FINAL

2017 Monitoring Report

Operable Unit 2

Fort Wainwright, Alaska

Site	ADEC File No.	ADEC Hazard ID
DRMO	108.38.069.01	1122
1168	108.38.069.02	1125
Building 5001	108.26.029	25010

Contract No. W911KB-12-D-0001

Task Order 33

May 2018

FES

FAIRBANKS ENVIRONMENTAL SERVICES, INC.

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #6000
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

May 30, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 OU2 MONITORING REPORT – OPERABLE UNIT 2, 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 Monitoring Report for Operable Unit 2 (OU2) 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 Dr. Laura Buelow, Project Manager, Environmental Protection Agency, 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 the undersigned at, (907) 361-9687 or email kristina.a.smith14.civ@mail.mil or you may contact Mr. Brian Adams, Directorate of Public Works, Remedial Program Manager, (907) 361-6623 or email brian.m.adams18.civ@mail.mil.

Sincerely;

for Brian M. Adams

Kristina A. Smith
Remedial Project Manager

CC:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #6000
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May 30, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 OU2 MONITORING REPORT – OPERABLE UNIT 2, FORT WAINWRIGHT, ALASKA, to Environmental Protection Agency.

Dr. Laura Buelow
Environmental Protection Agency
Project Manager
Hanford Project Office
825 Jadwin Ave, Ste 210
Richland, WA 99352

Dear Dr. Buelow:

This letter documents transmission of the Final 2017 Monitoring Report for Operable Unit 2 (OU2) on Fort Wainwright, Alaska.

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REPLY TO
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May 30, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 OU2 MONITORING REPORT – OPERABLE UNIT 2, 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 Monitoring Report for Operable Unit 2 (OU2) on Fort Wainwright, Alaska.

The document and all native files have been provided on a CD, and may also 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 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, Dr. Laura Buelow, Project Manager, Environmental Protection Agency, and Erica Blake, Environmental Program Specialist, Alaska Department of Environmental Conservation.

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Sincerely;

for Brian M. Adams
Kristina A. Smith
Remedial Project Manager

CC:
HQ, USAG FWA CERCLA Administrative Records (w/o encls)

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #6000
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

May 30, 2018

Directorate of Public Works

Subject: Submission of the FINAL 2017 OU2 MONITORING REPORT – OPERABLE UNIT 2, 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 Monitoring Report for Operable Unit 2 (OU2) on Fort Wainwright, Alaska.

The document and all native files have been provided on a CD, and may also 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 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, Dr. Laura Buelow, Project Manager, Environmental Protection Agency, and Dennis Shepard, Environmental Program Manager, Alaska Department of Environmental Conservation.

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Sincerely;

for Brian M. Adams
Kristina A. Smith
Remedial Project Manager

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HQ, USAG FWA CERCLA Administrative Records (w/o encls)

FINAL

2017 Monitoring Report

Operable Unit 2
U.S. Army Garrison Fort Wainwright, Alaska

ADEC File Numbers	ADEC Hazard IDs
108.38.069.01 (DRMO)	1122 (DRMO)
108.38.069.02 (Former Bldg 1168)	1125 (Former Bldg 1168)
108.26.029 (Former Bldg 5001)	25010 (Former Bldg 5001)

May 2018

Prepared for

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Under Contract to

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LIST OF ACRONYMS AND ABBREVIATIONS

1,1-DCE	1,1-dichloroethene
AAC	Alaska Administrative Code
AFCEE	Air Force Center for Engineering and the Environment
ADEC	Alaska Department of Environmental Conservation
AS	air sparging
AWQS	Alaska Water Quality Standards
bgs	below ground surface
CD	compact disc
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
COC	contaminants of concern
DERA	Defense Environmental Restoration Account
DO	dissolved oxygen
DoD	Department of Defense
DOL	Directorate of Logistics
DPW	Directorate of Public Works
DRO	diesel range organics
DRMO	Defense Reutilization Marketing Office
ECC	Environmental Compliance Consultants
EPA	Environmental Protection Agency
FES	Fairbanks Environmental Services Inc
FFA	Federal Facilities Agreement
GAC	granular activated carbon
GIS	geographic information systems
GRO	gasoline range organics
HLA	Harding Lawson Associates
HQAES	Headquarters Army Environmental System
IC	Institutional Control
IDW	investigation-derived waste
ISCO	*in-situ* chemical oxidation
ISCR	*in-situ* chemical reduction
LBE	Left Behind Equipment
LOD	limit of detection
LOQ	limit of quantitation
LTMO	long-term monitoring optimization
MAROS	Monitoring and Remediation Optimization System
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/L	milligrams per liter
mS/cm	milliSiemens per centimeter
mV	millivolts
N/A	not applicable
NA	natural attenuation
NC	not calculated

LIST OF ACRONYMS AND ABBREVIATIONS CONT'D

ND	not detected
NRC	National Response Corporation
ORC	oxygen-releasing compound
ORP	oxidation-reduction potential
OU2	Operable Unit 2
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
POL	petroleum, oil, and lubricants
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RAG	Remedial Action Goal
RAO	remedial action objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Program Manager
RRO	residual range organics
SGS	SGS North America Inc.
SVE	soil vapor extraction
SVOC	semivolatile organic compounds
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
trans-1,2-DCE	trans-1,2-dichloethene
UCL	Upper Confidence Limit
UCB	Upper Confidence Band
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USARAK	U.S. Army Alaska
UST	underground storage tank
VOC	volatile organic compounds
WSW	Water Supply Well

EXECUTIVE SUMMARY

Operable Unit 2 (OU2) includes several chlorinated solvent- and petroleum-contaminated sites at the Defense Reutilization Marketing Office (DRMO) Yard and Former Building 1168 at U.S. Army Garrison Fort Wainwright, Alaska. Cleanup activities at these sites were conducted under the 3-Party Agreement. There are several additional petroleum hydrocarbon-contaminated sites located in these areas where cleanup activities were conducted under the 2-Party Agreement. Some of the sites were actively treated while only groundwater monitoring was conducted at other sites. Groundwater monitoring continues at all of the sites. The results of the 2017 monitoring program and recommendations for 2018 are presented in this report.

DRMO Yard 3-Party Sites

Chlorinated compounds exceeding Record of Decision (ROD) remedial action goals (RAG) have historically been present within the DRMO1 and DRMO4 3-Party subareas of the DRMO Yard. Active treatment using air sparging (AS)/soil vapor extraction (SVE) was conducted between 1997 and 2005 at the DRMO1 site. Long-term monitoring optimization (LTMO) analysis of the sites in 2008 indicated stable and decreasing trends for the contaminants of concern (COCs), but also indicated that the contaminants would likely persist for a significant time above the RAG. Based on these results, a treatability study utilizing injection of an *in-situ* chemical reduction (ISCR) compound was completed (TS reference). The goals of the treatability study were to evaluate the potential to stimulate reductive dechlorination, reduce the time required to achieve the RAG, and reduce long-term monitoring costs. Injections as part of the treatability study were completed at the DRMO1 and DRMO4 sites in 2009. A second injection was completed at the DRMO1 site in 2010, and a second injection was completed at the DRMO4 site in 2011.

Post-injection groundwater monitoring has been conducted at these sites and has shown the stimulation of reducing conditions and biodegradation of the residual tetrachloroethene (PCE). PCE exceeded the RAG in one well in the DRMO 1 source area (AP-10016), and in one well in the DRMO4 source area (PO5) during 2017. However, groundwater geochemistry indicates that reducing conditions are persistent in these areas and natural attenuation of the residual PCE is continuing. Evaluation of water levels at the DRMO 3-Party sites has shown that PCE concentrations tend to increase with increasing groundwater elevations. The groundwater elevations in 2017 were lower than in 2016, and the lowest since 2013. This decrease in water level may have had an impact on the observed decrease in PCE concentration. Evaluation of the PCE plumes using the Monitoring and Remediation Optimization System (MAROS) software showed the PCE contaminant plume remains stable.

Based on the 2017 sampling results, annual sampling should continue in the fall at the DRMO1 and DRMO4 3-Party sites. However, TOC and alkalinity analyses are recommended to be removed from the monitoring program since the treatability studies have been completed, and measurement of other geochemical parameters and daughter product concentrations is sufficient for evaluating biodegradation.

DRMO Yard 2-Party Sites

There are three petroleum hydrocarbon-contaminated sites that are currently monitored within the DRMO Yard. The DRMO1 and DRMO5 2-Party sites are contaminated with DRO, and were initially treated using AS/SVE. Treatment in these areas was not effective and was discontinued in 2003. Each of these systems was decommissioned in October 2008. Groundwater sampling frequency for these sites was reduced from annual to once every five years following the 2011 sampling event. Groundwater samples were last collected from these sites in 2015 and the DRO concentrations were within the range normally observed at the site with no increasing trends.

The third petroleum hydrocarbon-contaminated area at the DRMO Yard, located near Building 5010 (DRMO2 subarea, former Building 5001), has not been actively treated. Groundwater samples were collected from this site in 2017 and continue to show that DRO is the only COC that exceeds the Alaska Department of Environmental Conservation (ADEC) cleanup level; however, there is a decreasing trend. A sample was also collected from the Water Supply Well (WSW), which is used to provide water to several DRMO buildings along with a fire suppression tank. No contaminants were detected in the sample.

Groundwater sampling should continue on a five year cycle for the DRMO1 and DRMO5 2-Party sites, with the next sampling event to be completed in 2019 in advance of the 2021 Five Year Review. However, annual sampling should continue for the Building 5010 and the WSW.

Former Building 1168 Site

The former Building 1168 3-Party site is located on the south side of the former building and is associated with the Leach Well. The primary COCs at this site included benzene and trichloroethene (TCE). Benzene and TCE were reduced below the RAG as a result of treatment system operation. TCE remained below the RAG; however, benzene rebounded above the RAG after treatment system shutdown and remained above the RAG for 11 consecutive sampling events. As a result, a treatability study was initiated in 2010 utilizing injection of chemical oxidation and oxygen releasing compounds as described in the Treatability Study Report (FES, 2017b). Groundwater sampling results show benzene has not been detected above the RAG since 2010. Statistical analysis of the post-treatability study results show that the benzene remedial goal has been achieved in all three wells at the site. DRO is intermittently detected above the ADEC cleanup level at the former Building 1168 site in AP-5751, although a long-term decreasing trend in this well has been observed.

Based on the statistical analysis of the benzene results at the former Building 1168 site, the Environmental Protection Agency (EPA) recommended an interim Remedial Action Completion Report (iRACR) to document remedial action complete under CERCLA (USACE, 2016). The data in the iRACR, this Annual Monitoring Report, and the 1168 Treatability Study Report (FES, 2017b), may be used as a basis for transfer of the site from the 3-Party Program to the 2-Party Program. Until this transfer is completed, groundwater sampling should continue on an annual basis at the former Building 1168 3-party site.

1,4-Dioxane Analysis Results

In addition to the evaluation of the COCs at the OU2 sites, 1,4-dioxane analysis was included in the 2017 monitoring program based on recommendations from the Fourth Five Year Review conducted in 2016 (U.S. Army Garrison Fort Wainwright, 2016). 1,4-dioxane analysis was not included in previous investigations, and the 2017 analysis showed only trace detections in one well at the DRMO4 3-Party site (PO5), and in one well at the Building 5010 site (AP-7348). These results were more than an order of magnitude below the cleanup level, and all other sampling results were non-detect. This indicates there is not 1,4-dioxane contamination at the OU2 sites, and no additional analysis for 1,4-dioxane in future sampling events is recommended.

Contaminant Concentration Comparison to Current ADEC Cleanup Levels

In November 2016, the ADEC cleanup levels were revised utilizing risk-based calculations. This resulted in a significant change in the groundwater cleanup level for many compounds. The revised cleanup levels would apply to 2-Party sites for evaluation of cleanup under ADEC regulations. In addition, the current ADEC cleanup levels should be applied to ROD analytes for any 3-Party site transferred to the 2-Party program after ROD objectives are achieved, or upon agreement by the Army, ADEC, and EPA.

The 2017 groundwater sampling results at the OU2 3-Party sites were compared to current ADEC cleanup levels for ROD COCs and non-ROD COCs for informational purposes. The comparison showed:

- Exceedances of ADEC cleanup levels where exceedances were not previously identified:
    - Non-ROD COC 1,2,4-trimethylbenzene at DRMO4 3-Party site
    - Non-ROD COC naphthalene at former Building 1168 3-Party site
    - ROD COC TCE at the DRMO4 3-Party site
- Concentrations that exceed the ROD RAG, but are below current ADEC cleanup levels
    - ROD COC PCE at DRMO1 and DRMO4 3-Party sites

The revised ADEC cleanup levels were also compared to the 2017 groundwater sampling results at the OU2 2-Party sites for evaluation of compliance with ADEC closure requirements. The comparison showed:

- Exceedances of ADEC cleanup levels where exceedances were not previously identified:
    - Naphthalene and 1,2,4-trimethylbenzene at Building 5010 2-Party Site

IC Inspection Summary

An annual Institutional Controls (IC) inspection was conducted at the DRMO yard and the former Building 1168 sites in 2017. The inspections showed the ICs have been properly implemented, and minor maintenance items (such as replacing locks on monitoring wells) were completed at

the time of the inspection. In addition, the fence on the north side of the DRMO yard was repaired in 2017 as a result of the findings from the 2016 IC inspection. Further details regarding the IC inspection are presented in the 2017 IC inspection report.

Monitoring Well Decommissioning

A Postwide monitoring well decommissioning effort was conducted in 2017, and the inactive wells at the OU2 sites were evaluated to determine if the wells may be decommissioned or if they should be retained for possible future sampling. All of the inactive wells at the OU2 sites were recommended for decommissioning, including 24 wells at the DRMO yard, 2 wells at Building 5010, and 6 wells at former Building 1168. The 32 inactive wells were decommissioned in September and October, 2017.

1.0 INTRODUCTION

This report documents site activities and groundwater monitoring results during 2017 at Operable Unit 2 (OU2) sites on Fort Wainwright, Alaska. The groundwater monitoring program during 2017 focused on evaluating contaminant concentration trends at several 2-Party and 3-Party sites in the Defense Reutilization Marketing Office (DRMO) Yard and at the 3-Party site at former Building 1168. This report also provides a summary of the Institutional Control (IC) inspections conducted at the OU2 sites during 2017.

This document and the associated fieldwork were completed by Fairbanks Environmental Services Inc. (FES) under U.S. Army Corps of Engineers (USACE) contract W911KB-16-D-0005, Task Order 3. The work was completed according to the 2017 Postwide Work Plan (FES, 2017a). The work was completed under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and in compliance with the OU2 Record of Decision (ROD), Federal Facility Agreement (FFA), and state of Alaska regulations.

1.1 DRMO Background

The DRMO Yard is a fenced area of approximately 25 acres located in the southeast portion of the main post area of Fort Wainwright, Alaska. It lies northwest of the intersection of Badger Road and the Richardson Highway adjacent to Fairbanks, Alaska. Under a FFA between the U.S. Department of Defense (DoD), Alaska Department of Environmental Conservation (ADEC), and the Environmental Protection Agency (EPA), the DRMO Yard was placed in OU2 for purposes of remediation under CERCLA. A site location map is included as Figure 1-1.

Historical activities conducted at the DRMO Yard included vehicle maintenance, drum storage, and open burning. The site was operated as a vehicle maintenance shop compound from 1945 until 1961 when it was converted to a salvage yard. Items stored at the salvage yard have included petroleum products, pesticides and herbicides, tar and asphalt, transformers, transformer oil [containing polychlorinated biphenyls (PCBs)], appliances, vehicles, and paint products. Currently, the DRMO Yard stores surplus equipment and supplies for the Army.

The Directorate of Logistics (DOL) has also constructed two large gravel pads in the DRMO Yard for storage and staging of equipment and vehicles prior to deployment. A number of fuel spills were observed as a result of the activities on these new pads. The nature and extent of these spills were investigated by Jacobs Engineering during 2010, and were described in the 2010 OU2 Monitoring Report (FES, 2011).

Contaminants were first observed in groundwater in the DRMO Yard during a study conducted at an adjacent facility between 1990 and 1993. Both diesel range organics (DRO) and trichloroethene (TCE) were discovered in groundwater samples collected from DRMO Yard wells

during this study. Pursuant to these findings, a preliminary source investigation was conducted at the DRMO Yard in 1992. This study, consisting of groundwater and soil sampling, indicated that diesel, naphthalene, petroleum hydrocarbons, and volatile organic compounds (VOCs) were present on site. A Remedial Investigation and Feasibility Study (RI/FS) was performed for all of OU2 in 1995 and characterized contamination throughout the DRMO Yard (Harding Lawson Associates [HLA], 1996). A ROD, prepared following completion of the RI/FS, specified the remedial actions to be undertaken to treat soil and groundwater contamination.

1.2 DRMO Subarea Descriptions

Based on the findings of the RI/FS, the OU2 ROD identified five subareas of contamination within the DRMO Yard (U.S. Army Alaska [USARAK], 1997). The subareas are shown on Figure 1-2 and summarized in Table 1-1.

Table 1-1. Summary of DRMO Yard Subareas

Subarea	Regulatory Authority	Location within DRMO Yard	Remediation Status
3-PARTY SITES			
DRMO1	OU2 ROD (3-Party)	Central and northwest (extending northwest)	OU2 AS/SVE Treatment System (1997–2005) ISCR Treatability Study (2009, 2010)
DRMO4	OU2 ROD (3-Party)	Southwest	ISCR Treatability Study (2009, 2011)
2-PARTY SITES			
DRMO1	2-Party	Central and northwest (extending northwest)	DRMO1 AS/SVE Treatment System (1996-2003)
DRMO2 Building 5010 (Former Building 5001)	2-Party	Eastern quarter	Long Term Monitoring
DRMO3	2-Party	South central	Long Term Monitoring
DRMO5	2-Party	Central west (across Channel B)	DRMO5 AS/SVE Treatment System (1996-2003)

1.2.1 DRMO1 Subarea

The DRMO1 subarea covers the central and northwest portions as well as a large area northwest of the DRMO Yard, and also includes Building 5008 and the Water Supply Well house. Contaminants of concern (COCs) within this subarea historically have included tetrachloroethene (PCE), TCE, DRO, and gasoline range organics (GRO). Sources of contamination are believed to have been waste oil drums and transformers previously stored in this area and former diesel

underground storage tanks (USTs). Two remediation systems, the DRMO1 (2-Party) air sparging (AS)/soil vapor extraction (SVE) treatment system and the DRMO1 (3-Party) AS/SVE treatment system, were installed in this subarea in 1996 and 1997, respectively, to treat soil and groundwater contamination. Although the treatment systems were initially effective in reducing groundwater contaminant concentrations, the systems were shutdown prior to achieving cleanup goals in all wells due to very low VOC removal rates.

Groundwater sampling of the DRMO1 (2-Party) wells following treatment system shutdown showed that there was not significant contaminant rebound, and continued operation of the system would result in limited impact to the residual contamination. As a result, the treatment system was decommissioned in 2008. Groundwater samples from the DRMO1 (2-Party) subarea are collected once every five years in coordination with the Five Year Review. Sampling was last conducted in 2015.

Groundwater sampling of the DRMO1 (3-Party) area between 2006 and 2008 did not identify contaminant rebound following the shutdown of the treatment system, and the system was decommissioned in October 2008. Long-term monitoring optimization (LTMO) analysis of the site completed in 2008 indicated stable and decreasing trends for the COCs, but also indicated that the contaminants will likely persist for a significant time above the Remedial Action Goal (RAG). Based on these results, an *in-situ* chemical oxidation (ISCR) treatability study was conducted to evaluate the effectiveness of reductive dechlorination to achieve RAGs in a shorter timeframe and reduce long-term monitoring costs. The treatability study (utilizing injection of the ISCR compound Adventus EHC®) was initiated in 2009 as described in the approved Work Plan (FES, 2009). Contaminant concentrations decreased as a result of the treatability study. However, the groundwater geochemistry returned to pre-injection conditions 10-months following the 2009 injection, indicating the ISCR product was depleted. As a result, a second injection was completed at this site in 2010. The second injection stimulated strong reducing conditions and PCE and all degradation products were below RAGs in 2013. PCE concentrations were identified above the ADEC cleanup level in one well (AP-10016) during 2014 and 2015. Groundwater monitoring was conducted in the DRMO1 (3-Party) treatment area during 2017 to continue evaluation of contaminant concentrations remaining in this area.

1.2.2 DRMO2 Subarea

The DRMO2 subarea covers the eastern quarter of the DRMO Yard and includes Buildings 5003 and 5010. COCs within this subarea historically have included DRO, GRO, and benzene. The major source of contamination is believed to have been several diesel USTs, which were removed from this area. These USTs were associated with former Building 5001, which was situated in the current location of Building 5010. In addition, an estimated 3,000 to 8,000 gallons of diesel fuel was spilled near former Building 5001 in the early 1980s. There has been no active remediation within this subarea.

A drinking water supply well and several groundwater monitoring wells have been sampled within this area. Groundwater samples from the monitoring wells were initially collected in 1998 and 1999, and then sampling has been conducted at least annually since 2002. Groundwater samples from the water supply well have been collected since 1998, and are currently collected on an annual basis.

1.2.3 DRMO3 Subarea

DRMO3, the smallest subarea, includes Building 5007 and the area in the south central portion of the DRMO Yard, and extends south of the yard beyond the Alaska Railroad line and the Old Richardson Highway. COCs within this subarea historically have included DRO and GRO. There has been no active remediation within this subarea, and there has been no groundwater sampling in this subarea since 1994 as described in the RI (HLA, 1995).

1.2.4 DRMO4 Subarea

The DRMO4 subarea encompasses the southwest section of the DRMO Yard which includes the Alaska Railroad spur line that enters the DRMO Yard, the associated loading ramp, and a portion of the Alaska Railroad line and the Old Richardson Highway south of the DRMO Yard. COCs within this subarea historically have included PCE, TCE, DRO, and GRO. Sources of contamination are believed to have been asphalt drums and transformers previously stored in this area and potential releases associated with the railroad spur. There has been no active remediation within this subarea.

Groundwater data indicated that reductive dechlorination was occurring; however, the rate may be limited by the availability of carbon sources. LTMO analysis showed that the COCs have stable and decreasing concentration trends, although the contaminants will likely remain above the RAGs for a significant period of time. A treatability study utilizing the same ISCR compound as was used at the DRMO1 site was also completed at this site to evaluate stimulation of reductive dechlorination and the potential to achieve RAGs in a shorter timeframe. The first injection was completed at the DRMO4 site in 2009 (FES, 2010a). Groundwater monitoring was continued during 2010 to evaluate the effectiveness of the injection, and a second injection was completed as part of the treatability study in 2011. Groundwater sampling results showed all PCE concentrations were below the RAG in all wells during May 2012 and August 2013. However, PCE exceedances were observed in two wells in October 2014, and in one well in August 2015. Groundwater monitoring was conducted in the DRMO1 (3-Party) treatment area during 2017 to continue evaluation of contaminant concentrations remaining in this area.

1.2.5 DRMO5 Subarea

The DRMO5 subarea includes the west central portion and west gate of the DRMO Yard and extends west beyond the DRMO Yard to cover a portion of a slough (Channel B). COCs within

this subarea historically have included petroleum hydrocarbons (DRO and GRO). Sources of contamination are believed to be a former waste oil drum storage area and a former fire burn pit in the eastern portion of this subarea. One remediation system, the DRMO5 AS/SVE treatment system, was installed in this subarea in 1996 to treat soil and groundwater contamination. This system was shutdown in 2003 due to asymptotic VOC removal rates and was decommissioned in October 2008. Groundwater samples from the DRMO5 subarea are collected once every five years in coordination with the Five Year Review. Sampling was last conducted in 2015.

1.3 Former Building 1168 Subarea Description

The former Building 1168 site is located on Trainor Gate Road on Fort Wainwright and is shown in Figure 1-3. Building 1168 was originally a motor pool and vehicle storage facility. In the 1960s, the building was converted into a laboratory for analyzing petroleum, oil, and lubricants (POL). Floor drains in the building connected to an oil/water separator, which connected to a drywell (Leach Well) situated about 100 feet southwest of the building. In principle, the POL products were supposed to be separated from the water and directed into a holding tank, while the water flowed into the drywell. In practice, some of the POL products did not separate from the water, but flowed into the drywell and surrounding soil. The types of products suspected of having entered the Leach Well include used oil from engines and transmissions, gasoline, diesel, jet fuel, and solvents. This site was addressed under the 3-Party Agreement.

An AS/SVE system was installed at the Building 1168 3-Party site in the fall of 1994. The system was centered on the Leach Well and consisted of eight AS wells, one SVE well, and several monitoring wells/probes. The system was operated between 1994 and 1998 and was effective at reducing groundwater concentrations below RAGs. Benzene and DRO concentrations rebounded in a few wells following shutdown of the treatment system; however, evaluation of the groundwater data showed that limited natural attenuation was occurring at this site and contaminant migration was not evident. As a result, the treatment system was decommissioned in 2003. First-order attenuation rate analysis completed in 2009 indicated that the contamination would likely persist at the site for a significant period of time. Based on these results, a treatability study was conducted to evaluate treatment of the residual benzene contamination using ISCO. The ISCO treatability study was completed during October 2010 as described in the Work Plan (FES, 2010b), and groundwater monitoring was conducted in 2010 and 2011 to evaluate the results of the treatability study. Benzene has remained below the RAG since the injection, although DRO has varied slightly above and below the ADEC cleanup level. Based on these results, GRO and RRO were eliminated from the monitoring program following the 2015 sampling event.

The former Building 1168 area also included a 2-Party site. During the demolition of Building 1168 in the late 1990s, petroleum contamination associated with a heating oil UST (UST #213) was identified. Investigation and remediation of this site was conducted under the 2-Party Agreement. An AS/SVE system was installed at the 2-Party site in 1997. The system was

shutdown in 2001. Treatment was stopped because the system was ineffective at reducing DRO concentrations; DRO was the only remaining contaminant exceeding ADEC cleanup levels. The 2-Party site was granted the status of Cleanup Complete with ICs by ADEC in 2009.

1.4 OU2 Source Area Tracking

The OU2 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 IDs are summarized in Table 1-2.

Table 1-2. Crosswalk Table for OU2 Source Area Tracking Numbers[1]

OU2 Source Area	HQAES Number	ADEC File ID	ADEC Hazard ID	Site Status[2]
DRMO 3-Party Sites DRMO1 DRMO4	02871.1024	108.38.069.01	1122	Open
DRMO 2-Party Sites DRMO1 DRMO5	02871.1068	108.38.069.01	1122	Open
DRMO2 2-Party Site Building 5001[3]		108.26.029	25010	Cleanup Complete – Institutional Controls
DRMO3 2-Party Site Building 5004	02871.1038	108.26.011	1093 and 24179	Cleanup Complete
Former Building 1168 3-Party Site	02871.1049	108.38.069.02	1125	Open
Former Building 1168 2-Party Site	02871.1074	108.38.069.06	2487	Cleanup Complete – Institutional Controls

[1] Based on information from the ADEC Contaminated Sites Database available at http://dec.alaska.gov/Applications/SPAR/PublicMVC/CSP/Search and the Army HQAES

[2] Site status from the ADEC Contaminated Sites Database

[3] This site is now the location of Building 5010 (built on site of former Building 5001)

N/A = Not Applicable

1.5 Remediation Objectives

1.5.1 OU2 Record of Decision

The OU2 ROD was signed under the FFA in March 1997 by the USARAK, ADEC, and EPA (USARAK, 1997). The ROD identified the following remedial action objectives (RAOs):

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control;

- Reduce or prevent further migration of contaminated groundwater from the source areas;
- Prevent use of groundwater containing contaminants at levels above federal Safe Drinking Water Act and State of Alaska Drinking Water Standard maximum contaminant levels (MCLs) and Alaska Water Quality Standards (AWQSs), and limit high-volume pumping from the aquifer at the DRMO Yard until state and federal MCLs are achieved;
- Use natural attenuation to attain AWQSs after reaching state and federal MCLs; and
- Prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and federal MCLs and AWQSs.

The RAGs for groundwater were established under the 3-Party FFA for DRMO1, DRMO4, and the former Building 1168 Leach Well source areas. The ROD RAGs are presented in Table 1-3.

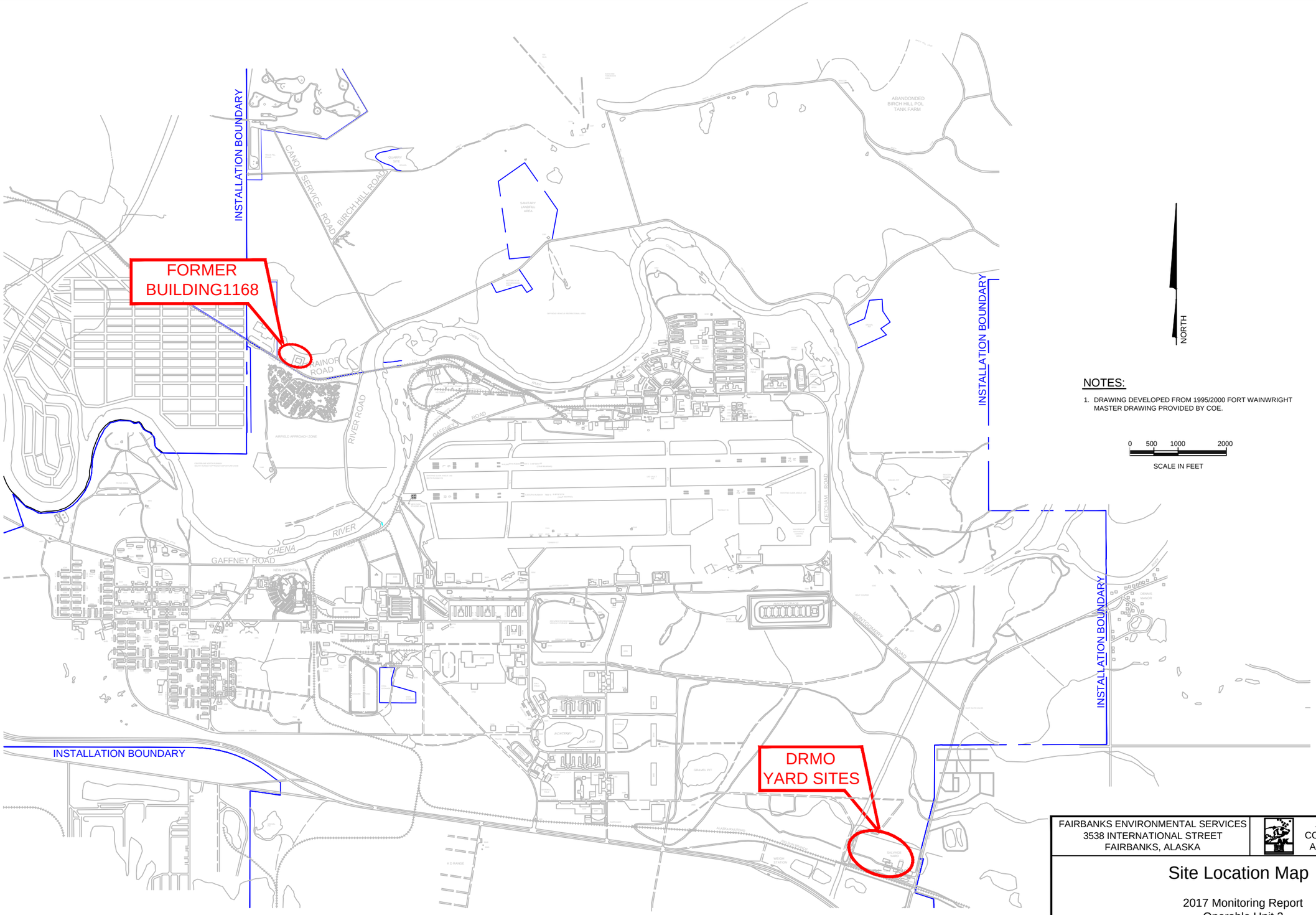
Table 1-3. DRMO and Former Building 1168 ROD Remedial Action Goals for Groundwater

Contaminants of Concern	ROD RAG (µg/L)	Basis
Benzene	5	MCL
Tetrachloroethene (PCE)	5	MCL
Trichloroethene (TCE)	5	MCL
Vinyl Chloride	2	MCL (breakdown product)
1,1-Dichloroethene (1,1-DCE)	7	MCL (breakdown product)
cis-1,2-Dichloroethene (cis-1,2-DCE)	70	MCL (breakdown product)

MCL – maximum contaminant level (EPA)

1.5.2 2-Party Agreement

Since the primary COCs identified in subareas DRMO2, DRMO3, and DRMO5 were petroleum hydrocarbons, these areas were addressed separately under a 2-Party Agreement between USARAK and ADEC, rather than under the ROD. ADEC groundwater cleanup standards, as presented in Table C of 18 AAC 75.345 were adopted as remediation goals for areas not addressed in the ROD. In November 2016, the ADEC cleanup levels were revised utilizing risk-based calculations. This resulted in a significant change in the cleanup levels from when the 2-Party Agreement was originally signed. The current levels will need to be utilized for 2-Party sites to attain cleanup complete under ADEC regulations. In addition, the current ADEC cleanup levels will be applied to any 3-Party site transferred to the 2-Party program after ROD objectives are achieved, or by agreement of the Army, EPA, and ADEC.



NOTES:

1. DRAWING DEVELOPED FROM 1995/2000 FORT WAINWRIGHT MASTER DRAWING PROVIDED BY COE.

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SCALE IN FEET

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Site Location Map

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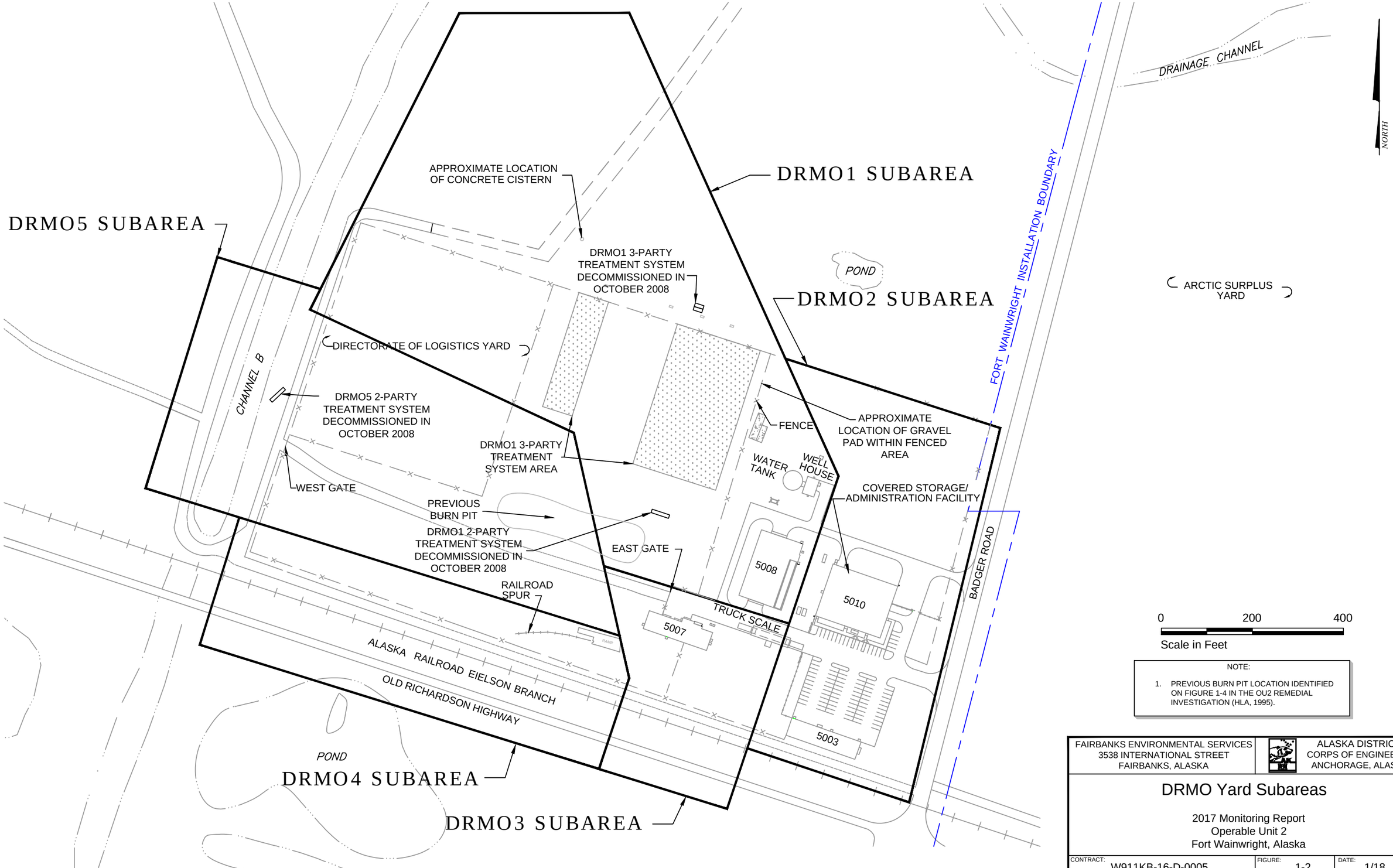

NOTE:

1. PREVIOUS BURN PIT LOCATION IDENTIFIED ON FIGURE 1-4 IN THE OU2 REMEDIAL INVESTIGATION (HLA, 1995).

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DRMO Yard Subareas

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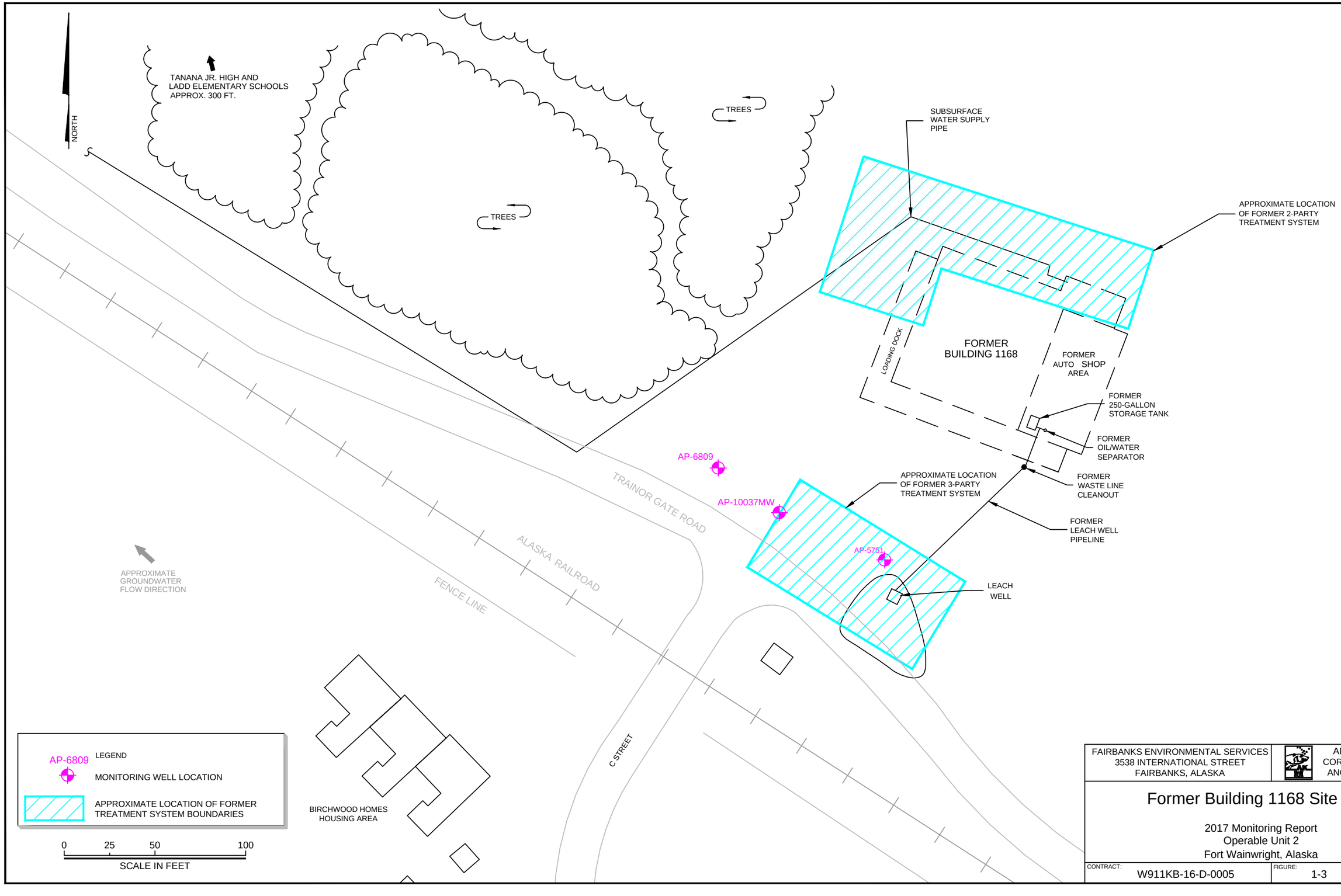
Figure 1-2



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Former Building 1168 Site Plan

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FIGURE 1-3

2.0 FIELD ACTIVITIES SUMMARY

This section describes the groundwater sampling procedures, investigation-derived waste (IDW) handling procedures, and a summary of the data quality review and annual IC inspection. Each of these activities was completed between May and October 2017.

2.1 OU2 Groundwater Monitoring Program Summary

Groundwater samples are collected annually from OU2 3-Party sites and select 2-Party sites, and every five years for the remaining 2-Party sites. A summary of the OU2 groundwater monitoring program is summarized in Table 2-1. 2017 groundwater sampling locations for the DRMO Yard and former Building 1168 are shown on Figures 2-1 and 2-2, respectively.

Table 2-1. Summary of the 2017 OU2 Groundwater Monitoring Program

OU2 Site	Subarea/ Site	Number of Wells/Probes	Contaminant Analyses[1]	NA Analyses[3]	Monitoring Frequency/Sample Collected in 2017
DRMO1 (3-Party)	DRMO1	7	DRO[2], VOC, 1,4-Dioxane[4]	Iron, sulfate, TOC, alkalinity	Annual/Yes
DRMO4 (3-Party)	DRMO4	3	DRO[2], VOC, 1,4-Dioxane[4]		Annual/Yes
DRMO1 (2-Party)	DRMO1	2	DRO	Iron, sulfate	Five Year/No
DRMO5 (2-Party)	DRMO5	2			Five Year/No
Building 5010 (2-Party)	DRMO2	2	DRO, VOC, 1,4-Dioxane[4]	--	Annual/Yes
Water Supply Well (2-Party)	DRMO1	1	GRO, DRO, VOC, SVOC, 1,4-Dioxane[4]	--	Annual/Yes
Former Building 1168 (3-Party)	Leach Well	3	DRO, VOC, 1,4-Dioxane[4]	Iron, sulfate	Annual/Yes

NA – Natural Attenuation; SVOC – semivolatile organic compounds

[1] Contaminant analyses were conducted by the following methods: VOC (8260C), SVOC (8270D), GRO (AK101), and DRO (AK102)

[2] Only one well in the DRMO1 (3-Party) area (AP-7560) and one well in the DRMO4 (3-Party) area (Probe B) was analyzed for DRO

[3] Natural attenuation analyses were conducted by the following methods: iron (6020A), sulfate (300.0), total organic carbon (TOC) (9060A), and alkalinity (2320B)

[4] 1,4-dioxane analysis was included in the 2017 monitoring program as part of a Postwide screening evaluation, and was analyzed using method 8260B-SIM.

Groundwater sampling at the former Building 1168 site, Building 5010 2-Party site, and the Water Supply Well (WSW), was conducted in May 2017. Groundwater sampling at the DRMO 3-Party sites was conducted in August 2017. Groundwater monitoring was conducted in accordance with the procedures detailed in the 2017 Work Plan (FES, 2017a). All groundwater samples were analyzed by SGS North America Inc., (SGS), of Anchorage, Alaska, for the analyses listed in Table 2-1.

The Chemical Data Quality Review (CDQR) and ADEC Laboratory Data Review Checklists summarizing the laboratory data review are presented in Appendix A. The groundwater tracking table and analytical results are presented in Appendix B as Tables B-1 and B-2, respectively. Copies of groundwater sample forms are included in Appendix C. Field parameters recorded on groundwater sample forms (dissolved oxygen [DO], temperature, pH, specific conductivity, oxidation-reduction potential [ORP], turbidity, and drawdown) are summarized in Table C-1.

2.2 Groundwater Sampling Procedures

Low-flow methodology (Puls and Barcelona, 1996) was used to collect water samples from all monitoring wells. The low-flow sampling method utilized variable-speed submersible pumps for all wells at least 2-inches in diameter. Low-flow sampling with variable-speed peristaltic pumps was utilized for wells with diameter smaller than 2-inches, including AP-10015, AP-10016, AP-10017, AP-10018, Probe B, and PO5. The low-flow sampling technique also utilized dedicated Teflon-lined tubing to purge and sample the wells, with sample tubing placed approximately 2 feet below the water table for wells screened across the water table. The only exception to the low-flow methodology was sampling of the WSW. Samples from the WSW are collected from a spigot (raw water tap) located directly downstream of the water supply well source.

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, 2017b). 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. Parameters measured included pH, temperature, specific conductivity, DO, and ORP. In addition, turbidity and drawdown were measured for each well and were recorded on sampling forms. Instrument calibration and sampling forms are presented in Appendix C, and a summary of the field parameters is provided in Tables 3-2, 4-1, and 5-1.

Following sampling, the submersible pumps were decontaminated in accordance with the procedures described in the Work Plan (FES, 2017a). The decontamination water was treated using granular activated carbon (GAC), and the treated water was disposed of at the DRMO yard and the former Building 1168 sites (location dependent on where the pumps had been used). The disposal locations are shown on Figures 2-1 and 2-2. Rinsate samples were also collected to evaluate decontamination of the re-usable pumps. The rinsate sample results are discussed in the CDQR.

2.3 Investigation-Derived Waste

IDW generated during OU2 field activities in 2017 included purge water, decontamination water, and general refuse (disposable tubing, nitrile gloves, etc.) from groundwater monitoring

activities. All IDW and other waste streams were managed according to the procedures outlined in the Work Plan (FES, 2017a).

Purge water was containerized at the time of sampling in 15-gallon polyethylene 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 purge water from the Building 5010 2-Party site and the former Building 1168 3-Party site was characterized using the results from individual wells and a separate toxicity characteristic leaching procedure (TCLP) analysis, and disposed of as petroleum-contaminated water by National Response Corporation (NRC) Alaska at their facility in Anchorage, AK. The disposal was conducted in accordance with their permit with the Anchorage Water and Wastewater Utility. The work was completed as part of a separate task in the scope of work for the Fort Wainwright contract, and copies of the manifest and sampling results will be included the 2017 IDW Technical Memorandum (anticipated in spring 2018).

The purge water from the DRMO 3-Party sites 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 spring 2018).

Following groundwater sampling, the submersible pumps used at the DRMO and Former Building 1168 sites were decontaminated in accordance with the Work Plan (FES, 2017a), and the decontamination water was containerized and treated using granular activated carbon (GAC). The treated water was discharged on the site where the pumps were used, at a location that was vegetated and at least 100 feet from any surface water body source. The discharge locations at the DRMO and Former Building 1168 sites are shown on Figures 2-1 and 2-2 respectively.

