Final
2020 Monitoring Report
Operable Unit 2

U.S. Army Garrison Alaska

HQAES No. 02871.1024
ADEC File No. 108.38.069.01
ADEC Hazard ID 1122

Contract W911KB-17-D-0020
Task Order W911KB-20-F-0053

JUNE 2021

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

June 24, 2021

Directorate of Public Works

SUBJECT: Submission of the Final 2020 Operable Unit 2 Monitoring Report to the Environmental Protection Agency

Ms. Sandra Halstead
Environmental Protection Agency
Remedial Project Manager
Alaska Operations Office
222 W. 7th Ave, #19
Anchorage, AK 99513

Dear Ms. Halstead:

This letter documents transmission of the Final 2020 Operable Unit 2 Monitoring Report, Fort Wainwright to the Environmental Protection Agency (EPA).

A digital copy of the document will be provided to you. A copy of this document is being provided to Ms. Erica Blake, Remedial Project Manager (RPM) and Ms. Cascade Galasso-Irish, Alternate RPM, Alaska Department of Environmental Conservation (ADEC); and Mr. Christopher Zell, Alternate RPM, EPA. If you would like to receive a hard copy of this document, please notify us within the next few weeks.

If you have questions or concerns regarding this action please contact Mr. Seth Reedy, RPM at (907) 361-6489 or email seth.a.reedy.civ@mail.mil; Mr. Brian Adams, Alternate RPM at (907) 361-6623 or email brian.m.adams18.civ@mail.mil; or Kama Mayne, Alternate RPM at (907) 361-3001 or email kama.e.mayne.civ@mail.mil.

Sincerely,

Seth Reedy
Remedial Project Manager,

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 24, 2021

Directorate of Public Works

SUBJECT: Submission of the Final 2020 Operable Unit 2 Monitoring Report to the State of Alaska Department Environmental Conservation.

Ms. Erica Blake
Remedial Project Manager
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

Dear Ms. Blake:

This letter documents transmission of the Final 2020 Operable Unit 2 Monitoring Report, Fort Wainwright to the State of Alaska Department Environmental Conservation (ADEC).

A digital copy of the document will be provided to you and a CD will be delivered to ADEC in Fairbanks. A copy of the document is also being provided to Ms. Sandra Halstead, Remedial Project Manager (RPM) and Mr. Christopher Zell, Alternate RPM, Environmental Protection Agency; and Ms. Cascade Galasso-Irish, Alternate RPM, ADEC. If you would like to receive a hard copy of this document, please notify us within the next few weeks.

If you have questions or concerns regarding this action please contact Mr. Seth Reedy, RPM at (907) 361-6489 or email seth.a.reedy.civ@mail.mil; Mr. Brian Adams, Alternate RPM at (907) 361-6623 or email brian.m.adams18.civ@mail.mil; or Kama Mayne, Alternate RPM at (907) 361-3001 or email kama.e.mayne.civ@mail.mil.

Sincerely,

Seth Reedy
Remedial Project Manager,

cc:
HQ, USAG FWA CERCLA Information Repository (w/o encls)

Final

2020 Monitoring Report

Operable Unit 2

Contract W911KB-17-D-0020
Task Order W911KB-20-F-0053

JUNE 2021

Prepared For:
U.S. Army Garrison Alaska

Prepared By:
Brice Engineering, LLC
3700 Centerpoint Drive, Suite 8223
Anchorage, Alaska 99503
907.275.2896 PH
www.BriceEng.com

This page intentionally blank

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS ..... **III**
EXECUTIVE SUMMARY ..... **V**
DRMO Yard Three-Party Sites v
IC Inspection Summary vi
1.0 INTRODUCTION **1-1**
1.1 DRMO Background 1-1
1.2 DRMO Subarea Descriptions 1-2
1.2.1 DRMO1 Subarea 1-2
1.2.2 DRMO2 Subarea 1-3
1.2.3 DRMO3 Subarea 1-4
1.2.4 DRMO4 Subarea 1-4
1.2.5 DRMO5 Subarea 1-4
1.3 OU2 Source Area Tracking 1-5
1.4 Remediation Objectives 1-5
1.4.1 OU2 Record of Decision 1-5
1.4.2 Two-Party Agreement 1-6
2.0 FIELD ACTIVITIES SUMMARY **2-1**
2.1 OU2 Groundwater Monitoring Program Summary 2-1
2.2 Groundwater Sampling Procedures 2-1
2.3 Investigation-Derived Waste 2-2
2.4 Groundwater Sample Data Quality 2-2
2.5 Long-Term Monitoring Optimization and Statistical Evaluation of Treatment Goals 2-3
2.6 Institutional Control Inspection 2-3
3.0 DRMO YARD GROUNDWATER MONITORING RESULTS (THREE-PARTY) **3-1**
3.1 DRMO Yard Groundwater Elevations and Flow Direction 3-1
3.2 DRMO1 Subarea Groundwater Monitoring Results 3-1
3.2.1 Groundwater Geochemistry Trends 3-1
3.2.2 Contaminant Concentration Changes in the Treatability Study Area: PCE Concentration Trends 3-2
3.2.3 Contaminant Concentration Changes Outside of the Treatability Study Area 3-5
3.2.4 DRMO Yard Water Supply Well Results 3-6
3.3 DRMO1 (Three-Party) LTMO Analysis Update 3-6
3.3.1 Statistical Trend Analysis Results 3-7
3.3.2 Spatial Moment Analysis Results 3-8
3.3.3 Monitoring Well Network and Sampling Frequency Evaluation 3-8
3.4 DRMO4 Subarea Groundwater Monitoring Results 3-9
3.4.1 Groundwater Geochemistry Trends 3-9
3.4.2 Contaminant Concentration Trends 3-9
3.5 DRMO4 (Three-Party) LTMO Analysis Update 3-13
3.5.1 Statistical Trend Analysis Results 3-13
3.5.2 Plume Stability Evaluation 3-13

TABLE OF CONTENTS (CONTINUED)

3.6 Summary and Recommendations for DRMO Three-Party Sites 3-14

4.0 REFERENCES 4-1

TABLES

Table 1-1 Summary of DRMO Yard Subareas
Table 1-2 Crosswalk Table for OU2 Source Area Tracking Numbers
Table 1-3 DRMO ROD RGs for Groundwater
Table 2-1 Summary of the 2020 OU2 Groundwater Monitoring Program
Table 3-1 OU2 DRMO Yard Groundwater Elevations
Table 3-2 2016-2020 DRMO1 (Three-Party) Subarea Groundwater Sample Results
Table 3-3 2016-2020 DRMO4 (Three-Party) Subarea Groundwater Sample Results
Table 3-4 Mann-Kendall Trend Analysis for DRMO1 (Three-Party) Wells
Table 3-5 Mann-Kendall Trend Analysis for DRMO4 (Three-Party) Wells

GRAPHS

Graph 3-1 PCE Concentrations and Water Elevations in the DRMO1 ISCR Treatment Area
Graph 3-2 TCE Concentrations and Water Elevations in the DRMO1 ISCR Treatment Area
Graph 3-3 cis-1,2-DCE Concentrations and Water Elevations in the DRMO1 ISCR Treatment Area
Graph 3-4 DRO Concentrations in AP-7560 in DRMO1
Graph 3-5 PCE Concentrations and Water Elevations in DRMO4 Wells
Graph 3-6 TCE Concentrations and Water Elevations in DRMO4 Wells
Graph 3-7 cis-1,2-DCE Concentrations and Water Elevations in DRMO4 Wells

FIGURES

Figure 1-1 Site Location Map
Figure 1-2 DRMO Yard Subareas
Figure 2-1 DRMO Yard Monitoring Well Locations
Figure 3-1 DRMO1 Groundwater Sample Results
Figure 3-2 DRMO4 Groundwater Sample Results
Figure 3-3 DRMO Yard Groundwater Geochemistry

APPENDICES

Appendix A Sample Summary and Analytical Results
Appendix B CDQR and ADEC Laboratory Data Review Checklist
Appendix C Field Forms and Notes
Appendix D Photograph Log
Appendix E LTMO Results

ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per Liter
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEE	Air Force Center for Environmental Excellence
AS	air sparging
Brice	Brice Engineering, LLC
btoc	below top of casing
CD	compact disc
CDQR	Chemical Data Quality Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CUL	cleanup level
DCE	dichloroethene
DERA	Defense Environmental Restoration Account
DES	Directorate of Emergency Services
DO	dissolved oxygen
DoD	U.S. Department of Defense
DOL	Directorate of Logistics
DRMO	Defense Reutilization Marketing Office
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
FES	Fairbanks Environmental Services, Inc.
FFA	Federal Facility Agreement
GAC	granular activated carbon
GIS	geographic information system
GRO	gasoline range organics
HLA	Harding Lawson Associates
HQAES	Headquarters Army Environmental System
IC	institutional control
IDW	investigation-derived waste
ISCR	in situ chemical reduction
LBE	Left Behind Equipment
LTMO	long-term monitoring optimization
MAROS	Monitoring and Remediation Optimization System
MCL	maximum contaminant level
mg/L	milligrams per liter
NA	not applicable
NAVD88	North American Vertical Datum of 1988
ND	not detected

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NGVD29	National Geodetic Vertical Datum of 1929
ORP	oxidation-reduction potential
OU2	Operable Unit 2
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
QSM	Quality Systems Manual
RAO	remedial action objective
RG	remedial goal
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SGS	SGS North America, Inc.
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TCE	trichloroethene
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USAG Alaska	U.S. Army Garrison Alaska
UST	underground storage tank
VOC	volatile organic compound
WSW	water supply well

EXECUTIVE SUMMARY

Operable Unit 2 (OU2) currently includes two chlorinated solvent-contaminated sites at the Defense Reutilization Marketing Office (DRMO) Yard at U.S. Army Garrison, Alaska: DRMO1 and DRMO4. Cleanup activities at these sites were conducted under the Three-Party Agreement, and groundwater monitoring was conducted at each of the sites in 2020. The results of the 2020 monitoring program and recommendations for 2021 are presented in this report.

DRMO Yard Three-Party Sites

Chlorinated compounds exceeding Record of Decision (ROD) remedial goals (RGs) have historically been present within the DRMO1 and DRMO4 Three-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 above the RG for a significant amount of time. Based on the 2008 LTMO analysis, a treatability study utilizing injection of an in situ chemical reduction (ISCR) compound was recommended (Fairbanks Environmental Services [FES] 2018b). The goals of the treatability study were to evaluate the potential to stimulate dechlorination, reduce the time required to achieve the RG, and reduce long-term monitoring costs. As part of the treatability study, injections were completed at the DRMO1 and DRMO4 sites in 2009. A second injection was completed at the DRMO1 site in 2010, and a second injection was completed at the DRMO4 site in 2011.

Post-injection groundwater monitoring has been conducted at these sites and has showed stimulation of dechlorination and biodegradation of the residual tetrachloroethene (PCE). In 2020, PCE exceeded the RG in three wells in the DRMO1 source area (AP-8914R, AP-10016R, and AP-10018R), and in one well in the DRMO4 source area (AP-8916). PCE concentrations generally increased between 2019 and 2020; however, the increase appears to be associated with the high water levels observed in 2020. Groundwater geochemistry indicates that reducing conditions are persistent in the DRMO1 and DRMO4 source areas, and natural attenuation of the residual PCE contamination is continuing.

Evaluation of the PCE and trichloroethene (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 RG.
- The estimate of dissolved mass in the PCE plume exhibited a probably increasing trend; however, this appeared to be significantly influenced by the increase in PCE concentrations between 2019 and 2020 due to the high water levels observed in 2020. The TCE plume dissolved mass exhibited no trend, consistent with previous results. Recent estimates show the overall dissolved mass for both contaminants is generally 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 as a result of the injection events. However, it does not indicate migration of the plumes with concentrations above the RG.

- The plume spread analysis for PCE and TCE generally showed stable trends or no trend. The only exception was an increasing trend for PCE perpendicular to groundwater flow. However, this was attributed to the increase in PCE concentrations in source area wells in 2020 due to high water levels, and was not an indication that the plume is expanding above the RG.

The results at the DRMO4 site showed:

- Contaminant concentration trends for PCE and TCE were stable or exhibited no trend. PCE was detected above the RG in AP-8916 for the first time since 2016, but this result appeared to be associated with high water levels in 2020. TCE concentrations continue to be observed below the RG.
- Quantitative plume analysis could not be completed due to the small well network; however, the sampling results show evidence of reductive dechlorination in source area wells, and the contaminant concentrations in downgradient wells have remained below the RG. 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 2020 sampling results, annual sampling should continue in the fall at the DRMO1 and DRMO4 Three-Party sites.

A groundwater sample was also collected from the Water Supply Well (WSW), which is used to provide potable water to Building 5010. The majority of results were non-detect, and all detections are at trace concentrations well below ROD RGs and U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs).

IC Inspection Summary

An annual institutional controls (IC) inspection was conducted at the OU2 DRMO Yard in 2020. The inspection showed the ICs have been properly implemented. Minor maintenance items (such as replacing locks on monitoring wells) were completed at the time of the inspection.

A nonconformance issue was identified at the DRMO Yard WSW in 2018, and a letter detailing this issue was sent to EPA and the Alaska Department of Environmental Conservation (ADEC). The well pump was locked out on 21 November 2018, and regulatory approval was requested to slowly fill the fire suppression tank with water from the well until permanent piping corrections could be completed. All 2019 filling events were documented, and piping modifications were completed in 2020. Further details regarding the IC inspection are presented in the 2020 IC Inspection Report (anticipated in Spring 2021).

1.0 INTRODUCTION

This report describes site activities and presents groundwater monitoring results from 2020 at Operable Unit 2 (OU2) sites on Fort Wainwright, Alaska, and also provides a summary of the institutional control (IC) inspections conducted at the OU2 sites during 2020. OU2 currently consists of the Defense Reutilization Marketing Office (DRMO)1 and DRMO4 Three-Party sites in the DRMO Yard, since the former Building 1168 Leach Well site was removed from OU2 in 2018 as described in the *Interim Remedial Action Completion Report* (Fairbanks Environmental Services, Inc. [FES] 2018a).

This document and the associated fieldwork were completed by Brice Engineering, LLC (Brice) under U.S. Army Corps of Engineers (USACE) contract W911KB-17-D-0020, Task Order W911KB-20-F-0053. The work was completed according to the *Postwide Uniform Federal Policy for Quality Assurance Project Plan* (UFP-QAPP; Brice 2020a); *2020 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan* (Brice 2020b); under authority of CERCLA; and in compliance with the OU2 Record of Decision (ROD; U.S. Army Garrison Alaska [USAG Alaska] 1997), 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 an FFA between the U.S. Department of Defense (DoD), the Alaska Department of Environmental Conservation (ADEC), and the U.S. 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. Several 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 in 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; it indicated that diesel, naphthalene, petroleum hydrocarbons, and volatile organic compounds (VOCs) were present on site. A Remedial Investigation (RI) and Feasibility Study (FS) was performed for all of OU2 in 1995 and characterized contamination throughout the DRMO Yard (Harding Lawson Associates [HLA] 1996). Following completion of the RI/FS, a ROD was prepared and 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 (USAG Alaska 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
Three-Party Sites			
DRMO1	OU2 ROD (Three-Party)	Central and northwest (extending northwest)	OU2 AS/SVE Treatment System (1997–2005) ISCR Treatability Study (2009, 2010) Long Term Monitoring
DRMO4	OU2 ROD (Three-Party)	Southwest	ISCR Treatability Study (2009, 2011) Long Term Monitoring
Two-Party Sites[1]			
DRMO1	Two-Party	Central and northwest (extending northwest)	DRMO1 AS/SVE Treatment System (1996-2003) Long Term Monitoring
DRMO2 Building 5010 (Former Building 5001)	Two-Party	East	Long Term Monitoring
DRMO3	Two-Party	South central	Currently not included in a sampling program. Last sampled in 1994.
DRMO5	Two-Party	Central west (across Channel B)	DRMO5 AS/SVE Treatment System (1996-2003) Long Term Monitoring

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] Monitoring results from DRMO Two-Party sites are not presented in this report.

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, including 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 (Two-Party) air sparging (AS)/soil vapor extraction (SVE) treatment system and the DRMO1 (Three-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 shut down in Fall 2005 prior to achieving cleanup goals in all wells due to very low VOC removal rates.

Groundwater sampling of the DRMO1 Two-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 Two-Party subarea are collected once every five years in

coordination with the Five-Year Review. Sampling at this site was conducted in 2019 and the results are presented in the Fort Wainwright Two-Party Report (FES 2020).

Groundwater sampling of the DRMO1 Three-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 goals (RGs). Based on these results, an in situ chemical reduction (ISCR) treatability study was conducted to evaluate the effectiveness of reductive dechlorination to achieve RGs 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 2009 Work Plan (FES 2009). PCE and degradation product 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 RGs in 2013. Since 2014, PCE concentrations above the RG have been consistently observed in well AP-10016 (and replacement well AP-10016R), and periodically observed in other wells at the site. Groundwater monitoring was conducted in the DRMO1 Three-Party treatment area during 2020 to continue evaluation of contaminant concentrations remaining in this area.

After the ISCR treatability study was conducted in 2009 and 2010, DRO concentrations in wells within the injection area were observed to exceed the ADEC CUL. The elevated DRO concentrations were determined to be caused by the ISCR compound Adventus EHC®, which is a carbon source that is detected in the DRO carbon range, rather than caused by a direct source of petroleum hydrocarbon contamination. This was verified by performing a silica gel cleanup method (SW-846 Method 3630C) on DRO samples in 2011, which separates petroleum hydrocarbons from biogenic interference caused by other organic materials (such as the ISCR compound). In addition, DRO was not found to exceed the CUL in this area prior to injections. Therefore, DRO analysis was discontinued for all wells except for one well located within the area of a known fuel release, downgradient from the PCE plume.

Groundwater samples from the WSW have been collected since 1998 to evaluate potential contaminant migration into the well. Samples are currently collected on an annual basis as part of the OU2 monitoring program. No analytes have ever been shown to exceed ROD RGs, EPA maximum contaminant levels (MCLs), or ADEC CULs in this well.

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. Long-term monitoring is conducted on an annual basis at this site, and the results are described as part of the Fort Wainwright Two-Party Report (Brice 2021).

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. However, a 1994 RI was conducted and results from the RI were used to calculate cumulative risk at DRMO3. The calculated values were evaluated using ADEC guidelines to assess the potential for contaminants at the site to cause a human health risk through soil ingestion or migration to groundwater. The results indicated that the existing soil concentrations were expected to be protective of human health via the soil ingestion route and did not pose a migration to groundwater risk (HLA 1996). Since the 1994 RI, there has been no groundwater sampling in this subarea.

1.2.4 DRMO4 Subarea

The DRMO4 subarea encompasses the southwest section of the DRMO Yard which includes the Alaska Railroad spur line (with the associated loading ramp) that enters the DRMO Yard, 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 RGs for a significant period of time. A treatability study utilizing the same ISCR compound that was used at the DRMO1 site was also completed at the DRMO4 site to evaluate stimulation of reductive dechlorination and the potential to achieve RGs in a shorter timeframe. The first injection was completed at the DRMO4 site in 2009 (FES 2010). 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 RG in all wells during May 2012 and August 2013. However, PCE exceedances were observed in well PO5 during 2014 through 2017, and periodically in well AP-8916 since October 2014. Groundwater monitoring was conducted in the DRMO4 (Three-Party) treatment area during 2020 to continue evaluation of contaminant concentrations remaining in this area.

Similar to DRMO1 (Section 1.2.1), DRO concentrations at DRMO4 were observed to exceed the ADEC CUL in the years following the 2009 and 2011 ISCR treatability studies. The silica gel cleanup method (SW-846 Method 3630C) was conducted and verified that the ISCR compound was the cause for the ADEC CUL exceedances rather than by a direct source of petroleum hydrocarbon contamination. Moreover, DRO was not found to exceed the CUL in this area prior to injections. Therefore, DRO analysis was discontinued for all wells except for one well located within the area of a known fuel release, downgradient from the PCE plume.

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 shut down 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 at this site was conducted in 2019 and the results are presented in the Fort Wainwright Two-Party Report (FES 2020).

1.3 OU2 Source Area Tracking

The remaining 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 Three-Party Sites: DRMO1 DRMO4	02871.1024	108.38.069.01	1122	Open

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[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

1.4 Remediation Objectives

1.4.1 OU2 Record of Decision

The OU2 ROD was signed under the FFA in March 1997 by the USAG Alaska, ADEC, and EPA (USAG Alaska 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 MCLs and Alaska Water Quality Standards, and limit high-volume pumping from the aquifer at the DRMO Yard until state and federal MCLs are achieved
- Use natural attenuation to attain Alaska Water Quality Standards after reaching state and federal MCLs
- Prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and federal MCLs and Alaska Water Quality Standards

The RGs for groundwater were established under the Three-Party FFA for DRMO1 and DRMO4. The ROD RGs are presented in Table 1-3.

Table 1-3 DRMO ROD RGs for Groundwater

CONTAMINANTS OF CONCERN	ROD RG (µg/L)	BASIS
Benzene	5	MCL
PCE	5	MCL
TCE	5	MCL
cis-1,2-Dichloroethene (cis-1,2-DCE)	70	MCL (breakdown product)
1,1-Dichloroethene (1,1-DCE)	7	MCL (breakdown product)
Vinyl Chloride	2	MCL (breakdown product)

Notes:
For definitions, refer to the Acronyms and Abbreviations section.

1.4.2 Two-Party Agreement

Since the primary COCs identified in subareas DRMO2, DRMO3, and DRMO5 were petroleum hydrocarbons, these areas were addressed separately under a Two-Party Agreement between USAG Alaska and ADEC, rather than under the ROD. ADEC groundwater cleanup levels (CULs), as presented in Table C of Title 18 of the Alaska Administrative Code (AAC), Chapter 75.345, were adopted as cleanup goals for areas not addressed in the ROD. In November 2016, the ADEC CULs were revised utilizing risk-based calculations. The ADEC CULs were revised again for select compounds in September 2018. These updates resulted in a significant change in the CULs from when the Two-Party Agreement was originally signed. The current levels (ADEC 2020) will need to be utilized for Two-Party sites to attain cleanup complete under ADEC regulations. In addition, the current ADEC CULs will be applied to any Three-Party site transferred to the Two-Party program after ROD objectives are achieved, or by agreement of the Army, EPA, and ADEC.

The ADEC CULs are not further discussed in the text. However, the cleanup goal for DRO in groundwater is presented and discussed for the DRMO1 and DRMO4 sites since the ROD specifically lists an RG for DRO in soil, and one of the primary ROD cleanup objectives is protection of the groundwater (USAG Alaska 1997). The current ADEC CULs for contaminants in groundwater as listed in Table C of 18 AAC 75.345 (ADEC 2020) are included in the results tables presented in Appendix A for informational purposes.

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 in August 2020.

2.1 OU2 Groundwater Monitoring Program Summary

Groundwater samples are collected annually from the OU2 DRMO1 and DRMO4 sites. A summary of the 2020 OU2 groundwater monitoring program is shown in Table 2-1. The 2020 groundwater sampling locations for the DRMO Yard are shown on Figure 2-1.

Table 2-1 Summary of the 2020 OU2 Groundwater Monitoring Program

OU2 SITE	SUBAREA/ SITE	NUMBER OF WELLS	CONTAMINANT ANALYSES[1]	NA ANALYSES[3]	MONITORING FREQUENCY
DRMO1 (Three-Party)	DRMO1	7	DRO[2], VOC	Iron, Sulfate	Annual
DRMO4 (Three-Party)	DRMO4	3	DRO[2], VOC		Annual
Water Supply Well (WSW)	DRMO1	1	GRO, DRO, VOC, SVOC	--	Annual

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] Contaminant analyses included the following methods: VOC (8260D), SVOC (8270D), GRO (AK101), and DRO (AK102)
[2] Only one well in the DRMO1 area (AP-7560) and one well in the DRMO4 area (AP-10445MW) were analyzed for DRO
[3] Natural attenuation analyses included the following methods: dissolved iron (6020B), sulfate (300.0)

Groundwater sampling at the DRMO Three-Party sites was conducted on 13 and 14 August 2020. Groundwater monitoring was conducted in accordance with the procedures detailed in the *2020 CERCLA Sites Work Plan* (Brice 2020b). All groundwater samples were analyzed by SGS North America Inc. (SGS), of Anchorage, Alaska, as presented in Table 2-1.

The groundwater sample summary table and analytical results are presented in Appendix A as Tables A-1 (sample summary), A-2 (DRMO1 results), A-3 (DRMO4 results), and A-4 (WSW results). The Chemical Data Quality Report (CDQR) and ADEC Laboratory Data Review Checklist summarizing the laboratory data review are presented in Appendix B. Copies of groundwater sample forms are included in Appendix C. Field parameters recorded on groundwater sample forms are summarized in Table C-1. A photograph log is included as Appendix D.

2.2 Groundwater Sampling Procedures

Low-flow methodology (EPA 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 2019a). 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, dissolved oxygen (DO), and oxidation-reduction potential (ORP). In addition, turbidity and drawdown were measured for each well and were recorded on sampling forms. Groundwater sampling forms are presented in Appendix C, and a summary of the field parameters is provided in Table C-1.

Following sampling, the submersible pumps were decontaminated in accordance with the procedures described in the *2020 CERCLA Sites Work Plan* (Brice 2020b). Equipment blank samples were also collected in accordance with the Work Plan to evaluate decontamination of the re-usable pumps. The equipment blank sample results are discussed in the CDQR.

2.3 Investigation-Derived Waste

IDW generated during OU2 groundwater monitoring activities in 2020 included purge water, decontamination water, and general refuse. All IDW and other waste streams were managed according to the procedures outlined in the *2020 CERCLA Sites Work Plan* (Brice 2020b).

Purge water was containerized at the time of sampling in 15-gallon poly drums. The drums were labeled with a unique ID and a form was completed documenting the well ID, container ID, and purge volume from each well. The drums were taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage. The water was characterized using the laboratory results from the individual wells. Sample results and the IDW storage forms will be provided to an off-Post contractor (e.g., U.S. Ecology) for proper manifesting and disposal in accordance with the CERCLA Off-Site Rule. The non-hazardous solid wastes, including water filters for dissolved metals analysis, nitrile gloves, paper towels, etc., were disposed of at the Fairbanks North Star Landfill. Complete documentation of IDW disposal, including purge water from OU2, will be included in a forthcoming 2020 IDW Management Technical Memorandum (anticipated 2021).

Following groundwater sampling, the submersible pumps used at the DRMO site were decontaminated in accordance with the Work Plan. 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 location at the DRMO Yard is shown on Figure 2-1.

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 (Brice 2020b), the ADEC Technical Memorandum (ADEC 2019b), and the DoD Quality Systems Manual (QSM), Version 5.3 (DoD 2019).

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 reviewed data are presented in Appendix A, and are used in tables and figures throughout the report. The specific data quality issues found during the review are presented in the CDQR in Appendix B.

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

The sampling data were 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 Environmental Excellence (AFCEE; AFCEE 2006). The MAROS software uses site-specific inputs (e.g., groundwater monitoring data, hydrogeologic parameters, and well location information) to conduct a statistical analysis of the groundwater monitoring network. The MAROS software is one among several tools that has been recommended for use in LTMO analyses (EPA 2005). The LTMO analysis updates for the DRMO1 and DRMO4 subareas are discussed in Sections 3.3 and 3.5, respectively. Complete MAROS results are included in Appendix E.

2.6 Institutional Control Inspection

IC inspections were conducted at OU2 during August 2020. The IC inspection included an evaluation of the OU2 DRMO sites discussed in the OU2 ROD (DRMO1, DRMO4, and WSW). The IC inspection included a site visit 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.

The IC requirements per the OU2 ROD include the following components (USAG Alaska 1997):

- "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."
- "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)."

A summary of the 2020 IC inspection is presented below, and the complete inspection results will be included in the 2020 Fort Wainwright IC Inspection Report (expected Spring 2021):

- Access on the east side of the DRMO is 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.
- The DRMO Yard fire suppression tank remained locked out to prevent unauthorized use. The following activities were conducted in 2020:
  - No unauthorized operations of the WSW occurred during 2020.
  - Permanent piping corrections were completed on 26 May 2020, which disconnected the WSW from the fire suppression tank.
  - The fire suppression tank is now filled by hauling water from Building 3003 using a truck fill stand. The truck fill stand was installed inside Building 5009 (Well House Building) on 8 January 2020.

- The WSW remains connected to Building 5010 and is used for domestic purposes.
- A new treatment system for the WSW and the water used in Building 5010 was installed by Doyon Utilities in 2020.

3.0 DRMO YARD GROUNDWATER MONITORING RESULTS THREE-PARTY)

This section presents the groundwater monitoring results for the DRMO1 and DRMO4 Three-Party sites through 2020. Groundwater sampling results for the DRMO1 site are summarized in Table 3-2 and on Figure 3-1, and sampling results for the DRMO4 site are summarized in Table 3-3 and on Figure 3-2. Groundwater geochemistry for the DRMO Yard is presented in Figure 3-3 and are summarized in Tables 3-2 and 3-3.

3.1 DRMO Yard Groundwater Elevations and Flow Direction

Groundwater levels were measured in each well during the sampling event on 13 and 14 August 2020, and groundwater elevations were calculated. The groundwater elevations associated with the sampling events conducted in 2018, 2019, and 2020 are shown in Table 3-1 for comparison; and groundwater elevations are shown for all sampling events on Figures 3-1 and 3-2 for DRMO1 and DRMO4, respectively. Water levels were approximately 1 foot higher in August 2020 than in August 2019. Although the water level was higher in 2020, the 2020 water levels were still within historical levels measured at the site. Groundwater was within the screen in all OU2 wells except for wells AP-7559 and AP-7560, where the water level was above the screen. Elevated water levels were observed across Fort Wainwright in Summer/Fall 2020 due to high levels of precipitation. The groundwater flow direction was consistent with past monitoring events and followed the regional groundwater flow (northwest).

3.2 DRMO1 Subarea Groundwater Monitoring Results

Seven monitoring wells (AP-7559, AP-7560, AP-8914R, AP-10015R, AP-10016R, AP-10017R, and AP-10018R) were sampled in August 2020 to evaluate the progress towards achieving the RGs at the DRMO1 site. The analytical results of the groundwater sampling are presented in Table 3-2 and shown on Figure 3-1, with complete 2020 results shown in Table A-2. Groundwater geochemistry results are presented in Table 3-2 and shown on Figure 3-3, with additional geochemical parameters summarized in Appendix C, Table C-1. The results are discussed in the following sections.

