUENE	0.26	U	0.26	1.0	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/02/02	ATCA	
FR-3	02FRLFWA06	BENZENE	0.25	U	0.25	1.0	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	TOLUENE	0.26	U	0.26	1.0	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/03/02	ATCA	
AP-3015	02FRLFWA07	BENZENE	0.25	U	0.25	1.0	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	TOLUENE	0.26	U	0.26	1.0	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	BENZENE	0.25	U	0.25	1.0	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	TOLUENE	0.26	U	0.26	1.0	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	BENZENE	0.25	U	0.25	1.0	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	TOLUENE	0.26	U	0.26	1.0	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/06/02	ATCA	
AP-3013	02FRLFWA12	BENZENE	0.25	U	0.25	1.0	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	TOLUENE	0.26	U	0.26	1.0	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/07/02	ATCA	
AP-3015	02FRLFWA08	BENZENE	0.25	U	0.25	1.0	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	TOLUENE	0.26	U	0.26	1.0	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/06/02	ATCA	FD
NA	02FRLFWA11	BENZENE	0.25	U	0.25	1.0	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	TOLUENE	0.26	U	0.26	1.0	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/06/02	ATCA	RB
NA	Trip Blank (5/1/2002)	BENZENE	0.25	U	0.25	1.0	µg/L	05/01/02	ATCA	TB
NA	Trip Blank (5/1/2002)	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/01/02	ATCA	TB
NA	Trip Blank (5/1/2002)	TOLUENE	0.26	U	0.26	1.0	µg/L	05/01/02	ATCA	TB
NA	Trip Blank (5/1/2002)	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/01/02	ATCA	TB
NA	Trip Blank (5/3/2002)	BENZENE	0.25	U	0.25	1.0	µg/L	05/03/02	ATCA	TB
NA	Trip Blank (5/3/2002)	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/03/02	ATCA	TB
NA	Trip Blank (5/3/2002)	TOLUENE	0.26	U	0.26	1.0	µg/L	05/03/02	ATCA	TB
NA	Trip Blank (5/3/2002)	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/03/02	ATCA	TB
NA	Trip Blank (5/6/2002)	BENZENE	0.25	U	0.25	1.0	µg/L	05/06/02	ATCA	TB
NA	Trip Blank (5/6/2002)	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/06/02	ATCA	TB
NA	Trip Blank (5/6/2002)	TOLUENE	0.26	U	0.26	1.0	µg/L	05/06/02	ATCA	TB
NA	Trip Blank (5/6/2002)	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/06/02	ATCA	TB
NA	Trip Blank (5/7/2002)	BENZENE	0.25	U	0.25	1.0	µg/L	05/07/02	ATCA	TB
NA	Trip Blank (5/7/2002)	ETHYLBENZENE	0.27	U	0.27	1.0	µg/L	05/07/02	ATCA	TB
NA	Trip Blank (5/7/2002)	TOLUENE	0.26	U	0.26	1.0	µg/L	05/07/02	ATCA	TB
NA	Trip Blank (5/7/2002)	XYLENES, TOTAL	1.1	U	1.1	3.2	µg/L	05/07/02	ATCA	TB
CONV (E300)										
FR-2	02FRLFWA01	CHLORIDE (AS CL)	8.1	=	0.071	0.50	mg/L	05/01/02	ATCA	

TABLE B-1
Validated Analytical Results for Groundwater, April 2002 Sampling Event
Groundwater Monitoring Program
Fort Richardson Landfill, Alaska

Location	Field Sample ID	Parameter	Value	Qualifier	Detection Limit	Reporting Limit	Units	Date	Lab	QA/QC
BTEX (SW8002)										
FR-2	02FRLFWA01	NITROGEN, NITRATE-NITRITE	1.4	=	0.095	0.50	mg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	SULFATE (AS SO4)	19	=	0.035	0.10	mg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	CHLORIDE (AS CL)	7.1	=	0.071	0.50	mg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	NITROGEN, NITRATE-NITRITE	1.2	=	0.095	0.50	mg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	SULFATE (AS SO4)	19	=	0.035	0.10	mg/L	05/01/02	ATCA	
AP-3010	02FRLFWA03	CHLORIDE (AS CL)	1.8	=	0.14	1.0	mg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	NITROGEN, NITRATE-NITRITE	0.67	=	0.095	0.50	mg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	SULFATE (AS SO4)	19	=	0.035	0.10	mg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	CHLORIDE (AS CL)	2.1	=	0.14	1.0	mg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	NITROGEN, NITRATE-NITRITE	0.095	U	0.095	0.50	mg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	SULFATE (AS SO4)	13	=	0.070	0.20	mg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	CHLORIDE (AS CL)	6.6	=	0.21	1.5	mg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	NITROGEN, NITRATE-NITRITE	0.79	=	0.095	0.50	mg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	SULFATE (AS SO4)	15	=	0.11	0.50	mg/L	05/02/02	ATCA	
FR-3	02FRLFWA06	CHLORIDE (AS CL)	2.7	=	0.071	0.50	mg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	NITROGEN, NITRATE-NITRITE	0.61	=	0.095	0.50	mg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	SULFATE (AS SO4)	12	=	0.035	0.10	mg/L	05/03/02	ATCA	
AP-3015	02FRLFWA07	CHLORIDE (AS CL)	9.0	=	0.14	1.0	mg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	NITROGEN, NITRATE-NITRITE	1.4	=	0.095	0.50	mg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	SULFATE (AS SO4)	18	=	0.070	0.20	mg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	CHLORIDE (AS CL)	1.3	U	0.071	0.50	mg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	NITROGEN, NITRATE-NITRITE	0.58	=	0.095	0.50	mg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	SULFATE (AS SO4)	5.3	U	0.035	0.10	mg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	CHLORIDE (AS CL)	7.7	=	0.14	1.0	mg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	NITROGEN, NITRATE-NITRITE	1.1	=	0.095	0.50	mg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	SULFATE (AS SO4)	18	=	0.035	0.10	mg/L	05/06/02	ATCA	
AP-3013	02FRLFWA12	CHLORIDE (AS CL)	7.1	=	0.14	1.0	mg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	NITROGEN, NITRATE-NITRITE	1.1	=	0.095	0.50	mg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	SULFATE (AS SO4)	18	=	0.070	0.20	mg/L	05/07/02	ATCA	
AP-3015	02FRLFWA08	CHLORIDE (AS CL)	9.1	=	0.14	1.0	mg/L	05/07/02	ATCA	
AP-3015	02FRLFWA08	NITROGEN, NITRATE-NITRITE	1.4	=	0.095	0.50	mg/L	05/08/02	ATCA	FD
AP-3015	02FRLFWA08	SULFATE (AS SO4)	19	=	0.070	0.20	mg/L	05/08/02	ATCA	FD
NA	02FRLFWA11	CHLORIDE (AS CL)	0.64	=	0.071	0.50	mg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	NITROGEN, NITRATE-NITRITE	0.095	U	0.095	0.50	mg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	SULFATE (AS SO4)	0.83	=	0.035	0.10	mg/L	05/06/02	ATCA	RB
GRO (AK101)										
FR-2	02FRLFWA01	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/01/02	ATCA	
AP-3010	02FRLFWA03	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/02/02	ATCA	
FR-3	02FRLFWA06	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/03/02	ATCA	
AP-3015	02FRLFWA07	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/06/02	ATCA	
AP-3013	02FRLFWA12	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA08	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/07/02	ATCA	
NA	02FRLFWA11	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/06/02	ATCA	FD
NA	Trip Blank (5/1/2002)	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/06/02	ATCA	RB
NA	Trip Blank (5/3/2002)	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/01/02	ATCA	TB
NA	Trip Blank (5/6/2002)	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/03/02	ATCA	TB
NA	Trip Blank (5/7/2002)	GASOLINE RANGE ORGANICS	6.7	U	6.7	67	µg/L	05/08/02	ATCA	TB
MERCURY (E241)										
FR-2	02FRLFWA01	MERCURY	0.058	U	0.058	0.20	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	MERCURY	0.058	U	0.058	0.20	µg/L	05/01/02	ATCA	
AP-3010	02FRLFWA03	MERCURY	0.058	U	0.058	0.20	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	MERCURY	0.058	U	0.058	0.20	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	MERCURY	0.058	U	0.058	0.20	µg/L	05/02/02	ATCA	
FR-3	02FRLFWA06	MERCURY	0.058	U	0.058	0.20	µg/L	05/02/02	ATCA	
AP-3015	02FRLFWA07	MERCURY	0.058	U	0.058	0.20	µg/L	05/03/02	ATCA	
AP-3014	02FRLFWA09	MERCURY	0.058	U	0.058	0.20	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	MERCURY	0.058	U	0.058	0.20	µg/L	05/06/02	ATCA	
AP-3013	02FRLFWA12	MERCURY	0.058	U	0.058	0.20	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA08	MERCURY	0.058	U	0.058	0.20	µg/L	05/07/02	ATCA	
NA	02FRLFWA11	MERCURY	0.058	U	0.058	0.20	µg/L	05/06/02	ATCA	FD
METALS (SW8002)										
FR-2	02FRLFWA01	MERCURY	0.058	U	0.058	0.20	µg/L	05/06/02	ATCA	RB

