FINAL

2018 Monitoring Report

Operable Unit 2

U.S. Army Garrison 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-16-D-0005

Task Order W911KB18F0053

June 2019

FES

FAIRBANKS ENVIRONMENTAL SERVICES, INC.

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON ALASKA
1046 MARKS ROAD #4500
FORT WAINWRIGHT, ALASKA 99703-6000

REPLY TO
ATTENTION OF:

June 17, 2019

Directorate of Public Works

Subject: Submission of the Final 2018 Monitoring Report, Operable Unit 2, 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:

Enclosed with this letter is one electronic copy of the Final 2018 Monitoring Report, Operable Unit 2, on Fort Wainwright to the Environmental Protection Agency.

A copy of this letter and the electronic version are being provided to Ms. Erica Blake, Environmental Protection Specialist, Alaska Department of Environmental Conservation. A copy of this letter is being provided to Mr. Kevin Fraley, Environmental Program Specialist, Alaska Department of Environmental Conservation.

If you have additional questions or concerns regarding this action please contact Mr. Brian Adams, Restoration Program Manager at (907) 361-6623 or email brian.m.adams18.civ@mail.mil, Ms. Tamara Scholten, Alternate Remedial Program Manager (907) 361-3001 or email tamara.a.scholten.civ@mail.mil or you may contact Mr. Seth Reedy, Alternate Remedial Program Manager (907) 361-6489 or email seth.a.reedy.civ@mail.mil.

Sincerely,

for Richard L. Morris
Chief, PW Environmental Division

cc:
HQ, USAG FWA CERCLA Information Repository (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

June 17, 2019

Directorate of Public Works

Subject: Submission of the Final 2018 Monitoring Report, Operable Unit 2, to State of Alaska Department Environmental Conservation.

Ms. Erica Blake
Environmental Program Specialist
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

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Alaska Department of Environmental Conservation
610 University Avenue
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FINAL

2018 Monitoring Report

Operable Unit 2
U.S. Army Garrison 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)

June 2019

Prepared for

U.S. Army Garrison Alaska

Under Contract to

U.S. Army Corps of Engineers, Alaska District

Post Office Box 6898
JBER, Alaska 99506-0898
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Prepared by

Fairbanks Environmental Services

3538 International Street
Fairbanks, Alaska 99701
(907) 452-1006
FES Project No. 9011-02

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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
IRACR	Interim Remedial Action Completion Report
ISCO	*in-situ* chemical oxidation
ISCR	*in-situ* chemical reduction
LBE	Left Behind Equipment
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
mV	millivolts
NA	natural attenuation
NRC	National Response Corporation
ORC	oxygen-releasing compound
ORP	oxidation-reduction potential
OU2	Operable Unit 2

LIST OF ACRONYMS AND ABBREVIATIONS CONT'D

PCB	polychlorinated biphenyl
PCE	tetrachloroethene
POL	petroleum, oil, and lubricants
PVC	polyvinyl chloride
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
trans-1,2-DCE	trans-1,2-dichloethene
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: DRMO1 and DRMO5 2-Party Sites, Building 5010 site, and the Building 1168 2-Party Site. Groundwater monitoring was conducted at all of the sites. Additionally, active treatment was conducted at the Building 1168 2-Party and 3-Party sites, the DRMO1 3-Party site, and the DRMO1 and DRMO5 2-Party sites. The results of the 2018 monitoring program and recommendations for 2019 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 (FES, 2017). 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 showed the stimulation of reducing conditions and biodegradation of the residual tetrachloroethene (PCE). PCE exceeded the RAG in one well in the DRMO1 source area (AP-10016R), but did not exceed the RAG in any well at the DRMO4 site during 2018. Groundwater geochemistry indicates that reducing conditions are persistent in these areas and natural attenuation of the residual PCE contamination is continuing.

Evaluation of the PCE and TCE plumes was completed at the DRMO1 and DRMO4 sites using the Monitoring and Remediation Optimization System (MAROS) software. The results at the DRMO1 site showed:

- Contaminant concentration trends for PCE and TCE do not indicate increasing concentrations that will result in additional exceedances of the RAG.
- The estimate of dissolved mass in the PCE and TCE plumes exhibited no trend, and recent estimates show the overall dissolved mass for both contaminants is stable.

- The location of the center of mass relative to the source for PCE and TCE exhibits an increasing trend, and has moved downgradient due to decreasing contaminant concentrations in the source area. However, it does not indicate migration of the plumes with concentrations above the RAG.
- The plume spread analysis for PCE and TCE generally showed no trend. The only exception was an increasing trend for TCE perpendicular to groundwater flow. However, there was no indication from TCE concentrations in individual wells that the plume is expanding above the RAG.

The results at the DRMO4 site showed:

- Contaminant concentration trends for PCE and TCE were not increasing. However, PCE concentrations have fluctuated slightly above and below the RAG in AP-8916.
- Quantitative plume analysis could not be completed due to the small well network; however, the sampling results show evidence of reductive dechlorination and the contaminant concentrations in downgradient wells have remained below the RAG. These results suggest the plumes are not expanding.

Overall, the LTMO analysis showed the PCE contaminant plumes at the DRMO1 and DRMO4 sites remain stable. Based on the 2018 sampling results, annual sampling should continue in the fall at the DRMO1 and DRMO4 3-Party sites.

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 diesel range organics (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 2018 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 DRO concentration trend. A groundwater 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, and contaminants were either not detected or detected below the ROD RAG and ADEC cleanup level.

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 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. All ROD COCs, including 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 in probe PS-23. As a result, a treatability study was initiated in 2010 utilizing injection of chemical oxidation and oxygen-releasing compounds (ORCs) as described in the Treatability Study Report (FES, 2017). Statistical analysis of the post-treatability study results between 2010 and 2017 showed that the benzene remedial goal was achieved in all three wells at the site. DRO has been 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. The 2018 groundwater monitoring results at the Building 1168 site were consistent with previous results, and showed benzene concentrations remained stable below the RAG, and DRO was detected below the cleanup level.

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 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The IRACR was approved in November 2018, and the 1168 Site will be transferred from the 3-Party Program to the 2-Party Program (FES, 2018c). Future groundwater sampling and reporting will be conducted in accordance with the requirements of the 2-Party Program.

Contaminant Concentration Comparison to Current ADEC Cleanup Levels

In November 2016, the ADEC cleanup levels were revised utilizing risk-based calculations. A second update for select compounds was completed in September 2018. This resulted in a significant change in the groundwater cleanup level for many compounds. The revised cleanup levels are found in Title 18 of the Alaska Administrative Code (AAC), Chapter 75.345 Table C, and 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 2018 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:

- ROD COC: PCE in AP-10016R at the DRMO1 3-Party site exceeded the ROD RAG, but was below the current ADEC cleanup level.

- Non-ROD COC: No additional non-ROD COCs exceeded the current ADEC cleanup levels.

The current ADEC cleanup levels were also compared to the 2018 groundwater sampling results at the OU2 2-Party site sampled in 2018 (Building 5010) for evaluation of compliance with ADEC closure requirements. The comparison showed:

- DRO, naphthalene and 1,2,4-trimethylbenzene were identified above the ADEC cleanup level in AP-7348 at the 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 2018. The inspection showed a majority of 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. However, a nonconformance issue was identified at the DRMO yard Water Supply Well (WSW). A site visit by DPW personnel determined that the fire suppression tank was designed to be refilled by the WSW, and the well pump is controlled by a float in the tank. A letter detailing this issue was sent to EPA and ADEC, and steps are in progress to rectify the situation. Further details regarding the IC inspection are presented in the 2018 IC inspection report (anticipated in spring 2019).

Monitoring Well Replacement

Six monitoring wells were identified for replacement at the DRMO 3-Party sites on Fort Wainwright during preparation of the 2018 Postwide Work Plan. The wells were recommended for replacement since the appropriate sampling equipment (including submersible pump and water level indicator) could not be placed into the existing wells/probes. The wells replaced at DRMO included AP-10015, AP-10016, AP-10017, AP-10018, Probe B, and PO5. The replacement wells were constructed using 10 foot pre-pack screens, and 2-inch polyvinyl chloride (PVC) risers. The replacement wells were developed and sampled as part of the annual DRMO 3-Party sampling event in August 2018.

1.0 INTRODUCTION

This report documents site activities and groundwater monitoring results during 2018 at Operable Unit 2 (OU2) sites on Fort Wainwright, Alaska. The groundwater monitoring program during 2018 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 2018.

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 W911KB18F0053. The work was completed according to the 2018 Postwide Work Plan (FES, 2018a); 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), the 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 consisted of groundwater and soil sampling, and 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 (WSW) 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 2018 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 WSW 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 sampling has been conducted at least annually since 2002. Groundwater samples from the WSW 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, 1996).

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.

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 2018 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 to have 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 *in-situ* chemical oxidation (ISCO). The ISCO treatability study was completed during October 2010), 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 residual range organics (RRO) were eliminated from the monitoring program following the 2015 sampling event. The treatability study procedures and results are described in the Treatability Study Report (FES, 2017).

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 – ICs
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 – ICs

[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)

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.

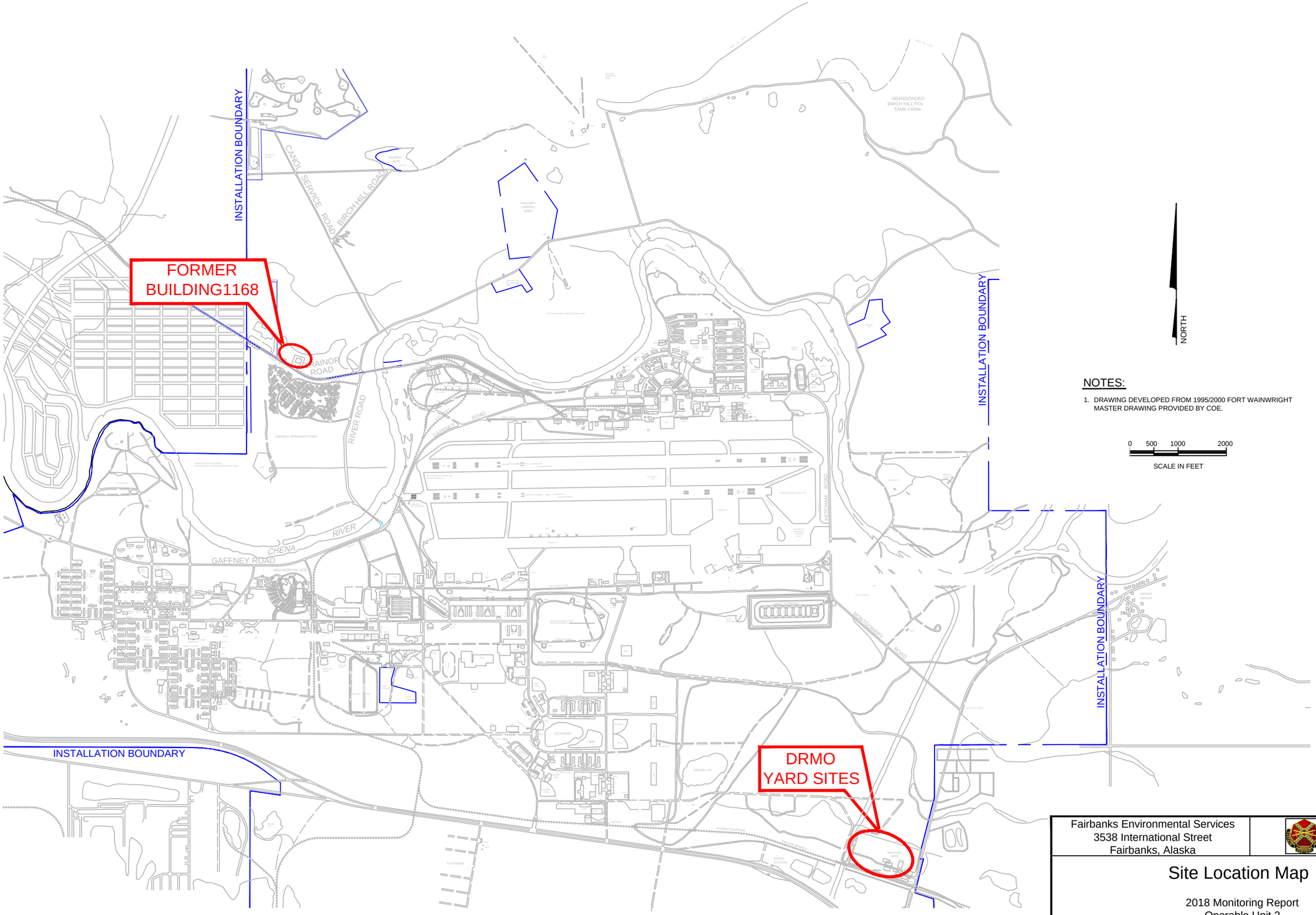
Table 1-3. DRMO and Former Building 1168 ROD RAGs for Groundwater

Contaminants of Concern	ROD RAG (µg/L)	Basis
Benzene	5	MCL
PCE	5	MCL
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)

µg/L – micrograms per liter

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 Title 18 of the Alaska Administrative Code (AAC), Chapter 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. The ADEC cleanup levels were revised again for select compounds as of September 29, 2018 (ADEC, 2018). These updates 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.

0 500 1000 2000

SCALE IN FEET

Fairbanks Environmental Services 3538 International Street Fairbanks, Alaska		USAGAK

Site Location Map

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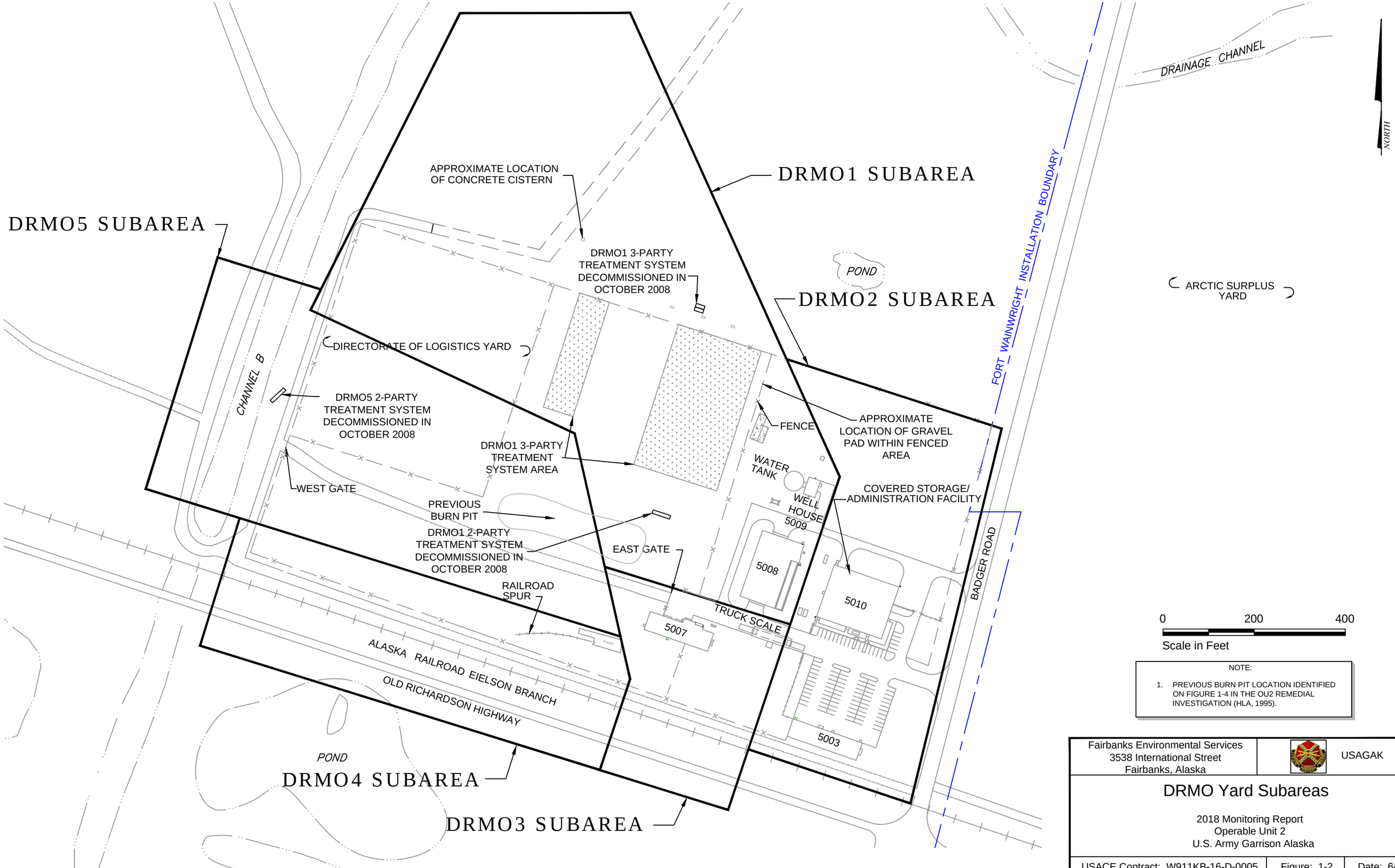

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Scale in Feet

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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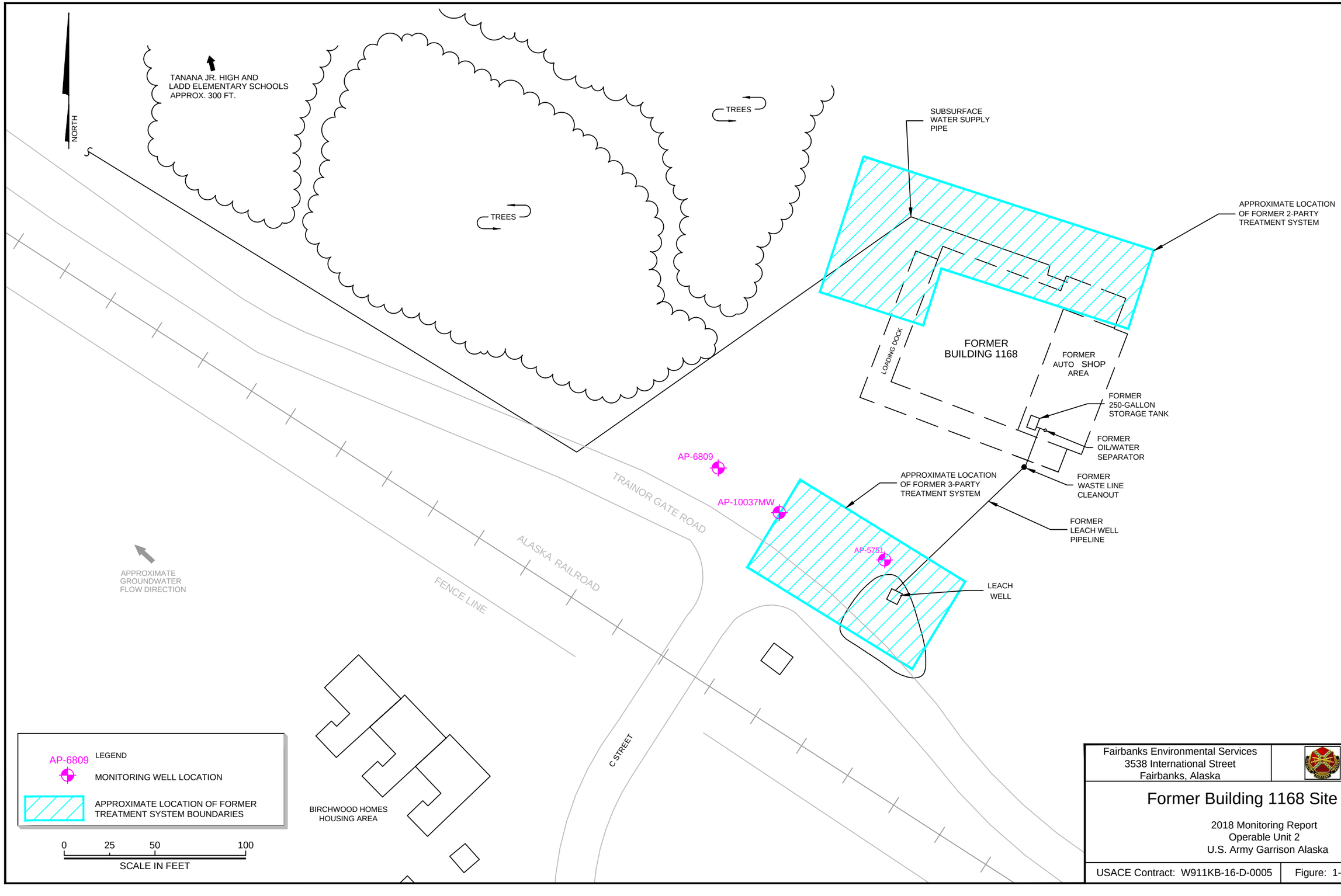

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Former Building 1168 Site Plan

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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 June and August 2018.

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. 2018 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 2018 OU2 Groundwater Monitoring Program

OU2 Site	Subarea/ Site	Number of Wells/Probes	Contaminant Analyses[1]	NA Analyses[3]	Monitoring Frequency/Sample Collected in 2018
DRMO1 (3-Party)	DRMO1	7	DRO[2], VOC	Iron, sulfate	Annual/Yes
DRMO4 (3-Party)	DRMO4	3	DRO[2], VOC		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	--	Annual/Yes
Water Supply Well (2-Party)	DRMO1	1	GRO, DRO, VOC, SVOC	--	Annual/Yes
Former Building 1168 (3-Party)	Leach Well	3	DRO, VOC	Iron, sulfate	Annual/Yes

NA – Natural Attenuation; SVOC – semivolatile organic compounds

[1] Contaminant analyses utilized 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) were analyzed for DRO

[3] Natural attenuation analyses were conducted by the following methods: iron (6020A), sulfate (300.0)

Groundwater sampling at the former Building 1168 site, Building 5010 2-Party site, and the WSW, was conducted in June 2018. Groundwater sampling at the DRMO 3-Party sites was conducted in August 2018. Groundwater monitoring was conducted in accordance with the procedures detailed in the 2018 Work Plan (FES, 2018a). All groundwater samples were analyzed by SGS North America Inc., (SGS), of Anchorage, Alaska, as presented 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, and dedicated Teflon-lined tubing to purge and sample the wells. 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 WSW 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, 2018a). 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 2018 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, 2018a).

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 2018 IDW Technical Memorandum (anticipated in spring 2019).

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 2018 IDW Technical Memorandum.

Following groundwater sampling, the submersible pumps used at the DRMO and Former Building 1168 sites were decontaminated in accordance with the Work Plan (FES, 2018a), 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, 2018a), the ADEC Technical Memorandum 06-002 (ADEC, 2017a), and the DoD Quality Systems Manual (QSM), Version 5.0 (DoD, 2017).

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* (EPA, 2014), 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 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 May and June 2018. 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 2018 IC survey is presented below, and the complete survey results will be included in the 2018 Fort Wainwright IC Inspection Report (expected spring 2019).

- **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).
  - *2018 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, including a limitation on refilling the DRMO Yard fire suppression water tank from the existing potable water supply well, until state and federal maximum contaminant levels are met (except in emergency situations)." (USARAK, 1997)

o *2018 IC Inspection Results:*

- Access on the east side of the DRMO is now controlled by the Directorate of Emergency Services (DES) (formerly controlled by DRMO), and access on the west side is managed by the Left Behind Equipment (LBE) group.
- It was determined that the DRMO Yard fire suppression tank has been filled from the potable water well since it was installed. A notification of non-conformance was sent to the regulators on November 21, 2018, and this letter is included as an appendix in the 2018 IC report. The following steps have been taken to rectify the situation:
  - Lockout of the water supply well pump on November 21, 2018
  - A Request for Proposal was sent to Doyon Utilities (the privatized utility operator on Fort Wainwright) to enable the tank to be truck-filled. The anticipated completion date is September 2019.
  - Fort Wainwright DPW has requested regulatory approval to slowly fill the fire suppression tank with the well until the piping corrections have been completed.

2.7 Monitoring Well Replacement

Six monitoring wells were identified for replacement at the DRMO1 and DRMO4 3-Party Sites during preparation of the 2018 Postwide Work Plan. The wells were recommended for replacement since the appropriate sampling equipment (including submersible pump and water level indicator) could not be placed in the wells. The wells replaced at the DRMO sites included AP-10015, AP-10016, AP-10017, AP-10018, Probe B, and PO5. The replacement wells consisted of 10 foot pre-pack screens and 2-inch polyvinyl chloride (PVC) risers, and were installed with similar screened intervals to the original well. A summary of the replacement wells at the DRMO1 and DRMO4 3-Party Sites is presented in Table 2-2. Complete details regarding well decommissioning, installation, and development, along with the survey information, are presented in the 2018 Monitoring Well Decommissioning Report (FES, 2018b).

Table 2-2. 2018 Replacement Well Summary

Site Name	Old Well ID	Old Screened Interval (ft bgs)	Replacement Well ID	New Screened Interval (feet bgs)	X-Coordinate[1]	Y-Coordinate[1]
DRMO1 3-Party	AP-10015	8-18	AP-10015R	7.7-17.7	472654.024	7187811.385
	AP-10016	7-17	AP-10016R	7-17	472660.366	7187798.103
	AP-10017	7-17	AP-10017R	7-17	472679.6929	7187793.202
	AP-10018	7-17	AP-10018R	7.4-17.4	472671.8731	7187808.879
	PO5	5-15	AP-10446MW	7.5-17.5	472557.9847	7187644.979

[1] Coordinates presented in WGS84 UTM Zone 6N, meters

Table 2-2 continued. 2018 Replacement Well Summary

Site Name	Old Well ID	Old Screened Interval (ft bgs)	Replacement Well ID	New Screened Interval (feet bgs)	X-Coordinate[1]	Y-Coordinate[1]
DRMO4 3-Party	Probe B	Unknown	AP-10445MW	7.4-17.4	472521.1467	7187681.463
	PO5	5-15	AP-10446MW	7.5-17.5	472557.9847	7187644.979

[1] Coordinates presented in WGS84 UTM Zone 6N, meters

The replacement wells were developed and sampled as part of the annual sampling event in August 2018. The sampling results from the replacement wells are presented and discussed in this report. Since the replacement wells were installed directly adjacent to the old well location, they may be referred to as the same location in the text (e.g. AP-10015/AP-10015R).

NOTES:

1. REPLACEMENT WELLS INSTALLED IN JUNE 2018, INCLUDING AP-10445MW, AP-10446MW, AP-10015R, AP-10016R, AP-10017R AND AP-10018R.
2. MONITORING WELLS THAT WERE REPLACED ARE SHOWN IN PARENTHESES.

LEGEND

- AP-8916 — ANNUAL FALL THREE PARTY MONITORING WELL SAMPLED IN 2018
- WATER WELL LOCATION
- AP-7348 — ANNUAL SPRING TWO PARTY MONITORING WELL SAMPLED IN 2018
- APPROXIMATE LOCATION OF DECON WATER DISCHARGE POINT

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DRMO Yard Monitoring Well Locations

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USACE Contract: W911KB-16-D-0005	Figure: 2-1	Date: 6/19

NOTES:

1. HORIZONTAL DATUM: UTM ZONE 6N, WGS 1984, METERS
2. AERIAL IMAGERY FROM FAIRBANKS NORTH STAR BOROUGH, 2017

LEGEND

- MONITORING WELL
- APPROXIMATE LOCATION OF DECON WATER DISCHARGE POINT

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, AK 99701

USAGAK

Former Building 1168 Groundwater Sampling Locations
2018 Monitoring Report
Operable Unit 2
US Army Garrison Alaska

USACE CONTRACT: W911KB-16-D-0005 | FIGURE: 2-2 | DATE: 6/19

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 2018. 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 2018 is summarized in Table 3-1. 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. Replacement wells installed in 2018 were also surveyed in 2018, and the most current survey results were used to calculate groundwater elevations.

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 0.5 foot higher in August 2018 than in August 2017. The 2018 water level remained among the highest that have been measured at the site, and groundwater was above the screen in AP-7560. 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-10015R, AP-10016R, AP-10017R, and AP-10018R were sampled in August 2018 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, and dissolved anions.

The area where the greatest reducing conditions were observed following each injection was in the vicinity of AP-8914R and AP-10018/AP-10018R. 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 2018 groundwater geochemistry results showed reducing conditions were persistent in monitoring wells AP-8914R, AP-10015R, AP-10016R, and AP-10018R; as indicated by negative ORP, dissolved oxygen less than 1 milligram per liter (mg/L), elevated dissolved iron, and lower sulfate concentrations. 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 2018 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-10015R, AP-10018R, 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-10015R, AP-10016R, and AP-10018R.