3.2.1 Groundwater Geochemistry Trends

Groundwater geochemistry was evaluated at the DRMO1 Three-Party subarea to evaluate the potential for reducing conditions and reductive dechlorination. The primary groundwater geochemistry parameters used in the evaluation were ORP, DO, dissolved iron, and sulfate, which are presented in Table 3-2.

The 2020 groundwater geochemistry results showed reducing conditions were persistent within and immediately downgradient of the PCE source area wells; as indicated by DO less than 2 milligrams per liter (mg/L), elevated dissolved iron, and lower sulfate concentrations. The areas of iron- and sulfate-reducing conditions identified at the time of groundwater sampling in August 2020 are shown on Figure 3-3. The area of iron-reducing conditions (as indicated by dissolved iron concentrations greater than or equal to 5 mg/L) in the PCE source area included AP-10015R, AP-10018R, and AP-8914R. Sulfate reducing conditions (as indicated by sulfate concentrations less than or equal to 20 mg/L) were also observed in those three wells and in AP-10016R. Additionally, iron- and sulfate-reducing conditions were observed around AP-7560, which is downgradient of the PCE source area and has the highest DRO concentrations observed in the DRMO1 Three-Party site.

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(R), AP-10016(R), AP-10017(R), and AP-10018(R) are shown in Graph 3-1 (downgradient wells AP-7559 and AP-7560 are not included due to PCE results consistently below the RG for several years). For AP-8914R and AP-10018 source area wells, PCE was detected in groundwater above the RG prior to the second EHC™ injection in 2010. Following the 2010 injection, the PCE concentration increased slightly in well AP-10018 (as observed in the October 2010 sampling event), and then PCE decreased below the RG in AP-8914R and AP-10018 for the first time in 2011. The PCE concentration has remained below the RG in subsequent sampling events in AP-10018 (and replacement AP-10018R beginning in 2018), but exceeded the RG again for the first time in nine years in 2020. The PCE concentration for AP-8914R has also remained below the RG, but exceeded the RG for the first time in 2016 and again in 2020, as shown in Graph 3-1.

For source well AP-10016, PCE increased following the 2009 injection, and exceeded the RG in two post-injection sampling events (September [8.7 µg/L] and November 2009 [6.8 µg/L]) (data not shown in Graph 3-1; all historical data is provided in Supplemental Information). The PCE concentration decreased below the RG in February 2010, and did not immediately exceed the RG following the second injection in August 2010. However, the PCE concentrations intermittently exceeded the RG between 2011 and 2013, and have consistently exceeded the RG since 2014, including exceedances in replacement well AP-10016R from 2018 through 2020, as shown in Graph 3-1. Although PCE concentrations are currently above the RG in this well, AP-10016R is crossgradient of the 2010 injection area, and the groundwater in this area is characterized by sulfate reducing conditions.

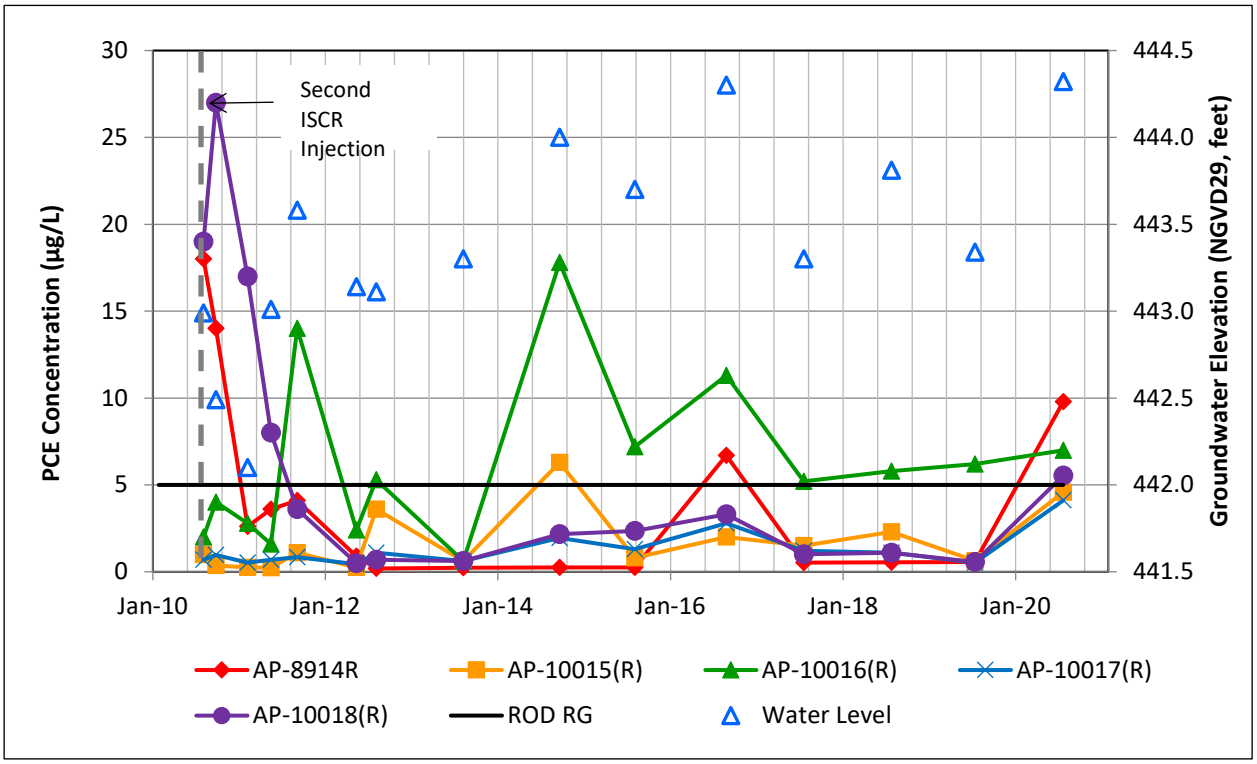
The other well where PCE exceeded the RG following the second injection was in downgradient well AP-10015. This exceedance was observed in 2014; however, the PCE concentrations observed in sampling events between 2015 and 2017 were below the RG. The PCE concentration in replacement well AP-10015R has also remained below the RG, though the 2020 concentration of 4.6 micrograms per liter (µg/L) was just below the RG of 5 µg/L. Iron- and sulfate-reducing conditions are 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(R) has remained below the RG in all sampling events conducted at the site; however, the 2020 concentration of 4.1 µg/L was the highest observed in this well.

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 RG exceedances (AP-10016(R), AP-10018(R) and AP-8914R) have been sensitive to changes in water levels since the second injection. When water levels increase, the PCE concentration tends to increase; and when water levels decrease, the PCE concentration decreases. This is particularly evident in the 2020 results, where PCE concentrations increased significantly in most injection area wells. The 2020 concentrations are similar to the 2016 concentrations, when a similar groundwater elevation increase was observed. These results suggest that residual source material that is not normally in contact with groundwater may be trapped in low-permeability soils in the vicinity of these wells. 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. In 2020, PCE concentrations in downgradient wells AP-10015R, AP-7559, and AP-7560 followed a similar pattern to source area wells due to high water levels observed. Although PCE concentrations in some downgradient

wells came close to the RG, the concentrations have remained below the RG, with the last PCE exceedance observed in AP-10015R in 2015.

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



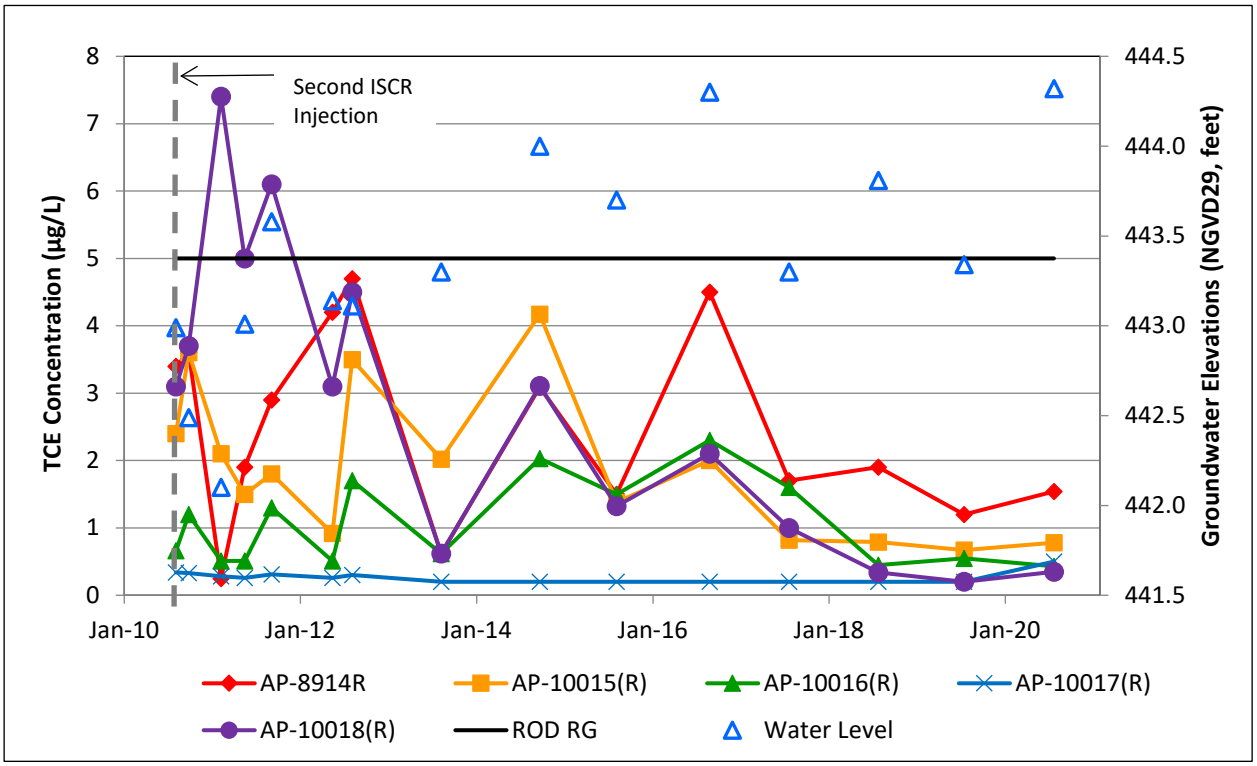
Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Only data collected between August 2010 (preceding the 2nd injection) and August 2020 are shown for clarity. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. The groundwater elevations depicted were measured in AP-8914R, which is representative of the water levels in the injection area.

3.2.2.1 Concentration Changes of Reductive Dechlorination Daughter Products

Concentrations of the two main reductive dechlorination daughter products, TCE and cis-1,2-dichloroethene (DCE), are shown in Graphs 3-2 and 3-3, respectively. 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 RG in all wells at the DRMO1 site since 2012. The highest concentrations have been identified in AP-8914R, AP-10015(R), and AP-10018(R), although concentrations have remained below the RG.

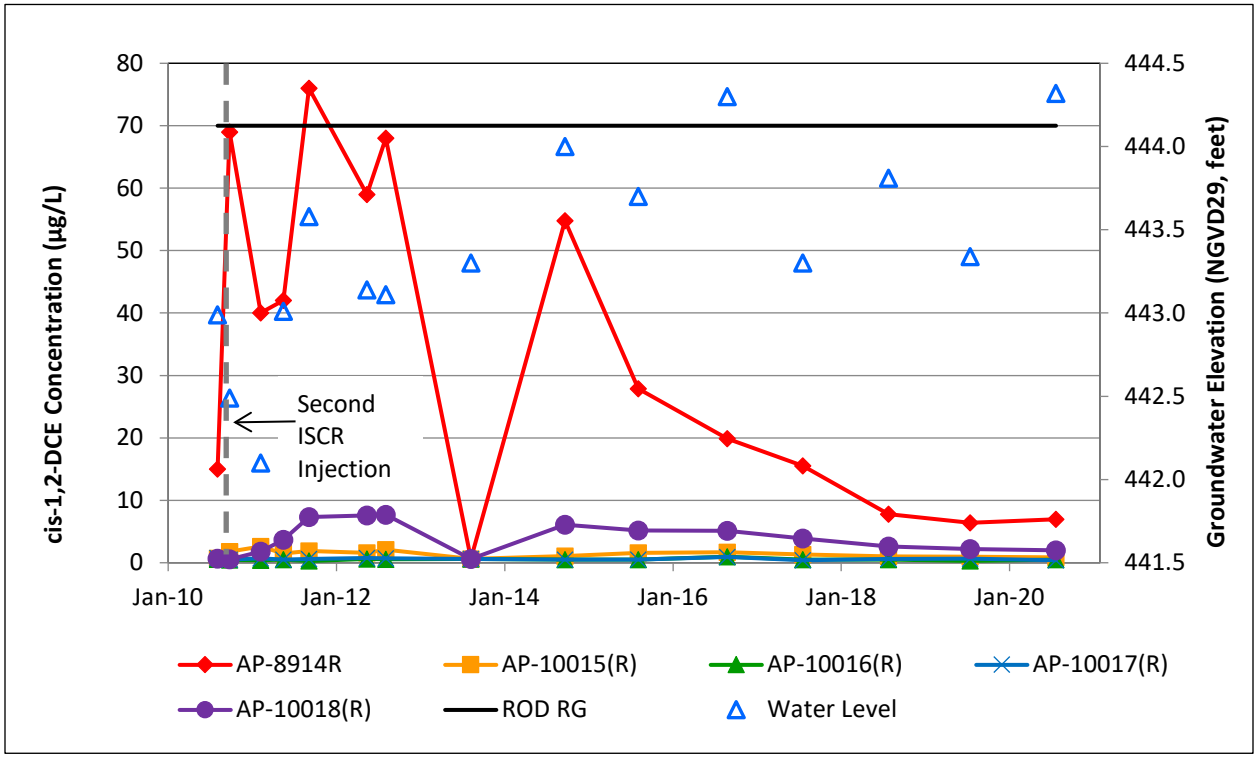
Graph 3-2 TCE Concentrations and Water Elevations in the DRMO1 ISCR Treatment Area



Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Only data collected between August 2010 (preceding the 2nd injection) and August 2020 are shown for clarity. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. The groundwater elevations depicted were measured in AP-8914R, which is representative of the water levels in the injection 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. A decrease in cis-1,2-DCE was initially observed in this well following the second injection event in 2010, but a rebound was observed in September 2011 at a concentration exceeding the RG. Cis-1,2-DCE again decreased below the RG in the 2012 events and has remained below the RG in subsequent sampling events. The next highest cis-1,2-DCE concentration has been observed in AP-10018(R), where some of the highest PCE and TCE concentrations have also been observed; however, cis-1,2-DCE has always remained an order of magnitude below the RG.

Graph 3-3 cis-1,2-DCE Concentrations and Water Elevations in the DRMO1 ISCR Treatment Area



Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Only data collected between August 2010 (preceding the 2nd injection) and August 2020 are shown for clarity. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. The groundwater elevations depicted were measured in AP-8914R, which is representative of the water levels in the injection area.

Trace detections of other reductive dechlorination daughter products including trans-1,2-DCE, 1,1-DCE, and vinyl chloride have been observed in post-injection sampling events, although no RG 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.

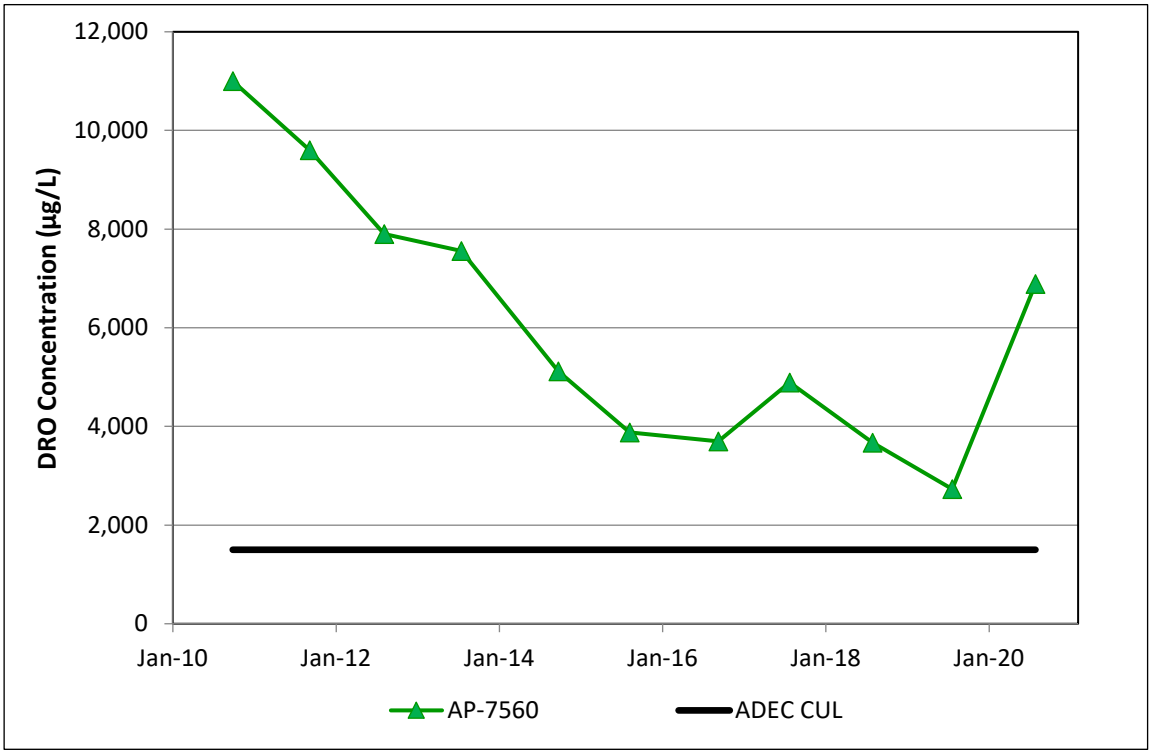
3.2.3 Contaminant Concentration Changes Outside of the Treatability Study Area

The only two monitoring wells sampled in 2020 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 previous LTMO analysis. PCE and TCE have been consistently detected, although below RGs, 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 RG in AP-7559 for the first time since 2001. The PCE concentration was below the RG in subsequent monitoring events (including 2020) 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 Three-Party area having DRO exceedances. DRO is consistently detected above the ADEC CUL 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 between 2010 and 2020 are shown in Graph 3-4. The highest DRO detection was 13,700 µg/L in June 2000 (not shown in Graph 3-4). The analytical results indicate an overall decreasing trend since 2010, and the 2019 result was the lowest observed since 2007. However, the 2020 sampling event shows an increase in DRO. This is likely due to a high water level for 2020 (see Section 3.2.2 for water level descriptions). Nonetheless, groundwater geochemistry results indicate biodegradation of DRO is likely occurring under iron-reducing conditions.

Graph 3-4 DRO Concentrations in AP-7560 in DRMO1



Notes:
For definitions, refer to the Acronyms and Abbreviations section.

3.2.4 DRMO Yard Water Supply Well Results

The WSW system is housed in Building 5009, located upgradient of the PCE and DRO source areas within the DRMO1 subarea. The well was installed in association with the fire suppression tank; however, the well was permanently disconnected from the tank in 2020, as discussed in Section 2.6. The WSW currently supplies potable water to Building 5010, which is treated prior to use.

Groundwater samples are collected from a raw water tap located upstream of the building water treatment system. Although occasional low-level detections of various contaminants are observed, neither ROD RGs nor EPA MCLs have ever been exceeded since sampling began in 1998. Complete 2020 results for the WSW are presented in Table A-4 in Appendix A.

3.3 DRMO1 (Three-Party) LTMO Analysis Update

The LTMO analysis (initially conducted in 2008) was updated using data collected between 2010 and 2020 for the DRMO1 (Three-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 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 (Three-Party) Wells

WELL	RELATIVE LOCATION TO INJECTION AREA	CONTAMINANTS OF CONCERN	
		PCE	TCE
AP-10017/AP-10017R	Upgradient	Probably Increasing	Decreasing
AP-8914R	Within treatability study area	**No Trend**	Stable
AP-10016/AP-10016R		**No Trend**	Stable
AP-10018/AP-10018R		**Probably Decreasing**	**Decreasing**
AP-10015/AP-10015R	Downgradient of treatability study area	**Increasing**	Probably Decreasing
AP-7559		**Probably Increasing**	No Trend
AP-7560		Stable	No Trend

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Trends in **bold type** exceeded the RG at least once during the time period used in the LTMO analysis (2010-2020).

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(R):** Probably increasing trend for PCE and a decreasing trend for TCE. Concentrations have remained below the RG. The probably increasing trend result for PCE is influenced by the elevated PCE concentration observed in 2020 due to high water levels.
- **Injection area wells AP-8914R, AP-10016(R), and AP-10018(R):**
  - PCE concentration trend in AP-10018(R) was probably decreasing, and the PCE concentration trends in AP-10016(R) and AP-8914R exhibited no trend. However, PCE exceeded the RG in each of these three wells in 2020.
  - Concentration trends for TCE were decreasing for AP-10018(R), and stable for AP-10016(R) and AP-8914R. TCE has remained below the RG in each of these wells since at least 2012.
- **Downgradient wells AP-10015R, AP-7559, and AP-7560:**
  - PCE exhibited an increasing trend in AP-10015(R), probably increasing in AP-7559, and a stable trend in AP-7560. PCE in AP-10015 increased following the injections and was above the RG in 2014. However, the PCE concentration has remained below the RG in the sampling events between 2015 and 2020. These results suggest the increasing trend identified by MAROS is a result of the PCE increases 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 probably decreasing trend was observed in AP-10015R. All TCE concentrations have remained below the RG in downgradient wells since the injections.
- The trend results reflect some influence from the increase in PCE concentrations observed in 2020 due to high water levels, but 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 in the DRMO1 (Three-Party) area showed:

- The PCE dissolved mass has been variable since the injection, and exhibited a probably increasing trend based on the 2020 results. However, this result is likely influenced by the elevated PCE concentrations observed in 2020 due to high water levels. Dissolved mass estimates have been generally stable since 2014.
- The TCE dissolved mass estimate exhibited no trend, and TCE remains below the RG in individual wells.

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

- The center of mass of PCE and TCE exhibited increasing trends over the period of analysis.
- However, this does not indicate expansion of the plumes at concentrations greater than the RG since the primary reason for the increasing trend is overall decreasing contaminant concentrations observed in source area wells since the injection events.

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

- PCE exhibited no trend in the direction of groundwater flow, and a probably increasing trend perpendicular to groundwater flow. These results reflect the increase in PCE concentration within the source area wells in 2020. However, plume spread downgradient of the source area has not been observed.
- TCE exhibited a stable trend in the direction of groundwater flow, and no trend perpendicular to groundwater flow. The plume spread estimated in 2020 was within the range observed since 2010, and there was no indication of plume spread in the spatial moment analysis results.

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 (Three-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 2020 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 RG. However, annual sampling should be continued for all DRMO1 wells since PCE is intermittently detected above the RG.

3.4 DRMO4 Subarea Groundwater Monitoring Results

Three monitoring wells at the DRMO4 site (AP-10446MW [replacement well for PO5], AP-8916, and AP-10445MW [replacement well for Probe B]) were sampled in August 2020. The wells were sampled as part of the annual monitoring event to evaluate the progress towards achieving the RGs. Groundwater analytical results are presented in Table 3-3 and shown on Figure 3-2. Groundwater geochemistry results are presented on Figure 3-3 and in Table 3-3, with additional geochemical parameters summarized in Table C-1. Geochemical and contaminant concentration trends are discussed in the following sections.

3.4.1 Groundwater Geochemistry Trends

Groundwater geochemistry indicators (ORP, DO, dissolved iron, and sulfate) were measured at the DRMO4 (Three-Party) site to evaluate the potential for conditions supportive of reductive dechlorination. In 2020, 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 2020 monitoring results are shown on Figure 3-3.

The 2020 results showed groundwater in the vicinity of AP-8916 was characterized by reducing conditions, with DO less than 1 mg/L. A dissolved iron concentration of 7.97 mg/L and a sulfate concentration of 7.00 mg/L were also observed in AP-8916, which suggests potential for biodegradation through iron and sulfate reduction. Groundwater geochemistry in downgradient wells AP-10445MW and AP-10446MW was characterized by concentrations of dissolved iron (less than 5 mg/L) and sulfate (greater than 20 mg/L) similar to background levels.

3.4.2 Contaminant Concentration Trends

3.4.2.1 PCE Concentration Trends

The PCE concentration changes over time and visual trends for AP-10446MW/PO5, AP-8916, and AP-10445MW/Probe B are shown in Graph 3-5. For clarity, the graph is based on groundwater data

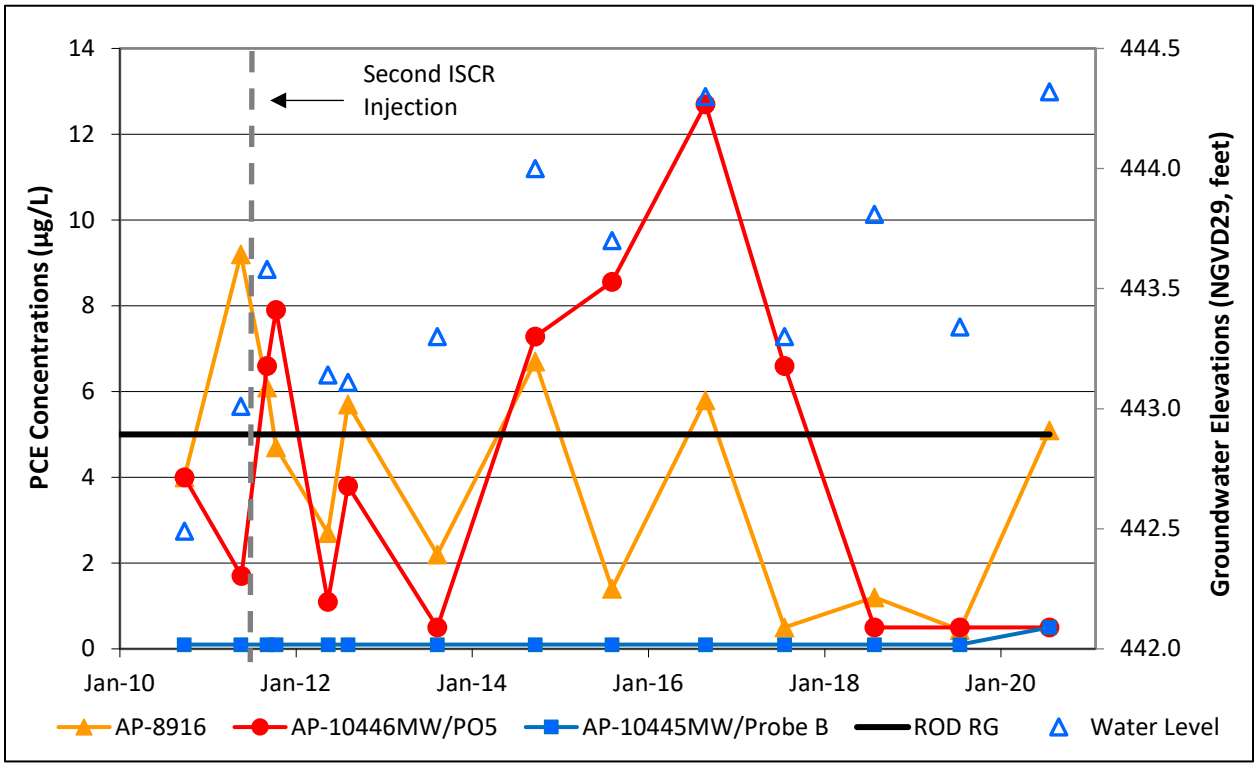
between October 2010 and August 2020. This represents the timeframe just prior to and following the second ISCR injection at the DRMO4 site.

As shown in Graph 3-5, the PCE concentrations in AP-10446MW/PO5 were variable following the September 2011 Adventus EHC™ injection. PCE was below the RG in PO5 during the 2012 and 2013 sampling events, but exceeded the RG between 2014 and 2017. PCE was not detected in replacement source area well AP-10446MW in 2018, and has remained non-detect in the 2019 and 2020 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 RG in AP-8916 immediately following the 2011 injection, but concentrations have continued to fluctuate above and below the RG in this well. In 2020, PCE in AP-8916 (5.1 µg/L) was slightly higher than the RG (5.0 µg/L). The PCE concentration in 2020 was similar to the concentration in 2016, and may be a result of high water levels observed during both sampling events.

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

Graph 3-5 PCE Concentrations and Water Elevations in DRMO4 Wells



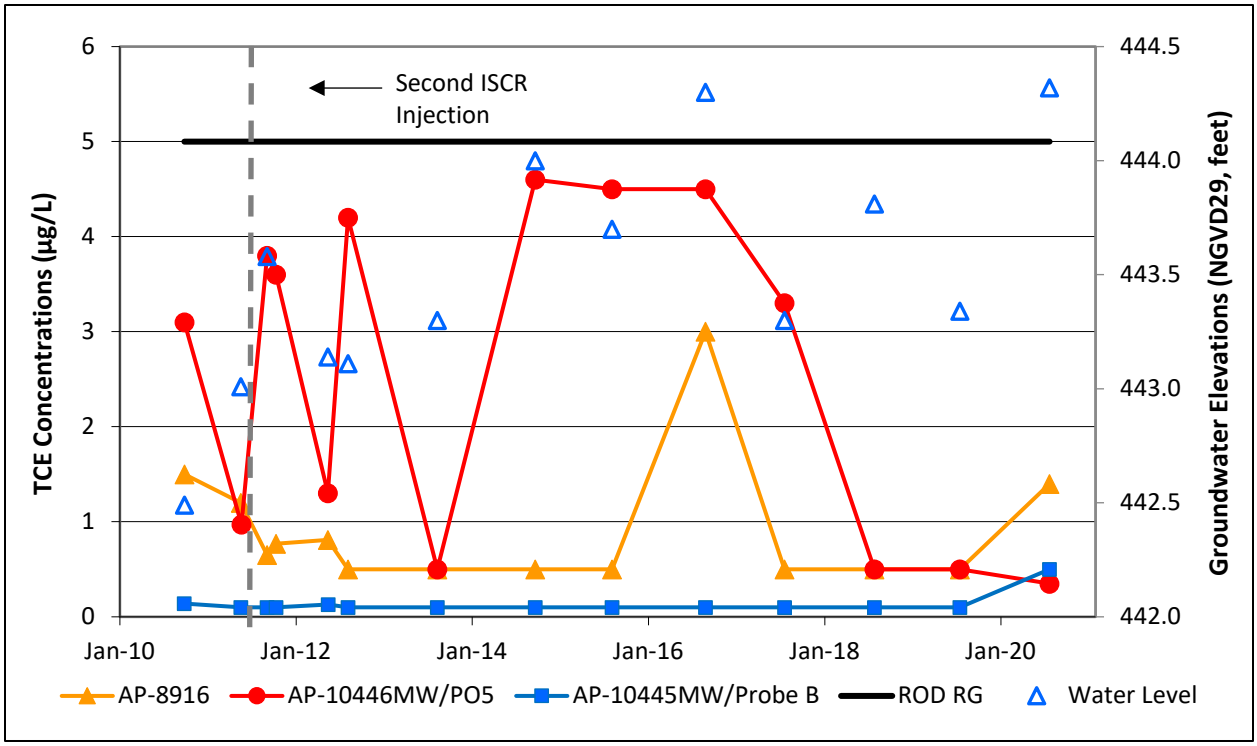
Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Only data collected between August 2010 (preceding the 2nd injection) and August 2020 are shown for clarity. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. The groundwater elevations depicted were measured in AP-8916, which are representative of the water levels in the DRMO4 subarea.

