



REPLY TO  
ATTENTION OF:

DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, ALASKA  
P.O. BOX 898  
ANCHORAGE, ALASKA 99506-0898

FTR 37595

ADM

06 NOV 1998

CEPOA-EN-EE-AI (200-1c)

MEMORANDUM FOR Commander, U.S. Army Alaska, ATTN: APVR-RPW-ENV (Fosbrook)  
600 Richardson, #6505, Bldg. 724, Fort Richardson, AK 99505-6505

SUBJECT: Landfill Closure Study, May/June 1998, Fort Richardson, Alaska

1. Enclosed for your information is a copy of the above mentioned subject document.
2. Please contact me at (907) 753- 5613 if you should have any questions.

FOR THE COMMANDER:

Encl.

BRIAN D. WEST, P.E.  
Engineering Manager

CF:

Commander, U.S. Army Alaska, ATTN: APVR-RPW-EV (J. Mets), 600 Richardson Drive,  
#6505, Bldg. 724, Fort Richardson, AK 99505-6505 (3 copies)

FTR Rec File  
FTR Admin File

CONCUR:  
Wallace

West/kr/5669/Brian/Landfill Study  
06 November, 1998



LANDFILL CLOSURE STUDY  
FORT RICHARDSON, ALASKA  
May/June 1998

PREPARED BY THE  
ALASKA DISTRICT U.S. ARMY CORPS OF ENGINEERS  
MATERIALS AND INSTRUMENTATION SECTION  
GEOTECHNICAL BRANCH

1 October 1998

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**ACRONYMS**

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AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AMSL	Above Mean Sea Level
AP	Auger Point
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CDQAR	Chemical Data Quality Assurance Report
DPW	Directorate of Public Works, Fort Richardson
DRO	Diesel Range Organics
FSP	Field Sampling Plan
GCS	Groundwater Cleanup Standard
GRO	Gasoline Range Organics
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	Mean Sea Level
ppb	parts per billion
ppm	parts per million
QA	Quality Assurance
QC	Quality Control
RBC	Risk-based Concentration
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
ug/L	micrograms per liter
ug/kg	micrograms per kilogram
USARAK	United States Army, Alaska

## Executive Summary

This report presents the analytical results for groundwater sampling performed by the Materials and Instrumentation Section of the U.S. Army Corps of Engineers, Alaska District, Geotechnical Branch (CEPOA-EN-G-MI) in late May and early June 1997 at the Fort Richardson landfill. The work was performed at the request of the Alaska District's Environmental Engineering Branch, Active Installations Section (CEPOA-EN-EE-AJ), on behalf of the Fort Richardson Department of Public Works (DPW), United States Army, Alaska (USARAK).

Water samples were collected from eleven of thirteen monitoring wells located within and around the landfill and were analyzed for a wide variety of potential contaminants and water quality parameters. Two of the wells (AP-3011, and AP-3012) could not be sampled because the water table had dropped below their well screens.

Data generated during this portion of the closure study is generally consistent with historical data for these wells. Very low levels of gasoline range organic compounds were reported in two of the wells. No unexpected inorganic analytes were detected. Groundwater quality in the vicinity of the landfill continues to be good.

## 1.0 Introduction

This effort represents the fifth sampling event of the five-year biannual groundwater monitoring program designed to fulfill Alaska Department of Environmental Conservation (ADEC) landfill closure requirements. Water samples were collected from eleven of thirteen monitoring wells located within and around the former Ft. Richardson landfill (see Figures 1 & 2) in late May and early June 1997. The samples were analyzed for several aromatic volatile organic compounds (AVO), gasoline range organic compounds (GRO), total and dissolved metals, total organic carbon (TOC), total dissolved solids (TDS), nitrate-nitrite, sulfate, chloride, alkalinity and turbidity. Two of the wells (AP-3011 and AP-3012) could not be sampled because the water table had dropped below the bottom of their well screens.

All of the wells included in this investigation have been periodically sampled during previous investigations. Prior to the commencement of the landfill monitoring program, most of the landfill wells were included in the basewide groundwater monitoring program that was implemented in 1989. Data generated during this investigation generally agrees with that of previous investigations. Significant variations from historical data are described in the text discussing individual analytical results.

## 2. Environmental Setting

**2.1 Location:** Fort Richardson is located on the northeast side of the city of Anchorage in south-central Alaska. It is bound by the municipality of Anchorage to the southwest, Elmendorf Air Force Base to the west, Eagle Bay and Knik Arm (of Cook Inlet) to the north and the Chugach Mountains to the east and south (see Figure 1). The Fort Richardson landfill is located about 0.75 miles north of the main cantonment area just north of Circle Road (see Figure 2).

**2.2 Landfill History:** The Ft. Richardson Landfill is an unlined landfill covering about 400 acres. Its former use is characterized as a trench and fill operation where one trench is dug (approximately 20 to 30 feet deep) while another is simultaneously being filled and covered. It is not known exactly when landfilling operations began at this site, but the first portion of the landfill to be utilized is known to have been closed prior to 1966. The landfill accepted sanitary waste and mess hall grease after 1987, when the municipality of Anchorage began operating a regional landfill that now accepts the solid waste from Ft. Richardson. In addition to the disposal of sanitary solid wastes, the landfill accepted construction rubble, paint and solvent waste, grease and is the site of a former fire training pit and a human waste disposal trench area.

**2.3 Area Geology:** The last major glaciation in the upper Cook Inlet extended to the area of the Fort Richardson landfill. Remnants from the glaciation include the massive Elmendorf Moraine, alluvial fans, and a large preglacial outwash deposit.

The Elmendorf Moraine is a northeast-southwest-tending, terminal moraine representing the Naptowne glaciation and consists of poorly sorted, unconsolidated till with boulders, gravel, sand and silt. This moraine represents the terminal margin of a glacier that once filled Cook Inlet. This moraine transects the main cantonment area at Fort Richardson. The southern boundary of the Elmendorf Moraine, about 60 feet high, forms the northern boundary of the landfill.

Glacial meltwater formed a large outwash plain along the margin of the Elmendorf Moraine. The outwash plain alluvium consists of gravel in the eastern portion of the installation and grades to sand to the west. Approximately 90% of the landfill lies within this deposit with the remainder located in areas mapped as alluvial fans.



Subsurface investigations performed at the Fort Richardson landfill indicate that surficial deposits consisting of interbedded glacial till, glaciofluvial and glaciolacustrine deposits extend to at least 240 feet below ground surface (bgs). A glacial till deposit consisting of silt, sand, gravel and cobbles occurs at the ground surface throughout the landfill area. No permafrost underlies the landfill.

North and west of the landfill, a glaciolacustrine deposit consisting of silt and clay occurs at approximately 45 feet bgs. Interbedded glacial till and glaciofluvial deposits underlie the glaciolacustrine deposits to a depth of at least 140 feet bgs.

South and east of the landfill, interbedded glacial till and glaciofluvial deposits extend to approximately 165 feet bgs. The glaciofluvial deposits consist of sand and gravel. These deposits are underlain by a 10-foot thick glaciolacustrine deposit that was also encountered to the north of the landfill, but not to the northwest.

**2.4 Groundwater:** Groundwater at Fort Richardson exists as a deep confined aquifer, a shallow unconfined aquifer, and discontinuous zones of perched groundwater. The Bootlegger Cove formation described above constitutes much of the confining layer that separates the confined and unconfined aquifers. Depth to groundwater ranges from near the surface along Ship Creek (see Figure 1) to greater than 250 feet bgs along the thicker glacial deposits found in the northern section of Fort Richardson. Lenses of silt found 20 to 40 feet below ground surface often underlie perched groundwater. Wells installed in these zones of perched groundwater often become unproductive or poorly productive after development. Water is known to recharge the groundwater system of Fort Richardson in several ways. Groundwater seeps from bedrock fractures into the sediments along the Chugach Mountains to the east. Snowmelt and rainfall infiltrate to the groundwater. Streams feed groundwater in areas where the elevation of the stream is above the water table. Discharge of the

aquifers is by groundwater flow into Knik Arm to the west, into streams (e.g., Ship Creek, Eagle River) that ultimately discharge into Knik Arm or to wells.

Groundwater within the unconfined aquifer is thought to flow in a direction trending to the northwest on the north side of Ship Creek and toward the southwest on the south side of Ship Creek. In the area directly adjacent to Ship Creek, the direction of flow appears to trend westward, parallel to the general downstream direction of Ship Creek. This is due to the fact that Ship Creek is a losing stream and is recharging the groundwater. The confined aquifer flow trends predominantly to the northwest.

Three aquifers were encountered during monitoring well installations at the Fort Richardson landfill. North and west of the landfill, a perched unconfined aquifer occurs at approximately 35 feet bgs. The lateral extent of this aquifer is not known; however, it is not believed to exist beneath the landfill and is likely a perennial water-bearing zone.

A second aquifer was encountered throughout the landfill area and has a groundwater potentiometric surface which occurs at approximately 170 to 178 feet above mean sea level (AMSL). Currently, eight monitoring wells (FR-1, FR-2, AP-3010, AP-3013, AP-3015, AP-3220, AP-3221 and AP-3222) are screened between about 160 and 180 feet AMSL within this glacial till aquifer. This aquifer is the first non-perched groundwater encountered in borings in the vicinity of the landfill. Groundwater levels measured in wells that screen this aquifer indicate that this groundwater flows primarily to the northwest. The hydraulic gradient in the vicinity of the landfill is about 0.0025.

A third aquifer was encountered at about 204 feet AMSL within a gravely, silty sand overlying a six-foot thick silt layer located east of the landfill. This aquifer, which overlies the glacial

till aquifer is not encountered elsewhere within or around the landfill. The lateral extent of this aquifer is not known and there does not appear to be a direct hydraulic connection with the glacial till aquifer. Well FR-3 is the only functioning well that is screened within this aquifer.

### 3. Field Activities

**3.1 Sample Summary:** Sampling activities began on 27 May, and concluded on 3 June 1998. All sampling was performed by Bret Walters, chemist, and Mathew Stichick, engineer in training (EIT), of CEPOA-EN-G-MI. Water samples were collected from eleven wells located within and around the Ft. Richardson landfill as described in the closure plan for the Ft. Richardson landfill. Two of the wells (AP-3011 and AP-3012) included for sampling in the closure plan could not be sampled because the water table had dropped below their well screens.

**3.2 Sampling Procedures:** Sampling was performed according to the procedures described in the closure plan and was consistent with the Sampling and Analysis Plan used for the Ft. Richardson Groundwater Monitoring Program, with the following notations. The dedicated submersible pump was removed from AP-3220 during the June 1997 investigation because of the well's low recharge rate. As a result, AP-3220 well was bailed dry three consecutive times and sampled using single-use bailers. Just prior to sampling, all wells, except AP-3220, were purged until physical parameters stabilized. Water conductivity, pH, oxidation-reduction potential, and temperature were measured periodically during purging of all wells to monitor stabilization of the groundwater. Measurements of physical characteristics along with other well-specific information are included in the individual well's Sample Summary Form provided in Appendix A. All purge water and decontamination water was disposed of through the water treatment facility operated on Ft. Richardson by ENSR Consulting and Engineering of Anchorage, Alaska.

Sampling began immediately after well stabilization. The types of containers and preservatives used and the volume of sample collected met standard protocols. All containers were precleaned with Teflon lined lids. Vials used to hold samples to be tested for volatiles were filled so that there was no headspace or trapped bubbles. Sufficient extra volume of one sample was sent to each laboratory for use as matrix spike and matrix spike duplicate samples.

**3.3 QA/QC Samples:** Quality assurance (QA) and quality control (QC) duplicates were collected for each method of analysis. QA and QC duplicates were collected so that a triplicate set of samples resulted. In this case, the triplicate sample sets were collected at AP-3013 and FR-3. The triplicate sets were tested for the same analytes as the rest of the samples.

Trip blanks and a rinsate blank were also prepared, used and analyzed for this project. Results indicate that cross contamination of contaminants during collection, shipment and storage was not likely. However, very low levels of several analytes were detected in the rinsate blank. Though these detections may be evidence of low level cross contamination, it is more likely that the water used to prepare the blanks contained low levels of these analytes or, in some cases, that laboratory contamination contributed to their presence.

## 4. Analytical Results

**4.1 Chemical Analyses:** Data from the chemical analyses are reported in Tables 1 through 5 (Appendix B). In the tables, parts per million (ppm) are expressed as milligrams per liter (mg/L). Parts per billion (ppb) are expressed as micrograms per liter (ug/L). One ppm is equal to 1000 ppb. Where possible, reported concentrations are compared to federal or state Maximum Contaminant

Levels (MCLs), State of Alaska Groundwater Cleanup Standards (GCS) proposed in the draft version of 18AAC75 and EPA Region III risk-based concentrations (RBCs).

