# Final 2017
# Annual Sampling Report

## Groundwater Monitoring and Data Analysis at the Landfill Source Area
## Operable Unit 4
## Fort Wainwright, Alaska

**HQAES No. 02871-10233**
**ADEC File No. 108.38.070.03**
**ADEC Hazard ID. 1129**

**Contract No. W911KB-16-D-0005**
**Task Order 3**

**October 2018**

*FES*

**FAIRBANKS ENVIRONMENTAL SERVICES INC.**

# FINAL 2017
# ANNUAL SAMPLING REPORT

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## Operable Unit 4
## Fort Wainwright, Alaska

**October 2018**

**Prepared for**

U.S. Army Corps of Engineers, Alaska District

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Contract W911KB-16-D-0005

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| AS/SVE | air sparge/soil vapor extraction |
| AWQS | Alaska Water Quality Standards |
| bgs | below ground surface |
| °C | degrees Celsius |
| CAT | Caterpillar |
| CDQR | Chemical Data Quality Review |
| CFR | Code of Federal Regulations |
| cis-1,2-DCE | cis-1,2-Dichloroethene |
| CRREL | Cold Regions Research and Engineering Laboratory |
| COC(s) | contaminant(s) of concern |
| DL | detection limit |
| DO | dissolved oxygen |
| DPW | Directorate of Public Works |
| DQO | data quality objective |
| EDF | electronic deliverable format |
| EPA | United States Environmental Protection Agency |
| °F | degrees Fahrenheit |
| FES | Fairbanks Environmental Services |
| FFA | Federal Facility Agreement |
| FNSB | Fairbanks North Star Borough |
| FSP | Field Sampling Plan |
| HQAES | Headquarters Army Environmental Systems |
| IBC | Intermediate Bulk Container |
| IC | Institutional Control |
| IDs | identification numbers |
| IDW | investigation-derived waste |
| Landfill | Fort Wainwright Landfill |
| LCS | laboratory control spike |
| LCSD | laboratory control spike duplicate |
| LL | low level |
| LOD | limit of detection |
| LOQ | limit of quantitation |
| MCL | maximum contaminant level |
| mg/L | milligrams per liter |
| µg/L | micrograms per liter |
| MOU | Memorandum of Understanding |
| MS/MSD | matrix spike/ matrix spike duplicate |
| NFA | No Further Action |
| OIT | Organic Incineration Technology, Inc. |
| OU4 | Operable Unit 4 |
| ORP | oxidation/reduction potential |

## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| PCA | 1,1,2,2-tetrachloroethane |
| PCE | tetrachloroethene |
| psi | pounds per square inch |
| PVC | polyvinyl chloride |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RAG | Remedial Action Goal |
| RAO | Remedial Action Objective |
| RI | remedial investigation |
| ROD | Record of Decision |
| RPD | relative percent difference |
| RPM | remedial program manager |
| SOW | Statement of Work |
| SSHP | Site Safety and Health Plan |
| SVOC | semi-volatile organic compounds |
| TAL | TestAmerica Laboratories of Denver, CO |
| TCE | trichloroethene |
| TCLP | toxicity characteristic leaching procedure |
| UFP | Uniform Federal Policy |
| USACE | U.S. Army Corps of Engineers |
| VOC | volatile organic compounds |

# EXECUTIVE SUMMARY

This report documents long-term groundwater monitoring activities at the Fort Wainwright Landfill (Landfill), Fort Wainwright, Alaska. The Landfill is part of Operable Unit 4 (OU4) and the remedial action at this source area consists of capping the approximately 14 acre inactive portion of the Landfill, institutional controls, and natural attenuation of contaminants of concern (COCs) in groundwater (U.S. Army, 1996). Groundwater monitoring results are evaluated to determine the effectiveness of the capping and natural attenuation with respect to Remedial Action Goals (RAGs) and to support decisions regarding the effectiveness of the Record of Decision (ROD) remedy. As monitoring data are accumulated, the results are also used to modify the monitoring approach and to better understand interactions between the capped portion of the Landfill and the local groundwater. This Annual Sampling Report provides documentation, evaluation, and a data quality review of data gathered during the spring and fall 2017 sampling events. Fairbanks Environmental Services (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-16-D-0005 Task Order 3.

Groundwater samples were collected from 8 wells during June 2017 and 10 wells during October/November 2017 to evaluate the migration of contaminants from the Landfill. All groundwater samples were submitted for analysis of volatile organic compounds (VOCs), 1,4-dioxane, semi-volatile organic compounds (SVOCs), and total metals. Dissolved (field-filtered) iron and sulfate analysis was also conducted. 1,4-Dioxane was added to the sampling program in 2017 based on a recommendation from the Fourth Five-Year Review.

Downgradient of the Landfill, COCs were detected above RAGs in four out of seven wells: shallow well AP-5588, intermediate well AP-5589, and deep wells AP-6532 and AP-8063. COCs were also detected above RAGS in one (AP-10257) of three wells located upgradient of the closed portion of the Landfill. The following compounds were detected above RAGs:

**Downgradient Wells**

- AP-5588 – cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,2,2-tetrachloroethane (PCA), 1,1,2-trichloroethane, and trichloroethene (TCE)
- AP-5589 – TCE
- AP-6532 – benzene
- AP-8063 – cis-1,2,-DCE, PCA, and TCE

**Upgradient Wells**

- AP-10257 – benzene

Arsenic was detected in all wells downgradient of the Landfill above the ADEC groundwater cleanup level. However these detections appear to be the result of naturally occurring mineral deposits, based on documented background concentrations of arsenic in groundwater at Fort Wainwright that exceed the CUL (USACE, 1993).

1,4-Dioxane exceeded the ADEC CUL in two wells, AP-5588 and AP-5589, during spring and fall sampling events and in downgradient deep well AP-8063 during the fall event only. 1,4-Dioxane was also detected below the ADEC CUL in an additional three downgradient wells and one upgradient well.

In general, contaminants appear to migrate along separate flow paths in groundwater downgradient of the Landfill site. Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, it appears that benzene is migrating below permafrost at concentrations exceeding RAGs in a predominately westerly flow path. Benzene is not seen at concentrations exceeding the RAG in deep downgradient wells that are along a southwesterly flow path. It is possible that the permafrost beneath the Landfill is discontinuous and benzene has migrated through permafrost; however, the presence of or depth to permafrost beneath the Landfill is unknown, and it is not known how permafrost affects groundwater flow at depth. Chlorinated solvents are less widespread than benzene in groundwater downgradient of the landfill and appear to be more prevalent on a southwesterly flow path. Specific sources of contamination within the landfill have not been investigated and it is possible that the chlorinated solvents originate from a separate source than the petroleum contaminants. It appears that chlorinated solvents migrate at the water table downgradient of the landfill until permafrost is encountered, when they continue migrating below permafrost.

Institutional control (IC) site inspections were conducted at the Landfill in August 2017. The Landfill cap and fence were observed to be in good condition. All groundwater monitoring wells in the active sampling program were found to be in good condition, and inactive wells were inspected to ensure they were secured. Minor maintenance items were completed at the time of the inspection.

Recommendations for 2018 include sampling wells at the frequency listed in the following table for VOCs, 1,4-dioxane, SVOCs, total metals, dissolved (field-filtered) iron and sulfate:

## Monitoring Well 2018 Sampling Recommendations

| Well | Sample in the Spring | Sample in the Fall |
|---|---|---|
| **AP-8061** | **X** | **X** |
| **AP-10257** | **X** | **X** |
| **AP-10258** | **X** | **X** |
| **AP-6532** | **X** | **X** |
| **AP-6535** | **X** | **X** |
| **AP-6530** | **X** | **X** |
| **AP-8063** | **X** | **X** |
| **AP-5588**[1] | **X** | |
| **FWLF-4**[2] | **X** | |
| **AP-5589**[3] | **X** | |

Note – **green** denotes a shallow well, **blue** an intermediate well, and **red** a deep well

[1] RPMs agreed to reduce sample frequency at well AP-5588 to annual spring sampling in 2015 because historically COC concentrations have not varied significantly between the spring and fall sampling events in this well.

[2] RPMs agreed to reduce sample frequency at FWLF-4 to annual spring sampling in 2015 due to consistently low levels of COC detected in this well since 1998.

[3] RPMs agreed to reduce sample frequency at well AP-5589 to annual spring sampling in 2015 in order to coincide with the sampling of AP-5588.

Due to the presence of benzene in the most upgradient shallow wells at this site, AP-10257 and AP-10258, sampling a well further upgradient may be needed. AP-5593 is a shallow well, located within a thaw channel upgradient of the Landfill, which could be sampled as an upgradient well. However, it is believed that the presence of benzene in AP-10257 is from the active portion of the Landfill, and not from an upgradient source.

# 1.0 INTRODUCTION

This report documents long-term groundwater monitoring activities conducted during 2017 at the Fort Wainwright Landfill (Landfill), Fort Wainwright, Alaska. It also describes the 2017 institutional controls (ICs) inspection. The Landfill is part of Operable Unit 4 (OU4) and the remedial action at this source area consists of capping the approximately 14 acre inactive portion of the Landfill, ICs, and natural attenuation of contaminants of concern (COC) in groundwater (USARAK, 1996). Groundwater monitoring results are evaluated to determine the effectiveness of the capping and natural attenuation with respect to Remedial Action Goals (RAG). As monitoring data are accumulated, the results are also used to modify the monitoring approach and to better understand interactions between the capped portion of the Landfill and the local groundwater

Fairbanks Environmental Services (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-16-D-0005 Task Order 3. The work was completed according to the 2017 Operable Unit Work Plan (FES, 2017a) and the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2017b). The work was completed under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and in compliance with the OU4 Record of Decision (ROD), Federal Facility Agreement (FFA), and state of Alaska regulations.

## 1.1 Sampling Report Organization

The 2017 field efforts included groundwater sampling of Landfill wells and completion of the annual IC inspection. This Annual Sampling Report provides documentation, evaluation, and a data quality review of data gathered during the spring and fall sampling events. A description of the procedures and results associated with these activities are presented in the following sections:

- Section 2 – Groundwater Monitoring, Sampling, and Analytical Program
- Section 3 – Groundwater Sample Results
- Section 4 – Institutional Control Inspection
- Section 5 – Conclusions and Recommendations
- Section 6 – References

Supporting information can be found in the appendices listed below. Additional information not provided in hard copy, such as laboratory reports and photographs, are provided in the Supplemental Data folder on the compact disc accompanying this report.

- Appendix A – Groundwater Sampling Forms and Field Notes
- Appendix B – Chemical Data Quality Review & ADEC Laboratory Data Review Checklists
- Appendix C – Groundwater Sample Summary and Analytical Result Tables
- Appendix D – MAROS Results
- Appendix E – Photographic Log

## 1.2 Background

U.S. Army Garrison Fort Wainwright is an active U.S. Army facility, located on the eastern edge of Fairbanks, Alaska. OU4 consists of three source areas on Fort Wainwright: the Coal Storage Yard (CSY), the Fire Training Pits (FTP), and the Landfill (consisting of an active and inactive portion). This report focuses on the current phase of a long-term monitoring program at the Landfill portion of OU4. This monitoring has been established as a key element of the remedial approach for the inactive portion of the Landfill. The following sections provide background information for each of the source areas at OU4.

### 1.2.1 Fort Wainwright Landfill

The Landfill source area covers approximately 14 acres adjacent to River Road in the north central portion of Fort Wainwright (Figure 1-1). The southwestern portion of the Landfill is capped and most of the current groundwater monitoring well network is located downgradient (west and southwest) of the capped area.

Landfill management practices have changed significantly over the years and, at present, the active portion of the Landfill is accepting only asbestos and coal ash. The active portion of the Landfill is currently permitted by the ADEC Solid Waste Program through 2021.

A Remedial Investigation (RI) was completed at the site in 1994. COCs identified in groundwater include benzene, several chlorinated compounds, bis(2-ethylhexyl)phthalate, and trace metals. Subsequent investigations have been completed, including the installation of additional monitoring wells and the delineation of permafrost regions. Groundwater flow in the vicinity of the Landfill is complicated by the presence of discontinuous permafrost. Several of the groundwater monitoring wells have been completed in underlying areas of permafrost and thawing the wells is necessary prior to sampling.

The OU4 ROD, signed in September 1996 (USARAK, 1996), specified the following phased approach to remediation of the Landfill source area:

- Capping the inactive portion of the Landfill – completed in September 1997 – along with natural attenuation, monitoring of groundwater, and institutional controls; and
- Evaluation of potential groundwater treatment, if levels of contamination in groundwater were found to increase (which has not been shown to date).

#### Landfill CAT Shed – Building 1191

The Landfill Caterpillar (CAT) Shed (Building 1191) is located south of the active Fort Wainwright Landfill, off River Road. A plan drawing dated August 1972, indicates that the building was previously used for vehicle storage and repair. The CAT Shed is equipped with a vehicle bay that was historically used for minor maintenance of landfill equipment (CAT D7 and front-end loader); however, the building lacks the proper lift equipment necessary to facilitate most maintenance, so the majority of maintenance occurs off site.

This building had a septic system and leach field that was investigated in 2010 (FES, 2011). Historically, wastewater from the CAT shed consisted of sanitary waste from the bathroom facilities and effluent from a floor drain in the vehicle bay. The sanitary waste-stream discharged to a buried 500 gallon septic tank on the west side of the building. From there, a sewer line extended 100 feet to a timber stave leaching pit. A bentonite slurry was pumped into the septic tank and leach pit on July 29, 2011 to permanently close the system.

An investigation was conducted at the Building 1191 Landfill CAT Shed on October 4, 2012 in order to assess groundwater contamination found while conducting a preliminary investigation in 2010 (FES, 2011). Three monitoring wells were installed: AP-10258 at the location where the highest benzene concentration was detected during the 2010 investigation, AP-10257 crossgradient of the site, and AP-10259 downgradient of the site.

During the 2012 investigation, benzene was detected above the remedial action goal (RAG) of 5 micrograms per liter (µg/L) in AP-10257 (crossgradient of the leach field) at a concentration of 14 µg/L. It is most likely that the benzene detected in this well is associated with the Landfill debris and not migration from the Building 1191 septic system. Benzene was not initially detected above the RAG in AP-10258 or AP-10259. Following the 2012 investigation, these wells were moved to the OU4 Landfill sampling program. Benzene was detected in AP-10258 in the following years, but not in AP-10259; therefore, AP-10257 and AP10258 continue to be sampled as part of the OU4 sampling effort. Monitoring well AP-10259 was decommissioned in 2017.

### 1.2.2 Memorandum of Understanding

In 1997, a Memorandum of Understanding (MOU) was signed stating that groundwater monitoring would meet the requirements of Title 40 of the Code of Federal Regulations Part 258 (40 CFR 258; VOCs and Metals), as well as the remedial goals established in the ROD (requiring the additional analysis of SVOCs) (ADEC, 1997). The MOU recommended sampling at the following well locations: AP-5588, AP-5589, AP-6136, AP-6137 (replaced by AP-8061), AP-6138, AP-6139 (replaced by AP-8062 and again by AP-9076), AP-6140, FWLF-4, AP-6532 (formerly identified as DH-6534) and AP-6130.

The MOU also states, however, that "If for some reason a well designated for sampling becomes damaged or frozen such that it cannot be used for collecting samples, a comparable well will be selected. If a comparable well does not exist, a new one will be drilled to meet these monitoring requirements".

Groundwater monitoring has been performed at the Landfill since 1997 and some changes to the wells identified in the MOU have been made over the years; however, these changes have not deviated from the MOU objectives and have been approved by remedial program managers (RPMs) through acceptance of recommendations made in annual groundwater sampling reports. Five of the original 10 wells identified in the MOU continue to be sampled as part of the Landfill groundwater monitoring program, which includes: AP-5588, AP-5589, FWLF-4, AP-8061 (replacement well for AP-6137), and AP-6532. Downgradient deep monitoring wells AP-8063, AP-6530 and AP-6535, and shallow wells AP-10257 and AP-10258 (originally associated with the Building 1191 leach field) were also added to the monitoring program. In 2016, wells AP-6136, AP-6138, and AP-10259 were removed from the monitoring program due to the lack of contamination detected at these wells over time. A brief description of changes that have been made to the sampling program since 1997 is provided below and outlined on Table 1-1.

### Table 1-1 – Changes to the Landfill Monitoring Well Network

| **Wells recommended in the MOU** | **Wells sampled in place of MOU wells** | **Comments** |
|---|---|---|
| AP-5588 | -- | Continues to be sampled in the monitoring network. |
| AP-5589 | -- | Continues to be sampled in the monitoring network. |
| AP-6136 | -- | Removed from the monitoring network in 2016 due to absence of COC above RAGs since 2005. |
| AP-6137 | AP-8061 | AP-8061 replaced damaged well AP-6137. AP-8061 continues to be sampled in the monitoring network. |
| FWLF-4 | -- | Continues to be sampled in the monitoring network. |
| AP-6138 | -- | Removed from the monitoring network in 2016 due to absence of COC above RAGs since 2006. |
| AP-6139 | AP-8062, AP-9076 | AP-8062 replaced damaged well AP-6139. AP-8062 was also damaged and was replaced by AP-9076. AP-6139 and its replacement wells were removed from the monitoring network in 2008 due to groundwater anomalies and frost jacking. |
| AP-6140 | AP-7505, AP-6132 | AP-6140 was a dry well and thus never sampled. Nearby well AP-7505 was sampled in place of dry well AP-6140. In 1999 well, AP-6132 replaced AP-7505 as an upgradient well as agreed upon by the RPMs. However, AP-6132 was removed from the monitoring network in 2011. |
| DH-6534 | AP-6532 | Well DH-6534 was incorrectly labeled and sampled in the monitoring network and is actually AP-6532. Well location remains the same and well will now be referenced as AP-6532. |
| AP-6130 | -- | AP-6130 was a dry well and was never sampled as part of the monitoring network. |
| -- | AP-8063 | AP-8063 was added to the monitoring network in order to further delineate contaminant migration in the subpermafrost aquifer. |
| -- | AP-6530 and AP-6535 | Added to the monitoring network in 2010 to monitor downgradient migration of benzene in the subpermafrost aquifer. |
|  | AP-10257, AP-10258,<br>AP-10259 | Added to the monitoring network in 2012 to monitor upgradient benzene concentrations associated with the Building 1191 leach field. Well AP-10259 was removed from the monitoring network in 2016 due to absence of COC above RAGs since it was installed. |

### AP-6130 and AP-6140

Well AP-6130 was installed upgradient of the Landfill in the vicinity of the Birch Hill Ski Area. Well AP-6140 was also installed upgradient, but in closer proximity to the Landfill. The 1994 RI documents that permafrost was encountered while drilling AP-6130 and AP-6140 and states that "Both wells failed to produce adequate quantities of water; therefore, no samples were collected." Additionally, no records of any groundwater sampling at these locations could be found, so it is not known why the 1997 MOU lists these wells as recommended sampling locations. AP-6140 was decommissioned in 2007 and AP-6130 is scheduled to be decommissioned in 2018. Based on historical records, AP-6140 was replaced by AP-7507, which was sampled in 1998 and spring 1999, when it was replaced with AP-6132. The August 1999 Groundwater Sampling Reports (DOWL, 2002) states "Due to the integrity of well AP-7507 being questionable, the State of Alaska and the Army agreed to have well AP-6132 sampled as a background well beginning in August 1999." AP-7507 is scheduled to be decommissioned in 2018.

### Wells AP-6137 and AP-6139

Wells AP-6137 and AP-6139 are located downgradient, southwest, of the Landfill. These wells were decommissioned in 2002 and replaced due to damage from frost jacking. The 2002 Monitoring Well Replacement Report (ENSR, 2002) documents the installation of replacement wells AP-6137A (also named AP-8061) and AP-6139A (also named AP-8062), which was subsequently damaged and replaced with well AP-9076 in 2004. AP-6139A was decommissioned in 2017. Well AP-9076 was sampled as part of the monitoring program until fall 2008 when it was removed from the sampling program due to historical groundwater elevation anomalies. Groundwater at this sampling location did not appear to be connected to the groundwater flow pathway, potentially due to discontinuous permafrost in the area. The recommendation for removal of well AP-9076 (formerly AP-6139, AP-6139A/AP-8062) from the sampling program was made in the Final 2008 Annual Sampling Report and approved by the RPMs. Well AP-9076 is scheduled to be decommissioned in 2018. Well AP-8061 continues to be sampled as part of the groundwater monitoring program for the Landfill.

### Well AP-8063

An additional well, AP-8063 (also named AP-6139B), was installed in 2002 to delineate downgradient migration of contaminants below permafrost. Well AP-8063 was replaced in 2003 with an adjacent well (also called AP-8063) that was pressurized. The presence of permafrost in the area around the Landfill causes groundwater in the deep wells to freeze between sampling events. There was an attempt by previous contractors to seal the well casing to maintain an internal pressure of 50 pounds per square inch (psi) between sampling events in order to depress the water level below permafrost to prevent freezing. However, pressurizing the well was not successful. Well AP-8063 continues to be sampled as part of the groundwater monitoring program for the Landfill; although, it is no longer pressurized and is thawed using dedicated heat trace. Additional details for thawing are presented in Section 2.3.

**Wells DH-6534/AP-6532**

Since sampling of the Landfill monitoring network began, there has been some confusion concerning the well identified as DH-6534. This well has been identified as DH-6534 since before 2004 and the well that is sampled is labeled DH-6534. However, the total depth of the well sampled did not match the total depth identified on the boring log for DH-6534. During the 2010 groundwater elevation survey and permafrost evaluations, additional research was conducted that included identifying wells associated with historical geophysical studies. This research verified the well identified as DH-6534 is actually AP-6532. A boring log for AP-6532 also matches the depth of the well. This research also verified that the well identified as Unknown F is actually DH-6534 (also referred to as AP-6534). These wells were correctly labeled in the field.

**Well AP-6132**

Well AP-6132 had been sampled as an upgradient well within the Landfill monitoring network. However, a permafrost evaluation conducted in 2010 identified a massive block of permafrost between this well and the Landfill (shown on Figure 3-1). The permafrost body effectively interrupts groundwater flow in the vicinity of AP-6132 and the Landfill source area. Since this well is not connected to groundwater flow to the Landfill source area, it was removed from the Landfill monitoring network in fall 2010. AP-6132 is scheduled to be decommissioned in 2018.

**Wells AP-6530 and AP-6535**

These two wells are the farthest downgradient deep wells in the monitoring network. They were added to the monitoring network in 2012 in order to monitor the downgradient migration of benzene in the subpermafrost aquifer.

**Wells AP-6136, AP-6138, and AP-10259**

Well AP-6136 and AP-6138 have been sampled as part of the Landfill monitoring network since 1997. The only COC that has ever been detected above the RAG in these wells is bis(2-ethylhexyl)phthalate, and the last time it was detected above the RAG was in 2005 and 2006, respectively. AP-10259 was installed in 2012 as part of the leach field investigation and no COCs have exceeded RAGs in this well since it was first sampled. Due to the absence of COCs above cleanup levels over time, these three wells were removed from the monitoring network following the spring 2015 sampling event. AP-10259 was decommissioned in 2017.

## 1.3 Remedial Action Objectives

The OU4 ROD (USARAK, 1996) established the following Remedial Action Objectives (RAOs) for groundwater COCs at the Landfill:

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame
- Reduce further migration of contaminated groundwater from source areas

- Prevent use of groundwater containing contaminants at levels above federal maximum contaminant levels (MCLs) and Alaska Water Quality Standards (AWQS)
- Use natural attenuation to attain AWQS

## 1.4 Remedial Goals

Federal and State of Alaska drinking water MCLs were adopted as groundwater remedial goals for benzene, cis-1,2- DCE, 1,1,2-trichloroethane, vinyl chloride, trichloroethene (TCE), and bis(2-ethylhexyl)phthalate. Since there were no federal or state MCLs for 1,1,2,2-tetrachloroethane (PCA) during the signing of the ROD, the RAG for this contaminant was based on 1 x $10^{-4}$ risk-based concentrations for human health risk estimates. The RAGs for the COCs that were identified in the ROD are shown below on Table 1-2.

**Table 1-2 – Groundwater Contaminants of Concern**

| **Contaminants of Concern** | **Remedial Goal micrograms per liter (μg/L)** |
|---|---|
| Benzene | 5 |
| cis-1,2 Dichloroethene (cis-1,2-DCE) | 70 |
| 1,1,2,2-Tetrachloroethane (PCA) | 5.2 |
| 1,1,2-Trichloroethane | 5 |
| Vinyl Chloride | 2 |
| Trichloroethene (TCE) | 5 |
| bis(2-Ethylhexyl)phthalate | 6 |

Metals analysis at the Landfill site is compared to ADEC cleanup levels (CULs). Since the signing of the ROD, the ADEC groundwater cleanup standards in 18 AAC 75 have been revised. The most significant revision was completed in November 2016 utilizing risk-based calculations. Contaminant concentrations are compared to ADEC cleanup levels in Table 3-3 and both ROD cleanup levels (when applicable) and current ADEC cleanup levels in the Appendix C tables.

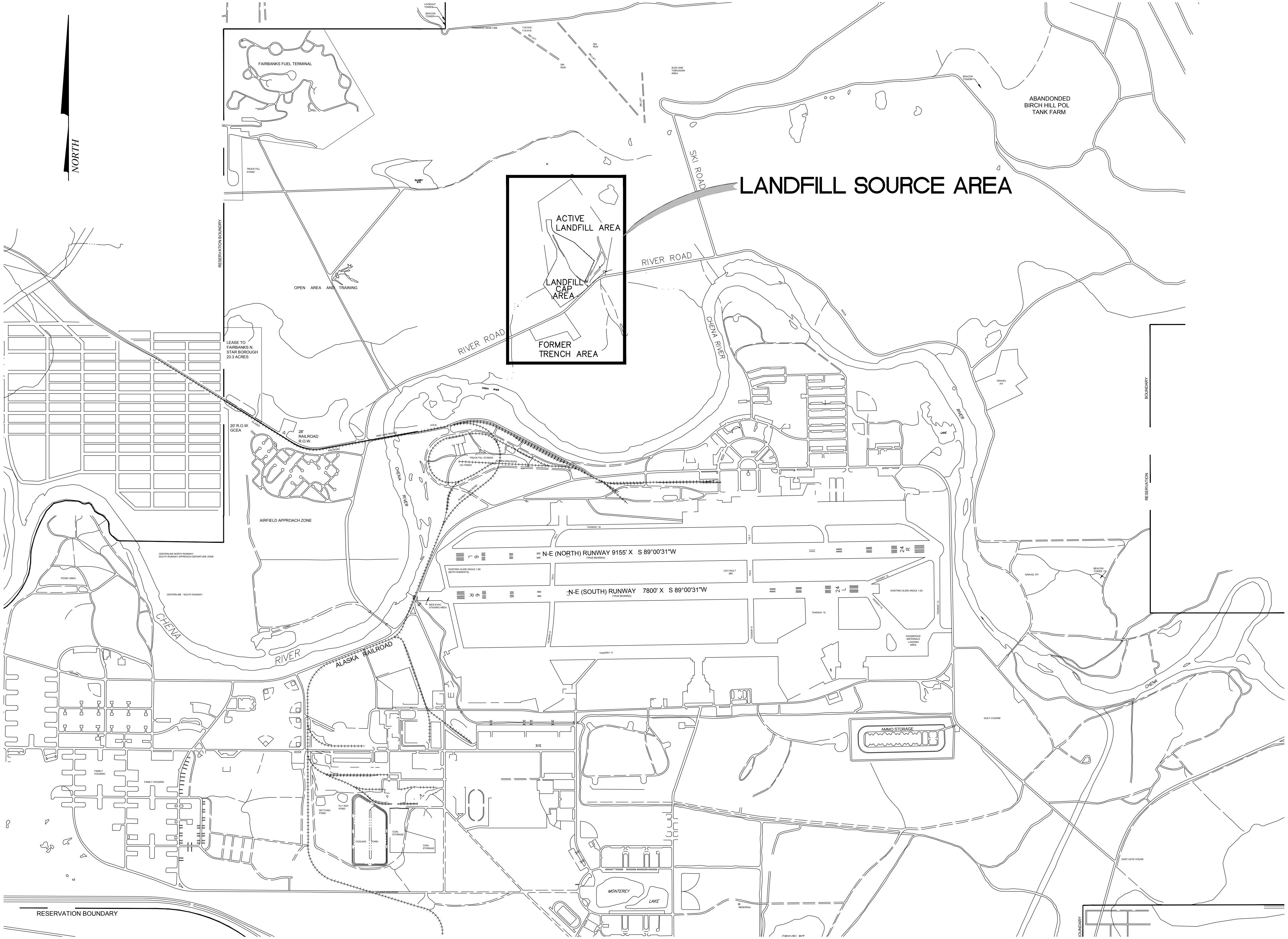
## 1.5 OU4 Source Area Tracking

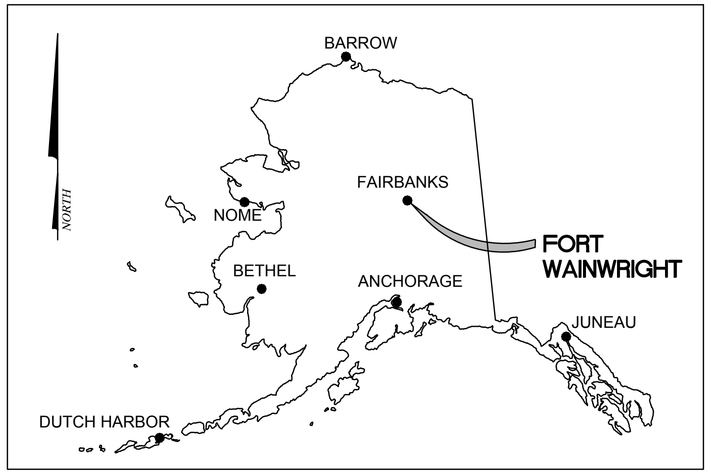
The OU4 source areas are tracked in the ADEC Contaminated Sites database, which is maintained by the ADEC project manager assigned to the site and by the Army in the Headquarters Army Environmental System (HQAES) for funding purposes. The source area description, along with the HQAES and ADEC identification numbers (IDs) are summarized in Table 1-3.

**Table 1-3. Crosswalk Table for OU4 Source Area Tracking Numbers[1]**

| OU4 Source Area[1] | HQAES[2] | ADEC File ID[2] | ADEC Hazard ID[2] | Site Status |
|---|---|---|---|---|
| Landfill Plume (FTWW-038) | 02871.1023 | 108.38.070.03 | 1129 | Active |
| Fire Training Area (FTWW-037) | 02871.1022 | 108.38.070.02 | 1419 | Active |
| Coal Storage Yard (FTWW-011) | 02871.1009 | 108.38.070 | 2342 | Active |
| Landfill Cat Shed Building 1191[3] | | 108.38.070.04 | 25741 | Active |

[1] Army AEDBR number is included for reference
[2] Based on information from the ADEC Contaminated Sites Database available at http://dec.alaska.gov/spar/csp/db_search.htm and the Army HQAES
[3] Wells installed to investigate the Building 1191 leach field are currently sampled as part of the Landfill site.





LOCATION MAP

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

## Site Vicinity and Location Map
## Landfill Source Area

2017 Annual Sampling Report
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| CONTRACT: | FIGURE: | DATE: |
|---|---|---|
| W911KB-16-D-0005 | 1-1 | 10/18 |

# 2.0 GROUNDWATER SAMPLING AND ANALYSIS PROGRAM

Field activities were completed at OU4 in 2017 according to the 2017 Operable Unit Work Plan (FES, 2017a) and the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2017b). Groundwater sampling was conducted in June and October/November 2017. This section discusses the sampling activities, with the sampling results discussed in Section 3.0.

## 2.1 Pre-sampling Activities

Each well was inspected prior to measuring water levels and collecting groundwater samples. Well inspection consisted primarily of visual observation of the wellhead to identify any damage to the overcasing or well casing.

Following visual inspection, the monitoring well cap was removed and the depth to the static water level was measured to the nearest 0.01 foot, relative to the top of the monitoring well casing. The total depth of the well and the depth to ice in frozen wells were also measured. Water level measurements were recorded on groundwater sampling forms (provided in Appendix A).

## 2.2 Groundwater Sampling and Analysis

A total of eight monitoring wells were sampled at the Landfill during June 2017. Two monitoring wells, AP-6532 and AP-6530, could not be sampled in June because the route to these wells was inaccessible. All 10 monitoring wells were sampled during October/November 2017 once the ground had frozen and the route was passable. General locations and depths of the sampled wells are listed in Table 2-1. Well locations are also shown on Figure 2-1.

**Table 2-1 Monitoring Wells Sampled in the Spring and Fall 2017 at the Landfill**

| Well | Depth | Location |
|---|---|---|
| AP-5588 | Shallow | Downgradient (west) of capped Landfill |
| AP-8061 | | |
| AP-5589 | Intermediate | |
| AP-6530[1] | Deep | |
| AP-6535 | | |
| AP-8063 | | |
| AP-6532[1] | | |
| FWLF-4 | Shallow | Upgradient (east) of capped Landfill |
| AP-10257 | Shallow | Crossgradient of the Building 1191 leach field area |
| AP-10258 | Shallow | Within the Building 1191 leach field area |

[1] Wells AP-6532 and AP-6530 were not sampled in spring 2017 because the route to these wells was impassable

Techniques used to purge and sample the groundwater were consistent with low-flow sampling methodology (Puls and Barcelona, 1996) and are detailed in the Operable Unit Sites Uniform

Federal Policy-Quality Assurance Project Plan (UFP-QAPP, FES, 2017b). The low-flow sampling method utilized submersible pumps in all but two wells where a submersible pump would not fit down the well casing. At wells AP-5588 and AP-8063, a variable speed peristaltic pump equipped with dedicated Teflon-lined tubing was used to purge and sample the wells. Wells were sampled by placing the pump intake or sample tubing approximately 2 feet below the water table for wells screened across the water table. For wells screened below the water table, the pump intake or tubing was placed in the middle of the wetted screen.

Groundwater was purged at a rate between 0.03 and 0.15 gallons per minute. Water quality measurements were recorded every five minutes and monitoring wells were purged until water quality parameters stabilized, per ADEC guidance (ADEC, 2016). Field parameters were measured using YSI water quality meters installed in a flow through cell. The instruments were calibrated at the beginning of each day according to the manufacturer's instructions. Measured parameters included pH, temperature, specific conductivity, dissolved oxygen (DO) concentration, and oxidation/reduction potential (ORP). Turbidity was also measured using an Oakton T-100 turbidity meter. When the parameters stabilized the flow-through cell was disconnected and samples were collected with the pump set at a low-flow rate. Instrument calibration and groundwater sampling forms are presented in Appendix A. Table 2-2 presents the field measurements recorded during the time of sampling.

Groundwater samples collected from each of the monitoring wells were analyzed for volatile organic compounds (VOCs), 1,4-dioxane, semi-volatile organic compounds (SVOCs), total metals, dissolved (field-filtered) iron, and sulfate. The samples collected during the spring sampling event were analyzed by ALS Environmental (ALS) of Kelso, Washington. The samples collected during the fall sampling event were analyzed by SGS of Anchorage, Alaska, with the exception of SVOC and 1,4-dioxane samples which was subcontracted to SGS, Orlando. An evaluation of data quality is detailed in a Chemical Data Qualify Review (CDQR) and ADEC Laboratory Data Review Checklists. The CDQR and ADEC Checklists are provided in Appendix B. The sample summary and analytical results tables are presented in Appendix C. The analytical methods used to analyze groundwater samples collected at the Landfill are based on requirements defined in the solid waste permit issued for this facility by the ADEC and are listed below.

- EPA Method 8260C (VOCs)
- EPA Method 8260B-SIM or 8270D-SIM (1,4-dioxane)
- EPA Method 8270D-LL (SVOCs – low level)
- EPA Method 6020A (Total Metals)
- EPA Method 6010C or 6020A (Iron, field filtered)
- EPA Method 300.0 (Sulfate)

## 2.3 Thawing of Frozen Wells

The presence of permafrost in the area around the Landfill causes groundwater in the deep wells to freeze between sampling events. As such, deep monitoring wells AP-6530, AP-6535, AP-6532, and AP-8063 require thawing prior to sample collection. In order to minimize dilution of groundwater and volatization of contaminants, heat trace cable has been placed in these wells to thaw the column of water frozen in the well casing by permafrost. Dedicated heat trace has been placed from the top of the casing to approximately five feet above the bottom of the wells. Prior to conducting each sampling event, the heat trace was connected to a generator that warmed the heat trace cable to approximately 50 degrees Fahrenheit (° F). The thawing process typically takes two to three days, depending on well depth and thickness of the ice in the well casing.

## 2.4 Decontamination

Reusable sampling equipment consisted of a water level meter, which was decontaminated between every well. The decontamination procedure consisted of an Alconox detergent wash followed by a potable water rinse. Dedicated Teflon-lined tubing prevented cross-contamination when using the peristaltic pump. Following groundwater sampling, the submersible pumps were decontaminated in accordance with the UFP-QAPP (FES, 2017b).

The decontamination water generated during groundwater sampling was containerized and treated using granular activated carbon (GAC). The treated water was discharged on the OU4 Landfill site, at a location that was vegetated and at least 100 feet from any surface water body source. The discharge location is shown on Figure 2-1.

## 2.5 Investigation Derived Waste Disposal

Investigation-derived waste (IDW) generated during OU4 field activities in 2017 included purge water, decontamination water, and miscellaneous non-hazardous solid waste (nitrile gloves, paper towels, etc.) from groundwater sampling activities. All IDW was managed according to the procedures outlined in the 2017 Operable Unit Sites Work Plan (FES, 2017a).

Purge water was containerized at the time of sampling in 15-gallon poly drums. The drums were labeled with a unique ID and a form was completed documenting the ID and purge volume from each well. The drums were taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage. The water was characterized using the laboratory results from the individual wells.

The purge water from the OU4 Landfill site was disposed of as CERCLA waste. The drums of purge water were provided to Environmental Compliance Consultants (ECC – the Fort Wainwright waste disposal contractor) at the completion of the sampling activities. Complete documentation of the CERCLA waste disposal will be provided in the 2017 IDW Technical Memorandum (anticipated in 2018).

# TABLE 2-2 OU4 LANDFILL FIELD MEASUREMENTS

| Well ID | Sample ID | Sample Date | Sample Time | Field Measurements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Water Depth[1] (feet btoc) | Drawdown[2] (feet) | Temp (°C) | Conductivity (mS/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (NTU) | Well Stabilized[3] (Y/N) |
| *OU4 Landfill* | | | | | | | | | | | | |
| FWLF-4 | 15FWOU401WG | 4/7/2015 | 855 | 17.93 | 0 | 1.51 | 0.772 | 0.85 | 6.50 | 42.1 | 3.92 | Y |
| | 16FWOU404WG | 7/11/2016 | 1400 | 15.90 | 0 | 7.07 | 0.722 | 0.99 | 6.44 | -21.7 | 7.82 | Y |
| | 17FWOU401WG | 6/26/2017 | 1120 | 16.90 | 0 | 2.86 | 0.677 | 0.92 | 6.40 | 35.8 | 5.59 | Y |
| | 17FWOU414WG | 10/30/2017 | 1430 | 15.67 | 0 | 2.33 | 0.679 | 0.46 | 6.62 | -64.4 | 5.37 | Y |
| AP-5588 | 15FWOU407WG | 4/7/2015 | 1520 | 17.00 | 0 | 1.51 | 1.239 | 0.61 | 6.64 | -49.6 | 16.11 | Y |
| | 16FWOU411WG | 7/12/2016 | 1720 | 14.87 | 0 | 2.57 | 1.250 | 0.56 | 5.80 | -35.4 | 12.62 | y |
| | 17FWOU408WG | 6/26/2017 | 1830 | 16.22 | 0 | 2.63 | 1.226 | 1.56 | 6.57 | -82.3 | 18.68 | y |
| | 17FWOU409WG | 6/26/2017 | 1845 | Duplicate of 17FWOU408WG | | | | | | | | |
| | 17FWOU416WG | 10/31/2017 | 1115 | 14.70 | 0 | 0.42 | 0.897 | 0.47 | 6.51 | 19.0 | 12.51 | y |
| | 17FWOU417WG | 10/31/2017 | 1130 | Duplicate of 17FWOU416WG | | | | | | | | |
| AP-5589 | 15FWOU409WG | 4/7/2015 | 1645 | 17.98 | 0 | 2.24 | 0.999 | 0.45 | 6.71 | -72.3 | 5.01 | Y |
| | 16FWOU408WG | 7/12/2016 | 1350 | 15.85 | 0 | 3.67 | 0.915 | 0.66 | 6.63 | -55.0 | 2.51 | y |
| | 16FWOU417WG | 10/18/2016 | 1015 | 16.00 | 0 | 1.03 | 0.977 | 0.62 | 6.21 | 6.1 | 1.94 | Y |
| | 17FWOU407WG | 6/26/2017 | 1700 | 17.23 | 0 | 2.25 | 1.022 | 1.06 | 6.70 | -125.8 | 2.54 | Y |
| | 17FWOU418WG | 10/31/2017 | 1330 | 15.70 | 0 | 0.98 | 1.044 | 0.70 | 6.64 | -55.9 | 7.01 | Y |
| AP-8061 | 15FWOU405WG | 4/7/2015 | 1210 | 10.07 | 0 | 1.38 | 0.717 | 0.48 | 6.79 | -58.2 | 9.12 | Y |
| | 15FWOU418WG | 11/6/2015 | 1030 | 7.71 | 0 | 1.42 | 0.700 | 0.25 | 4.13 | 28.7 | 2.07 | Y |
| | 16FWOU405WG | 7/11/2016 | 1700 | 7.87 | 0 | 1.78 | 0.690 | 0.30 | 6.23 | -64.9 | 36.54 | Y |
| | 17FWOU406WG | 6/26/2017 | 1500 | 9.33 | 0 | 4.47 | 0.552 | 0.56 | 6.87 | -72.2 | 30.34 | Y |
| | 17FWOU414WG | 10/30/2017 | 1600 | 7.71 | 0 | 1.76 | 0.735 | 2.32 | 6.74 | -111.8 | 58.62 | Y |
| AP-6530 | 15FWOU406WG | 4/7/2015 | 1510 | 16.70 | 0 | 1.07 | 0.494 | 1.12 | 6.34 | -3.3 | 1.98 | Y |
| | 15FWOU422WG | 11/6/2015 | 1630 | 14.02 | 0 | 3.30 | 0.479 | 1.29 | 5.64 | -83.8 | 2.67 | Y |
| | 16FWOU406WG | 7/12/2016 | 1145 | 14.13 | 0 | 3.28 | 0.471 | 0.55 | 6.25 | -62.7 | 5.92 | Y |
| | 16FWOU416WG | 10/17/2016 | 1545 | 14.53 | 0 | 1.48 | 0.477 | 0.28 | 6 | -24.2 | 4.91 | Y |
| | 17FWOU421WG | 11/1/2017 | 1130 | 14.22 | 0 | 1.69 | 0.486 | 0.49 | 6.86 | -6.7 | 3.42 | Y |
| AP-6532 | 15FWOU402WG | 4/7/2015 | 1045 | 17.46 | 0 | 1.16 | 0.379 | 1.22 | 6.03 | 24.5 | 9.66 | Y |
| | 15FWOU424WG | 11/9/2015 | 1350 | 14.92 | 0 | 1.00 | 0.399 | 0.45 | 5.47 | -13.9 | 6.49 | Y |
| | 16FWOU410WG | 7/12/2016 | 1600 | 14.98 | 0 | 1.65 | 0.415 | 0.39 | 6.02 | 111.7 | 4.52 | y |
| | 16FWOU415WG | 10/17/2016 | 1400 | 15.72 | 0 | 3.74 | 0.402 | 0.61 | 5.52 | 43.1 | 8.41 | Y |
| | 17FWOU420WG | 11/1/2017 | 930 | 15.02 | 0 | 4.97 | 0.387 | 0.79 | 6.55 | 21 | 3.99 | Y |
| AP-6535 | 15FWOU404WG | 4/7/2015 | 1300 | 14.95 | 0 | 2.20 | 0.438 | 2.38 | 6.17 | 6.9 | 11.94 | Y |
| | 15FWOU425WG | 11/9/2015 | 1510 | 12.35 | 0 | 1.08 | 0.467 | 0.34 | 5.88 | -40.2 | 33.98 | Y |
| | 16FWOU407WG | 7/12/2016 | 1430 | 12.41 | 0 | 3.89 | 0.449 | 0.56 | 6.13 | -34 | 78.95 | Y |
| | 16FWOU418WG | 10/18/2016 | 1130 | 13.22 | 0 | 1.26 | 0.497 | 0.45 | 6.08 | -35.6 | 9.41 | Y |
| | 17FWOU404WG | 6/26/2017 | 1100 | 14.25 | 0 | 1.34 | 0.478 | 0.58 | 6.81 | -68.9 | 11.07 | Y |
| | 17FWOU422WG | 11/1/2017 | 1330 | 12.59 | 0 | 1.83 | 0.489 | 0.61 | 6.66 | -10.1 | 11.69 | Y |
| AP-8063 | 15FWOU411WG | 4/8/2015 | 1015 | 17.33 | 0 | 0.80 | 0.171 | 1.37 | 6.22 | 35.4 | 49.62 | Y |
| | 16FWOU412WG | 7/12/2016 | 1800 | 15.04 | 0 | 2.72 | 0.860 | 1.58 | 6.34 | 176.4 | 6.99 | Y |
| | 16FWOU419WG | 10/18/2016 | 1315 | 15.43 | 0 | 3.02 | 0.870 | 0.43 | 6.29 | -56.9 | 3.42 | Y |
| | 17FWOU405WG | 6/26/2017 | 1315 | 16.63 | 0 | 2.18 | 0.425 | 0.64 | 7.45 | -117.1 | 4.47 | Y |
| | 17FWOU419WG | 10/31/2017 | 1515 | 14.97 | 0 | 2.06 | 0.922 | 0.60 | 6.63 | -75.3 | 6.95 | Y |
| AP-10257MW | 15FWOU413WG | 4/8/2015 | 1120 | 19.65 | 0 | 1.60 | 0.532 | 0.92 | 6.21 | 135.2 | 16.5 | Y |
| | 15FWOU420WG | 11/6/2015 | 1330 | 17.25 | 0 | 2.52 | 1.175 | 0.19 | 5.17 | 124.9 | 6.48 | Y |
| | 16FWOU401WG | 7/11/2016 | 1000 | 17.73 | 0 | 5.56 | 0.732 | 0.38 | 5.86 | 27.6 | 4.87 | Y |
| | 16FWOU422WG | 10/18/2016 | 1630 | 17.31 | 0 | 2.93 | 0.906 | 0.79 | 6.05 | 96.3 | 4.98 | Y |
| | 17FWOU403WG | 6/26/2017 | 1340 | 18.52 | 0 | 2.47 | 1.257 | 0.43 | 5.87 | 91.2 | 4.02 | Y |
| | 17FWOU412WG | 10/30/2017 | 1200 | 17.31 | 0 | 2.15 | 0.818 | 0.63 | 6.59 | -68.4 | 6.64 | Y |
| AP-10258MW | 15FWOU408WG | 4/8/2015 | 1325 | 19.15 | 0 | 1.55 | 0.590 | 0.75 | 6.18 | 129 | 2.96 | Y |
| | 15FWOU419WG | 11/6/2015 | 1150 | 16.77 | 0 | 3.07 | 0.554 | 0.31 | 5.42 | 168.6 | 3.15 | Y |
| | 16FWOU403WG | 7/11/2016 | 1230 | 17.24 | 0 | 5.14 | 0.652 | 0.29 | 6.01 | 80.6 | 1.93 | Y |
| | 16FWOU421WG | 10/18/2016 | 1515 | 16.86 | 0 | 3.40 | 0.654 | 0.38 | 5.67 | 142.4 | 1.32 | Y |
| | 17FWOU402WG | 6/26/2017 | 1235 | 18.08 | 0 | 2.48 | 0.644 | 0.61 | 5.79 | 158.9 | 3.26 | Y |
| | 17FWOU413WG | 10/30/2017 | 1315 | 17.03 | 0 | 2.98 | 0.611 | 0.58 | 6.33 | 33.4 | 6.8 | Y |

Notes:

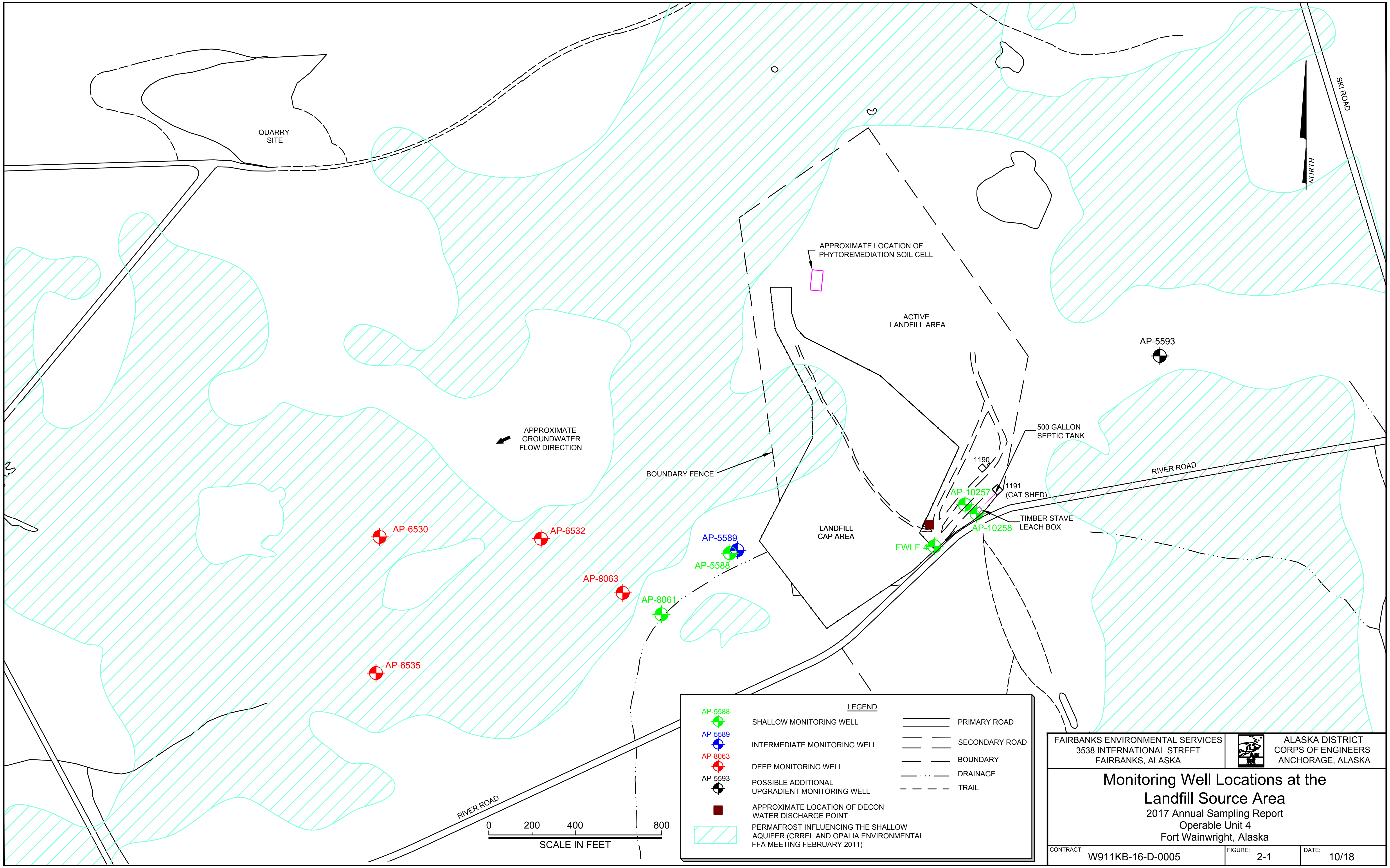
[1] Water depth shown was measured on the date shown prior to removing purge water

[2] Drawdown measured during the last three readings.

[3] Well stabilization as defined by ADEC Draft Field Sampling Guidance (May 2016). Individual parameter stabilization discrepancies and potential impact to data quality is discussed in the CDQR.

btoc - below top of casing
°C - degree Celsius
DO - dissolved oxygen
mg/L - milligrams per liter

mS/cm - millisiemens per centimeter
mV - millivolts
NTU - nephelomatic turbidity units
ORP - oxidation reduction potential



FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

# Monitoring Well Locations at the Landfill Source Area

2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

| CONTRACT: | FIGURE: | DATE: |
|---|---|---|
| W911KB-16-D-0005 | 2-1 | 10/18 |

# 3.0 GROUNDWATER MONITORING RESULTS

The following sections provide a discussion of the results of groundwater elevations and groundwater analytical results.

## 3.1 Groundwater Elevations

Groundwater levels were within the screened intervals of the shallow-screened monitoring wells during sample collection. However, the groundwater levels were above the screened intervals in the intermediate- and deep-screened wells. These wells are screened below the water table to investigate contaminants associated with different depths.

A groundwater elevation survey was conducted in 2010 that consisted of 28 wells, including 12 shallow wells, nine intermediate wells, and seven deep wells. The groundwater contour map of the potentiometric surface using groundwater elevations from all of the wells in the survey, regardless of their screen depth, showed overall groundwater flow to the southwest. The steeper topography of Birch Hill, located northeast of the Landfill, and the extensive deep permafrost west of the Landfill likely influence groundwater flow for this scenario. Therefore, groundwater flow direction in the shallow/intermediate aquifer was looked at separately from the groundwater flow direction in the deep, subpermafrost aquifer. Groundwater elevations in the shallow/intermediate wells showed groundwater flow direction to the west; however, when wells influenced by or perched on permafrost were removed, the flow direction was to the southwest. Groundwater flow in the subpermafrost aquifer was determined to be to the west/southwest.

In 2010, Cold Regions Research and Engineering Laboratories (CRREL) conducted a task to define permafrost boundaries in the vicinity of the Landfill. The permafrost delineation and modeling identified discontinuous permafrost east of the Landfill, thick continuous permafrost west of the Landfill, and highly variable permafrost south of the Landfill (Figure 3-1). A thaw bulb is assumed to exist beneath the Landfill. During the 2011 field season CRREL ran additional geophysical profiles south of the Landfill which confirmed the presence of sporadic permafrost bodies in this area.

Groundwater levels measured during June and October/November 2017 were collected from wells screened across different elevations. Groundwater elevations measured in June 2017 were an average of 1.3 feet higher than July 2016 groundwater elevations and groundwater elevations measured in October/November 2017 were an average of feet lower than October 2016 groundwater elevations. Water level measurements for 2017 are shown on Table 3-1. Although there are no stratigraphic confining layers separating shallow, intermediate, and deep wells, discontinuous permafrost is present in the monitored area, which can complicate flow patterns. An evaluation of groundwater elevations from all wells measured on the last day of October and the first day of November 2017 shows a relatively flat gradient with groundwater flow to the west/southwest (Figure 3-2), whereas the regional groundwater flow north of the

Chena River is to the west/northwest. Groundwater elevations measured during the 1994 RI included a larger data set (E&E, 1995) and also showed groundwater flow to the southwest.

## 3.2 Groundwater Analytical Results for Landfill Monitoring Wells

Eight monitoring wells were sampled at the Landfill during June 2017: five shallow wells, one intermediate well, and two deep wells. The route to two of the deep wells (AP-6532 and AP-6530) that were scheduled for sampling during spring 2017 was impassable; therefore, these wells were not sampled in the spring. All ten of the monitoring wells were sampled during October/November 2017: five shallow wells, one intermediate well, and four deep wells.

Groundwater samples collected from wells screened across the water table and extending approximately seven feet below the water table are designated as shallow wells. These wells are sampled to investigate contaminants that migrate along the surface of the water table. One intermediate well screened below the groundwater table and above permafrost was sampled to investigate the vertical distribution of contaminants in the unconfined groundwater that flows above permafrost. Several wells are screened below permafrost (deep wells). These deep wells are sampled to monitor contaminants that are migrating in the aquifer below the permafrost.

Groundwater analytical results for the 2017 sampling events for select VOC/SVOC and metals are presented in Table 3-2 and Table 3-3, respectively. Current and historical ROD COC concentrations are also presented on Figure 3-3. ROD COCs that exceed RAGs during 2017 are listed below, and metals that exceeded the ADEC groundwater cleanup level are discussed in Section 3.2.3.

- AP-5588 – cis-1,2,-DCE, PCA, 1,1,2-Trichloroethane, and TCE
- AP-5589 – TCE
- AP-6532 – benzene
- AP-8063 – cis-1,2,-DCE, PCA, and TCE
- AP-10257 – benzene

Benzene was detected in all samples that were analyzed during both 2017 monitoring events, but only exceeded the RAG in two wells. Benzene exceeded the RAG in shallow well AP-10257 during the spring and fall sampling events and in deep well AP-6532 during the fall (AP-6532 was not sampled in the spring 2017).

A data quality review was performed, which indicated that all project data is acceptable for use. Only minor data qualifications were applied, which are detailed in the CDQR and ADEC Laboratory Data Review Checklists. The CDQR and ADEC checklists are presented in Appendix B, and a sample summary table and analytical results table are provided in Appendix C.

Mann-Kendall trends for contaminant concentrations in individual wells at the OU4 Landfill were determined using the Monitoring and Remediation Optimization System (MAROS) software. The

Air Force Center for Engineering and the Environment (AFCEE) developed the MAROS software (AFCEE, 2006) as a tool to evaluate groundwater data trends and is one among several tools that have been recommended for use in Long Term Monitoring Optimization (LTMO) (EPA, 2005). The trend analysis was completed using all available groundwater sampling results for wells in the current monitoring network. Some wells had monitoring results back to 1997, whereas results for newer wells were available since 2012. A Mann-Kendall trend was determined for COCs that exceeded the cleanup level during the period of analysis, or had concentrations at approximately half of the cleanup level in recent sampling events. The trend results are summarized in Table 3-4, with the complete results presented in (Appendix D). Visual depiction of contaminant concentrations over time are shown on Figures 3-4 through 3-10. Groundwater elevations over time are also shown in Figures 3-4 through 3-10. A discussion of these trends is included in the discussion of the groundwater analytical results for the landfill wells in the following Section.

**Table 3-4 Summary of 2017 Mann-Kendall Trend Analysis of OU4 Landfill Wells**

| **Well** | **Benzene** | **Cis-1,2-Dichloroethylene (cis-1,2-DCE)** | **Trichloroethylene (TCE)** | **1,1,2,2-Tetrachloroehtane (PCA)** | **1,1,2-Trichloroethane** |
|---|---|---|---|---|---|
| AP-10257 | No Trend | -- | -- | -- | -- |
| AP-10258 | Increasing | -- | -- | -- | -- |
| FWLF-4 | Decreasing | -- | -- | -- | -- |
| AP-5588 | Decreasing | Decreasing | Probably Decreasing (Stable) | Decreasing (Probably Decreasing) | Decreasing |
| AP-5589 | Decreasing | -- | Increasing | Probably Increasing | -- |
| AP-8061 | Decreasing (Stable) | Decreasing | Decreasing | -- | -- |
| AP-8063 | Decreasing | Increasing | No Trend (Probably Increasing) | No Trend | -- |
| AP-6530 | Decreasing (Probably Decreasing) | -- | -- | -- | -- |
| AP-6532 | Increasing | -- | -- | -- | -- |
| AP-6535 | Stable | No Trend | -- | -- | -- |

-- Analyte did not exceeded the cleanup level during the period of analysis, or did not have concentrations at approximately half of the cleanup level in recent sampling events
2016 results are shown in parentheses if different from 2017 result

### 3.2.1 Volatile Organic Compounds in Groundwater

Groundwater monitoring has been performed at the Landfill since 1997. A sufficient volume of data has been accumulated at most wells to support assessment of concentration trends over time. Figures 3-4 through 3-10 present COC concentrations in groundwater from the following wells for the time period since remedial action was implemented in 1997: AP-5588, AP-5589, AP-8063, AP-8061, AP-6138, FWLF-4, and AP-6532 (formerly identified as DH-6534). Well AP-8061 replaced well AP-6137 in September 2001; therefore only the data that has accumulated from sampling well AP-8061 is presented on Figure 3-5.

#### Shallow Monitoring Wells

**Upgradient wells FWLF-4, AP-10257, and AP-10258 (Figure 3-6)**. Benzene has been consistently detected in FWLF-4 since sampling began at this well in 1998; however, benzene has never been detected above the RAG. Bis(2-ethylhexyl) phthalate exceeded the RAG in FWLF-4 during 2014 and 2015, but has not been detected above the RAG during the 2016 or 2017 monitoring events.

Two shallow wells (AP-10257 and AP-10258), located upgradient of the closed portion of the Landfill and originally associated with the Building 1191 leach field, have been sampled each year since they were installed in 2012. Benzene and bis(2-ethylhexyl) phthalate are the only ROD COCs that have been detected above the RAG in these two wells.

- Benzene has been above the RAG in well AP-10257 during each sampling event, with the exception of June 2013, ranging from 6.6 µg/L in fall 2014 to 29 µg/L in spring 2016. Benzene remained above the RAG throughout 2017. Overall, there is no discernable trend for benzene in AP-10257.
- Bis(2-ethylhexyl)phthalate was detected above the RAG in AP-10257 in 2015. However, this is the only exceedance observed in this well. Bis(2-ethylhexyl) phthalate was not detected above the RAG in 2016 or 2017.
- Benzene was detected above the RAG in AP-10258 for the first time during the fall 2014 sampling event at 5.7 µg/L, but was below the RAG during both the April and November 2015 sampling events. Benzene was again above the RAG during both 2016 sampling events, and the trend analysis showed an Increasing trend. However, benzene was below the RAG in both 2017 sampling events.
- Cis-1,2-DCE, the only other COC that is consistently detected in both AP-10257 and AP-10258, has always been more than an order of magnitude below the RAG.

Because wells AP-10257 and AP-10258 are located cross gradient to the former septic system, it is most likely that the benzene contamination detected in these wells is associated with the active Landfill debris rather than migration from the Building 1191 septic system.

**Downgradient well AP-5588 (Figure 3-4).** AP-5588 has historically exhibited the highest COC concentrations above RAGs for TCE, cis-1,2-DCE, PCA, and 1,1,2-trichloroethane. COC concentrations in this well exhibit overall decreasing trends. MAROS software trend analysis indicated that TCE has changed from a Stable trend in 2016 to Probably Decreasing in 2017 and PCA has changed from Probably Decreasing to Decreasing. Benzene is typically detected in AP-5588, but has never been detected above the RAG.

**Downgradient Well AP-8061 (Figure 3-5).** Historically, benzene and TCE have been the only contaminants detected at concentrations exceeding the RAGs in well AP-8061.

- Prior to 2011, the concentration of benzene in this well was sporadic, but typically exceeded the RAG during at least one sampling event each year. Benzene decreased to below the RAG in October 2011 and remained below the RAG for six sampling events, until November 2015 when it was detected slightly above the RAG (5 µg/L) at 5.4 µg/L. Benzene decreased to below the RAG in July 2016 and was below the RAG in both 2017 sampling events. In 2017, benzene was detected at the lowest concentration recorded in this well and Mann-Kendall trend analysis indicated a change in the trend from Stable in 2016 to Decreasing in 2017.
- TCE has exhibited a decreasing trend and has been detected above the RAG (5 µg/L) only twice since 2011. TCE was below the RAG during both sampling events in 2017.
- Cis-1,2-DCE, the only other COC that is consistently detected in this well, has always been below the RAG and the concentration exhibits a Decreasing trend.

### Intermediate Monitoring Well

**Downgradient Well AP-5589 (Figure 3-7)**. AP-5589 is co-located with shallow well AP-5588. TCE, PCA, and vinyl chloride have generally been detected below the RAG, but have periodically exceeded their respective RAGs. Concentrations of benzene and cis-1,2-DCE, have consistently been detected below the RAGs in this well.

- TCE in AP-5589 was detected slightly above the RAG during the spring 2007 and fall 2009 sampling events and has been just below the RAG during all other sampling events until fall 2016 when it was again detected slightly above the RAG at 5.1 µg/L. TCE was above the RAG again in June 2017 at 5.3 µg/L, but below the RAG in October 2017. TCE is exhibiting an increasing trend in this well
- PCA in AP-5589 was detected above the RAG between 2005 and 2007, with the highest concentration (25.2 µg/L) detected in spring 2007. PCA decreased to below the RAG during fall 2007 and remained below the RAG with the exception of one detection of 5.6 µg/L in spring 2009. PCA was again detected above the RAG during spring 2016 at 5.9 µg/L, but was below the RAG in fall 2016 and has remained below the RAG through 2017. Trend analysis indicates the PCA concentration is Probably Increasing in this well.