2.4 Groundwater Sample Data Quality

The OU2 groundwater data were reviewed in order to assess whether analytical data met data quality objectives and were acceptable for use. The project data were reviewed for deviations to the requirements presented in the Work Plan (FES, 2017a), the ADEC Technical Memorandum 06-002 (ADEC, 2017a), and the DoD Quality Systems Manual (QSM), Version 5.0 (DoD, 2013).

Several results were qualified as potential estimates during the data review process; however, no data were rejected. In all cases, the impact to the overall project due to the data qualifications was minor. The specific data quality issues found during the review are presented in the CDQR in Appendix A. The reviewed data are presented in Appendix B, and are used in tables and figures throughout the report.

2.5 Long-Term Monitoring Optimization and Statistical Evaluation of Treatment Goals

The sampling data are used to conduct LTMO analysis of the monitoring program. The analysis was initiated in 2008 following shutdown of the OU2 treatment systems and contaminant rebound study, and has been updated each year using the most recent sampling results. The update includes an evaluation of contaminant trends, plume stability, monitoring well redundancy, and sampling frequency using the Monitoring and Remediation Optimization System (MAROS) software developed by the Air Force Center for Engineering and the Environment (AFCEE). The MAROS software utilizes basic site-specific inputs (e.g., groundwater monitoring data, hydrogeologic parameters, and well location information) to conduct a statistical analysis of the groundwater monitoring system. The MAROS software is one among several tools that has been recommended for use in LTMO (EPA, 2005). The Remedial Program Managers (RPMs) at the Fort Wainwright Directorate of Public Works (DPW) recommended using MAROS to evaluate the monitoring program at the OU2 sites. The decision to conduct LTMO at the DRMO sites was discussed at the July 2008 FFA meeting.

The groundwater sampling results at the former Building 1168 site were evaluated using the Groundwater Statistics Tool developed by the EPA (EPA, 2014), since the ROD objectives have been achieved for VOCs identified at the site. The Microsoft Excel-based statistics tool was developed in conjunction with the *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well,* which outlined the process to use to determine if the groundwater has met and will continue to meet the cleanup level for a particular COC, and if the remedial action may be considered complete (EPA, 2014). The decision to utilize this tool was discussed at the February 2015 FFA meeting.

2.6 Institutional Controls Inspection

An IC survey was completed during July 2017. The IC survey included an evaluation of sites discussed in the OU2 ROD (DRMO1, DRMO4, and the former Building 1168 Leach Well), along with several OU2 2-Party sites (DRMO1, DRMO5, and former Building 1168). The IC inspection included site visits to evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized excavation or groundwater use. In addition to the site visit, reviews of the Fort Wainwright IC geographic information system (GIS) layer and the site-specific information in the ADEC Contaminated Sites database were conducted. A summary of the 2017 IC survey is presented below, and the complete survey results and corrective actions will be included in the 2017 Fort Wainwright IC Inspection Report (expected spring 2018).

- **Former Building 1168**
  - *IC Description:*
    - "Restricted access and well development restrictions, as long as hazardous substances remain on site at levels that preclude unrestricted use" (USARAK, 1997).

- *2017 IC Inspection Results:*
  - The ICs were determined to be properly implemented
  - The 3-Party site is undergoing long term monitoring, and the wells were located and in good condition

- **DRMO Yard**
  - *IC Description:*
    - "Restricted access and well development restrictions, and a groundwater monitoring and evaluation program for the potable drinking water supply wells. These controls will remain in place as long as hazardous substances remain on site at levels that preclude unrestricted use"; and
    - Additional institutional controls to prohibit refilling the DRMO Yard fire suppression water tank from the existing DRMO Yard potable water supply well until state and federal maximum contaminant levels are met (except in emergency situations)." (USARAK, 1997)
  - *2017 IC Inspection Results:*
    - The ICs were properly implemented
    - The DRMO yard is fenced, and the fence is in good condition. A portion of the fence on the north side of the DRMO yard was repaired in 2017 in response to a 2016 IC finding.
    - Access on the east side of the DRMO is controlled by operators of the DRMO facility, and access on the west side is managed by the Left Behind Equipment (LBE) group.

2.7 Monitoring Well Decommissioning

A Postwide monitoring well decommissioning effort was conducted in 2017 as described in the Monitoring Well Decommissioning Work Plan (FES, 2017c). The inactive wells at the OU2 sites were evaluated to determine if the wells may be decommissioned or if they should be retained for possible future sampling. All of the inactive wells at the OU2 sites were recommended for decommissioning, including 24 wells at the DRMO yard, 2 wells at Building 5010, and 6 wells at former Building 1168. Each of these wells were decommissioned in September and October, 2017. A list of the well IDs, maps of the well locations, along with the decommissioning procedures will be summarized in the Monitoring Well Decommissioning Report (expected spring 2018).

LEGEND

- AP-8916 — ANNUAL FALL THREE PARTY MONITORING WELL SAMPLED IN 2017
- PO5 — ANNUAL FALL THREE PARTY PROBE SAMPLED IN 2017
- AP-7348 — ANNUAL SPRING TWO PARTY MONITORING WELL SAMPLED IN 2017
- APPROXIMATE LOCATION OF DECON WATER DISCHARGE POINT

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DRMO Yard Monitoring Well Locations

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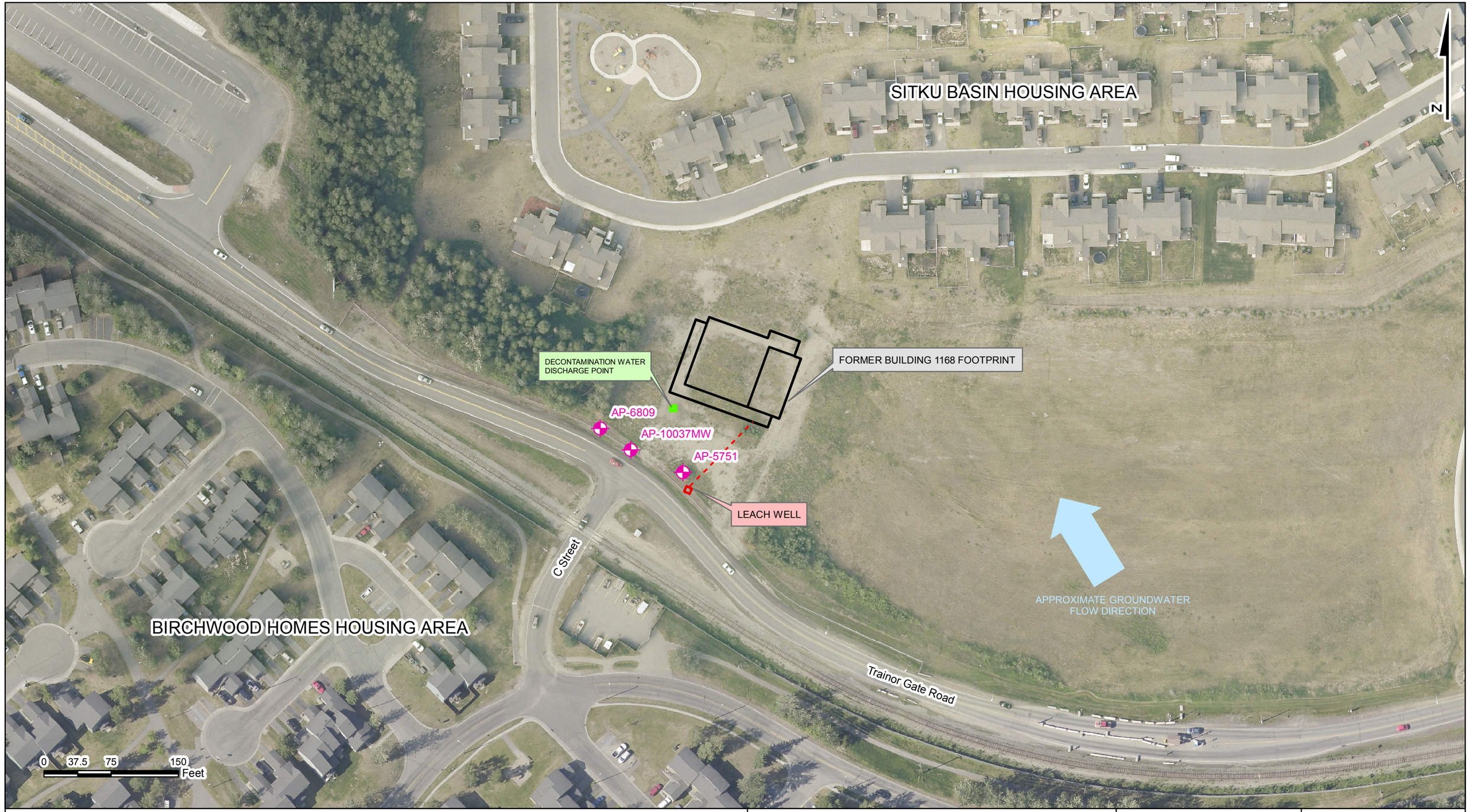

NOTES:

1. HORIZONTAL DATUM: UTM ZONE 6N, WGS 1984, METERS
2. AERIAL IMAGERY FROM FORT WAINWRIGHT, 2012

LEGEND

MONITORING WELL

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Former Building 1168 Groundwater Sampling Locations
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3.0 DRMO YARD GROUNDWATER MONITORING RESULTS (3-PARTY)

This section presents the groundwater monitoring results for the DRMO1 and DRMO4 3-Party sites through 2017. Groundwater sampling results are summarized in Tables 3-2 and 3-3. Figure 3-1 presents COC groundwater concentrations in the vicinity of the DRMO Yard since sampling began in 1994, and Figure 3-2 presents the approximate areas of reduced geochemistry in the DRMO Yard.

3.1 DRMO Yard Groundwater Elevations and Flow Direction

Groundwater elevation data collected for the DRMO Yard during 2017 is summarized in Table 3-1. Although the groundwater elevations from the 2-Party and 3-Party wells were measured in 2017, only the results from the 3-Party wells were used to evaluate changes over time. The 2-Party wells have been significantly impacted by frost jacking of the well casings, resulting in the need to cut down several casings so the wells could be properly secured. The wells have not been resurveyed, and the elevations from 2-Party wells should not be used for evaluation of groundwater elevation changes until a new survey is conducted. However, the 3-Party wells have not frost-jacked, and the water level measurements are suitable for use in evaluation of groundwater elevation and flow direction variation within the DRMO.

Groundwater elevations from DRMO 3-Party wells are included on Table 3-1 and Graphs 3-1 and 3-5 (represented by groundwater in AP-8914R), and were approximately 1 foot lower in August 2017 than in September 2016. This was the lowest water level observed in a sampling event since 2013. As shown in Graph 3-1, the water levels between 2014 and 2016 were among the highest that have been observed at the DRMO site, which resulted in groundwater above the screen in several wells. However, in 2017, the water level was within the screened interval in all monitoring wells. In addition, the groundwater flow direction was consistent with past monitoring events and followed the regional groundwater flow (northwest).

3.2 DRMO1 Subarea Groundwater Monitoring Results

Monitoring wells AP-7559, AP-7560, AP-8914R, AP-10015, AP-10016, AP-10017, and AP-10018 were sampled in August 2017 to evaluate the progress towards achieving the RAGs. The analytical results of the groundwater sampling are presented in Figure 3-1 and Table 3-2, with complete results in Table B-2. The results are discussed in the following sections.

3.2.1 Groundwater Geochemistry Trends

Groundwater geochemistry was evaluated at the DRMO1 3-Party subarea to evaluate the potential for reducing conditions and reductive dechlorination. Reducing conditions were

stimulated as part of a treatability study through injection of Adventus EHC™ in 2009 and 2010. The primary groundwater geochemistry parameters used in the evaluation were ORP, DO, dissolved metals, dissolved anions, alkalinity, and total organic carbon (TOC).

The area where the greatest reducing conditions were observed following each injection was in the vicinity of AP-8914R and AP-10018. This area had the highest PCE concentrations in groundwater, and was also the area with the highest density of injection points in the treatability study. The 2017 groundwater geochemistry results showed reducing conditions were persistent in monitoring wells AP-8914R, AP-10015, AP-10016, and AP-10018, as indicated by negative ORP, dissolved oxygen less than 1 milligram per liter (mg/L), elevated dissolved iron, and lower sulfate concentration. Monitoring well AP-7560 was also characterized by similar reducing conditions, likely a result of the DRO contamination that is persistent in the vicinity of this well.

The areas of iron and sulfate-reducing conditions identified at the time of groundwater sampling in August 2017 are shown in Figure 3-2. The area of iron-reducing conditions (as indicated by dissolved iron concentrations greater than 5 mg/L) in the PCE source area included AP-10015, AP-10016, AP-10018, and AP-8914R. Iron reducing conditions were also observed around AP-7560, which is downgradient of the PCE source area and has the highest DRO concentrations observed in the DRMO1 3-Party site. Sulfate reducing conditions (as indicated by sulfate concentrations less than 20 mg/L) were also observed in AP-10015, AP-10016, AP-10018, and AP-8914R.

3.2.2 Contaminant Concentration Changes in the Treatability Study Area

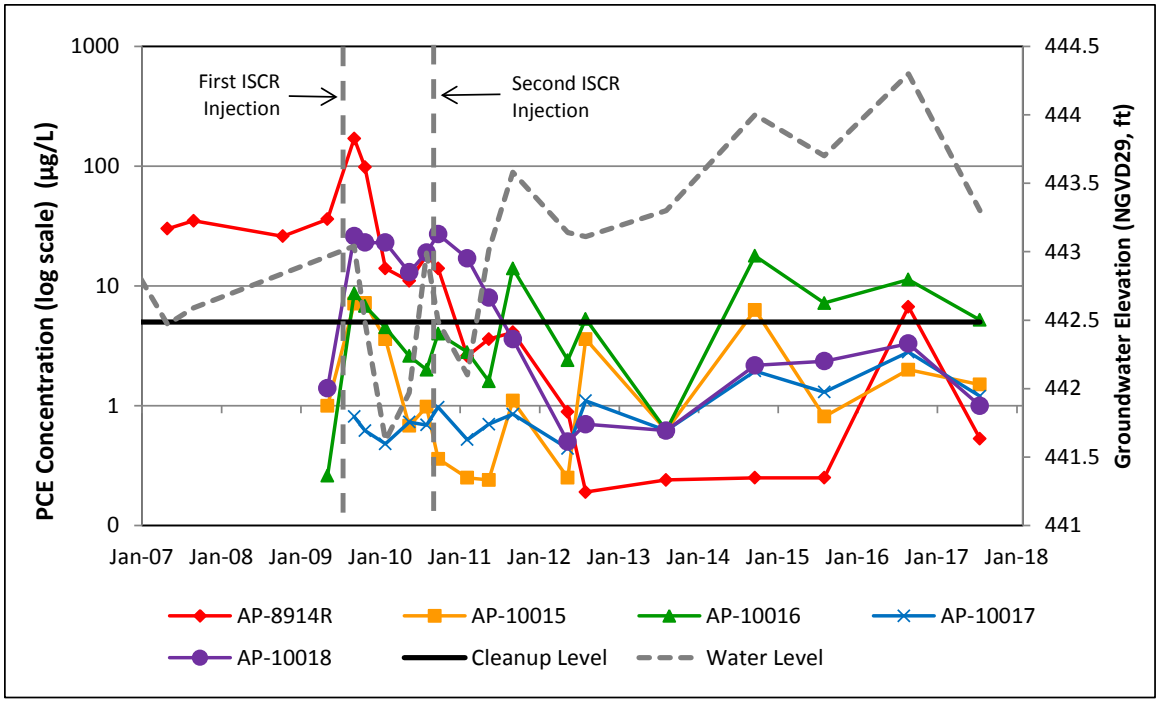
PCE Concentration Trends

The PCE concentrations over time and visual trends for monitoring wells AP-8914R, AP-10015, AP-10016, AP-10017, and AP-10018 are shown in Graph 3-1. Prior to the second EHC™ injection in 2010, PCE was detected in groundwater above the RAG in AP-8914R and AP-10018. Following the 2010 injection, PCE concentrations increased slightly in these wells (as observed in the October 2010 sampling event), but then decreased below the RAG. PCE decreased below the RAG in AP-8914R and AP-10018 for the first time in 2011. The PCE concentration has remained below the RAG in subsequent sampling events in AP-10018, but exceeded the RAG in AP-8914R for the first time in 2016, as shown in Graph 3-1. The PCE concentration in AP-8914R was below the RAG in the 2017 monitoring event.

PCE in AP-10016 increased slightly following the 2009 injection, and exceeded the RAG in two post-injection sampling events (September and November 2009). The PCE concentration decreased below the RAG in February 2010, and did not immediately exceed the RAG following the second injection in August 2010. However, the PCE concentrations intermittently exceeded the RAG between 2011 and 2013, and have consistently exceeded the RAG since 2014. The

2017 PCE concentration was the lowest that has been observed since 2013. This well is cross-gradient of the 2010 injection area, and is characterized by iron and sulfate reducing conditions. The other well where PCE exceeded the RAG following the second injection was in downgradient well AP-10015. This exceedance was observed in 2014 (October). However, the PCE concentrations observed in sampling events between 2015 and 2017 were below the RAG. Iron and sulfate reducing conditions are also persistent in this well, and these results suggest that natural attenuation continues to reduce contaminant concentrations in the treatment area.

The PCE concentration in upgradient well AP-10017 has remained below the RAG in all sampling events conducted at the site.



Graph 3-1. PCE Concentrations in the DRMO1 ISCR Treatment Area

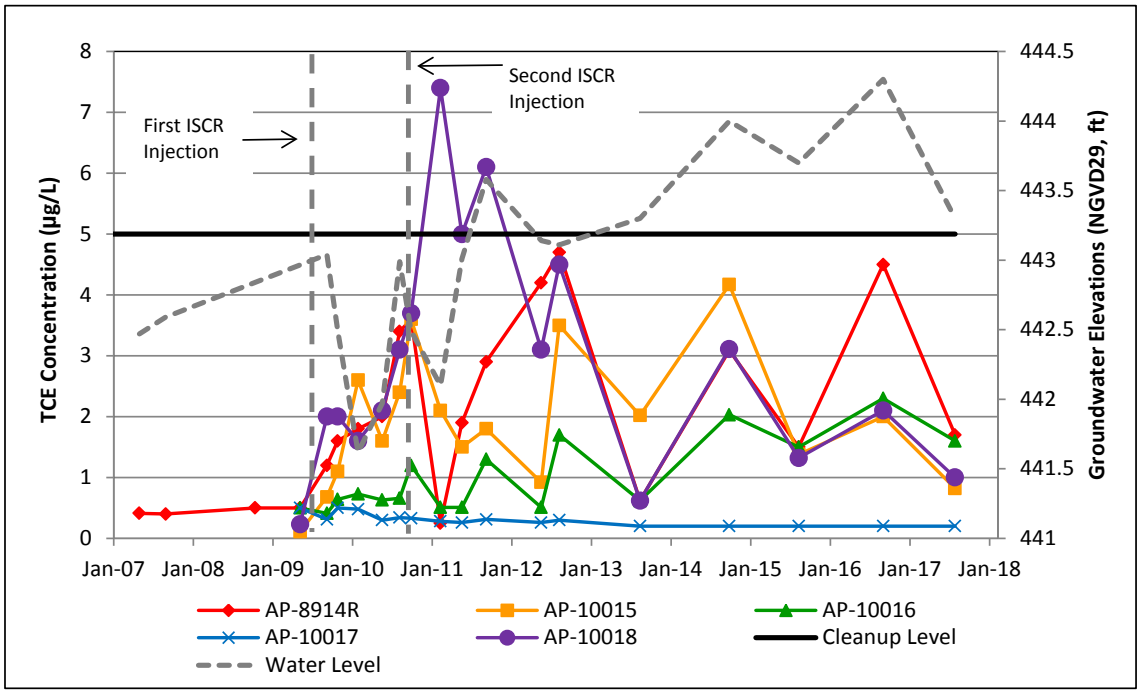
Graph 3-1 includes water levels measured in the injection area (represented by water levels in AP-8914R). The relationship between the PCE concentration and water levels indicates that the wells with recent RAG exceedances (AP-10015, AP-10016, and AP-8914R) have been sensitive to changes in water levels since the second injection. When water level increases, the PCE concentration tends to increase, and when water level decreases, the PCE concentration decreases. The PCE concentration decreased in all DRMO1 ISCR treatment area wells in 2017 as the water level decreased. These results suggest that residual source material may be trapped in low-permeability soils in the vicinity of these wells, that is not normally in contact with groundwater. During periods of high water levels, this contamination comes in contact with the groundwater, resulting in higher dissolved concentrations. Since reducing conditions are persistent in this area, the parent compound is likely degraded after it enters the groundwater

system, resulting in a decrease in concentration. This trend will continue to be evaluated in subsequent monitoring events.

Concentration Changes of Reductive Dechlorination Daughter Products

The decreases in the PCE concentrations shown in graph 3-1 were compared to concentrations of reductive dechlorination daughter products (TCE, cis-1,2-dichloroethene [cis-1,2-DCE], and trans-1,2-dichloroethene [trans-1,2-DCE]). Occurrences of these compounds are a strong indicator of the occurrence of reductive dechlorination, as these daughter products were either not detected or were detected only at trace levels prior to the treatability study.

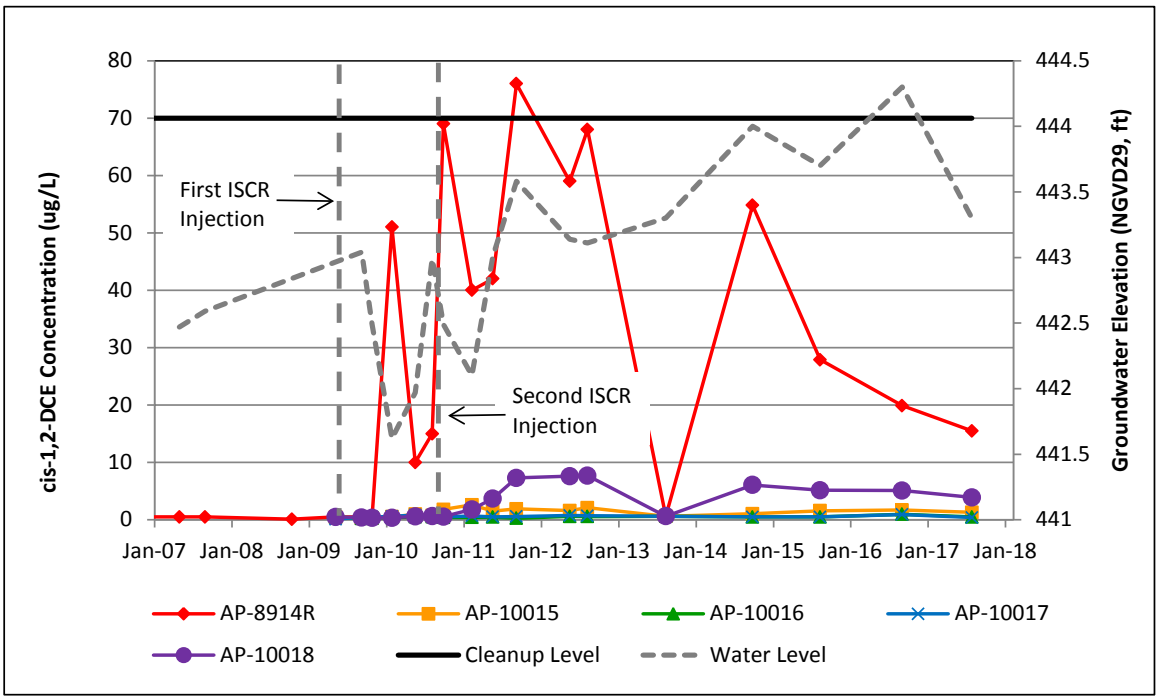
The TCE concentration changes over time and visual trends are shown in Graph 3-2, and complete results of the daughter product detections are presented in Table 3-2. As shown in Graph 3-2, TCE has remained below the RAG in all wells at the DRMO1 (3-Party) site since 2012. The highest concentrations have been identified in AP-8914R, AP-10015, and AP-10018. The graph also shows elevated TCE concentrations at different times in AP-8914R and AP-10015, although concentrations have remained below the RAG.



Graph 3-2. TCE Concentrations in the DRMO1 ISCR Treatment Area

Another daughter product with significant detections resulting from the treatability study injections is cis-1,2-DCE, as shown in Graph 3-3. The highest concentration of cis-1,2-DCE has been observed in AP-8914R, where an increasing trend was observed following the first injection in 2009. A decrease in cis-1,2-DCE was observed following the second injection event in 2010, but concentrations exceeded the RAG in the September 2011 sampling event. Cis-1,2-DCE

decreased below the RAG in the 2012 events and has remained below the RAG since 2013. The next highest cis-1,2-DCE concentration has been observed in AP-10018, where some of the highest PCE and TCE concentrations have also been observed. Cis-1,2-DCE also appears to be less impacted by changes in groundwater elevations, as shown in Graph 3-3.



Graph 3-3. cis-1,2-DCE Concentrations in the DRMO1 ISCR Treatment Area

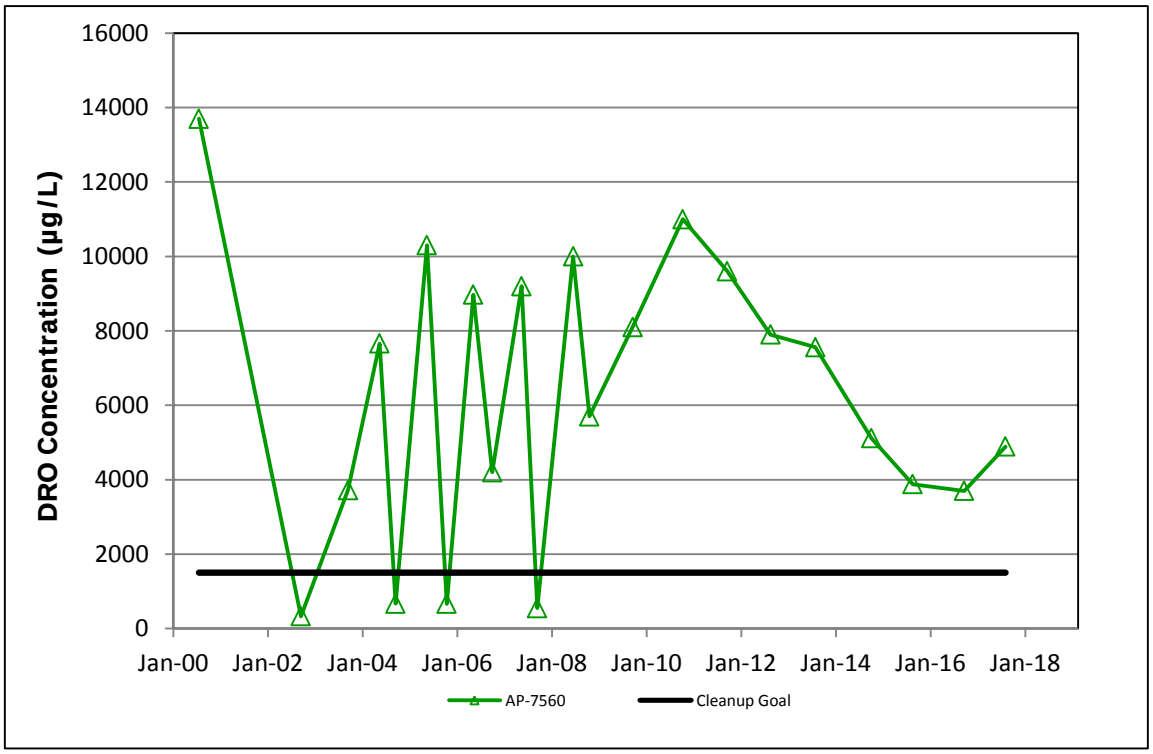
Trace detections of other reductive dechlorination daughter products, including trans-1,2-DCE, 1,1-dichloroethene (1,1-DCE), and vinyl chloride have been observed in post-injection sampling events, although no RAG exceedances of any of these daughter products have been observed. Detection of these daughter products provides evidence that complete degradation of PCE through reductive dechlorination is occurring at the site. Changes in the concentrations of the daughter products (particularly vinyl chloride) will continue to be evaluated as part of the annual sampling program.

3.2.3 Contaminant Concentration Changes Outside of the Treatability Study Area

The only two monitoring wells sampled in 2017 that were outside of the treatability study area were AP-7559 and AP-7560. Other monitoring wells sampled as part of DRMO1 have been eliminated from the well network based on LTMO analysis. PCE and TCE have been consistently detected below RAGs in the areas outside of the treatability study area, likely as a result of PCE releases from drum storage areas across the DRMO1 subarea (HLA, 1996). However, in 2016, PCE exceeded the RAG in AP-7559 for the first time since 2001. The PCE concentration was

below the RAG in the 2017 monitoring event and was similar to concentrations observed since the treatment system was shut down in 2006. The PCE concentrations in this well will continue to be evaluated in future sampling events.

DRO analysis is performed for samples collected from AP-7559 since it is the only DRMO1 3-Party area having DRO exceedances. DRO is consistently detected above the ADEC cleanup level in AP-7560, likely due to a former UST that was identified upgradient of this well during treatment system decommissioning (see Figure 3-1). The DRO concentration changes and visual trend for AP-7560 is shown in Graph 3-4. The highest DRO detection was 13,700 µg/L in June 2000, with typical detections between 5,000 µg/L and 10,000 µg/L. Graph 3-4 shows significantly less variability in DRO concentrations since 2008 when the sample frequency decreased from semi-annually to annually. Sampling is conducted in the fall since the DRO concentration in AP-7560 was consistently higher in the fall versus the spring sampling events. The analytical results indicate a decreasing trend since 2010, although the 2017 result was higher than the 2015 and 2016 results. Biodegradation of DRO is likely occurring under iron-reducing conditions.



Graph 3-4. DRO Concentrations in AP-7560

3.3 DRMO1 (3-Party) LTMO Analysis Update

The LTMO analysis (initially conducted in 2008) was updated using data collected between 2010 and 2017 for the DRMO1 (3-Party) site to evaluate the current monitoring well network in terms

of the remediation objectives. This time period of analysis was chosen to represent the site trends following the second ISCR injection in August 2010.

3.3.1 Statistical Trend Analysis Results

Plume stability was evaluated using the statistical trend analysis in the MAROS software, which determines trends of contaminant concentration in individual wells based on the Mann-Kendall test and linear regression. The trend for each COC was selected based on the highest confidence analysis method. The trend results for PCE and TCE are presented in Table 3-4 and are based on the Mann-Kendall trend analysis. Complete MAROS results are presented in Appendix E.

Table 3-4. Mann-Kendall Trend Analysis for DRMO1 (3-Party) Wells

Well	Relative Location to Injection Area	Contaminants of Concern	
		PCE	TCE
AP-10017	Upgradient	Increasing	Increasing
AP-8914R	Within treatability study area	**No Trend**	No Trend
AP-10016		**No Trend**	Probably Increasing
AP-10018		**Decreasing**	**Decreasing**
AP-10015	Downgradient of treatability study area	**Increasing**	Stable
AP-7559		**No Trend**	No Trend
AP-7560		No Trend	No Trend

Trends in **bold type** exceeded the RAG during the time period used in the LTMO analysis (2010-2017).

Table 3-4 identifies the contaminant trends for wells upgradient, within, and downgradient of the injection area, and the results showed:

- **Upgradient well AP-10017**– Increasing trends for PCE and TCE respectively, but concentrations have remained below the RAG. Increasing trends do not indicate concentrations will exceed the RAG.
- **Injection area wells AP-8914R, AP-10016, and AP-10018** –
  - PCE has exceeded the RAG in each of the three wells, but the concentration trends for one well was decreasing, and two wells exhibited no trend.
  - Concentration trends for TCE were probably increasing, no trend, and decreasing for AP-10016, AP-8914R, and AP-10018 respectively; however TCE has remained below the RAG in each of these wells. The probably increasing trend in AP-10016 was associated with an increase of TCE as a daughter product from reductive dechlorination of PCE stimulated by the injection product.
  - A decreasing TCE trend was observed in source area well AP-10018, the only DRMO well with TCE above the RAG during or following the treatability study. The TCE concentration in AP-10018 during 2017 was 1 µg/L.

- **Downgradient wells AP-10015, AP-7559, and AP-7560 –**
    - PCE exhibited an increasing trend in AP-10015, and no trend in the remaining two downgradient wells. PCE in AP-10015 increased following the injections and was above the RAG in 2014. However, the PCE concentration has remained below the RAG in the sampling events between 2015 and 2017. These results suggest the increasing trend identified by MAROS is a result of the PCE increases immediately following injections and do not represent a continuing increasing trend.
    - No Trend for TCE was observed in downgradient wells AP-7559 and AP-7560, and a stable trend was observed in AP-10015. All TCE concentrations have remained below the RAG in downgradient wells since the injections.
    - The trend results do not indicate significant downgradient migration of PCE or TCE from the treatability study area.

3.3.2 Spatial Moment Analysis Results

The spatial moment analysis in the MAROS software included an evaluation of dissolved contaminant mass (zeroth moment), trend of the location of the center of mass relative to the source (first moment), and trend of plume spread in the direction of groundwater flow and perpendicular to groundwater flow since the second ISCR injection in 2010. Not all wells were sampled during each monitoring event. As a result, there was variability in the spatial moment analysis as the size of the monitoring area changed. This analysis is based on an evaluation of the results considering the number of wells in each sampling event.

The results of the dissolved mass (zeroth moment) analysis for in the DRMO1 (3-Party) area showed:

- The PCE dissolved mass has been variable, and exhibited no trend. The dissolved mass estimate in 2017 was less than the 2016 estimate, and was similar to the 2012 estimate.
- The TCE dissolved mass estimate also exhibited no trend, and TCE remains below the RAG in individual wells.

The results of the analysis of the location of the center of mass relative to the source (first moment) are summarized as follows:

- The center of mass of PCE exhibited an increasing trend. However, the estimated center of mass location in 2017 was within the range observed since 2009.
- The center of mass of TCE exhibited a probably increasing trend, but the location has been variable in recent sampling events. The 2017 location was similar to the 2016 location, and within the range observed at the site.

- The first moment results do not indicate that the plume is migrating, based on the 2017 results and the range of distances between the center of mass and the source observed since 2009.

The plume spread results in the direction of groundwater flow and perpendicular to groundwater flow (second moment) showed:

- PCE trends exhibited no trend in the direction of groundwater flow, and no trend perpendicular to groundwater flow. These results indicate that although there have been intermittent RAG exceedances, there is no significant indication of plume spread.
- TCE exhibited no trend in the direction of groundwater flow, and an increasing trend perpendicular to groundwater flow. However, there were no RAG exceedances for TCE in 2017, the plume spread was within the range observed since 2009, and there was no indication from TCE trends in individual wells that concentrations will exceed the RAG.

3.3.3 Monitoring Well Network and Sampling Frequency Evaluation

MAROS software was also used to evaluate the redundancy of the monitoring well network and sampling frequency at the DRMO1 (3-Party) site. The goals were to verify that the monitoring network was sufficient for decision making, and then optimize it by identifying redundant wells and determining the most efficient sampling frequency.

The output from the MAROS software analysis for well redundancy and sampling frequency is provided in Appendix E, and shows that the only well recommended for removal from the monitoring program was AP-10015 based on TCE results. A qualitative evaluation of the results showed that AP-10015 should be retained in the monitoring well network since it is the closest downgradient well to the injection area and provides an indication of potential downgradient contaminant migration.

A review of the uncertainty of the residual TCE and PCE plumes within the monitoring well network showed Moderate and Small uncertainty. No wells are recommended for installation or removal based on the 2017 sampling event results.

The sampling frequency results from the MAROS software recommended annual sampling for most wells. Biennial sampling was recommended for some wells that have exhibited stable concentrations below the RAG. However, annual sampling should be conducted for all DRMO1 wells to generate sufficient data for evaluation of contaminant trends.

3.4 DRMO4 Subarea Groundwater Monitoring Results

Three monitoring wells at the DRMO4 site (PO5, AP-8916, and Probe B) were sampled in September 2017. The wells were sampled as part of the annual monitoring event to evaluate

the progress towards achieving the RAGs. Groundwater analytical results are presented in Table 3-3. Geochemical and contaminant concentration trends are discussed in the following sections.

3.4.1 Groundwater Geochemistry Trends

Groundwater geochemistry indicators (redox potential, DO, dissolved metals, sulfate, alkalinity, and TOC) were measured at the DRMO4 (3-Party) site to evaluate the potential for conditions supportive of reductive dechlorination. These parameters were measured in PO5 (within the 2009 injection treatability study area), in AP-8916 (upgradient, and within the 2011 injection treatability study area), and Probe B (downgradient of the injection treatability study area). The results and approximate regions of reduced geochemistry based on the 2017 monitoring results are shown on Figure 3-2.

The 2017 results showed groundwater in the vicinity of AP-8916 was characterized by reducing conditions, with ORP less than 0 millivolts (mV) and dissolved oxygen less than 1 mg/L. A dissolved iron concentration of 22.6 mg/L and a sulfate concentration of 2.4 mg/L were also observed in AP-8916, which suggests potential for biodegradation through iron and sulfate reduction.

Groundwater geochemistry in PO5 and Probe B were characterized by mildly reducing conditions, with dissolved iron concentrations in both wells suggesting iron reduction may be occurring. However, sulfate concentrations were similar to background levels, along with ORP and dissolved oxygen levels.

3.4.2 Contaminant Concentration Trends

PCE Concentration Trends

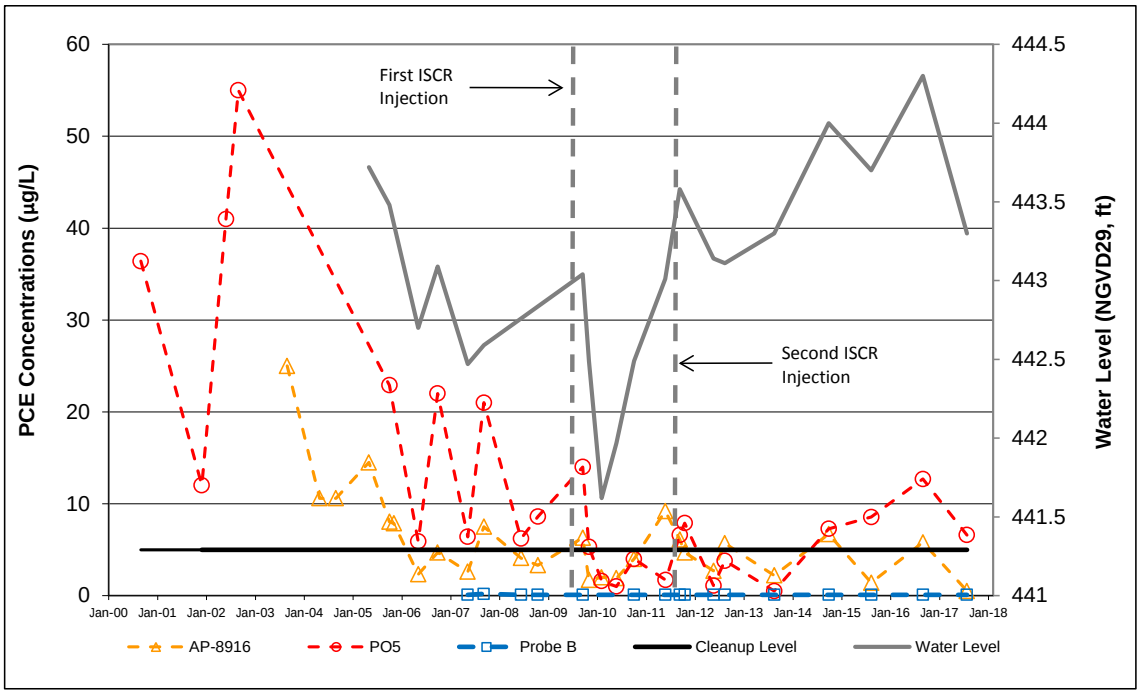
The PCE concentration changes over time and visual trends for PO5, AP-8916, and downgradient well Probe B from September 2000 through September 2017 are shown in Graph 3-5. The injection events completed as part of the treatability study are also shown on the graph (August 2009 near PO5 and September 2011 near AP-8916).

As shown in Graph 3-5, the PCE concentrations in PO5 have been variable just above and just below the RAG since the August 2009 Adventus EHC™ injection. PCE was below the RAG in PO5 during the 2012 and 2013 sampling events, but has exceeded the RAG since 2014. However, the 2017 result (6.6 µg/L)was the lowest that has been observed since 2013.

PCE concentrations in AP-8916 have also been variable; however, the September 2011 Adventus EHC™ injection was the first to target the groundwater in the vicinity of this well. PCE decreased below the RAG in AP-8916 immediately following the 2011 injection, but rebounded slightly above at the 11-month post-injection sampling event. PCE concentrations were below the RAG

in the 2013 and 2015 sampling events, and above the RAG in the 2014 and 2016 sampling events. PCE was again below the RAG in the 2017 sample.

PCE is either not detected or detected in trace concentrations in Probe B, located approximately 150 feet downgradient from PO5. This indicates no significant downgradient migration of PCE has occurred at the DRMO4 (3-Party) site.



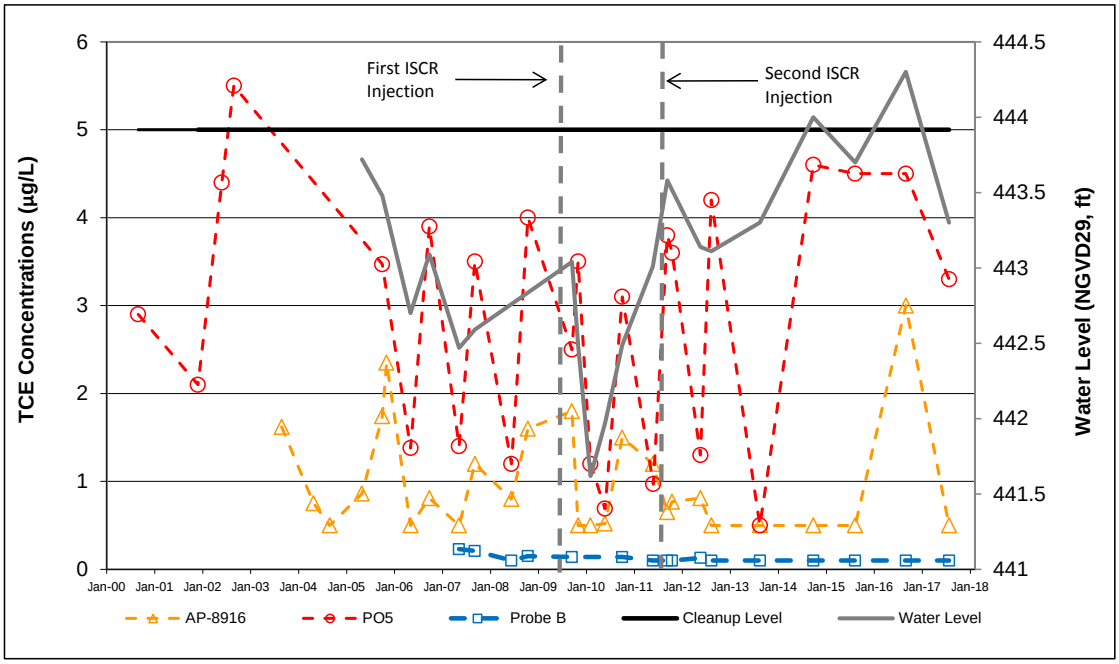
Graph 3-5. PCE Concentrations in DRMO4 Wells

The groundwater elevation at the DRMO4 site (as measured in AP-8916) is also shown in Graph 3-5. The graph indicates some correlation between water levels and PCE concentration in PO5 prior to the first injection, with higher concentrations in the fall when water levels were typically higher. Following the injections, the sample frequency was reduced to an annual sample in the fall, when the highest PCE concentrations were typically observed. The association between water levels and PCE concentration is not as apparent in the sampling events following the injection, although the decrease in PCE concentration in 2017 was accompanied by a decrease in water levels. This relationship will continue to be evaluated in future sampling events.

Concentration Changes of Reductive Dechlorination Daughter Products

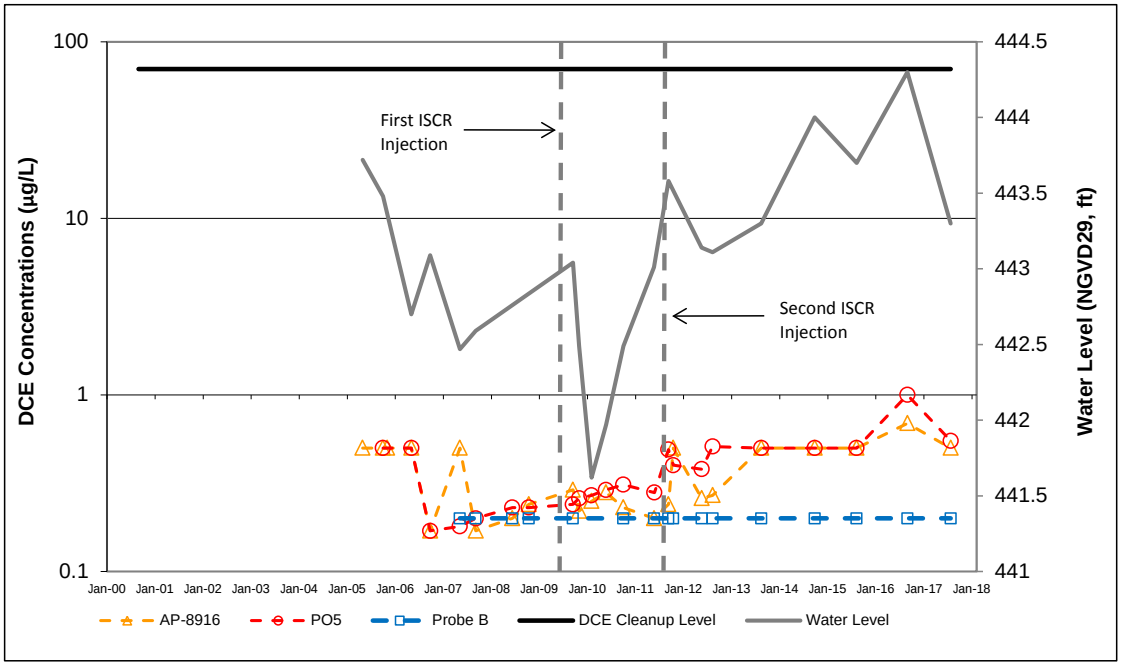
The distribution of PCE daughter products are indicative of reductive dechlorination occurring in the DRMO4 area, and the daughter products TCE and cis-DCE were detected in PO5 and AP-8916. TCE and cis-DCE were not detected in Probe B. The visual trends of TCE and cis-DCE, along with the water levels from AP-8916, are shown on graphs 3-6 and 3-7 respectively.

TCE was not detected in AP-8916 in 2017 after it was detected at 3 µg/L in 2016. The TCE concentration observed in PO5 has been seasonally variable, but increased since the injection event in 2009 and has remained more than half of the RAG shown in graph 3-6.