#### 4.2 Quality Assurance and Quality Control:

4.2.1 Data Quality Review: The complete chemical data packages, including the laboratories' internal quality control reports, are on file at CEPOA-EN-G-MI. The data and associated materials were reviewed by ETHIX, Inc., of Modesto, California. A copy of the resulting laboratory data quality report is included in Appendix C.

Laboratory data quality is summarized in the laboratory data quality report. A small portion of the data for this project has been qualified as estimated based on the report's conclusions. The impact on data usability is discussed in the text associated with specific test results. It should be noted that the data quality report indicates that all of the sample shipments arrived at the laboratories within the acceptable temperature range of 2°-6°C, except for samples 98FRLF10WA, 98FRLF13WA and 98FRLF22WA which were received at the QA laboratory at a temperature of 8.4 °C. These samples were stored at 4 °C in a refrigerator after collection and hand-delivered to the laboratory. They were only in the shipping cooler for about 15 minutes, thus, it is believed that the temperature blank did not have time to equilibrate with the samples and the recorded cooler temperature, upon receipt, is not representative of the temperature of the samples.

4.2.2 Replicate Samples: Blind duplicate quality control (QC) samples were submitted to the primary laboratory, which analyzed the majority of the samples. Analysis of the QC duplicate samples provide a measure of intra-laboratory variations. Additional replicate samples were provided to an independent quality assurance (QA) laboratory, to provide an indicator of inter-laboratory accuracy. QC and QA duplicates are so noted in the data tables. QA and QC duplicate sets were submitted for

each analytical method performed. Data from all replicate samples were analyzed by ETHIX as part of development of the laboratory data quality report. The three sets of data were carefully compared and tabulated. Nearly all of the data for duplicate samples are in agreement and are comparable. Any discrepancies are noted in the laboratory data quality report and included in the discussion of specific test results.

#### 4.3 Chemical Results:

4.3.1 Aromatic Volatile Organic compounds: All of the samples were tested for several AVOs (benzene, toluene, ethylbenzene, total xylenes, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene) by method 8021A. The data are presented in Table 1 of Appendix B. No AVOs were reported in any of the samples. All method reporting limits are below applicable regulatory levels and the data is usable as reported.

4.3.2 Gasoline Range Organic Compounds: All of the samples were tested for GRO by method AK-101. Data are presented in Table 2 of Appendix B.

GRO was reported below its practical quantitation limit in the sample from AP-3221 at an estimated concentration 0.012 ppm and above the practical quantitation limit in the sample from AP-3010 at a concentration of 0.058 ppm. The levels detected do not produce a chromatogram that can be used to determine if the results are due to fuel or if they are due to the presence of individual fuel constituents. All of the reported GRO concentrations are well below its GCS of 1.3 ppm. No RBC or MCL exists for GRO

4.3.3 **Total Metals:** Unfiltered water samples were analyzed for the ten metals (arsenic, barium, cadmium, chromium, lead, mercury, potassium, selenium, sodium and silver) specified in the Landfill Closure Plan. Data are included in Table 3 of Appendix B. Barium and sodium were detected in all of the samples and the remaining metals were randomly reported in several samples. All data for duplicate samples is in agreement with the exception of the lead results for the QA sample collected from FR-3 and all method reporting limits are below applicable regulatory levels.

Detected concentrations were compared to available primary MCLs, GCSs, action levels, RBCs and secondary MCLs. Primary MCLs, GCSs, action levels and RBCs are intended to protect human health while secondary MCLs are intended to preserve the aesthetic quality of drinking water. Detected concentrations and available MCLs, GCSs, action levels and RBCs are summarized in the table below.

Metal (Total)	MCL (ug/L)	GCS (ug/L)	RBC (ug/L)	Number of detections/ highest level detected (ug/L)	Well/level (ug/L) that exceeded MCL, GCS or RBC
Arsenic	50	50	11	3/11	None
Barium	2000	2000	2600	10/150	None
Cadmium	5	5	18	2/0.68	None
Chromium	100 <sup>a</sup>	100 <sup>a</sup>	180 <sup>b</sup>	6/732	FR-3/732
Lead	15 <sup>c</sup>	15	NA	7/21	FR-3/21
Mercury	2	2	11	2/0.32	None
Selenium	50	50	180	1/6.5	None
Sodium	250000 <sup>d</sup>	NA	NA	11/4400	None

a: Not differentiated between chromium III and chromium VI.  
 b: RBC is for chromium VI; RBC for chromium III is 37000 ug/L.  
 c: No MCL for lead; 15 ug/L is action level at the tap.  
 d: Secondary MCL to protect aesthetics of drinking water.

J: estimated concentration  
 NA: not available.  
 ND: not detected; method reporting limit in parentheses.

Potassium was detected in three of the wells at up to 3.17 ppm. This metal was not included in the table because there are no MCLs, GCSs or RBCs associated with them. It should also be noted that the RBC referenced for chromium is for chromium VI. The RBC for chromium III is 37000 ppb. The analytical method used, does not differentiate between chromium VI and chromium III. It is very unlikely that significant concentrations of chromium VI were present in the sample.

Total metal concentrations represent the metals contained in suspended particles as well as those dissolved in the water. Though turbidity is not a measurement of the amount of solid material suspended in the sample, they are related, and it should be noted that the highest turbidity readings were reported in the samples from FR-3. These elevated metals are most likely due to the increased amount of suspended material contained in the samples. This conclusion is supported by the dissolved metals results that are discussed in the subsequent section.

4.3.4 Dissolved Metals: Field-filtered samples were also analyzed for the same ten metals to determine the concentrations of dissolved metals in the samples. Data are presented in Table 4 of Appendix B. Samples were field filtered into clean containers. Thus, reported concentrations represent the amount of dissolved metal in the sample. Chromium was qualified as estimated in thirteen samples due to poor precision exhibited in laboratory control samples. Selenium was qualified as estimated in one sample due to high matrix spike recovery and sodium was detected in several method blanks. Affected data have been appropriately qualified in the data tables. All method reporting limits are below applicable regulatory levels and all data is usable for project purposes.

No arsenic, cadmium, mercury, selenium or silver was detected in any of the samples. No primary MCLs, GCS or RBCs were exceeded in any of the filtered samples.



4.3.5 Water Quality Parameters: All of the samples were also tested for a group of water quality parameters. These analytes include chloride, nitrate-nitrite, sulfate, total organic carbon, total dissolved solids and turbidity.

Primary MCLs are available for nitrate-nitrite (10 ppm). Secondary MCLs are available for chloride (250 ppm), sulfate (250 ppm) and total dissolved solids (500 ppm). No primary MCLs were exceeded. All primary and QA laboratory data agree and are comparable with the following exceptions: the QA duplicate sample data for total organic carbon in both triplicate sets do not agree with the primary or the QC duplicate sample data. In each case, the primary and QC duplicate data are accepted based on blind duplicate agreement and acceptable internal quality control results. Similarly, the turbidity data for the QA sample from FR-3 does not agree with the primary or QC duplicate results. Again, the primary data is accepted based on blind duplicate agreement and acceptable quality control results.

4.3.6 Field Data: Conductivity, pH, temperature and oxidation and reduction potential were measured in the field and are included in the sample summary forms in Appendix A. Associated data generally agree with field data from previous investigations and fall within expected ranges.

## 5. Conclusion

Groundwater quality in the area continues to be good. Data generated during this investigation is generally consistent with historical data generated for these wells. Though various analytes have been sporadically detected near and above levels of concern. No analytes have been consistently detected near levels of concern in any of the wells. Additionally, there does not appear to be a discernible difference in groundwater quality in the upgradient, downgradient or cross-gradient wells.

## 6. References

FTR 37613

Alaska Department of Environmental Conservation, Draft Title 18 Alaska Administrative Code Chapter 70 (18 AAC 70), Water Quality Standards, 2 July 1998.

Alaska Department of Environmental Conservation, Title 18 Alaska Administrative Code Chapter 80 (18 AAC 80), Drinking Water, 10 November 1994.

Ecology and Environment, Inc., Closure Plan, Ft. Richardson Landfill, October 1995

United States Army Corps of Engineers (USACE), memorandum CEPOA-EN-G dated 23 April 1998, subject: Final Chemical Data Report, Fall 1997, Landfill Wells GW Monitoring, Ft. Richardson, Alaska.

USACE, memorandum CEPOA-EN-G dated 24 November 1997, subject: Final Chemical Data Report, Spring 1997, Ft. Richardson landfill, Alaska.

USACE, memorandum CENPA-EN-G dated 13 November 1996, subject: Final Chemical Data Report, Summer 1996, Ft. Richardson landfill, Alaska.

USACE, memorandum CENPA-EN-G dated 10 May 1996, subject: Final Chemical Data Report, Groundwater Study (Fall 1995), Ft. Richardson, Alaska.

USACE, ER 1110-1-263, Chemical Data Quality Management for Hazardous Waste Remedial Activities, April 1997.

USACE, memorandum CENPA-EN-G-MI dated 8 April 1994, subject: Work Plan, Groundwater Monitoring, Ft. Richardson, AK.

United States Environmental Protection Agency, Region III Risk-Based Concentration Table, April 1998