- Vinyl chloride has been detected above the RAG three times since 1997 and concentrations range from not detected to slightly above the RAG of 2 µg/L; it has not been detected above the RAG since 2006.

## Deep Monitoring Wells

**Downgradient Monitoring Well AP-8063 (Figure 3-8).** This well has been sampled since September 2001. TCE, PCA, and cis-1,2-DCE have historically been detected above the RAGs in AP-8063. Anomalous results have occurred in 2004, 2009, 2015, and again during the June 2017 sampling event when these compounds were not detected. The sampling frequency of AP-8063 was decreased to annually following the spring 2015 sampling event; however, because of the anomalous results in 2015, the sampling frequency was return to biannual in 2016. TCE, PCA, and cis-1,2-DCE were again above the RAGs during the October 2017 sampling event. Benzene is consistently detected in AP-8063 at concentrations below the RAG.

- TCE is consistently detected an order of magnitude above the RAG, ranging up to 29 µg/L. TCE has been below the RAG during 4 sampling events since 2001. MAROS indicated a change in the contaminant trend from Probably Increasing in 2016 to No Trend in 2017.
- The PCA concentration peaked in fall 2003 at 77 µg/L; however, it decreased by an order of magnitude in spring 2004. PCA remained at concentrations near the RAG until spring 2008 when it began to steadily increase until it peaked again in 2011 at 61 µg/L. Concentrations of PCA have steadily decreased since 2011, but overall the PCA concentration in this well exhibits No Trend.
- Cis-1,2-DCE has shown an overall Increasing trend, and was detected at its highest concentration to date in 2014, at 120 µg/L.

**Downgradient Monitoring Well AP-6532 (Figure 3-9).**
Benzene has been consistently detected above the RAG and cis-1,2-DCE has been consistently detected below the RAG in this well since 2004. Bis(2-ethylhexyl)phthalate has exceeded the RAG in this well nine times since 1997. No other COCs were detected in this well.

- Benzene in well AP-6532 exceeded the RAG during the June 2004 sampling event for the first time since sampling at this well began in 1997, and remained above the RAG for eight sampling events. Benzene was below the RAG during both 2009 sampling events, but increased above the RAG in 2010. Benzene has remained above the RAG since then with one exception in the fall 2012 when it was detected below the RAG. Overall, benzene in this well exhibits an Increasing trend.

The non-ROD contaminant, 2,6-dinitrotoluene (2,6-DNT), was detected above the ADEC cleanup level in well AP-6532 during the 2013 and 2015 spring and fall sampling events. The source of 2,6-DNT at the Fort Wainwright landfill cannot be conclusively determined. However, common uses of 2,6-DNT include the manufacturing of munitions, polyurethane polymers, and herbicides, which may be associated with the landfill contents.

**Downgradient Monitoring Wells AP-6530 (Figure 3-10) and AP-6535.** Two deep downgradient wells, AP-6530 and AP-6535, were added to the Landfill monitoring network in 2010 to monitor the downgradient migration of benzene in the subpermafrost aquifer. These are currently the farthest downgradient monitoring wells associated with the Landfill monitoring network.

- Benzene has exceeded the RAG in three out of 12 sampling events at AP-6530. Benzene has been detected below the RAG since the fall 2014 and the Mann-Kendall trend analysis from the MAROS software indicated that the benzene trend changed from Probably Decreasing in 2016 to Decreasing in 2017. Bis(2-ethylhexyl)phthalate has been detected in seven out of 12 sampling events and exceeded the RAG in this well once during fall 2014. Cis-1,2-DCE is also consistently detected below the RAG in AP-6530. Vinyl Chloride was detected below the RAG in 2013. No other COC were detected in this well.

- Benzene, cis-1,2-DCE and TCE have been detected below the RAG in AP-6535 during each sampling event since sampling of this well began in 2010. Vinyl Chloride has been detected in 10 out of 12 sampling events and bis(2-ethylhexyl) phthalate has been detected in seven of 12 sampling events. All detections of both Vinyl Chloride and bis(2-ethylhexyl) phthalate have been below the RAG. PCA has never been detected in this well.

## Contaminant Flow Paths

### *Benzene*

Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, historically benzene has been detected above the RAG in three downgradient wells: deep wells AP-6532 (total depth (TD) 177 ft) and AP-6530 (TD 142 ft), and shallow well AP-8061 (TD 25 ft). It appears that benzene is migrating below permafrost at concentrations exceeding RAGs in a predominately westerly flow path. Figure 3-11 shows benzene concentrations along a westerly flow path downgradient of the Landfill. Benzene is not seen at concentrations exceeding the RAG in deep downgradient wells AP-8063 (TD 120 ft), AP-6534 (total depth 198 ft) or AP-6535 (TD 93 ft) that are along a southwesterly flow path. It is possible that the permafrost beneath the Landfill is discontinuous and benzene has migrated through permafrost; however, the presence of or depth to permafrost beneath the Landfill is unknown, and it is not known how permafrost affects groundwater flow at depth. AP-8061 is a shallow well located within a thaw channel downgradient of the landfill. It appears that benzene is migrating at the water table within this thawed area southwest of the landfill.

### *Chlorinated Solvents*

Chlorinated solvents PCA, TCE, cis-1,2- DCE and 1,1,2-trichloroethane appear to be more prevalent on a southwesterly flow path as seen in nested wells AP-5588 (shallow) and AP-5589 (intermediate) and deep wells AP-8063 and AP-6535. Except for cis-1,2- DCE and vinyl chloride, chlorinated solvents are not seen in deep wells AP-6532 and AP-6530. Figure 3-12 shows migration of chlorinated solvents along a southwesterly flow path. Specific sources of contamination within the landfill have not been investigated and it is possible that the chlorinated solvents originate from a separate source than the petroleum contaminants. It appears that chlorinated solvents migrate at the water table downgradient of the landfill until permafrost is encountered, where they continue migrating below permafrost.

### 3.2.2 SVOCs in Groundwater

Bis(2-ethylhexyl)phthalate is an OU4 COC that has been detected at low levels in most of the Landfill wells and it will periodically exceed the RAG. There are no established contaminant trends for bis(2-ethylhexyl)phthalate. However, it was detected above the RAG in three consecutive sampling events between April 2015 and July 2016 in deep downgradient well AP-6532. Bis(2-ethylhexyl)phthalate was below the RAG in this well in October 2016 and November 2017.

It is expected that bis(2-ethylhexyl)phthalate at OU4 is migrating from the landfill; however, the specific source is unknown. Bis(2-ethylhexyl)phthalate is common in the environment because of its use in plastics. Sampling and laboratory equipment, monitoring wells, and waste disposed in landfills may contain or be constructed of plastics. Bis(2-ethylhexyl)phthalate is also used in inks, adhesives, coatings, pesticides, cosmetics, vacuum pump oil and as a dielectric fluid in ballast capacitors and other electrical equipment (e.g., transformers). It has low solubility in water (300 - 400 µg/L), is soluble in most organic solvents, and evaporates slowly into the air. It has been shown to not degrade in anaerobic conditions, such as landfill leachate.

### 3.2.3 Metals in Groundwater

Groundwater samples collected at the Landfill were analyzed for a total of 15 trace metals in compliance with solid waste permit requirements. Groundwater analytical results showed that arsenic is the only trace metal detected above the current ADEC Groundwater Cleanup Level values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC, 2017). Background concentrations of arsenic in groundwater at Fort Wainwright have previously been shown to exceed the CUL (USACE, 1993). Table 3-3 presents groundwater monitoring results for the 15 trace metals typically reported for the Landfill during the last three years.

Arsenic was above the ADEC cleanup level of 0.52 µg/L in all eight of the wells sampled during spring 2017, at concentrations ranging from 0.64 µg/L to 16.2 µg/L. Arsenic was above the ADEC cleanup level in seven of the 10 wells sampled in the fall 2017 ranging from 1.57 µg/L to 20.6 µg/L. The frequent detection of arsenic in many of the landfill wells suggest that the arsenic is a consequence of natural mineral deposits known to occur in bedrock in the Fairbanks area; however, it is not known if arsenic leaching is also occurring from arsenic bearing solids potentially disposed of in the capped portion of the landfill.

## 3.2.4 Natural Attenuation of Chlorinated and Petroleum Hydrocarbon Contaminants

### 3.2.4.1 Formation of PCA Degradation Products

The biodegradation processes most important to the natural attenuation of chlorinated contaminants is reductive dechlorination. The presence of PCA daughter products TCE, 1,1,2-trichloroethane, cis-1,2-DCE, and vinyl chloride in downgradient monitoring wells is consistent with the occurrence of reductive dechlorination. Three reductive dechlorination reaction pathways can occur under anaerobic conditions – an abiotic dehydrochlorination reaction that produces TCE; a hydrogenolysis pathway that produces 1,1,2-trichloroethane and 1,2-DCA; and a dichloroelimination pathway that produces cis-1,2-DCE (both cis- and trans- isomers) and vinyl chloride (USGS, 2003). Vinyl chloride may undergo further reductive dechlorination reactions to non-toxic ethene (USGS, 2012).

Hydrogenolysis entails the sequential replacement of a single chlorine atom by hydrogen, whereas dichloroelimination entails the simultaneous replacement of two adjacent chlorine atoms by hydrogen to produce a double bond. Abiotic dehydrochlorination eliminates the inhibitory compound and creates a product that can be degraded using bacteria. For these reductive dechlorination reactions, the chlorinated compound serves as an electron acceptor, resulting in production of more reduced, less-chlorinated daughter compounds. Microorganisms require the presence of suitable electron donors for reductive dechlorination to occur. Possible electron donors include natural compounds such as hydrogen, acetate, and methanol, and anthropogenic organic compounds such as benzene and toluene. Dechlorination of PCA and TCE to cis-1,2-DCE can occur under mildly reducing conditions, similar to conditions suitable for iron reduction; whereas, the dechlorination of cis-1,2-DCE to vinyl chloride to ethene typically requires the stronger reducing conditions suitable for sulfate-reduction or methanogensis.

In addition to reductive dechlorination of vinyl chloride, anaerobic oxidation or mineralization of vinyl chloride to carbon dioxide (CO2) or to CO2 and methane (CH4) has been reported under iron-reducing, sulfate-reducing, humic acid-reducing and methanogenic conditions. For these reactions, the vinyl chloride serves as an electron donor (USGS, 2012).

Chemical and geochemical data including the concentrations of PCA, daughter products, and terminal electron acceptors (dissolved oxygen, manganese, iron, sulfate, etc.) provide evidence to evaluate the feasibility of bioremediation as a remedial alternative. Environmental conditions that support natural attenuation processes for chlorinated compounds (particularly reductive dechlorination) include:

- microorganisms capable of degrading the contaminants
- oxidation-reduction (redox) capacity of the groundwater
- sufficient electron donors (e.g., a carbon source)
- minimal competing electron acceptors

### 3.2.4.2 Geochemical Data Evaluation

Groundwater geochemical data were collected during the 2017 sampling events to facilitate natural attenuation evaluations. Geochemical data indicates that natural attenuation of site contaminants is occurring and iron and sulfate reduction processes appear to be the most important biodegradation pathways. The following are interpretations based on data collected 2005 through 2017 for wells located downgradient of the landfill.

- DO concentrations are less than 2 mg/L (with the exception of DO in shallow well AP-8061, which was 2.32 mg/L) and indicate that the aquifer is anaerobic.

- Background concentrations for dissolved iron are typically at trace concentrations (near 0 mg/L) in groundwater at Fort Wainwright. During the 2017 sampling events, dissolved iron concentrations in wells downgradient of the Landfill ranged from 12.9 mg/L to 50 mg/L. The dissolved iron concentrations in downgradient wells continue to remain elevated, indicating a redox potential range suitable for iron reduction.

- Background concentrations for sulfate typically range from 20 mg/L to 30 mg/L in groundwater at Fort Wainwright. During the 2017 sampling events, sulfate concentrations in upgradient wells ranged from 0.92 mg/L to 110 mg/L. In general, sulfate is detected above typical background concentrations in upgradient wells at the Landfill. Sulfate concentrations in downgradient wells ranged from 7.1 mg/L in AP-6532 (deep well) to 242 mg/L in AP-5588 (shallow well) during 2017 and are similar to background concentrations, indicating a wide range of sulfate concentrations and a complicated groundwater regime. Historically, sulfate concentrations were lower in downgradient wells relative to upgradient well concentrations and indicated a redox potential suitable for sulfate reduction in the downgradient wells.

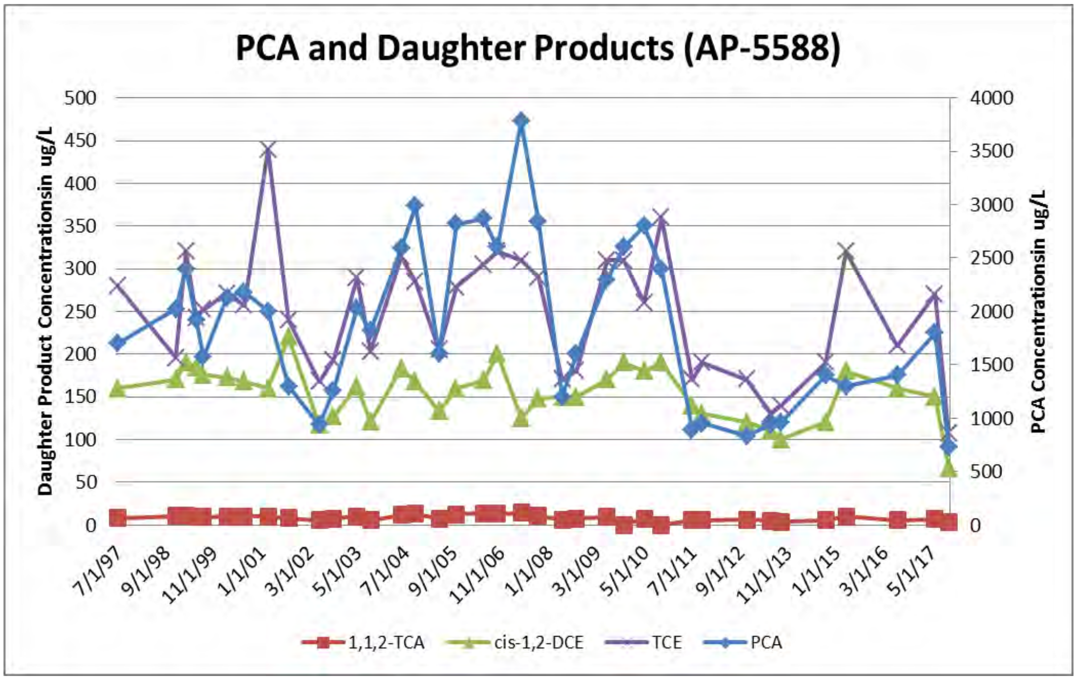
### 3.2.4.3 PCA Degradation Products in Groundwater

Concentrations of PCA and its three primary daughter products (1,1,2-trichloroethane, cis-1,2-DCE, and TCE) were graphed for the four wells that consistently exhibit the highest concentrations of these analytes including two shallow wells (AP-5588 and AP-8061), one intermediate well (AP-5589), and one deep well (AP-8063) located downgradient of the Landfill. Wells AP-5588 and AP-5589 are co-located but are screened at different intervals, AP-5588 is screened from 9 to 29 feet bgs and AP-5589 is screened from 46 to 56 feet bgs. PCA and daughter product concentrations were graphed to evaluate changes in these wells. The graphs are included as Graphs 3-1 through 3-4. Note that the four anomalous data points (representing severely low-biased data from October 2004, September 2009, April 2014, and June 2017) in well AP-8063 were omitted in Graph 3-4.

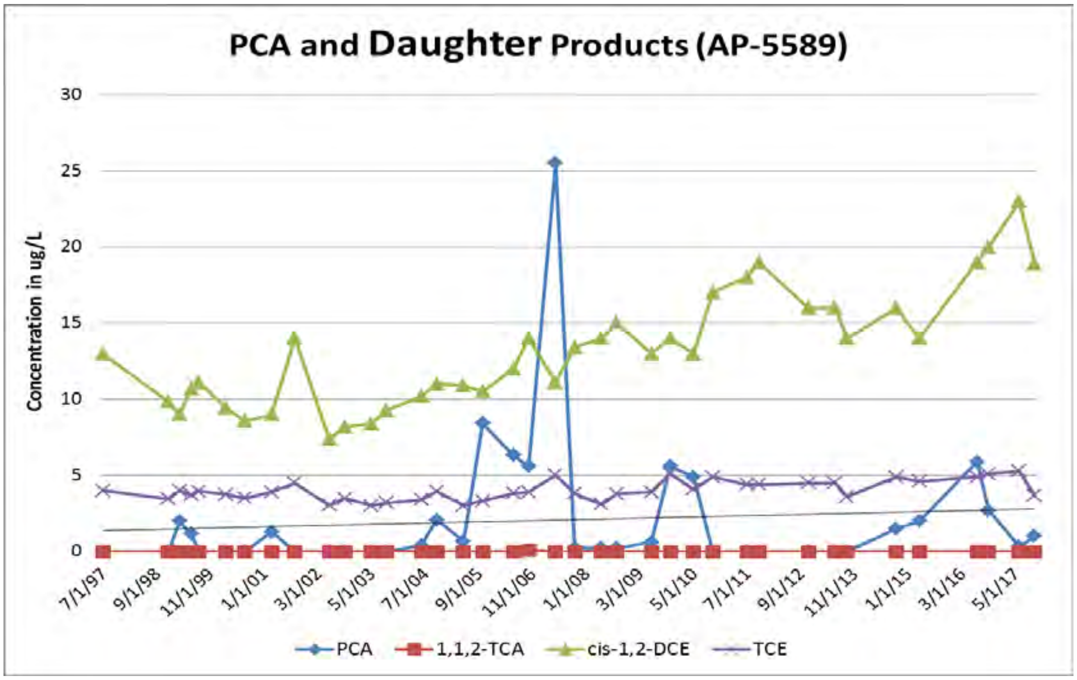
The relationship between PCA and its primary daughter products are further complicated by the fact that cis-1,2-DCE is also a daughter product of TCE, and that any of these analytes may be attributed to the Landfill contamination and are not necessarily daughter products of PCA. Cis-

1,2-DCE, for example, is detected in upgradient wells AP-10257 and AP-10258 but the presumed parent compound (PCA) is not.

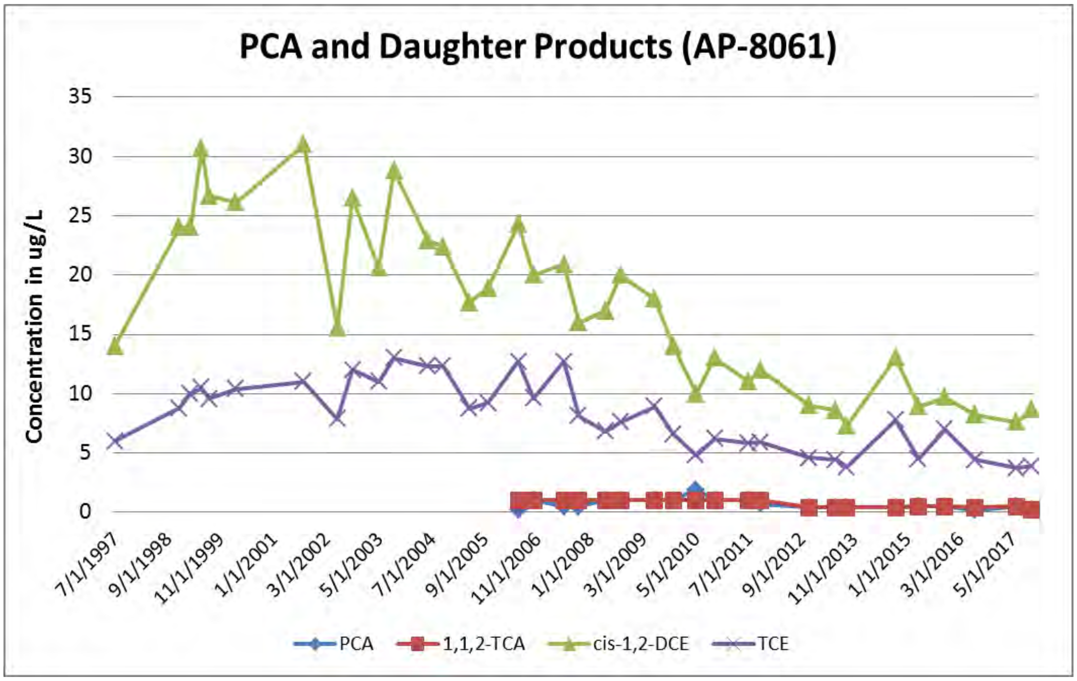
**Graph 3-1. PCA and Daughter Products in AP-5588**



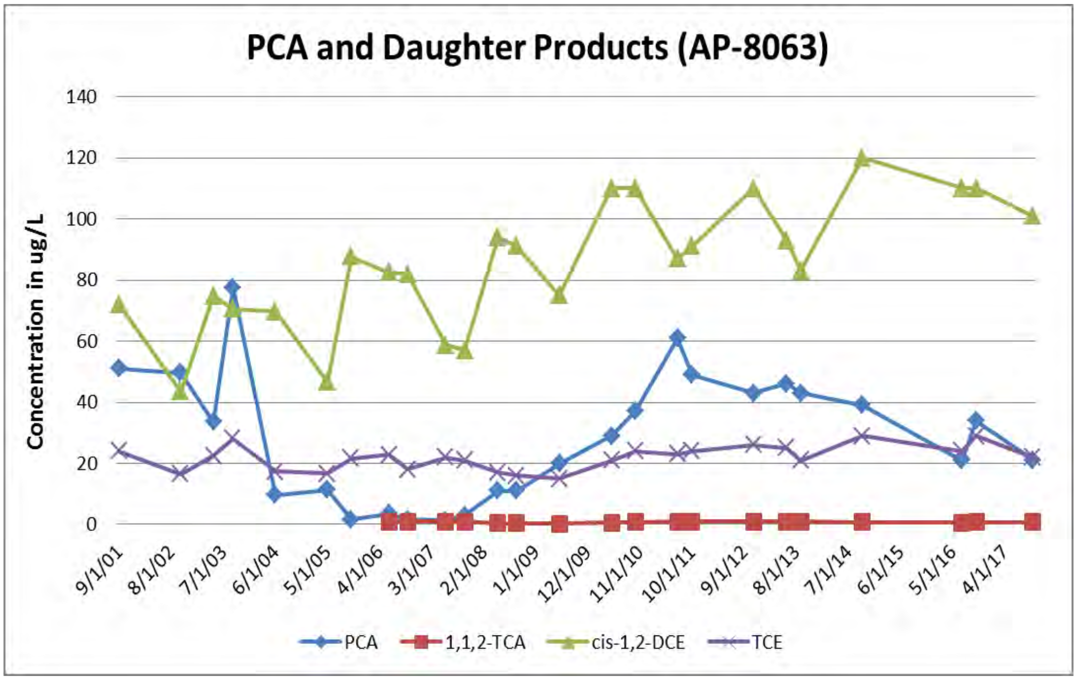
**Graph 3-2. PCA and Daughter Products in AP-5589**



**Graph 3-3. PCA and Daughter Products in AP-8061**



**Graph 3-4. PCA and Daughter Products in AP-8063**



The highest concentrations of PCA and daughter products are consistently detected in shallow well AP-5588 located closest to the Landfill. For this discussion, it is assumed that the contamination in wells AP-8061 and AP-8063 migrated from the upgradient area near wells

AP-5588. It is unknown whether the contamination detected in intermediate well AP-5589 stems from contamination present higher in the water column (represented by AP-5588) or directly from the landfill.

The following information was derived from the graphs:

- Well AP-5588 has the highest parent compound concentrations, and if PCA degradation was occurring and daughter products were being formed, it would likely be most evident in this well (assuming sufficiently reduced [anaerobic] conditions). Daughter products cis-1,2-DCE and TCE are present in AP-5588 at approximately one order of magnitude less than PCA, and the intermittent changes in concentrations of PCA, cis-1,2-DCE, and TCE between sampling events mirror each other (Graph 3-1). This indicates that reductive dechlorination of PCA (through the dechloroelimination and abiotic dechlorination pathways) is occurring and/or that all three of these compounds are contaminants emanating from the Landfill.

- For the purposes of this discussion, concentrations of daughter product 1,1,2-trichloroethane are negligible and likely indicates that the hydrogenolysis pathway is not a significant PCA degradation pathway and/or there is not a major source of this compound in the Landfill. Concentrations of 1,1,2-trichloroethane are detected at the RAG in AP-5588 but are not detected in any other wells except deep well AP-8063 (at concentrations an order of magnitude below the RAG).

- PCA concentrations in shallow well AP-5588 are significantly higher than the concentrations of all the daughter products in this well combined. The opposite is true for other three wells located downgradient of, or deeper than, AP-5588; the concentrations of daughter products cis-1,2-DCE and TCE were significantly higher than the parent PCA concentrations in shallow well AP-8061, intermediate well AP-5589, and deep well AP-8063 with exception of four consecutive data points in well AP-5589 (between 2005 and 2007). The significant increase in the ratio of daughter products to PCA in these wells may indicate that significant PCA degradation is occurring downgradient of, or deeper than, well AP-5588.

- The concentrations of TCE were consistently higher than cis-1,2-DCE concentrations in well AP-5588, while cis-1,2-DCE concentrations are consistently higher than TCE concentrations in the other three wells. The increase in the ratio of cis-1,2-DCE to TCE in wells located downgradient of AP-5588 is likely due to dechlorination of TCE to cis-1,2-DCE.

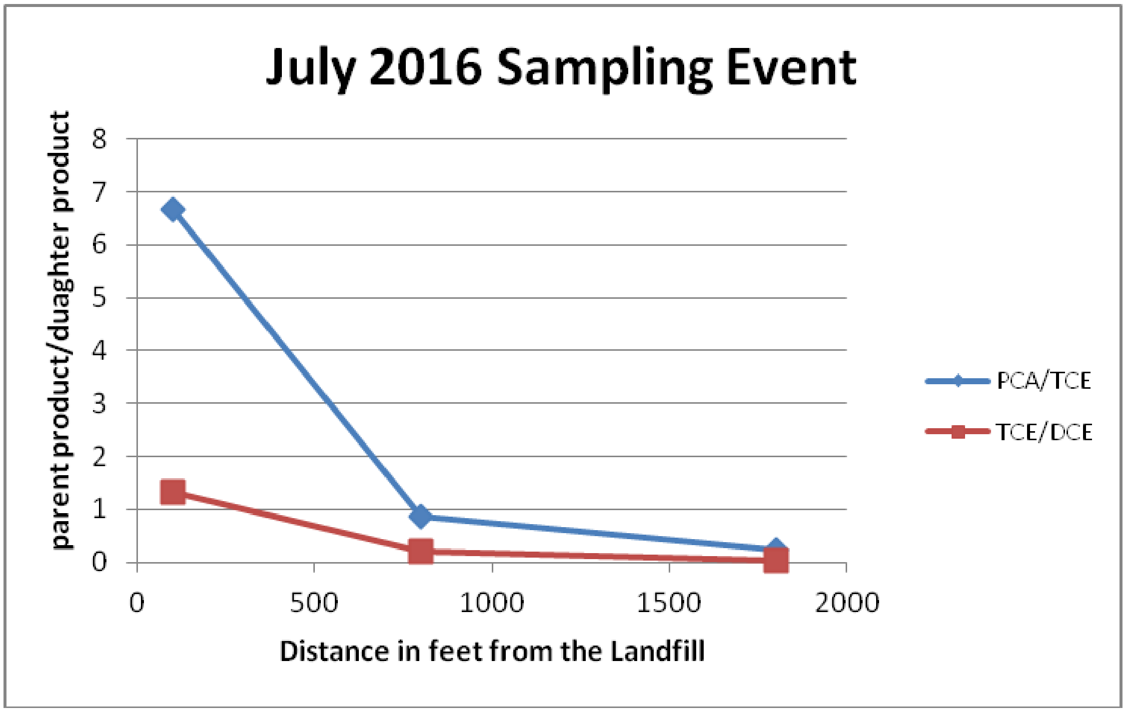
- Mann-Kendall analysis indicates that the concentrations of PCA in AP-5588 exhibits a Decreasing trend, whereas the concentrations of PCA are Probably Increasing or exhibit No Trend in wells AP-5589 and AP-8063, respectively (the PCA concentrations in shallow well AP-8061 are at the detection limit so no meaningful pattern can be differentiated from the data associated with that well). Cis-1,2-DCE and TCE concentrations exhibit Decreasing trends in both shallow wells (AP-5588 and AP-8061), but show an Increasing trends in deep well AP-8063 and intermediate well AP-5589. These changes indicate that the contaminant load is decreasing and that the center of the contaminant mass is potentially moving downward and away from the Landfill.

In general, degradation of PCA and TCE appears to be occurring based on increases of cis-1,2-DCE concentrations relative to parent (PCA and TCE) concentrations with distance away from the Landfill source as further discussed below.

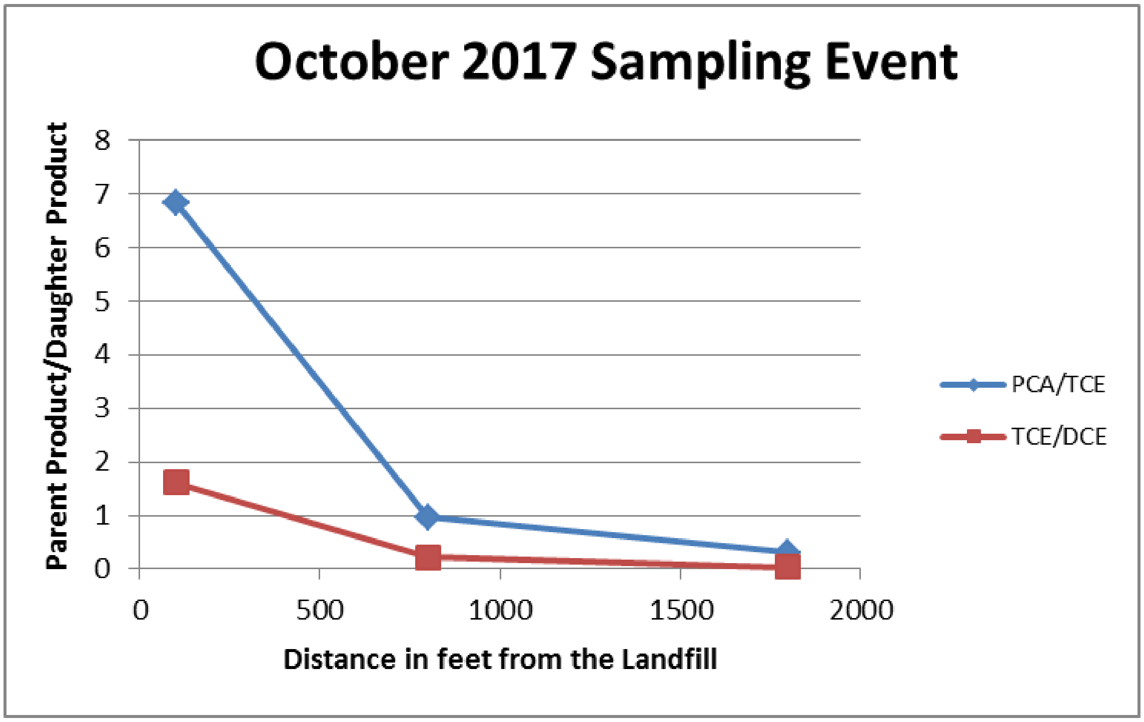
The highest concentrations of PCA, TCE, and cis-1,2-DCE are detected in well AP-5588 (located immediately downgradient of the inactive portion of the Landfill), and PCA concentrations have historically been one order of magnitude greater than TCE concentrations in this well. It is unknown whether TCE or cis-1,2-DCE are present in groundwater primarily due to a release at the site or if they were formed through reductive dechlorination of PCA. In part this is due to not having true source area wells, since it is not practical to install wells within the Landfill cap. Therefore, wells are located at varying distances downgradient of the Landfill.

Although the concentrations of all contaminants decrease with distance from the Landfill, as would be expected through natural attenuation and dilution, the ratios of parent to daughter products (i.e., PCA/TCE and TCE/ cis-1,2-DCE) also show decreasing trends, as shown in Graphs 3-5 and 3-6. Graphs 3-5 and 3-6 depict the ratios of parent to daughter products during July 2016 and October 2017 sampling events, respectively, along the southwesterly flow path encompassing wells AP-5588, AP-8063, and AP-6535 (as shown on cross-section Figure 3-12). These decreasing ratios indicate that parent product concentrations are decreasing at a faster rate than daughter product concentrations with distance from the source area, suggesting that dechlorination is occurring.

**Graph 3-5. Parent to Daughter Product Ratios with Distance from the Landfill (July 2016)**



**Graph 3-6. Parent to Daughter Product Ratios with Distance from the Landfill (October 2017)**



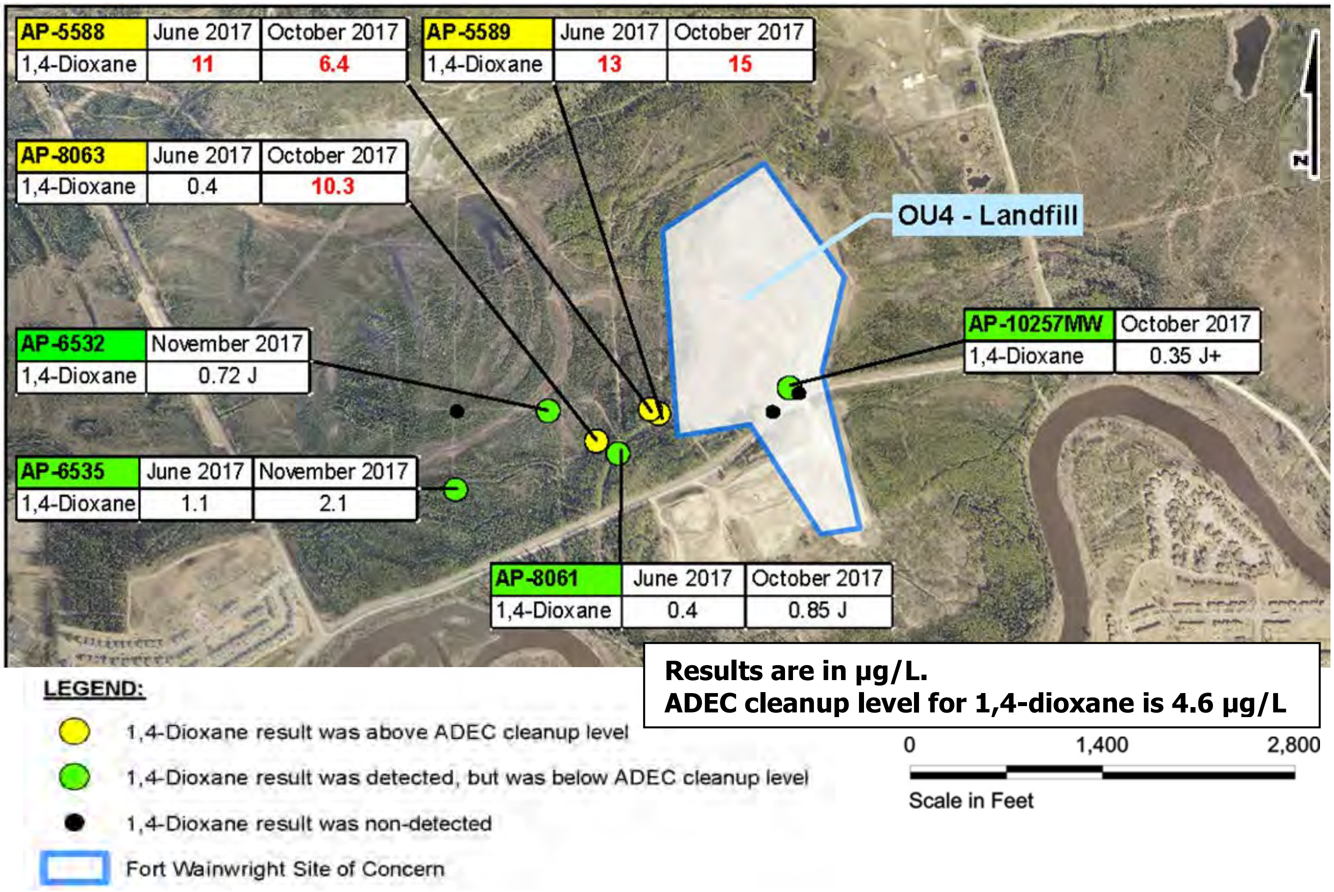
## 3.3 Evaluation of Potential 1,4-Dioxane Contamination

In addition to the evaluation of ROD COCs at the OU4 Landfill, 1,4-dioxane analysis was included in the 2017 monitoring program based on recommendations from the Fourth Five-Year Review prepared in 2016 (USARAK, 2016). 1,4-Dioxane analysis was not included in previous investigations. EPA classifies 1,4-dioxane as an emerging contaminant due to its classification as a possible carcinogen, it is highly mobile and water soluble, and it does not biodegrade in the environment. It is included in the Unregulated Contaminant Monitoring Rule (UCMR3), but a MCL for drinking water has not yet been established. EPA has issued a health-based advisory level of 0.35 µg/L for drinking water and ADEC has established a cleanup level of 4.6 µg/L.

1,4-Dioxane is a synthetic industrial chemical and was primarily used as a stabilizer for chlorinated solvents (particularly 1,1,1-TCA). 1,4-Dioxane is also found in numerous products, such as paint strippers, greases, waxes, dyes, varnishes, and various consumer products (e.g. deodorant, shampoos, and cosmetics), and is present in antifreeze and aircraft deicing fluids. Because of its widespread use as a chlorinated solvent stabilizer, 1,4-dioxane is commonly found at sites that have chlorinated solvent contaminant plumes in groundwater.

1,4-Dioxane analysis was conducted on samples collected from eight wells during the spring and 10 wells during the fall 2017 sampling events. 1,4-Dioxane exceeded the ADEC cleanup level in two wells during the spring and three wells in the fall; and was also detected below the ADEC cleanup level in two wells in the spring and four wells in the fall. 1,4 Dioxane concentrations were highest in wells where the highest concentrations of ROD COCs are also detected. 1,4-Dioxane was detected in all but one well downgradient of the landfill cap, including the farthest downgradient well, AP-6535, where it was detected at a concentration below the ADEC cleanup level. 1,4 Dioxane results are shown on the following Figure:

**Figure 3-13 1,4-Dioxane Detections in OU4 Landfill Wells**



## Table 3-1 Groundwater Elevations Measured in 2017

| Well Number | Total Depth (below TOC) | Screened Interval (feet bgs) | Relative Depth | TOC Elevations | Depth to Water from TOC June 2017 | Groundwater Elevation June 2017 | Depth to Water from TOC October/November 2017 | Groundwater Elevation October/November 2017 |
|---|---|---|---|---|---|---|---|---|
| FWLF-4 | 25.10 | 13.5-23.5 | Shallow | 452.23 | 16.90 | 435.33 | 15.67 | 436.56 |
| AP-5588 | 29.05 | 7-27 | Shallow | 451.13 | 16.22 | 434.91 | 14.70 | 436.43 |
| AP-5589 | 56.41 | 47.5-57.5 | Intermediate | 452.13 | 17.23 | 434.90 | 15.70 | 436.43 |
| AP-8061 | 25.29 | 15-25 | Shallow | 444.13 | 9.33 | 434.80 | 7.71 | 436.42 |
| AP-8063 | 116.30 | 110-120 | Deep | 451.21 | 16.63 | 434.58 | 14.97 | 436.24 |
| AP-6532 | 173.65 | 170-177 | Deep | 451.17 | NM |  | 15.02 | 436.15 |
| AP-6530 | 136.24 | 136.2-142.2 | Deep | 450.06 | NM |  | 14.22 | 435.84 |
| AP-6535 | 90.75 | 87.1-93.1 | Deep | 448.09 | 14.25 | 433.84 | 12.59 | 435.50 |
| AP-10257MW | 24.45 | 11.5-21.5 | Shallow | 454.01 | 18.52 | 435.49 | 17.51 | 436.50 |
| AP-10258MW | 23.80 | 11-21 | Shallow | 453.54 | 18.08 | 435.46 | 17.03 | 436.51 |

Notes:

bgs - below ground surface
TOC - top of casing
NA - not available
NI - not installed

### Table 3-2 Landfill Analytical Results - Volatile and Semi-Volatile Organic Compounds

| Well Number | Sample ID | Sample Date | Survey Elevation | Water Level | Groundwater Elevation | Iron (II) (mg/L) | Sulfate (mg/L) | Methane (µg/L) | ROD Contaminants of Concern | | | | | | | NON-ROD COCs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Benzene (µg/L) | cis-1,2-DCE (µg/L) | 1,1,2,2-PCA (µg/L) | 1,1,2-Trichloro-ethane (µg/L) | TCE (µg/L) | Vinyl Chloride (µg/L) | bis(2-Ethylhexyl) phthalate (µg/L) | 1,4-Dioxane (µg/L) |
| | | **RAOs in µg/L** | | | | **NA** | **NA** | **NA** | **5** | **70** | **4.3** | **5** | **5** | **2** | **6** | **4.6 [2]** |
| FWLF-4 | 15FWOU401WG | 4/7/2015 | 452.23 | 17.93 | 434.3 | 28 | 50 | 120 | 0.88 J | 0.29 J | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | **9.5** | NA |
| | 16FWOU404WG | 7/11/2016 | 452.23 | 15.90 | 436.33 | 26.4 | 56.9 | 43 | 1.9 | 0.62 | ND(0.2) | ND(0.4) | ND(0.1) | ND(0.1) | ND(1.9) | NA |
| | 17FWOU401WG | 6/26/2017 | 452.23 | 16.90 | 435.33 | 28.4 | 33.5 | NA | 3.3 | 1 | ND(0.2) | ND(0.4) | ND(0.50) | ND(0.50) | 0.32 J,B | ND(0.02) |
| | 17FWOU414WG | 10/30/2017 | 452.23 | 15.67 | 436.56 | 26.2 | 35.3 | NA | 1.6 | 0.78 J | ND(0.25) | ND(0.2) | ND(0.50) | ND(0.075) | ND(0.97) | ND(0.5) |
| AP-5588 | 15FWOU407WG | 4/7/2015 | 451.13 | 17.00 | 434.13 | 37 | 190 | 1,800 | 1.8 | **180 J** | **1300 J** | **10** | **320** | 0.87 J | 1.2 J | NA |
| | 16FWOU411WG | 7/12/2016 | 451.13 | 14.87 | 436.26 | 42 | 211 | 430 | 2.2 J | **160** | **1,400** | **5.8** | **210** | 0.95 J | ND(2.0) | NA |
| | 17FWOU408WG | 6/26/2017 | 451.13 | 16.22 | 434.91 | 41.8 | 242 | NA | 1.5 J | **140** | **1,600** | **6.5** | **250** | 0.70 J | ND(1.0) | **9.9** |
| | 17FWOU409WG[1] | | | | | 41.6 | 246 | NA | 1.6 J | **150** | **1,800 J-** | **6.9** | **270** | 0.08 J | ND(1.0) | **11** |
| | 17FWOU416WG | 10/31/2017 | 451.13 | 14.70 | 436.43 | 30.9 | 146 | NA | 0.7 | 66.6 J- | **696** | 3.28 | **107** | ND(0.075) | ND(0.98) | **6.4** |
| | 17FWOU417WG[1] | | | | | 30.2 | 146 | NA | 0.71 | 66.7 J- | **732** | 3.17 | **107** | ND(0.075) | ND(1.0) | **6.1 J+** |
| AP-5589 | 15FWOU409WG | 4/7/2015 | 452.13 | 17.98 | 434.15 | 50 | 120 | 3,400 | 3.3 | 14 | 2 | ND(0.50) | 4.6 | 1.1 | ND(1.9) | NA |
| | 16FWOU408WG | 7/12/2016 | 452.13 | 15.85 | 436.28 | 50.2 | 137 | 740 | 3.9 | 19 | **5.9** | ND(0.4) | 4.9 | 1.1 | ND(1.9) | NA |
| | 16FWOU417WG | 10/18/2016 | 452.13 | 16.00 | 436.13 | 49.2 | 133 | 610 | 4 | 20 J+ | 2.7 J+ | ND(0.4) | **5.1** | 1.3 | ND(1.9) | NA |
| | 17FWOU407WG | 6/26/2017 | 452.13 | 17.23 | 434.90 | 50 | 141 | NA | 4 | 23 | 0.34 J | ND(0.4) | **5.3** | 1.1 | 0.20 J,B | **13** |
| | 17FWOU418WG | 10/31/2017 | 452.13 | 15.70 | 436.43 | 48.2 | 145 | NA | 3.24 | 18.9 | 1.02 | ND(0.20) | 3.68 | ND(0.075) | ND(0.97) | **15.4** |
| AP-8061 | 15FWOU405WG | 4/7/2015 | 444.13 | 10.07 | 434.06 | 34 | 33 | 440 | 3.9 | 8.9 | ND(0.50) | ND(0.50) | 4.5 | ND(0.50) | ND(1.9) | NA |
| | 15FWOU418WG | 11/6/2015 | 444.13 | 7.71 | 436.42 | 30 | 40 | 630 | **5.4** | 9.7 | ND(0.50) | ND(0.50) | **7** | ND(0.50) | ND(2.1) | NA |
| | 16FWOU405WG | 7/11/2016 | 444.13 | 7.87 | 436.26 | 29.8 | 37.5 | 92 | 3.5 | 8.2 | ND(0.2) | ND(0.4) | 4.4 | 0.16 J | ND(1.9) | NA |
| | 17FWOU406WG | 6/26/2017 | 444.13 | 9.33 | 434.80 | 12.9 | 35.9 | NA | 1.9 | 7.6 | ND(0.2) | ND(0.4) | 3.7 | 0.13 J | ND(1.0) | 0.4 |
| | 17FWOU415WG | 10/30/2017 | 444.13 | 7.71 | 436.42 | 31.3 | 48.8 | NA | 2.07 | 8.66 | ND(0.25) | ND(0.20) | 3.39 | ND(0.075) | ND(0.96) | 0.85 J |
| AP-6532 | 15FWOU402WG | 4/7/2015 | 451.17 | 17.46 | 433.71 | 28 | 2.3 | 3,600 | **11** | 2.4 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | **20** | NA |
| | 15FWOU424WG | 11/9/2015 | 451.17 | 14.92 | 436.25 | 27 | 3.4 | 1,500 | **11** | 2.8 | ND(0.50) | ND(0.50) | ND(1) | 0.25 J | **19** | NA |
| | 16FWOU409WG | 7/12/2016 | 451.17 | 14.98 | 436.19 | 28.9 | 4.9 | 1,200 | **13** | 3 | ND(0.2) | ND(0.4) | ND(0.1) | 0.2 J | **10 J** | NA |
| | 16FWOU410WG[1] | | | | | 30.3 | 5 | 1,300 | **13** | 3.1 | ND(0.2) | ND(0.4) | ND(0.1) | 0.22 J | **23 J** | NA |
| | 16FWOU415WG | 10/17/2016 | 451.17 | 15.72 | 435.45 | 27.5 | 5.1 | 1,400 | **13** | 3 J+ | ND(0.2) | ND(0.4) | ND(0.1) | 0.26 J | 4.4 J | NA |
| | 17FWOU420WG | 11/1/2017 | 451.17 | 15.02 | 436.15 | 26.6 | 7.16 | NA | **9** | 2.48 | ND(0.25) | ND(0.20) | ND(0.5) | ND(0.075) | ND(0.95) | 0.72 J |
| AP-8063 | 15FWOU411WG | 4/8/2015 | 451.21 | 17.33 | 433.88 | 23 | 4.6 | 2,100 J | ND(1) | 4.5 | ND(0.50) | ND(0.50) | 0.78 J | ND(0.50) | 2.8 J | NA |
| | 15FWOU412WG[1] | | | | | 24 | 4.3 | 1,500 | ND(1) | 4.6 | ND(0.50) | ND(0.50) | 0.72 J | ND(0.50) | 5.7 | NA |
| | 16FWOU412WG | 7/12/2016 | 451.21 | 15.04 | 436.17 | 57.9 | 126 | 520 | 2.1 | **110** | **21** | 0.53 | **24** | 1.3 | ND(1.9) | NA |
| | 16FWOU419WG | 10/18/2016 | 451.21 | 15.43 | 435.78 | 53.1 | 131 | 650 | 2.4 | **110 J+** | **34 J,J+** | 0.71 | **29** | 1.3 | ND(2.4) | NA |
| | 16FWOU420WG[1] | | | | | 53.4 | 137 | 680 | 2.2 | **93 J+** | **25 J,J+** | 0.58 | **25** | 1.3 | ND(2.4) | NA |
| | 17FWOU405WG | 6/26/2017 | 451.21 | 16.63 | 434.58 | 20.9 | 32.6 | NA | 0.19 J,B | 2.4 | ND(0.50) | ND(0.50) | 0.22 J | 0.090 J | 0.16 J,B | 0.4 |
| | 17FWOU419WG | 10/31/2017 | 451.21 | 14.97 | 436.24 | 50 | 133 | NA | 1.74 | **101** | **21.2** | 0.73 | **22** | ND(0.075) | ND(0.99) | **10.3** |
| AP-6530 | 15FWOU406WG | 4/7/2015 | 450.06 | 16.7 | 433.36 | 24 | 21 | 330 | 3 | 0.62 J | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | ND(2.2) | NA |
| | 15FWOU422WG | 11/6/2015 | 450.06 | 14.02 | 436.04 | 20 | 16 | 120 | 1.9 | 0.26 J | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | 3.5 | NA |
| | 16FWOU406WG | 7/12/2016 | 450.06 | 14.13 | 435.93 | 20.4 | 11.6 | 15 | 1.7 | 0.18 J | ND(0.2) | ND(0.4) | ND(0.1) | ND(0.1) | ND(1.9) | NA |
| | 16FWOU416WG | 10/17/2016 | 450.06 | 14.93 | 435.13 | 19 | 9.5 | 9.9 | 1.3 | 0.15 J,J+ | ND(0.2) | ND(0.4) | ND(0.1) | ND(0.1) | ND(1.9) | NA |
| | 17FWOU421WG | 11/1/2017 | 450.06 | 14.22 | 435.84 | 19.3 | 10.5 | NA | 0.45 | ND(0.50) | ND(0.25) | ND(0.20) | ND(0.5) | ND(0.075) | ND(0.95) | ND(0.5) |
| AP-6535 | 15FWOU404WG | 4/7/2015 | 448.09 | 14.95 | 433.14 | 28 | 13 | 1,100 | 3 | 31 | ND(0.50) | ND(0.50) | 0.55 J | 1 | ND(2.3) | NA |
| | 15FWOU425WG | 11/9/2015 | 448.09 | 12.35 | 435.74 | 29 | 18 | 1,600 | 3.4 | 33 J | ND(0.50) | ND(0.50) | 0.6 J | ND(0.5) | ND(2) | NA |
| | 15FWOU426WG[1] | | | | | 30 | 18 | 1,300 | 3.4 | 33 | ND(0.50) | ND(0.50) | 0.59 J | ND(0.5) | ND(2.1) | NA |
| | 16FWOU407WG | 7/12/2016 | 448.09 | 12.41 | 435.68 | 27.8 | 18.4 | 220 | 3.4 | 35 | ND(0.20) | ND(0.40) | 0.87 | 1.2 | ND(2) | NA |
| | 16FWOU418WG | 10/18/2016 | 448.09 | 13.22 | 434.87 | 24.2 | 17.5 | 240 | 2.9 | 28 | ND(0.20) | ND(0.40) | 0.66 | 1.1 | ND(2) | NA |
| | 17FWOU404WG | 6/26/2017 | 448.09 | 14.25 | 433.84 | 27.9 | 19.3 | NA | 3.8 | 37 | ND(0.20) | ND(0.40) | 1 | 1.1 | 0.29 J,B | 1.1 |
| | 17FWOU422WG | 11/1/2017 | 448.09 | 12.59 | 435.50 | 29.1 | 22.7 | NA | 2.74 | 30.1 | ND(0.25) | ND(0.20) | 0.82 J | ND(0.075) | ND(0.95) | 2.1 |
| AP-10257 | 15FWOU413WG | 4/8/2015 | 454.01 | 19.65 | 434.36 | 2.4 | 22 | 2,300 J | **14** | 3.1 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | 2.1 J | NA |
| | 15FWOU414WG[1] | | | | | 2.5 | 23 | 2,500 | **14** | 3.3 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | 4.1 | NA |
| | 15FWOU420WG | 11/6/2015 | 454.01 | 17.25 | 436.76 | ND(0.36) | 270 | 2,700 | **7.4** | 3.1 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | ND(2.1) | NA |
| | 15FWOU421WG[1] | | | | | ND(0.36) | 270 | 2,300 | **5.3** | 1.9 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | **14** | NA |
| | 16FWOU401WG | 7/11/2016 | 454.01 | 17.73 | 436.28 | 8.13 | 3.4 | 1,400 | **29** | 6.6 | ND(0.20) | ND(0.4) | 0.15 J | 0.12 J | ND(1.9) | NA |
| | 16FWOU402WG[1] | | | | | 8.04 | 3.4 | 1,500 | **28** | 6.6 | ND(0.20) J- | ND(0.4) | 0.14 J | 0.12 J | ND(1.9) | NA |
| | 16FWOU422WG | 10/18/2016 | 454.01 | 17.31 | 436.70 | 3.22 | 127 | 620 | **7.3** | 3.3 J+ | ND(0.20) | ND(0.4) | ND(0.1) | 0.1 J | ND(2) | NA |
| | 17FWOU403WG | 6/26/2017 | 454.01 | 18.52 | 435.49 | 14.6 | 19.6 | NA | **14** | 3.8 | ND(0.20) J- | ND(0.4) | 0.11 J | 0.080 J | 2.8 | ND(0.02) |
| | 17FWOU412WG | 10/30/2017 | 454.01 | 17.51 | 436.50 | 28.8 | 0.942 | NA | **23.1** | 4.43 | ND(0.25) | ND(0.20) | ND(0.5) | ND(0.075) | ND(1.0) | 0.35 J,J+ |
| AP-10258 | 15FWOU408WG | 4/8/2015 | 453.54 | 19.15 | 434.39 | ND(0.36) | 110 | 480 | 4.9 | 3.5 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | ND(1.9) | NA |
| | 15FWOU419WG | 11/6/2015 | 453.54 | 16.77 | 436.77 | ND(0.36) | 120 | 680 | 3.4 | 2.9 | ND(0.50) | ND(0.50) | ND(1) | ND(0.50) | ND(2.0) | NA |
| | 16FWOU403WG | 7/11/2016 | 453.54 | 17.24 | 436.30 | 1.84 | 90.5 | 360 | **6.3** | 4.4 | ND(0.20) | ND(0.4) | 0.11 J | ND(0.1) | ND(1.9) | NA |
| | 16FWOU421WG | 10/18/2016 | 453.54 | 16.86 | 436.68 | 0.255 | 161 | 430 | **6** | 3.3 J+ | ND(0.20) | ND(0.4) | ND(0.1) | ND(0.1) | ND(1.9) | NA |
| | 17FWOU402WG | 6/26/2017 | 453.54 | 18.08 | 435.46 | 0.262 | 110 | NA | 4.9 | 3.3 | ND(0.20) | ND(0.4) | ND(0.20) | ND(0.1) | 0.98 B | ND(0.02) |
| | 17FWOU413WG | 10/30/2017 | 453.54 | 17.03 | 436.51 | 15.7 | 58.9 | NA | 3.73 | 4.04 | ND(0.25) | ND(0.20) | ND(0.50) | ND(0.075) | ND(0.99) | ND(0.5) |

Notes:

**Results in bold and yellow shading denote concentrations above the RAOs established in the ROD (USARAK, 1996)**

**Results in bold and green shading denote concentrations above the ADEC cleanup level**

[1] Sample is a field duplicate of the sample immediately above.

[2] 1,4-Dioxane cleanup level established in 18 AAC 75.345, Table C (revised as of November 7, 2017)

B - analyte was detected in a blank at a similar concentration and may be due to cross-contamination

DCE - cis-1,2-dichloroethene

J - result qualified as estimate because it is less than the LOQ, or because of a QC failure.

µg/L - micrograms per liter

J+ - result qualified as high-baised estimate because of a QC failure

ND - not detected at the detection limit (LOD in parentheses for 2012 results.  LOQ in parentheses for data prior to 2012.)