3.2.2 Contaminant Concentration Changes in the Treatability Study Area

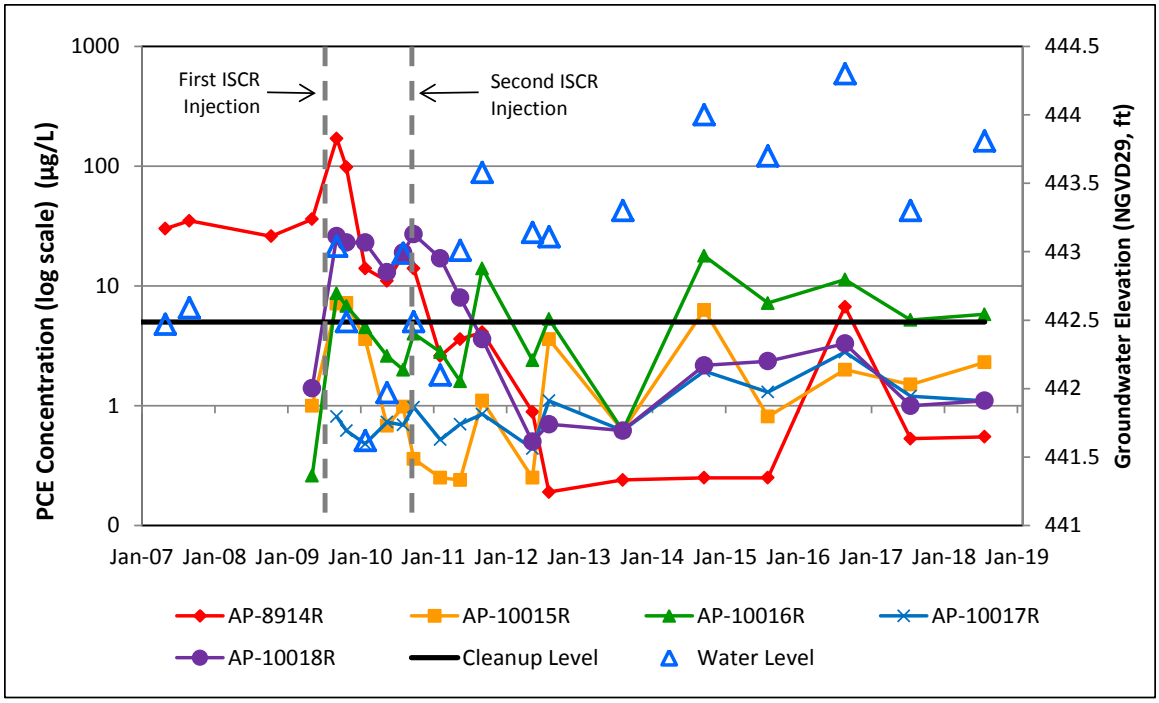
PCE Concentration Trends

The PCE concentrations over time and visual trends for monitoring wells AP-8914R, AP-10015/AP-10015R, AP-10016/AP-10016R, AP-10017/AP-10017R, and AP-10018/AP-10018R 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 (and replacement AP-10018R in 2018), 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 and 2018 monitoring events.

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 including an exceedance in replacement well AP-10016R in 2018. This well is cross-gradient of the 2010 injection area, and is characterized by 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. The PCE concentration in replacement well AP-10015R in 2018 was also 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/AP-10017R has remained below the RAG in all sampling events conducted at the site.



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

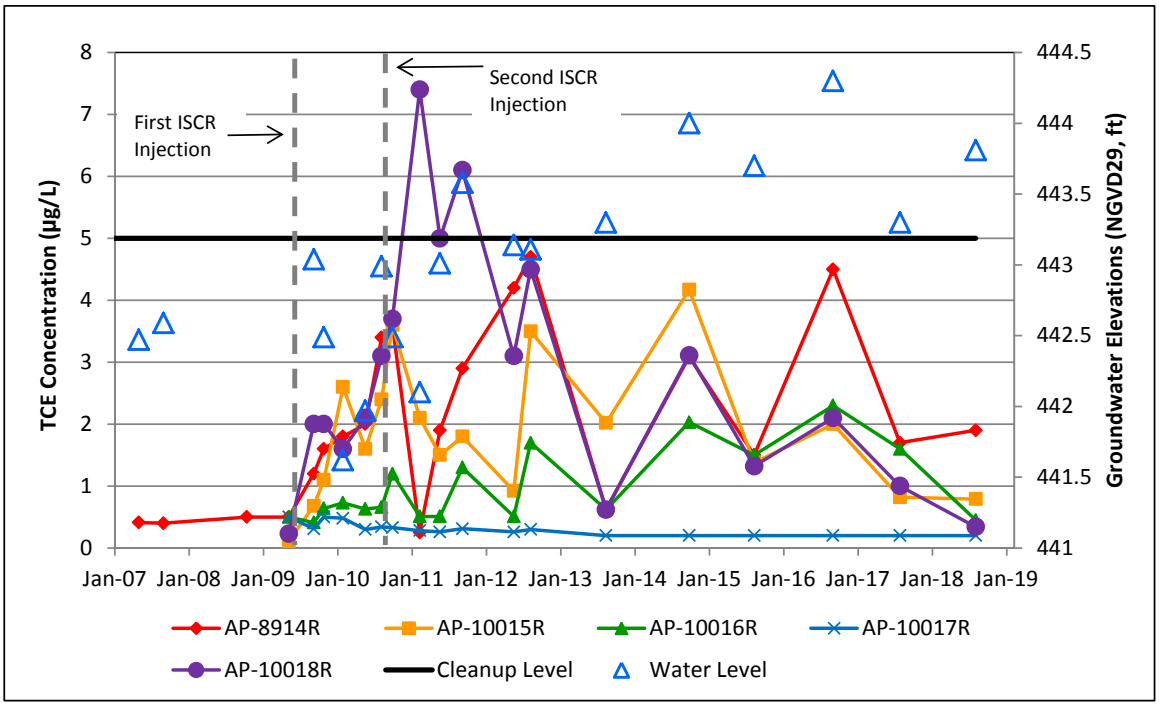
Graph 3-1 includes water levels measured in the injection area (represented by water levels in AP-8914R). The relationship between the PCE concentration and water levels indicates that the wells with recent RAG exceedances (AP-10015/AP-10015R, AP-10016/AP-10016R, and AP-8914R) have been sensitive to 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. 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.

The PCE concentrations in all DRMO1 ISCR treatment area wells were similar between 2017 and 2018, even though water levels increased. This suggests any residual source material remaining in the soil may be depleted. This trend will continue to be evaluated in future 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.

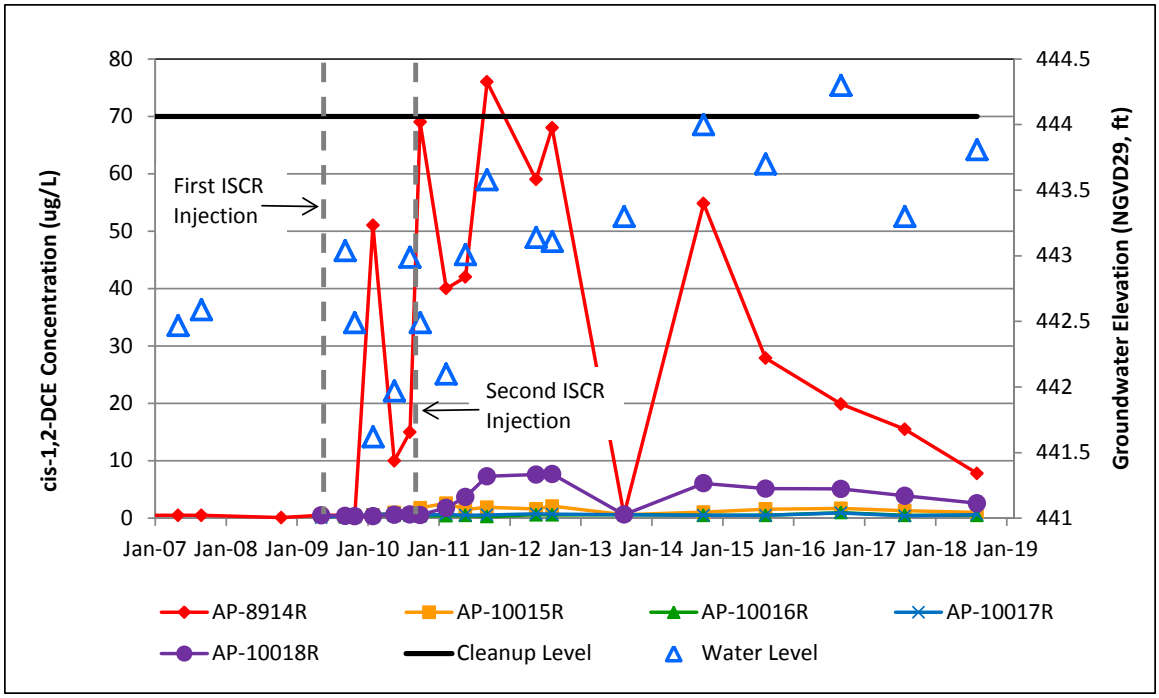
The TCE concentration changes over time and visual trends are shown in Graph 3-2, and complete results of the daughter product detections are presented in Table 3-2. As shown in Graph 3-2, TCE has remained below the RAG in all wells at the DRMO1 (3-Party) site since 2012. The highest concentrations have 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 and Water Levels 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 initially 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. . 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; though cis-1,2-DCE has never exceeded the RAG. 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 and Water Levels in the DRMO1 ISCR Treatment Area

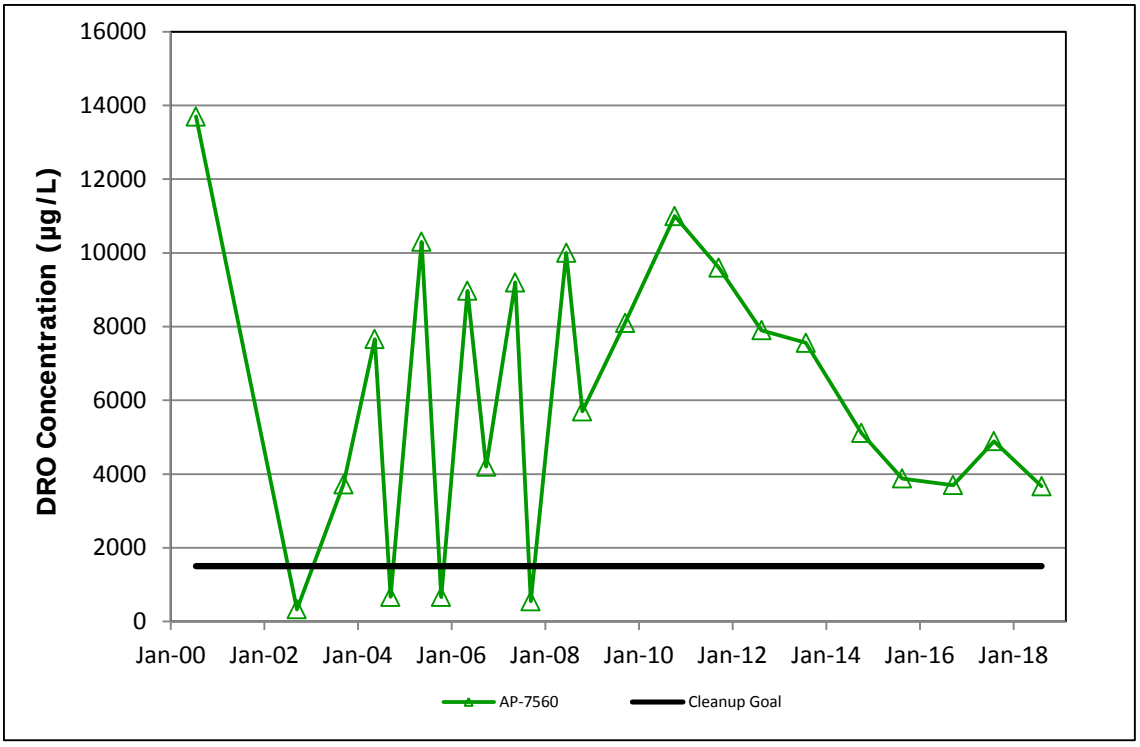
Trace detections of other reductive dechlorination daughter products including trans-1,2-DCE, 1,1-dichloroethene (1,1-DCE), and vinyl chloride have been observed in post-injection sampling events, although no RAG exceedances of any of these daughter products have been observed. Detection of these daughter 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 2018 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 2018 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-7560 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 micrograms per liter (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 concentrations have remained relatively consistent since 2015. 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 2018 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 concentrations 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/AP-10017R	Upgradient	Probably Increasing	Increasing
AP-8914R	Within treatability study area	**No Trend**	No Trend
AP-10016/AP-10016R		**No Trend**	No Trend
AP-10018/AP-10018R		**Decreasing**	**Decreasing**
AP-10015/AP-10015R	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 (2010-2018).

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/AP-10017R** – Probably increasing and 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/AP-10016R, and AP-10018/AP-10018R** –

  - PCE has exceeded the RAG in each of the three wells, but the concentration trend for one well (AP-10018/AP-10018R) was decreasing, and the remaining two wells exhibited no trend.

  - Concentration trends for TCE were decreasing for AP-10018/AP-10018R, and exhibited no trend for AP-10016/AP-10016R and AP-8914R. TCE has remained below the RAG in each of these wells since 2012. AP-10018 was the only DRMO well

with TCE above the RAG during or following the treatability study. The TCE concentration in AP-10018R in 2018 was 0.3 µg/L.

- **Downgradient wells AP-10015R, AP-7559, and AP-7560 –**
  - PCE exhibited an increasing trend in AP-10015/AP-10015R, 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 2018. 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-10015R. 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 since the injection, and exhibited no trend. However, dissolved mass estimates have been generally stable since 2014.
- The TCE dissolved mass estimate also exhibited no trend, and TCE remains below the RAG in individual wells. The 2018 estimate was the same as the 2017 estimate, and has decreased since 2012.

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 and TCE exhibited increasing trends over the period of analysis.

- However, this does not indicate expansion of the plumes at concentrations greater than the RAG, since the primary reason for the increasing trend is decreasing contaminant concentrations in source area wells. Only one well had PCE above the RAG in 2018, and no wells had TCE concentrations exceeding the RAG. In addition, there were no wells with increasing trends for PCE or TCE that would be expected to exceed the RAG.

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 2018; the plume spread was within the range observed since 2010, 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-10015R based on TCE results. A qualitative evaluation of the results showed that AP-10015R 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 2018 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 continued for all DRMO1 wells since contaminants remain above the RAG.

3.4 DRMO4 Subarea Groundwater Monitoring Results

Three monitoring wells at the DRMO4 site (PO5/AP-10446MW, AP-8916, and Probe B/AP-10445MW) were sampled in August 2018. The wells were sampled as part of the annual monitoring event to evaluate the progress towards achieving the RAGs. This was the first monitoring event for AP-10445MW and AP-10446MW, which were installed in 2018 to replace Probe B and PO5 respectively. 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, and sulfate) were measured at the DRMO4 (3-Party) site to evaluate the potential for conditions supportive of reductive dechlorination. In 2018, these parameters were measured in AP-10446MW (within the 2009 injection treatability study area), in AP-8916 (upgradient, and within the 2011 injection treatability study area), and AP-10445MW (downgradient of the injection treatability study area). The results and approximate regions of reduced geochemistry based on the 2018 monitoring results are shown on Figure 3-2.

The 2018 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 25.4 mg/L and a sulfate concentration of 9.4 mg/L were also observed in AP-8916, which suggests potential for biodegradation through iron and sulfate reduction. Groundwater geochemistry in AP-10445MW and AP-10446MW was characterized by mildly reducing conditions based on dissolved iron, sulfate, ORP, and dissolved oxygen concentrations.

3.4.2 Contaminant Concentration Trends

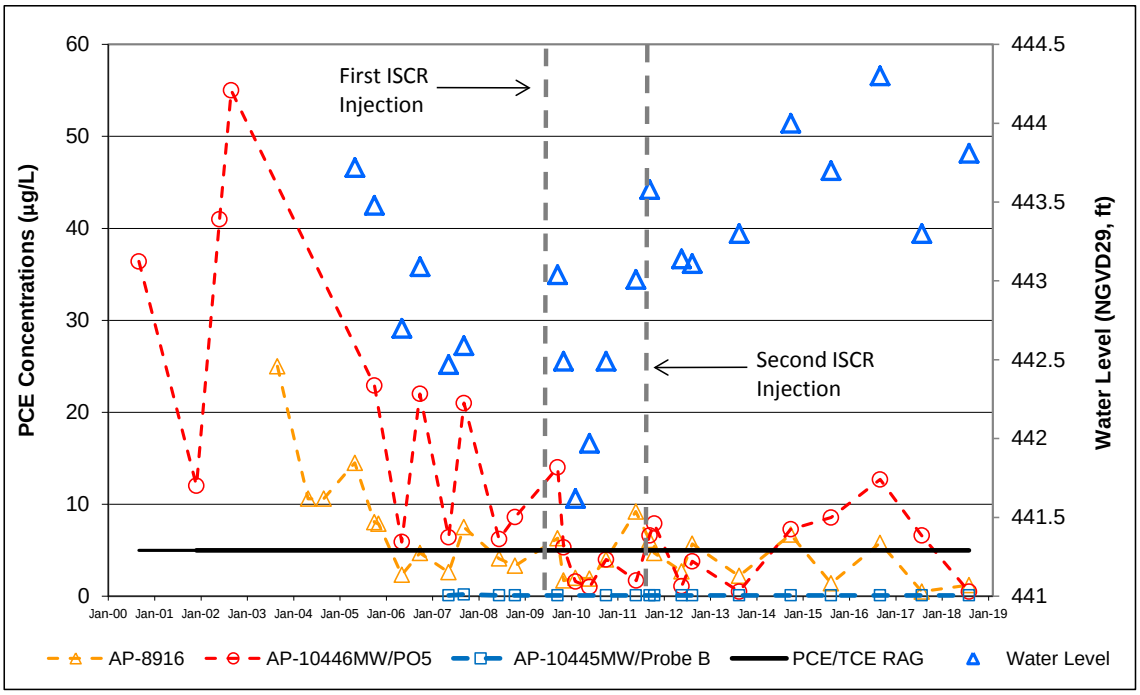
PCE Concentration Trends

The PCE concentration changes over time and visual trends for AP-10446MW/PO5, AP-8916, and downgradient well AP-10445MW/Probe B from September 2000 through August 2018 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 AP-10446MW/PO5 have been variable since the August 2009 Adventus EHC™ injection. PCE was below the RAG in PO5 during the 2012 and 2013 sampling events, but exceeded the RAG between 2014 and 2017. PCE was not detected in replacement well AP-10446MW in the 2018 sampling event, similar to the 2013 result. Concentrations will continue to be evaluated in the replacement well in future sampling events.

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 and 2018 samples.

PCE has been either not detected or detected at trace concentrations in Probe B/AP-10045MW, located approximately 150 feet downgradient from PO5/AP-10446MW. This indicates no significant downgradient migration of PCE has occurred at the DRMO4 (3-Party) site.



Graph 3-5. PCE Concentrations and Water Levels in DRMO4 Wells

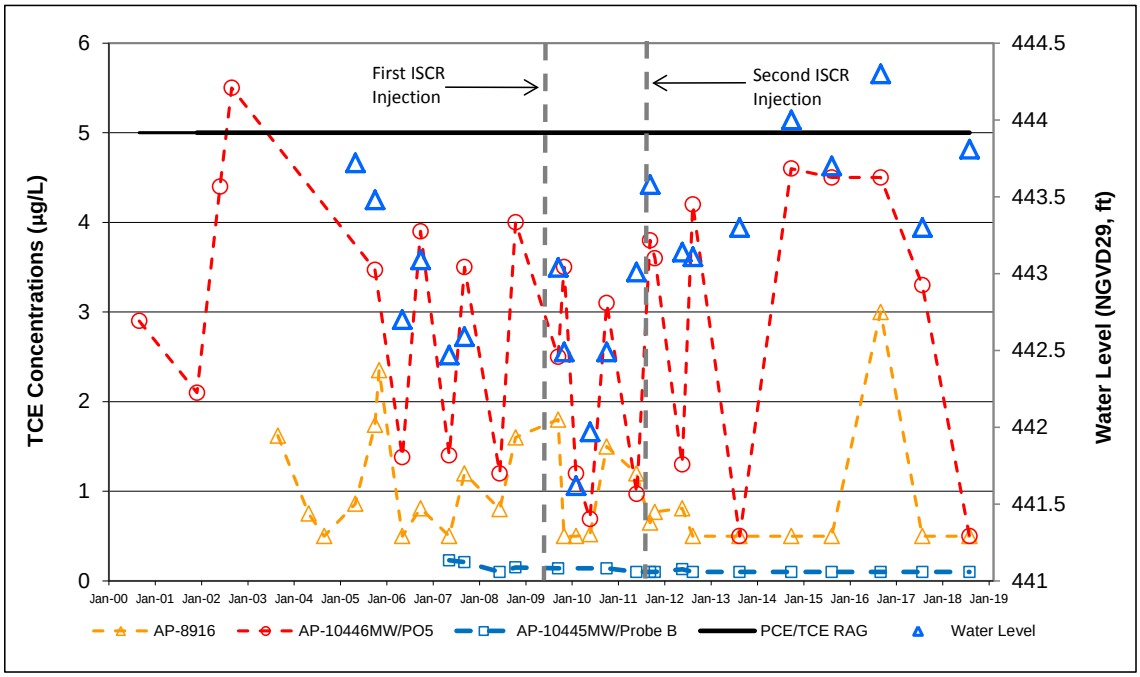
The groundwater elevation at the DRMO4 site (as measured in AP-8916) is also shown in Graph 3-5. The graph indicates some correlation between water levels and PCE concentration in PO5 prior to the first injection, with higher concentrations in the fall when water levels were typically higher. Following 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. 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-1,2-DCE were detected in PO5 and AP-

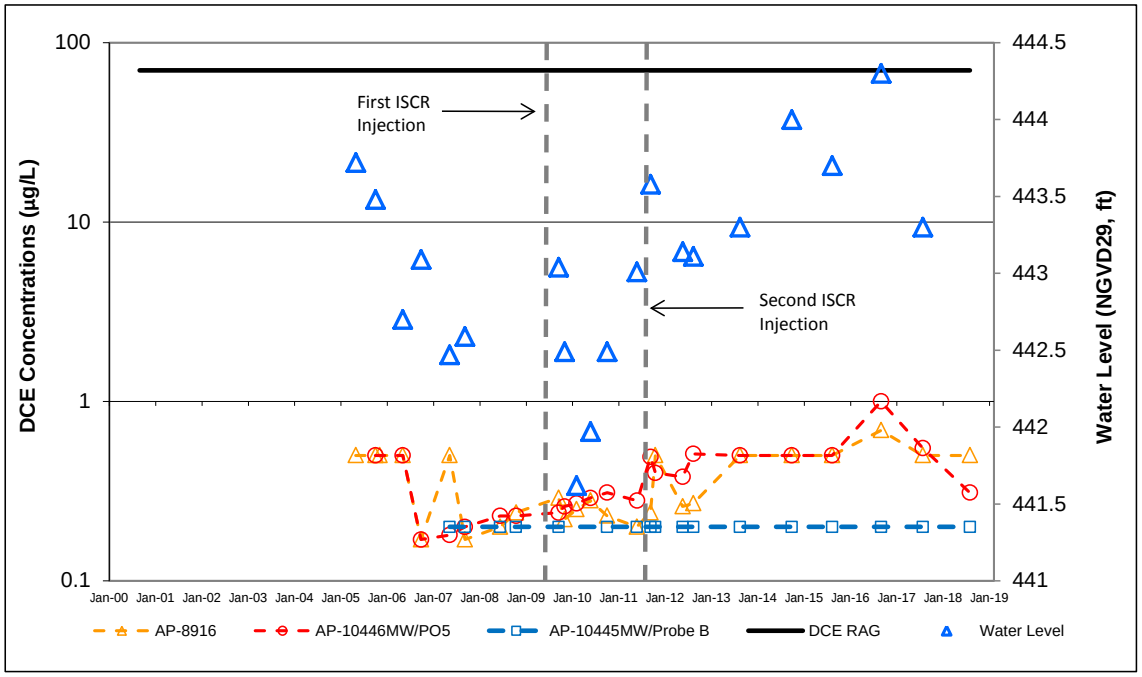
8916. TCE and cis-1,2-DCE has never been detected above trace concentrations in Probe B/AP-10445MW. The visual trends of TCE and cis-1,2-DCE, along with the water levels from AP-8916, are shown on graphs 3-6 and 3-7 respectively.

TCE has been ND in AP-8916 since 2012, with the exception of 2016 when it was detected at 3 µg/L. TCE concentrations have fluctuated in PO5/AP-10046MW, but have remained below the RAG. TCE was not detected in AP-10046MW in 2018. TCE has never been detected above trace levels in Probe B/AP-10045MW. TCE concentrations over time are shown in Graph 3-6.



Graph 3-6. TCE Concentrations and Water Levels in DRMO4 Wells

The cis-1,2-DCE concentrations in AP-10446MW/PO5 and AP-8916 increased since the injection events, indicating reductive dechlorination was stimulated as a result of the treatability study.



Graph 3-7. Cis-1,2-DCE Concentrations and Water Levels 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 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 DRMO1 (3-Party) during the 2012 sampling event. 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 were only slightly above the cleanup level. The DRO concentration observed in replacement well AP-10445MW in 2018 was above the ADEC cleanup level, but within the range of concentrations typically observed in this location.

3.5 DRMO4 (3-Party) LTMO Analysis Update

LTMO 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 October 2011 to August 2018 to represent the period of time following the injection events at the DRMO4 site. 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
AP-10446MW/PO5	Within 2009 injection area	**No Trend**	Stable
AP-10445MW/Probe B	Downgradient	Not Detected[1]	Stable

Trends in **bold type** exceeded the RAG during the time period used in the LTMO analysis (2011-2018).
[1] PCE was not detected in downgradient well Probe B/AP-10445MW between 2010 and 2018.

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 has 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. 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 16 sampling events since the injection treatability study in 2009, and PCE was not detected in replacement well AP-10446MW in 2018.

The PCE concentrations downgradient of the injection area have remained less than the RAG, as shown in the low-level detections in AP-10445MW/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, and TCE was not detected in any of the wells in 2018.

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 in PO5 initially increased following the 2009 injection, but then decreased as a result of the stimulation of reductive dehalogenation from the ISCR

compound. PCE concentrations initially decreased in AP-8916 following the injection in 2011, and reducing conditions are persistent in AP-8916 and AP-10446MW/PO5.

- PCE concentrations increased above the cleanup level in AP-8916 and PO5 since 2014, but have decreased since 2016. PCE was below the RAG in AP-8916 and replacement well AP-10446MW in 2018.
- The PCE concentration in downgradient well Probe B/AP-10445MW 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 increased since the injection, 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 Comparison of 2018 Sampling Results to Current ADEC Cleanup Levels

The 2018 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, and summarized in Table 3-6.

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

Contaminant	ROD RAG (µg/L)	Current ADEC Cleanup Level (µg/L)[1]	2018 ADEC Cleanup Level Exceedance	2018 Maximum Concentration (Well ID)
Benzene	5	4.6	None	ND
PCE	5	41	None	5.8 (AP-10016R)
TCE	5	2.8	None	2.3 (AP-7560)
Vinyl Chloride	2	0.19	None	ND
1,1-DCE	7	280	None	ND
1,2-DCE	70	36	None	7.8 (AP-8914R)

[1] Table C, 18 AAC 75.345 (ADEC, 2018)
ND = Not Detected

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

- PCE concentrations were above the ROD RAG in one well at the DRMO1 3-Party site. 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 and current ADEC cleanup level in all wells at the DRMO1 and DRMO4 3-Party sites.

3.7 Summary and Recommendations for DRMO 3-Party Sites

Groundwater sampling results from 2018 showed that PCE remains slightly above the ROD RAG in one source area well at the DRMO1 3-Party site, but was below the ROD RAG in each of the three wells at the DRMO4 3-Party site. 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. Annual sampling (conducted in the fall) would be sufficient to document progress towards achieving the RAGs for the sites.

Table 3-1. 2018 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)	Jun-18			Aug-18		
					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	NA	NA	NA	8/16/18	10.33	443.81
	AP-7559	20.0	6 - 16	454.00	NA	NA	NA	8/16/18	10.13	443.87
	AP-7560	20.1	6 - 16	453.31	NA	NA	NA	8/16/18	9.65	443.66
	AP-10015R[1]	20.35	7.7 - 17.7	456.16	NA	NA	NA	8/16/18	12.32	443.84
	AP-10016R[1]	20.40	7 - 17	456.33	NA	NA	NA	8/16/18	12.46	443.87
	AP-10017R[1]	20.35	7 - 17	455.95	NA	NA	NA	8/16/18	12.02	444.31
	AP-10018R[1]	20.43	7.4 - 17.4	455.72	NA	NA	NA	8/16/18	11.86	443.86
DRMO4 (3-Party) Source Area	AP-10446MW[1]	20.5	7.5 - 17.5	455.46	NM	NM	NM	8/17/18	11.47	443.99
	AP-8916	16.28	5 - 15	452.82	NA	NA	NA	8/17/18	10.77	442.05
	AP-10445MW[1]	20.4	7.4 - 17.4	456.14	NA	NA	NA	8/17/18	11.47	444.67
Building 5010 (2-Party) Source Area	AP-7346	12.7	4 - 14	451.72	6/4/18	7.54	444.18	NA	NA	NA
	AP-7348	15.3	6 - 16	453.84	6/4/18	9.46	444.38	NA	NA	NA
Former Building 1168 (3-Party) Leach Well Source Area	AP-5751	20.3	7 - 17	444.83	6/3/18	14.62	430.21	NA	NA	NA
	PS-23/AP-10037MW[3]	26.6	12 - 22	445.90	6/3/18	15.70	430.20	NA	NA	NA
	AP-6809	26.8	9 - 22	444.56	6/3/18	14.49	430.07	NA	NA	NA

[1] Monitoring wells AP-10015R, AP-10016R, AP-10017R, AP-10018R, AP-10445MW, and AP-10446MW were replacement wells installed in 2018.