TABLE B-1
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Groundwater Monitoring Program
Fort Richardson Landfill, Alaska

Location	Field Sample ID	Parameter	Value	Qualifier	Detection Limit	Reporting Limit	Units	Date	Lab	QA/QC
BTEX (SW802)										
FR-2	02FRLFWA01	ARSENIC	0.086	U	0.086	1.0	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	BARIUM	8.0	=	0.074	0.25	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	CADMIUM	0.029	U	0.029	0.20	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	CHROMIUM, TOTAL	1.5	=	0.030	0.10	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	LEAD	0.27	=	0.037	0.15	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	POTASSIUM	775	=	6.3	50	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	SELENIUM	0.010	U	0.010	0.50	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	SILVER	0.11	U	0.11	0.35	µg/L	05/01/02	ATCA	
FR-2	02FRLFWA01	SODIUM	3,050	=	7.4	50	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	ARSENIC	0.086	U	0.086	1.0	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	BARIUM	8.3	=	0.074	0.25	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	CADMIUM	0.029	U	0.029	0.20	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	CHROMIUM, TOTAL	0.50	=	0.030	0.10	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	LEAD	0.20	=	0.037	0.15	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	POTASSIUM	750	=	6.3	50	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	SELENIUM	0.010	U	0.010	0.50	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	SILVER	0.11	U	0.11	0.35	µg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	SODIUM	3,090	=	7.4	50	µg/L	05/01/02	ATCA	
AP-3010	02FRLFWA03	ARSENIC	0.086	U	0.086	1.0	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	BARIUM	12	=	0.074	0.25	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	CADMIUM	0.029	U	0.029	0.20	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	CHROMIUM, TOTAL	2.7	=	0.030	0.10	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	LEAD	0.55	=	0.037	0.15	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	POTASSIUM	1,170	=	6.3	50	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	SELENIUM	0.72	=	0.010	0.50	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	SILVER	0.11	U	0.11	0.35	µg/L	05/02/02	ATCA	
AP-3010	02FRLFWA03	SODIUM	3,510	=	7.4	50	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	ARSENIC	6.1	=	0.086	1.0	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	BARIUM	118	=	0.074	0.25	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	CADMIUM	0.28	=	0.029	0.20	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	CHROMIUM, TOTAL	11	=	0.030	0.10	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	LEAD	6.1	=	0.037	0.15	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	POTASSIUM	2,950	=	6.3	50	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	SELENIUM	0.52	=	0.010	0.50	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	SILVER	0.11	U	0.11	0.35	µg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	SODIUM	18,000	=	15	100	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	ARSENIC	0.086	U	0.086	1.0	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	BARIUM	42	=	0.074	0.25	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	CADMIUM	0.029	U	0.029	0.20	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	CHROMIUM, TOTAL	8.6	=	0.030	0.10	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	LEAD	0.41	=	0.037	0.15	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	POTASSIUM	1,330	=	6.3	50	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	SELENIUM	0.75	=	0.010	0.50	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	SILVER	0.11	U	0.11	0.35	µg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	SODIUM	4,460	=	7.4	50	µg/L	05/02/02	ATCA	
FR-3	02FRLFWA06	ARSENIC	1.5	=	0.086	1.0	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	BARIUM	29	=	0.074	0.25	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	CADMIUM	0.029	U	0.029	0.20	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	CHROMIUM, TOTAL	7.7	=	0.030	0.10	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	LEAD	1.8	=	0.037	0.15	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	POTASSIUM	1,290	=	6.3	50	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	SELENIUM	0.57	=	0.010	0.50	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	SILVER	0.11	U	0.11	0.35	µg/L	05/03/02	ATCA	
FR-3	02FRLFWA06	SODIUM	2,320	=	7.4	50	µg/L	05/03/02	ATCA	
AP-3015	02FRLFWA07	ARSENIC	0.086	U	0.086	1.0	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	BARIUM	7.5	=	0.074	0.25	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	CADMIUM	0.029	U	0.029	0.20	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	CHROMIUM, TOTAL	3.9	=	0.030	0.10	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	LEAD	0.39	=	0.037	0.15	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	POTASSIUM	785	=	6.3	50	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	SELENIUM	0.010	U	0.010	0.50	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	SILVER	0.11	U	0.11	0.35	µg/L	05/06/02	ATCA	
AP-3015	02FRLFWA07	SODIUM	3,040	=	7.4	50	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	ARSENIC	0.086	U	0.086	1.0	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	BARIUM	7.2	=	0.074	0.25	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	CADMIUM	0.029	U	0.029	0.20	µg/L	05/06/02	ATCA	