3.4.2.2 Concentration Changes of Reductive Dechlorination Daughter Products

The distribution of PCE daughter products is indicative of reductive dechlorination occurring in the DRMO4 area, and the daughter products TCE and cis-1,2-DCE were detected in all DRMO4 wells below the RG. 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 not been detected in AP-8916 since 2012, with the exceptions of 2016 and 2020, when it was detected at 3.0 µg/L and 1.4 µg/L, respectively. TCE concentrations fluctuated below the RG in PO5, with the first TCE detection in replacement well AP-10046MW in the 2020 sampling event at 0.35 µg/L, well below the RG. TCE has never been detected above trace levels in AP-10045MW/Probe B.

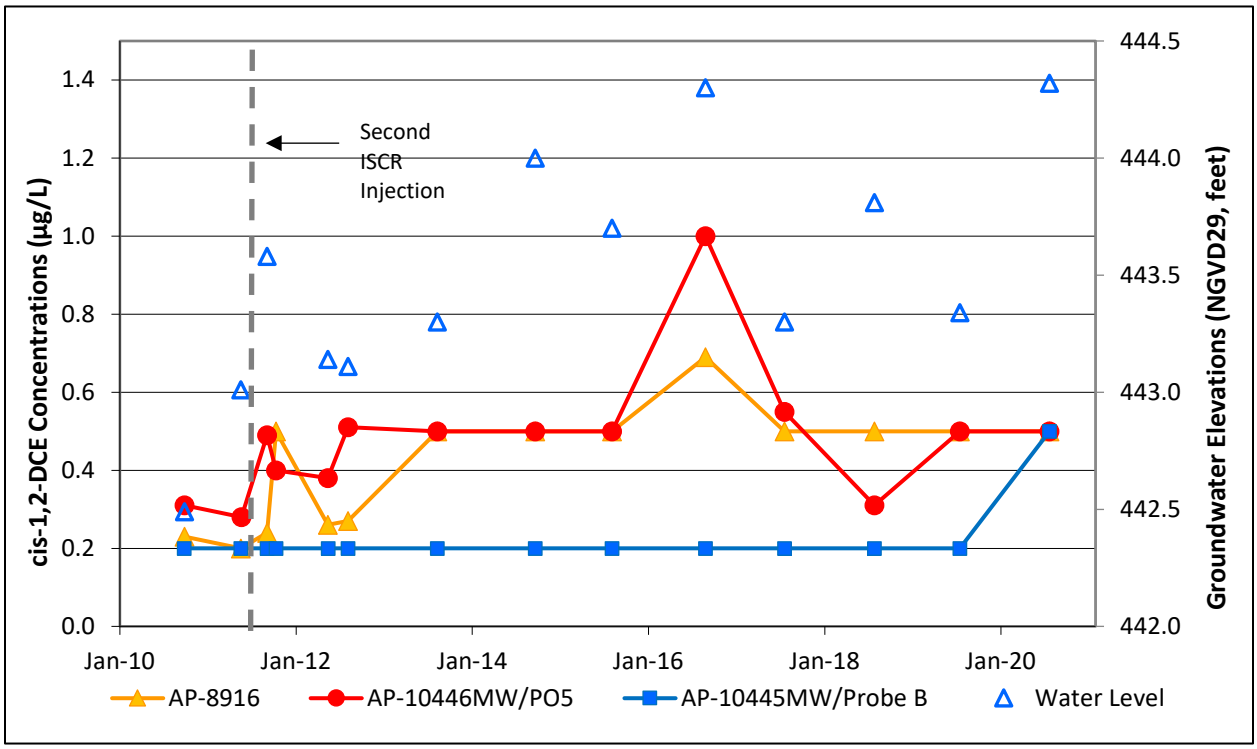
Graph 3-6 TCE Concentrations and Water Elevations in DRMO4 Wells



Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Only data collected between August 2010 (preceding the 2nd injection) and August 2020 are shown for clarity. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. The groundwater elevations depicted were measured in AP-8916, which are representative of the water levels in the DRMO4 subarea.

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. However, cis-1,2-DCE concentrations have remained more than an order of magnitude below the RG (70 µg/L).

Graph 3-7 cis-1,2-DCE Concentrations and Water Elevations in DRMO4 Wells



Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Only data collected between August 2010 (preceding the 2nd injection) and August 2020 are shown for clarity. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. The groundwater elevations depicted were measured in AP-8916, which are representative of the water levels in the DRMO4 subarea.

3.4.2.3 DRO Concentration Trends

DRO concentrations have also been monitored in DRMO4 wells since sampling began in 1994. As shown on Figure 3-2, the DRO concentrations never exceeded the ADEC CUL in PO5, but exceeded the CUL 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 (Three-Party) during the 2012 sampling event. As a result, the DRO exceedances in AP-8916 in 2012 and 2013 were attributed to the injection product and not contamination. DRO in AP-8916 steadily decreased from 10,000 µg/L in 2012 to 410 µg/L in 2017, when DRO analysis for this well was discontinued.

Probe B is located downgradient of the ISCR injection area so the DRO concentrations observed are not attributed to the 2011 ISCR injection. DRO exceedances have been intermittently observed in Probe B since 2010, with a maximum concentration of 4,500 µg/L in 2011. The DRO concentrations observed in replacement well AP-10445MW have also fluctuated above and below the CUL since installation in 2018. The 2020 sampling result was above the ADEC CUL.

3.5 DRMO4 (Three-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 2020 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 (Three-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	**Stable**	Stable
AP-10445MW/Probe B	Downgradient	Not Detected[1]	No Trend

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
Trends in **bold type** exceeded the RG at least once during the time period used in the LTMO analysis (2011-2020).
[1] The trend analysis indicated a stable trend in downgradient well Probe B/AP-10445MW; however, PCE was not detected in this well between 2011 and 2020.

Table 3-5 shows that PCE has exceeded the RG in two of the three wells sampled at the DRMO4 site since the injections were completed (AP-8916 and PO5). The PCE concentration in AP-8916 has fluctuated slightly above and slightly below the RG since 2011, but has been below the RG in three out of four sampling events since 2017. The trend results for PCE in PO5 showed a stable trend. PCE in PO5 was detected at a concentration of 7.9 µg/L in 2011, following the second injection. PCE concentrations subsequently decreased below the RG then exceeded the RG in all four events between 2014 and 2017. PCE has not been detected in replacement well AP-10446MW since 2018.

The PCE concentrations downgradient of the injection area have remained less than the RG, 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 RG in each of the three wells during the period of analysis, and the Mann-Kendall analysis indicates either no trend or a stable trend. The presence of TCE indicates biodegradation of PCE is occurring, but there are no trends that suggest TCE will exceed the RG.

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, but concentrations since then have fluctuated above and below the RG.

- PCE concentrations have been intermittently detected above the RG in AP-8916 since 2014 (2014, 2016, and 2020). The exceedances appear to be influenced by high water levels at the site during these events.
- PCE concentrations were detected above the RG in PO5 between 2014 and 2017, but PCE has not been detected in the replacement well (AP-10446MW) since installation in 2018.
- The PCE concentration in downgradient well AP-10445MW/Probe B has not been detected since 2010, which is an indicator that the plume is not expanding.
- TCE and cis-1,2-DCE concentrations remained below the RG and have been either not detected or detected at trace concentrations in recent sampling events.

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 Summary and Recommendations for DRMO Three-Party Sites

Groundwater sampling results from 2020 showed an overall increase in PCE concentrations in the DRMO1 source area, with concentrations exceeding the ROD RG in AP-8914R, AP-10016R, and AP-10018R. The increase was likely associated with the high water levels observed during the 2020 sampling event. Water levels in 2020 were approximately 1 foot higher than 2019, and were the highest since 2016 when elevated PCE concentrations were observed in these same wells. However, the PCE concentration in downgradient well AP-10015R remained below the ROD RG. In addition, groundwater geochemistry results showed reducing conditions supportive of reductive dichlorination are persistent in the source area, and daughter products TCE and cis-1,2-DCE continue to be detected below the RG. This indicates that biodegradation continues to occur at this site, and downgradient migration of PCE above the ROD RG is not occurring.

PCE concentrations also increased in one well (AP-8916) at the DRMO4 source area. The PCE concentration exceeded the ROD RG for the first time since 2016, and was likely a result of high water levels (similar to the DRMO1 site). PCE has not been detected in downgradient replacement wells (AP-10445MW and AP-10446MW) since installation in 2018. DRO exceeded the ADEC CUL in downgradient well AP-10445MW in 2020, and has intermittently exceeded the ADEC CUL in this area.

LTMO analysis showed that annual sampling is recommended to continue to evaluate groundwater geochemistry and contaminant concentration trends. Annual sampling (conducted in the fall) continues to be sufficient to document progress towards achieving the RGs for the sites. In addition, samples should continue to be collected from the WSW on an annual basis.

It is also recommended that OU2 wells be resurveyed. In 2018, newly installed wells were surveyed using the most current vertical datum, the North American Vertical Datum of 1988 (NAVD88). However, the wells installed prior to 2018 were not included in the survey. The older wells were surveyed using an older vertical datum, the National Geodetic Vertical Datum of 1929 (NGVD29). Vertical coordinate information from the pre-2018 wells is converted to NAVD88 in order to evaluate groundwater contours site-wide; however, converted data is less accurate. Due to the relatively flat hydraulic gradient on Fort Wainwright, resurveying all monitoring wells in the most current NAVD88 datum is recommended for improved accuracy of the groundwater contours.

Table 3-1 OU2 DRMO Yard Groundwater Elevations

LOCATION	WELL ID	TOTAL WELL DEPTH (feet btoc)	SCREENED INTERVAL (feet bgs)	WELL ELEVATION (NGVD29 feet)	AUG-2018			AUG-2019			AUG-2020		
					DATE	WATER LEVEL (feet btoc)	WATER ELEVATION (NGVD29 feet)	DATE	WATER LEVEL (feet btoc)	WATER ELEVATION (NGVD29 feet)	DATE	WATER LEVEL (feet btoc)	WATER ELEVATION (NGVD29 feet)
DRMO1 (Three-Party) Treatment System Area	AP-8914R	18.15	6 - 16	454.14	8/16/18	10.33	443.81	8/6/19	10.80	443.34	8/14/20	9.82	444.32
	AP-7559	20.02	6 - 16	454.00	8/16/18	10.13	443.87	8/7/19	10.54	443.46	8/13/20	9.60	444.40
	AP-7560	20.06	6 - 16	453.31	8/16/18	9.65	443.66	8/7/19	10.07	443.24	8/14/20	9.13	444.18
	AP-10015R[1]	20.35	7.7 - 17.7	456.16	8/16/18	12.32	443.84	8/6/19	12.83	443.33	8/14/20	11.85	444.31
	AP-10016R[1]	20.40	7 - 17	456.33	8/16/18	12.46	443.87	8/6/19	12.92	443.41	8/14/20	11.92	444.41
	AP-10017R[1]	20.35	7 - 17	455.95	8/16/18	12.02	443.93	8/6/19	12.52	443.43	8/14/20	11.51	444.44
	AP-10018R[1]	20.43	7.4 - 17.4	455.72	8/16/18	11.86	443.86	8/6/19	12.34	443.38	8/14/20	11.38	444.34
DRMO4 (Three-Party) Source Area	AP-10446MW[1]	20.50	7.5 - 17.5	455.46	8/17/18	11.47	443.99	8/7/19	11.86	443.60	8/14/20	11.07	444.39
	AP-8916	16.28	5 - 15	452.82	8/17/18	10.77	442.05	8/7/19	11.12	441.70	8/14/20	10.25	442.57
	AP-10445MW[1]	20.35	7.4 - 17.4	456.14	8/17/18	12.31	443.83	8/7/19	12.65	443.49	8/14/20	11.83	444.31

Notes:

For definitions, refer to the Acronyms and Abbreviations section

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

This page intentionally blank

Table 3-2 2016-2020 DRMO1 (Three-Party) Subarea Groundwater Sample Results

WELL ID	RELATIVE LOCATION	SAMPLE ID	SAMPLE DATE	WATER ELEVATION (NGVD29 feet)	GEOCHEMICAL PARAMETERS				ROD COCs (µg/L)						NON-ROD COC (µg/L)
					ORP (mV)	DO (mg/L)	DISSOLVED IRON (mg/L)	SULFATE (mg/L)	BENZENE	PCE	TCE	cis-1,2-DCE	1,1-DCE	VINYL CHLORIDE	DRO
ROD RGs (ROD ANALYTES) / ADEC CUL (NON-ROD ANALYTE)[1]									**5**	**5**	**5**	**70**	**7**	**2**	**1,500**
AP-10017	Upgradient	16FWOU219WG	9/14/2016	444.40	42.9	0.55	ND (0.3)	20.9	ND (0.2)	2.8	ND (0.5)	0.93 J	ND (0.5)	ND (0.5)	NA
		17FWOU217WG	8/9/2017	443.40	73.3	0.45	ND (0.3)	20.4	ND (0.2)	1.2	ND (0.5)	0.40 J	ND (0.5)	ND (0.08)	NA
AP-10017R		18FWOU216WG	8/16/2018	443.93	-6.3	0.82	0.35 J	22.6	ND (0.2)	1.1	ND (0.5)	0.63 J	ND (0.5)	ND (0.08)	NA
		19FWOU201WG	8/6/2019	443.43	218.2	0.53	0.21 J	23.8	ND (0.2)	0.52 J	ND (0.5)	0.67 J	ND (0.5)	ND (0.08)	NA
		20FWOU207WG	8/14/2020	444.44	125.7	0.80	0.24	22.3	ND [0.2]	4.1	ND (0.5)	0.40 J	ND [0.5]	ND (0.08)	NA
AP-8914R	Source Area	16FWOU220WG	9/14/2016	444.34	-72.4	0.37	33.7	23.1	ND (0.2)	**6.7**	4.5	20	ND (0.5)	ND (0.5)	NA
		17FWOU219WG	8/9/2017	443.34	-119.6	0.44	27.1	8.69	ND (0.2)	0.53 J	1.7	16	ND (0.5)	ND (0.08)	NA
		18FWOU214WG	8/16/2018	443.81	-111.9	0.59	25.2	20.4	ND (0.2)	0.55 J	1.9	7.8	ND (0.5)	ND (0.08)	NA
		19FWOU205WG	8/6/2019	443.34	-14.9	0.30	27.2	19.3	ND (0.2)	0.57 J	1.2	6.4	ND (0.5)	ND (0.08)	NA
		20FWOU204WG	8/14/2020	444.32	136.1	1.56	19.9	19.0	ND [0.2]	**9.8**	1.5	7.0	ND [0.5]	0.095 J	NA
AP-10016		16FWOU221WG	9/14/2016	444.14	-2.4	0.77	4.52	13.3	ND (0.2)	**11**	2.1	0.97 J	ND (0.5)	ND (0.5)	NA
		16FWOU222WG[2]					4.71	13.3	ND (0.2)	**11**	2.3	0.95 J	ND (0.5)	ND (0.5)	NA
		17FWOU215WG	8/9/2017	443.17	-53.2	0.98	5.97	10.0	ND (0.2)	**5.2**	1.6	0.50 J	ND (0.5)	ND (0.08)	NA
AP-10016R		18FWOU213WG	8/16/2018	443.87	-20.8	0.54	1.65	11.0	ND (0.2)	**5.8**	0.45 J	ND (0.5)	ND (0.5)	ND (0.08)	NA
		19FWOU204WG	8/6/2019	443.41	100.0	0.38	1.98	10.1	ND (0.2)	**6.2**	0.55 J	0.32 J	ND (0.5)	ND (0.08)	NA
		20FWOU206WG	8/14/2020	444.41	118.7	0.86	2.55	11.7	ND [0.2]	**7.0**	0.43 J	ND [0.5]	ND [0.5]	ND (0.08)	NA
AP-10018		16FWOU218WG	9/14/2016	444.21	-81.9	0.28	20.9	15.5	ND (0.2)	3.3	2.1	5.1	ND (0.5)	ND (0.5)	NA
		17FWOU214WG	8/9/2017	443.23	-3.3	0.50	15.1	14.3	ND (0.2)	1.0	1.0	3.9	ND (0.5)	ND (0.08)	NA
AP-10018R		18FWOU215WG	8/16/2018	443.86	-173.3	0.57	8.71	9.76	ND (0.2)	1.1	0.34 J	2.6	ND (0.5)	ND (0.08)	NA
		19FWOU202WG	8/6/2019	443.38	26.5	0.35	6.03	11.0	ND (0.2)	0.56 J	ND (0.5)	2.2	ND (0.5)	ND (0.08)	NA
		20FWOU208WG	8/14/2020	444.34	113.9	0.66	5.66	14.3	ND [0.2]	**5.5**	0.35 J	2.0	ND [0.5]	ND (0.08)	NA
AP-10015	Slightly Downgradient	16FWOU217WG	9/14/2016	444.21	19.0	0.47	7.80	15.3	ND (0.2)	2.0	2.0	1.7	ND (0.5)	ND (0.5)	NA
		17FWOU213WG	8/9/2017	443.19	-69.9	0.61	8.86	11.3	ND (0.2)	1.5	0.82 J	1.3	ND (0.5)	ND (0.08)	NA
AP-10015R		18FWOU212WG	8/16/2018	443.84	-74.2	0.74	7.14	9.06	ND (0.2)	2.3	0.79 J	1.0	ND (0.5)	ND (0.08)	NA
		19FWOU203WG	8/6/2019	443.33	57.7	0.52	7.10	8.69	ND (0.2)	0.63 J	0.67 J	0.99 J	ND (0.5)	ND (0.08)	NA
		20FWOU205WG	8/13/2020	444.31	143.2	1.83	5.70	9.60	ND [0.2]	4.6	0.74 J	0.84 J	ND [0.5]	ND (0.08)	NA
AP-7559	Downgradient	16FWOU212WG	9/16/2016	444.40	181.0	0.54	ND (0.25)	31.2	ND (0.2)	**5.5**	0.63 J	0.86 J	ND (0.5)	ND (0.5)	NA
		17FWOU221WG	8/9/2017	443.40	61.9	0.87	ND (0.25)	27.9	ND (0.2)	3.4	0.46 J	ND (0.5)	ND (0.5)	ND (0.08)	NA
		18FWOU209WG	8/16/2018	443.87	194.1	0.67	ND (0.25)	27.3	ND (0.2)	3.5	0.49 J	ND (0.5)	ND (0.5)	ND (0.08)	NA
		19FWOU208WG	8/7/2019	443.46	178.0	0.49	ND (0.25)	26.3	ND (0.2)	3.4	0.51 J	ND (0.5)	ND (0.5)	ND (0.08)	NA
		20FWOU201WG	8/13/2020	444.40	150.9	3.23	0.288 J	28.3	ND [0.2]	3.9	0.52 J	ND [0.5]	ND [0.5]	ND (0.08)	NA
AP-7560	Downgradient	16TFTOU213WG	9/13/2016	444.17	-6.8	0.30	10.2	24.4	ND (0.2)	3.0	2.3	0.90 J	ND (0.5)	ND (0.5)	**3,520**
		16TFTOU214WG[2]					10.9	25.9	ND (0.2)	3.2	2.4	1.33 J	ND (0.5)	ND (0.5)	**3,700**
		17FWOU222WG	8/9/2017	443.21	-63.6	0.63	10.1	14.3	ND (0.2)	1.4	1.0	0.36 J	ND (0.5)	ND (0.08)	**4,470**
		17FWOU223WG[2]					10.3	13.5	ND (0.2)	1.3	1.0	0.33 J	ND (0.5)	ND (0.08)	**4,890**
		18FWOU210WG	8/16/2018	443.66	-80.5	0.80	11.9	22.4	ND (0.2)	1.8	2.3	0.88 J	ND (0.5)	ND (0.08)	**3,040**
		18FWOU211WG[2]					10.8	22.6	ND (0.2)	1.9	2.2	0.87 J	ND (0.5)	ND (0.08)	**3,670**
		19FWOU208WG	8/7/2019	444.24	108.6	0.46	8.57	21.2	ND (0.2)	1.7	2.7	1.1	ND (0.5)	ND (0.08)	**2,730**
		19FWOU209WG[2]					8.88	20.5	ND (0.2)	1.7	2.8	1.2	ND (0.5)	ND (0.08)	**1,910**
		20FWOU202WG	8/14/2020	444.18	111.4	0.69	11.1	16.9	ND [0.2]	1.7	1.9	0.78 J	ND [0.5]	ND (0.08)	**6,890**
		20FWOU203WG[2]					11.5	17.1	ND [0.2]	1.7	1.9	0.78 J	ND [0.5]	ND (0.08)	**7,490**

Notes:

For Definitions, refer to Acronyms and Abbreviations section

Results in red and bold are ROD analytes that exceed RGs

Results in green and bold are non-ROD analytes that exceed ADEC CULs

[1] OU2 ROD analytes are compared against ROD RGs. The non-ROD analyte (DRO) is compared against the Groundwater Human Health value listed in ADEC 18 AAC 75.345, Table C (revised as of 7 November 2020).

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

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+"

Table 3-3 2016-2020 DRMO4 (Three-Party) Subarea Groundwater Sample Results

WELL ID	RELATIVE LOCATION	SAMPLE ID	SAMPLE DATE	WATER ELEVATION (NGVD29 feet)	GEOCHEMICAL PARAMETERS				ROD COCs (µg/L)						NON-ROD COC (µg/L)
					ORP (mV)	DO (mg/L)	DISSOLVED IRON (mg/L)	SULFATE (mg/L)	BENZENE	PCE	TCE	CIS-1,2-DCE	1,1-DCE	VINYL CHLORIDE	DRO
ROD RGs (ROD ANALYTES) / ADEC CUL (NON-ROD ANALYTE)[1]									**5**	**5**	**5**	**70**	**7**	**2**	**1,500**
AP-8916	Upgradient	16FWOU215WG	9/13/2016	442.52	-36.6	0.87	13.0	3.93	0.13 J	**5.8**	3.0	0.69 J	ND (0.5)	ND (0.5)	440 J,B
		17FWOU220WG	8/9/2017	441.61	-103.1	0.41	22.6	2.40	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	410 J
		18FWOU219WG	8/17/2018	442.05	-136.9	0.39	25.4	9.37	ND (0.2)	1.2	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	NA
		19FWOU207WG	8/7/2019	441.70	-98.1	0.66	20.6	4.30	ND (0.2)	0.44 J	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	NA
		20FWOU209WG	8/14/2020	442.57	50.2	0.53	7.97	7.00	ND [0.2]	**5.1**	1.4	ND [0.5]	ND [0.5]	ND (0.08)	NA
PO5	Source Area	16FWOU224WG	9/14/2016	NM	-15.6	5.01	4.28	27.8	ND (0.2)	**13**	4.5	1.0	ND (0.5)	ND (0.5)	278 J,B
		17FWOU216WG	8/9/2017	NM	-15.2	2.22	4.10	34.9	ND (0.2)	**6.6**	3.3	0.55 J	ND (0.5)	ND (0.08)	172 J
AP-10446MW		18FWOU218WG	8/17/2018	443.99	-121.2	0.61	3.84	27.9	ND (0.2)	ND (0.5)	ND (0.5)	0.31 J	ND (0.5)	ND (0.08)	NA
		19FWOU212WG	8/7/2019	443.6	-87.1	0.6	3.91	27.4	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	NA
		20FWOU211WG	8/14/2020	444.39	97.3	0.5	4.40	28.5	ND [0.2]	ND [0.5]	0.35 J	ND [0.5]	ND [0.5]	ND (0.08)	NA
Probe B	Downgradient	16FWOU223WG	9/14/2016	443.91	8.8	0.54	3.10	37.8	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	**2,020**
		17FWOU218WG	8/9/2017	443.20	51.9	0.6	2.60	30.7	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	640
AP-10445MW		18FWOU217WG	8/17/2018	443.83	14.9	0.93	0.940	31.1	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	**1,670**
		19FWOU208WG	8/7/2019	443.49	43.8	0.59	0.867	27.3	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.08)	280 J
		20FWOU210WG	8/14/2020	444.31	176.5	0.48	0.804	24.5	ND [0.2]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND (0.08)	**3,400**

Notes:

For definitions, refer to the Acronyms and Abbreviations section

Results in red and bold are ROD analytes that exceed RGs

Results in green and bold are non-ROD analytes that exceed ADEC CULs

[1] OU2 ROD analytes are compared against ROD RGs. The non-ROD analyte (DRO) is compared against the Groundwater Human Health value listed in ADEC 18 AAC 75.345, Table C (revised as of 7 November 2020).

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+"

4.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2019a. *Field Sampling Guidance.* October.

ADEC. 2019b. *Technical Memorandum – Data Quality Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data.* October.

ADEC. 2020. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control*. November.

Air Force Center for Environmental Excellence (AFCEE). 2006. *Monitoring and Remediation Optimization System (MAROS) Users Guide: Software Version 2.2. Brooks AFB, San Antonio, Texas.* March.

Brice Engineering, LLC (Brice). 2020a. *Final Postwide Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP), Various Sites, Fort Wainwright, Alaska.* June.

Brice. 2020b. *2020 CERCLA Sites Work Plan, Operable Units 1 Through 6, Fort Wainwright, Alaska.* July.

Brice. 2021. *Final 2020 Two-Party Sites Monitoring Report, Various Sites.* Fort Wainwright, Alaska. June.

Fairbanks Environmental Services, Inc (FES). 2009. *2009 Work Plan – Operable Unit 2.* Fort Wainwright, Alaska. May.

FES. 2010. *2009 Annual Monitoring Report, Operable Unit 2.* Fort Wainwright, Alaska. June.

FES. 2011. *2010 Annual Monitoring Report, Operable Unit 2.* Fort Wainwright, Alaska. July.

FES. 2018a. *Interim Remedial Action Completion Report – Building 1168 Leach Well.* Fort Wainwright, Alaska. November.

FES. 2018b. *DRMO1 and DRMO4 Treatability Study Report.* Fort Wainwright, Alaska. April.

FES. 2020. *2019 Two Party Monitoring Report.* U.S. Army Garrison Alaska. February.

Harding Lawson Associates (HLA). 1996. *Operable Unit 2 Final Remedial Investigation Report*, Fort Wainwright, Alaska. (Volumes I and II). January.

U.S. Army Garrison Alaska (USAG Alaska). 1997. *Record of Decision for Operable Unit 2*, Fort Wainwright, Alaska. January.

U.S. Department of Defense (DoD). 2019. *Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3.* May.

U.S. Environmental Protection Agency (EPA). 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.* EPA/540/S-95/504. R.W. Puls and M.J. Barcelona (authors). April.

EPA. 2005. *Roadmap to Long-Term Monitoring Optimization*. EPA 542-R-05-003. May.

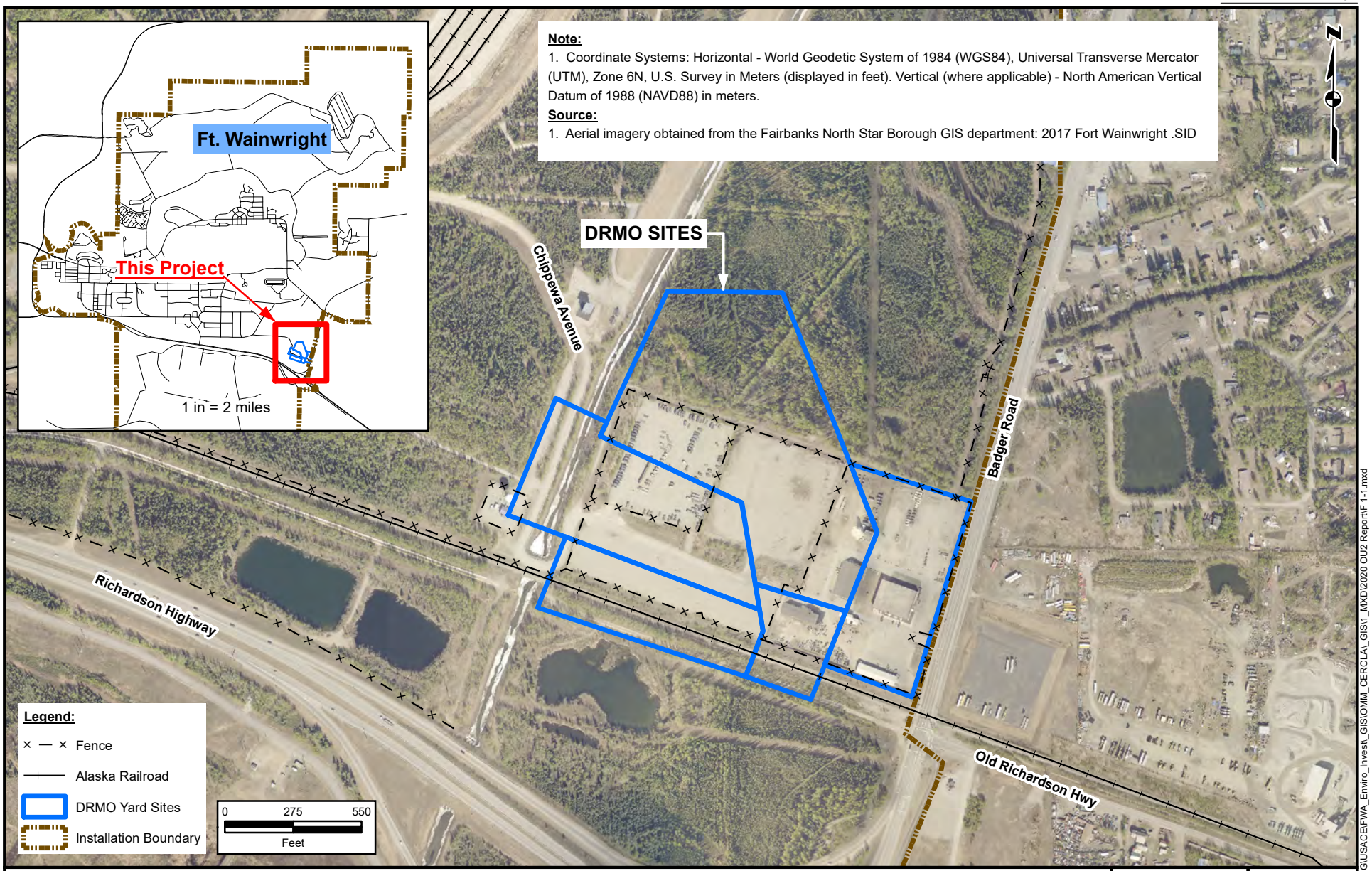
EPA. 2009. *National Primary Drinking Water Regulations.* EPA 816-F-09-004. May.