PCA - 1,1,2,2-tetrachloroethane

Q - result considered an estimate (L-low; H-high) due to a quality control failure

RAO - remedial action objectives

TCE - trichloroethene

**Table 3-3 Landfill Analytical Results - Trace Metals**

| Well Number | Sample ID | Sample Date | Antimony (µg/L) | Arsenic (µg/L) | Barium (µg/L) | Beryllium (µg/L) | Cadmium (µg/L) | Chromium (µg/L) | Cobalt (µg/L) | Copper (µg/L) | Lead (µg/L) | Nickel (µg/L) | Selenium (µg/L) | Silver (µg/L) | Thallium (µg/L) | Vanadium (µg/L) | Zinc (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2016 CULs in µg/L** | | | **6** | **10** | **2,000** | **4** | **5** | **100** | **NA** | **1,000** | **15** | **100** | **50** | **180** | **2** | **260** | **5,000** |
| *2017 CULs in µg/L* | | | *7.8* | *0.52* | *3,800* | *25* | *9.2* | *NA* | *NA* | *800* | *15* | *390* | *100* | *94* | *0.2* | *86* | *6,000* |
| FWLF-4 | 15FWOU401WG | 4/7/2015 | ND(1) | **5.7** | 360 | ND(1.3) | ND(0.3) | ND(1.5) | 6.1 | 4.9 J | ND(0.5) | 6.7 J | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 16FWOU404WG | 7/11/2016 | 0.053 | **6.6** | 324 | ND(0.02) | 0.034 | 0.38 | 3.7 | 0.46 | 0.038 | 4.41 | 0.4 J | ND(0.01) | ND(0.005) | 0.66 | 2.3 |
| | 17FWOU401WG | 6/26/2017 | 0.042 J | **15.8** | 403 | 0.005 J | 0.024 | 0.62 | 4.63 | 0.17 B | 0.05 | 4.65 | 0.2 J | ND(0.02) | ND(0.02) | 1.31 | 1.64 B |
| | 17FWOU414WG | 10/30/2017 | ND(1.5) | **11.2** | 363 | ND(0.5) | ND(1) | ND(2) | 4.56 | ND(3) | ND(0.5) | 6.06 | ND(10) | ND(1) | ND(1) | ND(10) | ND(12.5) |
| AP-5588 | 15FWOU407WG | 4/7/2015 | ND(1) | **18** | 460 | ND(1.3) | ND(0.3) | 1.1 J | 2.4 | ND(7.5) | ND(0.5) | 3.9 J | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 16FWOU411WG | 7/12/2016 | 0.072 | **12.4** | 500 | 0.012 J | 0.007 J | 0.88 | 1.42 | 0.52 | 0.012 J | 4.5 | 1 J | ND(0.01) | ND(0.005) | 2.33 | 0.9 |
| | 17FWOU408WG | 6/26/2017 | 0.08 J+ | **14** | 575 | 0.013 J | 0.013 J | 0.98 | 3.94 | 0.21 B | 0.018 J | 4.59 | 0.3 J | 0.002 J,B | ND(0.02) | 2.64 J+ | 1.03 B |
| | 17FWOU409WG[1] | | 0.071 J+ | **13.6** | 561 | 0.012] J | ND(0.02) | 1.02 | 3.81 | 0.24 B | 0.02 | 4.44 | 0.3 4 J | 0.004 4 J,B | ND [0.02] | 2.66 J+ | 1.11 B |
| | 17FWOU416WG | 10/31/2017 | ND(1.5) | **10.9** | 400 | ND(0.5) | ND(1) | ND(2) | 3.84 | ND(3) | ND(0.5) | 8.26 | ND(10) | ND(1) | ND(1) | ND(10) | ND(12.5) |
| | 17FWOU417WG[1] | | ND(1.5) | **12** | 391 | ND(0.5) | ND(1) | ND(2) | 3.62 | ND(3) | ND(0.5) | 8.46 | ND(10) | ND(1) | ND(1) | ND(10) | ND(12.5) |
| AP-5589 | 15FWOU409WG | 4/7/2015 | ND(1) | ND(4) | 640 | ND(1.3) | ND(0.3) | 1.5 J | 0.21 J | ND(7.5) | 0.49 J | ND(5) | ND(4) | ND(0.35) | ND(2.5) | 5.2 J | ND(20) |
| | 16FWOU408WG | 7/12/2016 | 0.066 | **0.9** | 606 | 0.022 | ND(0.02) | 1.27 | 0.244 | 0.42 | 0.055 | 1.24 | 0.6 J | ND(0.01) | ND(0.005) | 3.87 | 1.4 |
| | 16FWOU417WG | 10/18/2016 | 0.111 B | **0.92** | 619 | 0.037 | 0.011 B | 1.73 B | 0.157 B | 1.14 | 0.065 B | 0.73 B | ND(1) | ND(0.01) | 0.003 J | 5.02 | 1.56 B |
| | 17FWOU407WG | 6/26/2017 | 0.088 | **0.85** | 737 | 0.98 | ND(0.02) | 1.69 | 0.368 | 48.8 | 0.058 | 1.12 | 0.2 J | ND(0.02) | ND(0.02) | 5.34 | 217 |
| | 17FWOU418WG | 10/31/2017 | ND(1.5) | ND(2.5) | 637 | ND(0.5) | ND(1) | ND(2) | ND(0.5) | ND(3) | ND(0.5) | 2.84 | ND(10) | ND(1) | ND(1) | ND(10) | ND(12.5) |
| AP-8061 | 15FWOU405WG | 4/7/2015 | ND(1) | **8.8** | 590 | ND(1.3) | ND(0.3) | ND(1.5) | ND(0.6) | ND(7.5) | ND(0.5) | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 15FWOU418WG | 11/6/2015 | ND(1) | **9.6** | 590 | ND(1.3) | ND(0.3) | 1.1 | ND(0.6) | ND(7.5) | ND(0.5) | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 16FWOU405WG | 7/11/2016 | 0.081 | **10.4** | 575 | 0.018 J | ND(0.02) | 0.79 | 0.207 | 1.21 | 0.103 | 0.69 | ND(1) | ND(0.01) | ND(0.005) | 2.75 | 0.7 |
| | 17FWOU406WG | 6/26/2017 | 0.143 | **4.75** | 416 | 0.013 J | 0.012 J | 0.5 | 0.496 | 1.17 B | 0.15 | 1.91 | ND(1) | 0.002 J,B | ND(0.02) | 1.7 | 1.19 B |
| | 17FWOU415WG | 10/30/2017 | ND(1.5) | **10.8** | 594 | ND(0.5) | ND(1) | ND(2) | 0.34 J | 4.33 J | 0.772 J,B | 2.54 | ND(10) | ND(1) | ND(1) | ND(10) | ND(12.5) |
| AP-6532 | 15FWOU402WG | 4/7/2015 | 0.93 JB | **14** | 250 | ND(1.3) | ND(0.3) | 3.9 | 0.37 J | 6.4 J | 1.3 J | 8.6 J | ND(4) | ND(0.35) | ND(2.5) | 5.7 J | 35 |
| | 15FWOU424WG | 11/9/2015 | 1 | ND(4) | 240 | ND(1.3) | 0.21 J | 1.7 J | 0.34 J | ND(7.5) | 1.6 J | 2.4 J | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 17 J |
| | 16FWOU409WG | 7/12/2016 | 1.45 | **1.1** | 251 | 0.037 | 0.017 J | 2.67 | 0.247 | 5.14 | 2.09 | 2.51 J- | ND(1) | ND(0.01) | ND(0.005) | 3.19 | 24.6 |
| | 16FWOU410WG | | 1.31 | **1.1** | 253 | 0.03 | 0.011 J | 2.54 | 0.211 | 4.6 | 1.94 | 1.98 J- | ND(1) | ND(0.01) | ND(0.005) | 3.29 | 21 |
| | 16FWOU415WG | 10/17/2016 | 0.797 B | **0.98** | 241 | 0.037 | 0.009 J,B | 9.6 | 0.303 | 3.2 | 1.04 | 5.03 | ND(1) | ND(0.01) | ND(0.01) | 3.69 | 12.1 |
| | 17FWOU420WG | 11/1/2017 | ND(1.5) | ND(2.5) | 240 | ND(0.5) | ND(1) | ND(2) | ND(0.5) | ND(3) | 0.417 J,B | 1.62 J | ND(10) | ND(1) | ND(1) | ND(10) | 8.88 J |
| AP-8063 | 15FWOU411WG | 4/8/2015 | 0.63 J | **4.3 J** | 140 | ND(1.3) | ND(0.3) | 4.6 | 1.0 J | 5.9 J | 3.7 | 3.7 J | ND(4) | ND(0.35) | ND(2.5) | 7.9 J | 38 |
| | 15FWOU412WG[1] | | 0.55 J | **4.2 J** | 140 | ND(1.3) | 0.22 J | 5.4 | 0.98 J | 5.7 J | 3.7 | 4.2 | ND(4) | ND(0.35) | ND(2.5) | 8.5 J | 41 |
| | 16FWOU412WG | 7/12/2016 | 0.2 | **2.5** | 677 | 0.028 | 0.019 J | 1.61 | 0.393 | 1.51 | 1.06 | 1.75 | 0.6 J | ND(0.01) | ND(0.005) | 2.38 | 39.7 |
| | 16FWOU419WG | 10/18/2016 | 0.118 | **2.57** | 713 | 0.021 | 0.02 J | 1.16 | 0.135 | 0.25 | 0.12 | 0.91 | ND(1) | ND(0.01) | 0.007 J | 2.6 | 86.6 |
| | 16FWOU420WG | | 0.106 | **2.77** | 748 | 0.025 | ND(0.01) | 1.09 | 0.131 | 0.25 | 0.119 | 0.8 | ND(1) | ND(0.01) | ND(0.01) | 2.54 | 82.9 |
| | 17FWOU405WG | 6/26/2017 | 0.06 | **2.53** | 277 | 0.017 J | ND(0.02) | 0.92 | 0.086 | 0.28 B | 0.145 | 0.43 B | ND(1) | 0.003 J,B | ND(0.02) | 1.74 | 21.6 |
| | 17FWOU419WG | 10/31/2017 | ND(1.5) | **1.57 J** | 594 | ND(0.5) | ND(1) | ND(2) | ND(0.5) | ND(3) | 0.376 J | 2.28 | ND(10) | ND(1) | ND(1) | ND(10) | 32 |
| AP-6530 | 15FWOU406WG | 4/7/2015 | ND(1) | **4.3 J** | 330 | ND(1.3) | ND(0.3) | ND(1.5) | ND(0.6) | ND(7.5) | ND(0.5) | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 15FWOU422WG | 11/6/2015 | ND(1) | **4.8 J** | 320 | ND(1.3) | ND(0.3) | 0.76 J | ND(0.6) | ND(7.5) | ND(0.5) | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 16FWOU406WG | 7/12/2016 | 0.109 | **4.8** | 315 | 0.023 | 0.019 J | 0.78 | 0.126 | 2.4 | 0.584 | 0.51 | ND(1) | ND(0.01) | ND(0.005) | 1.92 | 7.5 |
| | 16FWOU416WG | 10/17/2016 | 0.026 J,B | **4.86** | 326 | 0.017 J | ND(0.01) | 0.5 B | 0.057 B | 0.22 B | 0.06 B | 0.13 J,B | ND(1) | ND(0.01) | ND(0.01) | 2.01 | 1.1 B |
| | 17FWOU421WG | 11/1/2017 | ND(1.5) | **5.47** | 303 | ND(0.5) | ND(1) | ND(2) | ND(0.5) | ND(3) | ND(0.5) | 1.17 J | ND(10) | ND(1) | ND(1) | ND(10) | 10.4 J |
| AP-6535 | 15FWOU404WG | 4/7/2015 | 0.43 J | **2.7** | 330 | ND(1.3) | ND(0.3) | 1.8 J | 0.2 J | 5.6 J | 0.87 J | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 9.8 J |
| | 15FWOU425WG | 11/9/2015 | ND(1) | **2.4 J** | 270 | ND(1.3) | 0.27 J | 1.6 J | ND(0.6) | ND(7.5) | 0.52 J | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 15FWOU426WG[1] | | ND(1) | **2.2 J** | 270 | ND(1.3) | ND(0.3) | 1.3 J | ND(0.6) | ND(7.5) | 0.39 J | ND(5) | ND(4) | ND(0.35) | ND(2.5) | ND(10) | ND(20) |
| | 16FWOU407WG | 7/12/2016 | 0.557 | **3.9** | 283 | 0.084 | 0.106 | 6.5 | 0.642 | 30.2 | 3.99 | 2.25 | ND(1) | 0.012 B | ND(0.005) | 5.63 | 36.7 |
| | 16FWOU418WG | 10/18/2016 | 0.391 B | **3.36** | 268 | 0.05 | 0.047 | 2.84 B | 0.297 | 10 | 1.37 | 0.99 B | ND(1) | 0.009 J | 0.004 J | 3.98 | 13.2 |
| | 17FWOU404WG | 6/26/2017 | 0.288 | **2.3** | 303 | 0.028 | 0.015 J | 1.31 | 0.168 | 2.43 B | 0.38 | 0.45 B | ND(1) | 0.002 J,B | ND(0.02) | 2.89 | 4.31 |
| | 17FWOU422WG | 11/1/2017 | ND(1.5) | **2.91** | 277 | ND(0.5) | ND(1) | ND(2) | ND(0.5) | 2.52 J | 1.05 B | 1.23 J | ND(10) | ND(1) | ND(1) | ND(10) | 13.6 J |

**Table 3-3 Landfill Analytical Results - Trace Metals**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP-10257 | 15FWOU413WG | 4/8/2015 | 1.3 J | **1.5 J** | 160 | ND(1.3) | 0.32 J | 2.2 | 22 | 9.9 J | 0.19 J | 60 | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 30 J |
| | 15FWOU414WG[1] | | 1.1 J | **1.6 J** | 170 | ND(1.3) | 0.38 J | 2 | 23 | 8.1 J | ND(0.5) | 66 | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 35 |
| | 15FWOU420WG | 11/6/2015 | 1.9 J | ND(4) | 200 | ND(1.3) | 1.1 J | 1.2 J | 26 | 15 | ND(0.5) | 77 | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 68 |
| | 15FWOU421WG[1] | | 1.8 J | ND(4) | 200 | ND(1.3) | 0.99 J | 1 J | 26 | 15 | ND(0.5) | 75 | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 68 |
| | 16FWOU401WG | 7/11/2016 | 0.433 | **1.6** | 387 | 0.023 | 0.432 | 1.39 | 20.1 | 3.74 | 0.091 | 71.3 | 0.9 J | 0.011 B | ND(0.005) | 2.73 | 50.7 |
| | 16FWOU402WG | | 0.456 | **1.5** | 388 | 0.019 J | 0.408 | 1.38 | 20 | 3.81 | 0.095 | 70 | 0.7 J | 0.009 J,B | ND(0.005) | 2.72 | 51 |
| | 16FWOU422WG | 10/18/2016 | 1.77 B | **2.96** | 254 | 0.029 | 0.68 | 1.72 B | 39.4 | 10.1 | 0.252 | 97.3 | 0.5 J | 0.034 | 0.037 | 3.53 | 34.4 |
| | 17FWOU403WG | 6/26/2017 | 0.812 | **16.2** | 255 | 0.046 | 0.429 | 2.79 | 25.4 | 6.57 | 0.567 | 79.1 | 0.7 J | 0.03 | 0.012 J | 9.78 | 36.3 |
| | 17FWOU412WG | 10/30/2017 | ND(1.5) | **20.6** | 227 | ND(0.5) | ND(1) | 1.59 J | 21.8 | 6.71 | ND(0.5) | 81.7 | ND(10) | ND(1) | ND(1) | 8.81 J | 34.3 |
| AP-10258 | 15FWOU408WG | 4/8/2015 | 1.9 J | ND(4) | 63 | ND(1.3) | 0.98 J | 1.4 J | 56 | 9.7 J | ND(0.5) | 210 | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 100 |
| | 15FWOU419WG | 11/6/2015 | 0.64 J | ND(4) | 91 | ND(1.3) | 1.1 J | ND(1.5) | 100 | 9.3 J | ND(0.5) | 240 | ND(4) | ND(0.35) | ND(2.5) | ND(10) | 180 |
| | 16FWOU403WG | 7/11/2016 | 1.1 | 0.4 J | 96.9 | 0.054 | 0.518 | 0.74 | 41.8 | 5.07 | 0.08 | 145 | ND(1) | ND(0.01) | ND(0.005) | 1.02 | 70.4 |
| | 16FWOU421WG | 10/18/2016 | 0.866 B | **1.17** | 63.9 B | 0.229 | 2.35 | 0.98 B | 172 | 13.2 | 0.448 | 338 | 0.8 J | 0.018 J,B | 0.034 | 2.07 | 298 |
| | 17FWOU402WG | 6/26/2017 | 0.783 | **0.64** | 70.9 | 0.09 | 1.45 | 0.88 | 116 | 9 | 0.263 | 273 | 0.4 J | 0.011 J,B | 0.045 | 1.51 | 174 |
| | 17FWOU413WG | 10/30/2017 | 1.08 J | ND(2.5) | 72.4 | ND(0.5) | ND(1) | 1.68 J | 59.2 | 6.34 | ND(0.5) | 180 | ND(10) | ND(1) | ND(1) | ND(10) | 86.5 |

Notes:

**Results in bold denote concentrations above groundwater cleanup levels established in Table C, 18 AAC 75.345 (ADEC, May 2016). Groundwater cleanup levels established in Table C, 18 AAC 75.345 after project inception are included for reference (ADEC, April 2017)**

[1] Sample is a field duplicate of the sample immediately above.

B - analyte was detected in a blank at a similar concentration and may be due to cross-contamination

J - result qualified as estimate because it is less than the LOQ, or because of a QC failure

J- - result qualified as a low-biased estimate because because of a QC failure

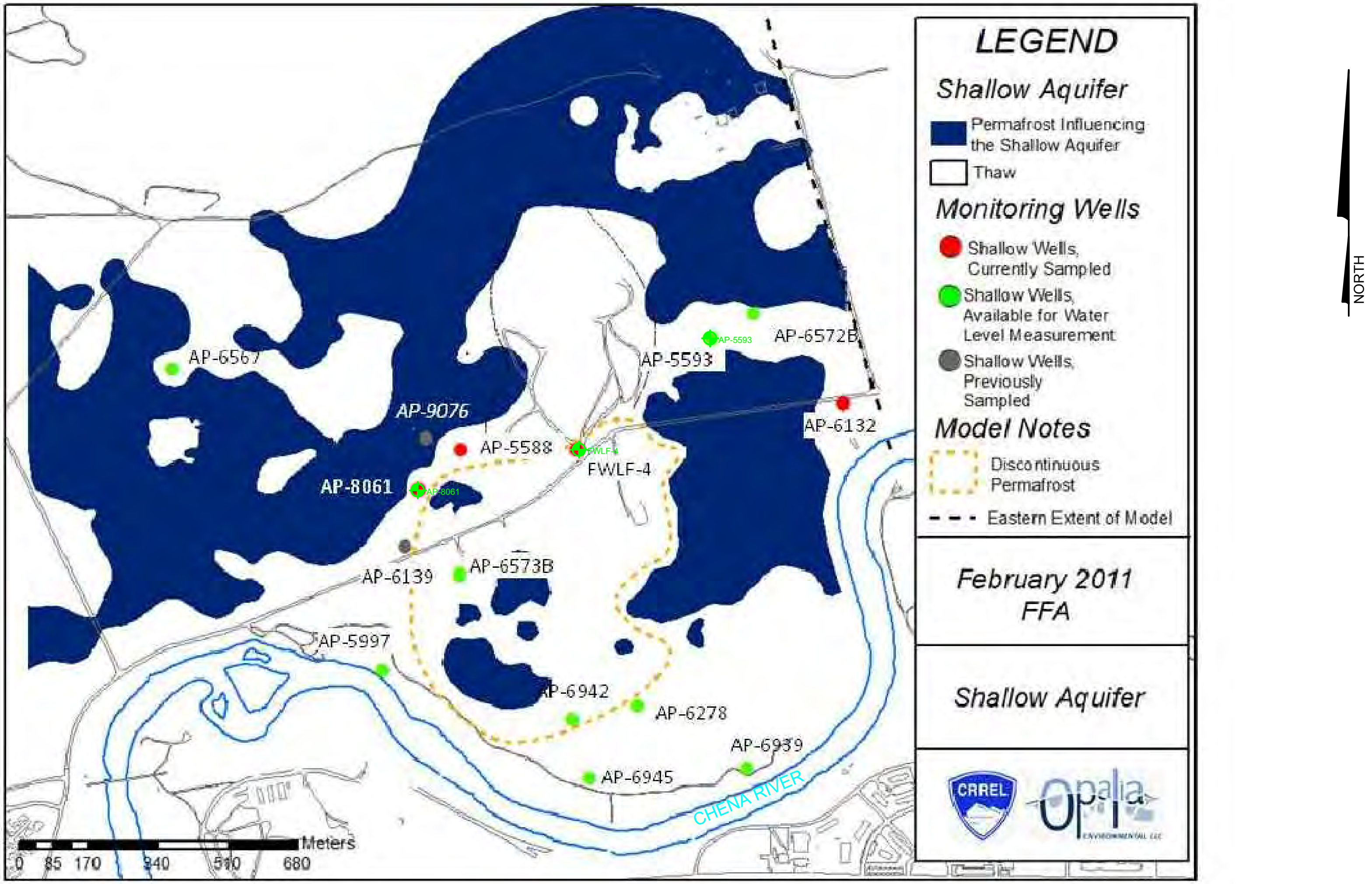
CUL - clean up level

µg/L - micrograms per liter

NA - not applicable or not analyzed

ND - not detected at the detection limit (LOD in parentheses for 2012 results. LOQ in parentheses for data prior to 2012.)

Q - result considered an estimate (L-low; H-high) due to a quality control failure



SOURCE:
CRREL AND OPALIA ENVIRONMENTAL INC, FFA MEETING FEBRUARY 2011

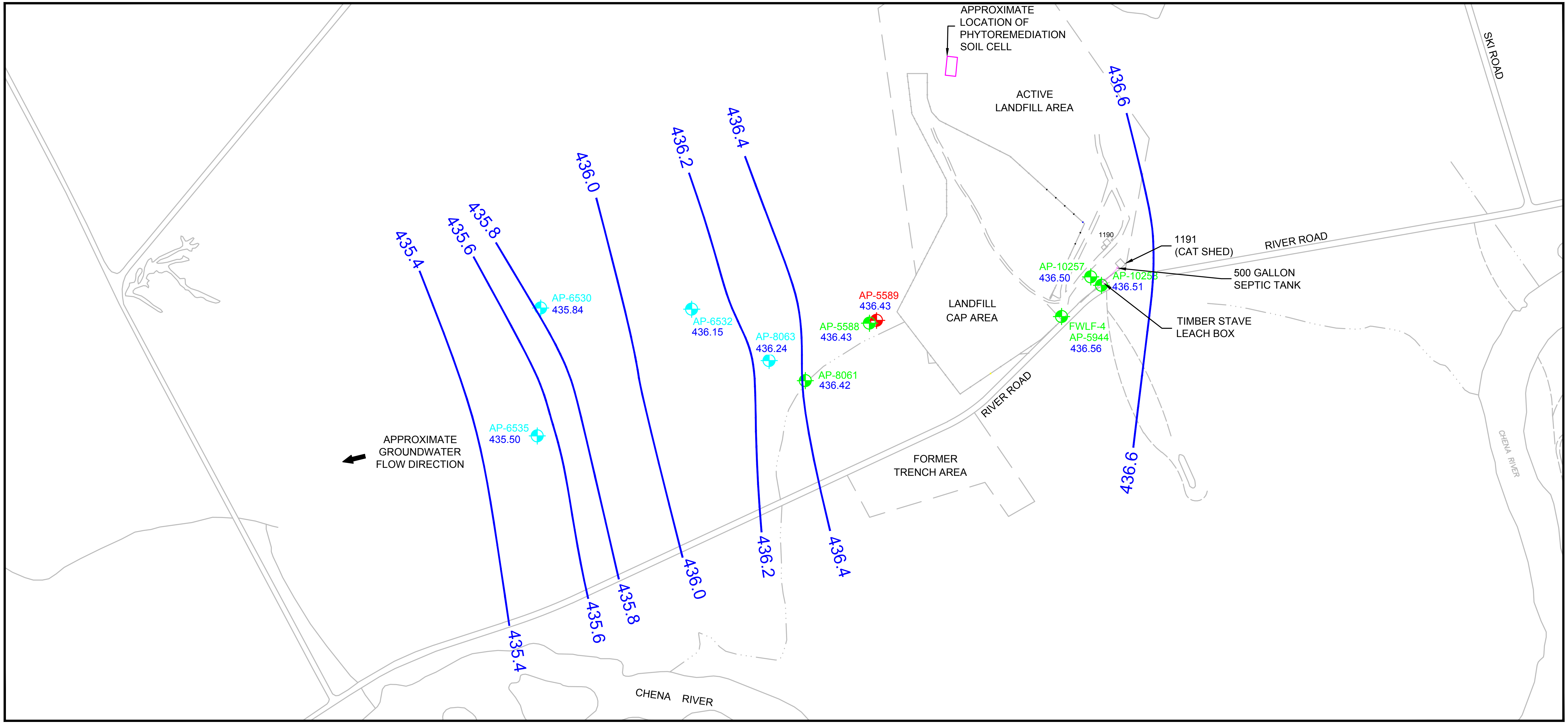
FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

# Permafrost Distribution at the Landfill Source Area

2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

| CONTRACT: | FIGURE: | DATE: |
|---|---|---|
| W911KB-16-D-0005 | 3-1 | 10/18 |



FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

# October/November 2017 Groundwater Contours at the Landfill

2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

| | | |
|---|---|---|
| CONTRACT: W911KB-16-D-0005 | FIGURE: 3-2 | DATE: 10/18 |

WELL AP-5589
Top of PVC 452.30

| Total Well Depth (ft) 56.2 | JUL 97 | DEC 98 | MAR 99 | JUN 99 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | OCT 02 | MAY 03 | SEP 03 | JUN 04 | OCT 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | JULY 16 | OCT 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 420.63 | 428.84 | 427.82 | 428.64 | 429.19 | 428.07 | 429.37 | 433.99 | 434.64 | 435.56 | 436.03 | 434.45 | 437.85 | 435.73 | 433.41 | 435.63 | 434.73 | 434.99 | 434.59 | 434.07 | 434.40 | 435.35 | 436.23 | 434.72 | 434.70 | 433.82 | 433.83 | 436.56 | 434.98 | 434.38 | 435.93 | 434.23 | 435.78 | 434.15 | 436.28 | 436.13 | 434.90 | 436.43 |
| Benzene | 4.00 | 4.03 | 4.00 | 4.01 | 4.28 | 3.87 | 3.86 | 4.10 | 4.10 | 3.54 | 3.32 | 3.47 | 4.25 | 3.95 | 3.38 | 3.58 | 3.43 | 3.98 | 3.40 | 3.20 | 2.54 | 3.30 | 3.60 | 3.00 | 3.40 | 2.80 | 3.50 | 3.3 | 3.1 | 2.6 | 3.0 | 2.4 | 3.3 | 3.3 | 3.3 | 3.9 | 4.0 | 3.24 |
| cis-1,2-Dichloroethene | 13.0 | 9.83 | 9.00 | 10.7 | 11.1 | 9.44 | 8.58 | 9.00 | 14.0 | 7.37 | 8.19 | 8.39 | 9.28 | 10.2 | 11.0 | 10.9 | 10.5 | 12.0 | 14.0 | 11.1 | 13.4 | 14.0 | 15.0 | 13.0 | 14.0 | 13.0 | 17 | 18 | 19 | 16 | 16 | 14 | 16 | 14 | 19 | 20 | 23 | 18.9 |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | 2.00 | 1.16 | ND(1.0) | ND(1.0) | ND(1.0) | 1.30 | ND(5.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.40 | 2.08 | 0.67 | 8.42 | 6.34 | 5.60 | 24.5 | ND(0.5) | 0.23 | 0.22 | 0.63 | 5.6 | 4.9 | ND(1.0) | ND(1.0) | ND(1.0) | 0.31 | ND(0.4) | ND(0.4) | 1.5 | 2.0 | 5.9 | 2.7 | 0.34 | 1.02 |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.094 J | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | 4.00 | 3.47 | 4.00 | 3.73 | 3.96 | 3.74 | 3.52 | 3.90 | 4.50 | 3.05 | 3.49 | 3.01 | 3.19 | 3.42 | 3.95 | 3.01 | 3.33 | 3.84 | 3.90 | 5.04 | 3.83 | 3.10 | 3.80 | 3.90 | 5.10 | 4.10 | 4.90 | 4.4 | 4.4 | 4.5 | 4.5 | 3.6 | 4.9 | 4.6 | 4.9 | 5.1 | 5.3 | 3.68 |
| Vinyl Chloride | ND(1.0) | 1.19 | ND(1.0) | 1.24 | 1.44 | 1.50 | 1.40 | 1.70 | 2.60 | ND(1.0) | 1.41 | 1.33 | 1.07 | 1.64 | 2.10 | 1.39 | 1.55 | 2.64 | 1.20 | 1.32 | 1.61 | 1.10 | 1.10 | ND(1.0) | 1.00 | ND(1.0) | 0.97 | 1.2 | 0.85 | 0.66 | 0.60 | 0.71 | 0.88 | 1.1 | 1.1 | 1.3 | 1.1 | ND(0.075) |
| bis (2-ethylhexyl)phthalate | 1.00 | ND(11) | 9.30 | NA | ND(11) | ND(10) | ND(10) | 2.80 | ND(5.0) | ND(20) | ND(20) | R | ND(16) | ND(9.3) | ND(10) | ND(10) | ND(10) | ND(10) | ND(16) | ND (10.4) | ND (10.7) | 4.00 | ND(15) | ND(15) | ND(9.6) | ND(9.6) | 1.6 | 0.79 | ND(5.2) | 0.97 | 23 | ND(0.2) | ND(0.3) | ND(1.9) | ND(1.9) | ND(1.9) | 0.20 | ND(0.97) |
| Methane | | | | | | | | | | | | | | | | | | | | | | | | | 6,200 | 2,400 | 1,400 | 2,700 | 2,800 | 5,300 | 1,700 | 4,200 | 4,100 | 3,400 | 740 | 610 | NA | NA |
| 1,4-Dioxane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 13 | 15.4 |

WELL AP-5588
Top of PVC 451.28

| Total Well Depth (ft) 29.03 | JUL 97 | DEC 98 | MAR 99 | JUN 99 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | OCT 02 | MAY 03 | SEP 03 | JUN 04 | OCT 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07* | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | JULY 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 430.90 | 428.32 | 427.80 | 428.72 | 429.31 | 428.12 | 429.45 | 434.03 | 434.66 | 435.70 | 435.9 | 434.42 | 436.37 | 435.15 | 432.64 | 435.61 | 434.97 | 434.98 | 434.57 | 434.11 | 434.36 | 435.31 | 436.20 | 434.73 | 434.63 | 433.82 | 433.83 | 436.56 | 434.96 | 434.50 | 435.92 | 434.20 | 435.75 | 434.13 | 436.26 | 434.91 | 436.43 |
| Benzene | 2.00 | 2.27 | 2.00 | 2.42 | 3.07 | 2.26 | 2.29 | 2.50 | 2.10 | 1.64 | 2.37 | 1.93 | ND (4.0) | 2.25 | 2.09 | 2.49 | 2.42 | 2.52 | 2.10 | 1.12 | 0.34 | 2.60 | 2.30 | 2.20 | ND(50) | 2.20 | ND(50) | 2.6 | 1.9 | 2.0 | 1.4 | 1.5 | 0.76 | 1.8 | 2.2 | 1.6 | 0.71 |
| cis-1,2-Dichloroethene | 160 | 170 | 190 | 184 | 176 | 173 | 168 | 160 | 220 | 117 | 127 | 162 | 121 | 183 | 168 | 133 | 160 | 169 | 200 | ND(25) | 148 | 150 | 150 | 170 | 190 | 180 | 190 | 140 | 130 | 120 | 110 | 110 | 120 | 180 | 160 | 150 | 66.7 |
| 1,1,2,2-Tetrachloroethane | 1,700 | 2,020 | 2,400 | 1,920 | 1,570 | 2,130 | 2,180 | 2,000 | 1,300 | 934 | 1,260 | 1,990 | 1,820 | 2,590 | 2,990 | 1,600 | 2,820 | 2,870 | 2,600 | 378 | 2,840 | 1,200 | 1,600 | 2,300 | 2,600 | 2,800 | 2,400 | 890 | 950 | 830 | 940 | 980 | 1,400 | 1,300 | 1,400 | 1,800 | 732 |
| 1,1,2-Trichloroethane | 8.00 | 10.2 | 11.0 | 9.92 | 9.41 | 10.1 | 9.71 | 10.0 | 7.70 | 5.46 | 7.10 | 9.52 | 9.53 | 11.8 | 13.2 | 7.58 | 12.4 | 13.8 | 13 | 13.9 | 10.4 | 6.00 | 7.40 | 9.20 | ND(50) | 73 | ND(50) | 5.2 | 5.7 | 6.2 | 4.7 | 4.2 | 5.4 | 10 | 5.8 | 6.9 | 3.28 |
| Trichloroethene | 280 | 196 | 320 | 243 | 252 | 271 | 257 | 440 | 240 | 168 | 193 | 248 | 203 | 314 | 295 | 205 | 279 | 305 | 320 | 31.0 | 290 | 170 | 180 | 310 | 310 | 260 | 360 | 170 | 190 | 170 | 130 | 140 | 190 | 320 | 210 | 270 | 107 |
| Vinyl Chloride | ND(1.0) | ND(1.0) | ND(1.0) | 1.11 | 1.37 | 1.17 | 1.31 | 1.10 | 1.30 | ND(1.0) | 1.33 | 0.88 | ND(10) | 1.21 | 1.45 | 1.49 | 1.52 | 2.42 | ND(10) | 1.42 | 1.06 | 1.30 | 1.10 | 1.20 | ND(50) | 0.51 | ND(50) | 1.5 | 1.0 | ND(0.4) | 0.51 | 0.96 | 0.4 | 0.87 | 0.95 | 0.70 | ND(0.075) |
| bis (2-ethylhexyl)phthalate | ND(11) | ND(11) | 0.60 | NA | ND(11) | ND(10) | ND(11) | 3.40 | ND(5.1) | ND(21) | ND(20) | 7.30 | ND(16) | ND(9.3) | ND(10) | ND(10) | ND(10) | ND(9.7) | ND(17) | ND(3.23) | ND(11.8) | 7.20 | 0.74 | ND(0.15) | ND(9.6) | 0.63 | ND(4.8) | 0.53 | ND(5) | 1.1 | 0.69 | ND(0.27) | ND(3) | 1.2 | ND(2) | ND(1) | ND(0.98) |
| Methane | | | | | | | | | | | | | | | | | | | | | | | | | 3,800 | 1,200 | 1,100 | 2,200 | 1,100 | 1,700 | 1,100 | 1,700 | 1,400 | 1,800 | 430 | NA | NA |
| 1,4-Dioxane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 11 | 6.4 |

WELL AP-6854A
Top of PVC 450.06

| Total Well Depth (ft) 64.8 | OCT 10 |
|---|---|
| Groundwater Elevation (feet) | 434.26 |
| Benzene | 0.45 |
| cis-1,2-Dichloroethene | ND(1.0) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) |
| 1,1,2-Trichloroethane | ND(1.0) |
| Trichloroethene | ND(1.0) |
| Vinyl Chloride | 0.95 |
| bis (2-ethylhexyl)phthalate | ND(4.8) |
| Methane | 14,000 |

WELL REMOVED FROM SAMPLING PROGRAM

WELL AP-6854
Top of PVC 449.17

| Total Well Depth (ft) 100 | OCT 10 |
|---|---|
| Groundwater Elevation (feet) | 434.27 |
| Benzene | 0.44 |
| cis-1,2-Dichloroethene | ND(1.0) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) |
| 1,1,2-Trichloroethane | ND(1.0) |
| Trichloroethene | ND(1.0) |
| Vinyl Chloride | ND(1.0) |
| bis (2-ethylhexyl)phthalate | ND(4.8) |
| Methane | 14,000 |

WELL REMOVED FROM SAMPLING PROGRAM

WELL FWLF-4
Top of PVC 452.26

| Total Well Depth (ft) 25.1 | DEC 98 | MAR 99 | JUN 99 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | OCT 02 | MAY 03 | SEP 03 | JUN 04 | OCT 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | JULY 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 429.35 | 428.27 | 429.25 | 429.60 | 428.50 | 429.95 | 433.89 | 434.64 | 435.54 | 435.87 | 434.91 | 437.13 | 436.20 | 433.39 | 435.17 | 434.97 | 435.04 | 434.63 | 434.00 | 434.47 | 435.36 | 436.48 | 434.66 | 434.74 | 433.82 | 434.0 | 436.67 | 435.02 | 429.53 | 436.07 | 434.40 | 437.07 | 434.30 | 436.33 | 435.33 | 436.56 |
| Benzene | 1.97 | 2.00 | 1.67 | 1.58 | 1.53 | 1.31 | 1.40 | 1.40 | 0.91 | 1.26 | 1.32 | 1.34 | 1.43 | 1.80 | 1.87 | 1.57 | 1.49 | 1.50 | 1.27 | ND(0.4) | 1.10 | 0.90 | 1.2 | 1.4 | 1.2 | 1.1 | 0.94 | 0.84 | 0.51 | 0.52 | 0.4 | 1.2 | 0.88 | 1.9 | 3.3 | 1.6 |
| cis-1,2-Dichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.41 | 0.36 | 0.41 | 0.36 | 0.44 | 0.50 | ND(1.0) | 0.45 | 0.52 | ND(1.0) | 0.95 | 0.41 | 0.38 | 0.40 | 0.47 | ND(1.0) | 0.50 | 0.36 | 0.37 | 0.31 | 0.26 | 0.19 | 0.47 | 0.29 | 0.62 | 1.0 | 0.78 |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(1.0) | ND(0.5) | ND(0.5) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.2) | ND(0.5) | ND(0.25) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(1) | ND(0.1) | ND(0.5) | ND(0.5) |
| Vinyl Chloride | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.5) | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.1) | ND(0.5) | ND(0.075) |
| bis (2-ethylhexyl)phthalate | 15.3 | 2.20 | NA | ND(11) | ND(10) | ND(10) | ND(5.0) | 4.30 | ND(22) | ND(22) | 6.7 | ND(16) | ND(9.3) | ND(10) | ND(10) | ND(10) | ND(9.7) | ND(16) | ND(10.8) | ND(11.1) | 1.80 | ND(15) | ND(15) | ND(9.6) | 5.4 | ND(4.8) | 0.49 | 0.37 | 1.1 | 0.66 | 0.8 | 13 | 9.5 | ND(1.9) | 0.32 | ND(0.97) |
| Methane | | | | | | | | | | | | | | | | | | | | | | | | 120 | 29 | 36 | 110 | 70 | 120 | 120 | 220 | 190 | 120 | 43 | NA | NA |
| 1,4-Dioxane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ND(0.02) | ND(0.5) |

WELL AP-6132
Top of PVC 456.06

| Total Well Depth (ft) 23.7 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | OCT 02 | MAY 03 | SEP 03 | JUN 04 | OCT 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 429.97 | 429.80 | 430.85 | 435.75 | 436.13 | 436.77 | 438.29 | 435.91 | 439.08 | 436.97 | 434.11 | 436.6 | 436.58 | 435.75 | 435.61 | 435.04 | 435.39 | 435.87 | 438.84 | 435.45 | 435.42 | 434.35 | 434.76 |
| Benzene | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.4) | ND(1.0) | ND(0.4) | ND(0.4) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) |
| cis-1,2-Dichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(1.0) | 0.96 | ND(0.5) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) |
| Trichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.89 | ND(1.0) | ND(1.0) | 0.31 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) |
| Vinyl Chloride | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) |
| bis (2-ethylhexyl)phthalate | ND(11) | ND(9.9) | ND(10) | 2.10 | 1.50 | ND(22) | ND(20) | 5.90 | ND(17) | ND(9.3) | ND(10) | ND(10) | ND(10) | ND(9.8) | ND(16) | ND(10.5) | ND(11.6) | 2.50 | 0.34 | ND(1.0) | ND(9.5) | 3.2 | 1.2 |
| Methane | | | | | | | | | | | | | | | | | | | | | 130 | 32 | 99 |

WELL REMOVED FROM SAMPLING PROGRAM

WELL AP-10257
Top of PVC 454.01

| Total Well Depth (ft) 24.45 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 434.51 | 436.22 | 434.40 | 436.31 | 434.36 | 436.76 | 436.28 | 436.70 | 435.49 | 436.50 |
| Benzene | 14 | 3.4 | 17 | 7.0 | 14 | 7.4 | 29 | 7.3 | 14 | 23.1 |
| cis-1,2-Dichloroethene | 3.9 | 1.6 | 3.9 | 2.0 | 3.3 | 3.1 | 6.6 | 3.3 | 3.8 | 4.43 |
| 1,1,2,2-Tetrachloroethane | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.2) | ND(0.5) | ND(0.25) |
| 1,1,2-Trichloroethane | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(1) | ND(1) | 0.15 | ND(0.1) | 0.11 | ND(0.5) |
| Vinyl Chloride | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | 0.12 | 0.10 | 0.08 | ND(0.075) |
| bis (2-ethylhexyl)phthalate | 1.1 | 1.1 | 1.1 | ND(2.0) | 4.1 | 14 | ND(1.9) | ND(2) | 2.8 | ND(1) |
| Methane | 1,400 | 46 | 1,200 | 300 | 2,500 | 2,700 | 1,500 | 620 | NA | NA |
| 1,4-Dioxane | | | | | | | | | ND(0.02) | 0.35 |

WELL AP-10258
Top of PVC 453.54

| Total Well Depth (ft) 18.90 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 434.64 | 436.22 | 434.42 | 436.29 | 434.39 | 436.77 | 436.30 | 436.68 | 435.46 | 436.51 |
| Benzene | ND(0.2) | 0.40 | 2.7 | 5.7 | 4.9 | 3.4 | 6.3 | 6.0 | 4.9 | 3.73 |
| cis-1,2-Dichloroethene | 0.45 | 0.39 | 1.7 | 2.5 | 3.5 | 2.9 | 4.4 | 3.3 | 3.3 | 4.04 |
| 1,1,2,2-Tetrachloroethane | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.2) | ND(0.5) | ND(0.25) |
| 1,1,2-Trichloroethane | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.2) | ND(1) | ND(1) | 0.11 | ND(0.1) | ND(0.5) | ND(0.5) |
| Vinyl Chloride | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.1) | ND(0.1) | ND(0.5) | ND(0.075) |
| bis (2-ethylhexyl)phthalate | 0.98 | 0.76 | ND(0.26) | ND(2.9) | ND(1.9) | ND(2.0) | ND(1.9) | ND(1.9) | 0.98 | ND(0.99) |
| Methane | 15 | 44 | 160 | 280 | 480 | 680 | 360 | 430 | NA | NA |
| 1,4-Dioxane | | | | | | | | | ND(0.02) | ND(0.5) |

WELL AP-10259
Top of PVC 453.95

| Total Well Depth (ft) 19.20 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 |
|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 434.75 | 436.31 | 434.44 | 436.57 | 434.35 |
| Benzene | 0.72 | 0.7 | 0.18 | ND(0.4) | ND(1) |
| cis-1,2-Dichloroethene | 0.45 | 0.37 | ND(0.2) | ND(0.4) | ND(0.5) |
| 1,1,2,2-Tetrachloroethane | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| 1,1,2-Trichloroethane | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| Trichloroethene | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(1) |
| Vinyl Chloride | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| bis (2-ethylhexyl)phthalate | 0.97 | 1.3 | ND(0.26) | ND(2.0) | ND(1.9) |
| Methane | 27 | 50 | 17 | 0.25 | ND(0.37) |

WELL REMOVED FROM SAMPLING PROGRAM

WELL AP-6527
Top of PVC UNKNOWN

| Total Well Depth (ft) 180.35 | AUG 11 | NOV 12 |
|---|---|---|
| Groundwater Elevation (feet) | UNKNOWN | UNKNOWN |
| Benzene | 1.2 | 1.5 |
| cis-1,2-Dichloroethene | ND(1.0) | ND(2) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(0.4) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(0.4) |
| Trichloroethene | ND(1.0) | ND(2) |
| Vinyl Chloride | ND(1.5) | ND(0.8) |
| bis (2-ethylhexyl)phthalate | ND(300) | 13 |
| Methane | 1.9 | 10 |

WELL REMOVED FROM SAMPLING PROGRAM

WELL AP-6530
Top of PVC 450.06

| Total Well Depth (ft) 142.2 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | NOV 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 432.96 | 435.43 | 434.08 | 434.26 | 434.84 | 434.24 | 434.81 | 433.36 | 436.04 | 435.93 | 435.13 | | 435.84 |
| Benzene | 0.69 | 5.7 | 4.2 | 2.5 | 5.8 | 5.0 | 3.2 | 3.0 | 1.9 | 1.7 | 1.3 | | 0.45 |
| cis-1,2-Dichloroethene | ND(1.0) | 1.6 | 0.90 | 0.54 | 1.8 | 1.6 | 0.42 | 0.62 | 0.26 | 0.18 | 0.15 | WELL NOT ACCESSIBLE AND NOT SAMPLED | ND(0.5) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | 0.89 | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.2) | | ND(0.25) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.4) | | ND(0.2) |
| Trichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(1) | ND(1) | ND(0.1) | ND(0.1) | | ND(0.5) |
| Vinyl Chloride | ND(1.0) | ND(1.5) | ND(1.5) | ND(0.8) | 0.31 | 0.27 | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.1) | ND(0.1) | | ND(0.075) |
| bis (2-ethylhexyl)phthalate | ND(52) | 0.43 | 0.50 | 1.1 | 1.3 | 1.1 | 27 | ND(2.2) | 3.5 | ND(1.9) | ND(1.9) | | ND(0.95) |
| Methane | 290 | 2,100 | 1,400 | 570 | 2,800 | 3,900 | 530 | 330 | 120 | 15 | 9.9 | | NA |
| 1,4-Dioxane | | | | | | | | | | | | | ND(0.5) |

WELL AP-6535
Top of PVC 448.09

| Total Well Depth (ft) 93.1 | OCT 10 | JULY 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | NOV 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 431.7 | 435.09 | 434.04 | 434.70 | 434.10 | 434.39 | 433.14 | 435.74 | 435.68 | 434.87 | 433.84 | 435.50 |
| Benzene | 3.6 | 3.4 | 3.1 | 3.3 | 2.1 | 3.3 | 3.0 | 3.4 | 3.4 | 2.9 | 3.8 | 2.74 |
| cis-1,2-Dichloroethene | 33 | 34 | 31 | 33 | 22 | 34 | 31 | 33 | 35 | 28 | 37 | 30.1 |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.2) | ND(0.5) | ND(0.25) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | 0.65 | 0.57 | 0.58 | 0.95 | 0.33 | 0.73 | 0.55 | 0.60 | 0.87 | 0.66 | 1.0 | 0.82 |
| Vinyl Chloride | 0.9 | 1.1 | 1.0 | 0.86 | 0.66 | 1.1 | 1.0 | ND(0.5) | 1.2 | 1.1 | 1.1 | ND(0.075) |
| bis (2-ethylhexyl)phthalate | 1.4 | 0.49 | 1.6 | 1.1 | 0.95 | 2.3 | ND(2.3) | ND(2.1) | ND(2) | ND(2) | 0.29 | ND(0.95) |
| Methane | 1,000 | 810 | 1,600 | 1,100 | 2,100 | 1,800 | 1,100 | 1,600 | 220 | 240 | NA | NA |
| 1,4-Dioxane | | | | | | | | | | | 1.1 | 2.1 |

WELL AP-6534
Top of PVC 450.15

| Total Well Depth (ft) 198.4 | OCT 10 | JULY 11 |
|---|---|---|
| Groundwater Elevation (feet) | 433.42 | 435.57 |
| Benzene | 1.9 | 1.2 |
| cis-1,2-Dichloroethene | ND(1.0) | ND(1.0) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) |
| Trichloroethene | ND(1.0) | ND(1.0) |
| Vinyl Chloride | ND(1.0) | ND(1.5) |
| bis (2-ethylhexyl)phthalate | ND (5.2) | 0.61 |
| Methane | 140 | 150 |

WELL REMOVED FROM SAMPLING PROGRAM

WELL AP-6532
Top of PVC 451.38

| Total Well Depth (ft) 177.2 | JUL 97 | DEC 98 | MAR 99 | JUN 99 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | SEP 02 | MAY 03 | SEP 03 | JUN 04 | NOV 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | NOV 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | * | 428.08 | 426.35 | 428.11 | 428.73 | 426.98 | 428.83 | 432.57 | 433.02 | 432.83 | 434.43 | 433.92 | 436.37 | 433.23 | 432.25 | 434.13 | 433.32 | 434.58 | 434.11 | 432.51 | 433.12 | 435.06 | 435.49 | 434.68 | 434.23 | 433.47 | 433.42 | 435.67 | 434.38 | 434.47 | 435.02 | 434.47 | 435.03 | 433.71 | 436.25 | 436.19 | 435.45 | | 436.15 |
| Benzene | 2.00 | 1.79 | 2.00 | 1.77 | 1.52 | 1.81 | 1.80 | 2.40 | 2.00 | 1.64 | 2.17 | 1.75 | 2.00 | 8.09 | 0.86 | 8.43 | 8.30 | 9.62 | 8.80 | 9.35 | 7.96 | 9.60 | 10.0 | 3.40 | 1.00 | 11.0 | 12.0 | 11.0 | 10.0 | 2.4 | 11.0 | 9.2 | 13 | 11 | 11 | 13 | 13 | | 9 |
| cis-1,2-Dichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 3.82 | ND(1.0) | 3.82 | 3.74 | 3.74 | 4.10 | 3.21 | 2.74 | 3.30 | 3.70 | 11.0 | 0.62 | 3.4 | 3.4 | 3.3 | 2.8 | 0.66 | 2.3 | 2.4 | 2.4 | 2.4 | 2.8 | 3.1 | 3.0 | WELL NOT ACCESSIBLE AND NOT SAMPLED | 2.48 |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(1.0) | ND(0.5) | ND(0.5) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.2) | | ND(0.25) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.4) | | ND(0.2) |
| Trichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.95 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(1) | ND(1) | ND(0.1) | ND(0.1) | | ND(0.5) |
| Vinyl Chloride | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.31 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.5) | ND(1.5) | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | 0.25 | 0.22 | 0.26 | | ND(0.075) |
| bis (2-ethylhexyl)phthalate | 6.00 | ND(12) | 8.90 | NA | 29.1 | 75.0 | ND(10) | ND(5.1) | ND(5.7) | ND(22) | ND(23) | 6.80 | ND(17) | ND(10) | ND(10) | ND(10) | ND(10) | ND(9.6) | 0.47 | ND(11.2) | ND(10.6) | 0.82 | ND(15) | ND(15) | 7.8 | ND(9.6) | 1.4 | 0.74 | 0.33 | 1.2 | 1.1 | 1.6 | ND(2.9) | 20 | 19 | 23 | 4.4 | | ND(0.95) |
| Methane | | | | | | | | | | | | | | | | | | | | | | | | | 1,400 | 5,300 | 5,200 | 5,300 | 5,300 | 1,500 | 2,200 | 5,900 | 4,300 | 3,600 | 1,500 | 1,300 | 1,400 | | NA |
| 1,4-Dioxane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.72 |

* NO ELEVATION GIVEN FOR TOP OF CASING.

WELL AP-6136
Top of PVC 454.14

| Total Well Depth (ft) 96.1 | JUL 97 | DEC 98 | MAR 99 | JUN 99 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | OCT 02 | MAY 03 | SEP 03 | JUN 04 | OCT 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 428.08 | 428.93 | 427.84 | 427.84 | 429.11 | 428.13 | 429.43 | 434.01 | 434.71 | 435.59 | 435.99 | 434.50 | 436.98 | 436.00 | 429.65 | 435.61 | 435.04 | 435.07 | 434.68 | 434.11 | 434.45 | 435.54 | 436.29 | 434.84 | 434.83 | 433.90 | 433.91 | 436.61 | 434.82 | 434.61 | 436.02 | 434.02 | 435.68 | 434.19 |
| Benzene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(0.5) | 0.42 | 0.28 | 0.26 | 0.34 | 0.43 | ND(0.4) | ND(0.4) | 0.35 | 0.32 | 0.26 | ND(0.4) | 0.19 | 0.27 | 0.43 | 0.35 | 0.29 | 0.35 | ND(1.0) | 0.29 | 0.21 | 0.16 | 0.21 | 0.53 | 0.74 |
| cis-1,2-Dichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.091 | 0.10 | ND(1.0) | 0.11 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(0.5) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.5) | ND(0.5) | 0.55 | ND(0.5) | ND(1.0) | ND(0.5) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| Trichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.2) | ND(1) |
| Vinyl Chloride | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(2.0) | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.5) | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| bis (2-ethylhexyl)phthalate | 22 .0 | 24.8 | 13.0 | NA | 32.3 | 36.8 | ND(10) | 33.0 | ND(5.0) | ND(22) | ND(22) | 5.30 | ND(17) | 4.20 | 13.0 | 8.90 | ND(10) | ND(9.9) | 0.43 | ND(10.5) | ND (10.9) | 2.40 | ND(15) | ND(15) | 1.2 | 2.6 | 2.6 | 0.32 | 0.32 | 1.1 | NA | 0.96 | 6.8 | ND(2.2) |
| Methane | | | | | | | | | | | | | | | | | | | | | | | | | 110 | 51 | 28 | 140 | 130 | 160 | 160 | 210 | 130 | 110 |

WELL REMOVED FROM SAMPLING PROGRAM

WELL AP-8061
Top of PVC 444.30

| Total Well Depth (ft) 25.2 | SEP 01 | JUN 02 | SEP 02 | MAY 03 | SEP 03 | JUN 04 | OCT 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 434.57 | 435.44 | 435.84 | 434.33 | 436.61 | 435.76 | 433.29 | 435.53 | 434.88 | 434.94 | 434.48 | 433.91 | 434.28 | 435.28 | 436.10 | 434.63 | 434.57 | 433.73 | 433.71 | 436.39 | 434.83 | 434.45 | 435.78 | 434.13 | 435.53 | 434.06 | 436.32 | 436.26 | 434.80 | 436.42 |
| Benzene | 5.00 | 2.46 | 4.84 | 3.39 | 5.80 | 3.34 | 5.77 | 3.09 | 5.07 | 5.74 | 5.50 | 5.08 | 5.00 | 4.40 | 5.5 | 4.40 | 5.2 | 4.7 | 5.8 | 5.3 | 4.8 | 4.3 | 2.9 | 3.9 | 3.9 | 3.9 | 5.4 | 3.5 | 1.9 | 2.07 |
| cis-1,2-Dichloroethene | 31.0 | 15.6 | 26.5 | 20.6 | 28.8 | 22.9 | 22.4 | 17.7 | 18.9 | 24.3 | 20.0 | 20.9 | 16.0 | 17.0 | 20.0 | 18.0 | 14.0 | 10 | 13 | 11 | 12 | 9 | 8.6 | 7.3 | 13 | 8.9 | 9.7 | 8.2 | 7.6 | 8.66 |
| 1,1,2,2-Tetrachloroethane | ND(2.0) | 1.50 | 3.85 | 2.92 | 3.05 | 1.05 | ND(0.5) | ND(0.5) | ND(0.5) | 0.24 | ND(1.0) | ND(0.5) | ND(0.5) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 1.9 | ND(1.0) | ND(1.0) | ND(1.0) | 0.71 | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.5) | ND(0.25) |
| 1,1,2-Trichloroethane | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | 11.0 | 7.86 | 12.9 | 11.0 | 13.0 | 12.3 | 12.3 | 8.74 | 9.20 | 12.7 | 9.60 | 12.7 | 8.11 | 6.8 | 7.6 | 8.9 | 6.6 | 4.8 | 6.2 | 5.8 | 5.9 | 4.6 | 4.4 | 3.8 | 7.8 | 4.5 | 7.0 | 4.4 | 3.7 | 3.39 |
| Vinyl Chloride | ND(2.0) | ND(1.0) | ND(1.0) | 0.33 | 0.47 | 0.53 | 0.65 | 0.43 | 0.59 | 1.25 | 0.49 | ND(1.0) | 0.66 | 0.40 | 0.56 | ND(1.0) | 0.30 | ND(1.0) | 0.24 | ND(1.5) | ND(1.5) | ND(0.8) | 0.13 | 0.15 | ND(0.4) | ND(0.5) | ND(0.5) | 0.16 | 0.13 | ND(0.075) |
| bis (2-ethylhexyl)phthalate | ND(5.0) | ND(22) | ND(23) | 6.00 | ND(17) | 5.00 | ND(10) | ND(10) | ND(11) | ND(9.5) | ND(16) | ND(10.4) | ND(10.5) | 4.00 | ND(15) | ND(15) | ND(9.7) | ND(15) | 1.3 | 0.3 | ND(5.1) | 0.92 | 0.79 | 0.81 | ND(1.9) | ND(1.9) | ND(2.1) | ND(1.9) | ND(1) | ND(96) |
| Methane | | | | | | | | | | | | | | | | | 960 | 280 | 610 | 460 | 670 | 880 | 260 | 600 | 560 | 440 | 630 | 92 | NA | NA |
| 1,4-Dioxane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.4 | 0.85 |

WELL AP-8063
Top of PVC 451.36

| Total Well Depth (ft) 120.55 | SEP 01 | JUN 02 | OCT 02 | JUN 03 | SEP 03 | JUN 04 | NOV 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | JULY 16 | OCT 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 434.34 | NS | 435.03 | 434.21 | 436.79 | 434.56 | 433.17 | 435.85 | 434.59 | 434.65 | 434.44 | 433.75 | 434.36 | 435.18 | 435.77 | 434.68 | 434.36 | 433.64 | 433.59 | 435.91 | 434.60 | 434.70 | 435.60 | 434.65 | 435.34 | 433.88 | 435.02 | 435.78 | 434.58 | 436.24 |
| Benzene | 4.50 | NS | 3.39 | 3.44 | 3.46 | 3.01 | 0.73 | 2.65 | 3.46 | 3.56 | 2.80 | 2.92 | 2.65 | 2.60 | 2.90 | 2.30 | 0.15 | 2.80 | 3.0 | 2.6 | 2.7 | 2.5 | 2.5 | 2.0 | 2.6 | ND(1) | 2.1 | 2.4 | 0.19 | 1.74 |
| cis-1,2-Dichloroethene | 72.0 | NS | 43.5 | 74.8 | 70.5 | 69.6 | 5.10 | 46.6 | 87.7 | 82.5 | 82.0 | 58.8 | 57.1 | 94.0 | 91.0 | 75.0 | 6.00 | 110 | 110 | 87 | 91 | 110 | 93 | 83 | 120 | 4.6 | 110 | 110 | 2.4 | 101 |
| 1,1,2,2-Tetrachloroethane | 51.0 | NS | 49.6 | 33.6 | 77.4 | 9.60 | 0.94 | 11.3 | 1.59 | 3.06 | 1.60 | 1.26 | 2.95 | 11.0 | 11.0 | 20.0 | 0.99 | 29.0 | 37.0 | 61 | 49 | 43 | 46 | 43 | 39 | ND(0.5) | 21 | 34 | ND(0.5) | 21.2 |
| 1,1,2-Trichloroethane | 0.85 | NS | 0.84 | 0.64 | 0.97 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(10) | ND(1.0) | ND(1.0) | 0.36 | 0.50 | 0.28 | ND(1.0) | 0.66 | 0.83 | 0.89 | 0.94 | 0.92 | 0.95 | 1 | 0.79 | ND(0.5) | 0.53 | 0.71 | ND(0.5) | 0.73 |
| Trichloroethene | 24.0 | NS | 16.5 | 22.5 | 28.2 | 17.3 | 1.23 | 16.7 | 21.6 | 22.9 | 18.0 | 22.0 | 21.0 | 17.0 | 16.0 | 15.0 | 1.10 | 21.0 | 24.0 | 23.0 | 24.0 | 26.0 | 25.0 | 21.0 | 29 | 0.78 | 24 | 29 | 0.22 | 22 |
| Vinyl Chloride | 2.10 | NS | 1.10 | 1.48 | 1.91 | 1.58 | ND(1.0) | 1.30 | 1.64 | 2.22 | ND(10) | 1.76 | 2.08 | 1.50 | 1.40 | 1.10 | ND(1.0) | 0.76 | 1.2 | 1.3 | 1.2 | 1.2 | 0.98 | 0.82 | 1.3 | ND(0.5) | 1.3 | 1.3 | 0.09 | ND(0.075) |
| bis (2-ethylhexyl)phthalate | ND(5.3) | NS | ND(20) | 41.0 | ND(16) | ND(10) | ND(10) | ND(10) | 11.0 | 7.40 | ND(17) | ND(10.5) | ND(10.9) | 0.39 | ND(15) | ND(15) | 3.8 | 1.1 | ND(5.2) | 0.77 | 15 | 1.2 | 2.0 | 2.5 | ND(2.9) | 5.7 | ND(1.9) | ND(2.4) | 0.16 | ND(0.99) |
| Methane | | | | | | | | | | | | | | | | | 440 | 3,000 | 1,300 | 2,900 | 3,400 | 4,600 | 2,800 | 4,700 | 3,100 | 2,100 | 520 | 680 | NA | NA |
| 1,4-Dioxane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.4 | 10.3 |

NS = NO SAMPLE COLLECTED BECAUSE WELL WAS FROZEN DURING SAMPLING EVENT.

WELL AP-6138
Top of PVC 444.92

| Total Well Depth (ft) 85.91 | JUL 97 | DEC 98 | MAR 99 | JUN 99 | AUG 99 | MAR 00 | AUG 00 | MAR 01 | SEP 01 | JUN 02 | SEP 02 | MAY 03 | SEP 03 | JUN 04 | NOV 04 | MAY 05 | OCT 05 | JUNE 06 | OCT 06 | MAY 07 | OCT 07 | MAY 08 | SEPT 08 | JUNE 09 | NOV 09 | MAY 10 | OCT 10 | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 428.10 | * | 427.62 | 428.70 | 428.45 | 427.91 | 429.10 | NS | 437.39 | 438.24 | 438.68 | 434.37 | NE | 435.96 | 433.52 | 435.77 | 435.15 | 435.02 | 434.62 | 434.17 | 434.48 | 435.19 | 436.12 | 434.65 | 434.56 | 433.72 | 433.68 | 436.39 | 434.81 | 434.53 | 435.75 | 434.14 | 435.50 | 434.06 |
| Benzene | 3.00 | 3.07 | 3.00 | 3.28 | 2.83 | 3.53 | 2.82 | NS | 2.00 | 3.29 | 2.86 | 3.15 | 3.04 | 4.14 | 4.24 | 3.90 | 3.66 | 3.80 | 3.70 | 3.71 | 2.22 | 3.10 | 3.30 | 2.90 | 3.30 | 3.40 | 4.70 | 2.9 | 3.0 | 2.8 | 2.8 | 2.23 | 2.5 | 3.2 |
| cis-1,2-Dichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | NS | ND(2.0) | ND(0.5) | 0.36 | ND(1.0) | 0.59 | 0.45 | 0.44 | 0.57 | ND(1.0) | 0.34 | 0.36 | ND(1.0) | 0.96 | 0.36 | 0.41 | 0.24 | 0.44 | 0.55 | 0.52 | 0.37 | 0.36 | 0.39 | 0.39 | 0.25 | 0.38 | 0.53 |
| 1,1,2,2-Tetrachloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | NS | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(0.5) | ND(1.0) | ND(0.5) | 0.95 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 1.5 | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | 0.75 | ND(0.5) |
| 1,1,2-Trichloroethane | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | NS | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| Trichloroethene | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | NS | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.47 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.42 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | 0.33 | ND(1.0) | ND(1.0) | ND(1.0) | ND(0.2) | ND(0.2) | ND(0.2) | ND(0.4) | ND(1) |
| Vinyl Chloride | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | NS | ND(2.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.5) | ND(0.8) | ND(0.4) | ND(0.4) | ND(0.4) | ND(0.5) |
| bis (2-ethylhexyl)phthalate | 1.00 | 35.5 | 3.10 | NA | 19.1 | ND(10) | ND(10) | NS | ND(5.3) | ND(22) | ND(22) | 5.6 | ND(16) | ND(9.4) | ND(10) | ND(11) | ND(11) | ND(10) | 11.0 | ND (11.5) | ND(10.8) | 2.10 | ND(15) | ND(15) | ND(9.6) | ND(9.6) | 2.4 | ND(4.8) | 0.67 | 0.82 | 0.76 | ND(0.2) | ND(2.9) | ND(1.9) |
| Methane | | | | | | | | | | | | | | | | | | | | | | | | | 160 | 56 | 110 | 89 | 88 | 170 | 91 | 160 | 160 | 190 |

WELL REMOVED FROM SAMPLING PROGRAM

* MEASUREMENT NOT TAKEN.
NS = WELL NOT SAMPLED, WELL STRUCTURE COMPR0MISED.
NE = REPLACE TOP 10 FEET OF PVC WITH STAINLESS STEEL CASING, THEREFORE CHANGING TOC ELEVATION.

WELL AP-5997
Top of PVC Unknown

| Total Well Depth (ft) 25.8 | JULY 11 |
|---|---|
| Groundwater Elevation (feet) | UNKNOWN |
| Benzene | ND(1.0) |
| cis-1,2-Dichloroethene | ND(1.0) |
| 1,1,2,2-Tetrachloroethane | ND(1.0) |
| 1,1,2-Trichloroethane | ND(1.0) |
| Trichloroethene | ND(1.0) |
| Vinyl Chloride | ND(1.0) |
| bis (2-ethylhexyl)phthalate | 0.35 |
| Methane | 7.4 |

WELL REMOVED FROM SAMPLING PROGRAM

LEGEND

| | |
|---|---|
| AP-5588 | SHALLOW MONITORING WELL |
| AP-5589 | INTERMEDIATE MONITORING WELL |
| AP-8063 | DEEP MONITORING WELL |
| AP-6138 | MONITORING WELL NO LONGER IN SAMPLING PROGRAM |
| NA | NOT ANALYZED |
| NE | NOT ESTABLISHED |
| ND | NOT DETECTED |

PRIMARY ROAD
SECONDARY ROAD
BOUNDARY
DRAINAGE
TRAIL
PERMAFROST INFLUENCING THE SHALLOW AQUIFER (CRREL AND OPALIA ENVIRONMENTAL FFA MEETING FEBRUARY 2011)

ADEC CULS IN $\mu$g/L

| | |
|---|---|
| 4.6 | 1,4-Dioxane |

1,4-Dioxane cleanup level established in 18 AAC 75.345 Table C (revised 11/7/17

RAOs IN $\mu$g/L

| | |
|---|---|
| 5 | Benzene |
| 70 | cis-1,2-Dichloroethene |
| 5.2 | 1,1,2,2-Tetrachloroethane |
| 5 | 1,1,2-Trichloroethane |
| 5 | Trichloroethene |
| 2 | Vinyl Chloride |
| 6 | bis (2-ethylhexyl)phthalate |
| NE | Methane |

KEY:

MONITORING WELL

WELL AP-8063
TOP OF PVC 451.13

| Total Well Depth (ft) 121.3 | SEP 01 | JUN 02 | OCT 02 | JUN 03 | SEP 03 | JUN 04 |
|---|---|---|---|---|---|---|
| Groundwater Elevation (feet) | 434.34 | NS | 435.03 | 434.21 | 436.79 | 436.79 |
| Benzene | 4.5 | NS | 3.39 | 3.44 | 3.46 | 3.01 |
| cis-1,2-Dichloroethene | 72 | NS | 43.5 | 74.8 | 70.5 | 69.6 |
| 1,1,2,2-Tetrachloroethane | 51 | NS | 49.6 | 33.6 | 77.4 | 9.60 |
| 1,1,2-Trichloroethane | 0.85 J | NS | 0.84 J | 0.64 J | 0.97 J | ND(1.0) |
| Trichloroethene | 24 | NS | 16.5 | 22.5 | 28.2 | 17.3 |
| Vinyl Chloride | 2.1 | NS | 1.1 | 1.48 | 1.91 J | 1.58 |
| bis (2-ethylhexyl)phthalate | ND (5.3) | NS | ND(20) | 41 B | ND(16) | ND(10) |

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

CONCENTRATIONS IN MICROGRAMS PER LITER ($\mu$g/L)

NS = NO SAMPLE COLLECTED BECAUSE WELL WAS FROZEN DURING SAMPLING EVENT.