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Fort Richardson Landfill, Alaska

Location	Field Sample ID	Parameter	Value	Qualifier	Detection Limit	Reporting Limit	Units	Date	Lab	QA/QC
BTEX (SW821)										
AP-3014	02FRLFWA09	CHROMIUM, TOTAL	0.89	U	0.030	0.10	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	LEAD	0.037	U	0.037	0.15	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	POTASSIUM	1,630	=	6.3	50	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	SELENIUM	0.010	U	0.010	0.50	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	SILVER	0.11	U	0.11	0.35	µg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	SODIUM	3,240	=	7.4	50	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	ARSENIC	0.086	U	0.086	1.0	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	BARIIUM	8.2	=	0.074	0.25	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	CADMIUM	0.029	U	0.029	0.20	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	CHROMIUM, TOTAL	5.7	U	0.030	0.10	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	LEAD	0.23	U	0.037	0.15	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	POTASSIUM	814	=	6.3	50	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	SELENIUM	0.010	U	0.010	0.50	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	SILVER	0.11	U	0.11	0.35	µg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	SODIUM	3,180	=	7.4	50	µg/L	05/06/02	ATCA	
AP-3013	02FRLFWA12	ARSENIC	0.086	U	0.086	1.0	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	BARIIUM	8.0	=	0.074	0.25	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	CADMIUM	0.029	U	0.029	0.20	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	CHROMIUM, TOTAL	1.7	=	0.030	0.10	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	LEAD	0.46	=	0.037	0.15	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	POTASSIUM	848	=	6.3	50	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	SELENIUM	0.010	U	0.010	0.50	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	SILVER	0.11	U	0.11	0.35	µg/L	05/07/02	ATCA	
AP-3013	02FRLFWA12	SODIUM	3,180	=	7.4	50	µg/L	05/07/02	ATCA	
AP-3015	02FRLFWA08	ARSENIC	0.086	U	0.086	1.0	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	BARIIUM	7.1	=	0.074	0.25	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	CADMIUM	0.029	U	0.029	0.20	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	CHROMIUM, TOTAL	4.2	=	0.030	0.10	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	LEAD	0.37	=	0.037	0.15	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	POTASSIUM	776	=	6.3	50	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	SELENIUM	0.54	=	0.010	0.50	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	SILVER	0.11	U	0.11	0.35	µg/L	05/06/02	ATCA	FD
AP-3015	02FRLFWA08	SODIUM	2,970	=	7.4	50	µg/L	05/06/02	ATCA	FD
NA	02FRLFWA11	ARSENIC	0.086	U	0.086	1.0	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	BARIIUM	0.73	=	0.074	0.25	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	CADMIUM	0.029	U	0.029	0.20	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	CHROMIUM, TOTAL	4.5	=	0.030	0.10	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	LEAD	0.98	=	0.037	0.15	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	POTASSIUM	708	=	6.3	50	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	SELENIUM	0.010	U	0.010	0.50	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	SILVER	0.11	U	0.11	0.35	µg/L	05/06/02	ATCA	RB
NA	02FRLFWA11	SODIUM	223	=	7.4	50	µg/L	05/06/02	ATCA	RB
TDS (E1601)										
FR-2	02FRLFWA01	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	256	=	5.0	20	mg/L	05/01/02	ATCA	
FR-1	02FRLFWA02	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	228	=	5.0	20	mg/L	05/01/02	ATCA	
AP-3010	02FRLFWA03	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	321	=	5.0	20	mg/L	05/02/02	ATCA	
AP-3220	02FRLFWA04	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	311	=	5.0	20	mg/L	05/02/02	ATCA	
AP-3221	02FRLFWA05	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	465	=	5.0	20	mg/L	05/02/02	ATCA	
FR-3	02FRLFWA06	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	188	=	5.0	20	mg/L	05/03/02	ATCA	
AP-3015	02FRLFWA07	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	226	=	5.0	20	mg/L	05/06/02	ATCA	
AP-3014	02FRLFWA09	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	85	=	5.0	20	mg/L	05/06/02	ATCA	
AP-3222	02FRLFWA10	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	228	=	5.0	20	mg/L	05/06/02	ATCA	
AP-3013	02FRLFWA12	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	191	=	5.0	20	mg/L	05/07/02	ATCA	
AP-3015	02FRLFWA08	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	221	=	5.0	20	mg/L	05/06/02	ATCA	FD
NA	02FRLFWA11	TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	5.0	U	5.0	20	mg/L	05/06/02	ATCA	RB
TOC (SW806)										
FR-2	02FRLFWA01	TOTAL ORGANIC CARBON	0.71	=	0.35	0.50	mg/L	05/01/02	STL8	
FR-1	02FRLFWA02	TOTAL ORGANIC CARBON	0.81	=	0.35	0.50	mg/L	05/01/02	STL8	
AP-3010	02FRLFWA03	TOTAL ORGANIC CARBON	1.1	=	0.35	0.50	mg/L	05/02/02	STL8	
AP-3220	02FRLFWA04	TOTAL ORGANIC CARBON	3.2	=	0.35	0.50	mg/L	05/02/02	STL8	
AP-3221	02FRLFWA05	TOTAL ORGANIC CARBON	3.0	=	0.35	0.50	mg/L	05/02/02	STL8	
FR-3	02FRLFWA06	TOTAL ORGANIC CARBON	1.3	=	0.35	0.50	mg/L	05/03/02	STL8	
AP-3015	02FRLFWA07	TOTAL ORGANIC CARBON	0.58	J	0.35	0.50	mg/L	05/06/02	STL8	
AP-3014	02FRLFWA09	TOTAL ORGANIC CARBON	2.1	J	0.35	0.50	mg/L	05/06/02	STL8	
AP-3222	02FRLFWA10	TOTAL ORGANIC CARBON	0.51	W	0.35	0.50	mg/L	05/06/02	STL8	
AP-3013	02FRLFWA12	TOTAL ORGANIC CARBON	0.75	=	0.35	0.50	mg/L	05/07/02	STL8	

TABLE B-1
 Validated Analytical Results for Groundwater, April 2002 Sampling Event
 Groundwater Monitoring Program
 Fort Richardson Landfill, Alaska