This page intentionally blank

FIGURES

This page intentionally blank

1 INCH



2020 OPERABLE UNIT 2 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

SITE LOCATION MAP

DATE: 1/13/2021

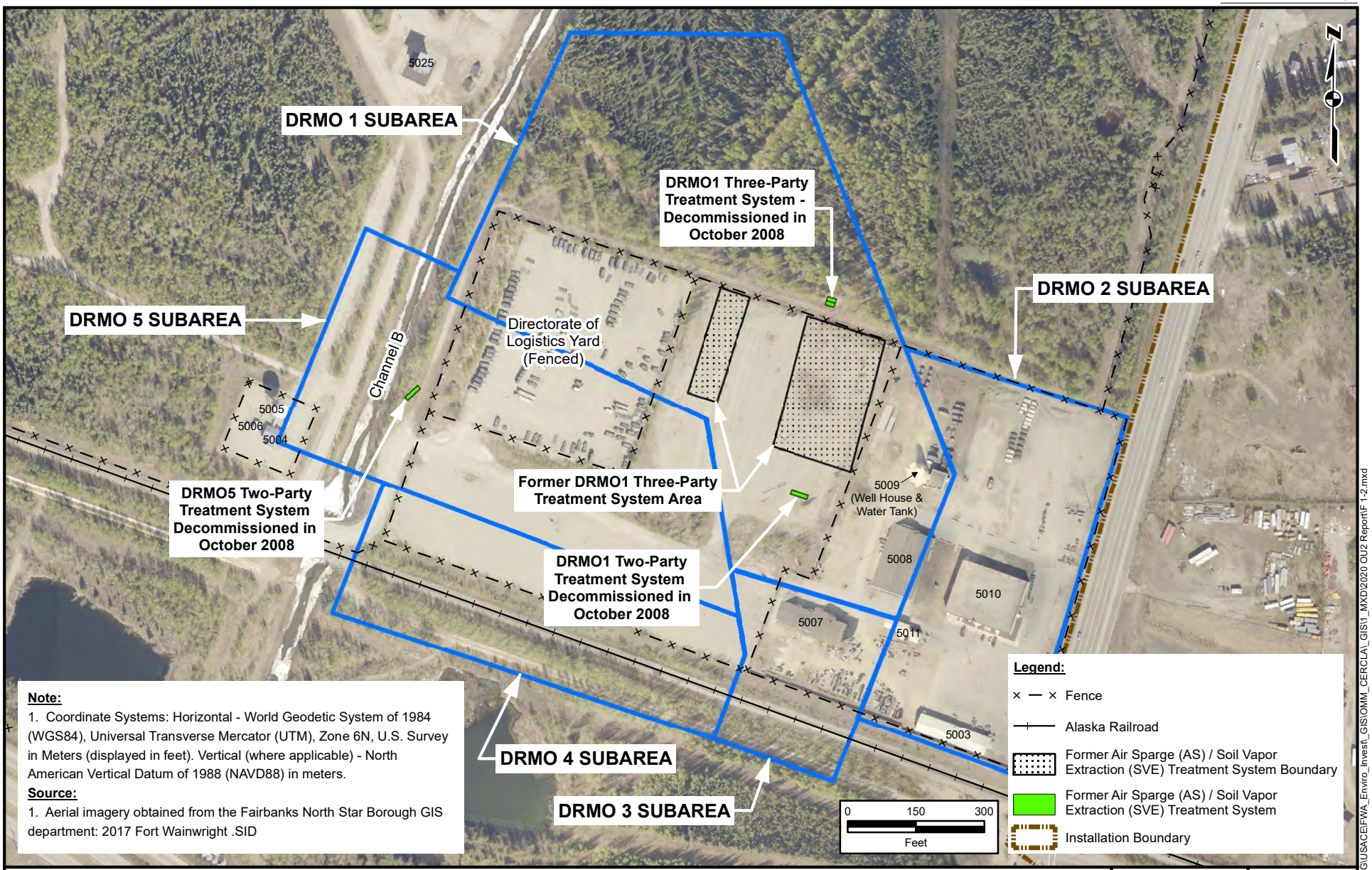
Project No.: 551203

P.M. / DRAWN V.R. / C.B.

FIGURE: 1-1

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU2 Report\F 1-1.mxd

This page intentionally blank



2020 OPERABLE UNIT 2 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

DRMO YARD SUBAREAS

DATE: 1/22/2021

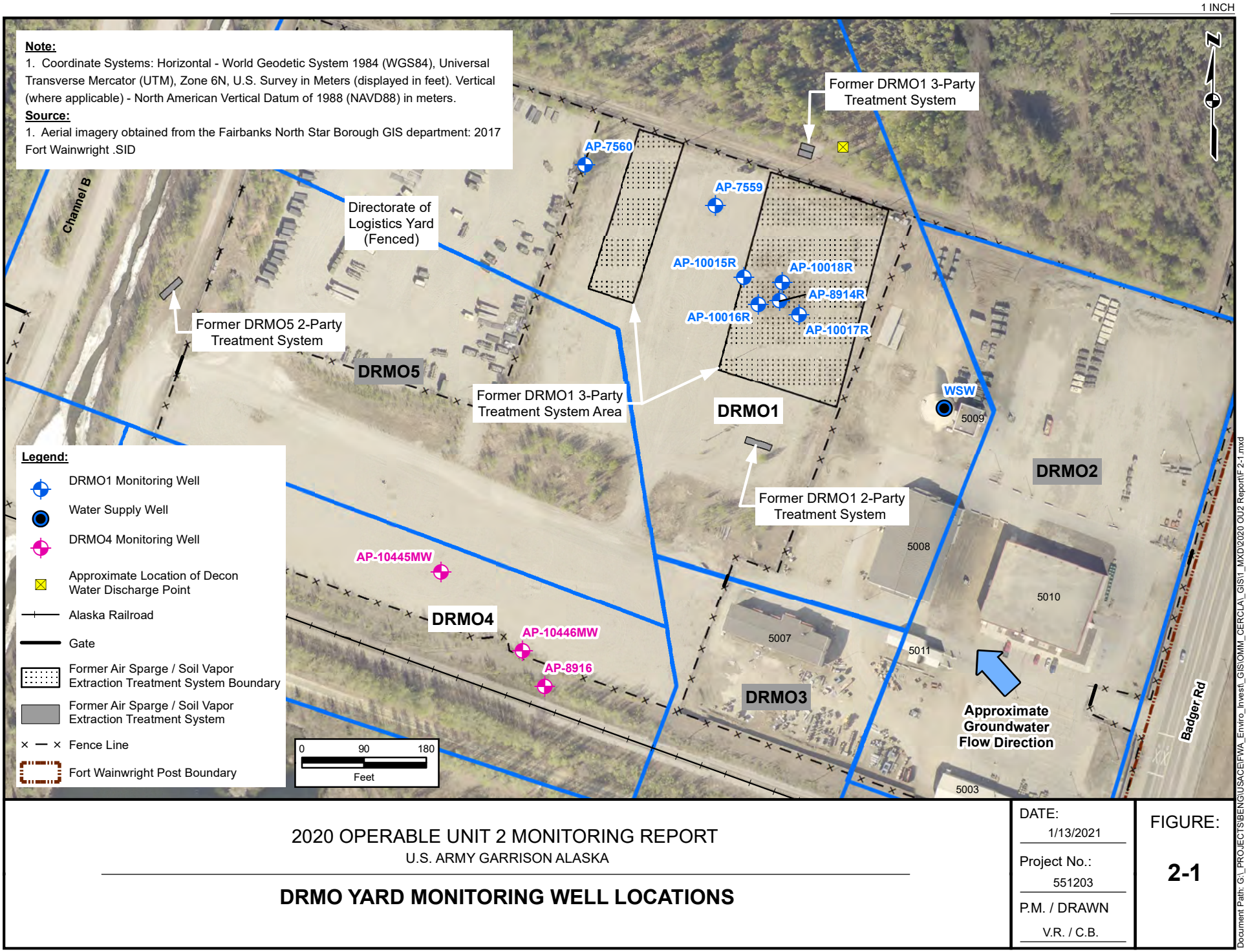
Project No.: 551203

P.M. / DRAWN V.R. / C.B.

FIGURE: 1-2

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU2 Report\F 1-2.mxd

This page intentionally blank



2020 OPERABLE UNIT 2 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

DRMO YARD MONITORING WELL LOCATIONS

DATE: 1/13/2021

Project No.: 551203

P.M. / DRAWN V.R. / C.B.

FIGURE: **2-1**

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU2 Report\F 2-1.mxd

This page intentionally blank

1 INCH

2020 OPERABLE UNIT 2 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

DRMO1 GROUNDWATER SAMPLE RESULTS

The results shown represent data from immediately prior to the second injection through 2020. Complete historical results are provided in Supplemental Information on the CD accompanying this report.

AP-7559 6-16' bgs	Aug 2010	Oct 2010	Feb 2011	June 2011	Sept 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev (ft)	*443.08*	*442.58*	*442.20*	*443.08*	*NM*	*443.22*	*443.24*	*443.33*	*444.04*	*443.76*	*444.40*	*443.40*	*443.87*	*443.46*	*444.40*
DRO	NA	130	NA	NA	77	NA	80	NA	ND(300)	NA	NA	NA	NA	NA	NA
PCE	3.1	3.2	2.6	2.8	4.0	2.9	ND(0.2)	ND(0.6)	4.6	4.5	**5.5**	3.4	3.5	3.4	3.9
TCE	0.51	0.52	0.42	0.48	0.58	0.61	0.69	ND(0.6)	0.58	ND(0.5)	0.63	0.46	0.49	0.51	0.52

AP-7560 6-16' bgs	Oct 2010	Sept 2011	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev (ft)	*442.31*	*443.40*	*443.02*	*443.13*	*443.83*	*443.67*	*444.17*	*443.21*	*443.66*	*444.24*	*444.18*
DRO	**11,000**	**9,600**	**7,900**	**7,560**	**5,190**	**4,320**	**3,700**	**4,890**	**3,670**	**2,730**	**7,490**
PCE	1.8	2.8	2.2	ND(0.6)	1.1	4.3	3.2	1.4	1.9	1.7	1.7
TCE	0.95	2.0	1.2	ND(0.6)	ND(0.5)	3.1	2.4	1.0	2.3	2.8	1.8

AP-10015R* (AP-10015) 8-18' bgs	Aug 2010	Oct 2010	Feb 2011	June 2011	Sept 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*444.82*	*442.46*	*442.02*	*442.97*	*443.48*	*443.03*	*443.10*	*443.16*	*443.88*	*443.66*	*444.21*	*443.19*	*443.84*	*443.33*	*444.31*
DRO	NA	1,400	NA	NA	140+	NA	850	NA	947	NA	NA	NA	NA	NA	NA
BENZENE	0.070	0.080	0.21	ND(0.5)	0.060	0.11	0.080	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	0.98	0.36	ND(0.5)	0.24	1.1	ND(0.2)	3.6	ND(0.6)	**6.3**	0.81	2.0	1.5	2.3	0.63	4.6
TCE	2.4	3.6	2.1	1.5	1.8	0.92	3.5	2.0	4.2	1.4	2.0	0.82	0.79	0.67	0.74
CIS-1,2-DCE	0.73	1.8	2.6	1.5	1.9	1.6	2.1	ND(0.6)	1.1	1.6	1.7	1.3	1.0	0.99	0.84

AP-10018R* (AP-10018) 7-17' bgs	Aug 2010	Oct 2010	Feb 2011	June 2011	Sept 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*442.97*	*442.49*	*442.06*	*442.91*	*443.55*	*443.13*	*443.10*	*443.21*	*443.96*	*443.66*	*444.21*	*443.23*	*443.86*	*443.38*	*444.34*
DRO	NA	**71,000****	NA	NA	**1,700+**	NA	1,200**	NA	347	NA	NA	NA	NA	NA	NA
BENZENE	0.15	0.24	0.42	0.10	0.12	0.39	0.11	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	**19**	**27**	**17**	**8.0**	3.6	0.50	0.70	ND(0.6)	2.2	2.4	3.3	1.0	1.1	0.56	**5.5**
TCE	3.1	3.7	**7.4**	**5.0**	**6.1**	3.1	4.5	ND(0.6)	3.1	1.3	2.1	1.0	0.34	ND(0.5)	0.35
CIS-1,2-DCE	0.64	0.55	1.8	3.7	7.3	7.6	7.7	ND(0.6)	6.1	5.2	5.1	3.9	2.6	2.2	2.0

AP-8914R 6.5-16.5' bgs	Aug 2010	Oct 2010	Feb 2011	June 2011	Sept 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*442.99*	*442.49*	*442.10*	*443.01*	*443.58*	*443.14*	*443.11*	*443.30*	*444.00*	*443.70*	*444.30*	*443.30*	*443.81*	*443.30*	*444.32*
DRO	NA	**42,000****	NA	NA	**2,500+**	NA	**6,800****	NA	586	NA	NA	NA	NA	NA	NA
PCE	**18**	**14**	2.6	3.6	4.1	0.89	0.19	ND(0.6)	ND(0.5)	ND(0.5)	**6.7**	0.53	0.55	0.57	**9.8**
TCE	3.4	3.6	ND(0.5)	1.9	2.9	4.2	4.7	ND(0.6)	3.1	1.5	4.5	1.7	1.9	1.2	1.5
CIS-1,2-DCE	15	69	40	42	**76**	59	68	ND(0.6)	55	28	20	16	7.8	6.4	7.0

AP-10017R* (AP-10017) 7-17' bgs	Aug 2010	Oct 2010	Feb 2011	June 2011	Sept 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*443.04*	*442.54*	*442.14*	*443.06*	*443.55*	*443.19*	*443.18*	*443.29*	*444.01*	*443.82*	*444.40*	*443.40*	*444.31*	*443.43*	*444.44*
DRO	NA	720	NA	NA	52+	NA	580	NA	424	NA	NA	NA	NA	NA	NA
BENZENE	ND(0.5)	0.06	0.19	ND(0.5)	0.07	0.32	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	0.69	0.97	0.52	0.70	0.85	0.44	1.1	ND(0.6)	2.0	1.3	2.8	1.2	1.1	0.52	4.1
TCE	0.34	0.33	0.28	0.26	0.31	0.26	0.30	ND(0.6)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
CIS-1,2-DCE	0.75	0.51	0.69	0.52	0.59	0.76	0.70	ND(0.6)	ND(0.5)	ND(0.5)	0.93	0.4	0.63	0.67	0.40

AP-10016R (AP-10016) 7-17' bgs	Aug 2010	Oct 2010	Feb 2011	June 2011	Sept 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*442.93*	*442.47*	*442.04*	*442.97*	*443.42*	*443.04*	*443.08*	*443.10*	*443.81*	*443.6*	*444.14*	*443.17*	*443.87*	*443.41*	*444.41*
DRO	NA	**1,800****	NA	NA	120+	NA	**1,900****	NA	**2,120****	NA	NA	NA	NA	NA	NA
BENZENE	0.080	0.090	0.22	0.06	ND(0.5)	0.22	0.080	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	2.0	4.0	2.8	1.6	**14**	2.4	**5.3**	ND(0.6)	**18**	**7.2**	**11**	**5.2**	**5.8**	**6.2**	**7.0**
TCE	0.66	1.2	0.51	0.51	1.3	0.51	1.7	ND(0.6)	2.0	1.5	2.3	1.6	0.45	0.55	0.43
CIS-1,2-DCE	0.54	0.43	0.43	0.48	0.28	0.60	0.57	ND(0.6)	ND(0.5)	ND(0.5)	0.97	0.50	ND(0.5)	0.32	ND(0.5)

WATER SUPPLY WELL (100+' bgs total depth)	June 2010	June 2011	Aug 2012	May 2013	May 2014	May 2015	July 2016	May 2017	June 2018	Aug 2019	Aug 2020
DRO	29	17	21	630	NO SAMPLE DUE TO MAINTENANCE	ND(300)	ND(319)	ND(324)	206	ND(300)	297
BENZENE	0.07	ND(0.5)	ND (0.1)	ND(0.2)		ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)

Analytes	ROD RG	ADEC CUL
	units in µg/L	
DRO	NA	1,500
Benzene	5.0	NA
PCE	5.0	NA
TCE	5.0	NA
cis-1,2-DCE	70	NA

Former DRMO1 3-Party Treatment System

AP-7560

Directorate of Logistics Yard (Fenced)

AP-7559

Approximate Location of Former Underground Storage Tank

DRMO1

AP-10015R

AP-10018R

AP-10016R

AP-8914R

AP-10017R

Former DRMO1 3-Party Treatment System Area

DRMO5

WSW

5009 (Well House & Water Tank)

DRMO2

Approximate Groundwater Flow Direction

Former DRMO1 2-Party Treatment System

0 40 80

Feet

Acronyms and Abbreviations

ADEC - Alaska Department of Environmental Conservation
COC - contaminant of concern
CUL - cleanup level
DRO - diesel range organics
ISCR - in situ chemical reduction
PCE - tetrachloroethene
TCE - trichloroethene
cis-1,2-DCE - cis-1,2-dichloroethene
ND - not detected (LOD in parentheses)
LOD - limit of detection
NA - not analyzed or not applicable
ROD - Record of Decision
RG - remedial goal
µg/L - micrograms per liter

Legend:

- DRMO1 Groundwater Monitoring Well
- Water Supply Well
- × — × Fence
- Approximate 2020 DRO Plume
- Approximate 2020 PCE Plume
- Former Air Sparge (AS) / Soil Vapor Extraction (SVE) Treatment System Boundary
- Former Air Sparge (AS) / Soil Vapor Extraction (SVE) Treatment System

Notes:

1. Contaminant concentrations that exceed ROD RGs are shown in **Red.** DRO concentrations that exceed ADEC CUL are shown in **Green.**
2. The numeric RG presented in this figure are based on the remedial action objectives described in the OU2 ROD.
3. Only data collected between 2010 and 2020 are shown due to space limitations. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. Complete sampling results for select COCs are also presented in graphs and discussed within the report text.
4. ADEC cleanup level for DRO based on Table C in 18 AAC 75 (ADEC 2020).
5. Analytical results shown in µg/L.
6. * Replacement wells AP-10015R, AP-10016R, AP-10017R, and AP-10018R were installed in June 2018. The original well IDs are shown in parentheses.
7. ** Elevated DRO results were largely attributed to the ISCR injection product which is an organic carbon source that is detected in the DRO carbon range.
8. + Post-silica gel treatment DRO result. Pre-silica gel treatment results were approximately one order of magnitude higher in concentration.
9. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Groundwater elevations are in the National Geodetic Vertical Datum of 1929 (NGVD29), feet.

Source:

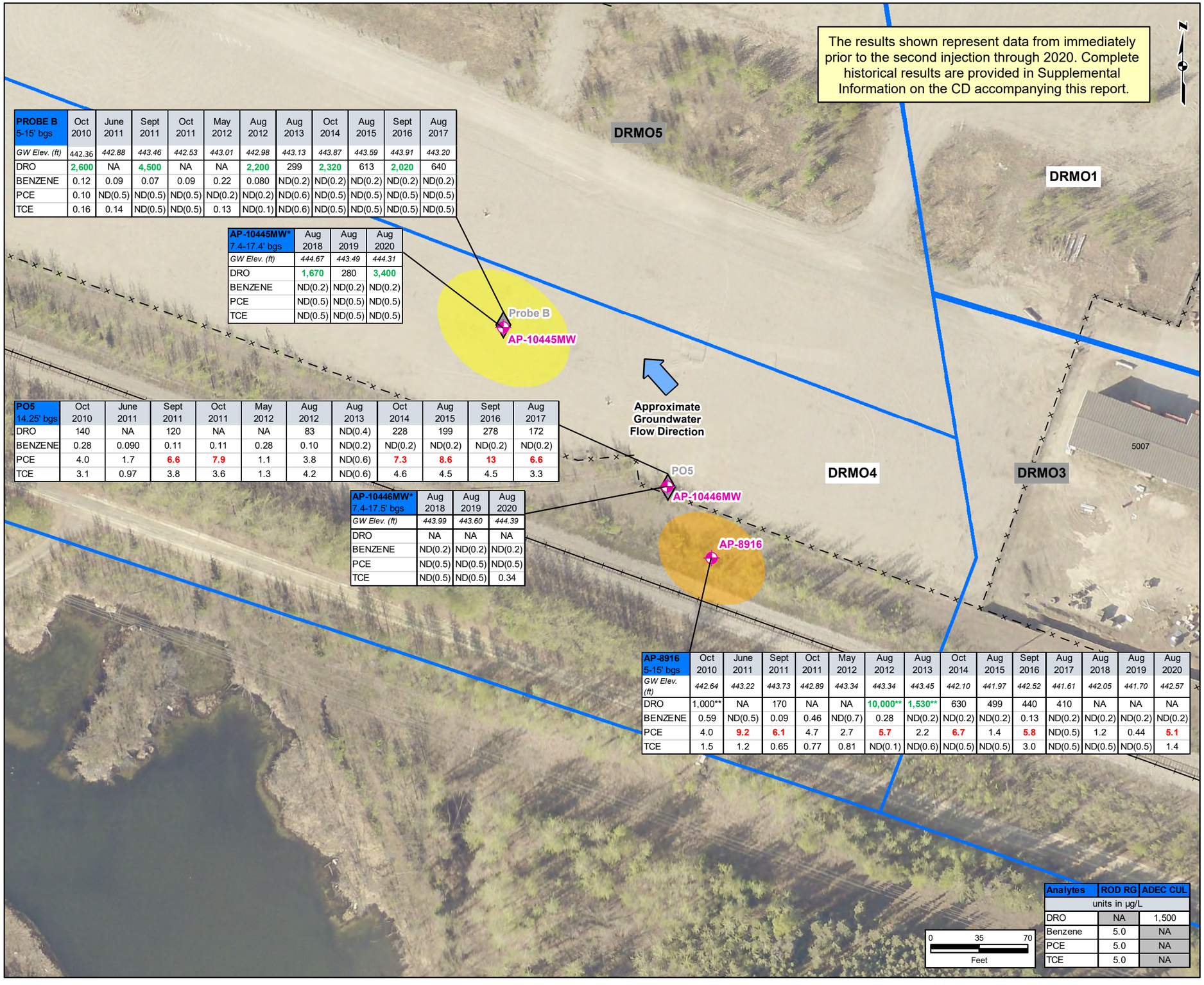
1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

PROJECT No.:	DATE:	FIGURE:
551203	5/25/2021	3-1
P.M.: V.R.	DRAWN: C.B.	

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU2 Report\F 3-1.mxd

This page intentionally blank

1 INCH



PROBE B 5-15' bgs	Oct 2010	June 2011	Sept 2011	Oct 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017
GW Elev. (ft)	*442.36*	*442.88*	*443.46*	*442.53*	*443.01*	*442.98*	*443.13*	*443.87*	*443.59*	*443.91*	*443.20*
DRO	2,600	NA	4,500	NA	NA	2,200	299	2,320	613	2,020	640
BENZENE	0.12	0.09	0.07	0.09	0.22	0.080	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	0.10	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.6)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TCE	0.16	0.14	ND(0.5)	ND(0.5)	0.13	ND(0.1)	ND(0.6)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

AP-10445MW* 7.4-17.4' bgs	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*444.67*	*443.49*	*444.31*
DRO	1,670	280	3,400
BENZENE	ND(0.2)	ND(0.2)	ND(0.2)
PCE	ND(0.5)	ND(0.5)	ND(0.5)
TCE	ND(0.5)	ND(0.5)	ND(0.5)

PO5 14.25' bgs	Oct 2010	June 2011	Sept 2011	Oct 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017
DRO	140	NA	120	NA	NA	83	ND(0.4)	228	199	278	172
BENZENE	0.28	0.090	0.11	0.11	0.28	0.10	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	4.0	1.7	6.6	7.9	1.1	3.8	ND(0.6)	7.3	8.6	13	6.6
TCE	3.1	0.97	3.8	3.6	1.3	4.2	ND(0.6)	4.6	4.5	4.5	3.3

AP-10446MW* 7.4-17.5' bgs	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*443.99*	*443.60*	*444.39*
DRO	NA	NA	NA
BENZENE	ND(0.2)	ND(0.2)	ND(0.2)
PCE	ND(0.5)	ND(0.5)	ND(0.5)
TCE	ND(0.5)	ND(0.5)	0.34

AP-8916 5-15' bgs	Oct 2010	June 2011	Sept 2011	Oct 2011	May 2012	Aug 2012	Aug 2013	Oct 2014	Aug 2015	Sept 2016	Aug 2017	Aug 2018	Aug 2019	Aug 2020
GW Elev. (ft)	*442.64*	*443.22*	*443.73*	*442.89*	*443.34*	*443.34*	*443.45*	*442.10*	*441.97*	*442.52*	*441.61*	*442.05*	*441.70*	*442.57*
DRO	1,000**	NA	170	NA	NA	10,000**	1,530**	630	499	440	410	NA	NA	NA
BENZENE	0.59	ND(0.5)	0.09	0.46	ND(0.7)	0.28	ND(0.2)	ND(0.2)	ND(0.2)	0.13	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
PCE	4.0	9.2	6.1	4.7	2.7	5.7	2.2	6.7	1.4	5.8	ND(0.5)	1.2	0.44	5.1
TCE	1.5	1.2	0.65	0.77	0.81	ND(0.1)	ND(0.6)	ND(0.5)	ND(0.5)	3.0	ND(0.5)	ND(0.5)	ND(0.5)	1.4

Analytes	ROD RG	ADEC CUL
units in µg/L		
DRO	NA	1,500
Benzene	5.0	NA
PCE	5.0	NA
TCE	5.0	NA

2020 OPERABLE UNIT 2 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

DRMO4 GROUNDWATER SAMPLE RESULTS

Acronyms and Abbreviations

ADEC - Alaska Department of Environmental Conservation
COC - contaminant of concern
CUL - cleanup level
DRO - diesel range organics
ISCR - in situ chemical reduction
LOD - limit of detection
NA - not analyzed or not applicable
ND - not detected (LOD in parentheses)
PCE - tetrachloroethene
ROD - Record of Decision
RG - remedial goal
TCE - trichloroethene
µg/L - micrograms per liter

Legend:

- DRMO4 Groundwater Monitoring Well
- Decommissioned Groundwater Monitoring Probe
- Alaska Railroad
- Fence
- Approximate 2020 DRO Plume
- Approximate 2020 PCE Plume

Notes:

1. Contaminant concentrations that exceed ROD RGs are shown in **Red.** DRO concentrations that exceed ADEC CUL are shown in **Green.**
2. The numeric remedial goals presented in this figure are based on the RG objectives described in the OU2 ROD.
3. Only data collected between 2010 and 2020 are shown due to space limitations. The complete historical sampling results for site COCs are presented as part of the Supplemental data in the CD accompanying this report. Complete sampling results for select COCs are also presented in graphs and discussed within the report text.
4. ADEC cleanup level for DRO based on Table C in 18 AAC 75 (ADEC 2020).
5. Analytical results shown in µg/L.
6. Data flags (qualifiers) are not shown due to space limitations.
7. * Wells AP-10445MW and AP-10446MW were installed in June 2018 as replacements for Probe B and PO5, respectively.
8. ** DRO ADEC CUL exceedances in AP-8916 in 2012 and 2013 were largely attributed to the ISCR injection product which is an organic carbon source that is detected in the DRO carbon range.
9. Screened intervals are presented below the Well IDs, unless otherwise noted.
10. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet). Groundwater elevations are in the National Geodetic Vertical Datum of 1929 (NGVD29), feet.

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

PROJECT No.:	DATE:	FIGURE:
551203	4/6/2021	3-2
P.M.: V.R.	DRAWN: C.B.	