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 - 2018 Groundwater Sample Results
DRMO1 (3-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Water Elevation (NGVD29 ft)	Geochemical Parameters								2-Party COC[3] (µg/L)	ROD COC[4] (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)	DRO	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE
ROD CLEANUP LEVELS (3-Party Site) / 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-10017R		18FWOU216WG	8/16/2018	443.93	-6.3	0.82	6.9	0.383	0.35 J	22.6	NA	NA	NA	ND (0.2)	ND (0.5)	1.1	ND (0.075)	ND (0.5)	0.63 J
AP-8914R		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	33.7	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	27.1	8.7	136	4.3	NA	ND (0.2)	1.7	0.53 J	ND (0.075)	ND (0.5)	15.5
		18FWOU214WG	8/16/2018	443.8	-111.9	0.59	6.8	0.367	25.2	20.4	NA	NA	NA	ND (0.2)	1.9	0.55 J	ND (0.075)	ND (0.5)	7.8
AP-10016	Source Area	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-10016R		18FWOU213WG	8/16/2018	443.87	-20.8	0.54	6.7	0.412	1.65	11.0	NA	NA	NA	ND (0.2)	0.45 J	**5.8**	ND (0.075)	ND (0.5)	ND (0.5)
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-10018R		18FWOU215WG	8/16/2018	443.86	-173.3	0.57	7.4	0.421	8.7	9.8	NA	NA	NA	ND (0.2)	0.34 J	1.1	ND (0.075)	ND (0.5)	2.6
AP-7559	Downgradient	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)
		18FWOU209WG	8/16/2018	443.87	194.1	0.67	6.9	0.428	ND (0.25)	27.3	NA	NA	NA	ND (0.2)	0.49 J	3.5	ND (0.075)	ND (0.5)	ND (0.5)

Table 3-2. 2013 - 2018 Groundwater Sample Results
DRMO1 (3-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Water Elevation (NGVD29 ft)	Geochemical Parameters								2-Party COC[3] (µg/L)	ROD COC[4] (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)	DRO	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE
ROD CLEANUP LEVELS (3-Party Site) / ADEC CLEANUP LEVEL[1]													**1,500**	**5**	**5**	**5**	**2**	**7**	**70**
AP-7560	Downgradient	13FW2A04WG	8/26/2013	443.12	-62.9	0.26	6.0	0.298	15.2	8.7	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+	1.3	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	1.0	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	36.4	208	13.9	**4,320**	ND (0.2)	2.5	4.26	ND (0.5)	ND (0.5)	1.1
		15TFTOU226WG[2]							14.1	36.0	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	13.5	126	14.3	**4,890**	ND (0.2)	1.0	1.3	ND (0.075)	ND (0.5)	0.33 J
		18FWOU210WG	8/16/2018	443.66	-80.5	0.80	6.7	0.431	11.9	22.4	NA	NA	**3,040**	ND (0.2)	2.3	1.8	ND (0.075)	ND (0.5)	0.88 J
		18FWOU211WG[2]							10.8	22.6	NA	NA	**3,670**	ND (0.2)	2.2	1.9	ND (0.075)	ND (0.5)	0.87 J
AP-10015		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
AP-10015R		18FWOU212WG	8/16/2018	443.84	-74.2	0.74	6.9	0.427	7.1	9.1	NA	NA	NA	ND (0.2)	0.79 J	2.3	ND (0.075)	ND (0.5)	1.0

Notes

Analytes exceeding remedial action goals (RAGs) established in the Record of Decision (ROD) or ADEC groundwater cleanup levels (from Table C of 18 AAC 75.345) are in bold type and yellow highlighting.

[1] 18 AAC 75.345, Table C values (ADEC, 2018)

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

[3] 2-Party COCs are compared to ADEC cleanup levels

[4] ROD COCs are compared to ROD RAGs

Acronyms/Abbreviations

COC - contaminant of concern
DCE - dichloroethene
DRO - diesel range organics
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
ORP - oxidation-reduction potential
PCE - tetrachloroethene
ROD - Record of Decision
TCE - trichloroethene

Data Qualifiers

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

Table 3-3. 2013 - 2018 Groundwater Sample Results
DRMO4 (3-Party) Subarea

Well Number	Relative Location	Sample Number	Date	Well Elevation (NGVD29 ft)	Water Level (btoc)	Water Elevation (feet NGVD29)	Geochemical Parameters								2-Party COC[3] (µg/L)	ROD COC[4] (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)	DRO	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE
ROD CLEANUP LEVELS (3-Party Site) / ADEC CLEANUP LEVEL[1]															**1,500**	**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	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.075)	ND (0.5)	ND (0.5)
		18FWOU219WG	8/17/2018	452.82	10.770	442.05	-136.9	0.390	7.04	0.565	25.4	9.4	NA	NA	NA	ND (0.2)	ND (0.5)	1.2	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 (0.2)	3.3	**6.6**	ND (0.075)	ND (0.5)	0.55 J
AP-10446MW		18FWOU218WG	8/17/2018	455.46	11.47	443.99	-121.2	0.61	7.2	0.436	3.8	27.9	NA	NA	NA	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.075)	ND (0.5)	0.31 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 (0.2)	ND (0.5)	ND (0.5)	ND (0.075)	ND (0.5)	ND (0.5)
AP-10445MW		18FWOU217WG	8/17/2018	456.14	12.31	443.83	14.9	0.93	6.7	0.767	0.9	31.1	NA	NA	**1,670**	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 ADEC groundwater cleanup levels (from Table C of 18 AAC 75.345) are in bold type and yellow highlighting.

[1] 18 AAC 75.345, Table C values (ADEC, 2018)

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

[3] 2-Party COCs are compared to ADEC cleanup levels

[4] ROD COCs are compared to ROD RAGs

Acronyms / Abbreviations

btoc - below top of casing
COC - contaminants of concern
DCE - dichloroethene
DRO - diesel range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mS/cm - milliSiemens per centimeter
mV - millivolts
NA - not analyzed or not applicable
NGVD29 - North American Vertical Datum of 1929
NM - not measured
ORP - oxidation-reduction potential
PCE - tetrachloroethene
ROD - Record of Decision
TCE - trichloroethene

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses)
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).

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	4,320	2.8	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
AUG 18	3,670	1.9	2.3	NA	443.66

AP–7559 (16, 6-16)

	DRO	PCE	TCE	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 (395)	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 03	112	4.49	0.41	444.33
MAY 04	146	4.59	0.5	443.87
SEP 04	180	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	443.40
AUG 18	NA	3.5	0.49	443.87

AP–10018R* **(AP–10018)** (17, 7-17)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	WATER ELEVATIONS
MAY 09	NA	ND(1)	1.4	0.23	ND(1)	443.03
SEPT 09	4,100*	0.18	26	2	0.41	443.05
NOV 09	NA	0.20	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	443.23
AUG 18	NA	ND(0.2)	1.1	0.34	2.6	443.86

AP–8914R (16.5, 6.5-16.5)

	DRO	PCE	TCE	CIS 1,2 DCE	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	290	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	NA	36	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	443.30
AUG 18	NA	0.55	1.9	7.8	443.81

AP–10017R* **(AP–10017)** (17, 7-17)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	WATER ELEVATIONS
MAY 09	NA	ND(1)	ND(1)	ND(1)	0.11	443.04
SEPT 09	570	0.060	0.51	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	0.050	0.59	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	443.40
AUG 18	NA	ND(0.2)	1.1	ND(0.5)	0.63	444.31

AP–10015R* **(AP–10015)** (18, 8-18)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	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	0.11	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)	ND(0.62)	ND(0.62)	443.16
OCT 14	947	ND(0.2)	6.3	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	443.79
AUG 18	NA	ND(0.2)	2.3	0.79	1.0	443.84

AP–10016R* **(AP–10016)** (17, 7-17)

	DRO	BENZENE	PCE	TCE	CIS 1,2 DCE	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	0.090	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	2.0	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	0.91	444.14
AUG 17	NA	ND(0.2)	5.2	1.6	0.50	443.17
AUG 18	NA	ND(0.2)	5.8	0.45	ND(0.5)	443.87

PROBE B (18.7, 7-15)

	DRO	PCE	TCE	BENZENE	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	NM	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)	443.20

AP–10445MW* (17.4, 7.4-17.4)

	DRO	PCE	TCE	BENZENE	WATER ELEVATIONS
AUG 18	1,670	ND(0.5)	ND(0.5)	ND(0.2)	444.07

AP–10446MW* (17.5, 7.5-17.5)

	DRO	PCE	TCE	BENZENE	WATER ELEVATIONS
AUG 18	NA	ND(0.5)	ND(0.5)	ND(0.2)	443.99

POS (14.25, NI)

	DRO	PCE	TCE	BENZENE	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	310	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	157	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)	

AP–8916 (15, 5-15)

	DRO	PCE	TCE	BENZENE	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 (5)	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	442.99
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	6.7	ND(0.5)	ND(0.2)	442.10
AUG 15	499	1.4	ND(0.5)	ND(0.2)	441.97
SEPT 16	440	5.8	3.0	0.13	442.52
AUG 17	410	ND(0.5)	ND(0.5)	ND(0.2)	441.61
AUG 18	NA	1.3	ND(0.5)	ND(0.2)	442.05

WATER SUPPLY WELL (100+, NI)

	DRO	BENZENE
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)
JUNE 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)
MAY 14	NO SAMPLE DUE TO MAINTENANCE	
MAY 15	ND(300)	ND (0.2)
JULY 16	ND(319)	ND (0.2)
MAY 17	ND(324)	ND (0.2)
JUNE 18	206	ND (0.2)

ROD RAG (µg/L)

5.0	BENZENE
5.0	PCE
5.0	TCE
70	CIS 1,2 DCE

ADEC CLEANUP LEVELS µg/L

BENZENE	4.6
PCE	41
TCE	2.8
CIS 1, 2DCE	36
DRO	1,500

ONLY ROD COCS THAT HAVE HISTORICALLY EXCEEDED REMEDIAL GOALS OR NON-ROD ANALYTES WHICH EXCEEDED ADEC CLEANUP LEVELS IN 2018 ARE SHOWN.

LEGEND:

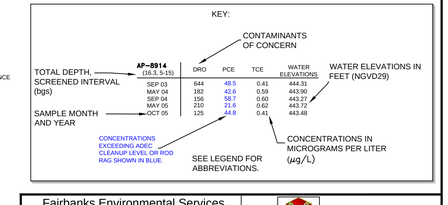
- AP-8914R — 3-PARTY GROUNDWATER SAMPLING LOCATION
- WATER SUPPLY WELL LOCATION
- DECOMMISSIONED GROUNDWATER PROBE
- APPROXIMATE 2018 DRO PLUME
- APPROXIMATE 2018 PCE PLUME
- FENCE

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 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, 2018).
12. * REPLACEMENT WELLS WERE INSTALLED IN JUNE 2018. RESULTS FROM JUNE 2018 AND AFTER ARE FROM SAMPLES COLLECTED FROM REPLACEMENT WELLS. ALL OTHER RESULTS ARE FROM THE GROUNDWATER PROBEWELL SHOWN IN PARENTHESES.

KEY:



AP–8914 (16.3, 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

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3538 International Street
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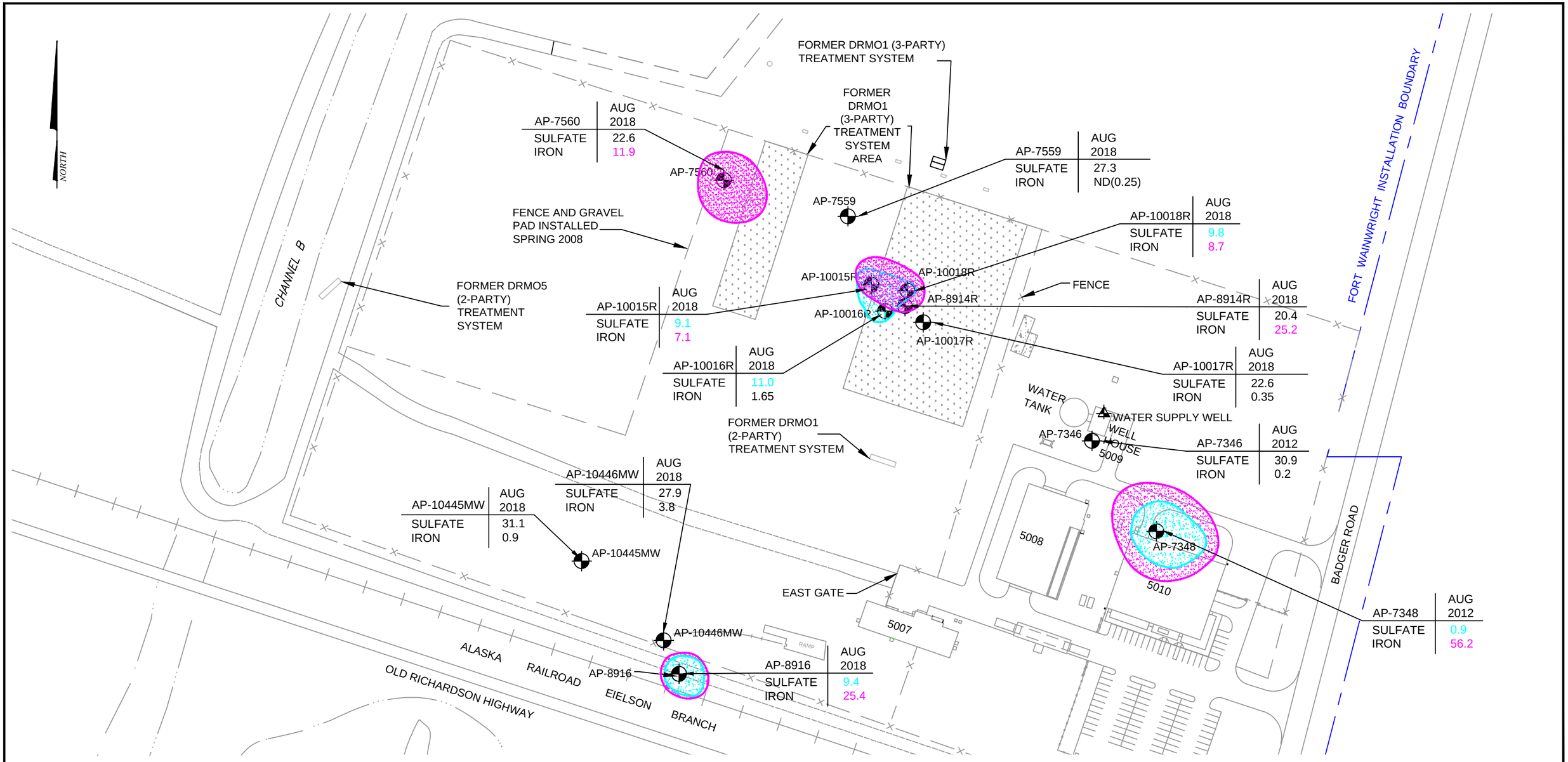
Contaminants of Concern Detected in DRMO Yard 3-Party Site Groundwater Samples

2018 Monitoring Report
Operable Unit 2
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 3-1 | Date: 6/19



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
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

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3538 International Street
Fairbanks, Alaska

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Approximate Regions of Reduced Groundwater Geochemistry

2018 Monitoring Report
Operable Unit 2
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 3-2 | Date: 6/19

FIGURE 3-2

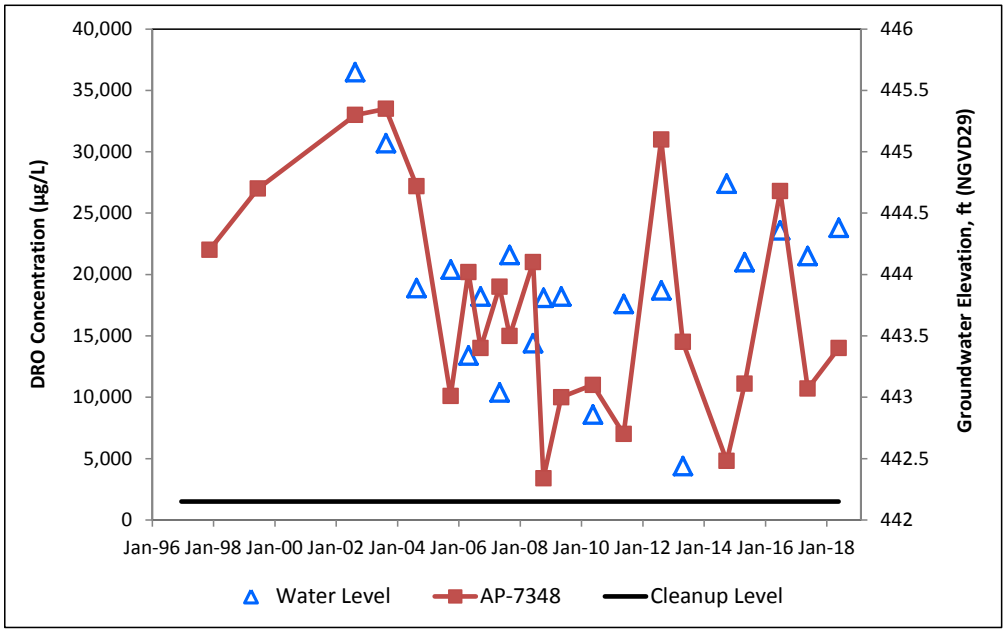
4.0 DRMO YARD GROUNDWATER MONITORING RESULTS (2-PARTY)

This section presents the groundwater monitoring results for the DRMO Yard 2-Party site from the 2018 sampling event. Groundwater samples are collected on an annual basis from Building 5010 and the WSW near Building 5010. Groundwater samples are collected on a five-year frequency from the DRMO1 and DRMO5 2-Party sites, with the next sampling event scheduled for 2019. The results from the 2018 sampling event are presented in Table 4-1 and Figure 4-1, 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, 2018), 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 June 2018 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; 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 in 2018 based on 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 2018 groundwater samples in AP-7348, including benzene, toluene, ethylbenzene, xylenes, and 1,3,5-trimethylbenzne; but no other exceedances were observed.

DRO was detected at trace concentrations (233 µg/L) in AP-7346, which is located approximately 150 feet downgradient of AP-7348. The 2018 concentration was similar to the concentrations observed in recent sampling events. 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 2018, 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	Relative Location	Contaminant of Concern
			DRO
Building 5010	AP-7346	Downgradient	**Decreasing**
	AP-7348	Source Area	**Decreasing**

BOLD indicates DRO concentration above cleanup level for the period of analysis (1997-2018).

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.

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 June 2018, and the samples were analyzed for GRO, DRO, VOCs, and semivolatile organic compounds (SVOCs). Complete results are shown in Table B-2, and although various low-level detections of various contaminants were observed, ADEC cleanup levels have never been exceeded for DRO or any other COC in the WSW since sampling began in 1998.

4.4 Recommendations for DRMO 2-Party Sites

4.4.1 Building 5010 Subarea

Groundwater sampling at the Building 5010 (former Building 5001) subarea should continue on an annual basis to evaluate contaminant concentration changes over time.

4.4.2 Water Supply Well

Samples should continue to be collected from the WSW on an annual basis, with the sample analyzed for GRO, DRO, VOCs, and SVOCs. The next sample should be collected in spring 2019 along with the Building 5010 samples.

4.4.3 DRMO1 and DRMO5 2-Party Sites

Groundwater samples were not collected from the DRMO1 or DRMO5 2-Party sites in 2018. The next scheduled sampling event for these wells is 2019, in advance of the 2021 Five Year Review.

Table 4-1. 2013 - 2018 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)	DRO	1,2,4-Trimethylbenzene	Naphthalene	Benzene
ADEC CLEANUP LEVELS[1]							**1,500**	**56**	**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)
		18FWOU206WG	6/4/2018	444.18	27.3	2.3	217 J,B	ND (0.5)	ND (0.5)	ND(0.2)
		18FWOU207WG[2]					233 J,B	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
		18FWOU208WG	6/4/2018	444.38	-90.6	0.93	**14,000**	**72.6**	**67**	0.42

Notes

Analytes exceeding ADEC groundwater cleanup levels (from Table C of 18 AAC 75.345) are in bold type and yellow highlighting.

[1] 18 AAC 75.345, Table C values (ADEC, 2018)

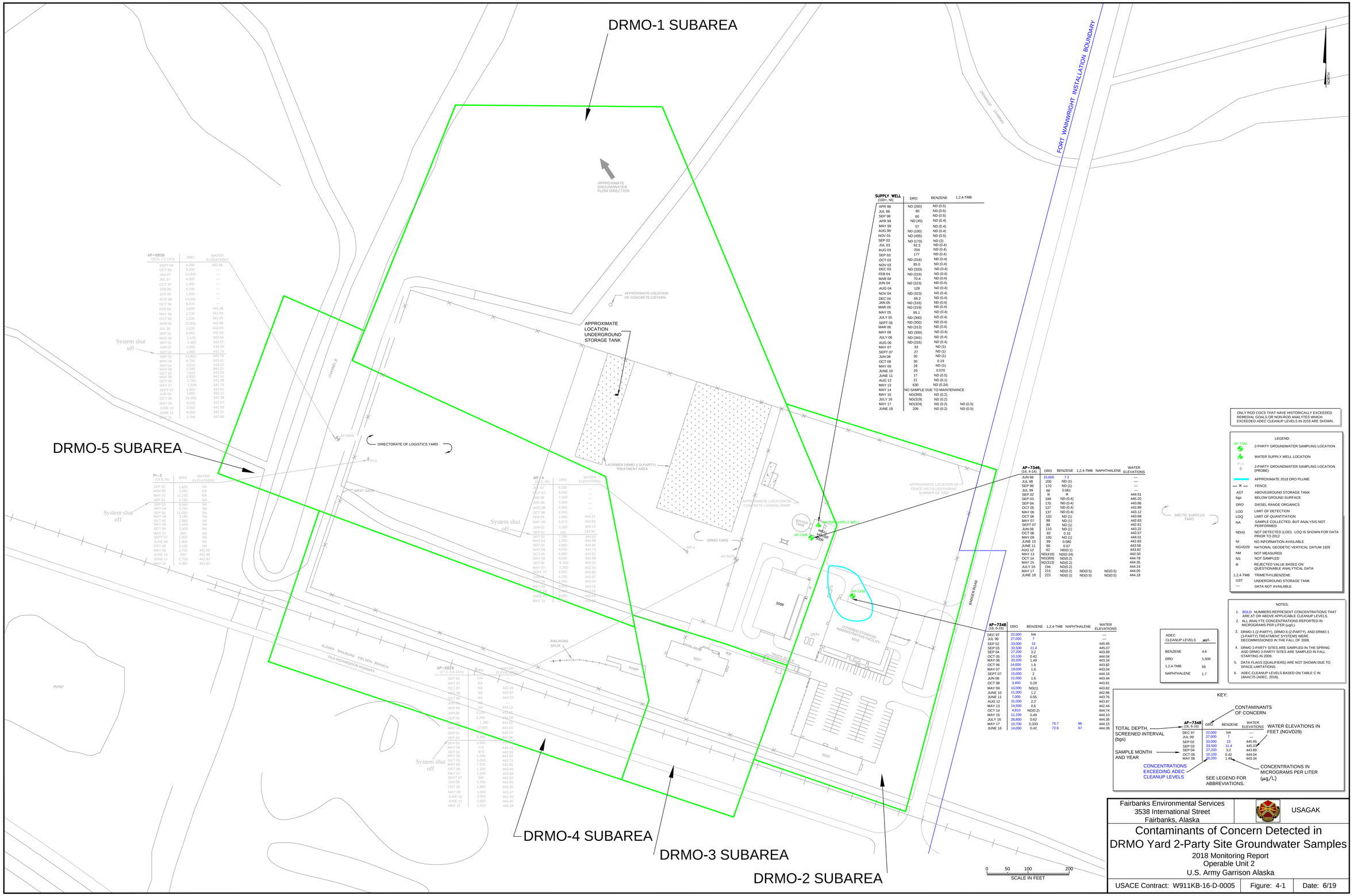
[2] Sample is a Field Duplicate of the sample immediately above.

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).

Acronyms/Abbreviations

DCE - dichloroethene
DRO - diesel range organics
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
ORP - oxidation-reduction potential



AP-6806 (20.5, 2.0-14.5)

	DRO	WATER ELEVATIONS
SEPT 94	4,200	443.48
OCT 96	9,200	—
JAN 97	14,000	—
JUL 97	4,300	—
OCT 97	1,900	—
JAN 98	8,100	—
JUN 98	1,500	—
AUG 98	14,000	—
OCT 98	8,470	—
FEB 99	3,690	441.36
MAY 99	2,730	441.63
OCT 99	1,530	441.95
APR 00	12,800	441.85
JUL 00	1,830	442.65
SEP 00	6,860	442.89
NOV 00	2,100	442.69
SEP 01	2,460	442.07
JUN 02	2,000	439.99
SEP 02	1,900	442.79
SEP 03	14,800	443.78
MAY 04	6,750	443.41
SEP 04	3,910	443.22
MAY 05	2,340	443.21
OCT 05	7,010	442.64
MAY 06	8,950	443.10
OCT 06	2,700	442.48
MAY 07	1,500	441.79
SEPT 07	1,900	442.61
JUN 08	3,900	442.12
OCT 08	16,000	442.38
MAY 09	8,200	442.57
JUNE 10	2,000	441.59
JUNE 11	9,300	442.51
MAY 12	2,700	442.68

PI-3 (19.9, NI)

	DRO	WATER ELEVATIONS
SEP 00	1,920	NA
NOV 00	2,680	NA
MAY 01	12,100	NA
SEP 01	2,700	NA
SEP 03	3,940	NA
MAY 04	3,700	NA
SEP 04	11,000	NA
MAY 05	3,180	NA
OCT 05	2,990	NA
MAY 06	1,440	NA
OCT 06	1,500	NA
MAY 07	860	NA
SEPT 07	1,500	NA
JUNE 08	1,900	NA
OCT 08	3,100	NA
MAY 09	2,700	442.55
JUNE 10	690	441.90
JUNE 11	2,700	442.83
MAY 15	4,090	442.83

MP-4 (14.1, NI)

	DRO	WATER ELEVATIONS
JUL 97	9,200	—
OCT 97	5,000	—
JAN 98	7,200	—
JUN 98	5,500	—
AUG 98	4,900	—
OCT 98	2,450	—
FEB 99	2,690	442.21
MAY 99	5,570	442.65
JUN 02	3,200	444.15
SEP 02	200	444.50
SEP 03	7,780	444.85
MAY 04	1,300	444.08
SEP 04	4,860	443.46
MAY 05	4,550	443.73
OCT 05	5,850	443.62
MAY 06	3,050	442.89
SEP 06	6,200	443.35
MAY 07	2,300	442.56
SEPT 07	3,600	443.60
JUN 08	4,200	442.97
OCT 08	6,200	443.26
MAY 09	5,300	443.26
JUNE 10	2,000	442.29
JUNE 11	6,000	443.08
MAY 15	4,600	443.08

AP-5825 (17.2, 4.5-14.5)

	DRO	WATER ELEVATIONS
SEP 94	670	—
MAY 97	NA	—
OCT 97	NA	443.20
MAY 98	NA	442.87
OCT 98	NA	443.33
JUN 99	NA	—
SEP 99	NA	443.13
JUN 00	1,100	443.66
SEP 00	2,250	443.34
MAY 01	1,380	443.65
MAY 03	12,900	443.45
SEP 01	430	443.74
SEP 02	5,900	443.90
SEP 03	2,340	444.05
MAY 04	779	444.19
SEP 04	870	443.55
MAY 05	1,200	443.83
OCT 05	1,050	443.72
MAY 06	7,370	442.95
OCT 06	1,100	443.46
MAY 07	1,200	442.68
SEPT 07	560	443.92
JUN 08	2,700	443.09
OCT 08	1,900	443.35
MAY 09	1,000	443.47
JUNE 10	3,900	442.50
JUNE 11	1,600	443.40
MAY 15	1,010	445.19

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)		
MAY 14	NO SAMPLE DUE TO MAINTENANCE			
MAY 15	ND(300)	ND (0.2)		
JULY 16	ND(319)	ND (0.2)		
MAY 17	ND(324)	ND (0.2)		ND (0.5)
JUNE 18	206	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
JUNE 18	223	ND(0.2)	ND(0.5)	ND(0.5)	444.18

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
JUNE 18	14,000	0.42	72.6	67	444.38

ONLY RDD COCS THAT HAVE HISTORICALLY EXCEEDED REMEDIAL GOALS OR NON-RDD ANALYTES WHICH EXCEEDED ADEC CLEANUP LEVELS IN 2018 ARE SHOWN.