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

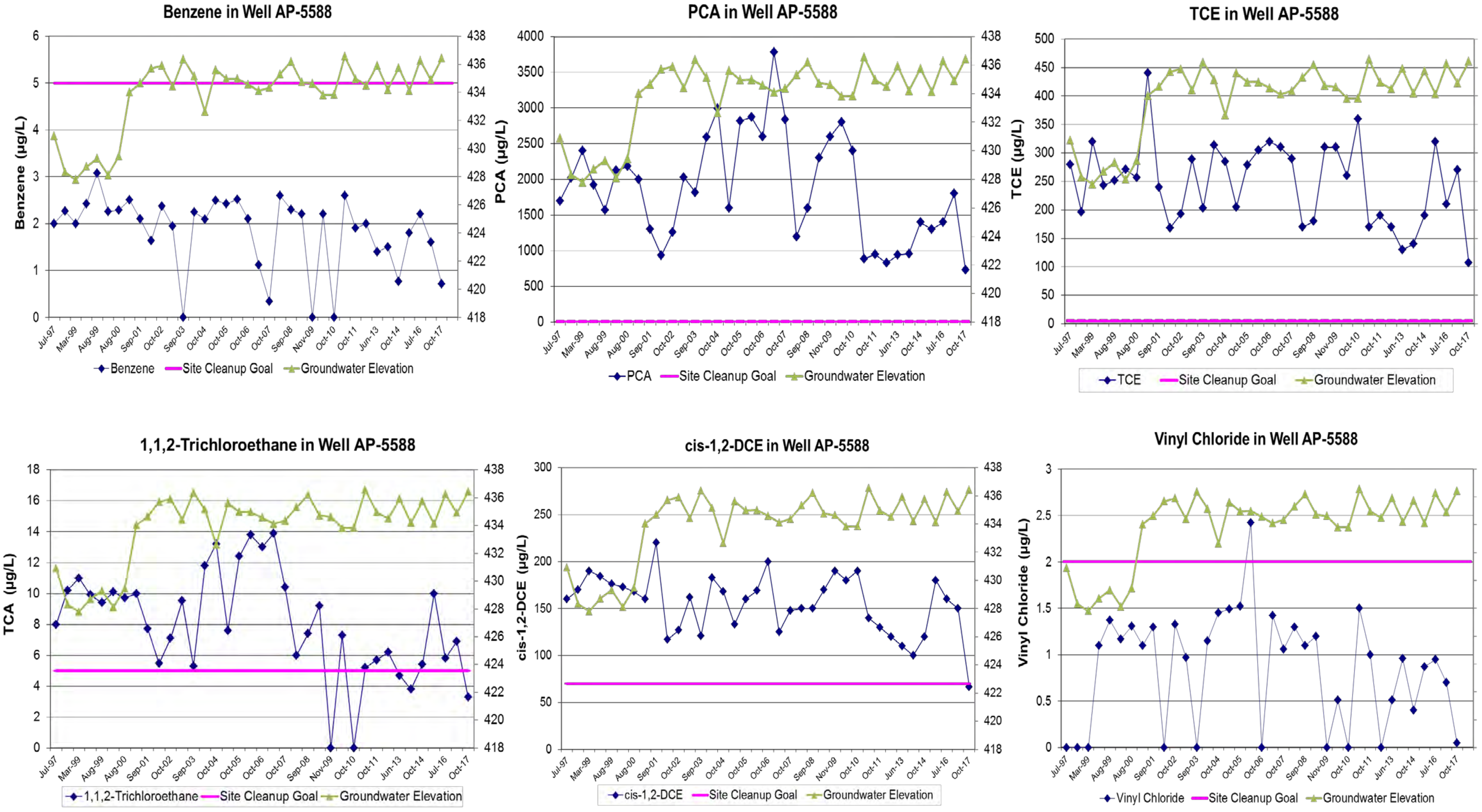
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

## Concentrations of Analytes in Groundwater at the Landfill Source Area

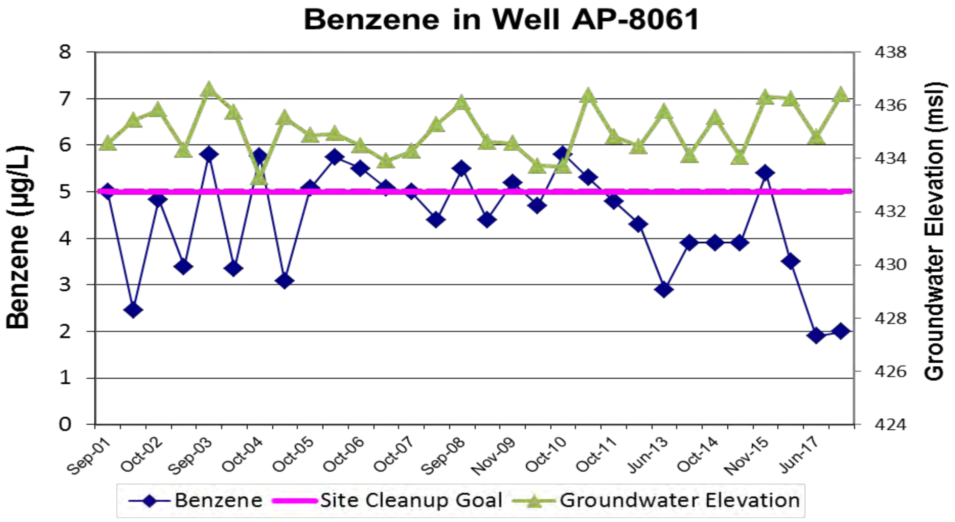
2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

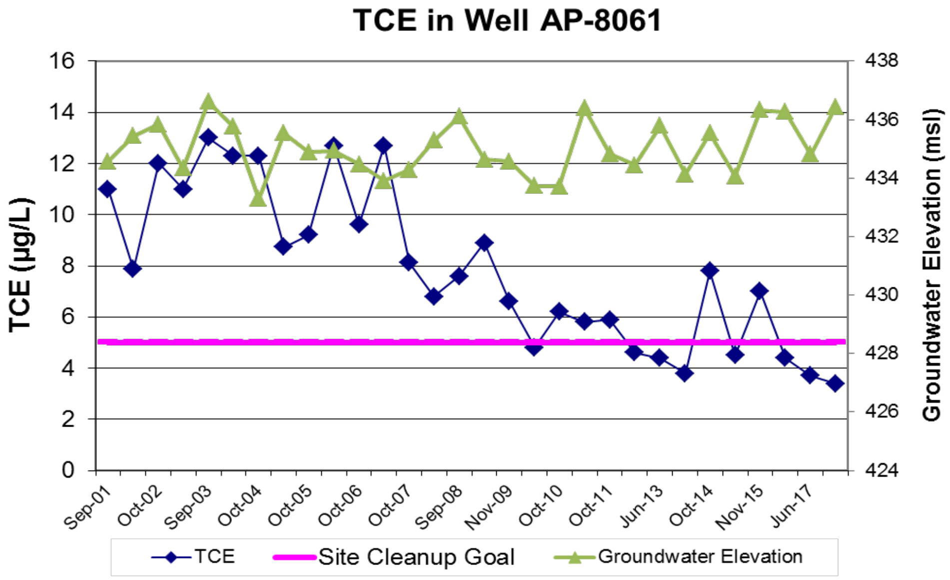
CONTRACT: W911KB-16-D-0005
FIGURE: 3-3
DATE: 10/18

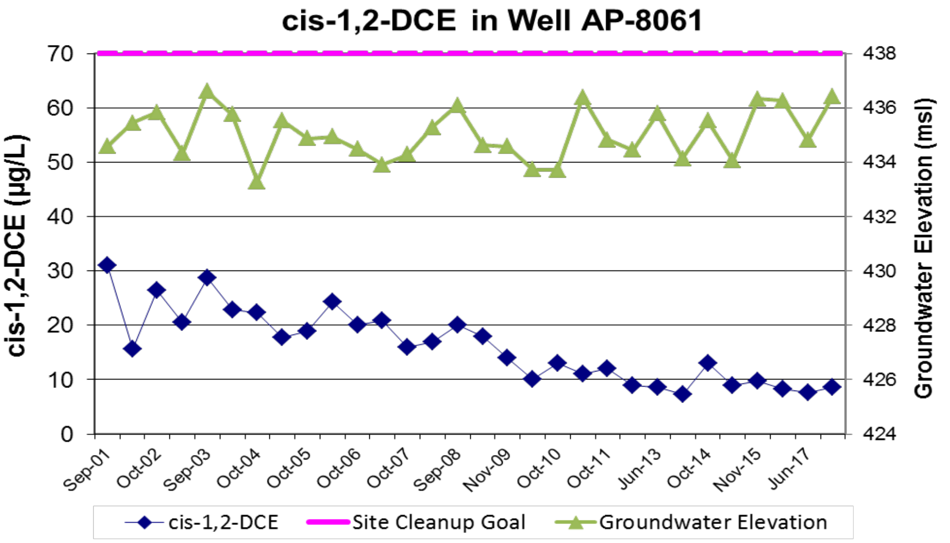
## Figure 3-4 Historical Contaminant Concentrations in AP-5588



## Figure 3-5 Historical Contaminant Concentrations in AP-8061

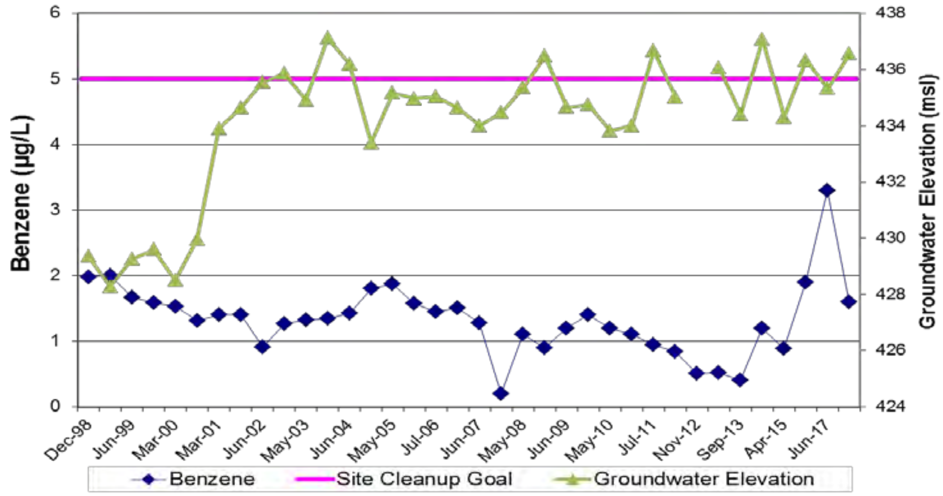




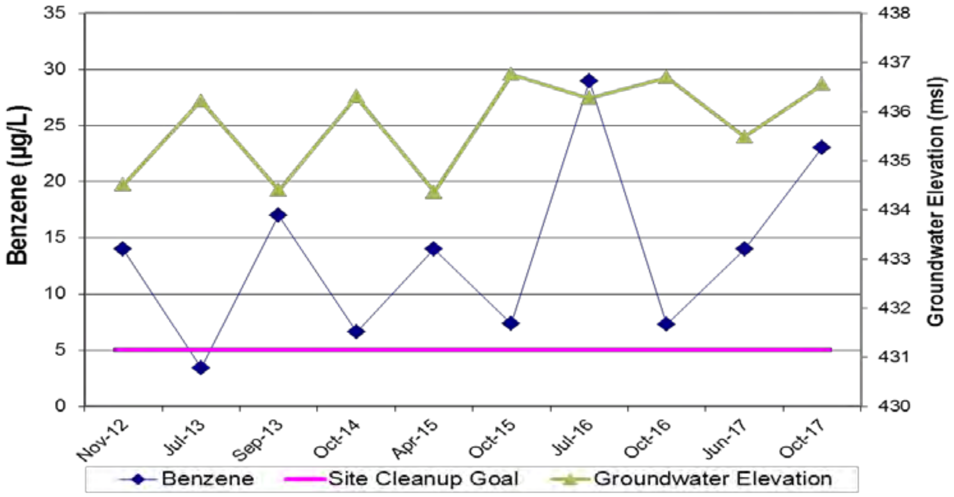


# Figure 3-6 Historical Benzene Concentrations in Upgradient Wells

**Benzene in Well FWLF-4**



**Benzene in Well AP-10257**



**Benzene in Well AP-10258**

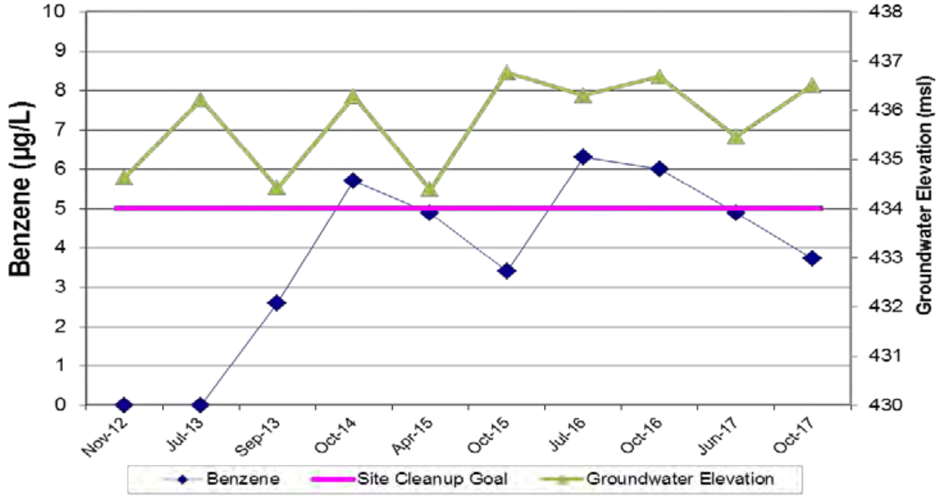
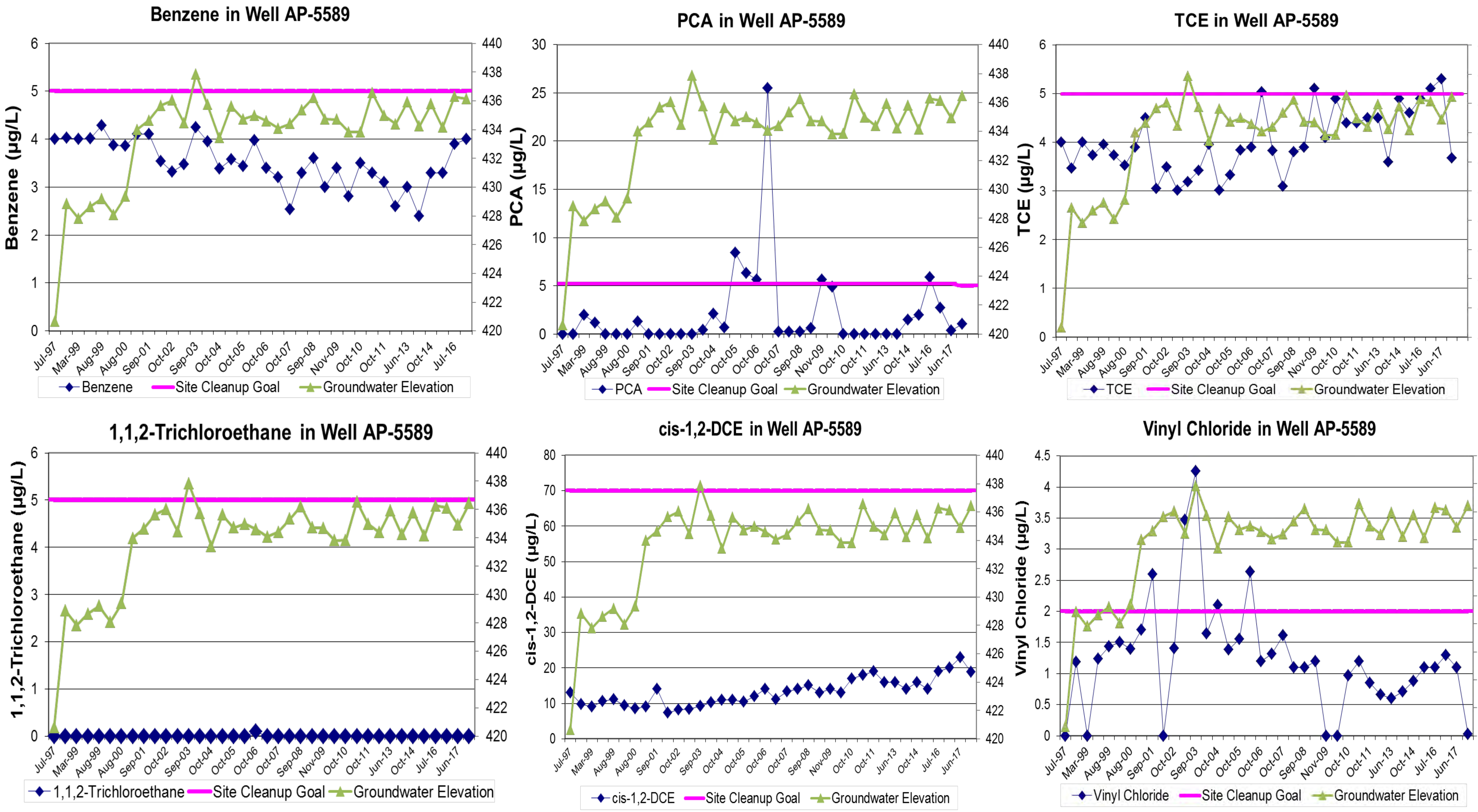


**Figure 3-7 Historical Contaminant Concentrations in AP-5589**



## Figure 3-8 Historical Contaminant Concentrations in AP-8063

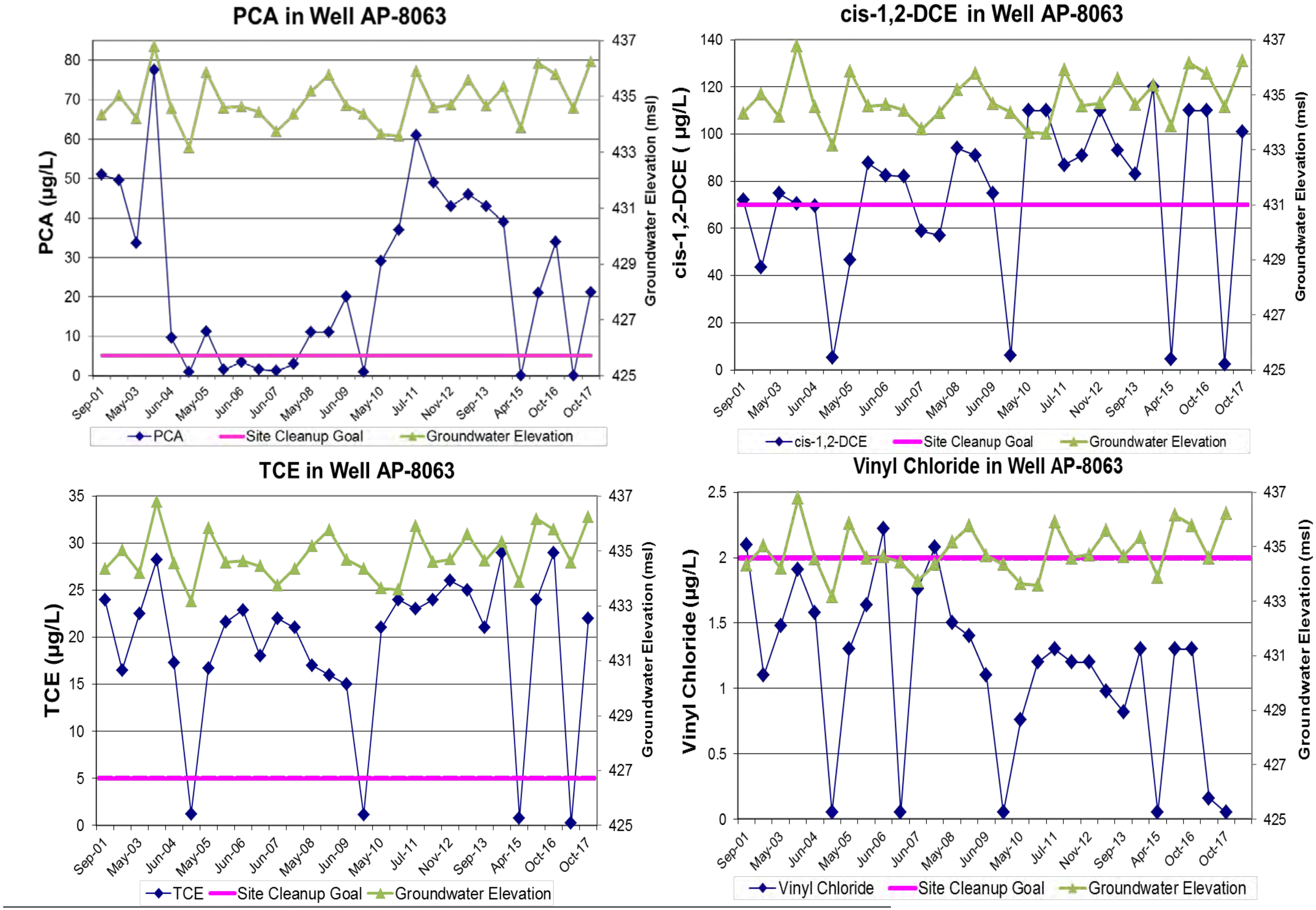


**Figure 3-9 Historical Benzene Concentrations in AP-6532**

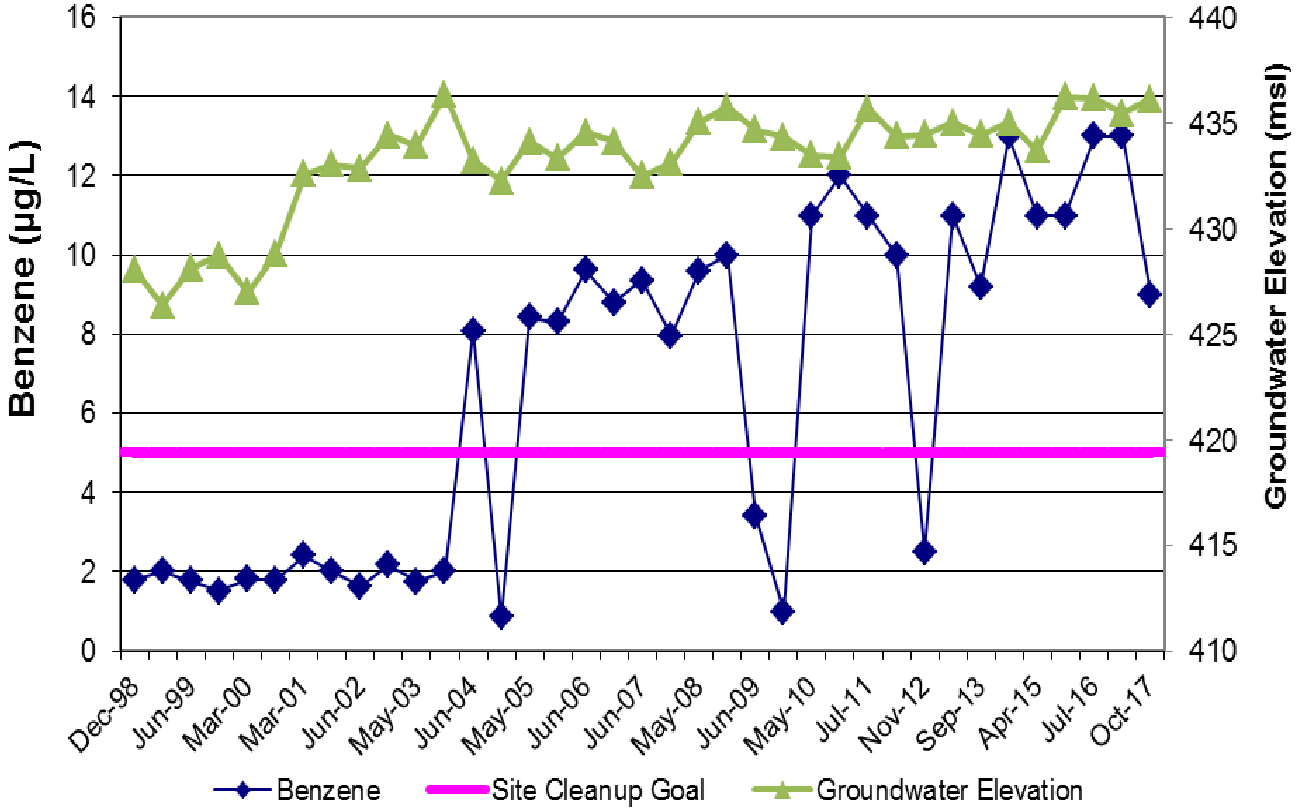
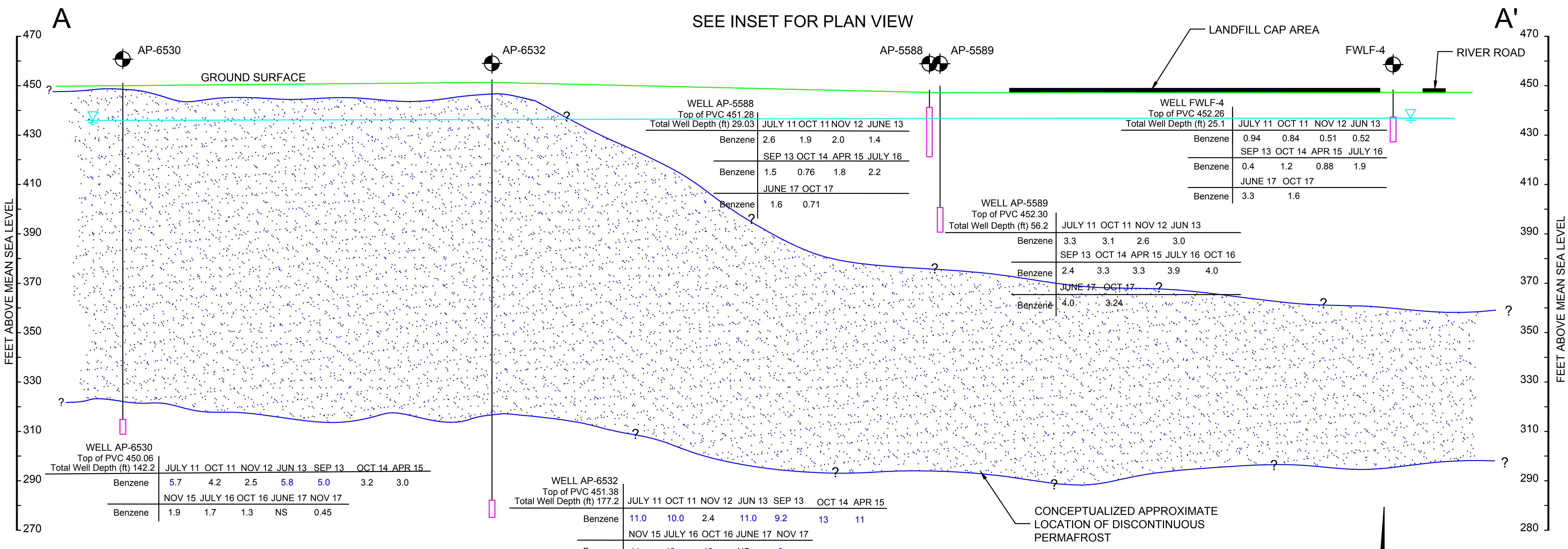


**Figure 3-10 Historical Benzene Concentrations in AP-6530**

## SEE INSET FOR PLAN VIEW



WELL AP-5588
Top of PVC 451.28
Total Well Depth (ft) 29.03

| | JULY 11 | OCT 11 | NOV 12 | JUNE 13 |
|---|---|---|---|---|
| Benzene | 2.6 | 1.9 | 2.0 | 1.4 |

| | SEP 13 | OCT 14 | APR 15 | JULY 16 |
|---|---|---|---|---|
| Benzene | 1.5 | 0.76 | 1.8 | 2.2 |

| | JUNE 17 | OCT 17 |
|---|---|---|
| Benzene | 1.6 | 0.71 |

WELL FWLF-4
Top of PVC 452.26
Total Well Depth (ft) 25.1

| | JULY 11 | OCT 11 | NOV 12 | JUN 13 |
|---|---|---|---|---|
| Benzene | 0.94 | 0.84 | 0.51 | 0.52 |

| | SEP 13 | OCT 14 | APR 15 | JULY 16 |
|---|---|---|---|---|
| Benzene | 0.4 | 1.2 | 0.88 | 1.9 |

| | JUNE 17 | OCT 17 |
|---|---|---|
| Benzene | 3.3 | 1.6 |

WELL AP-5589
Top of PVC 452.30
Total Well Depth (ft) 56.2

| | JULY 11 | OCT 11 | NOV 12 | JUN 13 |
|---|---|---|---|---|
| Benzene | 3.3 | 3.1 | 2.6 | 3.0 |

| | SEP 13 | OCT 14 | APR 15 | JULY 16 | OCT 16 |
|---|---|---|---|---|---|
| Benzene | 2.4 | 3.3 | 3.3 | 3.9 | 4.0 |

| | JUNE 17 | OCT 17 |
|---|---|---|
| Benzene | 4.0 | 3.24 |

WELL AP-6530
Top of PVC 450.06
Total Well Depth (ft) 142.2

| | JULY 11 | OCT 11 | NOV 12 | JUN 13 | SEP 13 | OCT 14 | APR 15 |
|---|---|---|---|---|---|---|---|
| Benzene | **5.7** | 4.2 | 2.5 | **5.8** | **5.0** | 3.2 | 3.0 |

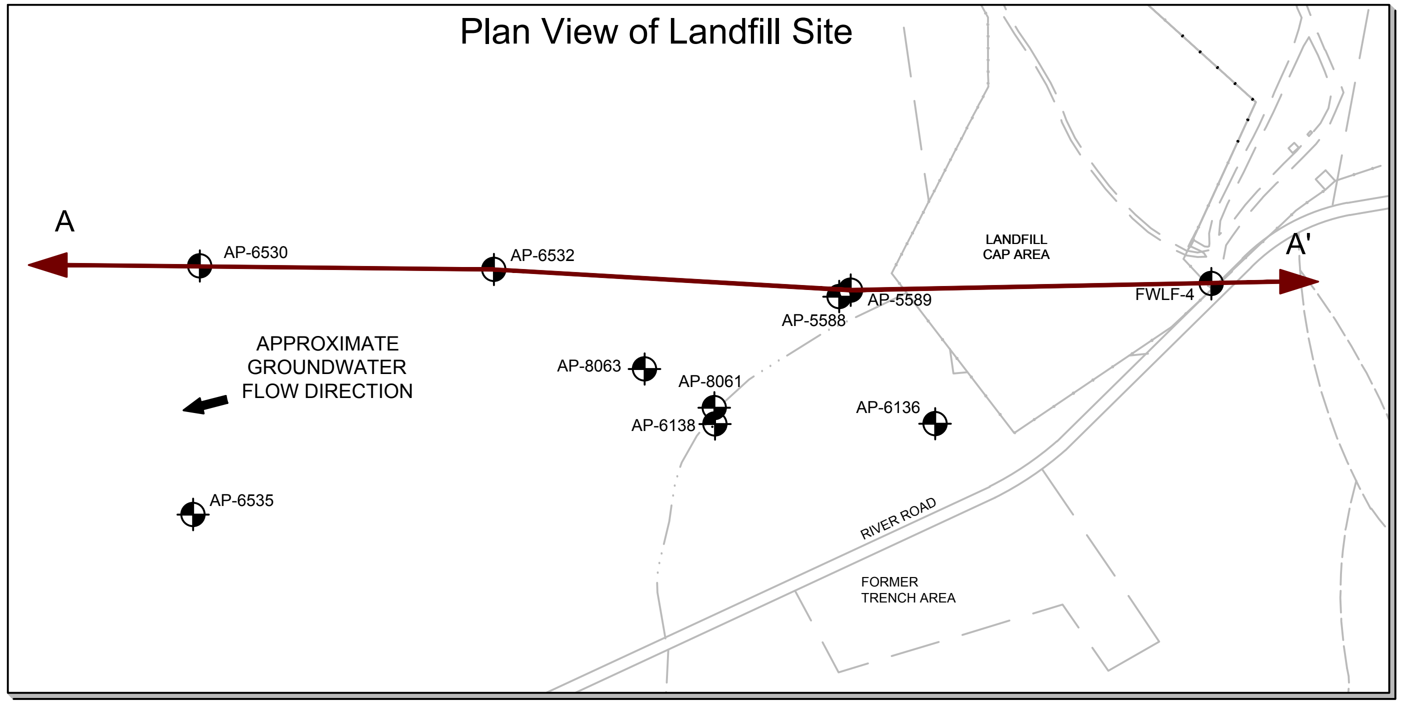
| | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | NOV 17 |
|---|---|---|---|---|---|
| Benzene | 1.9 | 1.7 | 1.3 | NS | 0.45 |

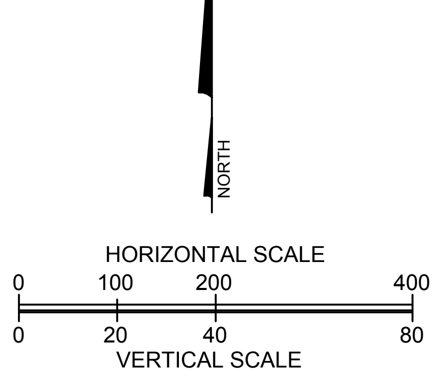
WELL AP-6532
Top of PVC 451.38
Total Well Depth (ft) 177.2

| | JULY 11 | OCT 11 | NOV 12 | JUN 13 | SEP 13 | OCT 14 | APR 15 |
|---|---|---|---|---|---|---|---|
| Benzene | **11.0** | **10.0** | 2.4 | **11.0** | **9.2** | **13** | **11** |

| | NOV 15 | JULY 16 | OCT 16 | JUNE 17 | NOV 17 |
|---|---|---|---|---|---|
| Benzene | **11** | **13** | **13** | NS | **9** |

## Plan View of Landfill Site





LEGEND

| | |
|---|---|
| AP-6532 ⊕ | MONITORING WELL |
| NS | WELL NOT ACCESSIBLE AND NOT SAMPLED |
| $\mu g/L$ | MICROGRAMS PER LITER |
| ▯ | SCREEN LENGTH |
| ▽ | JULY 2016 WATER LEVEL |
| ND | INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES. |

| RAOs IN $\mu g/L$ | |
|---|---|
| 5 | Benzene |

KEY:

MONITORING WELL

WELL AP-6532
Top of PVC 451.38
Total Well Depth (ft) 177.2

| | JULY 11 | OCT 11 |
|---|---|---|
| Groundwater Elevation (feet) | 435.67 | 434.38 |
| Benzene | **11.0** | **10.0** |

CONCENTRATIONS IN MICROGRAMS PER LITER ($\mu g/L$)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

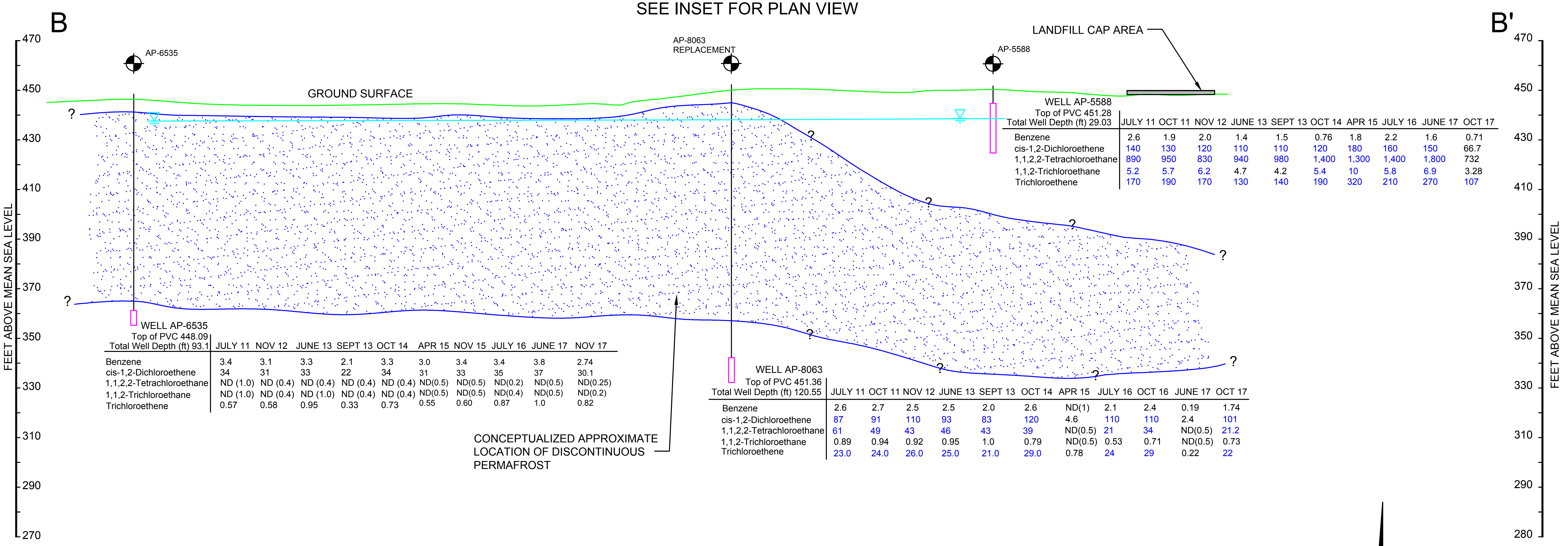
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

# Cross-Section A-A' View of Benzene Contamination

2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

| CONTRACT: | FIGURE: | DATE: |
|---|---|---|
| W911KB-16-D-0005 | 3-11 | 10/18 |

SEE INSET FOR PLAN VIEW



WELL AP-6535
Top of PVC 448.09
Total Well Depth (ft) 93.1

| | JULY 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | NOV 15 | JULY 16 | JUNE 17 | NOV 17 |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 3.4 | 3.1 | 3.3 | 2.1 | 3.3 | 3.0 | 3.4 | 3.4 | 3.8 | 2.74 |
| cis-1,2-Dichloroethene | 34 | 31 | 33 | 22 | 34 | 31 | 33 | 35 | 37 | 30.1 |
| 1,1,2,2-Tetrachloroethane | ND (1.0) | ND (0.4) | ND (0.4) | ND (0.4) | ND (0.4) | ND(0.5) | ND(0.5) | ND(0.2) | ND(0.5) | ND(0.25) |
| 1,1,2-Trichloroethane | ND (1.0) | ND (0.4) | ND (1.0) | ND (0.4) | ND (0.4) | ND(0.5) | ND(0.5) | ND(0.4) | ND(0.5) | ND(0.2) |
| Trichloroethene | 0.57 | 0.58 | 0.95 | 0.33 | 0.73 | 0.55 | 0.60 | 0.87 | 1.0 | 0.82 |

WELL AP-8063
Top of PVC 451.36
Total Well Depth (ft) 120.55

| | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | JULY 16 | OCT 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 2.6 | 2.7 | 2.5 | 2.5 | 2.0 | 2.6 | ND(1) | 2.1 | 2.4 | 0.19 | 1.74 |
| cis-1,2-Dichloroethene | 87 | 91 | 110 | 93 | 83 | 120 | 4.6 | 110 | 110 | 2.4 | 101 |
| 1,1,2,2-Tetrachloroethane | 61 | 49 | 43 | 46 | 43 | 39 | ND(0.5) | 21 | 34 | ND(0.5) | 21.2 |
| 1,1,2-Trichloroethane | 0.89 | 0.94 | 0.92 | 0.95 | 1.0 | 0.79 | ND(0.5) | 0.53 | 0.71 | ND(0.5) | 0.73 |
| Trichloroethene | 23.0 | 24.0 | 26.0 | 25.0 | 21.0 | 29.0 | 0.78 | 24 | 29 | 0.22 | 22 |

WELL AP-5588
Top of PVC 451.28
Total Well Depth (ft) 29.03

| | JULY 11 | OCT 11 | NOV 12 | JUNE 13 | SEPT 13 | OCT 14 | APR 15 | JULY 16 | JUNE 17 | OCT 17 |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 2.6 | 1.9 | 2.0 | 1.4 | 1.5 | 0.76 | 1.8 | 2.2 | 1.6 | 0.71 |
| cis-1,2-Dichloroethene | 140 | 130 | 120 | 110 | 110 | 120 | 180 | 160 | 150 | 66.7 |
| 1,1,2,2-Tetrachloroethane | 890 | 950 | 830 | 940 | 980 | 1,400 | 1,300 | 1,400 | 1,800 | 732 |
| 1,1,2-Trichloroethane | 5.2 | 5.7 | 6.2 | 4.7 | 4.2 | 5.4 | 10 | 5.8 | 6.9 | 3.28 |
| Trichloroethene | 170 | 190 | 170 | 130 | 140 | 190 | 320 | 210 | 270 | 107 |

LEGEND

| | |
|---|---|
| AP-6532 | MONITORING WELL |
| $\mu g/L$ | MICROGRAMS PER LITER |
| ▯ | SCREEN LENGTH |
| ▽ | JULY 2016 WATER LEVEL |
| ND | INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES. |

RAOs IN $\mu g/L$

| | |
|---|---|
| 70 | cis-1,2-Dichloroethene |
| 5.2 | 1,1,2,2-Tetrachloroethane |
| 5 | 1,1,2-Trichloroethane |
| 5 | Trichloroethene |

KEY:

MONITORING WELL

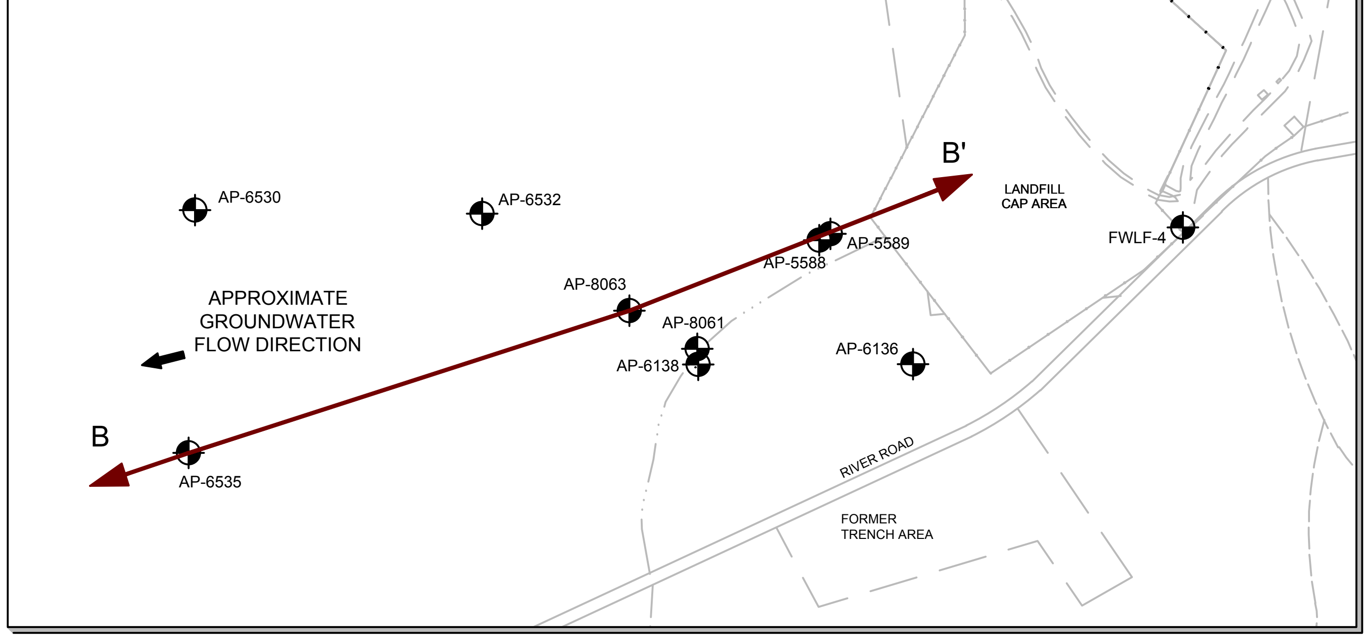
WELL AP-8063
Top of PVC 451.36
Total Well Depth (ft) 120.55

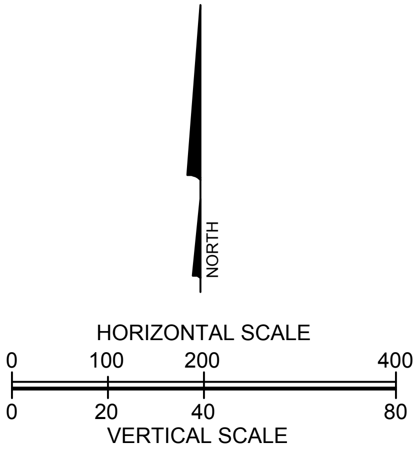
| | JULY 11 | OCT 11 |
|---|---|---|
| cis-1,2-Dichloroethene | 87 | 91 |
| 1,1,2,2-Tetrachloroethane | 61 | 49 |
| 1,1,2-Trichloroethane | 0.89 | 0.94 |
| Trichloroethene | 23.0 | 24.0 |

CONCENTRATIONS IN MICROGRAMS PER LITER ($\mu g/L$)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

## Plan View of Landfill Site





FAIRBANKS ENVIRONMENTAL SERVICES
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FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

# Cross-Section B-B' View of Groundwater Contamination

2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

| CONTRACT: | FIGURE: | DATE: |
|---|---|---|
| W911KB-16-D-0005 | 3-12 | 10/18 |

# 4.0 INSTITUTIONAL CONTROLS INSPECTION

The Institutional Controls (IC) site inspection was conducted at the Landfill on August 25th, 30th, and 31st 2017. The Landfill cap and fence were observed to be in good condition. All groundwater monitoring wells sampled to monitor site contaminants were found to be in good condition with locking caps. An IC Inspection Form, photographs, and further information pertaining to the Landfill site inspection will be included in 2017 Annual IC Inspection Report (anticipated 2018).

A summary of the IC Inspection and findings is provided below.

- The inactive portions of the Landfill are appropriately covered and graded.
- Some trees along the fence line and a few trees on the landfill cap were observed to have grown; however, the trees are not impacting the integrity of the Landfill cap.
- There are no signs of damage to the Landfill face or slopes.
- Signage at the Landfill is intact and in good condition.
- Fencing around the Landfill is intact and in good condition.
- All wells sampled as part of the Landfill monitoring program are in good condition. Well AP-8061 is slightly frost jacked; however, no significant change was noticed compared to the 2016 IC inspection. All wells were locked. In addition, over 100 wells associated with the Landfill, but no longer sampled, were located and inspected. Minor incidences of well caps/expansion plugs and locks that required replacing were noted. Additional information about specific wells can be found in the 2017 Annual IC Inspection Report (anticipated 2018).
- Two wells not in the monitoring well database were discovered during the IC inspection. GPS coordinates were recorded in the field and the wells were added to the database,

# 5.0 CONCLUSIONS AND RECOMMENDATIONS

The monitoring data collected during the 2017 sampling events was generally consistent with results detected during previous sampling events. Recommendations for the monitoring program are outlined in Table 5-1.

In general, contaminants appear to migrate along separate flow paths in groundwater downgradient of the Landfill site. Benzene is detected in all wells sampled downgradient of the landfill, typically at concentrations below the RAG; however, it appears that benzene is migrating below permafrost at concentrations exceeding RAGs in a predominately westerly flow path. Benzene is not seen at concentrations exceeding the RAG in deep downgradient wells that are along a southwesterly flow path. It is possible that the permafrost beneath the Landfill is discontinuous and benzene has migrated through thawed areas of the permafrost, into the aquifer below the permafrost; however, the presence of or depth to permafrost beneath the Landfill is unknown, and it is not known how permafrost affects groundwater flow at depth. Chlorinated solvents are less widespread than benzene in groundwater downgradient of the landfill and appear to be more prevalent on a southwesterly flow path. Specific sources of contamination within the landfill have not been investigated and it is possible that the chlorinated solvents originate from a separate source, or different area of the landfill than the petroleum contaminants. It appears that chlorinated solvents migrate at the water table downgradient of the landfill until permafrost is encountered, where they continue migrating below permafrost. Figure 5-1 depicts the estimated contaminate plume extents downgradient of the Landfill source area during 2017.

### *Shallow Wells (screened across the groundwater table)*

Shallow wells sampled at the Landfill source area include FWLF-4 (upgradient), AP-5588 (immediately downgradient), and AP-8061 (downgradient) as well as two shallow upgradient wells (AP-10257 and AP -10258) installed in 2012 to investigate the leach field at Building 1191. The following summarizes the recommendations for shallow wells at the Landfill source area:

AP-5588 – Well AP-5588, located immediately downgradient of the Landfill source area, continues to exhibit the highest concentrations of most COCs; however, concentrations have remained relatively stable since sampling began in 1997 and although COC concentrations fluctuate, overall the COCs are showing a decreasing trend. Benzene has never been detected above the RAG in AP-5588. The sample frequency at this well was reduced to annual spring sampling in 2015 by agreement of the RPMs because historically COC concentrations have not varied significantly between the spring and fall sampling events. It is recommended that AP-5588 be sample once in 2018, during the spring. Due to the presence of 1,4-dioxane in this well, it is also recommended that AP-5588 be sampled in the spring and fall of 2019 for 1,4-dioxane.

FWLF-4 – Bis(2-ethylhexyl)phthalate exceeded the RAG in fall 2014 and spring 2015 in this well. Prior to this, bis(2-ethylhexyl)phthalate exceeded the RAG in spring 2003 and fall 1998. Other than benzene and cis-1,2-DCE detected below the RAG, no other COC are detected in this well. It is suspected that the low levels of COC detected in FWLF-4 are from the active landfill as this well is upgradient of the closed and capped portion of the Landfill. The sample frequency at this well was reduced to annual spring sampling in 2015 due to consistently low levels of COC detected in this well since 1998. It is recommended that FWLF-4 be sample once in 2018, during the spring.

AP-8061 – This shallow well is located within a shallow permafrost thaw channel downgradient of the Landfill. Benzene and TCE have been detected above the RAGs in this well indicating that these contaminants are migrating at the water table within this thawed area southwest of the landfill. In 30 sampling events, benzene has been detected above the RAG 13 times, with 5.8 µg/L being the highest benzene concentration detected in this well (September 2003 and October 2010). Benzene was most recently detected above the RAG in 2015. TCE and 1,2-DCE are the only chlorinated COCs detected in this well. Cis-1,2-DCE is consistently detected well below the RAG. Overall TCE is showing a decreasing trend; although, it increased to above the RAG during the fall 2015 sampling event. It is recommended that this well be sampled during the spring and fall 2018 to monitor potential downgradient migration of COCs.

AP-10257 and AP-10258 – Benzene has been detected above the RAG in nine of the 10 sampling events at AP-10257 with the highest concentration detected in 2016 at 29 µg/L. Benzene has been detected above the RAG in three of the ten sampling events at AP-10258 (once during 2014 and again during both 2016 sampling events). Cis-1,2-DCE is also consistently detected in both wells at concentrations well below the RAG. It is suspected that the COCs detected in AP-10257 and AP-10258 are from the active landfill as these wells are upgradient of the closed and capped portion of the Landfill and cross gradient of the Building 1191 septic system and leach field. It is recommended that these wells be sampled during the spring and fall of 2018 to monitor the presence of benzene upgradient of the closed portion of the Landfill.

Upgradient Well Recommendation – Adding AP-5593 to the Landfill sampling program as a shallow upgradient well is recommended for 2019 because currently, sampling results from the most upgradient wells from the closed portion of the Landfill, AP-10257 and AP-10258, contain benzene above the RAG.

Historically, AP-6132 was sampled as an upgradient well for the landfill until 2011 when it was removed from the sampling program. The permafrost study that was conducted in 2010 showed that groundwater at AP-6132 was not hydraulically connected with the shallow groundwater aquifer at the landfill due to a large permafrost mass between the well and the landfill (Figure 3-1). FWLF-4 is upgradient of the capped portion of the landfill and was sampled as the upgradient well following the removal of AP-6132 from the sampling program.

Three wells were installed upgradient of FWLF-4 in 2012 to investigation the Building 1191 leach field and were subsequently added to the landfill monitoring program. Two of these wells, AP-10257 and AP-10258, have consistently contained benzene above cleanup levels, which is most likely migrating from the active portion of the landfill. It is recommended that FWLF-4, AP-10257, and AP-10258 continue to be sampled as upgradient wells at the landfill. However, AP-5593 is a shallow well, located within a permafrost thaw channel upgradient of the landfill (shown on Figure 2-1) that can possibly be added to the Landfill sampling program and sampled as an upgradient well. It should be noted that the condition of this well is unknown. It is also recommended that the condition of this well be inspected and determined during the 2018 IC survey.

### *Intermediate Well (screened below the groundwater table but above permafrost)*

One intermediate well, AP-5589, continues to be sampled as part the Landfill source area sampling program. The following summarizes the recommendations for this intermediate well:

AP-5589 – Intermediate well AP-5589 is located a few feet from shallow well AP-5588. Contaminants detected in well AP-5588 are commonly detected in well AP-5589; however, COC concentrations typically do not exceed RAGs. Exceptions include PCA, vinyl chloride (which has been below the RAG since 2006) and, TCE. Bis(2-ethylhexyl) phthalate has only been detected above the RAG one time in this well, during June 2013. In 2015, the RPMs approved reducing the sample frequency at this well to annual spring sampling to coincide with sampling at AP-5588. It is recommended that AP-5589 be sample once in 2018, during the spring. Due to the presence of 1,4-dioxane in this well, it is also recommended that AP-5589 be sampled in the spring and fall of 2019 for 1,4-dioxane.

### *Deep Wells (screened below permafrost)*

Deep wells sampled at the Landfill source area include downgradient wells AP-8063, AP-6532, AP-6535, and AP-6530. The following summarizes the recommendations for deep downgradient wells at the Landfill source area:

AP-8063 – While benzene has consistently been detected below the RAG in this well, it has never exceeded the RAG; however chlorinated solvents TCE, PCA and cis-1,2,-DCE are consistently detected above RAGs in AP-8063. TCE decreased between 2001 and 2009; however overall, concentrations of TCE have been increasing since spring 2010. Between 2001 and 2007, PCA concentrations decreased significantly, but concentrations have generally been increasing since 2008; although, a clear trend is not observed. Cis-1,2-DCE concentrations fluctuate; however, overall concentrations have increased since sampling began in 2001. The sample frequency at this well was reduced to annually in the spring during the 2015 sampling event because historically COC concentrations have not varied significantly between the spring and fall sampling events; however, due to anomalous results from the spring 2015 sampling event (all COC were non-detect) the sampling frequency at AP-8063 return to biannually. It is recommended that this well be sampled during the spring and fall of 2018 to monitor downgradient migration of contaminants.

AP-6535 – Benzene has been detected, but has not exceeded the RAG in well AP-6535 since sampling this well began in 2010. TCE and cis-1,2,-DCE have also been detected in this downgradient well, but at concentrations well below RAGs. It is recommended that this well be sampled during the spring and fall 2018 to monitor potential downgradient migration of contaminants in the subpermafrost aquifer.

AP-6532 and AP-6530 – Historical analytical results indicate that benzene has migrated at concentrations above the RAG to downgradient deep wells AP-6532 and AP-6530. Benzene was above the RAG during the 2017 sampling event in AP-6532 and benzene appears to exhibit an overall increasing trend in this well. Benzene was below the RAG in downgradient well AP-6530 in 2017 and benzene has decreased during each sampling event at AP-6530 since spring 2013. It is recommended that wells AP-6532 and AP-6530 be sampled during the spring and fall 2018 to monitor potential downgradient migration of benzene in the subpermafrost aquifer.

AP-6534 – It is recommended that this deep well, located southwest of AP-5588 and AP-8063, be sampled in 2019, prior to the next Five Year Review. Sampling AP-6534 will provide information on the boundary of the solvent plume detected in AP-5588 and AP-8063.

### Table 5-1 Summary of 2018 Monitoring Well Sampling Recommendations

| Well | Sample in the Spring | Sample in the Fall |
|---|---|---|
| **AP-8061** | **X** | **X** |
| **AP-10257** | **X** | **X** |
| **AP-10258** | **X** | **X** |
| **AP-6532** | **X** | **X** |
| **AP-6535** | **X** | **X** |
| **AP-6530** | **X** | **X** |
| **AP-8063** | **X** | **X** |
| **AP-5588**[1] | **X** | |
| **FWLF-4**[2] | **X** | |
| **AP-5589**[3] | **X** | |

Note – **green** denotes a shallow well, **blue** an intermediate well, and **red** a deep well

[1] RPMs agreed to reduce sample frequency at well AP-5588 to annual spring sampling in 2015 because historically COC concentrations have not varied significantly between the spring and fall sampling events in this well.

[2] RPMs agreed to reduce sample frequency at FWLF-4 to annual spring sampling in 2015 due to consistently low levels of COC detected in this well since 1998.

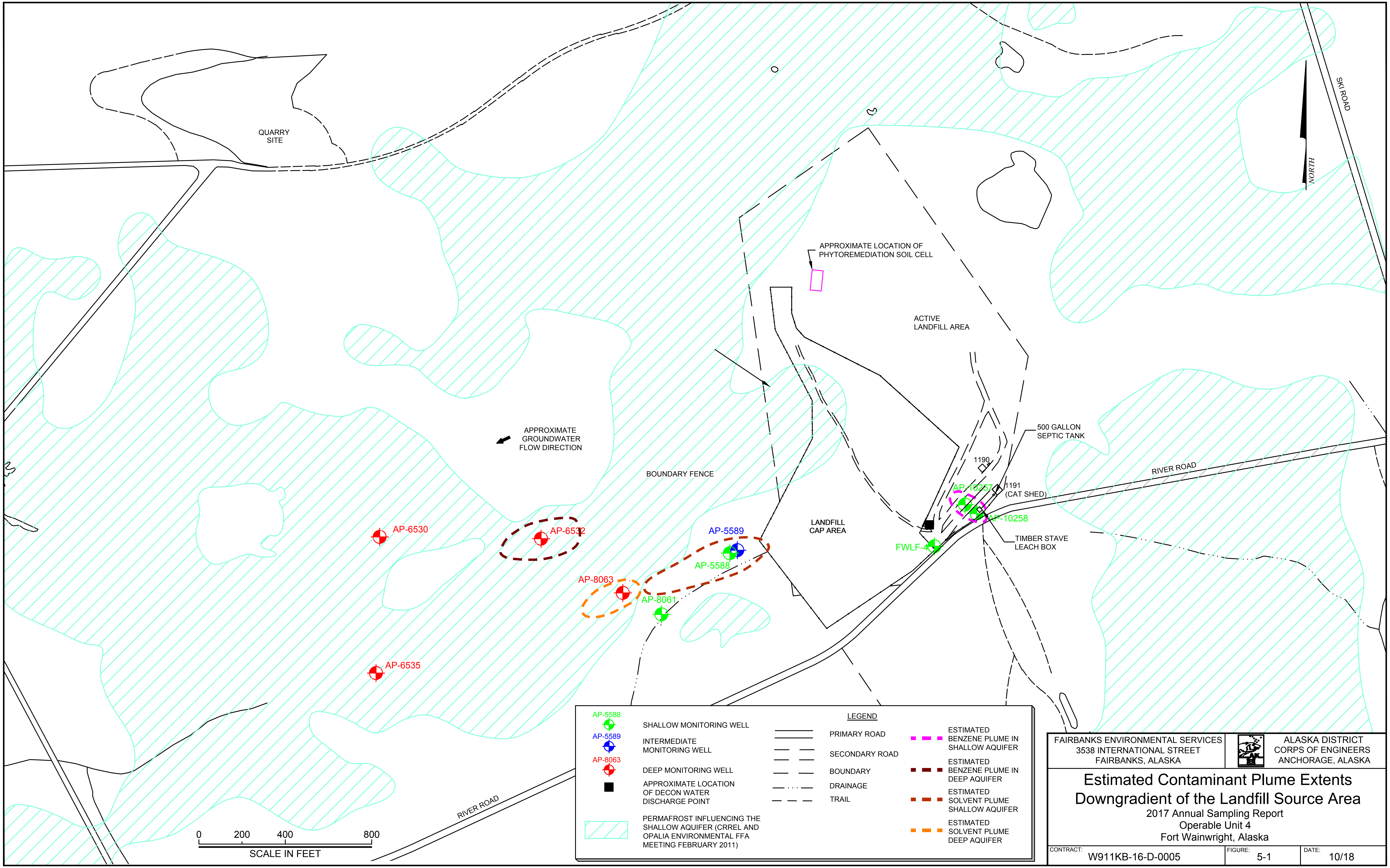
[3] RPMs agreed to reduce sample frequency at well AP-5589 to annual spring sampling in 2015 in order to coincide with the sampling of AP-5588.

### *1,4-Dioxane*

Due to the widespread occurrence of 1,4-Dioxane in the Landfill wells, it is recommended that this compound be added to the sampling program for the OU4 wells.

### *Institutional Control Survey*

It is recommended that the annual inspection of the capped section of the Fort Wainwright Landfill continue to be conducted to ensure that ICs are being met. This would include an inspection of the fence surrounding the area, the Landfill cap, and the monitoring wells. Site-specific ICs for these sites can be found in Appendix A of the Fourth Fort Wainwright Five-Year Review (USARAK, 2016).



FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

# Estimated Contaminant Plume Extents Downgradient of the Landfill Source Area

2017 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005
FIGURE: 5-1
DATE: 10/18

# 6.0 REFERENCES

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USGS, 2003. *Anaerobic Degradation of 1,1,2,2-Tetrachloroethane and Association with Microbial Communities in a Freshwater Tidal Wetland, Aberdeen Proving Ground, Maryland: Laboratory Experiments and Comparisons to Field Data*

# APPENDIX A
## GROUNDWATER SAMPLE FORMS AND FIELD NOTES

**YSI Calibration Form**

Name: OU4

**Calibration Liquid Lot Numbers/ Expiration Dates:**

| SPC | ORP | Ph 4 | Ph 7 or Ph 10 |
|---|---|---|---|
|  |  |  |  |

| Date | Project | YSI# / Turbidity # | Bar. PSI mmHg | D.O . Pre | D.O . Post | SPC Pre | SPC Post | ORP Pre | ORP Post | Ph 4 Pre | Ph 4 Post | Ph 7 Pre | Ph 7 Post | Calibrate Turbidity Meter (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/13/17 | OU4 | 9/11 | — | — | — | 1.017 | 1.000 | 243.4 | 240.0 | 4.00 | 4.00 | 6.97 | 7.00 | Y |
| 6/26/17 | OU4 | — | 756.4 | 8.60 | 8.81 | — | — | — | — | — | — | — | — | — |
| 6/26/17 | " | 6/12 | 754.9 | 8.52 | 8.83 | 1.009 | 1.000 | 232.1 | 240 | 4.06 | 4 | 7.05 | 7 | Y |
| 10/30/17 | OU4 | 9/11 | 755.8 | 8.47 | 9.29 | 1.017 | 1.000 | 242.4 | 240.0 | 4.15 | 4.00 | 6.92 | 7.00 | Y |
| 10/31/17 | OU4 | 9/11 | 768.4 | 9.60 | 9.43 | 0.997 | 1.000 | 241.9 | 240.0 | 3.86 | 4.00 | 7.08 | 7.00 | Y |
| 11/1/17 | " | 9/11 | 776.4 | 9.64 | 9.61 | 0.979 | 1.000 | 240.7 | 240.0 | 4.00 | 4.00 | 7.04 | 7.00 | Y |
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**Notes/ Maintenance Items:**

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** Landfill / CAT Shed
**Date:** 6/26/17
**Probe/Well #:** FWLF-4
**Time:** 1120
**Sample ID:** 17FWOU4 01 WG
**Sampler:** CB
**Weather:** SUNNY
**Outside Temperature:** 69°
**QA/QC Sample ID/Time/LOCID:**
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other
**Equipment Used for Sampling:** YSI # 6 **Turbidity Meter #:** 12 **Water Level:** 14
**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:**

**Column of Water in Probe/Well**
Total Depth in Probe/Well (feet btoc): 25.03
Depth to Water from TOC (feet): - 16.90
Column of Water in Probe/Well (feet): = 8.13
Circle: Gallons per foot of 1.25" (X 0.064) or 2" [✓ (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.32

**Sampling Depth**
Well Screened [✓ Across] / **Below** water table
Depth tubing / pump intake set* approx. 18 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | **±3% (or ±0.2°C max)** | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | **<0.33 feet after initial drawdown** |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.75 | 5 | 3.03 | 0.701 | 2.15 | 6.45 | 51.9 | 39.26 | 17.12 |
| 1.5 | 10 | 2.95 | 0.682 | 1.36 | 6.44 | 37.8 | 17.52 | 17.12 |
| 2.25 | 15 | 2.90 | 0.680 | 1.01 | 6.40 | 35.2 | 10.11 | 17.12 |
| 3 | 20 | 2.87 | 0.677 | 0.95 | 6.40 | 35.0 | 7.21 | 17.12 |
| 3.75 | 25 | 2.86 | 0.677 | 0.92 | 6.40 | 35.8 | 5.59 | 17.12 |
| 4.25 | FINAL | | | | | | | |
| Chris Bolse | | | | | | | | |
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Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**
*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**
**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC] (LL), [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** ________ **$HNO_3$ =** 0

**Purge Water**
Gallons generated: 4.25 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: [✓ POL Water] / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: CB

## GROUNDWATER SAMPLE FORM OU4 Ft. Wainwright, Alaska

**Project #:** 9003-20
**Date:** 6/26/17
**Time:** 1235
**Sampler:** UB
**Weather:** SUNNY
**QA/QC Sample ID/Time/LOCID:**

**Site Location:** Landfill / CAT Shed
**Probe/Well #:** AP-10258MW
**Sample ID:** 17FWOU4 02 WG
**Outside Temperature:** ~~69~~ °F 71 °F
**MS/MSD Performed?** Yes / [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 6 **Turbidity Meter #:** 12 **Water Level:** 14

**Free Product Observed in Probe/Well?** Yes / [✓ No] **If Yes, Depth to Product:** ____________

**Column of Water in Probe/Well**

Total Depth in Probe/Well (feet btoc): 23.80
Depth to Water from TOC (feet): - 18.08
Column of Water in Probe/Well (feet): = 5.72
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 0.93

**Sampling Depth**

Well Screened [✓ Across] / **Below** water table
Depth tubing / pump intake set* approx. 19.9 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| | | | *At least 3 of the 5 parameters below must stabilize* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters:** | | ±3% (or ±0.2°C max) | ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.75 | 5 | 2.76 | 0.640 | 1.16 | 5.75 | 120.9 | 9.92 | 18.16 |
| 1.5 | 10 | 2.62 | 0.644 | 0.90 | 5.77 | 133.6 | 4.02 | 18.16 |
| 2.25 | 15 | 2.55 | 0.644 | 0.72 | 5.77 | 140.3 | 4.16 | 18.16 |
| 3 | 20 | 2.50 | 0.643 | 0.62 | 5.78 | 151.2 | 3.28 | 18.17 |
| 3.75 | 25 | 2.47 | 0.644 | 0.60 | 5.79 | 155.6 | 4.05 | 18.17 |
| 4.5 | 30 | 2.48 | 0.644 | 0.61 | 5.79 | 158.9 | 3.26 | 18.17 |
| 4.75 | FINAL | | | | | | | |
| Chris Bossi | | | | | | | | |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?** ____________
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?** ____________
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?** ____________
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other: ____________
**Well Condition:** Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N **Comments:** ____________
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:** ____________
*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**
**Laboratory Analyses (Circle):** [✓ VOC, SVOC (LL), Metals*, Iron, Sulfate, [redacted] 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** ________ **$HNO_3$ =** 0

**Purge Water**
Gallons generated: 4.75 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: UB

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Date:** 6/26/17
**Time:** 1340
**Sampler:** CB
**Weather:** SUNNY
**QA/QC Sample ID/Time/LOCID:**

**Site Location:** Landfill / CAT Shed
**Probe/Well #:** AP-10257MW
**Sample ID:** 17FWOU403 WG
**Outside Temperature:** 72°F
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 6 **Turbidity Meter #:** 12 **Water Level:** 14

**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:**

**Column of Water in Probe/Well**

Total Depth in Probe/Well (feet btoc): 24.42
Depth to Water from TOC (feet): - 18.52
Column of Water in Probe/Well (feet): = 5.90
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 0.96

**Sampling Depth**

Well Screened [✓ Across] / Below water table 20.2
Depth tubing / pump intake set* approx. ~~19.2~~ CB feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| | | | *At least 3 of the 5 parameters below must stabilize* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters:** | | ±3% (or ±0.2°C max) | ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.75 | 5 | 2.57 | 1.279 | 0.56 | 5.88 | 97.2 | 7.70 | 18.61 |
| 1.5 | 10 | 2.55 | 1.270 | 0.50 | 5.88 | 95.6 | 6.28 | 18.61 |
| 2.25 | 15 | 2.50 | 1.265 | 0.49 | 5.87 | 90.2 | 4.92 | 18.61 |
| 3 | 20 | 2.42 | 1.261 | 0.45 | 5.87 | 89.7 | 4.06 | 18.62 |
| 3.75 | 25 | 2.45 | 1.258 | 0.42 | 5.87 | 90.5 | 4.66 | 18.62 |
| 4.5 | 30 | 2.47 | 1.257 | 0.43 | 5.87 | 91.2 | 4.02 | 18.62 |
| 5 | FINAL | | | | | | | |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] /No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, ~~Ag, Tl, V, Zn~~**

**Laboratory Analyses (Circle):** [✓ VOC, SVOC (LL), Metals*, Iron, Sulfate, [redacted], 1,4-Dioxane]

**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL):** HCl = ______ HNO3 = 0

**Purge Water**

Gallons generated: 5
Containerized and disposed as IDW? [✓ Yes] / No
If No, why not?
Disposal method*: [✓ POL Water] / CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: CB

## GROUNDWATER SAMPLE FORM

OU4

Ft. Wainwright, Alaska

Project #: 9003-20

Date: 6/26/17

Time: 1100

Sampler: SK

Weather: Clear

Site Location: [✓ Landfill] / CAT Shed

Probe/Well #: AP-6535

Sample ID: 17FWOU4 04 WG

Outside Temperature: 55°F

QA/QC Sample ID/Time/LOCID: —

MS/MSD Performed? Yes/ [✓ No]

Purge Method: Peristaltic Pump / [✓ Submersible] / Bladder

Sample Method: Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 11

Water Level: SOL 13

Free Product Observed in Probe/Well? Yes/ [✓ No]

If Yes, Depth to Product:

**Column of Water in Probe/Well**

Sampling Depth 5' Screen

Total Depth in Probe/Well (feet btoc): 90.9

Well Screened Across / [✓ Below] water table

Depth to Water from TOC (feet): - 14.25

Depth tubing / pump intake set* approx. 88' feet below top of casing

Column of Water in Probe/Well (feet): = 76.65

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.16)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 12.5

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| Field Parameters: | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 1.51 | 0.444 | 3.38 | 6.78 | -45.9 | 169.9 | 14.31 |
| 1.0 | 10 | 0.99 | 0.461 | 2.74 | 6.77 | -59.4 | 77.43 | 14.32 |
| 1.5 | 15 | 1.77 | 0.469 | 1.77 | 6.81 | -62.3 | 44.78 | 14.32 |
| 2.0 | 20 | 1.68 | 0.472 | 1.57 | 6.81 | -66.9 | 39.18 | 14.32 |
| 2.5 | 25 | 1.69 | 0.473 | 1.01 | 6.81 | -65.2 | 27.01 | 14.32 |
| 3.0 | 30 | 1.30 | 0.474 | 0.70 | 6.80 | -66.1 | 21.88 | 14.32 |
| 3.5 | 35 | 1.34 x | 0.478 ✓ | 0.56 x | 6.82 ✓ | -68.2 ✓ | 13.64 x | 14.32 |
| 4.0 | 40 | 1.34 ✓ | 0.478 ✓ | 0.58 ✓ | 6.81 ✓ | -68.9 ✓ | 11.07 x | 14.32 |
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Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?