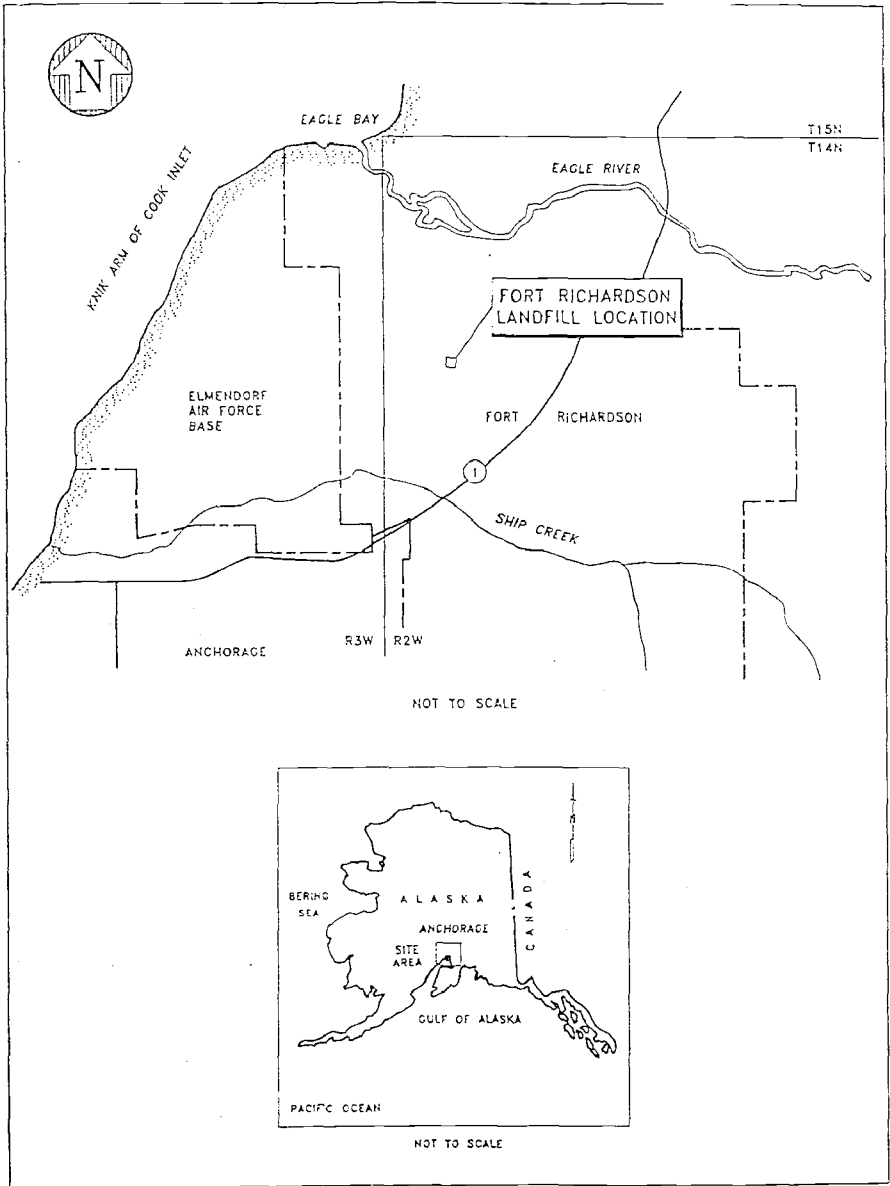


Figure 1  
FORT RICHARDSON LANDFILL SITE  
ANCHORAGE, ALASKA

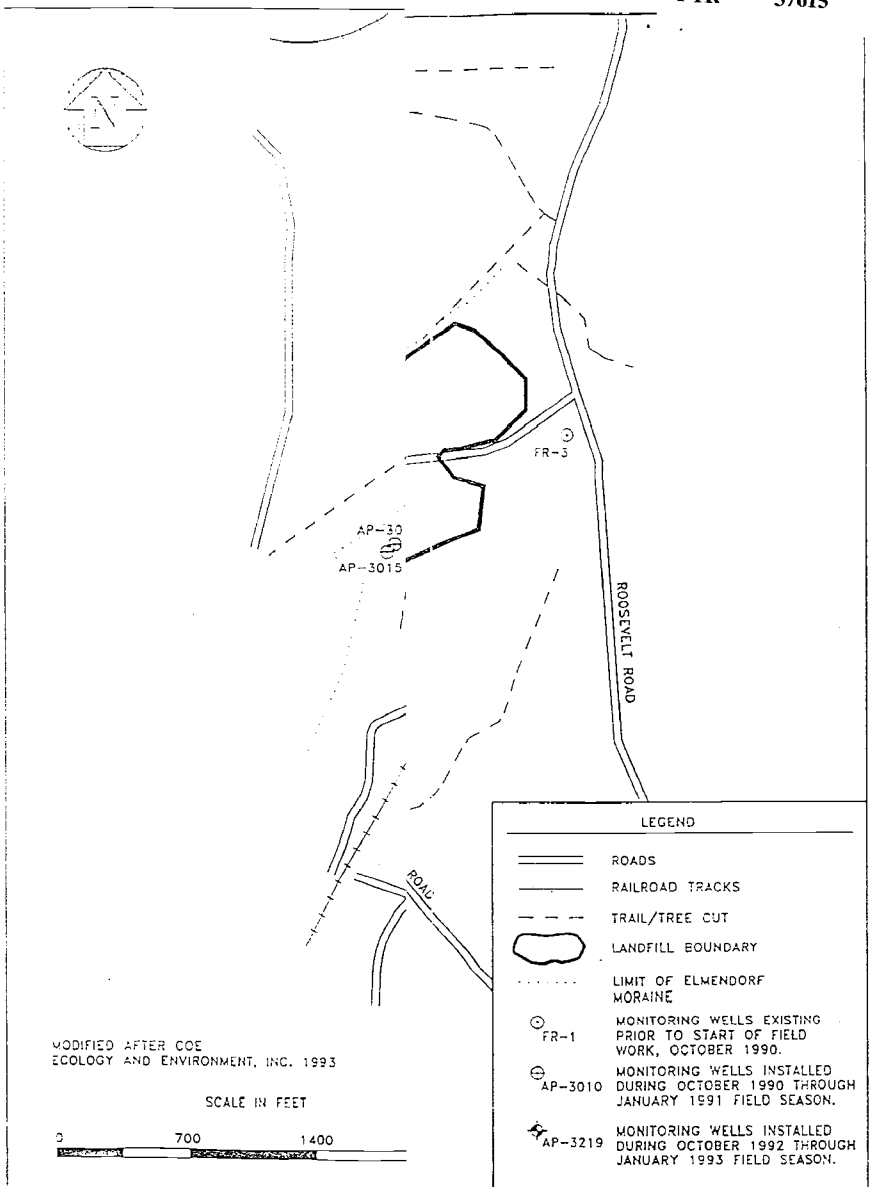


Figure 2 SITE MAP  
FORT RICHARDSON LANDFILL  
ANCHORAGE, ALASKA

APPENDIX A  
Sample Summary Forms

AP-3010

FTR 37617

Landfill Wells, Ft. Richardson

30-May-98

**Sampling Point:** 4-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 4000 watt, 240 volt, 8 hp generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: 232.75 ft

Casing top/bottom: 235.58 ft (from records)

Purge Volume: 20 L

Purge Rate: 1.0 L/min (380 Hz)

Sampled By: M Stichick

Physical Parameters and Observations at time of Sample Collection

Temperature: 8.9 °C

pH: 7.21

Conductivity: 0.533 millimhos/cm

Redox Potential: 11 millivolts

Odor: None Noticeable

Appearance: clear

Sample Number: 98FRLR06WA

Time of Sampling: 1433-1437

Rate of Sampling: slowest unbroken flow (less than 1L/min)

AP-3013

FTR 37618

Landfill Wells, Ft. Richardson

2-Jun-98

**Sampling Point:** 4-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 5000 watt, 240 volt generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: 139.69 ft

Casing top/bottom: 150.00 ft (from record)

Purge Volume: 77 L

Purge Rate: 1.0 L/min (330 Hz)

Sampled By: M Stichick

Physical Parameters and Observations at time of Sample Collection

Temperature: 6.1 °C

pH: 7.13

Conductivity: 0.396 millimhos/cm

Redox Potential: 207 millivolts

Odor: None Noticeable

Appearance: clean

Sample Number: 98FRLF08WA, -09WA and -10WA

Time of Sampling: 1141-1203

Rate of Sampling: Slowest sustainable non turbulent flow



**AP-3014**

Landfill Wells, Ft. Richardson

**FTR 37619**

2-Jun-98

**Sampling Point:** 4-inch Monitoring Well

**Equipment:** Disposable bailer

Casing top/water: 18.65 ft

Casing top/bottom: 31.1 ft (from records)

Purge Volume: 93 L

Purge Rate: pump inoperable a disposable teflon bailer was used.

Sampled By: M Stichick

Physical Parameters and Observations at time of Sample Collection

Temperature: 4.3 °C  
pH: 6.81  
Conductivity: 0.141 millimhos/cm  
Redox Potential: 111 millivolts  
Odor: None Noticeable  
Appearance: clear

Sample Number: 98FRLF11WA

Time of Sampling: 1926-1931

Rate of Sampling: less than 1L/min

AP-3015

FTR 37620

Landfill Wells, Ft. Richardson

3-Jun-98

**Sampling Point:** 4-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 4000 watt, 240 volt, 8 hp generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: 123.77 ft

Casing top/bottom: 130.1 ft (from records)

Purge Volume: 60 L

Purge Rate: 1.0 L/min (240 Hz)

Sampled By: M Stichick

Physical Parameters and Observations at time of Sample Collection

Temperature: 8.8 °C

pH: 7.51

Conductivity: 0.409 millimhos/cm

Redox Potential: 189 millivolts

Odor: None Noticeable

Appearance: clear

Sample Number: 98FRLF12WA

Time of Sampling: 1732-1740

Rate of Sampling: slowest unbroken flow (less than 1L/min)

**AP-3219**

**FTR 37621**

**28-May-98**

**Landfill Wells, Ft. Richardson**

**Sampling Point:** 4-inch Monitoring Well.

**Equipment:** Purged and sampled with disposable Teflon bailer.

Casing top/water: 30.37 ft

Casing top/bottom: 41.4 ft (from record)

Purge Volume: 85 L

Purge Rate: 0.88 L/min

Sampled By: B. Walters

Physical Parameters and Observations at time of Sample Collection

Temperature: 4.8 °C

pH: 6.64

Conductivity: 0.069 millimhos/cm

Redox Potential: 112 millivolts

Odor: None Noticeable

Appearance: clear

Sample Number: 98FRLF04WA

Time of Sampling: 1639 - 1644 28 May 1998

Rate of Sampling: Slowest unbroken flow

FTR

37622

AP-3220

20-30 May 1997

Landfill Well, Ft. Richardson

Sampling Point: 4-inch Monitoring Well

Equipment: Sample was collected using a disposable bailer.

Casing top/water: 231.27 ft

Casing top/bottom: 243.4 ft (from records)

Purge Volume: Bailed dry three times

Purge Rate: <1.00 L/min

Sampled By: B Walters

Physical Parameters and Observations at time of Sample Collection

Temperature: 3.7 °C

pH: 7.31

Conductivity: 0.51 millimhos/cm

Redox Potential: 17 millivolts

Odor: None Noticeable

Appearance: brown, water became more turbid with time.

Sample Number: 98FRLF05WA

Time of Sampling: 15:05 on 20 May - 1238 on 30 May 1997

Rate of Sampling: about 1.5 L/day

AP-3221

FTR 37623

Landfill Wells, Ft. Richardson

30 May 1998

**Sampling Point:** 4-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 4000 watt, 240 volt generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: not recorded

Casing top/bottom: 180.00 ft (from record)

Purge Volume: 105 L

Purge Rate: 1.75 L/min (293 Hz)

Sampled By: M Stichick

Physical Parameters and Observations at time of Sample Collection

Temperature: 8.8 °C  
pH: 7.01  
Conductivity: 0.696 millimhos/cm  
Redox Potential: 65 millivolts  
Odor: None Noticeable  
Appearance: LIGHT brown/cloudy

Sample Number: 98FRFL07WA

Time of Sampling: 1642-1649

Rate of Sampling: Slowest sustainable non turbulent flow

AP-3222

FTR 37624

28-May-98

Landfill Well, Ft. Richardson

**Sampling Point:** 4-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 4000 watt, 240 volt generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: 132.35 ft

Casing top/bottom: 141 ft (from records)

Purge Volume: 65 L

Purge Rate: 1.0 L/min (248 Hz)

Sampled By: B Walters

Physical Parameters and Observations at time of Sample Collection

Temperature: 8.1 °C

pH: 7.16

Conductivity: 0.383 millimhos/cm

Redox Potential: 114 millivolts

Odor: None Noticeable

Appearance: Clear

Sample Number: 98FRLF03WA

Time of Sampling: 1621-1630

Rate of Sampling: slowest unbroken flow (less than 1L/min)

**FR-1**

**27 May 1998**

**FTR 37625**

**Landfill Wells, Ft. Richardson**

**Sampling Point:** 2-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 5000 watt, 240 volt, generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: 135.65 ft

Casing top/bottom: 149.00 ft (from record)

Purge Volume: 25 L

Purge Rate: 1.0 L/min (260 Hz)

Sampled By: B Walters

Physical Parameters and Observations at time of Sample Collection

Temperature: 8.5 °C

pH: 7.62

Conductivity: 0.407 millimhos/cm

Redox Potential: 217 millivolts

Odor: None Noticeable

Appearance: clear

Sample Number: 98FRLF01WA

Time of Sampling: 1350-1410

Rate of Sampling: Slowest sustainable non turbulent flow

FR-2

FTR

37626

27-28 May 1997

Landfill Wells, Ft. Richardson

**Sampling Point:** 2-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 5000 watt, 240 volt, generator, Grundfos BMI/MP1 voltage control box; Teflon sampling tube.

Casing top/water: 151.47 ft

Casing top/bottom: 167.0 ft (from record)

Purge Volume: 24 L

Purge Rate: 1.5 L/min @ 365 Hz

Purged and sampled @ a higher than normal rate to prevent pump and water overheating.

Sampled By: B Walters

Physical Parameters and Observations at time of Sample Collection

Temperature: 11.3 °C

pH: 6.84

Conductivity: 0.449 millimhos/cm

Redox Potential: 188 millivolts

Odor: None Noticeable

Appearance: clear

Sample Number: 98FRLF02WA

Time of Sampling: 1323-1327

Rate of Sampling: 1.5 L/min A higher than normal rate to prevent pump and water overheating.



FR-3

FTR 37627

2-Jun-98

**Landfill Wells, Ft. Richardson**

**Sampling Point:** 2-inch Monitoring Well

**Equipment:** Dedicated 2-inch stainless steel submersible pump (Grundfos RediFlow II); PVC riser; Homelight 4000 watt, 240 volt, 8 hp generator, Grundfos BMI/MP1 voltage control box; Teflon sampler.