LEGEND:

- AP-7348 — 2-PARTY GROUNDWATER SAMPLING LOCATION
- WATER SUPPLY WELL LOCATION
- PI-3 — 2-PARTY GROUNDWATER SAMPLING LOCATION (PROBE)
- APPROXIMATE 2018 DRO PLUME
- 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

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, 2018).

ADEC CLEANUP LEVELS	µg/L
BENZENE	4.6
DRO	1,500
1,2,4-TMB	56
NAPHTHALENE	1.7

KEY:

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

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

2018 Monitoring Report
Operable Unit 2
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 4-1 | Date: 6/19

5.0 FORMER BUILDING 1168 GROUNDWATER MONITORING RESULTS

This section presents the 2018 sampling results from the former Building 1168 3-Party site. Groundwater sampling was conducted in June 2018, 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 2018 are summarized on Table 5-1. Table 5-1 shows that groundwater elevations were approximately 1 foot higher in June 2018 than May 2017, and Figure 5-1 shows that the 2018 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 June 2018 to monitor contaminant concentration and groundwater geochemistry changes over time. Groundwater samples were analyzed for DRO, VOCs, and natural attenuation parameters (total [field-filtered] iron and sulfate).

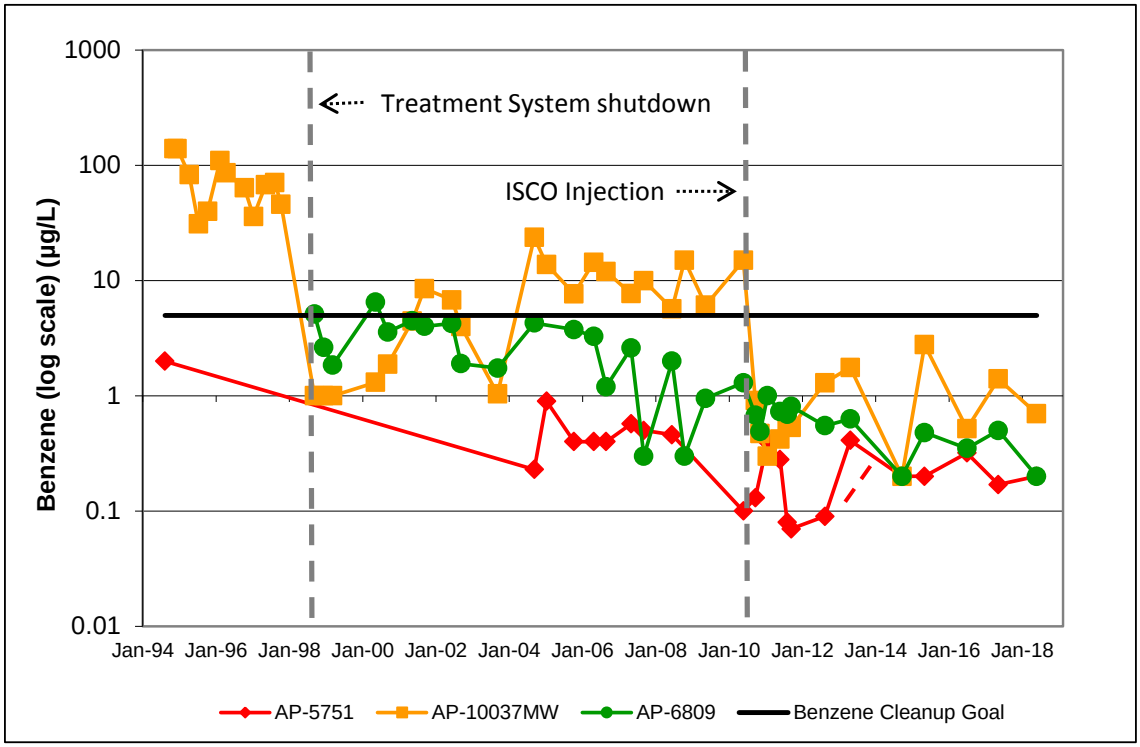
5.2.1 Groundwater Geochemistry Evaluation

Geochemical parameters in groundwater were measured at the former Building 1168 site to evaluate the potential mechanisms of biodegradation. The groundwater geochemistry parameters in AP-10037MW measured in 2018 showed DO concentrations less than 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 also had DO concentrations less than 1 mg/L, but iron and sulfate concentrations did not indicate reducing conditions. The groundwater geochemistry in upgradient well AP-5751 was characterized by oxidizing conditions, with dissolved oxygen near 3 mg/L, ORP greater than 0 mV, low dissolved iron, and sulfate at background concentrations.

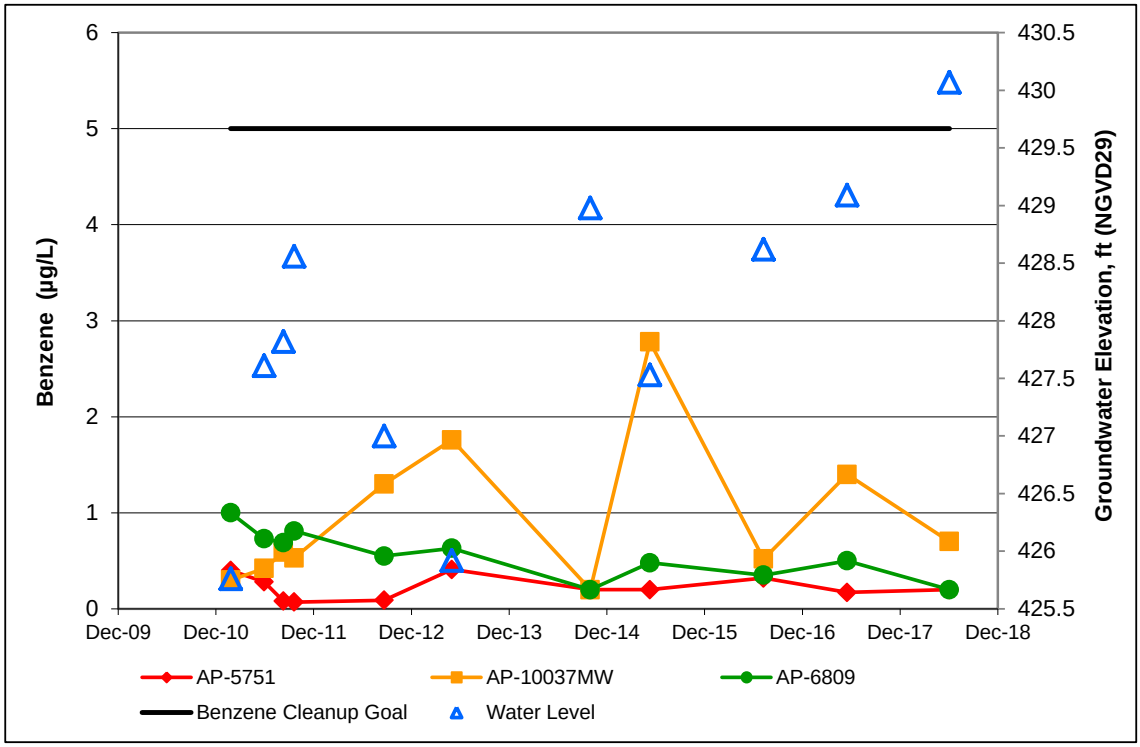
5.2.2 Benzene Groundwater Concentrations

Benzene was below the RAG in all wells sampled at the former Building 1168 3-Party site during June 2018. This was the 12th 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

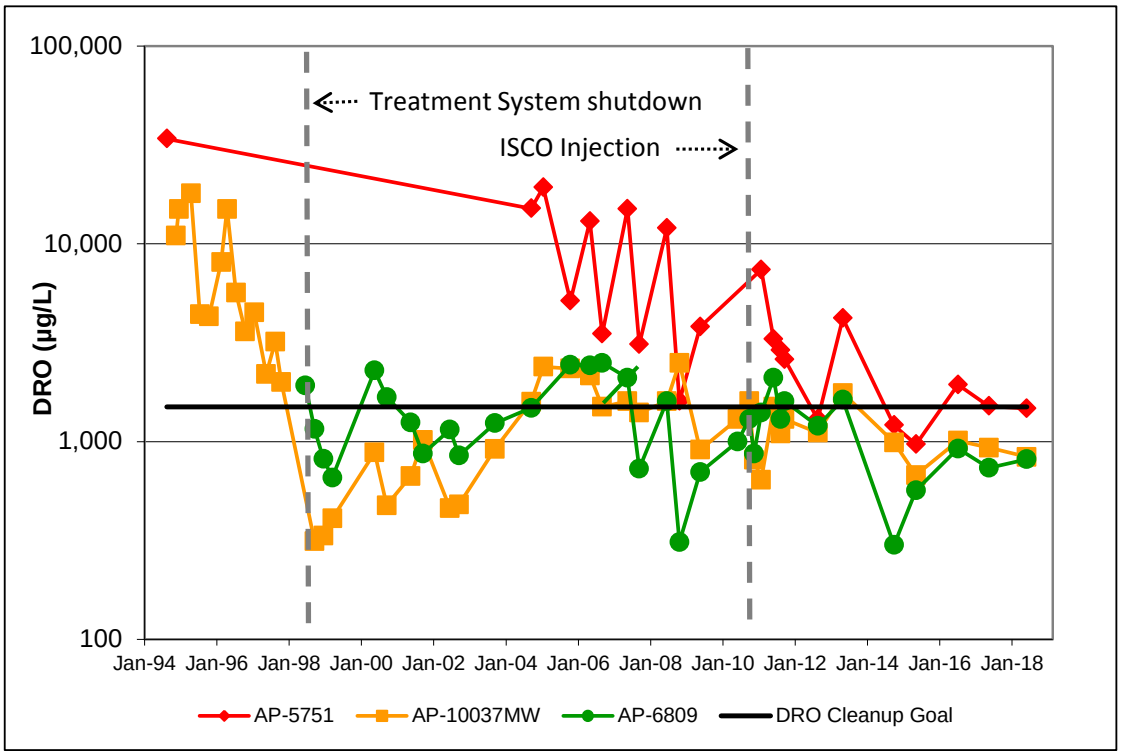
The benzene concentrations and groundwater elevations (measured in AP-6809) following the ISCO injection are shown in Graph 5-2. The graph shows benzene concentrations in AP-10037MW (the well where the injection was focused which exhibited the highest benzene concentrations) are generally inversely related 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 upgradient well AP-5751 was below the cleanup level in 2018 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

5.3 Comparison of 2018 Sampling Results to Current ADEC Cleanup Levels

The 2018 groundwater contaminant concentrations were compared to the current ADEC cleanup levels (18 AAC 75.345, Table C) 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. The results showed there were no exceedances of non-ROD COCs. The ROD COCs were also compared to current ADEC cleanup levels for informational purposes, as shown in Table 5-2. 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 5-2. OU2 Former Building 1168 3-Party Site ROD COC Summary

Contaminant	ROD RAG (µg/L)	Current ADEC Cleanup Level (µg/L)[1]	2018 ADEC Cleanup Level Exceedance	2018 Maximum Concentration (Well ID)
Benzene	5	4.6	None	0.7 (AP-10037MW)
TCE	5	2.8	None	ND
Vinyl Chloride	2	0.19	None	ND
1,1-DCE	7	280	None	ND
1,2-DCE	70	36	None	ND

[1] Table C, 18 AAC 75.345 (ADEC, 2018)
ND = Not Detected

5.4 Interim Remedial Action Completion Report (IRACR)

The IRACR was completed for the Former Building 1168 Leach Well site in 2018, and documented that the remedy was constructed and operated successfully in accordance with the RAOs described in the ROD (FES, 2018c). Long-term monitoring results have demonstrated that the COCs regulated under CERCLA have achieved RAGs, and the only contaminants remaining in groundwater are petroleum-related. The IRACR recommended moving the Former Bldg 1168 site from the 3-Party program to the 2-Party program. Both ADEC and EPA have approved the document and this recommendation. Copies of the concurrence letters are included in Appendix F.

Groundwater monitoring and reporting will continue until the ADEC groundwater cleanup levels are achieved.

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

The results from the 2018 groundwater sampling show that ROD COCs remain below the RAGs, and all non-ROD COCs were less than the current ADEC cleanup levels. The site was removed from the 3-Party Program based on signature of the IRACR in 2018, and future sampling and reporting will be conducted as part of the 2-Party Program.

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.

Table 5-1. 2013 - 2018 Groundwater Sample Results
Former Building 1168

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	Geochemical Parameters						2-Party COC[4] (µg/L)			ROD COC[5] (µg/L)					
					ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	GRO	DRO	Naphthalene	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE
ROD CLEANUP LEVELS / ADEC CLEANUP LEVEL[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)
		18FWOU204WG	6/3/2018	430.21	113.1	2.9	6.67	0.881	ND(0.25)	29.2	NA	1,470	1.7	ND(0.2)	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)
		18FWOU202WG	6/3/2018	430.20	-70.0	0.6	6.86	0.741	20.9	17.6	NA	663	ND (0.5)	0.7	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
		18FWOU203WG[2]							22	17.8	NA	836	ND (0.5)	0.6	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)
		18FWOU201WG	6/3/2018	430.07	71.90	0.86	6.65	1.041	0.57	60.1	NA	815	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 ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and yellow highlighting.

[1] ADEC Cleanup level from 18 AAC 75.345 (ADEC, 2018)

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

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

[4] 2-Party COCs are compared to ADEC cleanup levels

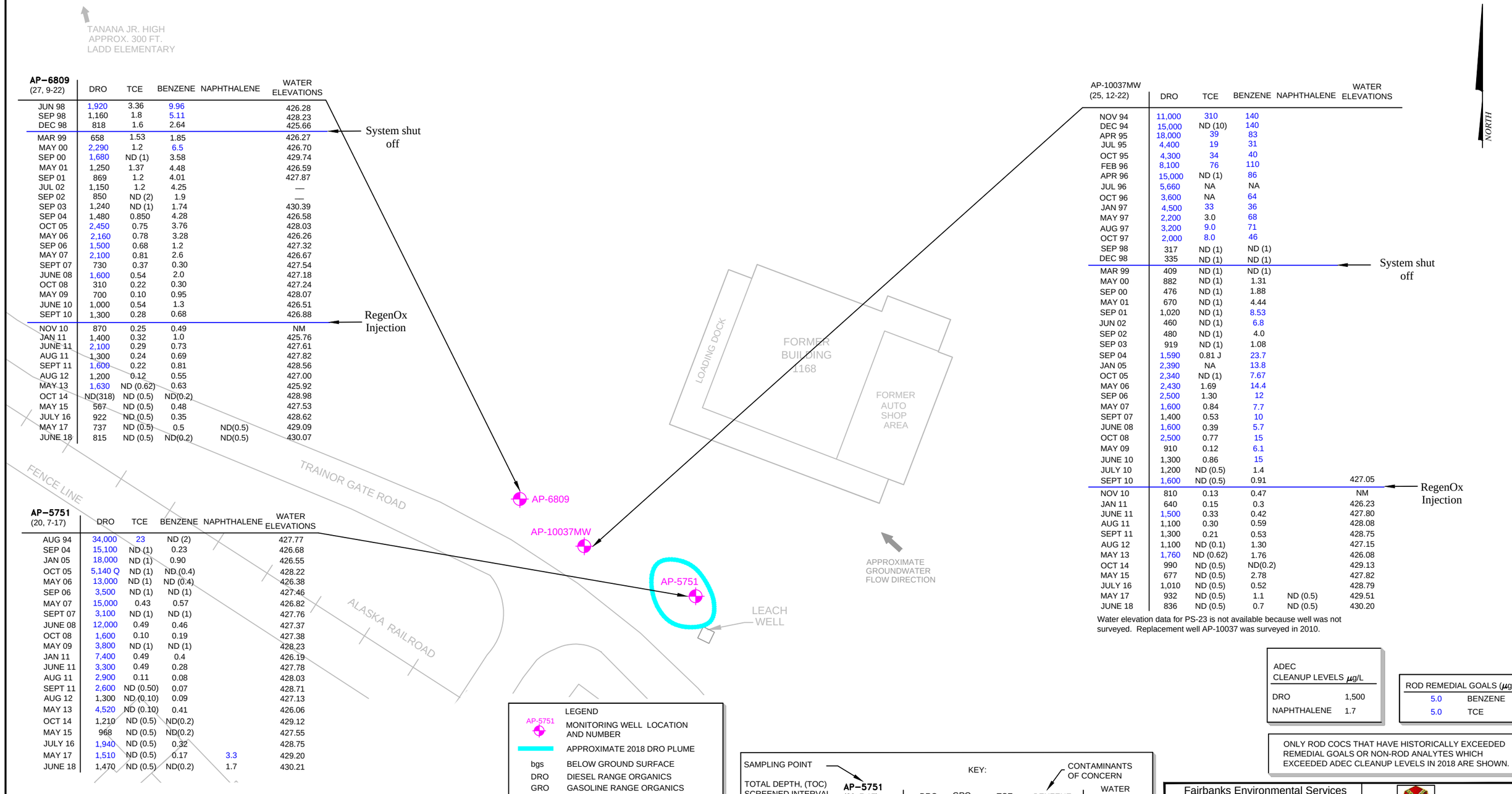
[5] ROD COCs are compared to ROD RAGs

Acronyms/Abbreviations

COC - contaminant of concern
DCE - dichloroethene
DRO - diesel range organics
GRO - gasoline range organics
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
ORP - oxidation-reduction potential
PCE - tetrachloroethene
ROD - Record of Decision
TCE - trichloroethene

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).



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
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
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
JUNE 18	815	ND (0.5)	ND(0.2)	ND(0.5)	430.07

System shut off

RegenOx Injection

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
JUNE 18	1,470	ND (0.5)	ND(0.2)	1.7	430.21

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)		
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
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
JUNE 18	836	ND (0.5)	0.7	ND (0.5)	430.20

System shut off

RegenOx Injection

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, 2018).

LEGEND

AP-5751 — MONITORING WELL LOCATION AND NUMBER

APPROXIMATE 2018 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

	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 2018 ARE SHOWN.

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Former Building 1168 Groundwater Monitoring Results

2018 Monitoring Report
Operable Unit 2
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 5-1 | Date: 1/19

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 # 18-085

Prepared: November 14, 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

Digitally signed by Vanessa Ritchie
DN: cn=Vanessa Ritchie, o=FES, ou, email=vritchie@fesalaska.com, c=US
Date: 2019.06.25 09:12:16 -08'00'

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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
CCV	continuing calibration verification
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
DRMO	Defense Reutilization Marketing Office
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
FES	Fairbanks Environmental Services, Inc
GRO	gasoline range organics
ICV	internal calibration verification
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
MS	matrix spike sample
MSD	matrix spike duplicate sample
NA	not applicable
ND	non-detect result
NPDL	North Pacific Division Laboratory
OU2	Operable Unit 2
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
R	analytical result is rejected and is not suitable for project use
ROD	Record of Decision
RPD	relative percent difference
SDG	sample data group

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

SGS	SGS North America, Inc.
SVOC	semi-volatile organic compound
UFP-QAPP	Postwide Uniform Federal Policy Quality Assurance Project Plans
USACE	United States Army Corps of Engineers
VOC	volatile organic compound
WSW	Water Supply Well

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 2018. The groundwater events are summarized in Section 1.3. Groundwater sample tracking and analytical results tables are presented in Appendix B.

Fairbanks Environmental Services, Inc (FES) reviewed project and quality control (QC) analytical data to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the Final 2018 Postwide Work Plan (FES, 2018); 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, 2017b); 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, 2018), 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	50 µg/L	60-120	20	90
Diesel Range Organics (DRO)	SW3520C	AK102	300 µg/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			0.075 µg/L	58-137	20	90
Remaining Volatile Organic Compounds (VOCs)			Analyte Specific[1]	Analyte Specific[1]	20	90
Semivolatile Organic Compounds (SVOCs)	SW3520C	SW8270D	Analyte Specific[1]	Analyte Specific[1]	20	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
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) 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 2018: 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 (with the exception noted in Section 2.2), and three equipment blank samples were collected to assess the potential for cross-contamination of the submersible pump (one from each site). 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. The laboratory is validated by the State of Alaska through the Contaminated Sites Program for all methods employed, with the exception of sulfate by United States Environmental Protection Agency (EPA) Method 300.0 (method 300.0 is not listed as a Contaminated Sites analysis). In addition, the laboratory is Environmental Laboratory Accreditation Program (ELAP) certified for all methods. 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 1182676, 1182701, and 1184633. 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, per the UFP-QAPP, with the exception of the well bulleted below. 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, 2017a) 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. Additional noteworthy observations are listed below.

- The Water Supply Well (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.
- All water levels were within the screened interval during sample collection, with the exception of AP-7560. The water level was measured to be slightly above (0.35 feet) the 10-foot well screen. Impact to the project is negligible as measurable free product has not been previously observed in this well and the pump intake was placed within the screen interval to obtain a sample representative of the aquifer.
- No free product was measured during sampling activities. Sheen was observed on purge water from two wells (AP-7560 and AP-8916) and odor was observed on purge water from five wells (AP-7348, AP-7560, AP-8916, AP-10015R, and AP-10016R).

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]). The following discrepancy was noted upon receipt at the laboratory.

- The trip blank listed on the COC was inadvertently not included in the shipment. Impact to the project is negligible as detections in historic trip blank samples associated with this site have been at trace concentrations (if detected). Moreover, there were no detections in the equipment blank sample included in this shipment. Had travel/storage cross-contamination been a significant probability, analytes would have been detected in the equipment blank sample.

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. No method blank contamination was noted.

Trip Blanks

Trip blank samples were shipped in every cooler containing samples for volatile analyses, with the exception noted in Section 2.2. The analyte listed below was detected in a trip blank sample and was also detected in associated project samples at a concentration less than five-times that of the trip blank. Consequently, these result was qualified (B) as potential travel/storage cross-contamination. Impact to the project is negligible as the affected result is a minimum of two orders of magnitude below the ADEC cleanup level.

- Toluene: 18FWOU208WG (report 1182676)

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 18FWOU2EB01WQ, 18FWOU2EB02WQ, and 18FWOU2EB03WQ were compared against results of associated project samples collected at the DRMO Two Party, Former Building 1168, 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. Affected project data are listed below. Equipment blanks are further discussed in associated ADEC Checklists.

- DRO: 18FWOU205WG through 18FWOU207WG (report 1182676)

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. No LCS and/or LCSD accuracy or precision discrepancies requiring qualifications were noted.

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: XXX39644 (report 1182676)
- VOC: VXX32377 (report 1182676)

Although potential sample matrix interference cannot be examined in the above listed QC batches, 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. All surrogate recoveries were recovered within acceptance limits and no data qualification was required.

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. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. If both results of the field duplicate pair were less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the UFP-QAPP.

All (applicable) results for the three field duplicate sample pairs were within the ADEC criterion of ≤30% and, therefore, are considered comparable.

Table A-3. Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Units	Primary 18FWOU206WG[1] (AP-7346)	Field Duplicate 18FWOU207WG[1] (AP-7346)	RPD %	Comparable Criteria Met? [4]
Diesel Range Organics	AK102	µg/L	217 [324] J	233 [315] J	7	Not Applicable
1,1-Dichloroethene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dichloroethane	SW8260C	µg/L	0.22 [0.25] J	0.22 [0.25] J	0	Not Applicable
Benzene	SW8260C	µg/L	ND [0.2]	ND [0.2]	0	Not Applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	0.37 [0.5] J	0.33 [0.5] J	11	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	0.32 [0.5] J	0.31 [0.5] J	3	Not Applicable
Vinyl chloride	SW8260C	µg/L	ND [0.075]	ND [0.075]	0	Not Applicable
Analyte	**Method**	**Units**	**Primary 18FWOU202WG[2] (AP-10037MW)**	**Field Duplicate 18FWOU203WG[2] (AP-10037MW)**	**RPD %**	**Comparable Criteria Met? [4]**
Diesel Range Organics	AK102	µg/L	663 [302]	836 [313]	23.1	Yes
Sulfate	E300.0	µg/L	17600 [500]	17800 [500]	1.1	Yes
Iron	SW6020A	µg/L	20900 [250]	22000 [250]	5.1	Yes
1,1-Dichloroethene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Benzene	SW8260C	µg/L	0.68 [0.2]	0.64 [0.2]	6.1	Yes
cis-1,2-Dichloroethene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Isopropylbenzene	SW8260C	µg/L	6.24 [0.5]	6.24 [0.5]	0	Yes
sec-Butylbenzene	SW8260C	µg/L	1.46 [0.5]	1.46 [0.5]	0	Yes
tert-Butylbenzene	SW8260C	µg/L	0.33 [0.5] J	0.32 [0.5] J	0.03	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Vinyl chloride	SW8260C	µg/L	ND [0.075]	ND [0.075]	3.1	Not Applicable

Table A-3. Groundwater Field Duplicate Sample Results Evaluation (continued)

Analyte	Method	Units	Primary 18FWOU210WG[3] (AP-7560)	Field Duplicate 18FWOU211WG[3] (AP-7560)	RPD %	Comparable Criteria Met?[4]
Diesel Range Organics	AK102	µg/L	3,040 [315]	3,670 [332]	3	Yes
Sulfate	E300.0	µg/L	22400 [500]	22600 [500]	2	Yes
Iron	SW6020A	µg/L	11900 [250]	10800 [250]	5	Yes
1,1-Dichloroethene	SW8260C	µg/L	ND [0.500]	ND [0.500]	4	Not Applicable
Benzene	SW8260C	µg/L	ND [0.200]	ND [0.200]	0	Yes
cis-1,2-Dichloroethene	SW8260C	µg/L	0.88 [0.500] J	0.87 [0.500] J	1	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	1.79 [0.500]	1.85 [0.500]	3	Yes
trans-1,2-Dichloroethene	SW8260C	µg/L	1.11 [0.500]	1.08 [0.500]	3	Yes
Trichloroethene (TCE)	SW8260C	µg/L	2.28 [0.500]	2.21 [0.500]	3	Not Applicable
Vinyl chloride	SW8260C	µg/L	ND [0.0750]	ND [0.0750]	0	Not Applicable

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 1182676.
[2] – The samples are associated with report 1182701.
[3] – The samples are associated with report 1184633.
[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; however, no discrepancies required data qualification. Discrepancies that did not result in data qualification are discussed in the associated ADEC Laboratory Data Review Checklists.

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 ROD remedial goal or ADEC cleanup level for non-detect results, as appropriate. 1,2,3-Trichloropropane in all samples analyzed by 8260C, and several SVOC analytes in the WSW sample analyzed by 8270C, 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 the analytes are not OU2 contaminants of concern. Moreover, the data obtained

from the WSW sample associated with this sampling program are 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 2018 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
1182676	18FWOU208WG	Toluene	B	Trip blank contamination
	18FWOU205WG 18FWOU206WG 18FWOU207WG	DRO		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 14 different data quality categories during the review process. A maximum of 10 points was awarded for each category; points were based on the number of samples successfully meeting data quality objectives for that category. Points were subtracted when failure to meet DQOs resulted in data qualification or data rejection. The scores were then summed to determine the total points for a method, and completeness scores were determined as follows: (total points received)/(total points possible) x 100.

A breakdown of the points received for each category and method is shown in Table 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 2018 OU2 Annual Monitoring Report.

Table A-5. Completeness Scores for Groundwater Samples

Data Quality Category	Points GRO	Points DRO	Points VOC	Points SVOC	Points Fe	Points Sulfate
Sample Collection	10	10	10	10	10	10
COC Documentation	10	10	10	10	10	10
Sample Containers/ Preservation	10	10	10	10	10	10
Cooler Temperature	10	10	10	10	10	10
Holding Times	10	10	10	10	10	10
Method Blanks	10	10	10	10	10	10
Trip Blanks	10	NA	9	NA	NA	NA
Equipment Blank	NA	8	10	NA	10	10
LCS/LCSD Recovery & RPD	10	10	10	10	10	10
MS/MSD Recovery & RPD	NR	10	10	NR	10	10
Surrogate Recovery	10	10	10	10	NA	NA
Field Duplicate	NR	10	10	NR	10	10
CCV, Internal Stds, other	10	10	10	10	10	10
Sensitivity (DL/LOD)	10	10	10	10	10	10
Total Points Received	110	128	139	99	120	120
Total Points Possible	110	130	140	100	120	120
Percent Completeness	100	98	99	99	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:

Vanessa Ritchie

Title:

Senior Chemist

Date:

08/06/2018

CS Report Name:

Fort Wainwright Operable Unit 2

Report Date:

06/29/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS North America Inc. – Anchorage, AK

Laboratory Report Number:

1182676

ADEC File Number:

108.38.069.01 (DRMO)

Hazard Identification Number:

1122 (DRMO)

1182676

1. Laboratory

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

   ☑ Yes ☐ No 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 Comments:

   Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   ☑ Yes ☐ No Comments:

   b. Correct Analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

No discrepancies were noted upon sample login.