Location	Field Sample ID	Parameter	Value	Qualifier	Detection Limit	Reporting Limit	Units	Date	Lab	QA/QC
BTEX (SW8961)										
AP-3015	02FRLFWA08	TOTAL ORGANIC CARBON	0.70	J	0.35	0.50	mg/L	05/06/02	STLB	FD
NA	02FRLFWA11	TOTAL ORGANIC CARBON	0.36	J	0.35	0.50	mg/L	05/06/02	STLB	RB
TURBIDITY (E180.1)										
FR-2	02FRLFWA01	TURBIDITY	0.68	J	0.10	2.0	NTU	05/01/02	ATCA	
FR-1	02FRLFWA02	TURBIDITY	0.41	J	0.10	2.0	NTU	05/01/02	ATCA	
AP-3010	02FRLFWA03	TURBIDITY	8.2	=	0.10	2.0	NTU	05/02/02	ATCA	
AP-3220	02FRLFWA04	TURBIDITY	18	=	0.10	2.0	NTU	05/02/02	ATCA	
AP-3221	02FRLFWA05	TURBIDITY	3.5	=	0.10	2.0	NTU	05/02/02	ATCA	
FR-3	02FRLFWA06	TURBIDITY	60	=	0.10	2.0	NTU	05/03/02	ATCA	
AP-3015	02FRLFWA07	TURBIDITY	0.92	=	0.050	0.20	NTU	05/06/02	ATCA	
AP-3014	02FRLFWA09	TURBIDITY	0.78	U	0.050	0.20	NTU	05/06/02	ATCA	
AP-3222	02FRLFWA10	TURBIDITY	3.2	U	0.050	0.20	NTU	05/06/02	ATCA	
AP-3013	02FRLFWA12	TURBIDITY	1.8	=	0.050	0.20	NTU	05/07/02	ATCA	
AP-3015	02FRLFWA08	TURBIDITY	0.70	=	0.050	0.20	NTU	05/06/02	ATCA	FD
NA	02FRLFWA11	TURBIDITY	1.0	=	0.050	0.20	NTU	05/06/02	ATCA	RB

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
 J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
 = - The analyte was positively identified; the associated numerical value is the concentration of the analyte in the sample.
 FD - Field Duplicate
 RB - Rinse or Equipment Blank
 TB - Trip Blank

Appendix C
Data Quality Assessment Memorandum

Data Quality Assessment Report

Project/Site Name: Fort Richardson Groundwater Monitoring Program, Fort Richardson Landfill, April 2002

Sample Delivery Group (SDG): A0205009, A0205007, A0205023, A0205025, A0205012

Parameters: GRO (Gasoline Range Organics) and BTEX (Benzene Toluene, Ethyl Benzene and Xylenes)

Method: AK101 and 8021B

Laboratory: Analytica Alaska Incorporated, Anchorage

<u>Sample ID</u>	<u>Description</u>	<u>Collection Date</u>	<u>Matrix</u>
02FRLFWA01	Field	5/1/02	Water
02FRLFWA02	Field	5/1/02	Water
Trip Blank	Trip Blank	5/1/02	Water
02FRLFWA03	Field	5/2/02	Water
02FRLFWA04	Field	5/2/02	Water
02FRLFWA05	Field	5/2/02	Water
02FRLFWA06	Field	5/3/02	Water
Trip Blank	Trip Blank	5/3/02	Water
02FRLFWA07	Field	5/6/02	Water
02FRLFWA08	Field Duplicate	5/6/02	Water
02FRLFWA09	Field	5/6/02	Water
02FRLFWA10	Field	5/6/02	Water
02FRLFWA11	Rinsate Blank	5/6/02	Water
Trip Blank	Trip Blank	5/6/02	Water
02FRLFWA12	Field	5/7/02	Water
Trip Blank	Trip Blank	5/7/02	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per AK101 (for gasoline range organics, GRO) and USEPA 8021B (for benzene, toluene, ethyl benzene and xylenes). The quality assurance and quality control procedures (QA/QC) were per the Project QAPP and the individual method requirements.

This review is based on the EPA method requirements and Project QAPP specification. The following sections describe the quality control parameters that were reviewed and detail noted deviations from requirements/criteria if any. Where applicable EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Organic Data Review* (February 1994) and *National Functional Guidelines (NFG) for Inorganic Data Review* (February 1994) provided guidelines for data qualification.

Tables summarizing all qualified data and associated flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified project protocols (P) or is of a technical advisory nature (A) due to sample matrix or method limitation.

All data were found to be acceptable per the above specifications, except as noted in summary tables showing sample specific data flag/qualifiers at the end of this report. Data completeness for reviewed parameters were found to be above 90% , thus meeting project objectives.

I. Sample Custody, Handling, and Preservation

Chain-of-custody (COC) forms and the laboratory sample receiving checklists were reviewed to determine if any sample handling procedures might affect the integrity or the quality of the sample results. It is noted that for SDG A0205007 the chain of custody lists a trip blank, however the laboratory reports not receiving a trip blank, no trip blank is reported and no trip blank is listed in the above sample table for this SDG.

All coolers were received by the laboratory at a temperature of $4\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, as recommended by EPA. It is noted that for SDG A0205023 the cooler receipt records the temperature at 1.7°C . As this deviation is not significant (that is if it was rounded it would be 2°C), no action is taken.

All sample containers were received intact.

No bubbles were noted for water samples submitted for this analyses.

II. Technical Holding Times

The analysis was done within 14 days (7 days if unpreserved) of the samples being received by the laboratory, the required holding time.

III. Blanks

a. Laboratory blanks

A method blank was prepared and analyzed as required. The method blank did not have concentrations above the reporting limit thus meeting criteria. No detects below the reporting limits have been reported.

b. Field blanks

A trip blank was included with each cooler. The trip blank did not show detects above reporting limits. No detects below the reporting limits were observed

A rinsate blank was analyzed. No detects were reported.

IV. Accuracy and Precision Data

a. Surrogates/ system monitoring compounds

All site samples and QC samples were spiked with surrogates.

All surrogate recoveries were within criteria of 60%-120%R.

b. Laboratory Control Sample

A laboratory control sample was analyzed with each analytical batch. The recoveries were within criteria.

c. Matrix Spikes/ Matrix Spikes Duplicate

A matrix spike and a matrix spike duplicate were reported with sample delivery group A0205025. Percent recovery data were within control limits.

d. Laboratory Duplicates

Laboratory duplicate analyses were performed with matrix spikes and laboratory control samples.

All relative percent differences/deviation were within criteria.

e. Field duplicates

A pair of duplicates have been reported with these samples (02FRLFWA07, 02FRLFWA08), relative percent deviations for detects above detection level if any were met. Both duplicates had no detects for any of the analytes within this analyses.

V. Sample Result Verification

Reported detection levels were per project requirements. Sample quantitation algorithms were per standard method.

VI. Field Quality Control

Field quality control data includes field blank (equipment rinsate and trip blanks) and field duplicate measurements; these data have been reviewed above under blank and precision data and associated data qualified. Field quality control samples were submitted at the required frequency.

VI. Overall Assessment

All data were found to be acceptable except for the data listed at the end of this, if any. Project completeness goal of 90 % was met for the above reviewed parameters.