Casing top/water: 154.86 ft

Casing top/bottom: 171.70 ft (from records)

Purge Volume: 30.5 L

Purge Rate: 1.0 L/min (290-300 Hz)

Sampled By: B Walters

Physical Parameters and Observations at time of Sample Collection

Temperature: 8.9 °C

pH: 6.77

Conductivity: 0.302 millimhos/cm

Redox Potential: 102 millivolts

Odor: None Noticeable

Appearance: Brown/cloudy

Sample Number: 98FRFL13WA,-14WA,-15WA

Time of Sampling: 1702-1730

Rate of Sampling: Slowest sustainable non turbulent flow (< 1L/min)

FTR

37628

APPENDIX B  
Laboratory Data

Table 1

**Ft. Richardson Landfill Well Groundwater Monitoring  
Method 8021A**

**Aromatic Volatile Organic Compounds**

**May/June, 1998**

**FTR 37629**

	AP-3010	AP-3013	QC Dup AP-3013	QA Dup AP-3013	AP-3014
<b>LOCATION OF SAMPLE:</b>	AP-3010	AP-3013	AP-3013	AP-3013	AP-3014
<b>DATE OF SAMPLE:</b>	5/30/98	6/2/98	6/2/98	6/2/98	6/2/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	06WA	08WA	09WA	10WA	11WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	CAS	SAS
<b>LABORATORY SAMPLE ID:</b>	73163-02	73289-01	73289-02	K983589-001	73289-03
<b>DATE RECEIVED:</b>	6/2/98	6/5/98	6/5/98	6/3/98	6/5/98
<b>DATE ANALYZED:</b>	6/2/98	6/16/98	6/16/98	6/16/98	6/16/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Benzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0005)	ND (0.001)
<b>Toluene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Ethylbenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Xylenes (Total)</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.001)	ND (0.002)
<b>Chlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0005)	ND (0.001)
<b>1,2-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,3-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,4-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Chlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0005)	ND (0.001)

CAS: Columbia Analytical Services, Inc., Anchorage, AK & Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 1

Ft. Richardson Landfill Well Groundwater Monitoring  
Method 8021A

Aromatic Volatile Organic Compounds  
May/June, 1998

FTR

37630

LOCATION OF SAMPLE:	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
DATE OF SAMPLE:	6/3/98	5/28/98	5/30/98	5/30/98	5/28/98
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID: 98FRLF-	12WA	04WA	05WA	07WA	03WA
TESTING LABORATORY:	SAS	SAS	SAS	SAS	SAS
LABORATORY SAMPLE ID:	73289-04	73127-04	73163-01	73163-03	73127-03
DATE RECEIVED:	6/5/98	5/30/98	6/2/98	6/2/98	5/30/98
DATE ANALYZED:	6/16/98	6/2/98	6/2/98	6/2/98	6/2/98
CONCENTRATION UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Benzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Toluene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Ethylbenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Xylenes (Total)</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)
<b>Chlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,2-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,3-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,4-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Chlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)

SAS: Sound Analytical Services, Inc., Tacoma, WA.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 1

**Ft. Richardson Landfill Well Groundwater Monitoring  
Method 8021A  
Aromatic Volatile Organic Compounds  
May/June, 1998**

FTR

37631

	FR-1	FR-2	FR-3	QC Dup FR-3	QA Dup FR-3
<b>LOCATION OF SAMPLE:</b>	FR-1	FR-2	FR-3	FR-3	FR-3
<b>DATE OF SAMPLE:</b>	5/27/98	5/28/98	6/2/98	6/2/98	6/2/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	01WA	02WA	14WA	15WA	13WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	SAS	CAS
<b>LABORATORY SAMPLE ID:</b>	73127-01	73127-02	73289-05	73289-06	K983589-002
<b>DATE RECEIVED:</b>	5/30/98	5/30/98	6/5/98	6/5/98	6/3/98
<b>DATE ANALYZED:</b>	6/2/98	6/2/98	6/16/98	6/16/98	6/16/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Benzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0005)
<b>Toluene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Ethylbenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Xylenes (Total)</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.001)
<b>Chlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0005)
<b>1,2-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,3-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>1,4-Dichlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
<b>Chlorobenzene</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0005)

CAS: Columbia Analytical Services, Inc., Anchorage, AK &amp; Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

**Table 2**  
**Ft Richardson Landfill Wells Groundwater Monitoring**  
**Method AK101**  
**Gasoline Range Organics**  
**May/June, 1998**

**FTR**  
**37632**

			QC Dup	QA Dup	
LOCATION OF SAMPLE:	AP-3010	AP-3013	AP-3013	AP-3013	AP-3014
DATE OF SAMPLE:	5/30/98	6/2/98	6/2/98	6/2/98	6/2/98
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID: 98FRLF-	06WA	08WA	09WA	10WA	11WA
TESTING LABORATORY:	SAS	SAS	SAS	CAS	SAS
LABORATORY SAMPLE ID:	73163-02	73289-01	73289-02	A98028501	73289-03
DATE RECEIVED:	6/2/98	6/5/98	6/5/98	6/3/98	6/5/98
DATE ANALYZED:	6/2/98	6/16/98	6/16/98	6/15/98	6/16/98
CONCENTRATION UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L
Gasoline Range Organics	0.058	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)

CAS: Columbia Analytical Services, Inc., Anchorage, AK.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

**Table 2**  
**Ft Richardson Landfill Wells Groundwater Monitoring**  
**Method AK101**  
**Gasoline Range Organics**  
**May/June, 1998**

**FTR 37633**

<b>LOCATION OF SAMPLE:</b>	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
<b>DATE OF SAMPLE:</b>	6/3/98	5/28/98	5/30/98	5/30/98	5/28/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	12WA	04WA	05WA	07WA	03WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	SAS	SAS
<b>LABORATORY SAMPLE ID:</b>	73289-04	73127-04	73163-01	73163-03	73127-03
<b>DATE RECEIVED:</b>	6/5/98	5/30/98	6/2/98	6/2/98	5/30/98
<b>DATE ANALYZED:</b>	6/16/98	6/2/98	6/2/98	6/2/98	6/2/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Gasoline Range Organics</b>	ND (0.05)	ND (0.05)	ND (0.05)	0.015 J	ND (0.05)

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 2  
 Ft Richardson Landfill Wells Groundwater Monitoring  
 Method AK101  
 Gasoline Range Organics  
 May/June, 1998

FTR 37634

	FR-1	FR-2	FR-3	QC Dup FR-3	QA Dup FR-3
LOCATION OF SAMPLE:	FR-1	FR-2	FR-3	FR-3	FR-3
DATE OF SAMPLE:	5/27/98	5/28/98	6/2/98	6/2/98	6/2/98
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID: 98FRLF-	01WA	02WA	14WA	15WA	13WA
TESTING LABORATORY:	SAS	SAS	SAS	SAS	CAS
LABORATORY SAMPLE ID:	73127-01	73127-02	73289-05	73289-06	A98028502
DATE RECEIVED:	5/30/98	5/30/98	6/5/98	6/5/98	6/3/98
DATE ANALYZED:	6/2/98	6/2/98	6/16/98	6/16/98	6/15/98
CONCENTRATION UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L
Gasoline Range Organics	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)

CAS: Columbia Analytical Services, Inc., Anchorage, AK.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).



**Table 3**  
**Ft Richardson Landfill Wells Groundwater Monitoring**  
**Total Metals**  
**May/June, 1998**

**FTR**      **37635**

	AP-3010	AP-3013	QC Dup AP-3013	QA Dup AP-3013	AP-3014
<b>LOCATION OF SAMPLE:</b>	AP-3010	AP-3013	AP-3013	AP-3013	AP-3014
<b>DATE OF SAMPLE:</b>	5/30/98	6/2/98	6/2/98	6/2/98	6/2/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	06WA	08WA	09WA	10WA	11WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	CAS	SAS
<b>LABORATORY SAMPLE ID:</b>	73163-02	73289-01	73289-02	A980285-001	73289-03
<b>DATE RECEIVED:</b>	6/2/98	6/5/98	6/5/98	6/3/98	6/5/98
<b>DATE ANALYZED:</b>	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/15 - 19/98	6/10 - 11/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Arsenic</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.005)	ND (0.001)
<b>Barium</b>	0.014	0.0079	0.0078	0.011	0.0099
<b>Cadmium</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.005)	ND (0.0005)
<b>Chromium</b>	0.0097 J	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
<b>Lead</b>	0.0018	0.00032 J	ND (0.0005)	0.003	0.00051
<b>Potassium</b>	ND (5)	ND (5)	ND (5)	0.7	ND (5)
<b>Mercury</b>	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)
<b>Selenium</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.005)	ND (0.002)
<b>Silver</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.005)	ND (0.0005)
<b>Sodium</b>	3.6 B	3.3 B	3.3 B	3.2	3.7 B

CAS: Columbia Analytical Services, Inc., Anchorage, AK & Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

B: Analyte was detected in the associated method blank.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 3  
 Ft Richardson Landfill Wells Groundwater Monitoring  
 Total Metals  
 May/June, 1998

FTR 37636

	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
LOCATION OF SAMPLE:	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
DATE OF SAMPLE:	6/3/98	5/28/98	5/30/98	5/30/98	5/28/98
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID: 98FRLF-	12WA	04WA	05WA	07WA	03WA
TESTING LABORATORY:	SAS	SAS	SAS	SAS	SAS
LABORATORY SAMPLE ID:	73289-04	73127-04	73163-01	73163-03	73127-03
DATE RECEIVED:	6/5/98	5/30/98	6/2/98	6/2/98	5/30/98
DATE ANALYZED:	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98
CONCENTRATION UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L
Arsenic	ND (0.001)	ND (0.001)	0.0086	0.00098 J	ND (0.001)
Barium	ND (0.01)	0.007	0.15	0.052	0.0078
Cadmium	ND (0.0005)	ND (0.0005)	0.00068	ND (0.0005)	ND (0.0005)
Chromium	0.011	ND (0.01)	0.0048 J	0.014	ND (0.01)
Lead	0.0004 J	0.00042 J	0.012	0.00099	ND (0.0005)
Potassium	ND (5)	ND (5)	2.9 J	ND (5)	ND (5)
Mercury	ND (0.0002)	ND (0.0002)	0.00032	ND (0.0002)	ND (0.0002)
Selenium	ND (0.002)	ND (0.002)	0.0065	ND (0.002)	ND (0.002)
Silver	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Sodium	3.3 B	1.2 B	20	4.4 B	3.4 B

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

B: Analyted was detected in the associated method blank.

NT: Not Tested.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 3

**Ft Richardson Landfill Wells Groundwater Monitoring  
Total Metals  
May/June, 1998**

**FTR 37637**

	FR-1	FR-2	FR-3	QC Dup FR-3	QA Dup FR-3
<b>LOCATION OF SAMPLE:</b>	FR-1	FR-2	FR-3	FR-3	FR-3
<b>DATE OF SAMPLE:</b>	5/27/98	5/28/98	6/2/98	6/2/98	6/2/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	01WA	02WA	14WA	15WA	13WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	SAS	CAS
<b>LABORATORY SAMPLE ID:</b>	73127-01	73127-02	73289-05	73289-06	A980285-002
<b>DATE RECEIVED:</b>	5/30/98	5/30/98	6/5/98	6/5/98	6/3/98
<b>DATE ANALYZED:</b>	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/15 - 19/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Arsenic</b>	ND (0.001)	ND (0.001)	0.0018	0.0022	0.011
<b>Barium</b>	0.0076	0.011	0.06	0.099	0.135
<b>Cadmium</b>	ND (0.0005)	ND (0.0005)	ND (0.005)	0.00027 J	ND (0.005)
<b>Chromium</b>	ND (0.01)	0.01	0.16	0.21	0.732
<b>Lead</b>	ND (0.0005)	ND (0.0005)	0.0094	0.015	0.021
<b>Potassium</b>	ND (5)	ND (5)	ND (5)	ND (5)	3.17
<b>Mercury</b>	ND (0.0002)	ND (0.0002)	0.0002 J	0.00026	ND (0.0002)
<b>Selenium</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.005)
<b>Silver</b>	ND (0.0005)	ND (0.0005)	0.00035 J	0.0005 J	ND (0.005)
<b>Sodium</b>	3.2 B	3.3 B	2.5 B	2.6 B	3.26

CAS: Columbia Analytical Services, Inc., Anchorage, AK & Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

B: Analyte was detected in the associated method blank.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

**Table 4**  
**Ft. Richardson Landfill Wells, Groundwater Monitoring**  
**Dissolved Metals**  
**May/June, 1998**

**FTR 37638**

	AP-3010	AP-3013	QC Dup AP-3013	QA Dup AP-3013	AP-3014
<b>LOCATION OF SAMPLE:</b>	AP-3010	AP-3013	QC Dup AP-3013	QA Dup AP-3013	AP-3014
<b>DATE OF SAMPLE:</b>	5/30/98	6/2/98	6/2/98	6/2/98	6/2/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	06WA	08WA	09WA	010WA	11WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	CAS	SAS
<b>LABORATORY SAMPLE ID:</b>	73163-02	73289-01	73289-02	A980285-001	73289-03
<b>DATE RECEIVED:</b>	6/2/98	6/5/98	6/5/98	6/3/98	6/5/98
<b>DATE ANALYZED:</b>	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/15 - 19/98	6/10 - 11/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Arsenic</b>	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.005)	ND (0.001)
<b>Barium</b>	0.0099	0.0085	0.0079	0.018	0.0048 J
<b>Cadmium</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.005)	ND (0.0005)
<b>Chromium</b>	ND (0.01 ) J	ND (0.01 ) J	ND (0.01 ) J	ND (0.01 )	ND (0.01 ) J
<b>Lead</b>	ND (0.0005)	0.00027 J	ND (0.0005)	ND (0.002)	ND (0.0005)
<b>Mercury</b>	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)
<b>Potassium</b>	ND (5)	ND (5)	ND (5)	0.680	ND (5)
<b>Selenium</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.005)	ND (0.002)
<b>Sodium</b>	3.4 B	3.3 B	3.2 B	3.18	3.6 B
<b>Silver</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.005)	ND (0.0005)

CAS: Columbia Analytical Services, Inc., Anchorage, AK & Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

B: Analyte was detected in the associated method blank.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 4