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

The case narrative described LCS/LCSD RPD exceptions discussed in section 6b. The narrative also described CCV and instrument blank exceptions, which are discussed here.

The 8260C CCV in batch VMS17877 had recovery for hexachlorobutadiene above the upper control limit (131% vs. 120%). However, naphthalene was the only analyte reported for the sample associated with this batch. No data were impacted.

The instrument blank associated with AK102/103 batch XFC14310 had an RRO detection greater than the DL but less than one half the LOQ. However, no RRO data were reported for samples associated with this work order, so no data were impacted.

c. Were all corrective actions documented?

☒ Yes ☐ No Comments:

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

Comments:

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

1182676

5. Samples Results

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

☑ Yes ☐ No Comments:

b. All applicable holding times met?

☑ Yes ☐ No Comments:

c. All soils reported on a dry weight basis?

☐ Yes ☑ No Comments:

No soil samples were included in this work order.

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

☐ Yes ☑ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal or ADEC cleanup level for non-detect results, as appropriate. 1,2,3-Trichloropropane in all samples analyzed by 8260C, and several SVOC analytes in the Water Supply Well (WSW) sample analyzed by 8270C, 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 the analytes are not OU2 contaminants of concern. Moreover, the data obtained from the WSW sample associated with this sampling program are 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 table (Table B-2) presented in the Annual Monitoring Report.

e. Data quality or usability affected?

☐ Yes ☑ No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

☑ Yes ☐ No Comments:

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

☑ Yes ☐ No Comments:

No target analytes were detected in the method blank samples.

iii. If above LOQ, what samples are affected?

Comments:

Not applicable, target analytes were not detected in the method blank samples.

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

☐ Yes ☑ No Comments:

Not applicable, qualifications were not necessary.

v. Data quality or usability affected?

Comments:

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

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

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

☑ Yes ☐ No Comments:

No MS/MSD was reported in SVOC and VOC extraction batches XXX39644 and VXX32377, respectively. 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. The SVOC batch contained results for sample 18FWOU205WG (WSW) and the data obtained from this sampling program is for information purposes only. The WSW is also sampled by a different entity under the Drinking Water Program, during which all QC criteria are met. The VOC batch only contained naphthalene results for equipment blank sample 18FWOU2EB02WG. All results for environmental samples were analyzed in a separate batch containing an MS/MSD sample.

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

☐ Yes ☑ No Comments:

No metals/inorganics were submitted in this work order.

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

☑ Yes ☐ No Comments:

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

☐ Yes ☒ No Comments:

SVOC LCS/LCSD samples in extraction batch XXX39644 had an RPD above the control limit (20%) for benzoic acid (36%). This analyte was 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 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 Comments:

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

☒ Yes ☐ No Comments:

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

☐ Yes ☒ No Comments:

Not applicable. All surrogates were recovered within control limits.

iv. Data quality or usability affected?

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 Comments:

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

☑ Yes ☐ No Comments:

Trip blank sample 18FWOU2TB02WQ for VOC and GRO analyses was included in Cooler FES01.

iii. All results less than LOQ?

☑ Yes ☐ No Comments:

No trip blank results were above the LOQ; however; toluene (0.37µg/L) was detected in the trip blank sample at a concentration below the LOQ (1.00µg/L). Toluene was detected at a concentration less than five-times that of the trip blank in associated sample 18FWOU208WG. Consequently, the result was qualified (B) as potential travel/storage cross-contamination. Impact to the project is negligible as the affected result is more than three orders of magnitude below the ADEC cleanup level.

iv. If above LOQ, what samples are affected?

Comments:

Target analytes were not detected in the trip blank sample 18FWOU2TB02WQ.

v. Data quality or usability affected?

Comments:

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

e. Field Duplicate

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

☑ Yes ☐ No Comments:

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

ii. Submitted blind to lab?

☒ Yes ☐ No Comments:

Sample 18FWOU207WG was a field duplicate of 18FWOU206WG.

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 Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the table below. 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. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the Postwide UFP-QAPP.

All results for field duplicate sample pair 18FWOU206WG/18FWOU207WG were comparable (RPD ≤ 30%); however, all results were ND or less than the LOQ so the comparison criterion was not applicable.

Analyte	Method	Units	Primary 18FWOU206WG (AP-7346)	Field Duplicate 18FWOU207WG (AP-7346)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	mg/L	0.217 [0.324] J	0.233 [0.315] J	7	Not Applicable
1,1-Dichloroethene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
1,2-Dichloroethane	SW8260C	µg/L	0.22 [0.25] J	0.22 [0.25] J	0	Not Applicable
Benzene	SW8260C	µg/L	ND [0.2]	ND [0.2]	0	Not Applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	0.37 [0.5] J	0.33 [0.5] J	11	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	0.32 [0.5] J	0.31 [0.5] J	3	Not Applicable
Vinyl chloride	SW8260C	µg/L	ND [0.075]	ND [0.075]	0	Not Applicable

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

Comments:

See 6eiii above.

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

☒ Yes ☐ No ☐ Not Applicable

Equipment blank sample 18FWOU2EB02WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells in this SDG were sampled with a submersible pump, per the UFP-QAPP.

i. All results less than LOQ?

☒ Yes ☐ No Comments:

DRO (0.185 mg/L) was detected in equipment blank sample 18FWOU2EB02WQ at a concentration below the LOQ (0.577 mg/L). DRO 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: 18FWOU205WG and field duplicate pair 18FWOU206WG/18FWOU207WG. Impact to the project is negligible as the affected results were less than the ADEC cleanup level.

ii. If above LOQ, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

☐ Yes ☒ No Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed By:

Vanessa Ritchie

Title:

Senior Chemist

Date:

08/06/2018

CS Report Name:

Fort Wainwright Operable Unit 2

Report Date:

06/20/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS North America Inc. – Anchorage, AK

Laboratory Report Number:

1182701

ADEC File Number:

108.38.069.02 (1168)

Hazard Identification Number:

1125 (1168)

1182701

1. Laboratory

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

   ☑ Yes ☐ No Comments:

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

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

   ☐ Yes ☑ No Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   ☑ Yes ☐ No Comments:

   b. Correct Analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

☑ Yes ☐ No Comments:

No discrepancies were noted upon sample login.

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

☑ Yes ☐ No Comments:

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

☑ Yes ☐ No Comments:

The case narrative described LCS/LCSD and MS/MSD exceptions discussed in section 6b. The narrative also described CCV and instrument blank exceptions, which are discussed here.

The case narrative describes a 6020A CCV recovery failure for silver and that RRO was detected in two instrument blanks; however, neither silver nor RRO are reported in this work order so no data were impacted.

c. Were all corrective actions documented?

☑ Yes ☐ No Comments:

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

Comments:

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

5. Samples Results

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

☑ Yes ☐ No Comments:

b. All applicable holding times met?

☑ Yes ☐ No Comments:

c. All soils reported on a dry weight basis?

☐ Yes ☑ No Comments:

Not applicable. No soil samples were included in this work order.

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

☐ Yes ☑ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal or ADEC cleanup level for non-detect results, as appropriate. 1,2,3-Trichloropropane 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 an OU2 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?

☐ Yes ☑ No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

☑ Yes ☐ No Comments:

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

☑ Yes ☐ No Comments:

No target analytes were detected in the method blank samples.

iii. If above LOQ, what samples are affected?

Comments:

Not applicable, target analytes were not detected in the method blank samples.

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

☐ Yes ☒ No Comments:

Not applicable, qualifications were not necessary.

v. Data quality or usability affected?

Comments:

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

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

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

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

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

☐ Yes ☒ No Comments:

VOC LCSD sample in extraction batch VXX32351 had recovery of hexachlorobutadiene (135%) marginally above the upper control limit (134%). This analyte was not detected in any project sample, so no data were qualified due to the high-biased recovery in the LCSD sample.

Additional sulfate MS and MSD recovery failures were noted in the case narrative; however, the affected samples were non-client samples.

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

☐ Yes ☒ No Comments:

VOC MS/MSD prepared from parent sample 18FWOU202WG had an RPD that was above the control limit (20%) for bromomethane (25% - analyzed twice with the same RPD). Bromomethane was not detected in the parent sample (or associated field duplicate sample 18FWOU203WG), so no data were qualified due to the RPD imprecision.

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

Comments:

See 6biii and 6biv above.

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

☐ Yes ☒ No Comments:

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 Comments:

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

☒ Yes ☐ No Comments:

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

☐ Yes ☒ No Comments:

Not applicable. All surrogates were recovered within control limits.

iv. Data quality or usability affected?

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 Comments:

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

☑ Yes ☐ No Comments:

Trip blank sample 18FWOU2TB01WQ for VOC analysis was included in cooler 060501.

iii. All results less than LOQ?

☑ Yes ☐ No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable.

v. Data quality or usability affected?

Comments:

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

e. Field Duplicate

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

☑ Yes ☐ No Comments:

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

ii. Submitted blind to lab?

☑ Yes ☐ No Comments:

Sample 18FWOU203WG was a field duplicate of 18FWOU202WG.

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 Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the table below. 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. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 18FWOU202WG/18FWOU203WG were comparable (RPD ≤ 30%).

Analyte	Method	Units	Primary 18FWOU202WG (AP-10037MW)	Field Duplicate 18FWOU203WG (AP-10037MW)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	mg/L	0.663 [0.302]	0.836 [0.313]	23.1	Yes
Sulfate	E300.0	µg/L	17600 [500]	17800 [500]	1.1	Yes
Iron	SW6020A	µg/L	20900 [250]	22000 [250]	5.1	Yes
1,1-Dichloroethene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Benzene	SW8260C	µg/L	0.68 [0.2]	0.64 [0.2]	6.1	Yes
cis-1,2-Dichloroethene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Isopropylbenzene	SW8260C	µg/L	6.24 [0.5]	6.24 [0.5]	0	Yes
sec-Butylbenzene	SW8260C	µg/L	1.46 [0.5]	1.46 [0.5]	0	Yes
tert-Butylbenzene	SW8260C	µg/L	0.33 [0.5] J	0.32 [0.5] J	0.03	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Vinyl chloride	SW8260C	µg/L	ND [0.075]	ND [0.075]	3.1	Not Applicable

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

Comments:

See 6eiii above.

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

☑ Yes ☐ No ☐ Not Applicable

Equipment blank sample 18FWOU2EB01WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells in this SDG were sampled with a submersible pump, with the exception of the WSW. The WSW is sampled at a building spigot, per standard protocol.

i. All results less than LOQ?

☑ Yes ☐ No Comments:

No target analytes were detected in the equipment blank sample.

ii. If above LOQ, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

☐ Yes ☑ No Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed By:

Vanessa Ritchie

Title:

Senior Chemist

Date:

10/23/2018

CS Report Name:

Fort Wainwright Operable Unit 2

Report Date:

09/20/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS North America Inc. – Anchorage, AK

Laboratory Report Number:

1184633

ADEC File Number:

108.38.069.01 (DRMO)

Hazard Identification Number:

1122 (DRMO)

1184633

1. Laboratory

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

   ☑ Yes ☐ No Comments:

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

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

   ☐ Yes ☑ No Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   ☑ Yes ☐ No Comments:

   b. Correct Analyses requested?

   ☑ Yes ☐ No Comments:

3. Laboratory Sample Receipt Documentation

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

   ☑ Yes ☐ No Comments:

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

☑ Yes ☐ No Comments:

The trip blank listed on the COC was inadvertently not included in the shipment. Impact to the project is negligible as detections in historic trip blank samples associated with this site have been at trace concentrations (if detected). Moreover, there were no detections in the equipment blank sample included in this shipment. Had travel/storage cross-contamination been a significant probability, analytes would have been detected in the equipment blank sample.

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

4. Case Narrative

a. Present and understandable?

☑ Yes ☐ No Comments:

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

☑ Yes ☐ No Comments:

The case narrative described LCS/LCSD and MS/MSD exceptions discussed in section 6b. The narrative also described CCV and low-level quantitation exceptions and calibration blank detections, which are discussed here.

Two 8260C CCVs in batch VMS18213 had recoveries for bromomethane (137% and 151%) and chloroethane (123%) above the upper control limit (120%). However, neither analyte was detected in associated samples so no data were impacted by the high recoveries.

The case narrative describes a low-level quantitation check recovery failure for mercury and mercury detections in three calibration blank samples. Mercury is not reported in this work order so no data were impacted.

c. Were all corrective actions documented?

☑ Yes ☐ No Comments:

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

Comments:

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

1184633

5. Samples Results

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

☒ Yes ☐ No Comments:

b. All applicable holding times met?

☒ Yes ☐ No Comments:

c. All soils reported on a dry weight basis?

☐ Yes ☒ No Comments:

Not applicable. No soil samples were included in this work order.

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

☐ Yes ☒ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ROD remedial goal or ADEC cleanup level for non-detect results, as appropriate. 1,2,3-Trichloropropane 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 an OU2 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?

☐ Yes ☒ No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

No target analytes were detected in the method blank samples.

iii. If above LOQ, what samples are affected?

Comments:

Not applicable, target analytes were not detected in the method blank samples.

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

☐ Yes ☒ No Comments:

Not applicable, qualifications were not necessary.

v. Data quality or usability affected?

Comments:

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

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

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

☒ Yes ☐ No Comments:

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

☒ Yes ☐ No Comments:

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

☐ Yes ☒ No Comments:

VOC LCSD sample in extraction batch VXX32944 had recovery of bromomethane (161%) above the upper control limit (141%). This analyte was not detected in any project sample, so no data were qualified due to the high recovery in the LCSD sample.

VOC MSD prepared from sample 18FWOU210WG had recovery of bromomethane (146%) above the upper control limit (141%). This analytes was not detected in the parent sample or associated field duplicate sample 18FWOU211WG, so no data were qualified due to the high recovery in the MSD sample.

The case narrative also describes LCS and MS recovery failures for methyl iodide; however, this analyte is not reported in this work order and no data were impacted.

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

☐ Yes ☒ No Comments:

The case narrative describes LCS/LCS RPD and MS/MSD RPD failures for methyl iodide; however, this analyte is not reported in this work order and no data were impacted.

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

Comments:

Not applicable. No data required qualification.

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

☐ Yes ☒ No Comments:

Not applicable. No data required qualification.

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 Comments:

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

☒ Yes ☐ No Comments:

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

☐ Yes ☒ No Comments:

Not applicable. All surrogates were recovered within control limits.

iv. Data quality or usability affected?

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 Comments:

As mentioned in 3d, the trip blank listed on the COC was inadvertently not included in the shipment. Impact to the project is negligible as detections in historic trip blank samples associated with this site have been at trace concentrations (if detected). Moreover, there were no detections in the equipment blank sample included in this shipment. Had travel/storage cross-contamination been a significant probability, analytes would have been detected in the equipment blank sample.

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

☐ Yes ☒ No Comments:

Not applicable. No trip blank sample was submitted.

iii. All results less than LOQ?

☐ Yes ☒ No Comments:

Not applicable. No trip blank sample was submitted.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable.

v. Data quality or usability affected?

Comments:

Not applicable. No trip blank sample was submitted. See 6di above.

e. Field Duplicate

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

☒ Yes ☐ No Comments:

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

ii. Submitted blind to lab?

☒ Yes ☐ No Comments:

Sample 18FWOU211WG was a field duplicate of 18FWOU210WG.

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 Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the table below. 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. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 18FWOU202WG/18FWOU203WG were comparable (RPD ≤ 30%).

Analyte	Method	Units	Primary 18FWOU210WG (AP-7560)	Field Duplicate 18FWOU211WG (AP-7560)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	mg/L	3.04 [0.315]	3.67 [0.332]	3	Yes
Sulfate	E300.0	µg/L	22400 [500]	22600 [500]	2	Yes
Iron	SW6020A	µg/L	11900 [250]	10800 [250]	5	Yes
1,1-Dichloroethene	SW8260C	µg/L	ND [0.500]	ND [0.500]	4	Not Applicable
Benzene	SW8260C	µg/L	ND [0.200]	ND [0.200]	0	Yes
cis-1,2-Dichloroethene	SW8260C	µg/L	0.88 [0.500] J	0.87 [0.500] J	1	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	1.79 [0.500]	1.85 [0.500]	3	Yes
trans-1,2-Dichloroethene	SW8260C	µg/L	1.11 [0.500]	1.08 [0.500]	3	Yes
Trichloroethene (TCE)	SW8260C	µg/L	2.28 [0.500]	2.21 [0.500]	3	Not Applicable
Vinyl chloride	SW8260C	µg/L	ND [0.0750]	ND [0.0750]	0	Not Applicable

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

Comments:

See 6eiii above.

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

☒ Yes ☐ No ☐ Not Applicable

Equipment blank sample 18FWOU2EB03WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All wells in this SDG were sampled with a submersible pump.

i. All results less than LOQ?

☒ Yes ☐ No Comments:

No target analytes were detected in the equipment blank sample.

ii. If above LOQ, what samples are affected?

Comments:

See 6fi above.

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

☐ Yes ☒ No Comments:

No other data flags/qualifiers were used.

APPENDIX B

SAMPLE TRACKING AND ANALYTICAL RESULTS TABLES

Table B-1. Groundwater Sample Summary
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	Iron 6020A	Sulfate 300.0	SDG	Cooler ID
GROUNDWATER SAMPLES															
Former Building 1168 Leach Well (Three Party)															
18FWOU201WG	AP-6809	15.5	Primary	WG	JK	6/3/2018	930	X		X		X	X	1182701	060501
18FWOU202WG	AP-10037MW	16.7	Primary	WG	JK	06/03/18	1045	X		X		X	X	1182701	060501
18FWOU203WG	AP-2020 (AP-	16.7	Field Duplicate of 18FWOU202WG	WG	JK	06/03/18	1100	X		X		X	X	1182701	060501
18FWOU204WG	AP-5751	15.6	Primary	WG	JK	6/3/2018	1210	X		X		X	X	1182701	060501
DRMO Building 5010 (Two Party) and DRMO Yard Water Supply Well (Three Party)															
18FWOU205WG	WSW	unknown[1]	Primary	WG	JK	06/04/18	900	X	X	X	X			1182676	FES01
18FWOU206WG	AP-7346	8.5	Primary	WG	JK	6/4/2018	1020	X		X				1182676	FES01
18FWOU207WG	AP-3030 (AP-7346)	8.5	Field Duplicate of 17FWOU207WG	WG	JK	6/4/2018	1035	X		X				1182676	FES01
18FWOU208WG	AP-7348	10.5	Primary	WG	JK	6/4/2018	1155	X		X				1182676	FES01
DRMO (Three Party)															
18FWOU209WG	AP-7559	11.1	Primary	WG	JK	08/16/18	845	X				X	X	1184633	082001
18FWOU210WG	AP-7560	15	Primary/MS/MSD	WG	JK	08/16/18	1100	X		X		X	X	1184633	082001
18FWOU211WG	AP-7070	15	Field Duplicate of 17FWOU207WG	WG	JK	08/16/18	1120	X		X		X	X	1184633	082001
18FWOU212WG	AP-10015R	13.3	Primary	WG	JK	08/16/18	1230	X				X	X	1184633	082001
18FWOU213WG	AP-10016R	13.5	Primary	WG	JK	08/16/18	1340	X				X	X	1184633	082001
18FWOU214WG	AP-8914R	11.3	Primary	WG	JK	08/16/18	1450	X				X	X	1184633	082001
18FWOU215WG	AP-10018R	12.8	Primary	WG	JK	08/16/18	1600	X				X	X	1184633	082001
18FWOU216WG	AP-10017R	13	Primary	WG	JK	08/16/18	1700	X				X	X	1184633	082001
18FWOU217WG	AP-10445MW	13.3	Primary	WG	JK	08/17/18	845	X		X		X	X	1184633	082001
18FWOU218WG	AP-10446MW	12.5	Primary	WG	JK	08/17/18	1000	X				X	X	1184633	082001
18FWOU219WG	AP-8916	11.75	Primary	WG	JK	08/17/18	1115	X				X	X	1184633	082001
QUALITY CONTROL SAMPLES															
18FWOU2EB01WQ	Rinsate 01	--	Equipment Blank	WQ	JK	06/03/18	1800	X		X		X	X	1182701	060501
18FWOU2TB01WQ	Trip Blank	--	Trip Blank	WQ	--	06/03/18	800	X						1182701	060501
18FWOU2EB02WQ	Rinsate 02	--	Equipment Blank	WQ	JK	06/04/18	1300	X		X		X	X	1182676	FES01
18FWOU2TB02WQ	Trip Blank	--	Trip Blank	WQ	--	06/04/18	800	X	X					1182676	FES01
18FWOU2EB03WQ	Rinsate 03	--	Equipment Blank	WQ	JK	08/16/18	1830	X		X		X	X	1184633	082001
18FWOU2TB03WQ	Trip Blank	--	Trip Blank	WQ	--	08/16/18	800	X[2]						1184633	082001

Note: All samples were submitted to SGS North America, Inc. of Anchorage, Alaska for analysis. The standard 21-day turnaround time was requested for all analyses. All sampling activities were conducted under NPDL work order number 18-085.

[1] The depth at which sample 18FWOU205WG was collected is unknown. The WSW is sampled from a building faucet, per standard protocol.

[2] Analysis of trip blank sample 18FWOU2TB03WQ was requested on the chain-of-custody but was inadertantly not included in the sample shipment. See Section 2.2 of the CDQR for discussion regarding impact to the project.

bgs - below ground surface
°C - degrees Celsius
CDQR - Chemical Data Quality Review
DRO - diesel range organics
GRO - gasoline range organics
HCl - hydrochloric acid
HDPE - high-density polyethylene
HNO_3 - nitric acid
JK - Josh Klynstra
L - liter
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
SDG - sample data group
SVOC - semivolatile organic compounds
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, 250 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

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

			Sample ID	18FWOU201WG	18FWOU202WG	18FWOU203WG	18FWOU204WG	18FWOU205WG	18FWOU209WG	18FWOU210WG	18FWOU211WG	18FWOU212WG	18FWOU213WG	18FWOU214WG	18FWOU215WG	18FWOU216WG	18FWOU217WG
			Location ID	AP-6809	AP-10037MW	AP-2020	AP-5751	WSW	AP-7559	AP-7560	AP-7070	AP-10015R	AP-10016R	AP-8914R	AP-10018R	AP-10017R	AP-10445MW
			Sample Data Group	1182701	1182701	1182701	1182701	1182676	1184633	1184633	1184633	1184633	1184633	1184633	1184633	1184633	1184633
			Laboratory ID	1182701001	1182701002	1182701005	1182701006	1182676001	1184633001	1184633002	1184633005	1184633006	1184633007	1184633008	1184633009	1184633010	1184633011
			Collection Date	6/3/2018	6/3/2018	6/3/2018	6/3/2018	6/4/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018		8/17/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU202WG	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU210WG	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**	**OU2 ROD RG or 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**
Gasoline Range Organics	AK101	µg/L	2,200	-	-	-	-	ND [50]	-	-	-	-	-	-	-	-	-
Diesel Range Organics	AK102	µg/L	2,200	815 [313]	663 [302]	836 [313]	1,470 [318]	206 [313] J,B	-	**3,040 [315]**	**3,670 [332]**	-	-	-	-	-	1,670 [329]
Sulfate	E300.0	µg/L	NE	60100 [500]	17600 [500]	17800 [500]	29200 [500]	-	27300 [500]	22400 [500]	22600 [500]	9060 [500]	11000 [500]	20400 [500]	9760 [500]	22600 [500]	31100 [500]
Iron	SW6020A	µg/L	NE	568 [250]	20900 [250]	22000 [250]	ND [250]	-	ND [250]	11900 [250]	10800 [250]	7140 [250]	1650 [250]	25200 [250]	8710 [250]	345 [250] J	936 [250]
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 [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
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 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
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 [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	10,000	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]
1,1-Dichloroethane	SW8260C	µg/L	28	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,1-Dichloroethene	SW8260C	µg/L	**7.0**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
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 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,4-Trimethylbenzene	SW8260C	µg/L	56	ND [0.5]	ND [0.5]	ND [0.5]	2.46 [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
1,2-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]
1,2-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2-Dichloroethane	SW8260C	µg/L	1.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,2-Dichloropropane	SW8260C	µg/L	8.2	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60	ND [0.5]	ND [0.5]	ND [0.5]	1.69 [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,3-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,3-Dichloropropane	SW8260C	µg/L	4.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
2-Butanone	SW8260C	µg/L	5,600	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
2-Hexanone	SW8260C	µg/L	38	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	0.35 [0.5] J	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Benzene	SW8260C	µg/L	**5.0**	ND [0.2]	0.68 [0.2]	0.64 [0.2]	ND [0.2]	ND [0.2]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]
Bromobenzene	SW8260C	µg/L	62	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Bromodichloromethane	SW8260C	µg/L	1.3	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Bromoform	SW8260C	µg/L	33	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Bromomethane	SW8260C	µg/L	7.5	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]
Carbon disulfide	SW8260C	µg/L	810	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Carbon tetrachloride	SW8260C	µg/L	4.6	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Chlorobenzene	SW8260C	µg/L	78	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Chloroethane	SW8260C	µg/L	21,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Chloroform	SW8260C	µg/L	2.20	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Chloromethane	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
cis-1,2-Dichloroethene	SW8260C	µg/L	**70**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	0.88 [0.500] J	0.87 [0.500] J	1.04 [0.500]	ND [0.500]	7.75 [0.500]	2.59 [0.500]	0.63 [0.500] J	ND [0.500]
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 [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Dibromochloromethane	SW8260C	µg/L	8.7	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Dibromomethane	SW8260C	µg/L	8.3	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Dichlorodifluoromethane	SW8260C	µg/L	200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Ethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.5]	ND [0.5]	1.38 [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Hexachlorobutadiene	SW8260C	µg/L	1.4	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Isopropylbenzene	SW8260C	µg/L	450	ND [0.5]	6.24 [0.5]	6.24 [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Methylene chloride	SW8260C	µg/L	110	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Naphthalene	SW8260C	µg/L	1.7	ND [0.5]	ND [0.5]	ND [0.5]	1.69 [0.5]	0.31 [0.5] J	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
n-Butylbenzene	SW8260C	µg/L	1,000	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
n-Propylbenzene	SW8260C	µg/L	660	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
sec-Butylbenzene	SW8260C	µg/L	2,000	ND [0.5]	1.46 [0.5]	1.46 [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Styrene	SW8260C	µg/L	1,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]

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

			Sample ID	18FWOU201WG	18FWOU202WG	18FWOU203WG	18FWOU204WG	18FWOU205WG	18FWOU209WG	18FWOU210WG	18FWOU211WG	18FWOU212WG	18FWOU213WG	18FWOU214WG	18FWOU215WG	18FWOU216WG	18FWOU217WG
			Location ID	AP-6809	AP-10037MW	AP-2020	AP-5751	WSW	AP-7559	AP-7560	AP-7070	AP-10015R	AP-10016R	AP-8914R	AP-10018R	AP-10017R	AP-10445MW
			Sample Data Group	1182701	1182701	1182701	1182701	1182676	1184633	1184633	1184633	1184633	1184633	1184633	1184633	1184633	1184633
			Laboratory ID	1182701001	1182701002	1182701005	1182701006	1182676001	1184633001	1184633002	1184633005	1184633006	1184633007	1184633008	1184633009	1184633010	1184633011
			Collection Date	6/3/2018	6/3/2018	6/3/2018	6/3/2018	6/4/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018		8/17/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU202WG	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU210WG	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**	**OU2 ROD RG or 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**
tert-Butylbenzene	SW8260C	µg/L	690	ND [0.5]	0.33 [0.5] J	0.32 [0.5] J	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Tetrachloroethene (PCE)	SW8260C	µg/L	**5.0**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	3.45 [0.500]	1.79 [0.500]	1.85 [0.500]	2.32 [0.500]	**5.84 [0.500]**	0.55 [0.500] J	1.14 [0.500]	1.09 [0.500]	ND [0.500]
Toluene	SW8260C	µg/L	1,100	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	1.11 [0.500]	1.08 [0.500]	1.93 [0.500]	0.44 [0.500] J	4.07 [0.500]	6.84 [0.500]	ND [0.500]	ND [0.500]
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 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.49 [0.500] J	2.28 [0.500]	2.21 [0.500]	0.79 [0.500] J	0.45 [0.500] J	1.91 [0.500]	0.34 [0.500] J	ND [0.500]	ND [0.500]
Trichlorofluoromethane	SW8260C	µg/L	5,200	ND [0.5]	ND [0.5]	ND [0.5]	5.58 [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Vinyl acetate	SW8260C	µg/L	410	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Vinyl chloride	SW8260C	µg/L	**2.0**	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]
o-Xylene	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]	10.6 [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1]	ND [1]	ND [1]	3.59 [1]	ND [1]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]
Xylenes	SW8260C	µg/L	190	ND [1.5]	ND [1.5]	ND [1.5]	14.2 [1.5]	ND [1.5]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]
1,2,4-Trichlorobenzene	SW8270D	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	0.30	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	SW8270D	µg/L	0.25	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	SW8270D	µg/L	2.5	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	SW8270D	µg/L	0.26	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	SW8270D	µg/L	0.80	-	-	-	-	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]	-	-	-	-	-	-	-	-	-
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]	-	-	-	-	-	-	-	-	-

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

			Sample ID	18FWOU201WG	18FWOU202WG	18FWOU203WG	18FWOU204WG	18FWOU205WG	18FWOU209WG	18FWOU210WG	18FWOU211WG	18FWOU212WG	18FWOU213WG	18FWOU214WG	18FWOU215WG	18FWOU216WG	18FWOU217WG
			Location ID	AP-6809	AP-10037MW	AP-2020	AP-5751	WSW	AP-7559	AP-7560	AP-7070	AP-10015R	AP-10016R	AP-8914R	AP-10018R	AP-10017R	AP-10445MW
			Sample Data Group	1182701	1182701	1182701	1182701	1182676	1184633	1184633	1184633	1184633	1184633	1184633	1184633	1184633	1184633
			Laboratory ID	1182701001	1182701002	1182701005	1182701006	1182676001	1184633001	1184633002	1184633005	1184633006	1184633007	1184633008	1184633009	1184633010	1184633011
			Collection Date	6/3/2018	6/3/2018	6/3/2018	6/3/2018	6/4/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018	8/16/2018		8/17/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU202WG	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU210WG	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**	**OU2 ROD RG or 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**
Carbazole	SW8270D	µg/L	NE	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-
Chrysene	SW8270D	µg/L	2.0	-	-	-	-	ND [5.45]	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	SW8270D	µg/L	0.25	-	-	-	-	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 ADEC groundwater cleanup levels.