**Fort Richardson Data Qualification Summary - SDG A0205009, A0205007,
A0205023, A0205025, A0205012**

No data have been qualified for this SDG.

**Fort Richardson Blank Data Summary-SDG A0205009, A0205007, A0205023,
A0205025, A0205012**

No data have been qualified due to blank contamination. If any, blank detects have been listed under section III.

Data Quality Assessment Report

Project/Site Name: Fort Richardson Groundwater Monitoring Program, Fort Richardson Landfill, April 2002

Sample Delivery Group (SDG): A0205014, A0205021, A0205027, A0205005

Parameters: Total Organic Carbon (TOC)

Method: EPA 415.1

Laboratory: Analytica Alaska Incorporated, Anchorage (Severn Trent Laboratories, Seattle)

<u>Sample ID</u>	<u>Description</u>	<u>Collection Date</u>	<u>Matrix</u>
02FRLFWA01	Field	5/1/02	Water
02FRLFWA02	Field	5/1/02	Water
02FRLFWA03	Field	5/2/02	Water
02FRLFWA04	Field	5/2/02	Water
02FRLFWA05	Field	5/2/02	Water
02FRLFWA06	Field	5/3/02	Water
02FRLFWA07	Field	5/6/02	Water
02FRLFWA08	Field Duplicate	5/6/02	Water
02FRLFWA09	Field	5/6/02	Water
02FRLFWA10	Field	5/6/02	Water
02FRLFWA11	Rinsate Blank	5/6/02	Water
02FRLFWA12	Field	5/7/02	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA 415.1. The quality assurance and quality control procedures (QA/QC) were per the Project QAPP and the individual method requirements.

This review is based on the EPA method requirements and Project QAPP specification. The following sections describe the quality control parameters that were reviewed and detail noted deviations from requirements/criteria if any. Where applicable EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Organic Data Review* (February 1994) and *National Functional Guidelines (NFG) for Inorganic Data Review* (February 1994) provided guidelines for data qualification..

Tables summarizing all qualified data and associated flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified project protocols (P) or is of a technical advisory nature (A) due to sample matrix or method limitation.

All data were found to be acceptable per the above specifications, except as noted in summary tables showing sample specific data flag/qualifiers at the end of this report. Data completeness for reviewed parameters were found to be above 90 % , thus meeting project objectives.

I. Sample Custody, Handling, and Preservation

Chain-of-custody (COC) forms and the laboratory sample receiving checklists were reviewed to determine if any sample handling procedures might affect the integrity or the quality of the sample results. There were Trip Blanks listed on the chain of custodies however they were not reported with this analyses.

All coolers were received by the laboratory at a temperature of $4\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, as recommended by EPA with the following exceptions:

SDG	Cooler Temp Reported	Affected Samples	Analyte	Flag	A or P
A0205021	0.5°C	02FRLFWA07 02FRLFWA08 02FRLFWA09 02FRLFWA10 02FRLFWA11	TOC	J	A
A0205027	1.8°C	02FRLFWA12	TOC	none	A

All sample containers were received intact.

II. Technical Holding Times

The analysis was done within 28 days of the samples being received by the laboratory, the required holding time.

III. Blanks

a. Laboratory blanks

A method blank was prepared and analyzed as required. The method blank did not have concentrations above the reporting limit thus meeting criteria. No detects below the reporting limits have been reported.

b. Field blanks

Trip blank is not analyzed for this analysis.

A rinsate blank was analyzed. No detects were reported except for the following:

Rinsate ID	Analyte (PQL ug/L)	Concentration (ug/L)
02FRLFWA 11	Total Organic Carbon (TOC) (0.50)	0.364

The following samples have been qualified:

Affected Samples	Analyte	Reported Concentration (ug/L)	Modified Report Concentration (ug/L)	A or P
02FRLFWA1 0	TOC	0.508	0.508 U	A

IV. Accuracy and Precision Data

a. Surrogates/ system monitoring compounds

Not Applicable.

b. Laboratory Control Sample

There were no laboratory control samples reported with these SDGs.

c. Matrix spikes/ matrix spikes duplicate

A matrix spike and matrix spike duplicate pair were reported for all the SDGs included in this assessment.

Percent recovery data were within control limits.

d. Laboratory Duplicates

Laboratory duplicate analyses were performed on matrix spikes.

All relative percent differences/deviation were within criteria.

e. Field duplicates

A pair of duplicates have been reported with these samples (02FRLFWA07, 02FRLFWA08), relative percent difference (RPD) for detects above detection level if

any were met. Sample 02FRLFWA07 and 02FRLFWA08 detected 0.582 ug/L and 0.698 ug/L respectively resulting in a 18 %RPD.

V. Sample Result Verification

Reported detection levels were per project requirements. Sample quantitation algorithms were per standard method.

VII. Field Quality Control

Field quality control data includes field blank (equipment rinsate and trip blanks) and field duplicate measurements; these data have been reviewed above under blank and precision data and associated data qualified . Field quality control samples were submitted at the required frequency.

VI. Overall Assessment

All data were found to be acceptable except for the data listed at the end of this, if any.

**Fort Richardson Data Qualification Summary - SDG A0205014, A0205021,
 A0205027, A0205005**

SDG	Sample ID	Analyte	Flag	A or P	Reason
A0205021	02FRLFWA07	TOC	J	A	Cooler outside temperature limits.
	02FRLFWA08				
	02FRLFWA09				
	02FRLFWA10				
	02FRLFWA11				

**Fort Richardson Blank Data Qualification Summary-SDG A0205014, A0205021,
 A0205027, A0205005**

Affected Samples	Analyte	Reported Concentration (ug/L)	Modified Report Concentration (ug/L)	A or P
02FRLFWA10	TOC	0.508	0.508 U	A

Data Quality Assessment Report

Project/Site Name: Fort Richardson Groundwater Monitoring Program, Fort Richardson Landfill, April 2002

Sample Delivery Group (SDG): J0205075, J0205065, J0205044, J0205024

Parameters: Total Dissolved Solids (TDS)

Method: 160.1

Laboratory: Analytica Alaska Incorporated, Anchorage

<u>Sample ID</u>	<u>Description</u>	<u>Collection Date</u>	<u>Matrix</u>
02FRLFWA01	Field	5/1/02	Water
02FRLFWA02	Field	5/1/02	Water
02FRLFWA03	Field	5/2/02	Water
02FRLFWA04	Field	5/2/02	Water
02FRLFWA05	Field	5/2/02	Water
02FRLFWA06	Field	5/3/02	Water
02FRLFWA07	Field	5/6/02	Water
02FRLFWA08	Field Duplicate	5/6/02	Water
02FRLFWA09	Field	5/6/02	Water
02FRLFWA10	Field	5/6/02	Water
02FRLFWA11	Rinsate Blank	5/6/02	Water
02FRLFWA12	Field	5/7/02	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA 160.1. The quality assurance and quality control procedures (QA/QC) were per the Project QAPP and the individual method requirements.