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\MM_CERCLA_GIS\1_MXD\2020 OU2 Report\F 3-2.mxd

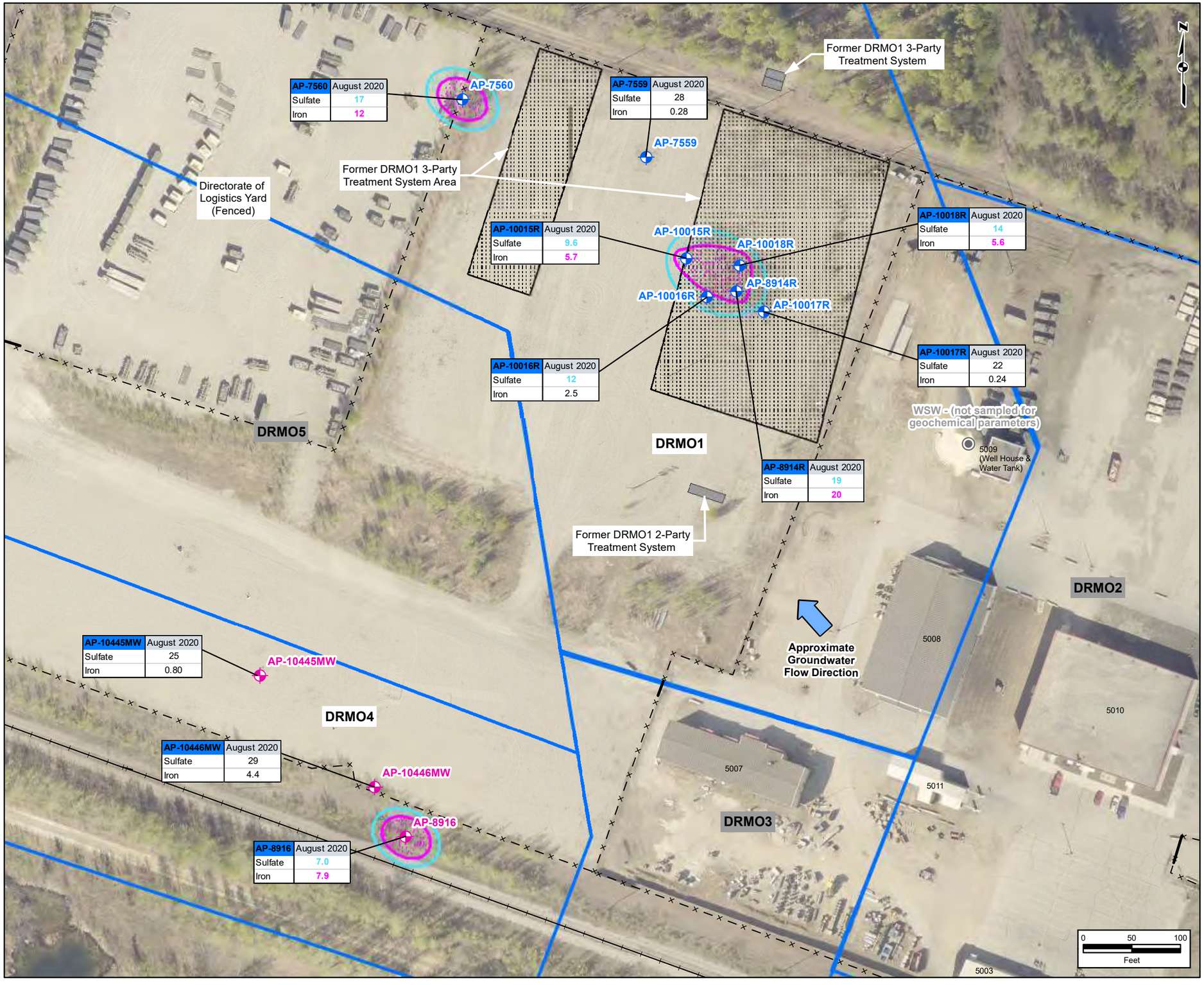
This page intentionally blank

1 INCH

2020 OPERABLE UNIT 2 MONITORING REPORT

U.S. ARMY GARRISON ALASKA

DRMO YARD GROUNDWATER GEOCHEMISTRY



Acronyms and Abbreviations

mg/L - milligrams per Liter

Legend:

- DRMO1 Groundwater Monitoring Well
- Water Supply Well
- DRMO4 Groundwater Monitoring Well
- Alaska Railroad
- Gate
- Fence
- Former Air Sparge / Soil Vapor Extraction Treatment System Boundary
- Former Air Sparge / Soil Vapor Extraction Treatment System
- Ferric Iron Reducing = Iron ≥ 5 mg/L
- Sulfate Reducing = Sulfate ≤ 20 mg/L

Note:

1. Analytical results shown in mg/L.
2. Coordinate Systems: Horizontal - World Geodetic System of 1984 (WGS84), Universal Transverse Mercator (UTM), Zone 6N, U.S. Survey in Meters (displayed in feet).

Source:

1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

PROJECT No.:	DATE:	FIGURE:
551203	1/14/2021	3-3
P.M.: V.R.	DRAWN: C.B.	

Document Path: G:_PROJECTS\BENG\USACE\FWA_Enviro_Invest_GIS\OMM_CERCLA_GIS\1_MXD\2020 OU2 Report\F 3-3.mxd

This page intentionally blank

APPENDIX A
SAMPLE SUMMARY AND ANALYTICAL RESULTS

This page intentionally blank

TABLE A-1 GROUNDWATER SAMPLE SUMMARY
OU2 - Fort Wainwright, Alaska

Sample ID	Location ID	QC Type	Matrix	Sample Depth (feet btoc)	Sample Date & Time	Sampler	SDG	Cooler ID	VOC (SW8260D)	SVOC (SW8270D)	GRO (AK101)	DRO (AK102)	Dissolved Iron (SW6020B)	Sulfate (E300.0)
DRMO1 (THREE-PARTY)														
20FWOU201WG	AP-7559	N	GW	11.0	8/13/20 1:40 PM	KM	1204304	081701	X				X	X
20FWOU202WG	AP-7560	N/MS/MSD	GW	11.0	8/14/20 12:50 PM	KM	1204304	081701	X			X	X	X
20FWOU203WG	AP-1010	FD of 20FWOU202WG	GW	11.0	8/14/20 1:05 PM	KM	1204304	081701	X			X	X	X
20FWOU204WG	AP-8914R	N	GW	10.8	8/14/20 9:10 AM	KM	1204304	081701	X				X	X
20FWOU205WG	AP-10015R	N	GW	12.9	8/13/20 2:20 PM	KM	1204304	081701	X				X	X
20FWOU206WG	AP-10016R	N	GW	12.9	8/14/20 10:15 AM	KM	1204304	081701	X				X	X
20FWOU207WG	AP-10017R	N	GW	12.5	8/14/20 11:05 AM	KM	1204304	081701	X				X	X
20FWOU208WG	AP-10018R	N	GW	12.4	8/14/20 12:05 PM	KM	1204304	081701	X				X	X
DRMO4 (THREE-PARTY)														
20FWOU209WG	AP-8916	N	GW	11.3	8/14/20 2:25 PM	CB	1204304	081701	X				X	X
20FWOU210WG	AP-10445MW	N	GW	12.8	8/14/20 10:50 AM	CB	1204304	081701	X			X	X	X
20FWOU211WG	AP-10446MW	N	GW	12.1	8/14/20 12:00 PM	CB	1204304	081701	X				X	X
DRMO WATER SUPPLY WELL														
20FWOU212WG	WSW	N	GW	unknown	8/14/20 3:30 PM	CB	1204304	081701	X	X	X	X		
QUALITY CONTROL SAMPLES														
20FWOU2EB01WQ	Rinsate 1	EB	WQ	--	8/14/20 2:05 PM	KM	1204304	081701	X			X	X	X
20FWOU2TB01WQ	Trip Blank	TB	WQ	--	8/13/20 8:00 AM	--	1204304	081701	X		X			

Notes:
All samples are associated with NPDL 20-088.
All samples were submitted to SGS of Anchorage, AK analyzed on standard turnaround time.

btoc - below top of casing
CB - Chris Boese
DRO - diesel range organics
EB - equipment blank
FD - field duplicate
GRO - gasoline range organics
GW - groundwater
HCl - hydrochloric acid
HDPE - high density polyethylene
HNO3 - nitric acid
ID - identification
KM - Kyle Milke
L - liter
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
N - normal environmental sample
NPDL - North Pacific Division Laboratory
QC - quality control
SDG - sample data group
SGS - SGS North America, Inc
SVOC - semivolatile organic compounds
TB - trip blank
VOA - volatile organic analysis
VOC - volatile organic compounds
WQ - water QC

Water Sample Collection (all samples were field-preserved at 0 to 6 °C)
VOC - three HCl-preserved, 40 mL VOA vials
SVOC - two non-preserved, 1 L bottles
GRO - three HCl-preserved, 40 mL VOA vials
DRO - two HCl-preserved, 250 mL amber bottles
Dissolved Iron - one HNO3-preserved, 125 mL HDPE bottle
Sulfate - one non-preserved, 125 mL HDPE bottle

This page intentionally blank

TABLE A-2 GROUNDWATER SAMPLE RESULTS
OU2, DRMO1 - Fort Wainwright, Alaska

					Sample ID	20FWOU201WG	20FWOU202WG	20FWOU203WG	20FWOU204WG	20FWOU205WG	20FWOU206WG	20FWOU207WG	20FWOU208WG	20FWOU2EB01WQ	20FWOU2TB01WQ
					Location	AP-7559	AP-7560	AP-1010	AP-8914R	AP-10015R	AP-10016R	AP-10017R	AP-10018R	Rinse 1	Trip Blank
					Lab ID	1204304001	1204304002	1204304005	1204304006	1204304007	1204304008	1204304009	1204304010	1204304015	1204304016
					Collection Date	8/13/2020 1:40 PM	8/14/2020 12:50 PM	8/14/2020 1:05 PM	8/14/2020 9:10 AM	8/13/2020 2:20 PM	8/14/2020 10:15 AM	8/14/2020 11:05 AM	8/14/2020 12:05 PM	8/14/2020 2:05 PM	8/13/2020 8:00 AM
					Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					QC Type	Primary	MS/MSD	FD of 20FWOU202WG	Primary	Primary	Primary	Primary	Primary	Equipment Blank	Trip Blank
Method	**Analyte**	**ROD RG[1]**	**EPA MCL[2,3]**	**Units**		**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**
AK102	Diesel Range Organics	NE	1,500	µg/L		--	6890 [300]	7490 [288]	--	--	--	--	--	ND [278]	--
E300.0	Sulfate	NE	NE	µg/L		28300 [500]	16900 [100]	17100 [100]	19000 [100]	9610 [100]	11700 [100]	22300 [200]	14300 [100]	50.0 [100] J	--
SW6020B	Iron	NE	NE	µg/L		288 [250] J	11100 [250]	11500 [250]	19900 [250]	5700 [250]	2550 [250]	241 [250] J	5660 [250]	ND [250]	--
SW8260D	1,1,1,2-Tetrachloroethane	NE	NE	µg/L		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]	ND [0.250]
SW8260D	1,1,1-Trichloroethane	NE	200	µg/L		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]
SW8260D	1,1,2,2-Tetrachloroethane	NE	NE	µg/L		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]	ND [0.250]
SW8260D	1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	µg/L		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]	ND [5.00]
SW8260D	1,1,2-Trichloroethane	NE	5	µg/L		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]	ND [0.200]
SW8260D	1,1-Dichloroethane	NE	NE	µg/L		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]
SW8260D	**1,1-Dichloroethene**	7	7	µg/L		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]
SW8260D	1,1-Dichloropropene	NE	NE	µg/L		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]
SW8260D	1,2,3-Trichlorobenzene	NE	NE	µg/L		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]
SW8260D	1,2,3-Trichloropropane	NE	NE	µg/L		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]
SW8260D	1,2,4-Trichlorobenzene	NE	70	µg/L		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]
SW8260D	1,2,4-Trimethylbenzene	NE	NE	µg/L		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]
SW8260D	1,2-Dibromo-3-chloropropane	NE	0.2	µg/L		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]	ND [5.00]
SW8260D	1,2-Dibromoethane	NE	0.05	µg/L		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]
SW8260D	1,2-Dichlorobenzene	NE	600	µg/L		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]
SW8260D	1,2-Dichloroethane	NE	5	µg/L		0.158 [0.250] J	0.162 [0.250] J	0.165 [0.250] J	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	1,2-Dichloropropane	NE	5	µg/L		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]
SW8260D	1,3,5-Trimethylbenzene	NE	NE	µg/L		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]
SW8260D	1,3-Dichlorobenzene	NE	NE	µg/L		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]
SW8260D	1,3-Dichloropropane	NE	NE	µg/L		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]	ND [0.250]
SW8260D	1,4-Dichlorobenzene	NE	75	µg/L		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]	ND [0.250]
SW8260D	2,2-Dichloropropane	NE	NE	µg/L		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]
SW8260D	2-Butanone	NE	NE	µg/L		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]	ND [5.00]
SW8260D	2-Chlorotoluene	NE	NE	µg/L		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]
SW8260D	2-Hexanone	NE	NE	µg/L		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]	ND [5.00]
SW8260D	4-Chlorotoluene	NE	NE	µg/L		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]
SW8260D	4-Isopropyltoluene	NE	NE	µg/L		ND [0.500]	0.530 [0.500] 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]
SW8260D	4-Methyl-2-pentanone	NE	NE	µg/L		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]	ND [5.00]
SW8260D	**Benzene**	5	5	µg/L		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]	ND [0.200]
SW8260D	Bromobenzene	NE	NE	µg/L		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]
SW8260D	Bromochloromethane	NE	NE	µg/L		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]
SW8260D	Bromodichloromethane	NE	80	µg/L		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]	ND [0.250]
SW8260D	Bromoform	NE	80	µg/L		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]
SW8260D	Bromomethane	NE	NE	µg/L		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]	ND [2.50]
SW8260D	Carbon disulfide	NE	NE	µg/L		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]	ND [5.00]
SW8260D	Carbon tetrachloride	NE	5	µg/L		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]
SW8260D	Chlorobenzene	NE	100	µg/L		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]	ND [0.250]
SW8260D	Chloroethane	NE	NE	µg/L		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]
SW8260D	Chloroform	NE	8	µg/L		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]
SW8260D	Chloromethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	0.387 [0.500] J,B	0.426 [0.500] J,B	ND [0.500]	0.355 [0.500] J,B	0.673 [0.500] J,B	ND [0.500]	0.394 [0.500] J	ND [0.500]
SW8260D	**cis-1,2-Dichloroethene**	70	70	µg/L		ND [0.500]	0.775 [0.500] J	0.783 [0.500] J	6.96 [0.500]	0.838 [0.500] J	ND [0.500]	0.401 [0.500] J	2.01 [0.500]	ND [0.500]	ND [0.500]
SW8260D	cis-1,3-Dichloropropene	NE	NE	µg/L		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]	ND [0.250]
SW8260D	Dibromochloromethane	NE	80	µg/L		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]	ND [0.250]
SW8260D	Dibromomethane	NE	NE	µg/L		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]
SW8260D	Dichlorodifluoromethane	NE	NE	µg/L		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]
SW8260D	Ethylbenzene	NE	700	µg/L		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]
SW8260D	Hexachlorobutadiene	NE	NE	µg/L		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]
SW8260D	Isopropylbenzene	NE	NE	µg/L		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]
SW8260D	m,p-Xylene	NE	NE	µg/L		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]	ND [1.00]
SW8260D	Methyl tert-butyl ether	NE	NE	µg/L		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]	ND [5.00]
SW8260D	Methylene chloride	NE	5	µg/L		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]	ND [5.00]
SW8260D	Naphthalene	NE	NE	µg/L		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]
SW8260D	n-Butylbenzene	NE	NE	µg/L		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]
SW8260D	n-Propylbenzene	NE	NE	µg/L		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]
SW8260D	o-Xylene	NE	NE	µg/L		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]
SW8260D	sec-Butylbenzene	NE	NE	µg/L		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]
SW8260D	Styrene	NE	100	µg/L		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]
SW8260D	tert-Butylbenzene	NE	NE	µg/L		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]
SW8260D	**Tetrachloroethene**	5	5	µg/L		3.91 [0.500]	1.70 [0.500]	1.74 [0.500]	**9.80 [0.500]**	4.58 [0.500]	**7.00 [0.500]**	4.11 [0.500]	**5.53 [0.500]**	ND [0.500]	ND [0.500]

TABLE A-2 GROUNDWATER SAMPLE RESULTS
OU2, DRMO1 - Fort Wainwright, Alaska

					Sample ID	20FWOU201WG	20FWOU202WG	20FWOU203WG	20FWOU204WG	20FWOU205WG	20FWOU206WG	20FWOU207WG	20FWOU208WG	20FWOU2EB01WQ	20FWOU2TB01WQ
					Location	AP-7559	AP-7560	AP-1010	AP-8914R	AP-10015R	AP-10016R	AP-10017R	AP-10018R	Rinse 1	Trip Blank
					Lab ID	1204304001	1204304002	1204304005	1204304006	1204304007	1204304008	1204304009	1204304010	1204304015	1204304016
					Collection Date	8/13/2020 1:40 PM	8/14/2020 12:50 PM	8/14/2020 1:05 PM	8/14/2020 9:10 AM	8/13/2020 2:20 PM	8/14/2020 10:15 AM	8/14/2020 11:05 AM	8/14/2020 12:05 PM	8/14/2020 2:05 PM	8/13/2020 8:00 AM
					Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					QC Type	Primary	MS/MSD	FD of 20FWOU202WG	Primary	Primary	Primary	Primary	Primary	Equipment Blank	Trip Blank
Method	**Analyte**	**ROD RG[1]**	**EPA MCL[2,3]**	**Units**	**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**
SW8260D	Toluene	NE	1,000	µg/L	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]	ND [0.500]
SW8260D	trans-1,2-Dichloroethene	NE	100	µg/L	ND [0.500]	0.958 [0.500] J	0.985 [0.500] J	6.20 [0.500]	1.85 [0.500]	0.358 [0.500] J	ND [0.500]	5.71 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	trans-1,3-Dichloropropene	NE	NE	µg/L	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]	ND [0.500]
SW8260D	Trichloroethene	5	5	µg/L	0.520 [0.500] J	1.89 [0.500]	1.86 [0.500]	1.54 [0.500]	0.737 [0.500] J	0.431 [0.500] J	ND [0.500]	0.345 [0.500] J	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Trichlorofluoromethane	NE	NE	µg/L	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]	ND [0.500]
SW8260D	Vinyl acetate	NE	NE	µg/L	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]	ND [5.00]	ND [5.00]
SW8260D	Vinyl chloride	2	2	µg/L	ND [0.0750]	ND [0.0750]	ND [0.0750]	0.0945 [0.0750] J	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]
SW8260D	Xylenes (total)	NE	10,000	µg/L	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]	ND [1.50]	ND [1.50]

Notes:

[1] **OU2 ROD analytes are identified in blue text.** The ROD analytes are compared against the OU2 ROD RGs. All LODs for ND results were below the ROD RGs.

[2] Non-ROD analytes are compared to EPA MCLs (EPA 2009), except for bulk fuels (see Note 3).

[3] Bulk fuel (DRO) results are compared against the ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC 2020).

ROD RG exceedances are identified in RED text.

ADEC CUL and/or EPA MCL exceedances are identified in GREEN text.

Gray shaded results are ND with LODs that exceed EPA MCLs.

ADEC - Alaska Department of Environmental Conservation
B - the result is biased high due to contamination present in a blank sample.
CUL - cleanup Level
EPA - U.S. Environemntal Protection Agency
FD - field duplicate
J/J-/J+ – the result is an estimated value based on an QAQC issue and/or is less than the LOQ. Where possible, direction of bias is indicated.
LOD - limit of detection
LOQ - limit of quantitation
MCL - maximum cleanup level
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
ND - not detected
NE - not established
OU2 - Operable Unit 2
QA - quality assurance
QC - quality control
RG - remedial goal
ROD - Record of Decision

TABLE A-3 GROUNDWATER SAMPLE RESULTS
OU2, DRMO4 - Fort Wainwright, Alaska

					Sample ID	20FWOU209WG	20FWOU210WG	20FWOU211WG	20FWOU2EB01WQ	20FWOU2TB01WQ
					Location	AP-8916	AP-10445MW	AP-10446MW	Rinsate 1	Trip Blank
					Lab ID	1204304011	1204304012	1204304013	1204304015	1204304016
					Collection Date	8/14/2020 2:25 PM	8/14/2020 10:50 AM	8/14/2020 12:00 PM	8/14/2020 2:05 PM	8/13/2020 8:00 AM
					Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					QC Type	Primary	Primary	Primary	Equipment Blank	Trip Blank
Method	Analyte	ROD RG[1]	EPA MCL[2,3]	Units		Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier
AK102	Diesel Range Organics	NE	1,500	µg/L		--	3400 [288]	--	ND [278]	--
E300.0	Sulfate	NE	NE	µg/L		7030 [500]	24500 [500]	28500 [200]	50.0 [100] J	--
SW6020B	Iron	NE	NE	µg/L		7970 [250]	804 [250]	4360 [250]	ND [250]	--
SW8260D	1,1,1,2-Tetrachloroethane	NE	NE	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	1,1,1-Trichloroethane	NE	200	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,1,2,2-Tetrachloroethane	NE	NE	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	1,1,2-Trichloroethane	NE	5	µg/L		ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]
SW8260D	1,1-Dichloroethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,1-Dichloroethene	7	7	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,1-Dichloropropene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,2,3-Trichlorobenzene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,2,3-Trichloropropane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,2,4-Trichlorobenzene	NE	70	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,2,4-Trimethylbenzene	NE	NE	µg/L		2.43 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,2-Dibromo-3-chloropropane	NE	0.2	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	1,2-Dibromoethane	NE	0.05	µg/L		ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
SW8260D	1,2-Dichlorobenzene	NE	600	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,2-Dichloroethane	NE	5	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	1,2-Dichloropropane	NE	5	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,3,5-Trimethylbenzene	NE	NE	µg/L		0.608 [0.500] J	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,3-Dichlorobenzene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	1,3-Dichloropropane	NE	NE	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	1,4-Dichlorobenzene	NE	75	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	2,2-Dichloropropane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	2-Butanone	NE	NE	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	2-Chlorotoluene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	2-Hexanone	NE	NE	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	4-Chlorotoluene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	4-Isopropyltoluene	NE	NE	µg/L		1.14 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	4-Methyl-2-pentanone	NE	NE	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	Benzene	5	5	µg/L		ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]
SW8260D	Bromobenzene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Bromochloromethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Bromodichloromethane	NE	80	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	Bromoform	NE	80	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Bromomethane	NE	NE	µg/L		ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]
SW8260D	Carbon disulfide	NE	NE	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	Carbon tetrachloride	NE	5	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Chlorobenzene	NE	100	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	Chloroethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Chloroform	NE	8	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Chloromethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	0.394 [0.500] J	ND [0.500]
SW8260D	cis-1,2-Dichloroethene	70	70	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	cis-1,3-Dichloropropene	NE	NE	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	Dibromochloromethane	NE	80	µg/L		ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
SW8260D	Dibromomethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Dichlorodifluoromethane	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Ethylbenzene	NE	700	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Hexachlorobutadiene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Isopropylbenzene	NE	NE	µg/L		0.474 [0.500] J	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	m,p-Xylene	NE	NE	µg/L		ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]
SW8260D	Methyl tert-butyl ether	NE	NE	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	Methylene chloride	NE	5	µg/L		ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	Naphthalene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	n-Butylbenzene	NE	NE	µg/L		1.17 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	n-Propylbenzene	NE	NE	µg/L		1.06 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	o-Xylene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	sec-Butylbenzene	NE	NE	µg/L		0.866 [0.500] J	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Styrene	NE	100	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	tert-Butylbenzene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Tetrachloroethene	5	5	µg/L		5.10 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Toluene	NE	1,000	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	trans-1,2-Dichloroethene	NE	100	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	trans-1,3-Dichloropropene	NE	NE	µg/L		ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Trichloroethene	5	5	µg/L		1.38 [0.500]	ND [0.500]	0.346 [0.500] J	ND [0.500]	ND [0.500]

TABLE A-3 GROUNDWATER SAMPLE RESULTS
OU2, DRMO4 - Fort Wainwright, Alaska

					20FWOU209WG AP-8916 1204304011 8/14/2020 2:25 PM Groundwater Primary	20FWOU210WG AP-10445MW 1204304012 8/14/2020 10:50 AM Groundwater Primary	20FWOU211WG AP-10446MW 1204304013 8/14/2020 12:00 PM Groundwater Primary	20FWOU2EB01WQ Rinsate 1 1204304015 8/14/2020 2:05 PM Groundwater Equipment Blank	20FWOU2TB01WQ Trip Blank 1204304016 8/13/2020 8:00 AM Groundwater Trip Blank
Method	**Analyte**	**ROD RG[1]**	**EPA MCL[2,3]**	**Units**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
SW8260D	Trichlorofluoromethane	NE	NE	µg/L	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
SW8260D	Vinyl acetate	NE	NE	µg/L	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
SW8260D	Vinyl chloride	2	2	µg/L	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]
SW8260D	Xylenes (total)	NE	10,000	µg/L	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]

Notes:

[1] **OU2 ROD analytes are identified in blue text.** The ROD analytes are compared against the OU2 ROD RGs. All LODs for ND results were below the ROD RGs.

[2] Non-ROD analytes are compared to EPA MCLs (EPA 2009), except for bulk fuels (see Note 3).

[3] Bulk fuel (DRO) results are compared against the ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC 2020).

ROD RG exceedances are identified in RED text.

ADEC CUL and/or EPA MCL exceedances are identified in GREEN text.

Gray shaded results are ND with LODs that exceed EPA MCLs.

ADEC - Alaska Department of Environmental Conservation
B - the result is biased high due to contamination present in a blank sample.
CUL - cleanup Level
EPA - U.S. Environemntal Protection Agency
FD - field duplicate
J/J-/J+ – the result is an estimated value based on an QAQC issue and/or is less than the LOQ. Where possible, direction of bias is indicated.
LOD - limit of detection
LOQ - limit of quantitation
MCL - maximum cleanup level
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
ND - not detected
NE - not established
OU2 - Operable Unit 2
QA - quality assurance
QC - quality control
RG - remedial goal
ROD - Record of Decision

TABLE A-4 GROUNDWATER SAMPLE RESULTS
OU2, DRMO Yard Water Supply Well - Fort Wainwright, Alaska

				Sample ID	20FWOU212WG	20FWOU2TB01WQ
				Location	WSW	Trip Blank
				Lab ID	1204304014	1204304016
				Collection Date	8/14/2020 3:30 PM	8/13/2020 8:00 AM
				Matrix	Groundwater	Groundwater
				QC Type	Primary	Trip Blank
Method	Analyte	ROD RG[1]	EPA MCL[2,3]	Units	Result [LOD] Qualifier	Result [LOD] Qualifier
AK101	Gasoline Range Organics	NE	2,200	µg/L	ND [50.0]	ND [50.0]
AK102	Diesel Range Organics	NE	1,500	µg/L	297 [278] J,B	--
SW8260D	1,1,1,2-Tetrachloroethane	NE	NE	µg/L	ND [0.250]	ND [0.250]
SW8260D	1,1,1-Trichloroethane	NE	200	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,1,2,2-Tetrachloroethane	NE	NE	µg/L	ND [0.250]	ND [0.250]
SW8260D	1,1,2-Trichloro-1,2,2-trifluoroethane	NE	NE	µg/L	ND [5.00]	ND [5.00]
SW8260D	1,1,2-Trichloroethane	NE	5	µg/L	ND [0.200]	ND [0.200]
SW8260D	1,1-Dichloroethane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	**1,1-Dichloroethene**	7	7	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,1-Dichloropropene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,2,3-Trichlorobenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,2,3-Trichloropropane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,2,4-Trichlorobenzene	NE	70	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,2,4-Trimethylbenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,2-Dibromo-3-chloropropane	NE	0.2	µg/L	ND [5.00]	ND [5.00]
SW8260D	1,2-Dibromoethane	NE	0.05	µg/L	ND [0.0375]	ND [0.0375]
SW8260D	1,2-Dichlorobenzene	NE	600	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,2-Dichloroethane	NE	5	µg/L	ND [0.250]	ND [0.250]
SW8260D	1,2-Dichloropropane	NE	5	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,3,5-Trimethylbenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,3-Dichlorobenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	1,3-Dichloropropane	NE	NE	µg/L	ND [0.250]	ND [0.250]
SW8260D	1,4-Dichlorobenzene	NE	75	µg/L	ND [0.250]	ND [0.250]
SW8260D	2,2-Dichloropropane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	2-Butanone	NE	NE	µg/L	ND [5.00]	ND [5.00]
SW8260D	2-Chlorotoluene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	2-Hexanone	NE	NE	µg/L	ND [5.00]	ND [5.00]
SW8260D	4-Chlorotoluene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	4-Isopropyltoluene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	4-Methyl-2-pentanone	NE	NE	µg/L	ND [5.00]	ND [5.00]
SW8260D	**Benzene**	5	5	µg/L	ND [0.200]	ND [0.200]
SW8260D	Bromobenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	Bromochloromethane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	Bromodichloromethane	NE	80	µg/L	ND [0.250]	ND [0.250]
SW8260D	Bromoform	NE	80	µg/L	ND [0.500]	ND [0.500]
SW8260D	Bromomethane	NE	NE	µg/L	ND [2.50]	ND [2.50]
SW8260D	Carbon disulfide	NE	NE	µg/L	ND [5.00]	ND [5.00]
SW8260D	Carbon tetrachloride	NE	5	µg/L	ND [0.500]	ND [0.500]
SW8260D	Chlorobenzene	NE	100	µg/L	ND [0.250]	ND [0.250]
SW8260D	Chloroethane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	Chloroform	NE	8	µg/L	0.595 [0.500] J	ND [0.500]
SW8260D	Chloromethane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	**cis-1,2-Dichloroethene**	70	70	µg/L	ND [0.500]	ND [0.500]
SW8260D	cis-1,3-Dichloropropene	NE	NE	µg/L	ND [0.250]	ND [0.250]
SW8260D	Dibromochloromethane	NE	80	µg/L	ND [0.250]	ND [0.250]
SW8260D	Dibromomethane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	Dichlorodifluoromethane	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	Ethylbenzene	NE	700	µg/L	ND [0.500]	ND [0.500]
SW8260D	Hexachlorobutadiene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	Isopropylbenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	m,p-Xylene	NE	NE	µg/L	ND [1.00]	ND [1.00]
SW8260D	Methyl tert-butyl ether	NE	NE	µg/L	ND [5.00]	ND [5.00]
SW8260D	Methylene chloride	NE	5	µg/L	ND [5.00]	ND [5.00]
SW8260D	Naphthalene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	n-Butylbenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	n-Propylbenzene	NE	NE	µg/L	ND [0.500]	ND [0.500]
SW8260D	o-Xylene	NE	NE	µg/L	ND [0.500]	ND [0.500]

TABLE A-4 GROUNDWATER SAMPLE RESULTS
OU2, DRMO Yard Water Supply Well - Fort Wainwright, Alaska