Ft. Richardson Landfill Wells, Groundwater Monitoring  
 Dissolved Metals  
 May/June, 1998

FTR

37639

	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
<b>LOCATION OF SAMPLE:</b>	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
<b>DATE OF SAMPLE:</b>	6/3/98	5/28/98	5/30/98	5/30/98	5/28/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	12WA	04WA	05WA	07WA	03WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	SAS	SAS
<b>LABORATORY SAMPLE ID:</b>	73289-04	73127-04	73163-01	73163-03	73127-03
<b>DATE RECEIVED:</b>	6/5/98	5/30/98	6/2/98	6/2/98	5/30/98
<b>DATE ANALYZED:</b>	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98	6/10 - 11/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Arsenic</b>	ND (0.0001)	ND (0.001)	0.0044	ND (0.001)	ND (0.001)
<b>Barium</b>	0.0086	0.0034 J	0.074	0.036	0.0074
<b>Cadmium</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
<b>Chromium</b>	ND (0.01 ) J	0.0052 J	ND (0.01)	0.0056 J	0.005 J
<b>Lead</b>	ND (0.0005)	0.0095	ND (0.0005) J	ND (0.0005) J	0.00036 J
<b>Mercury</b>	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)
<b>Potassium</b>	ND (5)	ND (5)	2.5 J	ND (5)	ND (5)
<b>Selenium</b>	ND (0.002)	ND (0.002)	0.0054 J	ND (0.002)	ND (0.002)
<b>Sodium</b>	3.1 B	1.2 B	20	4	3.2 B
<b>Silver</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

B: Analyte was detected in the associated method blank.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

Table 4

## Ft. Richardson Landfill Wells, Groundwater Monitoring

## Dissolved Metals

FTR

37640

May/June, 1998

	FR-1	FR-2	FR-3	QC Dup FR-3	QA Dup FR-3
<b>LOCATION OF SAMPLE:</b>	FR-1	FR-2	FR-3	FR-3	FR-3
<b>DATE OF SAMPLE:</b>	5/27/98	5/28/98	6/2/98	6/2/98	6/2/98
<b>TYPE OF SAMPLE:</b>	Water	Water	Water	Water	Water
<b>FIELD SAMPLE ID: 98FRLF-</b>	01WA	02WA	14WA	15WA	13WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	SAS	CAS
<b>LABORATORY SAMPLE ID:</b>	73127-01	73127-02	73289-05	73289-06	A980285-002
<b>DATE RECEIVED:</b>	5/30/98	5/30/98	6/5/98	6/5/98	6/3/98
<b>DATE ANALYZED:</b>	6/10 - 11/98	6/10 - 11/98	6/11/98	6/11/98	6/15 - 19/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Arsenic</b>	ND (0.001)	ND (0.001)	ND (0.0001)	ND (0.0001)	ND (0.005)
<b>Barium</b>	0.007	0.013	0.052	0.054	0.053
<b>Cadmium</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.005)
<b>Chromium</b>	ND (0.01) J	ND (0.01) J	ND (0.01) J	ND (0.01) J	ND (0.01)
<b>Lead</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	0.006
<b>Mercury</b>	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)
<b>Potassium</b>	ND (5)	ND (5)	ND (5)	ND (5)	0.94
<b>Selenium</b>	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.005)
<b>Sodium</b>	3 B	3.2	2.4 B	2.2 B	2.37
<b>Silver</b>	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.005)

CAS: Columbia Analytical Services, Inc., Anchorage, AK &amp; Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

B: Analyte was detected in the associated method blank.

NT: Not Tested.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

**Table 5**  
**Ft. Richardson Landfill Wells, Groundwater Monitoring**  
**Water Quality Parameters**  
**May/June, 1998**

			FTR	37641	
	AP-3010	AP-3013	QC Dup AP-3013	QA Dup AP-3013	AP-3014
LOCATION OF SAMPLE:	AP-3010	AP-3013	AP-3013	AP-3013	AP-3014
TYPE OF SAMPLE:	5/30/98	6/2/98	6/2/98	6/2/98	6/2/98
DATE OF SAMPLE:	5/30/98	6/2/98	6/2/98	6/2/98	6/2/98
FIELD SAMPLE ID: 98FRLF-	06WA	08WA	09WA	10WA	11WA
TESTING LABORATORY:	SAS	SAS	SAS	CAS	SAS
LABORATORY SAMPLE ID:	73163-02	73289-01	73289-02	A980285-001 K983589-001	73289-03
DATE RECEIVED:	6/2/98	6/5/98	6/5/98	6/3/98	6/5/98
DATE ANALYZED:	6/4 - 8/98	6/5 - 16/98	6/5 - 16/98	6/3/98	6/5 - 16/98
CONCENTRATION UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Sulfate</b>	18	22	22	19.9	7.1
<b>Chloride</b>	2.0	9.2	9.3	7.9	0.62
<b>Nitrogen, Nitrate-Nitrite</b>	0.34 J	0.83 J	0.82 J	1.0	ND (0.3) J
<b>Total Dissolved Solids</b>	290	200	200	217	52
<b>Total Organic Carbon (TOC)</b>	1.4	0.96	0.94	0.2 J	1.4
<b>Turbidity (NTU)</b>	13 J	0.9 J	0.5 J	0.5	8.6 J

CAS: Columbia Analytical Services, Inc., Anchorage, AK & Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

**Table 5**  
**Ft. Richardson Landfill Wells, Groundwater Monitoring**  
**Water Quality Parameters**  
**May/June, 1998**

**FTR**      **37642**

	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
<b>LOCATION OF SAMPLE:</b>	AP-3015	AP-3219	AP-3220	AP-3221	AP-3222
<b>TYPE OF SAMPLE:</b>	6/3/98	5/28/98	5/30/98	5/30/98	5/28/98
<b>DATE OF SAMPLE:</b>	6/3/98	5/28/98	5/30/98	5/30/98	5/28/98
<b>FIELD SAMPLE ID: 98FRLF-</b>	12WA	04WA	05WA	07WA	03WA
<b>TESTING LABORATORY:</b>	SAS	SAS	SAS	SAS	SAS
<b>LABORATORY SAMPLE ID:</b>	73289-04	73127-04	73163-01	73163-03	73127-03
<b>DATE RECEIVED:</b>	6/5/98	5/30/98	6/2/98	6/2/98	5/30/98
<b>DATE ANALYZED:</b>	6/5 - 16/98	6/1 - 2/98	6/4 - 8/98	6/4 - 8/98	6/1 - 2/98
<b>CONCENTRATION UNITS:</b>	mg/L	mg/L	mg/L	mg/L	mg/L
<b>Sulfate</b>	23	5.0	16	17	18
<b>Chloride</b>	13	1.0	3.1	4.2	9.4
<b>Nitrogen, Nitrate-Nitrite</b>	1.3 J	0.64 J	0.22 J	0.43 J	0.78 J
<b>Total Dissolved Solids</b>	220	63	290	390	240
<b>Total Organic Carbon (TOC)</b>	0.87	1.7	3.9	1.2	0.76
<b>Turbidity (NTU)</b>	2.2	9.8 J	54 J	47 J	0.4 J

SAS: Sound Analytical Services, Inc., Tacoma, WA.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).



**Table 5**  
**Ft. Richardson Landfill Wells, Groundwater Monitoring**  
**Water Quality Parameters**  
**May/June, 1998**

			FTR		37643
	FR-1	FR-2	FR-3	QC Dup FR-3	QA Dup FR-3
LOCATION OF SAMPLE:	FR-1	FR-2	FR-3	FR-3	FR-3
TYPE OF SAMPLE:	5/27/98	5/28/98	6/2/98	6/2/98	6/2/98
DATE OF SAMPLE:	5/27/98	5/28/98	6/2/98	6/2/98	6/2/98
FIELD SAMPLE ID: 98FRLF-	01WA	02WA	14WA	15WA	13WA
TESTING LABORATORY:	SAS	SAS	SAS	SAS	CAS
LABORATORY SAMPLE ID:	73127-01	73127-02	73289-05	73289-06	A980285-002 K983589-002
DATE RECEIVED:	5/30/98	5/30/98	6/5/98	6/5/98	6/3/98
DATE ANALYZED:	6/1 - 2/98	6/1 - 2/98	6/5 - 8/98	6/5 - 8/98	6/3/98
CONCENTRATION UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L
Sulfate	20	20	13	13	12.5
Chloride	9.6	11	2.7	2.8	3.0
Nitrogen, Nitrate-Nitrite	0.89 J	0.88 J	0.35 J	0.38 J	0.5
Total Dissolved Solids	240	270	180	170	187
Total Organic Carbon (TOC)	0.85	0.9	5.7	5.1	0.4 J
Turbidity (NTU)	ND (0.2) J	2.5 J	160 J	160 J	960

CAS: Columbia Analytical Services, Inc., Anchorage, AK & Kelso, WA.

SAS: Sound Analytical Services, Inc., Tacoma, WA.

J: Estimated Value.

ND: Not Detected. (The number in parentheses is the Method Reporting Limit (MRL)).

APPENDIX C  
Quality Assurance Report

# DATA VALIDATION REPORT

Fort Richardson (Spring '98)

Groundwater Sampling

Prepared for

Army Corps of Engineers - Alaska Division

Project #

98-046

## 1.0 Introduction

This report summarizes the technical review of analytical results generated in support of the Landfill Wells Groundwater Sampling Event, Spring 1998 at Ft. Richardson. The criteria applied for this review are consistent with analytical method protocols, in conjunction with the laboratory-established control limits. In cases where specific guidance was not available from either of these sources, the data have been evaluated using professional judgement consistent with industry standards. The review included evaluation of sample collection, holding time and summary information for blanks (to assess contamination), sample duplicates (to assess precision), laboratory control samples (to assess accuracy) and matrix spike and surrogate recoveries (to assess matrix effect). Instrument calibration review and raw data verification were not performed.

The report is arranged by method; within each method section is a sub-section addressing each data quality indicator. In situations where all applicable criteria were met, it will be stated. If criteria were not met, the non-compliance, qualifier and associated samples are listed. Appendices A and B list qualifier definitions and acronyms, respectively. Appendix C, the data summary table, displays all sample results, as well as qualifiers and descriptors that may apply. Appendix D includes a summary of all qualified data, by analysis type.

## 2.0 Sample Collection, Preservation and Handling

Samples were collected from May 27 to June 3, 1998. Samples were received by Sound Analytical Services, Inc. (primary laboratory) within 3 days of collection and received by Columbia Analytical Services, Inc. in Anchorage, Alaska (referee laboratory) within 2 days of collection. The following samples were collected and analyzed by all applicable methods:

Laboratory: SAS (Primary Laboratory)

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q <sup>1</sup>	
73127							
	-01	98FRLF01WA	W	5/27/98	1	none	
	-02	98FRLF02WA	W	5/28/98	1	none	
	-03	98FRLF03WA	W	5/28/98	1	none	
	-04	98FRLF04WA	W	5/28/98	1	none	
	-05	98FRLF20WA	Trip Blank	W	5/27/98	1	none

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q <sup>1</sup>
73163						
	-01	98FRLF05WA	W	5/30/98		none
	-02	98FRLF06WA	W	5/30/98		none
	-03	98FRLF07WA	W	5/30/98		none
	-04	98FRLF21WA	Trip Blank	W	5/30/98	none

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q <sup>1</sup>	
73289							
	-01	98FRLF08WA	Primary Sample	W	6/2/98	6	none
	-02	98FRLF09WA	QC Dup of -08WA	W	6/2/98	6	none
	-03	98FRLF11WA	W	6/2/98	6	none	
	-04	98FRLF12WA	W	6/3/98	6	none	
	-05	98FRLF14WA	Primary Sample	W	6/2/98	6	none
	-06	98FRLF15WA	QC Dup of -14WA	W	6/2/98	6	none
	-07	98FRLF23WA	Trip Blank	W	6/2/98	6	none
	-08	98FRLF30WA	Rinsate Blank	W	6/3/98	6	none

Laboratory: CAS-KW (Referee Laboratory)

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q <sup>1</sup>
K9803589						
-001	98FRLF10WA	QA Dup of -08WA	W	6/2/98	8.4	J/UJ
-002	98FRLF13WA	Primary Sample	W	6/2/98	8.4	J/UJ
-003	98FRLF22WA	Trip Blank	W	6/2/98	8.4	J/UJ

Laboratory: CAS-AK (Referee Laboratory)

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q <sup>1</sup>
A9800285						
-001	98FRLF10WA	QA Dup of -08V/A	W	6/2/98	4.6	none
-002	98FRLF13WA	Primary Sample	W	6/2/98	4.6	none
-003	98FRLF22WA	Trip Blank	W	6/2/98	4.6	none

<sup>1</sup> According to the National Functional Guidelines for Data Review, if the sample temperature exceeds 6° C, for selected analytes, flag all associated positive and non-detect results as estimated (J/UJ)

All samples were received intact and properly labeled. For the rinsate blank 98FRLF30WA, the following positive results were reported:

Laboratory: SAS

Field Blank ID	Date Collected	ANALYTE	Result	RL	Units
98FRLF30WA	6/3/98	lead	0.0003	0.0005	mg/L
		sodium	0.23 *	0.5	mg/L
		total organic carbon	2.2	0.5	mg/L
		turbidity	0.3	0.2	NTU

\* qualified as nondetect due to method blank contamination

Low level results reported for lead, total organic carbon and turbidity in some samples may be impacted by the above contamination.