This review is based on the EPA method requirements and Project QAPP specification. The following sections describe the quality control parameters that were reviewed and detail noted deviations from requirements/criteria if any. Where applicable EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Organic Data Review* (February 1994) and *National Functional Guidelines (NFG) for Inorganic Data Review* (February 1994) provided guidelines for data qualification..

Tables summarizing all qualified data and associated flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified project protocols (P) or is of a technical advisory nature (A) due to sample matrix or method limitation.

All data were found to be acceptable per the above specifications, except as noted in summary tables showing sample specific data flag/qualifiers at the end of this report. Data completeness for reviewed parameters were found to be above 90 % , thus meeting project objectives.

I. Sample Custody, Handling, and Preservation

Chain-of-custody (COC) forms and the laboratory sample receiving checklists were reviewed to determine if any sample handling procedures might affect the integrity or the quality of the sample results. There were Trip Blanks listed on the chain of custodies however they were not reported with this analyses. The SDG J0205044 did not have the chain of custody within the SDG.

All coolers were received by the laboratory at a temperature of $4\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, as recommended by EPA. The SDG J0205044 did not report the cooler temperature within the SDG.

All sample containers were received intact.

II. Technical Holding Times

The analysis was done within 7 days of the samples being received by the laboratory, the required holding time.

IV. Blanks

a. Laboratory blanks

A method blank was prepared and analyzed as required. The method blank did not have concentrations above the reporting limit thus meeting criteria. No detects below the reporting limits have been reported.

b. Field blanks

The trip blank is not analyzed for this method.

A rinsate blank was analyzed. No detects were reported.

IV. Accuracy and Precision Data

a. Surrogates/system monitoring compounds

Not Applicable.

b. Laboratory Control Sample

A laboratory control sample was analyzed with each analytical batch. The recoveries were within criteria.

c. Matrix spikes/ matrix spikes duplicate

There were no matrix spike or matrix spike duplicates reported for this analysis.

d. Laboratory Duplicates

Laboratory duplicate analyses were performed on laboratory control samples and samples that are not associated with the SDGs that this assessment discusses.

All relative percent differences/deviation were within criteria.

e. Field duplicates

A pair of duplicates have been reported with these samples (02FRLFWA07, 02FRLFWA08), relative percent difference (RPD) for detects above detection level if any were met. Sample 02FRLFWA07 and 02FRLFWA08 detected 226 ug/L and 221 ug/L respectively resulting in a 2.2 %RPD.

V. Sample Result Verification

Reported detection levels were per project requirements. Sample quantitation algorithms were per standard method.

VIII. Field Quality Control

Field quality control data includes field blank (equipment rinsate and trip blanks) and field duplicate measurements; these data have been reviewed above under blank and precision data and associated data qualified . Field quality control samples were submitted at the required frequency.

VI. Overall Assessment

All data were found to be acceptable except for the data listed at the end of this, if any.

Fort Richardson Data Qualification Summary - SDG J0205075, J0205065, J0205044, J0205024

No data have been qualified for this SDG.

Fort Richardson Blank Data Summary-SDG J0205075, J0205065, J0205044, J0205024

No data have been qualified due to blank contamination. If any, blank detects have been listed under section III.

Data Quality Assessment Report

Project/Site Name: Fort Richardson Groundwater Monitoring Program, Fort Richardson Landfill, April 2002

Sample Delivery Group (SDG): J0205075, J0205065, J0205044, J0205024

Parameters: Metals including Mercury

Method: 6020 and 245.1

Laboratory: Analytica Alaska Incorporated, Anchorage

<u>Sample ID</u>	<u>Description</u>	<u>Collection Date</u>	<u>Matrix</u>
02FRLFWA01	Field	5/1/02	Water
02FRLFWA02	Field	5/1/02	Water
02FRLFWA03	Field	5/2/02	Water
02FRLFWA04	Field	5/2/02	Water
02FRLFWA05	Field	5/2/02	Water
02FRLFWA06	Field	5/3/02	Water
02FRLFWA07	Field	5/6/02	Water
02FRLFWA08	Field Duplicate	5/6/02	Water
02FRLFWA09	Field	5/6/02	Water
02FRLFWA10	Field	5/6/02	Water
02FRLFWA11	Rinsate Blank	5/6/02	Water
02FRLFWA12	Field	5/7/02	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA 6020 and 245.1. The quality assurance and quality control procedures (QA/QC) were per the Project QAPP and the individual method requirements.

This review is based on the EPA method requirements and Project QAPP specification. The following sections describe the quality control parameters that were reviewed and detail noted deviations from requirements/criteria if any. Where applicable EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Organic Data Review* (February 1994) and *National Functional Guidelines (NFG) for Inorganic Data Review* (February 1994) provided guidelines for data qualification..

Tables summarizing all qualified data and associated flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified project protocols (P) or is of a technical advisory nature (A) due to sample matrix or method limitation.

All data were found to be acceptable per the above specifications, except as noted in summary tables showing sample specific data flag/qualifiers at the end of this report. Data completeness for reviewed parameters were found to be above 90 % , thus meeting project objectives.

I. Sample Custody, Handling, and Preservation

Chain-of-custody (COC) forms and the laboratory sample receiving checklists were reviewed to determine if any sample handling procedures might affect the integrity or the quality of the sample results. There were Trip Blanks listed on the chain of custodies however they were not reported with this analyses. The SDG J0205044 did not have the chain of custody within the SDG.

All coolers were received by the laboratory at a temperature of 4 °C ±2 °C, as recommended by EPA. The SDG J0205044 did not report the cooler temperature within the SDG.

All sample containers were received intact.

II. Technical Holding Times

The analysis was done within six month for ICP-MS metals and 28 days for mercury of the samples being received by the laboratory, the required holding time.