					Sample ID	20FWOU212WG	20FWOU2TB01WQ
					Location	WSW	Trip Blank
					Lab ID	1204304014	1204304016
					Collection Date	8/14/2020 3:30 PM	8/13/2020 8:00 AM
					Matrix	Groundwater	Groundwater
					QC Type	Primary	Trip Blank
Method	Analyte	ROD RG[1]	EPA MCL[2,3]	Units		Result [LOD] Qualifier	Result [LOD] Qualifier
SW8260D	sec-Butylbenzene	NE	NE	µg/L		ND [0.500]	ND [0.500]
SW8260D	Styrene	NE	100	µg/L		ND [0.500]	ND [0.500]
SW8260D	tert-Butylbenzene	NE	NE	µg/L		ND [0.500]	ND [0.500]
SW8260D	Tetrachloroethene	5	5	µg/L		ND [0.500]	ND [0.500]
SW8260D	Toluene	NE	1,000	µg/L		ND [0.500]	ND [0.500]
SW8260D	trans-1,2-Dichloroethene	NE	100	µg/L		ND [0.500]	ND [0.500]
SW8260D	trans-1,3-Dichloropropene	NE	NE	µg/L		ND [0.500]	ND [0.500]
SW8260D	Trichloroethene	5	5	µg/L		ND [0.500]	ND [0.500]
SW8260D	Trichlorofluoromethane	NE	NE	µg/L		ND [0.500]	ND [0.500]
SW8260D	Vinyl acetate	NE	NE	µg/L		ND [5.00]	ND [5.00]
SW8260D	Vinyl chloride	2	2	µg/L		ND [0.0750]	ND [0.0750]
SW8260D	Xylenes (total)	NE	10,000	µg/L		ND [1.50]	ND [1.50]
SW8270D	1,2,4-Trichlorobenzene	NE	70	µg/L		ND [5.05]	--
SW8270D	1,2-Dichlorobenzene	NE	600	µg/L		ND [5.05]	--
SW8270D	1,3-Dichlorobenzene	NE	NE	µg/L		ND [5.05]	--
SW8270D	1,4-Dichlorobenzene	NE	75	µg/L		ND [5.05]	--
SW8270D	1-Chloronaphthalene	NE	NE	µg/L		ND [5.05]	--
SW8270D	1-Methylnaphthalene	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,4,5-Trichlorophenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,4,6-Trichlorophenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,4-Dichlorophenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,4-Dimethylphenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,4-Dinitrophenol	NE	NE	µg/L		ND [50.5]	--
SW8270D	2,4-Dinitrotoluene	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,6-Dichlorophenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	2,6-Dinitrotoluene	NE	0.49	µg/L		ND [5.05]	--
SW8270D	2-Chloronaphthalene	NE	750	µg/L		ND [5.05]	--
SW8270D	2-Chlorophenol	NE	91	µg/L		ND [5.05]	--
SW8270D	2-Methylnaphthalene	NE	36	µg/L		ND [5.05]	--
SW8270D	2-Methylphenol	NE	930	µg/L		ND [5.05]	--
SW8270D	2-Nitroaniline	NE	NE	µg/L		ND [5.05]	--
SW8270D	2-Nitrophenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	3,3'-Dichlorobenzidine	NE	1.3	µg/L		ND [5.05]	--
SW8270D	3-Methylphenol/4-Methylphenol Coelution	NE	NE	µg/L		ND [10.1]	--
SW8270D	3-Nitroaniline	NE	NE	µg/L		ND [5.05]	--
SW8270D	4,6-Dinitro-2-methylphenol	NE	NE	µg/L		ND [50.5]	--
SW8270D	4-Bromophenyl phenyl ether	NE	NE	µg/L		ND [5.05]	--
SW8270D	4-Chloro-3-methylphenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	4-Chloroaniline	NE	NE	µg/L		ND [5.05]	--
SW8270D	4-Chlorophenyl phenyl ether	NE	NE	µg/L		ND [5.05]	--
SW8270D	4-Nitroaniline	NE	NE	µg/L		ND [5.05]	--
SW8270D	4-Nitrophenol	NE	NE	µg/L		ND [25.3]	--
SW8270D	Acenaphthene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Acenaphthylene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Aniline	NE	NE	µg/L		ND [25.3]	--
SW8270D	Anthracene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Azobenzene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Benzo(a)anthracene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Benzo(a)pyrene	NE	0.2	µg/L		ND [5.05]	--
SW8270D	Benzo(b)fluoranthene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Benzo(g,h,i)perylene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Benzo(k)fluoranthene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Benzoic acid	NE	NE	µg/L		ND [25.3]	--
SW8270D	Benzyl alcohol	NE	NE	µg/L		ND [5.05]	--
SW8270D	Bis(2-chlorethoxy)methane	NE	NE	µg/L		ND [5.05]	--
SW8270D	Bis(2-chloroethyl)ether	NE	NE	µg/L		ND [5.05]	--
SW8270D	Bis(2-chloroisopropyl)ether	NE	NE	µg/L		ND [5.05]	--

TABLE A-4 GROUNDWATER SAMPLE RESULTS
OU2, DRMO Yard Water Supply Well - Fort Wainwright, Alaska

					Sample ID	20FWOU212WG	20FWOU2TB01WQ
					Location	WSW	Trip Blank
					Lab ID	1204304014	1204304016
					Collection Date	8/14/2020 3:30 PM	8/13/2020 8:00 AM
					Matrix	Groundwater	Groundwater
					QC Type	Primary	Trip Blank
Method	**Analyte**	**ROD RG[1]**	**EPA MCL[2,3]**	**Units**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
SW8270D	Bis(2-ethylhexyl)phthalate	NE	6	µg/L		ND [5.05]	--
SW8270D	Butyl benzyl phthalate	NE	NE	µg/L		ND [5.05]	--
SW8270D	Carbazole	NE	NE	µg/L		ND [5.05]	--
SW8270D	Chrysene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Dibenzo(a,h)anthracene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Dibenzofuran	NE	NE	µg/L		ND [2.52]	--
SW8270D	Diethyl phthalate	NE	NE	µg/L		ND [5.05]	--
SW8270D	Dimethyl phthalate	NE	NE	µg/L		ND [5.05]	--
SW8270D	Di-n-butyl phthalate	NE	NE	µg/L		ND [5.05]	--
SW8270D	Di-n-octyl phthalate	NE	NE	µg/L		ND [5.05]	--
SW8270D	Fluoranthene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Fluorene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Hexachlorobenzene	NE	1	µg/L		ND [5.05]	--
SW8270D	Hexachlorobutadiene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Hexachlorocyclopentadiene	NE	50	µg/L		ND [15.2]	--
SW8270D	Hexachloroethane	NE	NE	µg/L		ND [5.05]	--
SW8270D	Indeno(1,2,3-cd)pyrene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Isophorone	NE	NE	µg/L		ND [5.05]	--
SW8270D	Naphthalene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Nitrobenzene	NE	NE	µg/L		ND [5.05]	--
SW8270D	N-Nitrosodimethylamine	NE	NE	µg/L		ND [5.05]	--
SW8270D	N-Nitrosodi-n-propylamine	NE	NE	µg/L		ND [5.05]	--
SW8270D	N-Nitrosodiphenylamine	NE	NE	µg/L		ND [5.05]	--
SW8270D	Pentachlorophenol	NE	1	µg/L		ND [25.3]	--
SW8270D	Phenanthrene	NE	NE	µg/L		ND [5.05]	--
SW8270D	Phenol	NE	NE	µg/L		ND [5.05]	--
SW8270D	Pyrene	NE	NE	µg/L		ND [5.05]	--

Notes:

[1] **OU2 ROD analytes are identified in blue text.** The ROD analytes are compared against the OU2 ROD RGs. All LODs for ND results were below the ROD RGs.

[2] Non-ROD analytes are compared to EPA MCLs (EPA 2009), except for bulk fuels (see Note 3).

[3] Bulk fuel (DRO) results are compared against the ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC 2020).

Gray shaded results are ND with LODs that exceed EPA MCLs.

ADEC - Alaska Department of Environmental Conservation
B - the result is biased high due to contamination present in a blank sample.
CUL - cleanup level
EPA - U.S. Environmental Protection Agency
FD - field duplicate
J/J-/J+ – the result is an estimated value based on an QAQC issue and/or is less than the LOQ. Where possible, direction of bias is indicated.
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
MCL - maximum cleanup level
ND - not detected
NE - not established
OU2 - Operable Unit 2
QA - quality assurance
QC - quality control
RG - remedial goal
ROD - Record of Decision

This page intentionally blank

APPENDIX B
CDQR AND ADEC LABORATORY DATA REVIEW CHECKLIST

This page intentionally blank

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS ..... B-III
1.0 INTRODUCTION B-1
2.0 DATA VERIFICATION, DATA QUALITY REVIEW, AND QUALIFICATION B-1
3.0 CHEMICAL DATA QUALITY REVIEW B-3

3.1 Analytical Samples and Field Quality Control B-4
3.2 Sample Collection B-4
3.3 Sample Handling and Chain-of-Custody B-5
3.4 Sample Preservation and Holding Time Compliance B-5
3.5 Sample Limits of Detection and Limits of Quantitation B-5
3.6 Blanks B-5
3.6.1 Method Blanks B-6
3.6.2 Trip Blanks B-6
3.6.3 Equipment Blanks B-6
3.7 Laboratory Control Samples B-6
3.8 Matrix Spike Samples and Duplicates B-6
3.9 Surrogates B-7
3.10 Field Duplicates B-7
3.11 Additional Quality Control Discrepancies B-7

4.0 COMPLETENESS B-7
5.0 OVERALL DATA QUALITY ASSESSMENT B-8
6.0 REFERENCES B-9

TABLES

Table B-1 Data Qualifiers B-3
Table B-2 Qualified Results Summary B-8

ATTACHMENTS

Attachment B-1 ADEC Laboratory Data Review Checklist

This page intentionally blank

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%	percent
%R	percent recovery
µg/L	micrograms per liter
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Brice	Brice Engineering, LLC
CCV	continuing calibration verification
CDQR	Chemical Data Quality Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain-of-custody
CUL	cleanup level
DL	detection limit
DoD	U.S. Department of Defense
DQO	data quality objective
DRMO	Defense Reutilization Marketing Office
DRO	diesel range organics
EB	equipment blank
EPA	U.S. Environmental Protection Agency
FD	field duplicate
GRO	gasoline range organics
ICV	initial calibration verification
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
MB	method blank
MPC	measurement performance criteria
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
OU2	Operable Unit 2
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RF	response factors
RG	remedial goal(s)

ACRONYMS AND ABBREVIATIONS (CONTINUED)

ROD	Record of Decision
RPD	relative percent difference
RSD	relative standard deviation
SDG	sample delivery group
SGS	SGS Environmental Services, Inc.
SOP	standard operating procedure
SVOC	semi-volatile organic compound
TB	trip blank
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
VOC	volatile organic compound

1.0 INTRODUCTION

This Chemical Data Quality Report (CDQR) summarizes the quality assurance (QA)/quality control (QC) evaluation of laboratory data collected during groundwater sampling activities at Operable Unit 2 (OU2) Defense Reutilization Marketing Office (DRMO) Yard Three-Party Sites, located at Fort Wainwright, Alaska during August 2020. These data have been reviewed to evaluate compliance with QA/QC criteria based on data quality objectives specified in the approved *Final 2020 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites Work Plan*, hereafter referred to as the Work Plan (Brice Engineering, LLC [Brice 2020a]), and *Final Postwide Uniform Federal Policy for Quality Assurance Project Plan* (UFP-QAPP), hereafter referred to as the QAPP (Brice 2020b).

The associated Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklist is included as Attachment B-1. A sample summary and complete analytical results presented in crosstab format are presented in Appendix A to the Monitoring Report.

2.0 DATA VERIFICATION, DATA QUALITY REVIEW, AND QUALIFICATION

SGS Environmental Services, Inc. (SGS) of Anchorage, Alaska was the primary laboratory for this project. SGS holds current ADEC laboratory approval and U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program certifications for all requested analyses, and chemical analyses for all parameters were performed in accordance with the DoD *Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3* (DoD 2019a). Samples were prepared and analyzed in accordance with analytical methods specified in *Test Methods for Evaluating Solid Waste SW-846* (U.S. Environmental Protection Agency [EPA] 2015); *Underground Storage Tanks Procedures Manual* (ADEC 2017); and laboratory standard operating procedures (SOPs).

The data quality review and assessment were performed by an experienced QA chemist independent of the analytical laboratory. This evaluation included completion of the ADEC Laboratory Data Review Checklist and review of analytical data including QC sample results, field and laboratory documentation, and all data submittals for each sample delivery group (SDG). Groundwater analytical results for OU2 Record of Decision (ROD) analytes were compared to the ROD remedial goals (RGs) throughout this review and in the results tables (Appendix A). In addition, diesel range organics (DRO) results were compared to the ADEC 18 Alaska Administrative Code (AAC) 75 Table C value (ADEC 2020). The ADEC Table C values for all other analytes are also shown in the results tables for informational purposes.

All project data were reviewed on an analytical-batch basis by assessing QC samples and associated field sample results. Data quality review and usability assessment was performed using the QC criteria defined in the *QSM 5.3* (DoD 2019a); the *General Data Validation Guidelines* (DoD 2019b)*; Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data* (ADEC 2019a); and specific method guidance, such as the ADEC *Underground Storage Tanks Procedures Manual* (ADEC 2017), Test Methods for Evaluating Solid Waste SW-846 (EPA 2015), and the laboratory SOPs, in that order.

The following data quality indicators were used for this data quality review and assessment:

- *Precision* is a measure of the reproducibility of measurements and can be used to verify laboratory procedures, determine matrix effect, or sample homogeneity. Precision was

measured by the relative percent difference (RPD) between laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike (MS) and matrix spike duplicates (MSD), or primary and field duplicate (FD) results.

- *Accuracy* is a measure of the correctness, or closeness to the true value. Accuracy was measured by the percent recovery (%R) of calibrations, surrogates, LCS, LCSD, MS, MSD, method blanks, relative response factors (RFs) and relative standard deviations (RSD), second column confirmations, and internal standards.
- *Representativeness* is a measure of the degree to which the samples reflect the site characteristics. Representativeness was measured by reviewing sampling design, sampling procedures, sample documentation, holding times and preservations.
- *Completeness* is a measure of the amount of valid data obtained compared to the amount that was expected to be obtained under correct, normal conditions. For completeness requirements, valid results were all results not rejected and determined to be usable in the context of the data quality objectives (DQOs). Completeness was evaluated for each analytical method for a particular sampling event with respect to each DQO or end data use. The completeness goal is 90 percent (%) for this project.
- *Comparability* is a measure of the confidence with which one data set can be compared to another. The following were reviewed to ensure comparability: use of standard methods for sampling and analysis, reporting in standard units, operating instruments within calibrated ranges, using standard and comprehensive reporting formats.
- *Sensitivity* is a measure of the ability of a method or instrument to detect the target analyte at the level of interest. The laboratory-specific limits were evaluated against the ROD RGs to determine whether the analytical methods and/or laboratory procedures were able to meet the project DQOs.

The following information was reviewed as part of the data quality review and assessment:

- Sample handling and chain-of-custody (CoC)
- Sample preservation and holding time compliance
- Field QC samples including trip blanks, equipment blanks, and field duplicates
- Laboratory reporting limits, including limits of detection (LOD) and limits of quantitation (LOQ)
- Method blanks
- LCS and LCSD recoveries
- Surrogate spike recoveries
- MS and MSD recoveries
- Initial and continuing calibration summary information
- Internal standards performance (gas chromatography-mass spectrometry)
- Precision, including RPD values for duplicate analyses
- Case narrative review, laboratory flagging review, and other analytical method-specific criteria.

The data quality review and assessment identified results requiring qualification and potential effects on data usability based on the measurement performance criteria outlined in the QAPP (Brice 2020b). The following qualifiers in Table B-1 were applied to the analytical data set, as appropriate.

Table B-1 Data Qualifiers

QUALIFIER	DESCRIPTION
ND [LOD]	Analyte is not detected above the DL [LOD is presented in brackets].
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 low-bias due to a QC deviation.
J+	The analyte is considered an estimated value with a high-bias due to a QC deviation.
B	The analyte is detected in an associated blank. Result is less than 10x the concentration. Therefore, the result may be high-biased.
R	Analyte result is rejected – result is not usable. Note that "R" replaces the chemical result (no result shall be reported with an "R" flag).

Notes:
For definitions, see the Acronyms and Abbreviations section.

Qualification was not required in the following circumstances:

- Surrogate or MS recoveries outside QC limits, and dilution of the sample resulted in surrogate or spike dilution to a level beyond quantitation.
- MS recoveries were outside QC limits, and the spiked concentration was less than that of the parent sample.
- An analyte was detected in the associated blank, but there was no detection in the associated sample.
- MS/MSD or LCS/LCSD recoveries exceeded upper control limits, and there was no detection in the sample(s).

Data were considered for rejection on the following grounds:

- Initial calibration (per compound) criteria not met
- Continuing calibration (per compound) not verified
- All non-detects with the continuing calibration recovery less than control limits
- All non-detects with the LCS recovery less than control limits
- Any compound with LCS recovery less than 10%
- Missed holding times greater than two times the method-specified holding time
- Surrogate recovery of less than 10% and a dilution factor of 5 or less

Data quality exceptions that do not result in qualifications are discussed in the associated ADEC Laboratory Data Review Checklist (Attachment B-1).

3.0 CHEMICAL DATA QUALITY REVIEW

The data verification and CDQR were performed to assess the overall quality and usability of the data collected to support sampling activities at OU2.

Complete details for the review and evaluation of field samples and associated QC samples are included in this CDQR and in the ADEC Laboratory Data Review Checklist (Attachment B-1). During the data quality review, analytical results or recoveries that fell outside acceptance criteria were identified and qualifiers

were applied to the results, where appropriate, in accordance with the project Work Plan (Brice 2020a). Qualified results are considered estimated, and whenever possible, direction of potential bias was assigned and effects on usability are discussed.

The following sections describe the results of the review and assessment of data for each analytical method. QC parameters met DoD QSM v5.3 except were noted. A complete summary of qualified results are presented in Table B-2, located at the end of this report.

3.1 Analytical Samples and Field Quality Control

A total of 11 primary groundwater samples, 1 field duplicate groundwater sample, and 1 equipment blank were collected and analyzed in support of field and sampling activities at OU2. The sample summary table in Appendix A includes all field samples submitted to the analytical laboratories.

The overall project-required frequency of one field duplicate for every 10 or fewer primary samples, per analyte, per matrix, was met. Note that the sample collected from the water supply well (WSW) is excluded from the calculation of the field duplicate collection frequency since this well is excluded from field QC criteria requirements, per the approved Work Plan (Brice 2020b). The WSW is also sampled by a different entity under the Drinking Water Program, during which all QC criteria (including field duplicates and MS/MSD samples) are met. The WSW sample results obtained from this sampling event are provided as supplemental data only. MS/MSDs were collected and submitted to the laboratory at the project-required frequency of one set for every analytical method (with the exception of gasoline range organics [GRO] and semi-volatile organic compounds (SVOC) at the WSW, as further discussed in Section 3.8) and every 20 or fewer project samples (5%); designated MS/MSD samples were included with the shipment. An equipment blank was collected and submitted to the laboratory at the project required frequency of 5%. Trip blanks were included in the cooler containing samples for volatile analyses (AK101, SW8260D).

3.2 Sample Collection

All monitoring wells were purged and sampled with reusable submersible pumps, with the exception of the WSW. The WSW was sampled with a dedicated high-flow, non-variable speed submersible pump from a hosebib from within the water supply building. 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 2019b) and the Work Plan (Brice 2020a), that low-flow sampling criteria was employed (EPA 1996), and that all groundwater levels were within the screened intervals at the time of sampling, as appropriate.

All samples were collected as presented in the Work Plan, all monitoring wells met stabilization criteria prior to sample collection, and all water levels were within the screened interval at the time of sampling, with the exceptions noted below. Also below is a summary of other notable observations discovered during groundwater sampling activities and/or review of the groundwater sample forms.

- The WSW was sampled at a raw water tap located upstream of the building water treatment system after purging the well for approximately 30 minutes, per standard protocol. The well was purged for 30 minutes to obtain a representative sample of the aquifer. 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.

- No free product was measured and sheen was not observed on purge water from any well. Fuel odor was noted on purge water from well AP-8916.
- Water levels were within the screened intervals of all wells at the time of sampling, except for wells AP-7559 and AP-7560. The water levels were approximately 0.5 and 1.5 feet above the screened interval, respectively. Elevated water levels were observed across Fort Wainwright in summer/fall 2020 due to frequent precipitation events.

3.3 Sample Handling and Chain-of-Custody

CoC forms and laboratory case narratives were reviewed to assess sample handling procedures that may affect the integrity of the samples and quality of the resulting data. Copies of CoCs and cooler receipt forms were included in the final laboratory report. Groundwater samples were required to be maintained at 0 to 6 degrees Celsius (°C) following collection, during storage, and upon receipt at the laboratory.

Samples were packed with frozen gel packs in accordance with the Work Plan and the packaging and shipping SOP, *BE-SOP-03 Labeling, Packaging, and Shipping Samples* (Brice 2020a). Groundwater samples were hand-delivered to SGS in Fairbanks, Alaska for transfer to their Anchorage laboratory via Lynden Transport. Groundwater samples received at SGS were included in one SDG, 1204304. All sample coolers were received with temperature blank and ambient cooler temperatures between 0 and 6°C.

No discrepancies were noted upon receipt of samples at the laboratory.

3.4 Sample Preservation and Holding Time Compliance

All field samples were initially extracted and/or analyzed within the recommended holding times and were properly preserved for the analytical procedures utilized for this project. However, the trip blank associated with SDG 1204304 was noted to have a pH greater than the recommended limit of 2. The trip blank is used as an indicator of potential cross-contamination during transport and storage. It is unlikely that the reported pH failure impacts data quality. Data usability is not affected.

3.5 Sample Limits of Detection and Limits of Quantitation

To determine whether the laboratory data met measurement performance criteria (MPC) for sensitivity, sample LODs for non-detects were compared to ROD RGs, and the LODs for non-detect non-ROD analytes were compared to the EPA maximum contaminant levels (MCLs), with the exception of bulk fuels. Bulk fuels (GRO and DRO) results were compared to 18 AAC 75 Table C values. All ROD analytes and DRO had LODs for non-detect results that met the MPC for sensitivity. Non-ROD analytes that did not meet the MPC for sensitivity are discussed in the ADEC Laboratory Data Review Checklist and are identified in gray shading in Tables A-2 through A-4 (Appendix A).

3.6 Blanks

Method blanks, trip blanks, and equipment blanks were reviewed to detect potential cross-contamination. Method blank detections are indicative of laboratory cross-contamination, trip blanks measure shipment and storage cross-contamination, and equipment blanks were reviewed to assess potential cross-contamination between wells where non-dedicated pumps are used.

3.6.1 Method Blanks

A method blank was included with each analytical batch of 20 or fewer samples, as required. The following analyte was detected above the detection limit (DL) in a method blank and had associated project sample detections less than ten times the blank amount:

- AK102 analyte DRO was detected in the method blank for batch XXX43729. The associated sample result for 20FWOU212WG was qualified "B" for potential high bias. The affected result was below the ADEC cleanup level (CUL), so data usability was not affected.

Method blank detections with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklists in Attachment B-1.

3.6.2 Trip Blanks

A trip blank was included in the with cooler containing volatile samples, as required. No analytes were detected in the trip blanks associated with this project.

3.6.3 Equipment Blanks

All OU2 wells were sampled with reusable submersible pumps (except the WSW; see Section 3.2) and an equipment blank was collected at the required project frequency of 5%. The following analyte was detected above the DL in the equipment blank and had associated project sample detections less than ten times the blank amount:

- SW8260D analyte chloromethane was detected in the equipment blank at a concentration greater than the DL but less than the LOQ. Associated sample results in project samples 20FWOU203WG, 20FWOU204WG, 20FWOU206WG, and 20FWOU207WG were qualified "B" for potential high bias. This analyte does not have a ROD RG, but all affected results are significantly below the ADEC CUL, so data usability is not affected.

Equipment blank detections with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklist in Attachment B-1.

3.7 Laboratory Control Samples

An LCS or LCS/LCSD was included with each analytical batch, as required. LCS and LCSD percent recovery (%R) and LCS/LCSD RPD were compared to project MPCs. No LCS or LCSD failures resulted in data qualification. LCS/LCSD failures with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklist in Attachment B-1.

3.8 Matrix Spike Samples and Duplicates

An MS/MSD was included with each analytical batch, with the following two exceptions: AK101 batch VXX36170 and SVOC batch XXX43697. The sample collected from the WSW was the only project sample submitted for these analyses, and the WSW samples are excluded from field QC requirements, per the approved Work Plan (see Section 3.1 for further discussion).

MS and MSD %R and MS/MSD RPD were compared to project MPCs. No MS/MSD failures required data qualification. All other MS/MSD failures with no related sample detections that required qualification are discussed in the ADEC Laboratory Data Review Checklist in Attachment B-1.

3.9 Surrogates

Surrogates were included with all laboratory QC and field samples for organic analyses, as required. Surrogate %R were reviewed and compared to method control limits. There were no surrogate failures that required data qualification.

Surrogate recovery failures that did not require qualification of associated project samples are discussed in the ADEC Laboratory Data Review Checklist in Attachment B-1.

3.10 Field Duplicates

Field duplicate precision was evaluated by calculating the RPD between the parent sample result and the field duplicate result when both results were above the LOQ. Acceptance criteria were less than 30% for water results.

One field duplicate sample was submitted for ten applicable groundwater locations included in the OU2 monitoring event. The field duplicate pair was analyzed for AK102, SW8260D, SW6020B, and E300.0.

Of 70 duplicate results, 60 pairs had both duplicate results as non-detect. Five pairs had both results less than the LOQ, so RPD could not be calculated. The remaining five pairs of duplicate results had both results greater than the LOQ and RPD was calculated. The RPD for all pairs was less than the recommended 30% for waters.

3.11 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. There were no additional discrepancies that impacted data quality. Any discrepancies that did not require qualification are discussed in the ADEC Laboratory Data Review Checklist in Attachment B-1.

4.0 COMPLETENESS

Completeness is a measure of the amount of valid data obtained compared with the amount that was expected to be obtained under correct, normal conditions. For completeness requirements, valid results are all results not rejected and determined to be usable in the context of project DQOs.

Completeness was evaluated using the formula below. The goal for completeness was 90% for all methods and matrices.

$$\%\ Completeness = 100\ x\ (\frac{V}{n})$$

Where: V = number of measurements judged valid

n = total number of measurements

No results were rejected, and all results were considered usable. The completeness goal of 90% for all methods and matrices was met.

5.0 OVERALL DATA QUALITY ASSESSMENT

In general, the overall quality of the project data was acceptable, and completeness goals were met. Two QC issues required qualification of project data; however, there was little impact to the usability of project data. The following QC issues required qualification:

- Detections in method blanks and equipment blanks. Affected results were all significantly below the ROD RGs or ADEC CULs. Data usability was not affected.

Qualified data are considered acceptable for use, with the limitations discussed within this QA/QC report and the ADEC Laboratory Data Review Checklist regarding the qualifiers applied to the results.

Table B-2 includes all qualified results and reasons for qualification.

Table B-2 Qualified Results Summary

LOCATION ID	SAMPLE ID	METHOD	ANALYTE	RESULT (µg/L)	QUAL	REASON FOR QUALIFICATION
SDG 1204304						
AP-1010	20FWOU203WG	SW8260D	Chloromethane	0.387 [0.500]	J,B	EB
AP-8914R	20FWOU204WG			0.426 [0.500]	J,B	
AP-10016R	20FWOU206WG			0.355 [0.500]	J,B	
AP-10017R	20FWOU207WG			0.673 [0.500]	J,B	
WSW	20FWOU212WG	AK102	DRO	297 [278]	J,B	MB

Notes:
For definitions, refer to Acronyms and Abbreviations section.
LOD is shown in brackets [ ].
B – the result is potentially biased high due to contamination present in the method blank or trip blank.
J – the result is an estimated value greater than or equal to the DL and below the LOQ.

6.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2017. *Underground Storage Tanks Procedures Manual, Guidance for Treatment of Petroleum-Contaminated Soil and Standard Sampling Procedures*. March.

ADEC. 2019a. *Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data*. October.

ADEC. 2019b. *Field Sampling Guidance.* October.

ADEC. 2020. *18 Alaska Administrative Code (AAC) 75, Oil and Other Hazardous Substances Pollution Control.* November.

Brice. 2020a. *Final 2020 CERCLA Site Work Plan Operable Units 1 through 6 – Fort Wainwright, Alaska*. July.

Brice Engineering, LLC (Brice). 2020b. *Final Postwide Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP) Various Sites – Fort Wainwright, Alaska*. June.

U.S. Department of Defense (DoD). 2019a. *Quality Systems Manual for Environmental Laboratories, Version 5.3*. January.

DoD. 2019b. *General Data Validation Guidelines.* November.

U.S. Environmental Protection Agency (EPA). 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.* EPA/540/S-95/504. R.W. Puls and M.J. Barcelona (authors). April.

EPA. 2015. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Third Edition, Final Updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), and V (2015).*

This page intentionally blank

ATTACHMENT B-1

ADEC Laboratory Data Review Checklist

This page intentionally blank

Laboratory Data Review Checklist

Completed By:

Jillian Janssen

Title:

Chemist

Date:

October 31, 2020

Consultant Firm:

Brice Engineering

Laboratory Name:

SGS Environmental Services of Anchorage, AK

Laboratory Report Number:

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

ADEC File Number:

108.38.069.01

Hazard Identification Number:

1122

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

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

   Yes☒ No☐ N/A☐ Comments:

Samples were received and analyzed by SGS of Anchorage, AK. CS Approval 17-021

   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☐ N/A☒ Comments:

All analyses performed at SGS.

2. Chain of Custody (CoC)

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

   Yes☒ No☐ N/A☐ Comments:

   b. Correct analyses requested?

   Yes☒ No☐ N/A☐ Comments:

3. Laboratory Sample Receipt Documentation

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

   Yes☒ No☐ N/A☐ Comments:

Cooler 081701 was received at a temp of 1.9° C

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

   Yes☒ No☐ N/A☐ Comments:

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

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

Yes☒ No☐ N/A☐ 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☐ N/A☒ Comments:

No discrepancies were noted.

e. Data quality or usability affected?

Comments:

N/A – no discrepancies

4. Case Narrative

a. Present and understandable?