Did drawdown stabilize? [✓ Yes] / No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?

Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock [✓ Y] N Labeled with LOC ID: [✓ Y] / N Comments:

Sheen: Yes / [✓ No] Odor: Yes / [✓ No] Notes/Comments:

* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Laboratory Analyses (Circle): [✓ VOC], [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]

pH checked of samples: [✓ Y] N Approximate volume added (mL): HCl = 0 HNO$_3$ = 0

**Purge Water**

Gallons generated: 5.0 Containerized and disposed as IDW? [✓ Yes] No If No, why not?

Disposal method*: [✓ POL Water] / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** [✓ Landfill] / CAT Shed
**Date:** 6/26/17
**Probe/Well #:** AP-8063
**Time:** 1315
**Sample ID:** 17FWOU4 05 WG
**Sampler:** SK
**Weather:** Clear
**Outside Temperature:** 60°F
**QA/QC Sample ID/Time/LOCID:** ←
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** [✓ Peristaltic Pump] / Submersible / Bladder
**Sample Method:** [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other
**Equipment Used for Sampling:** **YSI #** 9 **Turbidity Meter #:** 11 **Water Level:** Sol 13
**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:** —
**Column of Water in Probe/Well**
**Sampling Depth** 10' Screen
Total Depth in Probe/Well (feet btoc): 121.80
Well Screened Across / [✓ Below] water table
Depth to Water from TOC (feet): - 16.63
Depth tubing / pump intake set* approx. 116 feet below top of casing
Column of Water in Probe/Well (feet): = 105.17
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 17.14
Dedicated Tubing

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.4 | 5 | 2.63 | 0.277 | 3.37 | 5.35 | 34.3 | 9.43 | 16.64 |
| 0.8 | 10 | 2.72 | 0.317 | 2.32 | 7.14 | -71.7 | 8.55 | 16.64 |
| 1.2 | 15 | 2.02 | 0.345 | 1.68 | 7.26 | -77.5 | 7.69 | 16.64 |
| 1.6 | 20 | 2.18 | 0.379 | 1.38 | 7.31 | -88.0 | 7.05 | 16.64 |
| 2.0 | 25 | 2.14 | 0.396 | 1.23 | 7.33 | -94.5 | 6.76 | 16.64 |
| 2.4 | 30 | 2.14 ✓ | 0.414 x | 1.03 x | 7.36 ✓ | -101.3 x | 5.97 x | 16.64 |
| 2.8 | 35 | 2.15 | 0.413 | 0.82 | 7.38 | -108.6 | 5.47 | 16.64 |
| 3.2 | 40 | 2.16 ✓ | 0.424 ✓ | 0.75 x | 7.40 ✓ | -112.1 x | 4.78 x | 16.64 |
| 3.6 | 45 | 2.18 | 0.425 | 0.64 | 7.45 | -117.1 | 4.47 | 16.64 |
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Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] / No If no, why not?
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**
*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**
**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC] [✓ (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** 2 **HNO₃ =** 0

**Purge Water**
Gallons generated: 5.0
Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: [✓ POL Water] / CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** Landfill / CAT Shed
**Date:** 6/26/17
**Probe/Well #:** AP-8061
**Time:** 1500
**Sample ID:** 17FWOU406WG
**Sampler:** SK
**Weather:** Clear
**Outside Temperature:** 65°F
**QA/QC Sample ID/Time/LOCID:** ——
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other
**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** 502.13
**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:** —
**Column of Water in Probe/Well**
**Sampling Depth** 10' screen
Total Depth in Probe/Well (feet btoc): 29.30
Well Screened Across / [✓ Below] water table
Depth to Water from TOC (feet): - 9.33
Depth tubing / pump intake set* approx. 24.3 feet below top of casing
Column of Water in Probe/Well (feet): = 19.97
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 3.3

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| | | | *At least 3 of the 5 parameters below must stabilize* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters:** | | ±3% (or ±0.2°C max) | ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 7.00 | 0.578 | 1.16 | 6.87 | -67.5 | 59.35 | 9.37 |
| 1.0 | 10 | 7.77 | 0.569 | 1.02 | 6.86 | -69.2 | 74.49 | 9.37 |
| 1.5 | 15 | 4.57 | 0.549 | 0.72 | 6.87 | -66.1 | 44.21 | 9.37 |
| 2.0 | 20 | 4.43 | 0.550 | 0.65 | 6.87 | -70.1 | 35.67 | 9.37 |
| 2.5 | 25 | 4.48 | 0.552 | 0.59 | 6.87 | -71.8 | 31.77 | 9.37 |
| 3.0 | 30 | 4.47 | 0.552 | 0.56 | 6.87 | -72.2 | 30.34 | 9.37 |
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Did groundwater parameters stabilize? [✓ Yes] / No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes] /No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N **Comments:**
Sheen: Yes/ [✓ No] Odor: Yes/ [✓ No] **Notes/Comments:**
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC] [✓ SVOC] (LL) [✓ Metals*] [✓ Iron] [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = 2 HNO₃ = 0

**Purge Water**
Gallons generated: 3.25 Containerized and disposed as IDW [✓ Yes] / No If No, why not?
Disposal method*: [✓ POL Water] / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** OU4 Ft. Wainwright, Alaska

**Project #:** 9003-20
**Date:** 6/26/17
**Time:** 1700
**Sampler:** SK
**Weather:** Clear
**Site Location:** [✓ Landfill] / CAT Shed
**Probe/Well #:** AP-5589
**Sample ID:** 17FWOU407 WG
**Outside Temperature:** 65°F
**QA/QC Sample ID/Time/LOCID:** ——
**MS/MSD Performed?** Yes [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** SOL 13

**Free Product Observed in Probe/Well?** Yes/[✓ No] **If Yes, Depth to Product:** ∅

**Column of Water in Probe/Well**
**Sampling Depth** 10' Screen

Total Depth in Probe/Well (feet btoc): 56.32
Well Screened Across / [✓ Below] water table
Depth to Water from TOC (feet): - 17.23
Depth tubing / pump intake set* approx. 51 feet below top of casing
Column of Water in Probe/Well (feet): = 39.09
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 6.4

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 3.24 | 0.953 | 7.95 | 6.69 | -117.9 | 9.04 | 17.30 |
| 1.0 | 10 | 2.44 | 1.008 | 1.67 | 6.69 | -127.9 | 7.22 | 17.30 |
| 1.5 | 15 | 2.29 | 1.016 | 1.38 | 6.69 | -131.4 | 6.06 | 17.30 |
| 2.0 | 20 | 2.24 | 1.020 | 1.18 | 6.68 | -127.1 | 3.98 | 17.30 |
| 2.5 | 25 | 2.25 | 1.022 | 1.10 | 6.70 | -126.6 | 4.19 | 17.30 |
| 3.0 | 30 | 2.25 | 1.022 | 1.06 | 6.70 | -125.8 | 2.54 | 17.30 |
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Did groundwater parameters stabilize? [✓ Yes] No If no, why not?
Did drawdown stabilize? [✓ Yes] / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? [✓ Yes]/No If no, why not?
Water Color: [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock [✓ Y] / N Labeled with LOC ID [✓ Y] N Comments:
Sheen: Yes / [✓ No] Odor: Yes [✓ No] Notes/Comments:
* Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn
Laboratory Analyses (Circle): [✓ VOC] [✓ SVOC] (LL), [✓ Metals*] [✓ Iron] [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
pH checked of samples: [✓ Y] / N Approximate volume added (mL): HCl = ∅ HNO₃ = ∅

**Purge Water**
Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: [✓ POL Water] / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20

**Date:** 6/26/17

**Time:** 1830

**Sampler:** SK

**Weather:** Clear

**Site Location:** [✓ Landfill] / CAT Shed

**Probe/Well #:** ~~AP558~~ AP-5588

**Sample ID:** 17FWOU4 08 WG

**Outside Temperature:** 65°F

**QA/QC Sample ID/Time/LOCID:** 17FWOU409WG/1845/AP-2020 **MS/MSD Performed?** [✓ Yes] / No

**Purge Method:** [✓ Peristaltic Pump] / Submersible / Bladder **Sample Method:** [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** SOL 13

**Free Product Observed in Probe/Well?** Yes/[✓ No] **If Yes, Depth to Product:** ∅

**Column of Water in Probe/Well** **Sampling Depth** 18' screen

Total Depth in Probe/Well (feet btoc): 29.12

Depth to Water from TOC (feet): - 16.22

Column of Water in Probe/Well (feet): = 12.90

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 2.1

Well Screened [✓ Across] / **Below** water table

Depth tubing / pump intake set* approx. 17 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Dedicated Tubing (broken well)

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| | | | *At least 3 of the 5 parameters below must stabilize* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters:** | | **±3% (or ±0.2°C max)** | **±3%** | **±10% (<1mg/L, ±0.2 mg/L)** | **±0.1 units** | **±10 mV** | **±10% (<10NTU, ±1NTU)** | **<0.33 feet after initial drawdown** |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.4 | 5 | 2.35 | 1.123 | 4.92 | 6.50 | -73.9 | 107.1 | 16.24 |
| 0.8 | 10 | 2.44 | 1.159 | 3.35 | 6.52 | -70.2 | 38.35 | 16.24 |
| 1.2 | 15 | 2.57 | 1.171 | 2.37 | 6.53 | -71.8 | 31.18 | 16.24 |
| 1.6 | 20 | 2.45 | 1.188 | 2.14 | 6.54 | -73.7 | 29.91 | 16.24 |
| 2.0 | 25 | 2.50 | 1.199 | 1.94 | 6.56 | -76.8 | 25.24 | 16.24 |
| 2.4 | 30 | 2.56 | 1.208 | 1.66 | 6.56 | -79.3 | 23.27 | 16.24 |
| 2.8 | 35 | 2.59 ✓ | 1.216 ✓ | 1.68 x | 6.57 ✓ | -81.3 ✓ | 20.91 x | 16.24 |
| 3.2 | 40 | 2.63 | 1.226 | 1.56 | 6.57 | -82.3 | 18.68 | 16.24 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**

**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**

**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**

**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

**Well Condition:** Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N **Comments:**

**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC] [✓ SVOC(LL)] [✓ Metals*] [✓ Iron] [✓ Sulfate] Methane, [✓ 1,4-Dioxane]

**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL):** **HCl =** ∅ **$HNO_3$ =** ∅

**Purge Water**

Gallons generated: 3.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Disposal method*: [✓ POL Water] / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: SK

# Submersible Pump Equipment Blank

Rinsate #: 15

Sample ID: 17FW0U410 WQ

Date: 6/26/17

Time: 1525

Analysis: SVOc-LL, VOC, Fe, $SO_4$, Metals, 1,4 DIOXANE

Well that the pump was last used on: AP-10257MW

# Trip Blank Tracking Form

Trip Blank Number: 17FW04411WQ

Date: 6/26/17

Time: 0800

Analysis: VOC / [illegible] / [illegible]

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** Landfill / CAT Shed
**Date:** 10/30/17
**Probe/Well #:** AP-10257MW
**Time:** 1200
**Sample ID:** 17FWOU4 12 WG
**Sampler:** JK
**Weather:** Rain
**Outside Temperature:** 34°F
**QA/QC Sample ID/Time/LOCID:** --
**MS/MSD Performed?** Yes [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** [✓ Peristaltic Pump] / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** **YSI #** 09 **Turbidity Meter #:** 11 **Water Level:** SOL

**Free Product Observed in Probe/Well?** Yes [✓ No] **If Yes, Depth to Product:** 0

**Column of Water in Probe/Well**
**Sampling Depth** 10' Screen

Total Depth in Probe/Well (feet btoc): 24.48
Well Screened [✓ Across] / **Below** water table
Depth to Water from TOC (feet): - 17.5'
Depth tubing / pump intake set* approx. 18.5 feet below top of casing
Column of Water in Probe/Well (feet): = 6.97
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.14

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | **±3% (or ±0.2°C max)** | *At least 3 of the 5 parameters below must stabilize*<br>**±3%** | **±10% (<1mg/L, ±0.2 mg/L)** | **±0.1 units** | **±10 mV** | **±10% (<10NTU, ±1NTU)** | **<0.33 feet after initial drawdown** |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 1.71 | 0.823 | 2.33 | 6.51 | -37.9 | 27.64 | 17.55 |
| 1.0 | 10 | 2.06 | 0.824 | 1.32 | 6.56 | -51.7 | 18.07 | 17.55 |
| 1.5 | 15 | 2.14 | 0.822 | 0.94 | 6.58 | -60.5 | 12.58 | 17.55 |
| 2.0 | 20 | 2.20 | 0.819 | 0.74 | 6.58 | -64.7 | 9.81 | 17.55 |
| 2.5 | 25 | 2.16 | 0.817 | 0.68 | 6.58 | -67.2 | 7.88 | 17.55 |
| 3.0 | 30 | 2.15 | 0.818 | 0.63 | 6.59 | -68.4 | 6.64 | 17.55 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N **Comments:**
**Sheen:** Yes [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**
*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**
**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], [redacted], [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** 0 **HNO3 =** 0

**Purge Water**
Gallons generated: 3.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: JK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** Landfill / CAT Shed
**Date:** 10/30/17
**Probe/Well #:** AP-10258MW
**Time:** 1315
**Sample ID:** 17FWOU4 13 WG
**Sampler:** JK
**Weather:** Rain
**Outside Temperature:** 34°F
**QA/QC Sample ID/Time/LOCID:** —
**MS/MSD Performed?** Yes/[✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other
**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** SOL
**Free Product Observed in Probe/Well?** Yes/[✓ No] **If Yes, Depth to Product:** —

**Column of Water in Probe/Well**

Total Depth in Probe/Well (feet btoc): 23.80
Depth to Water from TOC (feet): - 17.03
Column of Water in Probe/Well (feet): = 6.77
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.1

**Sampling Depth**

Well Screened [✓ Across] / **Below** water table
Depth tubing / pump intake set* approx. 18.0 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* | | | | | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| | | | ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 2.91 | 0.589 | 1.87 | 6.25 | 30.3 | 12.82 | 17.06 |
| 1.0 | 10 | 2.96 | 0.591 | 1.31 | 6.29 | 30.4 | 10.67 | 17.07 |
| 1.5 | 15 | 2.97 | 0.589 | 0.88 | 6.32 | 31.5 | 8.91 | 17.07 |
| 2.0 | 20 | 2.90 | 0.605 | 0.69 | 6.33 | 32.4 | 7.90 | 17.07 |
| 2.5 | 25 | 2.93 | 0.609 | 0.60 | 6.33 | 33.0 | 7.17 | 17.07 |
| 3.0 | 30 | 2.98 | 0.611 | 0.58 | 6.33 | 33.4 | 6.50 | 17.07 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], ~~Methane~~, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL):** HCl = 0 HNO3 = 0

**Purge Water**

Gallons generated: 3.25 Containerized and disposed as IDW? [✓ Yes] No If No, why not?
Disposal method*: ~~POL Water~~ / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: JK

**GROUNDWATER SAMPLE FORM** OU4 **Ft. Wainwright, Alaska**

**Project #:** 9003-20

**Site Location:** Landfill [✓ CAT Shed]

**Date:** 10/30/17

**Probe/Well #:** FWLF-4

**Time:** 1430

**Sample ID:** 17FWOU4 14 WG

**Sampler:** JK

**Weather:** Rain

**Outside Temperature:** 34°F

**QA/QC Sample ID/Time/LOCID:** ——

**MS/MSD Performed?** Yes/[✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder

**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** SOL

**Free Product Observed in Probe/Well?** Yes/[✓ No] **If Yes, Depth to Product:** 0

**Column of Water in Probe/Well**

**Sampling Depth** 10' screen

Total Depth in Probe/Well (feet btoc): 25.08

Well Screened [✓ Across] **Below** water table

Depth to Water from TOC (feet): - 15.67

Depth tubing / pump intake set* approx. 17 feet below top of casing

Column of Water in Probe/Well (feet): = 9.41

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 1.5

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 2.79 | 0.719 | 2.35 | 6.51 | 33.9 | 50.16 | 15.70 |
| 1.0 | 10 | 2.59 | 0.706 | 1.59 | 6.55 | -7.0 | 52.91 | 15.70 |
| 1.5 | 15 | 2.45 | 0.688 | 0.83 | 6.58 | -39.6 | 27.30 | 15.70 |
| 2.0 | 20 | 2.38 | 0.679 | 0.65 | 6.60 | -51.2 | 11.58 | 15.70 |
| 2.5 | 25 | 2.36 | 0.678 | 0.54 | 6.61 | -58.1 | 7.81 | 15.70 |
| 3.0 | 30 | 2.33 ✓ | 0.679 ✓ | 0.46 ✓ | 6.62 ✓ | -64.4 x | 5.37 x | 15.70 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**

**Did drawdown stabilize?** [✓ Yes] No **If no, why not?**

**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes]/No **If no, why not?**

**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**

**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC] [✓ SVOC] (LL) [✓ Metals*] [✓ Iron] [✓ Sulfate] Methane, [✓ 1,4-Dioxane]

**pH checked of samples:** [✓ Y] N **Approximate volume added (mL):** HCl = 0 HNO$_3$ = 0

**Purge Water**

Gallons generated: 3.5 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: JK

**GROUNDWATER SAMPLE FORM** OU4 **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Date:** 10/30/17
**Time:** 1600
**Sampler:** SK
**Weather:** Overcast
**QA/QC Sample ID/Time/LOCID:** —

**Site Location:** [✓ Landfill] / CAT Shed
**Probe/Well #:** AP-8061
**Sample ID:** 17FWOU4 15 WG
**Outside Temperature:** 34°F
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 4 **Water Level:** SOL

**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:** —

**Column of Water in Probe/Well**
**Sampling Depth** 10' screen

Total Depth in Probe/Well (feet btoc): 25.35
Depth to Water from TOC (feet): - 7.71
Column of Water in Probe/Well (feet): = 17.64
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 2.9

Well Screened **Across** / [✓ **Below**] water table
Depth tubing / pump intake set* approx. 20 ft feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| | | | *At least 3 of the 5 parameters below must stabilize* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters:** | | ±3% (or ±0.2°C max) | ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 1.93 | 0.820 | 5.14 | 6.73 | -101.5 | 141.8 | 7.80 |
| 1.0 | 10 | 1.87 | 0.731 | 3.50 | 6.73 | 404.5 | 109.8 | 7.80 |
| 1.5 | 15 | 1.83 | 0.731 | 3.27 | 6.74 | -108.1 | 84.58 | 7.80 |
| 2.0 | 20 | 1.78 | 0.733 | 2.66 | 6.74 | -109.7 | 71.18 | 7.80 |
| 2.5 | 25 | 1.78 | 0.733 | 2.38 | 6.74 | -110.6 | 62.06 | 7.80 |
| 3.0 | 30 | 1.76 ✓ | 7.33 ✓ | 2.40 x | 6.74 | -111.2 | 66.93 | 7.80 |
| 3.5 | 35 | 1.76 | 0.735 | 2.32 | 6.74 | -111.8 | 58.62 | 7.80 |
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SK

**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**
**Water Color:** Clear [✓ Yellow] Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / No **Odor:** Yes / No **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC] [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** — **$HNO_3$ =** 0

**Purge Water**
Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** [✓ Landfill] / CAT Shed
**Date:** 10/31/17
**Probe/Well #:** AP-5588
**Time:** 1115
**Sample ID:** 17FWOU4 16 WG
**Sampler:** JK
**Weather:** P. Cloudy
**Outside Temperature:** 28°F
**QA/QC Sample ID/Time/LOCID:** 17FWOU417WG / 1130 / AP-5050
**MS/MSD Performed?** [✓ Yes] / No

**Purge Method:** [✓ Peristaltic Pump] / Submersible / Bladder
**Sample Method:** [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** **YSI #** 9 **Turbidity Meter #:** " **Water Level:** SOL

**Free Product Observed in Probe/Well?** Yes/[✓ No] **If Yes, Depth to Product:** 0

**Column of Water in Probe/Well**
**Sampling Depth** Dedicated Tubing 20' screen

Total Depth in Probe/Well (feet btoc): 29.12
Well Screened [✓ Across] / Below water table
Depth to Water from TOC (feet): - 14.70
Depth tubing / pump intake set* approx. 15.5 feet below top of casing
Column of Water in Probe/Well (feet): = 14.42
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) [✓ or 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 2.4

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 0.49 | 0.402 | 3.55 | 6.39 | 82.4 | 51.14 | 14.72 |
| 1.0 | 10 | 0.43 | 0.437 | 0.88 | 6.40 | 57.6 | 38.42 | 14.72 |
| 1.5 | 15 | 0.40 | 0.567 | 0.75 | 6.42 | 42.8 | 23.77 | 14.72 |
| 2.0 | 20 | 0.38 | 0.757 | 0.83 | 6.46 | 34.5 | 16.50 | 14.72 |
| 2.5 | 25 | 0.40 | 0.831 | 0.58 | 6.49 | 28.0 | 14.83 | 14.72 |
| 3.0 | 30 | 0.42 | 0.877 | 0.52 | 6.49 | 23.2 | 13.34 | 14.72 |
| 3.5 | 35 | 0.42 ✓ | 0.897 × | 0.47 ✓ | 6.51 ✓ | 19.0 ✓ | 12.51 × | 14.72 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**
*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**
**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** 0 **HNO₃ =** 0

**Purge Water**
Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: JK

**GROUNDWATER SAMPLE FORM** OU4 **Ft. Wainwright, Alaska**

**Project #:** 9003-20

**Date:** 10/31/17

**Time:** 1330

**Sampler:** JK

**Weather:** Cloudy

**QA/QC Sample ID/Time/LOCID:** /

**Site Location:** Landfill / CAT Shed

**Probe/Well #:** AP-5589

**Sample ID:** 17FWOU4 18 WG

**Outside Temperature:** 28°F

**MS/MSD Performed?** Yes [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder

**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** 502

**Free Product Observed in Probe/Well?** Yes/[✓ No] **If Yes, Depth to Product:** 0

**Column of Water in Probe/Well**

**Sampling Depth** 10' screen

Total Depth in Probe/Well (feet btoc): 56.32

Depth to Water from TOC (feet): - 15.70

Column of Water in Probe/Well (feet): = 40.62

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 6.6

Well Screened **Across** / [✓ **Below**] water table

Depth tubing / pump intake set* approx. 51 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 0.99 | 0.992 | 1.45 | 6.65 | -42.9 | 16.14 | 15.74 |
| 1.0 | 10 | 1.00 | 1.007 | 1.16 | 6.65 | -46.5 | 12.05 | 15.74 |
| 1.5 | 15 | 0.99 | 1.022 | 1.04 | 6.64 | -48.6 | 10.44 | 15.74 |
| 2.0 | 20 | 1.01 | 1.034 | 0.88 | 6.64 | -51.9 | 8.91 | 15.74 |
| 2.5 | 25 | 1.01 | 1.038 | 0.81 | 6.64 | -53.1 | 7.74 | 15.74 |
| 3.0 | 30 | 0.98 | 1.044 | 0.70 | 6.64 | -55.9 | 7.01 | 15.74 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**

**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**

**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**

**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**

**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]

**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** 2 **HNO₃ =** 0

**Purge Water**

Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: JK

**GROUNDWATER SAMPLE FORM** OU4 **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Date:** 10/31/17
**Time:** 1515
**Sampler:** SK
**Weather:** Overcast
**QA/QC Sample ID/Time/LOCID:** —

**Site Location:** Landfill / CAT Shed
**Probe/Well #:** AP-8063
**Sample ID:** 17FWOU4 19 WG
**Outside Temperature:** 28°F
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** [✓ Peristaltic Pump] / Submersible / Bladder
**Sample Method:** [✓ Peristaltic Pump] / Submersible / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** 30L

**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:** —

**Column of Water in Probe/Well**

Total Depth in Probe/Well (feet btoc): 121.8
Depth to Water from TOC (feet): - 14.97
Column of Water in Probe/Well (feet): = 106.83
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 17.4

**Sampling Depth**

Well Screened **Across** / [✓ **Below**] water table
Depth tubing / pump intake set* approx. 116 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 2.40 | 0.676 | 2.12 | 6.63 | -28.6 | 18.41 | 15.01 |
| 1.0 | 10 | 2.47 | 0.772 | 1.30 | 6.62 | -41.1 | 11.13 | 15.01 |
| 1.5 | 15 | 2.41 | 0.851 | 0.86 | 6.63 | -58.7 | 9.91 | 15.01 |
| 2.0 | 20 | 2.14 | 0.905 | 0.71 | 6.63 | -68.5 | 8.32 | 15.01 |
| 2.5 | 25 | 2.09 | 0.920 | 0.62 | 6.63 | -72.9 | 7.87 | 15.01 |
| 3.0 | 30 | 2.06 | 0.922 | 0.60 | 6.63 | -75.3 | 6.95 | 15.01 |
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SK

**Did groundwater parameters stabilize?** [✓ Yes] No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes]/No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC] (LL), [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** 0 **$HNO_3$ =** 0

**Purge Water**

Gallons generated: 3.5 Containerized and disposed as IDW? [✓ Yes] No If No, why not?
Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** OU4 **Ft. Wainwright, Alaska**

**Project #:** 9003-20

**Site Location:** Landfill / CAT Shed

**Date:** 11/1/17

**Probe/Well #:** AP-6532

**Time:** 0930

**Sample ID:** 17FWOU470 WG

**Sampler:** JK

**Weather:** Overcast

**Outside Temperature:** 28°F

**QA/QC Sample ID/Time/LOCID:**

**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder

**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** **YSI #** 9 **Turbidity Meter #:** 11

**Water Level:** SOL

**Free Product Observed in Probe/Well?** Yes/ [✓ No]

**If Yes, Depth to Product:** Ø

**Column of Water in Probe/Well**

Total Depth in Probe/Well (feet btoc): 173.78

Depth to Water from TOC (feet): - 15.02

Column of Water in Probe/Well (feet): = 158.76

Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)

Volume of Water in 1 Probe/Well Casing (gal): 25.9

**Sampling Depth**

Well Screened **Across** / [✓ **Below**] water table

Depth tubing / pump intake set* approx. 177 feet below top of casing

*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | ±3% (or ±0.2°C max) | *At least 3 of the 5 parameters below must stabilize* ±3% | ±10% (<1mg/L, ±0.2 mg/L) | ±0.1 units | ±10 mV | ±10% (<10NTU, ±1NTU) | <0.33 feet after initial drawdown |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 5.53 | 0.319 | 2.70 | 6.52 | 65.1 | 4.35 | 15.05 |
| 1.0 | 10 | 5.42 | 0.331 | 1.37 | 6.52 | 47.1 | 4.28 | 15.05 |
| 1.5 | 15 | 5.22 | 0.351 | 1.17 | 6.53 | 40.5 | 4.22 | 15.05 |
| 2.0 | 20 | 5.14 | 0.380 | 0.93 | 6.54 | 29.0 | 4.13 | 15.05 |
| 2.5 | 25 | 5.02 | 0.386 | 0.83 | 6.54 | 23.2 | 4.15 | 15.05 |
| 3.0 | 30 | 4.97 | 0.387 | 0.79 | 6.55 | 21.0 | 3.99 | 15.05 |
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JK

**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**

**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**

**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**

**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:

**Well Condition:** Lock [✓ Y] / N Labeled with LOC ID [✓ Y] / N **Comments:**

**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]

**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** Ø **HNO$_3$ =** Ø

**Purge Water**

Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?

Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: JK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Date:** 11/1/17
**Time:** 1130
**Sampler:** SK
**Weather:** Overcast / Lt. snow
**QA/QC Sample ID/Time/LOCID:**

**Site Location:** Landfill / CAT Shed
**Probe/Well #:** AP-6530
**Sample ID:** 17FWOU4 21 WG
**Outside Temperature:** 28°F
**MS/MSD Performed?** Yes/ [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other

**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** SOL

**Free Product Observed in Probe/Well?** Yes/ [✓ No] **If Yes, Depth to Product:** Ø

**Column of Water in Probe/Well**

Total Depth in Probe/Well (feet btoc): 139.15
Depth to Water from TOC (feet): - 14.22
Column of Water in Probe/Well (feet): = 124.93
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 20.4

**Sampling Depth**

Well Screened **Across** / [✓ Below] water table
Depth tubing / pump intake set* approx. 136 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| **Field Parameters:** | | **±3%<br>(or ±0.2°C max)** | *At least 3 of the 5 parameters below must stabilize*<br>**±3%** | **±10%<br>(<1mg/L, ±0.2 mg/L)** | **±0.1 units** | **±10 mV** | **±10%<br>(<10NTU, ±1NTU)** | **<0.33 feet after initial drawdown** |
|---|---|---|---|---|---|---|---|---|
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 1.94 | ~~2.69~~ | 2.61 | 6.60 | 23.1 | 35.40 | 14.23 |
| 1.0 | 10 | 1.82 | 0.484 | 0.62 | 6.87 | 5.0 | 9.12 | 14.23 |
| 1.5 | 15 | 1.81 | 0.485 | 0.55 | 6.87 | 1.3 | 5.69 | 14.23 |
| 2.0 | 20 | 1.70 | 0.480 | 0.51 | 6.86 | -2.7 | 4.86 | 14.23 |
| 2.5 | 25 | 1.69 | 0.486 | 0.49 | 6.86 | -6.7 | 3.42 | 14.23 |
| ~~3.0~~ | ~~30~~ | | | | | | | |
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SK

**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] /No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock: [✓ Y] / N Labeled with LOC ID: [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**

*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**

**Laboratory Analyses (Circle):** [✓ VOC], [✓ SVOC] [✓ (LL)], [✓ Metals*], [✓ Iron], [✓ Sulfate], Methane, [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** Ø **$HNO_3$ =** Ø

**Purge Water**

Gallons generated: 3.25 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

**GROUNDWATER SAMPLE FORM** **OU4** **Ft. Wainwright, Alaska**

**Project #:** 9003-20
**Site Location:** Landfill / CAT Shed
**Date:** 11/1/17
**Probe/Well #:** AP-6535
**Time:** 1330
**Sample ID:** 17FWOU422WG
**Sampler:** SK
**Weather:** Overcast
**Outside Temperature:** 28°F
**QA/QC Sample ID/Time/LOCID:** —
**MS/MSD Performed?** Yes / [✓ No]

**Purge Method:** Peristaltic Pump / [✓ Submersible] / Bladder
**Sample Method:** Peristaltic Pump / [✓ Submersible] / Hydrasleeve / Bladder / Other
**Equipment Used for Sampling:** YSI # 9 **Turbidity Meter #:** 11 **Water Level:** SDL
**Free Product Observed in Probe/Well?** Yes / [✓ No] **If Yes, Depth to Product:** Ø

**Column of Water in Probe/Well**
**Sampling Depth** 5' screen
Total Depth in Probe/Well (feet btoc): 90.80
Well Screened **Across** / [✓ Below] water table
Depth to Water from TOC (feet): - 12.59
Depth tubing / pump intake set* approx. 88 feet below top of casing
Column of Water in Probe/Well (feet): = 78.21
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or [✓ 2" (X 0.163)] or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 12.7

**Micropurge well/probe at a rate of 0.03 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.**

| | | | *At least 3 of the 5 parameters below must stabilize* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters:** | | **±3% (or ±0.2°C max)** | **±3%** | **±10% (<1mg/L, ±0.2 mg/L)** | **±0.1 units** | **±10 mV** | **±10% (<10NTU, ±1NTU)** | **<0.33 feet after initial drawdown** |
| Water Removed (gal) | Time Purged (min) | Temperature (°C) | Conductivity (mS/cm) | Dissolved $O_2$ (mg/L) | pH | Potential (mV) | Turbidity (NTU) | Water Level (ft) |
| 0.5 | 5 | 1.70 | 0.422 | 3.17 | 6.65 | 4.2 | 20.51 | 12.64 |
| 1.0 | 10 | 1.33 | 0.436 | 1.60 | 6.65 | 1.5 | 15.25 | 12.64 |
| 1.5 | 15 | 1.86 | 0.460 | 0.90 | 6.65 | -3.8 | 14.24 | 12.64 |
| 2.0 | 20 | 1.85 | 0.478 | 0.60 | 6.66 | -6.9 | 13.47 | 12.64 |
| 2.5 | 25 | 1.81 | 0.479 | 0.67 | 6.67 | -8.3 | 12.99 | 12.64 |
| 30 | 30 | 1.83 | 0.489 | 0.61 | 6.66 | -10.1 | 11.69 | 12.64 |
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**Did groundwater parameters stabilize?** [✓ Yes] / No **If no, why not?**
**Did drawdown stabilize?** [✓ Yes] / No **If no, why not?**
**Was flowrate between 0.03 and 0.15 GPM?** [✓ Yes] / No **If no, why not?**
**Water Color:** [✓ Clear] Yellow Orange Brown/Black (Sand/Silt) Other:
**Well Condition:** Lock? [✓ Y] / N Labeled with LOC ID? [✓ Y] / N **Comments:**
**Sheen:** Yes / [✓ No] **Odor:** Yes / [✓ No] **Notes/Comments:**
*** Metals include As, Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn**
**Laboratory Analyses (Circle):** [✓ VOC] [✓ SVOC] (LL), [✓ Metals*], [✓ Iron], [✓ Sulfate], ~~Methane~~ [✓ 1,4-Dioxane]
**pH checked of samples:** [✓ Y] / N **Approximate volume added (mL): HCl =** Ø **$HNO_3$ =** Ø

**Purge Water**
Gallons generated: 4.0 Containerized and disposed as IDW? [✓ Yes] / No If No, why not?
Disposal method*: POL Water / [✓ CERCLA Waste] * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

# Submersible Pump Equipment Blank

Rinsate #: Rinsate 25

Sample ID: 17FW 00423WQ

Date: 11/1/17

Time: 1600

Analysis: VOC/SVOC/Metals/Iron/Sulfate/Dioxane

Well that the pump was last used on: AP-5589

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OV4 FT. WAINWRIGHT
2017

*Rite in the Rain*
ALL-WEATHER
JOURNAL
№ 393N

CONTRACT No.
W911KB - 16 - D - 0005

CHRIS BOESE
9073784630

PREP ITEMS INCLUDE:

- →Talk to Project Manager(s) about Progress
- →Load Van with Necessary GWS Gear/Sample Kits/Ice
- →Print Necessary Forms
- →Calibrate YSI, Turbidity Meters, etc.
- →Dump and Refill Decon/Rinse Water Buckets
- →Rotate Cooler Ice
- →Develop and Implement Days Plan
- →Drive to site

CLEAN UP/END OF DAY ITEMS INCLUDE:

- →Talk to Project Manager(s) about Progress
- →Dump Trash
- →Clean YSI Probes
- →Rotate Ice in Sample Coolers
- →Clean Field Vehicle
- →Charge Peristaltic Pump/Submersiable Pump Batteries
- →Finish / Sign Fieldbook Entries
- →Drive Back to Shop / Hotel
- →Check / Add HCl to DRO Samples
- →
- →

*Rite in the Rain*
ALL-WEATHER WRITING PAPER

Name CHRIS BOESE

Address

Phone 907 3784630

Project OU4 FT. WAINWRIGHT
2017

OU4. FORT WAINWRIGHT

6/6/17

1200 - LEAVE SHOP

~1220 - ARRIVE OU4 LANDFILL TO CHECK AND SEE IF SITE IS DRY ENOUGH TO SAMPLE (MOBE AROUND SITE)

1230 - PICS OF A FEW MARSHY AREAS.

DETERMINED THAT SITE WAS DRY ENOUGH TO SAMPLE

1358 - RETURN TO SHOP.

6/15/17

1000 - 1300 - DETERMINED THAT LANDFILL SAMPLING WOULD HAVE TO BE POSTPONED

DUE TO RECENT RAINFALL. HELPED JK REMOVE RENTAL GENERATORS FROM DEEP WELLS - HAD TO HAND CARRY SEVERAL HUNDRED FEET B/C OF HIGH WATER CONDITIONS

Ch Bolte

6/26/17

0900 - SHOP - PREP FOR OU4 GWS W/ JK

0950 - ARRIVE AT LANDFILL - GATE LOCKED - CONTACTED DPW 1015 - GATE UNLOCKED

1120 - GWS FWLF-4 - 17FWOU401WG. MOBE TO AP-10258MW

1235 - GWS AP-10258MW - 17FW00402WG. MOBE TO AP-10257MW

1340 - GWS AP-10257MW 17FW00403WG. CLEAN UP.

1400 - LEAVE LANDFILL GATED AREA - LOOK FOR VK TO TAKE PICTURE

1423 - LEAVE SITE

1445 - ARRIVE AT SHOP. DECON PUMP USED IN AP-10257MW - COLLECT RINSATE - 17FW00410WQ.

CLEAN UP / START C.O.C.'S

1700 - END OF DAY

Chris Bolse

6/12/17 Rain 55°F

1030- Prepare gear to install generators @ OU4 Landfill for the spring GW sampling event.

→ check in the sample kit to ensure there are enough containers.

1210- Purchase new 3K generator @ store.

1300- fuel for generators

1315- Rent two generators from AER [2@3800]

1400- Arrive @ the OU4 site to install generators.
↳ unload UTV from trailer and load w/ gear.

6/12/17 P.Cloudy 55°F

1430- Finding that the site is far more saturated than previous years. Access to wells is limited and is resulting in more time being spent getting out of puddles & holes than actually setting up the generators. There are places on the trails that I have never seen puddles that have several inches of water; areas that are normally wet are near impassable today.

1600- All 4 generators are set at the heat-trace well and running.

1615- leaving site after loading UTV into the trailer.
↳ Return to the shop.

6/12/17 Rain 55°F

1700- upload todays photos on to the server.

End Day @ 1800

3/3

6/13/17 Clear 40°F

0600- Drive to OU4 site to refuel generators
↳ fill fuel jugs in route

0630- arrive @ OU4 site.

0815 - completed refueling generators.

*Found generators @ wells AP-8063/6532/6535 empty; refueled and started

*found the rental gen. @ AP-6530 not running but with a full tank of gas upon arrival. Restarted the generator and watched for several minutes to ensure it continued to operate.

0830 - leaving project.

6/13/17 Clear 61°F

1600 - Print forms for GW sampling of non-heat trace wells tomorrow
-prepare gear and calibrate ysi & Turbidimeter

1800 - Driving to 0U4 site after filling fuel jugs.

1840 - After fueling generators at AP-8063 and AP-6532, the UTU became lodged on the top of a hidden stump in a swampy path to AP-6530.
I will attempt to dislodge.

2000 - I have been unable to dislodge the UTU with the winch. The cable has broken 3 times. Walking back to the van for tools

2/

6/13/17 Clear 60°F

2040 - Able to get UTU off the stump by cutting and hammering at it for a period of time.
↳ discovered after that, that the other front axel has now broken and the UTU is only 2 wheel drive.
→ I have tried to walk to AP-6530 w/ a fuel jug but the trails all cross swampy areas that are more than waist deep in water. With 3WD on the UTU and the winch I was able to get there previously but not w/ just rear wheel drive.

2120 - Finally able to get the UTU out of the swamps and back to the trailer.
I am unable to even pass through the smallest puddle.

3/

6/13/17

2120 - Contacted CB earlier to see what his thoughts are on sampling.
↳ without the UTU, it may not be possible to sample the deep wells.

2130 - Leaving OU4 site.

End Day @ 2200

JK 4/4

---

6/22/17 Clear 50°F

0800 - Collect Generators from the shop and locks/cables.
↳ fill fuel jugs on the way to the site

0845 - Set up generators at OU4 Landfill Site.
AP-6535 - 2K gen.
AP-8063 - 3K gen.

Leaving project @ 1000

1700 - Drive to OU4 site to refuel generators

1720 - arrive @ site.
→ found AP-6535 not running. - hook up external tank.
→ found AP-8063 not running.

End Day @ 1830

JK 1/1

6/23/17 Lt. Rain 58°F

0600 - Fuel generators
@ Day 4
↳ stop to ~~fuel~~ fill fuel
jugs on the way.

0630 arrive @ site

AP-6535 - gen. not running
though the external
tank is full.
AP-8063 - gen. tank empty.

leaving project @ 1730

1730 - Drive to site to
refuel generators.
1755 - Arrive @ site.

↳ AP-6535 - generater
not running even though
the external tank is full

End Day @ 1900
JK 1/1

6/24/17 Clear 50°F

0800 - Refuel Generators

0830 - arrive @ Landfill.

AP-6535 not running
AP-8063 not running.

0930 - leaving site.

1830 - Drive to Refuel Gen's.

1900 - arrive @ site.

AP-6535 - gen. running
AP-8063 - tank empty

End Day @ 2000

JK

6/25/17 Lt Rain 60°F

1730 - Drive to Landfill site to refuel Generators.

1800 - Arrive on site.

AP-6535 - external tank empty. refill and start generator.

End Day @ 1930

JK

1/1

6/26/17 Clear 50°F

0700 - Prep Gear for sampling @ Landfill
→calibrate YSI / Turbi

0900 - Drive w/ Trailer to Landfill site.
→ transfer gear to UTV and move to sample at well AP-6535

1000 - Begin Sampling @ AP-6535
→generator not running when I arrived on site.

1130 - Completed sampling AP-6535
→return Generator to the van and move to sample at AP-8063

1340 - Moving to sample @ AP-8061

1/2

6/26/17 Clear 65°F

1530 - Return to Van to collect empty poly and sample containers.

1549 - set up to sample AP-5589

1710 - set up @ AP-5588

1900 - completed sampling @ AP-5588
↳ Demob from the site
↳ Return to the office

* Generators loaded into back of the UTV and stored there for later use inside the trailer.

2000 - Samples stored in the fridge.

End Day @ 2015

JK

2/2

10/28/17 P. Cloudy 29°F

0800 Prepare to install generators

0900 - arrive @ Landfill site

1130 - generators set up and running @ wells
↳ End project for now

1815 - Return to site to refuel generators.

End Day @ 2030

JK

10/29/17 P. Cloudy 30°F

0830 - Drive to site after filling Fuel jugs.
↳ AP-6530 - still running almost empty
AP-6535 - not running mostly full
AP-8063 - empty
AP-6532 - empty

1030 - leaving project

1300 - Vehicle maintenance associated w/ this project on UTU

1400 - leaving project

1830 - Return to fuel generators
AP-6530 - still running but low
AP-6535 - empty
AP-8063 - not running and mostly full
AP-6532 - Running but low

2030 - all generators fueled and running.

End Day

10/30/17 P. Cloudy 30°F

0815 - Prepare to GW sample @ OU4 Landfill

0830 - fill fuel jugs

0900 - Drive to DERA for empty 15 gallon Poly Drums.

0930 - Arrive @ OU4 to fuel generators

1045 - Set up to sample @ CAT Sand wells.
- AP-10257MW
- AP-10258MW
- FWLF-4

1440 - Found that the generator @ 8063 is not running and is still full.
↳ take out and clean spark plug and restart generator.

1500 - Moving to sample @ AP-8061

1600 completed sampling for today.
↳ Return to Shop and store samples in fridge and Decon YSI.

End Day @ 1715

10/30/17 Rain 34°F

* Note Generators refueled prior to leaving site for the day.

2/2

10/31/17 P.Cloudy 29°F

0630- Calibrate YSI & Turbidimeter

0740- Drive to site to refuel generators.
↳ fill fuel jugs

1000- moving to set up @ AP-5588 to sample. generators fueled.

1145- take samples to van from -5588 and get new smpl. containers.

1200- set up to sample @-5589

1335- Move to sample@-8063

1540- Completed sampling for today
↳ move 3K to AP-6535 and pick up 2K. Refuel on the way

1600- Leaving site Return to Shop

End Day @ 1645

11/1/17 Overcast 28°F

0615- Calibrate YSI & Turbi.

0700- Drive to Landfill

0720- move to sample @
AP-6532

0815- setup to sample @ AP-6532

1030- set up to sample AP-6530

1200- set up to sample AP-6535

1340- Completed sampling @ 6535
↳ move to collect generators
and return the rentals.

1500- Drive to drop off generators
↳ proceed to FES office.

1600- collect 2 rinsate and store
samples in fridge
End Day @ 1700

# APPENDIX B
# CHEMICAL DATA QUALITY REVIEW AND ADEC LABORATORY DATA REVIEW CHECKLISTS

# FINAL

# CHEMICAL DATA QUALITY REVIEW

Operable Unit 4 (2017)

Fort Wainwright, Alaska

NPDL # 17-050

**Prepared: March 21, 2018**

**Prepared for and Under Contract to**

Army Corps of Engineers - Alaska District

**Prepared by**

Fairbanks Environmental Services, Inc.

I certify that all data quality review criteria described in Section 1.1 were assessed, and that qualifications were made according to the criteria outlined in the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP).

Vanessa Ritchie
Senior Chemist

## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| AK | Alaska |
| ALS | ALS Environmental |
| B | analytical result is qualified as a potential high estimate due to contamination present in a blank sample |
| °C | degrees Celsius |
| CDQR | Chemical Data Quality Review |
| COC | chain-of-custody |
| DL | detection limit |
| DoD | United States Department of Defense |
| DQO | data quality objective |
| ELAP | Environmental Laboratory Accreditation Program |
| EPA | United States Environmental Protection Agency |
| FES | Fairbanks Environmental Services, Inc. |
| J | analytical result is qualified as an estimated value because the concentration is less than the LOQ |
| J+ | analytical result is qualified as an estimated value with a high-bias due to a QC deviation |
| J- | analytical result is qualified as an estimated value with a low-bias due to a QC deviation |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| LOD | limit of detection |
| LOQ | limit of quantitation |
| µg/L | micrograms per liter |
| mg/L | milligrams per liter |
| MS | matrix spike sample |
| MSD | matrix spike duplicate sample |
| ND | non-detect result |
| NPDL | North Pacific Division Laboratory |
| OU4 | Operable Unit 4 |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| QSM | Quality Systems Manual for Environmental Laboratories |
| R | analytical result is rejected and is not suitable for project use |
| RPD | relative percent difference |
| RSL | regional screening level |
| SDG | sample data group |
| SGS | SGS North America, Inc. |
| SVOC | semi-volatile organic compounds |
| U | analyte was analyzed for, but not detected |
| USACE | United States Army Corps of Engineers |
| VOC | volatile organic compounds |

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# 1.0 INTRODUCTION

This Chemical Data Quality Review (CDQR) summarizes the technical review of analytical results generated in support of groundwater sample collection at the Operable Unit 4 (OU4) Landfill during 2017. The groundwater events are summarized in Section 1.3. Groundwater sample summary and analytical results tables are presented in Appendix C.

Fairbanks Environmental Services, Inc (FES) reviewed project and quality control (QC) analytical data to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the Final 2017 Postwide Work Plan (FES, 2017); Final Postwide Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP; FES, 2016); Alaska Department of Environmental Conservation (ADEC) Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling Technical Memo (ADEC, 2017c); and United States Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.0 (DoD, 2013). The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), project sample and laboratory quality control sample duplicates (to assess precision), laboratory control samples (LCSs) and sample surrogate recoveries (to assess accuracy), and matrix spike sample (MS) recoveries (to assess matrix effects). Calibration curves and continuing calibration verification recoveries were not reviewed unless a QC discrepancy was noted by the laboratory in a case narrative. QC deviations that do not impact data quality (e.g., high LCS recovery associated with non-detect results), are not discussed. More elaborate data quality descriptions are reported in the ADEC Laboratory Data Review Checklists, which are included at the end of Appendix A.

Groundwater results and limits of detection (LODs) for non-detect results were compared to OU4 Record of Decision (ROD) remedial goals, or cleanup levels presented in Title 18 of the Alaska Administrative Code (AAC) Chapter 75.345, Table C (ADEC, 2017a), as appropriate. In addition, 1,4-dioxane results were compared against the Environmental Protection Agency (EPA) regional screening level (RSL) for tap water; carcinogenic target risk of $1x10^{-6}$ (revised as of May 2018).

Groundwater data quality is discussed in Section 2. Applicable data quality indicators are discussed for each method under separate subheadings. Data which did not meet acceptance criteria have been described and the associated samples and data quality implications or qualifications are summarized. All cited documents within the CDQR are listed in Section 3.

## 1.1 Analytical Methods and Data Quality Objectives

The analytical methods and associated data quality objectives (DQOs) used for this review were established in the UFP-QAPP (FES, 2016). The DQOs represent the minimum acceptable QC limits and goals for analytical measurements and are used as comparison criteria during data quality review to determine both the quality and usability of the analytical data. Table B-1 on the following page summarizes the analytical methods employed, and the associated DQO goals, for groundwater samples.

## Table B-1. Groundwater Analytical Methods and Data Quality Objectives

| Parameter | Preparation Method | Analytical Method | Limit of Detection | Accuracy (%) | Precision (RPD, %) | Completeness (%) |
|---|---|---|---|---|---|---|
| Benzene | SW5030B | SW8260C | 0.10 µg/L (ALS)<br>0.20 µg/L (SGS) | 79-120 | 20 | 90 |
| cis-1,2-Dichloroethene | | | 0.20 µg/L (ALS)<br>0.50 µg/L (SGS) | 78-123 | 20 | 90 |
| 1,1,2,2-Tetrachloroethane | | | 0.20 µg/L (ALS)<br>0.25 µg/L (SGS) | 71-121 | 20 | 90 |
| 1,1,2-Trichloroethane | | | 0.40 µg/L (ALS)<br>0.20 µg/L (SGS) | 80-119 | 20 | 90 |
| Vinyl Chloride | | | 0.10 µg/L (ALS)<br>0.075 µg/L (SGS) | 58-137 | 20 | 90 |
| Trichloroethene | | | 0.20 µg/L (ALS)<br>0.50 µg/L (SGS) | 79-123 | 20 | 90 |
| Remaining Volatile Organic Compounds (VOCs) | | | Analyte Specific[1] | Analyte Specific[1] | 20 | 90 |
| 1,4-Dioxane | SW8260B-SIM | | 0.50 µg/L (SGS) | 59-139 | 20 | 90 |
| | SW3535A | SW8270D-SIM | 0.02 µg/L (ALS) | 59-111 | 20 | 90 |
| bis(2-Ethylhexyl) phthalate | SW3520C | SW8270D | 0.50 µg/L (ALS) | 55-135 | 20 | 90 |
| Semivolatile Organic Compounds (SVOCs) | | | Analyte Specific[1] | Analyte Specific[1] | 20 | 90 |
| bis(2-Ethylhexyl) phthalate | SW3510C | SW8270D | 2.0 µg/L (SGS) | 55-135 | 20 | 90 |
| Semivolatile Organic Compounds (SVOCs) | | | Analyte Specific[1] | Analyte Specific[1] | 20 | 90 |
| Total Metals | SW3010A | SW6020A | Analyte Specific[1] | Analyte Specific[1] | 20 | 90 |
| Iron (field filtered) | EPA CLP-ILM04.0 | SW6010C | 8 µg/L (ALS) | 87-115 | 20 | 90 |
| | SW3010A | SW6020A | 220 µg/L (SGS) | 87-118 | 20 | 90 |
| Sulfate | 300.0 | | 0.02 mg/L (ALS)<br>0.10 mg/L (SGS) | 90-110 | 20 | 90 |

[1] The analyte-specific limits of detection (LODs) and accuracies are presented in the 2016 UFP-QAPP (FES, 2016) and 2017 Postwide Work Plan (FES, 2017).

µg/L – micrograms per liter
mg/L – milligrams per liter
RPD – relative percent difference

The six DQOs used for this review were accuracy, precision, representativeness, comparability, sensitivity, and completeness.

- *Accuracy* measures the correctness, or the closeness, between the true value and the quantity detected. It is measured by calculating the percent recovery of known concentrations of spiked compounds that were introduced into the appropriate sample matrix. Surrogate, LCS, and MS sample recoveries were used to measure accuracy for this project. LCS and surrogate recovery criteria are defined in the QSM.

- *Precision* measures the reproducibility of repetitive measurements. It is measured by calculating the relative percent difference (RPD) between duplicate samples. Laboratory duplicate samples, field duplicate samples, MS and matrix spike duplicate sample (MSD) sample pairs, and LCS and laboratory control sample duplicate (LCSD) pairs were used to measure precision for this project. LCS/LCSD precision criteria are defined in the QSM and field duplicate precision criteria are defined in the ADEC Laboratory Data Review Checklist (water: ≤30%).
- *Representativeness* describes the degree to which data accurately and precisely represents site characteristics. This is addressed in more detail in the following section(s).
- *Comparability* describes whether two data sets can be considered equivalent with respect to the project goal. This is addressed in more detail in the following section(s).
- *Sensitivity* describes the lowest concentration that the analytical method can reliably quantitate, and is evaluated by verifying that the detected results and/or LODs meet the project-specific cleanup levels and/or screening levels.
- *Completeness* describes the amount of valid data obtained from the sampling event(s). It is calculated as the percentage of valid measurements compared to the total number of measurements. The completeness goal for this project was set at 90 percent.

In addition to these criteria for the six DQOs described above, sample collection and handling procedures and blank samples were reviewed to ensure overall data quality. Sample collection forms were reviewed to verify that representative samples were collected and samples were without headspace (if applicable). Sample handling was reviewed to assess parameters such as chain-of-custody (COC) documentation, the use of appropriate sample containers and preservatives, shipment cooler temperature, and method-specified sample holding times. Blank samples were analyzed to detect potential field or laboratory cross-contamination. Each of these parameters contributes to the general representativeness and comparability of the project data. The combination of evaluations of the above-mentioned parameters will lead to a determination of the overall project data completeness.

## 1.2 Data Qualifiers

Table B-2 on the following page outlines general flagging criteria used for this project, listed in increasing severity, to indicate QC deficiencies. Data are qualified pursuant to findings determined in the review of project data.

**Table B-2. Data Qualifier Definitions**

| Qualifier | Definition |
|---|---|
| ND | The analyte was analyzed for, but not detected. |
| J | The analyte is considered an estimated value. The analyte may be estimated due to its quantitation level (≥ DL and <LOQ), or it may signify that there is a QC deviation and the bias is unknown. |
| J+ | The analyte is considered an estimated value with a high-bias due to a QC deviation. |
| J- | The analyte is considered an estimated value with a low-bias due to a QC deviation. |
| B | The analyte is detected in an associated blank. Result is less than 5x or 10x (for the common lab contaminants) the concentration. Therefore, the result may be high-biased. |
| R | Analyte result is rejected because of deficiencies in meeting QC criteria and may not be used for decision making. |

## 1.3 Summary of Groundwater Samples

A total of 20 groundwater samples were collected from monitoring wells at the OU4 Landfill during 2017; 9 (including 1 field duplicate) were collected during the spring sampling event and 11 (including 1 field duplicate) were collected during the fall sampling event. Extra volume was collected for MS/MSD samples for every analysis, analyte, and sample data group (SDG), at the minimum frequency of 1 per 20 samples. One equipment blank sample was collected during the each sampling event to assess the potential for cross-contamination of the submersible pump. In addition, one trip blank sample accompanied each cooler containing samples for volatile analyses. Samples were analyzed by one or more of the analytical methods presented in Table B-1.

The samples collected during the spring sampling event were analyzed by ALS Environmental (ALS) of Kelso, Washington. The samples collected during the fall sampling event were analyzed by SGS of Anchorage, Alaska, with the exception of SVOC and 1,4-dioxane samples which was subcontracted to SGS, Orlando. The laboratories are validated by the State of Alaska through the Contaminated Sites Program for applicable methods employed for this project. The three exceptions are EPA Method 8270D-SIM (1,4-dioxane; ALS), EPA Method 8260B-SIM (1,4-dioxane; SGS), and EPA Method 300.0 (sulfate; ALS and SGS), which are not methods and/or analytes included in the state approval program for contaminated sites. All laboratories are also certified through the Environmental Laboratory Accreditation Program (ELAP) for all methods employed for this project.

All groundwater samples were shipped in two SDGs and assigned the report numbers K1706778 (ALS) and 1179528 (SGS). A sample summary table (Table C-1) and analytical results table (Table C-2) are included in Appendix C. Groundwater sample data quality is discussed in Section 2.

# 2.0 GROUNDWATER DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for groundwater samples. All samples were analyzed by ALS and SGS and were included in two SDGs, as discussed in Section 1.3. See the associated ADEC Laboratory Data Review Checklists at the end of Appendix B for more elaborate data quality descriptions.

## 2.1 Work Plan Deviations

All monitoring wells were sampled and laboratory analyses were performed as specified in the Work Plan (FES, 2017), with the exceptions noted below.

- Deep-screened monitoring wells AP-6530 and AP-6532 could not be sampled during the spring sampling event. The wells were surrounded by standing water in a permafrost laden area, making access to the wells not feasible. The wells were sampled during the fall sampling event.
- 1,4-Dioxane samples were collected during both the spring and fall sampling events, rather than just during the spring event as specified in the Work Plan. The decision was made to conduct another round of 1,4-dioxane sampling in the fall since the spring sampling event did not contain all wells in the current sampling program (as mentioned in the preceding bullet) and so that more 1,4-dioxane data is available for site evaluation.
- All samples collected during the fall sampling event were submitted to SGS of Anchorage, Alaska for analysis due to a temporary suspension of ALS's DoD ELAP certification (SGS is identified as the backup laboratory in the UFP-QAPP). SGS-Anchorage subcontracted the analysis of SVOC and 1,4-dioxane samples to SGS Accutest-Orlando in order to meet project data quality objectives. Both SGS laboratories are approved by ADEC for contaminated sites analysis and hold current ELAP certifications.

## 2.2 Sample Collection

All monitoring wells were purged and sampled with submersible pumps employing dedicated Teflon-lined pump tubing, with the exception of two wells bulleted below. Groundwater sampling activities were recorded on groundwater sample forms provided in Appendix A. In addition, one equipment blank sample was collected from a decontaminated submersible pump during each sampling event to assess potential sampling cross-contamination. Equipment blank results are further discussed in Section 2.4.

Groundwater sample collection forms were reviewed to ensure that well drawdown and groundwater parameters met the stabilization criteria identified in the ADEC Field Sampling Guidance (ADEC, 2017b) and the 2016 Postwide UFP-QAPP (FES, 2016); that all parameters met the low-flow sampling criteria (Puls and Barcelona, 1996); and that all groundwater levels were within the screened intervals at the time of sampling (when applicable). All samples met stabilization criteria and all water levels were within the screened interval during sample collection, with the exception of those noted below. Also summarized below are any notable issues/observations discovered during groundwater sampling activities.

- Neither free product, sheen, nor odor was not observed on purge water from any well.
- All groundwater levels were within the screened intervals of the shallow-screened monitoring wells during sample collection. However, the groundwater levels were above the screened intervals in the intermediate- and deep-screened wells. These wells were purposely screened below the water table to investigate contaminants associated with different depths.
- All deep-screened wells required thawing prior to sampling as they are set in permafrost. Dedicated heat trace cable is installed in each well. A generator is used to power the cable and thaw the ice, which typically takes 3 to 4 days.
- All samples were collected with a submersible pump except for the samples from well AP-5588 (field duplicate samples 17FWOU408WG/17FWOU409WG and 17FWOU416WG/ 17FWOU417WG) and well AP-8063 (17FWOU405WG and 17FWOU419WG). These samples were collected with a peristaltic pump as the monitoring well casings are damaged and cannot house a submersible pump.

When applicable, groundwater samples were inspected in the field, as well as upon receipt at the laboratory, to ensure sample vials did not contain headspace. No headspace discrepancies were noted during sample collection or by the laboratory upon sample login.

## 2.3 Sample Handling

The evaluation of proper sample handling procedures include verification of the following: correct COC documentation, appropriate sample containers and preservatives, cooler temperatures maintained within the ADEC-recommended temperature range (0 to 6 degrees Celsius [°C]), and sample analyses performed within method-specified holding times. The following discrepancies were noted upon receipt at the laboratory.

Documentation Discrepancies

- (K1706778) The laboratory noted that two containers were received for trip blank sample 17FWOU411WQ; however, the COC listed three containers. The laboratory was able to complete the required analysis with the volume provided.
- (1179528) SVOC and 1,4-dioxane samples were sent directly to the sub-contracted lab, SGS Accutest of Orlando, due to the short sample hold time remaining on the SVOC samples. The COC that accompanied the samples was not included in SGS-Orlando’s laboratory report. Alternatively, the COC that was included was created by SGS-Anchorage (the primary project laboratory). This two page COC was not signed as relinquished but was signed as received. The samples were reported to have been received properly preserved and within receiving temperature, and no indication was given that the samples were compromised. No data were impacted or qualified based upon the COC discrepancy.

Holding Time Discrepancies

- (1179528) All data reported as primary results were from analytical runs performed within method-specified holding times. However, SVOC samples 17FWOU419WG, 17FWOU421WG, and 17FWOU423WG were re-extracted and re-analyzed six to ten days past the holding time due to low surrogate recoveries in the initial runs. The results of the re-analyses with passing surrogate recoveries confirmed the in-hold non-detect results; therefore, the in-hold results are reported as primary. The surrogate recoveries for in-hold results are discussed in section 6c below. The secondary, out-of-hold results were not reviewed.

## 2.4 Blanks

Method blanks, trip blanks, and equipment blanks were utilized to detect potential cross-contamination of project samples. Method blanks detect laboratory cross-contamination, trip blanks assess shipment and storage cross-contamination, and equipment blanks evaluate the potential for cross-contamination associated with wells that were sampled with non-dedicated submersible pumps. The following blank contaminations were noted.

### Method Blanks

Method blank samples were analyzed in every batch, as required. The following analytes were detected in the specified method blank samples at concentrations less than the LOQ and were also detected in the listed associated project samples within five times the concentration detected in the method blank. Consequently, these analytical results were qualified (B) as potential laboratory cross-contamination. In all cases, impact to data quality was minor as the affected results were less than ADEC cleanup levels. See the associated ADEC Checklists for more detailed discussion, including method blank detections that did not result in data qualification.