Graph 3-6. TCE Concentrations in DRMO4 Wells

The cis-1,2-DCE concentrations in PO5 and AP-8916 have been increasing since the injection events, indicating reductive dechlorination was likely stimulated as a result of treatability study.



Graph 3-7. Cis-1,2-DCE Concentrations in DRMO4 Wells

DRO Concentration Trends

DRO concentrations have also been monitored in DRMO4 wells since sampling began in 1994. As shown on Figure 3-1, the DRO concentrations have never exceeded the ADEC cleanup level in PO5, but exceeded the cleanup level in AP-8916 following the 2011 ISCR injection. The ISCR compound (Adventus EHC™) included an organic carbon source that was detected in the DRO range. This was confirmed when silica gel analysis was used on groundwater samples collected from the injection treatment area at DRMO 1 (3-Party) during the 2012 sampling event (FES, 2013). As a result, the DRO exceedances in AP-8916 were attributed to the injection product and not contamination.

DRO exceedances have been intermittently observed in Probe B since 2011, although the concentrations have been only slightly above the cleanup level. The DRO concentration detected in 2017 was below the ADEC cleanup level.

3.5 DRMO4 (3-Party) LTMO Analysis Update

Long-term monitoring optimization analysis was limited at the DRMO4 site due to the small number of wells. However, the trends in individual wells were determined using MAROS software, and the plume stability was evaluated on a qualitative basis.

3.5.1 Statistical Trend Analysis Results

A statistical trend analysis was conducted for the individual monitoring wells at the DRMO4 site using the MAROS software. The data used in the analysis were from September 2009 to August 2017 for PO5, and from October 2011 to August 2017 for AP-8916 to represent the period of time following the injection events in each area. The trend results for PCE and TCE are presented in Table 3-5, and are based on the Mann-Kendall test. Complete MAROS results are presented in Appendix E.

Table 3-5. Mann-Kendall Trend Analysis for DRMO4 (3-Party) Wells

Well	Relative Location to Injection Area	Contaminants of Concern	
		PCE	TCE
AP-8916	Within 2011 injection area	**Stable**	No Trend
PO5	Within 2009 injection area	**No Trend**	Probably Increasing
Probe B	Downgradient	No Trend[1]	Stable[1]

Trends in **bold type** exceeded the RAG during the time period used in the LTMO analysis.
[1] Trend based on trace and/or non-detect results between 2009 and 2017 in the downgradient well.

Table 3-5 shows that two of the three wells sampled at the DRMO4 site had PCE above the RAG since the injections were completed (AP-8916 and PO5). The PCE concentration in AP-8916 exhibited a stable trend since 2011, and has fluctuated slightly above and slightly below the RAG in recent sampling events. The trend results for PCE in PO5 showed no trend since 2009. The

highest concentration detected in PO5 within that period was 14 µg/L immediately following the injection. PCE concentrations subsequently decreased below the RAG and briefly exceeded the RAG again in fall 2011. Overall, PCE has been below the RAG in 7 out of 15 sampling events since the injection treatability study in 2009. PCE was above the RAG in the 2017 sample, but was at the lowest concentration since 2013.

The PCE concentrations downgradient of the injection area have remained less than the RAG, as shown in the low-level detections in Probe B. All sampling results in this well have been near the detection limit or not detected.

TCE concentrations were below the RAG in each of the three wells during the period of analysis. Concentrations have typically been less than 1 µg/L. However, TCE has been detected between 4 and 5 µg/L in PO5 in four of six sampling events since 2012 which has resulted in a probably increasing trend for TCE in PO5. The TCE trend in AP-8916 was no trend, and TCE was not detected in the 2017 sample. Overall, TCE has not been detected in 3 out of 8 sampling events in AP-8916 since the injection was completed in 2011.

3.5.2 Plume Stability Evaluation

The plume stability evaluation could not be conducted using the tools in the MAROS software due to the limited number of wells. As a result, a qualitative evaluation of plume stability was completed.

- PCE concentrations initially decreased as a result of the stimulation of reductive dehalogenation from the ISCR injection treatability study.
- PCE concentrations have increased since 2014, but reducing conditions are persistent at AP-8916 and PO5, and the PCE concentrations decreased between 2016 and 2017.
- The PCE concentration in downgradient well Probe B has remained below the RAG (mostly non-detect results), which is an indicator that the plume is not expanding.
- TCE and cis-1,2-DCE concentrations have increased which indicates evidence of reductive dechlorination. TCE and cis-1,2-DCE concentrations have remained below the RAG.

Based on these results, annual sampling (conducted in the fall) should continue at this site to evaluate groundwater geochemistry and contaminant concentration trends, and to document progress towards achieving the remedial objectives.

3.6 Evaluation of Potential 1,4-Dioxane Contamination

In addition to the evaluation of ROD COCs at the DRMO1 and DRMO4 3-Party sites, 1,4-dioxane analysis was included in the 2017 monitoring program based on recommendations from the Fourth Five Year Review conducted in 2016 (U.S. Army Garrison Fort Wainwright, 2016). 1,4-dioxane analysis was not included in previous investigations, and the 2017 analysis showed one

trace detection in PO5 at the DRMO4 site, more than an order of magnitude below the cleanup level. All other results from samples collected at the DRMO1 and DRMO4 3-Party sites were non-detect (complete results presented in Appendix B). This indicates there is not 1,4-dioxane contamination at the DRMO 3-Party sites.

3.7 Comparison of 2017 Sampling Results to Current ADEC Cleanup Levels

The 2017 groundwater contaminant concentrations were compared to the ADEC cleanup levels to allow for an evaluation of current compliance with 2-Party program closure requirements. ADEC cleanup level comparisons for DRMO1 and DRMO4 3-Party wells are presented in Table B-2. Cleanup level exceedances are presented in Tables 3-2 and 3-3, and a summary for non-ROD COCs is presented in Table 3-6. The following summarizes the ADEC cleanup level comparison for non-ROD COCs:

- One non-ROD COC was identified above the current ADEC cleanup level at the DRMO4 3-Party site; 1,2,4-trimethylbenzene in AP-8916.

Table 3-6. Comparison of Groundwater Results for non-ROD COCs to Current ADEC Cleanup Levels[1] at OU2 DRMO 3-Party Sites

Contaminant	2008 ADEC Cleanup Level (µg/L)	2016 ADEC Cleanup Level (µg/L)[1]	Monitoring Well Exceedance
1,2,4-Trimethylbenzene	1,800[3]	15	DRMO4 (AP-8916)

[1] Table C, 18 AAC 75 (ADEC, 2017c)

The ROD COCs were also compared to the current ADEC cleanup level for informational purposes, as presented in Table 3-7.

Table 3-7. Comparison of Groundwater Results for ROD COCs to Current ADEC Cleanup Levels[1] at OU2 DRMO 3-Party Sites

Contaminant	ROD RAG (µg/L)	2016 ADEC Cleanup Level (µg/L)[1]	Monitoring Well Exceedance Changes
Benzene	5	4.6	None
PCE	5	41	Below ADEC Cleanup Level: DRMO1 (AP-10016), DRMO4 (PO5)
TCE	5	2.8	Above ADEC Cleanup Level: DRMO4 (PO5)
Vinyl Chloride	2	0.19	None
1,1-DCE	7	280	None
1,2-DCE	70	36	None

[1] Table C, 18 AAC 75 (ADEC, 2017c)

The following summarizes the ADEC cleanup level comparison for ROD COCs:

- PCE concentrations were above the ROD RAG in one well each at the DRMO1 and DRMO4 3-Party sites. However, the PCE concentrations were below the current ADEC cleanup level in all wells at the DRMO1 and DRMO4 sites.
- TCE concentrations were below the ROD RAG in all wells at the DRMO1 and DRMO4 3-Party sites. However, TCE exceeded the current ADEC cleanup level in one well (PO5) at the DRMO4 3-Party site.

3.8 Summary and Recommendations for DRMO 3-Party Sites

Groundwater sampling results from 2017 showed that PCE remains slightly above the ROD RAG in one source area well each at the DRMO1 and DRMO4 3-Party sites. The treatability study was successful in stimulating reducing conditions, and reductive dehalogenation daughter products TCE and cis-1,2-DCE continue to be detected, but remain below RAGs at the DRMO1 (3-Party) and DRMO4 (3-Party) sites. This indicates that biodegradation continues to occur at these sites.

LTMO analysis showed that annual sampling is recommended to continue to evaluate groundwater geochemistry and contaminant concentration trends. However, TOC and alkalinity analyses are recommended to be removed from the monitoring program since the treatability study has been completed, and measurement of other geochemical parameters and daughter product concentrations is sufficient for evaluating biodegradation. Annual sampling (conducted in the fall) would be sufficient to document progress towards achieving the RAGs for the sites.

Analysis for 1,4-dioxane was added to the 2017 monitoring program, and the results showed only one trace detection in one well, with all other results non-detect. No additional 1,4-dioxane analysis in future monitoring events at the DRMO 3-Party sites is recommended.

Table 3-1. 2016-2017 OU2 Groundwater Elevations
DRMO Yard and Former Building 1168

Location	Well Number	Total Well Depth (feet btoc)	Screened Interval (feet bgs)	Well Elevation (feet - NGVD29)	Jul-16			Sep-16			May-17			Aug-17		
					Date	Water Level (btoc)	Water Elevation (feet - NGVD29)	Date	Water Level (btoc)	Water Elevation (feet - NGVD29)	Date	Water Level (btoc)	Water Elevation (feet - NGVD29)	Date	Water Level (btoc)	Water Elevation (feet - NGVD29)
DRMO1 (3-Party) Treatment System Area	AP-8914R	18.2	6 - 16	454.14	7/5/16	10.55	443.59	9/14/16	9.80	444.34	NA	NA	NA	8/9/17	10.80	443.34
	AP-7559	20.0	6 - 16	454.00	7/5/16	10.34	443.66	9/13/16	9.60	444.40	NA	NA	NA	8/9/17	10.60	443.40
	AP-7560	20.1	6 - 16	453.31	7/5/16	9.88	443.43	9/13/16	9.14	444.17	NA	NA	NA	8/9/17	10.10	443.21
	AP-10015[1]	20.94	8.0-18.0	453.23	7/5/16	9.80	443.43	9/14/16	9.02	444.21	NA	NA	NA	8/9/17	10.04	443.19
	AP-10016[1]	20.00	7.0-17.0	453.12	7/5/16	9.74	443.38	9/14/16	8.98	444.14	NA	NA	NA	8/9/17	9.95	443.17
	AP-10017[1]	19.91	7.0-17.0	452.29	7/5/16	8.66	443.63	9/14/16	7.89	444.40	NA	NA	NA	8/9/17	8.89	443.40
	AP-10018[1]	20.20	7.0-17.0	452.71	7/5/16	9.22	443.49	9/14/16	8.50	444.21	NA	NA	NA	8/9/17	9.48	443.23
DRMO4 (3-Party) Source Area	PO5[2]	No Info	No Info	No Info	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	AP-8916	15.3	5 - 15	454.82	7/5/16	11.03	443.79	9/13/16	10.30	444.52	NA	NA	NA	8/9/17	10.88	443.94
	Probe B	17.0	No Info	454.08	7/5/16	10.65	443.43	9/14/16	10.17	443.91	NA	NA	NA	8/9/17	11.21	442.87
DRMO1 (2-Party) Source Area[3]	AP-5826	17.2	4.5 - 14.5	453.55	7/5/16	9.53	444.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MP4	15.0	No Info	452.19	7/5/16	8.27	443.92	NA	NA	NA	NA	NA	NA	NA	NA	NA
DRMO5 (2-Party) Source Area[3]	PI3	19.6	No Info	453.47	7/5/16	10.51	442.96	NA	NA	NA	NA	NA	NA	NA	NA	NA
	AP-6806	20.6	2.1 - 14.5	453.69	7/5/16	10.79	442.90	NA	NA	NA	NA	NA	NA	NA	NA	NA
Building 5010 (2-Party) Source Area	AP-7346	12.7	4 - 14	451.72	7/5/16	7.11	444.61	NA	NA	NA	5/31/17	7.67	444.05	NA	NA	NA
	AP-7348	15.3	6 - 16	453.84	7/5/16	9.50	444.34	NA	NA	NA	5/31/17	9.69	444.15	NA	NA	NA
Former Building 1168 (3-Party) Leach Well Source Area	AP-5751	20.3	7 - 17	444.83	7/5/16	16.08	428.75	NA	NA	NA	5/17/17	15.63	429.20	NA	NA	NA
	PS-23/AP-10037MW[3]	26.6	12 - 22	445.90	7/5/16	17.11	428.79	NA	NA	NA	5/17/17	16.39	429.51	NA	NA	NA
	AP-6809	26.8	9 - 22	444.56	7/5/16	15.94	428.62	NA	NA	NA	5/17/17	15.47	429.09	NA	NA	NA

[1] Monitoring wells AP-10015, AP-10016, AP-10017, and AP-10018 were converted to flushmounts in August 2010.
[2] Water levels could not be measured in PO5 because it is a small diameter probe.
[3] Well casings were cut down due to frost jacking and not resurveyed. The water elevations may not be compared between sampling events.
[4] AP-10037MW was installed in July 2010.

bgs - below ground surface
btoc - below top of casing
NGVD29 - North American Vertical Datum of 1929
NM - not measured during the sampling event
NA - not applicable since the well was not sampled

Table 3-2. 2013 - 2017 Groundwater Sample Results
DRMO1 (3-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	Geochemical Parameters								2-Party Chemical of Concern	ROD Chemicals of Concern (µg/L)					
					ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene
ROD CLEANUP LEVELS (3-Party Site) / 2016 ADEC CLEANUP LEVEL[1]													**1,500**	**5**	**5**	**5**	**2**	**7**	**70**
AP-10017	Upgradient	13FW2A07WG	8/27/2013	443.29	79.9	0.19	6.4	0.399	ND(0.62)	24.8	148	4.1	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU212WG	10/9/2014	444.01	41.3	0.35	6.4	0.396	ND(0.25)	27.5	154	5.4	424 J	ND(0.2)	ND(0.5)	2.0	ND (0.5)	ND (0.5)	ND (0.5)
		15FWOU224WG	8/24/2015	443.82	15.6	0.20	6.2	0.362	ND(0.25)	22.0	152	4.4	NA	ND(0.2)	ND(0.5)	1.3	ND(0.5)	ND(0.5)	ND(0.5)
		16FWOU219WG	9/14/2016	444.40	42.9	0.55	6.3	0.345	ND (0.25)	20.9	147	3.4	NA	ND (0.2)	ND (0.5)	2.8	ND (0.5)	ND (0.5)	0.93 J
		17FWOU217WG	8/9/2017	443.40	73.3	0.45	6.9	0.365	ND (0.25)	20.4	150	2.2	NA	ND (0.2)	ND (0.5)	1.2	ND (0.075)	ND (0.5)	0.4 J
AP-8914R	Source Area	13FW2A01WG	8/26/2013	443.3	-105.3	0.20	6.1	0.958	86.2	4.1	371 Q	16.4	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2A02WG[2]							86.4	4.13	245 Q	17.1	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU207WG	10/9/2014	444.0	-52.2	0.24	6.3	1.006	74.2	3.35	428	31.6	586 J	ND(0.2)	3.1	ND(0.5)	0.48 J	ND(0.5)	54.8
		15FWOU223WG	8/24/2015	443.7	-86.8	0.17	6.2	0.581	56.0	21.1	193	10.3	NA	ND (0.2)	1.5	ND(0.5)	ND(0.5)	ND(0.5)	27.9
		16FWOU220WG	9/14/2016	444.3	-72.4	0.37	6.4	0.474	33.70	23.1	180	7.3	NA	ND (0.2)	4.5	**6.7**	ND (0.5)	ND (0.5)	19.9
		17FWOU219WG	8/9/2017	443.3	-119.6	0.44	6.9	0.374	27.10	8.7	136	4.3	NA	ND (0.2)	1.7	0.53 J	ND (0.075)	ND (0.5)	15.5
AP-10016		13FW2A08WG	8/27/2013	443.10	-75.4	0.15	6.7	0.458	8.9	10.9	180	7.3	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU206WG	10/9/2014	443.81	46.9	0.16	6.3	0.515	0.46J	46.9	207	9.8	**2,120**	ND(0.2)	2.0	**17.8**	ND (0.5)	ND (0.5)	ND (0.5)
		15FWOU220WG	8/24/2015	443.60	-35.1	0.48	5.7	0.453	6.4	12.9	200	11.5	NA	ND (0.2)	1.5	**7.2**	ND (0.5)	ND (0.5)	ND (0.5)
		16FWOU221WG	9/14/2016	444.14	-2.4	0.77	6.3	0.413	4.52	13.3	190	7.4	NA	ND (0.2)	2.1	**11.3**	ND (0.5)	ND (0.5)	0.97 J
		16FWOU222WG[2]							4.71	13.3	176	7.4	NA	ND (0.2)	2.3	**10.8**	ND (0.5)	ND (0.5)	0.95 J
		17FWOU215WG	8/9/2017	443.17	-53.2	0.98	6.8	0.422	5.97	10.0	181	5.6	NA	ND (0.2)	1.6	**5.2**	ND (0.075)	ND (0.5)	0.50 J
AP-10018		13FW2A06WG	8/27/2013	443.21	-106.7	0.15	6.6	0.701	55.6	7.3	243	7.1	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU213WG	10/9/2014	443.96	-72.1	0.10	6.5	0.775	49.5	39.2	262	10.5	347 J	ND(0.2)	3.1	2.17	ND(0.5)	ND(0.5)	6.1
		15FWOU222WG	8/24/2015	443.66	-136.8	0.16	6.4	0.565	37.5	33.9	203	7.7	NA	ND (0.2)	1.3	2.35	ND (0.5)	ND (0.5)	5.2
		16FWOU218WG	9/14/2016	444.21	-81.9	0.28	6.4	0.453	20.9	15.5	181	5.6	NA	ND (0.2)	2.1	3.3	ND (0.5)	ND (0.5)	5.1
		17FWOU214WG	8/9/2017	443.23	-3.3	0.50	6.4	0.398	15.1	14.3	170	3.7	NA	ND (0.2)	1.0	1.0	ND (0.075)	ND (0.5)	3.9
AP-7559		13FW2A03WG	8/26/2013	443.33	66.2	0.27	6.2	0.419	ND(1)	29	155	2.7	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU214WG	10/9/2014	444.04	46	0.24	6.4	0.524	ND(0.25)	47	211	5.0	ND(300)	ND(0.2)	0.58 J	4.6	ND (0.5)	ND (0.5)	ND (0.5)
		15FWOU219WG	8/21/2015	443.76	60.5	1.49	6.2	0.476	ND (0.25)	38	196	4.4	NA	ND (0.2)	ND (0.5)	4.5	ND (0.5)	ND (0.5)	ND (0.5)
		16FWOU212WG	9/16/2016	444.40	181.0	0.54	5.7	0.42	ND (0.25)	31.2	176	2.8	NA	ND (0.2)	0.63 J	**5.5**	ND (0.5)	ND (0.5)	0.86 J
		17FWOU221WG	8/9/2017	443.40	61.9	0.87	6.9	0.425	ND (0.25)	27.9	175	2.0	NA	ND (0.2)	0.46 J	3.4	ND (0.075)	ND (0.5)	ND (0.5)
AP-7560	Downgradient	13FW2A04WG	8/26/2013	443.12	-62.9	0.26	6.0	0.298	15.2	8.66	108	25.7	**7,560**	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU208WG	10/9/2014	443.83	29.7	0.46	6.0	0.387	19.2 J+	1.33	159	47.0	**5,150**	ND(0.2)	ND(0.5)	1.05	ND (0.5)	ND (0.5)	ND (0.5)
		14FWOU209WG							20.4	1.04	157	48.7	**5,190**	ND(0.2)	ND(0.5)	1.04	ND (0.5)	ND (0.5)	ND (0.5)
		15TFTOU225WG	8/24/2015	443.67	-80.7	1.03	6.2	0.534	13.8	36.40	208	13.9	**4,320**	ND (0.2)	2.5	4.26	ND (0.5)	ND (0.5)	1.1
		15TFTOU226WG[2]							14.1	36.00	213	15.4	**3,880**	ND (0.2)	3.1	3.95	ND (0.5)	ND (0.5)	1.0
		16TFTOU213WG	9/13/2016	444.17	-6.8	0.30	6.6	0.465	10.2	24.4	201 J+	13.2	**3,520**	ND (0.2)	2.3	3.0	ND (0.5)	ND (0.5)	0.9 J
		16TFTOU214WG[2]							10.9	25.9	259 J+	14.5	**3,700**	ND (0.2)	2.4	3.2	ND (0.5)	ND (0.5)	1.33 J
		17FWOU222WG	8/9/2017	443.21	-63.6	0.63	6.6	0.305	10.1	14.3	127	14.3	**4,470**	ND (0.2)	1.0	1.4	ND (0.075)	ND (0.5)	0.36 J
		17FWOU223WG[2]							10.3	13.50	126	14.3	**4,890**	ND (0.2)	1.0	1.3	ND (0.075)	ND (0.5)	0.33 J

Table 3-2. 2013 - 2017 Groundwater Sample Results
DRMO1 (3-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	Geochemical Parameters								2-Party Chemical of Concern	ROD Chemicals of Concern (µg/L)					
					ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene
ROD CLEANUP LEVELS (3-Party Site) / 2016 ADEC CLEANUP LEVEL[1]													**1,500**	**5**	**5**	**5**	**2**	**7**	**70**
AP-10015	Downgradient	13FW2A05WG	8/27/2013	443.16	-60.4	0.21	5.9	0.538	19.9	13.4	203	5.9	NA	ND(0.24)	2.0	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU205WG	10/9/2014	443.88	40.4	0.22	6.3	0.529	10.2	51.9	206	8.1	947	ND(0.2)	4.2	**6.29**	ND(0.5)	ND(0.5)	1.1
		15FWOU221WG	8/24/2015	443.66	-87.4	0.20	6.3	0.473	13.0	15.6	195	8.9	NA	ND (0.2)	1.4	0.81 J	ND (0.5)	ND (0.5)	1.6
		16FWOU217WG	9/14/2016	444.21	19.0	0.47	6.9	0.422	7.8	15.3	182	6.5	NA	ND (0.2)	2.0	2.0	ND (0.5)	ND (0.5)	1.7
		17FWOU213WG	8/9/2017	443.19	-69.9	0.61	6.9	0.438	8.9	11.3	188	4.6	NA	ND (0.2)	0.82 J	1.5	ND (0.075)	ND (0.5)	1.3

Notes

Analytes exceeding remedial action goals (RAGs) established in the Record of Decision (ROD) or 2016 ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and yellow highlighting.

DRO analysis in AP-10015, AP-10016, AP-10017, AP-10018, and AP-8914R in September 2011 included the silica gel cleanup method.

[1] 18 AAC 75, Table C values (ADEC, 2017)

[2] Sample is a Field Duplicate of the sample immediately above.

Acronyms/Abbreviations

btoc - below top of casing
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mS/cm - micro Siemens per centimeter
mV - millivolts
NA - not analyzed or not applicable
NGVD29 - North American Vertical Datum of 1929
ROD - Record of Decision

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data or older).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Table 3-3. 2013 - 2017 Groundwater Sample Results
DRMO4 (3-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Well Elevation (feet msl)	Water Level (btoc)	Water Elevation (feet NGVD29)	Geochemical Parameters								2-Party Chemicals of Concern (µg/L)		ROD Chemicals of Concern (µg/L)					
							ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics	1,2,4-Trimethylbenzene	Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene
ROD CLEANUP LEVELS (3-Party Site) / 2016 ADEC CLEANUP LEVEL[1]															**1,500**	**15**	**5**	**5**	**5**	**2**	**7**	**70**
AP-8916	Upgradient	13FW2C03WG	8/27/2013	454.82	11.37	443.45	-102.9	0.19	6.6	0.560	42.5	0.4	170	29.2	1,360		ND(0.24)	ND(0.62)	ND(0.62) Q	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2C04WG[2]									39.3	0.4	169	27.9	**1,530**		ND(0.24)	ND(0.62)	2.18 Q	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU215WG	10/9/2014	452.82	10.72	442.10	21.9	0.74	6.6	0.761	20.1	5.8	206	8.05	630		ND(0.2)	ND(0.5)	**6.7**	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU216WG	8/21/2015	452.82	10.85	441.97	-48.3	0.24	5.4	0.529	34.1	0.9	213	11.1	499 B		ND (0.2)	ND (0.5)	1.4	ND(0.5)	ND(0.5)	ND(0.5)
		16FWOU215WG	9/13/2016	452.82	10.300	442.52	-36.6	0.870	6.31	0.604	13.0	3.9	292	5.1	440 J,B		0.13 J	3.0	**5.8**	ND (0.5)	ND (0.5)	0.69 J
		17FWOU220WG	8/9/2017	452.82	11.210	441.61	-103.1	0.410	5.71	0.507	22.6	2.4	212	3.5	410 J	**16.6**	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.075)	ND (0.5)	ND (0.5)
PO5	Source Area	13FW2C02WG	8/27/2013	NM	NM	NM	-76.4	0.74	6.8	0.421	4.7	25.1	156	2.8	ND(0.39)		ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU211WG	10/9/2014	NM	NM	NM	16.5	4.7	6.5	0.501	5.1	28.4	213	4.7	228 J		ND(0.2)	4.6	**7.28**	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU217WG	8/21/2015	NM	NM	NM	-60.1	1.71	6.5	0.446	4.4	25.9	186	3.8	199 J,B		ND (0.2)	4.5	**8.56**	ND (0.5)	ND (0.5)	ND (0.5)
		16FWOU224WG	9/14/2016	NM	NM	NM	-15.6	5.01	6.5	0.495	4.3	27.8	226	3.6	278 J,B		ND (0.2)	4.5	**12.7**	ND (0.5)	ND (0.5)	1.0
		17FWOU216WG	8/9/2017	NM	NM	NM	-15.2	2.22	6.3	0.488	4.1	34.9	203	2.4	172 J	ND (0.5)	ND (0.2)	3.3	**6.6**	ND (0.075)	ND (0.5)	0.55 J
Probe B	Downgradient	13FW2C01WG	8/26/2013	454.08	10.95	443.13	-34.6	0.26	6.3	0.545	3.2	30.0	213	3.3	299 J		ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU210WG	10/9/2014	454.08	10.21	443.87	30.3	0.5	6.5	0.903	5.5	67.6	442	19.3	**2,320**		ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU218WG	8/21/2015	454.08	10.49	443.59	-21.3	0.25	6.3	0.616	2.8	32.9	266	6.6	613 J,B		ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		16FWOU223WG	9/14/2016	454.08	10.17	443.91	8.8	0.54	6.4	0.812	3.1	37.8	469	13.3	**2,020**		ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		17FWOU218WG	8/9/2017	454.08	10.88	443.20	51.9	0.6	6.2	0.719	2.6	30.7	362	4.4	640	ND (0.5)	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.075)	ND (0.5)	ND (0.5)

Notes

Analytes exceeding remedial action goals (RAG) established in the Record of Decision (ROD) or 2016 ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and yellow highlighting.

[1] 18 AAC 75, Table C values (ADEC, 2017)

[2] Sample is a Field Duplicate of the sample immediately above.

Acronyms / Abbreviations

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NA - not analyzed or not applicable
NGVD29 - North American Vertical Datum of 1929
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ROD - Record of Decision

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses)
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Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

DRMO-1 SUBAREA

DRMO-5 SUBAREA

DRMO-4 SUBAREA

DRMO-3 SUBAREA

DRMO-2 SUBAREA

AP-7560 (13.5, 6-16)

	DRO	PCE	TCE	1,2,4-TMB	WATER ELEVATIONS
MAY 98	NA	3	2		—
OCT 98	NA	1	ND (1)		442.67
JUN 99	NA	3	1.3		442.21
SEP 99	ND,(531)	5.3	2.7		442.59
JUN 00	19,700	4.3	1.4		—
SEP 00	NA	4.8	3		443.71
MAY 01	NA	2.42	ND (1)		442.66
OCT 01	NA	ND (1)	ND (1)		442.48
SEP 02	330	ND (2)	ND (2)		443.54
SEP 03	3,720	3.08	1.83		444.04
MAY 04	7,660	1.24	0.6		443.61
SEP 04	670	1.49	0.68		443.03
MAY 05	10,000	1.09	0.46		443.46
OCT 05	664	2.39	0.79		443.12
MAY 06	8,976	ND (3)	ND (1)		442.41
OCT 06	4,200	2.8	1.2		442.79
MAY 07	9,200	2.1	0.98		442.16
SEPT 07	550	3.6	1.9		443.13
JUNE 08	10,000	1.2	0.40		442.55
OCT 08	5,700	0.80	0.82		442.82
SEPT 09	8,100	1.8	0.9		442.91
OCT 10	11,000	1.8	0.96		442.91
SEPT 11	9,600	2.8	2.0		442.40
AUG 12	7,900	2.2	1.2		443.02
AUG 13	7,560	ND(0.62)	ND(0.62)		443.13
OCT 14	5,190	1.1	ND(0.5)		443.83
AUG 15	6,320	4.26	3.14		443.67
SEPT 16	3,700	3.2	2.4		444.17
AUG 17	4,890	1.4	1.0	ND(0.5)	443.21

AP-7559 (16, 6-16)

	DRO	PCE	TCE	1,2,4-TMB	WATER ELEVATIONS
MAY 98	NA	13	1		442.39
OCT 98	NA	13	ND (1)		442.96
JUN 99	NA	4.6	ND (1)		442.38
SEP 99	ND (316)	4.6	ND (1)		442.77
JUN 00	ND (353)	4.7	ND (1)		443.53
SEP 00	NA	4.9	ND (1)		443.95
MAY 01	NA	7.55	ND (1)		442.98
OCT 01	NA	6.22	ND (1)		442.70
SEP 02	112	4.49	0.41		444.33
MAY 04	146	4.59	0.5		443.87
SEP 04	150	4.48	0.49		443.18
MAY 05	80	3.84	0.49		443.66
OCT 05	66.7	2.42	ND (1)		443.34
MAY 06	63.0	ND (1)	ND (1)		442.59
SEP 06	97	2.4	0.43		442.98
MAY 07	120	1.6	0.42		442.36
SEPT 07	57	1.7	0.42		443.33
JUN 08	96	1.8	0.34		442.75
OCT 08	71	2.2	0.51		443.07
MAY 09	NA	1.1	ND(1)		443.15
SEPT 09	90	4.1	0.51		443.12
JUNE 10	NA	3	0.52		442.15
AUG 10	NA	3.1	0.51		443.08
OCT 10	130	3.2	0.52		442.58
FEB 11	NA	2.6	0.42		442.20
JUNE 11	NA	2.8	0.48		443.08
SEPT 11	77	4.0	0.58		NM
MAY 12	NM	2.9	0.61		443.22
AUG 12	80	ND(0.2)	0.69		443.24
AUG 13	NA	ND(0.62)	ND(0.62)		443.33
OCT 14	ND(300)	4.6	0.58		444.04
AUG 15	NA	4.5	ND(0.5)		443.76
SEPT 16	NA	5.5	0.63		444.40
AUG 17	NA	3.4	0.46	ND(0.5)	443.40

AP-10018 (17, 7-17)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	1,2,4-TMB	WATER ELEVATIONS
MAY 09	NA	ND(1)	1.4	0.23	ND(1)		443.03
SEPT 09	4,100*	0.16	26	2	0.41		443.05
NOV 09	NA	0.26	23	2	0.32		442.53
FEB 10	NA	0.12	23	1.6	0.35		441.38
JUNE 10	NA	0.16	13	2.1	0.63		441.94
AUG 10	NA	0.15	19	3.1	0.64		442.97
OCT 10	71,000	0.24	27	3.7	0.55		442.49
FEB 11	NA	0.42	17	7.4	1.8		442.06
JUNE 11	NA	0.1	8	5	3.7		442.91
SEPT 11	1,700+	0.12	3.6	6.1	7.3		443.55
MAY 12	NM	0.39	0.5	3.1	7.6		443.13
AUG 12	1,200	0.11	0.7	4.5	7.7		443.10
AUG 13	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)		443.21
OCT 14	347	ND(0.2)	2.2	3.11	6.08		443.96
AUG 15	NA	ND(0.2)	2.35	1.32	5.16		443.66
SEPT 16	NA	ND(0.2)	3.3	2.1	5.1		444.21
AUG 17	NA	ND(0.2)	1.0	1.0	3.9	ND(0.5)	443.23

ISCR Injection 1

ISCR Injection 2

AP-8914R (16.5, 6.5-16.5)

	DRO	PCE	TCE	CIS 1,2 DCE	1,2,4-TMB	WATER ELEVATIONS
SEP 03	644	48.5	0.41	-		444.31
MAY 04	182	42.6	0.59	-		443.90
SEP 04	156	58.7	0.60			443.27
MAY 05	210	21.6	0.62	ND(1)		443.72
OCT 05	125	44.8	0.41	ND(1)		443.48
MAY 06	164	29	ND (1)	ND (1)		442.70
SEP 06	170	41	0.48	ND(1)		443.09
MAY 07	130	30	0.41	ND(1)		442.47
SEPT 07	200	35	0.40	ND(1)		442.59
JUN 08	WELL DESTROYED. COULD NOT COLLECT SAMPLE. WELL WAS REINSTALLED IN OCTOBER 2008.					
OCT 08	520	26	0.50	0.11		NA
MAY 09	36	NA	ND (1)	ND (1)		NA
SEPT 09	8,600*	170	1.2	ND(0.5)		443.04
NOV 09	NA	98	1.6	0.5		442.49
FEB 10	NA	14	1.8	51		441.62
JUNE 10	NA	11	2	10		441.97
AUG 10	NA	18	3.4	15		442.99
OCT 10	42,000	14	3.6	69		442.49
FEB 11	NA	2.6	ND (0.5)	40		442.10
JUNE 11	NA	3.6	1.9	42		443.01
SEPT 11	2,500+	4.1	2.9	76		443.58
MAY 12	NM	0.89	4.2	59		443.14
AUG 12	6,800	0.19	4.7	68		443.11
AUG 13	NA	ND(0.62)	ND(0.62)	ND(0.62)		443.30
OCT 14	586	ND(0.5)	3.09	54.8		444.00
AUG 15	NA	ND(0.5)	1.50	27.9		443.70
SEPT 16	NA	6.7	4.5	19.9		444.30
AUG 17	NA	0.53	1.7	15.5	ND(0.5)	443.30

AP-10017 (17, 7-17)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	1,2,4-TMB	WATER ELEVATIONS
MAY 09	NA	ND(1)	ND(1)	ND(1)	0.11		443.04
SEPT 09	570	0.060	0.81	0.31	0.49		443.09
NOV 09	NA	0.040	0.62	0.32	0.49		442.52
FEB 10	NA	0.050	0.48	0.36	0.6		441.56
JUNE 10	NA	0.080	0.73	0.30	0.83		442.01
AUG 10	NA	ND(0.5)	0.69	0.34	0.75		443.04
OCT 10	720	0.06	0.97	0.33	0.51		442.54
FEB 11	NA	0.19	0.52	0.28	0.69		442.14
JUNE 11	NA	ND(0.5)	0.7	0.26	0.52		443.06
SEPT 11	52+	0.07	0.85	0.31	0.59		443.55
MAY 12	NA	0.32	0.44	0.26	0.76		443.19
AUG 12	580	ND(0.1)	1.1	0.30	0.70		443.18
AUG 13	NA	ND(0.24)	ND (0.62)	ND(0.62)	ND(0.62)		443.29
OCT 14	424	ND(0.2)	1.95	ND(0.5)	ND(0.5)		444.01
AUG 15	NA	ND(0.2)	1.3	ND(0.5)	ND(0.5)		443.82
SEPT 16	NA	ND(0.2)	2.8	ND(0.5)	0.93		444.40
AUG 17	NA	ND(0.2)	1.2	ND(0.5)	0.4	ND(0.5)	443.40

AP-10015 (18, 8-18)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	1,2,4-TMB	WATER ELEVATIONS
MAY 09	NA	ND(1)	1	0.11	ND(1)		444.53
SEPT 09	1,300	0.080	7.1	0.68	0.32		443.00
NOV 09	NA	0.070	7.2	1.1	0.34		442.52
FEB 10	NA	0.060	3.6	2.6	0.52		443.28
JUNE 10	NA	0.090	0.68	1.6	1.0		443.80
AUG 10	NA	0.070	0.98	2.4	0.73		444.82
OCT 10	1,400	0.080	0.35	3.6	1.8		442.46
FEB 11	NA	0.21	ND(0.5)	2.1	2.6		442.02
JUNE 11	NA	ND(0.5)	0.24	1.5	1.5		442.97
SEPT 11	140+	0.06	1.1	1.8	1.9		443.48
MAY 12	NM	0.13	ND(0.2)	0.92	1.6		443.03
AUG 12	850	0.08	0.4	3.5	2.1		443.10
AUG 13	NA	ND(0.24)	ND(0.62)	0.62	ND(0.62)		443.16
OCT 14	947	ND(0.2)	8.3	4.17	1.05		443.88
AUG 15	NA	ND(0.2)	0.81	1.38	1.59		443.66
SEPT 16	NA	ND(0.2)	2.0	2.0	1.7		444.21
AUG 17	NA	ND(0.2)	1.5	0.82	1.3	ND(0.5)	443.19

AP-10016 (17, 7-17)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	1,2,4-TMB	WATER ELEVATIONS
MAY 09	NA	ND(1)	0.26	ND(1)	ND(1)		443.04
SEPT 09	1,500*	0.070	8.7	0.41	0.23		443.04
NOV 09	NA	0.080	6.8	0.64	0.31		442.53
FEB 10	NA	0.080	4.5	0.73	0.38		441.45
JUNE 10	NA	0.11	2.6	0.63	0.53		441.93
AUG 10	NA	0.080	2	0.66	0.54		442.93
OCT 10	1,800	0.090	4	1.2	0.43		442.47
FEB 11	NA	0.22	2.8	0.51	0.43		442.04
JUNE 11	NA	0.06	1.6	0.51	0.48		442.97
SEPT 11	120+	ND(0.5)	14	1.3	0.28		443.42
MAY 12	NM	0.22	2.4	0.51	0.60		443.04
AUG 12	1,900	0.08	5.3	1.7	0.57		443.08
AUG 13	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)		443.10
OCT 14	2,120	ND(0.2)	17.8	2.6	ND(0.5)		443.81
AUG 15	NA	ND(0.2)	7.2	1.5	ND(0.5)		443.60
SEPT 16	NA	ND(0.2)	11.3	2.3	0.97		444.14
AUG 17	NA	ND(0.2)	5.2	1.6	0.50	ND(0.5)	443.17

PROBE B (16.7, 5-15)

	DRO	PCE	TCE	BENZENE	1,2,4-TMB	WATER ELEVATIONS
MAY 07	64	0.091	0.23	0.22		NA
SEPT 07	150	0.19	0.21	0.13		NA
JUNE 08	68	ND(1)	0.10	ND(1)		NA
OCT 08	1,400	ND(1)	0.15	0.18		NA
SEPT 09	1,000	0.090	0.14	0.15		NA
JUNE 11	NA	ND(0.5)	0.14	0.09		442.88
SEPT 11	4,500	ND(0.5)	ND(0.5)	0.07		443.46
OCT 11	NA	ND(0.5)	ND(0.5)	0.09		442.53
MAY 12	NA	ND(0.2)	0.13	0.22		443.01
AUG 12	2,200	ND(0.2)	ND(0.1)	0.08		442.98
AUG 13	299	ND(0.62)	ND(0.62)	ND(0.24)		443.13
OCT 14	2,320	ND(0.5)	ND(0.5)	ND(0.2)		443.87
AUG 15	613	ND(0.5)	ND(0.5)	ND(0.2)		443.59
SEPT 16	2,020	ND(0.5)	ND(0.5)	ND(0.2)		443.91
AUG 17	640	ND(0.5)	ND(0.5)	ND(0.2)	ND(0.5)	443.20

POS (14.25, NI)

	DRO	PCE	TCE	BENZENE	1,2,4-TMB	WATER ELEVATIONS
JUL 94	280	51	3.8	7.5		PROBE IS TOO SMALL FOR WATER LEVEL INDICATOR
SEP 00	ND (429)	36.4	2.9	1.33		
DEC 01	110	12	2.1	0.84		
JUN 02	ND (170)	41	4.4	ND (2)		
SEP 02	100	55	5.5	1.3		
OCT 05	232	22.9	3.47	ND (0.4)		
MAY 06	196	5.9	1.38	ND (0.4)		
OCT 06	170	22	3.9	0.13		
MAY 07	90	6.4	1.4	0.19		
SEPT 07	110	21	3.5	0.11		
JUNE 08	130	6.2	1.2	0.11		
OCT 08	240	8.6	4.0	0.30		
SEPT 09	220	14	2.5	0.25		
NOV 09	NA	5.3	3.5	0.32		
FEB 10	NA	1.6	1.2	0.32		
JUNE 10	NA	1	0.69	0.39		
OCT 10	140	4	3.1	0.28		
JUNE 11	NA	1.7	0.97	0.09		
SEPT 11	120	6.6	3.8	0.11		
OCT 11	NA	7.9	3.6	0.11		
MAY 12	NM	1.1	1.3	0.28		
AUG 12	83	3.8	4.2	0.10		
AUG 13	ND(0.39)	ND(0.62)	ND(0.62)	ND(0.24)		
OCT 14	228	7.3	4.63	ND(0.2)		
AUG 15	199	8.56	4.5	ND(0.2)		
SEPT 16	278	12.7	4.5	ND(0.2)		
AUG 17	172	6.6	3.3	ND(0.2)	ND(0.5)	

AP-8916 (15, 9-15)

	DRO	PCE	TCE	BENZENE	1,2,4-TMB	WATER ELEVATIONS
SEP 03	1,360	25	1.62	ND (0.4)		444.42
MAY 04	422	10.6	0.75	0.28		444.00
SEP 04	551	10.6	ND (1)	ND (0.4)		443.45
MAY 05	474	14.5	0.860	ND (0.4)		443.70
OCT 05	594	8.03	1.74	0.22		443.57
MAY 06	651	2.32	ND (1)	ND (0.4)		442.82
OCT 06	1,200	4.7	0.81	ND (1)		443.26
MAY 07	300	2.6	ND (2)	ND (5)		442.48
SEPT 07	260	7.5	1.2	ND (1)		443.52
JUNE 08	1,400	4.1	0.80	ND (1)		442.87
OCT 08	790	3.3	1.6	ND (1)		443.14
SEPT 09	870	6.3	1.8	ND (1)		443.17
NOV 09	NA	1.7	ND(0.5)	ND (1)		442.66
FEB 10	NA	2	ND(0.86)	ND (0.5)		441.76
JUNE 10	NA	1.9	0.52	0.34		442.25
OCT 10	1,000	4	1.50	0.59		442.64
JUNE 11	NA	9.2	1.2	ND (0.5)		443.22
SEPT 11	170	6.1	0.65	0.09		443.73
OCT 11	NA	4.7	0.77	0.46		442.89
MAY 12	NM	2.7	0.81	ND(0.7)		443.34
AUG 12	10,000	5.7	ND(0.1)	0.28		443.34
AUG 13	1,530	2.18	ND(0.62)	ND(0.24)		443.45
OCT 14	630	8.7	ND(0.5)	ND(0.2)		442.10
AUG 15	499	1.4	ND(0.5)	ND(0.2)		441.97
SEPT 16	440	7.4	3.0	0.13		442.52
AUG 17	410	ND(0.5)	ND(0.5)	ND(0.2)	16.6	441.61

SUPPLY WELL (100+, NI)

	DRO	BENZENE	1,2,4-TMB
APR 98	ND (260)	ND (0.5)	
JUL 98	80	ND (0.5)	
SEP 98	60	ND (0.5)	
APR 99	ND (45)	ND (0.4)	
MAY 99	57	ND (0.4)	
AUG 99	ND (100)	ND (0.4)	
NOV 01	ND (495)	ND (0.5)	
SEP 02	ND (170)	ND (2)	
JUL 03	92.5	ND (0.4)	
AUG 03	204	ND (0.4)	
SEP 03	177	ND (0.4)	
OCT 03	ND (316)	ND (0.4)	
NOV 03	85.0	ND (0.4)	
DEC 03	ND (333)	ND (0.4)	
FEB 04	ND (319)	ND (0.4)	
MAR 04	70.4	ND (0.4)	
JUN 04	ND (323)	ND (0.4)	
AUG 04	128	ND (0.4)	
NOV 04	ND (323)	ND (0.4)	
DEC 04	66.2	ND (0.4)	
JAN 05	ND (316)	ND (0.4)	
MAR 05	ND (319)	ND (0.4)	
MAY 05	95.1	ND (0.4)	
JULY 05	ND (300)	ND (0.4)	
SEPT 05	ND (300)	ND (0.4)	
MAR 06	ND (313)	ND (0.4)	
MAY 06	ND (300)	ND (0.4)	
JULY 06	ND (341)	ND (0.4)	
AUG 06	ND (316)	ND (0.4)	
MAY 07	33	ND (1)	
SEPT 07	27	ND (1)	
JUN 08	30	ND (1)	
OCT 08	30	0.19	
MAY 09	28	ND (1)	
JUNE 10	29	0.070	
JUNE 11	17	ND (0.5)	
AUG 12	21	ND (0.1)	
MAY 13	630	ND (0.24)	
SEPT 16	ND(324)	ND (0.2)	ND (0.5)

ONLY ROD COCS THAT HAVE HISTORICALLY EXCEEDED REMEDIAL GOALS OR NON-ROD ANALYTES WHICH EXCEEDED ADEC CLEANUP LEVELS IN 2017 ARE SHOWN.

LEGEND:

AP-8914R	3-PARTY GROUNDWATER SAMPLING LOCATION
POS	3-PARTY GROUNDWATER SAMPLING LOCATION (PROBE)
	APPROXIMATE 2017 DRO PLUME
	APPROXIMATE 2017 PCE PLUME
— x —	FENCE
AST	ABOVEGROUND STORAGE TANK
bgs	BELOW GROUND SURFACE
CIS 1,2 DCE	CIS-1,2-DICHLOROETHENE
DRO	DIESEL RANGE ORGANICS
ISCR	IN SITU CHEMICAL REDUCTION
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	SAMPLE COLLECTED, BUT ANALYSIS NOT PERFORMED
ND(4)	NOT DETECTED (LOD). LOQ IS SHOWN FOR DATA PRIOR TO 2012
NI	NO INFORMATION AVAILABLE
NGVD29	NATIONAL GEODETIC VERTICAL DATUM 1929
NM	NOT MEASURED
NS	NOT SAMPLED
PCE	TETRACHLOROETHENE
R	REJECTED VALUE BASED ON QUESTIONABLE ANALYTICAL DATA
TCE	TRICHLOROETHENE
1,2,4-TMB	TRIMETHYLBENZENE
UST	UNDERGROUND STORAGE TANK
—	DATA NOT AVAILABLE

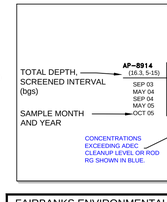
NOTES:

1. BOLD NUMBERS REPRESENT CONCENTRATIONS THAT ARE AT OR ABOVE APPLICABLE CLEANUP LEVELS.
2. ALL ANALYTE CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
3. AP-8914 WAS NOT SAMPLED IN JUNE 2008 BECAUSE THE WELL HAD BEEN DESTROYED.
4. DRMO-1 (2-PARTY), DRMO-5 (2-PARTY), AND DRMO-1 (3-PARTY) TREATMENT SYSTEMS WERE DECOMMISSIONED IN THE FALL OF 2008.
5. DRO EXCEEDANCES IN AP-10016, AP-10018 AND AP-8914R WERE LIKELY A RESULT OF ORGANIC MATERIAL INJECTED IN AUGUST 2009.
6. ISCR INJECTION COMPLETED AT THE DRMO1 (3-PARTY) AND DRMO4 SITES IN AUGUST 2009.
7. SECOND ISCR INJECTION COMPLETED AT THE DRMO1 (3-PARTY) SITE IN AUGUST 2010, AND SECOND ISCR INJECTION WAS COMPLETED AT THE DRMO 4 SITE IN SEPTEMBER 2011.
8. DRMO 2-PARTY SITES ARE SAMPLED IN THE SPRING AND DRMO 3-PARTY SITES ARE SAMPLED IN FALL, STARTING IN 2009.
9. * IDENTIFIES SILICA GEL CLEANUP METHOD USED FOR AK102 (DRO) ANALYSIS IN 2011 (AP-10015, AP-10016, AP-10017, AP-10018, AND AP-8914R.
10. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN DUE TO SPACE LIMITATIONS.
11. ADEC CLEANUP LEVELS BASED ON TABLE C IN 18AAC75 (ADEC, 2017).