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

[1] **OU2 ROD analytes and remedial goals are identified in BLUE text.** The remaining values are ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of October 27, 2018).

Data Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
J+ - result qualified as estimate with a high-bias due to a QC failure
J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

Acronyms:
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
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	18FWOU218WG	18FWOU219WG	18FWOU2EB01WQ	18FWOU2TB01WQ	18FWOU2EB03WQ
			Location ID	AP-10446MW	AP-8916	RINSATE 01	TRIP BLANK	Rinsate 03
			Sample Data Group	1184633	1184633	1182701	1182701	1184633
			Laboratory ID	1184633012	1184633013	1182701007	1182701008	1184633014
			Collection Date	8/17/2018	8/17/2018	6/3/2018	6/3/2018	8/16/2018
			Matrix	WG	WG	WQ	WQ	WQ
			Sample Type	Primary	Primary	Equipment Blank	Trip Blank	Equipment Blank
Analyte	**Method**	**Units**	**OU2 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	µg/L	2,200	-	-	-	-	-
Diesel Range Organics	AK102	µg/L	2,200	-	-	ND [302]	-	ND [321]
Sulfate	E300.0	µg/L	NE	27900 [500]	9370 [500]	ND [100]	-	ND [100]
Iron	SW6020A	µg/L	NE	3840 [250]	25400 [250]	ND [250]	-	ND [250]
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	10,000	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	ND [0.200]	ND [0.200]	ND [0.2]	ND [0.2]	ND [0.200]
1,1-Dichloroethane	SW8260C	µg/L	28	0.35 [0.500] J	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,1-Dichloroethene	SW8260C	µg/L	**7.0**	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,2,4-Trimethylbenzene	SW8260C	µg/L	56	ND [0.500]	9.63 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
1,2-Dibromoethane	SW8260C	µg/L	0.075	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,2-Dichloroethane	SW8260C	µg/L	1.7	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
1,2-Dichloropropane	SW8260C	µg/L	8.2	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60	ND [0.500]	2.28 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,3-Dichlorobenzene	SW8260C	µg/L	300	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
1,3-Dichloropropane	SW8260C	µg/L	4.7	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
2-Butanone	SW8260C	µg/L	5,600	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
2-Hexanone	SW8260C	µg/L	38	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [0.500]	3.73 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
Benzene	SW8260C	µg/L	**5.0**	ND [0.200]	ND [0.200]	ND [0.2]	ND [0.2]	ND [0.200]
Bromobenzene	SW8260C	µg/L	62	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Bromodichloromethane	SW8260C	µg/L	1.3	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
Bromoform	SW8260C	µg/L	33	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Bromomethane	SW8260C	µg/L	7.5	ND [2.50]	ND [2.50]	ND [2.5]	ND [2.5]	ND [2.50]
Carbon disulfide	SW8260C	µg/L	810	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
Carbon tetrachloride	SW8260C	µg/L	4.6	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Chlorobenzene	SW8260C	µg/L	78	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
Chloroethane	SW8260C	µg/L	21,000	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Chloroform	SW8260C	µg/L	2.20	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Chloromethane	SW8260C	µg/L	190	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
cis-1,2-Dichloroethene	SW8260C	µg/L	**70**	0.31 [0.500] J	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
Dibromochloromethane	SW8260C	µg/L	8.7	ND [0.250]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.250]
Dibromomethane	SW8260C	µg/L	8.3	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Dichlorodifluoromethane	SW8260C	µg/L	200	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Ethylbenzene	SW8260C	µg/L	15	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Hexachlorobutadiene	SW8260C	µg/L	1.4	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Isopropylbenzene	SW8260C	µg/L	450	ND [0.500]	1.53 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Methylene chloride	SW8260C	µg/L	110	ND [2.50]	ND [2.50]	ND [2.5]	ND [2.5]	ND [2.50]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
Naphthalene	SW8260C	µg/L	1.7	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
n-Butylbenzene	SW8260C	µg/L	1,000	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
n-Propylbenzene	SW8260C	µg/L	660	ND [0.500]	2.82 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
sec-Butylbenzene	SW8260C	µg/L	2,000	ND [0.500]	2.12 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Styrene	SW8260C	µg/L	1,200	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]

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

			Sample ID	18FWOU218WG	18FWOU219WG	18FWOU2EB01WQ	18FWOU2TB01WQ	18FWOU2EB03WQ
			Location ID	AP-10446MW	AP-8916	RINSATE 01	TRIP BLANK	Rinsate 03
			Sample Data Group	1184633	1184633	1182701	1182701	1184633
			Laboratory ID	1184633012	1184633013	1182701007	1182701008	1184633014
			Collection Date	8/17/2018	8/17/2018	6/3/2018	6/3/2018	8/16/2018
			Matrix	WG	WG	WQ	WQ	WQ
			Sample Type	Primary	Primary	Equipment Blank	Trip Blank	Equipment Blank
Analyte	**Method**	**Units**	**OU2 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
tert-Butylbenzene	SW8260C	µg/L	690	ND [0.500]	0.35 [0.500] J	ND [0.5]	ND [0.5]	ND [0.500]
Tetrachloroethene (PCE)	SW8260C	µg/L	**5.0**	ND [0.500]	1.18 [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Toluene	SW8260C	µg/L	1,100	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Trichlorofluoromethane	SW8260C	µg/L	5,200	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Vinyl acetate	SW8260C	µg/L	410	ND [5.00]	ND [5.00]	ND [5]	ND [5]	ND [5.00]
Vinyl chloride	SW8260C	µg/L	**2.0**	ND [0.0750]	ND [0.0750]	ND [0.075]	ND [0.075]	ND [0.0750]
o-Xylene	SW8260C	µg/L	190	ND [0.500]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.500]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1.00]	1.1 [1.00] J	ND [1]	ND [1]	ND [1.00]
Xylenes	SW8260C	µg/L	190	ND [1.50]	1.1 [1.50] J	ND [1.5]	ND [1.5]	ND [1.50]
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	0.30	-	-	-	-	-
Benzo(a)pyrene	SW8270D	µg/L	0.25	-	-	-	-	-
Benzo(b)fluoranthene	SW8270D	µg/L	2.5	-	-	-	-	-
Benzo(g,h,i)perylene	SW8270D	µg/L	0.26	-	-	-	-	-
Benzo(k)fluoranthene	SW8270D	µg/L	0.80	-	-	-	-	-
Benzoic acid	SW8270D	µg/L	75,000	-	-	-	-	-
Benzyl alcohol	SW8270D	µg/L	2,000	-	-	-	-	-
Benzyl butyl phthalate	SW8270D	µg/L	160	-	-	-	-	-
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	-	-	-	-	-

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

			Sample ID	18FWOU218WG	18FWOU219WG	18FWOU2EB01WQ	18FWOU2TB01WQ	18FWOU2EB03WQ
			Location ID	AP-10446MW	AP-8916	RINSATE 01	TRIP BLANK	Rinsate 03
			Sample Data Group	1184633	1184633	1182701	1182701	1184633
			Laboratory ID	1184633012	1184633013	1182701007	1182701008	1184633014
			Collection Date	8/17/2018	8/17/2018	6/3/2018	6/3/2018	8/16/2018
			Matrix	WG	WG	WQ	WQ	WQ
			Sample Type	Primary	Primary	Equipment Blank	Trip Blank	Equipment Blank
Analyte	**Method**	**Units**	**OU2 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Carbazole	SW8270D	µg/L	NE	-	-	-	-	-
Chrysene	SW8270D	µg/L	2.0	-	-	-	-	-
Dibenzo(a,h)anthracene	SW8270D	µg/L	0.25	-	-	-	-	-
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 ADEC groundwater cleanup levels.

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

[1] **OU2 ROD analytes and remedial goals are identified in BLUE text.** The remaining values are ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of October 27, 2018).

Data Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ or due to a QC failure
J+ - result qualified as estimate with a high-bias due to a QC failure
J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

Acronyms:
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
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	18FWOU206WG	18FWOU207WG	18FWOU208WG	18FWOU2EB02WQ	18FWOU2TB02WQ
			Location ID	AP-7346	AP-3030	AP-7348	RINSATE 02	TRIP BLANK
			Sample Data Group	1182676	1182676	1182676	1182676	1182676
			Laboratory ID	1182676002	1182676003	1182676004	1182676005	1182676006
			Collection Date	6/4/2018	6/4/2018	6/4/2018	6/4/2018	6/4/2018
			Matrix	WG	WG	WG	WQ	WQ
			Sample Type	Primary/MS/MSD	Field Duplicate of 18FWOU206WG	Primary	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	µg/L	2,200	-	-	-	-	ND [50]
Diesel Range Organics	AK102	µg/L	1,500	217 [324] J,B	233 [315] J,B	**14,000 [318]**	185 [288] J	-
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	10,000	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	56	ND [0.5]	ND [0.5]	**72.6 [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	0.22 [0.25] J	0.22 [0.25] J	ND [0.25]	ND [0.25]	ND [0.25]
1,2-Dichloropropane	SW8260C	µg/L	8.2	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60	ND [0.5]	ND [0.5]	35.3 [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]	4.63 [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]	0.42 [0.2]	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	ND [0.25]	ND [0.25]	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	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	0.37 [0.5] J	0.33 [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]	5.33 [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]	3.33 [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]	**67.4 [0.5]**	ND [0.5]	ND [0.5]
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]	4.7 [0.5]	ND [0.5]	ND [0.5]
sec-Butylbenzene	SW8260C	µg/L	2,000	ND [0.5]	ND [0.5]	3.13 [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]	0.71 [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]	0.44 [0.5] J,B	ND [0.5]	0.37 [0.5] J
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]

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

			Sample ID	18FWOU206WG	18FWOU207WG	18FWOU208WG	18FWOU2EB02WQ	18FWOU2TB02WQ
			Location ID	AP-7346	AP-3030	AP-7348	RINSATE 02	TRIP BLANK
			Sample Data Group	1182676	1182676	1182676	1182676	1182676
			Laboratory ID	1182676002	1182676003	1182676004	1182676005	1182676006
			Collection Date	6/4/2018	6/4/2018	6/4/2018	6/4/2018	6/4/2018
			Matrix	WG	WG	WG	WQ	WQ
			Sample Type	Primary/MS/MSD	Field Duplicate of 18FWOU206WG	Primary	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC Cleanup Level** [1]	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Trichloroethene (TCE)	SW8260C	µg/L	2.8	0.32 [0.5] J	0.31 [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]	17.2 [0.5]	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1]	ND [1]	17 [1]	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	ND [1.5]	ND [1.5]	34.2 [1.5]	ND [1.5]	ND [1.5]

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

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

[1] ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of October 27, 2018).

Data Qualifiers:

B - result may be due to cross-contamination
J - result qualified as estimate as it is less than the LOQ or due to 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
NE - not established
QC - quality control
RG - remedial goal
ROD - Record of Decision
WG - groundwater
WQ - water QC sample

APPENDIX C

GROUNDWATER SAMPLING FORMS AND GROUNDWATER FIELD MEASUREMENTS

Table C-1 - 2018 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	18FWOU204WG	6/3/2018	1210	Submersible	14.62	Y	0.00	3.80	0.881	2.88	6.67	113.1	1.50	Y
AP-10037MW	18FWOU201WG	6/3/2018	1045	Submersible	15.70	Y	0.00	5.49	0.741	0.62	6.86	-70.0	12.14	Y
AP-6809	18FWOU201WG	6/3/2018	930	Submersible	14.49	Y	0.00	5.83	1.041	0.86	6.65	71.9	9.37	Y
Operable Unit 2 - Building 5010 & WSW														
AP-7346	18FWOU206WG	6/4/2018	1020	Submersible	7.54	Y	0.00	3.16	0.400	2.27	6.92	27.3	3.56	Y
AP-7348	18FWOU208WG	6/4/2018	1155	Submersible	9.46	Y	0.00	7.16	0.644	0.93	6.66	-90.6	7.07	Y
WSW[4]	18FWOU205WG	6/4/2018	900	Raw Water Tap	NA	NA	NA	6.63	0.354	5.67	7.43	-35.8	2.33	NA
Operable Unit 2 - DRMO4 3-Party														
AP-10445MW	18FWOU217WG	8/17/2018	845	Submersible	12.31	Y	0.00	8.86	0.767	0.93	14.90	14.9	2.98	Y
AP-10446MW	18FWOU218WG	8/17/2018	1000	Submersible	11.47	Y	0.00	5.87	0.436	0.61	7.24	-121.2	4.08	Y
AP-8916	18FWOU219WG	8/17/2018	1115	Submersible	10.77	Y	0.00	6.87	0.565	0.39	7.04	-136.9	1.24	Y
Operable Unit 2 - DRMO1 3-Party														
AP-8914R	18FWOU214WG	8/16/2018	1450	Submersible	10.33	Y	0.00	9.22	0.367	0.59	6.79	-111.9	2.82	Y
AP-7559	18FWOU209WG	8/16/2018	845	Submersible	10.13	Y	0.00	8.71	0.428	0.67	6.85	194.1	3.78	Y
AP-7560	18FWOU210WG	8/16/2018	1100	Submersible	9.65	N	0.00	7.50	0.431	0.80	6.72	-80.5	1.09	Y
AP-10015R	18FWOU212WG	8/16/2018	1230	Submersible	12.32	Y	0.01	8.62	0.427	0.74	6.89	-74.2	6.74	Y
AP-10016R	18FWOU213WG	8/16/2018	1340	Submersible	12.46	Y	0.00	9.56	0.412	0.54	6.73	-20.8	3.98	Y
AP-10017R	18FWOU216WG	8/16/2018	1700	Submersible	12.02	Y	0.00	8.64	0.383	0.82	6.89	-6.3	2.63	Y
AP-10018R	18FWOU215WG	8/16/2018	1600	Submersible	11.86	Y	0.00	8.39	0.421	0.57	7.37	-173.3	3.50	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 | OU2 | Ft. Wainwright, Alaska

Project #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 6/3/18 | Probe/Well #: AP-6809

Time: 0930 | Sample ID: 18FWOU2 01 WG

Sampler: SK

Weather: Cloudy / Lt. Rain | 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 # 8 | Turbidity Meter #: 11 | Water Level: SOL 13

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

Column of Water in Probe/Well | Sampling Depth: 13' screen

Total Depth in Probe/Well (feet btoc): 27.00 | Well Screened Across / Below water table

Depth to Water from TOC (feet): 14.49 | Depth tubing / pump intake set* approx. 15.5 feet below top of casing

Column of Water in Probe/Well (feet) = 12.51 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 2.0

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	5.21	0.944	3.10	6.67	165.7	8.73	14.59
1.0	10	5.74	0.983	1.90	6.67	157.4	7.03	14.59
1.5	15	5.73	1.000	1.41	6.68	137.1	15.43	14.59
2.0	20	5.79	1.025	1.07	6.68	88.9	14.19	14.59
2.5	25	5.80	1.032	0.99	6.67	80.9	12.07	14.59
3.0	30	5.82 ✓	1.035 ✓	0.90 ✓	6.67 ✓	75.8	10.48	14.59
3.5	35	5.83	1.041	0.86	6.65	71.9	9.37	14.59
			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

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU2 — Ft. Wainwright, Alaska

Project #: 9011-02
Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010
Date: 6/3/18
Probe/Well #: AP-10037MW
Time: 1045
Sample ID: 18FWOU2 02 WG
Sampler: SK
Weather: P Cloudy
Outside Temperature: 55°F
QA/QC Sample ID/Time/LOCID: 18FWOU203W6 / 1100 / AP-2020
MS/MSD Performed? Yes / No

Purge Method: Peristaltic Pump / Submersible / Bladder
Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 11 Water Level: SOL 3
Free Product Observed in Probe/Well? Yes/No If Yes, Depth to Product:

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 25.32
Depth to Water from TOC (feet): 15.70
Column of Water in Probe/Well (feet): = 9.62
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.6

Sampling Depth: 10' Screen
Well Screened Across / Below water table
Depth tubing / pump intake set* approx 16.7 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	6.60	0.707	3.89	6.79	-51.8	111.1	15.74
1.0	10	6.06	0.728	1.62	6.83	-63.7	90.29	15.74
1.5	15	5.56	0.731	1.18	6.84	-68.8	43.50	15.74
2.0	20	5.47	0.736	0.90	6.86	-71.2	25.44	15.74
2.5	25	5.42	0.737	0.71	6.86	-71.4	16.93	15.74
3.0	30	5.57	0.740	0.68	6.86	-71.1	13.73	15.74
3.5	35	5.49	0.741	0.62	6.86	-70.0	12.14	15.74

SK

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

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate
pH checked of samples: Y / N Approximate volume added (mL): HCl = _____ HNO_3 = _____

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

GROUNDWATER SAMPLE FORM OU2 Ft. Wainwright, Alaska

Project #: 9011-02 Site Location: FB 1168/ DRMO-1 / DRMO-4 / 5010

Date: 6/3/18 Probe/Well #: AP-5751

Time: 1210 Sample ID: 18FWOU2 04 WG

Sampler: SK

Weather: Sunny 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 # 8 Turbidity Meter #: C1 Water Level: SOL13

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

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

Total Depth in Probe/Well (feet btoc): 20.52 Well Screened Across / Below water table

Depth to Water from TOC (feet): - 14.62 Depth tubing / pump intake set* approx 15.6 feet below top of casing

Column of Water in Probe/Well (feet): = 5.90 *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): 0.96

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	5.20	0.854	3.19	6.68	100.8	2.83	14.65
1.0	10	3.95	0.875	3.06	6.66	109.6	2.70	14.65
1.5	15	3.63	0.873	2.94	6.67	112.2	1.46	14.65
2.0	20	3.60	0.877	2.96	6.67	113.8	1.58	14.65
2.5	25	3.72	0.877	2.96	6.66	113.7	1.48	14.65
3.0	30	3.80	0.881	2.88	6.67	113.1	1.50	14.65
			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

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

Purge Water

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

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

Sampler's Initials: SK

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

Project #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 6/4/18 | Probe/Well #: WSW

Time: 0900 | Sample ID: 18FWOU2 05 WG

Sampler: SK

Weather: Clear | Outside Temperature: 60°F

QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/(No)

Purge Method: ~~Peristaltic Pump / Submersible / Bladder~~ Well | Sample Method: ~~Peristaltic Pump / Submersible / Hydrasleeve / Bladder~~ / (Other)

Equipment Used for Sampling: YSI # 8 | 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

Total Depth in Probe/Well (feet btoc):

Depth to Water from TOC (feet):

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

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):

Sampling Depth

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

Depth tubing / pump intake set* approx _____ 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)
Purge WSW for 30 Minutes then collect 1 reading before collecting Sample								
—	30 min	6.63	0.354	5.67	7.43	-35.8	2.33	—

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

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

Purge Water

Gallons generated: 0 Containerized and disposed as IDW? Yes / (No) If No, why not? NO purge water collected

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 #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 6/4/18 | Probe/Well #: AP-7346

Time: 1020 | Sample ID: 18FWOU2 06 WG

Sampler: SK

Weather: Clear | Outside Temperature: 60°F

QA/QC Sample ID/Time/LOCID: 18FWOU207WG / 1035 / AP-3030 | 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 #: 11 | Water Level: 5.2 / 3

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

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

Total Depth in Probe/Well (feet btoc): 11.91 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): 7.54 | Depth tubing / pump intake set* approx 8.5 feet below top of casing

Column of Water in Probe/Well (feet): = 4.37 | *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): 0.71

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	3.25	0.405	2.77	7.01	48.1	27.79	7.58
1.0	10	2.90	0.403	2.22	7.00	31.7	10.12	7.58
1.5	15	3.25	0.402	2.21	7.04	27.8	9.04	7.58
2.0	20	3.17	0.401	2.18	6.93	26.6	4.19	7.58
2.5	25	3.16	0.400	2.27	6.92	27.3	3.56	7.58
3.0	30							

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

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

Purge Water

Gallons generated: 3.15 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 #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 6/4/18 | Probe/Well #: AP 7348

Time: 1155 | Sample ID: 18FWOU2 08 WG

Sampler: SK

Weather: Clear | Outside Temperature: 65°F

QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes / (No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 11 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 15.41 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 9.46 | Depth tubing / pump intake set* approx. 10.5 feet below top of casing

Column of Water in Probe/Well (feet): = 5.95 | *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):

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	7.48	0.538	3.14	6.74	-96.6	17.79	9.52
1.0	10	7.11	0.547	1.85	6.74	-97.4	16.58	9.52
1.5	15	7.24	0.589	1.20	6.72	-97.3	15.60	9.52
2.0	20	7.15	0.611	1.04	6.69	-95.8	10.61	9.52
2.5	25	7.18	0.634	0.95	6.67	-92.7	11.31	9.52
3.0	30	7.14	0.636	0.94	6.65	-91.4	7.22	9.52
3.5	35	7.16	0.644	0.93	6.66	-90.6	7.07	9.52

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

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

Purge Water

Gallons generated: 3.75 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: SK

Submersible Pump Equipment Blank

Rinsate #: Rinsate 01

Sample ID: 18FW002EB01WQ

Date: 6/3/18

Time: 1800

Analysis: VOC/DRO/Fe/SO4

Well that the pump was last used on: AP-10037MW

GROUNDWATER SAMPLE FORM OU2 Ft. Wainwright, Alaska

Project #: 9011-02 Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/16/18 Probe/Well #: AP-7559

Time: 0845 Sample ID: 18FWOU2 09 WG

Sampler: JK

Weather: P. Cloudy Outside Temperature: 45°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: 50 1/3

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

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

Total Depth in Probe/Well (feet btoc): 20.00 Well Screened Across / Below water table

Depth to Water from TOC (feet): - 10.13 Depth tubing / pump intake set* approx 11.1 feet below top of casing

Column of Water in Probe/Well (feet): = 9.87 *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): 1.6

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	8.65	0.422	2.21	6.85	193.3	9.12	10.15
1.0	10	8.41	0.423	1.58	6.85	194.2	8.28	10.15
1.5	15	8.70	0.426	1.14	6.86	193.5	6.24	10.15
2.0	20	8.61	0.427	0.84	6.85	194.2	4.52	10.15
2.5	25	8.64	0.427	0.74	6.85	194.0	3.96	10.15
3.0	30	8.71	0.428	0.67	6.85	194.1	3.78	10.15

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

pH checked of samples: Y N Approximate volume added (mL): HCl = 10 HNO_3 = 0

Purge Water

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

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM | OU2 | Ft. Wainwright, Alaska

Project #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/16/18 | Probe/Well #: AP-7560

Time: 1100 | Sample ID: 18FWOU2 / 0 WG

Sampler: JK

Weather: P. Cloudy | Outside Temperature: 45°F

QA/QC Sample ID/Time/LOCID: 18FWOU211WG / 1120 / 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 # 8 | Turbidity Meter #: 12 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 20.00 | Well Screened Across / Below water table

Depth to Water from TOC (feet): 9.65 | Depth tubing / pump intake set* approx 15 feet below top of casing

Column of Water in Probe/Well (feet): = 10.35 | *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): 1.7

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

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	8.15	0.437	4.78	6.72	-60.7	26.24	9.67
1.0	10	8.58	0.436	2.94	6.73	-66.7	9.06	9.67
1.5	15	8.51	0.433	2.06	6.71	-69.9	4.78	9.67
2.0	20	7.85	0.432	1.39	6.72	-73.0	2.41	9.67
2.5	25	7.58	0.432	1.09	6.71	-75.2	2.34	9.67
3.0	30	7.32	0.432	0.94	6.72	-78.4	2.63	9.67
3.5	35	7.39	0.434	0.87	6.74	-80.2	1.36	9.67
4.0	40	7.50	0.431	0.80	6.72	-80.5	1.09	9.67
		SC						

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:

Slight

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM — OU2 — Ft. Wainwright, Alaska

Project #: 9011-02
Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010
Date: 8/16/18
Probe/Well #: AP-10015R
Time: 1230
Sample ID: 18FWOU2 12 WG
Sampler: SK
Weather: ~~Sunny~~ P.Cloudy
Outside Temperature: 54F
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: SOL 13
Free Product Observed in Probe/Well? Yes / No If Yes, Depth to Product:
Column of Water in Probe/Well
Sampling Depth 10' screen
Total Depth in Probe/Well (feet btoc): 20.40
Well Screened Across / Below water table
Depth to Water from TOC (feet): 12.32
Depth tubing / pump intake set* approx 13.3 feet below top of casing
Column of Water in Probe/Well (feet) = 8.08
*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): 1.3

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

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	8.32	0.420	8.01	6.68	-13.4	42.72	12.34
1.0	10	8.57	0.423	2.79	6.77	-43.8	23.41	12.35
1.5	15	8.82	0.425	1.67	6.86	-55.5	15.01	12.35
2.0	20	8.59	0.426	1.16	6.88	-67.4	8.09	12.35
2.5	25	8.57	0.426	0.92	6.87	-71.5	6.73	12.35
3.0	30	8.60	0.427	0.81	6.89	-73.3	4.70	12.35
3.5	35	8.62	0.427	0.74	6.89	-74.2	6.74	12.35
		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 / N Labeled with LOC ID? Y / N Comments:
Sheen: Yes / No Odor: Yes / No Notes/Comments: Slight
Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate
pH checked of samples: Y / N Approximate volume added (mL): HCl = ~~40~~ HNO_3 = ~~40~~

Purge Water
Gallons generated: 3.75 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: SK

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

Project #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/16/18 | Probe/Well #: AP-10016R

Time: 1340 | Sample ID: 18FWOU2 13 WG

Sampler: JK

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 # 6 | Turbidity Meter #: 12 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 20.46 | Well Screened Across / Below water table

Depth to Water from TOC (feet): 12.46 | Depth tubing / pump intake set* approx 13.5 feet below top of casing

Column of Water in Probe/Well (feet): = 8.00 | *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): 1.3

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

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	9.63	0.422	0.90	6.66	-30.6	24.53	12.50
1.0	10	9.69	0.417	0.75	6.72	-33.8	11.84	12.50
1.5	15	9.61	0.414	0.60	6.72	-30.4	6.38	12.50
2.0	20	9.62	0.413	0.58	6.73	-26.0	4.32	12.50
2.5	25	9.57	0.412	0.55	6.74	-23.4	4.05	12.50
3.0	30	9.56	0.412	0.54	6.73	-20.8	3.98	12.50
		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 (mild) | Notes/Comments:

Laboratory Analyses (Circle): VOC, SVOC, GRO, DRO, Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM OU2 Ft. Wainwright, Alaska

Project #: 9011-02 Site Location: FB 1168 / ORMO-1 / DRMO-4 / 5010

Date: 8/16/18 Probe/Well #: AP-89141R

Time: 1450 Sample ID: 18FWOU2 14 WG

Sampler: JK

Weather: P. Cloudy Outside Temperature: 58°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: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 18.15 Well Screened Across / Below water table

Depth to Water from TOC (feet): - 10.33 Depth tubing / pump intake set* approx: 11.3 feet below top of casing

Column of Water in Probe/Well (feet): = 7.82 *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): 1.27

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	8.88	0.363	5.13	6.64	-80.1	9.08	10.37
1.0	10	9.27	0.363	2.49	6.72	-93.8	6.88	10.37
1.5	15	9.20	0.364	1.80	6.73	-98.6	5.77	10.37
2.0	20	9.25	0.366	0.94	6.76	-104.0	2.69	10.37
2.5	25	9.25	0.365	0.73	6.77	-108.3	1.86	10.37
3.0	30	9.22	0.367	0.59	6.79	-111.9	2.82	10.35
		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

pH checked of samples: Y / N Approximate volume added (mL): HCl = X HNO_3 = 10

Purge Water

Gallons generated: 3.25 Containerized and disposed as IDW? Yes / No If No, why not?