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

The case narrative noted the following failures:

- Low Level QC (LLQC) recovery for arsenic, chromium, mercury, and zinc did not meet acceptance criteria in multiple metals batches.
- Several MS/MSD failures were noted for the MS/MSD performed for project sample 20FWOU202WG.
- Surrogate failure for AK102/AK103 surrogates 5a-androstane and n-triacontane were noted in the LCSD for batch XXX4372.
- The pH of the trip blank, 20FWOU2TB01WQ, was documented as being greater than 2.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

c. Were all corrective actions documented?

Yes☐ No☐ N/A☒ Comments:

Corrective action was not deemed necessary in either failure:

- LLQC failure: all associated sample concentrations were less than the LOQ or ten times greater than the LLQC.
- MS/MSD failures did not require corrective action because laboratory QC samples (LCS) met acceptance criteria
- The LCSD surrogate failures did not require corrective action because field sample surrogates met recovery criteria.

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

Comments:

- Project samples were not affected by the LLQC issues as arsenic, chromium, mercury, and zinc were not reported with this SDG.
- Effect of MS/MSD failures are discussed in section 6.C. below
- Effect of the LCSD surrogate recovery failures are discussed in section 6.D. below
- The trip blank is used as an indicator of potential cross-contamination during transport and storage. It is unlikely that the reported pH failure impacts data quality. Data usability is not affected.

5. Samples Results

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

Yes☒ No☐ N/A☐ Comments:

b. All applicable holding times met?

Yes☒ No☐ N/A☐ Comments:

c. All soils reported on a dry weight basis?

Yes☐ No☐ N/A☒ Comments:

No soil samples included with this SDG.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

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

Yes☒ No☐ N/A☐ Comments:

ROD analytes: LODs for non-detects were compared to ROD RGs. Laboratory data met MPC for sensitivity for all ROD analytes.

Non-ROD analytes: LODs for non-detects were compared to EPA MCLs, with the exception of bulk fuels (GRO and DRO). Bulk fuels were compared to were compared to the 18 AAC 75 Table C values. The analytes that did not met the MPC for sensitivity are discussed below.

e. Data quality or usability affected?

8260D analyte 1,2-dibromo-3-chloropropane did not meet the MPC for sensitivity for all samples. 8270D analytes 2,6-dinitrotoluene, 3,3-dichlorobenzidine, benzo(a)pyrene, hexachlorobenzene, and pentachlorophenol did not meet the MPC for sensitivity for the WSW (the only well sampled for SVOCs). Impact to the project is negligible as none of these analytes are site COCs.

6. QC Samples

a. Method Blank

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

Yes☒ No☐ N/A☐ Comments:

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes☐ No☒ N/A☐ Comments:

AK102 analyte DRO was detected in the MB (0.0706 mg/L) for batch XXX43729 at a concentration less than the LOQ (0.150 mg/L).

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

DRO was detected in project sample 20FWOU212WG (WSW) at a concentration less than ten times the MB amount.

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

Yes☒ No☐ N/A☐ Comments:

20FWOU212WG was qualified “B” for potential high bias.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

v. Data quality or usability affected?

Comments:

The affected result is significantly below the CUL, so data usability was not affected.

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☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

EPA 300.0 analytical batch WXX13421 did not include a lab duplicate but is not required by the method.

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Comments:

N/A – all %R and RPD met acceptance criteria.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

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

Yes☐ No☐ N/A☒ Comments:

N/A – all %R and RPD met acceptance criteria.

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

Comments:

N/A – all %R and RPD met acceptance criteria.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes☐ No☒ N/A☐ Comments:

All analytical batches had a project-specific MS/MSD except AK101 batch VXX36170 and SVOC batch XXX43697. The GRO batch included an LCS/LCSD. The SVOC batch included MS/MSD samples from another client's sample. The lack of project-specific MS/MSD samples in these batches does not impact the project. GRO and SVOC analyses were only performed on the WSW sample. The WSW is also sampled by a different entity under the Drink Water Program, during which all QC criteria (including MS/MSD samples) are met. The sample results from this sampling event are used as supplemental data and the collection of QC samples is not required, as detailed in the approved Work Plan.

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable?

Yes☐ No☒ N/A☐ Comments:

Naphthalene recovered above the UCL (128%) in the MS (148%) and MSD (147%) performed for project sample 20FWOU202WG in SW8260D batch VXX36161. The LCS met recovery criteria so this failure is likely due to matrix interference.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate.

Yes☐ No☒ N/A☐ Comments:

Trichlorofluoromethane RPD (21%) slightly exceeded the acceptance limit of 20% in the MS/MSD performed for project sample 20FWOU202WG in SW8260D batch VXX36161.

2,4-Dinitrophenol and 3,3'-Dichlorobenzidine RPDs exceeded the acceptance criteria of 20% in the MS/MSD performed for a non-project sample in SW8270D batch XXX43697.

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

Comments:

Naphthalene and trichlorofluoromethane were not detected in the parent sample, 20FWOU202WG. As these failures indicate a potential high bias and non-detect results are not affected by high bias, data qualification was not required.

Project samples are not affected by the QC failures noted in the MS/MSD performed for a non-project sample.

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

Yes☐ No☐ N/A☒ Comments:

Data qualification was not required.

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

Comments:

No impact to data quality or usability.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

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

Yes☒ No☐ N/A☐ Comments:

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R for field samples and 60-120 %R for QC samples; all other analyses see the laboratory report pages)

Yes☐ No☒ N/A☐ Comments:

AK102 surrogate 5a-Androstane recovered above the UCL in the LCSD for batch XXX43729.

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

Yes☐ No☒ N/A☐ Comments:

Surrogate recovery met acceptance criteria in all project samples, so data qualification was not required.

iv. Data quality or usability affected?

Comments:

Data quality and usability were not affected.

e. Trip Blanks

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

Yes☒ No☐ N/A☐ 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☐ N/A☐ Comments:

All volatile samples and the trip blank were received in cooler 081701

iii. All results less than LOQ and project specified objectives?

Yes☒ No☐ N/A☐ Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

N/A – no target analytes were detected in the TB.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

v. Data quality or usability affected?

Comments:

N/A – no target analytes were detected in the TB.

f. Field Duplicate

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

Yes☒ No☐ N/A☐ Comments:

One field duplicate, 20FWOU203WG, was submitted for ten primary field samples (excluding the WSW sample, 20FWOU212WG, per the approved Work Plan).

ii. Submitted blind to lab?

Yes☒ No☐ N/A☐ Comments:

iii. Precision – All relative percent differences (RPD) less than specified project objectives? (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☐ N/A☐ Comments:

Field duplicate pair 20FWOU202WG/20FWOU203WG were submitted and analyzed for sulfate (EPA 300.0), dissolved iron (SW6020B), DRO (AK102), and VOC (SW8260D). Of 70 duplicate results, 60 pairs had both duplicate results as non-detect. Five pairs had both results less than the LOQ, so RPD could not be calculated. The remaining 5 pairs had both results greater than the LOQ and RPD was calculated. The RPD for all pairs was less than the recommended 30% for waters.

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

Comments:

No impact to data quality or usability.

1204304

Laboratory Report Date:

November 3, 2020

CS Site Name:

Fort Wainwright (OU-2) FTWW 047 DRMO

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

Yes☒ No☐ N/A☐ Comments:

One equipment blank (EB) sample, 20FWOU2EB01WQ, was collected to evaluate the decontamination process of the submersible pumps. All samples were collected with a reusable submersible pump except for the WSW sample 20FWOU212WG. The WSW was sampled with a dedicated high-flow, non-variable speed submersible pump.

i. All results less than LOQ and project specified objectives?

Yes☐ No☒ N/A☐ Comments:

The following analytes were detected at concentrations greater than the DL but less than the LOQ in the EB: Sulfate (0.05 mg/L) and chloromethane (0.394 µg/L).

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

- Sulfate: all project samples had detections greater than ten times the amount in the EB, so were not affected.
- Chloromethane: 20FWOU203WG, 20FWOU204WG, 20FWOU206WG, and 20FWOU207WG had detections less than ten times the amount detected in the EB and were qualified "B" for potential high bias.

iii. Data quality or usability affected?

Comments:

Results are usable as qualified – sample results are significantly below the CULs, so data usability is not affected.

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

a. Defined and appropriate?

Yes☐ No☐ N/A☒ Comments:

This page intentionally blank

APPENDIX C
FIELD FORMS AND NOTES

This page intentionally blank

TABLE C-1 2020 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)
DRMO4 (THREE-PARTY)														
AP-10445MW	20FWOU210WG	8/14/2020	1050	Submersible	11.83	Y	0.00	10.03	0.911	0.48	5.78	176.5	7.11	Y
AP-10446MW	20FWOU211WG	8/14/2020	1200	Submersible	11.07	Y	0.00	6.38	0.496	0.50	5.75	97.3	6.22	Y
AP-8916	20FWOU209WG	8/14/2020	1425	Submersible	10.25	Y	0.00	7.30	0.631	0.53	6.07	50.2	3.02	Y
DRMO1 (THREE-PARTY)														
AP-8914R	20FWOU204WG	8/14/2020	910	Submersible	9.82	Y	0.00	8.20	0.373	1.56	5.79	136.1	4.10	Y
AP-7559	20FWOU201WG	8/13/2020	1340	Submersible	9.60	N	0.00	9.88	0.491	3.23	6.35	150.9	5.03	Y
AP-7560	20FWOU202WG	8/14/2020	1250	Submersible	9.13	N	0.00	9.35	0.400	0.69	5.81	111.4	0.94	Y
AP-10015R	20FWOU205WG	8/13/2020	1420	Submersible	11.85	Y	0.00	9.41	0.422	1.83	6.04	143.2	3.41	Y
AP-10016R	20FWOU206WG	8/14/2020	1015	Submersible	11.92	Y	0.00	9.36	0.416	0.86	6.09	118.7	2.24	Y
AP-10017R	20FWOU207WG	8/14/2020	1105	Submersible	11.51	Y	0.00	9.18	0.394	0.80	6.12	125.7	1.68	Y
AP-10018R	20FWOU208WG	8/14/2020	1205	Submersible	11.38	Y	0.00	8.31	0.458	0.66	6.24	113.9	1.76	Y
WATER SUPPLY WELL														
WSW	20FWOU212WG	8/14/2020	1530	Raw Water Tap	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]	NA[4]

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 2019a).

[4] Parameters were not measured as the sample was collected from a spigot inside the water supply building.

Acronyms

bgs - below ground surface
btoc - below top of casing
°C - degree Celsius
CDQR - Chemical Data Quality 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

This page intentionally blank

YSI Calibration Log

Project Name/Location: ~~OU3~~ OU2 DRMO Yard CERCLA Sites

ject Number: 551203

Equipment Make and Model(s): YSI & MPS556

Serial Number(s): 6, 7 &

Serial Num.	Date	Temp.	pH (3 pt.)		Cond. (µs/cm)		ORP (mV)		DO (100%)		Initials
			Standard	Reading	Standard	Reading	Standard	Reading	Atm. Press. (mmHg)	Reading (%)	
6	8/13	19.96	10	9.93	1.000	0.992	240	246.6	760.8	16.11	KM
			7	7.11							
			4	3.91							
6	8/14	19.73	10	10.08	1.000	0.984	240	227.3	761.4	13.35	KM
			7	7.01							
			4	4.03							
7	8/14	20.60	10	10.02	1.000	0.955	240	242.7	752.6	9.24	KM
			7	6.86							
			4	4.21							

Turbidity Meter Calibration Verification Check

Project Name/Location: OU2 DRMO Yard CERCLA Sites

Project Number: 551203

Equipment Make and Model(s): HF Scientific & MicroTPW Turbidimeter

Date	Time	Serial #: 14			Serial #: 11			Initials
		1000 NTU	10 NTU	0.02 NTU	1000 NTU	10 NTU	0.02 NTU	
8/13	0615	996.6	9.89	0.00				KM
8/14	0629	1003	10.13	0.00	1002	9.92	0.00	KM

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2
SAMPLE ID: 20FWOU2 01 WG
LOCATION ID: AP-7559
FD SAMPLE ID / LOC ID / TIME:
LABORATORY ANALYSIS (circle): (VOC) SVOC, GRO, DRO, (Dissolved Fe), (Sulfate)
CHECKED SAMPLE pH: (Y) / N
APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/13/20
TIME: 1340
SAMPLER: KM
WEATHER/TEMP: Sunny, 54°F
MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other
SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15
WELL COMPLETION (circle): (Stick-up) / Flushmount
WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)
FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):
ADDITIONAL NOTES: Oxidized Mn on outside of tubing.

TOTAL DEPTH (FT BTOC): 20.04
DEPTH TO WATER (FT BTOC): - 9.60
WATER COLUMN HEIGHT (FT): = 10.44
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.70

SCREENED INTERVAL (FT BTOC): 10-20 (Across Screen)
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ (NA)
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 11.0

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	11.42	0.477	4.07	6.52	157.2	6.84	9.61
10	1.0	10.52	0.484	3.46	6.43	154.9	5.65	9.62
15	1.5	10.58	0.488	3.36	6.39	152.9	5.21	9.62
20	2.0	9.82	0.492	3.21	6.39	150.6	6.20	9.62
25	2.5	9.88	0.491	3.23	6.35	150.9	5.03	

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT?
WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other:
SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 3.0 gal.
CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N
DISPOSAL METHOD*: POL Water / (CERCLA Waste)
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2
DATE: 8/14/20
SAMPLE ID: 20FWOU2 02 WG
TIME: 1250
LOCATION ID: AP-7560
SAMPLER: KM
FD SAMPLE ID / LOC ID / TIME: 20FWOU203WG / AP-1010 / 1305
WEATHER/TEMP: Sunny, 50°F
LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate
MS/MSD PERFORMED? Y / N
CHECKED SAMPLE pH: Y / N
APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other
SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15
WELL COMPLETION (circle): Stick-up / Flushmount
ADDITIONAL NOTES: Oxidized Fe on outside of tubing.
WELL CONDITION: Plug: Y / N Lock: Y / N Labeled: Y / N Well Damage: Y / N
FREE PRODUCT OBSERVED? Y / N IF YES, DEPTH TO PRODUCT (FT BTOC):
TOTAL DEPTH (FT BTOC): 20.70
SCREENED INTERVAL (FT BTOC): 10-20 (Above screen)
DEPTH TO WATER (FT BTOC): 9.13
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ (bs)
WATER COLUMN HEIGHT (FT): = 11.57
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 11.0
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.89
* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	10.86	0.303	0.92	6.21	107.9	6.52	9.17
10	1.0	9.27	0.373	0.80	5.95	112.9	3.34	9.17
15	1.5	9.14	0.389	0.69	5.82	116.3	1.66	9.17
20	2.0	9.10	0.395	0.67	5.80	114.8	1.10	9.17
25	2.5	9.35	0.400	0.69	5.81	111.4	0.94	9.17

DID PARAMETERS STABILIZE? Y / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? Y / N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? Y / N IF NO, WHY NOT?
WATER COLOR: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
SHEEN: Y / N ODOR: Y / N

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 3.0 gal.
CONTAINERIZED AND DISPOSED OF AS IDW? Y / N
DISPOSAL METHOD*: POL Water / ~~CERCLA Waste~~
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2 — DATE: 8/14/20

SAMPLE ID: 20FWOU2 C4 WG — TIME: 0910

LOCATION ID: AP-3914R — SAMPLER: KM

FD SAMPLE ID / LOC ID / TIME: — WEATHER/TEMP: Sunny, 45°F

LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate — MS/MSD PERFORMED? (Y) / N

CHECKED SAMPLE pH: (Y) / N — APPROXIMATE VOLUME ADDED (mL): HCl = 0 — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other — SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 — Turbidity Meter #: 14 — Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N — Lock: (Y) / N — Labeled: (Y) / N — Well Damage: Y / (N)

ADDITIONAL NOTES: Oxidized Fe on outside of tubing.

FREE PRODUCT OBSERVED? Y / (N) — IF YES, DEPTH TO PRODUCT (FT BTOC): —

TOTAL DEPTH (FT BTOC): 18.23

DEPTH TO WATER (FT BTOC): - 9.82

WATER COLUMN HEIGHT (FT): = 8.41

SCREENED INTERVAL (FT BTOC): 8.1 - 18.1 — Above screen

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 10.82

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.37

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	8.49	0.367	3.18	5.63	185.1	142.7	9.85
10	1.0	8.58	0.364	2.17	5.55	176.2	76.19	9.86
15	1.5	8.51	0.364	1.98	5.51	166.7	42.10	9.86
20	2.0	8.34	0.365	1.81	5.53	160.8	27.21	9.86
25	2.5	8.50	0.367	1.35	5.58	154.2	18.95	9.87
30	3.0	8.36	0.367	1.48	5.64	148.7	13.48	9.87
35	3.5	8.64	0.367	1.56	5.69	143.6	10.74	9.87
40	4.0	8.61	0.370	1.50	5.75	138.4	9.37	9.87
45	4.5	8.20	0.373	1.56	5.79	136.1	8.22	9.87

DID PARAMETERS STABILIZE? (Y) / N — IF NO, WHY NOT? —

DID DRAWDOWN STABILIZE? (Y) / N — IF NO, WHY NOT? —

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N — IF NO, WHY NOT? —

WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other: —

SHEEN: Y / (N) — ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.0 gal. — CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): ~~OU6~~ OU2 DRMO YARD

SAMPLE ID: 20FWOU2 05 WG

LOCATION ID: AP-1001SR

FD SAMPLE ID / LOC ID / TIME:

LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate

CHECKED SAMPLE pH: (Y) / N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/13/20

TIME: 1420

SAMPLER: KM

WEATHER/TEMP: Sunny, 54°F

MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES: Oxidized Fe on outside of tubing.

TOTAL DEPTH (FT BTOC): 20.33

DEPTH TO WATER (FT BTOC): 11.85

WATER COLUMN HEIGHT (FT): 8.48

SCREENED INTERVAL (FT BTOC): 10.4 - 20.41

WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ Above screen

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* ~~11.40~~ 12.85

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.38

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	8.80	0.398	2.51	6.28	148.1	16.30	12.87
10	1.0	8.91	0.415	1.87	6.12	151.4	4.59	12.87
15	1.5	9.48	0.419	1.78	6.07	149.2	3.53	12.87
20	2.0	9.54	0.423	1.72	6.04	146.5	3.15	12.87
25	2.5	9.41	0.422	1.83	6.04	143.2	3.41	12.87
								~~12.87~~ KM
				KM				

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT?

WATER COLOR: Clear (Yellow) Orange Brown/Black (Sand/Silt) Other:

SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 3.0 gal.

CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2

SAMPLE ID: 20FWOU2 06 WG

LOCATION ID: AP-1001GR

FD SAMPLE ID / LOC ID / TIME:

LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate

CHECKED SAMPLE pH: (Y) / N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/14/20

TIME: 1015

SAMPLER: KM

WEATHER/TEMP: Sunny, 46°F

MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES: Oxidized Fe on outside of tubing.

TOTAL DEPTH (FT BTOC): 20.45

DEPTH TO WATER (FT BTOC): - 11.92

WATER COLUMN HEIGHT (FT): = 8.53

SCREENED INTERVAL (FT BTOC): 10.4 - 20.4

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~ Above Screen

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 12.92

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.39

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	9.48	0.423	1.46	6.00	137.5	126.5	11.99
10	1.0	9.91	0.421	1.09	6.00	138.2	81.13	12.00
15	1.5	9.55	0.419	0.91	5.98	136.5	36.95	12.01
20	2.0	9.28	0.417	0.83	5.98	133.8	23.21	12.01
25	2.5	9.19	0.417	0.79	6.00	130.3	13.69	12.01
30	3.0	9.26	0.416	0.84	6.04	125.7	8.29	12.01
35	3.5	9.36	0.415	1.00	6.08	122.7	4.94	12.01
40	4.0	9.38	0.416	0.89	6.06	122.0	3.73	12.01
45	4.5	9.36	0.416	0.86	6.09	118.7	2.24	12.01

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT?

WATER COLOR: Clear Yellow (Orange) Brown/Black (Sand/Silt) Other:

SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.0 gal.

CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2

SAMPLE ID: 20FWOU2 07 WG

LOCATION ID: AP-10017R

FD SAMPLE ID / LOC ID / TIME:

LABORATORY ANALYSIS (circle): (VOC) SVOC, GRO, DRO, (Dissolved Fe) (Sulfate)

CHECKED SAMPLE pH: (Y) / N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/14/20

TIME: 1105

SAMPLER: KM

WEATHER/TEMP: Sunny, 47°F

MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES: oxidized Fe on outside of tubing.

TOTAL DEPTH (FT BTOC): 20.40

DEPTH TO WATER (FT BTOC): - 11.51

WATER COLUMN HEIGHT (FT): = 8.89

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.45

SCREENED INTERVAL (FT BTOC): 10.4 - 20.4 Above Screen

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* 12.51

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	9.65	0.359	1.66	6.21	121.1	28.93	11.55
10	1.0	9.78	0.367	1.09	6.10	127.4	9.23	11.56
15	1.5	9.40	0.350	0.92	6.07	128.7	6.47	11.56
20	2.0	9.38	0.334	0.81	6.08	128.5	5.28	11.56
25	2.5	9.15	0.339	0.79	6.10	127.2	2.65	11.56
30	3.0	9.16	0.387	0.79	6.11	126.6	1.80	11.56
35	3.5	9.18	0.394	0.80	6.12	125.7	1.68	11.56

KM

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) / N IF NO, WHY NOT?

WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:

SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 4.0 gal.

CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2

SAMPLE ID: 20FWOU2 08 WG

LOCATION ID: AP-10018R

FD SAMPLE ID / LOC ID / TIME:

LABORATORY ANALYSIS (circle): (VOC) SVOC, GRO, DRO, (Dissolved Fe), (Sulfate)

CHECKED SAMPLE pH: (Y) / N

APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

DATE: 8/14/20

TIME: 1205

SAMPLER: KM

WEATHER/TEMP: Sunny, 46°F

MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other

SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other

SAMPLING EQUIPMENT: YSI #: 6 Turbidity Meter #: 14 Water Level: 15

WELL COMPLETION (circle): (Stick-up) / Flushmount

WELL CONDITION: Plug: (Y) / N Lock: (Y) / N Labeled: (Y) / N Well Damage: Y / (N)

FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC):

ADDITIONAL NOTES: Oxidized Fe on outside of tubing.

TOTAL DEPTH (FT BTOC): 20.42

DEPTH TO WATER (FT BTOC): - 11.38

WATER COLUMN HEIGHT (FT): = 9.04

GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)

1 CASING VOLUME [gal/ft x water column height (ft)]: 1.47

SCREENED INTERVAL (FT BTOC): 10.5-20.5

WATER LEVEL WITH RESPECT TO SCREEN (circle): (Across Screen) / ~~Below Screen~~ Above Screen

DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 12.38

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.5	8.93	0.474	0.73	6.20	128.3	86.79	11.40
10	1.0	9.95	0.471	2.63	6.14	131.4	57.53	11.40
15	1.5	9.23	0.469	0.61	6.17	128.4	31.90	11.40
20	2.0	9.52	0.466	0.59	6.22	124.6	20.02	11.40
25	2.5	9.67	0.464	0.62	6.26	120.7	13.89	11.40
30	3.0	8.39	0.462	0.59	6.21	120.8	7.89	11.40
35	3.5	8.23	0.460	0.63	6.19	120.7	4.35	11.40
40	4.0	8.36	0.458	0.72	6.22	117.4	3.36	11.40
45	4.5	8.31	0.458	0.66	6.24	113.9	1.76	11.40

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT?

DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT?

FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) N IF NO, WHY NOT?

WATER COLOR: Clear Yellow (Orange) Brown/Black (Sand/Silt) Other:

SHEEN: Y (N) ODOR: Y (N)

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5 gal.

CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N

DISPOSAL METHOD*: POL Water / (CERCLA Waste)

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2 DRMO YD
DATE: 8/14/20
SAMPLE ID: 20FWOU2 09 WG
TIME: 1425
LOCATION ID: AP-8916
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP: PT CLOUDY / 70°F
LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate
MS/MSD PERFORMED? Y / N
CHECKED SAMPLE pH: Y / N
APPROXIMATE VOLUME ADDED (mL): HCl = — HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other
SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 16
WELL COMPLETION (circle): Stick-up / Flushmount
WELL CONDITION: Plug: Y / N Lock: Y / N Labeled: Y / N Well Damage: Y / N
FREE PRODUCT OBSERVED? Y / N IF YES, DEPTH TO PRODUCT (FT BTOC):
ADDITIONAL NOTES:
TOTAL DEPTH (FT BTOC): 16.54
SCREENED INTERVAL (FT BTOC): 6.3-16.3
DEPTH TO WATER (FT BTOC): - 10.25
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / Below Screen — Above Screen
WATER COLUMN HEIGHT (FT): = 6.29
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC) *: 6.3 = 11.25
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.02

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.6	7.65	0.759	1.23	4.56	189.8	16.23	10.34
10	1.2	7.33	0.686	0.89	4.99	153.5	6.18	10.36
15	1.8	7.35	0.650	0.72	5.27	100.7	5.16	10.36
20	2.4	7.36	0.642	0.68	5.71	72.5	5.96	10.37
25	3	7.33	0.635	0.62	5.89	59.8	5.28	10.37
30	3.6	7.32	0.632	0.57	6.00	55.3	2.98	10.37
35	4.2	7.29	0.632	0.55	6.05	52.0	3.15	10.37
40	4.8	7.30	0.631	0.53	6.07	50.2	3.02	10.37

CB

DID PARAMETERS STABILIZE? Y / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? Y / N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? Y / N IF NO, WHY NOT?
WATER COLOR: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
SHEEN: Y / N ODOR: Y / N POL

ADDITIONAL NOTES:
PIC COLLECTING SO4 SAMPLE

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5
CONTAINERIZED AND DISPOSED OF AS IDW? Y / N
DISPOSAL METHOD*: POL Water / CERCLA Waste

* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Bruce ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2 DRMO YARD
DATE: 8/14/20
SAMPLE ID: 20FWOU2 10 WG
TIME: 1050
LOCATION ID: AD-10445MW
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME: —
WEATHER/TEMP: SUNNY/55°F
LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate
MS/MSD PERFORMED? Y / N
CHECKED SAMPLE pH: Y / N
APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = 0

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other
SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 16
WELL COMPLETION (circle): Stick-up / Flushmount
ADDITIONAL NOTES:
WELL CONDITION: Plug: Y / N Lock: Y / N Labeled: Y / N Well Damage: Y / N
FREE PRODUCT OBSERVED? Y / N IF YES, DEPTH TO PRODUCT (FT BTOC): —
TOTAL DEPTH (FT BTOC): 20.41
SCREENED INTERVAL (FT BTOC): 10.4-20.4 Above Screen
DEPTH TO WATER (FT BTOC): - 11.83
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ CB
WATER COLUMN HEIGHT (FT): = 8.58
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 12.83
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.4
* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	~~.75~~ ~~10.58~~	10.58	0.904	1.33	5.05	222.1	34.29	11.86
10	1.5	10.14	0.907	0.83	5.17	211.1	27.03	11.86
15	2.25	10.00	0.909	0.66	5.36	200.1	15.31	11.87
20	3	9.94	0.910	0.53	5.58	185.3	14.98	11.87
25	3.75	10.00	0.910	0.50	5.68	180.9	10.76	11.87
30	4.5	10.01	0.910	0.50	5.75	177.2	9.59	11.87
35	5.25	10.03	0.911	0.48	5.78	176.5	7.11	11.87

CB

DID PARAMETERS STABILIZE? Y / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? Y / N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? Y / N IF NO, WHY NOT?
WATER COLOR: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
SHEEN: Y / N ODOR: Y / N

ADDITIONAL NOTES:

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 6
CONTAINERIZED AND DISPOSED OF AS IDW? Y / N
DISPOSAL METHOD*: POL Water / CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2 DRMO YD
SAMPLE ID: 20FWOU2 11 WG
LOCATION ID: AP-1044GMW
FD SAMPLE ID / LOC ID / TIME:
LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate
CHECKED SAMPLE pH: Y / N
APPROXIMATE VOLUME ADDED (mL): HCl = _____ HNO_3 = _____

DATE: 8/14/20
TIME: 1200
SAMPLER: CB
WEATHER/TEMP: SUNNY/61°F
MS/MSD PERFORMED? Y / (N)

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): (Submersible) / Peristaltic / Bladder / Other
SAMPLE METHOD: (Submersible) / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: 7 Turbidity Meter #: 11 Water Level: 16
WELL COMPLETION (circle): Stick-up / Flushmount
WELL CONDITION: Plug: (Y) N Lock: (Y) N Labeled: (Y) N Well Damage: Y / (N)
FREE PRODUCT OBSERVED? Y / (N) IF YES, DEPTH TO PRODUCT (FT BTOC): _____
TOTAL DEPTH (FT BTOC): 20.03
DEPTH TO WATER (FT BTOC): - 11.07
WATER COLUMN HEIGHT (FT): = 8.96
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]: 1.46

ADDITIONAL NOTES:

SCREENED INTERVAL (FT BTOC): 10.5 - 20.5
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC)*: 12.07

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
5	0.65	6.84	0.493	1.42	3.76	267.7	60.85	11.08
10	1.3	6.39	0.495	0.90	4.30	224.8	31.72	11.08
15	1.95	6.30	0.497	0.69	4.75	190.3	24.15	11.08
20	2.6	6.28	0.496	0.59	5.39	145.6	16.09	11.08
25	3.25	6.37	0.496	0.52	5.52	120.7	12.41	11.08
30	3.9	6.35	0.496	0.54	5.66	105.2	7.82	11.08
35	4.55	6.35	0.496	0.51	5.70	100.7	9.11	11.08
40	5.2	6.38	0.496	0.50	5.75	97.3	6.22	11.08

DID PARAMETERS STABILIZE? (Y) / N IF NO, WHY NOT? _____
DID DRAWDOWN STABILIZE? (Y) / N IF NO, WHY NOT? _____
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? (Y) N IF NO, WHY NOT? _____
WATER COLOR: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: _____
SHEEN: Y / (N) ODOR: Y / (N)

ADDITIONAL NOTES:
PIC AT 1125

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: 5.25
CONTAINERIZED AND DISPOSED OF AS IDW? (Y) / N
DISPOSAL METHOD*: POL Water / (CERCLA Waste)
* Purge water stored in the DERA Building for characterization prior to disposal

GROUNDWATER SAMPLE FORM

Brice ENGINEERING

PROJECT NAME: Operable Unit 2 — **FORT WAINWRIGHT, ALASKA**

ANALYTICAL SAMPLE INFORMATION

SITE / PLUME (if applicable): OU2 DRMO YARD
DATE: 8/14/20
SAMPLE ID: 20FWOU2 12 WG
TIME: 1530
LOCATION ID: WSW
SAMPLER: CB
FD SAMPLE ID / LOC ID / TIME:
WEATHER/TEMP:
LABORATORY ANALYSIS (circle): VOC, SVOC, GRO, DRO, Dissolved Fe, Sulfate
MS/MSD PERFORMED? Y / N
CHECKED SAMPLE pH: Y / N
APPROXIMATE VOLUME ADDED (mL): HCl = 0 HNO_3 = —

SAMPLE COLLECTION EQUIPMENT AND MONITORING WELL INFORMATION

PURGE METHOD (circle): Submersible / Peristaltic / Bladder / Other
SAMPLE METHOD: Submersible / Peristaltic / Bladder / Other
SAMPLING EQUIPMENT: YSI #: Turbidity Meter #: Water Level:
WELL COMPLETION (circle): Stick-up / Flushmount
WELL CONDITION: Plug: Y / N Lock: Y / N Labeled: Y / N Well Damage: Y / N
FREE PRODUCT OBSERVED? Y / N IF YES, DEPTH TO PRODUCT (FT BTOC):
TOTAL DEPTH (FT BTOC):
DEPTH TO WATER (FT BTOC): - NA
WATER COLUMN HEIGHT (FT): =
GALLONS/FT OF CASING (circle): 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
1 CASING VOLUME [gal/ft x water column height (ft)]:

ADDITIONAL NOTES: DRAIN WATER THROUGH HOSE BIB
SCREENED INTERVAL (FT BTOC): (PRE FILTERS)
WATER LEVEL WITH RESPECT TO SCREEN (circle): Across Screen / ~~Below Screen~~ / Above Screen
DEPTH OF TUBING OR PUMP INTAKE (FEET BTOC):* NA

* Tubing/pump intake must be set approximately 1 foot below the water table for wells screened across the water table, or within the top 1 foot of the screen 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.