ROD REMEDIAL GOALS (µg/L)	
5.0	BENZENE
5.0	PCE
5.0	TCE
70	CIS 1,2 DCE

ADEC CLEANUP LEVELS	µg/L
DRO	1,500
1,2,4-TMB	15

KEY:



AP-8914R (16.5, 5-15)

	DRO	PCE	TCE	WATER ELEVATIONS
SEP 03	644	48.5	0.41	444.31
MAY 04	182	42.6	0.59	443.90
SEP 04	156	58.7	0.60	443.27
MAY 05	210	21.6	0.62	443.72
OCT 05	125	44.8	0.41	443.48

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

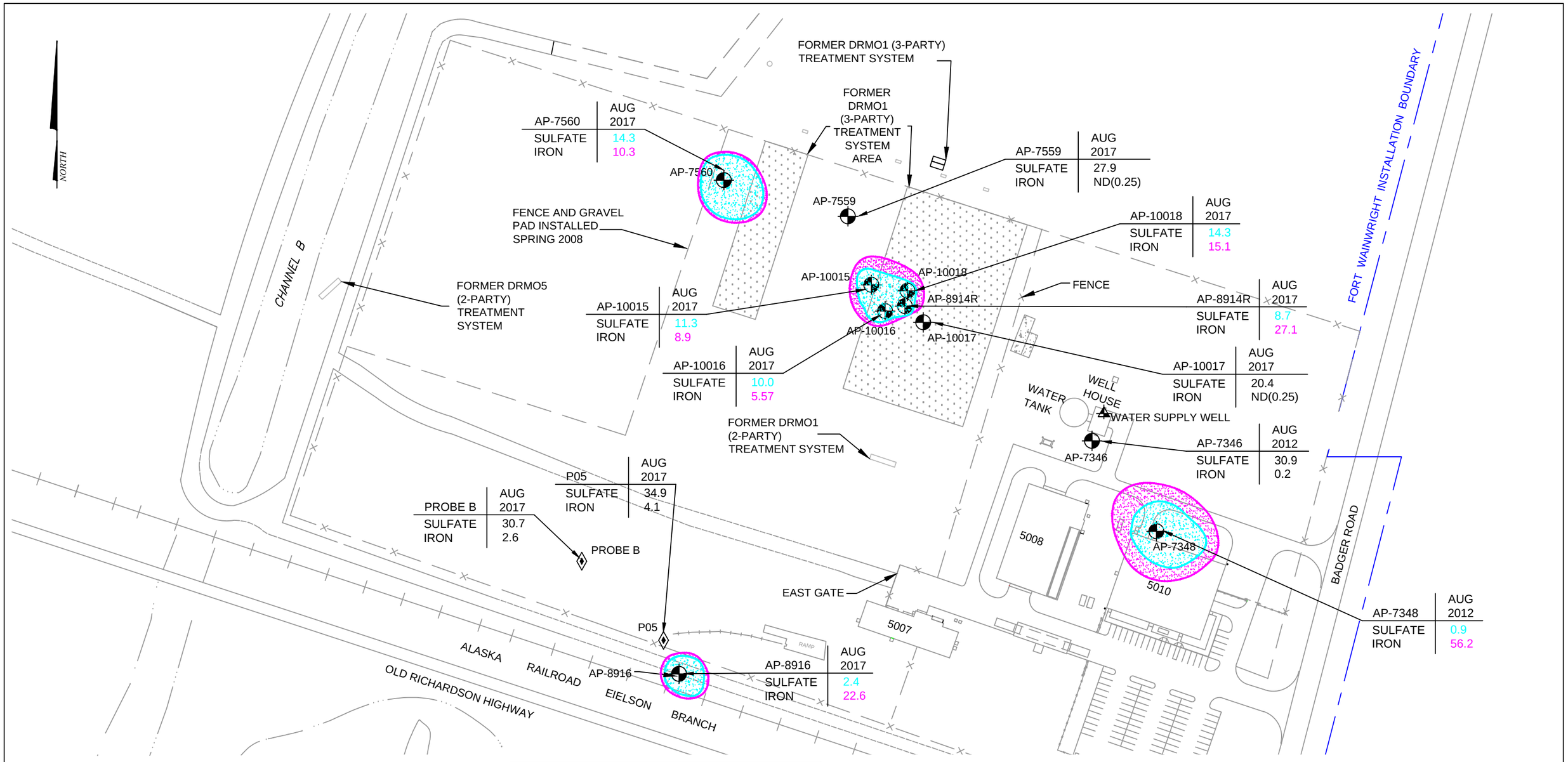
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Contaminants of Concern Detected in DRMO Yard 3-Party Site Groundwater Samples

2017 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

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

FIGURE 3-1



NOTES:

1. GROUNDWATER GEOCHEMISTRY BASED ON 2017 MONITORING RESULTS. WITH THE EXCEPTION OF GROUNDWATER GEOCHEMISTRY IN THE VICINITY OF AP-7348 AND AP-7346. GEOCHEMISTRY FROM 2012 USED IN THIS AREA.
2. DATA REPORTED IN MILLIGRAMS PER LITER (MG/L)

LEGEND:

AP-8916	MONITORING WELL LOCATION AND NUMBER
PROBE B	GROUNDWATER PROBE LOCATION AND NUMBER
WATER SUPPLY WELL	WATER WELL LOCATION
LOD	LIMIT OF DETECTION
MG/L	MILLIGRAMS PER LITER
ND	NOT DETECTED. LIMIT OF DETECTION (LOD) IN PARENTHESIS

0 150 300
Scale in Feet

KEY:

SULFATE REDUCING = SULFATE <20 MG/L

FERRIC IRON REDUCING = IRON >5 MG/L

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Approximate Regions of Reduced Groundwater Geochemistry

2017 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-16-D-0005	3-2	1/18

FIGURE 3-2

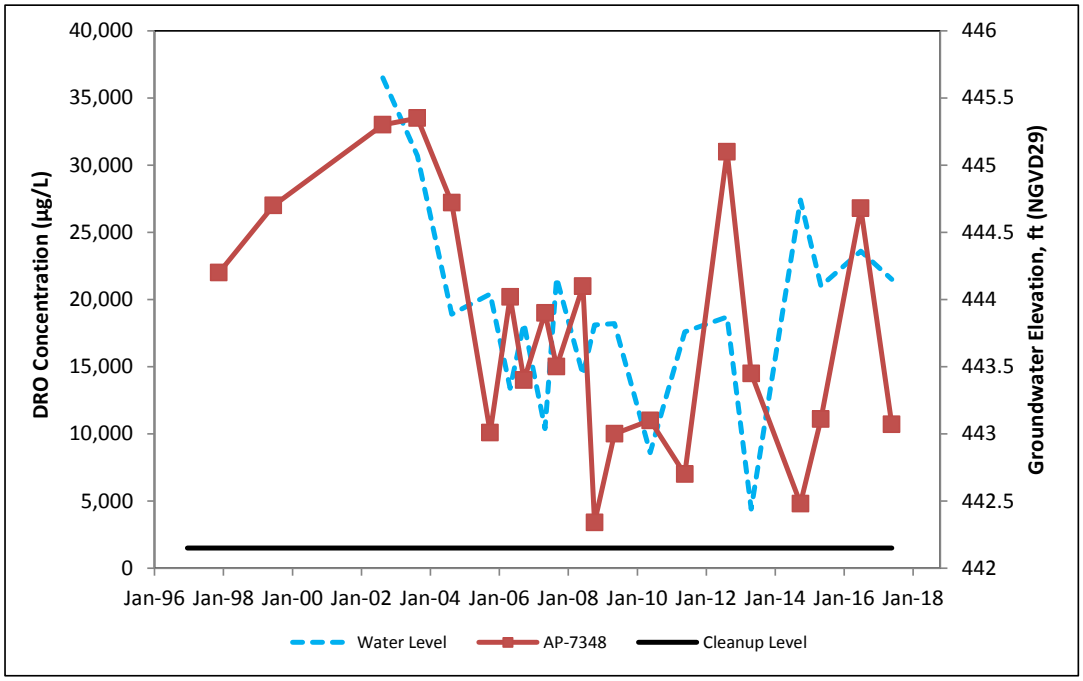
4.0 DRMO YARD GROUNDWATER RESULTS (2-PARTY)

This section presents the groundwater monitoring results for the DRMO Yard 2-Party site from the 2017 sampling event. Groundwater samples are collected on an annual basis from Building 5010 and the Water Supply Well near Building 5010. The results from the 2017 sampling event are presented in Table 4-1 and Figure 3-1 and described in the following sections.

To achieve site closure under the 2-Party program, groundwater concentrations must meet the cleanup levels identified in Table C of 18 AAC 75 (ADEC, 2017c). The ADEC cleanup levels were revised in 2016, and the results in this section are discussed relative to the current cleanup levels.

4.1 DRMO2 Subarea/Building 5010

Two monitoring wells were sampled during May 2017 in the Building 5010 area (DRMO2 subarea, former Building 5001 area). AP-7348 is located at the northwest corner of the DRMO Administration Facility (Building 5010) and AP-7346 is located further downgradient. Both are shallow wells screened across the groundwater table to a depth of approximately 15 feet below ground surface (bgs). They were installed to evaluate remaining contaminant concentrations from releases associated with former USTs in the area. DRO has consistently exceeded the RAG in AP-7348, and the DRO concentration changes over time along with groundwater elevations in AP-7348 are shown in Graph 4-1.



Graph 4-1. DRO Concentrations and Water Levels in AP-7348

As seen in Graph 4-1 and Table 4-1, the DRO concentration has been variable in recent sampling events, but the concentrations have remained within the range of detections observed in this well since sampling began in 1997. Although there has been wide variation in DRO concentrations between sampling events, Graph 4-1 does not show a consistent correlation between groundwater elevation and DRO concentration changes.

Exceedances for two fuel-related VOCs were observed in AP-7348 based on the 2017 sampling results and a comparison to the current ADEC cleanup levels. The exceedances were associated with 1,2,4-trimethylbenzene and naphthalene. Several low-level concentrations of additional fuel-related VOCs were detected in the 2017 groundwater samples in AP-7348, including benzene, toluene, ethylbenzene, xylenes, 1,3,5-trimethylbenzne, 1,2-dichloroethane, but no other exceedances were observed.

DRO was detected at trace concentrations (215 µg/L) in AP-7346, which is located approximately 150 feet downgradient of AP-7348. The only cleanup level exceedances in this well were observed in the first sampling event in June 1998.

4.2 Mann-Kendall Trend Analysis of DRO Concentration

Mann-Kendall trend analysis was performed for the Building 5010 wells using MAROS software to evaluate DRO concentration trends over time. The trend was evaluated using groundwater data between 1997 and 2017, and the results are presented in Appendix E and summarized in Table 4-2.

Table 4-2. Mann-Kendall Trend Analysis of DRO Concentrations for Building 5010 Wells

Site	Well	1997 -2017
Building 5010	AP-7346	Decreasing
	AP-7348	**Decreasing**

BOLD indicates DRO concentration above cleanup level for the period of analysis

The DRO trends in Building 5010 wells showed consistent decreasing trends in both wells since 1997. DRO has not been detected above the ADEC cleanup level in AP-7346 since 1998, but is consistently detected above the cleanup level in AP-7348.

4.3 DRMO Yard Water Supply Well Results

The WSW system is housed in Building 5009 located within the DRMO1 subarea. The well was installed in association with the fire suppression tank, and also supplies potable water to Building 5010. The well is typically sampled annually in association with the Building 5010 monitoring wells. Sampling results are shown on Table B-2.

Groundwater is processed through a water treatment/filtration system consisting of the addition of potassium permanganate, filtration through a green sand filtration unit, and chlorination. Treated water is then stored in an aboveground holding tank (fire suppression tank) adjacent to the water treatment building. Samples are typically collected from a raw water tap located directly downstream of the WSW source, upstream of all treatment processes.
Groundwater samples were collected from the WSW in May 2017, and the samples were analyzed for GRO, DRO, VOCs, and SVOCs. Complete results are shown in Table B-2, and no contaminants were detected. Although various low-level detections of various contaminants have been identified in previous sampling events, ADEC cleanup levels have never been exceeded for DRO or any other COC in the WSW since sampling began in 1998.

4.4 Evaluation of Potential 1,4-Dioxane Contamination

In addition to the evaluation of the COCs at Building 5010 and the WSW, 1,4-dioxane analysis was included in the 2017 monitoring program based on recommendations from the Fourth Five Year Review conducted in 2016 (U.S. Army Garrison Fort Wainwright, 2016). 1,4-dioxane analysis was not included in previous investigations, and the 2017 analysis showed one trace detection in AP-7348 at the Building 5010 site, more than an order of magnitude below the cleanup level. All other results from samples collected at Building 5010 and the WSW were non-detect (complete results presented in Appendix B). This indicates there is not 1,4-dioxane contamination in this area.

4.5 Recommendations for DRMO 2-Party Sites

4.5.1 Building 5010 Subarea

Groundwater sampling at the Building 5010 (former Building 5001) subarea should continue to evaluate contaminant concentration changes over time. However, no additional analysis for 1,4-dioxane is recommended in these wells based on the 2017 sampling results.

4.5.2 Water Supply Well

Samples should continue to be collected from the Water Supply Well on an annual basis, with the sample analyzed for GRO, DRO, VOCs, and SVOCs. The next sample should be collected in spring 2018 along with the Building 5010 samples. No additional analysis for 1,4-dioxane is recommended in the WSW based on the 2017 sampling results.

4.5.3 DRMO1 and DRMO5 2-Party Sites

Groundwater samples were not collected from the DRMO1 or DRMO5 2-Party sites in 2017. The next scheduled sampling event for these wells is 2019, in advance of the 2021 Five Year Review. Although the groundwater samples from these wells have not been analyzed for 1,4-dioxane,

there is not a need for the analysis to be included in a future sampling event based on the 2017 results from other wells in the DRMO yard.

Table 4-1. 2013 - 2017 Groundwater Sample Results
Building 5010 (2-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	Geochemical Parameters		Contaminant Concentrations (µg/L)			
					ORP (mV)	Dissolved Oxygen (mg/L)	Diesel Range Organics	1,2,4-Trimethylbenzene	Naphthalene	Benzene
ADEC CLEANUP LEVELS[1]							**1,500**	**15**	**1.7**	**4.6**
Building 5010 Wells										
AP-7346	Downgradient	13FW2F01WG	5/6/2013	442.50	-14.2	0.4	ND(376)			ND(0.24)
		13FW2F02WG[2]					ND(410)			ND(0.24)
		14FWOU216WG	10/10/2014	444.78	136	1.7	ND(300)			ND(0.2)
		15FWOU208WG	5/13/2015	444.35	74.8	0.9	ND(318)			ND(0.2)
		15WOU209WG[2]					ND(313)			ND(0.2)
		16FWOU202WG	7/8/2016	444.24	59	1.1	ND(600)			ND(0.2)
		16FWOU203WG[2]					194 J,B			ND(0.2)
		17FWOU207WG	5/31/2017	444.05	-0.4	1.1	ND(318)	ND (0.5)	ND (0.5)	ND(0.2)
		17FWOU208WG[2]					215 J	ND (0.5)	ND (0.5)	ND(0.2)
AP-7348	Source Area	13FW2F03WG	5/6/2013	442.44	-93.1	0.2	**14,500**			0.6
		14FWOU218WG	10/10/2014	444.74	-0.2	0.4	**4,810**			ND(0.2)
		15FWOU211WG	5/13/2015	444.10	-3.7	0.35	**11,100**			0.49
		16FWOU204WG	7/8/2016	444.36	-18.7	0.34	**26,800**			0.62
		17FWOU210WG	5/31/2017	444.15	-93.5	0.39	**10,700**	**75.7**	**86**	0.33 J

Notes

Analytes exceeding ADEC cleanup levels are in bold type and yellow highlighting.

[1] 18 AAC 75, Table C values (ADEC, 2017)

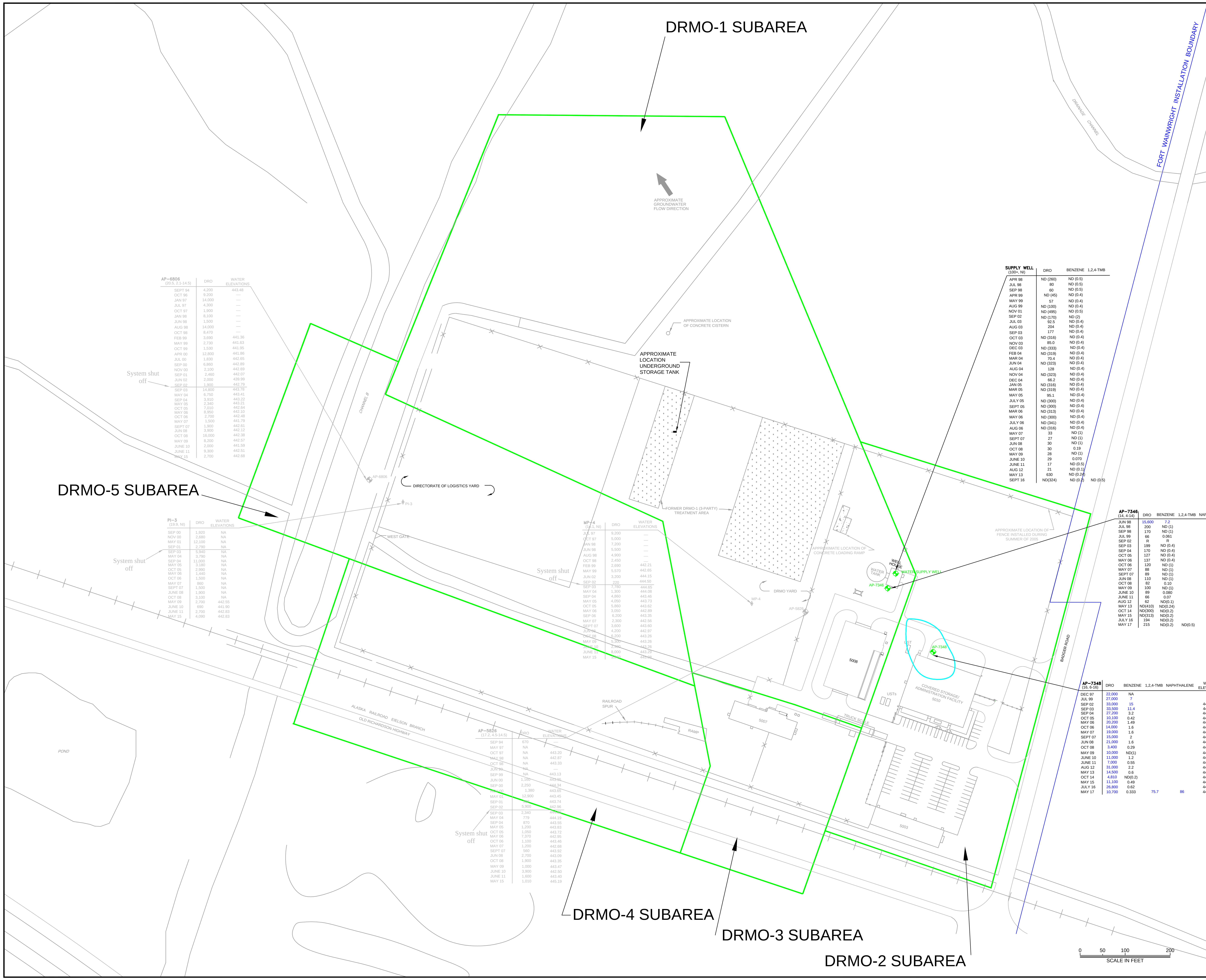
[2] Sample is a Field Duplicate of the sample immediately above.

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Acronyms/Abbreviations

btoc - below top of casing
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mS/cm - milliSiemens per cemtimeter
mV - millivolts
NA - not analyzed or not applicable
NGVD29 - North American Vertical Datum of 1929
NM - not measured



SUPPLY WELL (100+, NI)	DRO	BENZENE	1,2,4-TMB
APR 98	ND (260)	ND (0.5)	
JUL 98	80	ND (0.5)	
SEP 98	60	ND (0.5)	
APR 99	ND (45)	ND (0.4)	
MAY 99	57	ND (0.4)	
AUG 99	ND (100)	ND (0.4)	
NOV 01	ND (495)	ND (0.5)	
SEP 02	ND (170)	ND (2)	
JUL 03	92.5	ND (0.4)	
AUG 03	204	ND (0.4)	
SEP 03	177	ND (0.4)	
OCT 03	ND (316)	ND (0.4)	
NOV 03	85.0	ND (0.4)	
DEC 03	ND (333)	ND (0.4)	
FEB 04	ND (319)	ND (0.4)	
MAR 04	70.4	ND (0.4)	
JUN 04	ND (323)	ND (0.4)	
AUG 04	128	ND (0.4)	
NOV 04	ND (323)	ND (0.4)	
DEC 04	66.2	ND (0.4)	
JAN 05	ND (316)	ND (0.4)	
MAR 05	ND (319)	ND (0.4)	
MAY 05	95.1	ND (0.4)	
JULY 05	ND (300)	ND (0.4)	
SEPT 05	ND (300)	ND (0.4)	
MAR 06	ND (313)	ND (0.4)	
MAY 06	ND (300)	ND (0.4)	
JULY 06	ND (341)	ND (0.4)	
AUG 06	ND (316)	ND (0.4)	
MAY 07	33	ND (1)	
SEPT 07	27	ND (1)	
JUN 08	30	ND (1)	
OCT 08	30	0.19	
MAY 09	28	ND (1)	
JUNE 10	29	0.070	
JUNE 11	17	ND (0.5)	
AUG 12	21	ND (0.1)	
MAY 13	630	ND (0.24)	
SEPT 16	ND(324)	ND (0.2)	ND (0.5)

AP-7346 (14, 4-14)	DRO	BENZENE	1,2,4-TMB	NAPHTHALENE	WATER ELEVATIONS
JUN 98	**15,600**	**7.2**			—
JUL 98	200	ND (1)			—
SEP 98	170	ND (1)			—
JUL 99	66	0.061			—
SEP 02	R	R			444.51
SEP 03	199	ND (0.4)			445.20
SEP 04	170	ND (0.4)			443.86
OCT 05	127	ND (0.4)			443.89
MAY 06	137	ND (0.4)			443.12
OCT 06	120	ND (1)			443.68
MAY 07	88	ND (1)			442.83
SEPT 07	89	ND (1)			442.61
JUN 08	110	ND (1)			443.22
OCT 08	82	0.10			443.57
MAY 09	100	ND (1)			444.01
JUNE 10	89	0.080			442.83
JUNE 11	66	0.07			443.56
AUG 12	62	ND(0.1)			443.92
MAY 13	ND(410)	ND(0.24)			442.50
OCT 14	ND(300)	ND(0.2)			444.78
MAY 15	ND(313)	ND(0.2)			444.35
JULY 16	194	ND(0.2)			444.24
MAY 17	215	ND(0.2)	ND(0.5)	ND(0.5)	444.05

AP-7348 (16, 6-16)	DRO	BENZENE	1,2,4-TMB	NAPHTHALENE	WATER ELEVATIONS
DEC 97	**22,000**	NA			—
JUL 99	**27,000**	**7**			—
SEP 02	**33,000**	**15**			445.65
SEP 03	**33,500**	**11.4**			445.07
SEP 04	**27,200**	3.2			443.89
OCT 05	**10,100**	0.42			444.04
MAY 06	**20,200**	1.49			443.34
OCT 06	**14,000**	1.6			443.82
MAY 07	**19,000**	1.6			443.04
SEPT 07	**15,000**	2			444.16
JUN 08	**21,000**	1.6			443.44
OCT 08	**3,400**	0.29			443.81
MAY 09	**10,000**	ND(1)			443.82
JUNE 10	**11,000**	1.2			442.86
JUNE 11	**7,000**	0.55			443.76
AUG 12	**31,000**	2.2			443.87
MAY 13	**14,500**	0.6			442.44
OCT 14	**4,810**	ND(0.2)			444.74
MAY 15	**11,100**	0.49			444.10
JULY 16	**26,800**	0.62			444.36
MAY 17	**10,700**	0.333	**75.7**	**86**	444.15

ONLY ROD COCS THAT HAVE HISTORICALLY EXCEEDED REMEDIAL GOALS OR NON-ROD ANALYTES WHICH EXCEEDED ADEC CLEANUP LEVELS IN 2017 ARE SHOWN.

LEGEND:

AP-7348	2-PARTY GROUNDWATER SAMPLING LOCATION
PI-3	2-PARTY GROUNDWATER SAMPLING LOCATION (PROBE)
	APPROXIMATE 2017 DRO PLUME
— X —	FENCE
AST	ABOVEGROUND STORAGE TANK
bgs	BELOW GROUND SURFACE
DRO	DIESEL RANGE ORGANICS
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	SAMPLE COLLECTED, BUT ANALYSIS NOT PERFORMED
ND(4)	NOT DETECTED (LOD). LOQ IS SHOWN FOR DATA PRIOR TO 2012
NI	NO INFORMATION AVAILABLE
NGVD29	NATIONAL GEODETIC VERTICAL DATUM 1929
NM	NOT MEASURED
NS	NOT SAMPLED
R	REJECTED VALUE BASED ON QUESTIONABLE ANALYTICAL DATA
1,2,4-TMB	TRIMETHYLBENZENE
UST	UNDERGROUND STORAGE TANK
—	DATA NOT AVAILABLE

ADEC CLEANUP LEVELS	µg/L
BENZENE	4.6
DRO	1,500
1,2,4-TMB	15
NAPHTHALENE	1.7

NOTES:

1. **BOLD** NUMBERS REPRESENT CONCENTRATIONS THAT ARE AT OR ABOVE APPLICABLE CLEANUP LEVELS.
2. ALL ANALYTE CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
3. DRMO-1 (2-PARTY), DRMO-5 (2-PARTY), AND DRMO-1 (3-PARTY) TREATMENT SYSTEMS WERE DECOMMISSIONED IN THE FALL OF 2008.
4. DRMO 2-PARTY SITES ARE SAMPLED IN THE SPRING AND DRMO 3-PARTY SITES ARE SAMPLED IN FALL STARTING IN 2009.
5. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN DUE TO SPACE LIMITATIONS.
6. ADEC CLEANUP LEVELS BASED ON TABLE C IN 18AAC75 (ADEC, 2017).

KEY:

CONTAMINANTS OF CONCERN
TOTAL DEPTH, SCREENED INTERVAL (bgs)
SAMPLE MONTH AND YEAR
WATER ELEVATIONS IN FEET (NGVD29)
CONCENTRATIONS EXCEEDING ADEC CLEANUP LEVELS
CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)
SEE LEGEND FOR ABBREVIATIONS.

AP-7348 (16, 6-16)	DRO	BENZENE	WATER ELEVATIONS
DEC 97	**22,000**	NA	—
JUL 99	**27,000**	**7**	—
SEP 02	**33,000**	**15**	445.65
SEP 03	**33,500**	**11.4**	445.07
SEP 04	**27,200**	3.2	443.89
OCT 05	**10,100**	0.42	444.04
MAY 06	**20,200**	1.49	443.34

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Contaminants of Concern Detected in DRMO Yard 2-Party Site Groundwater Samples

2017 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT: W911KB-16-D-0005 | FIGURE: 4-1 | DATE: 1/18

FIGURE 3-1

5.0 FORMER BUILDING 1168 GROUNDWATER MONITORING RESULTS

This section presents the 2017 sampling results from the former Building 1168 3-Party site. Groundwater sampling was conducted in May 2017, and the results are summarized in Table 5-1 and Figure 5-1 and discussed in the following sections.

5.1 Former Building 1168 Groundwater Elevations and Flow Direction

Groundwater elevation data collected for the former Building 1168 site during 2017 are summarized in Table 3-1 and Table 5-1. Table 3-1 shows that groundwater elevations were approximately 0.7 feet higher in May 2017 than July 2016, and Figure 5-1 shows that the 2017 water levels are among the highest that have been observed at the site. Groundwater was within the screened interval of each of the monitoring wells at the time of sampling. Historic groundwater elevation results at the site show that the groundwater flow is to the northwest, consistent with the regional groundwater flow direction.

5.2 Former Building 1168 Sampling Results (3-Party Site)

Groundwater samples were collected from three monitoring wells (AP-6809, AP-5751, and AP-10037MW) associated with the 3-Party site during May 2017 to monitor contaminant concentration and groundwater geochemistry changes over time. Groundwater samples were analyzed for DRO, VOCs, 1,4-dioxane, and natural attenuation parameters (total [field-filtered] iron and sulfate).

5.2.1 Groundwater Geochemistry Evaluation

Geochemical parameters in groundwater were measured at the former Building 1168 site to evaluate the potential mechanisms of biodegradation. Although an ISCO and oxygen-releasing compound (ORC) injection (Regenesis RegenOx® and ORC-A®) was completed in October 2010, 2017 sampling results showed the groundwater geochemistry was representative of pre-injection conditions.

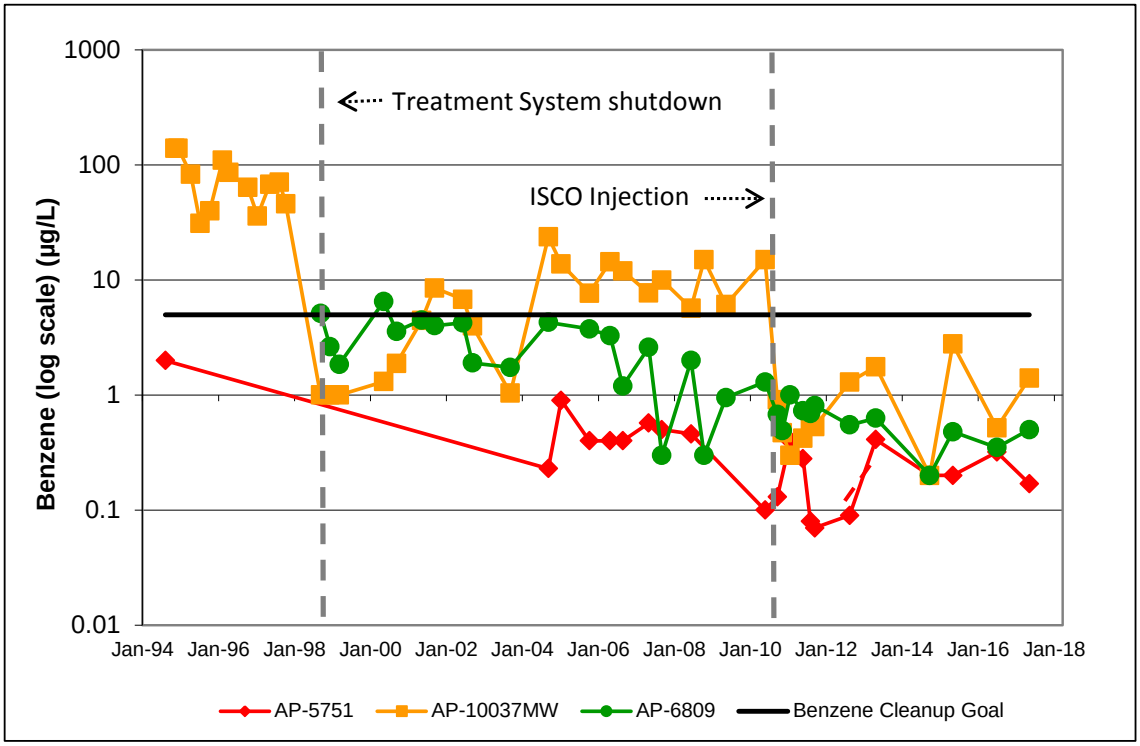
The groundwater geochemistry parameters in AP-10037MW measured in 2017 showed DO concentrations at 1 mg/L, and dissolved iron concentrations greater than 5 mg/L, indicating iron reducing conditions. The sulfate concentration was below background levels, which suggests that sulfate reduction is also occurring in this area.

The groundwater geochemistry in downgradient well AP-6809 was similar to the geochemistry in AP-10037MW, with the exception of the sulfate concentrations, which were significantly elevated above background levels. The groundwater geochemistry in upgradient well AP-5751 was

characterized by oxidizing conditions, with dissolved oxygen greater than 3 mg/L, ORP greater than 0 mV, low dissolved iron, and sulfate at background concentrations.

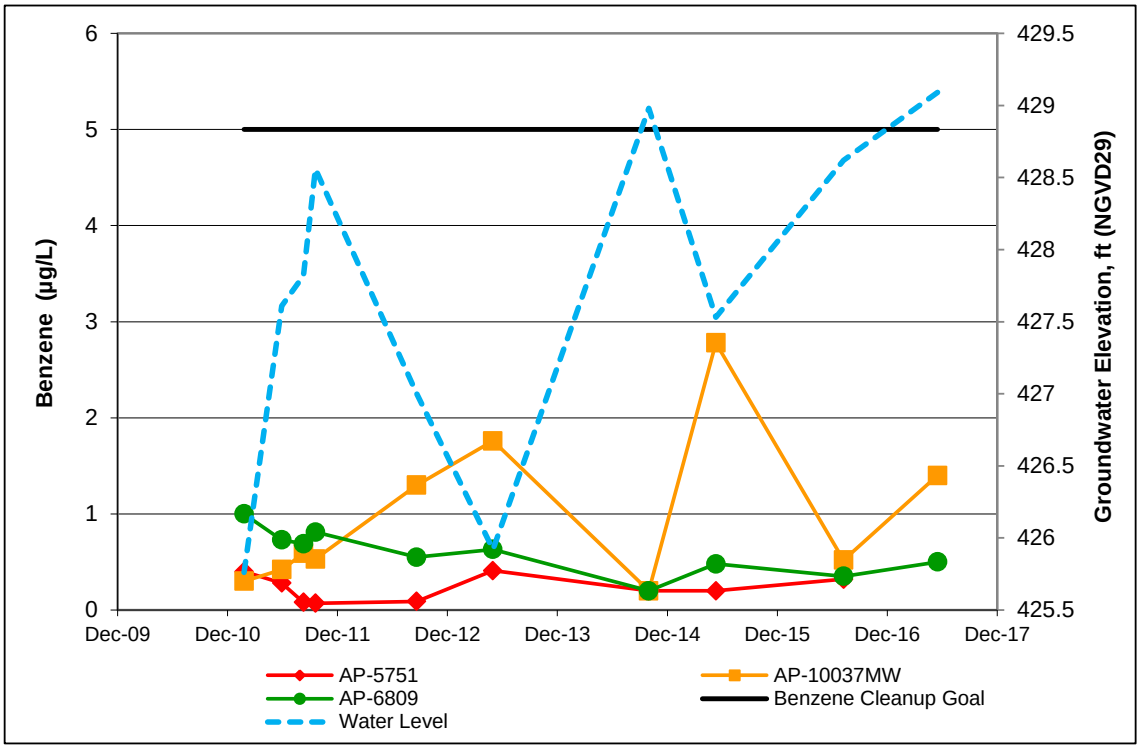
5.2.2 Benzene Groundwater Concentrations

Benzene was below the RAG in all wells sampled at the former Building 1168 3-Party site during May 2017. This was the 11th sampling event in a row where benzene was below the RAG. The benzene concentration results for the former Building 1168 wells are shown in Graph 5-1 and summarized in Table 5-1.



Graph 5-1. Benzene Concentrations in Former Building 1168 Wells

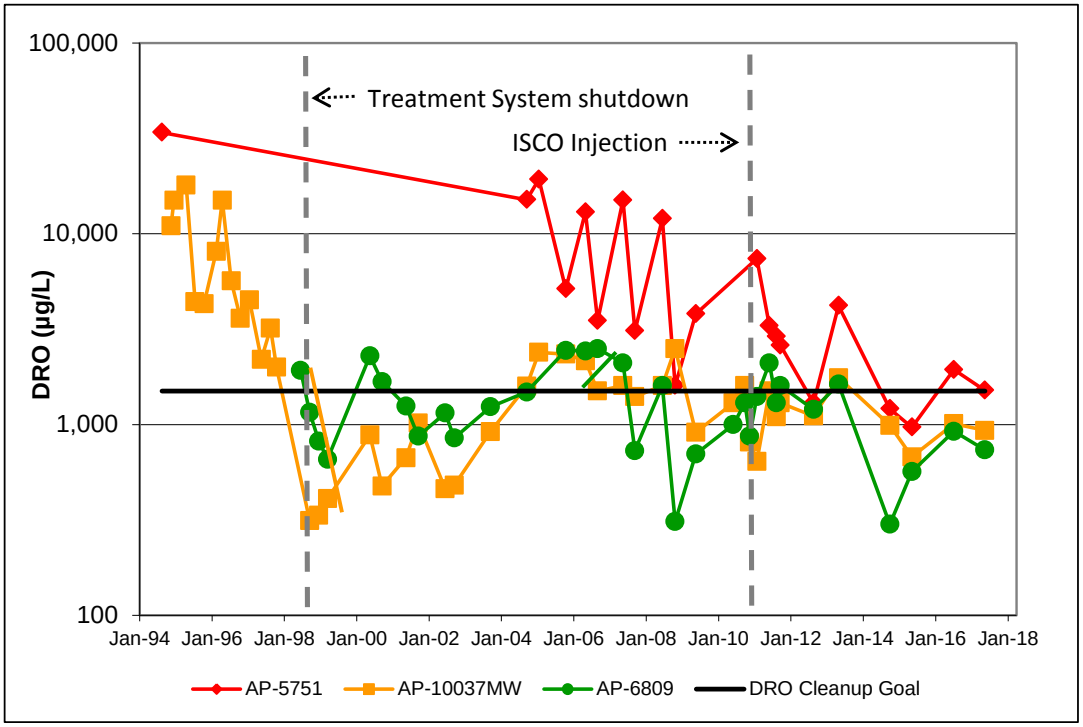
The benzene concentrations and groundwater elevations (measured in AP-6809) following the ISCO injection are shown in Graph 5-2. The graph shows benzene concentrations in AP-10037MW (the well where the injection was focused which exhibited the highest benzene concentrations) are generally inversely related to the groundwater elevation; when groundwater elevations are high, the benzene concentrations are low, and when the groundwater elevations are low, the benzene concentration is high. This may be a result of unusually high groundwater levels resulting in contact with a zone of residual soil contamination that is not typically impacted by groundwater. However, the magnitude of the increase in dissolved benzene concentration indicates the remaining contaminant mass is relatively small. Subsequent decreases in contaminant concentrations also suggest natural attenuation processes are continuing at this site, and benzene concentrations have remained below the RAG level since the ISCO injection.



Graph 5-2. Post-Injection Benzene Concentrations and Groundwater Elevations in Former Building 1168 Wells

5.2.3 DRO Groundwater Concentrations

The DRO concentration changes over time and visual trends for the three wells sampled at the former Building 1168 site are shown in Graph 5-3. DRO concentrations in AP-10037MW and downgradient well AP-6809 have varied slightly above and slightly below the ADEC cleanup level, and have been below the cleanup level for the past several sampling events. DRO in AP-5751 was below the cleanup level in 2017 and has a long-term decreasing trend. This trend will continue to be monitored in future sampling events.



Graph 5-3. DRO Concentrations in Former Building 1168 Wells

5.2.4 Evaluation of Potential 1,4-Dioxane Contamination

In addition to the evaluation of the COCs at the former Building 1168 site, 1,4-dioxane analysis was included in the 2017 monitoring program based on recommendations from the Fourth Five Year Review conducted in 2016 (U.S. Army Garrison Fort Wainwright, 2016). 1,4-dioxane analysis was not included in previous investigations, and the 2017 analysis showed no detections at the former Building 1168 site (complete results presented in Appendix B). This indicates there is not 1,4-dioxane contamination in this area.

5.3 Statistical Evaluation of Contaminant Concentration and RAGs

The groundwater sampling results at the former Building 1168 site were evaluated using the Groundwater Statistics Tool developed by the EPA (EPA, 2014). The analysis was completed for benzene in the three wells that are sampled at the site; AP-6809, AP-10037MW, and AP-5751. The time period selected for the analysis was between November 2010 and May 2017 (11 sampling events), which represents the period following the treatability study injection. The results of the statistical analysis are presented in Appendix E, and a summary of the results is presented in Table 5-2.

The evaluation for "attainment" is recommended after all treatments have ended. However, the evaluation at the former Building 1168 site included the events immediately following the ISCO

injection since many of the post-treatment sampling results were near the detection limit, and collection of additional data would not likely contribute meaningful input to the statistical analysis.

A total of 11 sampling events were used for each of the wells that have exceeded the RAG for benzene (AP-6809 and AP-10037MW). However, only 9 sampling events were used for AP-5751 since the variability of the data near the detection limit prevented the statistics tool from determining the 95% confidence level results if all sampling events were used.

Table 5-2. Cleanup Complete Evaluation for Benzene in 1168 (3-Party) Wells

Well	95% UCL	95% UCB Value[1]	Trend Result	Achieve RAG?
AP-6809	0.87	0.63	Decreasing	**Achieved**
AP-10037MW	1.99	2.72	Stable[2]	**Achieved**
AP-5751	0.40	0.42	Stable[2]	**Achieved**

The analysis is based on the EPA Groundwater Statistics Tool, available from https://www.epa.gov/superfund/superfund-groundwater-groundwater-response-completion
Gray highlight indicates the RAG has been achieved and will continue to achieve at a 95% confidence level
[1] Represents the value of the 95% Upper Confidence Band (UCB) value at the final sampling event
[2] Slope was not statistically increasing
UCL – Upper Confidence Limit

The following is a summary of the results presented in Table 5-2:

- The 95% Upper Confidence Limit (UCL) and the 95% Upper Confidence Band (UCB) for benzene have been achieved for each of the three wells at the former Building 1168 site.
- Analysis of the benzene trend in AP-10037MW showed the concentration was not statistically increasing. In addition, benzene has not exceeded the RAG since the injection, and the RAG has been achieved with a statistically significant confidence level.

5.4 Comparison of 2017 Sampling Results to Current ADEC Cleanup Levels

The 2017 groundwater contaminant concentrations were compared to the current ADEC cleanup levels to allow for an evaluation of current compliance with 2-Party program closure requirements. ADEC cleanup level comparisons for former Building 1168 wells are presented in Table B-2. Results of the comparison are presented in Tables 5-3 and 5-4 for non-ROD COCs and ROD COCs respectively. The following summarizes the comparison to ADEC cleanup levels for non-ROD COCs based on 2017 sampling results:

- Naphthalene was identified above the current ADEC cleanup level in AP-5751
- DRO was identified above the current ADEC cleanup level in AP-5751 in 2017. However, the petroleum hydrocarbon cleanup levels did not change in 2016.

Table 5-3. Comparison of Groundwater Results for non-ROD COCs to Current ADEC Cleanup Levels[1] at OU2 Former Building 1168 3-Party Site

Contaminant	2008 ADEC Cleanup Level (µg/L)	2016 ADEC Cleanup Level[1] (µg/L)	Exceedance Location
Naphthalene	730	1.7	AP-5751
DRO	1,500	1,500	AP-5751

[1] Table C, 18 AAC 75 (ADEC, 2017c)

The ROD COCs were also compared to current ADEC cleanup levels for informational purposes, as presented in Table 5-4. Although the current ADEC cleanup levels were different from the ROD RG for all five COCs, there were no changes to the number or location of exceedances.

Table 5-4. Comparison of Groundwater Results for ROD COCs to Current ADEC Cleanup Levels[1] at OU2 Former Building 1168 3-Party Site

Contaminant	ROD RAG (µg/L)	2016 ADEC Cleanup Level (µg/L)[1]	Monitoring Well Exceedance Changes
Benzene	5	4.6	None
TCE	5	2.8	None
Vinyl Chloride	2	0.19	None
1,1-DCE	7	280	None
1,2-DCE	70	36	None

[1] Table C, 18 AAC 75 (ADEC, 2017c)

5.5 Summary and Recommendations for the Former Building 1168 (3-Party) Site

The results from the 2017 groundwater sampling and statistical evaluation show that the RAG for benzene has been achieved for the former Building 1168 site since the injection treatability study. Sampling results from AP-10037MW in 2012, 2013, 2015, and 2017 were greater than 1 µg/L, with the highest recent concentration observed in 2015. However, the benzene increases were observed following unusually high water levels at the site and indicate a small amount of contaminant mass may still be associated with the soils. These results do not suggest benzene will increase above the RAG.

Based on these results, the Environmental Protection Agency (EPA) recommended an interim Remedial Action Completion Report (iRACR) to document remedial action complete under CERCLA (USACE, 2016). The data in the iRACR, this Annual Monitoring Report, and the 1168 Treatability Study Report (FES, 2017b), may be used as a basis for transfer of the site from the 3-Party Program to the 2-Party Program.

Based on these results, groundwater sampling should continue to be conducted annually in the spring (prior to breakup if possible, when groundwater elevations are lowest), and the samples should be analyzed for DRO and VOCs. Since the 1,4-dioxane analysis completed in 2017 did not show any detections, no additional sampling for 1,4-dioxane is recommended.