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM | OU2 | Ft. Wainwright, Alaska

Project #: 9011-02 | Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010

Date: 8/16/18 | Probe/Well #: AP-10018R

Time: ~~1100~~ 1600 | Sample ID: 18FWOU2 15 WG

Sampler: JK

Weather: 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 # B | Turbidity Meter #: 12 | Water Level: SEE 13

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

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

Total Depth in Probe/Well (feet btoc): 20.48 | Well Screened Across / Below water table

Depth to Water from TOC (feet): 11.86 | Depth tubing / pump intake set* approx. 12.8 feet below top of casing

Column of Water in Probe/Well (feet): = 8.62 | *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): 1.4

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					<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	9.83	0.423	4.58	7.29	-159.0	37.30	11.91
1.0	10	8.81	0.422	0.99	7.35	-164.4	10.11	11.91
1.5	15	8.58	0.422	0.72	7.40	-171.6	6.19	11.91
2.0	20	8.41	0.422	0.62	7.35	-171.5	5.36	11.91
2.5	25	8.43	0.422	0.56	7.37	-172.7	4.10	11.91
3.0	30	8.39	0.421	0.57	7.37	-173.3	3.50	11.91
			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

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

Purge Water

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

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM | OU2 | Ft. Wainwright, Alaska

Project #: 9011-02 | Site Location: FB 1168 / DRMO-3 / DRMO-4 / 5010

Date: 8/16/18 | Probe/Well #: AP-10017R

Time: 1700 | Sample ID: 18FWOU2 16 WG

Sampler: JK

Weather: Cloudy | Outside Temperature: 58°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: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 20.42 | Well Screened Across / Below water table

Depth to Water from TOC (feet): 12.02 | Depth tubing / pump intake set* approx 13 feet below top of casing

Column of Water in Probe/Well (feet): = 8.40

*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): 1.4

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					<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	7.03	0.358	1.99	6.82	-4.4	11.41	12.05
1.0	10	8.88	0.387	1.67	6.85	-5.1	8.36	12.05
1.5	15	8.69	0.385	1.11	6.88	-6.6	6.83	12.05
2.0	20	8.52	0.384	0.95	6.89	-6.7	5.50	12.05
2.5	25	8.57	0.383	0.79	6.89	-6.5	3.53	12.05
3.0	30	8.64	0.383	0.82	6.89	-6.3	2.63	12.05
			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

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

Purge Water

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

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

Sampler's Initials: JK

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

Project #: 9011-02 | Site Location: FB 1168 / DRMO-1 / (DRMO-4) 5010
Date: 8/17/18 | Probe/Well #: AP-10445MW
Time: 0845 | Sample ID: 18FWOU2 17 WG
Sampler: JK
Weather: Cloudy | Outside Temperature: 51°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 #: 1-2 | Water Level: SOC 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —

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

Total Depth in Probe/Well (feet btoc): 20.45 | Well Screened (Across) / Below water table
Depth to Water from TOC (feet): - 12.31 | Depth tubing / pump intake set* approx. 13.3 feet below top of casing
Column of Water in Probe/Well (feet): = 8.14 | *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): 1.3

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

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	9.23	0.784	4.10	6.57	74.0	14.37	12.33
1.0	10	9.15	0.773	2.19	6.59	51.4	6.71	12.33
1.5	15	8.97	0.770	1.15	6.62	31.9	5.17	12.33
2.0	20	8.95	0.774	1.08	6.63	25.4	3.62	12.33
2.5	25	8.89	0.769	0.95	6.64	19.2	3.17	12.33
3.0	30	8.86	0.767	0.93	6.65	14.9	2.98	12.33
		JK						

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

Laboratory Analyses (Circle): (VOC, SVOC, GRO, DRO, Iron, Sulfate)
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 #: 9011-02
Site Location: FB 1168 / DRMO-1 / (DRMO-4) / 5010
Date: 8/17/18
Probe/Well #: AR 10446 MW
Time: 1000
Sample ID: 18FWOU2 18 WG
Sampler: SK
Weather: Cloudy
Outside Temperature: 52°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: 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): 20.53
Depth to Water from TOC (feet): - 11.47
Column of Water in Probe/Well (feet): = 9.06
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): 1.5

Sampling Depth

Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 12.5 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					<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	5.16	0.437	3.69	7.13	-78.0	40.79	11.50
1.0	10	5.64	0.436	2.08	7.18	-99.7	22.18	11.50
1.5	15	5.77	0.436	0.95	7.25	-118.1	9.67	11.50
2.0	20	5.78	0.436	0.89	7.26	-119.7	5.77	11.50
2.5	25	5.83	0.437	0.57	7.25	-122.0	6.19	11.50
3.0	30	5.87	0.436	0.61	7.24	-121.2	4.08	11.50
			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)
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: SK

GROUNDWATER SAMPLE FORM

OU2 — Ft. Wainwright, Alaska

Project #: 9011-02
Site Location: FB 1168 / DRMO-1 / DRMO-4 / 5010
Date: 8/17/18
Probe/Well #: +P 8916
Time: 1115
Sample ID: 18FWOU2 / 9 WG
Sampler: JK
Weather: 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 # 8 Turbidity Meter #: 12 Water Level: SOL13
Free Product Observed in Probe/Well? Yes/(No) If Yes, Depth to Product:
Column of Water in Probe/Well
Sampling Depth 10' screen
Total Depth in Probe/Well (feet btoc): 16.28
Well Screened (Across) / Below water table
Depth to Water from TOC (feet): 10.77
Depth tubing / pump intake set* approx 11.75 feet below top of casing
Column of Water in Probe/Well (feet): = 5.51
*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): 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					<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	7.24	0.600	7.01	6.92	-120.2	18.62	10.80
1.0	10	6.70	0.587	2.98	6.97	-131.7	5.36	10.80
1.5	15	6.79	0.573	0.70	7.03	-135.3	2.99	10.80
2.0	20	6.84	0.571	0.38	7.03	-136.0	2.09	10.80
2.5	25	6.85	0.565	0.31	7.05	-137.9	1.04	10.80
3.0	30	6.87	0.565	0.39	7.04	-136.9	1.24	10.80
			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: Strong odor
Laboratory Analyses (Circle): (VOC, SVOC, GRO, DRO, Iron, Sulfate)
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = X HNO_3 = 0

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

Submersible Pump Equipment Blank

Rinsate #: Rinsate 03

Sample ID: 18PW0U2EB03WQ

Date: 8/16/18

Time: 1830

Analysis: VOC/DRO/Fe/SO4

Well that the pump was last used on: AP-100178

YSI AND TURBIDIMETER CALIBRATION FORM

Operable Unit

Name: OU2

Calibration Liquid Lot Numbers/ Expiration Dates:

SPC	ORP	Ph 4	Ph 7 or Ph 10
176100637 / 01/2019	0624 / 10/2021	17E3R / 05/2019	17025 / 04/2019
00653-18 / 01/2020			

Date	Project	YSI# / Turbidity #	Bar. PSI mmHg	D.O. Pre	D.O. Post	SPC Pre	SPC Post	ORP Pre	ORP Post	Ph 4 Pre	Ph 4 Post	Ph 7 Pre	Ph 7 Post	Calibrate Turbidity Meter (Y/N)
6/3/18	OU2/1168	8/11	759.2	9.19	8.68	1.004	1.000	237.2	240.0	4.01	4.00	6.98	7.00	Y
6/4/18	OU2/5010	8/11	757.1	8.69	8.52	0.991	1.000	237.7	240.0	4.06	4.00	6.98	7.00	Y
~~8/14/18~~	~~OU2 DEMO 1/4~~	~~8/12~~	~~750.8~~	~~881~~	~~8.63~~	~~1.414~~	~~1.413~~	~~239.5~~	~~240.0~~	~~4.03~~	~~4.00~~	~~6.96~~	~~7.00~~	Y
8/16/18	OU2	8/12	757.8	8.42	8.74	1.413	1.413	241.5	240.0	4.00	4.00	7.03	7.00	Y
8/17/18	OU2	8/12	758.4	9.16	8.93	1.406	1.413	242.8	240.0	4.00	4.00	7.01	7.00	Y

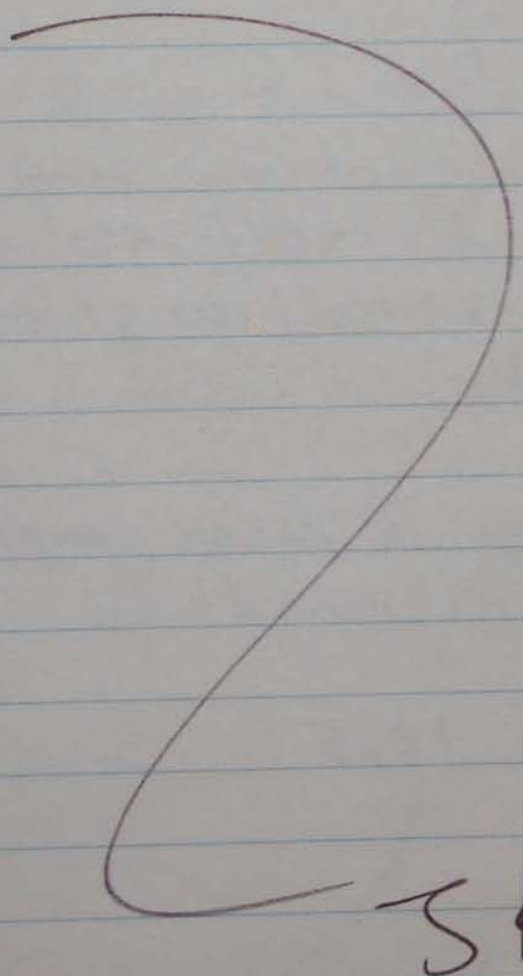
Notes/ Maintenance Items:

8/17/18 Cloudy 50°F

0600 - Prepare for OU2 GW sampling

0700 - Drive to site to sample DRMO-4 wells

1130 - Completed sampling @ DRMO.
↳ Leaving site for other tasks



SK

4/1

6/3/18 P.Cloudy 45°F

0600 - Prep gear for Our 1168 GW sampling.
↳ print old forms
↳ calibrate YSI

0805 - Drive to 1168 site.

0820 - set up to sample AP-6809.

1200 - Rain from earlier has passed on.
↳ completed sampling @ 1168

1205 - leaving site for separate task

JK

Rate in the Rain 1/1

6/4/18 Clear

0700 - Prepare gear for OU2 DRMO GW sampling

0805 - Drive to site.
↳ stop by [redacted] to see if they have any sub pump tubing, but there was no one there.

0820 - arrive @ DRMO bldg 5010

0825 - begin purging WSW.
↳ set up to collect sample after purging for 30 minutes.

0915 - set up to sample AP-7346/MS/MSD

1050 - set up to sample @ AP-7348

1150 - Completed sampling 5010
↳ Deliver IDW to DERA.

End Project @ 1200

7/3/18 Clear 55°F

0600 - Prepare to Develop wells @ OU2 DRMO.

0710 - Drive to DERA to pick up empty Poly's

0800 - set up to ~~sample~~ develop wells @ DRMO starting with ProbeB Rep. then P05R then AP-10015R

1430 - Water from Development collected and delivered from site to DERA.

1550 - Transfer complete for today. IBC 1804 full
↳ Return to shop
↳ pick up another IBC
↳ [redacted]

End Day @ 1615

10/17/2018 9:02

SK

16 7/4/18 Clear 58°F

0600 - Decon pumps from 7/3

0720 - Drive to DERA to transfer IDW into the new IBC.

0900 - Set up to develop the remaining three wells at DRMO
↳ AP-10016R/AP-10017R/AP-10018R

1600 - Drive to DERA to transfer into the IBC that was collected today.

1800 Return to shop.
↳ clean up gear from today

End Day @ 1845

JK

1/1

8/16/18 Cloudy 42°F 17

0600 - Prepare for GW sampling @ DRMO 1/4
↳ Calibrate YSI & Turbidimeter

0700 - Drive to our-DRMO site
↳ stop for fuel

0730 - Clear brush from around well AP-7559

1730 completed collecting samples from wells AP-7559/-7560/10015R AP-10016R/-8914R/10018R/10017R
↳ Return to shop.

1850 - Arrive @ shop to decon pumps and collect a rinsate.

End Day @ 1915

JK

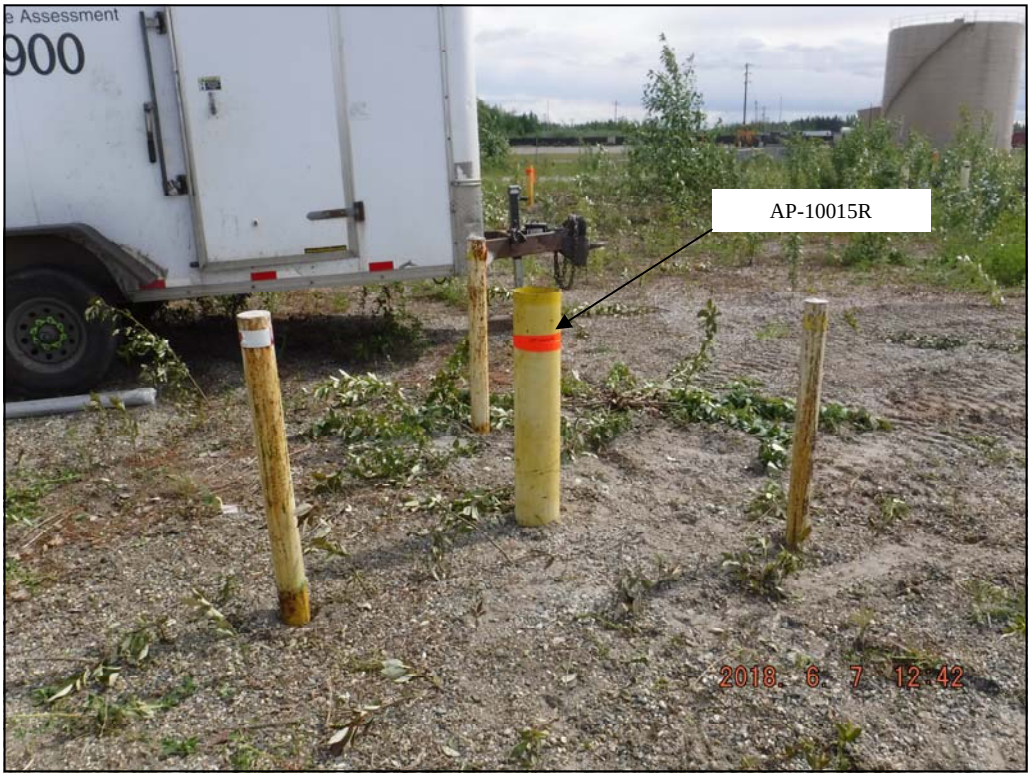
1/1

10/17/2018 9:02

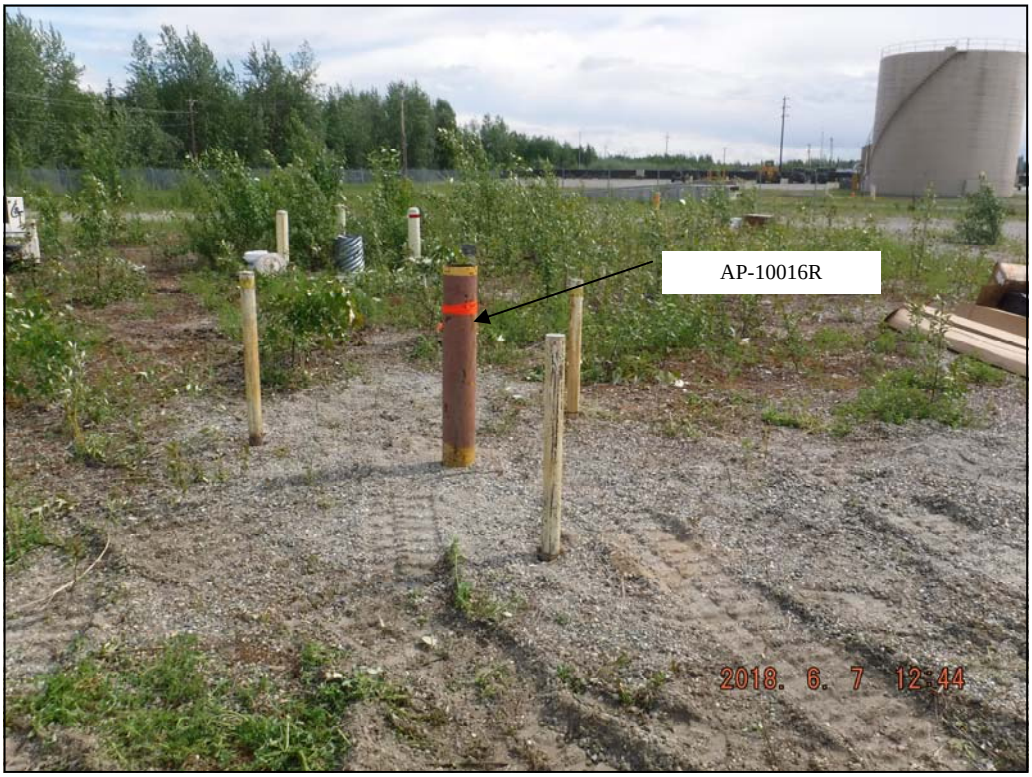
APPENDIX D

PHOTO LOG

OU2 DRMO1—Groundwater sampling at AP-7560
(view W)



OU2 DRMO1 (3-Party) — Replacement Monitoring Well AP-10015R
(view E)



OU2 DRMO1 (3-Party) — Replacement Monitoring Well AP-10016R
(view E)

OU2 DRMO1 (3-Party) — Replacement Monitoring Well AP-10017R
(view E)

OU2 DRMO1 (3-Party) — Replacement Monitoring Well AP-10018R
(view E)

OU2 DRMO4 (3-Party) — Replacement Monitoring Well AP-10445MW
(view S)

OU2 DRMO4 (3-Party) — Replacement Monitoring Well AP-10446W
(view S)

OU2 DRMO4 (3-Party) — Monitoring Well Development at AP-10445MW
(view N)

APPENDIX E

LTMO ANALYSIS RESULTS

MAROS Summary 1—DRMO1 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: OU2 DRMO_2018
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/1/2010 **to** 8/16/2018
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	12	9	1.6E-03	9.6E-04	No	I	I
AP-10016	S	12	11	6.5E-03	5.3E-03	No	NT	NT
AP-10017	S	12	11	1.1E-03	1.0E-03	No	PI	I
AP-10018	S	12	11	5.6E-03	2.3E-03	No	D	PD
AP-7559	T	12	10	3.2E-03	3.3E-03	No	NT	NT
AP-7560	T	9	8	2.1E-03	1.9E-03	No	NT	NT
AP-8914	S	12	9	2.9E-03	7.2E-04	No	NT	PD
TRICHLOROETHYLENE (TCE)								
AP-10015	T	12	12	1.9E-03	1.7E-03	No	S	S
AP-10016	S	12	11	1.2E-03	1.3E-03	No	NT	NT
AP-10017	S	12	6	4.0E-04	4.2E-04	No	I	I
AP-10018	S	12	11	3.2E-03	3.1E-03	No	D	D
AP-7559	T	12	10	5.4E-04	5.1E-04	No	NT	D
AP-7560	T	9	7	1.5E-03	1.2E-03	No	NT	NT
AP-8914	S	12	10	2.6E-03	2.4E-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: OU2 DRMO_2018
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	56	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	54	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	139	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	149	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
8/16/2018	1.4E-02	1,394,799	3,954,968	149	1,859	1,292	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	132	2,584	1,821	7
8/9/2017	4.9E-03	1,394,812	3,954,956	131	2,635	1,860	7
8/16/2018	4.9E-03	1,394,800	3,954,967	147	2,157	1,605	7

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

Project: OU2 DRMO_2018 **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)	0.62	18	87.5%	NT
	TRICHLOROETHYLENE (TCE)	0.50	10	72.7%	NT
1st Moment: Distance to Source					
	TETRACHLOROETHYLENE(PCE)	0.35	34	99.0%	I
	TRICHLOROETHYLENE (TCE)	0.32	32	98.4%	I
2nd Moment: Sigma XX					
	TETRACHLOROETHYLENE(PCE)	0.53	4	58.0%	NT
	TRICHLOROETHYLENE (TCE)	0.51	4	58.0%	NT
2nd Moment: Sigma YY					
	TETRACHLOROETHYLENE(PCE)	0.30	12	77.0%	NT
	TRICHLOROETHYLENE (TCE)	0.30	24	94.2%	PI

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

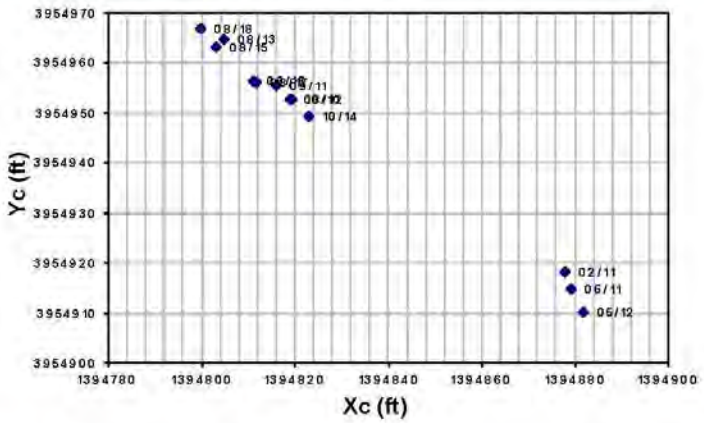
MAROS First Moment Analysis

Project: OU2 DRMO_2018 **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	132	7
8/9/2017	TRICHLOROETHYLENE (TCE	1,394,812	3,954,956	131	7
8/16/2018	TRICHLOROETHYLENE (TCE	1,394,800	3,954,967	147	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 4 —DRMO1 First Moment Analysis Plot for PCE

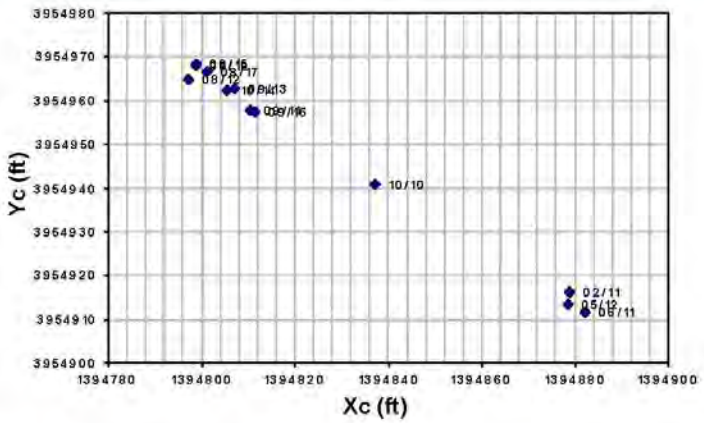
MAROS First Moment Analysis

Project: OU2 DRMO_2018 **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	56	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	54	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	139	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	149	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
8/16/2018	TETRACHLOROETHYLENE(P	1,394,799	3,954,968	149	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: OU2 DRMO_2018 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 36 10/11/2010 **to** Sample Event 47 8/16/2018

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	☑	0.359	0.000	0.752	☐
AP-10016	1394881.00	3954866.00	☑	0.342	0.000	0.541	☐
AP-10017	1394939.13	3954849.50	☑	0.322	0.000	0.595	☐
AP-10018	1394914.75	3954897.25	☑	0.211	0.000	0.452	☐
AP-7559	1394820.13	3955011.25	☑	0.348	0.000	0.737	☐
AP-7560	1394632.88	3955071.25	☑	0.187	0.000	0.492	☐
AP-8914	1394907.00	3954874.75	☑	0.303	0.000	0.778	☐
TRICHLOROETHYLENE (TCE)							
AP-10015	1394860.00	3954905.50	☑	0.155	0.012	0.465	☑
AP-10016	1394881.00	3954866.00	☑	0.170	0.017	0.432	☐
AP-10017	1394939.13	3954849.50	☑	0.516	0.000	0.735	☐
AP-10018	1394914.75	3954897.25	☑	0.188	0.002	0.630	☐
AP-7559	1394820.13	3955011.25	☑	0.357	0.108	0.474	☐
AP-7560	1394632.88	3955071.25	☑	0.239	0.037	0.526	☐
AP-8914	1394907.00	3954874.75	☑	0.234	0.103	0.487	☐

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.

MAROS Version 2.2, 2006, AFCEE Tuesday, October 23, 2018 Page 1 of 1

MAROS Summary 6 —DRMO1 Sampling Location Optimization, All COCs

MAROS Sampling Location Optimization

Results by Considering All COCs

Project: OU2 DRMO_2018 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

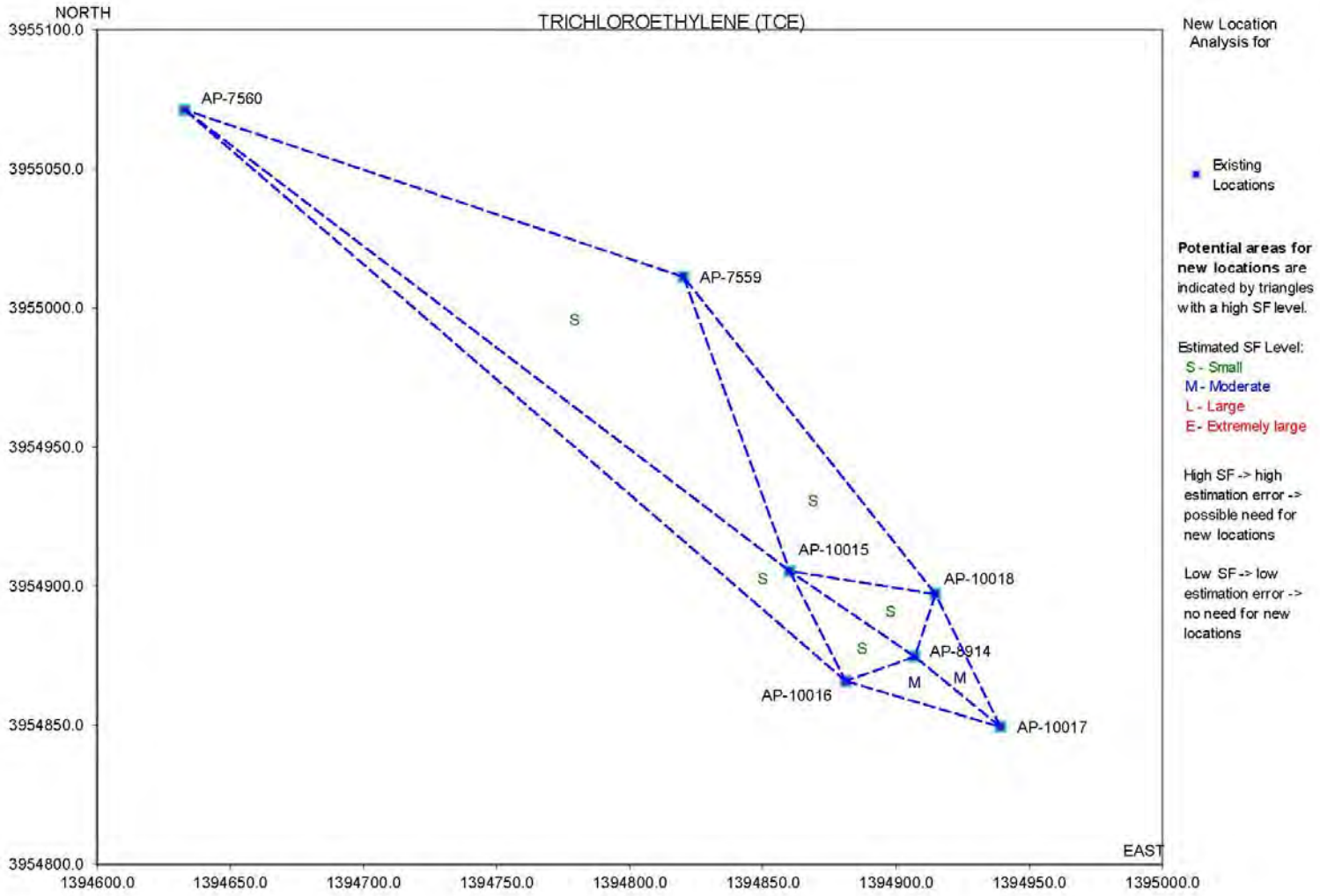
Sampling Events Analyzed: **From** Sample Event 36 10/11/2010 **to** Sample Event 47 8/16/2018

Well	X (feet)	Y (feet)	Number of COCs	COC-Averaged Slope Factor*	Abandoned?
AP-10015	1394860.00	3954905.50	2	0.257	☐
AP-10016	1394881.00	3954866.00	2	0.256	☐
AP-10017	1394939.13	3954849.50	2	0.419	☐
AP-10018	1394914.75	3954897.25	2	0.199	☐
AP-7559	1394820.13	3955011.25	2	0.352	☐
AP-7560	1394632.88	3955071.25	2	0.213	☐
AP-8914	1394907.00	3954874.75	2	0.269	☐

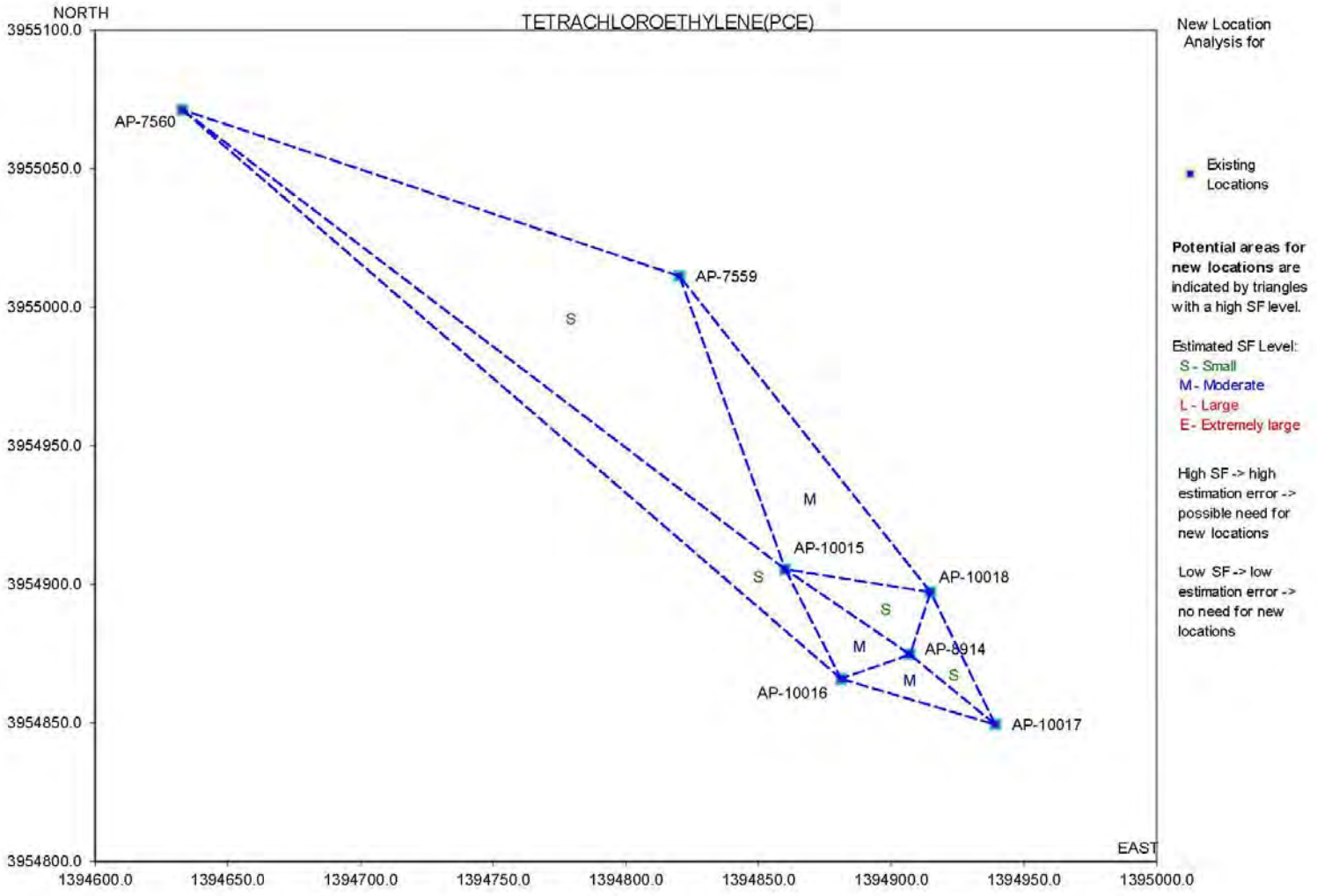
Note: the COC-Averaged Slope Factor is the value calculated by averaging those "Average Slope Factor" obtained earlier across COCs; to be conservative, a location is "abandoned" only when it is eliminated from all COCs; "abandoned" doesn't necessarily mean the abandon of well, it can mean that NO samples 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 Version 2.2, 2006, AFCEE Tuesday, October 23, 2018 Page 1 of 1

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: OU2 DRMO_2018 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 12

"Recent Period" defined by events: **From** Sample Event 36 (10/11/2010) **To** Sample Event 47 (8/16/2018)

"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.