V. Blanks

a. Laboratory blanks

A method blank was prepared and analyzed as required. The method blank did not have concentrations above the reporting limit thus meeting criteria. No detects below the reporting limits have been reported except:

Method Blank (SDG)	Analyte	Concentration in ug/L (PQL)
J020509013-MB (J0205044 and J0205065)	Chromium	0.127 (0.10)

The following samples have been qualified:

Affected Samples	Analyte	Reported Concentration (NTU)	Modified Report Concentration (NTU)	A or P
No Samples were Affected	Chromium			

b. Field blanks

A rinsate blank was analyzed. No detects were reported except for the following:

Rinsate ID	Analyte (PQL ug/L)	Concentration (ug/L)
02FRLFWA 11	Barium (0.25)	0.734
	Chromium (0.10)	4.52
	Lead (0.15)	0.978
	Potassium (50)	708
	Sodium (50)	223

The following samples have been qualified:

Affected Samples	Analyte	Reported Concentration (ug/L)	Modified Report Concentration (ug/L)	A or P
02FRLFWA09	Chromium	0.894	0.894 U	A
02FRLFWA10	Chromium	5.66	5.66 U	A
	Lead	0.233	0.233 U	

IV. Accuracy and Precision Data

a. Surrogates/ system monitoring compounds

Not Applicable.

b. Laboratory Control Sample

A laboratory control sample was analyzed with each analytical batch. The recoveries were within criteria.

c. Matrix spikes/ matrix spikes duplicate

A matrix spike was reported with SDG J0205024 and J0205075 (for metals) and a matrix spike and matrix spike duplicate pair were reported with SDG J0205044 and J0205065 (for metals). (The SDG J0205024 reported only lead for the MS/MSD pair.) A matrix spike and matrix spike duplicate was reported within all the SDGs for mercury. Percent recovery data were within control limits.

d. Laboratory Duplicates

Laboratory duplicate analyses were performed on laboratory control samples, samples that are not necessarily associated with the SDGs that this assessment discusses, and the MS/MSD pair.

All relative percent differences/deviation were within criteria.

e. Field duplicates

A pair of duplicates have been reported with these samples (02FRLFWA07, 02FRLFWA08), relative percent difference (RPD) for detects above detection level if any were met. Sample 02FRLFWA07 and 02FRLFWA08 detected 7.51 ug/L and 7.07 ug/L respectively for barium resulting in a 6.0% RPD, 3.91 ug/L and 4.16 ug/L respectively for chromium resulting in a 6.2 %RPD, 0.388 ug/L and 0.366 ug/L respectively for lead resulting in a 5.8% RPD, 785 ug/L and 776 ug/L respectively for potassium resulting in a 1.2% RPD, and 3040 ug/L and 2970 ug/L respectively for sodium resulting in a 2.3 %RPD.

V. Sample Result Verification

Reported detection levels were per project requirements. Sample quantitation algorithms were per standard method.

IX. Field Quality Control

Field quality control data includes field blank (equipment rinsate and trip blanks) and field duplicate measurements; these data have been reviewed above under blank and precision data and associated data qualified . Field quality control samples were submitted at the required frequency.

VI. Overall Assessment

All data were found to be acceptable except for the data listed at the end of this, if any. Project completeness goal of 90 % was met for the above reviewed parameters.

Fort Richardson Data Qualification Summary - SDG J0205075, J0205065, J0205044, J0205024

No data have been qualified for this SDG.

Fort Richardson Blank Data Summary-SDG J0205075, J0205065, J0205044, J0205024

Affected Samples	Analyte	Reported Concentration (ug/L)	Modified Report Concentration (ug/L)	A or P
02FRLFWA09	Chromium	0.894	0.894 U	A
02FRLFWA10	Chromium	5.66	5.66 U	A
	Lead	0.233	0.233 U	

Data Quality Review Report

Project/Site Name: Fort Richardson Groundwater Monitoring Program, Fort Richardson Landfill, April 2002

Sample Delivery Group (SDG): A0205009, A0205007, A0205023, A0205025, A0205012

Parameters: Turbidity

Method: 180.1

Laboratory: Analytica Alaska Incorporated, Anchorage

<u>Sample ID</u>	<u>Description</u>	<u>Collection Date</u>	<u>Matrix</u>
02FRLFWA01	Field	5/1/02	Water
02FRLFWA02	Field	5/1/02	Water
02FRLFWA03	Field	5/2/02	Water
02FRLFWA04	Field	5/2/02	Water
02FRLFWA05	Field	5/2/02	Water
02FRLFWA06	Field	5/3/02	Water
02FRLFWA07	Field	5/6/02	Water
02FRLFWA08	Field Duplicate	5/6/02	Water
02FRLFWA09	Field	5/6/02	Water
02FRLFWA10	Field	5/6/02	Water
02FRLFWA11	Rinsate Blank	5/6/02	Water
02FRLFWA12	Field	5/7/02	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA 180.1. The quality assurance and quality control procedures (QA/QC) were per the Project QAPP and the individual method requirements.

This review is based on the EPA method requirements and Project QAPP specification. The following sections describe the quality control parameters that were reviewed and detail noted deviations from requirements/criteria if any. Where applicable EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Organic Data Review* (February 1994) and *National Functional Guidelines (NFG) for Inorganic Data Review* (February 1994) provided guidelines for data qualification..

Tables summarizing all qualified data and associated flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified project protocols (P) or is of a technical advisory nature (A) due to sample matrix or method limitation.

All data were found to be acceptable per the above specifications, except as noted in summary tables showing sample specific data flag/qualifiers at the end of this report. Data completeness for reviewed parameters were found to be above 90 % , thus meeting project objectives.

I. Sample Custody, Handling, and Preservation

Chain-of-custody (COC) forms and the laboratory sample receiving checklists were reviewed to determine if any sample handling procedures might affect the integrity or the quality of the sample results. It is noted that for SDG A0205007 the chain of custody lists a trip blank, however the laboratory reports not receiving a trip blank, no trip blank is reported and no trip blank is listed in the above sample table for this SDG.

All coolers were received by the laboratory at a temperature of 4 °C ± °C, as recommended by EPA.

All sample containers were received intact.

II. Technical Holding Times

The analysis was done within 48 hours of the samples being received by the laboratory, the required holding time.

VI. Blanks

a. Laboratory blanks

A method blank was prepared and analyzed as required. The method blank did not have concentrations above the reporting limit thus meeting criteria. No detects below the reporting limits have been reported with the following exceptions:

SDG (Method Blank ID)	Analyte	Concentration in NTU(PQL)
A0205025 (A020513005-MB)	Turbidity	0.11 (0.20)
A0205023 (A020513005-MB)	Turbidity	0.11 (0.20)

The following samples have been qualified:

Affected Samples	Analyte	Reported Concentration (NTU)	Modified Report Concentration (NTU)	A or P
No Samples were Affected	Turbidity			

b. Field blanks

Trip blank is not analyzed for this method.

A rinsate blank was analyzed. No detects were reported with the following exceptions:

Rinsate ID	Analyte (PQL)	Value
02FRLFWA 11	Turbidity y (0.20)	1.0

The following samples have been qualified:

Affected Samples	Analyte	Reported Value	Modified Reported Value	A or P
02FRLFWA09	Turbidity	0.78	0.78 U	A
02FRLFWA10	Turbidity	3.2	3.2 U	A

IV. Accuracy and Precision Data

a. Surrogates/system monitoring compounds

Not applicable.

b. Laboratory Control Sample

Not applicable.

c. Matrix spikes/matrix spikes duplicate

Not applicable.

d. Laboratory Duplicates

Not reported.

e. Field duplicates

A pair of duplicates have been reported with these samples (02FRLFWA07, 02FRLFWA08), relative percent difference (RPD) for detects above detection level if any were met. Sample 02FRLFWA07 and 02FRLFWA08 detected 0.92 ug/L and 0.70 ug/L respectively resulting in a 27% RPD.