Table 5-1. 2013 - 2017 Groundwater Sample Results
Former Building 1168

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	Geochemical Parameters						2-Party Chemicals of Concern (µg/L)			ROD Chemicals of Concern (µg/L)					
					ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Gasoline Range Organics	Diesel Range Organics	Naphthalene	Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene
ROD CLEANUP LEVELS (3-Party Site) / ADEC CLEANUP LEVEL (2-Party Site)[1]											**2,200**	**1,500**	**1.7**	**5**	**5**	**5**	**2**	**7**	**70**
AP-5751	Upgradient	13FW2H01WG	5/2/2013	426.06	-24.2	0.3	6.07	0.502	5.95	13.5	350 B	**4,520**		0.41	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU204WG	10/9/2014	429.12	169	0.6	6.25	0.913	ND(0.25)	33.8	ND(50)	1,210		ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU204WG	5/12/2015	427.55	87.2	0.4	5.78	0.588	0.27	29.7	76.4 J	968 J-		ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		16FWOU209WG	7/9/2016	428.75	61.4	1.4	6.29	0.82	0.31	25.3	NA	**1,940**		0.32 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		17FWOU204WG	5/17/2017	429.20	80.2	3.5	6.67	0.929	0.55	32.7	NA	**1,510**	**3.3**	0.17 J	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
AP-10037MW[3]	Source Area	13FW2H02WG	5/2/2013	426.08	-107.6	0.3	6.85	1.686	8 QL	38.9	126 B	**1,760**		1.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2H03WG[2]							7.77	48.7	129 B	**1,550**		1.8	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU201WG	10/9/2014	429.13	209.5	0.7	7.2	3.758	ND(0.25) J-,J	185.0	32.5 J,B	773		ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		14FWOU202WG[2]							0.15 J-, J	188.0	33.7 J	990		ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU202WG	5/12/2015	427.82	24.7	0.3	6.31	1.138	8.3	34.2	135	677		2.75	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU203WG[2]							8.37	34.1	133	610 J		2.78	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		16FWOU207WG	7/9/2016	428.79	-34.2	0.4	6.69	0.864	12.2	18.4	NA	1,010		0.52	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		16FWOU208WG[2]							12.5	18.5	NA	1,010		0.5	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		17FWOU201WG	5/17/2017	429.51	41.9	1.0	6.66	0.746	14.1	15.7	NA	511 J		1.4	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
		17FWOU202WG[2]							14.6	15.8	NA	932	ND (0.5)	1.1	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
AP-6809	Downgradient	13FW2H04WG	5/2/2013	425.92	41.3	0.3	6.33	1.005	0.96 J	80.3	56 J,B	**1,630**		0.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU203WG	10/9/2014	428.98	181.4	1.0	6.36	1.254	ND(0.25)	102	ND(50)	ND(318)		ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU201WG	5/12/2015	427.53	94.9	0.4	5.98	1.099	1.3	71.7	71.7 J	567 J		0.48	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		16FWOU206WG	7/9/2016	428.62	101.30	0.62	6.45	1.045	0.38 J	63.2	NA	922		0.35 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		17FWOU303WG	5/17/2017	429.09	59.20	0.61	6.63	1.141	2.5	66.6	NA	737	ND (0.5)	0.5	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)

Notes

Analytes exceeding remedial action goals (RAG) established in the Record of Decision (ROD) or ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and yellow highlighting.

ROD chemicals of concern were analyzed by EPA Method 8260C.

[1] ADEC Cleanup level from 18 AAC 75 (ADEC, 2017)

[2] Sample is a Field Duplicate of the sample immediately above.

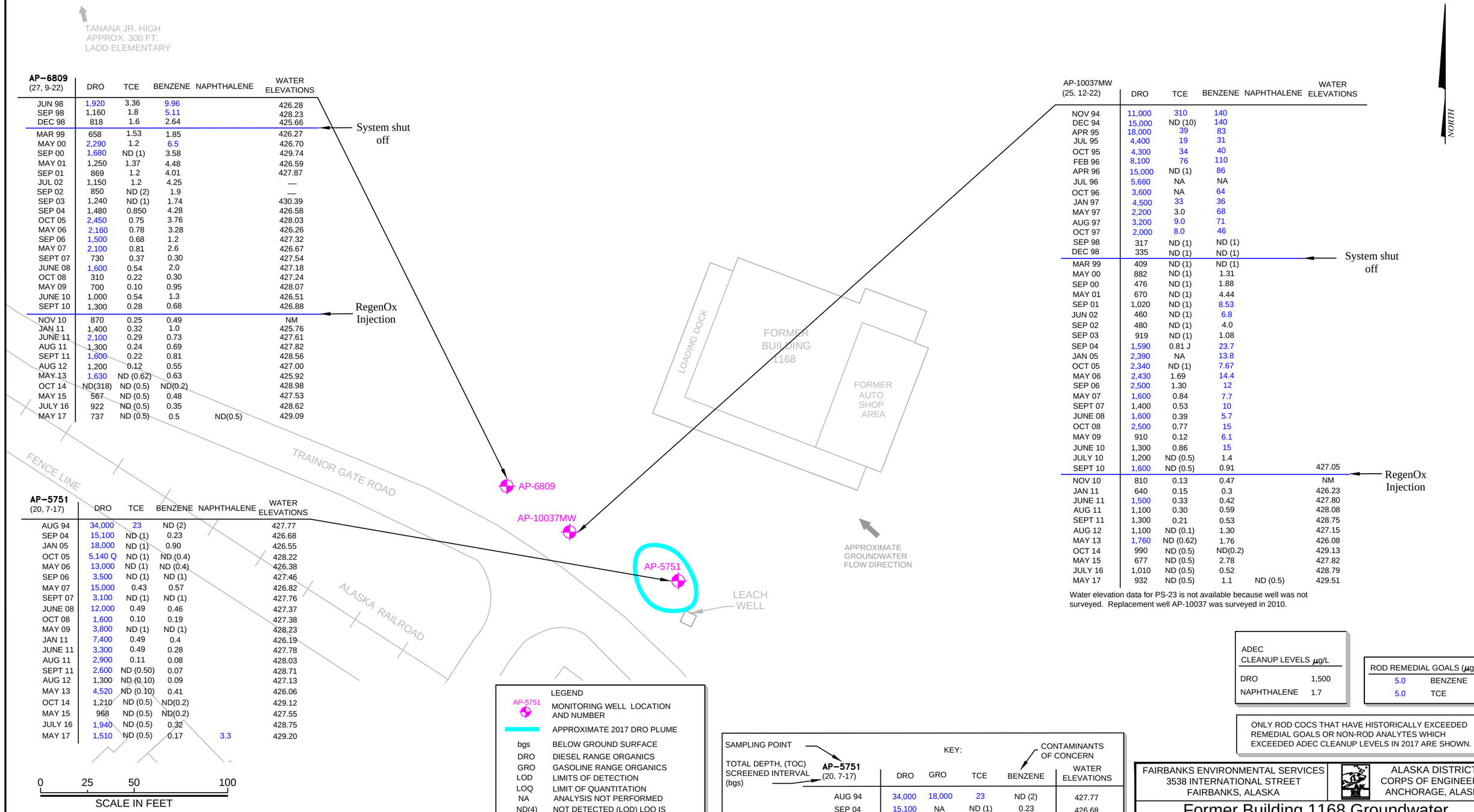
[3] PS-23 was replaced by AP-10037MW in July 2010.

Acronyms/Abbreviations

btoc - below top of casing
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NGVD29 - North American Vertical Datum of 1929
NM - not measured
ROD - Record of Decision

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).



AP-6809 (27, 9-22)	DRO	TCE	BENZENE	NAPHTHALENE	WATER ELEVATIONS	
JUN 98	1,920	3.36	9.96		426.28	
SEP 98	1,160	1.8	5.11		428.23	
DEC 98	818	1.6	2.64		425.66	System shut off
MAR 99	658	1.53	1.85		426.27	
MAY 00	2,290	1.2	6.5		426.70	
SEP 00	1,680	ND (1)	3.58		429.74	
MAY 01	1,250	1.37	4.48		426.59	
SEP 01	869	1.2	4.01		427.87	
JUL 02	1,150	1.2	4.25		—	
SEP 02	850	ND (2)	1.9		—	
SEP 03	1,240	ND (1)	1.74		430.39	
SEP 04	1,480	0.850	4.28		426.58	
OCT 05	2,450	0.75	3.76		428.03	
MAY 06	2,160	0.78	3.28		426.26	
SEP 06	1,500	0.68	1.2		427.32	
MAY 07	2,100	0.81	2.6		426.67	
SEPT 07	730	0.37	0.30		427.54	
JUNE 08	1,600	0.54	2.0		427.18	
OCT 08	310	0.22	0.30		427.24	
MAY 09	700	0.10	0.95		428.07	
JUNE 10	1,000	0.54	1.3		426.51	
SEPT 10	1,300	0.28	0.68		426.88	RegenOx Injection
NOV 10	870	0.25	0.49		NM	
JAN 11	1,400	0.32	1.0		425.76	
JUNE 11	2,100	0.29	0.73		427.61	
AUG 11	1,300	0.24	0.69		427.82	
SEPT 11	1,600	0.22	0.81		428.56	
AUG 12	1,200	0.12	0.55		427.00	
MAY 13	1,630	ND (0.62)	0.63		425.92	
OCT 14	ND(318)	ND (0.5)	ND(0.2)		428.98	
MAY 15	567	ND (0.5)	0.48		427.53	
JULY 16	922	ND (0.5)	0.35		428.62	
MAY 17	737	ND (0.5)	0.5	ND(0.5)	429.09	

AP-5751 (20, 7-17)	DRO	TCE	BENZENE	NAPHTHALENE	WATER ELEVATIONS
AUG 94	34,000	23	ND (2)		427.77
SEP 04	15,100	ND (1)	0.23		426.68
JAN 05	18,000	ND (1)	0.90		426.55
OCT 05	5,140 Q	ND (1)	ND (0.4)		428.22
MAY 06	13,000	ND (1)	ND (0.4)		426.38
SEP 06	3,500	ND (1)	ND (1)		427.46
MAY 07	15,000	0.43	0.57		426.82
SEPT 07	3,100	ND (1)	ND (1)		427.76
JUNE 08	12,000	0.49	0.46		427.37
OCT 08	1,600	0.10	0.19		427.38
MAY 09	3,800	ND (1)	ND (1)		428.23
JAN 11	7,400	0.49	0.4		426.19
JUNE 11	3,300	0.49	0.28		427.78
AUG 11	2,900	0.11	0.08		428.03
SEPT 11	2,600	ND (0.50)	0.07		428.71
AUG 12	1,300	ND (0.10)	0.09		427.13
MAY 13	4,520	ND (0.10)	0.41		426.06
OCT 14	1,210	ND (0.5)	ND(0.2)		429.12
MAY 15	968	ND (0.5)	ND(0.2)		427.55
JULY 16	1,940	ND (0.5)	0.32		428.75
MAY 17	1,510	ND (0.5)	0.17	3.3	429.20

AP-10037MW (25, 12-22)	DRO	TCE	BENZENE	NAPHTHALENE	WATER ELEVATIONS	
NOV 94	11,000	310	140			
DEC 94	15,000	ND (10)	140			
APR 95	18,000	39	83			
JUL 95	4,400	19	31			
OCT 95	4,300	34	40			
FEB 96	8,100	76	110			
APR 96	15,000	ND (1)	86			
JUL 96	5,660	NA	NA			
OCT 96	3,600	NA	64			
JAN 97	4,500	33	36			
MAY 97	2,200	3.0	68			
AUG 97	3,200	9.0	71			
OCT 97	2,000	8.0	46			
SEP 98	317	ND (1)	ND (1)			
DEC 98	335	ND (1)	ND (1)			System shut off
MAR 99	409	ND (1)	ND (1)			
MAY 00	882	ND (1)	1.31			
SEP 00	476	ND (1)	1.88			
MAY 01	670	ND (1)	4.44			
SEP 01	1,020	ND (1)	8.53			
JUN 02	460	ND (1)	6.8			
SEP 02	480	ND (1)	4.0			
SEP 03	919	ND (1)	1.08			
SEP 04	1,590	0.81 J	23.7			
JAN 05	2,390	NA	13.8			
OCT 05	2,340	ND (1)	7.67			
MAY 06	2,430	1.69	14.4			
SEP 06	2,500	1.30	12			
MAY 07	1,600	0.84	7.7			
SEPT 07	1,400	0.53	10			
JUNE 08	1,600	0.39	5.7			
OCT 08	2,500	0.77	15			
MAY 09	910	0.12	6.1			
JUNE 10	1,300	0.86	15			
JULY 10	1,200	ND (0.5)	1.4			
SEPT 10	1,600	ND (0.5)	0.91		427.05	RegenOx Injection
NOV 10	810	0.13	0.47		NM	
JAN 11	640	0.15	0.3		426.23	
JUNE 11	1,500	0.33	0.42		427.80	
AUG 11	1,100	0.30	0.59		428.08	
SEPT 11	1,300	0.21	0.53		428.75	
AUG 12	1,100	ND (0.1)	1.30		427.15	
MAY 13	1,760	ND (0.62)	1.76		426.08	
OCT 14	990	ND (0.5)	ND(0.2)		429.13	
MAY 15	677	ND (0.5)	2.78		427.82	
JULY 16	1,010	ND (0.5)	0.52		428.79	
MAY 17	932	ND (0.5)	1.1	ND (0.5)	429.51	

Water elevation data for PS-23 is not available because well was not surveyed. Replacement well AP-10037 was surveyed in 2010.

NOTES:
1. ADEC CLEANUP LEVEL FOR GRO IN 18AAC75 CHANGED FROM 1,300 mg/L TO 2,200 mg/L IN OCTOBER 2008.
2. PS-23 WAS REPLACED BY AP-10037MW IN JULY 2010.
3. REGENESIS REGENOX AND ORC-A INJECTION COMPLETED NEAR AP-10037MW IN OCTOBER 2010.
4. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN DUE TO SPACE LIMITATIONS.
5. ADEC CLEANUP LEVELS BASED ON TABLE C IN 18AAC75 (ADEC, 2017).

LEGEND

AP-5751 — MONITORING WELL LOCATION AND NUMBER

APPROXIMATE 2017 DRO PLUME

bgs	BELOW GROUND SURFACE
DRO	DIESEL RANGE ORGANICS
GRO	GASOLINE RANGE ORGANICS
LOD	LIMITS OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	ANALYSIS NOT PERFORMED
ND(4)	NOT DETECTED (LOD) LOQ IS SHOWN FOR DATA PRIOR TO 2012
NGVD29	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NM	NOT MEASURED
RRO	RESIDUAL RANGE ORGANICS
TCE	TRICHLOROETHENE
TOC	TOP OF CASING
—	DATA NOT FOUND

KEY:

SAMPLING POINT → AP-5751 (20, 7-17) (TOTAL DEPTH, (TOC) SCREENED INTERVAL (bgs))

SAMPLE MONTH

CONTAMINANTS OF CONCERN

AP-5751 (20, 7-17)	DRO	GRO	TCE	BENZENE	WATER ELEVATIONS
AUG 94	34,000	18,000	23	ND (2)	427.77
SEP 04	15,100	NA	ND (1)	0.23	426.68
JAN 05	19,300	1,080	NA	0.9	426.55
OCT 05	5,140	NA	ND (1)	ND (0.4)	428.22

CONCENTRATIONS EXCEEDING ADEC CLEANUP LEVEL OR ROD RG SHOWN IN BLUE.

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

ELEVATIONS IN FEET (NGVD29)

SEE LEGEND FOR ABBREVIATIONS.

ADEC CLEANUP LEVELS µg/L	
DRO	1,500
NAPHTHALENE	1.7

ROD REMEDIAL GOALS (µg/L)	
5.0	BENZENE
5.0	TCE

ONLY ROD COCS THAT HAVE HISTORICALLY EXCEEDED REMEDIAL GOALS OR NON-ROD ANALYTES WHICH EXCEEDED ADEC CLEANUP LEVELS IN 2017 ARE SHOWN.

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Former Building 1168 Groundwater Monitoring Results

2017 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

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

FIGURE 5-1

6.0 REFERENCES

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APPENDIX A

CHEMICAL DATA QUALITY REVIEW, ADEC CHECKLISTS, AND SUPPORTING INFORMATION

FINAL

CHEMICAL DATA QUALITY REVIEW

Operable Unit 2

Fort Wainwright, Alaska

NPDL # 17-048

Prepared: November 7, 2017
Revised: January 16, 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
Project Chemist

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
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
DRO	diesel range organics
EDB	1,2-dibromomethane
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
ERA	Environmental Resource Associates
FES	Fairbanks Environmental Services, Inc
FSP	Field Sampling Plan
GRO	gasoline range organics
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
OU2	Operable Unit 2
PE	performance evaluation
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories

LIST OF ACRONYMS AND ABBREVIATIONS – continued

R	analytical result is rejected and is not suitable for project use
ROD	Record of Decision
RPD	relative percent difference
SDG	sample data group
SGS	SGS North America, Inc.
SVOC	semi-volatile organic compounds
TOC	total organic carbon
U	analyte was analyzed for, but not detected
USACE	United States Army Corps of Engineers
VOC	volatile organic compounds

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 2 (OU2) sites during 2017. The groundwater events are summarized in Section 1.3. Groundwater sample tracking and analytical results tables are presented in Appendix B.

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 for Quality Assurance Project Plans (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, 2017a); and United States Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.1 (DoD, 2017). 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 OU2 Record of Decision remedial goals, or ADEC cleanup levels presented in Title 18 of the Alaska Administrative Code (AAC) Chapter 75.345, Table C (ADEC, 2017c), as appropriate.

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 A-1 on the following page summarizes the analytical methods employed, and the associated DQO goals, for groundwater samples.

Table A-1. Groundwater Analytical Methods and Data Quality Objectives

Parameter	Preparation Method	Analytical Method	Limit of Detection	Accuracy (%)	Precision (RPD, %)	Completeness (%)
Gasoline Range Organics (GRO)	SW5030B	AK101	0.050 mg/L	60-120	20	90
Diesel Range Organics (DRO)	SW3520C	AK102	0.300 mg/L	75-125	20	90
Benzene	SW5030B	SW8260C	0.200 µg/L	79-120	20	90
Tetrachloroethene			0.500 µg/L	74-129	20	90
Trichloroethene			0.500 µg/L	79-123	20	90
cis-1,2-Dichloroethene			0.500 µg/L	78-123	20	90
1,1-Dichloroethene			0.500 µg/L	71-131	20	90
Vinyl Chloride			0.500 µg/L	58-137	20	90
Remaining Volatile Organic Compounds (VOCs)			Analyte Specific[1]	Analyte Specific[1]	20	90
1,4-Dioxane	NA	SW8260B-SIM	0.50 µg/L	59-139	20	90
Semivolatile Organic Compounds (SVOCs)	SW3520C	SW8270D	Analyte Specific[1]	Analyte Specific[1]	20	90
Alkalinity	SM 2320B	SM 2320B	5000 µg/L	85-115	25	90
Total Organic Carbon (TOC)	SW9060A	SW9060A	250 µg/L	80-120	25	90
Iron (field filtered)	SW3010A	SW6020A	250 µg/L	87-118	20	90
Sulfate	300.0	300.0	100 µg/L	90-110	15	90

[1] The analyte-specific limits of detection (LODs) and accuracies are presented in the UFP-QAPP (FES, 2016)
µg/L – micrograms per liter
mg/L – milligrams per liter
RPD – relative percent difference
NA – Not applicable

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 A-2 below 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 A-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

Groundwater samples were collected from monitoring wells from three OU2 sites in 2017: Former Building 1168, and Defense Reutilization Marketing Office (DRMO) Two Party and Three Party sites. A total of 19 groundwater samples, consisting of 16 project samples and three field duplicate samples (one from each site), were collected. In addition, MS/MSD samples were submitted for every analysis (minimum of one per 20 samples) from each site, one trip blank sample accompanied each cooler containing samples for volatile analysis, and three equipment blank samples were collected to assess the potential for cross-contamination of the submersible pump. Samples were analyzed by one or more of the methods presented in Table A-1.

All project and quality control samples were analyzed by SGS North America, Inc. (SGS) of Anchorage, Alaska with the exception of 1,4-Dioxane which was subcontracted to SGS of Orlando, Florida. The laboratories are validated by the State of Alaska through the Contaminated Sites Program and are Environmental Laboratory Accreditation Program (ELAP) certified. In addition, SGS is compliant with the DoD QSM for Environmental Laboratories, Version 5.1 (DoD, 2017), for the methods employed for this project.

Samples were shipped in three sample data groups (SDGs) and assigned the SGS report numbers 1172520, 1172892, and 1175526. A sample summary table (Table B-1) and analytical results tables for Three Party and Two Party sites (Tables B-2 and B-3, respectively) are included in Appendix B. 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. In general, findings that did not result in data qualification are not discussed in this review. See the associated ADEC Laboratory Data Review Checklists for more elaborate data quality review descriptions.

2.1 Sample Collection

All monitoring wells were purged and sampled with submersible pumps, with the exception of those bulleted below, and groundwater sampling activities were recorded on the groundwater sample forms provided in Appendix C. Groundwater sample 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 UFP-QAPP (FES, 2016), that low-flow sampling criteria was employed (Puls and Barcelona, 1996), and that all groundwater levels were within the screened intervals at the time of sampling.

Groundwater sample forms indicate all samples met stabilization criteria and all water levels were within the screened interval during sample collection. No free product was measured during sampling activities, and slight sheen was observed on the purge water from one well (AP-7348) at the Two Party DRMO site. Additional noteworthy observations are listed below.

- All wells were sampled with a submersible pump, per the UFP-QAPP, with the exception of four small-diameter monitoring wells (AP-10015 through AP-10018), two groundwater probes (Probe B and PO5), and the water supply well (WSW). The casings of the monitoring wells/probes are too small to house a submersible pump and were sampled with a peristaltic pump employing new Teflon-lined tubing at each location. Sampling of the WSW is further discussed in the following bullet.
- The WSW was sampled at a raw water tap located upstream of the building water treatment system after purging the well for approximately 30 minutes, per standard protocol. The well is purged for 30 minutes to obtain a representative sample of the aquifer. One set of groundwater parameters was recorded after purging and prior to sample collection. Given the design of the water system, the well is sampled with a dedicated high-flow, non-variable speed submersible pump and the water level cannot be measured.
- The water level could not be measured while purging groundwater probe PO5 (sample 17FWOU216WG); therefore, potential drawdown could not be evaluated. The water level indicator is too large to fit down the ¾-inch diameter casing. All other groundwater parameters met stabilization criteria and turbidity was low, so no data were qualified.

An equipment blank sample was collected at each site/event to evaluate the potential for submersible pump cross-contamination. Equipment blank results are further discussed in Section 2.3.

2.2 Sample Handling

The evaluation of proper sample handling procedures include verification of the following: correct COC documentation, appropriate sample containers and preservatives, sample analyses performed within method-specified holding times, and cooler temperatures maintained within the ADEC-recommended temperature range (0 to 6 degrees Celsius [°C]). No discrepancies were noted upon receipt at the laboratory.

2.3 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. Three analytical batches had method blank detections at concentrations less than the LOQ. However, these analytes were either not detected in associated samples or were detected at concentrations greater than five-times that of the blank concentration and data qualifications were not necessary. Method blanks are further discussed in associated ADEC Checklists.

Trip Blanks

Trip blank samples were shipped in every cooler containing samples for volatile analyses. Analytes that were detected in trip blank samples that resulted in data qualification are discussed below. Trip blanks are further discussed in associated ADEC Checklists.

- Chloromethane (0.507µg/L) was detected in the trip blank sample at a concentration below the LOQ (1.00µg/L) (report 1172892). Chloromethane was detected at concentrations less than five-times that of the trip blank in associated samples 17FWOU207WG, 17FWOU208WG, and 17FWOU210WG. These results were qualified (B) as potential cross-contamination. Impact to the project is negligible as the detections are more than two orders of magnitude below the ADEC cleanup level.

Equipment Blanks

Three equipment blank samples were collected (one from each site) to evaluate the potential for submersible pump cross-contamination. The results of equipment blank samples 17FWOU205WQ, 17FWOU211WQ, and 17FWOU224WQ were compared against results of associated project samples collected at Former Building 1168, DRMO Two Party, and DRMO Three Party sites, respectively. Analytes that were detected in equipment blank samples and also detected in associated project samples at concentrations less than five-time that of the blank were qualified (B) as potential cross-contamination. All equipment blank detections were at concentrations less than the LOQ. Affected project data are listed below. Equipment blanks are further discussed in associated ADEC Checklists.

- DRO in samples 17FWOU201WG, 17FWOU202WG, and 17FWOU203WG; and toluene in sample 17FWOU204WG (equipment blank sample 17FWOU205WQ; report 1172520)
- 1,2-Dichloroethane in samples 17FWOU207WG, 17FWOU208WG, and 17FWOU210WG; and toluene in sample 17FWOU210WG (equipment blank sample 17FWOU211WQ; report 1172892)
- Toluene in sample 17FWOU220WG (equipment blank sample 17FWOU211WQ; report 1175226)

2.4 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 2.5.

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 following LCS and/or LCSD or duplicate accuracy and precision exceedances that resulted in data qualification are summarized below. Additional discrepancies that did not result in data qualification are presented in associated ADEC Checklists.

- VOC LCS/LCSD samples 1390246/1390247 in extraction batch VXX30645 (report 1172892) had an RPD above the control limit (20%) for chloromethane (28.8%). Chloromethane was detected below the LOQ in associated samples 17FWOU207WG, 17FWOU208WG, 17FWOU210WG, and trip blank 17FWOU212WQ and were qualified (J) as estimated. Impact to the project is negligible as the failure was marginal (<9%) and chloromethane is not a contaminant of concern.

2.5 Matrix Spike Samples and Sample Duplicates

MS samples were prepared by adding spike compounds to project samples in order to assess potential matrix interference. Only MS samples prepared from project samples were assessed for impact to project data quality. 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 was evaluated by performing either a MSD sample analysis or a sample duplicate analysis and calculating the RPD. All QC batches have met these criteria, except for the batches listed below.

- SVOC and DRO QC batch: XXX37473 (report 1172892)

Although potential sample matrix interference cannot be examined in the above listed QC batch, acceptable LCS recoveries indicate that the analytical batches were operating within the control criteria. Precision in these batches also was evaluated from the analysis of an LCSD sample.

For the batches containing MS/MSD samples, the accuracy and precision of the MS/MSD pair were evaluated. No MS/MSD recoveries and/or RPDs were outside the established control limits resulting in data qualification.

2.6 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. No surrogate exceedances resulted in data qualification. Surrogate recoveries that were outside control criteria that did not result in data qualification are discussed in associated ADEC Checklists.

2.7 Field Duplicates

Three field duplicate samples (one from each sampling event) were collected and submitted to the laboratory as blind samples during groundwater sampling operations at the OU2 sites. Field duplicate samples were collected at a minimum frequency of 10 percent for each analytical method, with the exception for GRO and SVOC. GRO and SVOC samples were only collected from the Water Supply Well (WSW) at the DRMO Yard. Field duplicates are not collected for these analyses, per the UFP-QAPP, as the data from the WSW are used for informational purposes only (the WSW is also sampled by a different entity under the Drinking Water Program, during which all QC criteria are met).

Field duplicate results for detected analytes, contaminants of concern (detected and not detected), and natural attenuation parameters are summarized in Table A-3. A complete list of field duplicate results are presented in associated ADEC Laboratory Data Review Checklists at the end of Appendix A. 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 results for the field duplicate sample pair 17FWOU201WG/17FWOU202WG (report 1172520) were within the ADEC criterion of ≤30% and, therefore, are considered comparable, with the exception of DRO (identified in gray shading in Table A-3). Both the parent and field duplicate DRO results were qualified (J) due to the imprecision. Impact to the results is negligible as the detections for both samples were less than the ADEC cleanup level and the results are within the concentration range recently observed for this well (AP-10037MW).

All (applicable) results for field duplicate sample pairs 17FWOU207WG/17FWOU208WG (report 1172892) and 17FWOU222WG/17FWOU223WG (report 1175526) were within the ADEC criterion of ≤30% and, therefore, are considered comparable.

Table A-3. Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Primary 17FWOU201WG (AP-10037MW)[1]	Field Duplicate 17FWOU202WG (AP-10037MW)[1]	RPD, %	Comparable Criteria Met?[4]
DRO	AK102	0.511 [0.278] J	0.932 [0.288]	58	NO
Sulfate	E300.0	15700 [500]	15800 [500]	1	YES
Iron	SW6020A	14100 [250]	14600 [250]	3	YES
1,1-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
Benzene	SW8260C	1.38 [0.2]	1.13 [0.2]	20	YES
cis-1,2-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
Isopropylbenzene	SW8260C	9.22 [0.5]	9.15 [0.5]	1	YES
sec-Butylbenzene	SW8260C	1.88 [0.5]	1.84 [0.5]	2	YES
tert-Butylbenzene	SW8260C	0.34 [0.5] J	0.34 [0.5] J	0	Not applicable
Tetrachloroethene (PCE)	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
Trichloroethene (TCE)	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
Vinyl chloride	SW8260C	ND [0.075]	ND [0.075]	0	Not applicable
Analyte	**Method**	**Primary 17FWOU207WG (AP-7346)[2]**	**Field Duplicate 17FWOU208WG (AP-7346)[2]**	**RPD, %**	**Comparable Criteria Met?[4]**
DRO	AK102	ND [0.318]	0.215 [0.305] J	33	Not applicable
1,1-Dichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
1,2-Dichloroethane	SW8260C	0.323 [0.25] J	0.312 [0.25] J	3	Not applicable
Benzene	SW8260C	ND [0.2]	ND [0.2]	0	Not applicable
Chlorobenzene	SW8260C	0.22 [0.25] J	0.236 [0.25] J	7	Not applicable
Chloromethane	SW8260C	0.334 [0.5] J	0.315 [0.5] J	6	Not applicable
cis-1,2-Dichloroethene	SW8260C	0.341 [0.5] J	0.36 [0.5] J	5	Not applicable
Tetrachloroethene (PCE)	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
Trichloroethene (TCE)	SW8260C	0.344 [0.5] J	0.335 [0.5] J	3	Not applicable
Vinyl chloride	SW8260C	ND [0.075]	ND [0.075]	0	Not applicable
Analyte	**Method**	**Primary 17FWOU222WG AP-7560[3]**	**Field Duplicate 17FWOU223WG AP-7070[3]**	**RPD, %**	**Comparable Criteria Met?[4]**
DRO	AK102	4.47 [0.294]	4.89 [0.3]	9	YES
Alkalinity, Total	A2320B	127 [5]	126 [5]	1	YES
TOCA	SW9060	14.3 [1.5]	14.3 [1.5]	0	YES
Sulfate	E300.0	14.3 [0.5]	13.5 [0.1]	6	YES
Iron	SW6020A	10100 [500]	10300 [250]	2	YES
1,1-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not applicable
Benzene	SW8260C	ND [0.2]	ND [0.2]	0	Not applicable
cis-1,2-Dichloroethene	SW8260C	0.356 [0.5] J	0.334 [0.5] J	6	Not applicable
Tetrachloroethene (PCE)	SW8260C	1.38 [0.5]	1.34 [0.5]	3	YES
Trichloroethene (TCE)	SW8260C	1.04 [0.5]	1.05 [0.5]	1	YES
Vinyl chloride	SW8260C	ND [0.075]	ND [0.075]	0	Not Applicable

All results are in micrograms per liter (µg/L), except for DRO, 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 1172520.

[2] – The samples are associated with report 1172892.

[3] – The samples are associated with report 1175526.

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

2.8 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, not all of which resulted in data qualification. Discrepancies that did not result in data qualification are not summarized in this CDQR, but are discussed in associated ADEC Laboratory Data Review Checklists. Discrepancies that did result in data qualification are detailed below.

- The internal standard 1,4-dioxane-d8 response associated with 1,4-dioxane in sample 17FWOU210WG was outside control limits (report 1172892). The internal standard response was below the lower control limit in both the initial and confirmation runs and the detected result was qualified (J+) as a potential high estimate due to the low responses. Impact to the project is negligible as the result may be high-biased and is more than an order of magnitude below ADEC cleanup level.

2.9 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 B.

Analytical sensitivity was evaluated to verify that LODs met the applicable action levels for non-detect results (ROD remedial goals or 2016 ADEC cleanup levels, as appropriate). 1,2,3-Trichloropropane in all samples analyzed by SW8260C, and 2,4-dinitrotoluene, 2,6-dinitrotoluene, 3,3'-dichlorobenzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis-(2-chloroethyl)ether, dibenzo(a,h)anthracene, hexachlorobenzene, indeno(1,2,3-cd)pyrene, n-nitrosodimethylamine, n-nitrosodi-n-propylamine, and pentachlorophenol in sample 17FWOU209WG analyzed by SW8270D, 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 levels. Impact to the project is not significant as these analytes are not contaminants of concern. Moreover, sample 17FWOU209WG was collected from the WSW and the data obtained from this sampling program is used for informational purposes only. The WSW is also sampled by a different entity under the Drinking Water Program.

All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results tables (Tables B-2 and B-3) presented in Appendix B of the Annual Monitoring Report.

2.10 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 A-4 below summarizes the qualified 2017 groundwater results associated with the sampling events at the OU2 sites, including the associated sample numbers, analytes, and the reason for qualification.

Table A-4. Summary of Groundwater Data Qualifications

SDG	Sample Numbers	Analytes	Qualification	Explanation
1172520	17FWOU201WG 17FWOU202WG 17FWOU203WG	DRO	B	Equipment blank contamination
	17FWOU204WG	Toluene		
	17FWOU201WG 17FWOU202WG	DRO	J	Field duplicate imprecision
1172892	17FWOU207WG 17FWOU208WG 17FWOU210WG	Chloromethane	B	Trip blank contamination
	17FWOU207WG 17FWOU208WG 17FWOU210WG	1,2-Dichloroethane		Equipment blank contamination
	17FWOU210WG	Toluene		
	17FWOU207WG 17FWOU208WG 17FWOU210WG Trip Blank 17FWOU212WQ	Chloromethane	J	LCS/LCSD imprecision
	17FWOU210WG	1,4-Dioxane	J+	Low internal standard response
1175526	17FWOU220WG	Toluene	B	Equipment blank contamination

2.11 Completeness

Completeness scores were calculated for each analytical method employed for the project. Scores were obtained by assigning points to 13 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 A-5 below. All OU2 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 OU2 Monitoring Report.

Table A-5. Completeness Scores for Groundwater Samples

Data Quality Category	Points GRO	Points DRO	Points VOC	Points SVOC	Points 1,4-Dioxane	Points Fe	Points TOC	Points Sulfate	Points Alkalinity
Sample Collection	10	10	10	10	10	10	10	10	10
COC Documentation	10	10	10	10	10	10	10	10	10
Sample Containers/ Preservation	10	10	10	10	10	10	10	10	10
Cooler Temperature	10	10	10	10	10	10	10	10	10
Holding Times	10	10	10	10	10	10	10	10	10
Method Blanks	10	10	10	10	10	10	10	10	10
Trip Blanks	10	NA	9	NA	10	NA	NA	NA	NA
Equipment Blank	NA	9	7	NA	10	10	10	10	10
LCS/LCSD Recovery & RPD	10	10	9	10	10	10	10	10	10
MS/MSD Recovery & RPD	NR	10	10	NR	10	10	10	10	NA
Surrogate Recovery	10	10	10	10	10	NA	NA	NA	NA
Field Duplicate	NR	10	9	NR	10	10	10	10	10
CCV, Internal Stds, other	10	10	10	10	9	10	10	10	10
Sensitivity (DL/LOD)	10	10	9	9	10	10	10	10	10
Total Points Received	130	129	133	99	139	120	120	120	110
Total Points Possible	130	130	140	100	140	120	120	120	110
Percent Completeness	100	99	95	99	99	100	100	100	100

NA – not applicable; NR – not required per UFP-QAPP

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3.0 REFERENCES

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Laboratory Data Review Checklist

Completed by: Jack James (reviewed and modified by Vanessa Ritchie, FES)

Title: Chemist, ERM Date: 11/07/2017

CS Report Name: Fort Wainwright Operable Unit 2 Report Date: 05/31/2017

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS – Anchorage, AK Laboratory Report Number: 1172520

ADEC File Number: 108.38.069.02 (Former Bldg 1168) ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      □✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

      Samples for 1,4-dioxane analysis by SW8260B-SIM were sub-contracted to SGS Accutest of Orlando, Florida. Although the laboratory is approved by ADEC to perform several contaminant analyses, 1,4-dioxane by 8260B-SIM is not listed in their approval letter. 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 □NA (Please explain.) Comments:

   b. Correct analyses requested?
      □✓Yes No □NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      □✓Yes No □NA (Please explain.) Comments:

      All coolers arrived at the laboratories containing temperature blanks 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 □NA (Please explain.) Comments:

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

□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

The laboratory did not note any discrepancies.

e. Data quality or usability affected? (Please explain.)

Comments:

No data quality or usability was affected by the sample receipt documentation.

4. Case Narrative

a. Present and understandable?

□✓Yes No □NA (Please explain.) Comments:

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

□✓Yes No □NA (Please explain.) Comments:

The case narratives described the MS exception discussed in section 6b and the surrogate exceptions associated with 1,4-dioxane analysis discussed in section 6c.

c. Were all corrective actions documented?

□Yes ✓No □NA (Please explain.) Comments:

See discussion above in 4b.

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 ☐NA (Please explain.) Comments:

b. All applicable holding times met?

☐✓Yes No ☐NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

☐Yes No ☐✓NA (Please explain.) Comments:

No soil samples were included in this work order.

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

☐Yes ✓No ☐NA (Please explain.) 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 in all samples analyzed by 8260C did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345. This analyte may not be detected, if present, at the respective cleanup level. Impact to the project is not significant as this analyte is not a contaminant of concern. All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results table (Table B-2) presented in the Annual Monitoring Report.

e. Data quality or usability affected?

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 ☐NA (Please explain.) Comments:

ii. All method blank results less than PQL?

□ ✓Yes No □NA (Please explain.) Comments:

No target analytes were detected in the method blank samples.

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

□Yes No □✓NA (Please explain.) Comments:

Qualifications were not necessary

v. Data quality or usability affected? (Please explain.)

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 □NA (Please explain.) Comments:

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

□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

Percent recoveries for all project LCS/LCSD and MS/MSD samples were within control limits. However, a MS recovery failure for iron on a non-client sample is reported. Since this sample is not associated with OU2 project samples, the MS recovery is not further discussed.

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 □NA (Please explain.) Comments:

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

Comments:

See 6biii above.

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

☐Yes No ☐✓NA (Please explain.) Comments:

Qualifications were not necessary.

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

Comments:

No data quality or usability was affected by the LCS/LCSD or MS/MSD samples.

c. Surrogates – Organics Only

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

☐✓Yes No ☐NA (Please explain.) 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 ☐NA (Please explain.) Comments:

Method SW8260B-SIM surrogate toluene-d8 recovered above the control limits (88-111%) in samples 17FWOU201WG (114% primary and 121% confirmation), 17FWOU202WG (117%), 17FWOU203WG (112%), and 17FWOU204WG (114%). The only associated analyte (1,4-dioxane) was not detected in the samples and qualifications due to the high recoveries were not necessary.

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

☐Yes No ☐✓NA (Please explain.) Comments:

Qualifications were not necessary.

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

Comments:

No data quality or usability was affected by the surrogates.

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 □NA (Please explain.) 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 □NA (Please explain.) Comments:

Trip blank sample 17FWOU206WQ for VOC and 1,4-dioxane analyses was included in Cooler OU2-1. SGS in Anchorage retained 3 VOA vials for VOC analysis by 8260C and sent 3 VOA vials with the samples to the subcontracted laboratory for 1,4-dioxane analysis.

iii. All results less than PQL?

□✓Yes No □NA (Please explain.) Comments:

No target analytes were detected in the trip blank sample.

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

v. Data quality or usability affected? (Please explain.)

Comments:

No data quality or usability was affected by the trip blank sample.

e. Field Duplicate

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

□✓Yes No □NA (Please explain.) Comments:

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

ii. Submitted blind to lab?

□✓Yes No □NA (Please explain.) Comments:

Sample 17FWOU202WG was a field duplicate of 17FWOU201WG.

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

RPD (%) = 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 ☐NA (Please explain.) Comments:

All results for the primary and field duplicate sample are shown in the table below (units are mg/L for DRO and µg/L for remaining analytes). 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. Analytes that do not meet the comparison criteria are identified in gray shading and are discussed in the following paragraph.

All results for the field duplicate/primary sample pair 17FWOU202WG/17FWOU201WG were comparable (RPD ≤ 30%) with the exception of DRO. DRO results were reported below the LOQ in the primary sample and above the LOQ in the field duplicate sample. Consequently, the DRO results for the field duplicate pair were qualified (J) due to imprecision. Impact to the results is negligible as the detections were less than the ADEC cleanup level and the results are within the concentration range recently observed for this well (AP-10037MW).

Analyte	Method	Primary 17FWOU201WG (AP-10037MW)	Field Duplicate 17FWOU202WG (AP-10037MW)	RPD, %	Comparable Criteria Met?
DRO (C10 - C25)	AK102	0.511 [0.278] J	0.932 [0.288]	58	NO
Sulfate	E300.0	15700 [500]	15800 [500]	1	YES
Iron	SW6020A	14100 [250]	14600 [250]	3	YES
1,4-Dioxane	SW8260B	ND [0.50]	ND [0.50]	0	Not Applicable
1,1,1,2-Tetrachloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,1,1-Trichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	ND [5]	ND [5]	0	Not Applicable
1,1,2-Trichloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not Applicable
1,1-Dichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1-Dichloropropene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,3-Trichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,3-Trichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,4-Trichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,4-Trimethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dibromo-3-chloropropane	SW8260C	ND [5]	ND [5]	0	Not Applicable
1,2-Dibromoethane	SW8260C	ND [0.0375]	ND [0.0375]	0	Not Applicable
1,2-Dichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dichloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,2-Dichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3,5-Trimethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable

Analyte	Method	Primary 17FWOU201WG (AP-10037MW)	Field Duplicate 17FWOU202WG (AP-10037MW)	RPD, %	Comparable Criteria Met?
1,3-Dichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3-Dichloropropane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,4-Dichlorobenzene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
2,2-Dichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
2-Butanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
2-Chlorotoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
2-Hexanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
4-Chlorotoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
4-Isopropyltoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
4-Methyl-2-pentanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
Benzene	SW8260C	1.38 [0.2]	1.13 [0.2]	20	YES
Bromobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromochloromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromodichloromethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Bromoform	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromomethane	SW8260C	ND [2.5]	ND [2.5]	0	Not Applicable
Carbon disulfide	SW8260C	ND [5]	ND [5]	0	Not Applicable
Carbon tetrachloride	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chlorobenzene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Chloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chloroform	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chloromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
cis-1,2-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
cis-1,3-Dichloropropene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Dibromochloromethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Dibromomethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Dichlorodifluoromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Ethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Hexachlorobutadiene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Isopropylbenzene	SW8260C	9.22 [0.5]	9.15 [0.5]	1	YES
Methylene chloride	SW8260C	ND [2.5]	ND [2.5]	0	Not Applicable
Methyl-tert-butyl ether (MTBE)	SW8260C	ND [5]	ND [5]	0	Not Applicable
Naphthalene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
n-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
n-Propylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
o-Xylene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
sec-Butylbenzene	SW8260C	1.88 [0.5]	1.84 [0.5]	2	YES
Styrene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
tert-Butylbenzene	SW8260C	0.34 [0.5] J	0.34 [0.5] J	0	Not Applicable
Tetrachloroethene (PCE)	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Toluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
trans-1,2-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
trans-1,3-Dichloropropene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Trichlorofluoromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Vinyl acetate	SW8260C	ND [5]	ND [5]	0	Not Applicable
Vinyl chloride	SW8260C	ND [0.075]	ND [0.075]	0	Not Applicable
Xylene, Isomers m & p	SW8260C	ND [1]	ND [1]	0	Not Applicable
Xylenes	SW8260C	ND [1.5]	ND [1.5]	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 used explain why).

☐✓Yes No ☐NA (Please explain.) Comments:

Equipment blank sample 17FWOU205WQ was included in this work order to assess the potential for cross-contamination of the submersible pump.

i. All results less than PQL?

☐✓Yes No ☐NA (Please explain.) Comments:

DRO (0.269mg/L) and toluene (0.5µg/L) were detected in equipment blank sample 17FWOU205WQ at concentrations below the LOQs (0.545mg/L and 1.0µg/L, respectively). The analytes in the following samples were detected at concentrations less than five-times that of the equipment blank and the results were qualified (B) as potential sampling cross-contamination: DRO in samples 17FWOU201WG, 17FWOU202WG, and 17FWOU203WG; and toluene in sample 17FWOU204WG. Impact to the project is negligible as the detections were less than the ADEC cleanup levels.

ii. If above PQL, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected? (Please explain.)

Comments:

See 6fi above.

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

a. Defined and appropriate?

Yes No ☐✓NA (Please explain.) Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed by: Jack James (reviewed and modified by Vanessa Ritchie, FES)

Title: Chemist, ERM Date: 11/07/2017

CS Report Name: Fort Wainwright Operable Unit 2 Report Date: 06/17/2017

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS – Anchorage, AK Laboratory Report Number: 1172892

ADEC File Number: 108.38.069.01 (DRMO) ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      □✓Yes No □NA (Please explain.) Comments:

   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 □NA (Please explain.) Comments:

      Samples for 1,4-dioxane analysis by SW8260B SIM were sub-contracted to SGS Accutest of Orlando, Florida. This location of SGS is not listed as a CS approved laboratory on the ADEC website. Although the laboratory is approved by ADEC to perform several contaminant analyses, 1,4-dioxane by 8260B-SIM is not listed in their approval letter. 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 □NA (Please explain.) Comments:

   b. Correct analyses requested?
      □✓Yes No □NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      □✓Yes No □NA (Please explain.) Comments:

      All coolers arrived at the laboratory containing temperature blanks 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 □NA (Please explain.) Comments:

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

□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

The laboratory did not note any discrepancies.

e. Data quality or usability affected? (Please explain.)

Comments:

No data quality or usability was affected by the sample receipt documentation.

4. Case Narrative

a. Present and understandable?

□✓Yes No □NA (Please explain.) Comments:

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

□✓Yes No □NA (Please explain.) Comments:

The case narratives described LCS/LCSD exceptions discussed in 6b. They also described internal standard response exceptions which are discussed here.

The internal standard 1,4-dioxane-d8 response associated with 1,4-dioxane in sample 17FWOU210WG was outside control limits. The internal standard response was below the lower control limit in both the initial and confirmation runs and the detected result was qualified (J+) as a potential high estimate due to the low responses. Impact to the project is negligible as the result may be high-biased and is more than an order of magnitude below ADEC cleanup level.

c. Were all corrective actions documented?

□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

b. All applicable holding times met?

□✓Yes No □NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

□Yes No □✓NA (Please explain.) Comments:

No soil samples were included in this work order.

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

□Yes ✓No □NA (Please explain.) 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 in all samples analyzed by SW8260C; and 2,4-dinitrotoluene, 2,6-dinitrotoluene, 3,3'-dichlorobenzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis-(2-chloroethyl)ether, dibenzo(a,h)anthracene, hexachlorobenzene, indeno(1,2,3-cd)pyrene, n-nitrosodimethylamine, n-nitrosodi-n-propylamine, and pentachlorophenol in sample 17FWOU209WG analyzed by SW8270D 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 levels. Impact to the project is not significant as these analytes are not contaminants of concern. Moreover, sample 17FWOU209WG was collected from the Water Supply Well (WSW) and the data obtained from this sampling program is used for informational purposes only. The WSW is also sampled by a different entity under the Drinking Water Program. All analytes that are non-detect with LODs elevated above cleanup levels are identified with gray shading in the results tables (Tables B-2 and B-3) presented in the Annual Monitoring Report.

e. Data quality or usability affected?

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 □NA (Please explain.) Comments:

ii. All method blank results less than PQL?

□ ✓Yes No □NA (Please explain.) Comments:

No method blank results were above the LOQ; however, two target analytes were detected in method blank samples at concentrations below the LOQ.

GRO was detected in method blank sample 1390005 contained in extraction batch VXX30638 at a concentration (0.0358mg/L) below the LOQ (0.100mg/L). GRO was not detected in the associated samples and qualifications were not necessary.