K1706778 (method blank sample KQ1709051-03)

- Zinc: 17FWOU401WG, 17FWOU406WG, 17FWOU408WG, 17FWOU409WG, and equipment blank sample 17FWOU410WQ

K1706778 (method blank sample KWG1705653-5)

- Chloromethane: 17FWOU401WG through 17FWOU409WG, equipment rinsate sample 17FWOU410WQ, and trip blank sample 17FWOU411WQ
- Chloroform: trip blank sample 17FWOU411WQ
- Naphthalene: 17FWOU403WG

K1706778 (method blank sample KWG1705539-3)

- Diethyl phthalate: 17FWOU401WG through 17FWOU409WG, and equipment blank sample 17FWOU410WQ
- Butyl benzyl phthalate: equipment blank sample 17FWOU410WQ

### Trip Blanks

Trip blank samples were shipped in every cooler containing samples for volatile analyses. The following analytes were detected in the specified trip blank samples and were also detected in the listed associated project samples within five times the concentration detected in the method blank (or ten times for common laboratory contaminants). Consequently, these analytical results were qualified (B) as potential travel/storage cross-contamination. In all cases, impact to data quality was minor as the affected results were less than ADEC cleanup levels. See the associated ADEC Checklists for more detailed discussion, including trip blank detections that did not result in data qualification.

K1706778 (trip blank sample 17WOU411WQ)

- Acetone (10x): 17FWOU402WG, 17FWOU403WG, 17FWOU405WG through 17FWOU407WG, and equipment blank sample 17FWOU410WQ
- Methylene chloride (10x): 17FWOU407WG through 17FWOU409WG, and equipment blank sample 17FWOU410WQ
- Toluene: 17FWOU401WG through 17FWOU407WG, and equipment blank sample 17FWOU410WQ
- Chloromethane and chloroform were also detected in the trip blank sample; however, the detections may be due to laboratory cross-contamination, as indicated by similar concentrations detected in the associated method blank sample (see the preceding Method Blank section). No additional qualifiers were added due to trip blank contamination.

## Equipment Blanks

Two equipment blank samples were collected to evaluate the potential for submersible pump cross-contamination; one was collected during the spring sampling event (17FWOU410WQ) and one was collected during the fall sampling event (17FWOU423WQ). The results of these equipment blank samples were compared against results of project samples. Analytes that were detected in equipment blank samples that resulted in data qualification are discussed below. Equipment blanks are further discussed in associated ADEC Checklists.

The following analytes were detected in equipment blank samples and were also detected in associated project samples within five times the concentration detected in the equipment blank (or ten times for common laboratory contaminants). Consequently, these analytical results were qualified (B) as potential sampling cross-contamination. In all cases, impact to data quality was minor as the affected results were less than the ROD remedial goal or ADEC cleanup level.

K1706778 (equipment blank sample 17FWOU410WQ)

- Acetone: 17FWOU402WG, 17FWOU403WG, and 17FWOU405WG through 17FWOU407WG
- Methylene chloride (10x): 17FWOU407WG through 17FWOU409WG
- Copper: 17FWOU401WG, 17FWOU404WG through 17FWOU406WG, 17FWOU408WG, and 17FWOU409WG
- Nickel: 17FWOU404WG and 17FWOU405WG
- Silver: 17FWOU402WG, 17FWOU404WG through 17FWOU406WG, 17FWOU408WG, and 17FWOU409WG
- 1,2-Dichloroethane: 17FWOU402WG through 17FWOU406WG
- Benzene: 17FWOU405WG
- Ethylbenzene: 17FWOU403WG and 17FWOU405WG

- m&p-Xylene: 17FWOU402WG, 17FWOU403WG, and 17FWOU405WG
- Bis-(2-ethylhexyl)phthalate: 17FWOU401WG, 17FWOU402WG, 17FWOU404WG, 17FWOU405WG, and 17FWOU407WG
- Di-n-butyl phthalate: 17FWOU401WG through 17FWOU409WG
- Naphthalene (8270D): 17FWOU402WG and 17FWOU403WG
- Zinc, chloromethane, diethyl phthalate, and benzyl butyl phthalate were also detected in the equipment blank sample; however the detections may be due to laboratory cross-contamination, as indicated by similar concentrations detected in the associated method blank sample (see the preceding Method Blank section); and the toluene was detected in the equipment blank sample but its detection may be due to travel/storage cross-contamination as indicated by a similar detection in the associated trip blank sample (see the preceding Trip Blank section). No additional qualifiers were added for these analytes due to equipment blank contamination.

1179528 (equipment blank sample 17FWOU423WQ)

- Lead: 17FWOU415WG, 17FWOU420WG, and 17FWOU422WG

## 2.5 Laboratory Control Samples

The LCS/LCSD samples were prepared by adding spike compounds to blank samples in order to assess laboratory extraction and instrumentation performance. The performance of a LCS sample is a requirement for every QC batch to evaluate recovery accuracy. In addition, a LCSD is required for all Alaska fuel methods to evaluate batch precision. For QC batches that do not contain a LCSD, precision is evaluated by performing a sample duplicate, which is further discussed in Section 2.6.

All LCS and/or LCSD samples were performed, as required. The accuracy of analyte recoveries for LCS samples, and precision of the LCS/LCSD sample pair (when applicable), was evaluated. The LCS/LCSD recovery and/or RPD exceedances that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklists for more elaborate details.

- (K1706778) The VOC LCS/LCSD samples contained in extraction batch KWG1705653 were recovered below the control limits for trans-1,3-dichloropropene. The trans-1,3-dichloropropene results in samples 17FWOU401WG through 17FWOU409WG, equipment blank sample 17FWOU410WQ, and trip blank sample 17FWOU411WQ were qualified (J-) as estimates with a low bias. Although the affected results are non-detect and may be low-biased, impact to the project is negligible as the failures were marginal (1% and 3% low) and the LODs were greater than one order of magnitude below the ADEC cleanup level.
- (K1706778) The SVOC LCS/LCSD samples contained in extraction batch KWG1705539 had 23 of 61 compounds with RPDs greater than the control limit (20%), with RPDs ranging between 21% and 30%. Of these compounds, only benzyl alcohol in equipment blank sample 17FWOU410WQ; naphthalene in samples 17FWOU402WG, 17FWOU403WG, and equipment blank sample 17FWOU410WQ; and phenol in samples 17FWOU401WG through 17FWOU403WG, and 17FWOU406WG through 17FWOU409WG were detected and the results

were qualified (J) as estimates due to the high RPDs. Impact to the project is negligible the detections were greater than four orders of magnitude below the ADEC cleanup levels.

- (report 1179528) The LCS and/or LCSD samples contained in extraction batch OP67526 recovered above the control limits for 3,3'-dichlorobenzidine (123% and 119% vs. 46-117%) and below the control limits for 2-methyl-4,6-dinitrophenol (named 4,6-dinitro-o-cresol in the lab report) (63% vs. 66-121%). Target analyte 3,3'-dichlorobenzidine was not detected in the associated samples and the results were not qualified due to the high LCS recoveries. 2-Methyl-4,6-dinitrophenol results in associated samples 17FWOU412WG, 17FWOU413WG, 17FWOU414WG, 17FWOU415WG, 17FWOU416WG, the field duplicate sample 17FWOU417WG, 17FWOU418WG, and 17FWOU419WG were qualified (J-) as estimates with a low bias due to the low LCS/LCSD recoveries. Impact to the project is negligible as the recovery failure was marginal and a cleanup level for 2-methyl-4,6-dinitrophenol is not established.

## 2.6 Matrix Spike Samples and Sample Duplicates

MS samples were prepared by adding spike compounds to project samples in order to assess potential matrix interference. The performance of a MS sample analysis is a requirement in every QC batch, at a minimum frequency of 1 for every 20 samples, to evaluate recovery accuracy. In addition, precision of each QC batch must be evaluated by performing either a MSD sample analysis or a sample duplicate analysis and calculating the RPD.

All MS/MSD samples were performed, as required, except in the extraction batches noted below. Although potential matrix interference could not be evaluated, batch accuracy and precision was evaluated through LCS/LCSD, laboratory duplicates, and/or MS/MSD analysis on another client’s sample. More detail is provided on a case-by-case basis in the associated ADEC Laboratory Data Review Checklists. No data were qualified.

- (K1706778) SVOC extraction batch KWG1705539
- (1179528) 1,4-Dioxane extraction batch VZ1844
- (1179528) SVOC extraction batch OP67535
- (1179528) Sulfate extraction batch WXX12103

The accuracy of the analyte recoveries, and the precision of the MS/MSD or laboratory duplicate pairs, was evaluated (when analyzed). The MS/MSD recovery and/or RPD exceedances that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklists for more elaborate details, including exceedances that did not result in data qualification.

- (K1706778) The vanadium MS sample prepared from 17FWOU408WG was recovered above the control limits and the antimony MS sample prepared from the same sample was recovered above the control limits. The vanadium and antimony results in parent sample 17FWOU408WG and associated field duplicate sample 17FWOU409WG were qualified (J+) as estimates with a high bias due to the high recoveries. Impact to the results is negligible as the failures were marginal (1% and 3% high) and the detections were greater than one order of magnitude below the ADEC cleanup level.

- (1179528) The VOC MS and MSD samples prepared from sample 17FWOU416WG were recovered below the control limits for cis-1,2-dichloroethene (both 54% vs. 78-123%). cis-1,2-Dichloroethene results in parent sample 17FWOU416WG and associated field duplicate sample 17FWOU417WG were qualified (J-) as estimates with a low bias due to the low MS/MSD recoveries. Impact to the data may be significant as the affected results were just below the ROD remedial goal in this well (AP-5588) but cis-1,2-dichloroethene has historically exceeded the ROD remedial goal since 2006. However, significant project decisions will not be made based solely on these results and the analyte will continue to be monitored in future sampling events.
- (1179528) The SVOC MS and MSD samples prepared from sample 17FWOU416WG contained in extraction batch OP67526 were recovered below the control limits for 2-methyl-4,6-dinitrophenol (named 4,6-dinitro-o-cresol in the lab report) (50% and 55% vs. 66-121%). 2-Methyl-4,6-dinitrophenol results in the parent sample 17FWOU416WG and the associated field duplicate sample 17FWOU417WG were qualified (J-) as estimates with a low bias due to the low MS/MSD recoveries (note that 2-methyl-4,6-dinitrophenol results for these two samples were also qualified (J-) due to a low LCS recovery). Impact to the data is negligible as the analyte is not a site contaminant of concern and a cleanup level is not established. Also reported are MS/MSD samples prepared from a non-project sample contained in extraction batch OP67535 that had numerous recoveries outside control limits for various analytes; however, since the parent sample was not from this project, qualifications were not applied.

## 2.7 Surrogate Recovery

Surrogate compounds were added to project samples by the laboratory prior to analysis, in accordance with method requirements. Surrogate recoveries were then calculated as percentages and reported by the laboratory as a measure of analytical extraction efficiency. The following surrogate recoveries were outside the established control limits and resulted in data qualification.

- (K1706778) VOC surrogate 4-bromofluorobenzene was recovered below the control limits (85-114%) in samples 17WOU403WG (82%) and 17WOU409WG (84%). The results for the analytes associated with this surrogate (1,1,2,2-tetrachloroethane, bromobenzene, n-propylbenzene, 1,2,3-trichloropropane, 2-chlorotoluene, 1,3,5-trimethylbenzene, 4-chlorotoluene, tert-butylbenzene, 1,2,4-trimethylbenzene, sec-butylbenzene, 4-isopropyltoluene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, n-butylbenzene, 1,2-dichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2,4-trichlorobenzene, hexachlorobutadiene, naphthalene, and 1,2,3-trichlorobenzene) in samples 17WOU403WG and 17WOU409WG were qualified (J-) as estimates with a low bias due to the low surrogate recoveries. Impact to the results is negligible as the recovery failures were marginal (3% and 1% low, respectively) and most detections or non-detect LODs were a minimum of one order of magnitude below the ADEC cleanup level or no cleanup level was established. The exception is 1,2,3-trichloropropane, which had a non-detect LOD above the cleanup level; however, this analyte is not a site contaminant of concern.

- (1179528) 1,4-Dioxane 8260B-SIM surrogate toluene-d8 was recovered above the control limits (88-111%) in samples 17FWOU412WG (118%), 17FWOU413WG (116%), and 17FWOU417WG (113%). Associated analyte 1,4-dioxane was not detected in sample 17FWOU413WG and it is considered unaffected by the high surrogate recovery. The detected 1,4-dioxane results in samples 17FWOU412WG and 17FWOU417WG were qualified (J+) as estimates with a high bias due to the high surrogate recoveries. Overall, impact to the project is insignificant as the recovery exceedances were marginal (up to 7% high). The 1,4-dioxane result for 17FWOU412WG was one order of magnitude below the ADEC cleanup level. Although sample 17FWOU417WG may be biased high and the results slightly exceeds the ADEC cleanup level, 1,4-dioxane also exceeded the cleanup level in this well (AP-5588) during the spring sampling event in field duplicate sample pair 17FWOU408WG/17FWOU409WG. Moreover, sample 17FWOU417WG is a field duplicate of primary sample 17FWOU416WG (which had acceptable surrogate recovery) and the results for the field duplicate pair are comparable.
- (report 1179528) SVOC surrogates 2-fluorophenol and phenol-d5 had recoveries below the control limits (14-67% and 10-50%, respectively) in samples 17FWOU419WG (6%), 17FWOU421WG (13%), and equipment blank sample 17FWOU423WQ (12%). Associated target analytes 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 2-chlorophenol, 2-methylphenol, 3&4-methylphenol, aniline, benzyl alcohol, bis(2-chloroethyl)ether, hexachloroethane, N-nitrosodimethylamine, N-nitroso-di-n-propylamine, and phenol were qualified (J-) as estimates with a low bias. Impact to the project is negligible as the associated analytes are not contaminants of concern.
- (report 1179528) The SVOC surrogate nitrobenzene-d5 recovery was below the DoD QSM control limits (42-108%) in sample 17FWOU419WG (25%). Associated target analytes 1,2,4-trichlorobenzene, 2,4-dichlorophenol, 2,4-dimethylphenol, 2-methylnaphthalene, 2-nitrophenol, 4-chloro-3-methylphenol, 4-chloroaniline, benzoic acid, bis-(2-chloroethoxy)methane, hexachlorobutadiene, isophorone, naphthalene, and nitrobenzene were qualified (J-) as estimates with a low bias. Impact to the project is negligible as the associated analytes are not contaminants of concern.

## 2.8 Field Duplicates

Two field duplicate samples were collected and submitted to the laboratory as blind samples during groundwater sampling operations. Field duplicate samples were collected at a minimum frequency of 10 percent for each analytical method, and for each SDG, which meets the requirement of the UFP-QAPP.

Field duplicate results of the contaminants of concern, natural attenuation parameters, and all other detected analytes are summarized in Table B-3. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. If both results of the field duplicate pair were less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the UFP-QAPP.

All (applicable) field duplicate sample results were within the ADEC criterion of ≤30% and, therefore, are considered comparable. Field duplicate results for all analytes are compared in the associated ADEC Laboratory Data Review Checklists at the end of Appendix B.

### Table B-3. Groundwater Field Duplicate Sample Results Evaluation

| **Analyte** | **Method** | **Primary 17FWOU408WG (AP-5588)[1]** | **Field Duplicate 17FWOU409WG (AP-2020)[1]** | **RPD, %** | **Comparable Criteria Met? [3]** |
|---|---|---|---|---|---|
| Sulfate | E300.0 | 242 [1] | 246 [1] | 2 | YES |
| Iron | SW6010C | 41800 [8] | 41600 [8] | 0 | YES |
| Antimony | SW6020A | 0.08 [0.05] | 0.071 [0.05] | 12 | YES |
| Arsenic | SW6020A | 14 [0.25] | 13.6 [0.25] | 3 | YES |
| Barium | SW6020A | 575 [0.05] | 561 [0.05] | 2 | YES |
| Beryllium | SW6020A | 0.013 [0.005] J | 0.012 [0.005] J | 8 | Not applicable |
| Cadmium | SW6020A | 0.013 [0.02] J | ND [0.02] | 42 | Not applicable |
| Chromium | SW6020A | 0.98 [0.1] | 1.02 [0.1] | 4 | YES |
| Cobalt | SW6020A | 3.94 [0.01] | 3.81 [0.01] | 3 | YES |
| Copper | SW6020A | 0.21 [0.05] | 0.24 [0.05] | 13 | YES |
| Lead | SW6020A | 0.018 [0.02] J | 0.02 [0.02] | 11 | YES |
| Nickel | SW6020A | 4.59 [0.1] | 4.44 [0.1] | 3 | YES |
| Selenium | SW6020A | 0.3 [0.5] J | 0.3 [0.5] J | 0 | Not applicable |
| Silver | SW6020A | 0.002 [0.005] J | 0.004 [0.005] J | 67 | Not applicable |
| Vanadium | SW6020A | 2.64 [0.1] | 2.66 [0.1] | 1 | YES |
| Zinc | SW6020A | 1.03 [0.25] | 1.11 [0.25] | 7 | YES |
| 1,4-Dioxane | 8270D-SIM | 9.9 [0.1] | 11 [0.1] | 11 | YES |
| 1,1,2,2-Tetrachloroethane | SW8260C | 1600 [20] | 1800 [20] | 12 | YES |
| 1,1,2-Trichloroethane | SW8260C | 6.5 [2] | 6.9 [2] | 6 | YES |
| 1,1-Dichloroethane | SW8260C | 0.8 [1] J | 0.85 [1] J | 6 | Not applicable |
| 1,2-Dichloroethane | SW8260C | 1.8 [0.75] J | 1.9 [0.75] J | 5 | Not applicable |
| Benzene | SW8260C | 1.5 [0.5] J | 1.6 [0.5] J | 6 | Not applicable |
| Chloroform | SW8260C | 0.55 [1] J | 0.6 [1] J | 9 | Not applicable |
| Chloromethane | SW8260C | 0.35 [1] J | 0.35 [1] J | 0 | Not applicable |
| cis-1,2-Dichloroethene | SW8260C | 140 [1] | 150 [1] | 7 | YES |
| Dichlorodifluoromethane | SW8260C | 1.5 [1] J | 1.7 [1] J | 13 | Not applicable |
| Methylene chloride | SW8260C | 0.8 [1] J | 0.8 [1] J | 0 | Not applicable |
| Tetrachloroethene (PCE) | SW8260C | 2.2 [1] J | 2.3 [1] J | 4 | Not applicable |
| trans-1,2-Dichloroethene | SW8260C | 31 [1] | 34 [1] | 9 | YES |
| Trichloroethene (TCE) | SW8260C | 250 [1] | 270 [1] | 8 | YES |
| Vinyl chloride | SW8260C | 0.7 [0.5] J | 0.8 [0.5] J | 13 | Not applicable |
| bis-(2-Ethylhexyl)phthalate | SW8270D-LL | ND [0.5] | ND [0.5] | 0 | Not applicable |
| Diethyl phthalate | SW8270D-LL | 0.039 [0.05] J | 0.04 [0.05] J | 3 | Not applicable |
| Di-n-butyl phthalate | SW8270D-LL | 0.06 [0.07] J | 0.067 [0.07] J | 11 | Not applicable |
| Phenol | SW8270D-LL | 0.13 [0.2] J | 0.12 [0.2] J | 8 | Not applicable |

## Table B-3 Cont'd. Groundwater Field Duplicate Sample Results Evaluation

| Analyte | Method | Primary 17FWOU416WG (AP-5588)[2] | Field Duplicate 17FWOU417WG (AP-5050)[2] | RPD, % | Comparable Criteria Met?[3] |
|---|---|---|---|---|---|
| Sulfate | E300.0 | 146 [2.00] | 146 [2.00] | 0 | YES |
| Iron | SW6010C | 30900 [250] | 30200 [250] | 2 | YES |
| Arsenic | SW6020A | 10.9 [2.50] | 12 [2.50] | 10 | YES |
| Barium | SW6020A | 400 [1.50] | 391 [1.50] | 2 | YES |
| Cobalt | SW6020A | 3.84 [0.500] | 3.62 [0.500] | 6 | YES |
| Nickel | SW6020A | 8.26 [1.00] | 8.46 [1.00] | 2 | YES |
| 1,4-Dioxane | 8260B-SIM | 6.4 [0.30] | 6.1 [0.30] | 5 | YES |
| 1,1,2,2-Tetrachloroethane | SW8260C | 696 [2.50] | 732 [2.50] | 5 | YES |
| 1,1,2-Trichloroethane | SW8260C | 3.28 [0.200] | 3.17 [0.200] | 3 | YES |
| 1,1-Dichloroethane | SW8260C | 0.46 [0.500] J | 0.46 [0.500] J | 0 | Not applicable |
| 1,2-Dichloroethane | SW8260C | 0.84 [0.250] | 0.83 [0.250] | 1 | YES |
| Benzene | SW8260C | 0.7 [0.200] | 0.71 [0.200] | 1 | YES |
| cis-1,2-Dichloroethene | SW8260C | 66.6 [0.500] | 66.7 [0.500] | 0 | YES |
| Dichlorodifluoromethane | SW8260C | 1.02 [0.500] | 1.02 [0.500] | 0 | YES |
| Tetrachloroethene (PCE) | SW8260C | 1.36 [0.500] | 1.36 [0.500] | 0 | YES |
| trans-1,2-Dichloroethene | SW8260C | 18.7 [0.500] | 18.8 [0.500] | 1 | YES |
| Trichloroethene (TCE) | SW8260C | 107 [0.500] | 107 [0.500] | 0 | YES |
| Vinyl chloride | SW8260C | ND [0.0750] | ND [0.0750] | 0 | Not applicable |
| bis-(2-Ethylhexyl)phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |

All results are in micrograms per liter (µg/L), except for sulfate, which is in milligrams per liter (mg/L). Non-detected (ND) results are shown with limits of detection (LODs) in brackets, which are used for relative percent difference (RPD) calculations.

[1] – The samples are associated with report K1706778

[2] – The samples are associated with report 1179528

[3] – RPD of ≤30 percent was used for evaluating water-matrix field duplicate samples.

## 2.9 Additional Quality Control Discrepancies

Additional QC samples and procedures not discussed in the preceding sections of this CDQR are evaluated if deviations are noted by the laboratory in the case narratives. Additional QC samples/procedures may include, but are not limited to, instrument tuning, initial calibration verification (ICV) samples, continuing calibration verification (CCV) samples, and internal standards.

Several QC discrepancies were noted by the laboratory. The discrepancies that resulted in data qualification are summarized below. The discrepancies that did not result in data qualification (e.g., high CCV recoveries but associated project results were non-detect) are discussed in detail in associated ADEC Laboratory Data Review Checklists.

- (K1706778) VOC CCV 0706F004 associated with analytical batch KWG1705652 was recovered below the control limit (± 20% recovery or drift) for 2,2-dichloropropane (-22%) and trans-1,3-dichloropropene (-24%). All samples in the report are associated with this batch and the 2,2-dichloropropane and trans-1,3-dichloropropene results were qualified (J-) as estimates with a low bias. Impact to the project is negligible as a 2,2-dichloropropane cleanup level is not established and neither analyte is a contaminant of concern.

- (K1706778) SVOC CCV MS29\0726F003.D associated with analytical batch KWG1706371 was recovered below the control limit (± 20% recovery or drift) for 2,4-dinitrophenol (-36%) and 2-methyl-4,6-dinitrophenol (-25%). All samples in the report are associated with this batch and the 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol results were qualified (J-) as estimates with a low bias. Impact to the project is negligible as a 2-methyl-4,6-dinitrophenol cleanup level is not established and neither analyte is a contaminant of concern.
- (1179528) SVOC ICV associated with analytical batches OP67526 and OP67535 was recovered below the control limit (± 20% recovery or drift) for benzidine (-24%) and 3,3'-dichlorobenzidine (-24%). All samples in the report are associated with these batches and were non-detect for benzidine and 3,3'-dichlorobenzidine. The non-detect results were qualified (J-) as estimates with a low bias. Impact to the project is negligible as a benzidine cleanup level is not established and neither analyte is a contaminant of concern.
- (1179528) SVOC CCVs associated with analytical batch OP67526 were recovered above the control limits (± 20% recovery or drift) for hexachlorocyclopentadiene (45%) and 2,4-dinitrophenol (51%). All samples in the report are associated with this batch; however, hexachlorocyclopentadiene and 2,4-dinitrophenol were not detected in the samples and qualifications due to the high recoveries were not necessary.

## 2.10 Analytical Sensitivity

Several project data analytes were reported above the DL but below the LOQ and were thus qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. These data qualifications are not reported again in this CDQR, but they are noted with a "J" in the associated results table in Appendix C.

Analytical sensitivity was evaluated to verify that LODs met the applicable cleanup level for non-detect results. Analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table C-2) presented in the Annual Sampling Report. These analytes may not be detected, if present, at the respective cleanup level. However, impact to the project is not significant as the affected analytes are not contaminants of concern.

## 2.11 Summary of Qualified Results

Overall, the review process deemed the groundwater project data acceptable for use. Several results were qualified as estimates; however, data quality impact is minor and no data were rejected pursuant to FES's data quality review.

Table B-4 on the following page summarizes the qualified 2017 groundwater results associated with the sampling events at the OU4 Landfill, including the associated sample numbers, analytes, and the reason for qualification.

## Table B-4. Summary of Groundwater Data Qualifications

| SDG | Sample Numbers | Analytes | Qualification | Explanation |
|---|---|---|---|---|
| K1706778 | 17FWOU401WG<br>17FWOU406WG<br>17FWOU408WG<br>17FWOU409WG<br>equipment blank 17FWOU410WQ | Zinc | B | Method blank contamination |
| | 17FWOU401WG – 17FWOU409WG<br>equipment blank 17FWOU410WQ<br>trip blank 17FWOU411WQ | Chloromethane | | |
| | trip blank 17FWOU411WQ | Chloroform | | |
| | 17FWOU403WG | Naphthalene (8260C) | | |
| | 17FWOU401WG – 17FWOU409WG<br>equipment blank 17FWOU410WQ | Diethyl phthalate | | |
| | equipment blank 17FWOU410WQ | Butyl benzyl phthalate | | |
| | 17FWOU402WG<br>17FWOU403WG<br>17FWOU405WG – 17FWOU407WG<br>equipment blank 17FWOU410WQ | Acetone | | Trip blank contamination |
| | 17FWOU407WG – 17FWOU409WG<br>equipment blank 17FWOU410WQ | Methylene chloride | | |
| | 17FWOU401WG – 17FWOU407WG<br>17FWOU410WQ | Toluene | | |
| | 17FWOU402WG 17FWOU403WG<br>17FWOU405WG – 17FWOU407WG | Acetone | | Equipment blank contamination |
| | 17FWOU407WG – 17FWOU409WG | Methylene chloride | | |
| | 17FWOU401WG<br>17FWOU404WG – 17FWOU406WG<br>17FWOU408WG<br>17FWOU409WG | Copper | | |
| | 17FWOU404WG<br>17FWOU405WG | Nickel | | |
| | 17FWOU402WG<br>17FWOU404WG – 17FWOU406WG<br>17FWOU408WG<br>17FWOU409WG | Silver | | |
| | 17FWOU402WG – 17FWOU406WG | 1,2-Dichloroethane | | |
| | 17FWOU405WG | Benzene | | |
| | 17FWOU403WG<br>17FWOU405WG | Ethylbenzene | | |
| | 17FWOU402WG<br>17FWOU403WG<br>17FWOU405WG | m & p – Xylene | | |
| | 17FWOU401WG<br>17FWOU402WG<br>17FWOU404WG<br>17FWOU405WG<br>17FWOU407WG | bis-(2-Ethylhexyl)phthalate | | |
| | 17FWOU401WG – 17FWOU409WG | di-n-Butyl phthalate | | |
| | 17FWOU402WG<br>17FWOU403WG | Naphthalene (8270D) | | |
| | 17FWOU401WG – 17FWOU409WG<br>equipment blank 17FWOU410WQ<br>trip blank 17FWOU411WQ | trans-1,3-Dichloropropene | J- | Low-biased LCS/LCSD recovery |
| | 17FWOU410WQ | Benzyl alcohol | J | LCS/LCSD imprecision |
| | 17FWOU402WG<br>17FWOU403WG<br>equipment blank 17FWOU410WQ | Naphthalene (8270D) | | |
| | 17FWOU401WG – 17FWOU403WG<br>17FWOU406WG – 17FWOU409WG | Phenol | | |

## Table B-4 Cont'd. Summary of Groundwater Data Qualifications

| SDG | Sample Numbers | Analytes | Qualification | Explanation |
|---|---|---|---|---|
| K1706778 | 17FWOU408WG<br>17FWOU409WG | Vanadium<br>Antimony | J+ | High-biased MS and/or MSD recovery |
| | 17WOU403WG<br>17WOU409WG | 1,1,2,2-Tetrachloroethane<br>Bromobenzene<br>n-Propylbenzene<br>1,2,3-Trichloropropane<br>2-Chlorotoluene<br>1,3,5-Trimethylbenzene<br>4-Chlorotoluene<br>tert-Butylbenzene<br>1,2,4-Trimethylbenzene<br>sec-Butylbenzene<br>4-Isopropyltoluene<br>1,3-Dichlorobenzene<br>1,4-Dichlorobenzene<br>n-Butylbenzene<br>1,2-Dichlorobenzene<br>1,2-Dibromo-3-chloropropane<br>1,2,4-Trichlorobenzene<br>Hexachlorobutadiene<br>Naphthalene (8260C)<br>1,2,3-Trichlorobenzene | J- | Low-biased surrogate recovery |
| | 17FWOU401WG – 17FWOU409WG<br>equipment blank 17FWOU410WQ<br>trip blank 17FWOU411WQ | 2,2-Dichloropropane<br>trans-1,3-Dichloropropene | | Low-biased CCV recovery |
| | 17FWOU401WG – 17FWOU409WG<br>equipment blank 17FWOU410WQ | 2,4-Dinitrophenol<br>2-Methyl-4,6-dinitrophenol | | |
| 1179528 | 17FWOU415WG<br>17FWOU420WG<br>17FWOU422WG | Lead | B | Equipment blank contamination |
| | 17FWOU412WG – 17FWOU419WG | 2-Methyl-4,6-dinitrophenol | J- | Low-biased LCS/LCSD recovery |
| | 17FWOU416WG<br>17FWOU417WG | cis-1,2-Dichloroethene | J- | Low-biased MS and/or MSD recovery |
| | 17FWOU416WG<br>17FWOU417WG | 2-Methyl-4,6-dinitrophenol | | |
| | 17FWOU412WG<br>17FWOU417WG | 1,4-Dioxane | J+ | High-biased surrogate recovery |
| | 17FWOU419WG<br>17FWOU421WG<br>equipment blank 17FWOU423WQ | 1,2-Dichlorobenzene<br>1,3-Dichlorobenzene<br>1,4-Dichlorobenzene<br>2-Chlorophenol<br>2-Methylphenol<br>3&4-Methylphenol<br>Aniline<br>Benzyl alcohol<br>bis(2-Chloroethyl)ether<br>Hexachloroethane<br>n-Nitrosodimethylamine<br>n-Nitroso-di-n-propylamine<br>Phenol | J- | Low-biased surrogate recovery |

### Table B-4 Cont'd. Summary of Groundwater Data Qualifications

| SDG | Sample Numbers | Analytes | Qualification | Explanation |
|---|---|---|---|---|
| 1179528 | 17FWOU419WG | 1,2,4-Trichlorobenzene<br>2,4-Dichlorophenol<br>2,4-Dimethylphenol<br>2-Methylnaphthalene<br>2-Nitrophenol<br>4-Chloro-3-methylphenol<br>4-Chloroaniline<br>Benzoic acid<br>bis(2Chloroethoxy)methane<br>Hexachlorobutadiene<br>Isophorone<br>Naphthalene (8270D)<br>Nitrobenzene | J- | Low-biased surrogate recovery |
| | 17FWOU412WG – 17FWOU422WG equipment blank 17FWOU423WQ | Benzidine<br>3,3'-Dichlorobenzidine | | Low-biased ICV recovery |

## 2.12 Completeness

Completeness scores were calculated for each analytical method employed for the project. Scores were obtained by assigning points to 14 different data quality categories during the review process. A maximum of 10 points was awarded for each category; points were based on the number of samples successfully meeting data quality objectives for that category. Points were subtracted when failure to meet DQOs resulted in data qualification or data rejection. The scores were then summed to determine the total points for a method, and completeness scores were determined as follows: (total points received)/(total points possible) x 100.

A breakdown of the points received for each category and method is shown in Table B-5 below. All OU4 site data quality categories met the completeness criteria of 90 percent established in the QAPP for the sampling events. No data were rejected pursuant to the data quality review, and all data may be used, as qualified, for the purposes of the 2017 OU4 Annual Sampling Report.

### Table B-5. Completeness Scores for Groundwater Samples

| Data Quality Category | Points VOC | Points SVOC | Points 1,4-Dioxane | Points Total Metals | Points Fe | Points Sulfate |
|---|---|---|---|---|---|---|
| Sample Collection | 10 | 10 | 10 | 10 | 10 | 10 |
| COC Documentation | 10 | 10 | 10 | 10 | 10 | 10 |
| Sample Containers/ Preservation | 10 | 10 | 10 | 10 | 10 | 10 |
| Cooler Temperature | 10 | 10 | 10 | 10 | 10 | 10 |
| Holding Times | 10 | 10 | 10 | 10 | 10 | 10 |
| Method Blanks | 9 | 9 | 10 | 9 | 10 | 10 |
| Trip Blanks | 9 | NA | 10 | NA | NA | NA |
| Equipment Blank | 9 | 9 | 10 | 9 | 10 | 10 |
| LCS/LCSD Recovery & RPD | 9 | 9 | 10 | 10 | 10 | 10 |
| MS/MSD Recovery & RPD | 9 | 7 | 10 | 9 | 10 | 10 |
| Surrogate Recovery | 9 | 8 | 9 | NA | NA | NA |

## Table B-5 Cont'd. Completeness Scores for Groundwater Samples

| Data Quality Category | Points VOC | Points SVOC | Points 1,4-Dioxane | Points Total Metals | Points Fe | Points Sulfate |
|---|---|---|---|---|---|---|
| Field Duplicate | 10 | 10 | 10 | 10 | 10 | 10 |
| CCV, Internal Stds, other | 9 | 9 | 10 | 10 | 10 | 10 |
| Sensitivity (DL/LOD) | 9 | 9 | 10 | 10 | 10 | 10 |
| Total Points Received | 132 | 120 | 139 | 117 | 120 | 120 |
| Total Points Possible | 140 | 130 | 140 | 120 | 120 | 120 |
| Percent Completeness | 94 | 92 | 99 | 97 | 100 | 100 |

NA – not applicable

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# 3.0 REFERENCES

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# Laboratory Data Review Checklist

Completed By:

Jack James (reviewed and revised by Vanessa Ritchie, FES Senior Chemist)

Title:

Chemist, ERM

Date:

01/16/2018

CS Report Name:

Fort Wainwright Operable Unit 4

Report Date:

01/03/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS North America Inc. – Anchorage, AK

Laboratory Report Number:

1179528

ADEC File Number:

108.38.070.0

Hazard Identification Number:

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

      ● Yes ○ No Comments:

      Yes; however, EPA Method 300.0 is not listed as a CS analysis.

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

      ○ Yes ● No Comments:

      Samples for 1,4-dioxane analysis by SW8260B SIM and SVOCs by SW8270D were sub-contracted to SGS Accutest of Orlando, Florida. Although the laboratory is approved by ADEC to perform several contaminant analyses, 8260B-SIM is not a method currently included in the Contaminated Sites Laboratory Approval Program. However, the laboratory holds a current DoD ELAP certification for this method.

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

      ○ Yes ● No Comments:

      SVOC and 1,4-dioxane samples were sent directly to the sub-contracted lab, SGS Accutest of Orlando, due to the short sample hold time remaining on the SVOC samples. The COC that accompanied the samples was not included in SGS-Orlando's laboratory report. Alternatively, the COC that is included was created by SGS-Anchorage (the primary project laboratory). This 2 page COC was not signed as relinquished but was signed as received. The samples were reported to have been received properly preserved and within receiving temperature and no indication given that the samples were compromised. No data were impacted or qualified based upon the COC discrepancy.

   b. Correct Analyses requested?

      ○ Yes ● No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

      ● Yes ○ No Comments:

      All coolers arrived at the laboratory containing temperature blanks with readings within the ADEC recommended temperature range of 0° to 6°C.

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

      ● Yes ○ No Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

● Yes ○ No Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

● Yes ○ No Comments:

No discrepancies were noted upon sample login.

e. Data quality or usability affected?

Comments:

Not applicable. No discrepancies were noted.

4. Case Narrative

a. Present and understandable?

● Yes ○ No Comments:

b. Discrepancies, errors, or QC failures identified by the lab?

● Yes ○ No Comments:

The case narrative described LCS/LCSD and MS/MSD exceptions discussed below in 6d and surrogate exceptions discussed below in 6c. It also discussed ICV and CCV exceptions, which are discussed here.

The SVOC ICV associated with analytical batches OP67526 and OP67535 was recovered below the control limit (± 20% recovery or drift) for benzidine (-24%) and 3,3'-dichlorobenzidine (-24%). All samples are associated with these batches and were non-detect for benzidine and 3,3'-dichlorobenzidine. The non-detect results were qualified (J-) as estimates with a low bias. Impact to the project is negligible as a benzidine cleanup level is not established and neither analyte is a contaminant of concern.

SVOC CCVs associated with analytical batch OP67526 were recovered above the control limits (± 20% recovery or drift) for hexachlorocyclopentadiene (45%) and 2,4-dinitrophenol (51%). All samples are associated with this batch; however, hexachlorocyclopentadiene and 2,4-dinitrophenol were not detected in the samples and qualifications due to the high recoveries were not necessary.

c. Were all corrective actions documented?

● Yes ○ No Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Case narrative does not discuss effect on data quality, it only discusses discrepancies and what was done in light of them. Any notable data quality issues mentioned in the case narrative are discussed above in 4b or elsewhere within this ADEC checklist.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

● Yes ○ No Comments:

b. All applicable holding times met?

● Yes ○ No Comments:

All data reported as primary results were from analytical runs performed within method-specified holding times. However, SVOC samples 17FWOU419WG, 17FWOU421WG, and 17FWOU423WG were re-extracted and re-analyzed past the holding time by six to ten days due to low surrogate recoveries in the initial runs. The results of the re-analyses with passing surrogate recoveries confirmed the in-hold non-detect results; therefore, the in-hold results are reported as primary. The surrogate recoveries for in-hold results are discussed in section 6c below. The secondary, out-of-hold results were not reviewed.

c. All soils reported on a dry weight basis?

○ Yes ● No Comments:

No soil samples were included in this work order.

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

○ Yes ● No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal or ADEC cleanup level for non-detect results, as appropriate. Thallium, 1,2,3-trichloropropane, 2,6-dinitrotoluene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis-(2-chloroethyl)ether, dibenzo(a,h)anthracene, hexachlorobenzene, hexachlorocyclopentadiene, indeno(1,2,3-cd)pyrene, n-nitrosodimethylamine, n-nitrosodi-n-propylamine, and pentachlorophenol in all samples, and arsenic in samples 17FWOU413WG, 17FWOU418WG, 17FWOU420WG, and equipment blank sample 17FWOU423WQ, did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345. These analytes may not be detected, if present, at the respective cleanup level. However, impact to the project is not significant as the affected analytes are not contaminants of concern.

All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table C-2) presented in the Annual Sampling Report.

e. Data quality or usability affected?

○ Yes

See discussion above in 5d.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

● Yes ○ No Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

● Yes ○ No Comments:

Target analytes were not detected in the method blank samples.

iii. If above LOQ, what samples are affected?

Comments:

Not applicable.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

○ Yes ● No Comments:

Not applicable.

v. Data quality or usability affected?

Comments:

No data quality or usability was affected by the method blank samples.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

● Yes ○ No Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

● Yes ○ No Comments:

No project MS/MSD samples were reported in sulfate extraction batch WXX12103, 8260B-SIM extraction batch VZ1844 for 1,4-dioxane, and SVOC extraction batch OP67535. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS samples and another client's MS/MSD (sulfate extraction batch WXX12103, VOC analytical batch VZ1844, and SVOC extraction batch OP67535). These batches contained sulfate results for samples 17FWOU417WG, 17FWOU418WG, and 17FWOU419WG; 1,4-dioxane results for samples 17FWOU412WG, 17FWOU413WG, 17FWOU414WG, and 17FWOU415WG; and SVOC results for samples 17FWOU420WG, 17FWOU421WG, 17FWOU422WG, and 17FWOU423WG.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ● No Comments:

The SVOC LCS and/or LCSD samples contained in extraction batch OP67526 recovered above the control limits for 3,3'-dichlorobenzidine (123% and 119% vs. 46-117%) and below the control limits for 2-methyl-4,6-dinitrophenol (named 4,6-dinitro-o-cresol in the lab report) (63% vs. 66-121%). Target analyte 3,3'-dichlorobenzidine was not detected in the associated samples and the results were not qualified due to the high LCS recoveries. 2-Methyl-4,6-dinitrophenol results in associated samples 17FWOU412WG, 17FWOU413WG, 17FWOU414WG, 17FWOU415WG, 17FWOU416WG, the field duplicate sample 17FWOU417WG, 17FWOU418WG, and 17FWOU419WG were qualified (J-) as estimates with a low bias due to the low LCS/LCSD recoveries. Impact to the project is negligible as the recovery failure was marginal and a cleanup level for 2-methyl-4,6-dinitrophenol is not established.

The total metals MS sample prepared form sample 17FWOU416WG contained in extraction batch MXX31204 was recovered below the control limits for total iron (73% vs. 87-118%). Total iron was not reported in the parent sample and no qualifications were necessary.

The dissolved metals MSD sample prepared from sample 17FWOU416WG contained in extraction batch MXX31205 was recovered below the control limits for dissolved iron (70% vs. 87-118%). The dissolved iron result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied.

The VOC MS and MSD samples prepared from sample 17FWOU416WG contained in extraction batch VXX31683 were recovered below the control limits for cis-1,2-dichloroethene (both 54% vs. 78-123%). cis-1,2-Dichloroethene results in the parent sample 17FWOU416WG and the associated field duplicate sample 17FWOU417WG were qualified (J-) as estimates with a low bias due to the low MS/MSD recoveries. Impact to the data may be significant as the affected results were just below the ROD remedial goal in this well (AP-5588) but cis-1,2-dichloroethene has historically exceeded the ROD remedial goal since 2006. However, significant project decisions will not be made based solely on these results and the analyte will continue to be monitored in future sampling events.

The SVOC MS and MSD samples prepared from sample 17FWOU416WG contained in extraction batch OP67526 were recovered below the control limits for 2-methyl-4,6-dinitrophenol (named 4,6-dinitro-o-cresol in the lab report) (50% and 55% vs. 66-121%). 2-Methyl-4,6-dinitrophenol results in the parent sample 17FWOU416WG and the associated field duplicate sample 17FWOU417WG were qualified (J-) as estimates with a low bias due to the low MS/MSD recoveries (note that 2-methyl-4,6-dinitrophenol results for these two samples were also qualified (J-) due to a low LCS recovery). Impact to the project is negligible as the analyte is not a site contaminant of concern and a cleanup level is not established. Also reported are MS/MSD samples prepared from a non-project sample contained in extraction batch OP67535 that had numerous recoveries outside control limits for various analytes; however, since the parent sample was not from this project, qualifications were not applied.

The anions MSD sample prepared from a non-project sample recovered below the control limits (88% vs. 90-110%). No qualifications were applied as the parent sample was not from this project.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

● Yes ○ No Comments:

All LCS/LCSD RPDs and project-specific MS/MSD RPDs had values with the control limit. However, SVOC MS/MSD samples prepared from a non-project sample contained in extraction batch OP67535 had an RPD outside the control limit. Since the parent sample was not from this project, qualifications were not applied.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

See 6biii and 6biv above.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

● Yes ○ No Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

See 6biii and 6biv above.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

● Yes ○ No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes ● No Comments:

1,4-Dioxane 8260B-SIM surrogate toluene-d8 was recovered above the control limits (88-111%) in samples 17FWOU412WG (118%), 17FWOU413WG (116%), and 17FWOU417WG (113%). Associated analyte 1,4-dioxane was not detected in sample 17FWOU413WG and it is considered unaffected by the high surrogate recovery. The detected 1,4-dioxane results in samples 17FWOU412WG and 17FWOU417WG were qualified (J+) as estimates with a high bias due to the high surrogate recoveries. Overall, impact to the project is insignificant as the recovery exceedances were marginal (up to 7% high). The 1,4-dioxane result for 17FWOU412WG was one order of magnitude below the ADEC cleanup level. Although sample 17FWOU417WG may be biased high and the results slightly exceeds the ADEC cleanup level, 1,4-dioxane also exceeded the cleanup level in this well (AP-5588) during the spring sampling event in field duplicate sample pair 17FWOU408WG/17FWOU409WG. Moreover, sample 17FWOU417WG is a field duplicate of primary sample 17FWOU416WG (which had acceptable surrogate recovery) and the results for the field duplicate pair are comparable.

SVOC surrogates 2-fluorophenol and phenol-d5 had recoveries below the control limits (14-67% and 10-50%, respectively) in samples 17FWOU419WG (6%), 17FWOU421WG (13%), and equipment blank sample 17FWOU423WQ (12%). Associated target analytes 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 2-chlorophenol, 2-methylphenol, 3&4-methylphenol, aniline, benzyl alcohol, bis(2-chloroethyl)ether, hexachloroethane, N-nitrosodimethylamine, N-nitroso-di-n-propylamine, and phenol were qualified (J-) as estimates with a low bias. Impact to the project is negligible as the associated analytes are not contaminants of concern.

The SVOC surrogate nitrobenzene-d5 recovery was below the control limits (42-108%) in sample 17FWOU419WG (25%). Associated target analytes 1,2,4-trichlorobenzene, 2,4-dichlorophenol, 2,4-dimethylphenol, 2-methylnaphthalene, 2-nitrophenol, 4-chloro-3-methylphenol, 4-chloroaniline, benzoic acid, bis-(2-chloroethoxy)methane, hexachlorobutadiene, isophorone, naphthalene, and nitrobenzene were qualified (J-) as estimates with a low bias. Impact to the project is negligible as the associated analytes are not contaminants of concern.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

● Yes ○ No Comments:

iv. Data quality or usability affected?

Comments:

See 6cii above.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

● Yes ○ No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

● Yes ○ No Comments:

Three VOA vials for trip blank sample 17FWOU424WQ were included in cooler 110201 sent to SGS, Anchorage for VOC analysis and three VOA vials were included in cooler FES303 sent to SGS Accutest of Orlando, FL for 1,4-dioxane analysis.

iii. All results less than LOQ?

● Yes ○ No Comments:

Target analytes were not detected in the trip blank sample 17FWOU424WQ.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable, analytes not detected in the trip blank sample 17FWOU424WQ.

v. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the trip blank sample.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

● Yes ○ No Comments:

One groundwater field duplicate was collected for the ten primary samples associated with this work order.

ii. Submitted blind to lab?

● Yes ○ No Comments:

17FWOU417WG was a field duplicate of sample 17FWOU416WG.

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$$

Where $R_1$ = Sample Concentration
$R_2$ = Field Duplicate Concentration

● Yes ○ No Comments:

All detected results for the primary and field duplicate samples are shown in the table below. In the case where a result was detected in one sample but non-detect in the other, the LOD was used for RPD calculation purposes. The non-detect results are identified with “ND” and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable. Units are mg/L for sulfate and µg/L for remaining analytes. Analytes that do not meet the comparison criteria are identified in gray shading and are discussed in the following paragraphs.

All results for the field duplicate/parent sample pair 17FWOU417WG /17FWOU416WG were comparable (RPD ≤ 30%).

Field duplicate/parent sample pair 17FWOU417WG /17FWOU416WG results can be found on the following pages.

| Analyte | Method | Primary 17FWOU416WG (AP-5588) | Field Duplicate 17FWOU417WG (AP-5050) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| Sulfate | E300.0 | 146 [2.00] | 146 [2.00] | 0 | YES |
| Iron | SW6010C | 30900 [250] | 30200 [250] | 2 | YES |
| Antimony | SW6020A | ND [1.50] | ND [1.50] | 0 | Not applicable |
| Arsenic | SW6020A | 10.9 [2.50] | 12 [2.50] | 10 | YES |
| Barium | SW6020A | 400 [1.50] | 391 [1.50] | 2 | YES |
| Beryllium | SW6020A | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Cadmium | SW6020A | ND [1.00] | ND [1.00] | 0 | Not applicable |
| Chromium | SW6020A | ND [2.00] | ND [2.00] | 0 | Not applicable |
| Cobalt | SW6020A | 3.84 [0.500] | 3.62 [0.500] | 6 | YES |
| Copper | SW6020A | ND [3.00] | ND [3.00] | 0 | Not applicable |
| Lead | SW6020A | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Nickel | SW6020A | 8.26 [1.00] | 8.46 [1.00] | 2 | YES |
| Selenium | SW6020A | ND [10.0] | ND [10.0] | 0 | Not applicable |
| Silver | SW6020A | ND [1.00] | ND [1.00] | 0 | Not applicable |
| Thallium | SW6020A | ND [1.00] | ND [1.00] | 0 | Not applicable |
| Vanadium | SW6020A | ND [10.0] | ND [10.0] | 0 | Not applicable |
| Zinc | SW6020A | ND [12.5] | ND [12.5] | 0 | Not applicable |
| 1,4-Dioxane | 8260B-SIM | 6.4 [0.30] | 6.1 [0.30] | 5 | YES |
| 1,1,1,2-Tetrachloroethane | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| 1,1,1-Trichloroethane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,1,2,2-Tetrachloroethane | SW8260C | 696 [2.50] | 732 [2.50] | 5 | YES |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| 1,1,2-Trichloroethane | SW8260C | 3.28 [0.200] | 3.17 [0.200] | 3 | YES |
| 1,1-Dichloroethane | SW8260C | 0.46 [0.500] J | 0.46 [0.500] J | 0 | Not applicable |
| 1,1-Dichloroethene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,1-Dichloropropene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,2,3-Trichlorobenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,2,3-Trichloropropane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,2,4-Trichlorobenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,2,4-Trimethylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,2-Dibromo-3-chloropropane | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| 1,2-Dibromoethane | SW8260C | ND [0.0375] | ND [0.0375] | 0 | Not applicable |
| 1,2-Dichlorobenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,2-Dichloroethane | SW8260C | 0.84 [0.250] | 0.83 [0.250] | 1 | YES |
| 1,2-Dichloropropane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,3,5-Trimethylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,3-Dichlorobenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 1,3-Dichloropropane | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| 1,4-Dichlorobenzene | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| 2,2-Dichloropropane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 2-Butanone | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| 2-Chlorotoluene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 2-Hexanone | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| 4-Chlorotoluene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 4-Isopropyltoluene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| 4-Methyl-2-pentanone | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| Benzene | SW8260C | 0.7 [0.200] | 0.71 [0.200] | 1 | YES |
| Bromobenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Bromochloromethane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |

| Analyte | Method | Primary 17FWOU416WG (AP-5588) | Field Duplicate 17FWOU417WG (AP-5050) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| Bromodichloromethane | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| Bromoform | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Bromomethane | SW8260C | ND [2.50] | ND [2.50] | 0 | Not applicable |
| Carbon disulfide | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| Carbon tetrachloride | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Chlorobenzene | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| Chloroethane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Chloroform | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Chloromethane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| cis-1,2-Dichloroethene | SW8260C | 66.6 [0.500] | 66.7 [0.500] | 0 | YES |
| cis-1,3-Dichloropropene | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| Dibromochloromethane | SW8260C | ND [0.250] | ND [0.250] | 0 | Not applicable |
| Dibromomethane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Dichlorodifluoromethane | SW8260C | 1.02 [0.500] | 1.02 [0.500] | 0 | YES |
| Ethylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Hexachlorobutadiene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Isopropylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Methylene chloride | SW8260C | ND [2.50] | ND [2.50] | 0 | Not applicable |
| Methyl-tert-butyl ether (MTBE) | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| Naphthalene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| n-Butylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| n-Propylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| o-Xylene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| sec-Butylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Styrene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| tert-Butylbenzene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Tetrachloroethene (PCE) | SW8260C | 1.36 [0.500] | 1.36 [0.500] | 0 | YES |
| Toluene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| trans-1,2-Dichloroethene | SW8260C | 18.7 [0.500] | 18.8 [0.500] | 1 | YES |
| trans-1,3-Dichloropropene | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Trichloroethene (TCE) | SW8260C | 107 [0.500] | 107 [0.500] | 0 | YES |
| Trichlorofluoromethane | SW8260C | ND [0.500] | ND [0.500] | 0 | Not applicable |
| Vinyl acetate | SW8260C | ND [5.00] | ND [5.00] | 0 | Not applicable |
| Vinyl chloride | SW8260C | ND [0.0750] | ND [0.0750] | 0 | Not applicable |
| Xylene, Isomers m & p | SW8260C | ND [1.00] | ND [1.00] | 0 | Not applicable |
| Xylenes | SW8260C | ND [1.50] | ND [1.50] | 0 | Not applicable |
| 1,2,4-Trichlorobenzene | SW8270D | ND [1.0] | ND [1.1] | 10 | Not applicable |
| 1,2-Dichlorobenzene | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| 1,2-Diphenylhydrazine | SW8270D | ND [0.75] | ND [0.76] | 1 | Not applicable |
| 1,3-Dichlorobenzene | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| 1,4-Dichlorobenzene | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| 1-Methylnaphthalene | SW8270D | ND [0.51] | ND [0.53] | 4 | Not applicable |
| 2,4,5-Trichlorophenol | SW8270D | ND [0.73] | ND [0.74] | 1 | Not applicable |
| 2,4,6-Trichlorophenol | SW8270D | ND [0.74] | ND [0.75] | 1 | Not applicable |
| 2,4-Dichlorophenol | SW8270D | ND [0.82] | ND [0.84] | 2 | Not applicable |
| 2,4-Dimethylphenol | SW8270D | ND [0.72] | ND [0.74] | 3 | Not applicable |
| 2,4-Dinitrophenol | SW8270D | ND [4.9] | ND [5.0] | 2 | Not applicable |
| 2,4-Dinitrotoluene | SW8270D | ND [0.80] | ND [0.81] | 1 | Not applicable |

| Analyte | Method | Primary 17FWOU416WG (AP-5588) | Field Duplicate 17FWOU417WG (AP-5050) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| 2,6-Dinitrotoluene | SW8270D | ND [0.70] | ND [0.71] | 1 | Not applicable |
| 2-Chloronaphthalene | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| 2-Chlorophenol | SW8270D | ND [0.62] | ND [0.63] | 2 | Not applicable |
| 2-Methyl-4,6-dinitrophenol | SW8270D | ND [2.0] | ND [2.0] | 0 | Not applicable |
| 2-Methylnaphthalene | SW8270D | ND [0.59] | ND [0.60] | 2 | Not applicable |
| 2-Methylphenol (o-Cresol) | SW8270D | ND [0.55] | ND [0.56] | 2 | Not applicable |
| 2-Nitroaniline | SW8270D | ND [1.8] | ND [1.8] | 0 | Not applicable |
| 2-Nitrophenol | SW8270D | ND [0.84] | ND [0.85] | 1 | Not applicable |
| 3,3'-Dichlorobenzidine | SW8270D | ND [0.63] | ND [0.64] | 2 | Not applicable |
| 3-Methylphenol/4-Methylphenol Coelution | SW8270D | ND [0.96] | ND [0.98] | 2 | Not applicable |
| 3-Nitroaniline | SW8270D | ND [0.86] | ND [0.88] | 2 | Not applicable |
| 4-Bromophenyl phenyl ether | SW8270D | ND [0.83] | ND [0.85] | 2 | Not applicable |
| 4-Chloro-3-methylphenol | SW8270D | ND [0.58] | ND [0.59] | 2 | Not applicable |
| 4-Chloroaniline | SW8270D | ND [0.62] | ND [0.63] | 2 | Not applicable |
| 4-Chlorophenyl phenyl ether | SW8270D | ND [0.53] | ND [0.54] | 2 | Not applicable |
| 4-Nitroaniline | SW8270D | ND [1.1] | ND [1.2] | 9 | Not applicable |
| 4-Nitrophenol | SW8270D | ND [4.9] | ND [5.0] | 2 | Not applicable |
| Acenaphthene | SW8270D | ND [0.61] | ND [0.63] | 3 | Not applicable |
| Acenaphthylene | SW8270D | ND [0.63] | ND [0.64] | 2 | Not applicable |
| Aniline | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| Anthracene | SW8270D | ND [0.78] | ND [0.80] | 3 | Not applicable |
| Benzidine | SW8270D | ND [4.9] | ND [5.0] | 2 | Not applicable |
| Benzo(a)anthracene | SW8270D | ND [0.75] | ND [0.76] | 1 | Not applicable |
| Benzo(a)pyrene | SW8270D | ND [0.77] | ND [0.78] | 1 | Not applicable |
| Benzo(b)fluoranthene | SW8270D | ND [0.76] | ND [0.78] | 3 | Not applicable |
| Benzo(g,h,i)perylene | SW8270D | ND [0.81] | ND [0.82] | 1 | Not applicable |
| Benzo(k)fluoranthene | SW8270D | ND [0.84] | ND [0.86] | 2 | Not applicable |
| Benzoic acid | SW8270D | ND [9.8] | ND [10] | 2 | Not applicable |
| Benzyl alcohol | SW8270D | ND [0.60] | ND [0.61] | 2 | Not applicable |
| Benzyl butyl phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| bis-(2-Chloroethoxy)methane | SW8270D | ND [0.79] | ND [0.81] | 3 | Not applicable |
| bis-(2-Chloroethyl)ether | SW8270D | ND [0.72] | ND [0.73] | 1 | Not applicable |
| bis(2-Chloroisopropyl)ether | SW8270D | ND [0.74] | ND [0.76] | 3 | Not applicable |
| bis-(2-Ethylhexyl)phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| Carbazole | SW8270D | ND [0.59] | ND [0.60] | 2 | Not applicable |
| Chrysene | SW8270D | ND [0.83] | ND [0.85] | 2 | Not applicable |
| Dibenzo(a,h)anthracene | SW8270D | ND [0.79] | ND [0.80] | 1 | Not applicable |
| Dibenzofuran | SW8270D | ND [0.59] | ND [0.60] | 2 | Not applicable |
| Diethyl phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| Dimethyl phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| Di-n-butyl phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| Di-n-octyl phthalate | SW8270D | ND [0.98] | ND [1.0] | 2 | Not applicable |
| Fluoranthene | SW8270D | ND [0.54] | ND [0.55] | 2 | Not applicable |
| Fluorene | SW8270D | ND [0.69] | ND [0.70] | 1 | Not applicable |
| Hexachlorobenzene | SW8270D | ND [0.68] | ND [0.69] | 1 | Not applicable |
| Hexachlorobutadiene | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| Hexachlorocyclopentadiene | SW8270D | ND [1.8] | ND [1.8] | 0 | Not applicable |
| Hexachloroethane | SW8270D | ND [1.6] | ND [1.6] | 0 | Not applicable |

| Analyte | Method | Primary 17FWOU416WG (AP-5588) | Field Duplicate 17FWOU417WG (AP-5050) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| Indeno(1,2,3-cd)pyrene | SW8270D | ND [0.70] | ND [0.71] | 1 | Not applicable |
| Isophorone | SW8270D | ND [0.76] | ND [0.78] | 3 | Not applicable |
| Naphthalene | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| Nitrobenzene | SW8270D | ND [0.91] | ND [0.93] | 2 | Not applicable |
| n-Nitrosodimethylamine | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| n-Nitrosodi-n-propylamine | SW8270D | ND [0.66] | ND [0.67] | 2 | Not applicable |
| n-Nitrosodiphenylamine | SW8270D | ND [0.79] | ND [0.81] | 3 | Not applicable |
| Pentachlorophenol | SW8270D | ND [4.9] | ND [5.0] | 2 | Not applicable |
| Phenanthrene | SW8270D | ND [0.85] | ND [0.86] | 1 | Not applicable |
| Phenol | SW8270D | ND [0.49] | ND [0.50] | 2 | Not applicable |
| Pyrene | SW8270D | ND [0.67] | ND [0.68] | 1 | Not applicable |
| Pyridine | SW8270D | ND [2.0] | ND [2.0] | 0 | Not applicable |

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No data quality or usability was affected by the field duplicate.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below).

● Yes ○ No ○ Not Applicable

Equipment blank sample 17FWOU423WQ was collected and included this work order to assess the potential for cross-contamination during sampling. All wells were sampled with a submersible pump, per the UFP-QAPP, with the exception of monitoring wells AP-5588 (17FWOU416WG and field duplicate 17FWOU417WG) and AP-8063 (17FWOU419WG). The casings of these wells are structurally damaged, which prohibits sampling with a submersible pump. Alternatively, these wells were sampled with a peristaltic pump employing new Teflon-lined tubing at each location. Therefore, the sample results associated with these wells were not compared to the equipment blank sample results.

i. All results less than LOQ?

○ Yes ● No Comments:

Lead was detected greater than the LOQ (0.500 µg/L) at 3.33 µg/L in equipment blank sample 17FWOU423WQ. Additionally, toluene was detected less than the LOQ (0.500 µg/L) at 0.32 µg/L.

ii. If above LOQ, what samples are affected?

Comments:

Lead in associated samples 17FWOU415WG, 17FWOU420WG, and 17FWOU422WG was detected at concentrations less than five-times that of the equipment blank sample and the results were qualified (B) as potential sampling cross-contamination. Impact to the results is negligible as the detections were approximately one order of magnitude below the ADEC cleanup level.

Toluene was not detected in the associated samples and qualifications were not applied due to the equipment blank contamination.

iii. Data quality or usability affected?

Comments:

See 6fi above.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

○ Yes ● No Comments:

No other data flags/qualifiers were used.

# Laboratory Data Review Checklist

Completed By:

Jack James (reviewed and revised by Vanessa Ritchie, FES Senior Chemist)

Title:

Chemist, ERM

Date:

12/19/2017

CS Report Name:

Fort Wainwright Operable Unit 4

Report Date:

7/31/2017

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

ALS – Kelso, WA

Laboratory Report Number:

K1706778

ADEC File Number:

108.38.070.0

Hazard Identification Number:

K1706778

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

      ● Yes ○ No Comments:

      Yes; however, EPA Method 300.0 is not listed as CS analysis

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

      ○ Yes ● No Comments:

      No samples were sub-contracted.

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

      ● Yes ○ No Comments:

   b. Correct Analyses requested?

      ● Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

      ● Yes ○ No Comments:

      All coolers arrived at the laboratory containing temperature blanks with readings within the ADEC recommended temperature range of 0° to 6°C.

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

      ● Yes ○ No Comments:

   c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

      ● Yes ○ No Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

● Yes ○ No Comments:

The laboratory noted that two containers were received for the trip blank sample 17FWOU411WQ; however, the COC listed three containers. The laboratory was able to complete the required analysis with the volume provided.

e. Data quality or usability affected?

Comments:

No data quality or usability was affected by the sample receipt documentation.

4. Case Narrative

a. Present and understandable?

● Yes ○ No Comments:

b. Discrepancies, errors, or QC failures identified by the lab?

● Yes ○ No Comments:

The case narrative described elevated LODs discussed below in 5d, LCS/LCSD and MS/MSD exceptions discussed below in 6d, and surrogate exceptions discussed below in 6c. It also discussed CCV exceptions and manual integrations, which are discussed here.

VOC CCV 0706F004 associated with analytical batch KWG1705652 was recovered below the control limit (± 20% recovery or drift) for 2,2-dichloropropane (-22%) and trans-1,3-dichloropropene (-24%). All samples are associated with this batch and the 2,2-dichloropropane and trans-1,3-dichloropropene results were qualified (J-) as estimates with a low bias. Impact to the project is negligible as a 2,2-dichloropropane cleanup level is not established and neither analyte is a contaminant of concern.

SVOC CCV MS29\0726F003.D associated with analytical batch KWG1706371 was recovered below the control limit (± 20% recovery or drift) for 2,4-dinitrophenol (-36%) and 2-methyl-4,6-dinitrophenol (-25%). All samples are associated with this batch and the 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol results were qualified (J-) as estimates with a low bias. Impact to the project is negligible as a 2-methyl-4,6-dinitrophenol cleanup level is not established and neither analyte is a contaminant of concern.