3.0 Dissolved Metals (SW6010, SW6020, SW7060, SW7421, SW7470, SW7610 and SW7740)

3.1 Holding Time

All samples were analyzed within the required technical holding time.

3.2 Blanks

One equipment rinsate blank was collected for analysis for dissolved metals. All target analytes were reported as non-detect. Method blanks were analyzed at the minimum recommended frequency. All target analytes were non-detect at the practical quantitation limit except the following:

Laboratory: SAS

MB Batch ID	Analyte	Result			Units
D439					
MATRIX: W	sodium	0.38			mg/L
Affected samples:			Qualified Result	Bias	
98FRLF04WA -04	sodium	1.2	1.2 B	H	mg/L

<sup>1</sup> According to the National Functional Guidelines for Inorganic Data Review, any analyte detected in a blank that was also detected in an associated sample is qualified if the sample result is less than 5x the blank concentration. The associated (PQL) is elevated to the sample result or the CRQL (RDL), whichever is higher. Flagging for this project modified to "B" at the amount found in the sample.

**3.3 Matrix Spike/ Sample Duplicates**

MS/SDs were analyzed at the recommended frequency. Recoveries and RPDs were within the laboratory - established limits except the following:

Laboratory: SAS  
 Prep Batch ID: D439  
 Spiked Sample: 98FRLF01WA  
 Matrix: W  
 DII Factor: 1

ANALYTE	Spiked Sample Result	Spike Conc.	% Recovery		Dup RPD	Limit <sup>1</sup>	Q	Bias
			MS	Limits <sup>1</sup>				
selenium	0	0.06 mg/L	126	75 - 125	0	20	J/none	H
chromium	0	0.4 mg/L	101	75 - 125	200	20	J/UJ	N
<b>Associated Samples:</b>								
	98FRLF06WA		98FRLF05WA		98FRLF01WA			
	98FRLF09WA		98FRLF06WA		98FRLF02WA			
	98FRLF11WA		98FRLF07WA		98FRLF03WA			
	98FRLF12WA		98FRLF04WA		98FRLF14WA			
	98FRLF15WA							

<sup>1</sup> Limits established by the laboratory

**3.4 Laboratory Control Samples**

Laboratory control samples were analyzed at the recommended frequency. All recoveries and RPDs were within the laboratory - established limits.

**3.5 Quantitation Limits**

The practical quantitation limits (PQLs) achieved by the laboratories were equivalent to the project required quantitation limits. Five percent of positive results were between the IDL and PQL, and are flagged "J". Results reported near the limit of detection are considered to be qualitatively acceptable, but quantitatively unreliable.

**3.6 Overall Assessment**

Chromium was qualified as estimated in thirteen samples due to poor precision exhibited in the laboratory duplicates. Selenium was qualified as estimated in one sample due to high recovery in the matrix spike. Sodium was qualified as non-detect in one sample due to method blank contamination. All other data quality criteria were met by this method, and all remaining data should be considered useable as reported.

**4.0 Total Metals (SW6010, SW6020, SW7060, SW7421, SW7470, SW7610 and SW7740)**

**4.1 Holding Time**

All samples were analyzed within the required technical holding time.

**4.2 Blanks**

One equipment rinsate blank was collected for analysis for total metals. All target analytes were reported as non-detect. Method blanks were analyzed at the minimum recommended frequency. All target analytes were non-detect at the practical quantitation limit except the following:

Laboratory: SAS

MB Batch ID	Analyte	Result	Units		
T440					
MATRIX: W	sodium	0.44			mg/L
<b>Affected samples:</b>					
			<sup>1</sup> Qualified Result	Blas	
98FRLF04WA -04	sodium	1.2	1.2 B	H	mg/L
98FRLF30WA -08	sodium	0.23	0.23 B	H	mg/L

<sup>1</sup> According to the National Functional Guidelines for Inorganic Data Review, any analyte detected in a blank that was also detected in an associated sample is qualified if the sample result is less than 5x the blank concentration. The associated (PQL) is elevated to the sample result or the CRQL (RDL), whichever is higher. Flagging for this project modified to "B" at the amount found in the sample.

**4.3 Matrix Spike/Sample Duplicates**

MS/SDs were analyzed at the recommended frequency. Recoveries and RPDs were within the laboratory - established limits.

**4.4 Laboratory Control Samples**

Laboratory control samples were analyzed at the recommended frequency. All recoveries and RPDs were within the laboratory - established limits.

**4.5 Quantitation Limits**

The practical quantitation limits (PQLs) achieved by the laboratories were equivalent to the project required quantitation limits. Five percent of positive results were between the IDL and PQL, and are flagged "J". Results reported near the limit of detection are considered to be qualitatively acceptable, but quantitatively unreliable.

**4.6 Overall Assessment**

Sodium was qualified as non-detect in two samples due to method blank contamination. All other data quality criteria were met by this method, and all remaining data should be considered useable as reported.



**5.0 Gasoline Range Organics (AK101)****5.1 Holding Time**

All samples were analyzed within the required technical holding time.

**5.2 Surrogates**

All surrogate recoveries were within the required limits.

**5.3 Blanks**

Four trip blanks and one equipment rinsate blank were collected for analysis by this method; all were reported as non-detect for gasoline range organics. Method blanks were analyzed at the minimum required frequency; all were reported as non-detect for gasoline range organics.

**5.4 Matrix Spike/Matrix Spike Duplicates**

MS/MSDs were not analyzed by the primary laboratory (SAS). Surrogate recoveries were within limits, and are an acceptable alternative to matrix spikes as an indicator of matrix recovery efficiency. Recoveries and RPDs for MS/MSDs analyzed by the referee laboratory (CAS) were within the laboratory - established limits.

**5.5 Laboratory Control Samples**

Laboratory control samples were analyzed at the required frequency. All recoveries and RPDs were within the laboratory - established limits.

**5.6 Quantitation Limits**

The practical quantitation limits (PQLs) achieved by the laboratories were equivalent to the project required quantitation limits. One of two positive results was below the quantitation limit, and is flagged "J". Results reported near the limit of detection are considered to be qualitatively acceptable, but quantitatively unreliable.

**5.7 Overall Assessment**

All data quality criteria were met by this method, and all data should be considered useable as reported.

## 6.0 General Chemistry (E160.1, E180.1, E300.0, E353.2 and E415.1)

### 6.1 Holding Time

All samples were analyzed within the required technical holding time except the following:

Laboratory: SAS

Method: E180.1

Field ID	Matrix	Collected	Analyzed	Holding	RTHT <sup>1</sup>	Q	Bias
				Time (Days)	(Days)		
				Analysis	Analysis		
98FRLF01WA	W	5/27/98	6/1/98	5	2	J/UJ	L
98FRLF02WA	W	5/28/98	6/1/98	4	2	J/UJ	L
98FRLF03WA	W	5/28/98	6/1/98	4	2	J/UJ	L
98FRLF04WA	W	5/28/98	6/1/98	4	2	J/UJ	L
98FRLF05WA	W	5/30/98	6/2/98	3	2	J/UJ	L
98FRLF06WA	W	5/30/98	6/2/98	3	2	J/UJ	L
98FRLF07WA	W	5/30/98	6/2/98	3	2	J/UJ	L
98FRLF08WA	W	6/2/98	6/5/98	3	2	J/UJ	L
98FRLF09WA	W	6/2/98	6/5/98	3	2	J/UJ	L
98FRLF11WA	W	6/2/98	6/5/98	3	2	J/UJ	L
98FRLF14WA	W	6/2/98	6/5/98	3	2	J/UJ	L
98FRLF15WA	W	6/2/98	6/5/98	3	2	J/UJ	L

<sup>1</sup> Required technical holding time established for the method

### 6.2 Blanks

Method blanks were analyzed at the recommended frequency. All target analytes were non-detect at the practical quantitation limit.

6.3 Matrix Spike/Sample Duplicates

MS/SDs were analyzed at the recommended frequency. Recoveries and RPDs were within the laboratory - established limits except the following:

Laboratory: CAS-KW

Prep Batch ID: 6/15/98-E415.1

Spiked Sample: 98FRLF10WA

Matrix: W

Dil Factor: 1

ANALYTE	Spiked Sample Result	Spike Conc.	% Recovery		Limits <sup>1</sup>	DUP RPD	Limit <sup>1</sup>	Q	Bias
			MS	MSD					
total organic carbon	0.2	25	112	NA	85 - 115	66	20	J/UJ	N
Associated Samples:	98FRLF10WA				98FRLF13WA				

Laboratory: SAS

Prep Batch ID: 938

Spiked Sample: 98FRLF01WA

Matrix: W

Dil Factor: 1

ANALYTE	Spiked Sample Result	Spike Conc.	% Recovery		Limits <sup>1</sup>	DUP RPD	Limit <sup>1</sup>	Q	Bias
			MS	MSD					
nitrate+nitrite as nitrogen	0.89	4	78	NA	80 - 120	5.1	20	J/UJ	L
Associated Samples:	98FRLF01WA 98FRLF04WA				98FRLF02WA				98FRLF03WA

Laboratory: SAS

Prep Batch ID: 939

Spiked Sample: 98FRLF30WA

Matrix: W

Dil Factor: 1

ANALYTE	Spiked Sample Result	Spike Conc.	% Recovery		Limits <sup>1</sup>	DUP RPD	Limit <sup>1</sup>	Q	Bias
			MS	MSD					
nitrate+nitrite as nitrogen	0	4	70	NA	80 - 120	0	20	J/UJ	L
Associated Samples:	98FRLF08WA 98FRLF12WA 98FRLF30WA				98FRLF09WA 98FRLF14WA				98FRLF11WA 98FRLF15WA

<sup>1</sup> Limits established by the laboratory

**6.4 Laboratory Control Samples**

Laboratory control samples were analyzed at the recommended frequency. All recoveries and RPDs were within the laboratory - established limits.

**6.5 Quantitation Limits**

The practical quantitation limits (PQLs) achieved by the laboratories were equivalent to the project required limits. All positive results reported were above the quantitation limit.

**6.6 Overall Assessment**

Samples 98FRLF10WA and 98FRLF13WA were qualified as estimated for chloride, sulfate and total organic carbon due to temperature exceedance; bias is anticipated to be low. Turbidity was qualified as estimated in twelve samples due to holding time exceedance. Due to low matrix spike recoveries, nitrate+nitrite as nitrogen was qualified as estimated in eleven samples. Total organic carbon was qualified as estimated in two samples due to poor precision. All other data quality criteria were met by this method, and all remaining data should be considered useable as reported.

## 7.0 Volatile Aromatic Hydrocarbons (SW8021A and SW8021B)

### 7.1 Holding Time

All samples were prepared and analyzed within the required technical holding time except the following:

Laboratory: CAS-KW

Field ID	Matrix	Collected	Analyzed	Holding Time (Days)	RTHT *	Q	Bias
				Analysis	Analysis (Days)		
98FRLF10WA	W	6/2/98	6/16/98	14	7	J/JJ	L
98FRLF22WA	W	6/2/98	6/16/98	14	7	J/JJ	L
98FRLF13WA	W	6/2/98	6/16/98	14	7	J/JJ	L

\* Required technical holding time of 14 days reduced to 7 days due to temperature exceedance (Functional Guidelines)

### 7.2 Surrogates

All surrogate recoveries were within the required limits.

### 7.3 Blanks

Four trip blanks and one equipment blank were collected for analysis by this method; all target analytes were reported as non-detect. Method blanks were analyzed at the minimum recommended frequency. All target analytes were non-detect at the practical quantitation limit.

### 7.4 Matrix Spike/Matrix Spike Duplicates

MS/MSDs were not analyzed by the primary laboratory (SAS). Surrogate recoveries were within limits, and are an acceptable alternative to matrix spikes as an indicator of matrix recovery efficiency. Recoveries and RPDs for MS/MSDs analyzed by the referee laboratory (CAS) were within the laboratory - established limits.

### 7.5 Laboratory Control Samples

Laboratory control samples were analyzed at the recommended frequency. All recoveries and RPDs were within the laboratory - established limits.

### 7.6 Quantitation Limits

The practical quantitation limits (PQLs) achieved were equivalent to the project required quantitation limits. All samples were reported as non-detect for all target compounds.