DRO was detected in method blank sample 1388322 contained in extraction batch XXX37477 at a concentration (0.190mg/L) below the LOQ (0.600mg/L). DRO was not detected in the associated sample and qualifications were not necessary.

iii. If above PQL, what samples are affected?

Comments:

See 6aii above.

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

□Yes No □✓NA (Please explain.) Comments:

Qualifications were not necessary

v. Data quality or usability affected? (Please explain.)

Comments:

No data quality or usability was affected by the method blanks.

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 □NA (Please explain.) Comments:

No MS/MSD was reported in SVOC and DRO extraction batch XXX37473. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batch were assessed from the LCS and LCSD samples. This batch contained SVOC results for 17FWOU209WG; and DRO results for samples 17FWOU208WG, 17FWOU209WG, 17FWOU210WG, and the equipment blank sample 17FWOU211WQ. Moreover, sample 17FWOU209WG was collected from the WSW and the data obtained from this sampling program is used for informational purposes only. The WSW is also sampled by a different entity under the Drinking Water Program, during which all QC criteria are met.

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

Yes No □✓NA (Please explain.) Comments:

Metals/inorganics were not included in this SDG.

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 □NA (Please explain.) Comments:

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 □NA (Please explain.) Comments:

VOC LCS/LCSD samples 1390246/1390247 in extraction batch VXX30645 had an RPD above the control limit (20%) for chloromethane (28.8%). Chloromethane was detected below the LOQ in associated samples 17FWOU207WG, 17FWOU208WG, 17FWOU210WG, and trip blank 17FWOU212WQ and were qualified (J) as estimated. Impact to the project is negligible as the failure was marginal (<9%) and chloromethane is not a contaminant of concern. SVOC LCS/LCSD samples 1388096/1388097 in extraction batch XXX37473 had RPDs above the control limit (20%) for aniline (55.7%) and benzoic acid (25.4%). These analytes were not detected in the associated samples and qualifications were not necessary.

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

Comments:

See 6biv above.

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

□✓Yes No □NA (Please explain.) Comments:

See 6biv above.

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

Comments:

See 6biv above.

c. Surrogates – Organics Only

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

□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

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

□Yes No □✓NA (Please explain.) Comments:

Qualifications were not necessary.

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

Comments:

No data quality or usability was affected by the surrogates.

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 □NA (Please explain.) 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 □NA (Please explain.) Comments:

Trip blank sample 17FWOU212WQ for VOC, GRO, and 1,4-dioxane was included in Cooler OU2-2. The 1,4-dioxane samples and accompanying trip blank were then sent to the subcontracted laboratory for analysis.

iii. All results less than PQL?

□✓Yes No □NA (Please explain.) Comments:

No trip blank results were above the LOQ; however; chloromethane (0.507µg/L) was detected in the trip blank sample at a concentration below the LOQ (1.00µg/L). Chloromethane was detected at concentrations less than five-times that of the trip blank in associated samples 17FWOU207WG, 17FWOU208WG, and 17FWOU210WG. These results were qualified (B) as potential travel cross-contamination. Impact to the project is negligible as the detections are greater than two orders of magnitude below the ADEC cleanup level.

iv. If above PQL, what samples are affected?

Comments:

See 6diii above.

v. Data quality or usability affected? (Please explain.)

Comments:

See 6diii above.

e. Field Duplicate

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

□✓Yes No □NA (Please explain.) Comments:

One groundwater field duplicate was collected for the three groundwater primary samples associated with this work order and was analyzed for all methods employed except for GRO and SVOCs. GRO and SVOC samples were only collected from the WSW. As discussed in 5d and 6bi above, the WSW is primarily sampled under the Drinking Water Program, during which all QC criteria are met.

ii. Submitted blind to lab?

□✓Yes No □NA (Please explain.) Comments:

Sample 17FWOU208WG was a field duplicate of 17FWOU207WG.

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 □NA (Please explain.) Comments:

All results for the primary and field duplicate samples are shown in the tables below (units are mg/L for GRO and DRO and µg/L for remaining analytes). 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. 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/primary sample pair 17FWOU208WG/17FWOU207WG were comparable (RPD ≤ 30%) with the exception of DRO. The DRO result was non-detect in the primary sample and less than the LOQ in the field duplicate sample and considered an estimated value, so no flagging was applied.

Analyte	Method	Primary 17FWOU207WG (AP-7346)	Field Duplicate 17FWOU208WG (AP-7346	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	ND [0.318]	0.215 [0.305] J	33	Not Applicable
1,4-Dioxane	SW8260B	ND [0.50]	ND [0.50]	0	Not Applicable
1,1,1,2-Tetrachloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,1,1-Trichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	ND [5]	ND [5]	0	Not Applicable
1,1,2-Trichloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not Applicable
1,1-Dichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1-Dichloropropene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,3-Trichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,3-Trichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,4-Trichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,4-Trimethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dibromo-3-chloropropane	SW8260C	ND [5]	ND [5]	0	Not Applicable
1,2-Dibromoethane	SW8260C	ND [0.0375]	ND [0.0375]	0	Not Applicable
1,2-Dichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dichloroethane	SW8260C	0.323 [0.25] J	0.312 [0.25] J	3	Not Applicable
1,2-Dichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3,5-Trimethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3-Dichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3-Dichloropropane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,4-Dichlorobenzene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
2,2-Dichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
2-Butanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
2-Chlorotoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
2-Hexanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
4-Chlorotoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
4-Isopropyltoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
4-Methyl-2-pentanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
Benzene	SW8260C	ND [0.2]	ND [0.2]	0	Not Applicable
Bromobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromochloromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromodichloromethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Bromoform	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromomethane	SW8260C	ND [2.5]	ND [2.5]	0	Not Applicable
Carbon disulfide	SW8260C	ND [5]	ND [5]	0	Not Applicable
Carbon tetrachloride	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chlorobenzene	SW8260C	0.22 [0.25] J	0.236 [0.25] J	7	Not Applicable
Chloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chloroform	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chloromethane	SW8260C	0.334 [0.5] J	0.315 [0.5] J	6	Not Applicable
cis-1,2-Dichloroethene	SW8260C	0.341 [0.5] J	0.36 [0.5] J	5	Not Applicable
cis-1,3-Dichloropropene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Dibromochloromethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Dibromomethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Dichlorodifluoromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Ethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Hexachlorobutadiene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Isopropylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Methylene chloride	SW8260C	ND [2.5]	ND [2.5]	0	Not Applicable

Analyte	Method	Primary 17FWOU207WG (AP-7346)	Field Duplicate 17FWOU208WG (AP-7346	RPD, %	Comparable Criteria Met?
Methyl-tert-butyl ether (MTBE)	SW8260C	ND [5]	ND [5]	0	Not Applicable
Naphthalene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
n-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
n-Propylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
o-Xylene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
sec-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Styrene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
tert-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Tetrachloroethene (PCE)	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Toluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
trans-1,2-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
trans-1,3-Dichloropropene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	0.344 [0.5] J	0.335 [0.5] J	3	Not Applicable
Trichlorofluoromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Vinyl acetate	SW8260C	ND [5]	ND [5]	0	Not Applicable
Vinyl chloride	SW8260C	ND [0.075]	ND [0.075]	0	Not Applicable
Xylene, Isomers m & p	SW8260C	ND [1]	ND [1]	0	Not Applicable
Xylenes	SW8260C	ND [1.5]	ND [1.5]	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 sample.

f. Decontamination or Equipment Blank (If not used explain why).

□✓Yes No □NA (Please explain.) Comments:

Equipment blank sample 17FWOU211WQ was included in this work order to assess the potential for cross-contamination of the submersible pump.

i. All results less than PQL?

□✓Yes No □NA (Please explain.) Comments:

No equipment blank results were above the LOQ; however 1,2-dichloroethane (0.257µg/L) and toluene (0.699µg/L) were detected in the equipment blank sample 17FWOU211WQ at concentrations above the LOQ (0.500 µg/L and 1.00µg/L, respectively). The analytes in the following samples were detected at concentrations less than five-times that of the equipment blank and the results were qualified (B) as potential sampling cross-contamination: 1,2-dichloroethane in samples 17FWOU207WG, 17FWOU208WG, and 17FWOU210WG; and toluene in sample 17FWOU210WG. Impact to the project is negligible as the detections were less than the ADEC cleanup levels.

ii. If above PQL, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected? (Please explain.)

Comments:

See 6fi above.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      Yes No ☐✓NA (Please explain.) Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed by: Jack James (reviewed and modified by Vanessa Ritchie, FES)

Title: Chemist, ERM Date: 11/07/2017

CS Report Name: Fort Wainwright Operable Unit 2 Report Date: 09/06/2017

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS – Anchorage, AK Laboratory Report Number: 1175526

ADEC File Number: 108.38.069.01 (DRMO) ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ✓Yes No □NA (Please explain.) Comments:

      Yes; however, EPA Method 300.0, SW9060A and Standard Method 2320B are not listed as CS analyses.

   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 □NA (Please explain.) Comments:

      Samples for 1,4-dioxane analysis by SW8260B SIM were sub-contracted to SGS Accutest of Orlando, Florida. Although the laboratory is approved by ADEC to perform several contaminant analyses, 1,4-dioxane by 8260B-SIM is not listed in their approval letter. 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 □NA (Please explain.) Comments:

   b. Correct analyses requested?
      ✓Yes No □NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ✓Yes No □NA (Please explain.) Comments:

      All coolers arrived at the laboratory containing temperature blanks 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 □NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

The laboratory did not note any discrepancies.

e. Data quality or usability affected? (Please explain.)
Comments:

No data quality or usability was affected by the sample receipt documentation.

4. Case Narrative
a. Present and understandable?
□✓Yes No □NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
□✓Yes No □NA (Please explain.) Comments:

The case narrative described surrogate recovery exceptions discussed in 6c.

c. Were all corrective actions documented?
□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

b. All applicable holding times met?

□✓Yes No □NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

□Yes No □✓NA (Please explain.) Comments:

No soil samples were included in this work order.

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

□Yes ✓No □NA (Please explain.) 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 in all samples analyzed by SW8260C did not meet applicable ADEC groundwater cleanup levels listed in 18 AAC 75.345. This analyte may not be detected, if present, at the respective cleanup level. Impact to the project is not significant as this analyte is not a contaminant of concern.

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

e. Data quality or usability affected?

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 □NA (Please explain.) Comments:

ii. All method blank results less than PQL?

□ ✓Yes No □NA (Please explain.) Comments:

No method blank results were above the LOQ; however, one target analyte was detected in a method blank sample at a concentration below the LOQ.

TOC was detected in method blank sample 1406944 contained in batch WTC2716 at a concentration (0.180mg/L) below the LOQ (0.500mg/L). TOC was detected in the associated sample at a concentration greater than five-times that of the blank concentration and qualifications were not necessary.

iii. If above PQL, what samples are affected?

Comments:

See 6aii above.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
□Yes No □✓NA (Please explain.) Comments:

Qualifications were not necessary.

v. Data quality or usability affected? (Please explain.)
Comments:

No data quality or usability was affected by the method blanks.

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 □NA (Please explain.) Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
□ ✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

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 □NA (Please explain.) Comments:

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

Not applicable.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
□ Yes No □✓NA (Please explain.) Comments:

Qualifications were not necessary.

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

Comments:

No data quality or usability was affected by the LCS/LCSD or MS/MSD samples.

c. Surrogates – Organics Only

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

□✓Yes No □NA (Please explain.) 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 □NA (Please explain.) Comments:

Method SW8260B-SIM surrogate toluene-d8 recovered above the control limits (88-111%) in sample 17FWOU220WG (164%). The only associated analyte (1,4-dioxane) was not detected in the sample and qualification due to the high recovery was not necessary.

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

□Yes No □✓NA (Please explain.) Comments:

Qualifications were not necessary.

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

Comments:

No data quality or usability was affected by the surrogates.

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 □NA (Please explain.) 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 □NA (Please explain.) Comments:

Trip blank sample 17FWOU225WQ (6 VOA vials) was included in Cooler 081001. SGS in Anchorage retained 3 VOA vials for VOC analysis by 8260C and sent 3 VOA vials with the samples to the subcontracted laboratory for 1,4-dioxane analysis.

iii. All results less than PQL?
□✓Yes No □NA (Please explain.) Comments:

No target analytes were detected in the trip blank sample.

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

v. Data quality or usability affected? (Please explain.)

Comments:

No data quality or usability was affected by the trip blank sample.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
□✓Yes No □NA (Please explain.) Comments:

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

ii. Submitted blind to lab?
□✓Yes No □NA (Please explain.) Comments:

Sample 17FWOU223WG was a field duplicate of 17FWOU222WG.

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

RPD (%) = 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 □NA (Please explain.) Comments:

All results for the primary and field duplicate samples are shown in the tables below (units are mg/L for DRO, Total Alkalinity, TOC, and Sulfate and µg/L for remaining analytes). 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. 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/primary sample pair 17FWOU223WG/17FWOU222WG were comparable (RPD ≤ 30%).

Analyte	Method	Primary 17FWOU222WG (AP-7560)	Field Duplicate 17FWOU223WG (AP-7070)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	4.47 [0.294]	4.89 [0.3]	9	YES
Alkalinity, Total	A2320B	127 [5]	126 [5]	1	YES
TOCA	SW9060	14.3 [1.5]	14.3 [1.5]	0	YES
Sulfate	E300.0	14.3 [0.5]	13.5 [0.1]	6	YES
Iron	SW6020A	10100 [500]	10300 [250]	2	YES
1,4-Dioxane	SW8260B-SIM	ND [0.50]	ND [0.50]	0	Not Applicable
1,1,1,2-Tetrachloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,1,1-Trichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1,2,2-Tetrachloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	ND [5]	ND [5]	0	Not Applicable
1,1,2-Trichloroethane	SW8260C	ND [0.2]	ND [0.2]	0	Not Applicable
1,1-Dichloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1-Dichloroethene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,1-Dichloropropene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,3-Trichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,3-Trichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,4-Trichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2,4-Trimethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dibromo-3-chloropropane	SW8260C	ND [5]	ND [5]	0	Not Applicable
1,2-Dibromoethane	SW8260C	ND [0.0375]	ND [0.0375]	0	Not Applicable
1,2-Dichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dichloroethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,2-Dichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3,5-Trimethylbenzene	SW8260C	0.347 [0.5] J	0.384 [0.5] J	10	Not Applicable
1,3-Dichlorobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
1,3-Dichloropropane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
1,4-Dichlorobenzene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
2,2-Dichloropropane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
2-Butanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
2-Chlorotoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
2-Hexanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
4-Chlorotoluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
4-Isopropyltoluene	SW8260C	0.568 [0.5] J	0.605 [0.5] J	6	Not Applicable
4-Methyl-2-pentanone	SW8260C	ND [5]	ND [5]	0	Not Applicable
Benzene	SW8260C	ND [0.2]	ND [0.2]	0	Not Applicable
Bromobenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromochloromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromodichloromethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Bromoform	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Bromomethane	SW8260C	ND [2.5]	ND [2.5]	0	Not Applicable
Carbon disulfide	SW8260C	ND [5]	ND [5]	0	Not Applicable
Carbon tetrachloride	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chlorobenzene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Chloroethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chloroform	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Chloromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
cis-1,2-Dichloroethene	SW8260C	0.356 [0.5] J	0.334 [0.5] J	6	Not Applicable
cis-1,3-Dichloropropene	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Dibromochloromethane	SW8260C	ND [0.25]	ND [0.25]	0	Not Applicable
Dibromomethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Dichlorodifluoromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Ethylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Hexachlorobutadiene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable

Isopropylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Methylene chloride	SW8260C	ND [2.5]	ND [2.5]	0	Not Applicable
Methyl-tert-butyl ether (MTBE)	SW8260C	ND [5]	ND [5]	0	Not Applicable
Naphthalene	SW8260C	0.731 [0.5] J	0.74 [0.5] J	1	Not Applicable
n-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
n-Propylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
o-Xylene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
sec-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Styrene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
tert-Butylbenzene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Tetrachloroethene (PCE)	SW8260C	1.38 [0.5]	1.34 [0.5]	3	YES
Toluene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
trans-1,2-Dichloroethene	SW8260C	0.417 [0.5] J	0.406 [0.5] J	3	Not Applicable
trans-1,3-Dichloropropene	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	1.04 [0.5]	1.05 [0.5]	1	YES
Trichlorofluoromethane	SW8260C	ND [0.5]	ND [0.5]	0	Not Applicable
Vinyl acetate	SW8260C	ND [5]	ND [5]	0	Not Applicable
Vinyl chloride	SW8260C	ND [0.075]	ND [0.075]	0	Not Applicable
Xylene, Isomers m & p	SW8260C	ND [1]	ND [1]	0	Not Applicable
Xylenes	SW8260C	ND [1.5]	ND [1.5]	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 sample.

f. Decontamination or Equipment Blank (If not used explain why).

□✓Yes No □NA (Please explain.) Comments:

Equipment blank sample 17FWOU224WQ was included in this work order to assess the potential for cross-contamination of the submersible pump.

i. All results less than PQL?

□✓Yes No □NA (Please explain.) Comments:

No equipment blank results were above the LOQ; however, toluene (0.514µg/L) was detected in the equipment blank sample 17FWOU224WQ at a concentration below the LOQ (1.00µg/L). Toluene was detected at a concentration less than five-times that of the equipment blank and the result was qualified (B) as potential sampling cross-contamination in sample 17FWOU220WG. Impact to the project is negligible as the detection was greater than three orders of magnitude below the ADEC cleanup level.

ii. If above PQL, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected? (Please explain.)

Comments:

See 6fi above.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      Yes No □✓NA (Please explain.) Comments:

No other data flags/qualifiers were used.

APPENDIX B

SAMPLE TRACKING AND ANALYTICAL RESULTS TABLES

Table B-1. Groundwater Sample Summary Table
Operable Unit 2
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Depth (feet bgs)	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	GRO AK101	DRO AK102	SVOC 8270D	Fe 6020A	Sulfate 300.0	TOC 9060A	1,4-Dioxane 8260B-SIM	Alkalinity 2320B	SDG	Cooler ID
GROUNDWATER SAMPLES																		
Former Building 1168 Leach Well (Three Party)																		
17FWOU201WG	AP-10037MW	16.9	Primary/MS/MSD	WG	CB	05/17/17	1050	X		X		X	X		X		1172520	OU2-1
17FWOU202WG	AP-10037MW	16.9	Field Duplicate of 17FWOU201WG	WG	CB	05/17/17	1105	X		X		X	X		X		1172520	OU2-1
17FWOU203WG	AP-6809	16	Primary	WG	CB	05/17/17	1540	X		X		X	X		X		1172520	OU2-1
17FWOU204WG	AP-5751	17	Primary	WG	CB	05/17/17	1705	X		X		X	X		X		1172520	OU2-1
DRMO Building 5010 (Two Party) and DRMO Yard Water Supply Well (Three Party)																		
17FWOU207WG	AP-7346	8.5	Primary/MS/MSD	WG	JK	05/31/17	1115	X		X					X		1172892	OU2-2
17FWOU208WG	AP-7346	8.5	Field Duplicate of 17FWOU207WG	WG	JK	05/31/17	1130	X		X					X		1172892	OU2-2
17FWOU209WG	WSW	unknown[1]	Primary	WG	JK	05/31/17	1215	X	X	X	X				X		1172892	OU2-2
17FWOU210WG	AP-7348	10.6	Primary	WG	JK	05/31/17	1335	X		X					X		1172892	OU2-2
DRMO (Three Party)																		
17FWOU213WG	AP-10015	11	Primary	WG	JK	08/09/17	930	X				X	X	X	X	X	1175526	081001/02
17FWOU214WG	AP-10018	10	Primary	WG	CB	08/09/17	1005	X				X	X	X	X	X	1175526	081001/02
17FWOU215WG	AP-10016	11	Primary	WG	JK	08/09/17	1030	X				X	X	X	X	X	1175526	081001/02
17FWOU216WG	PO5	unknown[1]	Primary	WG	CB	08/09/17	1100	X				X	X	X	X	X	1175526	081001/02
17FWOU217WG	AP-10017	10	Primary	WG	JK	08/09/17	1145	X				X	X	X	X	X	1175526	081001/02
17FWOU218WG	Probe B	11.5	Primary	WG	CB	08/09/17	1145	X		X		X	X	X	X	X	1175526	081001/02
17FWOU219WG	AP-8914R	11.8	Primary	WG	JK	08/09/17	1245	X				X	X	X	X	X	1175526	081001/02
17FWOU220WG	AP-8916	13	Primary	WG	CB	08/09/17	1240	X				X	X	X	X	X	1175526	081001/02
17FWOU221WG	AP-7559	11.6	Primary	WG	JK	08/09/17	1345	X				X	X	X	X	X	1175526	081001/02
17FWOU222WG	AP-7560	11.1	Primary/MS/MSD	WG	JK	08/09/17	1445	X		X		X	X	X	X	X	1175526	081001/02
17FWOU223WG	AP-7560	11.1	Field Duplicate of 17FWOU222WG	WG	JK	08/09/17	1300	X		X		X	X	X	X	X	1175526	081001/02
QUALITY CONTROL SAMPLES																		
17FWOU205WQ	Rinsate 06	--	Equipment Blank	WQ	CB	05/17/17	1755	X		X		X	X		X		1172520	OU2-1
17FWOU206WQ	Trip Blank	--	Trip Blank	WQ	--	05/17/17	800	X							X		1172520	OU2-1
17FWOU211WQ	Rinsate 14	--	Equipment Blank	WQ	JK	05/31/17	1445	X		X					X		1172892	OU2-2
17FWOU212WQ	Trip Blank	--	Trip Blank	WQ	--	05/31/17	800	X	X						X		1172892	OU2-2
17FWOU224WQ	Rinsate 22	--	Equipment Blank	WQ	JK	08/09/17	1630	X		X		X	X	X	X	X	1175526	OU2-2
17FWOU225WQ	Trip Blank	--	Trip Blank	WQ	--	08/09/17	800	X							X		1175526	OU2-2

Note: All samples were submitted to SGS North America, Inc. of Anchorage, Alaska for analysis. The laboratory subcontracted the 1,4-dioxane analyses to SGS of Orlando, Florida. The standard 21-day turnaround time was requested for all analyses. All sampling activities were conducted under NPDL work order number 17-048.

[1] The depths at which samples 17FWOU209WG (WSW) and 17FWOU216WG (PO5) were collected are unknown. The WSW is sampled from a building faucet, as described in Section 2.1 of the CDQR. Groundwater probe PO5 has a 3/4-inch casing, which is too small for the water level indicator.

bgs - below ground surface
°C - degrees Celsius
DRO - diesel range organics
Fe - iron
GRO - gasoline range organics
HCl - hydrochloric acid
HDPE - high-density polyethylene
HNO_3 - nitric acid
H_2SO_4 - sulfuric acid
JK - Josh Klynstra
L - liter
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
PE - performance evaluation
SDG - sample data group
SVOC - semivolatile organic compounds
TOC - total organic carbon
VOA - volatile organic analysis
VOC - volatile organic compounds
WG - groundwater matrix
WQ - water quality control

Water Sample Collection (all samples were field-preserved at 0 to 6°C)
VOC - three HCl-preserved, 40 mL VOA vials
GRO - three HCl-preserved, 40 mL VOA vials
DRO - two HCl-preserved, 500 mL amber bottles
SVOC - two non-preserved, 1 L amber bottles
Fe - one HNO_3-preserved, 250 mL HDPE bottle, field-filtered
SO_4 - one non-preserved, 125 mL HDPE bottle
TOC - one HCl-preserved, 250 mL HDPE bottle
Alkalinity - one non-preserved, 125 mL HDPE bottle

Table B-2. Groundwater Sample Results (3-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	17FWOU201WG	17FWOU202WG	17FWOU203WG	17FWOU204WG	17FWOU205WQ	17FWOU206WQ	17FWOU209WG	17FWOU213WG	17FWOU214WG	17FWOU215WG	17FWOU216WG	17FWOU217WG	17FWOU218WG	17FWOU219WG	17FWOU220WG	17FWOU221WG	17FWOU222WG
			Location ID	AP-10037MW	AP-5050	AP-6809	AP-5751	Rinsate 06	Trip Blank	WSW	AP-10015	AP-10018	AP-10016	P05	AP-10017	Probe B	AP-8914R	AP-8916	AP-7559	AP-7560
			Sample Data Group	1172520	1172520	1172520	1172520	1172520	1172520	1172892	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526
			Laboratory ID	1172520001	1172520004	1172520005	1172520006	1172520007	1172520008	1172892005	1175526001	1175526002	1175526003	1175526004	1175526005	1175526006	1175526007	1175526008	1175526009	1175526010
			Collection Date	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/31/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017
			Matrix	WG	WG	WG	WG	WQ	WQ	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary/MS/MSD	Field Duplicate of 17FWOU201WG	Primary	Primary	Equipment Blank	Trip Blank	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD
Analyte	**Method**	**Units**	**OU2 ROD RG 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**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	mg/L	2.2	-	-	-	-	-	-	ND [0.05]	-	-	-	-	-	-	-	-	-	-
Diesel Range Organics	AK102	mg/L	1.5	0.511 [0.278] J	0.932 [0.288]	0.737 [0.283]	**1.51 [0.283]**	0.269 [0.273] J	-	ND [0.324]	-	-	-	0.172 [0.283] J	-	0.64 [0.283]	-	0.41 [0.294] J	-	**4.47 [0.294]**
Sulfate	E300.0	µg/L	NE	15700 [500]	15800 [500]	66600 [1000]	32700 [500]	ND [100]	-	-	11.3 [0.5]	14.3 [0.5]	10 [0.5]	34.9 [0.5]	20.4 [0.5]	30.7 [0.5]	8.69 [0.1]	2.37 [0.500]	27.9 [0.5]	14.3 [0.5]
Iron	SW6020A	µg/L	NE	14100 [250]	14600 [250]	2460 [250]	554 [250]	ND [250]	-	-	8860 [500]	15100 [500]	5970 [500]	4070 [500]	ND [250]	2620 [500]	27100 [500]	22600 [500]	ND [250]	10100 [500]
Alkalinity, Total	A2320B	mg/L	NE	-	-	-	-	-	-	-	188 [5]	170 [5]	181 [5]	203 [5]	150 [5]	362 [5]	136 [5]	212 [5.00]	175 [5]	127 [5]
Total Organic Carbon	SW9060	mg/L	NE	-	-	-	-	-	-	-	4.64 [0.25]	3.65 [0.25]	5.62 [0.25]	2.36 [0.25]	2.23 [0.25]	4.39 [0.25]	4.32 [0.25]	3.52 [0.250]	2.02 [0.25]	14.3 [1.5]
1,4-Dioxane	SW8260B-SIM	µg/L	4.6	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	0.31 [0.50] J	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	55,000	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	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 [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.200]	ND [0.2]	ND [0.2]
1,1-Dichloroethane	SW8260C	µg/L	28	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,1-Dichloroethene	SW8260C	µg/L	**7.0**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	ND [0.5]	2.92 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	**16.6 [0.500]**	ND [0.5]	ND [0.5]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
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 [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,2-Dichloroethane	SW8260C	µg/L	1.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
1,2-Dichloropropane	SW8260C	µg/L	4.4	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	120	ND [0.5]	ND [0.5]	ND [0.5]	1.11 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	2.71 [0.500]	ND [0.5]	0.347 [0.5] J
1,3-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
1,3-Dichloropropane	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
2-Butanone	SW8260C	µg/L	5,600	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
2-Hexanone	SW8260C	µg/L	38	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	4.03 [0.500]	ND [0.5]	0.568 [0.5] J
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
Benzene	SW8260C	µg/L	**5.0**	1.38 [0.2]	1.13 [0.2]	0.46 [0.2]	0.17 [0.2] J	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 [0.2]	ND [0.200]	ND [0.2]	ND [0.2]
Bromobenzene	SW8260C	µg/L	62	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Bromodichloromethane	SW8260C	µg/L	1.3	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
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 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.5]	ND [2.5]
Carbon disulfide	SW8260C	µg/L	810	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
Carbon tetrachloride	SW8260C	µg/L	4.6	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Chlorobenzene	SW8260C	µg/L	78	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
Chloroethane	SW8260C	µg/L	21,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Chloroform	SW8260C	µg/L	2.20	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Chloromethane	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
cis-1,2-Dichloroethene	SW8260C	µg/L	**70**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	1.34 [0.5]	3.89 [0.5]	0.497 [0.5] J	0.548 [0.5] J	0.402 [0.5] J	ND [0.5]	15.5 [0.5]	ND [0.500]	ND [0.5]	0.356 [0.5] J
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
Dibromochloromethane	SW8260C	µg/L	8.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]
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 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Ethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	ND [0.5]	6.7 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.321 [0.500] J	ND [0.5]	ND [0.5]
Hexachlorobutadiene	SW8260C	µg/L	1.4	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Isopropylbenzene	SW8260C	µg/L	450	9.22 [0.5]	9.15 [0.5]	ND [0.5]	0.48 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.381 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	1.73 [0.500]	ND [0.5]	ND [0.5]
Methylene chloride	SW8260C	µg/L	110	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.5]	ND [2.5]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
Naphthalene	SW8260C	µg/L	1.7	ND [0.5]	ND [0.5]	ND [0.5]	**3.27 [0.5]**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.51 [0.500] J	ND [0.5]	0.731 [0.5] J

Table B-2. Groundwater Sample Results (3-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	17FWOU201WG	17FWOU202WG	17FWOU203WG	17FWOU204WG	17FWOU205WQ	17FWOU206WQ	17FWOU209WG	17FWOU213WG	17FWOU214WG	17FWOU215WG	17FWOU216WG	17FWOU217WG	17FWOU218WG	17FWOU219WG	17FWOU220WG	17FWOU221WG	17FWOU222WG
			Location ID	AP-10037MW	AP-5050	AP-6809	AP-5751	Rinsate 06	Trip Blank	WSW	AP-10015	AP-10018	AP-10016	P05	AP-10017	Probe B	AP-8914R	AP-8916	AP-7559	AP-7560
			Sample Data Group	1172520	1172520	1172520	1172520	1172520	1172520	1172892	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526
			Laboratory ID	1172520001	1172520004	1172520005	1172520006	1172520007	1172520008	1172892005	1175526001	1175526002	1175526003	1175526004	1175526005	1175526006	1175526007	1175526008	1175526009	1175526010
			Collection Date	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/31/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017
			Matrix	WG	WG	WG	WG	WQ	WQ	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary/MS/MSD	Field Duplicate of 17FWOU201WG	Primary	Primary	Equipment Blank	Trip Blank	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD
Analyte	**Method**	**Units**	**OU2 ROD RG 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**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
n-Butylbenzene	SW8260C	µg/L	1,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
n-Propylbenzene	SW8260C	µg/L	660	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	3.82 [0.500]	ND [0.5]	ND [0.5]
sec-Butylbenzene	SW8260C	µg/L	2,000	1.88 [0.5]	1.84 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.555 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	2.39 [0.500]	ND [0.5]	ND [0.5]
Styrene	SW8260C	µg/L	1,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
tert-Butylbenzene	SW8260C	µg/L	690	0.34 [0.5] J	0.34 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.393 [0.500] J	ND [0.5]	ND [0.5]
Tetrachloroethene (PCE)	SW8260C	µg/L	**5.0**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	1.55 [0.5]	1.02 [0.5]	**5.16 [0.5]**	**6.63 [0.5]**	1.16 [0.5]	ND [0.5]	0.532 [0.5] J	ND [0.500]	3.35 [0.5]	1.38 [0.5]
Toluene	SW8260C	µg/L	1,100	ND [0.5]	ND [0.5]	ND [0.5]	0.58 [0.5] J	0.5 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.339 [0.500] J	ND [0.5]	ND [0.5]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	2.68 [0.5]	9.15 [0.5]	0.565 [0.5] J	0.756 [0.5] J	ND [0.5]	ND [0.5]	4.27 [0.5]	ND [0.500]	ND [0.5]	0.417 [0.5] J
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.819 [0.5] J	0.787 [0.5] J	1.61 [0.5]	3.29 [0.5]	ND [0.5]	ND [0.5]	1.67 [0.5]	ND [0.500]	0.461 [0.5] J	1.04 [0.5]
Trichlorofluoromethane	SW8260C	µg/L	5,200	ND [0.5]	ND [0.5]	ND [0.5]	3.73 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Vinyl acetate	SW8260C	µg/L	410	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5]	ND [5]
Vinyl chloride	SW8260C	µg/L	**2.0**	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.0750]	ND [0.075]	ND [0.075]
o-Xylene	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]	15.4 [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1]	ND [1]	ND [1]	28.4 [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	ND [1]	1.36 [1.00] J	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	ND [1.5]	ND [1.5]	ND [1.5]	43.8 [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]	1.36 [1.50] J	ND [1.5]	ND [1.5]
1,2,4-Trichlorobenzene	SW8270D	µg/L	4.0	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	SW8270D	µg/L	300	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	SW8270D	µg/L	300	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	SW8270D	µg/L	4.8	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
1-Chloronaphthalene	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	SW8270D	µg/L	11	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	SW8270D	µg/L	1,200	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	SW8270D	µg/L	12	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	SW8270D	µg/L	46	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	SW8270D	µg/L	360	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrophenol	SW8270D	µg/L	39	-	-	-	-	-	-	ND [27.2]	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	SW8270D	µg/L	2.4	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,6-Dichlorophenol	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	SW8270D	µg/L	0.49	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	SW8270D	µg/L	750	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2-Chlorophenol	SW8270D	µg/L	91	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2-Methyl-4,6-dinitrophenol	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [27.2]	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	SW8270D	µg/L	36	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2-Methylphenol (o-Cresol)	SW8270D	µg/L	930	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2-Nitroaniline	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
2-Nitrophenol	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
3,3'-Dichlorobenzidine	SW8270D	µg/L	1.3	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
3-Methylphenol/4-Methylphenol Coelution	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [10.9]	-	-	-	-	-	-	-	-	-	-
3-Nitroaniline	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
4-Bromophenyl phenyl ether	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
4-Chloroaniline	SW8270D	µg/L	3.7	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
4-Chlorophenyl phenyl ether	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
4-Nitroaniline	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
4-Nitrophenol	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [27.2]	-	-	-	-	-	-	-	-	-	-
Acenaphthene	SW8270D	µg/L	530	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	SW8270D	µg/L	260	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Aniline	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [27.2]	-	-	-	-	-	-	-	-	-	-
Anthracene	SW8270D	µg/L	43	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Azobenzene	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	SW8270D	µg/L	0.12	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	SW8270D	µg/L	0.03	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	SW8270D	µg/L	0.34	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	SW8270D	µg/L	0.26	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	SW8270D	µg/L	0.8	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzoic acid	SW8270D	µg/L	75,000	-	-	-	-	-	-	ND [27.2]	-	-	-	-	-	-	-	-	-	-
Benzyl alcohol	SW8270D	µg/L	2,000	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Benzyl butyl phthalate	SW8270D	µg/L	160	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-

Table B-2. Groundwater Sample Results (3-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	17FWOU201WG	17FWOU202WG	17FWOU203WG	17FWOU204WG	17FWOU205WQ	17FWOU206WQ	17FWOU209WG	17FWOU213WG	17FWOU214WG	17FWOU215WG	17FWOU216WG	17FWOU217WG	17FWOU218WG	17FWOU219WG	17FWOU220WG	17FWOU221WG	17FWOU222WG
			Location ID	AP-10037MW	AP-5050	AP-6809	AP-5751	Rinsate 06	Trip Blank	WSW	AP-10015	AP-10018	AP-10016	P05	AP-10017	Probe B	AP-8914R	AP-8916	AP-7559	AP-7560
			Sample Data Group	1172520	1172520	1172520	1172520	1172520	1172520	1172892	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526	1175526
			Laboratory ID	1172520001	1172520004	1172520005	1172520006	1172520007	1172520008	1172892005	1175526001	1175526002	1175526003	1175526004	1175526005	1175526006	1175526007	1175526008	1175526009	1175526010
			Collection Date	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/17/2017	5/31/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017	8/9/2017
			Matrix	WG	WG	WG	WG	WQ	WQ	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary/MS/MSD	Field Duplicate of 17FWOU201WG	Primary	Primary	Equipment Blank	Trip Blank	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD
Analyte	**Method**	**Units**	**OU2 ROD RG 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**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
bis-(2-Chloroethoxy)methane	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
bis-(2-Chloroethyl)ether	SW8270D	µg/L	0.14	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
bis(2-Chloroisopropyl)ether	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/L	56	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Carbazole	SW8270D	µg/L	NE	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Chrysene	SW8270D	µg/L	2.0	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	SW8270D	µg/L	0.03	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	SW8270D	µg/L	7.9	-	-	-	-	-	-	ND [2.71]	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate	SW8270D	µg/L	15,000	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	SW8270D	µg/L	16,000	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	SW8270D	µg/L	900	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Di-n-octyl phthalate	SW8270D	µg/L	22	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Fluoranthene	SW8270D	µg/L	260	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Fluorene	SW8270D	µg/L	290	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	SW8270D	µg/L	0.098	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	SW8270D	µg/L	1.4	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	SW8270D	µg/L	0.41	-	-	-	-	-	-	ND [16.3]	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	SW8270D	µg/L	3.3	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	SW8270D	µg/L	0.19	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Isophorone	SW8270D	µg/L	780	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Naphthalene	SW8270D	µg/L	1.7	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	SW8270D	µg/L	1.4	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
n-Nitrosodimethylamine	SW8270D	µg/L	0.0011	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
n-Nitrosodi-n-propylamine	SW8270D	µg/L	0.11	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
n-Nitrosodiphenylamine	SW8270D	µg/L	120	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	SW8270D	µg/L	0.41	-	-	-	-	-	-	ND [27.2]	-	-	-	-	-	-	-	-	-	-
Phenanthrene	SW8270D	µg/L	170	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Phenol	SW8270D	µg/L	5,800	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-
Pyrene	SW8270D	µg/L	120	-	-	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-	-

Yellow highlighted and **bolded** results exceed OU2 ROD remedial goals or 2016 ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above OU2 ROD remedial goals or 2016 ADEC cleanup levels.

[1] **OU2 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.

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
WG - groundwater
WQ - water QC sample

Table B-2. Groundwater Sample Results (3-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	**17FWOU223WG**	**17FWOU224WQ**	**17FWOU225WQ**
			Location ID	AP-7070	Rinsate 22	Trip Blank
			Sample Data Group	1175526	1175526	1175526
			Laboratory ID	1175526013	1175526014	1175526015
			Collection Date	8/9/2017	8/9/2017	8/9/2017
			Matrix	WG	WQ	WQ
			Sample Type	Field Duplicate of 17FWOU222WG	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**OU2 ROD RG or 2016 ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	mg/L	2.2	-	-	-
Diesel Range Organics	AK102	mg/L	1.5	**4.89 [0.3]**	ND [0.283]	-
Sulfate	E300.0	µg/L	NE	13.5 [0.1]	ND [0.1]	-
Iron	SW6020A	µg/L	NE	10300 [250]	ND [250]	-
Alkalinity, Total	A2320B	mg/L	NE	126 [5]	ND [5]	-
Total Organic Carbon	SW9060	mg/L	NE	14.3 [1.5]	ND [0.25]	-
1,4-Dioxane	SW8260B-SIM	µg/L	4.6	ND [0.50]	ND [0.50]	ND [0.50]
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	ND [0.25]	ND [0.25]	ND [0.25]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	ND [0.5]	ND [0.5]	ND [0.5]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	ND [0.25]	ND [0.25]	ND [0.25]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	55,000	ND [5]	ND [5]	ND [5]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	ND [0.2]	ND [0.2]	ND [0.2]
1,1-Dichloroethane	SW8260C	µg/L	28	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloroethene	SW8260C	µg/L	**7.0**	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [5]	ND [5]	ND [5]
1,2-Dibromoethane	SW8260C	µg/L	0.075	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichloroethane	SW8260C	µg/L	1.7	ND [0.25]	ND [0.25]	ND [0.25]
1,2-Dichloropropane	SW8260C	µg/L	4.4	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	120	0.384 [0.5] J	ND [0.5]	ND [0.5]
1,3-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]
1,3-Dichloropropane	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	ND [0.25]	ND [0.25]	ND [0.25]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]
2-Butanone	SW8260C	µg/L	5,600	ND [5]	ND [5]	ND [5]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]
2-Hexanone	SW8260C	µg/L	38	ND [5]	ND [5]	ND [5]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]
4-Isopropyltoluene	SW8260C	µg/L	NE	0.605 [0.5] J	ND [0.5]	ND [0.5]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	ND [5]	ND [5]	ND [5]
Benzene	SW8260C	µg/L	**5.0**	ND [0.2]	ND [0.2]	ND [0.2]
Bromobenzene	SW8260C	µg/L	62	ND [0.5]	ND [0.5]	ND [0.5]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]
Bromodichloromethane	SW8260C	µg/L	1.3	ND [0.25]	ND [0.25]	ND [0.25]
Bromoform	SW8260C	µg/L	33	ND [0.5]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	ND [2.5]	ND [2.5]	ND [2.5]
Carbon disulfide	SW8260C	µg/L	810	ND [5]	ND [5]	ND [5]
Carbon tetrachloride	SW8260C	µg/L	4.6	ND [0.5]	ND [0.5]	ND [0.5]
Chlorobenzene	SW8260C	µg/L	78	ND [0.25]	ND [0.25]	ND [0.25]
Chloroethane	SW8260C	µg/L	21,000	ND [0.5]	ND [0.5]	ND [0.5]
Chloroform	SW8260C	µg/L	2.20	ND [0.5]	ND [0.5]	ND [0.5]
Chloromethane	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,2-Dichloroethene	SW8260C	µg/L	**70**	0.334 [0.5] J	ND [0.5]	ND [0.5]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]
Dibromochloromethane	SW8260C	µg/L	8.7	ND [0.25]	ND [0.25]	ND [0.25]
Dibromomethane	SW8260C	µg/L	8.3	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	200	ND [0.5]	ND [0.5]	ND [0.5]
Ethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	ND [0.5]
Hexachlorobutadiene	SW8260C	µg/L	1.4	ND [0.5]	ND [0.5]	ND [0.5]
Isopropylbenzene	SW8260C	µg/L	450	ND [0.5]	ND [0.5]	ND [0.5]
Methylene chloride	SW8260C	µg/L	110	ND [2.5]	ND [2.5]	ND [2.5]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	ND [5]	ND [5]	ND [5]
Naphthalene	SW8260C	µg/L	1.7	0.74 [0.5] J	ND [0.5]	ND [0.5]

Table B-2. Groundwater Sample Results (3-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	**17FWOU223WG**	**17FWOU224WQ**	**17FWOU225WQ**
			Location ID	AP-7070	Rinsate 22	Trip Blank
			Sample Data Group	1175526	1175526	1175526
			Laboratory ID	1175526013	1175526014	1175526015
			Collection Date	8/9/2017	8/9/2017	8/9/2017
			Matrix	WG	WQ	WQ
			Sample Type	Field Duplicate of 17FWOU222WG	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**OU2 ROD RG or 2016 ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
n-Butylbenzene	SW8260C	µg/L	1,000	ND [0.5]	ND [0.5]	ND [0.5]
n-Propylbenzene	SW8260C	µg/L	660	ND [0.5]	ND [0.5]	ND [0.5]
sec-Butylbenzene	SW8260C	µg/L	2,000	ND [0.5]	ND [0.5]	ND [0.5]
Styrene	SW8260C	µg/L	1,200	ND [0.5]	ND [0.5]	ND [0.5]
tert-Butylbenzene	SW8260C	µg/L	690	ND [0.5]	ND [0.5]	ND [0.5]
Tetrachloroethene (PCE)	SW8260C	µg/L	**5.0**	1.34 [0.5]	ND [0.5]	ND [0.5]
Toluene	SW8260C	µg/L	1,100	ND [0.5]	0.514 [0.5] J	ND [0.5]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	0.406 [0.5] J	ND [0.5]	ND [0.5]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.5]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	1.05 [0.5]	ND [0.5]	ND [0.5]
Trichlorofluoromethane	SW8260C	µg/L	5,200	ND [0.5]	ND [0.5]	ND [0.5]
Vinyl acetate	SW8260C	µg/L	410	ND [5]	ND [5]	ND [5]
Vinyl chloride	SW8260C	µg/L	**2.0**	ND [0.075]	ND [0.075]	ND [0.075]
o-Xylene	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1]	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	ND [1.5]	ND [1.5]	ND [1.5]
1,2,4-Trichlorobenzene	SW8270D	µg/L	4.0	-	-	-
1,2-Dichlorobenzene	SW8270D	µg/L	300	-	-	-
1,3-Dichlorobenzene	SW8270D	µg/L	300	-	-	-
1,4-Dichlorobenzene	SW8270D	µg/L	4.8	-	-	-
1-Chloronaphthalene	SW8270D	µg/L	NE	-	-	-
1-Methylnaphthalene	SW8270D	µg/L	11	-	-	-
2,4,5-Trichlorophenol	SW8270D	µg/L	1,200	-	-	-
2,4,6-Trichlorophenol	SW8270D	µg/L	12	-	-	-
2,4-Dichlorophenol	SW8270D	µg/L	46	-	-	-
2,4-Dimethylphenol	SW8270D	µg/L	360	-	-	-
2,4-Dinitrophenol	SW8270D	µg/L	39	-	-	-
2,4-Dinitrotoluene	SW8270D	µg/L	2.4	-	-	-
2,6-Dichlorophenol	SW8270D	µg/L	NE	-	-	-
2,6-Dinitrotoluene	SW8270D	µg/L	0.49	-	-	-
2-Chloronaphthalene	SW8270D	µg/L	750	-	-	-
2-Chlorophenol	SW8270D	µg/L	91	-	-	-
2-Methyl-4,6-dinitrophenol	SW8270D	µg/L	NE	-	-	-
2-Methylnaphthalene	SW8270D	µg/L	36	-	-	-
2-Methylphenol (o-Cresol)	SW8270D	µg/L	930	-	-	-
2-Nitroaniline	SW8270D	µg/L	NE	-	-	-
2-Nitrophenol	SW8270D	µg/L	NE	-	-	-
3,3'-Dichlorobenzidine	SW8270D	µg/L	1.3	-	-	-
3-Methylphenol/4-Methylphenol Coelution	SW8270D	µg/L	NE	-	-	-
3-Nitroaniline	SW8270D	µg/L	NE	-	-	-
4-Bromophenyl phenyl ether	SW8270D	µg/L	NE	-	-	-
4-Chloro-3-methylphenol	SW8270D	µg/L	NE	-	-	-
4-Chloroaniline	SW8270D	µg/L	3.7	-	-	-
4-Chlorophenyl phenyl ether	SW8270D	µg/L	NE	-	-	-
4-Nitroaniline	SW8270D	µg/L	NE	-	-	-
4-Nitrophenol	SW8270D	µg/L	NE	-	-	-
Acenaphthene	SW8270D	µg/L	530	-	-	-
Acenaphthylene	SW8270D	µg/L	260	-	-	-
Aniline	SW8270D	µg/L	NE	-	-	-
Anthracene	SW8270D	µg/L	43	-	-	-
Azobenzene	SW8270D	µg/L	NE	-	-	-
Benzo(a)anthracene	SW8270D	µg/L	0.12	-	-	-
Benzo(a)pyrene	SW8270D	µg/L	0.03	-	-	-
Benzo(b)fluoranthene	SW8270D	µg/L	0.34	-	-	-
Benzo(g,h,i)perylene	SW8270D	µg/L	0.26	-	-	-
Benzo(k)fluoranthene	SW8270D	µg/L	0.8	-	-	-
Benzoic acid	SW8270D	µg/L	75,000	-	-	-
Benzyl alcohol	SW8270D	µg/L	2,000	-	-	-
Benzyl butyl phthalate	SW8270D	µg/L	160	-	-	-

Table B-2. Groundwater Sample Results (3-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	**17FWOU223WG**	**17FWOU224WQ**	**17FWOU225WQ**
			Location ID	AP-7070	Rinsate 22	Trip Blank
			Sample Data Group	1175526	1175526	1175526
			Laboratory ID	1175526013	1175526014	1175526015
			Collection Date	8/9/2017	8/9/2017	8/9/2017
			Matrix	WG	WQ	WQ
			Sample Type	Field Duplicate of 17FWOU222WG	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**OU2 ROD RG or 2016 ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
bis-(2-Chloroethoxy)methane	SW8270D	µg/L	NE	-	-	-
bis-(2-Chloroethyl)ether	SW8270D	µg/L	0.14	-	-	-
bis(2-Chloroisopropyl)ether	SW8270D	µg/L	NE	-	-	-
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/L	56	-	-	-
Carbazole	SW8270D	µg/L	NE	-	-	-
Chrysene	SW8270D	µg/L	2.0	-	-	-
Dibenzo(a,h)anthracene	SW8270D	µg/L	0.03	-	-	-
Dibenzofuran	SW8270D	µg/L	7.9	-	-	-
Diethyl phthalate	SW8270D	µg/L	15,000	-	-	-
Dimethyl phthalate	SW8270D	µg/L	16,000	-	-	-
Di-n-butyl phthalate	SW8270D	µg/L	900	-	-	-
Di-n-octyl phthalate	SW8270D	µg/L	22	-	-	-
Fluoranthene	SW8270D	µg/L	260	-	-	-
Fluorene	SW8270D	µg/L	290	-	-	-
Hexachlorobenzene	SW8270D	µg/L	0.098	-	-	-
Hexachlorobutadiene	SW8270D	µg/L	1.4	-	-	-
Hexachlorocyclopentadiene	SW8270D	µg/L	0.41	-	-	-
Hexachloroethane	SW8270D	µg/L	3.3	-	-	-
Indeno(1,2,3-cd)pyrene	SW8270D	µg/L	0.19	-	-	-
Isophorone	SW8270D	µg/L	780	-	-	-
Naphthalene	SW8270D	µg/L	1.7	-	-	-
Nitrobenzene	SW8270D	µg/L	1.4	-	-	-
n-Nitrosodimethylamine	SW8270D	µg/L	0.0011	-	-	-
n-Nitrosodi-n-propylamine	SW8270D	µg/L	0.11	-	-	-
n-Nitrosodiphenylamine	SW8270D	µg/L	120	-	-	-
Pentachlorophenol	SW8270D	µg/L	0.41	-	-	-
Phenanthrene	SW8270D	µg/L	170	-	-	-
Phenol	SW8270D	µg/L	5,800	-	-	-
Pyrene	SW8270D	µg/L	120	-	-	-

Yellow highlighted and **bolded** results exceed OU2 ROD remedial goals or 2016 ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above OU2 ROD remedial goals or 2016 ADEC cleanup levels.