V. Sample Result Verification

Reported detection levels were per project requirements. Sample quantitation algorithms were per standard method.

VI. Field Quality Control

Field quality control data includes field blank (equipment rinsate and trip blanks) and field duplicate measurements; these data have been reviewed above under blank and precision data and associated data qualified. Field quality control samples were submitted at the required frequency.

VII. Overall Assessment

All data were found to be acceptable except for the data listed at the end of this, if any. Project completeness goal of 90 % was met for the above reviewed parameters.

**Fort Richardson Data Qualification Summary - SDG A0205009, A0205007,
A0205023, A0205025, A0205012**

No data have been qualified for this SDG.

**Fort Richardson Blank Data Qualification Summary-SDG A0205009, A0205007,
A0205023, A0205025, A0205012**

Affected Samples	Analyte	Reported Value	Modified Reported Value	A or P
02FRLFWA09	Turbidity	0.78	0.78 U	A
02FRLFWA10	Turbidity	3.2	3.2 U	A

Data Quality Assessment Report

Project/Site Name: Fort Richardson Groundwater Monitoring Program, Fort Richardson Landfill, April 2002

Sample Delivery Group (SDG): J0205075, J0205065, J0205044, J0205024

Parameters: Nitrate and Nitrite as Nitrogen, Chloride and Sulfate

Method: EPA300

Laboratory: Analytica Alaska Incorporated, Anchorage

<u>Sample ID</u>	<u>Description</u>	<u>Collection Date</u>	<u>Matrix</u>
02FRLFWA01	Field	5/1/02	Water
02FRLFWA02	Field	5/1/02	Water
02FRLFWA03	Field	5/2/02	Water
02FRLFWA04	Field	5/2/02	Water
02FRLFWA05	Field	5/2/02	Water
02FRLFWA06	Field	5/3/02	Water
02FRLFWA07	Field	5/6/02	Water
02FRLFWA08	Field Duplicate	5/6/02	Water
02FRLFWA09	Field	5/6/02	Water
02FRLFWA10	Field	5/6/02	Water
02FRLFWA11	Rinsate Blank	5/6/02	Water
02FRLFWA12	Field	5/7/02	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA 300. The quality assurance and quality control procedures (QA/QC) were per the Project QAPP and the individual method requirements.

This review is based on the EPA method requirements and Project QAPP specification. The following sections describe the quality control parameters that were reviewed and detail noted deviations from requirements/criteria if any. Where applicable EPA Contract Laboratory Program (CLP) *National Functional Guidelines (NFG) for Organic Data Review* (February 1994) and *National Functional Guidelines (NFG) for Inorganic Data Review* (February 1994) provided guidelines for data qualification..

Tables summarizing all qualified data and associated flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified project protocols (P) or is of a technical advisory nature (A) due to sample matrix or method limitation.

All data were found to be acceptable per the above specifications, except as noted in summary tables showing sample specific data flag/qualifiers at the end of this report. Data completeness for reviewed parameters were found to be above 90 % , thus meeting project objectives.

I. Sample Custody, Handling, and Preservation

Chain-of-custody (COC) forms and the laboratory sample receiving checklists were reviewed to determine if any sample handling procedures might affect the integrity or the quality of the sample results. There were Trip Blanks listed on the chain of custodies however they were not reported with this analyses. The SDG J0205044 did not have the chain of custody within the SDG.

All coolers were received by the laboratory at a temperature of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$, as recommended by EPA. The SDG J0205044 did not report the cooler temperature within the SDG.

All sample containers were received intact.

II. Technical Holding Times

The analysis was done within 28 days of the samples being received by the laboratory, the required holding time.

VII. Blanks

a. Laboratory blanks

A method blank was prepared and analyzed as required. The method blank did not have concentrations above the reporting limit thus meeting criteria. No detects below the reporting limits have been reported.

b. Field blanks

Trip blank is not analyzed for this method.

A rinsate blank was analyzed. No detects were reported except for the following:

Rinsate ID	Analyte (PQL)	Concentration (ug/L)
02FRLFWA 11	Chloride (1.0 ug/L)	0.636
	Sulfate (0.20 ug/L)	0.828

The following samples have been qualified:

Affected Samples	Analyte	Reported Concentration (ug/L)	Modified Report Concentration (ug/L)	A or P
02FRLFWA09	Chloride Sulfate	1.32	1.32 U	A
		5.28	5.28 U	

IV. Accuracy and Precision Data

a. Surrogates/ system monitoring compounds

Not Applicable.

b. Laboratory Control Sample

A laboratory control sample was analyzed with each analytical batch. The recoveries were within criteria.

c. Matrix spikes/ matrix spikes duplicate

A matrix spike and matrix spike duplicate pair were reported for all the SDGs included in this assessment for chloride and sulfate. There were no nitrate and nitrite as nitrogen matrix spike and matrix spike duplicate report with these SDGs.

Percent recovery data were within control limits.

d. Laboratory Duplicates

Laboratory duplicate analyses were performed on laboratory control samples, samples that are not necessarily associated with the SDGs that this assessment discusses, and the MS/MSD pair.

All relative percent differences/deviation were within criteria.

e. Field duplicates

A pair of duplicates have been reported with these samples (02FRLFWA07, 02FRLFWA08), relative percent difference (RPD) for detects above detection level if any were met. Sample 02FRLFWA07 and 02FRLFWA08 detected 1.42 ug/L and 1.39 ug/L respectively for nitrate and nitrite as nitrogen resulting in a 2.1 RPD, 9.01 ug/L

and 9.07 ug/L respectively for chloride resulting in a 0.66 RPD, and 18.3 ug/L and 18.6 ug/L respectively for sulfate resulting in a 1.6 RPD.

V. Sample Result Verification

Reported detection levels were per project requirements. Sample quantitation algorithms were per standard method.

X. Field Quality Control

Field quality control data includes field blank (equipment rinsate and trip blanks) and field duplicate measurements; these data have been reviewed above under blank and precision data and associated data qualified. Field quality control samples were submitted at the required frequency.

VI. Overall Assessment

All data were found to be acceptable except for the data listed at the end of this, if any. Project completeness goal of 90 % was met for the above reviewed parameters.

Fort Richardson Data Qualification Summary - SDG J0205075, J0205065, J0205044, J0205024

No data have been qualified for this SDG.

Fort Richardson Blank Data Summary-SDG J0205075, J0205065, J0205044, J0205024

Affected Samples	Analyte	Reported Concentration (ug/L)	Modified Report Concentration (ug/L)	A or P
02FRLFWA 09	Chloride	1.32	1.32 U	A
	Sulfate	5.28	5.28 U	