### 7.7 Overall Assessment

Samples 98FRLF10WA, 98FRLF13WA and 98FRLF22WA were qualified as estimated, due to exceeding the reduced holding time of seven days. All other criteria were met by this method, and all remaining data should be considered useable as reported.

8.0 Field Duplicates

Two sets of water matrix QA/QC field duplicates were collected. Results for primary samples, QC duplicates and QA duplicates were within three times each other except the following:

	Primary 98FRLF08WA				QC Dup 98FRLF09WA				QA Dup 98FRLF10WA			
	Result	Units	Q	Bias	Result	Units	Q	Bias	Result	Units	Q	Bias
<b>Dissolved Metals</b>												
lead	0.00027	mg/L	J	N	0.0005	mg/L	U		2	µg/L	U	
<b>General Chemistry</b>												
total organic carbon	0.96	mg/L			0.94	mg/L			0.2	mg/L	J	N
<b>Total Metals</b>												
lead	0.00032	mg/L	J	N	0.0005	mg/L	U		3	µg/L		

	Primary 98FRLF14WA				QC Dup 98FRLF15WA				QA Dup 98FRLF13WA			
	Result	Units	Q	Bias	Result	Units	Q	Bias	Result	Units	Q	Bias
<b>Dissolved Metals</b>												
lead	0.0005	mg/L	U		0.0005	mg/L	U		6	µg/L		
<b>General Chemistry</b>												
turbidity	160	NTU	J	L	160	NTU	J	L	960	NTU		
total organic carbon	5.7	mg/L			5.1	mg/L			0.4	mg/L	J	N

The reporting limits for cadmium and silver are ten times higher at the referee laboratory.

## 9.0 References

"USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods", July 1992 (SW-846)

"Methods for Chemical Analysis of Water and Wastes", March 1983 (EPA-600)

"National Functional Guidelines for Organic Data Review", February, 1994

"National Functional Guidelines for Inorganic Data Review", February, 1994

"Method AK101.0, for the Determination of Gasoline Range Organics"

*Appendix A*  
**Qualifier Definitions**

B	The sample result is less than 5 or 10 times (for common laboratory contaminants) the associated blank contamination.
U	The analyte was analyzed for, but was not detected above the reported quantitation limit.
UJ	The analyte was not detected above the reported quantitation limit. However, the reported quantitation is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J/none	Sample results for the analyte are estimated for positive results; results reported below the quantitation limit are not qualified (high bias).
J/UJ	Sample results for the analyte are estimated for both positive results and results reported below the quantitation limit (low bias).
R/UR	The sample results are rejected for both positive results and results reported below the quantitation limit due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.



*Appendix B***Acronyms**

CAS-AK	-	Columbia Analytical Services, Inc. - Alaska
CAS-KW	-	Columbia Analytical Services, Inc. - Kelso, Washington
CRQL	-	Contract Required Quantitation Limit
H	-	High Bias
L	-	Low Bias
LCL	-	Lower Control Limit
LCS/LCSD	-	Laboratory Control Sample/Laboratory Control Sample Duplicate
MB	-	Method Blank
MDL	-	Method Detection Limit
MS/MSD	-	Matrix Spike/Matrix Spike Duplicate
N	-	No Bias Determined
NA	-	Not Applicable
NE	-	Not Established
NR	-	Not Reported
PQL	-	Practical Quantitation Limit
Q	-	Qualifier
QA	-	Quality Assurance
QC	-	Quality Control
RPD	-	Relative Percent Difference
RRL	-	Required Reporting Limit
RSD	-	Relative Standard Deviation
RTHT	-	Required Technical Holding Time
S	-	Soil (solid) matrix
SAS	-	Sound Analytical Services, Inc.
SD	-	Sample Duplicate
SW-846	-	EPA Test Methods for Evaluating Solid Waste
UCL	-	Upper Control Limit
W	-	Water (aqueous) matrix

*Appendix C***Data Summary Table****QUALIFIER REASON CODES**

- a - The analyte was found in the method blank
- a- - Negative drift observed in instrument calibration blanks
- b - Surrogate spike recovery outside control limits
- c - Matrix Spike/Matrix Spike Duplicate (MS/MSD) recovery outside control limits
- d - Laboratory Control Sample (LCS) recovery outside control limits
- e - Holding time exceeded
- f - MS/LCS sample duplicate failed precision criteria
- h - Second column results indicate that the environmental results were not confirmed
- i - Instrument Calibration outside control limits
- k - The analyte was found in the field blank
- m - Numerical value between the MDL and PQL
- n - Laboratory care narrative related issues
- p - Sample was not properly collected, preserved or shipped
- s - Internal Standard outside control limits
- t - Sample temperature outside acceptance criteria

(Note: Where multiple qualifiers have been applied the first qualifier corresponds to the first reason code)

## Dissolved Metals

## DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
	0.001	U		0.001	U		0.001	U		0.001	U	
arsenic	0.001	U		0.001	U		0.001	U		0.001	U	
barium	0.007			0.013			0.0074			0.0034	J m	
cadmium	0.0005	U		0.0005	U		0.0005	U		0.0005	U	
chromium	0.01	UJ f		0.01	UJ f		0.005	J f,m		0.0052	J f,m	
lead	0.0005	U		0.0005	U		0.0004	J m		0.0065		
mercury	0.0002	U		0.0002	U		0.0002	U		0.0002	U	
potassium	5	U		5	U		5	U		5	U	
selenium	0.002	U		0.002	U		0.002	U		0.002	U	
sodium	3			3.2			3.2			1.2	B a	
silver	0.0005	U		0.0005	U		0.0005	U		0.0005	U	

PTR

37661

Gasoline Range Organics

DATA SUMMARY TABLE

	-01	-02	-03	-04	-05	
Sample ID	98FRLF01WA	98FRLF02WA	98FRLF03WA	98FRLF04WA	98FRLF20WA	
Field ID						
Matrix	W	W	W	W	W	
Date Collected	5/27/98	5/28/98	5/28/98	5/28/98	5/27/98	
Units	mg/L	mg/L	mg/L	mg/L	mg/L	
Analyte	RESULT Q RC	RESULT Q RC	RESULT Q RC	RESULT Q RC	RESULT Q RC	
gasoline range organics	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	

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General Chemistry

DATA SUMMARY TABLE

Analyte	-01			-01			-02			-02			-03			-03		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
chloride	9.6						11						9.4					
nitrate+nitrite as nitrogen	0.89	J	c				0.88	J	c				0.78	J	c			
sulfate	20						20						18					
total dissolved solids (TDS)	240						270						240					
turbidity				0.2	UJ	e				2.5	J	e				0.4	J	e
total organic carbon	0.85						0.9						0.76					

FTR

37663

General Chemistry

DATA SUMMARY TABLE

	Sample ID	-04	-04				
	Field ID	98FRLF04WA	98FRLF04WA				
	Matrix	W	W				
	Date Collected	5/28/98	5/28/98				
	Units	mg/L	NTU				
Analyte		RESULT	Q	RC	RESULT	Q	RC
chloride		1					
nitrate+nitrite as nitrogen		0.64	J	c			
sulfate		5					
total dissolved solids (TDS)		63					
turbidity					9.8	J	e
total organic carbon		1.7					

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37664

Total Metals

DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
Sample ID	98FRLF01WA			98FRLF02WA			98FRLF03WA			98FRLF04WA		
Field ID	W			W			W			W		
Matrix	5/27/98			5/28/98			5/28/98			5/28/98		
Date Collected	mg/L			mg/L			mg/L			mg/L		
Units												
arsenic	0.001	U		0.001	U		0.001	U		0.001	U	
barium	0.0076			0.011			0.0078			0.007		
cadmium	0.0005	U		0.0005	U		0.0005	U		0.0005	U	
chromium	0.01	U		0.01			0.01	U		0.01	U	
lead	0.0005	U		0.0005	U		0.0005	U		0.0004	J m	
mercury	0.0002	U		0.0002	U		0.0002	U		0.0002	U	
potassium	5	U		5	U		5	U		5	U	
selenium	0.002	U		0.002	U		0.002	U		0.002	U	
sodium	3.2			3.3			3.4			1.2	B a	
silver	0.0005	U		0.0005	U		0.0005	U		0.0005	U	

FTR  
37665

Volatile Aromatic Hydrocarbons

DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04			-05		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
benzene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
toluene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
ethylbenzene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
m,p-xylene	0.002	U		0.002	U		0.002	U		0.002	U		0.002	U	
o-xylene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	

FTR

37666



Dissolved Metals

DATA SUMMARY TABLE

Analyte	Sample ID	-01	-02	-03					
	Field ID	98FRLF05WA	98FRLF06WA	98FRLF07WA					
	Matrix	W	W	W					
	Date Collected	5/30/98	5/30/98	5/30/98					
	Units	mg/L	mg/L	mg/L					
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
arsenic	0.0044			0.001	U		0.001	U	
barium	0.074			0.0099			0.036		
cadmium	0.0005	U		0.0005	U		0.0005	U	
chromium	0.01	UJ	f	0.01	UJ	f	0.0056	J	f,m
lead	0.0005	U		0.0005	U		0.0005	U	
mercury	0.0002	U		0.0002	U		0.0002	U	
potassium	2.5	J	m	5	U		5	U	
selenium	0.0054	J	c	0.002	U		0.002	U	
sodium	20			3.4			4		
silver	0.0005	U		0.0005	U		0.0005	U	

FTR

37667

Gasoline Range Organics

DATA SUMMARY TABLE

Analyte	Sample ID	-01		-02		-03		-04	
	Field ID	98FRLF06WA		98FRLF06WA		98FRLF07WA		98FRLF21WA	
	Matrix	W		W		W		W	
	Date Collected	5/30/98		5/30/98		5/30/98		5/30/98	
	Units	mg/L		mg/L		mg/L		mg/L	
		RESULT	Q RC	RESULT	Q RC	RESULT	Q RC	RESULT	Q RC
gasoline range organics		0.05	U	0.058		0.015	J m	0.05	U

FTR

37668

General Chemistry

DATA SUMMARY TABLE

Analyte	-01			-01			-02			-02			-03			-03		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
Sample ID	98FRLF05WA			98FRLF05WA			98FRLF06WA			98FRLF06WA			98FRLF07WA			98FRLF07WA		
Field ID	W			W			W			W			W			W		
Matrix	5/30/98			5/30/98			5/30/98			5/30/98			5/30/98			5/30/98		
Date Collected	mg/L			NTU			mg/L			NTU			mg/L			NTU		
Units																		
chloride	3.1						2						4.2					
nitrate+nitrite as nitrogen	0.22	J	c				0.34	J	c				0.43	J	c			
sulfate	16						18						17					
total dissolved solids (TDS)	290						290						390					
turbidity				54	J	e				13	J	e				47	J	e
total organic carbon	3.9						1.4						1.2					

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37669

Total Metals

DATA SUMMARY TABLE

Analyte	-01			-02			-03		
	Field ID	Matrix	Units	Field ID	Matrix	Units	Field ID	Matrix	Units
	98FRLF05WA	W	mg/L	98FRLF06WA	W	mg/L	98FRLF07WA	W	mg/L
	5/30/98			5/30/98			5/30/98		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
arsenic	0.0086			0.001	U		0.001	J	m
barium	0.15			0.014			0.052		
cadmium	0.0007			0.0005	U		0.0005	U	
chromium	0.0048	J	m	0.0097	J	m	0.014		
lead	0.012			0.0018			0.001		
mercury	0.0003			0.0002	U		0.0002	U	
potassium	2.9	J	m	5	U		5	U	
selenium	0.0065			0.002	U		0.002	U	
sodium	20			3.6			4.4		
silver	0.0005	U		0.0005	U		0.0005	U	

FTR

37670

Volatile Aromatic Hydrocarbons

DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
benzene	0.001	U		0.001	U		0.001	U		0.001	U	
toluene	0.001	U		0.001	U		0.001	U		0.001	U	
ethylbenzene	0.001	U		0.001	U		0.001	U		0.001	U	
m,p-xylene	0.002	U		0.002	U		0.002	U		0.002	U	
o-xylene	0.001	U		0.001	U		0.001	U		0.001	U	

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## Dissolved Metals

## DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04			-05			-06					
	Field ID	Matrix	Date Collected	Field ID	Matrix	Date Collected	Field ID	Matrix	Date Collected	Field ID	Matrix	Date Collected	Field ID	Matrix	Date Collected	Field ID	Matrix	Date Collected			
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			
RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	
arsenic	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
barium	0.0085			0.0079			0.0048	J m		0.0086			0.052			0.054					
cadmium	0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U	
chromium	0.01	UJ f		0.01	UJ f		0.01	UJ f		0.01	UJ f		0.01	UJ f		0.01	UJ f		0.01	UJ f	
lead	0.0003	J m		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U	
mercury	0.0002	U		0.0002	U		0.0002	U		0.0002	U		0.0002	U		0.0002	U		0.0002	U	
potassium	5	U		5	U		5	U		5	U		5	U		5	U		5	U	
selenium	0.002	U		0.002	U		0.002	U		0.002	U		0.002	U		0.002	U		0.002	U	
sodium	3.3			3.2			3.6			3.1			2.4			2.2					
silver	0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U	