GROUNDWATER QUALITY PARAMETERS, STABILITY, AND SAMPLING NOTES

FIELD PARAMETERS AND STABILITY CRITERIA		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 ft after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
TIME PURGED (min)	VOLUME PURGED (gal)	TEMPERATURE (°C)	CONDUCTIVITY (mS/cm)	DISSOLVED O_2 (mg/L)	pH	ORP (mV)	TURBIDITY (NTU)	WATER LEVEL (ft)
		PURGED WSW FOR 30 MINUTES INTO FLOOR DRAIN THROUGH GARDEN HOSE. SAMPLE COLLECTED OUT OF HOSE BIB (DISCONNECTED HOSE)						
				CB				

DID PARAMETERS STABILIZE? Y / N IF NO, WHY NOT?
DID DRAWDOWN STABILIZE? Y / N IF NO, WHY NOT?
FLOWRATE BETWEEN 0.03 AND 0.15 GPM? Y / N IF NO, WHY NOT?
WATER COLOR: Clear / Yellow / Orange / Brown/Black (Sand/Silt) / Other:
SHEEN: Y / N ODOR: Y / N

ADDITIONAL NOTES: * NO PURGE WATER COLLECTED

IDW PURGE WATER MANAGEMENT

VOLUME GENERATED: *
CONTAINERIZED AND DISPOSED OF AS IDW? Y / N
DISPOSAL METHOD*: POL Water / CERCLA Waste
* Purge water stored in the DERA Building for characterization prior to disposal

Submersible Pump Equipment Blank

Rinsate #: 1

Sample ID: 20FW002EB01WQ

Date: 8/14/20

Time: 1405

Analysis: VOC, DRO, Dissolved Fe, Sulfate

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

OU2 FT. WAINWRIGHT

8/14/20

0800 - 0936 - STOP - CWS PREP + FUEL VAN & P/U WASP SPRAY FOR WELL AT DEMO YP.

0930 - 1600 DEMO YP

1050 - CWS AP - 10445 MW

1200 - CWS AP - 10446 MW

1425 - CWS AP - 8916

1530 - CWS WSW (MOVE TO IDW)

1700 - 1800 - STOP - CLEAN UP.

Chr Boyle

Scale: 1 square = _____

Scale: 1 square = _____

1 8/13/20 Sunny, 54°F

PPE: Level D

Personnel: K. Milke - Sci.

Task: Start sampling OU2 wells.

1249 Arrived @ AP-7559. Setting up equipment.

1346 Done sampling @ AP-7559. See field form for purging parameters. Heading to AP-10015R.

1346 Arrived @ AP-10015R. Setting up equipment. Took 1 photo (SE).

1427 Done @ AP-10015R. Heading to shop.

Scale: 1 square = _____

2 8/14/20 Sunny, 43°F

PPE: Level D

Personnel: K. Milke - Sci.
C. Boese - Env. Tech.

Task: Finish sampling OU2 wells.

0515 Calibrated YSI & turbidimeter and got bottles ready. See calibration forms.

0751 Arrived @ AP-7560. Setting up equipment. Hornets nest. Going to AP-8914R.

~~0914 Done @ AP-7560. See field form for purging parameters. Heading to AP-~~

0810 Arrived @ AP-8914R. Setting up equipment.

0914 Done @ AP-8914R. See field form for purging parameters. Heading to AP-.

0914 Arrived @ AP-10016R. Setting up equipment.

Scale: 1 square = _____

Rite in the Rain

3 8/14/20 Cont'd

1021 Done @ AP-10016R. See field form for purging parameters. Heading to AP-10017R.

1021 Arrived @ AP-10017R, Setting up equipment.

1112 Done @ AP-10017R See field form for purging parameters. Heading to AP-10018R.

1112 Arrived @ AP-10018R. Setting up equipment.

1213 Done @ AP-10018R. See field form for purging parameters. Heading to AP-7560.

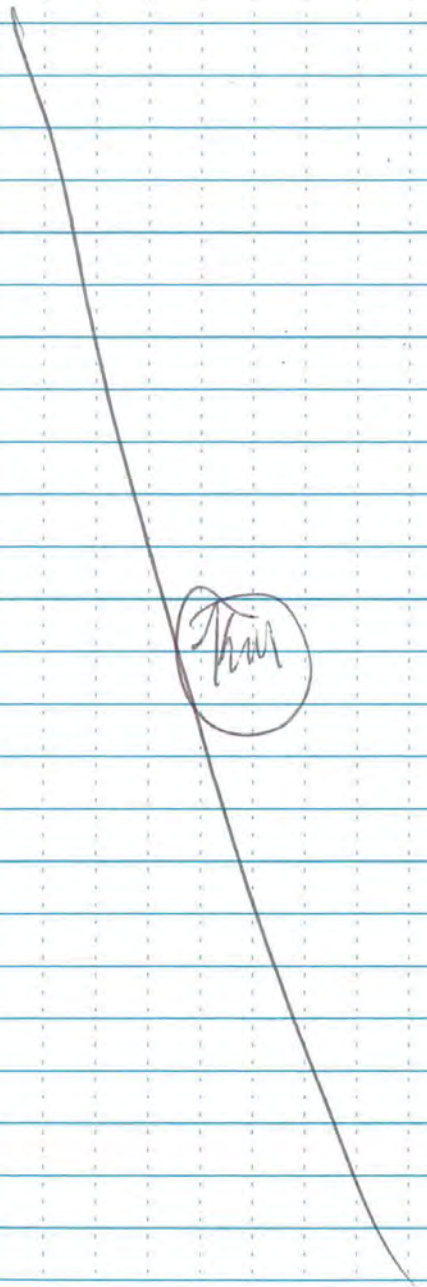
1213 Arrived @ AP-7560, Setting up equipment.

1302 Done @ AP-7560, See field form for purging parameters. Heading to Shop.

Scale: 1 square = _____

8/14/20 Cont'd

4



Scale: 1 square = _____

Rite in the Rain

This page intentionally blank

APPENDIX D
PHOTOGRAPH LOG

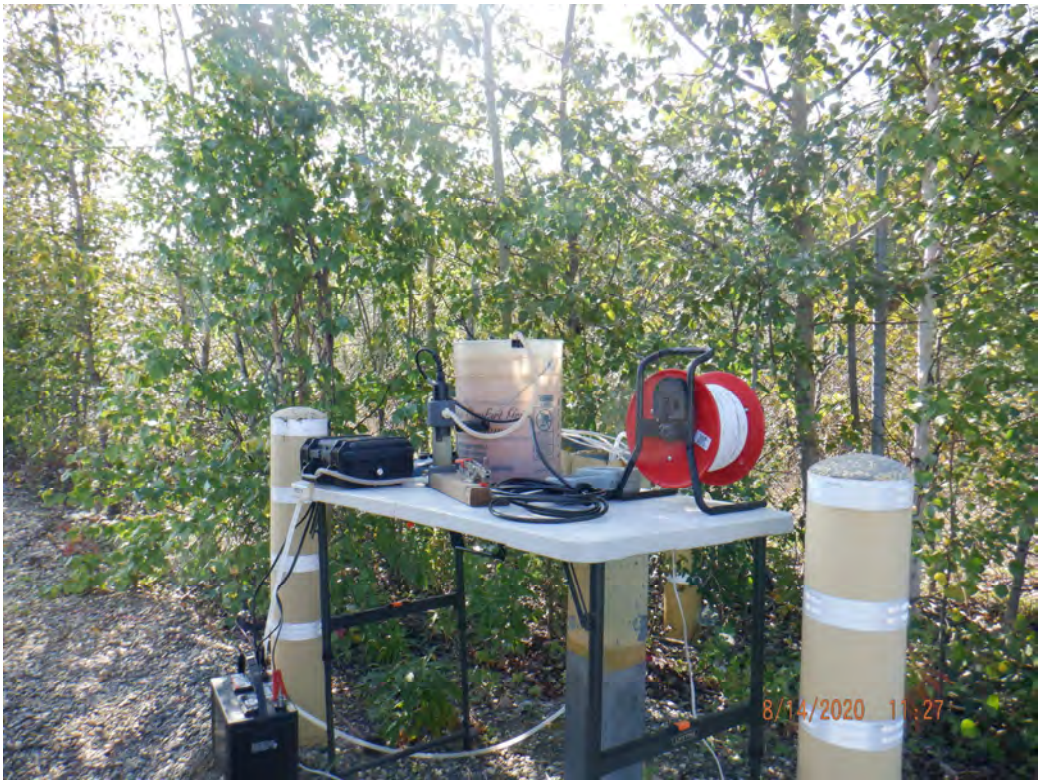
This page intentionally blank

Collecting groundwater parameters while purging monitoring well AP-10016R.
Water Supply Well building in background (view SE)

Collecting a groundwater sample at AP-8916 (view NA)

Conducting an IC inspection at OU2; well AP-10445MW is intact and secured (view SW)

Collecting groundwater parameters while purging monitoring well AP-10015R (view SE)



Groundwater sampling setup at monitoring well AP-10446MW (view SE)

Conducting an IC inspection at OU2; no IC discrepancies were observed in the area surrounding the water supply tank and building (view N)

This page intentionally blank

APPENDIX E
LTMO RESULTS

This page intentionally blank

MAROS Summary 1—DRMO1 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: OU2 2020
User Name: BENG
Location: Fort Wainwright
State: Alaska

Time Period: 10/1/2010 **to** 8/13/2020
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
TETRACHLOROETHYLENE(PCE)								
AP-10015	T	14	11	1.7E-03	9.8E-04	No	I	I
AP-10016	S	14	13	6.5E-03	5.6E-03	No	NT	NT
AP-10017	S	14	13	1.3E-03	1.0E-03	No	PI	I
AP-10018	S	14	13	5.2E-03	2.3E-03	No	PD	NT
AP-7559	T	14	12	3.2E-03	3.4E-03	No	PI	NT
AP-7560	T	11	10	2.0E-03	1.8E-03	No	S	NT
AP-8914	S	14	11	3.2E-03	7.3E-04	No	NT	NT
TRICHLOROETHYLENE (TCE)								
AP-10015	T	14	14	1.7E-03	1.4E-03	No	PD	PD
AP-10016	S	14	13	1.1E-03	8.8E-04	No	S	S
AP-10017	S	14	6	2.7E-04	2.5E-04	No	D	D
AP-10018	S	14	12	2.8E-03	2.8E-03	No	D	D
AP-7559	T	14	12	5.0E-04	5.1E-04	No	NT	D
AP-7560	T	11	9	1.6E-03	1.9E-03	No	NT	NT
AP-8914	S	14	12	2.4E-03	1.9E-03	No	S	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, December 29, 2020 Page 1 of 1

MAROS Summary 2—DRMO1 Spatial Moment Analysis Summary

MAROS Spatial Moment Analysis Summary

Project: OU2 2020
Location: Fort Wainwright

User Name: BENG
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	3.6E-03	1,394,880	3,954,914	53	427	864	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	1.2E-03	1,394,880	3,954,911	51	381	962	6
8/31/2012	8.8E-03	1,394,798	3,954,962	145	1,594	1,239	7
8/27/2013	1.4E-03	1,394,807	3,954,963	139	2,461	1,670	7
10/9/2014	2.0E-02	1,394,804	3,954,964	142	1,944	1,251	7
8/24/2015	1.3E-02	1,394,797	3,954,970	151	1,748	1,175	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
8/7/2019	8.3E-03	1,394,798	3,954,968	149	1,834	1,355	7
8/13/2020	2.3E-02	1,394,821	3,954,951	121	2,958	2,037	7
TRICHLOROETHYLENE (TCE)							
10/11/2010	8.9E-03	1,394,819	3,954,953	123	2,770	1,819	7
2/23/2011	1.6E-03	1,394,876	3,954,921	62	327	686	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	2.8E-03	1,394,804	3,954,965	143	2,185	1,451	7
10/9/2014	7.6E-03	1,394,828	3,954,946	113	2,793	1,838	7
8/24/2015	8.6E-03	1,394,804	3,954,961	140	2,157	1,560	7
9/14/2016	9.6E-03	1,394,810	3,954,958	133	2,484	1,748	7
8/9/2017	4.8E-03	1,394,810	3,954,957	133	2,518	1,772	7
8/16/2018	4.9E-03	1,394,799	3,954,968	149	2,045	1,522	7
8/7/2019	4.9E-03	1,394,795	3,954,970	153	1,770	1,371	7
8/13/2020	4.7E-03	1,394,799	3,954,968	149	2,037	1,495	7

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

Project: OU2 2020
Location: Fort Wainwright

User Name: BENG
State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	TETRACHLOROETHYLENE(PCE)	0.65	27	92.1%	PI
	TRICHLOROETHYLENE (TCE)	0.51	5	58.5%	NT
1st Moment: Distance to Source					
	TETRACHLOROETHYLENE(PCE)	0.33	41	98.7%	I
	TRICHLOROETHYLENE (TCE)	0.30	53	99.8%	I
2nd Moment: Sigma XX					
	TETRACHLOROETHYLENE(PCE)	0.49	17	80.6%	NT
	TRICHLOROETHYLENE (TCE)	0.47	-5	58.5%	S
2nd Moment: Sigma YY					
	TETRACHLOROETHYLENE(PCE)	0.29	25	90.4%	PI
	TRICHLOROETHYLENE (TCE)	0.28	5	58.5%	NT

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

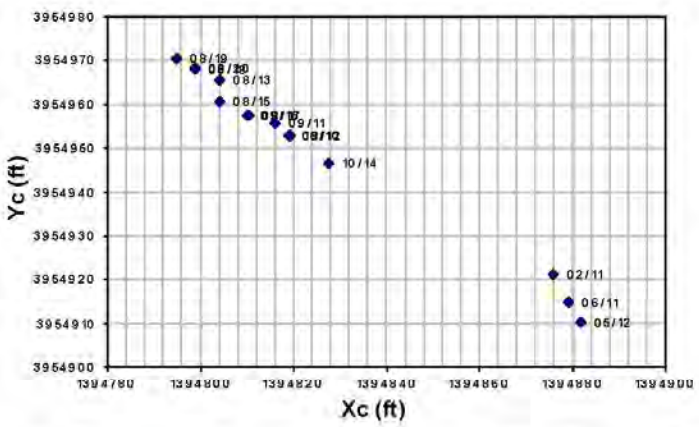
MAROS First Moment Analysis

Project: OU2 2020 **User Name:** BENG

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)	1,394,876	3,954,921	62	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)	1,394,892	3,954,910	49	6
8/31/2012	TRICHLOROETHYLENE (TCE)	1,394,819	3,954,953	123	7
8/27/2013	TRICHLOROETHYLENE (TCE)	1,394,804	3,954,965	143	7
10/9/2014	TRICHLOROETHYLENE (TCE)	1,394,828	3,954,946	113	7
8/24/2015	TRICHLOROETHYLENE (TCE)	1,394,804	3,954,961	140	7
9/14/2016	TRICHLOROETHYLENE (TCE)	1,394,810	3,954,958	133	7
8/9/2017	TRICHLOROETHYLENE (TCE)	1,394,810	3,954,957	133	7
8/16/2018	TRICHLOROETHYLENE (TCE)	1,394,799	3,954,968	149	7
8/7/2019	TRICHLOROETHYLENE (TCE)	1,394,795	3,954,970	153	7
8/13/2020	TRICHLOROETHYLENE (TCE)	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.

MAROS Version 2.2, 2006, AFCEE 12/29/2020 Page 1 of 1

MAROS Summary 4 —DRMO1 First Moment Analysis Plot for PCE

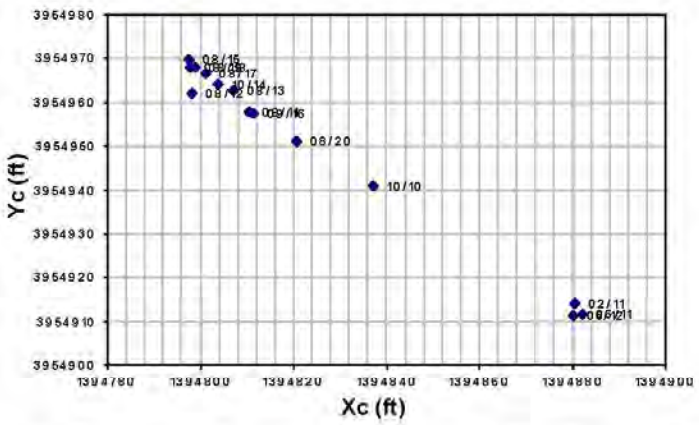
MAROS First Moment Analysis

Project: OU2 2020 **User Name:** BENG

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	1,394,880	3,954,914	53	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	1,394,880	3,954,911	51	6
8/31/2012	TETRACHLOROETHYLENE(P	1,394,798	3,954,962	145	7
8/27/2013	TETRACHLOROETHYLENE(P	1,394,807	3,954,963	139	7
10/9/2014	TETRACHLOROETHYLENE(P	1,394,804	3,954,964	142	7
8/24/2015	TETRACHLOROETHYLENE(P	1,394,797	3,954,970	151	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
8/7/2019	TETRACHLOROETHYLENE(P	1,394,798	3,954,968	149	7
8/13/2020	TETRACHLOROETHYLENE(P	1,394,821	3,954,951	121	7

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

MAROS Version 2.2, 2006, AFCEE 12/29/2020 Page 1 of 1

MAROS Summary 5 —DRMO1 Sampling Location Optimization Results

MAROS Sampling Location Optimization Results

Project: OU2 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: From Sample Event 36 (10/11/2010) to Sample Event 49 (8/13/2020)

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	☑	0.375	0.000	0.763	☐
AP-10016	1394881.00	3954866.00	☑	0.348	0.000	0.620	☐
AP-10017	1394939.13	3954849.50	☑	0.322	0.000	0.595	☐
AP-10018	1394914.75	3954897.25	☑	0.220	0.000	0.517	☐
AP-7559	1394820.13	3955011.25	☑	0.376	0.000	0.737	☐
AP-7560	1394632.88	3955071.25	☑	0.218	0.000	0.691	☐
AP-8914	1394907.00	3954874.75	☑	0.329	0.000	0.778	☐
TRICHLOROETHYLENE (TCE)							
AP-10015	1394860.00	3954905.50	☑	0.162	0.012	0.695	☑
AP-10016	1394881.00	3954866.00	☑	0.218	0.014	0.432	☐
AP-10017	1394939.13	3954849.50	☑	0.605	0.000	0.736	☐
AP-10018	1394914.75	3954897.25	☑	0.262	0.027	0.731	☐
AP-7559	1394820.13	3955011.25	☑	0.382	0.108	0.687	☐
AP-7560	1394632.88	3955071.25	☑	0.313	0.037	0.730	☐
AP-8914	1394907.00	3954874.75	☑	0.316	0.151	0.624	☐

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, December 29, 2020 Page 1 of 1

MAROS Summary 6 —DRMO1 Sampling Location Optimization, All COCs

MAROS Sampling Location Optimization

Results by Considering All COCs

Project: OU2 2020 **User Name:** BENG

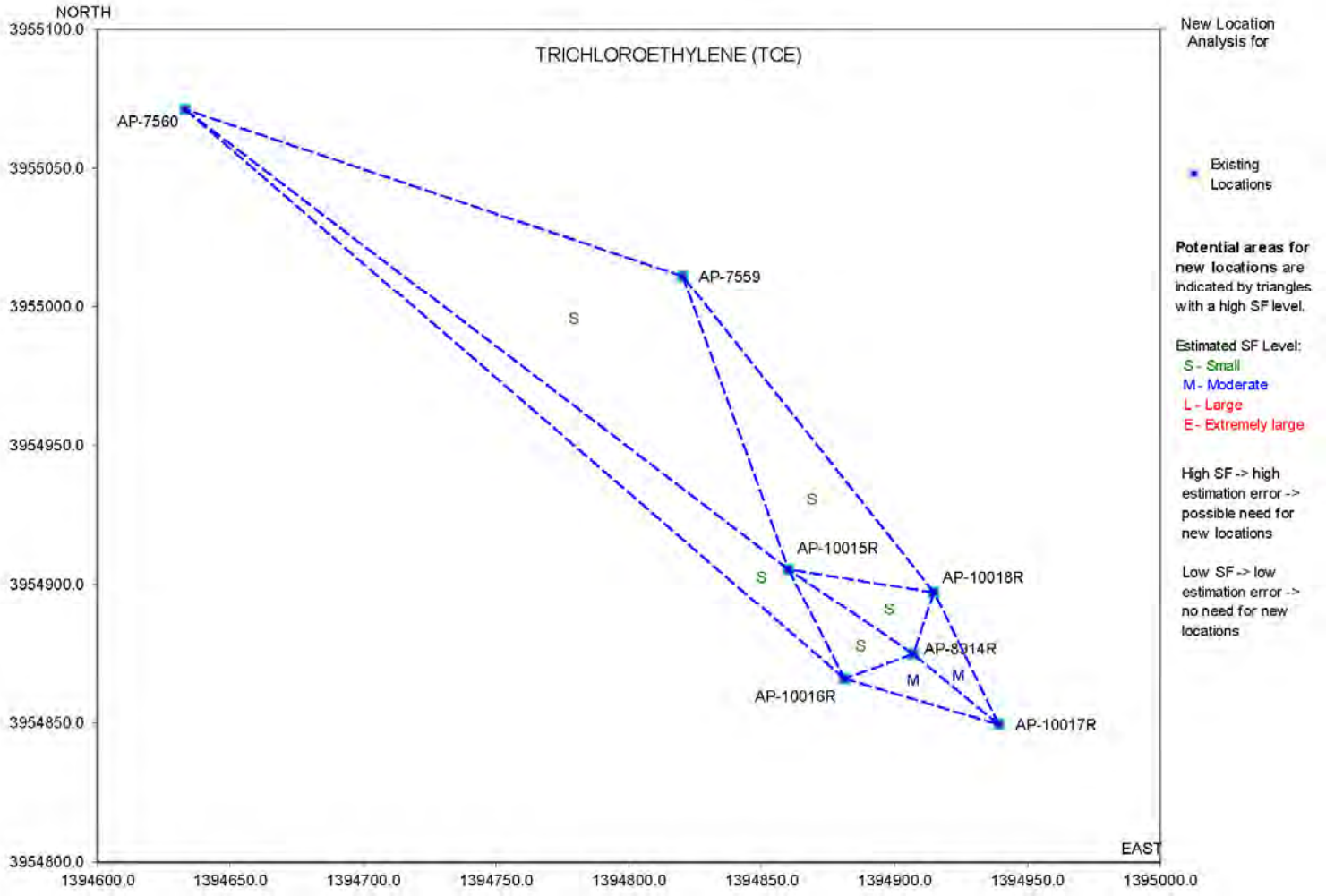
Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 36 10/11/2010 **to** Sample Event 49 8/13/2020

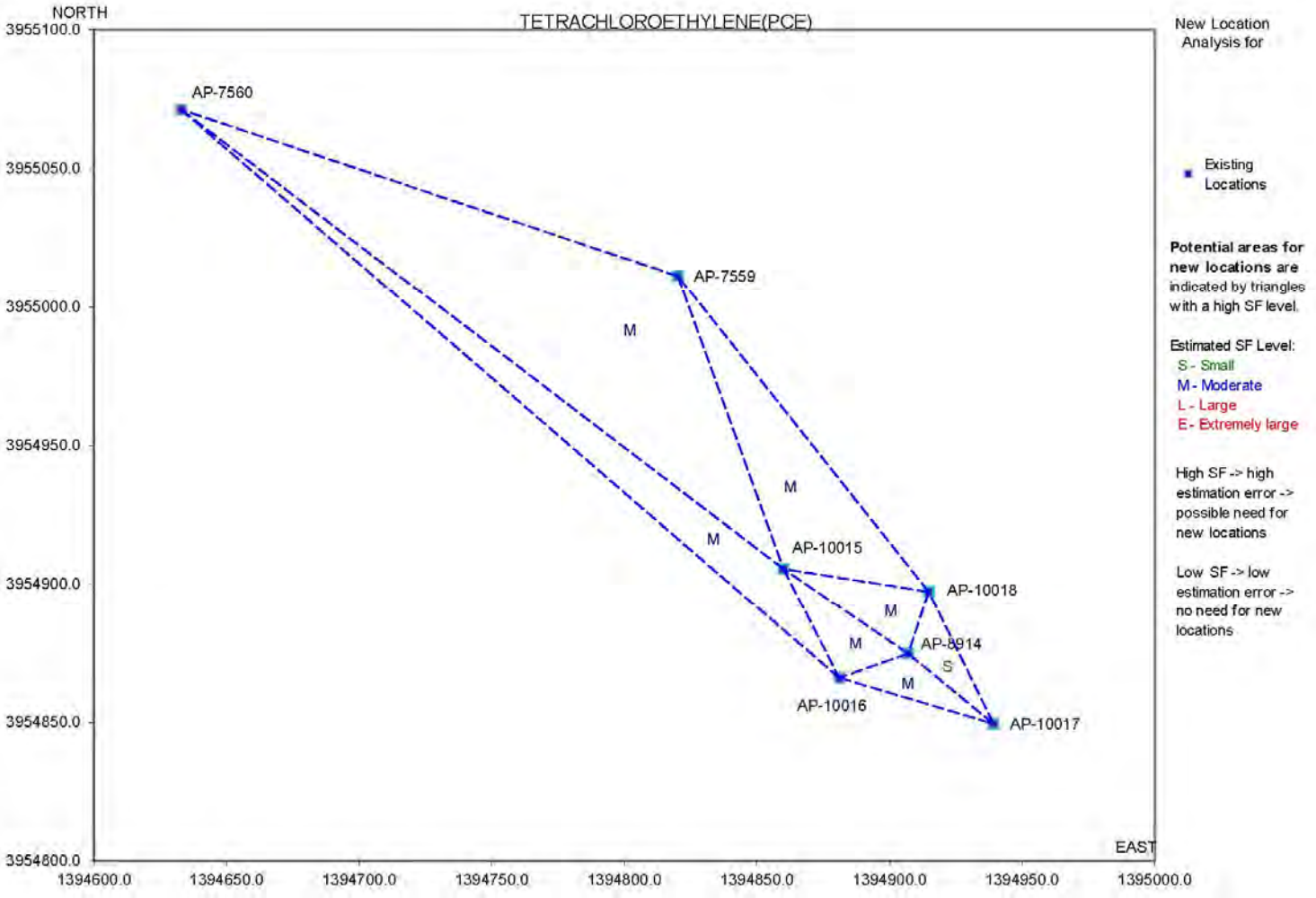
Well	X (feet)	Y (feet)	Number of COCs	COC-Averaged Slope Factor*	Abandoned?
AP-10015	1394860.00	3954905.50	2	0.288	☐
AP-10016	1394881.00	3954866.00	2	0.283	☐
AP-10017	1394939.13	3954849.50	2	0.464	☐
AP-10018	1394914.75	3954897.25	2	0.241	☐
AP-7559	1394820.13	3955011.25	2	0.379	☐
AP-7560	1394632.88	3955071.25	2	0.265	☐
AP-8914	1394907.00	3954874.75	2	0.323	☐

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

MAROS Summary 7 —DRMO1 Well Redundancy Analysis, TCE



MAROS Summary 8 —DRMO1 Well Redundancy Analysis, PCE



MAROS Summary 9 —DRMO1 Sampling Frequency Optimization

MAROS Sampling Frequency Optimization Results

Project: OU2 2020 **User Name:** BENG

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 14

"Recent Period" defined by events: **From** Sample Event 36 10/11/2010 **To** Sample Event 49 8/13/2020

"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	Biennial	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, December 29, 2020 Page 1 of 1

MAROS Summary 10 —DRMO4 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: OU2 2020
User Name: BENG
Location: Fort Wainwright
State: Alaska

Time Period: 10/1/2011 **to** 8/14/2020
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
TETRACHLOROETHYLENE(PCE)								
AP-8916	S	11	10	3.3E-03	2.7E-03	No	S	PD
PO-5	S	11	7	4.4E-03	3.8E-03	No	S	PD
Probe B	T	11	0	2.5E-04	2.5E-04	Yes	S	S
TRICHLOROETHYLENE (TCE)								
AP-8916	S	11	4	7.0E-04	2.5E-04	No	NT	NT
PO-5	S	11	8	2.5E-03	3.3E-03	No	S	PD
Probe B	T	11	1	2.4E-04	2.5E-04	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.

This page intentionally blank