Manual integrations were discussed for 1,4-dioxane, VOC, and SVOC analyses. The laboratory stated that the manual integration was performed in accordance with ALS policy, which is consistent with the National Environmental Laboratory Accreditation Program (NELAP), Department of Defense (DOD), and other certifying agencies. There were no effects on data quality or usability based upon the laboratory performing necessary manual integrations.

c. Were all corrective actions documented?

● Yes ○ No Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Case narrative does not discuss effect on data quality, it only discusses discrepancies and what was done in light of them. Any notable data quality issues mentioned in the case narrative are discussed above in 4b or elsewhere within this ADEC checklist.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

● Yes ○ No Comments:

b. All applicable holding times met?

● Yes ○ No Comments:

c. All soils reported on a dry weight basis?

○ Yes ● No Comments:

No soil samples were included in this work order.

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

○ Yes ● No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal or ADEC cleanup level for non-detect results, as appropriate. 1,2,3-Trichloropropane, 1,2-dibromoethane (EDB), benzo(a)pyrene, dibenzo(a,h)anthracene, and pentachlorophenol in all samples and 2-hexanone, bromodichloromethane, and hexachlorobutadiene in sample 17FWOU408WG and field duplicate sample 17FWOU409WG did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345. These analytes may not be detected, if present, at the respective cleanup level. However, impact to the project is not significant as the affected analytes are not contaminants of concern.

All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table C-2) presented in the Annual Sampling Report.

e. Data quality or usability affected?

○ Yes ● No Comments:

See discussion above in 5d.

6. QC Samples

   a. Method Blank

      i. One method blank reported per matrix, analysis and 20 samples?

● Yes ○ No Comments:

      ii. All method blank results less than limit of quantitation (LOQ)?

● Yes ○ No Comments:

No method blank results were above the LOQ; however, target analytes were detected below the LOQ in three method blank samples.

Barium (0.020µg/L) and zinc (0.33µg/L) were reported in method blank sample KQ1709051-03 contained in extraction batch 292211 at concentrations below the LOQs (0.050µg/L and 0.50µg/L, respectively). Barium was reported at concentrations greater than five-times that of the blank in all associated samples and qualifications were not necessary. Zinc was reported at concentrations less than five-times that of the method blank in associated samples 17FWOU401WG, 17FWOU406WG, 17FWOU408WG, 17FWOU409WG, and equipment blank sample 17FWOU410WQ. These results were qualified (B) as potential laboratory cross-contamination. Impact to the project is negligible as the detections were more than three orders of magnitude below the ADEC cleanup levels.

Chloromethane (0.080µg/L), chloroform (0.10µg/L), 1,2,4-trichlorobenzene (0.16µg/L), hexachlorobutadiene (0.14µg/L), naphthalene (0.10µg/L), and 1,2,3-trichlorobenzene (0.14µg/L) were reported in method blank sample KWG1705653-5 contained in extraction batch KWG1705653 at concentrations below the LOQs (0.50µg/L, 0.50µg/L, 2.0µg/L, 2.0µg/L, 2.0µg/L, and 2.0µg/L, respectively). 1,2,4-Trichlorobenzene, hexachlorobutadiene, and 1,2,3-trichlorobenzene were not detected in the associated samples and qualifications were not necessary. Chloromethane in samples 17FWOU401WG, 17FWOU402WG,17FWOU403WG, 17FWOU404WG,17FWOU405WG, 17FWOU406WG, 17FWOU407WG,17FWOU408WG, 17FWOU409WG, equipment rinsate sample 17FWOU410WQ, and trip blank sample 17FWOU411WQ; chloroform in trip blank sample 17FWOU411WQ; and naphthalene in sample 17FWOU403WG were reported at concentrations less than five-times that of the method blank and the results were qualified (B) as potential laboratory cross-contamination. Impact to the project is negligible as the detections were more than two orders of magnitude below the ADEC cleanup levels.

Diethyl phthalate (0.023µg/L) and butyl benzyl phthalate (0.026µg/L) were reported in method blank sample KWG1705539-3 contained in extraction batch KWG1705539 at concentrations below the LOQs (0.20µg/L and 0.20µg/L). Diethyl phthalate in samples 17FWOU401WG, 17FWOU402WG, 17FWOU403WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU407WG, 17FWOU408WG, 17FWOU409WG, and equipment rinsate sample 17FWOU410WQ; and butyl benzyl phthalate in equipment rinsate sample 17FWOU410WQ were reported at concentrations less than five-times that of the method blank and the results were qualified (B) as potential laboratory cross-contamination. Impact to the project is negligible as the detections were more than five orders of magnitude below the ADEC cleanup levels.

iii. If above LOQ, what samples are affected?

Comments:

See 6aii above.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

● Yes ○ No Comments:

v. Data quality or usability affected?

Comments:

See 6aii above.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

● Yes ○ No Comments:

No MS/MSD was reported in SVOC in extraction batch KWG1705539. Extra sample volume was submitted for MS/MSD analysis; however, due to laboratory oversight the MS/MSD was not performed. Although potential matrix interference could not be evaluated, batch accuracy and precision was evaluated through LCS and LCSD analysis. This batch results for all SVOC samples submitted: 17FWOU401WG, 17FWOU402WG, 17FWOU403WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU407WG, 17FWOU408WG, 17FWOU409WG, and the equipment blank sample 17FWOU410WQ.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

● Yes ○ No Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ● No Comments:

The iron MS/MSD samples prepared from 17FWOU408WG contained in extraction batch 292210 were recovered below the control limits (72% and 18% vs. 87-115%). The iron result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied.

The barium MS/MSD samples prepared from 17FWOU408WG contained in extraction batch 292211 were recovered above the control limits (150% and 148% vs. 86-114%). The barium result in the parent sample was greater than the spike concentration, so recovery criteria were not applicable. No qualifications were applied. Additionally, the vanadium MS sample prepared from 17FWOU408WG contained in extraction batch 292211 was recovered above the control limits (116% vs. 86-115%) and antimony MS sample prepared from 17FWOU408WG contained in extraction batch 293728 was recovered above the control limits (120% vs. 85-117%). The vanadium and antimony results in parent sample 17FWOU408WG and associated field duplicate sample 17FWOU409WG were qualified (J+) as estimates with a high bias due to the high recoveries. Impact to the results is negligible as the failures were marginal (1% and 3% high) and the detections were greater than one order of magnitude below the ADEC cleanup level.

The VOC LCS/LCSD samples KWG1705653-3/KWG1705653-4 contained in extraction batch KWG1705653 were recovered below the control limits for trans-1,3-dichloropropene (72% and 70% vs. 73-127%). The trans-1,3-dichloropropene results in samples 17FWOU401WG, 17FWOU402WG, 17FWOU403WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU407WG, 17FWOU408WG, 17FWOU409WG, the equipment rinsate sample 17FWOU410WQ, and the trip blank sample 17FWOU411WQ were qualified (J-) as estimates with a low bias. Although the affected results are non-detect and may be low-biased, impact to the project is negligible as the failures were marginal (1% and 3% low) and the LODs were greater than one order of magnitude below the ADEC cleanup level.

The VOC MS and/or MSD samples prepared from 17FWOU408WG contained in extraction batch KWG1705653 were recovered above the control limits for trichloroethene (127% vs 79-123%) and 1,1,2,2-tetrachloroethane (496% and 865% vs. 71-121%). The trichloroethene and 1,1,2,2-tetrachloroethane results in the parent sample were greater than the spike concentrations, so recovery criteria were not applicable. No qualifications were applied.

The 1,4-dioxane MS/MSD samples prepared from 17FWOU408WG contained in extraction batch KWG1705529 were recovered below the control limits (19% and 10% vs. 49-113%). The 1,4-dioxane result in the parent sample were greater than the spike concentrations, so recovery criteria were not applicable. No qualifications were applied.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

○ Yes ● No Comments:

The SVOC LCS/LCSD samples KWG1705539-1/ KWG1705539-2 contained in extraction batch KWG1705539 had 23 of 61 compounds with RPDs greater than the control limit (20%), with RPDs ranging between 21% and 30%. Of these compounds only benzyl alcohol in equipment rinsate sample 17FWOU410WQ; naphthalene in samples 17FWOU402WG, 17FWOU403WG, and equipment rinsate sample 17FWOU410WQ; and phenol in samples 17FWOU401WG, 17FWOU402WG, 17FWOU403WG, 17FWOU406WG, 17FWOU407WG, 17FWOU408WG, and 17FWOU409WG were detected and the results were qualified (J) as estimates due to the high RPDs. Impact to the project is negligible the detections were greater than four orders of magnitude below the ADEC cleanup levels.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

See 6biii and 6biv above.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

● Yes ○ No Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

See 6biii and 6biv above.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

● Yes ○ No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes ● No Comments:

VOC surrogate 4-bromofluorobenzene was recovered below the control limits (85-114%) in samples 17WOU403WG (82%) and 17WOU409WG (84%). The results for the analytes associated with this surrogate (1,1,2,2-tetrachloroethane, bromobenzene, n-propylbenzene, 1,2,3-trichloropropane, 2-chlorotoluene, 1,3,5-trimethylbenzene, 4-chlorotoluene, tert-butylbenzene, 1,2,4-trimethylbenzene, sec-butylbenzene, 4-isopropyltoluene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, n-butylbenzene, 1,2-dichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2,4-trichlorobenzene, hexachlorobutadiene, naphthalene, and 1,2,3-trichlorobenzene) in samples 17WOU403WG and 17WOU409WG were qualified (J-) as estimates with a low bias due to the low surrogate recoveries. Impact to the results is negligible as the recovery failures were marginal (3% and 1% low, respectively) and most detections or non-detect LODs were a minimum of one order of magnitude below the ADEC cleanup level or no cleanup level was established. The exception is 1,2,3-trichloropropane, which had a non-detect LOD above the cleanup level; however, this analyte is not a site contaminant of concern.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

● Yes ○ No Comments:

iv. Data quality or usability affected?

Comments:

See 6cii above.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

● Yes ○ No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

● Yes ○ No Comments:

Trip blank sample 17WOU411WQ was included in cooler 062701.

iii. All results less than LOQ?

○ Yes ● No Comments:

Toluene (1.1µg/L) was detected in the trip blank sample 17WOU411WQ at a concentration above the LOQ (0.50µg/L). Additionally, acetone (4.1µg/L), chloroform (0.13µg/L), chloromethane (0.12µg/L), and methylene chloride (0.12µg/L) were detected below the LOQs (20µg/L, 0.50µg/L, 0.50 µg/L, and 2.0µg/L, respectively). Common laboratory contaminants acetone in samples 17FWOU402WG, 17FWOU403WG, 17FWOU405WG, 17FWOU406WG, 17FWOU407WG, and the equipment rinsate sample 17FWOU410WQ; and methylene chloride in samples 17FWOU407WG, 17FWOU408WG, 17FWOU409WG, and the equipment rinsate sample 17FWOU410WQ were detected at concentrations less than ten-times that of the trip blank and the results were qualified (B) as potential travel/storage cross-contamination. The chloromethane and chloroform detections in the trip blank sample may be due to laboratory cross-contamination, as indicated by similar concentrations detected in the associated method blank sample. No additional qualifiers were added due to trip blank contamination. Toluene in samples 17FWOU401WG, 17FWOU402WG, 17FWOU403WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU407WG, and the equipment rinsate 17FWOU410WQ was detected at concentrations less than five-times that of the trip blank and the results were qualified (B) as potential travel/storage cross-contamination. Impact to the project is negligible as these results were less than the ADEC cleanup level and the analyte is not a contaminant of concern.

iv. If above LOQ, what samples are affected?

Comments:

See 6diii above.

v. Data quality or usability affected?

Comments:

See 6diii above.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

● Yes ○ No Comments:

One groundwater field duplicate was collected for the eight primary samples associated with this work order.

ii. Submitted blind to lab?

● Yes ○ No Comments:

Sample 17FWOU409WG was field duplicate of sample 17FWOU408WG.

iii. Precision – All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1\text{-}R_2)}{((R_1+R_2)/2)} \times 100$$

Where $R_1$ = Sample Concentration
$R_2$ = Field Duplicate Concentration

○ Yes ● No Comments:

All results for the primary and field duplicate samples are shown in the table below. In the case where a result was detected in one sample but non-detect in the other, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the UFP-QAPP. Units are mg/L for sulfate and µg/L for remaining analytes. The applicable analytes that do not meet the comparison criteria are identified in gray shading and are discussed in the following paragraphs.

All results for the field duplicate/parent sample pair 17FWOU409WG /17FWOU408WG were comparable (RPD ≤ 30%) with the exception of cadmium and silver. Results for cadmium and silver were less than the LOQ and considered estimated values or not detected, so no flagging was applied.

Field duplicate/parent sample pair 17FWOU409WG /17FWOU408WG results can be found on the following pages.

| Analyte | Method | Primary 17FWOU408WG (AP-5588) | Field Duplicate 17FWOU409WG (AP-2020) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| Sulfate | E300.0 | 242 [1] | 246 [1] | 2 | YES |
| Iron | SW6010C | 41800 [8] | 41600 [8] | 0 | YES |
| Antimony | SW6020A | 0.08 [0.05] | 0.071 [0.05] | 12 | YES |
| Arsenic | SW6020A | 14 [0.25] | 13.6 [0.25] | 3 | YES |
| Barium | SW6020A | 575 [0.05] | 561 [0.05] | 2 | YES |
| Beryllium | SW6020A | 0.013 [0.005] J | 0.012 [0.005] J | 8 | Not applicable |
| Cadmium | SW6020A | 0.013 [0.02] J | ND [0.02] | 42 | Not applicable |
| Chromium | SW6020A | 0.98 [0.1] | 1.02 [0.1] | 4 | YES |
| Cobalt | SW6020A | 3.94 [0.01] | 3.81 [0.01] | 3 | YES |
| Copper | SW6020A | 0.21 [0.05] | 0.24 [0.05] | 13 | YES |
| Lead | SW6020A | 0.018 [0.02] J | 0.02 [0.02] | 11 | YES |
| Nickel | SW6020A | 4.59 [0.1] | 4.44 [0.1] | 3 | YES |
| Selenium | SW6020A | 0.3 [0.5] J | 0.3 [0.5] J | 0 | Not applicable |
| Silver | SW6020A | 0.002 [0.005] J | 0.004 [0.005] J | 67 | Not applicable |
| Thallium | SW6020A | ND [0.02] | ND [0.02] | 0 | Not applicable |
| Vanadium | SW6020A | 2.64 [0.1] | 2.66 [0.1] | 1 | YES |
| Zinc | SW6020A | 1.03 [0.25] | 1.11 [0.25] | 7 | YES |
| 1,4-Dioxane | 8270D-SIM | 9.9 [0.1] | 11 [0.1] | 11 | YES |
| 1,1,1,2-Tetrachloroethane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,1,1-Trichloroethane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,1,2,2-Tetrachloroethane | SW8260C | 1600 [20] | 1800 [20] | 12 | YES |
| 1,1,2-Trichloroethane | SW8260C | 6.5 [2] | 6.9 [2] | 6 | YES |
| 1,1-Dichloroethane | SW8260C | 0.8 [1] J | 0.85 [1] J | 6 | Not applicable |

| Analyte | Method | Primary 17FWOU408WG (AP-5588) | Field Duplicate 17FWOU409WG (AP-2020) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| 1,1-Dichloroethene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,1-Dichloropropene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,2,3-Trichlorobenzene | SW8260C | ND [2] | ND [2] | 0 | Not applicable |
| 1,2,3-Trichloropropane | SW8260C | ND [2.5] | ND [2.5] | 0 | Not applicable |
| 1,2,4-Trichlorobenzene | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| 1,2,4-Trimethylbenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,2-Dibromo-3-chloropropane | SW8260C | ND [4] | ND [4] | 0 | Not applicable |
| 1,2-Dibromoethane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,2-Dichlorobenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,2-Dichloroethane | SW8260C | 1.8 [0.75] J | 1.9 [0.75] J | 5 | Not applicable |
| 1,2-Dichloropropane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,3,5-Trimethylbenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,3-Dichlorobenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,3-Dichloropropane | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| 1,4-Dichlorobenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 2,2-Dichloropropane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 2-Butanone | SW8260C | ND [20] | ND [20] | 0 | Not applicable |
| 2-Chlorotoluene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 2-Hexanone | SW8260C | ND [50] | ND [50] | 0 | Not applicable |
| 4-Chlorotoluene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 4-Isopropyltoluene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 4-Methyl-2-pentanone | SW8260C | ND [50] | ND [50] | 0 | Not applicable |
| Acetone | SW8260C | ND [50] | ND [50] | 0 | Not applicable |
| Benzene | SW8260C | 1.5 [0.5] J | 1.6 [0.5] J | 6 | Not applicable |
| Bromobenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Bromochloromethane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Bromodichloromethane | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| Bromoform | SW8260C | ND [2.5] | ND [2.5] | 0 | Not applicable |
| Bromomethane | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| Carbon disulfide | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Carbon tetrachloride | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Chlorobenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Chloroethane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Chloroform | SW8260C | 0.55 [1] J | 0.6 [1] J | 9 | Not applicable |
| Chloromethane | SW8260C | 0.35 [1] J | 0.35 [1] J | 0 | Not applicable |
| cis-1,2-Dichloroethene | SW8260C | 140 [1] | 150 [1] | 7 | YES |
| cis-1,3-Dichloropropene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Dibromochloromethane | SW8260C | ND [2.5] | ND [2.5] | 0 | Not applicable |
| Dibromomethane | SW8260C | ND [2.5] | ND [2.5] | 0 | Not applicable |
| Dichlorodifluoromethane | SW8260C | 1.5 [1] J | 1.7 [1] J | 13 | Not applicable |
| Ethylbenzene | SW8260C | ND [0.5] | ND [0.5] | 0 | Not applicable |
| Hexachlorobutadiene | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| Isopropylbenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Methylene chloride | SW8260C | 0.8 [1] J | 0.8 [1] J | 0 | Not applicable |
| Methyl-tert-butyl ether (MTBE) | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| Naphthalene | SW8260C | ND [1.5] | ND [1.5] | 0 | Not applicable |
| n-Butylbenzene | SW8260C | ND [0.5] | ND [0.5] | 0 | Not applicable |
| n-Propylbenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| o-Xylene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |

| Analyte | Method | Primary 17FWOU408WG (AP-5588) | Field Duplicate 17FWOU409WG (AP-2020) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| sec-Butylbenzene | SW8260C | ND [0.5] | ND [0.5] | 0 | Not applicable |
| Styrene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| tert-Butylbenzene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Tetrachloroethene (PCE) | SW8260C | 2.2 [1] J | 2.3 [1] J | 4 | Not applicable |
| Toluene | SW8260C | ND [0.5] | ND [0.5] | 0 | Not applicable |
| trans-1,2-Dichloroethene | SW8260C | 31 [1] | 34 [1] | 9 | YES |
| trans-1,3-Dichloropropene | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Trichloroethene (TCE) | SW8260C | 250 [1] | 270 [1] | 8 | YES |
| Trichlorofluoromethane | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| Vinyl chloride | SW8260C | 0.7 [0.5] J | 0.8 [0.5] J | 13 | Not applicable |
| Xylene, Isomers m & p | SW8260C | ND [1] | ND [1] | 0 | Not applicable |
| 1,2,4-Trichlorobenzene | SW8270D-LL | ND [0.05] | ND [0.05] | 0 | Not applicable |
| 1,2-Dichlorobenzene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 1,3-Dichlorobenzene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 1,4-Dichlorobenzene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 2,4,5-Trichlorophenol | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 2,4,6-Trichlorophenol | SW8270D-LL | ND [0.2] | ND [0.2] | 0 | Not applicable |
| 2,4-Dichlorophenol | SW8270D-LL | ND [0.1] | ND [0.1] | 0 | Not applicable |
| 2,4-Dimethylphenol | SW8270D-LL | ND [4] | ND [4] | 0 | Not applicable |
| 2,4-Dinitrophenol | SW8270D-LL | ND [2] | ND [2] | 0 | Not applicable |
| 2,4-Dinitrotoluene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 2,6-Dinitrotoluene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 2-Chloronaphthalene | SW8270D-LL | ND [0.1] | ND [0.1] | 0 | Not applicable |
| 2-Chlorophenol | SW8270D-LL | ND [0.2] | ND [0.2] | 0 | Not applicable |
| 2-Methyl-4,6-dinitrophenol | SW8270D-LL | ND [0.5] | ND [0.5] | 0 | Not applicable |
| 2-Methylnaphthalene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 2-Methylphenol (o-Cresol) | SW8270D-LL | ND [0.3] | ND [0.3] | 0 | Not applicable |
| 2-Nitroaniline | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 2-Nitrophenol | SW8270D-LL | ND [0.2] | ND [0.2] | 0 | Not applicable |
| 3,3'-Dichlorobenzidine | SW8270D-LL | ND [1] | ND [1] | 0 | Not applicable |
| 3-Nitroaniline | SW8270D-LL | ND [0.2] | ND [0.2] | 0 | Not applicable |
| 4-Bromophenyl phenyl ether | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 4-Chloro-3-methylphenol | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 4-Chloroaniline | SW8270D-LL | ND [0.2] | ND [0.2] | 0 | Not applicable |
| 4-Chlorophenyl phenyl ether | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| 4-Methylphenol (p-Cresol) | SW8270D-LL | ND [0.3] | ND [0.3] | 0 | Not applicable |
| Acenaphthene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Acenaphthylene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Anthracene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Benzo(a)anthracene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Benzo(a)pyrene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Benzo(b)fluoranthene | SW8270D-LL | ND [0.05] | ND [0.05] | 0 | Not applicable |
| Benzo(g,h,i)perylene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Benzo(k)fluoranthene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Benzyl alcohol | SW8270D-LL | ND [0.2] | ND [0.2] | 0 | Not applicable |
| Benzyl butyl phthalate | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| bis-(2-Chloroethoxy)methane | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| bis-(2-Chloroethyl)ether | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| bis(2-Chloroisopropyl)ether | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |

| Analyte | Method | Primary 17FWOU408WG (AP-5588) | Field Duplicate 17FWOU409WG (AP-2020) | RPD, % | Comparable Criteria Met? |
|---|---|---|---|---|---|
| bis-(2-Ethylhexyl)phthalate | SW8270D-LL | ND [0.5] | ND [0.5] | 0 | Not applicable |
| Chrysene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Dibenzo(a,h)anthracene | SW8270D-LL | ND [0.05] | ND [0.05] | 0 | Not applicable |
| Dibenzofuran | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Diethyl phthalate | SW8270D-LL | 0.039 [0.05] J | 0.04 [0.05] J | 3 | Not applicable |
| Dimethyl phthalate | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Di-n-butyl phthalate | SW8270D-LL | 0.06 [0.07] J | 0.067 [0.07] J | 11 | Not applicable |
| Di-n-octyl phthalate | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Fluoranthene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Fluorene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Hexachlorobenzene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Hexachlorobutadiene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Hexachloroethane | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Indeno(1,2,3-cd)pyrene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Isophorone | SW8270D-LL | ND [0.05] | ND [0.05] | 0 | Not applicable |
| Naphthalene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Nitrobenzene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| n-Nitrosodi-n-propylamine | SW8270D-LL | ND [0.1] | ND [0.1] | 0 | Not applicable |
| n-Nitrosodiphenylamine | SW8270D-LL | ND [0.1] | ND [0.1] | 0 | Not applicable |
| Pentachlorophenol | SW8270D-LL | ND [1] | ND [1] | 0 | Not applicable |
| Phenanthrene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |
| Phenol | SW8270D-LL | 0.13 [0.2] J | 0.12 [0.2] J | 8 | Not applicable |
| Pyrene | SW8270D-LL | ND [0.07] | ND [0.07] | 0 | Not applicable |

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

See 6eiii above.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below).

● Yes ○ No ○ Not Applicable

Equipment blank sample 17FWOU410WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells were sampled with a submersible pump, per the UFP-QAPP, with the exception of monitoring wells AP-5588 (17FWOU408WG and field duplicate 17FWOU409WG) and AP-8063 (17FWOU405WG). The casings of these wells are structurally damaged, which prohibits sampling with a submersible pump. Alternatively, these wells were sampled with a peristaltic pump employing new Teflon-lined tubing at each location. Therefore, the sample results associated with these wells were not compared to the equipment blank sample results.

i. All results less than LOQ?

○ Yes ● No Comments:

Barium (0.145µg/L), copper (0.54µg/L), and toluene (0.88µg/L) were detected in the equipment blank sample 17FWOU410WQ at concentrations above the LOQs (0.050µg/L, 0.10µg/L, and 0.50µg/L, respectively). Additionally, dissolved iron (7µg/L), nickel (0.11µg/L), silver (0.004µg/L), vanadium (0.08µg/L), zinc (0.41µg/L), 1,2-dichloroethane (0.21µg/L), acetone (7.3µg/L), benzene (0.09µg/L), chloromethane (0.10µg/L), ethylbenzene (0.080µg/L), methylene chloride (0.15µg/L), m & p - xylene (19µg/L), benzyl alcohol (0.07µg/L), benzyl butyl phthalate (0.031µg/L), di-n-butyl phthalate (0.027µg/L), diethyl phthalate (0.031µg/L), naphthalene (0.034µg/L; method 8270D), and bis-(2-ethylhexyl)phthalate (0.20µg/L) were detected in the equipment blank sample at concentrations below the LOQs (21µg/L, 0.20µg/L, 0.020µg/L, 0.20µg/L, 0.50µg/L, 0.50µg/L, 20µg/L, 0.50µg/L, 0.50µg/L, 0.50µg/L, 2.0µg/L, 0.50µg/L, 0.49µg/L, 0.20µg/L, 0.20µg/L, 0.20µg/L, 0.20µg/L, and 0.97µg/L, respectively).

The zinc, chloromethane, diethyl phthalate, and benzyl butyl phthalate detections in the equipment blank sample may be due to laboratory cross-contamination, as indicated by similar concentrations detected in the associated method blank sample; and the toluene detection may be due to travel/storage cross-contamination as indicated by a similar detection in the associated trip blank sample. No additional qualifiers were added for these analytes due to equipment blank contamination. Common laboratory contaminants acetone in samples 17FWOU402WG, 17FWOU403WG, 17FWOU405WG, 17FWOU406WG, and 17FWOU407WG, and methylene chloride in samples 17FWOU407WG, 17FWOU408WG, and 17FWOU409WG, were detected at concentrations less than ten-times that of the equipment blank sample and the results were qualified (B) as potential sampling cross-contamination. Copper in samples 17FWOU401WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU408WG, and 17FWOU409WG; nickel in samples 17FWOU404WG and 17FWOU405WG; silver in samples 17FWOU402WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU408WG, and 17FWOU409WG; 1,2-dichloroethane in samples 17FWOU402WG, 17FWOU403WG, 17FWOU404WG, 17FWOU405WG, and 17FWOU406WG; benzene in sample 17FWOU405WG; ethylbenzene in samples 17FWOU403WG and 17FWOU405WG; m & p – xylene in samples 17FWOU402WG, 17FWOU403WG, and 17FWOU405WG; bis-(2-ethylhexyl)phthalate in samples 17FWOU401WG, 17FWOU402WG, 17FWOU404WG, 17FWOU405WG, and 17FWOU407WG; di-n-butyl phthalate in samples, 17FWOU401WG, 17FWOU402WG, 17FWOU403WG, 17FWOU404WG, 17FWOU405WG, 17FWOU406WG, 17FWOU407WG, 17FWOU408WG, and 17FWOU409WG; and naphthalene (8270D) in samples 17FWOU402WG and 17FWOU403WG were detected at concentrations less than five-times that of the equipment blank sample and the results were qualified (B) as potential sampling cross-contamination. Impact to the results is negligible as the detections were approximately one order of magnitude or greater below the ADEC cleanup levels.

ii. If above LOQ, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected?

Comments:

See 6fi above.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

○ Yes ● No Comments:

No other data flags/qualifiers were used.

# APPENDIX C
## SAMPLE SUMMARY AND ANALTYICAL RESULTS TABLES

## Table C-1. Groundwater Sample Summary
## Operable Unit 4
## Fort Wainwright, Alaska

| Sample Number | Sample Location | Sample Depth (feet bgs) | Sample Type | Sampler Initials | Sample Date | Sample Time | VOC 8260C | SVOC-LL 8270D-LL | 1,4-Dioxane [1] 8270D-SIM or 8260B-SIM | Total Metals 6020A | Dissolved Iron [2] 6010C or 6020A | Sulfate 300.0 | SDG | Cooler ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Groundwater Samples* | | | | | | | | | | | | | | |
| 17FWOU401WG | FWLF-4 | 18 | Primary | CB | 6/26/2017 | 1120 | X | X | X | X | X | X | K1706778 | 062701/02 |
| 17FWOU402WG | AP-10258MW | 19.9 | Primary | CB | 6/26/2017 | 1235 | X | X | X | X | X | X | K1706778 | 062701/02 |
| 17FWOU403WG | AP-10257MW | 20.2 | Primary | CB | 6/26/2017 | 1340 | X | X | X | X | X | X | K1706778 | 062701/02/03 |
| 17FWOU404WG | AP-6535 | 88 | Primary | JK | 6/26/2017 | 1100 | X | X | X | X | X | X | K1706778 | 062701/02/03 |
| 17FWOU405WG | AP-8063 | 116 | Primary | JK | 6/26/2017 | 1315 | X | X | X | X | X | X | K1706778 | 062701/02/03 |
| 17FWOU406WG | AP-8061 | 24.3 | Primary | JK | 6/26/2017 | 1500 | X | X | X | X | X | X | K1706778 | 062701/02/03 |
| 17FWOU407WG | AP-5589 | 51 | Primary | JK | 6/26/2017 | 1700 | X | X | X | X | X | X | K1706778 | 062701/02/03 |
| 17FWOU408WG | AP-5588 | 17 | Primary/MS/MSD | JK | 6/26/2017 | 1830 | X | X | X | X | X | X | K1706778 | 062701/02/04 |
| 17FWOU409WG | AP-5588 | 17 | Field Duplicate of 17FWOU408WG | JK | 6/26/2017 | 1845 | X | X | X | X | X | X | K1706778 | 062701/02/04 |
| 17FWOU412WG | AP-10257MW | 18.5 | Primary | JK | 10/30/2017 | 1200 | X | X | X | X | X | X | 1179528 | 110201/FES01/FES03 |
| 17FWOU413WG | AP-10258MW | 18 | Primary | JK | 10/30/2017 | 1315 | X | X | X | X | X | X | 1179528 | 110201/FES01/FES03 |
| 17FWOU414WG | FWLF-4 | 17 | Primary | JK | 10/30/2017 | 1430 | X | X | X | X | X | X | 1179528 | 110201/FES01/FES03 |
| 17FWOU415WG | AP-8061 | 20 | Primary | JK | 10/30/2017 | 1600 | X | X | X | X | X | X | 1179528 | 110201/FES01/FES03 |
| 17FWOU416WG | AP-5588 | 15.5 | Primary/MS/MSD | JK | 10/31/2017 | 1115 | X | X | X | X | X | X | 1179528 | 110201/FES02/FES03 |
| 17FWOU417WG | AP-5050 | 15.5 | Field Duplicate of 17FWOU408WG | JK | 10/31/2017 | 1130 | X | X | X | X | X | X | 1179528 | 110201/FES01/FES03 |
| 17FWOU418WG | AP-5589 | 51 | Primary | JK | 10/31/2017 | 1330 | X | X | X | X | X | X | 1179528 | 110201/FES02/FES03 |
| 17FWOU419WG | AP-8063 | 116 | Primary | JK | 10/31/2017 | 1515 | X | X | X | X | X | X | 1179528 | 110201/FES03 |
| 17FWOU420WG | AP-6532 | 177 | Primary | JK | 11/1/2017 | 930 | X | X | X | X | X | X | 1179528 | 110201/FES03 |
| 17FWOU421WG | AP-6530 | 136 | Primary | JK | 11/1/2017 | 1130 | X | X | X | X | X | X | 1179528 | 110201/FES03 |
| 17FWOU422WG | AP-6535 | 88 | Primary | JK | 11/1/2017 | 1330 | X | X | X | X | X | X | 1179528 | 110201/FES03 |
| *Equipment Blanks* | | | | | | | | | | | | | | |
| 17FWOU410WQ | Rinsate 15 | -- | Equipment Blank | CB | 6/26/2017 | 1525 | X | X | X | X | X | X | K1706778 | 062701/02/04 |
| 17FWOU423WQ | Rinsate 25 | -- | Equipment Blank | JK | 11/1/2017 | 1600 | X | X | X | X | X | X | 1179528 | 110201/FES01/FES03 |
| *Trip Blanks* | | | | | | | | | | | | | | |
| 17FWOU411WQ | Trip Blank | -- | Trip Blank | -- | 6/26/2017 | 800 | X | | | | | | K1706778 | 062701/02 |
| 17FWOU4124WQ | Trip Blank | -- | Trip Blank | -- | 10/30/2017 | TBD | X | | X | | | | 1179528 | 110201/FES03 |

**Note:** Samples collected during the spring sampling event were analyzed by ALS Environmental of Kelso, Washington (ALS-Kelso). Samples collected during the fall sampling event were submitted to SGS of Anchorage, Alaska (SGS-Anchorage). SGS-Anchorage subcontracted the 1,4-dioxane and SVOC analyses to SGS of Orlando, Florida (SGS-Orlando). The standard 21-day turnaround time was requested for all analyses. All sampling was conducted under NPDL work order number 17-050.

[1] 1,4-Dioxane samples from the spring sampling event were analyzed by ALS-Kelso using method 8270D-SIM and samples from the fall sampling event were analyzed by SGS-Orlando using method 8260B-SIM.

[2] Dissolved (field filtered) iron samples from the spring sampling event were analyzed by ALS-Kelso using method 6010C and samples from the fall sampling event were analyzed by SGS-Anchorage using method 6020A.

bgs - below ground surface
°C - degrees Celsius
CB - Chris Boese
HCl - hydrochloric acid
HDPE - high-density polyethene
HNO3 - nitric acid
JK - Josh Klynstra
L- liter

mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
NPDL - North Pacific Division Laboratory
SDG - sample data group
SVOC - semi-volatile organic compounds
VOC - volatile organic compounds
VOA - volatile organic analysis

**Water Sample Collection** (all samples were field-preserved at 0 to 6°C)
VOC - three HCl-preserved, 40 mL VOA vials
SVOC - two non-preserved, 1L amber bottles
1,4-Dioxane (8270D-SIM) - two non-preserved, 250 mL amber bottles
1,4-Dioxane (8260B-SIM) - three HCl-preserved, 40 mL VOA vials
Total Metals - one $HNO_3$-preserved, 125 mL HDPE bottle
Iron - one $HNO_3$-preserved, 125 mL HDPE bottle, field-filtered
Sulfate - one non-preserved, 125 mL HDPE bottle

## Table C-2. Groundwater Sample Results
## Operable Unit 4
## Fort Wainwright, Alaska

| | | | **Sample ID** | **17FWOU401WG** | **17FWOU402WG** | **17FWOU403WG** | **17FWOU404WG** | **17FWOU405WG** | **17FWOU406WG** | **17FWOU407WG** | **17FWOU408WG** | **17FWOU409WG** | **17FWOU412WG** | **17FWOU413WG** | **17FWOU414WG** | **17FWOU415WG** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Location ID** | FWLF-4 | AP-10258MW | AP-10257MW | AP-6535 | AP-8063 | AP-8061 | AP-5589 | AP-5588 | AP-2020 | AP-10257MW | AP-10258MW | FWLF-4 | AP-8061 |
| | | | **Sample Data Group** | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | 1179528 | 1179528 | 1179528 | 1179528 |
| | | | **Laboratory ID** | K170677801 | K170677802 | K170677803 | K170677804 | K170677805 | K170677806 | K170677807 | K170677808 | K170677809 | 1179528001 | 1179528002 | 1179528003 | 1179528004 |
| | | | **Collection Date** | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 |
| | | | **Matrix** | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG |
| | | | **Sample Type** | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary/MS/MSD | Field Duplicate of 17WOU408WG | Primary | Primary | Primary | Primary |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level [1]** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** |
| Sulfate | E300.0 | mg/L | NE | 33.5 [0.1] | 110 [0.4] | 19.6 [0.4] | 19.3 [0.4] | 32.6 [0.4] | 35.9 [0.1] | 141 [0.4] | 242 [1] | 246 [1] | 0.942 [0.200] | 58.9 [0.500] | 34.3 [0.500] | 48.8 [0.500] |
| Iron | 6010C/6020A | µg/L | NE | 28400 [8] | 262 [8] | 14600 [8] | 27900 [8] | 20900 [8] | 12900 [8] | 50000 [8] | 41800 [8] | 41600 [8] | 28800 [250] | 1570 [250] | 26200 [250] | 31300 [250] |
| Antimony | SW6020A | µg/L | 7.8 | 0.042 [0.05] J | 0.783 [0.05] | 0.812 [0.05] | 0.288 [0.05] | 0.06 [0.05] | 0.143 [0.05] | 0.088 [0.05] | 0.08 [0.05] J+ | 0.071 [0.05] J+ | ND [1.50] | 1.08 [1.50] J | ND [1.50] | ND [1.50] |
| Arsenic | SW6020A | µg/L | 0.52 | **15.8 [0.25]** | **0.64 [0.25]** | **16.2 [0.25]** | **2.3 [0.25]** | **2.53 [0.25]** | **4.75 [0.25]** | **0.85 [0.25]** | **14 [0.25]** | **13.6 [0.25]** | **20.6 [2.50]** | ND [2.50] | **11.2 [2.50]** | **10.8 [2.50]** |
| Barium | SW6020A | µg/L | 3800 | 403 [0.05] | 70.9 [0.05] | 255 [0.05] | 303 [0.05] | 277 [0.05] | 416 [0.05] | 737 [0.05] | 575 [0.05] | 561 [0.05] | 227 [1.50] | 72.4 [1.50] | 363 [1.50] | 594 [1.50] |
| Beryllium | SW6020A | µg/L | 25 | 0.005 [0.005] J | 0.09 [0.005] | 0.046 [0.005] | 0.028 [0.005] | 0.017 [0.005] J | 0.013 [0.005] J | 0.98 [0.005] | 0.013 [0.005] J | 0.012 [0.005] J | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Cadmium | SW6020A | µg/L | 9.2 | 0.024 [0.02] | 1.45 [0.02] | 0.429 [0.02] | 0.015 [0.02] J | ND [0.02] | 0.012 [0.02] J | ND [0.02] | 0.013 [0.02] J | ND [0.02] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] |
| Chromium | SW6020A | µg/L | NE | 0.62 [0.1] | 0.88 [0.1] | 2.79 [0.1] | 1.31 [0.1] | 0.92 [0.1] | 0.5 [0.1] | 1.69 [0.1] | 0.98 [0.1] | 1.02 [0.1] | 1.59 [2.00] J | 1.68 [2.00] J | ND [2.00] | ND [2.00] |
| Cobalt | SW6020A | µg/L | NE | 4.63 [0.01] | 116 [0.01] | 25.4 [0.01] | 0.168 [0.01] | 0.086 [0.01] | 0.496 [0.01] | 0.368 [0.01] | 3.94 [0.01] | 3.81 [0.01] | 21.8 [0.500] | 59.2 [0.500] | 4.56 [0.500] | 0.34 [0.500] J |
| Copper | SW6020A | µg/L | 800 | 0.17 [0.05] B | 9 [0.05] | 6.57 [0.05] | 2.43 [0.05] B | 0.28 [0.05] B | 1.17 [0.05] B | 48.8 [0.05] | 0.21 [0.05] B | 0.24 [0.05] B | 6.71 [3.00] | 6.34 [3.00] | ND [3.00] | 4.33 [3.00] J |
| Lead | SW6020A | µg/L | 15 | 0.05 [0.02] | 0.263 [0.02] | 0.567 [0.02] | 0.38 [0.02] | 0.145 [0.02] | 0.15 [0.02] | 0.058 [0.02] | 0.018 [0.02] J | 0.02 [0.02] | ND [0.500] | ND [0.500] | ND [0.500] | 0.772 [0.500] J,B |
| Nickel | SW6020A | µg/L | 390 | 4.65 [0.1] | 273 [0.1] | 79.1 [0.1] | 0.45 [0.1] B | 0.43 [0.1] B | 1.91 [0.1] | 1.12 [0.1] | 4.59 [0.1] | 4.44 [0.1] | 81.7 [1.00] | 180 [1.00] | 6.06 [1.00] | 2.54 [1.00] |
| Selenium | SW6020A | µg/L | 100 | 0.2 [0.5] J | 0.4 [0.5] J | 0.7 [0.5] J | ND [0.5] | ND [0.5] | ND [0.5] | 0.2 [0.5] J | 0.3 [0.5] J | 0.3 [0.5] J | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] |
| Silver | SW6020A | µg/L | 94 | ND [0.005] | 0.011 [0.005] J,B | 0.03 [0.005] | 0.002 [0.005] J,B | 0.003 [0.005] J,B | 0.002 [0.005] J,B | ND [0.005] | 0.002 [0.005] J,B | 0.004 [0.005] J,B | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] |
| Thallium | SW6020A | µg/L | 0.2 | ND [0.02] | 0.045 [0.02] | 0.012 [0.02] J | ND [0.02] | ND [0.02] | ND [0.02] | ND [0.02] | ND [0.02] | ND [0.02] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] |
| Vanadium | SW6020A | µg/L | 86 | 1.31 [0.1] | 1.51 [0.1] | 9.78 [0.1] | 2.89 [0.1] | 1.74 [0.1] | 1.7 [0.1] | 5.34 [0.1] | 2.64 [0.1] J+ | 2.66 [0.1] J+ | 8.81 [10.0] J | ND [10.0] | ND [10.0] | ND [10.0] |
| Zinc | SW6020A | µg/L | 6000 | 1.64 [0.25] B | 174 [0.25] | 36.3 [0.25] | 4.31 [0.25] | 21.6 [0.25] | 1.19 [0.25] B | 217 [0.25] | 1.03 [0.25] B | 1.11 [0.25] B | 34.3 [12.5] | 86.5 [12.5] | ND [12.5] | ND [12.5] |
| 1,4-Dioxane | 8270D-SIM/8260B-SIM | µg/L | 4.6 / **0.46** [2] | ND [0.02] | ND [0.02] | ND [0.02] | **1.1 [0.02]** | 0.4 [0.02] | 0.4 [0.02] | **13 [0.1]** | **9.9 [0.1]** | **11 [0.1]** | 0.35 [0.50] J,J+ | ND [0.50] | ND [0.50] | **0.85 [0.50] J** |
| 1,1,1,2-Tetrachloroethane | SW8260C | µg/L | 5.7 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| 1,1,1-Trichloroethane | SW8260C | µg/L | 8,000 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| **1,1,2,2-Tetrachloroethane** | SW8260C | µg/L | **5.2** | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | 0.34 [0.2] J | **1600 [20]** | **1800 [20] J-** | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | SW8260C | µg/L | 55,000 | - | - | - | - | - | - | - | - | - | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| **1,1,2-Trichloroethane** | SW8260C | µg/L | **5** | ND [0.4] | ND [0.4] | ND [0.4] | ND [0.4] | ND [0.4] | ND [0.4] | ND [0.4] | **6.5 [2]** | **6.9 [2]** | ND [0.200] | ND [0.200] | ND [0.200] | ND [0.200] |
| 1,1-Dichloroethane | SW8260C | µg/L | 28 | ND [0.2] | ND [0.2] | ND [0.2] | 0.15 [0.2] J | ND [0.2] | 0.08 [0.2] J | 1.8 [0.2] | 0.8 [1] J | 0.85 [1] J | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,1-Dichloroethene | SW8260C | µg/L | 280 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,1-Dichloropropene | SW8260C | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,2,3-Trichlorobenzene | SW8260C | µg/L | NE | ND [0.4] | ND [0.4] | ND [0.4] J- | ND [0.4] | ND [0.4] | ND [0.4] | ND [0.4] | ND [2] | ND [2] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,2,3-Trichloropropane | SW8260C | µg/L | 0.0075 | ND [0.5] | ND [0.5] | ND [0.5] J- | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [2.5] | ND [2.5] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,2,4-Trichlorobenzene | SW8260C | µg/L | 4.0 | ND [0.3] | ND [0.3] | ND [0.3] J- | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,2,4-Trimethylbenzene | SW8260C | µg/L | 15 | ND [0.2] | 0.12 [0.2] J | 0.35 [0.2] J,J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | 2.81 [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,2-Dibromo-3-chloropropane | SW8260C | µg/L | NE | ND [0.8] | ND [0.8] | ND [0.8] J- | ND [0.8] | ND [0.8] | ND [0.8] | ND [0.8] | ND [4] | ND [4] J- | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| 1,2-Dibromoethane | SW8260C | µg/L | 0.075 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.0375] | ND [0.0375] | ND [0.0375] | ND [0.0375] |
| 1,2-Dichlorobenzene | SW8260C | µg/L | 300 | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,2-Dichloroethane | SW8260C | µg/L | 1.7 | ND [0.15] | 0.08 [0.15] J,B | 0.18 [0.15] J,B | 0.49 [0.15] J,B | 0.1 [0.15] J,B | 0.18 [0.15] J,B | **3 [0.15]** | **1.8 [0.75] J** | **1.9 [0.75] J** | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| 1,2-Dichloropropane | SW8260C | µg/L | 4.4 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 0.31 [0.2] J | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,3,5-Trimethylbenzene | SW8260C | µg/L | 120 | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,3-Dichlorobenzene | SW8260C | µg/L | 300 | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 1,3-Dichloropropane | SW8260C | µg/L | 4.7 | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| 1,4-Dichlorobenzene | SW8260C | µg/L | 4.8 | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| 2,2-Dichloropropane | SW8260C | µg/L | NE | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [1] J- | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 2-Butanone | SW8260C | µg/L | 5,600 | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [20] | ND [20] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| 2-Chlorotoluene | SW8260C | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 2-Hexanone | SW8260C | µg/L | 38 | ND [10] | ND [10] | ND [10] | ND [10] | ND [10] | ND [10] | ND [10] | ND [50] | ND [50] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| 4-Chlorotoluene | SW8260C | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 4-Isopropyltoluene | SW8260C | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| 4-Methyl-2-pentanone | SW8260C | µg/L | 6,300 | ND [10] | ND [10] | ND [10] | ND [10] | ND [10] | ND [10] | ND [10] | ND [50] | ND [50] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| Acetone | SW8260C | µg/L | 14,000 | ND [10] | 4.7 [10] J,B | 3.4 [10] J,B | ND [10] | 8.2 [10] J,B | 4.7 [10] J,B | 14 [10] J,B | ND [50] | ND [50] | - | - | - | - |
| **Benzene** | SW8260C | µg/L | **5** | 3.3 [0.1] | 4.9 [0.1] | **14 [0.1]** | 3.8 [0.1] | 0.19 [0.1] J,B | 1.9 [0.1] | 4 [0.1] | 1.5 [0.5] J | 1.6 [0.5] J | **23.1 [0.200]** | 3.73 [0.200] | 1.6 [0.200] | 2.07 [0.200] |
| Bromobenzene | SW8260C | µg/L | 62 | ND [0.2] | ND [0.2] | ND [0.2] J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |

## Table C-2. Groundwater Sample Results
## Operable Unit 4
## Fort Wainwright, Alaska

| **Sample ID** | | | | **17FWOU401WG** | **17FWOU402WG** | **17FWOU403WG** | **17FWOU404WG** | **17FWOU405WG** | **17FWOU406WG** | **17FWOU407WG** | **17FWOU408WG** | **17FWOU409WG** | **17FWOU412WG** | **17FWOU413WG** | **17FWOU414WG** | **17FWOU415WG** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location ID** | | | | FWLF-4 | AP-10258MW | AP-10257MW | AP-6535 | AP-8063 | AP-8061 | AP-5589 | AP-5588 | AP-2020 | AP-10257MW | AP-10258MW | FWLF-4 | AP-8061 |
| **Sample Data Group** | | | | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | 1179528 | 1179528 | 1179528 | 1179528 |
| **Laboratory ID** | | | | K170677801 | K170677802 | K170677803 | K170677804 | K170677805 | K170677806 | K170677807 | K170677808 | K170677809 | 1179528001 | 1179528002 | 1179528003 | 1179528004 |
| **Collection Date** | | | | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 |
| **Matrix** | | | | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG |
| **Sample Type** | | | | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary/MS/MSD | Field Duplicate of 17WOU408WG | Primary | Primary | Primary | Primary |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level** [1] | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** |
| Bromochloromethane | SW8260C | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Bromodichloromethane | SW8260C | µg/L | 1.3 | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| Bromoform | SW8260C | µg/L | 33 | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [2.5] | ND [2.5] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Bromomethane | SW8260C | µg/L | 7.5 | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] |
| Carbon disulfide | SW8260C | µg/L | 810 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| Carbon tetrachloride | SW8260C | µg/L | 4.6 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Chlorobenzene | SW8260C | µg/L | 78 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| Chloroethane | SW8260C | µg/L | 21,000 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 0.42 [0.2] J | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Chloroform | SW8260C | µg/L | 2.2 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 0.55 [1] J | 0.6 [1] J | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Chloromethane | SW8260C | µg/L | 190 | 0.08 [0.2] J,B | 0.17 [0.2] J,B | 0.1 [0.2] J,B | 0.14 [0.2] J,B | 0.34 [0.2] J,B | 0.18 [0.2] J,B | 0.22 [0.2] J,B | 0.35 [1] J,B | 0.35 [1] J,B | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| **cis-1,2-Dichloroethene** | SW8260C | µg/L | **70** | 1 [0.2] | 3.3 [0.2] | 3.8 [0.2] | 37 [0.2] | 2.4 [0.2] | 7.6 [0.2] | 23 [0.2] | **140 [1]** | **150 [1]** | 4.43 [0.500] | 4.04 [0.500] | 0.78 [0.500] J | 8.66 [0.500] |
| cis-1,3-Dichloropropene | SW8260C | µg/L | 4.7 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| Dibromochloromethane | SW8260C | µg/L | 8.7 | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [2.5] | ND [2.5] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] |
| Dibromomethane | SW8260C | µg/L | 8.3 | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [0.5] | ND [2.5] | ND [2.5] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Dichlorodifluoromethane | SW8260C | µg/L | 200 | ND [0.2] | ND [0.2] | ND [0.2] | 0.9 [0.2] | ND [0.2] | 0.17 [0.2] J | 3.9 [0.2] | 1.5 [1] J | 1.7 [1] J | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Ethylbenzene | SW8260C | µg/L | 15 | ND [0.1] | ND [0.1] | 0.06 [0.1] J,B | ND [0.1] | 0.11 [0.1] J,B | ND [0.1] | ND [0.1] | ND [0.5] | ND [0.5] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Hexachlorobutadiene | SW8260C | µg/L | 1.4 | ND [0.3] | ND [0.3] | ND [0.3] J- | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Isopropylbenzene | SW8260C | µg/L | 450 | ND [0.2] | 0.19 [0.2] J | 0.78 [0.2] J | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | 2.07 [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Methylene chloride | SW8260C | µg/L | 110 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 0.16 [0.2] J,B | 0.8 [1] J,B | 0.8 [1] J,B | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] |
| Methyl-tert-butyl ether (MTBE) | SW8260C | µg/L | 140 | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| Naphthalene | SW8260C | µg/L | 1.7 | ND [0.3] | ND [0.3] | 0.1 [0.3] J,B,J- | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [1.5] | ND [1.5] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| n-Butylbenzene | SW8260C | µg/L | 1,000 | ND [0.1] | ND [0.1] | 0.15 [0.1] J,J- | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.5] | ND [0.5] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| n-Propylbenzene | SW8260C | µg/L | 660 | ND [0.2] | ND [0.2] | 0.16 [0.2] J,J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | 0.89 [0.500] J | ND [0.500] | ND [0.500] | ND [0.500] |
| sec-Butylbenzene | SW8260C | µg/L | 2,000 | ND [0.1] | 0.29 [0.1] J | 0.71 [0.1] J,J- | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.5] | ND [0.5] J- | 0.91 [0.500] J | 0.46 [0.500] J | ND [0.500] | ND [0.500] |
| Styrene | SW8260C | µg/L | 1,200 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| tert-Butylbenzene | SW8260C | µg/L | 690 | ND [0.2] | ND [0.2] | 0.07 [0.2] J,J- | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [1] | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Tetrachloroethene (PCE) | SW8260C | µg/L | 41 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 2.2 [1] J | 2.3 [1] J | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Toluene | SW8260C | µg/L | 1,100 | 0.09 [0.1] J,B | 0.17 [0.1] J,B | 0.25 [0.1] J,B | 0.24 [0.1] J,B | 1.1 [0.1] B | 0.25 [0.1] J,B | 0.17 [0.1] J,B | ND [0.5] | ND [0.5] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| trans-1,2-Dichloroethene | SW8260C | µg/L | 360 | ND [0.2] | 0.25 [0.2] J | 0.56 [0.2] | 3.8 [0.2] | 0.18 [0.2] J | 2.9 [0.2] | 2.6 [0.2] | 31 [1] | 34 [1] | 0.57 [0.500] J | ND [0.500] | ND [0.500] | 3.35 [0.500] |
| trans-1,3-Dichloropropene | SW8260C | µg/L | 4.7 | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [0.2] J- | ND [1] J- | ND [1] J- | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| **Trichloroethene (TCE)** | SW8260C | µg/L | **5** | ND [0.2] | ND [0.2] | 0.11 [0.2] J | 1 [0.2] | 0.22 [0.2] J | 3.7 [0.2] | **5.3 [0.2]** | **250 [1]** | **270 [1]** | ND [0.500] | ND [0.500] | ND [0.500] | 3.39 [0.500] |
| Trichlorofluoromethane | SW8260C | µg/L | 5,200 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 0.15 [0.2] J | ND [1] | ND [1] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] |
| Vinyl acetate | SW8260C | µg/L | 410 | - | - | - | - | - | - | - | - | - | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] |
| **Vinyl chloride** | SW8260C | µg/L | **2** | ND [0.1] | ND [0.1] | 0.08 [0.1] J | 1.1 [0.1] | 0.09 [0.1] J | 0.13 [0.1] J | 1.1 [0.1] | 0.7 [0.5] J | 0.8 [0.5] J | ND [0.0750] | ND [0.0750] | ND [0.0750] | ND [0.0750] |
| o-Xylene | SW8260C | µg/L | 190 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | 0.17 [0.2] J | ND [0.2] | ND [0.2] | ND [1] | ND [1] | 0.57 [0.500] J | ND [0.500] | ND [0.500] | ND [0.500] |
| Xylene, Isomers m & p | SW8260C | µg/L | 190 | ND [0.2] | 0.11 [0.2] J,B | 0.2 [0.2] J,B | ND [0.2] | 0.41 [0.2] J,B | ND [0.2] | ND [0.2] | ND [1] | ND [1] | 1.75 [1.00] J | ND [1.00] | ND [1.00] | ND [1.00] |
| Xylenes | SW8260C | µg/L | 190 | ND [0.2] | 0.11 [0.2] J,B | 0.2 [0.2] J,B | ND [0.2] | 0.58 [0.2] J,B | ND [0.2] | ND [0.2] | ND [1] | ND [1] | 2.32 [1.50] J | ND [1.50] | ND [1.50] | ND [1.50] |
| | | | | | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | SW8270D-LL | µg/L | 4.0 | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [1.1] | ND [1.1] | ND [1.0] | ND [1.0] |
| 1,2-Dichlorobenzene | SW8270D-LL | µg/L | 300 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| 1,2-Diphenylhydrazine | SW8270D-LL | µg/L | 300.0 | - | - | - | - | - | - | - | - | - | ND [0.76] | ND [0.75] | ND [0.74] | ND [0.73] |
| 1,3-Dichlorobenzene | SW8270D-LL | µg/L | 5 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| 1,4-Dichlorobenzene | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| 1-Methylnaphthalene | SW8270D-LL | µg/L | 11 | - | - | - | - | - | - | - | - | - | ND [0.53] | ND [0.52] | ND [0.51] | ND [0.50] |
| 2,4,5-Trichlorophenol | SW8270D-LL | µg/L | 1,200.0 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.74] | ND [0.73] | ND [0.72] | ND [0.71] |
| 2,4,6-Trichlorophenol | SW8270D-LL | µg/L | 12 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.75] | ND [0.74] | ND [0.73] | ND [0.72] |
| 2,4-Dichlorophenol | SW8270D-LL | µg/L | 46.0 | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.84] | ND [0.83] | ND [0.81] | ND [0.80] |
| 2,4-Dimethylphenol | SW8270D-LL | µg/L | 360 | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [4] | ND [0.74] | ND [0.73] | ND [0.72] | ND [0.71] |
| 2,4-Dinitrophenol | SW8270D-LL | µg/L | 39.0 | ND [2] J- | ND [2] J- | ND [2] J- | ND [2] J- | ND [2] J- | ND [2] J- | ND [2] J- | ND [2] J- | ND [2] J- | ND [5.0] | ND [5.0] | ND [4.9] | ND [4.8] |
| 2,4-Dinitrotoluene | SW8270D-LL | µg/L | 2 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.81] | ND [0.80] | ND [0.79] | ND [0.78] |
| 2,6-Dinitrotoluene | SW8270D-LL | µg/L | 0.49 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.71] | ND [0.71] | ND [0.69] | ND [0.69] |

## Table C-2. Groundwater Sample Results
## Operable Unit 4
## Fort Wainwright, Alaska

| | | | **Sample ID** | **17FWOU401WG** | **17FWOU402WG** | **17FWOU403WG** | **17FWOU404WG** | **17FWOU405WG** | **17FWOU406WG** | **17FWOU407WG** | **17FWOU408WG** | **17FWOU409WG** | **17FWOU412WG** | **17FWOU413WG** | **17FWOU414WG** | **17FWOU415WG** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Location ID** | FWLF-4 | AP-10258MW | AP-10257MW | AP-6535 | AP-8063 | AP-8061 | AP-5589 | AP-5588 | AP-2020 | AP-10257MW | AP-10258MW | FWLF-4 | AP-8061 |
| | | | **Sample Data Group** | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | 1179528 | 1179528 | 1179528 | 1179528 |
| | | | **Laboratory ID** | K170677801 | K170677802 | K170677803 | K170677804 | K170677805 | K170677806 | K170677807 | K170677808 | K170677809 | 1179528001 | 1179528002 | 1179528003 | 1179528004 |
| | | | **Collection Date** | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 |
| | | | **Matrix** | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG |
| | | | **Sample Type** | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary/MS/MSD | Field Duplicate of 17WOU408WG | Primary | Primary | Primary | Primary |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level [1]** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** |
| 2-Chloronaphthalene | SW8270D-LL | µg/L | 750 | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| 2-Chlorophenol | SW8270D-LL | µg/L | 91 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.63] | ND [0.62] | ND [0.61] | ND [0.61] |
| 2-Methyl-4,6-dinitrophenol | SW8270D-LL | µg/L | NE | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [0.5] J- | ND [2.0] J- | ND [2.0] J- | ND [1.9] J- | ND [1.9] J- |
| 2-Methylnaphthalene | SW8270D-LL | µg/L | 36 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.60] | ND [0.59] | ND [0.58] | ND [0.58] |
| 2-Methylphenol (o-Cresol) | SW8270D-LL | µg/L | 930 | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.56] | ND [0.55] | ND [0.54] | ND [0.54] |
| 2-Nitroaniline | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [1.8] | ND [1.8] | ND [1.8] | ND [1.7] |
| 2-Nitrophenol | SW8270D-LL | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.85] | ND [0.84] | ND [0.83] | ND [0.82] |
| 3,3'-Dichlorobenzidine | SW8270D-LL | µg/L | 1.3 | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [0.64] J- | ND [0.64] J- | ND [0.62] J- | ND [0.62] J- |
| 3-Methylphenol/4-Methylphenol Coeluti | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [0.98] | ND [0.97] | ND [0.95] | ND [0.94] |
| 3-Nitroaniline | SW8270D-LL | µg/L | NE | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.88] | ND [0.87] | ND [0.85] | ND [0.85] |
| 4-Bromophenyl phenyl ether | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.85] | ND [0.84] | ND [0.82] | ND [0.81] |
| 4-Chloro-3-methylphenol | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.59] | ND [0.59] | ND [0.58] | ND [0.57] |
| 4-Chloroaniline | SW8270D-LL | µg/L | 3.7 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.63] | ND [0.62] | ND [0.61] | ND [0.61] |
| 4-Chlorophenyl phenyl ether | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.54] | ND [0.53] | ND [0.52] | ND [0.52] |
| 4-Methylphenol (p-Cresol) | SW8270D-LL | µg/L | 1900 | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | ND [0.3] | - | - | - | - |
| 4-Nitroaniline | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [1.2] | ND [1.2] | ND [1.1] | ND [1.1] |
| 4-Nitrophenol | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [5.0] | ND [5.0] | ND [4.9] | ND [4.8] |
| Acenaphthene | SW8270D-LL | µg/L | 530 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.63] | ND [0.62] | ND [0.61] | ND [0.60] |
| Acenaphthylene | SW8270D-LL | µg/L | 260 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.64] | ND [0.63] | ND [0.62] | ND [0.61] |
| Aniline | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| Anthracene | SW8270D-LL | µg/L | 43 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.80] | ND [0.79] | ND [0.77] | ND [0.77] |
| Benzidine | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [5.0] J- | ND [5.0] J- | ND [4.9] J- | ND [4.8] J- |
| Benzo(a)anthracene | SW8270D-LL | µg/L | 0.12 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.76] | ND [0.75] | ND [0.74] | ND [0.73] |
| Benzo(a)pyrene | SW8270D-LL | µg/L | 0.034 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.78] | ND [0.78] | ND [0.76] | ND [0.75] |
| Benzo(b)fluoranthene | SW8270D-LL | µg/L | 0.34 | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.78] | ND [0.77] | ND [0.75] | ND [0.75] |
| Benzo(g,h,i)perylene | SW8270D-LL | µg/L | 0.26 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.82] | ND [0.81] | ND [0.80] | ND [0.79] |
| Benzo(k)fluoranthene | SW8270D-LL | µg/L | 0.8 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.86] | ND [0.85] | ND [0.83] | ND [0.82] |
| Benzoic acid | SW8270D-LL | µg/L | 75000 | - | - | - | - | - | - | - | - | - | ND [10] | ND [9.9] | ND [9.7] | ND [9.6] |
| Benzyl alcohol | SW8270D-LL | µg/L | 2000 | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.2] | ND [0.61] | ND [0.61] | ND [0.60] | ND [0.59] |
| Benzyl butyl phthalate | SW8270D-LL | µg/L | 160 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| bis-(2-Chloroethoxy)methane | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.81] | ND [0.80] | ND [0.79] | ND [0.78] |
| bis-(2-Chloroethyl)ether | SW8270D-LL | µg/L | 0.14 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.73] | ND [0.72] | ND [0.71] | ND [0.70] |
| bis(2-Chloroisopropyl)ether | SW8270D-LL | µg/L | NE | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.76] | ND [0.75] | ND [0.73] | ND [0.73] |
| **bis-(2-Ethylhexyl)phthalate** | SW8270D-LL | µg/L | **6** | 0.32 [0.5] J,B | 0.98 [0.5] B | 2.8 [0.5] | 0.29 [0.5] J,B | 0.16 [0.5] J,B | ND [0.5] | 0.2 [0.5] J,B | ND [0.5] | ND [0.5] | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| Carbazole | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [0.60] | ND [0.59] | ND [0.58] | ND [0.58] |
| Chrysene | SW8270D-LL | µg/L | 2 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.85] | ND [0.84] | ND [0.83] | ND [0.82] |
| Dibenzo(a,h)anthracene | SW8270D-LL | µg/L | 0.034 | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.80] | ND [0.80] | ND [0.78] | ND [0.77] |
| Dibenzofuran | SW8270D-LL | µg/L | 7.9 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.60] | ND [0.60] | ND [0.58] | ND [0.58] |
| Diethyl phthalate | SW8270D-LL | µg/L | 15000 | 0.034 [0.05] J,B | 0.021 [0.05] J,B | 0.031 [0.05] J,B | 0.04 [0.05] J,B | 0.062 [0.05] J,B | 0.033 [0.05] J,B | 0.042 [0.05] J,B | 0.039 [0.05] J,B | 0.04 [0.05] J,B | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| Dimethyl phthalate | SW8270D-LL | µg/L | 16000 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| Di-n-butyl phthalate | SW8270D-LL | µg/L | 900 | 0.06 [0.07] J,B | 0.029 [0.07] J,B | 0.042 [0.07] J,B | 0.051 [0.07] J,B | 0.066 [0.07] J,B | 0.055 [0.07] J,B | 0.083 [0.07] J,B | 0.06 [0.07] J,B | 0.067 [0.07] J,B | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| Di-n-octyl phthalate | SW8270D-LL | µg/L | 22 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [1.0] | ND [0.99] | ND [0.97] | ND [0.96] |
| Fluoranthene | SW8270D-LL | µg/L | 260 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.55] | ND [0.55] | ND [0.54] | ND [0.53] |
| Fluorene | SW8270D-LL | µg/L | 290 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.70] | ND [0.69] | ND [0.68] | ND [0.67] |
| Hexachlorobenzene | SW8270D-LL | µg/L | 0.098 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.69] | ND [0.69] | ND [0.67] | ND [0.67] |
| Hexachlorobutadiene | SW8270D-LL | µg/L | 1.4 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| Hexachlorocyclopentadiene | SW8270D-LL | µg/L | 0.41 | - | - | - | - | - | - | - | - | - | ND [1.8] | ND [1.8] | ND [1.8] | ND [1.7] |
| Hexachloroethane | SW8270D-LL | µg/L | 3.3 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [1.6] | ND [1.6] | ND [1.6] | ND [1.6] |
| Indeno(1,2,3-cd)pyrene | SW8270D-LL | µg/L | 0.19 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.71] | ND [0.71] | ND [0.69] | ND [0.69] |
| Isophorone | SW8270D-LL | µg/L | 780 | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.05] | ND [0.78] | ND [0.77] | ND [0.75] | ND [0.75] |
| Naphthalene | SW8270D-LL | µg/L | 1.7 | ND [0.07] | 0.025 [0.07] J,B | 0.067 [0.07] J,B | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |

## Table C-2. Groundwater Sample Results
## Operable Unit 4
## Fort Wainwright, Alaska

| | | | **Sample ID** | **17FWOU401WG** | **17FWOU402WG** | **17FWOU403WG** | **17FWOU404WG** | **17FWOU405WG** | **17FWOU406WG** | **17FWOU407WG** | **17FWOU408WG** | **17FWOU409WG** | **17FWOU412WG** | **17FWOU413WG** | **17FWOU414WG** | **17FWOU415WG** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Location ID** | FWLF-4 | AP-10258MW | AP-10257MW | AP-6535 | AP-8063 | AP-8061 | AP-5589 | AP-5588 | AP-2020 | AP-10257MW | AP-10258MW | FWLF-4 | AP-8061 |
| | | | **Sample Data Group** | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | K1706778 | 1179528 | 1179528 | 1179528 | 1179528 |
| | | | **Laboratory ID** | K170677801 | K170677802 | K170677803 | K170677804 | K170677805 | K170677806 | K170677807 | K170677808 | K170677809 | 1179528001 | 1179528002 | 1179528003 | 1179528004 |
| | | | **Collection Date** | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 6/26/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 | 10/30/2017 |
| | | | **Matrix** | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG | WG |
| | | | **Sample Type** | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary/MS/MSD | Field Duplicate of 17WOU408WG | Primary | Primary | Primary | Primary |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level [1]** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** |
| Nitrobenzene | SW8270D-LL | µg/L | 1.4 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.93] | ND [0.92] | ND [0.91] | ND [0.90] |
| n-Nitrosodimethylamine | SW8270D-LL | µg/L | 0.0011 | - | - | - | - | - | - | - | - | - | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| n-Nitrosodi-n-propylamine | SW8270D-LL | µg/L | 0.11 | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.67] | ND [0.66] | ND [0.65] | ND [0.64] |
| n-Nitrosodiphenylamine | SW8270D-LL | µg/L | 120 | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.1] | ND [0.81] | ND [0.80] | ND [0.78] | ND [0.78] |
| Pentachlorophenol | SW8270D-LL | µg/L | 0.41 | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [1] | ND [5.0] | ND [5.0] | ND [4.9] | ND [4.8] |
| Phenanthrene | SW8270D-LL | µg/L | 170 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.86] | ND [0.86] | ND [0.84] | ND [0.83] |
| Phenol | SW8270D-LL | µg/L | 5800 | 0.14 [0.2] J | 0.08 [0.2] J | 0.45 [0.2] J | ND [0.2] | ND [0.2] | 0.075 [0.2] J | 0.94 [0.2] J | 0.13 [0.2] J | 0.12 [0.2] J | ND [0.50] | ND [0.50] | ND [0.49] | ND [0.48] |
| Pyrene | SW8270D-LL | µg/L | 120 | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.07] | ND [0.68] | ND [0.68] | ND [0.66] | ND [0.66] |
| Pyridine | SW8270D-LL | µg/L | NE | - | - | - | - | - | - | - | - | - | ND [2.0] | ND [2.0] | ND [1.9] | ND [1.9] |

Yellow highlighted and **bolded** results exceed OU4 ROD remedial goals or 2016 ADEC groundwater cleanup levels.