[1] **OU2 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.

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
WG - groundwater
WQ - water QC sample

Table B-3. Groundwater Sample Results (2-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	17FWOU207WG	17FWOU208WG	17FWOU210WG	17FWOU211WQ	17FWOU212WQ
			Location ID	AP-7346	AP-8080	AP-7348	Rinsate 14	Trip Blank
			Sample Data Group	1172892	1172892	1172892	1172892	1172892
			Laboratory ID	1172892001	1172892004	1172892006	1172892007	1172892008
			Collection Date	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
			Matrix	WG	WG	WG	WQ	WQ
			Sample Type	Primary/MS/MSD	Field Duplicate of 17FWOU207WG	Primary	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	mg/L	2.2	-	-	-	-	ND [0.05]
Diesel Range Organics	AK102	mg/L	1.5	ND [0.318]	0.215 [0.305] J	**10.7 [0.318]**	ND [0.3]	-
Sulfate	E300.0	µg/L	NE	-	-	-	-	-
Iron	SW6020A	µg/L	NE	-	-	-	-	-
Alkalinity, Total	A2320B	mg/L	NE	-	-	-	-	-
Total Organic Carbon	SW9060	mg/L	NE	-	-	-	-	-
1,4-Dioxane	SW8260B-SIM	µg/L	4.6	ND [0.50]	ND [0.50]	0.31 [0.50] J	ND [0.50]	ND [0.50]
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	55,000	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1-Dichloroethane	SW8260C	µg/L	28	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloroethene	SW8260C	µg/L	280	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	**75.7 [0.5]**	ND [0.5]	ND [0.5]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
1,2-Dibromoethane	SW8260C	µg/L	0.075	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichloroethane	SW8260C	µg/L	1.7	0.323 [0.25] J	0.312 [0.25] J	0.16 [0.25] J	0.257 [0.25] J	ND [0.25]
1,2-Dichloropropane	SW8260C	µg/L	4.4	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	120	ND [0.5]	ND [0.5]	39.4 [0.5]	ND [0.5]	ND [0.5]
1,3-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3-Dichloropropane	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
2-Butanone	SW8260C	µg/L	5,600	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
2-Hexanone	SW8260C	µg/L	38	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	4.86 [0.5]	ND [0.5]	ND [0.5]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Benzene	SW8260C	µg/L	4.6	ND [0.2]	ND [0.2]	0.333 [0.2] J	ND [0.2]	ND [0.2]
Bromobenzene	SW8260C	µg/L	62	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromodichloromethane	SW8260C	µg/L	1.3	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Bromoform	SW8260C	µg/L	33	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Carbon disulfide	SW8260C	µg/L	810	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Carbon tetrachloride	SW8260C	µg/L	4.6	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chlorobenzene	SW8260C	µg/L	78	0.22 [0.25] J	0.236 [0.25] J	ND [0.25]	ND [0.25]	ND [0.25]
Chloroethane	SW8260C	µg/L	21,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chloroform	SW8260C	µg/L	2.20	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chloromethane	SW8260C	µg/L	190	0.334 [0.5] J	0.315 [0.5] J	0.598 [0.5] J	ND [0.5]	0.507 [0.5] J
cis-1,2-Dichloroethene	SW8260C	µg/L	36	0.341 [0.5] J	0.36 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Dibromochloromethane	SW8260C	µg/L	8.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Dibromomethane	SW8260C	µg/L	8.3	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Ethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	5.03 [0.5]	ND [0.5]	ND [0.5]
Hexachlorobutadiene	SW8260C	µg/L	1.4	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Isopropylbenzene	SW8260C	µg/L	450	ND [0.5]	ND [0.5]	3.17 [0.5]	ND [0.5]	ND [0.5]
Methylene chloride	SW8260C	µg/L	110	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Naphthalene	SW8260C	µg/L	1.7	ND [0.5]	ND [0.5]	**86 [0.5]**	ND [0.5]	ND [0.5]

Table B-3. Groundwater Sample Results (2-Party)
Operable Unit 2
Fort Wainwright, Alaska

			Sample ID	**17FWOU207WG**	**17FWOU208WG**	**17FWOU210WG**	**17FWOU211WQ**	**17FWOU212WQ**
			Location ID	AP-7346	AP-8080	AP-7348	Rinsate 14	Trip Blank
			Sample Data Group	1172892	1172892	1172892	1172892	1172892
			Laboratory ID	1172892001	1172892004	1172892006	1172892007	1172892008
			Collection Date	5/31/2017	5/31/2017	5/31/2017	5/31/2017	5/31/2017
			Matrix	WG	WG	WG	WQ	WQ
			Sample Type	Primary/MS/MSD	Field Duplicate of 17FWOU207WG	Primary	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**2016 ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
n-Butylbenzene	SW8260C	µg/L	1,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
n-Propylbenzene	SW8260C	µg/L	660	ND [0.5]	ND [0.5]	4.28 [0.5]	ND [0.5]	ND [0.5]
sec-Butylbenzene	SW8260C	µg/L	2,000	ND [0.5]	ND [0.5]	3.28 [0.5]	ND [0.5]	ND [0.5]
Styrene	SW8260C	µg/L	1,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
tert-Butylbenzene	SW8260C	µg/L	690	ND [0.5]	ND [0.5]	0.751 [0.5] J	ND [0.5]	ND [0.5]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Toluene	SW8260C	µg/L	1,100	ND [0.5]	ND [0.5]	0.436 [0.5] J	0.699 [0.5] J	ND [0.5]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	0.344 [0.5] J	0.335 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]
Trichlorofluoromethane	SW8260C	µg/L	5,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Vinyl acetate	SW8260C	µg/L	410	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Vinyl chloride	SW8260C	µg/L	0.19	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]
o-Xylene	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	22.1 [0.5]	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1]	ND [1]	17.4 [1]	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	ND [1.5]	ND [1.5]	39.6 [1.5]	ND [1.5]	ND [1.5]

Yellow highlighted and **bolded** results exceed 2016 ADEC groundwater cleanup levels.

Grey highlighted results are non-detect with LODs above 2016 ADEC cleanup levels.

[1] 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.

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
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
WG - groundwater
WQ - water QC sample

APPENDIX C

GROUNDWATER SAMPLING FORMS AND GROUNDWATER FIELD MEASUREMENTS

Table C-1 - 2017 OU2 Groundwater Sample Field Measurements

Well ID	Sample ID	Sample Date	Sample Time	Pump Type	Field Measurements									
					Water Depth[1] (feet btoc)	Water Table Within Well Screen Interval (Y/N)	Drawdown[2] (feet)	Temp (°C)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Well Stabilized[3] (Y/N)
Operable Unit 2 - Former Building 1168														
AP-5751	17FWOU201WG	5/17/2017	1705	Submersible	15.63	Y	0.01	4.07	0.929	3.48	6.67	80.2	1.07	Y
AP-10037MW	17FWOU201WG	5/17/2017	1050	Submersible	16.39	Y	0.00	4.61	0.746	0.95	6.66	41.9	13.27	Y
AP-6809	17FWOU203WG	5/17/2017	1540	Submersible	15.47	Y	0.00	6.14	1.141	0.61	6.63	59.2	32.06	Y
Operable Unit 2 - Building 5010 & WSW														
AP-7346	17FWOU201WG	5/31/2017	1115	Submersible	7.67	Y	0.00	2.14	0.406	1.08	6.87	-0.4	4.24	Y
AP-7348	17FWOU201WG	5/31/2017	1335	Submersible	9.69	Y	0.00	6.53	0.707	0.39	6.59	-95.3	18.99	Y
WSW[4]	17FWOU201WG	5/31/2017	1215	Raw Water Tap	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Operable Unit 2 - DRMO4 3-Party														
PO5	17FWOU216WG	8/9/2017	1100	Peristaltic	NA	NA	NA	9.12	0.488	2.22	6.28	-15.2	3.96	Y
Probe-B	17FWOU218WG	8/9/2017	1145	Peristaltic	10.88	Y	0.30	8.94	0.719	0.60	6.20	51.9	21.70	Y
AP-8916	17FWOU220WG	8/9/2017	1240	Submersible	11.21	Y	0.00	6.63	0.507	0.41	5.71	-103.1	10.89	Y
Operable Unit 2 - DRMO1 3-Party														
AP-8914R	17FWOU219WG	8/9/2017	1245	Submersible	10.80	Y	0.00	8.85	0.374	0.44	6.87	-119.6	4.23	Y
AP-7559	17FWOU221WG	8/9/2017	1345	Submersible	10.60	Y	0.00	9.86	0.425	0.87	6.92	61.9	6.88	Y
AP-7560	17FWOU222WG	8/9/2017	1445	Submersible	10.10	Y	0.00	8.82	0.305	0.63	6.62	-63.6	1.00	Y
AP-10015	17FWOU213WG	8/9/2017	930	Peristaltic	10.04	Y	0.01	8.24	0.438	0.61	6.91	-69.9	3.45	Y
AP-10016	17FWOU215WG	8/9/2017	1030	Peristaltic	9.95	Y	0.00	8.86	0.422	0.98	6.82	-53.2	1.59	Y
AP-10017	17FWOU217WG	8/9/2017	1145	Peristaltic	8.89	Y	0.00	8.38	0.365	0.45	6.85	73.3	0.69	Y
AP-10018	17FWOU214WG	8/9/2017	1005	Peristaltic	9.48	Y	0.00	7.50	0.398	0.50	6.41	-3.3	5.26	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] Stabilization parameters described in ADEC Field Sampling Guidance (ADEC, 2016a). Impact to data quality is discussed in the CDQR.

[4] Parameters were measured using the YSI in a cup immediately prior to sampling

Acronyms

bgs - below ground surface
btoc - below top of casing
°C - degree Celsius
CDQR - Chemical Data Qualification Report
DO - dissolved oxygen
mg/L - milligrams per liter
mS/cm - milliSiemens per centimeter
mV - millivolts
NA - not applicable
NTU - nephelometric turbidity units
ORP - oxidation reduction potential
WSW - Water Supply Well

GROUNDWATER SAMPLE FORM ~~003~~ 002 Ft. Wainwright, Alaska

Project #: ~~9003-18~~ 9003-17 Site Location: ~~BHTF / VPA / VPB / VPC / ROLF~~ 1168

Date: 5/17/17 Probe/Well #: AP-10037MW

Time: 1050 Sample ID: 17FWOU201 WG

Sampler: CB

Weather: MOSTLY SUNNY Outside Temperature: 61°F

QA/QC Sample ID/Time/LOCID: 17FWOU202WG/1105/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 # 8 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		Sampling Depth	
Total Depth in Probe/Well (feet btoc):	25.27	Well Screened Across / Below water table	16.9
Depth to Water from TOC (feet):	- 16.39	Depth tubing / pump intake set* approx.	17.5 feet below top of casing
Column of Water in Probe/Well (feet):	= 8.88	*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across	
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)		the water table, or in the middle of the screened interval for wells screened below the water table	
Volume of Water in 1 Probe/Well Casing (gal):	1.4		

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)
0.75	5	5.08	0.775	2.87	6.14	89.4	210.5	16.78
1.5	10	4.05	0.777	1.77	6.29	74.4	105.7	16.78
2.25	15	4.61	0.761	1.38	6.50	61.1	72.19	16.78
3	20	4.55	0.752	1.16	6.58	52.5	36.29	16.78
3.75	25	4.58	0.746	1.00	6.64	45.3	17.08	16.78
4.5	30	4.60	0.746	0.97	6.65	42.2	15.95	16.78
5.25	35	4.61	0.746	0.95	6.66	41.9	13.27	16.18
5.5	FINAL							

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? INITIAL

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

Well Condition: Locked Y / N Labeled with LOC ID: Y / N Comments:

Sheen: Yes / No Odor: Yes / No Notes/Comments:

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

Laboratory Analyses (Circle): VOC, PAH, EDB, GRO, DRO, Iron, Sulfate 1,4-DIOXANE

pH checked of samples: Y / N Approximate volume added (mL): HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 5.5 Containerized and disposed as IDW? Yes / No If No, why not?

Sampler's Initials: CB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM ~~OU3~~ OU2 **Ft. Wainwright, Alaska**

Project #:	9003-18	**Site Location:**	~~BHTF / VPA / VPB / VPC / ROLF~~ 1168
Date:	5/17/17	**Probe/Well #:**	AP-6809
Time:	1540	**Sample ID:**	17FWOU3 03 WG
Sampler:	CB		
Weather:	PT CLOUDY	**Outside Temperature:**	70 °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 # 8 **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 **Sampling Depth** 13' SCREEN

Total Depth in Probe/Well (feet btoc): 26.76 Well Screened ~~Across~~ / **Below** water table

Depth to Water from TOC (feet): - 15.47 Depth tubing / pump intake set* approx. 16 feet below top of casing

Column of Water in Probe/Well (feet): = 11.29 *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): 1.84

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	5.39	1.122	1.93	6.33	64.8	162.8	15.58
1	10	5.78	1.130	1.19	6.41	66.2	137.2	15.58
1.5	15	5.96	1.135	0.78	6.60	60.1	112.9	15.58
2	20	6.00	1.139	0.65	6.63	58.7	76.82	15.58
2.5	25	6.16	1.139	0.62	6.62	59.3	43.47	15.58
3	30	6.12	1.140	0.60	6.62	59.1	40.16	15.58
3.5	35	6.13	1.141	0.59	6.63	59.7	37.41	15.58
4	40	6.14	1.141	0.61	6.63	57.2	32.06	15.58
4.25	FINAL							

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: Locked / 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, PAH, EDB, GRO, DRO, Iron, Sulfate + 1,4 DIOXANE

pH checked of samples: Y / N **Approximate volume added (mL):** HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 4.25 Containerized and disposed as IDW? Yes / No If No, why not?

Sampler's Initials: CB Disposal method: FWA IDW treatment facility / Emerald Environmental / GAC treatment and surface discharge / other

GROUNDWATER SAMPLE FORM OU B 2 Ft. Wainwright, Alaska

Project #: 9003-18 Site Location: BHTF / VPA / VPB / VPC / ROLF 1168

Date: 5/17/17 Probe/Well #: AP-5751

Time: 1705 Sample ID: 17FWOU3 04 WG

Sampler: CB

Weather: PT CLOUDY Outside Temperature: 70°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 # 8 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		Sampling Depth	
Total Depth in Probe/Well (feet btoc):	20.47	Well Screened (Across) / Below water table	
Depth to Water from TOC (feet):	- 15.63	Depth tubing / pump intake set* approx. 17	feet below top of casing
Column of Water in Probe/Well (feet):	= 4.84	*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across	
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)		the water table, or in the middle of the screened interval for wells screened below the water table	
Volume of Water in 1 Probe/Well Casing (gal):	0.8		

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	4.87	0.863	2.55	6.48	73.8	5.13	15.78
1	10	4.60	0.898	2.99	6.50	80.2	4.69	15.80
1.5	15	4.46	0.902	3.17	6.53	81.5	2.09	15.80
2	20	4.26	0.919	3.28	6.65	81.9	1.16	15.80
2.5	25	4.33	0.925	3.38	6.67	80.7	2.36	15.80
3	30	4.14	0.927	3.47	6.67	80.2	0.95	15.80
3.5	35	4.10	0.930	3.50	6.68	79.5	0.82	15.80
4	40	4.07	0.929	3.48	6.67	80.2	1.07	15.81
4.25	FINAL							

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: Locked (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, PAH, EDB, GRO, DRO, Iron, Sulfate) + 1,4 DIOXANE

pH checked of samples: (Y) N Approximate volume added (mL): HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 4.25 Containerized and disposed as IDW? (Yes) / No If No, why not? _____

Sampler's Initials: CB Disposal method: (RWA IDW treatment facility) / Emerald Environmental / GAC treatment and surface discharge / other

Submersible Pump Equipment Blank

Rinsate #: 17FW002 05WQ

Sample ID: 06

Date: 5/17/17

Time: 1755

Analysis: VOC, DRO, 1,4 DIOXANE
Fe / SO4

Well that the pump was last used on: AP-5751

GROUNDWATER SAMPLE FORM — OU2 — Ft. Wainwright, Alaska

Project #: 9003-17
Site Location: FB 1168 / DRMO-1 / DRMO-4 / (5010)
Date: 5/31/17
Probe/Well #: AP-7346
Time: 1115
Sample ID: 17FWOU2 07 WG
Sampler: JK
Weather: Clear
Outside Temperature: 55°F
QA/QC Sample ID/Time/LOCID: 17FWOU208WG / 1130 / AP-8080 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
Total Depth in Probe/Well (feet btoc): 11.83
Depth to Water from TOC (feet): - 7.67
Column of Water in Probe/Well (feet): = 4.16
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): 0.67

Sampling Depth 10' Screen
Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 8.5 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)
0.4	5	3.23	0.409	1.83	6.98	2.3	27.67	7.74
0.8	10	3.02	0.409	1.53	6.98	-7.5	16.84	7.74
1.2	15	2.34	0.409	1.07	6.90	-0.8	9.27	7.74
1.6	20	2.10	0.407	1.07	6.88	1.0	7.22	7.74
2.0	25	2.09	0.407	1.09	6.91	-3.0	5.06	7.74
2.4	30	2.14	0.406	1.08	6.87	-0.4	4.24	7.74
			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: Locked (Y) / N Labeled with LOC ID (Y) / N Comments:
Sheen: Yes / (No) Odor: Yes / (No) Notes/Comments:

Laboratory Analyses (Circle): (VOC), SVOC, GRO, (DRO), Iron, Sulfate, TOC, Alkalinity, (1,4-Dioxane)
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 0 HNO3 = NA

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 | **OU2** | **Ft. Wainwright, Alaska**

Project #: 9003-17 | Site Location: FB 1168 / DRMO-1 / DRMO-4 (5010)

Date: 5/31/17 | Probe/Well #: WSW

Time: 1215 | Sample ID: 17FWOU2 09 WG

Sampler: JK

Weather: Clear | 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 / Bla~~dder / Other

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 11 | Water Level: NA

Free Product Observed in Probe/Well? Yes/No | If Yes, Depth to Product: NA

Column of Water in Probe/Well | Sampling Depth: Unknown

Total Depth in Probe/Well (feet btoc): | Well Screened **Across** / **Below** water table

Depth to Water from TOC (feet): - NA | Depth tubing / pump intake set* approx. NA feet below top of casing

Column of Water in Probe/Well (feet): = | *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): NA

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)
		Purge well for ~30 minutes						
		before collecting sample						

Did groundwater parameters stabilize? Yes / No If no, why not? NA

Did drawdown stabilize? Yes / No If no, why not? Unknown

Was flowrate between 0.03 and 0.15 GPM? Yes (No) If no, why not? unable to control pump flow rate

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:

Laboratory Analyses (Circle): (VOC) (SVOC) (GRO) (DRO) Iron, Sulfate, TOC, Alkalinity, (1,4-Dioxane)

pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 0 HNO3 = NA

Purge Water

Gallons generated: NA Containerized and disposed as IDW? Yes (No) If No, why not? Water purged down drain

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 | **OU2** | **Ft. Wainwright, Alaska**

Project #: 9003-17 | **Site Location:** FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 5/31/17 | **Probe/Well #:** AP-7348

Time: 1335 | **Sample ID:** 17FWOU2 10 WG

Sampler: JK

Weather: Clear | **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:** 5.02 13

Free Product Observed in Probe/Well? Yes/No | **If Yes, Depth to Product:** 2

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

Total Depth in Probe/Well (feet btoc): 15.35 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 9.69 | Depth tubing / pump intake set* approx. 10.6 feet below top of casing

Column of Water in Probe/Well (feet): = 5.66 | *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): 5.66 0.9

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	7.37	0.622	2.40	6.65	-91.2	14.96	9.73
0.8	10	6.11	0.666	0.99	6.63	-91.9	23.67	9.73
1.2	15	6.44	0.687	0.64	6.61	-93.1	21.55	9.73
1.6	20	6.56	0.700	0.51	6.61	-93.9	27.44	9.73
~~2.0~~ 2.0	25	6.53	0.707	0.39	6.59	-93.3	18.99	9.73

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: Locked Y / N | Labeled with LOC ID Y / N | **Comments:**

Sheen Yes / No Slight | **Odor:** Yes / No | **Notes/Comments:** SK

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane

pH checked of samples: Y / N | **Approximate volume added (mL):** HCl = ~~~ HNO = NA

Purge Water

Gallons generated: 3.0 | 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

Submersible Pump Equipment Blank

Rinsate #: 14

Sample ID: 17FW 0211WQ

Date: 5/31/17

Time: 1445

Analysis: VOC, 1,4-Dioxane, DRO

Well that the pump was last used on: AP-7346

Trip Blank Tracking Form

Trip Blank Number: 17FW0052 12WQ

Date: 5/31/17

Time: 0800

Analysis: VOC, GRO, 1,4-Dioxane

GROUNDWATER SAMPLE FORM — OU2 — Ft. Wainwright, Alaska

Project #: 9003-17 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/9/17 | Probe/Well #: AP-10015

Time: 0930 | Sample ID: 17FWOU2 13 WG

Sampler: SK

Weather: P.Cloudy | 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 #: 4 | Water Level: SOL 13

Free Product Observed in Probe/Well? Yes/No | If Yes, Depth to Product: 4

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

Total Depth in Probe/Well (feet btoc): 17.79 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 10.04 | Depth tubing / pump intake set* approx. 11 feet below top of casing

Column of Water in Probe/Well (feet): = 7.75 | *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): 10.5

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)
0.4	5	8.45	0.460	1.09	6.91	-97.8	14.35	10.08
0.8	10	8.23	0.445	0.66	6.90	-80.4	7.94	10.08
1.2	15	8.18	0.441	0.60	6.91	-78.4	2.05	10.08
1.6	20	8.25	0.438	0.63	6.91	-71.5	4.29	10.08
2.0	25	8.24 ✓	0.438 ✓	0.61 ✓	6.91	-69.9	3.45	10.09

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: Locked Y / N Labeled with LOC ID: Y / N Comments:

Sheen: Yes / No Odor: Yes / No Notes/Comments:

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane

pH checked of samples: Y / N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 2.5 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 OU2 Ft. Wainwright, Alaska

Project #: 9003-17 Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/9/17 Probe/Well #: AP-10018

Time: 1005 Sample ID: 17FWOU2 14 WG

Sampler: CB

Weather: PT CLOUDY 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 # 8 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): 16.99

Depth to Water from TOC (feet): - 9.48

Column of Water in Probe/Well (feet): = 7.51

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): ~~1.22~~ 0.48

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 10 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)
0.8	10	7.62	0.399	0.94	6.26	8.2	12.29	9.52
1.2	15	7.55	0.399	0.71	6.39	6.1	6.21	9.52
1.6	20	7.52	0.399	0.52	6.40	-1.5	7.55	9.52
2.0	25	7.51	0.399	0.53	6.40	-2	5.28	9.52
2.4	30	7.50	0.398	0.50	6.41	-3.3	5.26	9.52
3	FINAL							
CLR	BOTH							

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: Locked Y / N Labeled with LOC ID: Y / N Comments:

Sheen: Yes / No Odor: Yes / No Notes/Comments:

Laboratory Analyses (Circle): VOC, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane, DRO, SVOC, GRO

pH checked of samples: Y / N Approximate volume added (mL): HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 3 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

OU2 — Ft. Wainwright, Alaska

Project #: 9003-17
Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010
Date: 8/9/17
Probe/Well #: AQ-10016
Time: 1030
Sample ID: 17FWOU2 15 WG
Sampler: JK
Weather: Picloudy
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

Total Depth in Probe/Well (feet btoc): 16.53
Depth to Water from TOC (feet): - 9.95
Column of Water in Probe/Well (feet): = 6.58
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. 11 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)
0.4	5	9.24	0.413	1.32	6.72	-14.0	3.72	10.01
0.8	10	8.86	0.421	1.18	6.80	-47.3	4.32	10.01
1.2	15	8.84	0.423	1.15	6.81	-51.5	3.05	10.01
1.6	20	8.83	0.423	1.04	6.82	-53.4	3.56	10.01
2.0	25	8.86	0.422	0.98	6.82	-53.2	1.59	10.01

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:

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane
pH checked of samples: Y N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 2.5 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 | **OU2** | **Ft. Wainwright, Alaska**

Project #: 9003-17 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/9/17 | Probe/Well #: P05

Time: 1100 | Sample ID: 17FWOU2 16 WG

Sampler: CB

Weather: MOSTLY CLOUDY | Outside Temperature: 66°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 # 8 | 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 | Sampling Depth

Total Depth in Probe/Well (feet btoc): PROBE DIAMETER | Well Screened Across / ~~Below~~ water table

Depth to Water from TOC (feet): TOO SMALL | Depth tubing / pump intake set* approx. NA feet below top of casing

Column of Water in Probe/Well (feet): =FOR WLI | *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): NA

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)
0.25	5	9.28	0.492	3.76	6.32	-1.7	12.39	
0.5	10	9.15	0.488	2.49	6.32	-5.8	11.52	
0.75	15	9.17	0.489	2.40	6.28	-11.2	6.98	
1	20	9.13	0.488	2.32	6.28	-14.8	4.52	
1.25	25	9.12	0.488	2.22	6.28	-15.2	3.96	
1.5	FINAL							
BUBBLES IN TUBING AT HIGHER FLOW RATES								

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:

Laboratory Analyses (Circle): VOC, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane, DRO, SVOC, GRO

pH checked of samples: Y N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 1.5 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

OU2 — Ft. Wainwright, Alaska

Project #: 9003-17
Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010
Date: 8/9/17
Probe/Well #: AP-10017
Time: 1145
Sample ID: 17FWOU2 17 WG
Sampler: JK
Weather: P.Cloudy
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: SOL13
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): 16.76
Depth to Water from TOC (feet): - 8.89
Column of Water in Probe/Well (feet): = 7.87
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): 0.5

Sampling Depth

Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 10 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)
0.4	5	8.61	0.364	1.84	6.82	57.7	2.40	8.91
0.8	10	8.58	0.364	0.93	6.84	67.8	1.73	8.91
1.2	15	8.30	0.364	0.63	6.84	71.1	1.27	8.91
1.6	20	8.32	0.364	0.49	6.84	73.3	0.74	8.91
2.0	25	8.38	0.365	0.45	6.85	73.3	0.69	8.91

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: Locked Y / N Labeled with LOC ID: Y / N Comments:
Sheen: Yes / No Odor: Yes / No Notes/Comments:

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane
pH checked of samples? Y / N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 215 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 | **OU2** | **Ft. Wainwright, Alaska**

Project #: 9003-17 | Site Location: FB 1168 / DRMO-1 / DRMO-3 / 5010
Date: 8/9/17 | Probe/Well #: PROBE B
Time: 1145 | Sample ID: 17FWOU2 18 WG
Sampler: CB
Weather: P. CLOUDY | Outside Temperature: 68°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 # 8 | 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): 16.94
Depth to Water from TOC (feet): - 10.88
Column of Water in Probe/Well (feet): = 6.06
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): 0.38

Sampling Depth

Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 11.5 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)
0.8	10	8.84	0.743	1.01	6.19	59.9	36.29	11.02
1.2	15	8.87	0.722	0.73	6.20	54.8	30.0	11.04
1.6	20	8.88	0.719	0.65	6.20	52.4	24.8	7.28
2.0	25	8.90	0.719	0.62	6.20	50.5	23.7	9.15
2.4	30	8.94	0.719	0.60	6.20	51.9	21.7	8.98
2.75	FINAL							
Ur	Burst							

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: Locked / N Labeled with LOC ID? Y / N Comments:
Sheen: Yes / No Odor: Yes / No Notes/Comments:

Laboratory Analyses (Circle): VOC, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane, DRO, SVOC, GRO
pH checked of samples: Y N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 2.75 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: CB

GROUNDWATER SAMPLE FORM | **OU2** | **Ft. Wainwright, Alaska**

Project #: 9003-17 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010
Date: 8/9/17 | Probe/Well #: AP-89141R
Time: 1245 | Sample ID: 17FWOU2 19 WG
Sampler: JK
Weather: Peloudy | 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: SOI3
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): 18.15
Depth to Water from TOC (feet): - 10.80
Column of Water in Probe/Well (feet): = 7.35
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): 1.2

Sampling Depth

Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 11.8 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	9.15	0.345	1.23	6.73	-102.2	28.60	10.84
1.0	10	9.07	0.357	0.85	6.77	-107.8	12.52	10.84
1.5	15	8.93	0.370	0.70	6.83	-114.1	8.16	10.84
2.0	20	8.89	0.377	0.56	6.84	-117.4	5.31	10.84
2.5	25	8.83	0.379	0.47	6.87	-118.8	4.75	10.84
3.0	30	8.85	0.374	0.44	6.87	-119.6	4.23	10.84

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: mild

Laboratory Analyses (Circle): (VOC) SVOC, GRO, DRO (Iron) (Sulfate) (TOC) (Alkalinity) 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 | **OU2** | **Ft. Wainwright, Alaska**

Project #:	9003-17	**Site Location:**	FB 1168 / DRMO-1 / DRMO-4 / 5010
Date:	8/9/17	**Probe/Well #:**	AP 8916
Time:	1240	**Sample ID:**	17FWOU2 20 WG
Sampler:	CB		
Weather:	P. CLOUDY	**Outside Temperature:**	73°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 # 8 **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): 16.28

Depth to Water from TOC (feet): - 11.21

Column of Water in Probe/Well (feet): = 5.07

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): 0.82

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 13 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						OVER	
1	10	TOO	TURBID				532	
1.5	15						195	
2	20	6.59	0.529	0.52	5.72	-88.7	56.7	11.42
2.5	25	6.62	0.513	0.49	5.75	-93.9	29.0	11.45
3	30	6.68	0.510	0.45	5.77	-97.2	15.96	11.45
3.5	35	6.65	0.507	0.42	5.77	-100.1	12.26	11.45
4	40	6.63	0.507	0.41	5.71	-103.1	10.89	11.45
4.25	FINAL							

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: INITIAL

Well Condition: Locked Y / N Labeled with LOC ID: Y / N **Comments:**

Sheen: Yes / No **Odor:** Yes / No STRONG! **Notes/Comments:**

Laboratory Analyses (Circle): VOC, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane, DRO, SVOC, GRO

pH checked of samples: Y / N **Approximate volume added (mL):** HCl = 0 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 — OU2 — Ft. Wainwright, Alaska

Project #:	9003-17	**Site Location:**	FB 1168 / DRMO-1 / DRMO-4 / 5010
Date:	8/9/17	**Probe/Well #:**	AP-7559
Time:	1345	**Sample ID:**	17FWOU2 21 WG
Sampler:	JK		
Weather:	P.Cloudy	**Outside Temperature:**	73F
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:** SOLID

Free Product Observed in Probe/Well? Yes (No) — **If Yes, Depth to Product:** 2

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 20.00
Depth to Water from TOC (feet): - 10.60
Column of Water in Probe/Well (feet): = 9.40
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

Sampling Depth

Well Screened (Across) / **Below** water table
Depth tubing / pump intake set* approx. 11.6 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	11.00	0.426	1.49	6.87	53.1	24.03	10.64
1.0	10	10.18	0.428	1.02	6.89	59.8	13.60	10.64
1.5	15	9.90	0.427	0.95	6.91	60.7	10.41	10.64
2.0	20	9.93	0.425	0.91	6.91	61.5	8.48	10.64
2.5	25	9.88	0.425	0.90	6.92	61.8	7.57	10.64
3.0	30	9.86	0.425	0.87	6.92	61.9	6.88	10.64

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: Locked (Y) / N — Labeled with LOC ID (Y) / N — **Comments:**
Sheen: Yes / (No) — **Odor:** Yes / (No) — **Notes/Comments:**

Laboratory Analyses (Circle): (VOC), SVOC, GRO, DRO, Iron, Sulfate, (TOC), Alkalinity, 1,4-Dioxane
pH checked of samples: (Y) / N — **Approximate volume added (mL):** HCl = 0 HNO = 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 | **OU2** | **Ft. Wainwright, Alaska**

Project #: 9003-17 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/9/17 | Probe/Well #: AP-7560

Time: 1445 | Sample ID: 17FWOU2 22 WG

Sampler: SK

Weather: Sunny | Outside Temperature: 75°F

QA/QC Sample ID/Time/LOCID: 17FWOU223WG / 1300 / AP-7070 | 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: SOL13

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: 0

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 20.00

Depth to Water from TOC (feet): - 10.10

Column of Water in Probe/Well (feet): = 9.90

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): 1.5

Sampling Depth

Well Screened **Across** / **Below** water table

Depth tubing / pump intake set* approx. 11.10 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	8.92	0.291	1.25	6.46	-51.7	6.70	10.16
1.0	10	8.87	0.300	0.97	6.55	-59.9	4.50	10.16
1.5	15	8.85	0.301	0.88	6.57	-61.4	3.81	10.16
2.0	20	8.84	0.303	0.78	6.55	-62.4	2.53	10.16
2.5	25	8.83	0.305	0.69	6.61	-63.1	1.76	10.16
3.0	30	8.82	0.305	0.63	6.62	-63.6	1.00	10.16
			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: Locked (Y) N Labeled with LOC ID: (Y) N Comments:

Sheen: Yes (No) Odor: (Yes) / No Notes/Comments:

Laboratory Analyses (Circle): (VOC, SVOC, GRO, DRO, Iron, Sulfate, TOC, Alkalinity, 1,4-Dioxane)

pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 4.5 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 #: Rinsate 22

Sample ID: 17FW0822WQ

Date: 8/9/17

Time: 1630

Analysis: DRO, VOC, 1,4-Dioxane, Fe, SO4, Alk, TOC

Well that the pump was last used on: AP-7560

8/7/17 P.Cloudy 65°F

1100 - Prepare gear for DRMO yard sampling
↳ calibrate YSI

1220 ~~Arrive at~~ sample later this week.
↳ move to sample OUT since the road To DRMO is Closed.

End project for today

8/9/17 Cloudy 54°F

0600 - Prepare to GW sample @ DRMO-1

0715 - Drive to site.
↳ road closed on base side of DRMO yard.
↳ Drive to 5010 to ask for access to site through their gate.

0820 - Set up to sample the following wells:
AP-10015
AP-10016
AP-10017
AP-8914R
AP-7559
AP-7560/MS/MSD/Dup.

1400 - Leave site for separate task.

1530 - Return to shop and store samples
End Day @ 1715

INCH

1

2

3

4

5

6

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OU2 Ft. Wainwright
Contract No.
W911KB-16-D-0005

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
→
→

JK = JOSH KLYNSTRA

GWS = GROUND WATER SAMPLE

Name _____

_____

Address _____

_____

Phone _____

Project _____

_____

_____

_____

OU2 FWW

5/17/17

0700 - GWS PREP. NOTE SAMPLING SOME OU2/OU3 WELLS TO GET OUT OF WAY OF ROAD CONSTRUCTION HAPPENING AT TRAINER GATE ENTRANCE ON 5/18/17

1042 - PIC OF GWS SETUP ON AP-10037MW

1050 - GWS AP-10037MW + DUPLICATE + MSMSD-17FWOU201WG/17FWOU2-02WG

1120- MOBE TO TANK FARM (NOW OPEN) TO FINISH OU3 WELLS.

1445. ARRIVE AT AP-6809
1540 - GWS AP-6809-17FWOU303WG

MOBE TO AP-5757.

1654 - PIC OF GWS SET UP ON AP-5757

1705 - GWS AP-5757 17FWOU204WG

1720- LEAVE SITE

~1740- STOP. CLEAN UP COLLECT RINSATE
1755. OFF AP-5757
1815 - END OF DAY

Chi Bolse

6/14/17

0920 - 0950 - SITE VISIT AT 1168 W/ RAMON SWANK. FOUND LEACH WELL ~19' FROM AP-5751 SHOWN CORRECT ON SITE MAP DRAWING

DRMO 1, 4

8/9/17

0800 - SHOP. GWS PREP

0910 - ARRIVE AT DRMO YARD

0913 - PIC OF JK SAMPLING

1005 - GWS AP-10018 17FWOU214WG. MOVE TO POS. MOVE TO PROBE B

1137 - PIC OF SETUP

1145 - GWS PROBE B 17FWOU218WG, MOVE TO AP-8916

1240. GWS AP-8916 - 17FWOU220WG. CLEAN UP - LEAVE SITE AT 1320.

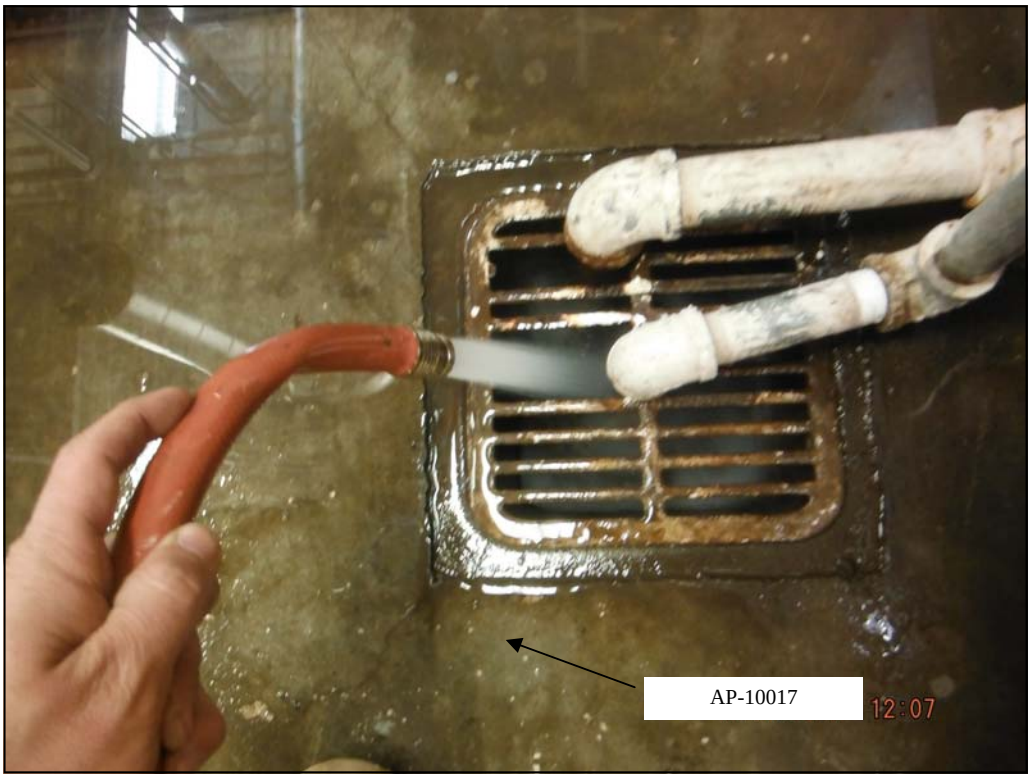
APPENDIX D

PHOTO LOG

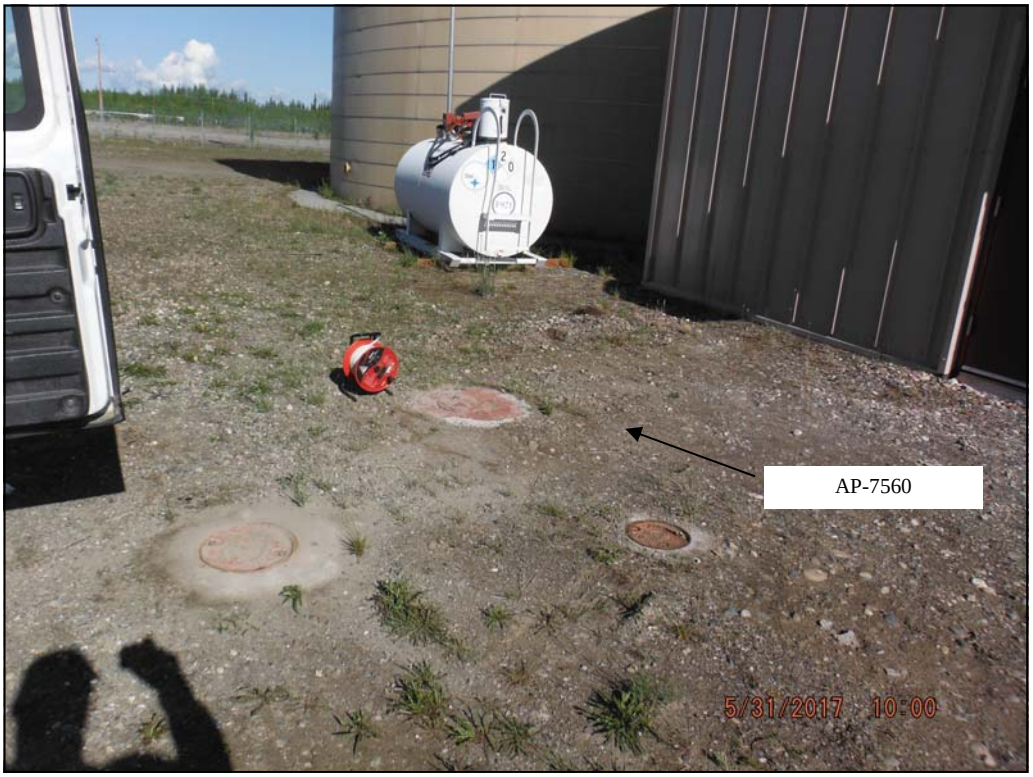
OU2 Building 1168—Groundwater sampling in AP-10037MW
(view E)

OU2 Building 1168—Groundwater sampling in AP-5751
(view W)

OU2 Water Supply Well—Preparation for sampling at the Water Supply Well (view N/A)



OU2 Water Supply Well—Running water prior to sampling at the Water Supply Well (view N/A)



OU2 Building 5010 —Monitoring Well AP-7346
(view W)

OU2 Building 5010 —Monitoring Well AP-7348
(view S)

OU2 DRMO1 (3-Party)—Groundwater sampling at AP-10018 (view N/A)

OU2 DRMO1 (3-Party)—Groundwater sampling at AP-8914R (view N/A)

APPENDIX E

LTMO ANALYSIS RESULTS

MAROS Summary 1—DRMO1 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: DRMO1 3-Party 2017
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/1/2010 **to** 8/9/2017
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 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
TETRACHLOROETHYLENE(PCE)								
AP-10015	T	11	8	1.6E-03	8.1E-04	No	I	I
AP-10016	S	11	10	6.6E-03	5.2E-03	No	NT	NT
AP-10017	S	11	10	1.1E-03	9.7E-04	No	I	I
AP-10018	S	11	10	6.0E-03	2.4E-03	No	D	PD
AP-7559	T	11	9	3.1E-03	3.2E-03	No	NT	NT
AP-7560	T	8	7	2.1E-03	2.0E-03	No	NT	NT
AP-8914	S	11	8	3.1E-03	8.9E-04	No	NT	NT
TRICHLOROETHYLENE (TCE)								
AP-10015	T	11	11	2.0E-03	1.8E-03	No	S	S
AP-10016	S	11	10	1.2E-03	1.3E-03	No	PI	I
AP-10017	S	11	6	3.9E-04	3.3E-04	No	I	I
AP-10018	S	11	10	3.4E-03	3.1E-03	No	D	D
AP-7559	T	11	9	5.4E-04	5.1E-04	No	NT	NT
AP-7560	T	8	6	1.5E-03	1.1E-03	No	NT	NT
AP-8914	S	11	9	2.6E-03	2.9E-03	No	NT	NT

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.