FTR

37672

## Gasoline Range Organics

## DATA SUMMARY TABLE

Sample ID Field ID Matrix Date Collected Units Analyte	-01			-02			-03			-04			-05			-06								
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC						
98FRLF08WA W 6/2/98 mg/L	0.05	U		98FRLF09WA W 6/2/98 mg/L	0.05	U		98FRLF11WA W 6/2/98 mg/L	0.05	U		98FRLF12WA W 6/3/98 mg/L	0.05	U		98FRLF14WA W 6/2/98 mg/L	0.05	U		98FRLF15WA W 6/2/98 mg/L	0.05	U		
gasoline range organics	0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U	

FTR

37673

Gasoline Range Organics

DATA SUMMARY TABLE

Analyte	Sample ID	-07	-08				
	Field ID	98FRLF23WA	98FRLF30WA	RESULT	Q	RC	
	Matrix	W	W				
	Date Collected	6/2/98	6/3/98				
	Units	mg/L	mg/L				
gasoline range organics		0.05 U	0.05 U				

FTR

37674



General Chemistry

DATA SUMMARY TABLE

Analyte	-01			-01			-02			-02			-03			-03				
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC		
chloride	9.2						9.3						0.62							
nitrate+nitrite as nitrogen	0.83	J	c				0.82	J	c				0.3	UJ	c					
sulfate	22						22						7.1							
total dissolved solids (TDS)	200						200						52							
turbidity				0.9	J	e				0.5	J	e						8.6	J	e
total organic carbon	0.96						0.94						1.4							

FTR

37675

General Chemistry

DATA SUMMARY TABLE

Analyte	-04			-04			-05			-05			-06			-06											
	Sample ID	Field ID	Matrix	Date Collected	Units	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC										
chloride	98FRLF12WA	98FRLF12WA	W	6/3/98	mg/L	13			98FRLF14WA	98FRLF14WA	W	6/2/98	mg/L	2.7				98FRLF15WA	98FRLF15WA	W	6/2/98	mg/L	2.8				
nitrate+nitrite as nitrogen					NTU	1.3	J	c						0.35	J	c							0.38	J	c		
sulfate						23								13									13				
total dissolved solids (TDS)						220								180									170				
turbidity								2.2									1.60	J	e						1.60	J	e
total organic carbon						0.87								5.7									5.1				

FTR

37676

General Chemistry

DATA SUMMARY TABLE

Analyte	Sample ID	-08	-08				
	Field ID	98FRLF30WA	98FRLF30WA				
	Matrix	W	W				
	Date Collected	6/3/98	6/3/98				
	Units	mg/L	NTU				
	RESULT	Q	RC	RESULT	Q	RC	
chloride	0.3	U					
nitrate+nitrite as nitrogen	0.3	UJ	c				
sulfate	0.3	U					
total dissolved solids (TDS)	10	U					
turbidity				0.3			
total organic carbon	2.2						

FTR

37677

## Total Metals

## DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04			-05			-06		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
arsenic	0.001	U		0.001	U		0.001	U		0.001	U		0.0018			0.0022		
barium	0.0079			0.0078			0.0099			0.01			0.06			0.099		
cadmium	0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0003	J	m
chromium	0.01	U		0.01	U		0.01	U		0.011			0.016			0.21		
lead	0.0003	J	m	0.0005	U		0.0005			0.0004	J	m	0.0094			0.015		
mercury	0.0002	U		0.0002	U		0.0002	U		0.0002	U		0.0002	J	m	0.0003		
potassium	5	U		5	U		5	U		5	U		5	U		5	U	
selenium	0.002	U		0.002	U		0.002	U		0.002	U		0.002	U		0.002	U	
sodium	3.3			3.3			3.7			3.3			2.5			2.6		
silver	0.0005	U		0.0005	U		0.0005	U		0.0005	U		0.0004	J	m	0.0005		

FTR

37678

Total Metals

DATA SUMMARY TABLE

Analyte	Sample ID	-08						
	Field ID	98FRLF30WA						
	Matrix	W						
	Date Collected	6/3/98						
	Units	mg/L						
	RESULT	Q	RC					
arsenic	0.001	U						
barium	0.005	U						
cadmium	0.0005	U						
chromium	0.01	U						
lead	0.0003	J	m					
mercury	0.0002	U						
potassium	5	U						
selenium	0.002	U						
sodium	0.23	B	a					
silver	0.0005	U						

FTR  
37679

Volatile Aromatic Hydrocarbons

DATA SUMMARY TABLE

Analyte	-01			-02			-03			-04			-05			-06		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
benzene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
toluene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
ethylbenzene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	
m,p-xylene	0.002	U		0.002	U		0.002	U		0.002	U		0.002	U		0.002	U	
o-xylene	0.001	U		0.001	U		0.001	U		0.001	U		0.001	U		0.001	U	

FTR

37680

Volatile Aromatic Hydrocarbons

DATA SUMMARY TABLE

Analyte	-07			-08						
	Field ID	Matrix	Units	Field ID	Matrix	Units				
	98FRLF23WA	W	mg/L	98FRLF30WA	W	mg/L				
	Date Collected	6/2/98		Date Collected	6/3/98					
	RESULT	Q	RC	RESULT	Q	RC				
benzene	0.001	U		0.001	U					
toluene	0.001	U		0.001	U					
ethylbenzene	0.001	U		0.001	U					
m,p-xylene	0.002	U		0.002	U					
o-xylene	0.001	U		0.001	U					

FTR

37681

Dissolved Metals

DATA SUMMARY TABLE

Analyte	-001			-002						
	Sample ID	Field ID	Matrix	Sample ID	Field ID	Matrix				
	98FRLF10WA	W	6/2/98	98FRLF13WA	W	6/2/98				
	Units	µg/L		Units	µg/L					
	RESULT	Q	RC	RESULT	Q	RC				
arsenic	5	U		5	U					
barium	18			53						
cadmium	5	U		5	U					
chromium	10	U		10	U					
lead	2	U		6						
mercury	0.2	U		0.2	U					
potassium	680			940						
selenium	5	U		5	U					
silver	5	U		5	U					
sodium	3180			2370						

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Gasoline Range Organics

DATA SUMMARY TABLE

Sample ID	-001	-002	-003			
Field ID	98FRLF10WA	98FRLF13WA	98FRLF22WA			
Matrix	W	W	W			
Date Collected	6/2/98	6/2/98	6/2/98			
Units	µg/L	µg/L	µg/L			
Analyte	RESULT	Q	RC	RESULT	Q	RC
gasoline range organics	50	U		50	U	

FTR

37683

General Chemistry

DATA SUMMARY TABLE

Analyte	Sample ID	-001	-001	-002	-002		
	Field ID	98FRLF10WA	98FRLF10WA	98FRLF13WA	98FRLF13WA		
	Matrix	W	W	W	W		
	Date Collected	6/2/98	6/2/98	6/2/98	6/2/98		
	Units	mg/L	NTU	mg/L	NTU		
	RESULT	Q	RC	RESULT	Q	RC	RESULT
nitrate+nitrite as nitrogen		1		0.5			
turbidity			0.5		960		
total dissolved solids (TDS)		217		187			

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Total Metals

DATA SUMMARY TABLE

Analyte	Sample ID	-001		-002		RC	RC	RC	RC
	Field ID	RESULT	Q	RESULT	Q				
	98FRLF10WA			98FRLF13WA					
	Matrix	W		W					
	Date Collected	6/298		6/298					
	Units	µg/L		µg/L					
Analyte	RESULT	Q	RC	RESULT	Q	RC	RC	RC	RC
arsenic	5	U		11					
barium	11			135					
cadmium	5	U		5	U				
chromium	10	U		732					
lead	3			21					
mercury	0.2	U		0.2	U				
potassium	700			3170					
selenium	5	U		5	U				
silver	5	U		5	U				
sodium	3200			3260					

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General Chemistry

DATA SUMMARY TABLE

Analyte	Sample ID	-001			-002						
	Field ID	RESULT	Q	RC	RESULT	Q	RC				
	98FRLF10WA				98FRLF13WA						
	Matrix	W			W						
	Date Collected	6/2/98			6/2/98						
	Units	mg/L			mg/L						
chloride		7.9	J	t	3	J	t				
sulfate		19.9	J	t	12.5	J	t				
total organic carbon		0.2	J	f,m,t	0.4	J	f,m,t				

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37686

Volatile Aromatic Hydrocarbons

DATA SUMMARY TABLE

Analyte	-001			-002			-003		
	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
benzene	0.5	UJ	e	0.5	UJ	e	0.5	UJ	e
toluene	1	UJ	e	1	UJ	e	1	UJ	e
chlorobenzene	0.5	UJ	e	0.5	UJ	e	0.5	UJ	e
ethylbenzene	1	UJ	e	1	UJ	e	1	UJ	e
total xylenes	1	UJ	e	1	UJ	e	1	UJ	e
1,3-dichlorobenzene	1	UJ	e	1	UJ	e	1	UJ	e
1,4-dichlorobenzene	1	UJ	e	1	UJ	e	1	UJ	e
1,2-dichlorobenzene	1	UJ	e	1	UJ	e	1	UJ	e

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37687

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*Appendix D*  
**Data Quality Summary**  
*by Analysis Type*

## Data Quality Summary

### Dissolved Metals

SW6010, SW6020, SW7060, SW7421, SW7470, SW7610 and SW7740

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
<b>TOTAL DATA POINTS:</b>	150	-	-	
<b>TOTAL QUALIFIED DATA POINTS:</b>	20	13.3%	-	
<b>TOTAL REJECTED DATA POINTS:</b>	0	0.0%	-	
<b>Qualified/Rejected as a result of:</b>				
a - The analyte was found in the method blank	1	0.7%	5.0%	H
c - Matrix Spike was outside control limits	1	0.7%	5.0%	H
f - Laboratory Duplicate failed precision criteria	10	6.7%	50.0%	N
f,m - Multiple Reasons	3	2.0%	15.0%	N
m - Numerical value is between the MDL and PQL	5	3.3%	25.0%	N

# Data Quality Summary

## Total Metals

SW6010, SW6020, SW7060, SW7421, SW7470, SW7610 and SW7740

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
<b>TOTAL DATA POINTS:</b>	160	-	-	
<b>TOTAL QUALIFIED DATA POINTS:</b>	13	8.1%	-	
<b>TOTAL REJECTED DATA POINTS:</b>	0	0.0%	-	
<b>Qualified/Rejected as a result of:</b>				
a - The analyte was found in the method blank	2	1.3%	15.4%	H
m - Numerical value is between the MDL and PQL	11	6.9%	84.6%	N



# Data Quality Summary

## Gasoline Range Organics AK101

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
<b>TOTAL DATA POINTS:</b>	20	-	-	-
<b>TOTAL QUALIFIED DATA POINTS:</b>	1	5.0%	-	-
<b>TOTAL REJECTED DATA POINTS:</b>	0	0.0%	-	-
<b>Qualified/Rejected as a result of:</b>				
m - Numerical value is between the MDL and RL	1	5.0%	100.0%	N

# Data Quality Summary

General Chemistry  
E160.1, E180.1, E300.0, E353.2 and E415.1

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
<b>TOTAL DATA POINTS:</b>	96	-	-	
<b>TOTAL QUALIFIED DATA POINTS:</b>	32	33.3%	-	
<b>TOTAL REJECTED DATA POINTS:</b>	0	0.0%	-	
<b>Qualified/Rejected as a result of:</b>				
c - Matrix Spike was outside control limits	14	14.6%	43.8%	L
e - Holding time was exceeded	12	12.5%	37.5%	L
f,m,t - Multiple Reasons	2	2.1%	6.3%	N
t - Sample temperature outside acceptance criteria	4	4.2%	12.5%	L

## Data Quality Summary

### Halogenated and Aromatic Volatiles SW8021A

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
<b>TOTAL DATA POINTS:</b>	24	-	-	-
<b>TOTAL QUALIFIED DATA POINTS:</b>	24	100.0%	-	-
<b>TOTAL REJECTED DATA POINTS:</b>	0	0.0%	-	-
<b>Qualified/Rejected as a result of:</b>				
e - Holding time exceeded	24	100.0%	100.0%	L

# Data Quality Summary

## Volatile Aromatic Hydrocarbons SW8021B

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
TOTAL DATA POINTS:	85	-	-	-
TOTAL QUALIFIED DATA POINTS:	0	0.0%	-	-
TOTAL REJECTED DATA POINTS:	0	0.0%	-	-