MAROS Version 2.2, 2006, AFCEE Tuesday, October 23, 2018 Page 1 of 1

MAROS Summary 10 —DRMO4 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: OU2 DRMO4_2018
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/1/2011 **to** 8/17/2018
Consolidation Period: No Time Consolidation
Consolidation Type: Median
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	9	8	3.4E-03	2.7E-03	No	S	PD
PO-5	S	9	7	5.4E-03	6.6E-03	No	NT	S
Probe B	T	9	0	2.5E-04	2.5E-04	Yes	ND	ND
TRICHLOROETHYLENE (TCE)								
AP-8916	S	9	3	6.8E-04	2.5E-04	No	NT	NT
PO-5	S	9	7	2.9E-03	3.6E-03	No	S	S
Probe B	T	9	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.

MAROS Version 2.2, 2006, AFCEE Tuesday, October 23, 2018 Page 1 of 1

MAROS Summary 11 —Building 5010 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: Bldg 5010_2018
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 12/1/1997 **to** 6/4/2018
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	17	11	7.0E-02	8.2E-02	No	D	D
AP-7348	S	22	22	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.

MAROS Version 2.2, 2006, AFCEE Tuesday, October 23, 2018 Page 1 of 1

APPENDIX F

IRACR CONCURRENCE LETTERS

THE STATE
of ALASKA
GOVERNOR MICHAEL J. DUNLEAVY

Department of Environmental Conservation
SPILL PREVENTION & RESPONSE
Contaminated Sites Program

610 University Avenue
Fairbanks, Alaska 99709
Main: 907.451.2143
Fax: 907.451.2155
www.dec.alaska.gov

File: 108.38.069.02

March 15, 2019

Dept. of the Army
Directorate of Public Works
ATTN: IMFW-PWE (R. Morris)
1046 Marks Road
Fort Wainwright, Alaska 99703

Dept. of the Army
Directorate of Public Works
ATTN: IMFW-PWE (B. Adams)
1046 Marks Road
Fort Wainwright, Alaska 99703

RE: DEC Concurrence with the *Interim Remedial Action Completion Report (IRACR) Building 1168 Leach Well Site, Operable Unit 2, U.S. Army Garrison Alaska* Dated December 2018

Dear Mr. Morris and Mr. Adams:

The Alaska Department of Environmental Conservation (DEC) received the final version of the above-referenced document on December 21, 2018. The Interim Remedial Action Completion Report (IRACR) for the Operable Unit 2 (OU2) Building 1168 Leach Well site on Fort Wainwright, Alaska (FWA) demonstrates that the remedy was constructed and operated successfully in accordance with the established remedial action objectives (RAOs) and the record of decision (ROD)[1].

The Former Building 1168 leach well site is located on the north side of Trainor Gate Road on FWA. 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). The types of products suspected to have entered the leach well include used oil from engines and transmissions, gasoline, diesel, jet fuel, and solvents. Building 1168 was demolished in 1997, however, the leach well and associated piping remained. After demolition of Building 1168, the area was graded flat and covered with gravel. Currently, the site remains a gravel lot, however it has been overgrown with vegetation including various grasses, alder, and willow trees.

[1] *Record of Decision for Operable Unit 2, Fort Wainwright, Fairbanks, Alaska. Dated January 1997.*

An air sparge (AS)/soil vapor extraction (SVE) system was installed in 1994 as part of a treatability study, and operated until 1998. Contaminants of concern (COCs) were below the remedial action goals (RAGs), however, after shutdown of the AS/SVE system, benzene rebounded. In 2003, the benzene concentration was again below the RAG, the AS/SVE system was decommissioned and removed from the site. After removal of the AS/SVE system, benzene rebounded again. An in-situ chemical oxidation (ISCO) treatability study was conducted. Results from the study indicated there was little to no benzene remaining in the soil, since there was no spike in contaminant levels in the groundwater following the ISCO injection.

Sample results indicate Comprehensive, Environmental, Response, Compensation and Liability Act (CERCLA) contaminants identified in the ROD are below the RAGs. Annual groundwater monitoring will continue under the 2-Party agreement[2] and the petroleum strategy[3] to monitor the natural attenuation and degradation of petroleum contaminants. Diesel range organics (DRO) and naphthalene remain in the groundwater above the RAGs. Institutional control (IC) inspections will be conducted annually while groundwater contamination concentrations remain above DEC cleanup levels. Because this site will be removed from OU2, the remedy will no longer be evaluated in future five-year reviews.

DEC concurs with the recommendation in this IRACR, to move the Former Building 1168 site into the 2-Party program. If there are any questions, please contact the project manager, Erica Blake by telephone at (907) 451-2182, or by email at erica.blake@alaska.gov.

Sincerely,

Melinda Brunner
Environmental Program Manager

cc (via email): Sandra Halstead, EPA
Tamara Scholten, FWA ENVR
Seth Reedy, FWA ENVR
Matthew Sprau, FWA ENVR Branch Chief
Bob Hazlett, USACE
Robert Glascott, USACE
Guy Warren, USACE
David Mays AEC
Jennifer Rawlings, AEC
Erica Blake, DEC
Kevin Fraley, DEC

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[2] *Compliance Agreement between the Alaska Department of Environmental Conservation and the United States Army 6th Infantry Division (Light) and U.S. Army Garrison, Fort Wainwright, Alaska. Dated March 25, 1992.*

[3] *Appendix D Fort Wainwright Petroleum Strategy: Two-Party Agreement Sites and Fort Wainwright CERCLA Federal Facility Agreement Recommended Action. Revised January 12, 1998.*

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3123

SUPERFUND &
EMERGENCY
MANAGEMENT DIVISION

June 3, 2019

MEMORANDUM

SUBJECT: CERCLA Contaminants Remedial Action Operations and Maintenance Completion Report, Fort Wainwright Operable Unit 2, Building 1168

FROM: Sandra Halstead
Remedial Project Manager, EPA R10

THRU: Dave Einan, Section Chief
Cami Grandinetti, Branch Chief

TO: Sheryl Bilbrey, Director

Introduction and Purpose

This memorandum provides Region 10's rationale to approve the Fort Wainwright Operable Unit 2 (OU 2), Building 1168 Interim Remedial Completion Action Report.

The report documents the completion of CERCLA contaminant remedial actions for Operation and Maintenance of a groundwater remedy and attainment of groundwater Remedial Action Goals (RAGs). It conforms with the DoD/EPA Joint Guidance on Streamlined Site Closeout and NPL Deletion Process For DoD Facilities (2005). The U.S. Environmental Protection Agency guidance in OSWER Directive 9320.2-22, Close Out Procedures for National Priorities List Sites (2011) refers to documenting attainment of cleanup levels in a Final Close Out Report[1]. However, Building 1168 is one of two source areas in OU 2. The OU 2 Record of Decision (ROD) also includes the site Defense Reuse and Marketing Organization, which has not achieved RAGs and is not included in the OU 2 Building 1168 iRACR.

Because the iRACR is not prepared by the EPA, it needs to be approved in writing by the designated official to achieve RA completion.

Summary of the Report

The Fort Wainwright Operable Unit 2, Building 1168 Interim Remedial Action Report, January 2019 describes the original remedy components and RAGs selected in the OU 2 ROD as signed by the US Army, the US EPA, and the State of Alaska in 1997.

[1] For federal facility-lead sites, groundwater and surface water restoration remedies transition from RA completion directly to O&M. Previous guidance distinguished between Interim and Final Remedial Action (RA) Reports, where Interim RA Reports were used to document RA completion for groundwater and surface water restoration actions (a Final RA Report would then be issued when cleanup levels were achieved). Current guidance eliminates this distinction, now referring to all reports simply as "RA Reports". Rather than producing a Final RA Report, monitoring data demonstrating that cleanup levels have been achieved may be referenced in the Final Close Out Report.

The selected remedy for the Building 1168 Leach Well included the following:

- In-situ air sparge of groundwater to remove volatile organic compounds and achieve Maximum Contaminant Levels (MCLs);
- In-situ SVE of soils to prevent contaminated soils from acting as an ongoing source of contamination to groundwater;
- Implementation of Institutional Controls (ICs) that include restrictions on site access and groundwater well installation;
- Natural attenuation with groundwater monitoring and evaluation to attain Alaska Water Quality Standards

Groundwater RAGs for the selected remedy were based on state and federal MCLs as shown in Table 1.

Table 1. ROD Remedial Action Goals for Groundwater

Contaminants of Concern	Remedial Action Goal
Benzene	5 µg/L
Tetrachloroethene (PCE)	5 µg/L
Trichloroethene (TCE)	5 µg/L
Vinyl Chloride	2 µg/L
1,1-Dichloroethene (1,1-DCE)	7 µg/L
cis-1,2-Dichloroethene (cis-1,2-DCE)	70 µg/L

Units: µg/L – micrograms per liter

The AS/SVE system operated between 1994 and 1998, and air monitoring results showed the system removed approximately 2,680 pounds of hydrocarbons through volatilization, and an estimated 1,900 pounds of hydrocarbons through aerobic biodegradation[2]. Effectiveness of the system was also evaluated through groundwater monitoring, and sampling was conducted on a quarterly basis to evaluate progress towards achieving the RAGs. The December 1998 sampling event showed the RAGs in groundwater had been achieved. Based on these results, the treatment system was shut down, although groundwater monitoring continued. Benzene concentrations rebounded above the RAG in 2000. The detections were less than the pre-treatment concentrations, but first-order attenuation rate analysis indicated that the contamination would likely persist at the site for a significant period of time. The treatment system was decommissioned in 2003.

After the treatment system was decommissioned, the benzene concentration rebounded above the RAG in a source area well. Since the treatment system had already been decommissioned, and re-installation of the AS/SVE treatment system was determined to be impractical and not cost effective, a treatability study was conducted. The treatability study utilized in-situ chemical oxidation (ISCO) and stimulation of aerobic biodegradation through addition of an oxygen-releasing compound (ORC). The treatability study was completed in 2010 and 2011, with the injection completed during October 2010. Complete results of the treatability study are presented in the Former Building 1168 Treatability Study Report[3].

[2] CH2M Hill, 2003. CLOSES Evaluation Building 1168. Fort Wainwright, Alaska. August.
[3] FES, 2017a. Former Building 1168 Treatability Study Report, Operable Unit 2, Fort Wainwright, Alaska.

Soil sampling in the vicinity of the source well has determined low benzene mass remains in soils at the site.

Benzene has remained below its RAG in all subsequent sampling events since the injection. The 2017 sampling event was the 11th consecutive sampling event where benzene was below its RAG. Groundwater sampling results collected from the Building 1168 Leach Well site were evaluated using the Groundwater Statistics Tool developed by the USEPA (USEPA, 2014) in conjunction with the *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well*, which outlines the process to use to determine if the groundwater has met and will continue to meet the RAGs for a particular COC, and if the remedial action may be considered complete[4]. The statistical analysis uses the 95% upper confidence limit (UCL) on the mean to determine attainment of the RAG, and trend analysis is utilized to determine if the groundwater will continue to meet the cleanup level in the future.

The statistical analysis for groundwater analytical results are summarized as:

- The 95% UCL for benzene has been achieved for each of the three wells at the Building 1168 Leach Well site.
- Analysis of the benzene trends showed the concentrations were not statistically increasing. In addition, benzene has not exceeded the RAG in any monitoring well since the ISCO treatability study, and the RAG has been achieved with a statistically significant confidence level.

Institutional controls for Building 1168 Leach Well site are formalized in the Post Wide IC policy. Annual inspections, started in 2012, evaluate the effectiveness and implementation of the IC restrictions. ICs restricting groundwater use will continue until all groundwater contaminant concentrations have achieved the ADEC cleanup requirements, and restrictions on soil disturbing activities will continue as described in the Post Wide IC policy.

All cleanup goals identified in the ROD have been attained and the Building 1168 Leach Well site will not be included in future Five-Year Reviews. However additional monitoring and remediation efforts will occur under the Fort Wainwright-State of Alaska Two-Party Agreement for petroleum contaminants.

I concur with the Army's Interim Remedial Action Completion Report for Fort Wainwright Operable Unit 2, Building 1168. The remaining petroleum contamination at site will be addressed by the State of Alaska regulations at 18 AAC 75 with oversight from the Alaska Department of Environmental Conservation.

Sheryl Bilbrey, Director

September.

[4] US EPA, 2014. Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Monitoring Well. OSWER 9283.1-45. August

REVIEW COMMENTS AND RESPONSES

THE STATE of ALASKA
GOVERNOR MICHAEL J. DUNLEAVY

Department of Environmental Conservation
SPILL PREVENTION & RESPONSE
Contaminated Sites Program

610 University Avenue
Fairbanks, Alaska 99709
Main: 907.451.2143
Fax: 907.451.2155
www.dec.alaska.gov

File: 108.38.069

February 12, 2019

Electronic Delivery Only
Dept. of the Army
Directorate of Public Works
ATTN: IMFW-PWE (R. Morris)
1046 Marks Road
Fort Wainwright, Alaska 99703

Electronic Delivery Only
Dept. of the Army
Directorate of Public Works
ATTN: IMFW-PWE (B. Adams)
1046 Marks Road
Fort Wainwright, Alaska 99703

RE: DEC comments for *Draft 2018 Monitoring Report, Operable Unit 2, Fort Wainwright, AK.* Dated January 2019.

Dear Mr. Morris and Mr. Adams:

The Alaska Department of Environmental Conservation (DEC) has completed a review of the above-referenced document. The document describes 2018 monitoring activities for Operable Unit 2 on Fort Wainwright, Alaska (FWA). Groundwater sample results show that PCE remains above the Record of Decision (ROD) Remedial Action Goals (RAG) at the Defense Reutilization Marketing Office (DRMO) 3-party sites, and DEC concurs with continuation of annual sampling at these locations. Groundwater samples showed continuing exceedances of diesel range organics (DRO) and volatile organic compounds (VOC) at the Building 5010 Subarea for DRMO 2-party sites, and DEC concurs with continued annual sampling of the Building 5010 Subarea and Water Supply Well. Samples from Former Building 1168, now a 2-party site, show that ROD and non-ROD COC's are below the RAGs and DEC cleanup levels, and DEC concurs with continued annual sampling for DRO and VOC analysis.

The institutional control (IC) inspection found that most IC's were properly in place, although an issue was identified and dealt with at the DRMO yard Water Supply Well, but was previously reported to DEC and has been corrected. It is stated that a full IC inspection report will be delivered to DEC later in 2019. No monitoring wells are recommended for installation or removal based on the monitoring results, although six non-functional wells were replaced.

DEC has provided comments (See Enclosure). If there are any questions, please contact me at (907) 451-2104, or at kevin.fraley@alaska.gov.

Sincerely,

Kevin Fraley
Environmental Program Specialist

Enclosure: DEC Review Comments

cc (via email): Sandra Halstead, EPA
Tamara Scholten, FWA ENVR
Seth Reedy, FWA ENVR
Matthew Sprau, FWA ENVR Branch Chief
Bob Hazlett, USACE
Robert Glascott, USACE
Guy Warren, USACE
David Mays AEC
Jennifer Rawlings, AEC
Erica Blake, DEC

REVIEW COMMENTS **PROJECT: Ft Wainwright, AK**
DOCUMENT: Draft 2018 Monitoring Report – Operable Unit 2

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 2/12/2019** **REVIEWER: Kevin Fraley & Erica Blake** **PHONE: 907-451-2104**	**Action taken on comment by:** **Aaron Swank – FES (2/20/19; 6/13/19)**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Executive Summary, DRMO Yard 3-party Sites, paragraph 2	Why is there no mention of the TCE and PCE moment 1 MAROS results showing increasing distance from source? See comment #3. Please add a sentence mentioning this.	A	More specific results for the DRMO1 and DRMO4 LTMO analysis will be added to the executive summary, including the results of the 1st moment analysis (also see response to comment #3).	Agree with comment back-check.
2.	Section 2.6, DRMO Yard, bullet point 2	Please specify "the steps in progress" to rectify the non-conformance issue. It is noted that more specific information will be included in the 2018 IC report, but a sentence or two specifically mentioning the steps taken is warranted here.	A	The current steps that have been taken to rectify the non-conformance issue include: - Lockout of the water supply well pump on November 21, 2018 - A Request for Proposal has been sent to Doyon Utilities, the Privatized Utility Operator on FWA, to revise the piping configuration to enable the tank to be truck filled. The anticipated completion date is September 2019. FWA DPW has requested regulatory approval to slowly fill the fire suppression tank with well until the piping corrections have been completed. Details regarding these steps will be added to Section 2.6.	Agree with comment back-check.
3.	Section 3.3.2, first moment analysis, bullet point 3	This bullet point is misleading, because the 1st moment distance to source test for both TCE and PCE shows an increasing trend (but this is listed in last order in the paragraph). The increasing trend (movement away from source) should be mentioned first within this bullet point, followed by the sentences that attempt to explain or qualify the result.	A	These bullets will be reorganized to more clearly present and describe the results regarding the 1st moment analysis. The bullets will be changed to the following: • The center of mass of PCE and TCE exhibited increasing trends over the	Agree with comment back-check.

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 2/12/2019 REVIEWER: Kevin Fraley & Erica Blake PHONE: 907-451-2104	Action taken on comment by: Aaron Swank – FES (2/20/19; 6/13/19)

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
				period of analysis. • However, this does not indicate expansion of the plumes at concentrations greater than the RAG, since the primary reason for the increasing trend is decreasing contaminant concentrations in source area wells. Only one well had PCE above the RAG in 2018, and no wells had TCE concentrations exceeding the RAG. In addition, there were no wells with increasing trends for PCE or TCE that would be expected to exceed the RAG.	
4.	Section 3.3.3	DEC concurs with the recommendation that no monitoring wells need to be installed or removed.	A	No changes to the wells in the monitoring program will be made in 2019.	Agree.
5.	Section 3.7	DEC concurs with recommendation of continuation of annual sampling.	A	Annual sampling will continue in 2019.	Agree.
6.	Section 4.4	DEC concurs with recommendation of annual sampling for Building 5010 Subarea and the Water Supply Well, and sampling in 2019 for the DRM01 and DRM05 2-party sites on the five year schedule.	A	These activities will proceed in 2019 as planned.	Agree.
7.	Section 5.5	DEC concurs with recommendation of annual sampling for DRO and VOCs. Former Building 1168 can be referred to as a 2-party site going forward.	A	Annual sampling will be conducted at the Former Building 1168 site in 2019, and the results will be included in the 2019 2-Party	DEC would like to provide an additional comment

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 2/12/2019** **REVIEWER: Kevin Fraley & Erica Blake** **PHONE: 907-451-2104**	**Action taken on comment by:** **Aaron Swank – FES (2/20/19; 6/13/19)**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
				Report. ADDITIONAL RESPONSE – 6/13/19 Agree to revise paragraph 2 in Section 5.4 by removing the first sentence. However, the following text should be added to the end of paragraph 1: "The IRACR recommended moving the Former Bldg 1168 site from the 3-Party program to the 2-Party program. Both ADEC and EPA have approved the document and this recommendation. Copies of the concurrence letters are included in Appendix F."	to the original comment provided. DEC still concurs with the recommendation for annual sampling for DRO and VOC's. DEC recommends removing the statement, "As a result, the Former Building 1168 Leach Well site has been removed from the 3-Party program, and future activities will be conducted in accordance with the 2-Party Agreement established between ADEC and the U.S. Army." The last sentence in paragraph 2 can remain in the report. The IRACR should be

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 2/12/2019** **REVIEWER: Kevin Fraley & Erica Blake** **PHONE: 907-451-2104**	**Action taken on comment by:** **Aaron Swank – FES (2/20/19; 6/13/19)**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
					referenced here, and it should be noted that the document is in the process of being approved by EPA and DEC. The first summary paragraph is acceptable, no recommended changes.
8.	Data Quality Review, Section 2.1, bullet point 3	This should be corrected to "no free product" rather than "no free project"	A	The typo was corrected.	Accept with comment back-check.
ADDITIONAL COMMENT ADDED ON MARCH 1, 2019					
9.	Section 5.5 and the Appended IRACR	While DEC has a final version of the IRACR, the document has not been approved by EPA or DEC. Those concurrence letters are in the process of being finalized. DEC recommends revising the statement about the site being removed from the 3-Party to, a statement that recommends the site be removed from the 3-party once the IRACR approval process is complete. Until the process is complete, DEC doesn't think it is appropriate to jump to conclusions that the	Noted	<u>ADDITIONAL RESPONSE – 6/13/19</u> The IRACR document and transfer of the 1168 Leach Well Site to the Two-Party program has been approved by ADEC and EPA as described in final approval letters from each agency dated 3/15/19 and 6/3/19 respectively. As a result, the language regarding transfer of the site will remain in the Final OU2	

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 2/12/2019 REVIEWER: Kevin Fraley & Erica Blake PHONE: 907-451-2104	Action taken on comment by: Aaron Swank – FES (2/20/19; 6/13/19)

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		site is now a 2-Party site. DEC also does not understand why the IRACR is appended to the groundwater monitoring report. A recommendation would be to add it to the references, and just reference the document in the report. The IRACR should be treated as a stand-alone document.		Monitoring Report. The IRACR has always been intended as a stand-alone document and will not be appended to the annual monitoring report. The report will be referenced from other documents as appropriate. However, the IRACR concurrence letters from ADEC and EPA will be included in the Final OU2 Monitoring Report to fully document the change in programmatic status of the 1168 Leach Well site (also described in response to comment #7).	
10.		--- End of Comments ---			

EPA Comments: Draft 2018 Monitoring Report, OU2 Fort Wainwright, AK, January 2019

Number	Page	Section	Comment	Response
EPA received the Draft **2018 Monitoring Report, OU2 Fort Wainwright, AK, January 2019** for review on following resumption of work after the partial government shutdown on January 29, 2019. Comments were sent on May 22, 2019. RESPONSES BY FES - 5/23/19				
1.	ix, Exec summary		Please clarify the sentence: "Post-injection groundwater monitoring has been conducted at these sites and showed 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-10016R), but did not exceed the RAG in any well at the DRMO site during 2018."	The sentence should read as follows: "PCE exceeded the RAG in one well in the DRMO 1 source area (AP-10016R), but did not exceed the RAG in any well at the DRMO 4 site during 2018."
2.	iRACR references		EPA has conflicting guidance at this time on closure of CERCLA sites on DoD facilities. The DoD/EPA Joint Guidance on Streamlined Site Closeout and NPL Deletion Process For DoD Facilities (2006) refers to iRACRs to document attainment of CERCLA ROD goals. (https://www.denix.osd.mil/references/dod/policy-guidance/dod-and-epa-joint-guidance/) EPA issued Closeout Procedures for National Priority List Sites guidance in 2011 (OSWER 9320.2-22, May 27, 2011) that eliminates interim reports and would capture CERCLA attainment in a Final Close Out Report. However, the 2011 guidance does not explicitly state the DoD/EPA Joint Guidance is superseded. EPA agrees O&M for CERCLA contaminants at OU2 Building 1168 is complete and the site should be transferred to state	Noted.

Number	Page	Section	Comment	Response
			oversight for the remaining petroleum contaminants. A signed memo stating this agreement is expected in June 2019. Clarification on the use of iRACRs is expected mid-summer 2019. In the meantime, the reference to the production of the iRACR for OU2 and transfer of oversight to the state can remain in the document.	
3.	p. 1-4, 1.2.4		Kind of picky but strike the sentence "There has been no active remediation within this subarea." since the original remedy may not have prescribed treatment but the 2009 treat study was an active remedy.	The sentence was removed as suggested.
4.	1.2.5		Any timeframe for when this was a burn pit? Any chance AFFF was used to extinguish fires? Maybe add PFAS to the next 5YR sampling or add this area to the potential PFAS source area list unless it can be definitively proven AFFF was not used at the site.	The PSE2 for the DRMO yard (HLA, 1993) included interview and a records search. The records showed this area was used for various activities as early as 1958, and a burn pit was used for discarded materials such as mattresses, wood furniture, and other waste materials. The PSE2 did not indicate AFFF was ever used at the site. The potential location of a DRMO burn pit was further evaluated during the OU2 RI using a geophysical survey.

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				The results of the survey were inconclusive.
5.	3-3, 3.2.2		Good summary of how groundwater levels are affecting desorption and mobilization of contaminants.	Thank you!
6.	5.4		Sect 5.4 strike this part of the sentence: "and the only contaminants remaining in groundwater are petroleum-related ~~and subject to the CERCLA Petroleum Exclusion~~" Since the leach well received waste oils, the petroleum constituents were subject to CERCLA (but not the DRO/GRO/RRO)	Sentence was revised as suggested.
7.	5.5		What VOCs will be analyzed for at Bldg 1168? it doesn't make sense to continue to monitor VOCs if they attained RAGs	The non-ROD VOCs remaining at Bldg 1168 are petroleum-related. Naphthalene has exceeded the ADEC cleanup level in past sampling events, and low-level detections of 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene have been identified.