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MAROS Summary 2—DRMO1 Spatial Moment Analysis Summary

MAROS Spatial Moment Analysis Summary

Project: DRMO1 3-Party 2017
Location: Fort Wainwright

User Name: FES
State: Alaska

	0th Moment	1st Moment (Center of Mass)			2nd Moment (Spread)		
Effective Date	Estimated Mass (Kg)	Xc (ft)	Yc (ft)	Source Distance (ft)	Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
TETRACHLOROETHYLENE(PCE)							
10/11/2010	1.2E-02	1,394,837	3,954,941	102	3,259	2,176	7
2/23/2011	4.4E-03	1,394,879	3,954,916	55	387	813	6
6/1/2011	3.1E-03	1,394,882	3,954,912	50	454	906	6
9/20/2011	1.5E-02	1,394,810	3,954,958	133	2,504	1,765	7
5/30/2012	1.5E-03	1,394,879	3,954,913	53	346	913	6
8/31/2012	1.0E-02	1,394,797	3,954,965	148	1,569	1,209	7
8/27/2013	2.9E-03	1,394,807	3,954,963	138	2,461	1,670	7
10/9/2014	2.0E-02	1,394,805	3,954,962	140	2,070	1,365	7
8/24/2015	1.3E-02	1,394,799	3,954,968	148	1,884	1,288	7
9/14/2016	2.1E-02	1,394,811	3,954,958	132	2,660	1,900	7
8/9/2017	1.0E-02	1,394,801	3,954,967	146	2,008	1,378	7
TRICHLOROETHYLENE (TCE)							
10/11/2010	8.9E-03	1,394,819	3,954,953	123	2,770	1,819	7
2/23/2011	1.7E-03	1,394,878	3,954,918	58	358	744	6
6/1/2011	2.6E-03	1,394,879	3,954,915	54	341	760	6
9/20/2011	8.9E-03	1,394,816	3,954,956	127	2,694	1,740	7
5/30/2012	2.3E-03	1,394,882	3,954,910	49	372	812	6
8/31/2012	1.1E-02	1,394,819	3,954,953	123	2,752	1,814	7
8/27/2013	4.5E-03	1,394,805	3,954,965	142	2,259	1,510	7
10/9/2014	8.7E-03	1,394,823	3,954,949	118	2,809	1,861	7
8/24/2015	7.7E-03	1,394,803	3,954,963	142	2,171	1,557	7
9/14/2016	9.7E-03	1,394,811	3,954,956	131	2,584	1,821	7
8/9/2017	4.9E-03	1,394,812	3,954,956	131	2,635	1,860	7

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MAROS Summary 2 cont'd—DRMO1 Spatial Moment Analysis Summary

Project: DRMO1 3-Party 2017 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	TETRACHLOROETHYLENE(PCE)	0.66	13	82.1%	NT
	TRICHLOROETHYLENE (TCE)	0.51	11	77.7%	NT
1st Moment: Distance to Source					
	TETRACHLOROETHYLENE(PCE)	0.36	25	97.0%	I
	TRICHLOROETHYLENE (TCE)	0.33	21	94.0%	PI
2nd Moment: Sigma XX					
	TETRACHLOROETHYLENE(PCE)	0.56	7	67.6%	NT
	TRICHLOROETHYLENE (TCE)	0.54	9	72.9%	NT
2nd Moment: Sigma YY					
	TETRACHLOROETHYLENE(PCE)	0.31	13	82.1%	NT
	TRICHLOROETHYLENE (TCE)	0.32	25	97.0%	I

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

Porosity: 0.25 **Saturated Thickness:** Uniform: 50 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

Note: The Sigma XX and Sigma YY components are estimated using the given field coordinate system and then rotated to align with the estimated groundwater flow direction. Moments are not calculated for sample events with less than 6 wells.

MAROS Summary 3 —DRMO1 First Moment Analysis Plot for TCE

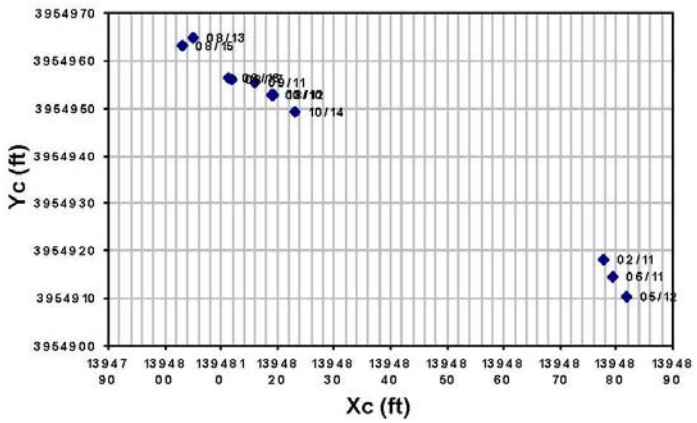
MAROS First Moment Analysis

Project: DRMO1 3-Party 2017 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: TRICHLOROETHYLENE (TCE)

Change in Location of Center of Mass Over Time



Groundwater Flow Direction:

Source Coordinate:

X: 1,394,911

Y: 3,954,871

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
10/11/2010	TRICHLOROETHYLENE (TCE	1,394,819	3,954,953	123	7
2/23/2011	TRICHLOROETHYLENE (TCE	1,394,878	3,954,918	58	6
6/1/2011	TRICHLOROETHYLENE (TCE	1,394,879	3,954,915	54	6
9/20/2011	TRICHLOROETHYLENE (TCE	1,394,816	3,954,956	127	7
5/30/2012	TRICHLOROETHYLENE (TCE	1,394,882	3,954,910	49	6
8/31/2012	TRICHLOROETHYLENE (TCE	1,394,819	3,954,953	123	7
8/27/2013	TRICHLOROETHYLENE (TCE	1,394,805	3,954,965	142	7
10/9/2014	TRICHLOROETHYLENE (TCE	1,394,823	3,954,949	118	7
8/24/2015	TRICHLOROETHYLENE (TCE	1,394,803	3,954,963	142	7
9/14/2016	TRICHLOROETHYLENE (TCE	1,394,811	3,954,956	131	7
8/9/2017	TRICHLOROETHYLENE (TCE	1,394,812	3,954,956	131	7

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

MAROS Version 2.2, 2006, AFCEE 11/16/2017 Page 1 of 1

MAROS Summary 4 —DRMO1 First Moment Analysis Plot for PCE

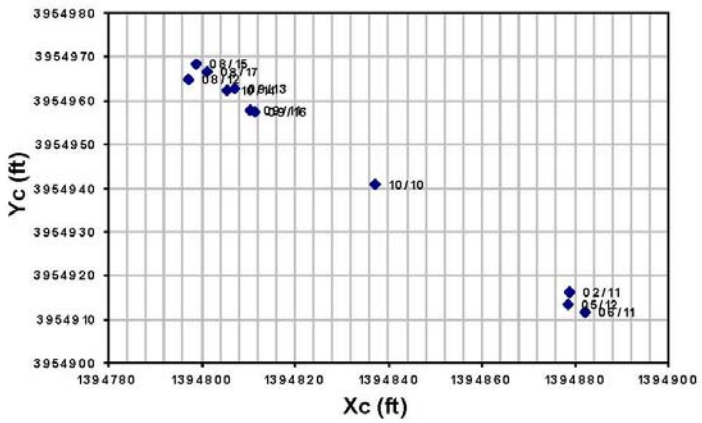
MAROS First Moment Analysis

Project: DRMO1 3-Party 2017 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: TETRACHLOROETHYLENE(PCE)

Change in Location of Center of Mass Over Time



Groundwater Flow Direction:

Source Coordinate:

X: 1,394,911

Y: 3,954,871

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
10/11/2010	TETRACHLOROETHYLENE(P	1,394,837	3,954,941	102	7
2/23/2011	TETRACHLOROETHYLENE(P	1,394,879	3,954,916	55	6
6/1/2011	TETRACHLOROETHYLENE(P	1,394,882	3,954,912	50	6
9/20/2011	TETRACHLOROETHYLENE(P	1,394,810	3,954,958	133	7
5/30/2012	TETRACHLOROETHYLENE(P	1,394,879	3,954,913	53	6
8/31/2012	TETRACHLOROETHYLENE(P	1,394,797	3,954,965	148	7
8/27/2013	TETRACHLOROETHYLENE(P	1,394,807	3,954,963	138	7
10/9/2014	TETRACHLOROETHYLENE(P	1,394,805	3,954,962	140	7
8/24/2015	TETRACHLOROETHYLENE(P	1,394,799	3,954,968	148	7
9/14/2016	TETRACHLOROETHYLENE(P	1,394,811	3,954,958	132	7
8/9/2017	TETRACHLOROETHYLENE(P	1,394,801	3,954,967	146	7

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

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MAROS Summary 5 —DRMO1 Sampling Location Optimization Results

MAROS Sampling Location Optimization Results

Project: DRMO1 3-Party 2017 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 36 10/11/2010 **to** Sample Event 46 8/9/2017

Parameters used:

Constituent	Inside SF	Hull SF	Area Ratio	Conc. Ratio
TETRACHLOROETHYLENE(PCE	0.2	0.1	0.9	0.8
TRICHLOROETHYLENE (TCE)	0.2	0.1	0.9	0.8

Well	X (feet)	Y (feet)	Removable?	Average Slope Factor*	Minimum Slope Factor*	Maximum Slope Factor*	Eliminated?
TETRACHLOROETHYLENE(PCE)							
AP-10015	1394860.00	3954905.50	☑	0.387	0.000	0.752	☐
AP-10016	1394881.00	3954866.00	☑	0.333	0.000	0.541	☐
AP-10017	1394939.13	3954849.50	☑	0.337	0.000	0.595	☐
AP-10018	1394914.75	3954897.25	☑	0.226	0.000	0.452	☐
AP-7559	1394820.13	3955011.25	☑	0.367	0.000	0.737	☐
AP-7560	1394632.88	3955071.25	☑	0.188	0.000	0.492	☐
AP-8914	1394907.00	3954874.75	☑	0.291	0.000	0.778	☐
TRICHLOROETHYLENE (TCE)							
AP-10015	1394860.00	3954905.50	☑	0.161	0.012	0.465	☑
AP-10016	1394881.00	3954866.00	☑	0.151	0.017	0.432	☐
AP-10017	1394939.13	3954849.50	☑	0.539	0.000	0.735	☐
AP-10018	1394914.75	3954897.25	☑	0.156	0.002	0.630	☐
AP-7559	1394820.13	3955011.25	☑	0.358	0.108	0.474	☐
AP-7560	1394632.88	3955071.25	☑	0.217	0.037	0.526	☐
AP-8914	1394907.00	3954874.75	☑	0.210	0.103	0.409	☐

Note: The Slope Factor indicates the relative importance of a well in the monitoring network at a given sampling event; the larger the SF value of a well, the more important the well is and vice versa; the Average Slope Factor measures the overall well importance in the selected time period; the state coordinates system (i.e., X and Y refer to Easting and Northing respectively) or local coordinates systems may be used; wells that are NOT selected for analysis are not shown above.
* When the report is generated after running the Excel module, SF values will NOT be shown above.

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MAROS Summary 6 —DRMO1 Sampling Location Optimization, All COCs

MAROS Sampling Location Optimization

Results by Considering All COCs

Project: DRMO1 3-Party 2017 **User Name:** FES

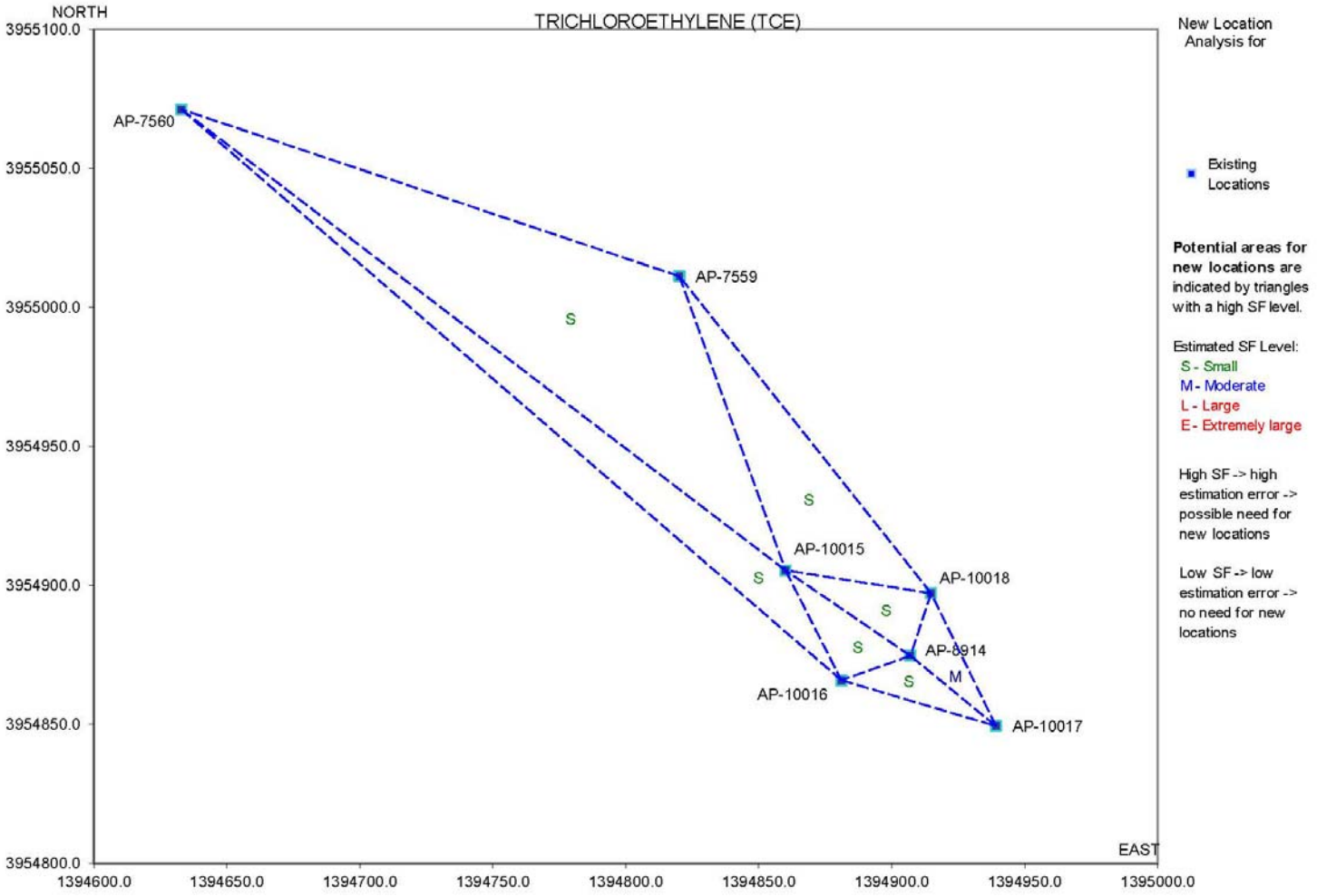
Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 36 10/11/2010 **to** Sample Event 46 8/9/2017

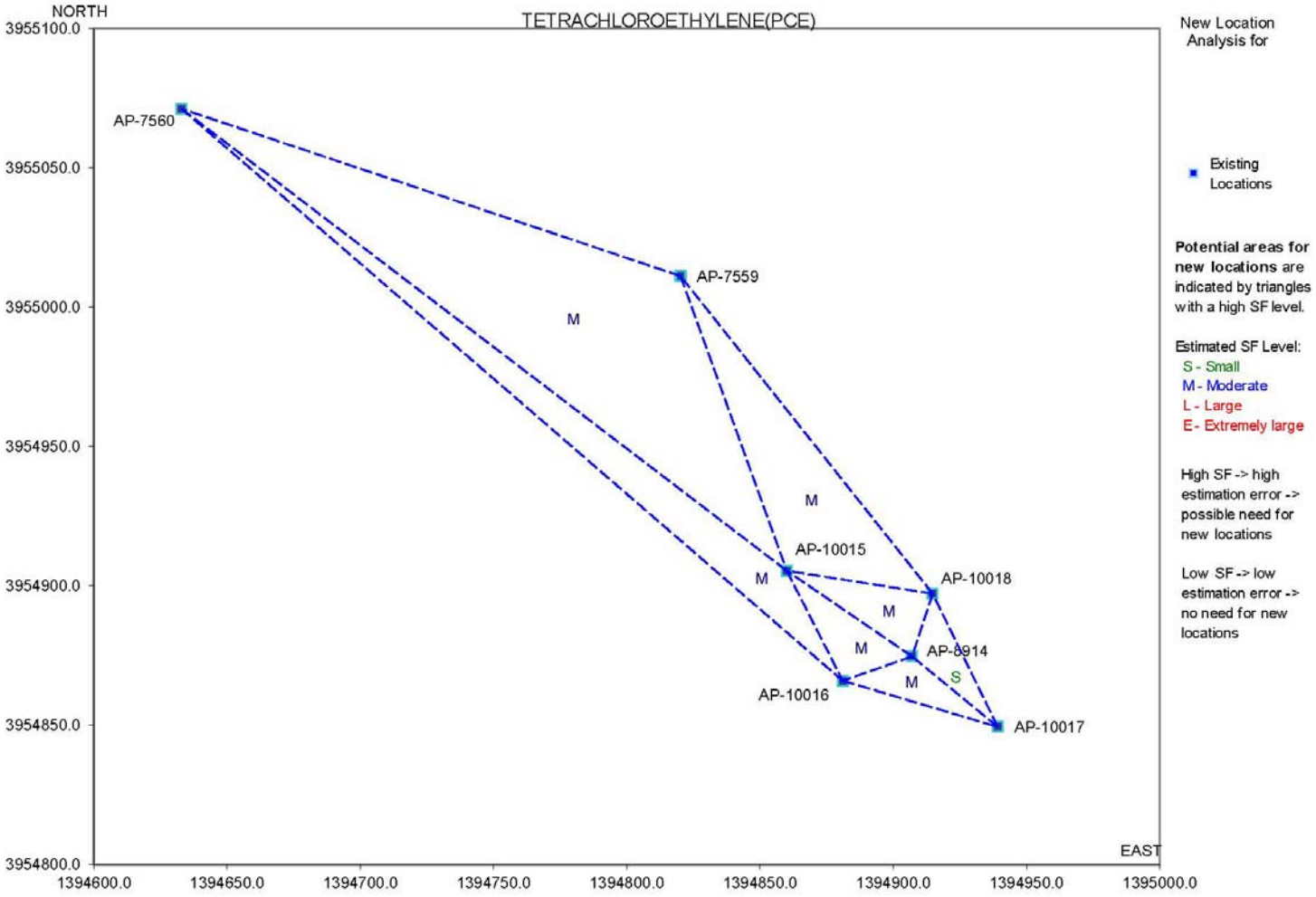
Well	X (feet)	Y (feet)	Number of COCs	COC-Averaged Slope Factor*	Abandoned?
AP-10015	1394860.00	3954905.50	2	0.274	☐
AP-10016	1394881.00	3954866.00	2	0.242	☐
AP-10017	1394939.13	3954849.50	2	0.438	☐
AP-10018	1394914.75	3954897.25	2	0.191	☐
AP-7559	1394820.13	3955011.25	2	0.363	☐
AP-7560	1394632.88	3955071.25	2	0.203	☐
AP-8914	1394907.00	3954874.75	2	0.250	☐

Note: the COC-Averaged Slope Factor is the value calculated by averaging those "Average Slope Factor" obtained earlier across COCs; to be conservative, a location is "abandoned" only when it is eliminated from all COCs; "abandoned" doesn't necessarily mean the abandon of well, it can mean that NO samples need to be collected for any COCs.
* When the report is generated after running the Excel module, SF values will NOT be shown above.

MAROS Summary 7 —DRMO1 Well Redundancy Analysis, TCE



MAROS Summary 8 —DRMO1 Well Redundancy Analysis, PCE



MAROS Summary 9 —DRMO1 Sampling Frequency Optimization

MAROS Sampling Frequency Optimization Results

Project: DRMO1 3-Party 2017 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 11

"Recent Period" defined by events: **From** Sample Event 36 (10/11/2010) **To** Sample Event 46 (8/9/2017)

"Rate of Change" parameters used:

Constituent	Cleanup Goal	Low Rate	Medium Rate	High Rate
TETRACHLOROETHYLENE(PCE	0.005	0.0025	0.005	0.01
TRICHLOROETHYLENE (TCE)	0.005	0.0025	0.005	0.01

Units: Cleanup Goal is in mg/L; all rate parameters are in mg/L/year.

Well	Recommended Sampling Frequency	Frequency Based on Recent Data	Frequency Based on Overall Data
TETRACHLOROETHYLENE(PCE)			
AP-10015	Annual	Annual	Annual
AP-10016	Annual	Annual	Annual
AP-10017	Annual	Annual	Annual
AP-10018	Annual	Annual	Annual
AP-7559	Annual	Annual	Annual
AP-7560	Annual	Annual	Annual
AP-8914	Annual	Annual	Annual
TRICHLOROETHYLENE (TCE)			
AP-10015	Annual	Annual	Annual
AP-10016	Biennial	Annual	Annual
AP-10017	Annual	Annual	Annual
AP-10018	Annual	Annual	Annual
AP-7559	Biennial	Annual	Annual
AP-7560	Annual	Annual	Annual
AP-8914	Annual	Annual	Annual

Note: Sampling frequency is determined considering both recent and overall concentration trends. Sampling Frequency is the final recommendation; Frequency Based on Recent Data is the frequency determined using recent (short) period of monitoring data; Frequency Based on Overall Data is the frequency determined using overall (long) period of monitoring data. If the "recent period" is defined using a different series of sampling events, the results could be different.

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MAROS Summary 10 —DRMO4 Statistical Trend Analysis Summary—PO5

MAROS Statistical Trend Analysis Summary

Project: DRMO4 3-Party 2017
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 9/1/2009 **to** 8/9/2017
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Detection Limit

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
TETRACHLOROETHYLENE(PCE)								
PO-5	S	15	14	5.5E-03	5.3E-03	No	NT	NT
Probe B	T	12	2	2.6E-04	2.5E-04	No	NT	NT
TRICHLOROETHYLENE (TCE)								
PO-5	S	15	14	2.8E-03	3.3E-03	No	PI	NT
Probe B	T	12	4	3.0E-04	2.5E-04	No	S	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.

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MAROS Summary 11 —DRMO4 Statistical Trend Analysis Summary—AP-8916

MAROS Statistical Trend Analysis Summary

Project: DRMO4 3-Party 2017
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 10/1/2011 **to** 8/9/2017
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Detection Limit

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
TETRACHLOROETHYLENE(PCE)								
AP-8916	S	8	7	3.7E-03	3.7E-03	No	S	PD
Probe B	T	8	0	2.5E-04	2.5E-04	Yes	ND	ND
TRICHLOROETHYLENE (TCE)								
AP-8916	S	8	3	7.3E-04	2.5E-04	No	NT	NT
Probe B	T	8	1	2.8E-04	2.5E-04	No	S	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.

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MAROS Summary 12 —Building 5010 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: OU2 Building 5010
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 12/1/1997 **to** 5/31/2017
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: 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
DIESEL COMPONENTS								
AP-7346	T	16	11	7.3E-02	8.5E-02	No	D	D
AP-7348	S	21	21	1.8E+01	1.5E+01	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.

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1168 Summary 1—Data Input Table for AP-5751—Benzene

Groundwater Statistics Tool
Data input worksheet

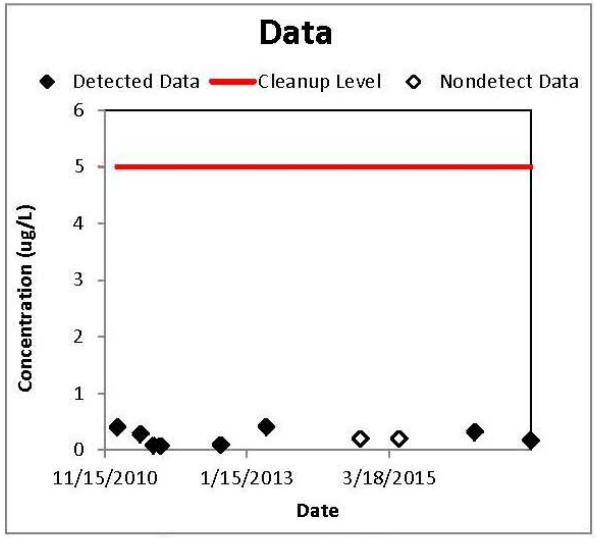
Site Name	1168
Operating Unit (OU)	OU2
Type of Evaluation	Attainment
Date of Evaluation	11/16/2017
Person performing analysis	AS

Chemical of Concern	Benzene
Well Name/Number	AP-5751
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	5
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	10
Number of detected results:	8
Number of nondetect results:	2
Detection frequency:	0.8

Date (Date)	Benzene Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
1/24/2011	0.4		Yes
6/1/11	0.28		Yes
8/12/2011	0.08		Yes
9/21/11	0.07		Yes
8/22/2012	0.09		Yes
5/2/2013	0.41		Yes
10/9/2014	0.2	U	No
5/12/2015	0.2	U	No
7/9/2016	0.32		Yes
5/17/2017	0.17		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

1168 Summary 2—95% UCL Results for AP-5751—Benzene

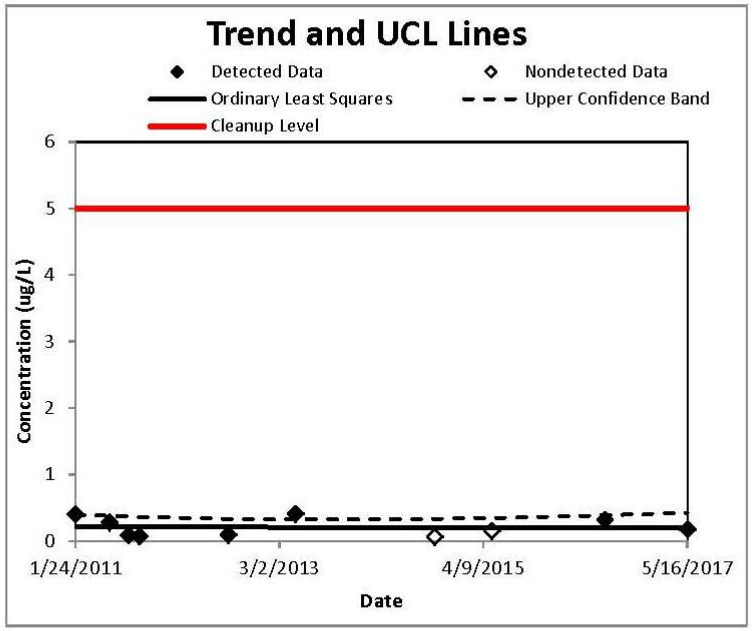
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	1168
Operating Unit (OU)	OU2
Type of Evaluation	Attainment
Date of Evaluation	11/16/2017
Person performing analysis	AS

Chemical of Concern	Benzene
Well Name/Number	AP-5751
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	10
Number of detected results	8
Number of non-detected results	2
Detection frequency	80%
Number at or below cleanup level	10
Are any potential outliers present?	No
Mean of concentration	0.203
Standard deviation of concentration	0.131



95% Upper Confidence Limit (UCL)	0.398
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.422
Trend calculation method	Ordinary Least Squares
Cleanup level	5
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Benzene Concentration (ug/L)	Data Qualifier	Imputed value*
40567	0.4		0.4
40695	0.28		0.28
40767	0.08		0.08
40807	0.07		0.07
41143	0.09		0.09
41396	0.41		0.41
41921	0.2	U	0.06
42136	0.2	U	0.15
42560	0.32		0.32
42872	0.17		0.17

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	57196.81641

1168 Summary 3—Data Input Table for AP-10037MW—Benzene

Groundwater Statistics Tool
Data input worksheet

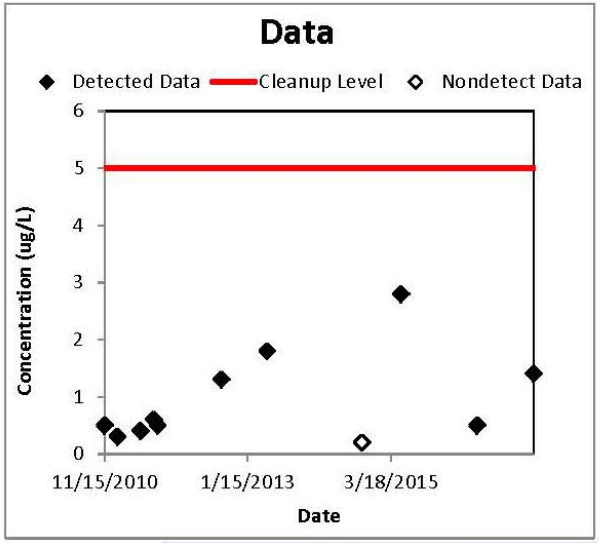
Site Name	1168
Operating Unit (OU)	OU2
Type of Evaluation	Attainment
Date of Evaluation	11/16/2017
Person performing analysis	AS

Chemical of Concern	Benzene
Well Name/Number	AP-10037MW
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	5
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	11
Number of detected results:	10
Number of nondetect results:	1
Detection frequency:	0.909090909

Date (Date)	Benzene Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
11/15/10	0.50		Yes
1/24/2011	0.3		Yes
6/1/11	0.4		Yes
8/12/2011	0.6		Yes
9/2/2011	0.5		Yes
8/22/2012	1.3		Yes
5/2/2013	1.8		Yes
10/9/2014	0.2	U	No
5/12/2015	2.8		Yes
7/9/2016	0.5		Yes
5/17/2017	1.4		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

1168 Summary 4—95% UCL Results for AP-10037MW—Benzene

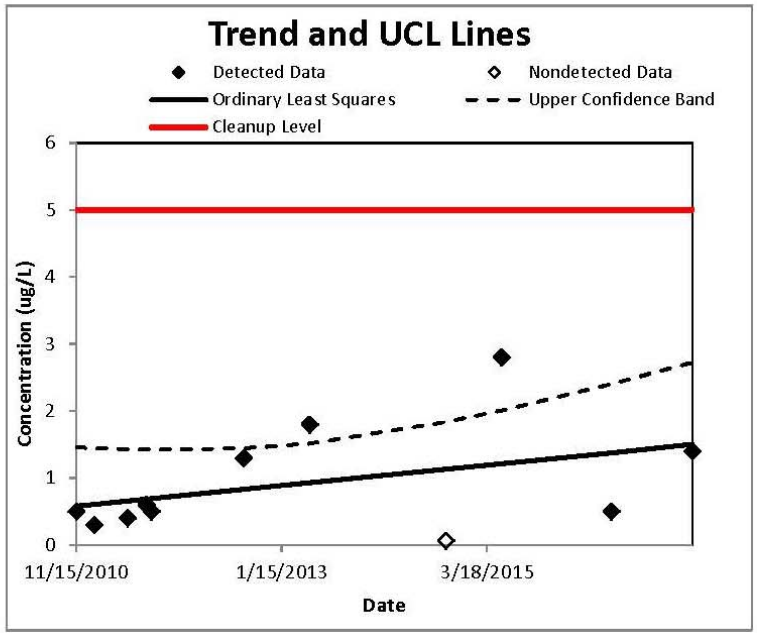
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	1168
Operating Unit (OU)	OU2
Type of Evaluation	Attainment
Date of Evaluation	11/16/2017
Person performing analysis	AS

Chemical of Concern	Benzene
Well Name/Number	AP-10037MW
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	11
Number of detected results	10
Number of non-detected results	1
Detection frequency	91%
Number at or below cleanup level	11
Are any potential outliers present?	No
Mean of concentration	0.936
Standard deviation of concentration	0.768



95% Upper Confidence Limit (UCL)	1.99
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	2.72
Trend calculation method	Ordinary Least Squares
Cleanup level	5
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Benzene Concentration (ug/L)	Data Qualifier	Imputed value*
40497	0.5		0.5
40567	0.3		0.3
40695	0.4		0.4
40767	0.6		0.6
40788	0.5		0.5
41143	1.3		1.3
41396	1.8		1.8
41921	0.2	U	0.06
42136	2.8		2.8
42560	0.5		0.5
42872	1.4		1.4

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	57196.81641

1168 Summary 5—Data Input Table for AP-6809—Benzene

Groundwater Statistics Tool
Data input worksheet

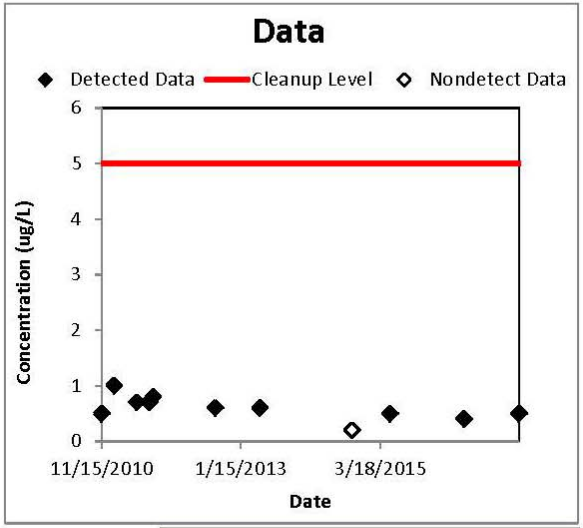
Site Name	1168
Operating Unit (OU)	OU2
Type of Evaluation	Attainment
Date of Evaluation	11/16/2017
Person performing analysis	AS

Chemical of Concern	Benzene
Well Name/Number	AP-6809
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	5
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	11
Number of detected results:	10
Number of nondetect results:	1
Detection frequency:	0.909090909

Date (Date)	Benzene Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
11/15/10	0.50		Yes
1/24/2011	1.0		Yes
6/1/11	0.7		Yes
8/12/2011	0.7		Yes
9/2/2011	0.8		Yes
8/22/2012	0.6		Yes
5/2/2013	0.6		Yes
10/9/2014	0.2	U	No
5/12/2015	0.5		Yes
7/9/2016	0.4		Yes
5/17/2017	0.5		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

1168 Summary 6—Trend Results for AP-6809—Benzene

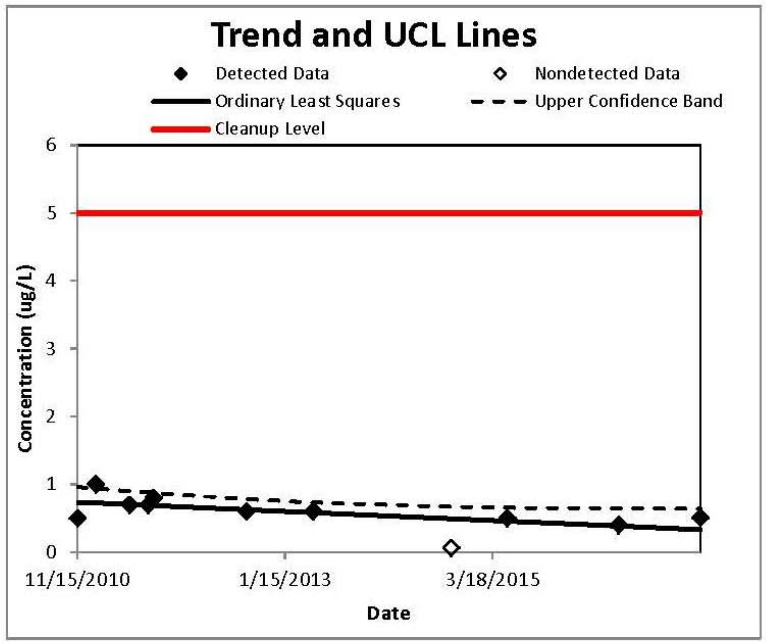
Groundwater Statistics Tool

UCL calculations and summary statistics for data sets with nondetects

Site Name	1168
Operating Unit (OU)	OU2
Type of Evaluation	Attainment
Date of Evaluation	11/16/2017
Person performing analysis	AS

Chemical of Concern	Benzene
Well Name/Number	AP-6809
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	11
Number of detected results	10
Number of non-detected results	1
Detection frequency	91%
Number at or below cleanup level	11
Are any potential outliers present?	No
Mean of concentration	0.591
Standard deviation of concentration	0.202



95% Upper Confidence Limit (UCL)	0.869
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.634
Trend calculation method	Ordinary Least Squares
Cleanup level	5
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	Benzene Concentration (ug/L)	Data Qualifier	Imputed value*
40497	0.5		0.5
40567	1		1
40695	0.7		0.7
40767	0.7		0.7
40788	0.8		0.8
41143	0.6		0.6
41396	0.6		0.6
41921	0.2	U	0.06
42136	0.5		0.5
42560	0.4		0.4
42872	0.5		0.5

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	57196.81641

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation
DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program
610 University Avenue
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File: 108.38.069

March 8, 2018

Dept. of the Army
Directorate of Public Works
ATTN: IMFW-PWE (Adams)
1046 Marks Road
Fort Wainwright, Alaska 99703

Re: DEC comments for the 2017 Monitoring Report, Operable Unit 2, Fort Wainwright, Alaska, dated January 2018.

Dear Mr. Adams:

The Alaska Department of Environmental Conservation (DEC) has completed a review of the above-referenced document. The document describes groundwater monitoring activities at the Defense Reutilization Marketing Office (DRMO) Yard 3-Party and 2-Party sites and at the Former Building 1168 site in Operable Unit 2 (OU2) at Fort Wainwright, Alaska. During the fourth Five-Year Review in 2016 it was recommended that analyte 1,4-dioxane be added to the 2017 sampling. Since 1,4-dioxane was not detected, the 2017 report recommended that no additional samples be collected. Based on the overall results from all three sites, annual groundwater monitoring is recommended to continue.

DEC concurs with the recommendations in this report. Comments are enclosed (See Enclosure). If there are any questions please don't hesitate to contact me at (907) 451-2182 or by email at erica.blake@alaska.gov.

Sincerely,

Erica Blake
Environmental Program Specialist

Enclosure: DEC Review Comments

cc via e-mail: Sandra Halstead, EPA
Kristina Smith, FWA ENVR
Bob Hazlett, USACE
Bob Brock, USACE
Robert Glascott, USACE
Guy Warren, USACE
Cheryl Churchman, AEC
Dennis Shepard, DEC
Eric Breitenberger, DEC

REVIEW COMMENTS | **PROJECT: Fort Wainwright, Alaska** | **DOCUMENT: 2017 Monitoring Report Operable Unit 2** | **Location: Fort Wainwright , Alaska**

ALASKA DEPT. OF ENVIRONMENAL CONSERVATION	**DATE: 3/08/2018** **REVIEWER: Erica Blake** **PHONE: 907-451-2182**	**Action taken on comment by: Aaron Swank - FES**

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 – Figures and Tables	DEC notes that 1,2,4-trimethlybenzene was added to the tables and figures. Are there historical results for 1,2,4-trimethylbenzene that can be added to the tables and figures to complete a trend analysis?	Noted	There were a limited number of exceedances of the current ADEC cleanup levels for 1,2,4-TMB based on the 2017 data. This was the first time the comparison was completed, and the results showed the TMB detections were not the primary driver for decision making at the sites. Trend evaluation may be completed in the future based on data from future sampling events.	A
2.	Section 3.2.1, 2nd Paragraph, 1st Sentence, pg 3-2	Statement: "The area where greatest reducing conditions were observed at the time of the injection was in the vicinity of AP-8914R and AP-10018." Please clarify in the report text, were the reducing conditions observed at the first injection, second injection or with both injections?	A	AP-8914R and AP-10018 were within the radius of both injections, and stimulation of reducing conditions was observed following each injection. The sentence was revised as follows *"The area where the greatest reducing conditions were observed following each injection was in the vicinity of AP-8914R and AP-10018."*	A

ALASKA DEPT. OF ENVIRONMENAL CONSERVATION	**DATE: 3/08/2018** **REVIEWER: Erica Blake** **PHONE: 907-451-2182**	**Action taken on comment by: Aaron Swank - FES**

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)
3.	Section 3.3.3, 4th Paragraph, pg 3-9	Statement: "The sampling frequency analysis within MAROS recommended annual sampling for most wells. Biennial sampling was recommended for some wells that have exhibited stable concentrations below the RAG." Please clarify in the report text what wells will be sampled annually, and what wells will be sampled biannually.	A	Although the MAROS software recommended less frequent sampling (biennial) for several wells, the overall recommendation for the site is annual sampling as described in Section 3.8. This sentence will be revised as follows: *"The sampling frequency results from the MAROS software recommended annual sampling for most wells. Biennial sampling was recommended for some wells that have exhibited stable concentrations below the RAG. However, annual sampling should be conducted for all DRMO1 wells to generate sufficient data for evaluation of contaminant trends."*	A
4.	Section 3.8, pg 3-16 and Section 4.5, pg 4-3.	DEC concurs with the recommendations for the DRMO 3-Party and 2-Party sites.	A	Recommendations will be incorporated into the 2018 monitoring program upon concurrence by EPA.	A
5.	Section 5.5, pg 5-6	DEC concurs with the recommendations for the Former Building 1168 (3-Party) site.	A	Recommendations will be incorporated into the 2018 monitoring program upon concurrence by EPA.	A
6.	Section 6.0, pg 6-1	Please only cite the most current, and up to date regulations. There is one dated May 8, 2016, please remove this reference from the list.	A	This reference will be deleted.	A

REVIEW COMMENTS | **PROJECT: Fort Wainwright, Alaska** | **DOCUMENT: 2017 Monitoring Report Operable Unit 2** | **Location: Fort Wainwright , Alaska**

ALASKA DEPT. OF ENVIRONMENAL CONSERVATION	**DATE: 3/08/2018** **REVIEWER: Erica Blake** **PHONE: 907-451-2182**	**Action taken on comment by: Aaron Swank - FES**

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)
7.	Appendix A Laboratory Data Review Checklists	DEC notes that 1,4-dioxane is not included in the DEC laboratory approval letter for SGS Accutest of Orlando, Florida. DEC compared the 1,4-dioxane LOD's used by SGS Accutest of Orlando, Florida to the DEC cleanup level. The LOD's used were well below the DEC cleanup level.	A	Noted	A
8.	Appendix E LTMO Analysis Results and Table 5-2	DEC notes the Groundwater Statistics Tool shows an increasing trend for benzene at AP-10037MW, and Table 5-2 indicates the trend for benzene is stable. Please clarify why that is the case.	A	Although there appears to be a visual increasing trend, the Groundwater Statistics Tool result was that the "slope is not statistically increasing", as shown on page 1168-4 in Appendix E. This is also noted in Table 5-2.	A
		--- End of Comments ---			

REVIEW COMMENTS | **PROJECT: Fort Wainwright, Alaska** | **DOCUMENT: 2017 Monitoring Report Operable Unit 2** | **Location: Fort Wainwright , Alaska**

USEPA	**DATE: 5/15/2018** **REVIEWER: Sandra Halstead** **PHONE: 907-271-1218**	**Action taken on comment by: Aaron Swank – FES (5/16/18)**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Section 3.8	EPA agrees with the following report recommendation: *"Discontinue monitoring for TOC and alkalinity at DRMO sites as indicators of reductive conditions post treatability injections."*	A	Changes will be implemented in the 2018 DRMO1 and DRMO4 groundwater monitoring program.	A
2.	Section 5.5	EPA agrees with the following report recommendation: *"Develop an interim Remedial Action Completion Report for OU2 Building 1168 as all CERCLA compounds have achieved attainment of ROD goals for GW"*	A	The Army has contracted development of an IRACR for 2018.	A
3.	Executive Summary p. xi	A recommendation is made to discontinue monitoring for 1,4-Dioxane at all OU2 sites due to detections one order of magnitude below ADEC cleanup levels of 4.6 ug/L based on carcinogenic risk 10-5 . The EPA most stringent RSL is 0.46 ug/L for resident tapwater based on a target carcinogenic risk 10-6 , which is one order of magnitude below the ADEC cleanup level. The LOD for 1,4-Dioxane in this report was 0.50 ug/L, above the EPA RSL. The 2017 workplan did not propose to screen 1,4-dioxane against EPA RSLs. This was an oversight and should have been the screening level. The recommendation to discontinue monitoring is approved, though without full confidence that the non-detect samples are not false negatives.	A	Noted.	A

USEPA	**DATE: 5/15/2018** **REVIEWER: Sandra Halstead** **PHONE: 907-271-1218**	**Action taken on comment by: Aaron Swank – FES (5/16/18)**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
4.	Section 3.7	The report Section 3.7 compares contaminant concentrations to the 2017 cleanup levels promulgated in 18 AAC 75 (Table C). The report states this is "to allow for an evaluation of current compliance with 2-Party program closure requirements." This comparison is fine for the intended purpose, however it is unlikely 1,2,4-TMB would be added as a ROD COC with a revised 2017 clean-up level of 15 ug/L. Any changes to ROD COCs would be determined during the next Five Year Review, in which the protectiveness of the current level would need to be evaluated.	A	Noted. ADEC has proposed revised cleanup levels for several compounds, including 1,2,4-TMB based on new toxicity values. Comparison to the revised cleanup levels will be completed as part of a future monitoring report after the new levels are promulgated, and may be included in a future Five Year Review as appropriate.	A
		--- End of Comments ---			

Supporting thoughts from the EPA for comment #4:

The OU2 ROD cites the ARARs for groundwater as:

Section 7.1.2.1 (footnote a) Groundwater remediation goals are based on federal and state MCLs for organic contaminants in public water supply systems (40 Code of Federal Regulations [CFR] 141.147 and 18 AAC 80).

USEPA	**DATE: 5/15/2018** **REVIEWER: Sandra Halstead** **PHONE: 907-271-1218**	**Action taken on comment by: Aaron Swank – FES (5/16/18)**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

Section 7.2.3 (footnote a). Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act and State of Alaska Drinking Water Standard MCLs and Alaska Water Quality Standards (AWQS), and limit high volume pumping from the aquifer at the DRMO Yard until state and federal MCLs are achieved;

and

18 AAC 80 defers to federal MCLs for treated water, not raw groundwater (there is no federal MCL for 1,2,4-TMB ; the most stringent RSL for 1,2,4-TMB is 5.6 ug/L based on noncarcinogenic impacts to child)

Section 8.2.2 of the ROD lists the following chemical specific ARARs:

8.2.2 Chemical-Specific Applicable or Relevant and Appropriate Requirements.

Federal Safe Drinking Water Act (40 CFR 141) and Alaska Drinking Water Regulations (18 AAC 80): The MCL and non-zero MCL goals were established under the Safe Drinking Water Act and are relevant and appropriate for groundwater that is a potential drinking water source;

AWQS (18 AAC 70): Alaska Water Quality Standards for Protection of Class (1)(A) Water Supply, Class (1)(B) Water Recreation, and Class (1) Aquatic Life and Wildlife (18 AAC 70) are applicable to both source areas. Many of the constituents of groundwater regulated by AWQS are identical to MCLs in Drinking Water Standards; .

Alaska Oil Pollution Regulations (18 AAC 75): Alaska Oil Pollution Control Regulations, are applicable. Under these regulations, responsible parties are required to clean up oil or hazardous material releases. The Army anticipates achieving a cleanup level consistent with this regulation; and

Alaska Regulations for Leaking Underground Storage Tanks (18 AAC 78): The State of Alaska has established cleanup requirements for petroleum-contaminated soils from leaking USTs to protect groundwater and are relevant and appropriate for the DRMO Yard.

The National Contingency Plan States that ARARs freeze at the ROD

USEPA	**DATE: 5/15/2018** **REVIEWER: Sandra Halstead** **PHONE: 907-271-1218**	**Action taken on comment by: Aaron Swank – FES (5/16/18)**

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		(NCP - 300.430(f)(1)(ii)(B)(1)): (B) On-site remedial actions selected in a ROD must attain those ARARs that are identified at the time of ROD signature or provide grounds for invoking a waiver under § 300.430(f)(1)(ii)(C). (1) Requirements that are promulgated or modified after ROD signature must be attained (or waived) only when determined to be applicable or relevant and appropriate and necessary to ensure that the remedy is protective of human health and the environment.			