Grey shaded results are non-detect with LODs above OU4 ROD remedial goals or 2016 ADEC cleanup levels.

1,4-Dioxane results in **red bold font** exceed the EPA RSL. See Note 2.

[1] **OU4 ROD analytes and remedial goals are identified in BLUE text.** The remaining values are 2016 ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of November 7, 2017). These cleanup levels were initially promulgated in November 6, 2016 and utilize risk-based calculations.

[2] 1,4-Dioxane results are compared against both the ADEC cleanup level (4.6 µg/L) and EPA RSL (0.46 µg/L; revised as of May 2018).

**Data Qualifiers:**

B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
J+ - result qualified as estimate with a high-bias due to a QC failure
J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

**Acronyms:**

LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
QC - quality control
RG - remedial goal
ROD - Record of Decision
RSL - regional screening level
WG - groundwater
WQ - water QC sample

## Table C-2. Groundwater Sample Results
## Operable Unit 4
## Fort Wainwright, Alaska

| Sample ID | | | | 17FWOU416WG | 17FWOU417WG | 17FWOU418WG | 17FWOU419WG | 17FWOU420WG | 17FWOU421WG | 17FWOU422WG | 17FWOU410WQ | 17FWOU411WQ | 17FWOU423WQ | 17FWOU424WQ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location ID | | | | AP-5588 | AP-5050 | AP-5589 | AP-8063 | AP-6532 | AP-6530 | AP-6535 | RINSATE 15 | TRIP BLANK | RINSATE 25 | TRIP BLANK |
| Sample Data Group | | | | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | K1706778 | K1706778 | 1179528 | 1179528 |
| Laboratory ID | | | | 1179528005 | 1179528008 | 1179528009 | 1179528010 | 1179528011 | 1179528012 | 1179528013 | K170677810 | K170677811 | 1179528014 | 1179528015 |
| Collection Date | | | | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 11/1/2017 | 11/1/2017 | 11/1/2017 | 6/26/2017 | 6/26/2017 | 11/1/2017 | 10/30/2017 |
| Matrix | | | | WG | WG | WG | WG | WG | WG | WG | WQ | WQ | WQ | WQ |
| Sample Type | | | | Primary/MS/MSD | Field Duplicate of 17FWOU416WG | Primary | Primary | Primary | Primary | Primary | Equipment Blank | Trip Blank | Equipment Blank | Trip Blank |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level [1]** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** |
| Sulfate | E300.0 | mg/L | NE | 146 [2.00] | 146 [2.00] | 145 [2.00] | 133 [2.00] | 7.16 [0.500] | 10.5 [0.500] | 22.7 [0.500] | ND [0.04] | - | ND [0.100] | - |
| Iron | 6010C/6020A | µg/L | NE | 30900 [250] | 30200 [250] | 48200 [500] | 50000 [500] | 26600 [250] | 19300 [250] | 29100 [250] | 7 [8] J | - | ND [250] | |
| Antimony | SW6020A | µg/L | 7.8 | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [0.05] | - | ND [1.50] | - |
| Arsenic | SW6020A | µg/L | 0.52 | **10.9 [2.50]** | **12 [2.50]** | ND [2.50] | **1.57 [2.50] J** | ND [2.50] | **5.47 [2.50]** | **2.91 [2.50] J** | ND [0.25] | - | ND [2.50] | - |
| Barium | SW6020A | µg/L | 3800 | 400 [1.50] | 391 [1.50] | 637 [1.50] | 594 [1.50] | 240 [1.50] | 303 [1.50] | 277 [1.50] | 0.145 [0.05] | - | ND [1.50] | - |
| Beryllium | SW6020A | µg/L | 25 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.005] | - | ND [0.500] | - |
| Cadmium | SW6020A | µg/L | 9.2 | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [0.02] | - | ND [1.00] | - |
| Chromium | SW6020A | µg/L | NE | ND [2.00] | ND [2.00] | ND [2.00] | ND [2.00] | ND [2.00] | ND [2.00] | ND [2.00] | ND [0.1] | - | ND [2.00] | - |
| Cobalt | SW6020A | µg/L | NE | 3.84 [0.500] | 3.62 [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.01] | - | ND [0.500] | - |
| Copper | SW6020A | µg/L | 800 | ND [3.00] | ND [3.00] | ND [3.00] | ND [3.00] | ND [3.00] | ND [3.00] | 2.52 [3.00] J | 0.54 [0.05] | - | ND [3.00] | - |
| Lead | SW6020A | µg/L | 15 | ND [0.500] | ND [0.500] | ND [0.500] | 0.376 [0.500] J | 0.417 [0.500] J,B | ND [0.500] | 1.05 [0.500] B | ND [0.02] | - | 3.33 [0.500] | - |
| Nickel | SW6020A | µg/L | 390 | 8.26 [1.00] | 8.46 [1.00] | 2.84 [1.00] | 2.28 [1.00] | 1.62 [1.00] J | 1.17 [1.00] J | 1.23 [1.00] J | 0.11 [0.1] J | - | ND [1.00] | - |
| Selenium | SW6020A | µg/L | 100 | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [0.5] | - | ND [10.0] | - |
| Silver | SW6020A | µg/L | 94 | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | 0.004 [0.005] J | - | ND [1.00] | - |
| Thallium | SW6020A | µg/L | 0.2 | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [0.02] | - | ND [1.00] | - |
| Vanadium | SW6020A | µg/L | 86 | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | ND [10.0] | 0.08 [0.1] J | - | ND [10.0] | - |
| Zinc | SW6020A | µg/L | 6000 | ND [12.5] | ND [12.5] | ND [12.5] | 32 [12.5] | 8.88 [12.5] J | 10.4 [12.5] J | 13.6 [12.5] J | 0.41 [0.25] J,B | - | ND [12.5] | - |
| 1,4-Dioxane | 8270D-SIM/8260B-SIM | µg/L | 4.6 / 0.46 [2] | **6.4 [0.50]** | **6.1 [0.50] J+** | **15.4 [0.50]** | **10.3 [0.50]** | **0.72 [0.50] J** | ND [0.50] | **2.1 [0.50]** | ND [0.02] | - | ND [0.50] | ND [0.50] |
| 1,1,1,2-Tetrachloroethane | SW8260C | µg/L | 5.7 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.2] | ND [0.2] | ND [0.250] | ND [0.250] |
| 1,1,1-Trichloroethane | SW8260C | µg/L | 8,000 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| **1,1,2,2-Tetrachloroethane** | SW8260C | µg/L | **5.2** | **696 [2.50]** | **732 [2.50]** | 1.04 [0.250] | **21.2 [0.250]** | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.2] | ND [0.2] | ND [0.250] | ND [0.250] |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | SW8260C | µg/L | 55,000 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | - | - | ND [5.00] | ND [5.00] |
| **1,1,2-Trichloroethane** | SW8260C | µg/L | **5** | 3.28 [0.200] | 3.17 [0.200] | ND [0.200] | 0.73 [0.200] | ND [0.200] | ND [0.200] | ND [0.200] | ND [0.4] | ND [0.4] | ND [0.200] | ND [0.200] |
| 1,1-Dichloroethane | SW8260C | µg/L | 28 | 0.46 [0.500] J | 0.46 [0.500] J | 1.69 [0.500] | 0.8 [0.500] J | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,1-Dichloroethene | SW8260C | µg/L | 280 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,1-Dichloropropene | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,2,3-Trichlorobenzene | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.4] | ND [0.4] | ND [0.500] | ND [0.500] |
| 1,2,3-Trichloropropane | SW8260C | µg/L | 0.0075 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.5] | ND [0.5] | ND [0.500] | ND [0.500] |
| 1,2,4-Trichlorobenzene | SW8260C | µg/L | 4.0 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.3] | ND [0.3] | ND [0.500] | ND [0.500] |
| 1,2,4-Trimethylbenzene | SW8260C | µg/L | 15 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,2-Dibromo-3-chloropropane | SW8260C | µg/L | NE | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [0.8] | ND [0.8] | ND [5.00] | ND [5.00] |
| 1,2-Dibromoethane | SW8260C | µg/L | 0.075 | ND [0.0375] | ND [0.0375] | ND [0.0375] | ND [0.0375] | ND [0.0375] | ND [0.0375] | ND [0.0375] | ND [0.2] | ND [0.2] | ND [0.0375] | ND [0.0375] |
| 1,2-Dichlorobenzene | SW8260C | µg/L | 300 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,2-Dichloroethane | SW8260C | µg/L | 1.7 | 0.84 [0.250] | 0.83 [0.250] | **2.91 [0.250]** | 1.61 [0.250] | ND [0.250] | ND [0.250] | 0.3 [0.250] J | 0.21 [0.15] J | ND [0.15] | ND [0.250] | ND [0.250] |
| 1,2-Dichloropropane | SW8260C | µg/L | 4.4 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,3,5-Trimethylbenzene | SW8260C | µg/L | 120 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,3-Dichlorobenzene | SW8260C | µg/L | 300 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 1,3-Dichloropropane | SW8260C | µg/L | 4.7 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.3] | ND [0.3] | ND [0.250] | ND [0.250] |
| 1,4-Dichlorobenzene | SW8260C | µg/L | 4.8 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.2] | ND [0.2] | ND [0.250] | ND [0.250] |
| 2,2-Dichloropropane | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] J- | ND [0.2] J- | ND [0.500] | ND [0.500] |
| 2-Butanone | SW8260C | µg/L | 5,600 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [4] | ND [4] | ND [5.00] | ND [5.00] |
| 2-Chlorotoluene | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 2-Hexanone | SW8260C | µg/L | 38 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [10] | ND [10] | ND [5.00] | ND [5.00] |
| 4-Chlorotoluene | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 4-Isopropyltoluene | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| 4-Methyl-2-pentanone | SW8260C | µg/L | 6,300 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [10] | ND [10] | ND [5.00] | ND [5.00] |
| Acetone | SW8260C | µg/L | 14,000 | - | - | - | - | - | - | - | 7.3 [10] J,B | 4.1 [10] J | - | - |
| **Benzene** | SW8260C | µg/L | **5** | 0.7 [0.200] | 0.71 [0.200] | 3.24 [0.200] | 1.74 [0.200] | **9 [0.200]** | 0.45 [0.200] | 2.74 [0.200] | 0.09 [0.1] J | ND [0.1] | ND [0.200] | ND [0.200] |
| Bromobenzene | SW8260C | µg/L | 62 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |

## Table C-2. Groundwater Sample Results
## Operable Unit 4
## Fort Wainwright, Alaska

| Sample ID | | | | 17FWOU416WG | 17FWOU417WG | 17FWOU418WG | 17FWOU419WG | 17FWOU420WG | 17FWOU421WG | 17FWOU422WG | 17FWOU410WQ | 17FWOU411WQ | 17FWOU423WQ | 17FWOU424WQ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location ID | | | | AP-5588 | AP-5050 | AP-5589 | AP-8063 | AP-6532 | AP-6530 | AP-6535 | RINSATE 15 | TRIP BLANK | RINSATE 25 | TRIP BLANK |
| Sample Data Group | | | | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | K1706778 | K1706778 | 1179528 | 1179528 |
| Laboratory ID | | | | 1179528005 | 1179528008 | 1179528009 | 1179528010 | 1179528011 | 1179528012 | 1179528013 | K170677810 | K170677811 | 1179528014 | 1179528015 |
| Collection Date | | | | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 11/1/2017 | 11/1/2017 | 11/1/2017 | 6/26/2017 | 6/26/2017 | 11/1/2017 | 10/30/2017 |
| Matrix | | | | WG | WG | WG | WG | WG | WG | WG | WQ | WQ | WQ | WQ |
| Sample Type | | | | Primary/MS/MSD | Field Duplicate of 17FWOU416WG | Primary | Primary | Primary | Primary | Primary | Equipment Blank | Trip Blank | Equipment Blank | Trip Blank |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level $^1$** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** |
| Bromochloromethane | SW8260C | µg/L | NE | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Bromodichloromethane | SW8260C | µg/L | 1.3 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.3] | ND [0.3] | ND [0.250] | ND [0.250] |
| Bromoform | SW8260C | µg/L | 33 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.5] | ND [0.5] | ND [0.500] | ND [0.500] |
| Bromomethane | SW8260C | µg/L | 7.5 | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [0.3] | ND [0.3] | ND [2.50] | ND [2.50] |
| Carbon disulfide | SW8260C | µg/L | 810 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [0.2] | ND [0.2] | ND [5.00] | ND [5.00] |
| Carbon tetrachloride | SW8260C | µg/L | 4.6 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Chlorobenzene | SW8260C | µg/L | 78 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.2] | ND [0.2] | ND [0.250] | ND [0.250] |
| Chloroethane | SW8260C | µg/L | 21,000 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Chloroform | SW8260C | µg/L | 2.2 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | 0.43 [0.500] J | ND [0.500] | ND [0.500] | ND [0.2] | 0.13 [0.2] J,B | ND [0.500] | ND [0.500] |
| Chloromethane | SW8260C | µg/L | 190 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | 0.1 [0.2] J,B | 0.12 [0.2] J,B | ND [0.500] | ND [0.500] |
| **cis-1,2-Dichloroethene** | SW8260C | µg/L | **70** | 66.6 [0.500] J- | 66.7 [0.500] J- | 18.9 [0.500] | **101 [0.500]** | 2.48 [0.500] | ND [0.500] | 30.1 [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| cis-1,3-Dichloropropene | SW8260C | µg/L | 4.7 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.2] | ND [0.2] | ND [0.250] | ND [0.250] |
| Dibromochloromethane | SW8260C | µg/L | 8.7 | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.250] | ND [0.5] | ND [0.5] | ND [0.250] | ND [0.250] |
| Dibromomethane | SW8260C | µg/L | 8.3 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.5] | ND [0.5] | ND [0.500] | ND [0.500] |
| Dichlorodifluoromethane | SW8260C | µg/L | 200 | 1.02 [0.500] | 1.02 [0.500] | 3.63 [0.500] | 2.08 [0.500] | 0.56 [0.500] J | ND [0.500] | 0.76 [0.500] J | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Ethylbenzene | SW8260C | µg/L | 15 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | 0.08 [0.1] J | ND [0.1] | ND [0.500] | ND [0.500] |
| Hexachlorobutadiene | SW8260C | µg/L | 1.4 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.3] | ND [0.3] | ND [0.500] | ND [0.500] |
| Isopropylbenzene | SW8260C | µg/L | 450 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Methylene chloride | SW8260C | µg/L | 110 | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | ND [2.50] | 0.15 [0.2] J,B | 0.12 [0.2] J | ND [2.50] | ND [2.50] |
| Methyl-tert-butyl ether (MTBE) | SW8260C | µg/L | 140 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [0.3] | ND [0.3] | ND [5.00] | ND [5.00] |
| Naphthalene | SW8260C | µg/L | 1.7 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.3] | ND [0.3] | ND [0.500] | ND [0.500] |
| n-Butylbenzene | SW8260C | µg/L | 1,000 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.1] | ND [0.1] | ND [0.500] | ND [0.500] |
| n-Propylbenzene | SW8260C | µg/L | 660 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| sec-Butylbenzene | SW8260C | µg/L | 2,000 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.1] | ND [0.1] | ND [0.500] | ND [0.500] |
| Styrene | SW8260C | µg/L | 1,200 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| tert-Butylbenzene | SW8260C | µg/L | 690 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Tetrachloroethene (PCE) | SW8260C | µg/L | 41 | 1.36 [0.500] | 1.36 [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Toluene | SW8260C | µg/L | 1,100 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | 0.88 [0.1] B | 1.1 [0.1] | 0.32 [0.500] J | ND [0.500] |
| trans-1,2-Dichloroethene | SW8260C | µg/L | 360 | 18.7 [0.500] | 18.8 [0.500] | 2.24 [0.500] | 12.6 [0.500] | ND [0.500] | ND [0.500] | 3.54 [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| trans-1,3-Dichloropropene | SW8260C | µg/L | 4.7 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] J- | ND [0.2] J- | ND [0.500] | ND [0.500] |
| **Trichloroethene (TCE)** | SW8260C | µg/L | **5** | **107 [0.500]** | **107 [0.500]** | 3.68 [0.500] | **22 [0.500]** | ND [0.500] | ND [0.500] | 0.82 [0.500] J | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Trichlorofluoromethane | SW8260C | µg/L | 5,200 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Vinyl acetate | SW8260C | µg/L | 410 | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | ND [5.00] | - | - | ND [5.00] | ND [5.00] |
| **Vinyl chloride** | SW8260C | µg/L | **2** | ND [0.0750] | ND [0.0750] | ND [0.0750] | ND [0.0750] | ND [0.0750] | ND [0.0750] | ND [0.0750] | ND [0.1] | ND [0.1] | ND [0.0750] | ND [0.0750] |
| o-Xylene | SW8260C | µg/L | 190 | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.500] | ND [0.2] | ND [0.2] | ND [0.500] | ND [0.500] |
| Xylene, Isomers m & p | SW8260C | µg/L | 190 | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | ND [1.00] | 0.19 [0.2] J | ND [0.2] | ND [1.00] | ND [1.00] |
| Xylenes | SW8260C | µg/L | 190 | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | ND [1.50] | | | ND [1.50] | ND [1.50] |
| | | | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | SW8270D-LL | µg/L | 4.0 | ND [1.0] | ND [1.1] | ND [1.0] | ND [1.1] J- | ND [1.0] | ND [1.0] | ND [1.0] | ND [0.05] | - | ND [1.0] | - |
| 1,2-Dichlorobenzene | SW8270D-LL | µg/L | 300 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] J- | ND [0.48] | ND [0.07] | - | ND [0.48] J- | - |
| 1,2-Diphenylhydrazine | SW8270D-LL | µg/L | 300.0 | ND [0.75] | ND [0.76] | ND [0.74] | ND [0.75] | ND [0.72] | ND [0.72] | ND [0.72] | - | - | ND [0.72] | - |
| 1,3-Dichlorobenzene | SW8270D-LL | µg/L | 5 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] J- | ND [0.48] | ND [0.07] | - | ND [0.48] J- | - |
| 1,4-Dichlorobenzene | SW8270D-LL | µg/L | NE | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] J- | ND [0.48] | ND [0.07] | - | ND [0.48] J- | - |
| 1-Methylnaphthalene | SW8270D-LL | µg/L | 11 | ND [0.51] | ND [0.53] | ND [0.51] | ND [0.52] | ND [0.50] | ND [0.50] | ND [0.50] | - | - | ND [0.50] | - |
| 2,4,5-Trichlorophenol | SW8270D-LL | µg/L | 1,200.0 | ND [0.73] | ND [0.74] | ND [0.72] | ND [0.73] | ND [0.70] | ND [0.70] | ND [0.70] | ND [0.07] | - | ND [0.70] | - |
| 2,4,6-Trichlorophenol | SW8270D-LL | µg/L | 12 | ND [0.74] | ND [0.75] | ND [0.73] | ND [0.74] | ND [0.72] | ND [0.72] | ND [0.72] | ND [0.2] | - | ND [0.72] | - |
| 2,4-Dichlorophenol | SW8270D-LL | µg/L | 46.0 | ND [0.82] | ND [0.84] | ND [0.81] | ND [0.83] J- | ND [0.80] | ND [0.80] | ND [0.80] | ND [0.1] | - | ND [0.80] | - |
| 2,4-Dimethylphenol | SW8270D-LL | µg/L | 360 | ND [0.72] | ND [0.74] | ND [0.72] | ND [0.73] J- | ND [0.70] | ND [0.70] | ND [0.70] | ND [4] | - | ND [0.70] | - |
| 2,4-Dinitrophenol | SW8270D-LL | µg/L | 39.0 | ND [4.9] | ND [5.0] | ND [4.9] | ND [5.0] | ND [4.8] | ND [4.8] | ND [4.8] | ND [2] J- | - | ND [4.8] | - |
| 2,4-Dinitrotoluene | SW8270D-LL | µg/L | 2 | ND [0.80] | ND [0.81] | ND [0.79] | ND [0.80] | ND [0.77] | ND [0.77] | ND [0.77] | ND [0.07] | - | ND [0.77] | - |
| 2,6-Dinitrotoluene | SW8270D-LL | µg/L | 0.49 | ND [0.70] | ND [0.71] | ND [0.69] | ND [0.71] | ND [0.68] | ND [0.68] | ND [0.68] | ND [0.07] | - | ND [0.68] | - |

# Table C-2. Groundwater Sample Results
# Operable Unit 4
# Fort Wainwright, Alaska

| Sample ID | | | | 17FWOU416WG | 17FWOU417WG | 17FWOU418WG | 17FWOU419WG | 17FWOU420WG | 17FWOU421WG | 17FWOU422WG | 17FWOU410WQ | 17FWOU411WQ | 17FWOU423WQ | 17FWOU424WQ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location ID | | | | AP-5588 | AP-5050 | AP-5589 | AP-8063 | AP-6532 | AP-6530 | AP-6535 | RINSATE 15 | TRIP BLANK | RINSATE 25 | TRIP BLANK |
| Sample Data Group | | | | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | K1706778 | K1706778 | 1179528 | 1179528 |
| Laboratory ID | | | | 1179528005 | 1179528008 | 1179528009 | 1179528010 | 1179528011 | 1179528012 | 1179528013 | K170677810 | K170677811 | 1179528014 | 1179528015 |
| Collection Date | | | | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 11/1/2017 | 11/1/2017 | 11/1/2017 | 6/26/2017 | 6/26/2017 | 11/1/2017 | 10/30/2017 |
| Matrix | | | | WG | WG | WG | WG | WG | WG | WG | WQ | WQ | WQ | WQ |
| Sample Type | | | | Primary/MS/MSD | Field Duplicate of 17FWOU416WG | Primary | Primary | Primary | Primary | Primary | Equipment Blank | Trip Blank | Equipment Blank | Trip Blank |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level** $^1$ | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** |
| 2-Chloronaphthalene | SW8270D-LL | µg/L | 750 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] | ND [0.48] | ND [0.48] | ND [0.48] | ND [0.1] | - | ND [0.48] | - |
| 2-Chlorophenol | SW8270D-LL | µg/L | 91 | ND [0.62] | ND [0.63] | ND [0.61] | ND [0.62] J- | ND [0.60] | ND [0.60] J- | ND [0.60] | ND [0.2] | - | ND [0.60] J- | - |
| 2-Methyl-4,6-dinitrophenol | SW8270D-LL | µg/L | NE | ND [2.0] J- | ND [2.0] J- | ND [1.9] J- | ND [2.0] J- | ND [1.9] | ND [1.9] | ND [1.9] | ND [0.5] J- | - | ND [1.9] | - |
| 2-Methylnaphthalene | SW8270D-LL | µg/L | 36 | ND [0.59] | ND [0.60] | ND [0.58] | ND [0.59] J- | ND [0.57] | ND [0.57] | ND [0.57] | ND [0.07] | - | ND [0.57] | - |
| 2-Methylphenol (o-Cresol) | SW8270D-LL | µg/L | 930 | ND [0.55] | ND [0.56] | ND [0.54] | ND [0.55] J- | ND [0.53] | ND [0.53] J- | ND [0.53] | ND [0.3] | - | ND [0.53] J- | - |
| 2-Nitroaniline | SW8270D-LL | µg/L | NE | ND [1.8] | ND [1.8] | ND [1.8] | ND [1.8] | ND [1.7] | ND [1.7] | ND [1.7] | ND [0.07] | - | ND [1.7] | - |
| 2-Nitrophenol | SW8270D-LL | µg/L | NE | ND [0.84] | ND [0.85] | ND [0.83] | ND [0.84] J- | ND [0.81] | ND [0.81] | ND [0.81] | ND [0.2] | - | ND [0.81] | - |
| 3,3'-Dichlorobenzidine | SW8270D-LL | µg/L | 1.3 | ND [0.63] J- | ND [0.64] J- | ND [0.62] J- | ND [0.64] J- | ND [0.61] J- | ND [0.61] J- | ND [0.61] J- | ND [1] | - | ND [0.61] J- | - |
| 3-Methylphenol/4-Methylphenol Coeluti | SW8270D-LL | µg/L | NE | ND [0.96] | ND [0.98] | ND [0.95] | ND [0.97] J- | ND [0.93] | ND [0.93] J- | ND [0.93] | - | - | ND [0.93] J- | - |
| 3-Nitroaniline | SW8270D-LL | µg/L | NE | ND [0.86] | ND [0.88] | ND [0.85] | ND [0.87] | ND [0.84] | ND [0.84] | ND [0.84] | ND [0.2] | - | ND [0.84] | - |
| 4-Bromophenyl phenyl ether | SW8270D-LL | µg/L | NE | ND [0.83] | ND [0.85] | ND [0.82] | ND [0.84] | ND [0.81] | ND [0.81] | ND [0.81] | ND [0.07] | - | ND [0.81] | - |
| 4-Chloro-3-methylphenol | SW8270D-LL | µg/L | NE | ND [0.58] | ND [0.59] | ND [0.58] | ND [0.59] J- | ND [0.56] | ND [0.56] | ND [0.56] | ND [0.07] | - | ND [0.56] | - |
| 4-Chloroaniline | SW8270D-LL | µg/L | 3.7 | ND [0.62] | ND [0.63] | ND [0.61] | ND [0.62] J- | ND [0.60] | ND [0.60] | ND [0.60] | ND [0.2] | - | ND [0.60] | - |
| 4-Chlorophenyl phenyl ether | SW8270D-LL | µg/L | NE | ND [0.53] | ND [0.54] | ND [0.52] | ND [0.53] | ND [0.51] | ND [0.51] | ND [0.51] | ND [0.07] | - | ND [0.51] | - |
| 4-Methylphenol (p-Cresol) | SW8270D-LL | µg/L | 1900 | - | - | - | - | - | - | - | ND [0.3] | - | - | - |
| 4-Nitroaniline | SW8270D-LL | µg/L | NE | ND [1.1] | ND [1.2] | ND [1.1] | ND [1.2] | ND [1.1] | ND [1.1] | ND [1.1] | - | - | ND [1.1] | - |
| 4-Nitrophenol | SW8270D-LL | µg/L | NE | ND [4.9] | ND [5.0] | ND [4.9] | ND [5.0] | ND [4.8] | ND [4.8] | ND [4.8] | - | - | ND [4.8] | - |
| Acenaphthene | SW8270D-LL | µg/L | 530 | ND [0.61] | ND [0.63] | ND [0.61] | ND [0.62] | ND [0.60] | ND [0.60] | ND [0.60] | ND [0.07] | - | ND [0.60] | - |
| Acenaphthylene | SW8270D-LL | µg/L | 260 | ND [0.63] | ND [0.64] | ND [0.62] | ND [0.63] | ND [0.61] | ND [0.61] | ND [0.61] | ND [0.07] | - | ND [0.61] | - |
| Aniline | SW8270D-LL | µg/L | NE | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] J- | ND [0.95] | ND [0.95] J- | ND [0.95] | - | - | ND [0.95] J- | - |
| Anthracene | SW8270D-LL | µg/L | 43 | ND [0.78] | ND [0.80] | ND [0.77] | ND [0.79] | ND [0.76] | ND [0.76] | ND [0.76] | ND [0.07] | - | ND [0.76] | - |
| Benzidine | SW8270D-LL | µg/L | NE | ND [4.9] J- | ND [5.0] J- | ND [4.9] J- | ND [5.0] J- | ND [4.8] J- | ND [4.8] J- | ND [4.8] J- | - | - | ND [4.8] J- | - |
| Benzo(a)anthracene | SW8270D-LL | µg/L | 0.12 | ND [0.75] | ND [0.76] | ND [0.74] | ND [0.75] | ND [0.72] | ND [0.72] | ND [0.72] | ND [0.07] | - | ND [0.72] | - |
| Benzo(a)pyrene | SW8270D-LL | µg/L | 0.034 | ND [0.77] | ND [0.78] | ND [0.76] | ND [0.78] | ND [0.75] | ND [0.75] | ND [0.75] | ND [0.07] | - | ND [0.75] | - |
| Benzo(b)fluoranthene | SW8270D-LL | µg/L | 0.34 | ND [0.76] | ND [0.78] | ND [0.75] | ND [0.77] | ND [0.74] | ND [0.74] | ND [0.74] | ND [0.05] | - | ND [0.74] | - |
| Benzo(g,h,i)perylene | SW8270D-LL | µg/L | 0.26 | ND [0.81] | ND [0.82] | ND [0.80] | ND [0.81] | ND [0.78] | ND [0.78] | ND [0.78] | ND [0.07] | - | ND [0.78] | - |
| Benzo(k)fluoranthene | SW8270D-LL | µg/L | 0.8 | ND [0.84] | ND [0.86] | ND [0.83] | ND [0.85] | ND [0.82] | ND [0.82] | ND [0.82] | ND [0.07] | - | ND [0.82] | - |
| Benzoic acid | SW8270D-LL | µg/L | 75000 | ND [9.8] | ND [10] | ND [9.7] | ND [9.9] J- | ND [9.5] | ND [9.5] | ND [9.5] | - | - | ND [9.5] | - |
| Benzyl alcohol | SW8270D-LL | µg/L | 2000 | ND [0.60] | ND [0.61] | ND [0.60] | ND [0.61] J- | ND [0.58] | ND [0.58] J- | ND [0.58] | 0.075 [0.2] J | - | ND [0.58] J- | - |
| Benzyl butyl phthalate | SW8270D-LL | µg/L | 160 | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] | ND [0.95] | ND [0.95] | ND [0.95] | 0.031 [0.07] J,B | - | ND [0.95] | - |
| bis-(2-Chloroethoxy)methane | SW8270D-LL | µg/L | NE | ND [0.79] | ND [0.81] | ND [0.79] | ND [0.80] J- | ND [0.77] | ND [0.77] | ND [0.77] | ND [0.07] | - | ND [0.77] | - |
| bis-(2-Chloroethyl)ether | SW8270D-LL | µg/L | 0.14 | ND [0.72] | ND [0.73] | ND [0.71] | ND [0.72] J- | ND [0.70] | ND [0.70] J- | ND [0.70] | ND [0.07] | - | ND [0.70] J- | - |
| bis(2-Chloroisopropyl)ether | SW8270D-LL | µg/L | NE | ND [0.74] | ND [0.76] | ND [0.73] | ND [0.75] | ND [0.72] | ND [0.72] | ND [0.72] | ND [0.07] | - | ND [0.72] | - |
| **bis-(2-Ethylhexyl)phthalate** | SW8270D-LL | µg/L | **6** | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] | ND [0.95] | ND [0.95] | ND [0.95] | 0.2 [0.5] J | - | ND [0.95] | - |
| Carbazole | SW8270D-LL | µg/L | NE | ND [0.59] | ND [0.60] | ND [0.58] | ND [0.59] | ND [0.57] | ND [0.57] | ND [0.57] | - | - | ND [0.57] | - |
| Chrysene | SW8270D-LL | µg/L | 2 | ND [0.83] | ND [0.85] | ND [0.83] | ND [0.84] | ND [0.81] | ND [0.81] | ND [0.81] | ND [0.07] | - | ND [0.81] | - |
| Dibenzo(a,h)anthracene | SW8270D-LL | µg/L | 0.034 | ND [0.79] | ND [0.80] | ND [0.78] | ND [0.80] | ND [0.77] | ND [0.77] | ND [0.77] | ND [0.05] | - | ND [0.77] | - |
| Dibenzofuran | SW8270D-LL | µg/L | 7.9 | ND [0.59] | ND [0.60] | ND [0.58] | ND [0.60] | ND [0.57] | ND [0.57] | ND [0.57] | ND [0.07] | - | ND [0.57] | - |
| Diethyl phthalate | SW8270D-LL | µg/L | 15000 | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] | ND [0.95] | ND [0.95] | ND [0.95] | 0.031 [0.05] J,B | - | ND [0.95] | - |
| Dimethyl phthalate | SW8270D-LL | µg/L | 16000 | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] | ND [0.95] | ND [0.95] | ND [0.95] | ND [0.07] | - | ND [0.95] | - |
| Di-n-butyl phthalate | SW8270D-LL | µg/L | 900 | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] | ND [0.95] | ND [0.95] | ND [0.95] | 0.027 [0.07] J | - | ND [0.95] | - |
| Di-n-octyl phthalate | SW8270D-LL | µg/L | 22 | ND [0.98] | ND [1.0] | ND [0.97] | ND [0.99] | ND [0.95] | ND [0.95] | ND [0.95] | ND [0.07] | - | ND [0.95] | - |
| Fluoranthene | SW8270D-LL | µg/L | 260 | ND [0.54] | ND [0.55] | ND [0.54] | ND [0.55] | ND [0.53] | ND [0.53] | ND [0.53] | ND [0.07] | - | ND [0.53] | - |
| Fluorene | SW8270D-LL | µg/L | 290 | ND [0.69] | ND [0.70] | ND [0.68] | ND [0.69] | ND [0.67] | ND [0.67] | ND [0.67] | ND [0.07] | - | ND [0.67] | - |
| Hexachlorobenzene | SW8270D-LL | µg/L | 0.098 | ND [0.68] | ND [0.69] | ND [0.67] | ND [0.69] | ND [0.66] | ND [0.66] | ND [0.66] | ND [0.07] | - | ND [0.66] | - |
| Hexachlorobutadiene | SW8270D-LL | µg/L | 1.4 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] | ND [0.48] | ND [0.07] | - | ND [0.48] | - |
| Hexachlorocyclopentadiene | SW8270D-LL | µg/L | 0.41 | ND [1.8] | ND [1.8] | ND [1.8] | ND [1.8] | ND [1.7] | ND [1.7] | ND [1.7] | - | - | ND [1.7] | - |
| Hexachloroethane | SW8270D-LL | µg/L | 3.3 | ND [1.6] | ND [1.6] | ND [1.6] | ND [1.6] J- | ND [1.6] | ND [1.6] J- | ND [1.6] | ND [0.07] | - | ND [1.6] J- | - |
| Indeno(1,2,3-cd)pyrene | SW8270D-LL | µg/L | 0.19 | ND [0.70] | ND [0.71] | ND [0.69] | ND [0.71] | ND [0.68] | ND [0.68] | ND [0.68] | ND [0.07] | - | ND [0.68] | - |
| Isophorone | SW8270D-LL | µg/L | 780 | ND [0.76] | ND [0.78] | ND [0.75] | ND [0.77] J- | ND [0.74] | ND [0.74] | ND [0.74] | ND [0.05] | - | ND [0.74] | - |
| Naphthalene | SW8270D-LL | µg/L | 1.7 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] | ND [0.48] | 0.034 [0.07] J | - | ND [0.48] | - |

# Table C-2. Groundwater Sample Results
# Operable Unit 4
# Fort Wainwright, Alaska

| | | | **Sample ID** | **17FWOU416WG** | **17FWOU417WG** | **17FWOU418WG** | **17FWOU419WG** | **17FWOU420WG** | **17FWOU421WG** | **17FWOU422WG** | **17FWOU410WQ** | **17FWOU411WQ** | **17FWOU423WQ** | **17FWOU424WQ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Location ID** | AP-5588 | AP-5050 | AP-5589 | AP-8063 | AP-6532 | AP-6530 | AP-6535 | RINSATE 15 | TRIP BLANK | RINSATE 25 | TRIP BLANK |
| | | | **Sample Data Group** | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | 1179528 | K1706778 | K1706778 | 1179528 | 1179528 |
| | | | **Laboratory ID** | 1179528005 | 1179528008 | 1179528009 | 1179528010 | 1179528011 | 1179528012 | 1179528013 | K170677810 | K170677811 | 1179528014 | 1179528015 |
| | | | **Collection Date** | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 11/1/2017 | 11/1/2017 | 11/1/2017 | 6/26/2017 | 6/26/2017 | 11/1/2017 | 10/30/2017 |
| | | | **Matrix** | WG | WG | WG | WG | WG | WG | WG | WQ | WQ | WQ | WQ |
| | | | **Sample Type** | Primary/MS/MSD | Field Duplicate of 17FWOU416WG | Primary | Primary | Primary | Primary | Primary | Equipment Blank | Trip Blank | Equipment Blank | Trip Blank |
| **Analyte** | **Method** | **Units** | **OU4 ROD RG, EPA RSL, or 2016 ADEC Cleanup Level** [1] | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** | **Result [LOD] Qualifier** | **Result [LOD] Qualifier** | **Result LOD Qualifier** | **Result LOD Qualifier** |
| Nitrobenzene | SW8270D-LL | µg/L | 1.4 | ND [0.91] | ND [0.93] | ND [0.91] | ND [0.92] J- | ND [0.89] | ND [0.89] | ND [0.89] | ND [0.07] | - | ND [0.89] | - |
| n-Nitrosodimethylamine | SW8270D-LL | µg/L | 0.0011 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] J- | ND [0.48] J- | - | - | ND [0.48] J- | - |
| n-Nitrosodi-n-propylamine | SW8270D-LL | µg/L | 0.11 | ND [0.66] | ND [0.67] | ND [0.65] | ND [0.66] J- | ND [0.64] | ND [0.64] J- | ND [0.64] | ND [0.1] | - | ND [0.64] J- | - |
| n-Nitrosodiphenylamine | SW8270D-LL | µg/L | 120 | ND [0.79] | ND [0.81] | ND [0.78] | ND [0.80] | ND [0.77] | ND [0.77] | ND [0.77] | ND [0.1] | - | ND [0.77] | - |
| Pentachlorophenol | SW8270D-LL | µg/L | 0.41 | ND [4.9] | ND [5.0] | ND [4.9] | ND [5.0] | ND [4.8] | ND [4.8] | ND [4.8] | ND [1] | - | ND [4.8] | - |
| Phenanthrene | SW8270D-LL | µg/L | 170 | ND [0.85] | ND [0.86] | ND [0.84] | ND [0.86] | ND [0.82] | ND [0.82] | ND [0.82] | ND [0.07] | - | ND [0.82] | - |
| Phenol | SW8270D-LL | µg/L | 5800 | ND [0.49] | ND [0.50] | ND [0.49] | ND [0.50] J- | ND [0.48] | ND [0.48] J- | ND [0.48] | ND [0.2] | - | ND [0.48] J- | - |
| Pyrene | SW8270D-LL | µg/L | 120 | ND [0.67] | ND [0.68] | ND [0.66] | ND [0.68] | ND [0.65] | ND [0.65] | ND [0.65] | ND [0.07] | - | ND [0.65] | - |
| Pyridine | SW8270D-LL | µg/L | NE | ND [2.0] | ND [2.0] | ND [1.9] | ND [2.0] | ND [1.9] | ND [1.9] | ND [1.9] | - | - | ND [1.9] | - |

Yellow highlighted and **bolded** results exceed OU4 ROD remedial goals or 2016 ADEC groundwater cleanup levels.

Grey shaded results are non-detect with LODs above OU4 ROD remedial goals or 2016 ADEC cleanup levels.

1,4-Dioxane results in **red bold font** exceed the EPA RSL. See Note 2.

[1] **OU4 ROD analytes and remedial goals are identified in BLUE text.** The remaining values are 2016 ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of November 7, 2017). These cleanup levels were initially promulgated in November 6, 2016 and utilize risk-based calculations.

[2] 1,4-Dioxane results are compared against both the ADEC cleanup level (4.6 µg/L) and EPA RSL (0.46 µg/L; revised as of May 2018).

**Data Qualifiers:**

B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
J+ - result qualified as estimate with a high-bias due to a QC failure
J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

**Acronyms:**

LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
QC - quality control
RG - remedial goal
ROD - Record of Decision
RSL - regional screening level
WG - groundwater
WQ - water QC sample

# APPENDIX D

MAROS OUTPUT

# MAROS Statistical Trend Analysis Summary

**Project:** OU4 2017

**Location:** Fort Wainwright

**User Name:** FES

**State:** Alaska

**Time Period:** 7/1/1997 **to** 10/30/2017

**Consolidation Period:** No Time Consolidation

**Consolidation Type:** Average

**Duplicate Consolidation:** Average

**ND Values:** 1/2 Detection Limit

**J Flag Values :** Actual Value

| Well | Source/ Tail | Number of Samples | Number of Detects | Average Conc. (mg/L) | Median Conc. (mg/L) | All Samples "ND" ? | Mann-Kendall Trend | Linear Regression Trend |
|---|---|---|---|---|---|---|---|---|
| 1,1,2,2-TETRACHLOROETHANE | | | | | | | | |
| AP-5588 | S | 37 | 37 | 1.8E+00 | 1.8E+00 | No | D | D |
| AP-5589 | S | 38 | 22 | 2.1E-03 | 3.3E-04 | No | PI | PI |
| AP-8063 | T | 29 | 27 | 2.4E-02 | 2.1E-02 | No | NT | S |
| 1,1,2-TRICHLOROETHANE | | | | | | | | |
| AP-5588 | S | 37 | 37 | 1.0E-02 | 9.4E-03 | No | D | D |
| BENZENE | | | | | | | | |
| AP-10257 | S | 10 | 10 | 1.4E-02 | 1.4E-02 | No | NT | NT |
| AP-10258 | S | 10 | 9 | 3.8E-03 | 4.3E-03 | No | I | I |
| AP-5588 | S | 37 | 37 | 2.0E-03 | 2.1E-03 | No | D | D |
| AP-5589 | S | 38 | 38 | 3.5E-03 | 3.5E-03 | No | D | D |
| AP-6530 | T | 12 | 12 | 3.0E-03 | 2.8E-03 | No | D | PD |
| AP-6532 | T | 38 | 38 | 6.5E-03 | 8.2E-03 | No | I | I |
| AP-6535 | T | 12 | 12 | 3.2E-03 | 3.3E-03 | No | S | S |
| AP-8061 | T | 30 | 30 | 4.4E-03 | 4.8E-03 | No | D | D |
| AP-8063 | T | 29 | 28 | 2.5E-03 | 2.7E-03 | No | D | D |
| FWLF-4 | S | 36 | 35 | 1.3E-03 | 1.3E-03 | No | D | S |
| cis-1,2-DICHLOROETHYLENE | | | | | | | | |
| AP-5588 | S | 37 | 36 | 1.5E-01 | 1.6E-01 | No | D | S |
| AP-6535 | T | 12 | 12 | 3.2E-02 | 3.3E-02 | No | NT | I |
| AP-8061 | T | 30 | 30 | 1.6E-02 | 1.6E-02 | No | D | D |
| AP-8063 | T | 29 | 29 | 7.4E-02 | 8.3E-02 | No | I | S |
| TRICHLOROETHYLENE (TCE) | | | | | | | | |
| AP-5588 | S | 37 | 37 | 2.4E-01 | 2.5E-01 | No | PD | PD |
| AP-5589 | S | 38 | 38 | 4.0E-03 | 3.9E-03 | No | I | I |
| AP-8061 | T | 30 | 30 | 7.9E-03 | 7.7E-03 | No | D | D |
| AP-8063 | T | 29 | 29 | 1.9E-02 | 2.2E-02 | No | NT | S |

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

# MAROS Statistical Trend Analysis Summary

**Project:** OU4 2017

**User Name:** FES

**Location:** Fort Wainwright

**State:** Alaska

**Time Period:** 7/1/1997 **to** 10/30/2017

**Consolidation Period:** No Time Consolidation

**Consolidation Type:** Average

**Duplicate Consolidation:** Average

**ND Values:** 1/2 Detection Limit

**J Flag Values :** Actual Value

| Well | Source/ Tail | Number of Samples | Number of Detects | Average Conc. (mg/L) | Median Conc. (mg/L) | All Samples "ND" ? | Mann-Kendall Trend | Linear Regression Trend |
|---|---|---|---|---|---|---|---|---|
| VINYL CHLORIDE | | | | | | | | |
| AP-5588 | S | 37 | 30 | 9.6E-04 | 1.1E-03 | No | S | NT |
| AP-5589 | S | 38 | 32 | 1.1E-03 | 1.1E-03 | No | D | S |
| AP-6535 | T | 12 | 10 | 8.4E-04 | 1.0E-03 | No | S | S |
| AP-8063 | T | 29 | 24 | 1.1E-03 | 1.3E-03 | No | D | D |

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

# APPENDIX E
## PHOTOGRAPHIC LOG

# 2017 GROUNDWATER SAMPLING LOG – OU4

Collecting groundwater parameters at the Landfill for well AP-8061.

Extremely wet conditions at well AP-6532.

Wet trail conditions near AP-6530 (view to the North).

Standing water near AP-8063 (view to the North).

Trail conditions between AP-6530 and AP-6532 (view to the East).

Trail conditions between AP-6535 and AP-6530 (view to the North).

Trail conditions at AP-6535 (view to the Northwest).

Trail conditions between AP-6530 and AP-6535 (view to the North).

# COMMENTS

**REVIEW COMMENTS** **PROJECT: Fort Wainwright, Alaska**
**DOCUMENT: 2017 OU4 Monitoring Report** **Location: Fort Wainwright , Alaska**

| | | |
|---|---|---|
| **U.S. ARMY CORPS OF ENGINEERS** | **DATE: 7/13/18**<br>**REVIEWER: Erica Blake, ADEC**<br>**PHONE: 451-2182** | **Action taken on comment by: Fairbanks Environmental Services Inc.** |

| **Item No.** | **Drawing Sheet No., Spec. Para.** | **COMMENTS** | **REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain) | **CONTRACTOR RESPONSE** | **ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)** |
|---|---|---|---|---|---|
| 1. | General | Benzene concentrations in AP-10257MW have been above the remedial action goal (RAG) for several years. The monitoring well was installed near the CAT Shed (Bldg 1191) to monitor contaminant migration. DEC is concerned the benzene exceedances above the RAG in the AP-10257MW well has migrated from the class V injection well located at the CAT Shed. In order to address this source area, DEC recommends removing the contaminated soil.<br>In a letter dated December 8, 2017 addressed to the Army, DEC requested an update on the removal of the septic system and wood stave leaching pit at the Landfill Garage (Building 1191). Has the Army made any further decisions on the cleanup at this area? | Noted | The status of this site is listed as open in the ADEC database. However, the two wells found to contain benzene during the investigations at the Building 1191 Landfill CAT Shed site continue to be monitored as part of the long-term Landfill monitoring program. This site currently meets EPA's objective to ensure the injection well at issue is in compliance with the Safe Drinking Water Act Regulations (Section 7.3 of the Third Five Year Report, Fort Wainwright).<br>Well AP-10257 is located crossgradient of the leach field, and downgradient of the active landfill. It has been determined that contamination in this well is most likely from the active landfill.<br>In a letter from Mr. Joseph Malen dated 17 August 2011 entitled *Incorporation of Building 1191, Landfill CAT Shed - Underground Injection Control Program Investigation Site into Operable Unit 4 Investigations*, to ADEC, Mr. Jacques Gusmano and Ms. Deb Caillouet, he states the following:<br>"In response to the US Environmental Protection Agency, Region 10 Underground Injection Control Program Consent Agreement and Final Order which includes the Landfill CAT Shed on Fort Wainwright, U.S. Army Garrison Fort Wainwright has committed to adding additional investigations related to the | Disagree. Based on your comment, there are currently investigations going on at Building 1191. DEC is unaware of any investigations and requests a copy of the schedule of investigations at Building 1191. DEC also requests further discussion on site cleanup progress at Building 1191 at the next RPM meeting scheduled for October 17, 2018. |

| **U.S. ARMY CORPS OF ENGINEERS** | **DATE: 7/13/18**<br>**REVIEWER: Erica Blake, ADEC**<br>**PHONE: 451-2182** | **Action taken on comment by: Fairbanks Environmental Services Inc.** |
|---|---|---|

| **Item No.** | **Drawing Sheet No., Spec. Para.** | **COMMENTS** | **REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain) | **CONTRACTOR RESPONSE** | **ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)** |
|---|---|---|---|---|---|
| | | | | subject injection well to the normal Operable Unit 4 investigations currently in progress at the Fort Wainwright Landfill. Building 1191 is already a part of the Landfill Source Area so additional administrative actions are not necessary.<br>Assistant Regional Counsel, Ankur Tohan's letter explicitly cites that "Any additional action, if necessary, to address contamination at the Landfill CAT Shed will be overseen by the CERCLA Program. Completion of these remaining actions will meet EPA's objectives to ensure the injection wells at issue in this enforcement action are in compliance with Safe Drinking Water Act Regulations."<br>According to the Certified Letter classified as "Enforcement Confidential" from the US EPA Region 10, Office of Regional Counsel, the Enforcement Action will be satisfied when the Landfill CAT Shed's UIC issue is incorporated/ documented within the Fort Wainwright Five Year Review. This information is mentioned in Section 7.3 of the Third Five Year Review. | |

| **U.S. ARMY CORPS OF ENGINEERS** | **DATE: 7/13/18**<br>**REVIEWER: Erica Blake, ADEC**<br>**PHONE: 451-2182** | **Action taken on comment by: Fairbanks Environmental Services Inc.** |
|---|---|---|

| Item No. | Drawing Sheet No., Spec. Para. | COMMENTS | REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain) | CONTRACTOR RESPONSE | ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE) |
|---|---|---|---|---|---|
| 2. | Executive Summary – General | The most recent permafrost study in the OU4 Landfill area was in 2010. DEC recommends re-surveying the permafrost in the OU4 area to obtain more current information about the permafrost beneath the landfill area. | Noted | The Army would like to defer this issue and evaluate it as a proposed recommendation to the next Five-Year Review. | Agree. |
| 3. | Figures – General | Please add to the figures the location of the containment cell containing pesticide-contaminated soil from Operable Unit 1.<br>This containment cell containing pesticide-contaminated soil needs to be documented on the figures for this 2017 report, as well as all future groundwater monitoring reports. | A | The containment cell of the pesticide-contaminated soil from OU1 will be identified on the figures. | Agree with comment back-check. |
| 4. | Figure 2-1 | Figure 2-1 should include the CAT shed, septic system and leach pit. Please provide the location of these features on a figure in this report. | A | The requested features will be added to Figure 2-1. | Agree with comment back-check. |
| 5. | Section 2.5, 3rd Paragraph | The most recent IDW Technical Memorandum DEC has is, 2016 FWA IDW TM, dated March 3, 2017. DEC has not received any 2017 IDW Technical Memorandum, is this reference different from the 2016 IDW Technical Memorandum? | A | The 2017 IDW TM has not been submitted yet. Once the manifest for the OU1 soils is approved, the TM will be submitted. | Agree. |
| 6. | Section 5.0 – UpgradientWell Recommendation | DEC agrees that AP-5593 should be added to the sampling program, assuming the condition of this well is good and it can be sampled. Would this well be added to the sampling program in 2019? | A | The soonest this well could be sampled is 2019. | Agree. Sampling the well in 2019 is fine. |
| 7. | Appendix D MAROS Output | There were no MAROS trend graphs included with this OU4 Landfill report, please include MAROS trend | Noted | This comment has been addressed for past Landfill Reports. FES typically uses MAROS | Agree. How many more rounds of |

**REVIEW COMMENTS** **PROJECT: Fort Wainwright, Alaska**
**DOCUMENT: 2017 OU4 Monitoring Report** **Location: Fort Wainwright , Alaska**

| | | |
|---|---|---|
| **U.S. ARMY CORPS OF ENGINEERS** | **DATE: 7/13/18**<br>**REVIEWER: Erica Blake, ADEC**<br>**PHONE: 451-2182** | **Action taken on comment by: Fairbanks Environmental Services Inc.** |

| **Item No.** | **Drawing Sheet No., Spec. Para.** | **COMMENTS** | **REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain) | **CONTRACTOR RESPONSE** | **ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)** |
|---|---|---|---|---|---|
| | | graphs for this report. It would be helpful to see these trend graphs for OU4. | | to conduct trend analysis at the Fort Wainwright OU sites where we collect groundwater samples; however, trend analysis has not been conducted at the OU4 landfill site due to the fact that too few wells are sampled within the separate groundwater flow networks (shallow, intermediate, deep) to complete the analysis. Contaminant trend discussions are based on monitoring data at each well that has accumulated since 1997. | samples will need to be collected to perform MAROS on OU4 monitoring well data? Once there is enough data, DEC would like to see MAROS trend graphs included with the annual reports. |
| | | --- End of Comments --- | | | |

**REVIEW COMMENTS**

**PROJECT: Fort Wainwright, Alaska**

**DOCUMENT: 2017 Annual IC Report**

**Location: Fort Wainwright , Alaska**

| | | |
|---|---|---|
| **U.S. ARMY CORPS OF ENGINEERS** | **DATE: 6/6/2018**<br>**REVIEWER: Sandra Halstead**<br>**PHONE: 271-1218** | **Action taken on comment by: Karol Johnson** |

| **Item No.** | **Drawing Sheet No., Spec. Para.** | **COMMENTS** | **REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain) | **CONTRACTOR RESPONSE** | **ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)** |
|---|---|---|---|---|---|
| 1. | General | Might be worth sampling AP-6534 (deep, SW of the chlorinated solvent wells AP-5588, AP-8063) to try to get a boundary on that plume. Maybe at least prior to the next Five Year Review. (this is a repeat comment from last year and the RTC said it would be revisited in 2017) | A | The additional downgradient well (AP-6534) will be sampled once as part of the Five-Year sampling next year. | |
| 2. | General | The screening level for 1,4-dioxane is using ADEC cleanup values. I didn't catch that in the original workplan. The tapwater RSL for 1,4-dioxane is EPA has calculated a screening level 0.46 µg/L for tap water, based on a 1 in 10-6 lifetime cancer risk. It appears nearly all wells exceed the EPA HA of 0.35 ug/L for 1,4-dioxane but the figures are using the ADEC cleanup number to portray exceedances. For the 2018 report, please compare results to the ADEC cleanup value and either the EPA tapwater RSL or EPA HA. | A | The Report will be updated to compare 1,4-dioxane to the EPA RSL. All tables and figures will be changed accordingly. Discussion about ADEC cleanup level exceedances will be covered, but only as secondary information. | |
| 3. | Section 3-3 | Section 3-3 says the "EPA classifies 1,4-dioxane as an emerging contaminant due to renewed interest in evaluating and investigating potential impacts, as new techniques for testing have become available." It would be preferred if this sentence could be changed to reflect that 1,4-dioxane is an emerging contaminant due to its classification as a possible carcinogen, is highly mobile and water soluble, and doesn't biodegrade in the environment. (see the EPA technical fact sheet if you want more info: Caution-Caution-Blockedhttps://www.epa.gov/sites/production/files/2014-03/documents/ffrro_factsheet_contaminant_14-dioxane_january2014_final.pdf < Caution-Caution- | A | The text will be modified to reflect that 1,4-dioxane is an emerging contaminant due to its classification as a possible carcinogen, is highly mobile and water soluble, and doesn't biodegrade in the environment. | |

| | | |
|---|---|---|
| **U.S. ARMY CORPS OF ENGINEERS** | **DATE: 6/6/2018**<br>**REVIEWER: Sandra Halstead**<br>**PHONE: 271-1218** | **Action taken on comment by: Karol Johnson** |

| Item No. | Drawing Sheet No., Spec. Para. | COMMENTS | REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain) | CONTRACTOR RESPONSE | ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE) |
|---|---|---|---|---|---|
| | | https://www.epa.gov/sites/production/files/2014-03/documents/ffrro_factsheet_contaminant_14-dioxane_january2014_final.pdf > ) | | | |
| 4. | | I agree with ADEC that at least once a decade the permafrost should be mapped at this site. The last mapping effort was in 2010 so if we could shoot for mapping in 2020 that would be useful. Climate change is real and it appears the integrity of the permafrost block is an important factor in plume mobility. (I made a similar comment in the 2015 report). | Noted | The Army would like to defer this issue and evaluate it as a proposed recommendation to the next Five-Year Review. | |
| 5. | | Not for this report, but just to make sure that the Army will be adding the OU4 Landfill as a potential source in the PFAS Preliminary Assessment to be conducted in 2018. The OU4 Fire Training Pit excavated soils were reported to be disposed at the landfill. | Noted | The landfill is listed as one of the areas that will be reviewed as part of the PFAS Preliminary Assessment slated for August 2018. However, it should be noted that The excavated soils from the Fire Training pits were thermally treated and then used for cap material at the ACTIVE landfill. | |
| End of comments | | | | | |

# COVER LETTERS

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**INSTALLATION MANAGEMENT COMMAND**
**HEADQUARTERS, U.S. ARMY GARRISON ALASKA**
**1046 MARKS ROAD #4500**
**FORT WAINWRIGHT, ALASKA 99703-6000**

REPLY TO
ATTENTION OF:

October 3, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 ANNUAL SAMPLING REPORT – OPERABLE UNIT 4, FORT WAINWRIGHT, ALASKA, to State of Alaska Department Environmental Conservation.

Ms. Erica Blake
Alaska Department of Environmental Conservation
Environmental Program Specialist
610 University Avenue
Fairbanks, AK 99709

Dear Ms. Blake:

This letter documents transmission of the Final 2017 Annual Sampling Report for Operable Unit 4 (OU4) on Fort Wainwright, Alaska.

The document may be retrieved via the Army Aviation and Missile Research Development and Engineering Center (AMRDEC) Safe Access File Exchange (SAFE) system. If you would like to receive a hard copy or CD of this document, please notify us within the next few weeks. A copy of this letter and document is being provided to Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency, and Dennis Shepard, Environmental Program Manager, Alaska Department of Environmental Conservation.

If you have questions or concerns regarding this action please contact Mr. Brian Adams, Directorate of Public Works, Remedial Program Manager, (907) 361-6623 or email: brian.m.adams18.civ@mail.mil.

Sincerely;

Brian M Adams

Brian Adams
Remedial Program Manager

CC:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**INSTALLATION MANAGEMENT COMMAND**
**HEADQUARTERS, U.S. ARMY GARRISON ALASKA**
**1046 MARKS ROAD #4500**
**FORT WAINWRIGHT, ALASKA 99703-6000**

REPLY TO
ATTENTION OF:

October 3, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 ANNUAL SAMPLING REPORT – OPERABLE UNIT 4, FORT WAINWRIGHT, ALASKA, to Environmental Protection Agency.

Ms. Sandra Halstead
Environmental Protection Agency
Federal Facilities Superfund Site Manager
Alaska Operations Office
222 W. 7th Ave, #19
Anchorage, AK 99513

Dear Ms. Halstead:

This letter documents transmission of the Final 2017 Annual Sampling Report for Operable Unit 4 (OU4) on Fort Wainwright, Alaska.

This deliverable may be retrieved via the Army Aviation and Missile Research Development and Engineering Center (AMRDEC) Safe Access File Exchange (SAFE) system. If you would like to receive a hard copy or CD of this document, please notify us within the next few weeks. A copy of this document is being provided to Mr. Dennis Shepard, Environmental Program Manager, Alaska Department of Environmental Conservation, and Ms. Erica Blake, Environmental Protection Specialist, Alaska Department of Environmental Conservation.

If you have questions or concerns regarding this action please contact Mr. Brian Adams, Directorate of Public Works, Remedial Program Manager, (907) 361-6623 or email: brian.m.adams18.civ@mail.mil.

Sincerely;

Brian M. Adams

Brian Adams
Remedial Program Manager

CC:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

**DEPARTMENT OF THE ARMY**
**INSTALLATION MANAGEMENT COMMAND**
**HEADQUARTERS, U.S. ARMY GARRISON ALASKA**
**1046 MARKS ROAD #4500**
**FORT WAINWRIGHT, ALASKA 99703-6000**

REPLY TO
ATTENTION OF:

October 3, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 ANNUAL SAMPLING REPORT – OPERABLE UNIT 4, FORT WAINWRIGHT, ALASKA, to State of Alaska Department Environmental Conservation.

Mr. Dennis Shepard
Alaska Department of Environmental Conservation
Environmental Program Manager
610 University Avenue
Fairbanks, AK 99709

Dear Mr. Shepard:

This letter documents transmission of the Final 2017 Annual Sampling Report for Operable Unit 4 (OU4) on Fort Wainwright, Alaska.

The document may be retrieved via the Army Aviation and Missile Research Development and Engineering Center (AMRDEC) Safe Access File Exchange (SAFE) system. If you would like to receive a hard copy or CD of this document, please notify us within the next few weeks. A copy of this letter and document is being provided to Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency, and Erica Blake, Environmental Program Specialist, Alaska Department of Environmental Conservation.

If you have questions or concerns regarding this action please contact Mr. Brian Adams, Directorate of Public Works, Remedial Program Manager, (907) 361-6623 or email: brian.m.adams18.civ@mail.mil.

Sincerely;

Brian M. Adams

Brian Adams
Remedial Program Manager

CC:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)